वर्गीय आवश्यकताओं के लिए मानक

टीईसी <दस्तावेज़ सं: नई नंबररंग स्कीम के अनुसार>

(पूर्व सं: टीईसी/जीआर/...)/ (सं: टीईसी....को अधिक्रमित करता है)

STANDARD FOR GENERIC REQUIREMENTS

TEC <document no. TEC 35XXX:2026]

(EarlierNo. TEC/GR/_____)/(SupersedesNo. TEC..)…asapplicable

निष्क्रिय वितरित एंटीना प्रणाली

Passive Distributed Antenna System

ISO 9001:2015

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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 Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This Standard for Generic Requirements (GR) for a Product/Equipment pertains to Passive Distributed Antenna Systems (PDAS) deployed for indoor and in-building mobile network coverage. This GR specifies the generic requirements and reference architecture applicable to PDAS installations. It defines the functional scope of operator signal input interfaces and the passive RF combining and distribution network using components such as multiplexers, combiners, splitters, and couplers, interconnecting RF paths and service antennas to enable multi-operator, multi-band, and multi-technology wireless coverage within indoor environments.

CONTENTS

HISTORY SHEET

Sl. No.	Standard/document No.	Title	Remarks
1.	TEC 35XXX:2026	PASSIVE DISTRIBUTED ANTENNA SYSTEM (PDAS)	First Issue

REFERENCES

S.No.	*Document No.*	*Title/ Document Name*
[1]	ISO 9001:2015	Quality management systems — Requirements
[2]	TEC 10009:2024	Safety Requirements of Telecommunication Equipment
[3]	TEC 14016:2010 (Old No. QM-333)	Standard for Environmental testing of Telecommunication equipment
[4]	TEC 11016:2016, (Old Document No.: TEC/SD/DD/EMC-221/05/OCT-16).	Standard for Electromagnetic Compatibility Standard for Telecommunication Equipment",
[5]	TEC 66130:2025.	Standard for Lightning for surge protection of telecom site.

Note:

Unless otherwise explicitly stated, the latest approved issue of the standard/GR/IR, with all amendments in force, listed in references, on the issuance date of this GR/IR are applicable.

CHAPTER-1

1.0 Introduction

1.1 Mobile networks supporting multiple frequency bands and radio access technologies (2G/3G/4G/5G) require dedicated indoor/in-building solutions to address signal attenuation caused by indoor and semi-enclosed environments.

1.2 A Passive Distributed Antenna System (Passive DAS) is a cabling-based coverage solution that distributes RF signals without the use of amplification, through passive components such as combiners, splitters, couplers, RF feeder cables, and service antennas. It comprises operator signal input interfaces and a passive RF distribution network terminating at service antennas, enabling multi-operator and multi-band coverage across licensed mobile frequency bands while maintaining signal integrity within passive link budget limits.

1.3 This Generic Requirement (GR) specifies the functional, technical, operational, quality, interoperability, environmental, and interface requirements for Passive DAS deployments in commercial buildings, public venues, transportation hubs, campuses, residential complexes, and similar environments.

2.0 Description

A Passive Distributed Antenna System (PDAS) is a non-amplified RF distribution system that passively delivers radio frequency signals from one or more mobile network operators to multiple service antennas using RF/coaxial feeder cables and passive RF components. The system operates without electronic signal processing or active gain within the distribution network.

Operator signals are combined and routed through a passive RF backbone using components such as multiplexers, combiners, splitters, and couplers. RF power distribution is carried out in accordance with the system RF design and link budget, with signal levels controlled through fixed passive losses.

The PDAS supports multi-operator and multi-band operation in a carrier-agnostic manner and is suitable for in-building environments where coverage requirements can be met through passive RF distribution. The passive architecture ensures reliable operation, predictable performance, and low

operational and maintenance complexity.

By appropriate deployment of directional and omnidirectional antennas, the PDAS provides uniform indoor coverage while maintaining RF isolation and impedance continuity. The system is suitable for small to medium-scale in-building deployments where signal distribution can be achieved within permissible passive link budget limits.

