ELECTRONICS RESEARCH, INC. ERI

Field Service Report
FM Combiner and Antenna System

Lawton, OK.
ERI Antenna SHPX-10C6-SP
ERI 973-3 “Branch” Combiner System
KZCD – 94.1 MHz.
KLAW – 101.3 MHz.
KVRW – 107.3 MHz.
ERI Project # 25882

June 10, 2010

Submitted By:

Jeff Taylor
7777 Gardner Rd.
Chandler, In. 47610
TX: 812-926-6000 Ext. 276
Cell: 812-459-6544
EM: JTaylor@eriinc.com

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INTRODUCTION

Listed below is a summary of the data and attached are the plots collected from the KZCD ~ KLAW ~ KVRW transmission site in Lawton, OK. by Jeff Taylor June 10, 2010.

- The antenna is an SHPX-10C6-SP.
- The combiner is a 973-3 “Branch”Combiner with forced air cooling.
- Equipment used for combiner testing is an Rohde & Schwarz ZVL Network Analyzer.
- Equipment used for antenna testing is an Rohde & Schwarz ZVL Network Analyzer High RF setup.
- All measurements of the combiner were taken at the plate reducres of each bank and at the output of the 6 to 4 reducer.
- All measurements of the antenna were taken at the 4” flex connector.

The reason for this Field Service Trip was to tune the antenna, install the filters and proof the combined system.

SUMMARY and RECOMMENDATIONS

All measurements were taken by Jeff Taylor of Electronics Research Inc. June, 2010.

Sincerely

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Jeff Taylor

DRAWINGS

Figure 1: Combiner Drawing

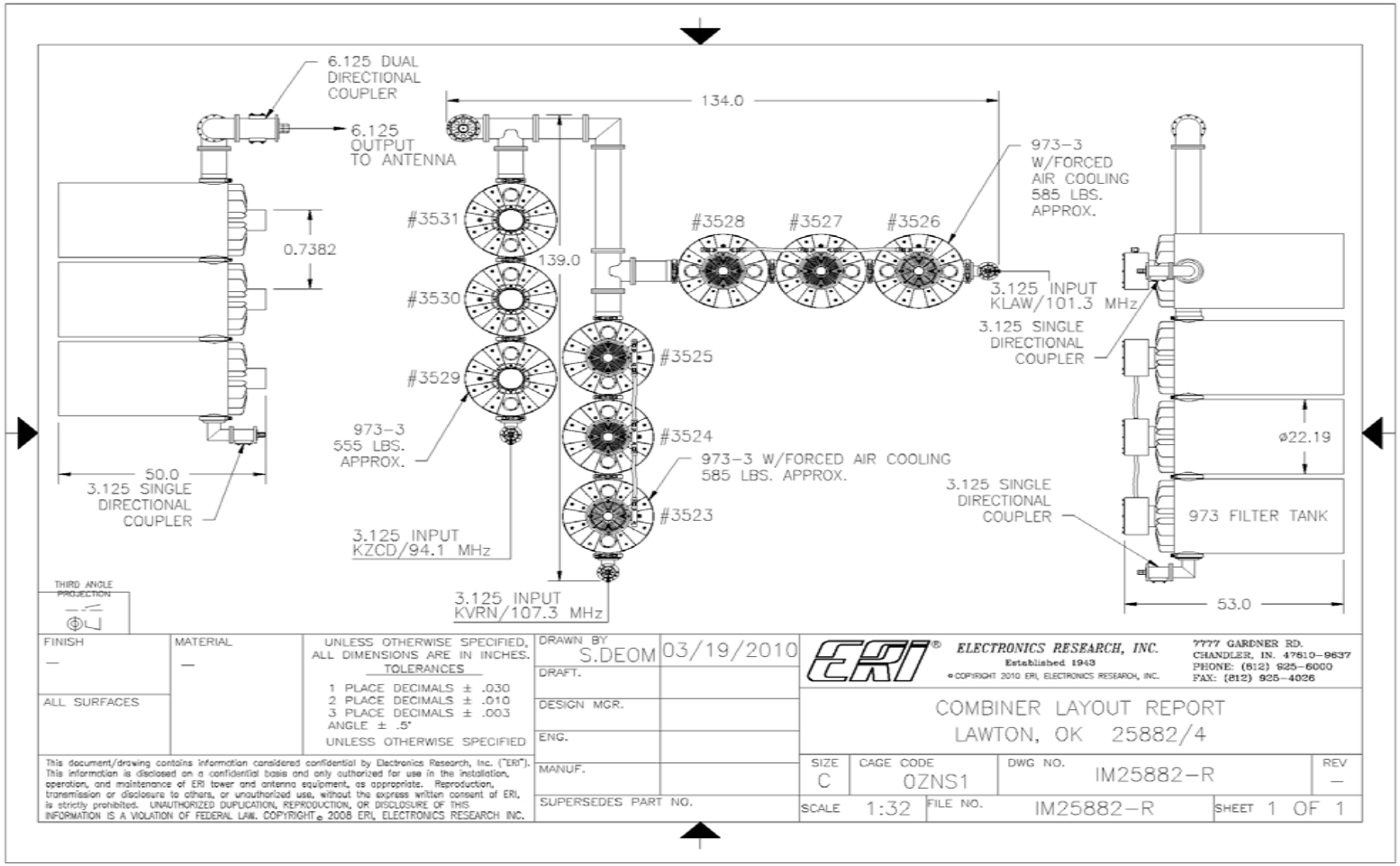


Figure 2: Antenna Drawing

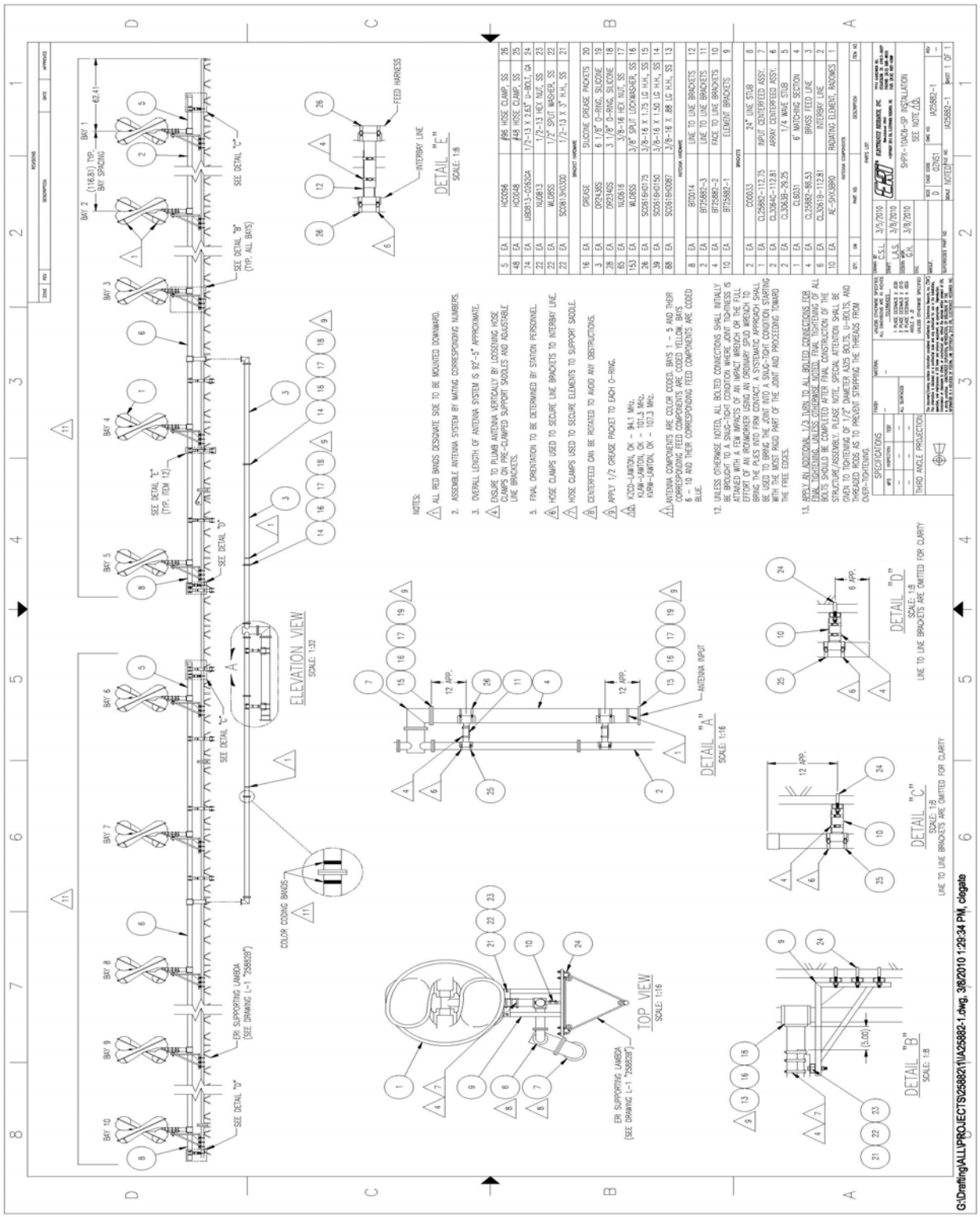
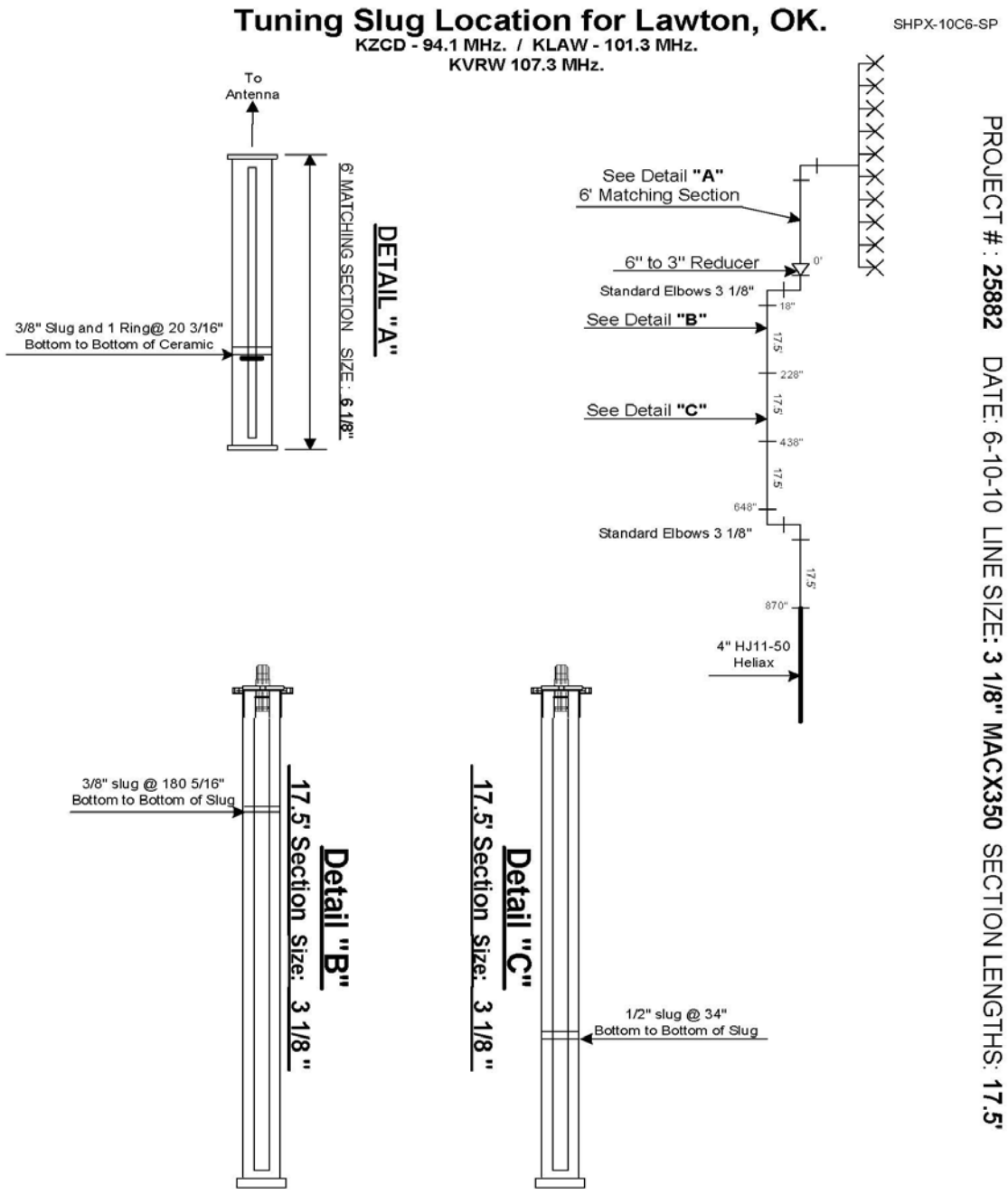
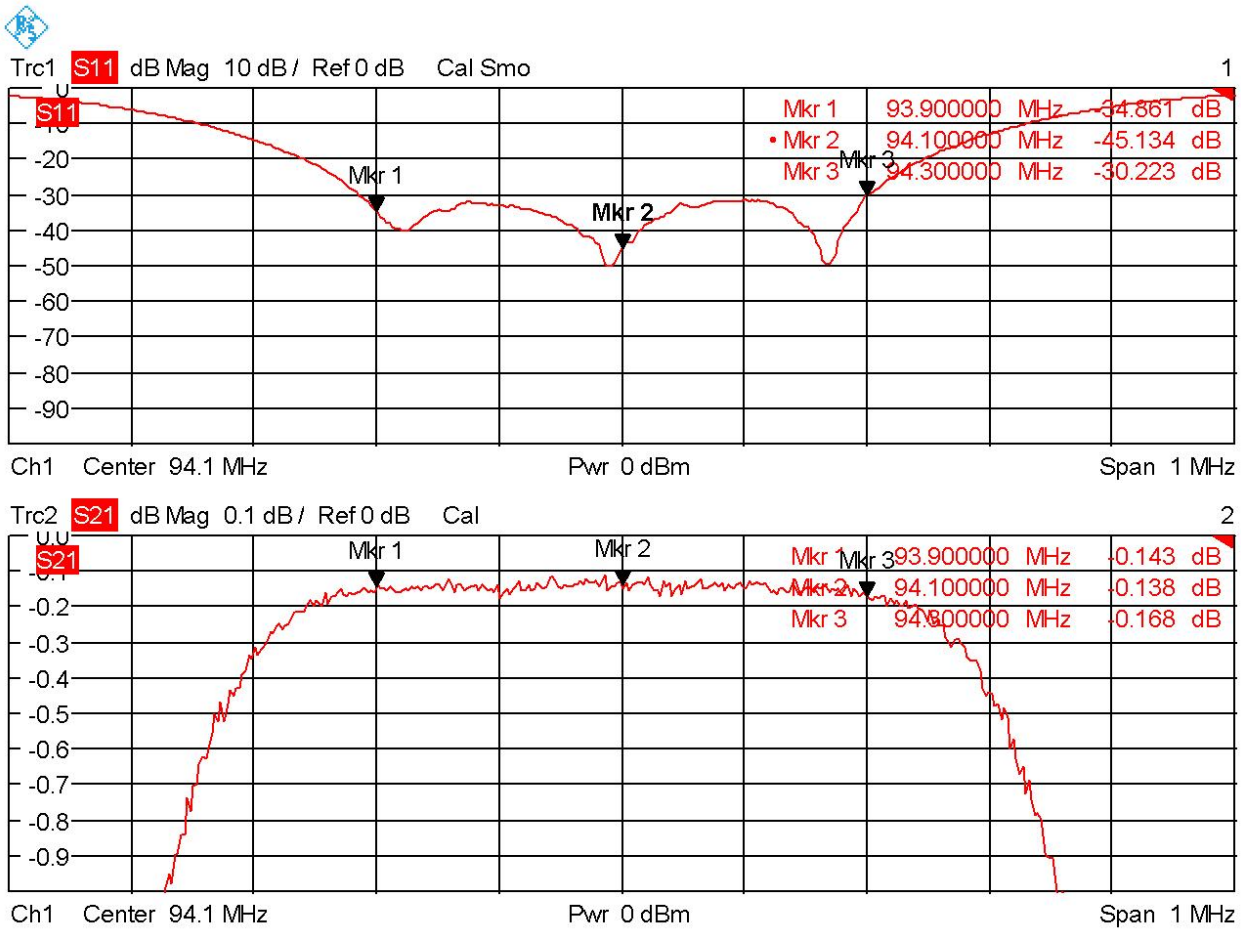


