



Open Radio equipment Interface (ORI); ORI interface Specification; Part 1: Low Layers (Release 4)

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Reference

RGS/ORI-0017

Keywords

E-UTRA, interface, radio, UTRA

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Contents

Intellectual Property Rights	5
Foreword.....	5
Modal verbs terminology.....	5
1 Scope	6
2 References	6
2.1 Normative references	6
2.2 Informative references.....	7
3 Definitions, symbols and abbreviations	7
3.1 Definitions.....	7
3.2 Symbols.....	8
3.3 Abbreviations	8
4 ORI Low Layers specification compliance	9
5 Layer 1 configuration	9
5.1 General	9
5.2 Optical interface	9
5.3 Electrical interface.....	10
6 Control plane	10
6.1 Mapping to CPRI protocol structure	10
6.2 C&M resource allocation	11
6.3 ORI reserved area.....	11
6.3.1 PORT_ID.....	11
6.3.2 UTRA RTWP measurement report.....	12
6.3.3 BFN cycle index	14
6.4 Additional requirements for CPRI-defined control words	14
6.4.1 ORI low layer reset.....	14
6.4.2 LOF.....	14
6.4.3 LOS.....	14
6.4.4 SDI.....	14
6.4.5 RAI	14
6.5 Data link layer for Fast C&M channel	15
7 User plane.....	15
7.1 Mapping and format of IQ data	15
7.1.1 E-UTRA.....	15
7.1.1A Compressed E-UTRA.....	16
7.1.2 UTRA-FDD	16
7.1.3 GSM.....	17
7.1.3.1 General	17
7.1.3.2 Usage of AxC container block stuffing bits	17
7.1.3.2.1 Frequency hopping information (downlink stuffing bits 0... 9).....	18
7.1.4 E-UTRA, UTRA-FDD and GSM in combination	18
7.2 IQ data compression/decompression	18
7.2.1 General.....	18
7.2.2 Compression process	19
7.2.2.1 Down-sampling.....	19
7.2.2.2 Non-linear quantization.....	19
7.2.3 Decompression process.....	19
7.2.3.1 Inversed non-linear quantization process	19
7.2.3.2 Up-sampling.....	19
7.2.4 Non-linear quantization process	19
7A Synchronization and timing.....	21
7A.1 GSM frame timing aspects	21

8	ORI start-up sequence	22
8.1	General	22
8.2	Optical interface	22
8.3	CPRI Transition 6 in ORI	22
8.4	Layer 1 start-up timer value	23
8.5	CPRI State B duration in ORI	23
	Annex A (informative): Example for topology detection based on PORT_ID.....	24
	History	25

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Foreword

This Group Specification (GS) has been produced by ETSI Industry Specification Group (ISG) Open Radio equipment Interface (ORI).

The present document is part 1 of a multi-part deliverable covering the ORI Interface Specification, as identified below:

Part 1: "Low Layers (Release 4)";

Part 2: "Control and Management (Release 4)".

Modal verbs terminology

In the present document "shall", "shall not", "should", "should not", "may", "may not", "need", "need not", "will", "will not", "can" and "cannot" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document defines low layer protocols aspects of the Open Radio equipment Interface (ORI). Low layer protocols are those terminating the ORI Link (a bi-directional interface in-between two directly-connected ORI ports, on two ORI nodes).

The Layer 1/2 protocols of CPRI Specification [1] have been used as a baseline for which further requirements for protocols up to and including the Layer 2 have been defined.

See the associated specification "Requirements for Open Radio equipment Interface" [2] for more information on how the Low Layer protocols relate to other aspects of the ORI interface.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

[1] "Common Public Radio Interface (CPRI); Interface Specification V6.0".

NOTE: Available at <http://www.cpri.info/spec.html>.

[2] ETSI GS ORI 001: "Open Radio equipment Interface (ORI); Requirements for Open Radio equipment Interface (ORI) (Release 4)".

[3] SFF INF-8074i: "SFP (Small Formfactor Pluggable) Transceiver", Revision 1.0, May 12, 2001.

NOTE: Available at <http://www.sffcommittee.com>.

