ACSS An L-3 Communications & Thales Company **Aviation Communication and Surveillance Systems**	**NXT FCC COMPLIANCE PLAN AND RESULTS**			
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Record of Revisions

Rev	Date	Authorization	Description of Change
-	04-JUN-2014	ECR013945	Initial Release

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1 INTRODUCTION

The NXT Mode-S Transponder product is a Diversity Mode-S Transponder which contains Data Link capabilities in addition to Mode-S specific services. The Transponder provides Automatic Dependent Surveillance-Broadcast (ADS-B) support using the Mode-S Extended Squitter. The NXT-800 model evolved from the predecessor ATDL Transponder unit while the NXT-600 unit evolved from the predecessor RCZ Transponder unit.

The NXT-800 Transponder will consist of two versions, one using a 115 VAC, 400 Hz or +28 VDC power supply (9008000-10xxx) and another which supports only a +28VDC power supply (9008000-55xxx).

The NXT-600 Transponder is designed for a +28 VDC power supply (9006000-55xxx).

The NXT-600 and NXT-800 share a common circuit card set for the processor, power supply, and transceiver. The two units have different form factors, rear connectors, and rear interconnect circuit card assemblies.

1.1 Purpose

The purpose is to provide the FCC compliance plan and test procedures for the 4MCU NXT-800 and custom form factor NXT-600 LRUs.

1.2 Scope

This test results document establishes the FCC compliance plan and procedures for the NXT-800 4 MCU AC/DC LRU, Part Number 9008000-10XXX, DC only LRU, Part Number 9008000-55XXX, and NXT-600 LRU, Part Number 9006000-55XXX.

1.3 References

Table 1-1 Referenced ACSS Documents

Document No.	Revision	Description
9008000-10	-	NXT-800 Hardware Assembly Drawing (AC/DC)
9008000-10000	-	Assembly, NXT-800 Hardware End item (AC/DC)
9008000-55	-	NXT-800 Hardware Assembly Drawing (28VDC only)
9008000-55000	-	Assembly, NXT-600 Hardware End item (28VDC only)
9006000-55		NXT-600 Hardware Assembly Drawing (28VDC only)
9006000-55000		Assembly, NXT-800 Hardware End item (28VDC only)
9006010-001	A	NXT-600 Rear Interconnect (RIA) CCA Drawing
9008010-001	A	NXT-800 Rear Interconnect (RIA) CCA Drawing
9008020-001	B	NXT Transponder Processor (TPA) CCA Drawing
9008030-001	D	NXT Power Supply (PSA) CCA Drawing

Table 1-1 Referenced ACSS Documents

Document No.	Revision	Description
9008040-001	G	NXT Transceiver (RFA) CCA Drawing
9006001-001	A	NXT-600 Outline and Installation Drawing (28VDC only)
9008001-001	-	NXT-800 Outline and Installation Drawing (AC/DC)
9008001-002	-	NXT-800 Outline and Installation Drawing (28VDC only)

Table 1-2: Referenced Industry Documents

Source	Document No.	Revision	Description
RTCA	RTCA DO-160G	December 8, 2010	Environmental Conditions and Test Procedures for Airborne Equipment
RTCA	DO-181E	March 17, 2011	Minimum Operational Performance Standards for Air Traffic Control Radar Beacon System / Mode Select (ATCRBS/MODE S) Airborne Equipment.
RTCA	RTCA DO-260B	December 13, 2011	Minimum Operational Performance Standards for 1090MHz Automatic Dependent Surveillance – Broadcast (ADS-B) and Traffic Information Services – Broadcast (TIS-B)
FAA	TSO-C166b	December 2, 2009	Extended Squitter Automatic Dependent Surveillance - Broadcast (ADS-B) and Traffic Information – Broadcast (TIS-B) Equipment Operation on the Radio Frequency of 1090 Megahertz (MHz)
FAA	TSO-C112d	June 6, 2011	Air Traffic Control Radar Beacon System / Mode Select (ATCRBS/MODE S) Airborne Equipment.

Table 1-3: ARINC Documents

Source	Document No.	Revision	Description
ARINC	413A		Aircraft Electrical Power Utilization and Transient Protection
ARINC	429-17	05/17/2004	Mark 33 Digital Information Transfer System (DITS) ARINC Specification 429-17
ARINC	718A-4	11/15/2011	Mark 4 Air Traffic Control Transponder (ATCRBS/Mode S)
ARINC	735B	12/14/2007	Traffic Computer TCAS and ADS-B Functionality

Table 1-4: Referenced FCC Documents

Document No.	Description
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	Code of Federal Regulations, Telecommunication. Part 87 – Aviation Services Revised as of 10/01/1989
PART 87	Code of Federal Regulations, Telecommunication. Part 87 – Aviation Services

1.4 Acronyms and Abbreviations

Table 1-5: Acronyms and Abbreviations

Acronym	Description
ACSS	Aviation Communication and Surveillance Systems
ADS-B	Automatic Dependent Surveillance - Broadcast
ARINC	Aeronautical Radio, Incorporated
ATC	Air Traffic Control
ATCRBS	Air Traffic Control Radar Beacon System
CCA	Circuit Card Assembly
DER	Designated Engineering Representative
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FAA	Federal Aviation Administration
FMC	Flight Management Computer
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HIRF	High Intensity Radiated Fields
IFR	Instrument Flight Rules
KHz	Kilohertz
LRU	Line Replaceable Unit
MCU	Modular Concept Unit
MHz	Mega Hertz
MOPS	Minimum Operational Performance Specification
MSL	Mean Sea Level
MTL	Minimum Trigger Level
N/A	Not Applicable
NTS	National Technical Systems
OEM	Original Equipment Manufacturer
PC	Personal Computer
PN	Part Number
RF	Radio Frequency

Table 1-5: Acronyms and Abbreviations

Acronym	Description
RTCA	Radio Technical Commission for Aeronautics
TCAS	Traffic Alert and Collision Avoidance System
TSO	Technical Standard Order
TSP	Twisted Shielded Pair
UUT	Unit Under Test
VALFAC	Validation Facility
VDC	Volts Direct Current
XPDR	Transponder

2 GENERAL INFORMATION

2.1 Type Designation

The equipment has been designated by ACSS as NXT Mode-S Transponder, P/Ns 9008000-10000 (AC/DC Power), 9008000-55000 (DC Power), and 9006000-55000 (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 NXT Functionality

The NXT Mode S Transponder product is a Diversity Mode S Transponder which contains Data Link capabilities in addition to Mode S specific services. The NXT units will meet the following TSO documents:

- TSO-C112d, ATCRBS/Mode S Airborne Equipment
- TSO-C166b, 1090MHz ADS-B (Transmit only)

2.3.1.1 Type of Emission

18MOP1D

2.3.1.2 Frequency Range

1090MHz ± 1 MHz

2.3.1.3 Power Rating

500 Watts Peak Effective Radiated Power (Pulsed)

2.3.1.4 Final Power Amplifier

There is one power amplifier chain. On the chain, the Power Amplifier stage is comprised of three, narrowband RF stages, each employing enhancement mode, LDMOS FETs. The total power amplifier gain at 1 dB compression is approximately 58 dB at 1090 MHz. The final power amplifier is a parallel combination of two (2) 500W LDMOS TRANSISTORS which are configured for Class AB operation.

2.3.1.5 Active Device Functions

Table 2-1: NXT Active Devices

Function	Device Type	Part	Manufacturer
Oscillator	Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO)	M6161S019	MtronPTI
	PLL Device with integrated VCO	ADF4360 chip	Analog Devices
	Broadband RFIC Amplifier	ABA-53563	AVAGO Technologies
Transmitter	Gain Block, Id = 35mA, 17 dB Gain	ADA-4643	AVAGO Technologies
	0.1W High Gain Driver Amplifier	MGA-31389	AVAGO Technologies
	Gain Block, Id = 60mA, 16.5 dB Gain	ADA-4743	AVAGO Technologies
	High Linearity Y-Mixer	ADL5350	Analog Devices
Transmitter	4W LDMOS Amplifier	MW6S004NT1	Freescale Semiconductor
	25W LDMOS Amplifier	BLL6H0514-25	NXP Semiconductor
	2x500W LDMOS Amplifier	BLA6H0912-500	NXP Semiconductor
Pulse Modulator	14-bit DAC	AD9707B	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 (NXT-600: 8600600-001 and NXT-800: 8600800-001), provides instructions for the proper installation of the NXT transponder 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

One (1) LO circuit exists in the NXT LRU. The LO generates the 1204 MHz signal used by the Transceiver CCA's down converting mixers in the receiver and transmitter chains. The LO utilizes a high precision VCTCXO, allowing for software to fine tune the LO frequency. It is the programming provided by the FPGA that determines the LO frequency. The reference oscillator used to generate the LO frequency can also be fine tuned via a voltage control driven by the FPGA. Tuning of the reference oscillator is only performed during initial unit calibration and is not performed in the field.

2.3.6 LO Source Circuitry

The LO signal is generated in U19, which is an integrated VCO and phase-locked loop (PLL) circuit. The LO signal output is passed through a series-resonant LC circuit and then passed to an RF amplifier via a pad. The output of the LO circuit is passed to the LO distribution circuitry, splitting the output and providing the LO signal to the transmitter mixer, the top receiver mixer, and the bottom receiver mixer.

The inductors are used to set the oscillation range when the LO is implemented using the ADF4360-6 component. 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 active high “Chip Enable” signal, and is permanently pulled to V_{CC}.

Programming of the LO oscillator is done using the LE, CLK, and DATA inputs (Driven by the Spartan 6 XIC FPGA) to the ADF4360 chip.

2.3.7 Frequency Stabilization

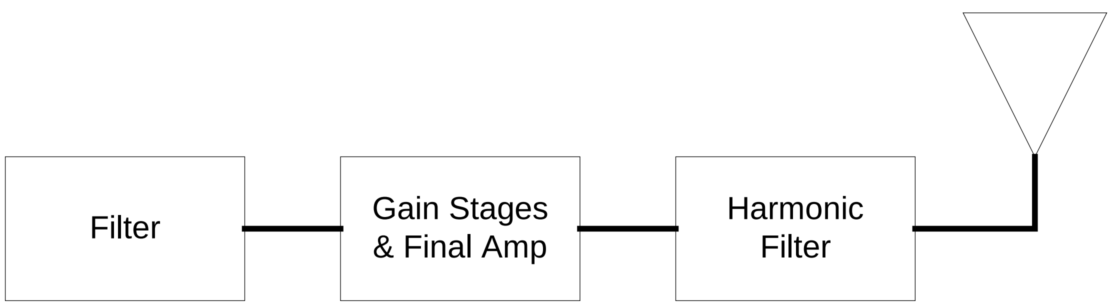
Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO).

2.3.8 Modulation Limiting

Not Applicable

2.3.9 Radiated Interference Suppression

The modulation bandwidth of the pulsed signal (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 1090 MHz transmissions will be limited to the following schedule:

Table 2-2 Transmitter Spectral Mask

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

3 MODULATION DETAILS

3.1 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 3-1.

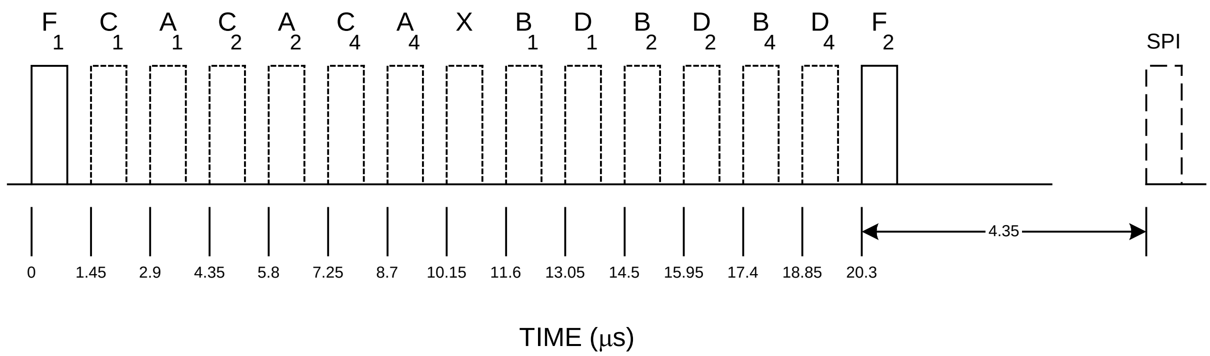


Figure 3-1: ATCRBS Reply

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

Table 3-1: 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 referenced here is currently unused. It is reserved 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 3-2.

Table 3-2: 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

3.2 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 3-2.

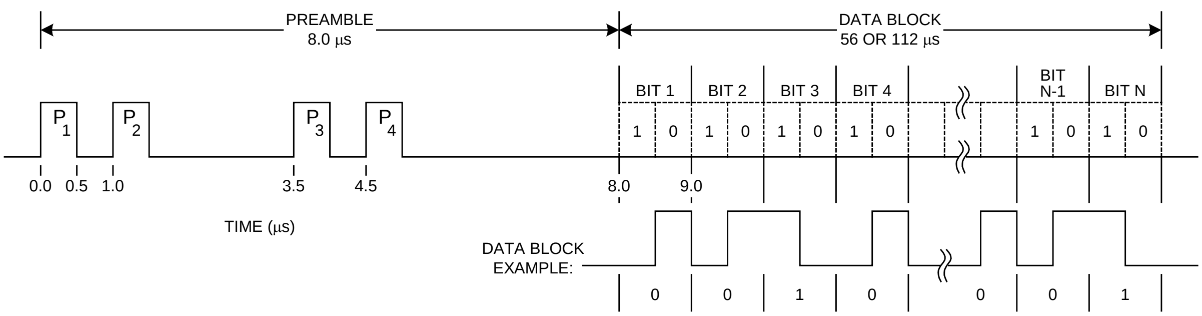


Figure 3-2: Mode S Reply

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 3-3.

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

	Rise Time (µsec)		Decay Time (µsec)	
	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 will be ± 0.05 microseconds, measured from the first pulse of the reply.

4 DRAWINGS AND PHOTOGRAPHS

4.1 Drawings

Refer to Table 1-1 for a list of ACSS drawings that will be furnished with the application.

4.2 Photographs

Photographs of the NXT units will be included in the FCC Compliance Test Report.

4.3 FCC Compliance Test Plan

4.4 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 4.4.2) to the sample tested except for permissive changes or other variations authorized by the commission.

4.4.1 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.

4.4.2 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 which 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.

4.5 NXT Model to be Subjected to FCC Compliance Testing

The NXT-800 4MCU unit (9008000-11000) will be subjected to the full suite of FCC compliance tests with the resulting data submitted to the FCC for certification. Additionally, a DC only version of the NXT-800 (9008000-55000) unit will be subjected to an unofficial Field Strength of Spurious Radiation test to verify that the DC only unit does not alter emissions characteristics.

The NXT-600 custom form factor unit (9006000-55000) will be subjected to the full suite of FCC compliance tests with the resulting data submitted to the FCC for certification.

Both the NXT-600 and NXT-800 will be tested. All results will be compiled in the report that follows.

4.6 Both NXT-800 Models Are Considered Identical

For purposes of FCC compliance testing and certification, both the AC/DC and DC only NXT-800 units are considered to meet the FCC definition of "Identical." Differences exist between the two NXT-800 models, however these differences fall within the definition of a Class I permissive change because the items which provide the transmit and receive functions (the RFA circuit card and the software) are the same in both NXT-800 models.

4.6.1 Conclusion

The full suite of FCC compliance tests will be performed on an NXT-800 and NXT-600 model units separately. An unofficial Field Strength of Spurious Radiation test will be performed on a DC only version of the NXT-800. Both AC and DC input models of the NXT-800 family are considered identical per the FCC definition. Test data from the NXT FCC compliance test will be submitted to the FCC to apply for a new certification and FCC identifier for the NXT family of units.

5 TEST FACILITIES

FCC testing will be performed at the following facilities:

DNB Engineering, Inc.
5969 Robinson Ave
Riverside, California 92503

Aviation Communication and Surveillance Systems (ACSS)
19810 North 7th Avenue
Phoenix, Arizona 85027-4400

6 TEST SCHEDULE

FCC testing will commence in May of 2014.

7 FCC COMPLIANCE TEST PROCEDURES

47CFR2.1041 states that for equipment operating under parts 15 & 18, the measurement procedures are specified in the rules governing the particular device for which certification is requested. For equipment operating in the authorized radio services, measurements are required as specified in sections 2.1046 (RF Power Output), 2.1047 (Modulation Characteristics), 2.1049 (Occupied Bandwidth), 2.1051 (Spurious Emissions at Antenna Terminals), 2.1053 (Field Strength of Spurious Radiation), 2.1055 (Frequency Stability), 2.1057 (Frequency Spectrum to be Investigated).

7.1 RF Power Output

47CFR Reference:
2.1046, RF Power Output
87.131, Bandwidth of Emission

Given that the power output of the transmitter located inside the NXT unit ranges from 400 W to 1000W at the rear of the unit, the transmitter's peak power output in dBm is calculated as follows:

P_{peak_Max} (dBm) = $10Log_{10}(P_{peak}$, W x 1000mW/W)
P_{peak_Max} (dBm) = $10Log_{10}$(1000 W x 1000mW/W)
P_{peak_Max} (dBm) = 60 dBm

P_{peak_Min} (dBm) = $10Log_{10}(P_{peak}$, W x 1000mW/W)
P_{peak_Min} (dBm) = $10Log_{10}$(400 W x 1000mW/W)
P_{peak_Min} (dBm) = 56 dBm

The transmitter's measured peak power output should be approximately 58 dBm (630 W) at the rear of the unit, considering manufacturing tolerances, measurement equipment tolerances and losses in any cables/connectors.

Comment: In this report, the LRU's output power may be referenced in two separate locations, at the antenna or at the rear of the unit. Per ARINC 718A-4, a loss of 3dB from the LRU to the aircraft antenna can be assumed. Therefore, when power is referenced to the rear of the LRU, the RF output power at the aircraft antenna can be assumed to be 3dB lower than the recorded power.

7.1.1 RF Power Output Test Equipment Required

Table 7-1: RF Power Output Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT LRU	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
C	Attenuator (or Equivalent)	Narda	765-20
D	Attenuator (or Equivalent)	Narda	765-20
E	Peak Power Meter	Agilent	N1911A
F	Spectrum Analyzer	Agilent	N9020A

Comment: Equivalent equipment may be used.

7.1.2 RF Power Output Test Setup

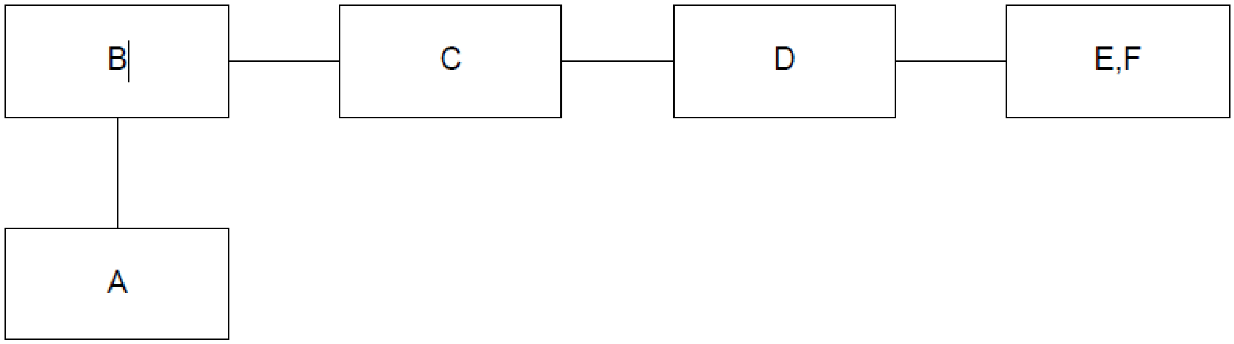


Figure 7-1: RF Power Output Test Setup

7.1.3 RF Power Output Test Procedure

1. Connect the equipment as shown in Figure 7-1 above.
2. Configure the VALFAC script tool to run DO181E_23221_modes_top.scp, DO181E_23221_modes_bot.scp (Mode S, Long DF-16 replies at 50 Hz on top/bottom antennas, respectively) and then DO181E_23221_atcrbs_top.scp and DO181E_23221_atcrbs_bot.scp (ATCRBS, Mode A replies at 500 Hz on top/bottom antennas, respectively).
3. Record the measured output power and frequency using the Peak Power Analyzer and Spectrum Analyzer.

7.1.4 Test Result Data

Results from the measurements of RF power output and frequency can be found in Figure 7-2 for the NXT-600 and Figure 7-3 for the NXT-800. Frequency deviations were less than 1 kHz between ports for both Mode S and Mode C. For the NXT-800 and no frequency difference was observed for the NXT-600. Power deviation were less than 0.1 dB between ports for the NXT-600 and less than 0.11 dB for the NXT-800 for Mode S. Power deviations were less than 0.1 dB for the NXT-600 and 0.6 dB for the NXT-800.

Table 7-2: NXT-600 Peak power output and frequency

NXT-600 Peak power output & frequency measured at bottom antenna port			
Modulation Characteristic	**Measurement**	**Top Antenna**	**Bottom Antenna**
Mode S	Power Output (dBm)	56.729	56.625
	Frequency (MHz)	1089.976	1089.976
Mode C	Power Output (dBm)	56.699	56.789
	Frequency (MHz)	1090.322	1090.322

Table 7-3: NXT-800 peak power output and frequency

NXT-800 Peak power output & frequency measured at top antenna port			
Modulation Characteristic	**Measurement**	**Top Antenna**	**Bottom Antenna**
Mode S	Power Output (dBm)	56.78	56.41
	Frequency (MHz)	1089.976	1089.977
Mode C	Power Output (dBm)	56.96	56.38
	Frequency (MHz)	1090.316	1090.317

7.2 Modulation Characteristics

47CFR Reference:
2.1047, Modulation Characteristics
87.141c, Modulation Requirements

7.2.1 Modulation Characteristics Test Equipment Required

Table 7-4: Modulation Characteristics Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
C	Attenuator	Narda	765-20
D	Attenuator	Narda	765-20
E	Peak Power Meter	Boonton	4500B

Comment: Equivalent equipment may be used.

7.2.2 Modulation Characteristics Test Setup

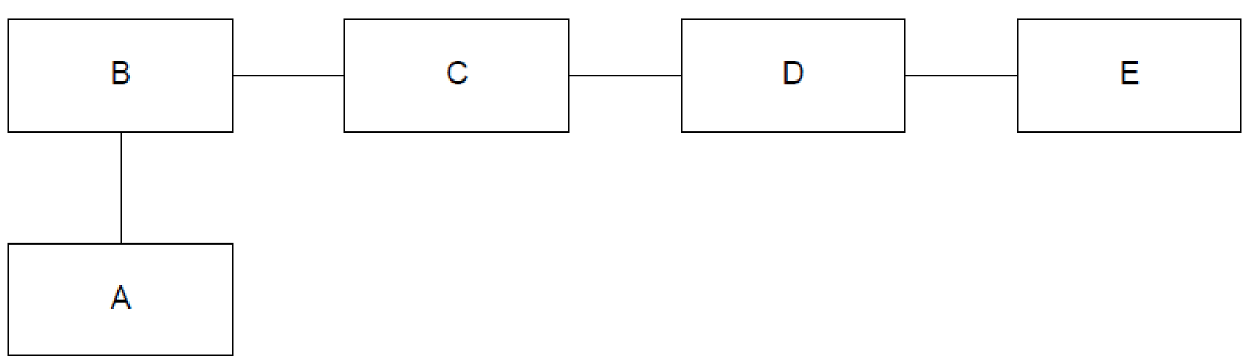


Figure 7-2: Modulation Characteristics Test Setup

7.2.3 Modulation Characteristics Test Procedure

1. Connect the equipment as shown in Figure 7-2above.
2. Configure the VALFAC script tool to run DO181E_23221_modes_top.scp, DO181E_23221_modes_bot.scp (Mode S, Long DF-16 replies at 50 Hz on top/bottom antennas, respectively), DO181E_23221_atcrbs_top.scp, and DO181E_23221_atcrbs_bot.scp (ATCRBS, Mode A replies at 500 Hz on top/bottom antennas, respectively).
3. Record the modulation characteristics on the Peak Power Analyzer. Capture pictures of the following data to be shown in the test report:
   - Typical ATCRBS or Mode S reply pulse showing rise and fall times.
   - Mode S reply with pulse position modulation
   - Close up of Mode S reply preamble
   - ATCRBS Mode C reply

7.2.4 Modulation Characteristics Test Results

See Appendix A for screen captures of the modulation characteristics. Because the modulation schemes utilized by the NXT-600 and NXT-800 are identical, the modulation characteristics from the NXT-600 only are being displayed and are representative of both the NXT-600 and NXT-800 modulation schemes.

7.3 Occupied Bandwidth

47CFR Reference:
2.1049, Occupied Bandwidth
87.135, Bandwidth of Emission

Occupied bandwidth is defined in 47CFR2.1049 as *"the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission."*

7.3.1 Occupied Bandwidth Test Equipment Required

Table 7-5: Occupied Bandwidth Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
C	Attenuator (or Equivalent)	Narda	765-20
D	Attenuator (or Equivalent)	Narda	765-20
E	Spectrum Analyzer	Agilent	N9020A

Comment: Equivalent equipment may be used.

7.3.2 Occupied Bandwidth Test Setup

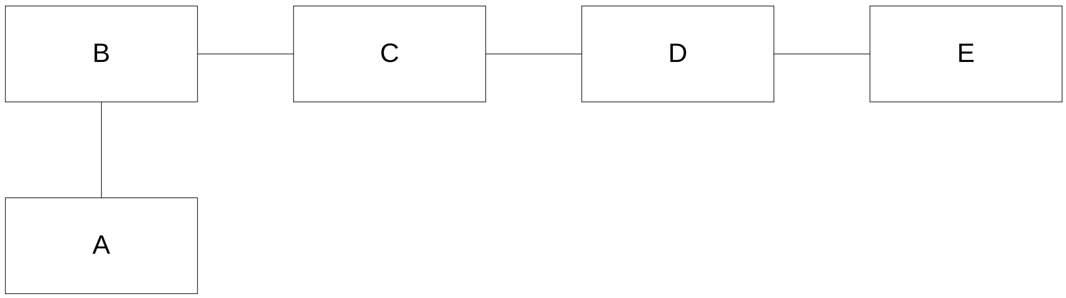


Figure 7-3: Occupied Bandwidth Test Setup

7.3.3 Occupied Bandwidth Test Procedure

1. Connect the equipment as shown in Figure 7-3 above.
2. Using the Spectrum analyzer, use the Occupied Bandwidth measurement function.
3. Set the center frequency to 1090 MHz, Span to 200 MHz, Resolution bandwidth to 2 MHz and Video bandwidth to 6 MHz.
4. Set the detector function to Average rms.
5. Select trace>>max hold and allow the window to fill up with the signal.
6. Record the occupied bandwidth in Table 7-6, below.

