ITU-T Workshop on Bridging the Standardization Gap and Interactive Training Session

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Emergency Communications and Disaster Management

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ITU References for Emergency Communications and Disaster Management

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ITU Reference for ECDM - 1

- Resolution 646 of World Radiocommunication Conference (Geneva, 2003) "Public protection and disaster relief" urges Member States to facilitate use of telecommunications for the safety and security of the personnel of humanitarian organizations;

- ITU-R Recommendation F. 1105-2 lists several types of radio communications which are useful in disaster mitigation and relief operations;

- Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations (Tampere, 1998) calls on Member States to facilitate the provision of prompt telecommunication assistance to mitigate the impact of a disaster, and covers both the installation and operation of reliable, flexible telecommunication services;

- ITU-D SG2 Q.22's Final Report contains many findings that can be referred to when implementing satellite telecommunications for early warning and disaster relief;

ITU Reference for ECDM - 2

- Recommendation ITU-R S.1001-2 provides useful guidelines for the use of systems in the fixed-satellite service in the event of natural disasters and similar emergencies for warning and relief operations;

- Report ITU-R S.2151 provides references on the use and examples of systems in the fixed-satellite service in the event of natural disasters and similar emergencies for warning and relief operations;

- Recommendation ITU-R M 1854 provides useful guidelines on the use of Mobile Satellite Services (MSS) in disaster response and relief;

- Report ITU-R M. 2149 provides references on the use and examples of Mobile Satellite Service Systems for relief operations in the event of natural disasters and similar emergencies;

ITU Reference for ECDM - 3

- Recommendation ITU-R BT 1774-1 provides useful guidelines on the use of Satellite and terrestrial broadcast infrastructures for public warning, disaster mitigation and relief;

- Recommendation 647 (WRC 07) provides spectrum management guidelines that can be referred to when considering emergency and disaster relief radiocommunication;

- Recommendation ITU-R M 1826 describes harmonized frequency channel plan for broadband public protection and disaster relief operations at 4 940-4 990 MHz in Regions 2 and 3;

- Recommendation ITU-R M. 1637 provides useful guidelines on global cross-border circulation of radiocommunication equipment in emergency and disaster relief situations;

ITU Reference for ECDM - 4

- Recommendation ITU-R M. 1042 provides useful guidelines on disaster communications in the amateur and amateur-satellite services;

- Recommendation ITU-D 13 provides useful guidelines on effective utilisation of the amateur services in disaster mitigation and relief operations;

- Report ITU-R M.2033 provides references on the radio communications objectives and requirements for public protection and disaster relief;

- Resolution 644 (Rev. WRC-07) urges the study and work on utilizing radiocommunication resources for early warning disaster mitigation and relief operations

- REPORT ITU-R M.2014 provides the technical and operational characteristics for spectrum efficient digital dispatch systems and also provides details of systems being introduced throughout the world.

REPORT ITU-R M.2033
Radiocommunication objectives and requirements for PPDR

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Radio Operating Environments for PPDR

- Day-to-day operations
- Large emergency and/or public events
- Disasters

International Telecommunication Union

Narrowband

- Voice - Person-to-person, One-to-many, Talk-around/direct mode operation, PTT, Instantaneous access, Security

- Facsimile

- Messages - Person-to-person, One-to-many (broadcasting)

- Security - Priority/instantaneous access

- Telemetry - Location status, Sensory data

- Database interaction (minimal record size)

Wideband

- Messages
- Data Talk-around/direct mode operation
- Database interaction (medium record size)
- Text file transfer
- Image transfer
- Telemetry - Location status and sensory data
- Security - Priority access
- Video - Download/upload compressed video
- Interactive - Location determination

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Broadband

- Database access

- Robotics control

- Video - Video streaming, live video feed

- Imagery - High resolution imagery

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Report ITU-R M.2014 Spectrumefficient Digital Land Mobile System for Dispatch Traffic

TETRA

- Standardized by ETSI
- For emergency services as well as commercial services
- 4:1 TDMA
- 25KHz for NB, while 25/50/100/150Khz for WB
- $\prod/4$ DQPSK for V+D, 4/16/64 QAM for WB
- ACELP coding algorithm for speech codec

