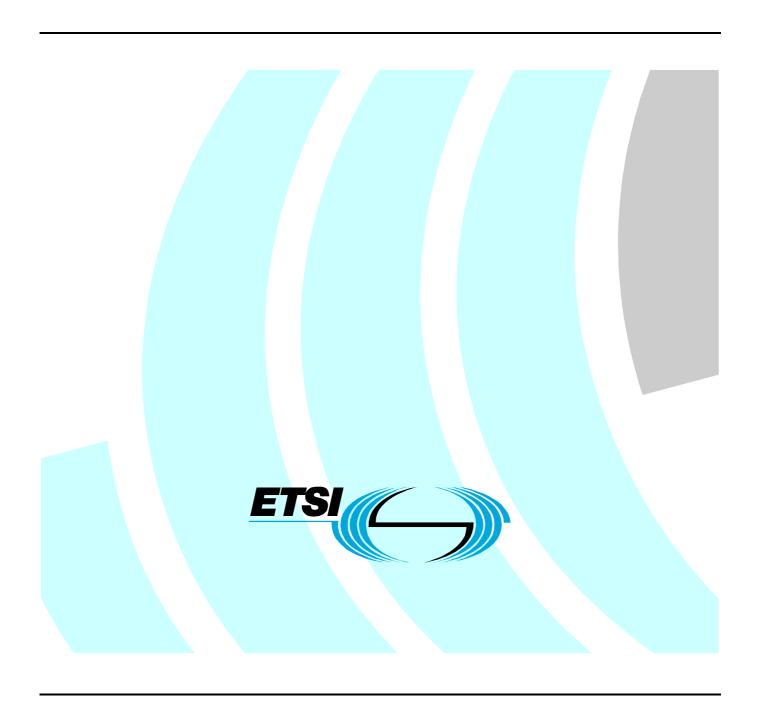# ETSI TS 102 210 V1.1.1 (2003-11)

*Technical Specification*

## Broadband Radio Access Networks (BRAN);
## HIPERMAN;
## System profiles

Reference

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# Contents

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# Foreword

This Technical Specification (TS) has been produced by ETSI Project Broadband Radio Access Networks (BRAN).

The present document describes the system profile specifications for High PERformance Radio Metropolitan Area Network (HIPERMAN), which operate on frequencies between 2 and 11 GHz. System profiles provide recommended implementations of HIPERMAN compliant systems.

# 1 Scope

The present document specifies the HIPERMAN system profiles. System profiles provide recommended implementations of HIPERMAN compliant systems. Compliance with the HIPERMAN specification does not require compliance with the present document.

# 2 References

Void.

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

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

**Base Station (BS):** generalized equipment consisting of one or more Base Station Controllers and one or more Base Station Transceivers

**guard time:** time at the beginning or end of each burst to allow power ramping up and down

**half duplex:** equipment that cannot transmit and receive at the same time

**Receive-Transmit Transition Gap (RTG):** time to switch from receive to transmit at the BS

**Subscriber Station (SS):** generalized equipment consisting of a Subscriber Station Controller and Subscriber Station Transceiver

**Transmit-Receive Transition Gap (TTG):** time to switch from transmit to receive at the BS

## 3.2 Symbols

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

| | |
|---|---|
| $BW$ | Nominal channel bandwidth (Hz) |
| $T_b$ | Useful OFDM symbol time (s) |
| $T_F$ | Frame duration (ms) |
| $T_g$ | OFDM symbol guard time or CP time (s) |
| $T_s$ | OFDM symbol time (s) |

## 3.3 Abbreviations

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

| | |
|---|---|
| AAS | Adaptive Antenna System |
| BER | Bit Error Rate |
| BS | Base Station |
| BW | Bandwidth |
| CID | Connection Identifier |
| CP | Cyclic Prefix |
| CTC | Convolutional Turbo Code |
| FDC | Frame Duration Code |
| FDD | Frequency Division Duplexing |

| | |
|---|---|
| H-FDD | Half duplex Frequency Division Duplexing |
| PMP | Point to Multi Point |
| QAM | Quadrature Amplitude Modulation |
| QPSK | Quadrature Phase Shift Keying |
| RF | Radio Frequency |
| RTG | Receive / Transmit Transition Gap |
| Rx | Receive |
| SS | Subscriber Station |
| STC | Space Time Coding |
| TDD | Time Division Duplexing |
| TTG | Transmit / Receive Transition Gap |
| Tx | Transmit |

# 4 System profiles

A system profile consists of five components: a DLC profile, a PHY profile, a RF band(s) selection, a duplexing selection (FDD and/or TDD) and a power class selection. A system may implement multiple profiles of each component.

