UltraTech
Group of Labs

31040/SIT

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entela

July 31, 2003

TIMCO ENGINEERING INC.
P O BOX 370
849 N.W. STATE ROAD 45
NEWBERRY, FLORIDA
USA 32669

Subject: FCC Certification Authorization Application under FCC PART 15, Subpart C, Sec. 15.247 - Intentional Radiators operating in the frequency band 5.735 - 5.815 GHz.

Product: AN-30 SYSTEM
Model No.: AN-30
FCC ID: QC8-AN30

Dear Sir/Madam

As appointed agent for REDLINE COMMUNICATIONS INC., we would like to submit the application to FCC for certification of the above product. Please review all necessary files uploaded to TIMCO UPLOAD SITE site for detailed information.

Grant Note: The power is conducted. This device requires professional installation with specified antennas and output power levels certified under this Grant for Point-to -Point and Point-to-Multipoint operations. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 3 meters from all persons during normal operation. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

If you have any queries, please do not hesitate to contact us.

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

Encl

3000 Bristol Circle,
Oakville, Ontario,
Canada L6H 6G4

Tel.: (905) 829-1570
Fax.: (905) 829-8050

Website: www.ultratech-labs.com
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July 31, 2003

REDLINE COMMUNICATIONS INC.
90 Tiverton Court, Suite 102
Markham, Ontario
Canada, L3R 9V2

Attn.: Mr. Eddie Chiu

Subject: FCC Certification Application Testing under FCC PART 15, Subpart C, Sec. 15.247 - Intentional Radiators operating in the frequency band 5.735 - 5.815 GHz.

Product: AN-30 SYSTEM
Model No.: AN-30
FCC ID: QC8-AN30

Dear Mr. Chiu,

The product sample, as provided by you, has been tested and found to comply with **FCC PART 15, Subpart C, Sec. 15.247 - Intentional Radiators operating in the frequency band 5.735 - 5.815 GHz.**

Grant Note: The power is conducted. This device requires professional installation with specified antennas and output power levels certified under this Grant for Point-to -Point and Point-to-Multipoint operations. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 3 meters from all persons during normal operation. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Enclosed you will find copies of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

Encl

ENGINEERING TEST REPORT

AN-30 SYSTEM
Model No.: AN-30

FCC ID: QC8-AN30

Applicant: **REDLINE COMMUNICATIONS INC.**
90 Tiverton Court, Suite 102
Markham, Ontario
Canada, L3R 9V2

In Accordance With

FEDERAL COMMUNICATIONS COMMISSION (FCC)
PART 15, SUBPART C, SEC. 15.247
Intentional Radiators
operating in: 5.735 - 5.815 GHz

UltraTech's File No.: RCI-028-FCC15C

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: June 03, 2002	
Report Prepared by: Tri M. Luu Issued Date: July 31, 2003	Tested by: Hung Trinh, RFI Technician Test Dates:July 01 - July 25, 2003

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
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EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
	Test Report	• Exhibit 1: Submittal check lists • Exhibit 2: Introduction • Exhibit 3: Performance Assessment • Exhibit 4: EUT Operation and Configuration during Tests • Exhibit 5: Summary of test Results • Exhibit 6: Measurement Data • Exhibit 7: Measurement Uncertainty • Exhibit 8: Measurement Methods	OK
1	Test Setup Photos	Photos # 1 to 12	OK
2	External Photos of EUT	Photos # 1 to 15	OK
3	Internal Photos of EUT	Photos of 1 to 17	OK
4	Cover Letters	• Letter from Ultratech for Certification Request	OK
5	Attestation Statements	• Request for Confidentiality Filing • Authority to act as an Agent	OK OK OK
6	ID Label/Location Info	• ID Label • Location of ID Label	OK OK
7	Block Diagrams	Block Diagrams	OK
8	Schematic Diagrams	Schematic Diagrams	OK
9	Parts List/Tune Up Info	Parts List/Tune Up Info	OK
10	Operational Description	Operational Description	OK
11	RF Exposure Info	RF Exposure Info	OK
12	Users Manual	Information/instructions that will be intended in the installation/operation pertains to: • Correct output power settings required for compliance operation for every antenna proposed for use with EUT • Point-to-point operational requirements and responsibilities • RF exposure compliance requirements, if any	 OK OK OK

EXHIBIT 2. INTRODUCTION

2.1. SCOPE

Reference:	FCC Part 15, Subpart C, Sec. 15.247 - Intentional Radiators
Title	Telecommunication - Code of Federal Regulations, CFR 47, Part 15, Subpart C, Sec. 15.247
Purpose of Test:	This report is covered test results for Certification compliance with FCC regulations for NEW TECHNOLOGY DIGITAL MODULATION devices operating in the 5.735 - 5.815 GHz band.
Test Procedures	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	• Light-industry, Commercial • Industry
Grant Note:	**The power is conducted. This device requires professional installation with specified antennas and output power levels certified under this Grant for Point-to -Point and Point-to-Multipoint operations. The antenna(s) used for this transmitter must be fixed-mounted on outdoor permanent structures with a separation distance of at least 3 meters from all persons during normal operation. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.**

2.2. NORMATIVE REFERENCES

Publication	YEAR	Title
FCC CFR Parts 0-19	2002	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 3. PERFORMANCE ASSESSMENT

3.1. CLIENT INFORMATION

APPLICANT:	
Name:	REDLINE COMMUNICATIONS INC.
Address:	90 Tiverton Court, Suite 102 Markham, Ontario Canada, L3R 9V2
Contact Person:	Mr. Eddie Chiu Phone #: 905-479-8344 (x228) Fax #: 905-479-7432 Email Address: rChiu@redlinecommunications.com

MANUFACTURER:	
Name:	REDLINE COMMUNICATIONS
Address:	90 Tiverton Court, Suite 102 Markham, Ontario Canada, L3R 9V2
Contact Person:	Mr. Eddie Chiu Phone #: 905-479-8344 (x228) Fax #: 905-479-7432 Email Address: rChiu@redlinecommunications.com

3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name	REDLINE COMMUNICATIONS INC.
Product Name	AN-30 SYSTEM
Model Name or Number	AN-30
Serial Number	Preproduction
Type of Equipment	New Technology Digital Modulation Device.
Input Power Supply Type	AC Mains
Primary User Functions of EUT:	Fixed, Point to Multipoint and Point to Point application wireless access. Please refer to attached Technical Description for details.

3.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	▪ Base station (fixed , point to Multipoint and Point to Point)
Intended Operating Environment:	▪ Commercial, light industry & heavy industry
Power Supply Requirement:	120V 60Hz
RF Peak Conducted Power Rating: *Note: Please refer to the following Table for Power Ratings versus Antenna Gain*	• Minimum: -5.4 dBm (0.288 mWatts) for all different antennas and applications • Maximum for Point to Point:: +25.3 dBm (339 mwatts) varied with different antennas.
RF Peak EIRP Ratings: *Note: Please refer to the following Table for Power Ratings versus Antenna Gain*	• Maximum for Point to Multipoint: 36 dBm or 4 Watts. • Maximum for Point to Point:: 60.1 dBm or 1023.3 Watts
Operating Frequency Range:	5.735-5.815 GHz
RF Output Impedance:	50 Ohms
Total number of Channels:	9
Channel Spacing:	10 MHz
Duty Cycle:	Continuous (as worst case)
6 dB Bandwidth:	15.3 MHz max.
Modulation Type (Maximum Data Rate):	• 64 QAM (54 Mb/s maximum) • 16 QAM (36 Mb/s maximum) • QPSK (18 Mb/s maximum) • BPSK (9 Mb/s maximum)
Environmental Temperature:	• Indoor Unit: 0°C to +55°C • Outdoor Unit: -40°C to +60°C
Antenna Connector Type:	• Standard TNC connector (transmitter side) and N connector (antenna side). Professional Installation is required by the manufacturer. Please refer to the User's manual for detailed instruction of antenna installation and RF Exposure Warning.
Antenna Description:	Please refer to the table below for available antennas provide for this EUT. This equipment and its antenna are required to be professionally installed by the manufacturer or its subcontracted professional installer.

3.4. CERTIFIED RF CONDUCTED OUTPUT POWER & EIRP WRT. TO SELECTED ANTENNAS

3.4.1. Antenna & Power Ratings for Point to Multipoint Application

Antenna Manufacturer	*Model Number*	*Gain (dBi)*	*Min. RF Power (dBm)*	*Max. RF Power (dBm)*	*Maximum EIRP (dBm)*
MTI	486001	28.0	-5.4	8.0	36.0
	485002	23.0	-5.4	13.0	36.0
	485024	21.0	-5.4	15.0	36.0
	484027	14.0	-5.4	22.0	36.0
	484026	15.0	-5.4	21.0	36.0
	484025	14.0	-5.4	22.0	36.0
Radiowaves	SP4-5.2	34.8	-5.4	1.2	36.0
	SP3-5.2	31.2	-5.4	4.8	36.0
	SP2-5.2	29.0	-5.4	7.0	36.0
	SP1-5.2	22.5	-5.4	13.5	36.0
Radiowaves	SEC-55V-60-17	17.0	-5.4	19.0	36.0
	SEC-55V-90-16	16.0	-5.4	20.0	36.0
MaxRad	MPR58031PTNF	31.0	-5.4	5.0	36.0
	MPR58029PTNF	29.0	-5.4	7.0	36.0
Tongyu	TDJ-5818AM-60	18.0	-5.4	18.0	36.0
	TDJ-5816AM-90	16.0	-5.4	20.0	36.0

3.4.2. Antenna & Power Ratings for Point to Point Application

Antenna Manufacturer	*Model Number*	*Gain (dBi)*	*Min. RF Power (dBm)*	*Max. RF Power (dBm)*	*Maximum EIRP (dBm)*
MTI	486001	28.0	-5.4	25.3	53.3
	485002	23.0	-5.4	25.3	48.3
	485024	21.0	-5.4	25.3	46.3
	484027	14.0	-5.4	25.3	39.3
	484026	15.0	-5.4	25.3	40.3
	484025	14.0	-5.4	25.3	39.3
Radiowaves	SP4-5.2	34.8	-5.4	25.3	60.1
	SP3-5.2	31.2	-5.4	25.3	56.5
	SP2-5.2	29.0	-5.4	25.3	54.3
	SP1-5.2	22.5	-5.4	25.3	47.8
Radiowaves	SEC-55V-60-17	17.0	-5.4	25.3	42.3
	SEC-55V-90-16	16.0	-5.4	25.3	41.3
MaxRad	MPR58031PTNF	31.0	-5.4	25.3	56.3
	MPR58029PTNF	29.0	-5.4	25.3	54.3
Tongyu	TDJ-5818AM-60	18.0	-5.4	25.3	43.3
	TDJ-5816AM-90	16.0	-5.4	25.3	41.3

Notes:

(1) The maximum RF output power is pre-programmed by the manufacturer or its professional installer with respect to the selected antenna as indicated in the above table.

(2) The antenna is required professional installation provided by manufacturer or its professional installer.

3.5. LIST OF EUT'S PORTS

3.5.1. I/O Ports of Indoor Unit

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Serial Port	1	DB9 (male)	Shielded
2	IF Out Port	1	F	Shielded
3	Sync Out Port	1	BNC	Shielded
4	Sync In Port	1	BNC	Shielded
5	Ethernet Port	1	RJ-45	Non-shielded
6	System Status Indicator Ports	4	RJ-45	Non-shielded

3.5.2. I/O Ports of Outdoor Unit

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	IF Input Port	1	F	Shielded
2	RF IN/Out Port	1	TNC	Shielded

3.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Laptop Computer
Brand name:	Dell
Model Name or Number:	PPX
FCC ID:	FCC Class B
Serial Number:	252-548-69
Connected to EUT's Port:	RS-232
Notes:	This laptop computer is used for technical services only; therefore, and it is used for control purpose only but not for testing.

3.7. BLOCK DIAGRAM OF TEST SETUP

The equipment under test is arranged as intended set up for normal operation. The Indoor AN-30 Unit is located indoor and connect to the Outdoor AN-30 (transmitter) Unit using a minimum 100 foot, F-type shielded cable. The Outdoor AN-30 (Transmitter) is mounted on the antenna and its RF output port is connected to the antenna using a short TNC-to-N cable.

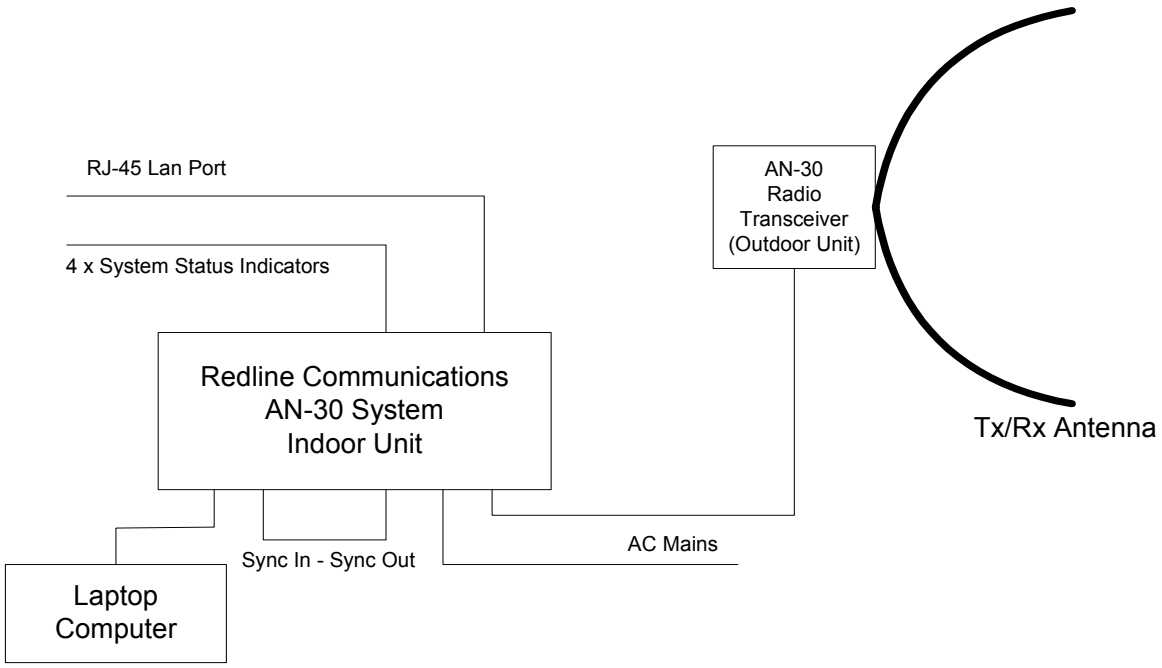


EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	120V 60Hz

4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	▪ Each channel from the transmitter is tested for worst case emissions since the maximum power rating of each channel is different. The transmitter is transmitted continuously in a test mode configuration for worst case and convenience of measurements
Special Test Software:	▪ Special software is provided by the Applicant to select and operate the EUT at each channel frequency continuously.
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as a non-integral antenna equipment. The professional installation is required field installation and operation

Transmitter Test Signals:	
Frequencies: ▪ 5.735-5.815 GHz	• Lowest, middle and highest channel frequencies will be tested.
Transmitter Wanted Output Test Signals: ▪ RF Power Output: ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ Tested with minimum & maximum RF power and maximum antenna gain of each antenna family. ▪ 64QAM, 16QAM, QPSK & BPSK ▪ Internal

EXHIBIT 5. SUMMARY OF TEST RESULTS

5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

- Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

  The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Aug. 10, 2002.

5.2. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

5.3. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.107 & 15.207	Class B - AC Power Conducted Emissions on Tx, Rx and standby modes	Yes
15.247(a)(2)	6dB Bandwidth of a Digital Modulation System	Yes
15.247(b) & 1.1310	Maximum Peak Power (Conducted)	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes
15.247(c)	Transmitter Band-edge and RF Conducted Spurious Emissions measured at the Transmitter Antenna Terminal	Yes
15.247(d)	Transmitted Power Density of a Digital Modulation System	Yes
15.247(c), 15.209 & 15.205	Transmitter Band-edge and Radiated Emissions @ 3m	Yes
15.109(b)	Class A - Radiated Emissions from Unintentional Radiators	Yes. A separate test report will be provided upon request.

EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report and ANSI C63-4:1992

6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

6.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C64-3:1992, FCC 15.247 and CISPR 16-1.

6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

6.5. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	
15.203	Described how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT. The exception is in those cases where EUT must be professionally installed. In order to demonstrate that professional installation is required, the following 3 points must be addressed: • The application (or intended use) of the EUT • The installation requirements of the EUT • The method by which the EUT will be marketed	Model AN-30's rf input/output port is is a TNC (female) standard connector and it is required Professional installation.
15.204	Provided the information for every antenna proposed for use with the EUT: (a) type (e.g. Yagi, patch, grid, dish, etc…), (b) manufacturer and model number (c) gain with reference to an isotropic radiator	Please refer to Sec. 3.4 of this test report for a list of antennas' specification

6.6. AC POWERLINE CONDUCTED EMISSIONS @ FCC PART 15, SUBPART B, PARA.15.207 & 15.107(A)

6.6.1. Limits

The equipment shall meet the limits of the following table:

Test Frequency Range	Test Limits Rx active & Tx active	EMI Detector Used	Measuring Bandwidth
0.15 to 0.5 MHz	66 to 56 dBµV 56 to 46 dBµV	Quasi-Peak Average	B = 9 kHz B = 9 kHz
> 0.5 to 5 MHz	56 dBµV 46 dBµV	Quasi-Peak Average	B = 9 kHz B = 9 kHz
> 5 to 30 MHz	60 dBµV 50 dBµV	Quasi-Peak Average	B = 9 kHz B = 9 kHz

6.6.2. Method of Measurements

Refer to Exhibit 8, Sec. 8.3 of this test report & ANSI C63-4:1992

6.6.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Transient Limiter	Hewlett Packard	11947A	310701998	9 kHz – 200 MHz 10 dB attenuation
L.I.S.N.	EMCO	3825/2	89071531	9 kHz – 200 MHz 50 Ohms / 50 µH
12'x16'x12' RF Shielded Chamber	RF Shielding	…	..	…

6.6.4. Photographs of Test Setup

Refer to Photographs # 1 & 2 in Annex 1 for setup and arrangement of equipment under tests and its ancillary equipment.

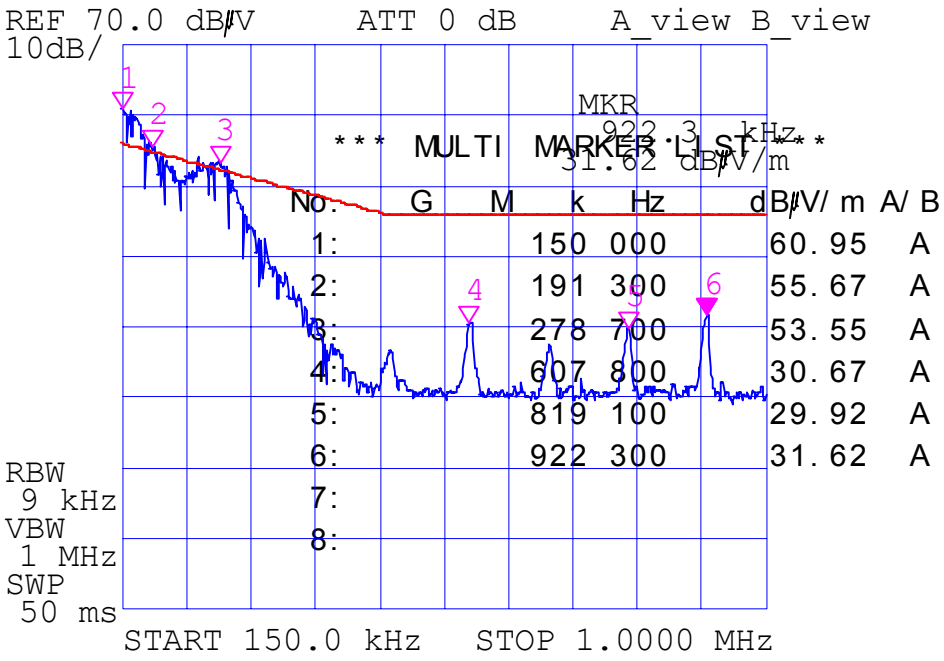
6.6.5. Test Data

- The emissions were scanned from 150 KHz to 30 MHz at AC mains Terminal via a LISN, and all emissions less than 30 dB below the limits were recorded.
- Please refer to Plots # 1 and 2 below for measurement details.

FREQUENCY (MHz)	RF LEVEL (dBuV)	RECEIVER DETECTOR (P/QP/AVG)	QP LIMIT (dBuV)	AVG LIMIT (dBuV)	MARGIN (dB)	PASS/ FAIL	LINE TESTED (L1/L2)
0.15	54.8	QP	66.0	56.0	-11.2	PASS	L1
0.15	19.5	AVG	66.0	56.0	-36.5	PASS	L1
0.19	49.2	QP	64.0	54.0	-14.8	PASS	L1
0.19	22.2	AVG	64.0	54.0	-31.8	PASS	L1
0.28	46.2	QP	60.8	50.8	-14.6	PASS	L1
0.28	23.6	AVG	60.8	50.8	-27.2	PASS	L1
1.90	35.2	PEAK	56.0	46.0	-10.8	PASS	L1
17.56	37.8	PEAK	60.0	50.0	-12.2	PASS	L1
25.19	33.4	PEAK	60.0	50.0	-16.6	PASS	L1
0.16	54.8	QP	65.5	55.5	-10.7	PASS	L2
0.16	19.5	AVG	65.5	55.5	-36.0	PASS	L2
0.27	49.2	QP	61.1	51.1	-11.9	PASS	L2
0.27	22.2	AVG	61.1	51.1	-28.9	PASS	L2
1.90	31.0	PEAK	56.0	46.0	-15.0	PASS	L2
17.61	33.8	PEAK	60.0	50.0	-16.2	PASS	L2

Plot # 1(a) - AC POWER LINE CONDUCTED EMISSIONS MEASUREMENT PLOT			
Detector:[X] PEAK [X] QUASI-PEAK [X] AVERAGE		Temp: 23°C	Humidity:46%
Line Tested : 1	Line Voltage : 120Vac	Test Tech: QUAN	Test Date: JULY 01/03
Standard FCC15 CLASS B			

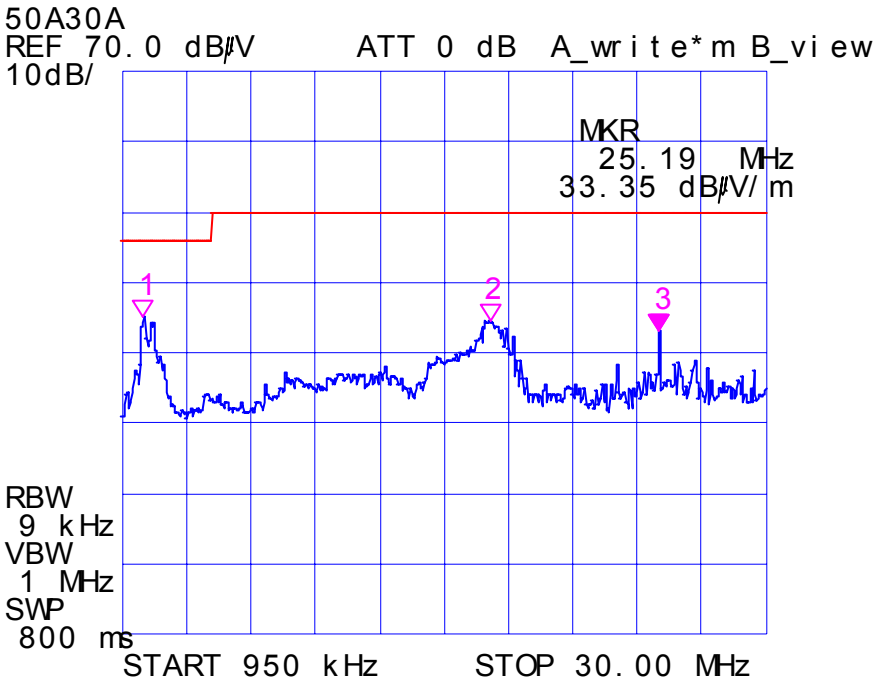
- 150 MHz, QP: 54.77 dBuV/m, AVG: 19.47 dBuV/m
- 191 MHz, QP: 49.15 dBuV/m, AVG: 22.17 dBuV/m
- 278 MHz, QP: 46.17 dBuV/m, AVG: 23.62 dBuV/m



Plot # 1(b) - AC POWER LINE CONDUCTED EMISSIONS MEASUREMENT PLOT			
Detector:[X] PEAK [X] QUASI-PEAK [X] AVERAGE		Temp: 23°C	Humidity:46%
Line Tested : 2	Line Voltage : 120Vac	Test Tech: QUAN	Test Date: JULY 01/03
Standard FCC15 CLASS B			

*** MULTI MARKER LIST ***

No.	G	M	k	Hz	dBµV/m	A/B
1:		1	900	000	35.20	A
2:		17	550	000	37.80	A
3:		25	190	000	33.35	A
4:						
5:						
6:						
7:						
8:						



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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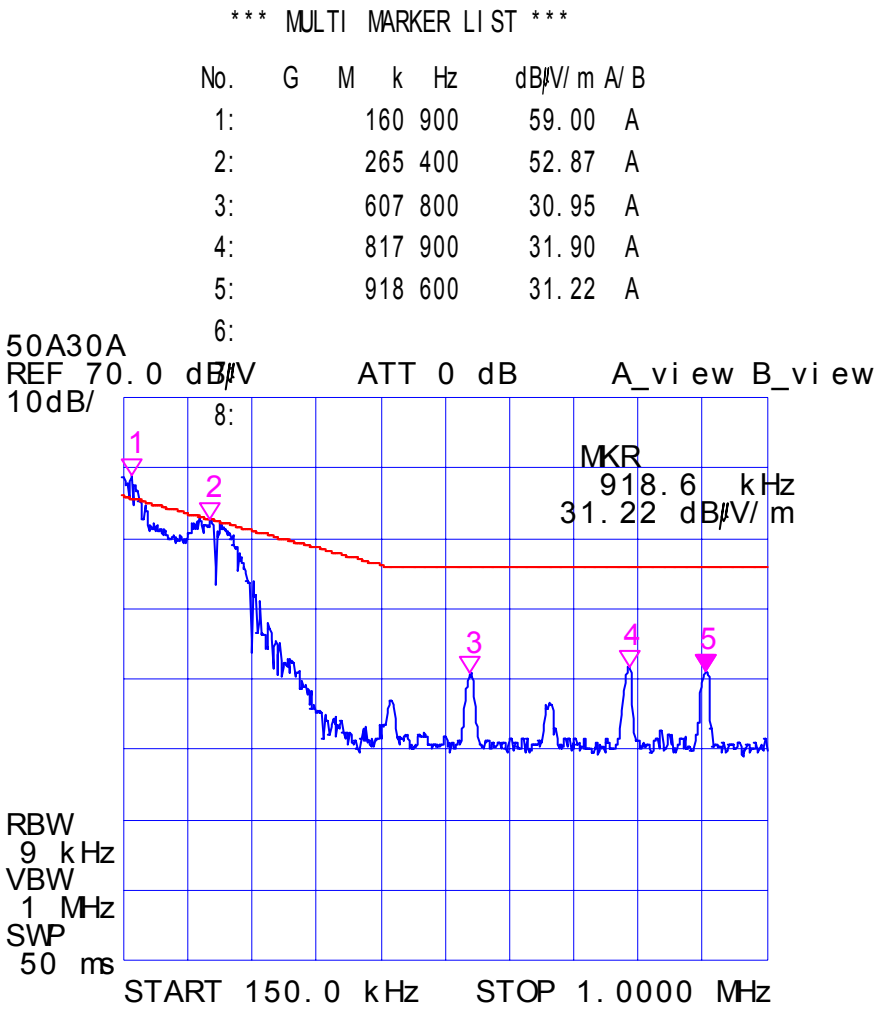
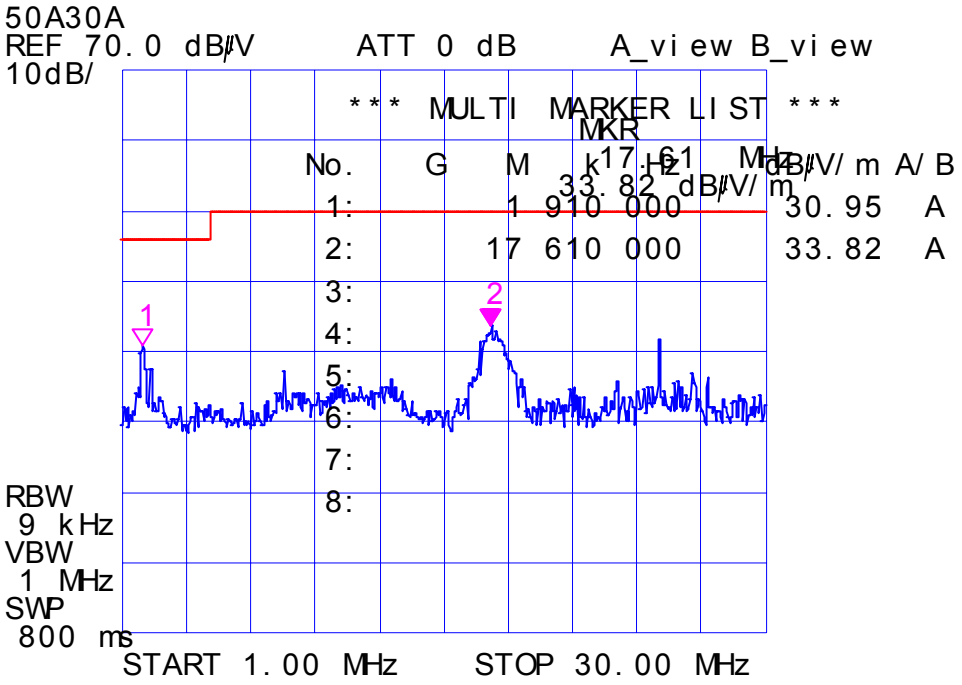
Plot # 2(a) - AC POWER LINE CONDUCTED EMISSIONS MEASUREMENT PLOT			
Detector:[X] PEAK [X] QUASI-PEAK [X] AVERAGE		Temp: 23°C	Humidity:46%
Line Tested : 2	Line Voltage : 120Vac	Test Tech: QUAN	Test Date: JULY 01/03
Standard FCC15 CLASS B			

- 160 MHz, QP: 55.32 dBuV/m, AVG: 19.67 dBuV/m
- 265 MHz, QP: 47.90 dBuV/m, AVG: 43.85 dBuV/m



Plot # 2(b) - AC POWER LINE CONDUCTED EMISSIONS MEASUREMENT PLOT			
Detector:[X] PEAK [X] QUASI-PEAK [X] AVERAGE		Temp: 23°C	Humidity:46%
Line Tested : 2	Line Voltage : 120Vac	Test Tech: QUAN	Test Date: JULY 01/03
Standard FCC15 CLASS B			



6.7. 6 DB BANDWIDTH @ FCC 15.247(A)(2)

6.7.1. Limits

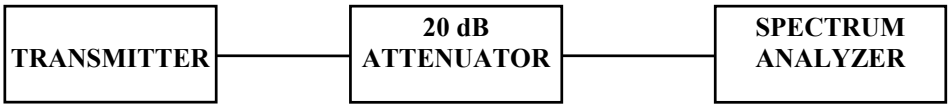
For a Digital Modulation System, the minimum 6 dB bandwidth shall be at least 500 KHz.

6.7.2. Method of Measurements

Refer to ANSI C63-4:1992

The transmitter output was connected to the spectrum analyzer through an attenuator. the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 30 KHz RBW, VBW = 100 KHz,. The 6 dB bandwidth was measured and recorded.

6.7.3. Test Arrangement



6.7.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz

6.7.5. Test Data

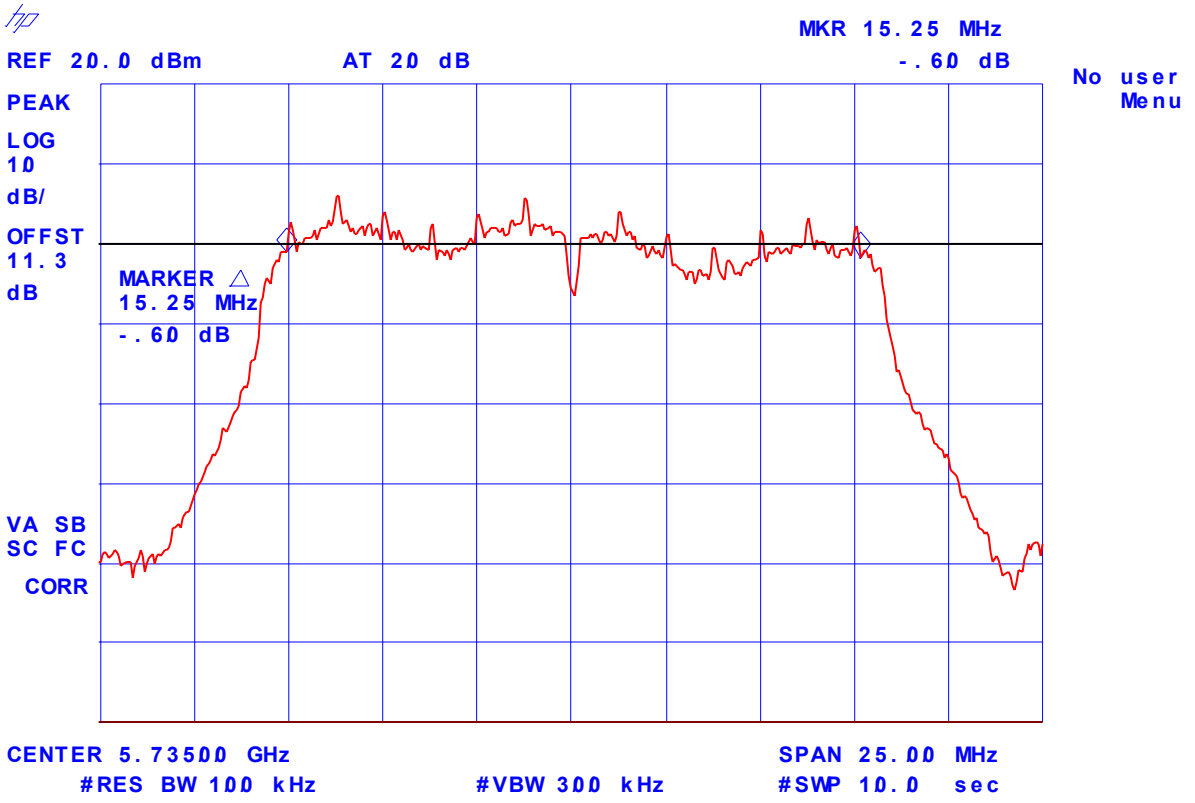
CHANNEL FREQUENCY (MHz)	MODULATION	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
5735	64QAM	15.3	0.5	PASS
5775	64QAM	15.2	0.5	PASS
5815	64QAM	15.3	0.5	PASS
5735	16QAM	15.2	0.5	PASS
5775	16QAM	15.3	0.5	PASS
5815	16QAM	15.3	0.5	PASS
5735	QPSK	15.1	0.5	PASS
5775	QPSK	15.2	0.5	PASS
5815	QPSK	15.2	0.5	PASS
5735	BPSK	15.2	0.5	PASS
5775	BPSK	15.2	0.5	PASS
5815	BPSK	15.3	0.5	PASS

Observation: *The 6 dB bandwidth were found to be identical with different modulations*

6.7.6. Plots

Please refer to Plots # 3 to 14 below for Measurements data

Plot #3: 6 dB Bandwidth - Channel 1, 5735 MHz, 64 QAM (54 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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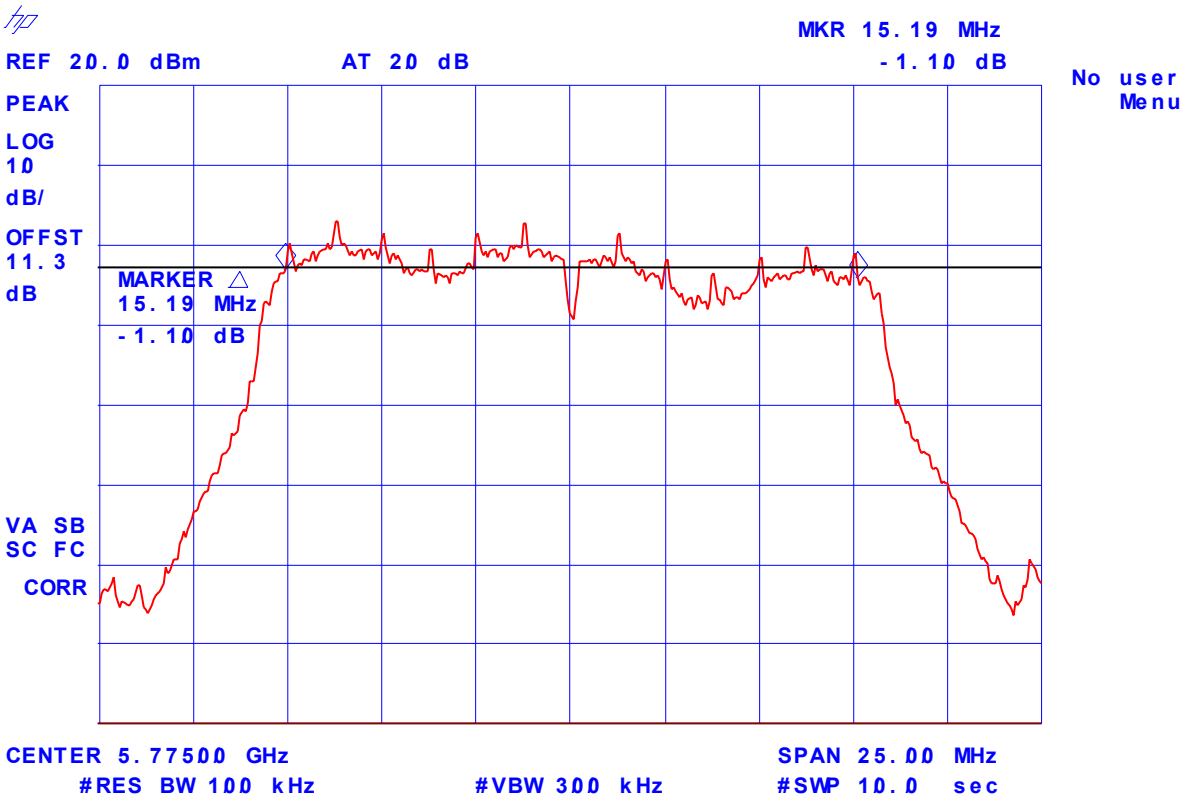
Plot #4: 6 dB Bandwidth - Channel 3, 5775 MHz, 64 QAM (54 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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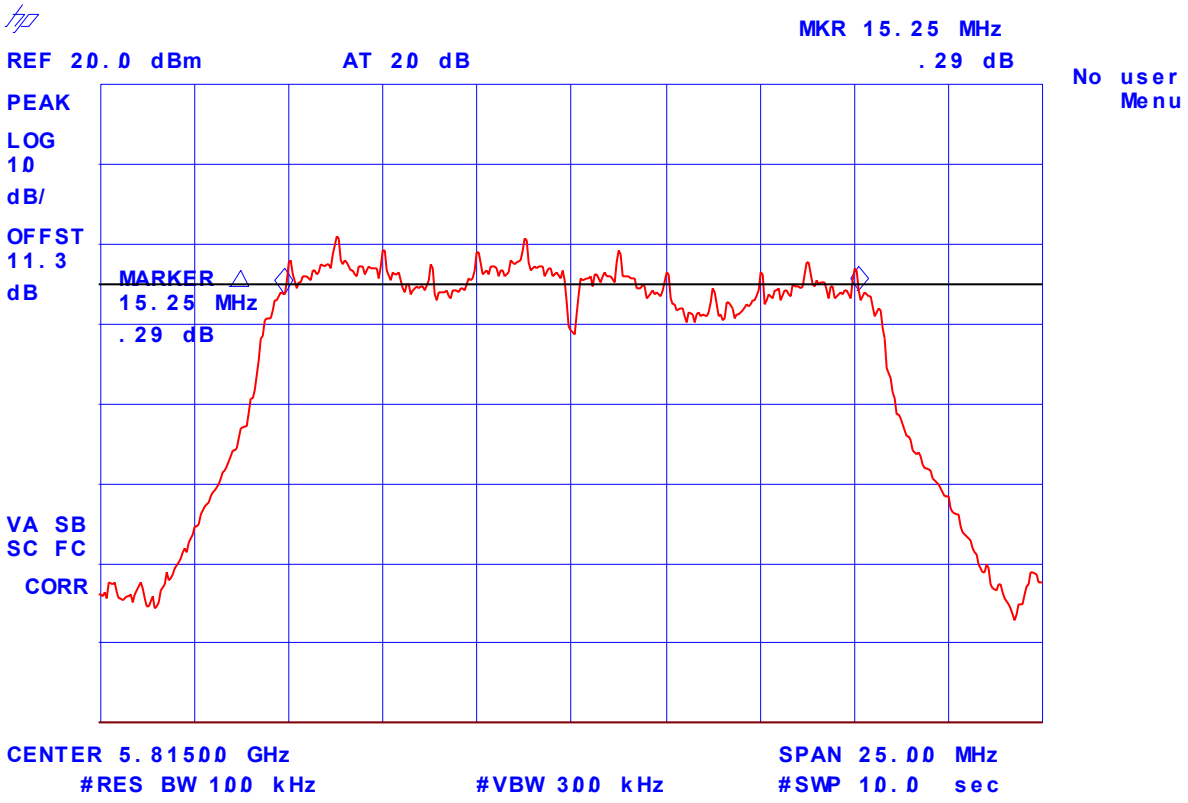
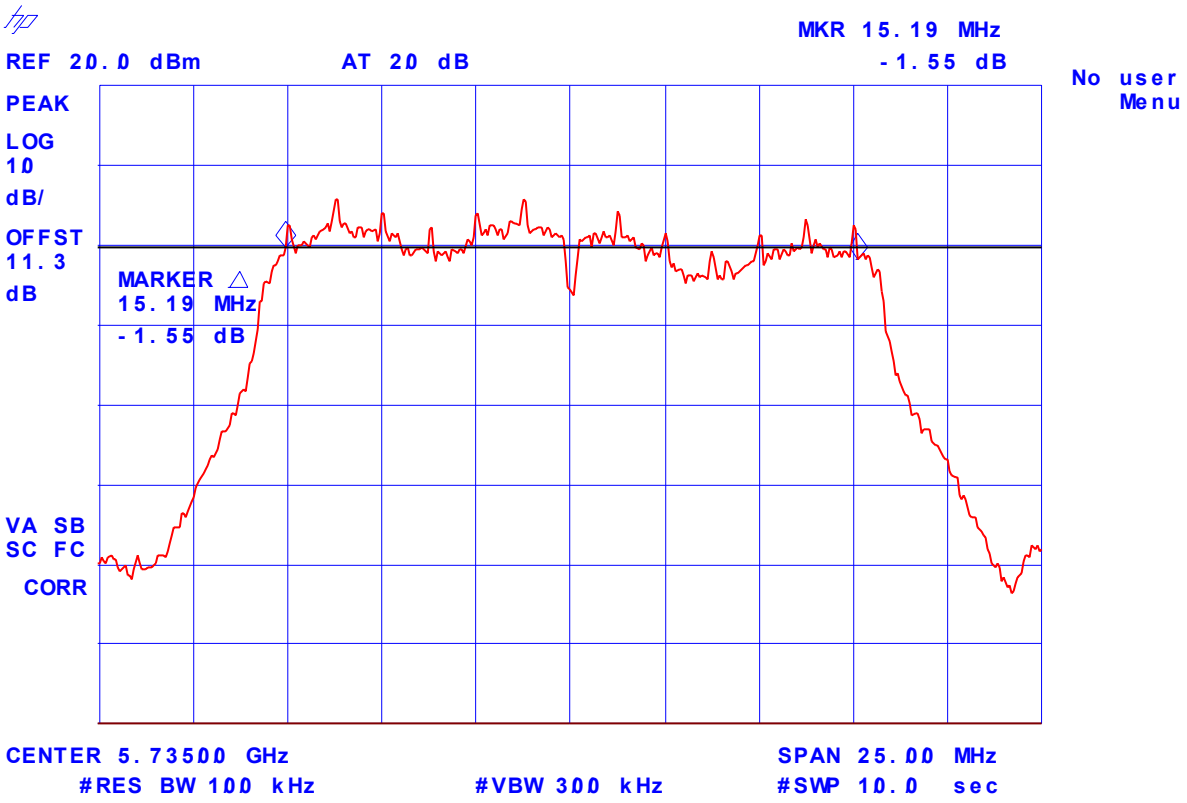
Plot #5: 6 dB Bandwidth - Channel 5, 5815 MHz, 64 QAM (54 Mb/s)



Plot #6: 6 dB Bandwidth - Channel 1, 5735 MHz, 16 QAM (36 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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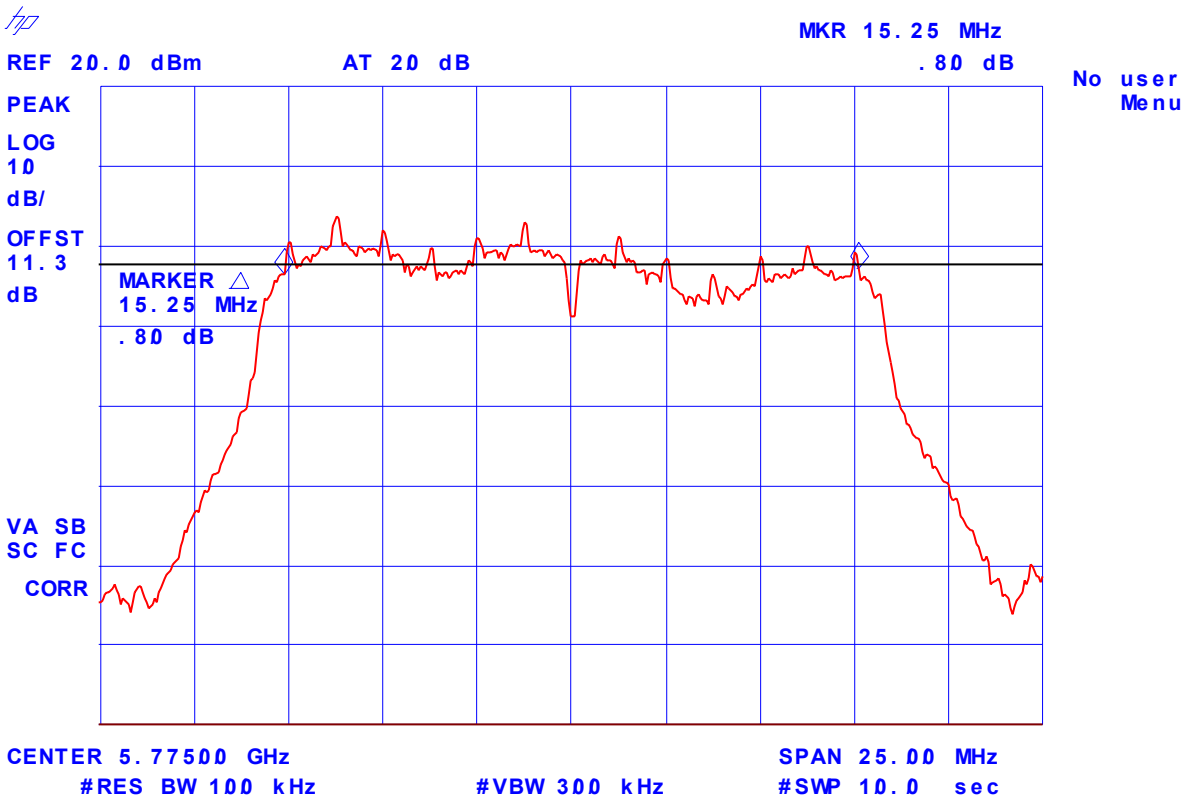
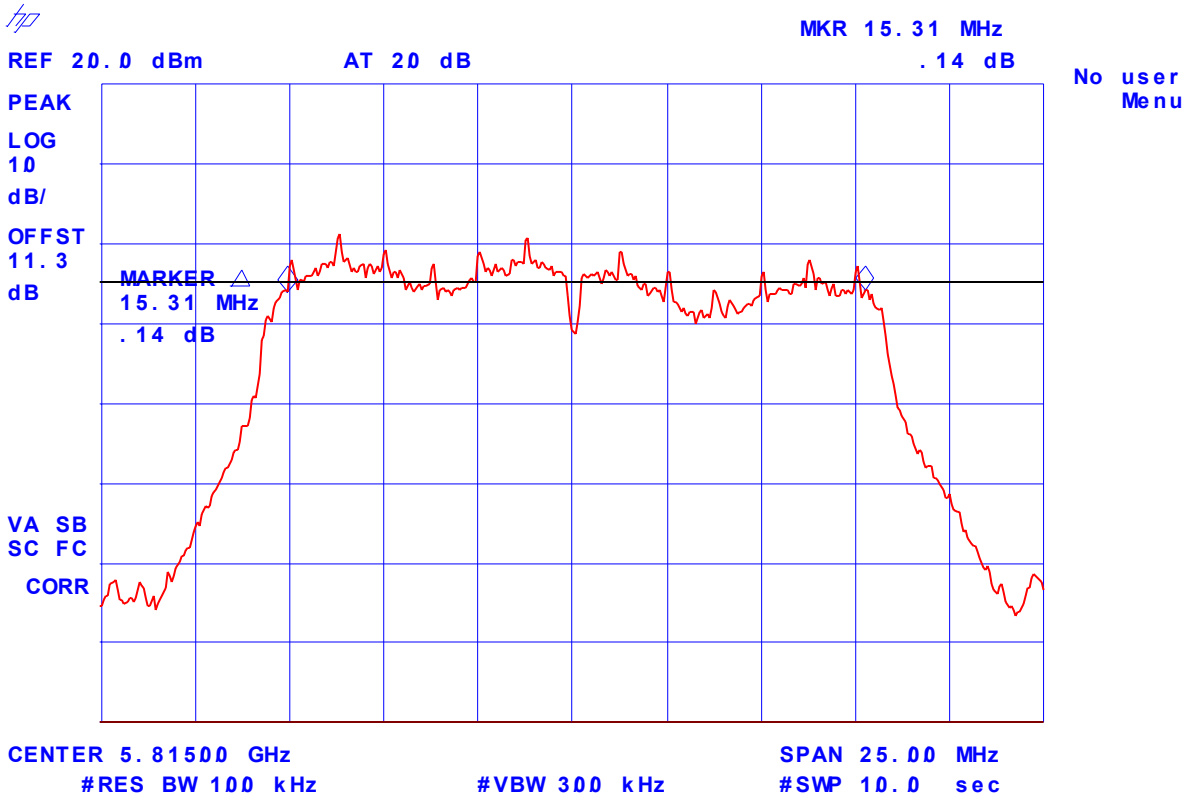
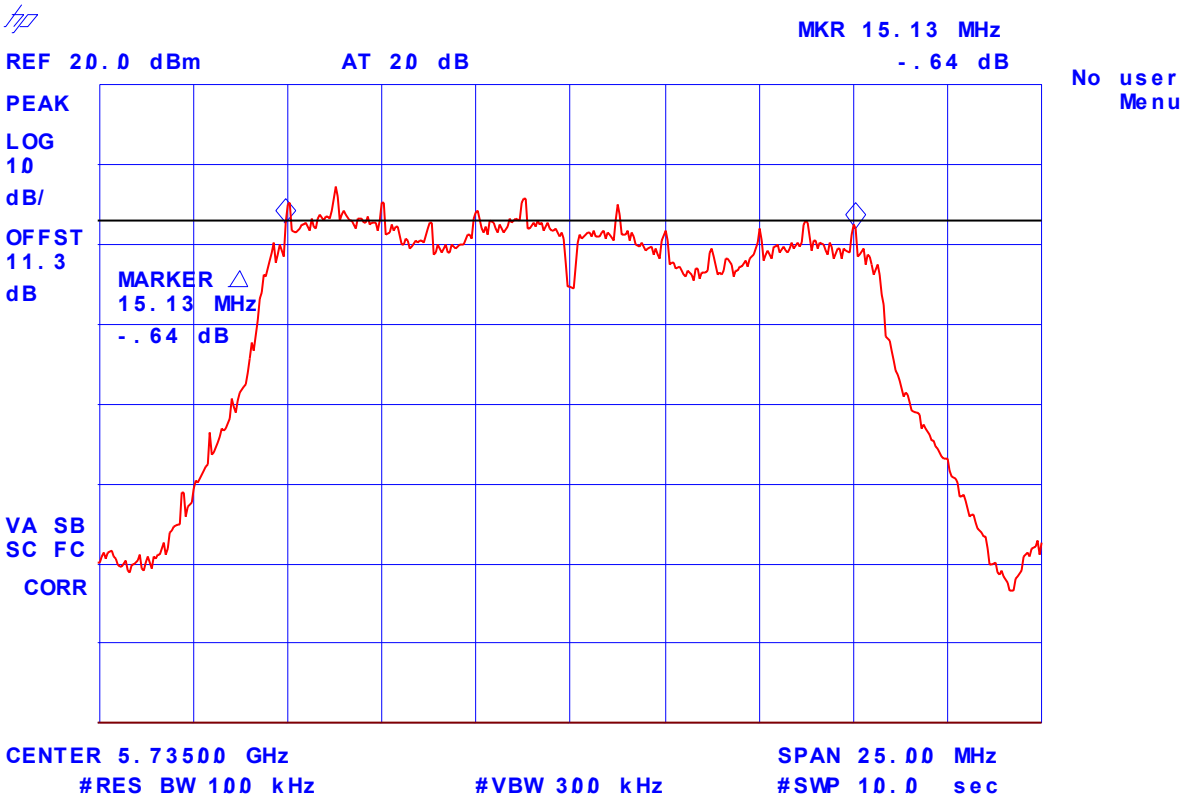
Plot #7: 6 dB Bandwidth - Channel 3, 5775 MHz, 16 QAM (36 Mb/s)



