

Field Service Report Feedline and Antenna System

Opportunity, WA.
ERI Antenna: DI-12A-HW
Feedline: Analog: Myat 3 1/8" Rigid
Digital: Myat 1 5/8" Rigid

KIXZ – 96.1 MHz.

ERI Project # 20223

November 4, 2012

Submitted By:

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INTRODUCTION

Listed below is a summary of the data and attached are the plots collected from the KIXZ transmission site in Spokane, WA. by Jeff Taylor November 4, 2012.

- The antenna is a DI-12A-HW
- Equipment used for antenna testing is a Rohde & Schwarz ZVL Network Analyzer high RF setup.
- All measurements of the Analog side of the antenna taken at the output of the Dielectric filter system on the 3 1/8" elbow.
- All measurements of the Digital side of the antenna taken at the 1 5/8" elbow above the Dielectric filter system.

The reason for this Field Service Trip was to optimize the isolation between analog and digital portions of the antenna adjusting the fine tuners above the hybrid on the tower.

After isolation was achieved the antenna was fine matched in both matching feeds of the antenna.

Isolation Analog to Digital and Digital to Analog final tuning VSWR's was 1.02:1 @ carrier and 1.02:1 +/- 100 KHz. of carrier.

Both feedlines were swept to the bottom of the 6 foot matching sections with VSWR's no worse than 1.02:1 @ 96.1 MHz.

The analog antenna was optimized with final VSWR of 1.01:1 at carrier and VSWR 1.03:1 +/- 100 KHz. of carrier with 1 1/8" slug @ 14 15/16" Bottom to Bottom of Slug.

The digital antenna was optimized with final VSWR of 1.05:1 at carrier and VSWR 1.10:1 +/- 100 KHz. of carrier with 3 1/8" slug @ 24 1/2" Bottom to Bottom of slug.

The Loss Budget table has been included in this report for the TPO calculation. An extra 15 feet of 1 5/8" rigid feedline will be included in the loss budget table for the line loss calculation that was not included in the TDR sweep of the digital feedline.

SUMMARY and RECOMMENDATIONS

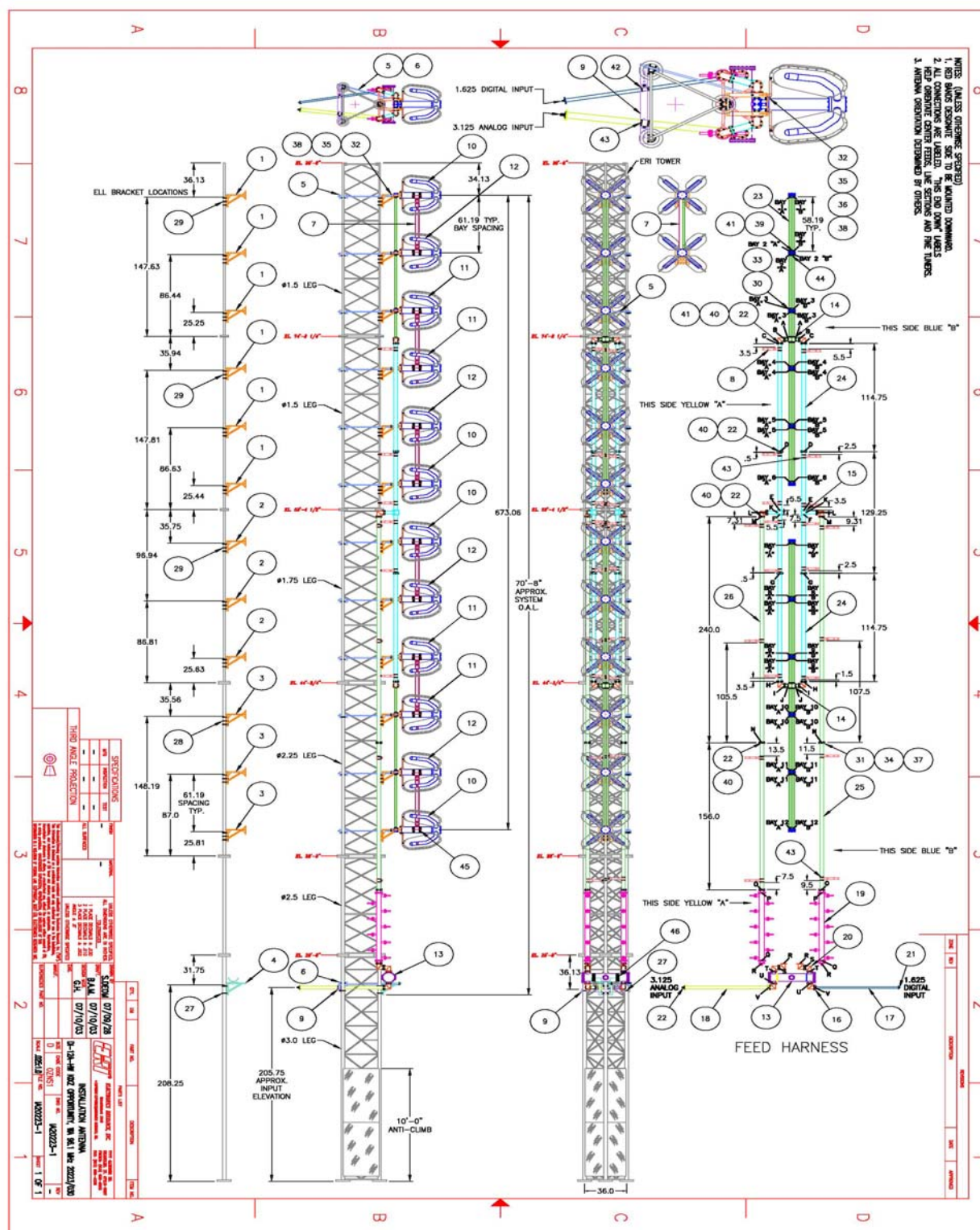
All measurements were taken by Jeff Taylor of Electronics Research Inc. November, 2012.

