Aviation Communication and Surveillance Systems	T^3CAS FCC Compliance Test Results			
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Record of Revisions

Rev	Date	Authorization	Description of Change
-	01-JUL-10	ECR010466	Initial Release

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1 INTRODUCTION

The T3CAS is an integrated system that provides TCAS II, Transponder, Automatic Dependent Surveillance – Broadcast (ADS-B) and Terrain Awareness Warning System (TAWS) functions in a single LRU (Line Replaceable Unit).

1.1 Purpose

The purpose is to provide the FCC compliance test results for the 6-MCU T3CAS LRU.

1.2 Scope

This test results document establishes the FCC operational results for the T3CAS 6 MCU AC/DC LRU, Part Number 9005000-10000.

1.3 References

Table 1-1: Referenced Industry Documents

Source	Document No.	Revision	Description
ABD	0100	04/20/2005	Airbus Industries Document: Equipment – Design / General Requirements for Suppliers
AC	No. 20-131A	03/29/1993	Airworthiness and Operational Approval of Traffic Alert and Collision Avoidance Systems
ARINC	413A	12/30/1976	Aircraft Electrical Power Utilization and Transient Protection
ARINC	429	10/2001	Mark 33 Digital Information Transfer System (DITS)
ARINC	600	03/2001	Air Transport Avionics Equipment Interfaces
ARINC	735B	12/14/07	Traffic Computer TCAS and ADS-B Functionality
Directive	8110.4B	04/24/2000	Type Certification
ED	14D	07/1997 Change 1 12/2000 Change 2 06/2001	Environmental Conditions and Test Procedures for Airborne Equipment
FAA	TSO-C119b	12/18/1998	Traffic Alert and Collision Avoidance System (TCAS) Airborne Equipment, TCAS II
FAA	TSO-C151b	12/17/2002	Terrain Awareness and Warning System
FAA	TSO-C166a	12/21/2006	Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Service – Broadcast (TIS-B) Equipment Operating on the Radio Frequency of 1090 Megahertz
FAA	TSO-C112	2/5/1986	Air Traffic Control Radar Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment
RTCA	DO-181C	6/1/2001	Minimum Operational Performance Standards for Air Traffic Control Radar beacon System/Mode Select (ATCRBS/Mode S Airborne Equipment)

RTCA	DO-185B	6/19/2008	Minimum Operational Performance Standards for Traffic Allert and Collision Avoidance System II (TCAS II)
RTCA	DO-260A (Change 1)	6/27/2006	Minimum Operational Performance Standards for 1090MHz Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)
RTCA	DO-260A (Change 2)	12/13/2006	Minimum Operational Performance Standards for 1090MHz Extended Squitter Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)

Table 1-2: Referenced ACSS Documents

Document No.	Description
8007537-001	T3CAS Environmental Qualification Test Procedures
8007538-001	T3CAS Environmental Qualification Test Results
8007539-001	T3CAS FCC Compliance Test Plan and Procedures
8600200-001	T3CAS System Description and Installation Manual
9005000-10000	T3CAS 6 MCU End Item Drawing
9005000-10	T3CAS 6 MCU Hardware Assembly Drawing
9005001-003	T3CAS Outline and Installation Drawing
9005010-001	T3CAS Rear Interconnect Assembly Drawing
9005020-001	T3CAS Processor Assembly Drawing
9005030-001	T3CAS Power Supply Drawing
9005040-001	T3CAS Transmitter Assembly Drawing
9005050-002	T3CAS Receiver Assembly Drawing

1.3.1 FCC Documents

Table 1-3: Referenced FCC Documents

CFR Title 47 Chapter 1 Part 2 Subpart J	Code of Federal Regulations – Telecommunications Federal Communications Commission Frequency Allocations and Radio Treaty Matters; General Rules and Regulations Equipment Authorization Procedures Revised as of October 1, 2001
CFR Title 47 Chapter 1 Part 15 Subpart A	Code of Federal Regulations – Telecommunications Federal Communications Commission Radio Frequency Devices General Revised as of October 1, 2001
CFR Title 47 Chapter 1 Part 87 Subpart D	Code of Federal Regulations – Telecommunications Federal Communications Commission Aviation Services Technical Requirements Revised as of October 1, 2001

1.4 Acronyms and Abbreviations

Table 1-4: Acronyms and abbreviations

Acronym	Definition
A/C	Aircraft
AC	Advisory Circular
ACAS	Airborne Collision Avoidance System
ACSS	Aviation Communication and Surveillance Systems
ADC	Analog to digital Conversion
ADL	On-Board Data Loader
ADS-B	Automatic Dependent Surveillance - Broadcast
ANT	Antenna
ASIC	Application Specific Integrated Circuit
ATCRBS	Air Traffic Control Radar Beacon System
BITE	Built-In Test Equipment
CAS	Collision Avoidance System
CCA	Circuit Card Assembly
CCP	Common Computing Platform
CF	Compact Flash
CFR	Code of Federal Regulations
CMM	Component Maintenance Manual
CPA	Common Processor Assembly
CPLD	Complex Programmable Logic Device
CPS	Common Power Supply
CRFA	Common RF Assembly
CS	Conducted Susceptibility
DAR	Designated Airworthiness Representative
DER	Designated Engineering Representative
EMI	Electromagnetic Interference
ESS	Environmental Stress Screen
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FMEA	Failure Modes and Effects Analysis
FPGA	Field Programmable Gate Array
HIRF	High Intensity Radiated Fields
HRD	Hardware Requirements Document
HSI	Hardware/Software Integration
HTS	Hardware Test Software
I/O	Input/Output
JTAG	Joint Test Action Group
JAR	Joint Aviation Regulations
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LISN	Line Impedance Stabilization Network
L-3	L-3 Communications, Inc.
LBP	Left Bottom Plug
LMP	Left Middle Plug
LO	Local Oscillator
LTP	Left Top Plug
LED	Light-Emitting Diode
LRU	Line Replaceable Unit
MCU	Modular Concept Unit
MOPS	Minimum Operational Performance Specification

Table 1-4: Acronyms and abbreviations

Acronym	Definition
NTS	National Technical Systems
PC	Personal Computer
PDL	Portable Data Loader
PWM	Pulse Width Modulation
QA	Quality Assurance
Qual	Qualification
RBP	Right Bottom Plug
RMP	Right Middle Plug
RTP	Right Top Plug
RCVR/Rx	Receiver
RF	Radio Frequency
RFI	Radio Frequency Interference
RS	Radiated Susceptibility
RTCA	Radio Technical Commission for Aeronautics
SRS	System Requirements Specification
SSA	System Safety Assessment
TAWS	Terrain Awareness and Warning System
TCAS	Traffic Alert and Collision Avoidance System
TSO	Technical Standard Order
TX/XMTR	Transmitter
UUT	Unit Under Test
VHF	Very High Frequency
XPDR	Transponder
XTAL	Crystal

2 GENERAL INFORMATION

2.1 Type Designation

The equipment has been designated by ACSS as T3CAS Integrated Platform, P/Ns 9005000-10000 (AC/DC Power).

2.2 Service and Rule for Intended Operation

Air Traffic Control
Part 87, Subpart A

2.3 Description of Equipment

2.3.1 T3CAS Functionality

The T3CAS Integrated Platform combines TCAS II, TAWS, Mode S Transponder, and ADS-B Functions in a single LRU. The T3CAS unit will meet the following TSO documents:

- TSO-C119b, TCAS-II
- TSO-C151b, TAWS
- TSO-C181c, Mode S Transponder
- TSO-C166a, 1090MHz ADS-B (Receive and Transmit)

2.3.1.1 Type of Emission

18MOP1D

2.3.1.2 Frequency Range

1030 ± 0.01 MHz and 1090 ± 1 MHz

2.3.1.3 Power Rating

0.4 to 500 Watts Peak Effective Radiated Power (Pulsed)

2.3.1.4 Final Power Amplifier

There are four chains. On each chain, the Power Amplifier stage comprises of three, narrowband RF stages, each employing enhancement mode, LDMOS FETs. The total power amplifier gain at 1 dB compression is approximately 48 dB at both 1030 and 1090 MHz. The final power amplifier is a 300W LDMOS TRANSISTOR and is configured for Class AB operation.

2.3.1.5 Active Device Functions

Table 2-1: T3CAS Active Devices

Function	Device Type	Part	Manufacterer
Oscillator	Temperature Compensated Crystal Oscillator (TCXO)	E4705	Rakon
	PLL Device with integrated VCO	ADF4360 chip	Analog Devices
Transmitter	Gain Block, Id = 35mA, 17 dB Gain	ADA-4643	AVAGO Technologies
	Gain Block, Id = 15mA, 15.1 dB Gain	ADA-4543	AVAGO Technologies
	Gain Block, Id = 60mA, 16.5 dB Gain	ADA-4743	AVAGO Technologies
	4W LDMOS Amplifier	SLD-1083CZ	RFMD/SIRENZA/Premier Devices Inc (PDI)
	12W LDMOS Amplifier	SLD-2083CZ	RFMD/SIRENZA/Premier

			Devices Inc (PDI)
	300W LDMOS Amplifier	BLA1011-300	NXP Semiconductor/Philips
Pulse Modulator and DPSK Modulator	14-bit DAC with internal PLL (uses DDS)	AD9722A	Analog Devices

2.3.2 Circuit Diagram

A block diagram and schematics will be provided with the FCC Form 731 when the application for certification is filed with the FCC.

2.3.3 Instruction Book

An ACSS document, System Description and Installation Manual, 8600200-001, provides instructions for the proper installation of the T3CAS Integrated Platform on a given aircraft.

2.3.4 Tune-up Procedure

No field tuning is required. Alignment is performed in the factory.

2.3.5 Oscillator Circuit

Two LO circuits exist in the T3CAS LRU. One LO generates the 1170 MHz signal used by the Transmitter CCA and by the Receiver self test oscillator. The second generates the 1202 MHz used by the eight receiver down converters. The LOs share the same 32MHz reference oscillator (Y1), and are nearly identical circuits. It is the programming provided by the FPGA that determines the LO frequency of each oscillator. Since the circuits are nearly identical, only one is described below.

2.3.6 LO Source Circuitry

The Receiver LO signal is generated in U9, and the Transmitter LO signal is generated in U135, which are both integrated VCO and phase-locked loop (PLL) circuits. On each, the LO signal output is passed through a series-resonant LC circuit formed and then passed to an RF amplifier via a pad. The output of the Receiver LO circuit is passed to the Receiver LO distribution circuitry, and the output of the Transmitter LO circuit amplifier is passed to the TX LO/Self test circuit.

The inductors are used to set the oscillation range when the LO is implemented using the ADF4360-7 component. The ADF4360-6 version requires a zero-ohm jumper at two of the inductors. The R-C network between pins 7 and 24 on each chip is part of the oscillator feedback circuit that affects stability, phase noise, and lock time. The signal pin 20 indicates when the PLL is in “locked” mode, which occurs after the inputs to the phase detector within the ADF4360 are in phase, and indicates that the oscillator is on frequency.

The control voltage input on pin 23 is the ”Chip Enable” signal, and must be driven by the TCAS FPGA (for the RX LO) or the TX FPGA (for the TX LO) to be high for normal LO operation.

Programming of the LO oscillator is done using the LE, CLK, and DATA inputs (Driven by Spartan 3 FPGA) to the ADF4360 chip.

2.3.7 Frequency Stabilization

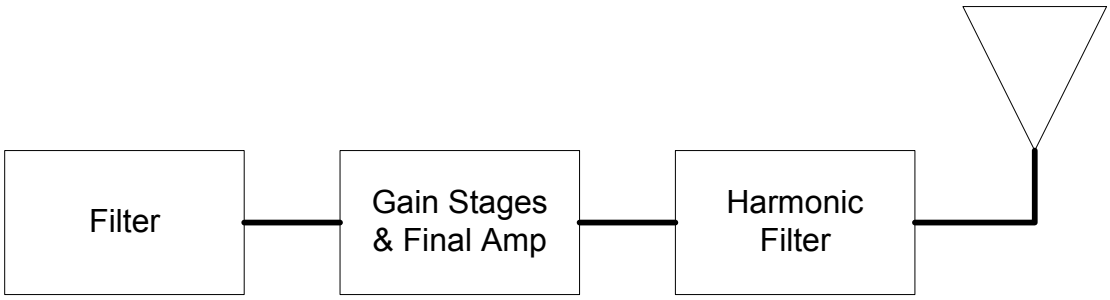
Temperature Compensated Crystal Oscillator (TCXO).

2.3.8 Modulation Limiting

Not Applicable

2.3.9 Radiated Interference Suppression

The modulation bandwidth of the pulsed signals (1030 and 1090 MHz) is controlled by affecting the rise and fall times (SPR Width – Mode S interrogation) of the RF pulses generated by the transmitter. Prior to the gain stages and final amplifier, there is a band pass filter intended to filter out spurious signals and attenuate sideband emissions caused by modulation. After the final amplifier, a harmonic filter is used to attenuate the 2nd and 3rd harmonics of the transmitted signal.



The spectral output for 1030 MHz transmissions will be limited to the following schedule:

Frequency difference (MHz from carrier)	Relative power (dB below maximum)
≥ 4, < 6	6
≥ 6, < 8	11
≥ 8, < 10	15
≥ 10, < 20	19
≥ 20, < 30	31
≥ 30, < 40	38
≥ 40, < 50	43
≥ 50, < 60	47
≥ 60, < 90	50
≥ 90	60

The spectral output for 1090 MHz transmissions will be limited to the following schedule:

Frequency difference (MHz from carrier)	Relative power (dB below maximum)
≥ 1.3, < 7	3
≥ 7, < 23	20
≥ 23, < 78	40
≥ 78	60

3 MODULATION DETAILS

3.1 ATCRBS Interrogations

Interrogations are sent out on an intentionally jittered 1+0.2 second interval in increasing power levels according to the schedules shown in Table 3-4, Table 3-5, and Table 3-6. By transmitting the weakest signals first only the closest aircraft will reply. The interrogations progress in a roughly circular pattern weighted toward the front of the aircraft since that is the area from which the greatest closing speeds originate. In areas of high density the sequence is halted when the computer has reached a limit defined by a complex set of three inequalities. In this manner, interference to other TCAS equipped aircraft in the area is minimized since the strongest interrogations are the first to be dropped. The priority of elimination of steps for interference limiting is also shown in Table 3-4, Table 3-5, and Table 3-6. This priority is inversely related to the order of the step sequence.

Pulse Widths: 0.8 + 0.05 usec
Rise Times (10% to 90%): ≥ 0.05 usec., < 0.1 usec
Fall Times (90% to 10%): ≥ 0.05 usec., < 0.2 usec

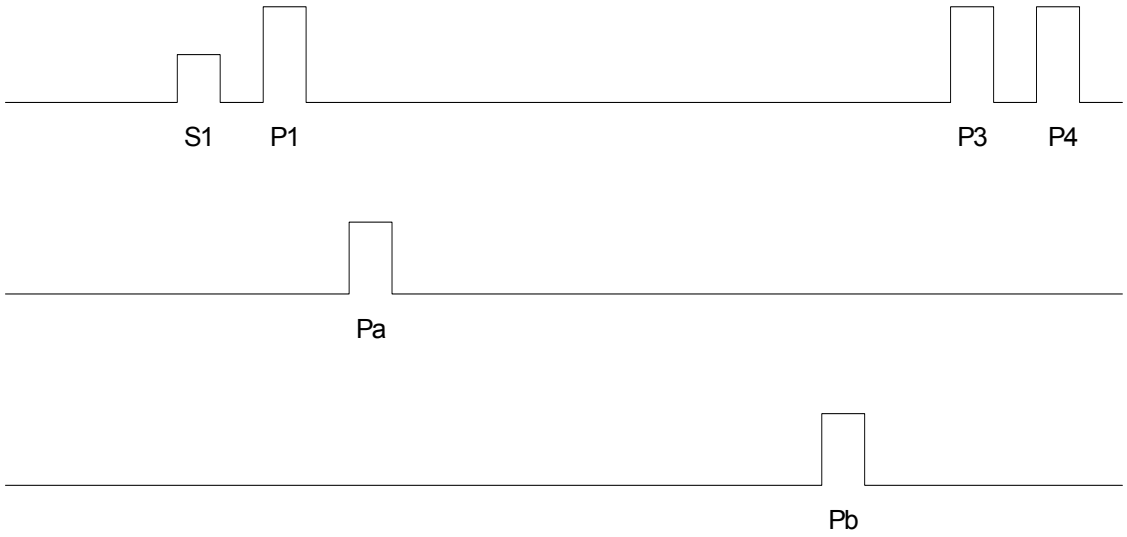


Figure 3-1: ATCRBS Interrogations

Pulses P1, P3, and P4 will appear in all interrogation steps of the whisper / shout sequence and will be at the same power level. Pulse S1 will appear in all steps except the initial step on each antenna direction and at a level two or three dB below the level of P1, etc. according to the schedules shown in Figure 3-1 through Figure 3-4. The steps occur at intervals of two milliseconds until the entire program is complete. The program length depends upon the individual aircraft installation. Options are available from using either an omni-directional bottom antenna or a directional bottom antenna. The top antenna is always directional. Pulses Pa and Pb are transmitted on the antenna. They are used for suppression of sensitivity of the receiving aircraft to the indicated pulses:

S1 = -2 microseconds
P1 = 0 microseconds
PA = 2 microseconds
PB = 19 microseconds
P3 = 21 microseconds
P4 = 23 microseconds

3.2 Mode S Interrogations

Details of the Mode S interrogations are shown in Figure 3-2 below. The preamble and the synchronizing phase reversal (SPR) will appear the same in all interrogations. The data block will be either 56 or 112 chips of 0.25 microseconds, depending upon the type of reply desired. The data chips will be reversed phase from their previous chips if their data bid are 1, they will remain the same phase as the previous chips is their data bits are 0. The allowable transition time of the phase reversals is a maximum of 80 nanoseconds. The Mode S interrogations are transmitted after the whisper/shout sequence of ATCRBS interrogations. When no Mode S equipped aircraft are replying, the TCAS CU sends out Mode S broadcast interrogations based upon a 10 second pattern with 2 or 3 seconds between transmissions on the four lobes of the antenna. The time remaining after the Mode S transmissions are completed is used as a listening period for other unacquired aircraft.

- Preamble Pulse Widths: 0.8 + 0.05 usec
- Rise Times (10% to 90%): < 0.1 usec
- Fall Times (90% to 10%): < 0.2 usec

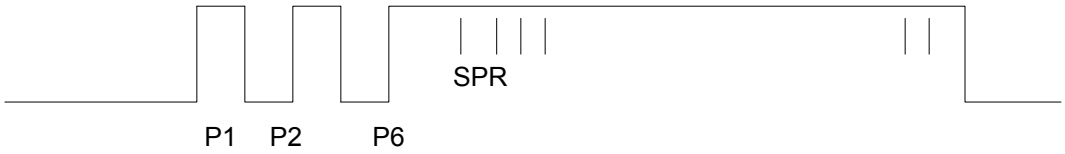


Figure 3-2: Mode S Interrogations

Timing of the Mode S interrogations is as follows, referenced to the leading edge of the P1 pulse:

Table 3-1: Mode S Interrogations Timing

Pulse	Distance
P1	0.0 microseconds
P2	2.0 microseconds
P6	3.5 microseconds
SPR	4.75 microseconds
Bit 1	5.25 microseconds
End P6	19.75 microseconds (56 bits) 33.75 microseconds (112 bits)

Table 3-2: Mode S Interrogations, Omni-directional Antenna

Omni-Directional Antenna		
Nominal Power Levels (dB relative to full power)		
Level	**P1,P3, P4 Pulses**	**S1 Pulse**
00	-13	-16
01	-15	-18
02	-17	-20
03	-19	-22
04	-21	-24
05	-23	-26
06	-25	none

Table 3-3: Mode S directional Antenna Interrogation Transmission Levels

Directional Antenna			
Nominal Power Levels (dB relative to full power)			
Level	**P1,P3, P4**	**S1 Pulse**	**Pa, Pb Pulse**
D0	0	-3	-2
D1	-1	-3	-3
D2	-2	-5	-4
D3	-3	-5	-5
D4	-4	-7	-6
D5	-5	-7	-7
D6	-6	-9	-8
D7	-7	-9	-9
D8	-8	-11	-10
D9	-9	-11	-11
D10	-10	-13	-12
D11	-11	-13	-13
D12	-12	-15	-14
D13	-13	-15	-15
D14	-14	-17	-16
D15	-15	-17	-17
D16	-16	-19	-18
D17	-17	-19	-19
D18	-18	-21	-20
D19	-19	-21	-21
D20	-20	-23	-22
D21	-21	-23	-23
D22	-22	-25	-24
D23	-23	-25	-25
D24	-24	-27	-26
D25	-25	-27	-27
D26	-26	--	-16 (P4 only)

Table 3-4: Top Directional/Bottom –Omni-Directional Interrogation Sequence

Bottom Omni-Directional Antenna			
Interference Limiting Priority / Interrogation Level			
98 / 06			
97 / 05			
96 / 04			
95 / 03			
94 / 02			
93 / 01			
92 / 00			
Top Directional Antenna			
Interference Limiting Priority / Interrogation Level			
0°	**180°**	**90°**	**270°**
91 / D26	-	-	-
90 / D25	-	-	-
89 / D24	-	-	-
88 / D23	-	87 / D26	86 / D26
85 / D22	-	84 / D25	83 / D25
82 / D21	-	81 / D24	80 / D24
79 / D20	-	78 / D23	77 / D23
76 / D19	-	75 / D23	74 / D22
73 / D18	72 / D26	71 / D21	70 / D21
69 / D17	68 / D25	67 / D20	66 / D20
65 / D16	64 / D24	63 / D20	62 / D19
61 / D15	60 / D23	59 / D18	58 / D18
57 / D14	56 / D22	55 / D17	54 / D17
49 / D12	48 / D20	47/ D15	46 / D15
45 / D11	44 / D19	43 / D14	42 / D14
41 / D10	40 / D18	39 / D13	38 / D13
37 / D9	36 / D17	35 / D12	34 / D12
33 / D8	32 / D16	31 / D11	30 / D11
29 / D7	28 / D15	27 / D10	26 / D10
25 / D6	24 / D14	23 / D9	22 / D9
21 / D5	20 / D13	19 / D8	18 / D8
17 / D4	16 / D12	15 / D7	14 / D7
13 / D3	12 / D11	11 / D6	10 / D6
9 / D2	8 / D10	7 / D5	6 / D5
5 / D1	4 / D10	3 / D4	2 / D4
1 / D0	**-**	**-**	**-**

(Interrogation sequence is right to left, top to bottom)

Table 3-5: Top Directional/Bottom Directional Interrogation Sequence

Interference Limiting Priority / Interrogation Level							
Top Directional Antenna				**Bottom Directional Antenna**			
0°	**180°**	**90°**	**270°**	**0°**	**180°**	**90°**	**270°**
113 / D26	-	-	-	112 / D26	-	-	-
111/ D25	-	-	-	-	110 / D25	-	-
109/ D24	-	-	-	108 / D24	-	-	-
107/ D23	-	-	-	106 / D23	-	-	-
-	-	105 / D26	104 / D26	-	-	103 / D26	102 / D26
101 / D22	-	-	-	100 / D22	-	-	-
-	-	99 / D25	98 / D25	-	-	97 / D25	96 / D25
95 / D21	-	-	-	94 / D21	93 / D26	-	-
-	-	92 / D24	91 / D24	-	-	90 / D24	89 / D24
88 / D20	-	-	-	87 / D20	86 / D25	-	-
-	-	85 / D23	84 / D23	-	-	83 / D23	82 / D23
81 / D19	-	-	-	80 / D19	79 / D24	-	-
-	-	78 / D22	77 / D22	-	-	76 / D22	75 / D22
74 / D18	-	-	-	73 / D18	-	-	-
-	72 / D26	71 / D21	70 / D21				
69 / D17	68 / D25	67 / D20	66 / D20				
65 / D16	64 / D24	63 / D19	62 / D19				
61 / D15	60 / D23	59 / D18	58 / D18				
57 / D14	56 / D22	55 / D17	54 / D17				
53 / D13	52 / D21	51 / D16	50 / D16				
49 / D12	48 / D20	47 / D15	46 / D15				
41 / D10	40 / D18	39 / D13	38 / D13				
37 / D9	36 / D17	35 / D12	34 / D12				
33 / D8	32 / D16	31 / D11	30 / D11				
29 / D7	28 / D15	27 / D10	26 / D10				
25 / D6	24 / D14	23 / D9	22 / D9				
21 / D5	20 / D13	19 / D8	18 / D8				
17 / D4	16 / D12	15 / D7	14 / D7				
13 / D3	12 / D11	11 / D6	10 / D6				
9 / D2	8 / D5	7 / D5	6 / D5				
5 / D1	4 / D9	3 / D4	2 / D4				
1 / D0	-	-	-	Interrogations for each sector that has a TA or RA present .			
				1/ D17	1 / D23	1 / D21	1 / D21
				1 / D16	1 / D22	1 / D20	1 / D20
				1 / D15	1 / D21	1 / D19	1 / D19
				1 / D14	1 / D20	1 / D18	1 / D18
				1 / D13	1 / D19	1 / D17	1 / D17
					1 / D18	1 / D16	1 / D16
					1 / D17	1 / D15	1 / D15
					1 / D16	1 / D14	1 / D14
					1 / D15	1 / D13	1 / D13
					1 / D14		
					1 / D13		

(Interrogation sequence is right to left, top to bottom)

3.3 ATCRBS Replies

ATCRBS replies are pulse amplitude modulated signals (PAM), and are formed in response to Mode A or Mode C interrogations. Mode A replies consist of a 4096 code which is an identifier and an optional SPI pulse. The Transmitter CCA transmits ATCRBS reply pulse waveforms as shown in Figure 3-3.

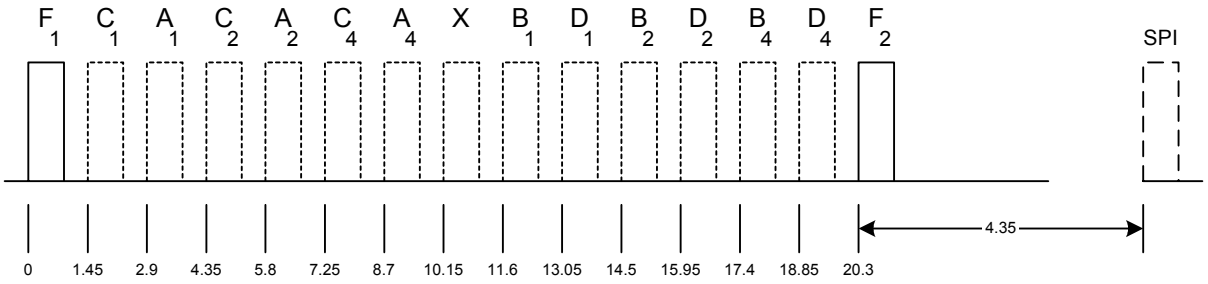


Figure 3-3: ATCRBS Reply

The designator of the information pulses and their positions from the first framing pulse are as follows:

Table 3-6: ATCRBS Reply Pulse Characteristics/Position

Pulse	Position (μsec)
FIRST FRAMING PULSE	0.0
C1	1.45
A1	2.90
C2	4.35
A2	5.80
C4	7.25
A4	8.70
X[1]	10.15
B1	11.60
D1	13.05
B2	14.50
D2	15.95
B4	17.40
D4	18.85
LAST FRAMING PULSE	20.30
SPI	24.65

Note 1: The X pulse is referenced here for possible future use.

The ATCRBS Reply Pulse Spacing Tolerance is as follows:

- First framing pulse to information/last framing pulse ± 0.1 μsec
- Last framing pulse to SPI pulse ± 0.1 μsec
- Any 2 pulses in pulse group (except First framing pulse) ± 0.15 μsec

The ATCRBS pulse characteristics are as specified in Table 3-7.

Table 3-7: ATCRBS Reply Pulses (in microseconds)

			Rise Time		Decay Time	
Pulse Designator	**Pulse Duration**	**Duration Tolerance**	**Min.**	**Max.**	**Min.**	**Max**
ATCRBS Reply Pulses	0.45	± 0.10	0.05	0.1	0.05	0.2

3.4 Mode S Replies

Mode S (Short & Long) replies, including preamble, data pulse, pulse shape, pulse spacing tolerance, and delay and jitter characteristics will be as follows.

The Transmitter CCA transmits Mode S reply pulse waveforms as shown in Figure 3-4.

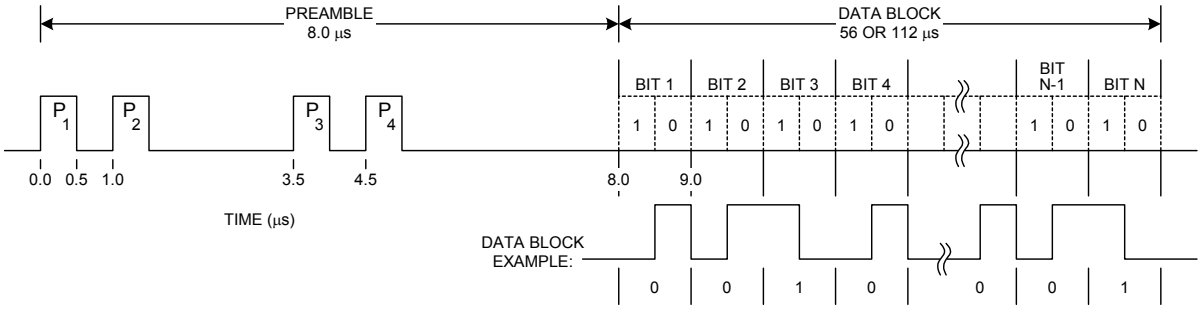


Figure 3-4: Mode S Reply

1. Mode S Reply
   a. The Mode S preamble consists of four 0.5 ± 0.05 microsecond pulses.
   b. The second, third and fourth pulses are spaced 1.0, 3.5, and 4.5 microseconds respectively from the first transmitted pulse.
   c. The block of reply data pulses begins 8.0 microseconds after the first transmitted pulse and is either 56 or 112 one microsecond intervals depending on the type of Mode S Reply.
   d. A pulse with a width of 0.5 ± 0.05 microseconds is transmitted either in the first (data bit "1") or in the second half (data bit "0") of each interval. Also, if a pulse transmitted in the second half of one interval is followed by a pulse transmitted in the first half of the next interval, the two pulses merge. Once the merging occurs, a 1.0 ± 0.05 microsecond pulse is transmitted
2. Mode S Reply Pulse Shape
   a. The pulse rise and decay time are as specified in Table 3-8.

Table 3-8: Mode S Reply Pulses (in microseconds)

	Rise Time		Decay Time	
Pulse Designator	**Min.**	**Max.**	**Min.**	**Max**
Mode S Reply Pulses	0.05	0.1	0.05	0.2

3. Mode S Reply Pulse Spacing Tolerance
   a. Mode S Reply pulses start at a defined multiple of 0.5 microseconds from the first transmitted pulse.
   b. The pulse position tolerance be ± 0.05 microseconds, measured from the first pulse of the reply.

4 EQUIPMENT AND SETUP

4.1 Test Equipment

The test equipment used, are listed in each test results section below.

4.1.1 Setup Block Diagram

Setup block diagrams are shown in each test results section below.

4.2 LRU Setup

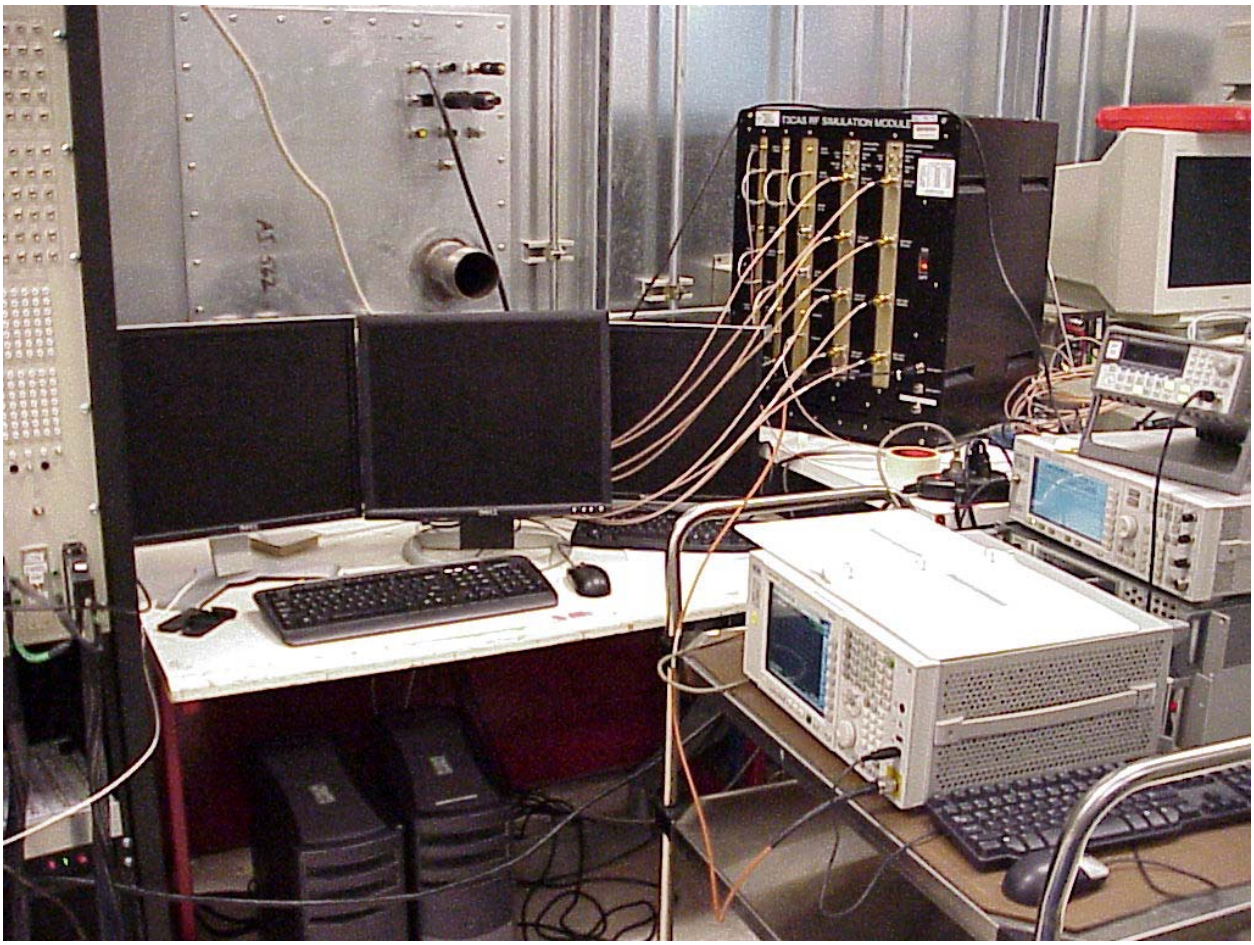


Figure 4-1: Test Equipment Setup

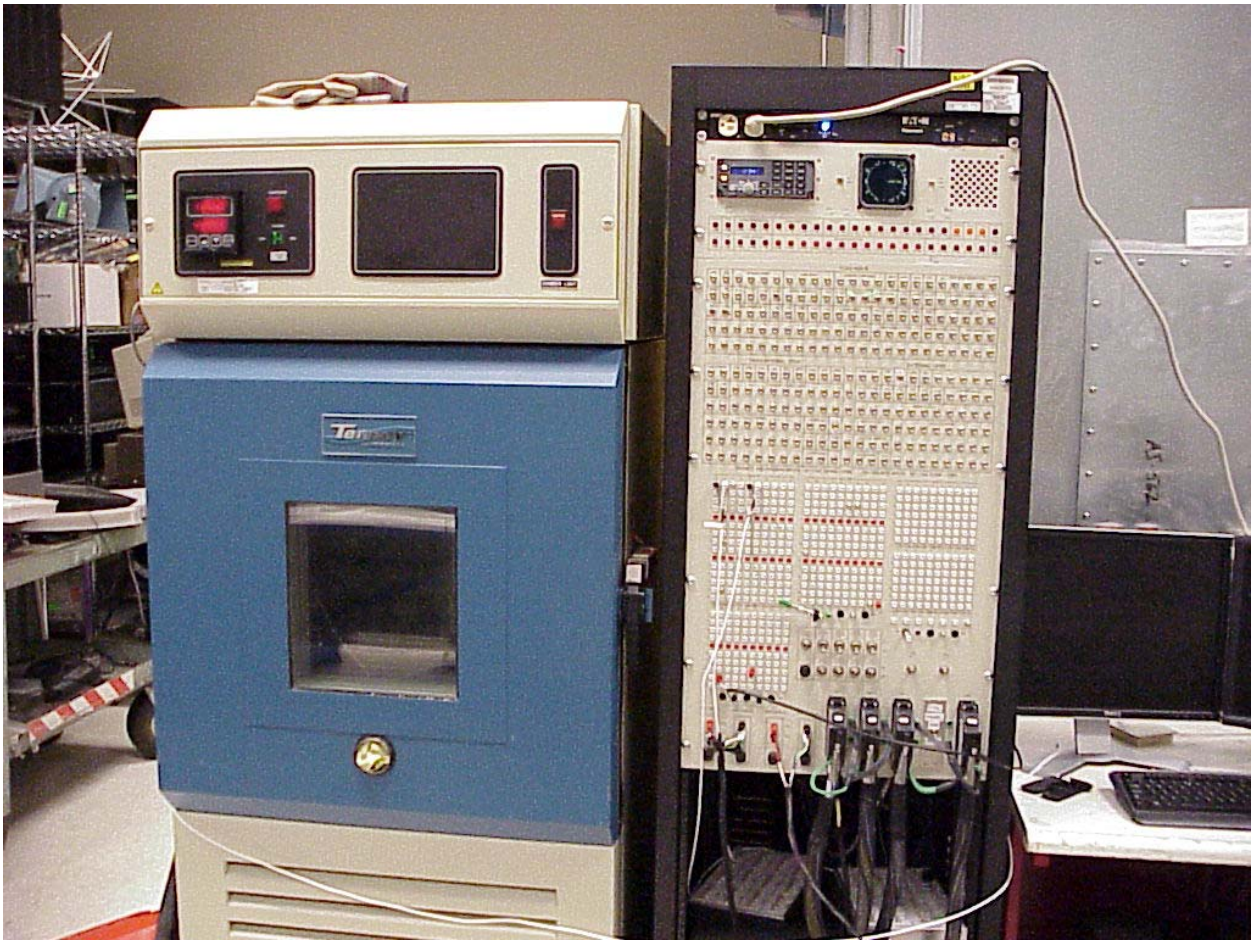


Figure 4-2: Test Equipment Setup and Temperature Chamber

4.2.1 Hardware Configuration

Testing was conducted on a single T3CAS LRU ACSS P/N 9005000-10001, S/N TQE00214 which was built using factory methods to hardware MOD C.

4.2.2 Software Configuration

Prior to testing, the software part numbers were acquired from the unit and are listed in Figure 4-3.

```
CCP PART NUMBERS and CRCs

Hardware
   LRU Part Number: F9005000-10GDD
   LRU Serial Number: TQE00214
   Hardware Mod Level: C
   Hardware Info: 9005110-001
P1 Application Software
   Part Number: RL51001-023
   CRC: 0x9B47D120
P2 Application Software
   Part Number: RL51002-020
   CRC: 0x2DD7FB8C
P3 Application Software
   Part Number: RL51003-020
   CRC: 0x3F7A71B9
AAA/ASDB Database
   Part Number: RL54001-013
   CRC: 0x9CC94F97
APM ACD Databases
   Part Number: ------------------
   CRC: 0x00000000
Obstacle Database
   Part Number: RL47001-004
   CRC: 0xC8EAA445
Terrain Database
   Part Number: RL46001-007
   CRC: 0x52595BA1
P1 Boot Software
   Part Number: RL53001-005
   CRC: 0x178AF8E1
P2 Boot Software
   Part Number: RL53002-005
   CRC: 0x178AF8E1
P3 Boot Software
   Part Number: RL53003-005
   CRC: 0x178AF8E1
P1 Dataloader Software (Copy 1)
   Part Number: RL52001-004
   CRC: 0xFD6C30C1
P1 Dataloader Software (Copy 2)
   Part Number: RL52001-004
   CRC: 0xFD6C30C1
P2 Dataloader Software (Copy 1)
   Part Number: RL52002-004
   CRC: 0xBB564E21
P2 Dataloader Software (Copy 2)
   Part Number: RL52002-004
   CRC: 0xBB564E21
P3 Dataloader Software (Copy 1)
   Part Number: RL52003-004
   CRC: 0x3D79AE69
P3 Dataloader Software (Copy 2)
   Part Number: RL52003-004
   CRC: 0x3D79AE69
IOC FPGA (Copy 1)
   Part Number: RL9005101-009
   CRC: 0x7823B3F2
IOC FPGA (Copy 2)
   Part Number: RL9005101-009
   CRC: 0x7823B3F2
TCAS FPGA
   Part Number: RL9005102-009
   CRC: 0x824C009C
TX FPGA
   Part Number: RL9005104-005
   CRC: 0x37817EF6
XPDR FPGA
   Part Number: RL9005103-005
   CRC: 0x290F147B
```

Figure 4-3: TQE00214 Part Number Dump

5 DRAWINGS AND PHOTOGRAPHS

5.1 Drawings

End Item and its associated drawings will be furnished with the applications. Refer to Table 1-2 for a list of these ACSS drawings that will be furnished with the application.

5.2 Photographs

Photographs of the T3CAS unit illustrating the assembly drawings are found in Figure 5-1 through Figure 5-18. All original photographs are available for inspection.