Figure 3: Feedline Layout

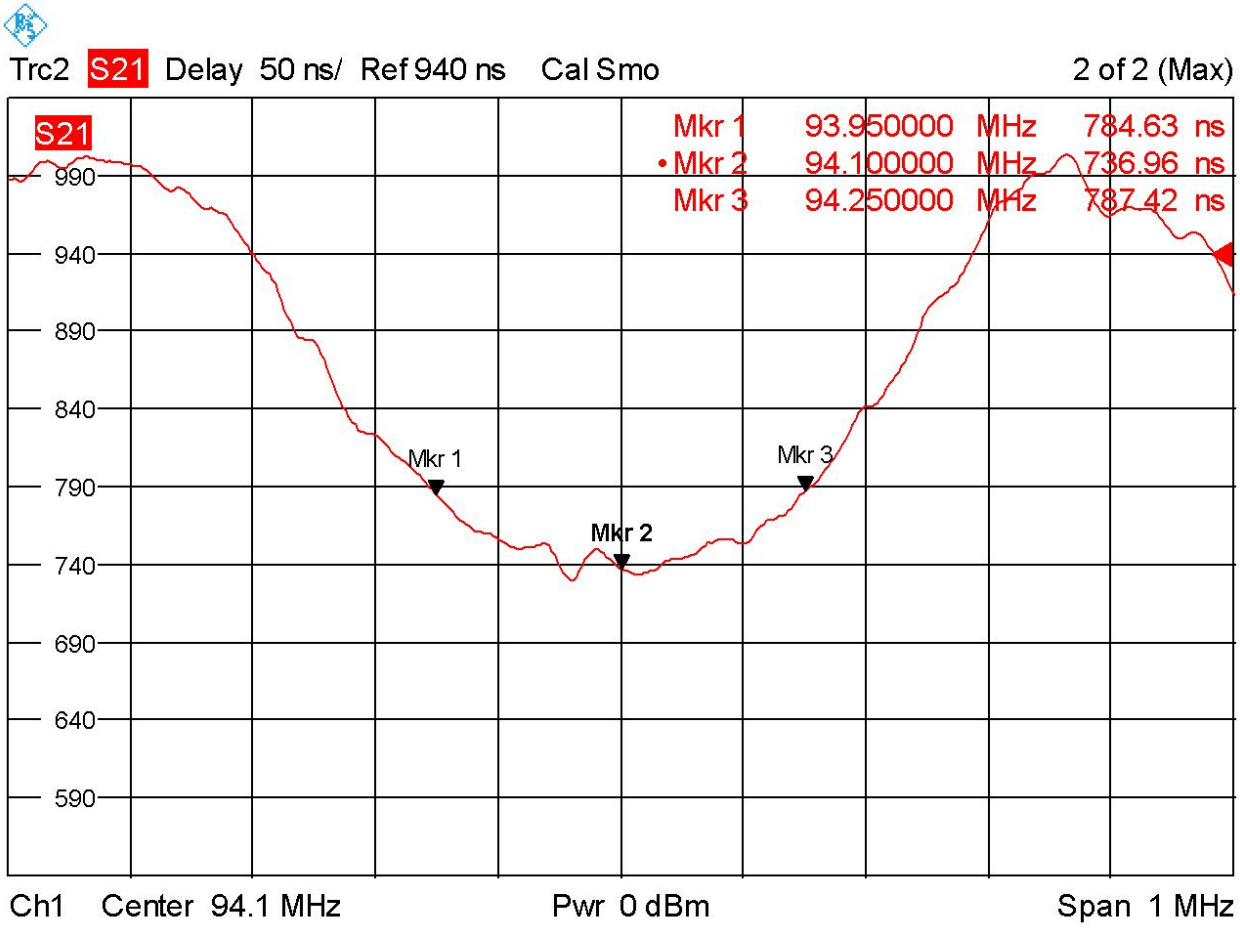


Measurement 1:Match and Insertion Loss of 94.1 MHz.



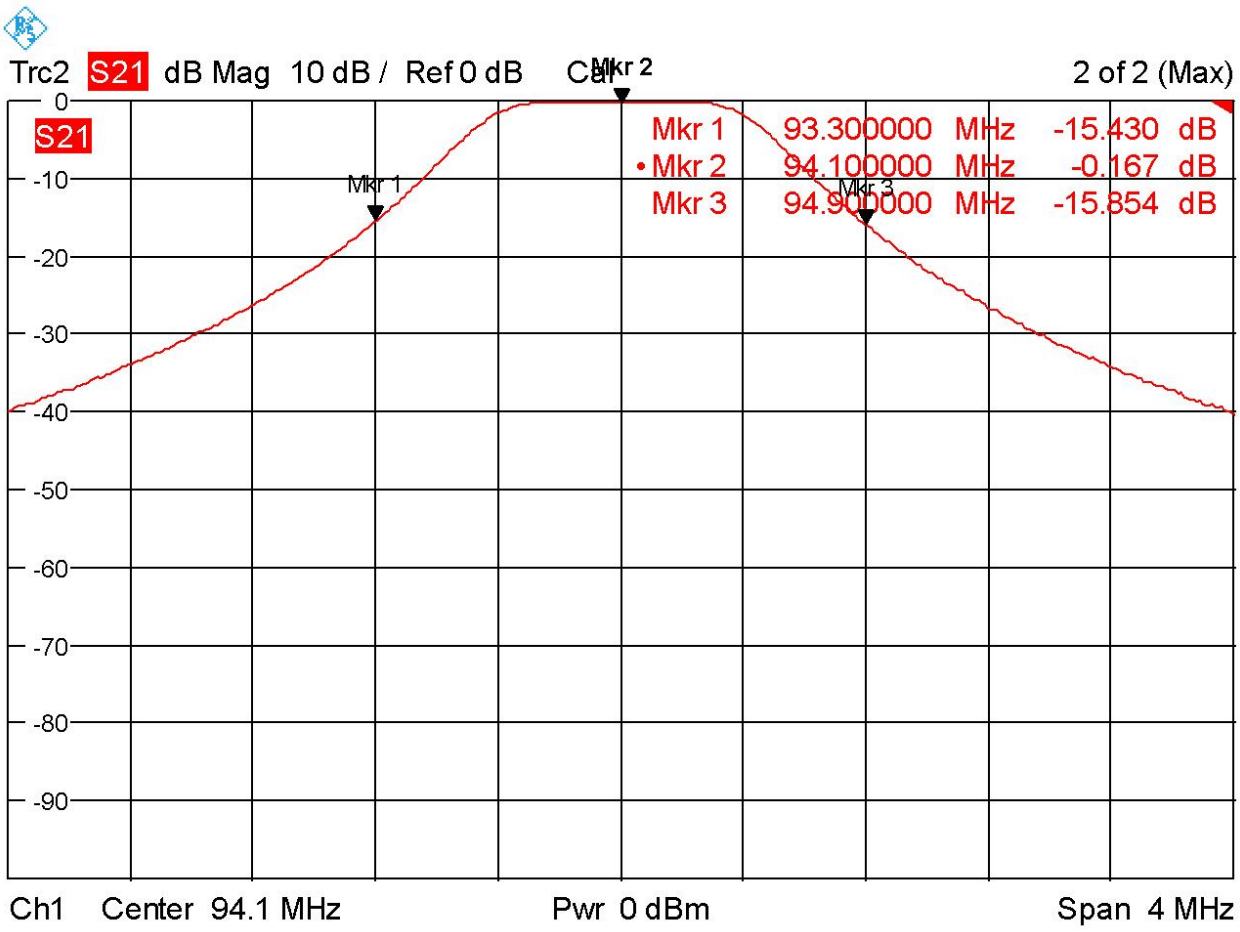
Date: 8.JUN.2010 14:36:23

Measurement 2: Group Daley of 94.1 MHz.



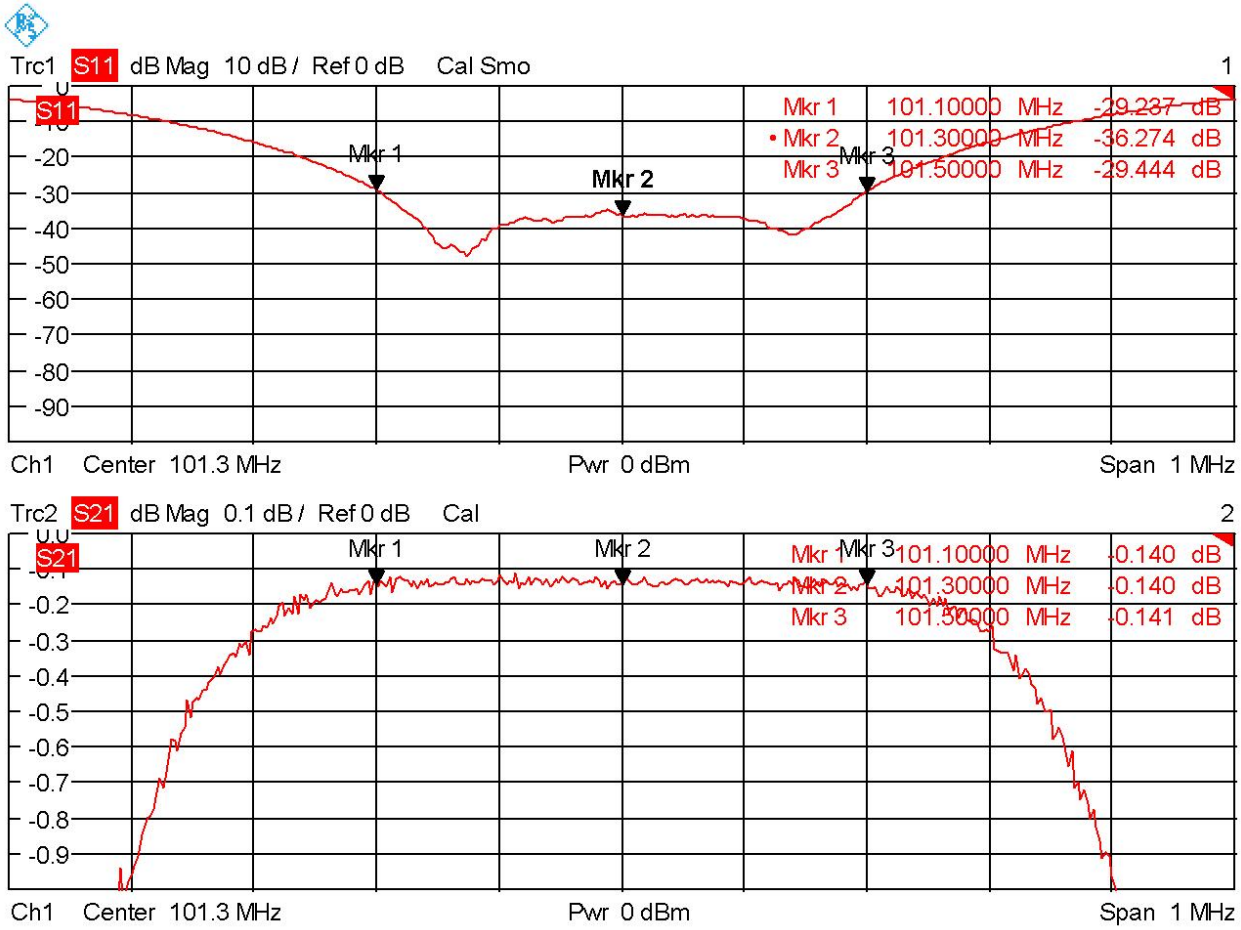
Date: 8.JUN.2010 14:39:45

Measurement 3: Isolation +/- 800 KHz. of 94.1 MHz.



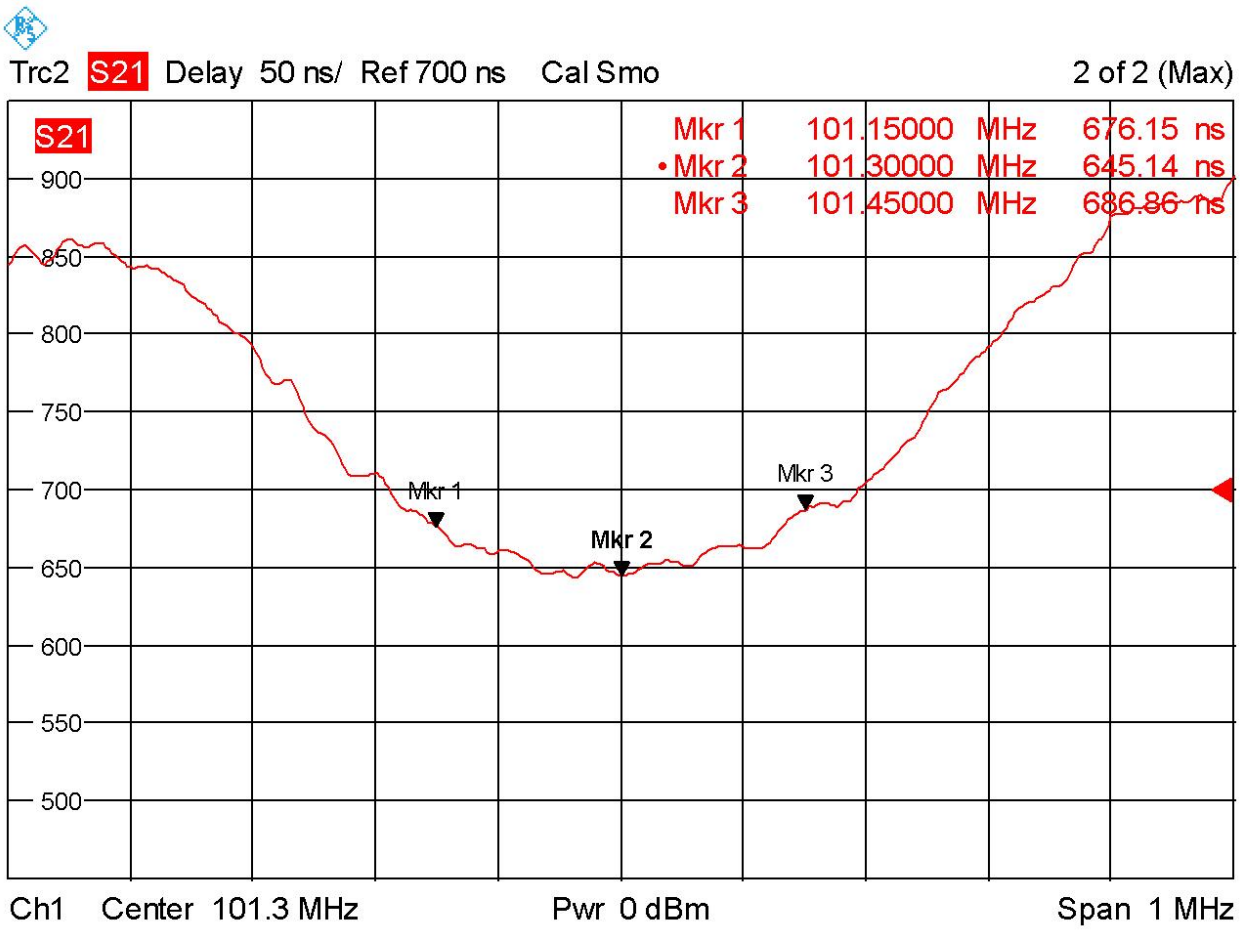
Date: 8.JUN.2010 14:37:44

Measurement 4: Match & Insertion Loss of 101.3 MHz.



