वर्गीय आवश्यकताओं के लिए मानक

टी.ई.सी. 23070:2022

STANDARD FOR GENERIC REQUIREMENTS

TEC 23070:2022

कॉम्पैक्ट एलटीई मोबाइल सिस्टम

Compact LTE Mobile System

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

खुर्शीदलाल भवन, जनपथ, नई दिल्ली-110001, भारत

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FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centres (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This document describes functional requirements, general requirements and features of Compact LTE (Long Term Evaluation) Mobile System systems for use in the Indian telecom network. It may also be called by other names like “LTE Network in One Box (LTE NIOB)” or “LTE Network in a Box (LTE NIB)” or “Compact Cellular Network (CCN)”. The System consists of integrated LTE Radio Access Network (RAN), Evolved Packet Core (EPC) and Element Management System (EMS)/Operation and Management Centre (OMC).

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HISTORY SHEET

Sl. No.	Standard / document *No.*	*Title*	*Remarks*
1.	23070:2022	Compact LTE Mobile System	New Standard for GR
2.			

REFERENCES

S.NO.	Document No.	Title/Document Name
1.	TEC 21050:2019	Standard for Generic Requirements of eNodeB
2.	TEC 22150:2019	Standard for Generic Requirements of Evolved Packet Core (EPC)
3.	TEC 22110:2012	Standard for Generic Requirements of IMS (IP Multimedia Subsystem)

Chapter 1

Introduction

1.1. Overview

This document contains standard for the Generic Requirements (GR) of “Compact LTE Mobile System”, which may be called by other names like “LTE Network in One Box (LTE NIOB)” or “LTE Network in a Box (LTE NIB)” or “Compact Cellular Network (CCN)”. The System consists of integrated LTE Radio Access Network (RAN), Evolved Packet Core (EPC) and Element Management System (EMS)/Operation and Management Centre (OMC). This document covers the functional requirements, general requirements and features of the system.

1.2. Objective

The key objective of Compact LTE Mobile System is to have compact, cost effective, power efficient and ecological friendly solution which can address the requirements in terms of coverage, capacity, and quality with ease of deployment and ease of maintenance at shortest possible timeframe. The prime requirement of the solution is to provide LTE Mobile services in remote and inaccessible areas depending upon the variable clutter/terrain, capacity and coverage needs. The solution is aimed to provide services pertaining to voice, video, data & SMS.

1.3. Applications

As the compact LTE Mobile system is compact and robust, quick to deploy besides, providing the LTE mobile communication in areas where it is deployed, the system may additionally be used for the following applications, if required:

i. LTE Mobile Private Network: In this application, Compact LTE Mobile System may be isolated or may have connectivity with public/private network without mobility or roaming support.

ii. Temporary LTE connectivity requirements for special purposes: The Compact LTE Mobile System can be deployed on mini-vans/ mini-trucks to provide temporary LTE connectivity at special events such as sporting events, conventions, short term projects and fairs, scientific exploration camps in areas where services of TSPs may not be available, etc. for limited number of users.

iii. Disaster Management: In this application, highly compact and power efficient Compact LTE Mobile system will provide easy and quick deployment for providing telecom facility in time of emergency and operate on non- conventional energy sources in the absence of Mains supply as a standalone communication system. In the scenario, the Compact LTE Mobile System may have connectivity with public/private network without mobility or roaming support.

1.4. LTE Mobile Network

The LTE Mobile Network consists of Radio Access Network (RAN), Evolved Packet Core (EPC) and EMS/OMC. The key components of the EPC as per TEC GR TEC 22150:2019 are: (i) MME (Mobility Management Entity); (ii) S-GW (Serving Gateway); (iii) P-GW (Packet Data Network Gateway); (iv) HSS (Home Subscriber Subsystem); and (v) PCRF (Policy Control and Charging Rules Function). In addition, IMS is also forms part of LTE Mobile Network.

1.5. Compact LTE Mobile System Architecture

The Compact LTE Mobile System shall consist of Radio Access Network (RAN)/ eNodeB, components of Evolved Packet Core (EPC), IMS and EMS/OMC integrated into a single box. As such, interfaces between various components within EPC as well as between RAN and EPC may or may not be exposed.