Figure 5-1: T3CAS Front Name Plate

Figure 5-2: Back Panel Showing ARINC Connector

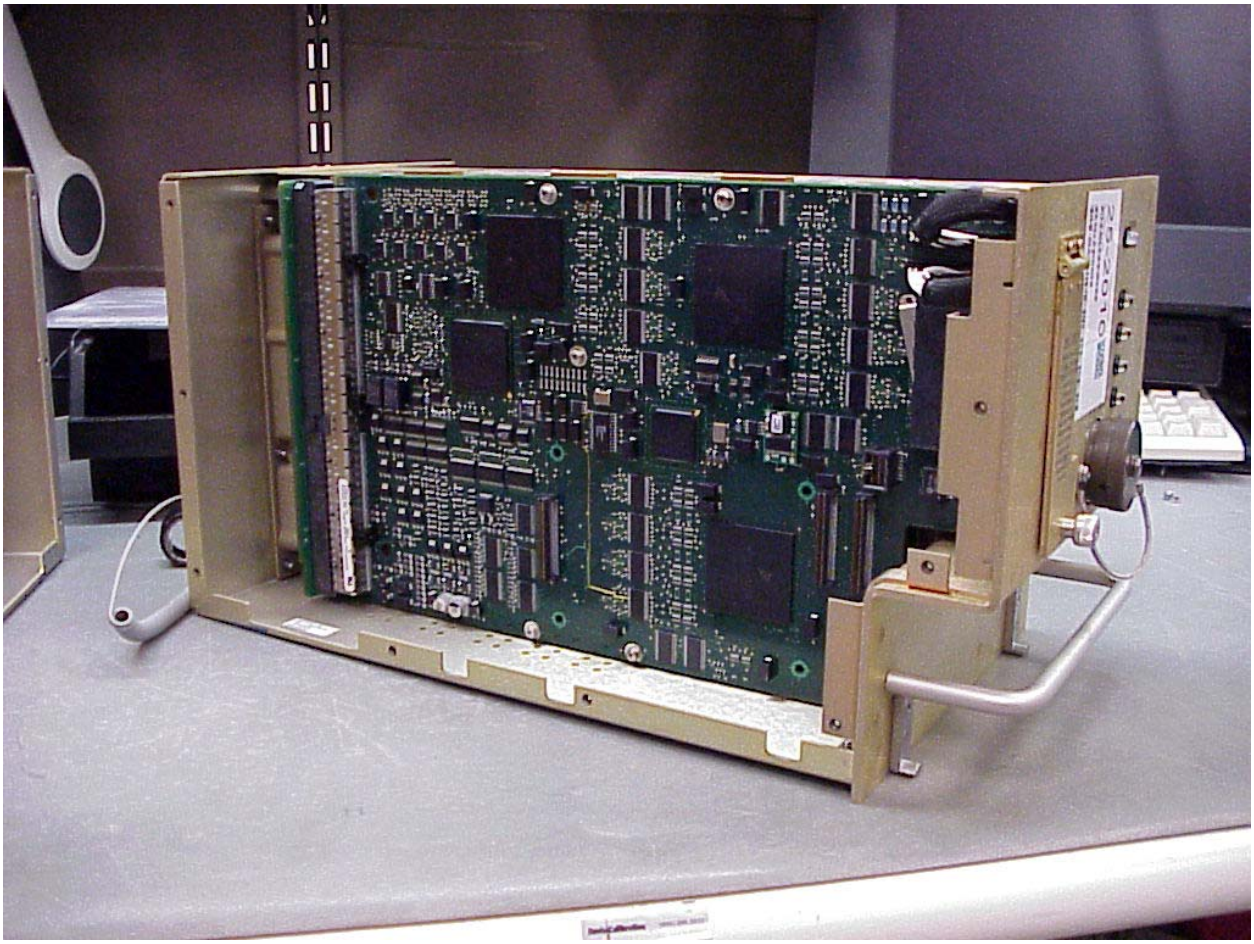


Figure 5-3: Left Side View, Covers Removed

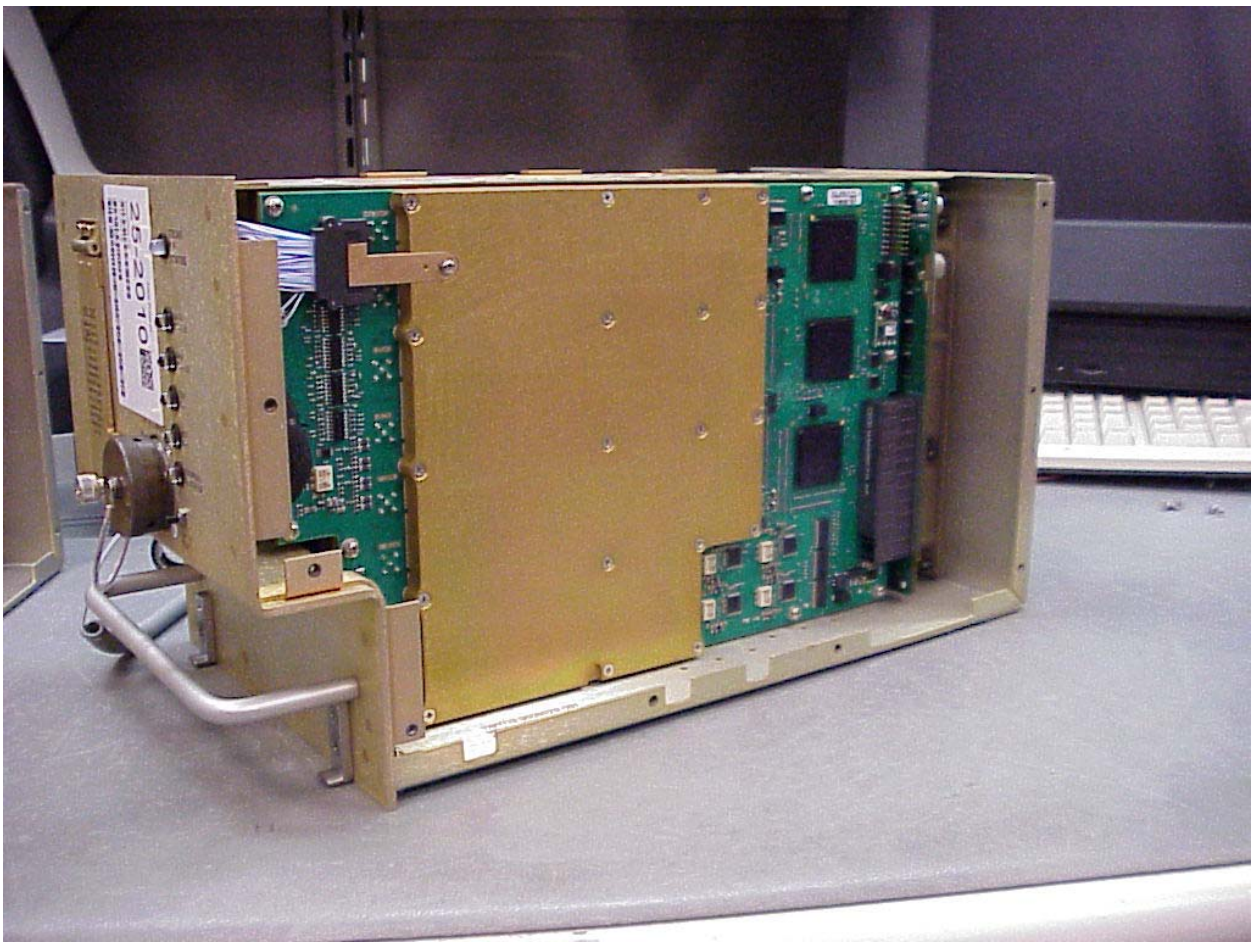


Figure 5-4: Right Side View Covers Removed, Showing A5 Receiver CCA

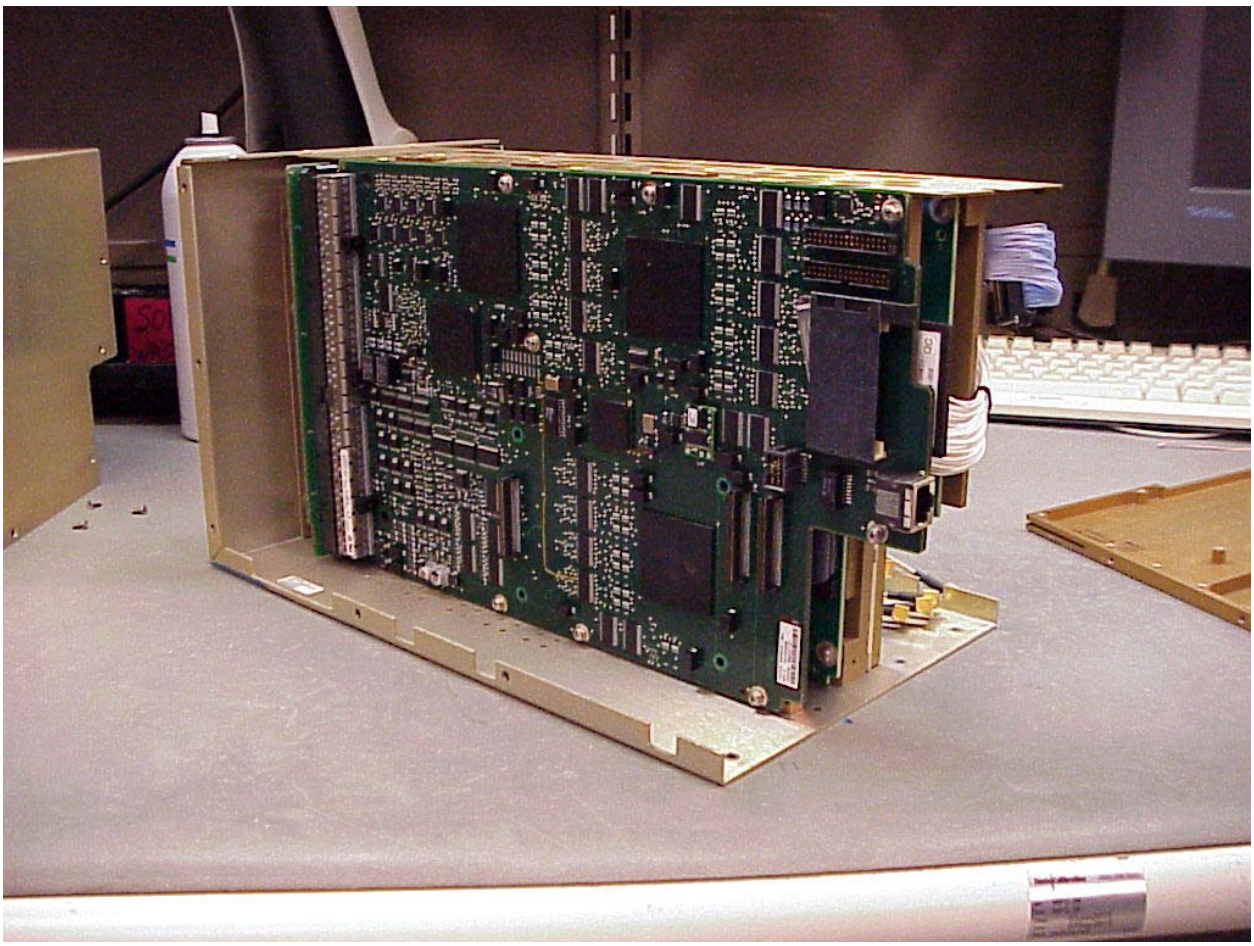


Figure 5-5: View Showing A2 Processor CCA

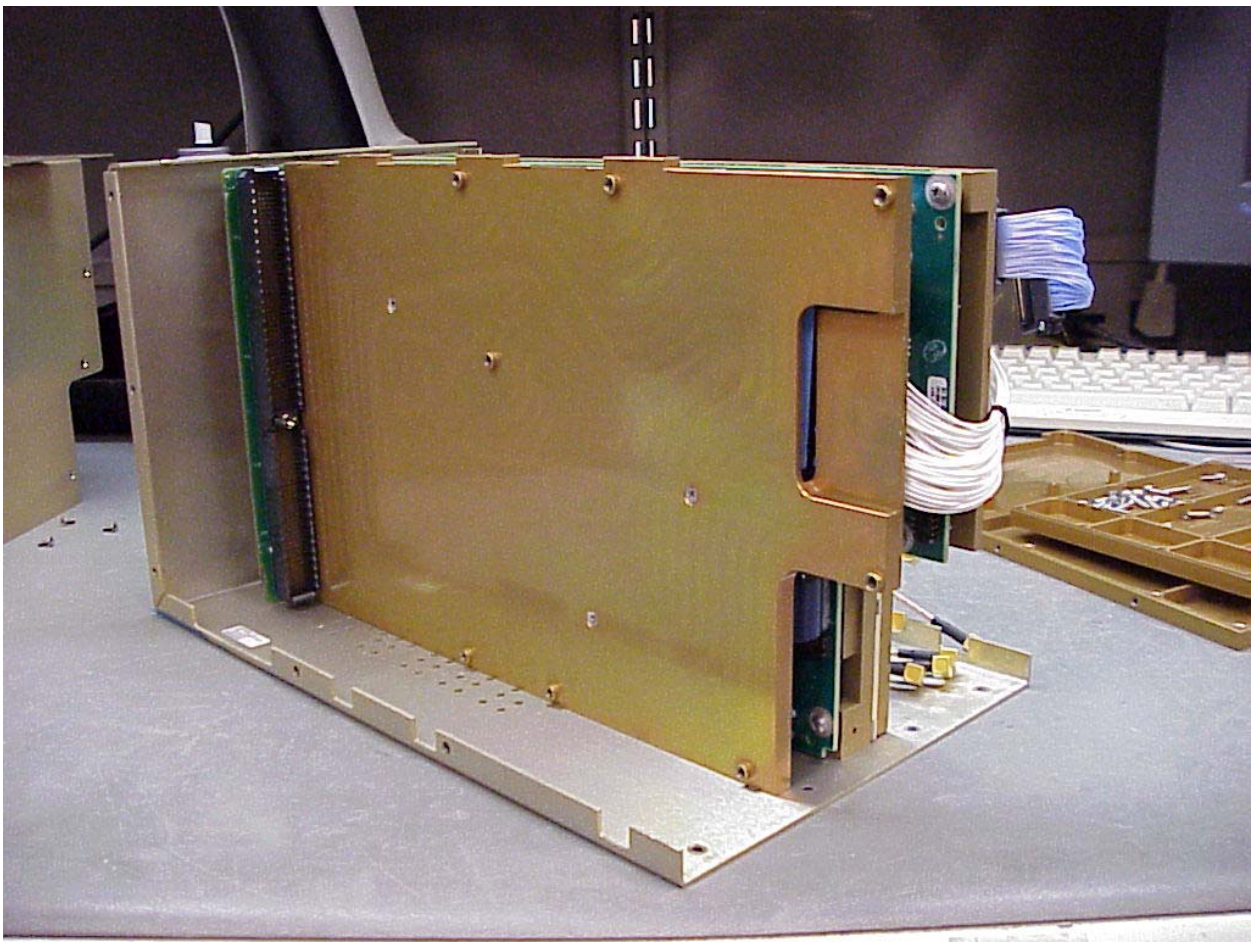


Figure 5-6: View Showing A3 Power Supply Heat Sink, Processor CCA Removed

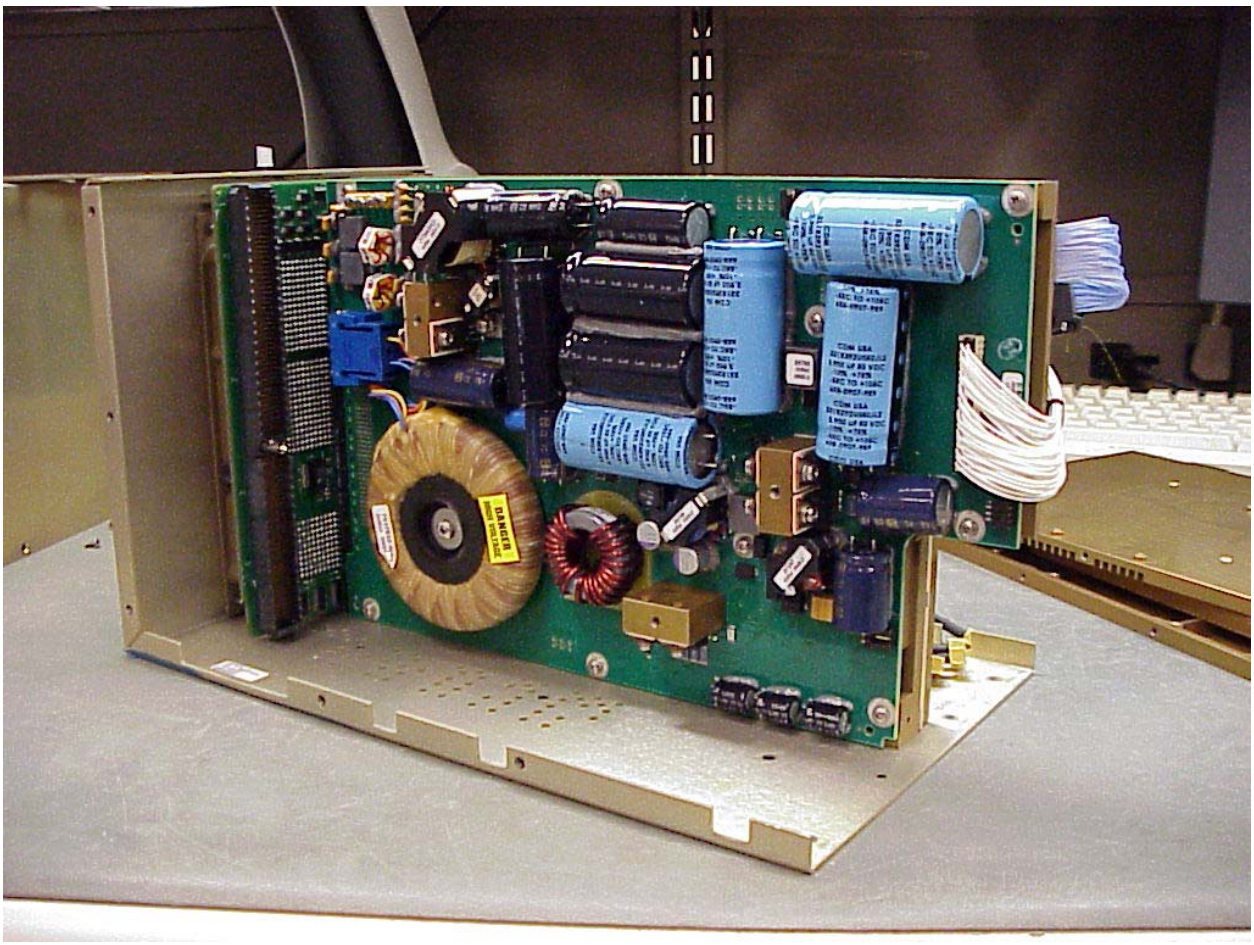


Figure 5-7: View Showing A3 Power Supply CCA

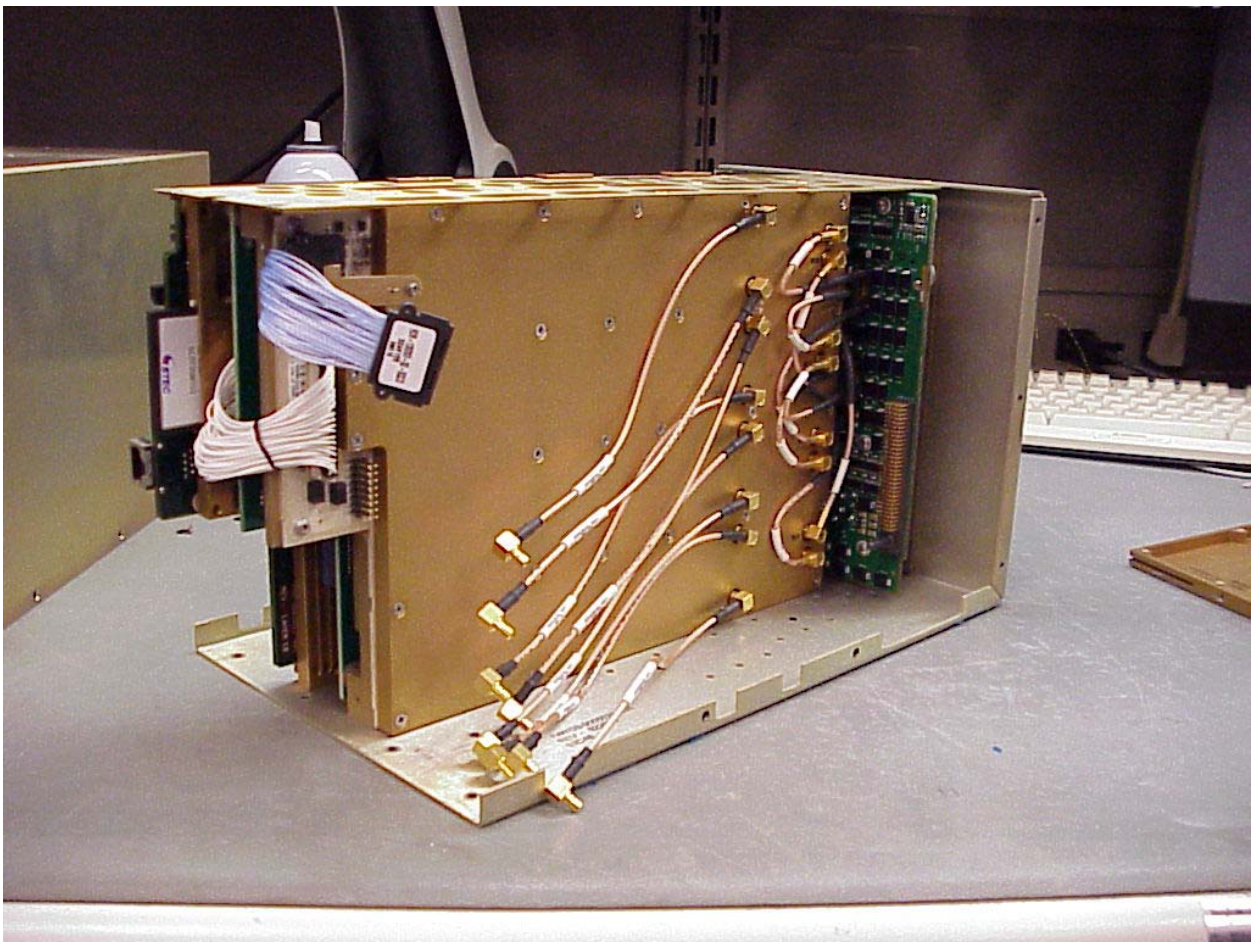


Figure 5-8: View Showing A4 Transmitter CCA, A5 Receiver Removed

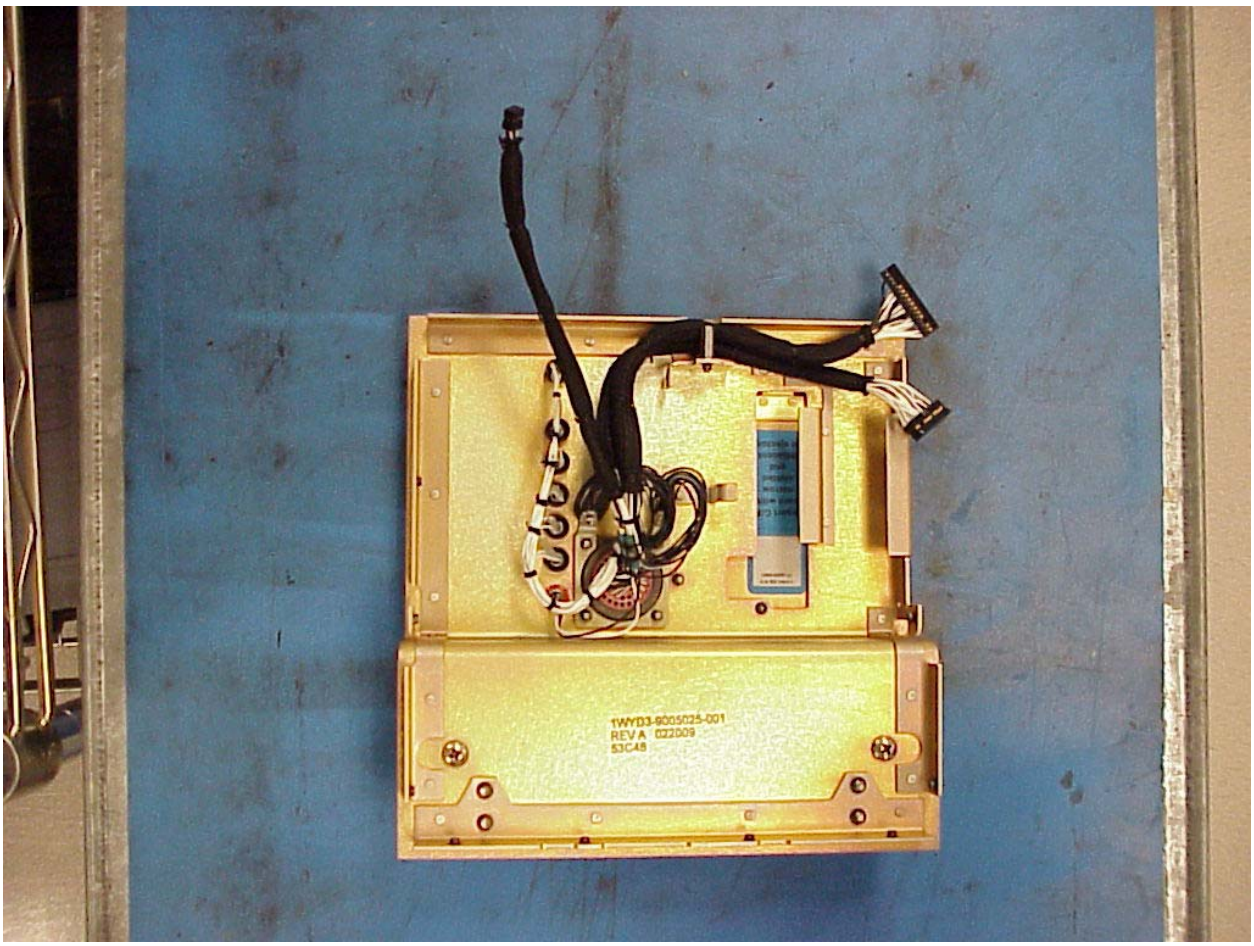


Figure 5-9: View Showing Front Plate Assembly

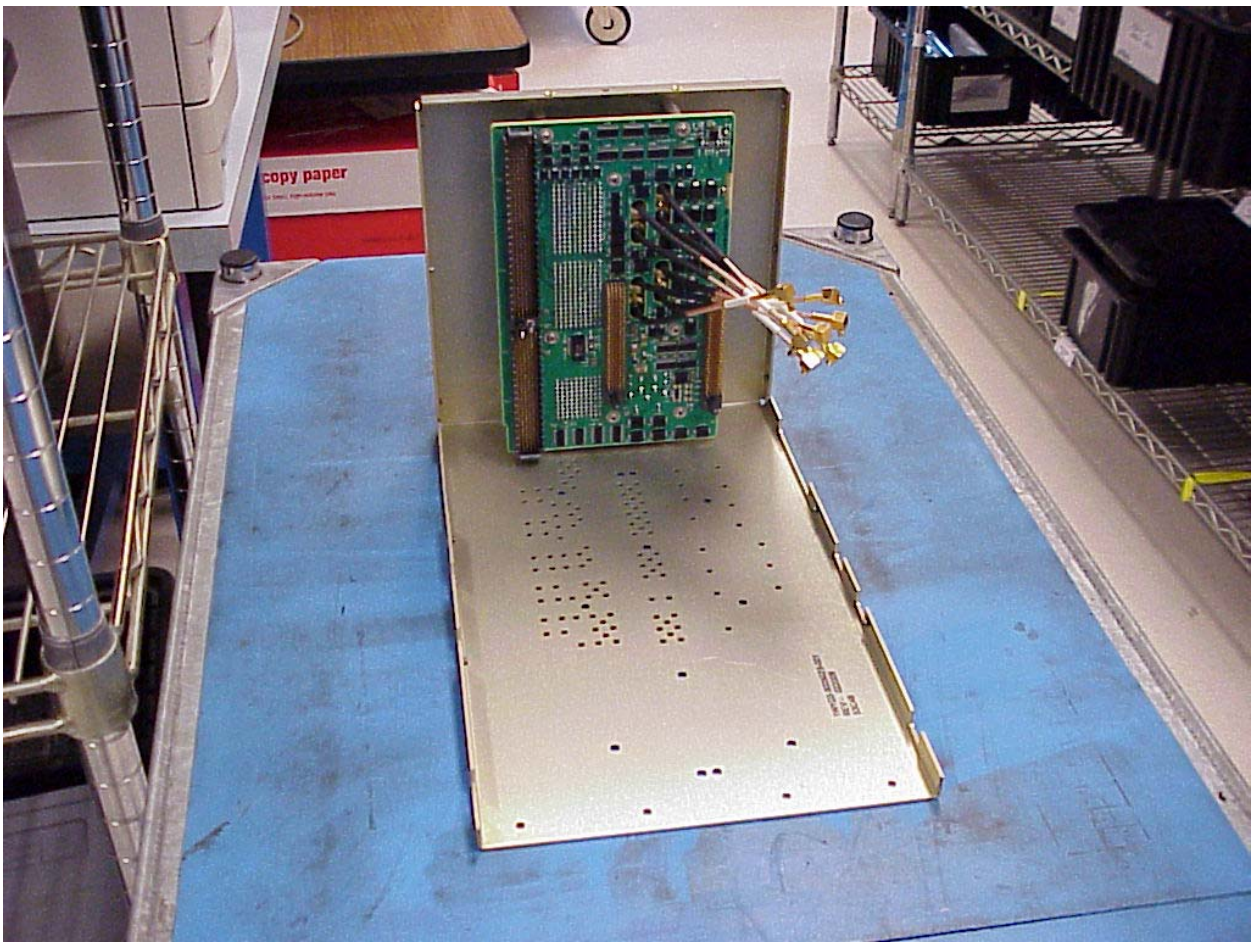


Figure 5-10: View Showing A1 Interconnect CCA

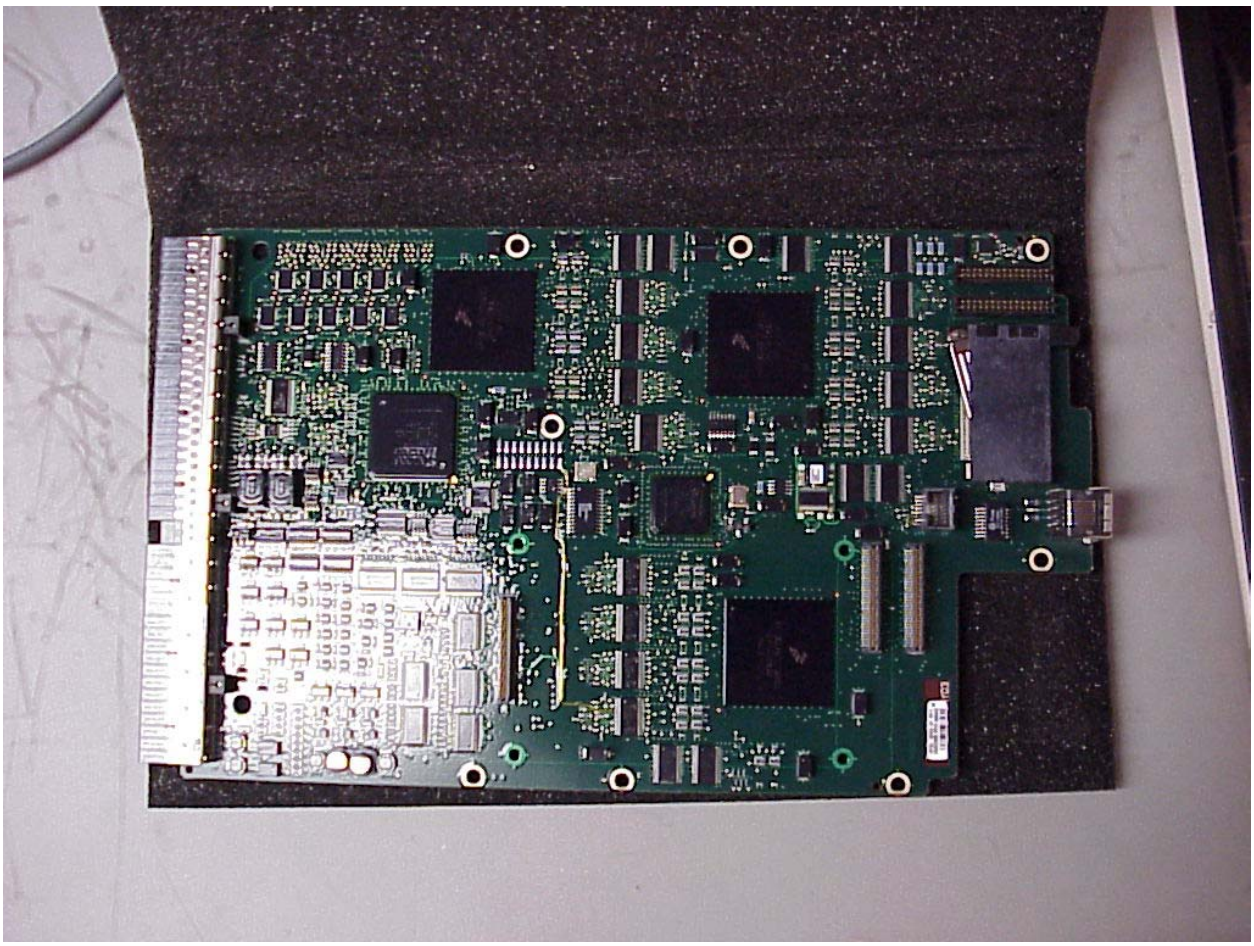


Figure 5-11: Front Side View of A2 Processor CCA

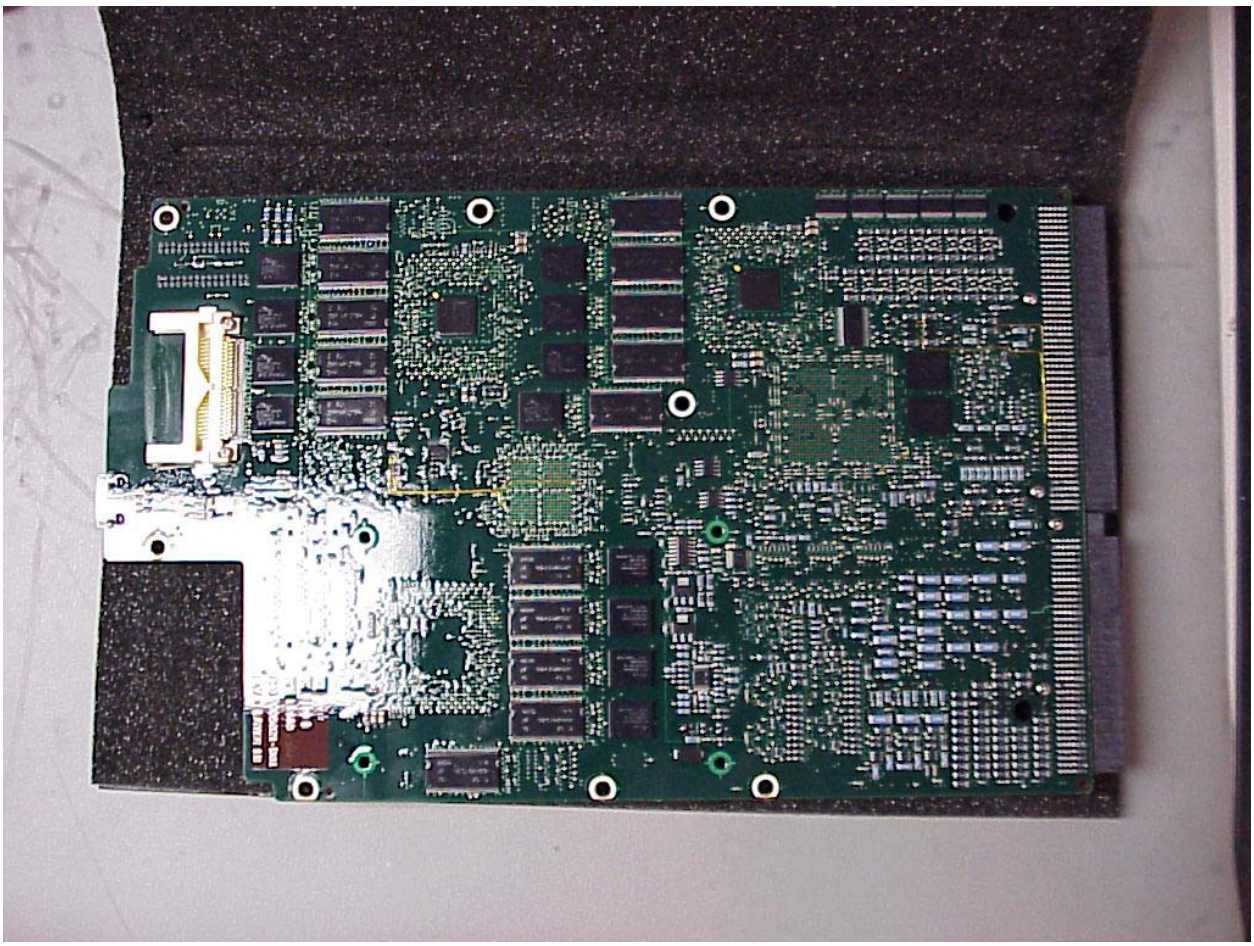


Figure 5-12: Back Side View of A2 Processor CCA

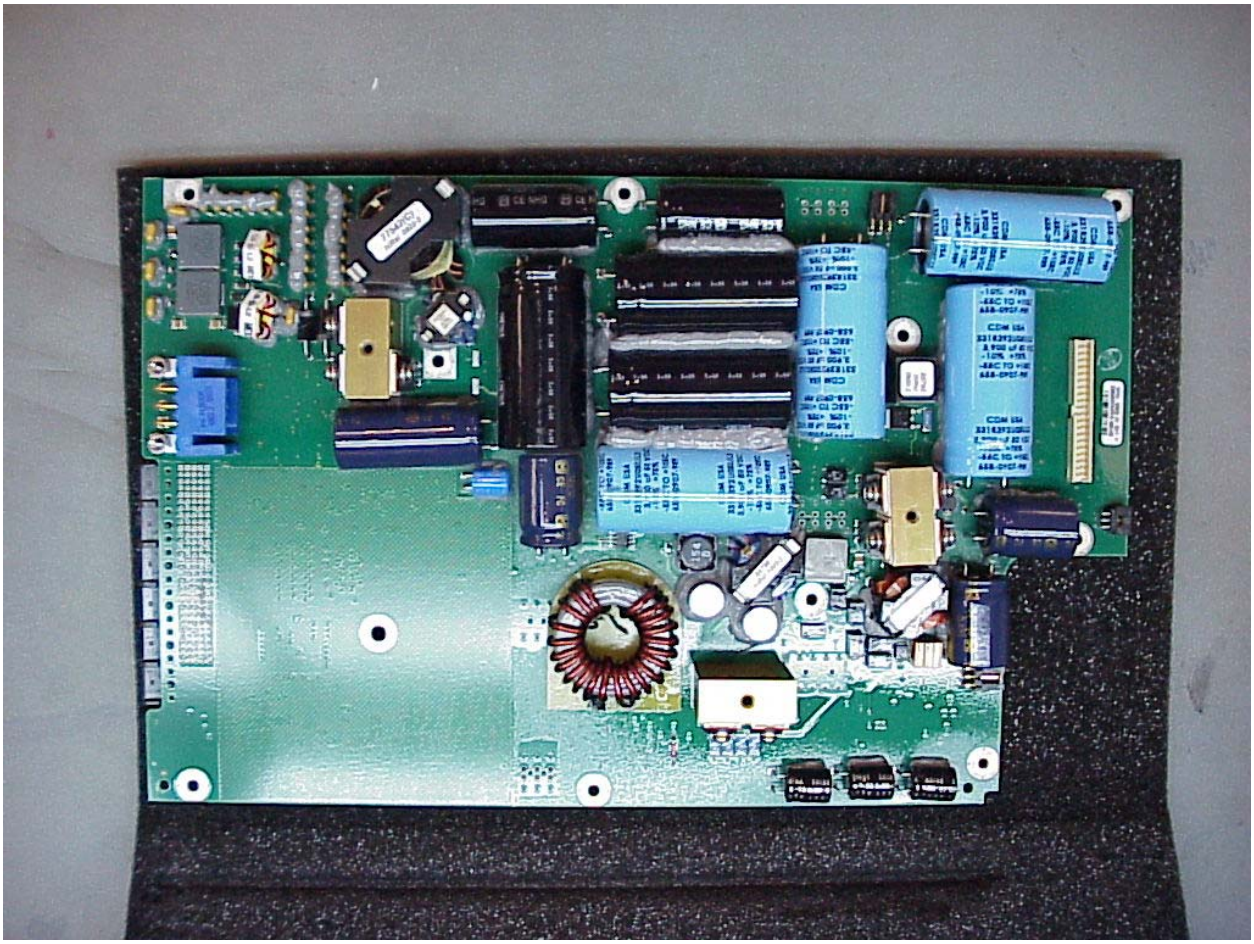


Figure 5-13: Front Side View of A3 Power Supply Assembly

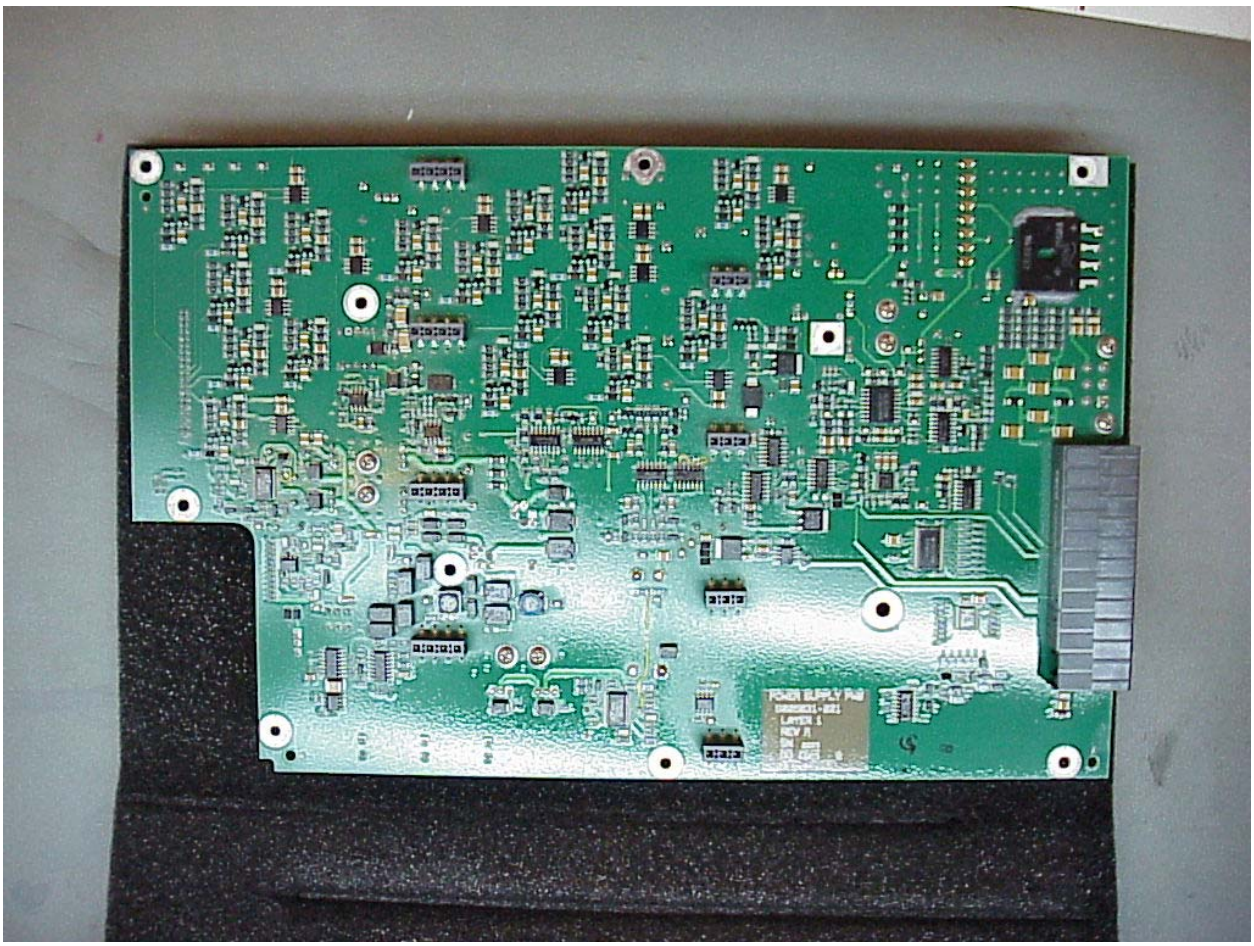


Figure 5-14: Back Side View of A3 Power Supply Assembly

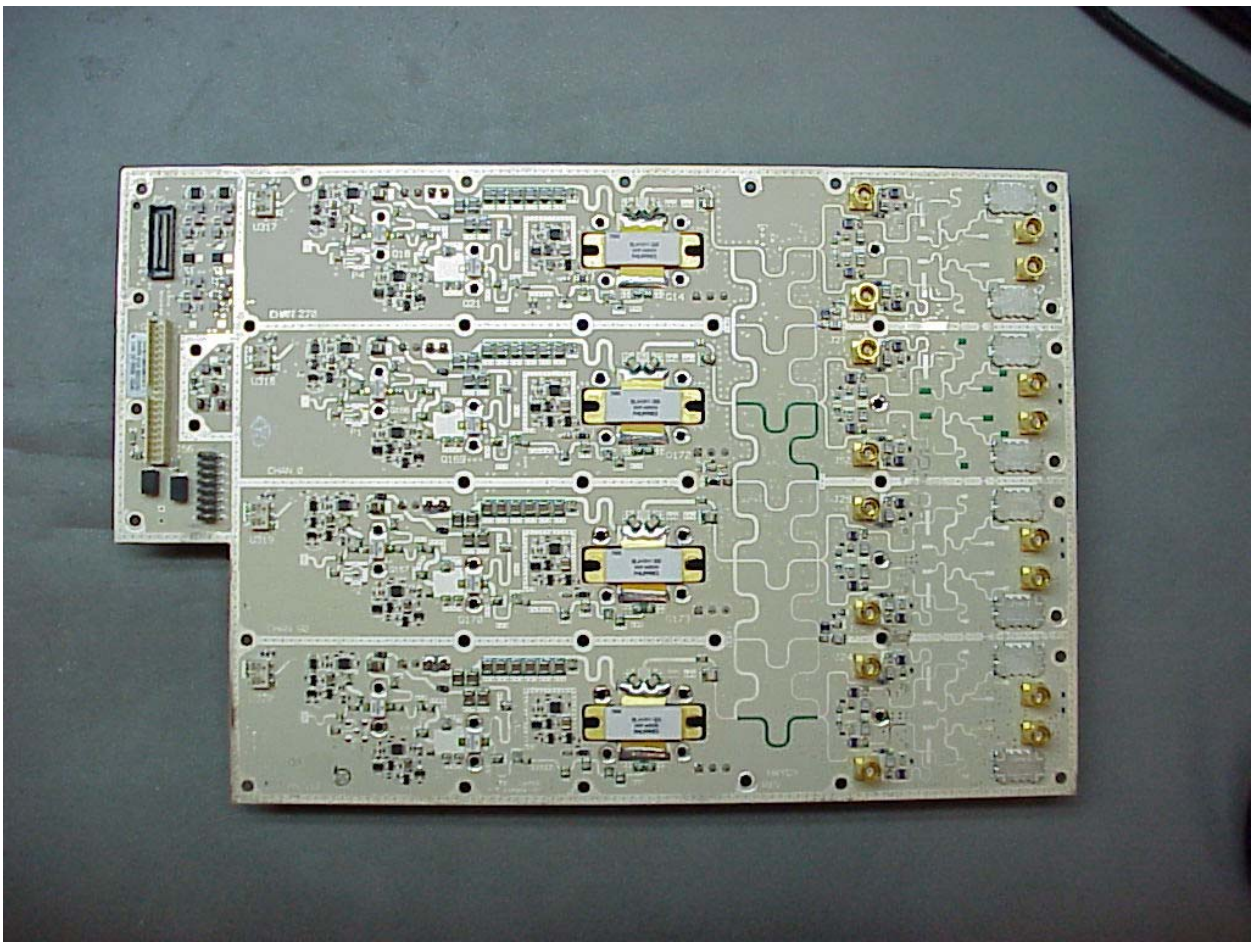


Figure 5-15: Front Side View of A4 Transmitter Assembly, Cover Removed

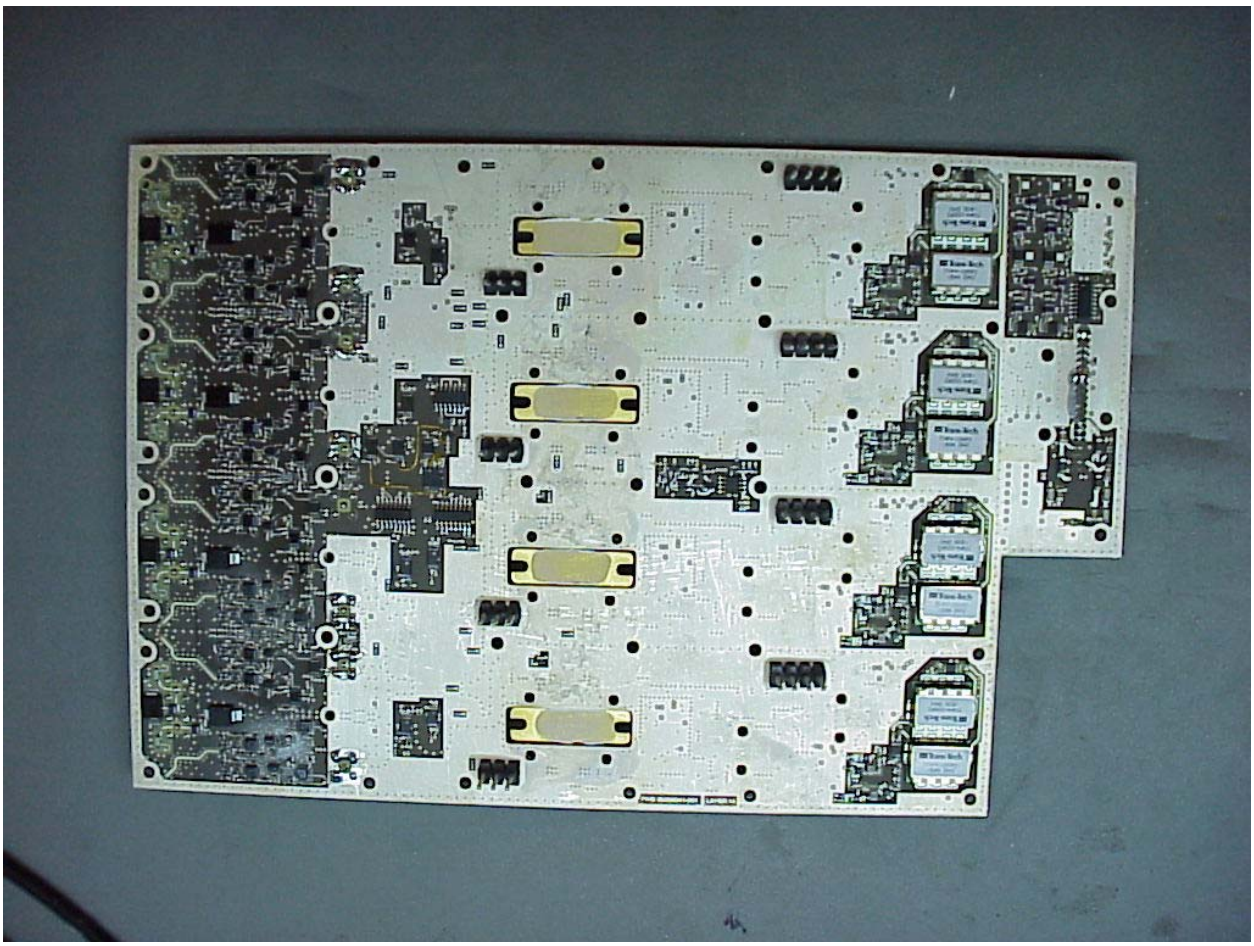


Figure 5-16: Back Side View of A4 Transmitter Assembly, Cover Removed

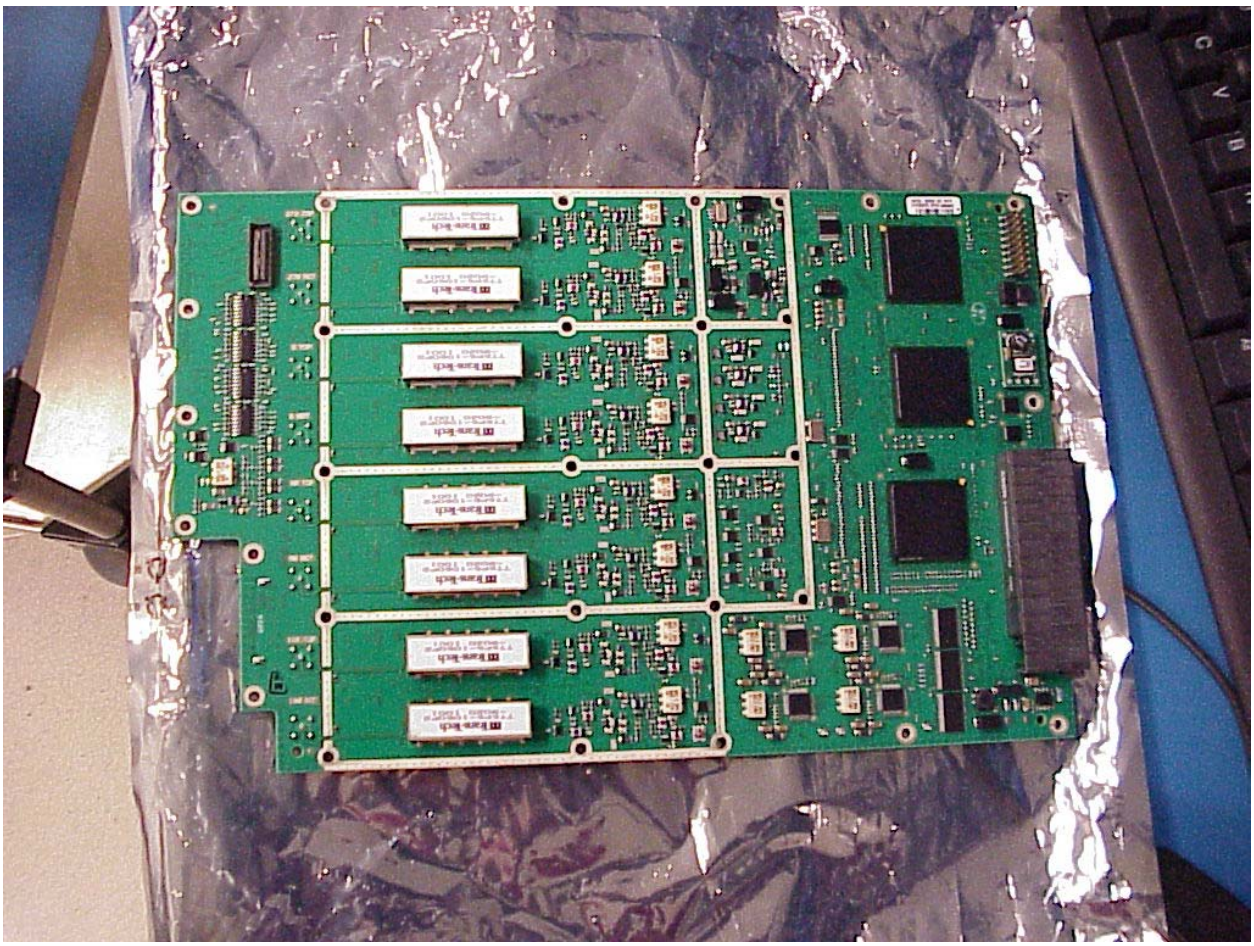


Figure 5-17: Front Side View of A5 Receiver CCA Assembly, Cover Removed

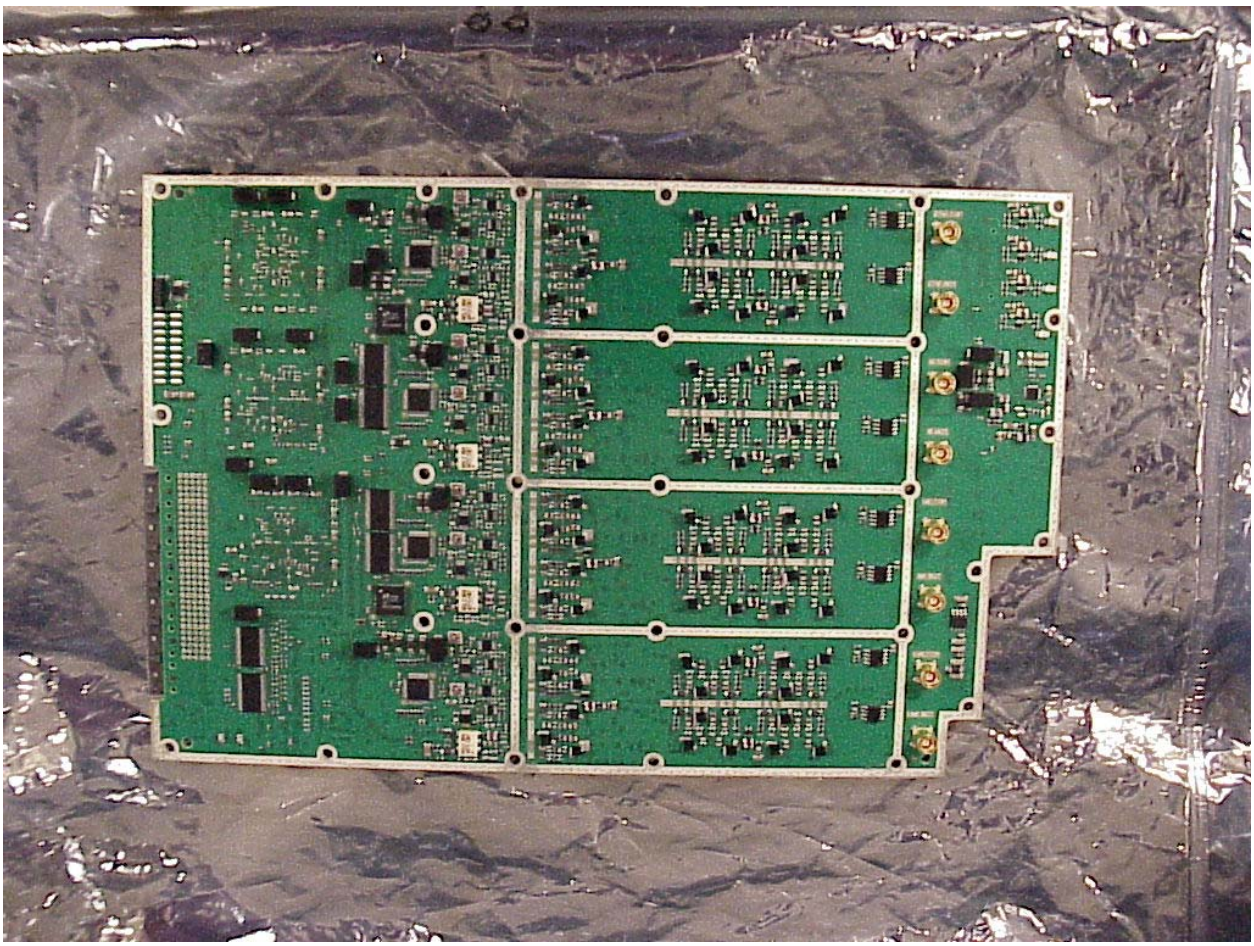


Figure 5-18: Back Side View of A5 Receiver CCA Assembly, Cover Removed

6 FCC COMPLIANCE TEST PLAN

6.1 FCC Compliance Overview

The Code of Federal Regulations, Title 47, Volume 1, Part 2, Subpart J (47CFR2.xxxx) provides procedures for radio frequency equipment to be authorized by the FCC. Certification is an equipment authorization issued by the commission, based on representations and test data submitted by the applicant. Certification attaches to all units subsequently marketed by the grantee which are identical (see section 6.1.2) to the sample tested except for permissive changes or other variations authorized by the commission.

6.1.1 FCC Identifier

47CFR2.924 states that equipment, which has been authorized by the FCC, bears an FCC Identifier. Equipment, which has been authorized, may be marketed under different model/type numbers or trade names without additional authorization from the commission, provided that such devices are electrically identical and the equipment bears an FCC Identifier validated by a grant of equipment authorization.

6.1.2 Changes in Certified Equipment

47CFR2.907, 8 defines Identical as either being units whose variances fall within those expected to arise as a result of quantity production techniques, or those that have been changed where the change meets the criteria of a *permissive change*.

47CFR2.1043 states that changes to the basic frequency determining and stabilizing circuitry (including clock or data rates), frequency multiplication stages, basic modulator circuit or maximum power or field strength ratings shall not be performed without application for and authorization of a new grant of certification.

Variations in electrical or mechanical construction, other than the above indicated items, are permitted provided the variations either do not affect the characteristics required to be reported to the commission or are made in compliance with other provisions in 47CFR2.1043

Two classes of permissive changes may be made in certified equipment without requiring a new application for and grant of certification. Neither class of change shall result in a change of identification.

- A Class I permissive change includes those modifications in the equipment that do not degrade the characteristics reported by the manufacturer and accepted by the commission when certification is granted (i.e., power, frequency, etc.). *No filing with the commission is required for a Class I permissive change.*

- A Class II permissive change includes those modifications that degrade the performance characteristics as reported to the commission at the time of initial certification.

6.2 T3CAS Units Subjected to FCC Compliance Testing

One T3CAS AC/DC unit, Part Number 9005000-10000, was subjected to the full suite of FCC Compliance tests: Serial Number TQE00214.

7 TEST DATA AND FACILITIES

7.1 Locations of Test Results

Table 7-1 contains the locations of FCC Compliance Test Results within this document.

Table 7-1: Locations of Test Results Within This Document

Paragraph	Description
8.3	Power Output
9.3	Modulation Characteristics
10.3	Occupied Bandwidth and in Close Spurious
11.3	Spurious Emissions 0-2000 MHz
11.4	Spurious Emissions 2000-11330 MHz
11.5	Spurious Emissions L.O. Leakage
12.3	Spurious Emissions (Radiated)
13.3	Frequency Stability (Temperature)
13.4	Frequency Stability (Primary Power Variation)

7.2 Location of Test Facilities

FCC testing was performed at the following facilities:

Spurious Emissions (Conducted and Radiated) except L.O. Leakage
National Technical Systems (NTS)
1536 East Valencia Drive
Fullerton, California 92831-4797

All other tests
ACSS
19810 North 7th Avenue
Phoenix, Arizona 85027-4400

8 RF POWER OUTPUT

8.1 47CFR Reference

2.1046, RF Power Output
87.135, Bandwidth of Emission

8.2 RF Power Output Test Setup

8.2.1 Equipment and Block Diagram

Table 8-1: RF Power Output Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10000
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Attenuator (or equivalent)	Narda	765-20
D	Attenuator (or equivalent)	Narda	765-20
E	Peak Power Analyzer	Agilent	N1911A
F	Spectrum Analyzer	Agilent	N9020A

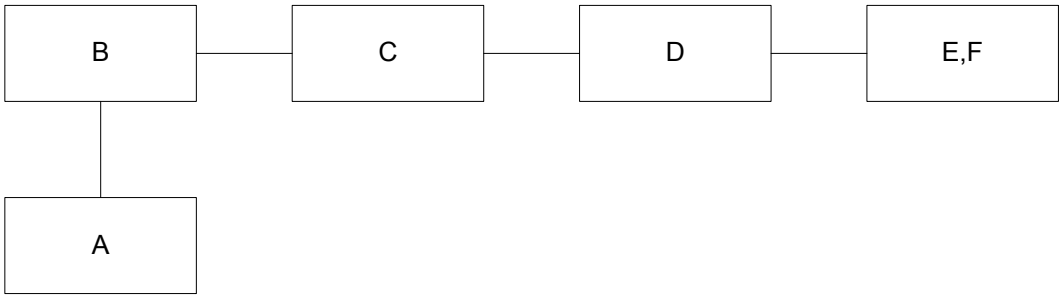


Figure 8-1: RF Power Output Test Setup

8.3 Test Results Data

Results from measurements of RF Power Output can be found in Table 8-2. Frequency measurements were rounded to the nearest kHz. Frequency deviations were 5 kHz or less, power deviations between ports were less than 0.78 dB for transponder modes, and less than 0.33 dB for TCAS modes.

