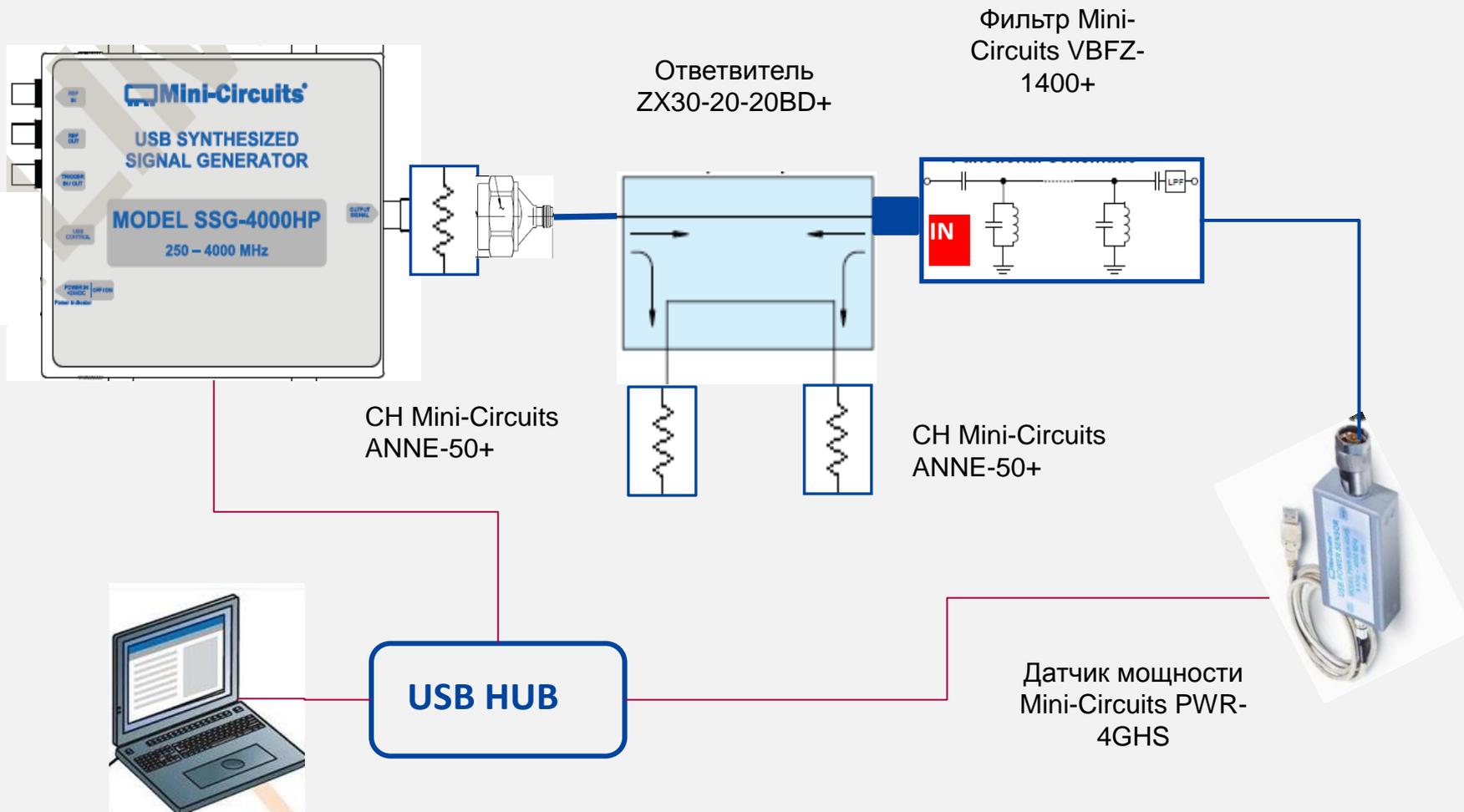




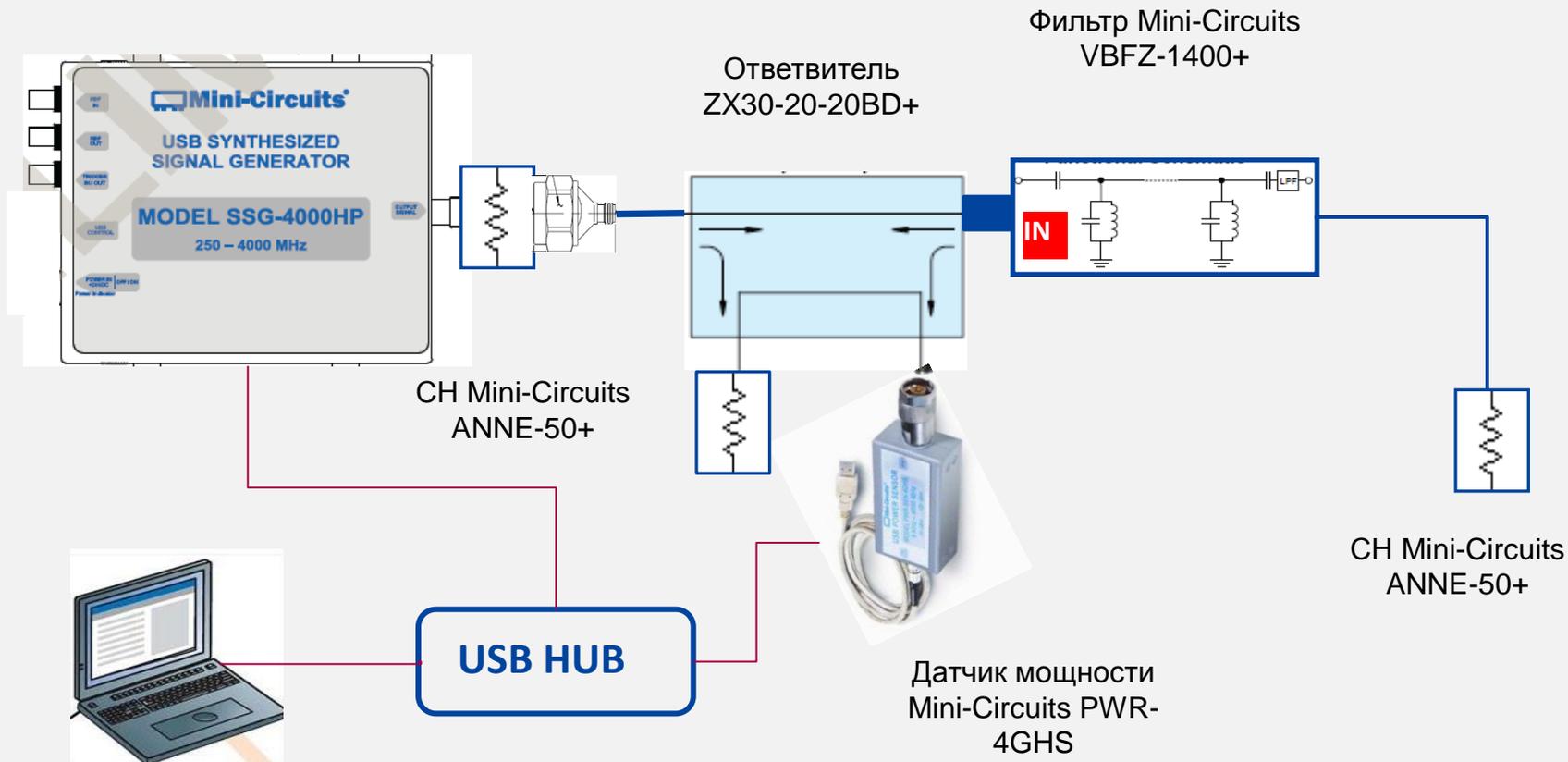
“Smart Power Sensor”