Plot #8: 6 dB Bandwidth - Channel 5, 5815 MHz, 16 QAM (36 Mb/s)



Plot #9: 6 dB Bandwidth - Channel 1, 5735 MHz, QPSK (18 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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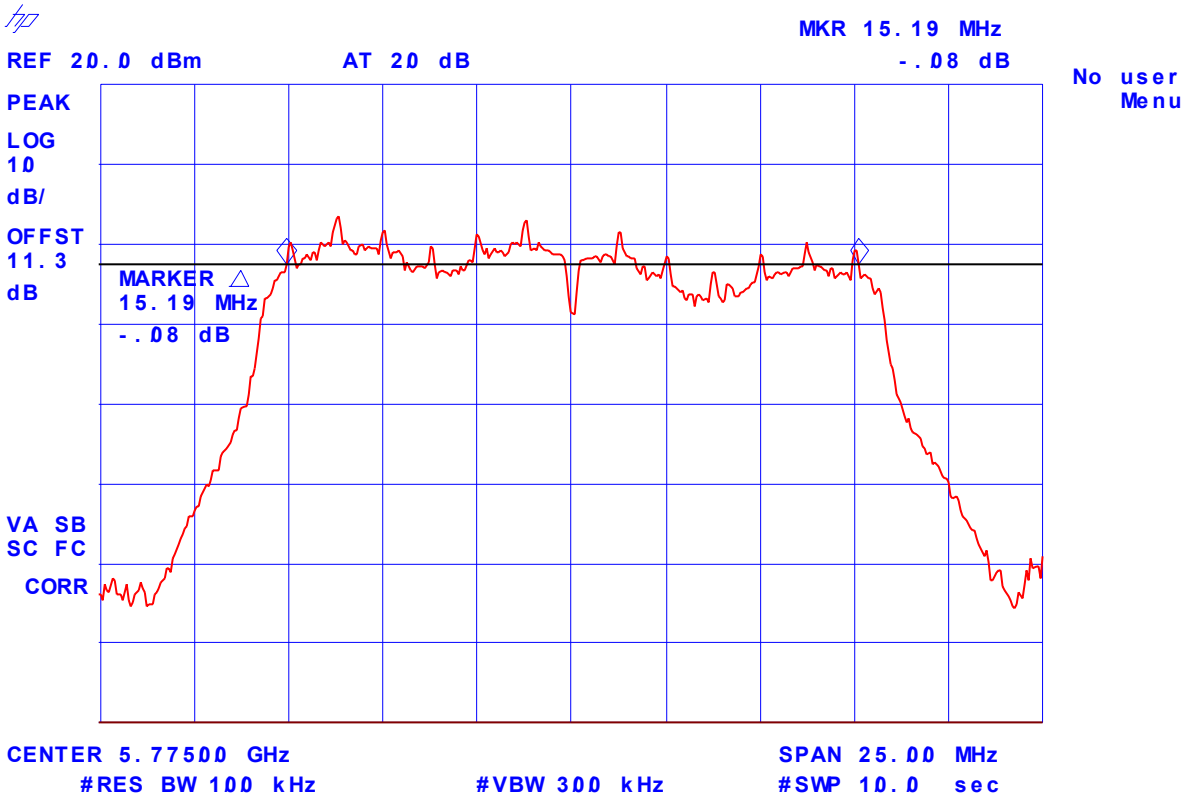
Plot #10: 6 dB Bandwidth - Channel 3, 5775 MHz, QPSK (18 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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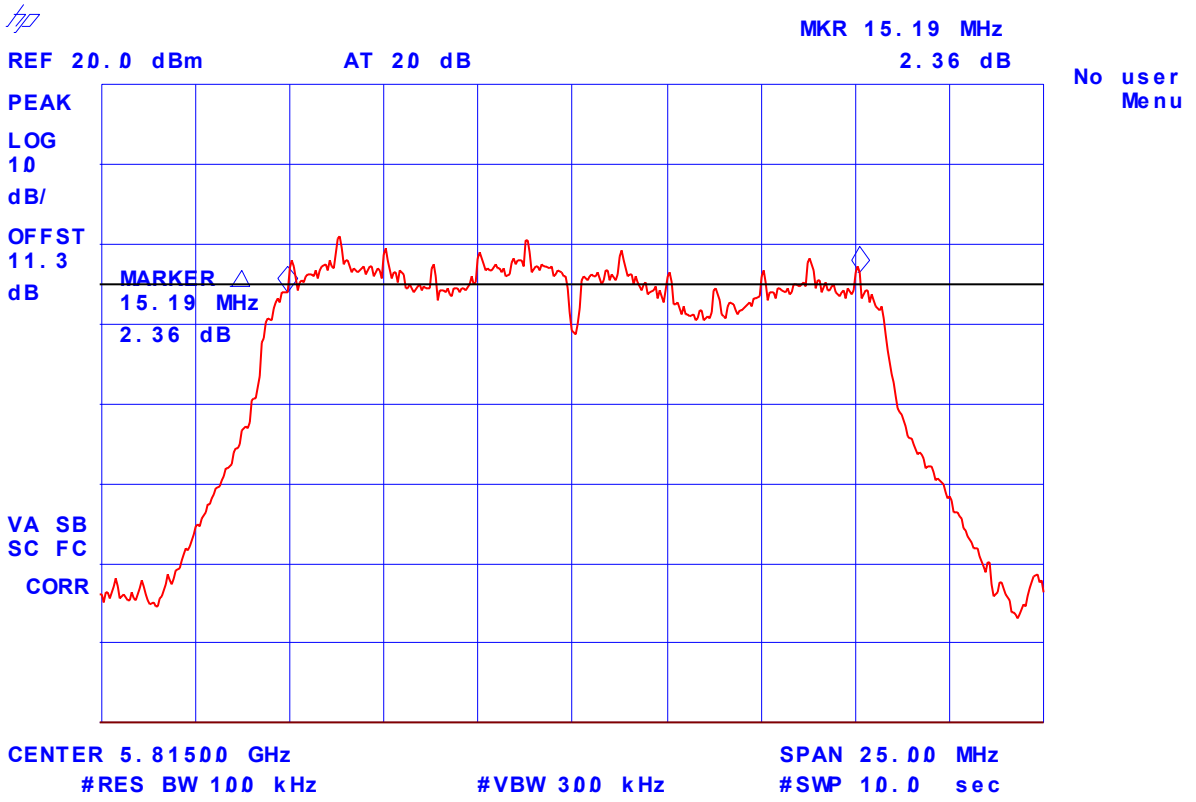
Plot #11: 6 dB Bandwidth - Channel 5, 5815 MHz, QPSK (18 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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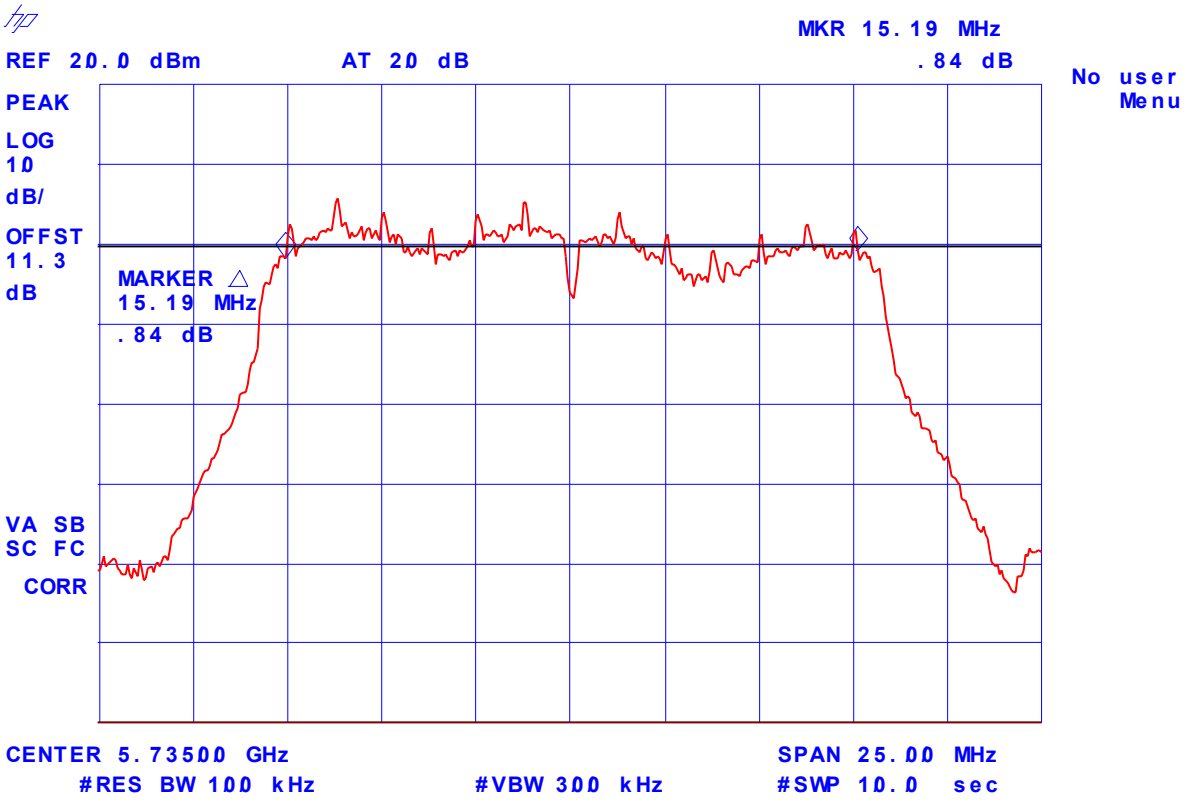
Plot #12: 6 dB Bandwidth - Channel 1, 5735 MHz, BPSK (9 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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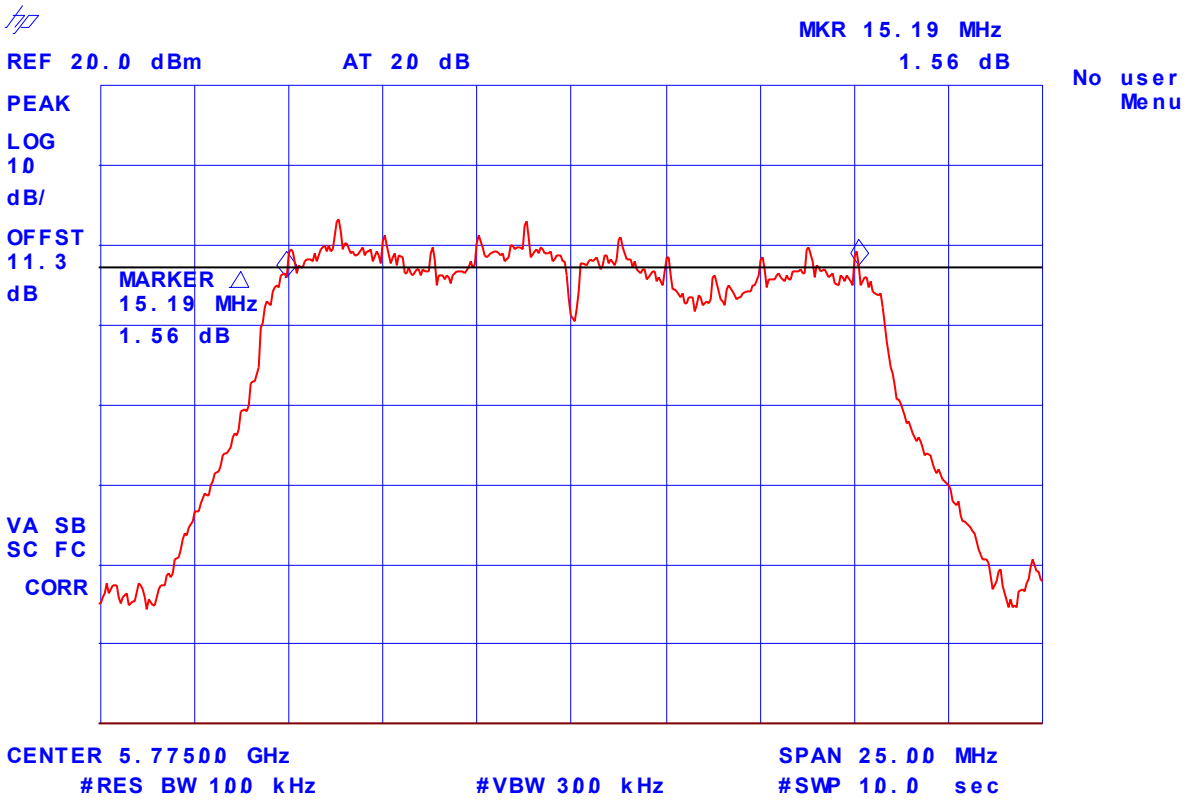
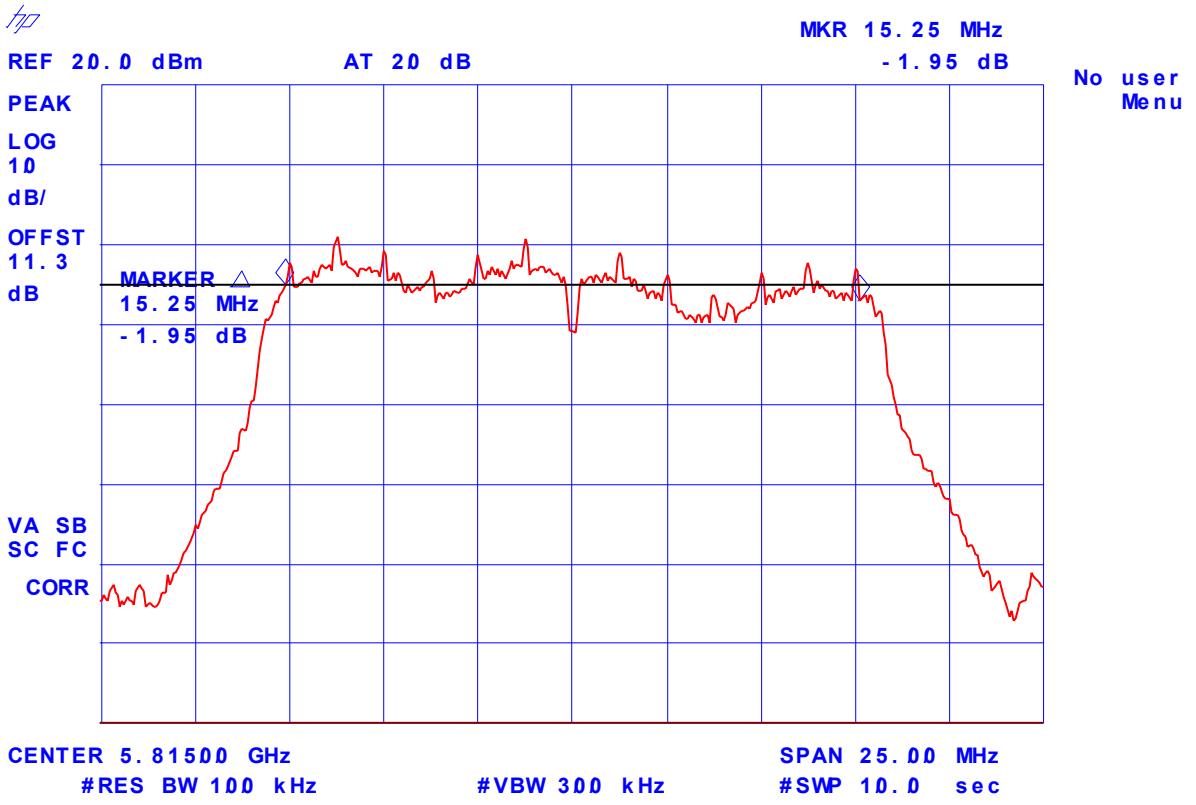
Plot #13: 6 dB Bandwidth - Channel 3, 5775 MHz, BPSK (9 Mb/s)



Plot #14: 6 dB Bandwidth - Channel 5, 5815 MHz, BPSK (9 Mb/s)



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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6.8. PEAK OUTPUT POWER (CONDUCTED) @ FCC 15.247(B)

6.8.1. Limits

- **FCC 15.247(b)(1):** Maximum peak output power of the transmitter shall not exceed 1 Watt.
- **FCC 15.247(b)(3)(ii):** Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.
- **FCC 15.247(b)(3)(iii):** Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) and (b)(3)(ii) of this section, excludes the use of point-to- multipoint systems, omnidirectional applications, and multiple co- located intentional radiators transmitting the same information. The operator of the New Technology Digital Modulation intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility

6.8.2. Method of Measurements & Test Arrangement

Refer to Exhibit 8, Sec. 8.4 of this test report, FCC 15.247(b)(1)&(3), ANSI C63-4:1992 & ETSI 300 328

Note: The conducted peak power measurement method was performed in accordance with ETSI 300 328 since it was proven to be independent with the peak power meter characteristics.

6.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
67297 RF Detector (Diode Detector)	Herotex	DZ122-553	63400	..
Storage Oscilloscope	Philips	PM3320A	ST9907959	--

6.8.4. Test Data

Summary of Maximum RF Conducted Output Power and EIRP wrt. Antenna

Channel Frequency (MHz)	Measured Minimum RF Conducted Output Power for both P-P and P-M (dBm)	Measured Maximum RF Conducted Output Power for P-M (dBm)	Measured Maximum RF Conducted Output Power for P-P (dBm)	FCC Limit (dBm)
5735	-5.4	Note (2) & (3)	25.3	30
5775	-7.5	Note (2) & (3)	24.4	30
5815	-9.1	Note (2) & (3)	20.8	30

P-P: Point to point, P-M: Point to multipoint

Notes:

(1) All of the above measurements were made at the end of a 12 inch long coaxial cable (LMR)-240) routed from the antenna output port to the antenna. This cable has a fixed length.

(2) For point to multipoint application, the RF output power is tuned by the manufacturer or its professional installer with respect to the selected antenna gain in the restriction that that the maximum EIRP (maximum RF output power in dBm + Antenna in dBi) does not exceed the FCC Limit of 36 dBm.

(3) The antenna is required professional installation provided by manufacturer or its professional installer.

(4) The RF output where found to be the same for all modulations.

6.9. RF EXPOSURE REQUIRMENTS @ FCC 15.247(B)(4), 1.1310 & 2.1091

6.9.1. Limits

- 15.247(b)(4) NEW TECHNOLOGY DIGITAL MODULATION devices are subject to the radio frequency radiation exposure requirements specified in Sec. 1.1307(b), Sec. 2.1091 and Sec. 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ``general population/uncontrolled'' environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.
- **FCC 1.1310:**- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
1500-100,000	...	...	1.0	30

F = Frequency in MHz

6.9.2. Method of Measurements

Refer to FCC @ 1.1310, 2.1091

- New Technology Digital Modulation transmitters operating under section 15.247 are categorically from routine environmental evaluation to demonstrating RF exposure compliance with respect to MPE and/or SAR limits. These devices are not exempted from compliance (As indicated in Section 15.247(b)(4), these transmitters are required to operate in a manner that ensures that exposure to public users and nearby persons) does not exceed the Commission's RF exposure guidelines (see Section 1.1307 and 2.1093). Unless a device operates at substantially low power levels, with a low gain antenna(s), supporting information is generally needed to establish the various potential operating configurations and exposure conditions of a transmitter and its antenna(s) in order to determine compliance with the RF exposure guidelines.

- In order to demonstrate compliance with MPE requirements (see Section 2.1091), the following information is typically needed:

(1) Calculation that estimates the minimum separation distance (20 cm or more) between an antenna and persons required to satisfy power density limits defined for free space.
(2) Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement
(3) Any caution statements and/or warning labels that are necessary in order to comply with the exposure limits
(4) Any other RF exposure related issues that may affect MPE compliance

Calculation Method of RF Safety Distance:

$S = PG/4\Pi r^2 = EIRP/4\Pi r^2$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm^2
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{PG/4\Pi S}$$

FCC radio frequency exposure limits may not be exceeded at distances closer than r cm from the antenna of this device

- For portable transmitters (see Section 2.1093), or devices designed to operate next to a person's body, compliance is determined with respect to the SAR limit (define in the body tissues) for near-field exposure conditions. If the maximum average output power, operating condition configurations and exposure conditions are comparable to those of existing cellular and PCS phones., an SAR evaluation may be required in order to determine if such a device complies with SAR limit. When SAR evaluation data is not available, and the additional supporting information cannot assure compliance, the Commission may request that a SAR evaluation be performed, as provided for in Section 1.1307(d)

6.9.3. Test Data

Remark: The Antenna separation distance requirements are not required for Base station with antenna located outdoor. However, we think it is necessary to inform the client of this antenna separation distance so that they are aware of the risk of RF exposure. The worst case of antenna separation is calculated using maximum rf conducted power and maximum antenna gain among all antennas that are listed in this FCC certification application.

Frequency of Maximum Peak Transmit Power sin Sec. 6.8 (GHz)	Measured Peak Conducted Transmit Power in Sec. 6.8 (dBm)	Maximum Antenna Gain (dBi)	Maximum EIRP (dBm)	Calculated Antenna Separation Distance (cm)
5.735	25.3	34.8	60.1	285

Note 1: RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\Pi S)^{1/2} = (EIRP/4\Pi S)^{1/2}$
$S = 1.0\ mW/cm^2$

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	**Compliance with FCC Rules**
Minimum calculated separation distance between antenna and persons required: • 2.85 meters for Point to Point application.	Manufacturer' instruction for separation distance between antenna and persons required: 3 meters

6.10. TRANSMITTER BAND-EDGE (CONDUCTED), FCC CFR 47, PARA. 15.247(C)

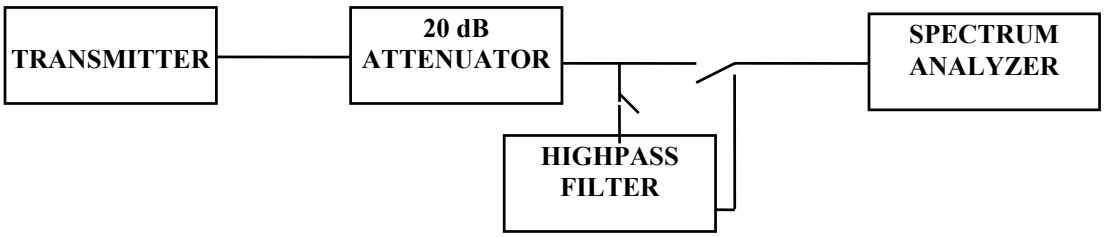
6.10.1. Limits

In any 100 kHz bandwidth outside the frequency band in which the New Technology Digital Modulation intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

6.10.2. Method of Measurements

Refer to Exhibit 8, Sec. 8.5.1 of this test report, FCC 15.247(c) & ANSI C63-4:1992

6.10.3. Test Arrangement



6.10.4. Test Equipment List

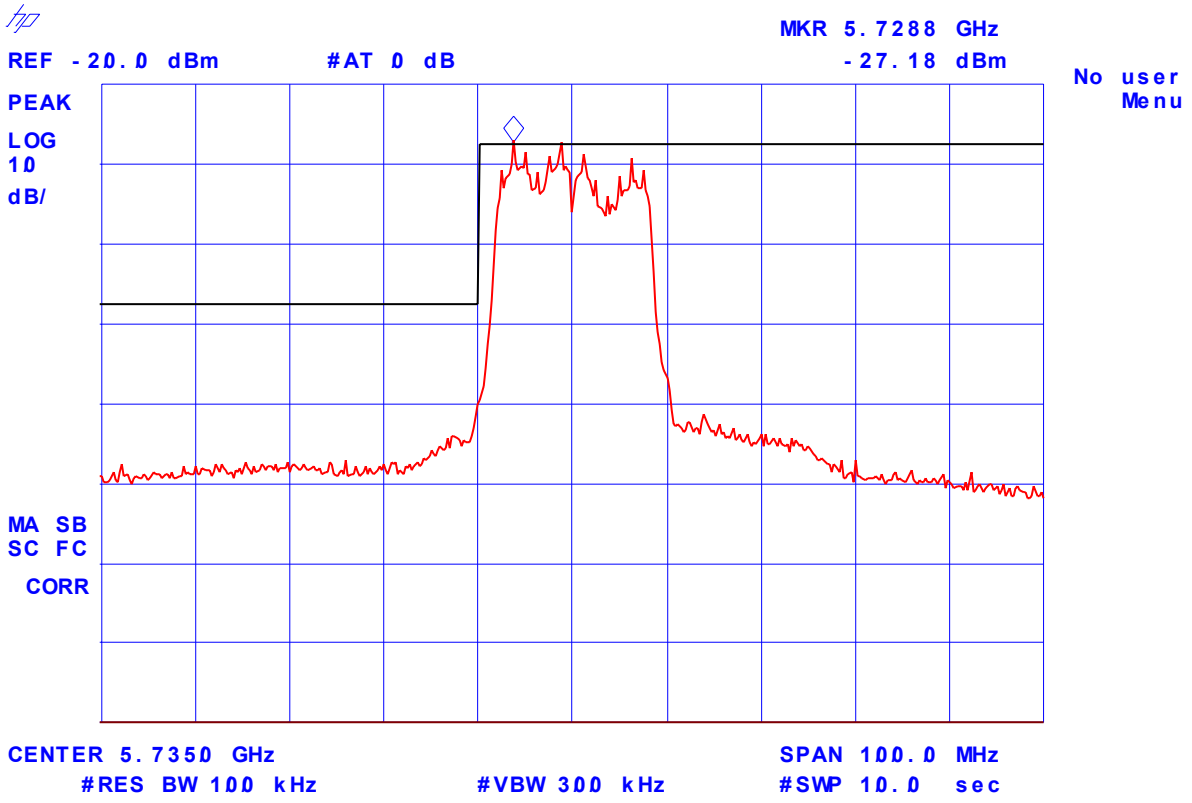
Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz

6.10.5. Plots & Test Data

- Please refer to Plots # 15 through 22 below for Conducted Band-edge with different modulations { 64 QAM (maximum data rate: 54 Mb/s), 16QAM (Maximum data rate: 36 Mb/s), QPSK (Maximum data rate: 18 Mb/s) and BPSK (Maximum Data Rate: 9 Mb/s) } and minimum rf conducted power output.
- Please refer to Plots # 23 through 30 below for Conducted Band-edge with different modulations { 64 QAM (maximum data rate: 54 Mb/s), 16QAM (Maximum data rate: 36 Mb/s), QPSK (Maximum data rate: 18 Mb/s) and BPSK (Maximum Data Rate: 9 Mb/s) } and maximum rf conducted power output.

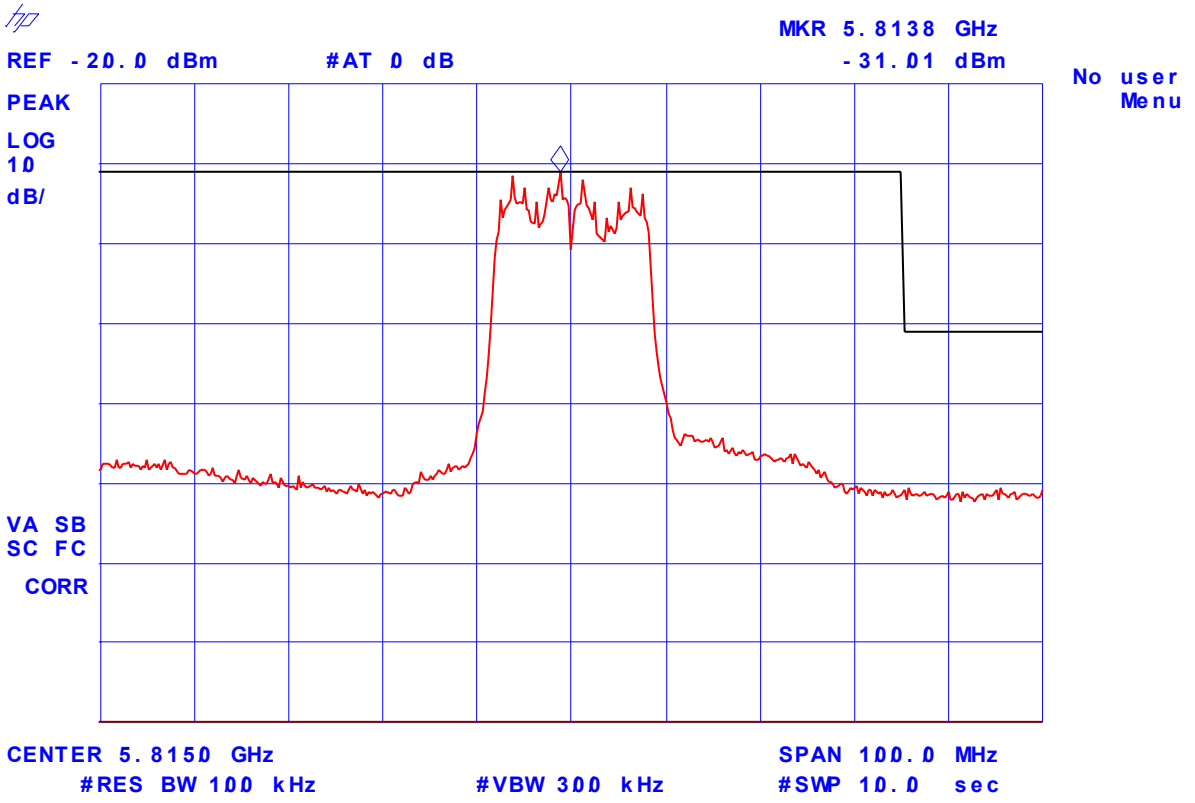
Plot #15: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: -5.36 dBm



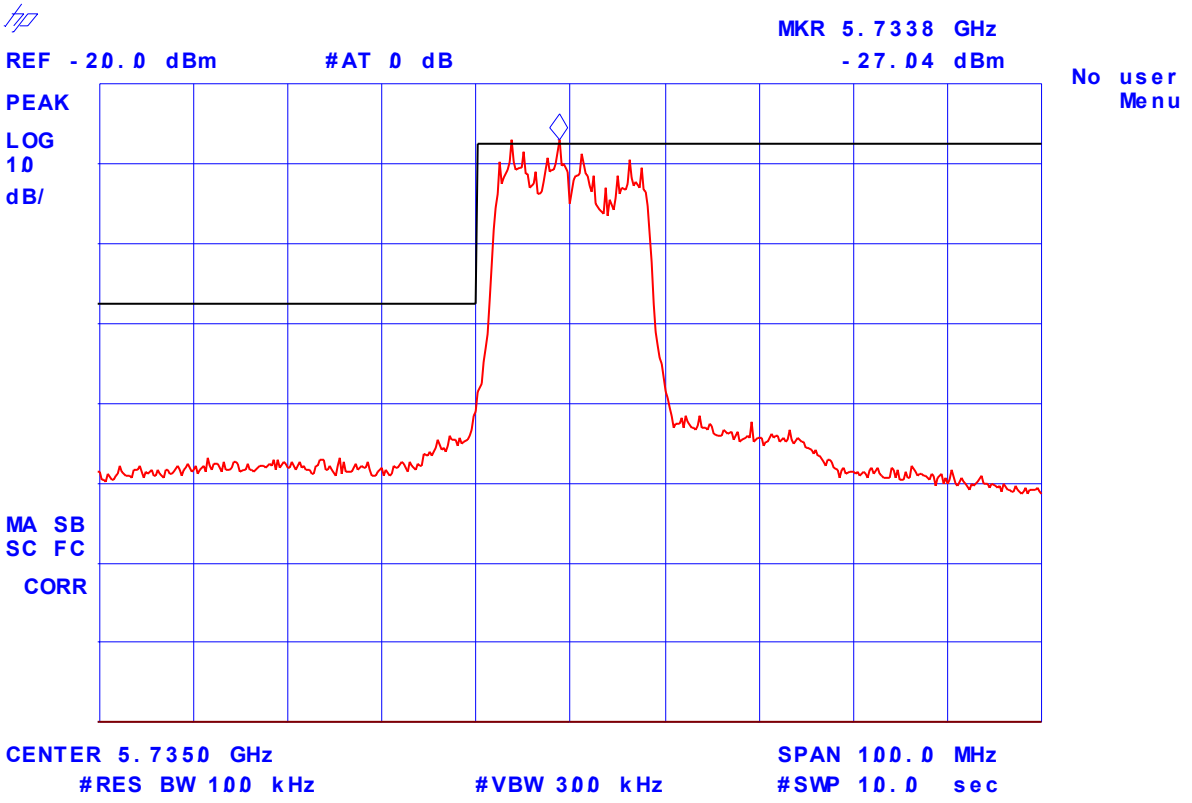
Plot #16: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: -9.06 dBm



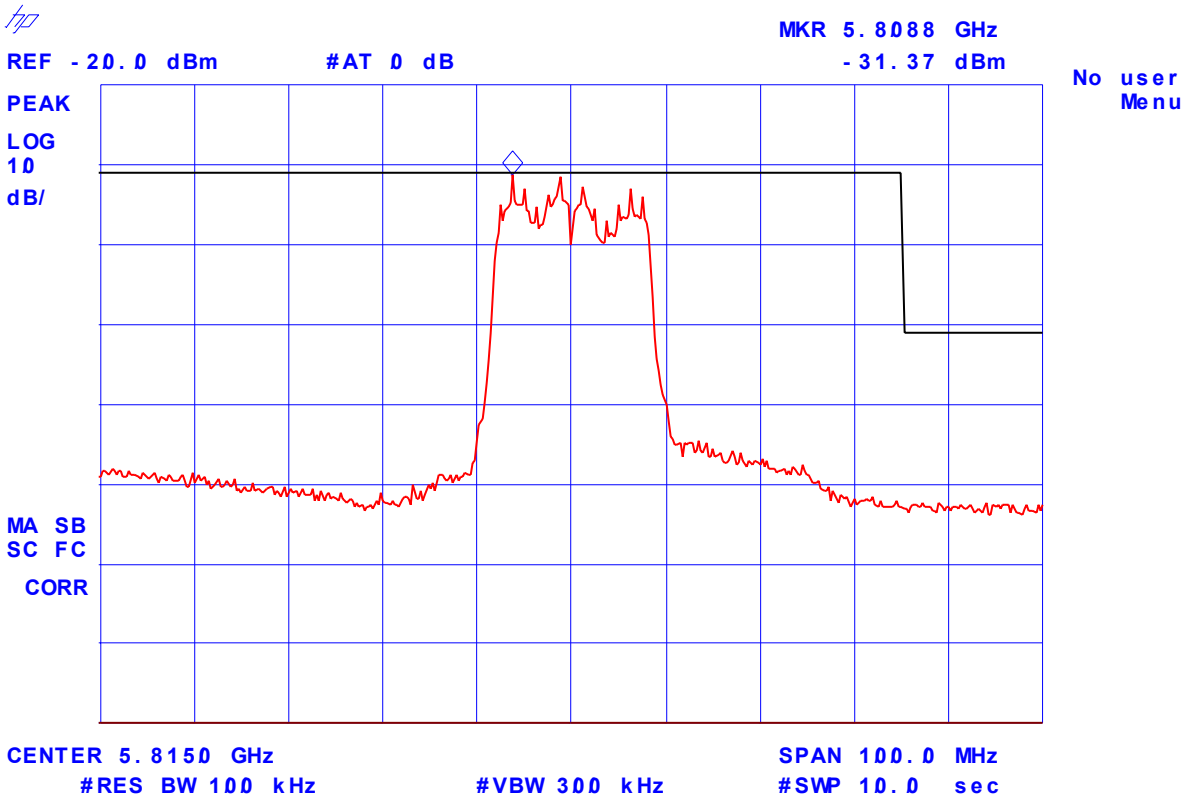
Plot #17: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, 16 QAM (36 Mb/s), Power Output: -5.36 dBm



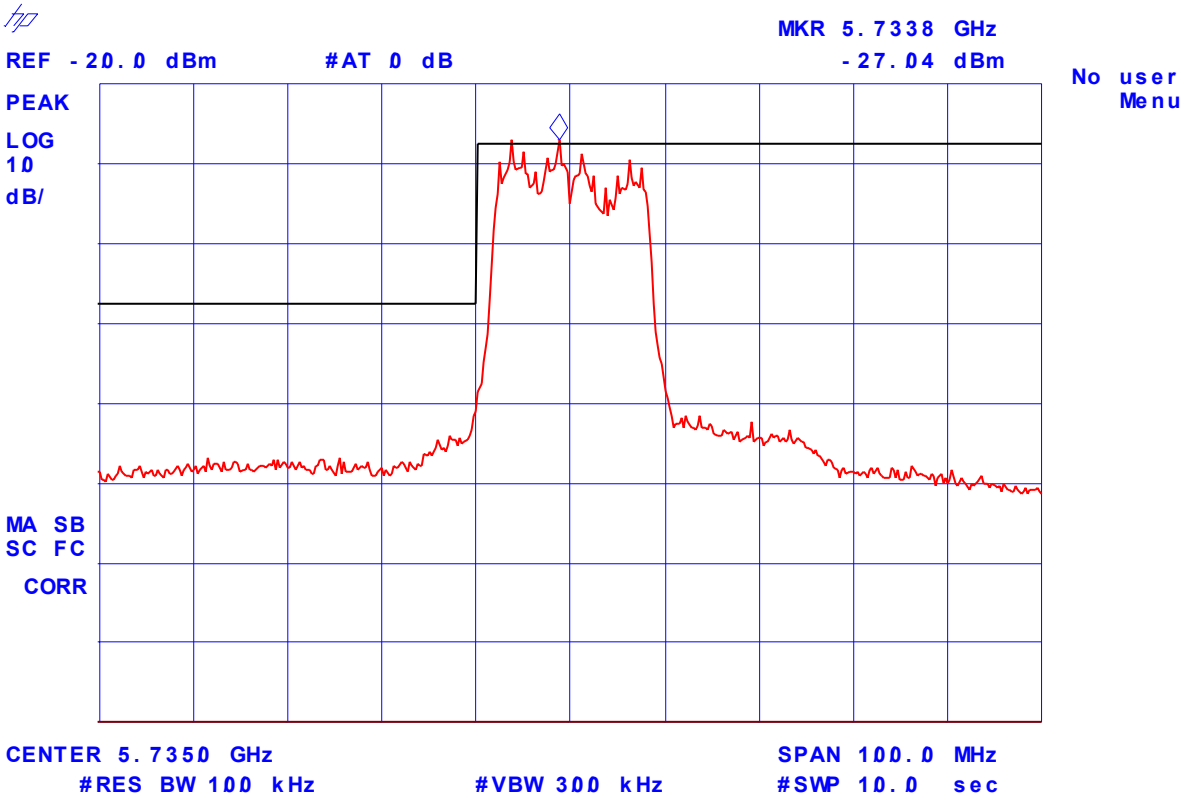
Plot #18: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, 16 QAM (36 Mb/s), Power Output: -9.06 dBm



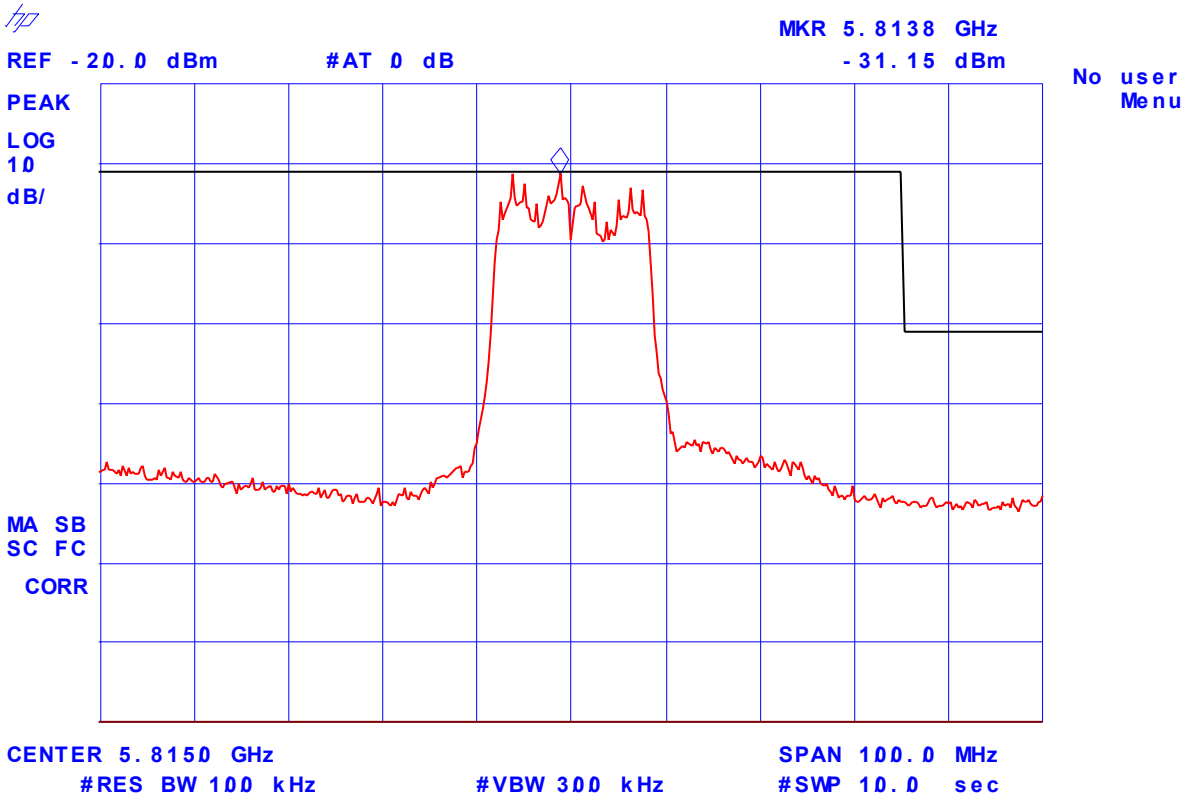
Plot #19: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, QPSK (18 Mb/s), Power Output: -5.36 dBm



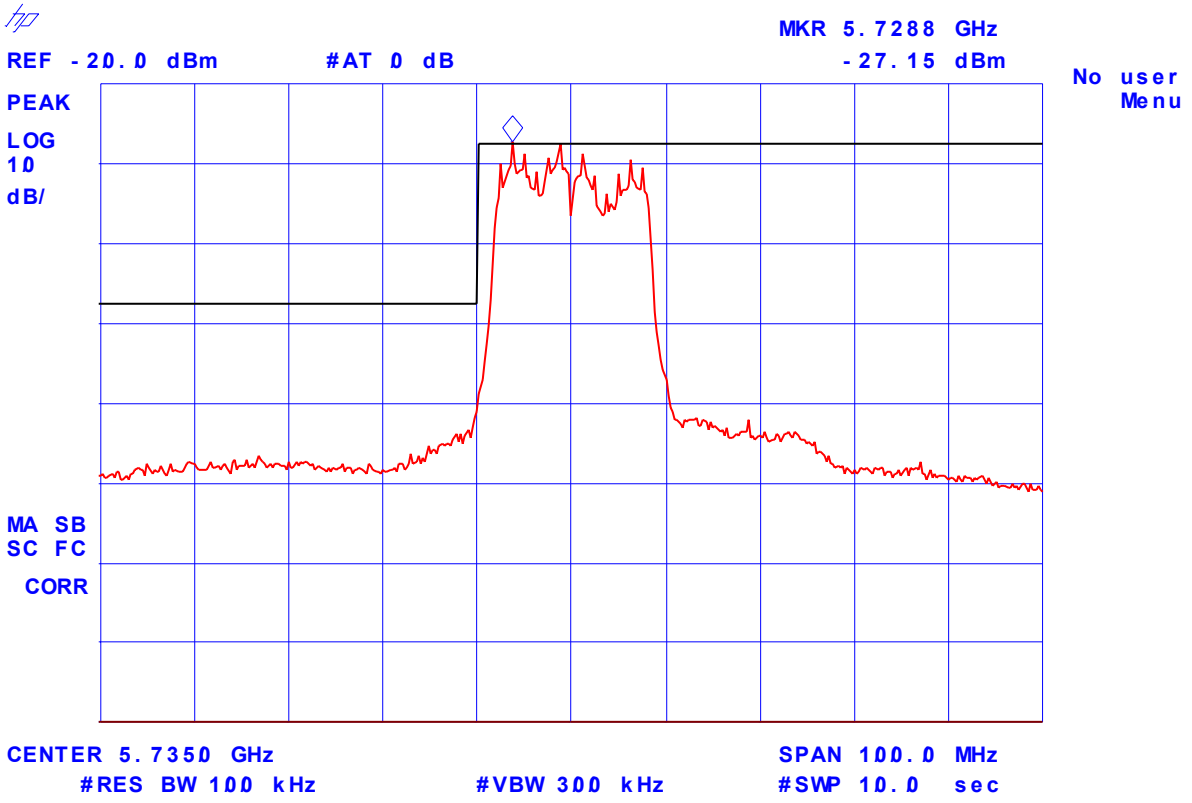
Plot #20: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, QPSK (18 Mb/s), Power Output: -9.06 dBm



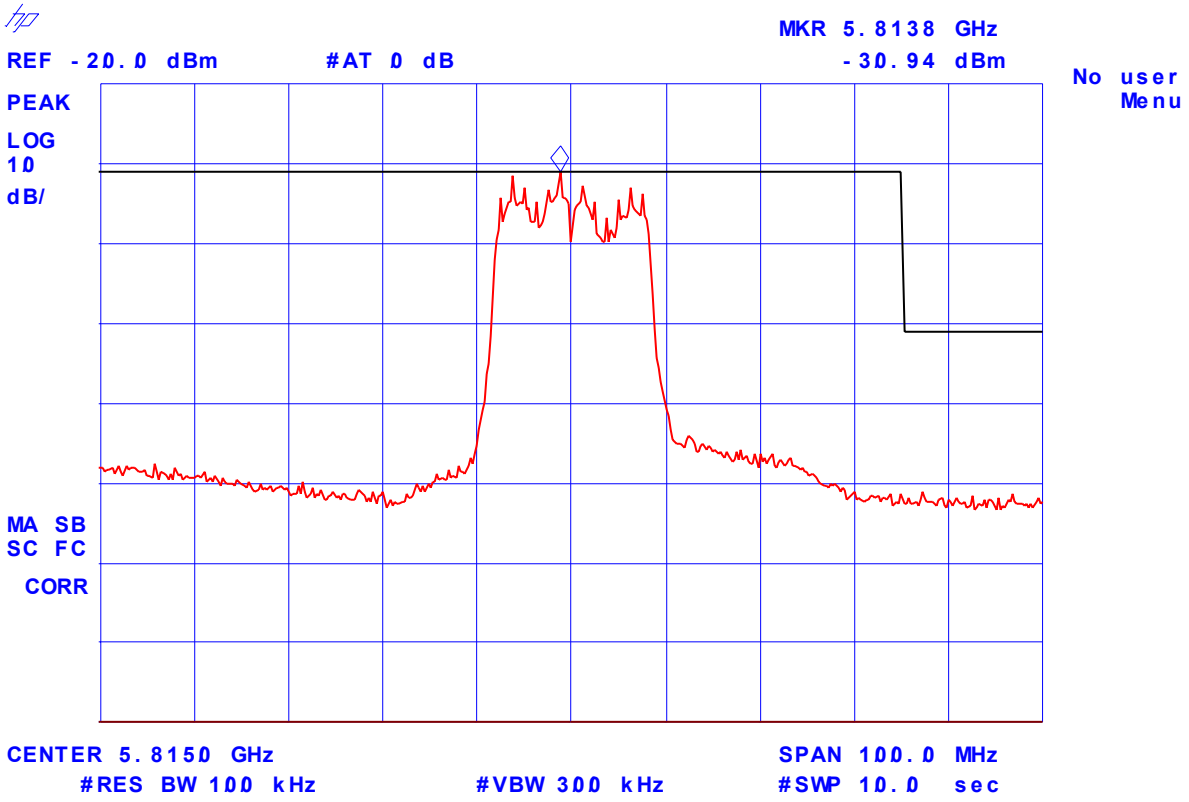
Plot #21: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, BPSK (9 Mb/s), Power Output: -5.36 dBm



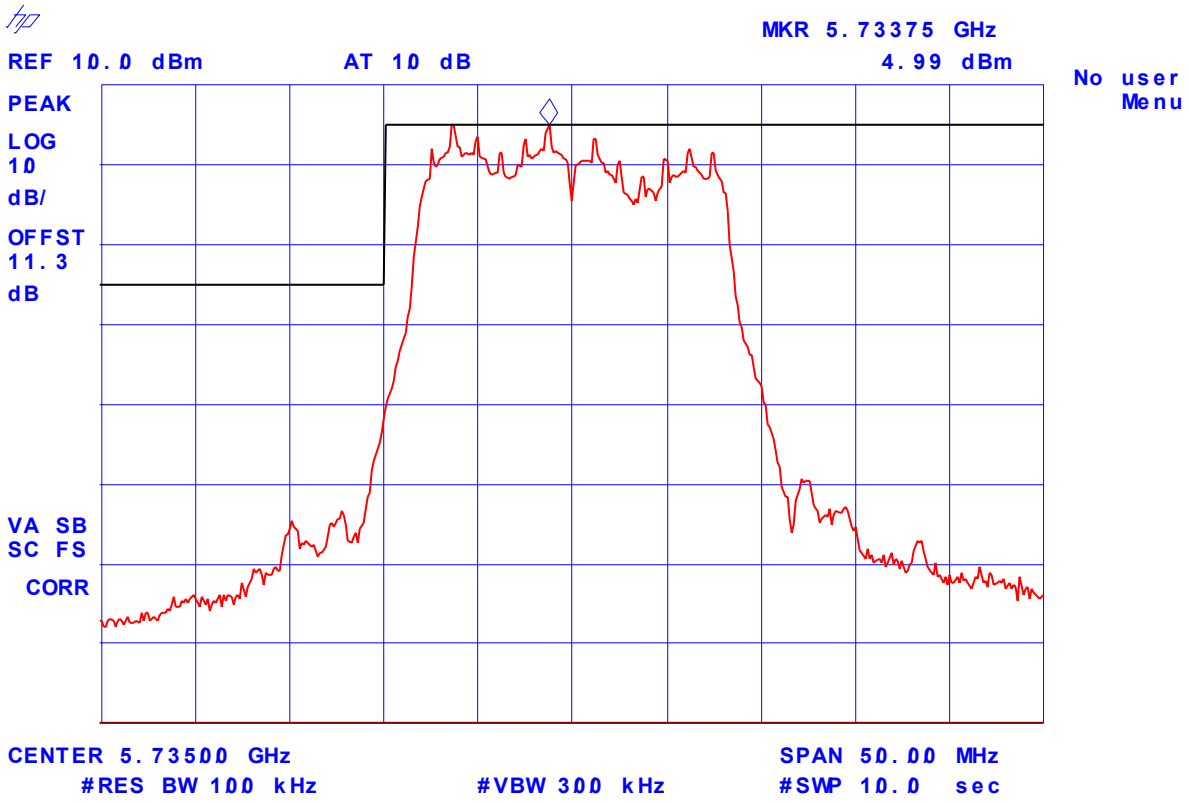
Plot #22: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, BPSK (9 Mb/s), Power Output: -9.06 dBm