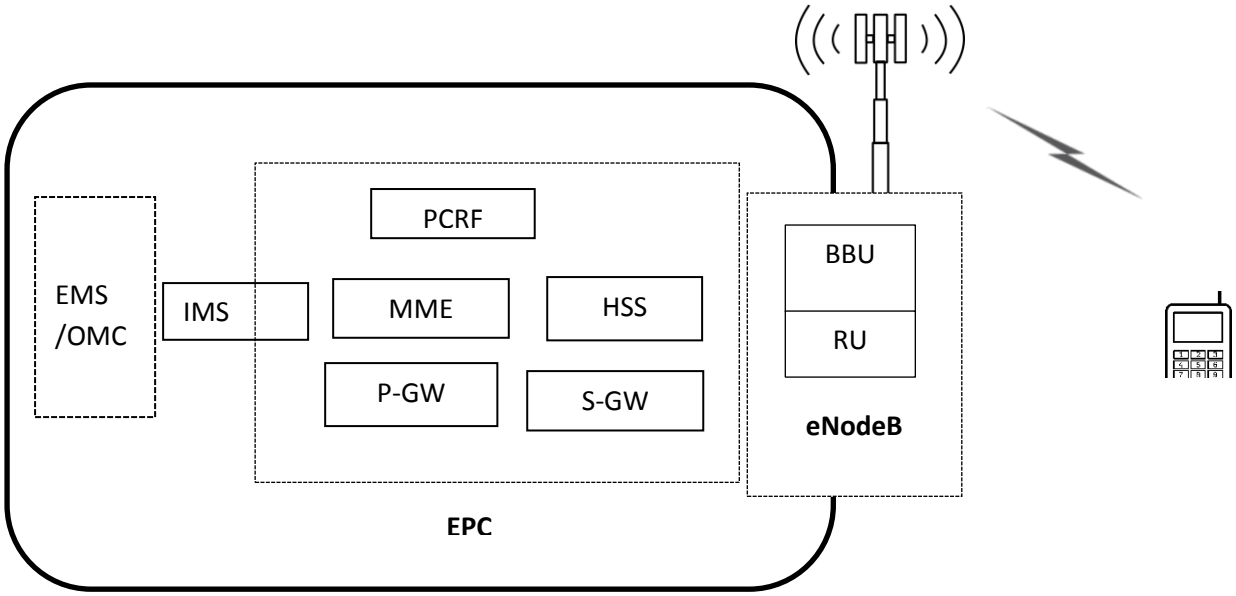

Fig 1: Compact LTE Mobile System

Chapter 2

LTE Radio Access Network

The Compact LTE Mobile System shall support the following functionalities related to LTE RAN:

2.1 Radio Resource Control/ Radio Resource Management (RRC/RRM)

2.1.1 Cell control and MME support[1]

2.1.2 Event-triggered measurement and reporting

2.1.3 System Information Broadcast (SIB)

2.1.4 Signalling Radio Bearer (SRB), including SRB0, SRB1, and SRB2

2.2 Packet Data Convergence Protocol (PDCP)

2.2.1 Ciphering of user plane data over the radio interface and integrity protection of RRC signalling

2.2.2 Storage of one-to-one mapping between data radio bearers and S1 bearers[2].

2.3 Radio Link Control (RLC) - Segmentation and concatenation to adapt the payload to the transport block size

2.4 Medium Access Control / Layer -1 (MAC/L1)

2.4.1 Handling of shared and random-access channels used for signalling and initial access

[1] LTE RAN owns and controls the radio resources of its own cell or cells. Cell resources as requested by and granted to MMEs shall be in an ordered fashion

[2]To create the binding between a data radio bearer and an S1 bearer in both the uplink and downlink to enable Quality of Service (QoS) enforcement.

2.4.2 HARQ (Hybrid automatic repeat request) functionality

2.4.3 Dynamic Resource Allocation (Scheduling)

2.4.4 Mapping of logical channels onto transport channels

2.4.5 Scrambling, Tx diversity, and OFDM modulation

2.4.6 Contention based and Contention free Random Access (RA) procedure

2.4.7 DL Power Allocation for data channels

2.4.8 Downlink power allocation parameters, such PDSCH-to-RS ratios

2.4.9 DL Power setting for signalling and control channels

2.4.10 Both the open-loop power control and the closed loop power control of the UE

2.4.11 Uplink demodulation reference signal

2.4.12 Radio Bearer (RB) combinations dynamic mapping to Physical Resource Block (PRB)

2.4.13 UL & DL Link Adaptation

2.4.14 Uplink-Downlink frame configuration for TDD defined by 3GPP as Configuration-1 & Configuration-2

2.4.15 Transmission modes: Open loop, closed loop for spatial multiplexing and Transmit diversity etc. Support for all the configurations is optional

2.4.16 Short Buffer Status Report (BSR) and Long BSR

2.4.17 Random Access Preamble burst format 0 (FDD/TDD) and 4 (TDD)

2.4.18 Cell-specific reference signal

2.4.19 Frequency Selective Scheduling (FSS) in Downlink

2.4.20 Interference aware and channel aware frequency selective scheduling on PUSCH using Sounding Reference Signals (SRS)

