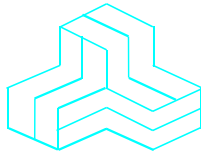


ENGINEERING TEST REPORT



Pico 900MHz 1W FHSS Module

Model: p900

FCC ID: NS913P900

Applicant:

Microhard Systems Inc.

150 Country Hills Landing NW

Calgary, Alberta

Canada T3K 5P3

In Accordance With

Federal Communications Commission (FCC)

Part 15, Subpart C, Section 15.247 Frequency Hopping Spread Spectrum (FHSS)

UltraTech's File No.: MCRS-061F15C247DSS

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: September 4, 2013

Report Prepared by: Dan Huynh

Tested by: Hung Trinh

Issued Date: September 4, 2013

Test Dates: June 1 - August 28, 2013

- *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.*

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15
Purpose of Test:	Equipment Certification for Frequency Hopping Spread Spectrum (FHSS) Transmitter.
Test Procedures:	<ul style="list-style-type: none">▪ ANSI C63.4▪ ANSI C63.10▪ FCC Public Notice DA 00-705
Environmental Classification:	<input checked="" type="checkbox"/> Commercial, industrial or business environment <input checked="" type="checkbox"/> Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2013	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2009	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
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances
FCC Public Notice DA 00-705	2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding to Spread Spectrum Devices

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Microhard Systems Inc.
Address:	150 Country Hills Landing NW Calgary, Alberta Canada T3K 5P3
Contact Person:	Mr. Hany Shenouda Phone #: 403 248-0028 Fax #: 403 248 2762 Email Address: shenouda@microhardcorp.com

MANUFACTURER	
Name:	Microhard Systems Inc.
Address:	150 Country Hills Landing NW Calgary, Alberta Canada T3K 5P3
Contact Person:	Mr. Hany Shenouda Phone #: 403 248-0028 Fax #: 403 248-2762 Email Address: shenouda@microhardcorp.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

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

Brand Name:	Microhard Systems Inc.
Product Name:	Pico 900MHz 1W FHSS Module
Model Name or Number:	p900
Serial Number:	Test Sample
Type of Equipment:	Spread Spectrum Transmitter
Input Power Supply Type:	External Regulated DC Sources
Primary User Functions of EUT:	OEM module

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2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	<ul style="list-style-type: none">MobileBase Station (fixed use)
Intended Operating Environment:	<ul style="list-style-type: none">Commercial, industrial or business environmentResidential environment
Power Supply Requirement:	3.3 VDC
RF Output Power Rating:	10 dBm to 30 dBm
Operating Frequency Range:	902.4 – 927.65 MHz at 172800 kbps data rate 902.4 – 927.60 MHz at 230400 kbps and 276480 kbps data rates
RF Output Impedance:	50 Ω
Duty Cycle:	Continuous
Modulation Type:	GFSK
Antenna Connector Type:	UFL

2.4. ASSOCIATED ANTENNA DESCRIPTIONS

There are five antenna types:

1. Rubber Ducky Antenna
2. Low Profile Vertical Transit Antenna
3. Flat Patch Antenna
4. Omni Directional Antenna
5. Yagi Antenna

The highest gain antenna from each of the above antenna types were selected for testing to represents the worst-case. Refer to antennas list exhibit for detailed specifications.

2.5. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	RF IN/OUT Port	1	UFL	Shielded coaxial cable with unique coupling connectors
2	DC Supply & I/O Port	1	Pin Header	No cable, direct connection

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2.6. 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:	Test Jig
Brand name:	Microhard Systems Inc.
Model Name or Number:	N/A
Connected to EUT's Port:	I/O Port

Ancillary Equipment # 2	
Description:	AC/DC Adapter
Brand name:	BI
Model Name or Number:	BI30-120200-AdU
Connected to EUT's Port:	Test Jig of the EUT

Ancillary Equipment # 3	
Description:	Laptop
Brand name:	Dell
Model Name or Number:	PPL
Connected to EUT's Port:	Test Jig of the EUT

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EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power Input Source:	3.3VDC

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	<ul style="list-style-type: none">Each of lowest, middle and highest channel frequencies transmits continuously for emissions measurements.The EUT operates in normal Frequency Hopping mode for occupancy duration, and frequency separation.
Special Test Software & Hardware:	Special software provided by the Applicant is installed to allow the EUT to operate in hopping mode or at each channel frequency continuously. For example, the transmitter will be operated at each of lowest, middle and highest frequencies individually continuously during testing.
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 as described with the test results.

Transmitter Test Signals	
Frequency Band(s):	902.40 - 927.65 MHz 902.40 - 927.60 MHz
Frequency(ies) Tested: (Near lowest, near middle & near highest frequencies in the frequency range of operation.)	902.40 MHz, 914.90 MHz and 927.65 MHz 902.40 MHz, 915.00 MHz and 927.60 MHz
RF Power Output: (measured maximum output power at antenna terminals)	1 Watt (conducted)
Normal Test Modulation:	GFSK
Modulating Signal Source:	Internal

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EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. 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 Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site 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 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2014-04-04.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
15.203	Antenna requirements	Yes
15.207(a)	AC Power Line Conducted Emissions	Yes
15.247(a)	Provisions for Frequency Hopping Systems	Yes
15.247(b)(1)	Peak Conducted Output Power	Yes
15.247(d)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes
15.247(i), 1.1307, 1.1310, 2.1091	RF Exposure	Yes

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

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EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. POWER LINE CONDUCTED EMISSIONS [§15.207(a)]

5.1.1. Limit(s)

The equipment shall meet the limits of the following table:

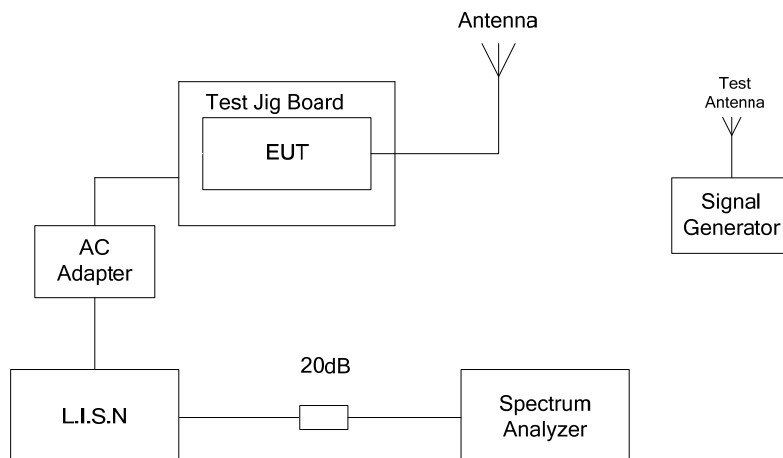
Frequency of emission (MHz)	Conducted Limits (dB μ V)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases linearly with the logarithm of the frequency

5.1.2. Method of Measurements

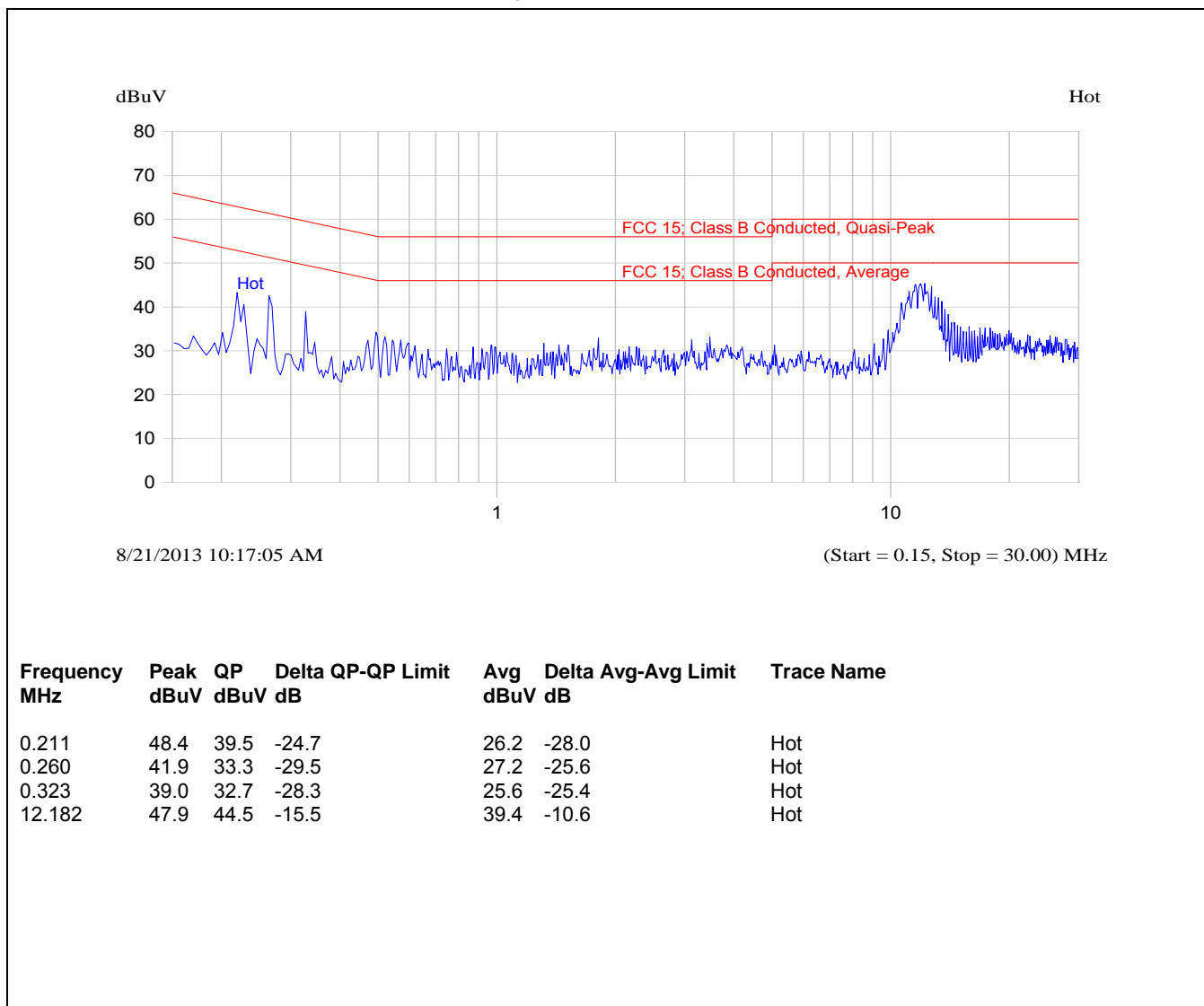
ANSI C63.4-2009

5.1.3. Test Arrangement



5.1.4. Test Data

Plot 5.1.4.1. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 120 VAC; Line Tested: Hot



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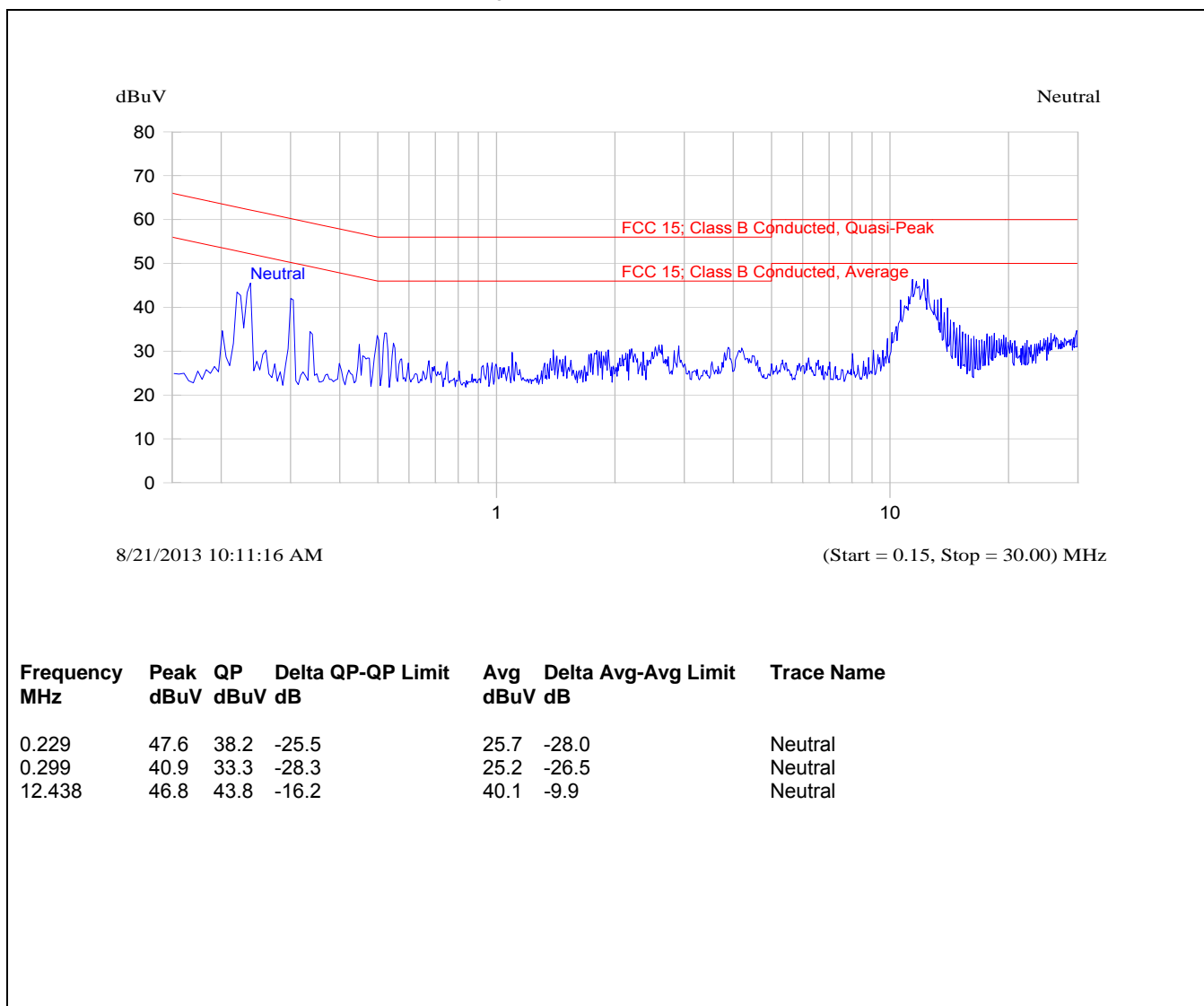
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Plot 5.1.4.2. Power Line Conducted Emissions (Tx Mode)
Line Voltage: 120 VAC; Line Tested: Neutral



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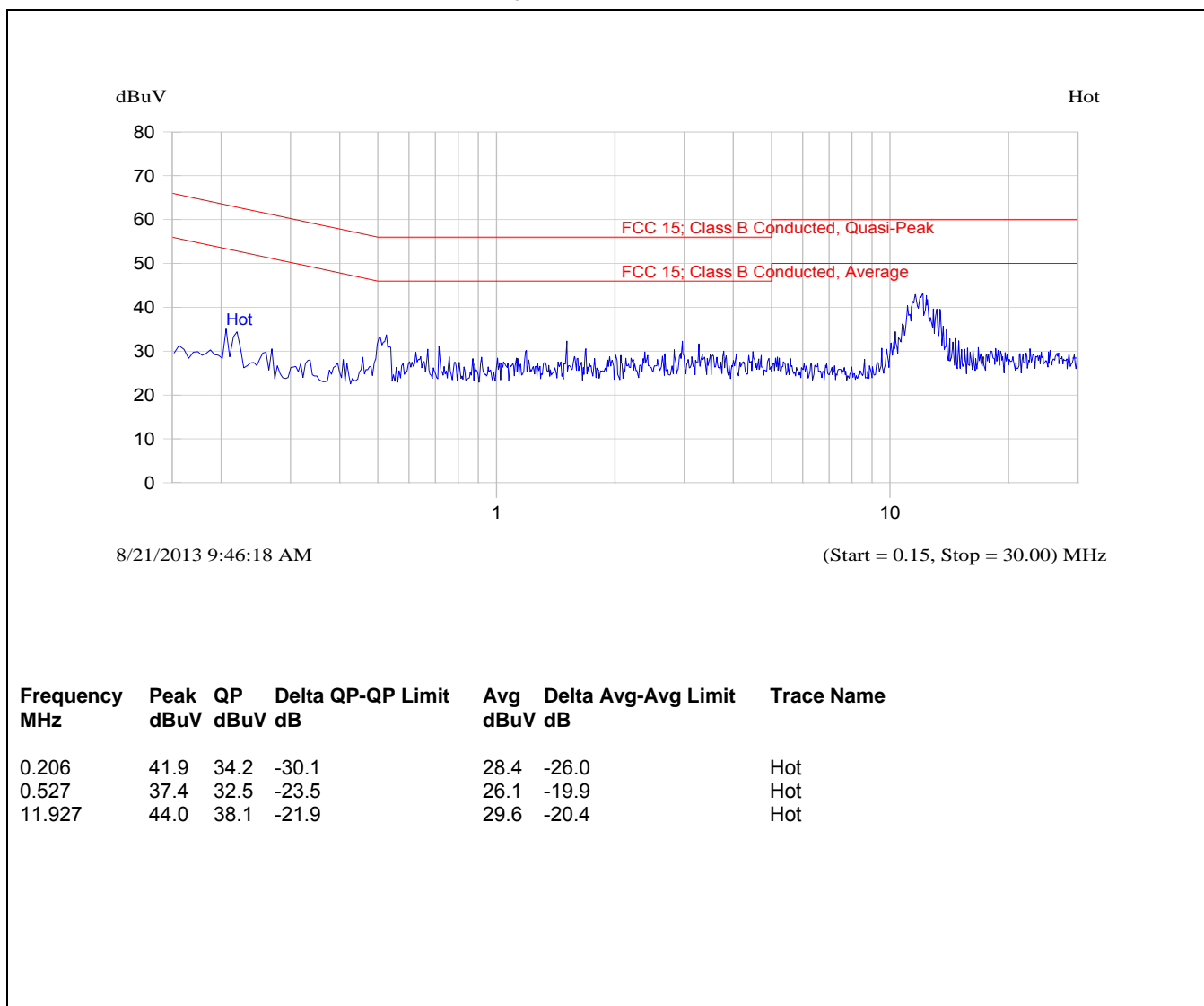
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Plot 5.1.4.3. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 120 VAC; Line Tested: Hot



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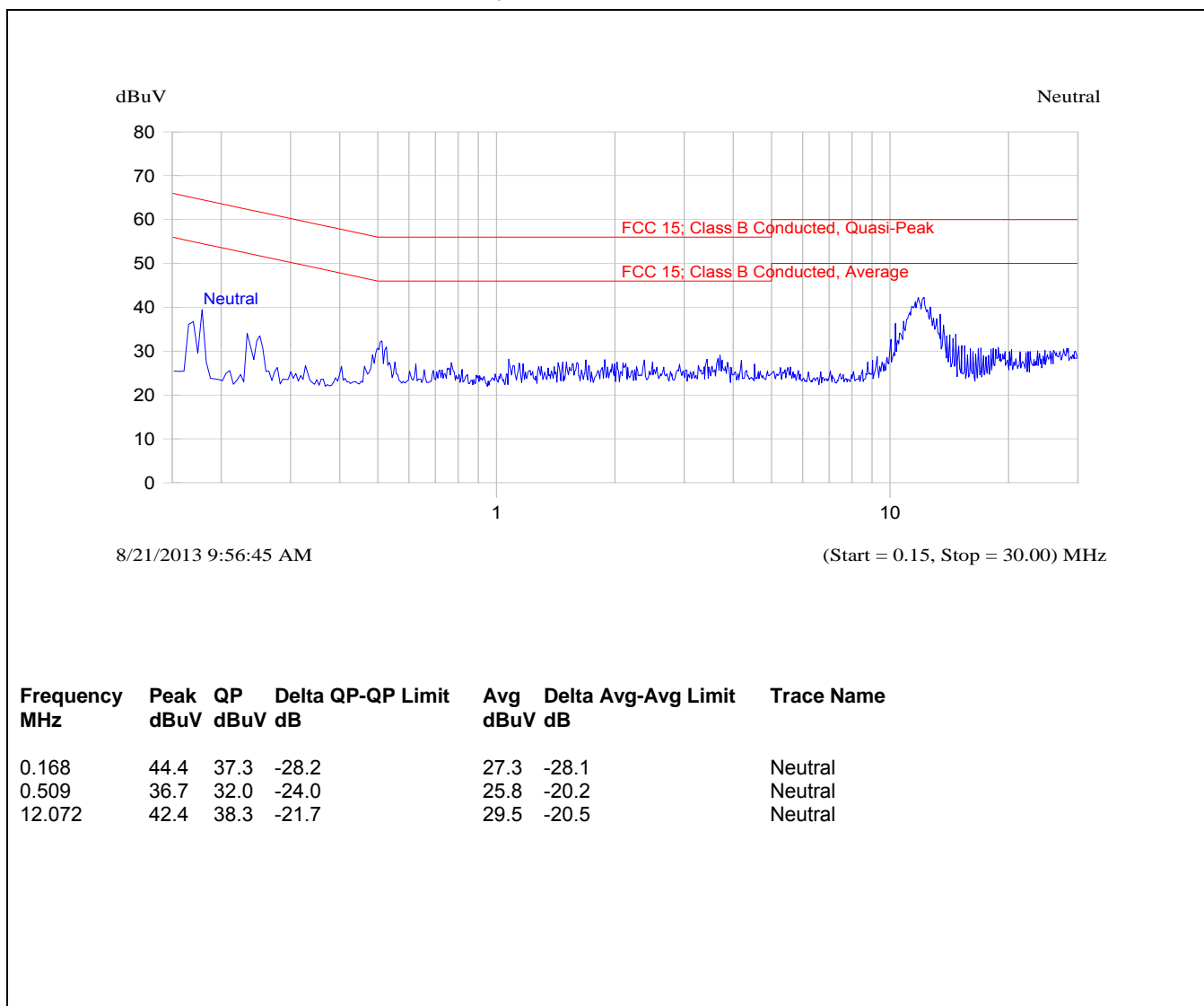
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Plot 5.1.4.4. Power Line Conducted Emissions (Rx Mode)
Line Voltage: 120 VAC; Line Tested: Neutral



