Template for submitting comments/inputs on draft Test Guide titled "TRUNK MEDIA GATEWAY (TMG)"

(Draft Test Guide No. TEC/TG/SW/TMG-301/01/FEB-17)

Name of Manufacturer/Stakeholder:

Organisation:

Contact Details:

S. No	Clause No.	Clause	Comments	Other Remarks, if any

Note: The comments/inputs on the draft Test Guide (Draft Test Guide No. **TEC/TG/SW/TMG-301/01/FEB-17**) may be provided in the above format vide email to **director-al.tec-dot@gov.in, ddglte.tec@gov.in**

परीक्षण अनुसूची और परीक्षण प्रक्रिया सं:टीईसी/टीजी/एसडबल्यू/टीएमजी-301/01/फरवरी-17

TEST SCHEDULE & TEST PROCEDURE No. : TEC/TG/SW/TMG-301/01/FEB-17

ट्रंक मीडिया गेटवे

TRUNK MEDIA GATEWAY

(जीआर सं:. टीईसी/जीआर/एसडबल्यू/टीएमजी-001/05/सितंबर-16)

(GR No.: TEC/GR/SW/TMG-001/05/SEP-16)

दूरसंचार अभियांत्रिकी केंद्र

खुर्शीदलाल भवन, जनपथ, नई दिल्ली-110001, भारत

TELECOMMUNICATION ENGINEERING CENTRE

KHURSHIDLAL BHAWAN, JANPATH, NEW DELHI–110001, INDIA

www.tec.gov.in

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A INTRODUCTION

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of Trunk Media Gateway as per GR No. TEC/GR/SW/TMG-001/05/SEP-16

B. HISTORY SHEET

Sl. No.	TSTP No.	Equipment/Interface	Issue
1.	TEC/TG/SW/TMG-301/01/FEB-17	Trunk Media Gateway	1st Edition

C. General information:

Sn.	General Information	Details *(to be filled by testing team)*	
1	Name and Address of the Applicant		
2	Date of Registration		
3	Name and No. of GR/IR/Applicant's Spec. against which the approval sought		
4	Details of Equipment		
	Type of Equipment	Model No.	Serial No.
(i)			
(ii)			
5	Any other relevant Information:-		

D. Testing team: *(to be filled by testing team)*

Sl. No.	Name	Designation	Organization	Signature
1.				
2.				

E. List of the Test Instruments:

S. No.	Name of the test instrument	Make /Model *(to be filled by testing team)*	Validity of calibration *(to be filled by testing team)*
1	IP Tester, Wireshark software		dd/mm/yyy
2	PC/Laptops		
3	SIP Phones		
4	Analogue Phones		
5	Connectivity with softswitch/MGC and PSTN switch or simulator		
6	Connectivity with NMS or PC with software for data analysis		
7	PDH performance analyser, Jitter tester with POS capability and Packet Payload Capability for PDH		
8	External clock		

9	BER Tester		
10	Optical Power Meter		
11	Frequency Meter		
12	CCS7 analyser		

F. Equipment Configuration Offered: *(to be filled by testing team)*

(a) <Equipment/product name> Configuration:

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

(b) <Other equipment name> Configuration:

S.No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

G. Equipment/System Manuals: *(to be filled by testing team)*

Availability of Maintenance manuals, Installation manual, Repair manual & User Manual etc. **(Y/N)**

H. Clause-wise Test Type and Test No.:-

Clause No.	*Clause*	*Type of Test / Test No. etc. **
1.1	This document specifies the Generic of Requirements (GR) of Trunk Media Gateway (TMG) to interconnect the IP and TDM networks of Telecom Service Providers. The TMG shall accept the TDM traffic which may consist of voice, FAX and Voice band data and convert it to IP packet format for transmission over the Packet Network. The IP media gateway shall be capable of handling the requirements in terms of the DTMF Relay, support for supplementary services and call handling capabilities.	Information
1.2	(a) For all ITU–T/IEEE recommendations, TEC standards/ specification and other standards referred in this document, the latest release/issue with all associated amendments, addendum and corrigendum shall be applicable. (b) The RFC's documents of IETF are subject to periodic revision. Hence, where ever RFC's are mentioned in this document, the offered product shall meet either the referred RFC or its previous version or its previous draft or its updated version. Wherever a feature of RFC is mentioned, the product shall comply with the part of RFC specifying the feature. (c) For all IETF RFC's, the interpretation of clauses of RFC's shall be as per RFC 2119	Information
1.3	Functioning or intended use of the equipment shall conform to the prevailing laws/ regulation/instructions of Govt .of India	Undertaking

1.4	All the requirements described in chapter 2 of this document are suggestive requirements and shall be decided by the purchaser at the time of procurement/ tender as per his requirements. However, the requirements described in Chapter-2 shall not be tested/ verified by TEC at the time of initial certification.	Information
2.0 2.1	Description Functional Architecture: Trunk Media Gateway is a translation device that converts media streams between circuit switch and packet switch networks. It enable multimedia communications across packet networks using IP transport protocols. Since TMG connects different types of networks, one of its main functions is to do conversion between different transmission and coding techniques. Media streaming functions such as echo cancellation, DTMF, and tone sender are also located in the media gateway.	Information
2.2	TMGs are often controlled by a separate Media Gateway Controller (MGC) or Call Agent (Softswitch) which provides the call control and signaling functionality. Communication between TMG and MGC/Call Agents is achieved by means of protocols such as MGCP or Megaco (H.248) or SIP. However TMG used with SIP may also be stand-alone units with their own call and signaling control functioning integrated and may function as independent, intelligent SIP end-points. (Ref. RFC 2805)	Information

2.3	Signalling gateway function is needed to convey the signalling messages (e.g. call control messages) across different transport domains. These messages are set up between the PSTN node & MGC/Call agent but the call is transmitted through the TMG. Signalling gateway functions is normally co-located in TMG node but can also be separate node.	Information
3.0 3.1	Functional/Operational Requirements TMG shall terminate circuit switched network trunks, packetize the media stream and deliver the packetized traffic to IP/MPLS network. Similarly, it shall also convert the packetized stream received from IP network and shall deliver it over TDM trunks. TMG shall support point-to-point connections and conferences and shall supports resource functions such as media conversion, resource allocation, resource management and O&M notifications.	Make number of simultaneous voice calls from analogue phones to IP numbers on MPLS side and vice-versa. Make some conference calls also. All calls should be processed successfully.
3.2	In addition to Media resource management functionality, TMG shall include – i Trunk Media Gateway Control ii Media Resource	Information
3.3 3.3.1	Resource Management For the creation of voice paths over IP/MPLS, traffic parameters shall be received from the Soft Switch/MGC. The Trunk Media Gateway shall set up IP paths over IP/MPLS network and send the voice packets. TMG shall provide media connection between the circuit-switched domain and the IP domain, by means of RTP bearer connections	Information
3.3.2	It should be possible to pre-configure the bandwidth between TMG and IP interface.	Configure the band-width on any one IP interface towards MPLS. It should be done successfully.

3.3.3	TMG shall provide the media mapping and trans-coding functions between PSTN/ISDN/PLMN and IP/MPLS based packet network.	Define different codec on different trunk groups. It should be done successfully.
3.3.4	TMG should support reservation and release of resources for smooth migration of incoming TDM traffic to IP network and vice-versa.	Make number of simultaneous calls from analogue phones to IP numbers on MPLS side. All calls should be processed successfully.
3.3.5	TMG should support both Hairpin as well as Non Hairpin connections. For hair pin connections on the TDM side it shall support Echo cancellation also.	Test No. 1
3.3.6	TMG shall support back-up IP route i.e. it shall have the capability to set up an IP call path between two IP end-points by routing the voice call away from the usual TDM bus connection.	Take undertaking from the applicant
3.3.7	It should provide a smooth migration of the telephony services when calls/data including all value added services, are transmitted from circuit switched network to packet network and vice-versa.	Test No. 2
3.3.8	The Dual Tone Multi Frequency (DTMF) dialled by the subscribers after the call set up shall be transparently passed as per RFC 4733. TMG shall be able to indicate detection of fax tone and should transport it as per ITU-T rec. T.38	Test No. 3
3.3.9	It shall support two way communications for Bidirectional Forwarding Detection (BFD) protocol with other Trunk Media Gateways.	Undertaking may be taken
3.4	TMG shall generate tones as per H.248 control profile ETSI ES283024. Optionally, it may support connectivity with Media server to provide different types of announcements and Tones.	Test No. 2

3.5	It shall support Virtual Media Gateway (VMGW) features and the maximum number of supported virtual media gateway shall be specified by the purchaser. Each virtual Media Gateway can work as induvidual Media Gateway meeting all functional requirements of TMG.	Test No. 4
3.6 3.6.1	Hardware and software The functional modularity of the hardware and software should permit addition or removal of any functionality without disturbing the other functionalities.	▪ Remove & then add some hardware. System functioning should not be affected during removal/addition of hardware ▪ Install, activate and remove a software patch. During installation/ activation/ removal of software patch, any system functioning, calls processing, observations etc. should not be affected.
3.6.2	Enhancement/upgrades of existing hardware/software should be possible without loss of the services.	
3.6.3	The normal operation of the system should not be adversely affected (excluding planned outage) while undertaking i Extension to existing equipment (Hardware expansion). ii Enhancement of facilities. iii Correction to programs or functional blocks. iv Software up-gradation and up-dates/Patch loading.	Covered in clause 3.6.1 & 3.6.2
3.6.4	Facilities should be in-built to ensure automatic system recovery on detection of hardware/ software fault.	Covered in clause 3.9

3.6.5	The software shall provide automatic switchover to the standby sub-system in the event of any hardware/ software fault.	Covered in clause 3.9
3.7 3.7.1	Synchronisation: The TMG shall be capable of synchronising with an external timing signal derived from any one or more of the following input PSTN interfaces. i. 2048 Kbps E1 interface ii. STM-1 input stream iii. 2048 KHz external timing reference as per clause 13.0 of ITU-T G.703, 75 ohms coaxial.	Test No. 5
3.7.2	In case of provision of more than one external clock, TMG shall be capable of selecting the clock from any one of the above provisioned interfaces as per pre-set priority.	Functional Verification
3.7.3	The acceptable slip rate shall be in accordance with ITU-T Rec. G.822	Test No. 6
3.7.4	Bit Error Rate - I. A long term bit error rate of the signalling data link should be less than 10-6 II. A medium term bit error rate should be less than 10-4	Test No. 7
3.7.5	The TMG shall be capable of synchronising with Network Time Protocol (NTP) server and use this timing information for time stamping of all messages. (Ref. RFC1305)	Test No. 8
3.8 3.8.1	O&M terminal (LCT) - The LCT shall support Graphical User Interface (GUI) for maintenance, configuration, management and supervision. It shall be possible to test trunk circuits/IP link from LCT.	▪ Check the hardware of terminals provided and check some commands. check if it is GUI based

3.8.2	It shall provide facility for cancelling and aborting the execution of commands.	terminal ▪ Check that all output from system contain time and date ▪ Give some wrong command. It should be rejected by the system and its function should not be affected. ▪ Test some trunk circuits/IP link from O&M terminal. It should be possible to do so.
3.8.3	Where same command is given from different terminals, a mechanism shall be available to avoid clashes	Give same command from two different terminals simultaneously with different parameters. System should accept the command from any one terminal.
3.9	Diagnostic a. On a faulty condition, the equipment shall identify the faulty sub-system and shall run diagnostic automatically and take it out of service. Normal function of the system shall not be affected due to invocation of any diagnostic program. The resolution of the fault diagnosis in the offered system shall be indicated. b. Details of the off-line diagnostic programs shall be given. The procedure for invoking such programs shall be described. The procedure for consulting fault dictionary for diagnostic programs	▪ Block any sub-system, create a fault and give diagnostic command. Diagnostic programme should be able to detect the fault and should display the suspected module/part etc. Repeat this test for different sub-systems

	should be made available. c. In case a fault requiring reloading of the program is detected, this shall be carried out automatically. In case of manual re-loading, it should be possible to stop and start at any particular point in the program.	▪ Create a hardware/ software fault on any sub-system (in service). Check self diagnostics for fault localisation in case of any hardware/ software fault. Verify that in such a case, faulty element is automatically put out-of-service and stand by element is made in-service ▪ Repeat the above tests for all system elements. ▪ Check even when there is no fault, system should perform self-diagnostics (without any manual intervention) after at a pre-defined interval. Create a fault. Faulty Sub-system should be put out of service automatically and suitable alarm should be generated
3.10 3.10.1	Command/Command Log Under normal conditions, the execution of any command shall not result in malfunctioning and/or over loading of the system.	Under taking may be taken

3.10.2	It shall be implemented in such a way that errors in commands or control actions shall not cause the system to stop or unduly alter the system configuration.	Give some commands with wrong/ contradictory parameters. Commands should not be executed and terminal should not hang. System shall give some suitable error message
3.10.3	Command errors detected by the system shall be indicated by the output of error messages.	
3.10.4	The system shall support priority messages to interrupt an input or output message of lower priority	Under taking may be taken
3.10.5	Commands which are used for modification of system program or data shall be logged in a file and it shall be possible to retrieve the same on demand whenever required, using MML command. It should not be possible to modify or delete log file by any MML command.	▪ Check system log record ▪ Edit some commands in the log ▪ All the commands given in the system should be logged It should not be possible to edit or delete log
3.11	System back-up It should be possible to save system back-up automatically at a specified time in the system hard disk. In addition, it should also be possible to save system backup automatically on external disk/device. system backup	▪ Copy system dump from hard disk into external storage device. It should be possible to copy system back up from hard disk to any memory device. ▪ Copy system dump from external device to hard-disk. It should be possible to copy system back up from any memory device to hard disk. ▪ Load dump from

		hard-disk into system and initialise. All sub-system should perform their normal functions after initialisation. ▪ Check automatic system back up at pre-defined time is done automatically Check retrieval of stored files.
3.12	System Redundancy a) Sufficient redundancy shall be built into the design of the system so that the failure of any component/sub-system shall not result in the total system failure. b) System shall be equipped with redundancy for power supply	a) Take undertaking from the applicant b) Verify power redundancy physically
3.13	Power Supply Option 1: The equipment shall be capable of working with –40 V to -60 V. DC input from power supply. Switching mode Power Supply (SMPS) shall be used. Power supply and battery shall be modular and expendable to support the ultimate equipment configuration. Option 2: AC Mains supply of 220 Volts with a tolerance of -15% to + 10% would be available. The frequency may be 50 Hz ± 2 Hz. UPS and other power requirements are to be specified by the system developer. Purchaser may decide option 1 or option 2 of power supply as per its requirement.	Check the power system supplied is as per option 1 or option 2. Same may be indicated in TAC

3.13.1	All TMG units shall have redundant power supply arrangement. The power feeding arrangement to power supply units shall also be provided in redundant configuration.	Remove one power unit. Re-insert it and remove second power unit. System functioning should not be interrupted.
3.14	NMS/eMS connectivity- It should be possible for TMG to interface with Network Management system (NMS)) either directly or through Element Management System (eMS). From NMS/eMS, it shall be possible to create different user category for local and remote O&M terminal (including LCTs) with different privilege for configuration & other management functions. Following FCAPS management functions shall be supported:	Test No. 9