Date: 8.JUN.2010 15:01:14

Measurement 5: Group Delay of 101.3 MHz.



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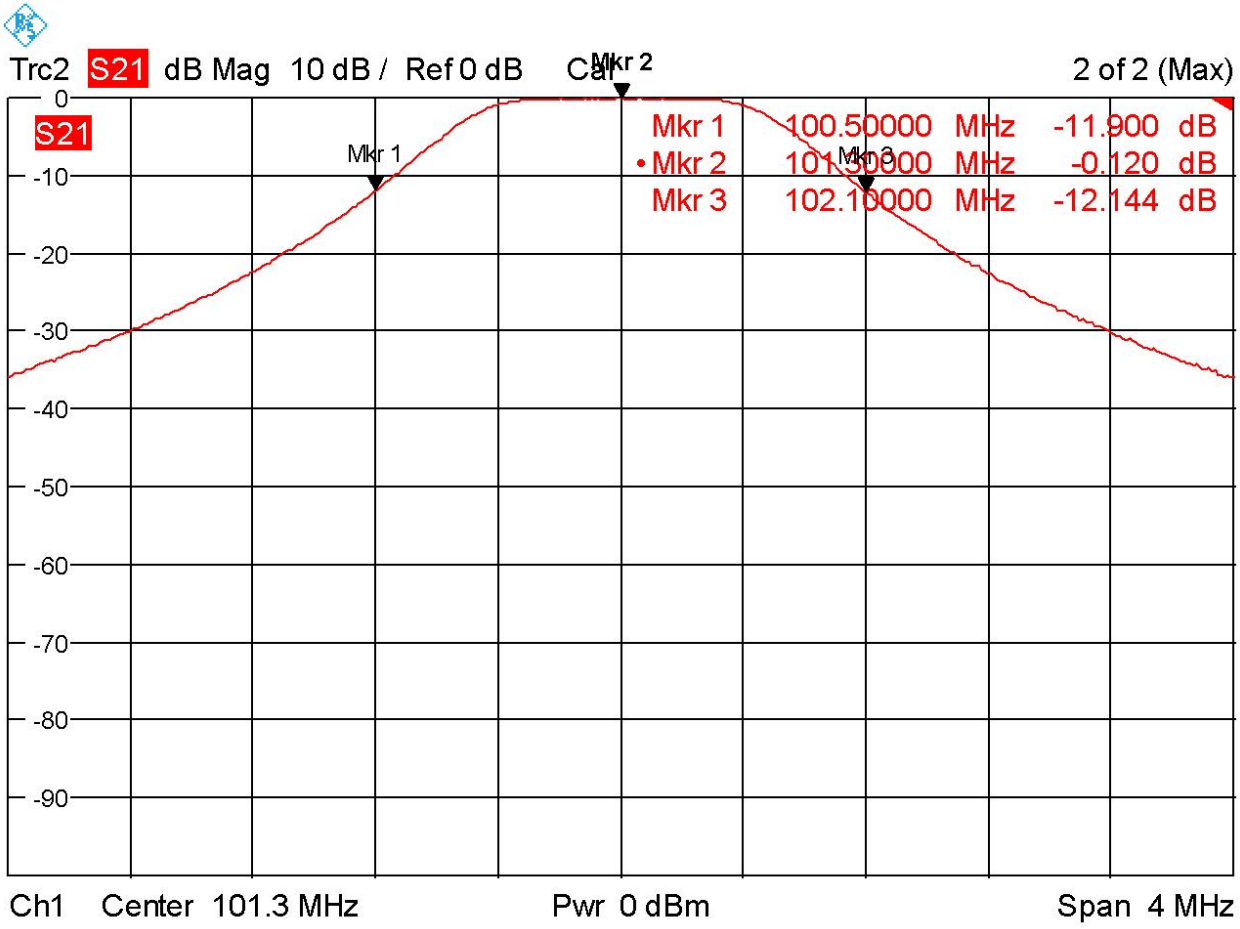
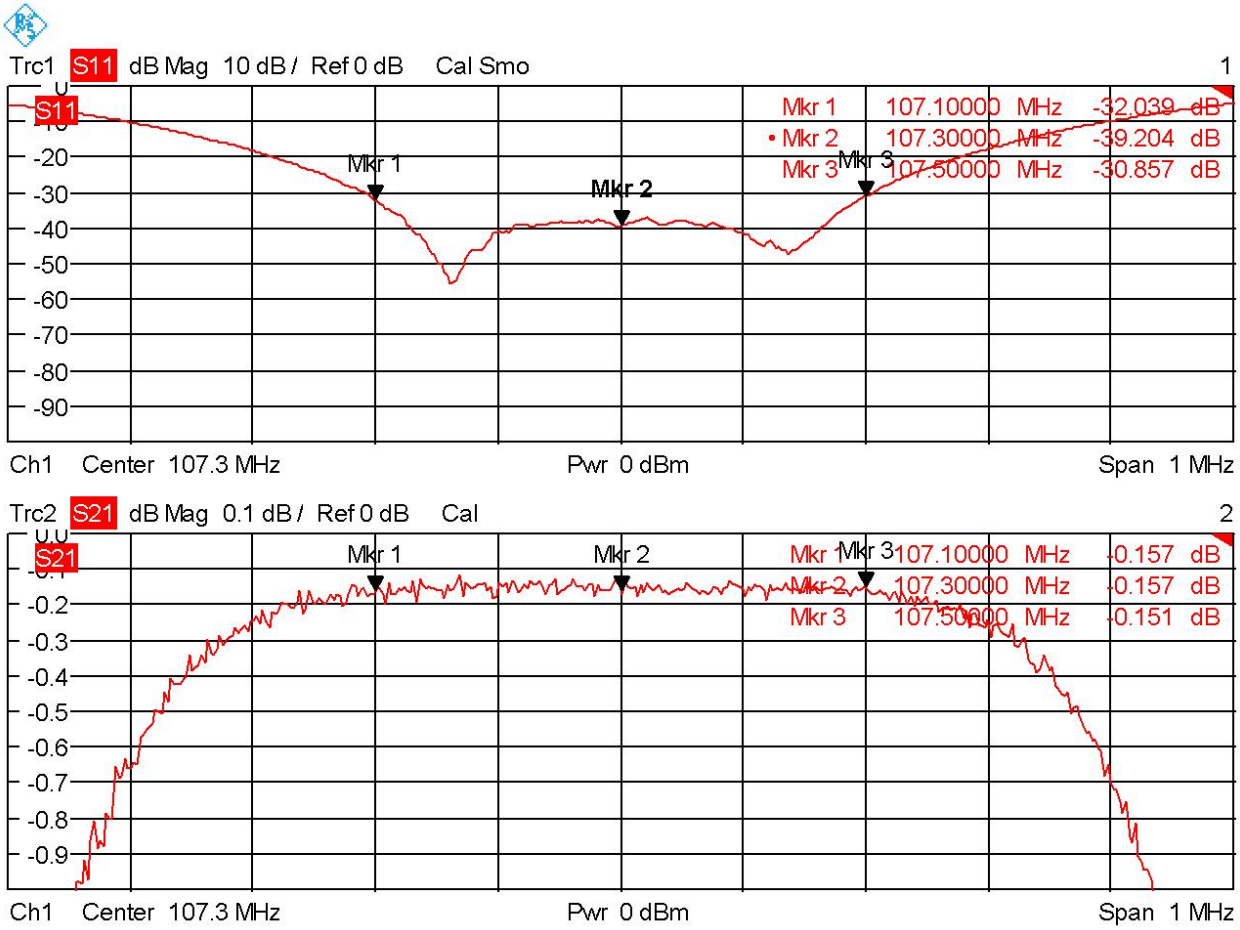
Measurement 6: Isolation +/- 800 KHz. of 101.3 MHz.



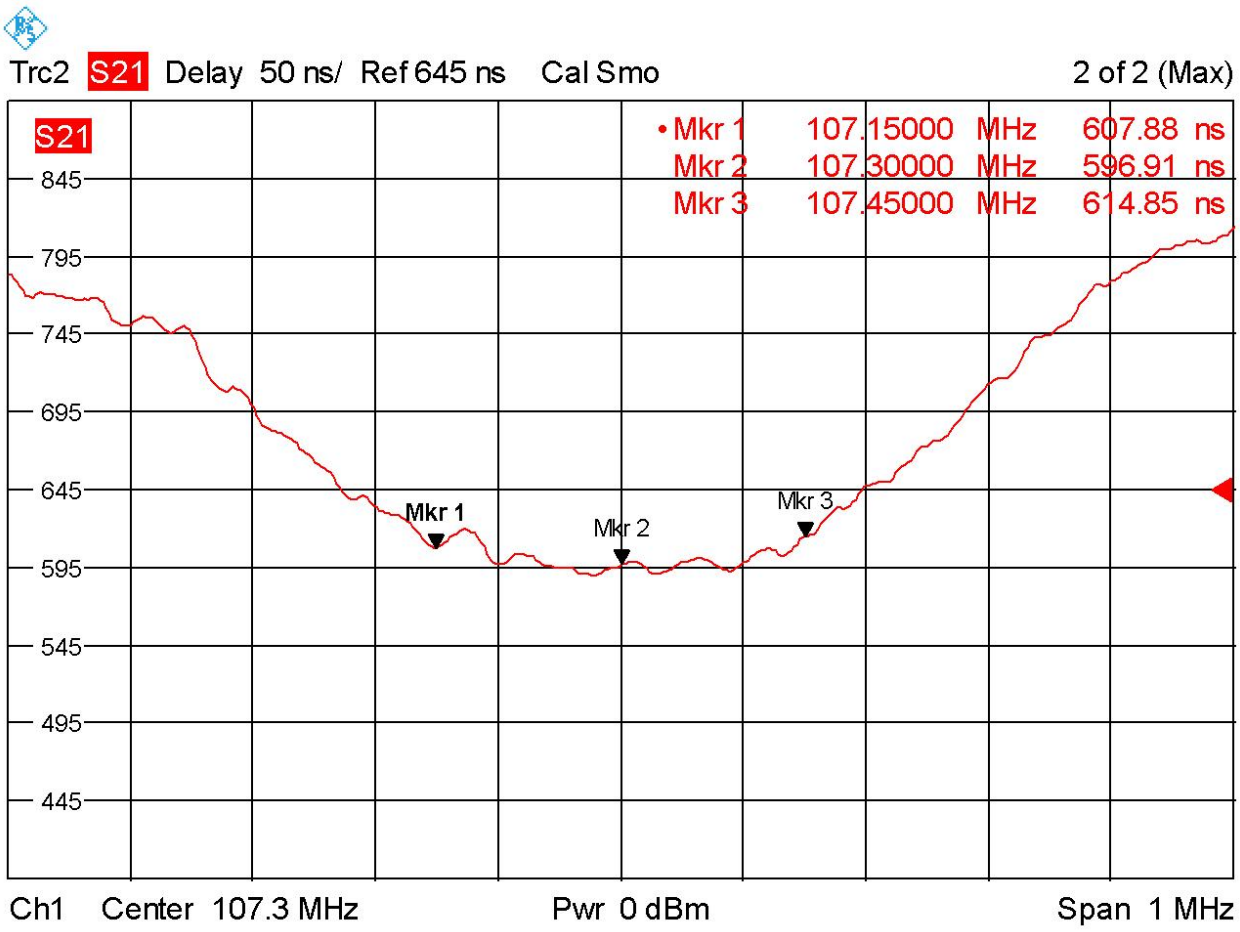
Date: 8.JUN.2010 15:02:11

Measurement 7: Match & Insertion Loss of 107.3 MHz.



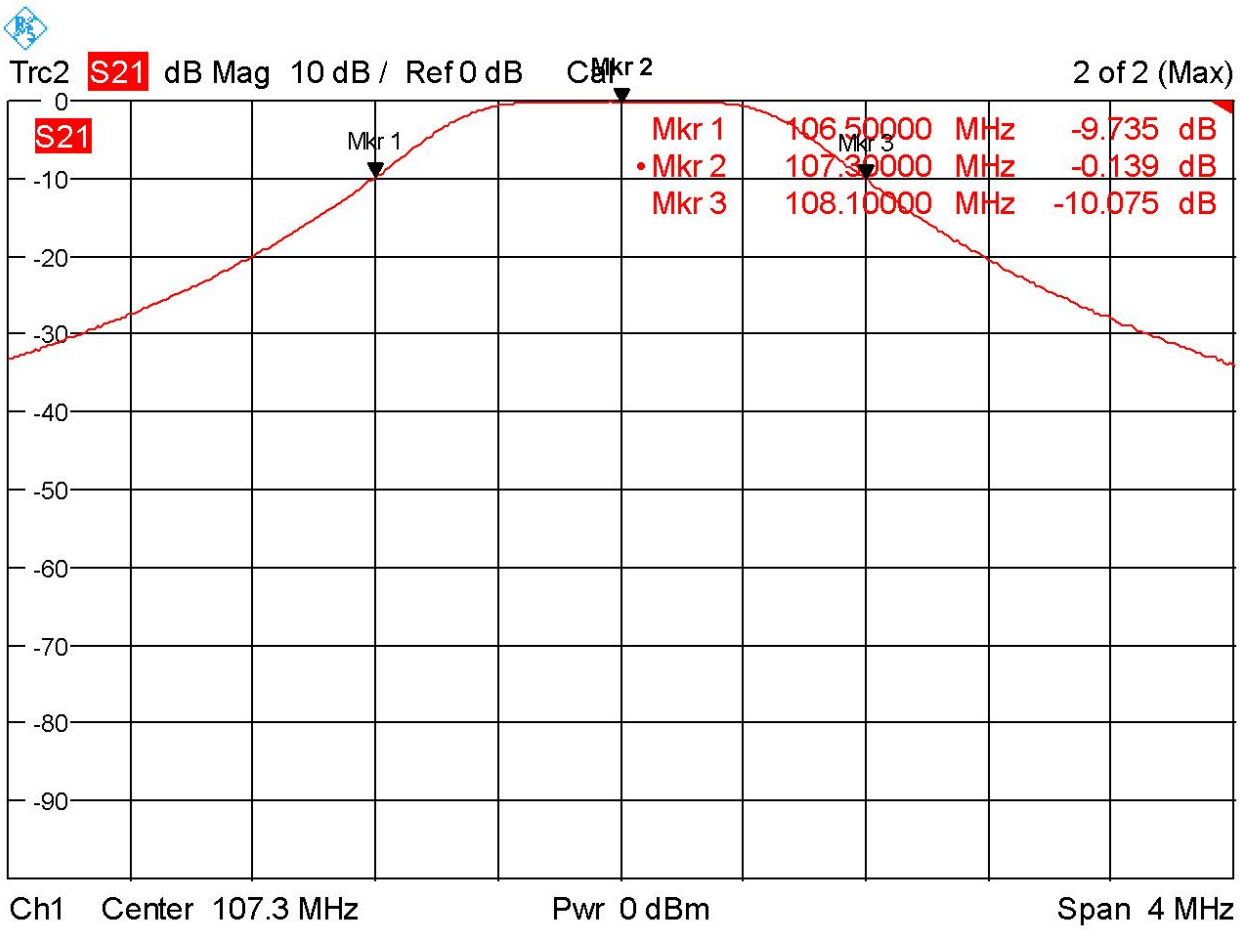
Date: 8.JUN.2010 14:52:40

Measurement 8: Group Delay of 107.3 MHz.



