FIBER OPTIC TECHNOLOGY
CALIBRATION LABORATORY

LS-215

Optical Light Source

INSTRUCTION MANUAL

Revision 1.0

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1 Introduction

The LS-215 optical Light Source is a small size low cost item which fulfils all necessary technical field equipment requirements. Available of working wavelengths 850/1300 for multimode or 1310/1550 nm single mode applications or a visible 650 nm laser source. The rechargeable battery ensures long term working with a minimum life time of 2 years. Batteries can be charged via a USB port or external AC/DC adaptor.

The universal output port allows the easy connection of mostly used in telecommunications, data and industry networks of optical connectors FC, SC or ST.

The LS-215 light source can be used in cooperation with the PM-215, the same smallest design optical power meter for measurement of Insertion loss and evaluation of power budget in optical networks.

2 Features:

- Smallest size, light weight
- Universal 2.5 mm output port
- Battery status indicator
- Single or dual wavelengths source
- Powered by Li-Pol type battery
- Battery charging via USB port
- 10 min Auto Off
- Protection rubber cover

3 Application

- Optical network testing
- Fiber continuity testing
- Measurement attenuation in fiber cabling and connection with PM-215 Optical power meter (or other type: PM-800, PM-212 etc.)
- Testing of connectors, splices, adaptors, switches and other components
- Easy and fast identification of failure points in fiber networks
- Suitable for SM and MM applications

4 Accessories

4.1 Standard

- Light source
- USB cable
- Power charging adapter
- Traceable calibration certificate
- Hard plastic case TE-HC-215
- 265x270x90 mm

4.2 Optional

- Master patchcords
- Master adaptors
- Soft case TE-EVA-215,
- 130x32x80 mm

Hard case
TE-HC-215

Soft case
TE-EVA-215

5 Specifications

Specifications		
Parameter	**Value:**	**Note:**
Output power:		
LD 650 nm	0 dBm	Visible laser
LED 850, 1300 nm	-20 dBm	
LD 1310, 1550 nm	-5 dBm	
Stability (1 hour, delta/2):		tested after 20 min warm up temperature 23 ± 1°
LD 850 nm, LED 850, 1300 nm	± 0.1 dB	
LD 1310, 1550 nm	± 0.05 dB	
Dimensions:	15 x 38 x 90 mm	without adaptor
Weight:	55 g	With battery
Temperature:		
Operating	-10 to +50 °C	
Storage	-40 to +70 °C	< 1 month
Humidity (non condensing)	0 to 95%	
Battery working time	> 7 hrs	between battery charging
Battery life time	> 2 years	320 mA/h Li-Pol

6 Safety information

This equipment complies with the following safety classifications: IEC825-1 and 21CFR1040: Class1

This applies to laser and LED options up to 1 mW, above 700 nm. Devices in this category are classified as safe for use by technicians under normal viewing, provided that magnifying devices are not used.

It is the responsibility of the user to acquire adequate training and familiarity with relevant safety issues and work practices before using this equipment.

WARNING!

- Never use magnifying devices to inspect optical fiber ends unless you are certain that no optical power is being emitted.
- Only use magnifying devices with a built-in infra-red filter to ensure safety.
- During operation, testing or maintenance of a fiber optic system, never look into an active fiber optic cable. Infrared radiation may be present and this can result in permanent eye damage.
- Avoid direct exposure to the beam.
- Do not activate the laser when there is no fiber attached to the optical output connector

Under no circumstances should you look into the end of an optical cable attached to the optical output when the device is operational. The laser radiation can seriously damage your eyesight.

7 Maintenance

7.1 Battery care

The LS-215 comes equipped with a built-in charger and is powered by Li-pol type battery (standard accessories).

- Charging – via USB port (PC) or by an external USB power charging adaptor (standard accessories)
- Only use the supplied USB power charging adapter.
- Charge the batteries for 75% before storing the LS-215 for long periods (100 % is not recommended). The batteries will lose the charge during storage.
- The batteries are consumable. Repeated charging and discharging decreases the lifetime of the batteries.