7.3.4 Occupied Bandwidth Test Results

Occupied bandwidth was less than or equal to 7.6 MHz for all transmission modes and antenna ports.

Table 7-6 Occupied Bandwidth and In-Close Spurious Results

	NXT-600		NXT-800	
Occupied Bandwidth (MHz)	**Top Antenna (MHz)**	**Bottom Antenna (MHz)**	**Top Antenna (MHz)**	**Bottom Antenna (MHz)**
Mode S	7.5126	7.5461	6.7566	6.7994
ATCRBS	7.5583	7.5409	6.749	6.7699

7.4 Spurious Emissions at Antenna Terminals

47CFR Reference:
2.1051, Spurious Emissions at Antenna Terminals
87.139, Emission Limitations

47CFR2.1051 states that the radio frequency voltages or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna.

47CFR2.1051 says that curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in Sec 2.1049 (Occupied Bandwidth) as appropriate.

7.5 Spurious Emissions at Antenna Terminals (0 – 2000 MHz)

7.5.1 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Equipment Required

Table 7-7: Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
C	Attenuator (or Equivalent)	Narda	765-20
D	Attenuator (or Equivalent)	Narda	765-20
E	Spectrum Analyzer	Agilent	N9020A

Comment: Equivalent equipment may be used.

7.5.2 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Setup

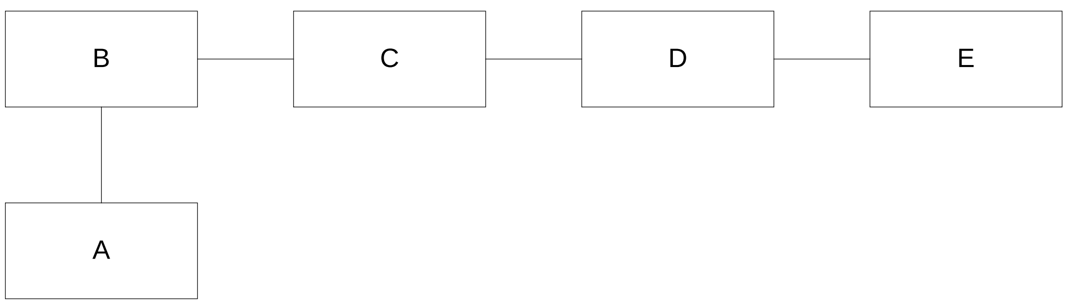


Figure 7-4: Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Setup

7.5.3 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Procedure

1. Connect the equipment as shown in Figure 7-4 above.
2. Configure the VALFAC script tool to run DO181E_23221_modes_top.scp, DO181E_23221_modes_bot.scp (Mode S, Long DF-16 replies at 50 Hz on top/bottom antennas, respectively).
3. Measure and plot all spurs below 2000 MHz. Use 200 MHz spans and a 300 kHz IF bandwidth on the Spectrum Analyzer.