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5.2. COMPLIANCE WITH FCC PART 15 – GENERAL TECHNICAL REQUIREMENTS

FCC Section	FCC Rules	Manufacturer's Clarification
15.31	The hopping function must be disabled for tests, which should be performed with the EUT transmitting on the number of frequencies specified in this Section. The measurements made at the upper and lower ends of the band of operation should be made with the EUT tuned to the highest and lowest available channels.	See Operational Description
15.203	<p>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.</p> <p>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:</p> <ul style="list-style-type: none">➤ The application (or intended use) of the EUT➤ The installation requirements of the EUT➤ The method by which the EUT will be marketed	The antenna employs a unique antenna connector.
15.204	<p>Provided the information for every antenna proposed for use with the EUT:</p> <ul style="list-style-type: none">➤ type (e.g. Yagi, patch, grid, dish, etc...),➤ manufacturer and model number➤ gain with reference to an isotropic radiator	See proposed antenna list.
15.247(a)	Description of how the EUT meets the definition of a frequency hopping spread spectrum, found in Section 2.1. Based on the technical description.	See Operational Description
15.247(a)	Pseudo Frequency Hopping Sequence: Describe how the hopping sequence is generated. Provide an example of the hopping sequence channels, in order to demonstrate that the sequence meets the requirements specified in the definition of a frequency hopping spread spectrum system, found in Section 2.1	See Operational Description

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FCC Section	FCC Rules	Manufacturer's Clarification
15.247(a)	<u>Equal Hopping Frequency Use:</u> Describe how each individual EUT meets the requirement that each of its hopping channels is used equally on average (e.g. that each new transmission event begins on the next channel in the hopping sequence after final channel used in the previous transmission events).	See Operational Description
15.247(g)	Describe how the EUT complies with the requirement that it be designed to be capable of operating as a true frequency hopping system	See Operational Description
15.247(h)	Describe how the EUT complies with the requirement that it not have the ability to coordinated with other FHSS is an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters	See Operational Description
Public Notice DA 00-705	<u>System Receiver Input Bandwidth:</u> Describe how the associated receiver(s) complies with the requirement that its input bandwidth (either RF or IF) matches the bandwidth of the transmitted signal.	See Operational Description
Public Notice DA 00-705	<u>System Receiver Hopping Capability:</u> Describe how the associated receiver(s) has the ability to shift frequencies in synchronization with the transmitted signals	See Operational Description

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5.3. PROVISIONS FOR FREQUENCY HOPPING SYSTEMS [§ 15.247(a)(1)]

5.3.1. Limits

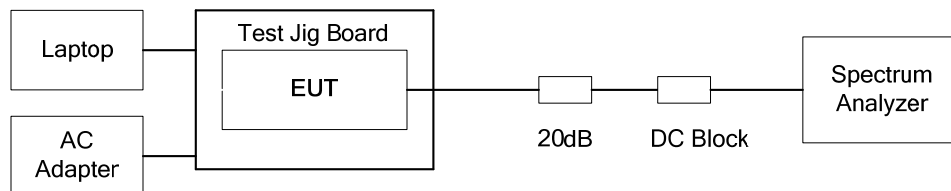
§ 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

§ 15.247(a)(1)(i): For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

5.3.2. Method of Measurements

FCC Public Notice DA 00-705 and ANSI C63.10

5.3.3. Test Arrangement



5.3.4. Test Data

Test Description	FCC Specification	Measured Values	Comments
Frequency Hopping Systems Requirements	The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.	--	See Note 1
20 dB BW of the hopping channel	The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz	208.42 kHz at data rate of 172800 kbps 278.96 kHz at data rate of 230400 kbps 335.27 kHz at data rate of 276480 kbps	See Note 2
Channel Hopping Frequency Separation	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.	250.50 kHz at data rate of 172800 kbps 282.57 kHz at data rate of 230400 kbps 346.69 kHz at data rate of 276480 kbps	See Note 2
Number hopping frequencies	If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.	50 hopping frequencies for all data rates	See Note 1 and 2
Average Time of Occupancy	If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.	396.80 ms at data rate of 172800 kbps 198.40 ms at data rate of 230400 kbps 198.40 ms at data rate of 276480 kbps	See Note 2

Note 1: See operational description exhibit for details.

Note 2: See the following plots for details.

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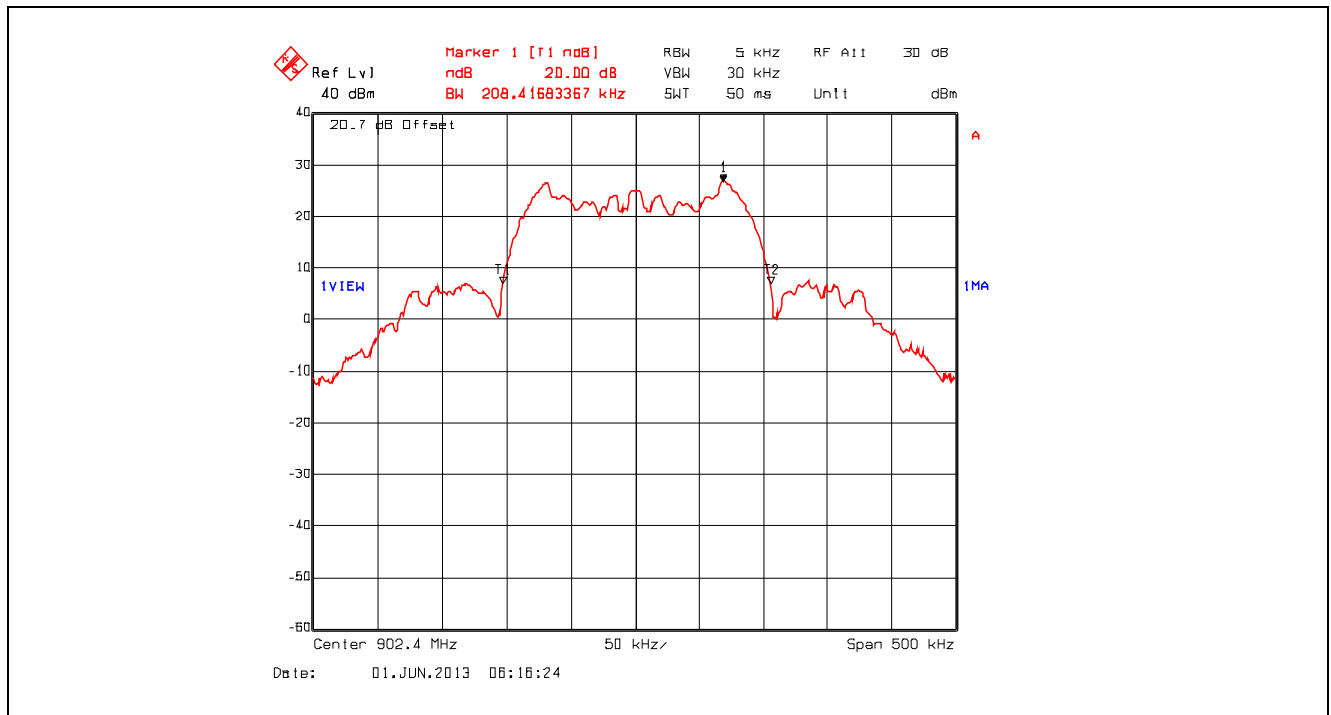
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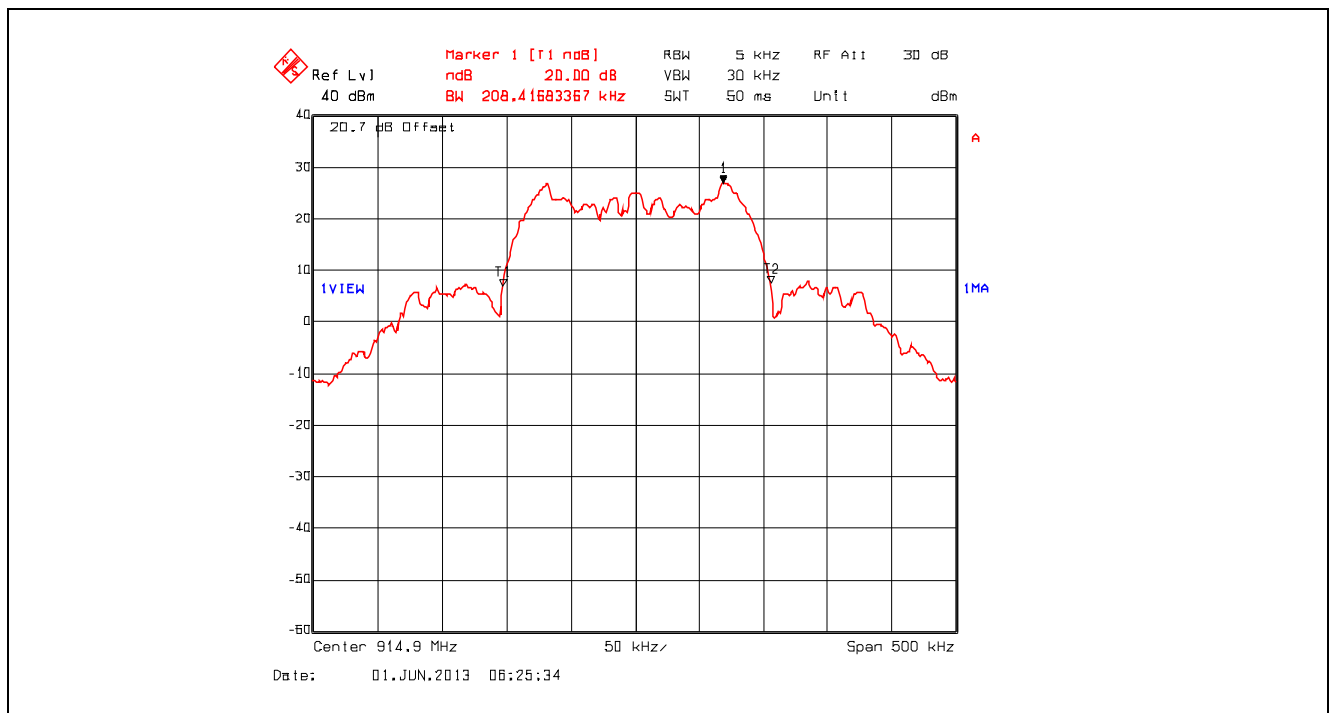
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Plot 5.3.4.1. 20 dB Bandwidth, 902.40 MHz, Data Rate at 172800 kbps



Plot 5.3.4.2. 20 dB Bandwidth, 914.90 MHz, Data Rate at 172800 kbps



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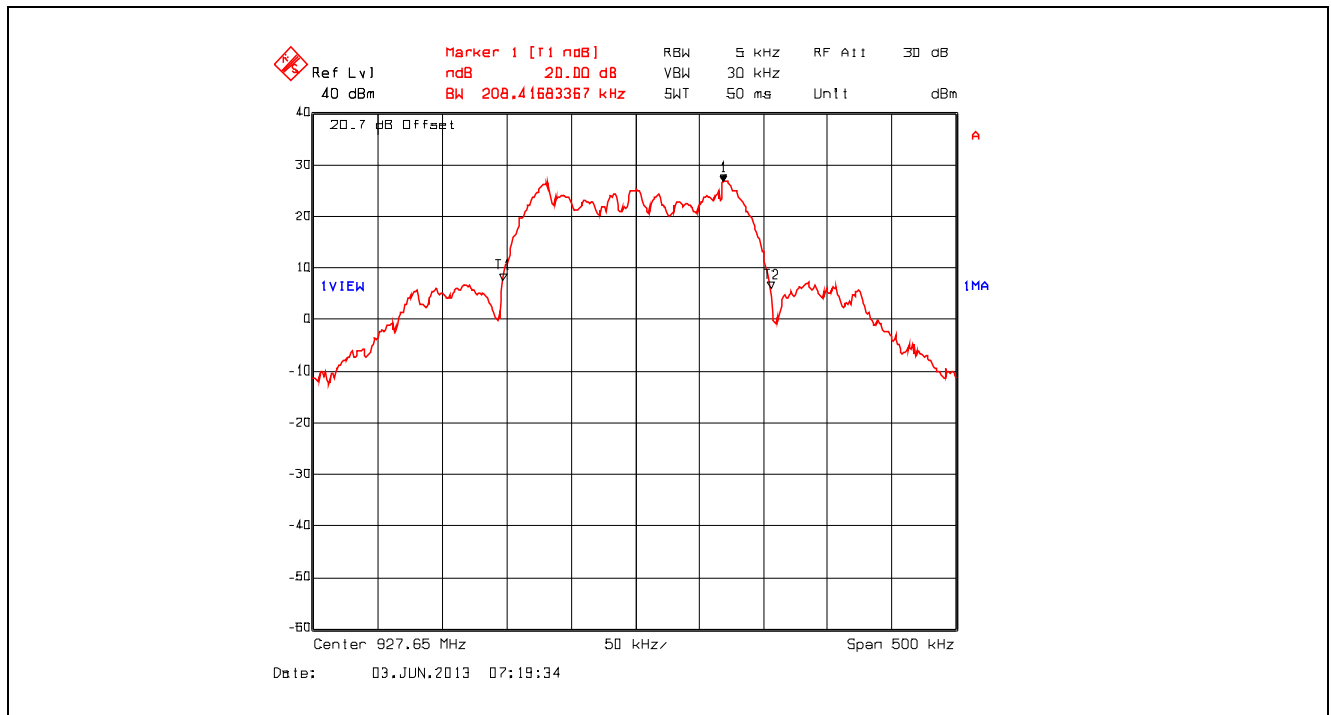
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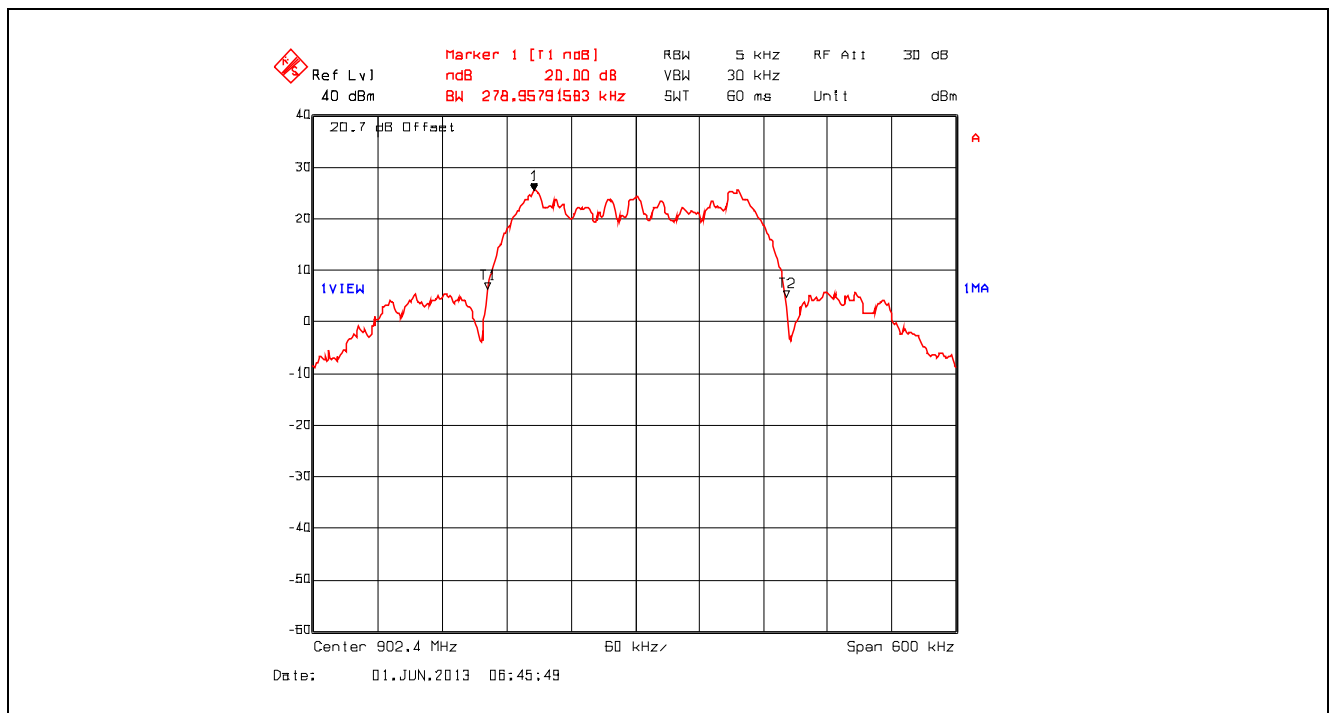
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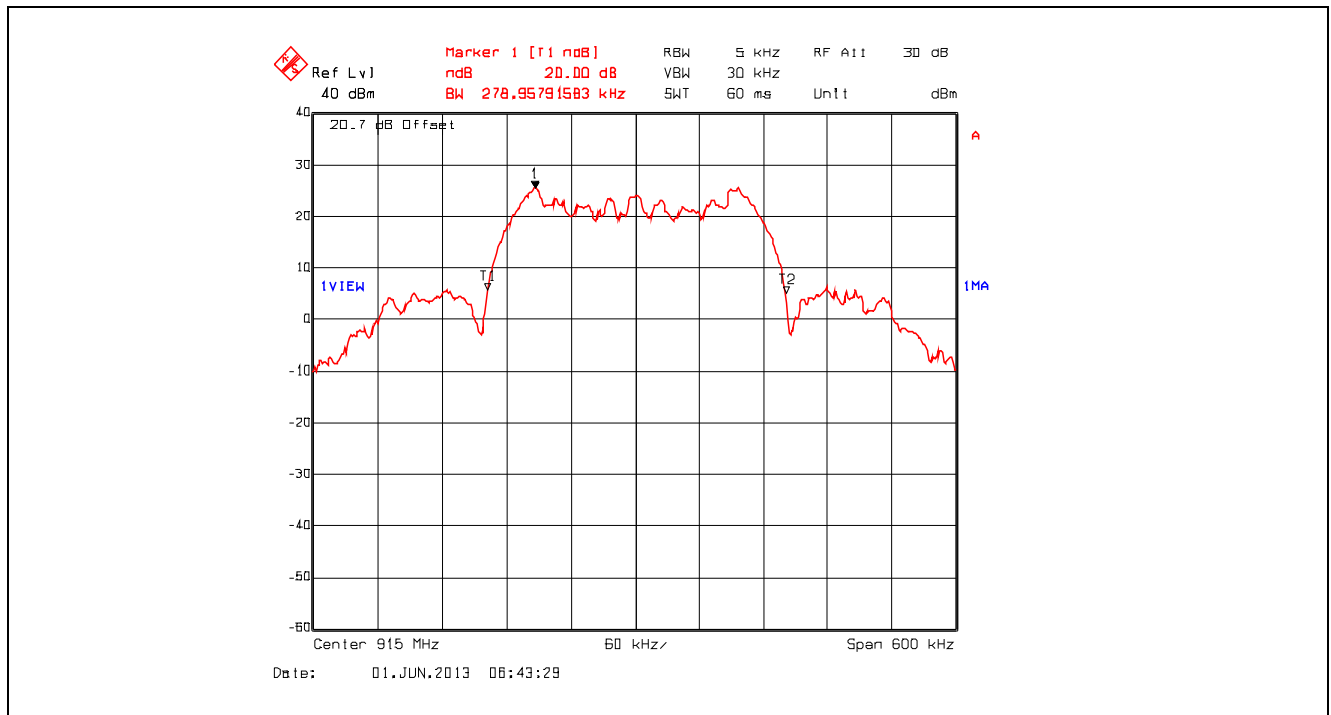
Plot 5.3.4.3. 20 dB Bandwidth, 927.65 MHz, Data Rate at 172800 kbps



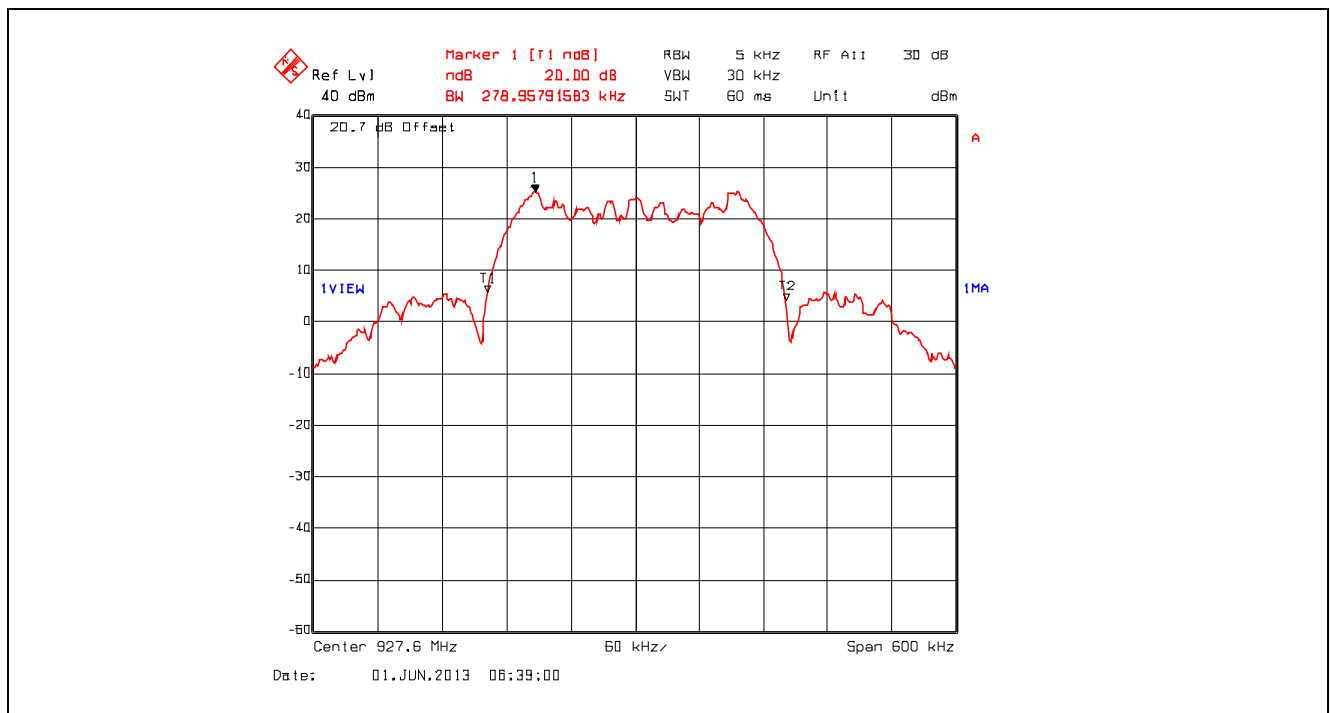
Plot 5.3.4.4. 20 dB Bandwidth, 902.40 MHz, Data Rate at 230400 kbps