7.2 Instrument care

- During storage and transport keep the instrument in its carry case to protect against crushing, vibration, dust and moisture.
- Where possible keep the instrument away from strong sunlight.
- Clean the instrument housing using alcohol or other cleaning agents. Acetone or other active solvents may damage the case.
- The instrument is resistant to normal dust and moisture, however it is not waterproof. If moisture gets into the instrument, dry it out carefully before using it again.

7.3 Recommended cleaning and mating instructions

Cleanliness affects the performance of an optical fiber system. You should perform the following procedures prior to installation: Clean all connectors, adapters and attenuators before making any connections. The following cleaning materials are recommended and should form part of your cleaning kit:

- Lint-free laboratory wipes.
- Isopropyl alcohol in a pressurized dispenser
- Lint free pipe cleaners
- Clean, dry, oil-free compressed air

CLEANING

Connectors/Terminators:

1. Fold a clean, new wipe into a pad 2" by 2" square.
2. Moisten, but do not saturate the pad with alcohol making a spot approximately 1/2" in diameter.
3. Open the protective cap (E2000 only).
4. Press the ferrule and face into the wet spot on the wipe. Using force, twist the ferrule so that a hard wiping action occurs. Repeat twice, using a clean alcohol-moistened pad each time.
5. Press the ferrule end face into a dry spot on the wipe. Using force, twist the ferrule so that a hard wiping action occurs.
6. Close the cap (E2000 only).
7. Discard the used pad.

Attenuators:

1. For an exposed ferrule (in-line type), see the connector cleaning procedure, blow the other end dry with clean compressed air.
2. Clean bulkhead attenuators only by blowing with clean compressed air.

Adapters:

1. Moisten one end of a lint-free pipe cleaner with alcohol.
2. Remove any excess alcohol from the pipe cleaner with a clean wipe.
3. Insert the moistened pipe cleaner into either end of the adapter and scrub it in and out so that the inside surface of the adapter is wiped with the pipe cleaner. Repeat this step for the opposite end.
4. Insert the dry end of the pipe cleaner into either end of the adapter to remove any residual alcohol. For oversized adapters (biconic), slightly blow the middle of the pipe cleaner for better surface contact. Repeat this step for the opposite end.
5. Blow the adapter dry with clean compressed air.

MATING

SC, MT-RJ, LC:

1. Align the housing key with the slot in the adapter.
2. Push the connector into the adapter until a click is heard/felt indicating the latching system is engaged. When the SC connector is fully engaged, the white stripes on the side of the housing should be hidden inside the adapter.

E 2000:

1. Align slots with the key on the adapter.
2. Push the connector into the adapter until it clicks.

FC:

1. Insert the ferrule tip into the adapter.
2. Align the key with the slot in the adapter.
3. Push the connector into the adapter until the coupling nut reaches the adapter housing.
4. Screw the coupling nut clockwise into the adapter.

ST:

1. Align the ferrule hub key with the slot in the adapter.
2. Insert the connector into the adapter until the coupling nut reaches the adapter housing.
3. Align the bayonet slots on the coupling nut with the pins on the outside of the adapter.
4. Push the coupling nut into the adapter while rotating the coupler nut clockwise to lock the bayonet and secure the connection.

Infrared radiation is invisible and can seriously damage the retina of the eye. Never look into the ends of any optical fiber.