## 4.1 DLC profiles

### 4.1.1 Basic packet PMP DLC profile

Profile identifier: prof_HM_DLC_PMP.

Table 1 lists the optional DLC features and whether their implementation is required to comply with this profile.

**Table 1: Optional feature requirements prof_HM_DLC_PMP**

| Feature | Required? | Conditions / Notes |
|---|---|---|
| Packet convergence sublayer | Yes | |
|     Payload header suppression | No | |
|     Ipv4 | Yes | |
|     Ethernet | Yes | |
| ATM convergence sublayer | No | |
| Provisioned connections | No | |
| Classification of packets on incoming physical port | No | |
| Multicast polling groups<br>    Multicast polling | No | |
| CRC functionality | Yes | Elective per connection |
| Dynamic services | Yes | |
| Unsolicited grant service functionality | No | |
| Real-Time Polling services | No | |
| Best effort services | Yes | |
| Non-Real-Time Polling services | Yes | |
| TEK encryption algorithms:<br>    3-DES EDE with 128-bit key (type 1)<br>    RSA with 1024-bit key | <br>No<br>Yes | |
| Undecodable initial ranging feature | Conditional | Required for SS<br>Not required for BS |
| ARQ | No | If used, a minimum of 8 simultaneous ARQ connections shall be supportable. |
| Mesh | No | If supported, apply prof_HM_DLC2 |
| AAS | No | |

## 4.1.2 Basic packet Mesh DLC profile

Profile identifier: prof_HM_DLC_Mesh.

This profile shall only be used in combination with TDD duplexing.

Table 2 lists the optional DLC features and whether their implentation is required to comply with this profile.

**Table 2: Optional feature requirements prof_HM_DLC_Mesh**

| Feature | Required? | Conditions / Notes |
|---|---|---|
| Prof_HM_DLC1 for packet PMP | Yes | |
| Packet convergence sublayer | Yes | |
|     Payload header suppression | No | |
|     Ipv4 | Yes | |
| Ethernet | Yes | |
| ATM convergence sublayer | No | |
|     Support of PVCs | | |
|     VC switched connections | | |
|     VP switched connections | | |
| Provisioned connections | No | |
| Classification of packets on incoming physical port | No | |
| Multicast polling groups | N/A | |
|     Multicast polling | | |
| CRC functionality | Yes | |
| Dynamic services | No | |
| Unsolicited grant service functionality | N/A | |
| Real-Time Polling services | N/A | |
| Best effort services | Yes | |
| Non-Real-Time Polling services | N/A | |
| TEK encryption algorithms: | | |
|     3-DES EDE with 128-bit key (type 1) | No | |
|     RSA with 1024-bit key | Yes | |
| Undecodable initial ranging feature | N/A | |
| ARQ | No | If used, a minimum of 8 simultaneous ARQ state machines shall be supportable. |
| AAS | No | |

If implemented, ARQ functionality may be turned on or off on a per packet basis. ARQ shall be used when the reliability bit in the Mesh CID is set to 1, and shall not be used otherwise. ARQ parameters shall be set to:

- ARQ Window Size = $64_{DEC}$

ARQ Retry Timeout = $\lceil 2T_F \rceil_{DEC}$, with $T_F$ the PHY dependent frame duration in μs

ARQ Fragment Lifetime = $\lceil T_F / 2 \rceil_{DEC}$, with $T_F$ the PHY dependent frame duration in μs

ARQ RX Purge Time Timeout = $\lceil 2T_F \rceil_{DEC}$, with $T_F$ the PHY dependent frame duration in μs

- ARQ Sync Loss Timeout = 0

- ARQ Deliver in Order = 0

## 4.2     PHY profiles

Table 3 lists all optional PHY components.