Plot 5.3.4.5. 20 dB Bandwidth, 915.00 MHz, Data Rate at 230400 kbps



Plot 5.3.4.6. 20 dB Bandwidth, 927.60 MHz, Data Rate at 230400 kbps



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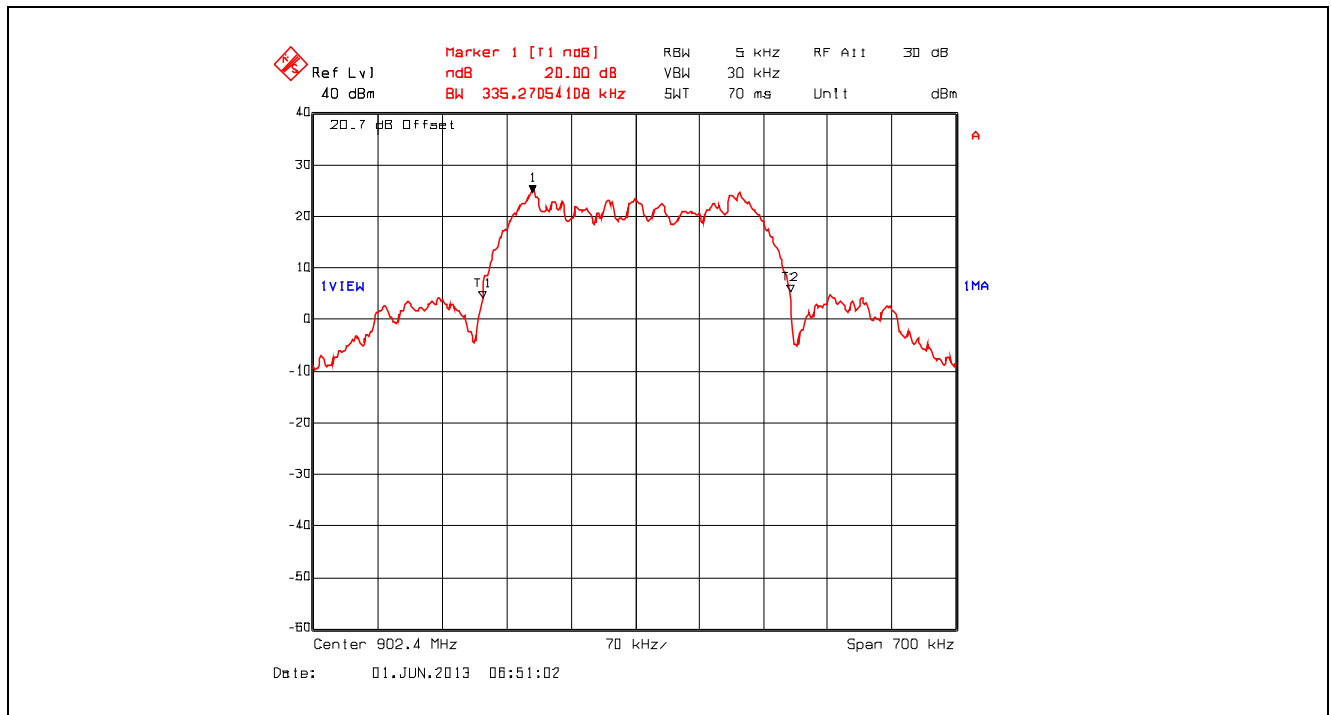
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

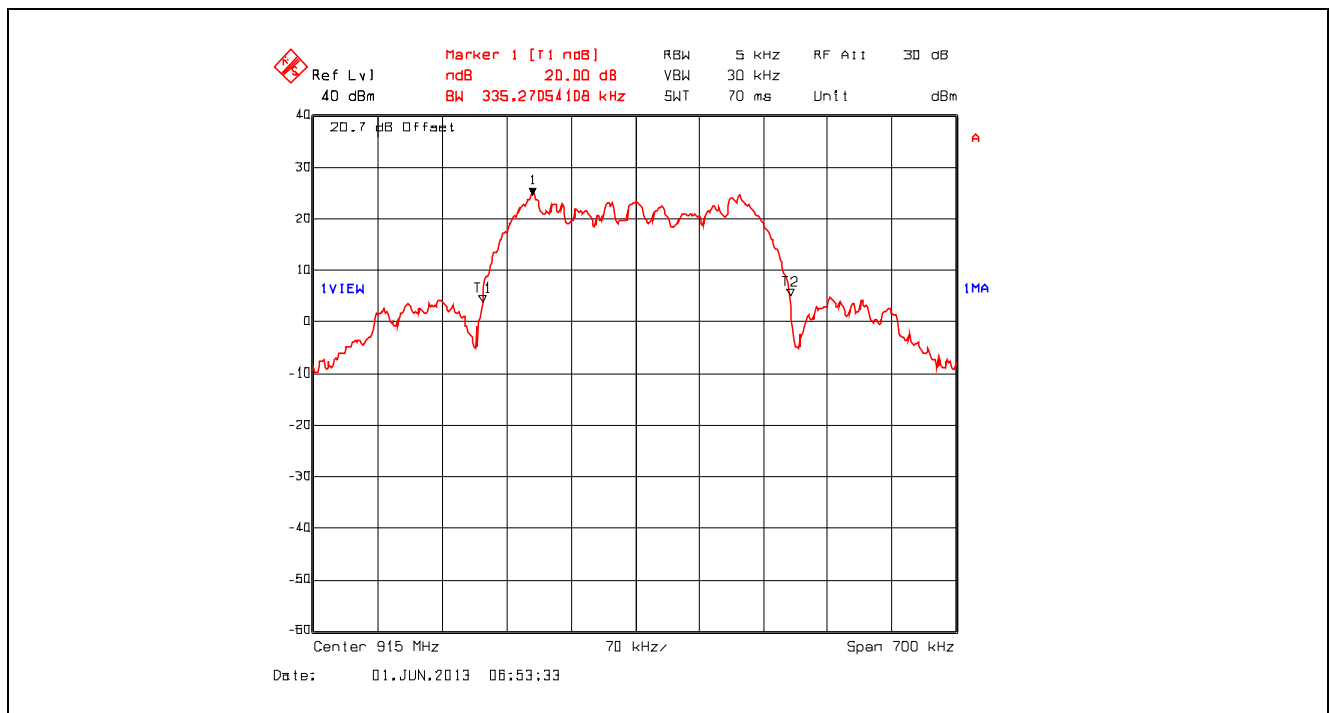
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Plot 5.3.4.7. 20 dB Bandwidth, 902.40 MHz, Data Rate at 276480 kbps



Plot 5.3.4.8. 20 dB Bandwidth, 915.00 MHz, Data Rate at 276480 kbps



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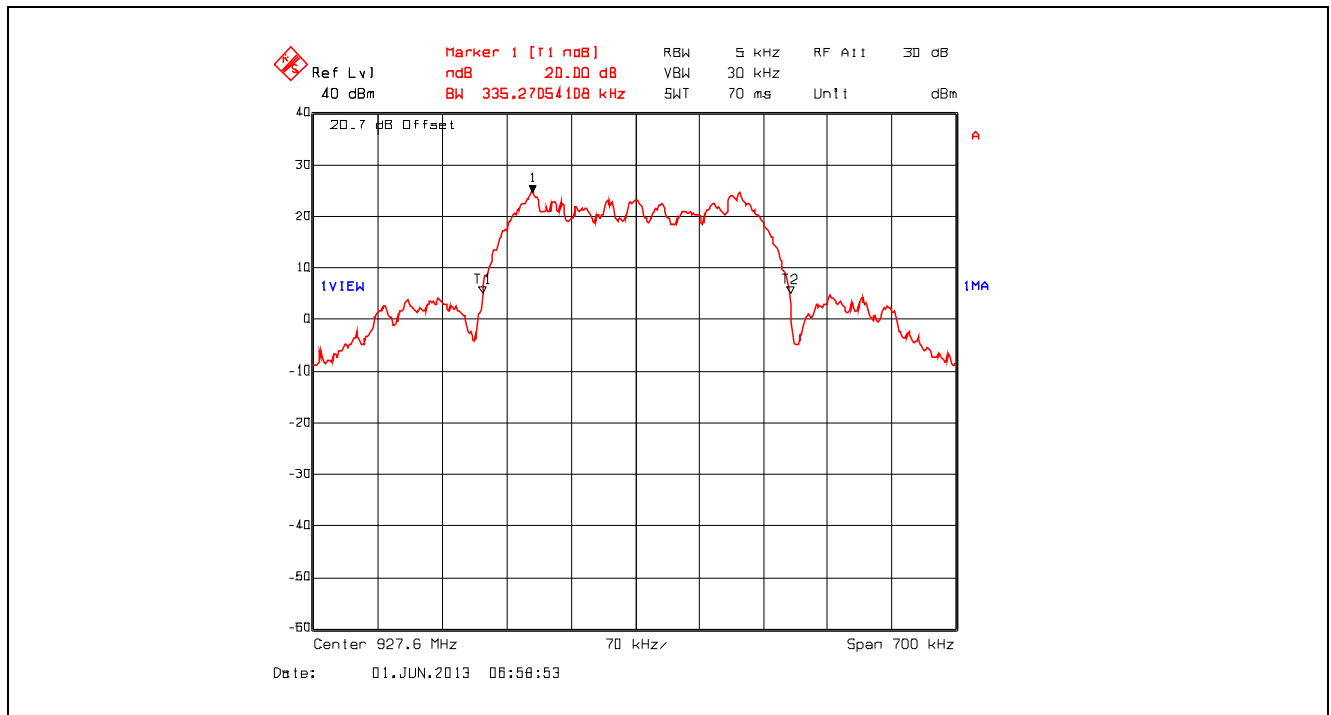
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File #: MCRS-061F15C247DSS

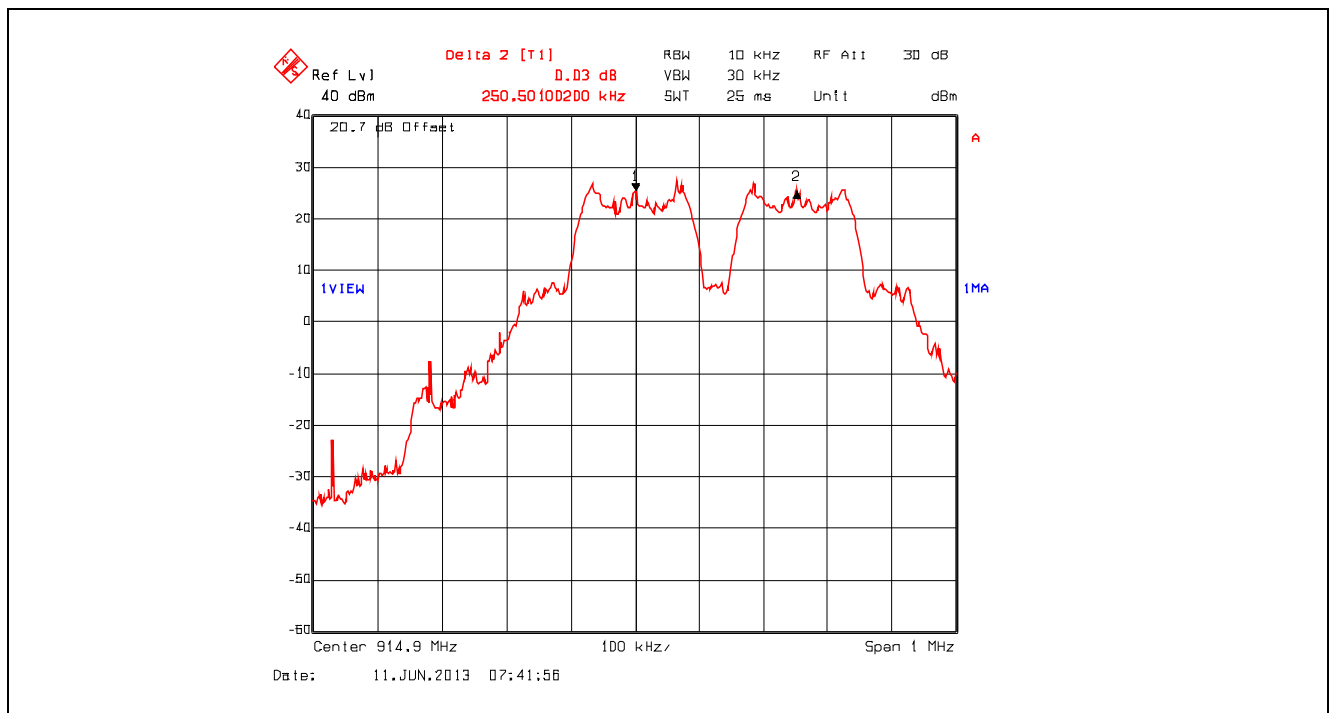
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Plot 5.3.4.9. 20 dB Bandwidth, 927.60 MHz, Data Rate at 276480 kbps



Plot 5.3.4.10. Carrier Frequency Separation, Data Rate at 172800 kbps



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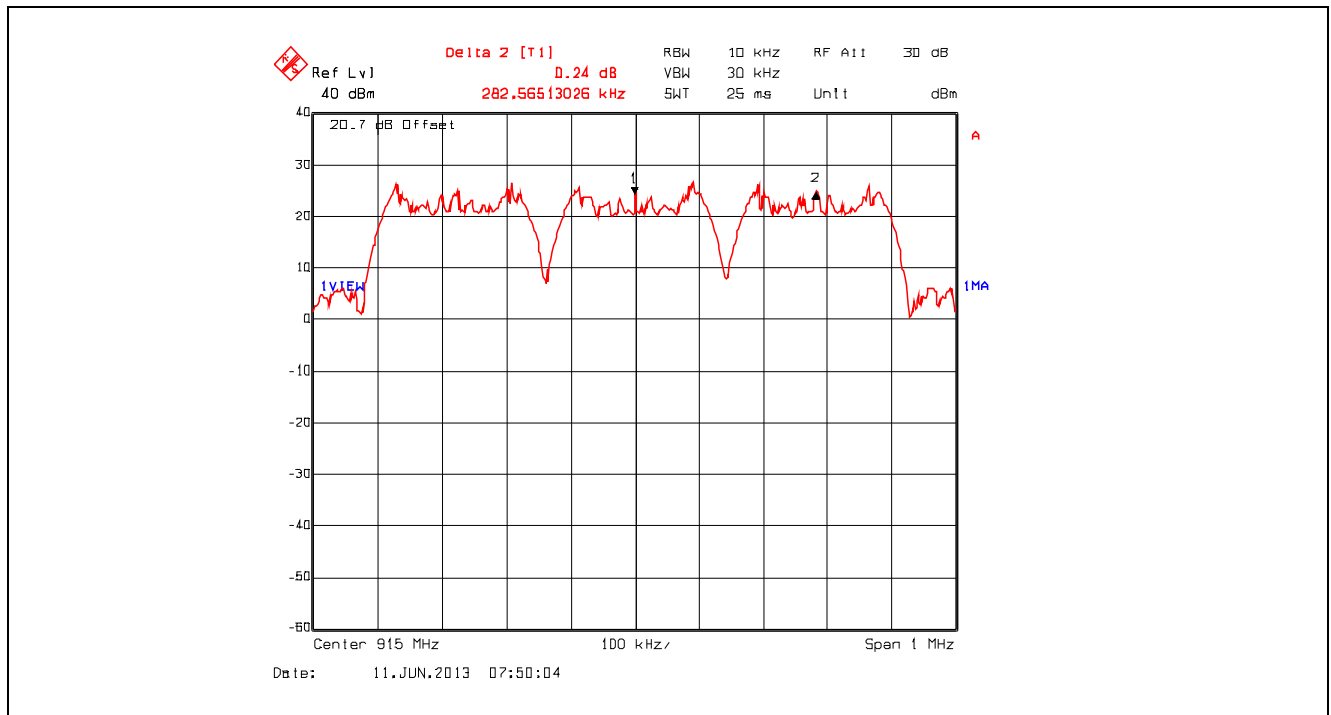
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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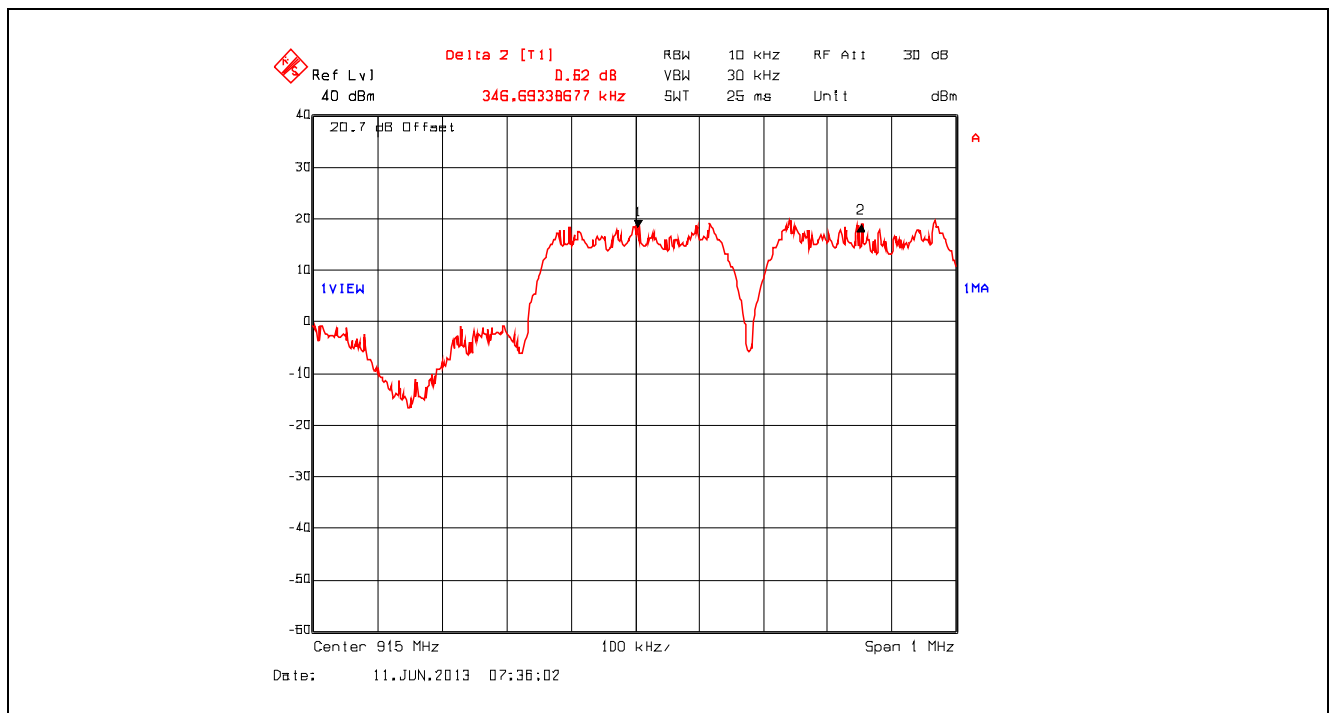
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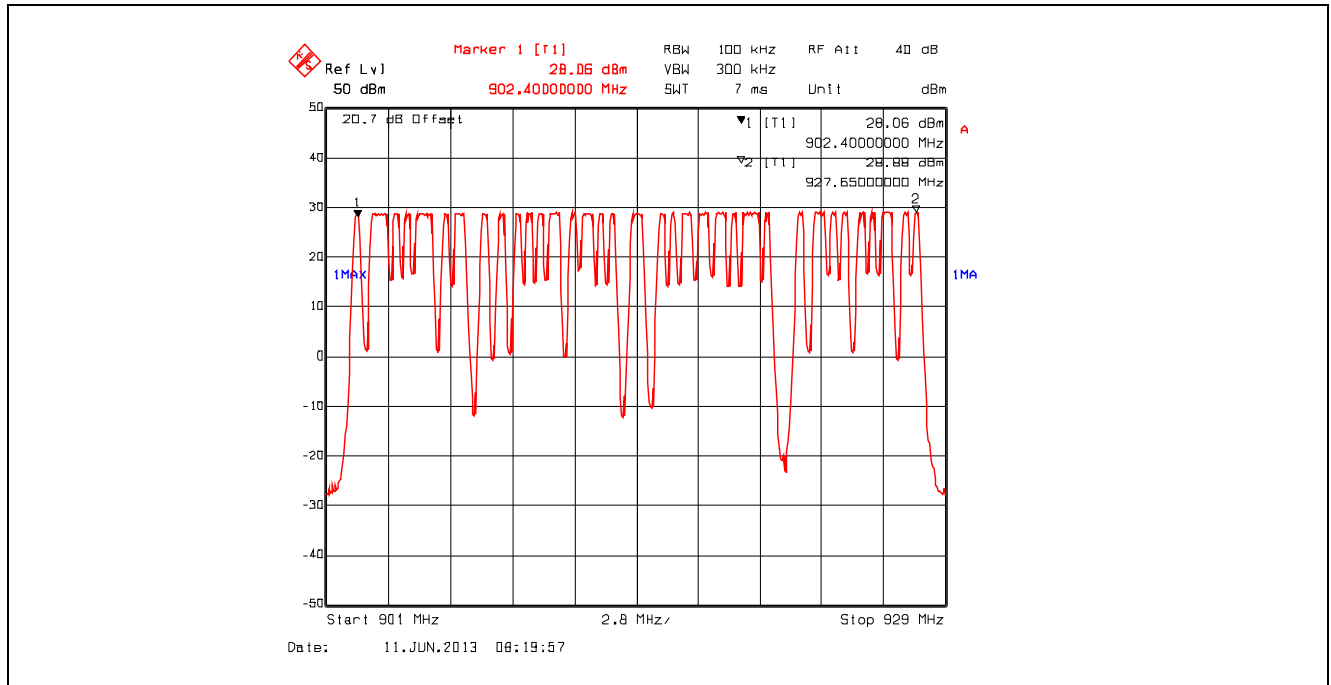
Plot 5.3.4.11. Carrier Frequency Separation, Data Rate at 230400 kbps