8 Instrument and button function description

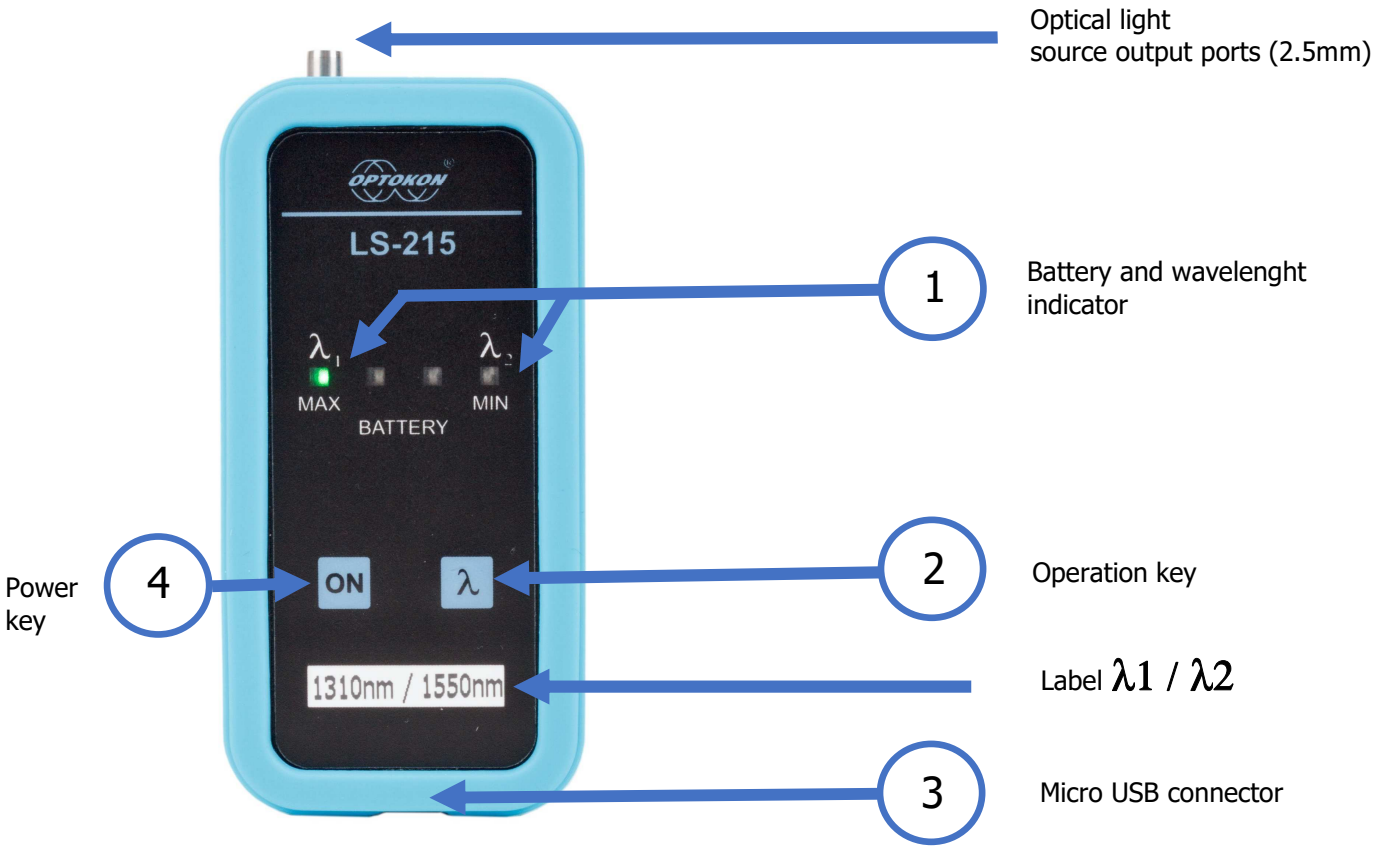
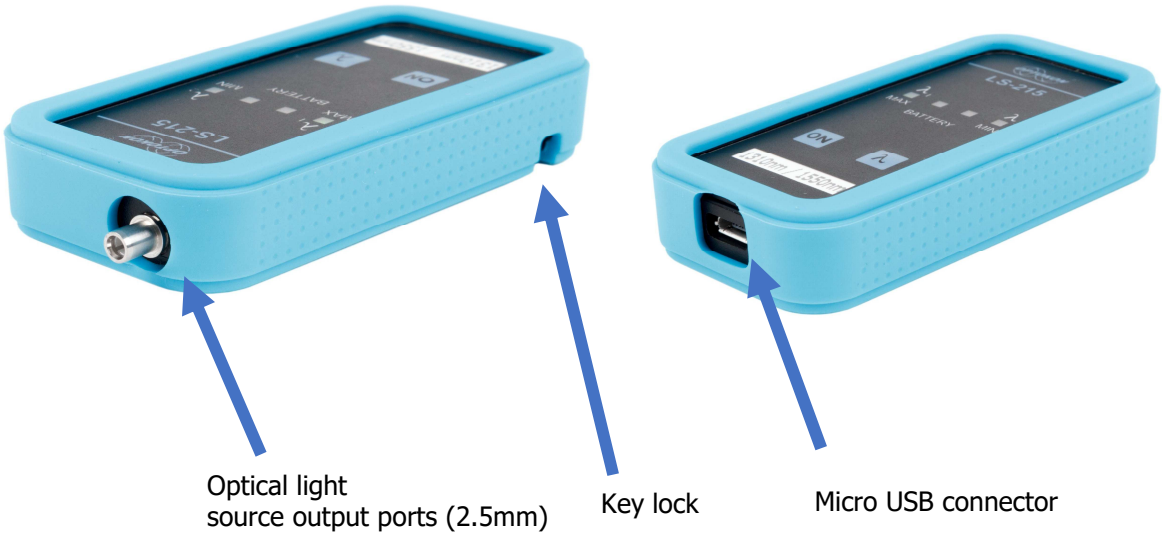