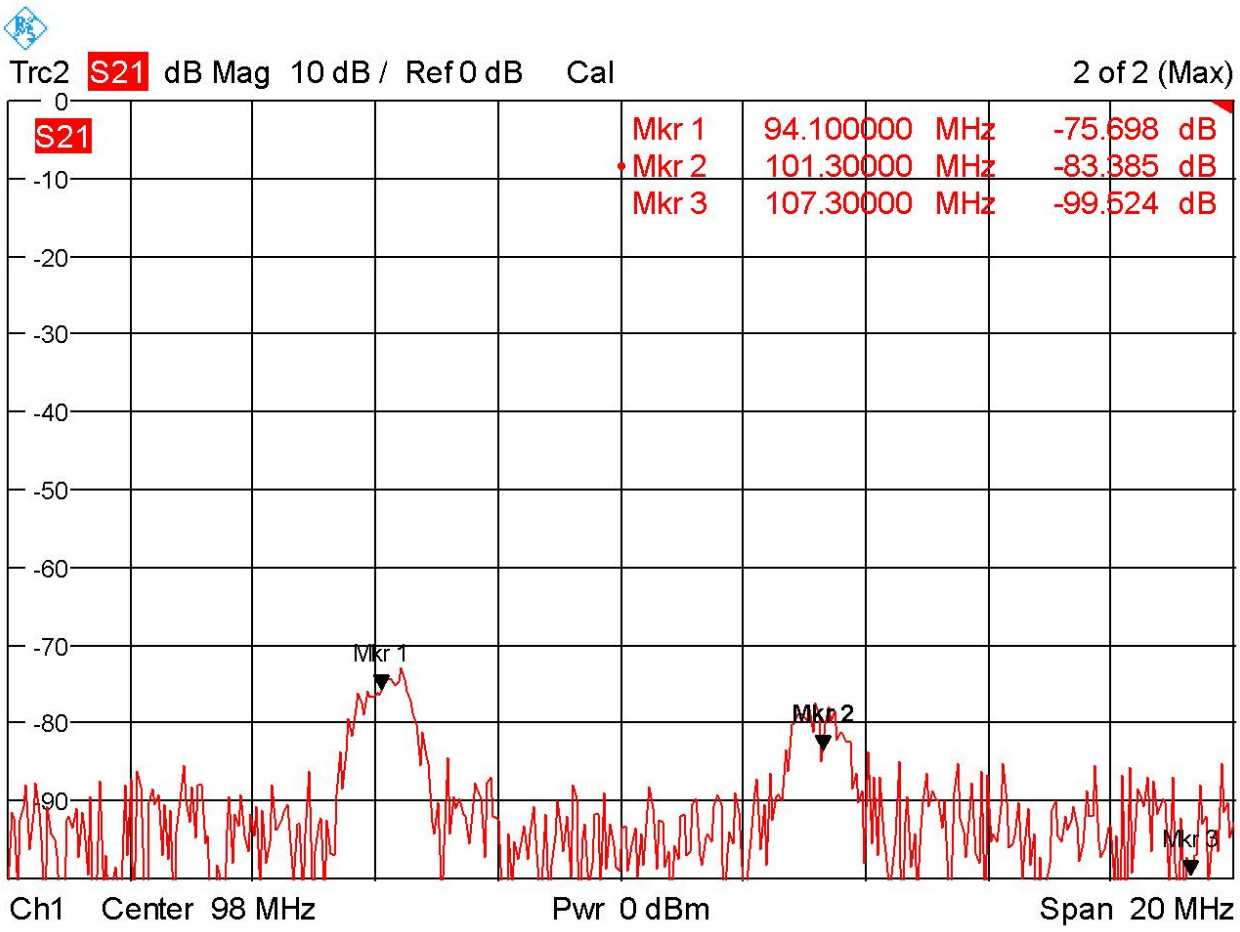
Date: 8.JUN.2010 14:55:19

Measurement 9: Isolation +/- 800 KHz. of 107.3 MHz.



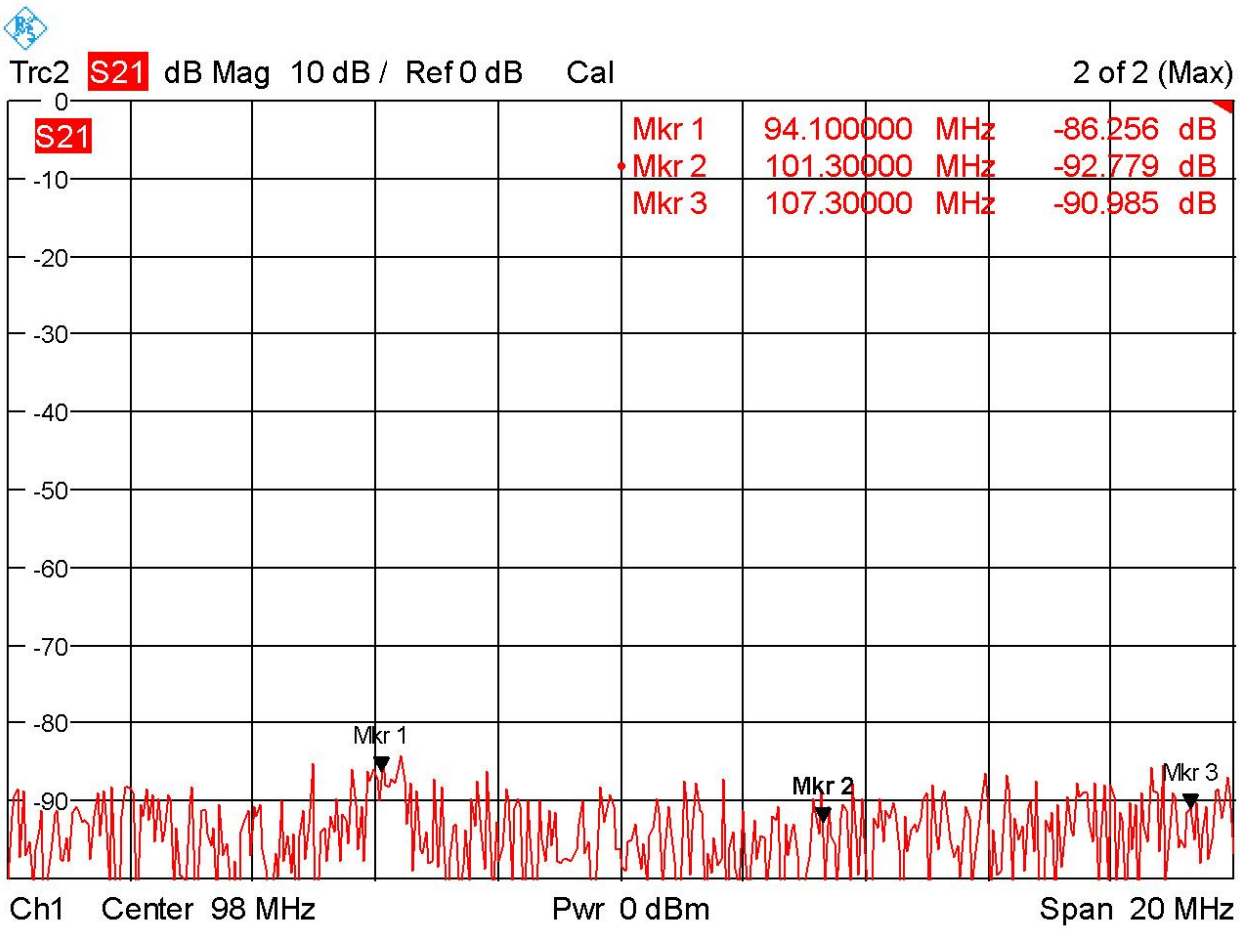
Date: 8.JUN.2010 14:53:25

Measurement 10: Port to Port Isolation from 94.1 to 101.3 MHz.



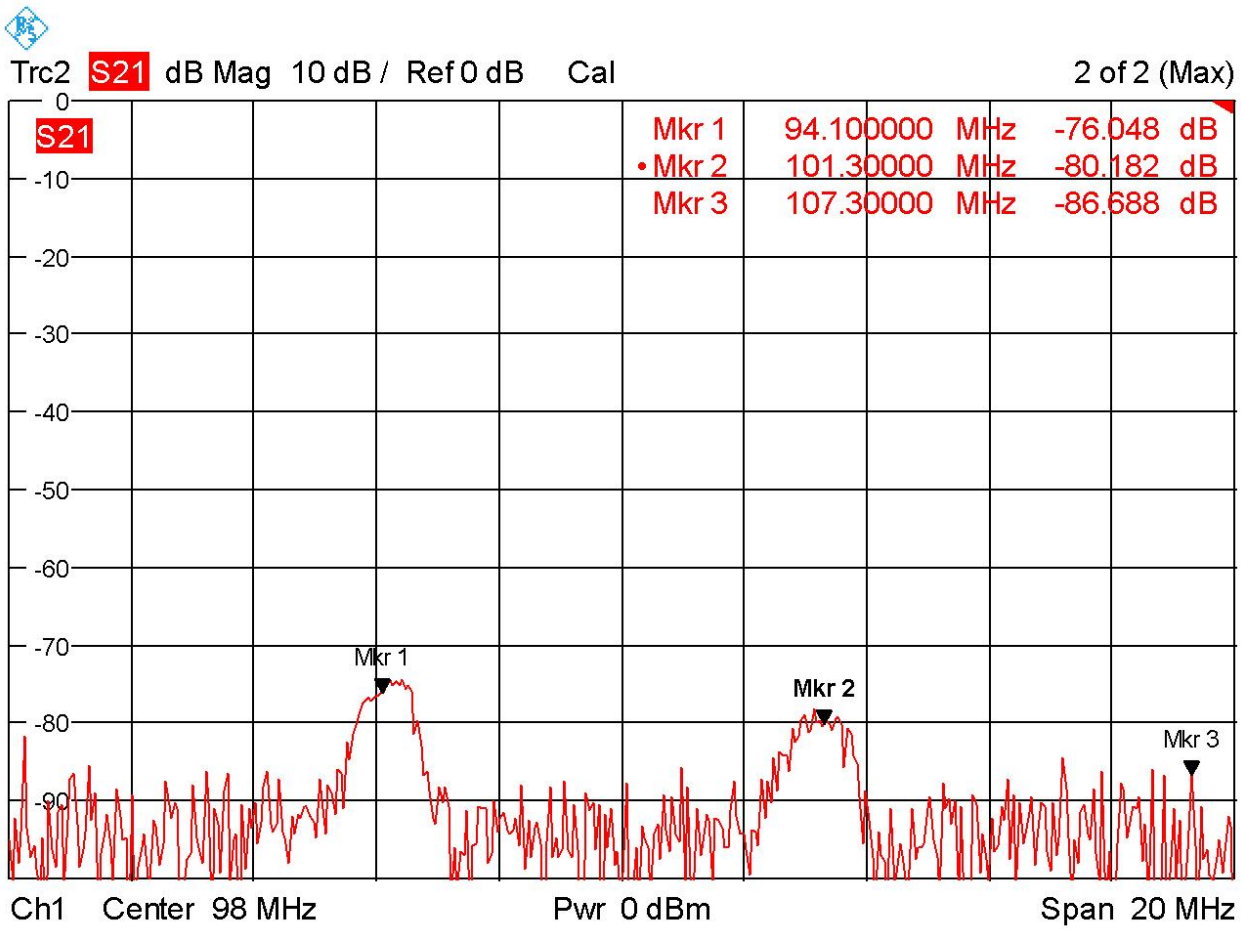
Date: 8.JUN.2010 15:14:36

Measurement 11: Port to Port Isolation from 94.1 to 107.3 MHz.



