



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

Valid To: July 31, 2024

Certificate Number: 4264.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following optical communication tests:

<u>Technology</u>	<u>Standard(s)</u>	<u>Description</u>
Fiber Specification	ITU-T G.652 (06/2005); ITU-T G.652	Characteristics of SM optical fiber
	ITU-T G.653 (11/2006); ITU-T G.653	Characteristics of a dispersion-shifted single-mode optical fiber cable
	ITU-T G.654 (12/2006); ITU-T G.654	Characteristics of cut-off shifted single-mode optical fiber and cable
SDH	ITU-T G.661 (07/2007); ITU-T G.661	Definition and test methods for the relevant generic parameter of fiber optics 1. Noise Figure, clause 4.13
Amplifiers	ITU-T G.662 (07/2005); ITU-T G.662	Generic characteristics of optical Fiber Amplifier device and sub-systems 1. OSNR, clause 3.4
	ITU-T G.663 (04/2000); ITU-T G.663	Application related aspects of optical amplifiers devices and sub-system 1. Loss of signal, Appendix II & IV
Laser Safety	ITU-T G.664 (03/2006); ITU-T G.664	Optical Safety Procedure and requirements for optical components 1. ALS, clause 6.2 (table 1)
DWDM	ITU-T G.671 (01/2009); ITU-T G.671	Transmission characteristics of optical components and subsystems 1. Adjacent channel isolation, clause 3.2.2 2. Channel insertion loss (WDM devices), clause 3.2.9 3. Non-adjacent channel isolation, clause 3.2.20
SDH	ITU-T G.691 (03/2006); ITU-T G.691	Optical interfaces for single channel STM-64, STM-256 and other SDH system with optical amplifier 1. Min sensitivity, clause 6.4.1 2. Min overload, clause 6.4.2 3. Source type, wavelength & spectral width clause 6.2.1 4. Mean launch power, clause 6.2.2 5. Eye Pattern, clauses 6.2.3 & 6.2.4 6. Optical Path – Penalty, clause 6.4.3

<u>Technology</u>	<u>Standard(s)</u>	<u>Description</u>
SDH	ITU-T G.692 (10/1998); ITU-T G.692	Optical interfaces for multi-channel SDH system with optical amplifiers 1. Channel allocation, clause 6.1.5. (Table A.1) 2. Output gain Tilt clause, 6.5.2
SDH/OTN	ITU-T G.693 (11/2009)	Optical interfaces for intra-office systems
DWDM	ITU-T G.694.1 (06/2002); ITU-T G.694.1	Spectral grids for WDM applications: DWDM frequency grid 1. Frequency grid (Table 1)
CWDM	ITU-T G.694.2 (12/2003); ITU-T G.694.2	Spectral grids for WDM applications: CWDM wavelength grid 1. CWDM wavelength grid (Table 1)
CWDM	ITU-T G.695 (12/2006); ITU-T G.695	Optical interfaces for coarse wavelength division multiplexing applications 1. CWDM specifications
DWDM	ITU-T G.697 (02/2012)	Optical monitoring for dense wavelength division multiplexing systems
DWDM	ITU-T G.698.1 (11/2009)	Multichannel DWDM applications with single-channel optical interfaces
E1 Optical	IEEE C37.94	Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment
SDH/OTN	ITU-T G.709 (03/2003); ITU-T G.709	Interface for optical transport network (OTN – X.1331) 1. Bit rate acceptance (Table 7-1)
PDH	ITU-T G.703 (03/2008); ITU-T G.703	Physical/electrical characteristics of hierarchical digital interfaces 1. Chapter 5 interface at 1554 kbit/s 2. Chapter 8 interface at 44 736 kbit/s 3. Chapter 9 interface at 2048 kbit/s 4. Chapter 11 interface at 34 368 kbit/s 5. Chapter 13 2048 kHz synchronization interface 6. Chapter 15 interface at 15 5520 kbit/s (STM-1 interface)
PDH	ITU-T G.752 (11/1988); ITU-T G.752	Characteristics of digital multiplex equipment based on a second order bit rate of 6312 kbit/s and using positive justification, clause 1
PDH	ITU-T G.772 (03/1993); ITU-T G.772	Protected monitoring points provided on digital transmission system, all clauses
PDH	ITU-T G.775 (10/1998); ITU-T G.775	Loss of Signal (LOS), Alarm Indication Signal (AIS) and Remote Defect Indication (RDI) defect detection and clearance criteria for PDH signals, (Table 1)
SDH	ITU-T G.783 (05/2008); ITU-T G.783	Characteristics of SDH Multiplexing equipment functional block 1. Bit rate acceptance, clause 9.3.1.2 2. Jitter Transfer, clause 15.1.3 3. Output jitter (Table 9.7) 4. Combined jitter and wander from tributary mapping and pointer adjustments, clause 15.2.3.3
OTN Spec	ITU-T G.798 (12/2006); ITU-T G.798	Characteristics of Optical transport network hierarchy equipment functional block



