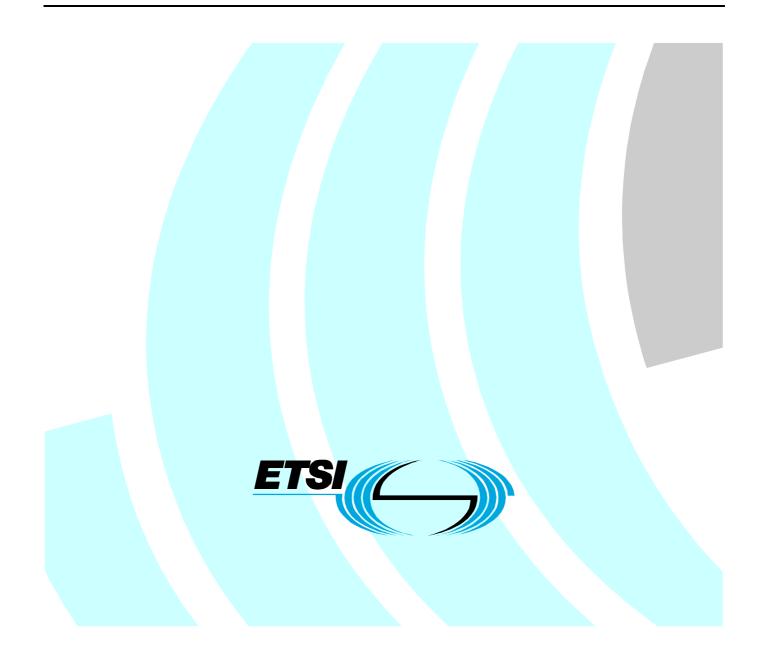# ETSI TS 102 587-3 V1.1.1 (2007-04)

Technical Specification

**Electromagnetic compatibility and
Radio spectrum Matters (ERM);
Peer-to-Peer Digital Private Mobile Radio;
Part 3: Requirements catalogue**

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 3 of a multi-part deliverable covering the Electromagnetic compatibility and Radio spectrum Matters (ERM); Conformance testing for the Peer-to-Peer Digital Private Mobile Radio, as identified below:

Part 1:   "Protocol Implementation Conformance Statement (PICS) proforma";

Part 2:   "Test Suite Structure and Test Purposes (TSS&TP) specification";

Part 3:   "Requirements catalogue";

Part 4:   "Abstract Test Suite (ATS)";

Part 5:   "Interoperability Test Suite Structure and Test Purposes (TSS & TP) specification".

1 Scope

The present document is to provide a catalogue of requirements extracted from ETSI Specifications. The catalogues has been written based on the test specification framework defined in TS 102 351 [2].

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

[1] ETSI TS 102 490 (V1.3.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Peer-to-Peer Digital Private Mobile Radio using FDMA with a channel spacing of 6,25 kHz with e.r.p. of up to 500 mW".

[2] ETSI TS 102 351: "Methods for Testing and Specification (MTS); Internet Protocol Testing (IPT); IPv6 Testing: Methodology and Framework".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

conditionally mandatory: requirement that shall be supported by a standard conformant equipment if and only if the condition(s) stated within its requirement text are met

NOTE: If one of these conditions is not met the requirement is considered to be not applicable.

EXAMPLE: Such a condition may be the support of an optional higher level requirement by the equipment.

conditionally optional: requirement that may be supported by a standard conformant equipment if and only if the condition(s) stated within its requirement text are met

NOTE: If one of these conditions is not met the requirement is considered to be not applicable.

mandatory: requirement that shall be supported by a standard conformant equipment

optional: requirement that may be supported by a standard conformant equipment

not applicable: requirement that does not have to be met by a standard conformant equipment

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ACK   ACKnowledgment
AI   Air Interface
ARQ   Automatic Retransmission reQuest
CC   Colour Code
CCH   Control CHannel
CI   Call Information
Cont   Continuation flag
CRC   Cyclic Redundancy Checksum for data error detection
CSF   Configured Services and Facilities
Di-bit   2 bits grouped together to represent a 4-level symbol
DP   Data Position
ET   End Type
FDMA   Frequency Division Multiple Access
FEC   Forward Error Correction
FN   Frame Numbering
HI   Header Information
HT   Header Type
ID   IDentifier
ISF   Initial Services and Facilities
MFID   Manufacturer's FID
MS   Mobile Station
NACK   Negative ACKnowledgment
OACSU   Off Air Call Set Up
PAR   PARameter data
PDF   Packet Data Format
RF   Radio Frequency
RSSI   Received Signal Strength Indication
SLD   SLow Data
SYNC   SYNChronization
TCH   Traffic CHannel

4 Requirements Catalogue

4.1 dPMR common requirements

4.1.1 All Call

RQ_001_0824	**All Call:**	
TS 102 490 [1]	Clause 8.1.1.1, paragraph 3	*Type: Mandatory*
Applies to:	ISF	
Requirement:	**A dPMR radio shall support voice group "All call" supplementary service.**	
Specification Text:	{{**All radios will decode an All call (common ID = 255) irrespective of the common ID selected by the user**}}. However, radios that have 255 selected as the common ID will only respond to calls addressed to a common ID of 255.	
Family:	**RQ_001_0804**, RQ_001_0824, RQ_001_0858	
Test Purposes:	None	

RQ_001_0858   **All Call:**

TS 102 490 [1]   Clause 8.1.1.1, paragraph 3   *Type:* Conditionally Mandatory

Applies to: ISF

Requirement: **IF an ISF radio Common ID is set to 255**
                         THEN the radio shall only respond to call addressed to Common ID of 255.

Specification Text: All radios will decode an All call (common ID = 255) irrespective of the common ID selected
                         by the user. {{**However, radios that have 255 selected as the common ID will only respond to
                         calls addressed to a common ID of 255**}}.

Family: **RQ_001_0804**, RQ_001_0824, RQ_001_0858
Test Purposes: None

4.1.2   Channel Access

RQ_001_1001   **Channel Access:**

TS 102 490 [1]   Clause 10.1, paragraph 2   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **A caller radio shall listen before transmit. When the received signal level has**
                         not exceeded -105 dBm for the duration of the T_ch_chk timer then the radio
                         shall assume the channel to be free.

Specification Text: When determining whether activity is present on a channel, the radio shall
                         monitor the RSSI level. {{**If after a maximum period of time (T_ch_chk) the RSSI**
                         level has not exceeded a configurable (within a predefined range) threshold
                         RSSI_LO, then the radio shall assume that activity is not present on the
                         channel.}}
                         RSSI_LO shall be set to -105 dBm ± 3 dB.

Family: No Duplicates
Test Purposes: None

RQ_001_1002   **Channel Access:**

TS 102 490 [1]   Clause 10.1, paragraph 5   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **A radio shall listen before transmitting.**
                         IF the received signal level is equal or above -105 dBm
                         AND the radio can synchronize on the channel.
                         THEN the radio shall assume that there is dPMR activity on the channel.

Specification Text: If however the RSSI level does exceed this threshold, then the radio shall
                         assume that activity is present on the channel and it shall attempt to become
                         frame synchronized to the activity.

                         {{**If the radio is successful in becoming frame synchronized to the activity,**
                         then the radio shall assume that 6,25 kHz FDMA activity is present on the
                         channel. }}

Family: No Duplicates

Test Purposes: None

RQ_001_1003   **Channel Access:**

TS 102 490 [1]   Clause 10.1, paragraph 5   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **A radio shall listen before transmitting.**
                        IF the received signal level is above -105 dBm
                        AND the radio can not synchronize to the channel for the duration of the
                        T_ch_free timer
                        THEN it shall assume the activity is not dPMR.

Specification Text: If however the RSSI level does exceed this threshold, then the radio shall
                        assume that activity is present on the channel and it shall attempt to become
                        frame synchronized to the activity.

                        {{**If however after a maximum period of time (T_ch_free), the radio has not**
                        become frame synchronized to the activity, then the radio shall assume that the
                        activity is non-6,25 kHz FDMA activity.}}

Family: No Duplicates

Test Purposes: None

RQ_001_1004   **Channel Access:**

TS 102 490 [1]   Clause 10.1, paragraph 5   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **A radio shall listen before transmitting. When the received signal level is**
                        above -105 dBm and the radio manages to synchronize to the channel but the
                        color code is incorrect then it shall assume the activity is interference.

Specification Text: If the radio is successful in becoming frame synchronized to the activity, then
                        the radio shall assume that 6,25 kHz FDMA activity is present on the channel.

                        {{**If the Colour Code is different then the radio shall assume that the activity**
                        is interference.}}

Family: No Duplicates

Test Purposes: None

RQ_001_1005   **Channel Access:**

TS 102 490 [1]   Clause 10.2.2, paragraph 1   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **IF a transmitting radio announces a non zero Tx WAIT time then other radios**
                        shall not commence any PTT activated transmissions during this Tx WAIT period.

Specification Text:

{{**When a transmitting radio announces a non zero Tx WAIT time then PTT activated transmissions**
                        shall not be permitted to start during this Tx WAIT time irrespective of any
                        polite or impolite criteria employed.}}

Family: No Duplicates

Test Purposes: None

RQ_001_1006   **Channel Access:**

TS 102 490 [1]   Clause 10.3, paragraph   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **A transmission shall be automatically terminated if it exceeds 180 seconds. The transmission may only be resumed by rekeying the transmitter.**

Specification Text: dPMR HSs shall have a transmit TimeOut timer which limits the time of a single transmission item. This timer shall be set to the value of 180 seconds whenever the PTT key is pressed and counts down to zero.
{{**If the transmit TimeOut timer expires, then all HSs will stop transmitting immediately and may not re-transmit until PTT has been released and pressed again.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1007   **Channel Access:**

TS 102 490 [1]   Clause 10.4.1, paragraph 1   *Type:* Optional

Applies to: CSF

Requirement: **When an acknowledgement is required in response to a received call the callee may transmit this acknowledgement irrespective of whether the RF channel is busy during a defined period after the call has been received.**

Specification Text: {{**Where a radio has been solicited to transmit a response, it may transmit the response within response time [T_ack] irrespective of whether the channel is "Idle" or "Busy".** }}

Family: No Duplicates

Test Purposes: None

RQ_001_1008   **Channel Access:**

TS 102 490 [1]   Clause 10.4.2, 10.4.3, paragraph 1   *Type:* Optional

Applies to: ISF, CSF

Requirement: **When a radio is involved in a voice call it may transmit even if another party to the same call is transmitting on the RF channel.**

Specification Text: Additionally, {{**while a radio is partied to a voice call, it may transmit irrespective of whether the channel is "Idle" or "Busy" with 6,25 kHz FDMA activity pertaining to the same voice call**}} but may not transmit if a Tx WAIT time has been invoked.

Family: No Duplicates

Test Purposes: None

RQ_001_1009   **Channel Access:**

TS 102 490 [1]   Clause 10.4.2, paragraph 2   *Type:* Conditionally Mandatory

Applies to: ISF

Requirement: **IF a ISF radio has polite to own Colour Code enabled
THEN the radio shall not transmit when the RF channel is occupied by a transmission using the same Colour Code.**

Specification Text: {{**Polite to own Colour Code: The radio shall refrain from transmitting on a channel while the channel is "Busy" with other 6,25 kHz FDMA activity from radios using the same Colour Code.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1010   **Channel Access:**

TS 102 490 [1]   Clause 10.4.2, paragraph 3   *Type:* Conditionally Optional

Applies to: ISF

Requirement: `IF an ISF radio has impolite channel access enabled`
`THEN it may transmit if the RF channel is occupied by any other signal.`

Specification Text: `{{Impolite: The radio shall transmit on a channel regardless of any other`
`activity (either 6,25 kHz FDMA or otherwise) already present on the channel.}}`

Family: No Duplicates

Test Purposes: None

RQ_001_1011   **Channel Access:**

TS 102 490 [1]   Clause 10.4.3, paragraph 2   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: `IF a CSF radio has polite to own Group or Talkgroup enabled`
`THEN the radio shall not transmit while the  RF channel is occupied by`
`transmissions by members of its own group or talkgroup.`

Specification Text: `Polite to own Group or Talkgroup: {{`**`The radio shall refrain from transmitting`**
`on a channel while the channel is "Busy" with other 6,25 kHz FDMA activity from`
`radios within its own group or talkgroup. }}``For all other types of activity`
`already present on the channel, the radio shall transmit regardless.`

Family: No Duplicates

Test Purposes: None

RQ_001_1012   **Channel Access:**

TS 102 490 [1]   Clause 10.5, 10.6.2, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: `Certain received calls require acknowledgement responses. When these`
`acknowledgements are lost because of interference etc they may be repeated.`
`IF these acknowledgements are repeated`
`THEN they shall be limited to a maximum number of 4 times with 300-500ms time`
`intervals between each repeat.`

Specification Text: `Certain transmissions solicit responses and where these responses are not`
`received (e.g. due to collisions, interference etc.) the transmitting entity`
`may repeat the original transmission a number of times either until the`
`response is received or the transmitting entity gives up.`
`The waiting times for re-transmission and the maximum number of retries are`
`defined in clause 10.6.2.`

`{{`**`Automatic retries are permitted for acknowledgement (and nack) signalling.`**
`A maximum of four retries are permitted. The time between any such repeated`
`signalling shall be in the range 300 ms to 500 ms.}}`

Family: No Duplicates

Test Purposes: None

RQ_001_1013 **Channel Access:**

TS 102 490 [1] Clause 10.4.3, paragraph 3 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio has Polite to own Colour Code enabled
THEN the radio shall not transmit while the RF channel is occupied by
transmissions using the same Colour Code.**

Specification Text: Polite to own Colour Code: {{**The radio shall refrain from transmitting on a
channel while the channel is "Busy" with other 6,25 kHz FDMA activity from
radios using the same Colour Code.** }}For all other types of activity already
present on the channel, the radio shall transmit regardless.

Family: No Duplicates

Test Purposes: None

RQ_001_1014 **Channel Access:**

TS 102 490 [1] Clause 10.4.3, paragraph 4 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio has impolite channel access enabled
THEN it may transmit if the RF channel is occupied by any other signal.**

Specification Text: {{**Impolite: The radio shall transmit on a channel regardless of any other
activity (either 6,25 kHz FDMA or otherwise) already present on the channel**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1017 **Channel Access:**

TS 102 490 [1] Clause 10.6.1 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Before transmitting, radios shall observe certain minimum times in assessing
whether an RF channel is busy (T_ch_chk : 100 ms) .**

Specification Text: {{**T_ch_chk: Channel check timer: 100 ms.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1020 **Channel Access:**

TS 102 490 [1] Clause 10.1, paragraph 5 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Before transmitting, radios shall observe certain minimum times for trying to
synchronise to any activity found on the channel (T_ch_free : 200 ms).**

Specification Text: {{**T_ch_free: Unsynchronizable activity timer: 200 ms.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1021 **Channel Access:**

TS 102 490 [1] Clause 10.4.1, paragraph 1 *Type:* Conditionally Optional

Applies to: CSF

Requirement: **Where a radio has been solicited to transmit a response, it may transmit the response within the T_ack response time irrespective of whether the channel is "Idle" or "Busy".**

Specification Text: {{**Where a radio has been solicited to transmit a response, it may transmit the response within response time [T_ack] irrespective of whether the channel is "Idle" or "Busy".**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1022 **Channel Access:**

TS 102 490 [1] Clause 10.6.1, paragraph 3 *Type:* Conditionally Optional

Applies to: CSF

Requirement: **Where a radio has been solicited to transmit a response it may always disregard any polite channel access enabled for the duration of the T_ack timer of 3 seconds.**

Specification Text: {{**T_ack: Acknowledgement timer : 3 s**}}

Family: No Duplicates

Test Purposes: None

4.1.3   Framing

RQ_001_0401 **Framing:**

TS 102 490 [1] Clause 4.2.2 ¶ *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **All transmissions are made up from 80 ms (384 bits) frames.**

Normal frames (not packet data) are the concatenation of:
24 bits of either FrameSync or ColourCode
72 bits of Control Channel data
Followed by 4 blocks of 72 bits of payload.

Specification Text: {{**The FDMA transmission is made up of 80 ms payload frames, each comprising 384 bits.**
Payload frame:
a b c d e f

a: 24 bits FrameSync2 (FS2) or ColourCode (CC) bits
b: 72 bits Control Channel (CCH) data
c: 72 bits Traffic channel (TCH)
d: 72 bits TCH
e: 72 bits TCH
f: 72 bits TCH

}}

Family: No Duplicates

Test Purposes: None

RQ_001_0402   **Framing:**

TS 102 490 [1]   Clause 4.2.3 ¶   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **All normal (non packet data) transmissions are made up from an integral number of superframes.**

Specification Text: These transmissions are always started with a Header frame containing a preamble (for bit synchronisation) and a frame synch (for frame synchronisation). The Header is followed by a series of Superframes that contain both the payload (voice or data) and the information about the call such that receiving stations can implement late entry. {{**A call always consists of an integral number of superframes** }}and is terminated by an End frame.

Family: No Duplicates

Test Purposes: None

RQ_001_0403   **Framing:**

TS 102 490 [1]   Clause 4.2.2 ¶   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each superframe is the concatenation of four 80 ms frames.**

Specification Text: {{**Four 80 ms frames are concatenated to form a superframe of 320 ms.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0404   **Framing:**

TS 102 490 [1]   Clause 4.2.3 ¶   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Normal calls with voice or data continuous transmission generated by the radio will start with a Header frame, an integral number of superframes and then terminated by an End frame.**

Specification Text: {{**Voice or data payload continuous transmission:**

These transmissions are always started with a Header frame containing a preamble (for bit synchronisation) and a frame synch (for frame synchronisation). The Header is followed by a series of Superframes that contain both the payload (voice or data) and the information about the call such that receiving stations can implement late entry. A call always consists of an integral number of superframes and is terminated by an End frame.}}

Family: No Duplicates

Test Purposes: None

RQ_001_0405   **Framing:**

TS 102 490 [1]   Clause 4.2.3 ¶   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Calls generated by the radio for the purposes of call set-up or service request etc will be that of a concatenated Header frame and an End frame.**

Specification Text: {{**Call set up, service request, etc:**
These transmissions are simply a concatenation of a Header frame and an End frame. Their purpose is to inform the receiving station of the call, type of call or information required.
}}

Family: No Duplicates

Test Purposes: None

RQ_001_0406   **Framing:**

TS 102 490 [1]   Clause 4.2.3 ¶   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **Calls generated by the radio for the purposes of acknowledgements will be**
                     simply a Header frame.

Specification Text: **{{Acknowledgement:**
                     Acknowledgements are a type of Header that contains information such as
                     confirmation of received data, errors in received data etc.
                     }}

Family: No Duplicates

Test Purposes: None

RQ_001_0407   **Framing:**

TS 102 490 [1]   Clause 4.2.3 ¶   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the radio supports disconnection request**
                     THEN calls generated by the radio for the purposes of confirming the end of the
                     series of exchanges of a call shall be the concatenation of a Header frame and
                     End frame repeated once.

