

rOSNR Test System
Control Software
Operation Manual
v1.01

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1 Introduction

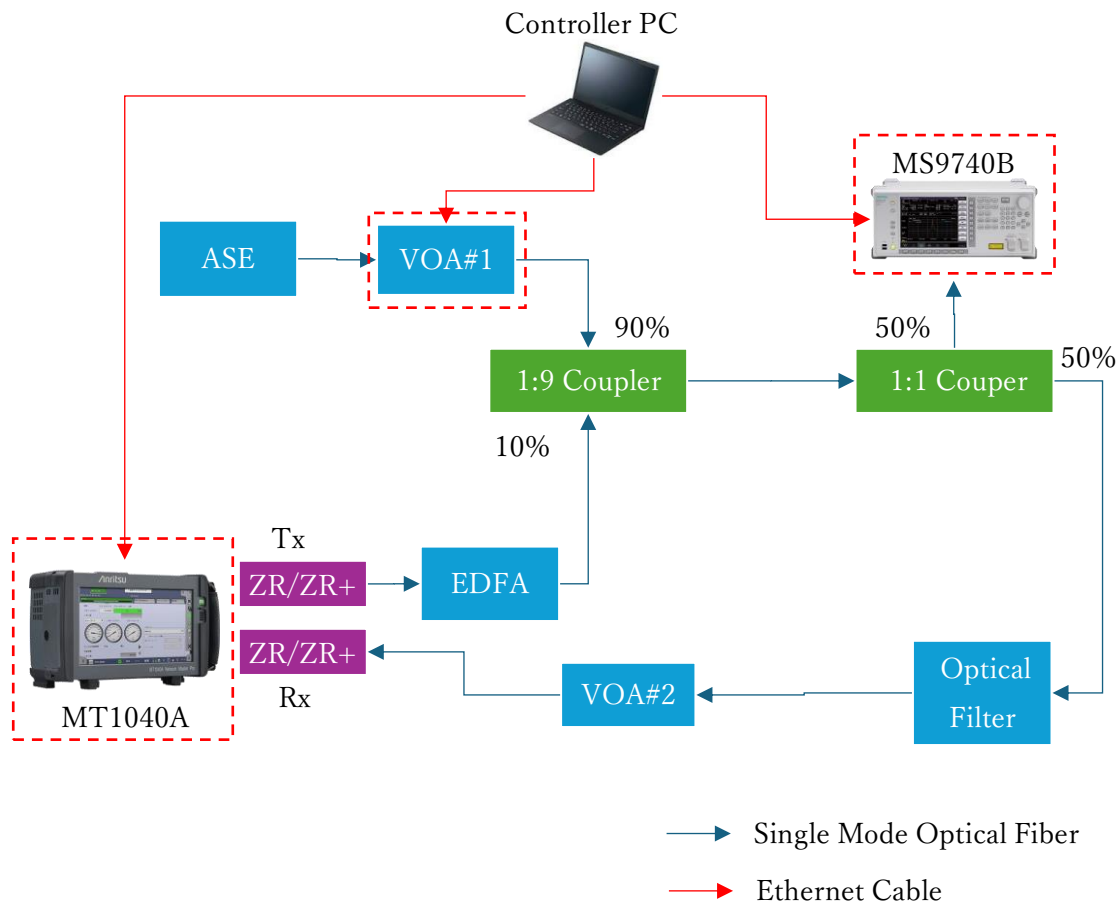
ZR/ZR+ Test Software is software for controlling the measuring instruments described in Chapter 2 and measuring rOSNR*1 of 400ZR/ZR+.

This software is provided as Visual Studio C# source code.

*1) Minimum received OSNR that can maintain error-free status in transceiver relay data

Please note that this software is free software, and we provide support for the software itself and inquiries.

2 Test Setup



Equipment	Note
Controller PC	PC to control MT1040A, MS9740B and VOA#1
MT1040A with two MU104014B	400G Analyzer
MS9740B	Optical Spectrum Analyzer to measure OSNR
VOA#1	Variable Optical Attenuator to control ASE. The control software supports following models, Quantify Photonics VOA-1002 Anritsu MN9610B
ZR/ZR+	400G ZR or ZR+ (Device under test)
ASE	Amplified Spontaneous Emission Source
VOA#2	VOA used to control optical input power to ZR/ZR+. It should be able to control output optical power automatically.
1:9 Coupler	Coupler for combining ASE output and ZR/ZR+ output

1:1 Coupler	Splitter for distributing optical power to OSA and ZR/ZR+.
Optical Filter	Optical bandpass filter

3 Test Procedure

<Manual Setting>

- 1.1 Set EDFA gain
- 1.2 Select filter channel to be tested
- 1.3 Check fiber connector edge with G0382A Video Inspection Probe
- 1.4 Insert 400ZR/ZR+(Tx/Rx) module into MT1040A
- 1.5 On MT1040A, set 400ZR/ZR+ transceiver parameters
(Example).
 - Grid: 75G
 - Frequency : Channel 24(193.700THz)
 - Target Output Power : 0dBm (Tx)
- 1.6 Connect all the fibers
- 1.7 Turn transceiver laser on
- 1.8 Adjust VOA#1 to get Transceiver Error Free

<Automated Testing>

- 2.1 Decrease the attenuation of VOA#1 by steps of 1dB to decrease OSNR measured on MS9740B OSA
- 2.2 Wait for 1 sec then start measurement
- 2.3 Measure OSNR on MS9740B OSA
- 2.4 Monitor errors on MT1040A 400G Analyzer
- 2.5 Repeat 2.1 to 2.4 until MT1040A 400G Analyzer detects the errors
- 2.6 From the attenuation of VOA#1 of step 2.5
- 2.7 Increase the attenuation of VOA#1 by steps of 0.1dB to increase the OSNR measured on MS9740B OSA
- 2.8 Wait for 1 sec then start measurement
- 2.9 Measure OSNR on MS9740B OSA
- 2.10 Monitor errors on MT1040A 400G Analyzer up to 30sec
- 2.11 If the Error is detected on MT1040A 400G Analyzer, repeat 2.7 to 2.10
- 2.12 If the Error is not detected on MT1040A 400G Analyzer for 30sec, finish the measurement.
- 2.13 The OSNR measured in the last step is rOSNR.

4 System Requirements

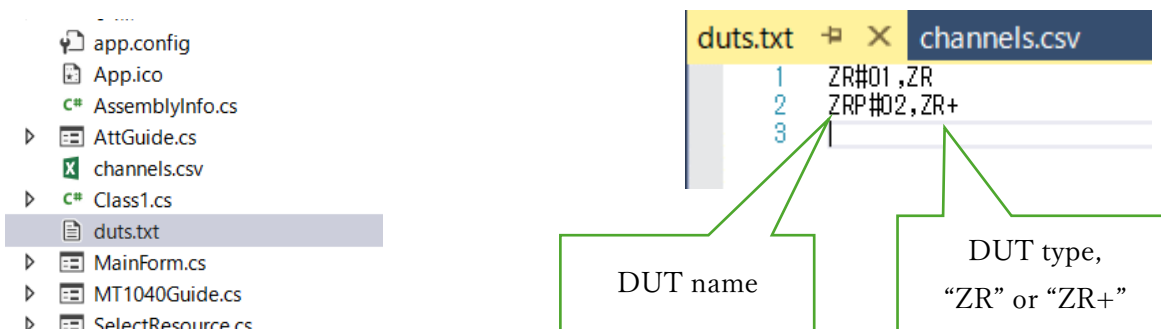
System Requirements

Item	Version
OS	Window10
Visual Studio C#	2022
NI-VISA	2024-Q4
MS9740B	v1.01.01
MT1040A	v15.00