2.1 Architecture of Passive Distributed Antenna System

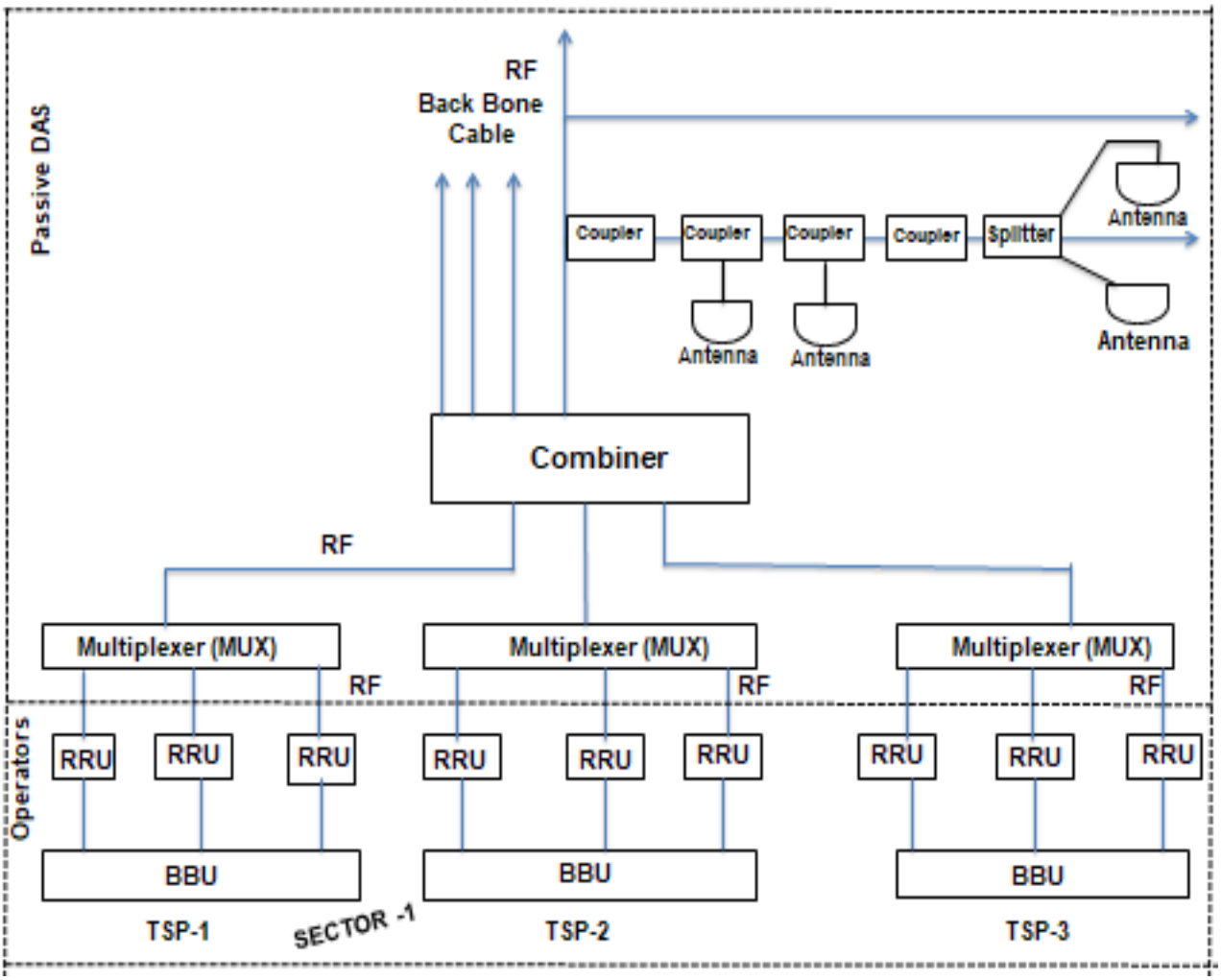

Figure 1: Architecture of Passive DAS

2.2 Network Elements of the Passive Distributed Antenna System (Passive DAS)

A. The Passive DAS shall consist of the following major network elements required to support end-to-end RF signal aggregation, distribution, transport, and radiation within the intended coverage area. The Passive DAS may have the following network elements

(a) Multiplexer
   i. Diplexers
   ii. Triplexer
   iii. Pentaplexer

(b) Combiner
   i. Hybrid(2X2)
   ii. Hybrid(4x4)

(c) Coupler(Directional)
   i. 6db
   ii. 10db
   iii. 15db

(d) Power Splitter
   i. Two way
   ii. Three way
   iii. Four way

(e) Antenna
   i. Panel(SISO/MIMO-2x2)
   ii. Omnidirectional(SISO/MIMO-2x2)