Specification Text: **{{Disconnection:**
                     Sending stations can signal that all exchanges of a call have been completed by
                     transmitting a disconnection request. This is a Header + End frame pair that is
                     repeated.
                     }}

Family: No Duplicates

Test Purposes: None

RQ_001_0408   **Framing:**

TS 102 490 [1]   Clause 4.2.3 ¶   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **Calls generated by the radio for the purposes of status request responses will**
                     be a Header frame and End frame.

Specification Text: **{{Status request acknowledgements:**
                     As the status information is contained within the End frame then the response
                     of a receiving station to a status request call will be a Header + End frame
                     pair.}}

Family: No Duplicates

Test Purposes: None

RQ_001_0811   **Framing:**

TS 102 490 [1]   Clause 8.2.3, paragraph 1   *Type:* Mandatory

Applies to: CSF

Requirement: **A CSF radio shall use only Group B Colour Codes as defined in the table**

```
Group                    Channel Frequency Colour Code (Bit) Colour Code (Hex)
B      446,103125 11110111010101011101010111      F75757
       446,109375 11110111011111010101010111      F77D57
       446,115625 11110111110101010101010101      F7D555
       446,121875 11110111111111111101010101      F7FF55
       446,128125 11110101010101111101011101      F55F5D
       446,134375 11110101011101010101011101      F5755D
       446,140625 11110101110111010101011111      F5DD5F
       446,146875 11110101111101110101011111      F5F75F
       446,153125 11111111010101110101111111      FF5D7F
       446,159375 11111111011101110101111111      FF777F
       446,165625 11111111110101111101111101      FFDF7D
       446,171875 11111111111101010101111101      FFF57D
       446,178125 11111101010101010101110101      FD5575
       446,184375 11111101011111111101110101      FD7F75
       446,190625 11111101110101110101110111      FDD777
       446,196875 11111101111111110101110111      FDFD77
```

Specification Text: {{**Radios shall use only the Group B CC**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0812   **Framing:**

TS 102 490 [1]   Clause 8.1.2, paragraph 1   *Type:* Mandatory

Applies to: ISF

Requirement: **A ISF radio shall use only the Group A Colour Codes as defined in the table:**

```
Group Channel Frequency Colour Code (Bit)                      Colour Code (Hex)
A      446,103125      01010111011101010101110111      577577
       446,109375      01010111110111010101110101      57DD75
       446,115625      01010111111101111101110101      57F775
       446,121875      01010101010101011101111101      55577D
       446,128125      01010101011111010101111101      557D7D
       446,134375      01010101110101010101111111      55D57F
       446,140625      01010101111111111101111111      55FF7F
       446,146875      01011111010101010101011111      5F555F
       446,153125      01011111011111111101011111      5F7F5F
       446,159375      01011111110101110101011101      5FD75D
       446,165625      01011111111101110101011101      5FFD5D
       446,171875      01011101010101110101010101      5D5D55
       446,178125      01011101011101110101010101      5D7755
       446,184375      01011101110101111101010111      5DDF57
       446,190625      01011101111101010101010111      5DF557
       446,196875      01110111010101110111010111      775DD7
```

Specification Text: {{**Radios shall use only the Group A CC**}}.

Family: No Duplicates

Test Purposes: None

4.1.3.1   End Frame

RQ_001_0984   **End frame:**

TS 102 490 [1]   Clause 9.6, paragraph 9   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each End frame shall start with a Frame syncronisation sequence 3, 24 bits**
                         long.
                         Frame syncronisation sequence 3 is made by following 3 bytes: 7D DF F5 (all in
                         HEX).

Specification Text: {{**Finally the 24 bit FS3 synchronization sequence is prefixed to these end data**
                         bits.}}

                         {{**Clause 6.1.3 FS3**}}
                         The Frame sync 3 sequence contained in the End frame is a 24 bit sequence that
                         shall have the following value:
                         Binary: 011111011101111111110101.
                         Hex: 7D DF F5.

Family: No Duplicates

Test Purposes: None

RQ_001_0985   **End frame:**

TS 102 490 [1]   Clause 9.6, paragraph 2   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each End frame shall have a two bits long End Type (ET) field using the values**
                         :

                         00 Normal end frame
                         01 End frame with status message
                         10 Reserved
                         11 Reserved

Specification Text: {{**The end data starts with the End Type (ET) which is either 00 (normal end**
                         frame) or 01 (end frame with status message).}}

                         {{**Clause 5.12 End type**}}
                         Frame used END Frame.
                         Data length 2 bits.
                         Definition:
                         {{**Table 5.12**}}: End type

Family: No Duplicates

Test Purposes: None

RQ_001_0986   **End frame:**

TS 102 490 [1]   Clause 9.6, paragraph 3   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each End frame shall have a two bits long acknowledgement request (ARQ) field using the values :**

                        00 No ACK request to called station
                        01 ACK request to called station
                        10 Reserved
                        11 Reserved

Specification Text: {{**The next 2 bit are the acknowledgement request (ARQ).** }}00 signifies that no
                        acknowledgement is requested and 01 requires an acknowledgement.

                        {{**Clause 5.13 ARQ**}}
                        Frame used END Frame.
                        Data length 2 bits.
                        Definition:
                        Table 5.13: ARQ

Family: No Duplicates

Test Purposes: None

RQ_001_0987   **End frame:**

TS 102 490 [1]   Clause 9.6, paragraph 4   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each End frame shall have a four bits long Tx wait time (WAIT) field using the values:**

                        0000 No specified time
                        0001 40 ms (half a frame)
                        0010 80 ms (one frame)
                        0011 160 ms (two frames)
                        0100 320 ms (one superframe)
                        Other Reserved

Specification Text: {{**The next 4 bits define any Tx wait time (WAIT)** }} using the values given in
                        clause 5.14.

                        {{**clause 5.14 Tx Wait**}}
                        Frame used END.
                        Data length 4 bits.
                        Definition:
                        The Tx wait time will be implemented by the called station(s) such that other
                        radios who have a break-in request pre-keyed by the user may transmit during
                        the specified time.
                        Table 5.14: Tx wait time

Family: No Duplicates

Test Purposes: None

RQ_001_0988	**End frame:**	
TS 102 490 [1]	Clause 9.6, paragraph 5	*Type:* Mandatory
Applies to:	ISF, CSF	

Requirement: **Each End frame shall have a five bits long status message field using the values 0 to 31.**
When End Type (ET) field vaue has been set to 00 (binary) these bits shall be considered as dummy data.

Specification Text: 5 bit of status message will then follow if ET has been set to 01 (or 5 bits of dummy data if ET = 00).

{{**Clause 5.15 Status**}}
Frame used END Frame.
Data length 5 bits.
Definition:
0 to 31 Status message

Family: No Duplicates

Test Purposes: None

RQ_001_0989	**End frame:**	
TS 102 490 [1]	Clause 9.6, paragraph 6	*Type:* Mandatory
Applies to:	ISF, CSF	

Requirement: **Each frame shall have a four bits long reserved field and shall always contain a 0.**

Specification Text: {{**Finally the 4 reserved bits are set to 0000.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0990	**End frame:**	
TS 102 490 [1]	Clause 9.6, paragraphs 7, 8	*Type:* Mandatory
Applies to:	ISF, CSF	

Requirement: **In each End frame the End Information (EI0) field shall be used to calculate a 7 bit checksum, generated by the X^7 + X^3 + 1 polynomial.The checksum shall be appended, giving a 24 bits field**
referred as END0 DATA)

Specification Text: {{**The 7 bit CRC checksum is added using the polynomial given in clause 7.2 giving a total of 24 bits.**}}

{{**These 24 bits are now separated into 3 bytes. Each byte is now coded by a shortened 12,8 Hamming Code (clause 7.3) giving 3 x 12 bit blocks. These 36 bits are now repeated and the total 72 bits are scrambled using the polynomial given in clause 7.4.**}}

Clause 7.2 CRC addition
Use   CRC Polynomial
Frame (CCH) CRC7 X^7 + X^3 + 1

See figure 10.

Family: No Duplicates

Test Purposes: None

RQ_001_0991 **End frame:**

TS 102 490 [1] Clause 9.6, paragraphs 7, 8 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **In each End frame the END0 DATA field shall be separated into 3 bytes. Each of these bytes shall be coded by shortened 12,8 Hamming code**
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit)
C3,C2,C1,C0 is parity bit (4 bit)

The Generator matrix is as follows:

```
  12 11 10  9  8  7  6  5  4  3  2  1
   X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
```

The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.
This gives the Shortened Hamming END0 DATA.

See Figure 10.

Specification Text: {{**These 24 bits are now separated into 3 bytes. Each byte is now coded by a shortened 12,8 Hamming Code (clause 7.3) giving 3 x 12 bit blocks.**}} These 36 bits are now repeated and the total 72 bits are scrambled using the polynomial given in clause 7.5.

Clause 7.3 Hamming code
A shortened Hamming code (12,8) is employed and the generator matrix is shown below:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit): C3,C2,C1,C0 is Parity bit (4 bit).

Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.

Family: No Duplicates

Test Purposes: None

RQ_001_0992 **End frame:**

TS 102 490 [1] Clause 9.6, paragraphs 7, 8 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **In each End frame the End Information (EI1) field shall be used to calculate a 7 bit checksum, generated by the X^7 + X^3 + 1 polynomial. The checksum shall be appended, giving a 24 bits field referred as END1 DATA)**

Specification Text: {{**The 7 bit CRC checksum is added using the polynomial given in clause 7.2 giving a total of 24 bits.**}}
See figure 10.

Family: No Duplicates

Test Purposes: None

RQ_001_0993   **End frame:**

TS 102 490 [1]   Clause 9.6, paragraphs 7, 8   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **In each End frame the END1 DATA field shall be separated into 3 bytes. Each of these bytes shall be coded by shortened 12,8 Hamming code, as shown in clause 7.3**
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit): C3,C2,C1,C0 is parity bit (4 bit).

```
The Generator matrix is as follows:
  12 11 10  9  8  7  6  5  4  3  2  1
  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
```

The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.
This gives the Shortened Hamming END1 DATA.

Specification Text: These 24 bits are now separated into 3 bytes. {{**Each byte is now coded by a shortened 12,8 Hamming Code (clause 7.3) giving 3 x 12 bit blocks.**}} These 36 bits are now repeated and the total 72 bits are scrambled using the polynomial given in clause 7.5.

Clause 7.3   Hamming code
A shortened Hamming code (12,8) is employed and the generator matrix is shown below:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):   C3,C2,C1,C0 is Parity bit (4 bit).
Table 7.3: Generator matrix

Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.

See Figure 10.

Family: No Duplicates

Test Purposes: None

RQ_001_0994   **End frame:**

TS 102 490 [1]   Clause 9.6, paragraph 8   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **In each End frame the concatenation of Shortened Hamming END0 DATA and Shortened Hamming END1 DATA shall be scrambled using the polynomial X^9 + X^5 + 1 with an initial preset value of all "1"s.**

Specification Text: These 24 bits are now separated into 3 bytes. Each byte is now coded by a shortened 12,8 Hamming Code (clause 7.3) giving 3 x 12 bit blocks. These 36 bits are now repeated and {{**the total 72 bits are scrambled using the polynomial given in clause 7.4.**}}

Clause 7.4   Scrambling
The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all "1"s.

See Figure 10.

Family: No Duplicates

Test Purposes: None

4.1.3.2 Header Frames

RQ_001_0816 **Header frames:**

TS 102 490 [1] Clause 8.3.1, paragraph 1 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **If the transmission is a type 3 data**
THEN A CSF radio shall use frame sync 4 (FS4) in the header.

Specification Text: {{**Packet data uses a different format to the normal communications frame**
format. The use of frame sync 4 (FS4) indicates that the frames following will
be in PDF format}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0959 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 14 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header frame shall start with a preamble field, at least 72 bits long,**
composed by a repetition of a byte containing the value 5F (HEX). If more than
72 bits are sent then the same 5F (HEX) data shall be used.

Specification Text: {{**The header is completed by prefixing with the 48 bit FS1 synchronization**
sequence (see note 2) and then prefixing the synchronization sequence with a
minimum of 72 bits of preamble}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0960 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 14 *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **If the Header frame is not a Packet data header**
THEN the Frame syncronisation sequence field shall be made by following 6
bytes: 57 FF 5F 75 D5 77 (all in HEX). This is referred as Frame syncronisation
sequence 1.

Specification Text: {{**The header is completed by prefixing with the 48 bit FS1 synchronization**
sequence and then prefixing FS1 with a minimum of 72 bits of preamble}}

{{**Clause 6.1.1 FS1**}}
The Frame sync 1 sequence contained in the non packet data Header frame (Header
1) is a 48 bit sequence that shall have the following value:
Binary: 010101111111111101011110111010111010101110111.
Hex: 57 FF 5F 75 D5 77.

Family: No Duplicates

Test Purposes: None

RQ_001_0961 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 14 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **If the Header frame is a Packet data header**
THEN the Frame syncronisation sequence field shall be made by following 6
bytes: FD 55 F5 DF 7F DD (all in HEX). This is referred as Frame syncronisation
sequence 4.

Specification Text: NOTE 2: {{**In the case where this is a Packet Data Header, the 48 bit FS4**
synchronization sequence shall be used.}}

Clause 6.1.4 FS4
The Frame sync 4 sequence contained in the Packet Data Header frame (Header 2)
is a 48 bit sequence that shall have the following value:
Binary: 111111010101010101111101011101111101111111111011101.
Hex: FD 55 F5 DF 7F DD.

Family: No Duplicates

Test Purposes: None

RQ_001_0962 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 2 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall be identified by the Header Type (HT) field. This shall have**
a length of four bits and it's value shall be as follows:

0000 Communication start Header (a superframe follows)
0001 Connection request Header (an END frame follows)
0010 Unconnect request Header (an END frame follows)
0011 ACK (this a single frame, ACK or NACK is differentiated by the CI bits
setting)
0100 System request Header (an END frame follows)
0101 ACK Header reply to a system request (a superframe follows)
0110 System delivery Header (a superframe follows)
0111 Status response Header
1000 Status request Header
Other Reserved

Specification Text: {{**First there are 4 bits allocated to Header Type (HT) which is selected**
according to clause 5.11.}}

{{**Clause 5.11** **Header type**}}
Frame used Header Frame/Packet Data Header Frame.
Data length 4 bits.
Table 5.11: Header type

Family: No Duplicates

Test Purposes: None

RQ_001_0963 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 3 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall have a 24 bit long field containing the called station ID.**

Specification Text: {{**HT is followed by the 24 bits of the called station ID.**}} To this the 24 bits
of the own ID is added.

Family: No Duplicates

Test Purposes: None

RQ_001_0964 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 3 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall have a 24 bit long field containing the own ID.**

Specification Text: HT is followed by the 24 bits of the called station ID. {{**To this the 24 bits of the own ID is added.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0965 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 4 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall state the type of the call through a three bits long communications mode field, as follows:**
000 Voice communication (no user data in SLD field)
001 Voice + slow data (user data in SLD field)
010 Data communication type 1 (Payload is user data without FEC)
011 Data communication type 2 (Payload is user data with FEC)
100 Data communication type 3 (Packet data, ARQ method)
101 Voice and appended data (Type 2)
Other Reserved

Specification Text: {{**The communications mode value is added according to the table in clause 5.7.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0966 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 5 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall have a four bits long Communication format field (F).**
This shall be as follows:
Values shall be as follows:
0000 Call ALL
0001 Peer-to-peer communication
Other Reserved

Specification Text: {{**The communications format bits are now added according to clause 5.8. Generally these will be set to 0001(peer-to-peer call). Occasionally they may be set to 0000 (all call) but this is a special case, similar to a broadcast.**}}

{{**Table 5.8**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0967 **Header frames:**

TS 102 490 [1] Clause 9.5, paragraph 6 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall have a two bits long Reserved field (RES).**
The two bits shall be always se to 0.

Specification Text: {{**The next 2 bits are set to 00 (reserved bits).**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0974	**Header frames:**	
TS 102 490 [1]	Clause 9.5, paragraph 9	*Type:* Mandatory
Applies to:	ISF, CSF	

Requirement: **The Header information field (HI0) shall be used to calculate an 8 bit checksum, generated by the X^8 + X^2 + X^1 + 1 polynomial. This 8 bits are added, giving a total of 80 bits.**

Specification Text: {{**The 8 bit CRC checksum is added using the polynomial given in clause 7.2 giving a total of 80 bits.**}}

{{**Clause 7.2 CRC addition**}}
Use   CRC Polynomial
Header (HI) CRC8 X^8 + X^2 + X^1 + 1

See{{ **figure 1**}}0.

Family: No Duplicates

Test Purposes: None

RQ_001_0975	**Header frames:**	
TS 102 490 [1]	Clause 9.5, paragraph 10	*Type:* Mandatory
Applies to:	ISF, CSF	

Requirement: **This 80 bits shall be separated into 10 bytes. Each of these bytes shall be coded by shortened 12,8 Hamming code:**
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit)
C3,C2,C1,C0 is parity bit (4 bit)

The Generator matrix is as follows:
```
  12 11 10  9  8  7  6  5  4  3  2  1
  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
```

The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.
This will generate a 12x10 bit blocks.

Specification Text: {{**These 80 bits are now separated into 10 bytes. Each byte is now coded by a shortened 12,8 Hamming Code (clause 7.3) giving 10 x 12 bit blocks.**}}

{{**7.3 Hamming code**}}
A shortened Hamming code (12,8) is employed and the generator matrix is shown below:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):   C3,C2,C1,C0 is Parity bit (4 bit).
{{**Table 7.1**}}: Generator matrix

Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.

See figure 10.

Family: No Duplicates

Test Purposes: None

RQ_001_0976   **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraph 11   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The 12x10 bit blocks shall be interleaved using the following 12x10**
                        interleaving matrix:

```
   1  2  3  4  5  6  7  8  9   10
1  1  13 25 37 49 61 73 85 97  109
2  2  14 26 38 50 62 74 86 98  110
3  3  15 27 39 51 63 75 87 99  111
4  4  16 28 40 52 64 76 88 100 112
5  5  17 29 41 53 65 77 89 101 113
6  6  18 30 42 54 66 78 90 102 114
7  7  19 31 43 55 67 79 91 103 115
8  8  20 32 44 56 68 80 92 104 116
9  9  21 33 45 57 69 81 93 105 117
10 10 22 34 46 58 70 82 94 106 118
11 11 23 35 47 59 71 83 95 107 119
12 12 24 36 48 60 72 84 96 108 120
```

                        This gives the interleaved HI0 data.

Specification Text: {{**To protect against burst interference, these 10 x 12 bit blocks are now**
                        interleaved using the 12 x 10 HI interleaving matrix given in clause 7.5.}}

                        {{**7.5 Interleaving**}}
                        There are two interleaving matrices, one for the TCH and one for the HI field.

                        {{**Table 7.3**}}: HI field Interleaving matrix
                        NOTE: Applied in the Header HI0/HI1.

                        See {{**figure 10**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0977   **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraphs 9, 10, 11, 12   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The interleaved HI0 data shall be scrambled using the polynomial X^9 + X^5 + 1**
                        with an initial preset value of all "1"s.

