



SHENZHEN WINTOP OPTICAL TECHNOLOGY CO.,LTD.

CE LVD REPORT

Prepared For :	SHENZHEN WINTOP OPTICAL TECHNOLOGY CO.,LTD. 6/F, Bldg. 1, Sec. 3, South Area, Honghualing Industrial Zone Xili Town, Nanshan District, Shenzhen China
Product Name:	SFP TRANSCEIVER
Trade Name:	WT
Model :	WT-9110G/SM/20,WT-9110/SM/20,WT-9110/MM/02, WT-9110G/SM/20, WT-9110G/MM/05,WT/9110/BIDI/20A, WT-9110/BIDI/20B,WT-9110G/BIDI/20, WT-9110G/BIDI/20B, WT-9110 SERIES
Prepared By :	Shenzhen BST Technology Co., Ltd. 3F,Weames Technology Building,No. 10 Kefa Road, Science Park,Nanshan District,Shenzhen,Guangdong,China
Test Date:	Dec. 9-19, 2009
Date of Report :	Dec. 21, 2009
Report No.:	BST09122650421R-2



LVD Report EN60825-1+ EN 60825-2 Safety of laser products – Part 1: Equipment classification and requirements Part 2: Safety of optical fibre communication systems (OFCS)	
Testing Laboratory Name	Shenzhen BST Technology Co.,Ltd.
Address	3F,Weames Technology Building,No. 10 Kefa Road, Science Park,Nanshan District,Shenzhen,Guangdong,China
Testing location	Shenzhen BST Technology Co.,Ltd.
Applicant	SHENZHEN WINTOP OPTICAL TECHNOLOGY CO.,LTD.
Address	6/F, Bldg. 1, Sec. 3, South Area, Honghualing Industrial Zone Xili Town, Nanshan District, Shenzhen China
Standard	EN 60825-1: 2007 + EN 60825-2:2004+A1:2007
Test Result	Compliance with EN 60825-1: 2007 + EN 60825-2:2004+A1:2007
Procedure deviation	N.A.
Non-standard test method	N.A.
Type of test object	SFP TRANSCEIVER
Trademark	WT
Model/type reference	WT-9110G/SM/20,WT-9110/SM/20,WT-9110/MM/02, WT-9110G/SM/20, WT-9110G/MM/05,WT/9110/BIDI/20A, WT-9110/BIDI/20B,WT-9110G/BIDI/20, WT-9110G/BIDI/20B, WT-9110 SERIES
Rating	DC3.3V, 0.99W, 0.3A, 800MHz
Manufacturer	SHENZHEN WINTOP OPTICAL TECHNOLOGY CO.,LTD.
Address	6/F, Bldg. 1, Sec. 3, South Area, Honghualing Industrial Zone Xili Town, Nanshan District, Shenzhen China
Test item particulars :	
Equipment mobility	Fixed Equipment
Operation condition	Continuous
Class of equipment	CLASS 1
Mass of equipment (Kg)	0.016Kg
Protection against ingress of water .:	IP20



Possible test case verdicts :

test case does not apply to the test object : N(A.)

test object does meet the requirement : P(ass)

test object does not meet the requirement : F(ail)



Name and address of the testing laboratory :Shenzhen BST Technology Co.,Ltd.

3F,Weames Technology Building,No. 10 Kefa Road,
Science Park,Nanshan District,Shenzhen,
Guangdong,China

Test by : _____
Signature Date

Technician
Title

Review by : _____
Signature Date

Project Engineer
Title

Approved by : _____
Signature Date

Christina / Manager
Name and Title



<p>General remarks:</p> <p>"(see remark #)" refers to a remark appended to the report.</p> <p>"(see appended table)" refers to a table appended to the report.</p> <p>Throughout this report a comma is used as the decimal separator.</p> <p>The test results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced except in full without the written approval of the testing laboratory.</p>	<p>Attached with:</p> <p style="padding-left: 40px;">A. Photo documentation</p> <p>Remark:</p>
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EN 60825-1			
Cl.	Requirement – Test	Result	Verdict