(f) Accessories as per requirement (RF cable, Terminators, Adapters, Jumper, Connector, etc)

B. Operating Frequency Range- The system shall operate over a frequency range of 600 MHz to 4 GHz, and this range shall be supported and compatible across all network elements of the Passive DAS. The commercial use of frequency and power limits shall be governed as per NFAP 2025 and its amendments from time to time

2.2.1 Multiplexer (MUX)

The Multiplexer (MUX) in a Passive DAS is a passive RF band-management network element that combines or separates multiple frequency bands from one or more operators before distribution within the DAS. It enables efficient handling of different radio access technologies and frequency ranges while maintaining high isolation between bands to prevent interference and intermodulation.

This includes diplexers, triplexers, and pentaplexers, which manage two, three, or five frequency bands, respectively. All such devices operate without external power and preserve RF signal integrity by introducing minimal insertion loss and distortion, ensuring reliable multi-band, multi-operator performance throughout the Passive DAS infrastructure.

2.2.1.1 Technical Specifications - Diplexer, DIN-Female

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	DIN-Female
1.2	Mounting Type	Wall/Pole
2	ELECTRICAL SPECIFICATIONS	
2.1	Isolation (dB)	≤50
2.2	Insertion Loss(dB)	≤0.5±0.1
2.3	VSWR	≤1.25
2.4	Impedance (Ω)	50 ± 2
2.5	PIM @ 2x43dBm (dBc)	≤-150
2.6	Power Handling (W)	100/Port

2.2.1.2 Technical Specifications – Triplexer

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	DIN-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Isolation (dB)	≤50

2.2	Insertion Loss(dB)	0.7±0.1
2.3	VSWR	≤1.25
2.4	Impedance (Ω)	50 ± 2
2.5	PIM @ 2x43dBm (dBc)	≤-150
2.6	Power Handling (W)	100/Port

2.2.1.3 Technical Specifications - Pentaplexer, DIN-Female

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	DIN-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Isolation (dB)	≤50
2.2	Insertion Loss(dB)	≤0.5±0.2
2.3	VSWR	≤1.3
2.4	Impedance (Ω)	50 ± 2
2.5	PIM @ 2x43dBm (dBc)	≤-157± 2
2.6	Power Handling (W)	200/Port

2.2.2 Combiner

The Combiner shall aggregate RF signals from multiple operators and/or frequency bands into a combined RF output for distribution over a common RF backbone. It shall support simultaneous multi-operator signal distribution while ensuring adequate isolation between input ports to minimize interference. The combiner shall maintain signal linearity and impedance characteristics across the supported operating frequency range and shall be suitable for continuous passive operation in indoor Passive DAS deployments.

2.2.2.1 Technical Specifications - Hybrid Combiner, 2x2

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	DIN-Female
1.2	Number of Ports	2 Input & 2 Output
2	ELECTRICAL SPECIFICATIONS	

2.1	Impedance (Ω)	50
2.2	VSWR	≤1.30
2.3	PIM @ 2x43dBm (dBc)	≤-150
2.4	Combining Loss (dB)	3.9 ± 0.2
2.5	Isolation (dB)	≥23
2.6	Power Handling, Average (W)	300

2.2.2.2 Technical Specifications - Hybrid Combiner, 4x4

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	DIN-Female
1.2	Number of Ports	4 Input & 4 Output
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50 ± 2
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	VSWR	≤1.30
2.4	Combining Loss (dB)	7.4 ± 0.2
2.5	Isolation (dB)	≥23
2.6	Power Handling (W)	100/Port

2.2.3 Coupler

The Directional Coupler is a critical passive network element in a Passive Distributed Antenna System (PDAS), designed to extract a predefined portion of RF power from the main backbone cable while allowing the majority of the signal to continue uninterrupted along the primary transmission path. This functionality enables controlled distribution of signal power over extended cable runs to multiple remote antenna locations, ensuring balanced coverage across different areas within a building or facility.

Directional couplers with standard coupling values such as 6 dB, 10 dB, and 15 dB are typically employed to achieve the required level of signal tapping based on coverage and design requirements.

