TECHNICAL EXHIBIT
APPLICATION FOR LICENSE
AUXILIARY FACILITY
RADIO STATION KISS-FM
SAN ANTONIO, TEXAS
CH 258C 1 KW 433 M

Technical Statement

This Technical Exhibit, of which this statement is part, was prepared on behalf of radio station KISS-FM on Channel 258C at San Antonio, Texas. KISS-FM has authorization to construct a new auxiliary [stand-by] facility.[1] By this instant application, station licensure is requested.

Figure 1 is a tabulation of the RF transmission system.

Within the construction permit, a special condition was specified; requiring spurious emissions measurements to be performed with all the operating stations on this common antenna system and submitted with this herein application for license. This auxiliary system was installed specifically for IBOC (digital) use and cannot be readily employed for analog transmission. Therefore, the applicant is submitting within the Appendix the "Digital Intermodulation Report" prepared by the system manufacturer to fulfill this special condition. As demonstrated within the report, measurements were completed on the frequency response of the combiner system that indicates that "…

[1] See FCC Construction Permit BXPH-20060601AOB.

transmitters will not couple due to the great amount of isolation which prevents intermodulation products between transmitters connected to the common transmission lines and antenna." Therefore, the applicant hereby requests that the enclosed intermodulation report be accepted as fulfilling the spurious emissions measurement special condition.

Charles A. Cooper

June 13, 2006

du Treil, Lundin & Rackley, Inc.
201 Fletcher Avenue
Sarasota, Florida 34237
941.329.6000

Figure 1

TECHNICAL EXHIBIT
APPLICATION FOR LICENSE
AUXILIARY FACILITY
RADIO STATION KISS-FM
SAN ANTONIO, TEXAS
CH 258C 1 KW 433 M

KISS-FM RF Transmission System Specifications

Description	System
Transmitter Power Output (1.3 kW):	1.1 dBk
Combiner*:*	0.6 dB
Myat Transmission Line Loss (3-1/8″ Rigid) 1449 feet:	1.3 dB
Andrew Transmission Line Loss (7/8″ foam) 60 feet:	0.2 dB
ERI SHPX-4AC-HW-SP (1.3 Power Gain):	1.0 dB
Effective Radiated Power (1 kW):	0.0 dBk

APPENDIX

DIGITAL
INTERMODULATION
REPORT

ELECTRONICS RESEARCH, INC.

Digital Intermodulation Report

KISS, KSMG, KXTN San Antonio, Texas

1.1 Introduction

To augment their preexisting Analog operation in San Antonio,Texas, the radio station group elected to use **In Band On Channel** (IBOC) simultaneous Analog and Digital broadcasting. After considering all other practical approaches the group elected (for its ease of implementation) to install a separate, independent Antenna and Combiner for digital broadcasting. A new SHPX -4AC-HW-SP IBOC antenna was installed on the tower just 12 feet below the existing Analog ERI SHPX-10BC-SP antenna and a separate Digital combiner was constructed.

Having consolidated the station's IBOC and Analog broadcast operations, they now operate from a common tower site using new Digital combining equipment and Antenna provided by ERI. The focus of this report is on maintaining good transmitter-to-transmitter isolation and on reviewing the equipment required to insure FCC compliance. This report concludes with comments on the operating performance of the system while operating at licensed RF power levels.

1.2 Discussion On Intermod Products and Findings

This document presents findings from an investigation into intermodulation emissions associated with the operation of three IBOC transmitters simultaneously broadcasting from a common antenna. When two or more signals of different frequencies are "mixed" in a non-linear transmitter, a large number of new frequencies known as intermod products are generated. These intermod products have become the major source of interference within the radio spectrum in the past few years and are regulated by the FCC. The source of the "Intermod Products" usually is found in the front-end of the final amplifier of a transmitter that has been coupled with other transmitters. Electronics Research Inc. (ERI) provides a solution to the problem of transmitter coupling and intermodulation generation through the use of selectively tuned bandpass filters.

The following is a list of equipment that has been added to the San Antonio facility for IBOC broadcasting this material is in addition to the already in place Analog equipment.

1) IBOC Antenna Type : ERI SHPX-4AC-HW-SP
2) IBOC Transmission Feed Line Type : Rigid $3^{1}/_{8}$ Coax
3) IBOC Combiner Type : Irte Stare tuned to 99.5 MHz, 105.3 MHz, and 107.5 MHz.

1.3 Bandpass Filters, Used To Optimize Transmitter Isolation

Station combining methods have become highly dependent on band-pass cavity resonators. Band-pass filters have been used with great success in all types of station multiplexing applications involving closely spaced frequencies. The ability to meet FCC requirements for spurious emissions is inherent in a well thought out filter design that includes combining stations with ***Starpoint*** as well as ***T-Type*** combiners and ***Constant-Z*** combiner modules.

A bank of bandpass filters is comprised of individual high Q resonant cavities designed to pass a narrow band of frequencies with low insertion loss while at the same time attenuating frequencies outside of this narrow band. As frequencies become further removed from the resonant frequency of the cavity, they become more attenuated. Therefore, one can achieve greater selectivity with little increase in insertion loss by coupling several bandpass filter cavities together. The total insertion loss at resonance will be nearly the loss of one cavity times the number of cavities that are ganged together. However, the attenuation of resonance will be greater than the additive attenuation of a single cavity. Four cavities form a bank of filters that are used on each station. Measurements indicate that each filter bank has a pass-band loss of -0.6 dB @ Fo (though at a frequency shifted 0.8 MHz from Fo the filter provides approximately -21 dB attenuation). Note that 2.2 MHz. is the frequency separation between the three user frequencies of this combiner and the input port to input port isolation is no less that -65 dB.

A filter bank (series of four interconnected high Q cavities) form a pass-band with a frequency response that is broad and flat, making it ideal for passing an **IBOC** channel. The same filter bank, while providing for IBOC, must have a frequency response that will reduce interference from undesired frequencies that are above and below the IBOC bandpass frequency spectrum. Primarily, the steep-sloped rejection characteristic of the filters prevent intermodulation that might be caused by the interference of transmitters sharing the Combiner. Also, the filter-bank will isolate all out-of-band frequencies that may be generated from within the transmitter such as fundamental harmonics. Furthermore, the filter-bank will provide protection from stations that coexist within a congested, overloaded broadcast site.

1.4 Combiner, Theory of Operation

The combining hardware consists primarily of tuned, interconnected banks of Band-Pass filters. At the multiplexed output is placed a Directional Coupler that provided forward and reverse signal samples. The samples supply carrier reference levels, investigated emission levels and information pertaining to each station's Analog carrier that also broadcasts from the same antenna. Consequently, analysis (rationalization of measured levels using a spectrum analyzer) of all the collected data shows that while stations are operating at their licensed power levels, NO spurious emissions were present.

In the San Antonio system three transmitters with various frequencies operate into a single antenna. The ERI type SHPX-4AC-HW-SP antenna was selected due to its wide-band-with and ability to handle the combined power of three IBOC transmitters. The transmitters are connected to the common antenna by means of a Starpoint Combiner unit, all built with Band-Pass filters. The filters mainly provide for isolation between the individual IBOC transmitters while guiding the signals from transmitters to the antenna.

A Starpoint IBOC combiner can combine three IBOC transmitters and exhibits low passband losses and high transmitter isolation provided that a minimum spacing of 2 Mhz between transmitter frequencies is maintained. At the San Antonio broadcast facility frequencies F1, F2,and F3 are within this spacing and the Starpoint is therefor used in the following manner:

The signal from IBOC transmitter F1 is taken via the bandpass filter bank B1, which is tuned to frequency F1, to the Starpoint . The input impedance (seen from the Starpoint) of the bandpass filters B2 and B3, which are tuned to the frequencies F2 and F3 must now be transformed to the Starpoint via the line lengths L2 and L3 such that parallel resonance is obtained for the frequency F1and the power of transmitter 1 transfers fully to the antenna. The same consideration holds true for the connection of IBOC transmitter 2 and 3.

1.5 Conclusion

This report has attempted to convey that through the use of band-pass filters used in station combining schemes it is possible to reduce station coupling and eliminate spurious emission problems. By providing measured graphs and system schematics it can be seen how the high Q frequency response of banks of cavity resonators are used to isolate two or more transmitters of different frequencies sharing the same antenna.

The report's contention is that the measured frequency response (graphs) of Band-Pass Filters used provides, in itself, mathematical proof that a given number of transmitters will not couple due to the great amount of isolation which prevents intermodulation products between transmitters connected to common transmission lines and antenna.

Listed below is a summary of the data and attached are the plots collected of the antenna and installation of the Combiner System April, 2006.

FILTER MEASUREMENTS
99.5 MHz. Input Port

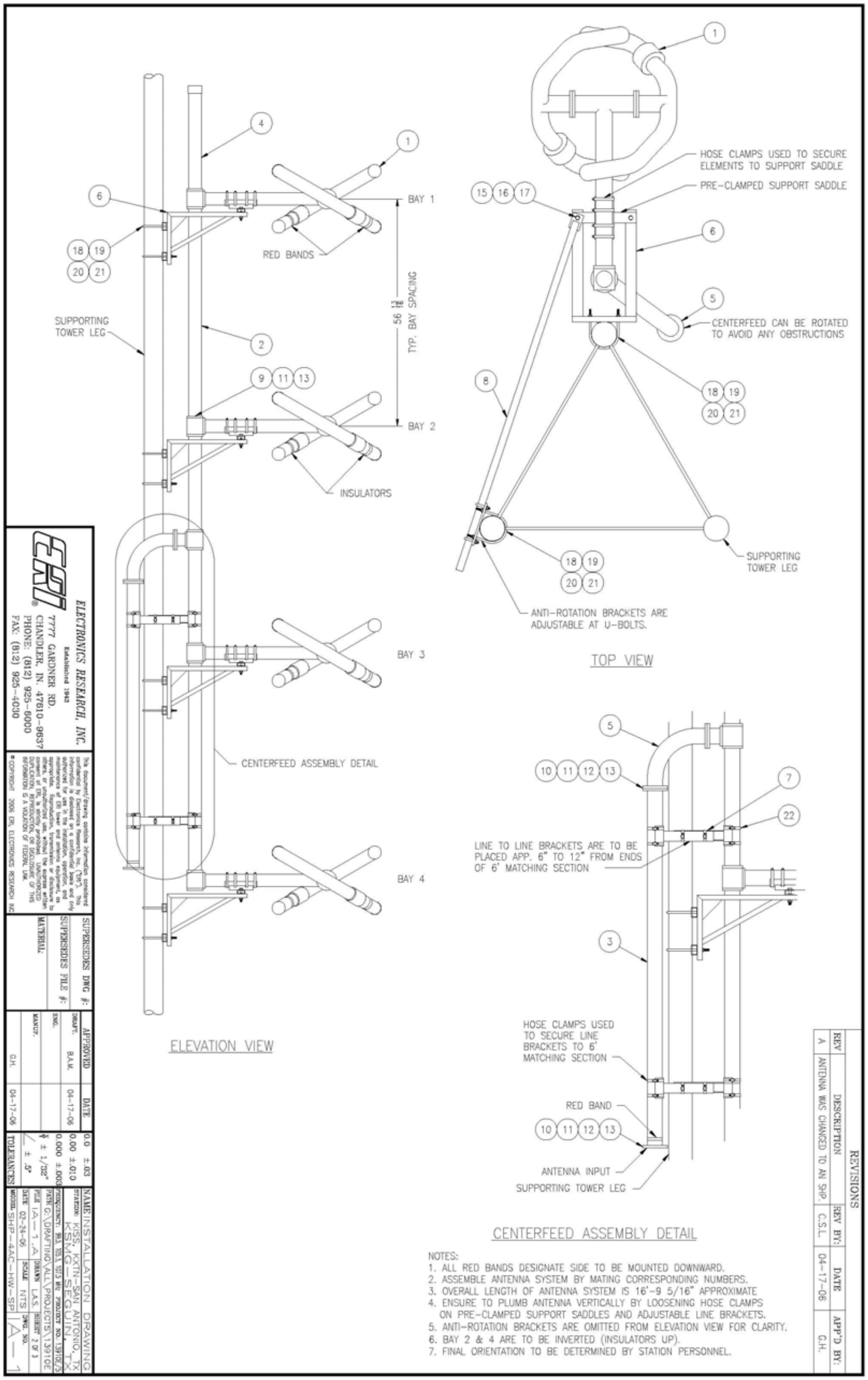
FILTER MEASUREMENTS
105.3 MHz. Input Port