[4] SFF SFF-8431: "Enhanced Small Form Factor Pluggable Module SFP+", Revision 4.1, 6th of July 2009.

NOTE: Available at <http://www.sffcommittee.com>.

[5] ETSI TS 125 104: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) radio transmission and reception (FDD) (3GPP TS 25.104)".

[6] ETSI TS 125 215: "Universal Mobile Telecommunications System (UMTS); Physical layer; Measurements (FDD) (3GPP TS 25.215)".

[7] ETSI TS 125 133: "Universal Mobile Telecommunications System (UMTS); Requirements for support of radio resource management (FDD) (3GPP TS 25.133)".

[8] ETSI TS 136 104: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception (3GPP TS 36.104)".

[9] ETSI GS ORI 002-2: "Open Radio equipment Interface (ORI); ORI interface specification, Part 2: Control and Management (Release 4)".

[10] ETSI TS 145 001: "Digital cellular telecommunications system (Phase 2+); Physical layer on the radio path; General description (3GPP TS 45.001)".

- [11] ETSI TS 145 004: "Digital cellular telecommunications system (Phase 2+); Modulation (3GPP TS 45.004)".
- [12] ETSI TS 145 005: "Digital cellular telecommunications system (Phase 2+); Radio transmission and reception (3GPP TS 45.005)".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in GS ORI 001 [2] and the following apply:

NOTE: For any terms used in the present document that are not defined either here or directly in the clause in which they are used, refer to CPRI specification [1].

active link: See clause 3.1 in GS ORI 001 [2].

Antenna-Carrier (AxC): See section 2.1 in [1].

AxC container: See section 2.1 in [1].

AxC container block: See section 2.1 in [1].

AxC group: See section 2.1 in [1].

GSM time slot: time slot of GSM radio access technology, as defined in TS 145 001 [10]

Master port: See section 2.1 in [1].

ORI port: See clause 3.1 in GS ORI 001 [2].

ORI-specific negotiation: subset of negotiations between master port and slave port that are defined in section 4.5.3.5 of [1] to be "vendor-specific", but for which behaviour is explicitly defined within the ORI specification

ORI vendor-specific negotiation: subset of negotiations between master port and slave port that are defined in section 4.5.3.5 of [1] to be "vendor-specific", and not defined within the ORI specification to be "ORI-specific negotiations"

passive link: See clause 3.1 of GS ORI 001 [2].

RE antenna port: for Rx and Tx antenna ports, this corresponds to the Tx and Rx BS antenna connector as defined as Test Port A in [5] for UTRA-FDD, and [8] for E-UTRA

slave port: See section 2.1 in [1].

stuffing bits: See section 2.1 in [1].

stuffing samples: See section 2.1 in [1].

subchannel: See section 4.2.7.4 in [1].

Uplink Automatic Gain Control (UL AGC): function that controls the gain of the RE UL signal path of an UTRA UL AxC with the target to keep the RMS level of the UL IQ signal at the ORI port at a target value (see clause 7.1.2)

3.2 Symbols

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

AxC	Antenna-carrier
N_A	Number of Antenna-Carrier (AxC) in one AxC Group
NOTE:	See section 4.2.7.2.7 in [1].
N_C	Number of AxC Containers of one AxC Container Group per basic frame
NOTE:	See section 4.2.7.2.7 in [1].
N_V	Number of stuffing samples per AxC Container Block
NOTE:	See section 4.2.7.2.7 in [1].
V_{RMS}	Target RMS level
$\lceil x \rceil$	Ceiling function: the largest integer y where $y < x + 1,0$
μ	Parameter used within the IQ data compression/decompression process
σ	Parameter used within the IQ data compression/decompression process

3.3 Abbreviations

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

3GPP	3 rd Generation Partner Project
AGC	Automatic Gain Control
ARFCN	Absolute Radio Frequency Channel Number
BCI	BFN Cycle Index
BFN	Node B Frame Number
BS	Base Station
C&M	Control and Management
CPRI	Common Public Radio Interface
dec	Decimal
DL	DownLink
E-UTRA	Evolved UMTS Terrestrial Radio Access
FDD	Frequency Division Duplex
GSM	Global System for Mobile communications (Group Special Mobile)
HFN	Hyper-Frame Number
IQ	In-phase data and Quadrature data
L1	Layer 1
L2	Layer 2
LOF	Loss Of Frame

NOTE: As defined in [1].