7.5.4 NXT-600 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Results

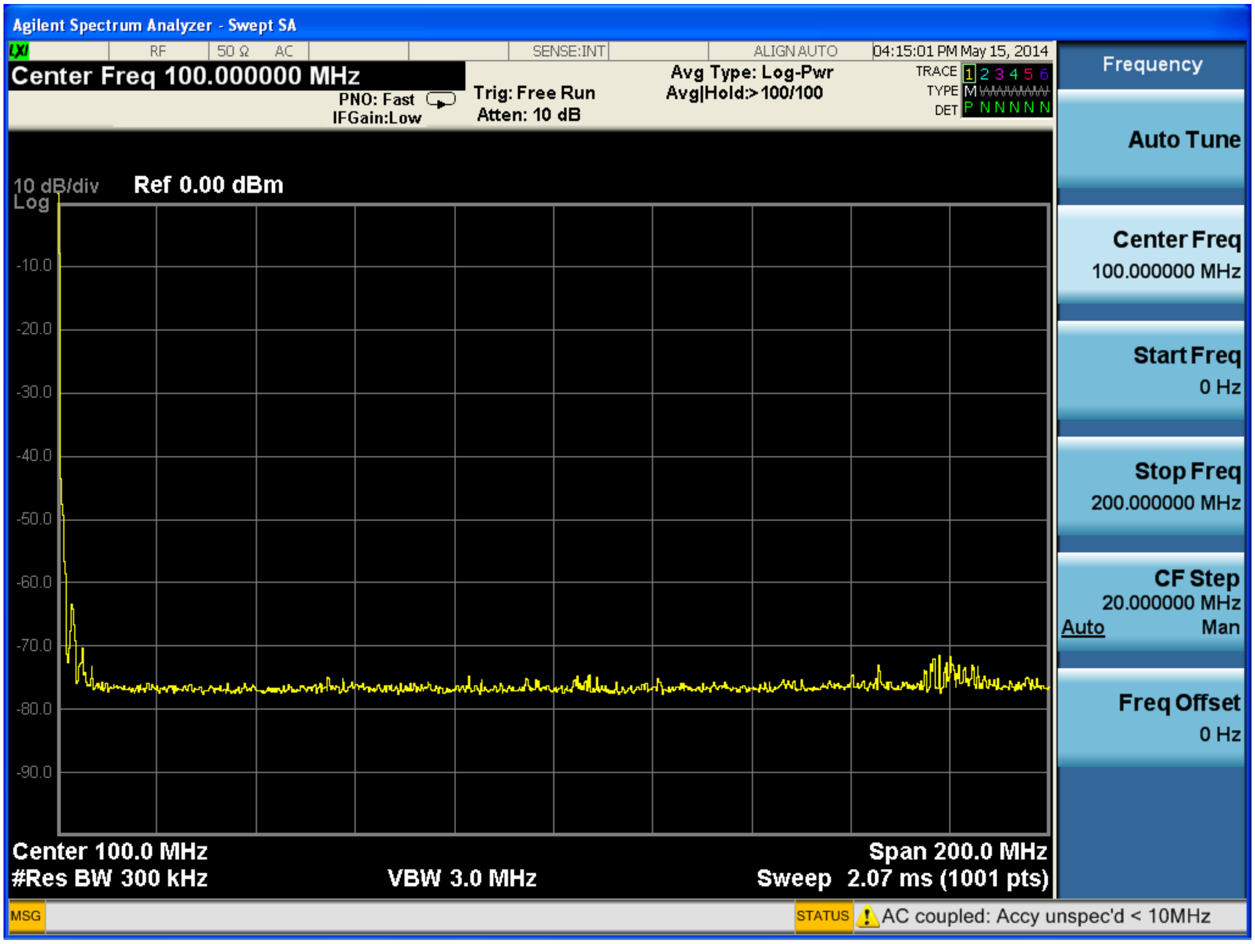


Figure 7-5: NXT-600 Spurious Emissions, 0 – 200 MHz

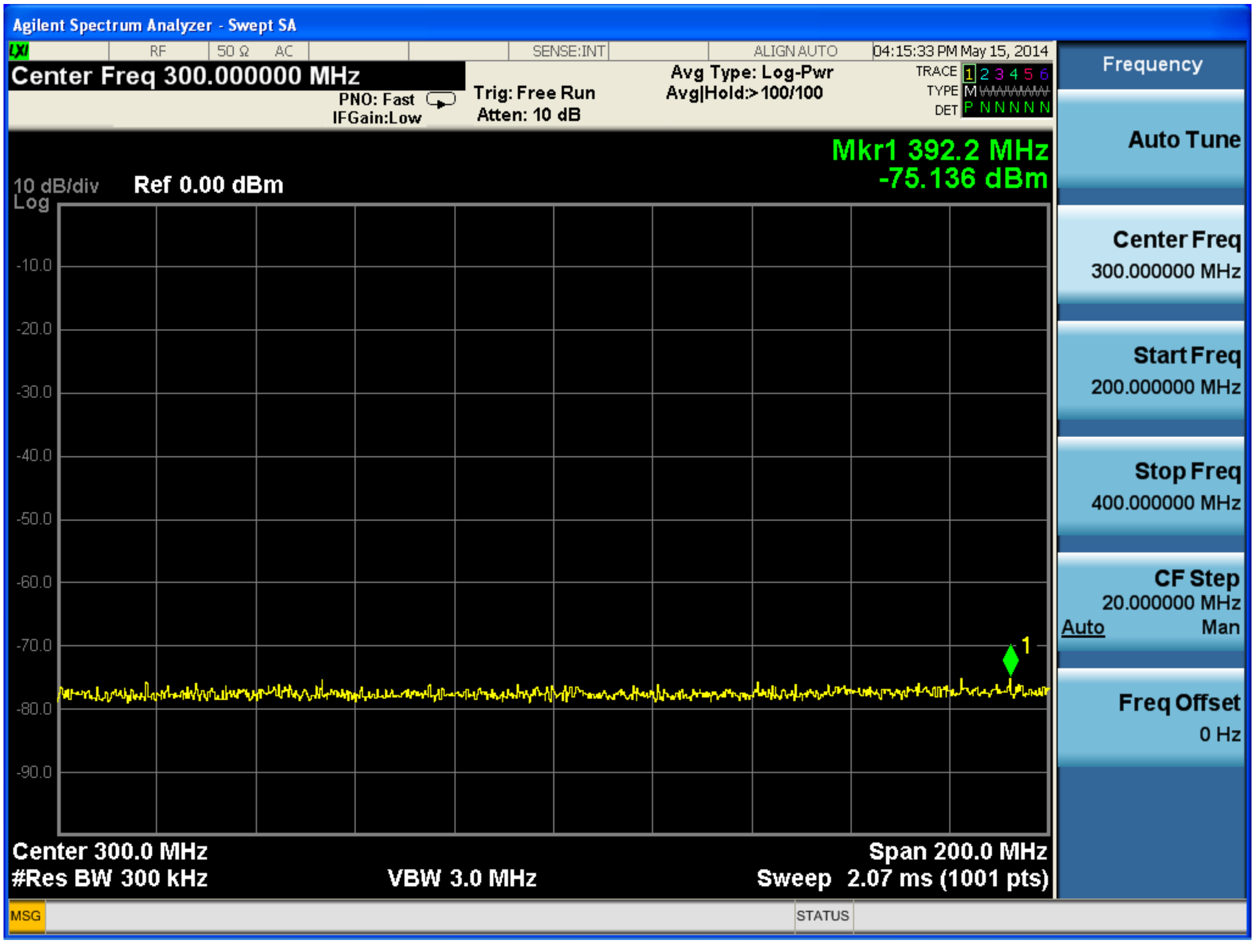


Figure 7-6: NXT-600 Spurious Emissions, 200 – 400 MHz

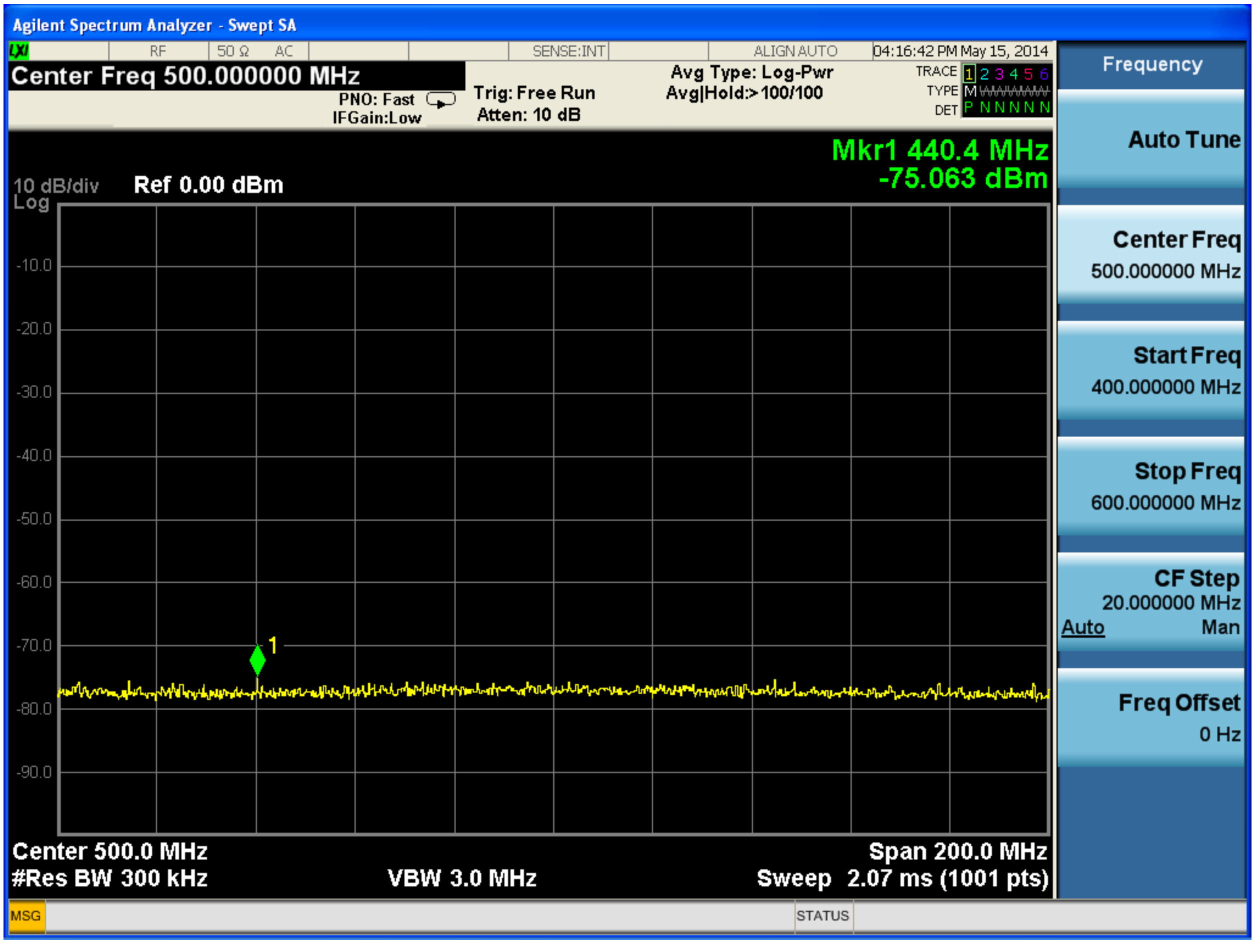


Figure 7-7: NXT-600 Spurious Emissions, 400 – 600 MHz

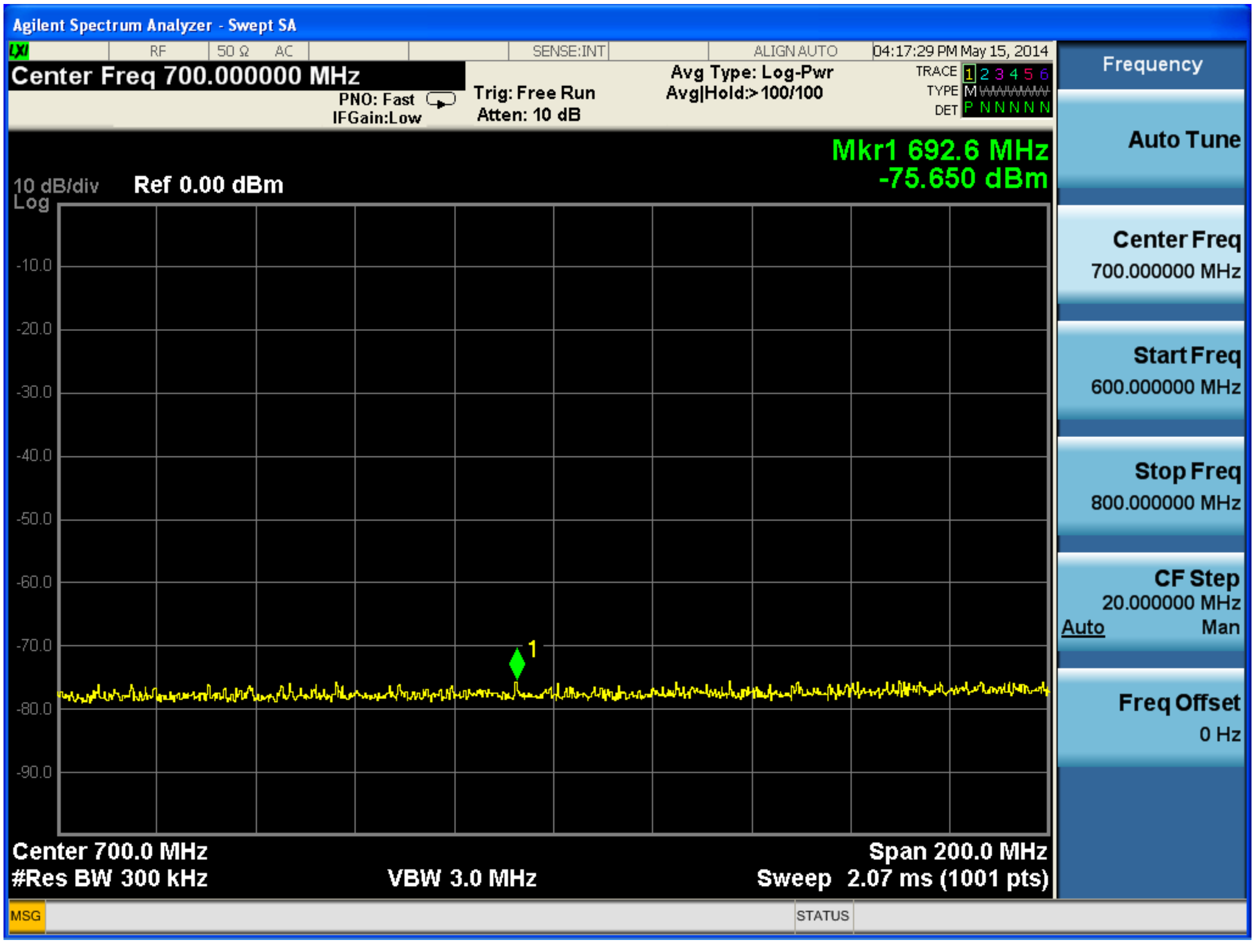


Figure 7-8: NXT-600 Spurious emissions, 600 – 800 MHz

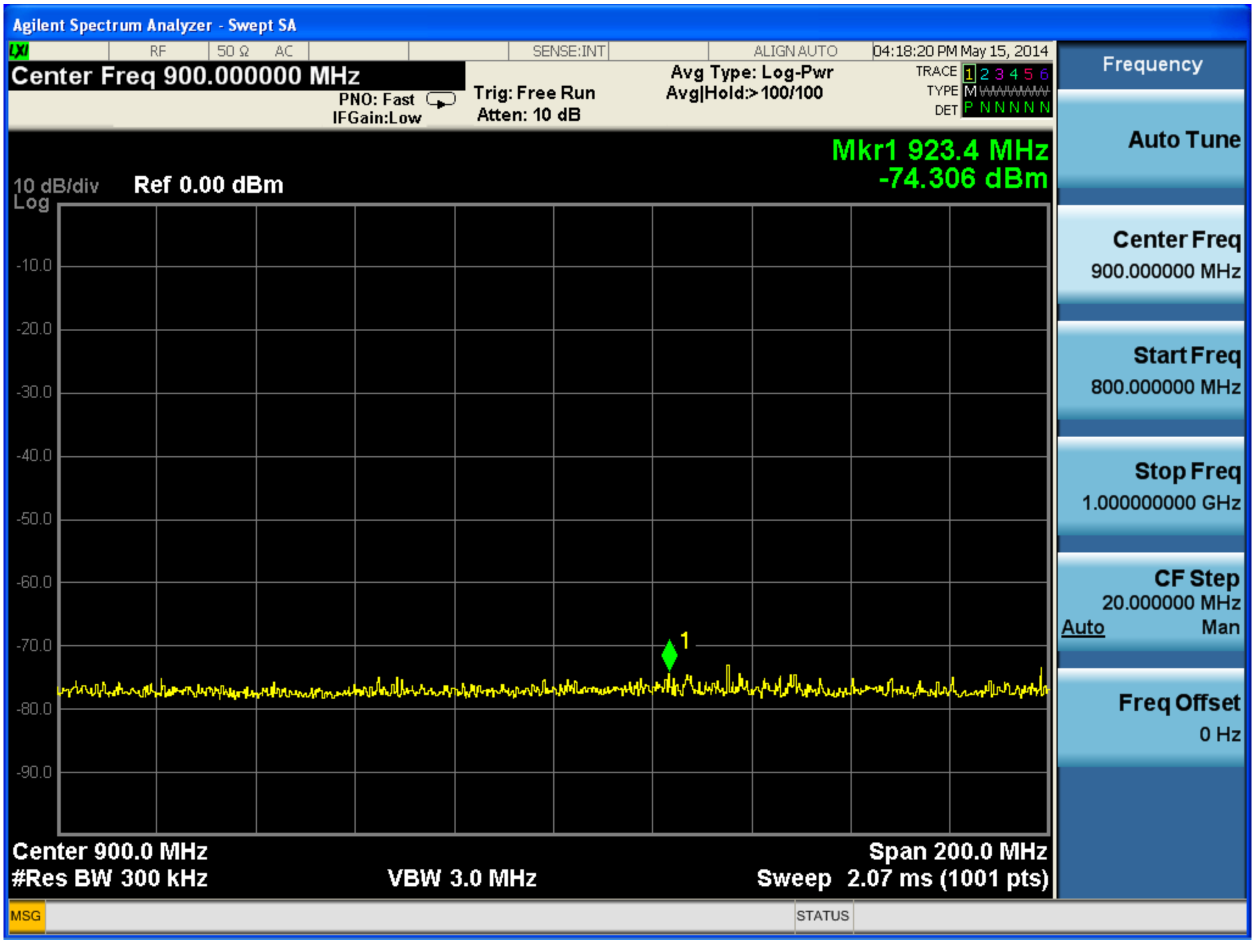


Figure 7-9: NXT-600 Spurious emissions, 800 – 1000 MHz

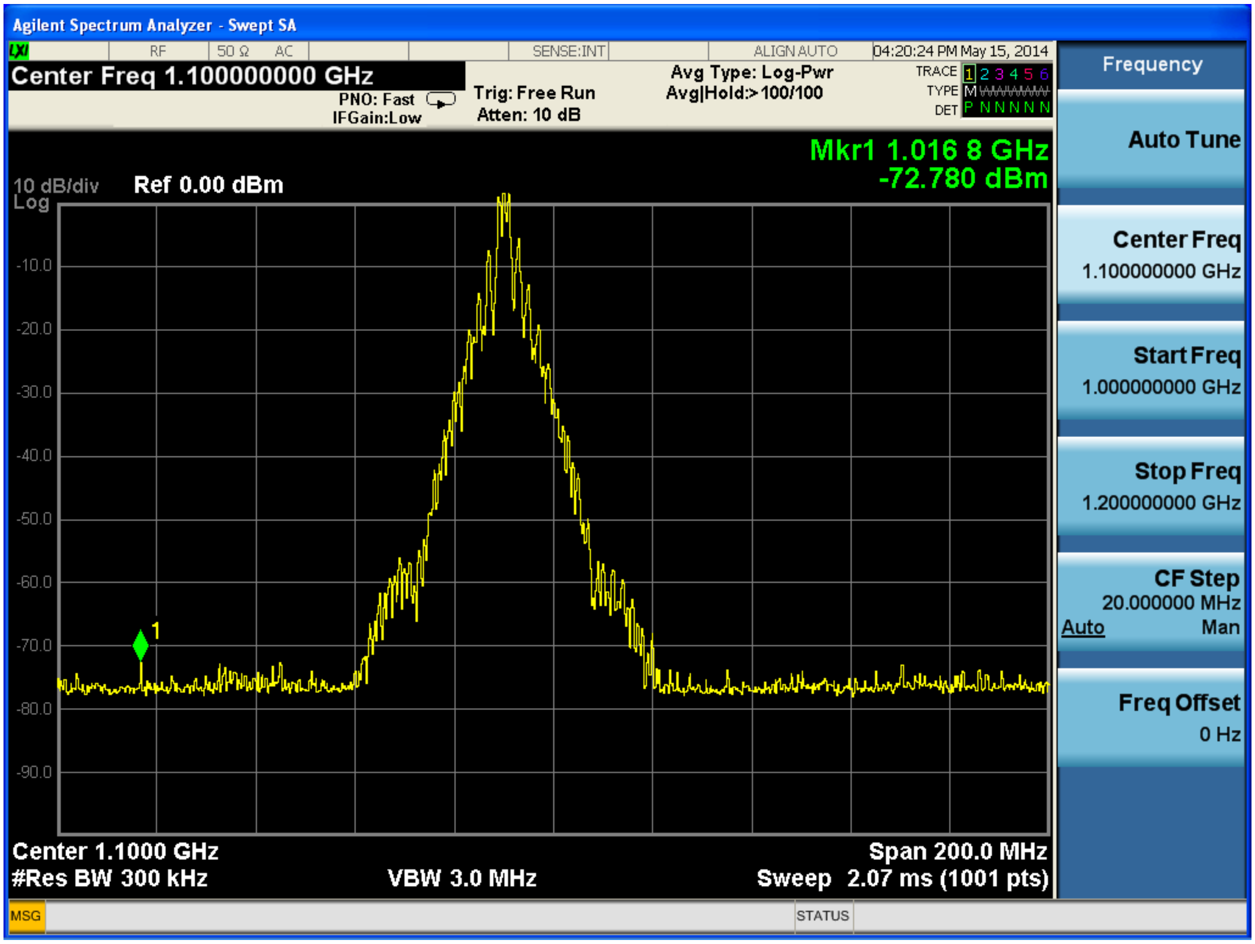


Figure 7-10: NXT-600 Spurious emissions, 1000 – 1200 MHz

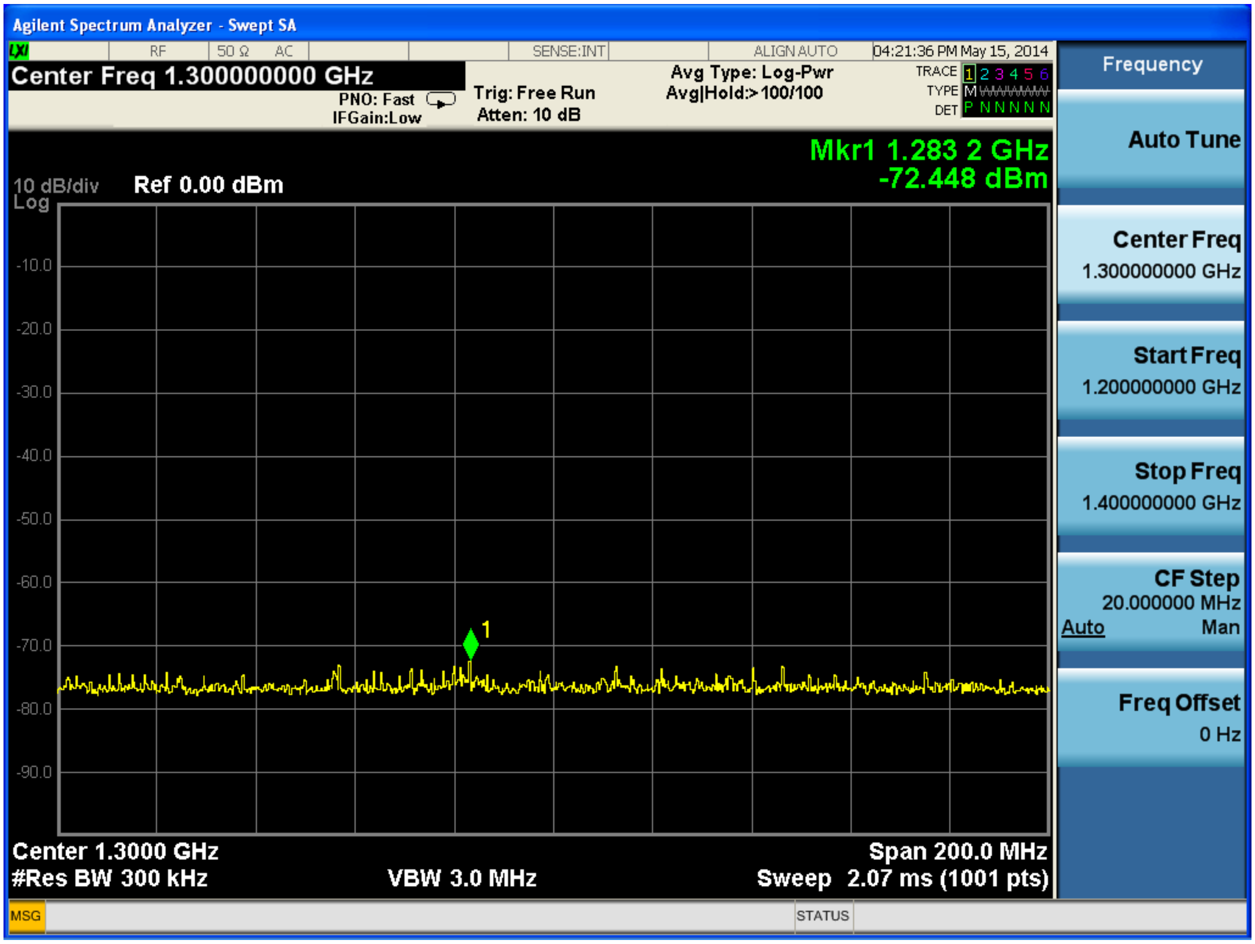


Figure 7-11: NXT-600 Spurious emissions, 1200 – 1400 MHz

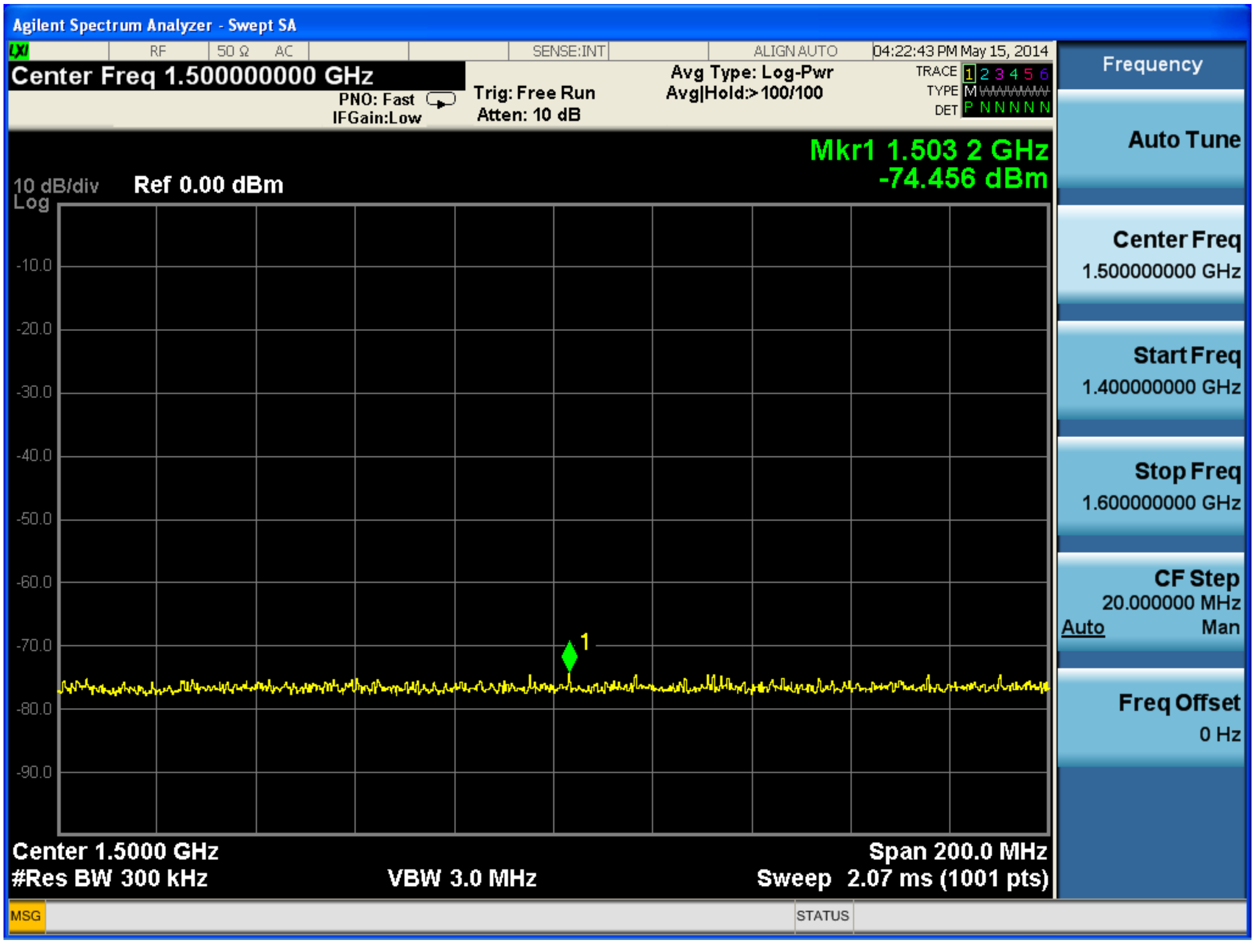


Figure 7-12: NXT-600 Spurious emissions, 1400 – 1600 MHz

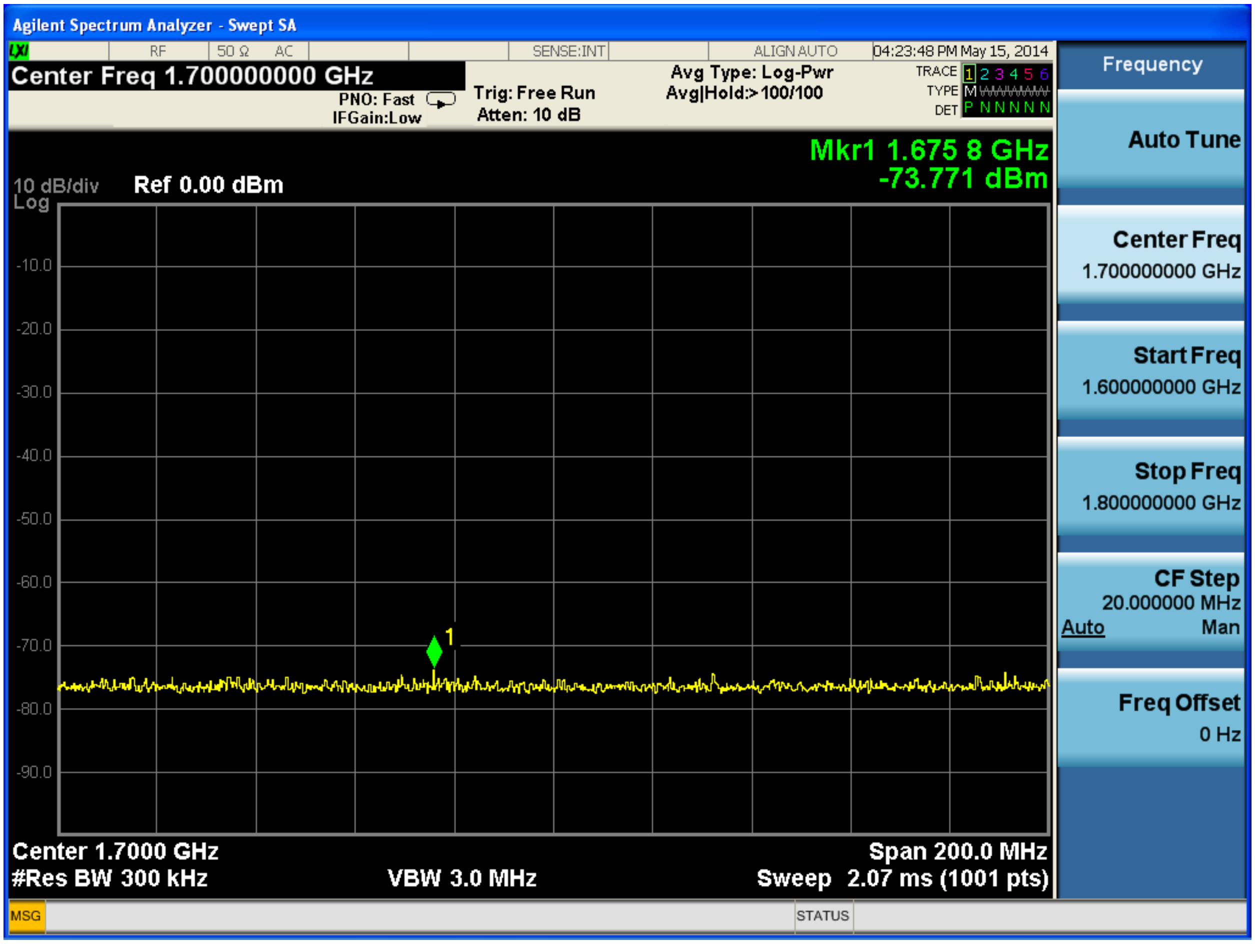


Figure 7-13: NXT-600 Spurious emissions, 1600 – 1800 MHz

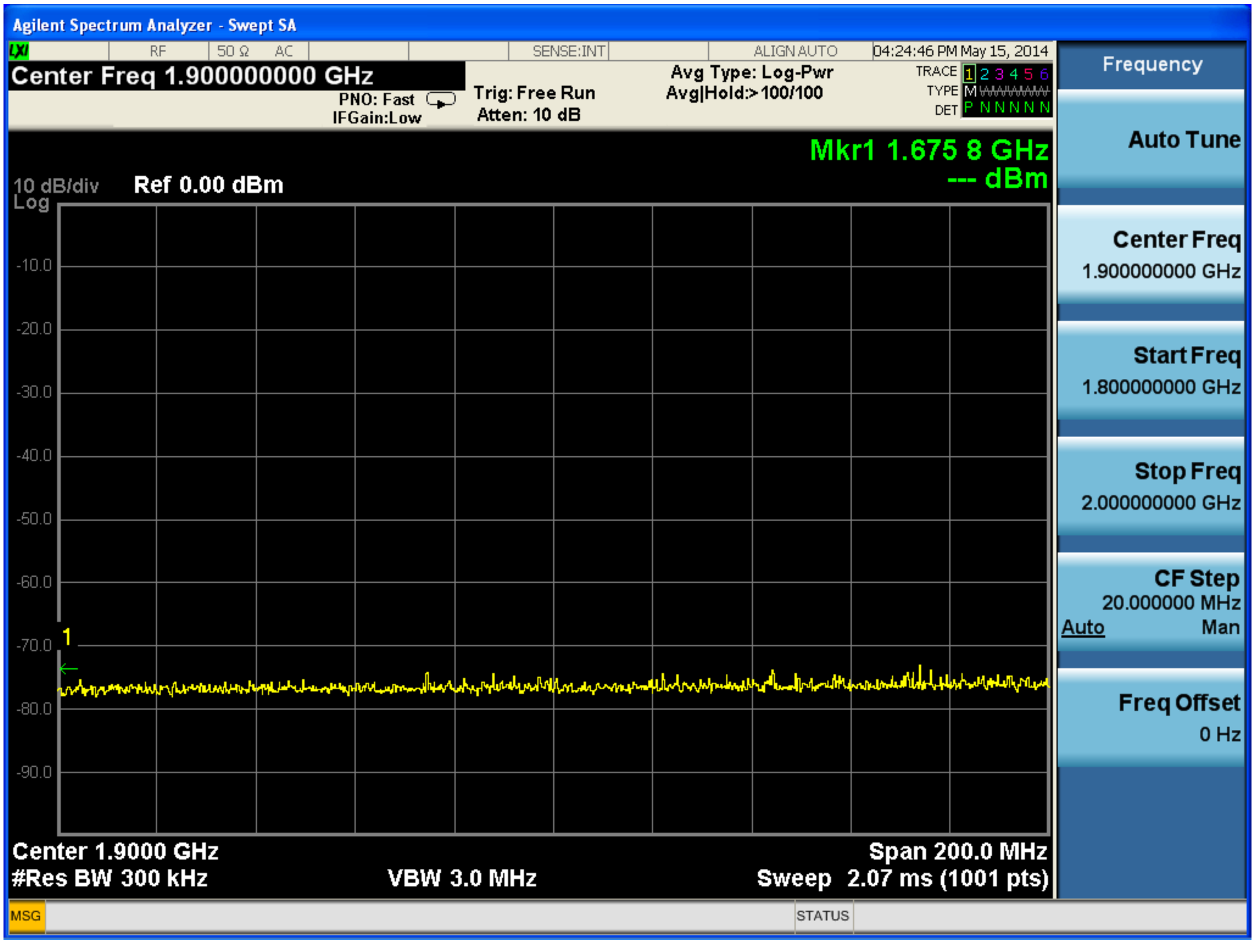


Figure 7-14: NXT-600 Spurious emissions, 1800 – 2000 MHz

7.5.5 NXT-800 Spurious Emissions at Antenna Terminals (0 – 2000 MHz) Test Results

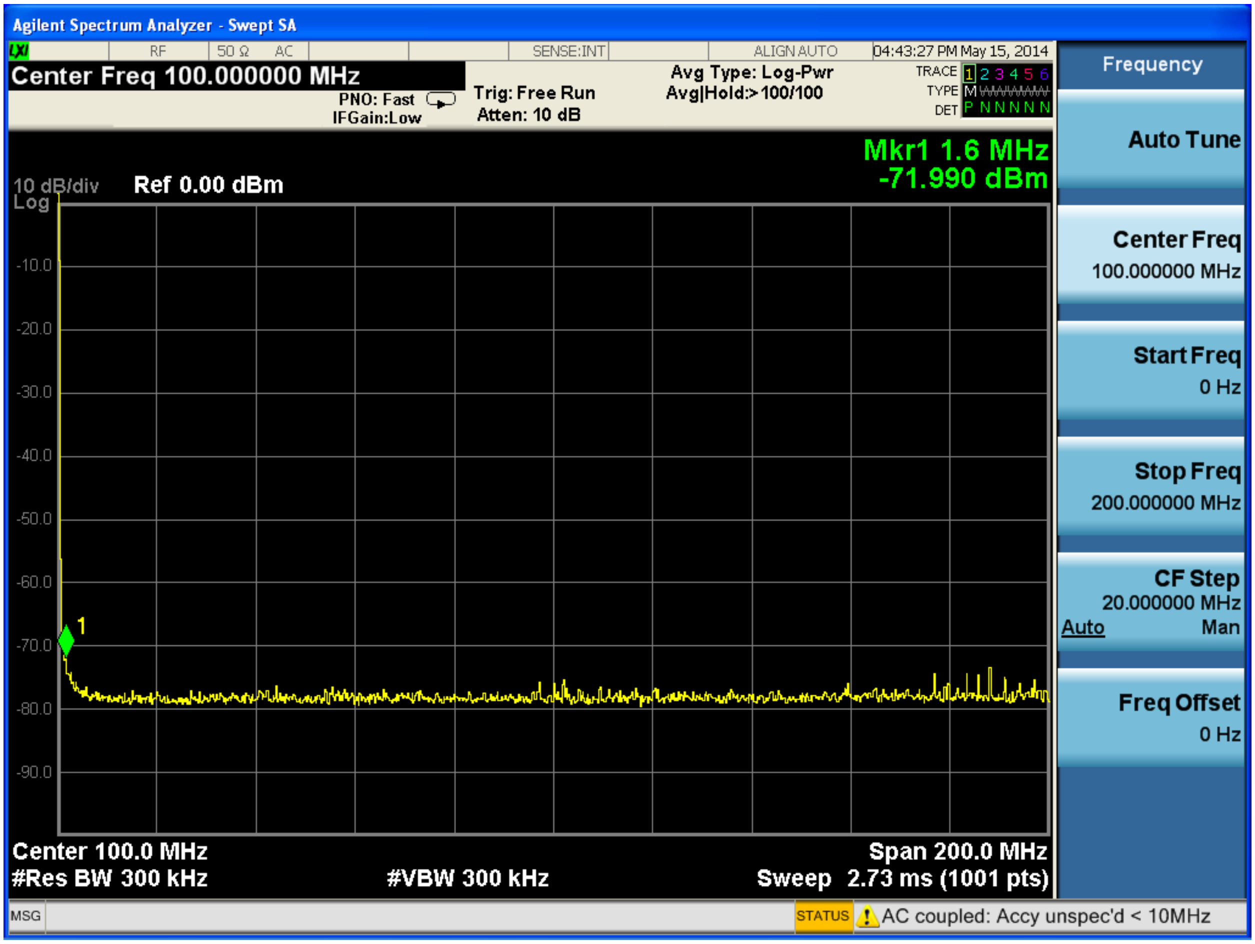


Figure 7-15: NXT-800 Spurious emissions, 0 – 200 MHz

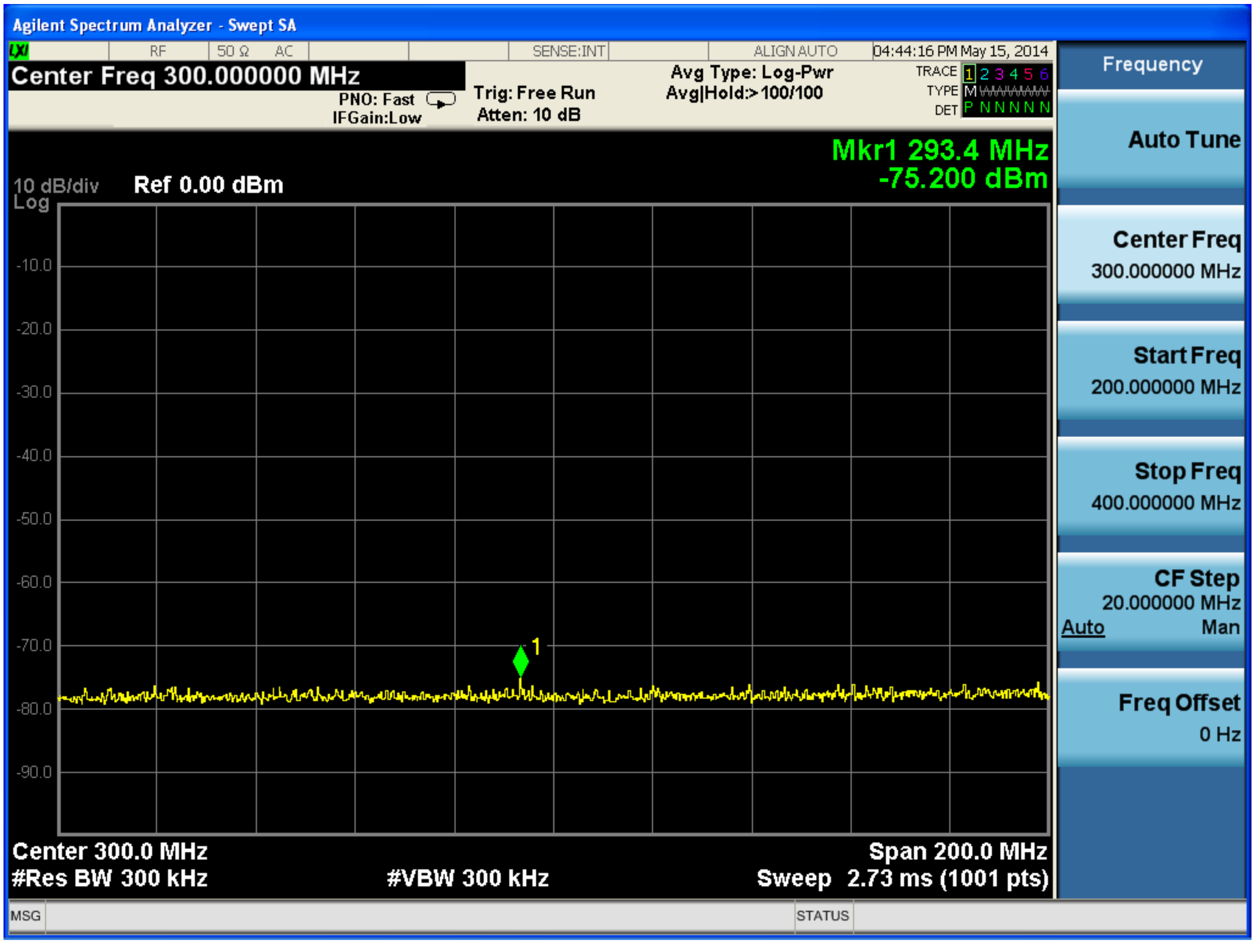