Sincerely

Jeff Taylor

DRAWINGS

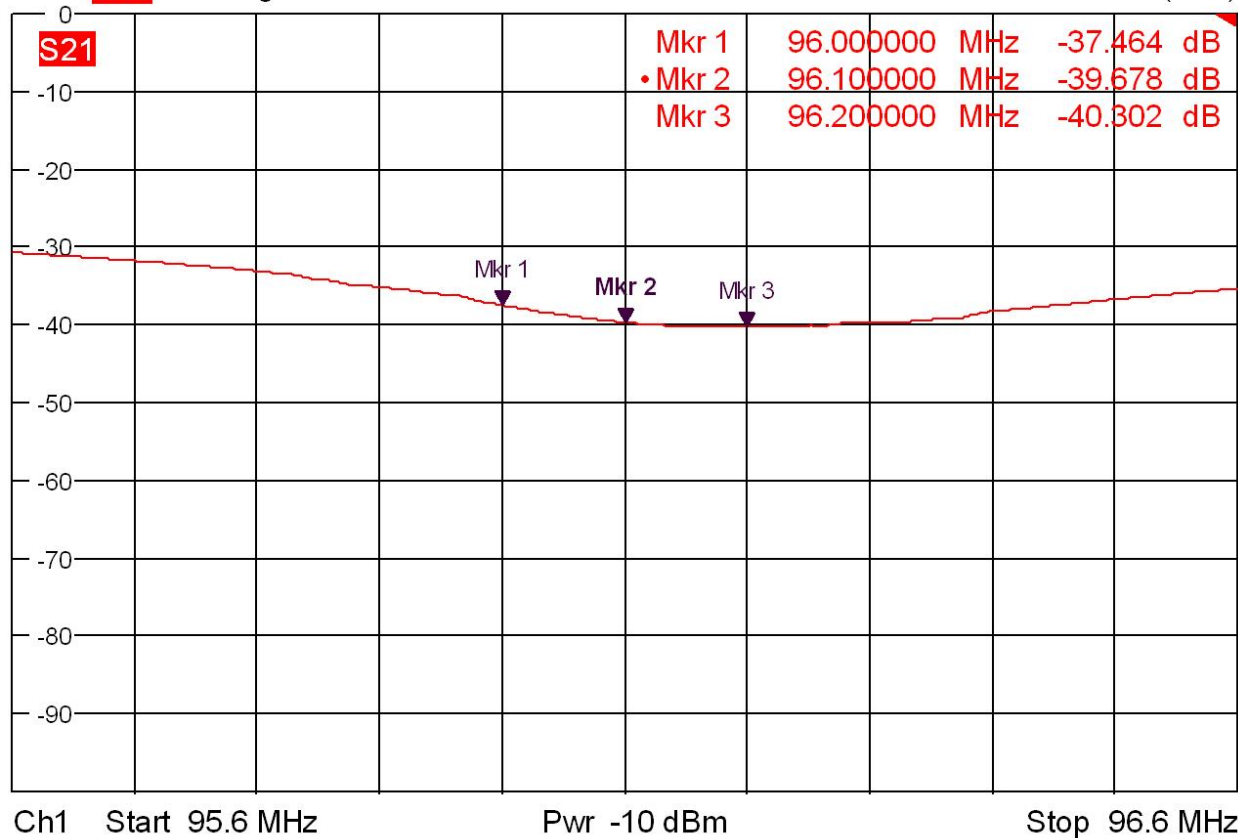
Figure 1: Antenna Drawing



Measurement 1: Isolation Analog to Digital & Digital to Analog of 96.1 MHz.



Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal Smo 2 of 2 (Max)