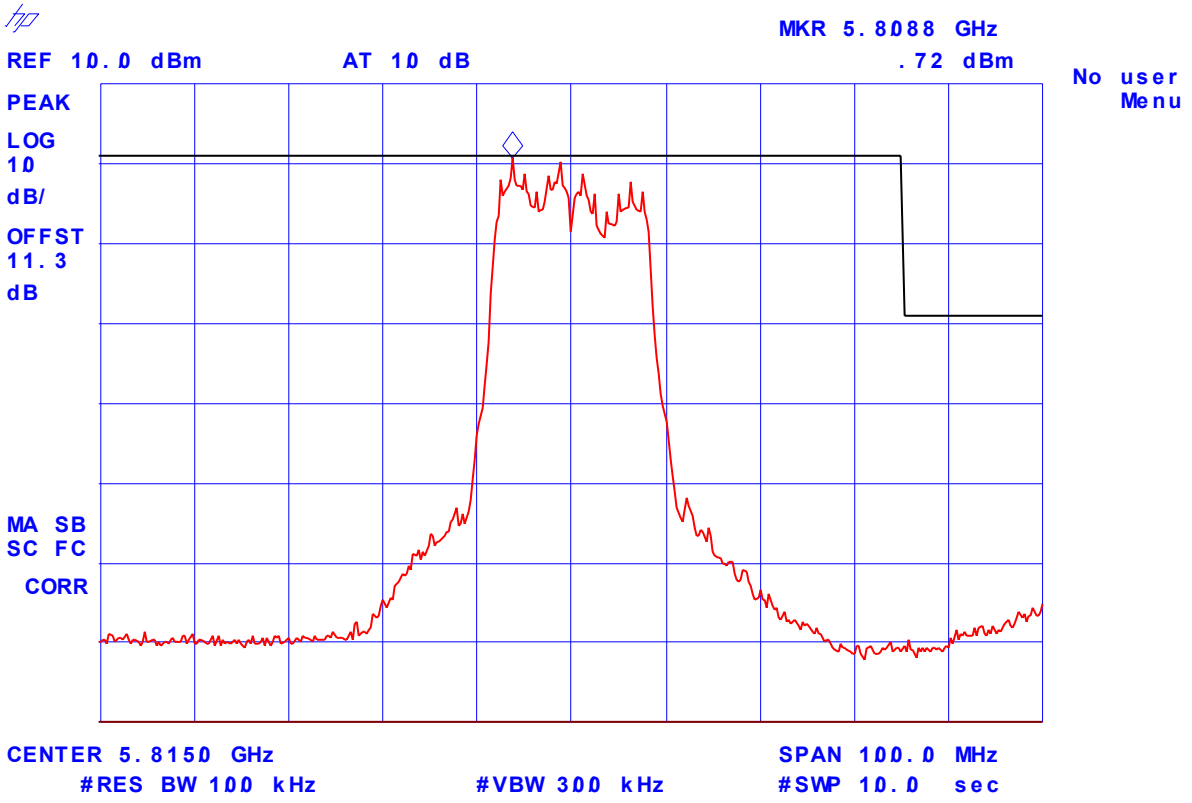
Plot #23: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



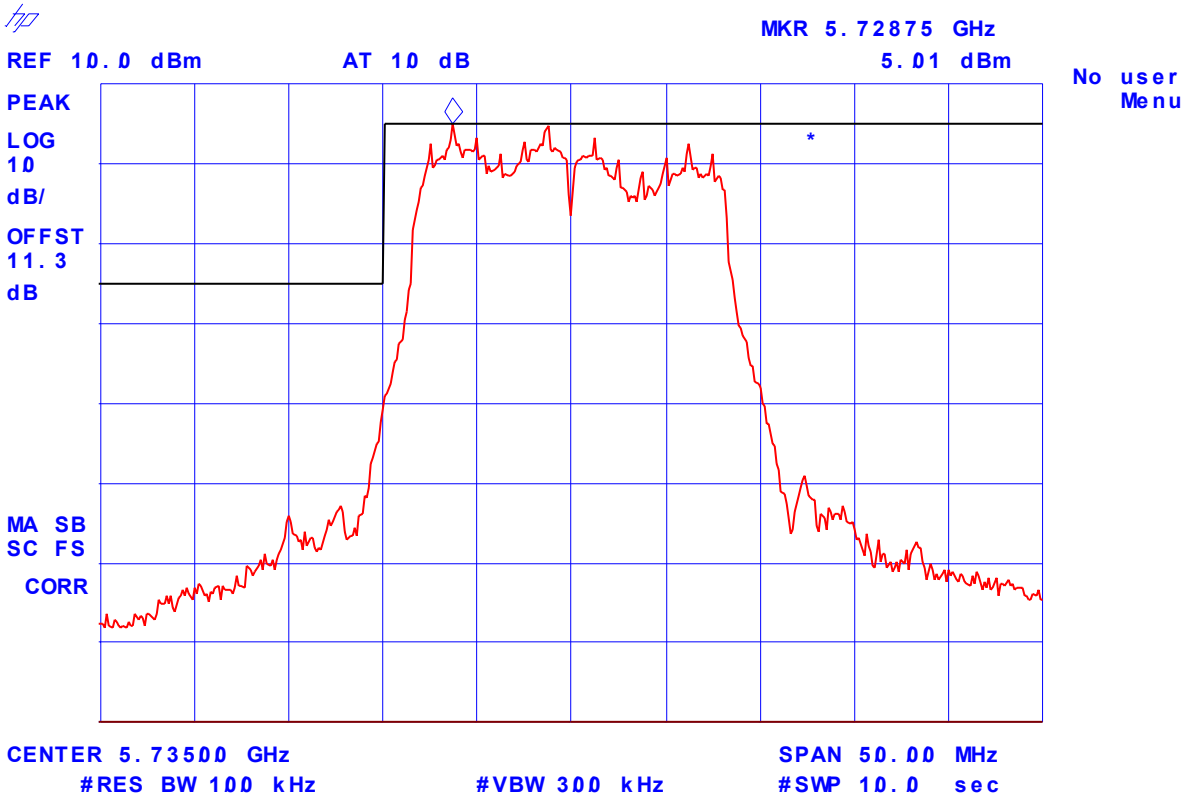
Plot #24: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



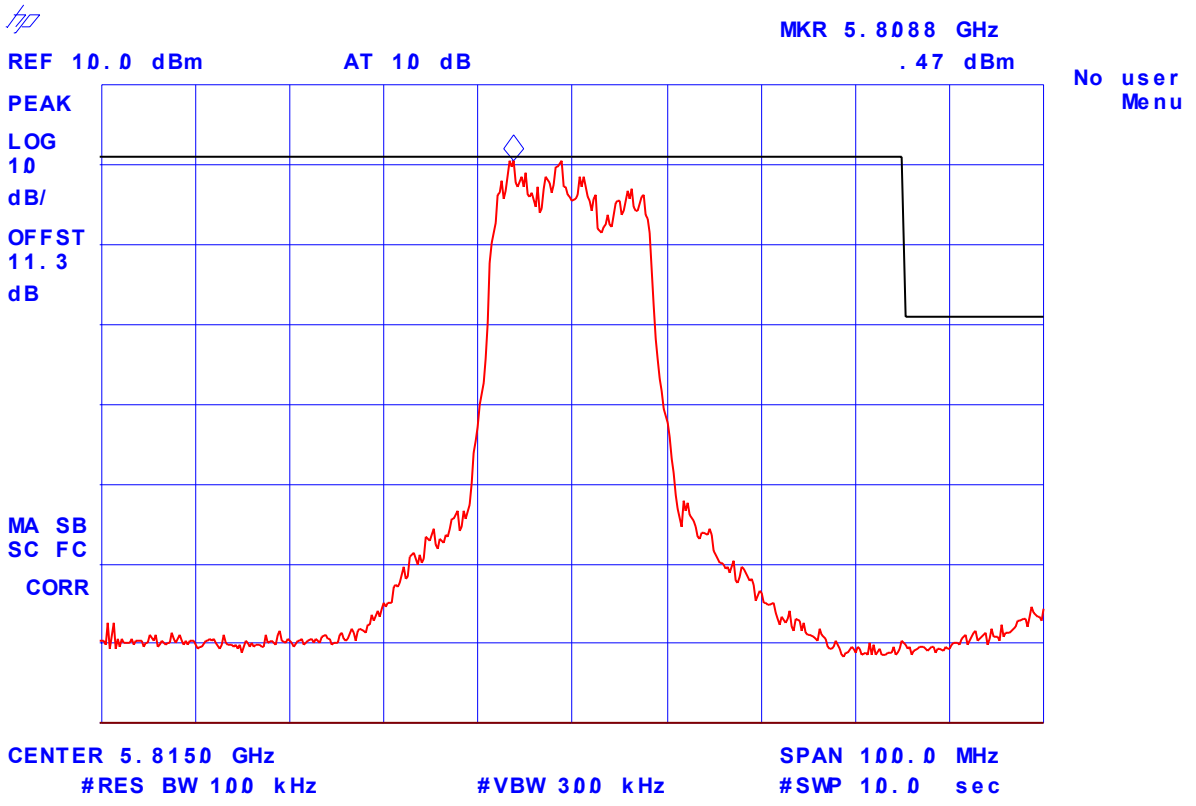
Plot #25: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, 16 QAM (36 Mb/s), Power Output: 25.30 dBm



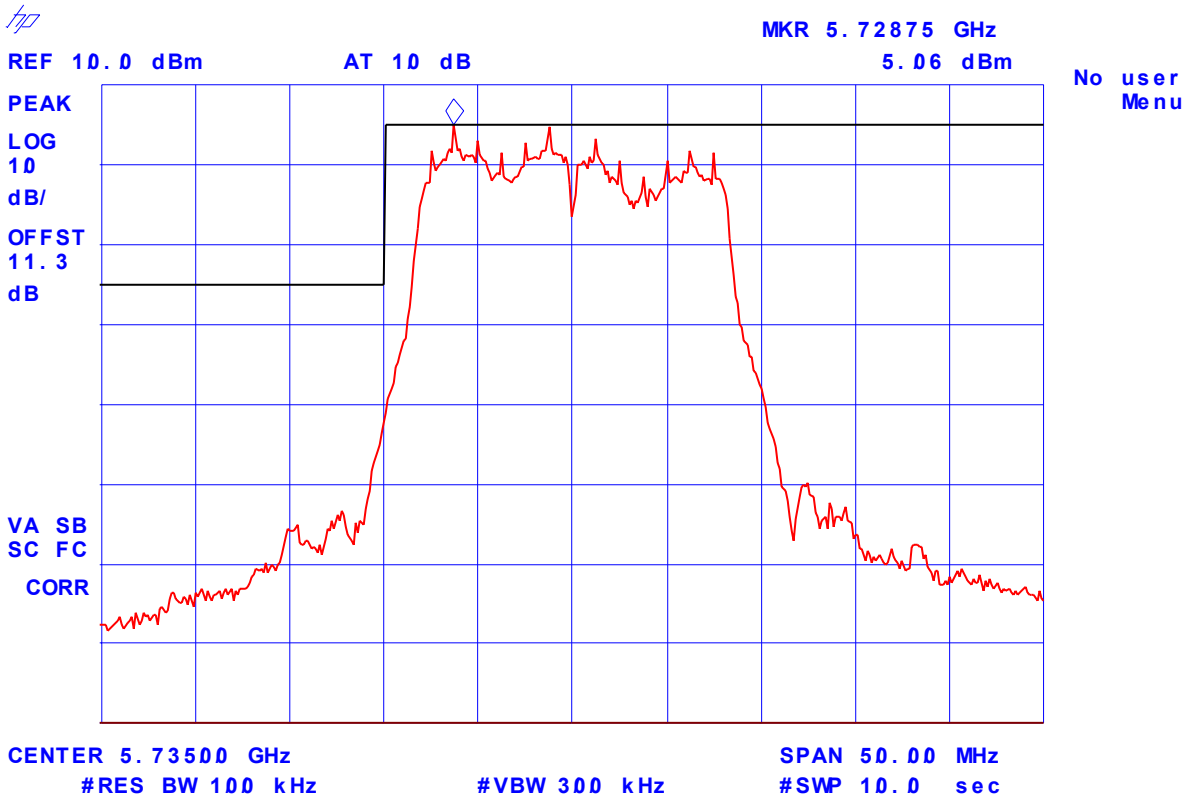
Plot #26: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, 16 QAM (36 Mb/s), Power Output: 20.74 dBm



Plot #27: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, QPSK (18 Mb/s), Power Output: 25.30 dBm



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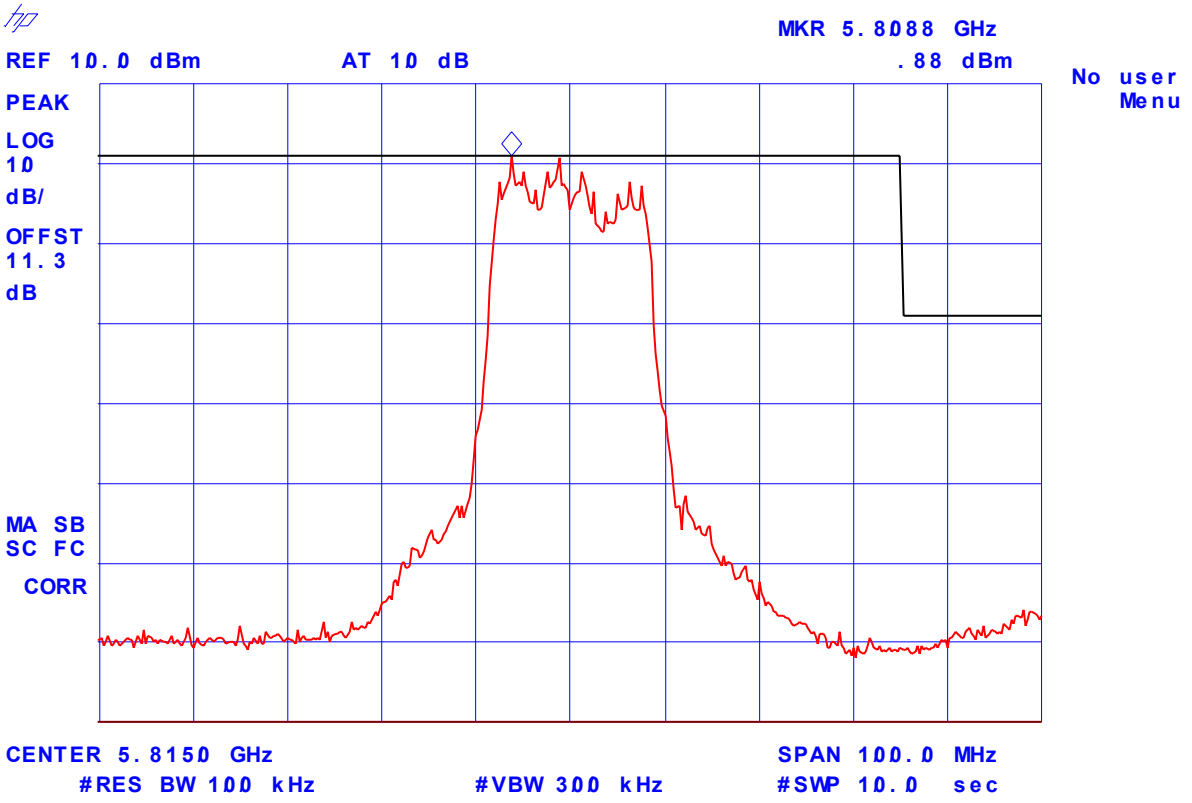
Plot #28: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, QPSK (18 Mb/s), Power Output: 20.74 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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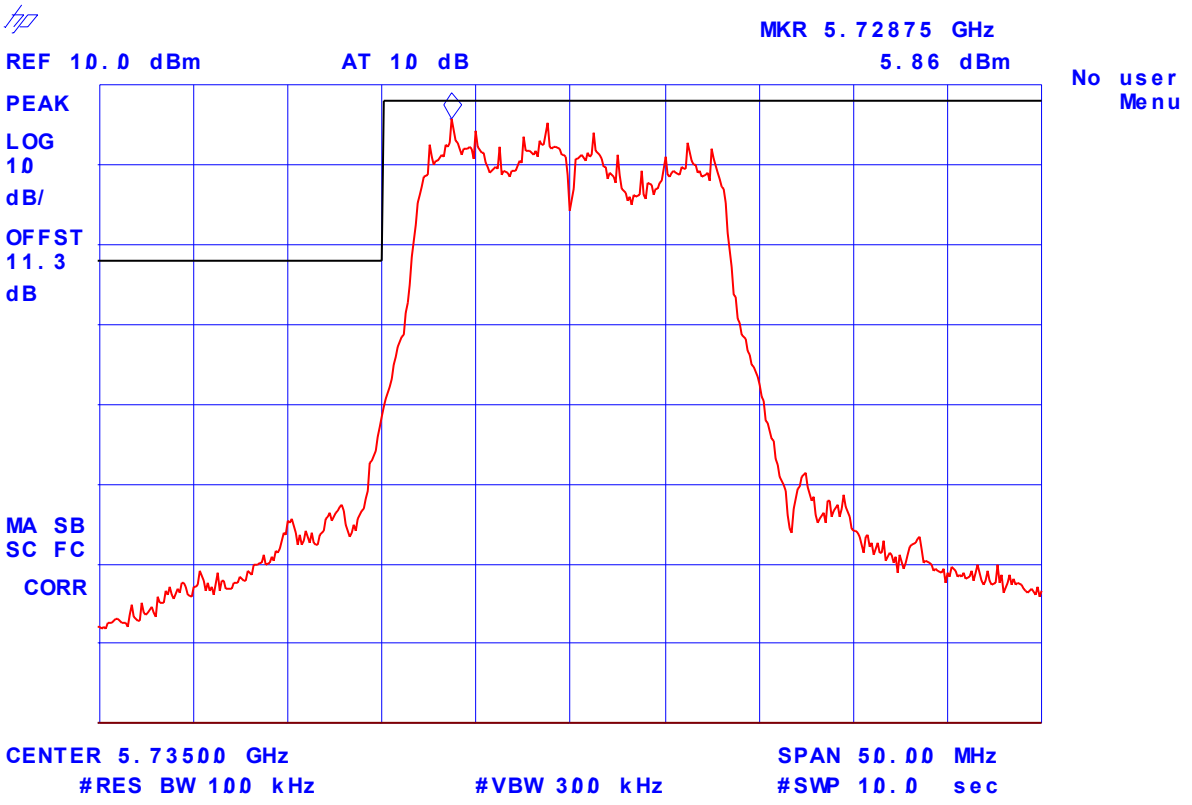
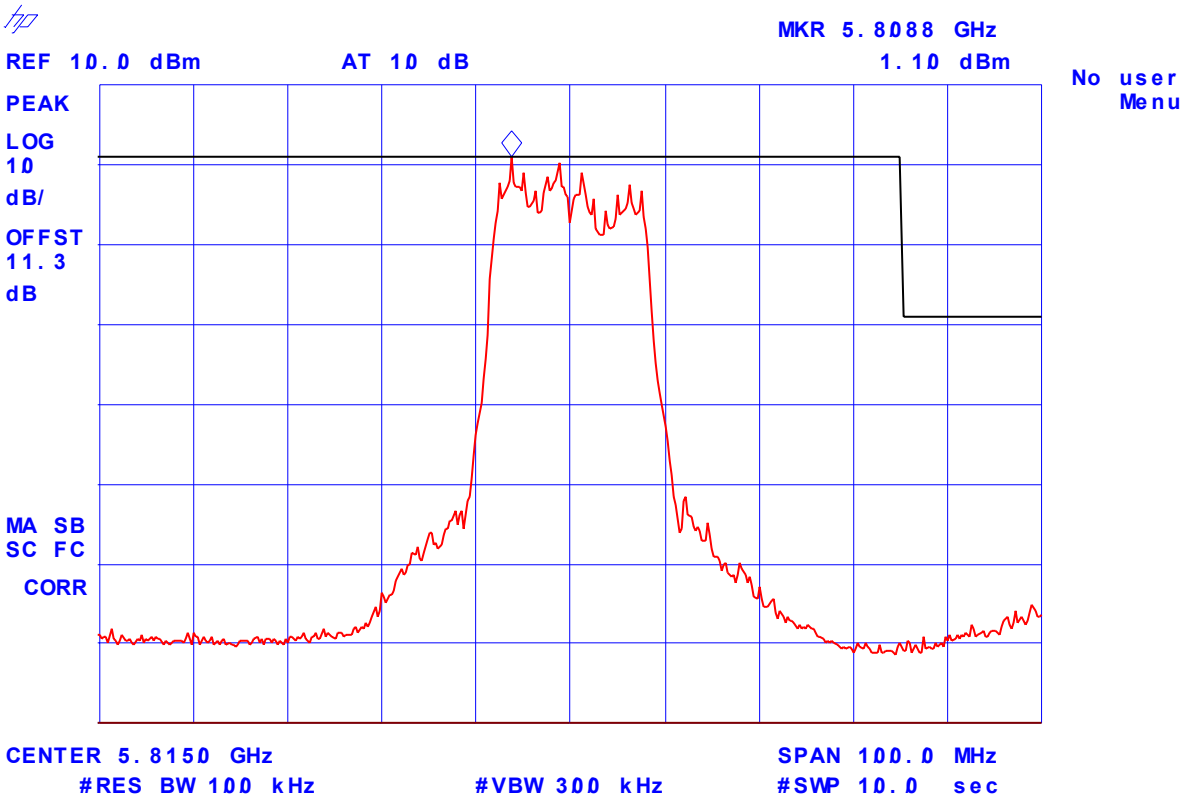
Plot #29: Band-Edge Conducted Emissions

Channel 1, 5735 MHz, BPSK (9 Mb/s), Power Output: 25.30 dBm



Plot #30: Band-Edge Conducted Emissions

Channel 5, 5815 MHz, BPSK (9 Mb/s), Power Output: 20.74 dBm



6.11. TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED), FCC CFR 47, PARA. 15.247(C)

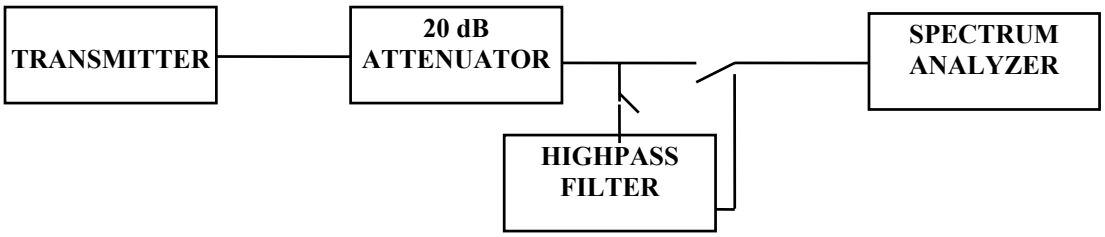
6.11.1. Limits

In any 100 kHz bandwidth outside the frequency band in which the New Technology Digital Modulation intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

6.11.2. Method of Measurements

Refer to Exhibit 8, Sec. 8.5.1 of this test report, FCC 15.247(c) & ANSI C63-4:1992

6.11.3. Test Arrangement



6.11.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz

6.11.5. Plots & Test Data

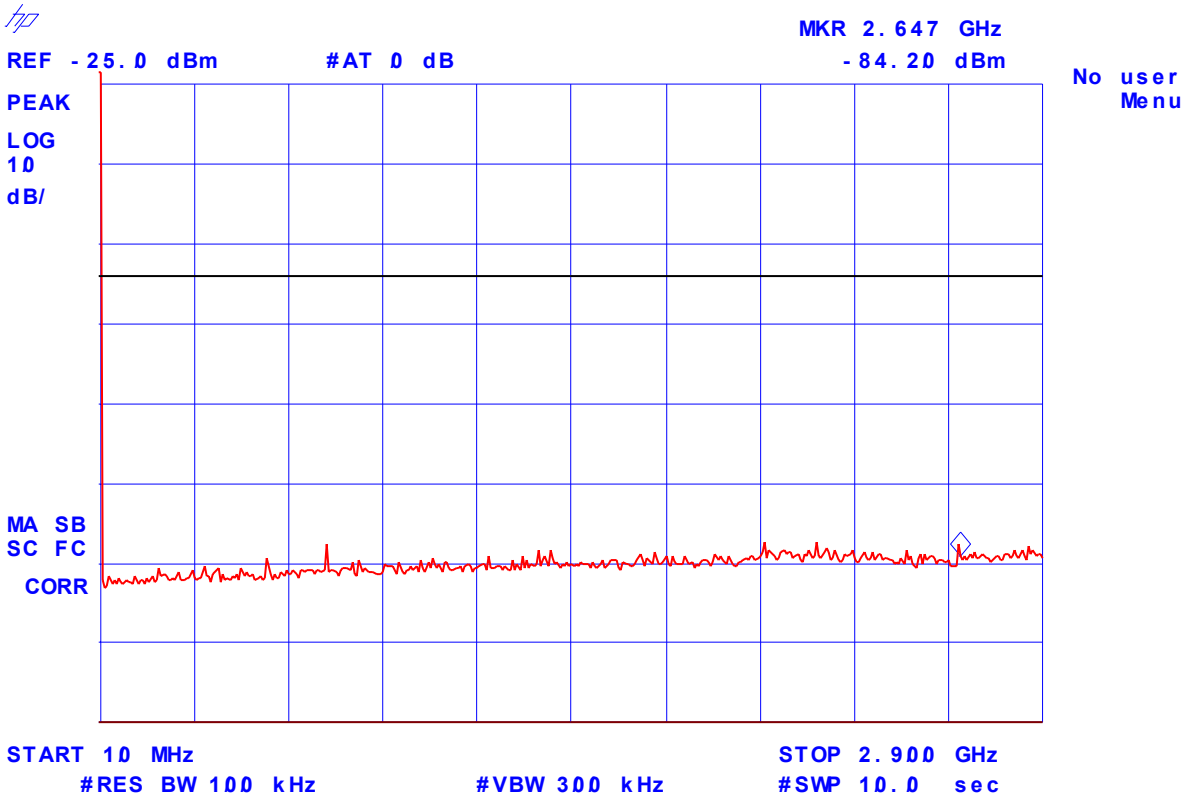
No significant rf emissions were found at the antenna ports in the frequency range from 10 MHz to 60 GHz.

- Please refer to Plots # 31 through 45 below for Conducted emissions with 64 QAM modulation (maximum data rate: 54 Mb/s) and minimum rf conducted power output.
- Please refer to Plots # 46 through 60 below for Conducted Band-edge with 64 QAM modulation (maximum data rate: 54 Mb/s) and maximum rf conducted power output.

Remarks: Since the spectrum bandwidth and rf output powers are the same for all different modulation, tests with different modulation are not necessary to be repated.

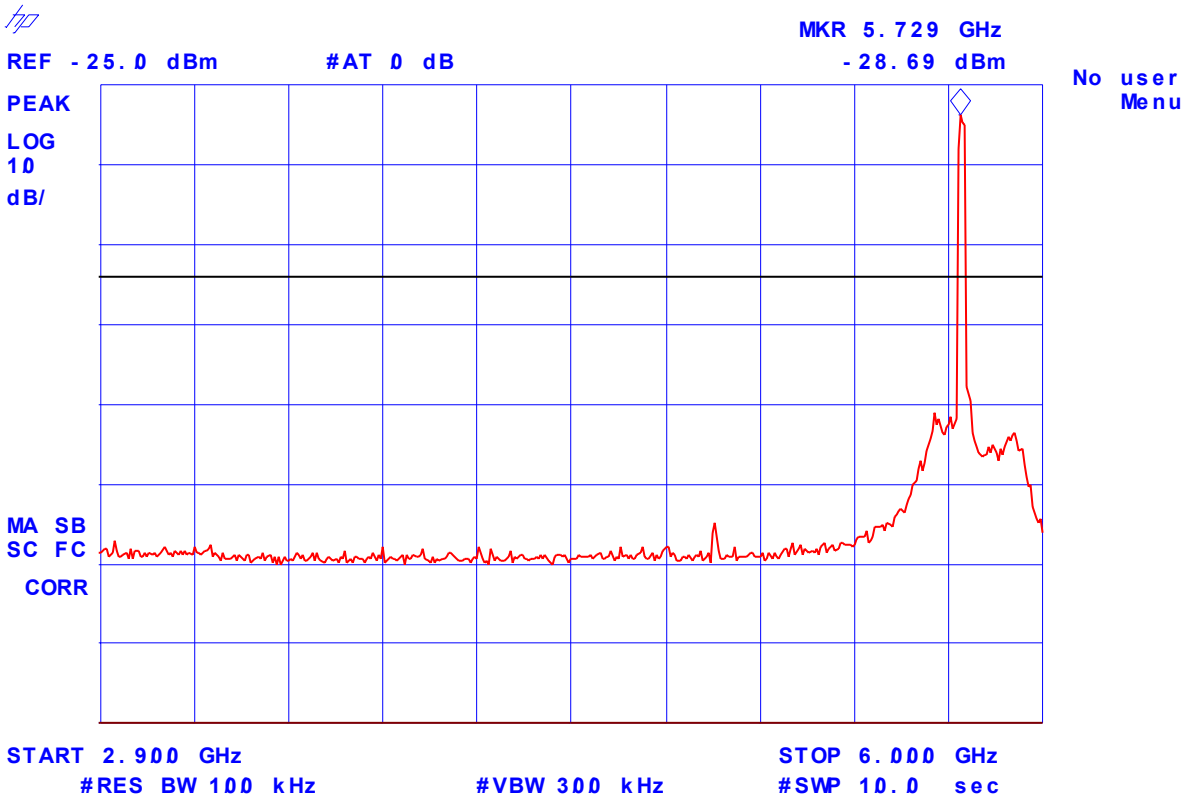
PLOT# 31: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: -5.36 dBm



PLOT# 32: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: -5.36 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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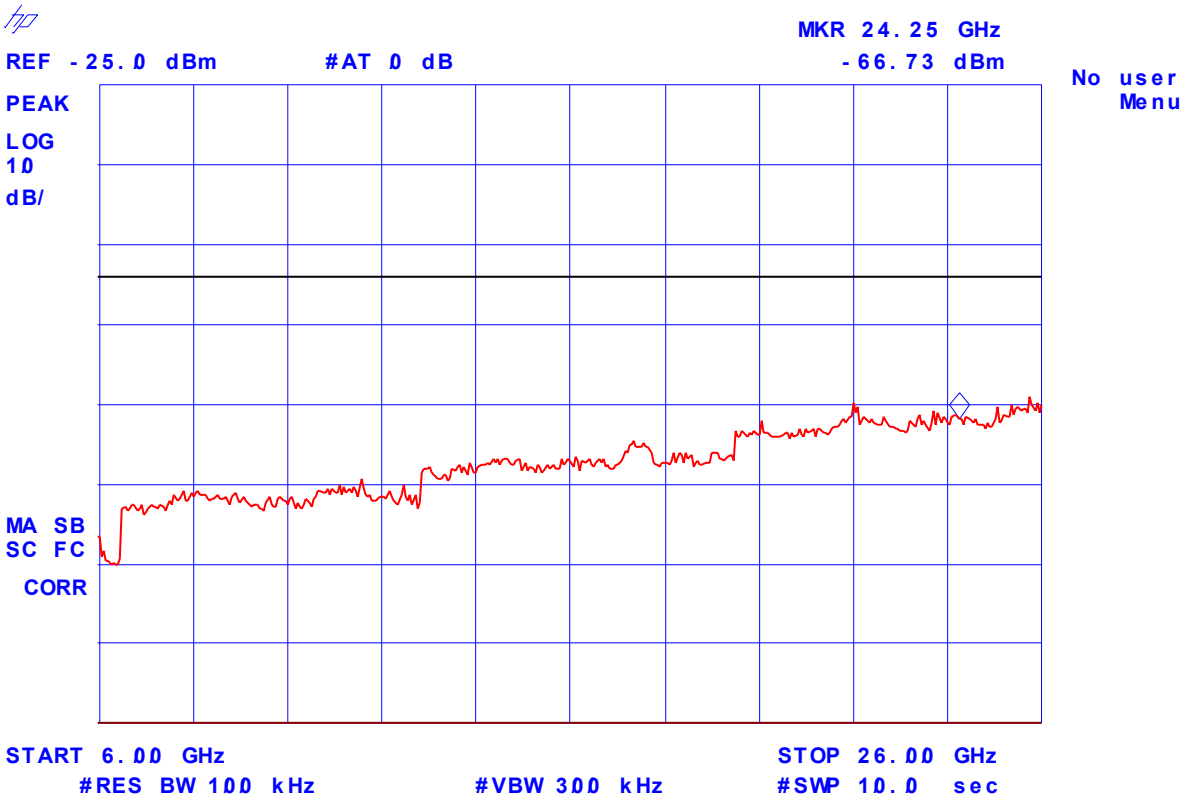
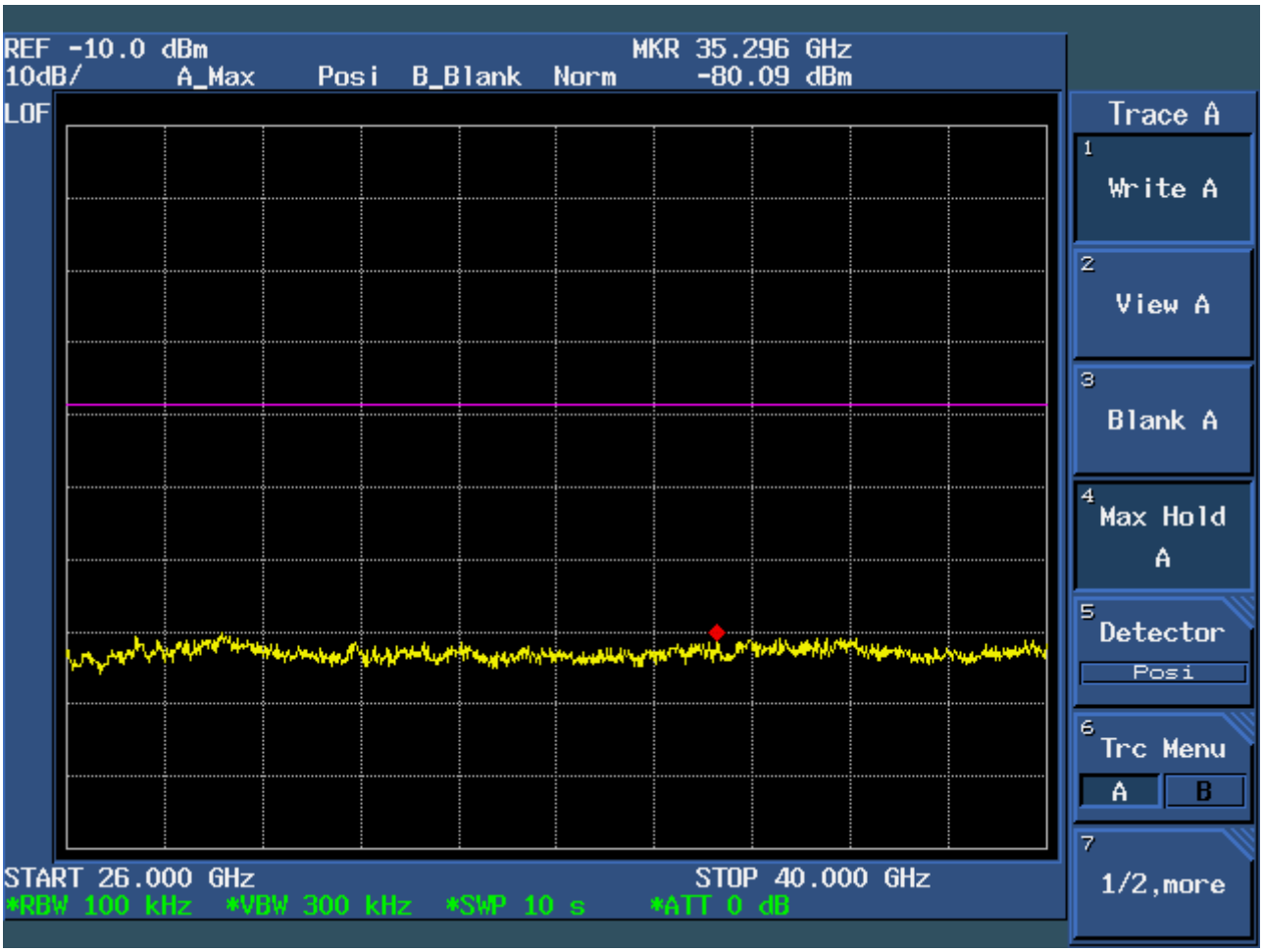
PLOT# 33: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: -5.36 dBm



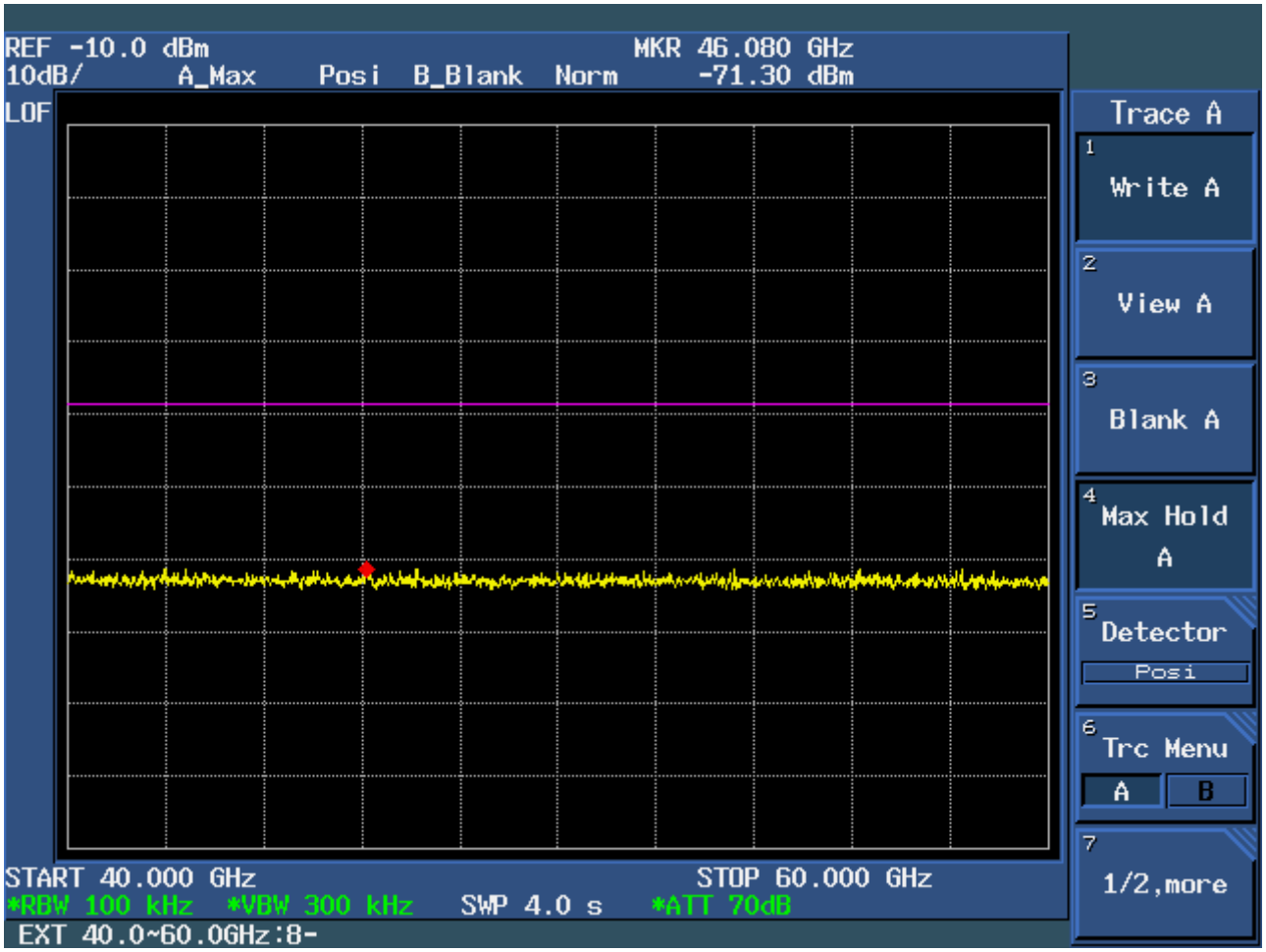
PLOT# 34: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: -5.36 dBm



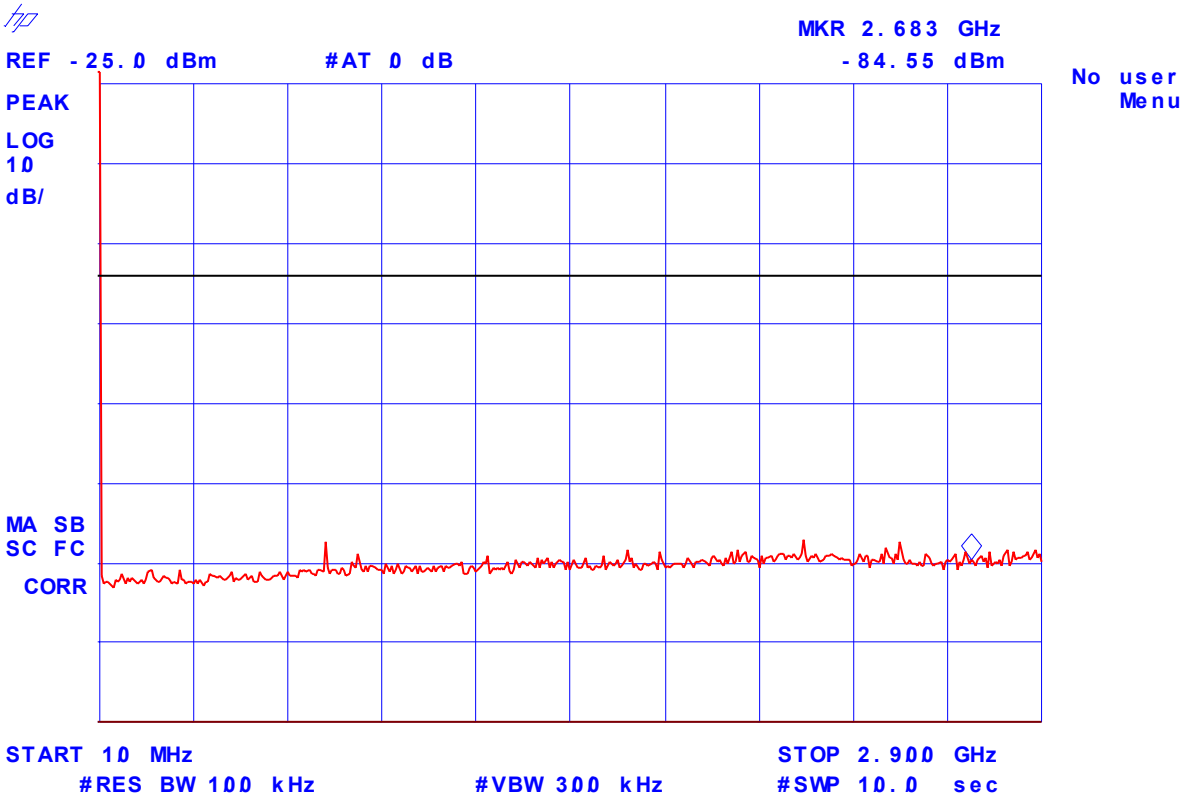
PLOT# 35: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: -5.36 dBm



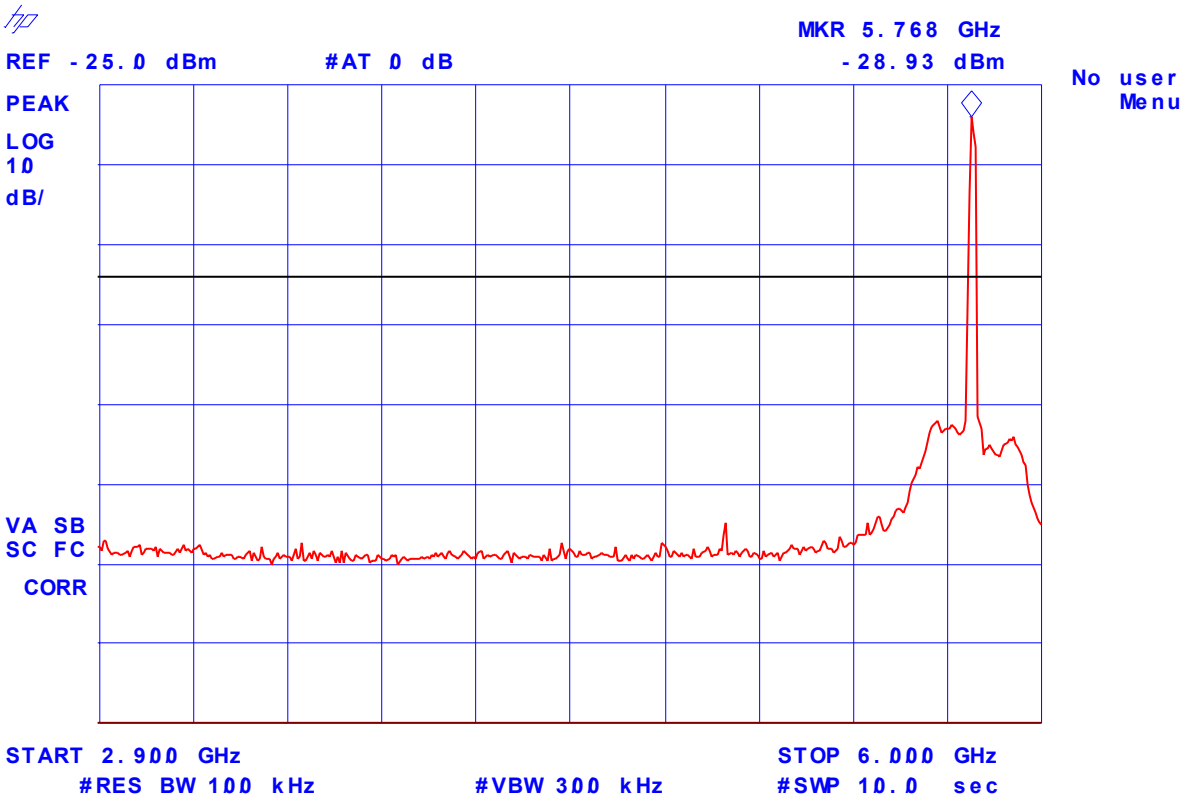
PLOT# 36: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: -7.50 dBm



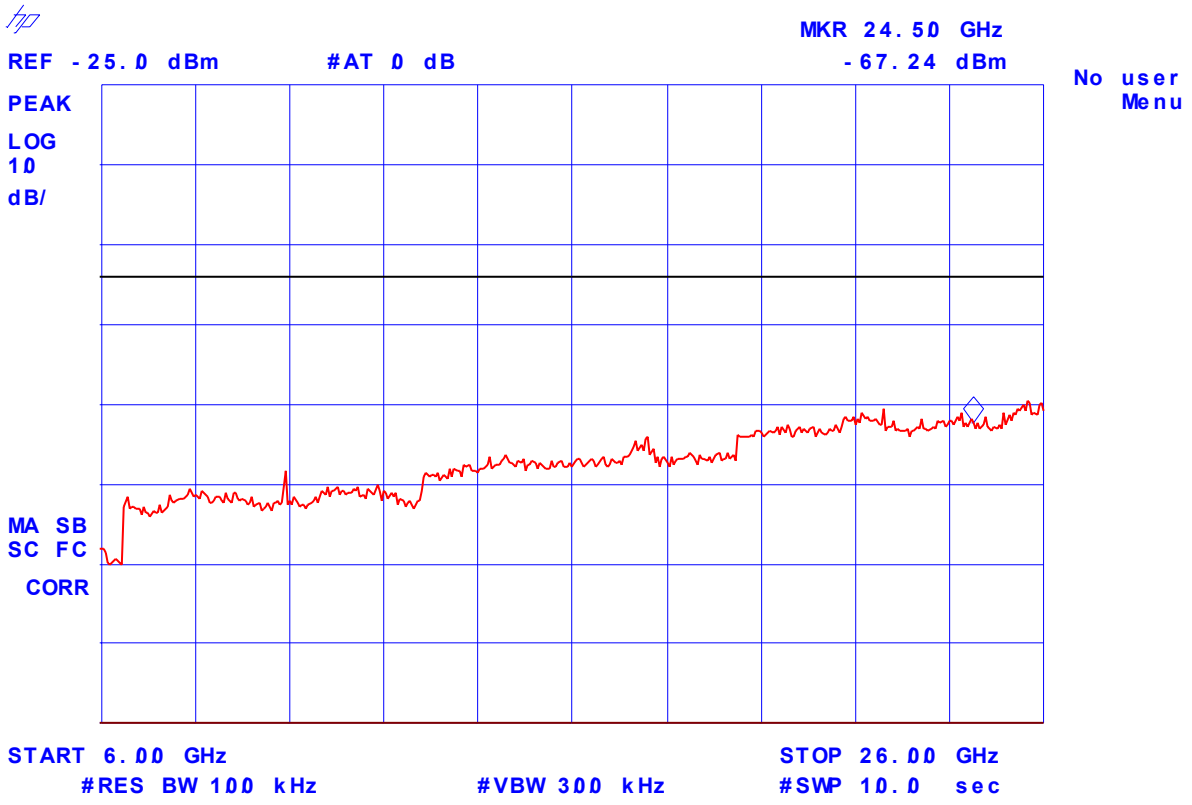
PLOT# 37: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: -7.50 dBm