Table 8-2: Results of RF Power Output Measurements

RF Power Output			Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
TCAS	Mode S	Freq (MHz)	1029.997	1030.001	1029.997	1030	1029.999	1030.002	1030	1029.998
		Pwr (dBm)	54.08	53.87	53.94	54.07	53.86	53.90	53.77	53.93
	Mode C	Freq (MHz)	1029.997	1029.999	1029.997	1030	1029.999	1029.997	1029.999	1030
		Pwr (dBm)	53.97	53.84	54.01	54.04	53.82	53.95	53.71	53.82
XPDR	Mode S	Freq (MHz)	1089.998	1089.999	1090	1089.999	1089.999	1089.999	1089.999	1089.999
		Pwr (dBm)	51.84	52.23	52.61	51.91	52.05	51.95	52.61	52.01
	Mode C	Freq (MHz)	1089.998	1089.998	1090	1089.999	1089.999	1089.998	1089.999	1089.999
		Pwr (dBm)	51.94	52.21	52.64	51.90	52.02	51.95	52.61	52.02

9 MODULATION CHARACTERISTICS

9.1 47CFR Reference

2.1047 Modulation Characteristics
87.141c, Modulation Requirements

9.2 Modulation Characteristics Test Setup

9.2.1 Equipment and Block Diagram

Table 9-1: Modulation Characteristics Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10001
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Attenuator (or equivalent)	Narda	765-20
D	Attenuator (or equivalent)	Narda	765-20
E	Peak Power Analyzer	Boonton	

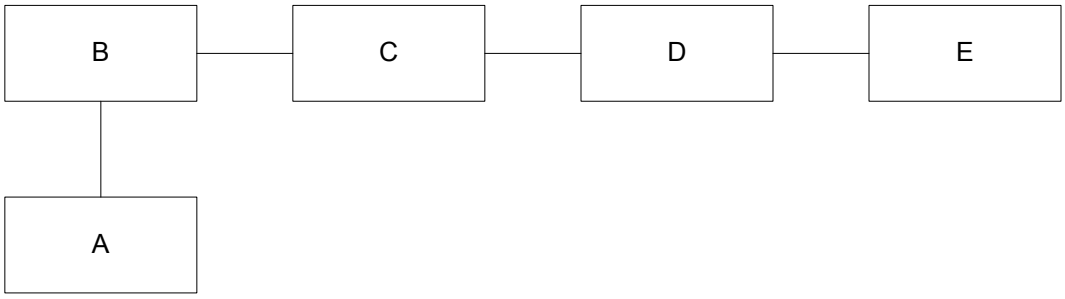


Figure 9-1: Modulation Characteristics Test Setup

9.3 Test Results Data

See Appendix A for screen captures.

10 OCCUPIED BANDWIDTH AND IN CLOSE SPURIOUS

10.1 47CFR Reference

2.1049, Occupied Bandwidth
87.135, Bandwidth of Emission

10.2 Occupied Bandwidth and In Close Spurious Test Setup

10.2.1 Equipment and Block Diagram

Table 10-1: Occupied Bandwidth Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10001
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Attenuator (or equivalent)	Narda	765-20
D	Attenuator (or equivalent)	Narda	765-20
E	Spectrum Analyzer	Agilent	N9020A

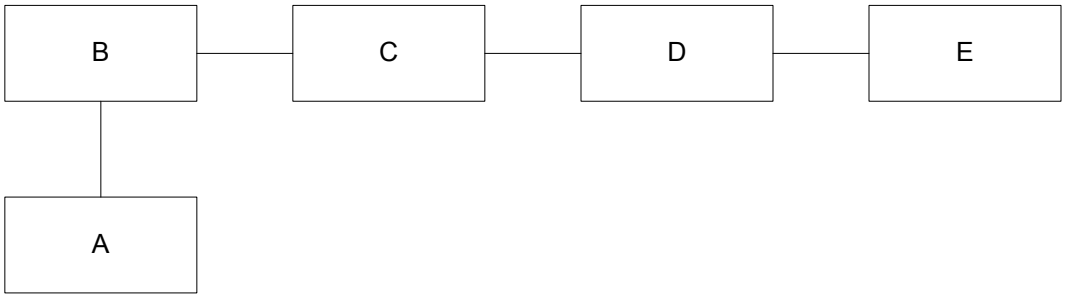


Figure 10-1: Occupied Bandwidth Test Setup

10.3 Test Results Data

Occupied bandwidth was less than 3 MHz for all transmission modes and antenna ports.

Table 10-2: Occuped Bandwidth and In-Close Spurious Results

Occupied BW (MHz)		Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
TCAS	Mode S	2.9694	2.9702	2.9699	2.9690	2.9700	2.9693	2.9690	2.9680
	Mode C	2.1433	2.1356	2.7032	2.1335	2.1461	2.1432	2.1452	2.1224
XPDR	Mode S	2.7317	2.7593	2.7472	2.7622	2.7278	2.7710	2.7366	2.7512
	Mode C	2.8304	2.8024	2.8013	2.8030	2.8309	2.8131	2.8022	2.8057

11 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

11.1 47CFR Reference

2.1051, Spurious Emissions at Antenna Terminals
87.139, Emissions Limitations

11.2 Spurious Emissions Test Setup

11.2.1 Equipment and Block Diagram

Table 11-1: Spurious Emissions at Antenna Terminals Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10001
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Attenuator (or equivalent)	Narda	765-20
D	Attenuator (or equivalent)	Narda	765-20
E	Spectrum Analyzer	Agilent	N9020A

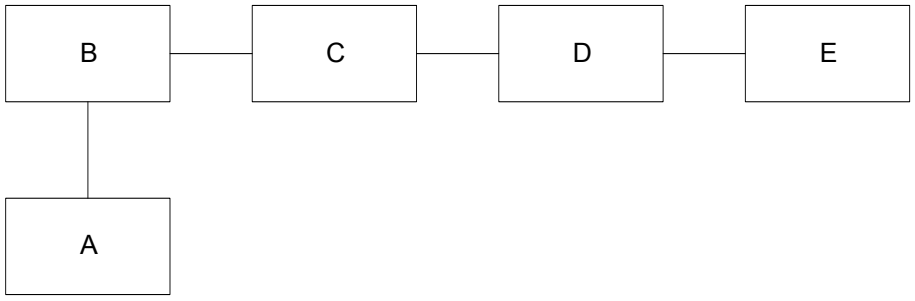


Figure 11-1: Spurious Emissions at Antenna Terminals Test Setup

Table 11-2: L.O. Leakage Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10001
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Spectrum Analyzer	Agilent	N9020A

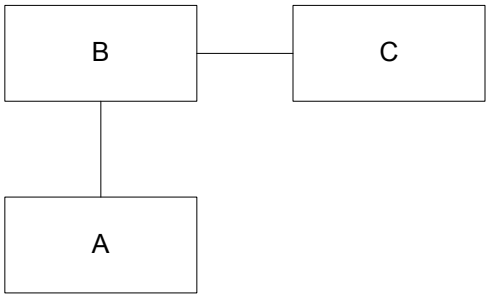


Figure 11-2: L.O. Leakage Test Setup

11.3 Test Results Data, 0 – 2000 MHz

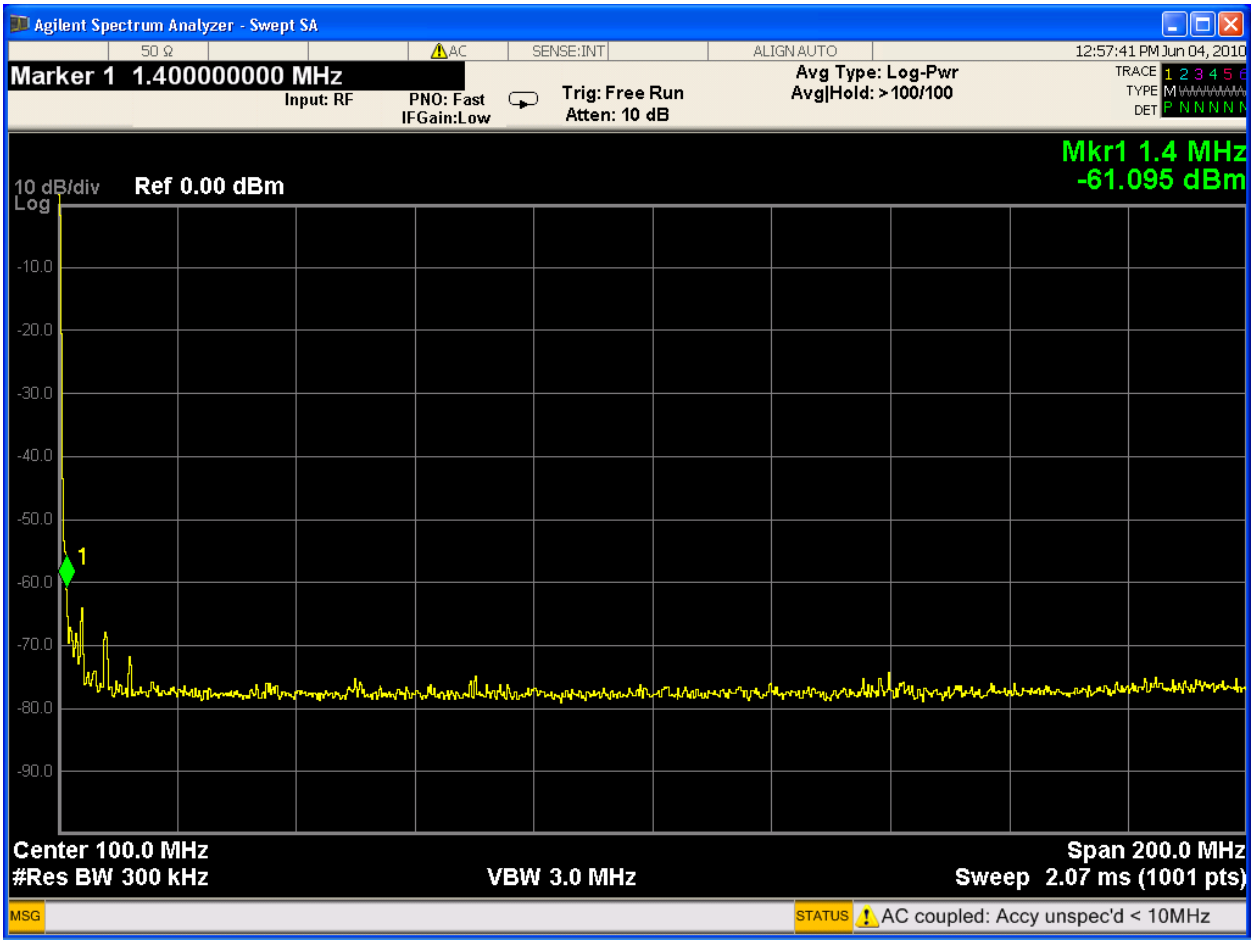


Figure 11-3: Spurious Emissions, 0-200 MHz

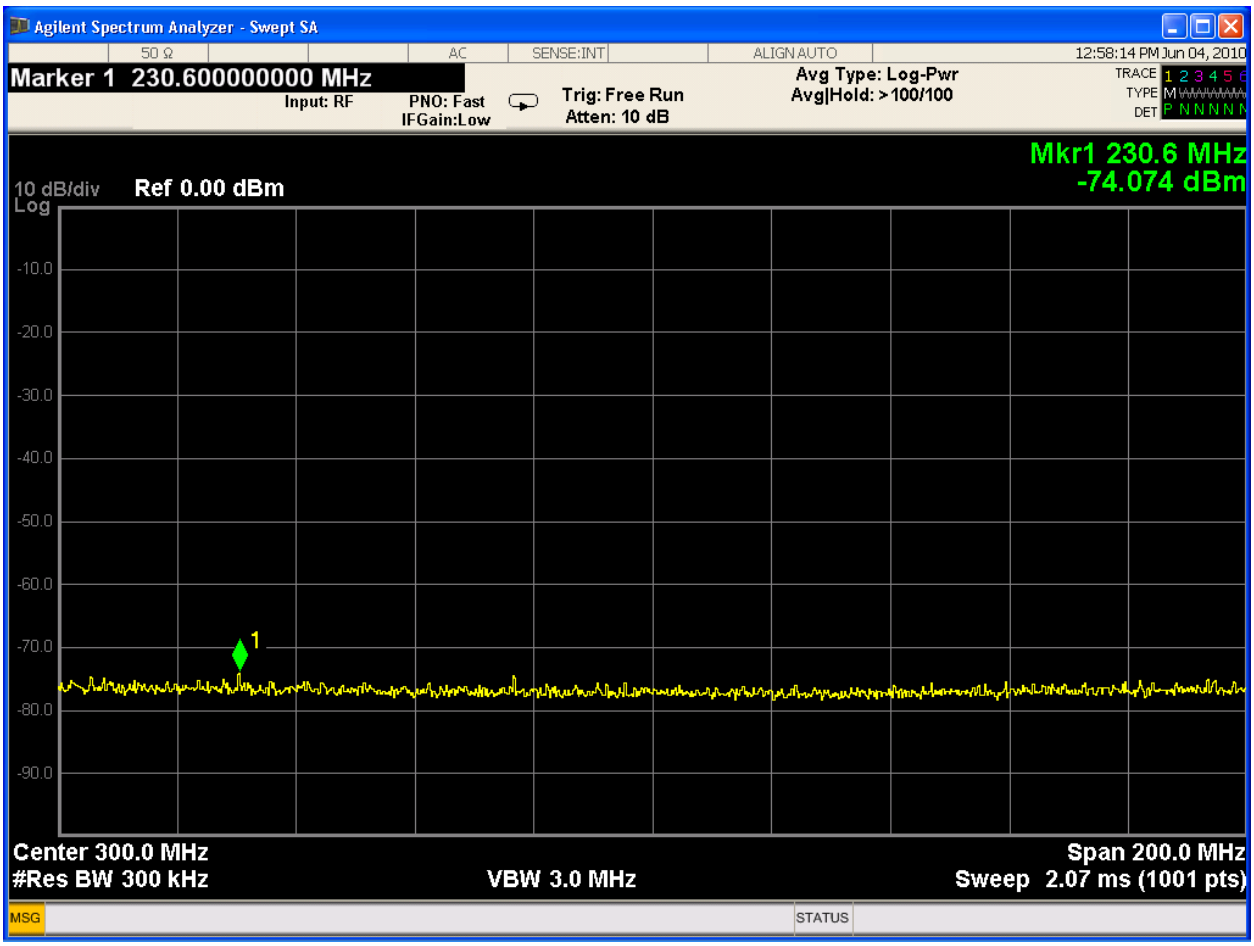


Figure 11-4: Spurious Emissions, 200-400 MHz

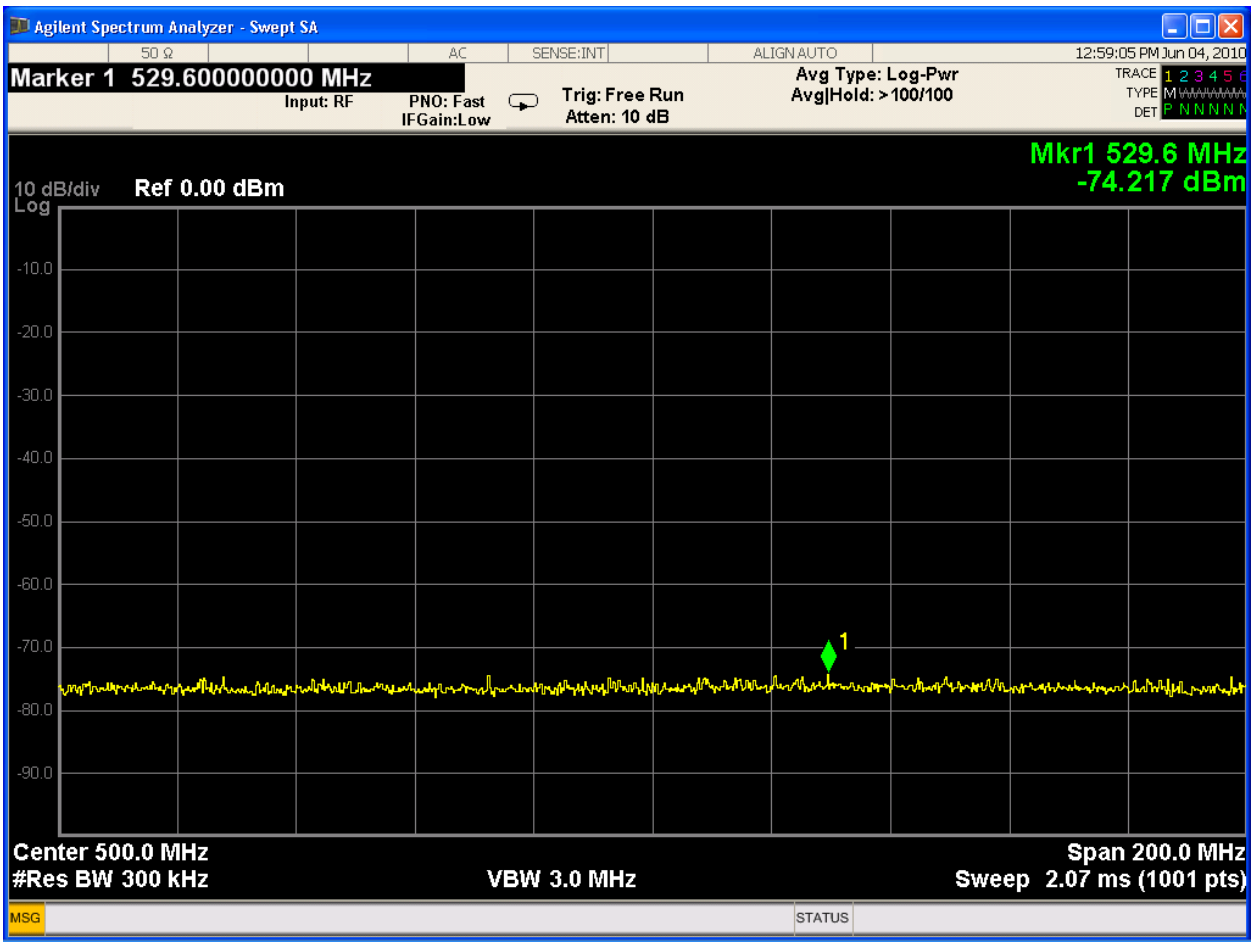


Figure 11-5: Spurious Emissions, 400-600 MHz

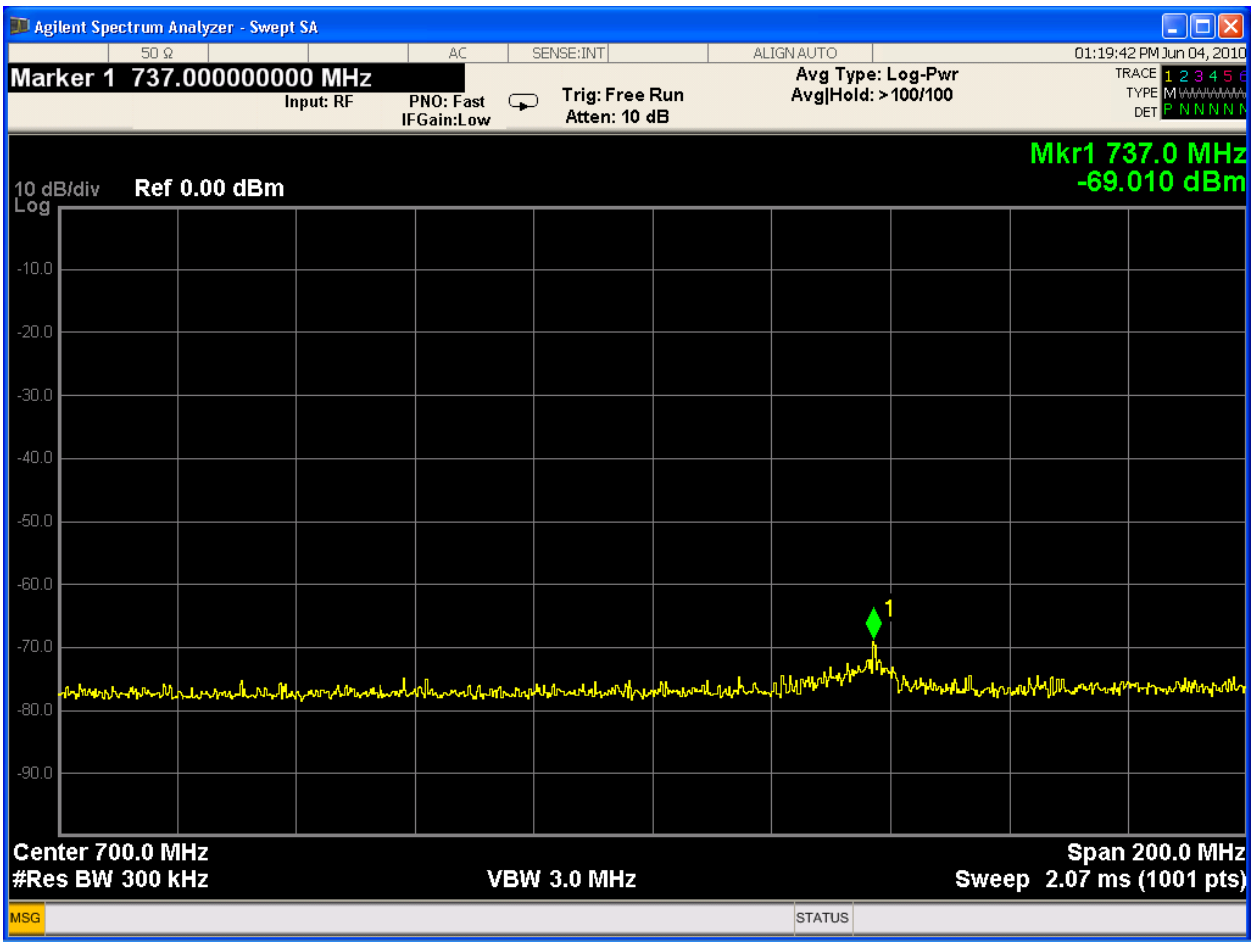


Figure 11-6: Spurious Emissions, 600-800 MHz

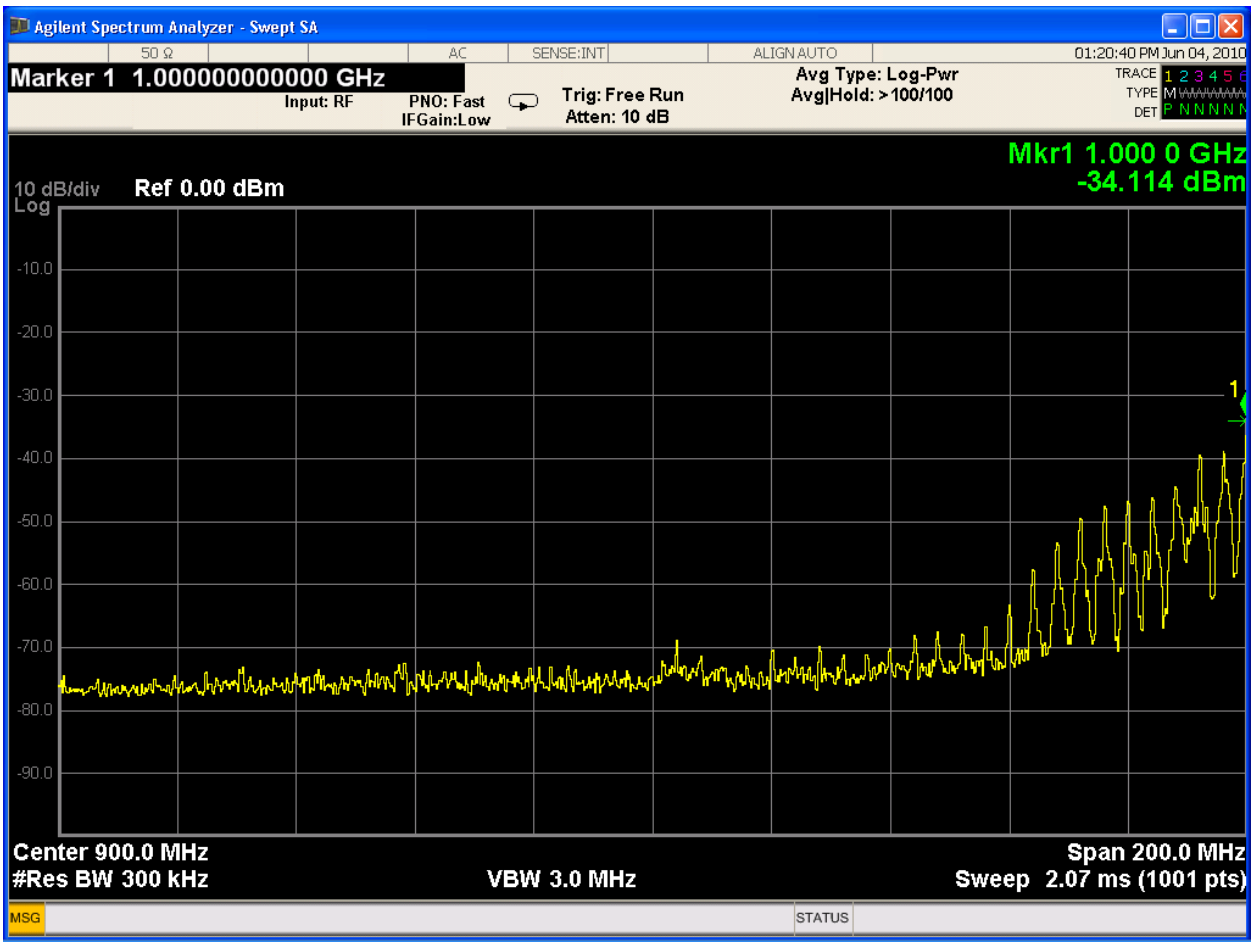


Figure 11-7: Spurious Emissions, 800-1000 MHz

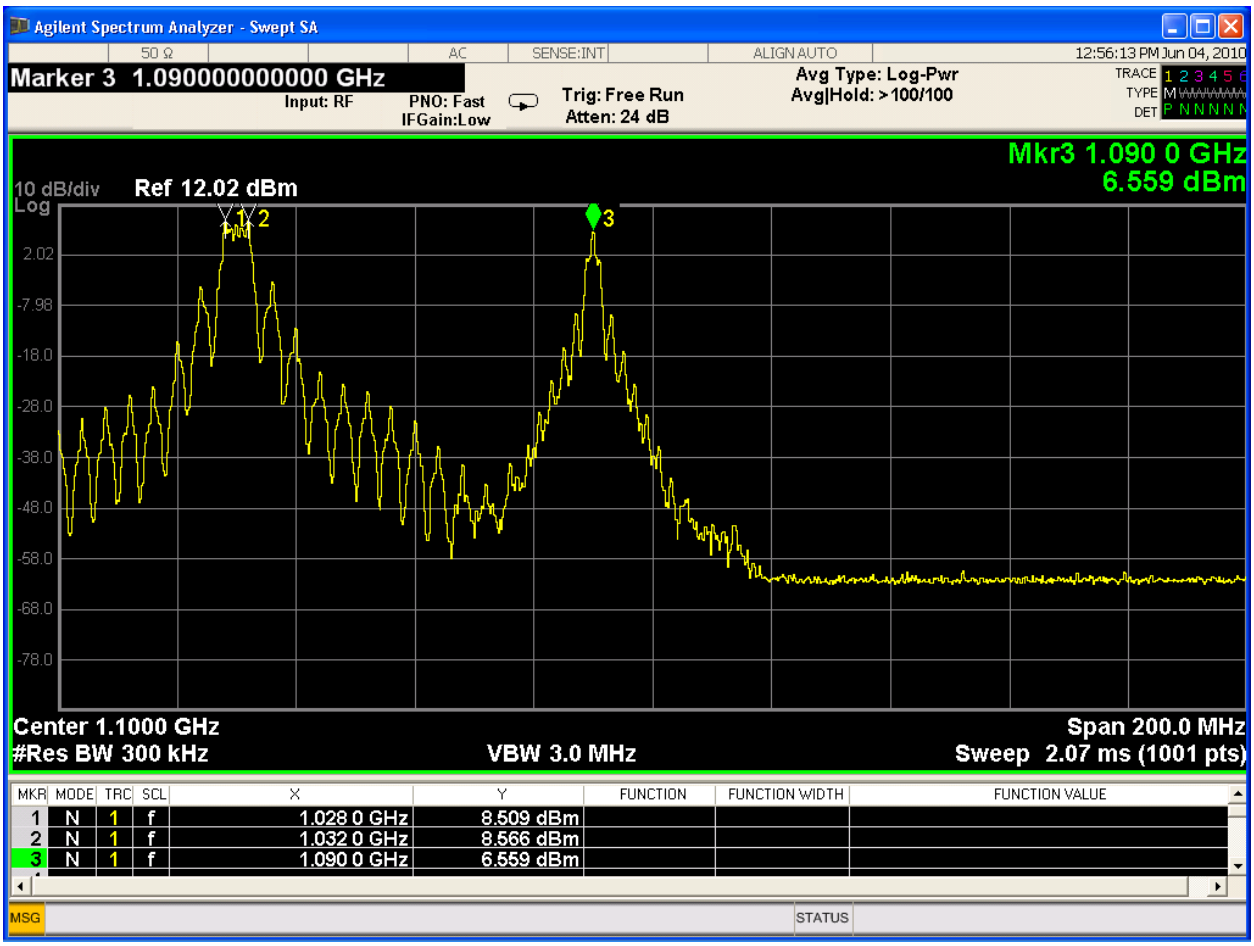


Figure 11-8: Spurious Emissions, 1000-1200 MHz

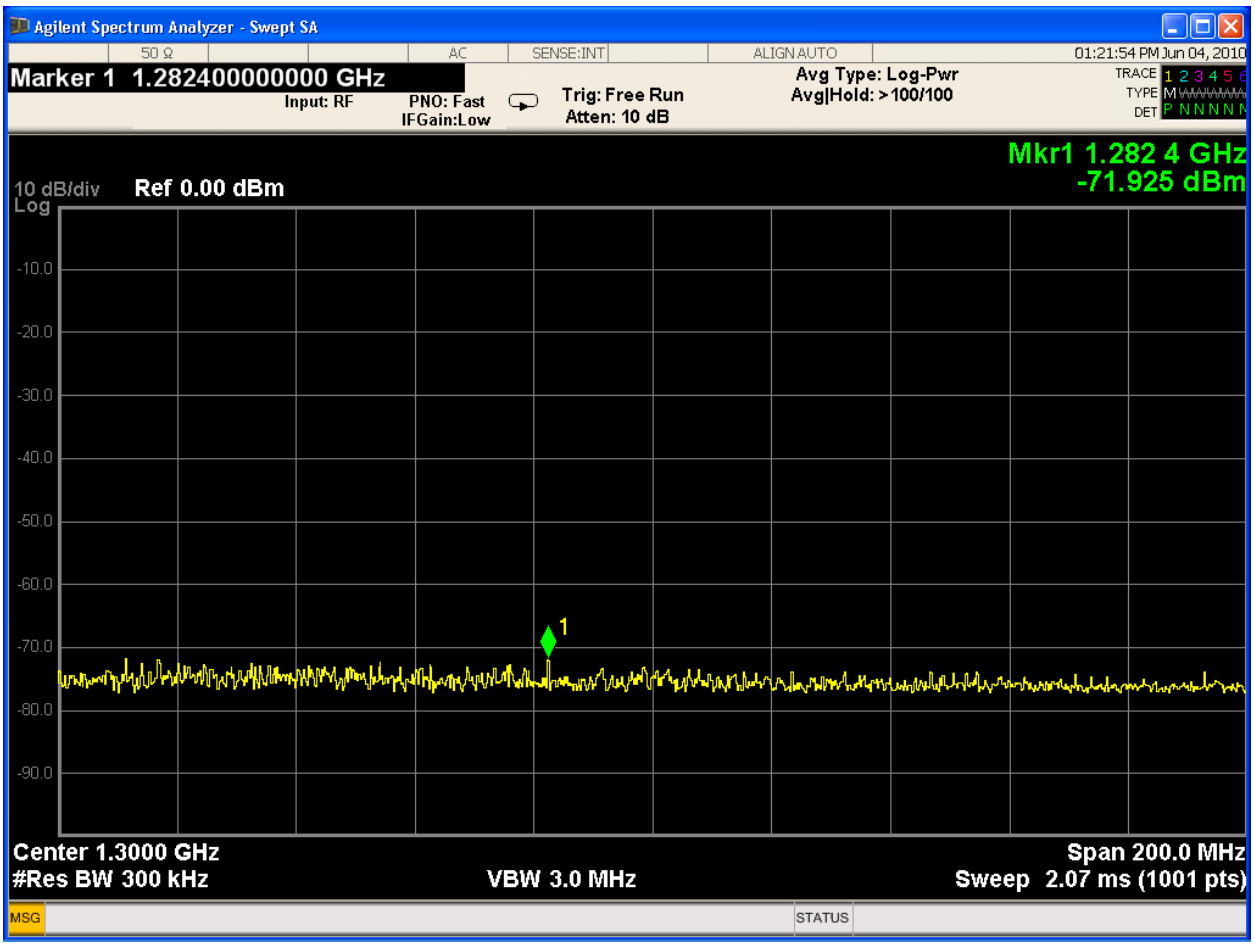


Figure 11-9: Spurious Emissions, 1200-1400 MHz

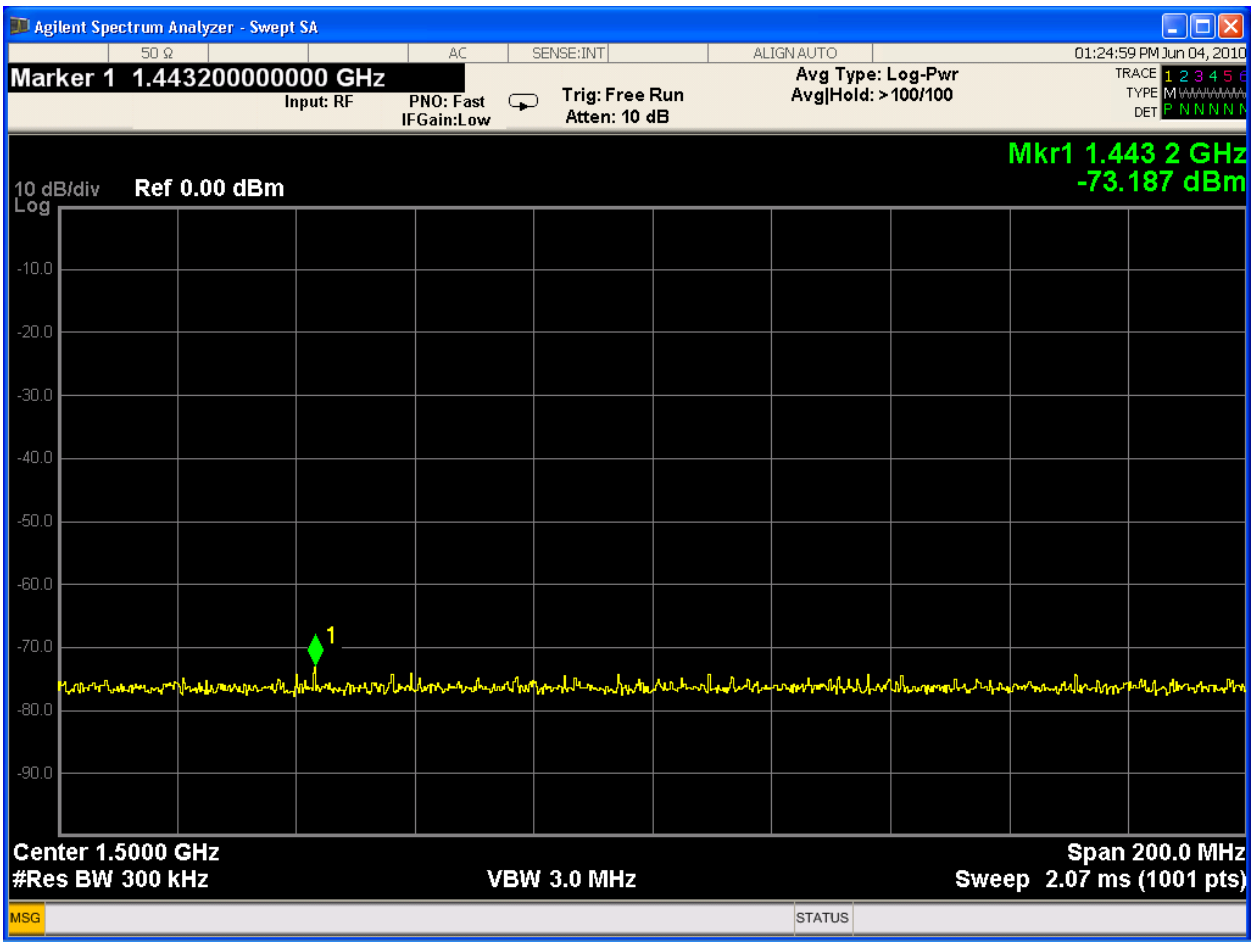


Figure 11-10: Spurious Emissions, 1400-1600 MHz

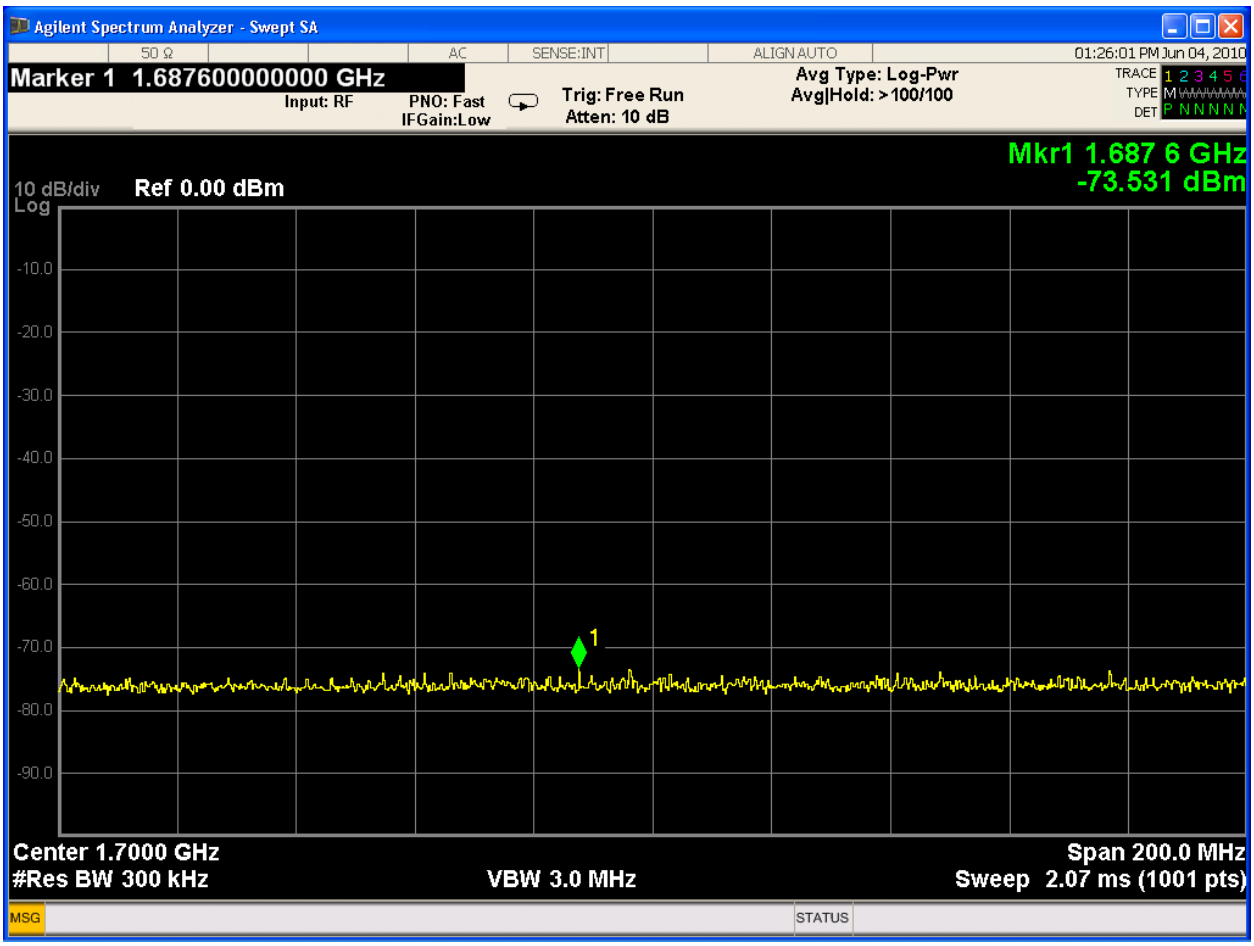


Figure 11-11: Spurious Emissions, 1600-1800 MHz

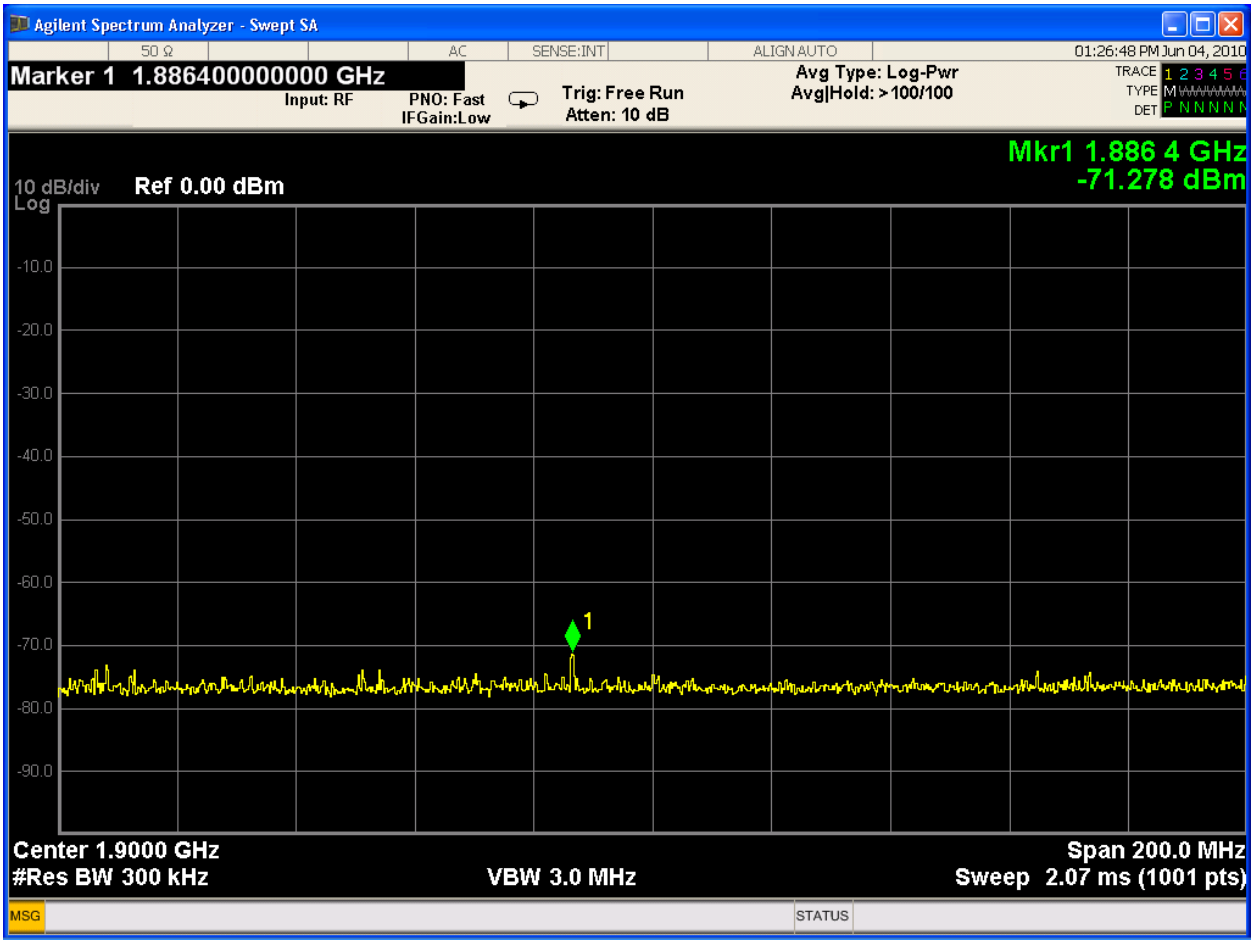


Figure 11-12: Spurious Emissions, 1800-2000 MHz

11.4 Test Results Data, 2000 – 8000 MHz

Frequency (MHz)	Calibration Factor (dB)	Top Antenna Spurious Level (dB)	Bottom Antenna Spurious Level (dB)	Top Antenna Spurious Level Corrected (dB)	Bottom Antenna Spurious Level Corrected (dB)	Spurious Output Limit
2060	60.37	-50.242	-62.997	10.128	-2.627	12.5 dBm
2180	63.15	-59.027	-58.787	4.123	4.363	12.5 dBm
3090	51.5	-62.340	-62.813	-10.84	-11.313	12.5 dBm
3270	51.43	-61.123	-61.498	-9.693	-10.068	12.5 dBm
4120	53.48	-62.402	-62.996	-8.844	-9.516	12.5 dBm
4360	52.83	-62.324	-62.730	-9.494	-9.9	12.5 dBm
5150	52.78	-61.569	-62.814	-8.789	-10.034	12.5 dBm
5450	54.04	-61.965	-60.967	-7.925	-6.927	12.5 dBm
6180	51.38	-61.244	-63.007	-9.864	-11.627	12.5 dBm
6540	56.78	-63.011	-62.727	-6.231	-5.947	12.5 dBm
7210	54.78	-61.757	-61.932	-6.977	-7.152	12.5 dBm
7630	63.65	-63.161	-61.739	0.489	1.911	12.5 dBm
8240	60.98	-63.633	-63.644	-2.653	-2.664	12.5 dBm

*Test equipment limitations preclude spurious testing above 8.24 GHz.