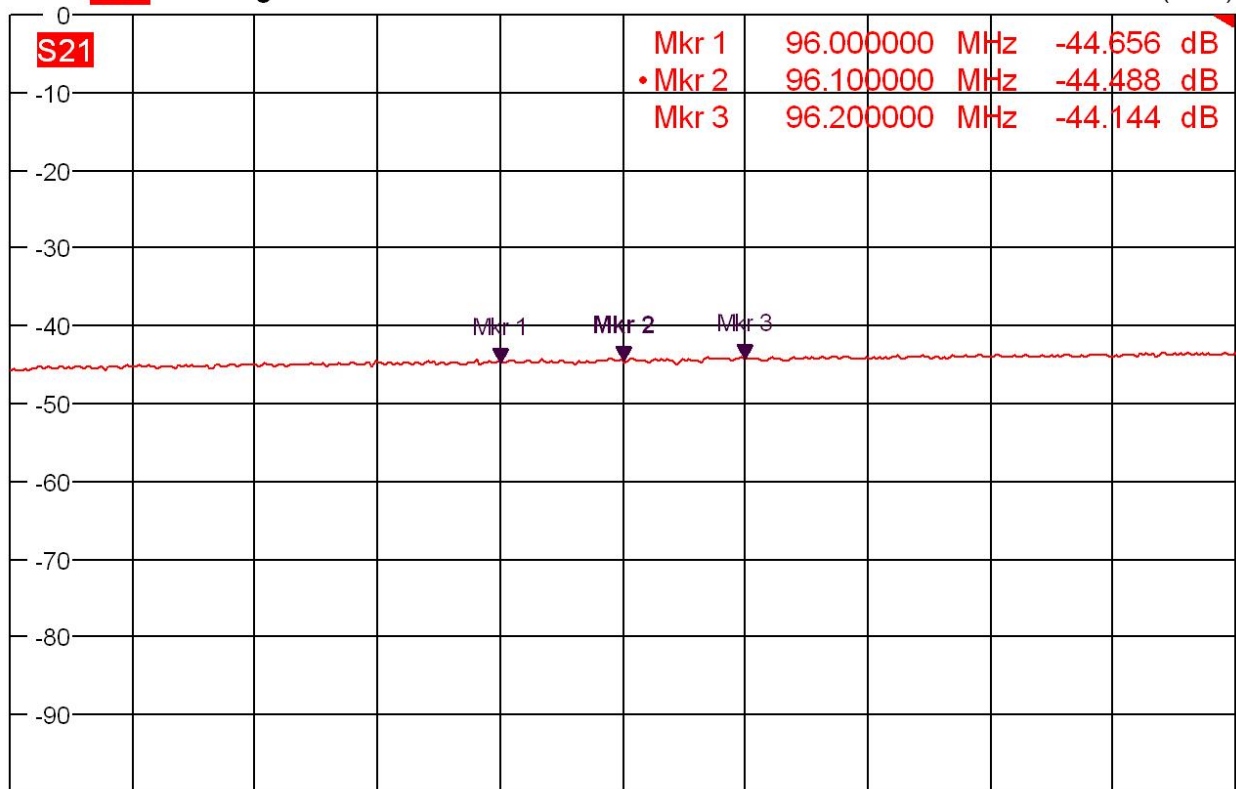


Date: 4.NOV.2012 00:19:08

Measurement 2: 1 MHz. Sweep of Analog Feedline with 50 ohm Load.



Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal 2 of 2 (Max)



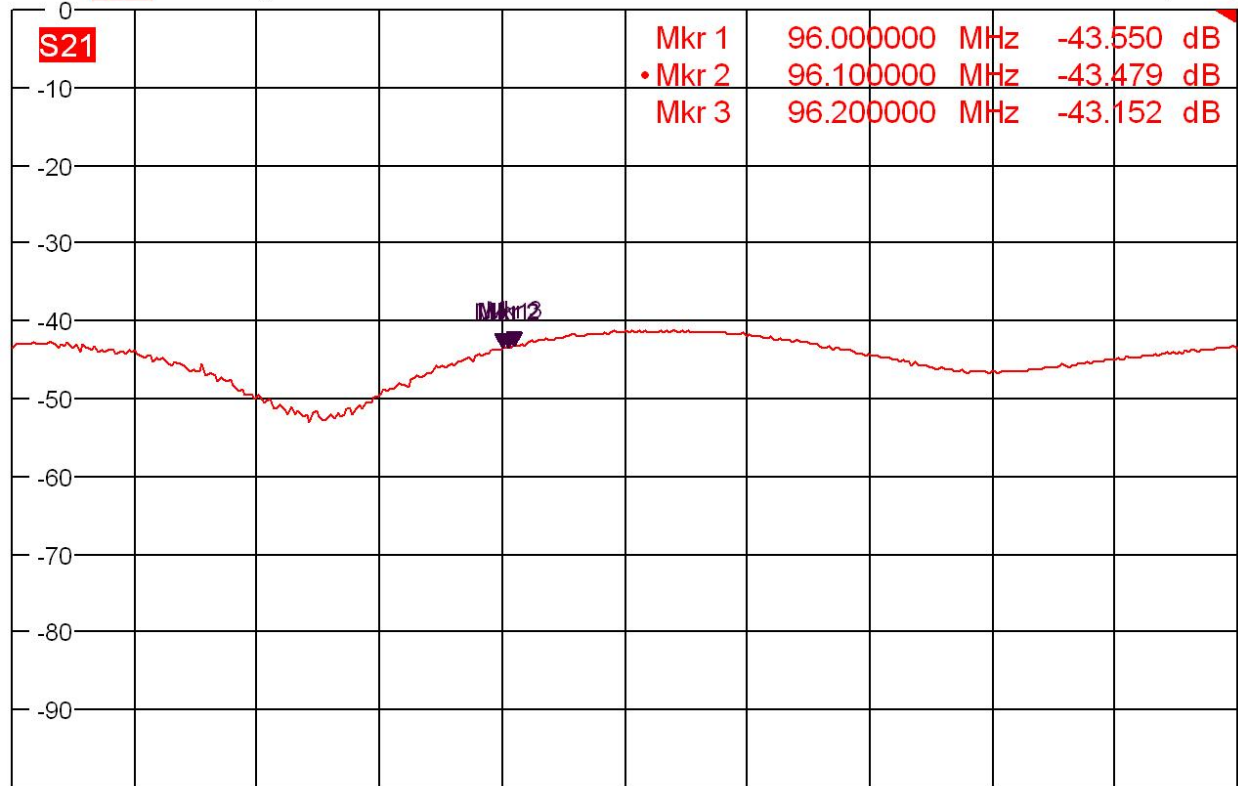
Ch1 Center 96.1 MHz Pwr -10 dBm Span 1 MHz