Figure 1:LS-215

Other Views



1	**Battery indicator**	Battery status is displayed during turn off device.
1	**Wavelength indicator**	Wavelenght indicator is displayed when is device turn on.
2	**Operation Key**	Key "λ" switchs between λ1 and λ2.
3	**Micro USB connector**	Micro USB connector: Interface for charging LS-215 Charging LS-215 is realized via USB port (PC) or by an external USB power charging adaptor (standard accessories). During connection: Battery diod is blinking when LS-215 is charging. LS-215 is fully charged when battery stops blinking.
4	**Power key**	Press the key to turn the LS-215 on/off.

9 Measurement loss

9.1 Basic theory

Loss measures the signal degradation in a fiber optic cable. A light source injects an optical signal of the appropriate wavelength into the fiber and a power meter measures the received signal at the same wavelength.

There are two different measurement methods:

- Method 6
- Method 7

according to IEC 874-1 4.4.7.4.

Power measurement is the basis of optical testing and determines the power budget of the fiber optic link by comparing the power of the transmitter and the sensitivity of the receiver. This difference is the maximum acceptable loss. Power loss is caused by different phenomena such as attenuation of the fiber, dirty connector mating faces, connector misalignment, loss of splices and other issues such as sharp fiber bends.

The "end to end" loss test is the most commonly used acceptance test for power loss in fiber optic links. The test is based on measurement the power difference at the input and output of the link.

The PM 215 and LS-800/LS-215 are used for this test, where the light source (LS-800/LS-215) acts as a transmitter and the optical power meter (PM 215) as a receiver.

The "end to end" test includes two steps:

1. Setting the reference

2. Measurement the loss

Important

- All connectors and fiber end faces should be cleaned prior to testing (see chapter 7.3).
- The master cord used to set the reference should be the same type as the patchcords (cables) to be tested (MM: 50/125, 62.5/125 or SM).
- It is very important that the connections are not disturbed after the reference value is established.

9.2 Method 6

For method 6 two master cords are used to set the reference. Method 6 cancels the effects of the master cords and one adaptor for all subsequent measurements.

9.2.1 Setting the reference

1.Connect the first master cord to the power meter (PM-215).