**Аппаратно-программная
компьютерная система для
измерения АЧХ коэффициентов
передачи и отражения на СВЧ**

Измерение прямых потерь ($|S_{21}|$) СВЧ фильтра



Измерение обратных потерь ($|S_{11}|$)



ПО - Измерение прямых потерь



Mini-Circuits Smart RF Power Meter (Ver B11)

Format: dBm, Watt

Device Temp: +25.00°C

Freq (1 - 8000 MHz): 1800

Fastest, Faster, Low Noise

Averaging: Avg. Count: 100

Offset Val.: 0.00 (dB)

Offset File: Ignore

Display Graph

Relative: 0.00 dBm

Rel. Table

Sensor Model: PWR-SEN-8FS

Serial Number: 11109190009

Buttons: Add Sensor, Reset Connection, Record, Measurement Applications, Compact View, Always on top

Запустить

Meas. Applications

Recall Setup

Sensor Serial Number: 11109190009

Measurement Applications

1. - Power Measurement of source
2. - High Power Measurement using Virtual Coupler (Up to +53 dBm)
3. - Continuous Power Monitoring Measurement (Low or High)
4. - Calibrating a Coupler (Extending Frequency range of a coupler by converting to Virtual Coupler)
5. - Calibrating an Attenuator (Normalizing attenuation to nominal value by converting to Virtual Attenuator)
6. - Insertion Loss - 2 Port device (Attenuator, Filter, etc)
7. - Insertion Loss - 3 Port device (2 Way Splitter, Coupler)
8. - Gain
9. - Return Loss Measurement Using Coupler
10. - Calibrating Thru-Path (Create Offset File of Gain/Loss Path)

Buttons: Back, Next

Выбрать Insertion Loss

Ввод параметров проекта



Project Information:

Project Name:

Unit Type: Model Name: Run No.:

Lot No.: Tested By: Date:

Remarks:

Safe Attenuator for Power Reference (Optional):

Safe Attenuator: (dB)

Load Virtual Attenuator File:

Attenuator Part Number: Attenuator Serial Number:

Safe Attenuator for D.U.T. Measurement (Optional):

Safe Attenuator: (dB)

Load Virtual Attenuator File:

Attenuator Part Number: Attenuator Serial Number:

Notes:

1. If maximum power to sensor exceeds +20 dBm, a safe attenuator is required.
2. If safe attenuator is not flat, use Virtual Attenuator CAL File (see Calibrating an attenuator on Meas. Application screen).

Test Plan

Test Plan: Frequency Measurement Points

Test Frequency List:

Segments Frequency Entry Entire Band Frequency Entry

Seg. #	Freq. Start (MHz)	Freq. Stop (MHz)	No. Of Points	Source Start (dBm)	Source Stop (dBm)
1	1450	2550	101	18	18
2					

Введите план измерений - начальную и конечную частоты, количество точек измерения и уровень сигнала

#	Freq (MHz)	Source Pwr (dBm)
84	2363.000000	18.00
85	2374.000000	18.00
86	2385.000000	18.00
87	2396.000000	18.00
88	2407.000000	18.00
89	2418.000000	18.00
90	2429.000000	18.00
91	2440.000000	18.00
92	2451.000000	18.00
93	2462.000000	18.00
94	2473.000000	18.00
95	2484.000000	18.00
96	2495.000000	18.00
97	2506.000000	18.00
98	2517.000000	18.00
99	2528.000000	18.00
100	2539.000000	18.00
101	2550.000000	18.00

Sort By Freq Value Sort By Power Value Eliminate Duplicate Points

Прямые потери фильтра, калибровка



Подключите выход ответвителя
напрямую к измерителю
мощности в обход фильтра

Project: Filter Thru Loss

Sensor Serial Number: 11109190007

Model Name: ZX75BP-1842-S+

Run No.: 1234

Application: Insertion Loss 2 Port

I.LOSS Measurement

Step 1: Power Reference In

Step 2: D.U.T Measurement

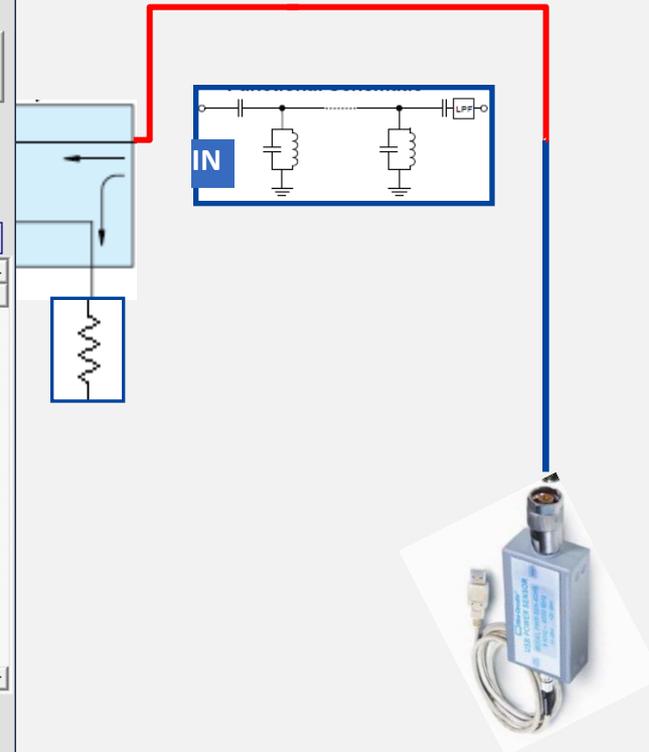
Avg. 8

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	I.Loss (dB)	I.Loss Min (dB)	I.Loss Max (dB)	Pass/Fail	Safe Att. (dB)
1	1450.000000	18.00							
2	1461.000000	18.00							
3	1472.000000	18.00							
4	1483.000000	18.00							
5	1494.000000	18.00							
6	1505.000000	18.00							
7	1516.000000	18.00							
8	1527.000000	18.00							
9	1538.000000	18.00							
10	1549.000000	18.00							
11	1560.000000	18.00							
12	1571.000000	18.00							
13	1582.000000	18.00							
14	1593.000000	18.00							
15	1604.000000	18.00							
16	1615.000000	18.00							