SECTION TWO --- MANUFACTURING REQUIREMENTS

4	Engineering specifications		P
4.1	General remarks		P
4.1.1	If the modification of a previously classified laser product affects any aspects of the product's performance or intended functions within the scope of this standard, the person or organization performing any such modification is responsible for ensuring the reclassification and relabelling of the laser product.		N
4.2	Protective housing		P
4.2.1	Each laser product shall have a protective housing .		P
4.2.2	Any parts of the housing or enclosure of a laser product that can be removed or displaced for service and which would allow access to laser radiation in excess of the AEL assigned and are not interlocked shall be secured in such a way that removal or displacement of the parts requires the use of tools		P
4.2.3	Removable laser system		N
4.3	Access panels and safety interlocks		N
4.3.1	A safety interlock shall be provided for access panels of protective housing when both of the following conditions are met: a) the access panel is intended to be removed or displaced during maintenance or operation, and b) the removal of the panel gives access to laser radiation levels designated by "X" in the table		N
4.3.2	If a deliberate override mechanism is provided, the manufacturer shall also provide adequate instructions about safety methods of working. It shall not be possible to leave the override in operation when the access panel is returned to its normal position. The interlock shall be clearly associated with a label conforming to 5.9.2		N
4.4	Each class 3B and class 4 laser system shall have a remote interlock connector. When the terminals of the connector are open-circuited, the accessible radiation shall not exceed class 1 M or class 2M .		N



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Cl.	Requirement – Test	Result	Verdict
4.5	Each class 3B and class 4 laser system shall incorporate a key-operated master control. The key shall be removable and the laser radiation shall not be accessible when the key is removed.		N
4.6	Laser radiation emission warning		P
4.6.1	Each class 3R and each class 3B and class 4 laser system shall give an audible or visible warning when it is switched on or if capacitor banks of a pulsed laser are being charged or have not positively discharged.		N
4.6.2	Each operational control and laser aperture that can be separated by 2m or more from a radiation warning device shall itself be provided with a radiation warning device.		N
4.6.3	Where the laser emission may be distributed through more than one output aperture , then a visible warning device shall clearly indicate the output aperture or apertures.		N
4.7	Each class 3B and class 4 laser system shall incorporate one or more permanently attached means of attenuation		N
4.8	Each laser product shall have control located so that adjustment and operation do not require exposure to laser radiation of class 3R,3B or class 4.		N
4.9	Any viewing optics, viewport or display screen incorporated in a laser product shall provide sufficient attenuation to prevent human access to laser radiation in excess of the AEL for Class 1M		N
4.10	Laser products intended to emit scanned radiation, shall not ,as a result of scan failure or of variation in either scan velocity or amplitude, permit human access to laser radiation in excess of the AEL for the assigned class.		N
4.11	Where routine maintenance requires the alignment of beam path components, then a safe means of achieving this shall be provided.		N
4.12	“Walk-in “ access		N
4.13	The laser product shall meet the safety requirements defined in this standard under all expected operating conditions appropriate to the intended use of the product.		P
4.14	Protection against other hazards		P



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Cl.	Requirement – Test	Result	Verdict
4.14.1	The requirements of the relevant product safety standard shall be fulfilled during operation and in the event of a single fault		P
4.14.2	The protective housing of laser products will normally protect against the hazards of collateral radiation		P

5	Labelling		P
5.1	Each laser product shall carry labels. The labels shall be permanently fixed, legible, and clearly visible during operation, maintenance or service. They shall be so positioned that they can be read without the necessity for human exposure to laser radiation in excess of the AEL for Class 1		P
5.2	Each class 1 laser product shall have affixed an explanatory label (figure 15) bearing the words: CLASS 1 LASER PRODUCT Each class 1M laser product shall have affixed an explanatory label (figure 15) bearing the words: LASER RADIATION DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 1M LASER PRODUCT	CLASS 1 LASER PRODUCT	P
5.3	Each class 2 laser product shall have affixed a warning label (figure 14) and an explanatory label (figure 15) bearing the words: LASER RADIATION DO NOT STARE INTO BEAM CLASS 2 LASER PRODUCT Each class 2M laser product shall have affixed a warning label (figure 14) and an explanatory label (figure 15) bearing the words: LASER RADIATION DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH OPTICAL INSTRUMENTS CLASS 2M LASER PRODUCT		N



EN 60825-1			
Cl.	Requirement – Test	Result	Verdict
5.4	Each class 3R laser product in the wavelength range from 400nm to 1400 nm shall have affixed a warning label (figure 14) and an explanatory label (figure 15) bearing the words: LASER RADIATION AVOID DIRECT EYE EXPOSURE CLASS 3R LASER PRODUCT For other wavelengths, Each class 3R laser product shall have affixed a warning label (figure 14) and an explanatory label (figure 15) bearing the words: LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3R LASER PRODUCT		N
5.5	Each class 3B laser product shall have affixed a warning label (figure 14) and an explanatory label (figure 15) bearing the words: LASER RADIATION AVOID EXPOSURE TO BEAM CLASS 3B LASER PRODUCT		N
5.6	Each class 4 laser product shall have affixed a warning label (figure 14) and an explanatory label (figure 15) bearing the words: LASER RADIATION AVOID EYE OR SKIN EXPOSURE TO DIRECT OR SCATTERED RADIATION CLASS 4 LASER PRODUCT		N
5.7	Each class 3R, class 3B and class 4 laser product shall have affixed a label close to each aperture through which radiation in excess of the AEL for class 1 or class 2 is emitted. The label shall bear the words: LASER APERTURE or AVOID EXPOSURE -----LASER RADIATION IS EMITTED FROM THIS APERTURE		N
5.8	Radiation output and standards information		P
5.9	Labels for access panels		N
5.9.1	Labels for panels		N
5.9.2	Labels for safety interlocked panels		N
5.10	In many cases, the wording prescribed for labels in clause 5 includes the phrase "laser radiation" or "invisible laser radiation" or "Visible and invisible laser radiation" or		N