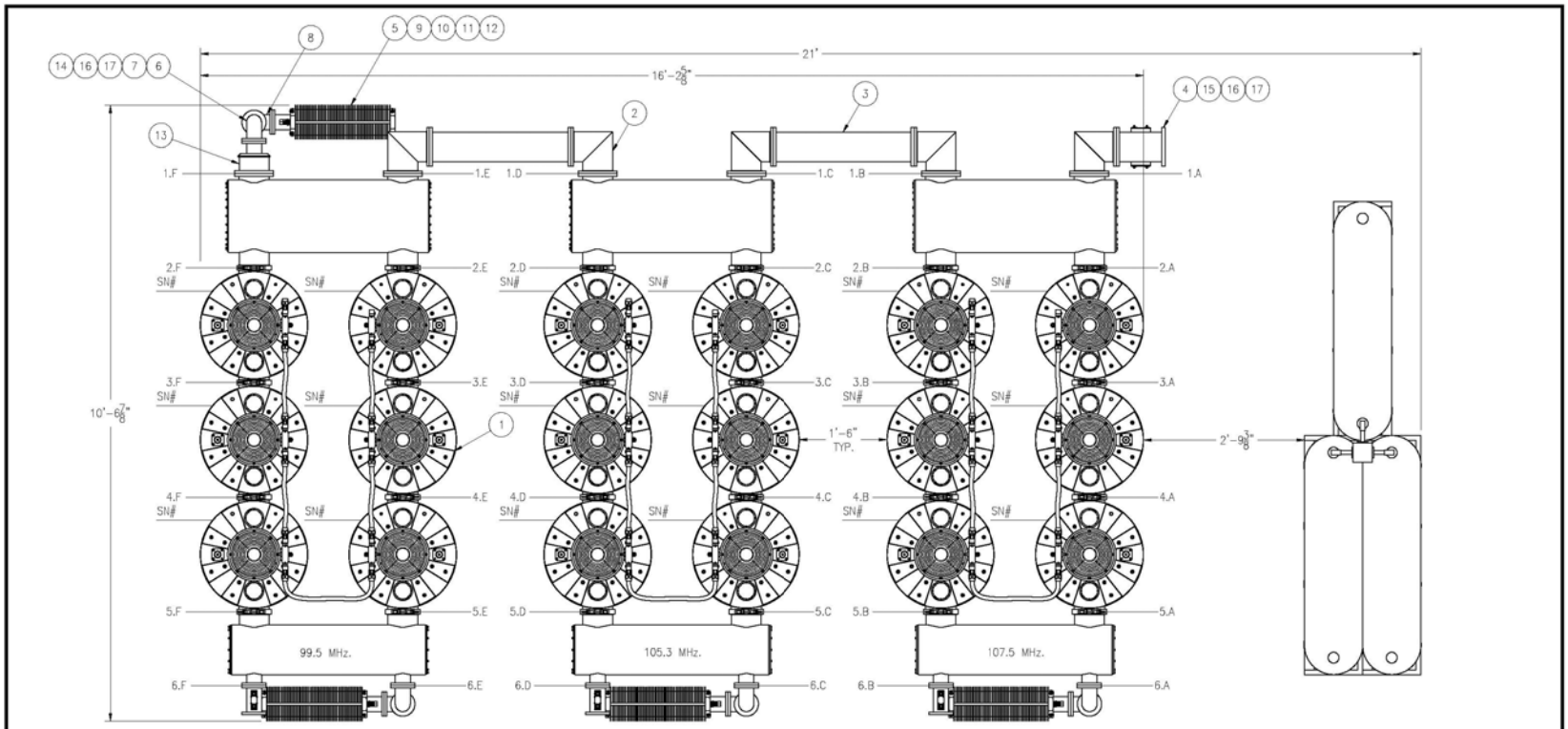
FILTER MEASUREMENTS
107.5 MHz. Input Port

OCCUPIED BANDWIDTH MEASUREMENTS

All measurements were taken by Jon Adams and Jeff Taylor of Electronics Research Inc. April, 2006
Sincerely _____

Jeff Taylor


BAY 1
BAY 2
BAY 3
BAY 4
RED BANDS
INSULATORS
SUPPORTING TOWER LEG
TYP. BAY SPACING
CENTERFEED ASSEMBLY DETAIL
ELEVATION VIEW
HOSE CLAMPS USED TO SECURE ELEMENTS TO SUPPORT SADDLE
PRE-CLAMPED SUPPORT SADDLE
CENTERFEED CAN BE ROTATED TO AVOID ANY OBSTRUCTIONS
ANTI-ROTATION BRACKETS ARE ADJUSTABLE AT U-BOLTS.
TOP VIEW
LINE TO LINE BRACKETS ARE TO BE PLACED APP. 6" TO 12" FROM ENDS OF 6' MATCHING SECTION
HOSE CLAMPS USED TO SECURE LINE BRACKETS TO 6' MATCHING SECTION
RED BAND
ANTENNA INPUT
CENTERFEED ASSEMBLY DETAIL
NOTES:
1. ALL RED BANDS DESIGNATE SIDE TO BE MOUNTED DOWNWARD.
2. ASSEMBLE ANTENNA SYSTEM BY MATING CORRESPONDING NUMBERS.
3. OVERALL LENGTH OF ANTENNA SYSTEM IS 16'-9 5/16" APPROXIMATE
4. ENSURE TO PLUMB ANTENNA VERTICALLY BY LOOSENING HOSE CLAMPS ON PRE-CLAMPED SUPPORT SADDLES AND ADJUSTABLE LINE BRACKETS.
5. ANTI-ROTATION BRACKETS ARE OMITTED FROM ELEVATION VIEW FOR CLARITY.
6. BAY 2 & 4 ARE TO BE INVERTED (INSULATORS UP).
7. FINAL ORIENTATION TO BE DETERMINED BY STATION PERSONNEL.
REVISIONS
REV
DESCRIPTION
REV BY:
DATE
APP'D BY:
A
ANTENNA WAS CHANGED TO AN SHP.
C.S.L.
04-17-06
G.H.
ELECTRONICS RESEARCH, INC.
7777 GARDNER RD.
CHANDLER, IN. 47610-9637
PHONE: (812) 925-6000
FAX: (812) 925-4030
SUPERSEDES DWG #:
SUPERSEDES FILE #:
MATERIAL:
APPROVED
DATE
B.A.M.
04-17-06
G.H.
04-17-06
TOLERANCES
NAME: INSTALLATION DRAWING
MODEL SHP-4AC-HW-SP



ITEM NO.	PART NO.	DESCRIPTION	QTY
11	WL05SS	5/16" LOCKWASHER SPLIT TYPE	4
10	WF05SS	5/16" FLATWASHER	8
9	FI0223	DUMPLOAD LEGS	4
8	CE3021	3-1/8" FLANGED TO UNFLANGED ELBOW	1
7	CL3034	3-1/8" FLGED TO UNFLGED LN SEC	1
6	CE3022	3-1/8" FLANGED TO FLANGED ELBOW	1
5	LD02500	2.5 KW DUMP LOAD	1
4	DC6005	6 1/8 DUAL DIRECTIONAL COUPLER	1
3	CL6038	COMBINER MODULE ADJOINING SECTION	2
2	ACX650B-10SE	6 1/8 MITERED ELBOW	5
1	IM-1	COMBINER MODULE ASSEMBLY	3
17	WL06SS	3/8" LOCKWASHER SPLIT TYPE	18
16	NU0616	3/8" HEX NUT	18
15	SC0616H0175	3/8"-16 X 1-3/4" LONG HEX HEAD BOLT	12
14	SC0616H0150	3/8"-16 X 1-1/2" LONG HEX HEAD BOLT	6
13	CR0015	6 1/8 TO 3 1/8 EIA REDUCER	1
12	NU0518	5/16"-18 HEX NUT	8

BILL OF MATERIAL

ELECTRONICS RESEARCH, INC.
Established 1943
7777 GARDNER RD.
CHANDLER, IN. 47610-9637
PHONE: (812) 925-6000
FAX: (812) 925-4030

SUPERSEDES DWG #:
SUPERSEDES FILE #:
MATERIAL:

	APPROVED	DATE
DRAFT.		
ENG.		
MANUF.		

TOLERANCES: 0.0 ±.03; 0.00 ±.010; 0.000 ±.003; ∅ ± 1/32"; ∠ ± .5°

NAME: COMBINER SYSTEM LAYOUT
STATION: SAN ANTONIO, TX
FREQ: 99.5, 105.3 & 107.5 MHz. PROJECT NO.: 16464/2
PATH: G:\DRAFTING\ALL\PROJECTS\13910E\3
FILE: IM-2 DRAWN: BAM SHEET: 1 OF 1
DATE: 2/1/06 SCALE: FULL DWG NO.
MODEL: MA973F06-000-035 IM-2

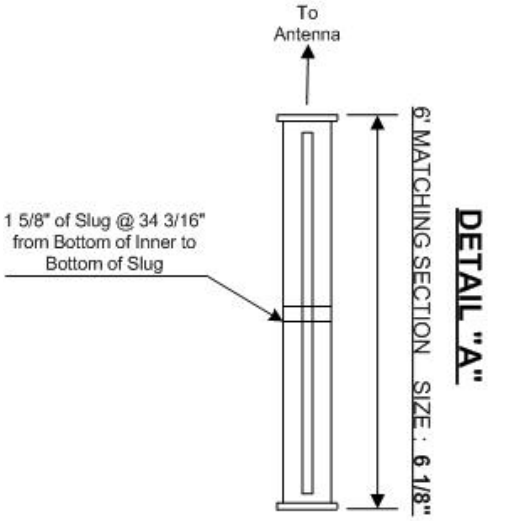
City	Project #	Date				
San Antonio, TX	13910E	3/28/2006				
Freq.	**MHz.**	**99.5**	**105.3**	**107.5**		
ERP	Watts	1,000	1,000	1,000		
Antenna Gain		1.261	1.326	1.347		
Antenna Input	Watts	793	754	742		
Losses						
Feed Line Length	Feet	1449	1449	1449		
Loss / 100'	dB	0.092	0.095	0.096		
Outside Line Loss		1.3331	1.3766	1.3910		
Inside Line Length	Feet	60	29	75		
Loss / 100'	dB	0.376	0.365	0.096		
Inside Line Loss	dB	0.2256	0.1059	0.0720		
Circulators	.2 Each	0	0	0		
TOTAL LINE LOSS	dB	1.559	1.483	1.463		
COMBINER LOSS	dB	0.638	0.622	0.587		
TOTAL LOSS	dB	2.197	2.105	2.050		
	dBK	31.1897319	30.8787135	30.7540391		
TPO		**1,315**	**1,224**	**1,190**		

Digital Antenna

Tuning Slug Location for San Antonio, TX.

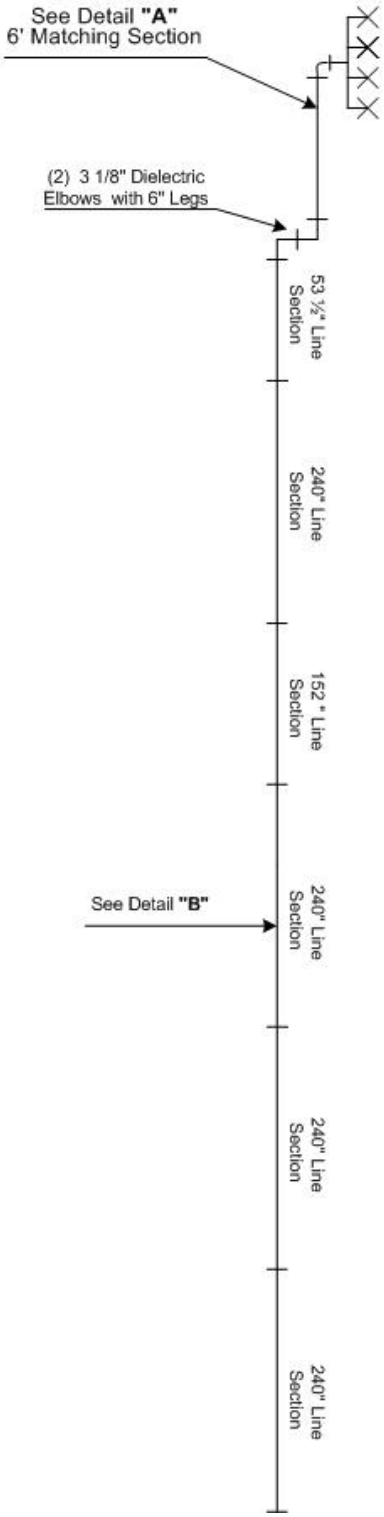
KISS - 99.5 MHz. / KSMG - 105.3 MHz.
KXTN - 107.5 MHz.

SHP-4AC-HW-SP



DETAIL "A"

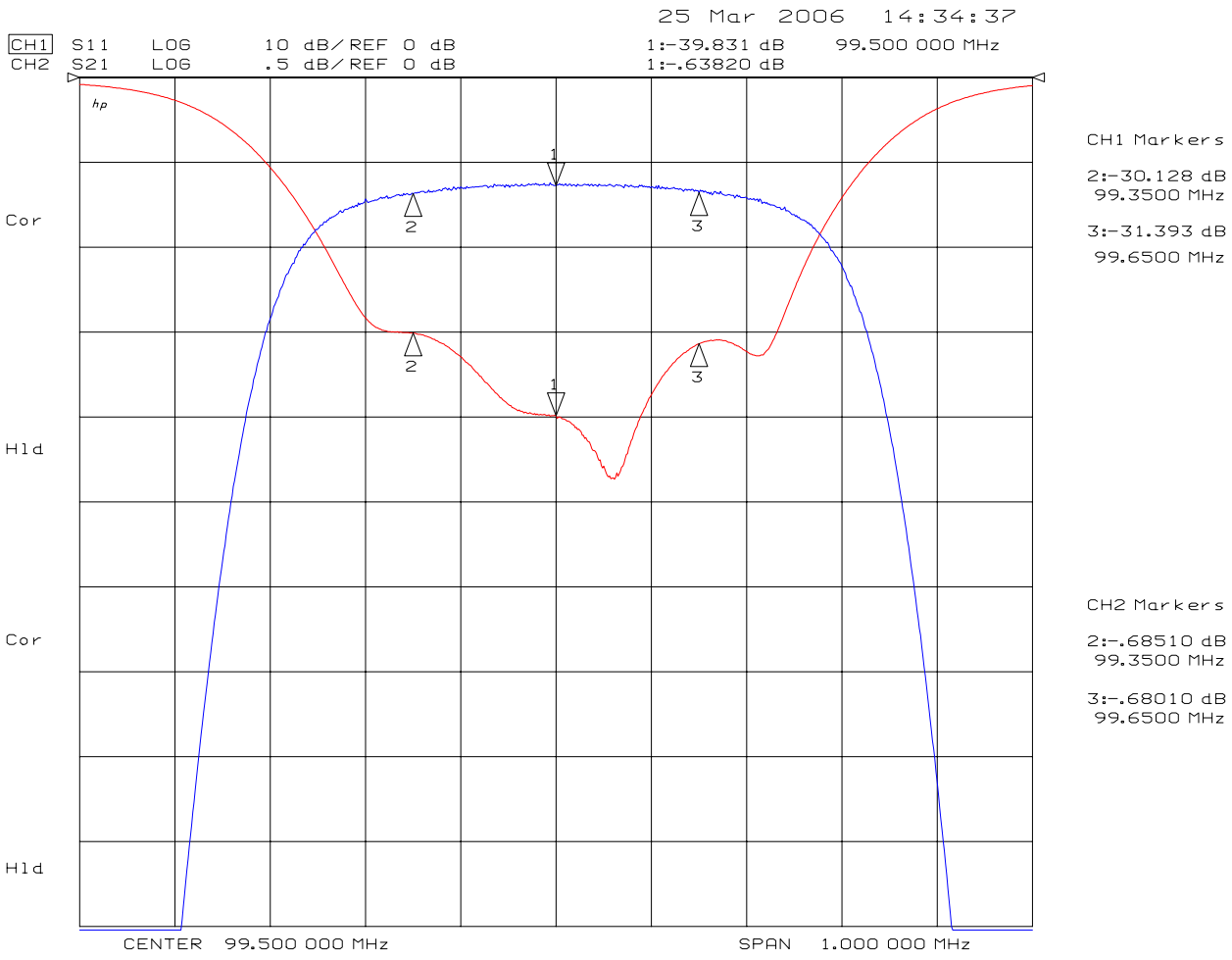
Detail "B"
Size: 3 1/8 "