Project 25

- Standardized by Project 25, a combined effort of US local APCO, state NASTD and federal government users; in collaboration with the TIA

- Primarily for public safety and governmental operations

- 12.5KHz carrier and 2:1 TDMA

- IMBE coding algorithm for speech codec

IDRA

- Standardized by ARIB
- For emergency services but also for commercial and industrial organizations
- 25KHz carrier and 6:1 TDMA
- M16QAM(M=4) modulation

iDEN

- The iDEN system is one of the methods being used in North America

- 25KHz carrier and 6:1 TDMA

- M16QAM(M=4)

- VSELP coding algorithm for speech codec

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TETRAPOL

- Standardized by TETRAPOL Forum and the TETRAPOL users' club

- Primarily for the public safety sector but also for other PMR networks

- 12.5-10KHz or 6.25KHz carrier

- GMSK modulation

- RPCELP coding algorithm for speech codec

EDACS

- Standardized by TIA
- For public safety, industry, utility and commercial users
- 25 or 12.5Khz carrier
- GFSK modulation
- AME coding algorithm for speech codec

FHMA

- This FHMA system has been developed in Israel

- Primarily for PAMR market but also for commercial users

- 25KHz carrier

- $\prod/4$ SQPSK modulation

- IMBE/AMBE coding algorithm for speech codec

POPULARITY OF LAND MOBILE SYSTEMS IN KOREA

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Popularity of Land Mobile Systems in Korea

- **TETRA**
  - GRN for police, fire, ambulance and etc.
  - Many commercial private networks
- **iDEN**
  - One nationwide public network
- **Astro (pre P25)**
  - KTX Ph1
- **FHMA**
  - One small public network was tried.
- **Analog Conventional Radio**
  - Used to be majority but retiring

TETRA STANDARD
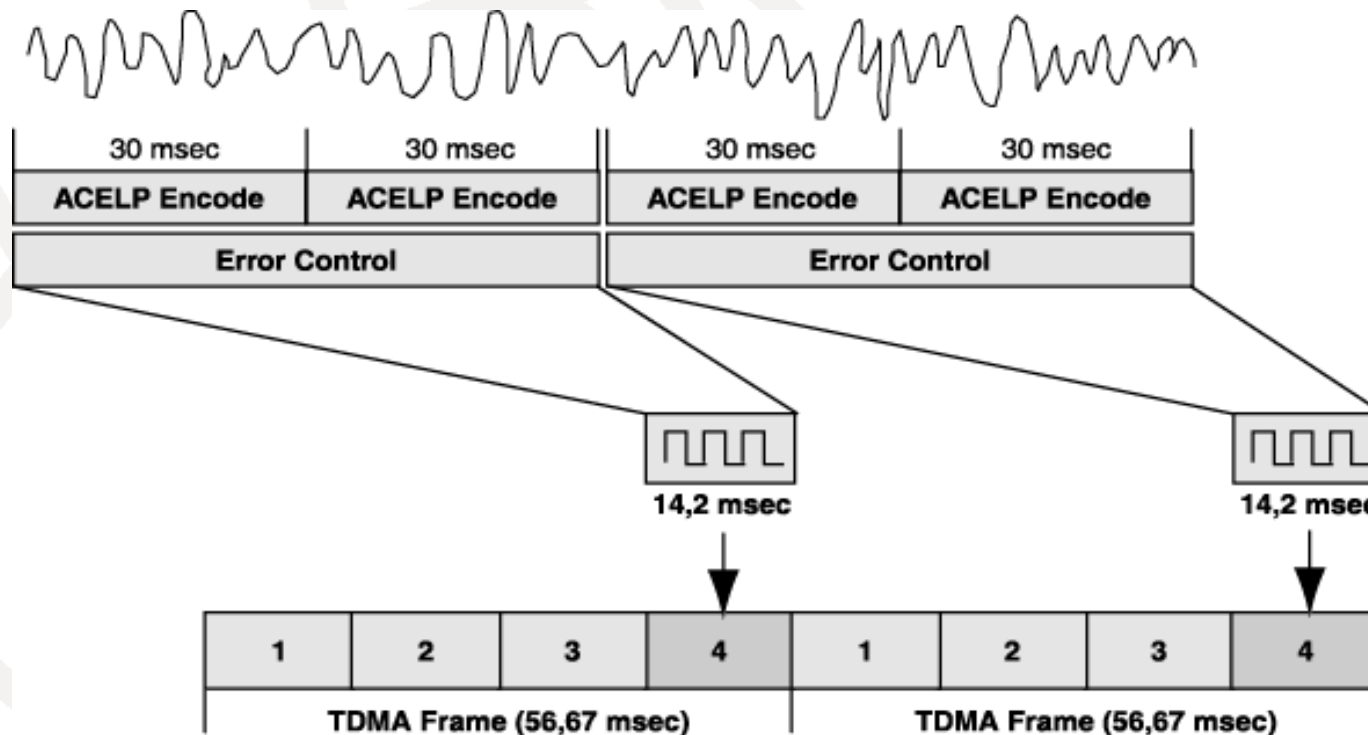
TETRA Technologies - Coding (1)