EN 60825-1			
Cl.	Requirement – Test	Result	Verdict
5.11	The wording “laser radiation“ for labels in clause 5 may be modified to be read “laser light“ if the output of the laser is in the (visible) wavelength range from 400 nm to 700 nm.		N
5.12	For LED MR16 LIGHT radiation the word laser on the labels in clause 5 shall be replaced by “LED MR16 LIGHT“		N

6	Other informational requirements		P
6.1	Information for the user		P
6.1	Manufacturers of laser products shall provide as an integral part of any user instruction or operation manual which is regularly supplied with the laser product:		P
	a) Adequate instruction for proper assembly,maintenance, and safe use, including clear warnings concerning precautions to avoid possible exposure to hazardous laser radiation		P
	b)For class 1M and 2M laser products an additional warning is required.		N
	c)A statement in appropriate units of beam divergence for collimated beams,pulse duration and maximum output,with the magnitudes of the cumulative measurement uncertainty and any expected increase in the measured quantities at any time after manufacture . Additionally,for embedded laser products and other incorporated laser products, similar information shall be provided to describe the laser		N
	d)legible reproductions of all required labels and hazard warning to be affixed to the laser product or provided with the product. The corresponding position of each label affixed to the product shall be indicated.		P
	e)A clear indication in the manual of all locations of laser apertures.		N
	f)A listing of controls,adjustments and procedures for operation and maintenance,including the warning.		P
	g)In the case of laser products that do not incorporate the laser energy source necessary for laser emission, a statement of the		N



EN 60825-1			
Cl.	Requirement – Test	Result	Verdict
	compatibility requirements for a laser energy source to ensure safety.		
6.2	Purchasing and servicing information		P
	a)specification sheets and descriptive brochures,the classification of each laser product and any warnings required shall be state.		P
	b)To servicing dealers and distributors, and to others upon request, adequate instructions for service adjustments and service procedures for each laser product model. The instructions shall include protective procedures for service personnel,and legible reproductions of required labels and hazard warning		P
7	Additional requirements for specific laser products		N
7.1	Medical laser products Each medical laser product shall comply with all of the applicable requirements for laser products of its class		N
7.2	Other parts of the standards series IEC 60825		N
8	classification		P
8.2	Description of laser classes		P
8.3	It is the responsibility of the manufacture or his agent to provide correct classification of a laser product.		P
8.4	Classification rules		P
	a) radiation of a single wavelength a single wavelength laser product ,with a spectral range of the emission line narrow enough so that AELs do not change, is assigned to a class when the accessible laser radiation, measured under the conditions appropriate to that class,exceeds the AEL of all lower classes but does not exceed that of the class assigned.		P
	b) Radiation of multiple wavelengths		N
	1)A laser product emitting two or more wavelengths in spectral regions shown as additive in table 5 is assigned to a class when the sum of the ratios of the accessible laser radiation,measured under the conditions appropriate to that class , to the AELs of those wavelengths is greater than unity for all lower classes but does not exceed unity for the class assigned.		N
	2) A laser product emitting two or more wavelengths not shown as additive in table 5 is assigned to a class when the accessible laser		N