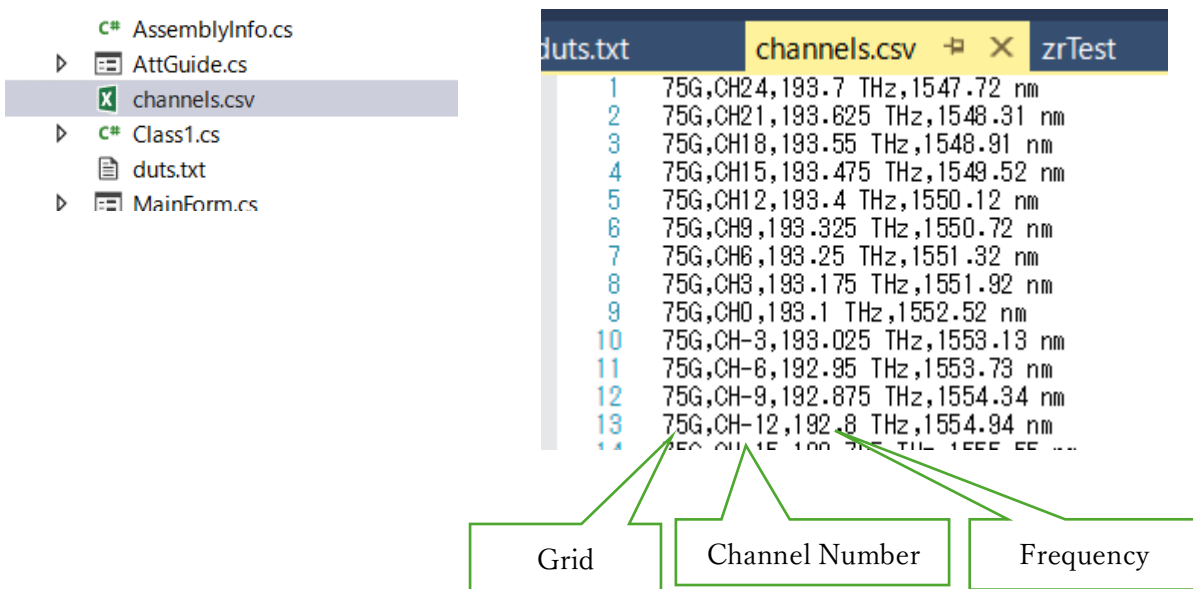
Search and register MS9740B and VOA in NI-MAX before measurement.

5 Measurement

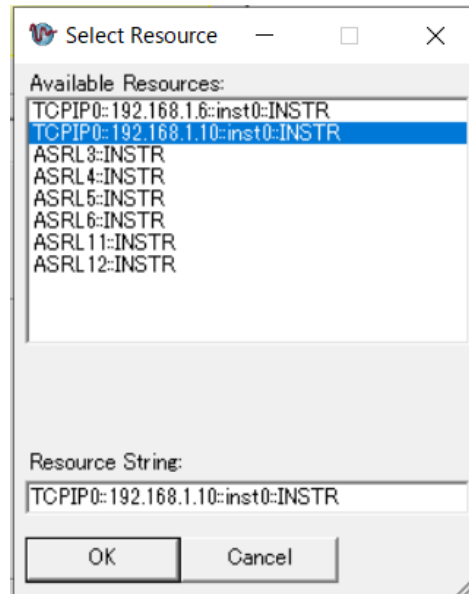
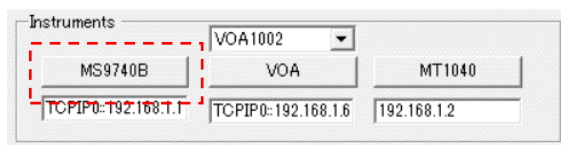
1. Open “ZrTest.sln” with Visual Studio.
2. Edit DUT File (duts.txt)



3. Edit channel definition file (channels.csv) if required.

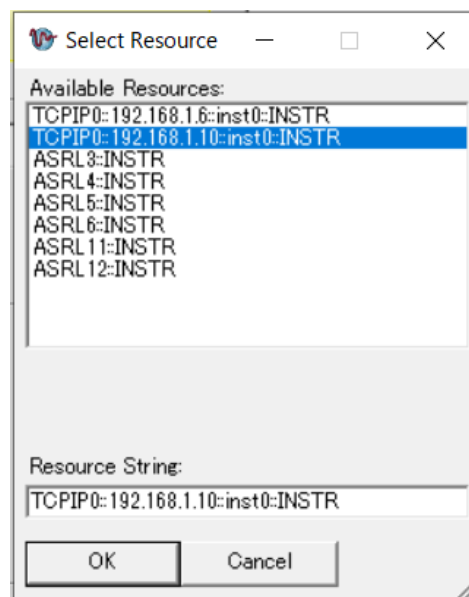
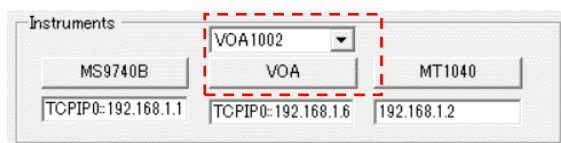


4. Push “F5” on Visual Studio to start application.
5. Connect to MS9740B
Push “MS9740B” button to select the resource.



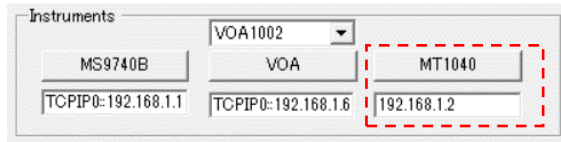
6. Connect to VOA

Select VOA name and push “VOA” to select the resource.



7. Connect to MT1040A

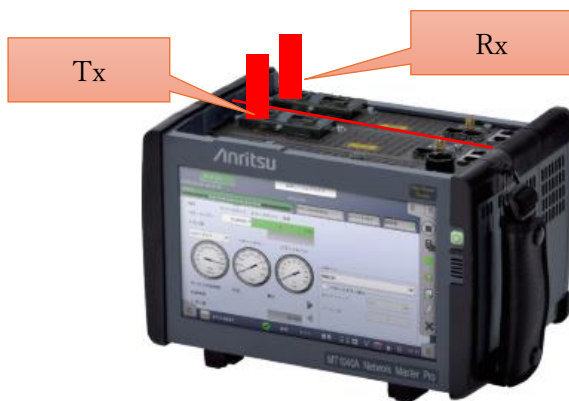
Input the IP address in the text box and push “MT1040” button to launch applications in MT1040A.



8. Plug DUT ZR/ZR+ modules in MT1040A.

For single module(loopback) test, plug the ZR/ZR+ module in the rear tester module.

For two modules test, plug the Tx ZR/ZR+ module in the front tester module and Rx ZR/ZR+ module in the rear tester module.