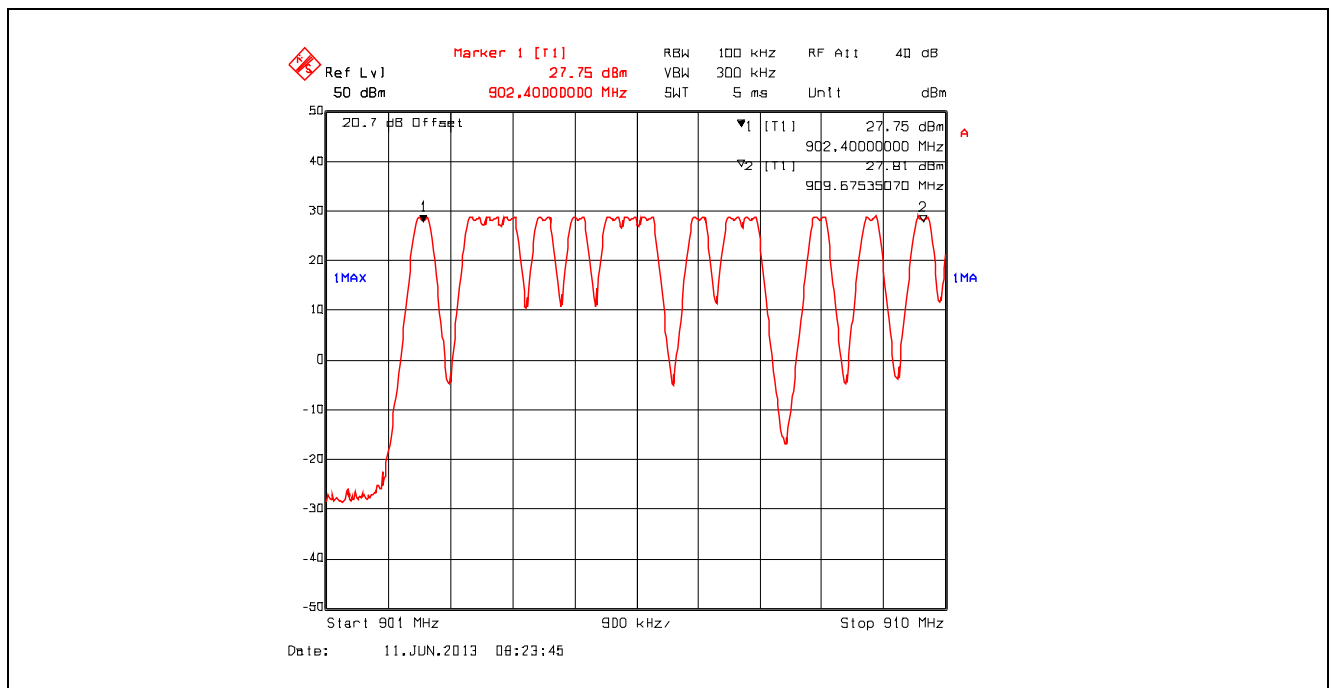
Plot 5.3.4.12. Carrier Frequency Separation, Data Rate at 276480 kbps



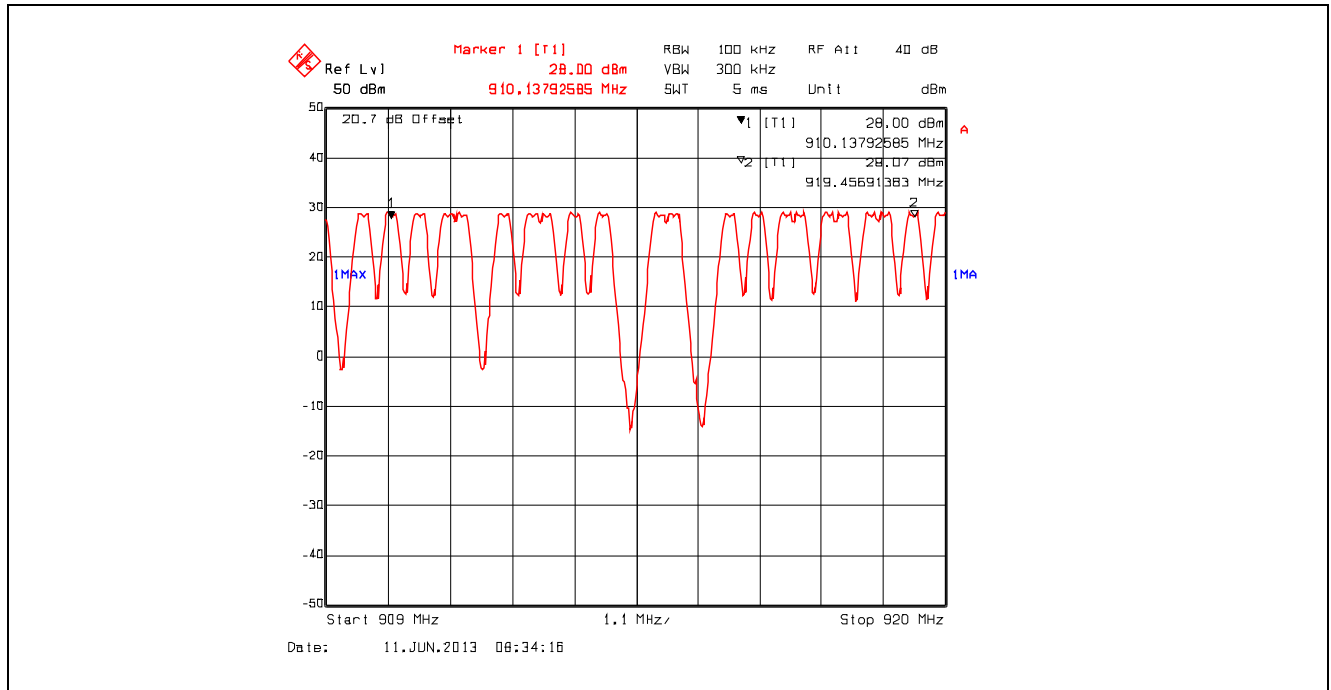
Plot 5.3.4.13. Number of Hopping Frequencies, Data Rate at 172800 kbps
50 Hopping Channels from 902 – 928 MHz



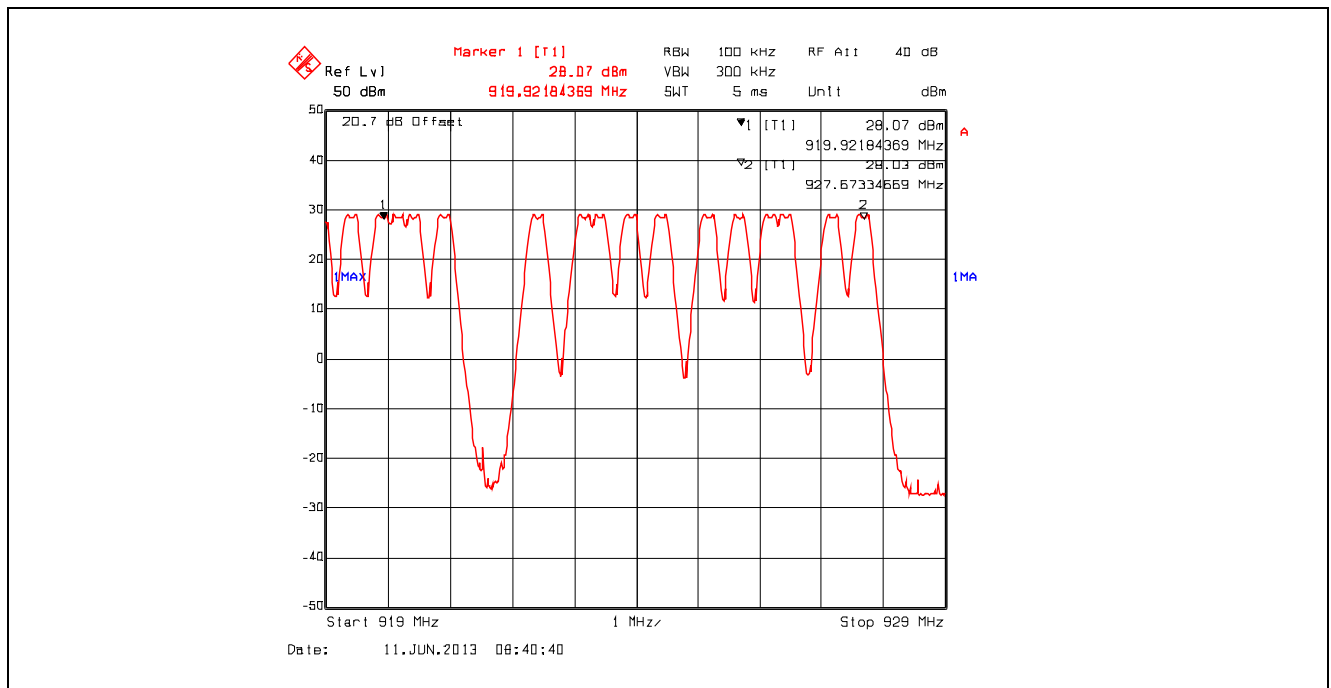
Plot 5.3.4.14. Number of Hopping Frequencies, Data Rate at 172800 kbps
15 Hopping Channels from 902 – 910 MHz



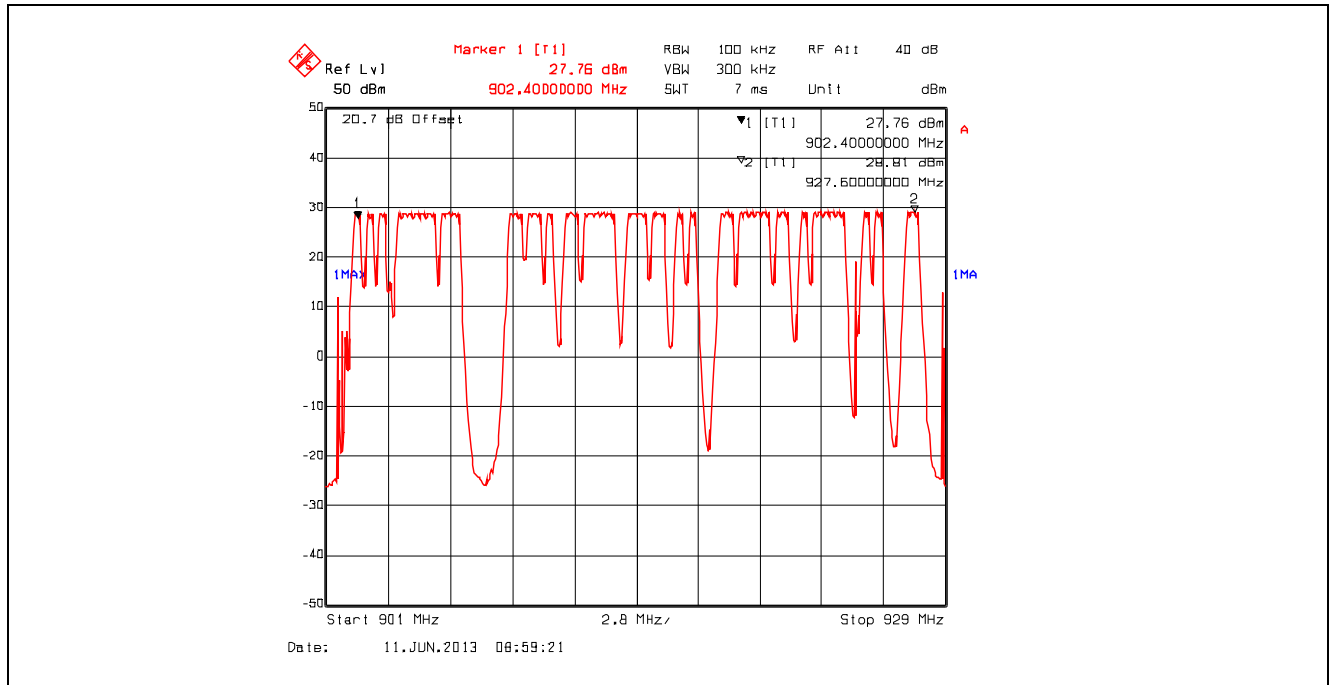
Plot 5.3.4.15. Number of Hopping Frequencies, Data Rate at 172800 kbps
20 Hopping Channels from 910 – 920 MHz



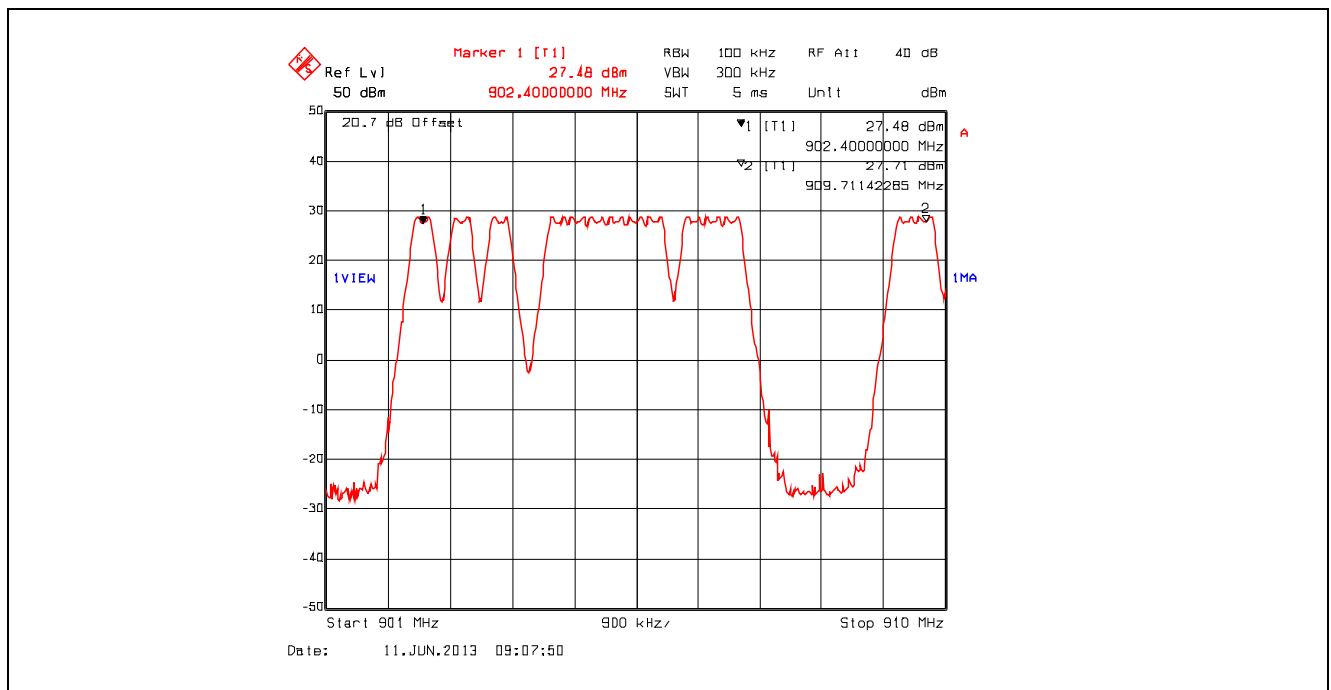
Plot 5.3.4.16. Number of Hopping Frequencies, Data Rate at 172800 kbps
15 Hopping Channels from 920 – 928 MHz



Plot 5.3.4.17. Number of Hopping Frequencies, Data Rate at 230400 kbps
50 Hopping Channels from 902 - 928 MHz



Plot 5.3.4.18. Number of Hopping Frequencies, Data Rate at 230400 kbps
14 Hopping Channels from 902 – 910 MHz



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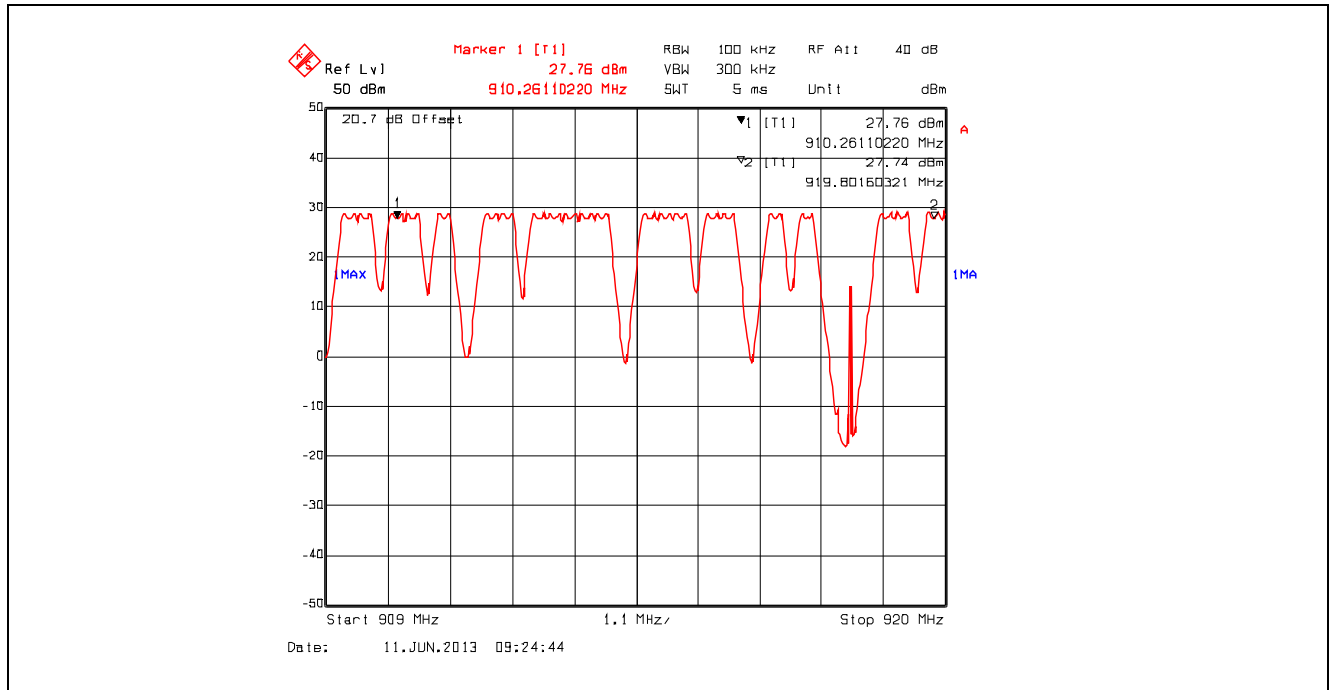
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

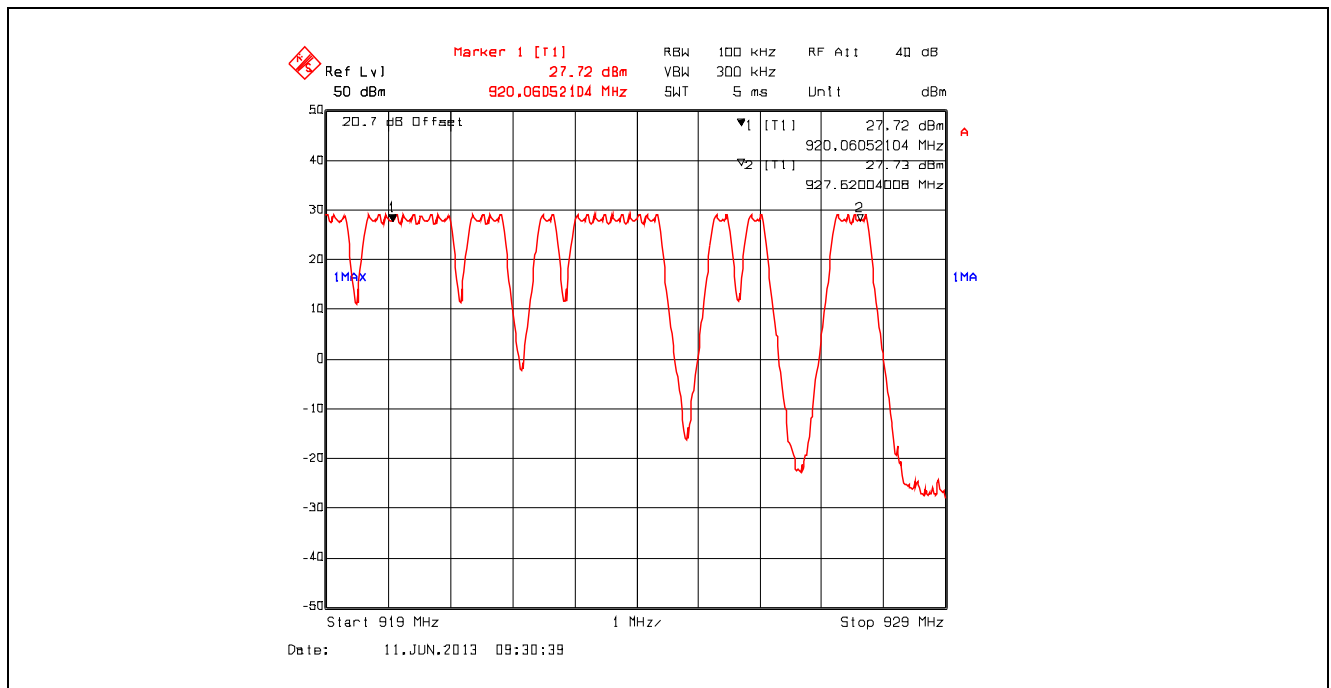
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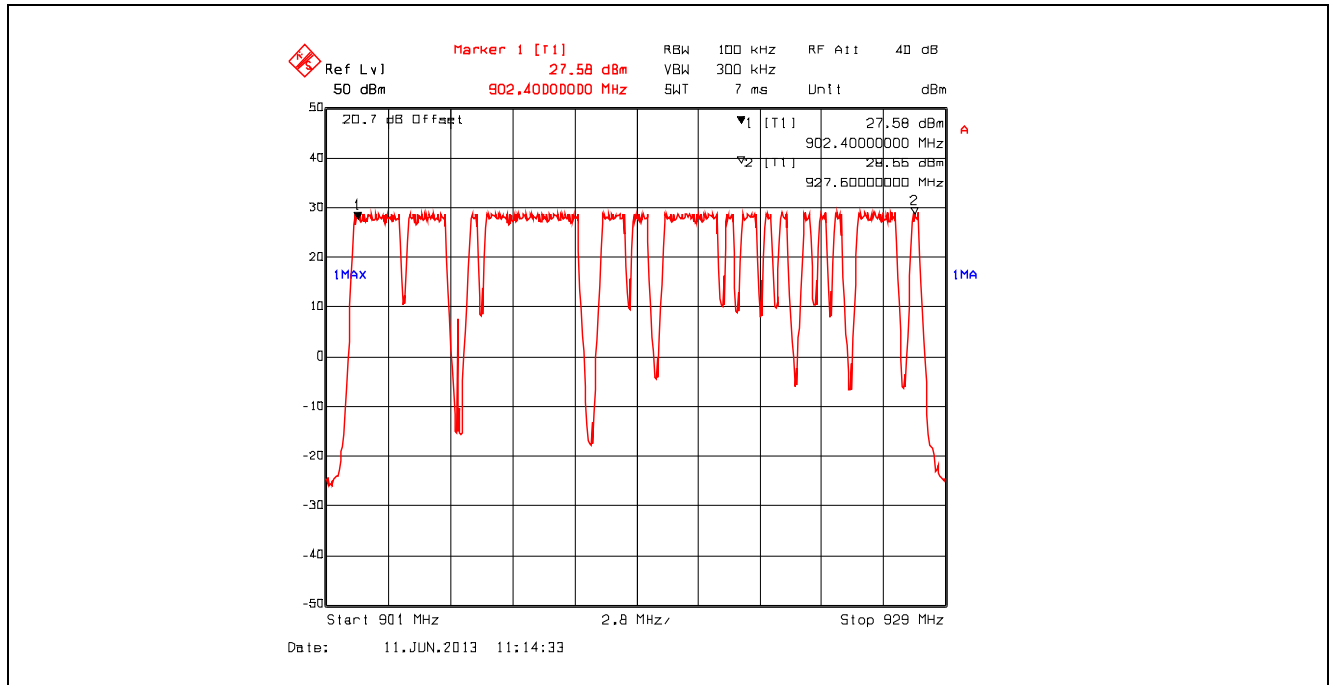
Plot 5.3.4.19. Number of Hopping Frequencies, Data Rate at 230400 kbps
20 Hopping Channels from 910 – 920 MHz