EN 60825-1			
Cl.	Requirement – Test	Result	Verdict
	radiation,measured under the conditions appropriate to that class , exceeds the AELs of all lower classes for at least one wavelength but does not exceed the AEL for the class assigned for any wavelength.		
	c)Radiation from extended sources for an extended source ,the power or energy measured be below the permitted power or energy for the AEL specified for the class as a function of the angular subtense of the source a		N
	d) Non-circular and multiple sources for laser radiation where the apparent source consists of multiple points or is a linear source with an angular subtense greater than a_{min} and within the wavelength range from 400 nm to 1400 nm,measurements or evaluations shall be made for every single point ,or assembly of points,necessary to assure that the source does not exceed the AEL for each possible angle a subtended by each partical area,		N
	e)time bases		N
	i)0.25 s for class 2, class 2M and class 3R laser radiation in the wavelength range from 400 nm to 700 nm		N
	ii)100 s for laser radiation of all wavelength greater than 400 nm except for the cases listed in i) and iii)		N
	iii)30000 s for laser radiation of all wavelengths less than or equal to 400 nm and for laser radiation of wavelengths greater than 400 nm where intentional long-term viewing is inherent in the design or function of the laser product.		N
	f)Repetitively pulsed or modulated lasers		N
9	Measurements for classification		P
9.1	Tests Tests shall take into account all errors and statistical uncertainties in the measurement process and increases in emission and degradation in radiation safety with age. Tests during operation shall be used to determine the classification of the product. The above tests shall be made under each and every reasonably foreseeable single-fault condition.		P
9.2	Measurement of laser levels may be necessary to classify a laser product in accordance with 9.1. Measurements are unnecessary when the physical characteristics and limitations of the laser source place the laser product or laser installation clearly in a particular class.	See Page 12	P



EN 60825-1			
Cl.	Requirement – Test	Result	Verdict
9.3	Measurement geometry		P
	a)Aperture diameters		P
	b)Measurements distance		P
	c)Angle of acceptance		P

SECTION THREE --- USER'S GUIDE

10	Safety precautions		N
10.2	Use of remote interlock connector		N
10.3	Key control		N
10.4	Beam stop or attenuator		N
10.5	Warning signs		N
10.6	Beam paths		N
10.7	Specular reflections		N
10.8	Eye protection		N
10.8.1	Identification of eyewear		N
10.8.2	Required optical density		N
10.8.3	Protective eyewear		N
10.9	Protective clothing		N
10.10	Training		N
10.11	Medical supervision		N

11	Hazards incidental to laser operation		P
11.1	Atmospheric contamination		P
11.2	Collateral radiation hazards		N
11.2.1	Ultra-violet collateral radiation		N
11.2.2	Visible and infra-red collateral radiation		N
11.3	Electrical hazards		N
11.4	Cryogenic coolants		N
11.5	Materials processing		N
11.6	Other hazards		N

12	Procedures for hazard control		P
12.1	General		P
12.2	Hazard evaluation for lasers used outdoors		P
12.3	Personal protection		P
12.4	Laser demonstrations,displays and exhibitions		P
12.5	Lab and workshop laser installations		N
12.5.1	Class 1M,class 2,class 2M and class 3R laser products		N
12.5.2	Class 3B laser products		N
12.5.3	Class 4 laser products		N
12.6	Outdoor and construction laser installations		N
12.6.1	Class 2 laser products		N
12.6.2	Class 1M, class 2M and class 3R laser products used for surveying,alignment and levelling		N



EN 60825-1			
Cl.	Requirement – Test	Result	Verdict
12.6.3	Class 3B and Class 4 laser products		N
12.6.4	lasers used for surveying, alignment and levelling		N
13	Maximum permissible exposures		P
13.1	General remarks		P
13.2	Limiting apertures		N
13.3	Repetitively pulsed or modulated lasers		N
13.4	Measurements conditions		N
13.4.1	Limiting apertures		N
13.4.2	Angle of acceptance		P
13.5	Extended source lasers		N

Comparison of accessible emission level of laser radiation emitted with the accessible emission limit of certain class. Accessible emission levels are measurement values or calculated from the measurement values when necessary.

9.2	Emission Duration	Class
Measurement of laser radiation	0.10s	1
	10s	1
	10^4 s	1
	$>10^4$ s	1
	10^3 s	1



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
4	Requirements		P
4.1	General		P
	<p>This section defines the restrictions that are to be placed on an OFCS and on the location types in which an OFCS can operate, in accordance with the hazard that arises from optical radiation becoming accessible as a result of a reasonably foreseeable event. Whenever one or more alterations are made to an OFCS, the organization responsible for that alteration shall make a determination of whether each alteration could affect the hazard level. If the hazard level has changed, the organization responsible for the alteration(s) shall re-label those locations in the system that are accessible so as to ensure continued compliance with this standard.</p>		P
	<p>Each accessible location within an OFCS shall be separately assessed to determine the hazard level at that location. Where multiple communications systems are present at a location, the hazard level for the location shall be the highest of the levels arising from each of those systems. Based on the hazard level determined, appropriate actions shall be taken to ensure compliance with this standard. These actions could for example involve restriction of access to the location, or the implementation of safety features or redesign of the optical communications system to reduce the hazard level.</p>		P
	<p>Suppliers of active components and subassemblies in conformance with this standard that do not comprise an OFCS need to comply only with the applicable portions of Clause 4.</p>		P
	<p>OFCS that also transmit electrical power shall meet the requirements of this standard in addition to any applicable electrical standard.</p>		P
4.2	Protective housing of OFCS		P



