

**DECREE OF THE MINISTER OF COMMUNICATION AND INFORMATION
TECHNOLOGY OF THE REPUBLIC OF INDONESIA**

NUMBER : 11/PER/M.KOMINFO/04/2012

ON

**TECHNICAL REQUIREMENTS OF TELECOMMUNICATION EQUIPMENT OF
COARSE WAVELENGTH DIGITAL MULTIPLEXER**

BY THE GRACE OF GOD THE ALMIGHTY

**MINISTER OF COMMUNICATION AND INFORMATION TECHNOLOGY OF THE
REPUBLIC OF INDONESIA**

- Considering:
- a. that in accordance with the provision of Article 71 paragraph (1) of the Government Regulation of the Republic of Indonesia Number 52 Year 2000 on Telecommunication Provision which states that every telecommunication tool and equipment manufactured, assembled, imported for trade and or use in the territory of the Republic of Indonesia shall fulfil the technical requirements;
 - b. that based on consideration referred to in point a, it is considered necessary to issue a Decree of the Minister of Communication and Information Technology on Technical Requirements of Telecommunication Equipment of *.Coarse-Wavelength Digital Multiplexer (CWDM)..*

- Bearing in mind:
1. Law of the Republic of Indonesia Number 36 Year 1999 on Telecommunication (State Gazette of the Republic of Indonesia Number 154 Year 1999, Supplement to the State Gazette of the Republic of Indonesia Number 3881).
 2. Government Regulation of the Republic of Indonesia Number 52 Year 2000 on Telecommunication Provision (State Gazette of the Republic of Indonesia Number 107 Year 2000, Supplement to the State Gazette of the Republic of Indonesia Number 3980);

In case the English translation gives rise to different interpretation, please refer to the original version in Indonesian language

SSH	: <i>Secure Shell</i>
STM	: Synchronous Transport Module
TELNET	: <i>Telecommunication Network</i>
V	: <i>Volt</i>

4. Terms

<i>Backplane</i>	: a group of connectors connected one another in a parallel manner in one unit.
<i>Coarse-Wavelength Digital Multiplexing</i>	: Combining a number of wave lengths with very narrow canal spaces with the number of canals (4, 8, 16, 32, etc) in a single optical fiber.

CHAPTER II

TECHNICAL REQUIREMENTS

1. Raw material and Construction of Equipment

Raw material and construction of equipment must comply with the following provisions :

- a. Equipment is made of strong and solid material in line with the tropical climate;
- b. The components of equipment are made of high quality material;
- c. Parts of the equipment which are modular in nature must be arranged well and neatly;
- d. Must be equipped with terminals of measurement and maintenance;
- e. Connecting system at connecting terminals is easily done and has good nature of electricity;
- f. Must be equipped with good cooling system;
- g. *Backplane of CWDM Transponder* must have minimum one (1) kind of interface management.

2. Operation Requirement

- a. Power Supply
Equipment must work well using *backplane* supply:
 - 1) alternating current voltage of 220 Vac \pm 10%, 50 Hz \pm 6%; or
 - 2) direct current voltage -48 Vdc \pm 10%.
- b. Environmental Condition

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Table 4. ; Characteristics of STM-64 interface (ITU-T Rec. G.691)

Parameter	Unit	Value				
Digital Signal Nominal bit rate	kbps	9,953,280				
Application code		1, 2, 3, 4	5, 6, 7, 8	9, 10, 11, 12	13, 14, 15, 16	17, 18, 19, 20
Operational range	Hz	1,200-1,320	1,400-1,500	1,600-1,700	1,800-1,900	1,500-1,600
Maximum 20 dB width	Hz	10	10	10	10	10
Maximum Sub-MHz Suppression	dB	30	10	10	10	10
Mean fluctuation	dBm	+7	+2	+3	+2	+3
Maximum fluctuation	dBm	+8	+1	+1	+1	+1
Maximum rejection	dB	6	6	8.2	6	8.2
Maximum carrier to noise ratio	dB	10	10	11	10	10
Maximum carrier to crosstalk	dBm	+10	+9	+3	+9	+3
Maximum receiver noise	dB	-27	-27	-27	-27	-27

3.. Gigabit Ethernet, with characteristics referring to Table 5

In case the English translation gives rise to different interpretation, please refer to the original version in Indonesian language

Table 5. ; Characteristics of 1000BASE-X interface (IEEE 802.3-2008)