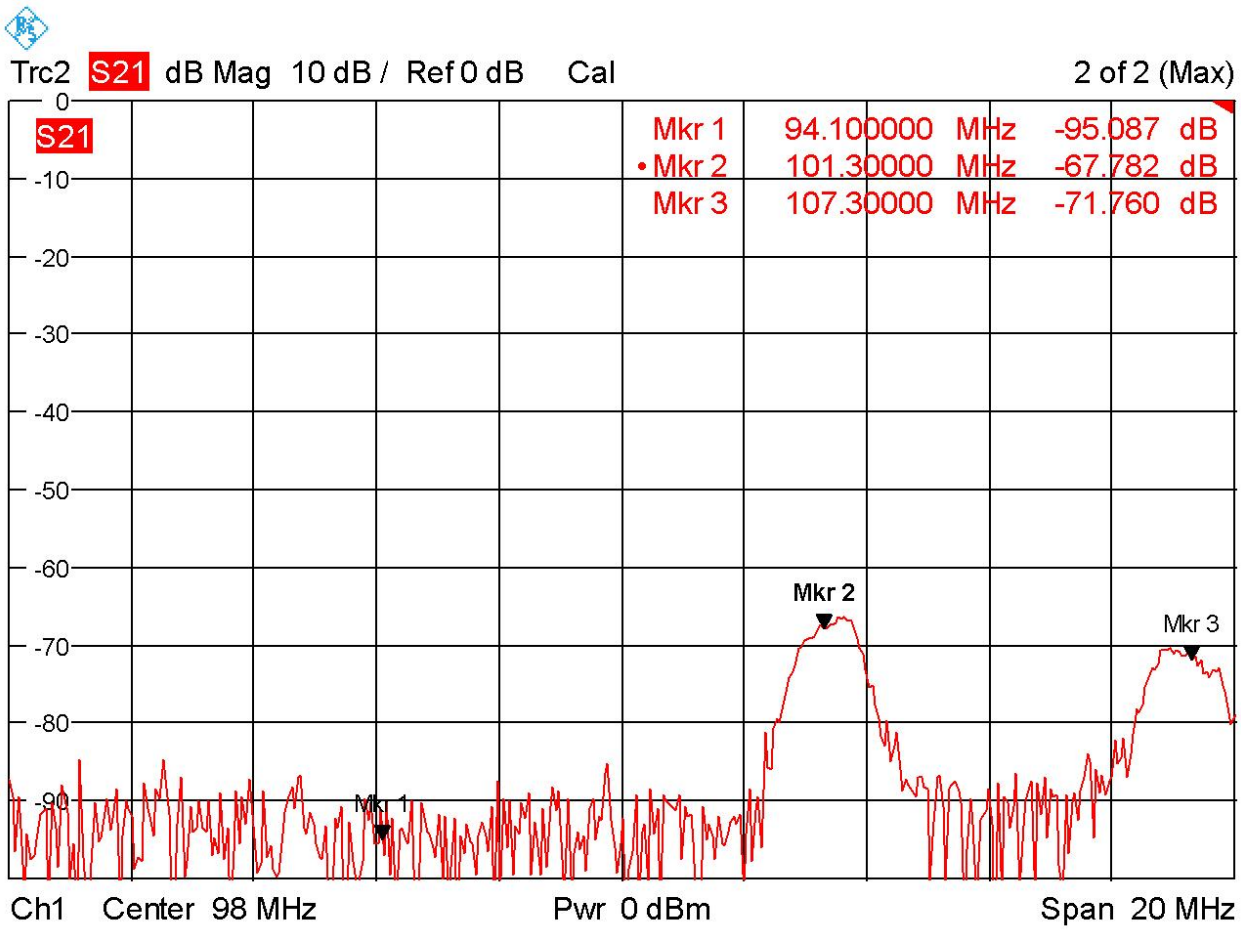
Date: 8.JUN.2010 15:13:20

Measurement 12: Port to Port Isolation from 101.3 to 94.1 MHz.



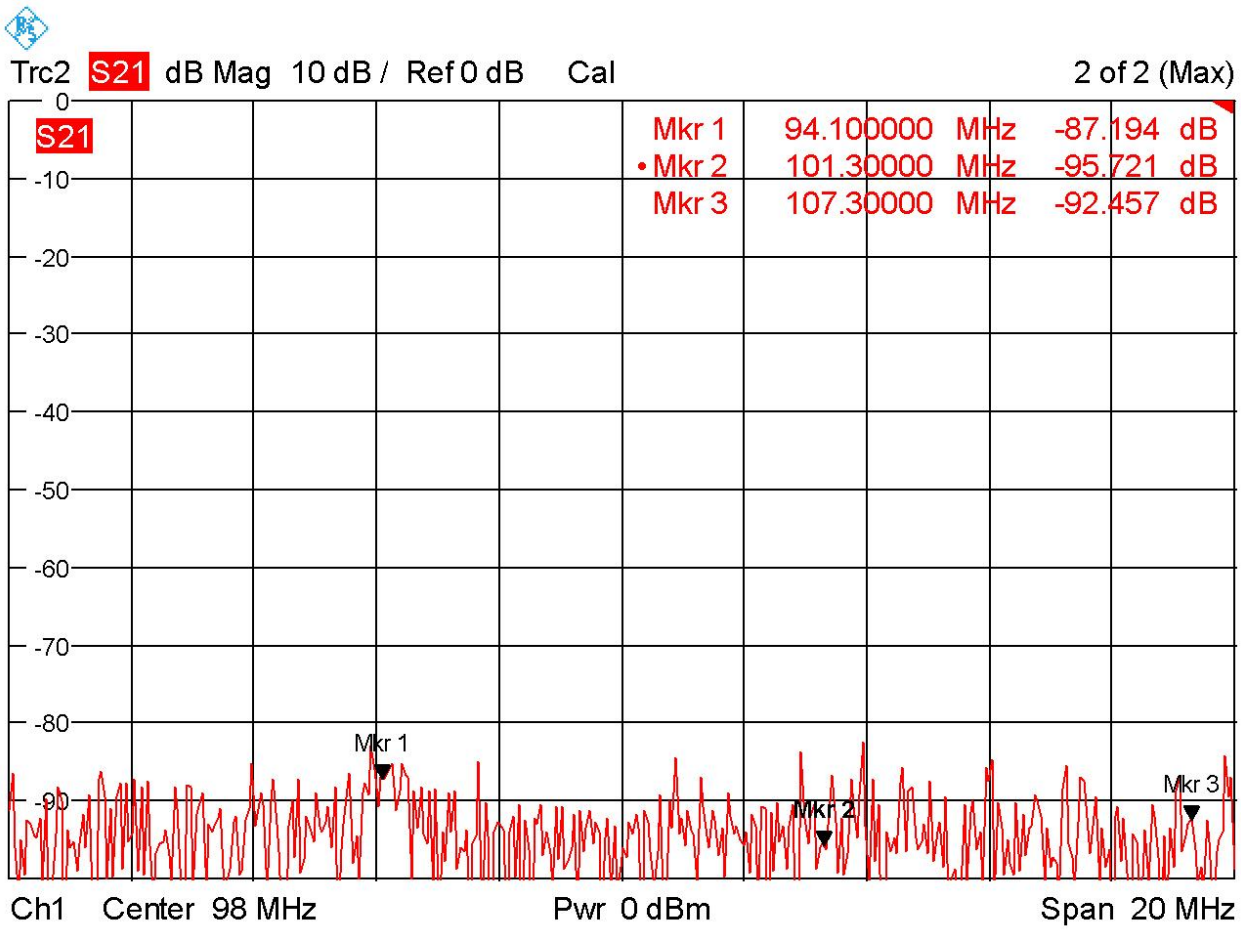
Date: 8.JUN.2010 15:05:41

Measurement 13: Port to Port Isolation from 101.3 to 107.3 MHz.



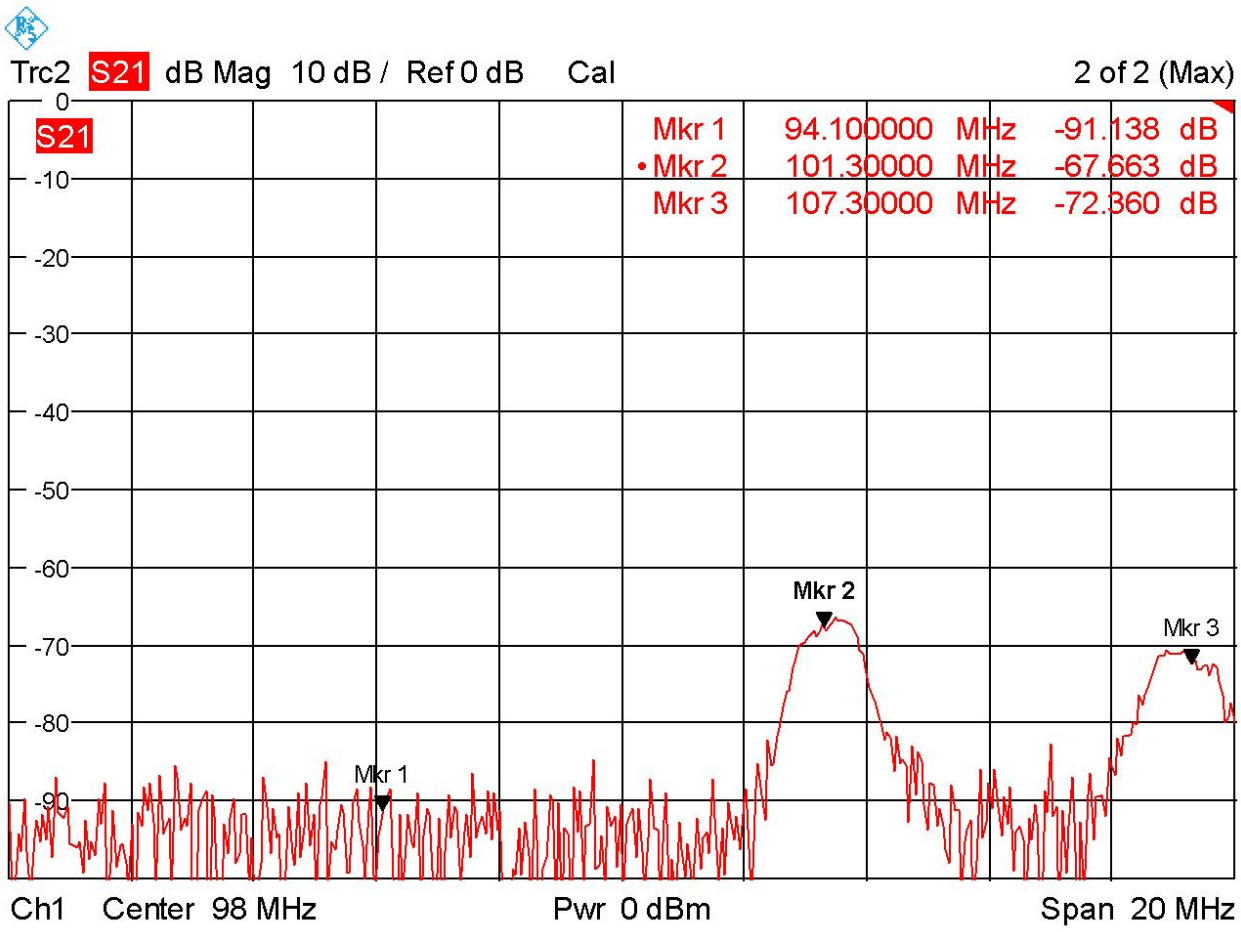
Date: 8.JUN.2010 15:07:06

Measurement 14: Port to Port Isolation from 107.3 to 94.1 MHz.



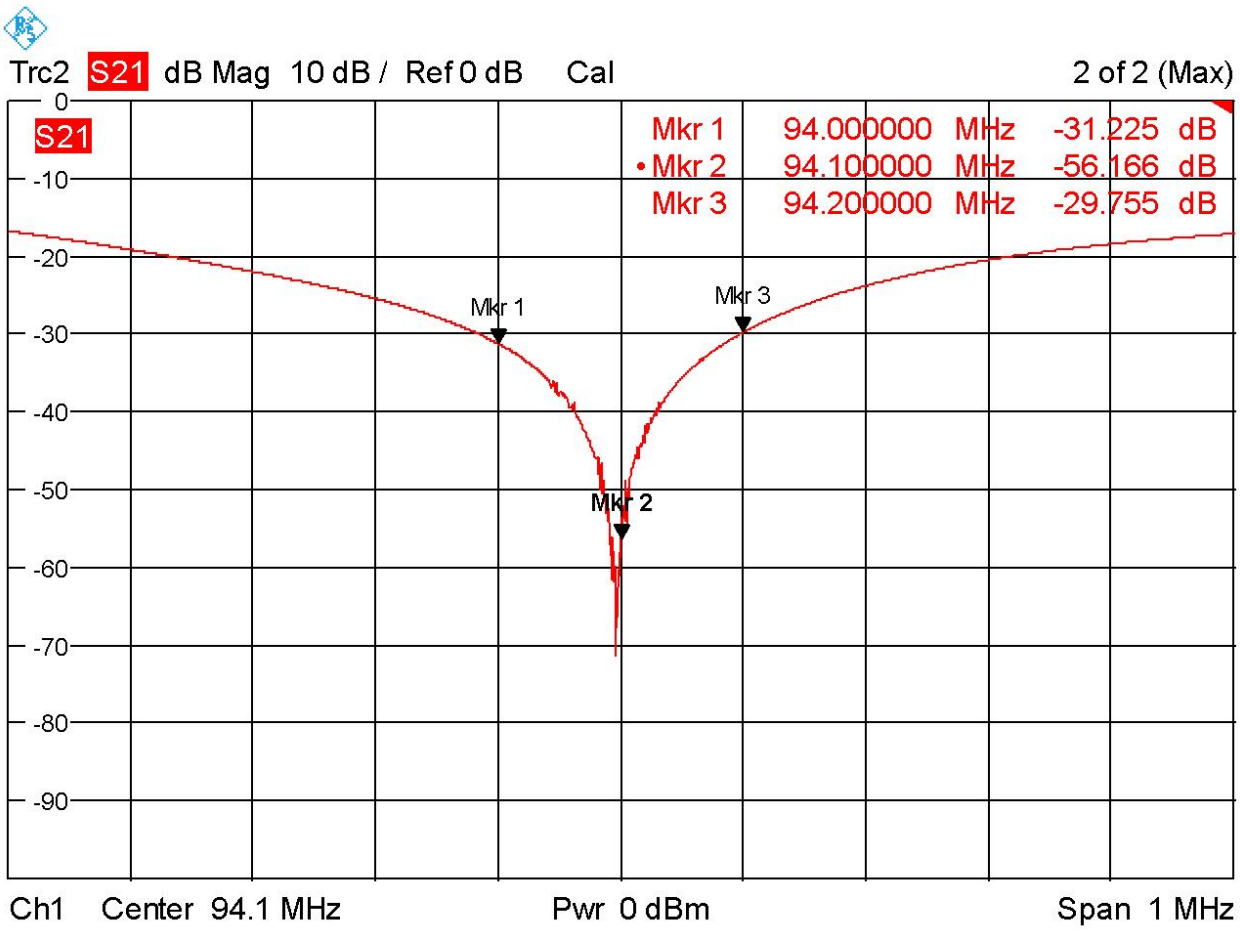
Date: 8.JUN.2010 15:11:59

Measurement 15: Port to Port Isolation from 107.3 to 101.3 MHz.