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	Each OFCS shall have a protective housing which, when in place, prevents human access to laser radiation in excess of hazard level 1 limits under normal operating conditions.		P
4.3	Fibre cables		N
	If the potential hazard at any accessible location within an OFCS is hazard level 1M, 2M, 3R or 3B, then the fibre optic cable shall have mechanical properties appropriate to its physical location. Cables for various physical locations are described in the IEC 60794 series. Where necessary, additional protection, for example ducting, conduit or raceway, may be required for locations where the fibre would otherwise be susceptible to damage.		N
4.4	Cable connectors		P
	The following requirements for cable connectors may be achieved by the mechanical design of the connectors, or by the positioning of the connector, or by any other suitable means. Whichever means is chosen, human access to radiation above that permitted for connectors in a particular location type shall be prevented.		P
4.4.1	Unrestricted locations		P
	In unrestricted locations, if the accessible radiation level exceeds: – hazard level 2 within the wavelength range 400 nm to 700 nm, or – hazard level 1 in all other cases, then suitable means shall limit access to the radiation from the connector.		P
4.4.2	Restricted locations		N
	In restricted locations, if the accessible radiation level exceeds: – hazard level 2M within the wavelength range 400 nm to 700 nm, or – hazard level 1M in all other cases, then suitable means shall limit access to the radiation from the connector.		N
4.4.3	Controlled locations		N



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	In controlled locations, if the accessible radiation level exceeds: – hazard level 2M within the wavelength range 400 nm to 700 nm, or – hazard level 1M in all other cases, then suitable means shall limit access to the radiation from the connector.		N
4.5	Automatic power reduction (APR) and restart pulses		N
	If equipment makes use of an automatic power reduction (APR) system in order to reduce its assigned hazard level, then it shall be restarted with restrictions which are described in the following three scenarios. In addition, the APR shall be designed to have an adequate level of reliability (see Note 1).		N
4.5.1	Automatic restart		N
	In the case where the restart is initiated automatically, the timing and power of the restart process shall be restricted such that the hazard level assigned to each accessible location of the system shall not be exceeded.		N
4.5.2	Manual restart with assured continuity		N
	In the case where the restart is initiated manually and the continuity of the communications path is assured by the use of administrative controls or other means, the timing and power of the restart process is not restricted (see Note 3). The manufacturer's instructions shall specify that administrative controls (or other means) must take account of the fact that the assigned hazard level at any accessible location may be exceeded during this restart procedure.		N
4.5.3	Manual restart without assured continuity		N
	In the case where the restart is initiated manually and the continuity of the communications path is not assured, the timing and power of the restart process shall be restricted such that the hazard level assigned to each accessible location of the system shall not be exceeded.		N
4.5.4	Disabling of the APR		N



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	If a manual initiated restart of the system temporarily inactivates the APR, the system must indicate that the APR is not operable for the duration of the reboot so that the operating organization can take the appropriate precautions. Unless these conditions are met, the hazard level must be assigned using the transmitting power level before APR.		N
	Disabling of the APR mechanism shall not be permitted for Class 3B and 4 transmitting powers, unless all of the following conditions are met:		N
	1) that such disabling is necessary only for the infrequent incidences of system installation and service;		N
	2) that such disabling can only be done via software commands or a manual lockout key system;		N
	3) if disabling is done via software commands, incorporated in such software shall be a security system that prevents inadvertent disabling of the APR mechanism;		N
	4) that such software incorporate a warning indicator that the APR will be disabled if the procedure is continued;		N
	5) continuous operation of the traffic-carrying OFCS with APR disabled shall be prevented by suitable engineering means;		N
	6) proper instructions on the safe use of the equipment with the disabled APR are included in the documentation.		N
4.6	Labelling or marking		P
4.6.1	General requirements		P
	Where required by this subclause, each optical connector, splice box or other part emitting radiation when opened shall be marked (e.g. with a label, sleeve, tag, tape etc.), if the hazard level at the location is in excess of hazard level 1. The information shall consist of the information identified in Tables 1, 2 or 3 as applicable.		P