Figure 7-16: NXT-800 Spurious emissions, 200 – 400 MHz

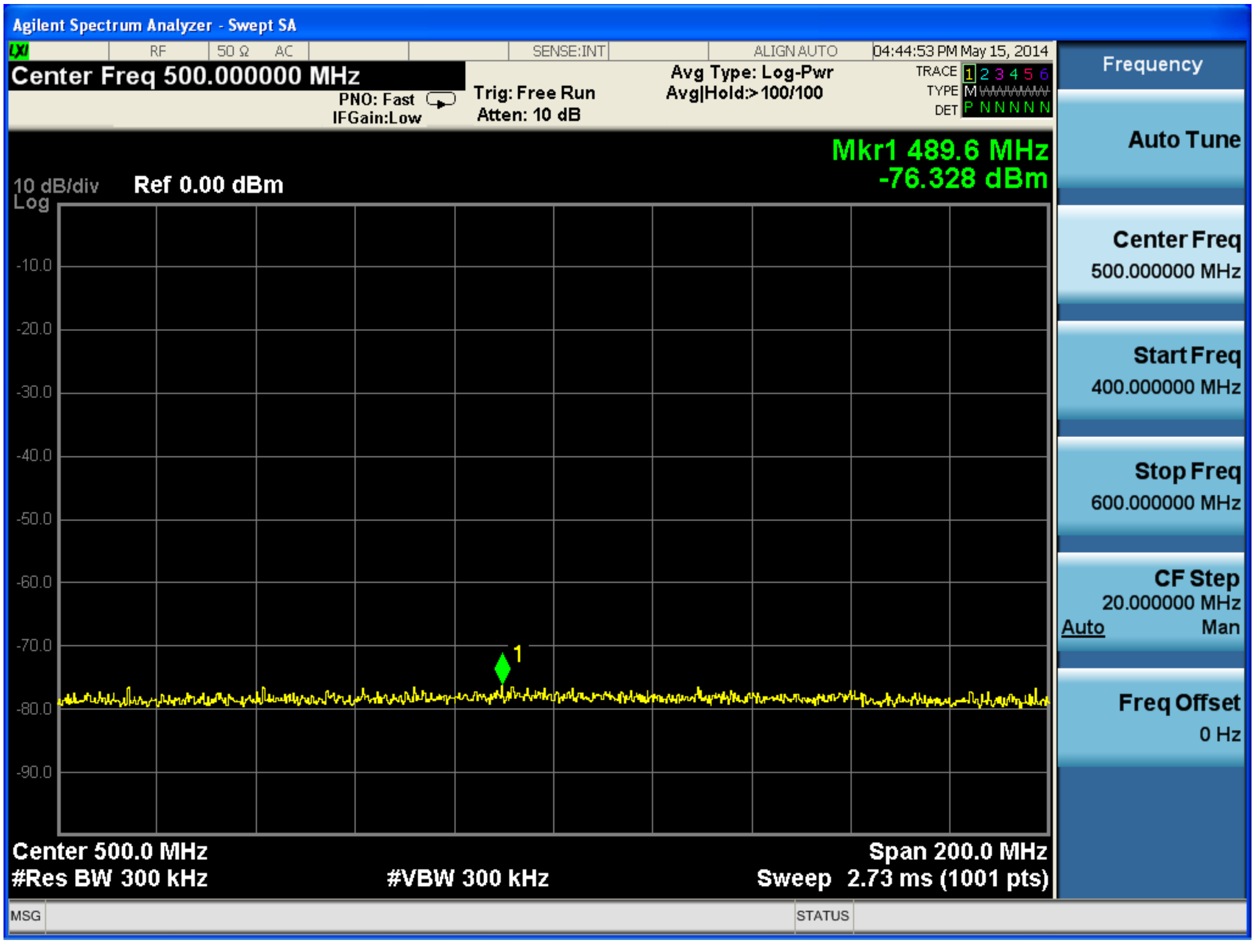


Figure 7-17: NXT-800 Spurious emissions, 400 – 600 MHz

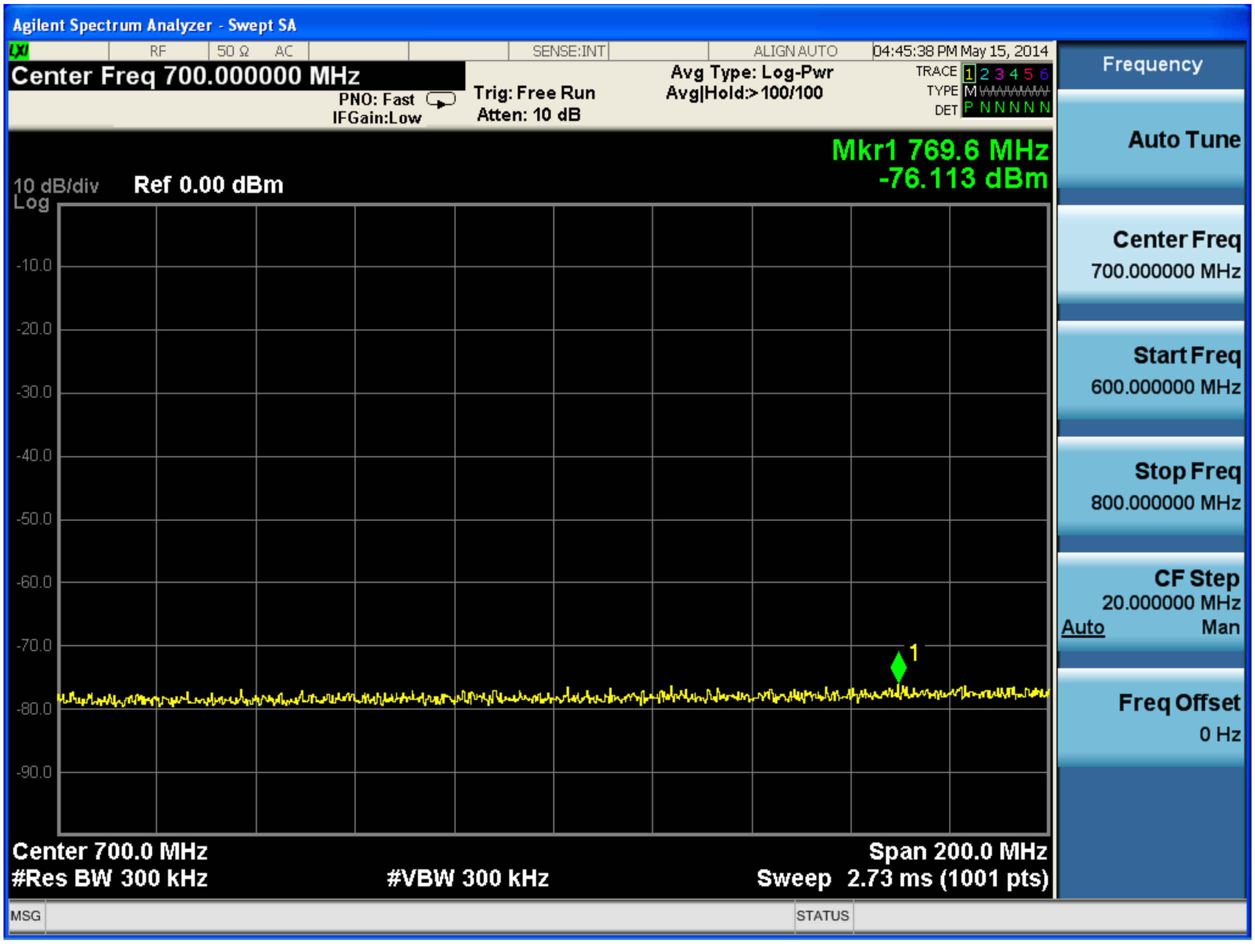


Figure 7-18: NXT-800 Spurious emissions, 400 – 600 MHz

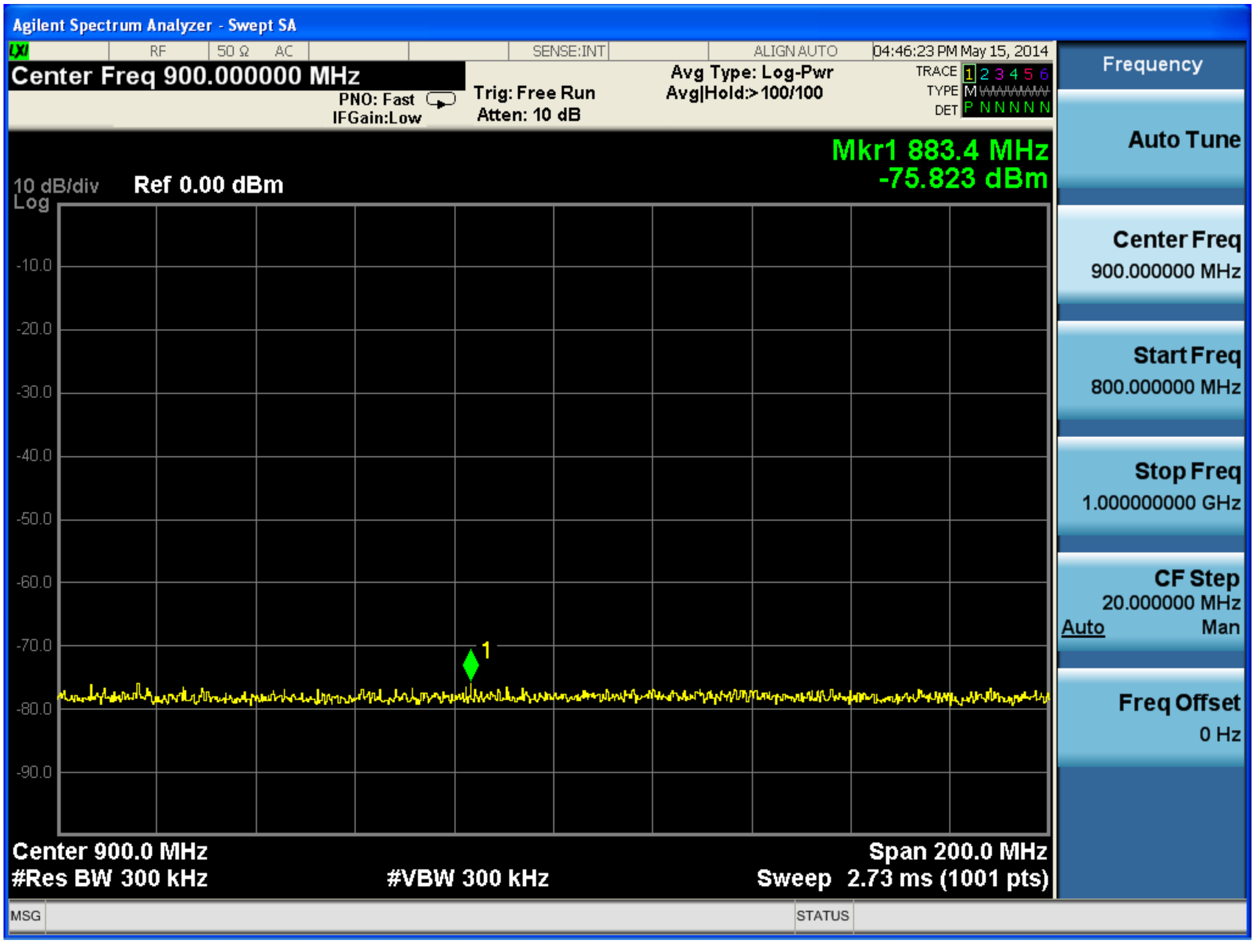


Figure 7-19: NXT-800 Spurious emissions, 800 – 1000 MHz

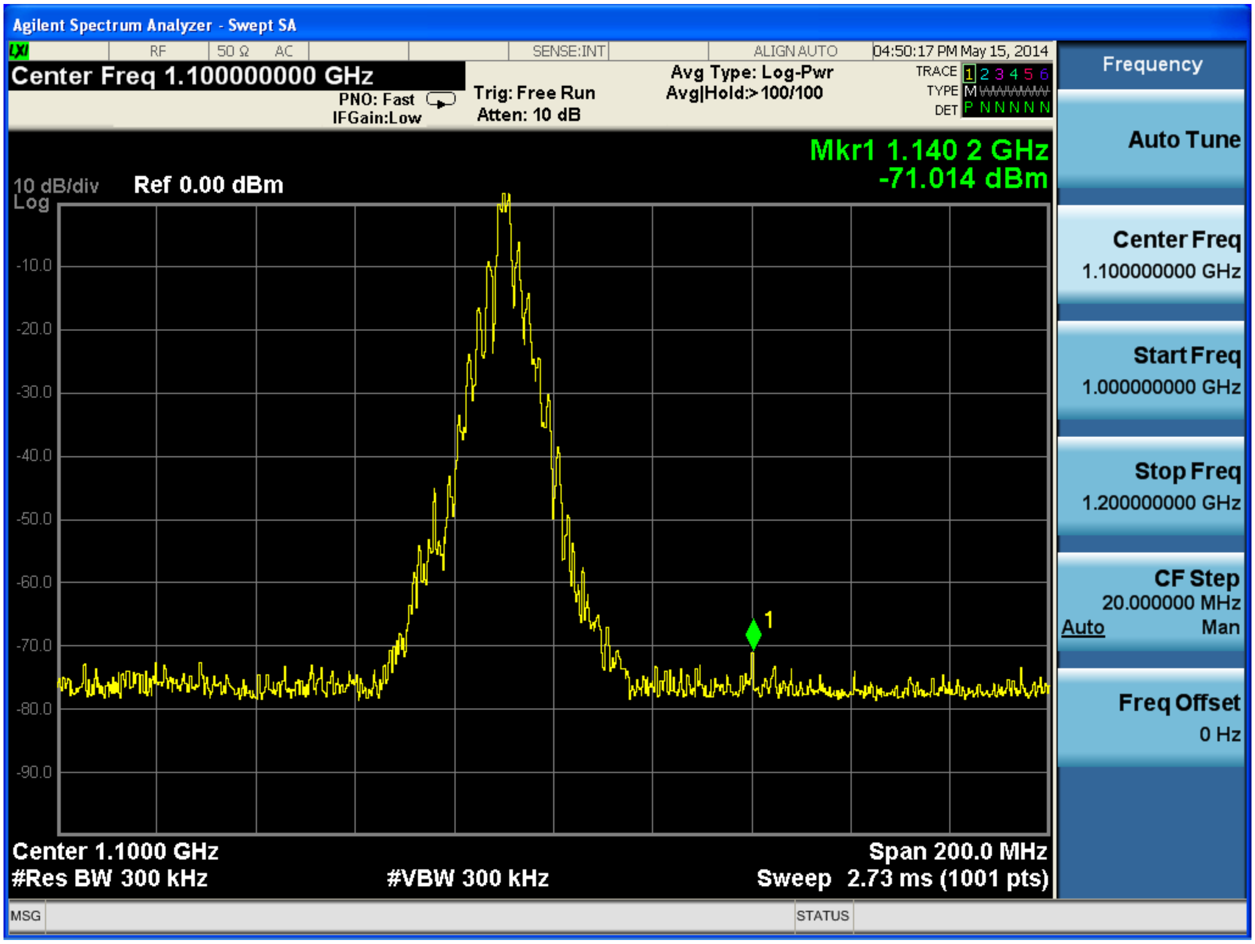


Figure 7-20: NXT-800 Spurious emissions, 1000 – 1200 MHz

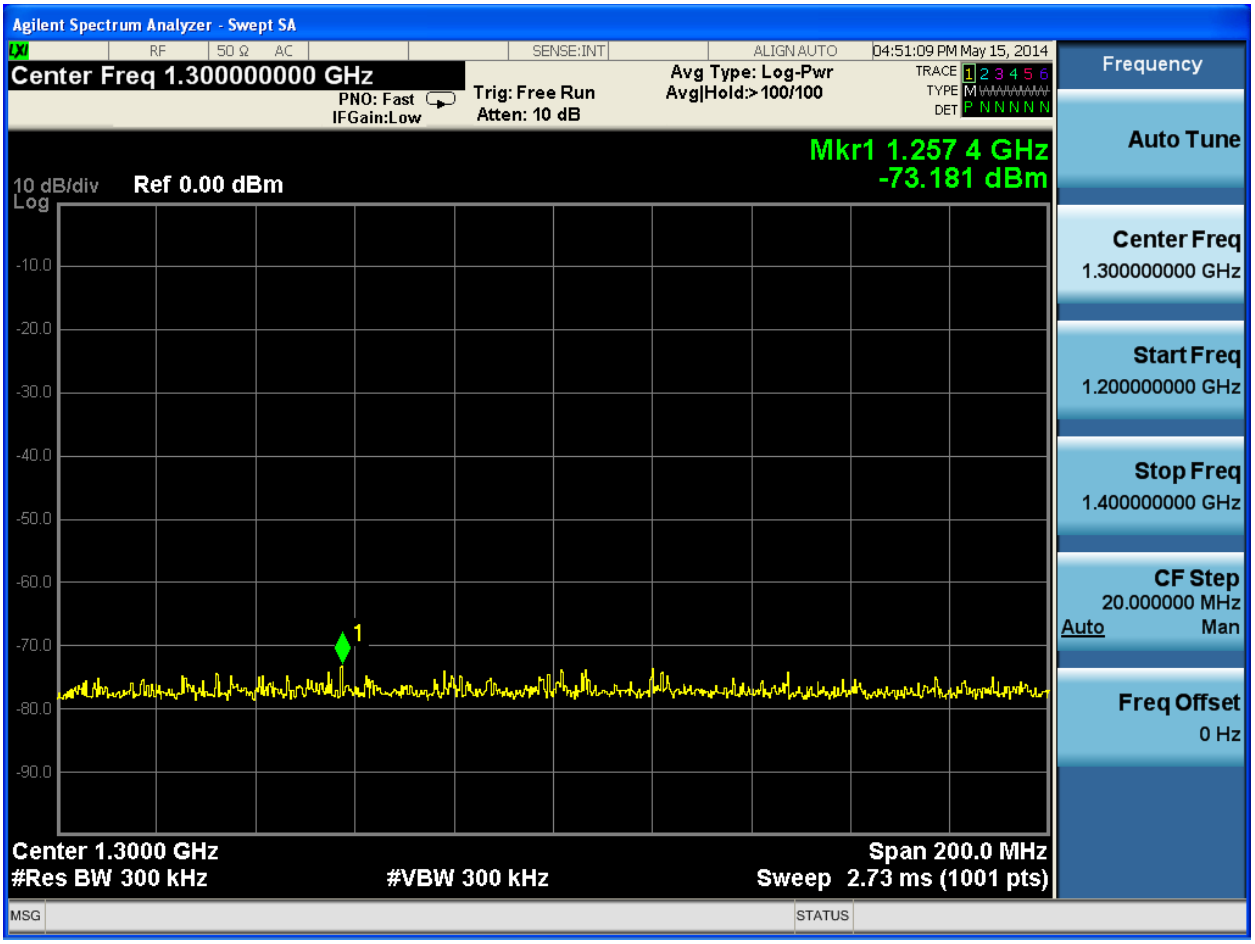


Figure 7-21: NXT-800 Spurious emissions, 1200 – 1400 MHz

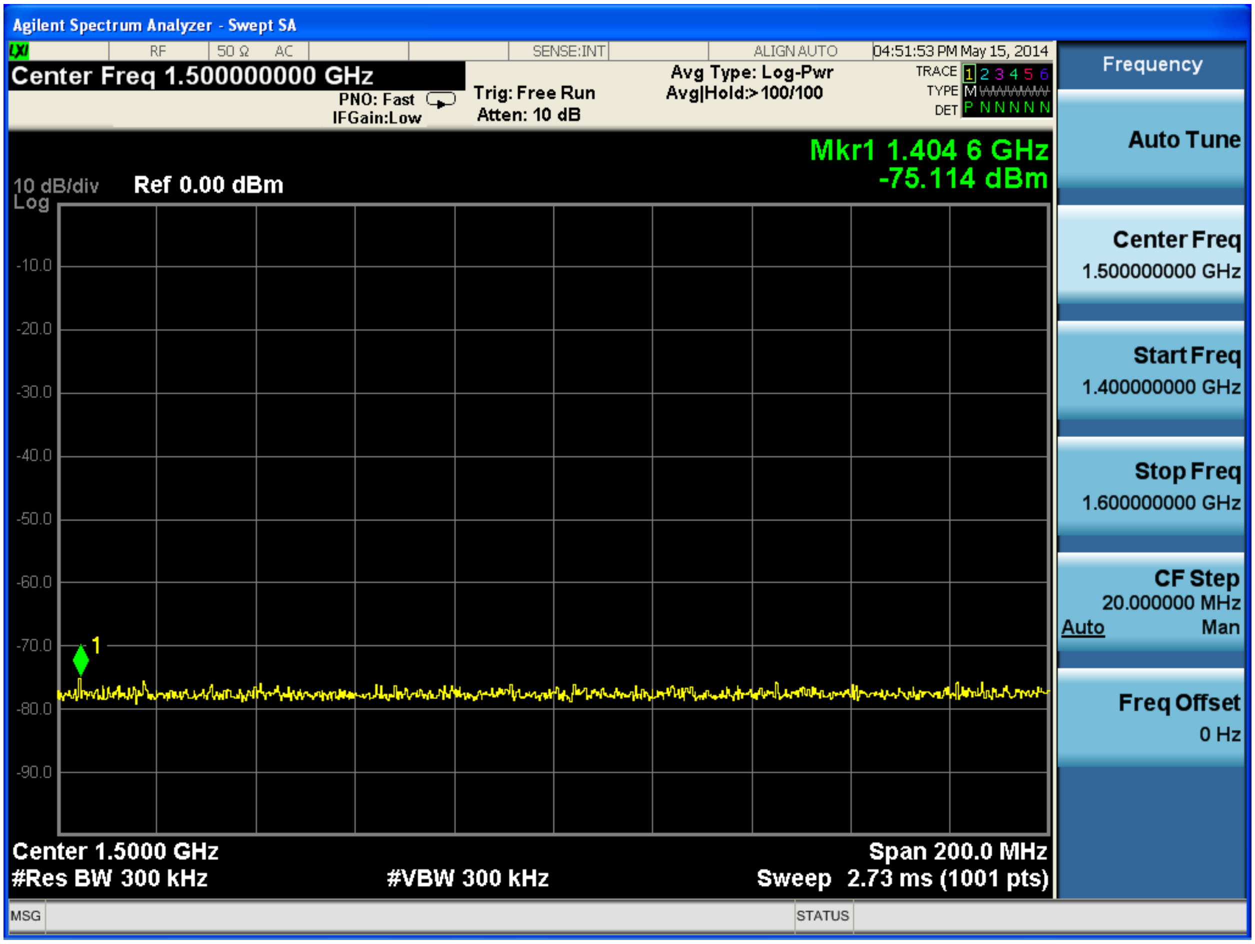


Figure 7-22: NXT-800 Spurious emissions, 1400 – 1600 MHz

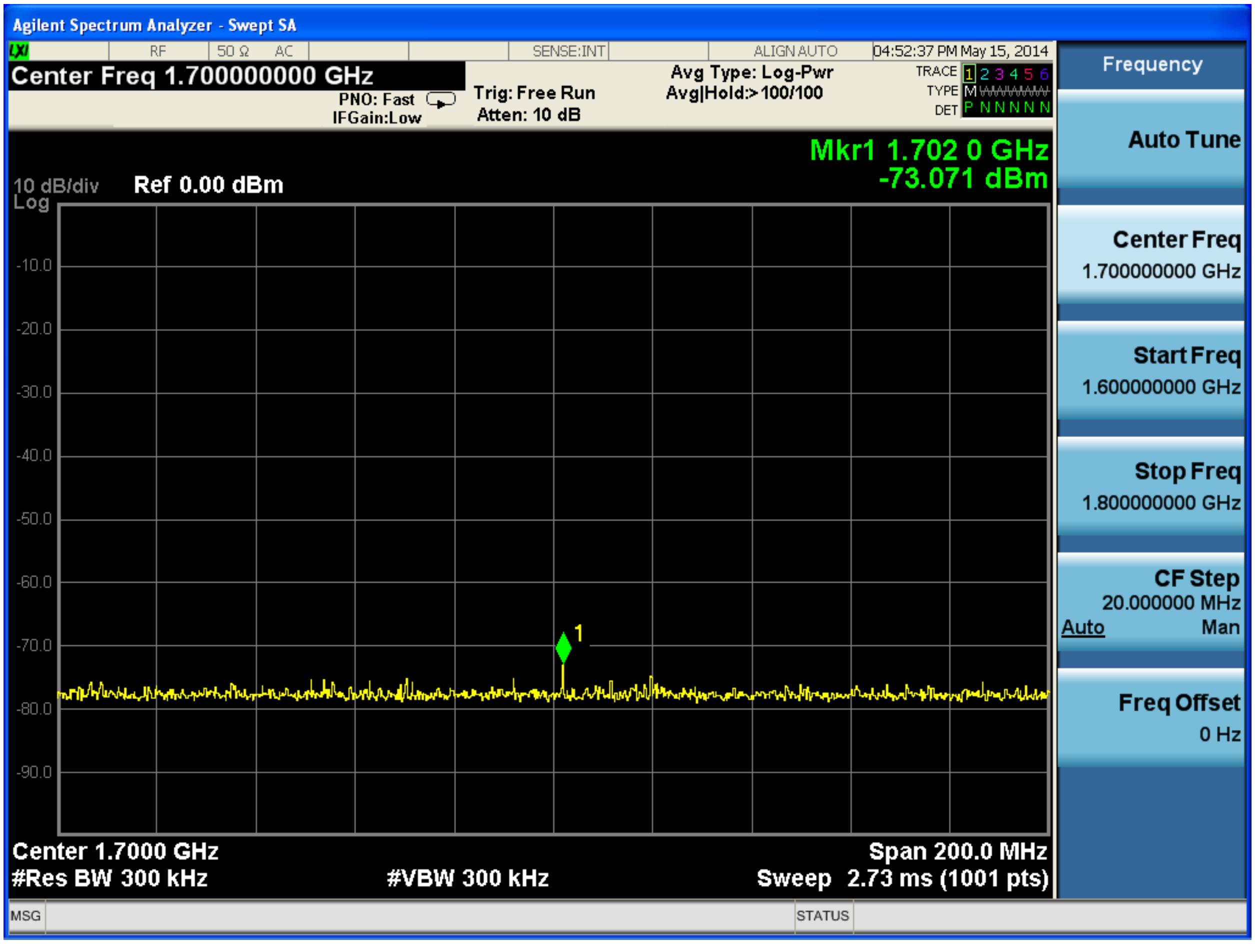


Figure 7-23: NXT-800 Spurious emissions, 1600 – 1800 MHz

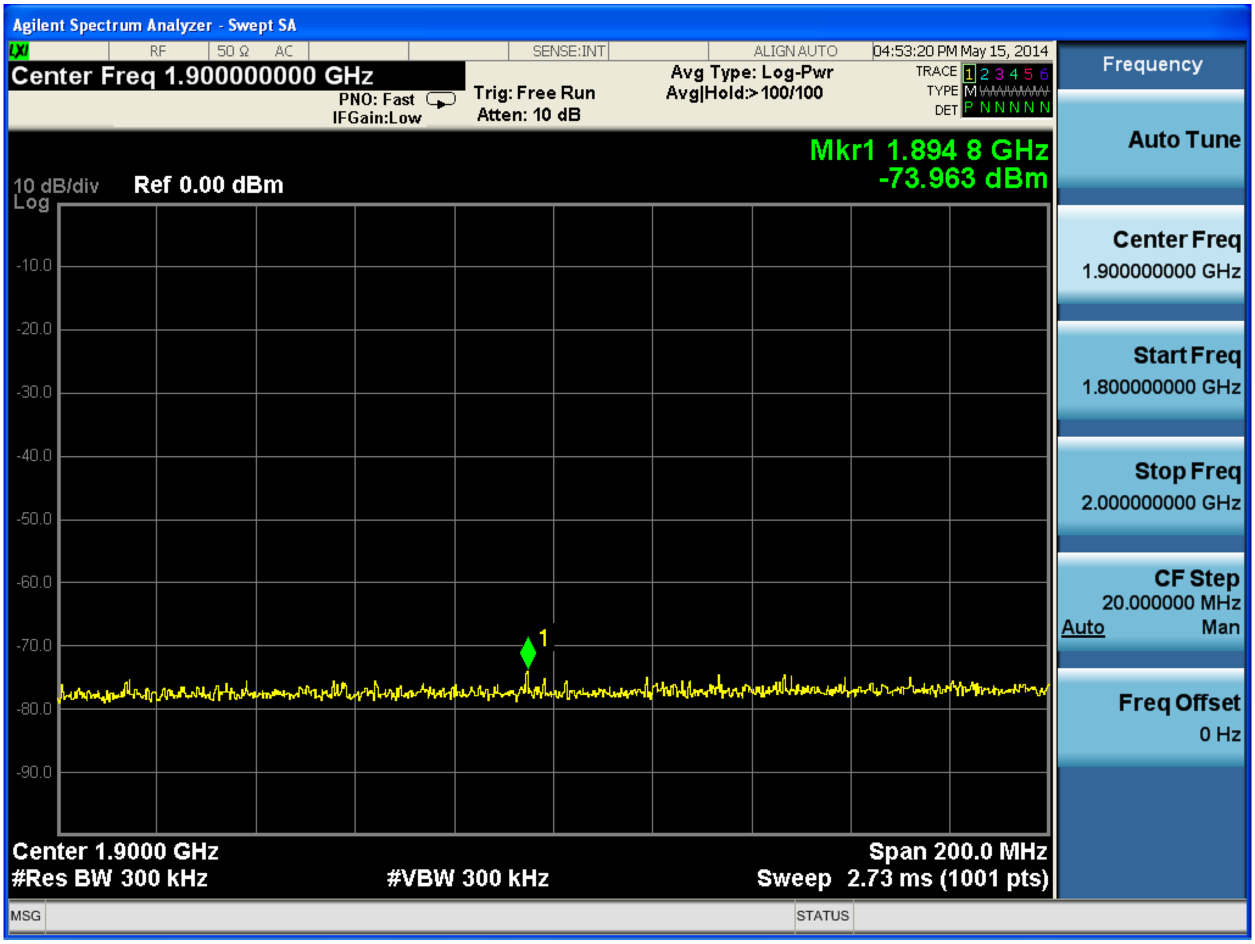


Figure 7-24: NXT-800 Spurious emissions, 1800 – 2000 MHz

7.6 Spurious Emissions at Antenna Terminals (2000 - 11330 MHz)

7.6.1 Spurious Emissions at Antenna Terminals (2000 - 11330 MHz) Test Equipment Required

Table 7-8: Spurious Emissions at Antenna Terminals (2000 – 11330 MHz) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
C	Attenuator (or Equivalent)	Narda	765-20
D	Attenuator (or Equivalent)	Narda	765-20
E	Spectrum Analyzer	Agilent	N9020A

Comment: Equivalent equipment may be used.