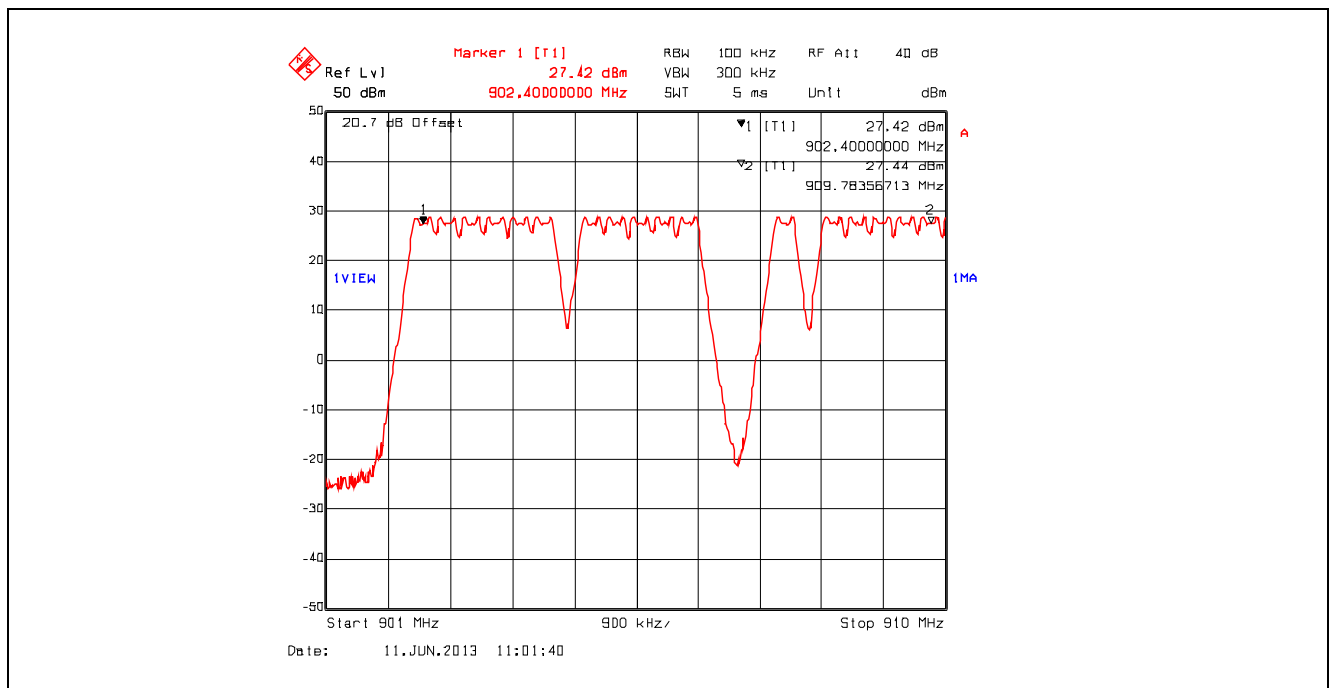
Plot 5.3.4.20. Number of Hopping Frequencies, Data Rate at 230400 kbps
16 Hopping Channels from 920 – 928 MHz



Plot 5.3.4.21. Number of Hopping Frequencies, Data Rate at 276480 kbps
50 Hopping Channels from 902 – 928 MHz



Plot 5.3.4.22. Number of Hopping Frequencies, Data Rate at 276480 kbps
17 Hopping Channels from 902 – 910 MHz



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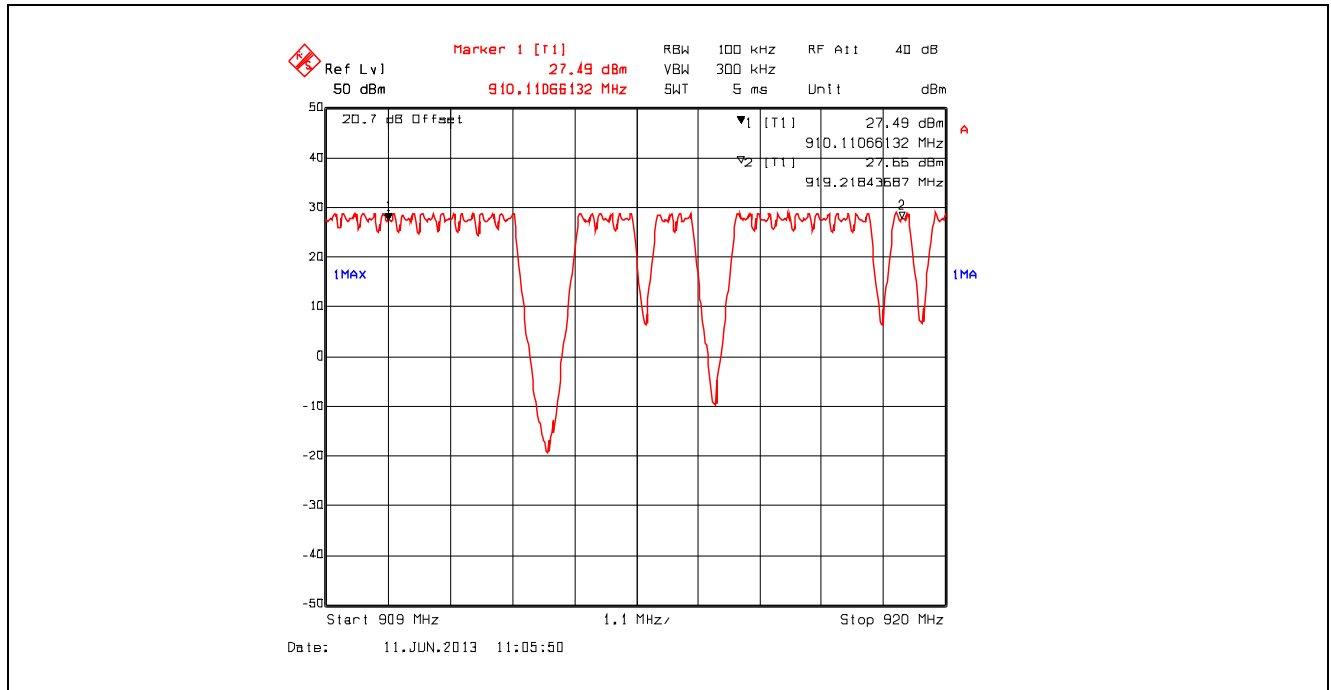
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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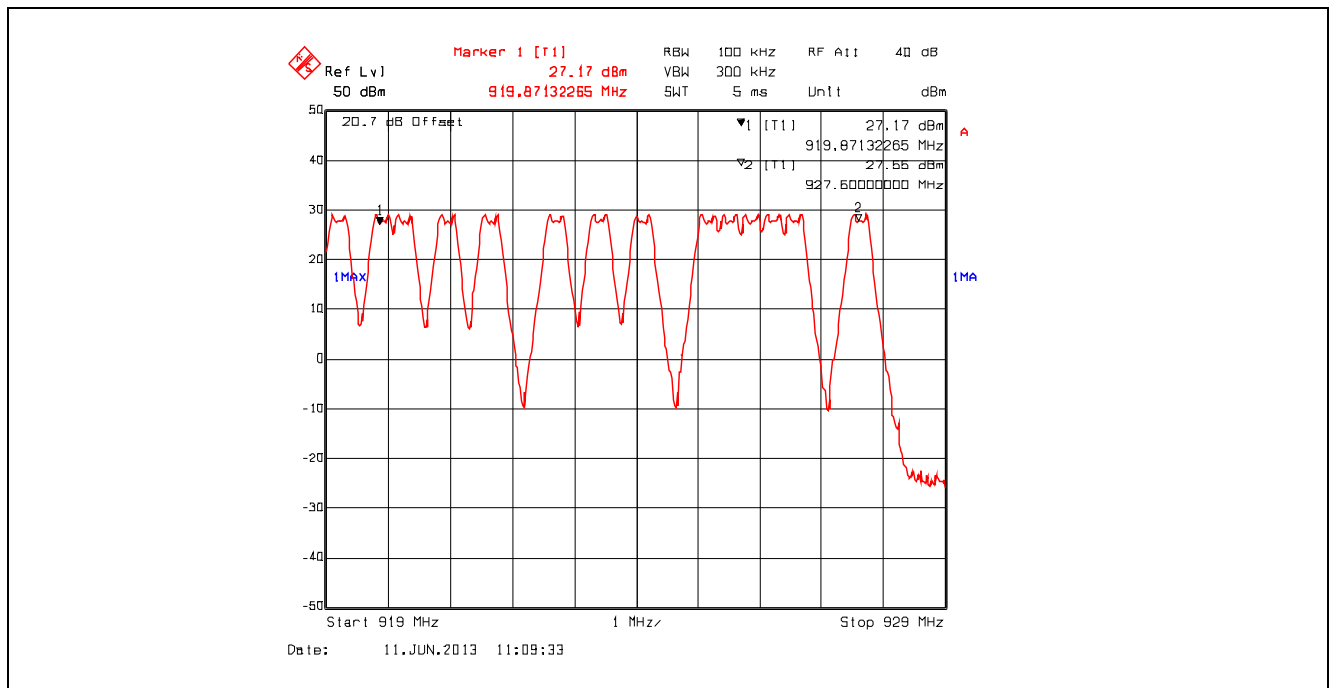
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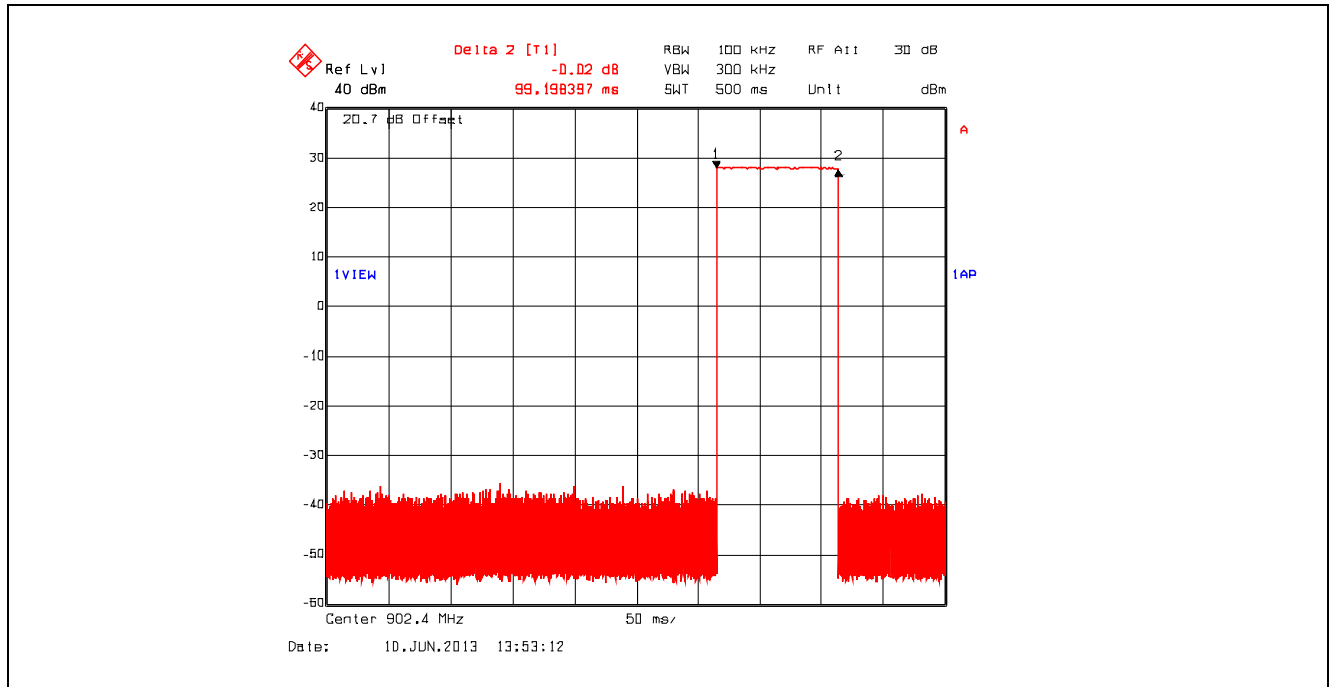
Plot 5.3.4.23. Number of Hopping Frequencies, Data Rate at 276480 kbps
20 Hopping Channels from 910 - 920 MHz



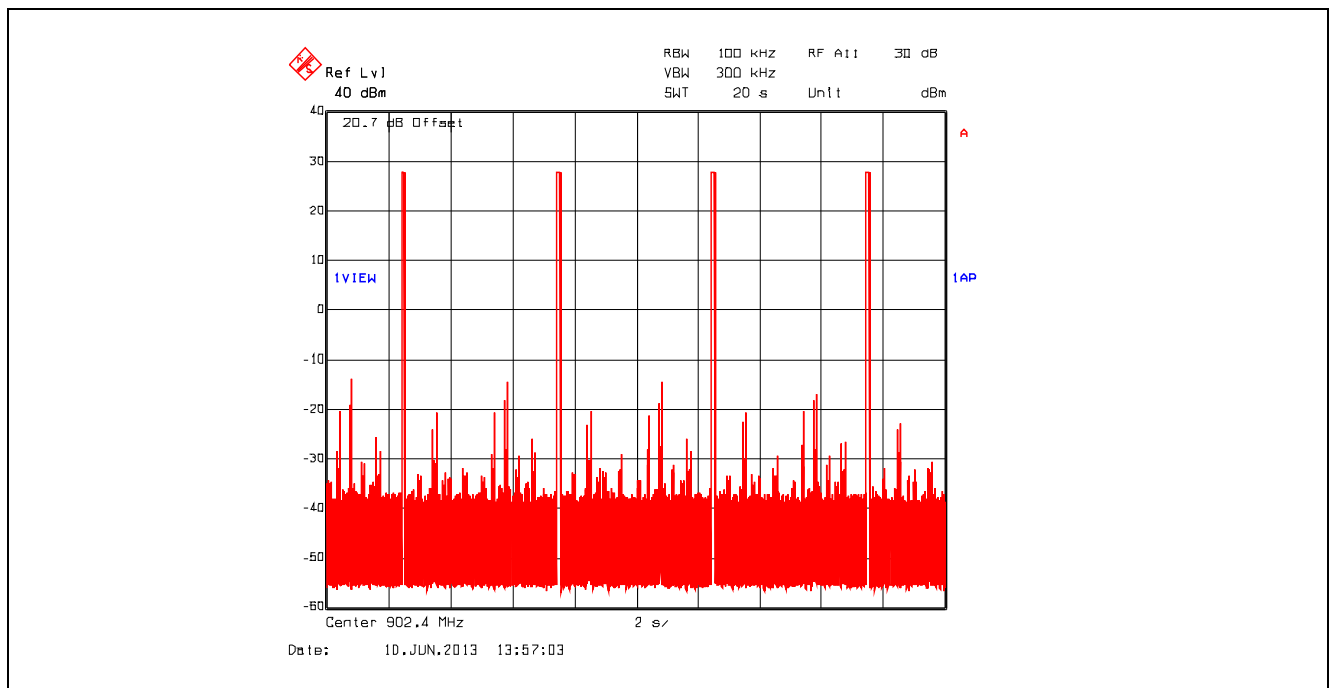
Plot 5.3.4.24. Number of Hopping Frequencies, Data Rate at 276480 kbps
13 Hopping Channels from 920 – 928 MHz



Plot 5.3.4.25. Time of Occupancy, 902.40 MHz, Data Rate at 172800 kbps
Dwell Time @ 902.40 MHz = 99.198397 ms



Plot 5.3.4.26. Time of Occupancy, 902.40 MHz at Data Rate at 172800 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 4 = 396.80 ms



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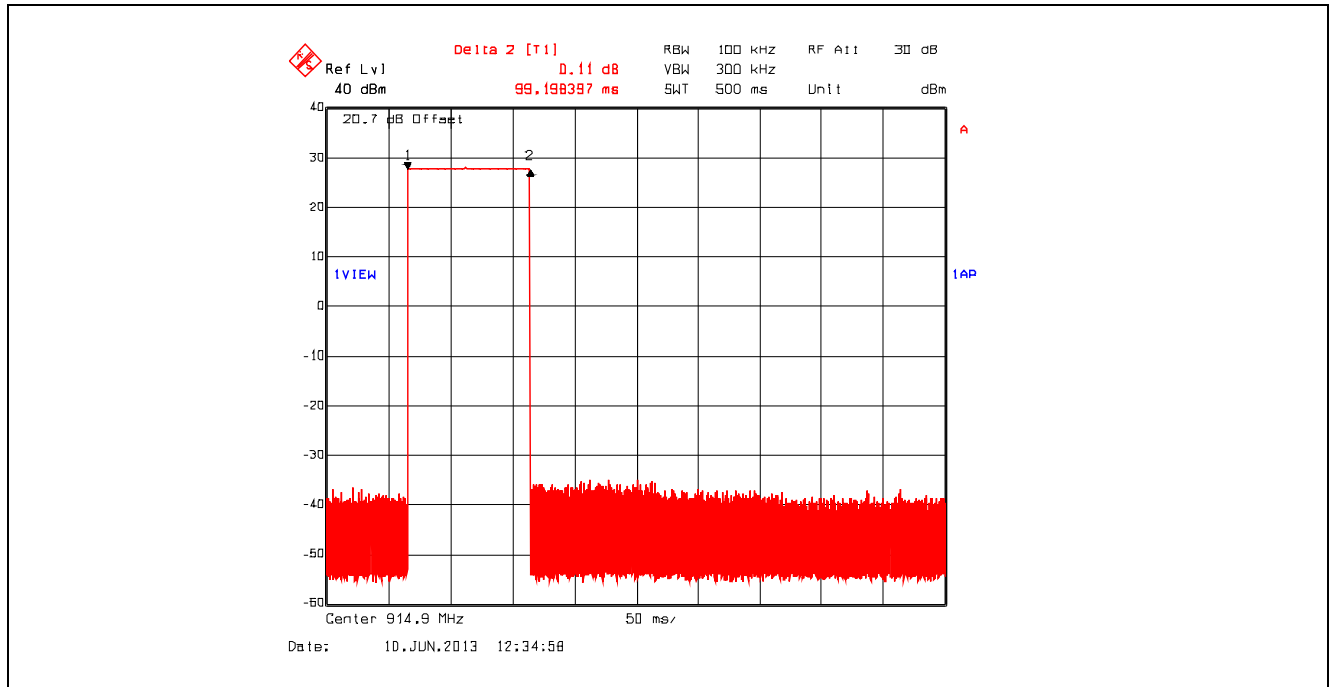
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

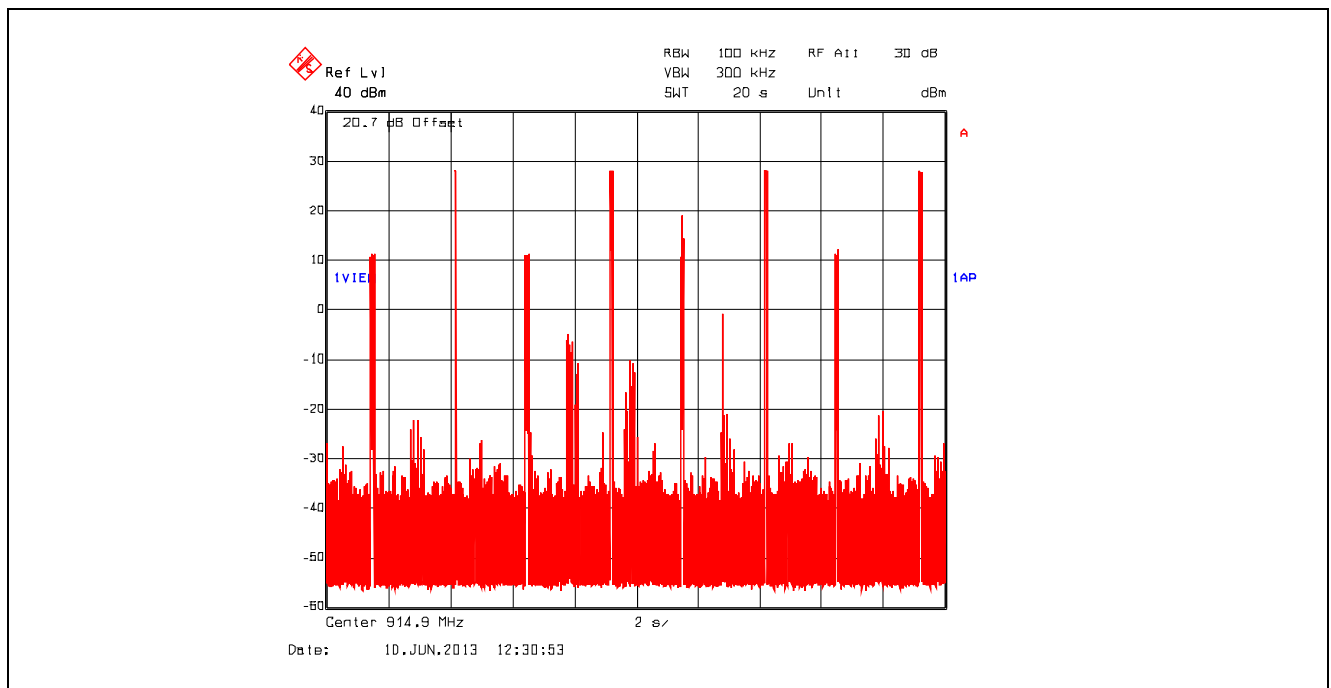
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Plot 5.3.4.27. Time of Occupancy, 914.90 MHz at Data Rate at 172800 kbps
Dwell Time @ 914.90 MHz = 99.198397 ms