Mini-Circuits Power Meter

Please Connect Generator Port to Power Sensor

Run Stop Continuous Mode Display On-Line Graph



Прямые потери фильтра, калибровка



Project: Filter Thru Loss

Sensor Serial Number: 11109190007

Model Name: ZX75BP-1842-S+
Run No.: 1234
Application: Insertion Loss 2 Port

I.LOSS Measurement

Step 1: Power Reference In
Step 2: D.U.T Measurement

Avg. 8 Faster Mode

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	Measured		I.Loss Spec		Pass/Fail	Safe Att. (dB)
					I.Loss (dB)	Min (dB)	Max (dB)			
85	2374.000000	18.00	5.39							
86	2385.000000	18.00	5.41							
87	2396.000000	18.00	5.41							
88	2407.000000	18.00	5.44							
89	2418.000000	18.00	5.43							
90	2429.000000	18.00	5.38							
91	2440.000000	18.00	5.57							
92	2451.000000	18.00	5.52							
93	2462.000000	18.00	5.53							
94	2473.000000	18.00	5.56							
95	2484.000000	18.00	5.61							
96	2495.000000	18.00	5.60							
97	2506.000000	18.00	5.61							
98	2517.000000	18.00	5.61							
99	2528.000000	18.00	5.55							
100	2539.000000	18.00	5.72							

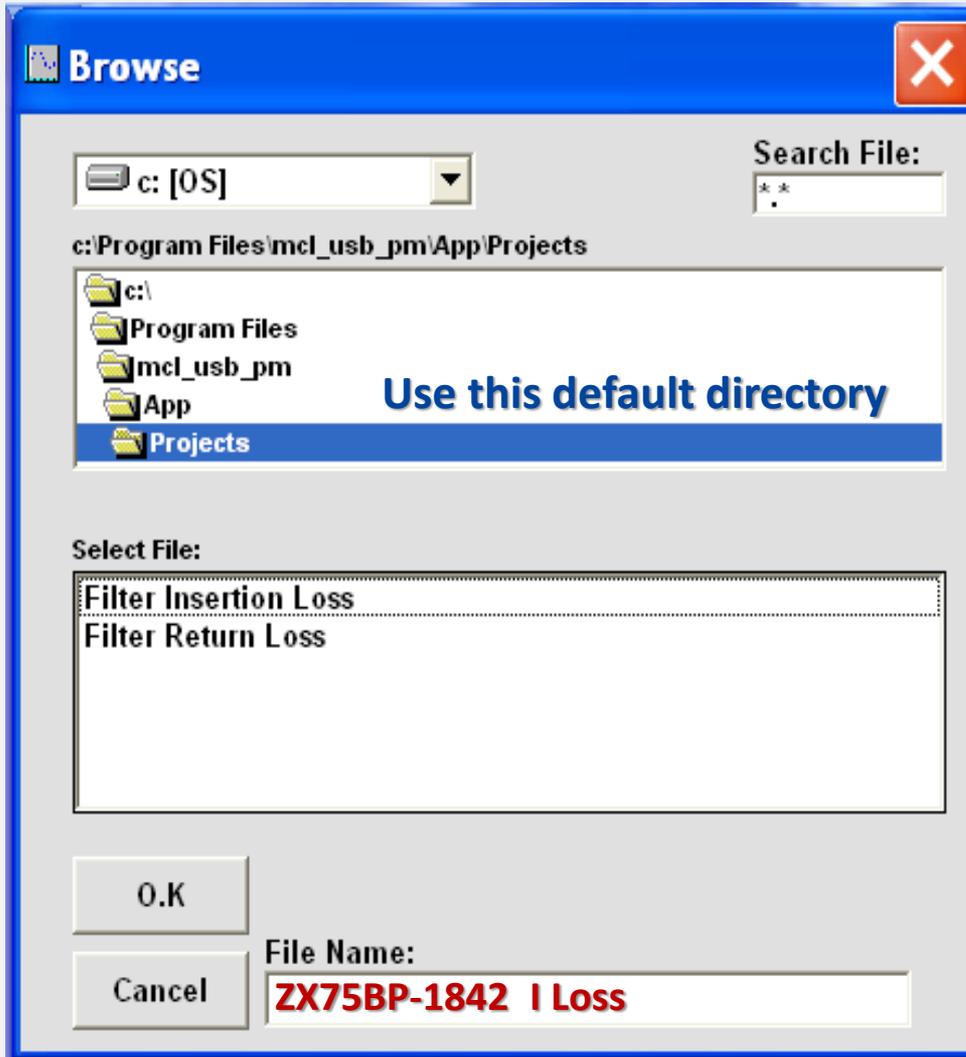
Mini-Circuits Power Me...
End of Measurements
OK

Сохраните проект перед запуском п.2

Save

Run Stop Continuous Mode Display On-Line Graph

Сохранение калибровки в файле



 Вы можете загрузить сохраненный проект со значениями калибровки при следующих измерениях.

Подготовка к измерению потерь устройства



Project: Filter Thru Loss

Sensor Serial Number: 11109190007

Model Name: ZX75BP-1842-S+

Run No.: 1234

Application: Insertion Loss 2 Port

I.LOSS Measurement

Step 1: Power Reference In

Step 2: D.U.T Measurement

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	Measured I.Loss (dB)	I.Loss Spec Min (dB)	I.Loss Spec Max (dB)	Pass/Fail	Saf
1	1450.000000	18.00	6.10						
2	1461.000000	18.00	6.22						
3	1472.000000	18.00	6.12						
4	1483.000000	18.00	6.25						
5	1494.000000	18.00	6.33						
6	1505.000000	18.00	6.12						
7	1516.000000	18.00	6.24						
8	1527.000000	18.00	6.11						
9	1538.000000	18.00	6.00						
10	1549.000000	18.00	6.12						
11	1560.000000	18.00	6.03						
12	1571.000000	18.00	6.17						
13	1582.000000	18.00	6.09						
14	1593.000000	18.00	6.03						
15	1604.000000	18.00	6.00						
16	1615.000000	18.00	6.16						

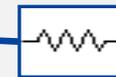
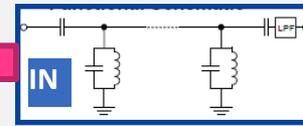
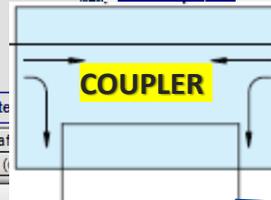
Mini-Circuits Power Meter

Prepare Setup for D.U.T. Measurement
Please Connect Source Generator to D.U.T. Input Port and Power Sensor to D.U.T. OUT Port

Выполнить указанные соединения

Run Stop Continuous Mode Display On-Line Graph

D.U.T. No: 1 D.U.T. Serial No:



Измерение прямых потерь в фильтре

Project: Filter Insertion Loss

Back New Proj Recall Save Print Data Setup

Sensor Serial Number: 11109190009

Model Name: ZX75BP-1842-S+

Run No.:

Application: Insertion Loss 2 Port

I.LOSS Measurement

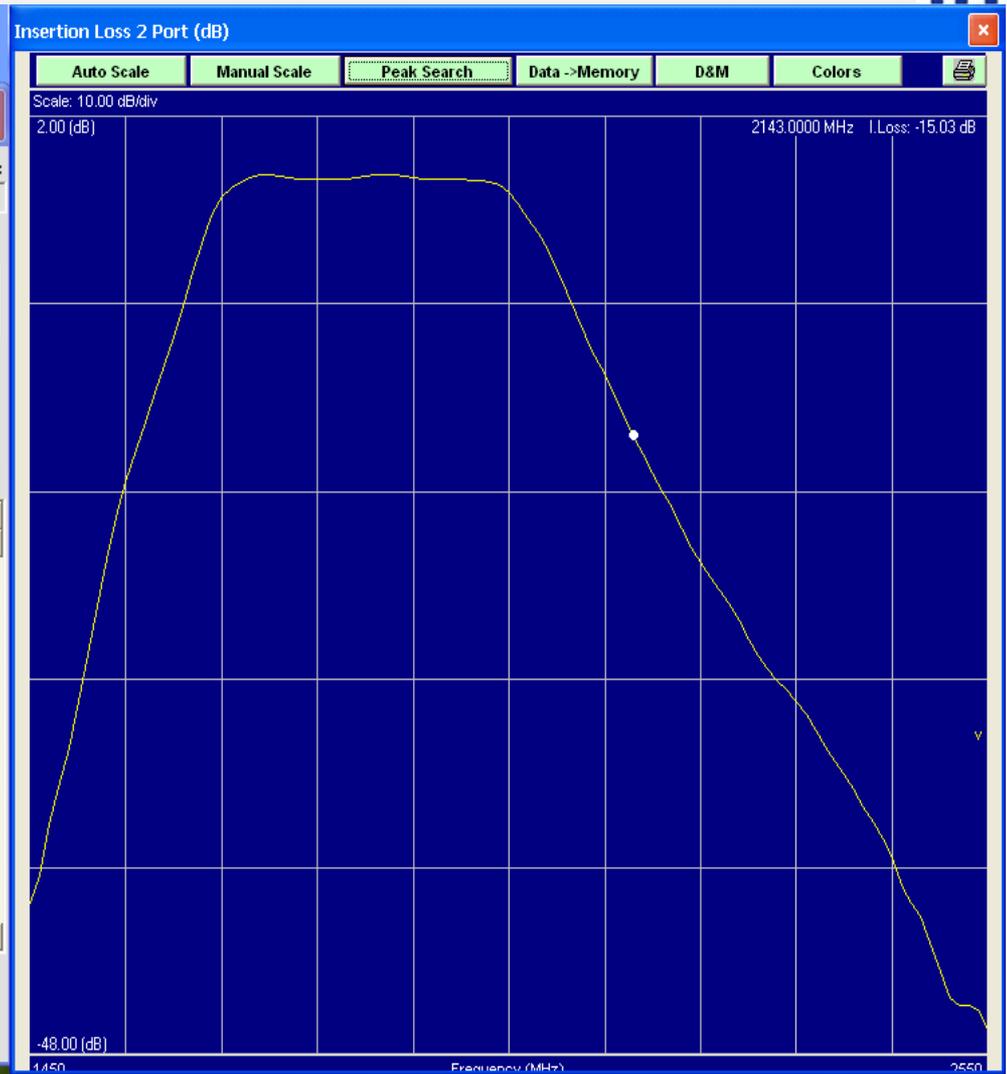
Step 1: Power Reference In

Step 2: D.U.T Measurement

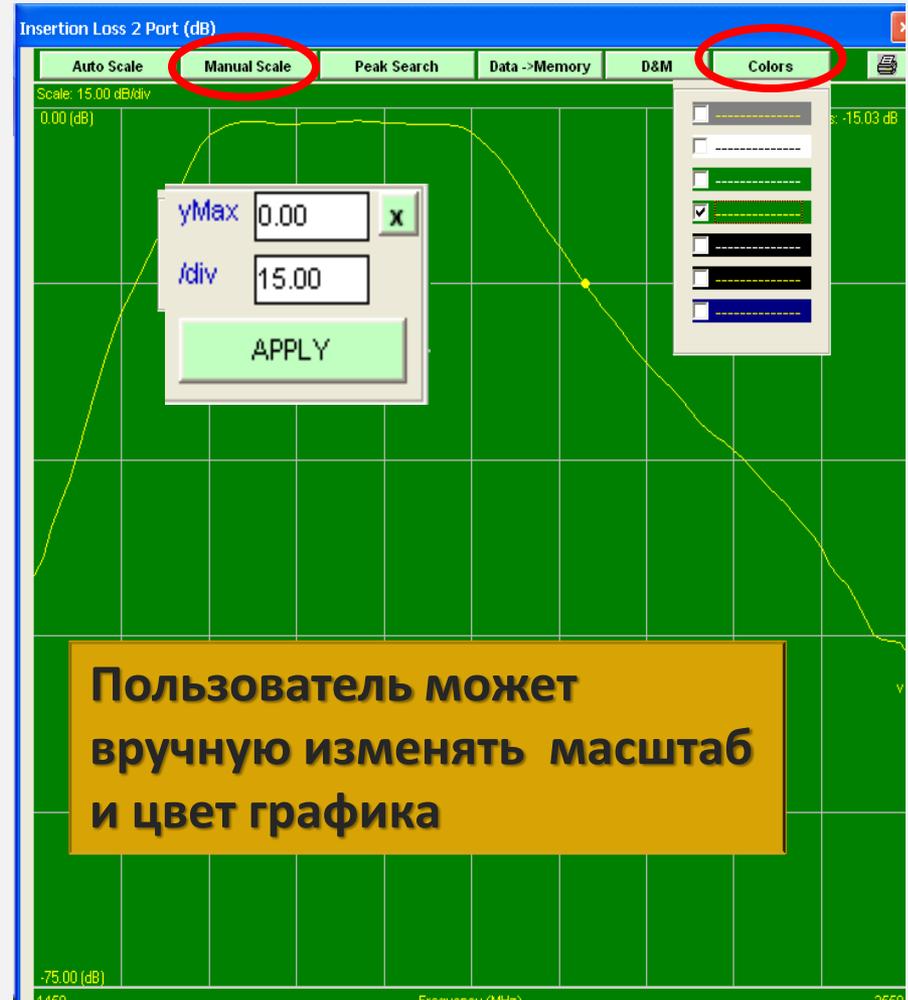
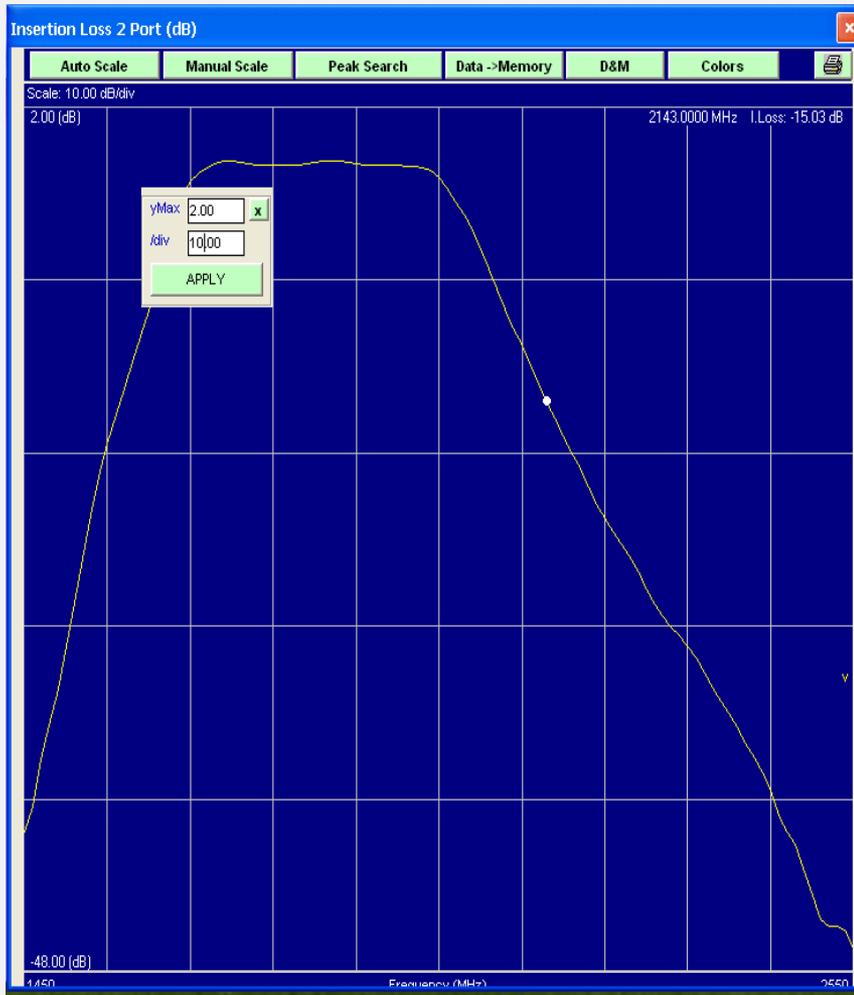
Avg: 8 Faster Mode