                        This scrambled data shall be referred as HI0 data.

Specification Text: {{**Then the interleaved HI data is scrambled using the polynomial given in**
                        clause 7.4.}}

                        {{**Clause 7.4 Scrambling**}}
                        The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all
                        "1"s.

Family: No Duplicates

Test Purposes: None

RQ_001_0978   **Header frames:**

TS 102 490 [1]   Clause 9.5 ¶   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The Header information field (HI1) shall be used to calculate an 8 bit checksum, generated by the X^8 + X^2 + X^1 + 1 polynomial. This 8 bits are added, giving a total of 80 bits.**

Specification Text: The 24 bit Colour Code is appended to the HI data and {{**then the HI data is repeated after the CC**}}.

{{**The 8 bit CRC checksum is added using the polynomial given in clause 7.2 giving a total of 80 bits.**}}

{{**Clause 7.2 CRC addition**}}
Use   CRC   Polynomial
Header (HI) CRC8   X^8 + X^2 + X^1 + 1

See {{**figure 10**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0979   **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraphs 9, 10, 11, 12   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **This 80 bits shall be separated into 10 bytes. Each of these bytes shall be coded by shortened 12,8 Hamming code:**
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit)
C3,C2,C1,C0 is parity bit (4 bit).

```
  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
```

The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.
This will generate a 12x10 bit blocks.

Specification Text: {{**These 80 bits are now separated into 10 bytes. Each byte is now coded by a shortened 12,8 Hamming Code (clause 7.3) giving 10 x 12 bit blocks.**}}

{{**7.3 Hamming code**}}
A shortened Hamming code (12,8) is employed and the generator matrix is shown below:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):   C3,C2,C1,C0 is Parity bit (4 bit).
Table 7.1: Generator matrix
Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.
See {{**figure 10**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0980   **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraphs 9, 10, 11, 12   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The generated a 12x10 bit blocks, that shall be interleaved using the following**
                        12x10 interleaving matrix:
```
   1  2  3  4  5  6  7  8  9   10
1  1  13 25 37 49 61 73 85 97  109
2  2  14 26 38 50 62 74 86 98  110
3  3  15 27 39 51 63 75 87 99  111
4  4  16 28 40 52 64 76 88 100 112
5  5  17 29 41 53 65 77 89 101 113
6  6  18 30 42 54 66 78 90 102 114
7  7  19 31 43 55 67 79 91 103 115
8  8  20 32 44 56 68 80 92 104 116
9  9  21 33 45 57 69 81 93 105 117
10 10 22 34 46 58 70 82 94 106 118
11 11 23 35 47 59 71 83 95 107 119
12 12 24 36 48 60 72 84 96 108 120
```

                        This gives the interleaved HI1 data.

Specification Text: {{**To protect against burst interference, these 10 x 12 bit blocks are now**
                        interleaved using the 12 x 10 HI interleaving matrix given in clause 7.5.}}

                        {{**7.5 Interleaving**}}
                        There are two interleaving matrices, one for the TCH and one for the HI field.

                        Table 7.3: HI field Interleaving matrix
                        NOTE: Applied in the Header HI0/HI1.

                        See figure 10.

Family: No Duplicates

Test Purposes: None

RQ_001_0981   **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraphs 9, 10, 11, 12   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The interleaved HI1 data shall be scrambled using the polynomial X^9 + X^5 + 1**
                        with an initial preset value of all "1"s.
                        This scrambled data shall be referred as HI1 data.

Specification Text: {{**Then the interleaved HI data is scrambled using the polynomial given in**
                        clause 7.4.}}

                        {{**Clause 7.4 Scrambling**}}
                        The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all
                        "1"s.

                        See figure 10.

Family: No Duplicates

Test Purposes: None

RQ_001_0982 **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraph 13   *Type:* Mandatory

Applies to: ISF, CSF

Requirement:

```
The Header shall have a Colour Code (CC) field appended after the HI0 data
field.
The Colour Code depend on the operation frequency.
In case  of a ISF Radio the CC is
Group Channel Frequency Colour Code (Bit)                      Colour Code (Hex)
A     446,103125       010101110111010101110111      577577
      446,109375       010101111101110101110101      57DD75
      446,115625       010101111111011101110101      57F775
      446,121875       010101010101011101111101      55577D
      446,128125       010101010111110101111101      557D7D
      446,134375       010101011101010101111111      55D57F
      446,140625       010101011111111101111111      55FF7F
      446,146875       010111110101010101011111      5F555F
      446,153125       010111110111111101011111      5F7F5F
      446,159375       010111111101011101011101      5FD75D
      446,165625       010111111111110101011101      5FFD5D
      446,171875       010111010101110101010101      5D5D55
      446,178125       010111010111011101010101      5D7755
      446,184375       010111011101111101010111      5DDF57
      446,190625       010111011111010101010111      5DF557
      446,196875       011101110101110111010111      775DD7


In Case of a CSF Radio io the CC is
Group                   Channel Frequency Colour Code (Bit) Colour Code (Hex)
B     446,103125 111101110101011101010111      F75757
      446,109375 111101110111110101010111      F77D57
      446,115625 111101111101010101010101      F7D555
      446,121875 111101111111111101010101      F7FF55
      446,128125 111101010101111101011101      F55F5D
      446,134375 111101010111010101011101      F5755D
      446,140625 111101011101110101011111      F5DD5F
      446,146875 111101011111011101011111      F5F75F
      446,153125 111111110101110101111111      FF5D7F
      446,159375 111111110111011101111111      FF777F
      446,165625 111111111101111101111101      FFDF7D
      446,171875 111111111111010101111101      FFF57D
      446,178125 111111010101010101110101      FD5575
      446,184375 111111010111111101110101      FD7F75
      446,190625 111111011101011101110111      FDD777
      446,196875 111111011111110101110111      FDFD77
```

Specification Text: {{**The 24 bit Colour Code is appended to the HI data and then the HI data is repeated after the CC.**}}

{{**6.1.5 Colour code**}}
The Colour Code is a 12 bit code that is di-bit encoded into a 24 bit sequence.
Colour Code are attributed directly to the RF operating channel and are not
freely selectable.
Radios employing Initial Services and Facilities shall use the Group A colour
codes.
Radios employing Configured Services and Facilities shall use the Group B
colour codes.
{{**Table 6.1 Colour code by RF channel**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0983   **Header frames:**

TS 102 490 [1]   Clause 9.5, paragraph 13   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall be made up of the concatenation of Preamble, Frame Sync, HI0
data, Colour Code data and HI1 data.**

Specification Text: {{**The 24 bit Colour Code is appended to the HI data and then the HI data is
repeated after the CC.**}}See figure 10.

Family: No Duplicates

Test Purposes: None

4.1.3.2.1   Call Information Field

RQ_001_0968   **Call information field:**

TS 102 490 [1]   Clause 9.5, paragraph 7   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each Header shall contain the Call Information (CI) field, formed by 3 bits of
data type and 8 bits of information fields.
The information contained in this field is depending on the Header type:**

**Call Information is used to give supplementary data about the call. It has
different content and purpose depending on the call type:**

```
Use                Purpose
Powersave          Indicate normal or extended header type
T1 or T2 Data      Indicate the type of data (supplementary service)
T3 Data (Packet)   Indicate data frame size and number of frames
Acknowledgements   Indicate ACK or NACK and reason
System request     CI Type defines the purpose
System response    CI Type defines the purpose
Delivery Header    CI Type defines the purpose
```

Specification Text: {{**Finally there are the 11 bits of Call Information (CI) that are made up of 3
CI Type bits and 8 CI information bits as described in clauses 5.10.1 to 5.10.5
(see Table 9.1).**

```
        Table 9.1: Use of Call Information
Use                Purpose                                     Clause
Powersave          Indicate normal or extended header type     5.10.1
T1 or T2 Data      Indicate the type of data (supplementary service) 5.10.2
T3 Data (Packet)   Indicate data frame size and number of frames     5.10.3
Acknowledgements   Indicate ACK or NACK and reason             5.10.5
System request     CI Type defines the purpose                 5.10.4
System response    CI Type defines the purpose                 5.10.4
Delivery Header    CI Type defines the purpose                 5.10.4 }}
```

NOTE 1: In the case where this is a Packet Data header, the 48 bit FS4
synchronization sequence shall be used. Normally receiving stations determine
the call type from the Header Information but techniques such as determination
by FS type (as used by ETS300 230, MPT1327 and others) can be equally valid.

Family: No Duplicates

Test Purposes: None

RQ_001_0969   **Call information field:**

TS 102 490 [1]   Clause 9.5, paragraph 7   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the content of call information type field is 111 (binary)**
                   THEN this is an extended wake-up header
                   AND the CI information field contains the number of Headers that follow the
                   current one. This value must be at maximum 0000 1111 (binary).

Specification Text: {{**Finally there are the 11 bits of Call Information (CI) that are made up of 3**
                   CI Type bits and 8 CI information bits as described in clauses 5.10.1 to 5.10.5
                   (see Table 9.1).}}

```
              Table 9.1: Use of Call Information
Use              Purpose                                    Clause
{{Powersave        Indicate normal or extended header type      5.10.1}}
T1 or T2 Data    Indicate the type of data (supplementary service) 5.10.2
T3 Data (Packet) Indicate data frame size and number of frames 5.10.3
Acknowledgements Indicate ACK or NACK and reason            5.10.5
System request   CI Type defines the purpose                5.10.4
System response  CI Type defines the purpose                5.10.4
Delivery Header  CI Type defines the purpose                5.10.4
```

Family: No Duplicates

Test Purposes: None

RQ_001_0970   **Call information field:**

TS 102 490 [1]   Clause 9.5, paragraph 7   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF Header type field is either 0000 or 0001 (binary) - Comm. start or Conn.**
                   request -
                   AND the Header is for a Data communication type 1 or 2 transmission
                   THEN
                   ** - the 3 CI type field bits shall set to 001 (binary)**
                   ** - first 4 bits of the information field shall be set as follows:**
                   **   0000 Status message**
                   **   0001 Precoded message**
                   **   0010 Free text message (radio generated data)**
                   **   0011 Short file transfer**
                   **   0100 User defined data 1**
                   **   0101 User defined data 2**
                   **   0110 User defined data 3**
                   **   0111 User defined data 4**
                   **   Other Reserved**
                   ** - last 4 bits of the information field shall be set to 0**

Specification Text: {{**Finally there are the 11 bits of Call Information (CI) that are made up of 3**
                   CI Type bits and 8 CI information bits as described in clauses 5.10.1 to 5.10.5
                   (see Table 9.1).}}

```
              Table 9.1: Use of Call Information
Use              Purpose                                    Clause
Powersave        Indicate normal or extended header type    5.10.1
{{T1 or T2 Data    Indicate the type of data (supplementary service)  5.10.2}}
T3 Data (Packet) Indicate data frame size and number of frames 5.10.3
Acknowledgements Indicate ACK or NACK and reason            5.10.5
System request   CI Type defines the purpose                5.10.4
System response  CI Type defines the purpose                5.10.4

Delivery Header  CI Type defines the purpose                5.10.4
```

Family: No Duplicates

Test Purposes: None

RQ_001_0971   **Call information field:**

TS 102 490 [1]   Clause 9.5, paragraph 7   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement:
```
IF Header type field is either 0000 or 0001 (binary) - Comm. start or Conn.
request -
AND the Header is for a Packet data communication type 3 transmission
THEN
   - the 3 CI type field bits shall set to 011 (binary)
   - first 4 bits of the information field shall be the Packet data frame size,
set as follows:
     pdS      Frame time (ms)      Data size bits
     0           80                    288
     1          160                    672
     2          240                  1 056
     3          320                  1 440
     Other    Reserved               Reserved
   - last 4 bits of the information field shall be the Packet data frame
number, set as follows:
     pdM      Number of Data frames
     0          1 frame
     1          2 frames
     2          3 frames
     3          4 frames
     4          5 frames
     5          6 frames
     6          7 frames
     7          8 frames
     Other    Reserved
```

Specification Text:
```
{{Finally there are the 11 bits of Call Information (CI) that are made up of 3
CI Type bits and 8 CI information bits as described in clauses 5.10.1 to 5.10.5
(see Table 9.1).}}
```

```
          Table 9.1: Use of Call Information
Use               Purpose                                    Clause
Powersave         Indicate normal or extended header type    5.10.1
T1 or T2 Data     Indicate the type of data (supplementary service) 5.10.2
{{T3 Data (Packet) Indicate data frame size and number of frames    5.10.3}}
Acknowledgements  Indicate ACK or NACK and reason            5.10.5
System request    CI Type defines the purpose                5.10.4
System response   CI Type defines the purpose                5.10.4

Delivery Header   CI Type defines the purpose                5.10.4
```

Family: No Duplicates

Test Purposes: None

RQ_001_0972   **Call information field:**

TS 102 490 [1]   Clause 9.5, paragraph 7   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: ```
                      IF Header is a system transaction header -
                      THEN
                       - the 3 data type field bits shall be set as follows:
                         000
                         001 Dynamic group request/answer/delivery
                         010 Reserved
                         011 Reserved
                         100 ESN request/reply
                         101 MFID request/reply
                         110 Contact station address (via Interconnect, IP)
                         111 Reserved
                       - the 8 information bits shall all set to 0
                      ```

*Specification Text:* **{{Finally there are the 11 bits of Call Information (CI) that are made up of 3 CI Type bits and 8 CI information bits as described in clauses 5.10.1 to 5.10.5 (see Table 9.1).}}**

```
        Table 9.1: Use of Call Information
Use   Purpose   Clause
Powersave   Indicate normal or extended header type   5.10.1
T1 or T2 Data   Indicate the type of data (supplementary service) 5.10.2
T3 Data (Packet) Indicate data frame size and number of frames 5.10.3
Acknowledgements Indicate ACK or NACK and reason   5.10.5
```
{{**System request   CI Type defines the purpose                5.10.4**
**System response  CI Type defines the purpose                5.10.4**

**Delivery Header  CI Type defines the purpose                5.10.4 }}**

*Family:*             No Duplicates

*Test Purposes:*      None

---

**RQ_001_0973**        **Call information field:**

TS 102 490 [1]        Clause 9.5, paragraph 7                          *Type:* Conditionally Mandatory

*Applies to:*         ISF, CSF

*Requirement:*        ```
                      IF Header type field is 0101 (bin) - Acknowledgement -
                      THEN
                       - the 3 CI type field bits shall be set as follows:
                         000
                         001    ACK (Rx OK)
                         010    NACK (data error, resend request)
                         011    NACK (request denied)
                         Other Reserved
                       - the 8 information bits shall be set as follows:
                   0

                         1 to 255 ACK / NACK status (rejection reason defined by user)
                      ```

Specification Text: **{{Finally there are the 11 bits of Call Information (CI) that are made up of 3 CI Type bits and 8 CI information bits as described in clauses 5.10.1 to 5.10.5 (see Table 9.1).}}**

```
        Table 9.1: Use of Call Information
Use               Purpose                                     Clause
Powersave         Indicate normal or extended header type     5.10.1
T1 or T2 Data     Indicate the type of data (supplementary service) 5.10.2
T3 Data (Packet)  Indicate data frame size and number of frames 5.10.3
```
{{**Acknowledgements Indicate ACK or NACK and reason   5.10.5**}}
```
System request    CI Type defines the purpose                5.10.4
System response   CI Type defines the purpose                5.10.4

Delivery Header   CI Type defines the purpose                5.10.4
```

Family: No Duplicates

Test Purposes: None

4.1.3.3   Packet Data Frame

RQ_001_0948   **Packet data frame:**

TS 102 490 [1]   Clause 9.4, paragraph 2   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: ```
                      IF the radio offers Packet data
                      THEN each packet data burst shall consist of up to 8 data frames.
                      ```

*Specification Text:* {{**The packet burst can consist of up to 8 data frames.**}}

*Family:*             No Duplicates

*Test Purposes:*      None


**RQ_001_0949**       **Packet data frame:**

TS 102 490 [1]       Clause 9.4, paragraph 10                                   *Type:* Conditionally Mandatory

*Applies to:*         CSF

*Requirement:*        ```
                      IF the radio offers Packet data
                      THEN each Type 3 Packet data burst frame shall start with a 24 bits long field,
                      containing the

                      Colour Code (CC) data which depend on the operation frequency:
                      B       446,103125 111101110101011101010111      F75757
                              446,109375 111101110111110101010111      F77D57
                              446,115625 111101111101010101010101      F7D555
                              446,121875 111101111111111101010101      F7FF55
                              446,128125 111101010101011101011101      F55F5D
                              446,134375 111101010111010101011101      F5755D
                              446,140625 111101011101110101011111      F5DD5F
                              446,146875 111101011111011101011111      F5F75F
                              446,153125 111111110101110101111111      FF5D7F
                              446,159375 111111110111011101111111      FF777F
                              446,165625 111111111101111101111101      FFDF7D
                              446,171875 111111111111010101111101      FFF57D
                              446,178125 111111010101010101110101      FD5575
                              446,184375 111111010111111101110101      FD7F75
                              446,190625 111111011101011101110111      FDD777
                              446,196875 111111011111110101110111      FDFD77
                      ```

Specification Text: ```
                      The packet burst can consist of up to 8 data frames.
                      ```

                      {{**The frame is completed by prefixing the 24 bits of Colour Code.**}}

                      {{**6.1.5 Colour code**}}
                      ```
                      The Colour Code is a 12 bit code that is di-bit encoded into a 24 bit sequence.
                      Colour Code are attributed directly to the RF operating channel and are not
                      freely selectable.
                      Radios employing Initial Services and Facilities shall use the Group A colour
                      codes.
                      Radios employing Configured Services and Facilities shall use the Group B
                      colour codes.
                      Table 6.1: Colour code by RF channel
                      ```

*Family:*             No Duplicates

*Test Purposes:*      None

**RQ_001_0950**        **Packet data frame:**

TS 102 490 [1]         Clause 9.4, paragraph 2                    *Type:* Conditionally Mandatory

*Applies to:*          CSF

*Requirement:*         **IF the radio offers Packet data**
                       **THEN each frame is numbered in the three bits long data frame number (N) field.**
                       **It's value shall be from 000 to 111 (binary).**

*Specification Text:*  {{**The current data frame number (N) is from 000 to 111.**}}

*Family:*              No Duplicates

*Test Purposes:*       None


**RQ_001_0951**        **Packet data frame:**

TS 102 490 [1]         Clause 9.4, paragraph 3                    *Type:* Conditionally Mandatory

*Applies to:*          CSF

*Requirement:*         **IF the radio offers Packet data**
                       **THEN each frame shall have an 8 bits long field Data lenght (LEN), giving the**
                       **number of data bytes contained in the current burst.**

*Specification Text:*  {{**N is followed by 8 bits that give the total number of data bytes contained in**
                       **the current burst.**}}

                       See {{**table 8.5**}}

*Family:*              No Duplicates

*Test Purposes:*       None


**RQ_001_0952**        **Packet data frame:**

TS 102 490 [1]         Clause 9.4, paragraph 4                    *Type:* Conditionally Mandatory