2.4.21 Discontinuous Reception (DRX) to enable reasonable UE battery consumption

2.5 Uu Interface

2.5.1 RACH Access

2.5.2 RRC Connection Establishment Procedure

2.5.3 RRC Connection Re-establishment Procedure

2.5.4 Mobility Control through RRC Connection Reconfiguration

2.5.5 Measurement Event Reporting

2.6 Ethernet Transport features

2.6.1 Operator configurable use of VLANs compliant to IEEE802.1Q on any Ethernet interfaces.

2.6.2 Traffic mapping onto one or more VLANs

2.7 QoS in the Transport Layer (Optional)

2.7.1 Compliance with the IETF DiffServe architecture as defined in IETF

2.7.2 DSCP interpretation of the TOS field in the IPv4 header as defined in IETF RFC2474

2.7.3 Ethernet Priority Code Point (PCP) field as defined in IEEE802.1Q-2005 section 9

2.7.4 Indication of DSCP value in the technical document supplied with the equipment that are supported in LTE RAN

2.7.5 Layer 2 QoS marking[3]

2.7.6 Transport QoS management at layer 3 with the DSCP field of IP packets

2.7.7 Transport QoS management at layer 2 with the “PCP” bits in the Ethernet frames

[3]When the backbone network supporting the LTE RAN is a layer 2 switched network

2.8 Compact LTE System Synchronization

2.8.1 At least one of the following synchronization options: GPS/ IEEE 1588 V2/ SyncE/ IRNSS Timing Source,

2.8.2 At least 48 hr hold over mode in case of frequency synchronization loss

2.8.3 At least 6 hr hold over mode in case of Phase synchronization loss

2.8.4 Phase accuracy for Wide Area BS TDD systems as follows:

Cell Type	Cell Radius	Requirement
Small cell	≤ 3Km	≤ 3 µs
Large Cell	> 3Km	≤ 10 µs

2.9 Transmission Modes, MIMO requirements & Modulation Schemes

2.9.1 DL TM Modes: TM1 – TM4

2.9.2 DL SU MIMO

2.9.3 DL MIMO Layers: 2X2

2.9.4 UL TM Modes: TM1

2.9.5 UL Rx Diversity: 2X

2.9.6 DL modulation Schemes: BPSK, QPSK, 16 QAM, 64 QAM

2.9.7 UL modulation Schemes: BPSK, QPSK, 16 QAM

2.10 LTE QoS Requirements

2.10.1 All nine Quality of Service Class Identifiers (QCIs)

2.10.2 Multiple data radio bearers (DRBs)

2.10.3 Dynamic addition and deletion of dedicated bearers

2.10.4 Both UE initiated as well as Network Initiated dedicated bearer creation

2.10.5 Prioritization of traffic in downlink as per the QCI priority value by scheduler

2.10.6 ARP (Allocation and Retention Priority) parameters of priority level, the pre-emption capability and the pre-emption vulnerability during bearer establishment

2.11 Mobility Control

2.11.1 Mobility for terminals in active state

2.11.2 Cell Reselection procedures based on:

2.11.3 Broadcast priority indication

2.11.4 Broadcast cell-specific reselection parameters

2.11.5 Broadcast cell-specific blacklists

2.11.6 Access class baring parameters

2.11.7 Connection Re-establishment procedure

2.12 Mobility Requirements Advanced: Load control mechanisms

2.13 **Interference Mitigation Requirements:** Maximum Ratio Combining (MRC)

2.14 VoLTE, ViLTE Support

2.14.1 Creation of dedicated bearers with the following QCIs

2.14.2 QCI-5 for IMS signalling

2.14.3 QCI-1 for Voice Traffic

2.14.4 QCI-2 for Video Traffic.

2.14.5 RLC UM (Unacknowledged Mode)

2.14.6 Robust Header Compression (RoHC)

2.15 Public Warning System (Optional)

2.15.1 Warning messages distribution on behalf of public authority

2.15.2 Distribution of ETWS (Earthquake and Tsunami Warning System)

2.16 Enhanced Multimedia Priority Service (optional)

2.16.1 Prioritization of calls (RRC establishment cause high Priority Access)

2.16.2 Prioritization of paging messages in overload situations

2.17 **Operating Frequency and Channel Bandwidth Specifications:** Operating Frequency and Channel Bandwidth Specifications shall be as per applicable National Frequency Allocation Plan.