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	I.Loss (dB)	Min (dB)	Max (dB)	Pass/Fail	Safe Att. (dB)
1	1450.000000	18.00	4.68	-35.20	-39.88				
2	1461.000000	18.00	4.48	-33.95	-38.43				
3	1472.000000	18.00	4.54	-31.16	-35.70				
4	1483.000000	18.00	4.33	-29.45	-33.78				
5	1494.000000	18.00	4.30	-27.32	-31.62				
6	1505.000000	18.00	4.21	-24.96	-29.17				
7	1516.000000	18.00	3.94	-22.74	-26.68				
8	1527.000000	18.00	3.69	-20.40	-24.09				
9	1538.000000	18.00	3.68	-17.90	-21.58				
10	1549.000000	18.00	3.49	-15.88	-19.37				
11	1560.000000	18.00	3.31	-14.13	-17.44				
12	1571.000000	18.00	3.39	-12.40	-15.79				
13	1582.000000	18.00	3.29	-10.95	-14.24				
14	1593.000000	18.00	3.26	-9.46	-12.72				
15	1604.000000	18.00	3.50	-7.75	-11.25				
16	1615.000000	18.00	3.56	-6.23	-9.79				

Run Stop Continuous Mode Display On-Line Graph D.U.T. No: 1 DUT Serial No:



Визуальное отображение графика АЧХ



**Пользователь может
вручную изменять масштаб
и цвет графика**

Установка порога потерь в полосе частот



Project: Filter Insertion Loss

Sensor Serial Number: 11109190009

Model Name: ZX75BP-1842-S+

Run No.:

Application: Insertion Loss 2 Port

I.LOSS Measurement

Step 1: Power Reference In

Step 2: D.U.T Measurement

Avg. 8

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	I.Loss Measured (dB)	I.Loss Spec Min (dB)	I.Loss Spec Max (dB)	Pass/Fail	Safe Att. (dB)
1	1450.000000	18.00	4.68	-35.20	-39.88				
2	1461.000000	18.00	4.48	-33.95	-38.43				
3	1472.000000	18.00							
4	1483.000000	18.00							
5	1494.000000	18.00							
6	1505.000000	18.00							
7	1516.000000	18.00							
8	1527.000000	18.00							
9	1538.000000	18.00							
10	1549.000000	18.00							
11	1560.000000	18.00							
12	1571.000000	18.00							
13	1582.000000	18.00	3.25	-10.55	-13.24				
14	1593.000000	18.00	3.26	-9.46	-12.72				
15	1604.000000	18.00	3.50	-7.75	-11.25				
16	1615.000000	18.00	3.56	-6.23	-9.79				

Edit Spec Limit for Measurement Point # 1

Low Spec Limit: -2

High Spec Limit (dB): 0

From Meas #: 1

To Meas #: 101

Update

Run Stop Continuous Mode Display On-Line Graph D.U.T. No: 1 DUT Serial No:

Project: Filter Insertion Loss

Sensor Serial Number: 11109190009

Model Name: ZX75BP-1842-S+

Run No.:

Application: Insertion Loss 2 Port

I.LOSS Measurement

Step 1: Power Reference In

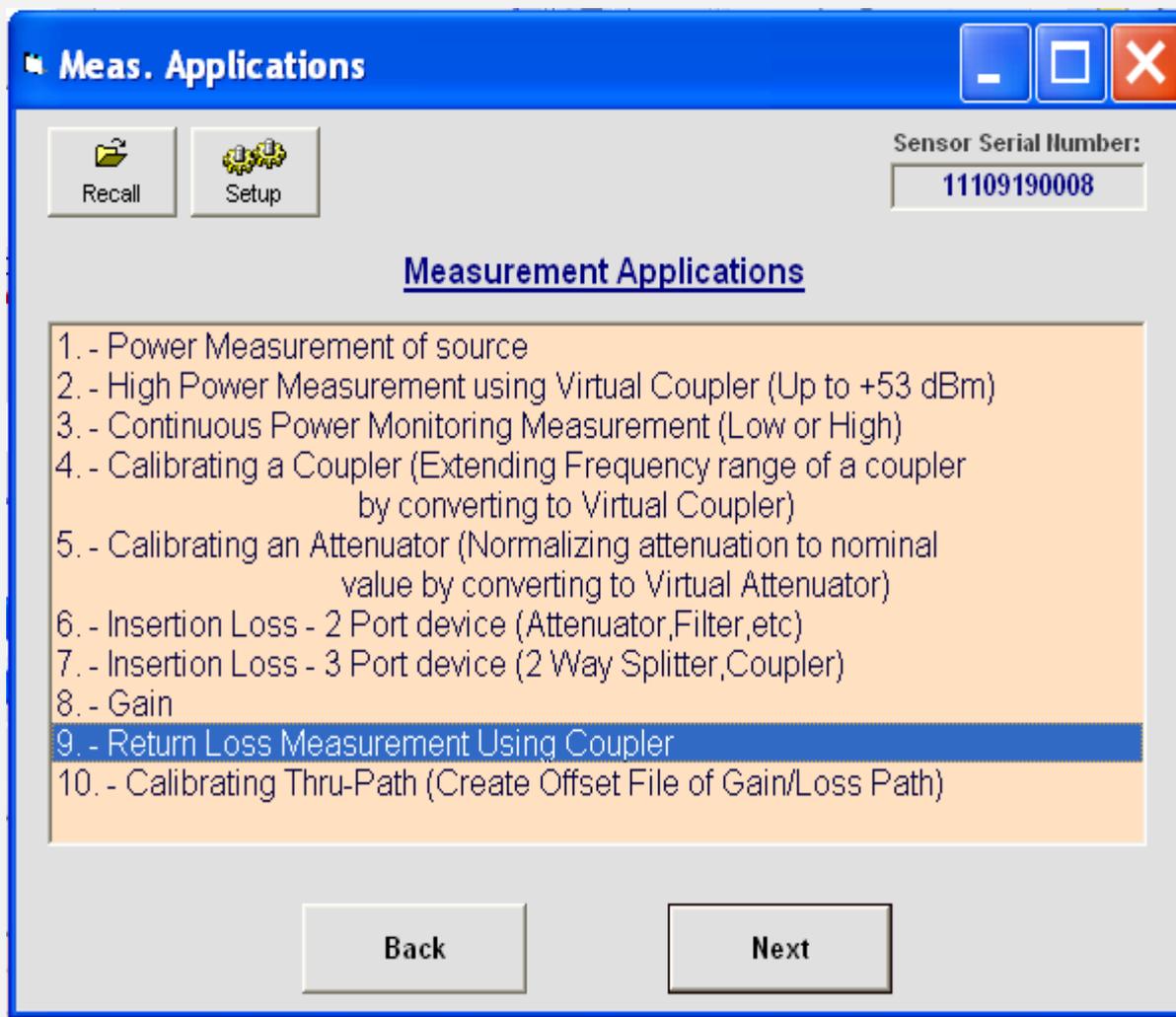
Step 2: D.U.T Measurement

Avg. 8

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	I.Loss Measured (dB)	I.Loss Spec Min (dB)	I.Loss Spec Max (dB)	Pass/Fail	Safe Att. (dB)
17	1626.000000	18.00	3.62	-4.52	-8.14	-2.0	0.0	Fail	
18	1637.000000	18.00	3.68	-2.65	-6.33	-2.0	0.0	Fail	
19	1648.000000	18.00	3.77	-0.77	-4.54	-2.0	0.0	Fail	
20	1659.000000	18.00	3.90	0.75	-3.15	-2.0	0.0	Fail	
21	1670.000000	18.00	4.05	1.74	-2.31	-2.0	0.0	Fail	
22	1681.000000	18.00	4.44	2.60	-1.84	-2.0	0.0	Pass	
23	1692.000000	18.00	4.52	3.03	-1.49	-2.0	0.0	Pass	
24	1703.000000	18.00	4.57	3.32	-1.25	-2.0	0.0	Pass	
25	1714.000000	18.00	4.60	3.48	-1.12	-2.0	0.0	Pass	
26	1725.000000	18.00	4.83	3.70	-1.13	-2.0	0.0	Pass	
27	1736.000000	18.00	4.89	3.70	-1.19	-2.0	0.0	Pass	
28	1747.000000	18.00	4.93	3.63	-1.30	-2.0	0.0	Pass	
29	1758.000000	18.00	4.94	3.59	-1.35	-2.0	0.0	Pass	
30	1769.000000	18.00	4.93	3.58	-1.35	-2.0	0.0	Pass	
31	1780.000000	18.00	5.07	3.71	-1.36	-2.0	0.0	Pass	
32	1791.000000	18.00	5.05	3.72	-1.33	-2.0	0.0	Pass	

Run Stop Continuous Mode Display On-Line Graph D.U.T. No: 1 DUT Serial No:

Пользователь может указать допустимые значения ослабления.



Информация о проекте



Enter all information

Project Information:

Project Name: **Filter Return Loss**

Unit Type: Bandpass Filter Model Name: ZX75BP-1842-S+ Run No.: 1234

Lot No.: ABC Tested By: Superman Date: Oct 24,11

Remarks:
This is a high Q ceramic resonator bandpass filter

Safe Attenuator for Power Reference (Optional):

Safe Attenuator: (dB)

Load Virtual Attenuator File: Virtual Attenuator File

Attenuator Part Number: P/N Attenuator Serial Number: S/N

Safe Attenuator for D.U.T. Measurement (Optional):

Safe Attenuator: (dB)

Load Virtual Attenuator File: Virtual Attenuator File

Attenuator Part Number: P/N Attenuator Serial Number: S/N

Notes:
1. If maximum power to sensor exceeds +20 dBm, a safe attenuator is required.
2. If safe attenuator is not flat, use Virtual Attenuator CAL File (see Calibrating an attenuator on Meas. Application screen).

< Back Next >

Test Plan

Test Plan: Frequency Measurement Points

Test Frequency List:

#	Freq (MHz)	Source Pwr (dBm)
84	2363.000000	18.00
85	2374.000000	18.00
86	2385.000000	18.00
87	2396.000000	18.00
88	2407.000000	18.00
89	2418.000000	18.00
90	2429.000000	18.00
91	2440.000000	18.00
92	2451.000000	18.00
93	2462.000000	18.00
94	2473.000000	18.00
95	2484.000000	18.00
96	2495.000000	18.00
97	2506.000000	18.00
98	2517.000000	18.00
99	2528.000000	18.00
100	2539.000000	18.00
101	2550.000000	18.00

Segments Frequency Entry Entire Band Frequency Entry

Seg. #	Freq. Start (MHz)	Freq. Stop (MHz)	No. Of Points	Source Start (dBm)	Source Stop (dBm)
1	1450	2550	101	18	18
2					

Введите план измерений

Build Reset Help

Sort By Freq Value Sort By Power Value Eliminate Duplicate Points

< Back Next >

Калибровка при измерении обратных потерь



Project: Filter Return Loss

Back New Proj Recall Save Print Data Setup

Sensor Serial Number: 11109190009

Model Name: ZX75BP-1842-S+

Run No.:

Application: Return Loss

R.LOSS Measurement

Step 1: Return Loss Reference

Step 2: D.U.T Measurement

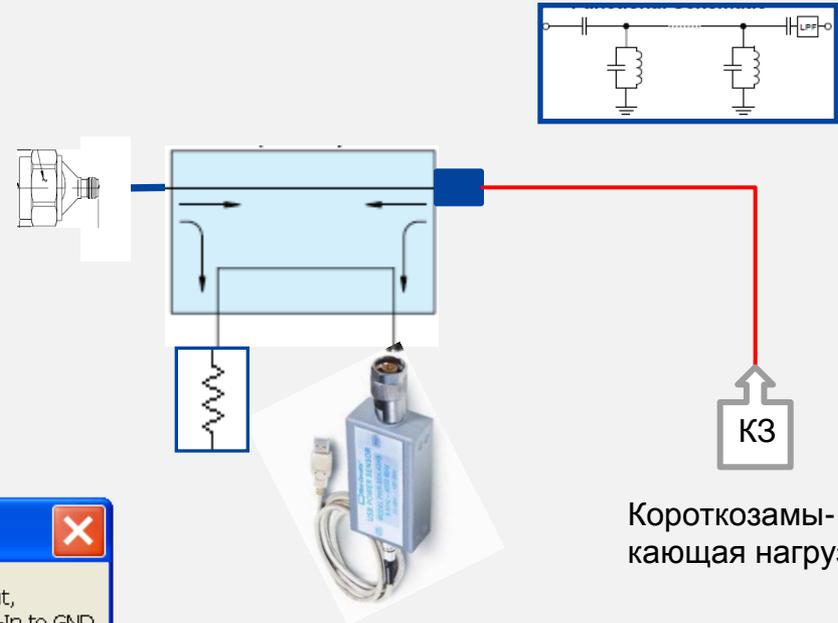
Avg. 8

Measured R.Loss Spec

Faster Mode

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	R.Loss (dB)	Min (dB)	Max (dB)	Pass/Fail	Safe Att. (dB)
1	1450.000000	18.00							
2	1461.000000	18.00							
3	1472.000000	18.00							
4	1483.000000	18.00							
5	1494.000000	18.00							
6	1505.000000	18.00							
7	1516.000000	18.00							
8	1527.000000	18.00							
9	1538.000000	18.00							
10	1549.000000	18.00							
11	1560.000000	18.00							
12	1571.000000	18.00							
13	1582.000000	18.00							
14	1593.000000	18.00							
15	1604.000000	18.00							
16	1615.000000	18.00							