7.6.2 Spurious Emissions at Antenna Terminals (2000 - 8000 MHz) Test Setup

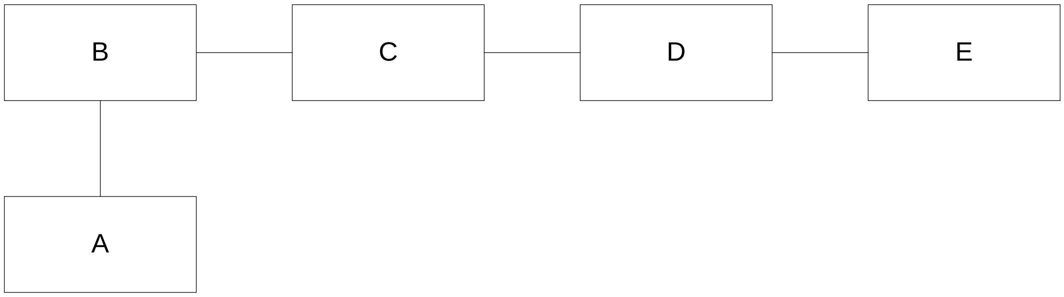


Figure 7-25: Spurious Emissions at Antenna Terminals (2000 - 8000 MHz) Test Setup

7.6.3 Spurious Emissions at Antenna Terminals (2000 - 8000 MHz) Test Procedure

1. Connect the equipment as shown in Figure 7-15 above.
2. Configure the VALFAC script tool to run DO181E_23221_modes_top.scp, DO181E_23221_modes_bot.scp (Mode S, Long DF-16 replies at 50 Hz on top/bottom antennas, respectively).
3. Adjust the Spectrum Analyzer so that no signal exceeds the dynamic range of the analyzer. Set the resolution bandwidth to 3 MHz.
4. Record the spurious emission levels of the harmonic frequencies up to the eighth harmonic of the EUT (2180 MHz, 3270 MHz, 4360 MHz, 5450 MHz, 6540 MHz, 7630 MHz, and 8720 MHz)
5. Measure and record Attenuator/filter/cable calibration factor for each harmonic.

7.6.4 Spurious Emissions at Antenna Terminals (2000 – 8000 MHz) Test Results

Refer to Appendix A for NXT-800 test results for Spurious Emissions at the Antenna Terminals (2000 – 8000 MHz).

Refer to Appendix B for NXT-600 test results for Spurious Emissions at the Antenna Terminals (2000 – 8000 MHz).

7.7 Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz)

7.7.1 Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz) Test Equipment Required

Table 7-9: Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
C	Spectrum Analyzer	Agilent	N9020A

Comment: Equivalent equipment may be used.

7.7.2 Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz) Test Setup

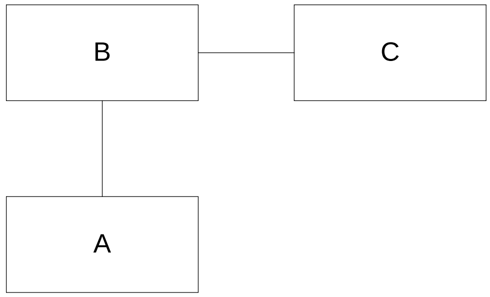


Figure 7-26: Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz) Test Setup

7.7.3 Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz) Test Procedure

1. Connect the equipment as shown in Figure 7-26 above.
2. Configure the spectrum analyzer for a center frequency of 1204 MHz, 300 kHz IF bandwidth, and a span of 200 MHz
3. Configure the NXT transponder in standby mode.
4. Prior to performing the measurement, verify that the NXT is not transmitting.
5. Using a spectrum analyzer, measure and record the L.O. leakage out of the top and bottom antenna ports in Figure 7-10.

7.7.4 Spurious Emissions at Antenna Terminals Local Oscillator Leakage (1204 MHz) Test Results

Signal power at 1204 MHz was measured.

Table 7-10: LO Signal Power at Antenna Terminals

Antenna LO Leakage		
Antenna	**NXT-600**	**NXT-800**
Top	-77.28	-74.748
Bottom	-76.997	-76.734

7.8 Field Strength of Spurious Radiation

47CFR References:
2.1053, Field Strength of Spurious Radiation
15.109, Radiated Emission Limits
15.31, Measurement Standards
15.33, Frequency Range of Radiated Measurements
87.139, Emission Limitations

Per 47CFR15.109, the following limits on radiated emissions apply to the NXT units because it contains digital devices:

Table 7-11: Allowable radiated emissions levels for units containing digital devices per 47CFR15.109

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

47CFR15.31 para (i) states that the emission tests shall be performed with the device and accessories configured in a manner that tends to produce maximized emissions within the range of variations that can be expected under normal operating conditions. In order to accomplish this, the NXT will be operated in a maximum duty cycle mode of operation by running the VALFAC script DO181E_23222.scp. This script interrogates the unit with 500 ATCRBS, 50 Mode S short and 50 Mode S long interrogations per second.

Per 47CFR15.33 para (a) (1), because the NXT operates below 10 Ghz, the 10th harmonic of the highest frequency or to 40 Ghz, whichever is lower, shall be used for the upper frequency of the measurement range.

47CFR15.33 para (b) (3) states that receivers employing super heterodyne techniques controlled by digital devices shall be investigated up to the higher of the 2nd harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range of the digital device. Thus, a check for emissions at the first two harmonics of the fundamental frequency (1204 Mhz) will be done.

7.8.1 Field Strength of Spurious Radiation Test Equipment Required

Table 7-12: Field Strength of Spurious Radiation Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
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

Comment: Equivalent equipment may be used.

7.8.2 Field Strength of Spurious Radiation Test Setup

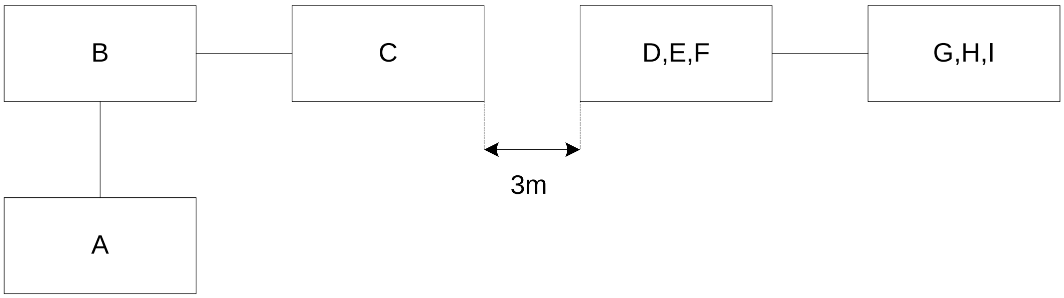


Figure 7-27: Field Strength of Spurious Radiation Test Setup

7.8.3 Field Strength of Spurious Radiation Test Procedure

1. Connect the equipment as shown in Figure 7-17 above.
2. Configure the VALFAC script tool to run DO181E_23222.scp (ATCRBS replies at 500 Hz and Mode S, replies at 100 Hz on top antenna).
3. Measure and record all spurious emissions using the appropriate antenna in the frequency ranges indicated in Table 7-11 at a distance of 3 meters.
4. Calculate the field strength at 3m using the recorded power measurement, antenna factor and cable loss for each frequency.

7.8.4 Field Strength of Spurious Radiation Test Results

Refer to Appendix A for NXT-800 test results for Spurious Emissions at the Antenna Terminals (2000 – 8000 MHz).

Refer to Appendix B for NXT-600 test results for Spurious Emissions at the Antenna Terminals (2000 – 8000 MHz).

7.9 Frequency Stability

7.9.1 Frequency Stability (Temperature Variation)

47CFR Reference:
2.1055, Frequency Stability
15.31, Measurement Standards
87.133, Frequency Stability

7.9.1.1 Frequency Stability (Temperature Variation) Test Equipment Required

Table 7-13: Frequency Stability (Temperature Variation) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT VALFAC	ACSS	9006052-001 and 9000717-002
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

Comment: Equivalent equipment may be used.

7.9.1.2 Frequency Stability (Temperature Variation) Test Setup

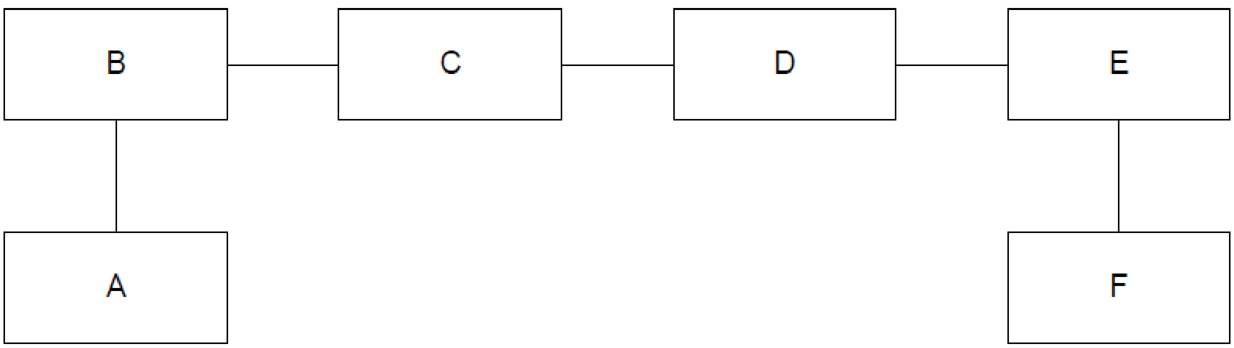


Figure 7-28: Frequency Stability (Temperature Variation) Test Setup

7.9.1.3 Frequency Stability (Temperature Variation) Test Procedure

1. Connect the equipment as shown in Figure 7-18 above.
2. Configure the VALFAC script tool to run DO181E_23221_modes_top.scp and DO181E_23221_modes_bot.scp (Mode S, Long DF-16 replies at 50 Hz on top/bottom antennas, respectively).
3. Set the temperature chamber to - 5 °C and allow the transmitter (non-operating) temperature to stabilize.
4. Apply power to the unit and record the transmission frequency for both the top and bottom antennas.
5. Repeat steps 3 and 4 at –40°C, -30°C, -20°C, -10°C, 0°C, +10°C, +20°C, +30°C, +40°C, +50°C, +60°C, and +70°C. Perform the test for both +28 VDC and +115 VAC power.
6. Record results in tables similar to Table 7-14 and Table 7-15 below.

7.9.1.4 Frequency Stability (Temperature Variation) Test Results

Over the operating temperature range for both the NXT-600 and NXT-800, the frequency varied by no more than 150 kHz and the output power varied by less than 2.7 dB. All measurements remained within the limits established by the MOPS.

Table 7-14: Frequency Stability (Temperature Variation, 115 VAC Power Supply) Test Results

NXT-800: 115VAC Supply				
	Top Antenna		Bottom Antenna	
Temp Deg C	Power Out	Frequency	Power Out	Frequency
-50	57.74	1089.9872	58.07	1089.9860
-40	57.72	1089.9866	58.02	1089.9871
-30	57.53	1089.9883	58.07	1089.9846
-20	57.45	1089.9856	58.07	1089.9864
-10	57.03	1089.9851	58.03	1089.9843
0	57.06	1089.9865	57.82	1089.9851
10	56.56	1089.9843	57.73	1089.9847
20	56.92	1089.9855	57.42	1089.9839
30	56.42	1089.9859	57.27	1089.9860
40	56.08	1089.9848	56.79	1089.8420
50	55.72	1089.9847	56.67	1089.9849
60	55.56	1089.9845	56.22	1089.9847
70	55.17	1089.9838	55.95	1089.9832

Table 7-15 Frequency Stability (Temperature Variation, 28VDC Power Supply) Test Results

NXT-600: 28VDC Supply				
	Top Antenna		Bottom Antenna	
Temp Deg C	Power Out	Frequency	Power Out	Frequency
-50	56.00	1089.9785	56.55	1089.9789
-40	56.74	1089.9770	56.38	1089.9753
-30	55.98	1089.9783	56.23	1089.9767
-20	55.85	1089.9761	55.3	1089.9776
-10	56.12	1089.9769	55.26	1089.9784
0	55.68	1089.9755	55.54	1089.9767
10	55.48	1089.9761	55.45	1089.9776
20	55.06	1089.9757	55.13	1089.9786
30	54.71	1089.9768	54.87	1089.9756
40	54.44	1089.9754	54.52	1089.9773
50	54.01	1089.9760	54.2	1089.9763
60	53.80	1089.9744	53.91	1089.9751
70	53.63	1089.9745	53.85	1089.9733

7.9.2 Frequency Stability (Primary Power Variation)

47CFR references:
2.1055, Frequency Stability
15.31, Measurement Standards
87.133, Frequency Stability

47CFR15.31 (e) states that measurements of the radiated signal level of the fundamental frequency component of the emission shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

For the 28 VDC power, 85%/115% = 23.8 VDC/32.2 VDC, and 23 VDC & 33 VDC will be used.
For the 115 VAC power, 85%/115% = 97.75 VAC/132.25 VAC and 97 VAC & 133 VAC will be used

7.9.2.1 Frequency Stability (Primary Power Variation) Test Equipment Required

Table 7-16: Frequency Stability (Primary Power Variation) Test Equipment Required

Block Diagram Reference	Type	Manufacturer	Model
A	NXT Test Unit	ACSS	9008000-11000 / 9005000-55000
B	NXT RF Module	ACSS	9006052-001
C	Attenuator	Narda	765-20
D	Attenuator	Narda	765-20
E	Spectrum Analyzer	Hewlett-Packard	HP8592L

Comment: Equivalent equipment may be used.

7.9.2.2 Frequency Stability (Primary Power Variation) Test Setup

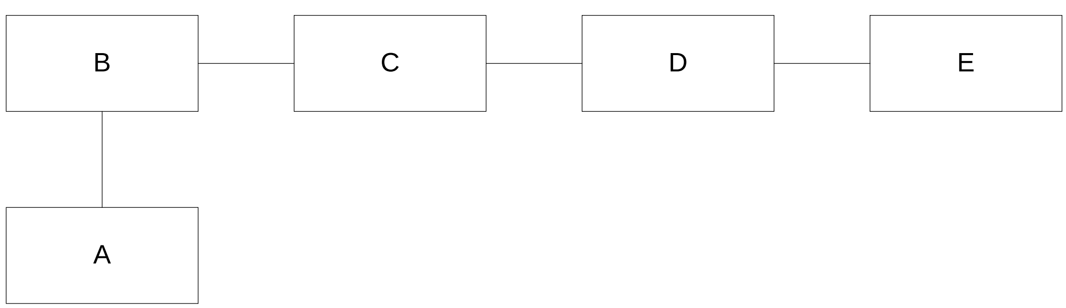


Figure 7-29: Frequency Stability (Primary Power Variation) Test Setup

7.9.2.3 Frequency Stability (Primary Power Variation) Test Procedure

1. Connect the equipment as shown in the block diagram above.
2. Configure the VALFAC script tool to run DO181E_23221_modes_top.scp and DO181E_23221_modes_bot.scp (Mode S, Long DF-16 replies at 50 Hz on top/bottom antennas, respectively).
3. Apply +28VDC power to the unit and vary the primary power by +/-15% to the values shown in Table 7-16. Record the transmission frequency and power out for both the top and bottom antennas in Table 7-16 and Table 7-17.

4 Repeat step 3 for +115VAC power.

7.9.2.4 Frequency Stability (Primary Power Variation) Test Results

Over the power input ranges, the frequency varied by less than 100 kHz and the output power varied by less than 0.1 dB in all instances. All measured results remained within the limits established by the MOPS.

Table 7-17: Frequency Stability (Primary Power Variation) Test Results Example Table (AC Power)

Frequency Stability (Primary Power Variation) 115 VAC					
Power Supply Voltage (VRMS)	Top Ant Port		Bot Ant Port		Limits
	Measured Frequency	Measured Power	Measured Frequency	Measured Power	Frequency
97	1089.9762	56.45	1089.9762	56.72	1090 +/- 1 MHZ
115	1089.9756	56.47	1089.9756	56.73	1090 +/- 1 MHZ
133	1089.9756	56.48	1089.9761	56.71	1090 +/- 1 MHZ

Table 7-18: Frequency Stability (Primary Power variation) Test Results Example Table (DC Power)

Frequency Stability (Primary Power Variation) +28 VDC					
Power Supply Voltage (VRMS)	Top Ant Port		Bot Ant Port		Limits
	Measured Frequency	Measured Power	Measured Frequency	Measured Power	Frequency
23	1089.976	56.751	1089.976	56.61	1090 +/- 1 MHz
28	1089.976	56.789	1089.976	56.625	1090 +/- 1 MHz
33	1089.976	56.81	1089.976	56.62	1090 +/- 1 MHz

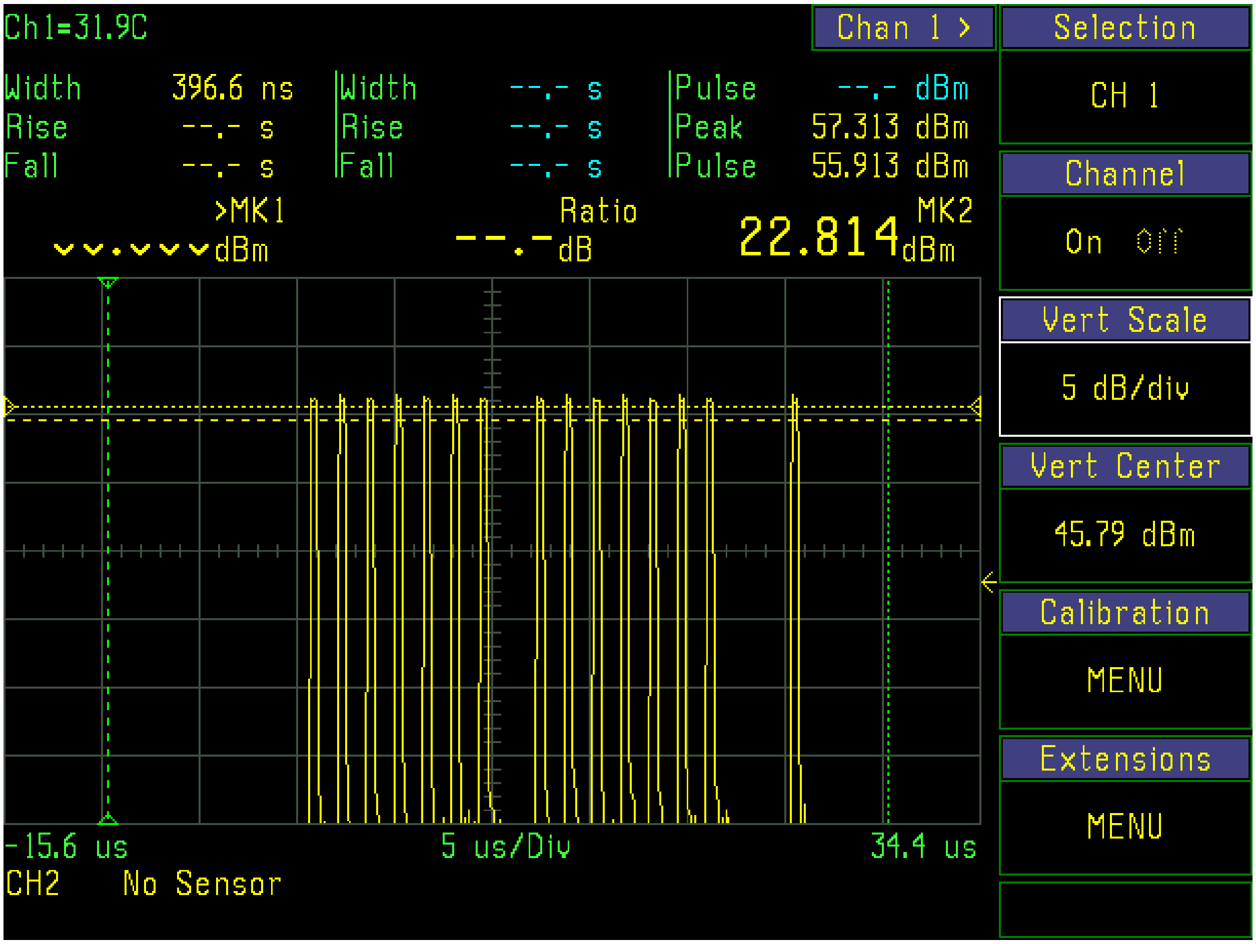


Figure 7-30: Typical Mode C Reply

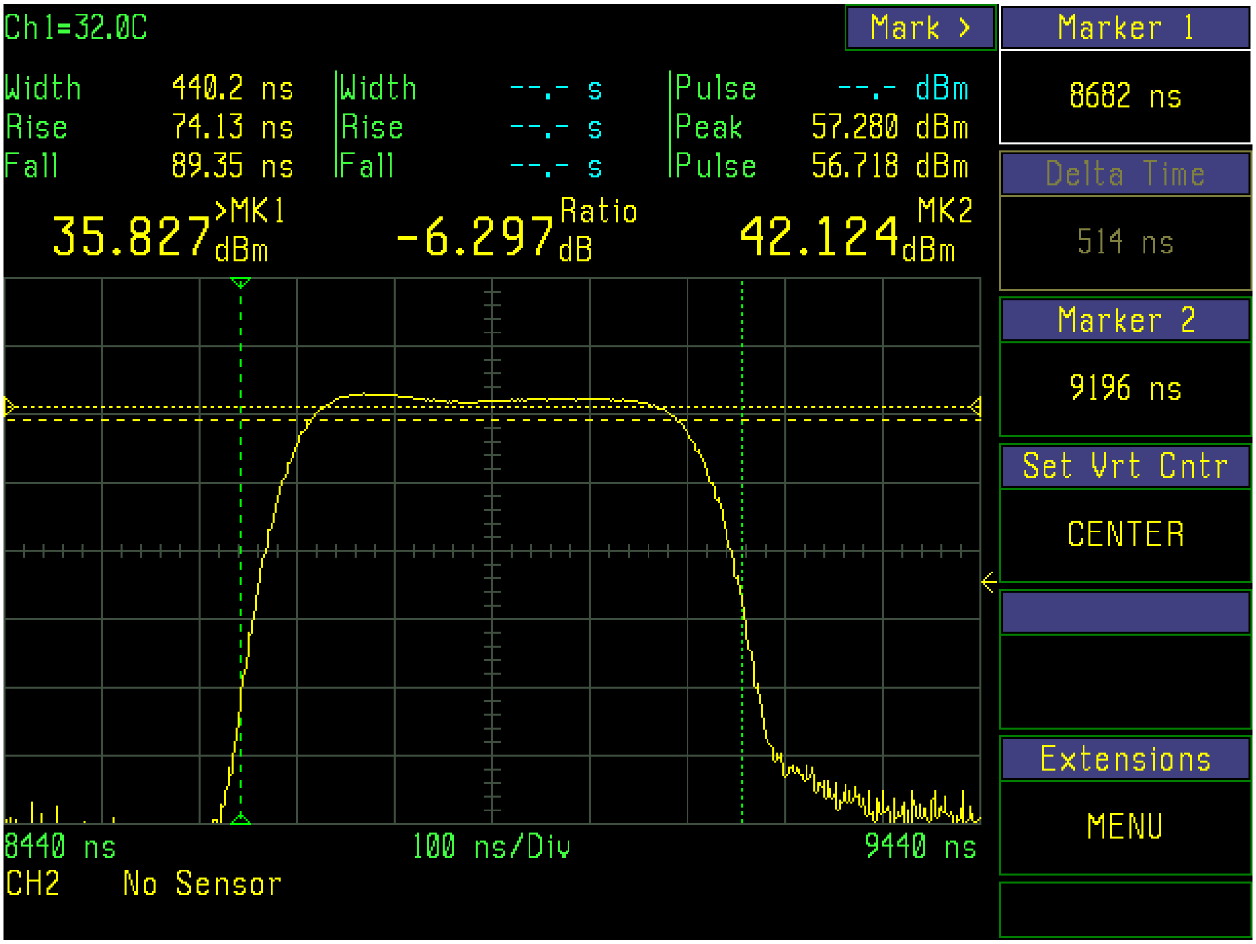


Figure 7-31: Typical Mode C Reply Pulse Widths, Rise Time, Fall Time, and Amplitude

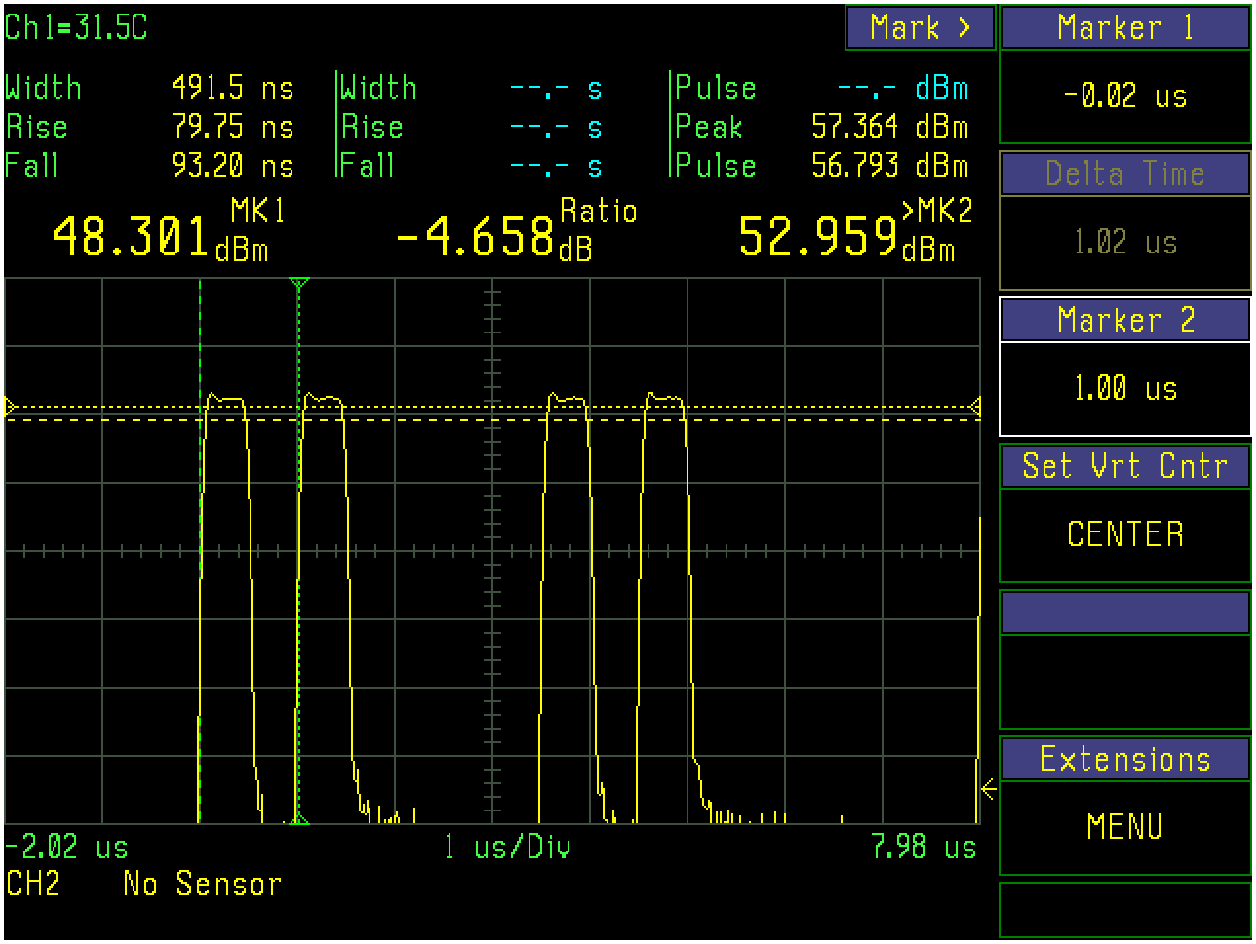


Figure 7-32: Typical Mode S Preamble, P1 to P2 spacing.