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	Where the accessible radiation at points of disconnection is hazard level 1 or hazard level 1M it is permitted for the above information to be provided in information for the user instead of as a marking on the product.		P
	Markings shall be coloured black on a yellow background. Labels reproduced in the documentation provided by the manufacturer or by the operating organisation are permitted to use black on a white background.		P
	It is acceptable to reduce the marking in size, providing that the result is legible. For subassemblies containing lasers or optical amplifiers, it is the responsibility of the manufacturer of the subassembly to provide such labelling; all other labelling is the responsibility of the operating organization."		P
	!Except as permitted below, each optical connector, splice box or other part that is intended to permit access to optical radiation when opened shall be marked (e.g. with a label, sleeve, tag, tape etc.) in accordance with Tables 1, 2 or 3, as applicable.		P
	In addition to the marking required in this Part 2, certain subassemblies may also need to be marked because of their stand-alone application under Part 1, and in such situations it is left to the manufacturer of the OFCS whether they supplement the marking required by Part 1 or replace it with the marking as required by Part 2.		P
4.6.2	Marking of connectors of optical transmitters and optical amplifiers		P
	Manufacturers of optical transmitters and manufacturers of optical amplifiers shall comply with the requirements of 4.6.1 as regards each optical port, or group of ports (see 4.6.3) that may be connected to an optical fibre. For such connectors of optical transmitters and optical amplifiers, the requirements of 4.6.1 are modified as below."		P



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	<p>If 4.6.1 requires a marking to be provided, then the wavelength range shall be added to the information already required by Tables 1, 2 and 3. Preferred values of wavelength range are:</p> <ul style="list-style-type: none"> – 400 nm to 700 nm – 700 nm to 1 150 nm – 1 200 nm to 1 400 nm – 1 400 nm to 1 600 nm. <p>Between 1 150 nm and 1 200 nm, the exact wavelength shall be marked.</p>		P
4.6.3	Markings for groups of connectors		N
	<p>Groups of connectors such as patch panels may be marked as a group, with just a single clearly visible Hazard Level marking rather than having each connector individually marked. If a group of connectors is enclosed within a housing and it is a foreseeable event that exposure to optical radiation above Hazard Level 1M could result from accessing the connectors in that housing, then a marking shall be clearly visible both before and after the housing is opened.</p> <p>This may require the use of more than one marking.</p>		N
	<p>The tables intentionally omit the (optional) inclusion of the type of optical instrument which might result in an increased hazard for hazard level 1M and 2M (i.e. 'BINOCULARS OR TELESCOPES' or 'MAGNIFIERS') (see Section 5 of IEC 60825-1).</p>		N
4.6.4	Durability – Indelibility requirements for safety markings		P
	<p>Any marking required by this standard shall be durable and legible. In considering the durability of the marking, the effect of normal use shall be taken into account.</p>		P
	<p>Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit. After this test, the marking shall be legible; it shall not be possible to remove marking plates easily and they shall show no curling.</p>		P



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	The petroleum spirit to be used for the test is aliphatic solvent hexane having a maximum aromatics content of 0,1 % by volume, a kauributanol value of 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C and a mass per unit volume of approximately 0,7 kg/l.		P
4.6.5	Warning for invisible radiation		N
	If the output of the laser is outside the wavelength range 400 nm to 700 nm, the wording 'laser radiation' in the labels in Tables 1, 2 and 3 shall be modified to read 'invisible laser radiation', or if the output is at wavelengths both inside and outside this wavelength range, to read 'visible and invisible laser radiation'. If a product is classified on the basis of the level of visible laser radiation and also emits in excess of the AEL of Class 1 at invisible wavelengths, the label shall include the words 'visible and invisible laser radiation' in lieu of 'laser radiation'.		N
4.7	Organizational requirements		P
4.7.1	Manufacturers of ready-to-use OFCS, turn key systems or subassemblies		P
	Manufacturers of OFCS, turnkey end-to-end systems or subassemblies shall:		P
	1) ensure that the equipment satisfies the applicable requirements of this standard;		P
	2) provide the following information:		P
	a) adequate description of the engineering design features incorporated into the product to prevent exposure to radiation above the MPE levels;		P
	b) adequate instructions for proper assembly, maintenance and safe use including clear warnings concerning precautions to avoid possible exposure to radiation above the MPE levels;		P
	c) adequate instructions to installation organizations and service organizations to ensure the product can be installed and serviced in a manner that the radiation accessible under reasonably foreseeable events meets the requirements of Clause 4;		P



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	d) the hazard levels at accessible locations within the system or subassembly and the parameters upon which those hazard levels are based;		P
	e) for systems with APR:		N
	– the reaction time and operating parameters of the APR;		N
	– where installation or service requires overriding an APR, information shall be included to enable the operating organization to specify safe work practices while the APR is overridden and safe procedures reinstating and testing such systems;		N
	– if a manual initiated restart temporarily inactivates the APR, the timing of the restart shall be stated clearly in the user manual;		N
	– all scenarios (e.g. removal or failure of a controller or other element) where the APR would not be operable including appropriate precautions that need to be taken under such conditions.		N
	f) any other information relevant to the safe use of the OFCS;		P
	g) a statement that the equipment must be installed according to the manufacturer's instructions, including the warning "CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure."		P
4.7.2	Installation and service organization		P
	The organization responsible for the installation and servicing of OFCS shall follow the manufacturer's instructions for installation of equipment in a manner that will ensure that the accessible radiation under reasonably foreseeable events satisfies the requirements of Clause 4.		P
	Before placing an OFCS into service, the installation organization or service organization, as applicable, shall ensure that APR, if used, is in appropriate working condition as designated in 4.5 and 4.8.		N