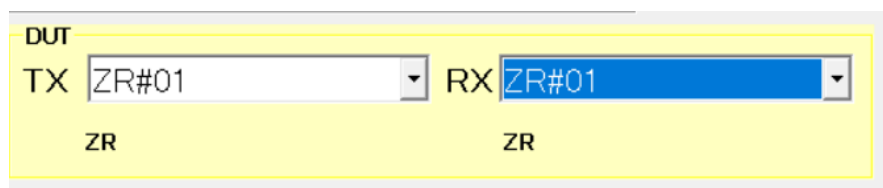


Two modules test

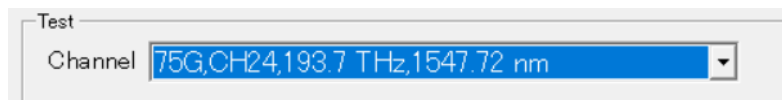


Single module test

9. Select ZR/ZR+ module configuration.



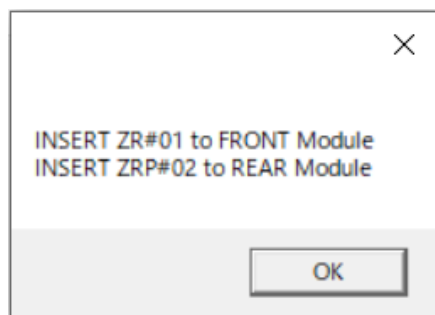
10. Select Channel



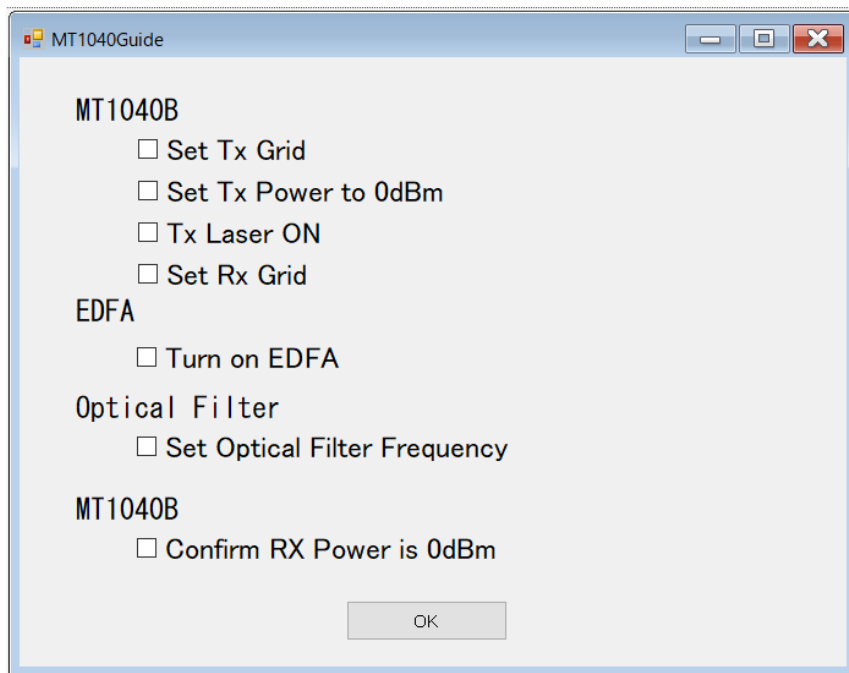
11. Push "Start" to start test



12. Confirm the DUT connection



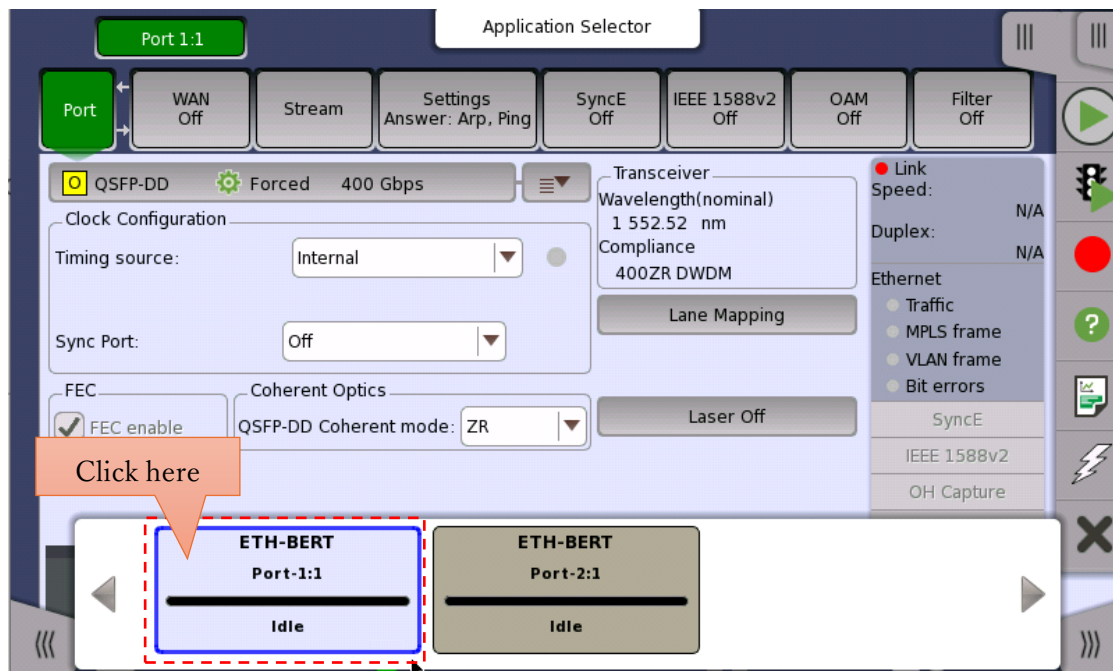
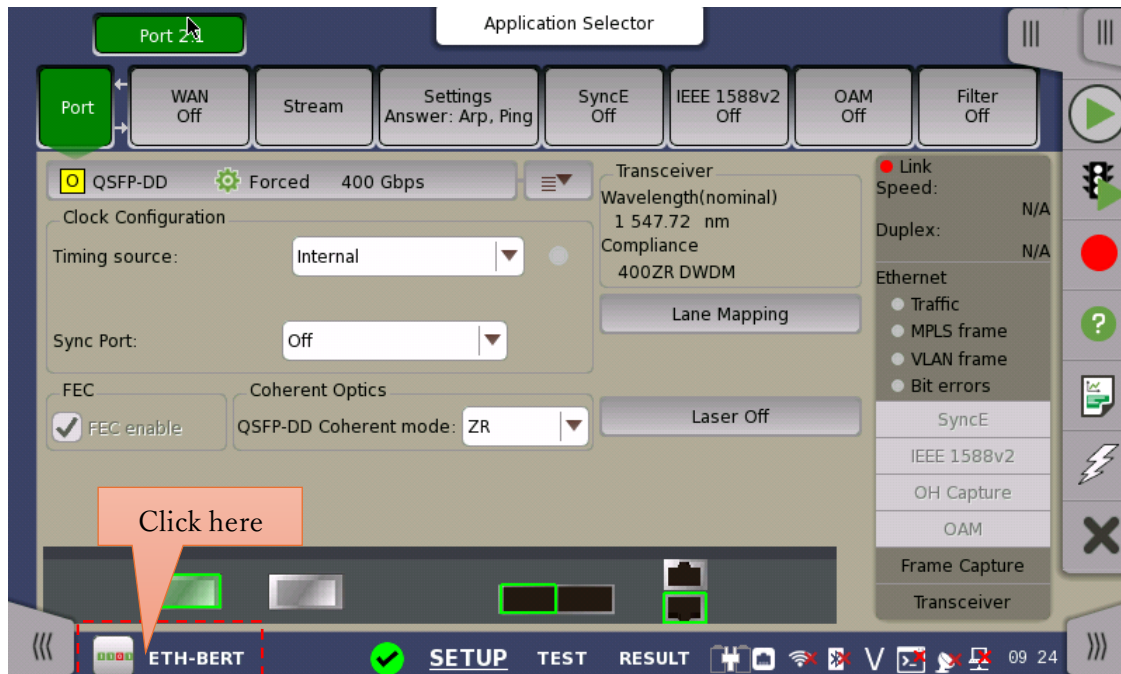
13. Confirm the test setup before measurement.



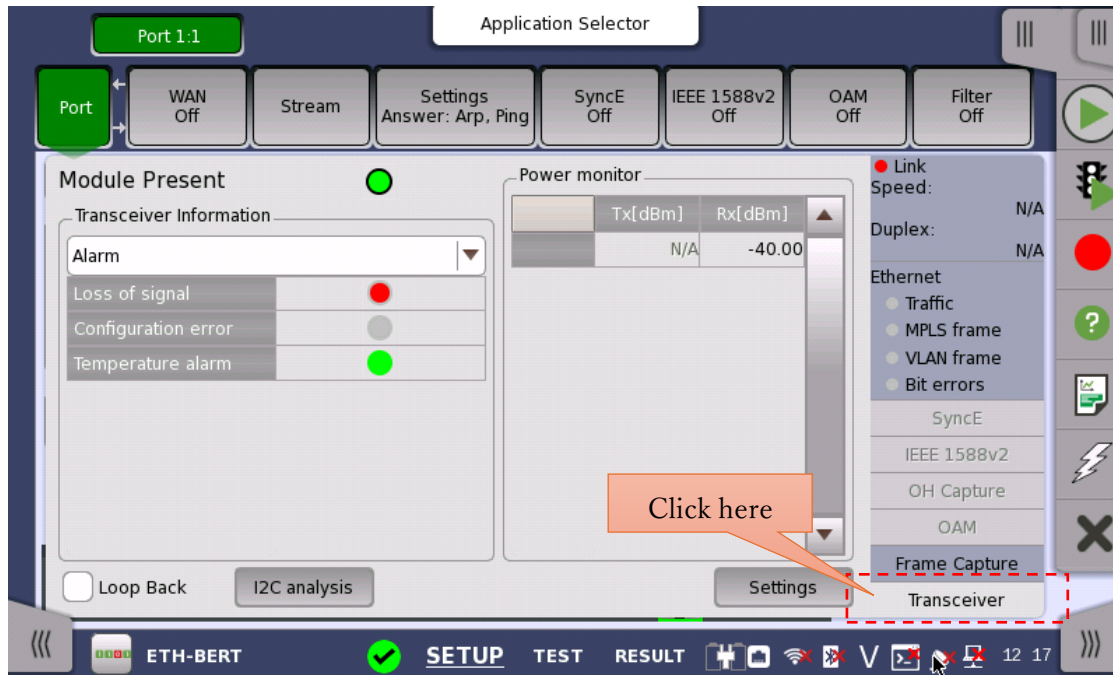
Check above checkboxes by confirming MT1040A setup window as follows.