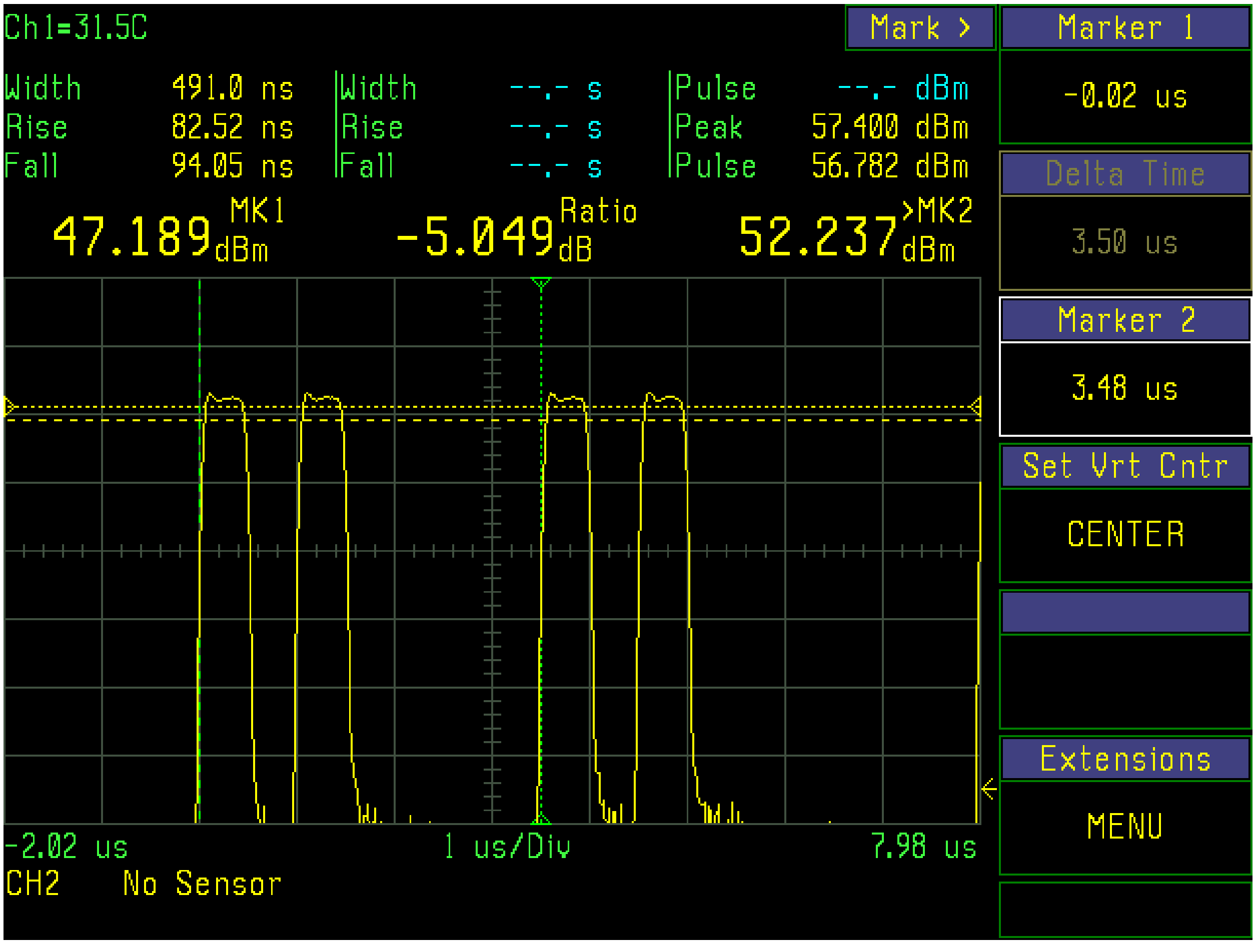


Figure 7-33: Typical Mode S Preamble, P1 to P3 spacing.

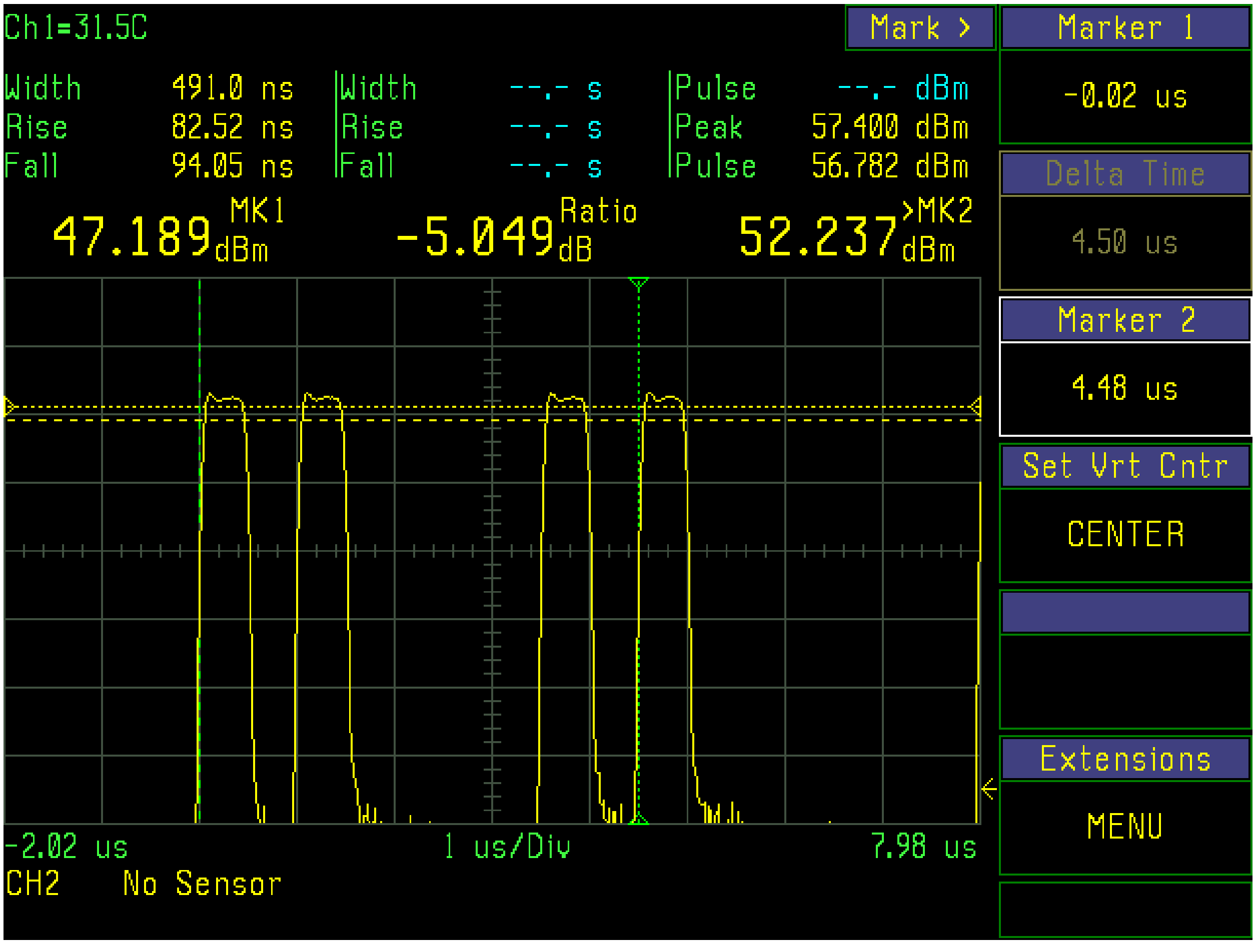


Figure 7-34: Typical Mode S Preamble, P1 to P4 spacing.

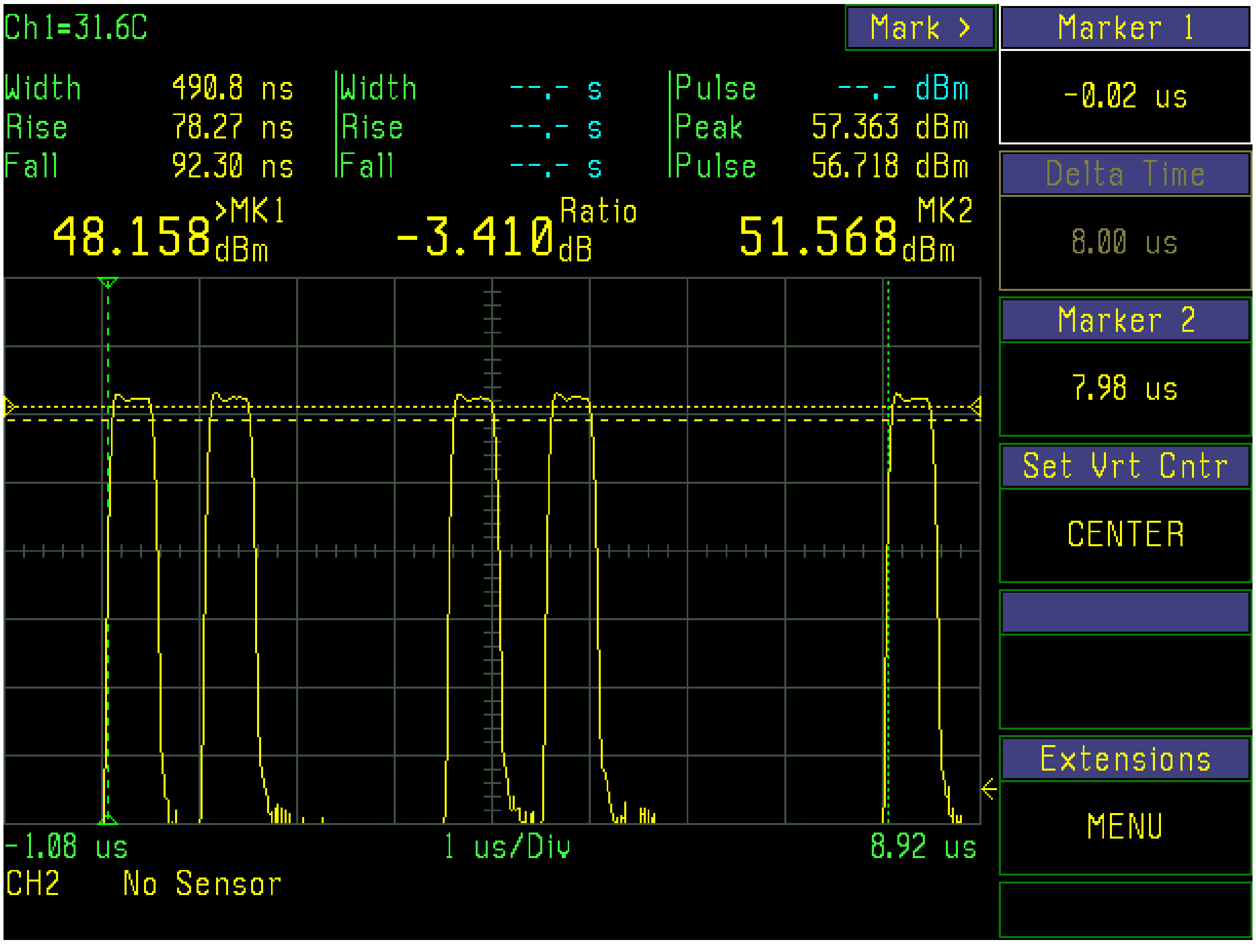


Figure 7-35: Typical Mode S Preamble, Preamble to Datablock spacing.

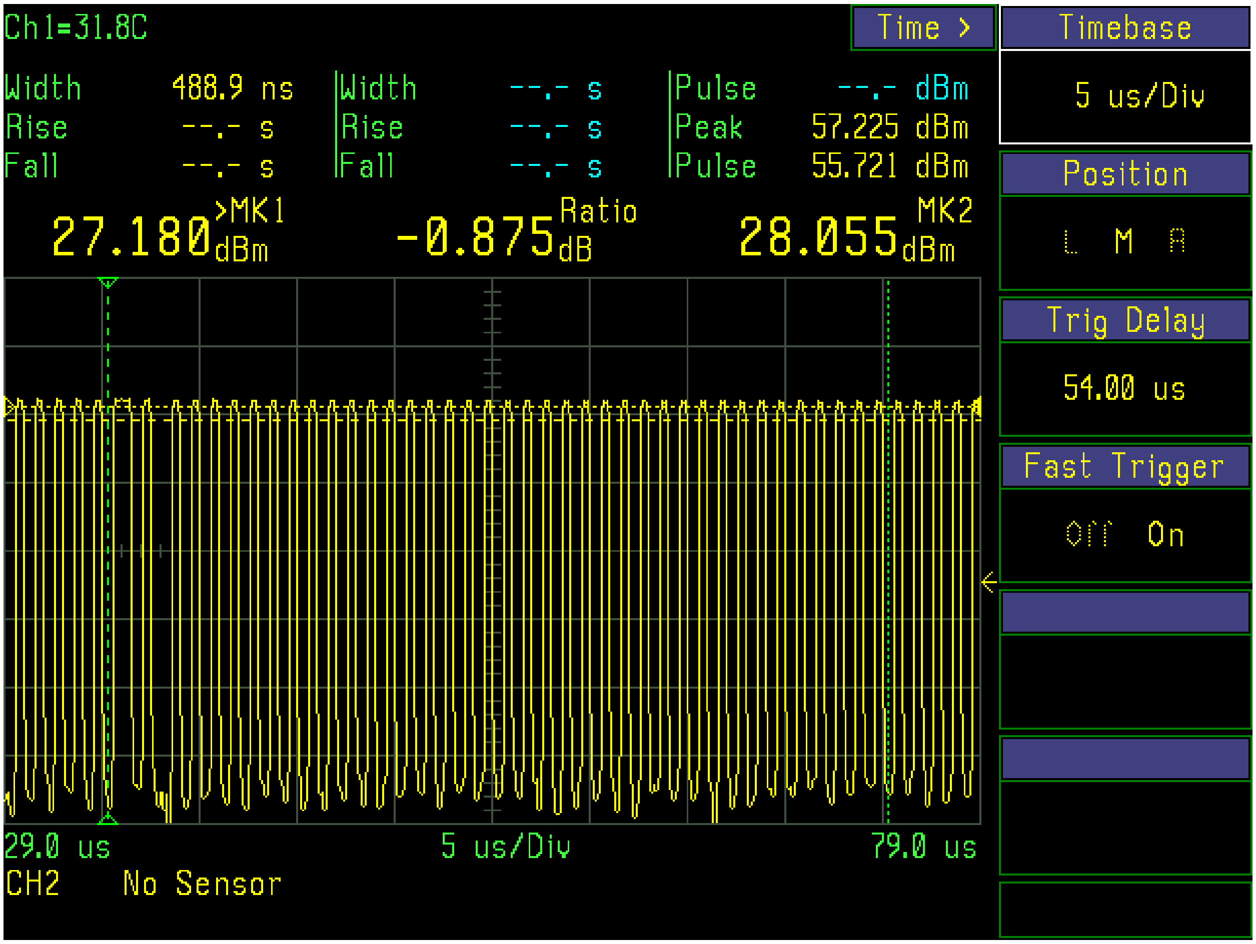


Figure 7-36: Typical Mode S Datablock.

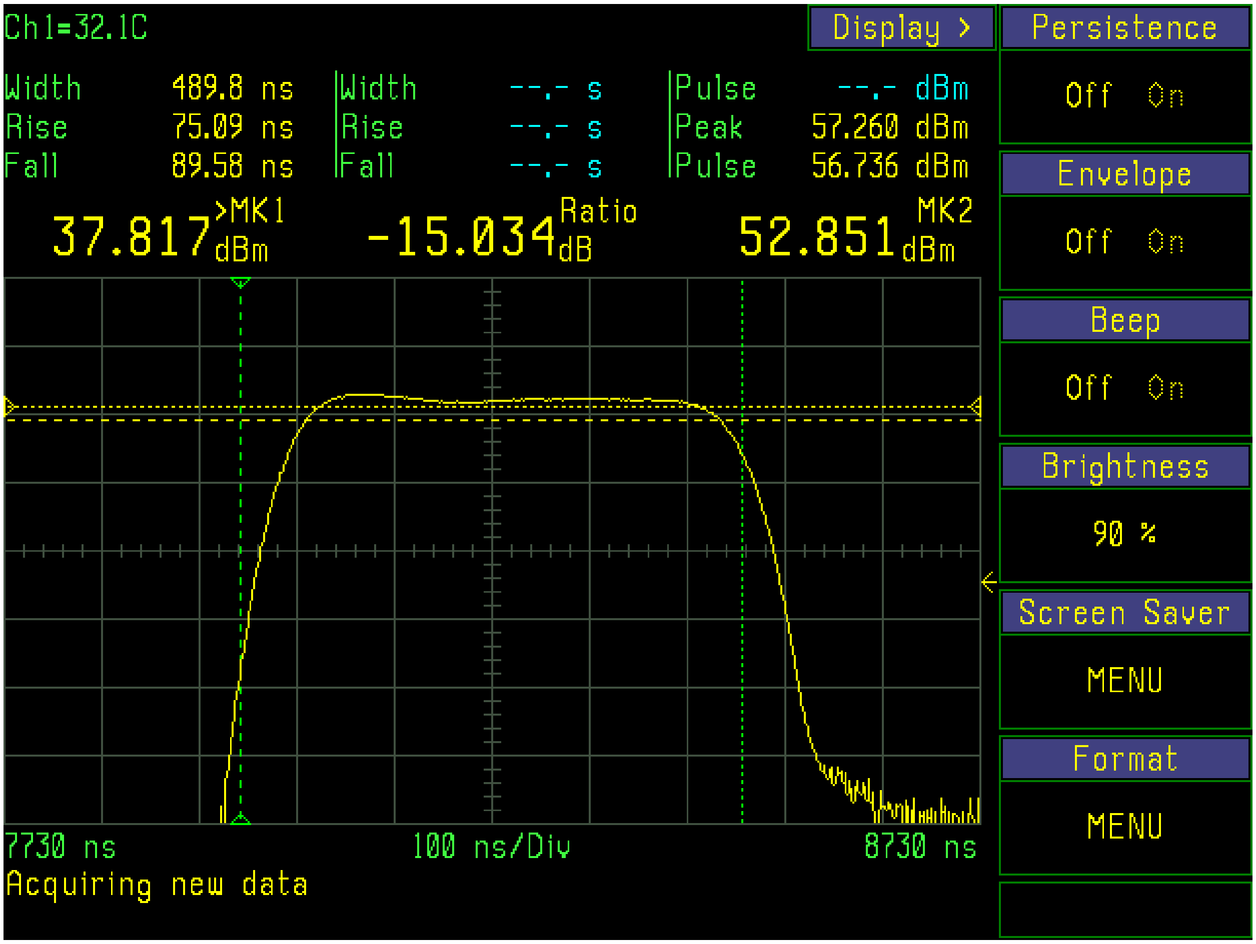


Figure 7-37: Typical Mode S Pulse Rise time, Fall time, Pulse width, and Amplitude

APPENDIX A DNB TEST DATA – RIVERSIDE, CALIFORNIA

Appendix A

DNB Test Results – Riverside, California

FCC Part 2, Part 15, Part 87
Model NXT- 800

FCC Part 2, Part 15, Part 87

Test Report
for the

Transponder

Model # NXT-800

Test Report Number RV48077A-001

Prepared For:
ACSS, an L-3 Communications & Thales Company
19810 N. 7th Avenue
Phoenix, AZ 85027

Prepared by:

DNB Engineering, Inc.
5969 Robinson Avenue
Riverside, CA 92503

Lab Code: 200851-0

NEMKO Authorized

TABLE OF CONTENTS

DOCUMENT HISTORY

Revision	Number of Pages	Revised Pages	Description	Date
-001	All	All	Report Release	20 May 2014

CERTIFICATION OF TEST DATA

This report, containing electromagnetic immunity and emissions test data and evaluations, has been prepared by an independent electromagnetic compatibility laboratory, DNB ENGINEERING, in accordance with the applicable specifications and instructions required per the Introduction. DNB Engineering has received accreditation to perform these tests by the following authorizations:

NEMKO EMC Laboratory Authorization No. ELA 115A
NIST / NVLAP: Lab Code No: 200851-0

FCC Registration No. 99985

The data evaluation and equipment configuration presented herein are a true and accurate representation of the measurements of the test sample's electromagnetic immunity and emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

This report shall not be reproduced, except in full, without the written approval of DNB ENGINEERING, INC. Results contained in this report relate only to the item tested.

Disclaimer: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Report Prepared By:	Maridee Winans *Maridee Winans* Administrative Assistant	20 May 2014 Date
Report Reviewed by:	Thomas Elders *Thomas Elders* Facility Manager	20 May 2014 Date

FCC Part 2, Part 15, Part 87 Test Completion Record for:

ACSS, an L-3 Communications & Thales Company: **Transponder**
Model # NXT-800

Test Start Date: 7 May 2014 Test Completion Date: 9 May 2014

The EUT was tested in accordance with the requirements of the specifications and standards listed below and found to be fully compliant:

FCC 47 CFR Reference:
2.1051, Spurious Emissions at Antenna Terminals
2.1053, Field Strength of Spurious Radiation
15.109, Radiated Emission Limits
87.139, Emission Limitations

Conducted Spurious Emissions:	**Pass** ☒	**Fail** ☐	**N/A** ☐
Radiated Emissions Digital Devices:	**Pass** ☒	**Fail** ☐	**N/A** ☐
Field Strength of Spurious Radiation:	**Pass** ☒	**Fail** ☐	**N/A** ☐

1.0 INTRODUCTION

Electromagnetic Compatibility (EMC) tests were performed on a representative sample(s) of ACSS, an L-3 Communications & Thales Company, Transponder, Model # NXT-800. The purpose of this test was to demonstrate compliance of the EUT with the applicable limits. The test results have been summarized herein, and all data sheets have been incorporated in Appendix C.

Where applicable, cables were routed consistent with the typical application by varying the configuration of the test sample. The effect of varying the position of cables was investigated to find the configuration that produced maximum emissions and susceptibility.

The EUT was evaluated to determine the "worst case" positioning of both cables and axis. Once the "worst case" configuration was determined care was used to maintain this configuration throughout the test.

2.0 DEVIATIONS

Deviations/Modifications to the EUT

NONE

Deviations/Modifications from the Test Standards

NONE

3.0 TEST SITE AND EQUIPMENT

The test equipment utilized in the performance of this test, along with current calibration information, is listed in the Test Equipment Log of Appendix A.

UNCERTAINTY TOLERANCE

DNB Engineering's Riverside Facility is within acceptable uncertainty tolerances per ANSI C63.4 (2009) sections 5.4.6.1 and 5.4.6.2 as well as CISPR 16-1(2002) Annex L, section L.2.