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	For systems with accessible locations other than hazard level 1 or 2, the installation organization and/or the service organization shall:		N
	a) provide adequate laser safety training of personnel responsible for carrying out installation and service activities;		P
	b) ensure that suitable access controls and warning labels are employed on controlled and restricted locations.		P
4.7.3	Operating organization		P
	The operating organization has the ultimate responsibility for the safety of the end-to-end system. This includes, especially:		P
	a) identification of the location type at all accessible locations of the entire OFCS;		P
	b) ensuring that the hazard levels are not exceeded for those location types under reasonably foreseeable events;		P
	c) ensuring that installation and service is performed only by organizations with the capability of satisfying the requirements of 4.2 to 4.9;		P
	d) ensuring that access to restricted and controlled locations is appropriately addressed with respect to laser safety;		N
	e) ensuring continuous compliance with system manufacturing, operating, installation, service and safety requirements.		P
4.8	Assessment of hazard level		P
4.8.1	Determination of hazard level		P
	The hazard level is determined by the measurement of the optical radiation that could become accessible following any reasonably foreseeable event (e.g. fibre break) during operation and maintenance. The methods for the determination of compliance with the specified radiation limit values are the same as those described for classification in IEC 60825-1. Measurements need to be taken under the appropriate conditions, e.g. simulated fibre cable break, and shall be based on the relevant clauses in IEC 60825-1.		P



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	The assessment of the hazard level with and without automatic power reduction shall take place:		P
	– 1 s after the reasonably foreseeable event for unrestricted locations, unless measurement at a later time would result in a larger exposure;		P
	– 3 s after the reasonably foreseeable event for restricted and controlled locations, unless measurement at a later time would result in a larger exposure.		N
	In circumstances where it is difficult to carry out direct measurements, an assessment of hazard level based on calculations is acceptable. For example, the knowledge of the laser or amplifier power and fibre attenuation may allow an assessment of the hazard at any particular location.		P
	For OFCS with automatic power reduction, the hazard level will be determined by the accessible emission (pulse or continuous wave) after the time interval given above (1 s for unrestricted locations, 3 s for restricted locations or controlled locations). Additionally, the MPE requirement in 4.8.2 shall be satisfied.		N
4.8.2	Impact of using automatic power reduction features		N
	Where the OFCS uses an automatic power reduction feature to meet the limits of a hazard level that is lower than that which would have to be assigned if no automatic power reduction feature would be present, the irradiance or radiant exposure during the maximum time to reach the lower hazard level specified in 4.8.1 (1 s for unrestricted, 3 s for restricted or controlled locations) shall not exceed the irradiance or radiant exposure limits (MPE). For controlled locations the measurement distance is 250 mm for this subclause only.		N
4.8.3	Conditions for tests and assessment		N
	Tests and assessments shall be carried out under reasonably foreseeable fault conditions.		N



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	In some complex systems (e.g. where the optical output is dependent on the integrity of other components and the performance of circuit design and software), it may be necessary to use other recognised methods for hazard/safety assessment (see Annex C).		N
	However, faults which result in the emission of radiation in excess of the hazard level need not be considered if:		N
	– they are for a limited duration only; and		N
	– it is not reasonably foreseeable that human access to the radiation will occur before the product is taken out of service.		N
4.9	Hazard level requirements by location type		N
	The required hazard level shall be determined for each accessible location within an OFCS.		N
4.9.1	Unrestricted access locations		P
	At a location with unrestricted access the hazard level shall be 1, 1M, 2 or 2M.		P
4.9.2	Restricted access locations		N
	At a location with restricted access the hazard level shall be 1, 1M, 2, 2M or 3R.		N
4.9.3	Controlled access locations		N
	At a location with controlled access the hazard level shall be 1, 1M, 2, 2M, 3R or 3B.		N