Date: 4.NOV.2012 13:18:28

Measurement 3: 88 to 108 MHz. Sweep of Analog Feedline with 50 ohm Load.



Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal 2 of 2 (Max)



Ch1 Center 98 MHz Pwr -10 dBm Span 20 MHz

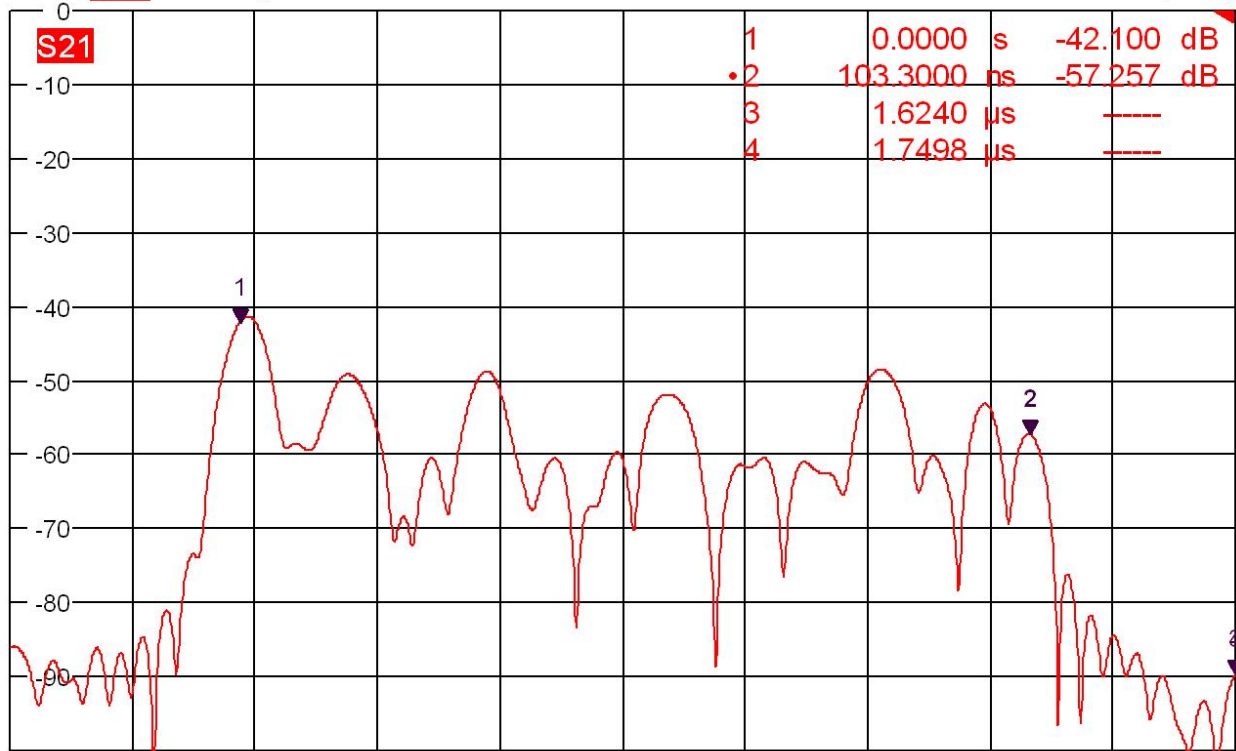
Date: 4.NOV.2012 13:20:22

Measurement 4: TDR of Analog Feedline with 50 ohm Load.

Mkr#1 is Test Adapter @ 0 Feet.
Mkr#2 is 50 ohm Load @ Approx 51 Feet.



Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal 2 of 2 (Max)



Ch1 Start 2 MHz Pwr -10 dBm Stop 352 MHz
Trc2 Start -30 ns — Time Domain Stop 130 ns

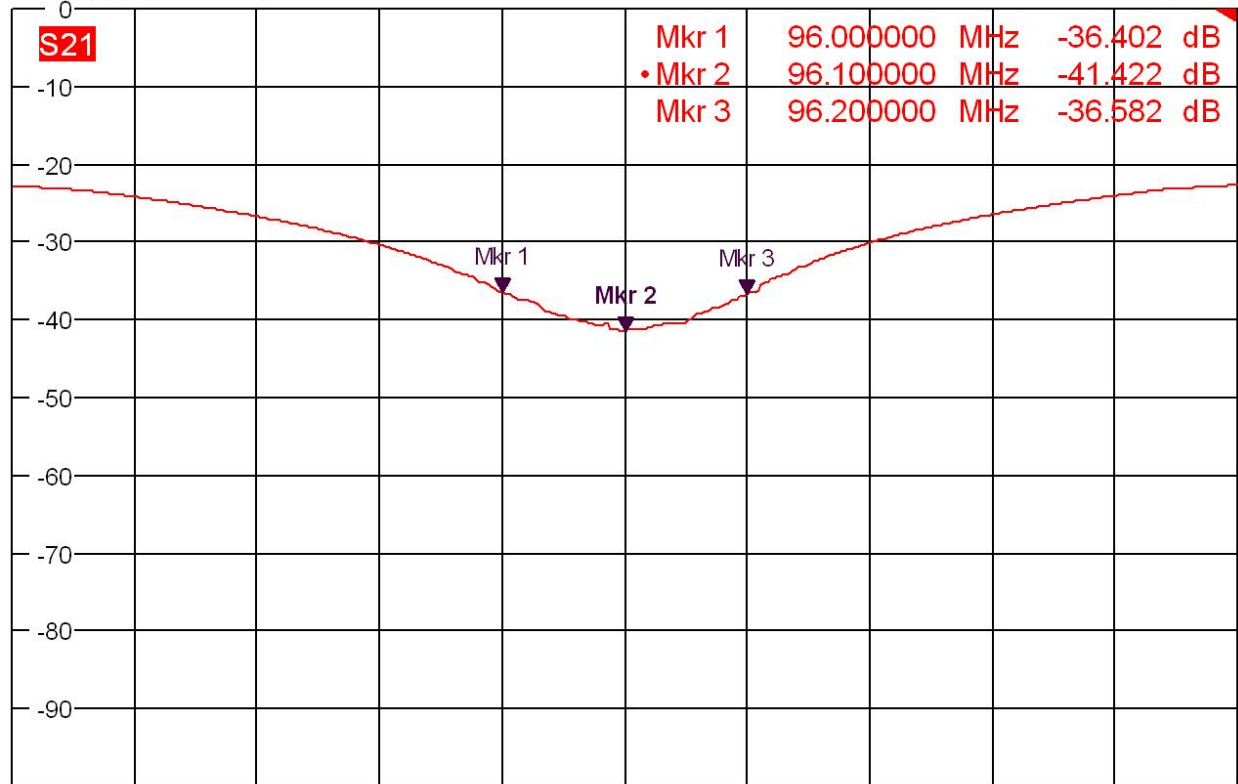
Date: 4.NOV.2012 13:22:49

Measurement 5: Final Match of Analog Antenna @ 96.1 MHz.

1 1/8" of 3 1/8" Slug @ 14 15/16" Bottom to Bottom of Slug.



Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal Smo 2 of 2 (Max)