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SDH	ITU-T G.813 (06/2005); ITU-T G.813	Timing characteristics of SDH equipment Slave Clock (SEC) and Output Jitter at STM-N (Table 6) and All applicable clauses, which are related to timing
PDH	ITU-T G.823 (03/2000); ITU-T G.823	The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy and All applicable clauses, which are related to E1 & E3
SDH	ITU-T G.825 (05/2008); ITU-T G.825	The control of jitter and wander within Digital networks, which are based on the Synchronous Digital Hierarchy (SDH) 1. Bit rate at SDH output (Table 2) 2. Output jitter, clause 5.1 3. Max tolerance jitter, clause 6.1.2
SDH/OTN	ITU-T G.8251 (05/2008); ITU-T G.8251	The control of jitter and wander within the optical transport network (OTN) 1. Jitter Tolerance 2. Jitter Transfer 3. Jitter Generation
SDH	ITU-T G.957 (03/2006); ITU-T G.957	Optical interfaces for equipment's and systems relating to the Synchronous Digital Hierarchy 1. Min sensitivity, clause 6.4.1 2. Min overload, clause 6.4.2 3. Source type, wavelength & spectral width, clause 6.2.2 4. Mean launch power, clause 6.2.3 5. Eye Pattern & Extinction ratio, clauses 6.2.4 & 6.2.5 6. Optical Path – Penalty, clause 6.4.4
SDH/OTN	ITU-T G.959.1 (03/2008); ITU-T G.959.1	Optical transport network physical layer interfaces 1. Physical parameter for multi-channel IrDI (Table 7.1) 2. Physical parameter for single channel IrDI (Table 7.2) 3. Physical parameter and value for multi-channel IrDI application (Table 8.1) 4. Physical parameter and value for multi-channel IrDI application (Table 8.1) 5. Physical layer parameters and values for multi-channel IrDI applications (Table 8.1) 6. Single channel IrDI parameters and values for optical tributary signal class NRZ 2.5G (Table 8.2) 7. Single channel IrDI parameters and values for optical tributary signal class NRZ 10G (Table 8.3) 8. Single channel IrDI parameters and values for optical tributary signal class NRZ 10G (Table 8.4)
Fast Ethernet	ITU-T G.985 (01/2009); ITU-T G.985	100 Mbit/s point-to-point Ethernet based optical access system and all applicable clauses, which are related to optical fast Ethernet
Optical safety	IEC 60825-2 (01/2007); IEC 60825-2	System of laser safety products part 2: Safety of optical fiber communication system. 1. APR time measurements
Optical safety	IEC 60825-1 (08/2008); IEC 60825-1	System of laser safety products part 1: Equipment classifications requirements and user's guides 1. Laser classification