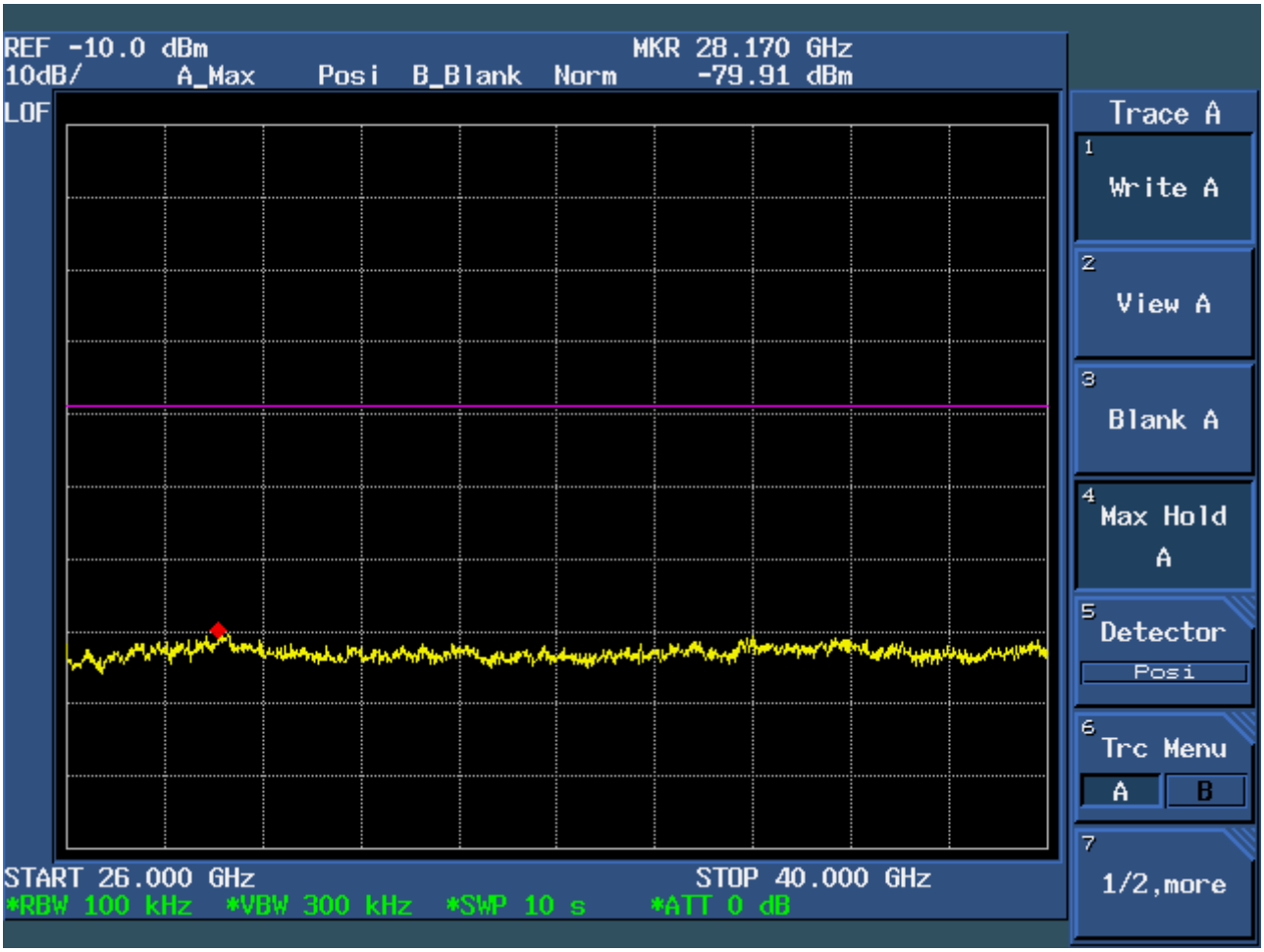
PLOT# 38: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: -7.50 dBm



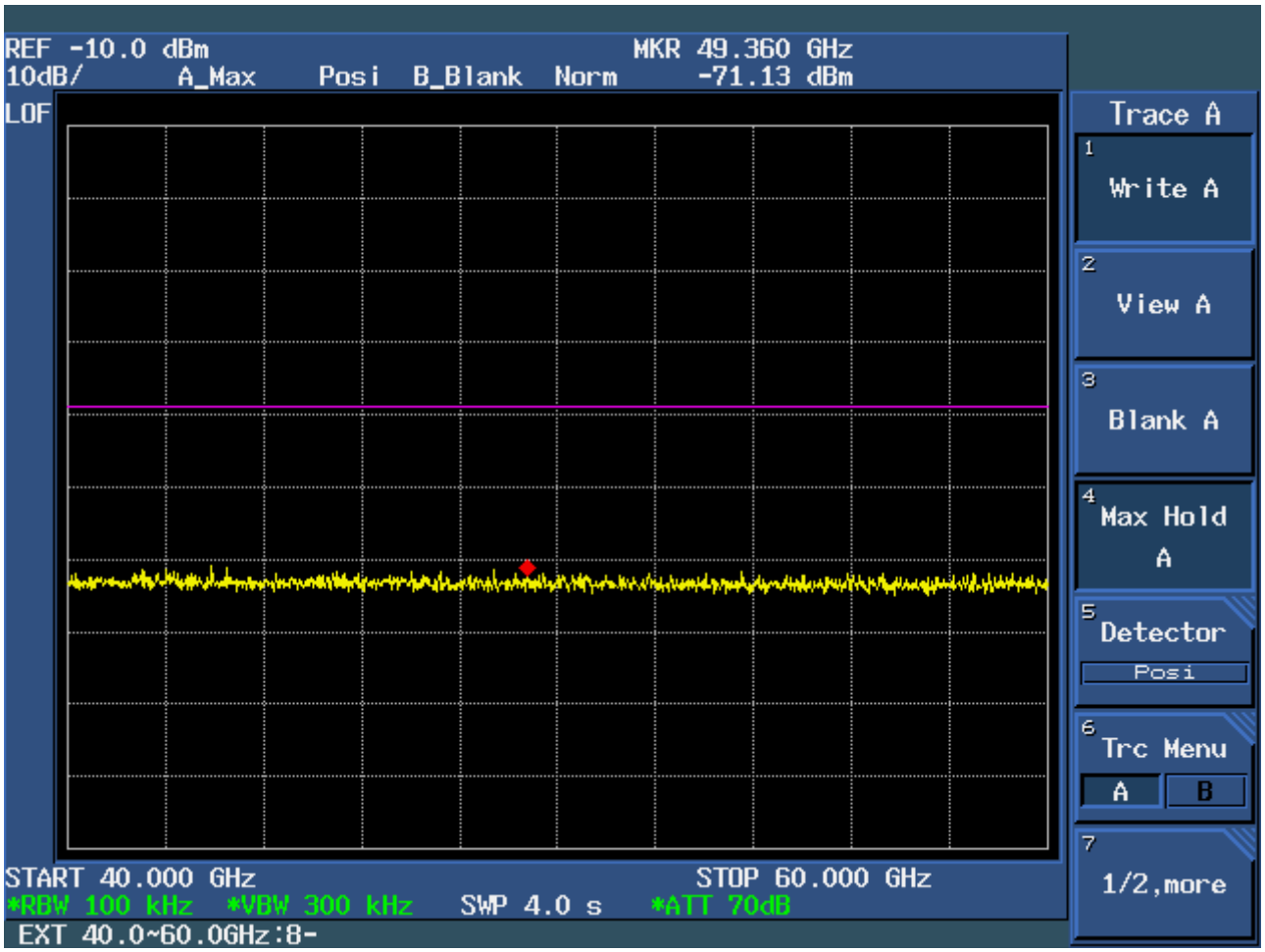
PLOT# 39: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: -7.50 dBm



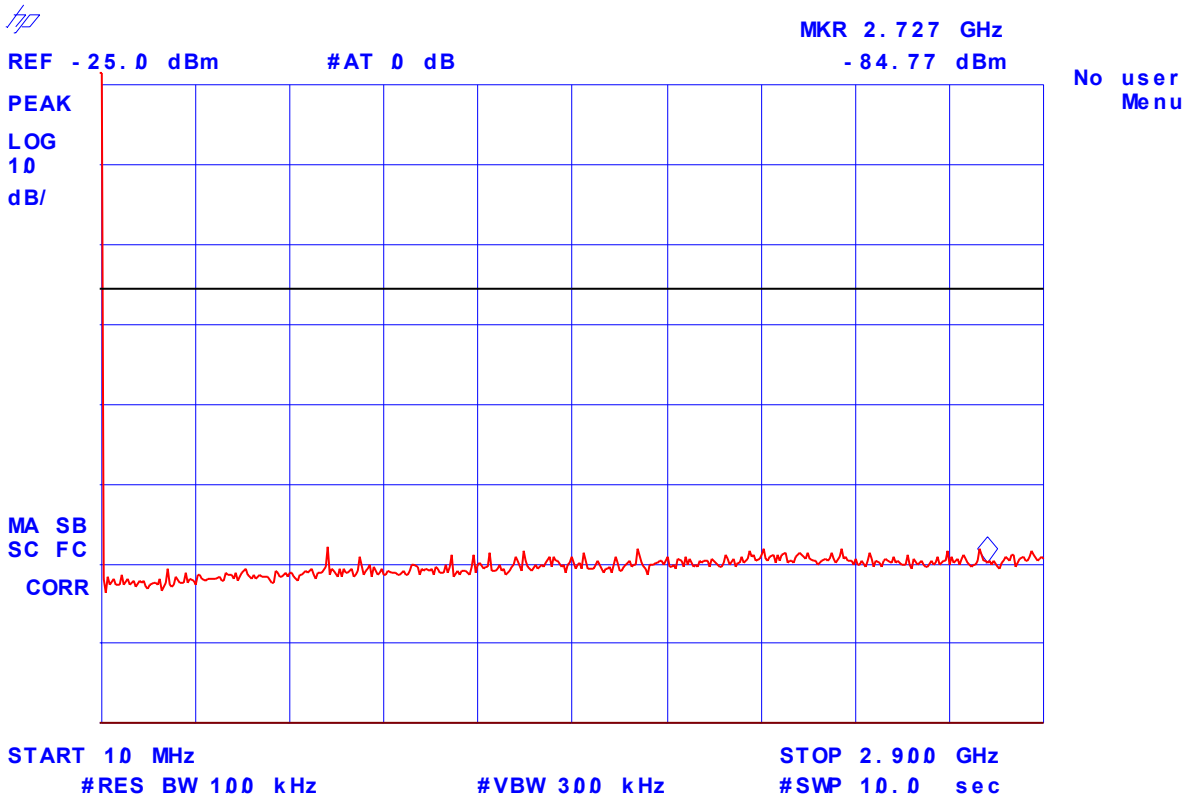
PLOT# 40: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: -7.50 dBm



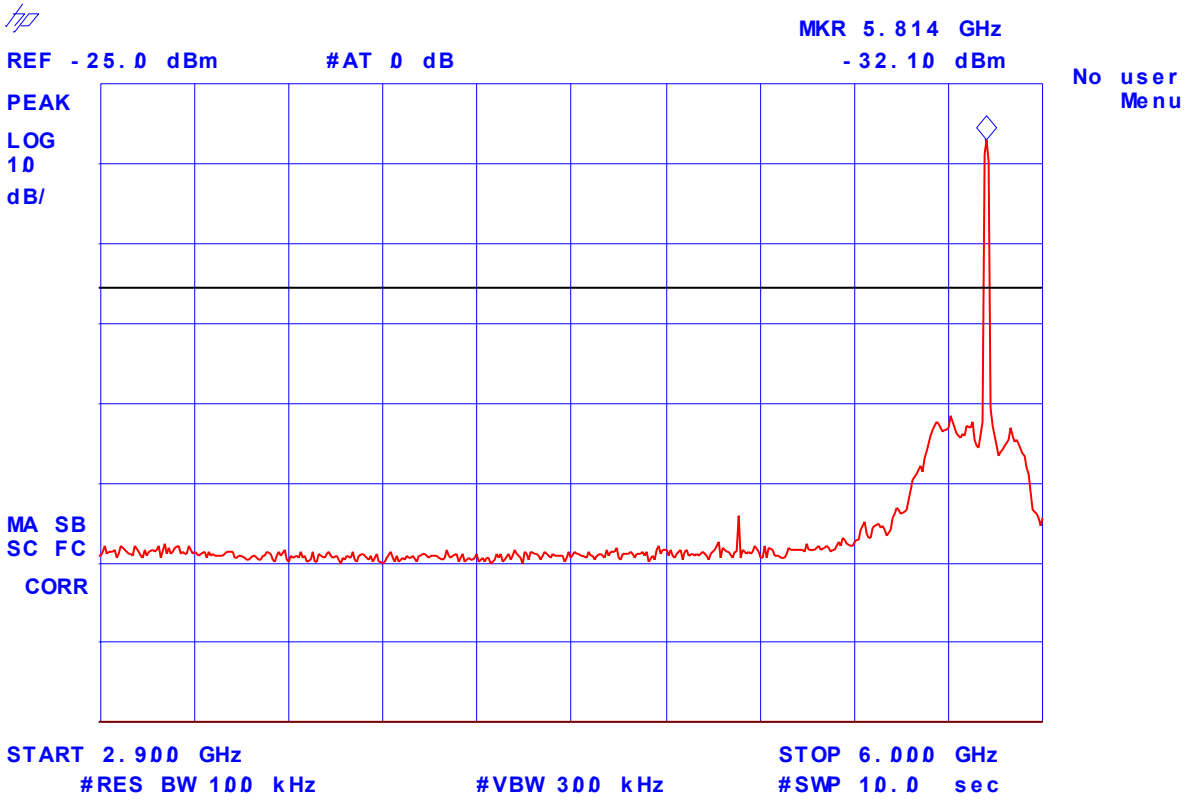
PLOT# 41: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: -9.06 dBm



PLOT# 42: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: -9.06 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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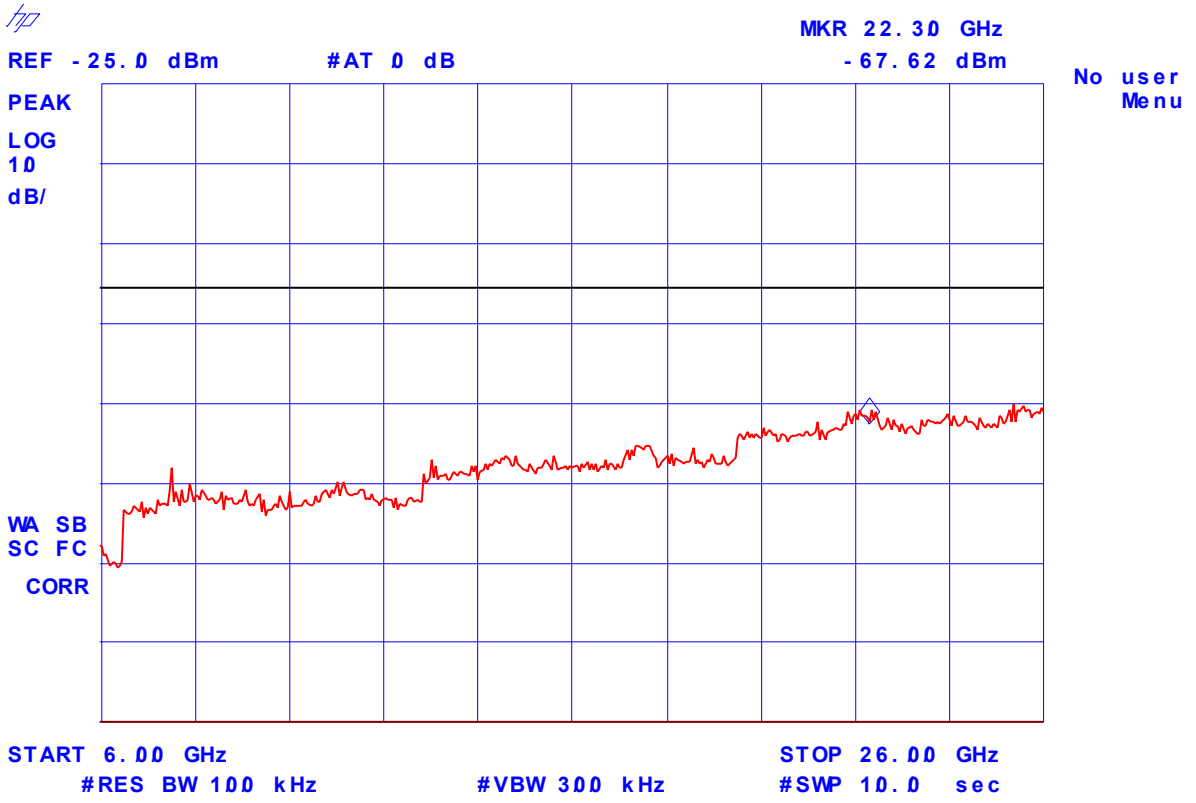
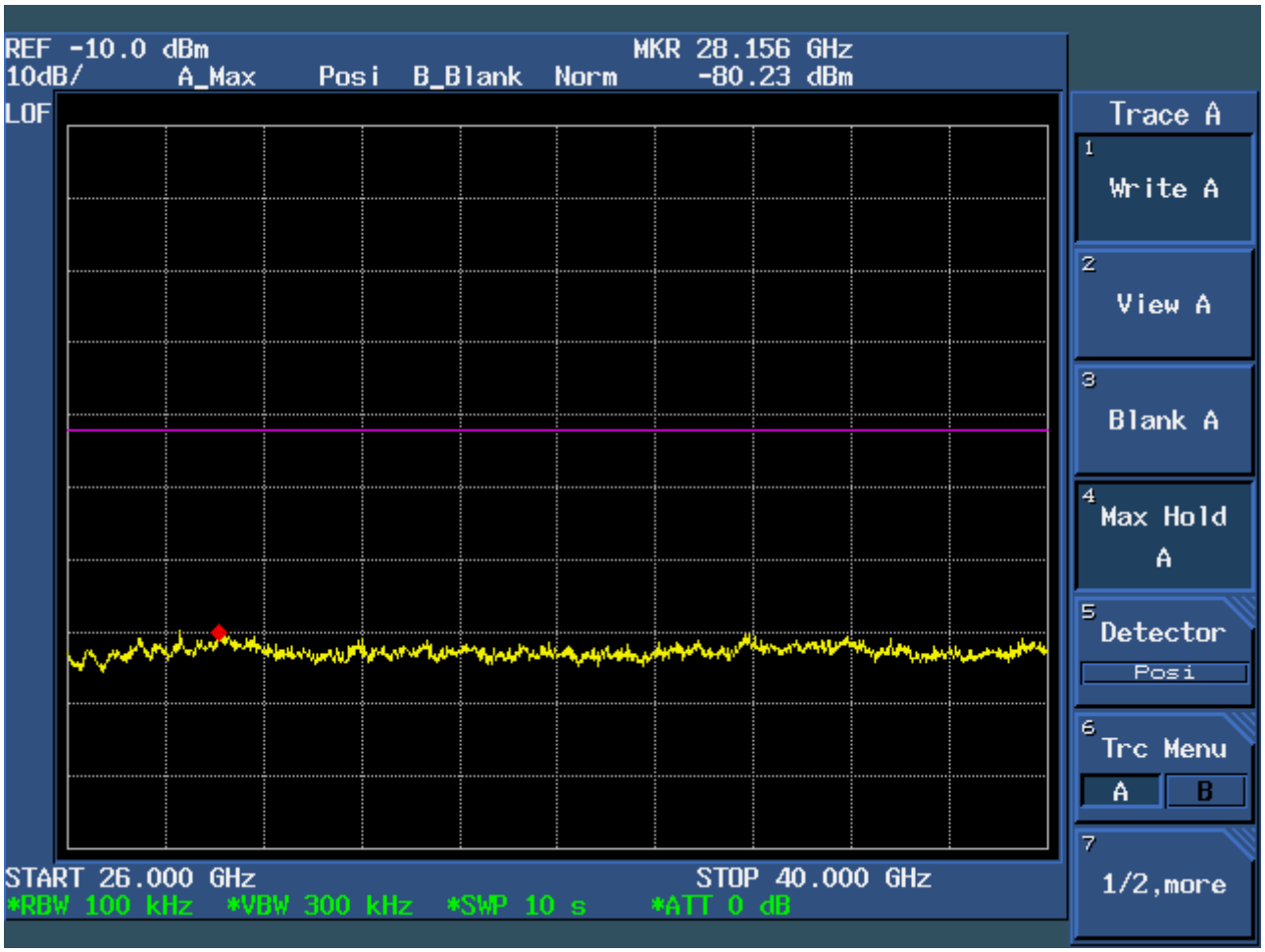
PLOT# 43: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: -9.06 dBm



PLOT# 44: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: -9.06 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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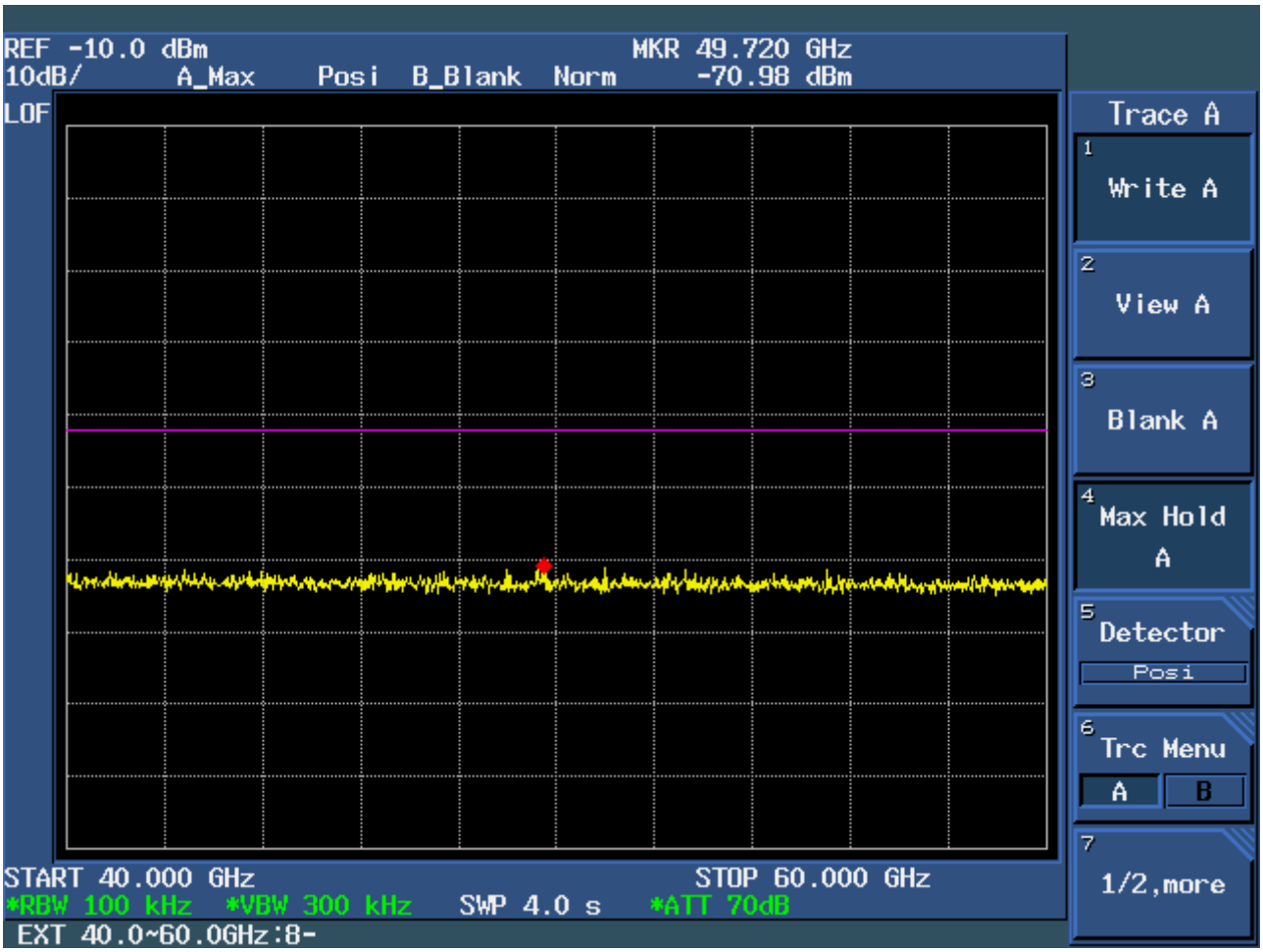
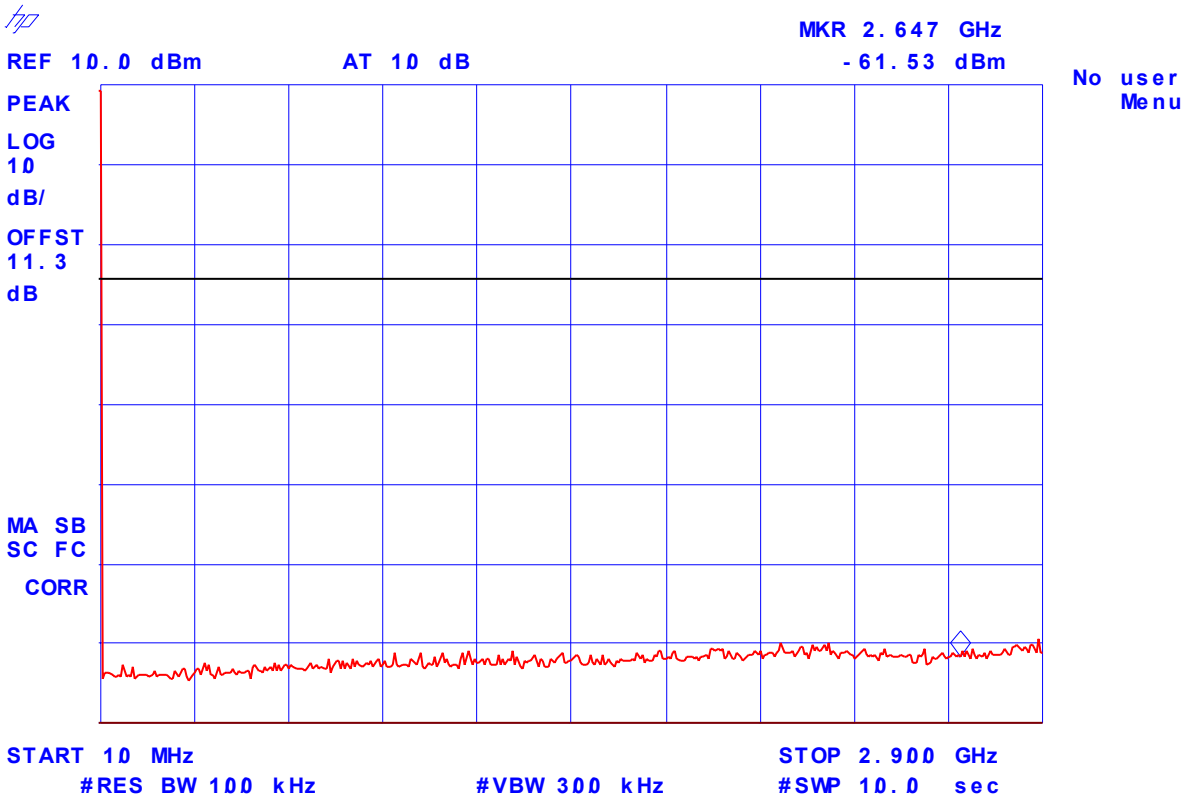
PLOT# 45: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: -9.06 dBm



PLOT# 46: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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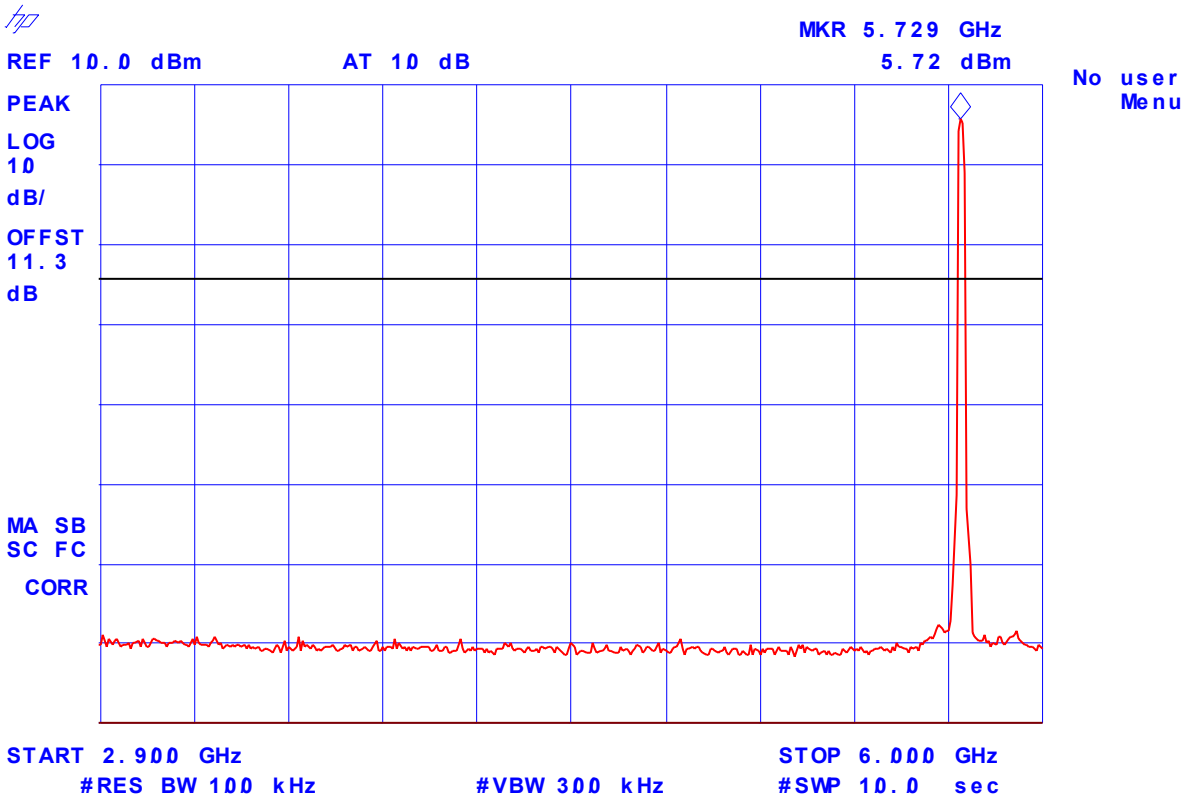
PLOT# 47: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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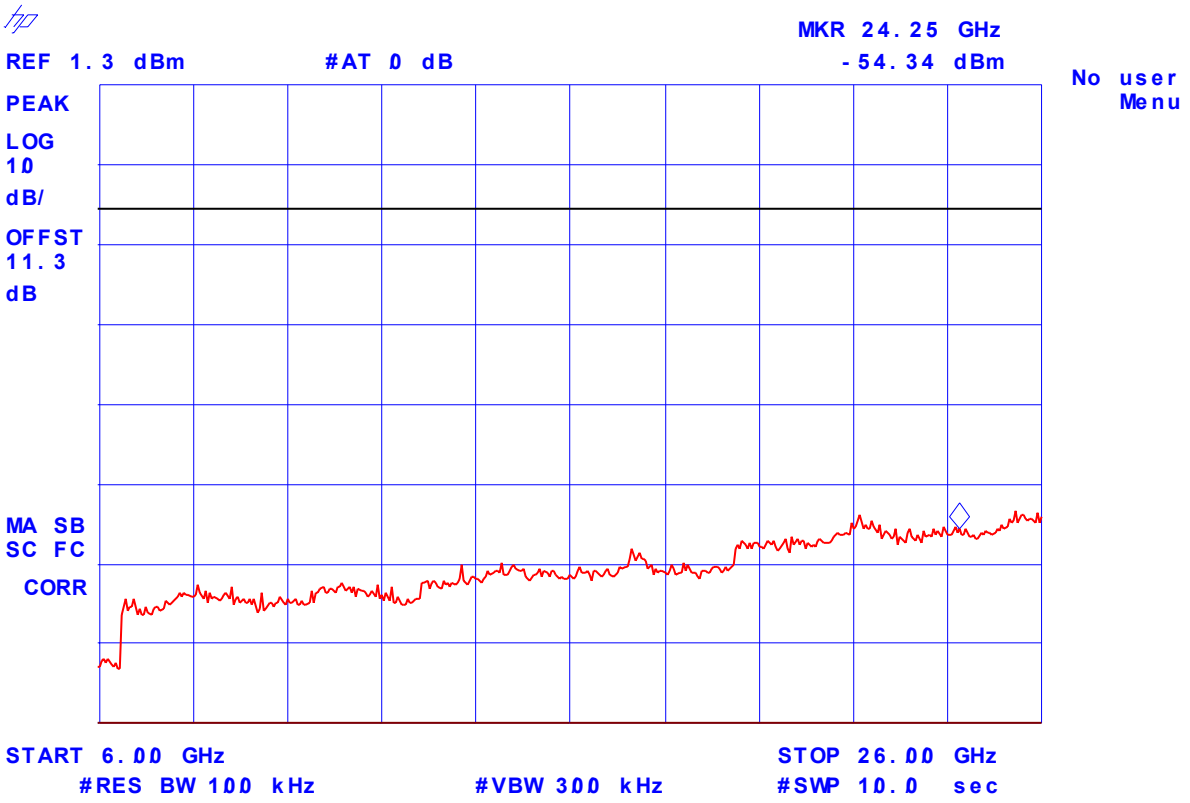
PLOT# 48: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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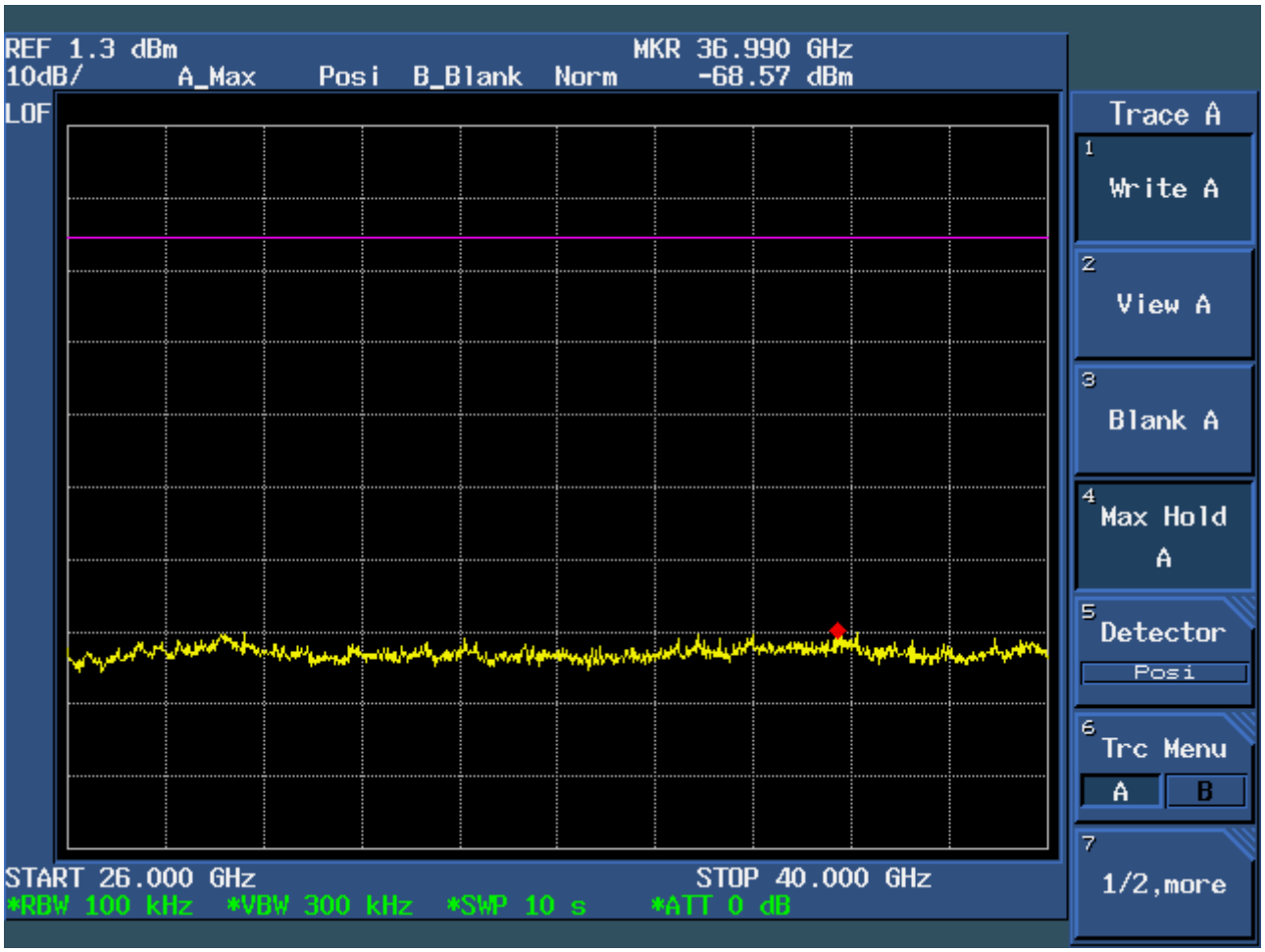
PLOT# 49: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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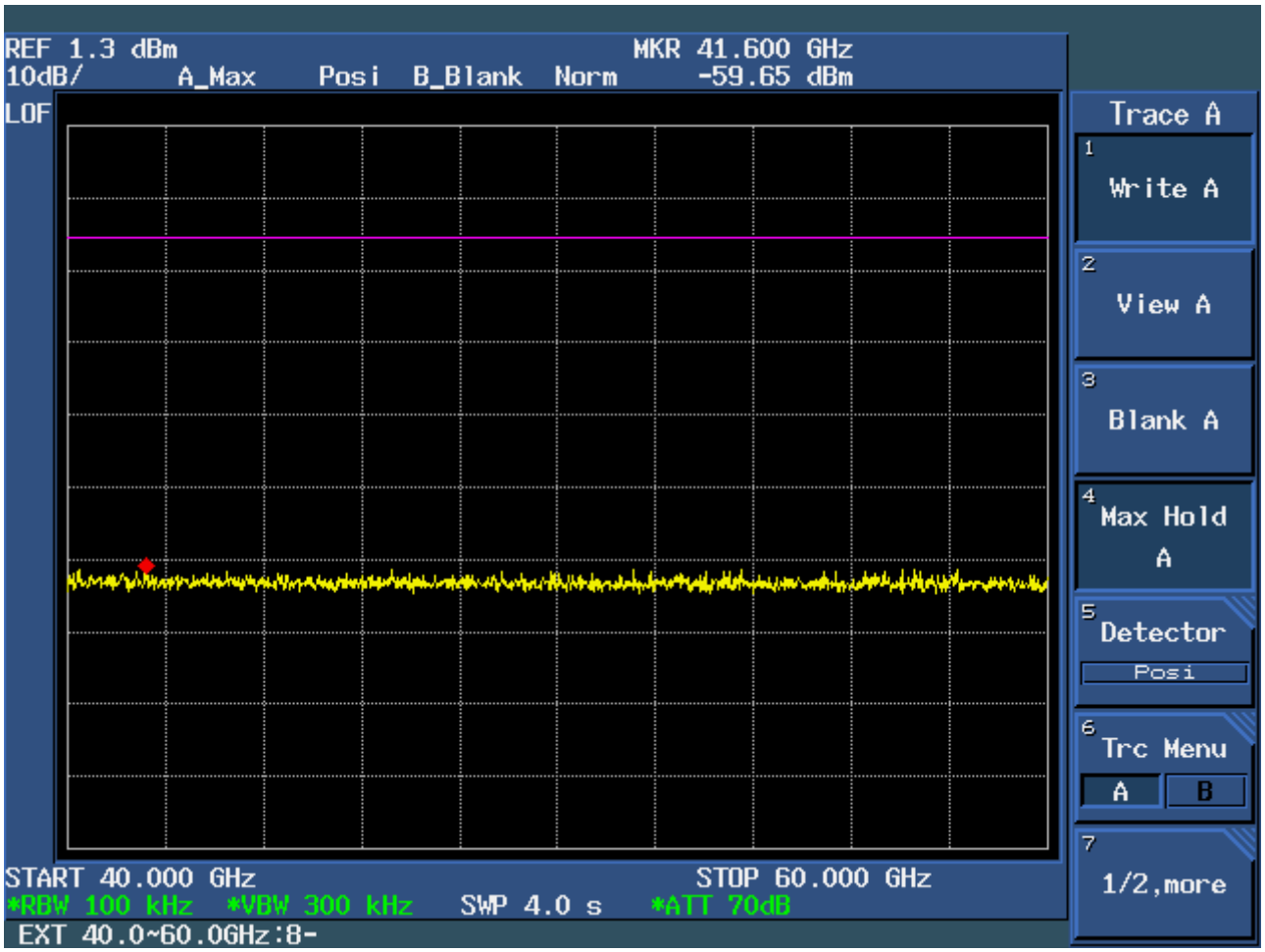
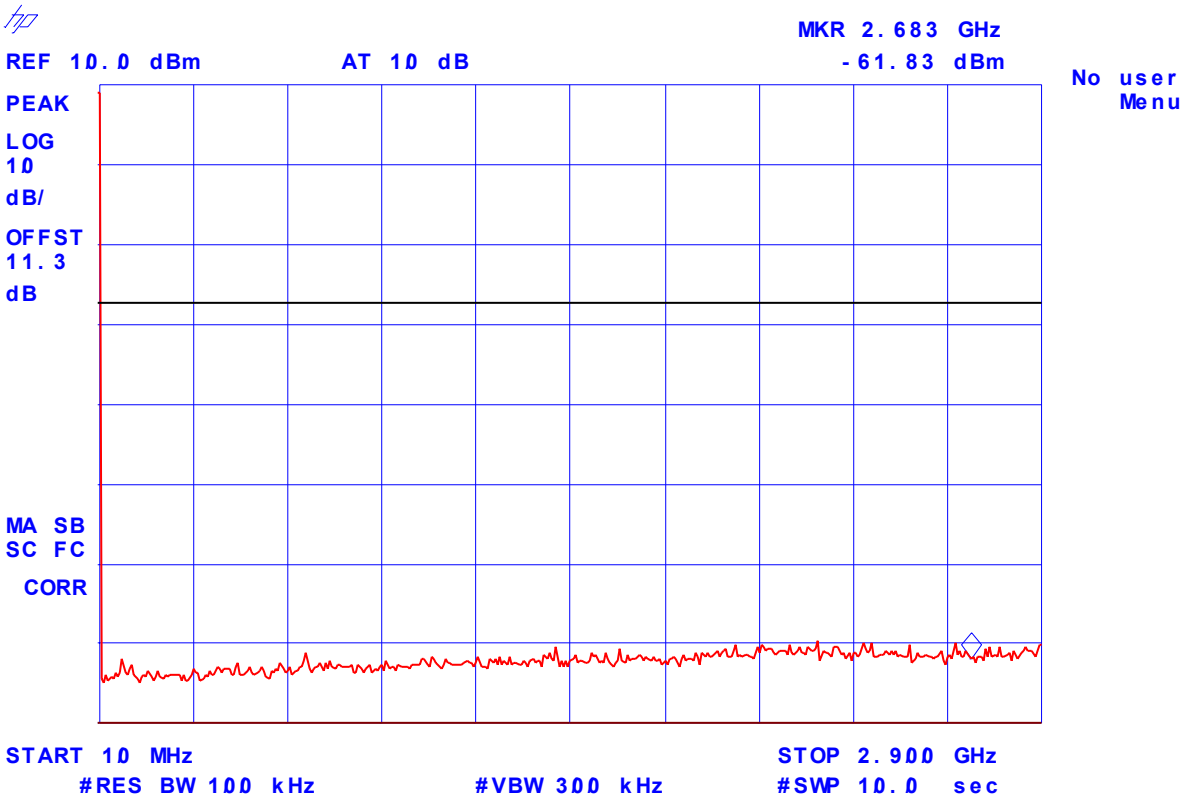
PLOT# 50: Spurious Emissions RF Antenna Conducted

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



PLOT# 51: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: 24.37 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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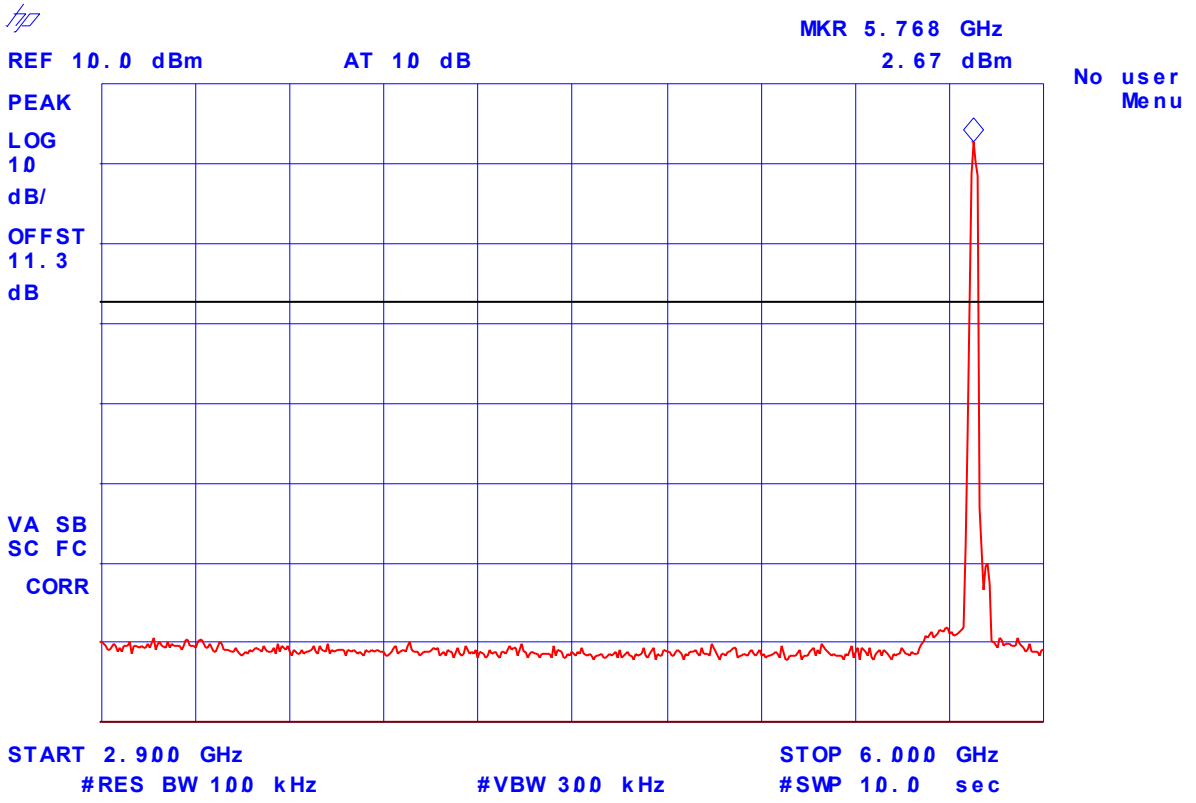
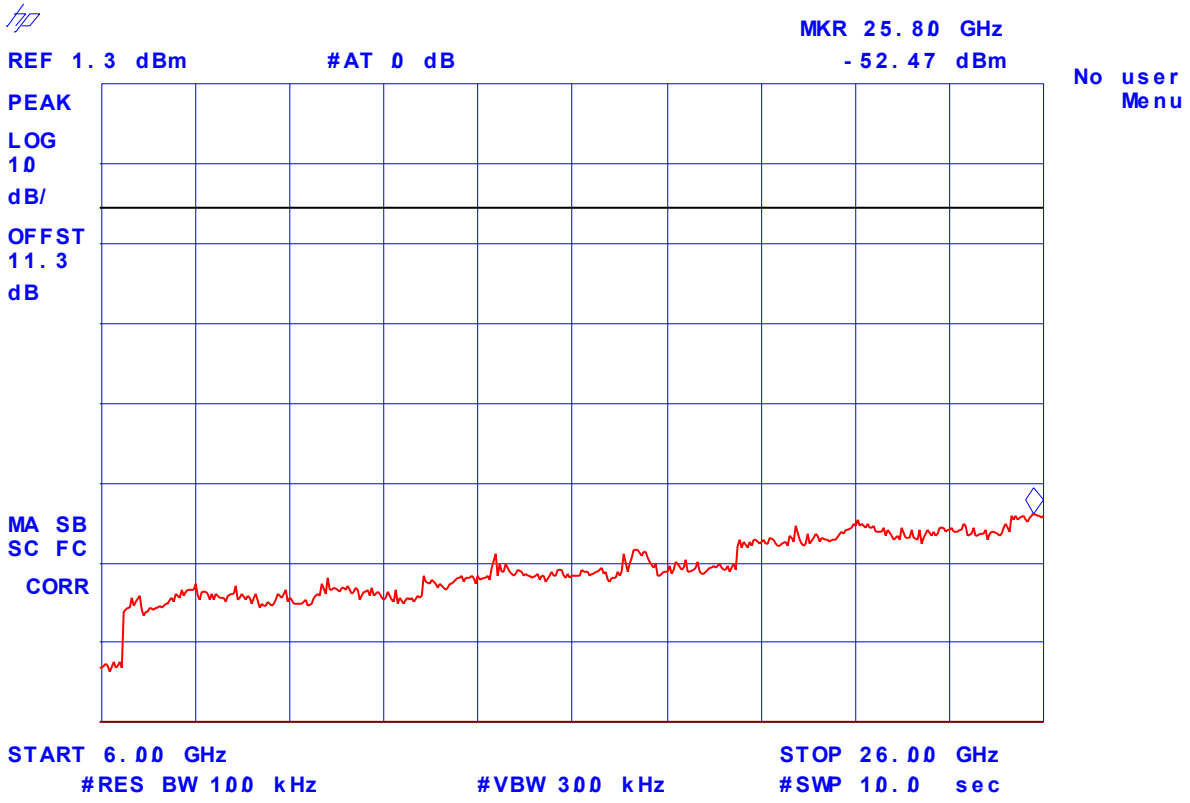
PLOT# 52: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: 24.37 dBm