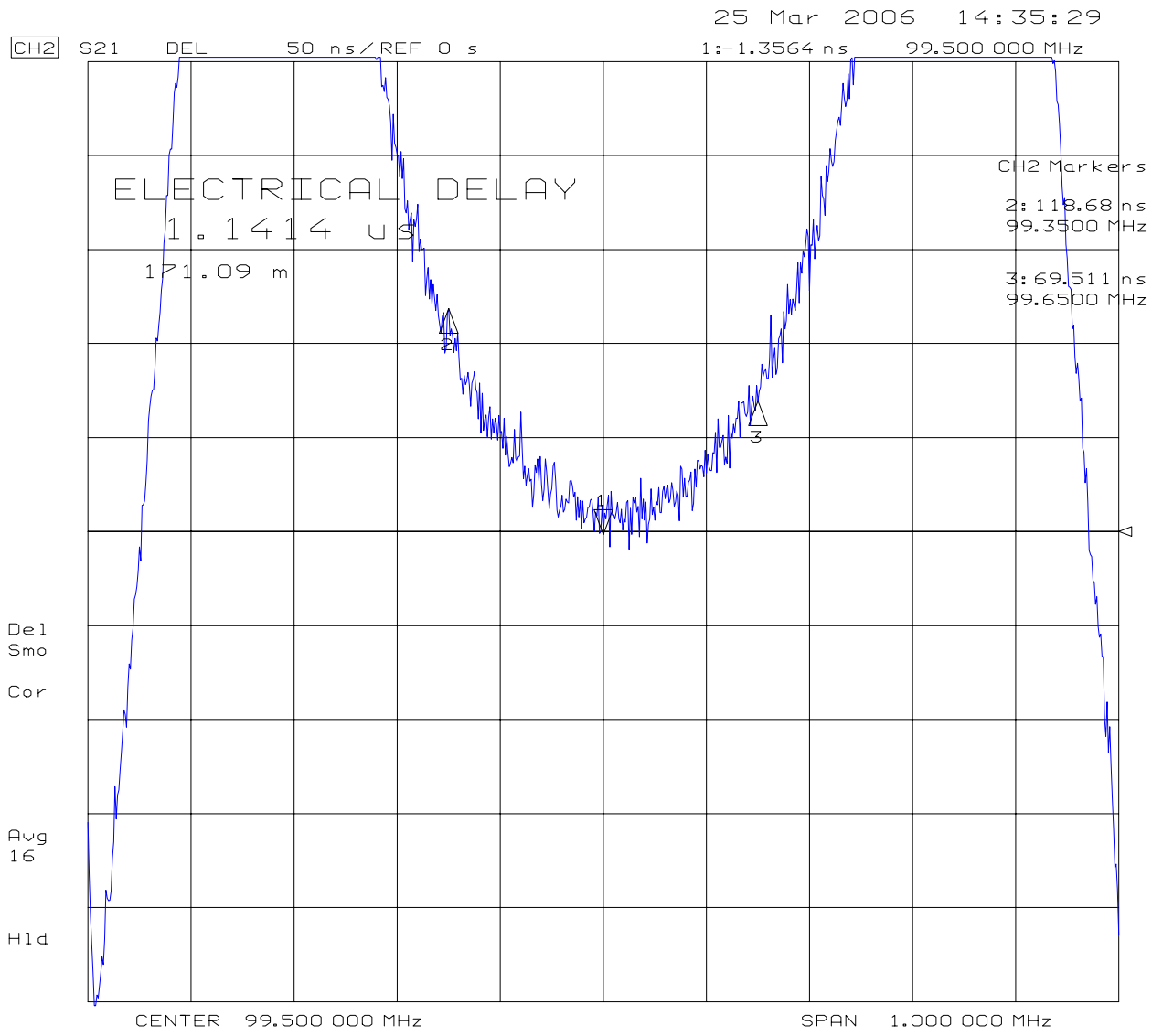
PROJECT # : **13910** DATE: **4/10/06** LINE SIZE: **3 1/8" MYAT** SECTION LENGTHS: **20'**

KISS 99.5 MHz Data

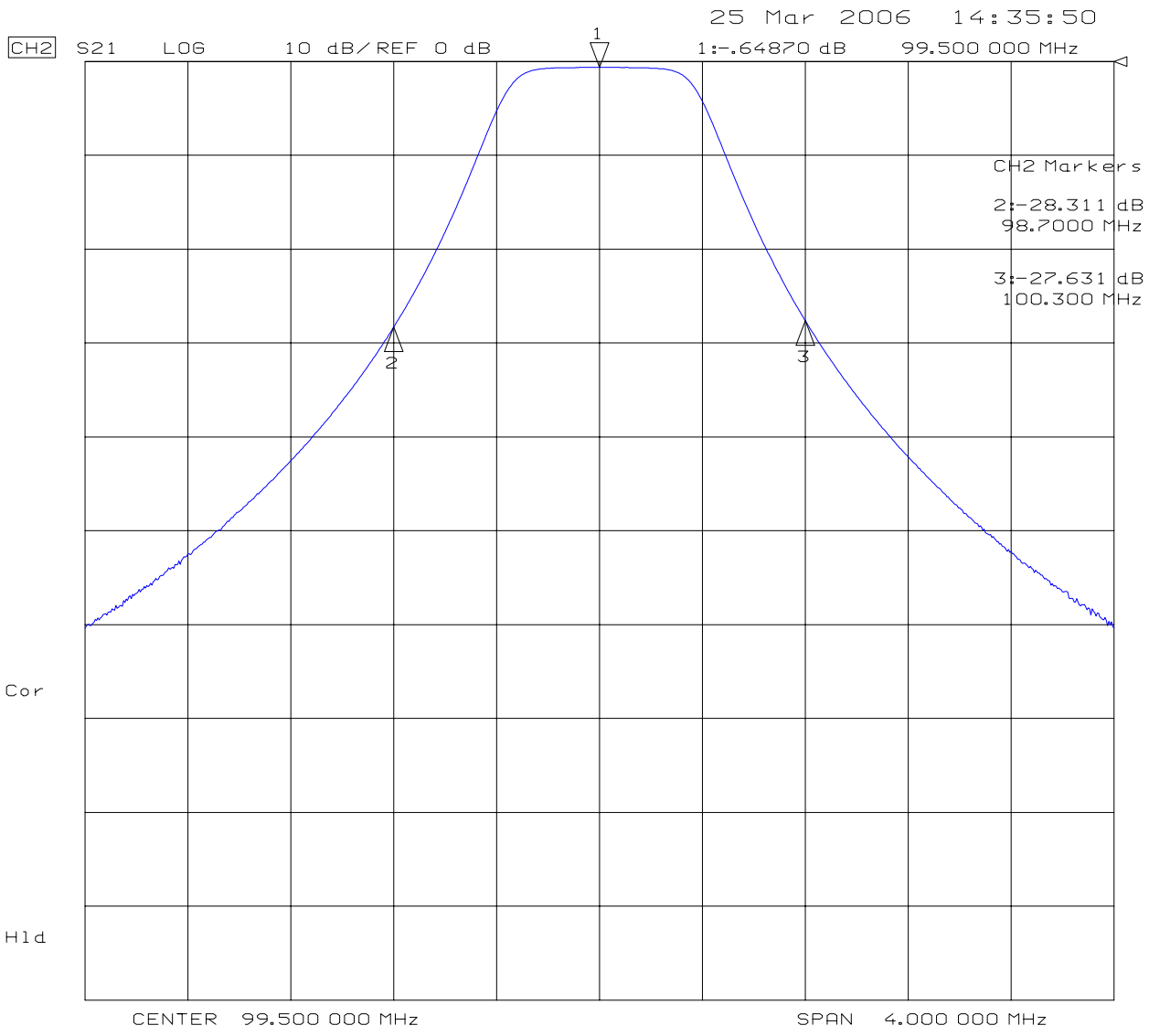
Red trace is Return Loss and the blue is measured Insertion Loss



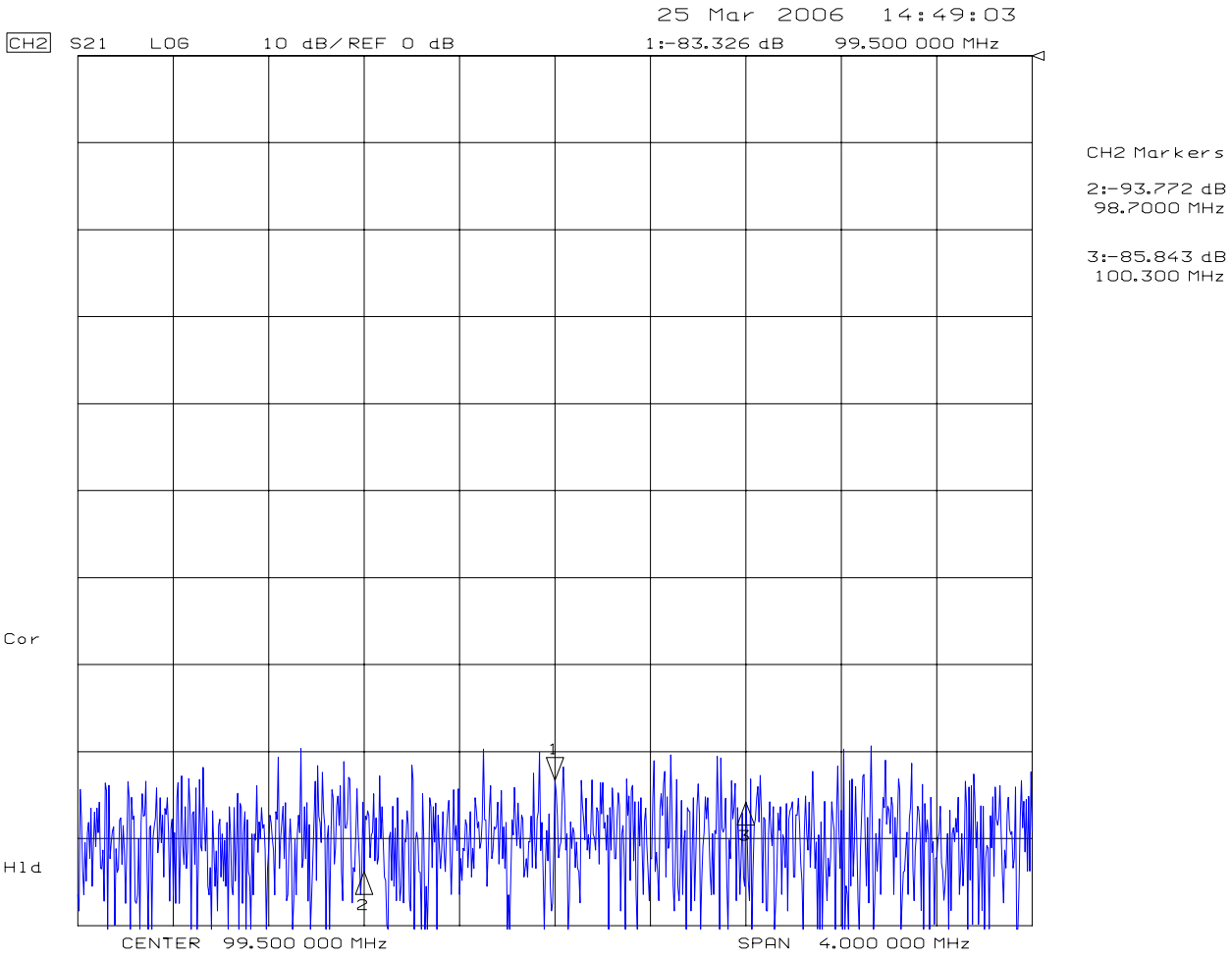
Group Delay


25 Mar 2006 14:35:29
CH2 S21 DEL 50 ns/ REF 0 s
1:-1.3564 ns 99.500 000 MHz
ELECTRICAL DELAY
1.1414 us
171.09 m
CH2 Markers
2: 118.68 ns
99.3500 MHz
3: 69.511 ns
99.6500 MHz
Del
Smo
Cor
Avg
16
Hld
CENTER 99.500 000 MHz
SPAN 1.000 000 MHz