2.18 TX Specifications

S. No.	Parameter	Standard TEC 25119:2020 Clause No.
a.	Base Station Output Power	6.2
b.	RE Power Control Dynamic Range	6.3.1
c.	Total Power Dynamic Range	6.3.2
d.	Transmitter OFF power	6.4
e.	Frequency Error	6.5.1
f.	Error Vector Magnitude	6.5.2
g.	Time Alignment Error	6.5.3
h.	DL RS Power	6.5.4
i.	Occupied Bandwidth	6.6.1

j.	Adjacent Channel Leakage Power Ratio (ACLR)	6.6.2
k.	Operating Band Unwanted Emissions	6.6.3
l.	Transmitter Spurious Emissions	6.6.4
m.	Transmitter Intermodulation	6.7

2.19 RX Specifications

S. No.	Parameter	Standard TEC 25119:2020 Clause
a.	Receiver Spurious Emissions	7.7
b.	Blocking	7.6
c.	Receiver Intermodulation	7.8.1
d.	Adjacent Channel Selectivity (ACS) and Narrow-Band Blocking	7.5
e.	Reference Sensitivity Level	7.2
f.	Dynamic Range	7.3
g.	In-Channel Selectivity	7.4

Chapter 3

LTE Evolved Packet Core

The Compact LTE Mobile System shall support the following functionalities related to LTE EPC:

3.1 EPS Mobility Management Procedures

3.1.1 UE authentication

3.1.2 NAS Security Procedures based on encryption algorithms EEA0/EEA1/EEA2 and integrity algorithm EIA1/EIA2

3.1.3 UE Identification

3.1.4 EMM Information

3.1.5 GUTI Reallocation

3.1.6 Attach

3.1.7 Detach

3.1.8 UE-Initiated Detach

3.1.9 HSS-Initiated Detach

3.1.10 MME-Initiated Detach

3.1.11 Tracking Area Update (TAU)

3.1.12 Periodic TAU

3.1.13 Service Request

3.1.14 Paging

3.1.15 Transport of UL/DL NAS Messages

3.2 EPS Session Management Procedures

3.2.1 PDN Connectivity (default bearer activation)

3.2.2 PDN Disconnection (default bearer deactivation)

3.2.3 Dedicated Bearer Activation

3.2.4 Dedicated Bearer Deactivation

3.2.5 Bearer Modification

3.3 E-RAB Management Procedures

3.3.1 E-RAB Set Up

3.3.2 E-RAB Modification

3.3.3 E-RAB Release

3.4 Context Management Procedures

3.4.1 Initial Context Setup

3.4.2 UE Context Release

3.4.3 UE Context Modification

3.5 Session and Mobility management procedure logs

3.5.1 Attach

3.5.2 Activation of EPS bearer context, both primary and secondary

3.5.3 Deactivation of EPS Bearer Context

3.5.4 Attach for LTE Access

3.5.5 Detach for LTE Access

3.5.6 Tracking Area Update (TAU)

3.5.7 Service Request for LTE Access

3.6 **VoLTE, ViLTE & Instant Messaging (SMS):** The system shall support VoLTE, ViLTE & Instant Messageing through IMS.

3.7 **HSS initiated APN re-direct functionality:** On the basis of subscribed Default APN and Subscribed APN received on HSS (optional).

3.8 **P-GW and S-GW functions**

3.8.1 Idle Mode Paging

3.8.2 Handling EPS Bearer and Session Management like creation, modification, and termination of connections and handles the connections over the EPS Network between a User Equipment (UE) and the Packet Data Network (PDN)

3.8.3 Capable of acting as a PCEF and be able to fetch dynamic policies from PCRF

3.8.4 Guaranteed Bit Rate (GBR) bearers and Allocation Retention Policy (ARP)

3.8.5 Multiple PDN connectivity per UE and the UE attaching to any of the Packet data network (Optional)

3.9 **Policy and Charging Rules Functions**

3.9.1 Policy and Charging Enforcement Function (PCEF) compliant to 3GPP TS 23.203

3.9.2 Emergency Calls for IMSI via IMS service using an emergency APN

3.9.3 Capability of Dynamic Policy control (applicable for next session) including change of values & attributes in respect of functionalities such as Binding, Gating Control, Event Reporting, QoS control and IP-CAN Bearer establishment

3.9.4 Time of day Policy Activation by sending Revalidation -Time

3.9.5 To provide a new value for their validation timeout by including Revalidation-Time in CCA or RAR

3.9.6 CDR generation of all sessions either voice, data and IMS etc.

3.9.7 Storage of CDRs at least for a week or more.

3.10 Home Subscriber Server (HSS) Functions

3.10.1 Handle subscription management, user authentication, mobility management, session establishment and access authorization functions.