<u>Technology</u>	<u>Standard(s)</u>	<u>Description</u>
Optical safety	IS 1249-1 (12/2000); IS 1249-1	Safety of Laser products: Equipment classification requirements and users guide 1. Laser classification
SDH/PDH	ETSI ETR 275 (04/96); ETSI ETR 275	Considerations on Transmission Delay and Transmission Delay value for components on connections supporting speech communication over evolving digital networks 1. Data transfer delay (Table A.2)
Environmental	ETSI EN 300 019-2-3 (04/2003); ETSI EN 300 019-2-3	Environmental conditions and environmental tests for telecommunications equipment; Part 2-3: Specification of 1. Cold Start, clause 3.2 (partly temperature-controlled locations) (Table B.1) 2. Warm Start, clause 3.2 (partly temperature-controlled locations) (Table 4)
Power	ETSI EN 300 132 (01/2007); ETSI EN 300 132	Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (DC) 1. Nominal voltage, clause 4.1 2. Nominal service voltage, clause 4.2 3. Abnormal service voltage, clause 4.3.1 4. Recovery steady state abnormal, clause 4.3.2 5. Maximum current drain, clause 4.6 6. In-rush current, clause 4.7.1
Power	ETSI EN 300 166 (09/2001); ETSI EN 300 166	Physical and electrical characteristics of hierarchical digital interfaces for equipment using the 2048 kbit/s based plesiochronous or synchronous digital hierarchies, clause 4.2 (minimum output return loss)
SDH	ETSI EN 301 164 (05/1999); ETSI EN 301 164	SDH leased lines connection characteristics, clauses 4.2 & 4.3, Annexes A.2.1 & A.2.2
SDH (Product family)	ETSI EN 301 165 (08/2002); ETSI EN 301 165	SDH leased lines Network and Terminal interface presentation (Table 2)
SDH (Product family)	ETSI EN 300 417-2-1 (10/2001); ETSI EN 300 417-2-1	Transmission and Multiplexing (TM); Generic requirements of transport functionality of equipment; Part 2-1: Synchronous Digital Hierarchy (SDH) and Plesiochronous Digital Hierarchy (PDH) physical section layer functions, clauses 4 through 8
SDH (Product family)	ETSI EN 300 417-5-1 (10/2001); ETSI EN 300 417-5-1	Generic requirements of transport functionality of equipment; Part 5-1: Plesiochronous Digital Hierarchy (PDH) path layer functions

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SDH	ETSI EN 300 462-5-1 (05/1998); ETSI EN 300 462-5-1	Transmission and Multiplexing (TM); Generic requirements for synchronization networks; Part 5-1: Timing characteristics of slave clocks suitable for operation in Synchronous Digital Hierarchy (SDH) equipment and output Jitter at STM-N, clause 6.3.2 and all applicable clauses, which are related to timing
PDH	ETSI EN 300 689 (07/2001); ETSI EN 300 689	34 Mbit/s digital leased lines (D34U and D34S); Terminal equipment interface, clause 4.2
SONET/SDH	GR-253-Core (10/2009); GR-253-Core	Synchronous Optical Network (SONET) transport system: Common Generic criteria 1. Min sensitivity, clause 4.2.5 (R4-12) 2. Min overload, clause 4.2.5 (O4-13) 3. Bit rate acceptance, clause 5.2 (R5-8) 4. Max Tolerance Jitter, clause 5.6.2.2.2, figures 5-28 & O5-242 5. Source type, wavelength & spectral width, clause 4.2.4 (Tables 4-6 through 4-18) 6. Mean launch power, clause 4.2.4 (Table 4-6 through 4-18) 7. Eye Pattern & Extinction ratio, clause 4.2.4.4 & 4.2.4.3 8. Bit rate at SDH output, clause 5 (R5-114 & CR5-115) 9. Output jitter (R5-248) 10. Jitter Transfer, clause 5.6.2.1, figure 5-27 & R5-239 11. Optical Path - Penalty P <sub>O</sub> (within Table 4-6) 12. All applicable clauses, which are related to DS3
PDH	GR-499-Core (09/2004); GR-499-Core	Transport System Generic Requirements (TSGR): Common Requirements 1. Data transfer delay R8-2.  All applicable clauses, which are related to DS3
DWDM	GR-1209-Core (03/2001)	Generic requirements for Passive Optical Components
SONET/SDH	GR-1244-Core (10/2009); GR-1244-Core	Clock for the synchronization network: Common generic criteria 1. All applicable clauses, which are related to Stratum 3 & Stratum 3E
DWDM	GR-2979-Core (03/2005); GR-2979-Core	Common Generic Requirements for Optical Add-Drop Multiplexers (OADMs) and optical Terminal Multiplexers (OTMs)
DWDM	GR-1312-Core (03/1999); GR-1312-Core	Optical Fiber requirements for Optical Fiber amplifiers and proprietary DWDM system 1. Single channel parameter, clause 3.9.1 2. Multi-channel parameter, clause 3.9.2 3. Noise, clause 3.9.3 4. Digital system, clause 3.9.4 5. Multiplexer, clause 3.9.5 6. Optical Supervisory Channel, clause 3.6
SDH	FTZ 153 TL 1 part 1 (07/1995); FTZ 153 TL 1 part 1	Synchronous Multiplexing Equipment (SM) for Synchronous Multiplex Hierarchy 1. Eye Diagram at test jacks for STM-N Signals