3.14.1	Fault management – The system shall provide for visual/audible alarms to assist in efficient administration. The following minimum printouts/alarms are envisaged: a) The alarm program shall provide an alarm on O&M terminal to indicate the failure of power supply. b) A suitable message on O&M terminal shall be provided to indicate the operating status of the processors (e.g. When the processor load exceeds a certain pre-set value), signalling links e.g. link/link set failure, inaccessibility of a route i.e. `Route Busy' (RTB) on any group or circuits c) The Ethernet link down condition shall result in an alarm of highest category d) A visual display of faults detected with identification of faulty units. The display/message shall contain the date and the time. e) Emergency action procedures and alarm dictionary shall be provided.	Test No. 9
3.14.2	Configuration management- a. It shall be possible to configure PSTN links/trunks b. It shall be possible to configure IP links. It shall also be possible to allocate bandwidth to individual voice link. c. It shall be possible to monitor the traffic over any data link and to decrease/increase bandwidth allocation. d. It shall be possible to test trunk circuits/IP link testing towards PSTN network and it shall be possible to test 'reach ability' of IP network.	Test No. 9
3.14.3	Accounting management From NMS it shall be possible to collect at the least the following measurements- a) Number of calls answered/ non-answered	Test No. 10

	b) Traffic carried over Ethernet interface wise c) RTP packets handled by TMG d) RTP packets handled announcement server (Optional)	
3.14.4	Performance management – (i) Performance management module shall support collection, processing and presentation of the performance related data for the purpose of study of route profile, traffic study, planning of capacities, monitoring of network health etc. it shall include (a) Processor utilisation for the TMG and the announcement server. (b) Total traffic handled by the Trunk Media Gateway. (c) The total traffic carried by the Ethernet interface. The total RTP Traffic carried by the Ethernet Interface. (d) Total Packets carried per Destination wise. (e) Jitter as per RFC 3550 (ii) The above measurements, when activated and performed, shall not affect the call handling capacity of the TMG and the announcement Server (iii) All the measurements related to individual circuit groups shall be measurable. Information for estimating the average number of circuits in service during the result accumulation period shall be provided in addition to the traffic data for each circuit.	Test No. 11
3.14.5	Security management - Security requirements shall be as described in Clause 8 of this document.	Information
4.0 4.1	Interface Requirements The TMG shall support interfaces towards PSTN/PLMN and Packet based IP Networks	Information
4.2	PSTN Interface:	Test No. 12 and 13

	The TMG shall interface to the PSTN/PLMN with any one or any combination of the following signaling interfaces - a) 2048 Kbps (E1) 120 ohms balanced as per clause 9 of ITU-T G.703 b) STM-1 optical interface for short haul operation using Monomode or Multimode laser diode as per Table 2 / G.957 c) STM-1 optical interface for long haul operation using monomode or multimode laser diode as per Table 2 / G.957	
4.2.1	The 2048 Kbps Electrical interface shall meet the Output Pulse Mask, Output Jitter, Output Return Loss, Input Jitter Tolerance and Input Return Loss tests as per G.703.	Test No. 12
4.2.2	The optical output power, extinction ratio, spectrum receiver sensitivity and eye pattern of the STM-1 optical interface shall be as per G.957 and Input Jitter tolerance shall be as per G.825	Test No. 13
4.2.3	Only Standard bit rate of 64 kbps shall be used for digital signalling data link which shall be derived either from 2 Mbps or nX2 Mbps stream.	Information

4.3 4.3.1	TMG shall support the following: CCS7 Signalling *(a)* TMG shall support ISUP, MTP and SCCP messages as per TEC standard S/CCS-02 and S/CCS-03 and TEC/IR/CCS-SIG/01 (b) The signaling and media information can be carried over common or separate links. (c) TMG shall support the receipt of charge band message on CCS-7 link, including the configurability to ignore the charge-band message without rejecting the call. *(d)* 'N*o charge' indication in ACM, CPG, CON and ANM shall not be sent over inter-working trunk group between PSTN/PLMN and TMG.* (e) TMG shall use SIGTRAN signaling for carrying CCS7 signalling over IP network.	Test No. 14, 14 A, 14 B, 14 C
4.3.2	TMG shall support junction testing towards PSTN/PLMN.	Verify by testing some junctions towards PSTN exchange from TMG
4.3.3	TMG shall support static or dynamic routing protocol or Layer-2 forwarding for routing or forwarding the IP packet to IP transport network.	Configure static routing in TMG. Now make call from PSTN subscriber to Soft-switch subscriber so as the call is routed through TMG. Configure dynamic routing in TMG and repeat the above test Call should be processed successfully.
4.4 4.4.1	Interface towards IP network. TMG shall support any one or any combination of the following interfaces in order to carry the packetized voice over the IP network- i) 10/100 Mbps Ethernet electrical interface as per	Test No. 15 & 16

	IEEE 802.3 ii) 10/100/1000 Mbps Ethernet optical interface as per IEEE 802.3 iii) GE optical interface as per as per IEEE 802.3 iv) 10GE optical interface as per as per IEEE 802.3	
4.4.2	The optical output power, extinction ratio, spectrum and receiver sensitivity of the Ethernet optical interfaces shall be as per IEEE 802.3.	Test No. 17, 18 & 19
4.4.3	The Ethernet electrical interfaces shall meet the Differential output voltage, AC Differential input impedance and Output Jitter tests as per IEEE 802.3.	Test No. 20
4.5	Addressing (a) TMG shall support any one of the following addressing: (i) IPv4 as per IETF RFC No 791 (ii) Dual stack i.e. IPv4 (as per IETF RFC No 791) as well as IPv6 as per IETF RFC 2460. (iii) IPv6 as per IETF RFC 2460	* Test no. 27 & 27A, for RFC 791 (Functional check) * Test no. 28 for RFC 2460 (Conformance Check)
	(b) Transport Control protocol as per IETF RFC 793	Test No. 21 (Functional Check RFC793)
4.6	For multi-media session between two or more participants, TMG shall support RFC 3261 and RFC 3264.	Test No. 21
4.7	Interface towards eMS/NMS – Interface from TMG to eMS/NMS should support SNMP/XML/CORBA etc. Protocol supported shall be specified by the applicant and the same shall be specified in TAC (after testing).	Give some commands from remote terminal and verify the protocol used between TMG and remote terminal.
4.8 4.8.1	TMG Control: TMG shall be controlled by Soft switches (of different makes) conforming to TEC GR No. GR/SW/NGN-LTS/01 or MGC using any of the	Test No. 27 and Test No. 27A (Functional check)

<table>
<tr><td></td><td>following protocol(s) -
i. MGCP
ii. H.248
Applicant can apply for any one or both of the above protocol(s) and the same shall be indicated in TAC.</td><td></td></tr>
<tr><td>4.8.2</td><td>TMG shall be controllable by at least two different softswitches/ MGCs (of different makes) in hot standby mode.</td><td>Test No. 22</td></tr>
<tr><td>4.9</td><td>Signalling transport protocol
TMG shall support following transport protocol
<table><tr><th>S. No.</th><th>Control function</th><th>Protocol</th></tr><tr><td>1</td><td>Bearer Control</td><td>• RTP, RTCP as per RFC 3550 & 3551
• cRTP (Optional) as per RFC 3545</td></tr><tr><td>2</td><td>Transport Control protocol</td><td>TCP (as per IETF RFC 793) or UDP or SCTP</td></tr></table></td><td>Test No. 21
(Functional check)</td></tr>
<tr><td>5.0
5.1</td><td>Quality Requirements:
Codec support
It shall automatically recognize the voice, FAX & data traffic coming from PSTN/PLMN and do the required compression, echo cancellation. It shall support different codecs for GSM, WCDMA, CDMA (optional) and video applications as required by the purchaser. It shall support Modem to Modem (voice band data) communication by detecting the Modem tone and switching over to suitable Encoding scheme.</td><td>Test No. 23</td></tr>
</table>

<table>
<tr>
<td>5.2</td>
<td>TMG shall support at least the following codec's as per latest ITU-T recommendations -

<table>
<tr><td></td><td>Type of service</td><td>Codec to be supported</td></tr>
<tr><td>a)</td><td>Voice Call</td><td>G.711(μlaw)
G.729 A</td></tr>
<tr><td>b)</td><td>FAX</td><td>T.38</td></tr>
<tr><td>c)</td><td>GSM Applications (Ref. G/PCS-01)</td><td>a). AMR-FR
b). AMR-HR
c). EFR
d). FR
e). HR
f). AMR-WB</td></tr>
<tr><td>d)</td><td>Video applications</td><td>H.264
H.263 (Optional)</td></tr>
<tr><td>e)</td><td>CDMA</td><td>EVRC (optional)</td></tr>
</table>
</td>
<td>Check the 'list of available Codec's' that can be used for the call set-up.

Check any additional codec, declared by Applicant

Test No. 23 & 24</td>
</tr>
<tr>
<td>5.3</td>
<td>Codec Negotiation: The Trunk media Gateway shall support the Codec negotiation in association with Softswitch which shall provide the ability for one Trunk Media Gateway to connect to other Trunk Media Gateways without necessarily knowing the type of Codec (used at the time of call set-up). It shall also support mid call detection and codec negotiation e.g. Voice call to fax call, voice call to modem call. Voice call to ISDN data call and vice versa. Any voice processing functions shall not interfere with transparent interchange of FAX signals It shall support FAX over IP as per ITU-T recommendation T.38</td>
<td>Configure codec on some trunk groups. Now modify the codec of any trunk group and make a call from analogue phone to IP phone through TMG. It shall be possible to modify the codec and call shall be processed successfully. Make a voice call. When call is in progress make a FAX call. Voice call should not be disturbed.</td>
</tr>
</table>

5.4	TMG shall support the Diffserv as per RFC No. 2474, 2475. The Trunk Media Gateway shall be able to set the Type of Service (TOS) bits depending upon the Codec, priority subscribers, incoming PSTN Ports etc.	Test No. 21
5.5	TMG shall generate voice quality deterioration alarms in case RTP characteristics go down below a configured threshold. The TMG shall not contribute to Packet Loss. The one way Delay introduced by the Trunk Media Gateway for different encoding schemes shall be as per Table I.3 of ITU-T Rec G.114. The Trunk Media Gateway shall support adaptive and configurable jitter buffer upto 50ms	Take an undertaking from the manufacturer
5.6	Echo Cancellation: It shall support integrated echo cancellations, as per ITU-T recommendations G.168 upto a configurable value of 128 ms. It shall be configurable to activate and deactivate the echo cancellation on each trunk group. Activation of Echo cancellation shall not result in decrease in number of circuits.	Test No. 25

5.7	Voice Activity Detection (VAD) and silence suppression functionality shall be integrated with voice codec. It shall be possible to activate and deactivate VAD and Silence Suppression. The Trunk Media Gateway shall support the Comfort Noise Generation and insertion. This shall not result in performance deterioration.	Take an undertaking from the manufacturer
6.0	EMI/EMC Requirements:	Certificate from accredited Lab. May be accepted
7.0	Safety Requirements:	1. A test certificate and tests

7.1 7.2 7.3	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" and A test certificate and test report shall be furnished from a test agency. The test agency for safety requirements tests shall be an ISO 17025 accredited agency and details of accreditation shall be submitted.	report shall be furnished from a test agency. 2. Test agency shall be an ISO 17025 accredited and details of accreditation shall be furnished.
8.0 8.1 8.1.1	Security Requirements: Unauthorised Access Access to system operations shall be controlled through multi-level password and authentication checks	(i) Check password management. Give different command from different user account. It should not be possible to access system without password (ii) Password should not be visible on the monitor (iii) Make a call from PSTN subscriber to IP network subscriber and access the system for some management function from console/PC. System access should not interrupt the call processing. (iv) Now make another call & during call set up phase, give some command on the system. Both command & Call should be processed successfully
8.1.2	The man-machine communication programs shall have the facility of restricting the use of certain commands or procedures to certain passwords and	Create a user "ABC' and allow only few commands to this user. Now log in from user 'ABC' ID and give some command for which he

	terminals	is not authorized. Command should be rejected.
8.1.3	It shall be possible to define users and user groups with different access rights	
8.1.4	It shall be possible to modify user password number of times.	Log in from user password. Change the password 2 to 3 times. It should be possible to do so.
8.1.5	Session ID shall be logged with information of user ID, password, time of login, commands/parameters given etc.	Check the system log. It should contain all the commands given with information of user ID, password, time of login, commands/ parameters given etc.
8.1.6	All passwords shall be stored in encrypted form and no user including 'Network Manager' shall be able to read the password.	Take undertaking from the applicant that user's account, password, authentication and registration information are transmitted in the secured form
8.1.7	The system must support 'session logout timing with configurable time periods	Log in the system and leave the terminal ideal (i.e. do not give any command). After Session logout timing, terminal shall automatically log-out.
8.1.8	The system should block the access from local as well from remote terminals after receipt of consecutive predefined (say 5) wrong login/passwords and unauthorized commands.	Try to login from user ID by giving wrong password. Try again and again. After certain number of attempts, system block the access to this user i.e. this user shall not be able to login even with correct password.
8.2	Appropriate security mechanisms for authentication, integrity and confidentiality shall be used for secured transportation through IP network as per IETF RFC 2401 and RFC 2402.	Take undertaking from the manufacturer
8.3 8.3.1	Monitoring TMG shall pose no limitation in Lawful	Provision some targets in TMG say some any one trunk group.

8.3.2	interception and monitoring TMG shall have the capability of provisioning of target, delivery of Intercept Related Information (IRI) and Call Content (CC) for the purpose of Lawful Interception.	Make some calls on this trunk group. Verify that all the calls on this trunk group, in addition to called number are routed to monitoring position (any phone may be configured as monitoring position) also.
8.3.3	In case of IP connectivity with TMG, the system shall have safe guards to prevent Denial of Service (DOS) attacks. It should be possible to configurable IP port linking it with IP address or port number interface identity (Applicable for IP interface only)	Undertaking from the manufacturer may be taken
9.0	Various requirements of category/configuration of the product for testing 1. TMG with inbuilt SG 2. TMG without SG	Information

** Physical Check/Declaration/Documentation/ Report from Accredited test lab/ Functional verification / Information / Test No.*

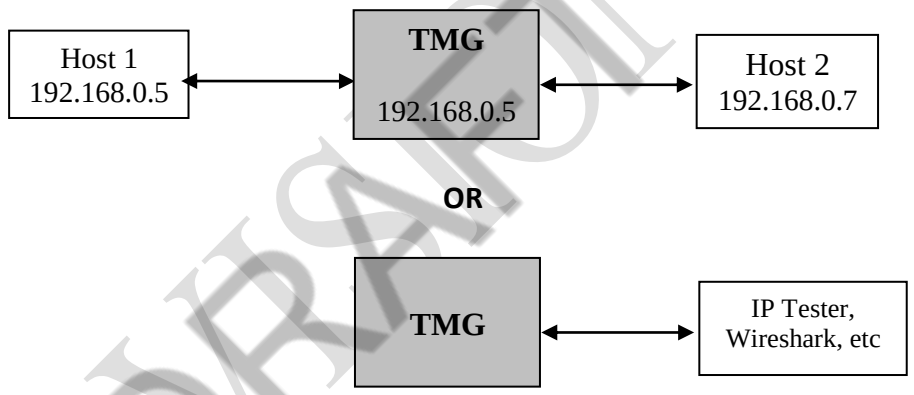
I. TEST SETUP & PROCEDURES:

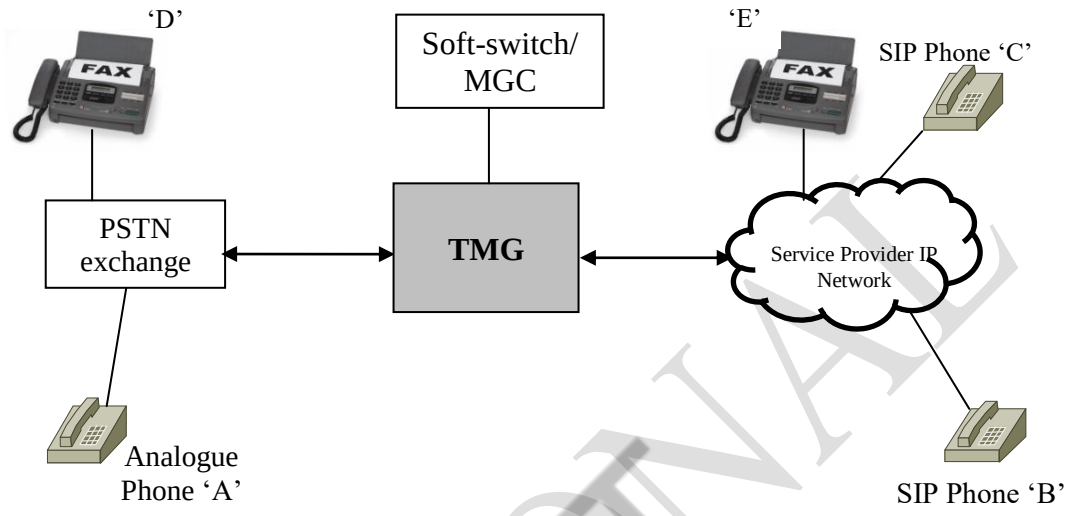
Note:

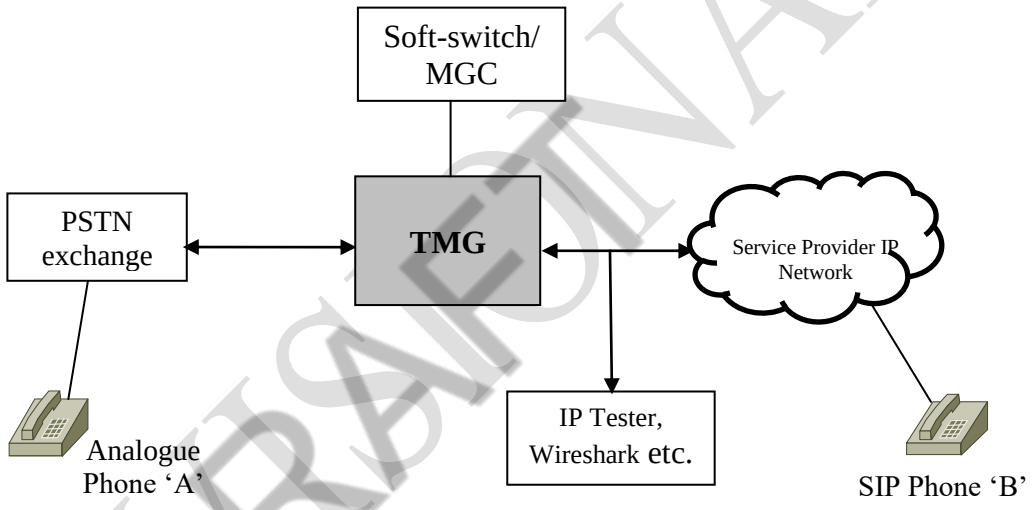
(a) The test set-up given in this document are tentative and may be changed by testing officer, taking in to account, network/testers/ analyzer/simulator availability. In case of any discrepancy between this TSTP and GR, GR clause shall prevail.

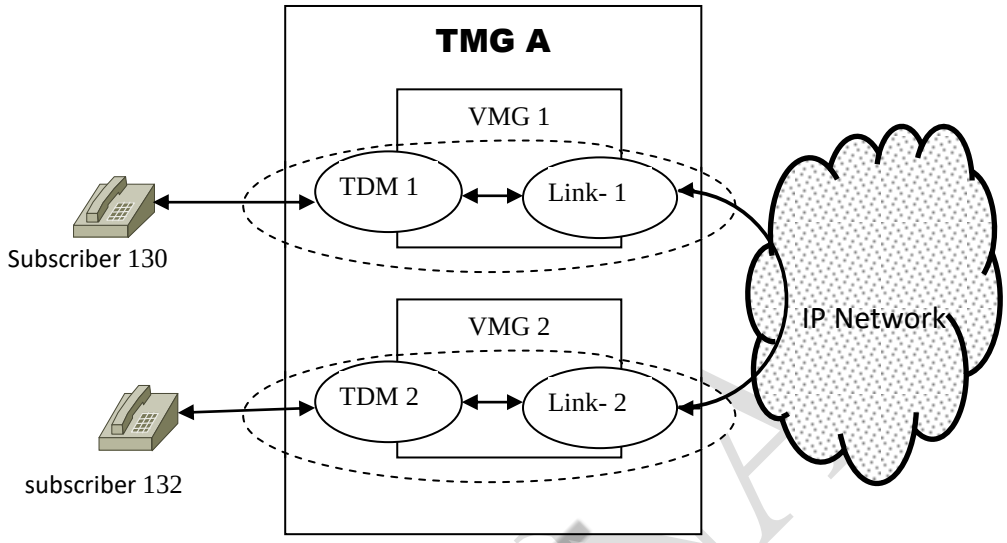
(b) Where, it is not possible to conduct the test with public network exchange/ system or main exchange connectivity is not available, simulator or any switching node may be used for testing purpose.

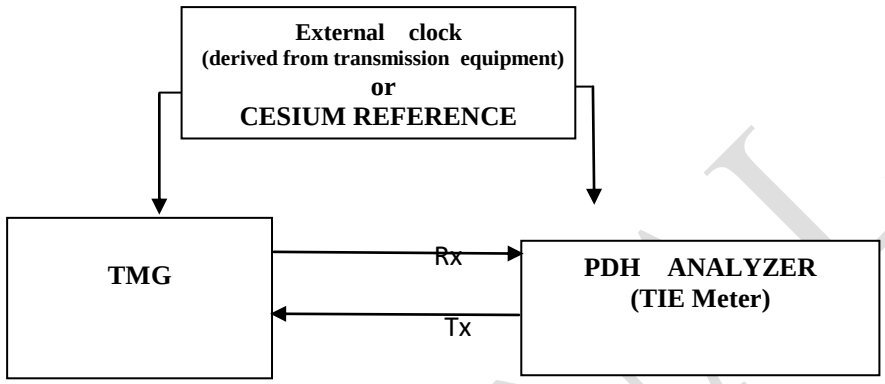
(c) Message sequence given in expected results contain messages which testing officers should look-for but it may contain some messages

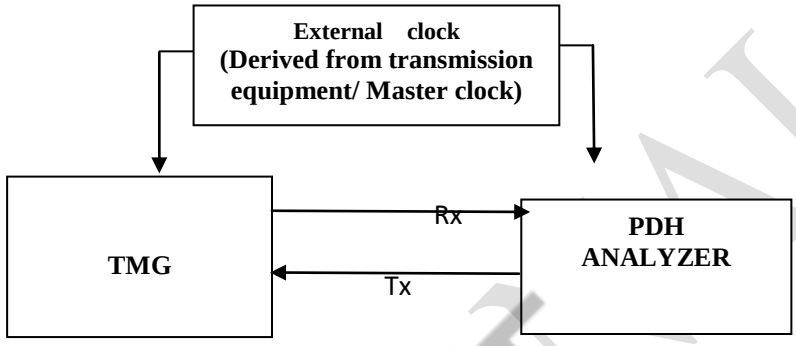
Test No.	**1**
Test Details	Clause 3.3.5 - Hair pinning
Test Setup	
Test Procedure	IP addresses given are only for illustration. Any IP address can be allotted. Let Gateway address is 192.168.0.1 Host 1: 192.168.0.5 Host 2: 192.168.0.7 The gateway has an external IP : 192.0.2.1 Now from Host 1 run P2P (Peer-to-peer) application P1 on its port 12345 which is externally mapped to 4444 From Host 2 run any P2P application P2 on its port 12345 which is externally mapped to 5555 OR Do functional check of RFC 5128
Expected Results	If TMG supports hair pinning, then P1 application can connect to the P2 application using the external endpoint 192.0.2.1:5555. If TMG does not supports hair pinning, the communication will not work.

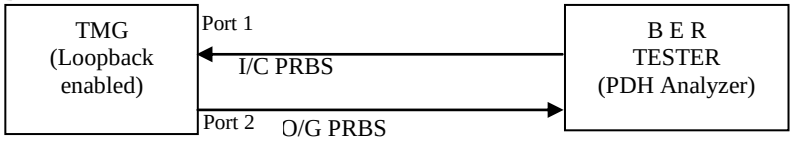
Test No.	**2**
Test Details	Clause 3.3.7 – Value added services Clause 3.4 – Tone/Announcement
Test Setup	
Test Procedure	(i) Make call from one Subscriber 'A' to Subscriber 'B' (ii) Now activate some value added services like conference, call waiting etc. (iii) Send FAX from 'D' to 'E' and vice versa (iv) Listen to tone/announcement, wherever required
Expected Results	(i) All the calls should be processed successfully (ii) All the value added services should be activated successfully (iii) FAX should be received at 'E' successfully (iv) Caller should get suitable tone/announcement

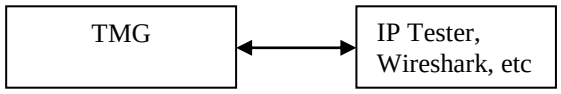
Test No.	**3**
Test Details	Clause 3.3.8 – DTMF Tones Table shows the DTMF-related event codes within the telephone-event payload format Digit — Event ID — Type 0 - 9 — 0 - 9 — Tone * — 10 — Tone # — 11 — Tone A-D — 12-15 — Tone
Test Setup	
Test Procedure	Step 1. Configured the RTP codec G.711 (a-law or u-law), DTMF Type RFC4733 and dynamic payload type (96~127) for DTMF RFC4733 Type in SIP Client-B and TMG under test. Step 2. Start SIP packets capture in IP Tester, in PC by using Wireshark, etc. Step 3. Make a call from Subscriber 'A' to SIP Client-B Step 4. Dial any valid digit (from 0-9) from Subscriber 'A' Step 5. Check the SDP body of the INVITE message sent from TMG. Step 6. Also Check the RTP-event message.
Expected Results	**Expected Result step 5** TMG MUST include media attribute telephone-event in Message body(SDP) of INVITE request. It must also include supported event types from 0 to 16 in fmtp media attribute. Verify INVITE message in packet captured. **Expected Result step 6** TMG must send the dialled DTMF digits as per Payload defined in the RFC4733 Verify RTP-event message in packet captured.

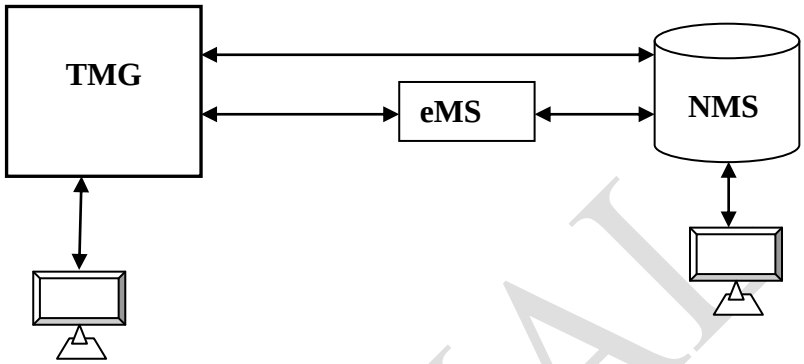
Test No.	**4**
Test Details	Clause 3.5 – Virtual Media Gateway
Test Setup	
Test Procedure	Split TMG under test (say TMG 'A') in to two virtual media gateways VMG1 & VMG2. Connect VMG1 & VMG2 to different TDM switching nodes TDM1 & TDM2 respectively. Connect analogue phone with each TDM switching node. Connect IP side of VMG1 & VMG2 with IP network with links-1 & link-2 respectively. Now make a call from subscriber 130 to subscriber 132. Call shall be routed through IP core network. **OR** If it is not possible to have above test set-up, undertaking from the applicant may be taken.
Expected Results	Verify that call from 130 to 132 is routed through IP core network.

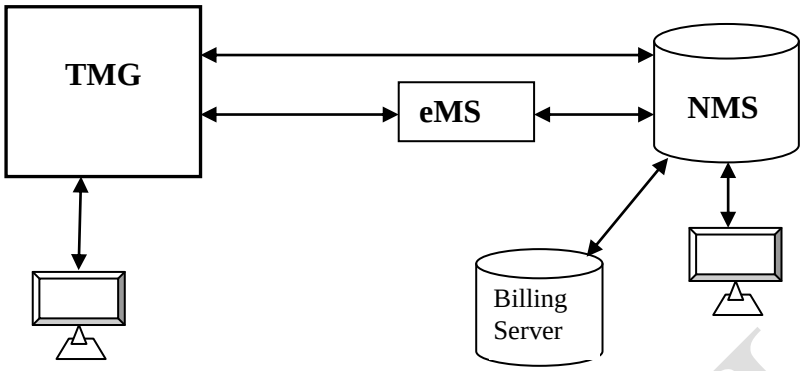
Test No.	5
Test Details	Clause 3.7.1 (Clock synchronization on E1, STM-1 and E1 external timing reference) Test for Frequency Stability in Holdover Mode
Test Instruments Required	PDH Analyzer
Test Setup	
Test Procedure	1. Connect the Setup as shown in the figure. Synchronies both the TMG & PDH Analyser (Testing equipment) as per test setup from external timing reference which may be extracted from transmission equipment.) *2. After the EUT is synchronised and stabilised, introduce the jitter in the reference input. Increase jitter amplitude upto 1.5 UI at 20 Hz. If the jitter amplitude is increased further, exchange clock will reject this input and it will go to holdover mode.* *3. The input reference should be removed and Now run the TIE measurement in holdover mode which should be started at this point for 24 Hrs.* 4. Measure Time Interval Error (TIE) on PDH analyzer *5. Clock stability should be calculated as follows:* *Clock stability= Time Interval Error (TIE)/Measurement Duration*
Test Limits	Frequency Stability in Holdover Mode. Minimum stability of clock in holdover mode shall be $1*10^{-9}$ per day. The term 'minimum stability' implies that the stability should be equal to or better than the value specified.

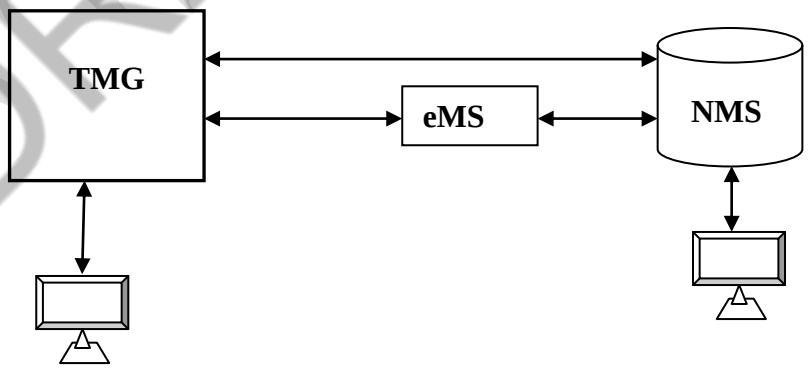
Test No.	6
Test Details	Clause 3.7.3 (Slip Rate)
Test Instruments Required	PDH Analyzer
Test Setup	
Test Procedure	1. Connect the Setup as shown in the figure. Synchronize both the TMG & PDH Analyser (Testing equipment) as per test setup from external timing reference which may be extracted from transmission equipment.) 2. After the TMG is synchronised and stabilized, run the measurement (PRBS bit pattern) which should be started at this point for 96 Hrs. 3. Measure Slip on PDH analyzer for a period of at least 96 hours of operation. In synchronised mode of operation, not more than 2 slips per day are permitted.
Test Limits	Under synchronized condition, slips observed at the given interface of tmg shall be less than or equal to 2 slips in 24 hours.