*Applies to:*          CSF

*Requirement:*         **IF the radio offers Packet data**
                       **THEN the 14 bits long field (DUMMY) shall always set to 0.**

*Specification Text:*  {{**This is followed by 14 dummy bits that are set to zero.**}}
                       See {{**table 8.5**}}

*Family:*              No Duplicates

*Test Purposes:*       None


**RQ_001_0953**        **Packet data frame:**

TS 102 490 [1]         Clause 9.4, paragraph 5                    *Type:* Conditionally Mandatory

*Applies to:*          CSF

*Requirement:*         **IF the radio offers Packet data**
                       **THEN the 16 bits long field, CRC for DATA field (CRC-D) of the current frame**
                       **shall be calculated with the polinomial X^16 + X^12 + X^5 + 1.**

*Specification Text:*  {{**The next 16 bits are the CRC for the data field contained in this burst.**}}

                       See {{**table 8.5**}}

*Family:*              No Duplicates

*Test Purposes:*       None

**RQ_001_0954**        **Packet data frame:**

TS 102 490 [1]        Clause 9.4, paragraph 6                    *Type:* Conditionally Mandatory

*Applies to:*        CSF

*Requirement:*       **IF the radio offers Packet data**
                     **THEN a 7 bit CRC checksum shall be calculated on the above 41 bits, using the**
                     **X^7 + X^3 + 1 polinomial.**
                     **The concatenation of above 48 bits shall be defined and referred as the**
                     **parameter data (PAR)**

*Specification Text:*  {{**The 7 bit CRC checksum is added to these 41 bits using the polynomial given**
                     **in clause 7.2 giving a total of 48 bits.**}}
                     Clause 7.2 CRC addition
                     Use       CRC  Polynomial
                     Frame (CCH) CRC7 X^7 + X^3 + 1


                     See also {{**table 8.5** }}and {{**figure 9.**}}

*Family:*            No Duplicates

*Test Purposes:*     None



**RQ_001_0955**        **Packet data frame:**

TS 102 490 [1]        Clause 9.4, paragraph 7                    *Type:* Conditionally Mandatory

*Applies to:*        CSF

*Requirement:*       **IF the radio offers Packet data**
                     **THEN each data burst frame the 48 bits referred as parameter data (PAR) shall**
                     **be separated into 6 bytes. Each of these bytes shall be coded by shortened 12,8**
                     **Hamming code where**
                     **X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):**
                     **C3,C2,C1,C0 is parity bit (4 bit).**

                     **The generator matrix is:**
                     **  12 11 10  9  8  7  6  5  4  3  2  1**
                     **  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0**
                     **1  1  0  0  0  0  0  0  0  0  1  1  1  0**
                     **2  0  1  0  0  0  0  0  0  0  1  1  1**
                     **3  0  0  1  0  0  0  0  0  1  0  1  0**
                     **4  0  0  0  1  0  0  0  0  0  1  0  1**
                     **5  0  0  0  0  1  0  0  0  1  0  1  1**
                     **6  0  0  0  0  0  1  0  0  1  1  0  0**
                     **7  0  0  0  0  0  0  1  0  0  1  1  0**
                     **8  0  0  0  0  0  0  0  1  0  0  1  1**

                     **The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.**
                     **This will generate a 6x12 bit Packet data blocks**

*Specification Text:*  {{**These 48 data bits are now separated into 6 bytes. Each byte is now coded by**
                     **a shortened 12,8 Hamming Code (clause 7.3) giving 6 x 12 bit blocks.**}}

                     {{**Clause 7.3                                              Hamming code**}}
                     A shortened Hamming code (12,8) is employed and the generator matrix is shown
                     below:
                     X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):      C3,C2,C1,C0 is Parity bit
                     (4 bit).
                     {{**Table 7.1**}}: Generator matrix

                     Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.


                     See also {{**figure 9**}}.

*Family:*            No Duplicates

*Test Purposes:*     None

**RQ_001_0956**         **Packet data frame:**

TS 102 490 [1]         Clause 9.4, paragraph 8                          *Type:* Conditionally Mandatory

*Applies to:*          CSF

*Requirement:*         **IF the radio offers Packet data**
                       **THEN the 6x12 bit Packet data blocks shall be interleaved using the following**
                       **12x6 interleaving matrix:**

```
    1  2  3  4  5  6
1   1  13 25 37 49 61
2   2  14 26 38 50 62
3   3  15 27 39 51 63
4   4  16 28 40 52 64
5   5  17 29 41 53 65
6   6  18 30 42 54 66
7   7  19 31 43 55 67
8   8  20 32 44 56 68
9   9  21 33 45 57 69
10  10 22 34 46 58 70
11  11 23 35 47 59 71
12  12 24 36 48 60 72
```

                       This 72 generated bit shall be referred as the interleaved PAR DATA.

Specification Text: {{**To protect against burst interference, these 6 x 12 bit blocks are now**
                       interleaved using the 12 x 6 TCH interleaving matrix given in clause 7.5.}}

                       Clause 7.5   Interleaving
                       There are two interleaving matrices, one for the TCH and one for the HI field.
                       TCH interleave structure matrix:
                       Table 7.2: TCH Interleaving matrix

                       See{{ **figure** }}9.

Family: No Duplicates

Test Purposes: None

RQ_001_0958   **Packet data frame:**

TS 102 490 [1]   Clause 9.4, paragraph 9   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF the radio offers Packet data**
                       THEN the interleaved PAR DATA and the DATA frames are scrambled using the
                       polinomial X^9 + X^5 + 1 with an initial preset value of all "1"s.

Specification Text: {{**Next the associated data frames are appended to the interleaved PAR data and**
                       scrambled using the polynomial given in clause 7.4.}}

                       {{**Clause 7.4 Scrambling**}}
                       The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all
                       "1"s.

                       See {{**figure 9**}}.

Family: No Duplicates

Test Purposes: None

4.1.3.4   Superframe

RQ_001_0915	**Superframe:**	
TS 102 490 [1]	Clause 9.1, paragraph 2	*Type:* Mandatory
Applies to:	ISF, CSF	
Requirement:	**The Frame Number (FN) field of each Superframe shall be two bits long. It's value shall be from 00 to 11 (binary).**	
Specification Text:	{{**Frame Numbering (FN) is from 00 to 11 (1 to 4)**}}.	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_0916	**Superframe:**	
TS 102 490 [1]	Clause 9.1, paragraph 9	*Type:* Mandatory
Applies to:	ISF, CSF	
Requirement:	**Each frame of the Voice Superframe shall state the type of the call through the communications mode field (M). This shall have a length of three bits and it's value shall be as follows:** **Values shall be as follows:** **000 Voice communication (no user data in SLD field)** **001 Voice + slow data (user data in SLD field)** **101 Voice and appended data (Type 2)** **Other Reserved**	
Specification Text:	{{**The communications mode value is added according to the table in clause 5.7**}}.For example, if slow data (SLD) is being included within the voice superframe then communications mode value is set to 001. Table 5.7. 000 Voice communication (no user data in SLD field) 001 Voice + slow data (user data in SLD field) 010 Data communication type 1 (Payload is user data without FEC) 011 Data communication type 2 (Payload is user data with FEC) 100 Data communication type 3 (Packet data, ARQ method) 101 Voice and appended data (Type 2) Other Reserved	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_0917	**Superframe:**	
TS 102 490 [1]	Clause 9.1, paragraph 10	*Type:* Mandatory
Applies to:	ISF, CSF	
Requirement:	**Each frame of a Superframe shall have a Communication format field (F). This field must be four bits long and must have a value from 0 to 1.** **Values shall be as follows:** **0000 Call ALL** **0001 Peer-to-peer communication** **Other Reserved**	
Specification Text:	{{**The communications format bits are now added according to clause 5.8. Generally these will be set to 0001 (peer-to-peer call). O**}}ccasionally they may be set to 0000 (all call) but this is a special case, similar to a broadcast. See also {{**Table 5.8**}}	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_0918   **Superframe:**

TS 102 490 [1]   Clause 9.1, paragraph 11   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **After the Communication format field in all Superframe there shall be the two**
                      bits long Reserved field (RES).
                      The two bits shall be always se to 0.

Specification Text: {{**The next 2 bits are set to 00 (reserved bits)**}}:

Family: No Duplicates

Test Purposes: None

RQ_001_0919   **Superframe:**

TS 102 490 [1]   Clause 9.1, paragraph 3, 4   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each frame in a Superframe shall have a field containing called or own ID.**
                      This field shall be 12 bits long and the data it shall contain depends on the
                      Frame Numbering field.
                      • Frame Numbering 0 will include the upper 12 bits of the called station ID.
                      (ID0)
                      • Frame Numbering 1 will include the lower 12 bits of the called station ID.
                      (ID1)
                      • Frame Numbering 2 will include the upper 12 bits of the own ID. (ID2)
                      • Frame Numbering 3 will include the lower 12 bits of the own ID. (ID3)

Specification Text: {{**FN is followed by 12 bits of the called station address or own ID**}} as
                      follows:
                      The called station ID and own ID make a total of 48 bits. These bits are split
                      into 12 bit blocks and one block is included in each of the 4 frames of the
                      superframe.
                      • FN 00 will include the upper 12 bits of the called station ID.
                      • FN 01 will include the lower 12 bits of the called station ID.
                      • FN 10 will include the upper 12 bits of the own ID.
                      • FN 11 will include the lower 12 bits of the own ID.

Family: No Duplicates

Test Purposes: None

RQ_001_0929 **Superframe:**

TS 102 490 [1] Clause 9.1, paragraph 20 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each frame of the Superframe shall start with 24 bit field containing:**

in frame number 1 and 3 the Frame Sync 2 data, as follows:
Binary: 010111111111011101111101
Hex: 5F F7 7D

in frame number 2 and 4 the Colour Code (CC) data which depend on the operation frequency.
In case of a ISF Radio the CC is

Group	Channel Frequency	Colour Code (Bit)	Colour Code (Hex)
A	446,103125	010101110111010101110111	577577
	446,109375	010101111101110101110101	57DD75
	446,115625	010101111111011101110101	57F775
	446,121875	010101010101011101111101	55577D
	446,128125	010101010111110101111101	557D7D
	446,134375	010101011101010101111111	55D57F
	446,140625	010101011111111101111111	55FF7F
	446,146875	010111110101010101011111	5F555F
	446,153125	010111110111111101011111	5F7F5F
	446,159375	010111111101011101011101	5FD75D
	446,165625	010111111111110101011101	5FFD5D
	446,171875	010111010101110101010101	5D5D55
	446,178125	010111010111011101010101	5D7755
	446,184375	010111011101111101010111	5DDF57
	446,190625	010111011111010101010111	5DF557
	446,196875	011101110101110111010111	775DD7

In Case of a CSF Radio io the CC is

Group	Channel Frequency	Colour Code (Bit)	Colour Code (Hex)
B	446,103125	111101110101011101010111	F75757
	446,109375	111101110111110101010111	F77D57
	446,115625	111101111101010101010101	F7D555
	446,121875	111101111111111101010101	F7FF55
	446,128125	111101010101111101011101	F55F5D
	446,134375	111101010111010101011101	F5755D
	446,140625	111101011101110101011111	F5DD5F
	446,146875	111101011111011101011111	F5F75F
	446,153125	111111110101110101111111	FF5D7F
	446,159375	111111110111011101111111	FF777F
	446,165625	111111111101110101110111	FFDF7D
	446,171875	111111111111010101111101	FFF57D
	446,178125	111111010101010101110101	FD5575
	446,184375	111111010111111101110101	FD7F75
	446,190625	111111011101011101110111	FDD777
	446,196875	111111011111110101110111	FDFD77

Specification Text: {{**The frame is completed by prefixing with either the 24 bits of FS2 (frame numbers 00 or 10) or the 24 bits of Colour Code (frame numbers 01 or 11)}}**.

{{**6.1.2**}}
The Frame sync 2 sequence contained in the superframe (frames 1 and 3) is a 24 bit sequence that shall have the following value:
Binary: 010111111111011101111101.
Hex: 5F F7 7D.

{{**6.1.5 Colour code**}}
The Colour Code is a 12 bit code that is di-bit encoded into a 24 bit sequence.
Colour Code are attributed directly to the RF operating channel and are not freely selectable.
Radios employing Initial Services and Facilities shall use the Group A colour codes.
Radios employing Configured Services and Facilities shall use the Group B colour codes.

{{**Table 6.1: Colour code by RF channel**}}

Family: No Duplicates

Test Purposes: None

4.1.3.4.1   Type 1 Data

RQ_001_0807   **Type 1 data:**

TS 102 490 [1]   Clause*s* 8.1, 8.2, paragraph 1   *Type:* Optional

Applies to: ISF, CSF

Requirement: **A dPMR radio may support Type 1 Group Short Data Message.**

Specification Text: {{**Type 1 data Group Short Message**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0810   **Type 1 data:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio may support Type 1 Individual Short Data Message service.**

Specification Text: {{**Type 1 data, Individual Short Data Message**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0831   **Type 1 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF a dPMR radio supports type 1 data**
                     AND is using Group Short Data Message
                     THEN it may support the supplementary service "Status Message".

Specification Text: {{**Table 8.1 and Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0832   **Type 1 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF a dPMR radio supports type 1 data**
                     AND is using Group Short Data Message
                     THEN it may support the supplementary service "Precoded Message".

Specification Text: {{**Table 8.1 and Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0833	**Type 1 data:**	
TS 102 490 [1]	Clause 8.1, paragraph 1	*Type:* Conditionally Optional
Applies to:	ISF, CSF	
Requirement:	**IF a dPMR radio supports type 1 data** **AND is using Group Short Data Message** **THEN it may support the supplementary service "Free Text Message".**	
Specification Text:	{{**Table 8.1 and Table 8.3**}}	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_0834	**Type 1 data:**	
TS 102 490 [1]	Clause 8.1, paragraph 1	*Type:* Conditionally Optional
Applies to:	ISF, CSF	
Requirement:	**IF a dPMR radio supports type 1 data** **AND is using Group Short Data Message** **THEN it may support the supplementary service "Short file transfer".**	
Specification Text:	{{**Table 8.1 and Table 8.3**}}	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_0934	**Type 1 data:**	
TS 102 490 [1]	Clause 9.2, paragraph 9	*Type:* Conditionally Mandatory
Applies to:	ISF, CSF	
Requirement:	**IF the radio offers Type 1 data** **THEN the communications mode (M) field in the header frame shall be set to 010** **(binary).**	
Specification Text:	{{**The communications mode, 010 is added (clause 5.7).**}}. For example, if slow data (SLD) is being included within the voice superframe then communications mode value is set to 001. {{**Table 5.7.**}} 000 Voice communication (no user data in SLD field) 001 Voice + slow data (user data in SLD field) 010 Data communication type 1 (Payload is user data without FEC) 011 Data communication type 2 (Payload is user data with FEC) 100 Data communication type 3 (Packet data, ARQ method) 101 Voice and appended data (Type 2) Other Reserved See also {{**figure 7**}}.	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_0935	**Type 1 data:**	
TS 102 490 [1]	Clause 9.2, paragraph 12	*Type:* Conditionally Mandatory
Applies to:	ISF, CSF	

Requirement:
```
IF the radio offers Type 1 data
THEN the Slow data field (SLD) shall be used to convey information of data
format, position and continuation, etc.
Data shall be formatted as follows:


Reserved  DP      Format  Cont.   Data length (bytes)
5 bits    2 bits  4 bits  1 bit   6 bits


Data Position (DP):
00 There is no data in this frame
01 Reserved
10 Reserved
11 This frame is the data frame
```

```
Format:
          0000  Status message
          0001  Precoded message
          0010  Free text message (radio generated data)
          0011  Short file transfer
          0100  User defined data 1
          0101  User defined data 2
          0110  User defined data 3
          0111  User defined data 4
Other Reserved


          Continuation flag:
          0 Data continues after this frame.
          1 Data finishes at this frame.
```

Specification Text: {{**Then there are the 18 bits of the slow user data field (SLD)**}}. These bits
are set according to clause 5.9.2 depending on the data to be transmitted.

{{**Clause 5.9.2 Slow data field use with Type 1 or 2 data**}}.
When Type 1 or 2 data is transmitted, the SLD field is used to convey
information of data format, position and continuation, etc. The SLD field is
also used when a voice transmission has data appended to the end of the
transmission.

{{**Table 5.9.a:** }}DP coding

{{**Table 5.9.b:** }}Format coding

Family:	No Duplicates
Test Purposes:	None

RQ_001_0936	**Type 1 data:**
TS 102 490 [1]	Clause 9.2, paragraph 15 *Type:* Conditionally Mandatory
Applies to:	ISF, CSF

Requirement:	`IF the radio offers Type 1 data`
	`THEN the Control CHannel (CCH) field shall be separated into 6 bytes. Each of`
	`these bytes shall be coded by shortened 12,8 Hamming code, as shown in clause`
	`7.3`
	`X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit): C3,C2,C1,C0 is parity bit`
	`(4 bit).`
	`The Generator matrix is as follows:`

```
  12 11 10  9  8  7  6  5  4  3  2  1
   X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
```

`The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.`
`This gives the 6x12 Type 1 data CCH bit blocks.`

Specification Text:	{{`These 48 bits are now separated into 6 bytes. Each byte is now coded by a`
	`shortened 12,8 Hamming Code (clause 7.3) giving 6 x 12 bit blocks.`}}
	
	{{`Clause 7.3` `Hamming code`}}
	`A shortened Hamming code (12,8) is employed and the generator matrix is shown`
	`below:`
	`X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):    C3,C2,C1,C0 is Parity bit`
	`(4 bit).`
	
	{{`Table 7.1: Generator matrix`}}
	
	`Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.`
	
	`See also` {{`figure 7`}}.

Family:	No Duplicates
Test Purposes:	None

RQ_001_0937   **Type 1 data:**

TS 102 490 [1]   Clause 9.2, paragraph 16, 17   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: ```
The 6x12 Type 1 data CCH shall be interleaved using the following 12x6
interleaving matrix:
   1 2 3 4 5 6
1 1 13 25 37 49 61
2 2 14 26 38 50 62
3 3 15 27 39 51 63
4 4 16 28 40 52 64
5 5 17 29 41 53 65
6 6 18 30 42 54 66
7 7 19 31 43 55 67
8 8 20 32 44 56 68
9 9 21 33 45 57 69
10 10 22 34 46 58 70
11 11 23 35 47 59 71
12 12 24 36 48 60 72.