- Analog audio is first converted to Pulse Code Modulation (PCM)

- Data compared to codebook

- Data replaced by index numbers from codebook

- Receiving station uses codebook to reconstruct PCM
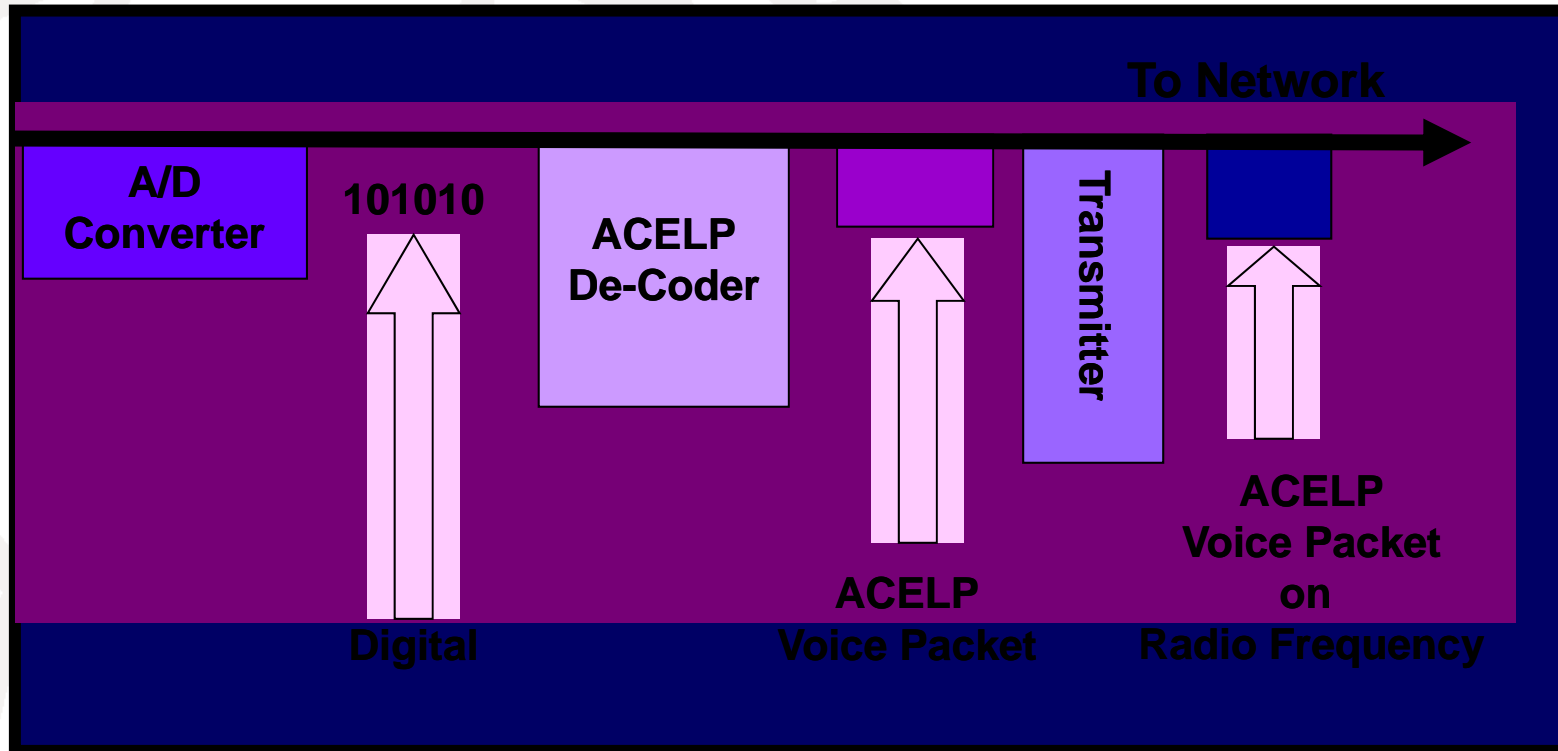
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TETRA Technologies – Coding (2)