2.2.3.1 Technical Specifications - Directional Coupler – 06dB

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	Coupling Port Loss (dB)	6.0 ± 0.9
2.4	Through Port Loss (dB)	1.7 ± 0.1
2.5	VSWR	≤1.25
2.6	Power Handling (W)	200

2.2.3.2 Technical Specifications - Directional Coupler – 10dB

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	Coupling Port Loss (dB)	10.0 ± 1.0
2.4	Through Port Loss (dB)	1.0 ± 0.1
2.5	VSWR	≤1.25
2.6	Power Handling (W)	200

2.2.3.3 Technical Specifications - Directional Coupler – 15dB

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	Coupling Port Loss (dB)	15.0 ± 1.0
2.4	Through Port Loss (dB)	0.5 ± 0.1

2.5	VSWR	≤1.25
2.6	Power Handling (W)	200

2.2.4 Splitter

The Splitter is a passive RF network element in a Passive DAS used to divide an input RF signal into multiple output paths for distribution to downstream antennas or RF branches. It shall provide either equal or designed power division while preserving RF signal integrity and maintaining proper impedance matching at all ports to minimize losses and reflections within the DAS network. Any unused output ports shall be terminated with suitable RF loads to ensure stable system operation and to prevent degradation of overall Passive DAS performance.

2.2.4.1 Technical Specifications - Power Splitter, Two-Way

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	Dividing Loss (dB)	3.5 ± 0.2
2.4	In-band Ripple (dB)	≤0.3
2.5	VSWR	≤1.25
2.6	Power Handling (W)	300

2.2.4.2 Technical Specifications - Power Splitter, Three-Way

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	Dividing Loss (dB)	5.3 ± 0.2
2.4	In-band Ripple (dB)	≤0.3
2.5	VSWR	≤1.25

2.6	Power Handling (W)	300

2.2.4.3 Technical Specifications - Power Splitter, Four-Way

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Interface	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Impedance (Ω)	50
2.2	PIM @ 2x43dBm (dBc)	≤-150
2.3	Dividing Loss (dB)	6.5 ± 0.2
2.4	In-band Ripple (dB)	≤0.3
2.5	VSWR	≤1.25
2.6	Power Handling (W)	300

2.2.5 Antennas

The antenna subsystem in a Passive DAS converts RF signals from the distribution network into electromagnetic fields for reliable indoor coverage. Antennas shall support multi-technology operation (2G/3G/4G/5G), comply with in-building wireless standards, provide appropriate radiation patterns and polarization, and ensure low passive intermodulation (PIM) with broad frequency band support to maintain signal quality.

2.2.5.1 Panel Antenna

A Panel Antenna is a directional radiating element in a Passive DAS that provides controlled RF coverage within a defined sector. It is used in areas requiring focused radiation, such as corridors, tunnels, platform edges, and linear indoor environments, to optimize coverage and limit interference.

Panel antennas support broadband operation across relevant cellular and wireless service bands and are configured in SISO (Single Input Single Output) or MIMO (Multiple Input Multiple Output) arrangements to enhance spectral efficiency, throughput, and link reliability for modern multi-carrier systems. In MIMO configurations, multiple ports and polarization diversity improve channel capacity and resilience to multipath fading, which is essential for 4G LTE and 5G NR performance in dense indoor settings.

2.2.5.1.1 Technical Specifications - Panel Antenna (Directional), SISO

S. No.	Parameter	Specification
1	ELECTRICAL SPECIFICATIONS	
1.1	Typical Gain (dBi)	5.0±0.5
1.2	Horizontal Beamwidth (°)	95±10
1.3	Vertical Beamwidth (°)	90±10
1.4	Front to Back Ratio (dB)	≥10
1.5	VSWR	≤2.0±0.2
1.6	Polarization	Vertical
1.7	Impedance (Ω)	50
1.8	PIM @ 2x43 dBm (dBc)	≤–150
1.9	Maximum Input Power (W)	50
2	MECHANICAL SPECIFICATIONS	
2.1	Antenna Array	SISO
2.2	Connector Type	N-Female with Pigtail

2.2.5.1.2 Technical Specifications - Panel Antenna (Directional), 2X2 MIMO

S. No.	Parameter	Specification
1	ELECTRICAL SPECIFICATIONS	
1.1	Typical Gain (dBi)	5.0±0.5
1.2	Horizontal Beamwidth (°)	95±10
1.3	Vertical Beamwidth (°)	80±10
1.4	Front to Back Ratio (dB)	≥7
1.5	VSWR	≤2.0
1.1	Polarization	±45°
1.2	Impedance (Ω)	50
1.3	PIM @ 2x43 dBm (dBc)	≤–150
1.4	Maximum Input Power (W)	50
2	MECHANICAL SPECIFICATIONS	
2.1	Antenna Array	2X2 MIMO
2.2	Connector Type	N-Female with Pigtail

2.2.5.2 Omnidirectional Antenna

The Omnidirectional Antenna provides uniform RF radiation in the horizontal plane, suitable for large, open indoor areas such as halls, lobbies, and open spaces where broad coverage is needed. Ensures even RF distribution in all horizontal directions from a central location for consistent signal strength.