2. Connect the second master cord to the light source (LS-800/LS-215).

3. Use the master adaptor to connect the two fiber ends (figure 1).

4. Power on the light source and by pushing **[λ]**. Select the appropriate wavelength.

5. Power on the power meter and by pushing **[λ]** select the appropriate wavelength range.

6. On the power meter activate the relative power measurement mode - by pushing **[REL].**

7. Set and store the new reference for the selected wavelength - push **[REF]**, **[CONFIRM].**

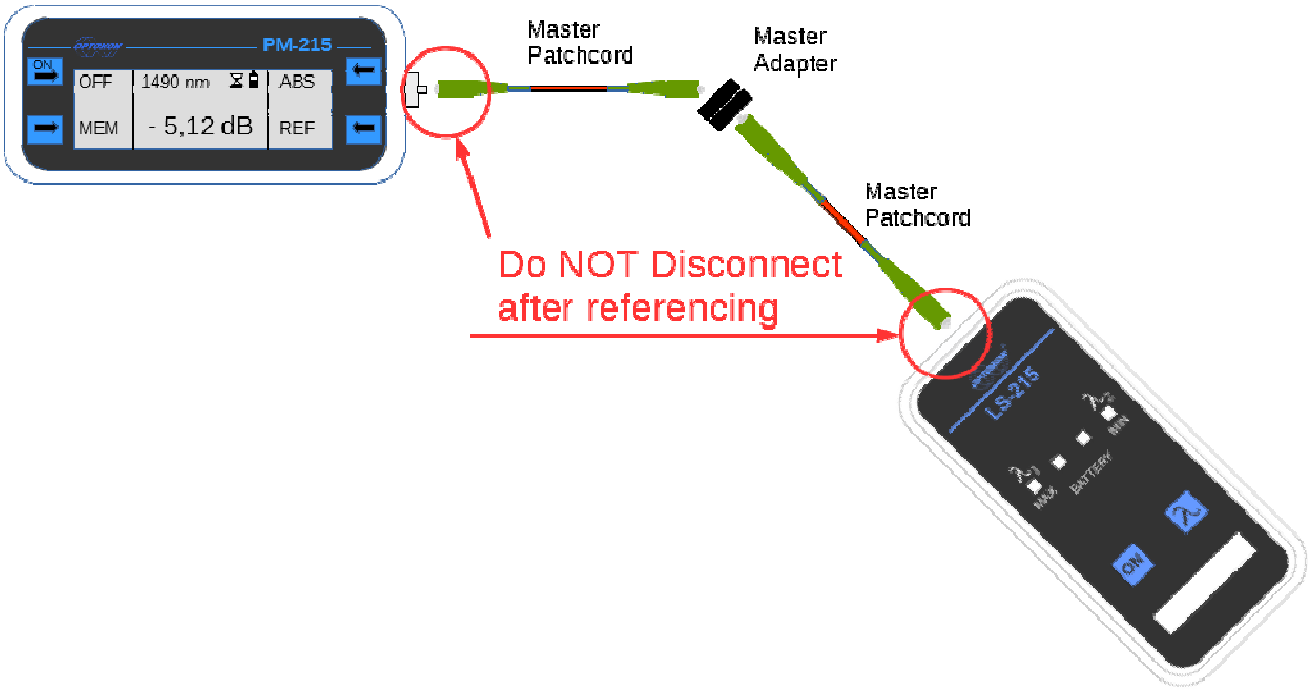


Figure 2: Setting reference by method 6

9.2.2 Measurement Loss

1. Do not disconnect the master cords from the light source and power meter.
2. Disconnect the second master cord from the adaptor.
3. Connect the trace to be measured between the master cords. An extra master adaptor is required (pic.2).
4. The power meter display will simultaneously report the value with the message "LOSS" or "GAIN" in dB.
5. This value represents the difference between the reference and the performed measurement.
6. If the value will be displayed with the "LOSS" message, the trace to be measured only has this loss.
7. If the value will be displayed with the "GAIN" message, this means that the trace to be measured has been compared with the reference for this gain.
8. The value of the loss (or gain) can be stored in the internal memory