Test No.	7
Test Details	Clause 3.7.4 - Bit Error Ratio
Test Set up	
Test Procedure	*1.* Connect the Setup as shown in the figure. 2. Measure the BER using the BER tester for 48 Hrs. Also measure PRBS loss, if any 3. Check whether the BER is within limits as per clause

Test No.	*8*
Test Details	*Clause 3.7.5 – Network Time Protocol*
Test Instruments Required	*Laptop/PC*
Test Parameters	*Functional check of RFC 1305*
Test Setup	
Test Procedure	*1. Connect the test setup as shown in figure* *2. The TMG shall be configured through the CLI [Command Line Interface]* *3. The IP Packets may be observed in the IP Tester, Wireshark, etc.* *4. The test results may be recorded.*
Expected Results	*Analyze and enclose the Test Results*

Test No.	*9*
Test Details	*Clause 3.14, 3.14.1 & 3.14.2 –* *NMS (Fault management & Configuration management)*
Test Setup	 ***Note:*** If connectivity with NMS is not available, PC with software for data analysis may be used
Test Procedure	Connect TMG to NMS/TMN either directly or through eMS and do all O&M function from NMS/TMN. From O&M terminal connected to NMS system carry out the following functions- a) Configure one of the terminal for alarm & check • Remove power supply card in TMG • Create some fault in TMG by removing some card/cable • Break some links from TMG to IP exchange/Simulator • From terminal give command to configure alarm threshold limits b) Give some O&M command(s) , • Configure some PSTN trunks & IP links and allot bandwidth to some IP links. • Change the band width on any IP link. • Test some trunk circuit from the terminal
Expected Results	a) Observe on Alarm terminal • Power failure alarm should be provided on O&M terminal • O&M terminal should display status of the processors, IP link failure, etc. • It should be possible to store the said alarms • On each alarm condition, O&M terminal should display identification of faulty units with date and the time. • It should be possible to configure threshold limits from O&M terminal • It should be possible to log & brows the alarms b) All the functions should be carried out successfully

Test No.	*10*
Test Details	*Clause 3.14.3 - NMS (Accounting management)*
Test Setup	 ***Note:*** If connectivity with NMS is not available, PC with software for data analysis may be used. Instead of billing server, a PC with billing software may be used.
Test Procedure	Check that following measurements are available (either in NMS or in billing server) ▪ Number calls answered/ non- answered ▪ Traffic carried over Ethernet interface wise. ▪ RTP packets handled by TMG ▪ RTP packets handled by announcement server (optional)
Expected Results	All types of above measurements should be available Above data should be transferred to NMS automatically at specified periodic interval. This period should be configurable.

Test No.	*11*
Test Details	*Clause 3.14.4 - Performance management*
Test Setup	 ***Note:*** If connectivity with NMS is not available, PC with software for data analysis may be used.
Test Procedure	Transfer performance data from TMG to NMS
Expected Results	It should be possible to transfer performance data from TMG to NMS. All the performance related data as per clause 3.14.4 should be available.

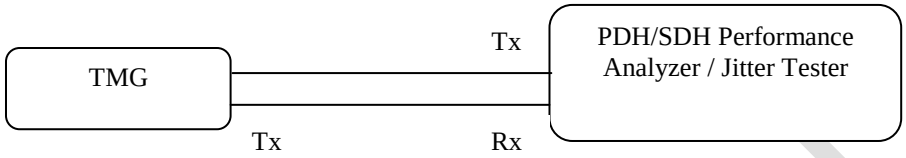
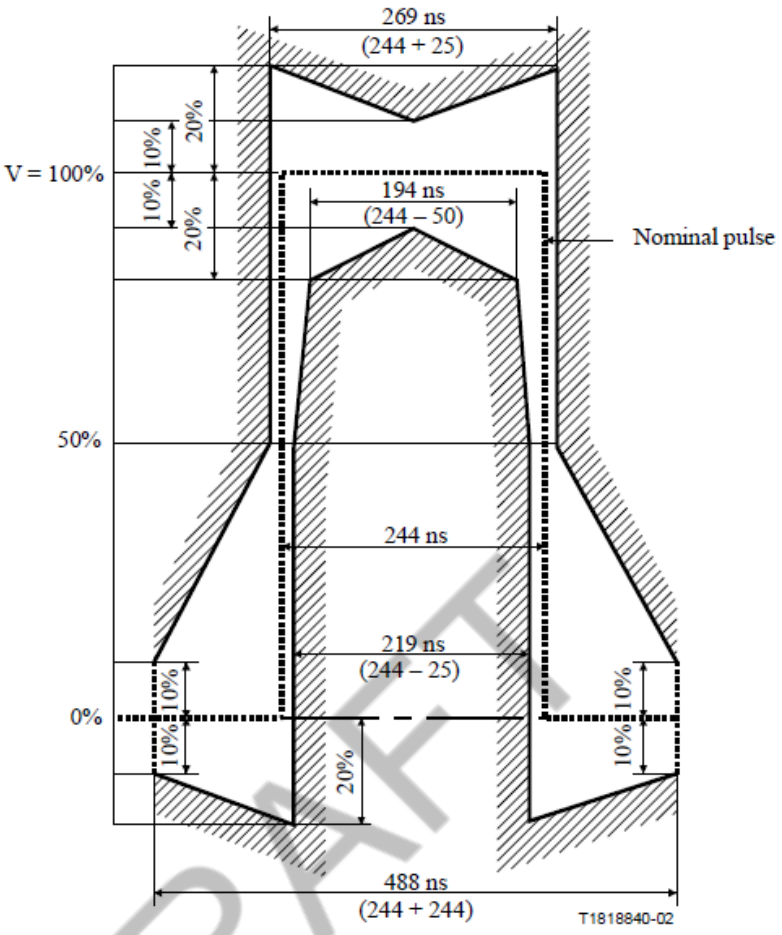
Test No.	12
Test Details	Clause 4.2 & Clause 4.2.1 - 2048 Kbps electric interface
Test Instruments Required	PDH/SDH Performance Analyser or Jitter Tester
Test Setup	PDH/SDH Interface in loopback mode Rx 
Test Limits	• Limits for Output Jitter [Maximum Permissible Jitter at Output Interfaces] for 2 Mbps interfaces Refer ITU-T standard G.703 (04.2016) Nominal bit rate: 2048 kbit/s. Bit rate accuracy: ±50 ppm (±102.4 bit/s).
Standards Reference	**Specifications at the output ports**

Table 11-1 – Digital interface at 2048 kbit/s

Parameter	Specification	
Pulse shape (nominally rectangular)	All marks of a valid signal must conform with the mask (Fig. 11-1) irrespective of sign. The value V corresponds to nominal peak vale	
Pair(s) in each direction	One coaxial pair (see clause 11.4)	One symmetrical pair (see clause 11.4)
Total load impedance	75 ohms resistive	120 ohms resistive
Nominal peak voltage of a mask (pulse)	2.37 V	3 V
Peak voltage of a space (no pulse)	0± 0.237 V	0± 0.3 V
Nominal pulse width	244 ns	
Ratio of amplitudes of positive and negative pulse at the centre of pulse interval	0.95 to 1.05	
Ratio of width of positive and negative pulse at the nominal half amplitude	0.95 to 1.05	
Maximum peak to peak jitter at an output port	Refer to clause 5.1 of ITU-T G.823	

Table 11-2 Minimum Return loss at 2 Mbps output port

Frequency range (kHz)	Return loss
51 to 102	6 db
102 to 3072	8 db



NOTE – V corresponds to the nominal peak value.

Figure 11-1/G.703 – Mask of the pulse at the 2048 kbit/s interface

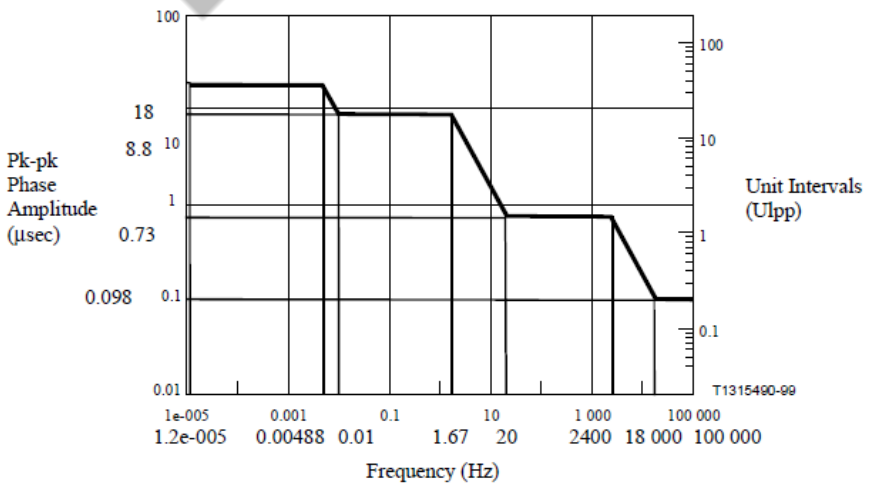
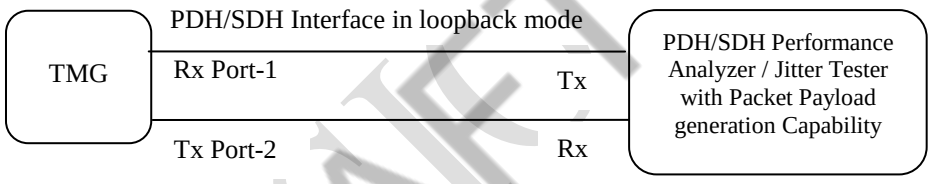
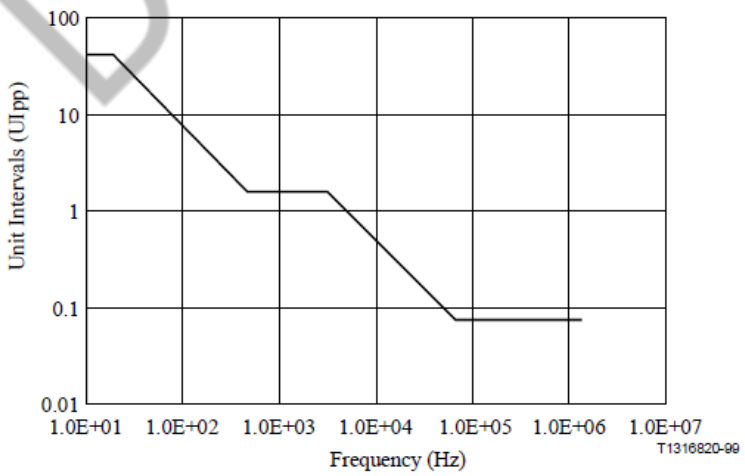


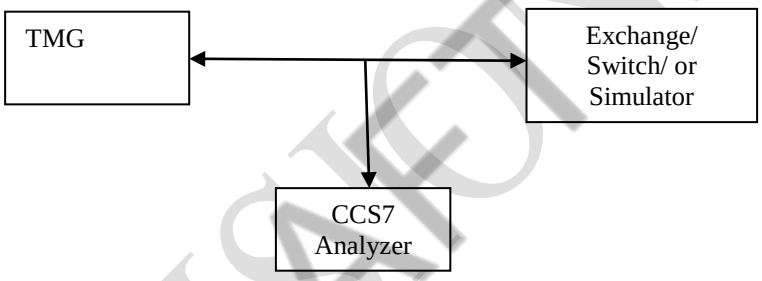
Figure 13/G.823 – 2048 kbit/s input jitter and wander tolerance limit

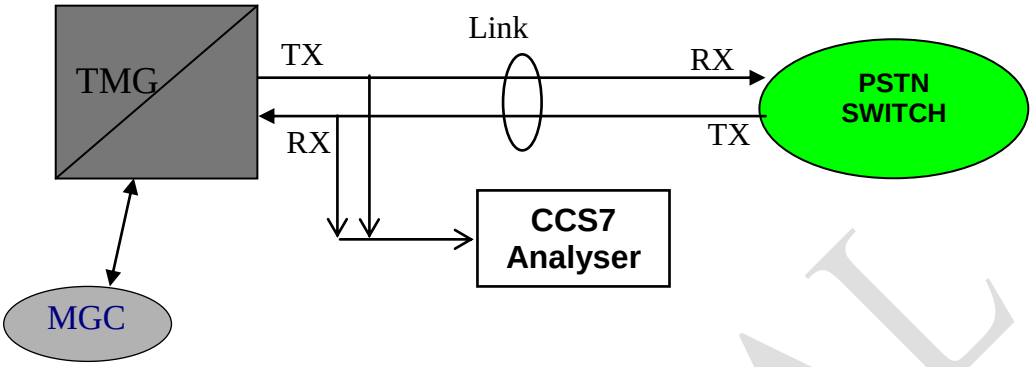
Test	1. Connect the setup as shown in the figure.

Procedure	2. Measure the output jitter on the connected PDH/SDH interface 3. Verify whether the output jitter is within the tolerance limits as specified in the relevant ITU specifications as indicated above. 4. Enclose the test results
Expected Results	Enclose the Test Results

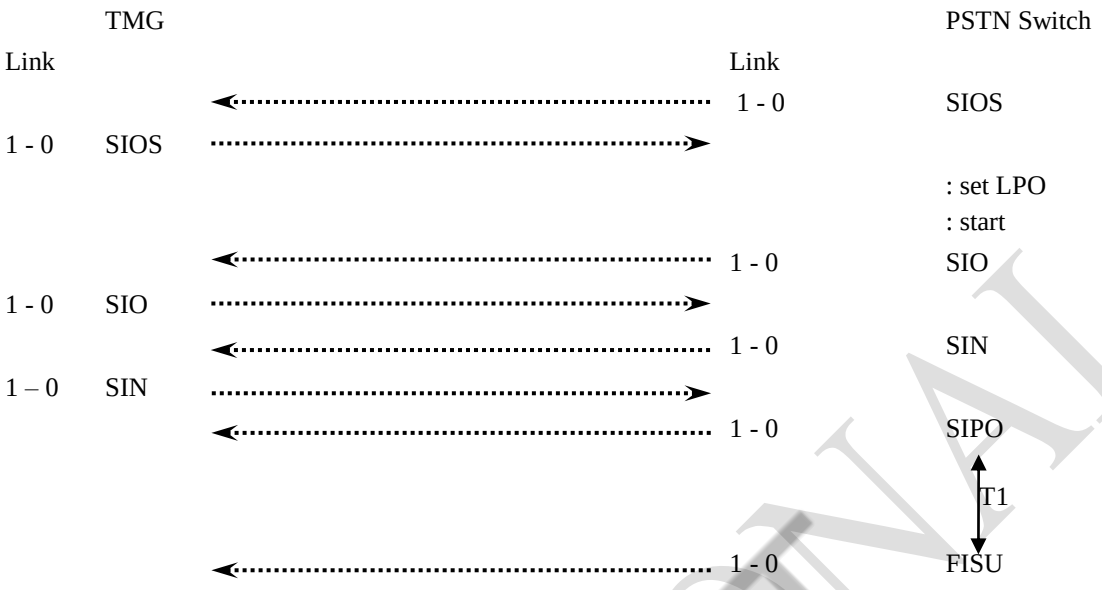
Test No.	13
Test Details	Clause 4.2 and 4.2.2 - Input Jitter Tolerance for STM1
Test Instruments Required	PDH/SDH Performance analyser with POS capability for SDH and Packet Payload Capability for PDH
Test Setup	
Test Limits	**Table 1/G.825 – Maximum permissible jitter at network interfaces** Measurement bandwidth, -3 dB frequencies (Hz) / Peak to peak amplitude (UIpp) 500 to 1.3 M / 1.5 65 K to 1.3 M / 0.15
Standard reference	 **Figure 2/G.825 – STM-1e jitter tolerance requirement (applies to 2048 kbit/s networks only)**

Test Procedure	1. Connect the setup as shown in the figure. 2. Configure the TMG with Port-1 as P-1 and Port-2 as P-2 3. Configure the POS in the SDH analyser 4. SDH analyser shall introduce Jitter over the generated packets with PRBS pattern as per G.825 5. Measure the Jitter tolerance as per the Mask and Range of frequencies 6. Take a plot of the Jitter tolerance along with the Mask 5. Measure the output jitter on the connected PDH/SDH interface 6. Verify whether the output jitter is within the tolerance limits as specified in the relevant ITU specifications as indicated above.
Expected Results	Enclose the Test Results

Test No.	14
	Clause 4.3.1 - CCS7 Signalling
Test Setup	
Tests	1. Protocol Data Check 2. MTP Level 2 Tests 3. MTP Level 3 Tests 4. ISUP Tests 5. Interface Tests
Test arrangement:	At least 2 signaling link sets should be available to check various capabilities of CCS7 signaling. A suitable CCS7 protocol Simulator and Analyser is required to be connected to IP based Integrated Media Gateway for simulating and monitoring the messages. The testing shall be carried out as per the test description given in each Test sheet of the ITU-T document given in the following Test Schedule.