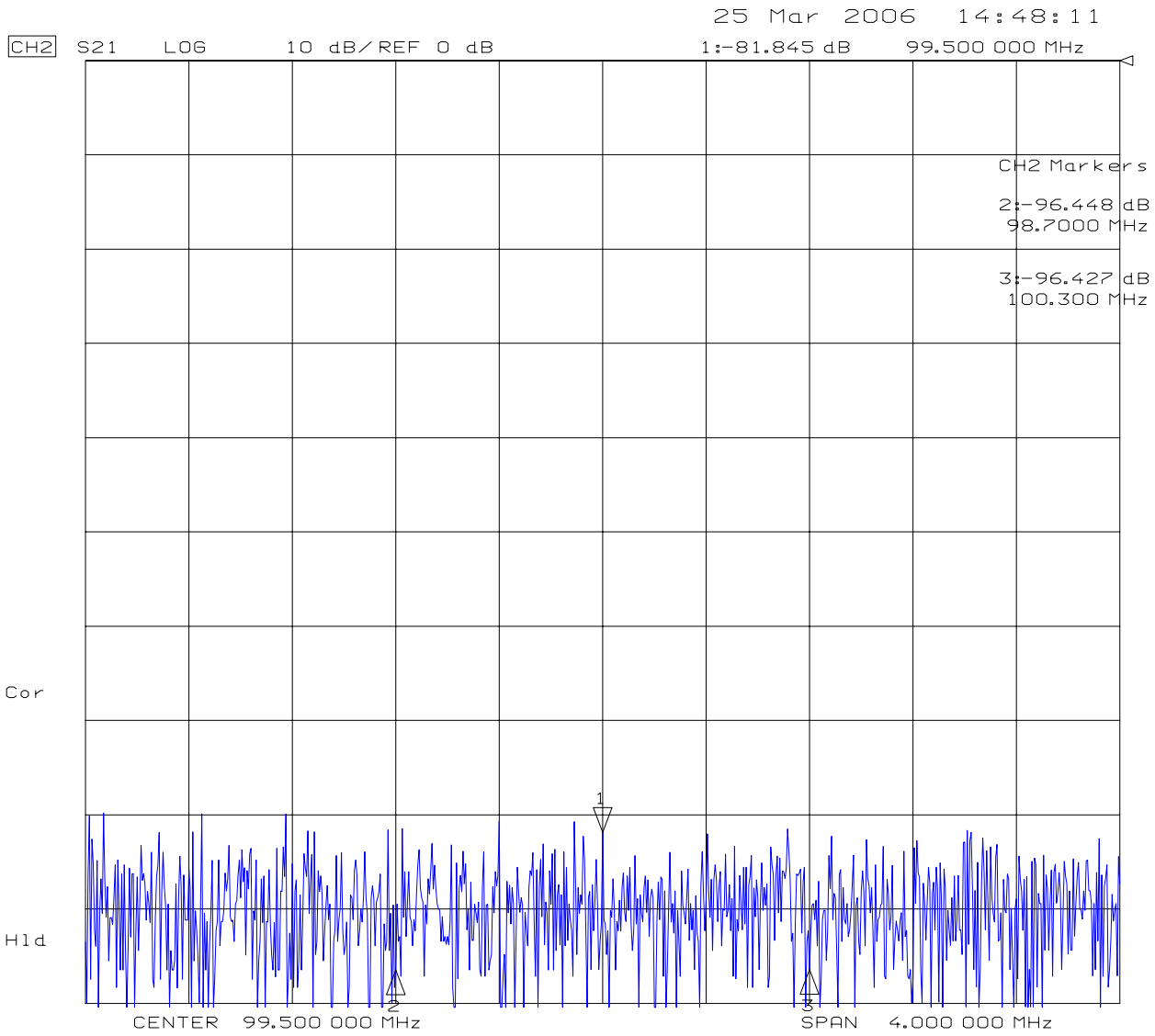
Filter rejection



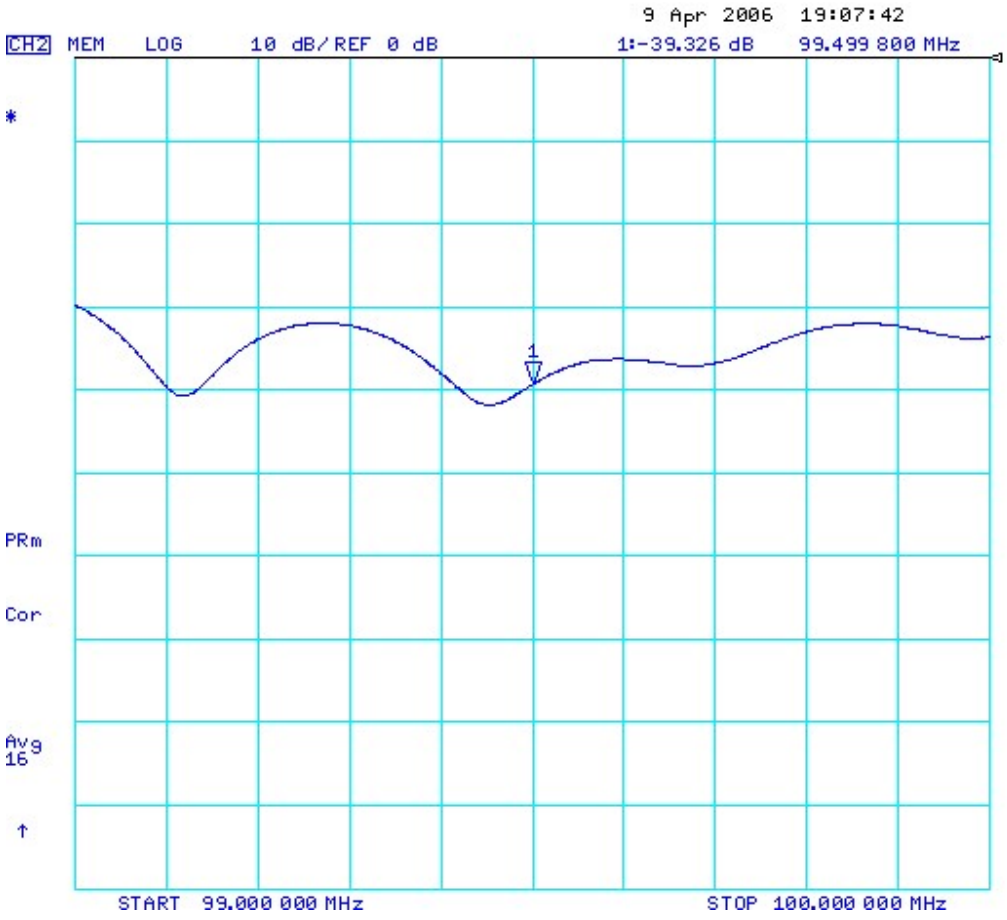
Isolation from 99.5 MHz to 105.3 MHz



Isolation from 99.5 MHz to 107.5 MHz

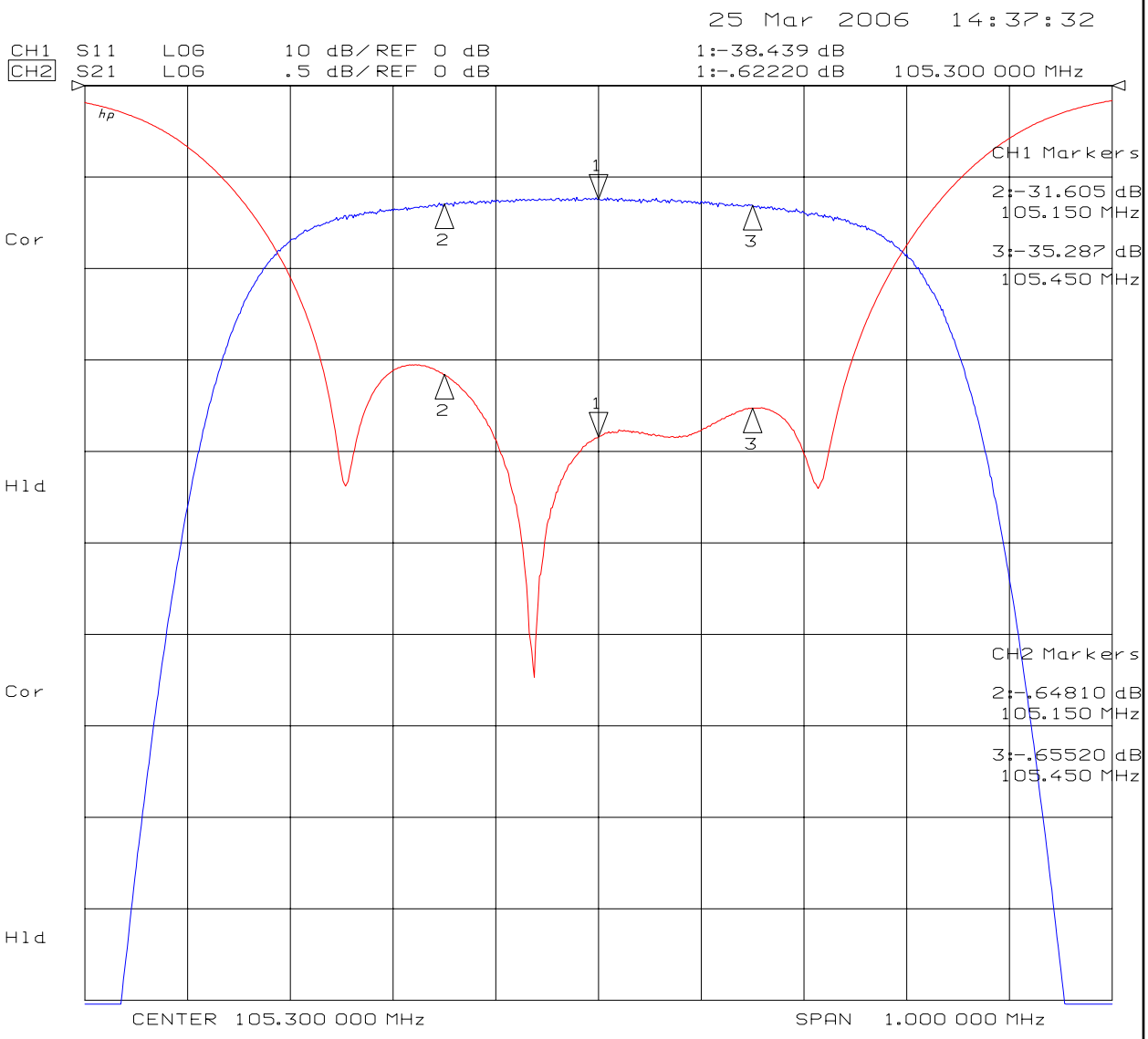


Digital Antenna Match at Output of Filter System

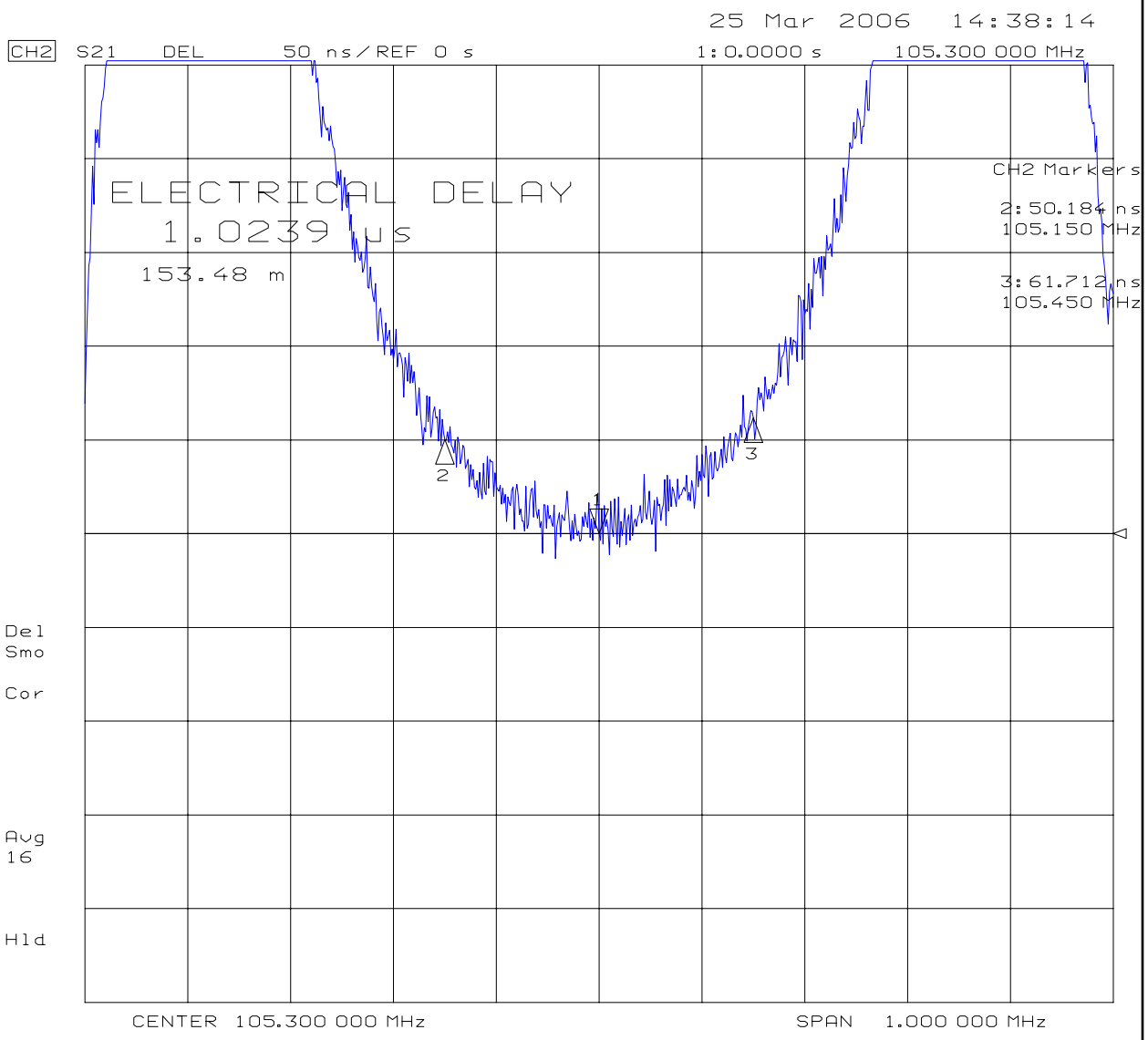


KSMG 105.3 MHz Data

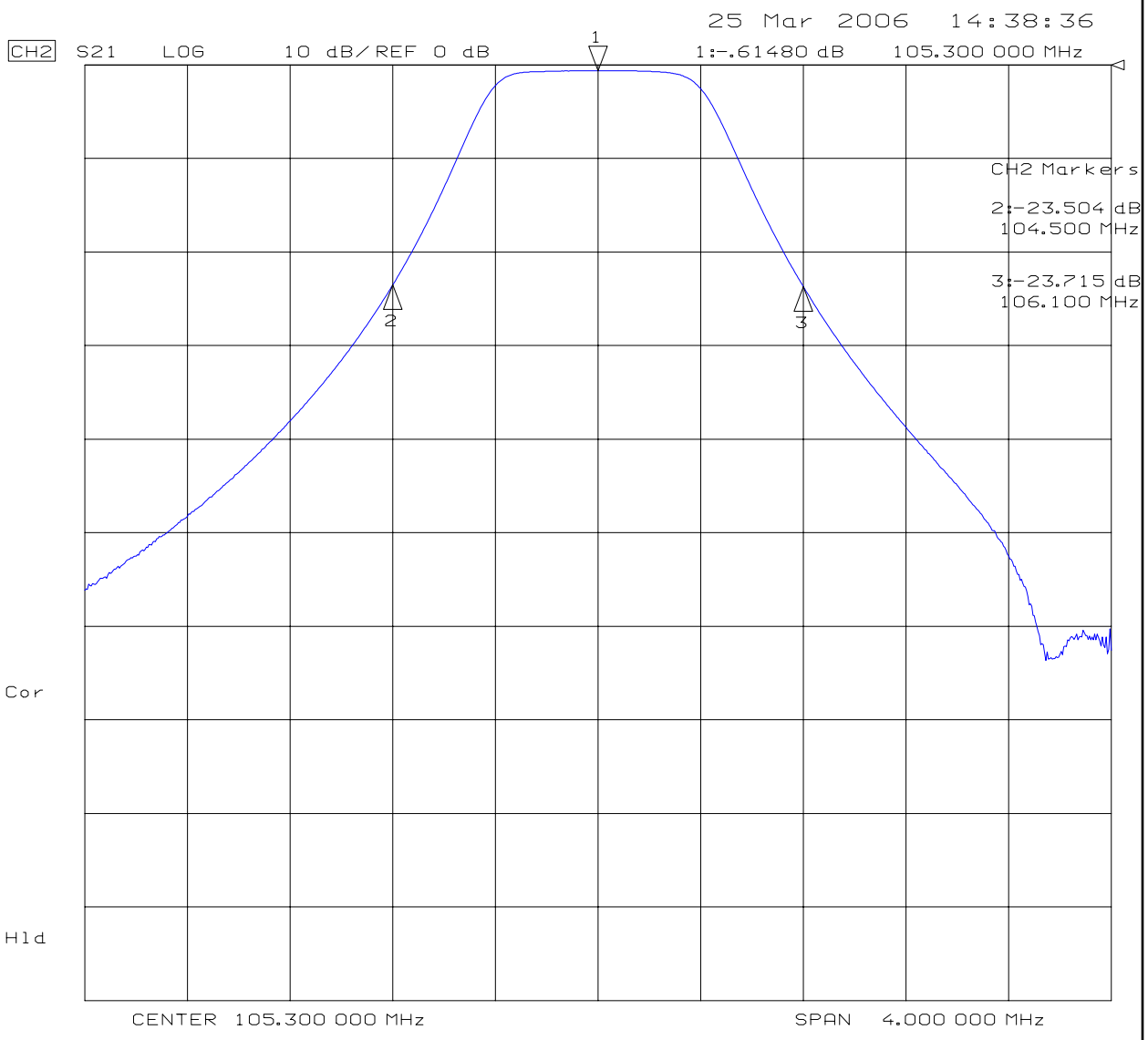
Red trace is Return Loss and the blue is measured Insertion Loss



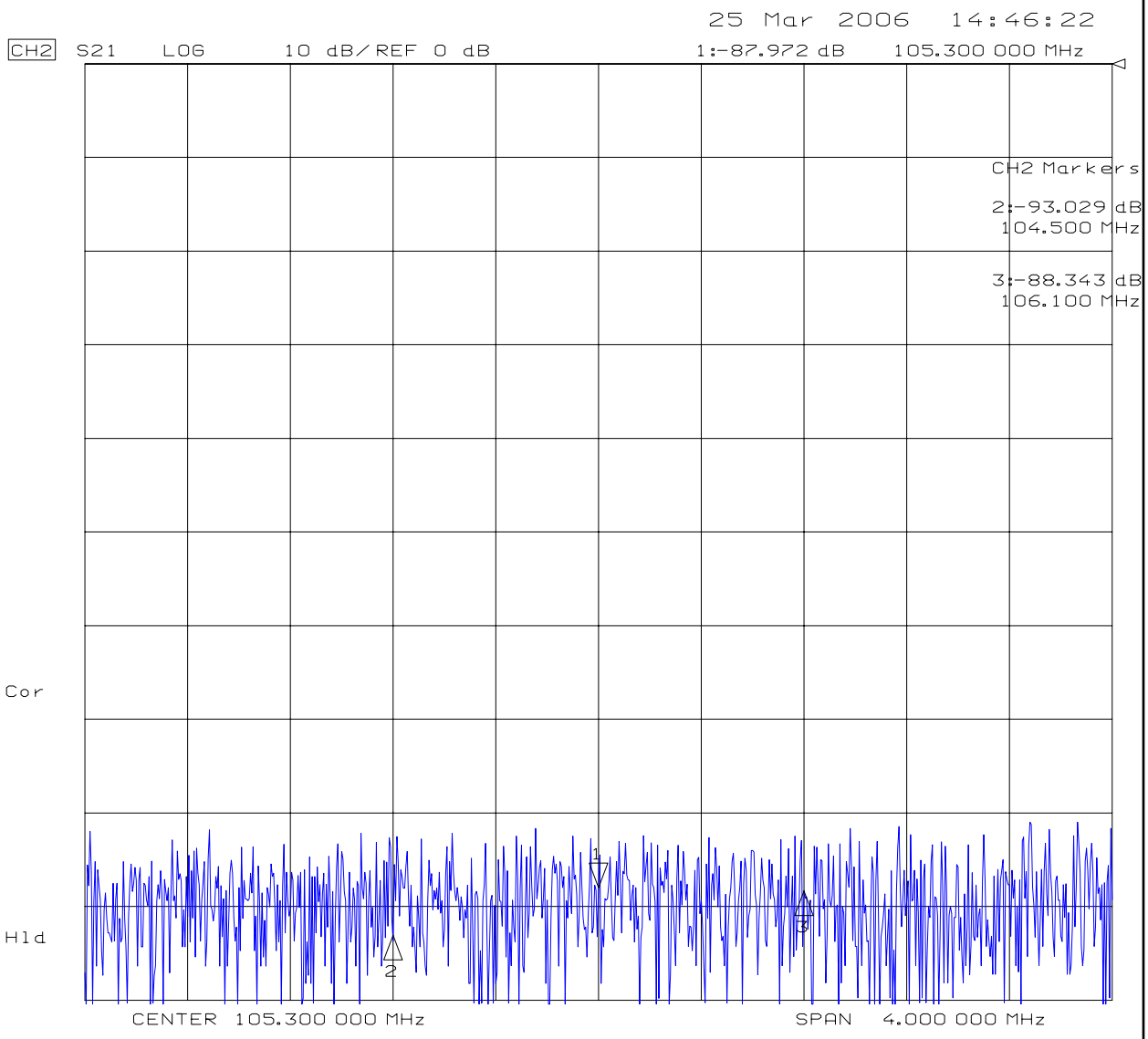
Group Delay


25 Mar 2006 14:38:14
CH2 S21 DEL 50 ns/REF 0 s
1:0.0000 s
105.300 000 MHz
ELECTRICAL DELAY
1.0239 µs
153.48 m
CH2 Markers
2:50.184 ns
105.150 MHz
3:61.712 ns
105.450 MHz
Del
Smo
Cor
Avg
16
Hld
CENTER 105.300 000 MHz
SPAN 1.000 000 MHz