3.10.2 LTE access authentication based on USIM AKA authentication, using domain specific vector generation procedures

3.10.3 EPC Subscription Management

3.10.4 Implementation of the IMS functionality of the HSS network entity

3.10.5 IPv6 User Plane (optional)

3.10.6 EPC mobility management

3.10.7 EPC flexible profile management (optional)

3.10.8 IMS Mobility Management

3.10.9 IMS User Profile Management

3.10.10 IMS Session Handling Support

3.10.11 IMS Identity Management

3.10.12 IMS Implicit Registration

3.10.13 Barring Handling in IMS (optional)

3.10.14 Provisioning performance counters (optional)

3.10.15 Traceability of all provisioning requests in failure (optional)

3.10.16 Manual De-registration via provisioning interface (optional)

3.11 QoS / Latency (optional)

3.11.1 EPS Bearers using QCI

3.11.2 Granular QoS parameters and attributes such as UE AMBR, APN-AMBR, Maximum Bit Rate (MBR), Guaranteed Bit Rate (GBR), and Allocation and Retention Priority (ARP)

3.11.3 All standardized QCI classes 1-9 for GBRs & non-GBRs

3.11.4 QoS (based on 3GPP TS 23.401) enforcement based on the QCI filters/PCC rules (including APN-AMBR) supplied dynamically or pre-configured static QoS rules

3.11.5 QoS Enforcement based on QCI filters/PCC rules as a minimum with static QoS

3.11.6 QoS Control for Default and Dedicated Bearer at Service Data Flow Level and IP CAN Bearer Level (PCRF)

Chapter 4

IP Multimedia Subsystem

The IP Multimedia Subsystem (IMS) is a standardized Next Generation Network (NGN) architecture for enabling a mobile to use mobile and fixed multimedia services. IMS uses a number of Internet Protocol (IP)-based services viz. Voice over IP (VoIP), multi-party gaming, video-conferencing, Instant Messaging, community services, presence information and content sharing etc. based on standardized Session Initiation Protocol (SIP) implemented by 3rd Generation Partnership Project (3GPP). SIP is used for the real-time, peer-to-peer, multi-party and multi-media capabilities of IMS. Service control, security functions, routing, registrations, charging, SIP compression and QoS support may be achieved through necessary IMS capabilities.

The Compact LTE Mobile System shall support:

4.1 IMS related functionalities:

4.1.1 The Compact LTE Mobile System shall support:

4.1.1.1 IMS functionality for supporting VoLTE, ViLTE and SMS.

4.1.1.2 SIP & RTP interface for external interface towards IP PABX/MGW for voice interworking etc.

Chapter 5

OMC/EMS Requirements

The Compact LTE Mobile System shall support O&M interface for debugging, troubleshooting and for providing fault, configuration and performance data to an O&M server (EMS / OMC) with following requirements:

5.1 Management Functions

5.1.1 Configuration management

5.1.2 Fault report and alarm handling

5.1.3 Performance supervision/management

5.1.4 Storage of system software and data

5.1.5 Security management

5.2 OMC database

5.2.1 Inclusion of configuration data, maintenance data fault data and performance / QoS data

5.2.2 Capability of storage of the generated performance data

5.2.3 Collection of statistical information relating to events in the network with configurable Collection Frequency

5.2.4 Provision of fault/alarm history with at least function element, severity class and fault type

5.3 OMC Generic Features

5.3.1 OMC software – UNIX/LINUX/Windows System Platform

5.3.2 Optional interfaces like CORBA / TCP / IP / CMIP / SNMP/ REST / HTTP etc. to work with a remote NMS

5.3.3 Graphical User Interface (GUI)

5.3.4 On-Line Help

5.3.5 Consistency Checks

5.3.6 Object Alarm Status Management / Display

5.3.7 Configuration Change/Event Log

5.3.8 Collection of PM counters

5.3.9 Limited Access Restriction by User

5.3.10 Access Restriction by Function and by Operation

5.4 Operation & Maintenance Functions

5.4.1 Interaction of control software with various hardware / software entities of the Compact LTE Mobile System.

5.4.2 Control software to provide health status/Alarms of the entire system on the EMS

5.4.3 Flexible, cost-effective & secure management interface for configuration, fault management and performance management

5.4.4 O&M interface for debugging and troubleshooting

5.4.5 Ethernet O&M interface

5.4.6 Performance Management[4]

5.4.7 Fault Report and Alarm Handling

5.4.7.1 Event Based Monitoring

5.4.7.2 Detection and mitigation or recovery from faults

5.4.7.3 Fault Detection and Isolation

5.4.7.4 Detection and isolation of faults from its own autonomous perspective

[4] Generation of various performance counters and provide mechanism to transfer the same to external entity for further analysis.