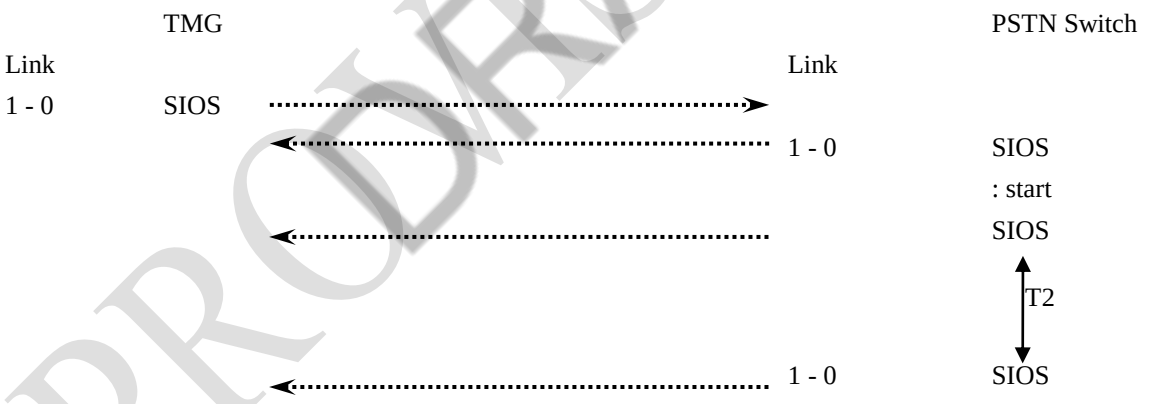
Test No.	**14 A**
Test Details	Timers
Test Setup	
Test Procedure	Start up procedure Some example are given below. For details refer to ITU-T rec. Q.781 I. Timer T1- Put the Link out of service. In PSTN switch set LPO and start link. Enter 'aligned not ready'. II. Timer T2- Not-Aligned ready Timer T2. Put the Link out of service III. Timer T3- Put the Link out of service. IV. Timer T4- Aligned ready Timer T1 & Proving Period T4. Put the Link out of service V. Timer T5- Put the Link in service- Make congestion at SCP. Check SCP sends SIB & STP receives SIBs at interval of T5. Clear congestion. SCP stops sending SIBs. VI. Timer T6- Put the Link in service. Generate MSU at SCP. Generate SIB from STP until link becomes out of service and SCP sends SIOS. VII. Timer T7- Put the Link in service. Set FISU at SCP. Generate MSU at SCP & discard MSU at STP. Do not send any acknowledgement to SCP. Link shall be taken out after T7 expires.
Expected Results	I. Refer Signal Unit sequence 1, Check SCP takes link out of service after time T1 (40 – 50 sec.) II. Refer SU sequence 2 III. Refer Signal Unit sequence 3 IV. Refer Signal Unit sequence 4 V. Refer Signal Unit sequence 5 VI. Refer Signal Unit sequence 6 VII. Refer Signal Unit sequence 7

Expected Signal Unit Sequence 1



T1 should be in range of 40 secs to 50 secs.

Expected Signal Unit Sequence 2

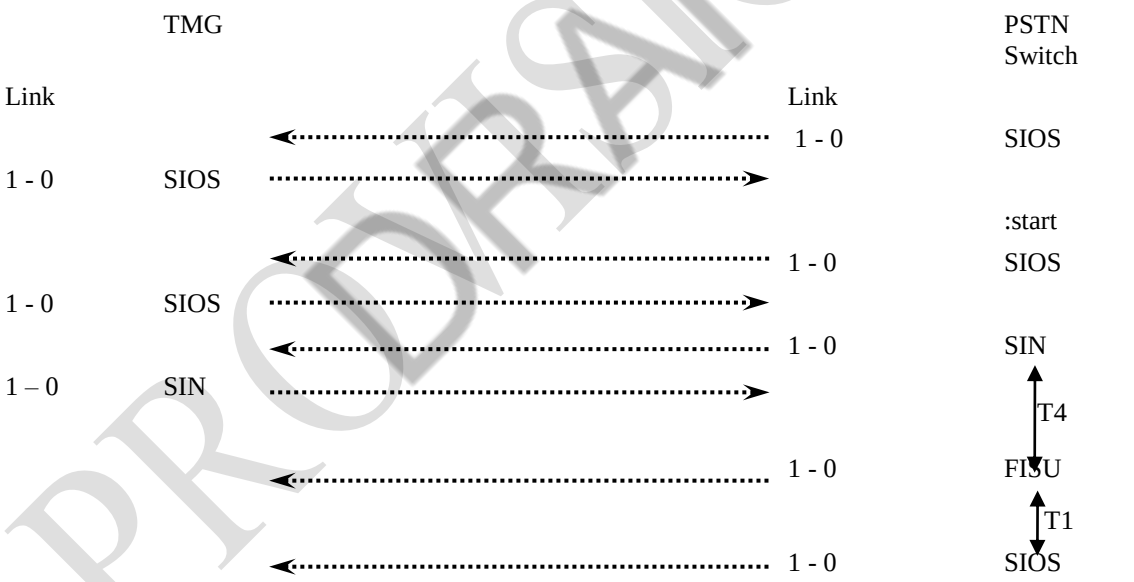


Timer T2 should be in the range 5 sec to 150 sec.

Expected Signal Unit Sequence 3

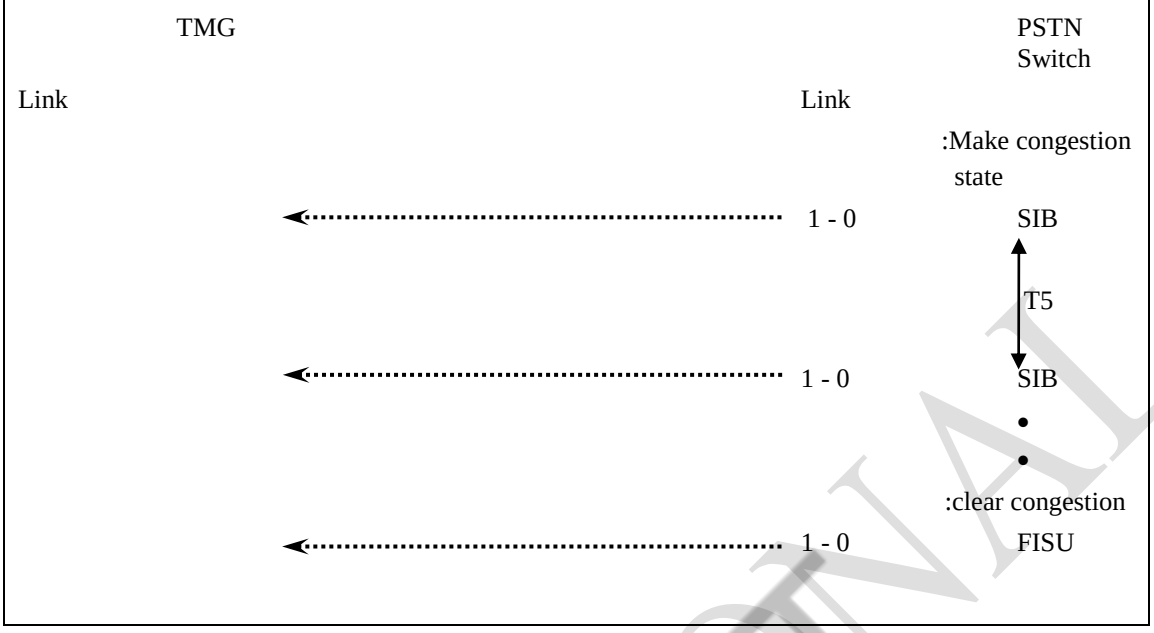
Timer T3 should be in the range 1 sec to 1.5 sec

Expected Signal Unit Sequence 4

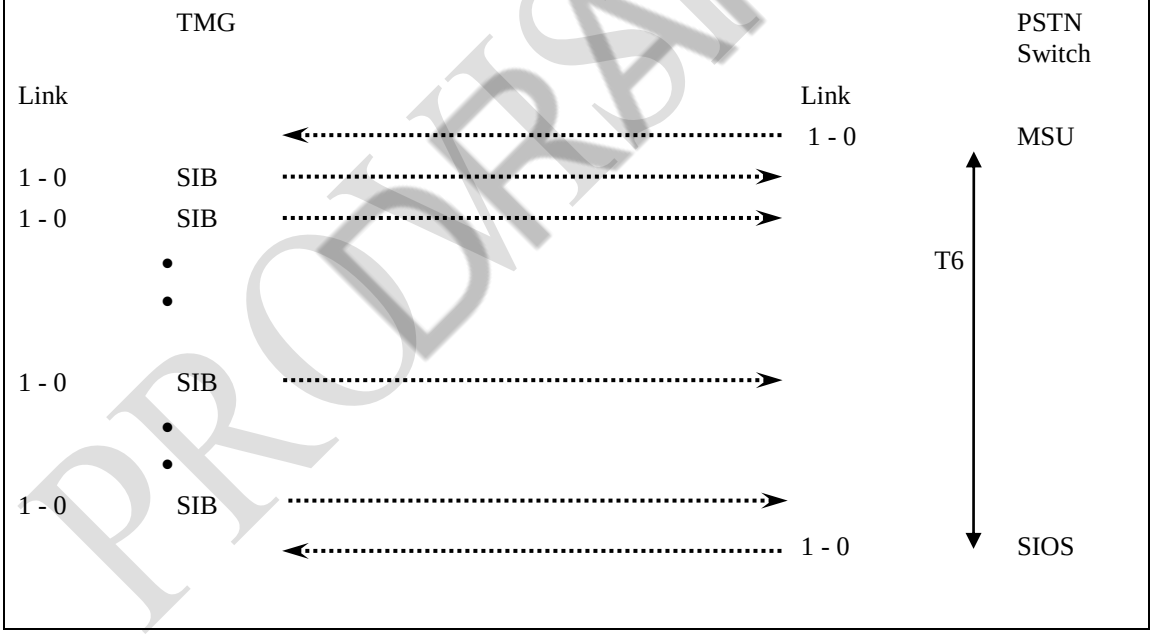


For 64 kbps
T4 should be in range of 7.5 secs to 9.5 secs.
T1 should be in range of 40 secs to 50 secs.

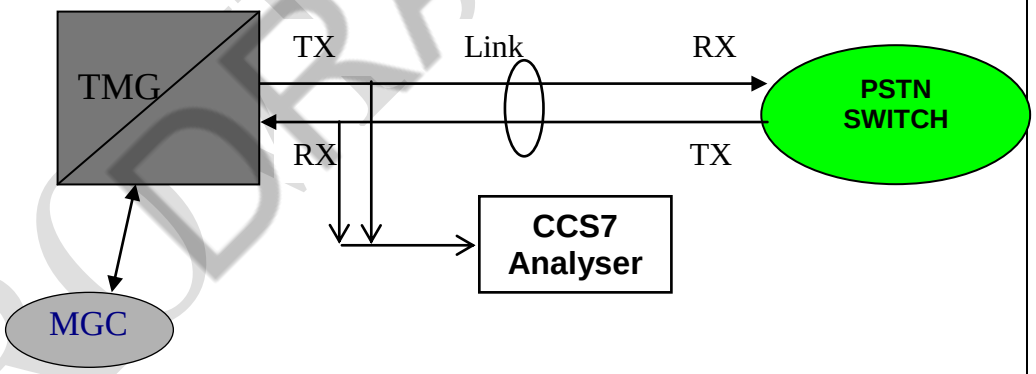
Expected Signal Unit Sequence 5



Expected Signal Unit Sequence 6

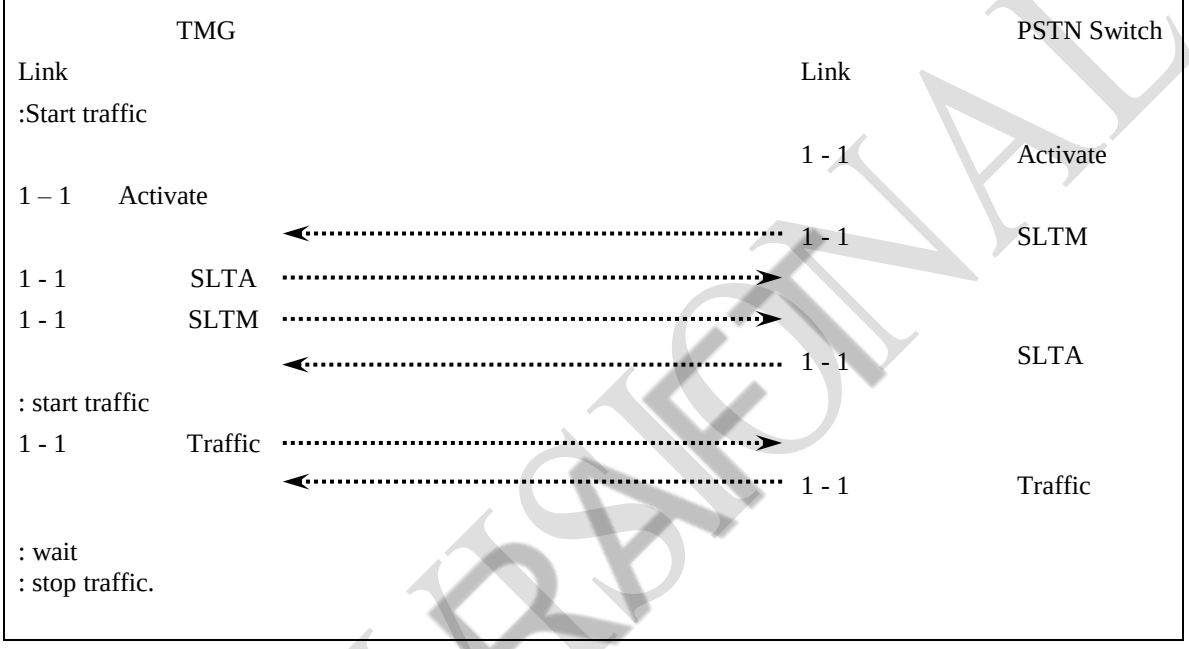


Expected Signal Unit Sequence 7				
	TMG			PSTN Switch
Link			Link	
		⟵	1 - 0	MSU
1 - 0	SIB	⟶		
1 - 0	SIB	⟶		
• •	Ct		T6	
1 - 0	SIB	⟶		
• •	Bt			
1 - 0	SIB	⟶		
		⟵	1 - 0	SIOS
Time T7 starts at reception of first SIB and ends when last SIB is received at SCP (it is less than T6)				

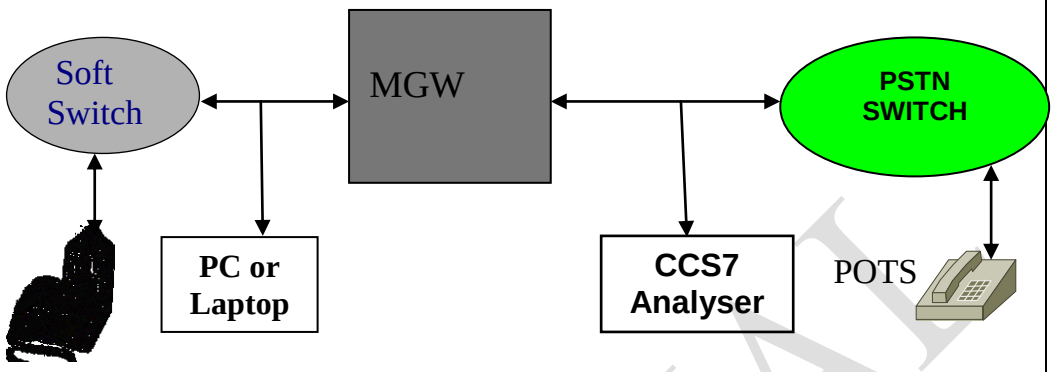
Test No.	**14 B**
Test Details	Activation/deactivation of link
Test Setup	
Test Procedure	Start up procedure Some example are given below. For details refer to ITU-T rec. Q.782 i. First signalling link activation ▪ Check that the signalling link becomes available. ▪ Check the reception and sending of variable length messages on the activated linkset from/to the PSTN Switch at the other end of this links. ▪ Check that, after the alignment, the level 2 does not send any message received before or during the deactivation. ▪ Check that all messages are correctly received (no loss of messages, no duplication and no mis-sequencing). ▪ Stop traffic. ▪ Repeat the test with different SLC values.