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	The safety of laser products, equipment classification, requirements and user's guide are covered by IEC 60825-1. Part 1 is primarily aimed at self-contained products which are under effective local control. An OFCS will be safe under normal operating conditions because the optical radiation is totally enclosed under intended operation. However, because of the extended nature of these systems (where optical power, under certain conditions, may be accessible many kilometres from the optical source), the precautions to minimise the hazard will be different from those concerning laser sources which are normally under local operator control. (It should be noted that many OFCS contain LEDs, which are included in the scope of IEC 60825-1.)		N
	The potential hazard of an OFCS depends on the likelihood of the protective housing being breached (e.g. a disconnected fibre connector or a broken cable) and on the nature of the optical radiation that might subsequently become accessible. The engineering requirements and user precautions that are required to minimise the hazard are specified in this Part 2 of IEC 60825.		N
	Each accessible location within an OFCS is allocated, by the system operating organization or its delegate, a hazard level that gives a guide as to the potential hazard if optical radiation becomes accessible. These hazard levels are described as hazard levels 1 to 4, in a fashion similar to the classification procedure described in IEC 60825-1. In fibre optic applications the limits of hazard levels 1M and 2M are often higher than the limit of hazard level 3R, but less than the limit of hazard level 3B. For these applications hazard level 3R is not applicable (see notes to 3.6, 3.8 and 3.9).		N
	Where operating organizations subcontract the installation, operation or maintenance of fibre optic communication systems, the responsibilities in relation to laser safety should be clearly defined by the operator.		N
	In summary, the primary differences between IEC 60825-1 and this Part 2 are as follows.		N



EN 60825-2			
Cl.	Requirement – Test	Result	Verdict
	<p>– A whole OFCS will not be classified as required by IEC 60825-1. This is because under intended operation, the optical radiation is totally enclosed, and it can be argued that a rigorous interpretation of IEC 60825-1 would give a Class 1 allocation to all systems, which may not reflect the potential hazard accurately. However, if the source can be operated separately, it should be classified according to IEC 60825-1.</p>		N
	<p>– Each accessible location in the extended enclosed optical transmission system will be designated by a hazard level on similar procedures as those for classification in IEC 60825-1, but this level will be based not on accessible radiation but on radiation that could become accessible under reasonably foreseeable circumstances (e.g. a fibre cable break, a disconnected fibre connector etc.).</p>		N
	<p>– The nature of the safety precautions required for any particular hazard level will depend on the type of location, i.e. domestic premises, industrial areas where there would be limited access, and switching centres where there could be controlled access. For example, it is specified that in the home a disconnected fibre connector should only be able to emit radiation corresponding to Class 1 or 2, whilst in controlled areas it could be higher.</p>		N



ANNEX A:

Photo-documentation



Figure 1 General Appearance of the EUT

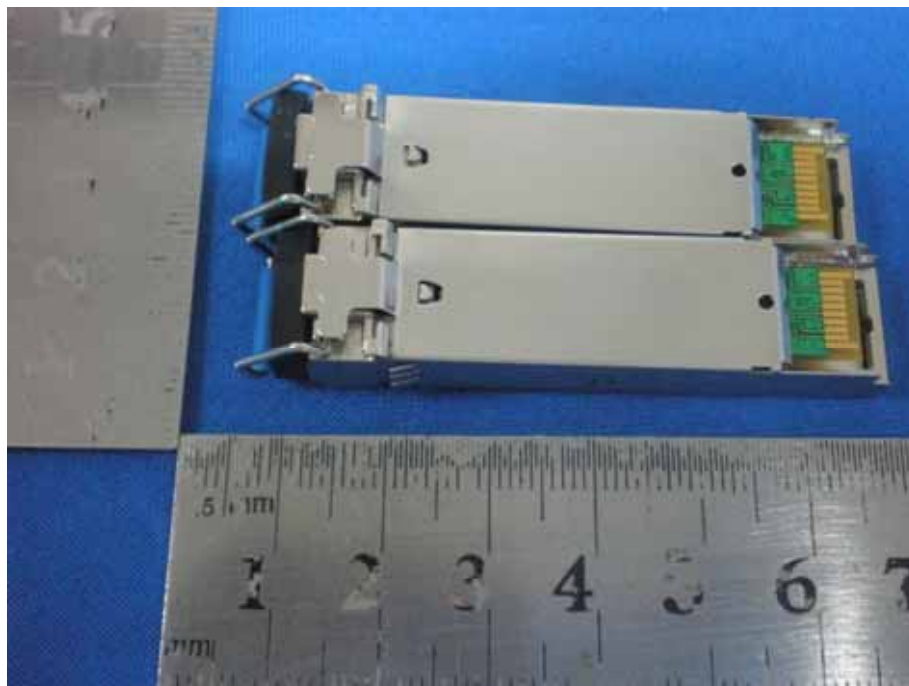


Figure 2 General Appearance of the EUT



ANNEX B:

Marking lable



CLASS 1 LASER PRODUCT

Wavelength: 1310 nm

EN60825-1:2007 EN 60825-2:2004+A1:2007

The difference of wavelength for each model shown as below:



ANNEX C:

Laser path