5.4.7.5 Alarm Surveillance including

5.4.7.5.1 Alarm type

5.4.7.5.2 The probable cause

5.4.7.5.3 The specific problem

5.4.7.5.4 The perceived severity

5.4.7.5.5 Network Element ID

5.4.7.5.6 Network Element Type

5.4.8 Automatic alarm clearance when failure condition is resolved

5.4.9 No recording or forwarding of duplicate alarms for detection of the same failure condition

5.4.10 Local or remote software/firmware upgrade

5.4.11 Logging and sending of log file on the network to a designated syslog server

5.4.12 Maintaining system log and core dump logs

5.4.13 Alarms, events to OMC for visual indicators of status and fault

5.4.14 Reboot and shut-down capability

5.4.15 Local Maintenance Ports for any debugging and troubleshooting

5.4.16 Detection and reporting of any hardware fault within the equipment

5.5 IPV4, IPV6 (dual stack)

Both IPV4, IPV6 (dual stack), NAT64/DNS64 on all control/data interfaces in compliance with IETF RFC 4213

5.6 System Availability

5.6.1 Implementation for automatic recovery from faults.

Chapter 6

General Requirements

The Compact LTE Mobile System shall support following requirements:

6.1 General Requirements

6.1.1 Facilities for locating and updating mobile subscribers

6.1.2 Equipment operation in the frequency band allotted

6.1.3 No change in normal functioning of system due to changes in date and time caused by events such as changeover of leap year etc

6.2 Hardware Requirements

6.2.1 Integrated design and should be compact (all hardware except antenna and battery pack to be contained into a single box)

6.3 Relative UE Speed

6.3.1 Stationary (0 Km/hr)

6.3.2 Pedestrian (up to 10Km/hr)

6.3.3 Typical vehicular (up to 80Km/hr)

6.4 Processors Requirements

6.4.1 Procedure for system restoration to its normal state

6.4.2 for prevention of the loss/alteration of memory contents due to power failures, improper operating procedures

6.5 Equipment Practice Requirements

6.5.1 No inflammable or in absence of it, self-extinguishable components and material used in the equipment

6.5.2 Human isolation and protection from accidental high voltage power contact

6.5.3 Indication at the external interface against induced voltages and currents due to lightning, high power system, etc.

6.5.4 Protection of buses (if any) against electrical and magnetic interference from neighbouring system

6.6 Input-Output Devices Requirements

6.6.1 Availability of adequate number of man-machine interfaces

6.6.2 For remote terminal,

6.6.2.1 Data links conform to the ITU-T Recommendations Q.513

6.6.2.2 Reliability of the data links towards remote terminal does not, in any way, affect the reliability of the system

6.6.2.3 Special provision for storage of failure event even when the system is unable to transmit an output message

6.6.3 Communication facilities between the System and the maintenance and operating personnel includes facilities for a system test, control, and alarm indication at OMC

6.6.4 Suitable alarm and display system at OMC for a continuous indication of the system status

6.7 Quality Requirements

6.7.1 Availability of components from multiple sources with adequate qualification

6.7.2 Tropical finish and coating of components for protection against saline atmosphere

6.7.3 Minimum number of proprietary components with a list to indicate such components

6.7.4 Conformity to ISO 9001:2015 certifications

6.7.5 Submission of quality plan describing the quality assurance system followed by the manufacturer

6.8 Software Requirements

6.8.1 Modular, structured software written in High-Level Language

6.8.2 Software easy to handle during installation and normal operations as well as during extensions

6.8.3 Introduction of changes in software, wherever necessary, with least impact on other modules

6.8.4 Open-ended to allow addition of new features

6.8.5 Adequate flexibility to easily adopt changes in service features & facilities and technological evolution in hardware

6.8.6 Propagation of software faults is contained

6.8.7 Test programs to include fault tracing for detection and localization of system faults

6.9 Software Maintenance Requirements

6.9.1 Continuous supply of all software updates, for the period specified

6.9.2 Integration of software updates without posing any problem to the existing functionality

6.10 System Supervision

6.10.1 Provision for continuous testing of the system to allow both system qualities check and fault indication as a fault arises

6.10.2 Automatic reloading of a program in case a fault detected require reloading

6.10.3 Stop and start at any particular point in the program, in case of manual re-loading

6.11 Diagnostic Capability

6.11.1 Minimize human efforts required.

6.11.2 Indication for the diagnostic programs which are normally resident in the online program

6.11.3 Availability of details of the off-line diagnostic programs

6.11.4 Described procedure for invoking diagnostic programs

6.11.5 Availability of procedure for consulting fault dictionary for diagnostic programs

6.11.6 Facility for automatic restart under severe fault conditions

6.11.7 Facility for manual restart of the system where automatic restart fails to restore system sanity

6.12 Power Supply Requirements

6.12.1 DC / AC Power Supply

6.12.2 System with DC Power Supply

6.12.2.1 Nominal voltage -48V (-40 to -60 V) DC supply voltage

6.12.2.2 Protection on Power Input Ports

6.12.2.2.1 Reverse Polarity protection at the DC input

6.12.2.2.2 Over voltage protection at the DC input

6.12.2.2.3DC input under voltage cut-off. Indication of under voltage limit by vendor

Note: The system may include in-built battery pack of suitable backup capacity conforming to above specifications.

