SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

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ELECTRICAL

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

| Technology | Standard(s) | Description |
|---|---|---|
| SDH | ITU-T G.661 (07/2007); ITU-T G.661 | Definition and test methods for the relevant generic parameter of fiber optics<br>1. Noise Figure, clause 4.13 |
| | 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<br>1. Min sensitivity, clause 6.4.1<br>2. Min overload, clause 6.4.2<br>3. Source type, wavelength & spectral width clause 6.2.1<br>4. Mean lunch power, clause 6.2.2<br>5. Eye Pattern, clauses 6.2.3 & 6.2.4<br>6. Optical Path – Penalty, clause 6.4.3 |
| | ITU-T G.692 (10/1998); ITU-T G.692 | Optical interfaces for multi-channel SDH system with optical amplifiers<br>1. Channel allocation, clause 6.1.5. (Table A.1)<br>2. Output gain Tilt clause, 6.5.2 |
| | ITU-T G.783 (05/2008); ITU-T G.783 | Characteristics of SDH Multiplexing equipment functional block<br>1. Bit rate acceptance, clause 9.3.1.2<br>2. Jitter Transfer, clause 15.1.3<br>3. Output jitter (Table 9.7)<br>4. Combined jitter and wander from tributary mapping and pointer adjustments, clause 15.2.3.3 |
| | 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<br>All applicable clauses, which are related to timing |
| | 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)<br>1. Bit rate at SDH output (Table 2) |

| Technology | Standard(s) | Description |
|---|---|---|
| SDH - continued | ITU-T G.825 (05/2008); ITU-T G.825 | 2. Output jitter, clause 5.1<br>3. Max tolerance jitter, clause 6.1.2 |
| | ITU-T G.957 (03/2006); ITU-T G.957 | Optical interfaces for equipment's and systems relating to the Synchronous Digital Hierarchy<br>1. Min sensitivity, clause 6.4.1<br>2. Min overload, clause 6.4.2<br>3. Source type, wavelength & spectral width, clause 6.2.2<br>4. Mean lunch power, clause 6.2.3<br>5. Eye Pattern & Extinction ratio, clauses 6.2.4 & 6.2.5<br>6. Optical Path – Penalty, clause 6.4.4 |
| | 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 |
| | ETSI EN 301 165 (08/2002); ETSI EN 301 165 | SDH leased lines Network and Terminal interface presentation (Table 2) |
| | 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 |
| | 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 |
| | 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 |
| | FTZ 153 TL 1, Part 1 (07/1995); FTZ 153 TL 1, Part 1 | Synchronous Multiplexing Equipment (SM) for Synchronous Multiplex Hierarchy<br>1.Eye Diagram at test jacks for STM-N Signals |
| Amplifiers | ITU-T G.662 (07/2005); ITU-T G.662 | Generic characteristics of optical Fiber Amplifier device and sub-systems<br>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<br>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<br>1. ALS, clause 6.2 (table 1) |
| Optical Safety | IEC 60825-2 (01/2007); IEC 60825-2 | System of laser safety products part 2: Safety of optical fiber communication system.<br>1. APR time measurements |
| | IEC 60825-1 (08/2008); IEC 60825-1 | System of laser safety products part 1: Equipment classifications requirements and user's guides<br>1.Laser classification |

| Technology | Standard(s) | Description |
|---|---|---|
| Optical Safety – cont. | IS 1249-1 (12/2000); IS 1249-1 | Safety of Laser products: Equipment classification requirements and users guide<br>1. Laser classification |
| DWDM | ITU-T G.671 (01/2009); ITU-T G.671 | Transmission characteristics of optical components and subsystems<br>1. Adjacent channel isolation, clause 3.2.2<br>2. Channel insertion loss (WDM devices), clause 3.2.9<br>3. Non-adjacent channel isolation, clause 3.2.20 |
| | ITU-T G.694.1 (06/2002); ITU-T G.694.1 | Spectral grids for WDM applications: DWDM frequency grid<br>1. Frequency grid (Table 1) |
| | ITU-T G.697 (02/2012) | Optical monitoring for dense wavelength division multiplexing systems |
| | ITU-T G.698.1 (11/2009) | Multichannel DWDM applications with single-channel optical interfaces |
| | GR-1209-Core (03/2001) | Generic requirements for Passive Optical Components |
| | GR-2979-Core (03/2005); GR-2979-Core | Common Generic Requirements for Optical Add-Drop Multiplexers (OADMs) and optical Terminal Multiplexers (OTMs) |
| | GR-1312-Core (03/1999); GR-1312-Core | Optical Fiber requirements for Optical Fiber amplifiers and proprietary DWDM system<br>1. Single channel parameter, clause 3.9.1<br>2. Multi-channel parameter, clause 3.9.2<br>3. Noise, clause 3.9.3<br>4. Digital system, clause 3.9.4<br>5. Multiplexer, clause 3.9.5<br>6. Optical Supervisory Channel, clause 3.6 |
| CWDM | ITU-T G.694.2 (12/2003); ITU-T G.694.2 | Spectral grids for WDM applications: CWDM wavelength grid<br>1. CWDM wavelength grid (Table 1) |
| | ITU-T G.695 (12/2006); ITU-T G.695 | Optical interfaces for coarse wavelength division multiplexing applications<br>1. CWDM specifications |
| SDH/OTN | ITU-T G.693 (11/2009) | Optical interfaces for intra-office systems |
| | ITU-T G.709 (03/2003); ITU-T G.709 | Interface for optical transport network (OTN – X.1331)<br>1. Bit rate acceptance (Table 7-1) |
| | ITU-T G.8251 (05/2008); ITU-T G.8251 | The control of jitter and wander within the optical transport network (OTN)<br>1. Jitter Tolerance<br>2. Jitter Transfer<br>3. Jitter Generation |