Run Stop Continuous Mode Display On-Line Graph



Короткозамы-
кающая нагрузка

Mini-Circuits Power Meter

Please Connect Generator Port to Coupler-Output,
Power Sensor to Coupler-CPL and Short Coupler-In to GND

OK Cancel

Калибровка при измерении обратных потерь



Project: Filter Return Loss

Back New Proj Recall Save Print Data Setup

Sensor Serial Number: 11109190009

Model Name: ZX75BP-1842-S+

Run No.:

Application: Return Loss

R.LOSS Measurement

Step 1: Return Loss Reference

Step 2: D.U.T Measurement

Avg: 8

Measured R.Loss Spec Faster Mode

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	R.Loss (dB)	Min (dB)	Max (dB)	Pass/Fail	Safe Att. (dB)
85	2374.000000	18.00	-6.54						
86	2385.000000	18.00	-6.55						
87	2396.000000	18.00	-6.52						
88	2407.000000	18.00	-6.56						
89	2418.000000	18.00	-6.64						
90	2429.000000	18.00	-6.78						
91	2440.000000	18.00	-6.88						
92	2451.000000	18.00	-7.02						
93	2462.000000	18.00	-7.15						
94	2473.000000	18.00	-7.26						
95	2484.000000	18.00	-7.36						
96	2495.000000	18.00	-7.46						
97	2506.000000	18.00	-7.54						
98	2517.000000	18.00	-7.34						
99	2528.000000	18.00	-7.42						
100	2539.000000	18.00	-7.52						

Run Stop Continuous Mode Display On-Line Graph

После окончания калибровки необходимо подключить фильтр и перейти к Step2 для измерения.

Mini-Circuits Power M...

End of Measurements

OK

Измерение обратных потерь



Project: Filter Return Loss

Back New Proj Recall Save Print Data Setup

Sensor Serial Number: 11109190009

Model Name: ZX75BP-1842-S+

Run No.: []

Application: Return Loss

R.LOSS Measurement

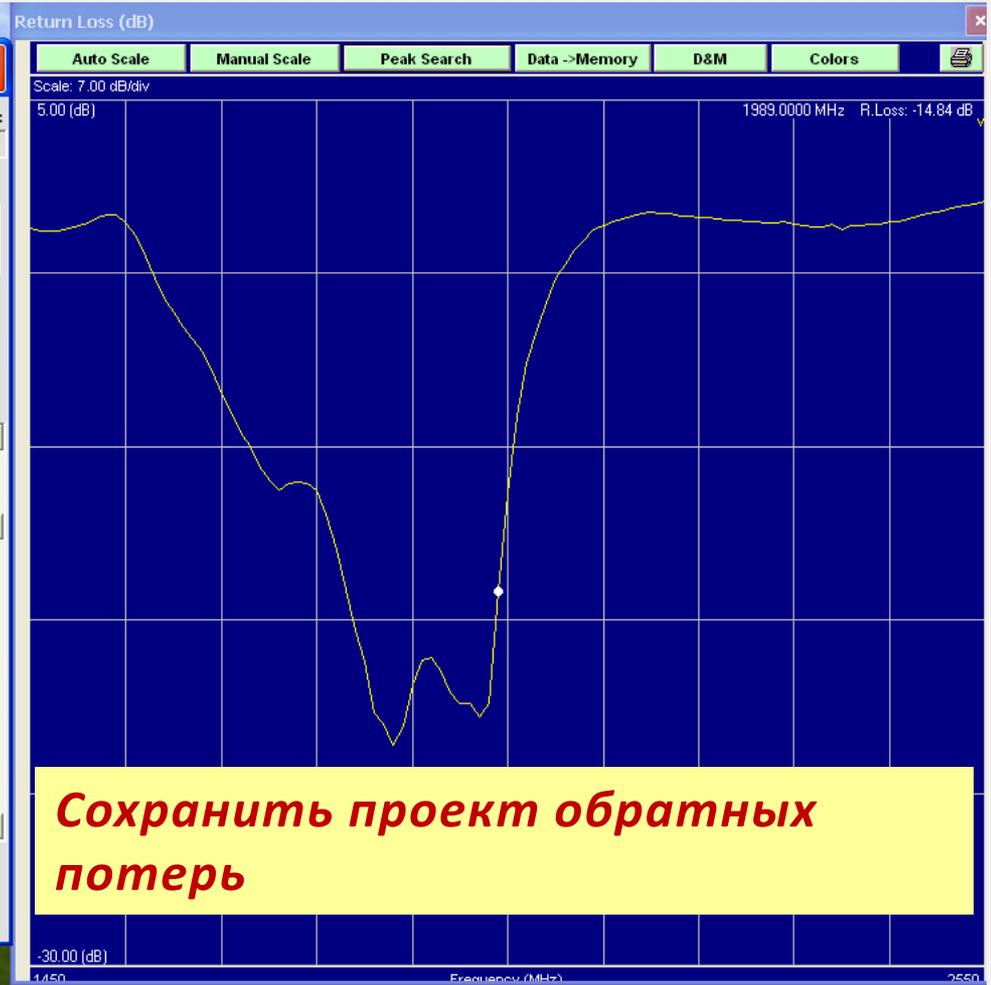
Step 1: Return Loss Reference

Step 2: D.U.T Measurement

Avg: 8

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	Measured R.Loss (dB)	R.Loss Spec Min (dB)	R.Loss Spec Max (dB)	Pass/Fail	Safe Att. (dB)
17	1626.000000	18.00	-6.38	-10.52	-4.14	-10.0	-10.0	Fail	
18	1637.000000	18.00	-6.56	-11.19	-4.63	-10.0	-10.0	Fail	
19	1648.000000	18.00	-6.72	-11.94	-5.22	-10.0	-10.0	Fail	
20	1659.000000	18.00	-6.84	-12.81	-5.97	-10.0	-10.0	Fail	
21	1670.000000	18.00	-6.97	-13.83	-6.86	-10.0	-10.0	Fail	
22	1681.000000	18.00	-6.79	-14.37	-7.58	-10.0	-10.0	Fail	
23	1692.000000	18.00	-6.84	-15.24	-8.40	-10.0	-10.0	Fail	
24	1703.000000	18.00	-6.86	-15.79	-8.93	-10.0	-10.0	Fail	
25	1714.000000	18.00	-6.87	-16.64	-9.77	-10.0	-10.0	Fail	
26	1725.000000	18.00	-6.74	-17.13	-10.39	-10.0	-10.0	Pass	
27	1736.000000	18.00	-6.71	-17.45	-10.74	-10.0	-10.0	Pass	
28	1747.000000	18.00	-6.67	-17.17	-10.50	-10.0	-10.0	Pass	
29	1758.000000	18.00	-6.63	-17.05	-10.42	-10.0	-10.0	Pass	
30	1769.000000	18.00	-6.51	-17.00	-10.49	-10.0	-10.0	Pass	
31	1780.000000	18.00	-6.46	-17.22	-10.76	-10.0	-10.0	Pass	
32	1791.000000	18.00	-6.36	-18.07	-11.71	-10.0	-10.0	Pass	

Run Stop Continuous Mode Display On-Line Graph D.U.T. No: 1 DUT Serial No: []



Сохранить проект обратных потерь

Ввод уровня -10dB обратных потерь дает полосу частот по коэффициенту отражения.