6.12.3 System with AC Power Supply: In-built/external AC to DC converter module, with nominal voltage as per IS 12360:1988 (as amended from time to time)

6.13 Environmental specifications

6.13.1 Outdoor System

6.13.1.1 At least IP65 ingress protection

6.13.1.2 Pre-installation conditions specified under Category D of QM333 for environmental testing of electronic equipment for transmission and switching use

6.13.1.3 Capability of working in an environment specified for category D of QM333

6.13.1.4 Indication of extreme environmental conditions under which the system is capable of short-term emergency operations without permanent damage

6.13.1.5 Transport and storage: As per QM333

6.14 **Environmental Test Conditions:** Compliance to Category D SD: QM-333, Category E SD: QM-333 and IP65

6.15 RF Output Power Vs Power Consumption /weight etc.

The system shall be compact, power efficient, easy to deploy and shall be able to work in difficult environmental conditions. The system shall meet the following requirements:

	Type	RF Output power	Power consumption	Weight	Remarks
1	Macro Cell (Fixed /Tripod /Vehicle Mounted)	2 X 10W	<200W	<20Kg	The maximum power radiation shall be regulated as per latest DoT guidelines/ instructions / licensing conditions
2	Micro (Backpack or Tripod)	2 X 5W	<150W	<10Kg	
	Micro (Backpack or Tripod)	2 X 1W	<100W	<6Kg	

Note: In case in-built battery pack forms part of the system, the same may have additional weight depending upon backup time / capacity required. Further, for backpack configuration, there may be additional weight of backpack frame and external Omni antenna. Typical additional weight for battery packs, backpack frame and Omni antenna may be up to 15Kg depending on the configuration and battery capacity.

Chapter 7

Safety and EMI/ EMC Requirements

7.1 Safety Requirements

Clause	Parameter	Standard
1.	The equipment shall conform to IS 13252 part 1:2010- "Information Technology Equipment – Safety- Part 1: General Requirements" [equivalent to IEC 60950-1 {2005} "Information Technology Equipment – Safety- Part 1: General Requirements"] OR IEC 62368-I:2014	IS 13252 part 1:2010 / IEC 60950-1 {2005} part 1; OR IEC 62368-I:2014
2.	IEC 60215 (1987) Safety requirements of radio transmitting equipment (for Radio equipment only)	IEC 60215 (1987)

7.2 Electromagnetic Compatibility (EMC)

Clause	Parameter	Standard
1.	Conducted and Radiated Emission	CISPR 22 (2008) OR

Clause	Parameter	Standard
		CISPR 32 Class-A
2.	Immunity to Electrostatic discharge: Contact discharge level 2 {± 4 kV}	IEC-61000-4-2 Performance Criteria-B, Clause 9
3.	Immunity to Electrostatic discharge: Air discharge level 3 {± 8 kV}	IEC-61000-4-2 Performance Criteria-B, Clause 9
4.	Immunity to radiated RF: (a) Radio Frequency: 80 MHz to 1 GHz, Electromagnetic field: 3V/m (b) Radio Frequency: 800 MHz to 960MHz, Electromagnetic field: 10V/m (c) Radio Frequency: 1.4 GHz to 6 GHz, Electromagnetic field: 10V/m	IEC 61000-4-3 (2010); Performance Criteria-A, Clause 9
5.	Immunity to fast transients (burst): Test Level 2: (a) 1 kV for AC/DC power port (b) 0. 5 kV for signal / control / data / telecom lines.	IEC 61000- 4- 4 {2012); Performance Criteria-B, Clause 9

Clause	Parameter	Standard
6.	Immunity to surges: AC/DC ports a. 2 kV peak open circuit voltage for line to ground b. 1kV peak open circuit voltage for line to line	IEC 61000-4-5(2014) Performance Criteria-B, Clause 9
7.	Immunity to surges: Telecom ports (a) 2 kV peak open circuit voltage for line to ground coupling. (b) 2 kV peak open circuit voltage for line to line coupling.	IEC 61000-4-5(2014) Performance Criteria-C, Clause 9
8.	Immunity to conducted disturbance induced by Radio frequency fields: Under the test level 2 {3 V r.m.s.} in the frequency range 150 kHz-80 MHz for AC / DC lines and Signal /Control/telecom lines.	IEC 61000-4-6(2013) Performance Criteria-A, Clause 9
9.	Immunity to voltage dips & short interruptions (applicable to only ac mains power input ports, if any): Limits: -	IEC 61000-4-11 (2004):

Clause	Parameter	Standard
	a. A voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70% supply voltage for 500ms)	a. Performance Criteria B for Reduction of Supply 30% for 500ms or Dip to reduction of 60% for 100ms
	b. A voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms;(i.e.40% supply voltage for 200ms)	b. Performance Criteria C for Reduction of 60% for 200ms
	c. A voltage interruption corresponding to a reduction of supply voltage of > 95% for 5s.	c. Performance criteria C for Voltage Interruption>95% for 5 s (Note: In case of Battery back-up performance criteria A is applicable).