This gives the Type 1 interleaved CCH data.
Then a 288 bit block of uncorrected user data is added
```

Specification Text: {{To protect against burst interference, these 6 x 12 bit blocks are now
                       interleaved using the 12 x 6 TCH interleaving matrix given in table 7.2}}

                       {{Next the 288 bit block of uncorrected user data are appended.}}

                       {{Clause 7.5   Interleaving}}
                       There are two interleaving matrices, one for the TCH and one for the HI field.
                       TCH interleave structure matrix:
                       Table 7.2: TCH Interleaving matrix

                       See also {{figure 7}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0938   **Type 1 data:**

TS 102 490 [1]   Clause 9.2, paragraph 18   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: The Type 1 interleaved CCH data bits and appended data blocks will be scrambled
                       using the polinomial ^9 + X^5 + 1 with an initial preset value of all "1"s.

Specification Text: {{Finally the interleaved TCH data and appended data blocks are scrambled using
                       the polynomial given in clause 7.4}}

                       {{Clause 7.4   Scrambling}}
                       The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all
                       "1"s.

                       See {{figure 7}}.

Family: No Duplicates

Test Purposes: None

4.1.3.4.2   Type 2 Data

RQ_001_0806   **Type 2 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Optional

Applies to: ISF, CSF

Requirement: **A dPMR radio may support type 2 Group short Data Message**

Specification Text: {{**Type 2 data Group Short Data Message**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0809   **Type 2 data:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio may support Type 2 Individual Short data message.**

Specification Text: {{**Type 2 data, Individual Short Data Message**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0825   **Type 2 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF a dPMR radio supports type 2 data**
                      AND is using Group Short Data Message
                      THEN it may support the supplementary service "Status Message".

Specification Text: {{**Table 8.1 and Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0827   **Type 2 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF a dPMR radio supports type 2 data**
                      AND is using Group Short Data Message
                      THEN it may support the supplementary service "Precoded Message".

Specification Text: {{**Table 8.1 and Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0829   **Type 2 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF a dPMR radio supports type 2 data**
                         AND is using Group Short Data Message
                         THEN it may support the supplementary service "Free Text Message".

Specification Text: {{**Table 8.1 and Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0830   **Type 2 data:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF a dPMR radio supports type 2 data**
                         AND is using Group Short Data Message
                         THEN it may support the supplementary service "Short file transfer".

Specification Text: {{**Table 8.1 and Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0939   **Type 2 data:**

TS 102 490 [1]   Clause 9.3, paragraph 9   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF radio offers Type 2 data**
                         THEN the communications mode (M) field shall be 011 (binary).

Specification Text: {{**The communications mode, 011 is added**}} (clause 5.7).

                         ```
                         Table 5.7.
                         000    Voice communication (no user data in SLD field)
                         001    Voice + slow data (user data in SLD field)
                         010    Data communication type 1 (Payload is user data without FEC)
                         011    Data communication type 2 (Payload is user data with FEC)
                         100    Data communication type 3 (Packet data, ARQ method)
                         101    Voice and appended data (Type 2)
                         Other  Reserved
                         ```

Family: No Duplicates

Test Purposes: None

RQ_001_0940	**Type 2 data:**	
TS 102 490 [1]	Clause 9.3, paragraph 12	*Type:* Conditionally Mandatory
Applies to:	ISF, CSF	

Requirement:

```
IF the radio offers Type 2 data
THEN the Slow data field (SLD) shall be used to convey information of data
format, position and continuation, etc.
Data shall be formatted as follows:


Reserved DP     Format Cont. Data length (bytes)
5 bits   2 bits 4 bits 1 bit 6 bits


Data Position (DP):
00 There is no data in this frame
01 Reserved
10 Reserved
11 This frame is the data frame
```

Format:

```
                0000  Status message
                0001  Precoded message
                0010  Free text message (radio generated data)
                0011  Short file transfer
                0100  User defined data 1
                0101  User defined data 2
                0110  User defined data 3
                0111  User defined data 4
```

Other Reserved

```
                Continuation flag:
                0 Data continues after this frame.
                1 Data finishes at this frame.
```

Specification Text: {{**Finally there are the 18 bits of the slow user data field (SLD)**}}. These bits are set according to clause 5.9.2 depending on the data to be transmitted.

{{**Clause 5.9.2 Slow data field use with Type 1 or 2 data**}}.
When Type 1 or 2 data is transmitted, the SLD field is used to convey information of data format, position and continuation, etc. The SLD field is also used when a voice transmission has data appended to the end of the transmission.

Reserved	DP	Format	Cont.	Data length (bytes)
5 bits	2 bits	4 bits	1 bit	6 bits

{{**Table 5.9.a**}}: DP coding

{{**Table 5.9.b**}}: Format coding

Family:	No Duplicates
Test Purposes:	None

RQ_001_0941	**Type 2 data:**	
TS 102 490 [1]	Clause 9.3, paragraph 15	*Type:* Conditionally Mandatory
Applies to:	ISF, CSF	

Requirement:

```
IF the radio offers Type 2 data
THEN the Control CHannel (CCH) field shall be separated into 6 bytes. Each of
these bytes shall be coded by shortened 12,8 Hamming code:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit)
C3,C2,C1,C0 is parity bit (4 bit).


The generator matrix is as follows:
  12 11 10  9  8  7  6  5  4  3  2  1
  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.
This will give the 6x12 bit blocks Type data 2 bits.
```

Specification Text:

{{**These 48 bits are now separated into 6 bytes. Each byte is now coded by a shortened 12,8 Hamming Code** }}(clause 7.3) giving 6 x 12 bit blocks.

{{**Clause 7.3**   **Hamming code**}}
A shortened Hamming code (12,8) is employed and the generator matrix is shown below:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit):   C3,C2,C1,C0 is Parity bit (4 bit).

{{**Table 7.3:**}} Generator matrix

Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.

See also {{**figure 8.**}}

Family:	No Duplicates
Test Purposes:	None

RQ_001_0942   **Type 2 data:**

TS 102 490 [1]   Clause 9.3, paragraph 16   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **The 6x12 bit blocks Type data 2 shall be interleaved using the following 12x6**
                      interleaving matrix:
                      ```
                         1  2   3   4   5   6
                      1  1  13  25  37  49  61
                      2  2  14  26  38  50  62
                      3  3  15  27  39  51  63
                      4  4  16  28  40  52  64
                      5  5  17  29  41  53  65
                      6  6  18  30  42  54  66
                      7  7  19  31  43  55  67
                      8  8  20  32  44  56  68
                      9  9  21  33  45  57  69
                      10 10  22  34  46  58  70
                      11 11  23  35  47  59  71
                      12 12  24  36  48  60  72.
                      ```

                      This will generate the 72 CCH interleaved Type 2 data bits.

Specification Text: {{**To protect against burst interference, these 6 x 12 bit blocks are now**
                      interleaved using the 12 x 6 TCH interleaving matrix given in table 7.2}}

                      {{**Clause 7.5   Interleaving**}}
                      There are two interleaving matrices, one for the TCH and one for the HI field.
                      TCH interleave structure matrix:
                      {{**Table 7.2**}}: TCH Interleaving matrix

                      See also {{**figure 8**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0943   **Type 2 data:**

TS 102 490 [1]   Clause 9.3, paragraphs 17, 18, 19, 20   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the radio offers Type 2 data**
                      THEN user data shall be broken down into 5 byte blocks (40 bits) to which 1 bit
                      of null data (i.e. set to 0) shall be appended. Four of these 41 bit blocks
                      will be allocated to each frame of the Type 2 Superframe.
                      For each 4 of these 41 bit block the next three reqirements in sequence will be
                      applied.

Specification Text: {{**The user data is broken down into 5 byte blocks (40 bits) to which 1 bit of**
                      null data (i.e. set to 0) is appended. 4 of these 41 bit blocks will be
                      allocated to each frame.}}

                      See {{**figure 8**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0944   **Type 2 data:**

TS 102 490 [1]   Clause 9.3, paragraphs 17, 18, 19, 20   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the radio offers Type 2 data**
                       THEN a 7 bit CRC shall be applied using the polynomial X^7 + X^3 + 1.
                       This will give a total of 48 bits.

Specification Text: {{**The 7 bit CRC checksum is added to each 41 bit block using the polynomial**
                       given in clause 7.2 giving a total of 48 data bits.}}
                       See {{**figure 8**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0945   **Type 2 data:**

TS 102 490 [1]   Clause 9.3, paragraphs 17, 18, 19, 20   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the radio offers Type 2 data**
                       THEN the 48 bits shall be separated into 6 bytes. Each of these bytes shall be
                       coded by shortened 12,8 Hamming code, as shown in clause 7.3
                       X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit): C3,C2,C1,C0 is parity bit
                       (4 bit).
                       The Generator matrix is as follows:
                       ` 12 11 10  9  8  7  6  5  4  3  2  1`
                       `  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0`
                       `1  1  0  0  0  0  0  0  0  1  1  1  0`
                       `2  0  1  0  0  0  0  0  0  0  1  1  1`
                       `3  0  0  1  0  0  0  0  0  1  0  1  0`
                       `4  0  0  0  1  0  0  0  0  0  1  0  1`
                       `5  0  0  0  0  1  0  0  0  1  0  1  1`
                       `6  0  0  0  0  0  1  0  0  1  1  0  0`
                       `7  0  0  0  0  0  0  1  0  0  1  1  0`
                       `8  0  0  0  0  0  0  0  1  0  0  1  1`

                       Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.
                       This will generate a 6x12 bit blocks.

Specification Text: {{**These 48 data bits are now separated into 6 bytes. Each byte is now coded by**
                       a shortened 12,8 Hamming Code (clause 7.3) }}giving 6 x 12 bit blocks.
                       See {{**figure 8**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0946 **Type 2 data:**

TS 102 490 [1] Clause 9.3, paragraphs 17, 18, 19, 20 *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the radio offers Type 2 data**
THEN the generated 6x12 bit blocks shall be interleaved using the following
12x6 interleaving matrix
```
   1  2  3  4  5  6
1  1 13 25 37 49 61
2  2 14 26 38 50 62
3  3 15 27 39 51 63
4  4 16 28 40 52 64
5  5 17 29 41 53 65
6  6 18 30 42 54 66
7  7 19 31 43 55 67
8  8 20 32 44 56 68
9  9 21 33 45 57 69
10 10 22 34 46 58 70
11 11 23 35 47 59 71
12 12 24 36 48 60 72.
```

This will generate the 4x72 coded data blocks.

Specification Text: To protect against burst interference, {{**these 6 x 12 bit blocks are now**
interleaved using the 12 x 6 TCH interleaving matrix given in table 7.2.}}
See {{**figure 8**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0947 **Type 2 data:**

TS 102 490 [1] Clause 9.3, paragraph 21 *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF the radio offers Type 2 data**
THEN data composed by the concatenation of following bits:

72 TCH interleaved bits and
4x72 bits coded data blocks

shall be scrambled using the polinomial X^9 + X^5 + 1 with an initial preset
value of all "1"s.

Specification Text: {{**Next 4 of the 72 bit coded data blocks are appended to the interleaved TCH**
data and scrambled using the polynomial given in clause 7.4.}}

{{**Clause 7.4** **Scrambling**}}
The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all
"1"s.

See {{**figure 8**}}.

Family: No Duplicates

Test Purposes: None

4.1.3.4.3 Voice

RQ_001_0801 **Voice:**

TS 102 490 [1] Clause 8.1, paragraph 1 *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **A dPMR radio shall support PTT calls.**

Specification Text: See {{**tables 8.1 and 8.3** }}in document.

Family: No Duplicates

Test Purposes: None

RQ_001_0920 **Voice:**

TS 102 490 [1] Clause 9.1, paragraph 12 *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **Each frame of a Superframe shall contain an eighteen bits long Slow data field (SLD).**
It's contents depends on the Communication mode field (M) value.

IF the Communications mode is set to 000 (binary)
THEN the 18 bits of slow user data field are set to zero.

Specification Text: {{**If the communications mode is set to 000 the 18 bits of slow user data (SLD) field are set to zero**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0921 **Voice:**

TS 102 490 [1] Clause 9.1, paragraph 13 *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **Each frame of a Superframe shall contain an eighteen bits long Slow data field (SLD).**
It's contents depends on the Communication mode field (M) value.

IF the Communications mode is set to 001 (binary)
THEN the Slow user data field shall be assembled as follows:

Cont. User data Cont. User data
1 bit 8 bits   1 bit 8 bits
Continuation Flag:
0 User data continues after the following byte.
1 User data is terminated by the following byte.

Specification Text: {{**If the communications mode is set to 001 the 18 bits of slow user data (SLD) field is assembled according to clause 5.9.1**}}.

{{**Clause 5.9.1 Slow data in the voice superframe**}}.
Each byte of user data is preceded by a continuation flag (Cont.) to inform the receiving party if the subsequent byte is the last.
Cont. User data Cont. User data
1 bit 8 bits   1 bit 8 bits
Continuation Flag:
0 User data continues after the following byte.
1 User data is terminated by the following byte.

Family: No Duplicates

Test Purposes: None

RQ_001_0922	**Voice:**	
TS 102 490 [1]	Clause 9.1, paragraph 14	*Type:* Conditionally Mandatory
Applies to:	ISF, CSF	

Requirement:

Each frame of a Superframe shall contain an eighteen bits long Slow data field (SLD).
It's contents depends on the Communication mode field (M) value.

IF the Communications mode is set to 101 (binary)
THEN the Slow user data field shall be assembled as follows:

```
Reserved    DP      Format  Cont.  Data length (bytes)
5 bits      2 bits  4 bits  1 bit  6 bits
```

Data Position (DP):
Table 5.9a: DP coding
00 There is no data in this frame
01 Reserved

10 Reserved

11 This frame is the data frame

Format:

Table 5.9b: Format coding
0000 Status message
0001 Precoded message
0010 Free text message (radio generated data)
0011 Short file transfer
0100 User defined data 1
0101 User defined data 2
0110 User defined data 3
0111 User defined data 4

Other Reserved

Continuation flag:
0 Data continues after this frame.
1 Data finishes at this frame.

Specification Text:

{{**If the communications mode is set to 101 the slow user data (SLD) field is assembled according to clause 5.9.2**}}.

Clause 5.9.2 Slow data field use with Type 1 or 2 data
When Type 1 or 2 data is transmitted, the SLD field is used to convey information of data format, position and continuation, etc. The SLD field is also used when a voice transmission has data appended to the end of the transmission.

See {{**Tables 5.9x**}}

Family:	No Duplicates
Test Purposes:	None

RQ_001_0923 **Voice:**

TS 102 490 [1]   Clause 9.1, paragraph 16   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each frame of a Superframe shall contain a 7 bit CRC field.**
Involved bits for CRC calculation shall be the ones in fields: Frame Number,
Called/Own ID, communication mode, communication format, reserved and Slow
data. (CCH data).

The polynomial to generate them is X^7 + X^3 + 1.

Specification Text: {{**The 7 bit CRC checksum is added using the polynomial given in clause 7.2**}}
giving a total of 48 bits

{{**Clause 7.2 CRC addition**}}
Use   CRC   Polynomial
Frame (CCH) CRC7   X^7 + X^3 + 1

Family: No Duplicates

Test Purposes: None

RQ_001_0926 **Voice:**

TS 102 490 [1]   Clause 9.1, paragraph 17   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The Control CHannel (CCH) field shall be separated into 6 bytes. Each of these**
bytes shall be coded by shortened 12,8 Hamming code with
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit)
C3,C2,C1,C0 is parity bit (4 bit)

The Generator matrix is as follows:
```
  12 11 10  9  8  7  6  5  4  3  2  1
  X7 X6 X5 X4 X3 X2 X1  1 C3 C2 C1 C0
1  1  0  0  0  0  0  0  0  1  1  1  0
2  0  1  0  0  0  0  0  0  0  1  1  1
3  0  0  1  0  0  0  0  0  1  0  1  0
4  0  0  0  1  0  0  0  0  0  1  0  1
5  0  0  0  0  1  0  0  0  1  0  1  1
6  0  0  0  0  0  1  0  0  1  1  0  0
7  0  0  0  0  0  0  1  0  0  1  1  0
8  0  0  0  0  0  0  0  1  0  0  1  1
```

The Shortened Hamming code (12,8) Polynomial is X^4 + X + 1.
This gives the 6x12 CCH bit blocks.

See figure 6.

Specification Text: {{**These 48 bits are now separated into 6 bytes. Each byte is now coded by a**
shortened 12,8 Hamming Code (clause 7.3) giving 6 x 12 bit blocks.}}

{{**Clause 7.3 Hamming code**}}
A shortened Hamming code (12,8) is employed and the generator matrix is shown
below:
X7,X6,X5,X4,X3,X2,X1,1 is Identity bit (8 bit): C3,C2,C1,C0 is Parity bit
(4 bit).
{{**Table 7.1: Generator matrix**}}
Shortened Hamming code (12,8) Polynomial: X^4 + X + 1.

Family: No Duplicates

Test Purposes: None

RQ_001_0927   **Voice:**

TS 102 490 [1]   Clause 9.1, paragraph 18   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The 6x12 CCH bit blocks shall be interleaved using the following 12x6**
                       interleaving matrix:
                       **   1 2 3 4 5 6**
                       1 1 13 25 37 49 61
                       2 2 14 26 38 50 62
                       3 3 15 27 39 51 63
                       4 4 16 28 40 52 64
                       5 5 17 29 41 53 65
                       6 6 18 30 42 54 66
                       7 7 19 31 43 55 67
                       8 8 20 32 44 56 68
                       9 9 21 33 45 57 69
                       10 10 22 34 46 58 70
                       11 11 23 35 47 59 71
                       12 12 24 36 48 60 72.

                       This gives the interleaved CCH data.

Specification Text: {{**To protect against burst interference, these 6 x 12 bit blocks are now**
                       interleaved using the 12x6 TCH interleaving matrix given in table 7.2}}

                       {{**Table 7.2: TCH Interleaving matrix**}}

                       See also {{**Figure 6**}}

Family: No Duplicates
Test Purposes: None

RQ_001_0928   **Voice:**

TS 102 490 [1]   Clause 9.1, paragraph 19   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **The interleaved CCH data shall be scrambled using the polinomial X^9 + X^5 + 1**
                       with an initial preset value of all "1"s.

Specification Text: {{**Then the interleaved CCH data is scrambled using the polynomial given in**
                       clause 7.4.}}

                       {{**Clause 7.4 Scrambling**}}
                       The scrambling polynomial is X^9 + X^5 + 1 with an initial preset value of all
                       "1"s.

                       See also {{**figure 3.**}}

Family: No Duplicates
Test Purposes: None

RQ_001_0930   **Voice:**

TS 102 490 [1]   Clause 9.1, paragraph 21   *Type:* Mandatory

Applies to: ISF, CSF

Requirement: **Each frame of the voice Superframe shall end with four 72 bits long Traffic**
                       Channel (TCH) fields. Each field shall contain the 72 bit block of Forward
                       Error corrected vocoder data.

Specification Text: {{**Finally the 4 x 72 bit blocks of Forward Error corrected vocoder data (TCH)**
                       are appended}}.

                       See also {{**figure 6**}}

Family: No Duplicates
Test Purposes: None

RQ_001_0931	**Voice:**	
TS 102 490 [1]	Clause 9.1, paragraph 22	*Type:* Mandatory
Applies to:	ISF, CSF	
Requirement:	**In a voice transmission, when the PTT is released before the end of the current Superframe the current frame and the subsequents frames until the end of the Superframe shall be completed using silence data for the Traffic Channel field.**	
Specification Text:	{{**If the PTT is released before the end of the current superframe, then the superframe will be completed using silence data for the TCH ("silence data" is the vocoder output data when no sound is input)**}}.	
Family:	No Duplicates	
Test Purposes:	None	

4.1.4   Late Entry

RQ_001_0802	**Late Entry:**	
TS 102 490 [1]	Clause 8.1, paragraph 1	*Type:* Mandatory
Applies to:	ISF, CSF	
Requirement:	**A dPMR radio shall support late entry**	
Specification Text:	See {{**tables 8.1 and 8.3** }}in document.	
Family:	**RQ_001_0802**, RQ_001_0839	
Test Purposes:	None	

RQ_001_0839	**Late Entry:**	
TS 102 490 [1]	Clause 8.2, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	
Requirement:	**For Voice individual calls a CSF radio shall support supplementary service "Late Entry".**	
Specification Text:	{{**Table 8.3**}}	
Family:	**RQ_001_0802**, RQ_001_0839	
Test Purposes:	None	

4.1.5   Powersave

RQ_001_1101	**Powersave:**	
TS 102 490 [1]	Clause 11.1, paragraph 2	*Type:* Conditionally Mandatory
Applies to:	ISF, CSF	
Requirement:	**IF powersave is supported AND repeated headers are used for powersave THEN the preamble by each header shall be fixed at 72 bits.**	
Specification Text:	{{**In the case of repeated Headers for powersave use, the preamble used by each Header shall be fixed at 72 bits**}}.	
Family:	No Duplicates	
Test Purposes:	None	

RQ_001_1102   **Powersave:**

TS 102 490 [1]   Clause 11.1, paragraph 5   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       THEN when transmitting extended wake-up headers the first 3 bits (Call
                       Information Type) of the 11 bits of the Call Information (CI) field shall be
                       set to '111' in these headers.

Specification Text: These extended wake-up Headers shall be coded according to clauses 5.2 and
                       5.10.
                       The 11 bits of Call Information (CI) are used as follows:
                       {{**CI Type = 111 (extended wake-up Header)**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1103   **Powersave:**

TS 102 490 [1]   Clause 11.1, paragraph 6   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       THEN when transmitting extended wake-up headers the last 4 bits of the 11 bits
                       of the Call Information (CI) field shall indicate the number of Header frames
                       to follow.

Specification Text: These extended wake-up Headers shall be coded according to clauses 5.2 and
                       5.10.
                       The 11 bits of Call Information (CI) are used as follows:
                       CI Type = 111 (extended wake-up Header).
                       {{**CI Information uses that last 4 bits to show how many Header frames follow**
                       the current one}}

Family: No Duplicates

Test Purposes: None

RQ_001_1104   **Powersave:**

TS 102 490 [1]   Clause 11.1, paragraph 7   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF powersave is supported**
                       THEN the calling radio can be programmed to use up to 15 extended wake-up
                       headers for extended wake-up purposes.

Specification Text: {{**Radios can be programmed to use up to 15 extended header frames for wake-up**
                       purposes. This will give a maximum response time of 1,2 seconds}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1105   **Powersave:**

TS 102 490 [1]   Clause 11.1, paragraph 7   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       THEN a caller using the wake-up procedure shall end the sequence of extended
                       wake-up header sending a normal header, indicating the call type in the Call
                       Information (CI) field.

Specification Text: See {{**Figure 12**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1106   **Powersave:**

TS 102 490 [1]   Clause 11.2, paragraph 1   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       THEN the wake-up periods of a radio in standby (sleep mode) shall have a
                       duration of at least
                       T_ch_chk (100 ms).

Specification Text: Radio in standby (sleep) will be programmed to wake-up and monitor the channel
                       at regular intervals. {{**Each wake-up shall have a minimum duration of T_ch_chk**
                       (clause 10.6.1)}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1107   **Powersave:**

TS 102 490 [1]   Clause 11.2, paragraph 2   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       THEN the maximum sampling interval between wake-up periods shall be (n-1) x
                       80ms, where n is the number of extended wake-up headers used.

Specification Text: The intervals between successive wake-ups shall be dependant on the number of
                       repeated Header frames used in extended wake-up according to clause 11.1.
                       {{**The maximum sampling interval between wake-ups shall be:**
                       T_sam = (n - 1) x 80 ms}}.
                       Where T_sam is the sampling interval and n is the number of extended wake-up
                       Headers used.

Family: No Duplicates

Test Purposes: None

RQ_001_1108   **Powersave:**

TS 102 490 [1]   Clause 11.2, paragraph 4   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       AND the radio is awaken
                       THEN it may return to sleep mode if there is no activity on the channel for the
                       duration of T_ch_chk.

Specification Text: {{**If the radio wakes and there is no activity on the channel for the duration**
                       of T_ch_chk it may return to sleep}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1109   **Powersave:**

TS 102 490 [1]   Clause 11.2, paragraph 5   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                       AND the radio is awaken by activity on the channel
                       THEN the radio return to sleep mode if the called address in received and
                       decoded traffic does not match it own.

Specification Text: {{**If the radio wakes and decodes the dPMR activity but the called station ID**
                       does not match it may return to sleep}}.

Family: No Duplicates

Test Purposes: None

RQ_001_1110   **Powersave:**

TS 102 490 [1]   Clause 11.2, paragraph 6   *Type:* Conditionally Optional

Applies to: ISF, CSF

Requirement: **IF powersave supported**
                    AND has completed payload or signalling reception
                    THEN it may return to sleep.

Specification Text: If the radio wakes and decodes the dPMR activity and the called station ID
                    matches, it shall then be able to calculate from the CI information bits when
                    the payload item or signalling will commence. {{**Upon completion of the payload
                    item or signalling the radio may return to sleep again.**}}

Family: No Duplicates

Test Purposes: None

4.1.6   Talking Party Indentification

RQ_001_0803   **Talking Party ID:**

TS 102 490 [1]   Clause 8.1, paragraph 1   *Type:* Optional

Applies to: ISF, CSF

Requirement: **A dPMR radio may support Talking Party Identification.**

Specification Text: See {{**tables 8.1 and 8.3** }}in document.

Family: **RQ_001_0803**, RQ_001_0845

Test Purposes: None

RQ_001_0845   **Talking Party ID:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice individual calls a CSF radio may support supplementary service**
                    "Talking Party Identification".

Specification Text: {{**Table 8.3**}}

Family: **RQ_001_0803**, RQ_001_0845

Test Purposes: None

4.2   Configured Services and Facilities Radios

4.2.1   Broadcast Call

RQ_001_0838   **Broadcast Call:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice group calls a CSF radio may support supplementary service "Broadcast**
                    Call".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

4.2.2 Dialling Plan

RQ_001_0814	**Dialling Plan:**
TS 102 490 [1]	Clause 8.2.2, paragraph 2 *Type:* Conditionally Mandatory
Applies to:	CSF
Requirement:	**A CSF radio complying to the Standard User Interface shall use a 7 digit addressing scheme that is encoded into the 24 bit address field as defined by the algorithm:** **SUM(K1 * 1464100, K2 * 146410, K3 * 14641, K4 * 1331, K5 * 121, K6 * 11, K7)** **where** **K1,K2,K3 represent decimal symbols in the range 0 to 9.** **K4,K5,K6,K7 represent symbols to base 11 using the digits** **0,1,2,3,4,5,6,7,8,9,*.** **The "*" is a symbol that has the value of 10.**
Specification Text:	{{**For equipment compliant with the Standard User Interface radios shall use a 7 digit addressing scheme that is encoded into the 24 bit address field as detailed in annex A.**}}
Family:	**RQ_001_1310**, RQ_001_0814, RQ_001_0814, RQ_001_1306, RQ_001_1309, RQ_001_1301
Test Purposes:	None

RQ_001_1301	**Dialling Plan:**
TS 102 490 [1]	Clause A.2.1, paragraph 1 *Type:* Conditionally Mandatory
Applies to:	CSF
Requirement:	**For a CSF radio complying with the Standard User Interface, dialled digits that represent a destination address shall be encoded to give the 24 bit content of the Air Interface address field.**
Specification Text:	Dialled digits are represented in decimal notation and utilize the numbers "0" to "9" and the keys "*" and "#". For an MS fitted with a keypad, the "#" key may initiate a call (although other initiate methods may be implemented by a manufacturer). {{**Dialled digits that represent a destination address are translated to a form for the Air Interface by a coding algorithm. This is illustrated in figure A.2. (see document)** **Address fields in the Air-Interface domain structure has a length of 24 bits.**}} The content of a 24-bit AI MS address field may represent: • an MS individual address; • an MS group address. The Air Interface provides call services for voice and data. The AI also permits the call services to be modified. The application that converts the User Interface to the Air Interface recognizes the "call modifier" and request the lower layers to set appropriate bits in the PDUs carried between the entities. At the User Interface, the "call modifier" is indicated by preceding the destination address digits with additional "call modifier" digits.
Family:	**RQ_001_1310**, RQ_001_0814, RQ_001_0814, RQ_001_1306, RQ_001_1309, RQ_001_1301
Test Purposes:	None

RQ_001_1302	**Dialling Plan:**	
TS 102 490 [1]	Clause A.2.1.1, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	
Requirement:	**For CSF radios complying with the Standard User Interface, calls shall be addressed to numeric or non-numeric addresses (i.e., addresses containing "wildcards")**	
Specification Text:	{{**Each call is made to a numeric or non-numeric address (with "wildcards").** }}The mapping between the User-Interface domain and the Air Interface uses a reversible coding algorithm. MS will establish the call type from analysis of the decoded Air Interface address. There are a number of methods by which a MS may distinguish between talkgroup and individual calls and these are described in the following clauses.	
Family:	**RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307, RQ_001_1304, RQ_001_1303, RQ_001_1302	
Test Purposes:	None	

RQ_001_1303	**Dialling Plan:**	
TS 102 490 [1]	Clause A.2.1.1.1, paragraph 2	*Type:* Conditionally Mandatory
Applies to:	CSF	
Requirement:	**IF the "wildcard" feature is enabled** **THEN a CSF radio complying with the Standard User Interface shall identify group calls by analysing the decoded air interface address for "wildcards"**	
Specification Text:	MS will establish the call type from analysis of the decoded Air Interface address. There are a number of methods by which a MS may distinguish between talkgroup and individual calls and these are described in the following clauses. {{**The MS may discriminate a talkgroup call from an individual call by the use of the "wildcard".** **In the User Interface domain structure, if the dialled string represents an MS address, and contains a "*" in any of the four least significant characters, then that MS address represents a group of MSs.** }}The "*" character is the "wildcard" and represents all numeric values in that digit position, as defined in example 1 to 3. EXAMPLE 1: The user dials "012345*" means that the MS is addressing 10 separate MSs whose individual addresses are "0123450", "0123451", "0123452", "0123453", "0123454", "0123455", "0123456", "0123457", "0123458", and "0123459". EXAMPLE 2: The user dials "01234*6" means the MS is addressing 10 separate MSs whose individual addresses are "0123406", "0123416", "0123426", "0123436", "0123446", "0123456", "0123466", "0123476", "0123486", and "0123496". EXAMPLE 3:Wildcards may be combined. The user dials "01234**" represents 100 MSs in the range "0123400" to "0123499". For operators who have no interest in this method of defining talkgroups, the "wildcard" feature may be disabled by MS programming.	
Family:	**RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307, RQ_001_1304, RQ_001_1303, RQ_001_1302	
Test Purposes:	None	

RQ_001_1304 **Dialling Plan:**

TS 102 490 [1] Clause A.2.1.1.2, paragraph 1 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio complying with the Standard User Interface has one or more numeric talk group address stored in memory**
THEN the radio shall identify group calls by analysing the decoded AI address and comparing it to the stored talk group address(es).

Specification Text: MS will establish the call type from analysis of the decoded Air Interface address. There are a number of methods by which a MS may distinguish between talkgroup and individual calls and these are described in the following clauses.

{{**The MS equipment may contain predefined parameters prescribing the MS addresses that will be interpreted as talkgroup addresses. These addresses may be stored as a list programmed during manufacture or before connecting an MS into service.**}}

Family: **RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307, RQ_001_1304, RQ_001_1303, RQ_001_1302

Test Purposes: None

RQ_001_1305 **Dialling Plan:**

TS 102 490 [1] Clause A.2.1.1.3, paragraph 1 *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio may use a range of addresses that are all talkgroup addresses.**

Specification Text: {{**The MS equipment may simply rely on a range of addresses that all equipment is known to be talkgroup addresses.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1306 **Dialling Plan:**

TS 102 490 [1] Clause A.2.1.1.4, paragraph 1 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **A CSF caller radio complying with the Standard User Interface shall encode the dialled user digits to a 24 bit air interface address by using the reversible B2 algorithm.**

Specification Text: {{**The MS codes the dialled user digits to a 24 bit Air Interface address by using the reversible algorithm B2.** }}

Family: **RQ_001_1310**, RQ_001_0814, RQ_001_0814, RQ_001_1306, RQ_001_1309, RQ_001_1301

Test Purposes: None

RQ_001_1307	**Dialling Plan:**	
TS 102 490 [1]	Clause A.2.1.1.5, paragraph 3	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement: **A CSF callee radio complying with the Standard User Interface shall decode the**
24 bit air interface address of a received call by using the reverse B2
algorithm to a 7 digit string.

IF this 7 digit string contains a "*" character in any of the 4 least
significant characters, the radio shall compare the received string to its
individual address for match and ignore any mismatch if there is a "*"
character at that position. If all other digits match then the radio is party
to this talk group call.

Specification Text: These rules determine whether a call is to a talkgroup or individual address
and will be accepted by a MS.
(All reference to MS in this clause refer to the recipient.)
MS receives a dPMR call.
MS uses the reverse of the B2 function specified in clause A.2.1.2.6 to
translate the AI talkgroup address to the User Interface domain.
{{**IF digits (User Interface)**
contains a "*" in any of the least significant four characters
THEN
each digit received is compared with each corresponding digit of the MS
individual address except where the received digit is a "*". If there is a
match on all applicable digits then this MS is party to the talkgroup call.}}
ELSE
(consists of numeric characters only)
THEN
EITHER
The string of digits received is compared with each corresponding string of
talkgroup digits that the MS has stored (specifically indicating a talkgroup).
If there is a match then this MS is party to the talkgroup call.
OR
The string of digits received is compared with each corresponding string of
individual address digits that the MS has stored.
If there is a match then this MS is party to the individual call.
ENDIF

Family: **RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307,
RQ_001_1304, RQ_001_1303, RQ_001_1302

Test Purposes: None

RQ_001_1308	**Dialling Plan:**	
TS 102 490 [1]	Clause A.2.1.1.5, paragraph 3	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:

A CSF radio complying with the Standard User Interface shall decode the 24 bit air interface address address of a received call by using the reverse B2 algorithm to a 7 digit string.

**IF this 7 digit string contains only numerical digits
THEN
EITHER the radio shall compare the received string to any talk group address programmed in memory and if there is a match then the radio is party to this talk group call.**

OR the radio shall compare the received string to any individual address programmed in memory and if there is a match then the radio is party to this individual call.

Specification Text:

These rules determine whether a call is to a talkgroup or individual address and will be accepted by a MS.
(All reference to MS in this clause refer to the recipient.)
MS receives a dPMR call.
MS uses the reverse of the B2 function specified in clause A.2.1.2.6 to translate the AI talkgroup address to the User Interface domain.
IF digits (User Interface)
contains a "*" in any of the least significant four characters
THEN
each digit received is compared with each corresponding digit of the MS individual address except where the received digit is a "*". If there is a match on all applicable digits then this MS is party to the talkgroup call.
{{**ELSE**
(consists of numeric characters only)
THEN
EITHER
The string of digits received is compared with each corresponding string of talkgroup digits that the MS has stored (specifically indicating a talkgroup).
If there is a match then this MS is party to the talkgroup call.
OR
The string of digits received is compared with each corresponding string of individual address digits that the MS has stored.
If there is a match then this MS is party to the individual call.
ENDI}}F

Family: **RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307, RQ_001_1304, RQ_001_1303, RQ_001_1302

Test Purposes: None

RQ_001_1309	**Dialling Plan:**	
TS 102 490 [1]	Clause A.2.1.1.6, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:

A CSF radio complying with the Standard User Interface shall use the reversible B2 algorithm to convert between 7 digit string and 24 bit air interface addresses and vice-versa.

Specification Text:

{{**A MS address is a 7-character numeric string in the range "0000001" to "999****", these characters are mapped to the Air Interface domain structure bits by the reversible function B2.**}}
Addresses may consist of all numeric characters (but the MS must be able to ascertain the address is a talkgroup address rather than an individual address). Alternatively any of the last four characters may contain one or more "*" characters that explicitly signifies the address is a talkgroup address.

Family: **RQ_001_1310**, RQ_001_0814, RQ_001_0814, RQ_001_1306, RQ_001_1309, RQ_001_1301

Test Purposes: None

RQ_001_1310	**Dialling Plan:**	
TS 102 490 [1]	Clause A.2.1.1.6.1, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:

```
A CSF radio complying with the Standard User Interface shall use the following
rules for mapping between 7 digit address field (K1 to K7) at the user level
and the 24 bit address field at the Air interface.

K1 is the most significant digit.
K1,K2,K3 represent decimal symbols in the range 0 to 9.
K4,K5,K6,K7 represent symbols to base 11 using the digits
0,1,2,3,4,5,6,7,8,9,*.
The "*" is a symbol that has the value of 10.

The six least significant user dialled digits K2 to K7 in the range "000001" to
"999999" are converted to the 20 least significant 20 bits of the AI ID using
true decimal to binary conversion. The most significant user dialled digit K1
is converted to the most significant 4 bits of the AI ID using a true decimal
to binary conversion.

To following steps are needed to convert the dialled digits to an ID in the AI
domain:
c) take the first digit (0 to 9) and multiply by 1 464 100;
d) take the second digit (0 to 9), multiply by 146 410;
e) take the third digit (0 to 9) and multiply by 14 641;
f) take the fourth digit (0 to 9) or * (* has a value of 10) and multiply by 1
331;
g) take the fifth digit (0 to 9) or * (* has a value of 10) and multiply by
121;
h) take the sixth digit (0 to 9) or * (* has a value of 10) and multiply by 11;
i) take the seventh digit (0 to 9) or * (* has a value of 10);
j) add c) to i); and
k) convert the sum to a 24-bit binary number.
```

Specification Text:

```
{{K1,K2,K3 represent decimal symbols in the range 0 to 9.
K4,K5,K6,K7 represent symbols to base 11 using the digits
0,1,2,3,4,5,6,7,8,9,*.
The "*" is a symbol that has the value of 10.
The six least significant user dialled digits K2 to K7 in the range "000001" to
"999999" are converted to the 20 least significant 20 bits of the AI ID using
true decimal to binary conversion. The most significant user dialled digit K1
is converted to the most significant 4 bits of the AI ID using a true decimal
to binary conversion.