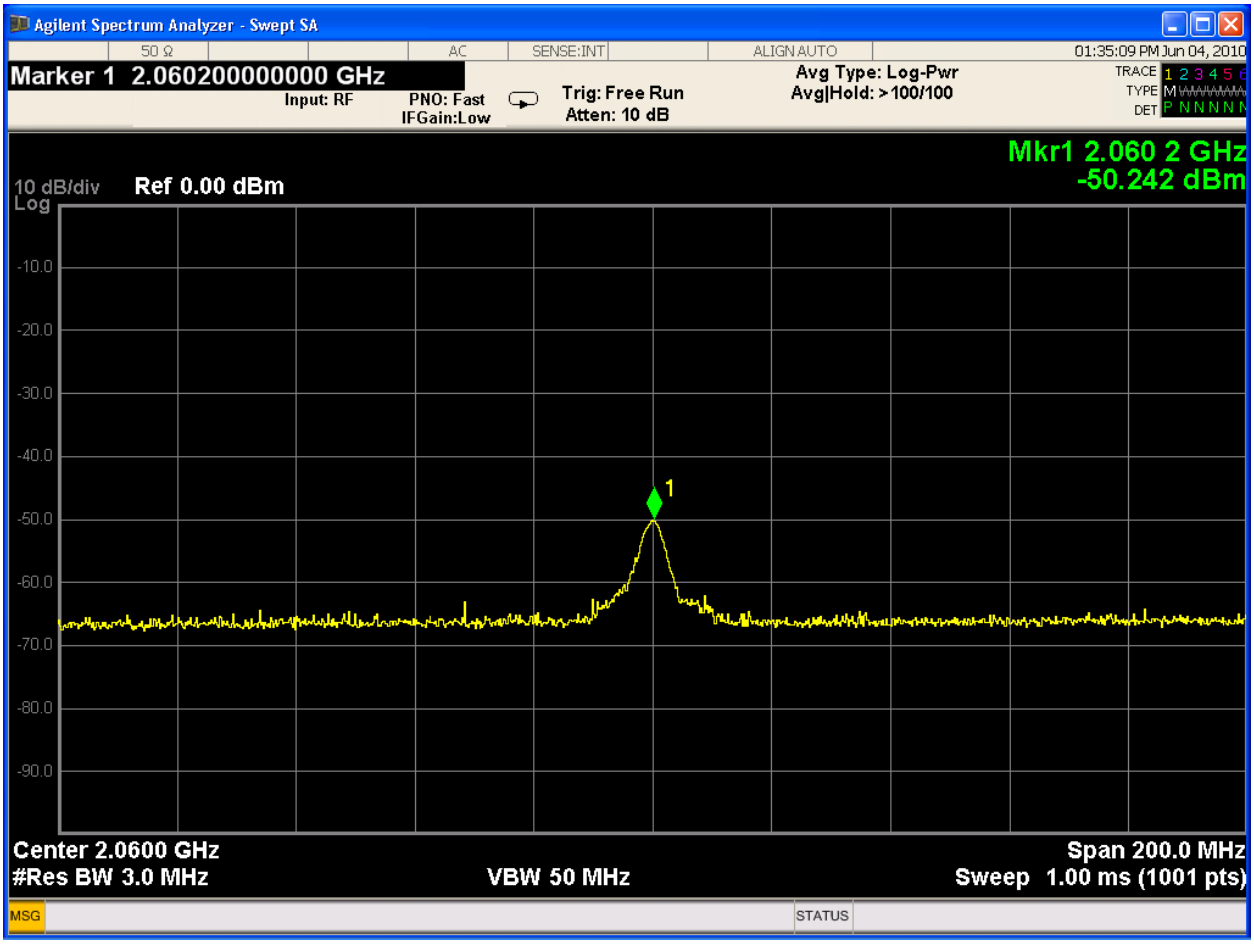


Figure 11-13: TCAS 2nd Harmonic

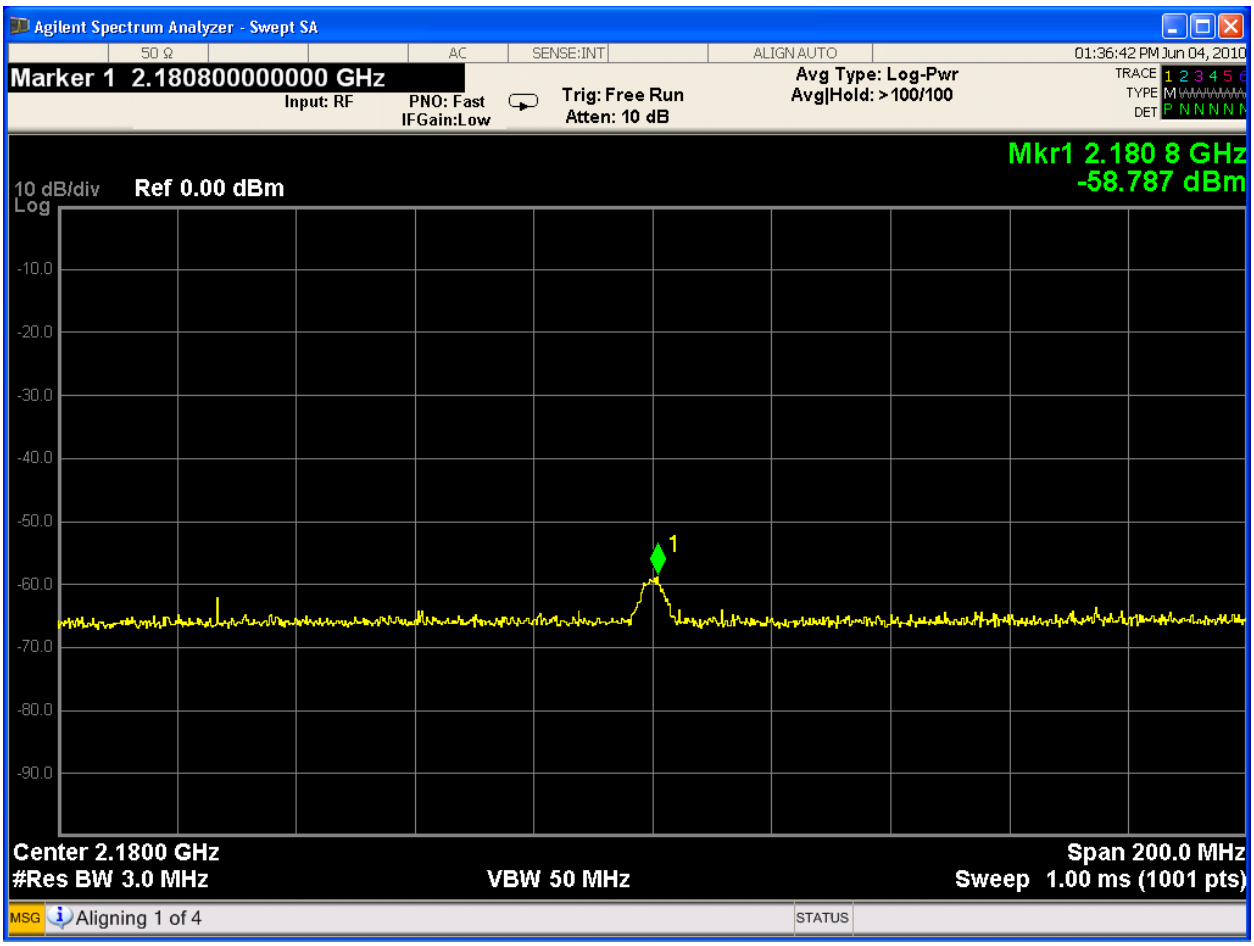


Figure 11-14: XPDR 2nd Harmonic

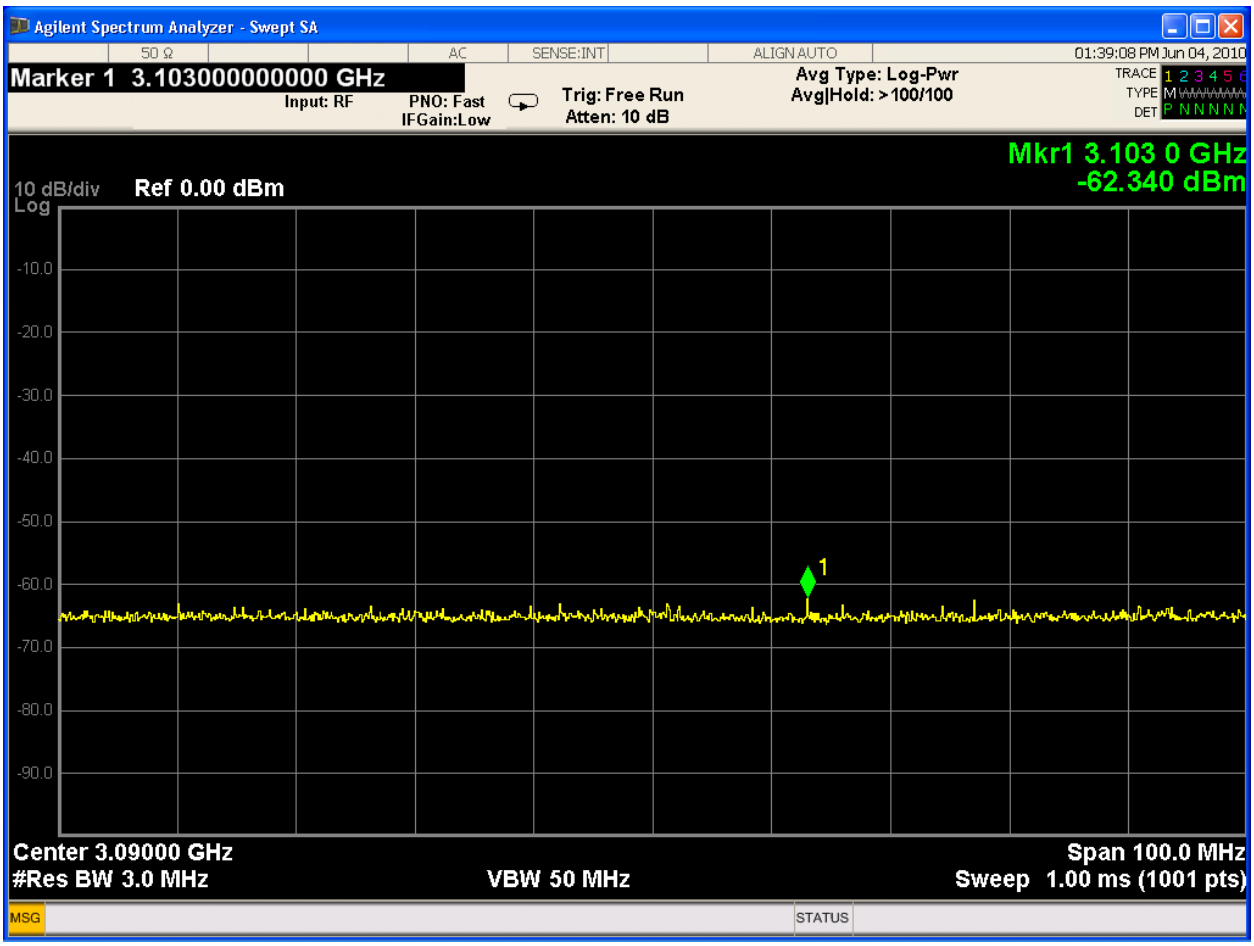


Figure 11-15: TCAS 3rd Harmonic

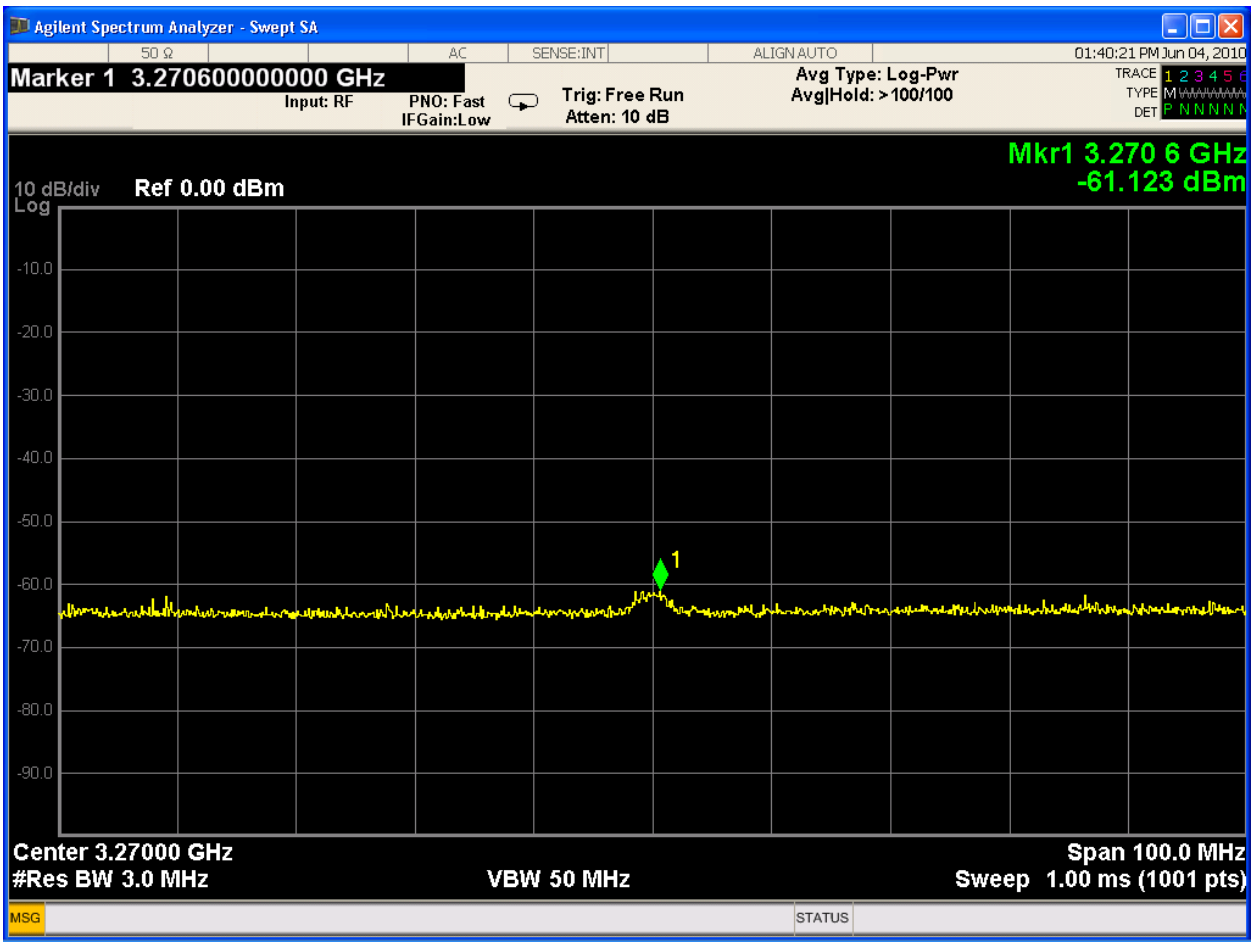


Figure 11-16: XPDR 3rd Harmonic

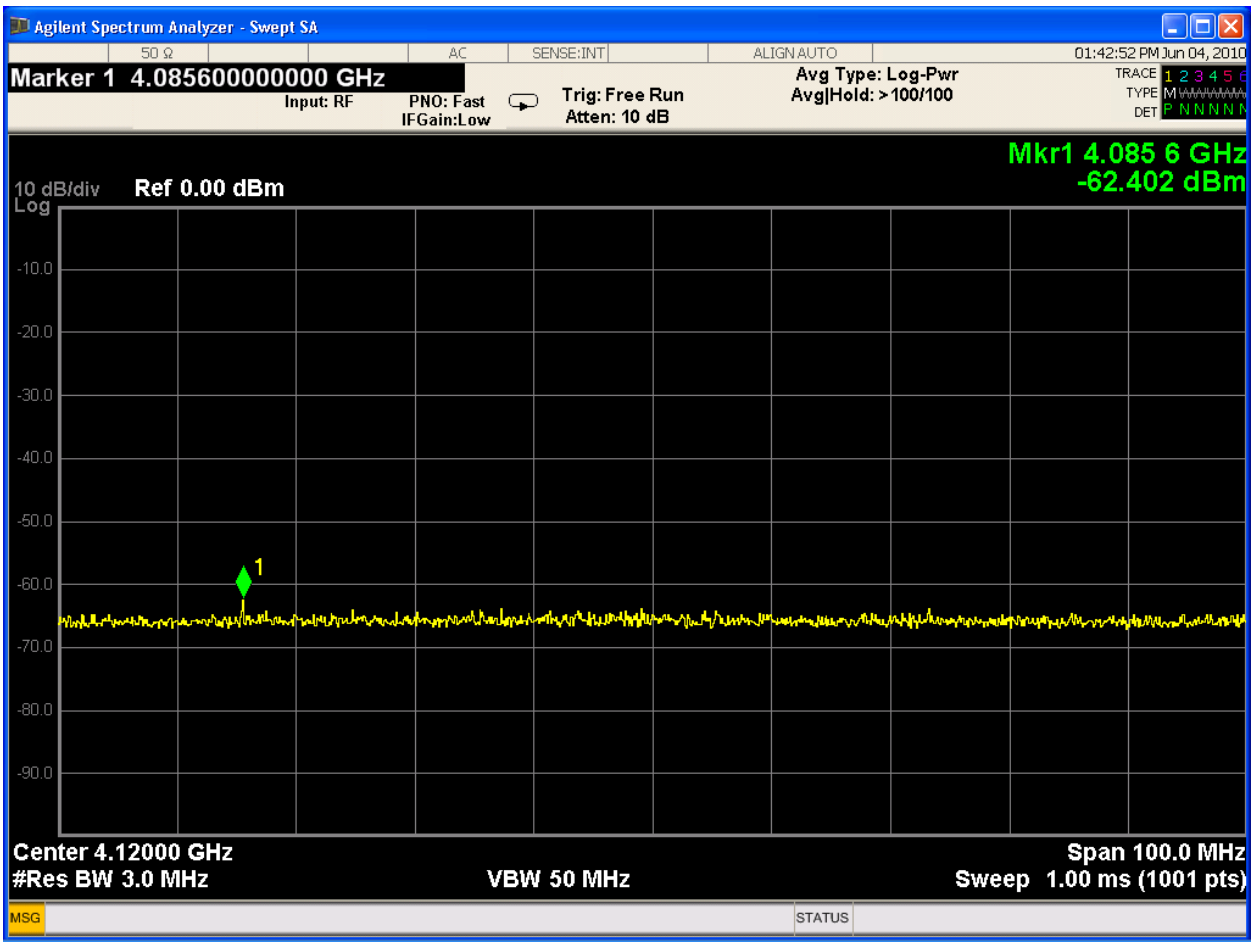


Figure 11-17: TCAS 4th Harmonic

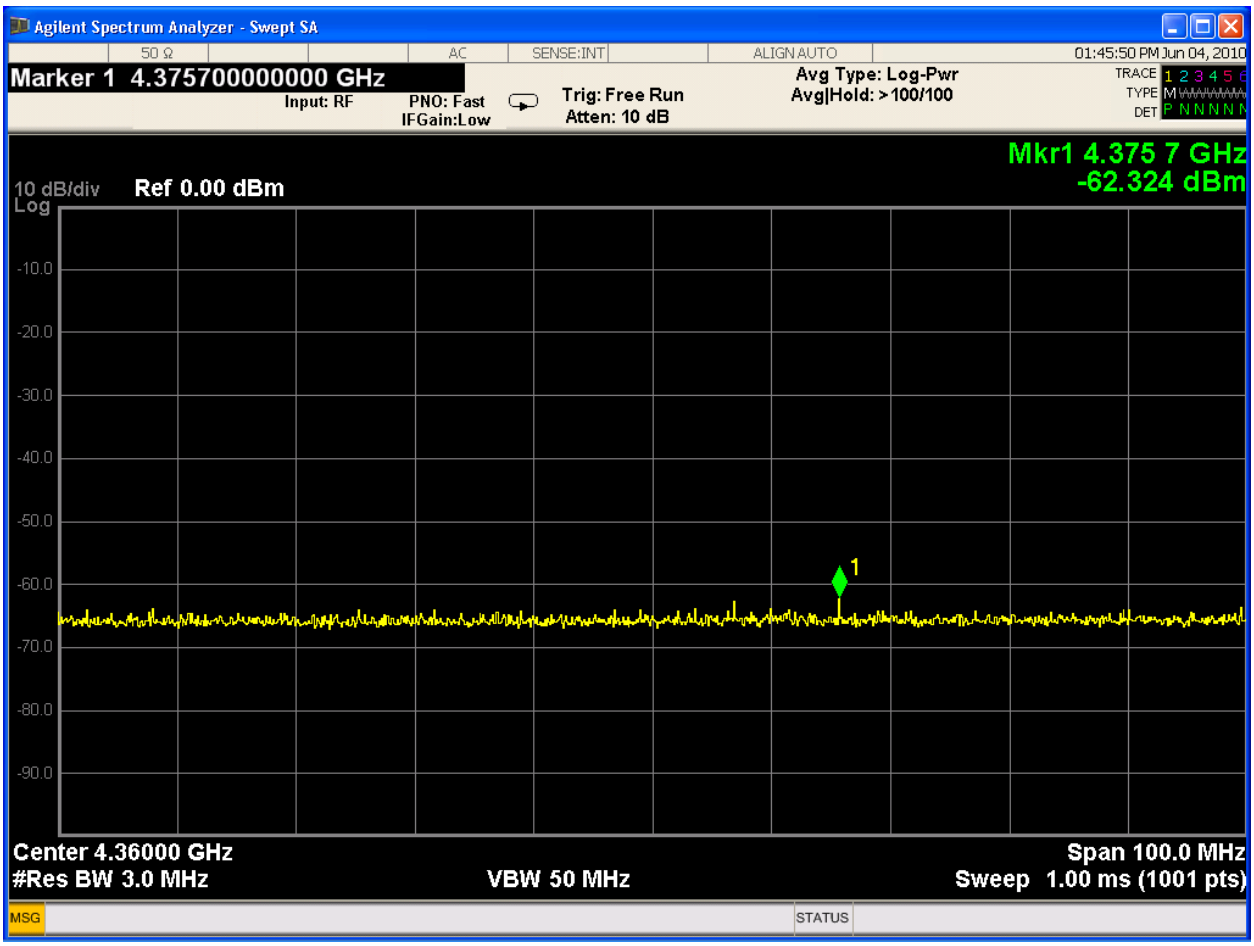


Figure 11-18: XPDR 4th Harmonic

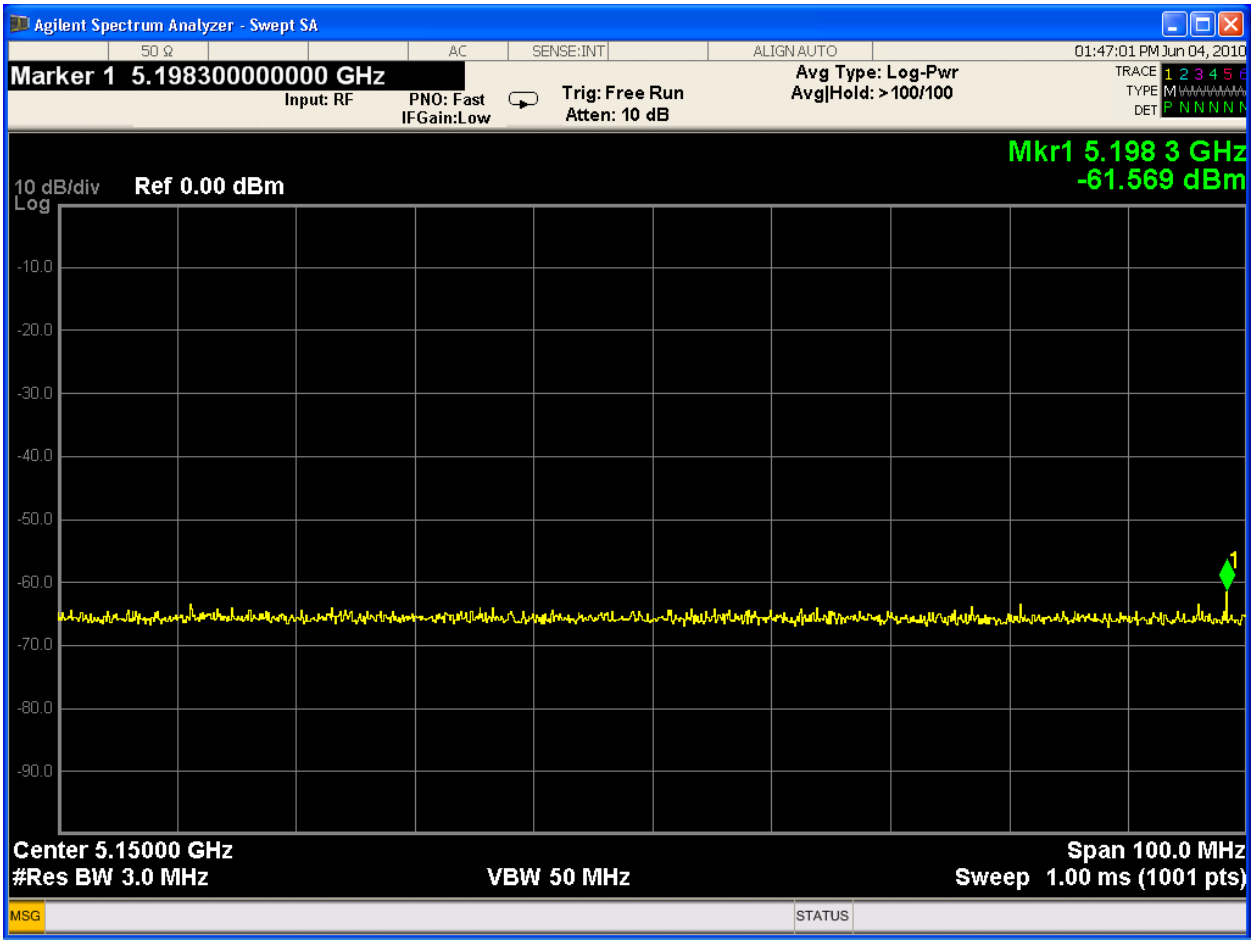


Figure 11-19: TCAS 5th Harmonic

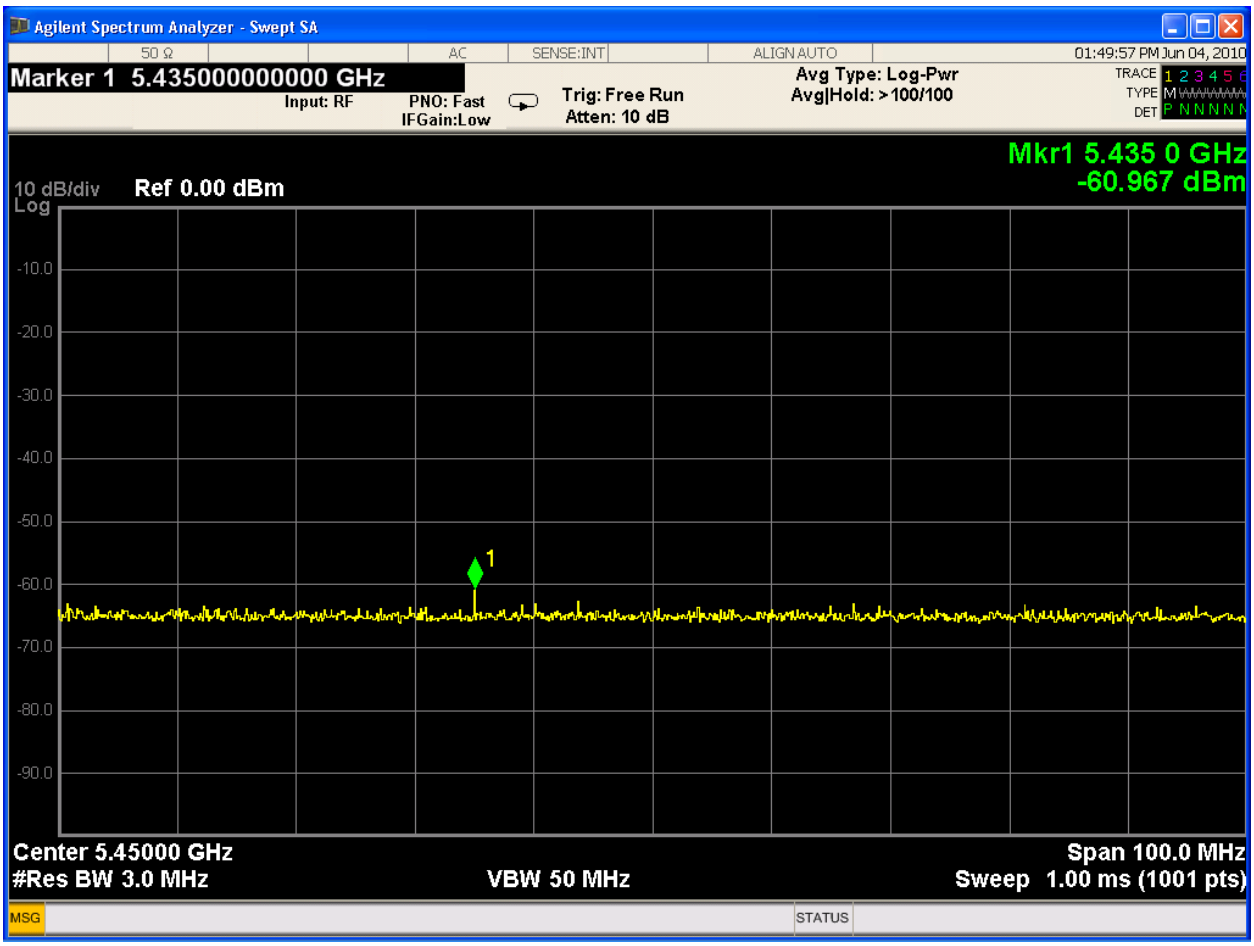


Figure 11-20: XPDR 5th Harmonic

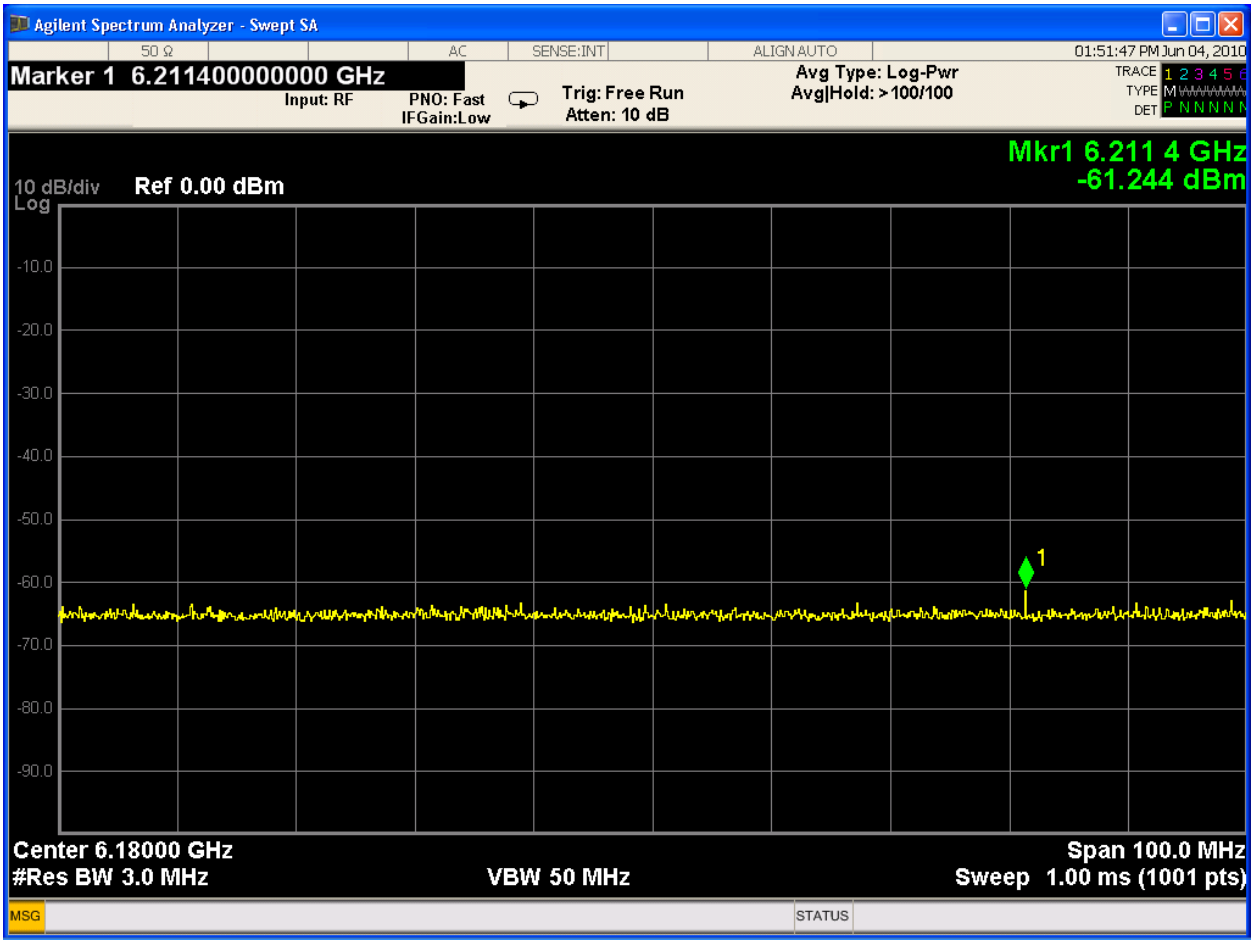


Figure 11-21: TCAS 6th Harmonic

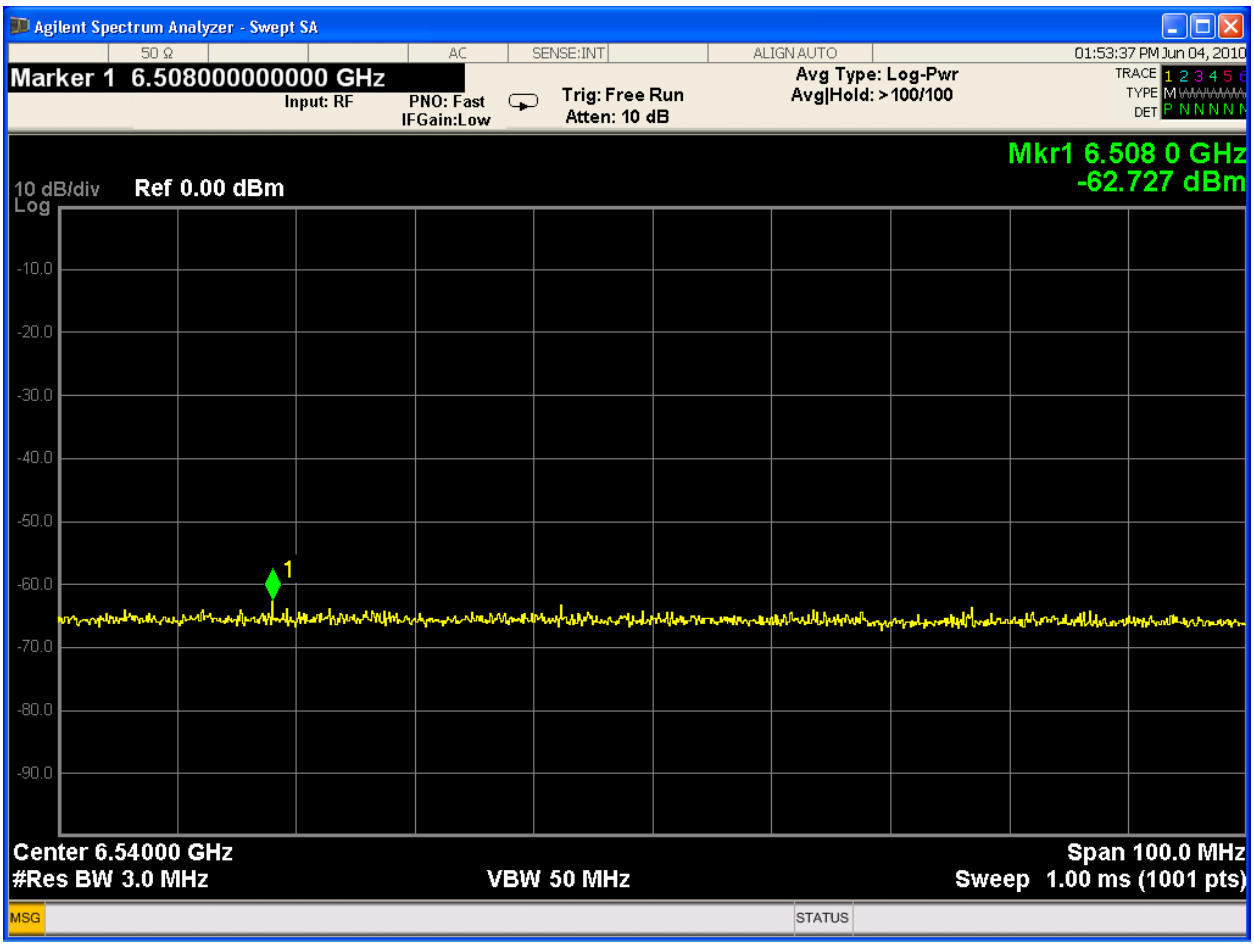


Figure 11-22: XPDR 6th Harmonic

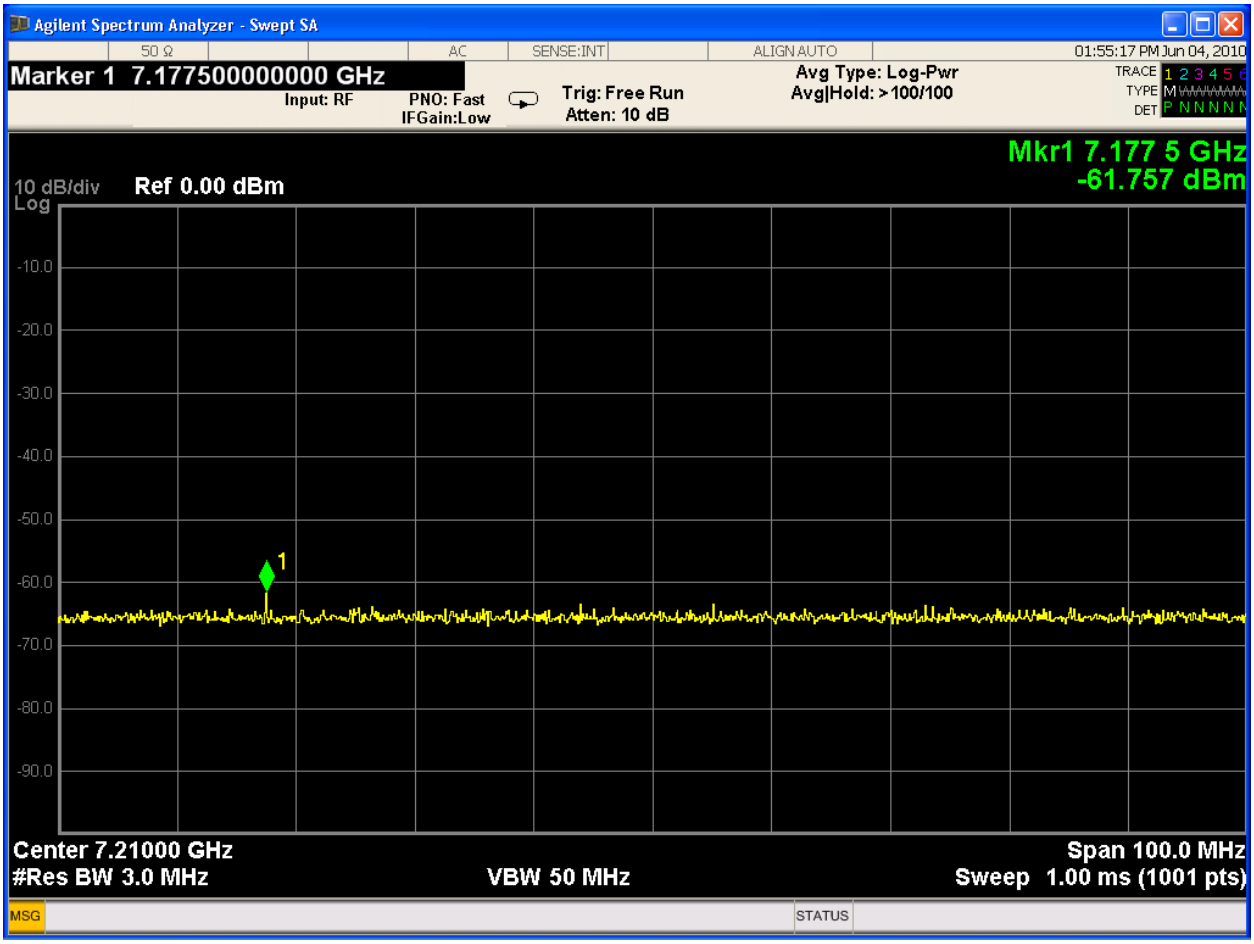


Figure 11-23: TCAS 7th Harmonic

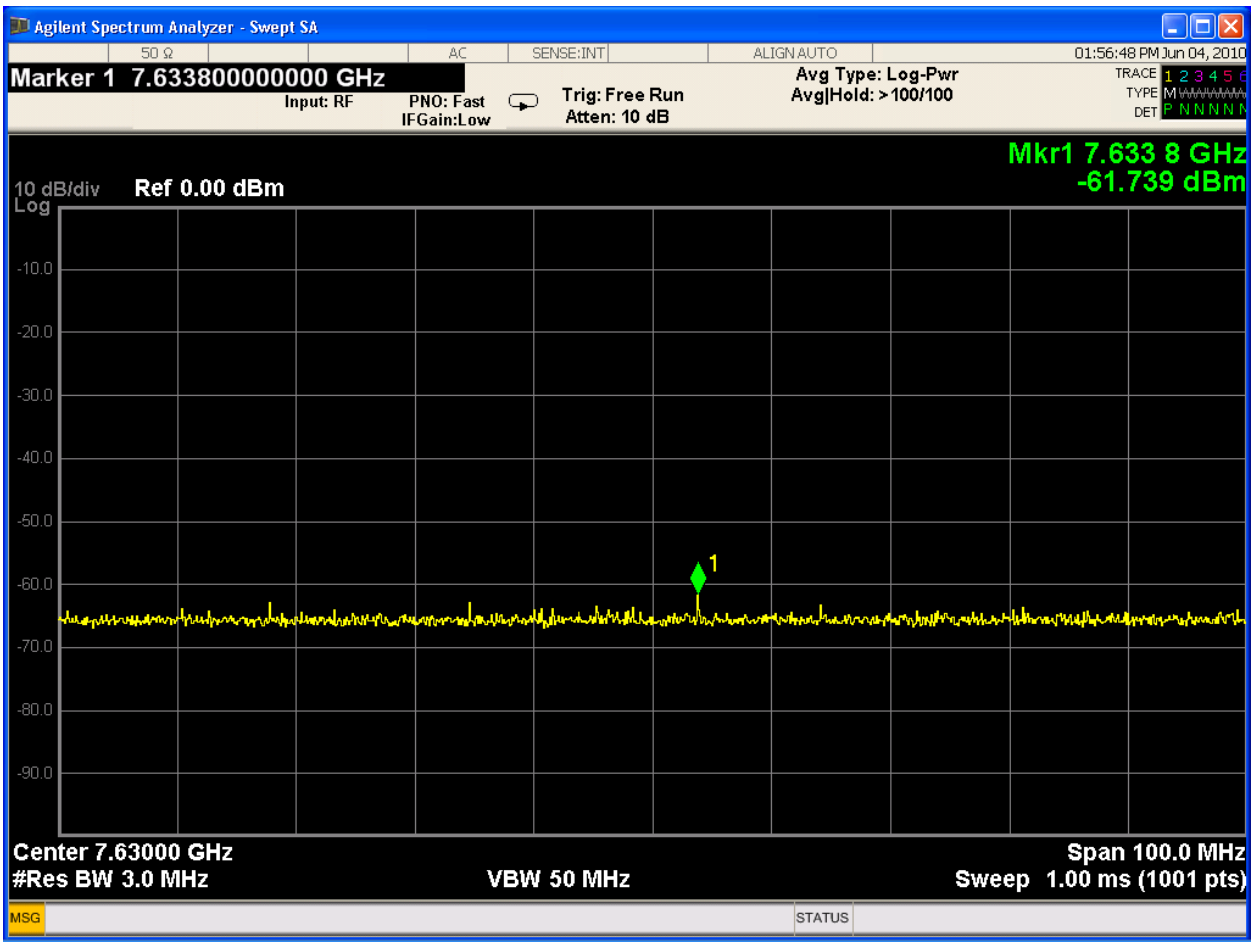


Figure 11-24: XPDR 7th Harmonic

11.5 Test Results Data, L.O Leakage

Table 11-3: Local Oscillator Leakage Results

L.O Leakage		Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
1170	Freq (MHz)	1169.999	1170.000	1170.002	1169.999	1169.999	1169.999	1170.000	1170.000
	Pwr (dBm)	-93.217	-100.114	-100.500	-97.447	-90.209	-99.151	-100.730	-97.363
1202	Freq (MHz)	1201.999	1201.999	1201.999	1201.999	1201.999	1201.999	1201.999	1201.999
	Pwr (dBm)	-82.568	-81.103	-83.614	-80.497	-84.992	-83.703	-80.526	-92.184

12 FIELD STRENGTH OF SPURIOUS RADIATION

12.1 47CFR Reference

2.1053, Field Strength of Spurious Radiation
15.109, Radiated Emissions Limits
15.31, Measurement Standards
15.33, Frequency Range of Radiated Measurements
87.139, Emissions Limitations

12.2 Spurious Radiation Test Setup

12.2.1 Equipment and Block Diagram

Table 12-1: Field Strength of Spurious Radiation Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10001
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Termination	ATTA	N4425-10
D	Antenna, Biconical	Emco	3109
E	Antenna, Log Per.	Aprel	AL-2001
F	Antenna, Horn	Aprel	AH-118
G	Spectrum Analyzer	Hewlett-Packard	HP8566B
H	Preselector	Hewlett-Packard	85685A
I	Quasi-Peak	Hewlett-Packard	85650A

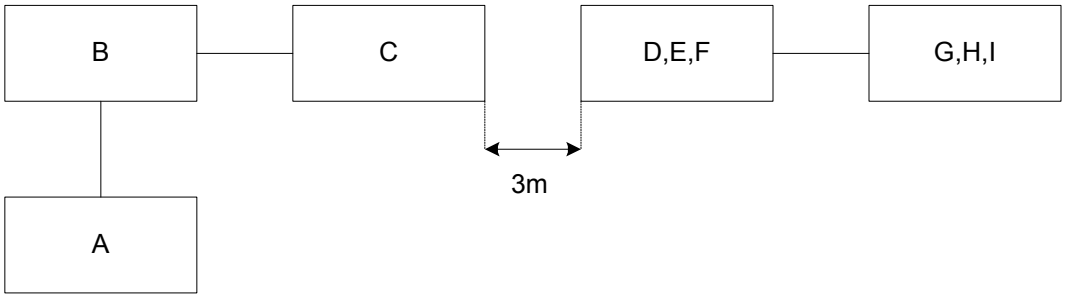


Figure 12-1: Field Strength of Spurious Radiation Test Setup

12.3 Test Results Data

See Appendix B for National Technical Systems (NTS) report.

13 FREQUENCY STABILITY

13.1 47CFR Reference

2.1055, Frequency Stability
15.31, Measurement Standards
87.133, Frequency Stability

13.2 Frequency Stability Test Setup

13.2.1 Equipment and Block Diagram

Table 13-1: Frequency Stability Test Equipment

Block Diagram Reference	Type	Manufacturer	Model P/N
A	T3CAS LRU	ACSS	9005000-10001
B	T3CAS Qualtest Station	ACSS	9001041-001
C	Attenuator (or equivalent)	Narda	765-20
D	Attenuator (or equivalent)	Narda	765-20
E	Peak Power Analyzer	Agilent	N1911A
F	Spectrum Analyzer	Agilent	N9020A

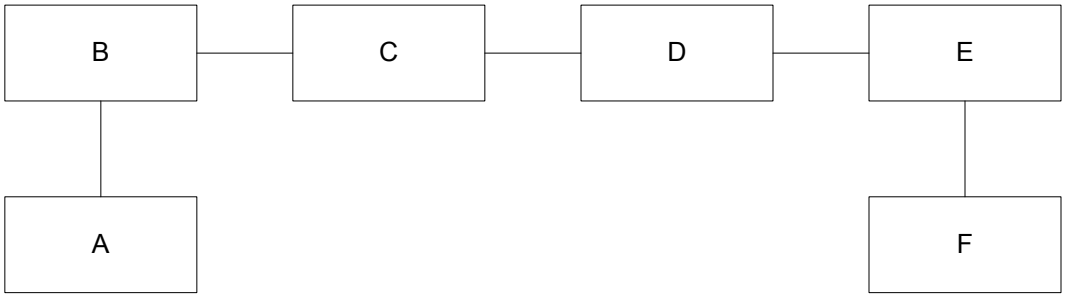


Figure 13-1: Frequency Stability Test Setup

13.3 Test Results Data, Temperature Variation

Frequency deviation for any antenna port between temperature levels of -60°C and +80°C was less than 8 kHz for TCAS transmissions and less than 3 kHz for XPDR transmissions.

Table 13-2: Temp Variation of Frequency, TCAS Transmissions 115 Vac, 400 Hz

Temp °C	TCAS							
	Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
-50	1029.997	1029.998	1029.998	1030.001	1029.997	1029.999	1029.994	1029.999
-40	1030.000	1029.999	1029.996	1029.999	1029.998	1029.996	1029.996	1030.000
-30	1030.002	1029.999	1029.999	1029.998	1030.000	1030.001	1029.996	1029.999
-20	1030.000	1029.997	1029.999	1029.998	1030.000	1029.998	1029.997	1029.996
-10	1029.997	1029.998	1029.996	1030.001	1029.999	1030.001	1029.997	1029.998
0	1029.998	1029.998	1029.996	1030.001	1029.998	1030.000	1029.999	1029.999
10	1029.998	1029.998	1029.997	1029.997	1030.000	1030.000	1029.996	1029.998
20	1030.000	1029.999	1029.998	1029.997	1029.999	1029.997	1029.999	1029.999

30	1030.000	1029.999	1029.998	1030.001	1029.998	1029.999	1029.998	1030.000
40	1030.000	1030.000	1029.998	1029.998	1029.998	1030.001	1030.000	1030.000
50	1030.001	1030.001	1029.999	1030.000	1030.000	1029.998	1030.001	1029.997
60	1029.999	1029.999	1029.999	1030.000	1029.999	1030.000	1030.001	1029.999
70	1030.002	1030.001	1030.002	1030.000	1030.002	1029.997	1030.001	1030.000
80	1030.002	1030.000	1030.000	1030.001	1030.000	1030.001	1030.001	1030.000

Table 13-3: Temp Variation of Frequency, TCAS Transmissions 28 Vdc

Temp °C	TCAS							
	Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
-50	1029.998	1029.997	1029.995	1029.998	1029.997	1029.997	1029.997	1029.999
-40	1030.000	1030.000	1029.997	1030.001	1029.998	1029.996	1029.997	1030.000
-30	1030.002	1029.998	1029.997	1030.000	1029.999	1029.998	1029.996	1029.997
-20	1029.998	1029.998	1029.996	1030.001	1030.000	1029.997	1029.999	1029.997
-10	1029.999	1030.001	1029.998	1029.999	1029.999	1029.999	1029.998	1029.997
0	1029.998	1029.997	1029.997	1030.000	1029.997	1029.997	1029.996	1030.002
10	1030.000	1029.998	1029.996	1029.999	1029.998	1029.998	1029.999	1029.998
20	1029.999	1029.998	1029.999	1029.999	1030.000	1029.999	1030.000	1030.001
30	1030.000	1029.999	1029.998	1029.999	1029.998	1029.999	1029.999	1030.000
40	1029.999	1029.998	1029.998	1030.000	1030.000	1030.000	1029.998	1029.999
50	1029.999	1030.000	1029.997	1029.999	1029.998	1030.001	1030.000	1029.999
60	1029.999	1030.000	1029.998	1029.999	1029.999	1030.000	1030.002	1030.002
70	1030.001	1030.000	1030.000	1030.002	1029.999	1029.999	1030.000	1030.001
80	1030.001	1030.002	1030.001	1030.000	1030.001	1029.999	1030.000	1030.002

Table 13-4: Temp Variation of Frequency, XPDR Transmissions 115 Vac, 400 Hz

Temp °C	XPDR							
	Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
-50	1090.000	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
-40	1089.999	1089.999	1090.000	1089.999	1089.999	1089.999	1089.999	1089.999
-30	1089.998	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
-20	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
-10	1089.998	1089.999	1089.998	1089.999	1089.999	1089.999	1089.999	1089.999
0	1090.000	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
10	1089.998	1089.999	1089.999	1089.999	1090.000	1089.999	1089.999	1089.999
20	1090.000	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
30	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
40	1089.999	1089.999	1089.999	1089.999	1089.999	1090.000	1089.999	1089.999
50	1089.999	1090.000	1089.999	1090.000	1089.999	1089.999	1090.000	1089.999
60	1090.000	1090.000	1089.999	1090.000	1090.000	1090.000	1089.999	1090.000
70	1089.999	1089.999	1090.000	1090.000	1090.000	1090.000	1090.000	1090.000

80	1090.000	1090.000	1090.000	1090.000	1090.000	1090.000	1090.001	1090.000

Table 13-5: Temp Variation of Frequency, XPDR Transmissions 28 Vdc

Temp °C	XPDR							
	Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
-50	1089.999	1089.999	1089.999	1089.999	1090.000	1090.000	1089.999	1089.999
-40	1089.998	1089.999	1089.999	1089.998	1089.999	1089.999	1089.999	1089.999
-30	1089.999	1089.999	1089.998	1089.999	1089.999	1089.999	1089.999	1089.999
-20	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
-10	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1090.000
0	1089.998	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
10	1089.998	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
20	1090.000	1090.000	1089.998	1089.999	1089.999	1089.999	1089.999	1089.999
30	1089.999	1089.999	1090.000	1089.999	1090.000	1089.999	1089.999	1089.999
40	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
50	1090.000	1089.999	1090.000	1089.999	1089.999	1090.000	1090.000	1090.000
60	1089.999	1089.999	1089.999	1089.999	1090.000	1090.000	1089.999	1090.000
70	1089.999	1089.999	1089.999	1090.000	1090.000	1089.999	1090.000	1089.999
80	1090.000	1090.000	1090.000	1090.000	1090.000	1090.000	1090.000	1090.000

13.4 Test Results Data, Primary Power Variation

Frequency deviation for any antenna port between power levels is 4 kHz or less, power deviation for any antenna port between power levels is 0.42 dB or less for TCAS and 0.69 dB or less for transponder.