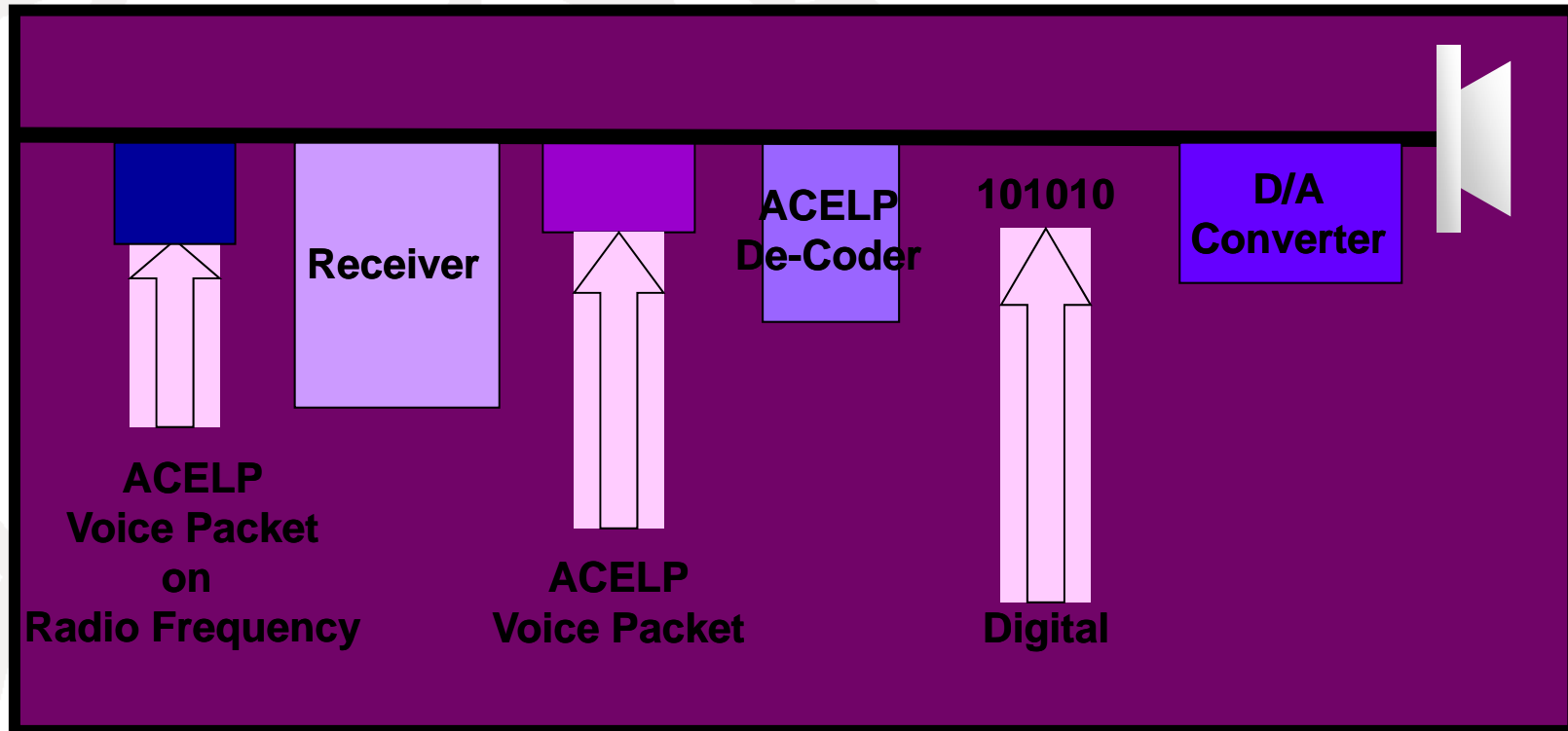- **ACELP (Algebraic Code Exited Linear Prediction)**