Parameter	Unit	Value				
Signaling speed (range)	GBd	1.25 ± 100 ppm				
Application		1000BASE-SX		1000BASE-LX		
Media type		OM3 MMF	OM4 MMF	OM3 MMF	OM4 MMF	Plastic SMP
Wavelength (nm)		850	1310	1310	1550	1550
Dispersion (ps/nm.km)		80	165	165	165	165
Attenuation (dB/km)		0.5	0.5	0.5	0.5	0.5
Dispersion slope (ps/nm.km/nm)		0.08	0.08	0.08	0.08	0.08
Bandwidth (nm)		20	20	20	20	20
Temperature range (°C)		-5 to 70	-5 to 70	-5 to 70	-5 to 70	-5 to 70
Power consumption (mW)		10	10	10	10	10
Physical dimensions (mm)		12.5	12.5	12.5	12.5	12.5
Material		Plastic	Plastic	Plastic	Plastic	Plastic
Connector type		LC	LC	LC	LC	LC
Mounting		Surface	Surface	Surface	Surface	Surface
RoHS compliance		Yes	Yes	Yes	Yes	Yes
Lead-free		Yes	Yes	Yes	Yes	Yes
Halogen-free		Yes	Yes	Yes	Yes	Yes
Biocompatible		Yes	Yes	Yes	Yes	Yes
Flame retardant		Yes	Yes	Yes	Yes	Yes
Shock resistant		Yes	Yes	Yes	Yes	Yes
Vibration resistant		Yes	Yes	Yes	Yes	Yes
Temperature stability		Yes	Yes	Yes	Yes	Yes
Humidity resistant		Yes	Yes	Yes	Yes	Yes
Corrosion resistant		Yes	Yes	Yes	Yes	Yes
UV resistant		Yes	Yes	Yes	Yes	Yes
Electromagnetic interference (EMI) shielded		Yes	Yes	Yes	Yes	Yes
Electrostatic discharge (ESD) protected		Yes	Yes	Yes	Yes	Yes
Static discharge resistant		Yes	Yes	Yes	Yes	Yes
ESD protection level (PELV)		±15kV	±15kV	±15kV	±15kV	±15kV
ESD protection level (IEC61000-4-2)		±8kV	±8kV	±8kV	±8kV	±8kV
ESD protection level (IEC61000-4-5)		±2kV	±2kV	±2kV	±2kV	±2kV
ESD protection level (IEC61000-4-6)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-8)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-11)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-15)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-18)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-20)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-24)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-29)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-30)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-32)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-33)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-34)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-35)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-36)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-37)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-38)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-39)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-40)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-41)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-42)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-43)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-44)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-45)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-46)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-47)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-48)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-49)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-50)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-51)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-52)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-53)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-54)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-55)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-56)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-57)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-58)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-59)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-60)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-61)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-62)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-63)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-64)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-65)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-66)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-67)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-68)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-69)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-70)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-71)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-72)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-73)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-74)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-75)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-76)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-77)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-78)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-79)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-80)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-81)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-82)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-83)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-84)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-85)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-86)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-87)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-88)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-89)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-90)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-91)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-92)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-93)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-94)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-95)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-96)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-97)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-98)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-99)		±1kV	±1kV	±1kV	±1kV	±1kV
ESD protection level (IEC61000-4-100)		±1kV	±1kV	±1kV	±1kV	±1kV

In case the English translation gives rise to different interpretation, please refer to the original version in Indonesian language

4.. 10G Ethernet, with characteristics referring to Tables 6, 7, 8, 9, 10, 11 and figure 2

Table 6. ; Characteristics of 10GBASE-S interface (IEEE 802.3-2008)

Parameter	Unit	Value			
Interface		10GBASE-SW	10GBASE-SR		
Standard		IEEE 802.3-2008	IEEE 802.3-2008		
Speed		10 Gbps	10 Gbps		
Bit rate		62.5	62.5	62.5	62.5
Bit Error Rate		10 ⁻¹²	10 ⁻¹²	10 ⁻¹²	10 ⁻¹²
Operating temperature	°C	0 to 70	0 to 70	0 to 70	0 to 70
Humidity	%	5 to 95	5 to 95	5 to 95	5 to 95
Power consumption	W	1.5	1.5	1.5	1.5
Dimensions	mm	12.5 x 12.5 x 12.5	12.5 x 12.5 x 12.5	12.5 x 12.5 x 12.5	12.5 x 12.5 x 12.5
Weight	g	1.5	1.5	1.5	1.5
Material		Plastic	Plastic	Plastic	Plastic
Color		Black	Black	Black	Black
Manufacturer		Various	Various	Various	Various
Availability		Available	Available	Available	Available

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Table 8. ; Characteristics of 10GBASE-L interface (IEEE 802.3-2008)

Parameter	Unit	Value	
Application code		10GBASE-LW	10GBASE-LR
Wavelength	nm	1270-1330	1270-1330
Modulation		NRZ	NRZ
Encoding		6B4B and 8B10B	8B10B and 6B4B
Optical interface		SMF	SMF
Operating temperature range	°C	0-40	0-40
Minimum size	mm	30	30
Maximum length	km	0.1	0.1
Maximum power	dBm	0	0
Maximum loss	dB	3.5	3.5
Maximum attenuation	dB	12.6	12.6
Maximum dispersion	ps/nm.km	17	17