**Table 3: Optional PHY components**

| Feature | Status? | Conditions / Notes |
|---|---|---|
| CTC | Optional | |
| 64 QAM | Optional | |
| Sub-channelization | Optional | |
| STC | Optional | |
| Focused contention | Optional | |
| $T_g/T_b$ | Conditional | BS shall be capable of using at least one allowed value. SS shall be capable of detecting and using entire set of allowed values. |

Table 4 lists the common minimum performance requirements with which all PHY profiles shall comply.

**Table 4: Minimum performance requirements**

| Capability | Minimum performance |
|---|---|
| Tx Dynamic range<br>    BS<br>    SS | <br>≥10 dB<br>≥30 dB |
| Tx Power Level minimum adjustment step | ≤1 dB |
| Tx Power Level minimum relative step accuracy | ≤ ±0,5 dB |
| Tx Spectral flatness<br>    Absolute difference between adjacent carriers:<br>    Deviation of average energy in each carrier<br>    from the measured energy averaged over<br>    all 200 active tones:<br>        Carriers -50 to -1 and +1 to +50:<br>        Carriers -100 to -50 and +50 to +100: | ≤ 0,06 dB<br><br><br><br>±2 dB<br>+2/-4 dB |
| Spectral mask (OOB) | Local regulation |
| Tx relative constellation error:<br>QPSK-1/2<br>QPSK-3/4<br>16QAM-1/2<br>16QAM-3/4<br>64QAM-2/3 (if 64-QAM supported)<br>64QAM-3/4 (if 64-QAM supported) | <br>≤ -19,4 dB<br>≤ -21,2 dB<br>≤ -26,4 dB<br>≤ -28,2 dB<br>≤ -32,7 dB<br>≤ -34,4 dB |
| Rx max. input level on-channel reception tolerance | ≥ -30 dBm |
| Rx max. input level on-channel damage tolerance | ≥ 0 dBm |
| Input Intercept Point | ≥ -10 dBm |
| Adjacent channel rejection at BER=$10^{-6}$ for 3 dB degradation C/I<br>    16QAM-3/4<br>    64QAM-3/4 (if 64-QAM supported) | <br><br>≥ 11 dBr, ≥ -30 dBm<br>≥ 4 dBr, ≥ -30 dBm |
| Non-adjacent channel rejection at BER=$10^{-6}$ for 3 dB degradation C/I<br>    16QAM-3/4<br>    64QAM-3/4 (if 64-QAM supported) | <br><br>≥ 30 dBr, ≥ -30 dBm<br>≥ 23 dBr, ≥ -30 dBm |
| Out of band signal immunity<br>    $\|f_{blocker} - f_{signal}\| < 100$ MHz<br><br>    $100$ MHz $< \|f_{blocker} - f_{signal}\| < 1$ GHz<br>    $1$GHz $< \|f_{blocker} - f_{signal}\|$ | Idem to non-adj. Channel rejection<br>≥ -30 dBm, ≥20 dBr<br>≥ -10 dBm, ≥30 dBr |
| Spurious emissions<br>30 MHz to 1 GHz (measurement BW: 100 kHz)<br>1 GHz to 26,5 GHz (measurement BW: 1 MHz) | <br>≤ -57 dBm<br>≤ -50 dBm |
| TTG and RTG (TDD only) | ≤ 50 µs |

| Capability | Minimum performance |
|---|---|
| SSTTG and SSRTG | TDD ≤ 50 µs<br>H-FDD ≤ 100 µs |
| Reference frequency tolerance<br>    BS<br>    Mesh system (TDD only) | <br>≤ ±4 ppm<br>≤ ±6 ppm |

## 4.2.1    1,75 MHz channelization PHY profile

Profile identifier: prof_HM_PHY1.75.

Mandatory features:

- Licensed band usage only

- Channel bandwidth $BW$ = 1,75 MHz

- Use with PMP only. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.

Systems implementing prof_HM_PHY1.75 shall meet the minimum performance requirements listed in table 5.

