

# ETSI TS 155 226 V14.0.0 (2017-04)



**Digital cellular telecommunications system (Phase 2+) (GSM);  
3G Security;  
Specification of the A5/4 Encryption Algorithms for GSM and  
ECSD, and the GEA4 Encryption Algorithm for GPRS  
(3GPP TS 55.226 version 14.0.0 Release 14)**



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**ETSI**

650 Route des Lucioles  
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C  
Association à but non lucratif enregistrée à la  
Sous-Préfecture de Grasse (06) N° 7803/88

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# Foreword

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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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# Introduction

In this document are specified three ciphering algorithms: A5/4 for GSM, A5/4 for ECSD, and GEA4 for GPRS (including EGPRS). The algorithms are stream ciphers that are used to encrypt/decrypt blocks of data under a confidentiality key KC. Each of these algorithms is based on the KASUMI algorithm that is specified in TS 35.202 [5]. The three algorithms are all very similar. We first define a core keystream generator function KGCORE (clause 4); we then specify each of the three algorithms in turn (clauses 5, 6 and 7) in terms of this core function.

Note that:

- GSM A5/4 is the same algorithms as GSM A5/3 but with KLEN changed from 64 to 128 bits.
- and ECSD A5/4 is the same algorithms as ECSD A5/3 but with KLEN changed from 64 to 128 bits.
- and GEA 4 is the same algorithms as GEA3 but with KLEN changed from 64 to 128 bits.

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# 1 Scope

This specification of the **A5/4** encryption algorithms for GSM and ECSD, and of the **GEA4** encryption algorithm for GPRS has been derived from TS 55.516 [1]: Specification of the A5/3 Encryption Algorithms for GSM and ECSD, and the **GEA3** Encryption Algorithm for GPRS. The only essential change is the change of external key length input from 64 bits to 128 bits.

This document should be read in conjunction with the entire specification of the **A5/3** and **GEA3** algorithms:

- Specification of the A5/3 Encryption Algorithms for GSM and ECSD, and the GEA3 Encryption Algorithm for GPRS. Document 1: A5/3 and GEA3 Specifications.
- Specification of the A5/3 Encryption Algorithms for GSM and ECSD, and the GEA3 Encryption Algorithm for GPRS. Document 2: Implementors' Test Data.
- Specification of the A5/3 Encryption Algorithms for GSM and ECSD, and the GEA3 Encryption Algorithm for GPRS. Document 3: Design Conformance Test Data.

The normative part of the specification of the block cipher (**KASUMI**) on which the **A5/3**, **A5/4**, **GEA3** and **GEA4** algorithms are based can be found in TS 35.202 [5].

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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] to [5] (void)

[6] 3GPP Task Force Specification: "3G Security; Specification of the A5/4 Encryption Algorithms for GSM and ECSD, and the GEA4 Encryption Algorithm for GPRS", version 9.0.0.

Note: Reference [6] is available via <http://www.etsi.org/WebSite/OurServices/Algorithms/algorithms.aspx> and is subject to licensing conditions described at this site.

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# 3 Technical provisions

The technical provisions of the current document are contained in the 3GPP Task Force Specification [6].

## Annex F (informative): Change history

| Change history |       |           |    |     |  |        |               |
|----------------|-------|-----------|----|-----|--|--------|---------------|
| Date           | TSG # | TSG Doc.  | CR | Rev | Subject/Comment                                  | Old    | New           |
| 02-2004        | -     | -         | -  | -   | Draft presented to SA WG3 for agreement          | ---    | 0.1.0         |
| 03-2004        | SA_23 | SP-040170 | -  | -   | Draft provided to TSG SA for information         | 0.1.0  | 1.0.0         |
| 09-2009        | SA_45 | SP-090647 | -  | -   | Draft provided to TSG SA for approval            | 1.0.0  | 2.0.0         |
| 09-2009        | SA_45 | SP-090647 | -  | -   | Approval at SA#45 and placement under CR control | 2.0.0  | 9.0.0         |
| 2011-03        | -     | -         | -  | -   | Update to Rel-10 version (MCC)                   | 9.0.0  | 10.0.0        |
| 2012-09        | -     | -         | -  | -   | Update to Rel-11 version (MCC)                   | 10.0.0 | <b>11.0.0</b> |
| 2014-09        | -     | -         | -  | -   | Update to Rel-12 version (MCC)                   | 11.0.0 | <b>12.0.0</b> |
| 2016-01        | -     | -         | -  | -   | Update to Rel-13 version (MCC)                   | 12.0.0 | <b>13.0.0</b> |
| 2017-03        | SA#75 | -         | -  | -   | Promotion to Release 14 without technical change | 13.0.0 | <b>14.0.0</b> |

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# History

| <b>Document history</b> |            |             |
|-------------------------|------------|-------------|
| V14.0.0                 | April 2017 | Publication |
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