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Maximum transmission distance per lane	10	100	2.2
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Table 9. ; Characteristics of 10GBASE-E interface (IEEE 802.3-2008)

Parameter	Unit	Value	
Application code		10GBASE-ERW	10GBASE-ER
Maximum averaging length	µm	10.5328 ± 20 1000	10.5128 ± 100 1000
Filter type		B1.1 and B1.2 SMF	B1.1 and B1.3 SMF
Optical transmission range	nm	1270-1675	1270-1675
State Mode Synchronization Mode	B	30	30
Mean insertion loss	dBm	4.0	4.0
Maximum insertion loss	dBm	4.7	4.7
Average insertion loss	dBm	4.5	4.5
Maximum attenuation coefficient	dB/km	0.5	0.5
Maximum attenuation coefficient	dB	1	1

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Maximum wavelength	nm	141	141
Maximum transmission loss	dB	2,5	2,5
Maximum attenuation coefficient	dB/km	2,7	2,7

Table 10. ; Characteristics of 10GBASE-LX4 interface (IEEE 802.3-2008)

Parameter	Unit	Value	
Nominal transmission speed	Gbit/s	3,125 ± 100 ppm	
Fiber type		Plastic OM3 OM4	10 km SMF
		MMF	
Wavelength range (nm)	nm	1260,0 - 1282,4	1269,0 - 1282,4
		1290,0 - 1306,0	1293,5 - 1306,0
		1310,0 - 1331,4	1318,0 - 1331,4
		1340,0 - 1357,9	1342,5 - 1357,9
Maximum transmission loss	dB		
Maximum attenuation coefficient	dB/km	2,5	2,5
Maximum transmission loss	dB	2,5	2,5
Maximum attenuation coefficient	dB/km	2,7	2,7

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Maximum Temperature			
Number of Ports	128	256	512
Maximum Power Consumption (Watt)	111	113	117
Maximum Power Consumption (Watt)	111	114.25	114.45
Maximum Power Consumption (Watt)	111	114	114
Maximum Power Consumption (Watt)	113	117	111

5.. STM – 256, with characteristics referring to Table

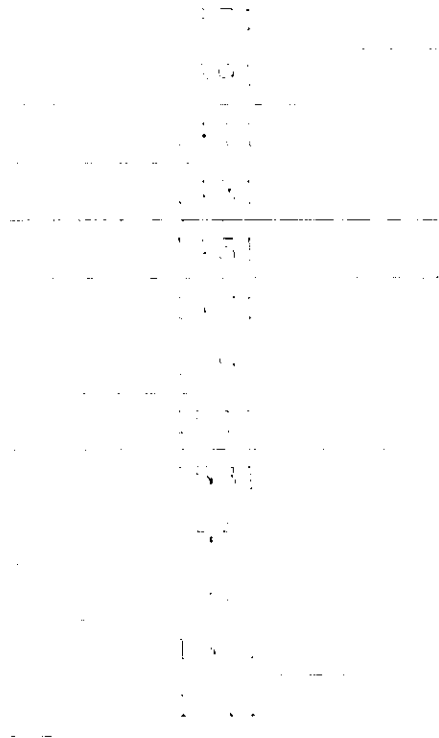
Table 10. ; Characteristics of 10GBASE-LX4 interface (IEEE 802.3-2008)

Parameter	Unit	Value	
Nominal Wavelength	nm	1290.0 ± 0.5	
Wavelength Tolerance	nm	± 0.5	
Operating Wavelength Range	nm	1282.4 – 1299.0	1282.4 – 1306.9
Operating Wavelength Range	nm	1282.4 – 1306.9	1306.9 – 1331.4
Operating Wavelength Range	nm	1282.4 – 1306.9	1331.4 – 1355.9

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Parameter	Unit	Value	
Application code		40GBASE-SR4	40GBASE-LR4
Nominal rate	Gbps	40.000 + 20 10%	40.000 + 100 10%
Fiber Type		50 μ m MMF	B1.1, B1.3, and B6 A SMF
Operating wavelength range	nm	800-860	1264.5-1277.5 1284.5-1297.5 1304.5-1317.5 1324.5-1337.5
Attenuation Coefficient Maximum	dB	0.5	0.5
Insertion loss	dB	2.4	2.3
Maximum transmission loss	dB	7.0	6.7
Average power consumption	W	2.0	2.0
Maximum power consumption	W	4.0	4.0
Temperature range	°C	0-70	-10-70