Plot 5.3.4.28. Time of Occupancy, 914.90 MHz at Data Rate at 172800 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 4 = 396.80 ms



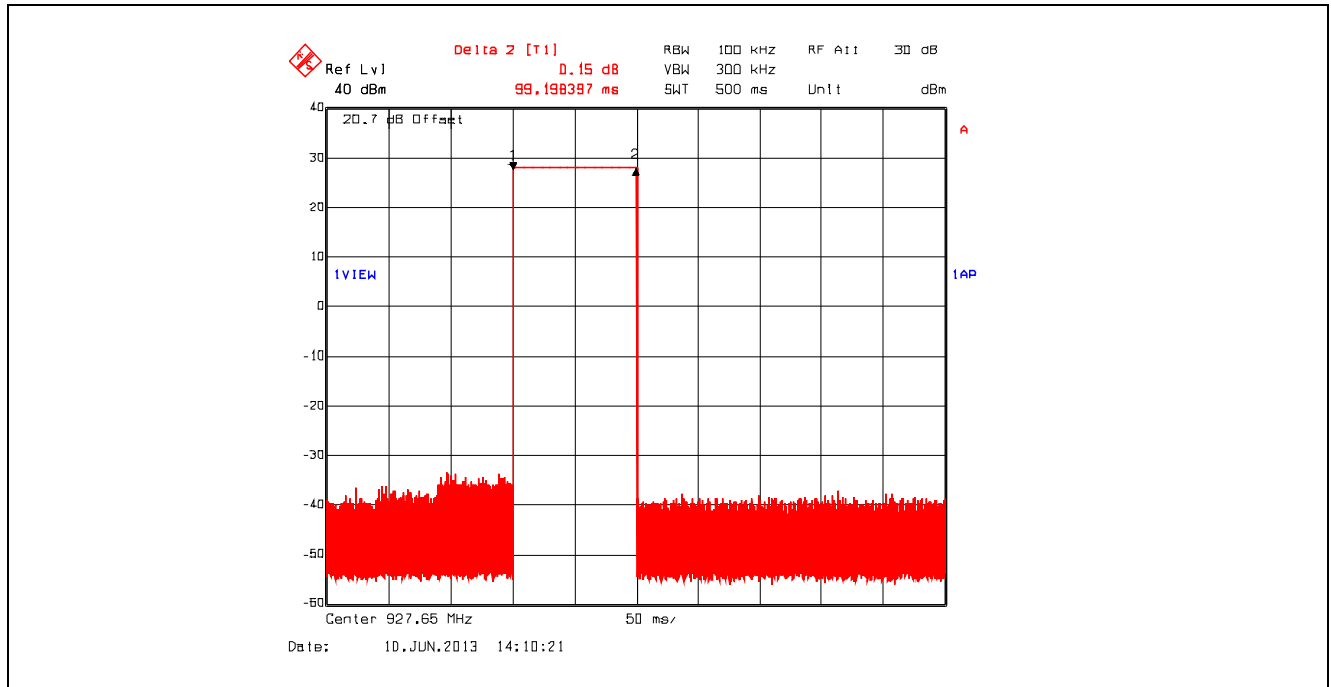
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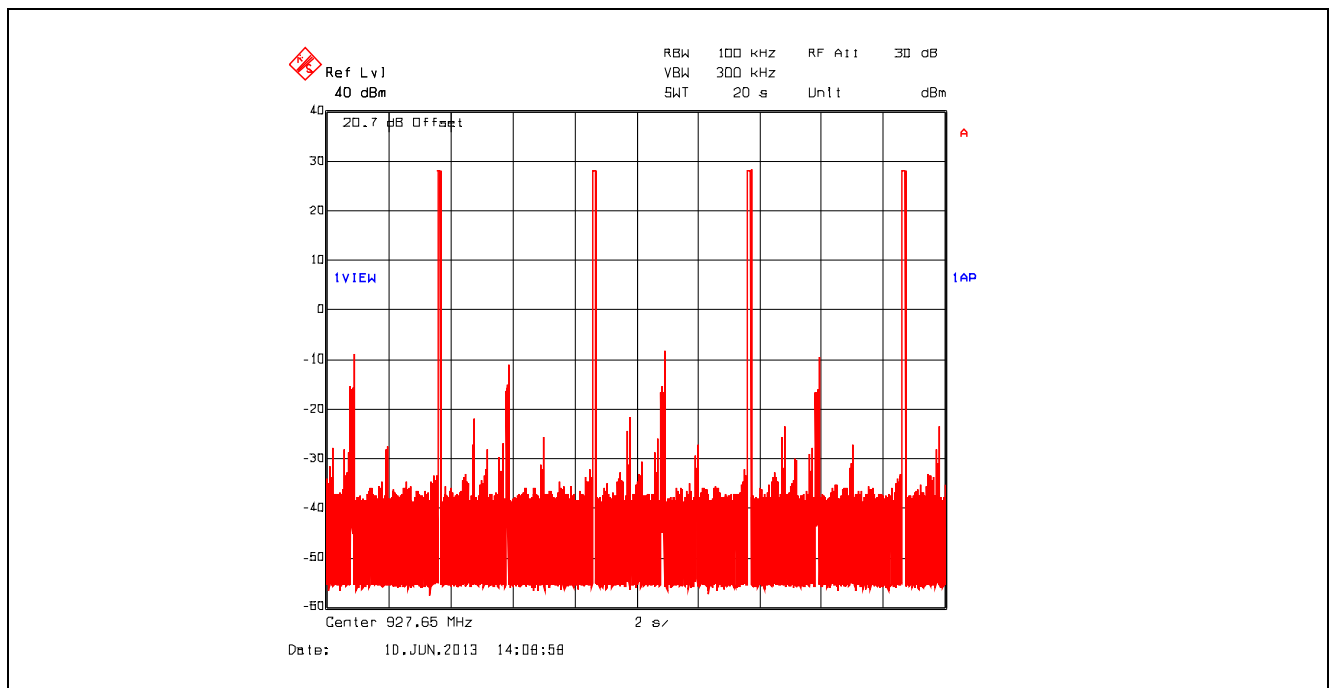
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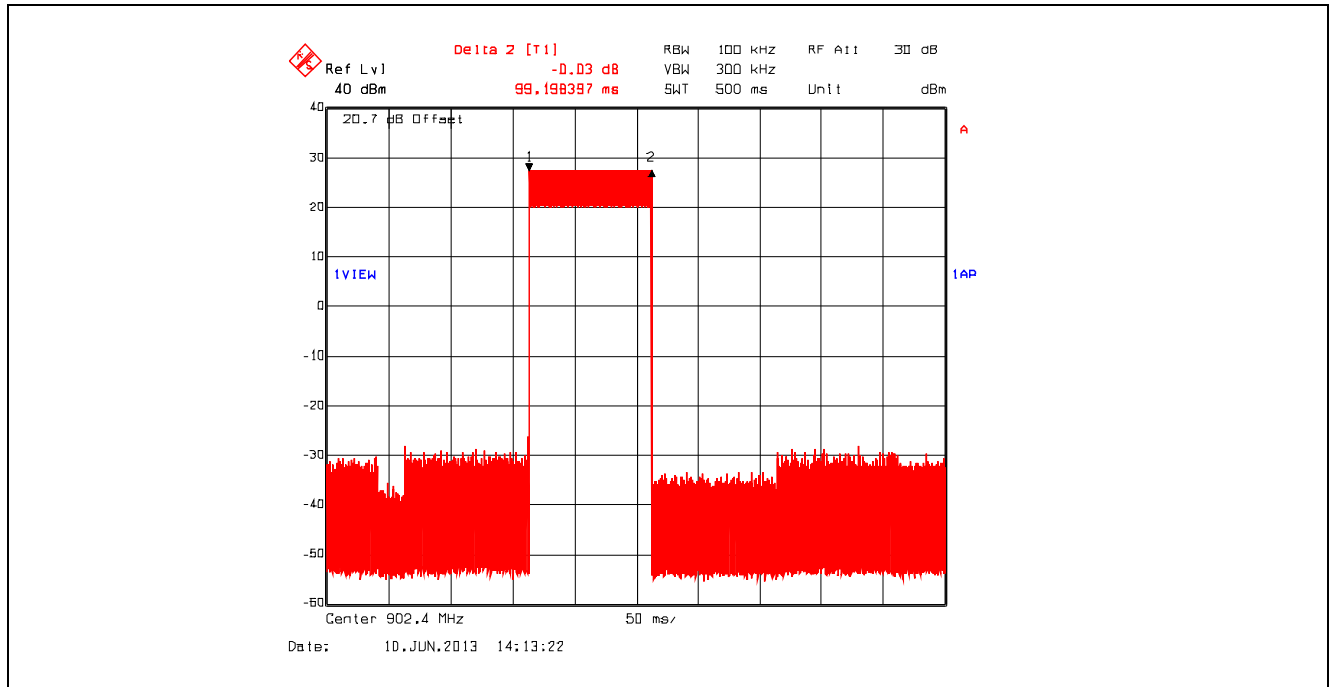
Plot 5.3.4.29. Time of Occupancy, 927.65 MHz at Data Rate at 172800 kbps
Dwell Time @ 927.65 MHz = 99.198397 ms



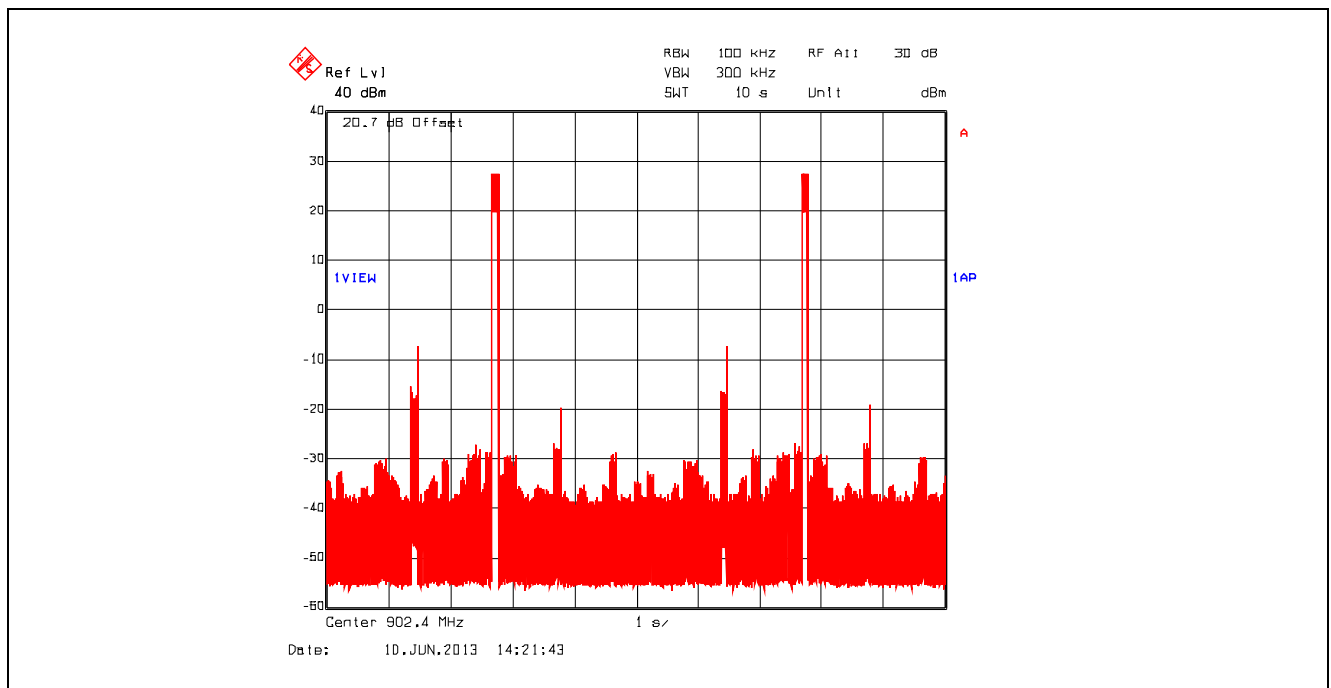
Plot 5.3.4.30. Time of Occupancy, 927.65 MHz at Data Rate at 172800 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 4 = 396.80 ms



Plot 5.3.4.31. Time of Occupancy, 902.40 MHz, Data Rate at 230400 kbps
Dwell Time @ 902.40 MHz = 99.198397 ms



Plot 5.3.4.32. Time of Occupancy, 902.40 MHz, Data Rate at 230400 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 2 = 198.40 ms



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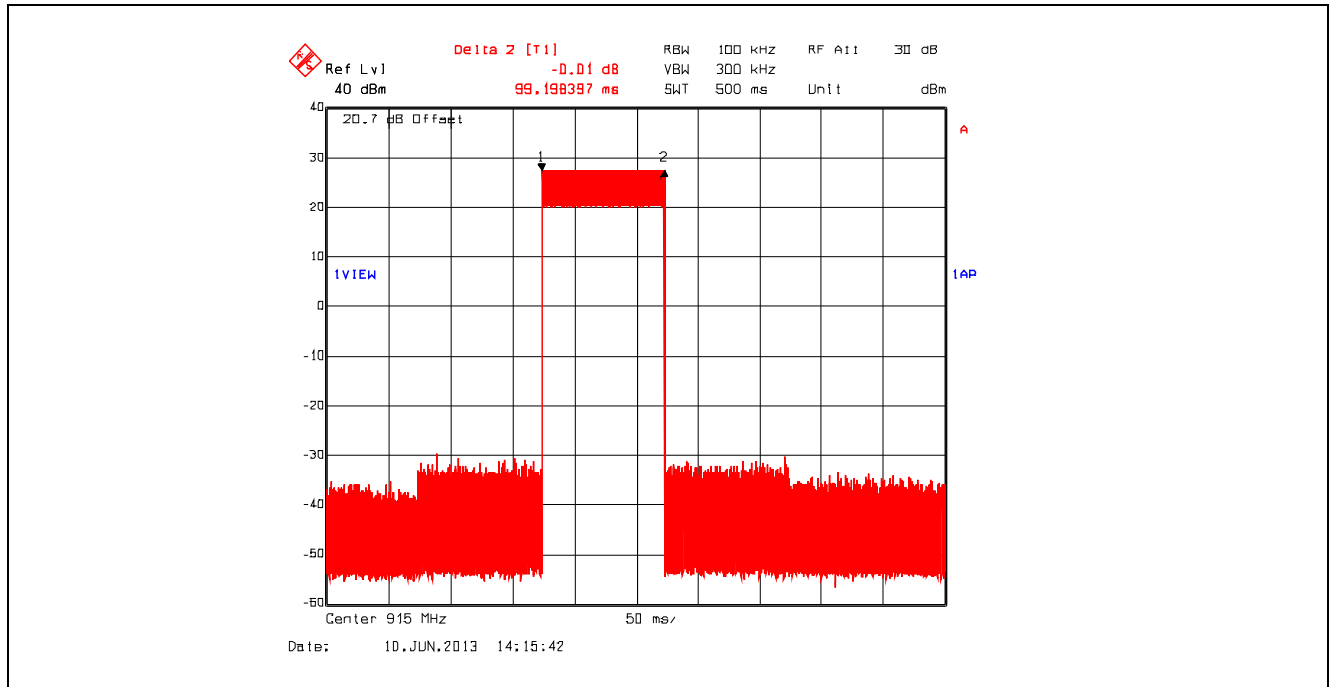
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: yic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

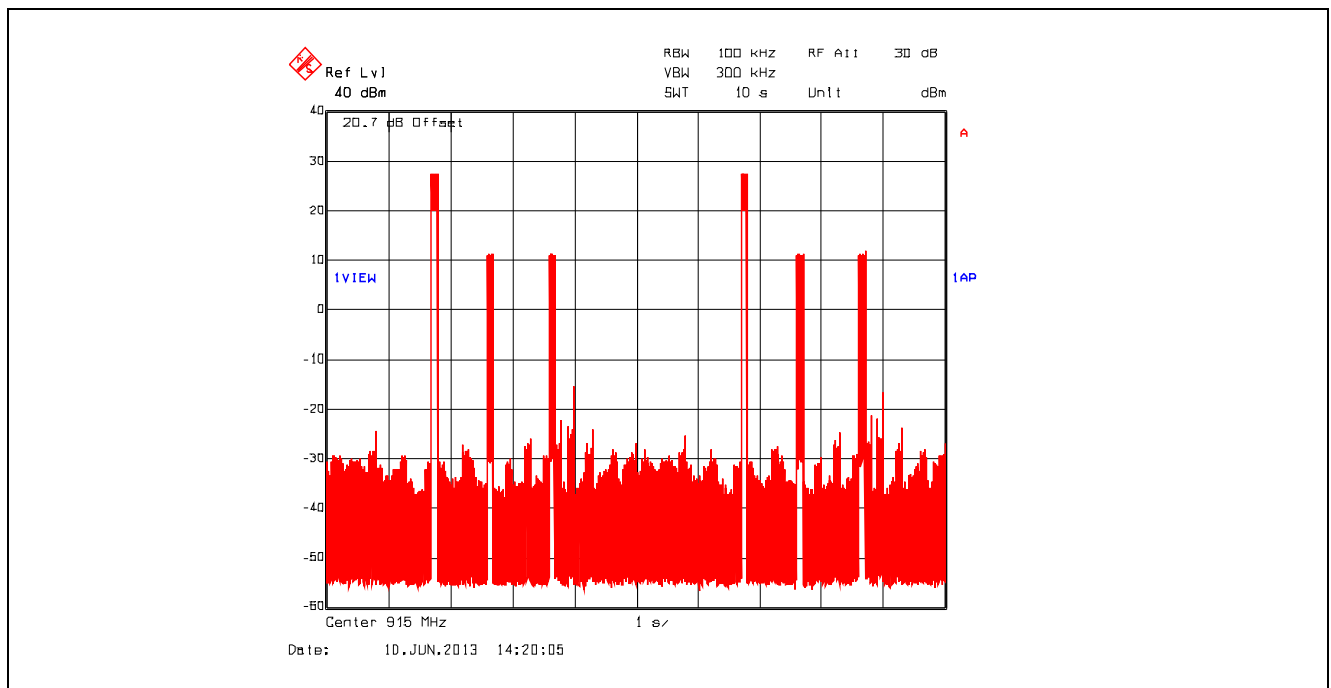
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Plot 5.3.4.33. Time of Occupancy, 915.00 MHz, Data Rate at 230400 kbps
Dwell Time @ 915.00 MHz = 99.198397 ms



Plot 5.3.4.34. Time of Occupancy, 915.00 MHz, Data Rate at 230400 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 2 = 198.40 ms



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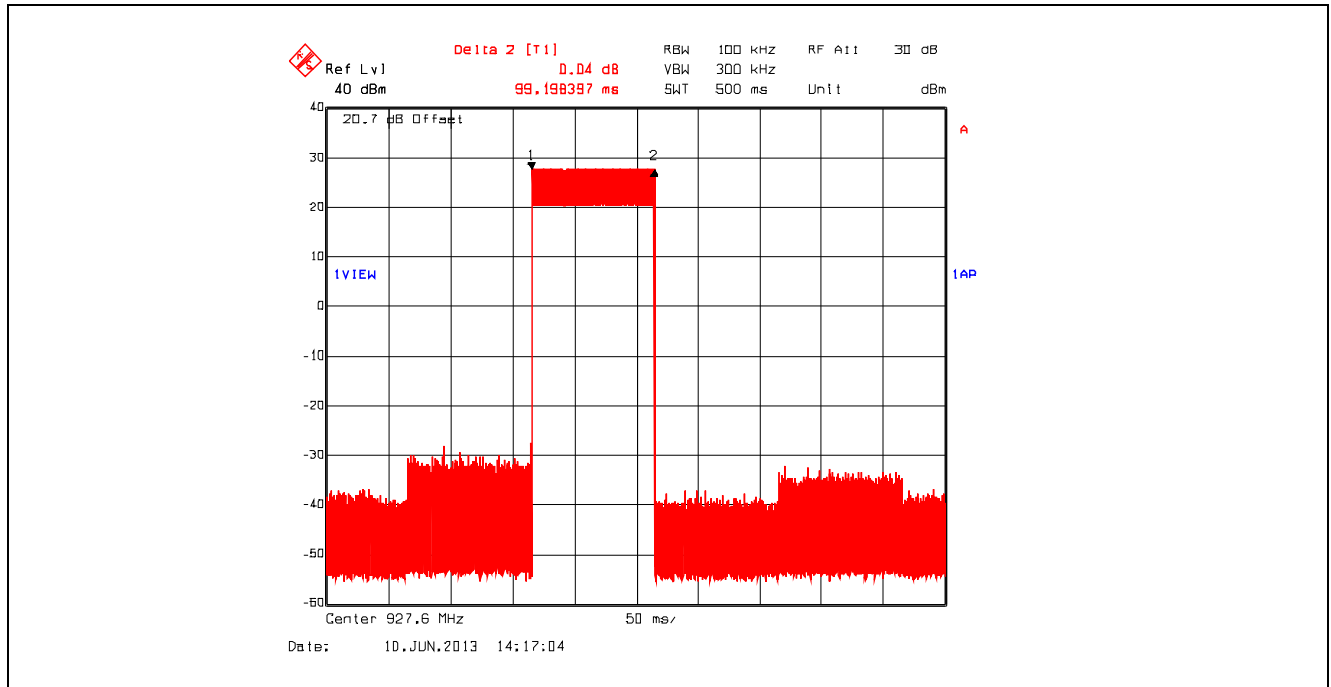
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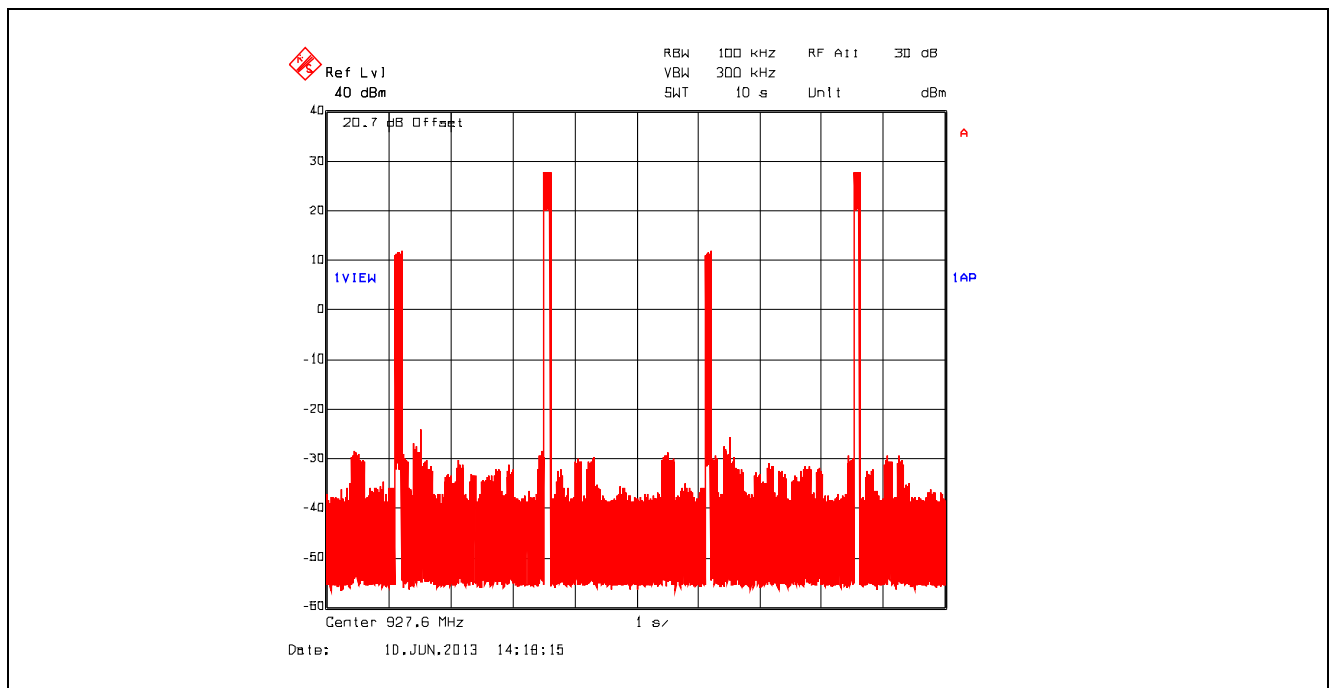
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Plot 5.3.4.35. Time of Occupancy, 927.60 MHz, Data Rate at 230400 kbps
Dwell Time @ 927.60 MHz = 99.198397 ms