Omnidirectional antennas in Passive DAS also support broadband frequency ranges and can be built for SISO or MIMO configurations, enabling simultaneous support for multiple signal paths and improving overall system capacity and performance. MIMO omnidirectional antennas particularly benefit capacity and spectral efficiency in environments with high user density.

2.2.5.2.1 Technical Specifications – Indoor Omnidirectional Antenna, SISO

S. No.	Parameter	Specification
1	ELECTRICAL SPECIFICATIONS	
1.1	Typical Gain (dBi)	2.0±0.5
1.2	Horizontal Beamwidth (°)	360 each band
1.3	Vertical Beamwidth (°)	90±5
1.4	VSWR	≤2.0±0.2
1.5	Polarization	Vertical
1.6	Impedance (Ω)	50
1.7	PIM @ 2x43 dBm (dBc)	≤–150
1.8	Maximum Input Power (W)	50
2	MECHANICAL SPECIFICATIONS	
2.1	Antenna Array	SISO
2.2	Connector Type	N-Female with Pigtail

2.2.5.2.2 Technical Specifications-Indoor Omnidirectional Antenna, 2X2 MIMO

S. No.	Parameter	Specification
1	ELECTRICAL SPECIFICATIONS	
1.1	Typical Gain (dBi)	2.0±0.5
1.2	Horizontal Beamwidth (°)	360 each band
1.3	Vertical Beamwidth (°)	95±5
1.4	VSWR	2.0±0.2

1.5	Polarization	Horizontal
1.6	Impedance (Ω)	50±0.2
1.7	PIM @ 2x43 dBm (dBc)	≤–150
1.8	Maximum Input Power (W)	50
2	MECHANICAL SPECIFICATIONS	
2.1	Antenna Array	2x2 MIMO
2.2	Connector Type	N-Female with Pigtail

2.2.5.3 Technical Specifications - High Gain Antenna

S. No.	Parameter	Specification
1	GENERAL SPECIFICATIONS	
1.1	Polarization	Vertical
1.2	Impedance (Ω)	50
1.3	Connector Type	N-Female
2	ELECTRICAL SPECIFICATIONS	
2.1	Gain (dBi)	10±1
2.2	VSWR	<2.0 ±0.2
2.3	Polarization	Vertical
2.4	Front to Back Ratio (dB)	>20 / >23
2.5	PIM, 3rd Order @ 2x20W (dBc)	≤–150
2.6	Horizontal Beamwidth (°)	80±5 / 65±5
2.7	Vertical Beamwidth (°)	35±5
2.8	Max. Power (W)	100

2.2.6 Passive DAS Accessories

Following accessories may be deployed with network elements of passive DAS as per requirement such that the above-stated technical/operational performance requirements are complied.

2.2.6.1 RF Cable (½" Low Loss Corrugated RF Cable and ⅞" Low Loss Corrugated RF Cable)

2.2.6.2 Terminator (50W, 100W)

2.2.6.3 Adaptors (Right-Angled Adaptors, N(M)-N(F))

2.2.6.4 Jumper (1/2" SF Cable – 02 Meter, D(M)-4(M) / D(M)-N(F) / D(M)-N(M) / N(M)-N(M))

2.2.6.5 Connector (N-Male Straight Connector for 7/8" RF Cable / 1-1/4" RF Cable / ½" RF Cable)

Note#1- This list is illustrative not exhaustive

3.0 Quality Requirements

3.1 The manufacturer of the passive DAS equipment shall have a valid ISO 9001:2015 quality management certification or any equivalent international quality standard.

3.2 The equipment shall meet the environmental requirements as per Category B of the TEC Standard for "Environmental Testing of Telecommunication Equipment", TEC14016:2010 (old no. QM-333 Issue March 2010).

3.3 For coverage, the target RSRP shall be better than –110 dBm for all technology. However, this may be reviewed in tender requirements.