To following steps are needed to convert the dialled digits to an ID in the AI
domain:
c) take the first digit (0 to 9) and multiply by 1 464 100;
d) take the second digit (0 to 9), multiply by 146 410;
e) take the third digit (0 to 9) and multiply by 14 641;
f) take the fourth digit (0 to 9) or * (* has a value of 10) and multiply by 1
331;
g) take the fifth digit (0 to 9) or * (* has a value of 10) and multiply by
121;
h)  take the sixth digit (0 to 9) or * (* has a value of 10) and multiply by
11;
i)take the seventh digit (0 to 9) or * (* has a value of 10);
j) add c) to i); and
k) convert the sum to a 24-bit binary number.}}

Examples are shown in table A.2.
Table A.2.1.1.5.1.2: Examples of address translation
User-Interface Air-Interface (Hex)  Air Interface (Binary)
1234567        1B91FD               0001 1011 1001 0001 1111 1101
468956*        68BF08               0110 1000 1011 1111 0000 1000
012345*        02C00A               0000 0010 1100 0000 0000 1010
0123460        02C00B               0000 0010 C000 0000 0000 1011
999****        DF6767               1101 1111 0110 0111 0110 0111
```

Family:	**RQ_001_1310**, RQ_001_0814, RQ_001_0814, RQ_001_1306, RQ_001_1309, RQ_001_1301
Test Purposes:	None

RQ_001_1311 **Dialling Plan:**

TS 102 490 [1]   Clause A.2.2, paragraph 1   *Type:* Mandatory

Applies to: CSF

Requirement: **A CSF radio shall have at least one individual address.**

Specification Text: {{**An MS is pre-programmed with at least one individual identity.**}}
An MS is permitted to have multiple individual identities and one or more
talkgroup identities.
An MS may contain a list of talkgroup identities, which may be pre-programmed
or dynamically updated (manually or over the AI).
The User Interface domain maps to the AI address space by the B2 algorithm.

Family: **RQ_001_1408**, RQ_001_1311, RQ_001_1311

Test Purposes: None

RQ_001_1312 **Dialling Plan:**

TS 102 490 [1]   Clause A.2.2, paragraph 2   *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio may have multiple individual addresses and one or more talk group
addresses.**

Specification Text: {{**An MS is permitted to have multiple individual identities and one or more
talkgroup identities.**}}
Where an MS has more than one individual identity then one of these shall be
assigned as the primary individual identity. This primary individual identity
is the one that shall be used for all forms of abbreviated or masked dialling
(clauses A.3.4.1.2 and A.3.4.1.3)
An MS may contain a list of talkgroup identities, which may be pre-programmed
or dynamically updated (manually or over the AI).

Family: No Duplicates

Test Purposes: None

RQ_001_1313 **Dialling Plan:**

TS 102 490 [1]   Clause A.2.2, paragraph 3   *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio may be programmed with a list of talkgroup identities, which may be
pre-programmed or dynamically updated (manually or over the AI).**

Specification Text: An MS is pre-programmed with at least one individual or one talkgroup identity.
An MS is permitted to have multiple individual identities and multiple
talkgroup identities.
{{**An MS may contain a list of talkgroup identities, which may be pre-programmed
or dynamically updated (manually or over the AI).**}}
The User Interface domain maps to the AI address space by the B2 algorithm.

Family: No Duplicates

Test Purposes: None

RQ_001_1314   **Dialling Plan:**

TS 102 490 [1]   Clause A.2.3.1, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **For a CSF radio complying with the Standard User Interface the 7 characters**
                        used for individual addresses shall contain only the digits "0" to "9".

Specification Text: {{**An MS address in the User-Interface structure is defined as 7 characters of**
                        which for an individual MS address contain the characters "0" to "9". }}For a
                        talkgroup address the three most significant contain the characters "0" to "9"
                        and least significant four characters contain the characters "0" to "9" or "*".

Family: No Duplicates

Test Purposes: None

RQ_001_1315   **Dialling Plan:**

TS 102 490 [1]   Clause A.2.3.1, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **For a CSF radio complying with the Standard User Interface the 7 characters**
                        used for talkgroup addresses shall be as follows:
                        The three most significant contain the characters "0" to "9" and least
                        significant four characters contain the characters "0" to "9" or "*".

Specification Text: An MS address in the User-Interface structure is defined as 7 characters of
                        which for an individual MS address contain the characters "0" to "9". {{**For a**
                        talkgroup address the three most significant contain the characters "0" to "9"
                        and least significant four characters contain the characters "0" to "9" or
                        "*".}}

Family: **RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307,
                        RQ_001_1304, RQ_001_1303, RQ_001_1302

Test Purposes: None

RQ_001_1316   **Dialling Plan:**

TS 102 490 [1]   Clause A.2.3.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
                        THEN the radio may limit the number of digits that can be changed in any
                        dialled address string, thereby limiting the addressable range from that radio.

Specification Text: {{**The MS equipment may contain predefined parameters prescribing the minimum**
                        and maximum length of the user dial string. By limiting the length of the
                        dialled string, the address range that the MS is able to dial is restricted.}}

Family: **RQ_001_1418**, RQ_001_1316

Test Purposes: None

RQ_001_1317   **Dialling Plan:**

TS 102 490 [1]   Clause A.2.3.3, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: `For a CSF radio complying with the Standard User Interface the All Call dialled`
                        `strings shall be dialled and encoded as follows:`

                        `The All Call dialled string "n******" (All Call within a prefix)`
                        `User dialled string  Air Interface ID Remark`
                        `"0******"            18 CC 3E        All Talkgroup ID0`
                        `"1******"            2F 23 62        All Talkgroup ID1`
                        `etc.                  etc.           etc.`
                        `"9******"            E1 DC 82        All Talkgroup ID9`

                        `The All Call dialled string: "******" is mapped to the All Talkgroup ID15 and`
                        `addresses all MSs irrespective of their prefix.`
                        `User dialled string  Air Interface ID  Remark`
                        `"*******"            F8 33 A6          All Talkgroup ID15`

Specification Text: `{{The All Call dialled string "n******" (All Call within a prefix) is mapped as`
                        `shown in table A.3.`
                        `Table A.2.3.3.1: Mapping of prefixed All Call to the AI`
                        `User dialled string  Air Interface ID  Remark`
                        `"0******"            18 CC 3E          All Talkgroup ID0`
                        `"1******"            2F 23 62          All Talkgroup ID1`
                        `etc.                  etc.             etc.`
                        `"9******"            E1 DC 82          All Talkgroup ID9`

                        `The All Call dialled string: "******" is mapped to the All Talkgroup ID15 and`
                        `addresses all MSs irrespective of their prefix.`
                        `Table A. 2.3.3.2: Mapping of all prefix call to the AI`
                        `User dialled string  Air Interface ID  Remark`

                        `"*******"            F8 33 A6          All Talkgroup ID15}}`

Family: **RQ_001_1317**, RQ_001_1410, RQ_001_1411

Test Purposes: None

RQ_001_1401   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.1, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: `For a CSF radio complying with the Standard User Interface dialled addresses`
                        `are always read and dialled in the sense left to right.`

Specification Text: `{{All dialled strings, as defined in the clause A.3 of the present document,`
                        `are read from left to right and are dialled in the sequence in which they are`
                        `read. }}Throughout this clause all representations of dialled strings are`
                        `underlined.`
                        `MSs may only be required to dial sufficient numbers of characters unambiguously`
                        `define the destination and service required.`

Family: No Duplicates

Test Purposes: None

RQ_001_1402   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.1, paragraph 2   *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio complying with the Standard User Interface may support abbreviated dialling.**

Specification Text: A.3.1   User numbering
All dialled strings, as defined in the clause A.3 of the present document, are read from left to right and are dialled in the sequence in which they are read. Throughout this clause all representations of dialled strings are underlined.
{{MSs may only be required to dial sufficient numbers of characters unambiguously define the destination and service required.}}

Family: **RQ_001_1417**, RQ_001_1402, RQ_001_1402, RQ_001_1406

Test Purposes: None

RQ_001_1403   **Dialling Plan:**

TS 102 490 [1]   Clause A3.1.1, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF the user has entered or selected the series of digits as required for the dialled address**
THEN a CSF radio complying with the Standard User Interface shall also require the pressing of the "#" key or other dedicated send key to initiate the call.

Specification Text: **{{To maximize channel utilization, the user should enter a string of digits and then press a button to initiate the call.**
The "#" key or a dedicated "send" key is used to initiate the call. }}The "#" key has an additional purpose of modifying the call type or priority.

Family: No Duplicates

Test Purposes: None

RQ_001_1404   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.1.2, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **A CSF radio complying with the Standard User Interface shall determine the type of call from user dialled string. The user should not have to also select call type.**

Specification Text: **{{Underlying signalling and system functionality is hidden from the user. MSs determine the call type and function from the length and content of the dialled string.}}**

Family: No Duplicates

Test Purposes: None

RQ_001_1405	**Dialling Plan:**	
TS 102 490 [1]	Clause A3.1.3, paragraph 3	*Type:* Conditionally Optional
Applies to:	CSF	

Requirement:

```
In a CSF radio complying with the Standard User Interface
IF the dialled number is preceded by a hash "#"
THEN the dialling function or call type may be modified.
```

Specification Text:

```
Dialled strings that commence with a hash "#" provide secondary uses for the
keypad.
Secondary dialling functions may be as follows:
• status call;
• broadcast call.
```
{{**Secondary dialling is achieved by the use of call modifier strings in front of the dialled number. These call modifier sequences utilize the "#" and "*" keys.**}}

Family: **RQ_001_1420**, RQ_001_1405

Test Purposes: None

RQ_001_1406	**Dialling Plan:**	
TS 102 490 [1]	Clause A.3.2, paragraph 3	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:

```
IF a CSF radio is complying with the Standard User Interface
AND abbreviated dialling is available
THEN the abreviated dialling shall operate as follows:


An MS shall construct the called address by adding the most significant digits
of its own ID to the entered digit string to form a complete destination
address.


Example


An MS whose individual address is "1234567" (in the user domain), dials "43".


MS own ID               1234567
Dialled destination          43
Full destination address  1234543
```

Specification Text:

```
In the User-Interface domain structure, if the string represents an MS address,
and contains a "*" in any of the four least significant characters, then that
MS address represents a group of MSs.
```
{{**The length of destination MS address dialled digits is in the range from 1 to 7, and is interpreted as the right most digits of the recipient's number. The MSs individual address is used as a base address, and the right-most digits of that number are replaced by the user dialled digits, as shown in example 1 and 2. The resulting number is then converted to the AI ID using the algorithm presented in the annex A.**}}

```
See example 1 in document.
```

Family: **RQ_001_1417**, RQ_001_1402, RQ_001_1402, RQ_001_1406

Test Purposes: None

RQ_001_1407	**Dialling Plan:**	
TS 102 490 [1]	Clause A.3.2, paragraph 2	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:

```
IF the radio is a CSF radio
AND the radio is complying with the Standard User Interface
AND abbreviated dialling is available
THEN the abreviated dialling of a group address shall operate as follows:


An MS shall construct the called address by adding the most significant digits
of its own ID to the entered digit string to form a complete destination
address.


Example


An MS whose individual address is "1234567" (in the user domain), dials "*" to
place a group call.


MS own ID                 1234567
Dialled destination             *
Full destination address 123456*
```

Specification Text:

```
{{In the User-Interface domain structure, if the string represents an MS
address, and contains a "*" in any of the four least significant characters,
then that MS address represents a group of MSs.}}
```

```
The length of destination MS address dialled digits is in the range from 1 to
7, and is interpreted as the right most digits of the recipient's number. The
MSs individual address is used as a base address, and the right-most digits of
that number are replaced by the user dialled digits, as shown in example 1 and
2. The resulting number is then converted to the AI ID using the algorithm
presented in the annex A.


See example 2 in document
```

Family: **RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307, RQ_001_1304, RQ_001_1303, RQ_001_1302

Test Purposes: None

RQ_001_1408	**Dialling Plan:**	
TS 102 490 [1]	Clause A.3.3.1, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:

```
A CSF radio complying with the Standard User Interface shall have at least one
individual numeric address in the range 0000001 to 9999999 with the exception
of the following:
"1000000", "2000000", "3000000", "4000000", "5000000", "6000000", "7000000",
"8000000", and "9000000".
```

Specification Text:

```
{{An MS is allocated a numeric address in the range in the range "0000001" to
"9999999", see note. MSs may be programmed with more than one individual
address.
NOTE:The addresses "1000000", "2000000", "3000000", "4000000", "5000000", "6000000",
"7000000", "8000000", and "9000000" are not valid.
}}
```

Family: **RQ_001_1408**, RQ_001_1311, RQ_001_1311

Test Purposes: None

RQ_001_1409	**Dialling Plan:**	
TS 102 490 [1]	Clause A.3.3.2, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:	`IF a CSF radio complying with the Standard User Interface is programmed with more than one numeric address`
	`THEN any additional address may be a talkgroup address in the range 0000001 to 9999999 with the exception of the following:`
	`"1000000", "2000000", "3000000", "4000000", "5000000", "6000000", "7000000", "8000000", and "9000000".`	

Specification Text:	{{**Talkgroups may be both all numeric numbers**}}, or contain a "*" in any of the least significant four digits.	
Family:	**RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307, RQ_001_1304, RQ_001_1303, RQ_001_1302	
Test Purposes:	None	

RQ_001_1410	**Dialling Plan:**	
TS 102 490 [1]	Clause A.3.3.3, paragraph 1	*Type:* Conditionally Mandatory
Applies to:	CSF	
Requirement:	`A CSF radio complying with the Standard User Interface shall always respond to call that has an all 'wild card' address, "*******"`	
Specification Text:	{{**All units respond to All MSs address "*******#".**}}	
Family:	**RQ_001_1317**, RQ_001_1410, RQ_001_1411	
Test Purposes:	None	

RQ_001_1411	**Dialling Plan:**	
TS 102 490 [1]	Clause A.3.3.3, paragraph 2	*Type:* Conditionally Mandatory
Applies to:	CSF	

Requirement:	`Every CSF radio complying with the Standard User Interface with the prefix (most significant digit) n shall respond to call that has an "n" prefix and 6 'wild cards', "n******". Where n can be 0 to 9.`
	
	`i.e. any radios with an address "2nnnnnn" will respond to a call addressed to "2******".`	

Specification Text:	{{**All units with prefix "n" respond to the prefixed All MS address "n******#" with n=0 to 9.**}}	
Family:	**RQ_001_1317**, RQ_001_1410, RQ_001_1411	
Test Purposes:	None	

RQ_001_1412 **Dialling Plan:**

TS 102 490 [1] Clause A.3.3.4, paragraph 1 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
THEN it shall not be possible for the radio to compose or send a non-diallable
number.
These numbers are: "0000000", "1000000", "200000", "300000", "4000000",
"5000000", "6000000", "7000000", "8000000", "9000000".

If a user enters any of these addresses the radio shall not send the call and
give an appropriate error indication to the user.

Specification Text: {{**MS addresses' "0000000", "1000000", "200000", "300000", "4000000", "5000000",**
"6000000", "7000000", "8000000", "9000000" are not dialable. If the user inputs
a dialled string of digits that is not assigned to any of the dialling
algorithms, then the MS should not try to establish the call and appropriate
feedback given to the user.}}

Family: No Duplicates

Test Purposes: None

RQ_001_1413 **Dialling Plan:**

TS 102 490 [1] Clause A.3.3.5.1, paragraph 1 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
AND all numeric talk groups are programmed
AND a callee address has been entered
THEN the MS shall be able to compare this address with its own talkgroup memory
table and establish if the call is a talkgroup call.

Specification Text: {{**Each MS has storage allocated for numeric talkgroup addresses. The table is**
populated during MS personalization by the user. The sender (MS) may use
entries in this table to establish that the destination address is a talkgroup
rather than an individual address.}}
The talkgroup table contains entries consisting of the full talkgroup address
consisting of 7 characters as shown in the example.
EXAMPLE: The sender (MS) whose individual address is "1234561" has the
destination "1234567" stored in its talkgroup table. The user enters a single
digit "7" as the destination address.
The full destination address is formed from the dialled digit(s) and the MS own
individual address.
MS source address   1234561
Dialled destination   7
Full (Talkgroup), see note 1234567
NOTE: Destination address after processing.

The talkgroup table is searched for a match. In this example there is a match
so the destination address is a talkgroup addresses

Family: No Duplicates

Test Purposes: None

RQ_001_1414　　　**Dialling Plan:**

TS 102 490 [1]　　　Clause A3.3.5.2, paragraph 1　　　　　　　　　*Type:* Conditionally Mandatory

Applies to:　　　CSF

Requirement:　　**IF a CSF radio is complying with the Standard User Interface**
AND a callee address containing a wilcard is entered
THEN the MS shall recognise that the call is a talkgroup call.

Specification Text:　{{**The dialled string is examined by the initiating MS. If the destination is**
identified as a talkgroup because the address contains a "wildcard" character
in one of the four least significant digits then call set-up procedure is to a
talkgroup as shown in the example. }}Abbreviated dialling minimizes the number
of dialled digits. An advantage of using "wildcard" to define talkgroups is
that no pre-arrangement is necessary, i.e. there is no need for a talkgroup
table or other MS configuration to recognize an address as a talkgroup.
EXAMPLE:
MS source address　　　　　　　　　　1234561
Dialled destination　　　　　　　　　　　*
Full destination address, see note　123456*
NOTE:　　　　　　　　　　　　　　　　　Destination address after processing.

Family:　　　No Duplicates

Test Purposes:　None

RQ_001_1415　　　**Dialling Plan:**

TS 102 490 [1]　　　Clause A.3.3.5.3, paragraph 1　　　　　　　　　*Type:* Conditionally Mandatory

Applies to:　　　CSF

Requirement:　　**Upon receiving a call a CSF radio complying with the Standard User Interface**
shall decode the 24 bit address field using the reverse B2 algorithm to recover
the dialled digits.

A:　If the received digits contain a "*" in the digits K4 to K7 then each digit
is compared in turn　　with the corresponding digit of the MS individual
identity looking for a match. If an "*" is encountered then a match for that
digit is assumed.

B:　If the received digits are all numeric then the digits K1 to K7 are
compared with each of the entries in the talkgroup table looking for a match.

If either　A or B result in a match being found the radio will respond to the
call as a talk group call.

Specification Text:　{{**The recipient MS applies the reverse B2 to recover the dialled digits K1 to**
K7.
• If the received digits contain a "*" in the digits K4 to K7 then:
- each digit is compared in turn with the corresponding digit of the MS
individual identity looking for a match. If an "*" is encountered then a match
for that digit is assumed.
• If the received digits are all numeric then:
- the digits K1 to K7 are compared with each of the entries in the talkgroup
table looking for a match (after each entry in the table has been expanded to
the full 7 address digits as described in clause A.3.3.5.1).
A match must exist for the MS to respond to the talkgroup call.

　}}

Family:　　　**RQ_001_1415**, RQ_001_1407, RQ_001_1315, RQ_001_1409, RQ_001_1308, RQ_001_1307,
RQ_001_1304, RQ_001_1303, RQ_001_1302

Test Purposes:　None

RQ_001_1416   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.4.1.1, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
                        The user may enter the full 7 digit address of the radio to be called.

Specification Text: `{{A.3.4.1.1                                    Seven digit dialling`
                        `The user may enter the whole seven digit address to complete the dialled string`
                        `prior to transmission.`
                        `These seven digits may also contain wildcards.`
                        `}}`

Family: No Duplicates

Test Purposes: None

RQ_001_1417   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.4.1.2, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
                        AND abbreviated dialling is available
                        THEN User entered digits shall be used as the least significant digits and the
                        radio will use its own ID as the base number for any unentered digits.

Specification Text: `{{Where abbreviated keypad dialling is used in the MS, the MS should insert the`
                        `more significant characters from the MS individual address to complete the`
                        `dialled string prior to transmission.`
                        `Those digits entered may also include wildcards.`
                        `If all digits are not dialled the more significant digits from the MS`
                        `individual address are copied to the dialled string to build a seven digit`
                        `address as follows:`
                        `for the MS individual address "2112345":`
                        `• if the user dials    6#, the destination address shall be 2112346;`
                        `• if the user dials   56#, the destination address shall be 2112356;`
                        `• if the user dials  958#, the destination address shall be 2112958;`
                        `• if the user dials 1385#, the destination address shall be 2111385;`
                        `• if the user dials 13*5#, the destination address shall be 21113*5`
                        `(talkgroup).`
                        `NOTE:}}` The double underlined characters represent those that have been copied
                        from the MS individual address.
                        At the Air Interface the calling party address is transferred to the called
                        party. The abbreviated dialling may be applied to display only an abbreviated
                        calling party address on the display of the called party.
                        l) The calling party dials a single digit "2".
                        m) The MS inserts the more significant digits from its individual address to
                        complete the dialled string prior to transmission - i.e. the destination
                        address becomes "1234562".
                        n) The called and calling party addresses are passed across the Air Interface.
                        o) The "B" party decodes the called party address and there is a match and the
                        "B" party receives the call.
                        p) The "B" party decodes the calling party address and may display only an
                        abbreviated digit(s). In this case a single digit "1".
                        The abbreviated display is sufficient for the "B" party to know who has called
                        because the "B" party could call the "A" party by the same abbreviated
                        dialling.
                        By using abbreviated dialling, the dPMR dialling plan is appropriate for the
                        smallest and largest fleets.

Family: **RQ_001_1417**, RQ_001_1402, RQ_001_1402, RQ_001_1406

Test Purposes: None

RQ_001_1418   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.4.1.3, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
                         The radio may use a mask to limit the number of digits to be entered to be less
                         than 7.
                         Masked dialling may also be used in conjunction with abbreviated dialling.

Specification Text: {{**The number of digits of a dialling string that can be entered may be**
                         restricted by MS programming to restrict the number range accessible from the
                         user interface. For example the user interface could mask the most significant
                         digit of an address to prevent the MS from reaching other MSs outside its own
                         prefix.
                         Where masked dialling is used in the MS, the MS shall insert the characters
                         from its own individual address that correspond to the each of the blocked
                         positions to complete the dialled string prior to transmission.
                         Masked dialling may also be used in conjunction with abbreviated dialling.
                         Those digits entered may also include wildcards.
                         Example:
                         For the MS individual address of 3456789.
                         The dialling string entry mask is [X] [X] [X] [X] [ ] [ ] [ ]
                         The user may only enter digits in those positions not marked with an X.
                         -   If the user enters 888# then the resulting dialling string will be 3456888.
                         -   If the user enters 8# then the resulting dialling string will be 3456788
                         -   If the user enters 88*# then the resulting dialling string will be 345688*
                         (Talkgroup call)

                         }}

Family: **RQ_001_1418**, RQ_001_1316

Test Purposes: None

RQ_001_1420   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.4.2.1, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
                         AND the user keys in a call modifier prefix of #1*......
                         AND the dialled digits after this prefix correspond to a talk group address in
                         the radio's memory
                         THEN the radio shall set up a broadcast talk group call to that address.

Specification Text: Functions such as the modification of call requests to change to type of
                         service request, and the implementation of other facilities (status, broadcast,
                         etc), are initiated using the syntax in the following clauses. The call
                         modifier is defined by the dialled string by adding extra digits to the dialled
                         destination in the form.
                         # <call modifier code> * destination as defined in clauses A.3.4.3.1 to
                         A.3.4.3.7

                         Table A.5: Summary of call modifiers
                         Dialled Digits   Call Modifier
                         #1*nn…#   Broadcast call, clause A.3.4.2.1
                         #0ss*nn…#   Status call, clause A.3.4.2.2
                         #6*nnn..#   Force talkgroup service, clause A.3.4.2.3

                         {{**A.3.4.2.1   Broadcast call**
                         The MS shall set-up a broadcast call to the destination talkgroup nn by
                         dialling "#1*nn#".
                         The broadcast call shall be a normal group call but with the Communications
                         Format set to 'Call All' (Broadcast).
                         EXAMPLE 1: "#1*112345*#" should make a broadcast talkgroup call to MS address
                         "112345*".
                         NOTE:The dialled string "#1*nnn". "#" should generate an error if the address is not a
                         talkgroup address.
                         EXAMPLE 2: If the MS calling party address is "1234567". "#1#" should make a**
                         broadcast talkgroup call to "123456*" (i.e. to "1234560", "1234561", etc.,
                         "1234569")}}.

Family: **RQ_001_1420**, RQ_001_1405

Test Purposes: None

RQ_001_1421	**Dialling Plan:**

TS 102 490 [1]	Clause A.3.4.2.2, paragraph 1	*Type:* Conditionally Mandatory

Applies to: CSF

Requirement:
**IF a CSF radio is complying with the Standard User Interface
AND the user keys in a call modifier prefix of #0ss*.......
AND the ss digits have a value of 0 to 31
THEN the radio shall send a status call to the address specified after the call
modifier with the status bits set to the value entered.**

Entering a status value greater than 31 shall generate an error warning.

Specification Text:
Functions such as the modification of call requests to change to type of
service request, and the implementation of other facilities (status, broadcast
etc.), are initiated using the syntax in the following clauses. The call
modifier is defined by the dialled string by adding extra digits to the dialled
destination in the form.
<call modifier code> * destination as defined in clauses A.3.4.3.1 to
A.3.4.3.7.
Table A.3.4.2: Summary of call modifiers
Dialled Digits Call Modifier
#1*nn…#   Broadcast call, clause A.3.4.2.1
#0ss*nn…#   Status call, clause A.3.4.2.2
#6*nnn..#   Force talkgroup service, clause A.3.4.2.3

A.3.4.2.2 Status call
{{**The string "#0ss*nnn#" causes the MS to set up a status call to the
destination address nnn. The status digits "ss" are numeric in the range 0 to
31**}}.
The status call shall have the Header frame + End frame format of a status
response call.

Entry of a status value greater than 31 shall generate an error warning to the
user.

Family: No Duplicates

Test Purposes: None

RQ_001_1423	**Dialling Plan:**

TS 102 490 [1]	Clause A.3.4.2.3, paragraph 1	*Type:* Conditionally Mandatory

Applies to: CSF

Requirement:
**IF a CSF radio is complying with the Standard User Interface
AND the user enters a call modifier prefix of #6*......
AND the dialled digits after this prefix correspond to a talk group address in
the radio's memory
THEN the radio shall set up a talk group call to that address.**

Specification Text:
Functions such as the modification of call requests to change to type of
service request, and the implementation of other facilities (status, broadcast,
etc.), are initiated using the syntax in the following clauses. The call
modifier is defined by the dialled string by adding extra digits to the dialled
destination in the form.
<call modifier code> * destination as defined in clauses A.3.4.3.1 to
A.3.4.3.7.
Table A.3.4.2: Summary of call modifiers
Dialled Digits Call Modifier
#1*nn…#   Broadcast call, clause A.3.4.2.1
#0ss*nn…#   Status call, clause A.3.4.2.2
#6*nnn..#   Force talkgroup service, clause A.3.4.2.3

A.3.4.2.3 Force talkgroup service
{{**The string "#6*nnn..#" causes the MS to set up a talkgroup call to
destination talkgroup nnn. where nnn. is a numeric string of length from 1 to 7
digits.
EXAMPLE: To make a talkgroup call from MS 1122345 to talkgroup MSs 1122356 dial
"#6*1122356#". In this case dialling "#6*56#" would achieve the same result.**}}

Family: No Duplicates

Test Purposes: None

RQ_001_1424   **Dialling Plan:**

TS 102 490 [1]   Clause A.3.4.4, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio is complying with the Standard User Interface**
                     AND the user keys "##" following dialling an address and "#" terminator,
                     AND the radio has not yet transmitted the call,
                     THEN the radio shall not initiate the call.

Specification Text: {{**"##" may be dialled after digits and a terminator have been entered on the**
                     keyboard. If the radio unit has not transmitted a call request, it shall
                     abandon the call.}}

Family: **RQ_001_1424**, RQ_001_0841

Test Purposes: None

4.2.3   Individual Short Data

4.2.3.1   ISDM Free Text Message

RQ_001_0852   **ISDM Free Text Message:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 2 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Free Text Message".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0853   **ISDM Free Text Message:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 1 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Free Text Message".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

4.2.3.2   ISDM Precoded Message

RQ_001_0850   **ISDM Precoded Message:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 1 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Precoded Message".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0851   **ISDM Precoded Message:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 2 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Precoded Message".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

4.2.3.3   ISDM Short File Transfer

RQ_001_0855   **ISDM Short File Transfer:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 3 data (Packet Data)**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Short File Transfer".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0856   **ISDM Short File Transfer:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 2 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Short File Transfer".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0857   **ISDM Short File Transfer:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 1 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Short File Transfer".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

4.2.3.4   ISDM Status Message

RQ_001_0846   **ISDM Status Message:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 2 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Status Message".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0847   **ISDM Status Message:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **IF a CSF radio supports Type 1 data**
                     THEN using Individual Short Data Message it may support supplementary service
                     "Status Message".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

4.2.4   Off Air Call Set-up

RQ_001_0840   **OACSU:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice individual calls a CSF radio may support supplementary service "Off**
                     Air Call Set Up (OACSU)".

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0841   **OACSU:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice individual calls a CSF radio may support supplementary service**
                     "Cancel call set-up".

Specification Text: {{**Table 8.3**}}

Family: **RQ_001_1424**, RQ_001_0841

Test Purposes: None

4.2.5   Short Appended Data

RQ_001_0837	**Short Appended Data:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice group calls a CSF radio may support supplementary service "Short appended data".**

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0844	**Short Appended Data:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice individual calls a CSF radio may support supplementary service "Short appended data".**

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0932	**Short Appended Data:**

TS 102 490 [1]   Clause 9.1, paragraph 23   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: **IF radio is an ISF radio and current transmission is voice plus appended data AND the PTT key is released before the end of the current Superframe THEN the current frame shall be completed using silence data for the Traffic Channel field and subsequent frames shall be coded as Type 2 data frames.**

Specification Text: {{**In the case of a voice + data and the voice transmission ends before the end of the current superframe, the current frame will be completed using silence data for the TCH** }}("silence data" is the vocoder output data when no sound is input). After completion of the current frame, subsequent frames in the superframe are available for data and coded according to clause 9.3. DP in the SLD field will indicate if the frame contains voice or data information (clause 5.9.1).

{{**Clause 5.9.1 Slow data in the voice superframe**}}
This is the normal use of the slow data field and 2 bytes of user data can be included within each frame of the voice superframe.
In this case the communication mode is set to 001 (clause 5.7).
Each byte of user data is preceded by a continuation flag (Cont.) to inform the receiving party if the subsequent byte is the last.

```
Cont.   User data   Cont.   User data
1 bit   8 bits      1 bit   8 bits


Continuation Flag:
0 User data continues after the following byte.
1 User data is terminated by the following byte.
```

Family: No Duplicates

Test Purposes: None

RQ_001_0933   **Short Appended Data:**

TS 102 490 [1]   Clause 9.1, paragraph 23   *Type:* Conditionally Mandatory

Applies to: ISF, CSF

Requirement: ```
                      IF radio is an ISF radio AND current transmission is voice plus appended data
                      AND the PTT key is released before the end of the current Superframe
                      THEN Data Position (DP) in the Slow Data (SLD) field shall indicate if the
                      frame contains voice or data information as follows:

                      Cont.   User data   Cont.   User data
                      1 bit   8 bits   1 bit   8 bits

                      Continuation Flag:
                      0 User data continues after the following byte.
                      1 User data is terminated by the following byte.
                      ```

*Specification Text:* {{**In the case of a voice + data and the voice transmission ends before the end
                      of the current superframe, the current frame will be completed using silence
                      data for the TCH** }}("silence data" is the vocoder output data when no sound is
                      input). After completion of the current frame, subsequent frames in the
                      superframe are available for data and coded according to clause 9.3. DP in the
                      SLD field will indicate if the frame contains voice or data information
                      (clause 5.9.1).

                      {{**Clause 5.9.1 Slow data in the voice superframe**}}
                      This is the normal use of the slow data field and 2 bytes of user data can be
                      included within each frame of the voice superframe.
                      In this case the communication mode is set to 001 (clause 5.7).
                      Each byte of user data is preceded by a continuation flag (Cont.) to inform the
                      receiving party if the subsequent byte is the last.

                      ```
                      Cont.    User data    Cont.    User data
                      1 bit    8 bits       1 bit    8 bits

                      Continuation Flag:
                      0 User data continues after the following byte.
                      1 User data is terminated by the following byte.
                      ```

Family: No Duplicates

Test Purposes: None

4.2.6   Slow User Data

RQ_001_0836   **Slow User Data:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice group calls a CSF radio may support supplementary service "Slow user
                      data".**

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0843   **Slow User Data:**

TS 102 490 [1]   Clause 8.2, paragraph 1   *Type:* Conditionally Optional

Applies to: CSF

Requirement: **For Voice individual calls a CSF radio may support supplementary service "Slow
                      user data".**

Specification Text: {{**Table 8.3**}}

Family: No Duplicates

Test Purposes: None

4.2.7 Type 3 Data

RQ_001_0808 | **Type 3 data:**

TS 102 490 [1] | Clause 8.2, paragraph 1 | *Type:* Optional

Applies to: CSF

Requirement: **A CSF radio may support Individual Short Data Message service (Type 3, Packet data)**

Specification Text: {{**Type 3 data, Individual Short Data Message**}}.

Family: No Duplicates

Test Purposes: None

RQ_001_0817 | **Type 3 data:**

TS 102 490 [1] | Clause 8.3.2, paragraph 1 | *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF it supports Packet Data message service (Type 3)**
THEN in case of successful reception and decoding of a type 3 packet data transmission including a header frame, a sequence of packet data frames, and an end frame, a CSF radio
shall send an acknowledge message containing information element Call Information with value "ACK RX(ok)".

Specification Text: {{**Receiving parties will signal to the transmitting party whether the data has been received without errors.**
Where there where no errors in any of the received packet frames, the response shall be an ACK frame with the Acknowledgement type (in the CI data) set to 001.
}}

Family: No Duplicates

Test Purposes: None

RQ_001_0818 | **Type 3 data:**

TS 102 490 [1] | Clause 8.3.2, paragraph 3 | *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio supports Packet Data message service (Type 3)**
THEN receiving a packet data message (type 3) it shall send a negative acknowlegdement message
NACK when there is an error in the decoded data. The NACk message shall indicate the packet data frame number from which to re-transmit the last communication frame.

Specification Text: {{**Where errors are detected in any of the received packet frames, the response shall be an ACK frame with the Acknowledgement type (in the CI data) set to 010. This is a NACK frame. The information bits in the CI data will denote the number of the last packet frame received without error. The NACK retransmit values are given in Table 8.4**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0819   **Type 3 data:**

TS 102 490 [1]   Clause 8.3.6 ¶   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio supports Packet Data message service (Type 3)**
                       THEN it shall indicate the completion of a packet data call by sending a
                       disconnect request consisting of two consecutive Header frame, End frame pairs.

Specification Text: See {{**Figure 4** }}in document

Family: No Duplicates

Test Purposes: None

RQ_001_0820   **Type 3 data:**

TS 102 490 [1]   Clause 8.3.6 ¶   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio supports Packet Data message service (Type 3)**
                       ANd it receives a negative acknowledgement message (NACK) after a packet data
                       message transmission
                       THEN it shall re-transmit the frames from the frame number indicated in the
                       NACK message.

Specification Text: {{**Figure 5**}}

Family: No Duplicates

Test Purposes: None

RQ_001_0821   **Type 3 data:**

TS 102 490 [1]   Clause 8.3.5, paragraph 1   *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF a CSF radio supports Packet Data message service (Type 3)**
                       THEN it shall set unused bytes in the DATA information element in the last Data
                       Packet Frame to "0" when transmitting Packet data messages. The unused bytes
                       are those bytes (if any) exceeding the specified data length up to the DATA
                       information element length.

Specification Text: {{**The transmitting party will signal the actual length of the valid data**
                       contained in each packet using the LEN parameter. Any unused bytes of each
                       packet shall be completed with null data (all zeroes).}}

Family: No Duplicates

Test Purposes: None

RQ_001_0822 **Type 3 data:**

TS 102 490 [1] Clause 8.3.6, paragraph 1 *Type:* Conditionally Mandatory

Applies to: CSF

Requirement: **IF CSF radio supports Packet Data message service (Type 3)**
THEN it shall in each packet data frame include a 16 bit CRC field (CRC_D) for
the DATA information element using the Generated Polynomial X^16 + X^12 + X^5 +
1 when transmitting a Packet Data message.

Specification Text: **{{A 16 bit CRC checksum is calculated from the contents of the data field in**
each packet frame, CRC-D.
The Generated Polynomial uses X^16 + X^12 + X^5 + 1.
This CRC-D checksum is used in the parameter field (PAR) of the packet data
frame.

}}

Family: No Duplicates

Test Purposes: None

4.3   Initial Services and Facilities Radios

RQ_001_0804 **ISF:**

TS 102 490 [1] Clause 8.1.1.1 ¶ *Type:* Mandatory

Applies to: ISF

Requirement: **A ISF radio shall have 255 selectable IDs.**

Specification Text: Selectable values (decimal) are as follows:
Table 8.2: Common ID addressing
Com ID
0   Reserved
{{1 to 254   Applicable
255   All call
}}

Family: **RQ_001_0804**, RQ_001_0824, RQ_001_0858

Test Purposes: None

RQ_001_0805 **ISF:**

TS 102 490 [1] Clause*s* 8.1.1, 8.1.1.2, paragraph 1 *Type:* Mandatory

Applies to: ISF

Requirement: **A ISF radio shall use the first 8 bits of the address field as a user**
selectable Common ID and the following 16 bits shall be all set to 1.

Specification Text: For the purposes of interoperability "out of the box", radios employing Initial
Services and Facilities shall operate with simplified addressing scheme. {{**Of**
the 24 bit address space, 16 bits are fixed and only the 8 bit Common ID is
selectable by the user.}} This results in 254 selectable codes which operate
indiscriminately as both individual and group addresses.

{{**The 16 bits following the common ID field shall all be set to 1.**}}

Family: No Duplicates

Test Purposes: None

History

Document history		
V1.1.1	April 2007	Publication