Plot 5.3.4.36. Time of Occupancy, 927.60 MHz, Data Rate at 230400 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 2 = 198.40 ms



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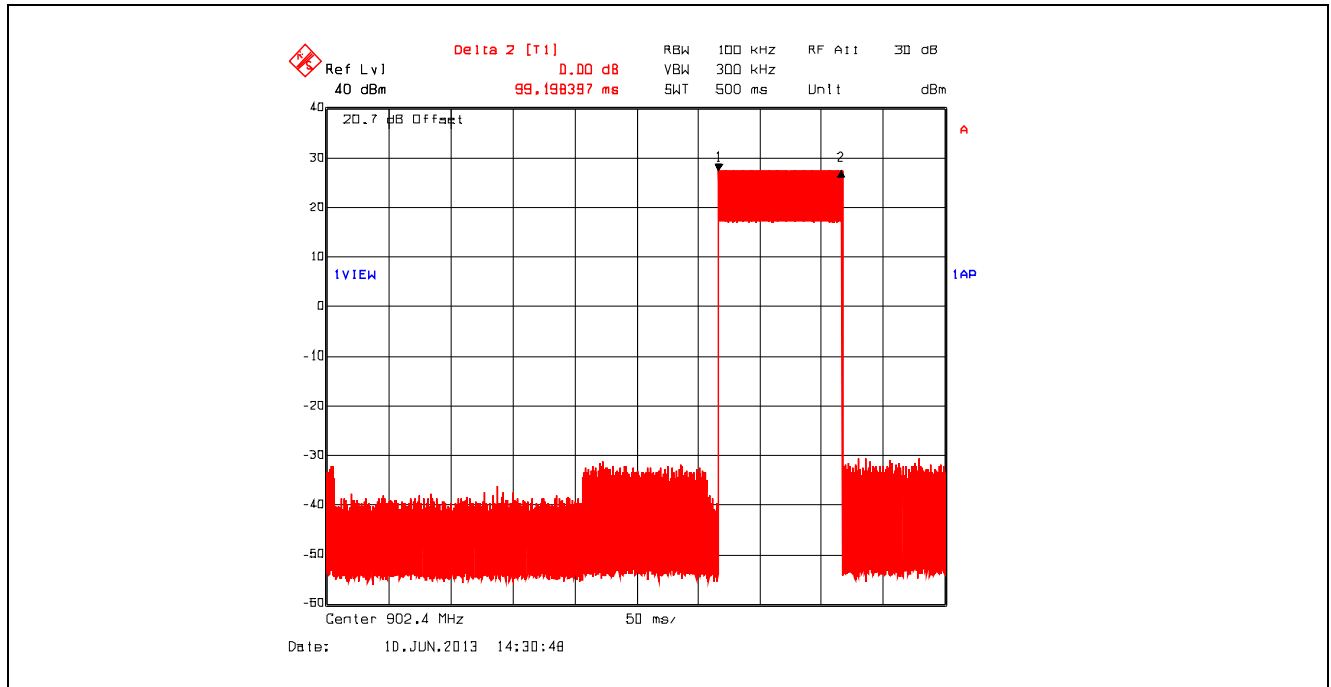
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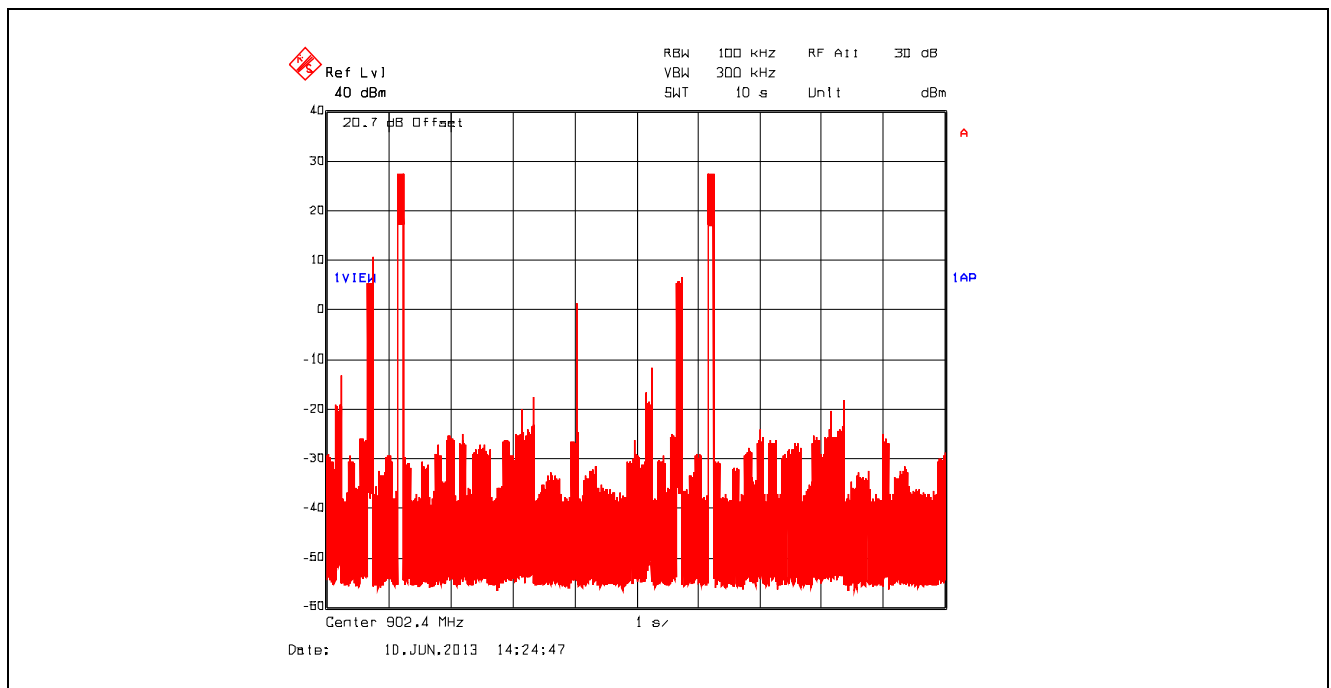
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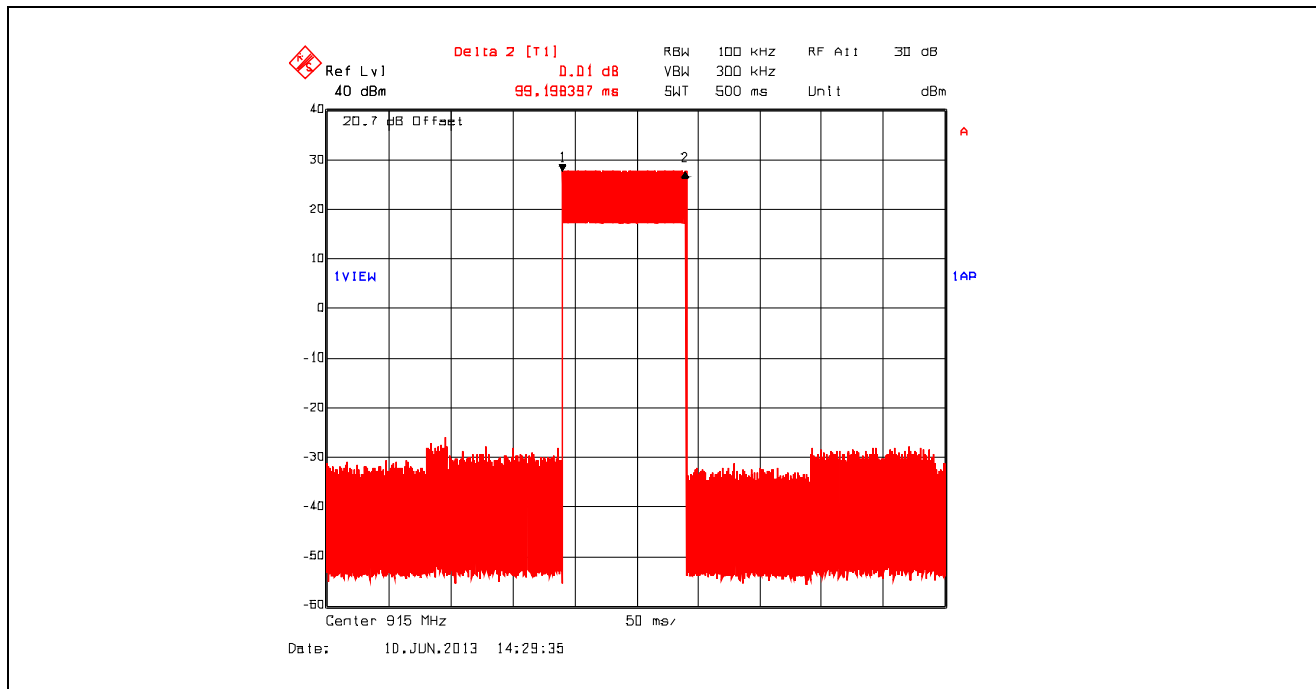
Plot 5.3.4.37. Time of Occupancy, 902.40 MHz, Data Rate at 276480 kbps
Dwell Time @ 902.40 MHz = 99.198397 ms



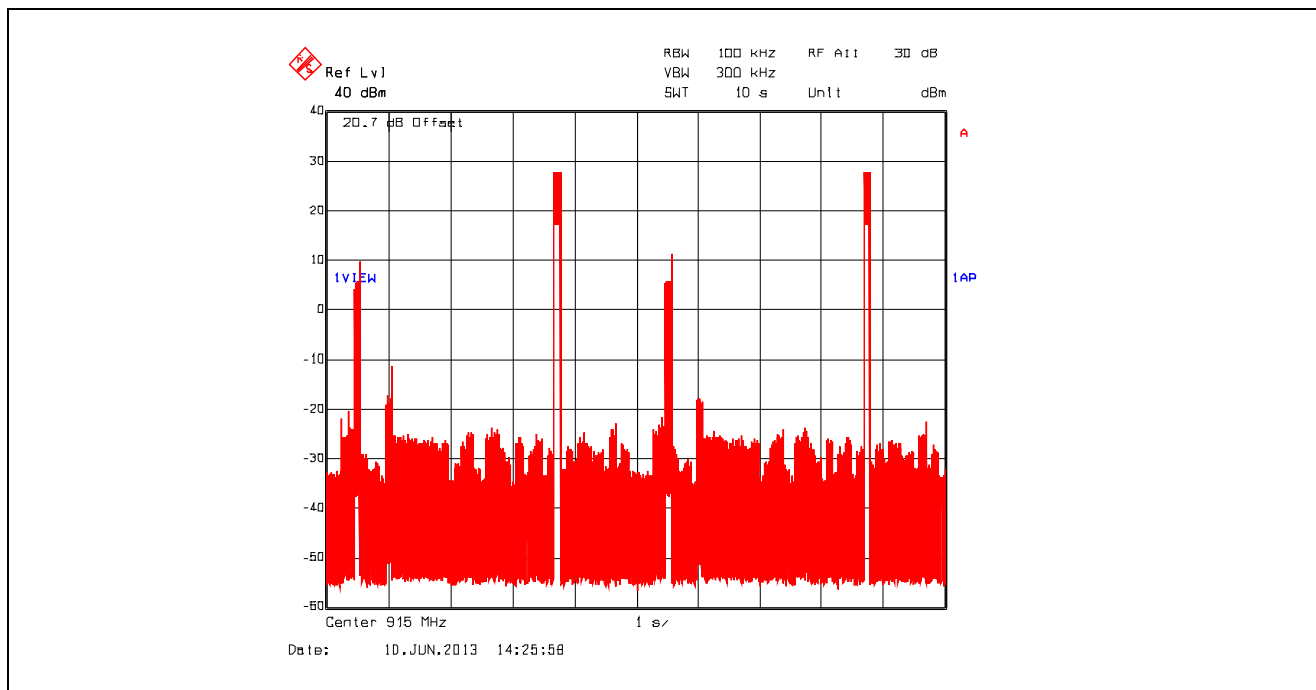
Plot 5.3.4.38. Time of Occupancy, 902.40 MHz, Data Rate at 276480 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 2 = 198.40 ms



Plot 5.3.4.39. Time of Occupancy, 915.00 MHz, Data Rate at 276480 kbps
Dwell Time @ 915.00 MHz = 99.198397 ms



Plot 5.3.4.40. Time of Occupancy, 915.00 MHz, Data Rate at 276480 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 2 = 198.40 ms



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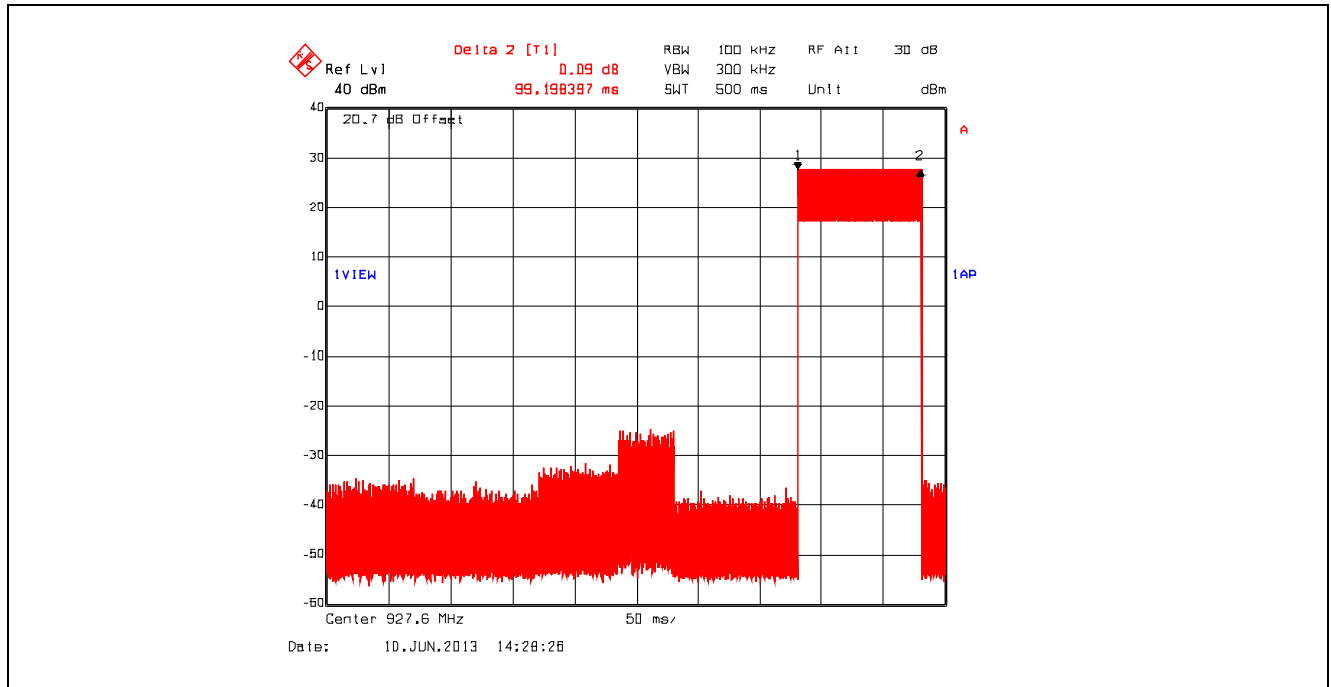
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: yic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

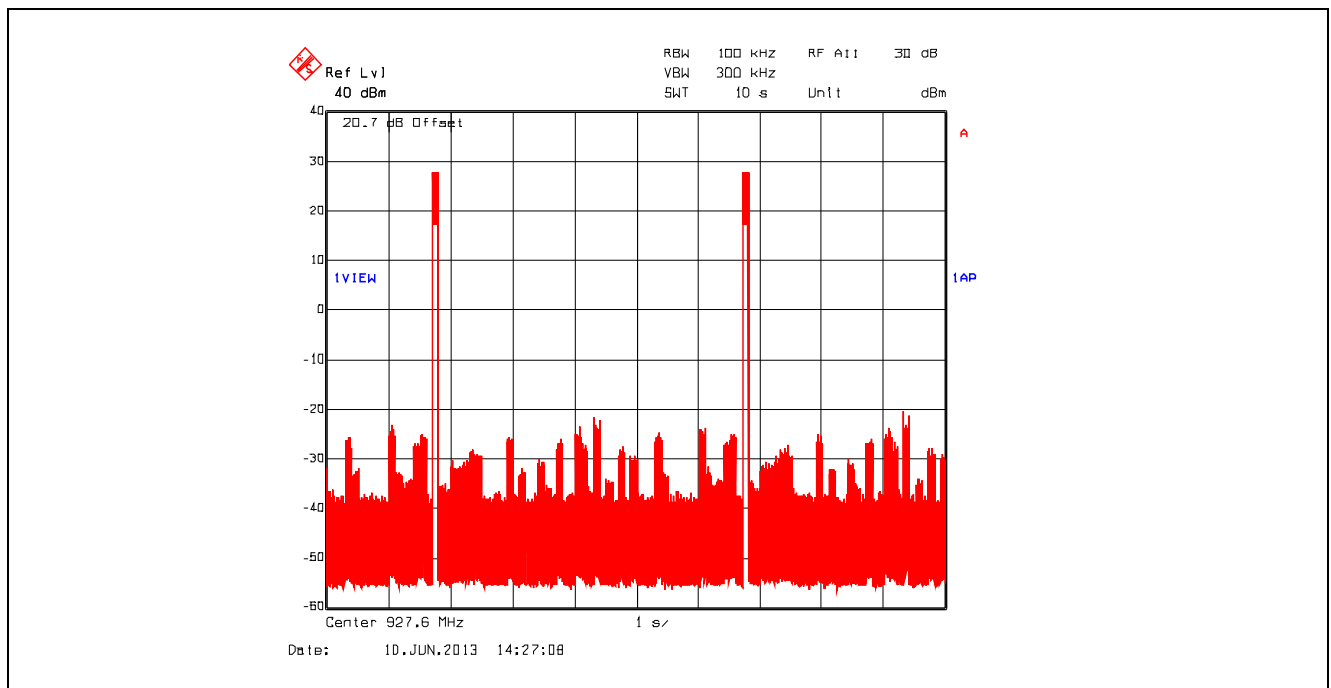
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Plot 5.3.4.41. Time of Occupancy, 927.60 MHz, Data Rate at 276480 kbps
Dwell Time @ 927.60 MHz = 99.198397 ms



Plot 5.3.4.42. Time of Occupancy, 927.60 MHz, Data Rate at 276480 kbps
Average time of occupancy = (Dwell Time) x (number of hops within a period) = 99.198397 ms x 2 = 198.40 ms



5.4. PEAK CONDUCTED OUTPUT POWER [§ 15.247(b)(2)]

5.4.1. Limits

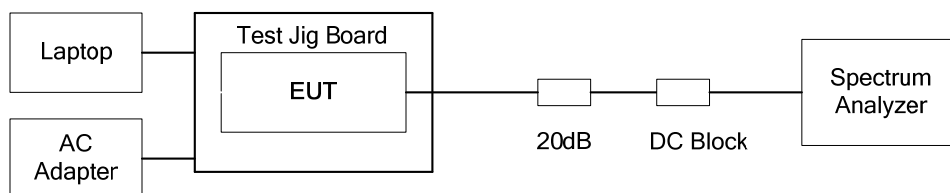
§15.247(b)(2): For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

§15.247(b)(4): The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.4.2. Method of Measurements

FCC Public Notice DA 00-705 and ANSI C63.10.