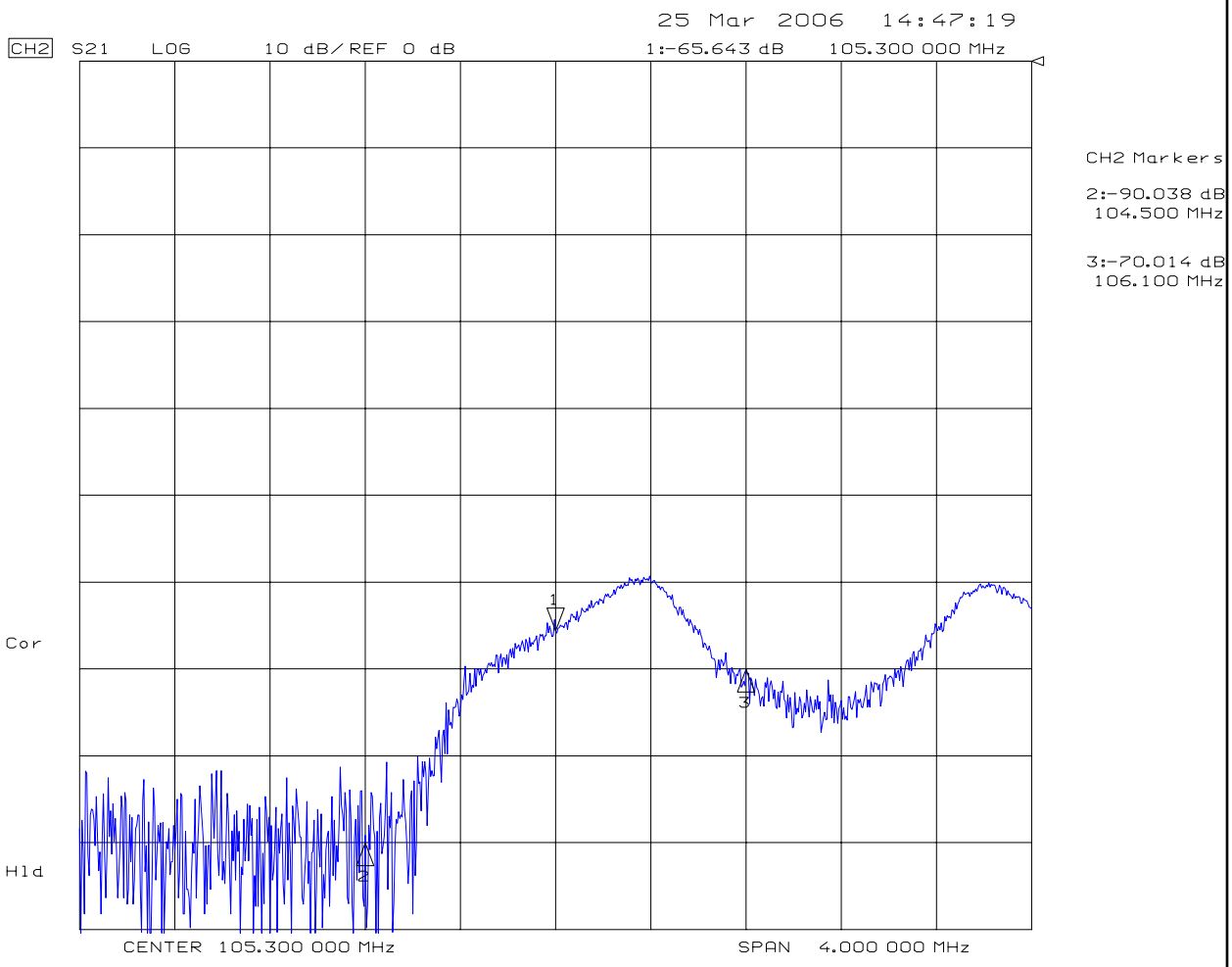
Filter Rejection



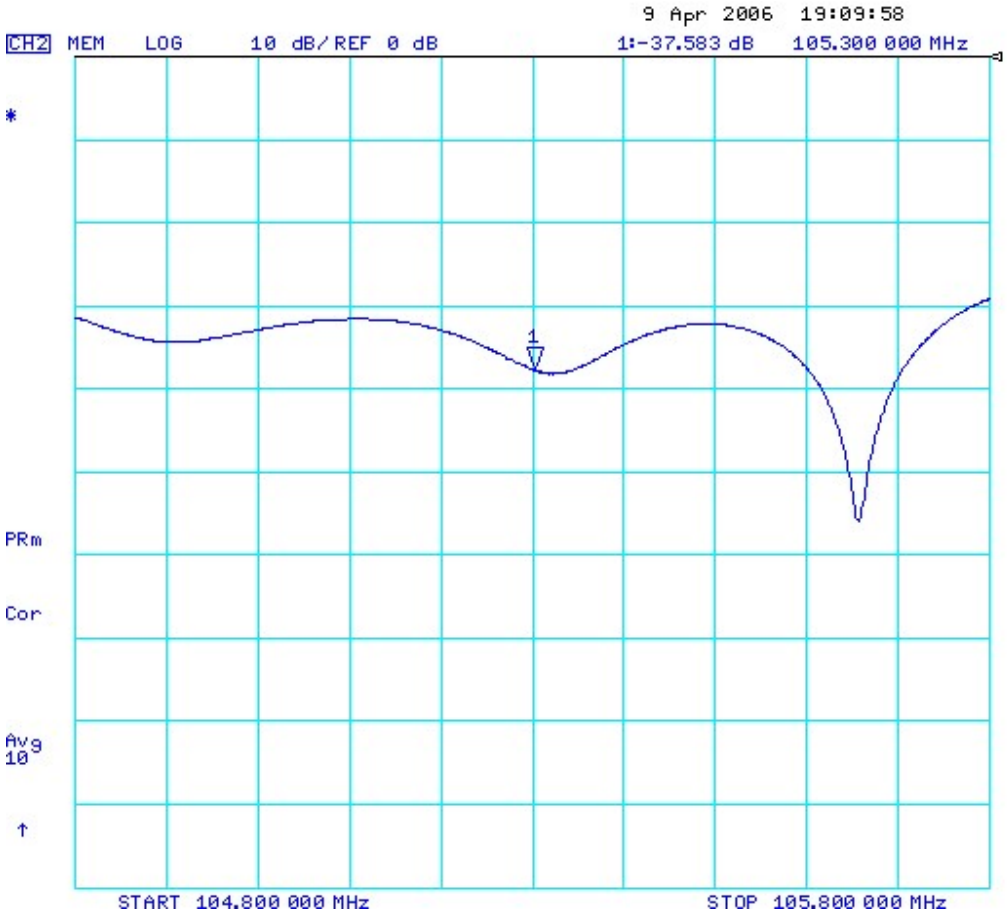
Isolation from 105.3 MHz to 99.5 MHz



Isolation from 105.3 MHz to 107.5 MHz

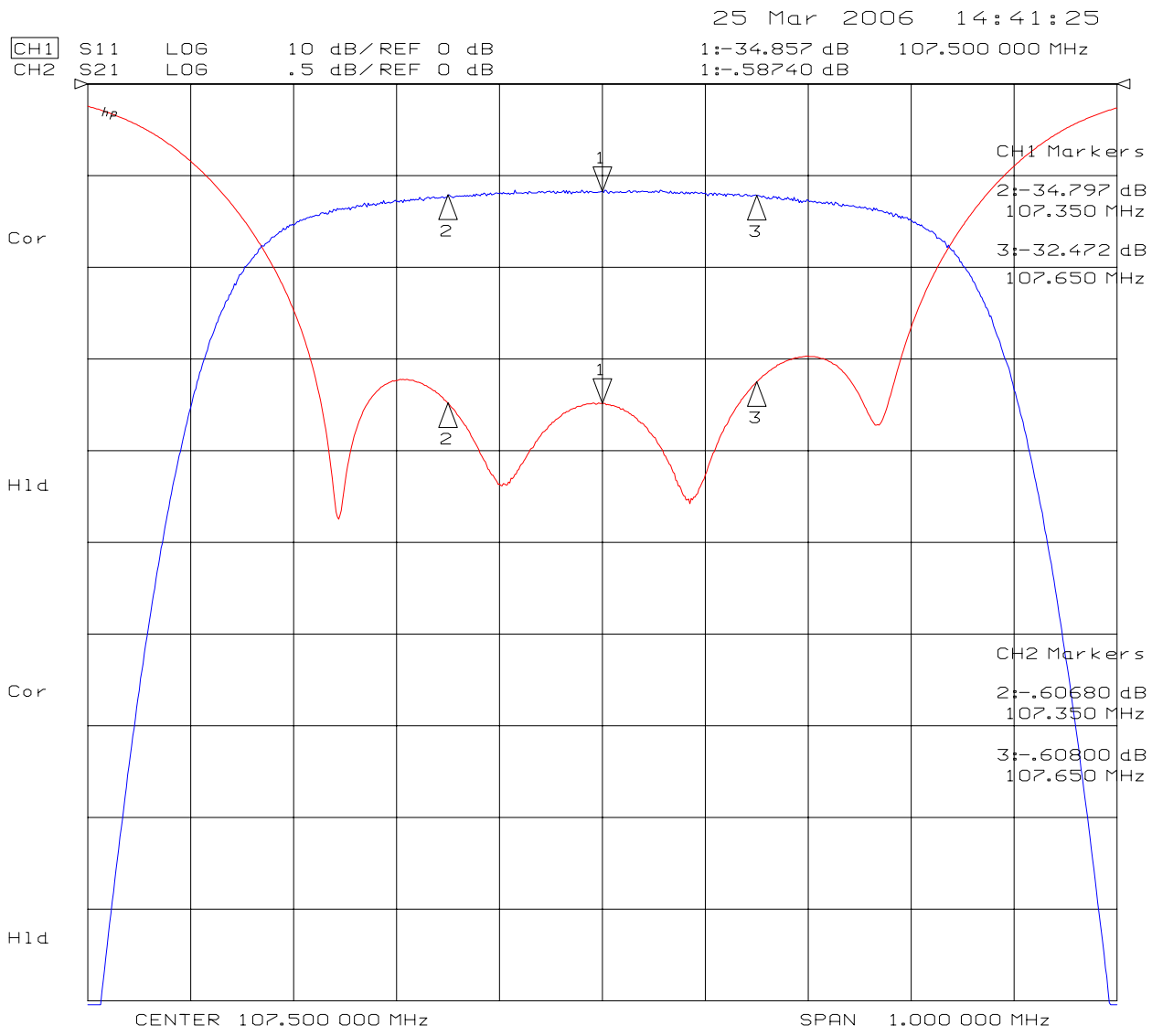


Digital Antenna Match at Output of Filter System

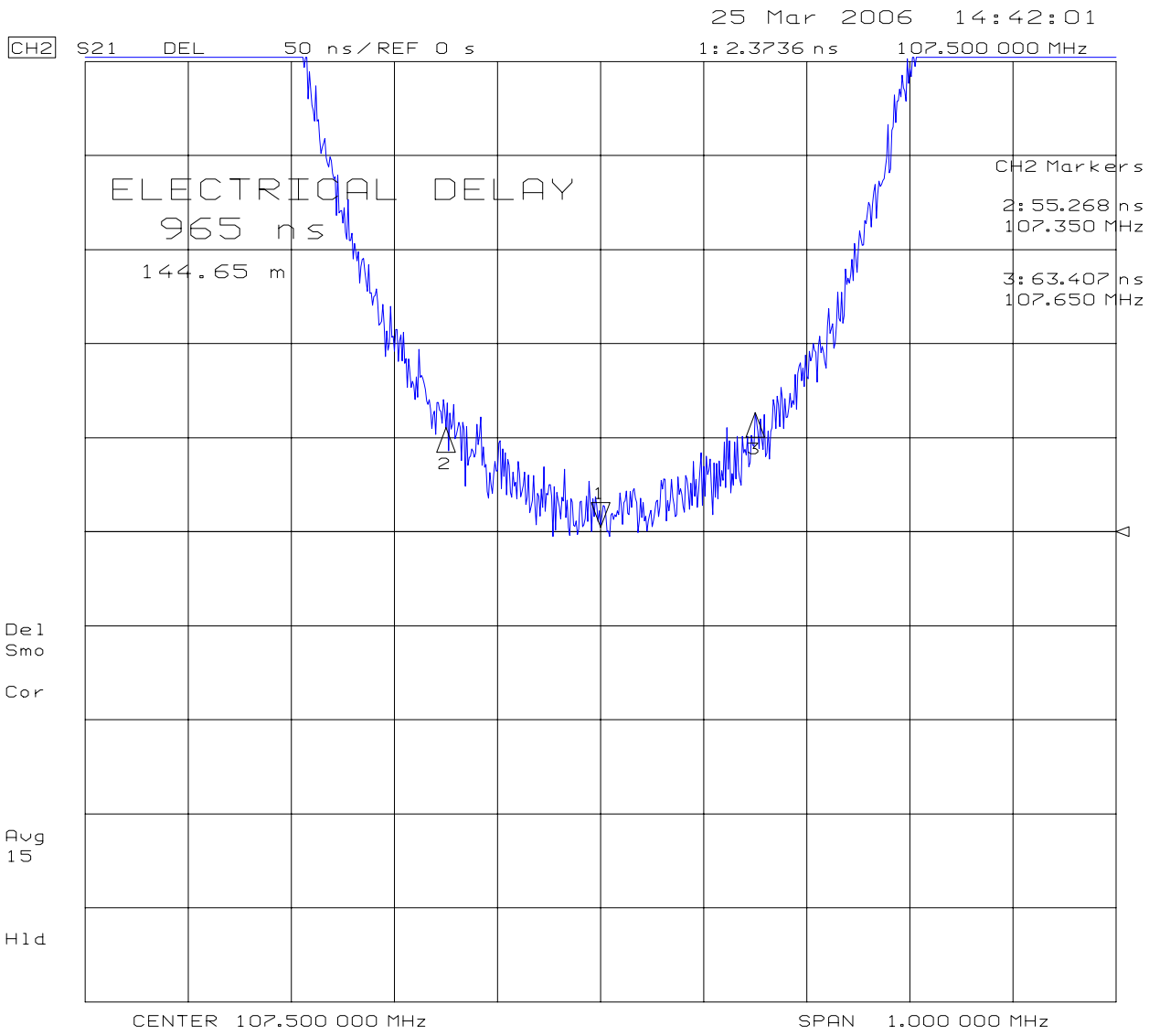


KXTN 107.5 MHz Data

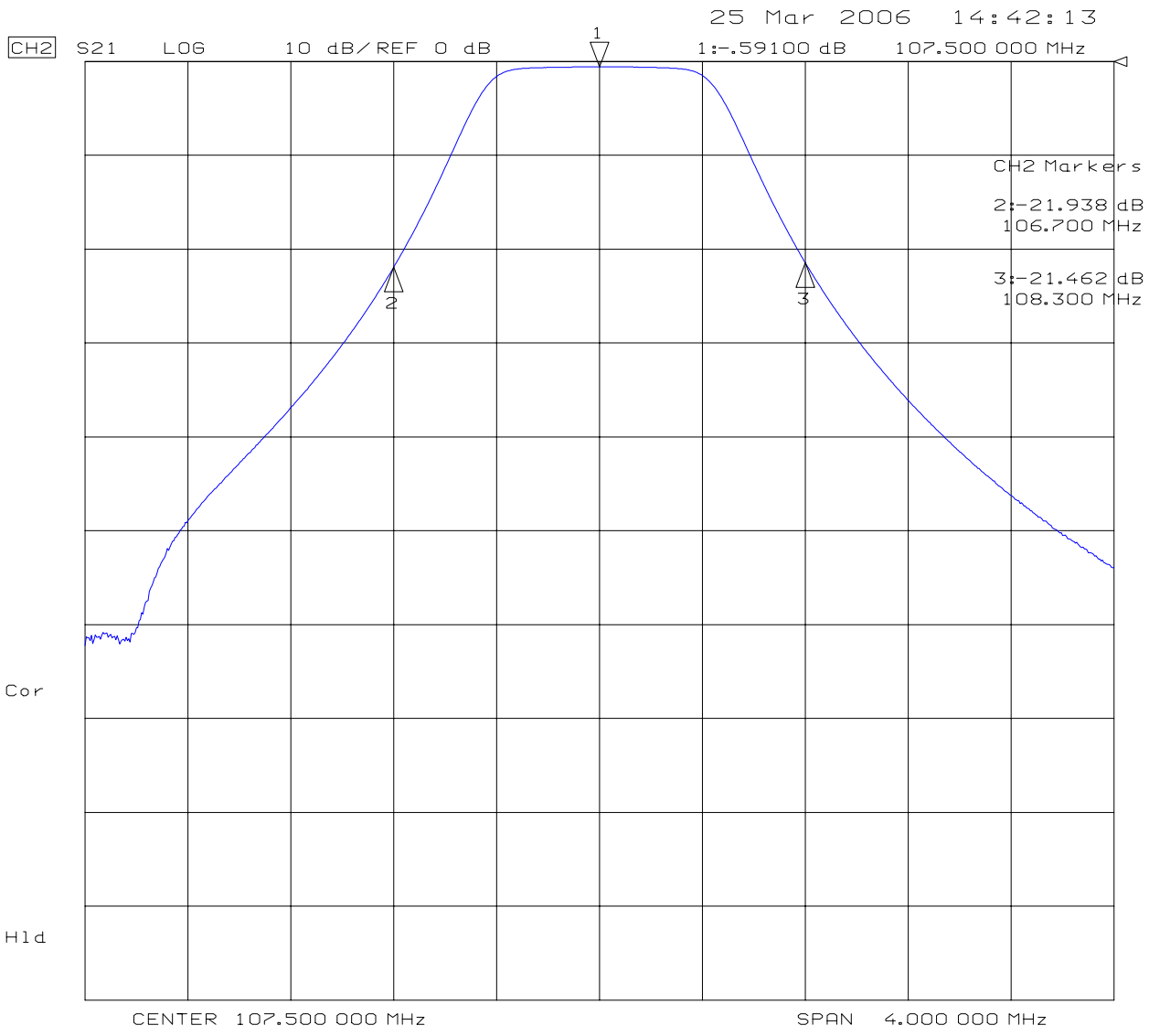
Red trace is Return Loss and the blue is measured Insertion Loss