Table 13-6: Frequency Stability, Primary Power Variation Results

Freq Stability			Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
TCAS	23 Vdc	Freq (MHz)	1030.000	1030.000	1029.998	1030.001	1030.002	1030.001	1029.998	1029.999
		Pwr (dBm)	54.03	53.88	54.16	54.07	53.76	54.00	53.94	54.04
	33 Vdc	Freq (MHz)	1029.999	1029.998	1029.997	1029.999	1029.999	1030.000	1029.997	1030.000
		Pwr (dBm)	53.61	53.73	53.78	54.11	53.78	53.96	53.66	53.97
	97 Vac	Freq (MHz)	1030.001	1030.001	1029.996	1030.000	1030.000	1030.000	1030.000	1030.001
		Pwr (dBm)	53.97	53.91	54.29	54.26	53.82	53.97	53.76	54.06
	133 Vac	Freq (MHz)	1030.000	1029.999	1029.998	1030.000	1029.999	1029.997	1029.999	1029.999
		Pwr (dBm)	53.99	53.90	53.95	54.18	53.98	53.95	53.63	53.99
XPDR	23 Vdc	Freq (MHz)	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
		Pwr (dBm)	52.49	52.81	52.87	52.60	52.42	52.33	52.79	52.44
	33 Vdc	Freq (MHz)	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
		Pwr (dBm)	51.91	52.40	52.59	52.09	52.02	52.03	52.62	52.11
	97 Vac	Freq (MHz)	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999	1089.999
		Pwr (dBm)	52.02	52.45	52.62	52.10	52.05	52.06	52.63	52.05
	133	Freq (MHz)	1089.999	1089.999	1089.999	1089.999	1089.999	1090.000	1089.999	1089.999

Freq Stability			Top 0	Top 90	Top 180	Top 270	Bot 0	Bot 90	Bot 180	Bot 270
	Vac	Pwr (dBm)	51.85	52.26	52.54	51.91	51.83	51.91	52.57	51.85

A. APPENDIX A: MODULATION CHARACTERISTICS SCREEN CAPTURES

A.1 TCAS Mode C Interrogations

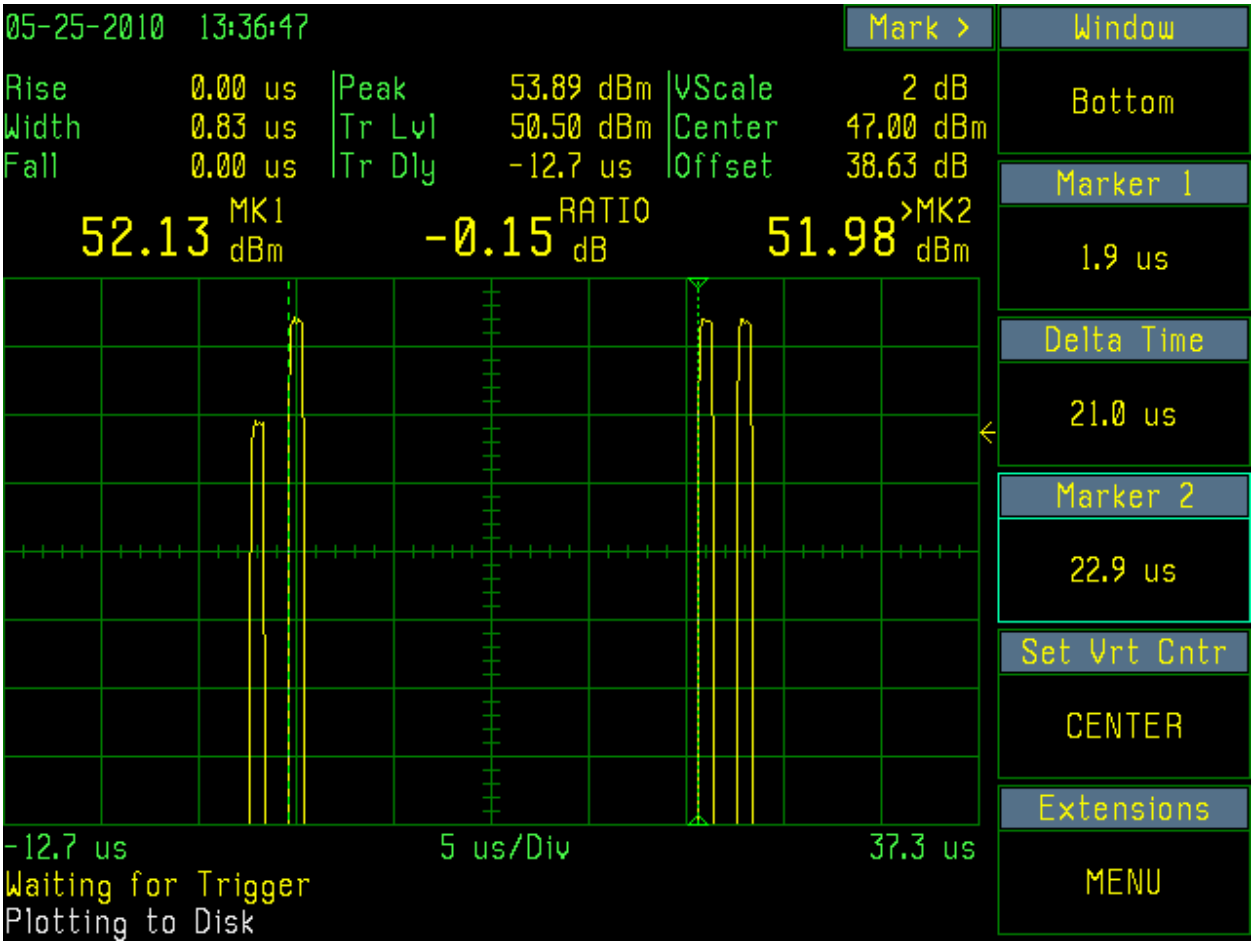


Figure A-1: Typical Mode C Interrogation and P1 to P3 Spacing

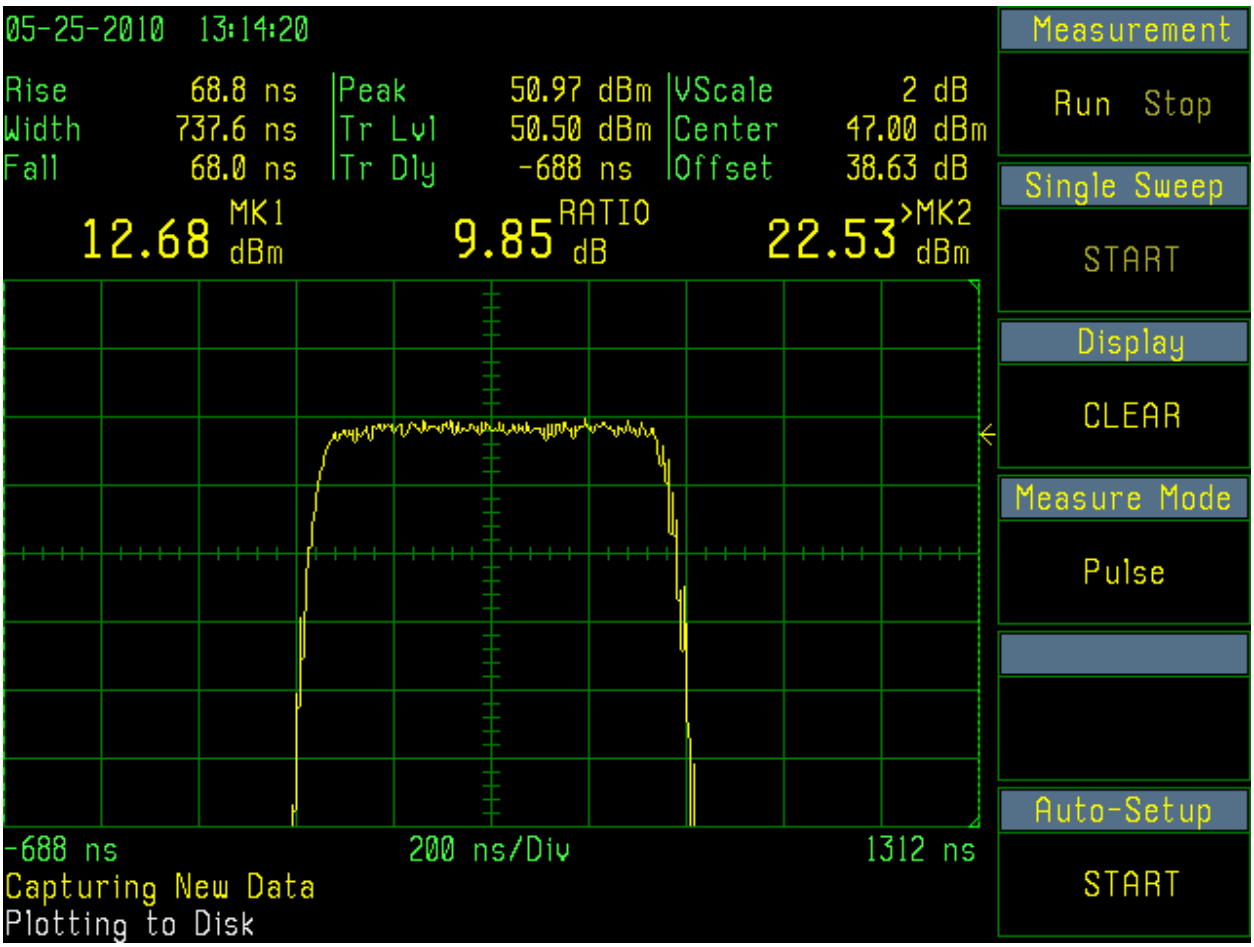


Figure A-2: Typical Mode C Interrogation, S1 Pulse

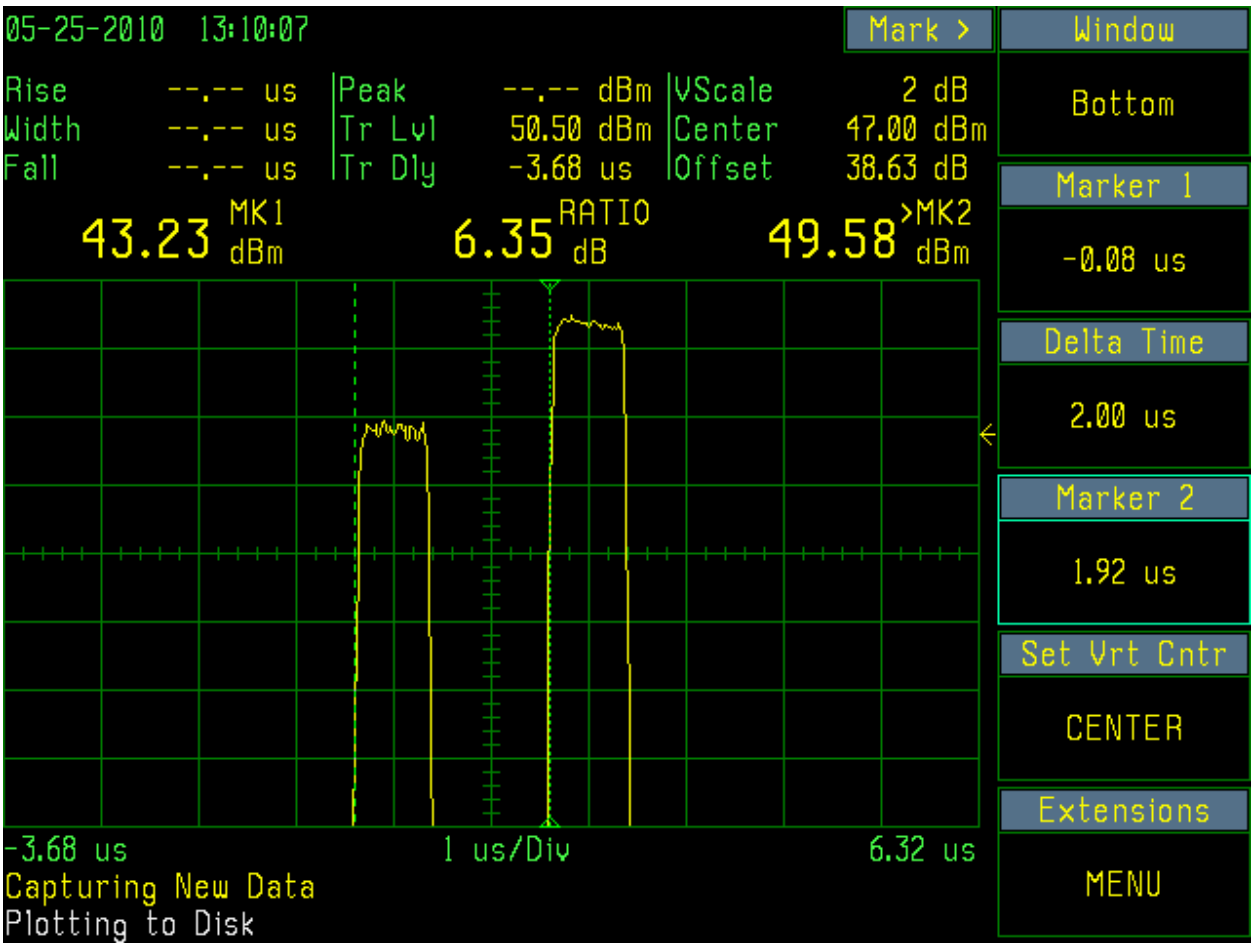


Figure A-3: Typical Mode C Interrogation, S1 to P1 Spacing

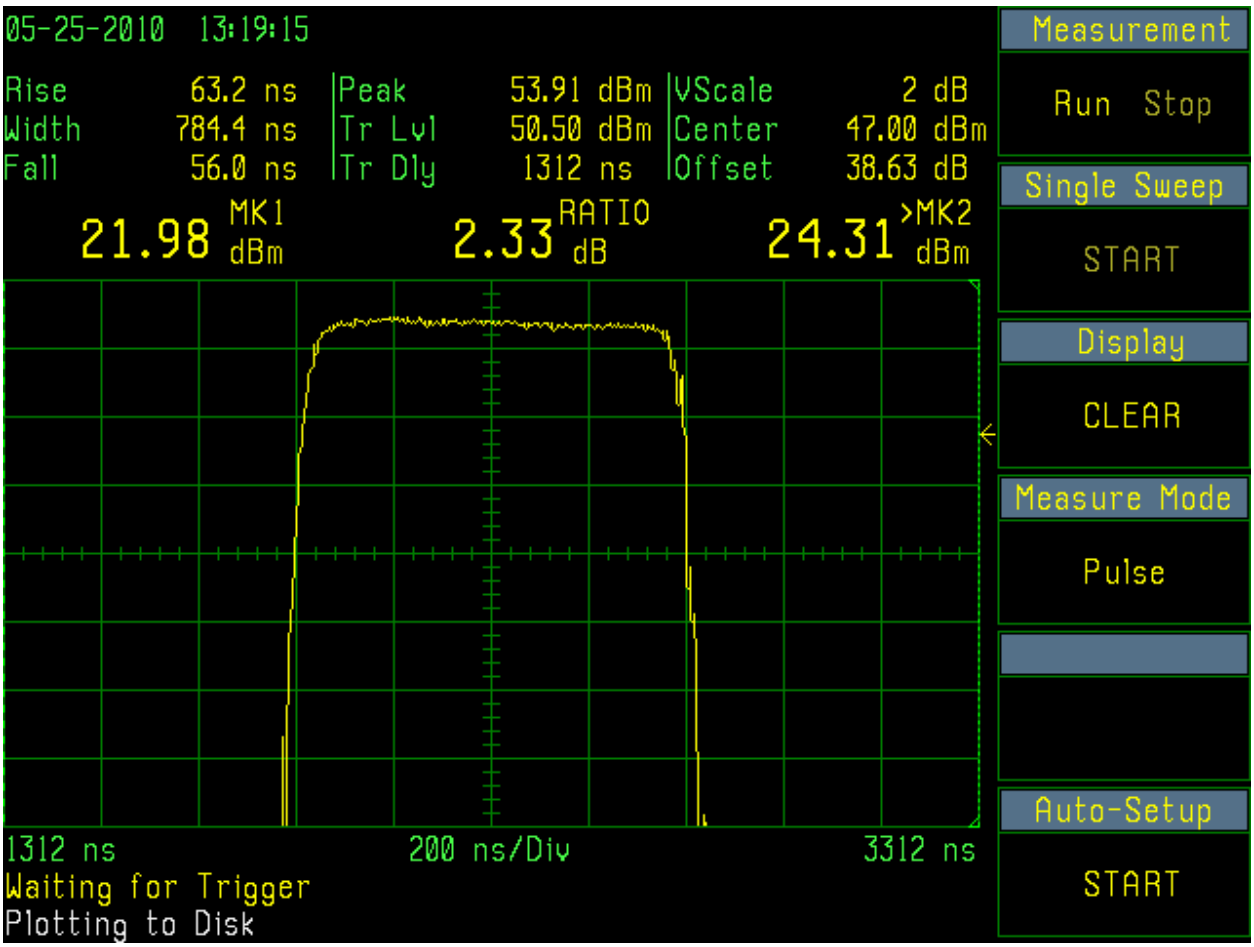


Figure A-4: Typical Mode C Interrogation, P1 Pulse

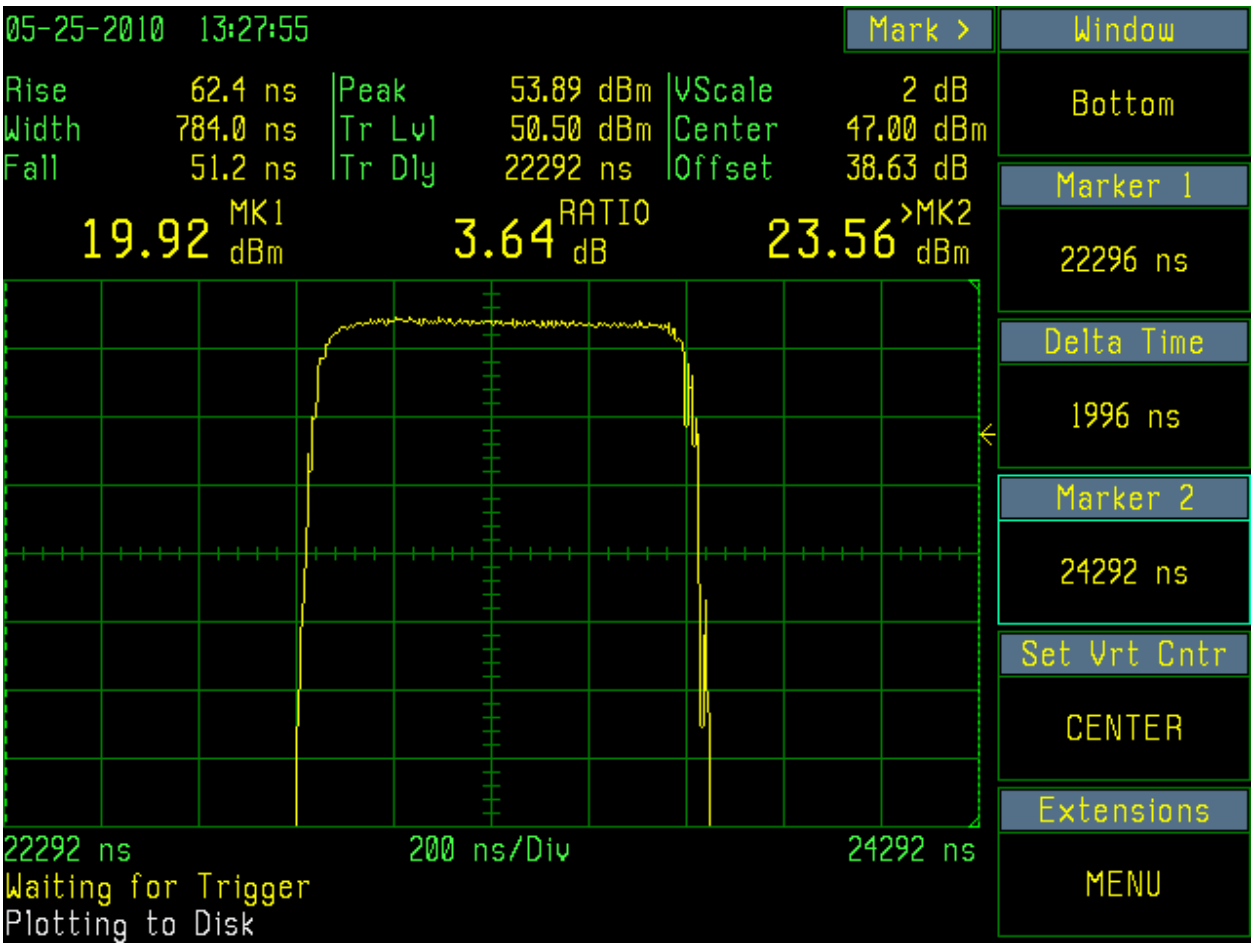


Figure A-5: Typical Mode C Interrogation, P3 Pulse

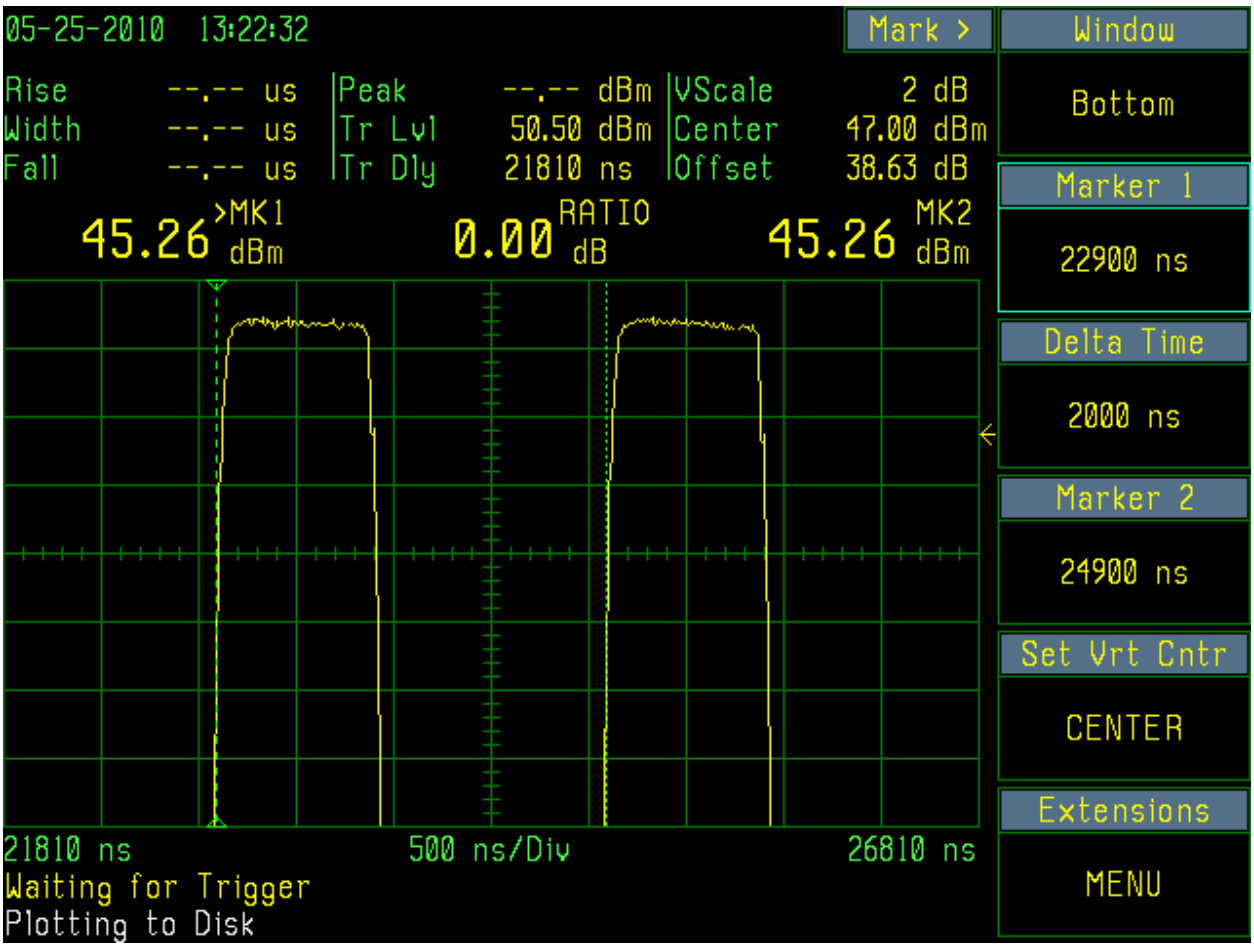


Figure A-6: Typical Mode C Interrogation, P3 to P4 Spacing

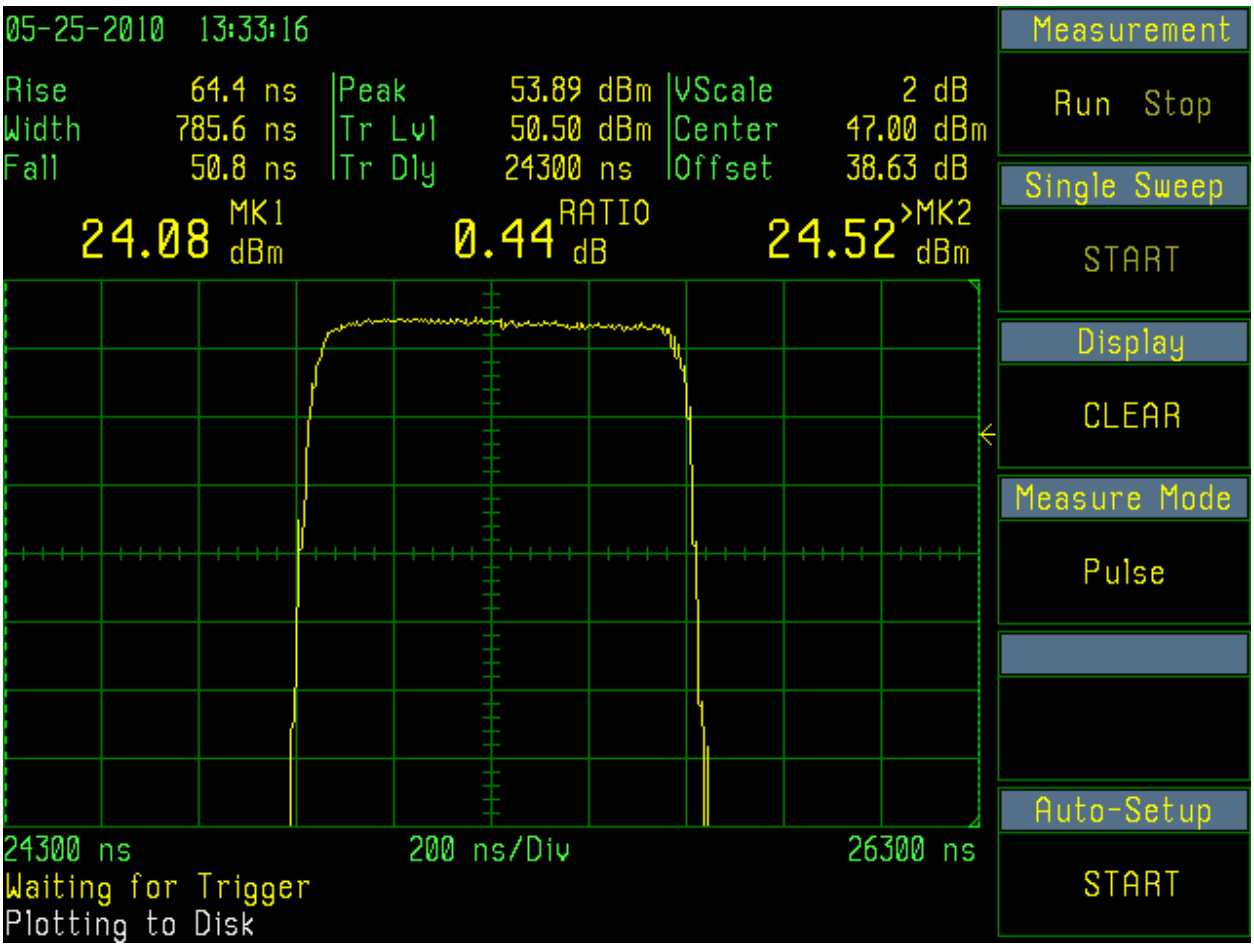


Figure A-7: Typical Mode C Interrogation, P4 Pulse

A.2 TCAS Mode S Interrogations

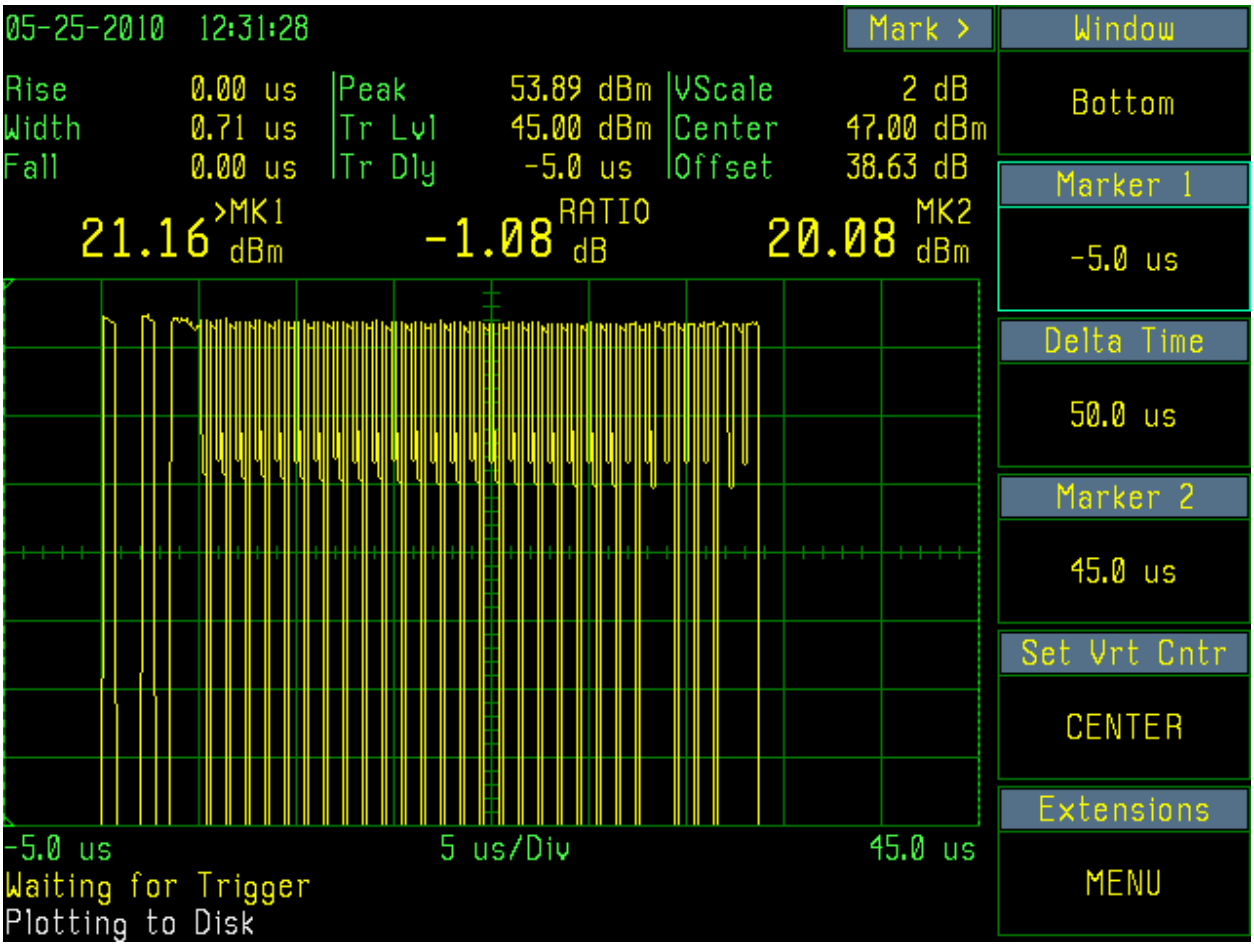


Figure A-8: Typical Mode S Interrogation

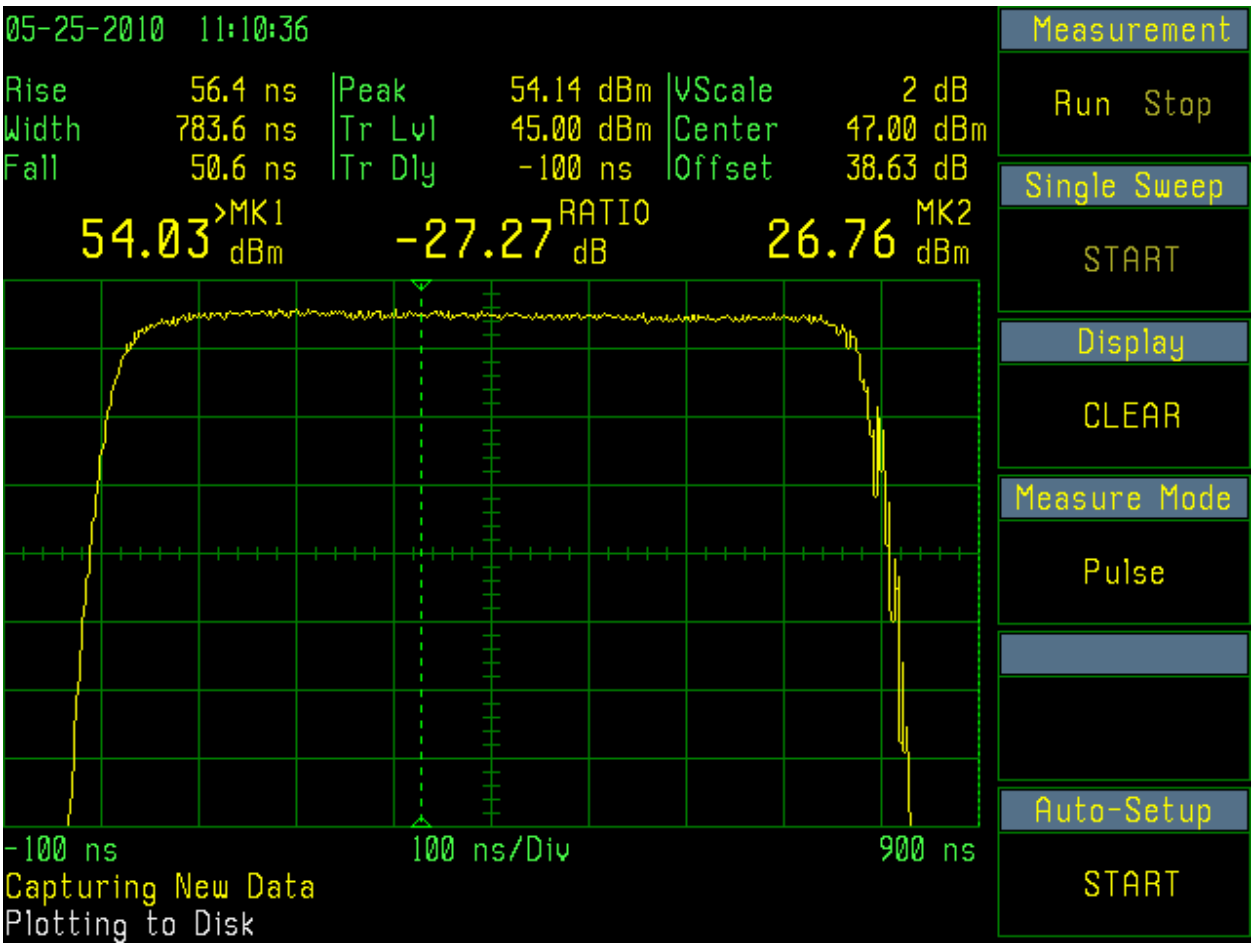


Figure A-9: Typical Mode S Interrogation, P1 and P2 Pulse Shapes

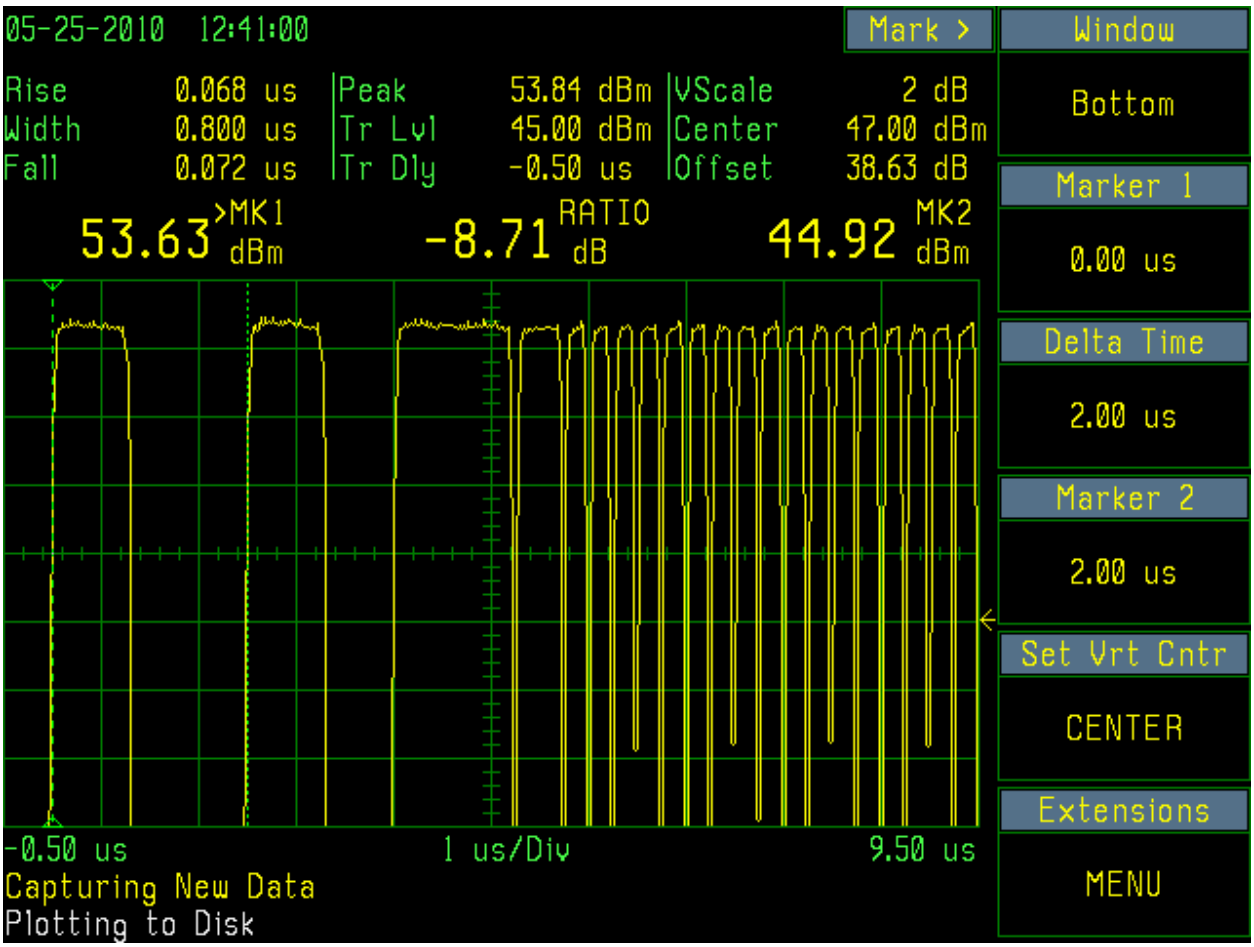


Figure A-10: Typical Mode S Interrogation, P1 to P2 Spacing

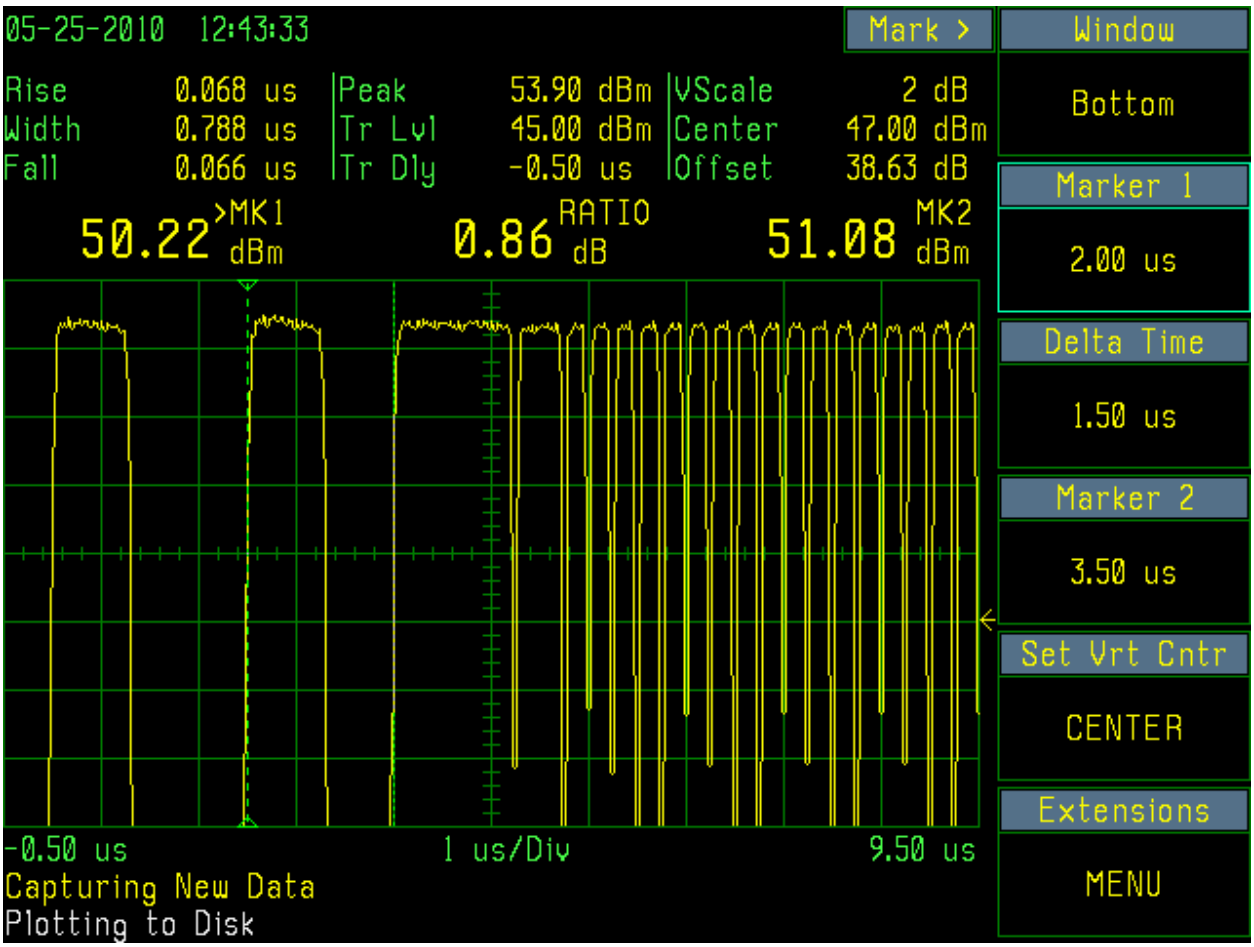


Figure A-11: Typical Mode S Interrogation, P2 to P6 Spacing

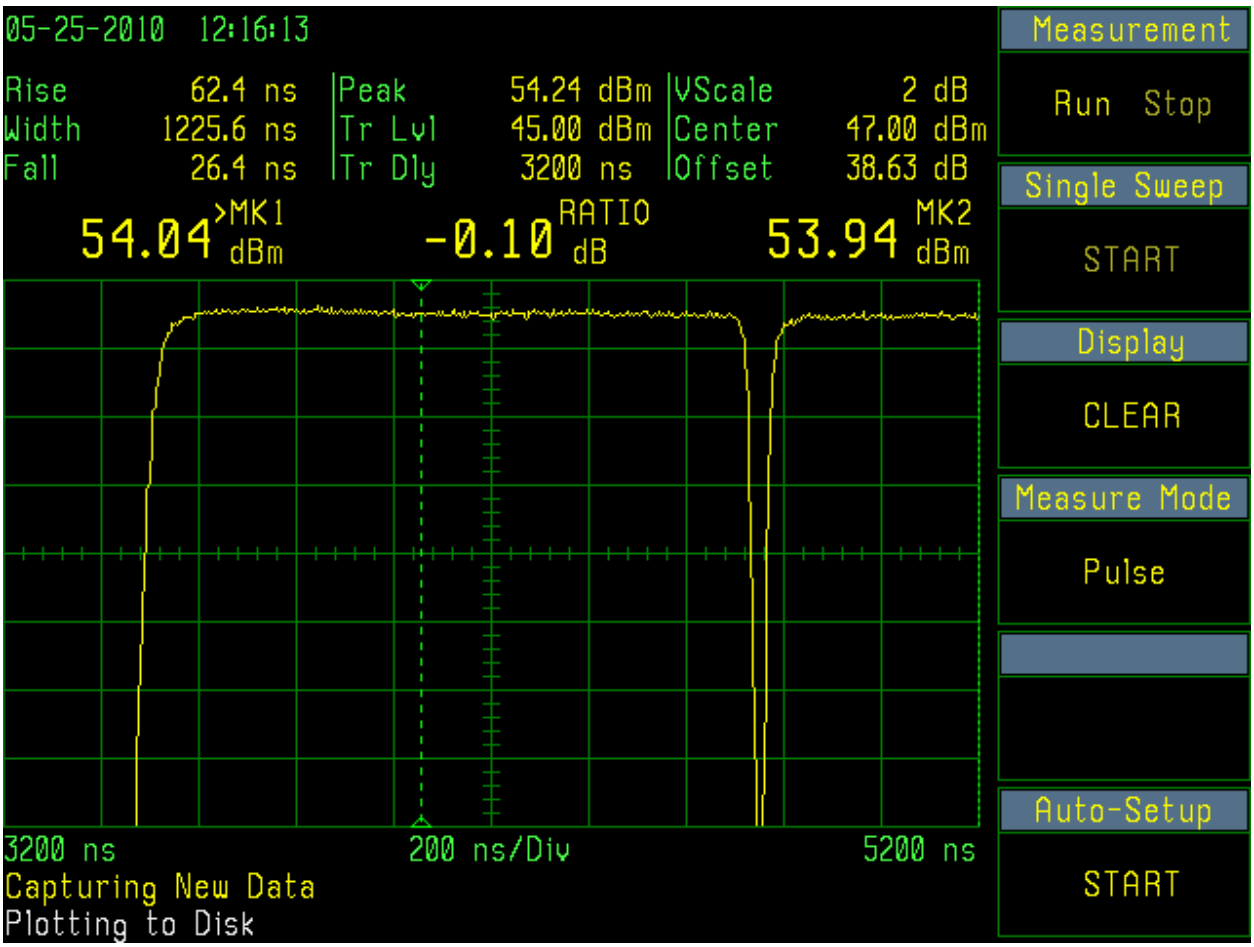


Figure A-12: Typical Mode S Interrogation, P6 Preamble

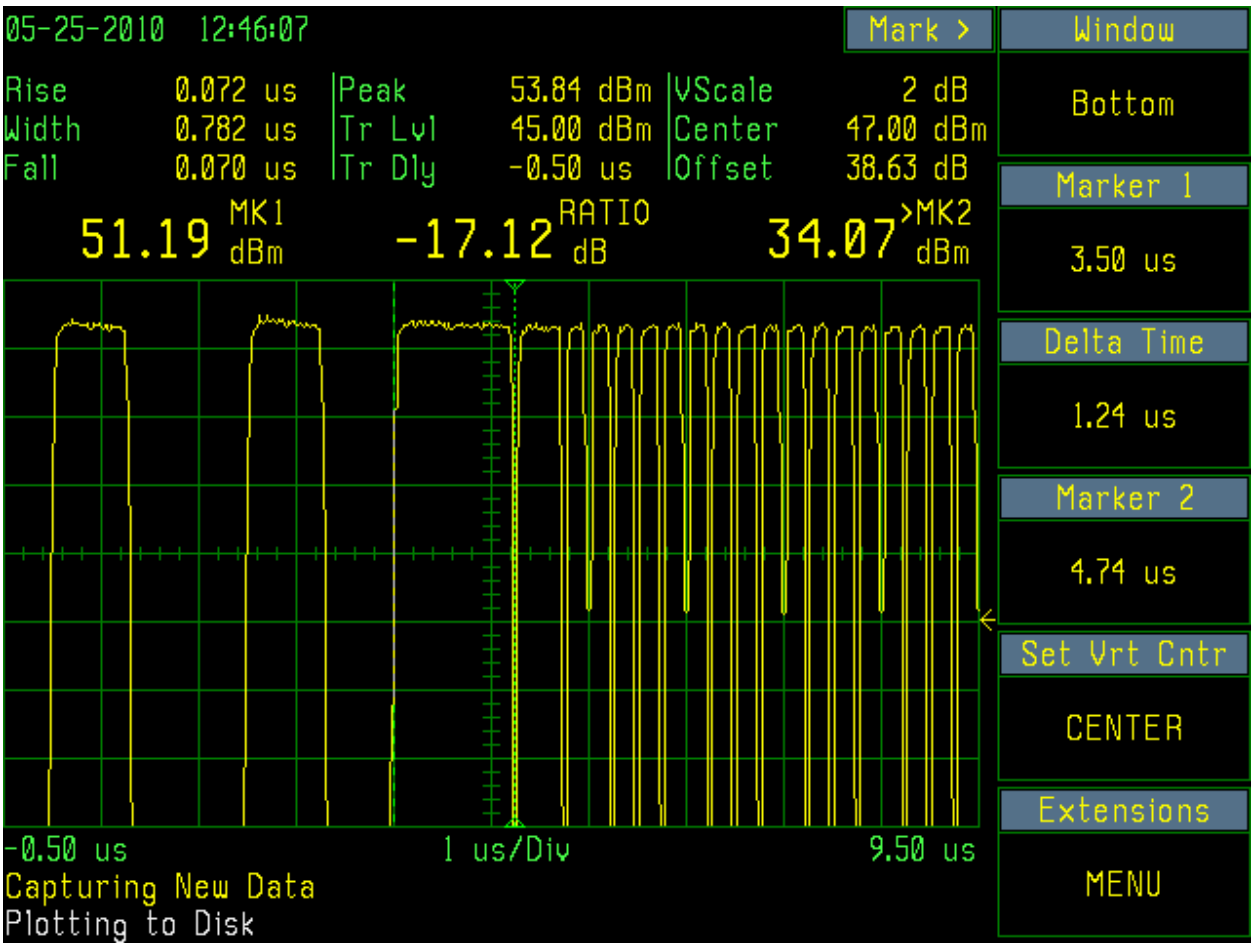


Figure A-13: Typical Mode S Interrogation, P6 to Minimum of Sync Phase Reversal (SPR) Spacing

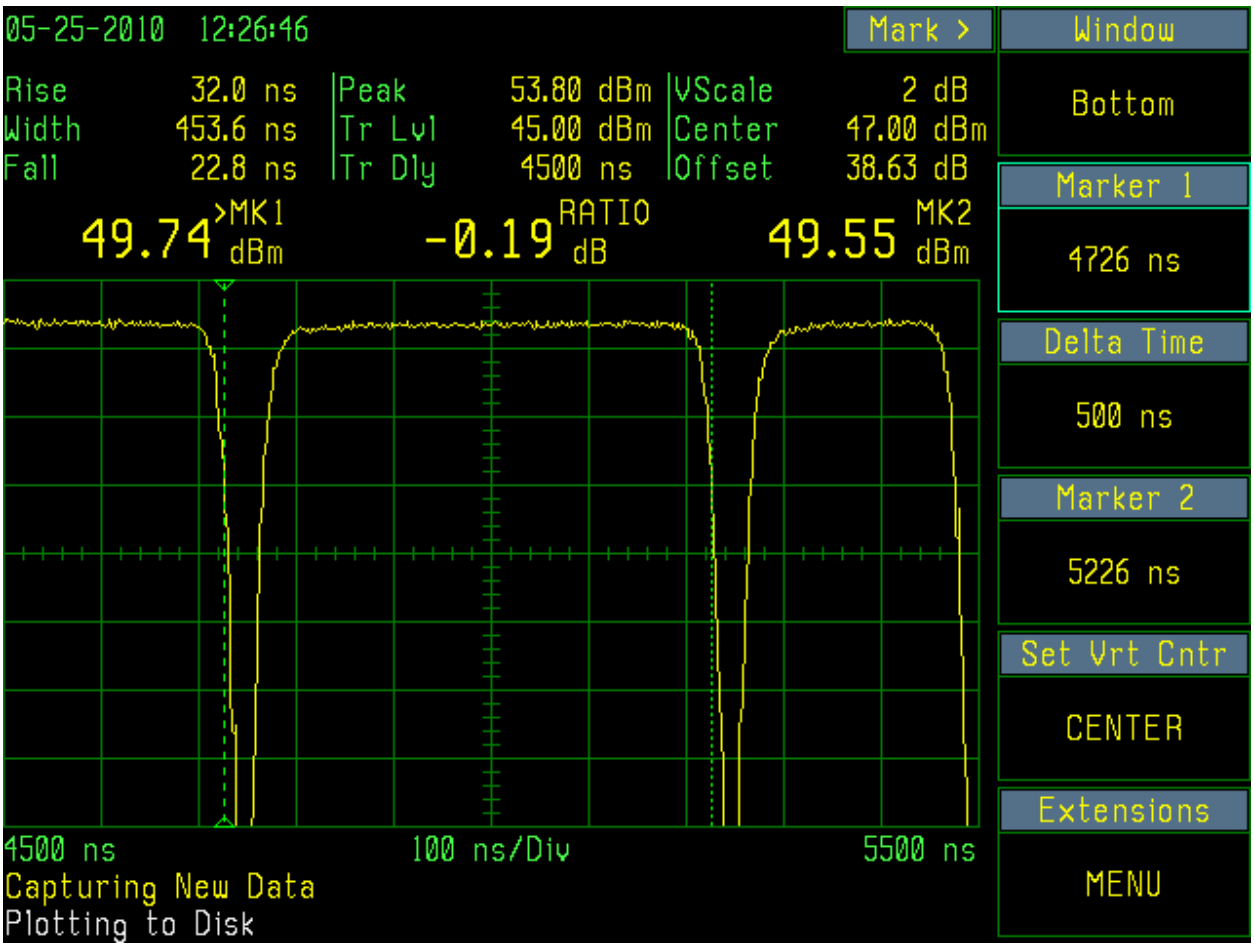


Figure A-14: Typical Mode S Interrogation, Sync Phase Reversal (SPR)