PLOT# 53: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: 24.37 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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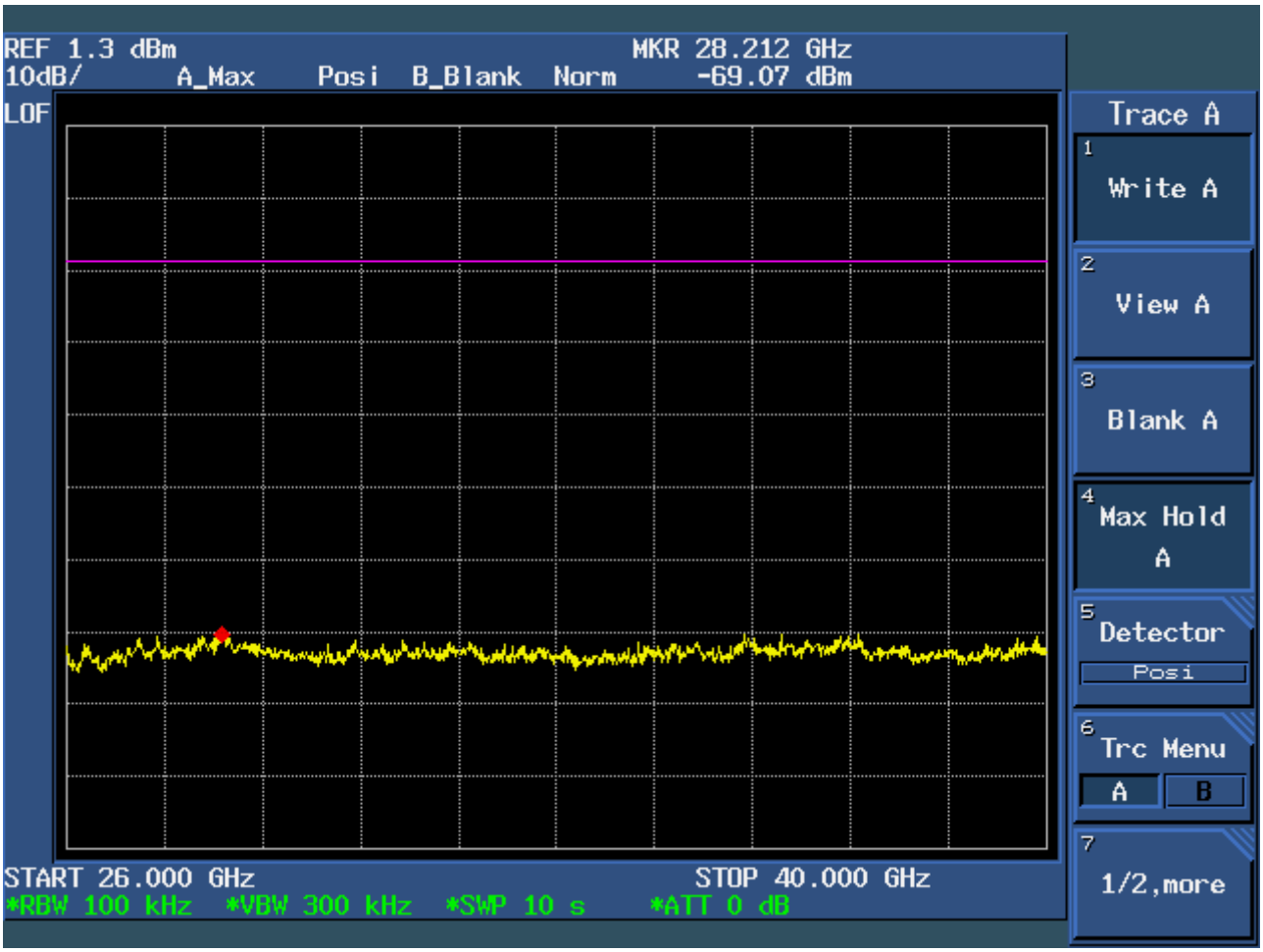
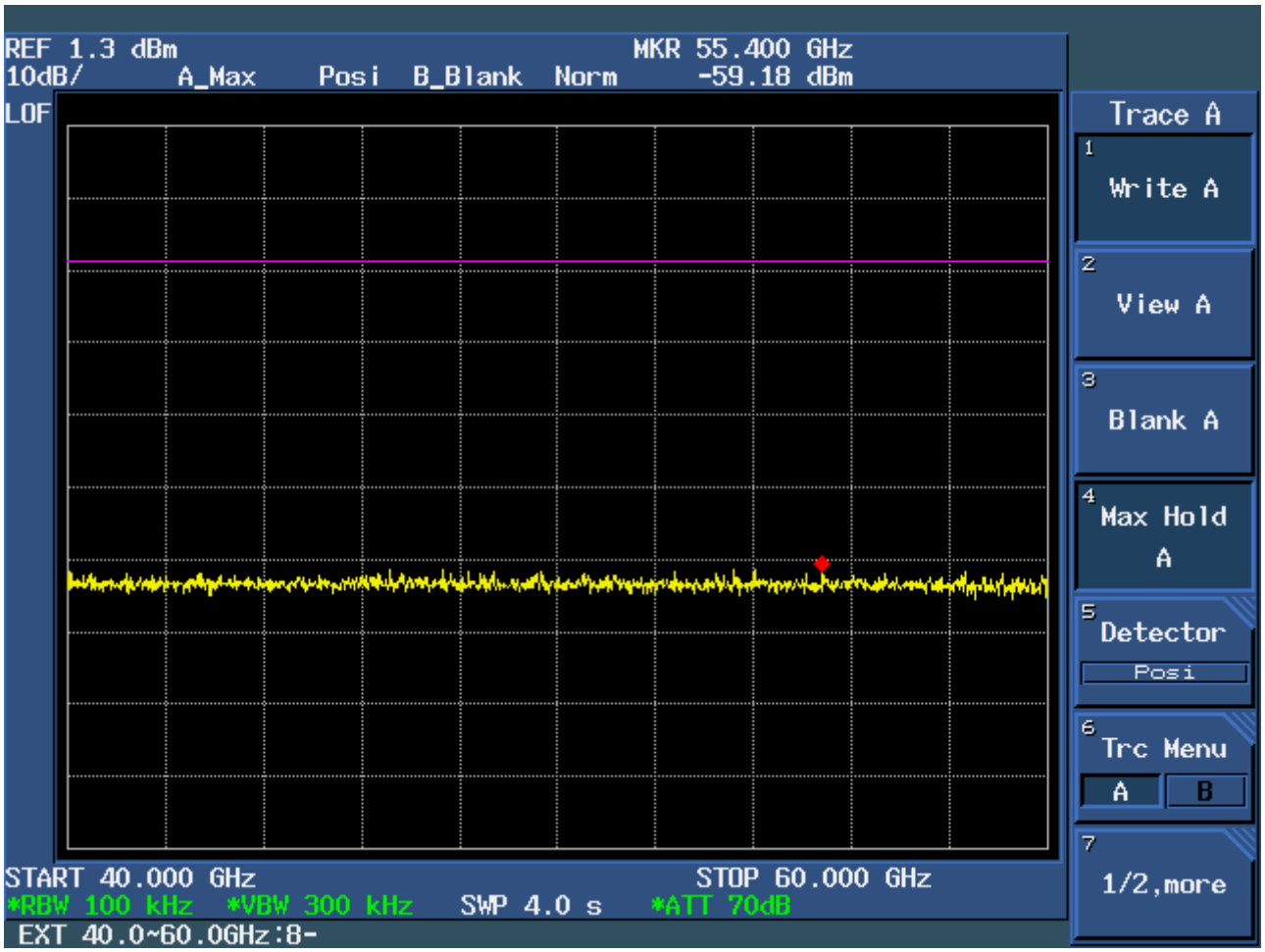
PLOT# 54: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: 24.37 dBm



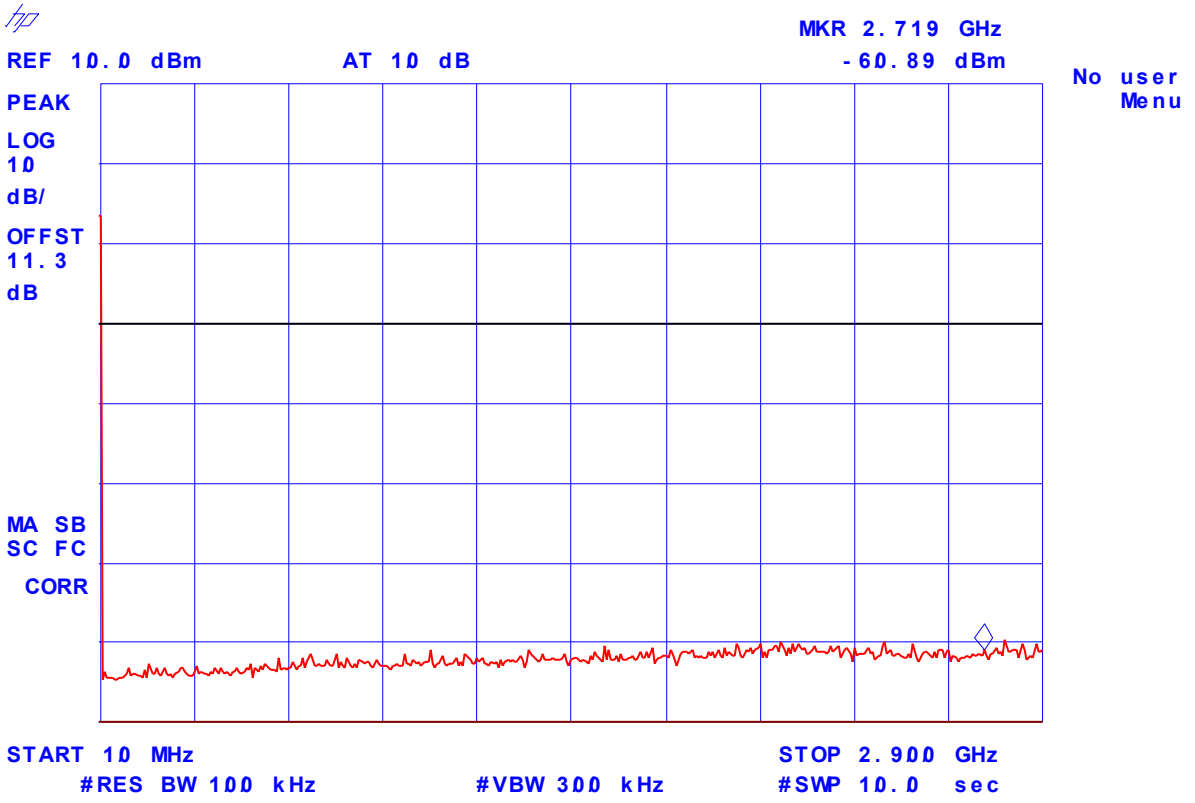
PLOT# 55: Spurious Emissions RF Antenna Conducted

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: 24.37 dBm



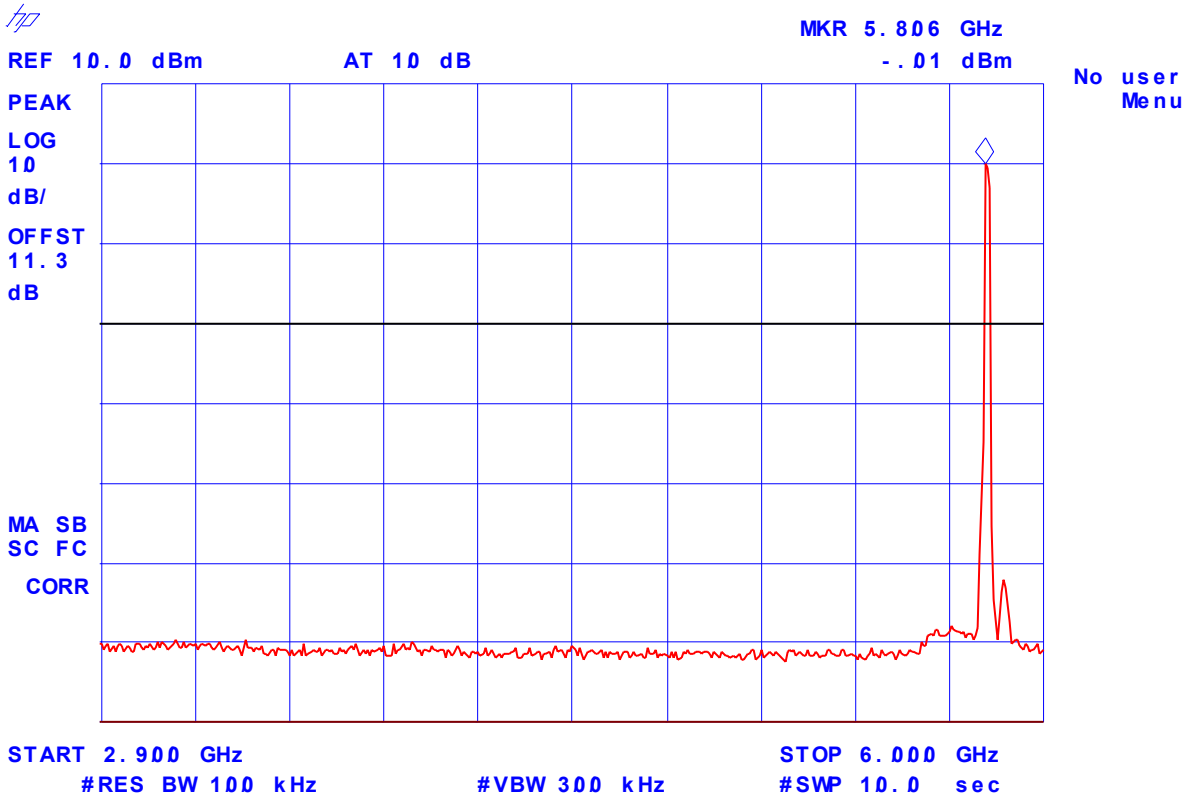
PLOT# 56: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



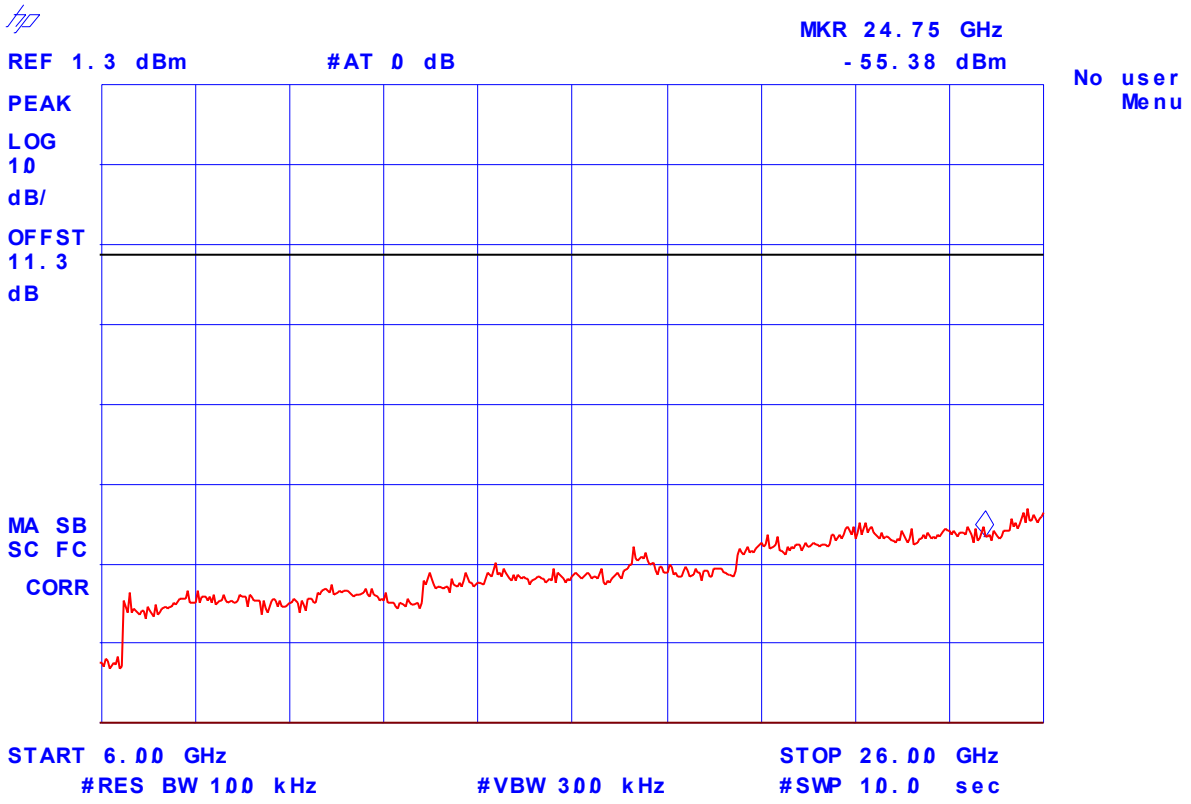
PLOT# 57: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



PLOT# 58: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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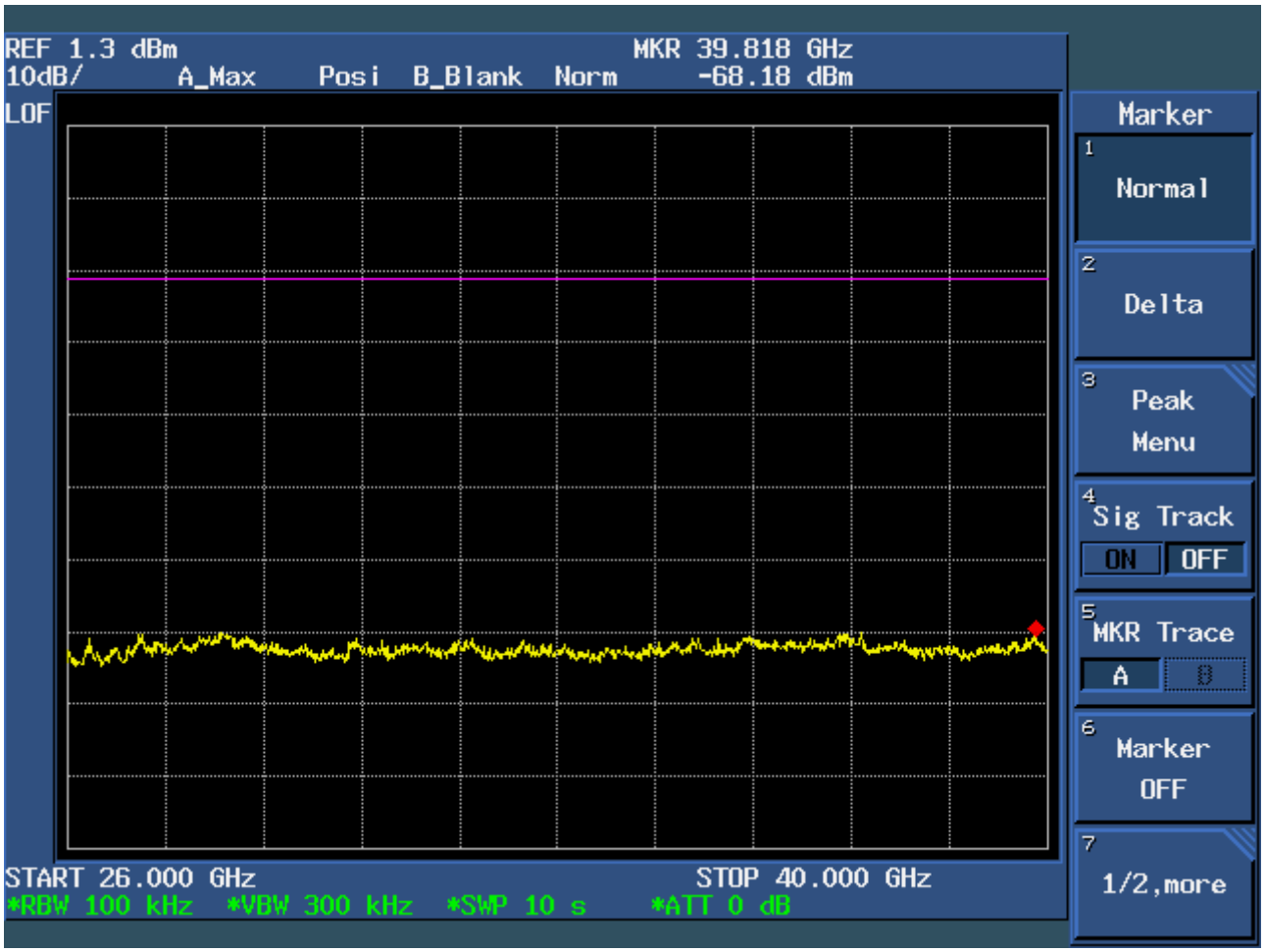
PLOT# 59: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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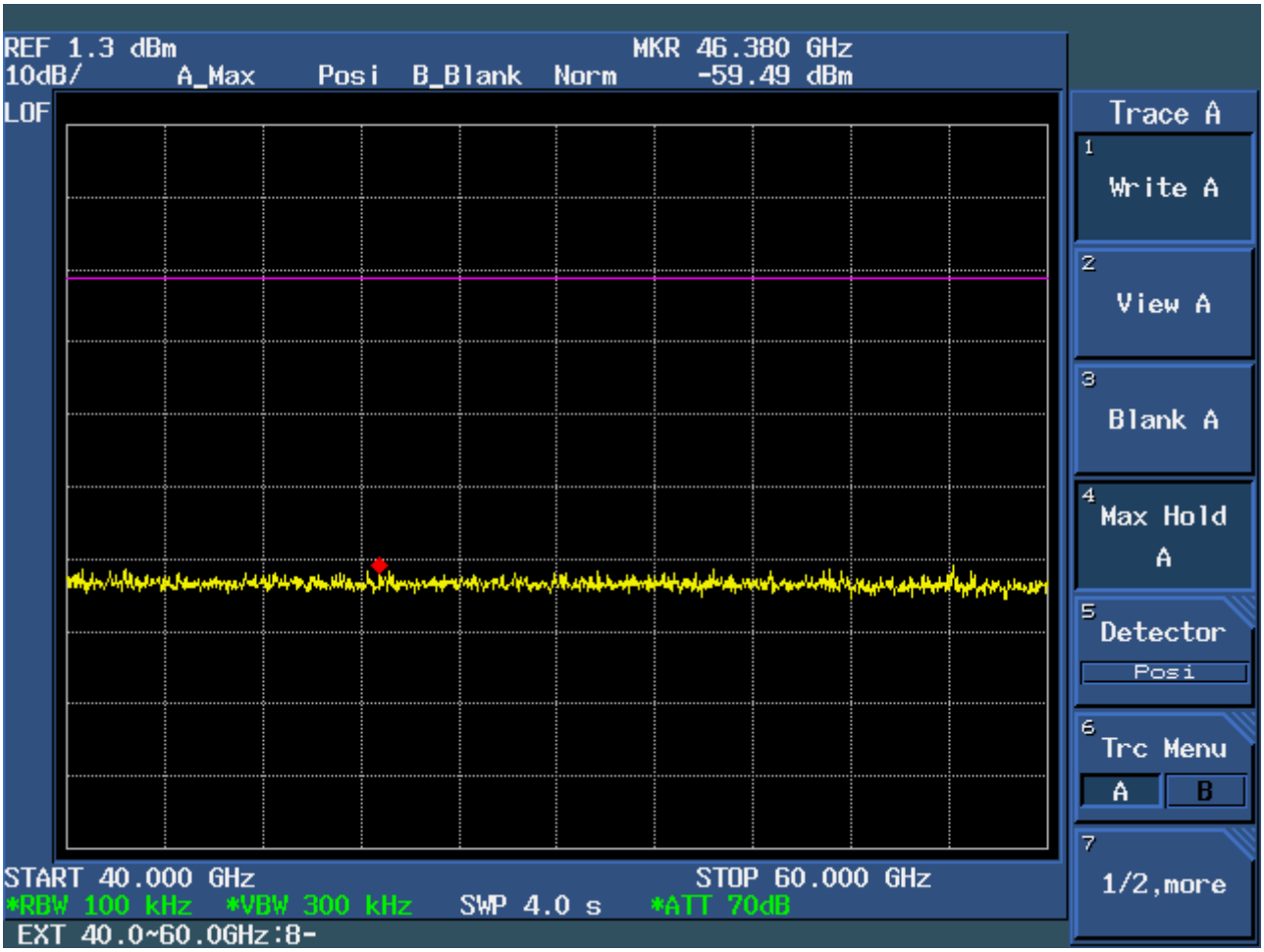
PLOT# 60: Spurious Emissions RF Antenna Conducted

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



6.12. TRANSMITTED POWER DENSITY OF A DIGITAL MODULATION SYSTEM, FCC CFR 47, PARA. 15.247(D)

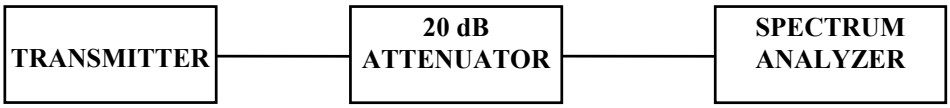
6.12.1. Limits

For New Technology Digital Modulation systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

6.12.2. Method of Measurements

Refer to Exhibit 8, Sec. 8.5 of this test report for detailed measurement procedures

6.12.3. Test Arrangement



6.12.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz

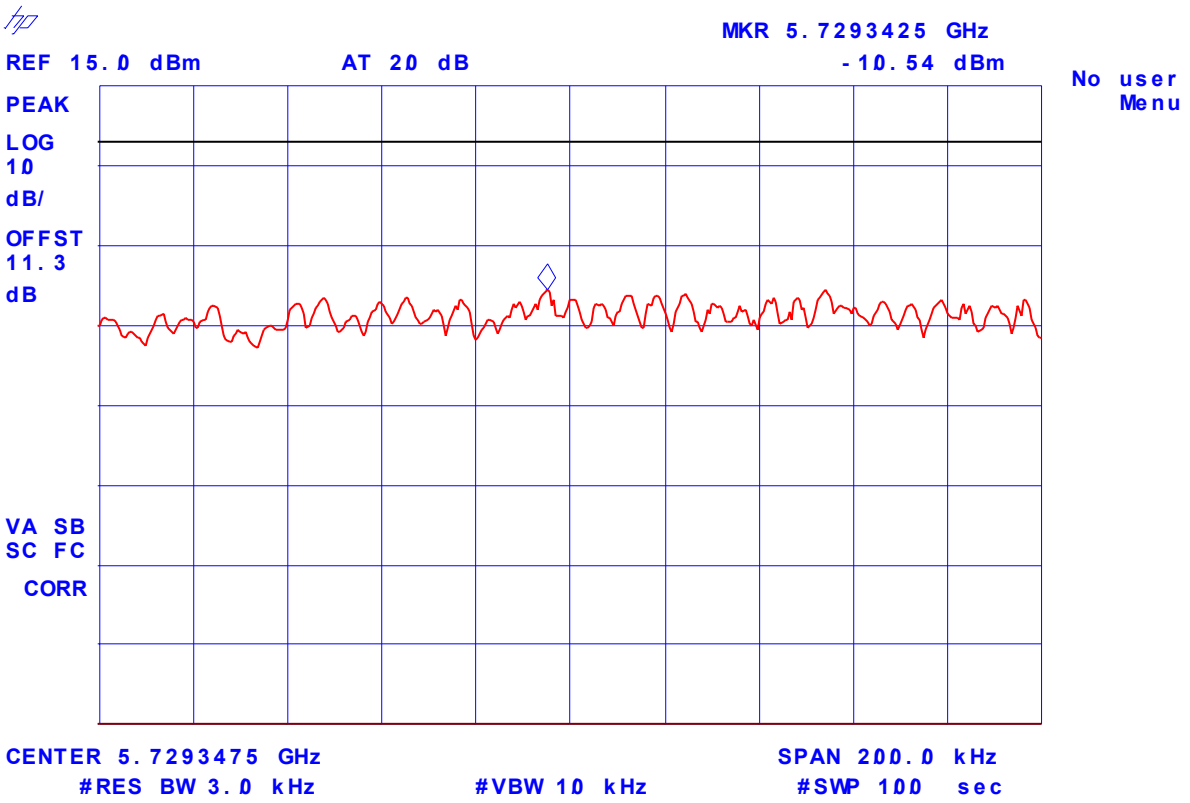
6.12.5. Test Data

CHANNEL FREQUENCY (MHz)	MODULATION DATA RATE	RF POWER LEVEL IN 3 KHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	COMMENTS (PASS/FAIL)
5735	64 QAM (54 Mb/s)	-10.8	8.0	-18.8	PASS
5775	64 QAM (54 Mb/s)	-11.2	8.0	-19.2	PASS
5815	64 QAM (54 Mb/s)	-12.2	8.0	-20.2	PASS
5735	16QAM (36 Mb/s)	-8.7	8.0	-16.7	PASS
5775	16QAM (36 Mb/s)	-11.6	8.0	-19.6	PASS
5815	16QAM (36 Mb/s)	-11.9	8.0	-19.9	PASS
5735	QPSK (18 Mb/s)	-9.7	8.0	-17.7	PASS
5775	QPSK (18 Mb/s)	-11.0	8.0	-19.0	PASS
5815	QPSK (18 Mb/s)	-9.5	8.0	-17.5	PASS
5735	BPSK (9 Mb/s)	-8.9	8.0	-16.9	PASS
5775	BPSK (9 Mb/s)	-10.8	8.0	-18.8	PASS
5815	BPSK (9 Mb/s)	-12.8	8.0	-20.8	PASS

Refer to Plots # 61 to 72 below for Measurement Plots

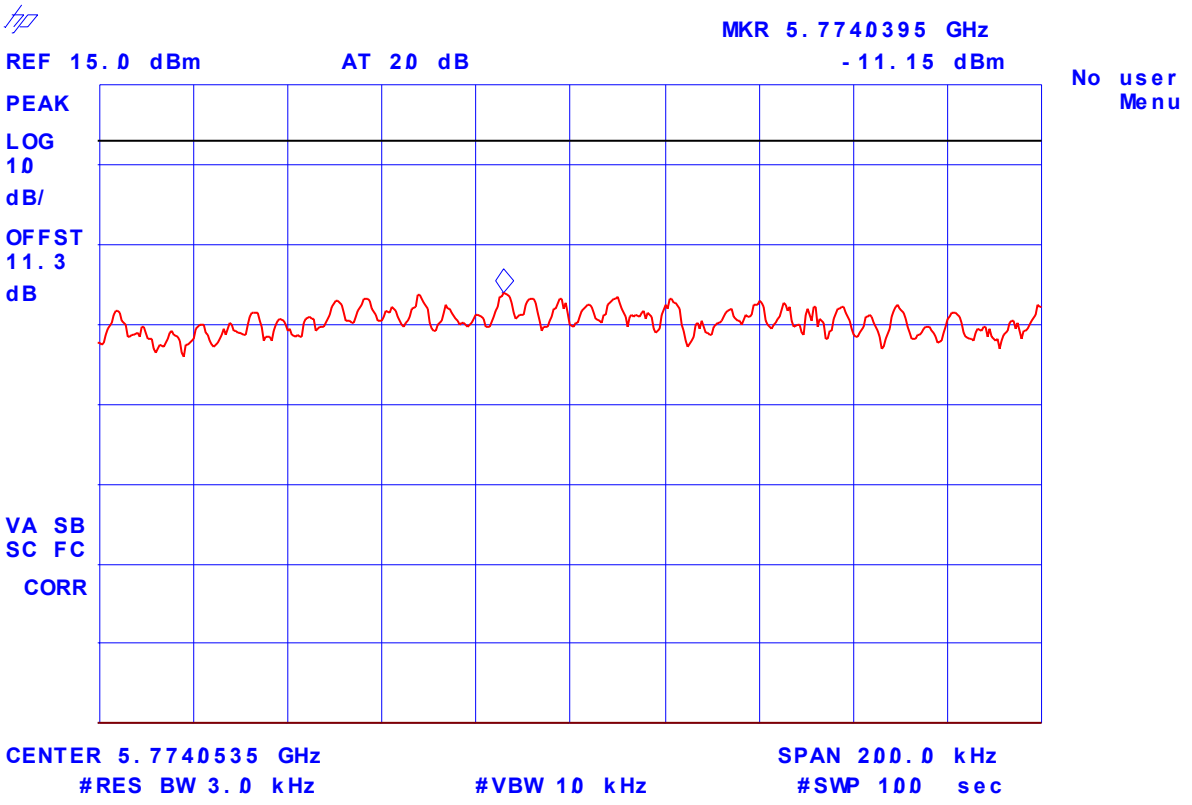
Plot # 61: Power Spectral Density

Channel 1, 5735 MHz, 64 QAM (54 Mb/s), Power Output: 25.30 dBm



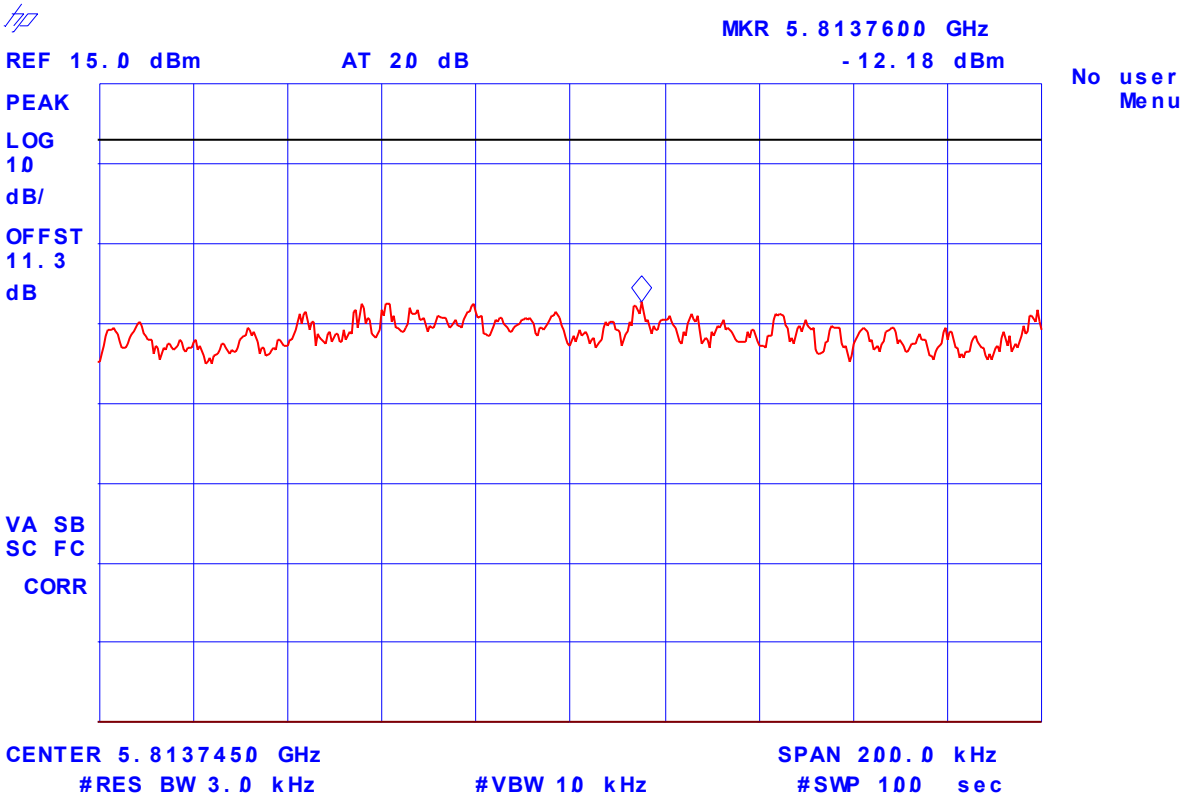
Plot # 62: Power Spectral Density

Channel 3, 5775 MHz, 64 QAM (54 Mb/s), Power Output: 24.37 dBm



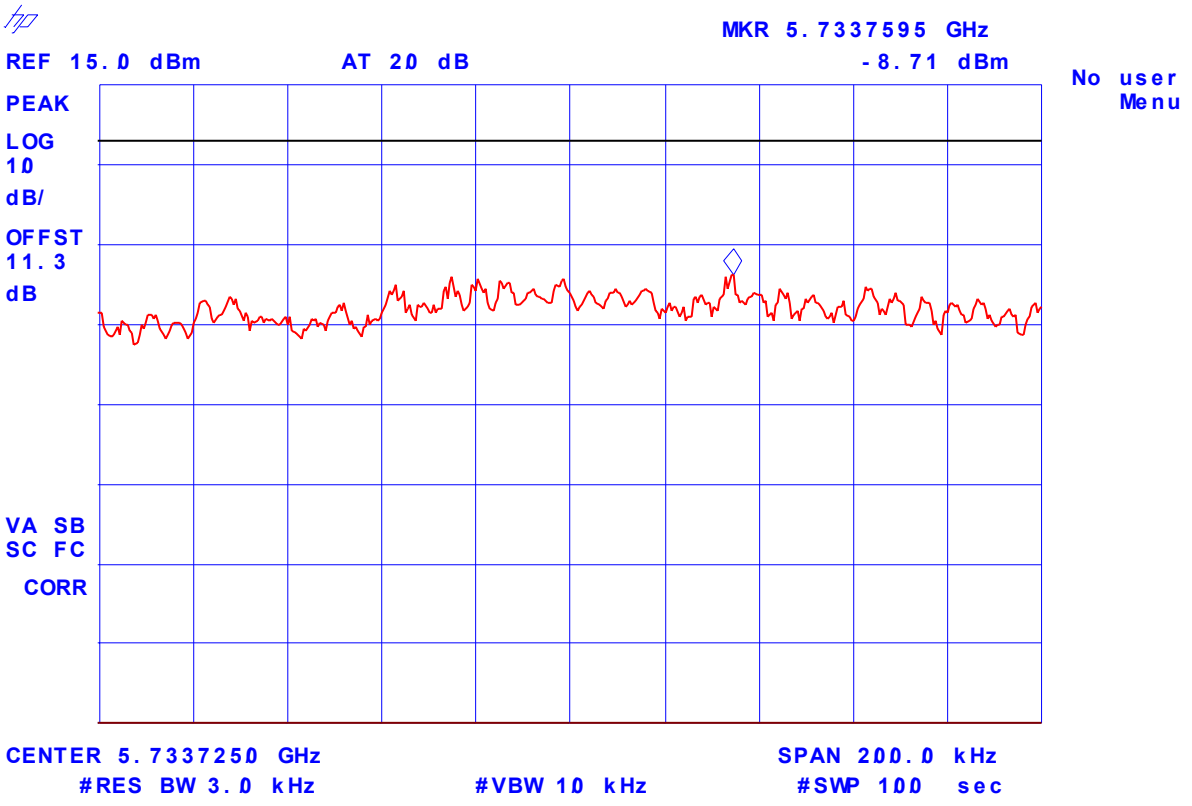
Plot # 63: Power Spectral Density

Channel 5, 5815 MHz, 64 QAM (54 Mb/s), Power Output: 20.74 dBm



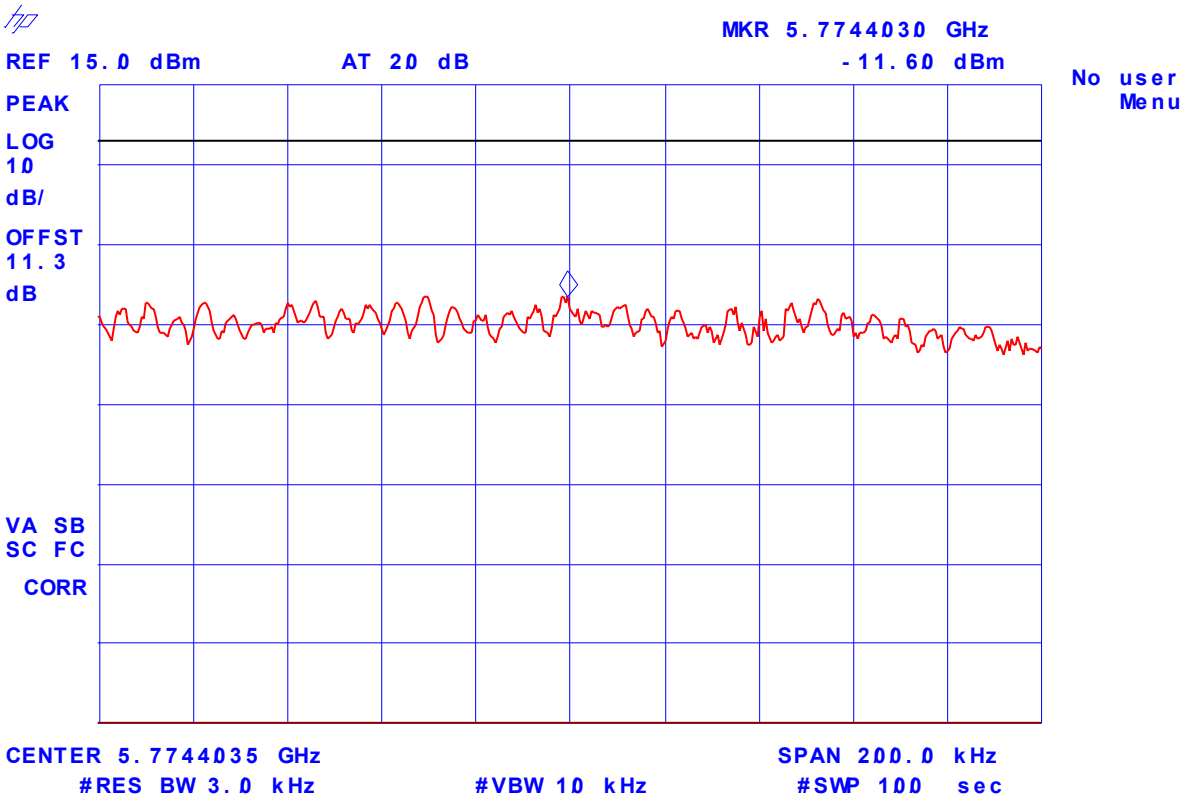
Plot # 64: Power Spectral Density

Channel 1, 5735 MHz, 16 QAM (36 Mb/s), Power Output: 25.30 dBm



Plot # 65: Power Spectral Density

Channel 3, 5775 MHz, 16 QAM (36 Mb/s), Power Output: 24.37 dBm



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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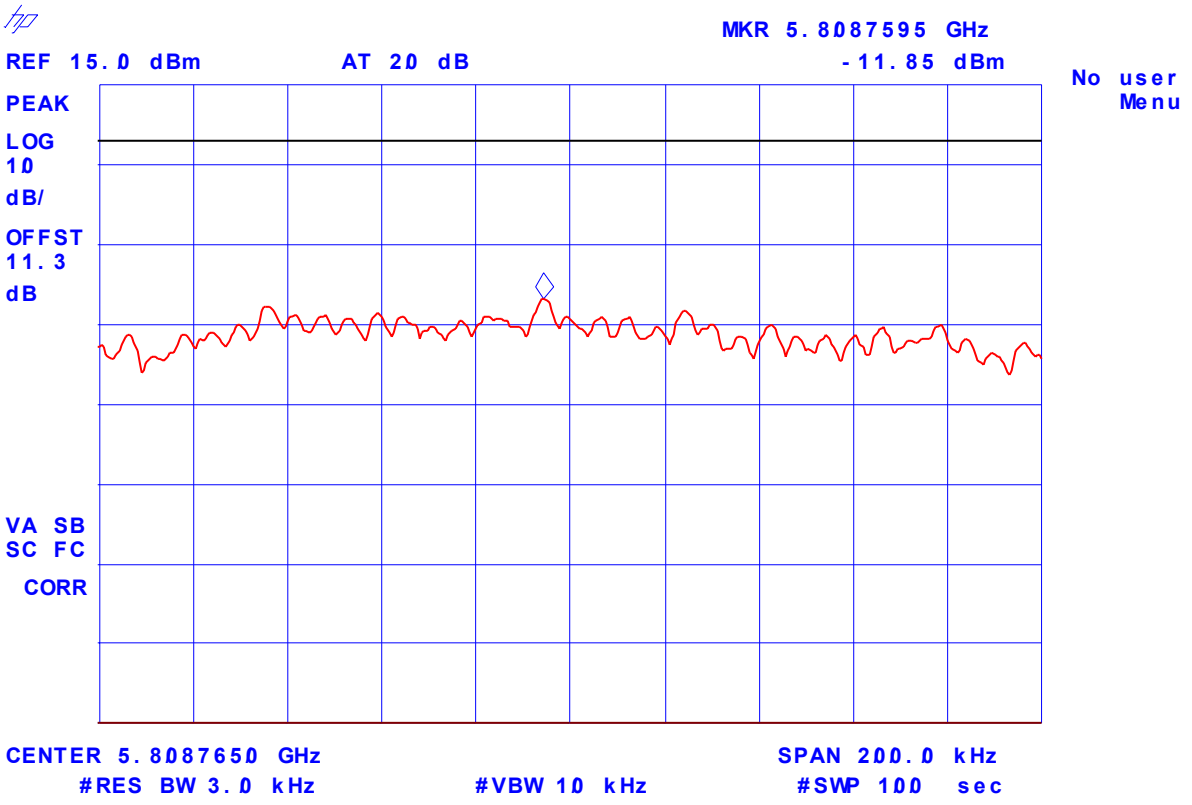
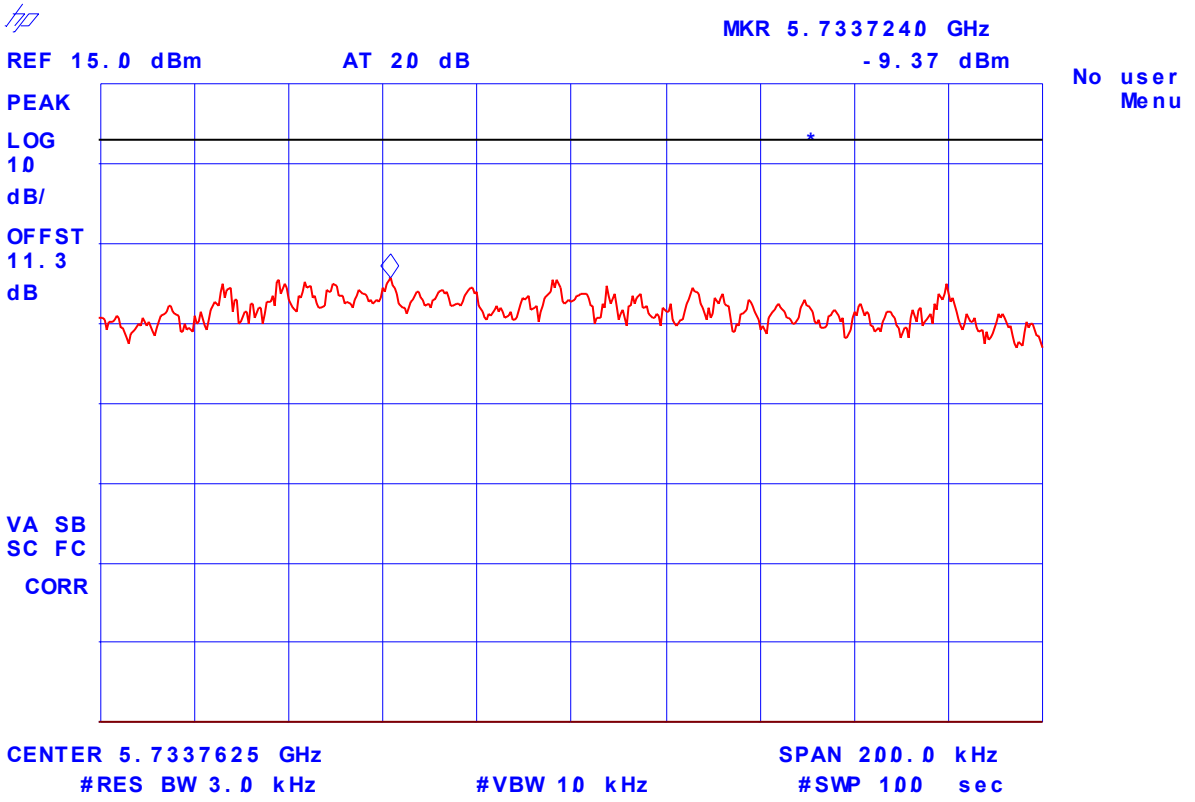
Plot # 66: Power Spectral Density