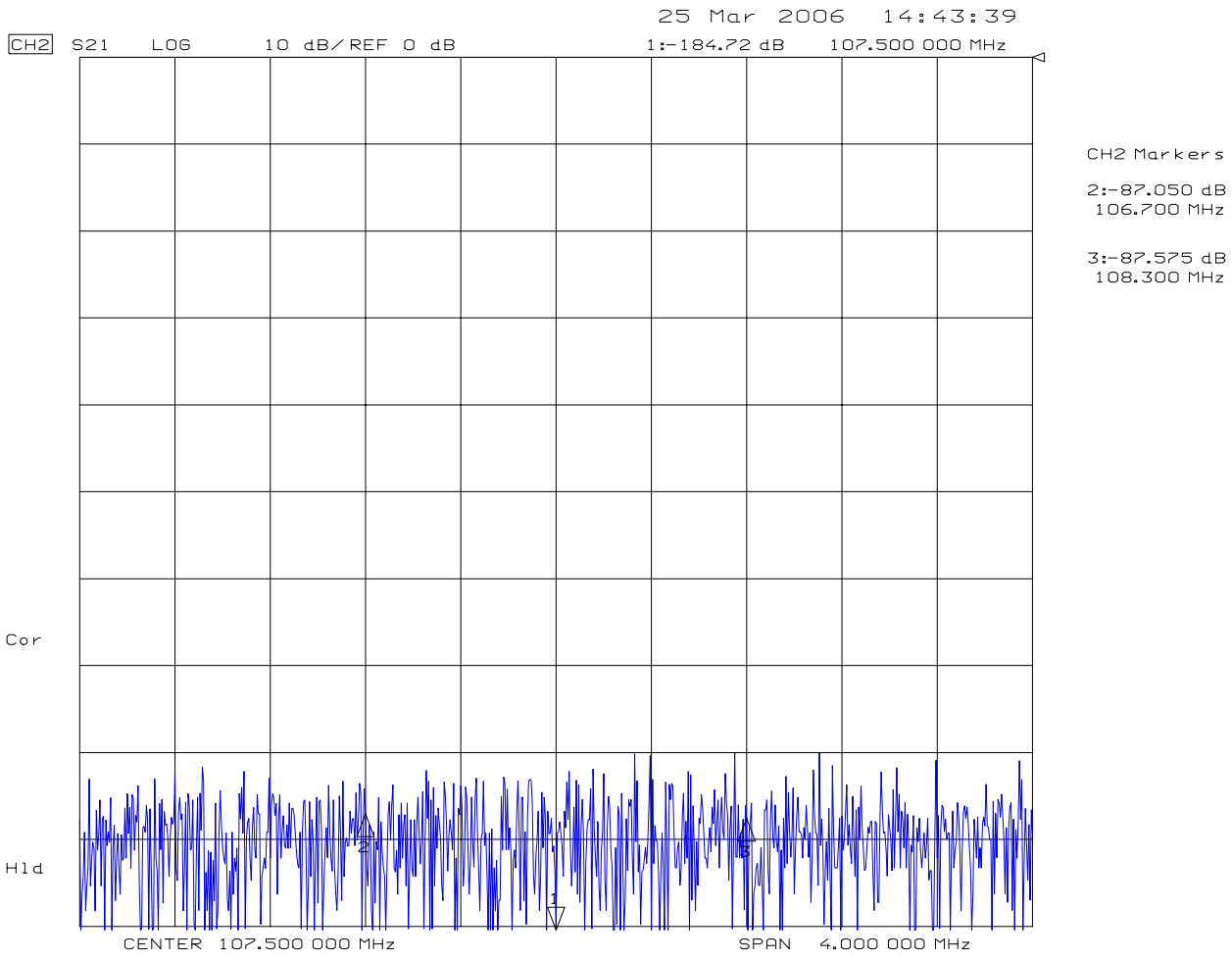
Group Delay


25 Mar 2006 14:42:01
CH2 S21 DEL 50 ns/REF 0 s
1:2.3736 ns 107.500 000 MHz
ELECTRICAL DELAY
965 ns
144.65 m
CH2 Markers
2:55.268 ns
107.350 MHz
3:63.407 ns
107.650 MHz
Del
Smo
Cor
Avg
15
Hld
CENTER 107.500 000 MHz
SPAN 1.000 000 MHz