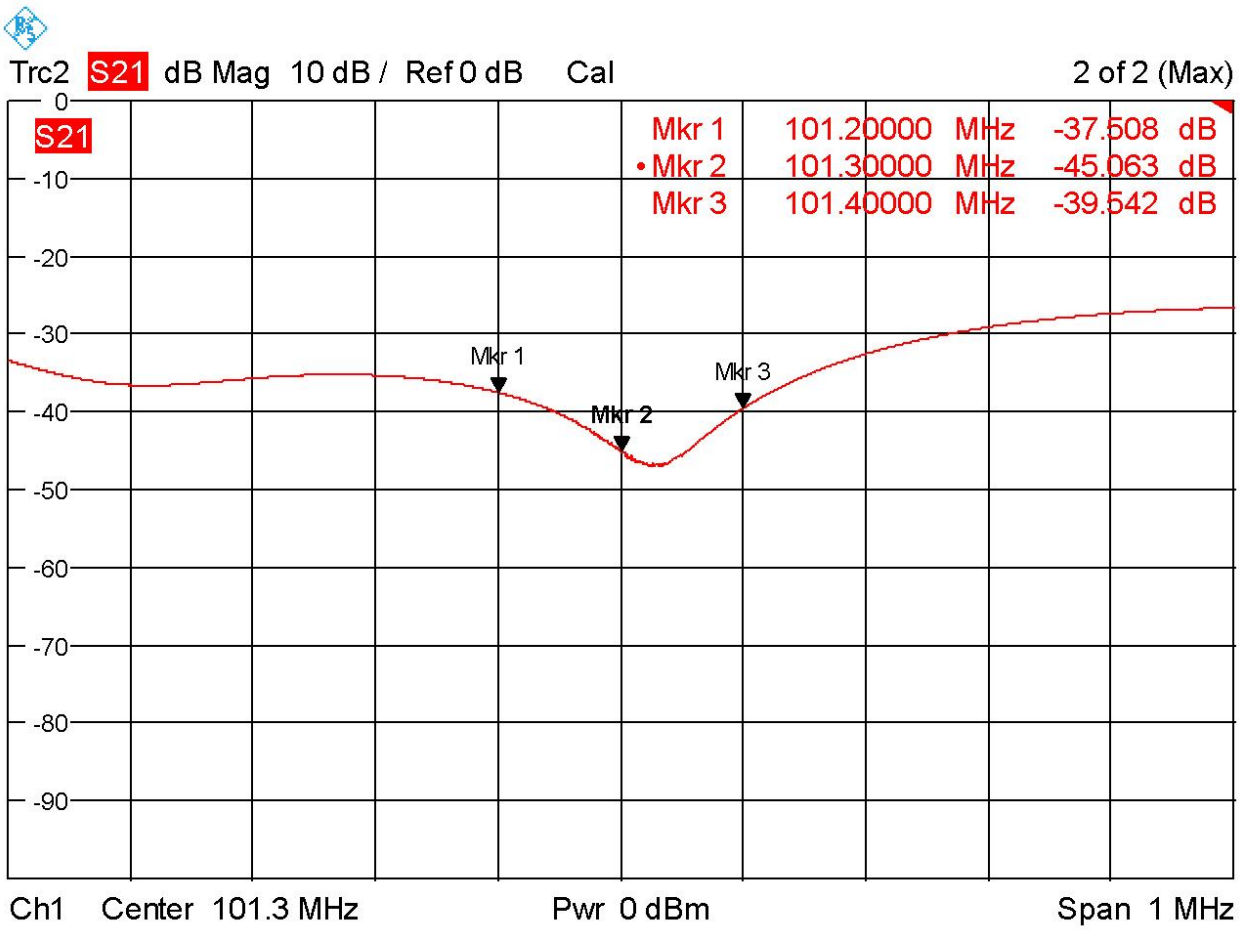
Date: 8.JUN.2010 15:11:01

Measurement 16: Final Antenna of 94.1 MHz.



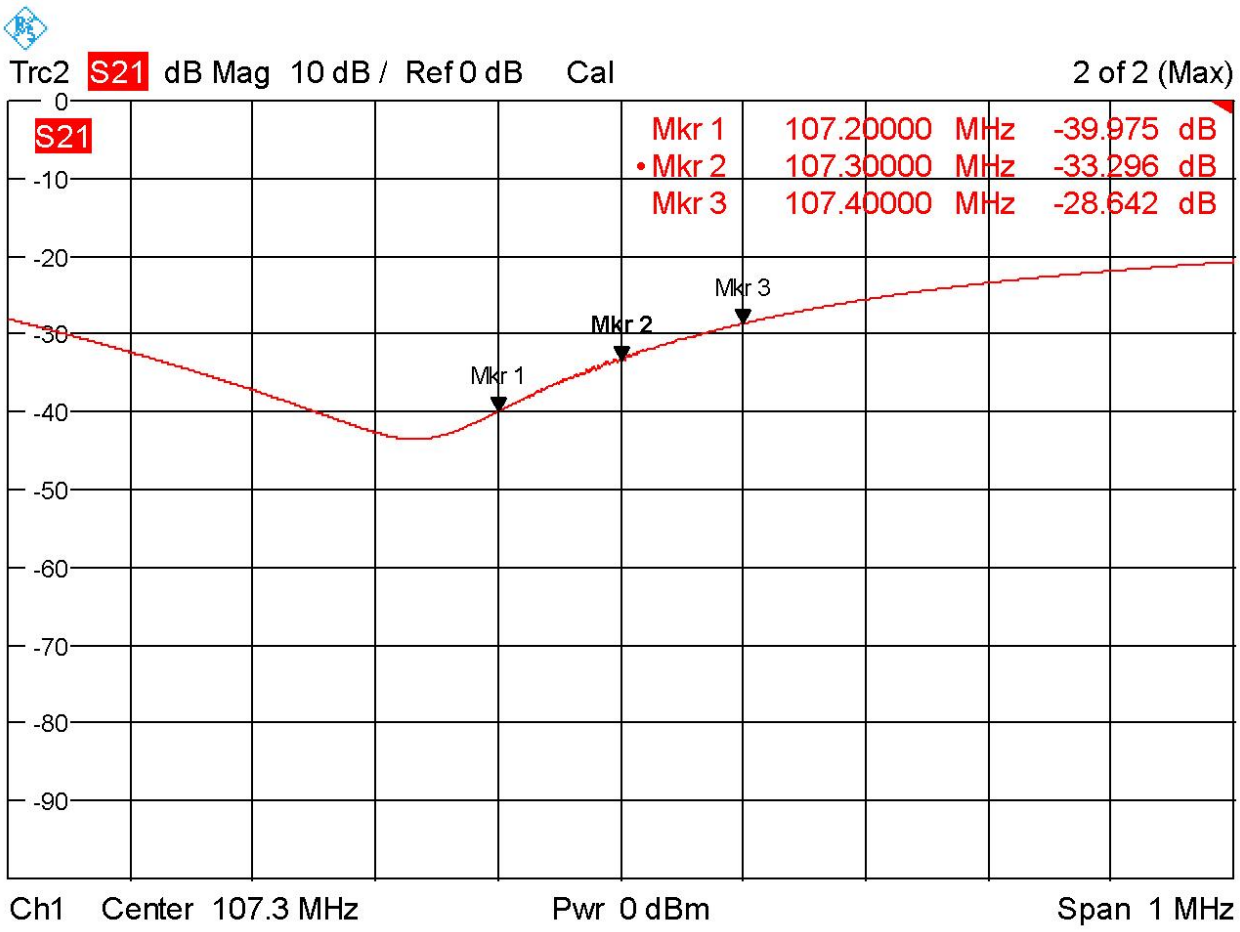
Date: 10.JUN.2010 19:32:23

Measurement 17: Final Antenna of 101.3 MHz.



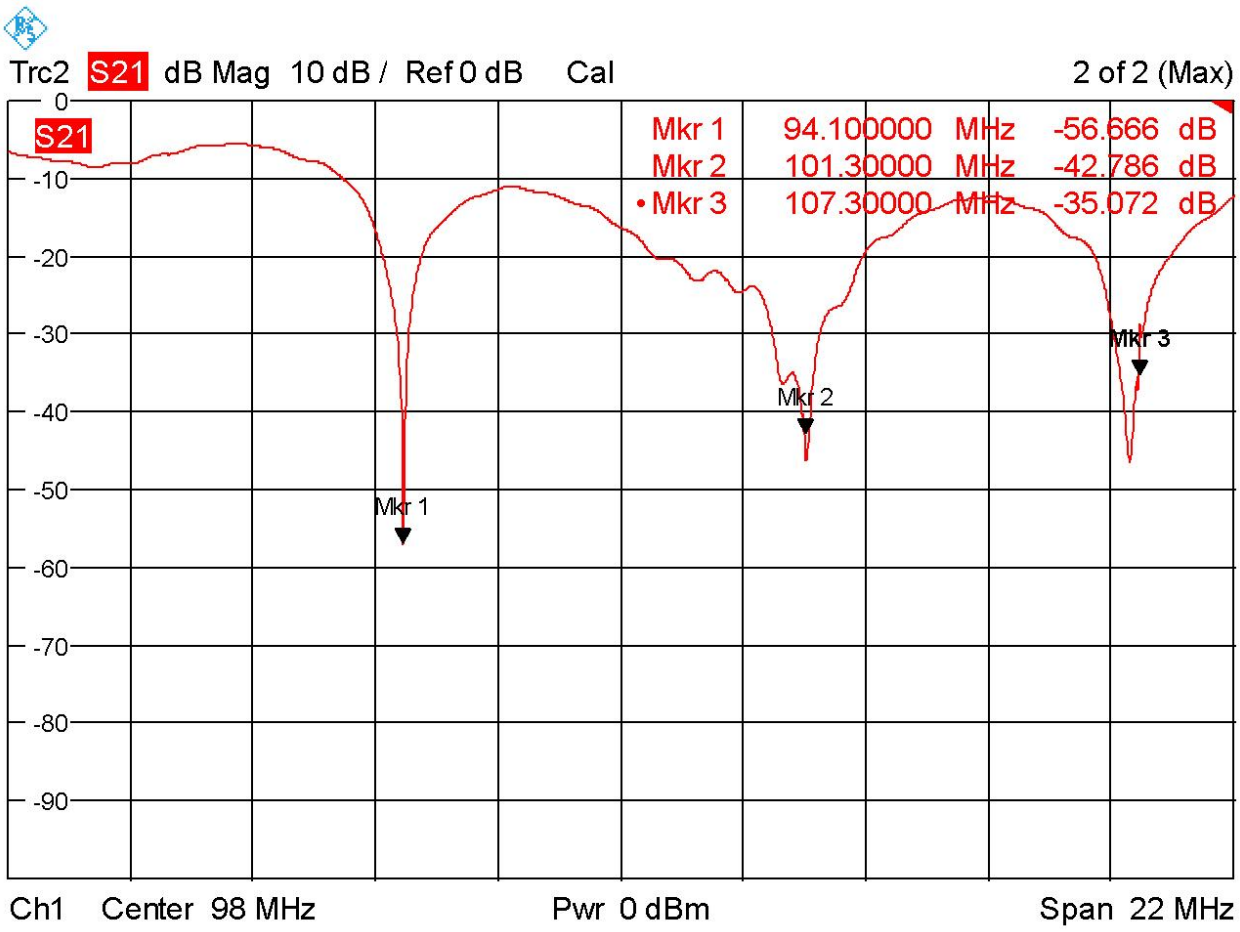
Date: 10.JUN.2010 19:36:45

Measurement 18: Final Antenna of 107.3 MHz.



