Val Avionics Ltd.

COM 2000

Report #: VALA0005

Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: February 14, 2012
Val Avionics Ltd.
Model: COM 2000

Emissions

Test Description	Specification	Test Method	Pass/Fail
Spurious Radiated Emissions	FCC 15.109:2012 Class B	ANSI C63.4:2009	**Pass**
Spurious Radiated Emissions	FCC 87:2012	TIA/EIA-603-B:2002	**Pass**

Deviations From Test Standards

None

Approved By:

Don Facteau, IS Manager

NVLAP Lab Code: 200630-0

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc.
22975 NW Evergreen Parkway, Suite 400
Hillsboro, OR 97124

Phone: (503) 844-4066 Fax: 844-3826

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834D-1).

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision History

Revision Number	Description	Date	Page Number
00	None		

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025. The scope includes radio, ITE, and medical standards from around the world. See: http://www.nwemc.com/accreditations/

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

KCC / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Hong Kong

OFTA – Recognized by OFTA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

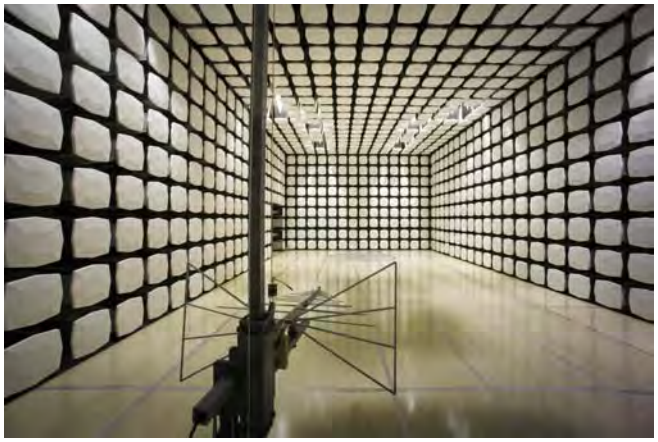
Russia

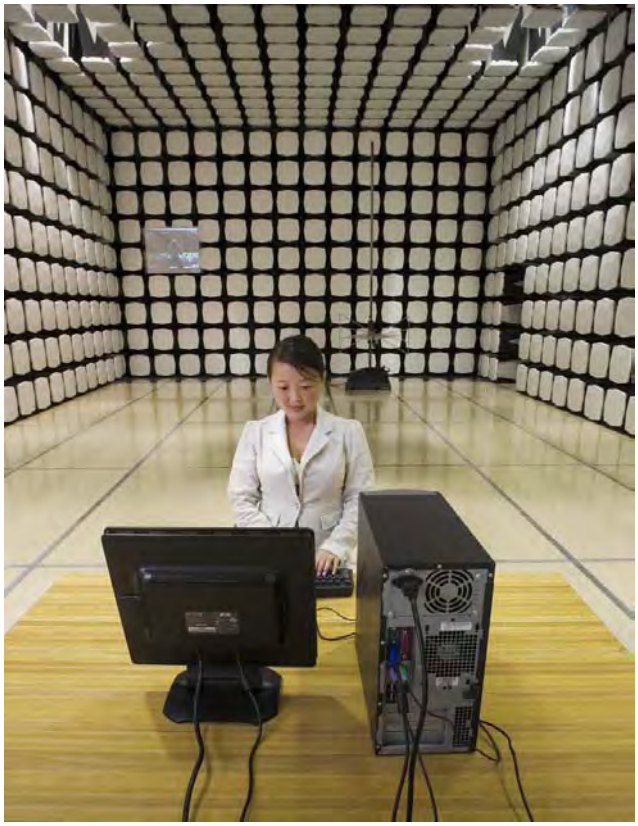
GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards**.**

Locations

Revision 2/23/12

Oregon Labs EV01-EV12 22975 NW Evergreen Pkwy, #400 Hillsboro, OR 97124 (503) 844-4066	**California** Labs OC01-OC13 41 Tesla Irvine, CA 92618 (949) 861-8918	**New York** Labs WA01-WA04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	**Minnesota** Labs MN01-MN08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	**Washington** Labs SU01-SU07 14128 339th Ave. SE Sultan, WA 98294 (360) 793-8675
VCCI				
C-1071, R-1025, G-84, C-2687, T-1658, R-2318	R-1943, G-85, C-2766, T-1659, G-548		R-3125, G-86, G-141, C-3464, T-1634	R-871, G-83, C-3265, T-1511
Industry Canada				
2834D-1, 2834D-*2*	2834B-1, 2834B-2, 2834B-3		2834E-1	2834C-1