Channel 5, 5815 MHz, 16 QAM (36 Mb/s), Power Output: 20.74 dBm



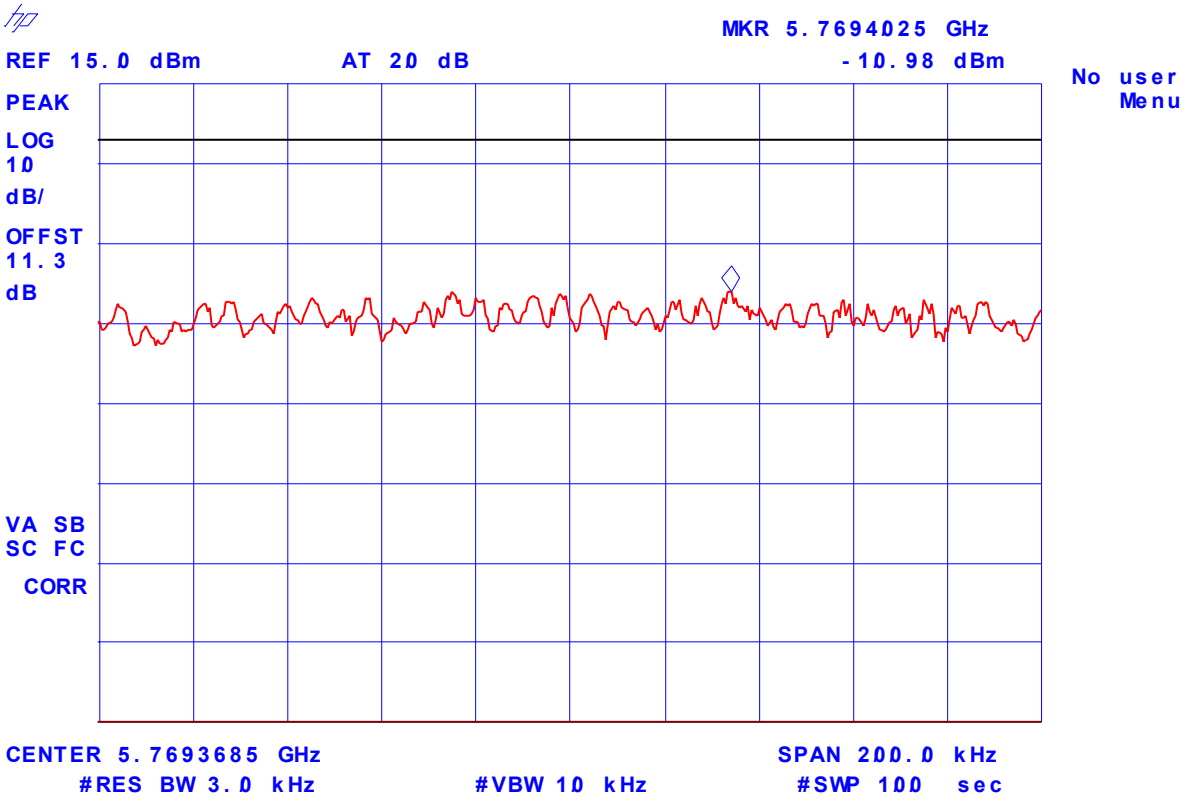
Plot # 67: Power Spectral Density

Channel 1, 5735 MHz, QPSK (18 Mb/s), Power Output: 25.30 dBm



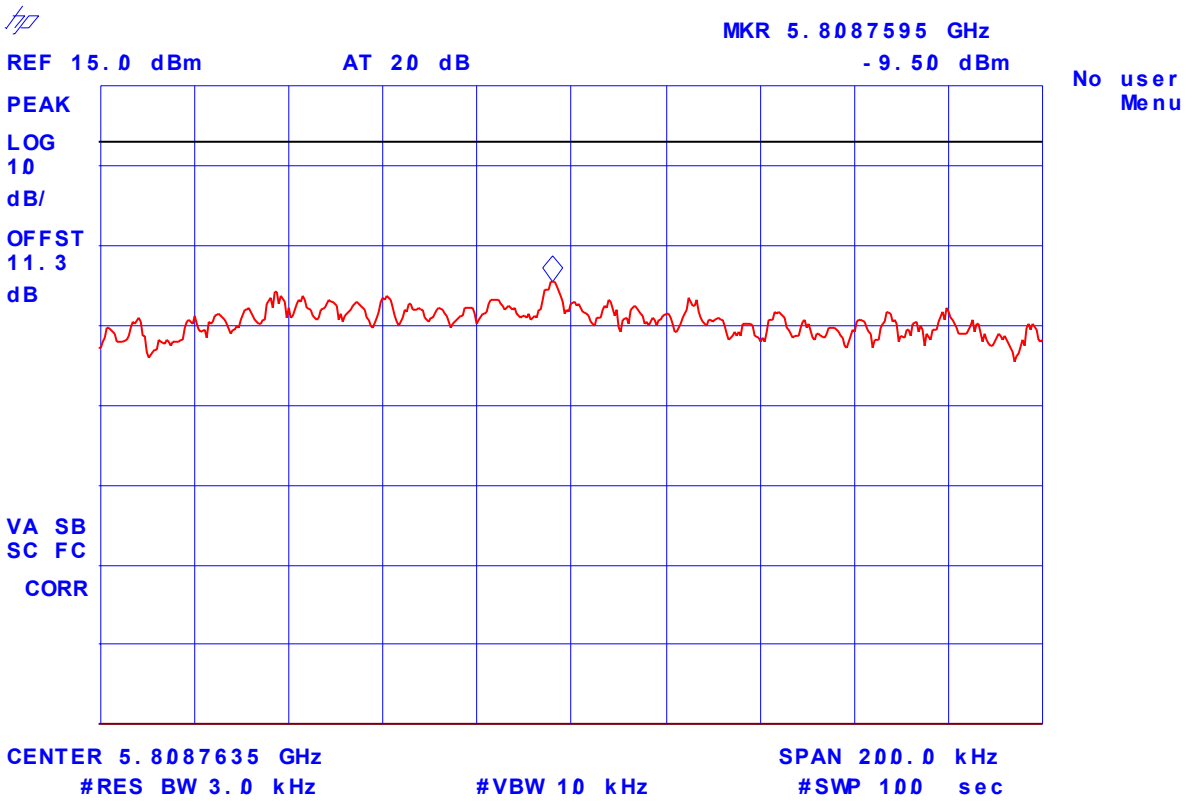
Plot # 68: Power Spectral Density

Channel 3, 5775 MHz, QPSK (18 Mb/s), Power Output: 24.37 dBm



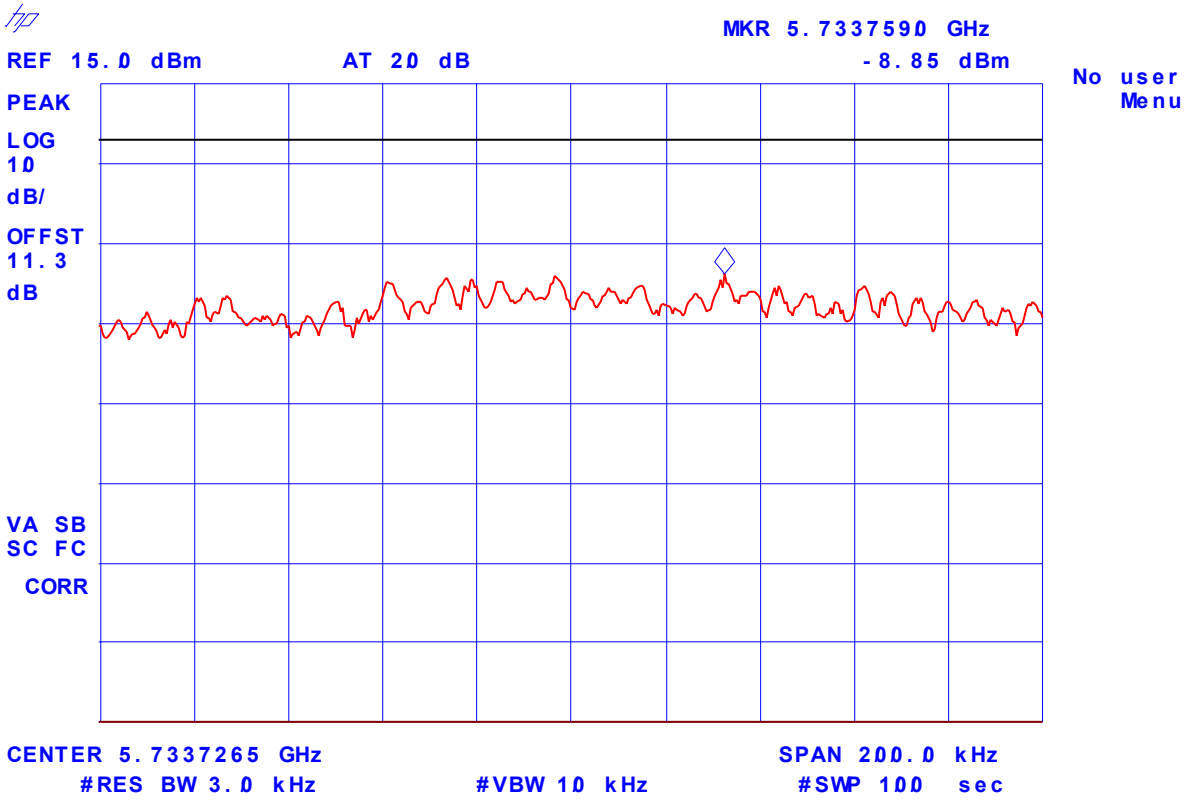
Plot # 69: Power Spectral Density

Channel 5, 5815 MHz, QPSK (18 Mb/s), Power Output: 20.74 dBm



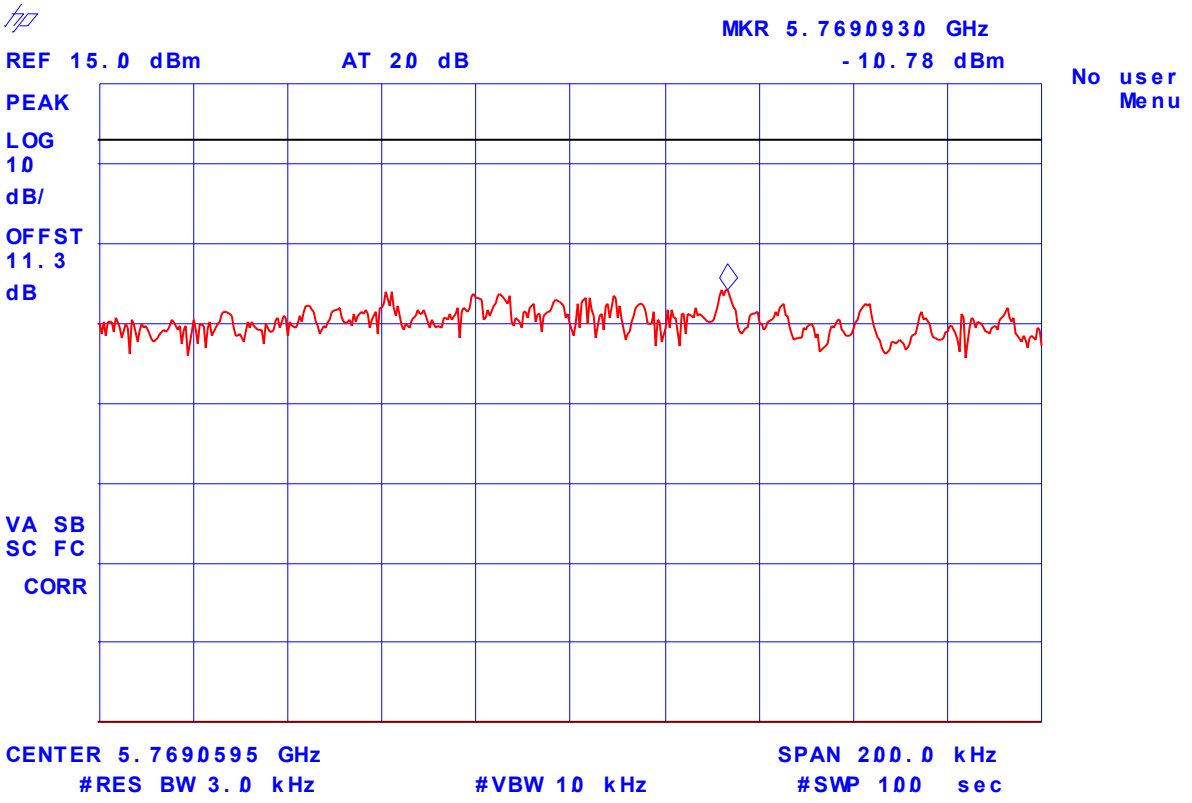
Plot # 70: Power Spectral Density

Channel 1, 5735 MHz, BPSK (9 Mb/s), Power Output: 25.30 dBm



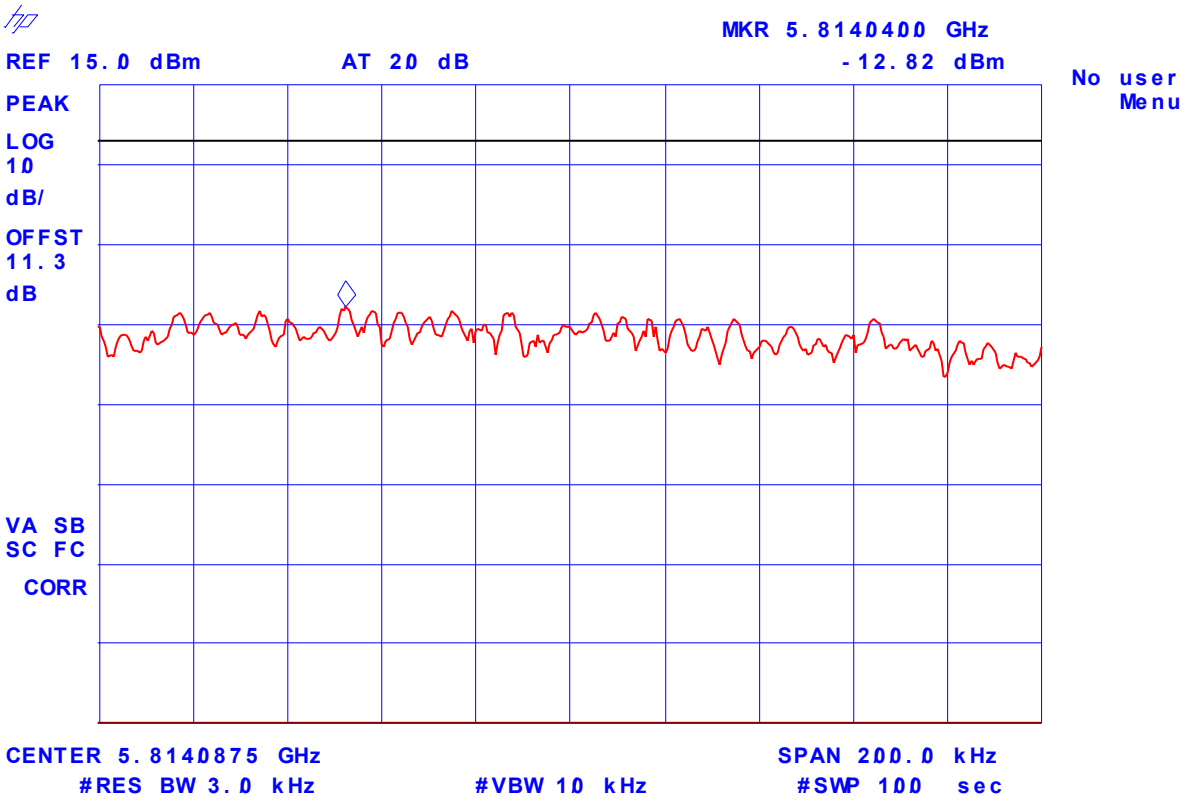
Plot # 71: Power Spectral Density

Channel 3, 5775 MHz, BPSK (9 Mb/s), Power Output: 24.37 dBm



Plot # 72: Power Spectral Density

Channel 5, 5815 MHz, BPSK (9 Mb/s), Power Output: 20.74 dBm



6.13. TRANSMITTER BAND-EDGE & SPURIOUS RADIATED EMISSIONS @ 3 METERS, FCC CFR 47, PARA. 15.247(C), 15.209 & 15.205

6.13.1. Limits

In any 100 kHz bandwidth outside the frequency band in which the New Technology Digital Modulation intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Sec. 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Sec. 15.205(a), must also comply with the radiated emission limits specified in Sec. 15.209(a) (see Sec. 15.205(c)).

Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- **@ FCC CFR 47, Para. 15.237(c)** - The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in **@15.35** for limiting peak emissions apply.

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) - Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 – 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	14.35 - 16.2
25.5 – 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 – 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 – 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 – 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 – 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 – 156.9	2200 - 2300	9000 - 9200	

FCC CFR 47, Part 15, Subpart C, Para. 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

FREQUENCY (MHz)	FIELD STRENGTH LIMITS (microvolts/m)	DISTANCE (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

6.13.2. Method of Measurements

Refer to Exhibit 8, Sec. 8.5.2 of this test report and **ANSI 63.4-1992, Para. 8** for detailed radiated emissions measurement procedures.

The following measurement procedures were also applied:

- Applies to harmonics/spurious that fall in the restricted bands listed in Section 15.205. the maximum permitted average field strength is listed in Section 15.209. A Pre-Amp and highpass filter are used for this measurement.
- For measurement below 1 GHz, set RBW = 100 KHz, VBW $\geq$ 100 KHz, SWEEP=AUTO.
- For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz (Peak) & VBW = 10 Hz (Average), SWEEP=AUTO.
- If the emission is pulsed, modified the unit for continuous operation, then use the settings above for measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

6.13.3. Test Arrangement

Please refer to Test Arrangement in Sec. 5.5.3 for details of test setup for emission measurements.

6.13.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Advantest	R3271	15050203	100 Hz to 32 GHz with external mixer for frequency above 32 GHz
Microwave Amplifier	Hewlett Packard	HP 83017A		1 GHz to 26.5 GHz
Biconilog Antenna	EMCO	3143	1029	20 MHz to 2 GHz
Horn Antenna	EMCO	3155	9701-5061	1 GHz – 18 GHz
Horn Antenna	EMCO	3160-09	..	18 GHz – 26.5 GHz
Horn Antenna	EMCO	3160-10	..	26.5 GHz – 40 GHz
Mixer	Tektronix	118-0098-00	..	18 GHz – 26.5 GHz
Mixer	Tektronix	119-0098-00	..	26.5 GHz – 40 GHz

6.13.5. Plots

The following plots graphically represent the test results recorded in the above Test Data Table.

6.13.6. Photographs of Test Setup

Refer to the Photographs #3 & #21 in Annex 1 for setup and arrangement of equipment under tests and its ancillary equipment.

6.13.7. Test Data

6.13.7.1. Band-edge Radiated Emissions at 3 meters

Notes: Plots # 73 to 102 below show worst case of band-edge emissions measured with the following worst case operating conditions:

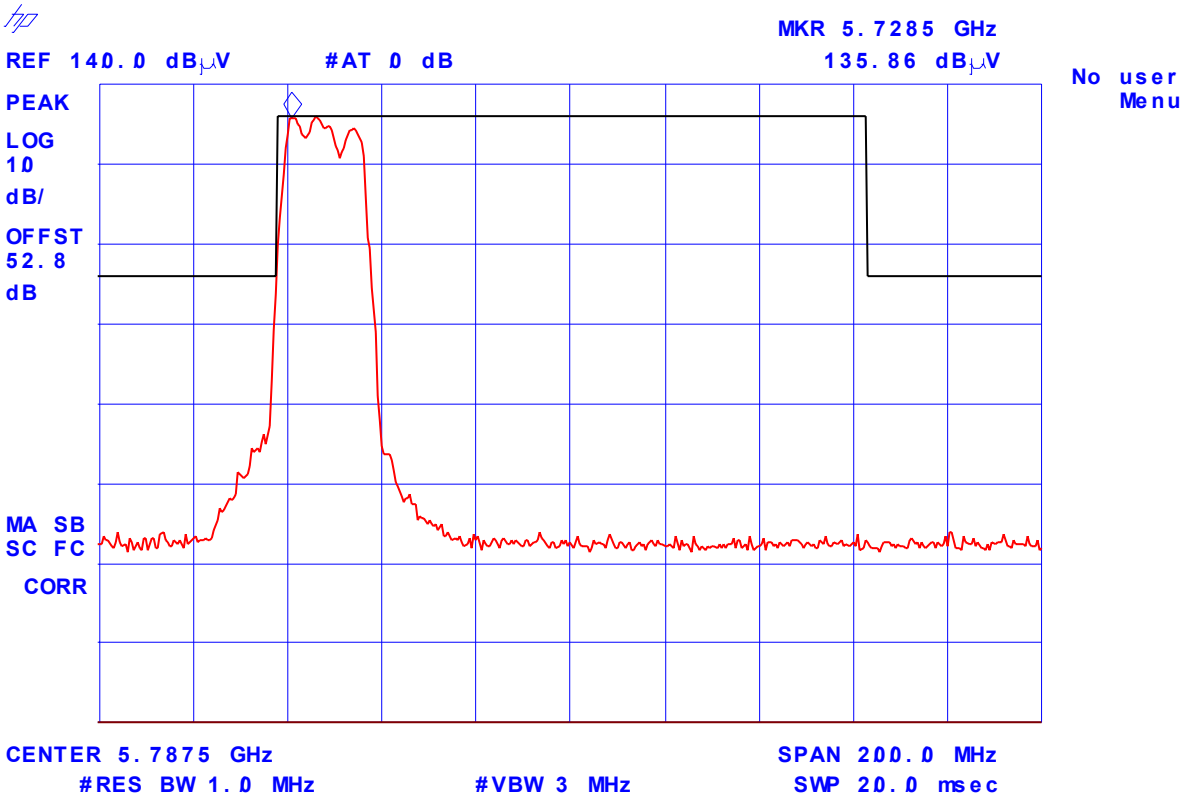
(1) Maximum gain antenna within its family as below:
(2) Maximum rf output powers rated (25.3 dBm) for Point-to-Point application

Antenna Manufacturer	*Model Number*	*Max. Gain within Family (dBi)*	*Max. RF Power (dBm)*	*Maximum EIRP (dBm)*	*Plots #*
MTI	486001	28.0	25.3	53.3	71 - 76
Radiowaves	SP4-5.2	34.8	25.3	60.1	77 - 82
Radiowaves	SEC-55V-60-17	17.0	25.3	42.3	83 - 88
MaxRad	MPR58031PTNF	31.0	25.3	56.3	89 - 94
Tongyu	TDJ-5818AM-60	18.0	25.3	43.3	95 - 100

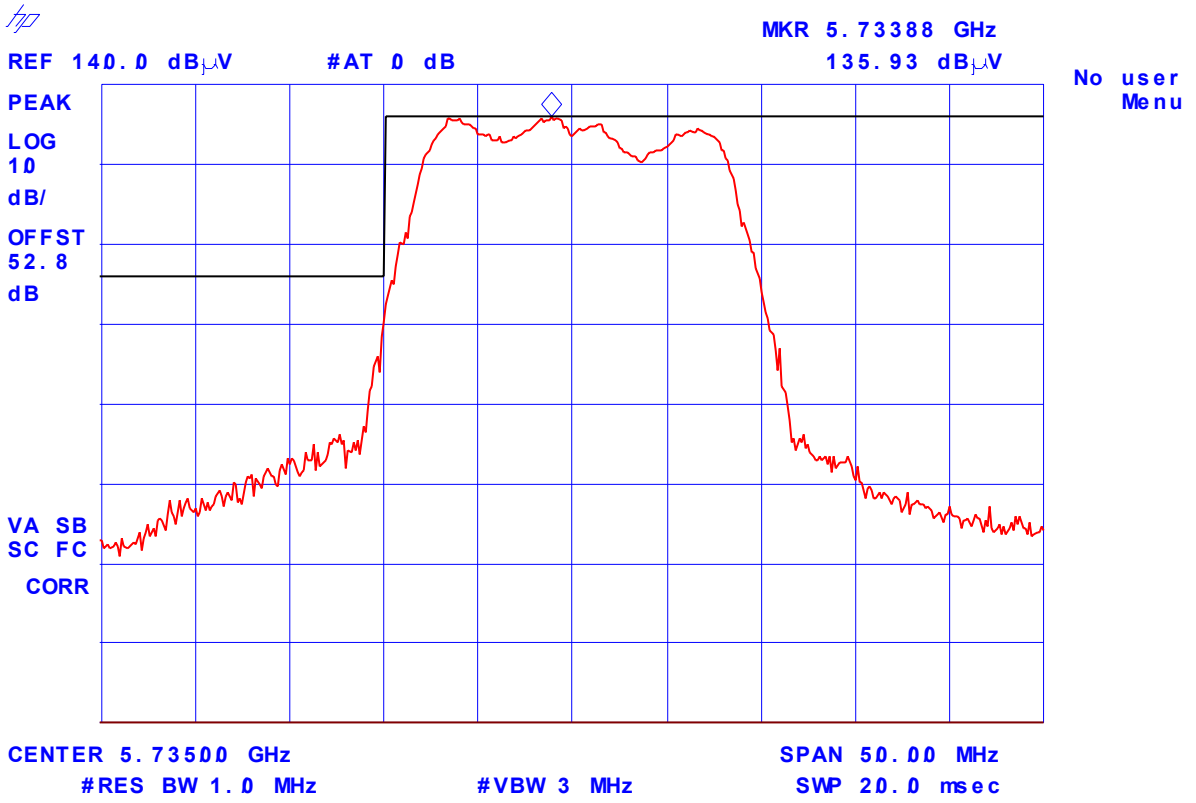
The modulation 64QAM (54 Mb/s) was tested and represent for other modulations since all rf output signal are identical.

Plot # 73: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with MTI Antenna, Model: 486001/A, Serial: 00058

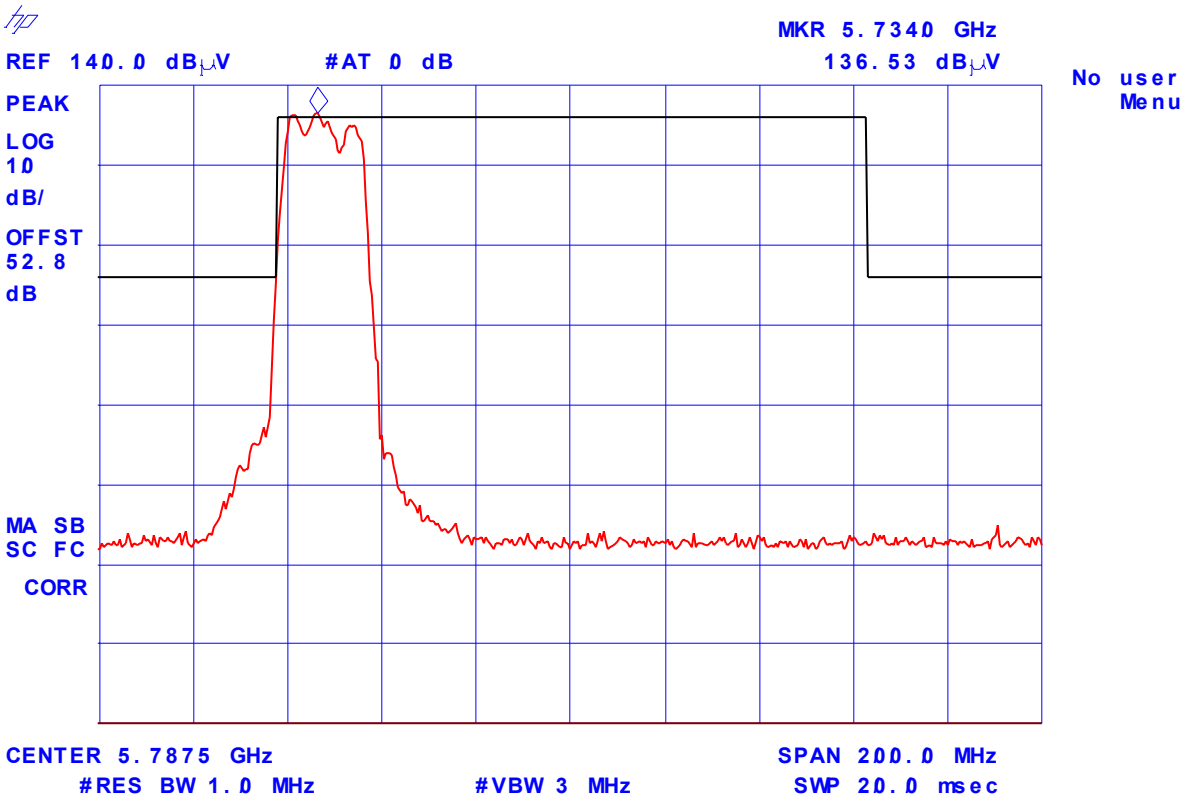


Plot # 74: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with MTI Antenna, Model: 486001/A, Serial: 00058

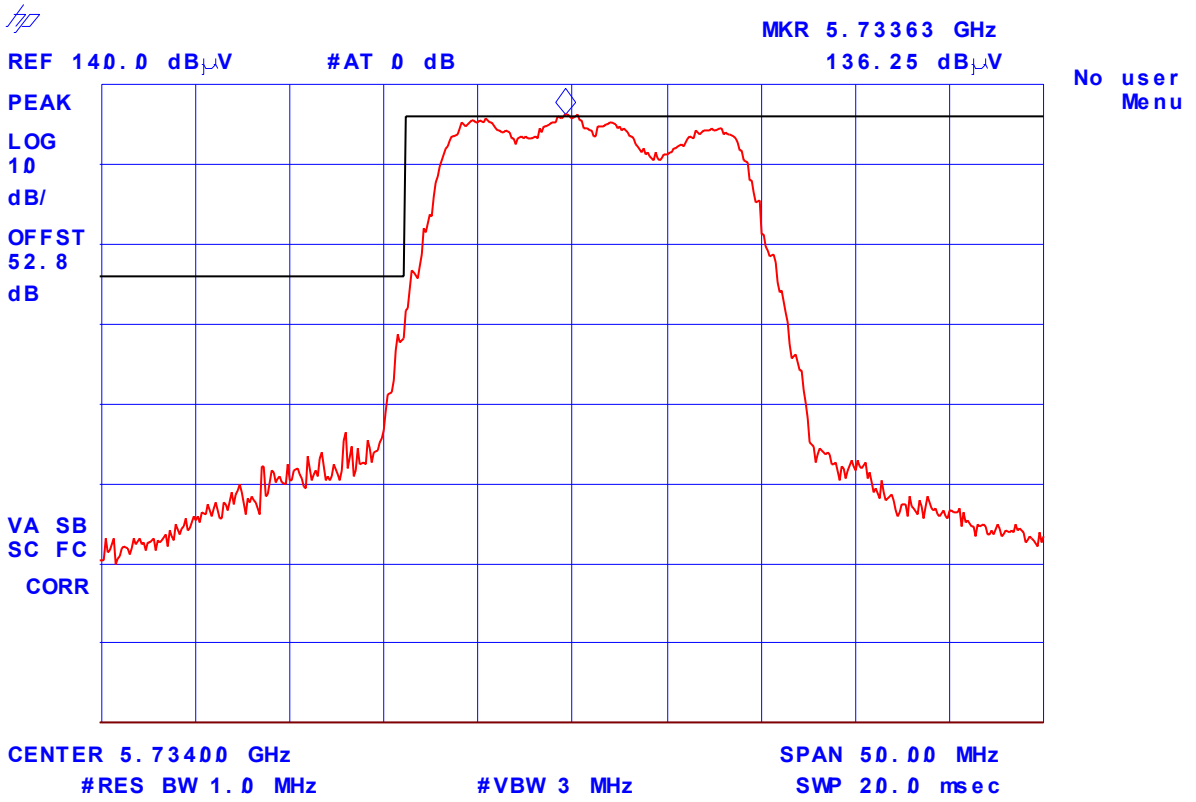


Plot # 75: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with MTI Antenna, Model: 486001/A, Serial: 00058

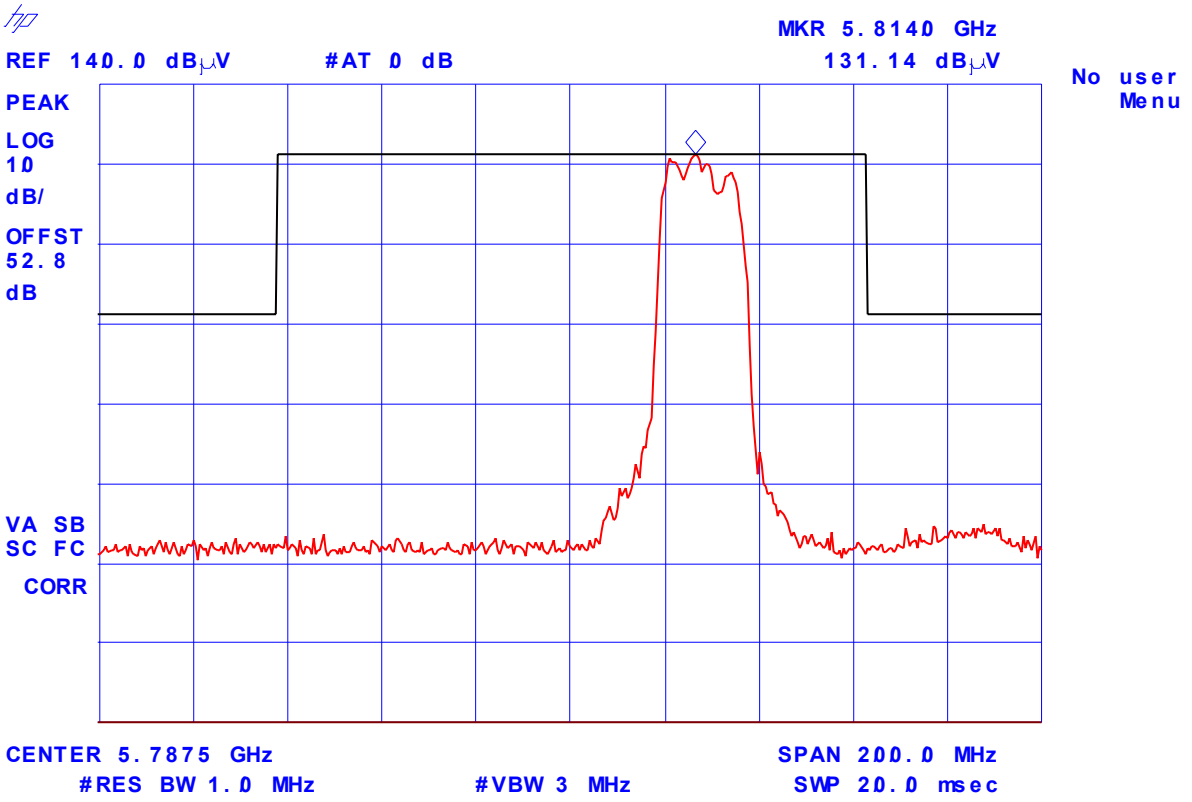


Plot # 76: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with MTI Antenna, Model: 486001/A, Serial: 00058



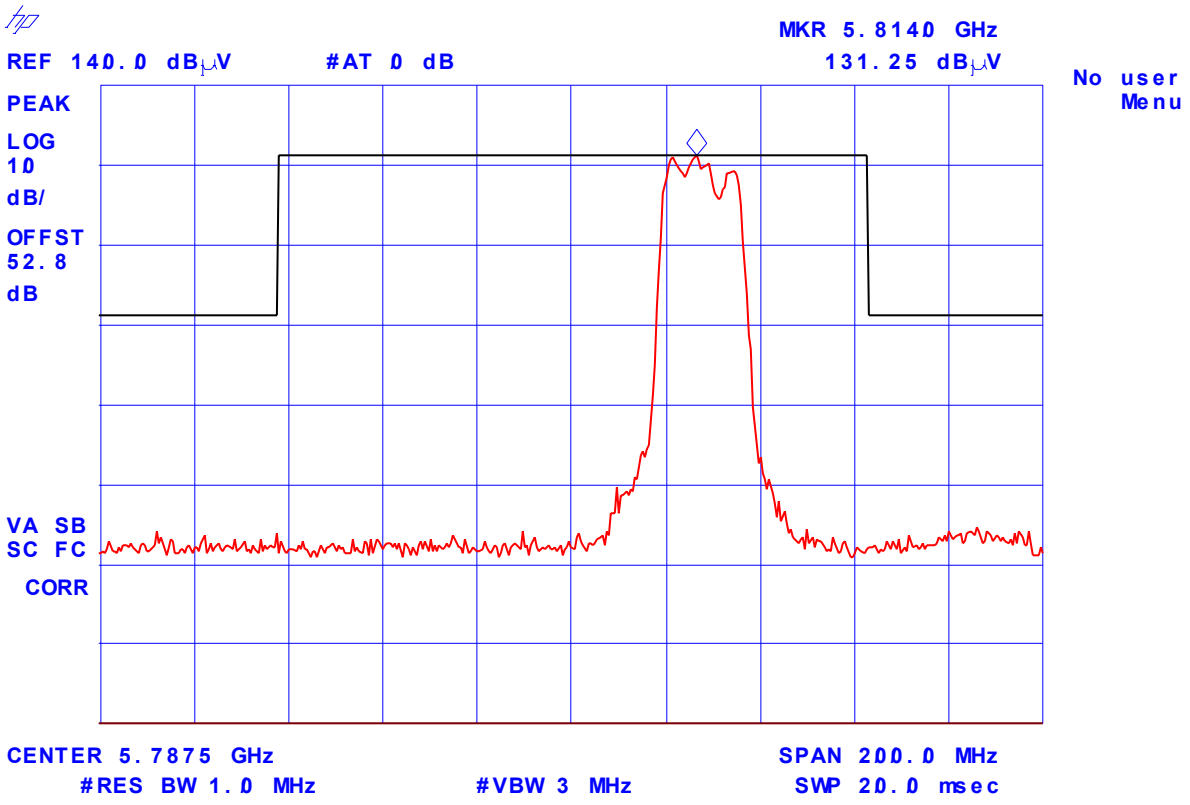
Plot # 77: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with MTI Antenna, Model: 486001/A, Serial: 00058



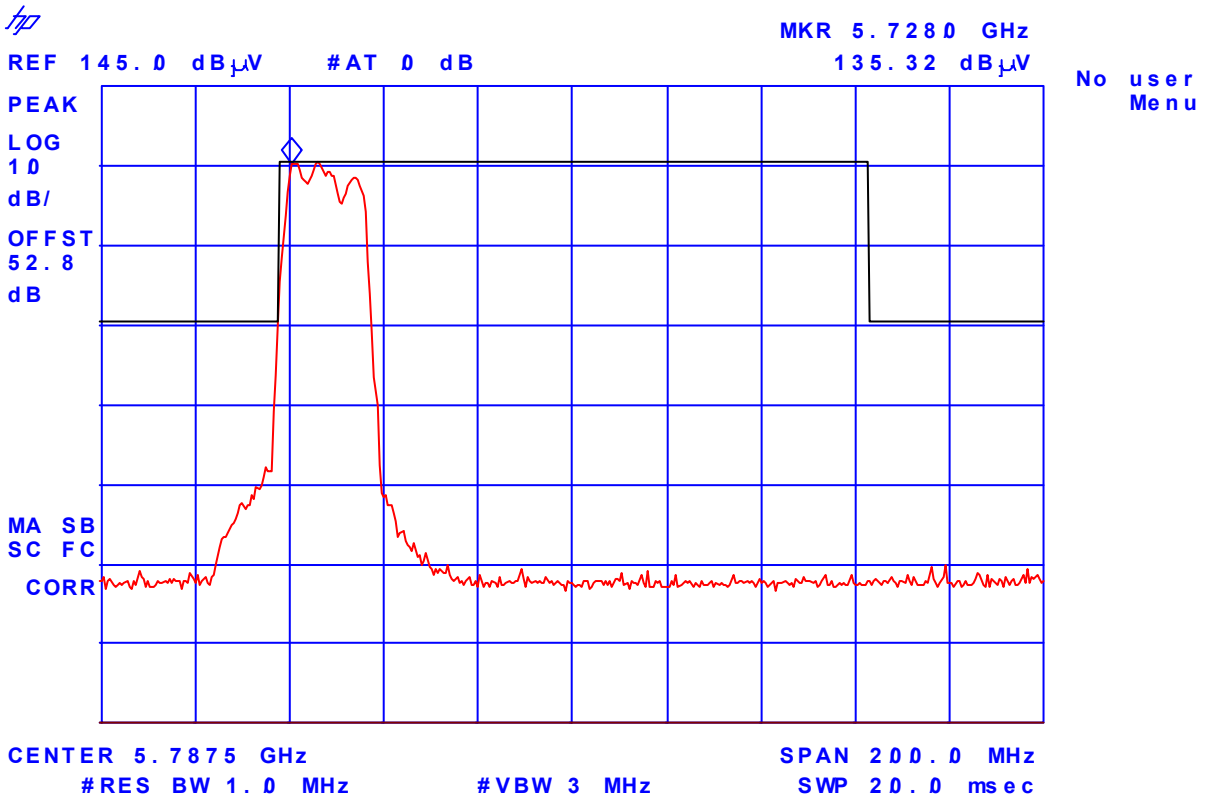
Plot # 78: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with MTI Antenna, Model: 486001/A, Serial: 00058

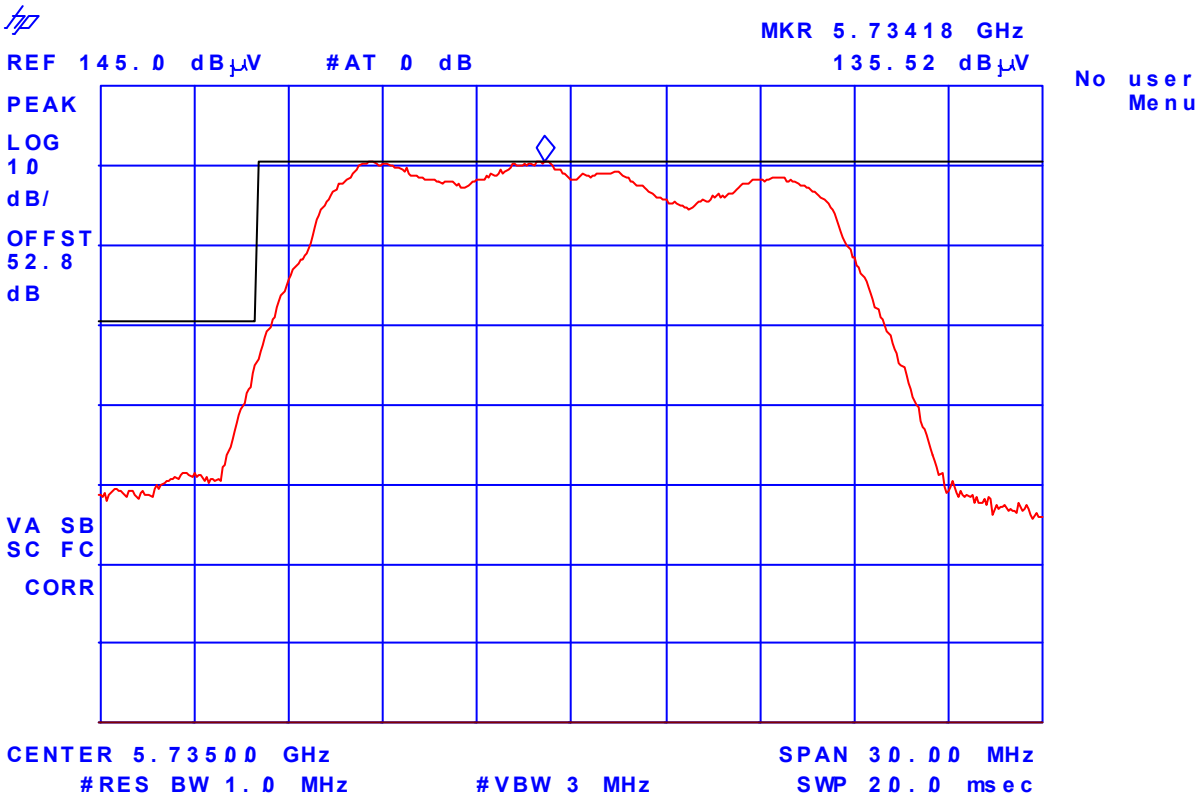


Plot # 79: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SP4-5.2NS, Serial: 5444

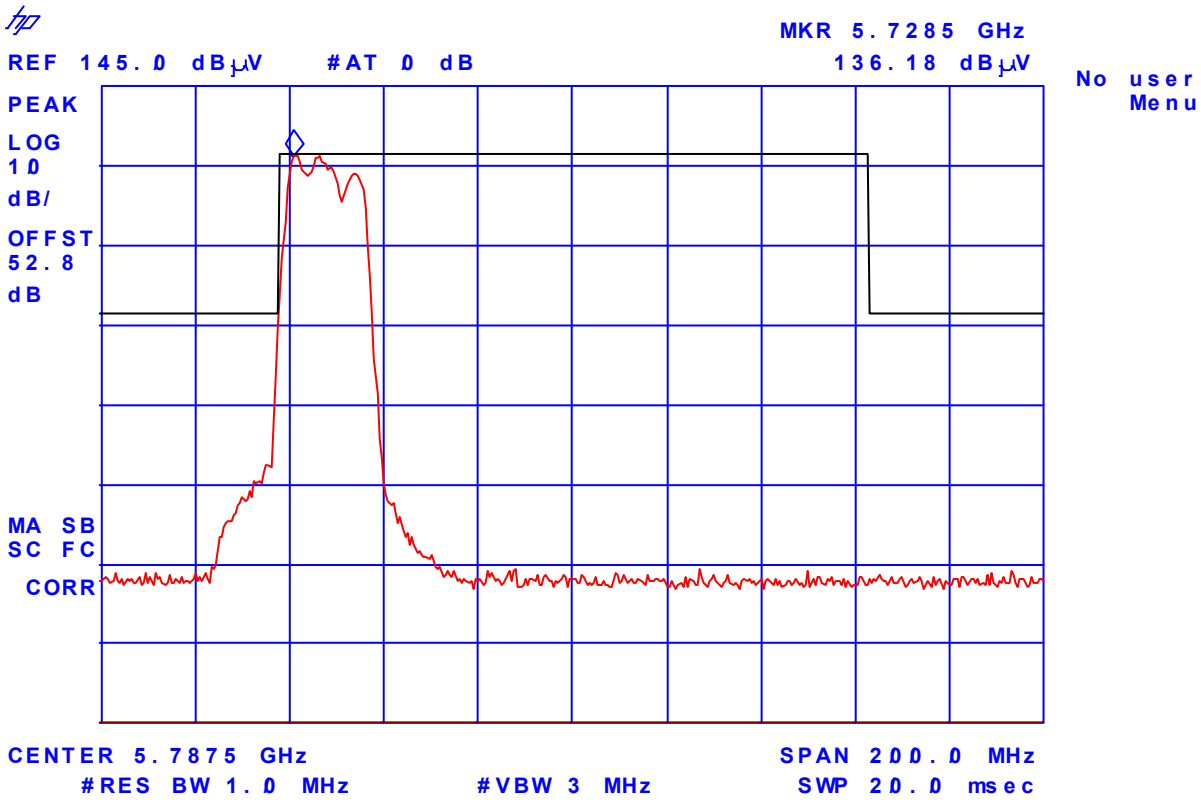


Plot # 80: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SP4-5.2NS, Serial: 5444

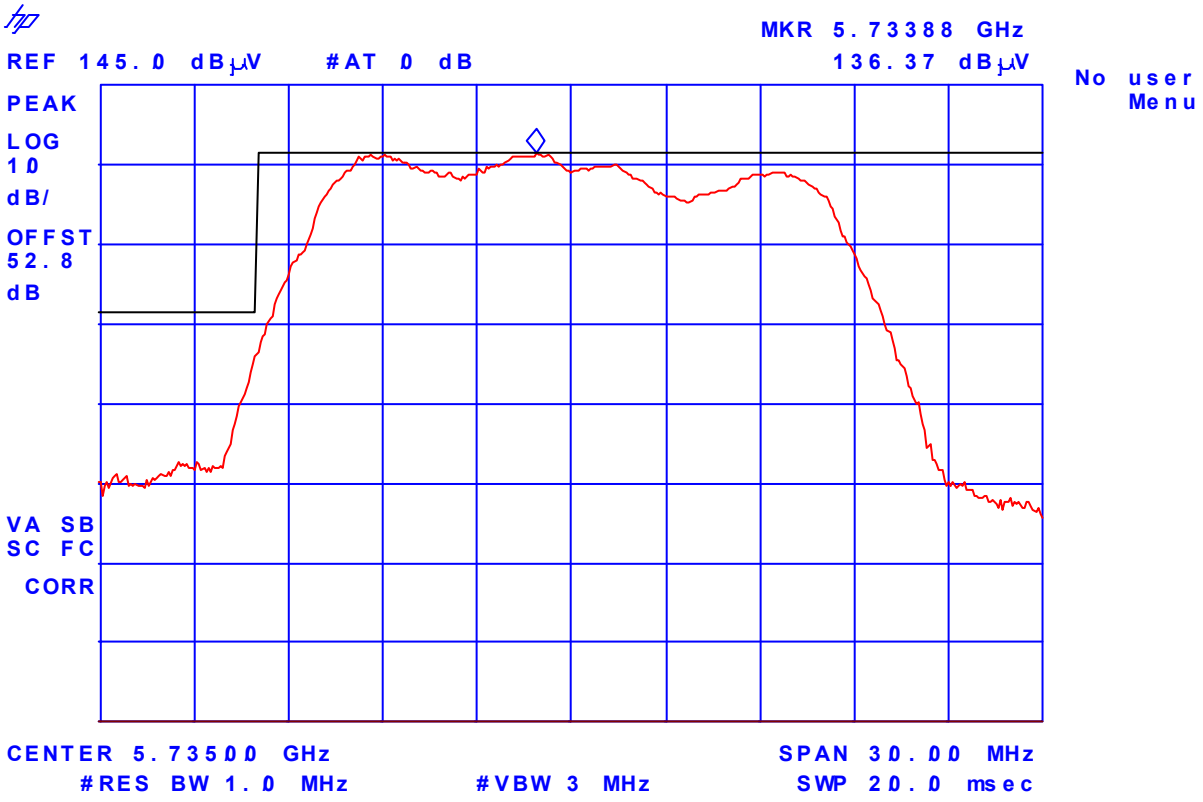


Plot # 81: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SP4-5.2NS, Serial: 5444

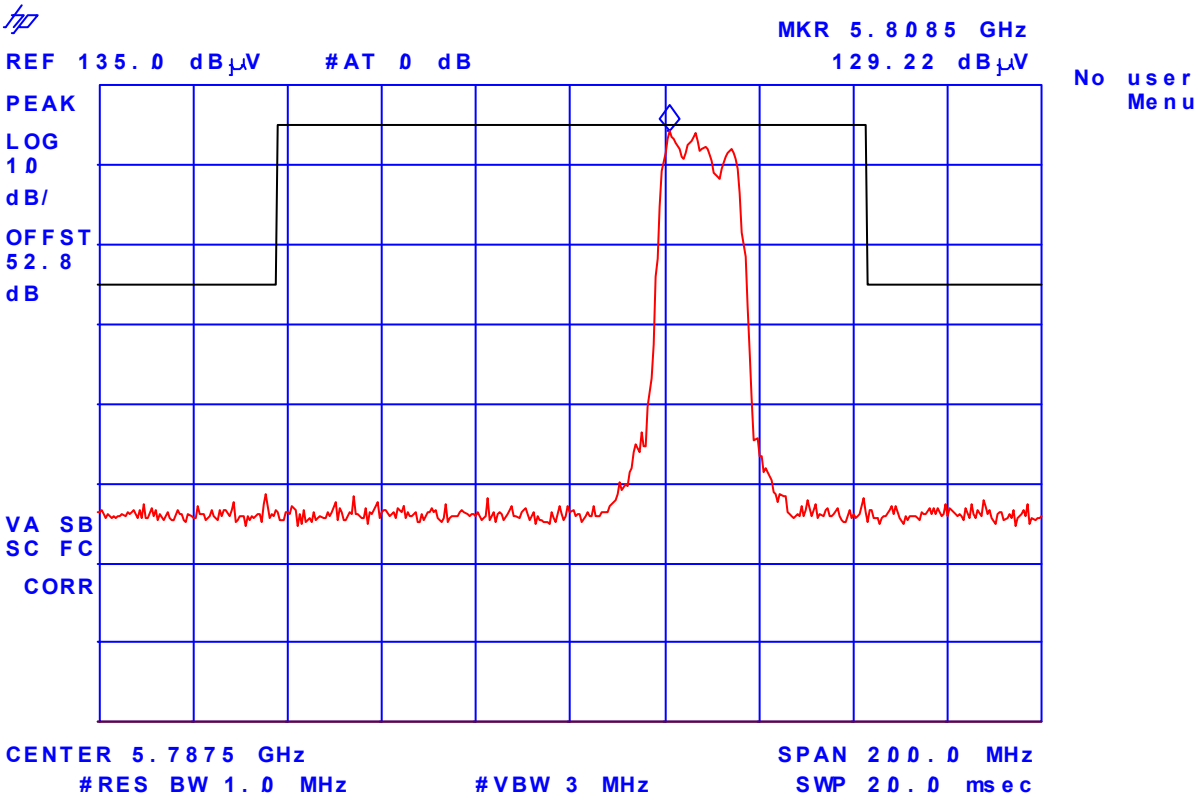


Plot # 82: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SP4-5.2NS, Serial: 5444



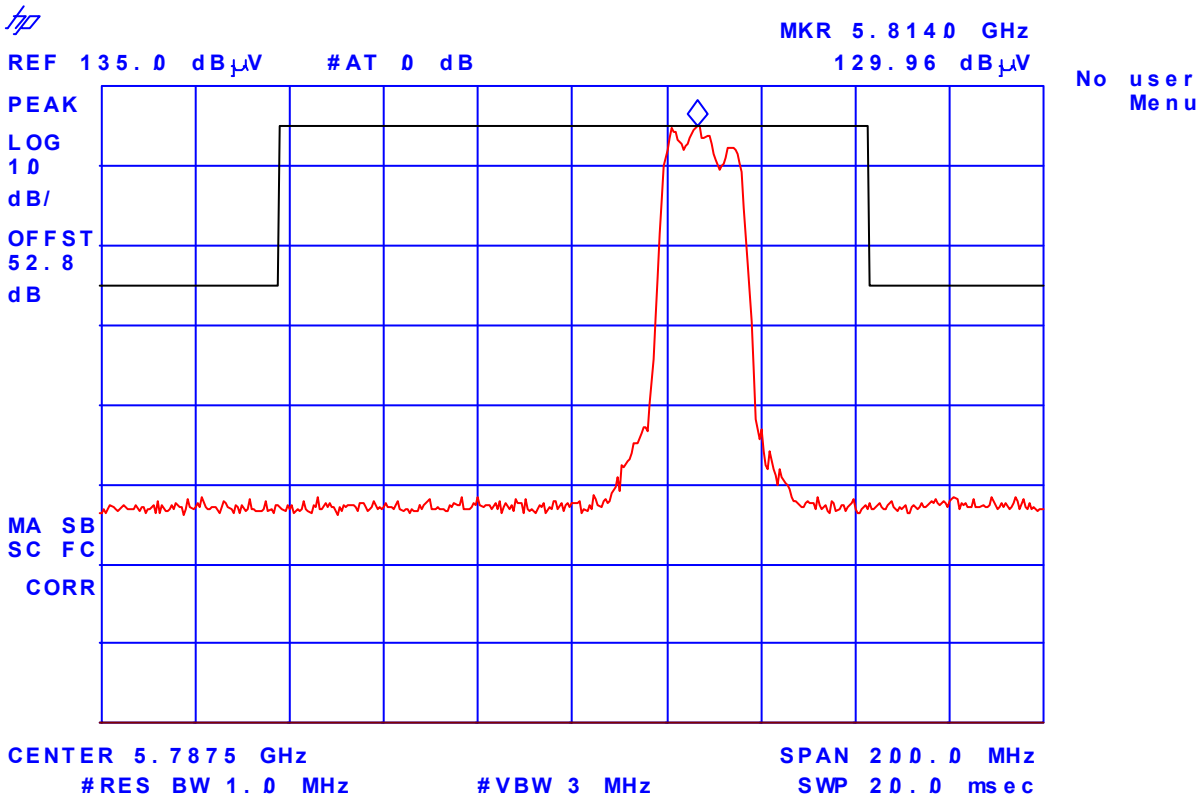
Plot # 83: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SP4-5.2NS, Serial: 5444



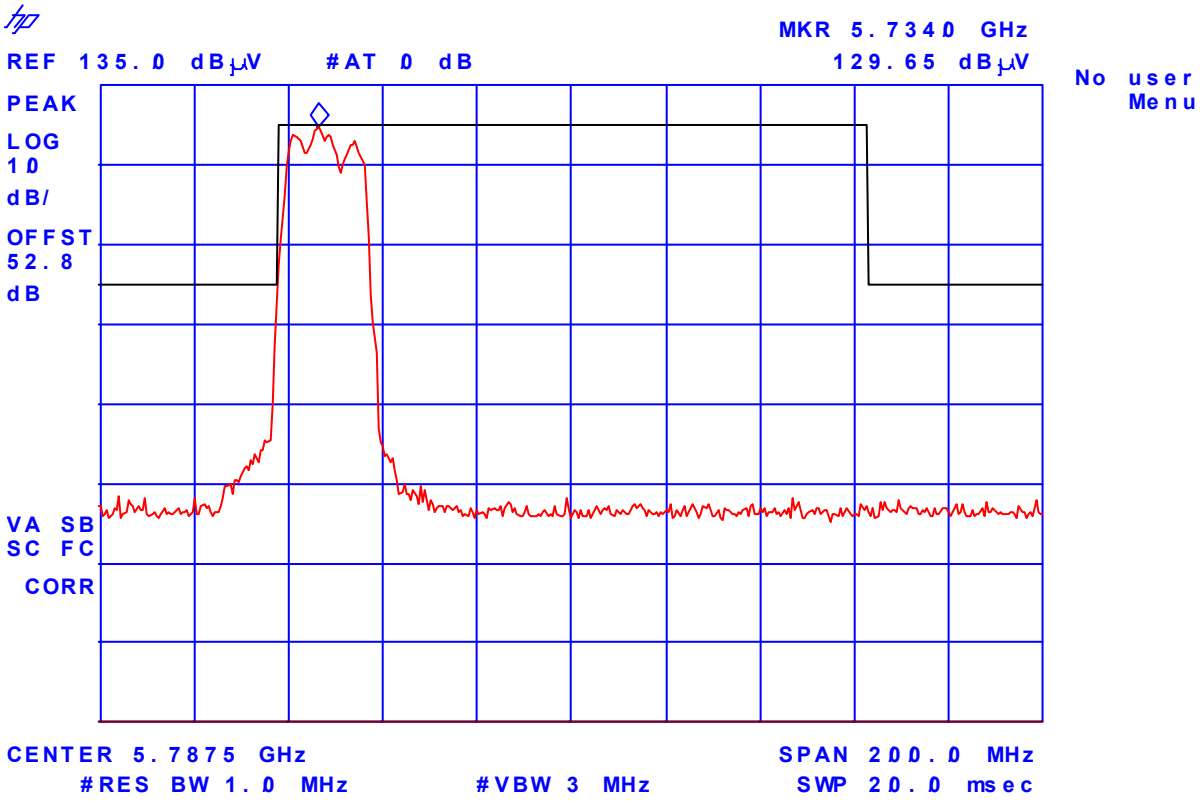
Plot # 84: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SP4-5.2NS, Serial: 5444