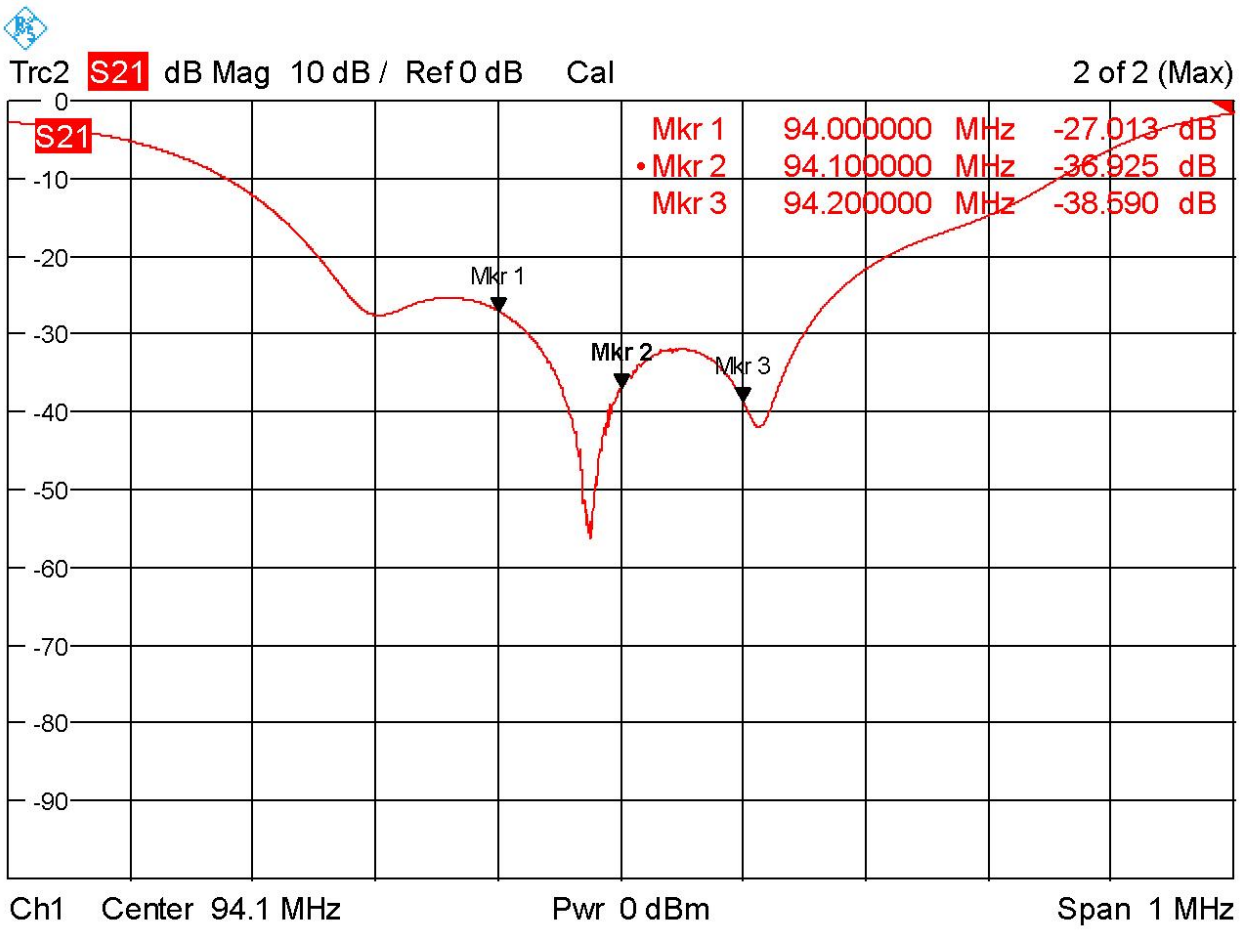
Date: 10.JUN.2010 19:39:49

Measurement 19: Final Broad Sweep of Antenna



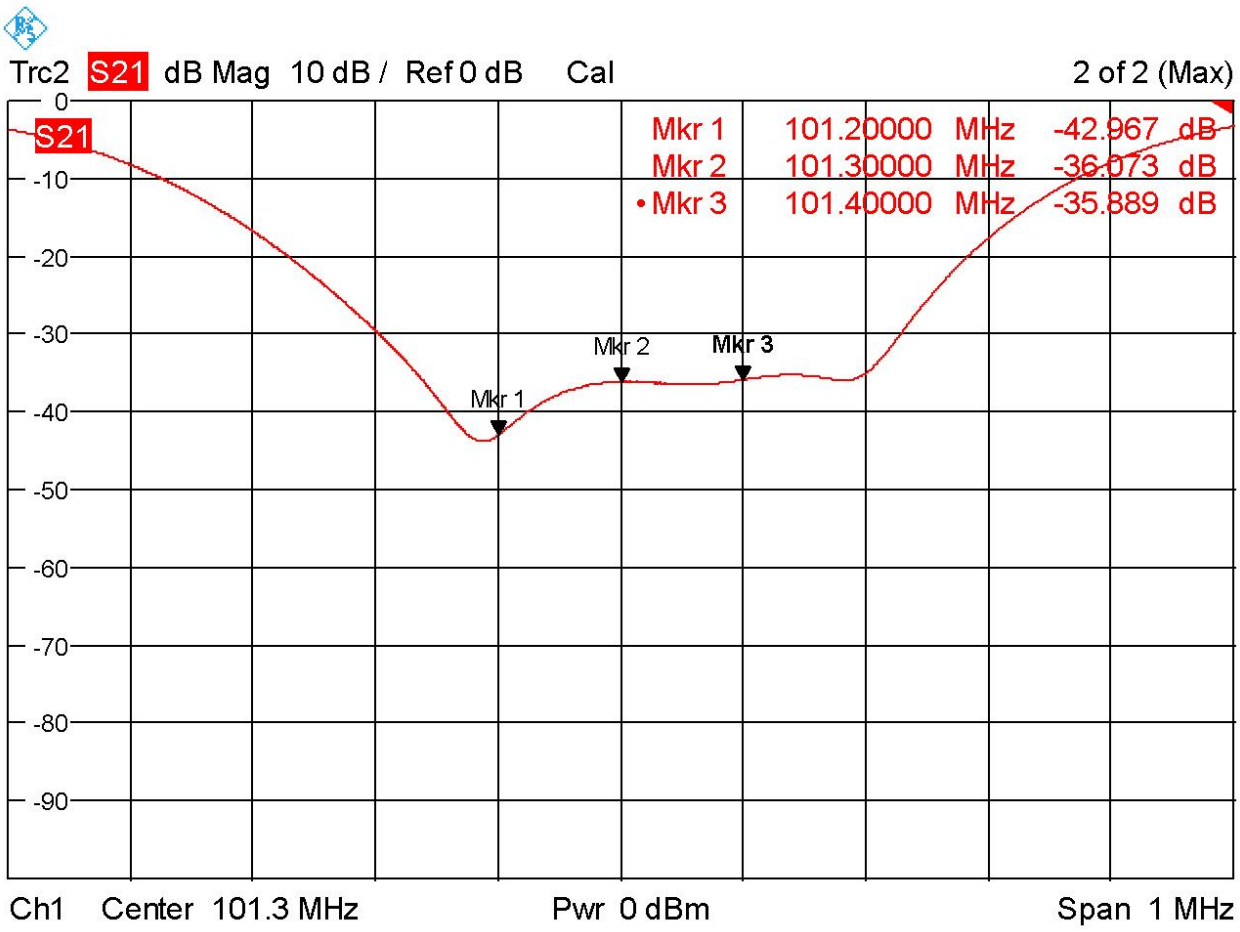
Date: 10.JUN.2010 19:34:28

Measurement 20: Final Filter to Antenna of 94.1 MHz.



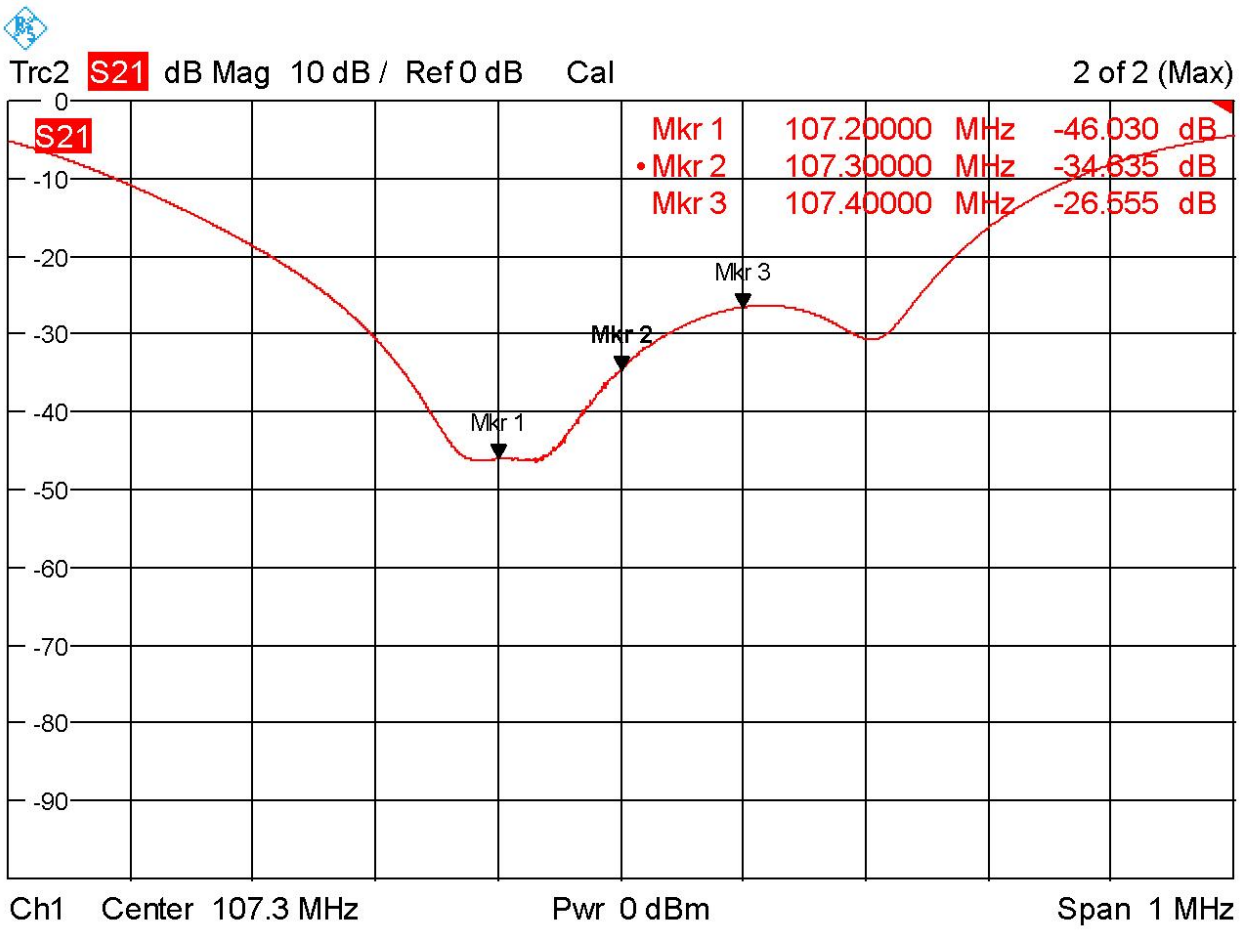
Date: 10.JUN.2010 20:08:52

Measurement 21: Final Filter to Antenna of 101.3 MHz.



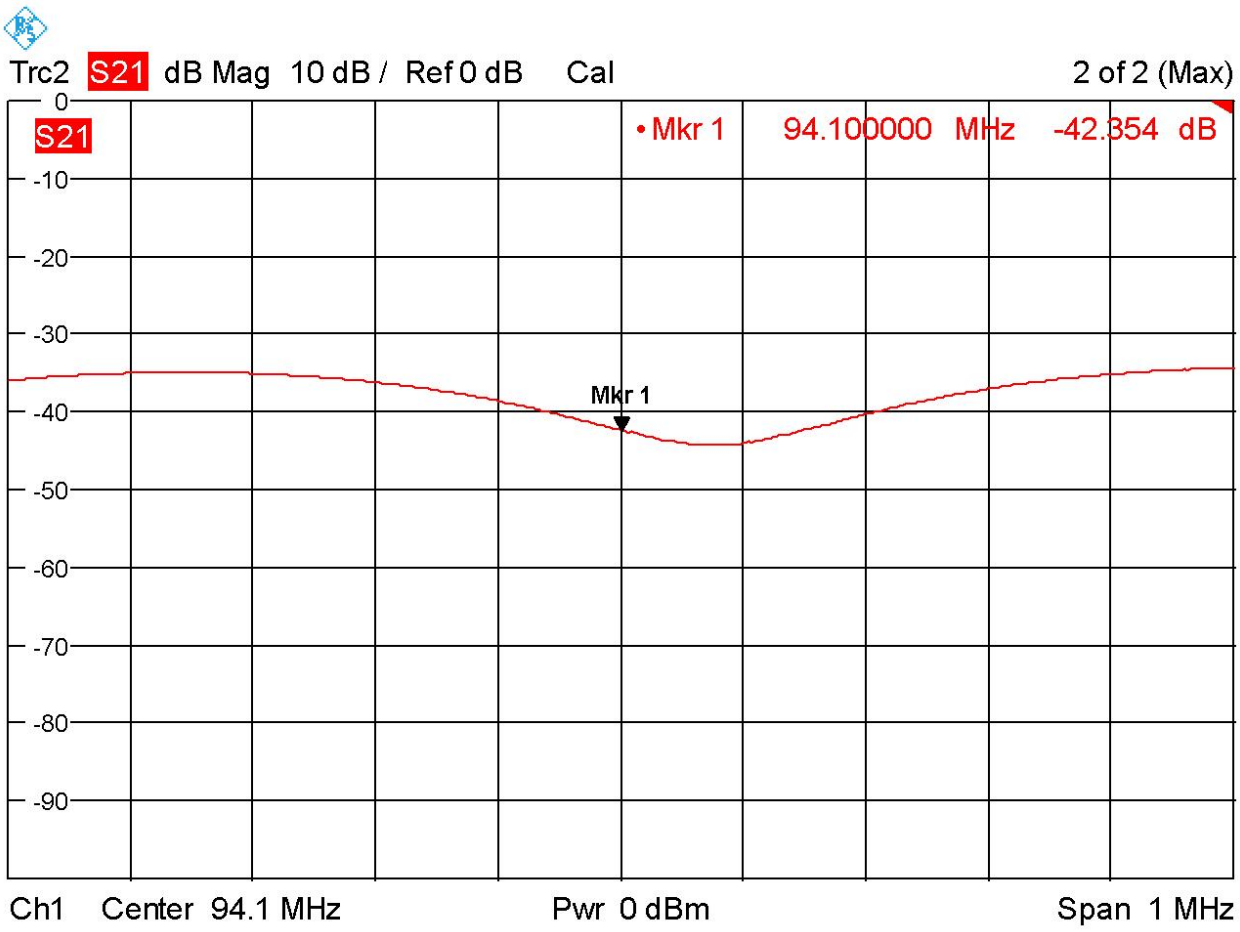
Date: 10.JUN.2010 20:12:08

Measurement 22: Final Filter to Antenna of 107.3 MHz.



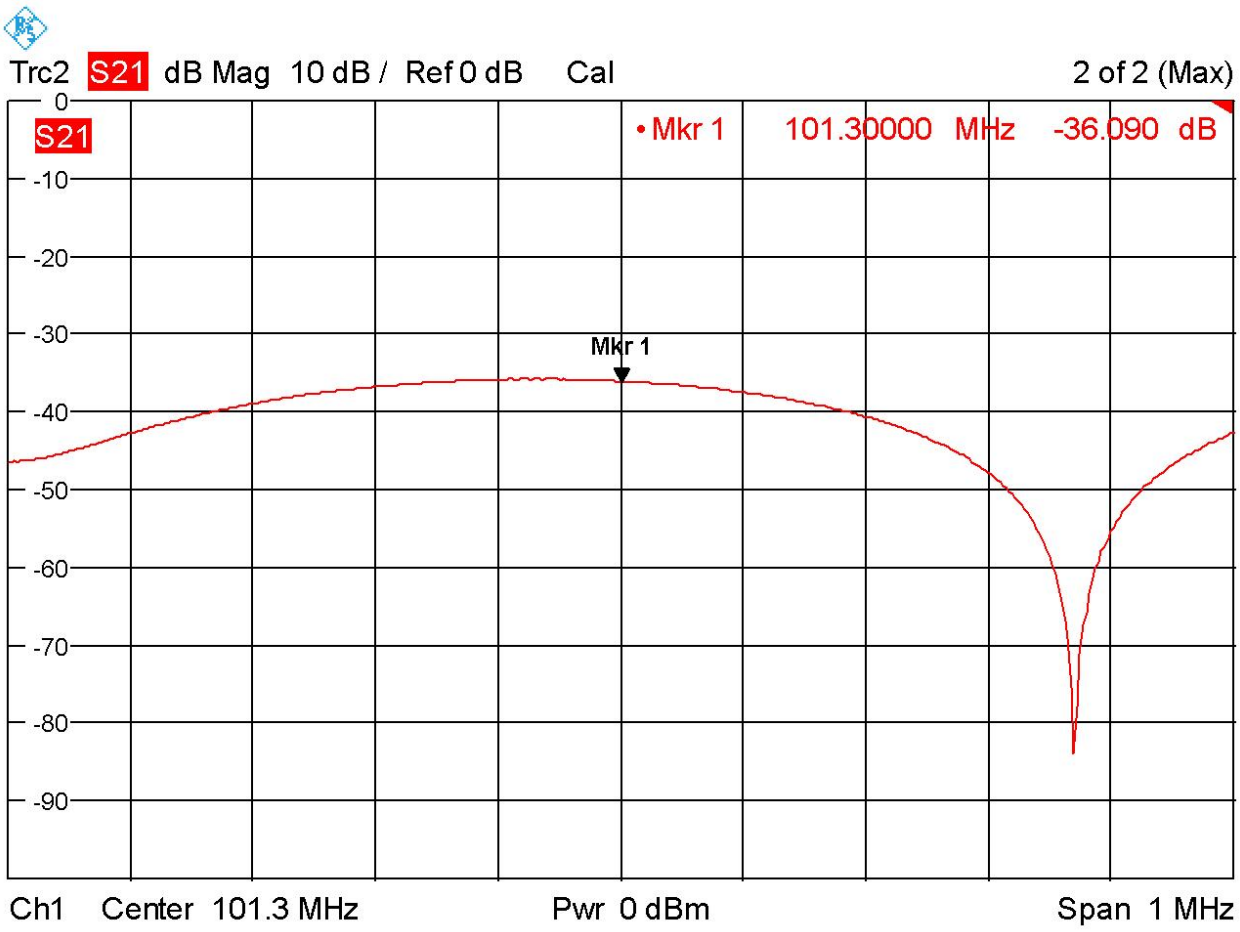
Date: 10.JUN.2010 20:05:12

Measurement 23: 1 MHz. Sweep of Feedline w/ 50 ohm Load @ 94.1 MHz.