Product Description

Client and Equipment Under Test (EUT) Information

Company Name:	Val Avionics Ltd.
Address:	3280 25th Street SE
City, State, Zip:	Salem, OR 97302
Test Requested By:	Jim Harr
Model:	COM 2000
First Date of Test:	February 14, 2012
Last Date of Test:	February 14, 2012
Receipt Date of Samples:	February 14, 2012
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Aircraft Transceiver

Testing Objective:
These tests were selected to satisfy the EMC requirements requested by the client.

Configurations

Configuration 1 VALA0005

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Aircraft Transceiver	Val Avionics Limited	COM 2000	20500

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
DC Bench Supply	MPJA	9950 PS	006708
Terminator	Fairview Microwave	ST6N-20	none

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
Speaker leads	No	1.25m	No	Aircraft Transceiver	Unterminated
DC Power	No	1.25m	No	Aircraft Transceiver	Lab power Supply
Microphone	No	1.25m	No	Aircraft Transceiver	Unterminated
Headset	No	1.25m	No	Aircraft Transceiver	Unterminated
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Modifications

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2/14/2012	Transmitter Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	2/14/2012	Receiver Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.

RADIATED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Receive mode low channel, 118 MHz
Receive mode mid channel, 127 MHz
Receive mode high channel, 136.975 MHz

POWER SETTINGS INVESTIGATED

13.7 VDC

CONFIGURATIONS INVESTIGATED

VALA0005 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	2000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440	AFE	1/23/2012	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/28/2011	12
Antenna, Biconilog	EMCO	3142	AXJ	5/17/2011	12
EV01 Cables	N/A	Bilog Cables	EVA	6/28/2011	12

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, a final radiated emissions test was performed. The frequency range investigated (scanned), is also noted in this report. Radiated emissions measurements were made at the EUT azimuth and antenna height such that the maximum radiated emissions level was detected. This required the use of a turntable and an antenna positioner. The preferred method of a continuous azimuth search was utilized for frequency scans of the EUT field strength with both polarities of the measuring antenna. A calibrated, linearly polarized antenna was positioned at the specified distance from the periphery of the EUT.

Tests were made with the antenna positioned in both the horizontal and vertical planes of polarization. The antenna was varied in height above the conducting ground plane to obtain the maximum signal strength. Though specified in the report, the measurement distance was 3 meters or 10 meters. At any measurement distance, the antenna height was varied from 1 meter to 4 meters. These height scans apply for both horizontal and vertical polarization, except that for vertical polarization the minimum height of the center of the antenna was increased so that the lowest point of the bottom of the antenna cleared the ground surface by at least 25 cm.

If measurements above 1 GHz were required, the test setup was modified to meet the regulatory requirements for higher frequency measurements. If required, RF absorber was placed on the floor between the measurement antenna and EUT. Measurements were made at a 3 meter test distance with the EUT placed on a 0.8 meter high table. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.

RADIATED EMISSIONS

EUT:	COM 2000			Work Order:	VALA0005
Serial Number:	20500			Date:	02/14/12
Customer:	Val Avionics Limited			Temperature:	22
Attendees:	James Mac Innes			Humidity:	38%
Project:	None			Barometric Pres.:	29.99 in
Tested by:	Rod Peloquin	Power:	13.7 VDC	Job Site:	EV01