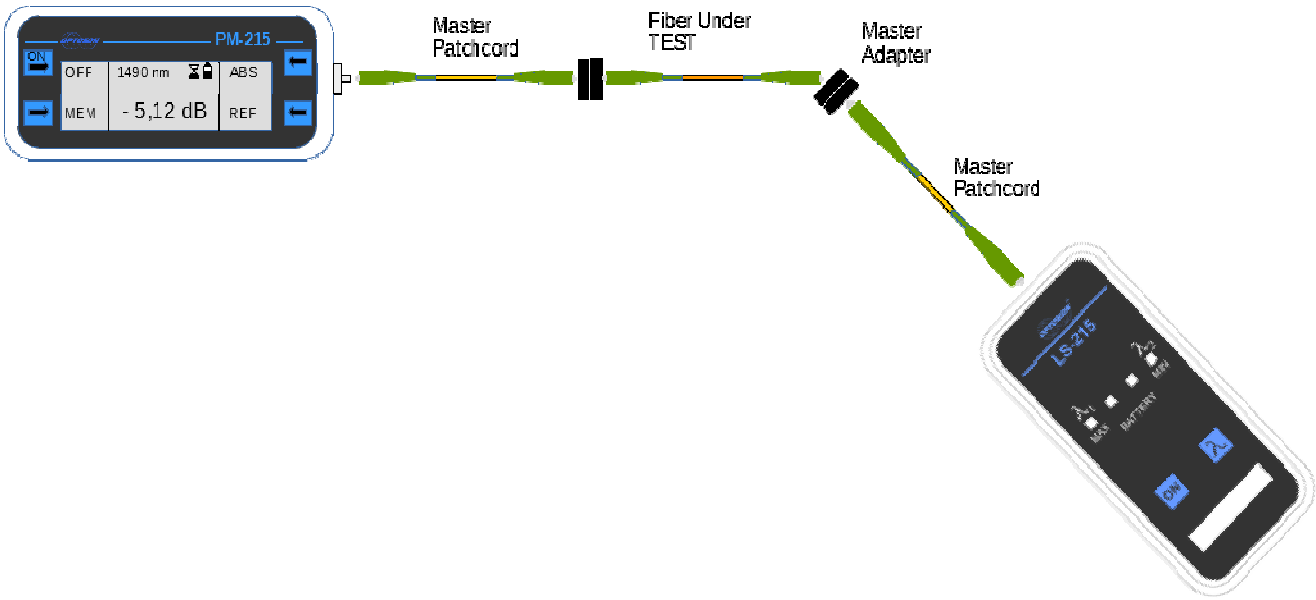


Figure 3: Measurement Loss by method 6

9.3 Method 7

For method 7, one master cord is used to set the reference. The master cord will be cancelled for all subsequent measurements.

9.3.1 Setting the reference

1. Connect the master cord to the power meter (PM 215).
2. Connect the second end of the master cord to the light source (LS-800/LS-215).
3. Power on the light source and select the appropriate wavelength - by pushing **[λ]**.
4. Power on the power meter and select the appropriate wavelength range - by pushing **[λ].**
5. On the power meter activate the relative power measurement mode - by pushing **[REL]**.