ANSI C63.4 (2009)

5.4.6.1 Site Attenuation. A measurement site shall be considered acceptable for radiated electromagnetic field measurements if the horizontal and vertical NSA derived from measurements, i.e., the "measured NSA," are within +/- 4 dB of the theoretical NSA (5.4.6.3) for an ideal site.

5.4.6.2 NSA Tolerance. The +/- 4 dB tolerance in 5.4.6.1 includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies. These errors are analyzed in ANSI C63.6- 1998 [3], wherein it is shown that the performance of a well-built site contributes only 1 db of the total allowable tolerance.

CISPR 16-1 (2002)

L.2 Error analysis

…The total estimated errors are the basis for the +/- 4 dB site acceptability criterions consisting of approximately 3 dB measurement uncertainty and an additional allowable 1 dB for site imperfections.

This uncertainty represents an expanded uncertainty
expressed at approximately the 95% confidence level using a coverage factor of k=2.

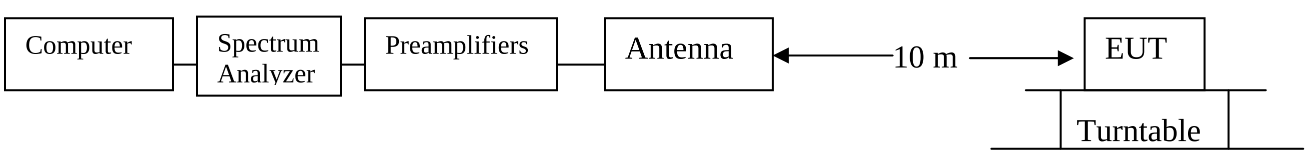
4.0 TEST DESCRIPTION

4.2 **Radiated RF Emissions** (ANSI C63.4 2009)

To measure radiated emissions, the EUT was set up on the 3 or 10-meter open air test site. The EUT is placed on a wooden table, which rests on a wooden turntable. The top of the table is one meter above the ground, and the turntable can be rotated 360 degrees. For each frequency measured, the antenna is raised and lowered for both horizontal and vertical polarities to obtain the maximum reading on the analyzer. The turntable is also rotated throughout the 360 degrees in azimuth to determine the position of the maximum emissions. The applicable frequency range is searched using the antennas listed below. The respective antenna and preamplifier were connected to an HP 8568B Spectrum Analyzer. Preamplifiers were used for all ranges to achieve the needed dynamic range. A list of the equipment used in this test is included in Appendix A. Photographs of this test set up are included in Appendix B.

Antenna(s):

Electro-Metrics 6505-A (.009 - 30 MHz) [ ]
SAS 200/540 BICONICAL (30 - 200 MHz) [X]
EMCO 3146 LOG PERIODIC (200 - 1000 MHz) [X]
EMCO 3115 DRG (1GHz – 18GHz) [X]
OTHER (See Equipment Log in Appendix B) [X]



5.0 CONCLUSIONS

The ACSS, an L-3 Communications & Thales Company, Transponder, Model #NXT-800, was tested in accordance with the requirements listed herein. Pass/Fail status for each test is listed in Section 5.0. At the completion of testing the EUT and support equipment were returned to representatives of ACSS, an L-3 Communications & Thales Company.

APPENDIX A

Test Equipment Log

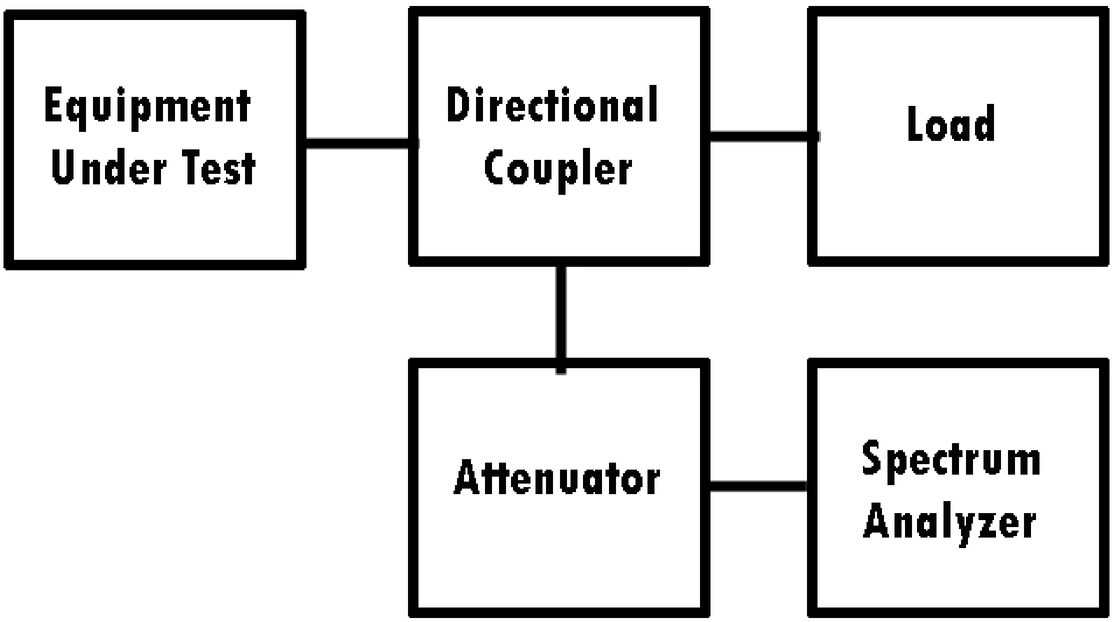
Asset No	Item	Manufacturer	Model No	Serial No	Calibration Date	Calibration Interval	Calibration Due
11	Antenna (Small DRG)	Emco	3115	2281	09-Jan-13	730	09-Jan-15
31	Antenna (Log Periodic)	Emco	3146	1284	29-Jul-13	730	29-Jul-15
364	Pre-Amp	Miteq	afd304008040	121391	17-Oct-13	365	17-Oct-14
387	Pre-Amp	H/P	10855A	1250-0212	05-Jul-13	365	05-Jul-14
844	QP Adapter	H/P	85650A	2811A01240	20-Aug-13	365	20-Aug-14
1063	Antenna Collapsable	Antenna Research	CB1071	1063	10-Aug-13	730	10-Aug-15
1233	Spectrum Analyzer	H/P	8568B	2732A03600	23-Oct-13	365	23-Oct-14
1234	Spec Analyzer Display	H/P	85662A	2648A15552	23-Oct-13	365	23-Oct-14
1242	Spectrum Analyzer	H/P	8568B	2503A01257	20-Aug-13	365	20-Aug-14
1430	RF Pre-Selector	HP	85685A	2724A00659	23-Oct-13	365	23-Oct-14
1698	Pre-Amp	Miteq	AFS4-08001800-35-LN	378064	17-Oct-13	365	17-Oct-14
1758	Antenna (Bicon)	AH Systems	SAS-200/540	524	10-Aug-13	730	10-Aug-15
1760	Pre-Amp (called ZFL)	Mini-Circuits	ZFL-2000	8350	22-Jan-14	365	22-Jan-15
1771	Attenuator	Alan	Attenuator Kit	117018	20-Aug-13	365	20-Aug-14
1874	Cable	DNB	NMN	11874	20-Aug-13	365	20-Aug-14
1875	Cable	DNB	RG214	11875	20-Aug-13	365	20-Aug-14
1880	Cable	DNB	NMN	11880	20-Aug-13	365	20-Aug-14
1896	OATS	DNB	OATS	11896	02-Dec-13	365	02-Dec-14
1965	Quasi-Peak Adapter	HP	85650A	2043A00277	223 Oct 13	365	23-Oct-14
2079	Cable	Addams Russell Co	1998-120	2079	16-Aug-13	365	16-Aug-14
2180	LISN	Fischer	FCC-LISN-50-50-4-02	04077	07-Oct-13	365	07-Oct-14
2264	Spectrum Analyzer	Agilent	E4407B	MY45103462	20-Aug-13	365	20-Aug-14
3066	Directional Coupler	HP	11691D	1212A01914	31 May 13	425	31 Jul 2014
3131	Attenuator	Inmet	18N50W-20dB	13131	31 May 13	425	31 Jul 14

APPENDIX B

Photographs

Block diagram **Conducted Spurious**

Notes: 1GHz – 11GHz

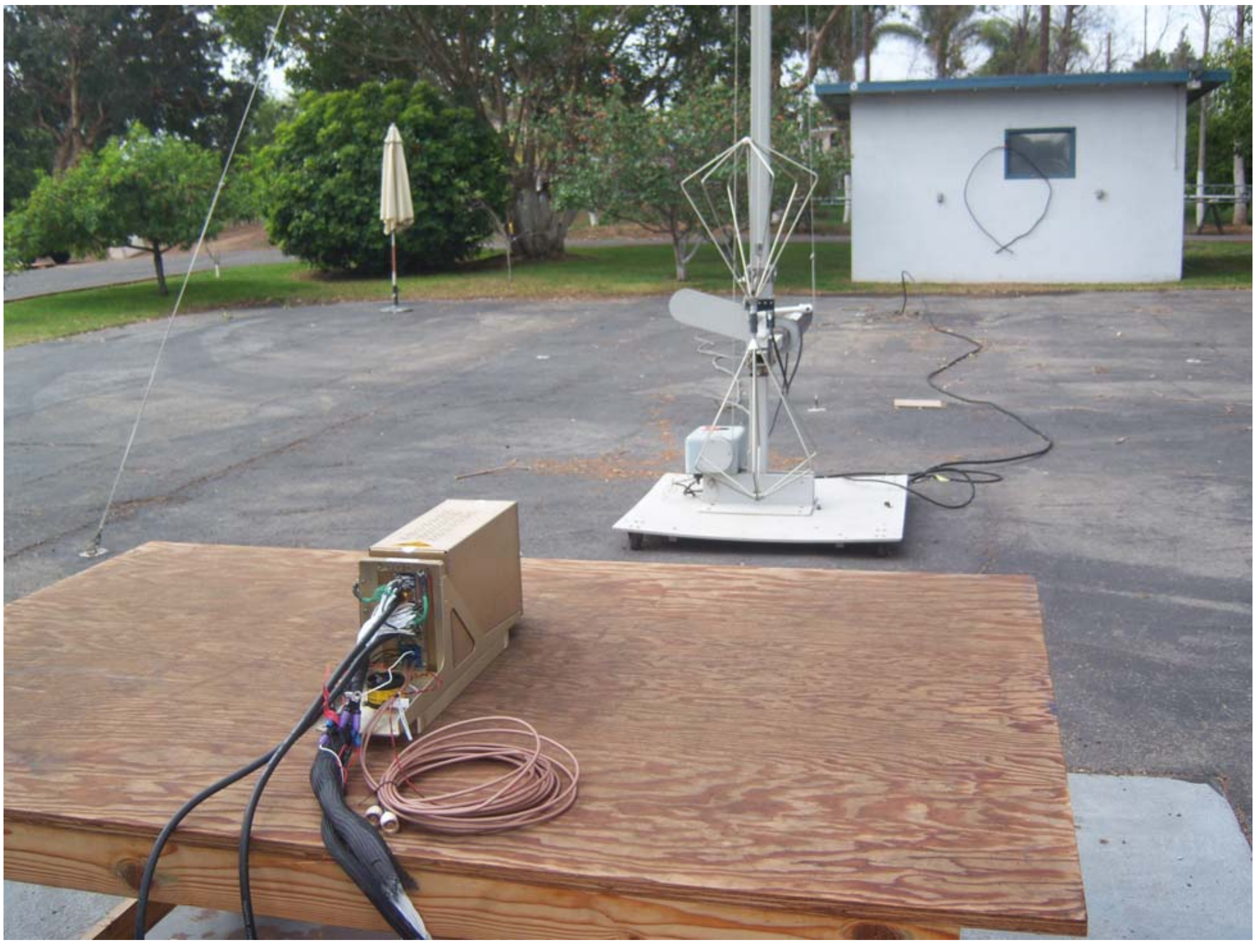


Photos **Radiated Emissions-Bicon**

Notes: 30MHz – 200 MHz

Photos **Radiated Emissions-Bicon**

Notes: 30MHz – 200 MHz



Photos Radiated Emissions – Log Periodic

Notes: 200MHz – 1000MHz

Photos — Radiated Emissions – Log Periodic

Notes: 200MHz – 1000MHz

Photos Radiated Emissions - DRG

Notes: - 1GHz - 18GHz

APPENDIX C

Test Data

Conducted Spurious Emissions

DNB Job Number:	RV48077A-001	Date:		**Specification** FCC 47 CFR 2.1051 87.139
Customer:	ACSS, an L-3 Communications & Thales Company			
Model Number:	NXT-800			
Description:	Transponder	S/N: N/A		
Test Equipment: (See pg. 23)	Asset #'s: 3066, 3131, 2264			
EUT performed within the requirements of the applicable Standard(s) YES ☒ NO ☐ SIGNED Thomas Elders				

Top Port

Frequency (MHz)	Measured (dBm)	Directional coupler (dB)	Attenuator (dB)	Corrected (dBm)	Corrected Fundamental (dBm)	dBc (dBm)
2180	-35.4	21.4	20.4	6.4	52.4	-46
3270	-65.7	20.8	20.5	-24.4	52.4	-76.8
4360	-51.3	20.5	20.5	-10.3	52.4	-62.7
5450	-72.9	20.3	20.4	-32.2	52.4	-84.6
6540	-73.7	20.3	20.3	-33.1	52.4	-85.5
7650	-68.7	20.4	20.3	-28	52.4	-80.4
8760	-70.3	20.7	20.2	-29.4	52.4	-81.8
9810	-70.3	20.5	20.1	-29.7	52.4	-82.1
10900	-69.9	20.5	20.1	-29.3	52.4	-81.7

Bottom Port

Frequency (MHz)	Measured (dBm)	Directional coupler (dB)	Attenuator (dB)	Corrected (dBm)	Corrected Fundamental (dBm)	dBc (dBm)
2180	-35.3	21.4	20.4	6.5	52.4	-45.9
3270	-63.6	20.8	20.5	-22.3	52.4	-74.7
4360	-54.5	20.5	20.5	-13.5	52.4	-65.9
5450	-67.5	20.3	20.4	-26.8	52.4	-79.2
6540	-74.3	20.3	20.3	-33.7	52.4	-86.1
7650	-70.5	20.4	20.3	-29.8	52.4	-82.2
8760	-70.2	20.7	20.2	-29.3	52.4	-81.7
9810	-68.8	20.5	20.1	-28.2	52.4	-80.6
10900	-70.6	20.5	20.1	-30	52.4	-82.4

DNB	5969 Robinson Ave Riverside, CA 92503 (951) 637-2630 FAX (951) 637-2704 www.dnbenginc.com	20 May 2014 RV48077A-001

Radiated Emissions Datasheet

DNB Job Number:	RV48077A-001	Date: 8 May 2014	**Specification** FCC 47 CFR 15.109 87.139
Customer:	ACSS, an L-3 Communications & Thales Company		
Model Number:	NXT-800	Serial Number: N/A	
Description:	Transponder		
Test Equipment: (See pg. 23)	Asset #'s: 11, 31, 1758, 1874, 1875, 1880, 1760, 364, 1698, 1234, 1430, , 1965		

EUT performed within the requirements of the applicable Standard(s) YES ☒ NO ☐ SIGNED Thomas Elders

Freq (MHz)	Meter (dBµV)	Ant (dB)	Cbl (dB)	Dis (dB)	Amp (dB)	Corr (dBµV/m)	Spec (dBµ/m)	Delta (dB)	Type	Tbl	Pol
30.707	44.6	13.1	1.2	0	-21.9	37	40	-3	PK	92	V
35.248	48.7	12.8	1.3	0	-21.9	40.9	40	0.9	PK	10	V
34.917	47.4	12.9	1.3	0	-21.9	39.7	40	-0.3	QP	10	V
40.883	47	11.6	1.4	0	-21.9	38.1	40	-1.9	QP	99	V
59.474	44.2	9.5	1.6	0	-21.8	33.5	40	-6.5	PK	66	V
71.436	45.3	9.4	1.7	0	-21.8	34.6	40	-5.4	PK	66	V
81.232	49.6	9.1	1.8	0	-21.9	38.6	40	-1.4	QP	177	V
84.749	48	9.2	1.8	0	-21.9	37.1	40	-2.9	QP	177	V
110.006	45.4	10.2	2.1	0	-21.9	35.8	43.5	-7.7	PK	177	V
114.535	47	10.6	2.1	0	-21.9	37.8	43.5	-5.7	PK	177	V
122.824	42.7	11.1	2.2	0	-21.9	34.1	43.5	-9.4	PK	177	V
133.259	50.6	11.6	2.3	0	-21.9	42.6	43.5	-0.9	QP	66	V
147.457	49.4	12.2	2.5	0	-21.9	42.2	43.5	-1.3	QP	74	V
160	46.8	12.8	2.6	0	-21.8	40.4	43.5	-3.1	PK	94	V
170.03	38.2	13.2	2.7	0	-21.8	32.3	43.5	-11.2	PK	86	V
31.251	35.4	13	1.3	0	-21.9	27.8	40	-12.2	PK	98	H
34.58	42.7	12.9	1.3	0	-21.9	35	40	-5	PK	64	H
44.465	38.7	11	1.4	0	-21.8	29.3	40	-10.7	PK	64	H
53.987	36.7	9.9	1.5	0	-21.8	26.3	40	-13.7	PK	64	H
65.039	41.8	9.4	1.7	0	-21.8	31.1	40	-8.9	PK	101	H
71.326	49.3	9.4	1.7	0	-21.8	38.6	40	-1.4	PK	101	H
71.304	47.2	9.4	1.7	0	-21.8	36.5	40	-3.5	QP	101	H
74.034	47.2	9.3	1.7	0	-21.8	36.4	40	-3.6	PK	101	H
86.474	42.9	9.2	1.9	0	-21.9	32.1	40	-7.9	QP	101	H

Freq (MHz)	Meter (dBµV)	Ant (dB)	Cbl (dB)	Dis (dB)	Amp (dB)	Corr (dBµV/m)	Spec (dBµ/m)	Delta (dB)	Type	Tbl	Pol
109.991	44.8	10.2	2.1	0	-21.9	35.2	43.5	-8.3	PK	101	H
119.133	44.8	10.8	2.2	0	-21.9	35.9	43.5	-7.6	PK	101	H
133.253	52.1	11.6	2.3	0	-21.9	44.1	43.5	0.6	PK	82	H
133.256	51.2	11.6	2.3	0	-21.9	43.2	43.5	-0.3	QP	82	H
147.458	42.4	12.2	2.5	0	-21.9	35.2	43.5	-8.3	PK	82	H
154.788	40.4	12.6	2.5	0	-21.8	33.7	43.5	-9.8	PK	82	H
228.021	36	10.6	3.2	0	-21.7	28.1	46	-17.9	PK	176	H
234.9	38.8	10.8	3.3	0	-21.7	31.2	46	-14.8	PK	120	H
250.015	36.5	11.7	3.4	0	-21.7	29.9	46	-16.1	PK	120	H
266.653	48.5	12.3	3.5	0	-21.7	42.6	46	-3.4	PK	56	H
282.6	37.4	13.2	3.6	0	-21.6	32.6	46	-13.4	PK	56	H
298.785	50.9	13.7	3.7	0	-21.6	46.7	46	0.7	PK	88	H
298.839	49.2	13.7	3.7	0	-21.6	45	46	-1	QP	88	H
319.983	47.2	14.4	3.9	0	-21.6	43.9	46	-2.1	PK	145	H
331.979	43.2	13.9	4	0	-21.5	39.6	46	-6.4	PK	184	H
399.36	35.7	15	4.5	0	-21.4	33.8	46	-12.2	PK	184	H
466.476	36.4	16.7	5	0	-21.3	36.8	46	-9.2	PK	122	H
229.935	33.2	10.6	3.2	0	-21.7	25.3	46	-20.7	PK	122	V
232.4	50.3	10.7	3.2	0	-21.7	42.5	46	-3.5	PK	0	V
266.645	42.5	12.3	3.5	0	-21.7	36.6	46	-9.4	PK	104	V
299.955	43.8	13.7	3.7	0	-21.6	39.6	46	-6.4	PK	11	V
333.19	42.8	13.9	4	0	-21.5	39.2	46	-6.8	PK	11	V
365.19	32.6	14.7	4.2	0	-21.5	30	46	-16	PK	11	V
433.15	32.2	16.2	4.7	0	-21.3	31.8	46	-14.2	PK	11	V
466.63	36	16.7	5	0	-21.3	36.4	46	-9.6	PK	11	V
630.66	37.9	19.3	5.7	0	-21.2	41.7	46	-4.3	PK	11	V

Field Strength of Radiated Spurious

DNB Job Number:	RV48077A-001	Date: 8 May 2014	**Specification** FCC 47 CFR 2.1053 15.109 87.139
Customer:	ACSS, an L-3 Communications & Thales Company		
Model Number:	NXT-800	Serial Number: N/A	
Description:	Transponder		
Test Equipment: (See pg. 23)	Asset #'s: 11, 364, 1698, 2079, 2264		
EUT performed within the requirements of the applicable Standard(s) YES ☒ NO ☐ SIGNED Thomas Elders			

Frequency (MHz)	Measured (dBµV)	Antenna (dB)	Amplifier (dB)	Cable (dB)	Corrected (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Polarization
2180	44.8	28.9	29.0	0.8	45.5	54.0	-8.5	Horizontal
3270	31.7	31.9	29.0	1.2	35.8	54.0	-18.2	Horizontal
4360	32.4	33.1	29.0	1.5	38.0	54.0	-16.0	Horizontal
5450	28.5	34.9	29.0	2.1	36.5	54.0	-17.5	Horizontal
6540	27.9	36.4	29.0	2.5	37.8	54.0	-16.2	Horizontal
7630	28.9	37.6	24.9	2.8	44.4	54.0	-9.6	Horizontal
8720	25.8	37.6	23.7	3.1	42.8	54.0	-11.2	Horizontal
9810	24.0	38.1	24.4	3.3	41.0	54.0	-13.0	Horizontal
10900	23.9	39.3	24.0	3.7	42.9	54.0	-11.1	Horizontal
2180	48.5	28.9	29.0	0.8	49.2	54.0	-4.8	Vertical
3270	33.8	31.9	29.0	1.2	37.9	54.0	-16.1	Vertical
4360	28.6	33.1	29.0	1.5	34.2	54.0	-19.8	Vertical
5450	31.7	34.9	29.0	2.1	39.7	54.0	-14.3	Vertical
6540	29.6	36.4	29.0	2.5	39.5	54.0	-14.5	Vertical
7630	28.2	37.6	24.9	2.8	43.7	54.0	-10.3	Vertical
8720	25.5	37.6	23.7	3.1	42.5	54.0	-11.5	Vertical
9810	23.9	38.1	24.4	3.3	40.9	54.0	-13.1	Vertical
10900	22.9	39.3	24.0	3.7	41.9	54.0	-12.1	Vertical

End of Report

APPENDIX B DNB TEST DATA – RIVERSIDE, CALIFORNIA

Appendix B

DNB Test Results – Riverside, California

FCC Part 2, Part 15, Part 87
Model NXT- 600

FCC Part 2, Part 15, Part 87

Test Report
for the

Transponder

Model # NXT-600

Test Report Number RV48077B-001

Prepared For:
ACSS, an L-3 Communications & Thales Company
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NIST

NVLAP® Lab Code: 200851-0

NEMKO Authorized

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DOCUMENT HISTORY

Revision	Number of Pages	Revised Pages	Description	Date
-001	All	All	Report Release	20 May 2014

CERTIFICATION OF TEST DATA

This report, containing electromagnetic immunity and emissions test data and evaluations, has been prepared by an independent electromagnetic compatibility laboratory, DNB ENGINEERING, in accordance with the applicable specifications and instructions required per the Introduction. DNB Engineering has received accreditation to perform these tests by the following authorizations:

NEMKO EMC Laboratory Authorization No. ELA 115A
NIST / NVLAP: Lab Code No: 200851-0

FCC Registration No. 99985

The data evaluation and equipment configuration presented herein are a true and accurate representation of the measurements of the test sample's electromagnetic immunity and emissions characteristics as of the dates and at the times of the test under the conditions herein specified.

This report shall not be reproduced, except in full, without the written approval of DNB ENGINEERING, INC. Results contained in this report relate only to the item tested.

Disclaimer: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Report Prepared By:	Maridee Winans *Maridee Winans* Administrative Assistant	20 May 2014 Date
Report Reviewed by:	Thomas Elders *Thomas Elders* Facility Manager	20 May 2014 Date

FCC Part 2, Part 15, Part 87 Test Completion Record for:

ACSS, an L-3 Communications & Thales Company: Transponder
Model # NXT-600

Test Start Date: 7 May 2014 Test Completion Date: 9 May 2014

The EUT was tested in accordance with the requirements of the specifications and standards listed below and found to be fully compliant:

FCC 47 CFR Reference:
2.1051, Spurious Emissions at Antenna Terminals
2.1053, Field Strength of Spurious Radiation
15.109, Radiated Emission Limits
87.139, Emission Limitations

Conducted Spurious Emissions:	**Pass** ☒	**Fail** ☐	**N/A** ☐
Radiated Emissions Digital Devices:	**Pass** ☒	**Fail** ☐	**N/A** ☐
Field Strength of Spurious Radiation:	**Pass** ☒	**Fail** ☐	**N/A** ☐

1.0 INTRODUCTION

Electromagnetic Compatibility (EMC) tests were performed on a representative sample(s) of ACSS, an L-3 Communications & Thales Company, Transponder**,** Model # NXT-600. The purpose of this test was to demonstrate compliance of the EUT with the applicable limits. The test results have been summarized herein, and all data sheets have been incorporated in Appendix C.

Where applicable, cables were routed consistent with the typical application by varying the configuration of the test sample. The effect of varying the position of cables was investigated to find the configuration that produced maximum emissions and susceptibility.

The EUT was evaluated to determine the “worst case” positioning of both cables and axis. Once the “worst case” configuration was determined care was used to maintain this configuration throughout the test.

2.0 DEVIATIONS

Deviations/Modifications to the EUT

NONE

Deviations/Modifications from the Test Standards

NONE

3.0 TEST SITE AND EQUIPMENT

The test equipment utilized in the performance of this test, along with current calibration information, is listed in the Test Equipment Log of Appendix A.