<For two modules test>

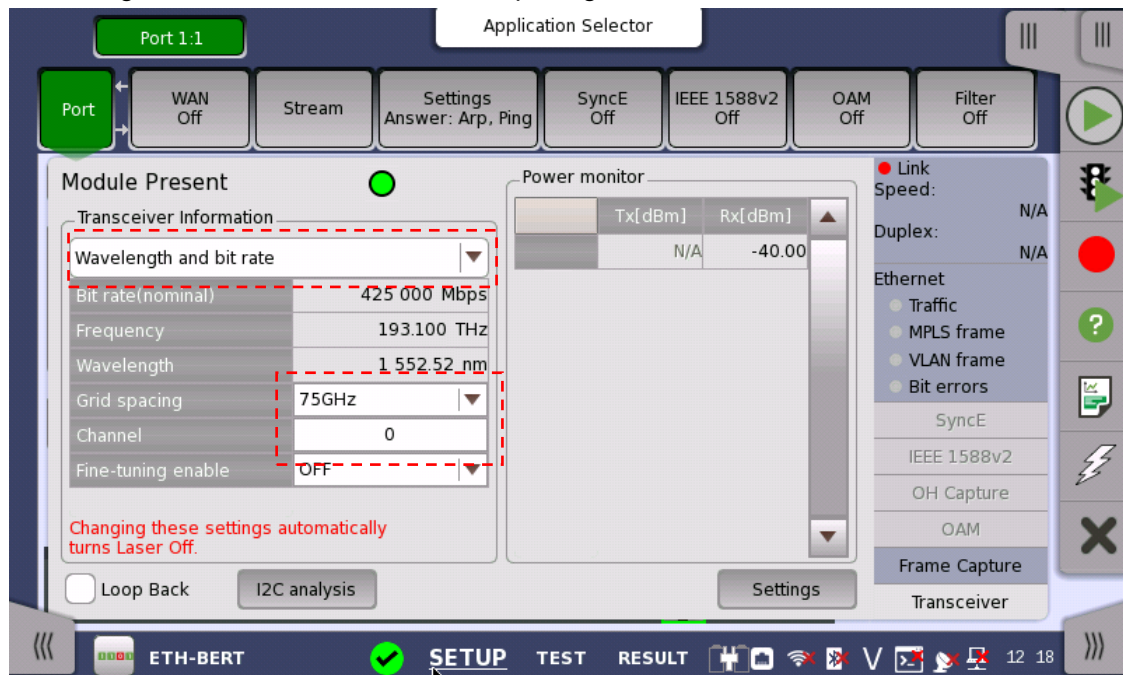
Select Tx module



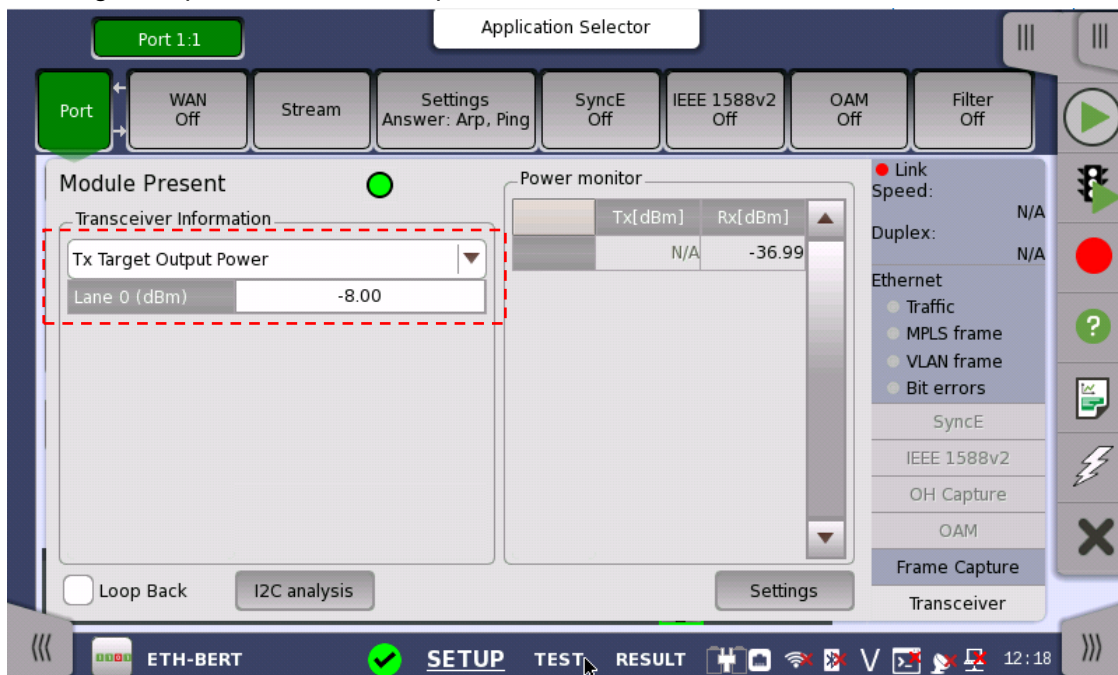
Push “Transceiver” tab button to show transceiver information



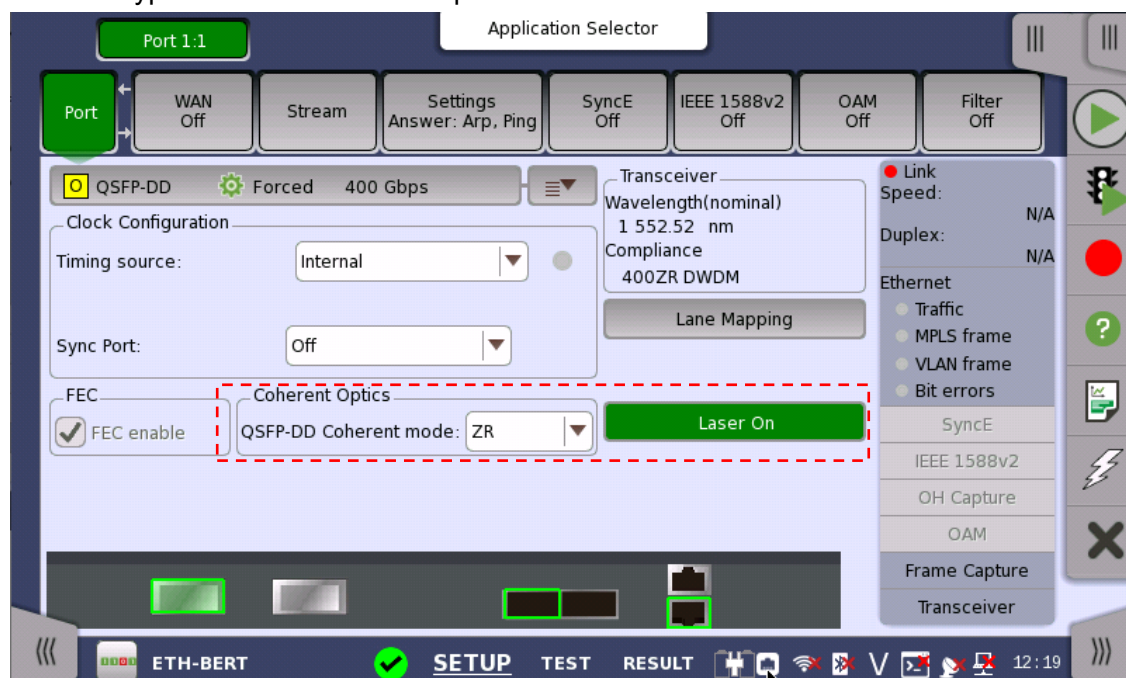
Select “Wavelength and bit rate” then set “Grid spacing” and “Channel”.