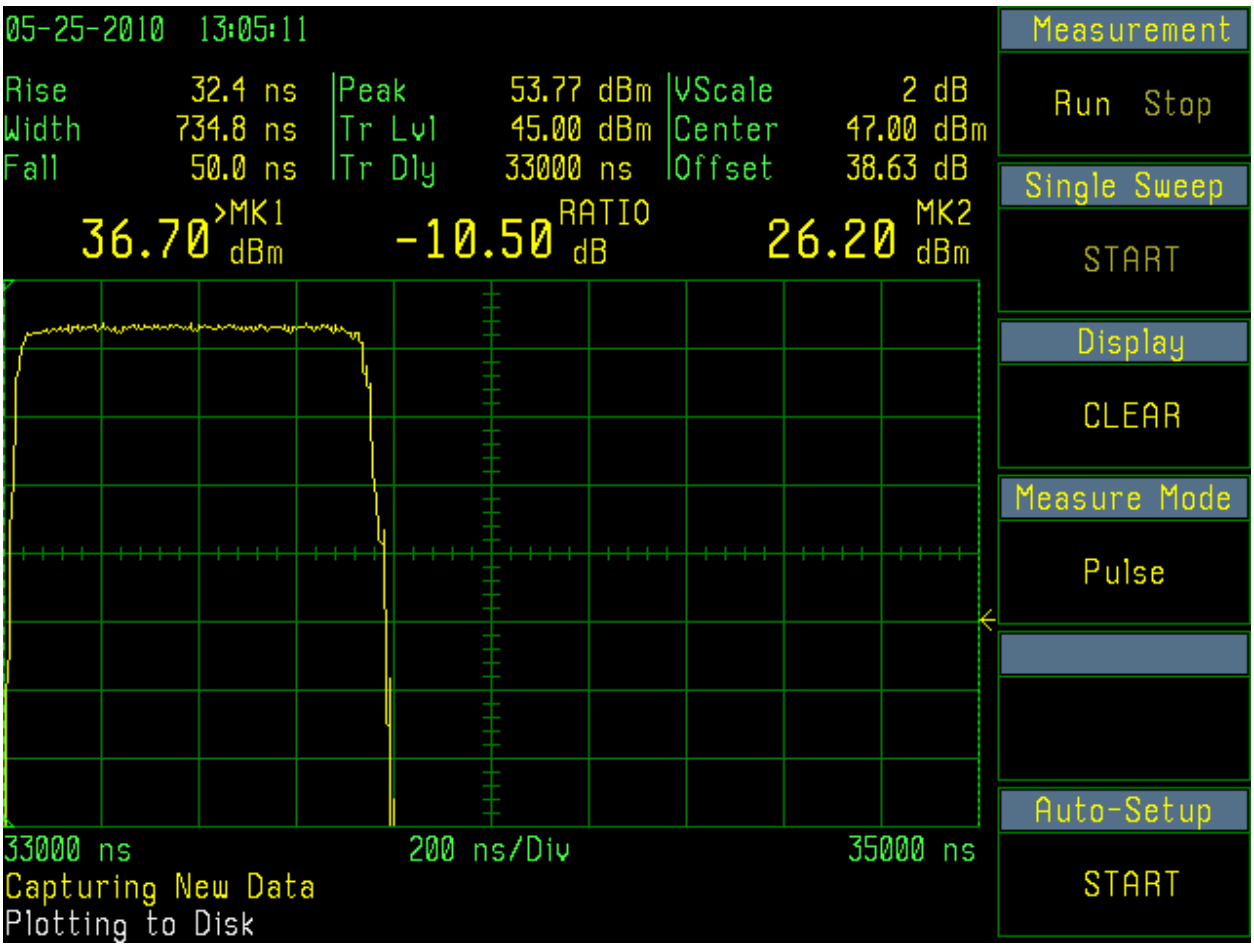


Figure A-15: Typical Mode S Interrogation, P6 Decay

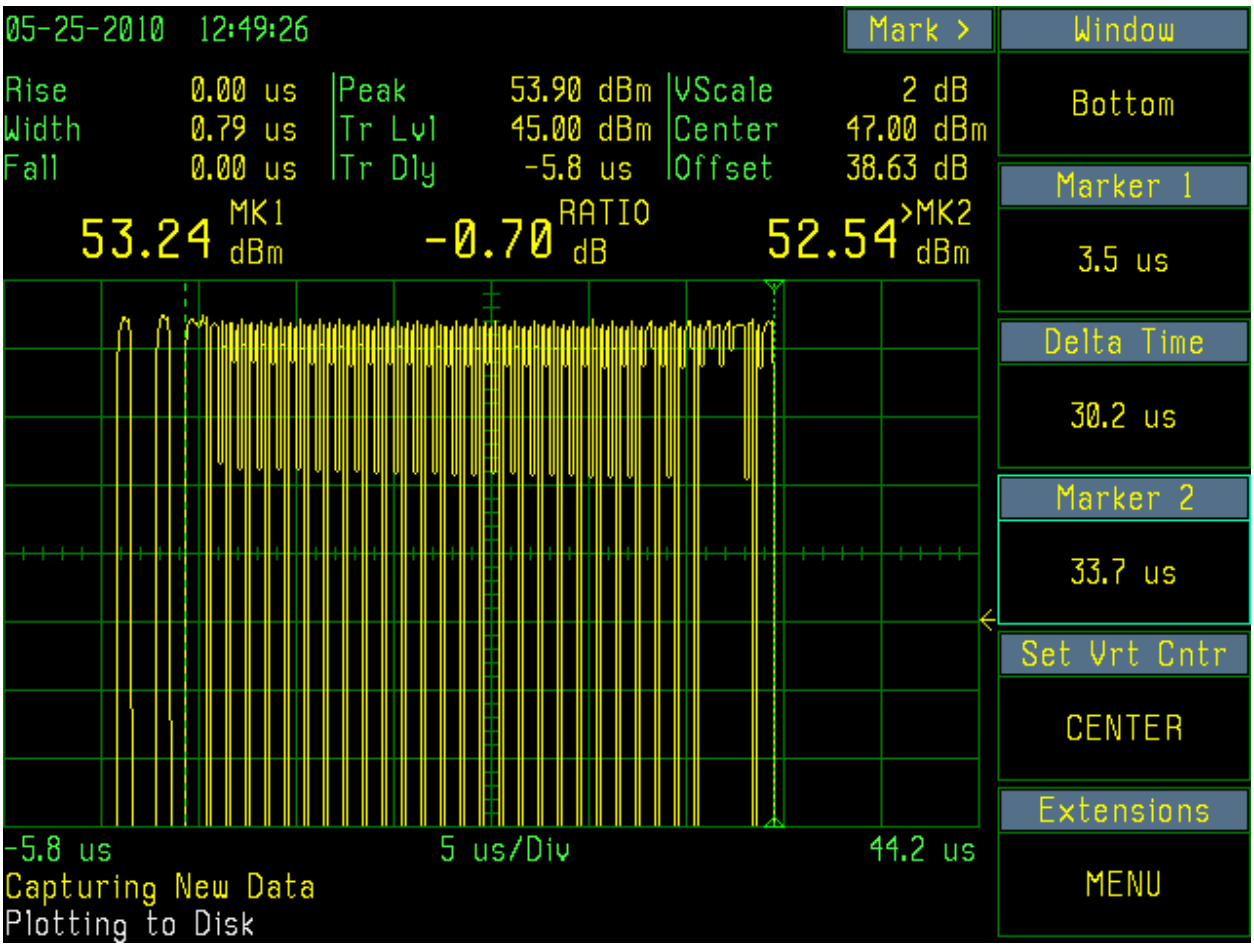


Figure A-16: Typical Mode S Interrogation, P6 Pulse Width

A.3 XPDR Mode C Replies

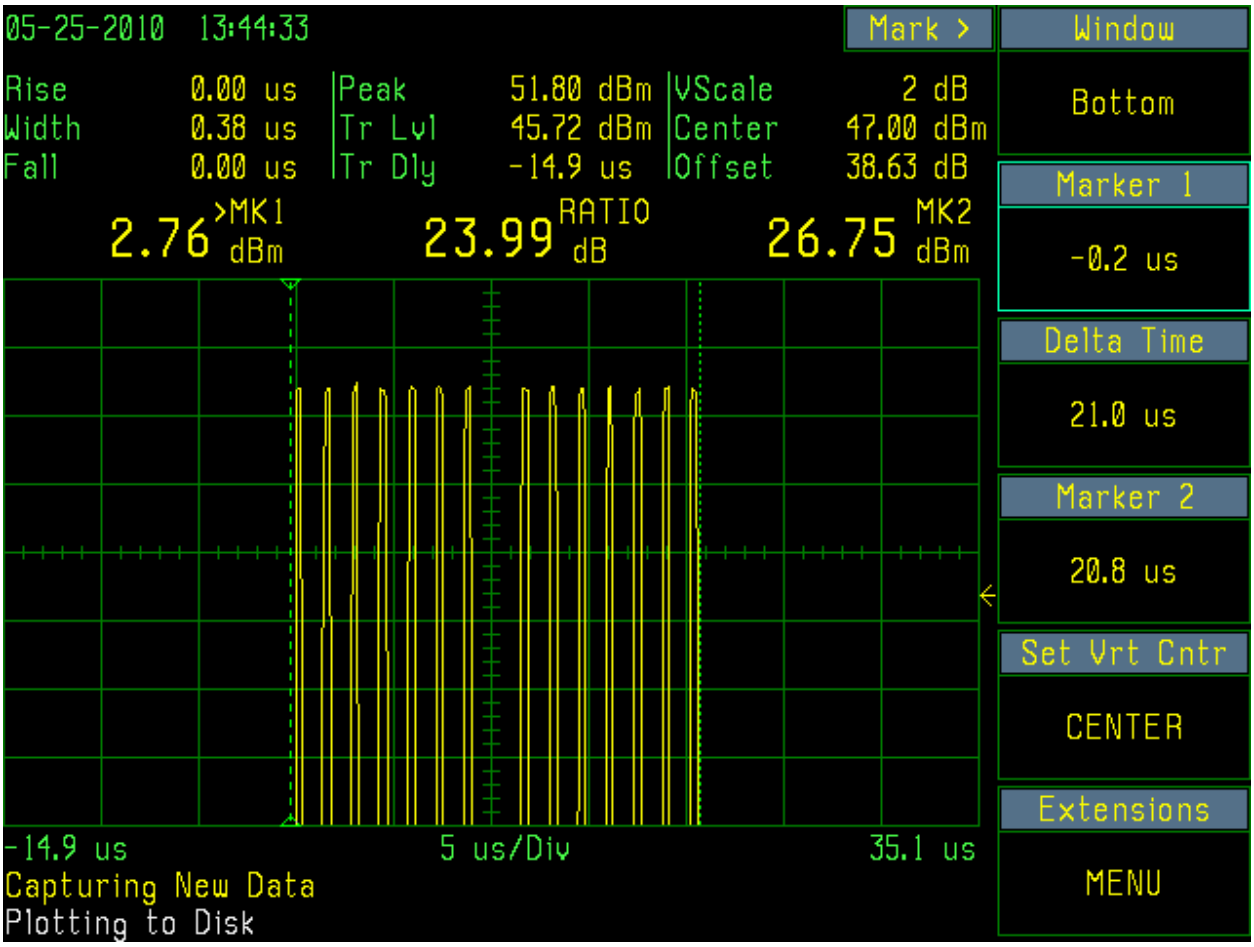


Figure A-17: Typical Mode C Reply

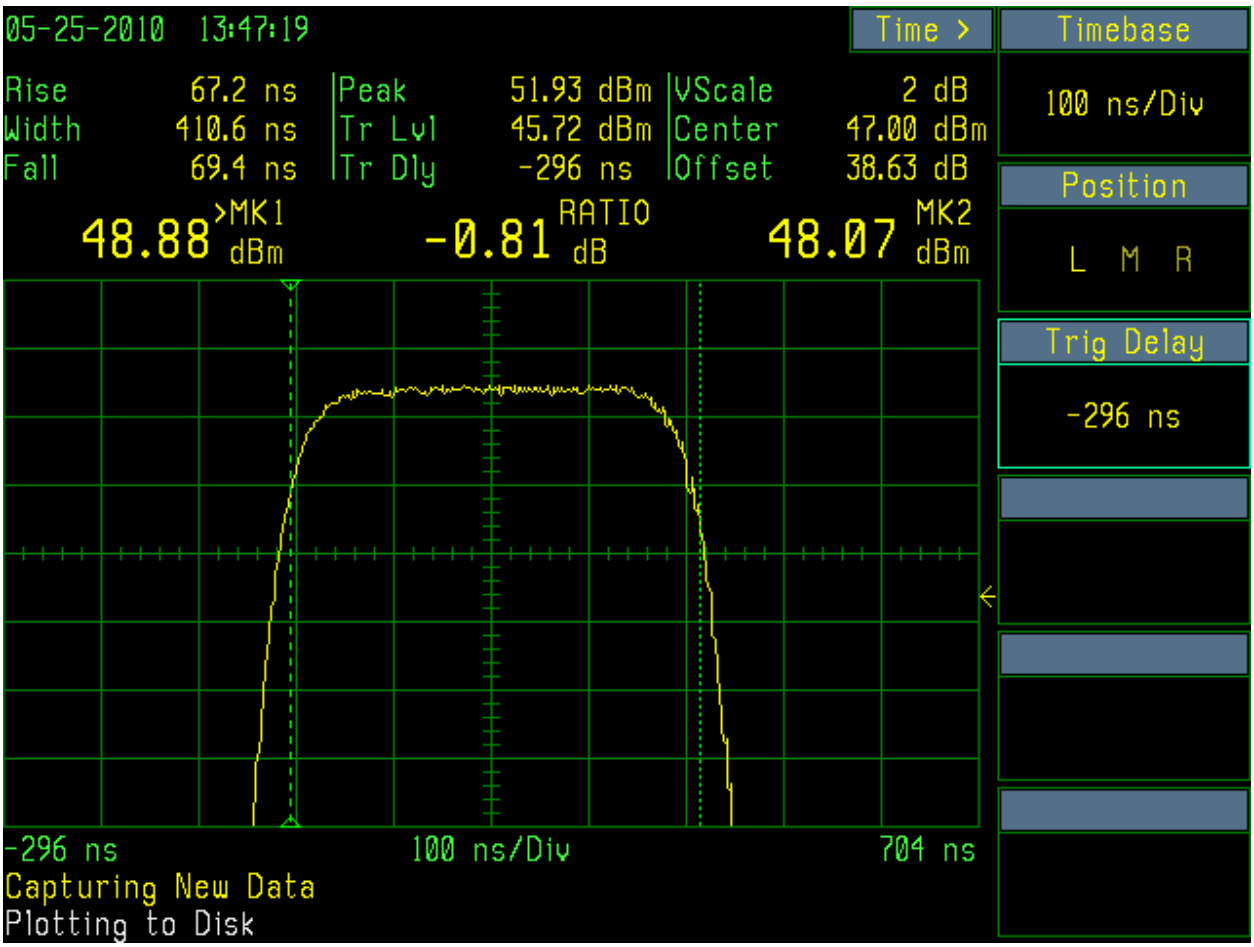


Figure A-18: Typical Mode C Reply, General Pulse Shape

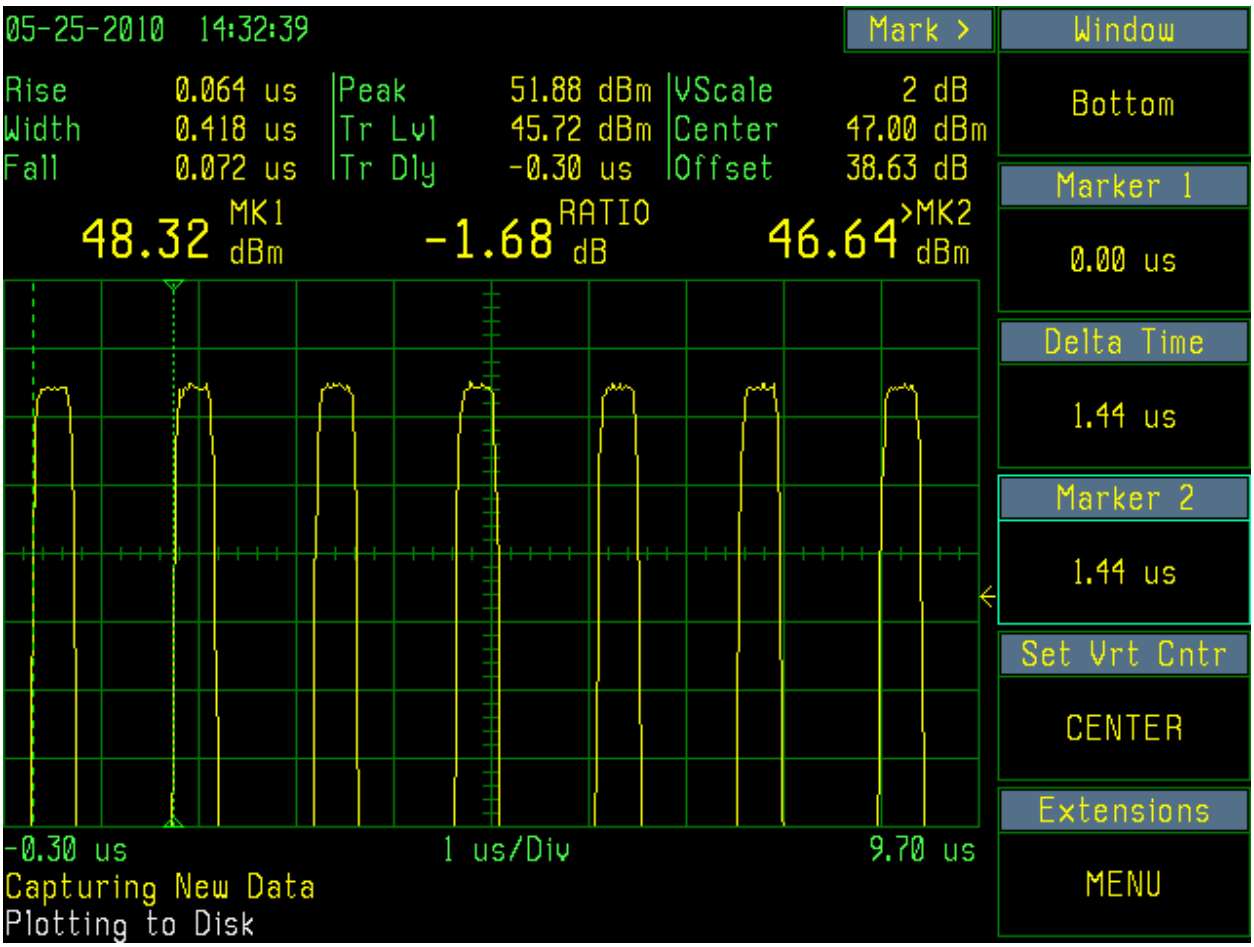


Figure A-19: Typical Mode C Reply, F1 to C1 Spacing

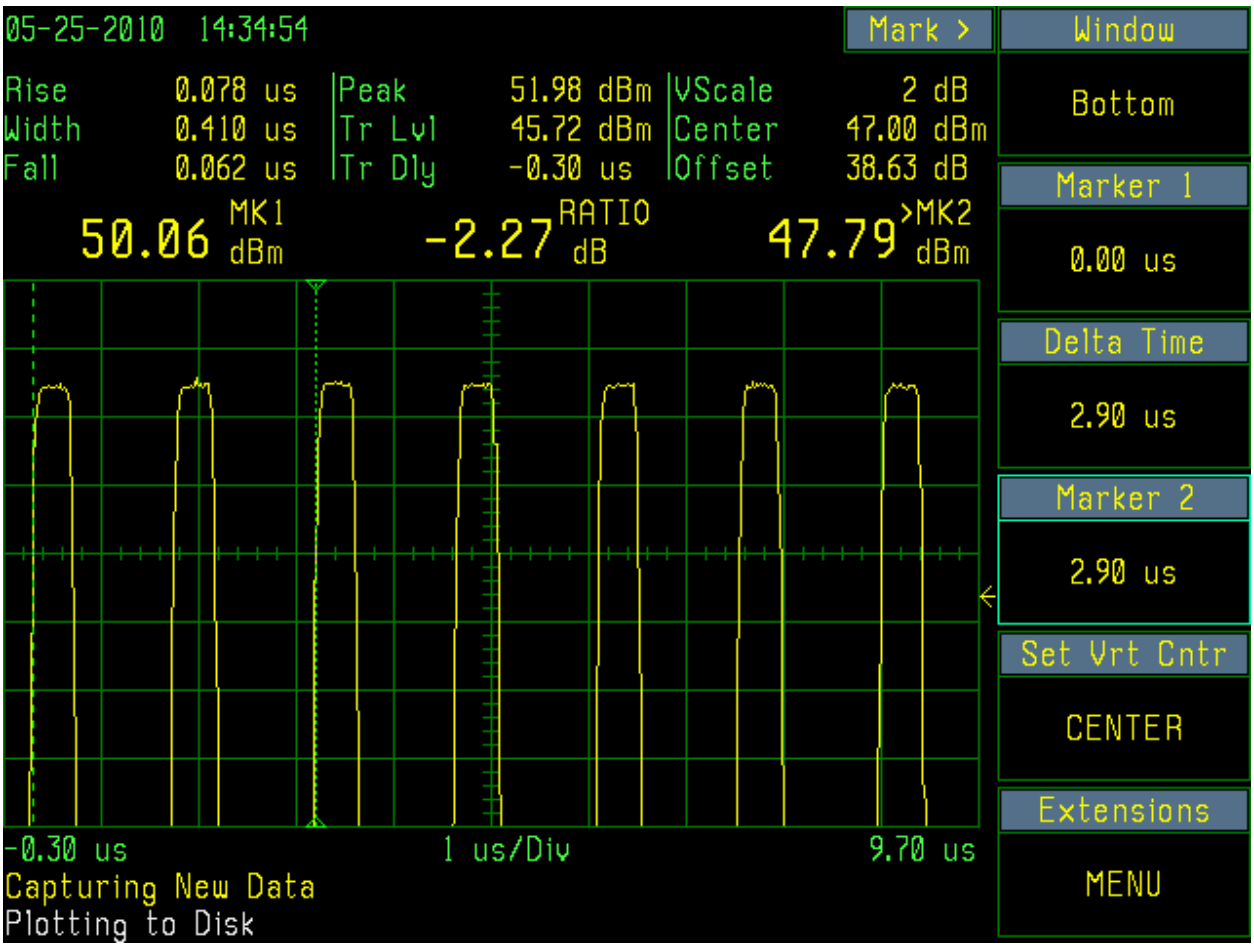


Figure A-20: Typical Mode C Reply, F1 to A1 Spacing

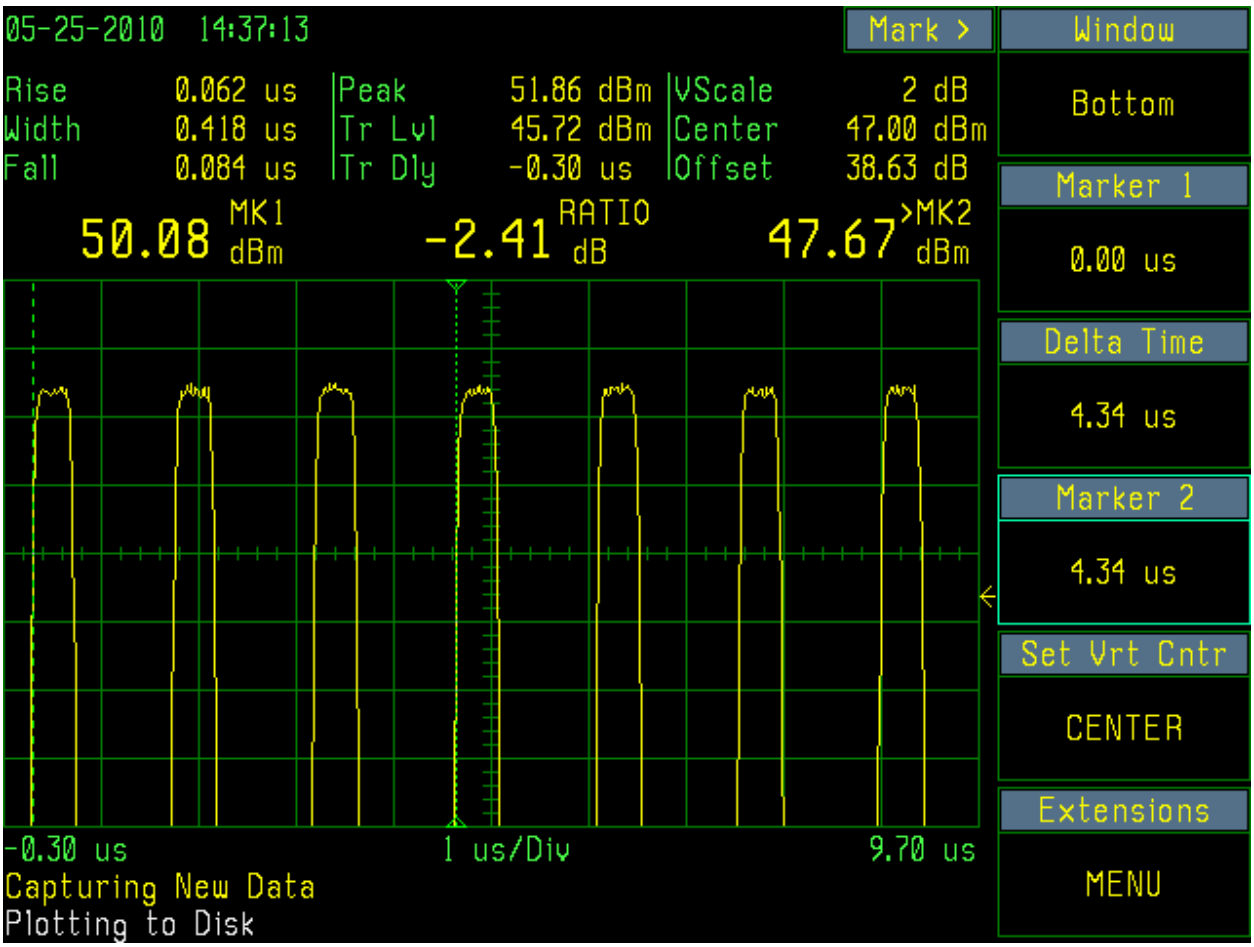


Figure A-21: Typical Mode C Reply, F1 to C2 Spacing

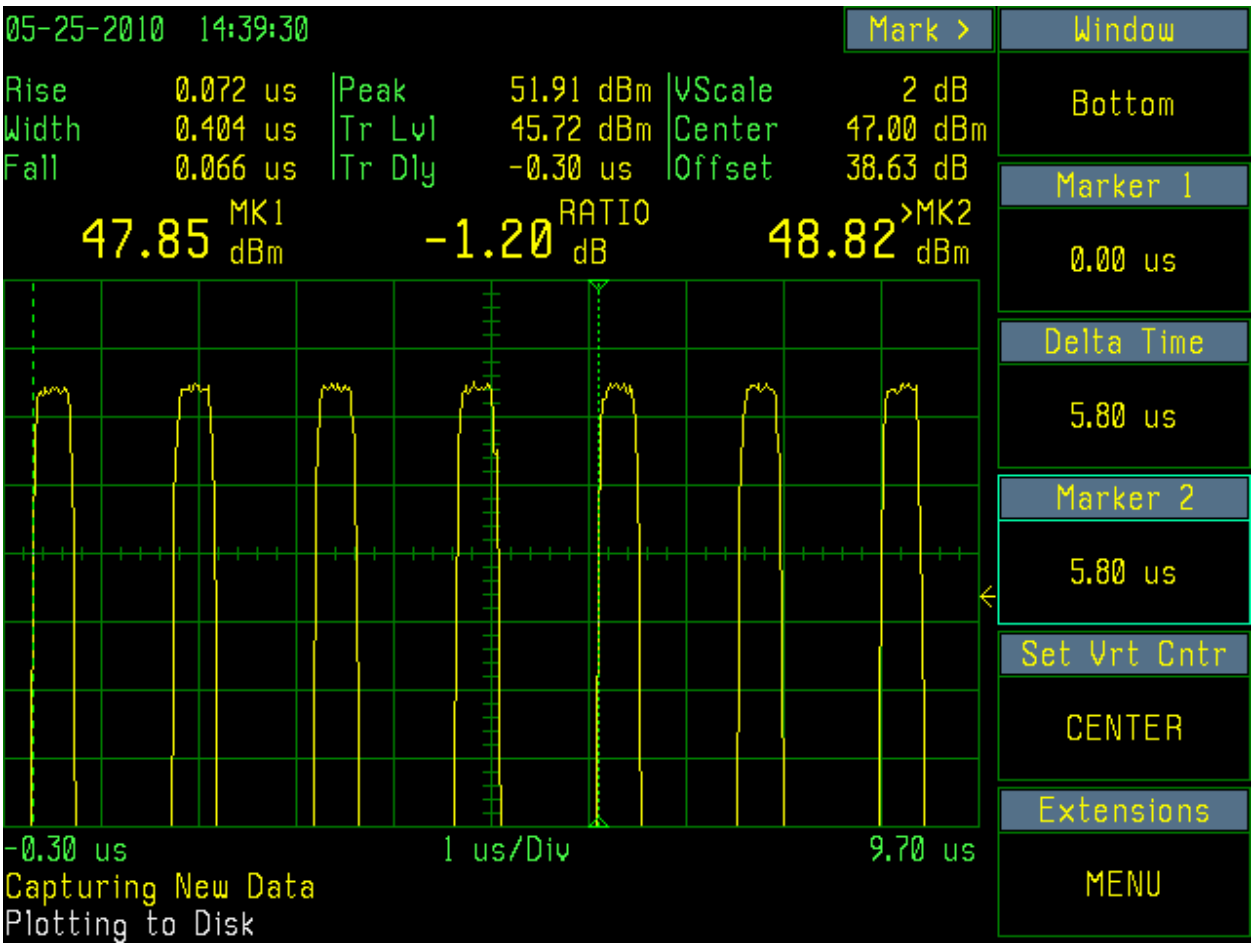


Figure A-22: Typical Mode C Reply, F1 to A2 Spacing

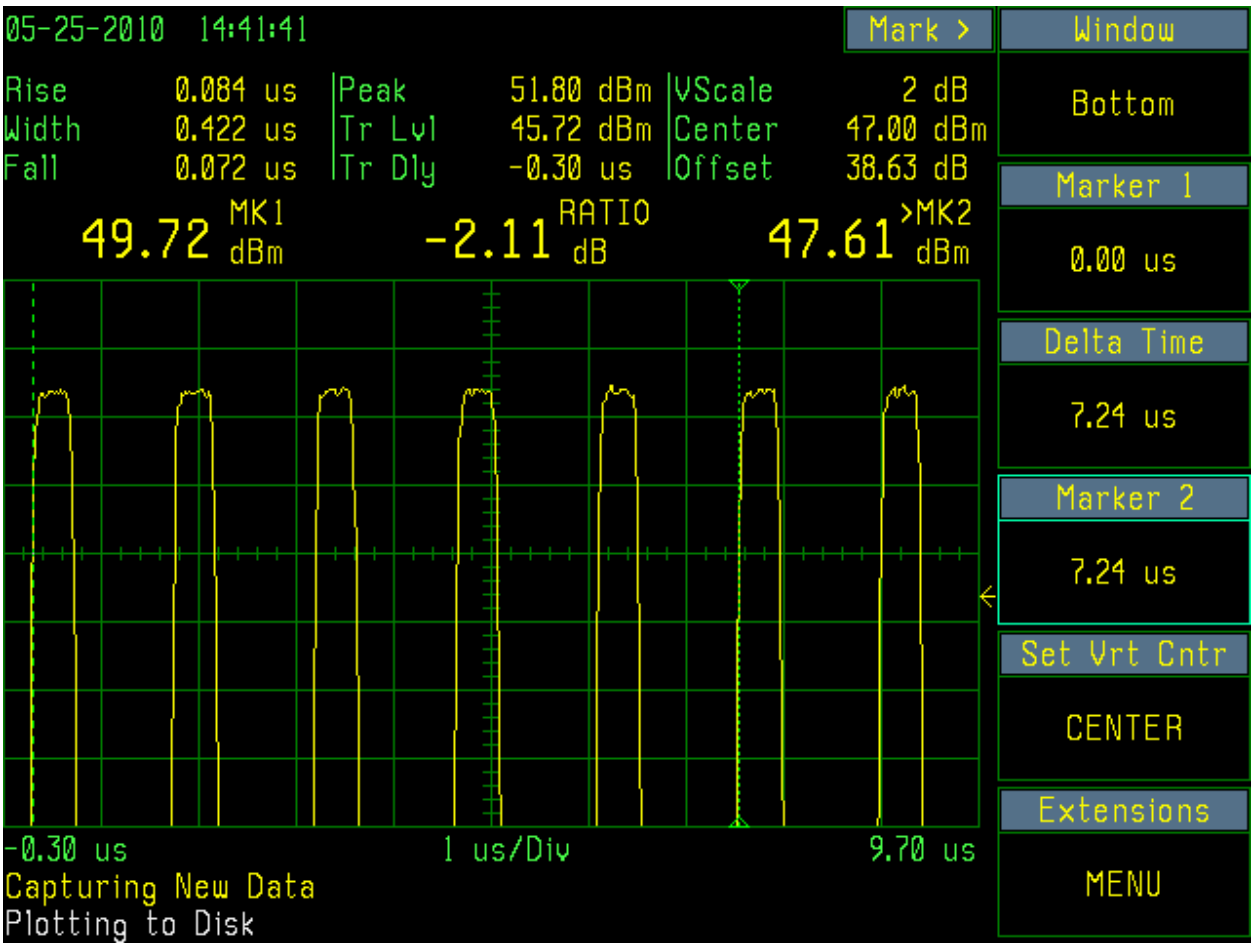


Figure A-23: Typical Mode C Reply, F1 to C4 Spacing

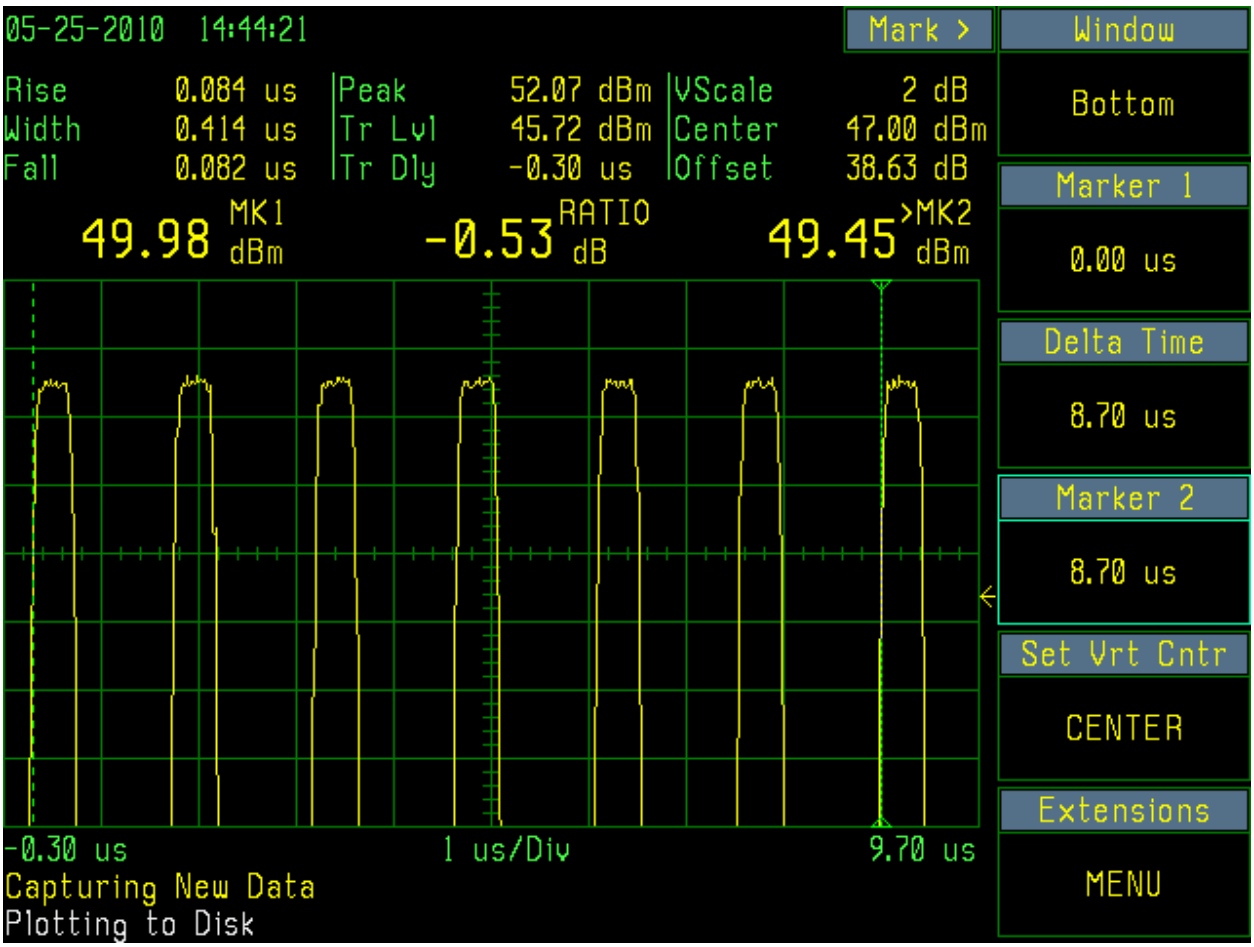


Figure A-24: Typical Mode C Reply, F1 to A4 Spacing

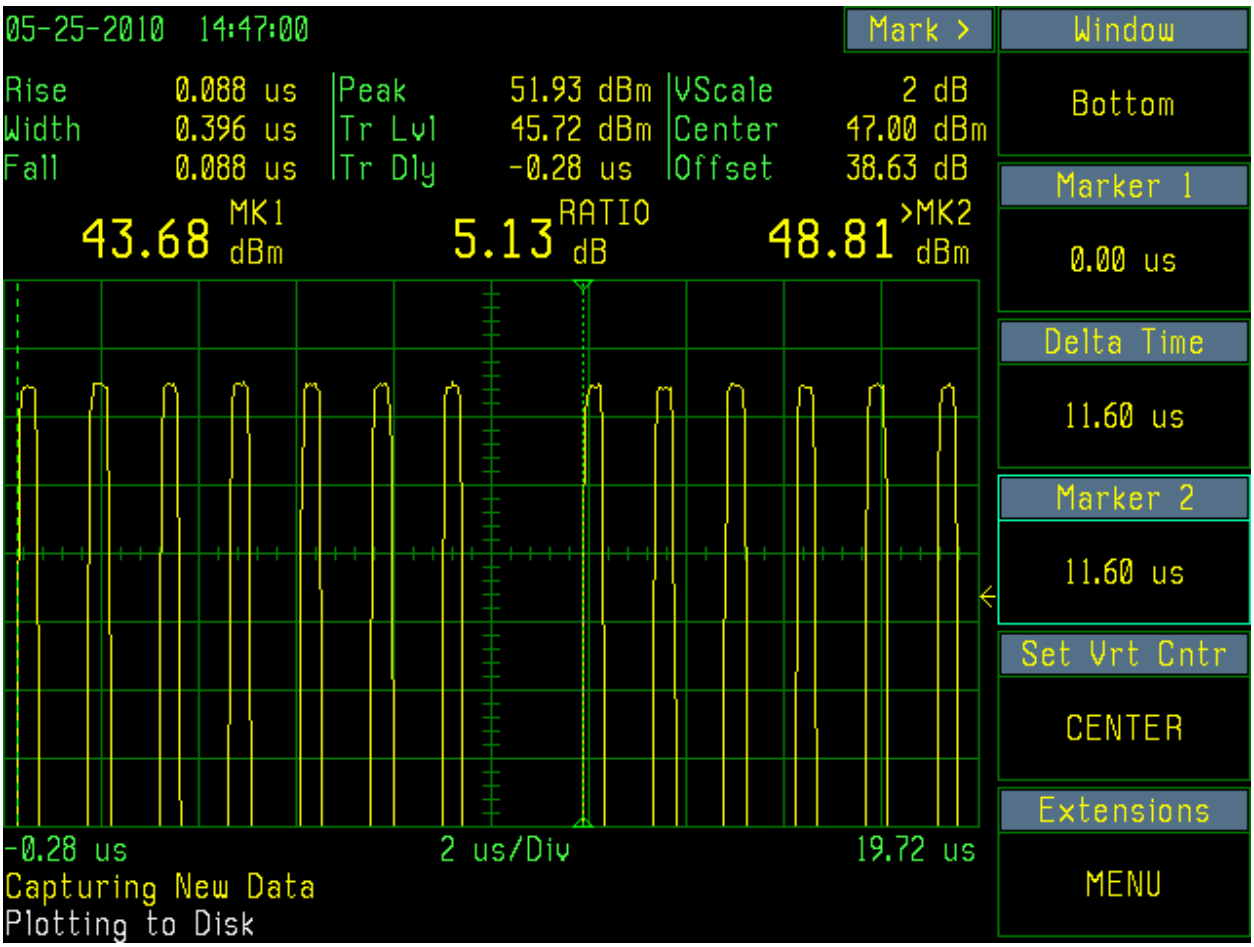


Figure A-25: Typical Mode C Reply, F1 to B1 Spacing

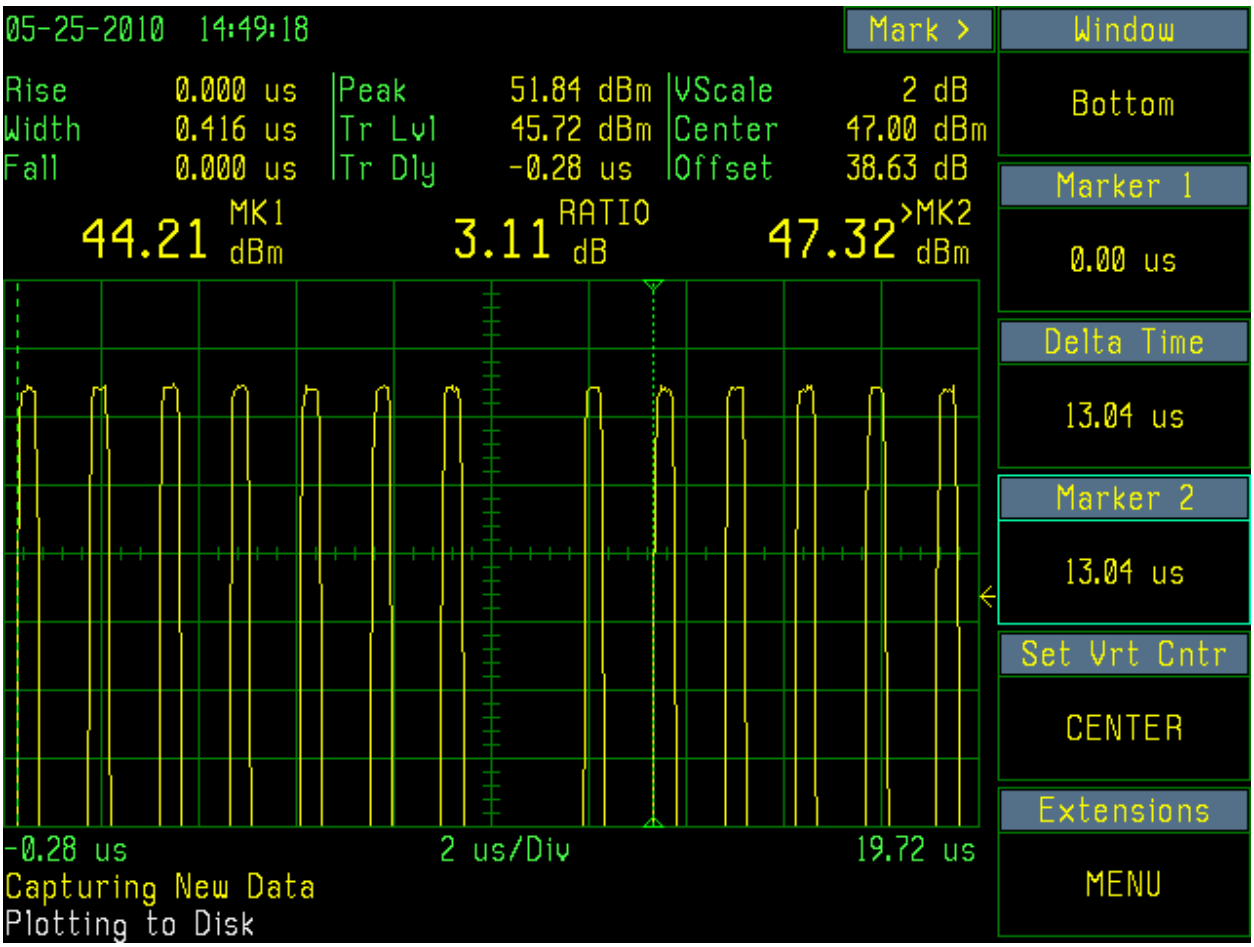


Figure A-26: Typical Mode C Reply, F1 to D1 Spacing

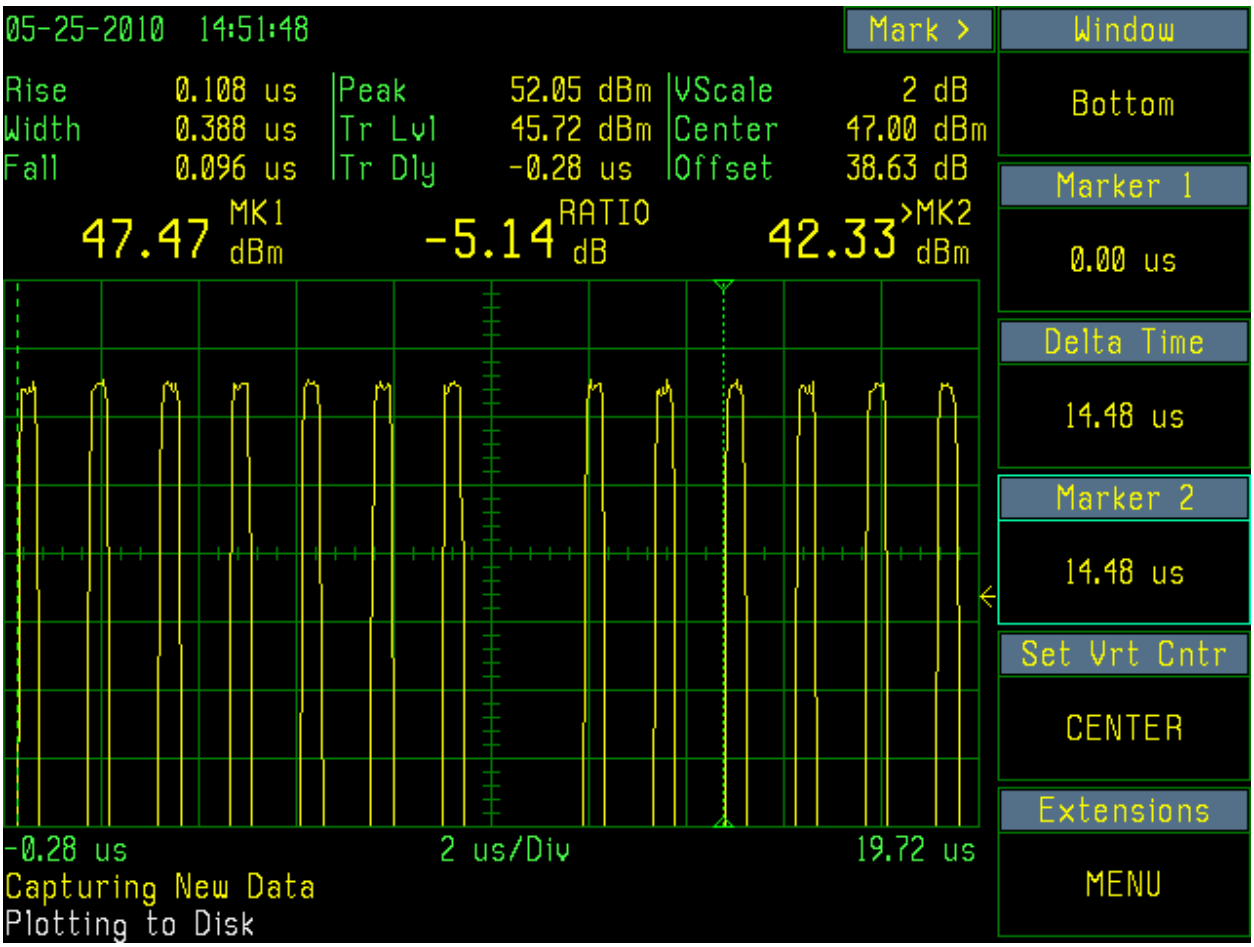


Figure A-27: Typical Mode C Reply, F1 to B2 Spacing

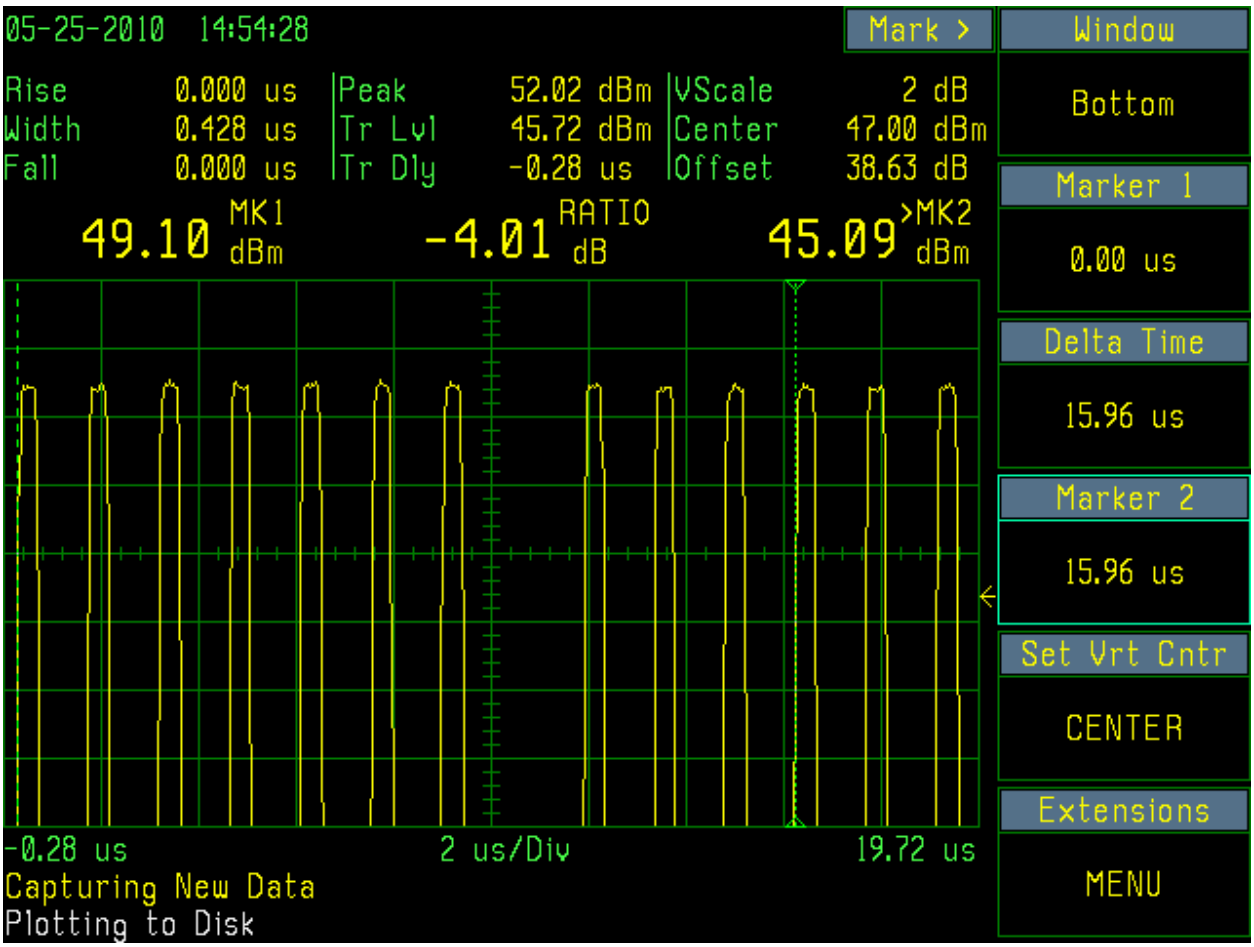


Figure A-28: Typical Mode C Reply, F1 to D2 Spacing

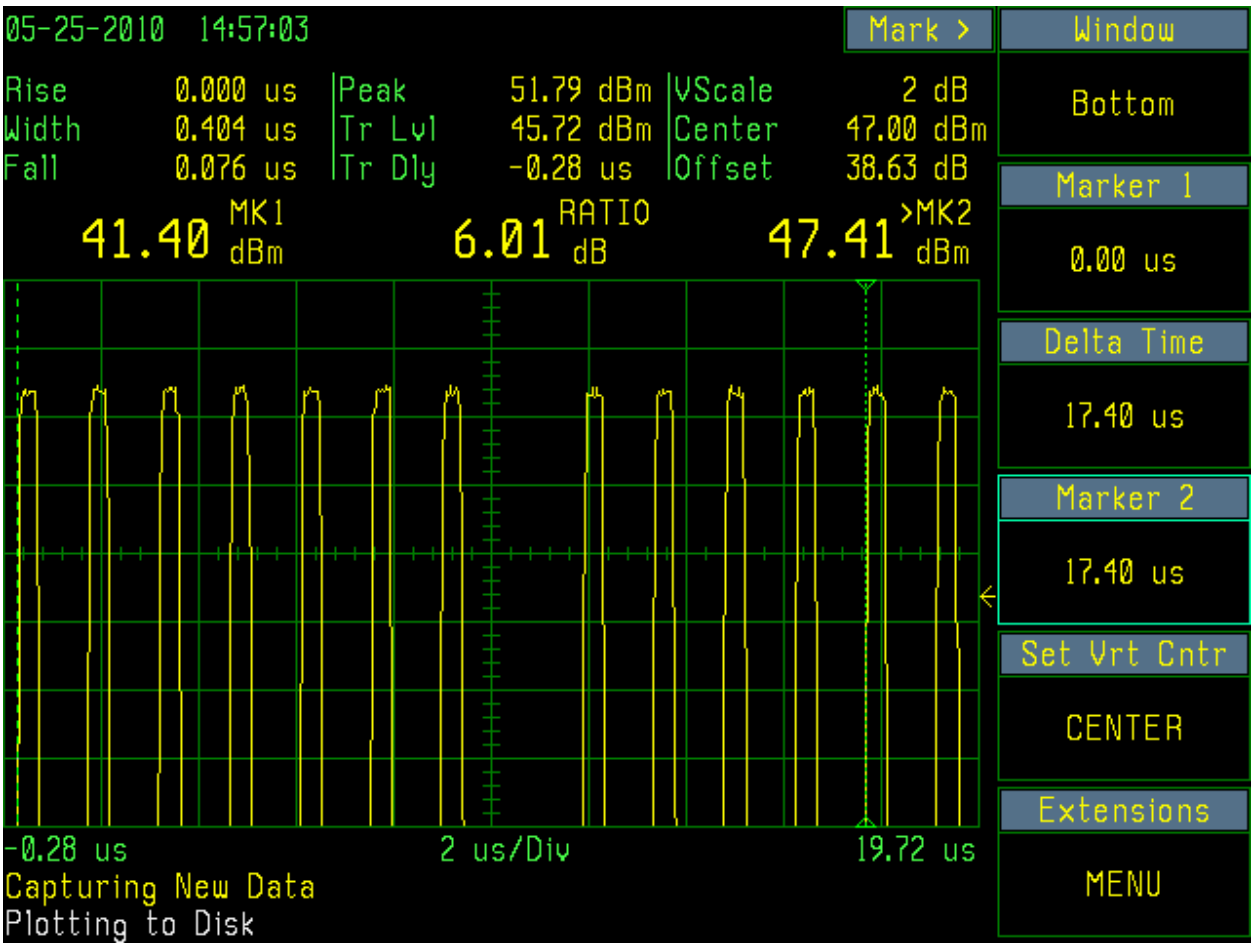


Figure A-29: Typical Mode C Reply, F1 to B4 Spacing

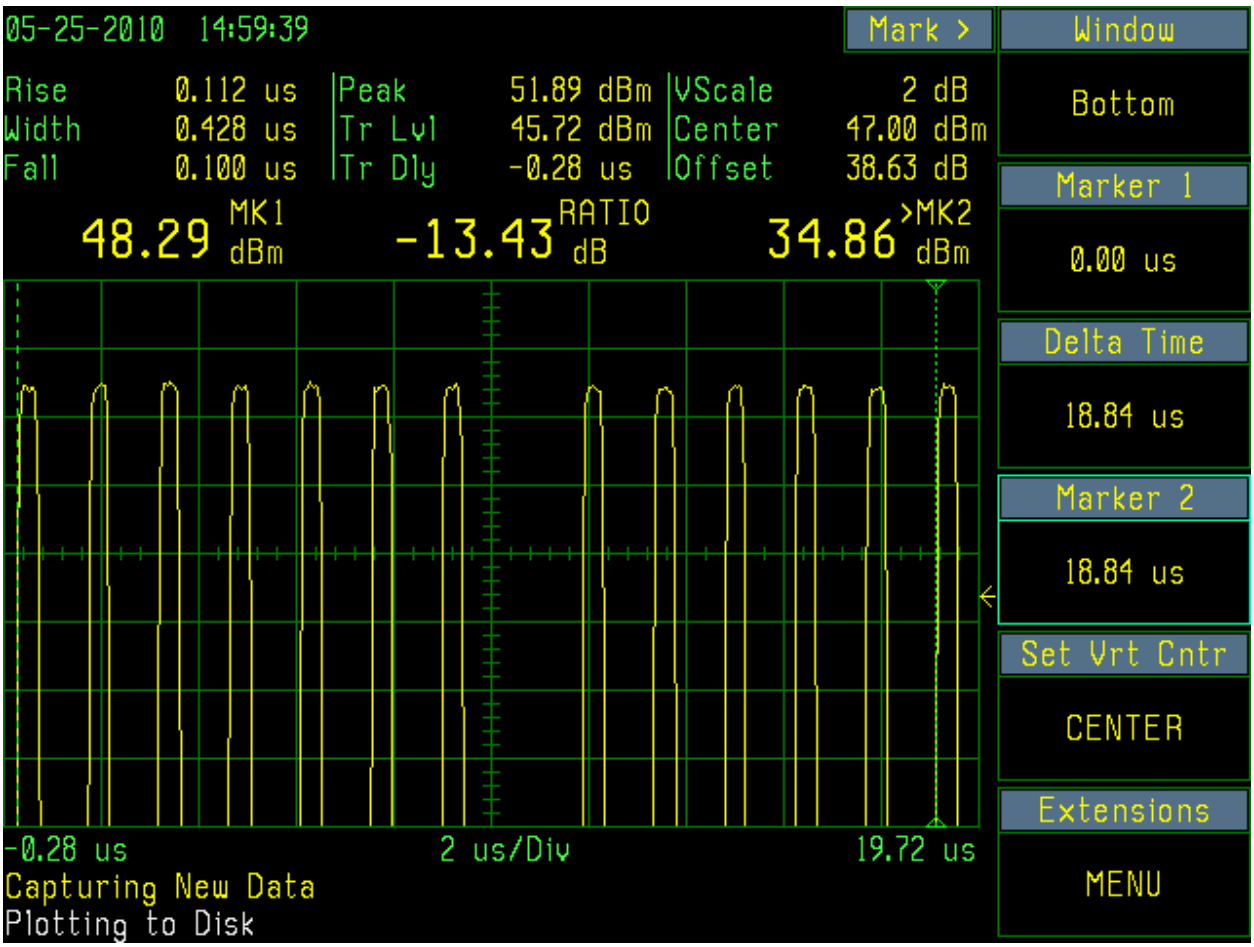


Figure A-30: Typical Mode C Reply, F1 to D4 Spacing

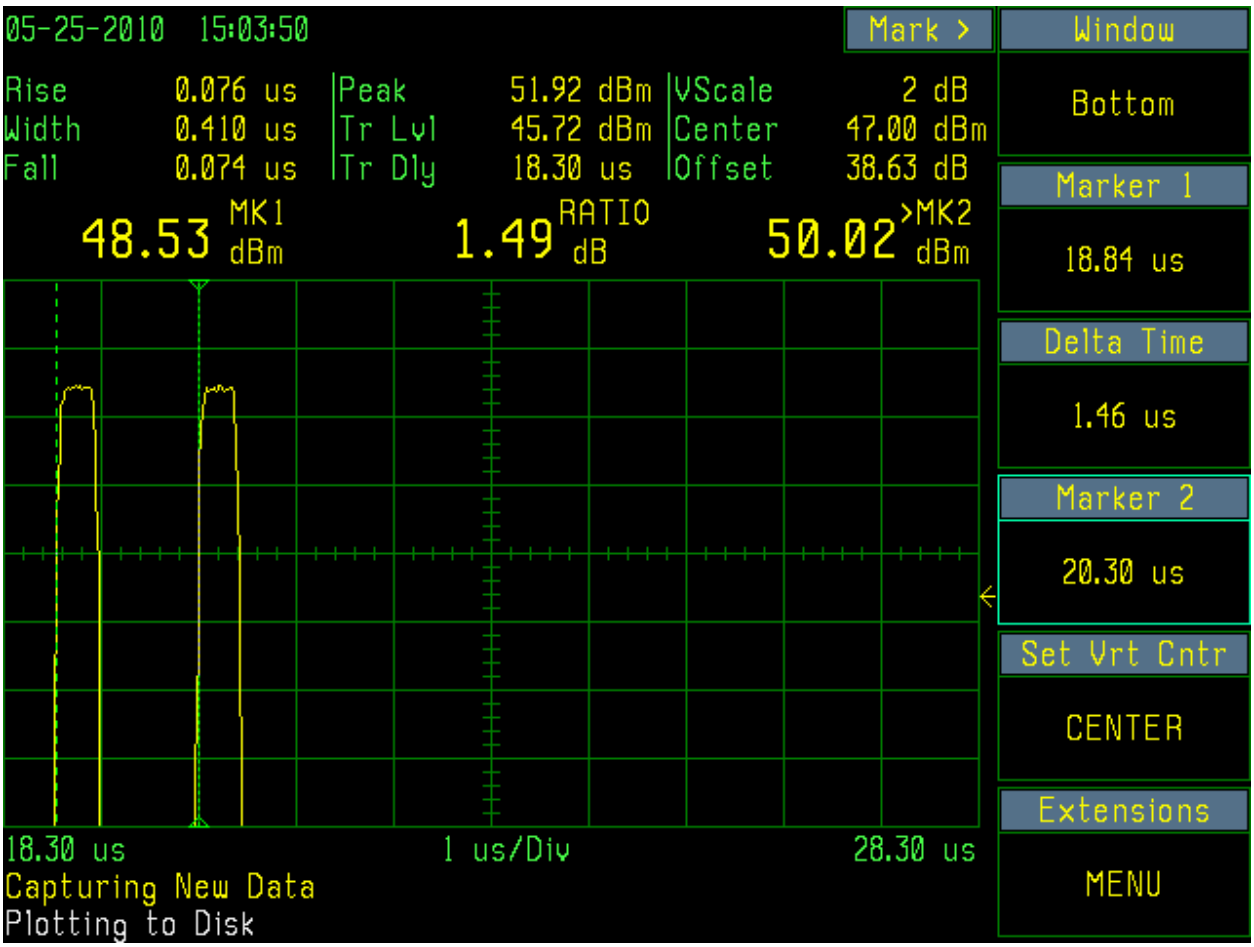


Figure A-31: Typical Mode C Reply, D4 to F2 Spacing

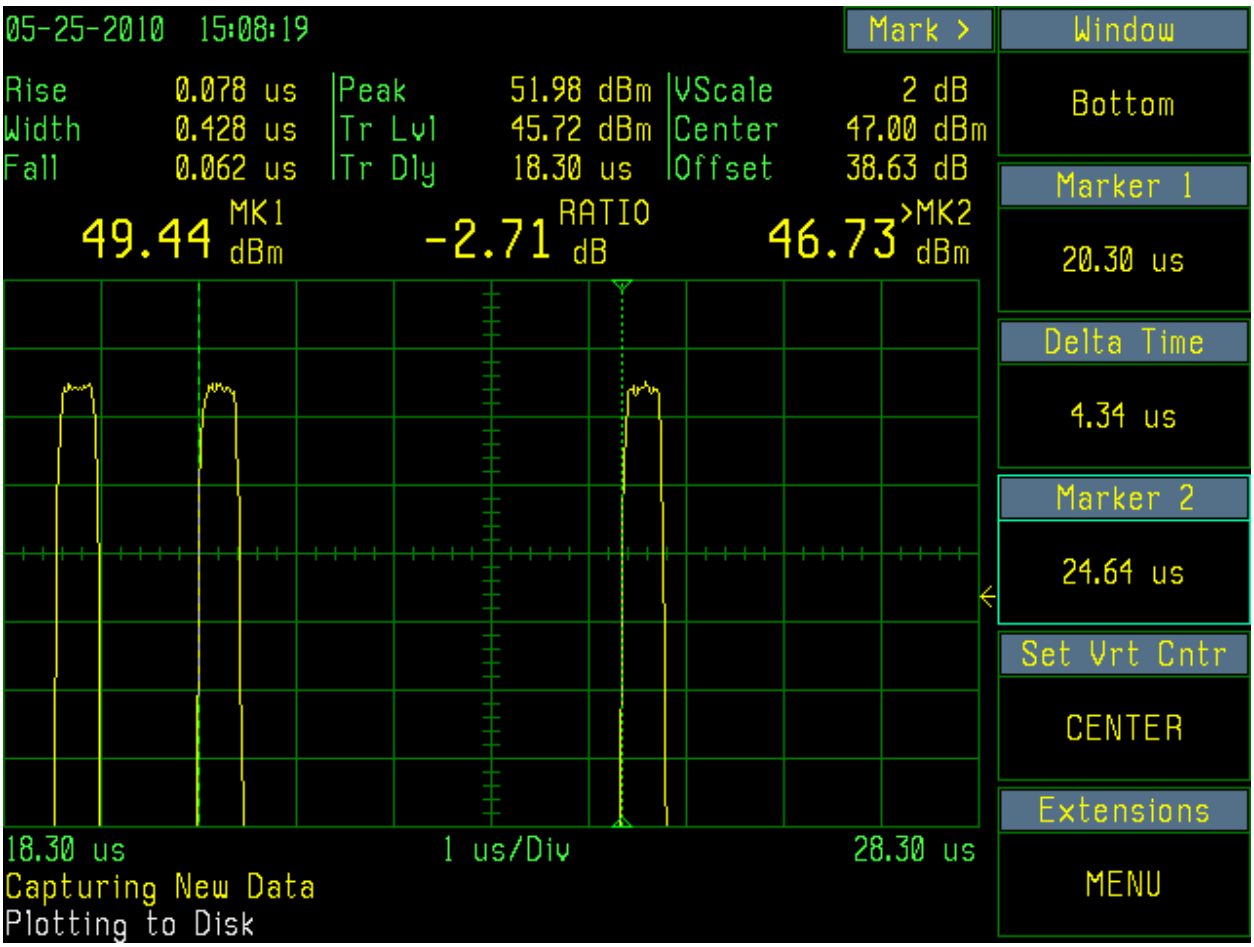


Figure A-32: Typical Mode C Reply, F2 to SPI Spacing

A.4 XPDR Mode S Replies

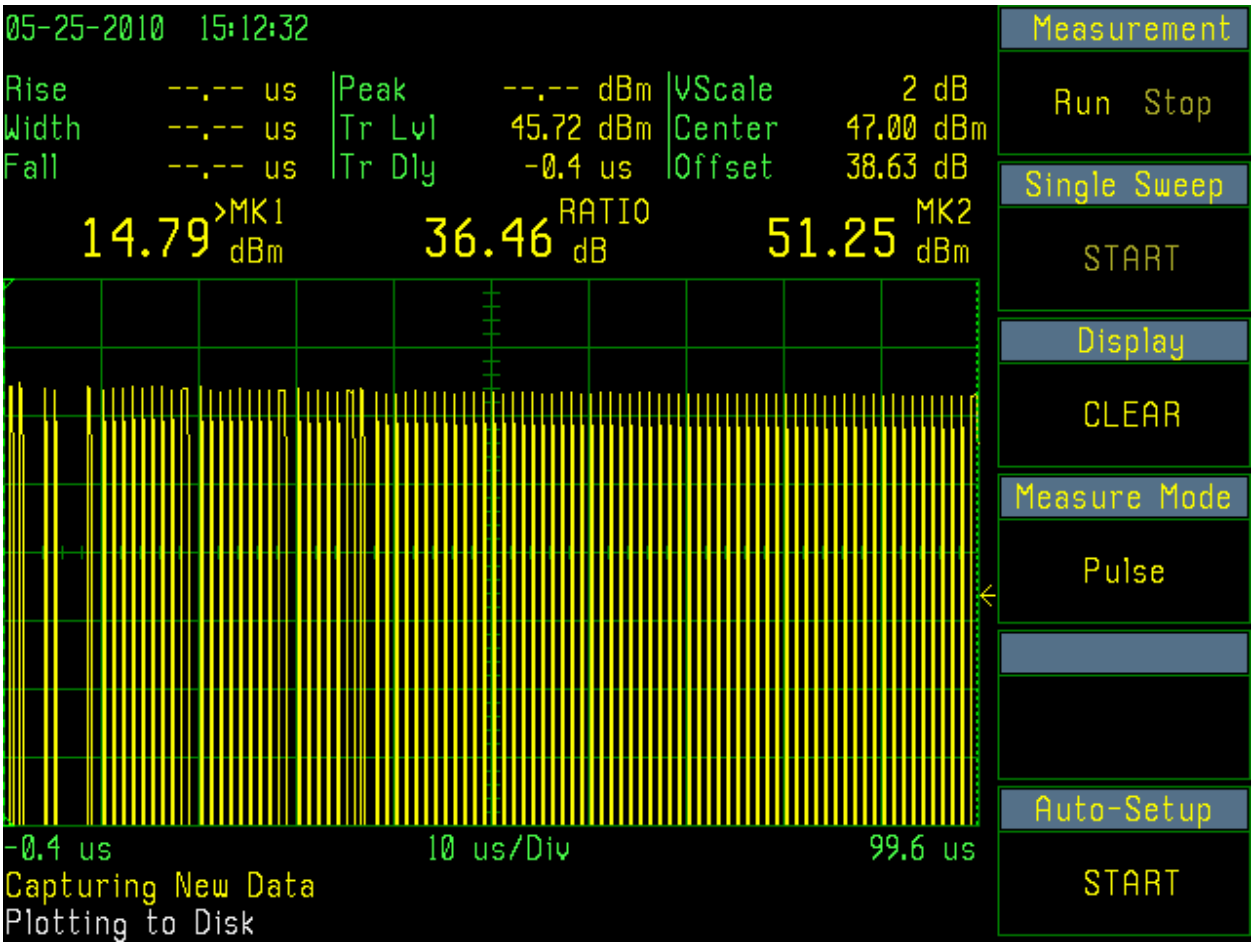


Figure A-33: Typical Mode S Reply

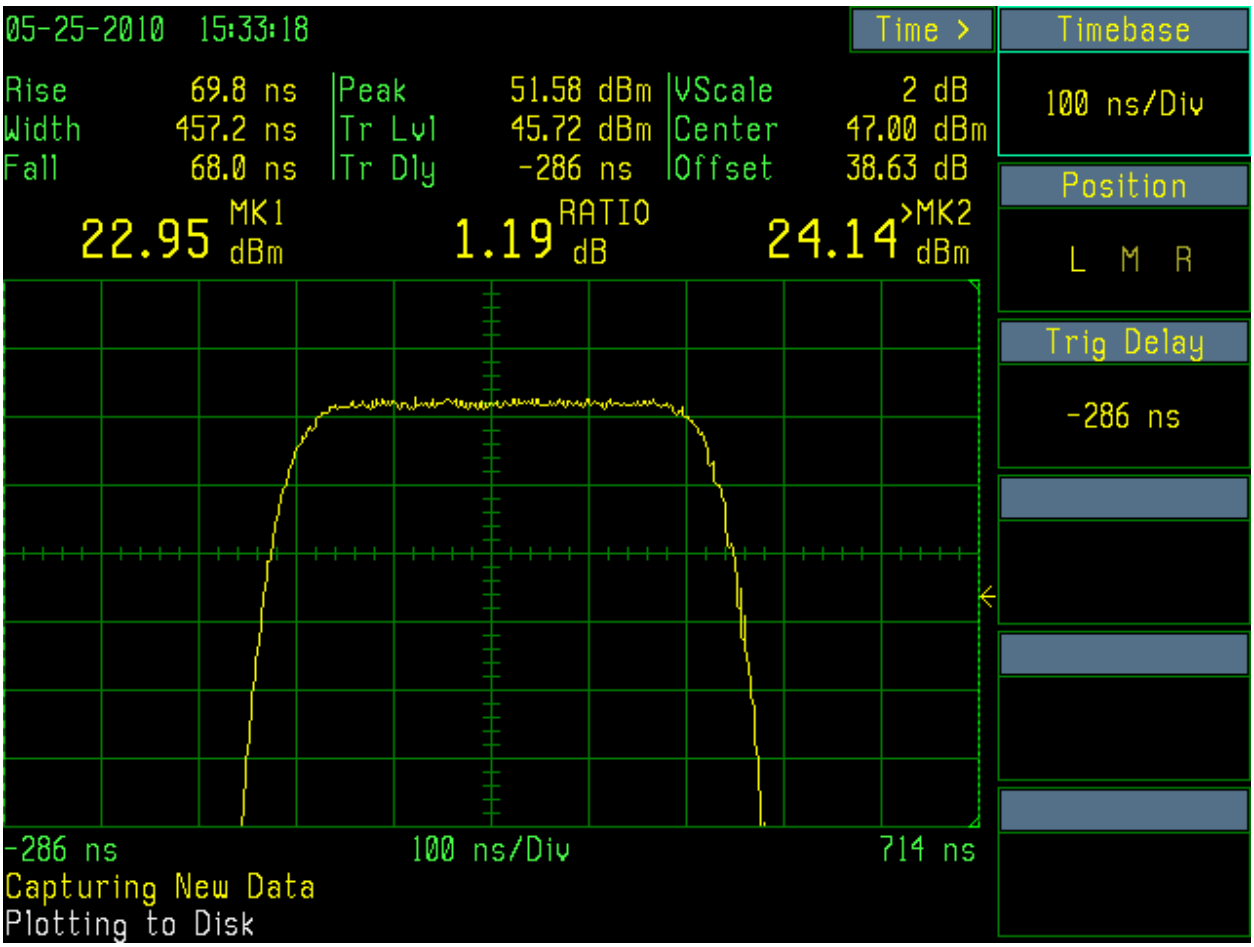


Figure A-34: Typical Mode S Reply, General Pulse Shape

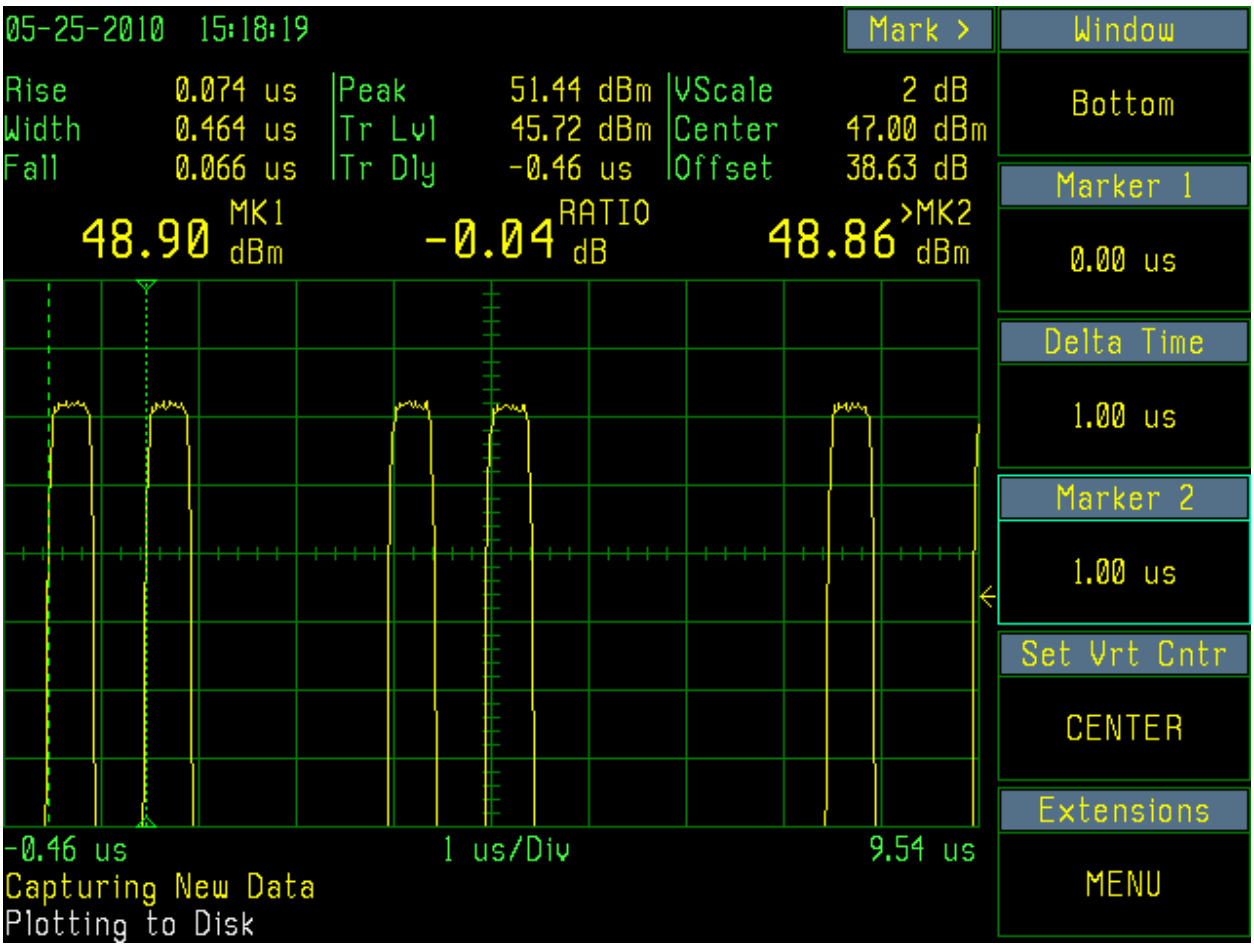


Figure A-35: Typical Mode S Reply, P1 to P2 Spacing

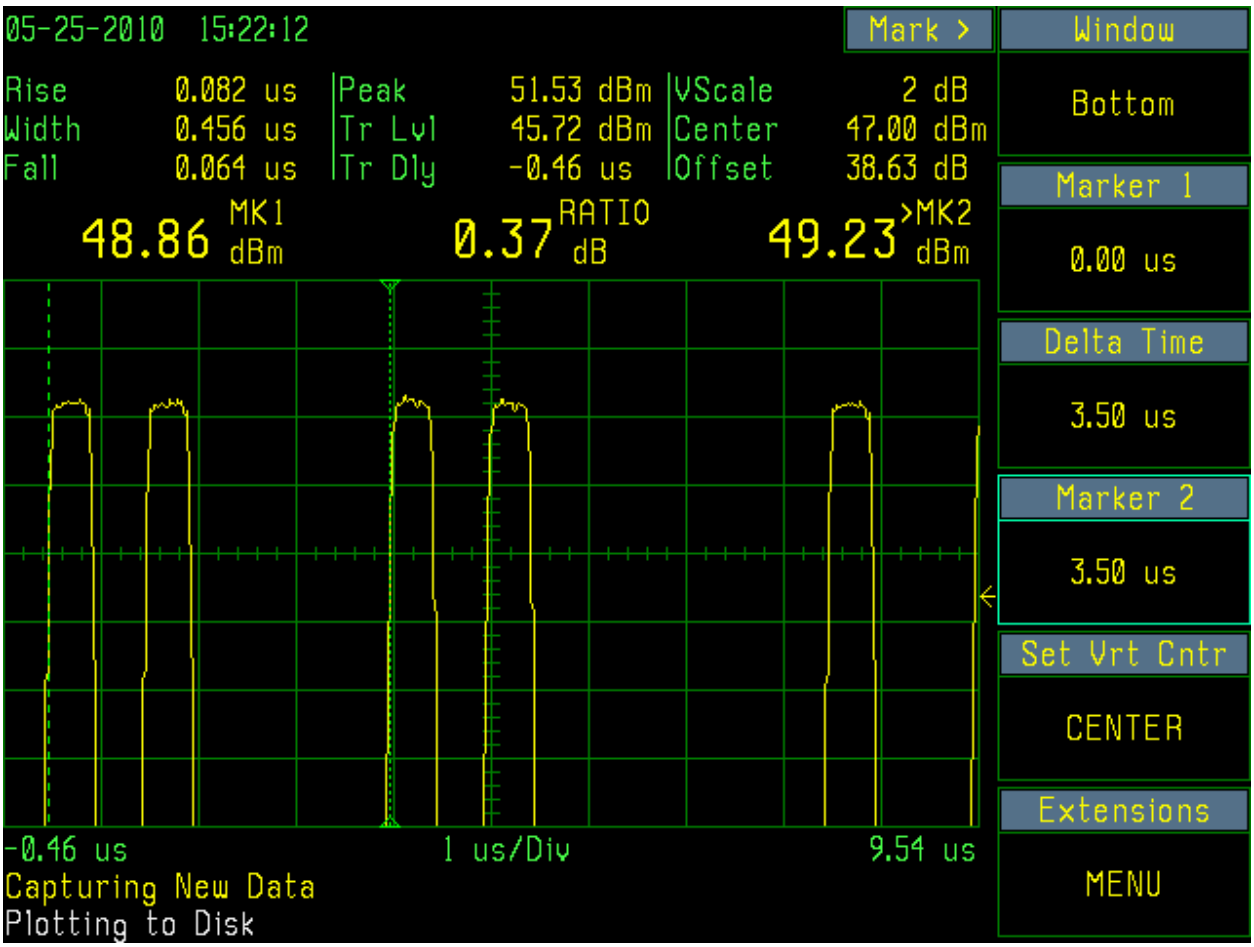


Figure A-36: Typical Mode S Reply, P1 to P3 Spacing

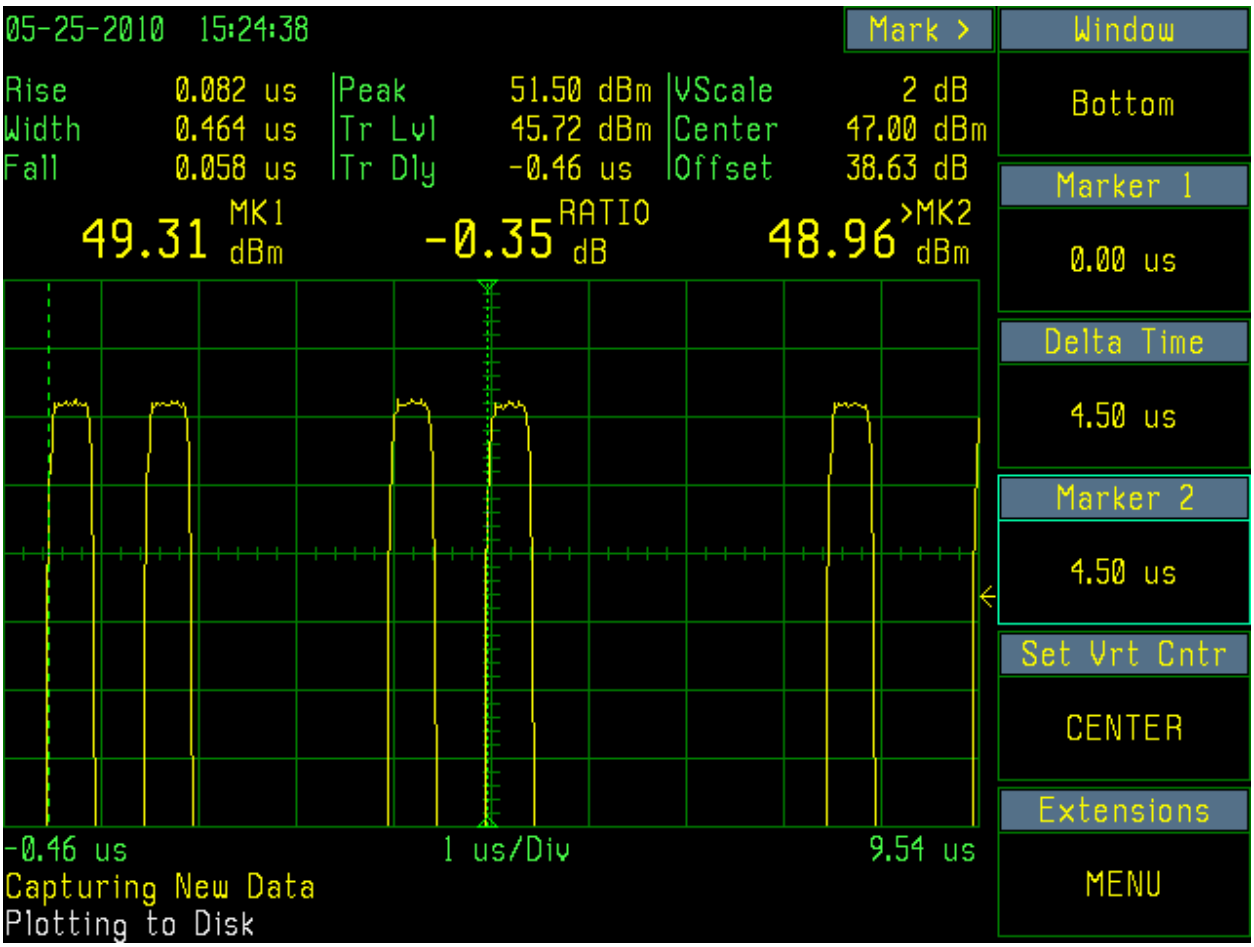


Figure A-37: Typical Mode S Reply, P1 to P4 Spacing

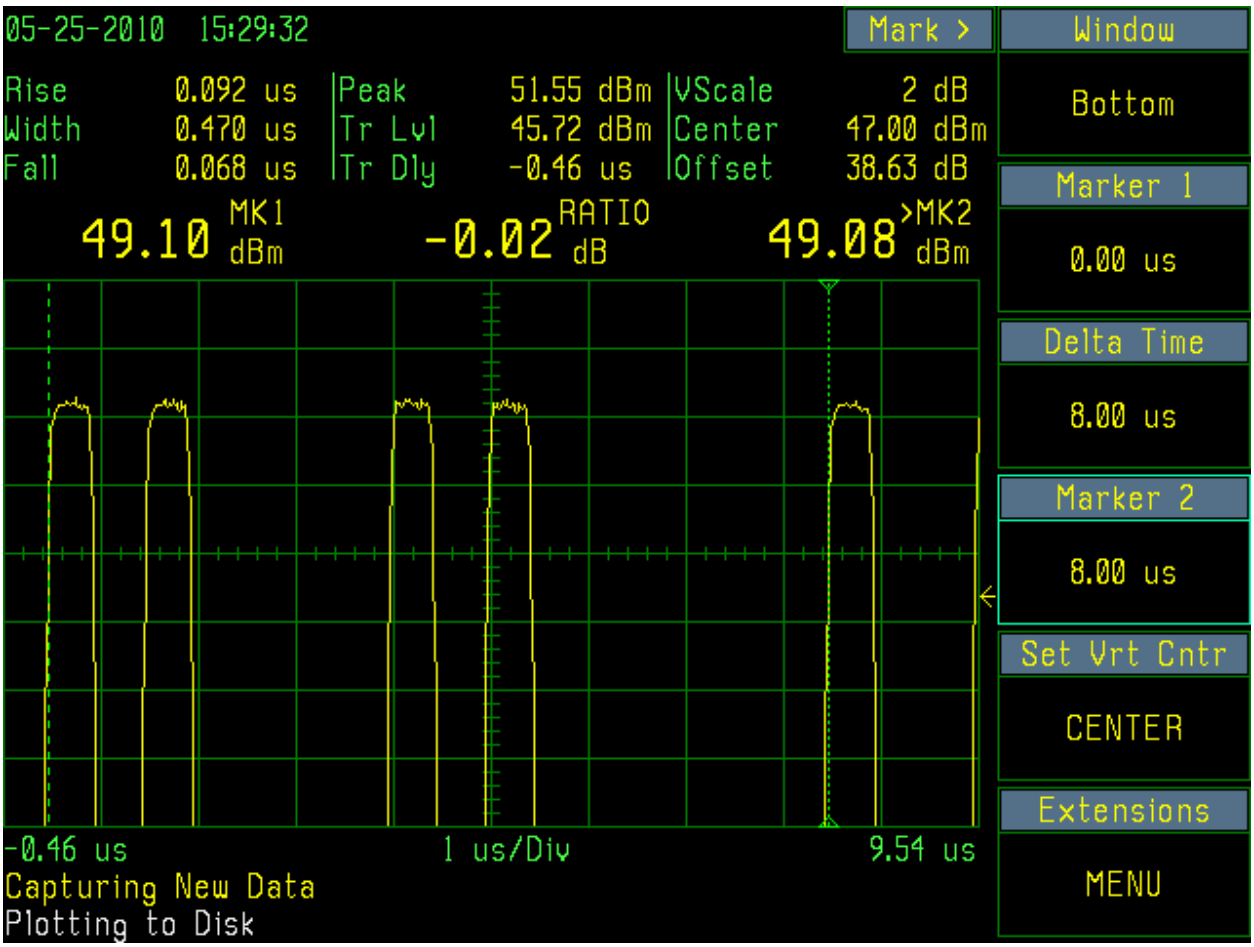


Figure A-38: Typical Mode S Reply, P1 to Data Block Spacing

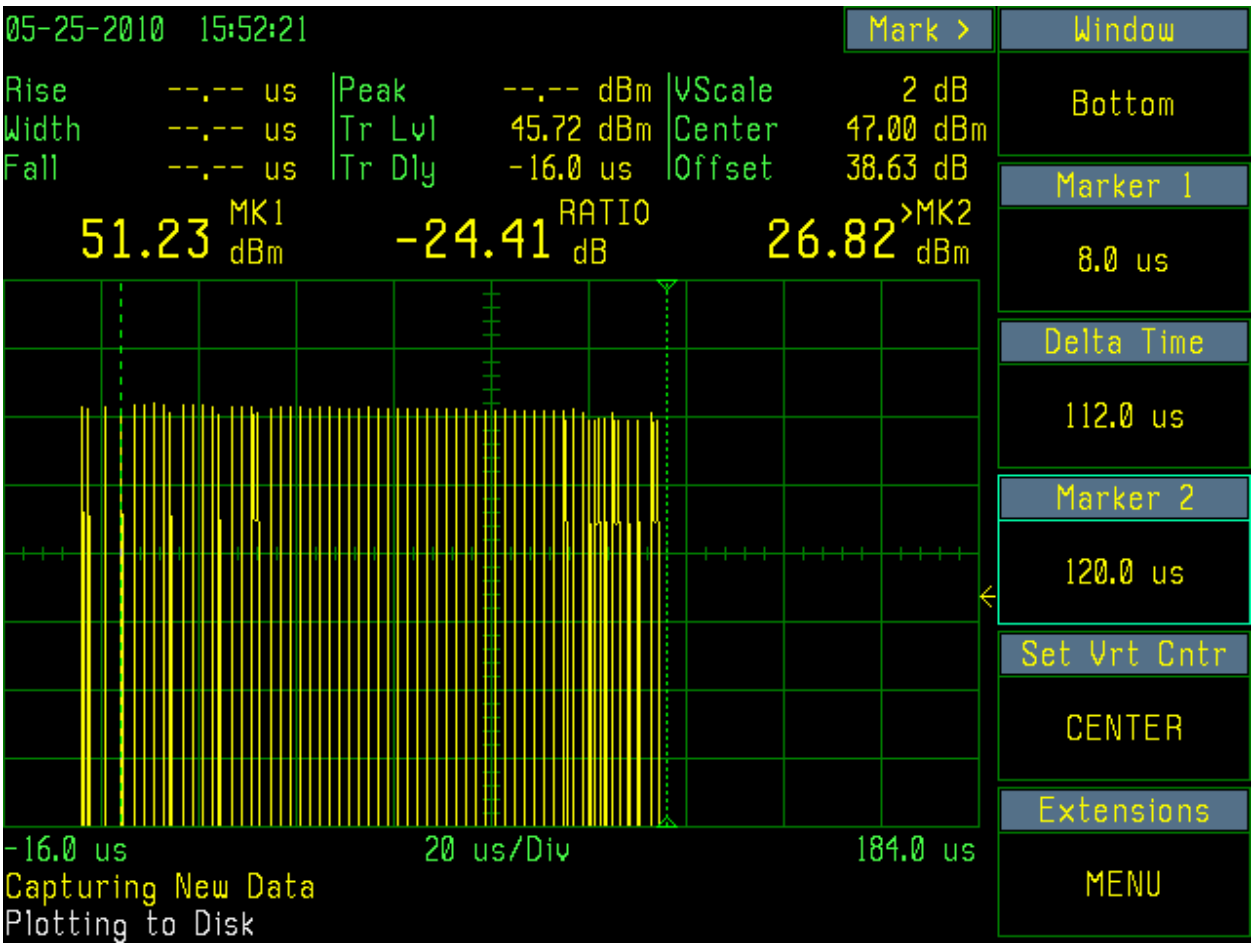


Figure A-39: Typical Mode S Reply, Data Block Length

B. APPENDIX B: NATIONAL TECHNICAL SYSTEMS (NTS) REPORT OF RADIATED AND CONDUCTED SPURIOUS EMISSIONS

National
Technical
Systems

1536 East Valencia Drive
Fullerton, California 92831-4797
Tel: 714-879-6110
Fax: 714-879-6117
www.ntscorp.com

Electromagnetic Compatibility (EMC) Test Report
for
L-3 Communications
Aviation Communication & Surveillance Systems (ACCS)
ACSS T3CAS Integrated Platform

concerning

47CFR, Part 15, Subpart B (FCC)

Prepared For: L-3 Communications/ACSS
19810 North 7th Avenue
Phoenix, Arizona 85027-4400

Prepared By: National Technical Systems
1536 East Valencia Drive
Fullerton, California 92831

Issued: February 24, 2010

TRACKING PAGE

Report No.	Reason for Upgrade	Date
101-1048-2-N	Initial release	2/19/10
101-1048-2-N, Revision 1	Corrected EUT Input Power from 208 to 115 (see Page 13).	2/24/10

LIST OF RESPONSIBLE PARTIES

Test Laboratory Customer

The customer listed on page one of this report under "Prepared For" is responsible for the following with respect to the standards contained in the Test Summary:

a. Ensuring that subsequent Product will be manufactured to the same specifications as the sample tested;

b. Ensuring that the Product retains electromagnetic compatibility after modifications to its design and/or it manufacturing process; and

c. Conducting the appropriate EMC auditing of subsequent Product unless conformance herein has been demonstrated by statistical means.

If manufacture of the Product is by a third party, then the customer is strongly encouraged to implement an agreement with his supplier(s) whereby adherence to the above responsibilities is ensured.

Test Laboratory Responsibilities

ith our signatures we, the undersigned, attest to the accuracy of this report and to testing having been conducted with adherence to the appropriate international quality standards and test procedures.

Approved by: _____
Ba Nguyen, EMI/EMC Program Manager

Reviewed by: _____
Betty Matteson, Quality Assurance Manager

Prepared by: _____
Audrey Harris, Group Administrator

Test Report No. 101-1048-2-N
Revision 1, 2/24/10

TEST SUMMARY

This test record demonstrates conformance of the L-3 Communications/ACSS T3CAS Integrated Platform to the standards listed below.

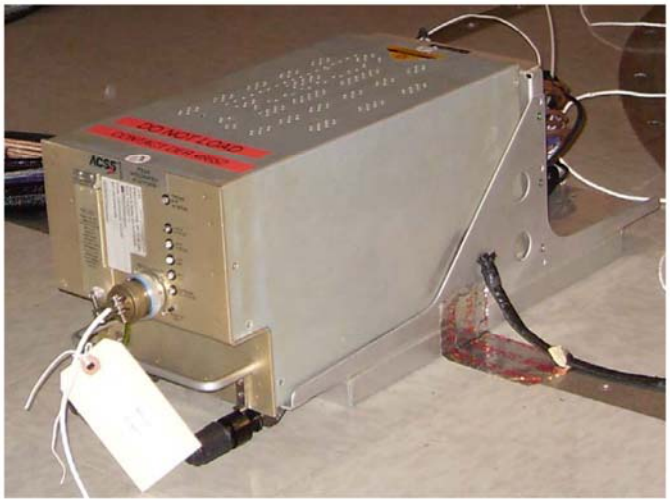
Region	Specification	Title/Intent	Conforms Yes/No/NA	Comments
US (FCC)	47 CFR, Part 15, Subpart B	RF Emissions from Digital Devices	Yes	Class B

TABLE OF CONTENTS

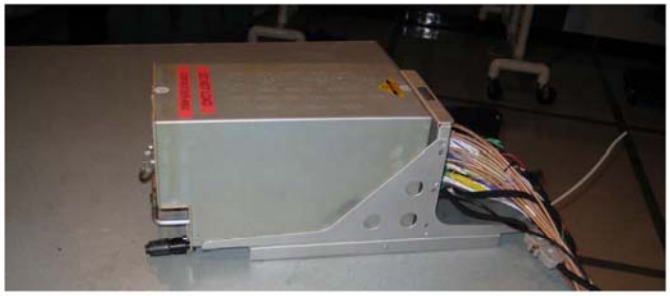
1.0 General Information

1.1 Product Description

The Equipment Under Test (EUT) was the T3CAS Integrated Platform.

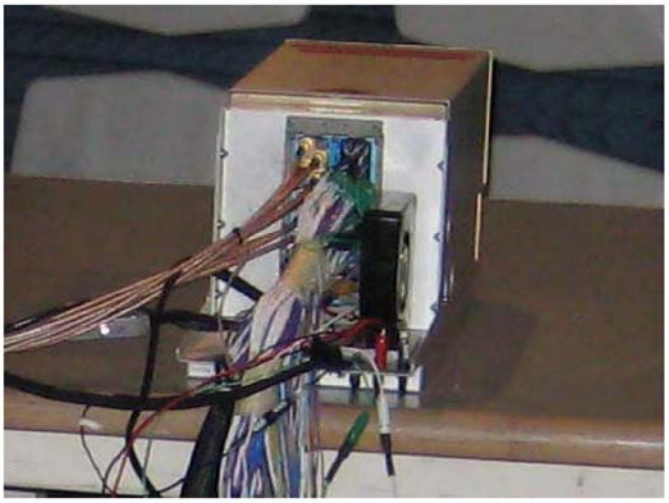


ACSS T3CAS Integrated Platform

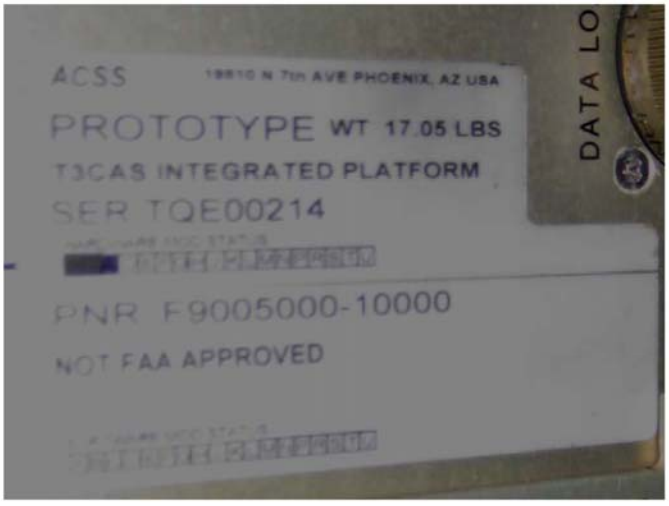


ACSS T3CAS Integrated Platform
Side View

ACSS T3CAS Integrated Platform
Front View



ACSS T3CAS Integrated Platform
Rear View



ACSS T3CAS Integrated Platform
PNR F9005000-10000
SER TQE00214

1.1.1 Model Variants

None provided

1.1.2 Hardware Details

EUT Components	Model/Part No.	Serial No.
T3CAS Integrated Platform	F9005000-10000	TQE00214

1.1.3 Support Equipment

For support equipment contact L-3 Communications/ACSS.

1.1.4 Interconnecting Cables

External to Building		Length	Shielded		Name/Function/EUT Port
Yes	No		Yes	No	
X		20 ft		X	Interface Cable

1.1.5 Cable Configuration

For cable configuration contact L-3 Communications/ACSS.

1.1.6 Internal, Fundamental Oscillator Frequencies

For clock frequencies contact L-3 Communications/ACSS.

1.2 Administrative Data

1.2.1 References

- ACSS Purchase Order No. PO-008128
- 47 CFR, Part 15, Subpart B (US)
- ISO/IEC 17025:2005
- ANSI C63.4-1992

1.2.2 Test Facility Information

Testing was accomplished at the National Technical Systems EMC Test Facility, 1536 East Valencia Drive, Fullerton, California, USA. At the time of testing, the EMC facility had the following accreditations, registrations, etc.:

- Accredited by the American Association for Laboratory Accreditation (A2LA) requirements of ISO/IEC 17025:2005 (E)
- Compliance with the requirements of ISO 9000: 1997 (E)
- Compliance with the radiated and AC line conducted test site criteria in ANSI C63.4-1992 as required by the Federal Communications Commission (FCC)
- NRTL Approved, NTS Acton, MA
- U.S. Conformity Assessment Body as defined in the US/EU Mutual Recognition Agreement
- Accredited by the BSMI of Taiwan as a Conformity Assessment Body under the APEC Agreement, with certification number SL2-IN-E-074R
- Accredited by the VCCI of Japan (R-1295, C-1362)

1.2.3 Test Measurement Instrument Calibration

All test instrumentation requiring calibration had a valid calibration sticker attached and was calibrated in accordance with ANSI Standard NCSL Z540-1.

1.2.4 Ambient Tests

In the event that an out-of-tolerance interference condition arose, ambient measurements were made in the frequency range where the out-of-tolerance condition was present. Ambient rf measurements were made with power applied to all equipment, with the exception of the system under test. This level must be at least 6 dB below the applicable rf emissions specification limit(s).

1.2.4.1 Ambient Test Conditions

During testing contained in this test report, average ambient test conditions were as follows: relative humidity between 30-60%, temperature 15-35°C, and barometric pressure between 860-1060 mbar.

2.0 General Test Methodology and Facility Information

2.1 Emissions

Required emissions testing was performed in accordance with the measurement procedures appropriate for the requirements listed in the Test Summary. Specifics such as test locations are listed in the appropriate data sections of this report.

Conducted measurements of powerlines were made with power supplied to the EUT through a 50Ω/50µh Line Impedance Stabilization Network (LISN); support equipment not part of the EUT was powered through a similar but separate LISN. If required, measurements of interface cables were made through either the appropriate Impedance Stabilization Network (ISN) or a suitable substitute.

Radiated measurements were made in the listed 3m anechoic chamber. The applicable frequency spectrum was searched with a calibrated antenna system for RF emissions approaching the appropriate limits. "Maximization" of each suspect frequency was accomplished by a combination of a 360° azimuth search and varying the antenna to ground plane height from 1m to 4m, in both the vertical and horizontal polarizations. Final data was collected in the worst-case configurations of the EUT producing the highest emission levels.

Typically, conducted and radiated emissions measurements were first made with a peak detector. The highest peak amplitudes relative to the appropriate limits were identified and re-measured using quasi-peak and/or average detectors as required. Conducted emissions testing was performed using automatic EMI test equipment. This equipment utilizes HP EMI measurement software running on an HP computer. The computer interfaced directly with HPIB (IEEE) compatible instruments having graphical displays presented on the spectrum analyzer's CRT and to a plotter, which generated hard copies of the data. The program automatically selected the range of test frequencies or band and set the specification line limits to be used during the test. This equipment/software allowed for real-time data reduction and printed tabulated data on peak, quasi-peak, or average value measurements.

All other emission measurements (e.g. powerline voltage and current fluctuations) were made using calibrated, automatic equipment designed for the purpose.

The 3m chamber has been qualified as one having performance characteristics suitable for testing to the requirements of IEC/EN 61000-4-3, ENV 50140, CISPR 16, and ANSI C63.4-1992.

2.2 Radiated Emissions Field Strength Calculations

FS = RA + AF + CL - AG

where: FS = field strength AF = antenna factor AG = amplifier gain
RA = receiver amplitude CL = cable loss

The receiver used for radiated emissions measurements performed the field strength calculations automatically. The program has resident AF and CL figures for individual antennas and cables.

2.3 Immunity

Not applicable

2.4 Order of Testing

Testing normally proceeds from the least volatile to the most. As discussed here, volatility refers to the potential for causing physical damage to the EUT. The actual order may vary due to tests conducted, scheduling and facility availability.

2.5 Deviation from Standard Test Methods

None

3.0 Test Configuration

3.1 EUT Input Power

Components	Voltage	Hz	ϕ	Comments
T3CAS Integrated Platform	115	400	--	--

3.2 EUT Condition

As delivered for testing the EUT condition can be described as a pre-production model with no variations from final product.

3.3 EUT Configuration and Modes of Operation

As per measurement procedures, the worst-case test configuration and mode of operation were used for all testing. The selection process was based on investigative testing of the EUT. Operational modes considered were all those available to the operator, including standby.

The T3CAS Integrated Platform was in Test Mode 14 – TCAS/Mods S Radiated Emissions at full duty cycle.

TCAS – 1030MHz
60 UF-16 Long Mode S Interrogations/Second
35 UF 0 Short Mode S Interrogations/Second
High Resolution Whisper/Shout Sequence (92)

Mode S Transponder – 1090MHz
500 14-Pulse ATCRBS Replies/Second
56 Long Mode S Replies/Second

3.4 VDU Mode

The EUT design does not allow for the use of the prescribed "scrolling H's" VDU display.

3.5 EUT Exercise Software

For software information contact L-3 Communications/ACSS.

3.6 Equipment Modifications, Audit Actions, and EMC Components

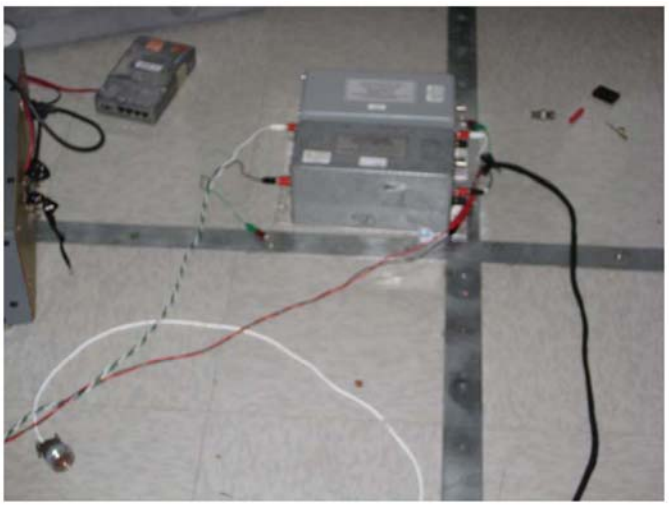
3.6.1 Modifications made to the EUT during this Test

None

4.0 Test Setup Photographs

Radiated Emissions
30 MHz – 1 GHz

Radiated Emissions
1 GHz – 12 GHz



Conducted Emissions (LISN) Test Setup
150 kHz – 30 MHz

5.0 Test Instrumentation

The instrumentation calibrations contained herein are traceable to NIST.