Сохранение результатов измерений



Project: Filter Return Loss

Sensor Serial Number: 1004060004

Model Name: ZX75BP-1842-S+

Run No.: []

Application: Return Loss

R.LOSS Measurement

Step 1: Return Loss Reference

Step 2: D.U.T Measurement

Avg: 8

#	Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	Measured R.Loss (dB)	R.Loss Spec Min (dB)	R.Loss Spec Max (dB)	Pass/Fail	Safe Att. (dB)
21	1670.000000	18.00	-6.97	-13.83	-6.86		-10.0	Fail	
22	1681.000000	18.00	-6.79	-14.37	-7.58		-10.0	Fail	
23	1692.000000	18.00	-6.84	-15.24	-8.40		-10.0	Fail	
24	1703.000000	18.00	-6.86	-15.79	-8.93		-10.0	Fail	
25	1714.000000	18.00	-6.87	-16.64	-9.77		-10.0	Fail	
26	1725.000000	18.00	-6.74	-17.13	-10.39		-10.0	Pass	
27	1736.000000	18.00	-6.71	-17.45	-10.74		-10.0	Pass	
28	1747.000000	18.00	-6.67	-17.17	-10.50		-10.0	Pass	
29	1758.000000	18.00	-6.63	-17.05	-10.42		-10.0	Pass	
30	1769.000000	18.00	-6.51	-17.00	-10.49		-10.0	Pass	
31	1780.000000	18.00	-6.46	-17.22	-10.76		-10.0	Pass	
32	1791.000000	18.00	-6.36	-18.07	-11.71		-10.0	Pass	
33	1802.000000	18.00	-6.04	-19.20	-13.16		-10.0	Pass	
34	1813.000000	18.00	-5.95	-20.76	-14.81		-10.0	Pass	
35	1824.000000	18.00	-5.86	-22.29	-16.43		-10.0	Pass	
36	1835.000000	18.00	-5.67	-23.33	-17.66		-10.0	Pass	

Run Stop

Continuous Mode []

Display On-Line Graph []

D.U.T. No: 1

DUT Serial No: []

Return Loss (dB)

Auto Scale Manual Scale Peak Search Data -> Memory D&M Colors

Scale: 8.00 dB/div

5.00 (dB) 1653.0000 MHz R.Loss: -5.97 dB

Print Data Reports

Project Information:

Unit Type: Bandpass filter Model Name: ZX75BP-1842-S+ Run No.: 1234

Lot No.: 3345 Tested By: YOUR NAME te: Oct 14, 11

Remarks: THIS IS A CERAMIC FILTER FOR XYZ COMPANY QUALIFICATION PROJECT

YOUR NAME

All Units Data []

From Unit No. 1 to: 1

Units: [] (Enter units No. separated by commas)

Select printer: Adobe PDF

Print Data Exit

Можно сохранить результаты путем захвата экрана в графическом редакторе или экспортом данных в PDF файл, используя режим Print Data

Сохранение отчета результатов



Unit Type: Bandpass filter
 Model Name: ZX75BP-1842-S+
 Run No: 1234
 Lot No: 3345
 Tested By: YOUR NAME
 Date: Oct 14,11



Сохранение результатов в виде отчета

Remarks:

THIS IS A CERAMIC FILTER FOR XYZ COMPANY QUALIFICATION PROJECT

Unit No: 1

Freq (MHz)	Source Pwr (dBm)	PwrRef In (dBm)	Read Pwr (dBm)	R.Loss (dB)	Min (dB)	Max (dB)	Pass/Fail
1450.000000	18.00	-7.75	-7.90	-0.15		-10.0	Fail
1461.000000	18.00	-7.74	-8.02	-0.28		-10.0	Fail
1472.000000	18.00	-7.53	-7.84	-0.31		-10.0	Fail
1483.000000	18.00	-7.57	-7.86	-0.29		-10.0	Fail
1494.000000	18.00	-7.40	-7.61	-0.21		-10.0	Fail
1505.000000	18.00	-7.22	-7.30	-0.08		-10.0	Fail
1516.000000	18.00	-7.13	-7.06	0.07		-10.0	Fail
1527.000000	18.00	-7.02	-6.79	0.23		-10.0	Fail
1538.000000	18.00	-6.69	-6.33	0.36		-10.0	Fail
1549.000000	18.00	-6.57	-6.21	0.36		-10.0	Fail
1560.000000	18.00	-6.42	-6.36	0.06		-10.0	Fail
1571.000000	18.00	-6.13	-6.65	-0.52		-10.0	Fail
1582.000000	18.00	-6.09	-7.39	-1.30		-10.0	Fail
1593.000000	18.00	-6.12	-8.32	-2.20		-10.0	Fail
1604.000000	18.00	-6.03	-9.02	-2.99		-10.0	Fail
1615.000000	18.00	-6.26	-9.81	-3.55		-10.0	Fail
1626.000000	18.00	-6.38	-10.52	-4.14		-10.0	Fail
1637.000000	18.00	-6.56	-11.19	-4.63		-10.0	Fail
1648.000000	18.00	-6.72	-11.94	-5.22		-10.0	Fail
1659.000000	18.00	-6.84	-12.81	-5.97		-10.0	Fail
1670.000000	18.00	-6.97	-13.83	-6.86		-10.0	Fail
1681.000000	18.00	-6.79	-14.37	-7.58		-10.0	Fail
1692.000000	18.00	-6.84	-15.24	-8.40		-10.0	Fail
1703.000000	18.00	-6.86	-15.79	-8.93		-10.0	Fail
1714.000000	18.00	-6.87	-16.64	-9.77		-10.0	Fail
1725.000000	18.00	-6.74	-17.13	-10.39		-10.0	Pass
1736.000000	18.00	-6.71	-17.45	-10.74		-10.0	Pass
1747.000000	18.00	-6.67	-17.17	-10.50		-10.0	Pass
1758.000000	18.00	-6.63	-17.05	-10.42		-10.0	Pass
1769.000000	18.00	-6.51	-17.00	-10.49		-10.0	Pass
1780.000000	18.00	-6.46	-17.22	-10.76		-10.0	Pass
1791.000000	18.00	-6.36	-18.07	-11.71		-10.0	Pass