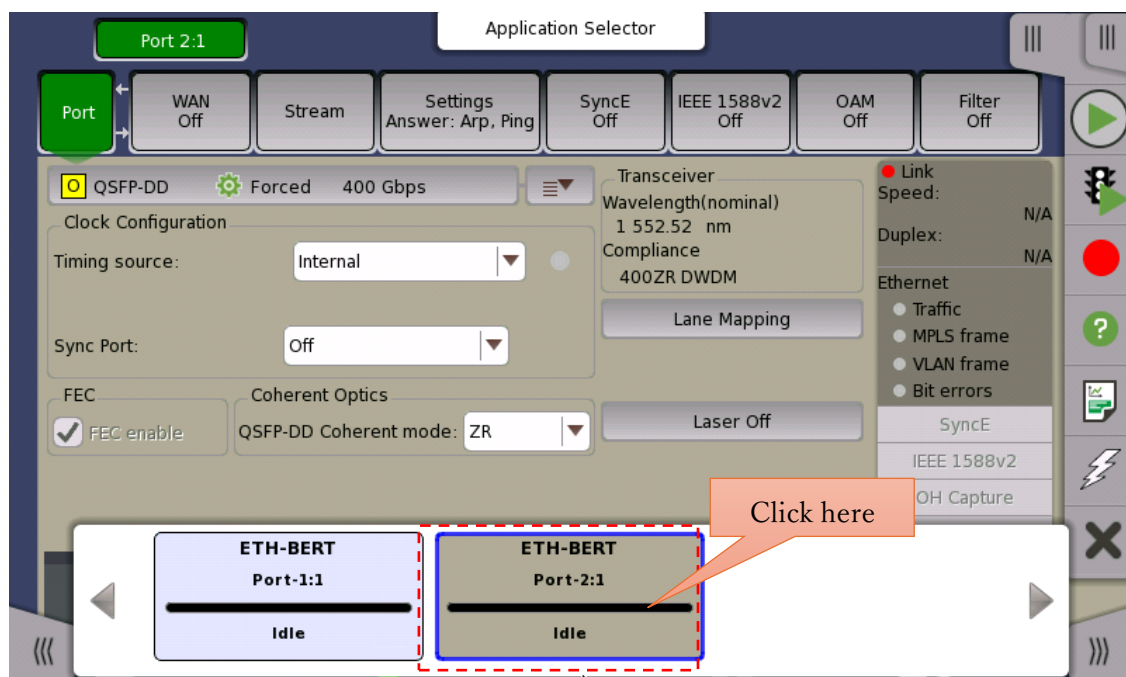
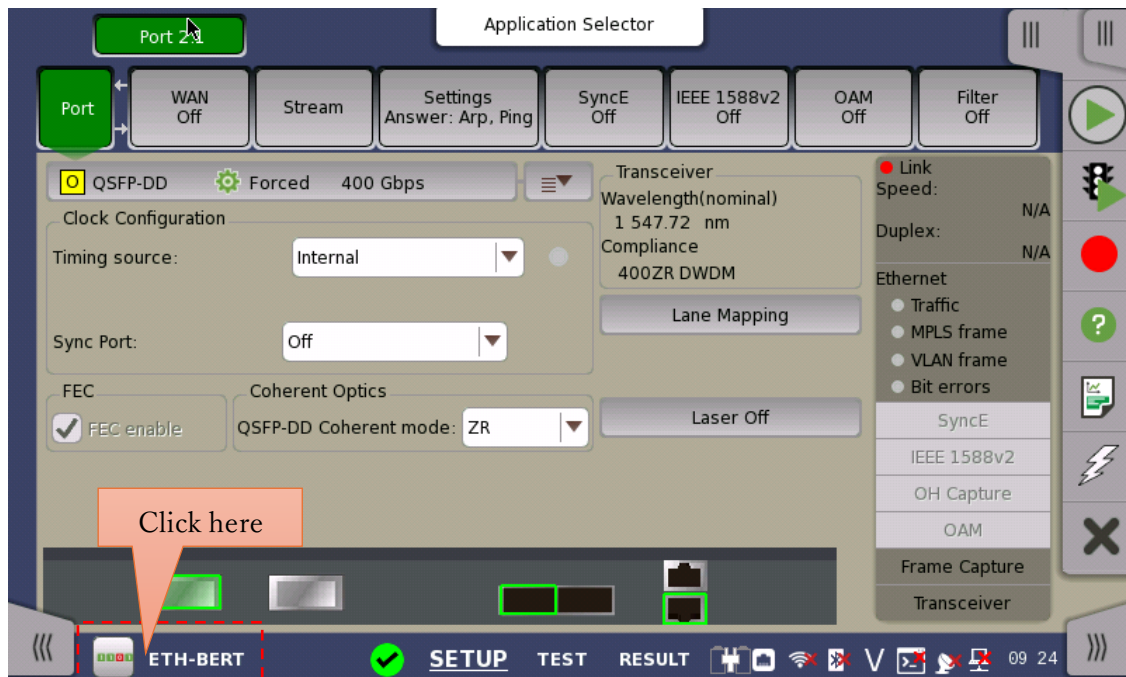
Select “Tx Target Output Power” then set power.



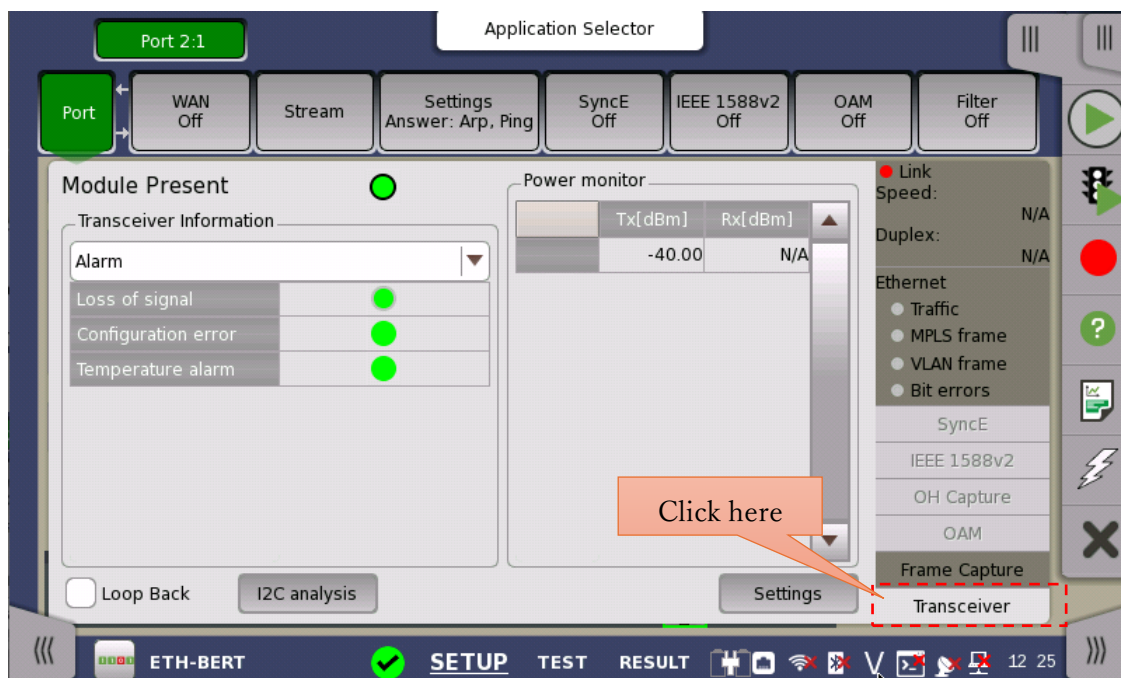
Confirm module type is “ZR” or “ZR+” then push “Laser On” button.