3.4 The DAS shall meet the minimum radio service quality requirements, including RSRP, SINR, and RSRQ performance for 2G, 3G, 4G, and 5G services at the user equipment level across the declared coverage area. Compliance shall be verified during acceptance and performance testing. However, these quality requirements may be further improved as per the mutual requirements of the purchaser/procurer and the mobile service operator.

3.5 The supplier shall ensure availability of maintenance support, spare modules, for the declared product life cycle.

4.0 EMI/EMC Requirements

The equipment in the Distributed Antenna System (DAS) shall conform to the TEC Standards on EMI/EMC as applicable for telecommunication equipment, as prescribed in the relevant TEC document "Electromagnetic Compatibility Standard for Telecommunication Equipment", TEC 11016:2016, (Old Document No.: TEC/SD/DD/EMC-221/05/OCT-16).

5.0 Safety Requirements

5.1 The equipment in the Distributed Antenna System (DAS) shall conform to the relevant TEC standards on safety requirements as applicable to

telecommunication equipment, as prescribed in the TEC document "Safety Requirements of Telecommunication Equipment", TEC 10009:2024.

5.2 The equipment in the Distributed Antenna System (DAS) shall conform to the relevant TEC standards on safety requirements as applicable(stage-II) to telecommunication equipment, as prescribed in the relevant TEC document "Lightning for surge protection of telecom site.", TEC 66130:2025.

6.0 Environmental Requirements

6.1. The Passive DAS equipment shall meet the following environmental specifications to ensure reliable operation under defined conditions:

6.1.1 The equipment shall operate within a temperature range of –10°C to +55°C.

6.1.2 The equipment shall be capable of storage within a temperature range of –25°C to +85°C.

6.1.3 The equipment shall operate reliably at relative humidity levels up to 95%.

6.1.4 The equipment shall have a water-proofing rating of IP65.

6.1.5 The equipment shall be suitable for both indoor and outdoor applications.

7.0 Interoperability Requirements

7.1 The Distributed Antenna System (DAS) shall meet the following interoperability requirements to support multi-operator, multi-band, multi-technology, and multi-vendor deployments:

7.1.1 Operator signals shall remain logically separated across the DAS, ensuring independent and interference-free operation.

Note - The system shall support per-operator power control, including an output power of 20 Watt per RRU per operator, configurable attenuation settings, and resource allocation for efficient multi-operator performance. The installation site shall have sufficient and reliable electrical power/backup/grid supply etc to support continuous operation of the RRU(s), including peak power consumption, with provision for redundancy where applicable)

CHAPTER 2

8.0 GUIDELINES FOR THE PURCHASER /PROCURER

This chapter describes the requirements which may be included in the tender document by the Purchaser / Procurer based on the intended application, deployment environment, and operational needs of the Passive Distributed Antenna System (PDAS). The following aspects shall be specified by the Ordering Authority as per actual site and network requirements.

8.1 The Purchaser / Procurer shall specify the intended deployment scenario of the Passive DAS such as building type, coverage objective, and general installation environment (indoor/outdoor / in-building).

8.2 The Purchaser / Procurer may specify compliance of the respective network element as per the technical specification mentioned in para 2 of this GR.

8.3 The Purchaser may specify any requirement for field trials, system validation, or acceptance testing prior to final deployment. Feedback, if any, may be furnished to TEC for future improvement of this GR.

9.0 ORDERING INFORMATION

The following information shall be specified by the Tendering / Ordering Authority while placing orders, depending upon operational requirements:

9.1 Intended frequency band(s) and services to be supported by the Passive DAS.

9.2 General system configuration and coverage area requirements.

9.3 Quantity and deployment scale of the Passive DAS network.

10.0 SPECIFIC ITEMS TO BE MENTIONED IN THE CERTIFICATE

Make and Model number of the network elements/components of the Passive Distributed Antenna System (PDAS) as declared by the manufacturer.

ABBREVIATIONS

For the purpose of this document the following abbreviations apply:

DAS	Distributed Antenna System
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
IEC	International Electrotechnical Commission
MIMO	Multiple Input Multiple Output
MOCN	Multi-Operator Core Network
MORAN	Multi-Operator Radio Access Network
MUX	Multiplexer
PDAS	Passive Distributed Antenna System
RSRP	Reference Signal Received Power
RSRQ	Reference Signal Received Quality
SINR	Signal-to-Interference-plus-Noise Ratio
SISO	Single Input Single Output
VSWR	Voltage Standing Wave Ratio

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