TEST SPECIFICATIONS	Test Method
FCC 15.109:2012 Class B	ANSI C63.4:2009

TEST PARAMETERS

Antenna Height(s) (m)	1 - 4	Test Distance (m)	3

COMMENTS

DC Supply on floor, Antenna port terminated

EUT OPERATING MODES

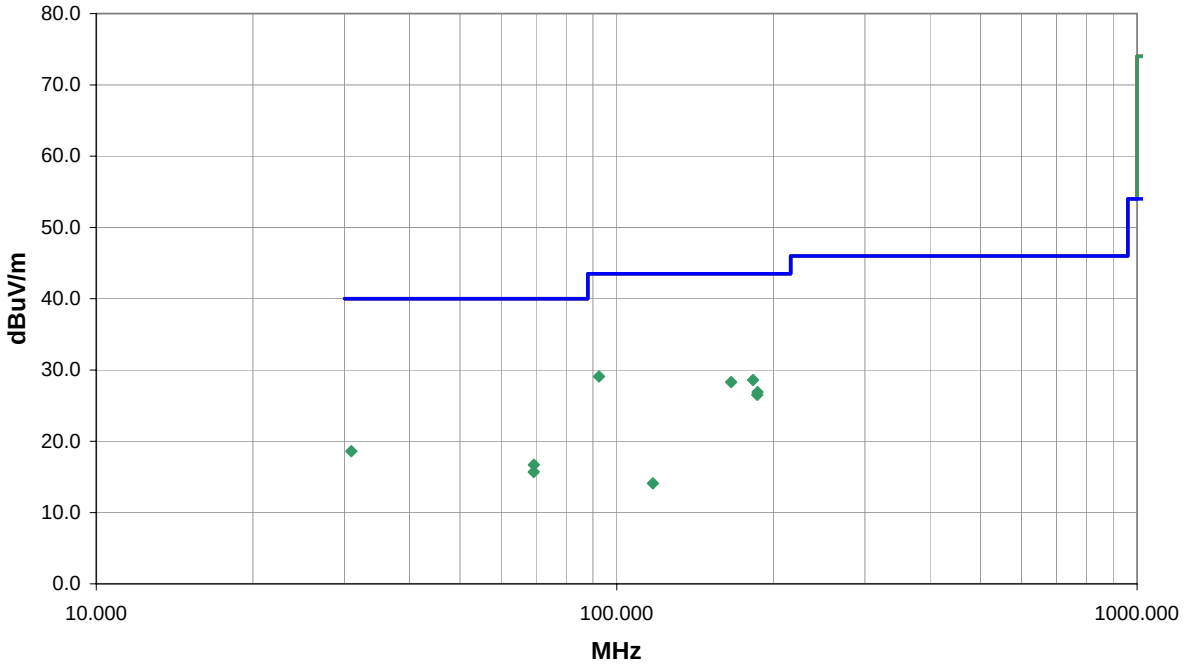
Receive mode mid channel

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1
Configuration #	1
Results	Pass

Signature



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
92.473	36.6	-7.5	281.0	1.2	3.0	0.0	V-Bilog	QP	0.0	29.1	43.5	-14.4
182.853	33.0	-4.4	305.0	1.7	3.0	0.0	H-Bilog	QP	0.0	28.6	43.5	-14.9
165.896	33.0	-4.7	271.0	1.0	3.0	0.0	H-Bilog	QP	0.0	28.3	43.5	-15.2
186.487	31.1	-4.2	120.0	1.5	3.0	0.0	H-Bilog	QP	0.0	26.9	43.5	-16.6
186.297	30.7	-4.2	108.0	1.5	3.0	0.0	H-Bilog	QP	0.0	26.5	43.5	-17.0
30.919	16.9	1.7	0.0	1.2	3.0	0.0	V-Bilog	QP	0.0	18.6	40.0	-21.4
69.321	24.9	-8.2	285.0	1.5	3.0	0.0	H-Bilog	QP	0.0	16.7	40.0	-23.3
69.289	23.9	-8.2	239.0	1.0	3.0	0.0	V-Bilog	QP	0.0	15.7	40.0	-24.3
117.412	21.5	-7.4	174.0	2.9	3.0	0.0	H-Bilog	QP	0.0	14.1	43.5	-29.4

SPURIOUS RADIATED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

Transmitting High channel, 136.975 MHz
Transmitting Mid channel, 127 MHz
Transmitting low channel, 118 MHz

POWER SETTINGS INVESTIGATED

13.7 VDC

CONFIGURATIONS INVESTIGATED

VALA0005 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	1400 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Spectrum Analyzer	Agilent	E4440A	AFD	7/5/2011	12
EV01 Cables	N/A	Bilog Cables	EVA	6/28/2011	12
Pre-Amplifier	Miteq	AM-1616-1000	AOL	6/28/2011	12
Antenna, Biconilog	EMCO	3142	AXJ	5/17/2011	12
Pre-Amplifier	Miteq	AMF-4D-010100-24-10P	APW	6/28/2011	12
Antenna, Horn	ETS	3115	AIZ	1/24/2011	24
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	6/28/2011	12
Antenna, Horn	EMCO	3115	AHE	NCR	0
Antenna, Dipole (ADAA included)	Roberts	Roberts	ADA	NCR	0
Antenna, Dipole	ETS	3121C-DB4	ADH	3/6/2009	36
Power Meter	Gigatronics	8651A	SPM	1/9/2012	24
Power Sensor	Gigatronics	80701A	SPL	7/8/2011	24
MXG Vector Signal Generator	Agilent	N5182A	TIF	NCR	0