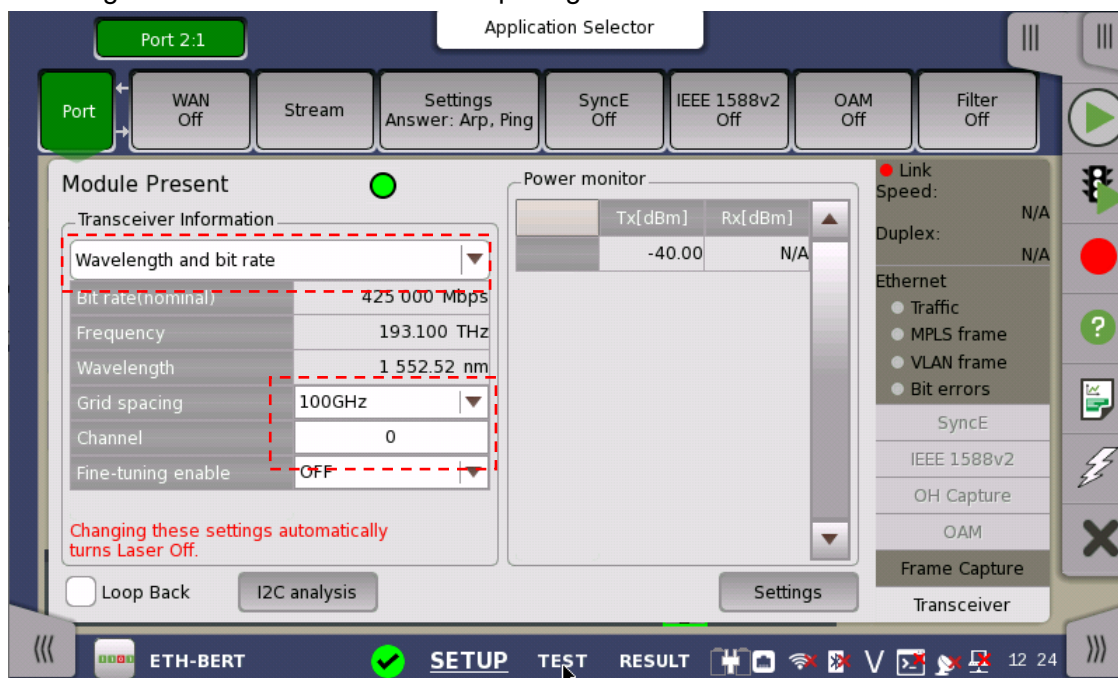
Select Rx module



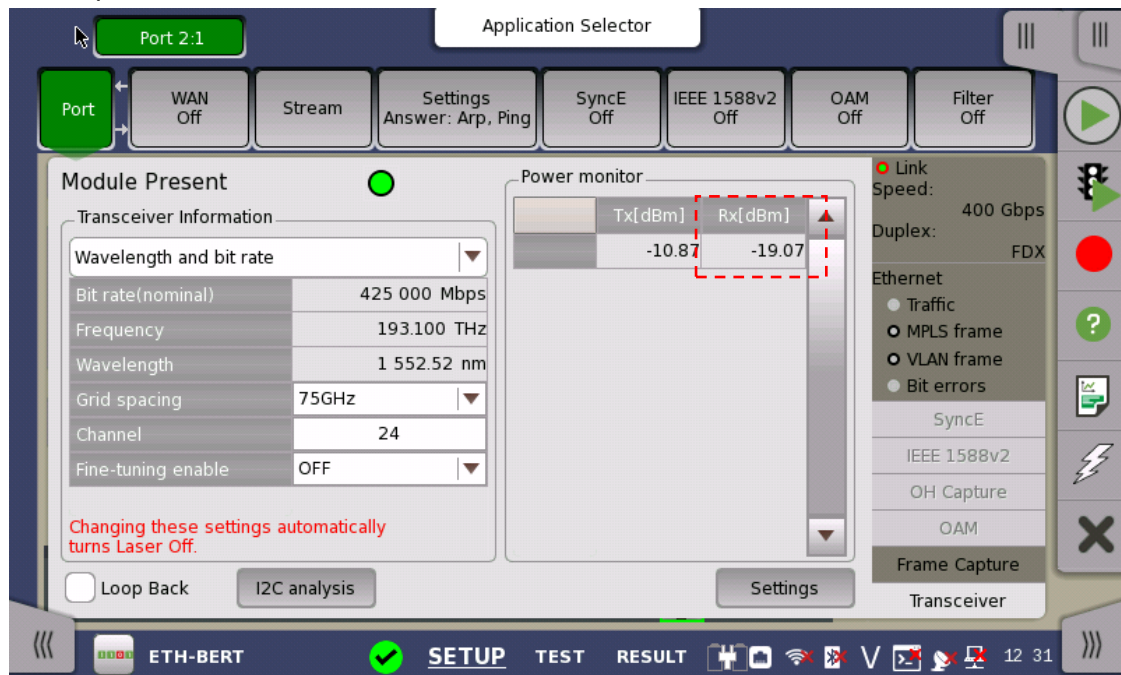
Push “Transceiver” tab button



Select “Wavelength and bit rate” then set “Grid spacing” and “Channel”.