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- 2) *Channel Spacing* 29 nm
- 3) *Maximum -20 dB width*: 1 nm; (?)
- 4) *Minimum Side Mode Suppression Ratio*: 30 dB; (?)
- 5) *Mean Launched Power*: (?)
 - a) 2.5G: -10 dBm – 0 dBm; or
 - b) 10G: -5 dBm - +5 dBm;
- 6) *Minimum Extinction Ratio* : 8.2 dB; (?)
- 7) *Minimum OSNR*: 18 dB; (?)
- 8) *Maximum Local Loop BER*: 10^{-12} ; (?)
- 9) *Minimum Receiver Sensitivity*: (?)
 - a) 2.5G: -24 dBm; or
 - b) 10G / 40G: - 14 dBm;
- 10) *Minimum Receiver Overload*: (?)
- 11) *Maximum Receiver Reflectance*: -27 dB (?)

c.. *Function*

- 1) Conduct conversion and mapping of optical signal from one of the *input* format in the form of:
 - a) *Ethernet (Gigabit Ethernet or 10G Ethernet)* and or
 - b) *STM - 16 and or STM – 64;*
 into CWDM standard in accordance with ITU-T G.694.2 recommendation and the reverse;
- 2) Conduct the function of 3R, i.e.
 - a) *Re-time;*

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- b) *Re-transmit*, and
- c) *Re-shape*
- 3) In case of *tunable* type, *transponder* must:
 - a) Have *Forward Error Correction* (FEC) mechanism;
 - b) Have the capability of arranging work frequency;
 - c) Have the capability of arranging emission power.

4. **Multiplexer/Demultiplexer Requirement**

Multiplexer / Demultiplexer at CWDM equipment must be in line with the following provisions:

- a. Optical characteristics:
 - 1) *Operating Wavelength* refers to Table 12;
 - 2) *Insertion Loss*: ≤ 4 dB;
 - 3) *Crosstalk*: ≥ 25 dB;
 - 4) *Return Loss*: ≥ 40 dB;
 - 5) *Center Wavelength Offset*: ≤ 0.05 nm;
 - 6) *Channel Uniformity*: ≤ 3 dB.
- b. Function
 - 1) Combine and transmit *multiple signal* from a number of wavelengths in one optical fiber;
 - 2) Has capability of supporting *unidirectional* or *bidirectional* transmission system..

5. **Optical Amplifier Requirement**

Optical Amplifier at CWDM equipment must comply with the following provisions:

- a. *Signal Gain*: 16 – 31 dB;
- b. *Gain Variation*: ≤ 1.5 dB;
- c. *Gain Tilt*: ≤ 1 dB / dB;
- d. *Total Receive Power*: -42 dBm ~ +2 dBm;
- e. *Total Transmit Power*: +6 dBm ~ +23 dBm;
- f. *Spontaneous Noise Figure*: ≤ 7 dB;
- g. *Return Loss* (I / O port): ≥ 40 dB.

6. **Backplane Requirement**

Backplane of CWDM equipment must have minimum one (1) of the kinds of the following management interfaces:

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- a) RS 232 (EIA/TIA-232);
- b) Ethernet (minimum *Fast Ethernet*) with characteristics.

CHAPTER III

COMPLETENESS OF EQUIPMENT

CWDM tools and equipment to be tested must be furnished with :

- 1. Identity containing brand, *type/model*, manufacturing country, and serial number;
- 2. Operational guide of the Equipment in Bahasa Indonesia and or in English

CHAPTER IV

TESTING

1. Testing Implementation

Testing of CWDM equipment is carried out by a Test Office that has owned accreditation from authorized institution and designated by Directorate General of Resources and Equipment of Post and Information Technology.

2. Sampling Method

Sampling of test material is done at random according to test procedure based on legal regulations.

3. Test Method

Test Method used is in accordance with *Standard Operating Procedure* of the respective Test Offices.

4. Partial Testing

Testing may be done partially only for *transponder* module. Partial testing for *transponder* module comprises CHAPTER II (raw material and construction requirement, operation requirement, *transponder* requirement, multiplexer / demultiplexer requirement, *optical amplifier* requirement, backplane requirement, management method requirement, and electrical safety requirement and *Electromagnetic Compatibility* requirement) and the whole of CHAPTER III.

5. Condition for Passing the Test

Testing result is declared PASS THE TEST, if each sample of tested material complies with all the provisions or partial provisions as regards *transponder* as indicated in these technical requirements and has been declared to pass the test by Team of Evaluators.

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**MINISTER OF COMMUNICATION AND INFORMATION TECHNOLOGY OF THE
REPUBLIC OF INDONESIA**

Signed

TIFATUL SEMBIRING

In case the English translation gives rise to different interpretation, please refer to the original version in Indonesian language