TETRA Technologies
- Coding Audio to Digital Conversion

To Network

A/D Converter	101010	ACELP De-Coder		Transmitter	

Digital

ACELP Voice Packet

ACELP Voice Packet on Radio Frequency

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TETRA Technologies
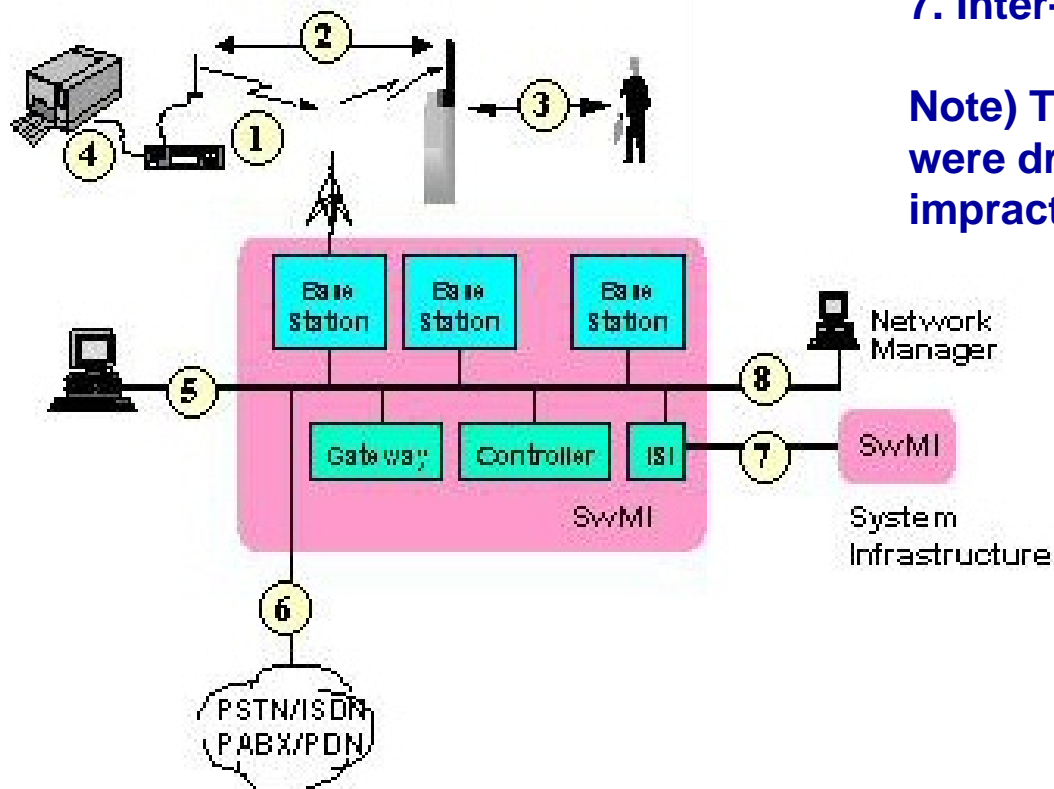## - Coding Digital to Audio Conversion

ETSI TETRA Standard

Interfaces
1. Network Air Interface
2. DMO Air Interface
4. Peripheral Equipment Interface (PEI)
6. PSTN/ISDN/PABX
7. Inter-System Interface (ISI)

Note) The interfaces for 3, 5 and 8 were dropped because those are impractical.