**Table 5: Minimum performance requirements for prof_HM_PHY1.75**

| Capability | Minimum performance |
|---|---|
| $T_b$ | = 128 µs |
| BER performance threshold, BER=$10^{-6}$<br>    QPSK-1/2<br>    QPSK-3/4<br>    16QAM-1/2<br>    16QAM-3/4<br>    64QAM-2/3 (if 64-QAM supported)<br>    64QAM-3/4 (if 64-QAM supported) | <br>≤ -90 dBm<br>≤ -87 dBm<br>≤ -83 dBm<br>≤ -81 dBm<br>≤ -77 dBm<br>≤ -75 dBm |
| Reference frequency tolerance<br>    SS to BS synchronization tolerance | <br>≤ 156,25 Hz |
| Reference time tolerance | ± ≤ $T_g$ / 2 µs |

## 4.2.2    3,5 MHz channelization PHY profile

Profile identifier: prof_HM_PHY3.5.

Mandatory features:

- Licensed band usage only

- Channel bandwidth $BW$ = 3,5 MHz

- FDC set for mesh:{6}. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.

Systems implementing prof_HM_PHY3.5 shall meet the minimum performance requirements listed in table 6.

**Table 6: Minimum performance requirements for prof_HM_PHY3.5**

| Capability | Minimum performance |
|---|---|
| $T_b$ | = 64 µs |
| BER performance threshold, BER=$10^{-6}$<br>　QPSK-1/2<br>　QPSK-3/4<br>　16QAM-1/2<br>　16QAM-3/4<br>　64QAM-2/3 (if 64-QAM supported)<br>　64QAM-3/4 (if 64-QAM supported) | ≤ -87 dBm<br>≤ -85 dBm<br>≤ -80 dBm<br>≤ -78 dBm<br>≤ -74 dBm<br>≤ -72 dBm |
| Reference frequency tolerance<br>　SS to BS synchronization tolerance<br>　Mesh to Mesh synchronization tolerance (TDD only) | ≤ 312,5 Hz<br>≤ 468,75 Hz |
| Reference time tolerance | ± ≤ $T_g$ / 2 µs |

## 4.2.3    7,0 MHz channelization PHY profile

Profile identifier: prof_HM_PHY7.

Mandatory features:

- Licensed band usage only

- Channel bandwidth $BW$ = 7 MHz

- FDC set for mesh:{4}. SSs shall be capable of operating with any of the Frame Durations indicated in the code set.

Systems implementing prof_HM_PHY7 shall meet the minimum performance requirements listed in table 7.

**Table 7: Minimum performance requirements for prof_HM_PHY3**

| Capability | Minimum performance |
|---|---|
| $T_b$ | = 32 µs |
| BER performance threshold, BER=$10^{-6}$<br>　QPSK-1/2<br>　QPSK-3/4<br>　16QAM-1/2<br>　16QAM-3/4<br>　64QAM-2/3 (if 64-QAM supported)<br>　64QAM-3/4 (if 64-QAM supported) | ≤ -84 dBm<br>≤ -82 dBm<br>≤ -77 dBm<br>≤ -75 dBm<br>≤ -71 dBm<br>≤ -69 dBm |
| Reference frequency tolerance<br>　SS to BS synchronization tolerance<br>　Mesh to Mesh synchronization tolerance (TDD only) | ≤ 625 Hz<br>≤ 937,5 Hz |
| Reference time tolerance | ± ≤ $T_g$ / 2 µs |

## 4.3    Duplexing selection

A system shall implement TDD and/or FDD. A FDD SS system may be implemented as half-duplex. A FDD BS system must respect the half-duplex nature of half-duplex SSs.

## 4.4    Power class profiles

Table 8 lists the defined power classes. A power class is defined as the maximum mean transmit power $P_{TX,max}$ using all non-guard carriers for which all transmitter requirements are met.

**Table 8: Power classes**

| Class | Minimum performance |
|---|---|
| Prof_HM_PC17-20 | 17 dBm ≤ $P_{TX,max}$ < 20 dBm |
| Prof_HM_PC20-23 | 20 dBm ≤ $P_{TX,max}$ < 23 dBm |
| Prof_HM_PC23 | $P_{TX,max}$ ≥ 23 dBm |

# Annex A (informative):
# Bibliography

ETSI TS 102 177: "Broadband Radio Access Networks (BRAN); HIPERMAN; Physical layer".

ETSI TS 102 178: "Broadband Radio Access Networks (BRAN); HIPERMAN; Data Link Control (DLC) layer".

# History

| Document history | | |
|---|---|---|
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