Ch1 Center 96.1 MHz

Pwr -10 dBm

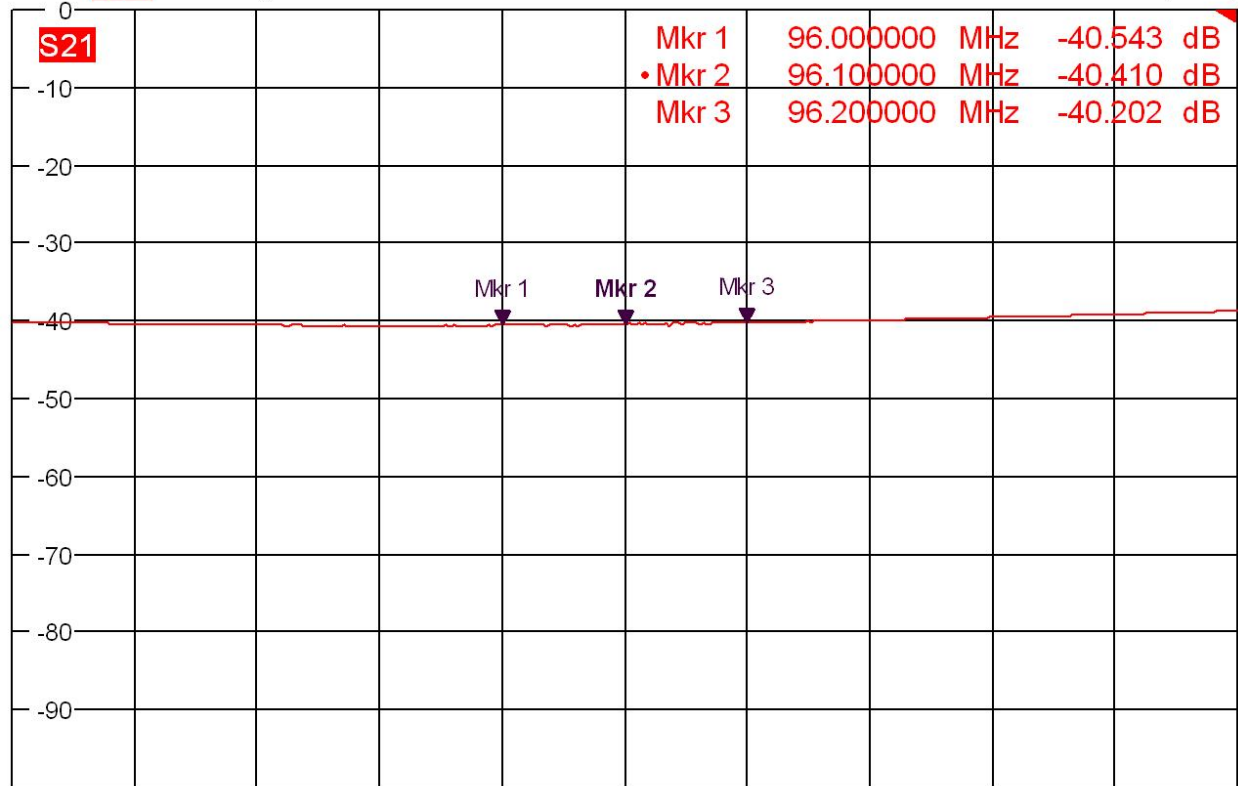
Span 1 MHz

Date: 4.NOV.2012 13:30:50

Measurement 6: 1 MHz. Sweep of Digital Feedline with 50 ohm Load.



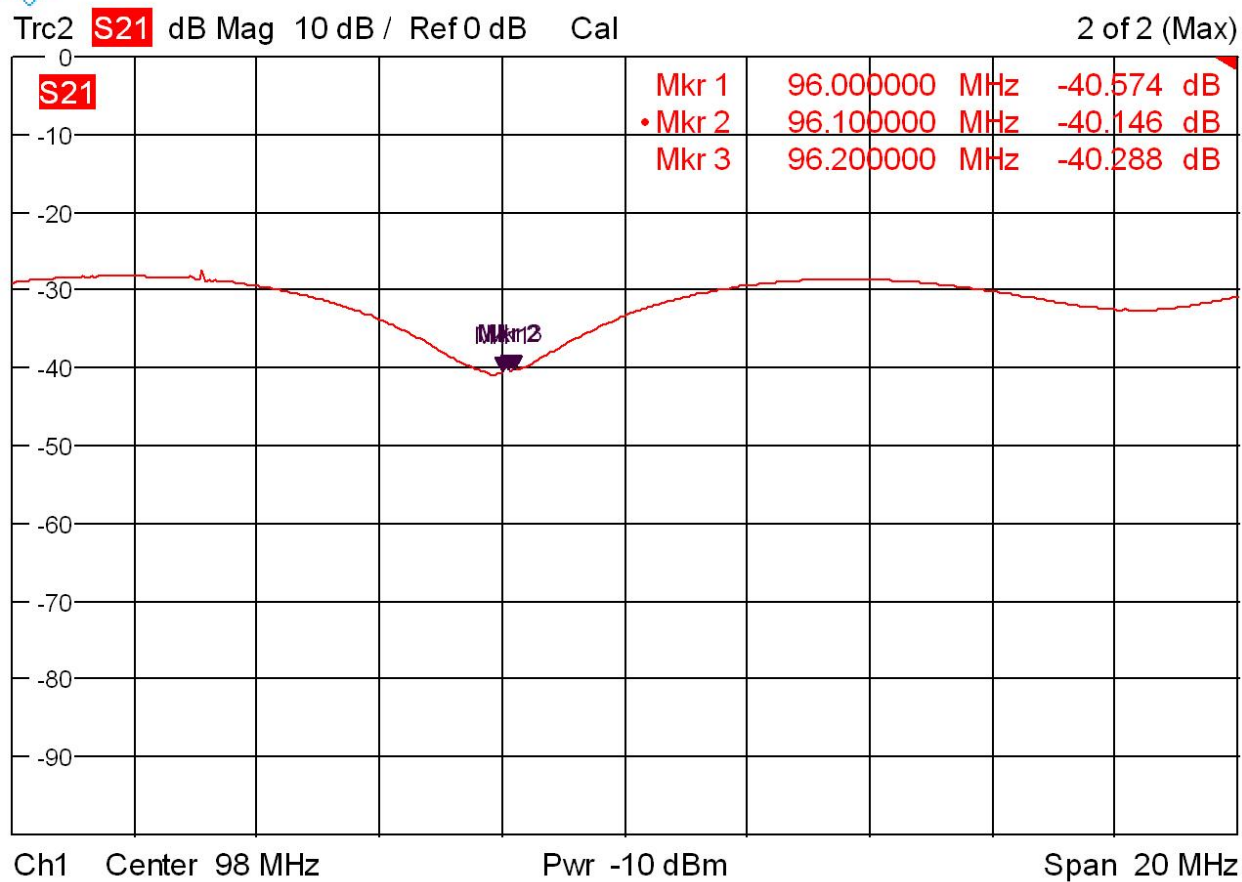
Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal 2 of 2 (Max)