<u>Technology</u>	<u>Standard(s)</u>	<u>Description</u>
Ethernet	IEEE 802.3	IEEE Standard for Ethernet
	Fast Ethernet, Section 2, clause 25 & 26	
	1000baseLX, 1000baseSX, Section 3, clause 38	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	10GbaseS, 10GbaseL, 10GbaseE, Section 4, clause 52	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	10GbaseLRM, IEEE802.3aq 2006 Section 68	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	100Gbase, IEEE802.3-2015 Section 6	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	25GbaseSR, IEEE802.3 Section 7 Clause 112	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	25GbaseLR/ER, IEEE802.3 Section 7 Clause 114	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	400Gbase-DR4 , IEEE802.3-2018 Section 8 Clause 124	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	400Gbase-FR4, 100G Lambda MSA Group, 400G-FR4 Technical Spec D2p0	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	100Gbase-DR, IEEE802.3cd Clause 140	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	100Gbase-FR/LR, 100G Lambda MSA Group, 400G-FR4 Technical Spec D2p0	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	50Gbase-FR/LR, IEEE802.3cd Clause 139	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
	400Gbase-SR8, IEEE802.3cd Clause 138	<i>Except for the following:</i> 1. <i>Optical Return Loss / Reflection</i> 2. <i>Stressed Receive Sensitivity</i>
Fast Ethernet	IEC 9314 – 3 (10/1990); IEC 9314 – 3	Information system - fiber distributed data interface (FDDI) Multiplex, all applicable clauses, which are related to optical Fast Ethernet
PDH	ANSI T1.102 (12/1993) (R2005); ANSI T1.102	Digital hierarchy electrical interface, all applicable clauses, which are related to DS3

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Fiber Channel	ANSI FC-F1-2 (08/2005); ANSI FC-F1-2	Fiber Channel Physical Interface REV 10
	ANSI INCITS 450	Fiber Channel Physical Interface-4 (FC-PI-4); Fiber Channel Physical Interface-5 (FC-PI-5)
	ANSI INCITS 512-FC (2015)	Fiber Channel Physical Interface -6 (FC-PI-6)
SBcon	ANSI X3.296 (03/1997); ANSI X3.296	Single-Byte Command code sets CONnection (SBCON) architecture
Data	ITU-T G.8261/Y. 1361 (04/2008); ITU-T G.8261/Y. 1361	Timing and synchronization aspects in packet network
Data	ITU-T G.8262/Y. 1362 (04/2008); ITU-T G.8262/Y. 1362; ITU-T G.8262 /Y.1362 (07/2010)	Timing characteristics of synchronous Ethernet equipment slave clock (EEC)
GPON	ITU-T G. 984.2; ITU-T G. 983.1	Gigabit-capable Passive Optical Network (GPON); Physical Media dependent (PMD) layer specification <ol style="list-style-type: none"> <li>1. Receiver sensitivity, clause 8.2.8.1</li> <li>2. Receiver overload, clause 8.2.8.2</li> <li>3. Attenuation Rang, clause 8.2.7.1</li> <li>4. Downstream &amp; upstream Bit Rate, clause 8.2.3</li> <li>5. Downstream &amp; upstream source type, wavelength range, clause 8.2.5</li> <li>6. Mean Launch power, clause 8.2.6.3</li> <li>7. Eye pattern &amp; Extinction ratio, clause 8.2.6.4, 5</li> <li>8. Output jitter, clause 8.2.9.3</li> <li>9. Max logical reach, clause 8.2.8.4</li> <li>10. Max diff logical reach, clause 8.2.8.5</li> <li>11. 1550 video overlay, clause I.3.5</li> </ol> Broadband optical access systems based on Passive Optical Networks (PON) <ol style="list-style-type: none"> <li>1. Differential optical path loss, clause 8.2.8.5</li> <li>Upstream downstream clock sync, clause 8.2.8.6</li> </ol>
Electrical 100Base-T (FE/Electrical)	ANSI X3.263	Fibre Distributed Data Interface (FDDI) Token Ring Twisted Pair Physical Layer Medium Dependent (TP-PMD)





## Accredited Laboratory

A2LA has accredited

**ECI TELECOM LTD. LQLAB**

*Petah-Tikva, Israel*

for technical competence in the field of

**Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 6<sup>th</sup> day of July 2022.

A blue ink signature of Trace McInturff, written in a cursive style.

Trace McInturff, Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 4264.01  
Valid to July 31, 2024  
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*For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*