



TECHNICAL REPORT

**Universal Mobile Telecommunications System (UMTS);  
LTE;**

**Specification of the TUAK algorithm set: A second example  
algorithm set for the 3GPP authentication and key generation  
functions  $f_1$ ,  $f_1^*$ ,  $f_2$ ,  $f_3$ ,  $f_4$ ,  $f_5$  and  $f_5^*$ ;  
Document 5: Performance evaluation  
(3GPP TR 35.935 version 19.0.0 Release 19)**



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**Reference**

RTR/TSGS-0335935vj00

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**Keywords**

LTE,SECURITY,UMTS

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# Foreword

This Technical Report has been produced by the 3<sup>rd</sup> Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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# 1 Scope

The present document provides a reference to an independent performance evaluation report of the Tuak algorithm set carried out by the ISG Smart Card Centre of the Royal Holloway University of London.

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## 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, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TS 35. 231: "Specification of the Tuak algorithm set: A second example algorithm set for the 3GPP authentication and key generation functions f1, f1\*, f2, f3, f4, f5 and f5\*; Document 1: Algorithm specification".
  - [2] "Performance Evaluation of the TUAK algorithm in support of the ETSI Sage standardisation group"; Keith Mayes; ISG Smart Card Centre, Royal Holloway University of London; (available at [http://www.3gpp.org/ftp/Specs/archive/35\\_series/35.936/SAGE\\_report/Perfevaluation.zip](http://www.3gpp.org/ftp/Specs/archive/35_series/35.936/SAGE_report/Perfevaluation.zip))
  - [3] "Performance Evaluation of the TUAK algorithm in support of the GSMA and ETSI SAGE standardisation group"; Keith Mayes; ISG Smart Card Centre, Royal Holloway University of London; Crisp Telecom Limited; (available at [http://www.3gpp.org/ftp/Specs/archive/35\\_series/35.936/SAGE\\_report/Perfevaluationext.zip](http://www.3gpp.org/ftp/Specs/archive/35_series/35.936/SAGE_report/Perfevaluationext.zip))
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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 35.231 apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TS 35.231 [1].

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## 4 Performance evaluation of the Tuak algorithm set

The performance evaluation report of the Tuak algorithm set [1] can be found here: [2].

An extension to the performance evaluation report can be found here: [3].

## Annex A: Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
Nov 2014					First TR version		0.1.0
Dec 2014	SA#66	SP-140817			Version for information and approval	0.1.0	1.0.0
					Version after approval	1.0.0	12.0.0
Jan 2016	SA#70				Upgrade to Rel-13 (MCC)	12.0.0	13.0.0

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-03	SA#75					Promotion to Release 14 without technical change	14.0.0
2018-06	-	-	-	-	-	Update to Rel-15 version (MCC)	15.0.0
2020-07	-	-	-	-	-	Update to Rel-16 version (MCC)	16.0.0
2022-03	-	-	-	-	-	Update to Rel-17 version (MCC)	17.0.0
2024-03	-	-	-	-	-	Update to Rel-18 version (MCC)	18.0.0
2025-10	-	-	-	-	-	Update to Rel-19 version (MCC)	19.0.0

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# History

<b>Document history</b>		
V19.0.0	October 2025	Publication