Instrument	Manufacturer	Calibration Frequency	Calibration Due	NTS Control No
Radiated Emissions				
Spectrum Analyzer	Agilent	12 months	12-18-10	FL 4503
BiconiLog Antenna	EMC Systems	24 months	1-19-12	FL 0867
Dbl Ridge Guide Antenna	Temco	24 months	8-25-10	FL 0308
Pre-Amplifier	HP	12 months	4-8-10	FL 0913
Conducted Emissions				
Spectrum Analyzer	Agilent	12 months	12-18-10	FL 4503
Attenuator	Aeroflex/Weinschel	Not Required	NA	FL 5346
LISN	Solar	24 months	4-9-11	FL 5195
LISN	Solar	24 months	11-30-11	FL 0631

6.0 Emissions

The test procedures are those appropriate for the requirements listed in the Test Summary. All readings are quasi-peak unless otherwise noted, and are listed in order of ascending delta (Δ) from the limit.

Region	Applicability of Radiated and Conducted Emissions Data by Input Test Voltage			
	208VAC 400Hz L-L 3ϕ	230VAC 50Hz L-N 1ϕ	120VAC 60Hz L-N 1ϕ	-48VDC
United States (FCC)	X			
Canada (IC)				
Japan (VCCI)				
Taiwan (BSMI)				
Australia				
New Zealand				
European Union (CE)				
Other CISPR Regions, according to power mains				

6.1 Test Results

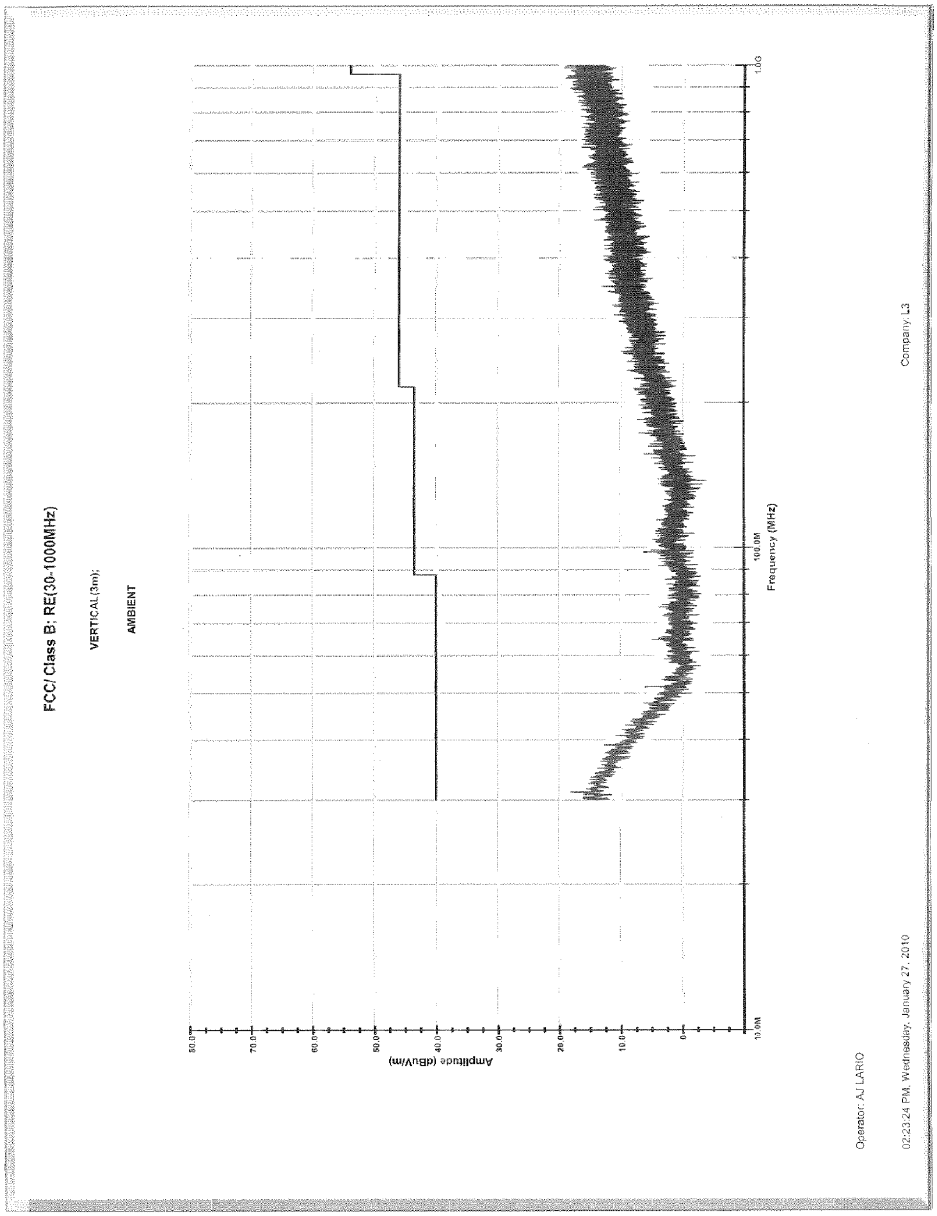
Radiated Emissions

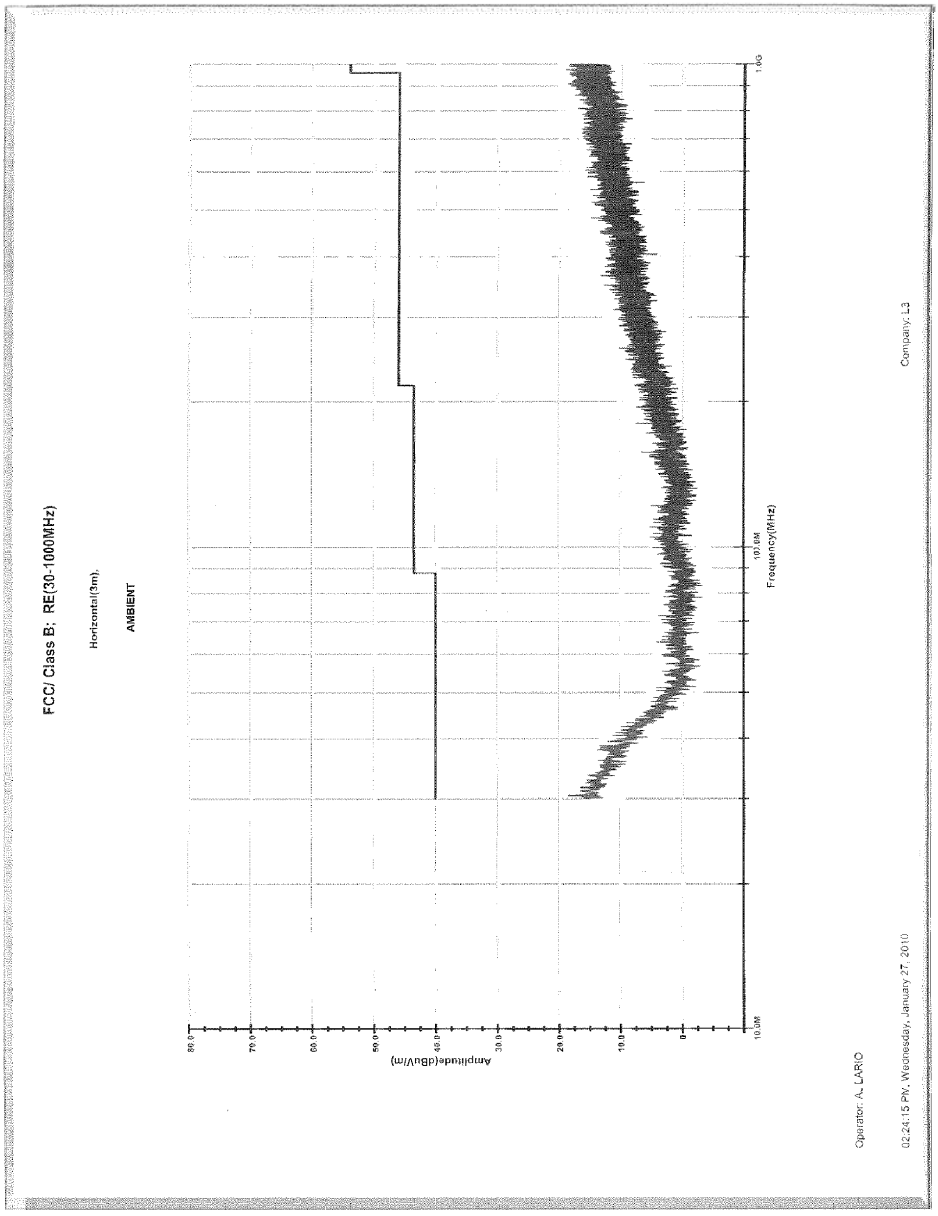
Radiated measurements were made in the listed 3m chamber. The T3CAS Integrated Platform continued to perform its intended functions as specified by the manufacturer.

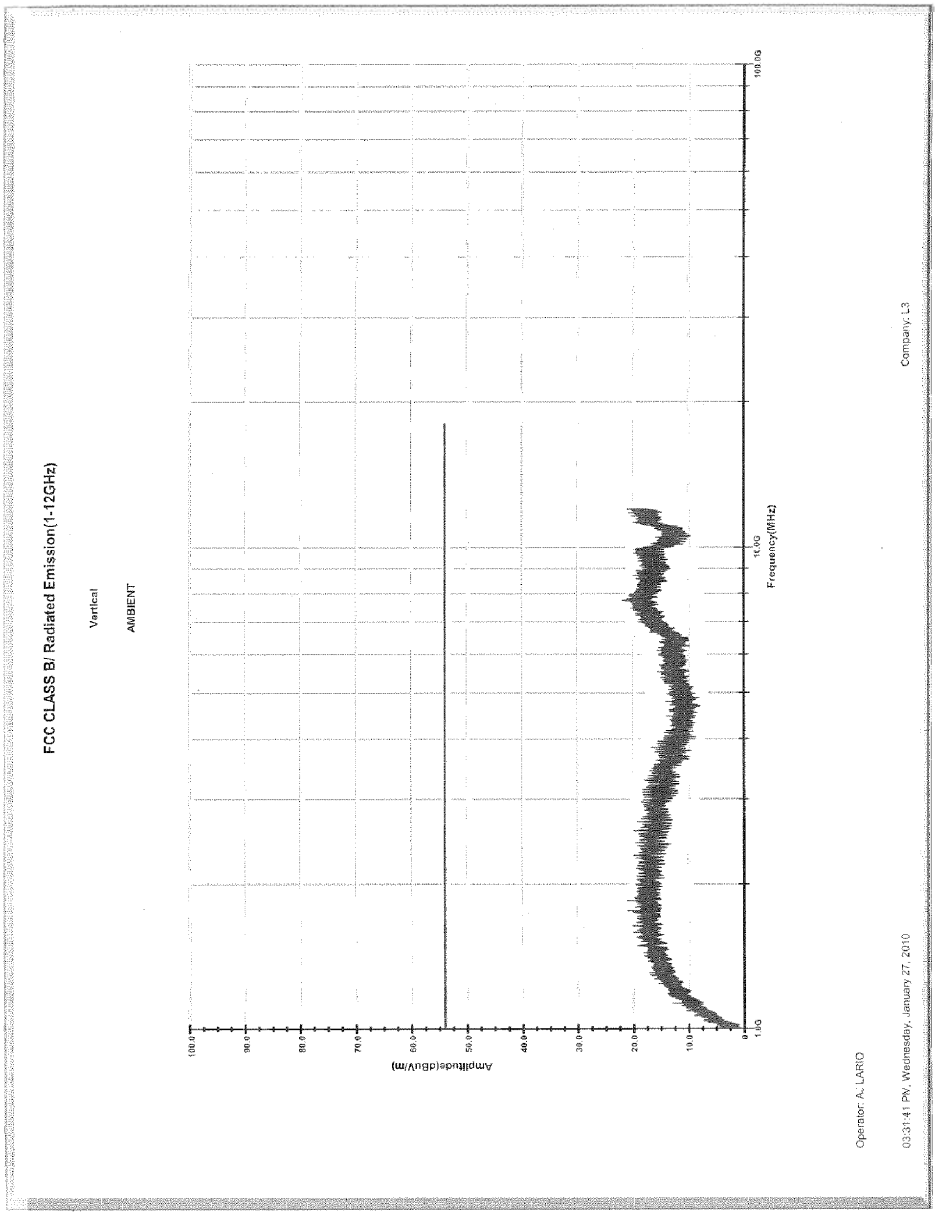
Conducted Emissions

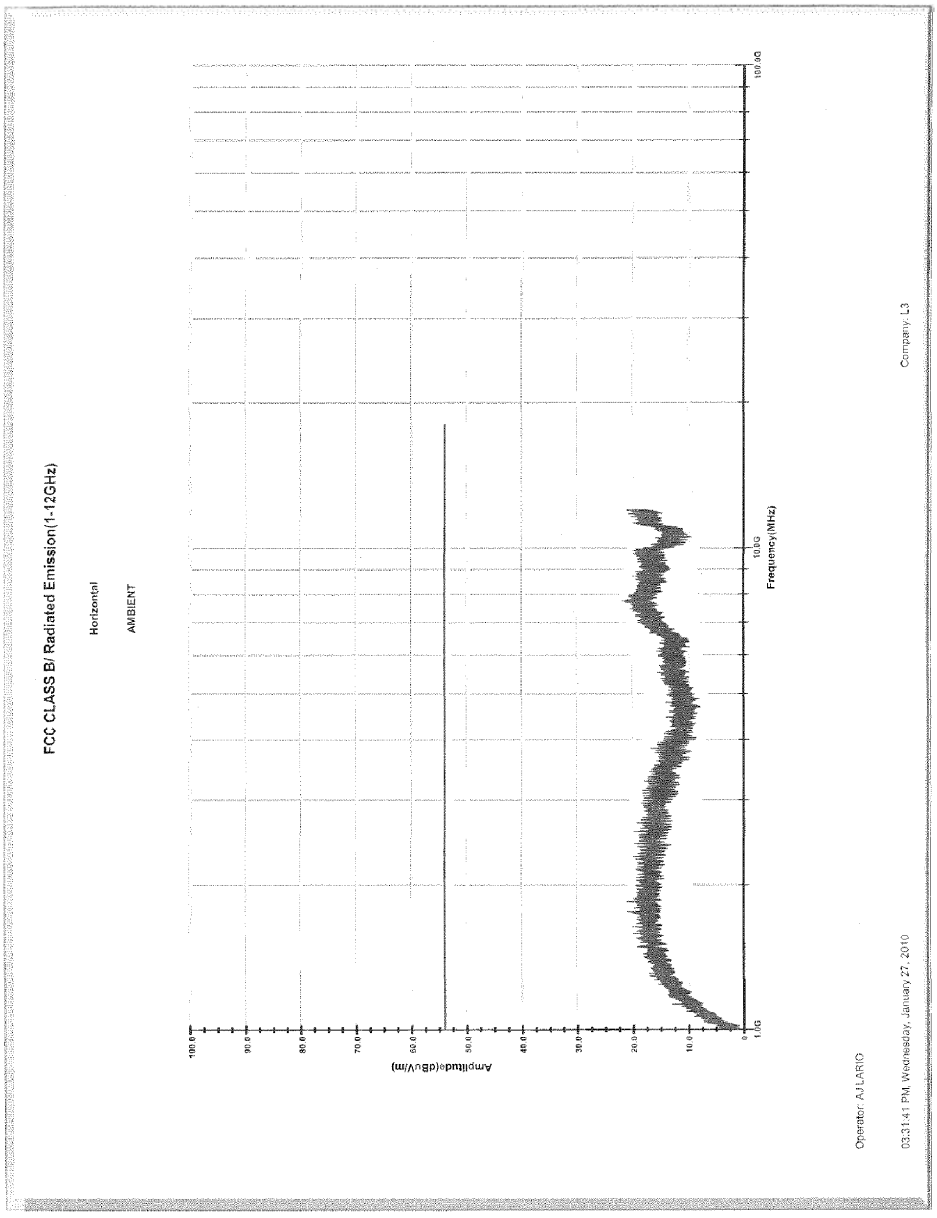
Conducted measurements were made in the listed 3m chamber. The T3CAS Integrated Platform continued to perform its intended functions as specified by the manufacturer.

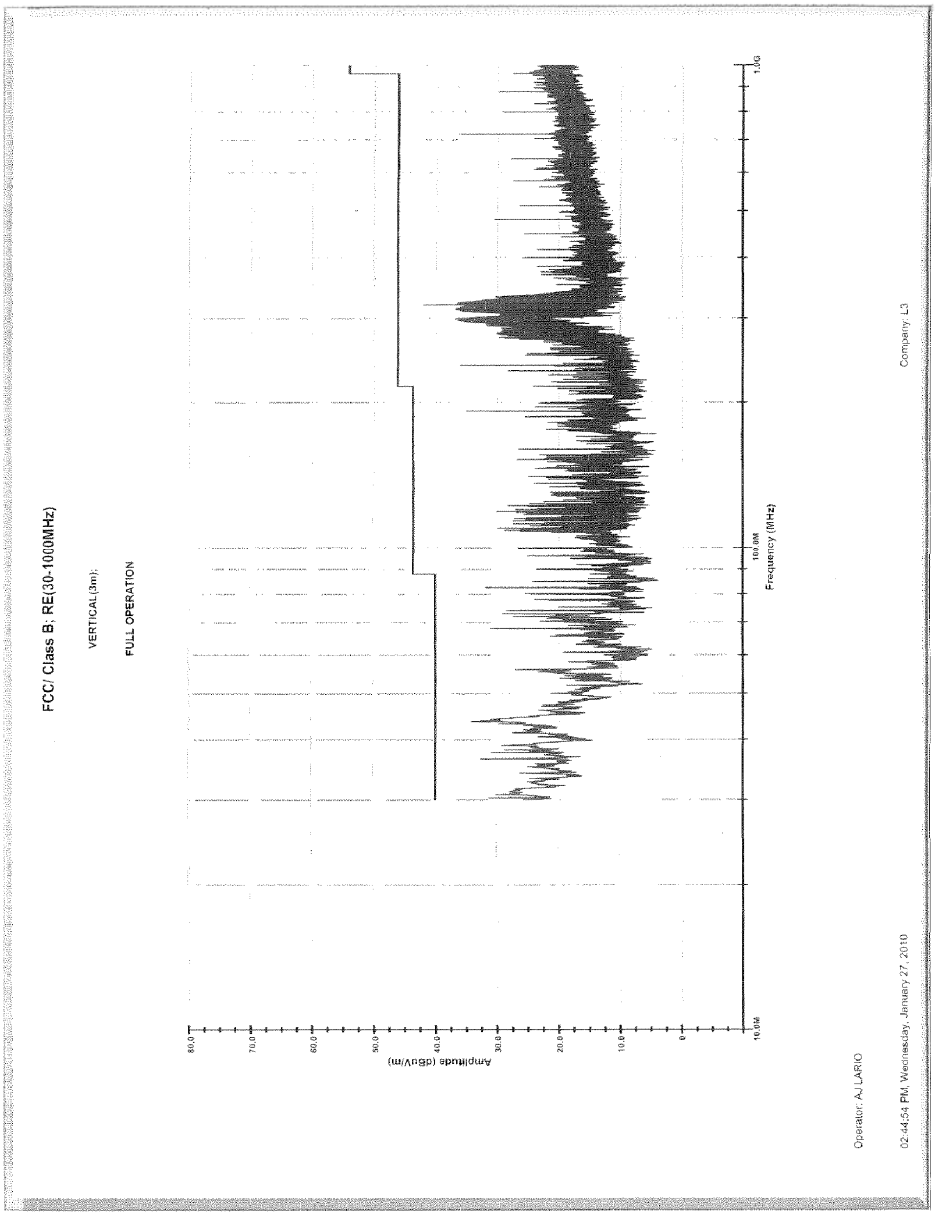
6.2 Radiated Emissions Test Data

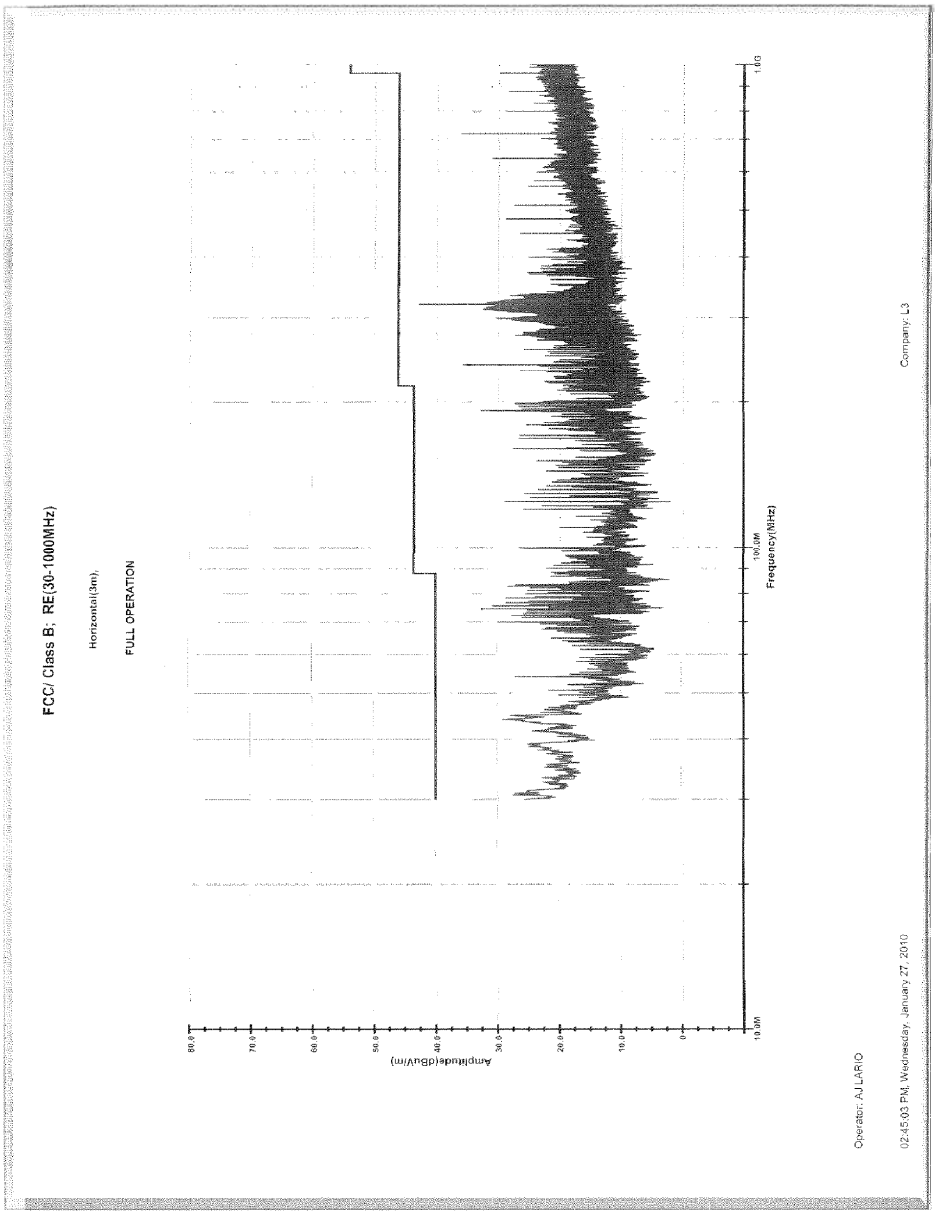


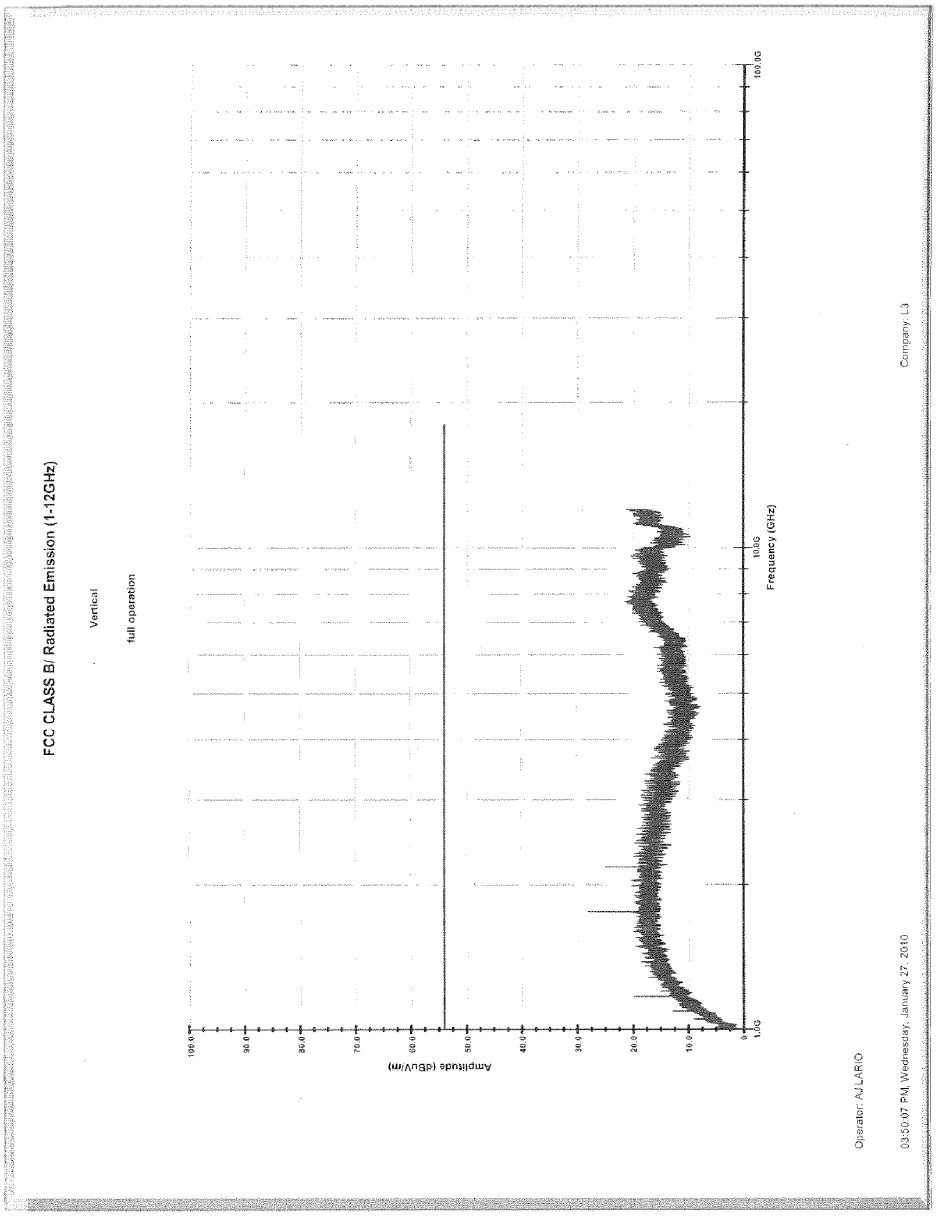

FCC/ Class B; RE(30-1000MHz)
Horizontal(3m).
AMBIENT
Company: L3
Frequency(MHz)
Amplitude(dBuV/m)
Operator: AL LARIO
02:24:15 PM, Wednesday, January 27, 2010

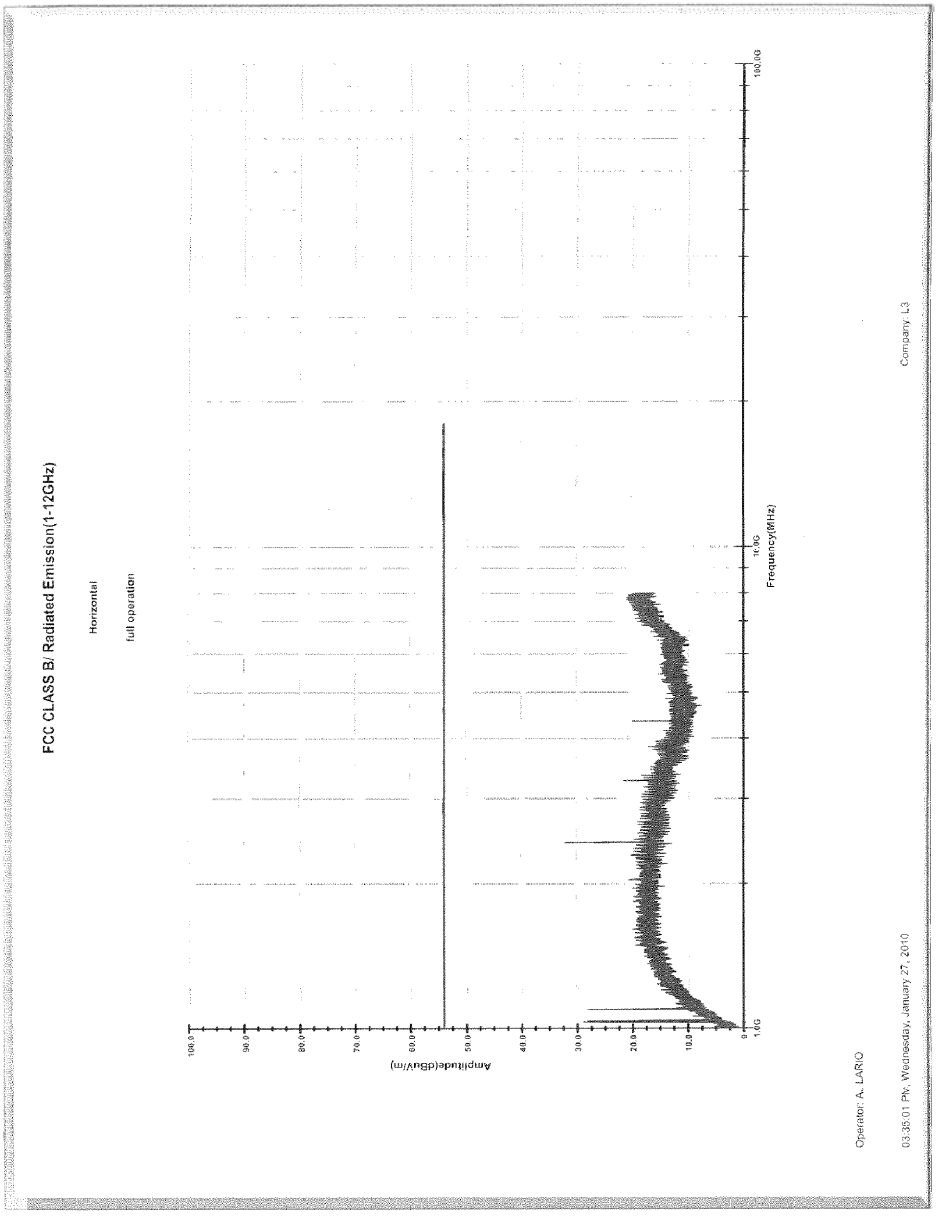

FCC CLASS B/ Radiated Emission(1-12GHz)
Vertical
AMBIENT
Company: L3
Operator: A. LARIO
03:31:41 PM, Wednesday, January 27, 2010
Frequency(MHz)
Amplitude(dBuV/m)

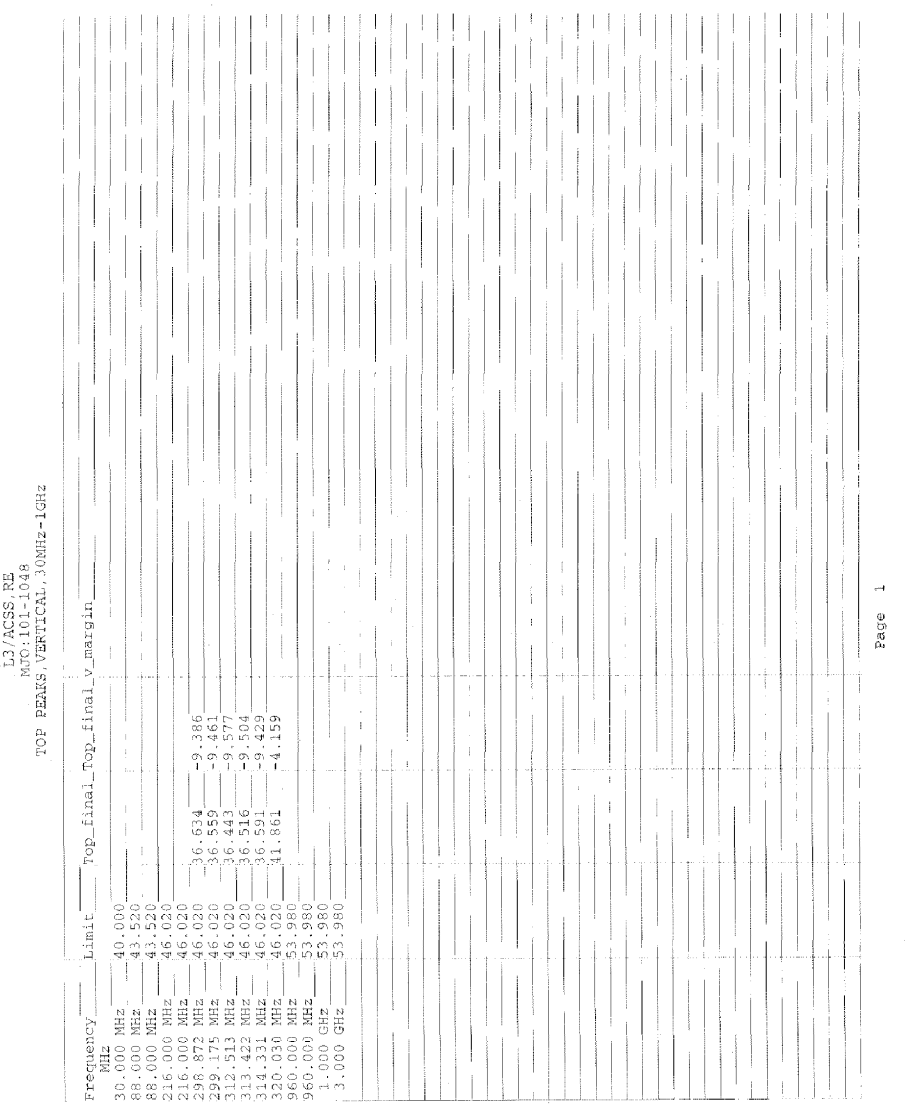

FCC CLASS B/ Radiated Emission(1-12GHz)
Horizontal
AMBIENT
Company: L3
Frequency(MHz)
Amplitude(dBuV/m)
Operator: AJ LARIO
03:31:41 PM, Wednesday, January 27, 2010


FCC/ Class B:. RE(30-1000MHz)
VERTICAL(3m):
FULL OPERATION
Company: L3
Frequency (MHz)
Amplitude (dBuV/m)
Operator: AJ LARIO
02:44:54 PM, Wednesday, January 27, 2010

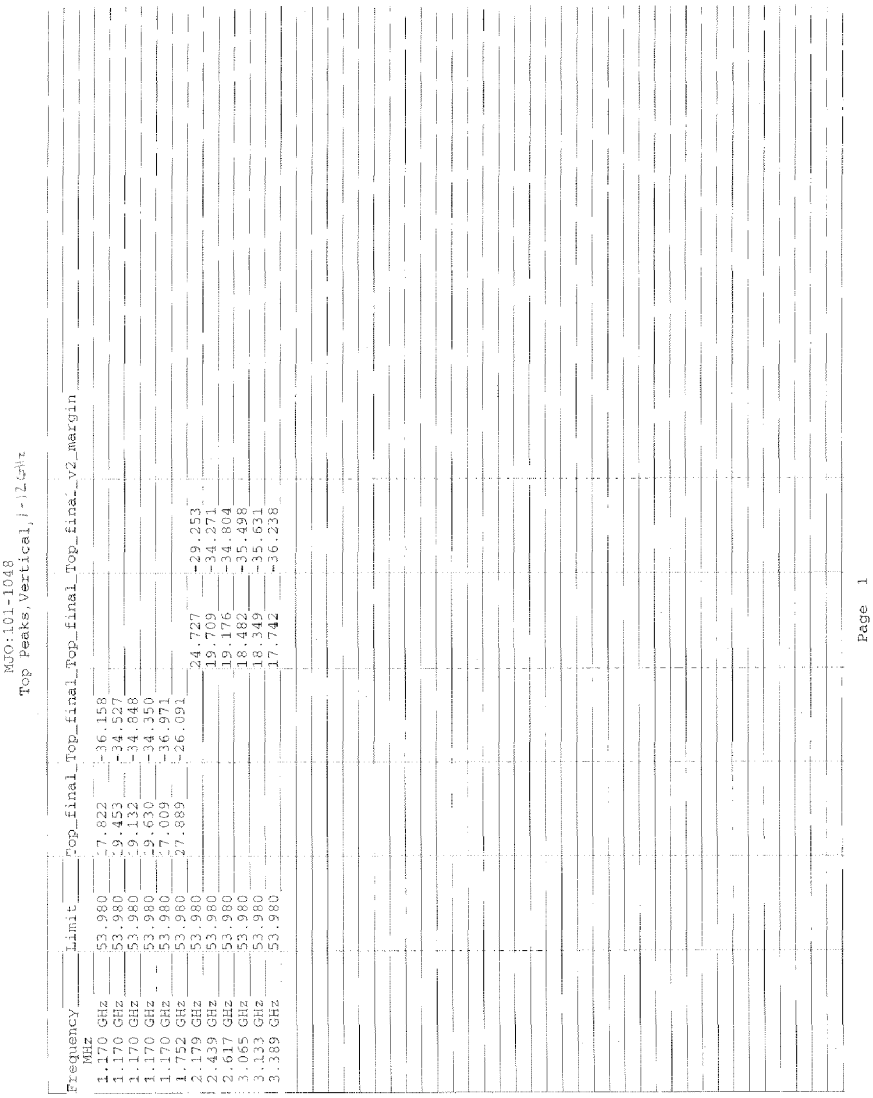

FCC/ Class B; RE(30-1000MHz)
Horizontal(3m);
FULL OPERATION
Company: L3
Frequency(MHz)
Amplitude(dBuV/m)
Operator: AJ LARIO
02:45:03 PM, Wednesday, January 27, 2010


FCC CLASS B/ Radiated Emission (1-12GHz)
Vertical
full operation
Company: L3
Frequency (GHz)
Amplitude (dBuV/m)
Operator: AJ LARIO
03:50:07 PM, Wednesday, January 27, 2010


FCC CLASS B/ Radiated Emission(1-12GHz)
Horizontal
full operation
Company: L3
Frequency(MHz)
Amplitude(dBuV/m)
Operator: A. LARIO
03:35:01 PM, Wednesday, January 27, 2010


L3/ACSS,RE
MJC:101-1048
TOP PEAKS,VERTICAL,30MHz-1GHz
Frequency MHz
Limit
Top_final
Top_final_v_margin
30.000 MHz 40.000
88.000 MHz 43.520
88.000 MHz 43.520
216.000 MHz 46.020
216.000 MHz 46.020 36.634 -9.386
298.872 MHz 46.020 36.559 -9.461
299.175 MHz 46.020 36.443 -9.577
312.513 MHz 46.020 36.516 -9.504
313.422 MHz 46.020 36.591 -9.429
314.331 MHz 46.020 41.861 -4.159
320.030 MHz 46.020
960.000 MHz 53.980
960.009 MHz 53.980
1.000 GHz 53.980
3.000 GHz 53.980
Page 1


L3/ACSS.RE
MJC:101-1048
TOP PEAKS,HORIZONTAL,30MHz-1GHz
Frequency Limit Top_final Top_final_H_margin
MHz
30.000 MHz 40.000 32.454 -7.546
74.438 MHz 40.000 32.454 -7.546
88.000 MHz 43.520 -7.935
88.000 MHz 43.520 -7.935
191.990 MHz 43.520 32.605 -10.915
216.000 MHz 46.020 -10.764
216.000 MHz 46.020 -10.764
240.005 MHz 46.020 35.407 -10.613
312.937 MHz 46.020 32.314 -13.706
319.969 MHz 46.020 42.674 -3.346
719.973 MHz 46.020 35.876 -10.144
960.000 MHz 53.980
960.003 MHz 53.980
1.000 GHz 53.980
3.000 GHz 53.980
Page 1

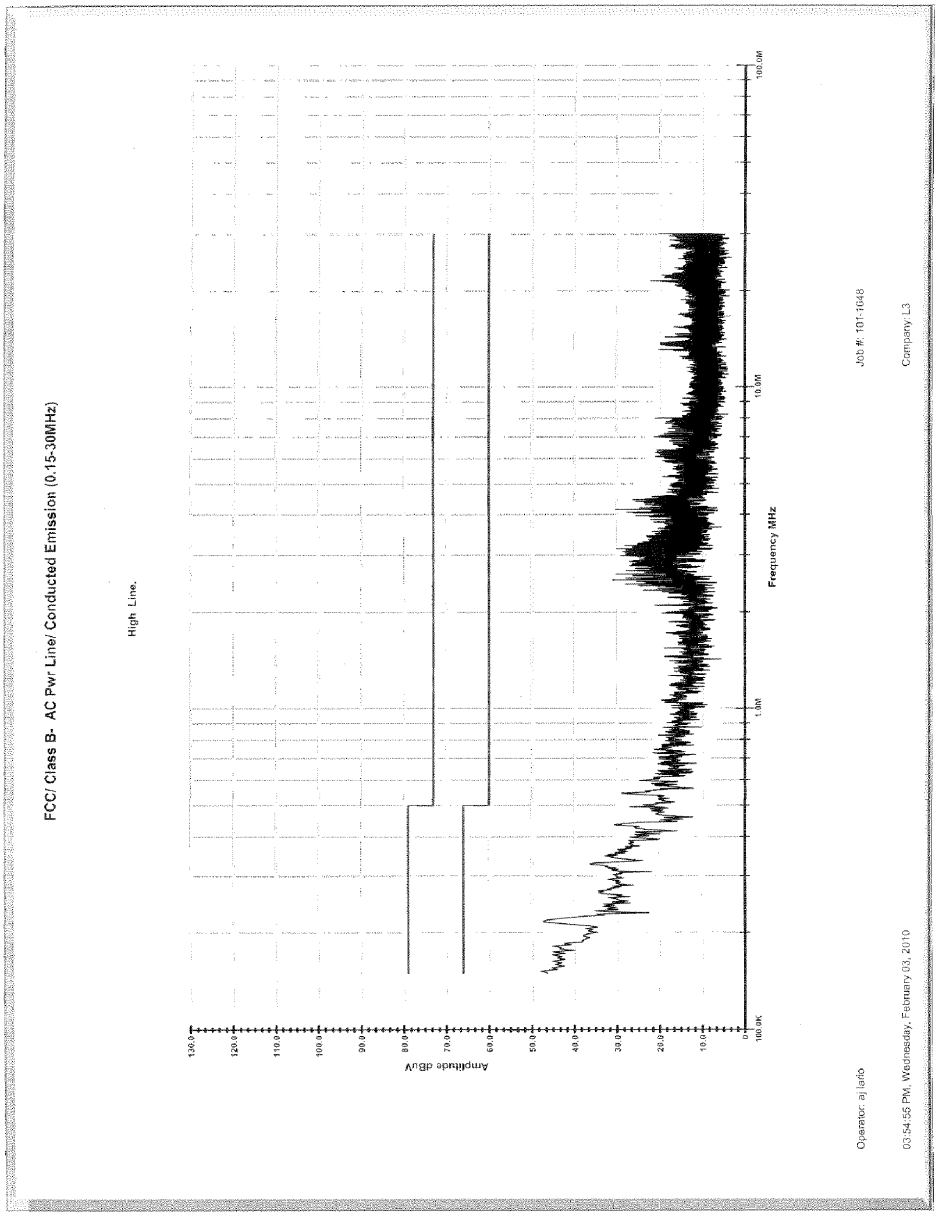

CE
L3/ACSS
MJO:101-1048
Top Peaks,Vertical,1-12GHz
Top_final_Top_final_Top_final_Top_fina_v2_Margin
Frequency MHz
Limit
1.170 GHz 53.980 -7.822 -36.158
1.170 GHz 53.980 -9.453 -34.527
1.170 GHz 53.980 -9.132 -34.848
1.170 GHz 53.980 -9.630 -34.350
1.170 GHz 53.980 -7.009 -36.971
1.752 GHz 53.980 -27.889 -26.091
2.179 GHz 53.980 24.727 -29.253
2.439 GHz 53.980 19.709 -34.271
2.617 GHz 53.980 19.176 -34.804
3.065 GHz 53.980 18.482 -35.498
3.333 GHz 53.980 18.349 -35.631
3.389 GHz 53.980 17.742 -36.238
Page 1

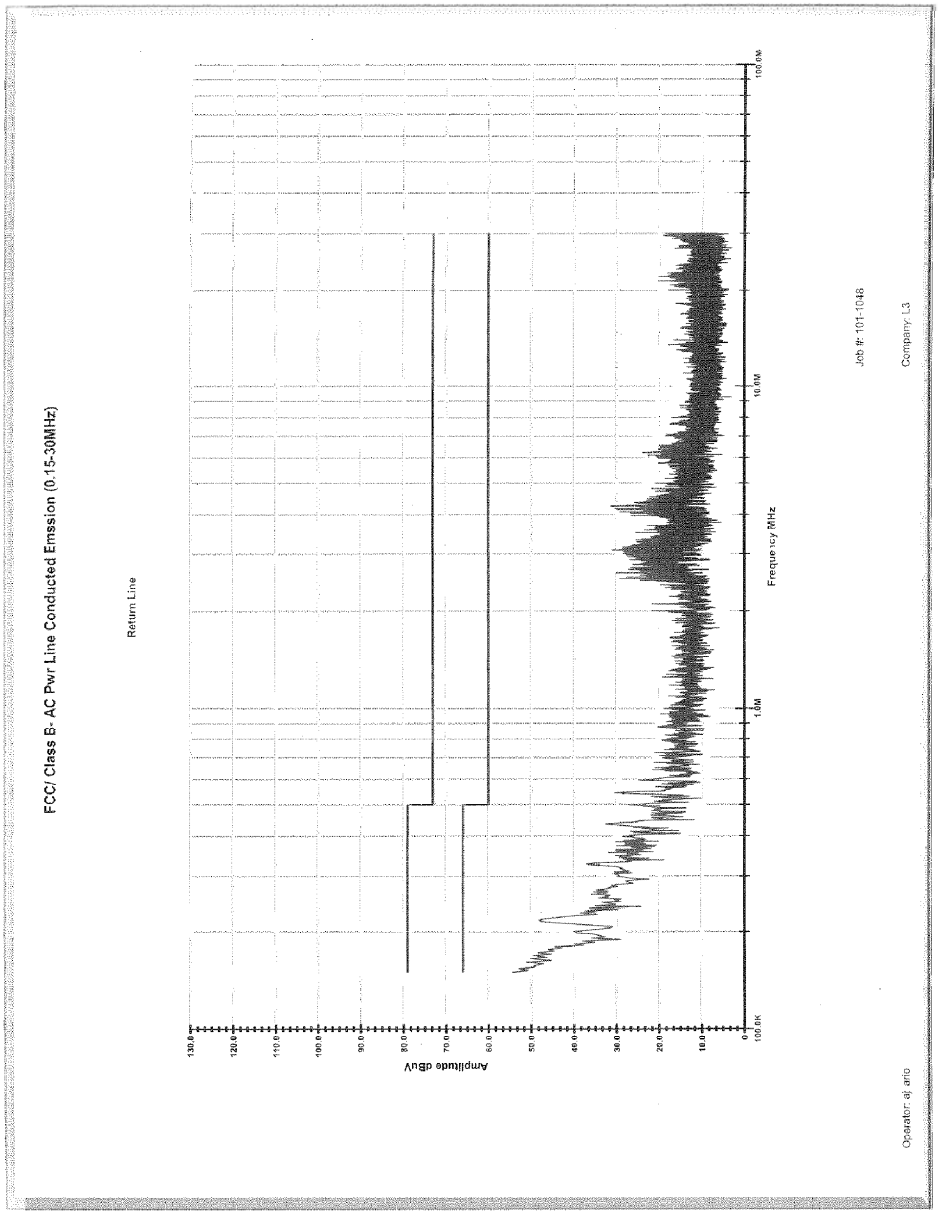
CE
L3/ACSS
MJO:101-1048
TOP PEAKS HORIZONTAL, 1-12GHz

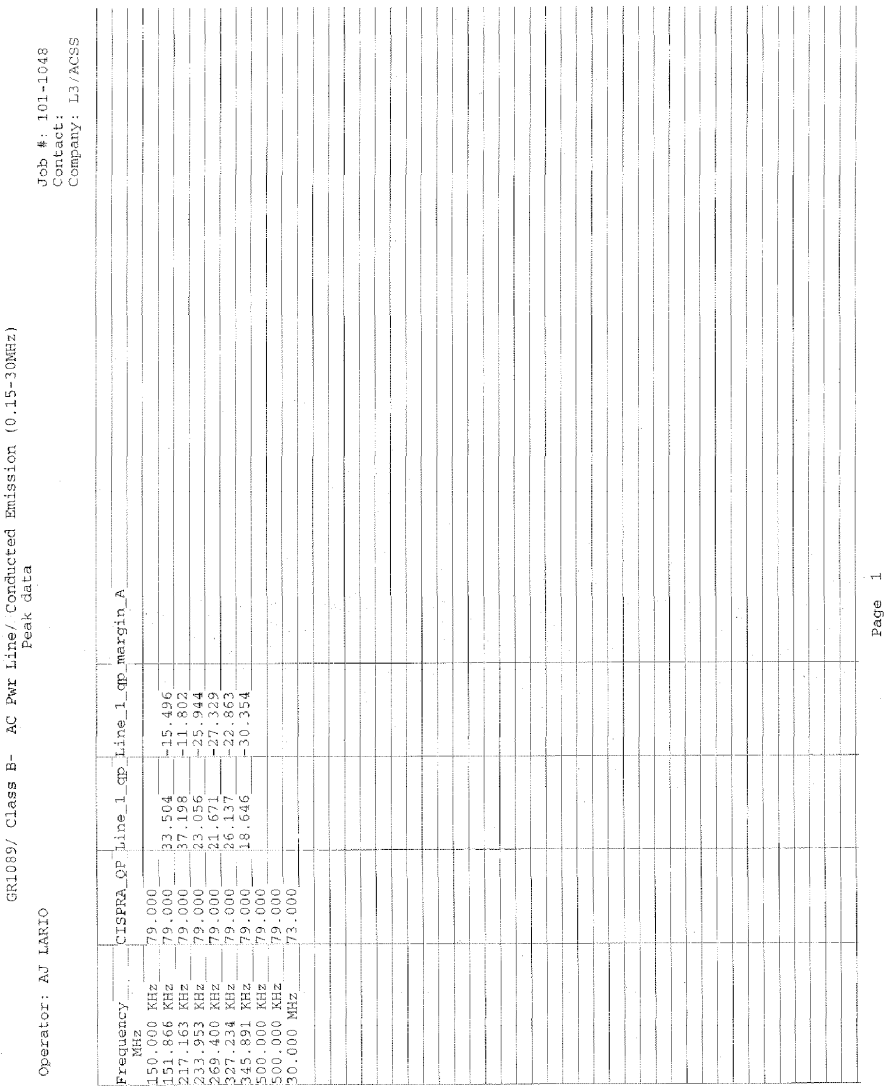
Frequency	Limit	Top_final_Top_final_Top_final_H2_margin
MHz		
30.000 MHz	40.000	
88.000 MHz	43.520	
88.000 MHz	43.520	
216.000 MHz	43.520	
216.000 MHz	43.520	
960.000 MHz	46.020	
960.000 MHz	46.020	
1.000 GHz	53.980	
1.030 GHz	53.980	-28.035
1.030 GHz	53.980	-25.209
1.030 GHz	53.980	-25.626
1.036 GHz	53.980	-25.987
1.093 GHz	53.980	-25.977
1.094 GHz	53.980	-27.190
2.434 GHz	53.980	32.125 -21.855
2.434 GHz	53.980	30.401 -23.579
2.435 GHz	53.980	30.426 -23.554
2.436 GHz	53.980	31.611 -22.369
2.436 GHz	53.980	31.693 -22.287
2.437 GHz	53.980	30.320 -23.660
3.000 GHz	53.980	
8.000 GHz	53.980	
18.000 GHz	53.980	

Page 1

6.3 Conducted Emissions Test Data




FCC/ Class B- AC Pwr Line Conducted Emission (0.15-30MHz)
Return Line
Amplitude dBuV
Frequency MHz
Job #: 101-1048
Company: L3
Operator: aj_arlo



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