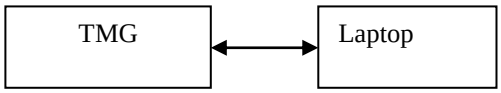
	ii. Signalling linkset deactivation Deactivate the linkset. Check that the signalling linkset becomes unavailable
Expected Results	i. Refer Signal Unit sequence 28 ii. Refer SU sequence 29

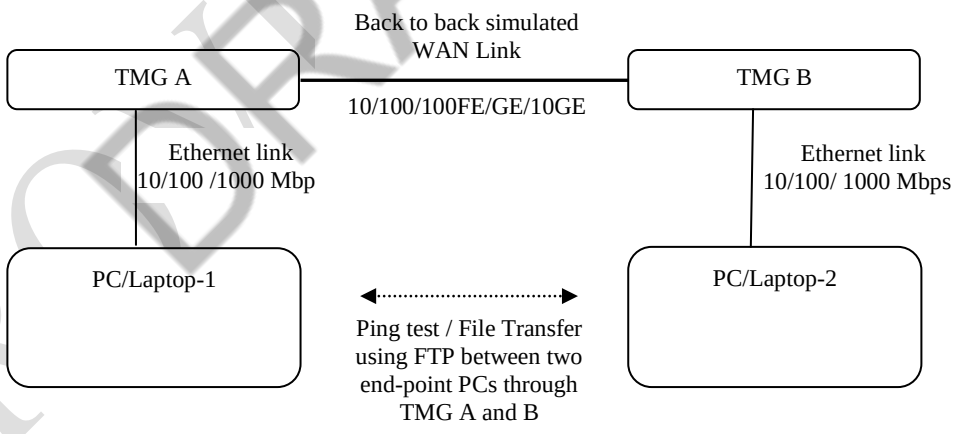
Expected Signal Unit Sequence 8



Expected Signal Unit Sequence 9			
	TMG		PSTN Switch
Link		Link	
1 – 1	Deactivate		

Test No.	**14 C**
Test Details	Signalling Message
Test Setup	 SIP Phone
Test Procedure	Make call from SIP phone to Analogue phone and vice-versa and take call trace
Expected Results	Message flow shoud be as given below
	TMG SIP Server/ Switch INVITE 100 TRYING 180 RINGING 200 OK ACK RTP/PCP BYE 200 OK
	PSTN Switch TMG IAM SAM ACM ANM REL RLC

Test No.	15
Test Details	Clause 4.4.1 Auto-negotiation Ethernet Interface
Test Instruments Required	1. Laptop
Test Setup	
Test Procedure	1. Set the Laptop Ethernet interface speed to 10Mbps and see whether the TMG is syncing with the Laptop. I.e. the Ethernet interface lamp of the Laptop shall glow. 2. Repeat the above for 100Mbps 3. Repeat the same for each type of Ethernet port e.g. 10/100 FE, 10/100/1000 FE, GE, 10 GE optical interface
Expected Results	Analyse and enclose the Screen Capture Results

Test No.	16
Test Details	Clause 4.4.1 - Availability of Service
Test Instruments Required	PC / Laptop – 2 Nos
Test Setup	
Test Procedure	1. Connect the 10/100/1000FE/GE/10GE interface as the case may be as shown in the setup. 2. Connect the PC/Laptop to the 10/100/1000Mbps link as shown 3. Configure the Interface IP of the TMG as well as the PC/Laptop 4. Carry out the Ping test from PC/Laptop-1 to PC/Laptop-2 and see whether it is reachable as well as there are no packet drop 5. Carry out file transfer from PC/Laptop-1 to PC/Laptop-2
Expected Results	Analyse and enclose the Ping Results

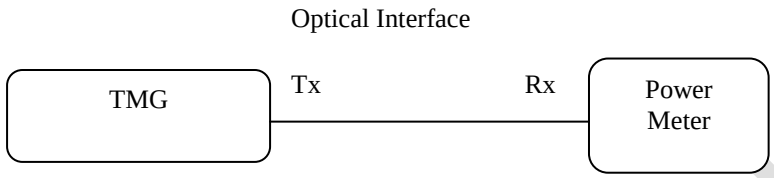
Test No.	17
Test Details	Clause 4.4.2 -Output Power [Mean Launch Power]
Test Instruments Required	Optical Power Meter
Test Setup	
Test Limits	FE Short Haul/Long Haul (100BASE-FX/SX/LX): Refer IEEE 802.3u GE Short Haul (1000BASE-SX): Refer clause 38.3.1 Transmitter optical specifications of IEEE 802.3 2008 Section-3 GE Long Haul (1000BASE-LX): Refer clause 38.4.1 Transmitter optical specifications of IEEE 802.3 2008 Section-3 10 GE Short Haul/Long Haul (10G-SR/LR/ER): Refer table 52-7 for SR, 52-12 for LR and 52-16 for ER of IEEE 802.3ae specifications
Standards Reference	**Clause 38.3.1 Transmitter optical specifications of IEEE 802.3 2008 Section-3**

Table 38–3—1000BASE-SX transmit characteristics

Description	62.5 μm MMF	50 μm MMF	Unit
Transmitter type	Shortwave Laser		
Signaling speed (range)	1.25 ± 100 ppm		GBd
Wavelength (λ, range)	770 to 860		nm
T_{rise}/T_{fall} (max; 20%-80%; λ > 830 nm)	0.26		ns
T_{rise}/T_{fall} (max; 20%-80%; λ ≤ 830 nm)	0.21		ns
RMS spectral width (max)	0.85		nm
Average launch power (max)	See footnote [a]		dBm
Average launch power (min)	–9.5		dBm
Average launch power of OFF transmitter (max)[b]	–30		dBm
Extinction ratio (min)	9		dB
RIN (max)	–117		dB/Hz
Coupled Power Ratio (CPR) (min)[c]	9 < CPR		dB

[a]The 1000BASE-SX launch power shall be the lesser of the class 1 safety limit as defined by 38.7.2 or the average receive power (max) defined by Table 38–4.

[b]Examples of an OFF transmitter are: no power supplied to the PMD, laser shutdown for safety conditions, activation of a "transmit disable" or other optional module laser shut down conditions. During all conditions when the PMA is powered, the ac signal (data) into the transmit port will be valid encoded 8B/10B patterns (this is a requirement of the PCS layers) except for short durations during system power-on-reset or diagnostics when the PMA is placed in a loopback mode.

[c]Radial overfilled launches as described in 38A.2, while they may meet CPR ranges, should be avoided.

Standards Reference

Clause 38.4.1 Transmitter optical specifications of IEEE 802.3 2008 Section-3

Table 38–7—1000BASE-LX transmit characteristics

Description	62.5 μm MMF	50 μm MMF	10 μm SMF	Unit
Transmitter type	Longwave Laser			
Signaling speed (range)	1.25 ± 100 ppm			GBd
Wavelength (range)	1270 to 1355			nm
T_{rise}/T_{fall} (max, 20-80% response time)	0.26			ns
RMS spectral width (max)	4			nm
Average launch power (max)	–3			dBm
Average launch power (min)	–11.5	–11.5	–11.0	dBm
Average launch power of OFF transmitter (max)	–30			dBm
Extinction ratio (min)	9			dB
RIN (max)	–120			dB/Hz
Coupled Power Ratio (CPR)[a]	28 < CPR< 40	12 < CPR < 20	N/A	dB

[a]Due to the dual media (single-mode and multimode) support of the LX transmitter, fulfillment of this specification requires a single-mode fiber offset-launch mode-conditioning patch cord described in 38.11.4 for MMF operation. This patch cord is not used for single-mode operation.

Standards Reference

Table 52-7 for SR of IEEE 802.3ae specifications

Table 52–7—10GBASE-S transmit characteristics

Description	10GBASE-SW	10GBASE-SR	Unit
Signaling speed (nominal)	9.95328	10.3125	GBd
Signaling speed variation from nominal (max)	± 20	± 100	ppm
Center wavelength (range)	840 to 860		nm
RMS spectral width[a] (max)	See footnote[b]		
Average launch power (max)	See footnote[c]		
Average launch power[d] (min)	–7.3		dBm
Launch power (min) in OMA	See footnote[b]		
Average launch power of OFF transmitter[e] (max)	–30		dBm
Extinction ratio (min)	3		dB
$RIN_{12}OMA$ (max)	–128		dB/Hz
Optical Return Loss Tolerance (max)	12		dB
Encircled flux	See footnote[f]		
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.25, 0.40, 0.45, 0.25, 0.28, 0.40}		
Transmitter and dispersion penalty[g] (max)	3.9 dB		dB

[a]RMS spectral width is the standard deviation of the spectrum.
[b]Trade-offs are available between spectral width, center wavelength and minimum optical modulation amplitude. See Figure 52–3 and Table 52–8.
[c]The 10GBASE-S launch power shall be the lesser of the class 1 safety limit as defined by 52.10.2 or the average receive power (max) defined by Table 52–9.
[d]Average launch power (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
[e]Examples of an OFF transmitter are: no power supplied to the PMD, laser shutdown for safety conditions, activation of a PMD_global_transmit_disable or other optional transmitter shut down conditions.
[f]The encircled flux at 19 μm shall be greater than or equal to 86% and the encircled flux at 4.5 μm shall be less than or equal to 30% when measured into Type A1a (50/125 μm multimode) fiber per ANSI/TIA/EIA-455-203-2001.
[g]TDP(max) and OMA(min) are at the respective wavelength and spectral width as specified in Table 52–8.

Standards Reference

Table 52-12 for LR of IEEE 802.3ae specifications

Table 52–12—10GBASE-L transmit characteristics

Description	10GBASE-LW	10GBASE-LR	Unit
Signaling speed (nominal)	9.95328	10.3125	GBd
Signaling speed variation from nominal (max)	± 20	± 100	ppm
Center wavelength (range)	1260 to 1355		nm
Side Mode Suppression Ratio (min)	30		dB
Average launch power (max)	0.5		dBm
Average launch power[a] (min)	–8.2		dBm
Launch power (min) in OMA minus TDP[b]	–6.2		dBm
Optical Modulation Amplitude[c] (min)	–5.2		dBm
Transmitter and dispersion penalty (max)	3.2		dB
Average launch power of OFF transmitter[d] (max)	–30		dBm
Extinction ratio (min)	3.5		dB
$RIN_{12}OMA$ (max)	–128		dB/Hz
Optical Return Loss Tolerance (max)	12		dB
Transmitter Reflectance[e] (max)	–12		dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.25, 0.40, 0.45, 0.25, 0.28, 0.40}		

[a]Average launch power (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
[b]TDP is transmitter and dispersion penalty.
[c]Even if the TDP < 1 dB, the OMA(min) must exceed this value.
[d]Examples of an OFF transmitter are: no power supplied to the PMD, laser shutdown for safety conditions, activation of a PMD_global_transmit_disable or other optional transmitter shut down conditions.
[e]Transmitter reflectance is defined looking into the transmitter.

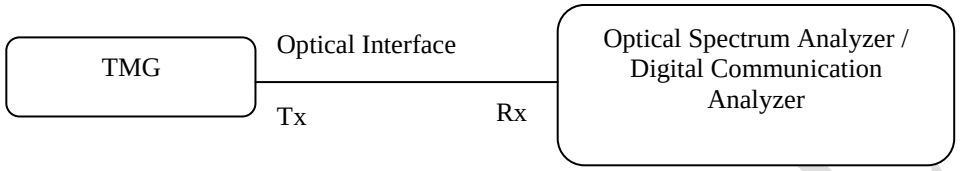
Standards Reference

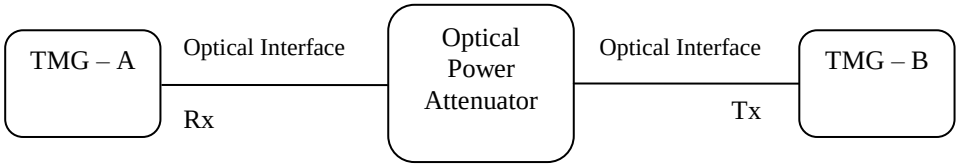
Table 52-16 for ER of IEEE 802.3ae specifications

Table 52–16—10GBASE-E transmit characteristics

Description	10GBASE-EW	10GBASE-ER	Unit
Signaling speed (nominal)	9.95328	10.3125	GBd
Signaling speed variation from nominal (max)	± 20	± 100	ppm
Center wavelength (range)	1530 to 1565		nm
Side Mode Suppression Ratio (min)	30		dB
Average launch power (max)	4.0		dBm
Average launch power[a] (min)	–4.7		dBm
Launch power (min) in OMA minus TDP[b]	–2.1		dBm
Average launch power of OFF transmitter[c] (max)	–30		dBm
Optical Modulation Amplitude[d] (min)	–1.7		dBm
Transmitter and dispersion penalty (max)	3.0		dB
Extinction ratio (min)	3		dB
$RIN_{21}OMA$[e] (max)	–128		dB/Hz
Optical Return Loss Tolerance (max)	21		dB
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}	{0.25, 0.40, 0.45, 0.25, 0.28, 0.40}		

[a]Average launch power (min) is informative and not the principal indicator of signal strength. A transmitter with launch power below this value cannot be compliant; however, a value above this does not ensure compliance.
[b]TDP is transmitter and dispersion penalty.
[c]Examples of an OFF transmitter are: no power supplied to the PMD, laser shutdown for safety conditions, activation of a PMD_global_transmit_disable or other optional transmitter shut-down conditions.
[d]Even if the TDP < 0.4 dB, the OMA(min) must exceed this value.
[e]RIN measurement is made with a return loss at 21 dB.