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty for radiated emissions measurements is less than +/- 4 dB, and for conducted emissions measurements is less than +/- 2.7 dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

For licensed transmitters, the FCC references TIA/EIA-603 as the measurement procedure standard. TIA/EIA-603 Section 2.2.12 describes a method for measuring radiated spurious emissions that utilizes an antenna substitution method:

At an approved test site, the transmitter is place on a remotely controlled turntable, and the measurement antenna is placed 3 meters from the transmitter. The turntable azimuth is varied to maximize the level of spurious emissions. The height of the measurement antenna is also varied from 1 to 4 meters. The amplitude and frequency of the highest emissions are noted. The transmitter is then replaced with a ½ wave dipole that is successively tuned to each of the highest spurious emissions. A signal generator is connected to the dipole (horn antenna for frequencies above 1 GHz), and its output is adjusted to match the level previously noted for each frequency. The output of the signal generator is recorded, and by factoring in the cable loss to the dipole antenna and its gain; the power (dBm) into an ideal ½ wave dipole antenna is determined for each radiated spurious emission.

For the purposes of preliminary measurements, the field strength of the spurious emissions can be measured and compared with a 3 meter limit. The final measurements must be made utilizing the substitution method described above.

SPURIOUS RADIATED EMISSIONS

EUT:	COM 2000			**Work Order:**	VALA0005
Serial Number:	20500			**Date:**	02/14/12
Customer:	Val Avionics Limited			**Temperature:**	22
Attendees:	James Mac Innes			**Humidity:**	38%
Project:	None			**Barometric Pres.:**	29.99 in
Tested by:	Rod Peloquin	**Power:**	13.7 VDC	**Job Site:**	EV01

TEST SPECIFICATIONS

FCC 87.139:2012	TIA/EIA-603-B:2002

TEST PARAMETERS

Antenna Height(s) (m)	1 - 4	**Test Distance (m)**	3

COMMENTS

DC Supply on floor, Antenna port terminated

EUT OPERATING MODES

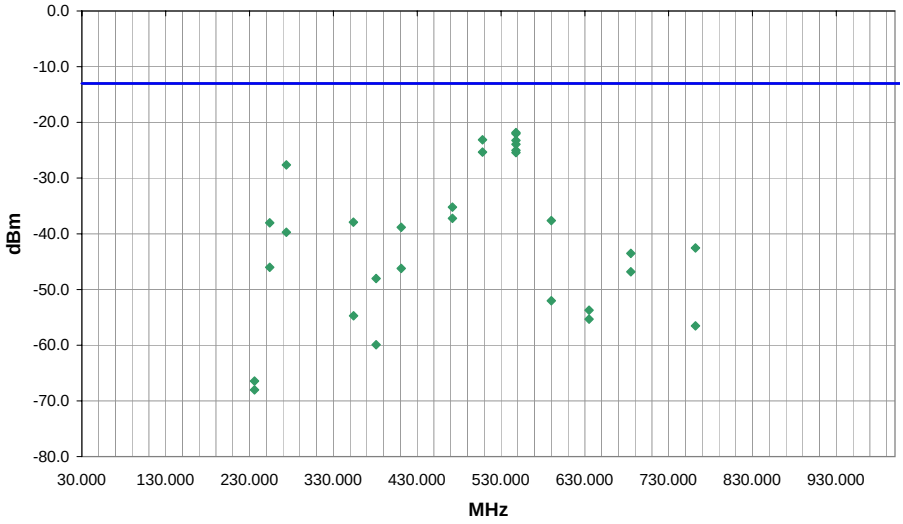
Transmitting

DEVIATIONS FROM TEST STANDARD

No deviations.