Clause	Parameter	Standard
	d. A voltage interruption corresponding to a reduction of supply voltage of >95% for 10ms.	d. Performance Criteria B for Voltage Interruption >95%duration:10 ms (Note: In case of Battery back-up Performance Criteria A is applicable for above conditions.)
10.	Immunity to voltage dips & short interruptions (applicable to only DC power input ports, if any):	IEC 61000-4-29(2000)
	a. Voltage Interruption with 0% ofsupplyfor10ms.	a. Applicable Performance Criteria shall be B.
	b. Voltage Interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms.	b. Applicable Performance

Clause	Parameter	Standard
		Criteria shall be C.
	c. Voltage dip corresponding to 40% & 70% of supply for 10ms, 30ms.	c. Applicable Performance Criteria shall be B.
	d. Voltage dip corresponding to 40% & 70% of supply for 100ms, 300ms and 1000ms.	d. Applicable Performance Criteria shall be C.
	e. Voltage variations corresponding to 80% and 120%of supply for 100ms to 10s as per Table 1c of IEC 61000-4-29.	e. Applicable Performance Criteria shall be B.

Chapter 8

Information for the Procurer of Product

8.1 Tendering Parameters

The procurer may specify the requirements of the following parameters out of the various values indicated in the various clauses of this GR indicated against each parameter below (as per specific deployment/application requirements suitable for the procurer's business plan).

Note: The equipment vendor shall indicate product specific configuration being offered for the Type approval

S. No.	Tendering parameter	Options
1.	Compact LTE Mobile System Type	Refer section 5.11
2.	Power Supply Option AC/DC	As per Section 5.9 Power Supply Requirements In-built battery pack, if required
3.	Operating Frequency and channel bandwidth	To be specified by the procurer (as per NFAP)
4.	Antenna Type	May support option of OMNI &/ sector Antenna configurations

Abbreviations

For the purpose of this document the following abbreviations apply:

ACLR	Adjacent Channel Leakage Ratio
ACK	Acknowledgement (in HARQ protocols)
ACS	Adjacent Channel Selectivity
ANR	Automatic Neighbour Relation
APN	Access Point Name
AMBR	Aggregate Maximum Bit Rate
ARP	Allocation and Retention Priority
AS	Application Server
AWGN	Additive White Gaussian Noise
BS	Base Station
CA	Carrier Aggregation
CMIP	Common Management Information Protocol
CW	Continuous Wave
DC	Direct Current
DSCP	Differential Service Code Point
EMS	Element Management System
EPC	Evolved Packet Core

E-RAB	E-UTRAN Radio Access Bearer
E-UTRA	Evolved UTRA
E-UTRAN	Evolved UTRAN
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
GCS	Group Communication Service
GUI	Graphical User Interface
HARQ	Hybrid Automatic Repeat Request
HSS	Home Subscriber Server
ICIC	Inter-Cell Interference Co-ordination
ICS	In-Channel Selectivity
IMS	IP Multimedia Subsystem
IOPS	Isolated E-UTRAN Operation for Public Safety
ITU	R Radio communication Sector of the ITU
LTE	Long Term Evolution
MAC	Medium Access Control
MIMO	Multiple Input Multiple Output
MME	Mobility Management Entity
MTBF	Mean Time Between Failure

MTTR Mean Time to Repair

OFDM Orthogonal Frequency Division Multiplex

OMC Operations and Maintenance Controller

O&M Operations and Maintenance

PBX Private Branch Exchange

PCP Priority Code Point

PCRF Policy and Charging Rules Function

PDCCH Physical Downlink Control Channel

PDN Packet Data Network

PDSCH Physical Downlink Shared Channel

PTT Push to Talk

PTV Push to Video

PUSCH Physical Uplink Shared Channel

PRACH Physical Random-Access Channel

QAM Quadrature Amplitude Modulation

QCI QoS Class Identifier

QOS Quality of Service

QPSK Quadrature Phase-Shift Keying

RAN Radio Access Network

RF	Radio Frequency
RoHC	Robust Header Compression
RS	Reference Symbol
RSRP	Reference Signal Received Power
RX	Receiver
RLC	Radio Link Control
RRC	Radio Resource Control
SNMP	Simple Network Management Protocol
SON	Self Organising Network
SRVCC	Single Radio Voice Call Continuity
TDD	Time Division Duplex
TOS	Type of Service
TX	Transmitter
UE	User Equipment
UTRA	Universal Terrestrial Radio Access
UTRAN	Universal Terrestrial Radio Access Network
VLAN	Virtual Local Area Network
VoLTE	Voice over LTE
ViLTE	Video over LTE