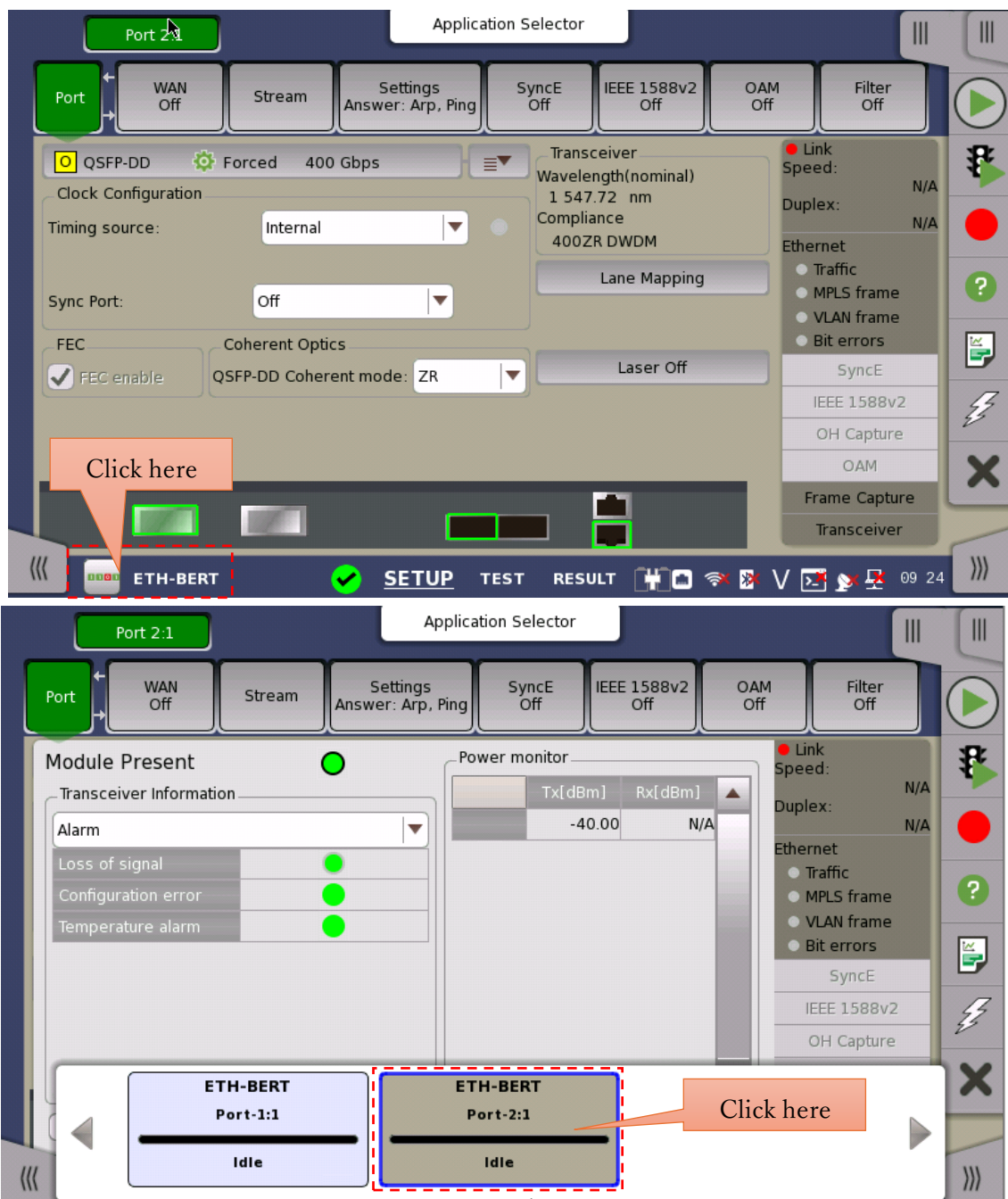


Confirm the Rx power

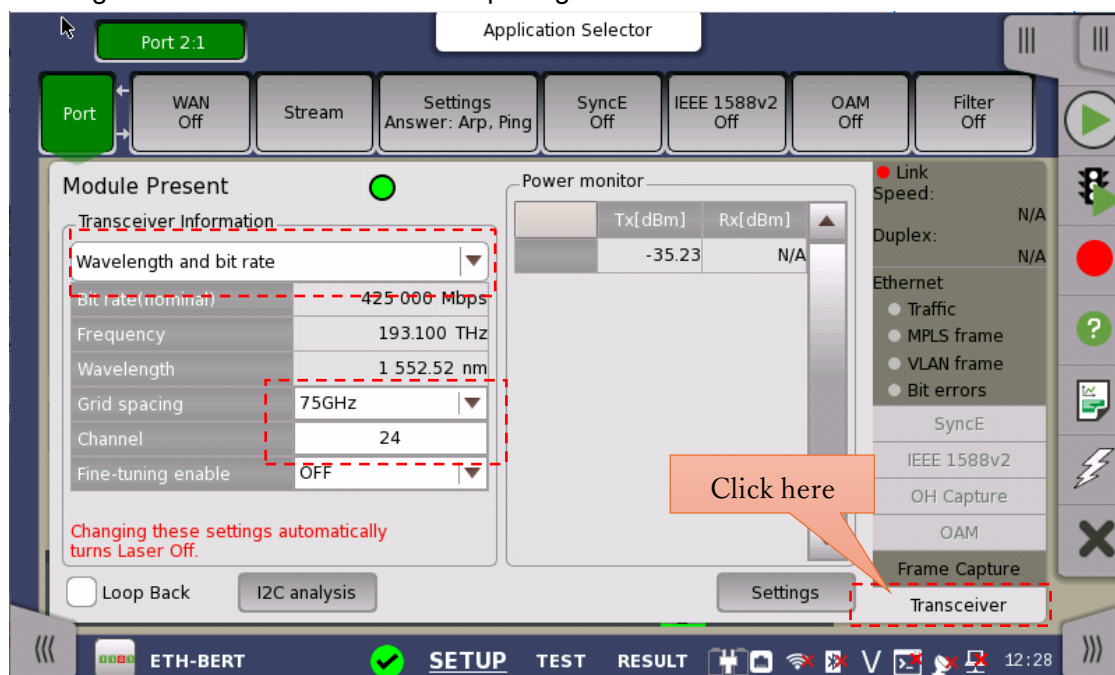


<For single module test(loopback)>

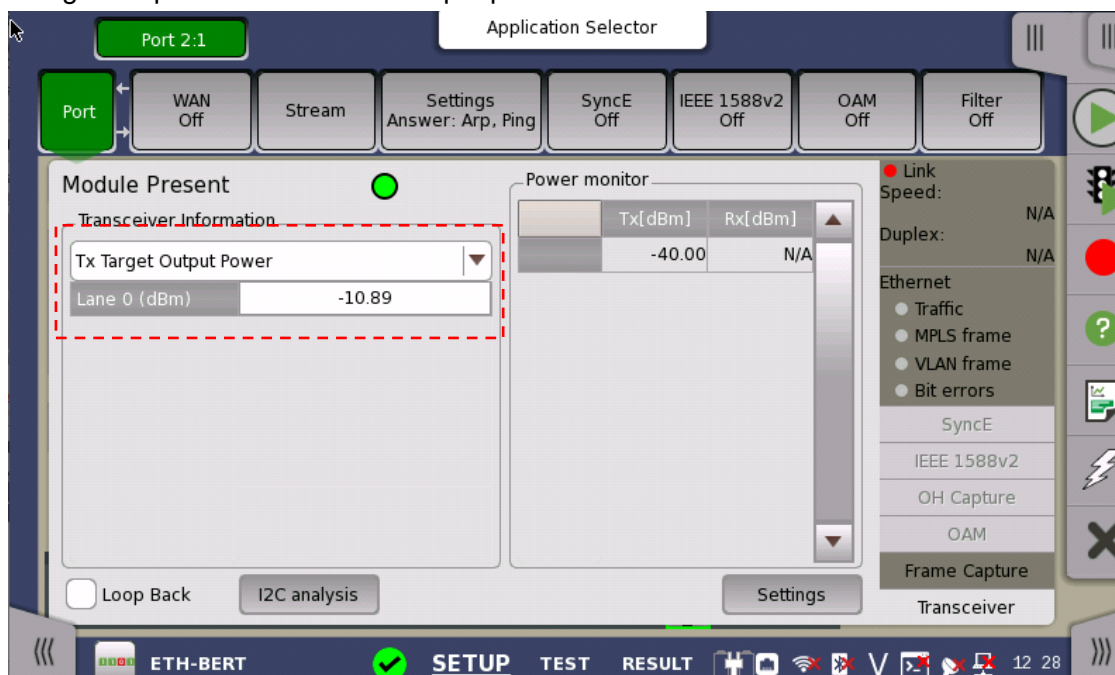
Select rear tester module



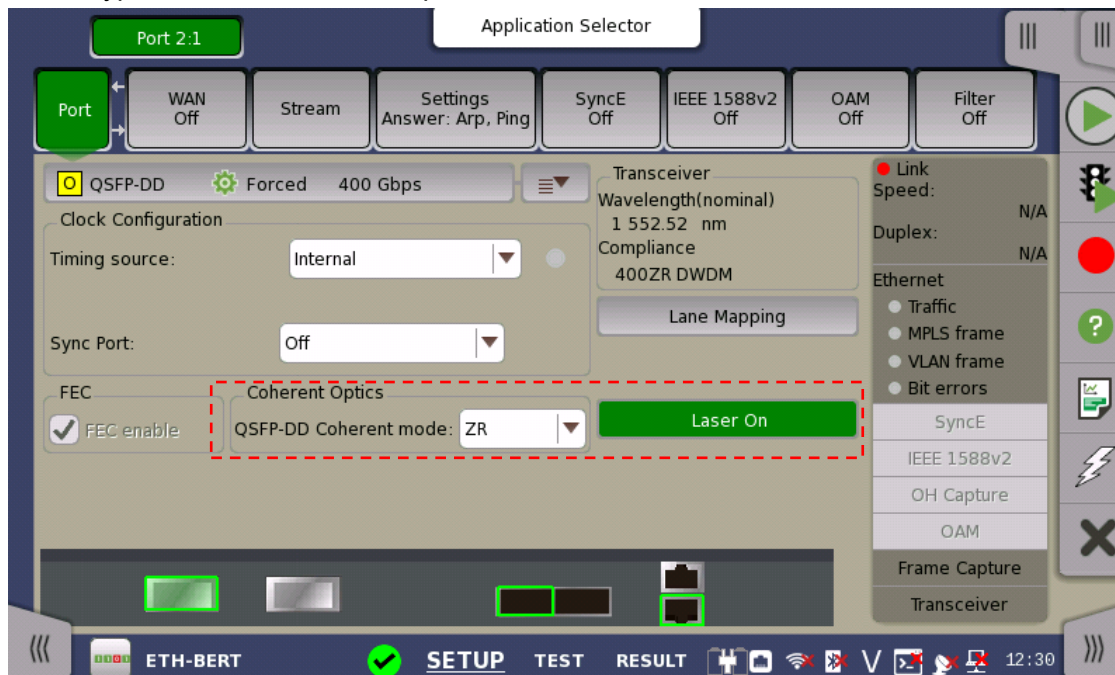
Select “Wavelength and bit rate” then set “Grid spacing” and “Channel”.



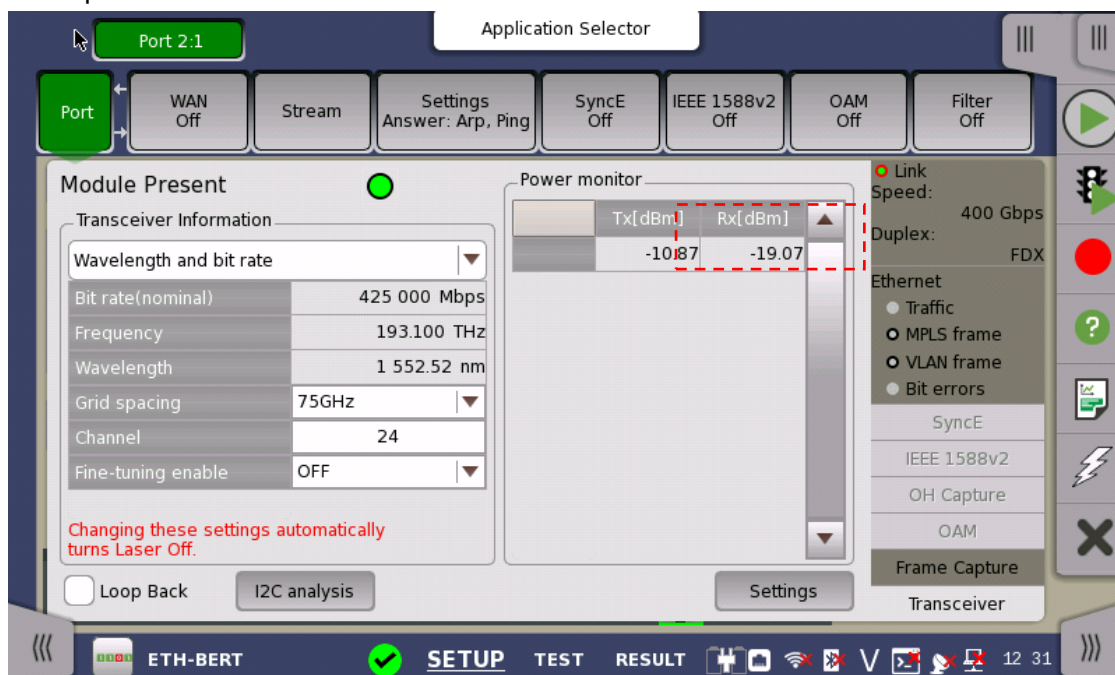
Select “Tx Target Output Power” then set output power.



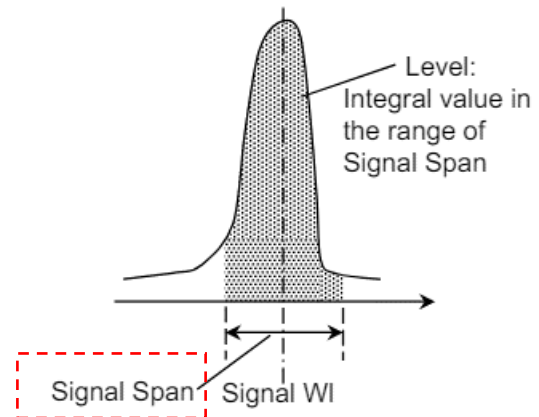
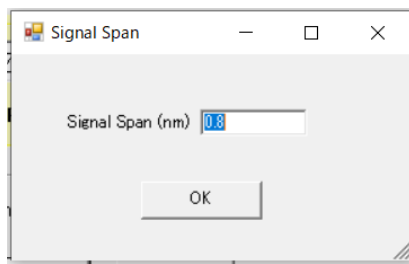
Confirm module type is “ZR” or “ZR+” then push “Laser On”.