Ch1 Center 96.1 MHz Pwr -10 dBm Span 1 MHz

Date: 4.NOV.2012 13:51:45

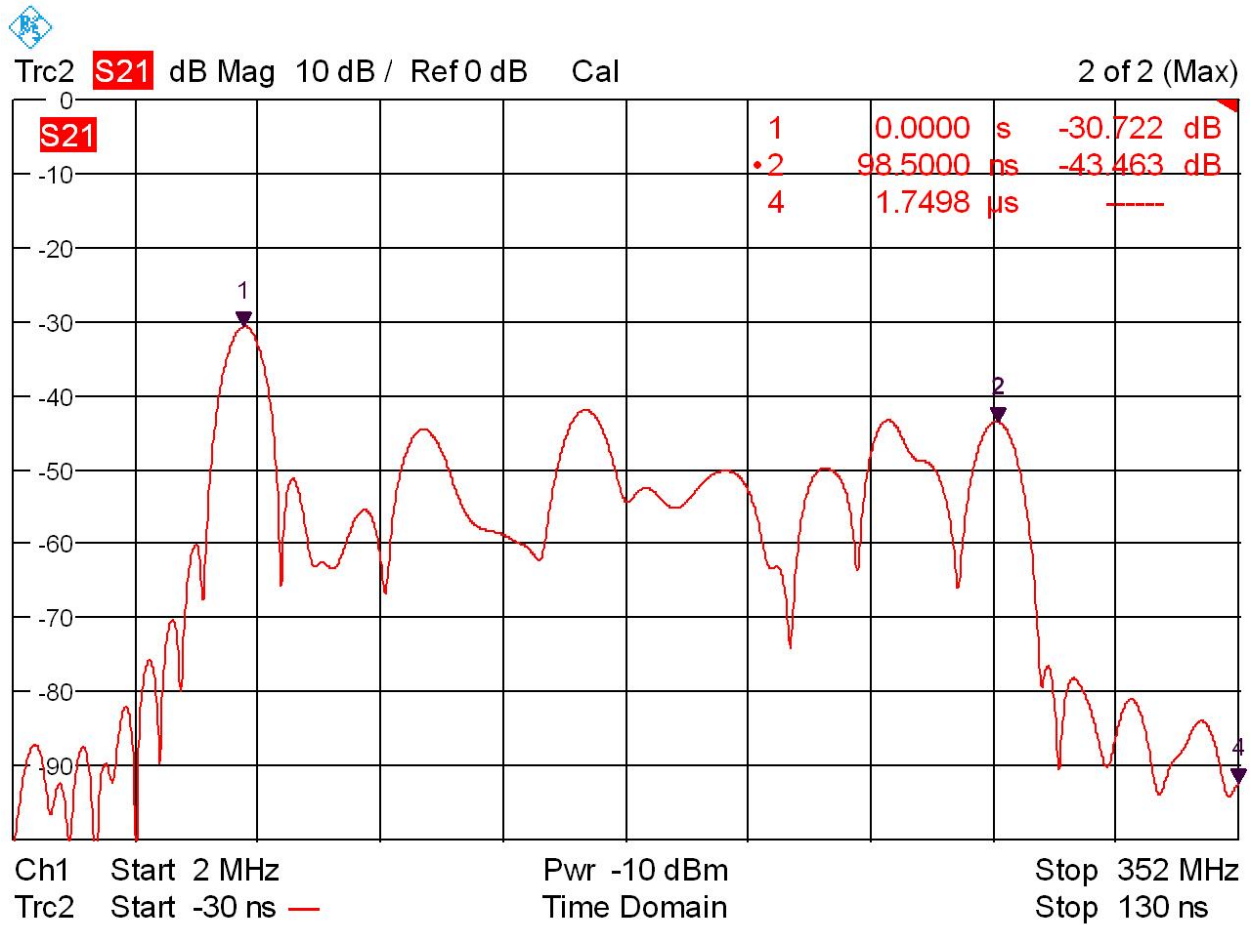
Measurement 7: 88 to 108 MHz. Sweep of Feedline with 50 ohm Load.



Date: 4.NOV.2012 13:53:51

Measurement 8: TDR of Digital Feedline with 50 ohm Load.

Mkr#1 is Test Adapter @ 0 Feet.
Mkr#2 is end of 50 ohm Load @ Approx 49 Feet.