Set and store the new reference for the selected wavelength - push **[REF], [CONFIRM].**

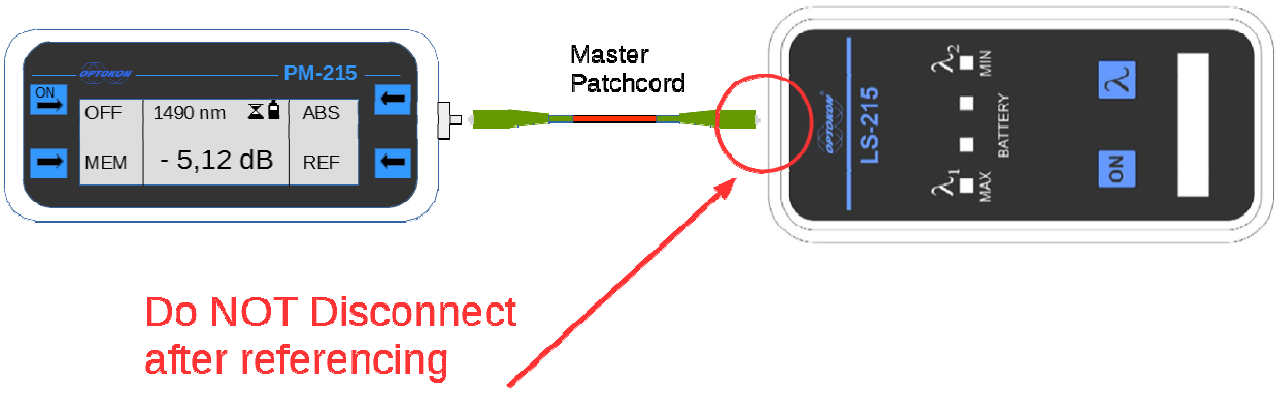


Figure 4:Setting reference by method 7

9.3.2 Measurement Loss

1. Do not disconnect the master cord from the light source.
2. Disconnect the master cord from the power meter port.
3. Connect the trace to be measured between the power meter port and the master cord that is attached to the light source. An extra master adaptor is required (pic.4)
4. The power meter display will report the value simultaneously with the message "LOSS" or "GAIN" in dB.
5. This value represents the difference between the reference and the performed measurement.
6. If the value will be displayed with the message "LOSS", the trace to be measured only has this loss.
7. If the value will be displayed with the message "GAIN", this means that the trace to be measured has been compared with the reference for this gain.
8. The value of the loss can be stored in the internal memor

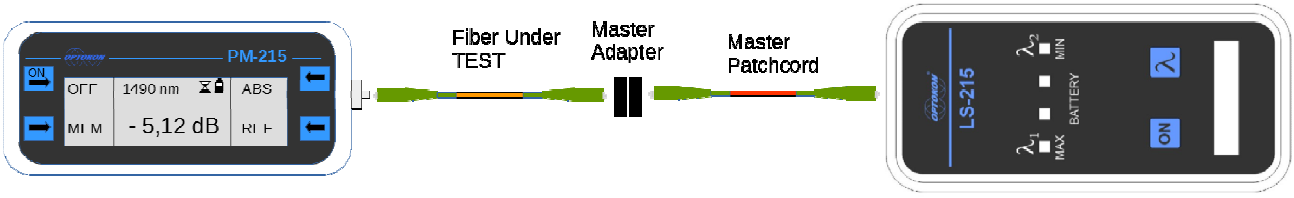


Figure 5: Measurement Loss by method 7

9.4 Notes

10 Power loss and decibels

Loss (dB)	% Loss	dBm	Power (mW)
0	0,0	-50	0,00001
0,1	2,3	-40	0,0001
0,2	4,5	-30	0,001
0,3	6,7	-20	0,01
0,4	8,8	-10	0,10
0,5	10,9	-9	0,13
0,6	12,9	-8	0,16
0,7	14,9	-7	0,20
0,8	16,8	-6	0,25
0,9	18,7	-5	0,32
1	20,6	-4	0,40
2	36,9	-3	0,50
3	49,9	-2	0,63
4	60,2	-1	0,79
5	68,4	0	1,00
6	74,9	1	1,26
7	80,0	3	2,00
8	84,2	5	3,16
9	87,7	7	5,01
10	90,0	10	10,00
12	93,7	12	15,84
15	96,8	15	31,62
20	99,0	17	50,12
30	99,9	20	100,00

11 Calibration, service center

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