



**Rail Telecommunications (RT);
Future Railway Mobile Communication System (FRMCS);
Building Blocks and Functions;
Part 5: User Equipment (UE) capabilities**

Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Railway Telecommunications (RT) and is now submitted for the combined Public Enquiry and Vote phase of the ETSI Standardisation Request deliverable Approval Procedure (SRdAP).

The present document is part 5 of a multi-part deliverable covering Building Blocks and Functions for the Future Railway Mobile Communication System (FRMCS), as identified below:

- Part 1: "Transport Stratum";
- Part 2: "Service Stratum";
- Part 3: "Train On-Board functions and interfaces";
- Part 4: "Trackside functions and interfaces";
- Part 5: "User Equipment (UE) capabilities".**

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**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).

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1 Scope

The present document specifies the UE capabilities applicable to an On-Board FRMCS Radio Module.

NOTE: The present document does not specify UE capabilities applicable to FRMCS-capable Handhelds and FRMCS-capable Objects.

2 References

2.1 Normative 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 referenced document (including any amendments) applies.

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

- [1] [ETSI TS 138 211 \(V18.6.0\)](#): "5G; NR; Physical channels and modulation (3GPP TS 38.211 version 18.6.0 Release 18)".
- [2] [GSMA SGP.21 V3.1](#): "RSP Architecture".
- [3] [GSMA SGP.22 V3.1](#): "RSP Technical Specification".
- [4] [ETSI TS 103 765-1](#): "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Building Blocks and Functions; Part 1: Transport Stratum".

2.2 Informative 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 referenced document (including any amendments) applies.

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

- [i.1] ETSI TR 103 791: "Rail Telecommunications (RT); Future Railway Mobile Communication System (FRMCS); Terminology for FRMCS specifications".
- [i.2] [CEPT ECC Recommendation \(23\)01](#): "Cross-border coordination for Railway Mobile Radio (RMR) in the 1900-1910 MHz TDD frequency band".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI TR 103 791 [i.1] apply.

3.2 Symbols

Void.

3.3 Abbreviations

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

5QI	5G QoS Identifier
DL	DownLink
eUICC	embedded Universal Integrated Circuit Card
FRMCS	Future Railway Mobile Communication System
GNSS	Global Navigation Satellite System
GP	Guard Period
GPS	Global Positioning System
GSMA	GSM Association
NR	New Radio
PRTC	Primary Reference Time Clock
RSP	Remote SIM Provisioning
SCS	Subcarrier Spacing
SIM	Subscriber Identity Module
TDD	Time Division Duplex
UE	User Equipment
UL	UpLink

4 Onboard FRMCS Radio Module capabilities

4.1 General capabilities

4.1.1 TDD Frame configuration

For TDD operation in band n101, an Onboard FRMCS Radio Module shall support the reference frame specified in Annex A.

4.1.2 FRMCS Profile management

An Onboard FRMCS Radio Module shall be equipped with an eUICC that complies with the GSMA specifications SGP.21 [2] and SGP.22 [3] for Remote SIM Provisioning to enable secure and standardized profile management operations, including profile download, installation, enabling, disabling, and deletion.

The Onboard FRMCS Radio Module shall support the ES9+ interface as specified in GSMA SGP.22 [3].

The Onboard FRMCS Radio Module shall support the ES11 interface as specified in GSMA SGP.22 [3].

4.2 Radio Access UE capabilities

The present document does not specify Radio Access UE capabilities for an On-Board FRMCS Radio Module.

NOTE: At the time of publication, ongoing industrial testing and validation programs are expected to help identifying any specific Radio Access UE capabilities to mandate from an On-Board FRMCS Radio Module.

4.3 5G Core Mobility Management UE capabilities

The present document does not specify 5G Core Mobility Management UE capabilities for an On-Board FRMCS Radio Module.

NOTE: At the time of publication, ongoing industrial testing and validation programs are expected to help identifying any specific 5G Core Mobility Management UE capabilities to mandate from an On-Board FRMCS Radio Module.

4.4 5G Core Session Management UE capabilities

4.4.1 Introduction

The present document specifies a minimal set of 5G Core Session Management UE capabilities for an On-Board FRMCS Radio Module.

NOTE: At the time of publication, ongoing industrial testing and validation programs are expected to help identifying any specific 5G Core Session Management UE capabilities to mandate from an On-Board FRMCS Radio Module.

4.4.2 5QI

An Onboard FRMCS Radio Module shall support at least the 5QI identified in ETSI TS 103 765-1 [4], Table 9.3-1.

Annex A (normative):

Reference TDD frame from ECC Recommendation (23)01

Annex 5 of ECC Recommendation (23)01 [i.2] specifies the reference TDD parameters to be supported by an Onboard FRMCS Radio Module indicated in Table A-1.

Table A-1: TDD frame reference parameters
(Source: ECC Recommendation (23)01 [i.2])

Parameter	Value
Reference phase / time clock	Aligned with UTC, properly monitored to ensure the local clock drift does not exceed +/- 1.5 μ s in the event of a PRTC outage NOTE: GNSS (e.g. GPS) is an example of compliant PRTC).
Reference frame	<p>With $T_c := 1/(480000 \cdot 4096)$ seconds (Basic time unit for NR as defined in ETSI TS 138 211 [1], clause 4.1):</p> <ol style="list-style-type: none"> 1. Start-of-frame, aligned with the reference clock 2. Downlink for $3371008 \cdot T_c$ 3. Guard period for $280576 \cdot T_c$ 4. Uplink for $2246656 \cdot T_c$ 5. Downlink for $1685504 \cdot T_c$ 6. Guard period for $280576 \cdot T_c$ 7. Uplink for $1966080 \cdot T_c$ 8. Downlink for $3371008 \cdot T_c$ 9. Guard period for $280576 \cdot T_c$ 10. Uplink for $2246656 \cdot T_c$ 11. Downlink for $1685504 \cdot T_c$ 12. Guard period for $280576 \cdot T_c$ 13. Uplink for $1966080 \cdot T_c$ 14. Back to start-of-frame <p>NOTE 1: Those timings correspond to 5G-NR configuration "DSaUSbU DSaUSbU" with a 15 kHz SCS and $S(DL/GP/UL) := (S_a = 10:2:2, S_b = 12:2:0)$ and 5G NR configuration "DDDS1UUUS2UU DDS1UUUS2UU" with a 30 kHz SCS and $S(DL/GP/UL) := (S_1 = 6:4:4, S_2 = 10:4:0)$</p> <p>NOTE 2: All SCS are acceptable as long as the frame complies with the above timings. Other frame configurations are also deemed compatible if they do not lead to any downlink/uplink overlap (e.g. if they implement a larger guard period).</p>

History

Version	Date	Status
V1.0.0	July 2025	SRdAP process EV 20251008: 2025-07-10 to 2025-10-08