| Technology | Standard(s) | Description |
|---|---|---|
| SDH/OTN - continued | ITU-T G.959.1 (03/2008);<br>ITU-T G.959.1 | Optical transport network physical layer interfaces<br>1. Physical parameter for multi-channel IrDI (Table 7.1)<br>2. Physical parameter for single channel IrDI (Table 7.2)<br>3. Physical parameter and value for multi-channel IrDi application (Table 8.1)<br>4. Physical parameter and value for multi-channel IrDI application (Table 8.1)<br>5. Physical layer parameters and values for multi-channel IrDI applications (Table 8.1)<br>6. Single channel IrDI parameters and values for optical tributary signal class NRZ 2.5G (Table 8.2)<br>7. Single channel IrDI parameters and values for optical tributary signal class NRZ 10G (Table 8.3)<br>8. Single channel IrDI parameters and values for optical tributary signal class NRZ 10G (Table 8.4) |
| E1 Optical | IEEE C37.94 | Standard for N Times 64 Kilobit Per Second Optical Fiber Interfaces Between Teleprotection and Multiplexer Equipment |
| PDH | ITU-T G.703 (03/2008);<br>ITU-T G.703 | Physical/electrical characteristics of hierarchical digital interfaces<br>1. Chapter 5 interface at 1554 kbit/s<br>2. Chapter 8 interface at 44 736 kbit/s<br>3. Chapter 9 interface at 2048 kbit/s<br>4. Chapter 11 interface at 34 368 kbit/s<br>5. Chapter 13 2048 kHz synchronization interface<br>6. Chapter 15 interface at 15 5520 kbit/s (STM-1 interface) |
| | ITU-T G.752 (11/1988);<br>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 |
| | ITU-T G.772 (03/1993);<br>ITU-T G.772 | Protected monitoring points provided on digital transmission system, all clauses |
| | ITU-T G.775 (10/1998);<br>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) |
| | ITU-T G.823 (03/2000);<br>ITU-T G.823 | The control of jitter and wander within digital networks which are based on the 2048 kbit/s hierarchy and<br>All applicable clauses, which are related to E1 & E3 |
| | ETSI EN 300 689 (07/2001);<br>ETSI EN 300 689 | 34 Mbit/s digital leased lines (D34U and D34S); Terminal equipment interface, clause 4.2 |
| | GR-499-Core (09/2004);<br>GR-499-Core | Transport System Generic Requirements (TSGR): Common Requirements<br>1. Data transfer delay R8-2.<br><br>All applicable clauses, which are related to DS3 |