LOS Loss Of Signal

NOTE: As defined in [1].

LSB	Least Significant Bit
MAC	Media Access Control
MSB	Most Significant Bit
ORI	Open Radio equipment Interface
RAI	Remote Alarm Indication

NOTE: As defined in [1].

RE Radio Equipment
 REC Radio Equipment Control

RMS	Root Mean Square
RTWP	Received Total Wideband Power
Rx	Receiver
SAP	Service Access Point
SDI	SAP Defect Indication

NOTE: As defined in [1].

SFP	Small Form-factor Pluggable
Tx	Transmitter
UL	UpLink
UTRA	UMTS Terrestrial Radio Access

4 ORI Low Layers specification compliance

The RE/REC compliant to the ORI Low Layers specification shall:

- be fully compliant to CPRI Specification, as defined in section 5.2 of [1];
- support mandatory requirements defined within ORI that are defined as options within CPRI Specifications;
- support mandatory requirements defined within ORI that do not refer to functionality in CPRI Specifications.

5 Layer 1 configuration

5.1 General

Requirements for the L1 characteristics are defined below. For each of the defined characteristics, the level of support shall be declared for each port of the RE/REC.

Line bit rate

At least one of the CPRI line bit rate options specified in [1], section 4.2.1 shall be supported by the RE and REC, with the exception of 614,4 Mbit/s line bit rate.

Physical Interface

At least one of the following interfaces shall be supported:

- Optical interface parameters defined in clause 5.2.
- Electrical interface parameters defined in clause 5.3.

5.2 Optical interface

Connector type

At least one of the following connector types shall be supported by the RE and REC: LC-type, SC-type.

Simplex/Duplex operation mode

At least one of the following operation modes shall be supported by the RE and REC: Simplex (one fibre per direction), Duplex (one fibre for both transmission and reception).

Optical Fibre Type

The ORI recommendation for optical cabling follows section 4.2.4.1 of [1].

Wave length

The wave lengths to be supported by RE and REC are not specified.

Optical output power

Optical output power to be supported by RE and REC is not specified.

Sensitivity

The optical sensitivity to be supported by RE and REC is not specified.

Signal condition capabilities

The maximum fibre length and attenuation to be supported by RE and REC are not specified.

5.3 Electrical interface

Electrical Connector type

At least one of the following connector types shall be supported by the RE and REC:

- SFP [3], SFP+ [4], those defined in section 4.2.3.2 of the CPRI Specification [1].

Electrical Cable Type

The Electrical Cable Type for the ORI link follows section 4.2.3.1 in the CPRI Specification [1].

Electrical Interface Characteristics

No specific Electrical Interface Characteristics are specified by ORI. It is recommended to follow section 6.2 of the CPRI Specification [1].

6 Control plane

6.1 Mapping to CPRI protocol structure

ORI compliant nodes shall apply the usage of subchannels defined in CPRI control words (see [1]), as described in Table 6.1.1.

Table 6.1.1: Subchannel allocation within ORI

Subchannel Ns	Area	Usage
0 to 15	CPRI reserved control words	Refer to CPRI [1] for usage.
16 to 40	Vendor specific area	This area is open for vendor specific use; general ORI rules for vendor specific extensions apply (see GS ORI 001 [2]).
41 to 52	ORI reserved area	This area shall be reserved for specification by ORI. See clause 6.3 for further definition.
53 to 63	Fast C&M channel	This area carries the ORI C&M messaging (for active links only). (min. 10,56 Mbit/s @ 1 228,8 Mbit/s link speed).

NOTE: As the minimum CPRI link rate supported by ORI is 1 228,8 Mbit/s, control words have a minimum width of 16 bits.

The listed allocation leads to the map of CPRI control words, which shall be mapped for active links as described in Figure 6.1.1.