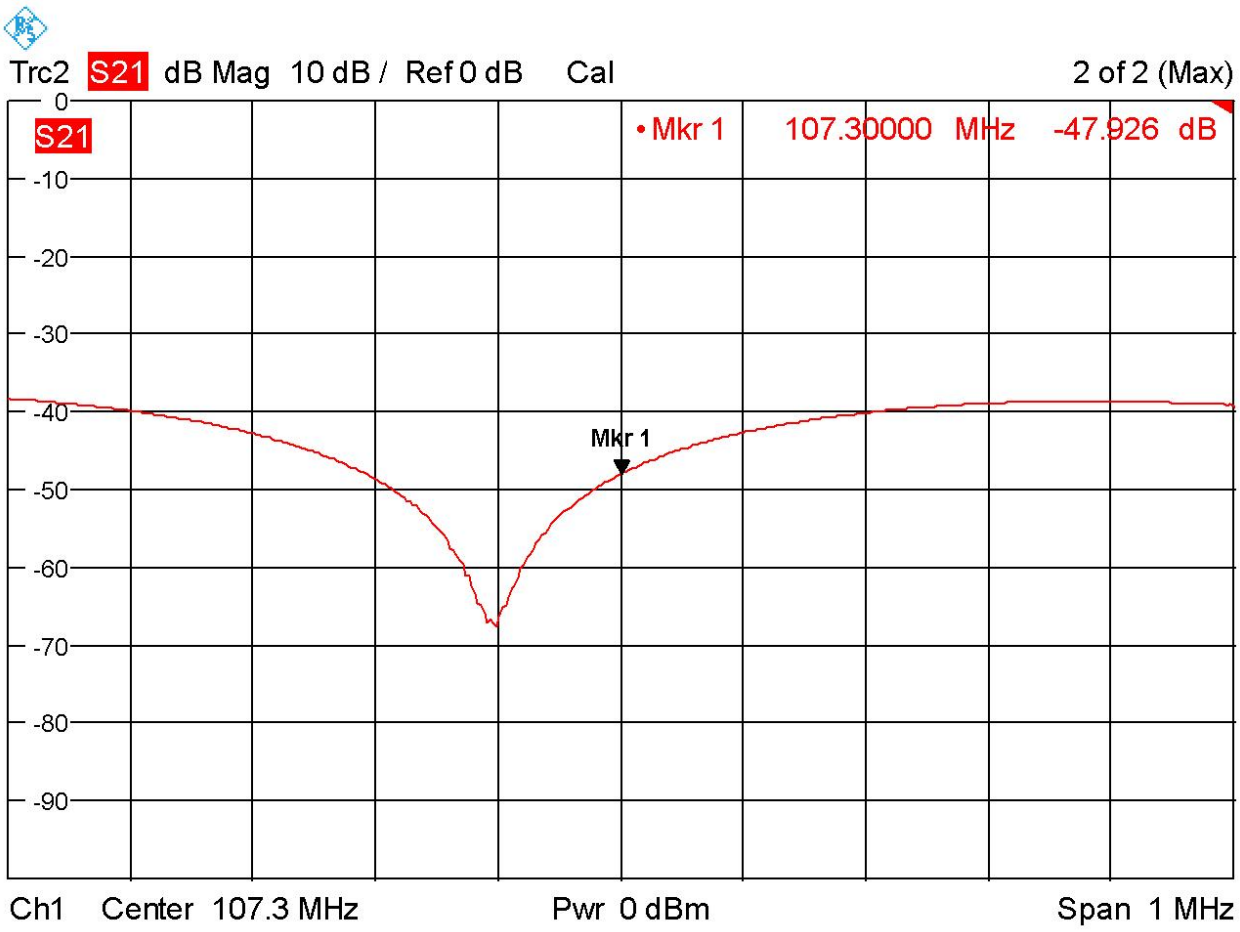
Date: 9.JUN.2010 15:56:06

Measurement 24: 1 MHz. Sweep of Feedline w/ 50 ohm Load @ 101.3 MHz.



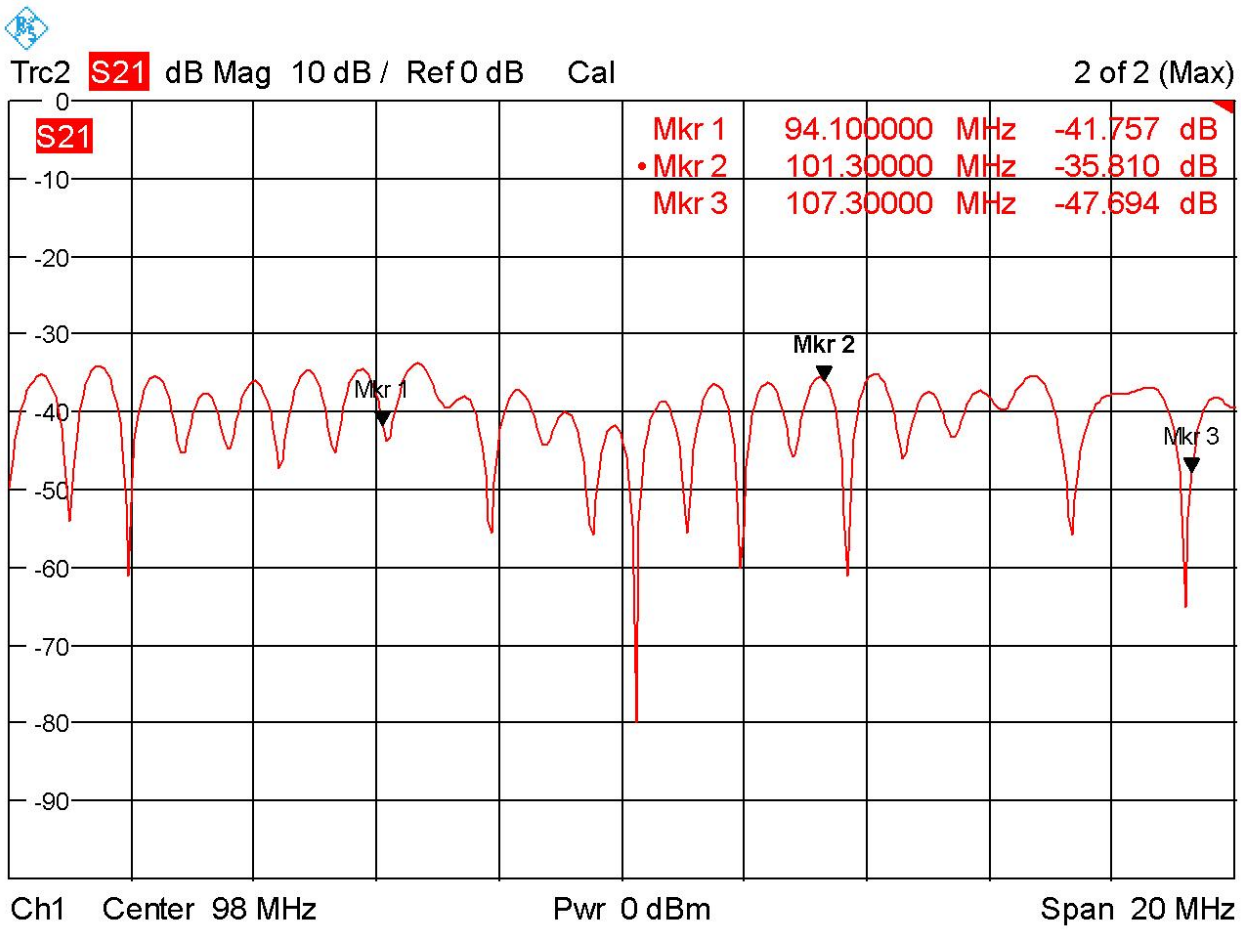
Date: 9.JUN.2010 15:57:29

Measurement 25: 1 MHz. Sweep of Feedline w/ 50 ohm Load @ 107.3 MHz.



Date: 9.JUN.2010 15:59:20

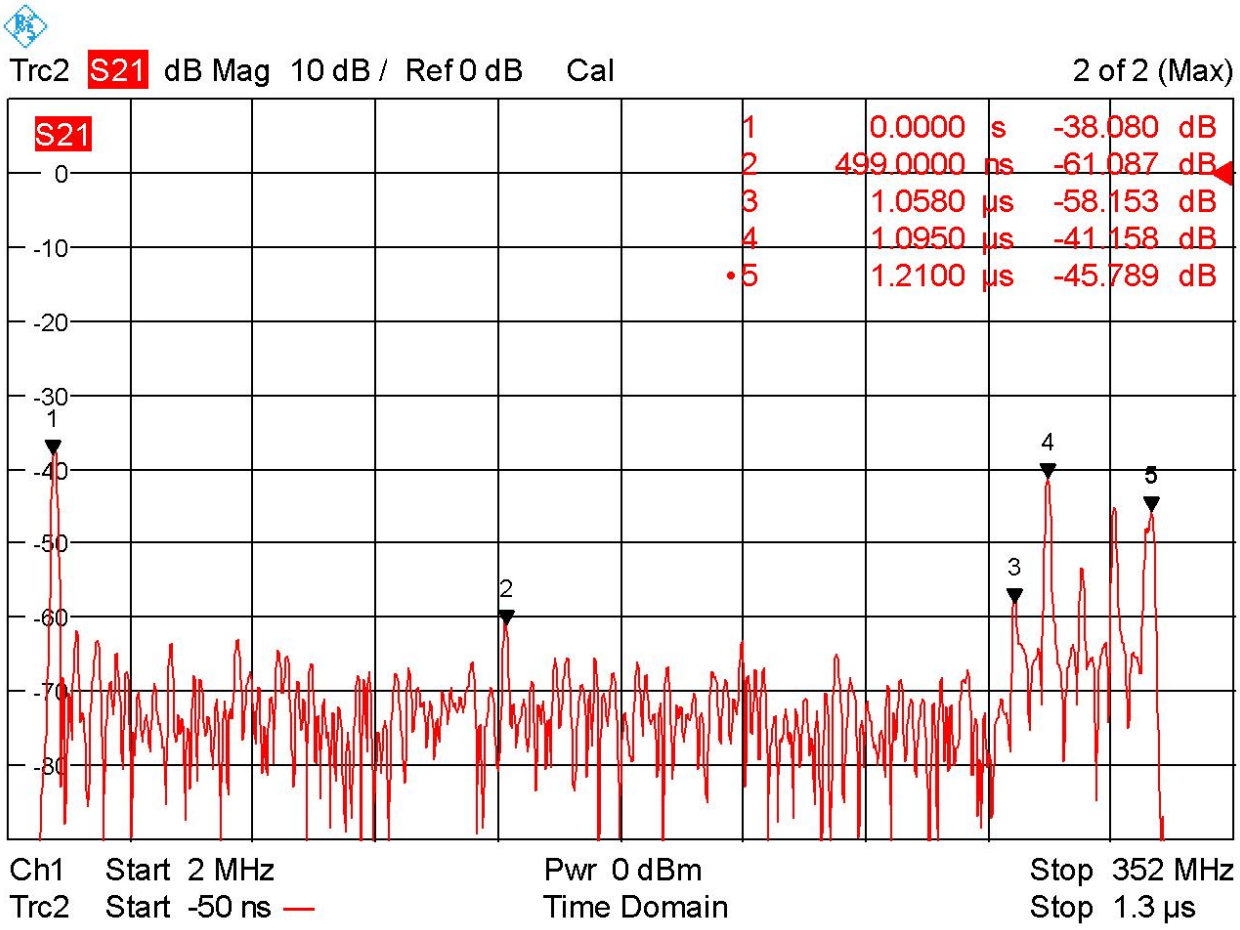
Measurement 26: 88 to 108 MHz. Sweep of Feedline with 50 ohm Load.



Date: 9.JUN.2010 15:53:12

Measurement 27: TDR of Feedline with 50 ohm Load 2 to 352 MHz. Span

Mkr#1 is 4" Test Adapter on 4" Flex Connector @ 0 Feet.
Mkr#2 is Ground Kit or Hoisting Grip @ Approx 225 Feet.
Mkr#3 is Transition fro 4' Flex to 3 1/8" Rigid @ Approx 478 Feet.
Mkr#4 is 3 1/8" Back to Back Elbow Complex @ Approx 495 Feet.
Mkr#5 is End of Transmission Line Run with 50 ohm Load @ Approx 554 Feet.



Date: 9.JUN.2010 16:04:02

Figure 4: TPO Calculations for 94.1 MHz.

25882

Station Call Sign	**KZCD**	
Frequency (MHz)	**94.1**	
	Analog	**Digital**
ERP (W)	**16000**	
Antenna Model	SHPX-10C6-SP	
Antenna Gain (multiplier)	4.992	
Antenna input power (W)	**3205**	**0**
Main Horizontal and Vertical Line	4" Heliax HJ11-50	
Line Length (feet)	479	
Line loss per hundred feet (dB/100')	-0.1110	0.0000
Line loss total (dB)	-0.5317	0.0000
Analog to Digital Isolation base of feedlines (dB)	0	
Analog to Digital Isolation at Antenna Input (dB)	0.00	
Analog to Digital Coupling Loss (dB)	0.0000	
Power Into Base of Vertical Line Run (W)	**3623**	
Coupled Power at Filter Output Ports (W)	0	0
Filter Insertion Loss (dB)	-0.138	0.000
Power Input to Filter (W)	**3740**	**0**
Circulator Insertion Loss (dB)	0	0
Digital Power Input to Circulator	NA	**0**
Rigid Feedline	3 1/8" MACXLine	
Line Length (feet)	75	
Line loss per hundred feet (dB/100')	-0.094	
Line loss total (dB)	-0.0705	0.000
TPO (W)	**3801**	**0**

Figure 5: TPO Calculations for 101.3 MHz.

25882

Station Call Sign	**KLAW**	
Frequency (MHz)	**101.3**	
	Analog	**Digital**
ERP (W)	**100000**	
Antenna Model	SHPX-10C6-SP	
Antenna Gain (multiplier)	5.652	
Antenna input power (W)	**17693**	**0**
Main Horizontal and Vertical Line	4" Heliax HJ11-50	
Line Length (feet)	479	
Line loss per hundred feet (dB/100')	-0.1150	0.0000
Line loss total (dB)	-0.5509	0.0000
Analog to Digital Isolation base of feedlines (dB)	0	
Analog to Digital Isolation at Antenna Input (dB)	0.00	
Analog to Digital Coupling Loss (dB)	0.0000	
Power Into Base of Vertical Line Run (W)	**20086**	
Coupled Power at Filter Output Ports (W)	0	0
Filter Insertion Loss (dB)	-0.140	0.000
Power Input to Filter (W)	**20744**	**0**
Circulator Insertion Loss (dB)	0	0
Digital Power Input to Circulator	NA	**0**
Rigid Feedline	3 1/8" MACXLine	
Line Length (feet)	75	
Line loss per hundred feet (dB/100')	-0.097	
Line loss total (dB)	-0.0728	0.000
TPO (W)	**21094**	**0**

Figure 6: TPO Calculations for 107.3 MHz.

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Station Call Sign	**KVRW**	
Frequency (MHz)	**107.3**	
	Analog	**Digital**
ERP (W)	**26000**	
Antenna Model	SHPX-10C6-SP	
Antenna Gain (multiplier)	4.723	
Antenna input power (W)	**5505**	**0**
Main Horizontal and Vertical Line	4" Heliax HJ11-50	
Line Length (feet)	479	
Line loss per hundred feet (dB/100')	-0.1190	0.0000
Line loss total (dB)	-0.5700	0.0000
Analog to Digital Isolation base of feedlines (dB)	0	
Analog to Digital Isolation at Antenna Input (dB)	0.00	
Analog to Digital Coupling Loss (dB)	0.0000	
Power Into Base of Vertical Line Run (W)	**6277**	
Coupled Power at Filter Output Ports (W)	0	0
Filter Insertion Loss (dB)	-0.157	0.000
Power Input to Filter (W)	**6508**	**0**
Circulator Insertion Loss (dB)	0	0
Digital Power Input to Circulator	NA	**0**
Rigid Feedline	3 1/8" MACXLine	
Line Length (feet)	75	
Line loss per hundred feet (dB/100')	-0.100	
Line loss total (dB)	-0.0750	0.000
TPO (W)	**6621**	**0**