CASE STUDY OF KOREA GOVERNMENT RADIO NETWORK

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Standardization for GRN – PG316

- PG316 Project Group was formed for Disaster Communications in TTA in 2004

- Through many meetings, seminars and workshops, TETRA was selected to be adapted by PG316

- First output for TETRA Release 1 in 2005

- 2nd output for TIP in 2007

- Working for TETRA Release 2 is on-going

Standardization for GRN — BB PPDR Forum

- BB PPDR Forum was formed for BB Disaster Communications in RAPA in 2010

- Studying and comparing various technologies

- Standardization process will go through TTA

- For long term and next phase KGRN

KGRN Network - Existing

- TETRA

- 800Mhz band complying Resolution 647 (WRC 07)

- Capital region, 5 major cities and highways

- Interconnection with airport, metro and subway train

- Authentication

- Air Interface Encryption

- E2E Encryption

- 400 base stations

- 80k radios (mobile or portable) for police, fire, ambulance, military, government and etc.

International
Telecommunication
Union

KGRN Network – Future Plan

- Nationwide coverage
- 200k radios (mobile or portable)
- Authentication
- Encryption
- Voice
- Data
- Video

BACK UP SLIDES

ETSI TETRA Standard (2)

TETRA RELEASE 1.3

Voice + Data (V + D)

300 392-1 General Design

300 392-2 Air Interface (AI)

300 392-3 Inter System Interface (ISI)

300 392-4 Gateways (PSTN and ISDN)

300 392-5 Peripheral Equipment Interface (PEI)

300 392-7 Security

300 392-9 Supplementary Services - General Design

300 392-10 Supplementary Services (SS) Stage 1

300 392-11 SS Stage 2

300 392-12 SS Stage 3

ETSI TETRA Standard (3)

TS 100 392-15 Frequency bands, duplex spacing & channel numbering.

TS 100 392-16 Network Performance Metrics

TS 100 392-18 Location Information protocol (LIP) (2008)

300 394 Conformance Testing

300 395 Speech Codec

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ETSI TETRA Standard (4)

Direct Mode (DMO)

300 396-1 General Network design

300 396-2 Radio Aspects

300 396-3 MS-MS Radio Air Interface

300 396-4 Type 1 Repeater Air Interface

300 396-5 Gateway Air Interface

300 396-6 Security

300 396-7 Type 2 Repeater Air Interface

300 396-10 Managed Direct Mode (MDMO)

ETSI TETRA Standard (5)

TS 100 812 Subscriber Identity Module (SIM)
TS 200 812 Subscriber Identity Module (SIM)
EN 300 812 Subscriber Identity Module (SIM)

ETSI TETRA Standard (6)

Technical Reports and ETSI Guides

102 300-3 Designer's Guide DMO

102 300-5 Designer's Guide Numbering and Addressing

101 052 Rules for the management of the encryption
  algorithm TAA1

101 053-1 Rules for the management of TEA1

101 053-2 Rules for the management of TEA2

101 053-3 Rules for the management of TEA3

101 053-4 Rules for the management of TEA4

101 448 Functional requirements for ISI from 3-Country
  Pilot

300-4 Designer's Guide Network Management

ETSI TETRA Standard (7)

Other Specifications

TS 101 747 V+D IP Interworking (IPI)

TR 101 789-1 TMO Repeaters: Requirements,
  test methods and limits

EN 302 109 Synchronization mechanism
  for end-to-end encryption (2003)

ES 202 109 Synchronization mechanism
  for end-to-end encryption

EN 301 040 Lawful Interception (LI) Interface (2006-3)

TR 101 957 RF Sensitive Area Operation Mode
  ("TX Inhibit")

ETSI TETRA Standard (8)

TETRA RELEASE 2 User Requirement Specification

TR 102 021-1 General Overview User Requirement
  Specification (URS)

TR 102 021-2 High Speed Data (HSD) URS

TR 102 021-3 Codec URS

TR 102 021-4 Air Interface Enhancements URS

TR 102 021-5 Interworking and Roaming URS

TR 102 021-6 SIM URS

TR 102 021-7 Security URS

TR 102 021-8 Air-Ground-Air Services URS