Date: 4.NOV.2012 13:55:59

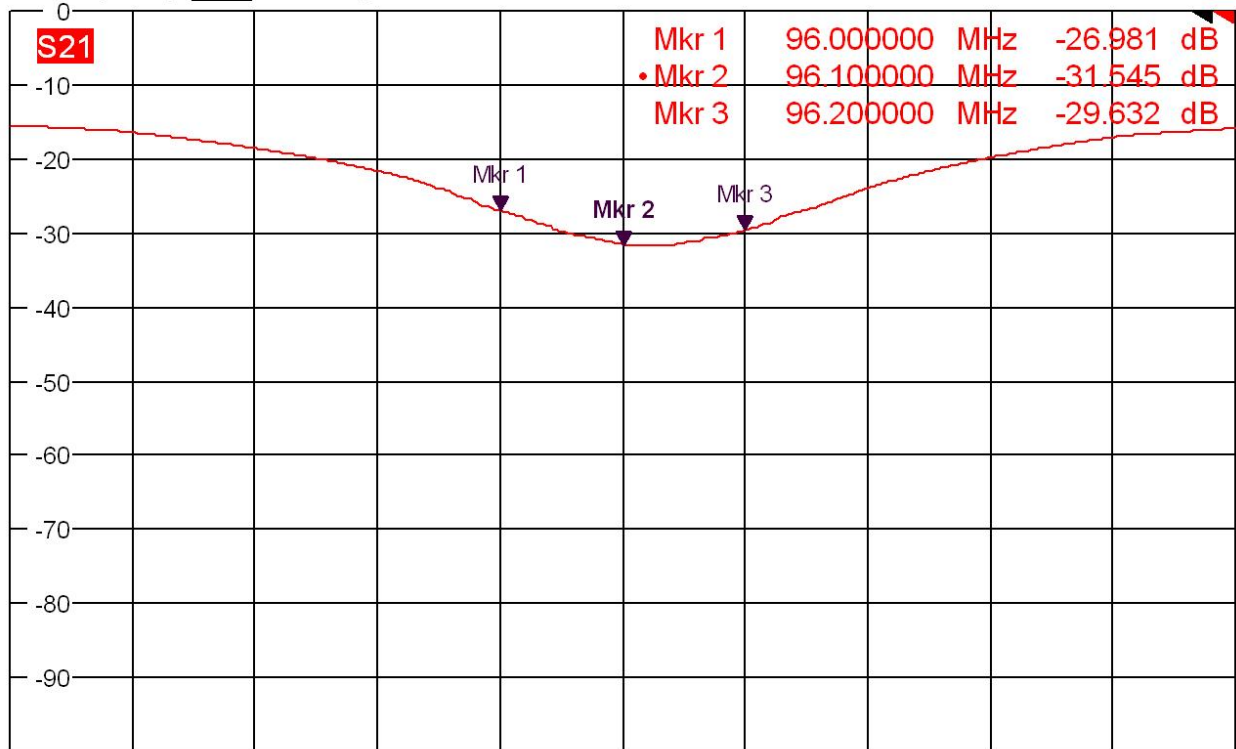
Measurement 1: Final Match of Digital Antenna @ 96.1 MHz.

3 1/8" of 1 5/8" Slug @ 24 1/2" Bottom to Bottom of Slug.



Trc2 **S21** dB Mag 10 dB / Ref 0 dB Cal Smo 2 of 2 (Max)

Mem3[Trc2] **S21** dB Mag 10 dB / Ref 0 dB Invisible



Ch1 Center 96.1 MHz

Pwr -10 dBm

Span 1 MHz

Date: 4.NOV.2012 15:55:42

Exhibit 1: Loss Budget Table @-14 dB.

System Gains and Losses for Dual Input Antenna Digital @ -14dB

Station Call Sign	KIXZ	
Frequency (MHz)	96.1	
	Analog	Digital
ERP (W)	60000	2400
Antenna Model	DI-12A-HW	
Antenna Gain (multiplier)	3.73	3.73
Antenna input power (W)	16086	643
Main Horizontal and Vertical Line	Myat 3 1/8 Rigid	Myat 1 5/8" Rigid
Line Length (feet)	51	65
Line loss per hundred feet (dB/100')	0.0950	0.1850
Line loss total (dB)	-0.0485	-0.1203
Analog to Digital Isolation base of feedlines (dB)	-39	
Analog to Digital Isolation at Antenna Input (dB)	-38.83	
Analog to Digital Coupling Loss (dB)	-0.0006	
Power Into Base of Vertical Line Run (W)	16269	662
Coupled Power at Filter Output Ports (W)	2	0
Filter Insertion Loss (dB)	-0.400	0.000
Power Input to Filter (W)	17838	662
Circulator Insertion Loss (dB)	0	-0.25
Digital Power Input to Circulator	NA	701
TX to Circulator Line	N/A	N/A
Line Length (feet)	0	0
Line loss per hundred feet (dB/100')	0.000	0.000
Line loss total (dB)	0.0000	0.000
TPO (W)	17838	701

Exhibit 2: Loss Budget @ -20 dB.

System Gains and Losses for Dual Input Antenna Digital @ -20dB

Station Call Sign	KIXZ	
Frequency (MHz)	96.1	
	Analog	Digital
ERP (W)	60000	600
Antenna Model	DI-12A-HW	
Antenna Gain (multiplier)	3.73	3.73
Antenna input power (W)	16086	161
Main Horizontal and Vertical Line	Myat 3 1/8 Rigid	Myat 1 5/8" Rigid
Line Length (feet)	51	65
Line loss per hundred feet (dB/100')	0.0950	0.1850
Line loss total (dB)	-0.0485	-0.1203
Analog to Digital Isolation base of feedlines (dB)	-39	
Analog to Digital Isolation at Antenna Input (dB)	-38.83	
Analog to Digital Coupling Loss (dB)	-0.0006	
Power Into Base of Vertical Line Run (W)	16269	165
Coupled Power at Filter Output Ports (W)	0	0
Filter Insertion Loss (dB)	-0.400	0.000
Power Input to Filter (W)	17838	165
Circulator Insertion Loss (dB)	0	-0.25
Digital Power Input to Circulator	NA	175
TX to Circulator Line	N/A	N/A
Line Length (feet)	0	0
Line loss per hundred feet (dB/100')	0.000	0.000
Line loss total (dB)	0.0000	0.000
TPO (W)	17838	175