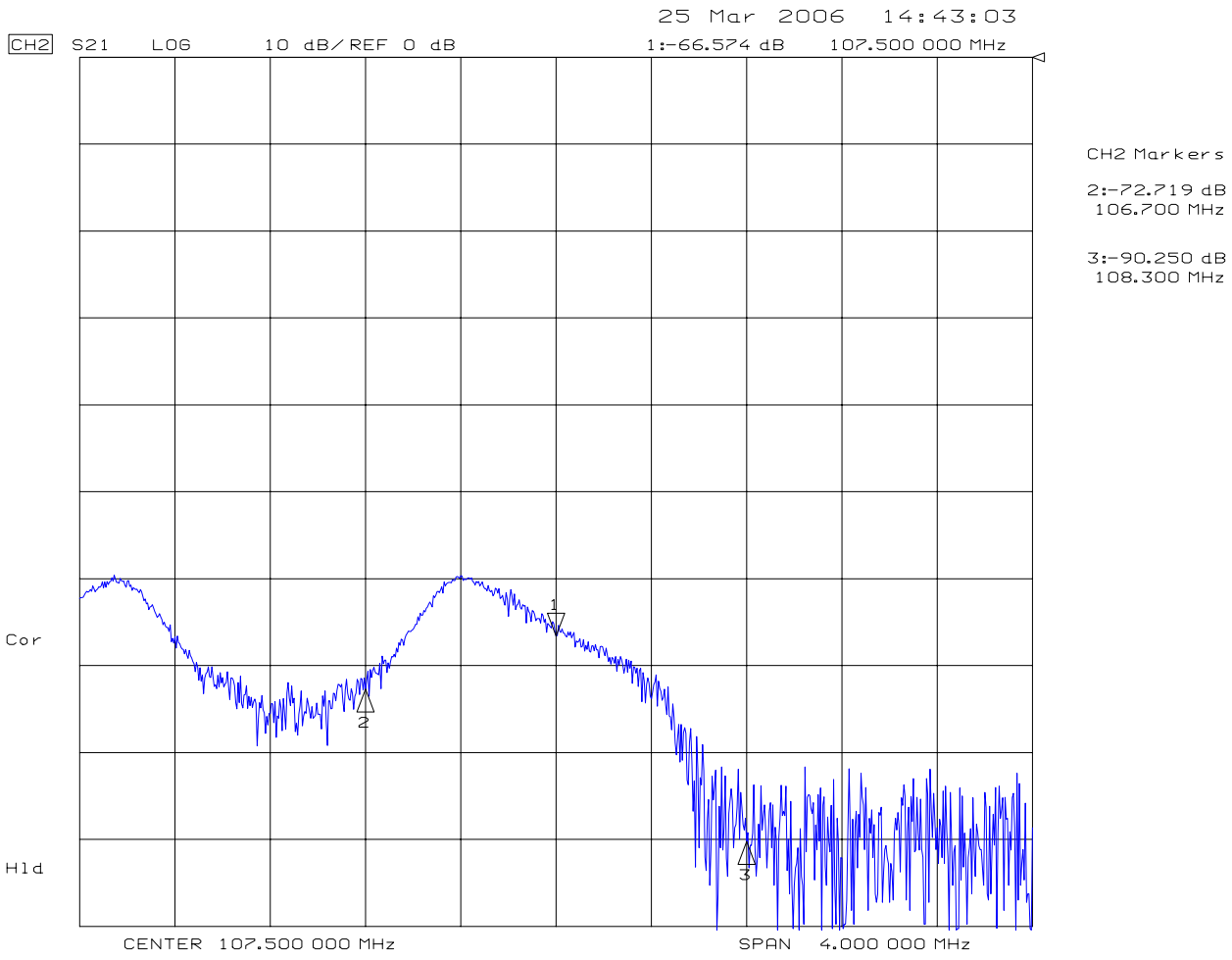
Filter Rejection



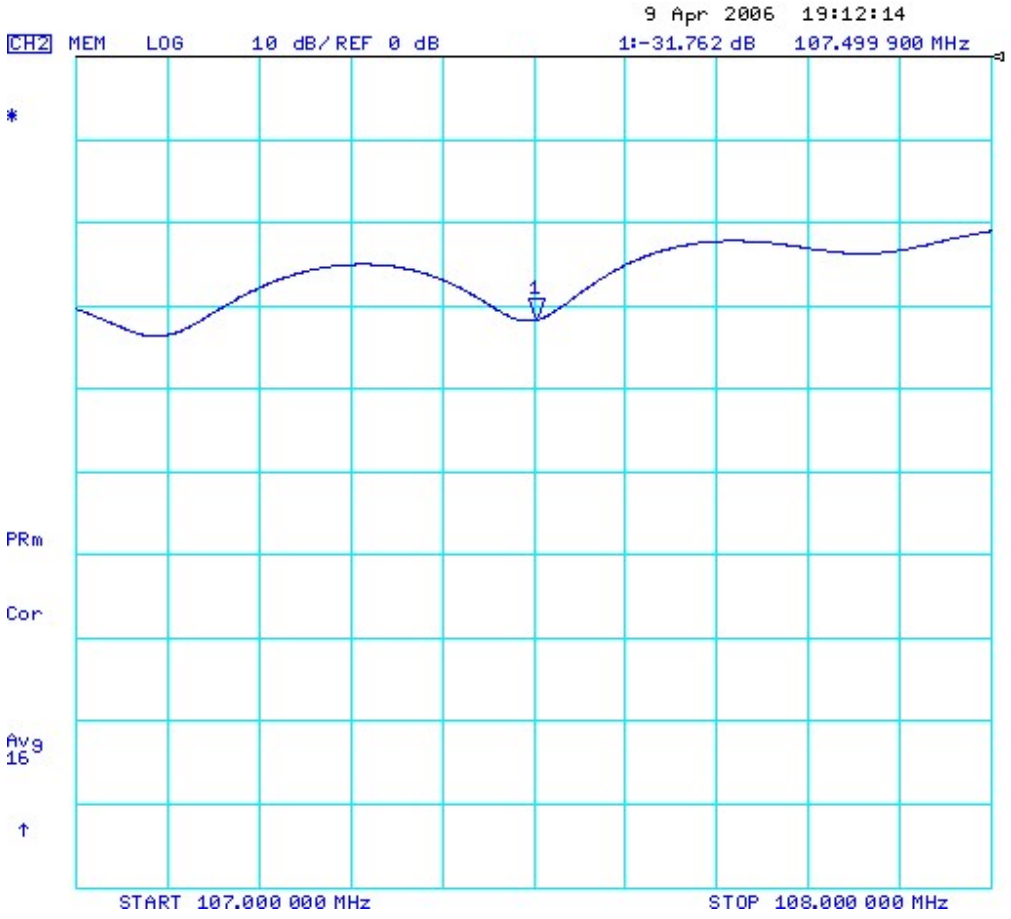
Isolation from 107.5 MHz to 99.5 MHz



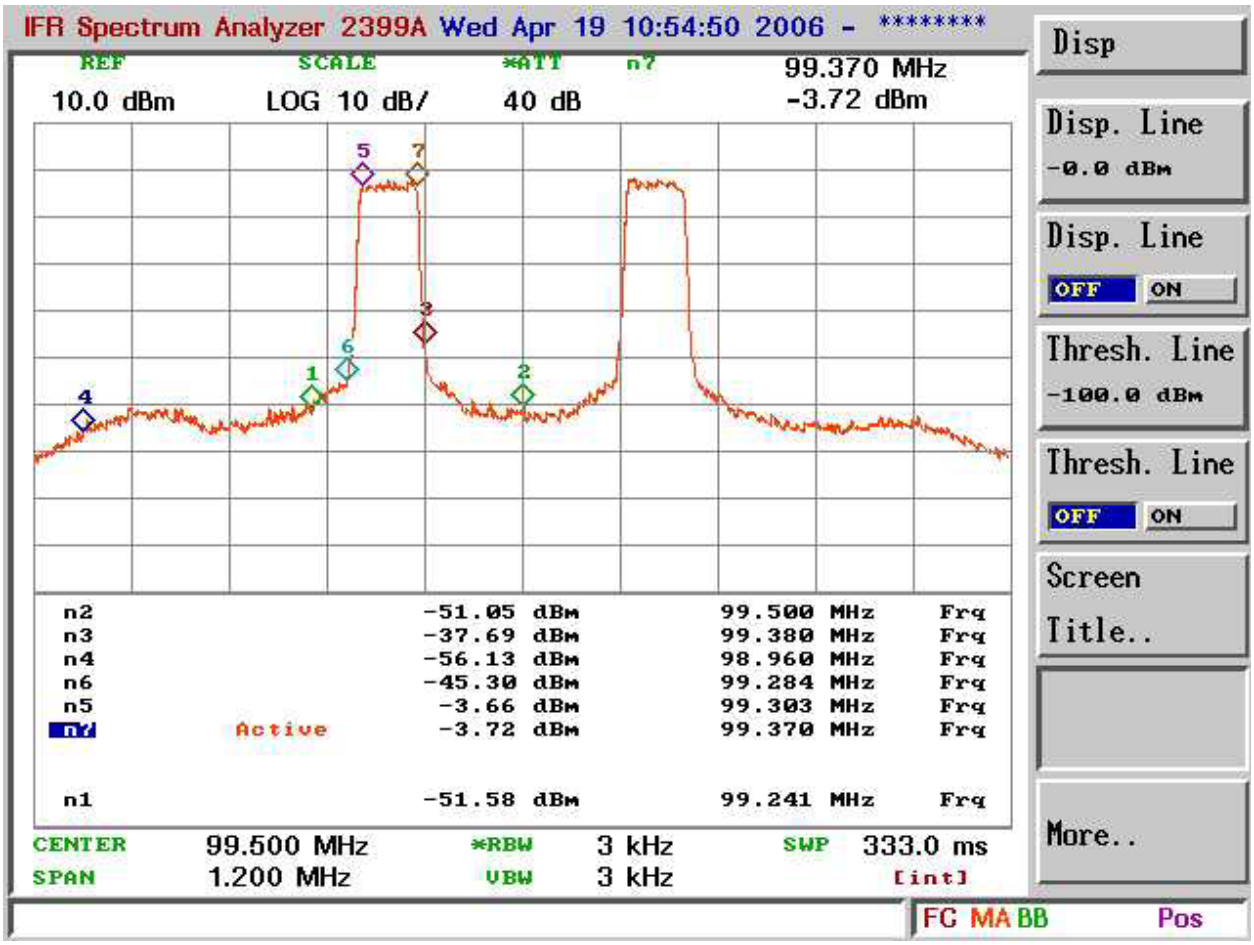
Isolation from 107.5 MHz to 105.3 MHz



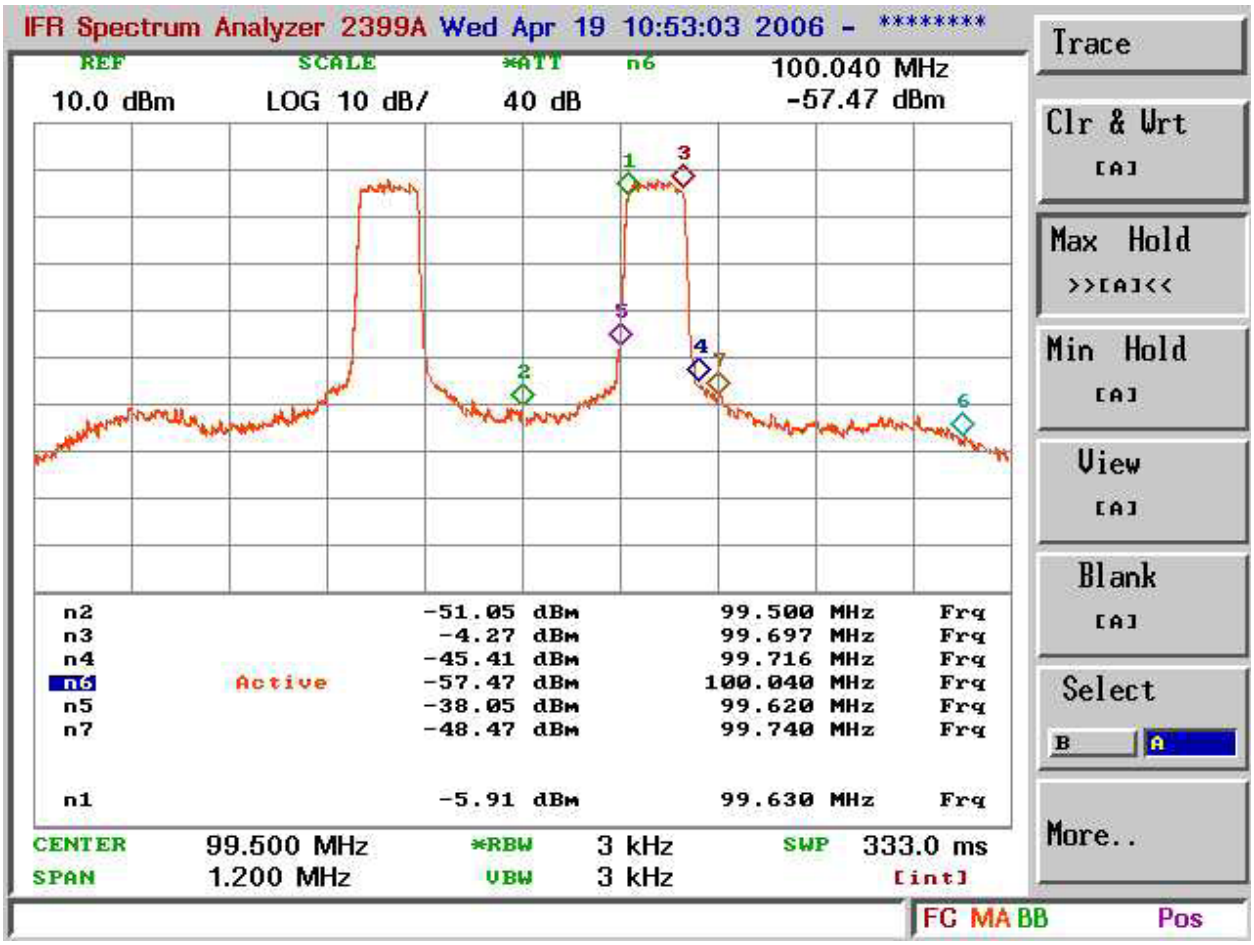