<table>
<tr><td>Test No.</td><td>18</td></tr>
<tr><td>Test Details</td><td>Clause 4.4.2 - Wavelength/Spectrum / Extinction Ratio</td></tr>
<tr><td>Test Instruments Required</td><td>Optical Spectrum Analyser or Digital Communication Analyser</td></tr>
<tr><td>Test Setup</td><td> 
</td></tr>
<tr><td>Test Limits</td><td><table>
<tr><td>FE Short Haul/Long Haul (100BASE-FX/SX/LX)</td><td>Refer IEEE 802.3u</td></tr>
<tr><td>GE Short Haul (1000BASE-SX)</td><td>Refer clause 38.3.1 Transmitter optical specifications of IEEE 802.3 2008 Section-3</td></tr>
<tr><td>GE Long Haul (1000BASE-LX)</td><td>Refer clause 38.4.1 Transmitter optical specifications of IEEE 802.3 2008 Section-3</td></tr>
<tr><td>10 GE Short Haul/Long Haul (10G-SR/LR/ER)</td><td>Refer table 52-7 for SR, 52-12 for LR and 52-16 for ER of IEEE 802.3ae specifications</td></tr>
</table></td></tr>
<tr><td>Standards Reference</td><td>Refer the Standards References in Test 17</td></tr>
<tr><td>Test Procedure</td><td>1. Connect the Setup as shown in the figure.
2. Enable the output Optical Port
3. Measure the Wavelength/Spectrum / Extinction Ratio
4. Check whether the Wavelength/Spectrum / Extinction Ratio is within the specification limits</td></tr>
<tr><td>Expected Results</td><td>Analyse and enclose the Test Results</td></tr>
</table>

Test No.	19
Test Details	Test for Receiver Sensitivity
Test Setup	

Test Limits		
	FE Short Haul/Long Haul (100BASE-FX/SX/LX)	Refer IEEE 802.3u
	GE Short Haul (1000BASE-SX)	Refer clause 38.3.2 Receiver optical specifications of IEEE 802.3 2008 Section-3
	GE Long Haul (1000BASE-LX)	Refer clause 38.4.2 Receiver optical specifications of IEEE 802.3 2008 Section-3
	10 GE Short Haul/Long Haul (10G-SR/LR/ER)	Refer table 52-9 for SR, 52-13 for LR and 52-17 for ER of IEEE 802.3ae specifications

Standards Reference

Clause 38.3.2 Receiver optical specifications of IEEE 802.3 2008 Section-3

Table 38–4—1000BASE-SX receive characteristics

Description	62.5 μm MMF	50 μm MMF	Unit
Signaling Speed (range)	1.25 ± 100 ppm		GBd
Wavelength (range)	770 to 860		nm
Average receive power (max)	0		dBm
Receive sensitivity	–17		dBm
Return loss (min)	12		dB
Stressed receive sensitivity[a, b]	–12.5	–13.5	dBm
Vertical eye-closure penalty[c]	2.60	2.20	dB
Receive electrical 3 dB upper cutoff frequency (max)	1500		MHz

[a]Measured with conformance test signal at TP3 (see 38.6.11) for BER = 10^{-12} at the eye center.
[b]Measured with a transmit signal having a 9 dB extinction ratio. If another extinction ratio is used, the stressed receive sensitivity should be corrected for the extinction ratio penalty.
[c]Vertical eye-closure penalty is a test condition for measuring stressed receive sensitivity. It is not a required characteristic of the receiver.

Standards Reference

Clause 38.4.2 Receiver optical specifications of IEEE 802.3 2008 Section-3

Table 38–8—1000BASE-LX receive characteristics

Description	Value	Unit
Signaling speed (range)	1.25 ± 100 ppm	GBd
Wavelength (range)	1270 to 1355	nm
Average receive power (max)	–3	dBm
Receive sensitivity	–19	dBm
Return loss (min)	12	dB
Stressed receive sensitivity[a, b]	–14.4	dBm
Vertical eye-closure penalty[c]	2.60	dB
Receive electrical 3 dB upper cutoff frequency (max)	1500	MHz

[a]Measured with conformance test signal at TP3 (see 38.6.11) for BER = 10^{-12} at the eye center.
[b]Measured with a transmit signal having a 9 dB extinction ratio. If another extinction ratio is used, the stressed receive sensitivity should be corrected for the extinction ratio penalty.
[c]Vertical eye-closure penalty is a test condition for measuring stressed receive sensitivity. It is not a required characteristic of the receiver.

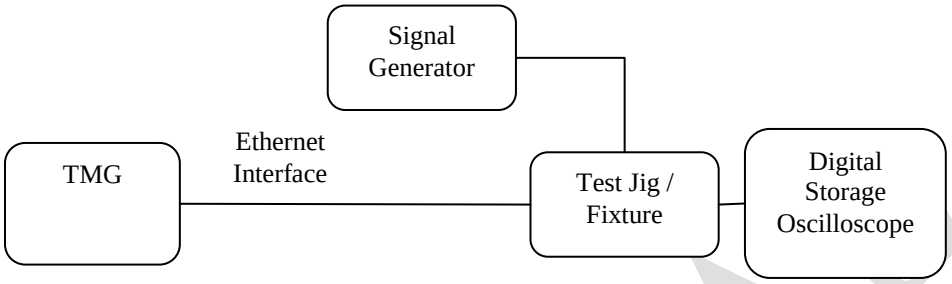
Standards Reference

Table 52-9 for SR of IEEE 802.3ae specifications

Table 52–9—10GBASE-S receive characteristics

Description	10GBASE-S	Unit
Signaling speed (nominal) 10GBASE-SR 10GBASE-SW	 10.3125 9.95328	GBd
Signaling speed variation from nominal (max)	± 100	ppm
Center wavelength (range)	840 to 860	nm
Average receive power[a] (max)	–1.0	dBm
Average receive power[b] (min)	–9.9	dBm
Receiver sensitivity (max) in OMA[c]	0.077 (–11.1)	mW (dBm)
Receiver Reflectance (max)	–12	dB
Stressed receiver sensitivity in OMA[d] [e](max)	0.18 (–7.5)	mW (dBm)
Vertical eye closure penalty[f] (min)	3.5	dB
Stressed eye jitter[g] (min)	0.3	UI pk-pk
Receive electrical 3 dB upper cutoff frequency (max)	12.3	GHz

[a]The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having a power level equal to the Average Receive Power (max) plus at least 1 dB.
[b]Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
[c]Receiver sensitivity is informative.
[d]Measured with conformance test signal at TP3 (see 52.9.9.2) for BER = 10^{-12}.
[e]The stressed sensitivity values in the table are for system level BER measurements which include the effects of CDR circuits. It is recommended that at least 0.4 dB additional margin be allocated if component level measurements are made without the effect of CDR circuits
[f]Vertical eye closure penalty is a test condition for measuring stressed receiver sensitivity. It is not a required characteristic of the receiver.
[g]Stressed eye jitter is a test condition for measuring stressed receiver sensitivity. It is not a required characteristic of the receiver.

<table>
<tr><td>Test No.</td><td>20</td></tr>
<tr><td>Test Details</td><td>Clause 4.4.3
1. Differential output voltage
2. AC Differential input impedance
3. Output Jitter</td></tr>
<tr><td>Test Setup</td><td> 
</td></tr>
<tr><td>Test Limits</td><td>
<table>
<tr><td>Differential output voltage, loaded 10Base-T</td><td>Refer 14.3.1.2.1of IEEE802.3 Section-1 Differential output voltage</td></tr>
<tr><td>Differential output voltage, 100Base-T</td><td>Refer 23.5.1.2.1 of IEEE802.3 Section-2 Peak differential output voltage</td></tr>
<tr><td>Differential output voltage, loaded 1000Base-T</td><td>Refer 40.6.1.2.1 of IEEE802.3 Section-3 Peak differential output voltage</td></tr>
<tr><td>Differential input impedance - 10Base-T</td><td>Refer 14.3.1.3.4 of IEEE802.3 Section-1AC differential input impedance</td></tr>
<tr><td>Receiver differential input impedance - 100Base-T</td><td>Refer 23.5.1.3.3 of IEEE802.3 Section-2 Receiver differential input impedance</td></tr>
<tr><td>10Base-T Output timing Jitter</td><td>Refer 14.3.1.2.3of IEEE802.3 Section 3 Output timing jitter</td></tr>
<tr><td>100base-T Output timing Jitter</td><td>Refer 23.5.1.2.5 of IEEE802.3 Section 3 Output timing jitter</td></tr>
<tr><td>1000Base-T Transmitter output Jitter</td><td>Refer 40.6.1.2.6 of IEEE802.3 Section 3 Transmitter Timing Jitter</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure</td><td>1. Connect the test setup as shown in figure to each type of Ethernet interface applied (one by one).
2. The test Jig / Fixture is an electronics hardware attached to the oscilloscope / Network analyser for the measurement of Ethernet parameters
3. Measure the Ethernet parameters</td></tr>
<tr><td>Expected Results</td><td>Analyse and enclose the Test Results</td></tr>
<tr><td>Note:</td><td>Tests can be conducted with IP Tester, Wireshark software in a PC/Laptop, etc.
In case it is not possible to carry out the tests as above, the test results from any one of the following options can be accepted.
• Results from any Indian/Foreign lab accredited as per ISO 17025 and having Ethernet Physical interface testing included in the scope of accreditation
• In house test results of the Equipment Under Test (EUT) in case of Foreign OEM
• In house test results of the Ethernet chipsets used in the TMG, from the OEM of the Ethernet chipset. The physical availability of the Ethernet Chipset in the TMG shall be verified by the testing officer. The following remark shall be indicated in the TAC.
“The chipset number/code of the Ethernet chipset used in the equipment offered for testing: ……”</td></tr>
</table>

Standard Refrences

Table 52-13 for LR of IEEE 802.3ae specifications

Table 52–13—10GBASE-L receive characteristics

Description	10GBASE-L	Unit
Signaling speed (nominal) 10GBASE-LR 10GBASE-LW	 10.3125 9.95328	GBd
Signaling speed variation from nominal (max)	± 100	ppm
Center wavelength (range)	1260 to 1355	nm
Average receive power[a] (max)	0.5	dBm
Average receive power[b] (min)	–14.4	dBm
Receiver sensitivity (max) in OMA[c]	0.055 (-12.6)	mW (dBm)
Receiver Reflectance (max)	–12	dB
Stressed receiver sensitivity (max) in OMA[d, e]	0.093 (–10.3)	mW (dBm)
Vertical eye closure penalty[f] (min)	2.2	dB
Stressed eye jitter[g] (min)	0.3	UI pk-pk
Receive electrical 3 dB upper cutoff frequency (max)	12.3	GHz

[a]The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having a power level equal to the Average Receive Power (max) plus at least 1 dB.
[b]Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
[c]Receiver sensitivity is informative.
[d]Measured with conformance test signal at TP3 (see 52.9.9.2) for BER = 10^{-12}.
[e]The stressed sensitivity values in the table are for system level BER measurements which include the effects of CDR circuits. It is recommended that at least 0.4 dB additional margin be allocated if component level measurements are made without the effect of CDR circuits.
[f]Vertical eye closure penalty is a test condition for measuring stressed receiver sensitivity. It is not a required characteristic of the receiver.
[g]Stressed eye jitter is a test condition for measuring stressed receiver sensitivity. It is not a required characteristic of the receiver.

Standard Refrences

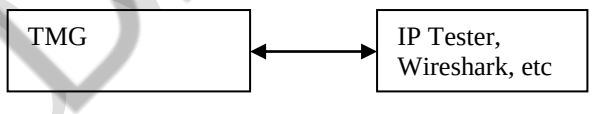
Table 52-17 for ER of IEEE 802.3ae specifications

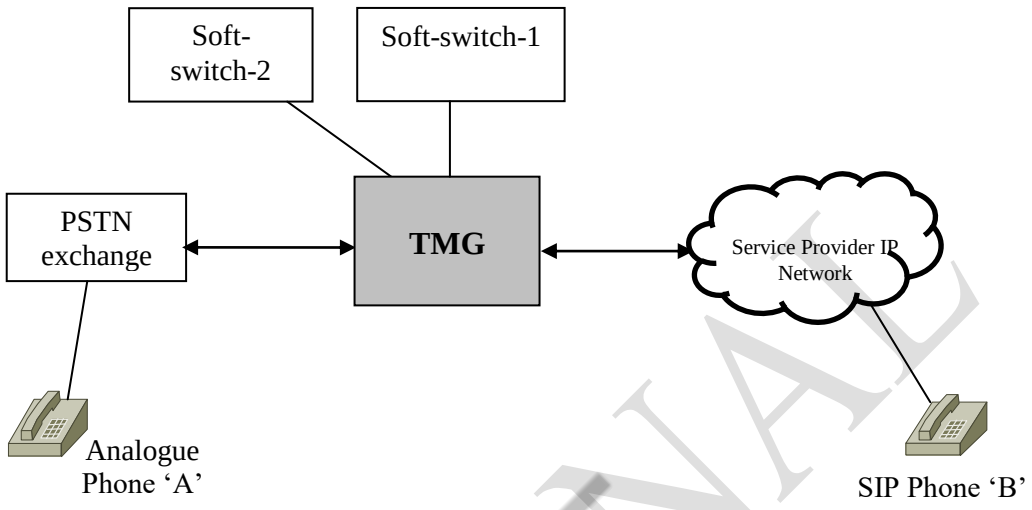
Table 52–17—10GBASE-E receive characteristics

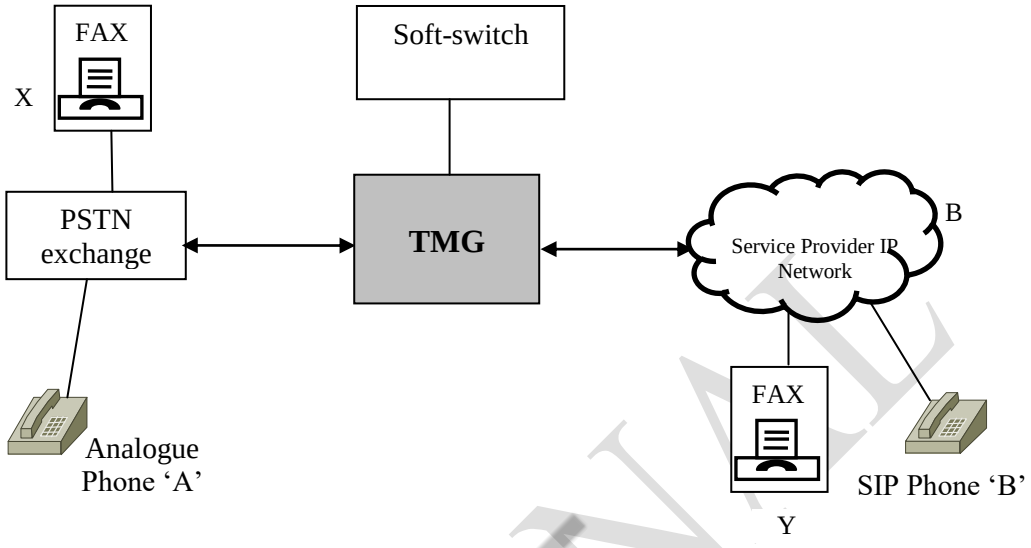
Description	10GBASE-E	Unit
Signaling speed (nominal) 10GBASE-ER 10GBASE-EW	 10.3125 9.95328	GBd
Signaling speed variation from nominal (max)	± 100	ppm
Center wavelength (range)	1530 to 1565	nm
Average receive power (max)	–1.0	dBm
Average receive power[a] (min)	–15.8	dBm
Maximum receive power (for damage)	4.0	dBm
Receiver sensitivity (max) in OMA[b]	0.039 (–14.1)	mW (dBm)
Receiver Reflectance (max)	–26	dB
Stressed receiver sensitivity (max) in OMA[c,d]	0.074 (-11.3)	mW (dBm)
Vertical eye closure penalty[e] (min)	2.7	dB
Stressed eye jitter (min)[f]	0.3	UI pk-pk
Receive electrical 3 dB upper cutoff frequency (max)	12.3	GHz

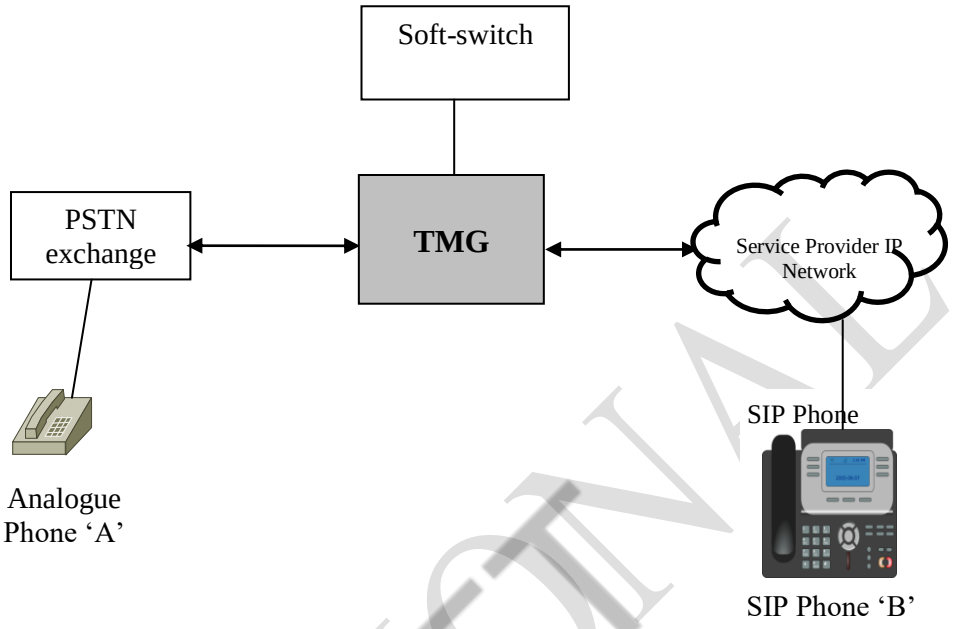
[a]Average receive power (min) is informative and not the principal indicator of signal strength. A received power below this value cannot be compliant; however, a value above this does not ensure compliance.
[b]Receiver sensitivity is informative.
[c]Measured with conformance test signal at TP3 (see 52.9.9.2) for BER = 10^{-12}.
[d]The stressed sensitivity values in the table are for system level BER measurements which include the effects of CDR circuits. It is recommended that at least 0.4 dB additional margin be allocated if component level measurements are made without the effects of CDR circuits.
[e]Vertical eye closure penalty is a test condition for measuring stressed receiver sensitivity. It is not a required characteristic of the receiver.
[f]Stressed eye jitter is a test condition for measuring stressed receiver sensitivity. It is not a required characteristic of the receiver.

