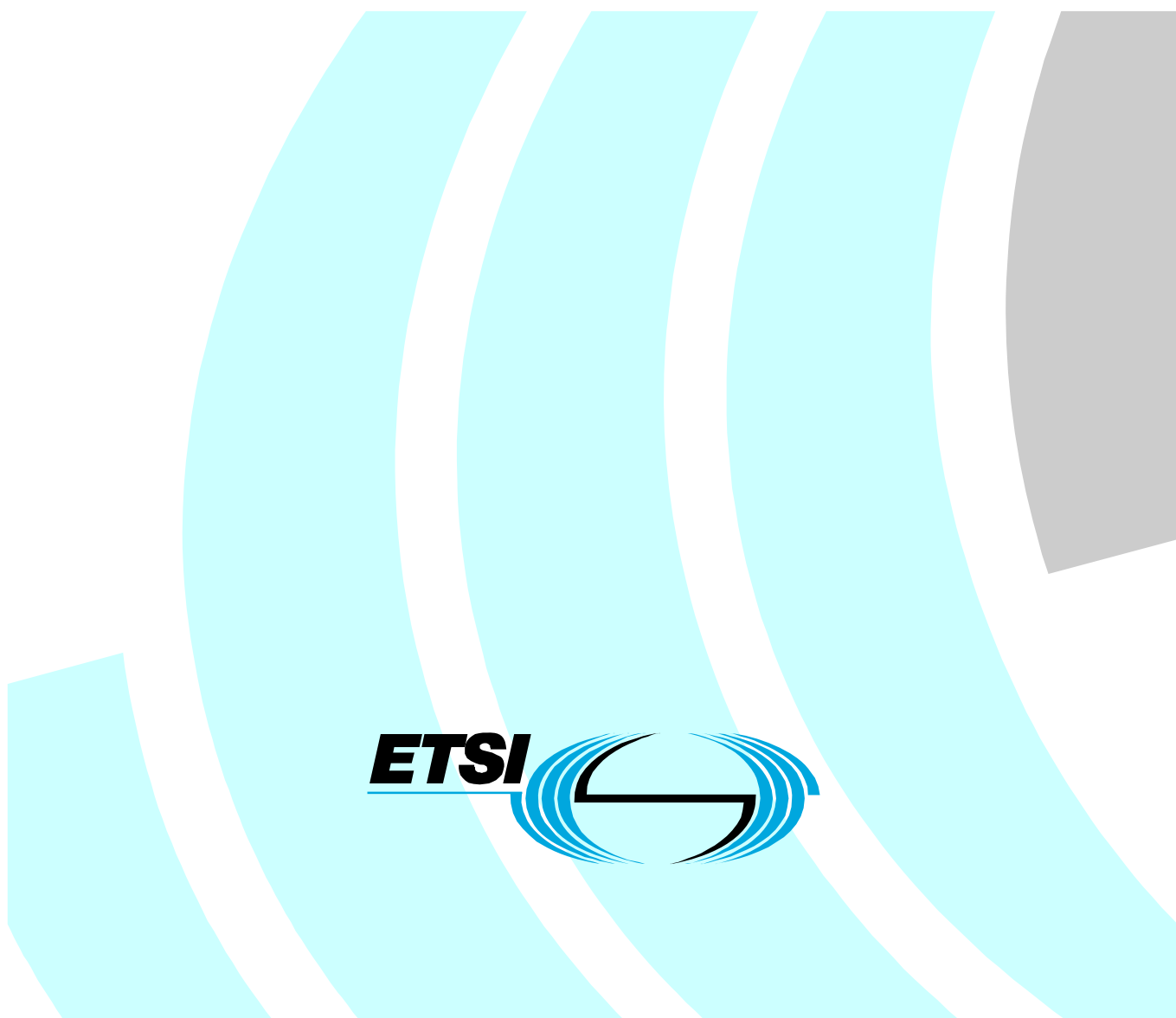


Terrestrial Trunked Radio (TETRA); Evaluation of low rate (2,4 kbit/s) speech codec



Reference

DTR/TETRA-05131

Keywords

CODEC, radio, TETRA, voice

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

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at

<http://portal.etsi.org/tb/status/status.asp>

If you find errors in the present document, please send your comment to one of the following services:

http://portal.etsi.org/chaicor/ETSI_support.asp

Copyright Notification

Reproduction is only permitted for the purpose of standardization work undertaken within ETSI.
The copyright and the foregoing restrictions extend to reproduction in all media.

© European Telecommunications Standards Institute 2007.
All rights reserved.

DECTTM, **PLUGTESTS**TM and **UMTS**TM are Trade Marks of ETSI registered for the benefit of its Members.
TIPHONTM and the **TIPHON logo** are Trade Marks currently being registered by ETSI for the benefit of its Members.
3GPPTM is a Trade Mark of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

Contents

Intellectual Property Rights	5
Foreword.....	5
1 Scope	6
2 References	6
3 Definitions and abbreviations.....	6
3.1 Definitions	6
3.2 Abbreviations	6
4 General	7
4.1 Work requirements	7
4.2 Tasks	7
5 Initial study of the TETRA speech Codec.....	7
5.1 Introduction	7
5.2 Polynomial search for ¼ mother code rate	8
5.3 Bit classification	12
5.3.1 Bit distribution constraints.....	12
5.3.2 Average Protection Level (APL) metric	13
5.4 Puncturing Patterns.....	15
5.5 Integration and Testing.....	17
5.5.1 Speech encoder	17
5.5.2 Channel encoder	17
5.5.3 Channel decoder	19
5.5.4 Speech decoder	19
5.5.5 Frame Stealing Mode - CRC Test.....	19
6 Performance Evaluation	20
6.1 Evaluation Criteria	20
6.2 Results	23
6.3 Additional TU 50 results	28
7 Summary	29
8 Conclusions	30
9 Further Work	30
Annex A: Complete simulation data.....	31
A.1 Distribution 2-44-6-2.....	31
A.1.1 Polynomial 17 ($1 + X^2 + X^3 + X^4$).....	31
A.1.2 Polynomial 1E ($1 + X + X^2 + X^3$).....	32
A.1.3 Polynomial 1D ($1 + X + X^2 + X^4$).....	34
A.1.4 Polynomial 0F ($X + X^2 + X^3 + X^4$).....	36
A.2 Distribution 12-28-9-5.....	37
A.2.1 Polynomial 1E ($1 + X + X^2 + X^3$).....	37
A.2.2 Polynomial 1D ($1 + X + X^2 + X^4$).....	39
A.2.3 Polynomial 17 ($1 + X^2 + X^3 + X^4$).....	40
A.2.4 Polynomial 0F ($X + X^2 + X^3 + X^4$).....	42
A.3 Distribution 20-12-17-5.....	44
A.3.1 Polynomial 1E ($1 + X + X^2 + X^3$).....	44
A.3.2 Polynomial 1D ($1 + X + X^2 + X^4$).....	45
A.3.3 Polynomial 17 ($1 + X^2 + X^3 + X^4$).....	47
A.3.4 Polynomial 0F ($X + X^2 + X^3 + X^4$).....	49
A.4 Distribution 30-4-6-14.....	50