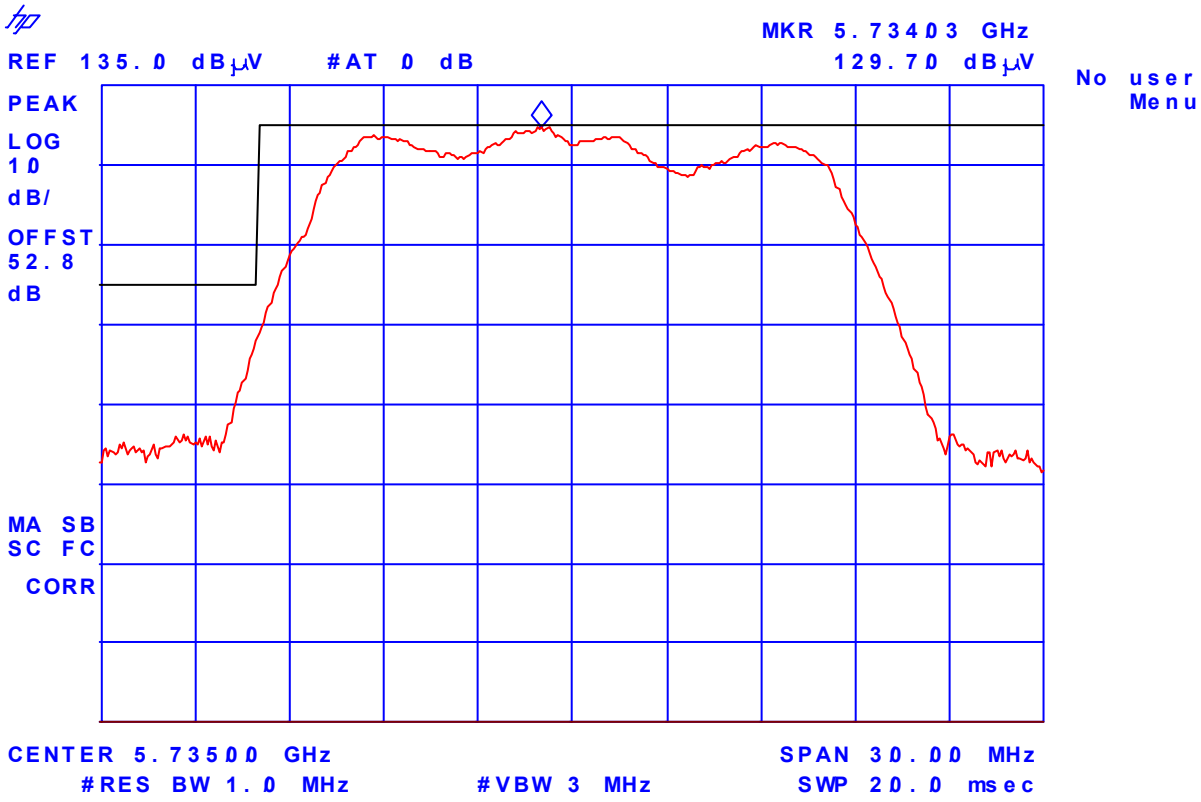


Plot # 85: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SEC-5.5V-60-17, Serial: 141

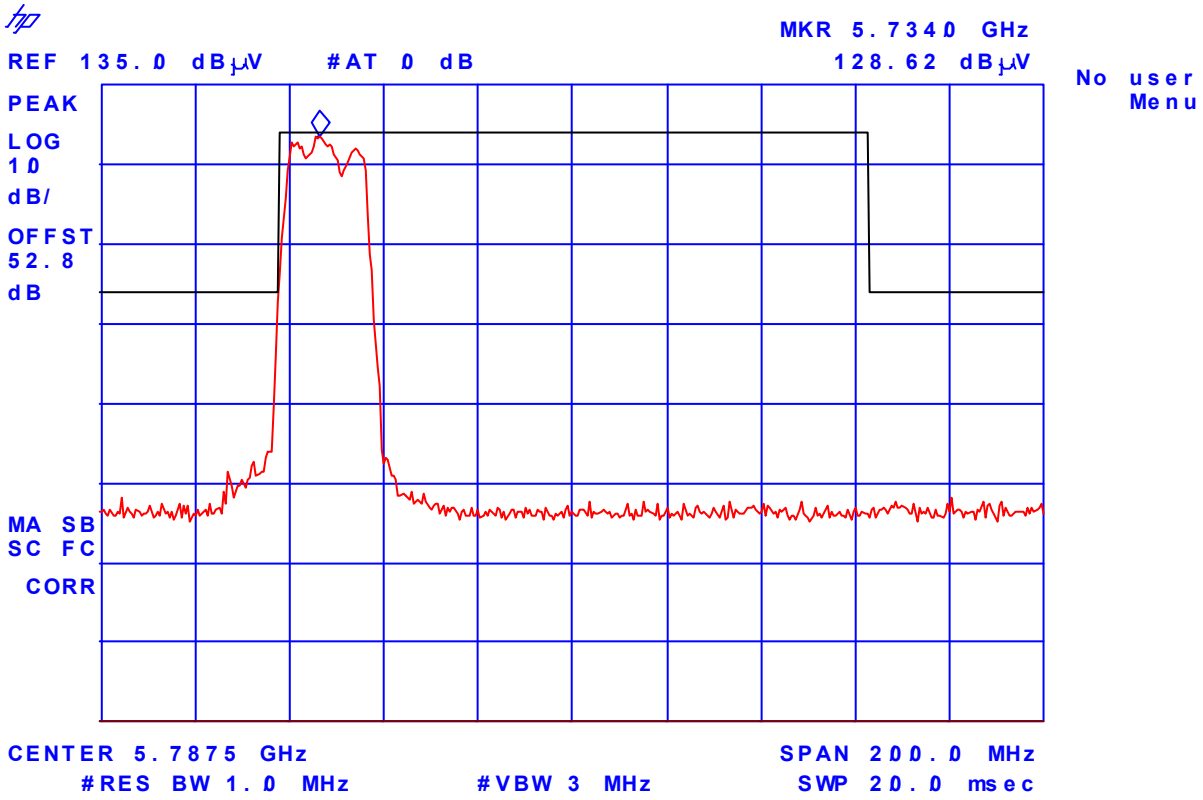


Plot # 86: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SEC-5.5V-60-17, Serial: 141

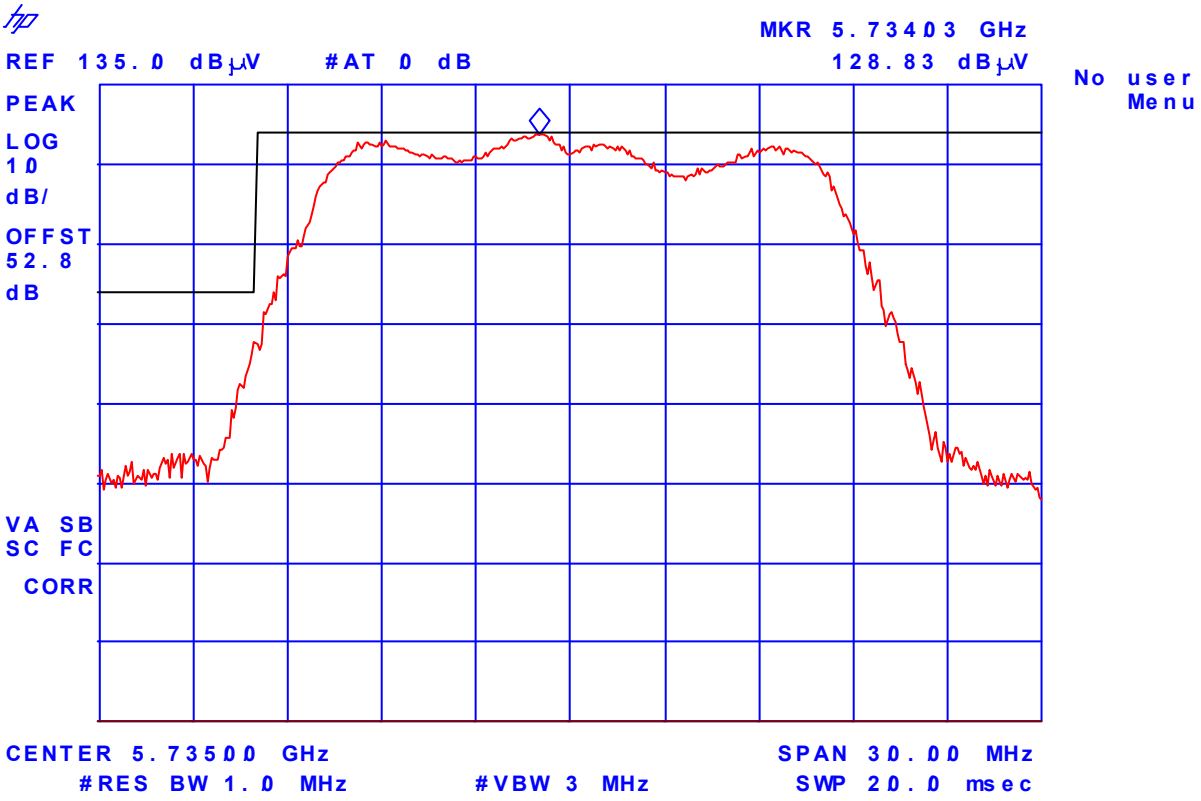


Plot # 87: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SEC-5.5V-60-17, Serial: 141

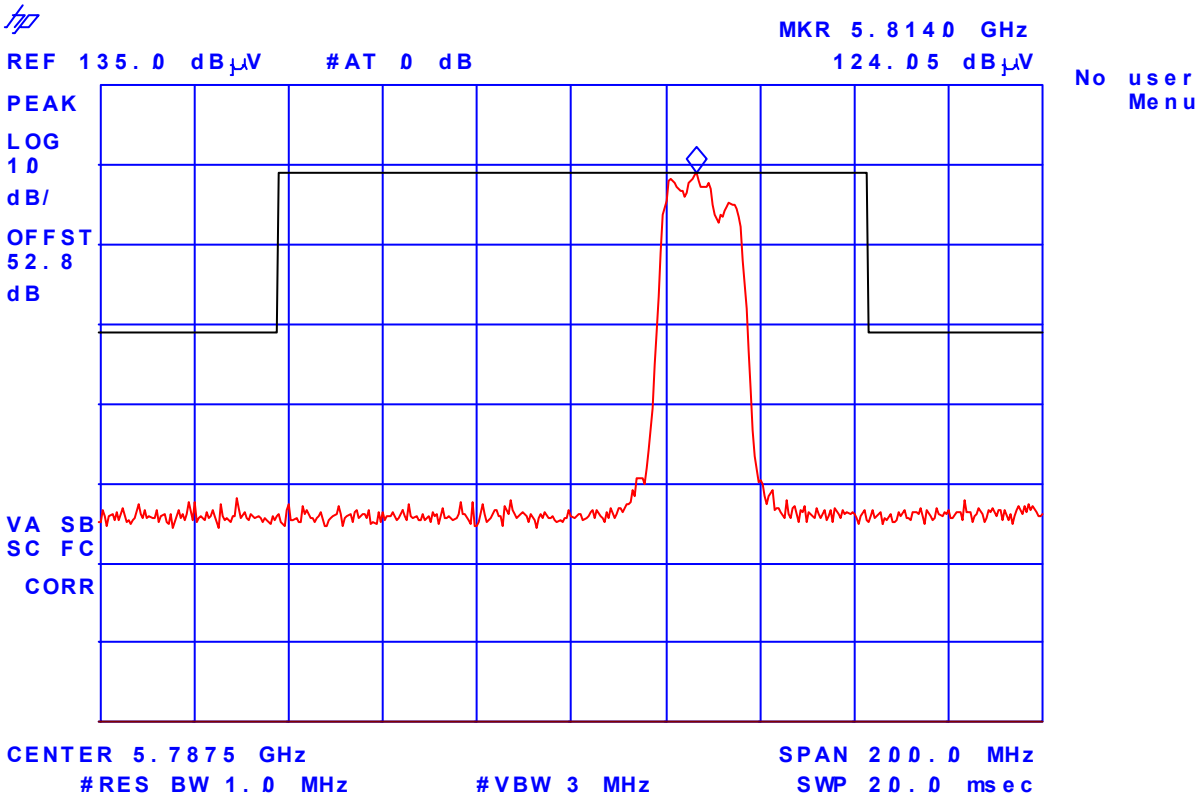


Plot # 88: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SEC-5.5V-60-17, Serial: 141



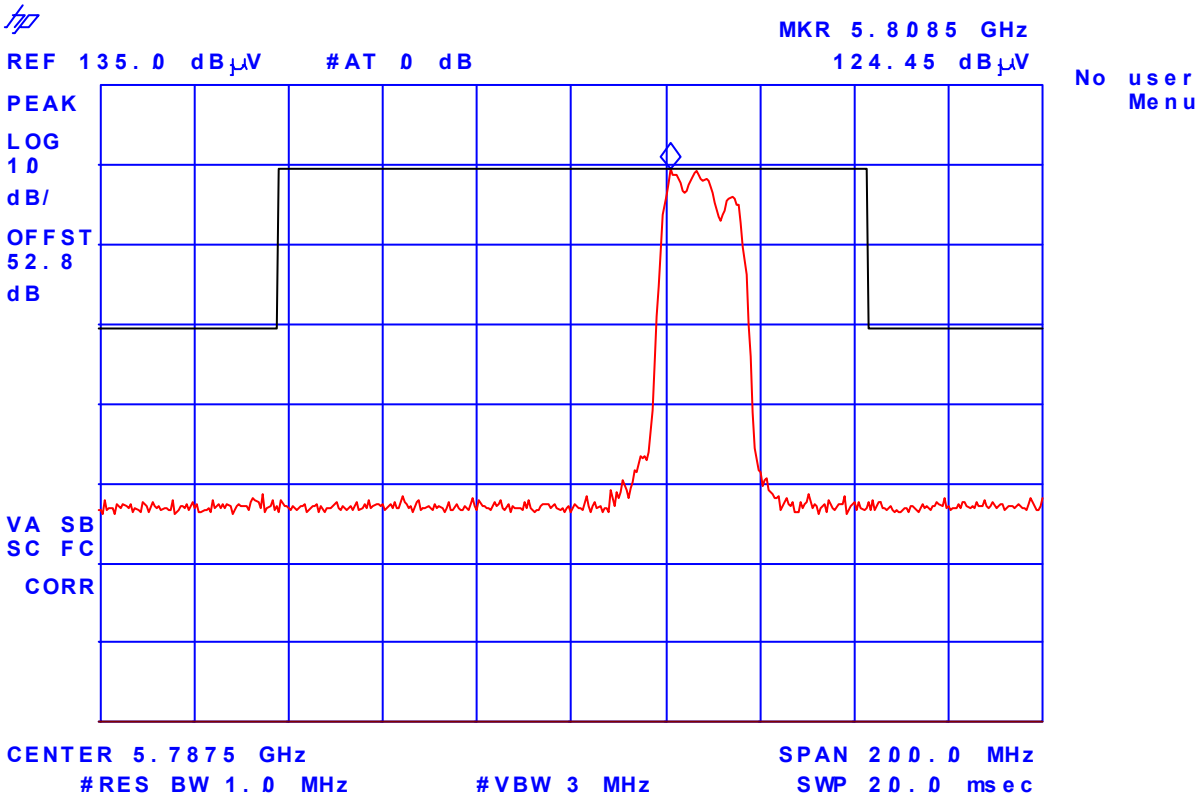
Plot # 89: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SEC-5.5V-60-17, Serial: 141



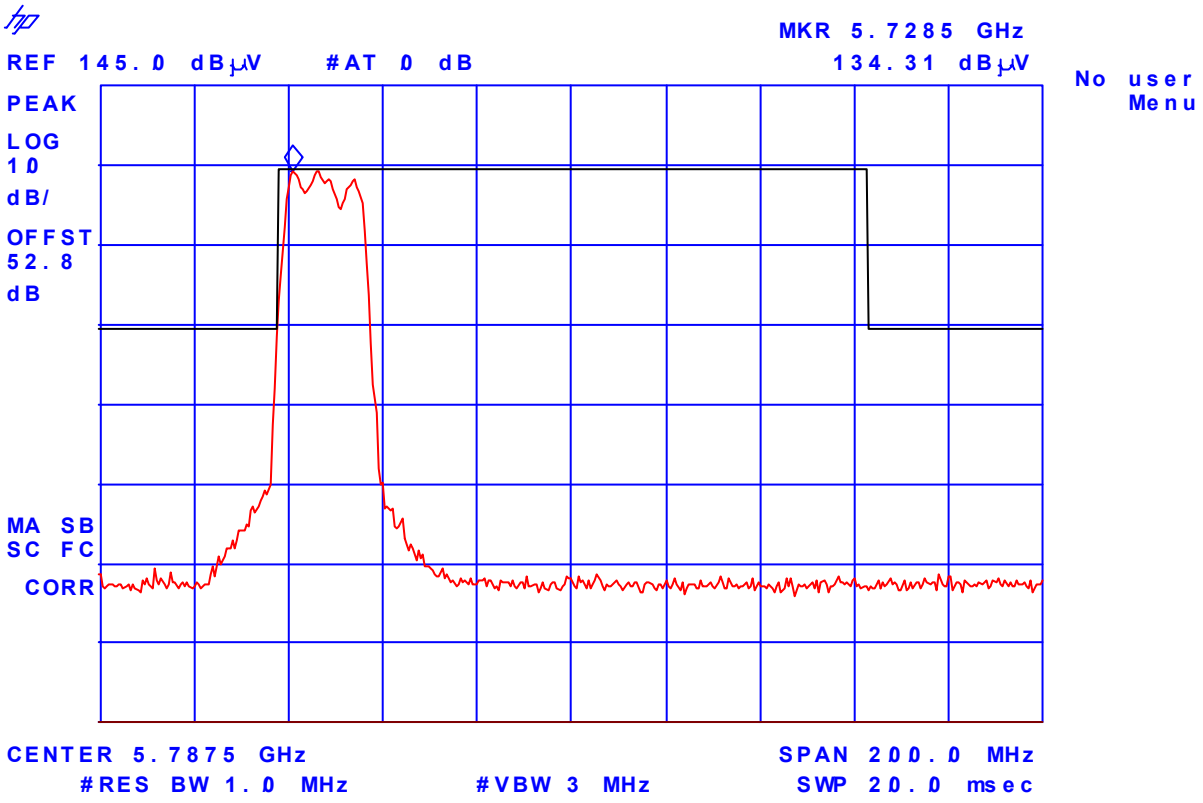
Plot # 90: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Radiowaves Antenna, Model: SEC-5.5V-60-17, Serial: 141

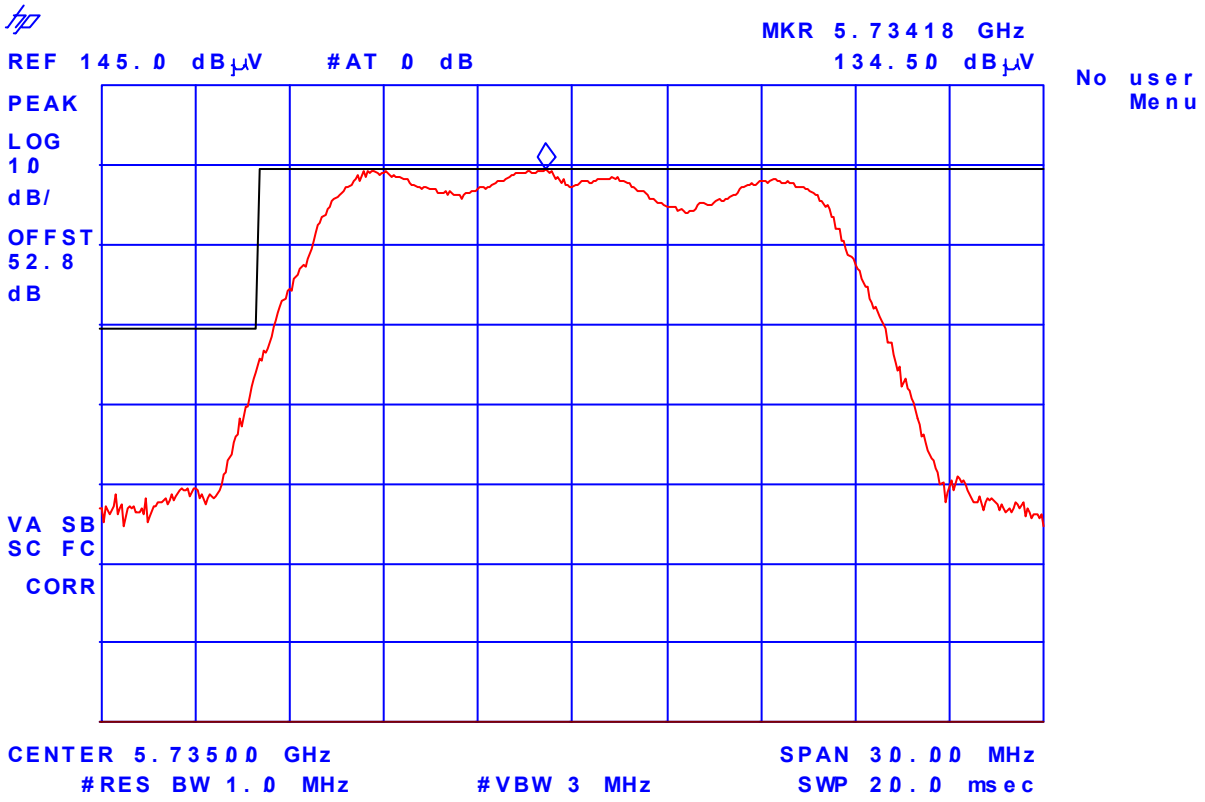


Plot # 91: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Maxrad Antenna, Model: MPR58031PTNF

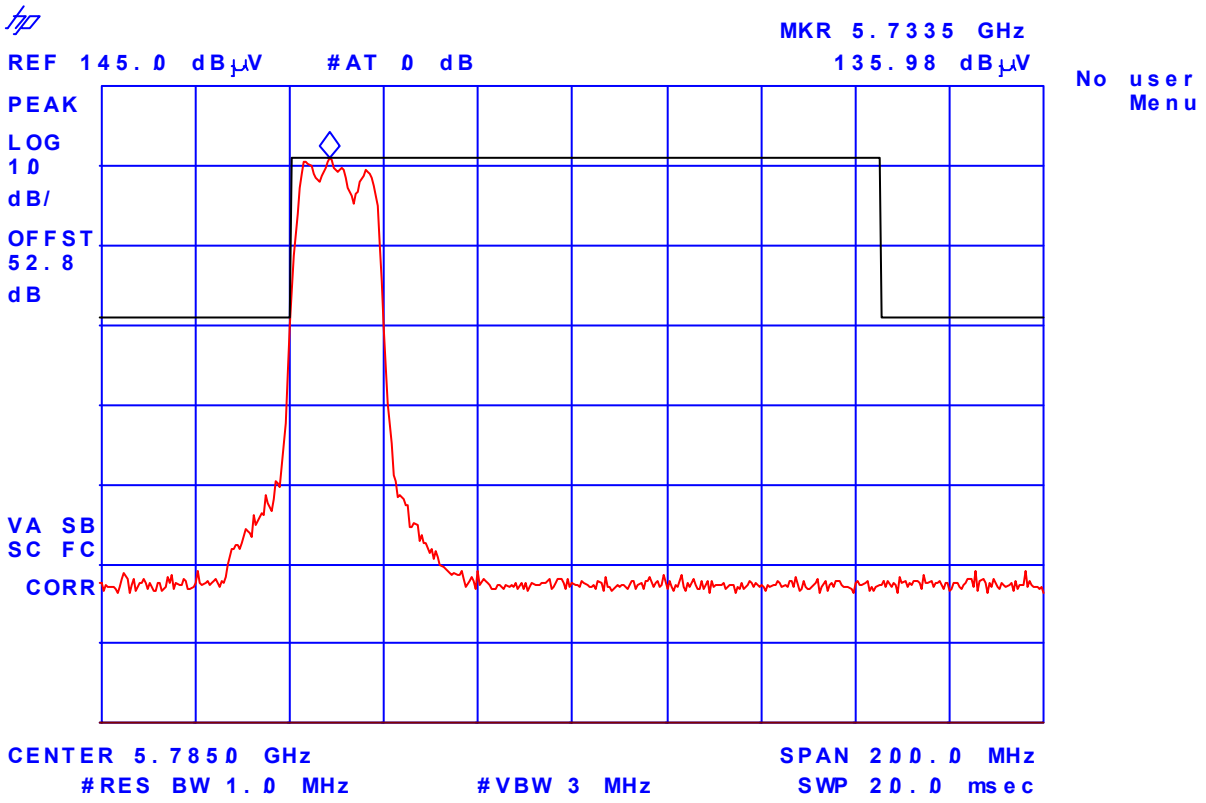


Plot # 92: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Maxrad Antenna, Model: MPR58031PTNF

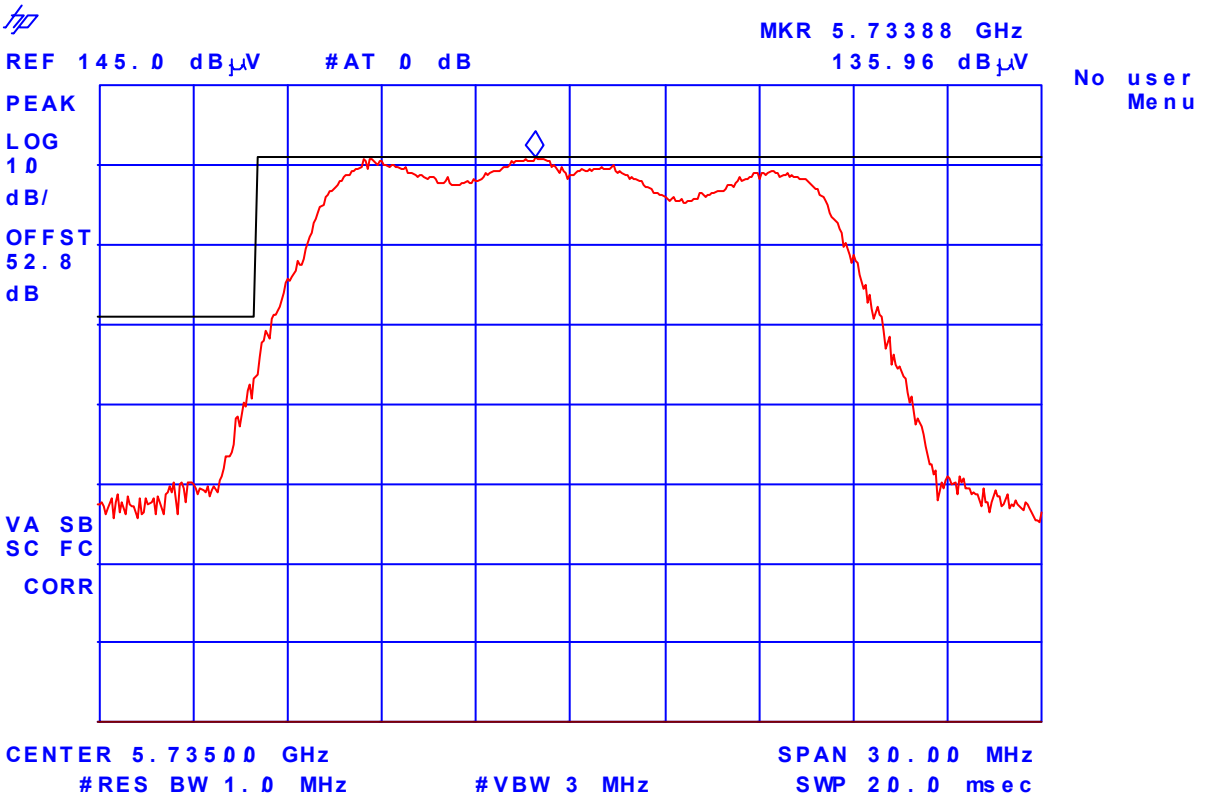


Plot # 93: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Maxrad Antenna, Model: MPR58031PTNF

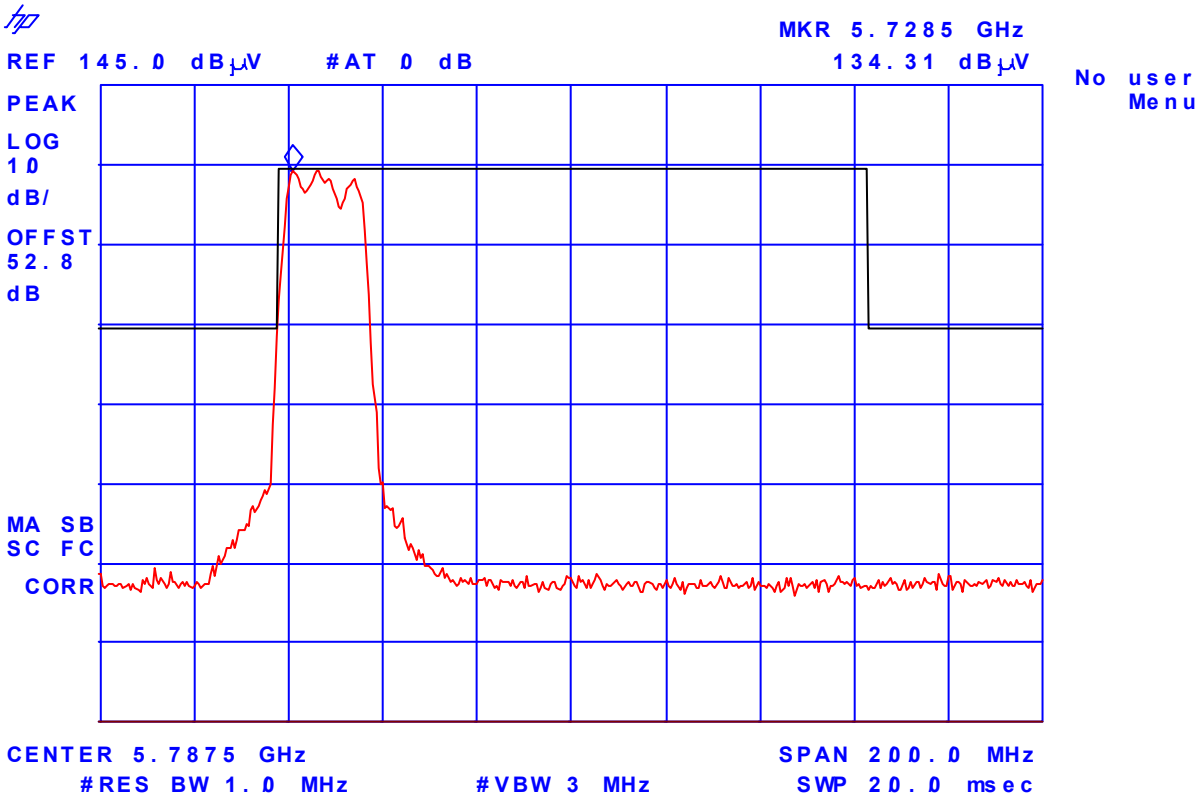


Plot # 94: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Maxrad Antenna, Model: MPR58031PTNF



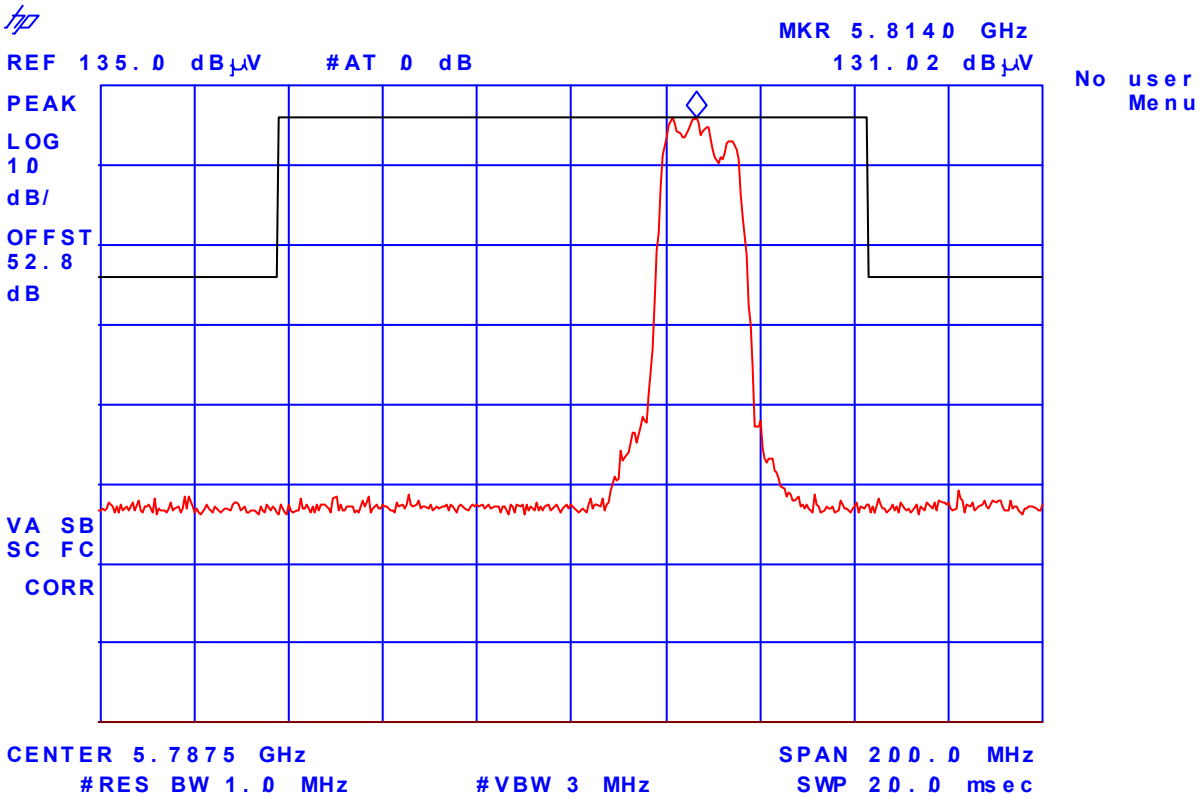
Plot # 95: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Maxrad Antenna, Model: MPR58031PTNF



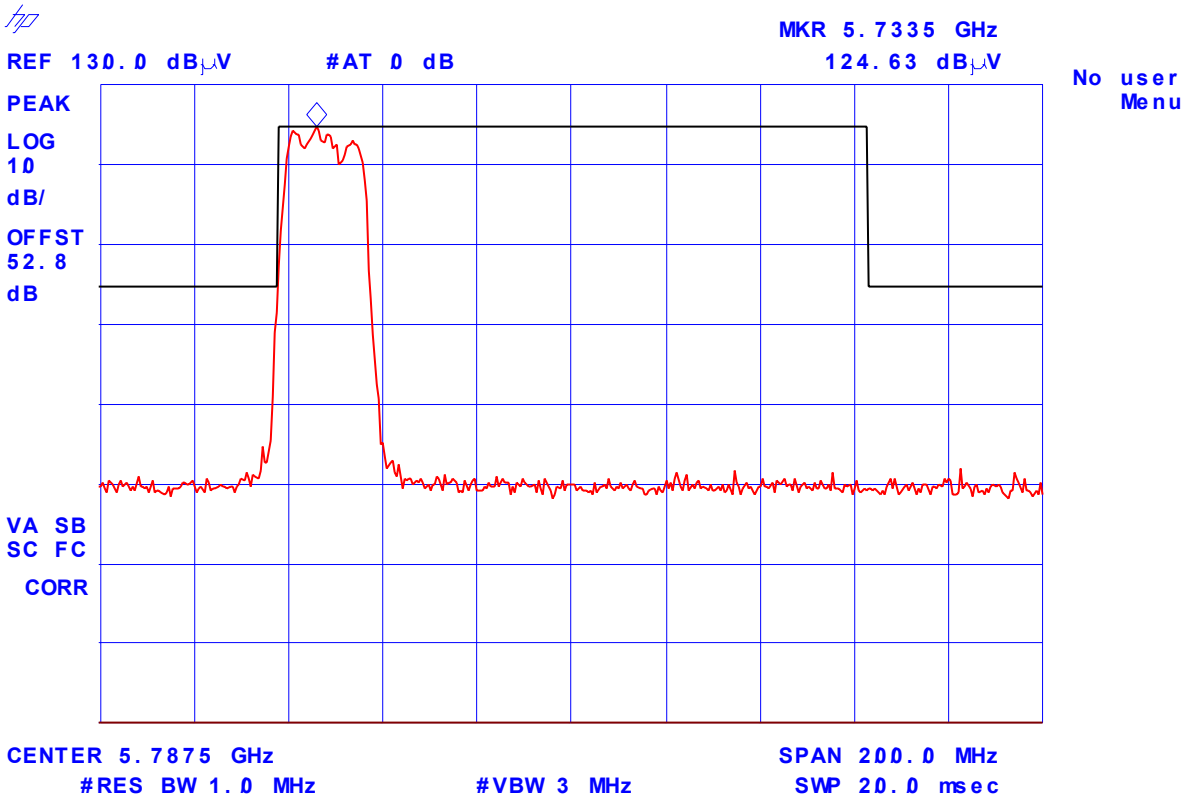
Plot # 96: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Maxrad Antenna, Model: MPR58031PTNF



Plot # 97: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Tongyu Directional Antenna, Model: TDJ-5818AM-60



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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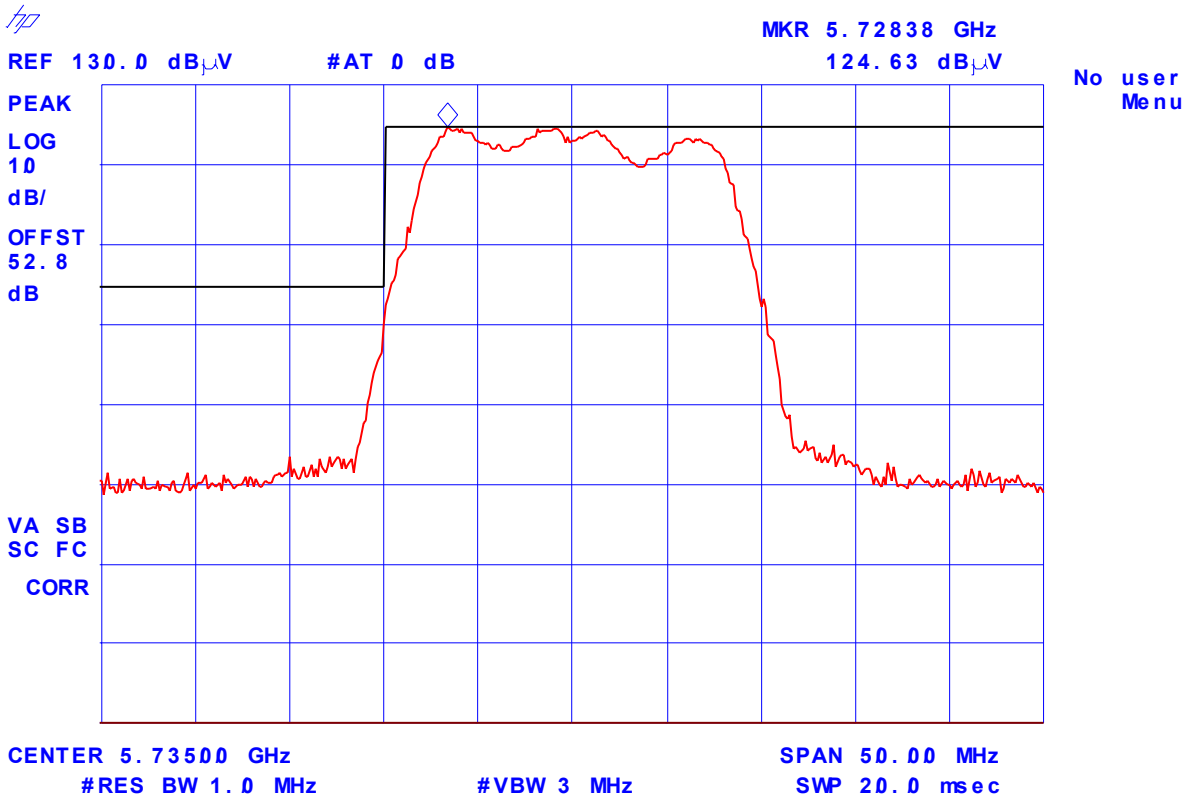
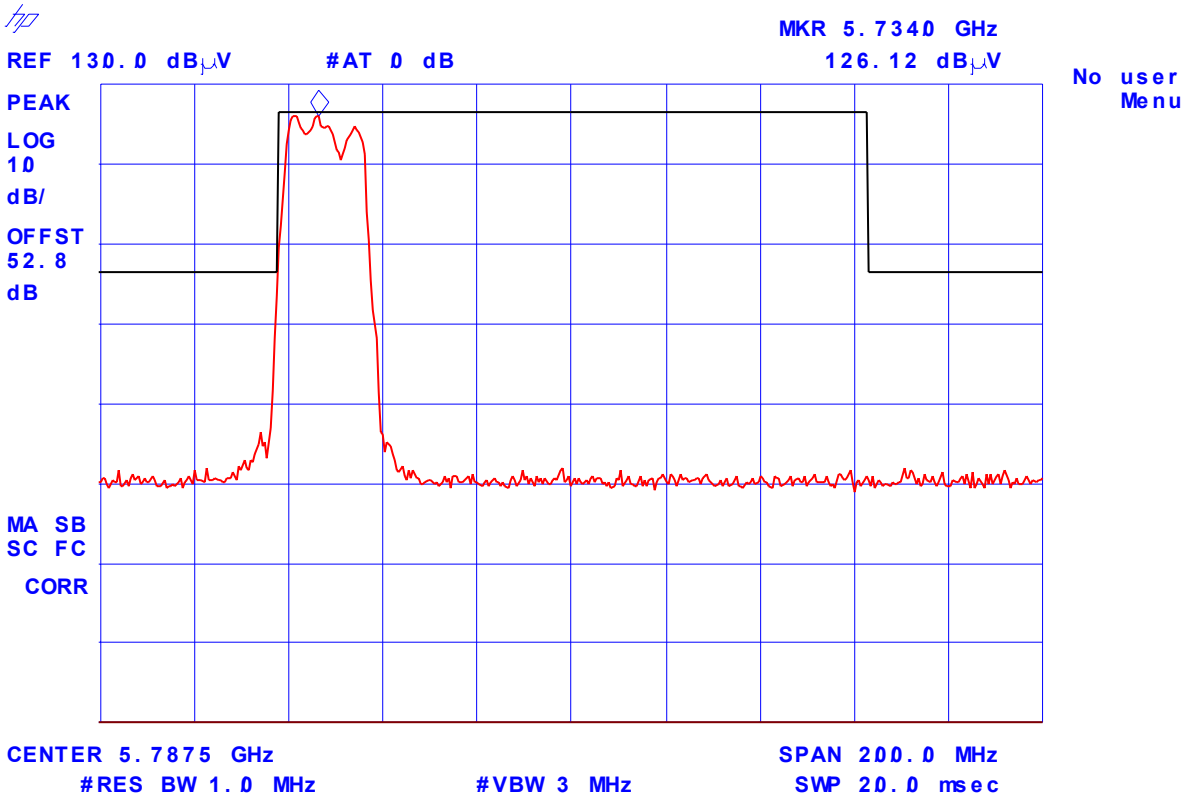
Plot # 98: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Tongyu Directional Antenna, Model: TDJ-5818AM-60

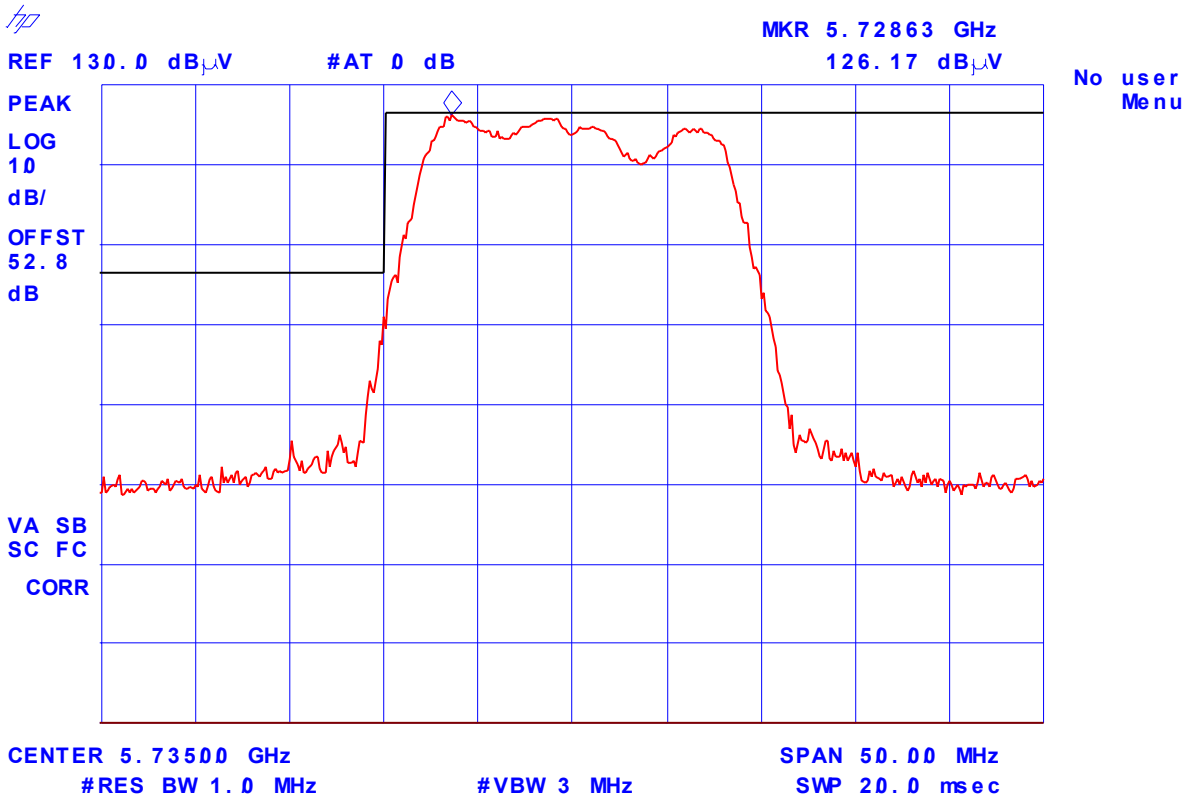


Plot # 99: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Tongyu Directional Antenna, Model: TDJ-5818AM-60

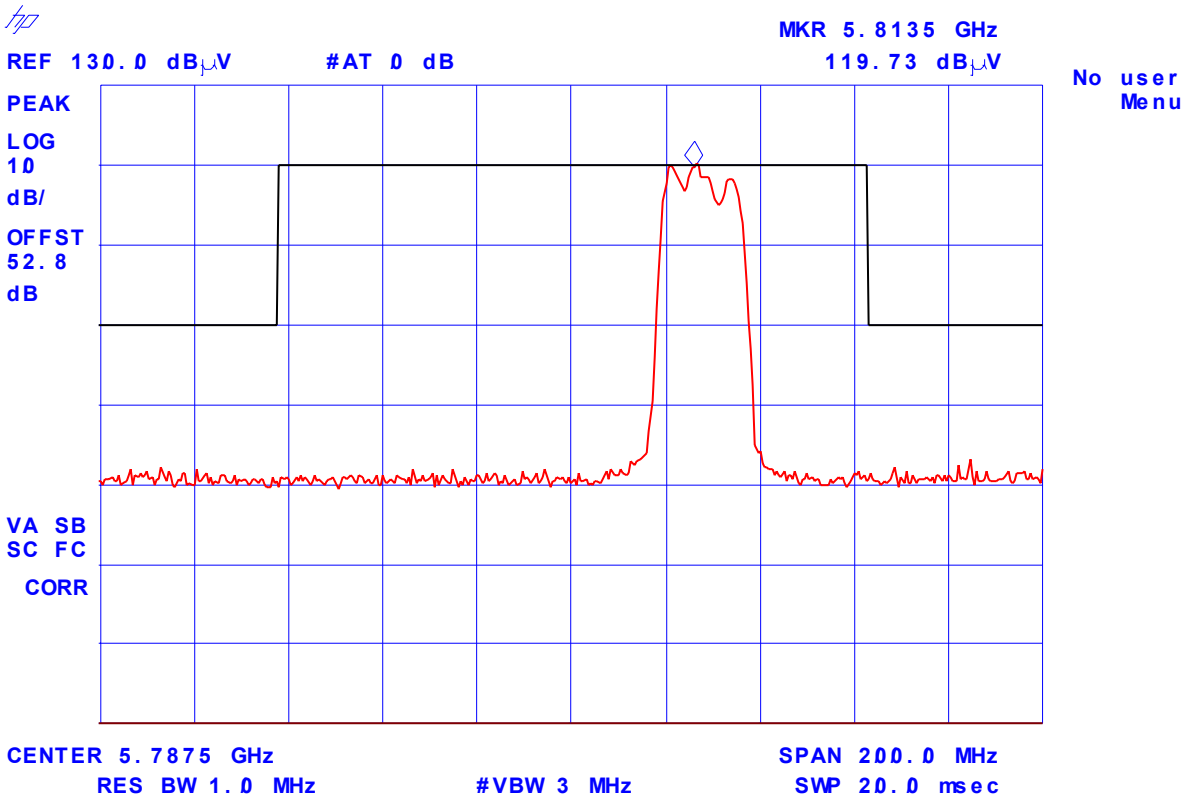


Plot # 100: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization (Zoom in) - Channel 1, 5735 MHz, 64 QAM (54 Mb/s) with Tongyu Directional Antenna, Model: TDJ-5818AM-60



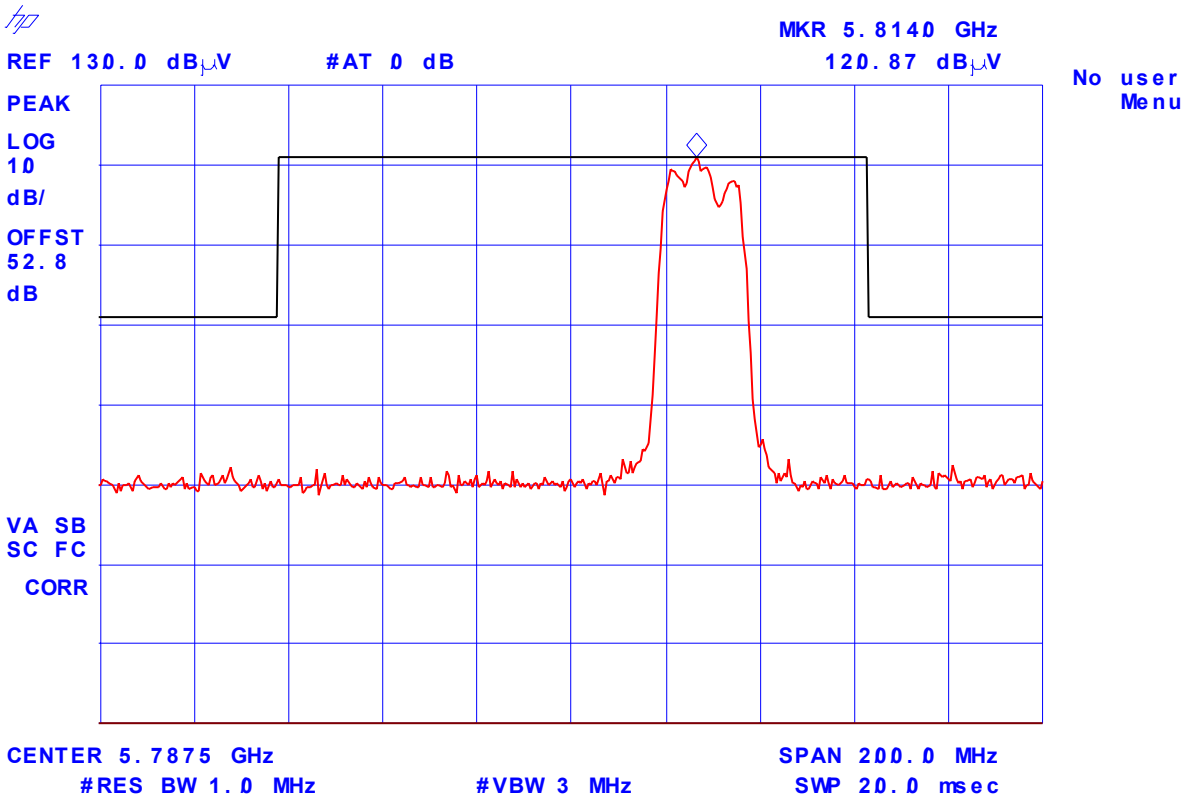
Plot # 101: Bandedge Radiated Emissions @ 3 Meters, Vertical Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Tongyu Directional Antenna, Model: TDJ-5818AM-60



Plot # 102: Bandedge Radiated Emissions @ 3 Meters, Horizontal Polarization

Channel 5, 5815 MHz, 64 QAM (54 Mb/s) with Tongyu Directional Antenna, Model: TDJ-5818AM-60



All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

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6.13.7.2. Spurious/Harmonic Radiated Emissions at 3 meters

Notes: The test data in the tables below show worst case of spurious/harmonic emissions measured with the following worst case operating conditions:

(1) Maximum gain antenna within its family as below:
(2) Maximum rf output powers rated (25.3 dBm) for Point-to-Point application

Antenna Manufacturer	*Model Number*	*Max. Gain within Family (dBi)*	*Max. RF Power (dBm)*	*Maximum EIRP (dBm)*	*Plots #*
MTI	486001	28.0	25.3	53.3	71 - 76
Radiowaves	SP4-5.2	34.8	25.3	60.1	77 - 82
Radiowaves	SEC-55V-60-17	17.0	25.3	42.3	83 - 88
MaxRad	MPR58031PTNF	31.0	25.3	56.3	89 - 94
Tongyu	TDJ-5818AM-60	18.0	25.3	43.3	95 - 100

The modulation 64QAM (54 Mb/s) was tested and represent for other modulations since all rf output signal are identical.