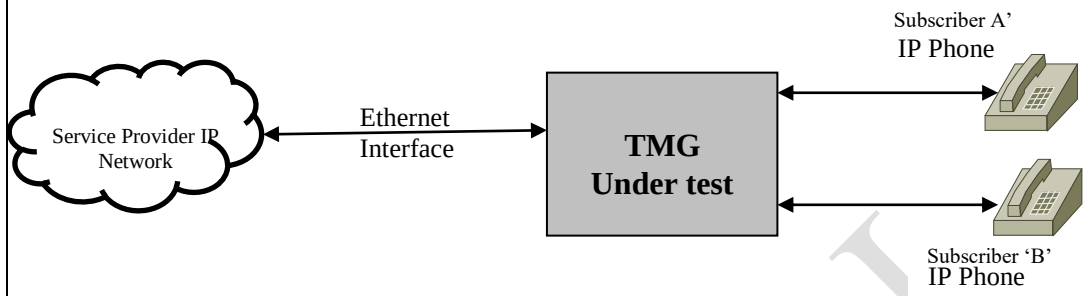
Test Procedure	1. Connect the setup as shown in the figure above. 2. Configure EUT B for sending packets to EUT A 3. Enable the output Optical Port of EUT B 4. Adjust the Optical Power Attenuator 5. Measure the Receiver Sensitivity 6. Verify whether the Receiver Sensitivity is within limits. 7. In case of Ethernet Optical Ports verify whether the Output Power / Receiver Sensitivity combination is able to meet the distance criteria requirements
Expected Results	Analyse and enclose the Test Results

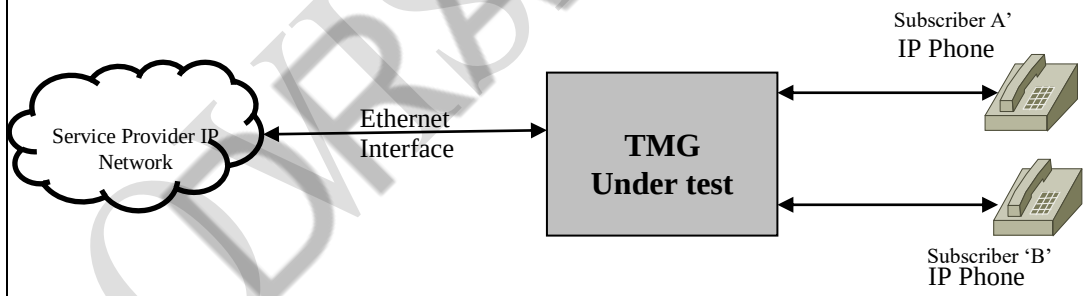
Test No.	21
Test Details	(i) Clause no. 4.5(b) Functional check of RFC 793 using IP Tester, Wireshark etc (ii) Clause 4.6 – Multi-media session Functional check of RFC 3261 & 3264 (iii) Clause 4.9 Transport protocol Functional check of RFC 3550, 3551 & 793 (iv) Clause 5.4- Diffser & TOS Functional check of RFC 2474 & RFC 2475
Test Parameters	Test the following ((Check relevant RFCs as per applicant's application) 1. TCP as per RFC 793 2. RFC 3261 3. RFC 3264 4. RFC 2474 5. RFC 2475
Test Setup	
Test Procedure	1. Connect the test setup as shown in figure 2. The TMG shall be configured through the CLI [Command Line Interface] or SNMP interface for the TCP & UDP test. 3. The IP Packets may be observed in the IP Tester ,Wireshark, etc for TCP/UDP Compliance 4. The test results may be recorded.
Expected Results	Analyse & enclose the Test Results

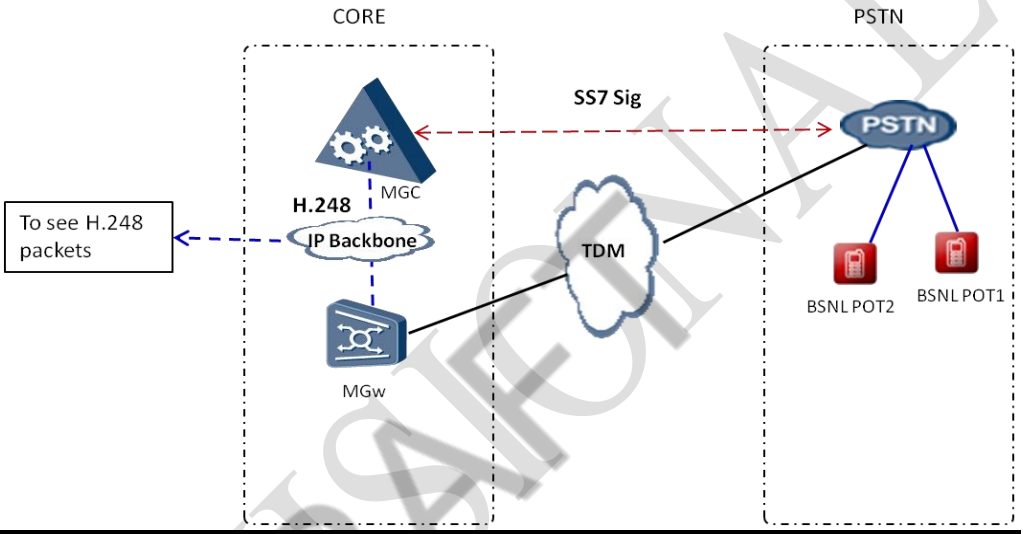
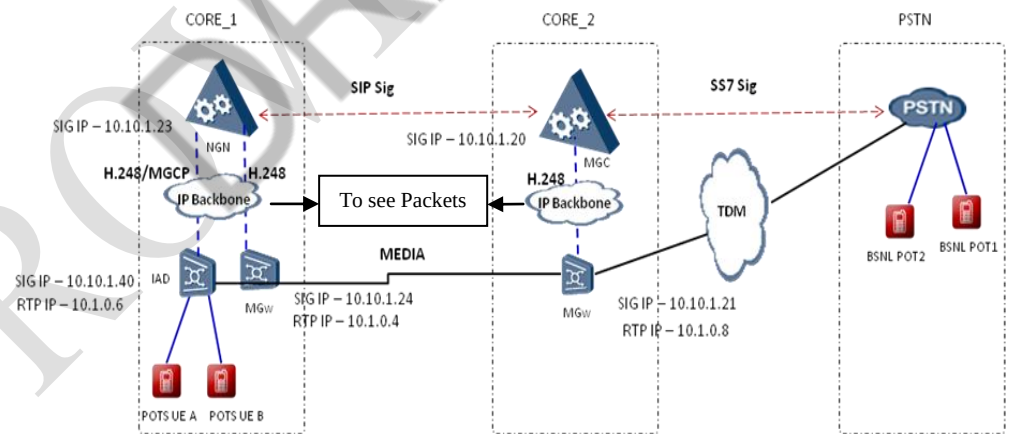
Test No.	**22**
Test Details	Clause 4.8.2 – Connectivity with soft-switches in Hot-standby mode
Test Setup	
Test Procedure	• Connect TMG with 2 different MGCs/Soft-switches. • Generate traffic by making calls through TMG. • Switch-off Softswitch-1. • Now switch on Softswitch-1 and switch-off the softswitch-2. **Note-** in case connectivity with 2 soft-switches is not possible, undertaking from the manufacturer may be accepted.
Expected Results	Traffic should not be disturbed.

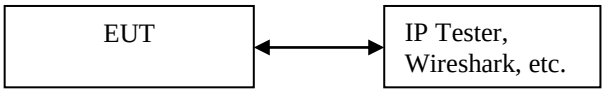
Test No.	**23**
Test Details	Clause no. 5.2 (b) FAX
Test Setup	
Test Procedure	Step 1 - Configured the RTP codec T.38 Step 2 - Send FAX from 'FAX machine X' to 'FAX machine Y' Note: Instead of FAX machine, PC with required FAX software may also be used.
Expected Results	FAX should be received at Y end

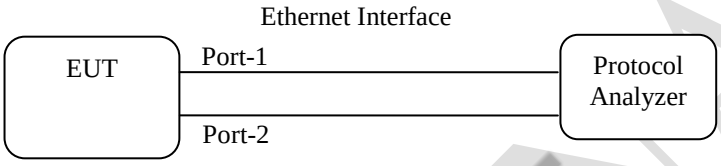
Test No.	24
Test Details	Clause 5.2 Codec
Test Setup	
Test Procedure	Step 1. Configured the RTP codec G.711 (a-law or u-law), DTMF Type RFC4733 and dynamic payload type (96~127) for DTMF RFC2833/4733 Type in SIP Client, and TMG under test. Step 2. Start SIP packets capture in IP Tester, in PC/Laptop by using Wireshark, etc. Step 3. Make a call from Analogue phone 'A' to SIP Client-B. Step 4. Dial any valid digit (from 0-9) from SIP Client-1. Step 5. Check the SDP body of the INVITE message sent from TMG. Step 6. Also Check the RTP-event message. ▪ Repeat above test by configuring RTP codec G.729A & H.264, (for video call) and H.263 (optional) ▪ Repeat above test by configuring RTP codec AMR-FR, AMR-HR, EFR, FR, HR & AMR-WB and make call from GSM phone to SIP phone or vice-versa ▪ Repeat above test by configuring RTP codec EVRC (optional) and make call from CDMA phone to SIP phone or vice-versa
Expected results	TMG MUST include media attribute telephone-event in Message body(SDP) of INVITE request. It must also include supported event types from 0 to 16 in **fmtp** media attribute. Verify INVITE message in packet captured as shown below. **Note**: Below snapshot is taken from packet capture tool IP Tester, Wireshark, similarly other tools can be used.

Test No.	**25**
Test Details	Clause no. 5.6 - Echo cancellation
Test Setup	
Test Procedure	a) Configure IP Subscriber and Service Provider IP Trunk with TMG under test b) Enable Echo cancellation for Service Provider IP Trunk and configure Tail length in range of 32ms to 128ms
Expected Results	a) It shall be possible to Enable or Disable Echo cancellation Trunk wise in TMG b) Its shall be possible configure Tail length as per G.168 up to a configurable value of 128ms

Test No.	**26**
Test Details	Clause no. 5.1.7 - Echo cancellation
Test Setup	
Test Procedure	a) Configure IP Subscriber and Service Provider IP Trunk with TMG under test b) Enable Echo cancellation for Service Provider IP Trunk and configure Tail length in range of 32ms to 128ms
Expected Results	a) It shall be possible to Enable or Disable Echo cancellation Trunk wise in Call-Manager/IP-PBX b) Its shall be possible configure Tail length as per G.168 up to a configurable value of 128ms

Test No.	**27**
Test Details	Clause 4.8.1 , Clause 4.5 (Applicable for IPv4 RFC 791) Test for Various Protocols using IP Tester, Wireshark, etc.
Test Instruments Required	Connectivity with Service provider network or any other IP switching node or simulator
Test Parameters	Test the MGCP, H.248, RFC791
Test Setup	Test set for H.248 & MGCP  Test set for RFC 791 
Test Procedure	1. Capture the H.248/MGCP messages like ADD_REQ, MOD_REQ, Notify_Req etc in MGW during any call & analyze them on IP Tester, Wireshark or MGWs internal tracing tools, etc. (see Test 27 A for analysis on IP Tester, Wireshark, etc). 2. Initiate call from Core 1 towards PSTN. Voice will travel from Core 1 & Core 2 via RTP IP's. In messages check which RTP IP is used during call.
Expected Results	Enclose the Test Results

Test No.	**27 A**
Test Details	Clause 4.8.1 , Clause 4.5 (Applicable for IPv4 RFC 791) Test for Various Protocols using IP Tester, Wireshark, etc.
Test Instruments Required	Laptop/PC
Test Parameters	Test the following (as applicable) MGCP H.248 RFC 791
Test Setup	
Test Procedure	1. Connect the test setup as shown in figure. 2. The EUT shall be configured through the CLI [Command Line Interface] or SNMP interface for the TCP & UDP test. 3. The IP Packets may be observed in the IP Tester, Wireshark, etc for TCP/UDP Compliance 4. The test results may be recorded.
Expected Results	Enclose the Test Results

Test No.	**28**
Test Details	Clause 4.5 (Applicable for IPv6 RFC 2460) Conformance Testing
Test Instruments Required	1. IP Protocol Analyser
Test Parameters	As per various protocols being referred in the respective clause of the Test Schedule (TSTP)
Test Setup	
Test Procedure	1. Connect the test setup as shown in figure 2. The EUT shall be configured through the CLI [Command Line Interface] or SNMP interface for the various tests like IPv4, **IPv6,** TCP, Static Routing, Dynamic Routing, BGP, PPP etc 3. Various test parameters shall be measured using this setup 4. The test results may be recorded.
Expected Results	Enclose the Test Results
	Note: 1. TEC New Delhi NGN Lab has this test facility 2. Where ever conformance tests are not available, functional tests shall be carried out. 3. The protocol analyser shall be able to send various test packets to the EUT, check the response packet and check the conformance/functionality. Software tools like wireshark has got only the capability to analyse the received packets and do not have the capability to send test packets and measure the response. Hence the tools like wireshark cannot be used for this test. 4. In case the product is offered (with the same product version) is 'IPv6 Readylogo Certified', then the tests against RFC 4862, RFC 4443, RFC 4291, RFC 2460, RFC 4861, RFC 1981 and RFC 5095 (where ever referred in the Test Schedule) which are covered as part of the 'IPv6 Readylogo certification' shall not be carried out. I.e. in this case, the product version of the 'IPv6 Readylogo certificate' and the offered product shall be the same. Later versions than the certified versions will not come under the purview of this condition.

J. SUMMARY OF TEST RESULTS

GR/IR No._____

TSTP No._____

Equipment name & Model No._____

Clause No.	*Compliance* *(Complied /Not Complied / Submitted/Not Submitted / Not Applicable)*	*Remarks / Test Report Annexure No.*

Date:

Place: *Signature & Name of TEC testing Officer*

** Signature of Applicant / Authorized Signatory*

** Section J as given above is also to be submitted by the Applicant/ Authorised signatory as part of in-house test results along with Form-A. The Authorised signatory shall be the same as the one for Form 'A'.*