Confirm the Rx power

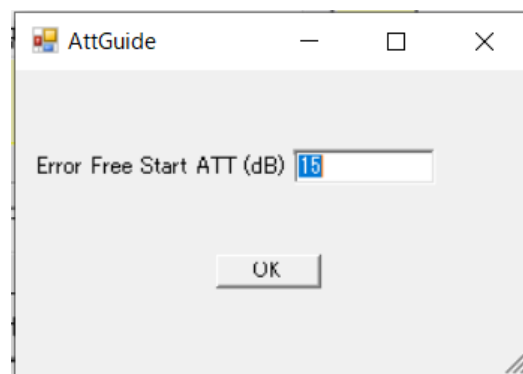


14. Input signal span for OSNR calculation.



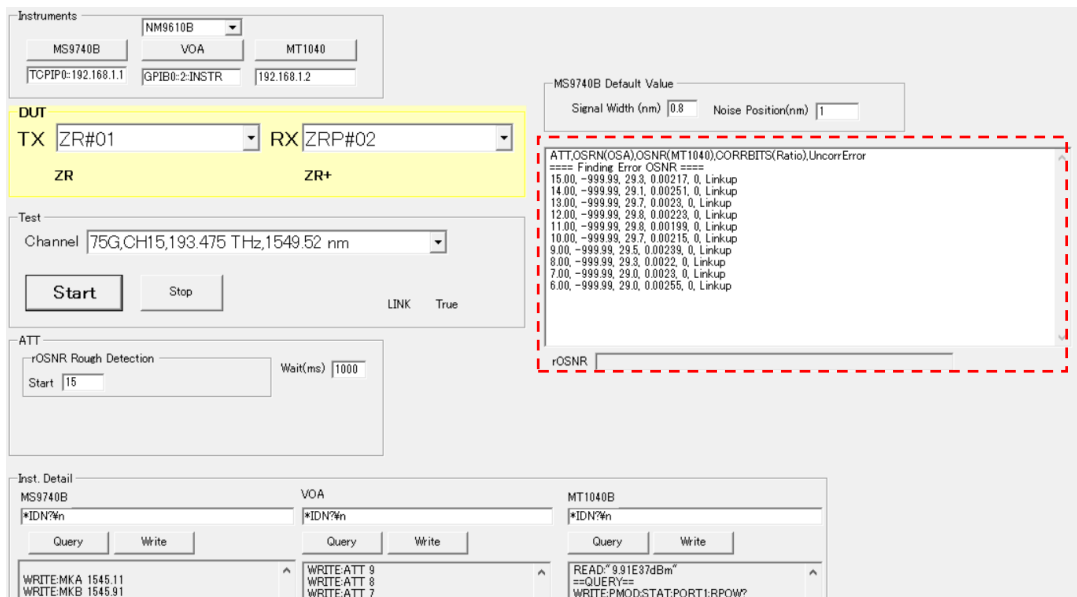
15. Set start attenuation to VOA

Find error free attenuation by manually and set it.



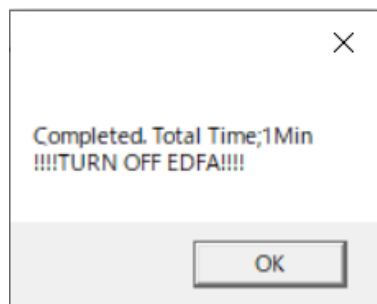
16. Measuring

Test progress is shown.



17. Test completion.

Following message is shown.



18. Test Results

<rOSNR>

The result files are saved in \$(Project Folder)\¥bin¥Debug¥Result

The contents "result.csv" are as follows.

The rOSNR is printed on the last row.

<MS9740B Data>

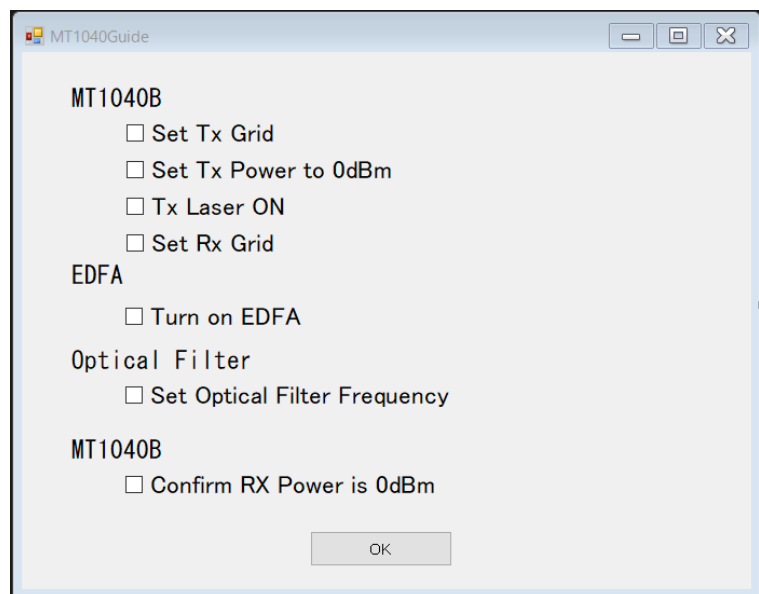
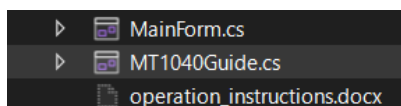
Saved in USB memory (E drive of MS9740B)

ATT	OSNR(OSA)	OSNR(MT1040)	CORRBITS(Ratio)	UncorrError		
==== Finding Error OSNR ====						
15	29.47	31.8	0.000371	0	Linkup	
14	28.5	31.8	0.000579	0	Linkup	
13	27.51	31.8	0.000903	0	Linkup	
12	26.5	31.3	0.00152	0	Linkup	
11	25.49	29.3	0.00258	0	Linkup	
10	24.48	27.2	0.00438	0	Linkup	
9	23.46	25.3	0.0072	0	Linkup	
8	22.46	24.8	0.0115	0	Linkup	
7	21.45	23.7	0.0179	0	Linkup	
6	20.44	0	0	1065353216	Linkdown	
==== Measuring rOSNR ====						
6	20.46	0	0	7457472512	Linkdown	
6.1	20.58	0	0	6392119296	Linkdown	
6.2	20.72	0	0	7457472512	Linkdown	
6.3	20.84	0	0.667	2130706436	Linkdown	
6.4	20.91	0	0.714	2130706441	Linkdown	
6.5	21.01	0	0.021	5236692	Linkdown	
6.6	21.13	0	0.0198	14941	Linkup	
6.7	21.23	2.9	0.0194	264	Linkup	
6.8	21.36	20.7	0.0185	0	Linkup	
rOSNR(OSA)=21.23	ATT=6.70	RX="-10.54dBm"	TX="-40.00dBm"			

6 Customizing Program

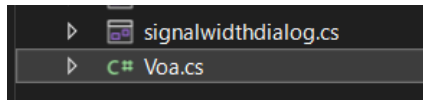
6.1 Changing Guidance

Open “MT1040Guide.cs” and edit it.



6.2 Using another VOA

Open "Voa.cs" and replace commands with proper ones.



```

namespace Anritsu.Examples.ZrTest {
    1 個の参照
    class YourVOA : AttSCPI
    {
        3 個の参照
        public override string Init()
        {
            return "YOUR:VOA:COMMAND:INITALIZE";
        }

        3 個の参照
        public override string Attenuation(double db)
        {
            return "YOUR:VOA:COMMAND::ATT " + db.ToString();
        }

        2 個の参照
        public override string Wavelength(double nm)
        {
            return "YOUR:VOA:COMMAND::WAV " + nm.ToString() + " NM";
        }
    }
}
    
```

Replace

Replace

Replace

Open "MainForm.cs".

Replace VOA name with proper one.

Change default index to 2.

```

// Chane name if required
attMap.Add("YourVOA", new YourVOA());
foreach (KeyValuePair<string, AttSCPI> kv in attMap)
{
    comboBoxAtt.Items.Add(kv.Key);
}

// Set default VOA to MN9610B
comboBoxAtt.SelectedIndex = 1;
    
```

Replace

Change to 2

6.3 Controlling other instruments

Open “MainForm.cs”.

Add codes to control other instruments in “testThread” method.