UNCERTAINTY TOLERANCE

DNB Engineering's Riverside Facility is within acceptable uncertainty tolerances per ANSI C63.4 (2009) sections 5.4.6.1 and 5.4.6.2 as well as CISPR 16-1(2002) Annex L, section L.2.

ANSI C63.4 (2009)

5.4.6.1 Site Attenuation. A measurement site shall be considered acceptable for radiated electromagnetic field measurements if the horizontal and vertical NSA derived from measurements, i.e., the "measured NSA," are within +/- 4 dB of the theoretical NSA (5.4.6.3) for an ideal site.

5.4.6.2 NSA Tolerance. The +/- 4 dB tolerance in 5.4.6.1 includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies. These errors are analyzed in ANSI C63.6- 1998 [3], wherein it is shown that the performance of a well-built site contributes only 1 db of the total allowable tolerance.

CISPR 16-1 (2002)

L.2 Error analysis

…The total estimated errors are the basis for the +/- 4 dB site acceptability criterions consisting of approximately 3 dB measurement uncertainty and an additional allowable 1 dB for site imperfections.

This uncertainty represents an expanded uncertainty
expressed at approximately the 95% confidence level using a coverage factor of k=2.

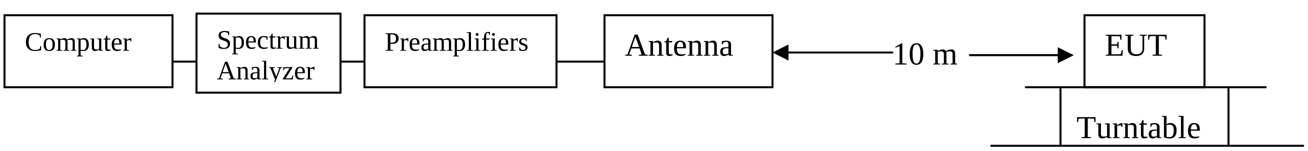
4.0 TEST DESCRIPTION

4.2 **Radiated RF Emissions** (ANSI C63.4 2009)

To measure radiated emissions, the EUT was set up on the 3 or 10-meter open air test site. The EUT is placed on a wooden table, which rests on a wooden turntable. The top of the table is one meter above the ground, and the turntable can be rotated 360 degrees. For each frequency measured, the antenna is raised and lowered for both horizontal and vertical polarities to obtain the maximum reading on the analyzer. The turntable is also rotated throughout the 360 degrees in azimuth to determine the position of the maximum emissions. The applicable frequency range is searched using the antennas listed below. The respective antenna and preamplifier were connected to an HP 8568B Spectrum Analyzer. Preamplifiers were used for all ranges to achieve the needed dynamic range. A list of the equipment used in this test is included in Appendix A. Photographs of this test set up are included in Appendix B.

Antenna(s):

Electro-Metrics 6505-A (.009 - 30 MHz) [ ]
SAS 200/540 BICONICAL (30 - 200 MHz) [X]
EMCO 3146 LOG PERIODIC (200 - 1000 MHz) [X]
EMCO 3115 DRG (1GHz – 18GHz) [X]
OTHER (See Equipment Log in Appendix B) [X]



5.0 CONCLUSIONS

The ACSS, an L-3 Communications & Thales Company, Transponder, Model #NXT-600, was tested in accordance with the requirements listed herein. Pass/Fail status for each test is listed in Section 5.0. At the completion of testing the EUT and support equipment were returned to representatives of ACSS, an L-3 Communications & Thales Company.

APPENDIX A

Test Equipment Log

Asset No	Item	Manufacturer	Model No	Serial No	Calibration Date	Calibration Interval	Calibration Due
11	Antenna (Small DRG)	Emco	3115	2281	09-Jan-13	730	09-Jan-15
31	Antenna (Log Periodic)	Emco	3146	1284	29-Jul-13	730	29-Jul-15
364	Pre-Amp	Miteq	afd304008040	121391	17-Oct-13	365	17-Oct-14
387	Pre-Amp	H/P	10855A	1250-0212	05-Jul-13	365	05-Jul-14
844	QP Adapter	H/P	85650A	2811A01240	20-Aug-13	365	20-Aug-14
1063	Antenna Collapsable	Antenna Research	CB1071	1063	10-Aug-13	730	10-Aug-15
1233	Spectrum Analyzer	H/P	8568B	2732A03600	23-Oct-13	365	23-Oct-14
1234	Spec Analyzer Display	H/P	85662A	2648A15552	23-Oct-13	365	23-Oct-14
1242	Spectrum Analyzer	H/P	8568B	2503A01257	20-Aug-13	365	20-Aug-14
1430	RF Pre-Selector	HP	85685A	2724A00659	23-Oct-13	365	23-Oct-14
1698	Pre-Amp	Miteq	AFS4-08001800-35-LN	378064	17-Oct-13	365	17-Oct-14
1758	Antenna (Bicon)	AH Systems	SAS-200/540	524	10-Aug-13	730	10-Aug-15
1760	Pre-Amp (called ZFL)	Mini-Circuits	ZFL-2000	8350	22-Jan-14	365	22-Jan-15
1771	Attenuator	Alan	Attenuator Kit	117018	20-Aug-13	365	20-Aug-14
1874	Cable	DNB	NMN	11874	20-Aug-13	365	20-Aug-14
1875	Cable	DNB	RG214	11875	20-Aug-13	365	20-Aug-14
1880	Cable	DNB	NMN	11880	20-Aug-13	365	20-Aug-14
1896	OATS	DNB	OATS	11896	02-Dec-13	365	02-Dec-14
1965	Quasi-Peak Adapter	HP	85650A	2043A00277	223 Oct 13	365	23-Oct-14
2079	Cable	Addams Russell Co	1998-120	2079	16-Aug-13	365	16-Aug-14
2180	LISN	Fischer	FCC-LISN-50-50-4-02	04077	07-Oct-13	365	07-Oct-14
2264	Spectrum Analyzer	Agilent	E4407B	MY45103462	20-Aug-13	365	20-Aug-14
3066	Directional Coupler	HP	11691D	1212A01914	31 May 13	425	31 Jul 2014
3131	Attenuator	Inmet	18N50W-20dB	13131	31 May 13	425	31 Jul 14

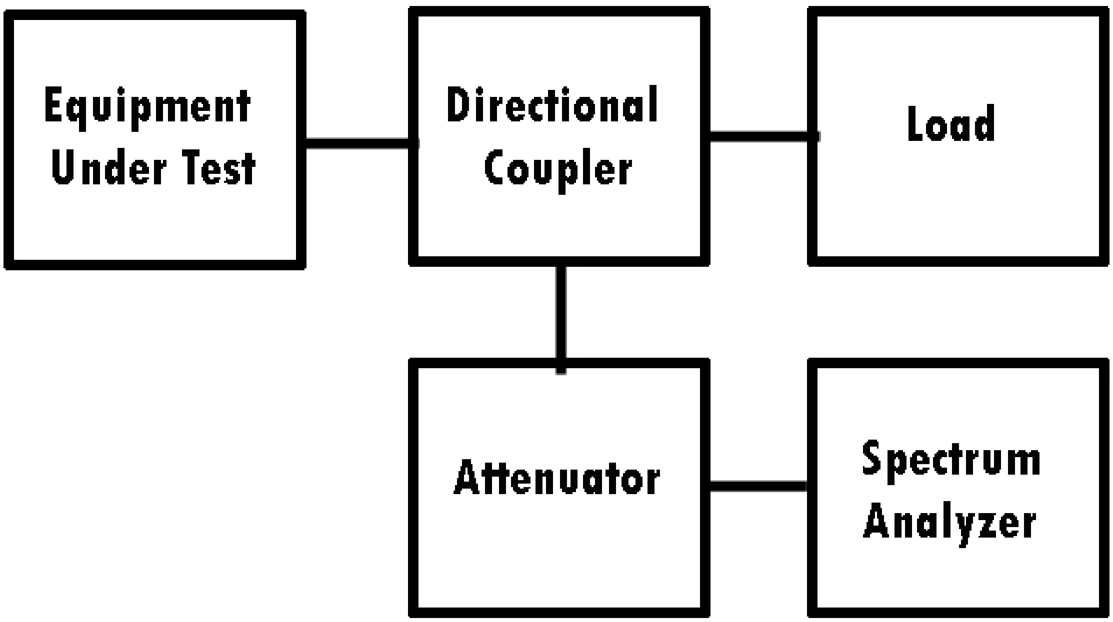
APPENDIX B

Photographs

Block diagram

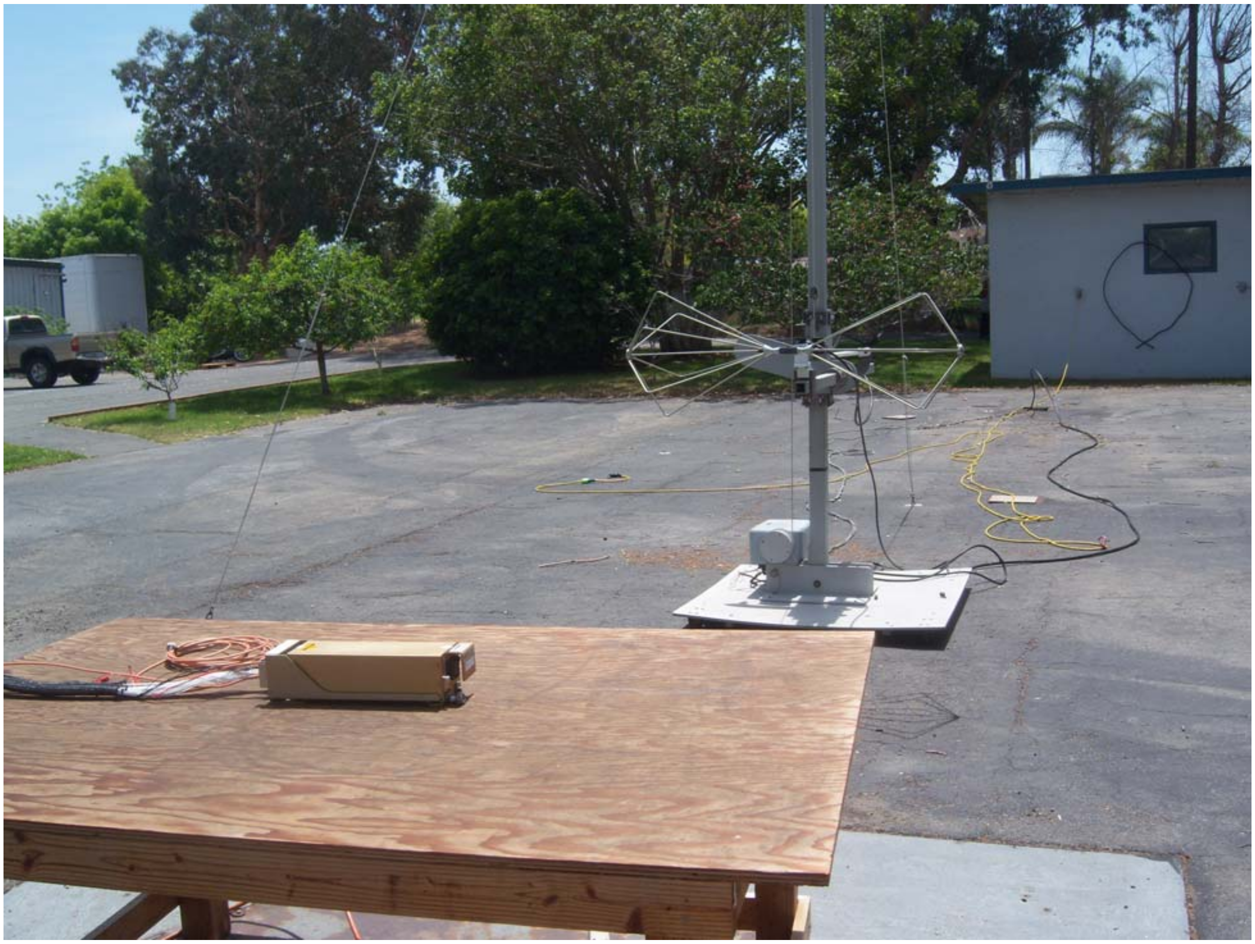
Conducted Spurious

Notes: 1GHz – 11GHz



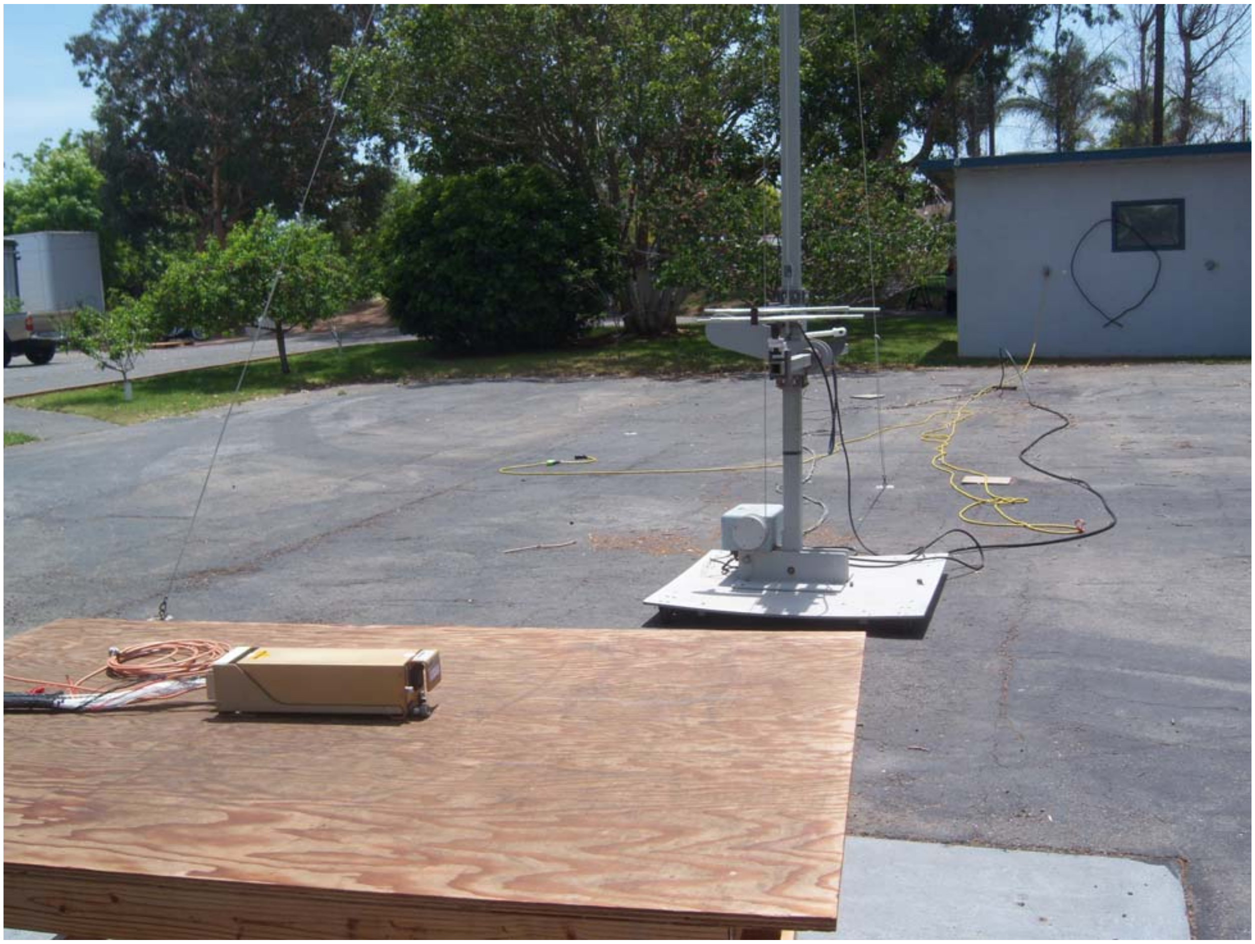
Photos Radiated Emissions-Bicon

Notes: 30MHz – 200 MHz



Photos Radiated Emissions – Log Periodic

Notes: 200MHz – 1000MHz



APPENDIX C

Test Data

Conducted Spurious Emissions

DNB Job Number:	RV48077B-001	Date:		**Specification** FCC 47 CFR 2.1051 87.139
Customer:	ACSS, an L-3 Communications & Thales Company			
Model Number:	NXT-600			
Description:	Transponder	S/N: N/A		
Test Equipment: (See pg. 23)	Asset #'s: 3066, 3131, 2264			
EUT performed within the requirements of the applicable Standard(s) YES ☒ NO ☐ SIGNED Thomas Elders				

Top Port

Frequency (MHz)	Measured (dBm)	Directional coupler (dB)	Attenuator (dB)	Corrected (dBm)	Corrected Fundamental (dBm)	dBc (dBm)
2180	-43.6	21.4	20.4	-1.8	52.4	-54.2
3270	-58.1	20.8	20.5	-16.8	52.4	-69.2
4360	-64.9	20.5	20.5	-23.9	52.4	-76.3
5450	-70.3	20.3	20.4	-29.6	52.4	-82
6540	-72.8	20.3	20.3	-32.2	52.4	-84.6
7650	-68.5	20.4	20.3	-27.8	52.4	-80.2
8760	-70.3	20.7	20.2	-29.4	52.4	-81.8
9810	-70.2	20.5	20.1	-29.6	52.4	-82
10900	-69.9	20.5	20.1	-29.3	52.4	-81.7

Bottom Port

Frequency (MHz)	Measured (dBm)	Directional coupler (dB)	Attenuator (dB)	Corrected (dBm)	Corrected Fundamental (dBm)	dBc (dBm)
2180	-42.7	21.4	20.4	-0.9	52.4	-53.3
3270	-52.2	20.8	20.5	-10.9	52.4	-63.3
4360	-65.8	20.5	20.5	-24.8	52.4	-77.2
5450	-72.2	20.3	20.4	-31.5	52.4	-83.9
6540	-68.9	20.3	20.3	-28.3	52.4	-80.7
7650	-71.1	20.4	20.3	-30.4	52.4	-82.8
8760	-70.1	20.7	20.2	-29.2	52.4	-81.6
9810	-73.2	20.5	20.1	-32.6	52.4	-85
10900	-70.1	20.5	20.1	-29.5	52.4	-81.9

Radiated Emissions Datasheet

DNB Job Number:	RV48077B-001	Date: 8 May 2014	**Specification** FCC 47 CFR 15.109 87.139
Customer:	ACSS, an L-3 Communications & Thales Company		
Model Number:	NXT-600	Serial Number: N/A	
Description:	Transponder		
Test Equipment: (See pg. 23)	Asset #'s: 11, 31, 1758, 1874, 1875, 1880, 1760, 364, 1698, 1234, 1430, , 1965		

EUT performed within the requirements of the applicable Standard(s) YES ☒ NO ☐ SIGNED Thomas Elders

Freq (MHz)	Meter (dBµV)	Ant (dB)	Cbl (dB)	Dis (dB)	Amp (dB)	Corr (dBµV/m)	Spec (dBµ/m)	Delta (dB)	Type	Tbl	Pol
31.337	45.9	13	1.3	0	-21.9	38.3	40	-1.7	PK	0	V
33.415	41.8	13	1.3	0	-21.9	34.2	40	-5.8	PK	0	V
37.295	43.2	12.4	1.3	0	-21.9	35	40	-5	PK	0	V
38.746	47.9	12.1	1.3	0	-21.9	39.4	40	-0.6	PK	190	V
38.964	43.8	12	1.4	0	-21.9	35.3	40	-4.7	QP	190	V
44.03	47.8	11.1	1.4	0	-21.8	38.5	40	-1.5	PK	190	V
44.145	45.5	11.1	1.4	0	-21.8	36.2	40	-3.8	QP	190	V
46.214	49	10.8	1.4	0	-21.8	39.4	40	-0.6	PK	190	V
46.53	47.2	10.7	1.5	0	-21.8	37.6	40	-2.4	QP	190	V
56.02	50.9	9.7	1.6	0	-21.8	40.4	40	0.4	PK	190	V
56.367	48.8	9.7	1.6	0	-21.8	38.3	40	-1.7	QP	190	V
84.732	52.5	9.2	1.8	0	-21.9	41.6	40	1.6	PK	91	V
84.416	50.1	9.2	1.8	0	-21.9	39.2	40	-0.8	QP	91	V
119.995	43.6	10.9	2.2	0	-21.9	34.8	43.5	-8.7	PK	91	V
137.135	41	11.8	2.4	0	-21.9	33.3	43.5	-10.2	PK	172	V
140.02	46.4	11.9	2.4	0	-21.9	38.8	43.5	-4.7	PK	172	V
151.014	44.2	12.4	2.5	0	-21.8	37.3	43.5	-6.2	PK	172	V
156.67	34.3	12.7	2.6	0	-21.8	27.8	43.5	-15.7	PK	172	V
166.043	37.8	13	2.7	0	-21.8	31.7	43.5	-11.8	PK	172	V
31.919	35.6	13	1.3	0	-21.9	28	40	-12	PK	172	H
36.358	36.4	12.6	1.3	0	-21.9	28.4	40	-11.6	PK	172	H
39.061	43.6	12	1.4	0	-21.9	35.1	40	-4.9	PK	172	H
42.355	38.8	11.4	1.4	0	-21.9	29.7	40	-10.3	PK	172	H
50.092	49.3	10.3	1.5	0	-21.8	39.3	40	-0.7	PK	172	H

Freq (MHz)	Meter (dBµV)	Ant (dB)	Cbl (dB)	Dis (dB)	Amp (dB)	Corr (dBµV/m)	Spec (dBµ/m)	Delta (dB)	Type	Tbl	Pol
50.413	47.8	10.3	1.5	0	-21.8	37.8	40	-2.2	QP	172	H
73.346	45.9	9.3	1.7	0	-21.8	35.1	40	-4.9	PK	172	H
78.961	50.1	9.1	1.8	0	-21.9	39.1	40	-0.9	PK	172	H
78.991	48.6	9.1	1.8	0	-21.9	37.6	40	-2.4	QP	172	H
124.844	37.2	11.2	2.2	0	-21.9	28.7	43.5	-14.8	PK	172	H
194.344	27.4	14.3	2.9	0	-21.8	22.8	43.5	-20.7	PK	172	H
205.802	36.5	10.8	3	0	-21.8	28.5	43.5	-15	PK	172	H
230.007	37.6	10.6	3.2	0	-21.7	29.7	46	-16.3	PK	172	H
250.01	38.3	11.7	3.4	0	-21.7	31.7	46	-14.3	PK	172	H
259.989	41.3	12	3.4	0	-21.7	35	46	-11	PK	172	H
400.005	38.2	15	4.5	0	-21.4	36.3	46	-9.7	PK	82	H
502.505	22.8	17.5	5.2	0	-21.2	24.3	46	-21.7	PK	82	H
614	28.2	18.8	5.6	0	-21.2	31.4	46	-14.6	PK	82	H
760.01	24.3	20.8	6.2	0	-21.3	30	46	-16	PK	82	H
820.02	23.4	20.9	6.4	0	-21.3	29.4	46	-16.6	PK	82	H
945.02	20.5	22.5	6.9	0	-21.3	28.6	46	-17.4	PK	82	H
205.29	30.6	10.8	3	0	-21.8	22.6	43.5	-20.9	PK	82	V
312.525	26.9	14.6	3.8	0	-21.6	23.7	46	-22.3	PK	82	V
520.015	30.2	17.9	5.3	0	-21.2	32.2	46	-13.8	PK	82	V
657.225	33	19.4	5.8	0	-21.2	37	46	-9	PK	82	V
792.495	23.8	20.6	6.3	0	-21.3	29.4	46	-16.6	PK	82	V
821.24	23.7	21	6.4	0	-21.3	29.8	46	-16.2	PK	82	V

Field Strength of Radiated Spurious

DNB Job Number:	RV48077B-001	Date: 8 May 2014	**Specification** FCC 47 CFR 2.1053 15.109 87.139
Customer:	ACSS, an L-3 Communications & Thales Company		
Model Number:	NXT-600	Serial Number: N/A	
Description:	Transponder		
Test Equipment: (See pg. 23)	Asset #'s: 11, 364, 1698, 2079, 2264		
EUT performed within the requirements of the applicable Standard(s) YES ☒ NO ☐ SIGNED Thomas Elders			

Frequency (MHz)	Measured (dBµV)	Antenna (dB)	Amplifier (dB)	Cable (dB)	Corrected (dBµV/m)	Limit (dBµV/m)	Delta (dB)	Polarization
2180	51.1	28.9	29.0	0.8	51.8	54.0	-2.2	Horizontal
3270	38.8	31.9	29.0	1.2	42.9	54.0	-11.1	Horizontal
4360	46.2	33.1	29.0	1.5	51.8	54.0	-2.2	Horizontal
5450	42.1	34.9	29.0	2.1	50.1	54.0	-3.9	Horizontal
6540	38.9	36.4	29.0	2.5	48.8	54.0	-5.2	Horizontal
7630	35.1	37.6	24.9	2.8	50.6	54.0	-3.4	Horizontal
8720	32.4	37.6	23.7	3.1	49.4	54.0	-4.6	Horizontal
9810	27.6	38.1	24.4	3.3	44.6	54.0	-9.4	Horizontal
10900	22.5	39.3	24.0	3.7	41.5	54.0	-12.5	Horizontal
2180	46.3	28.9	29.0	0.8	47.0	54.0	-7.0	Vertical
3270	41.4	31.9	29.0	1.2	45.5	54.0	-8.5	Vertical
4360	32.1	33.1	29.0	1.5	37.7	54.0	-16.3	Vertical
5450	41.5	34.9	29.0	2.1	49.5	54.0	-4.5	Vertical
6540	36.7	36.4	29.0	2.5	46.6	54.0	-7.4	Vertical
7630	30.5	37.6	24.9	2.8	46.0	54.0	-8.0	Vertical
8720	29.5	37.6	23.7	3.1	46.5	54.0	-7.5	Vertical
9810	27.7	38.1	24.4	3.3	44.7	54.0	-9.3	Vertical
10900	23.1	39.3	24.0	3.7	42.1	54.0	-11.9	Vertical

End of Report

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