6.13.7.3. Transmitter Radiated Emissions with MTI Antenna Model 486001, Gain: 28 dBi (maximum gain within its family)

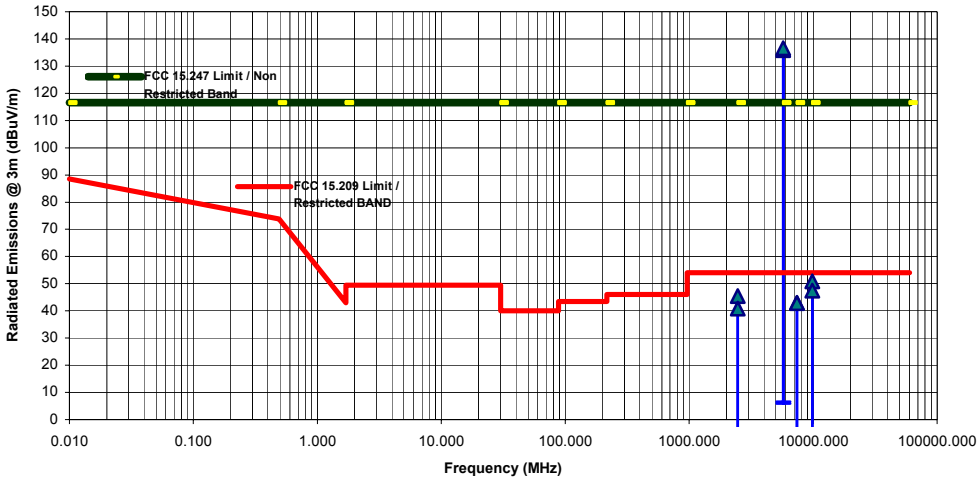
6.13.7.3.1. Channel #1, Frequency: 5735 MHz, Output power: 25.3 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2460.00	48.1	45.4	V	54.0	116.6	-71.2	PASS
2460.00	46.8	40.8	H	54.0	116.6	-75.8	PASS
5735.00	135.9	135.9	V	--	--	--	PASS
5735.00	136.6	136.6	H	--	--	--	PASS
7380.00	52.3	43.0	V	54.0	116.6	-11.0	*PASS
7380.00	51.8	42.8	H	54.0	116.6	-11.2	*PASS
9840.00	57.1	50.9	V	54.0	116.6	-65.7	PASS
9840.00	56.0	47.5	H	54.0	116.6	-69.1	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 3 to 4 in Annex 1 for detailed of test setup.

Plot # 103

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5735 MHz, RF Output: 25.3 dBm, Modulation: 64QAM
MTI Antenna Model 486001, Gain: 28 dBi



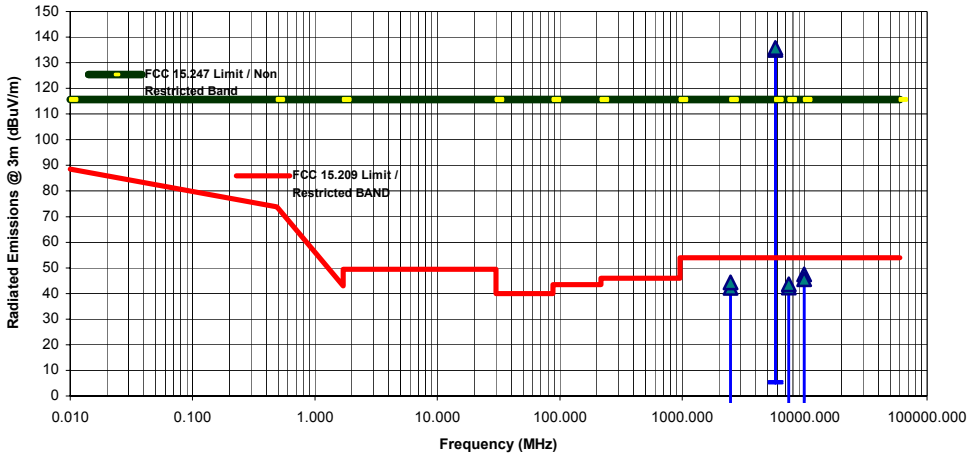
6.13.7.3.2. Channel #3, Frequency: 5775 MHz, Output power: 24.4 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2480.00	47.7	42.2	V	54.0	115.7	-73.5	PASS
2480.00	47.3	44.3	H	54.0	115.7	-71.4	PASS
5775.00	135.0	135.0	V	--	--	--	PASS
5775.00	135.7	135.7	H	--	--	--	PASS
7440.00	51.4	42.4	V	54.0	115.7	-11.6	*PASS
7440.00	52.1	43.6	H	54.0	115.7	-10.4	*PASS
9920.00	55.3	47.4	V	54.0	115.7	-68.3	PASS
9920.00	56.0	45.6	H	54.0	115.7	-70.1	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 5 to 6 in Annex 1 for detailed of test setup.

Plot # 104

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5775 MHz, RF Output: 24.4 dBm, Modulation: 64QAM
MTI Antenna Model 486001, Gain: 28 dBi



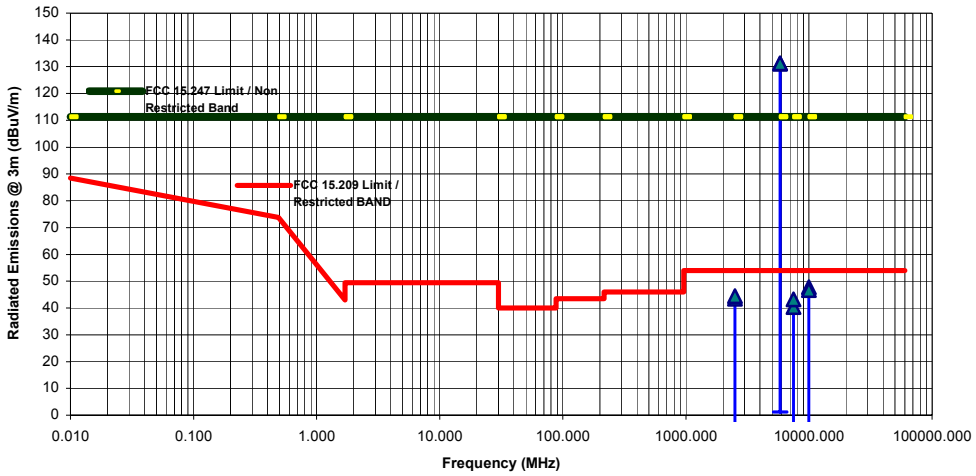
6.13.7.3.3. Channel #5, Frequency: 5815 MHz, Output Power: 20.8 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2500.00	48.4	43.5	V	54.0	111.3	-67.8	PASS
2500.00	48.4	44.4	H	54.0	111.3	-66.9	PASS
5815.00	131.1	131.1	V	--	--	--	PASS
5815.00	131.3	131.3	H	--	--	--	PASS
7500.00	51.6	40.4	V	54.0	111.3	-13.6	*PASS
7500.00	51.9	43.2	H	54.0	111.3	-10.8	*PASS
10000.00	55.5	47.8	V	54.0	111.3	-63.5	PASS
10000.00	55.6	46.7	H	54.0	111.3	-64.6	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 5 to 6 in Annex 1 for detailed of test setup.

Plot # 105

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5815 MHz, RF Output: 20.8 dBm, Modulation: 64QAM
MTI Antenna Model 486001, Gain: 28 dBi



6.13.7.4. Transmitter Radiated Emissions with Radiowave Antenna Model SP4-5.2NS, Gain: 34.8 dBi (maximum gain within its family)

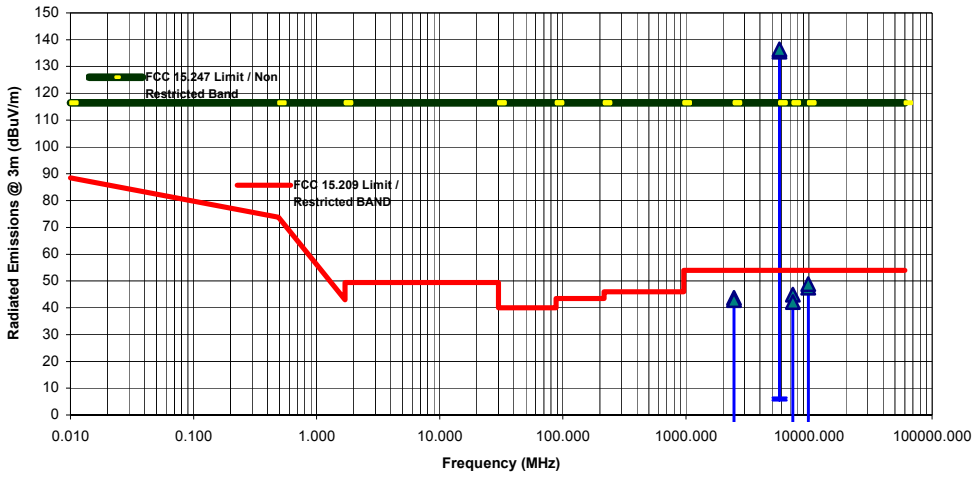
6.13.7.4.1. Channel #1, Frequency: 5735 MHz, Output power: 25.3 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2460.00	47.4	43.7	V	54.0	116.4	-72.7	PASS
2460.00	46.5	42.9	H	54.0	116.4	-73.5	PASS
5735.00	135.5	135.5	V	--	--	--	PASS
5735.00	136.4	136.4	H	--	--	--	PASS
7380.00	53.7	44.9	V	54.0	116.4	-9.1	*PASS
7380.00	52.0	42.1	H	54.0	116.4	-11.9	*PASS
9840.00	55.7	47.5	V	54.0	116.4	-68.9	PASS
9840.00	56.2	48.8	H	54.0	116.4	-67.6	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 7 to 8 in Annex 1 for detailed of test setup.

Plot # 106

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5735 MHz, RF Output: 25.3 dBm, Modulation: 64QAM
Radiowave Antenna Model SP4-5.2NS, Gain: 34.8 dBi



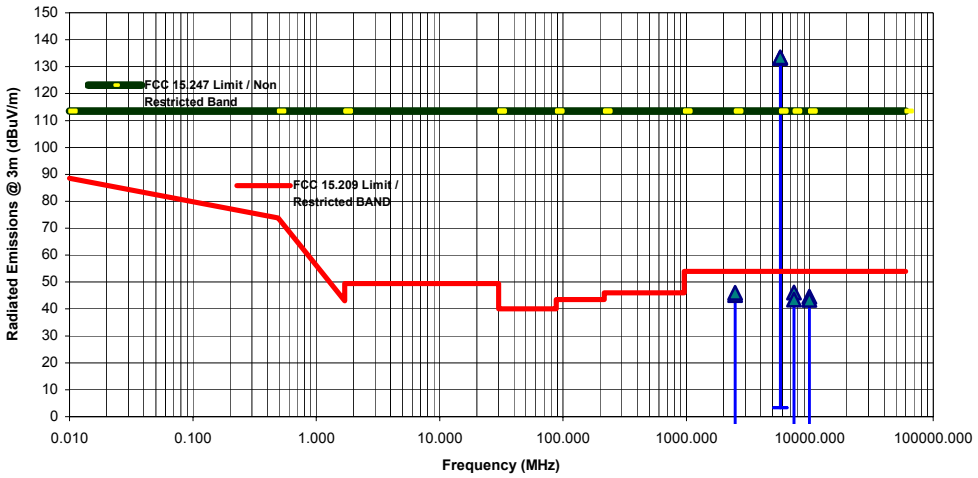
6.13.7.4.2. Channel #3, Frequency: 5775 MHz, Output power: 24.4 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2480.00	48.4	45.2	V	54.0	113.5	-68.3	PASS
2480.00	48.5	46.0	H	54.0	113.5	-67.5	PASS
5775.00	133.2	133.2	V	--	--	--	PASS
5775.00	133.5	133.5	H	--	--	--	PASS
7440.00	54.3	46.1	V	54.0	113.5	-7.9	*PASS
7440.00	52.1	43.5	H	54.0	113.5	-10.5	*PASS
9920.00	54.9	44.6	V	54.0	113.5	-68.9	PASS
9920.00	54.8	43.4	H	54.0	113.5	-70.1	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 7 to 8 in Annex 1 for detailed of test setup.

Plot # 107

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5775 MHz, RF Output: 24.4 dBm, Modulation: 64QAM
Radiowave Antenna Model SP4-5.2NS, Gain: 34.8 dBi



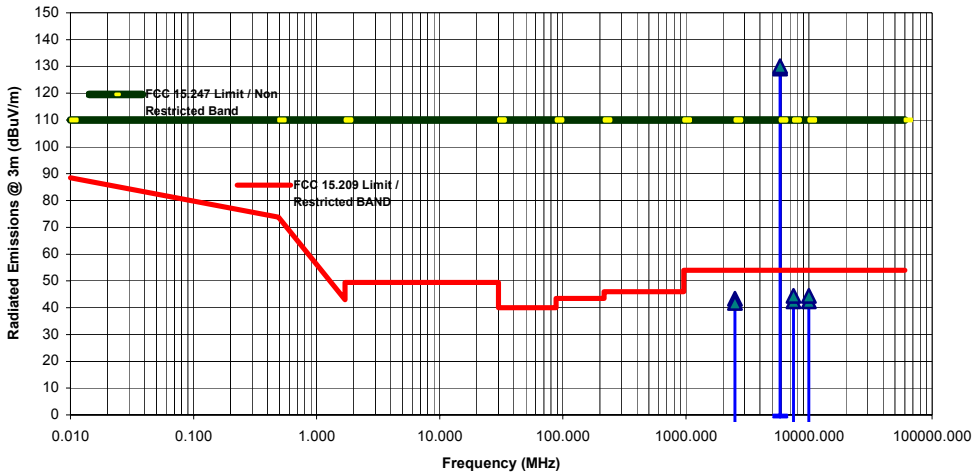
6.13.7.4.3. Channel #5, Frequency: 5815 MHz, Output Power: 20.8 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2500.00	48.1	43.4	V	54.0	110.0	-66.6	PASS
2500.00	46.5	41.8	H	54.0	110.0	-68.2	PASS
5815.00	129.2	129.2	V	--	--	--	PASS
5815.00	130.0	130.0	H	--	--	--	PASS
7500.00	53.5	42.4	V	54.0	110.0	-11.6	*PASS
7500.00	53.1	44.4	H	54.0	110.0	-9.6	*PASS
10000.00	55.3	42.4	V	54.0	110.0	-67.6	PASS
10000.00	55.7	44.4	H	54.0	110.0	-65.6	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 7 to 8 in Annex 1 for detailed of test setup.

Plot # 108

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5815 MHz, RF Output: 20.8 dBm, Modulation: 64QAM
Radiowave Antenna Model SP4-5.2NS, Gain: 34.8 dBi



6.13.7.5. Transmitter Radiated Emissions with Radiowave Antenna Model SEC-55V-60-17, Gain: 17 dBi (maximum gain within its family)

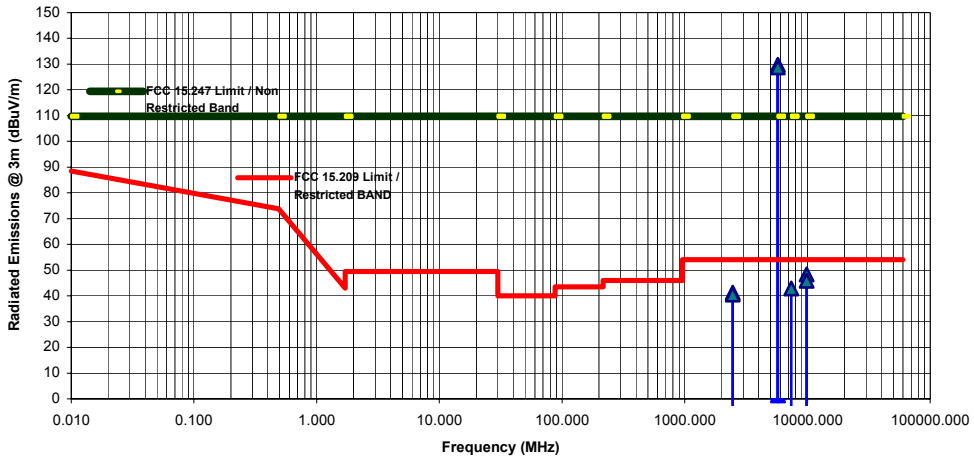
6.13.7.5.1. Channel #1, Frequency: 5735 MHz, Output power: 25.3 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2460.00	46.8	41.2	V	54.0	109.7	-68.5	PASS
2460.00	46.6	40.5	H	54.0	109.7	-69.2	PASS
5735.00	129.7	129.7	V	--	--	--	PASS
5735.00	128.8	128.8	H	--	--	--	PASS
7380.00	51.5	42.9	H	54.0	109.7	-11.1	*PASS
9840.00	55.8	48.4	V	54.0	109.7	-61.3	PASS
9840.00	55.1	45.9	H	54.0	109.7	-63.8	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 9 to 10 in Annex 1 for detailed of test setup.

Plot # 109

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5735 MHz, RF Output: 25.3 dBm, Modulation: 64QAM
Radiowave Antenna Model SEC-55V-60-17, Gain: 17 dBi



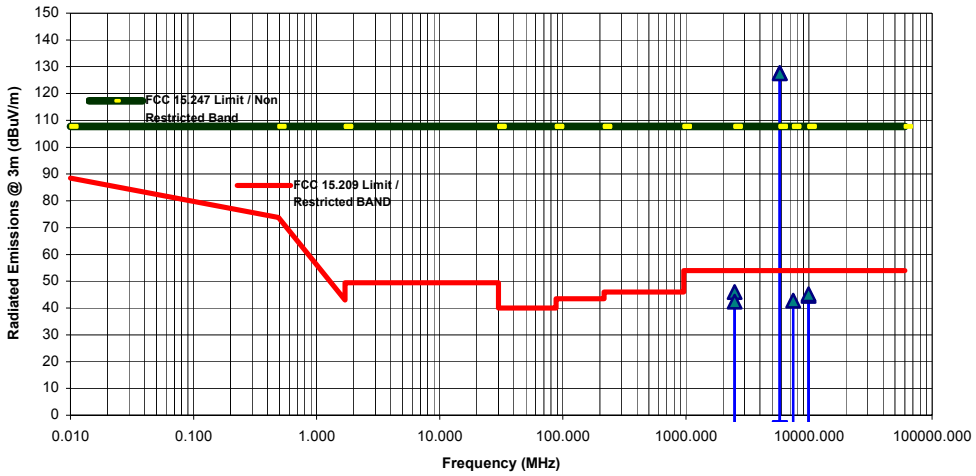
6.13.7.5.2. Channel #3, Frequency: 5775 MHz, Output power: 24.4 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2480.00	49.0	46.0	V	54.0	107.7	-61.7	PASS
2480.00	46.0	42.4	H	54.0	107.7	-65.3	PASS
5775.00	127.7	127.7	V	--	--	--	PASS
5775.00	127.6	127.6	H	--	--	--	PASS
7440.00	52.0	42.7	H	54.0	107.7	-11.3	*PASS
9920.00	54.3	44.5	V	54.0	107.7	-63.2	PASS
9920.00	54.5	45.1	H	54.0	107.7	-62.6	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 9 to 10 in Annex 1 for detailed of test setup.

Plot # 110

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5775 MHz, RF Output: 24.4 dBm, Modulation: 64QAM
Radiowave Antenna Model SEC-55V-60-17, Gain: 17 dBi



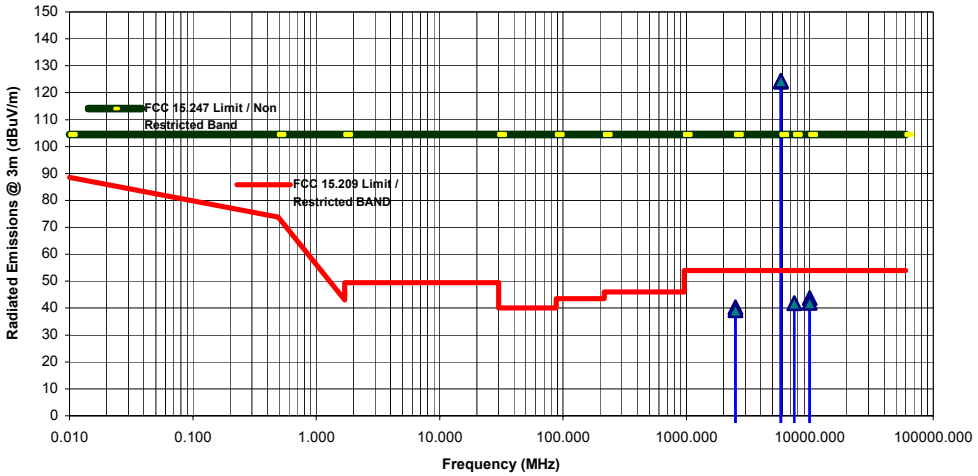
6.13.7.5.3. Channel #5, Frequency: 5815 MHz, Output Power: 20.8 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2500.00	45.6	40.3	V	54.0	104.5	-64.2	PASS
2500.00	45.5	39.2	H	54.0	104.5	-65.3	PASS
5815.00	124.1	124.1	V	--	--	--	PASS
5815.00	124.5	124.5	H	--	--	--	PASS
7500.00	51.5	41.8	H	54.0	104.5	-12.2	*PASS
10000.00	51.9	43.7	V	54.0	104.5	-60.8	PASS
10000.00	51.7	41.9	H	54.0	104.5	-62.6	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 9 to 10 in Annex 1 for detailed of test setup.

Plot # 111

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5815 MHz, RF Output: 20.8 dBm, Modulation: 64QAM
Radiowave Antenna Model SEC-55V-60-17, Gain: 17 dBi



6.13.7.6. Transmitter Radiated Emissions with MaxRad Antenna Model MPR68031PTNF, Gain: 31.0 dBi (maximum gain within its family)

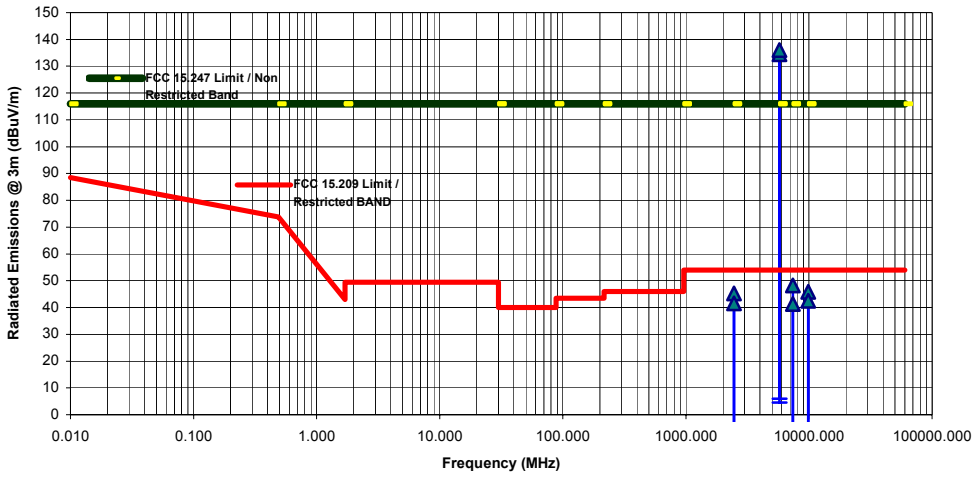
6.13.7.6.1. Channel #1, Frequency: 5735 MHz, Output power: 25.3 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2460.00	48.7	45.3	V	54.0	116.0	-70.7	PASS
2460.00	46.1	41.6	H	54.0	116.0	-74.4	PASS
5735.00	134.5	134.5	V	--	--	--	PASS
5735.00	136.0	136.0	H	--	--	--	PASS
7380.00	54.1	48.3	V	54.0	116.0	-5.7	*PASS
7380.00	52.8	41.3	H	54.0	116.0	-12.7	*PASS
9840.00	55.3	45.9	V	54.0	116.0	-70.1	PASS
9840.00	54.8	42.5	H	54.0	116.0	-73.5	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 11 to 12 in Annex 1 for detailed of test setup.

Plot # 112

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5735 MHz, RF Output: 25.3 dBm, Modulation: 64QAM
MaxRad Antenna Model MPR68031PTNF, Gain: 31.0 dBi



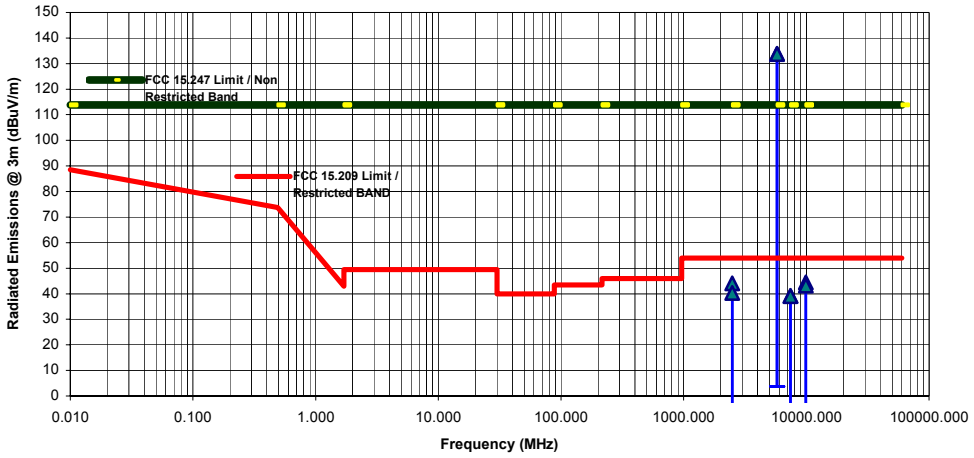
6.13.7.6.2. Channel #3, Frequency: 5775 MHz, Output power: 24.4 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2480.00	47.5	44.1	V	54.0	113.8	-69.7	PASS
2480.00	45.5	40.3	H	54.0	113.8	-73.5	PASS
5775.00	133.8	133.8	V	--	--	--	PASS
5775.00	133.7	133.7	H	--	--	--	PASS
7440.00	51.6	39.2	V	54.0	113.8	-14.8	*PASS
7440.00	50.3	39.1	H	54.0	113.8	-14.9	*PASS
9920.00	54.0	44.5	V	54.0	113.8	-69.3	PASS
9920.00	53.7	43.2	H	54.0	113.8	-70.6	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 11 to 12 in Annex 1 for detailed of test setup.

Plot # 113

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5775 MHz, RF Output: 24.4 dBm, Modulation: 64QAM
MaxRad Antenna Model MPR68031PTNF, Gain: 31.0 dBi



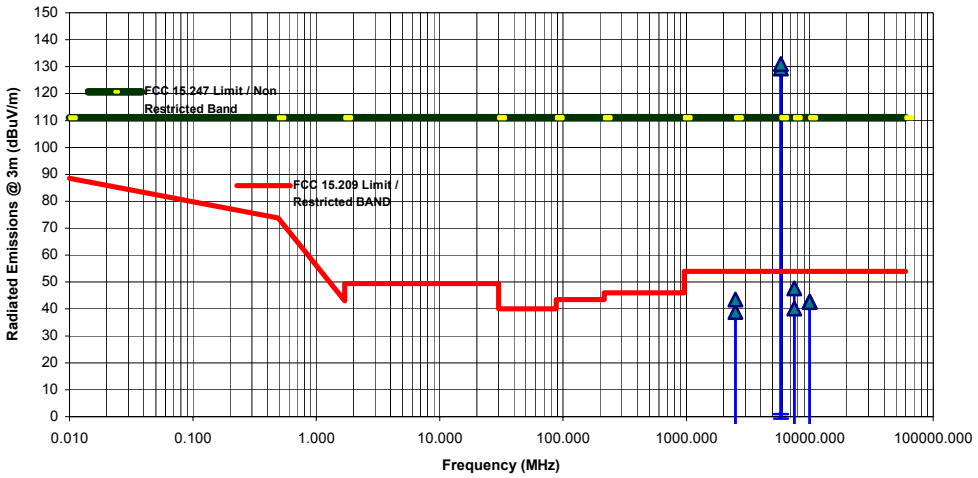
6.13.7.6.3. Channel #5, Frequency: 5815 MHz, Output Power: 20.8 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2500.00	45.8	38.9	V	54.0	111.0	-72.1	PASS
2500.00	48.8	43.5	H	54.0	111.0	-67.5	PASS
5815.00	129.3	129.3	V	--	--	--	PASS
5815.00	131.0	131.0	H	--	--	--	PASS
7500.00	51.3	40.2	V	54.0	111.0	-13.8	*PASS
7500.00	53.3	47.7	H	54.0	111.0	-6.3	*PASS
10000.00	53.5	42.8	V	54.0	111.0	-68.2	PASS
10000.00	54.1	42.5	H	54.0	111.0	-68.5	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 11 to 12 in Annex 1 for detailed of test setup.

Plot # 114

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5815 MHz, RF Output: 20.8 dBm, Modulation: 64QAM
MaxRad Antenna Model MPR68031PTNF, Gain: 31.0 dBi



6.13.7.7. Transmitter Radiated Emissions with Tongyu Antenna Model TDJ-5818AM-60, Gain: 18.0 dBi (maximum gain within its family)

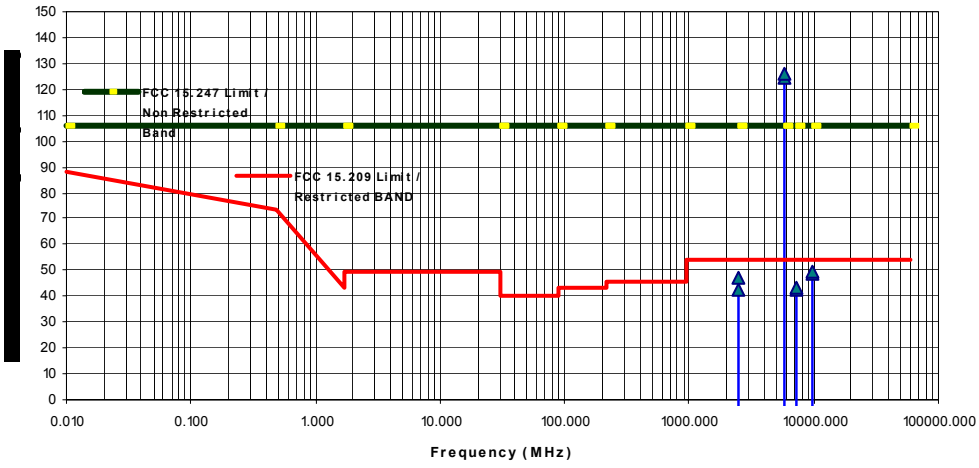
6.13.7.7.1. Channel #1, Frequency: 5735 MHz, Output power: 25.3 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2460.00	49.2	47.1	V	54.0	106.2	-59.1	PASS
2460.00	47.5	42.9	H	54.0	106.2	-63.3	PASS
5735.00	124.6	124.6	V	--	--	--	PASS
5735.00	126.2	126.2	H	--	--	--	PASS
7380.00	52.0	42.5	V	54.0	106.2	-11.5	*PASS
7380.00	53.0	43.0	H	54.0	106.2	-11.0	*PASS
9840.00	56.7	48.6	V	54.0	106.2	-57.6	PASS
9840.00	56.9	49.1	H	54.0	106.2	-57.1	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 13 to 14 in Annex 1 for detailed of test setup.

Plot # 115

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5735 MHz, RF Output: 25.3 dBm, Modulation: 64QAM
Tongyu Antenna Model TDJ-5818AM-60, Gain: 18.0 dBi



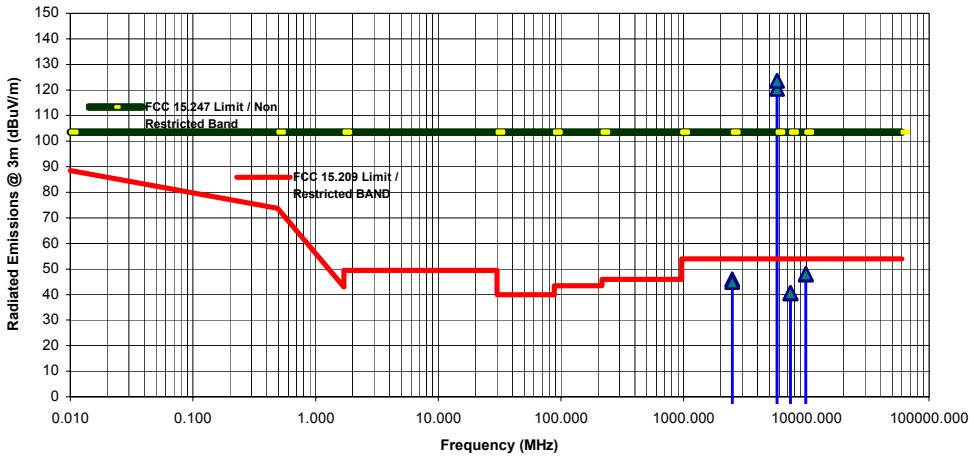
6.13.7.7.2. Channel #3, Frequency: 5775 MHz, Output power: 24.4 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2480.00	48.4	46.0	V	54.0	103.6	-57.6	PASS
2480.00	48.3	44.9	H	54.0	103.6	-58.7	PASS
5775.00	120.4	120.4	V	--	--	--	PASS
5775.00	123.6	123.6	H	--	--	--	PASS
7440.00	51.7	40.4	V	54.0	103.6	-13.6	*PASS
7440.00	52.3	40.7	H	54.0	103.6	-13.3	*PASS
9920.00	56.5	47.8	V	54.0	103.6	-55.8	PASS
9920.00	56.5	48.1	H	54.0	103.6	-55.5	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 13 to 14 in Annex 1 for detailed of test setup.

Plot # 116

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5775 MHz, RF Output: 24.4 dBm, Modulation: 64QAM
Tongyu Antenna Model TDJ-5818AM-60, Gain: 18.0 dBi



6.13.7.7.3. Channel #5, Frequency: 5815 MHz, Output Power: 20.8 dBm, Modulation: 64QAM

FREQUENCY (MHz)	RF PEAK LEVEL @ 3m (dBuV/m)	RF AVG LEVEL @3m (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2500.00	47.6	43.3	V	54.0	100.9	-57.6	PASS
2500.00	46.2	41.9	H	54.0	100.9	-59.0	PASS
5815.00	118.7	118.7	V	--	--	--	PASS
5815.00	120.9	120.9	H	--	--	--	PASS
7500.00	53.8	44.2	V	54.0	100.9	-9.8	*PASS
7500.00	52.6	41.2	H	54.0	100.9	-12.8	*PASS
10000.00	54.7	44.8	V	54.0	100.9	-56.1	PASS
10000.00	55.7	45.5	H	54.0	100.9	-55.4	PASS

- The emissions were scanned from 10 MHz to 60 GHz and all emissions less 20 dB below the FCC 15.209 Limits or 60 dB below FCC 15.247 Limits were recorded.
- * emissions that fall in the restricted band
- Refer to Photos # 13 to 14 in Annex 1 for detailed of test setup.

Plot # 117

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
Redline Communications Model AN-30
TRANSMIT Freq.: 5815 MHz, RF Output: 20.8 dBm, Modulation: 64QAM
Tongyu Antenna Model TDJ-5818AM-60, Gain: 18.0 dBi

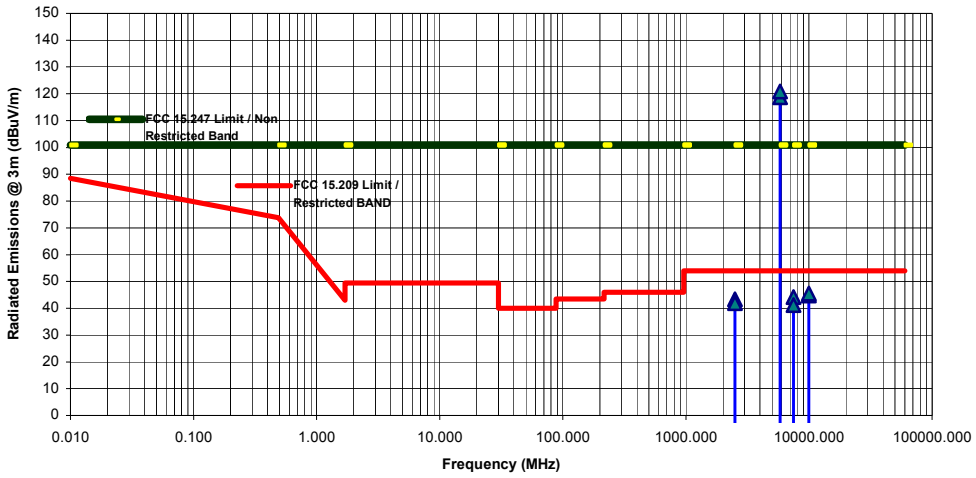


EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	±1.5	±1.5
LISN coupling specification	Rectangular	±1.5	±1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	±0.3	±0.5
Mismatch: Receiver VRC $\Gamma_1 = 0.03$ LISN VRC $\Gamma_R = 0.8$(9 kHz) 0.2 (30 MHz) Uncertainty limits $20\text{Log}(1\pm\Gamma_1\Gamma_R)$	U-Shaped	±0.2	±0.3
System repeatability	Std. deviation	±0.2	±0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	±1.25	±1.30
Expanded uncertainty U	Normal (k=2)	±2.50	±2.60

Sample Calculation for Measurement Accuracy in 450 kHz to 30 MHz Band:

$$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30 \text{ dB}$$

$$U = 2u_c(y) = \pm 2.6 \text{ dB}$$

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp) Uncertainty limits $20\text{Log}(1\pm\Gamma_1\Gamma_R)$	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 8. MEASUREMENT METHODS

8.1. GENERAL TEST CONDITIONS

The following test conditions shall be applied throughout the tests covered in this report.

8.1.1. Normal temperature and humidity

- Normal temperature: +15°C to +35°C
- Relative Humidity: +20% to 75%

The actual values during tests shall be recorded in the test report.

8.1.2. Normal power source

8.1.2.1. Mains Voltage

The nominal test voltage of the equipment to be connected to mains shall be the nominal mains voltage which is the declared voltage or any of the declared voltages for which the equipment was designed.

The frequency of test power source corresponding to the AC mains shall be between 59 Hz and 61 Hz.

8.1.3. Operating Condition of Equipment under Test

- All tests were carried out while the equipment operated at the following frequencies:
  - The lowest operating frequency,
  - The middle operating frequency and
  - The highest operating frequency

- Modulation were applied using the Test Data sequence
- The transmitter was operated at the highest output power, or in the case the equipment able to operate at more than one power level, at the lowest and highest output powers

8.2. TRANSMITTER POWER DENSITY

- The radio was connected to the measuring equipment via a suitable attenuator.
- Locate and zoom in on emission peak(s) within the passband
- The spectrum analyzer were used and set as follows:

  - Resolution BW: 3 kHz
  - Video BW: same or greater
  - Detector Mode: Normal
  - Averaging: Off
  - Span: 3 MHz
  - Amplitude: Adjust for middle of the instrument's range
  - Sweep Time: 1000 seconds

- Locate and zoom in on emission peak(s) within the passband. Set RBW = 3 KHz, VBW $\geq$ RBW, Sweep = SPAN/3 KHz. For example, a span of 1.5 MHz, the sweep should be $1.6x10^6/3.0x10^3$= 500 seconds. The measured peak level must be no greater than +8 dBm.
- For devices with spectrum line spacing greater than 3 KHz no change is required.
- For devices with spectrum line spacing equal to or less than 3 KHz, the resolution bandwidth must be reduced below 3 KHz until the individual lines in the spectrum are resolved. The measurement data must then be normalized to 3 KHz by summing the power of all the individual spectral lines within 3 KHz band (in linear power units) to determine compliance.
- If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzer will directly measure the noise power density normalized to 1 Hz noise power bandwidth. Add 30 dB for correction to 3 KHz.

Should all the above fail or any controversy develop regarding accuracy of measurement, the Laboratory will use HP 89440A Vector Signal Analyzer for final measurement unless a clear showing can be made for a further alternate.

8.3. METHOD OF MEASUREMENTS - AC MAINS CONDUCTED EMISSIONS

- AC Mains conducted emissions measurements were performed in accordance with the standard against appropriate limits for each detector function.
- The test was performed in the shielded room, 16'(L) by 16'(W) by 12'(H).
- The test was performed were made over the frequency range from 450 kHz to 30 MHz to determine the line-to-ground radio noise voltage which was conducted from the EUT power-input terminals that were directly connected to a public power network.
- The EUT normally received power from another device that connects to the public utility ac power lines, measurements would be made on that device with the EUT in operation to ensure that the device continues to comply with the appropriate limits while providing the EUT with power.
- If the EUT operates only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines, AC Mains conducted measurements are not required.
- Table-top devices were placed on a platform of nominal size 1 m by 1.5m raised 80 cm above the conducting ground plane.
- The EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the power source. All unused 50-Ohm connectors of the LISN was terminated in 50-ohm when not connected to the measuring instruments.
- The line cord of the EUT connected to one LISN which was connected to the measuring instrument. Those power cords for the units of devices not under measurement were connected to a separate multiple ac outlet. Drawings and photographs of typically conducted emission test setups were shown in the Test Report. Each current-carrying conductor of the EUT shall be individually tested.
- The EUT was normally operated with a ground (safety) connection, the EUT was connected to the ground at the LISN through a conductor provided in the lead from the ac power mains to the LISN.
- The excess length of the power cord was folded back and forth in an 8-shape on a wooden strip with a vertical prong located on the top of the LISN case.
- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- A preliminary scan was made by using spectrum analyzer system with the detector function set to PEAK mode (9 KHz RBW, VBW > RBW), frequency span 450 kHz to 30 MHz.

- The maximum conducted emission for a given mode of operation was found by using the following step-by-step procedure:

  Step1. Monitor the frequency range of interest at a fixed EUT azimuth.

  Step2. Manipulate the system cables and peripheral devices to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

  Step3. The effects of various modes of operation is examined. This is done by varying equipment operation modes as step 2 is being performed.

  Step4. After completing step 1 through 3, record EUT and peripheral device configuration, mode of operation, cable configuration, signal levels and frequencies for final test.

- Each highest signal level at the maximized test configuration was zoomed in a small frequency span on the spectrum analyzer's display (the manipulation of cables and peripheral devices and EUT operation modes might have to be repeated to obtain the highest signal level with the spectrum analyzer set to PEAK detector mode 10 KHz RBW and VBW > RBW). The spectrum analyzer was then set to CISPR QUASI-PEAK detector mode (9 KHz RBW, 1 MHz

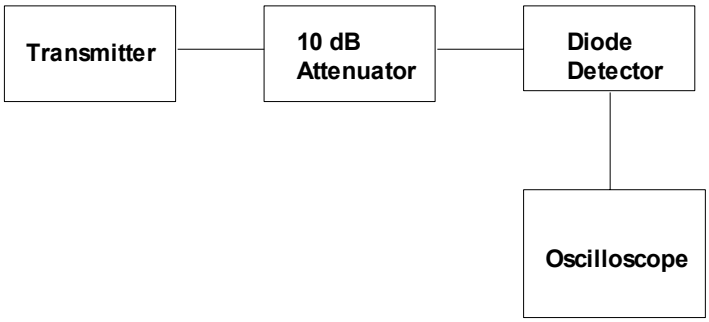
VBW) and AVERAGE detector mode (10 kHz RBW, 1 Hz VBW). The final highest RF signal levels and frequencies were record.

8.4. PEAK CONDUCTED TRANSMIT POWER

Test procedure shall be as follows:

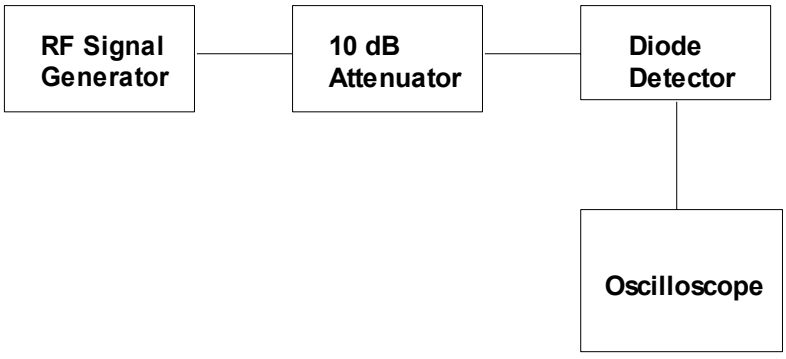
Step 1:

- Connect the transmitter output to a diode detector through an attenuator
- Connect the diode detector to the vertical channel of an oscilloscope.
- The observed duty cycle of the transmitter, x = Tx on / (Tx on + Tx off) with 0<x<1, is measure and recorded in the test report. For the purpose of testing, the equipment shall be operated with a duty cycle that is equal or more than 0.1.
- Observe and record the y parameter of the DC level on the oscilloscope.



Step 2: Peak Power Measurements

- Replace the transmitter by a RF signal generator
- Set the signal generator frequency be the same as the transmitter frequency
- Adjust the rf output level of the RF signal generator until the DC level on the oscilloscope is same as that (y) recorded in step 1.
- Measure the RF signal generator output level using a power meter
- Calculate the total peak power (Pp) by adding the signal generator level with the attenuator value and the cable loss.



8.5. SPURIOUS EMISSIONS (CONDUCTED & RADIATED)

For both conducted and radiated measurements, the spurious emissions were scanned from the lowest frequency generated by the EUT or 10 MHz whichever is lower to 10th harmonic of the highest frequency generated by the EUT.

8.5.1. Band-edge and Spurious Emissions (Conducted)

Band-edge Compliance of RF Conducted Emissions:

Use the following spectrum analyzer settings:

- The radio was connected to the measuring equipment via a suitable attenuator.
- Span = wide enough to capture the peak level of the emission operating on the channel closest to the band-edge, as well as any modulation products which fall outside of the authorized band of operation.
- RBW = 1 % of the span
- VBW = RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize
- Set the marker on the emission at the band-edge, or on the highest modulation product outside of the band, if this level is greater than that at the band-edge
- Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission.
- The marker-delta value now displayed must comply with the limit specified
- Submit this plot

Spurious RF Conducted Emissions:

Use the following spectrum analyzer settings:

- The radio was connected to the measuring equipment via a suitable attenuator.
- Span = wide enough to capture the peak level of the in-band-emission and all spurious emissions (e.g. harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, sevral plots are required to cover this entire span.
- RBW = 100 kHz
- VBW = RBW
- Sweep = auto
- Detector function = peak
- Trace = max hold
- Allow the trace to stabilize
- Set the marker on the any spurious emission recorded. The level displayed must comply with the limit specified in this Section.
- Submit this plot

8.5.2. Spurious Emissions (Radiated)

- The radiated emission measurements were performed at the UltraTech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC, Industry Canada, ACA/Austel, NVLap and ITI.

- Radiated emissions measurements were made using the following test instruments:

1. Calibrated EMCO BiconiLog antenna in the frequency range from 30 MHz to 2000 MHz.
2. Calibrated Emco Horn antennas in the frequency range above 1000 MHz (1GHz - 40 GHz).
3. The test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

   - RBW = 100 kHz for f < 1GHz and RBW = 1 MHz for f ≥ 1 GHz
   - VBW = RBW
   - Sweep = auto
   - Detector function = peak
   - Trace = max hold
   - Follows the guidelines in ANSI C63.4-1992 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc.. A pre-amp and highpass filter are required for this test, in order to provide the measuring system with sufficient sensitivity.
   - Allow the trace to stabilize.
   - The peak reading of the emission, after being corrected by the antenna correction factor, cable loss, pre-amp gain, etc…. is the peak field strength which comply with the limit specified in Section 15.35(b)

   Calculation of Field Strength:

   The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

   FS = RA + AF + CF - AG

Where FS = Field Strength
RA = Receiver/Analyzer Reading
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:

Field Level = 60 + 7.0 + 1.0 - 30 = 38.0 dBuV/m.
Field Level = $10^{(38/20)}$ = 79.43 uV/m.

- Submit this test data
- Now set the VBW to 10Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time of the each channel is less than 100ms, then the reading obtained may be further adjusted by a "duty cycle correction factor", derived from 10log(dwell time/100mS) in an effort to demonstrate compliance with the 15.209.
- Submit test data

Maximizing The Radiated Emissions:

- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- During this process, cables and peripheral devices were manipulated within the range of likely configuration.
- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.

Step4: Move the antenna over its full allowable range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.

Step5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.

Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.

Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.