Run #	1
Configuration #	1
Results	Pass

Signature



Freq (MHz)			Azimuth (degrees)	Height (meters)			Polarity	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
547.898			125.0	1.6			H-Bilog	PK	6.56E-06	-21.8	-13.0	-8.8	High Channel, EUT horizontal
547.897			340.0	2.0			V-Bilog	PK	6.27E-06	-22.0	-13.0	-9.0	High Channel, EUT vertical
507.997			235.0	1.8			H-Bilog	PK	4.87E-06	-23.1	-13.0	-10.1	Mid Channel, EUT horizontal
547.899			241.0	1.5			H-Bilog	PK	4.75E-06	-23.2	-13.0	-10.2	High Channel, EUT on side
547.896			239.0	1.4			H-Bilog	PK	4.05E-06	-23.9	-13.0	-10.9	High Channel, EUT vertical
547.897			264.0	2.0			V-Bilog	PK	3.14E-06	-25.0	-13.0	-12.0	High Channel, EUT on side
507.998			219.0	1.6			V-Bilog	PK	2.93E-06	-25.3	-13.0	-12.3	Mid Channel, EUT vertical
547.899			315.0	1.8			V-Bilog	PK	2.86E-06	-25.4	-13.0	-12.4	High Channel, EUT horizontal
273.950			246.0	1.7			V-Bilog	PK	1.73E-06	-27.6	-13.0	-14.6	High Channel, EUT vertical
472.004			284.0	1.9			H-Bilog	PK	3.00E-07	-35.2	-13.0	-22.2	Low Channel, EUT horizontal
472.003			274.0	1.0			V-Bilog	PK	1.89E-07	-37.2	-13.0	-24.2	Low Channel, EUT vertical
590.001			357.0	1.1			V-Bilog	PK	1.73E-07	-37.6	-13.0	-24.6	Low Channel, EUT vertical
354.000			275.0	1.0			H-Bilog	PK	1.61E-07	-37.9	-13.0	-24.9	Low Channel, EUT horizontal
254.002			205.0	1.8			V-Bilog	PK	1.57E-07	-38.0	-13.0	-25.0	Mid Channel, EUT vertical
410.933			148.0	1.0			H-Bilog	PK	1.31E-07	-38.8	-13.0	-25.8	High Channel, EUT horizontal
273.947			142.0	1.4			H-Bilog	PK	1.06E-07	-39.7	-13.0	-26.7	High Channel, EUT horizontal
762.007			224.0	1.0			H-Bilog	PK	5.59E-08	-42.5	-13.0	-29.5	Mid Channel, EUT horizontal
684.867			297.0	1.0			V-Bilog	PK	4.44E-08	-43.5	-13.0	-30.5	High Channel, EUT vertical
254.003			276.0	1.0			H-Bilog	PK	2.50E-08	-46.0	-13.0	-33.0	Mid Channel, EUT horizontal
410.927			281.0	1.0			V-Bilog	PK	2.38E-08	-46.2	-13.0	-33.2	High Channel, EUT vertical
684.883			215.0	1.0			H-Bilog	PK	2.08E-08	-46.8	-13.0	-33.8	High Channel, EUT horizontal
381.003			284.0	1.0			H-Bilog	PK	1.57E-08	-48.0	-13.0	-35.0	Mid Channel, EUT horizontal
590.002			328.0	1.0			H-Bilog	PK	6.27E-09	-52.0	-13.0	-39.0	Low Channel, EUT horizontal
634.991			236.0	1.4			H-Bilog	PK	4.24E-09	-53.7	-13.0	-40.7	Mid Channel, EUT horizontal
354.006			328.0	1.3			V-Bilog	PK	3.37E-09	-54.7	-13.0	-41.7	Low Channel, EUT vertical
635.013			245.0	1.0			V-Bilog	PK	2.93E-09	-55.3	-13.0	-42.3	Mid Channel, EUT vertical
761.987			291.0	2.0			V-Bilog	PK	2.22E-09	-56.5	-13.0	-43.5	Mid Channel, EUT vertical
380.983			247.0	1.0			V-Bilog	PK	1.02E-09	-59.9	-13.0	-46.9	Mid Channel, EUT vertical
235.984			151.0	1.4			H-Bilog	PK	2.28E-10	-66.4	-13.0	-53.4	Low Channel, EUT horizontal
236.017			305.0	1.8			V-Bilog	PK	1.57E-10	-68.0	-13.0	-55.0	Low Channel, EUT vertical