Digital Antenna Match at Output of Filter System



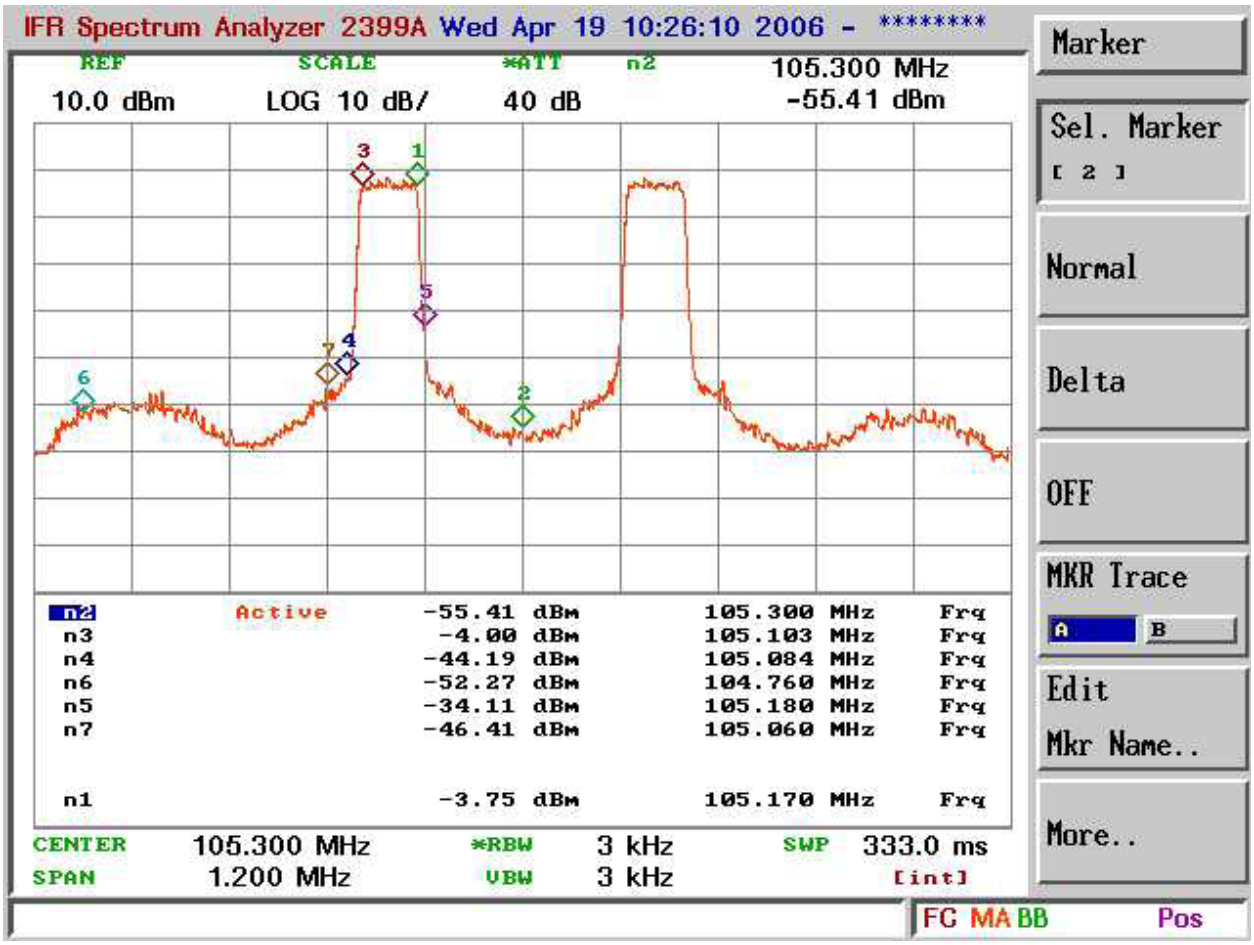
OCBW OF 99.5 MHz.



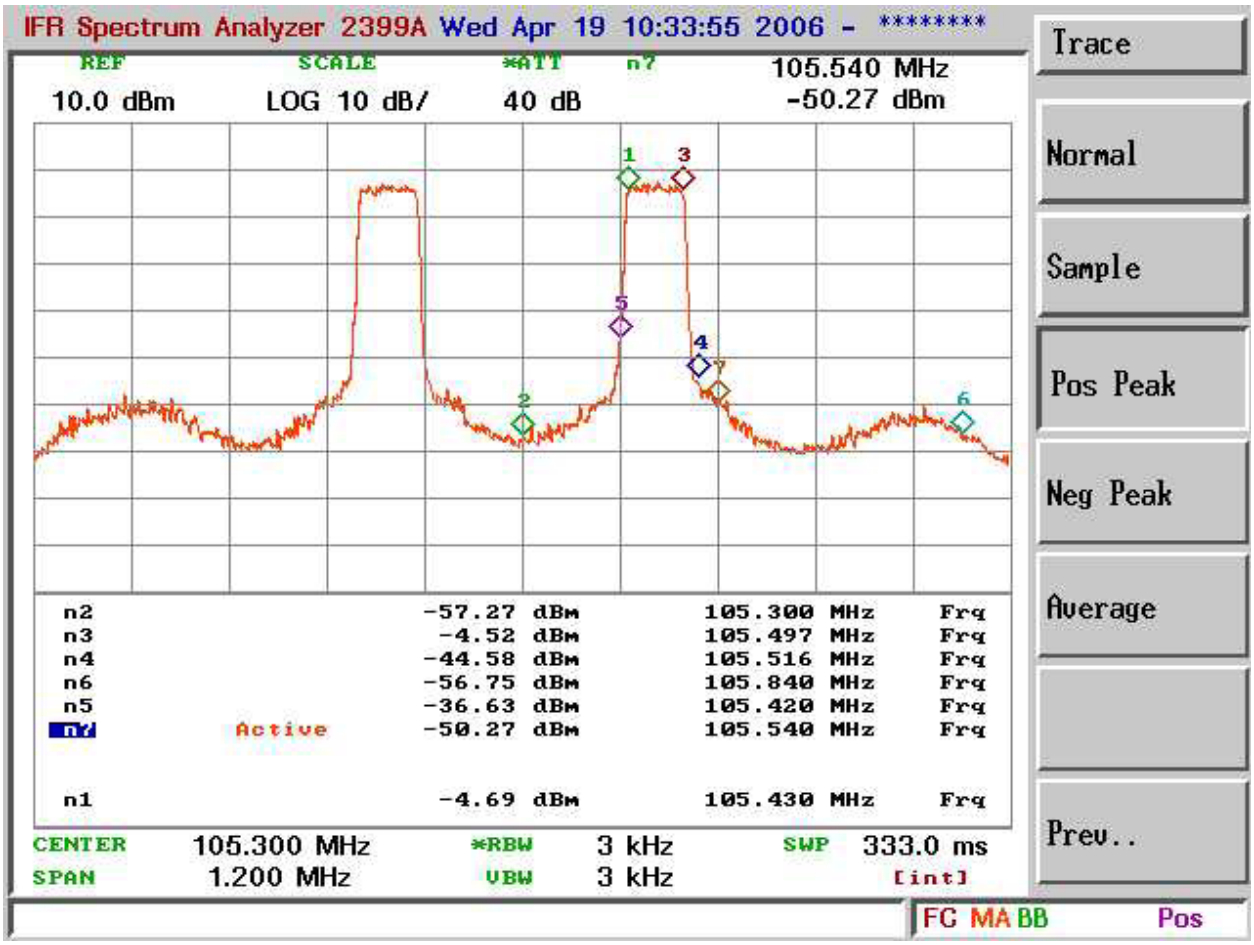
OCBW OF 99.5 MHz.



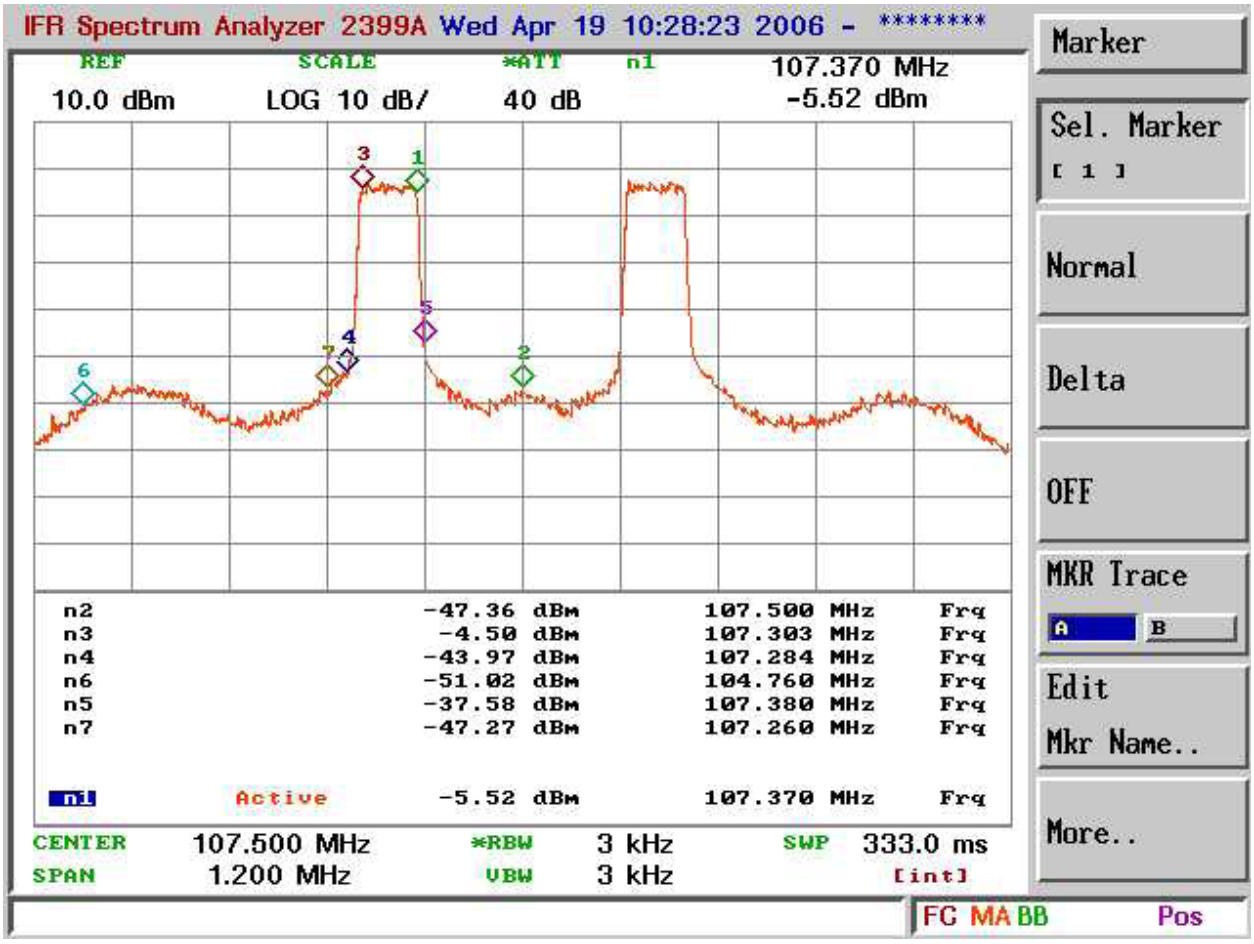
OCBW OF 105.3 MHz.



OCBW OF 105.3 MHz.



OCBW OF 107.5 MHz.



OCBW OF 107.5 MHz.