| Technology | Standard(s) | Description |
|---|---|---|
| PDH - continued | ANSI T1.102 (12/1993) (R2005);<br>ANSI T1.102 | Digital hierarchy electrical interface, all applicable clauses, which are related to DS3 |
| SDH/PDH | ETSI ETR 275 (04/96);<br>ETSI ETR 275 | Considerations on Transmission Delay and Transmission Delay value for components on connections supporting speech communication over evolving digital networks<br>1. Data transfer delay (Table A.2) |
| Environmental | ETSI EN 300 019-2-3 (04/2003);<br>ETSI EN 300 019-2-3 | Environmental conditions and environmental tests for telecommunications equipment; Part 2-3: Specification of<br>1. Cold Start, clause 3.2 (partly temperature-controlled locations) (Table B.1)<br>2. Warm Start, clause 3.2 (partly temperature-controlled locations) (Table 4) |
| Power | ETSI EN 300 132 (01/2007);<br>ETSI EN 300 132 | Power supply interface at the input to telecommunications equipment; Part 2: Operated by direct current (DC)<br>1. Nominal voltage, clause 4.1<br>2. Nominal service voltage, clause 4.2<br>3. Abnormal service voltage, clause 4.3.1<br>4. Recovery steady state abnormal, clause 4.3.2<br>5. Maximum current drain, clause 4.6<br>6. In-rush current, clause 4.7.1 |
| | ETSI EN 300 166 (09/2001);<br>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,<br>clause 4.2 (minimum output return loss) |
| SONET/SDH | GR-253-Core (10/2009);<br>GR-253-Core | Synchronous Optical Network (SONET) transport system: Common Generic criteria<br>1. Min sensitivity, clause 4.2.5 (R4-12)<br>2. Min overload, clause 4.2.5 (O4-13)<br>3. Bit rate acceptance, clause 5.2 (R5-8)<br>4. Max Tolerance Jitter, clause 5.6.2.2.2, figures 5-28 & O5-242<br>5. Source type, wavelength & spectral width, clause 4.2.4 (Tables 4-6 through 4-18)<br>6. Mean lunch power, clause 4.2.4 (Table 4-6 through 4-18)<br>7. Eye Pattern & Extinction ratio, clause 4.2.4.4 & 4.2.4.3<br>8. Bit rate at SDH output, clause 5 (R5-114 & CR5-115)<br>9. Output jitter (R5-248)<br>10. Jitter Transfer, clause 5.6.2.1, figure 5-27 & R5-239<br>11. Optical Path - Penalty $P_O$ (within Table 4-6)<br>12. All applicable clauses, which are related to DS3 |

| Technology | Standard(s) | Description |
|---|---|---|
| Ethernet | IEEE 802.3 | IEEE Standard for Ethernet |
| | Fast Ethernet, Section 2, clause 25 & 26 | |
| | 1000baseLX, 1000baseSX, Section 3, clause 38 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 10GbaseS, 10GbaseL, 10GbaseE, Section 4, clause 52 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 10GbaseLRM, IEEE802.3aq 2006 Section 68 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 100Gbase, IEEE802.3-2015 Section 6 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 25GbaseSR, IEEE802.3 Section 7 Clause 112 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 25GbaseLR/ER, IEEE802.3 Section 7 Clause 114 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 400Gbase-DR4 , IEEE802.3-2018 Section 8 Clause 124 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 400Gbase-FR4, 100G Lambda MSA Group, 400G-FR4 Technical Spec D2p0 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 100Gbase-DR, IEEE802.3cd Clause 140 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 100Gbase-FR/LR, 100G Lambda MSA Group, 400G-FR4 Technical Spec D2p0 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 50Gbase-FR/LR, IEEE802.3cd Clause 139 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| | 400Gbase-SR8, IEEE802.3cd Clause 138 | *Except for the following:*<br>*1. Optical Return Loss / Reflection*<br>*2. Stressed Receive Sensitivity* |
| 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 |
| | 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 |

| Technology | Standard(s) | Description |
|---|---|---|
| Fiber Channel | ANSI FC–F1-2 (08/2005);<br>ANSI FC–F1-2 | Fiber Channel Physical Interface REV 10 |
| | ANSI INCITS 450 | Fiber Channel Physical Interface-4 (FC-PI-4);<br>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);<br>ANSI X3.296 | Single-Byte Command code sets CONnection (SBCON) architecture |
| Data | ITU-T G.8261/Y. 1361 (04/2008);<br>ITU-T G.8261/Y. 1361 | Timing and synchronization aspects in packet network |
| | ITU-T G.8262/Y. 1362 (04/2008);<br>ITU-T G.8262/Y. 1362;<br>ITU-T G.8262 /Y.1362 (07/2010) | Timing characteristics of synchronous Ethernet equipment slave clock (EEC) |
| GPON | ITU-T G. 984.2;<br>ITU-T G. 983.1 | Gigabit-capable Passive Optical Network (GPON); Physical Media dependent (PMD) layer specification<br>1. Receiver sensitivity, clause 8.2.8.1<br>2. Receiver overload, clause 8.2.8.2<br>3. Attenuation Rang, clause 8.2.7.1<br>4. Downstream & upstream Bit Rate, clause 8.2.3<br>5. Downstream & upstream source type, wavelength range, clause 8.2.5<br>6. Mean Launch power, clause 8.2.6.3<br>7. Eye pattern & Extinction ratio, clause 8.2.6.4, 5<br>8. Output jitter, clause 8.2.9.3<br>9. Max logical reach, clause 8.2.8.4<br>10. Max diff logical reach, clause 8.2.8.5<br>11. 1550 video overlay, clause I.3.5<br><br>Broadband optical access systems based on Passive Optical Networks (PON)<br>1. Differential optical path loss, clause 8.2.8.5<br>Upstream downstream clock sync, clause 8.2.8.6 |
| 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 25th day of July 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 4264.01
Valid to June 30, 2026

*For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.*