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Specification of the network side of the Optical Capacity leased circuits' user- network interfaces.

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1 Scope

This document specifies the Network Termination Point (NTP) of the Optical Capacity leased lines. The NTP is the connection point between the Telenor Network Terminating Equipment (NTE) and the Customer Premises Equipment (CPE) interface.

2 References

- [1] IEEE 802.3: *Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications*
- [2] Telenor Wholesale product specification: *Optisk Kapasitet*
- [3] ITU-T Recommendation G.691: *Optical interfaces for single Capacity STM-64 and other SDH systems with optical amplifiers*
- [4] ITU-T Recommendation G.957: *Optical interfaces for equipments and systems relating to the synchronous digital hierarchy*
- [5] IEC 60874-14-10: *SC/APC Fibre Optic Pigtail or Patch Cord Connector Type SC-APC Untuned 8 Degrees Terminated on Single Mode Fibre Type B1 - Detail Specification*
- [6] IEC 61754-20: *Fibre Optic Connector Interfaces - Part 20: Type LC Connector Family*
- [7] ITU-G.709: *Interfaces for the Optical Transport Network (OTN)*

3 Definitions and abbreviations

NTE	Network terminating equipment
CPE	Customer Premises Equipment
NTP	Network Termination Point
ODF	Optical Distribution Frame
MTU	Maximum Transmission Unit
CWDM	Coarse Wavelength Division Multiplexing
DWDM	Dense Wavelength Division Multiplexing

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4 Overview

4.1 General

The Optical Capacity product provides a dedicated point to point connection between optical interfaces with client capacities from 1 Gbit/s to 10 Gbit/s. The traffic is transported over Telenor CWDM and/or DWDM systems.

4.2 Fibre and Connectors

The customer must provide the fibre patch connection between the NTE and the CPE. The network interface will be provided on an ODF by means of two optical sockets, one each for transmit and receive. Connectors to be used are normally SC-APC type complying with [5] IEC 60874-14-10. Optionally the network interface may be provided directly on the NTE by means of LC-PC connectors complying with [6] IEC 61754-20.

4.3 Signal types

The following signal types are supported:

- 1000BASE-LX10
- STM-16
- STM-64
- 10GBASE-LW
- 10GBASE-LR
- OTU2

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5 Detailed Specification

5.1 GbE

5.1.1 Optical power levels and wavelengths at NTE interface

The Rx power level is the minimum power level received at Telenor NTE or ODF.

The Tx power levels represents the range of power levels that may be transmitted from Telenor NTE or ODF. Only the minimum power is guaranteed.

The customer must, if necessary, insert an attenuator on the CPE ingress for protecting it against an excessive level from Telenor NTE.

Receive direction		Transmit direction		
Nominal wavelength (nm)	Rx min power (dBm)	Nominal wavelength (nm)	Tx max power (dBm)	Tx min power (dBm)
1310 to 1550	-13 *)	1310	+3	-10

*) Minimum power down to – 25 dBm may be supported on request.

5.1.2 Supported signal types

The supported signal type is:

- 1000BASE-LX10, as specified in [1] IEEE 802.3.

Full line rate with MTU up to 9600 is supported. No rate limiting is performed at the NTE. Depending on Telenor NTE the signal may be subject to either through-timing or re-timing.

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5.2 2.5 Gbit/s

5.2.1 Optical power levels and wavelengths at NTE interface

The Rx power level is the minimum power level received at Telenor NTE or ODF.
 The Tx power levels represents the range of power levels that may be transmitted from Telenor NTE or ODF. Only the minimum power is guaranteed.
 The customer must, if necessary, insert an attenuator on the CPE ingress for protecting it against an excessive level from Telenor NTE.

Receive direction		Transmit direction		
Nominal wavelength (nm)	Rx min power (dBm)	Nominal wavelength (nm)	Tx max power (dBm)	Tx min power (dBm)
1310 to 1550	-13 *)	1310	+3	-15

*) Minimum power down to – 25 dBm may be supported on request.

5.2.2 Supported signal types

The supported signal types are:

- 2.5 Gbit/s, as specified in [4] ITU-T Recommendation G.957

Depending on Telenor NTE the signal may be subject to either through-timing or re-timing.

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5.3 10 Gbit/s

5.3.1 Optical power levels and wavelengths at NTE interface

The Rx power level is the minimum power level received at Telenor NTE or ODF.

The Tx power levels represents the range of power levels that may be transmitted from Telenor NTE or ODF. Only the minimum power is guaranteed.

The customer must, if necessary, insert an attenuator on the CPE ingress for protecting it against an excessive level from Telenor NTE.

Receive direction		Transmit direction		
Nominal wavelength (nm)	Rx min power (dBm)	Nominal wavelength (nm)	Tx max power (dBm)	Tx min power (dBm)
1310 to 1550	-8	1310	-1	-6
1310 to 1550	Down to -20 may be supported on request	1550	+4	-5

5.3.2 Supported signal types

The supported signal types are:

- STM-64, as specified in [3] ITU-T Recommendation G.691
- 10GBASE-LW (WAN PHY), as specified in [1] IEEE 802.3.
Full line rate with MTU up to 9600 is supported. No rate limiting is performed at the NTE.
- 10GBASE-LR (LAN PHY), as specified in [1] IEEE 802.3.
Full line rate with MTU up to 9600 is supported. No rate limiting is performed at the NTE.
- OTU2, as specified in [7] ITU-T Recommendation G.709

10GBASE-EW or 10GBASE-ER may be supported on request.

Depending on Telenor NTE the signal may be subject to either through-timing or re-timing.

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5.4 100 Gbit/s

5.4.1 100GBASE-LR4

5.4.1.1 Optical power levels and wavelengths at NTE interface

The Rx power level is the minimum power level received at Telenor NTE or ODF.
The Tx power levels represents the range of power levels that may be transmitted from Telenor NTE or ODF. Only the minimum power is guaranteed.
The customer must, if necessary, insert an attenuator on the CPE ingress for protecting it against an excessive level from Telenor NTE.

Receive direction		Transmit direction	
Nominal wavelength (nm)	Rx min power (dBm)	Tx max power (dBm)	Tx min power (dBm)
Lane1: 1294.53-1296.59			
Lane 2: 1299.02-1301.09			
Lane3: 1303.54-1305.63			
Lane4: 1308.09-1310.19	-10.5	+3.0	-2.5

5.4.2 Supported signal types

The supported signal types are:

- 100GBASE-LR4 as specified in [1] IEEE 802.3ba
Fiber type: Single-mode (SM)

Other signal types may later be supported on request.

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