5.4.3. Test Arrangement



5.4.4. Test Data

Peak Conducted Output Power for High and Low Power Settings

Operating Power Setting	Software Power Setting	Data Rate (kbps)	Frequency (MHz)	Peak Output Power at Antenna Terminal (dBm)	Peak Conducted Output Power Limit (dBm)
High Power (30 dBm)	40	172800	902.40	29.98	30
			914.90	29.98	30
			927.65	29.98	30
		230400	902.40	29.98	30
			915.00	29.98	30
			927.60	29.98	30
		276480	902.40	29.98	30
			915.00	29.98	30
			927.60	29.98	30
Low Power (10 dBm)	6	172800	902.40	7.34	30
			914.90	9.45	30
			927.65	11.47	30
		230400	902.40	7.48	30
			915.00	8.91	30
			927.60	11.47	30
		276480	902.40	7.48	30
			915.00	9.31	30
			927.60	11.61	30

Peak Conducted Output Power and EIRP for 3 dBi Rubber Ducky Antenna with 0.77 dB Assembly Cable Loss

Software Power Setting	Data Rate (kbps)	Frequency (MHz)	Peak Output Power at Antenna Terminal (dBm)	*Calculated EIRP (dBm)	Limit (dBm)	
					Peak Conducted Output Power	EIRP
40	172800	902.40	29.98	32.21	30	36
		914.90	29.98	32.21	30	36
		927.65	29.98	32.21	30	36
	230400	902.40	29.98	32.21	30	36
		915.00	29.98	32.21	30	36
		927.60	29.98	32.21	30	36
	276480	902.40	29.98	32.21	30	36
		915.00	29.98	32.21	30	36
		927.60	29.98	32.21	30	36

* The EIRP shall be calculated based on the transmitter antenna gain (G_{dBi}), cable loss (CL_{dB}) and peak output power at antenna terminal (P_{dBm}). Calculated EIRP = $P_{dBm} + G_{dBi} - CL_{dB}$

Peak Conducted Output Power and EIRP for 3 dBi Low Profile Vertical Transit Antenna with 0.29 dB Assembly Cable Loss

Software Power Setting	Data Rate (kbps)	Frequency (MHz)	Peak Output Power at Antenna Terminal (dBm)	*Calculated EIRP (dBm)	Limit (dBm)	
					Peak Conducted Output Power	EIRP
40	172800	902.40	29.98	32.69	30	36
		914.90	29.98	32.69	30	36
		927.65	29.98	32.69	30	36
	230400	902.40	29.98	32.69	30	36
		915.00	29.98	32.69	30	36
		927.60	29.98	32.69	30	36
	276480	902.40	29.98	32.69	30	36
		915.00	29.98	32.69	30	36
		927.60	29.98	32.69	30	36

* The EIRP shall be calculated based on the transmitter antenna gain (G_{dBi}), cable loss (CL_{dB}) and peak output power at antenna terminal (P_{dBm}). Calculated EIRP = $P_{dBm} + G_{dBi} - CL_{dB}$

Peak Conducted Output Power and EIRP for 8 dBi Flat Patch Antenna with 0.29 dB Assembly Cable Loss

Software Power Setting	Data Rate (kbps)	Frequency (MHz)	Peak Output Power at Antenna Terminal (dBm)	*Calculated EIRP (dBm)	Limit (dBm)	
					Peak Conducted Output Power	EIRP
26	172800	902.40	27.91	35.62	30	36
		914.90	28.15	35.86	30	36
		927.65	28.28	35.99	30	36
	230400	902.40	27.91	35.62	30	36
		915.00	28.00	35.71	30	36
		927.60	28.28	35.99	30	36
	276480	902.40	27.79	35.50	30	36
		915.00	28.15	35.86	30	36
		927.60	28.28	35.99	30	36

* The EIRP shall be calculated based on the transmitter antenna gain (G_{dBi}), cable loss (CL_{dB}) and peak output power at antenna terminal (P_{dBm}). Calculated EIRP = $P_{dBm} + G_{dBi} - CL_{dB}$

Peak Conducted Output Power and EIRP for 8.15 dBi Omni Directional Antenna with 1.38 dB Assembly Cable Loss

Software Power Setting	Data Rate (kbps)	Frequency (MHz)	Peak Output Power at Antenna Terminal (dBm)	*Calculated EIRP (dBm)	Limit (dBm)	
					Peak Conducted Output Power	EIRP
30	172800	902.40	28.45	35.22	30	36
		914.90	28.70	35.47	30	36
		927.65	29.20	35.97	30	36
	230400	902.40	28.33	35.10	30	36
		915.00	28.70	35.47	30	36
		927.60	29.20	35.97	30	36
	276480	902.40	28.45	35.22	30	36
		915.00	28.70	35.47	30	36
		927.60	29.20	35.97	30	36

* The EIRP shall be calculated based on the transmitter antenna gain (G_{dBi}), cable loss (CL_{dB}) and peak output power at antenna terminal (P_{dBm}). Calculated EIRP = $P_{dBm} + G_{dBi} - CL_{dB}$

**Peak Conducted Output Power and EIRP for 13.15 dBi Omni Directional Antenna
with 1.38 dB Assembly Cable Loss**

Software Power Setting	Data Rate (kbps)	Frequency (MHz)	Peak Output Power at Antenna Terminal (dBm)	*Calculated EIRP (dBm)	Limit (dBm)	
					Peak Conducted Output Power	EIRP
20	172800	902.40	22.69	34.46	30	36
		914.90	23.08	34.85	30	36
		927.65	24.11	35.88	30	36
	230400	902.40	22.69	34.46	30	36
		915.00	23.21	34.98	30	36
		927.60	24.11	35.88	30	36
	276480	902.40	22.69	34.46	30	36
		915.00	23.08	34.85	30	36
		927.60	24.11	35.88	30	36

* The EIRP shall be calculated based on the transmitter antenna gain (G_{dBi}), cable loss (CL_{dB}) and peak output power at antenna terminal (P_{dBm}). Calculated EIRP = $P_{dBm} + G_{dBi} - CL_{dB}$

5.5. TRANSMITTER BAND-EDGE & SPURIOUS CONDUCTED EMISSIONS [§ 15.247(d)]

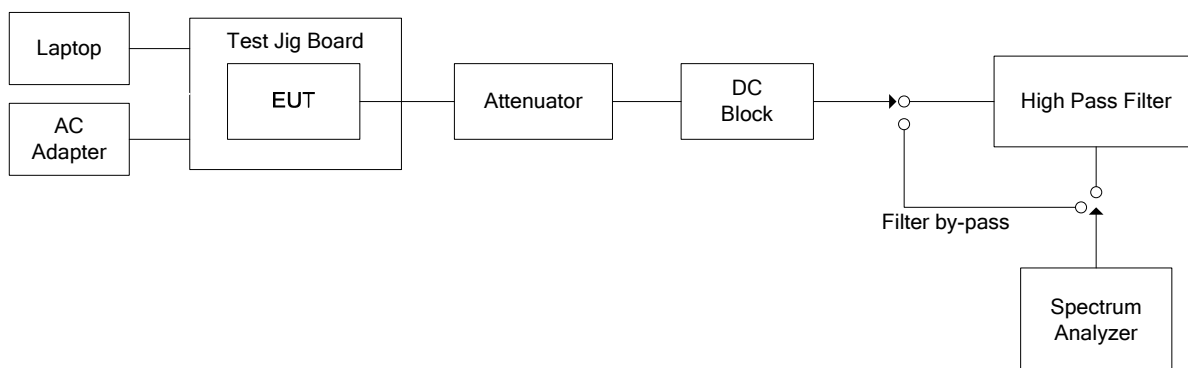
5.5.1. Limit

§ 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

5.5.2. Method of Measurements

FCC Public Notice DA 00-705 and ANSI C63.10

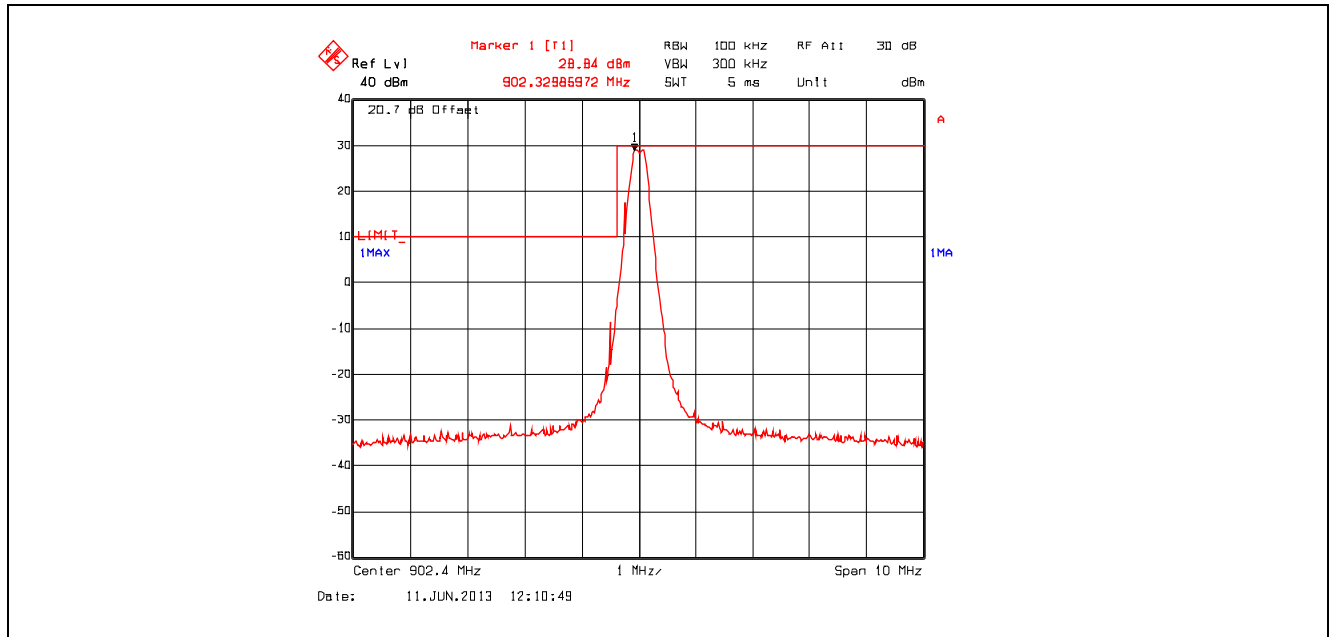
5.5.3. Test Arrangement



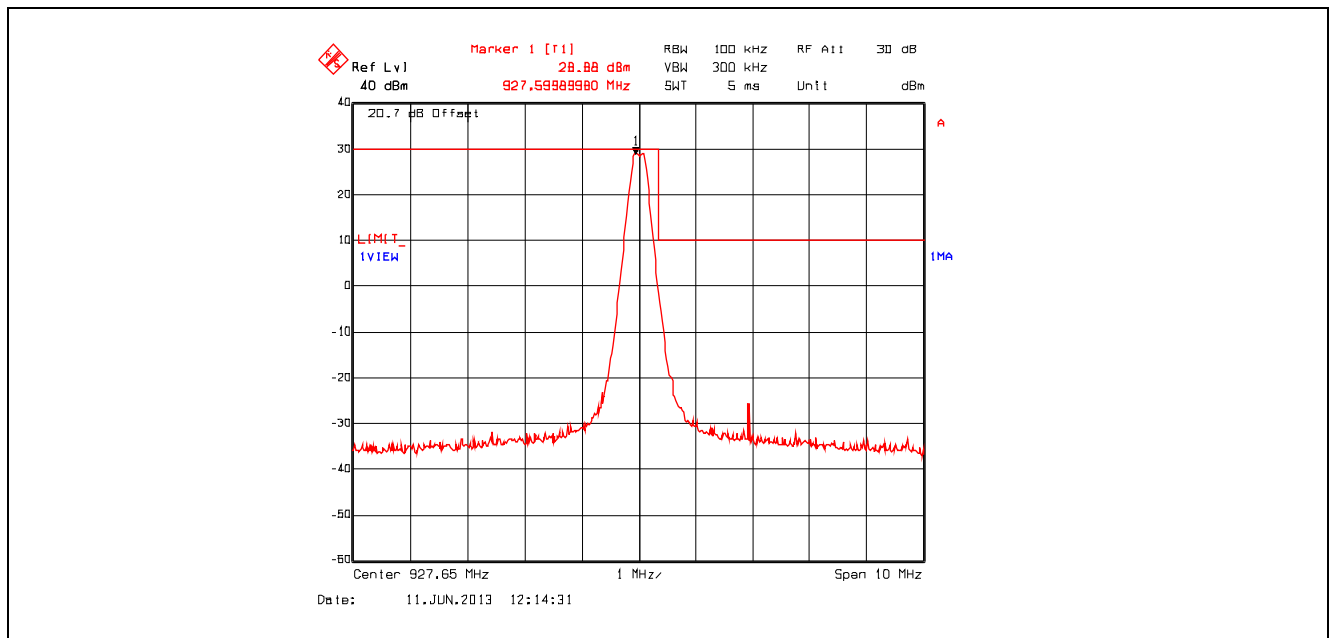
5.5.4. Test Data

5.5.4.1. Band-Edge RF Conducted Emissions

Plot 5.5.4.1.1. Band-Edge RF Conducted Emissions at 172800 kbps Data Rate
Single Frequency Mode, Low End of Frequency Band



Plot 5.5.4.1.2. Band-Edge RF Conducted Emissions at 172800 kbps Data Rate
Single Frequency Mode, High End of Frequency Band



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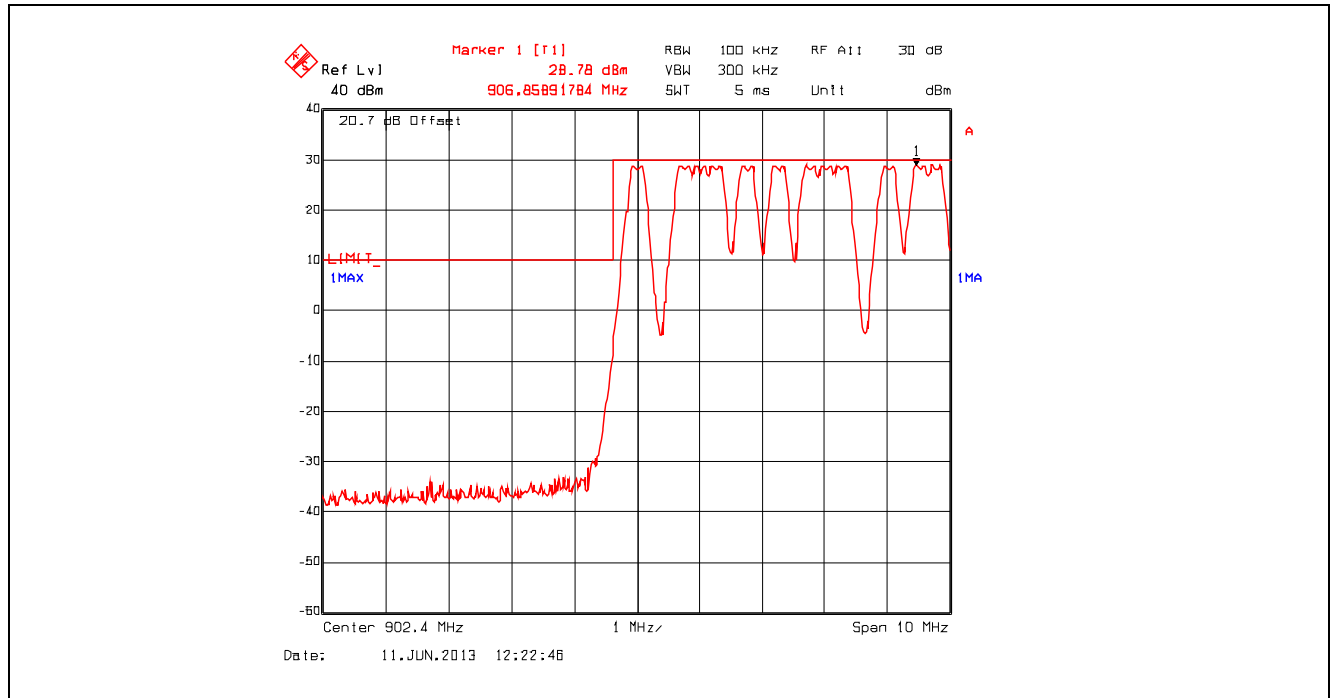
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

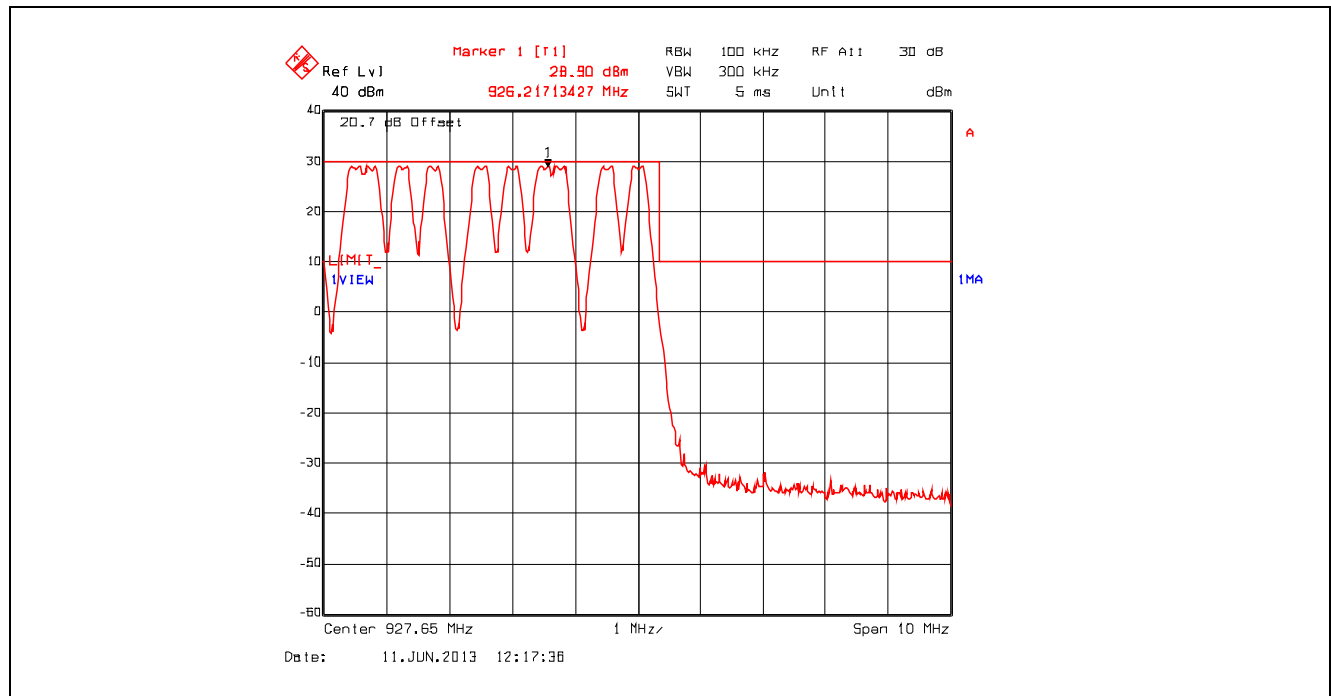
September 4, 2013

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

**Plot 5.5.4.1.3. Band-Edge RF Conducted Emissions at 172800 kbps Data Rate
Pseudorandom Channel Hopping Mode, Low End of Frequency Band**



**Plot 5.5.4.1.4. Band-Edge RF Conducted Emissions at 172800 kbps Data Rate
Pseudorandom Channel Hopping Mode, High End of Frequency Band**



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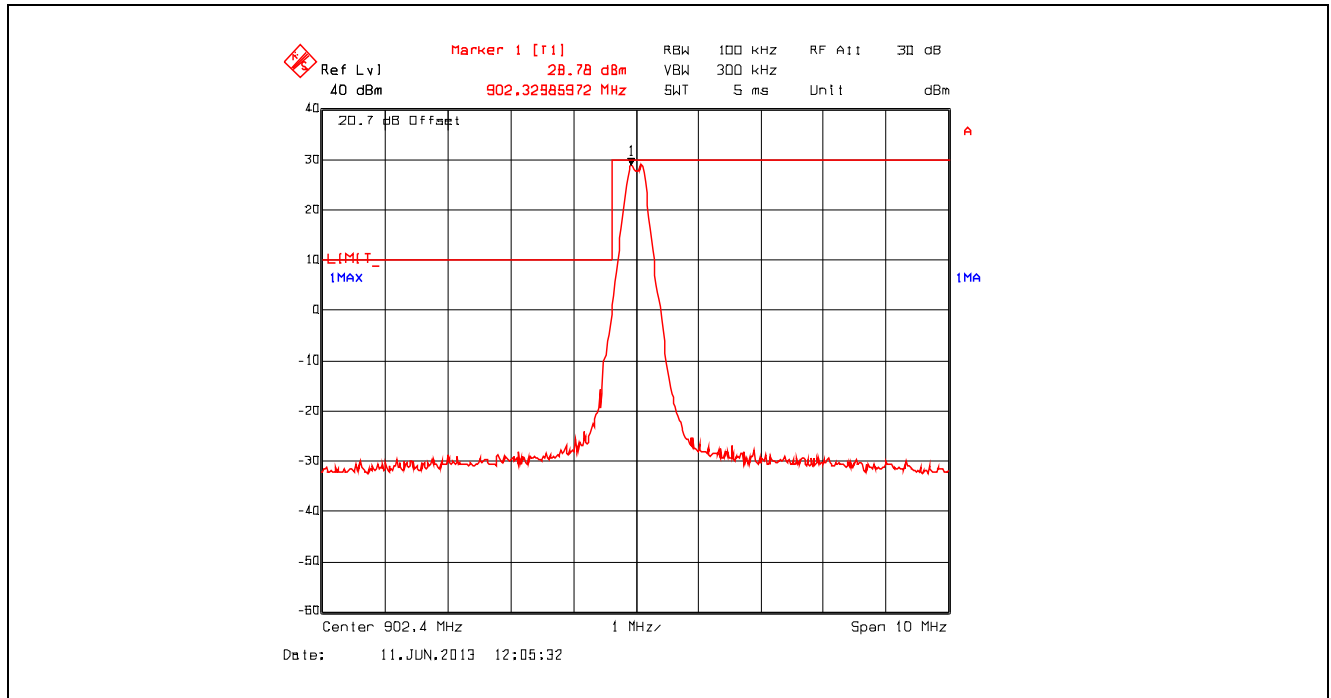
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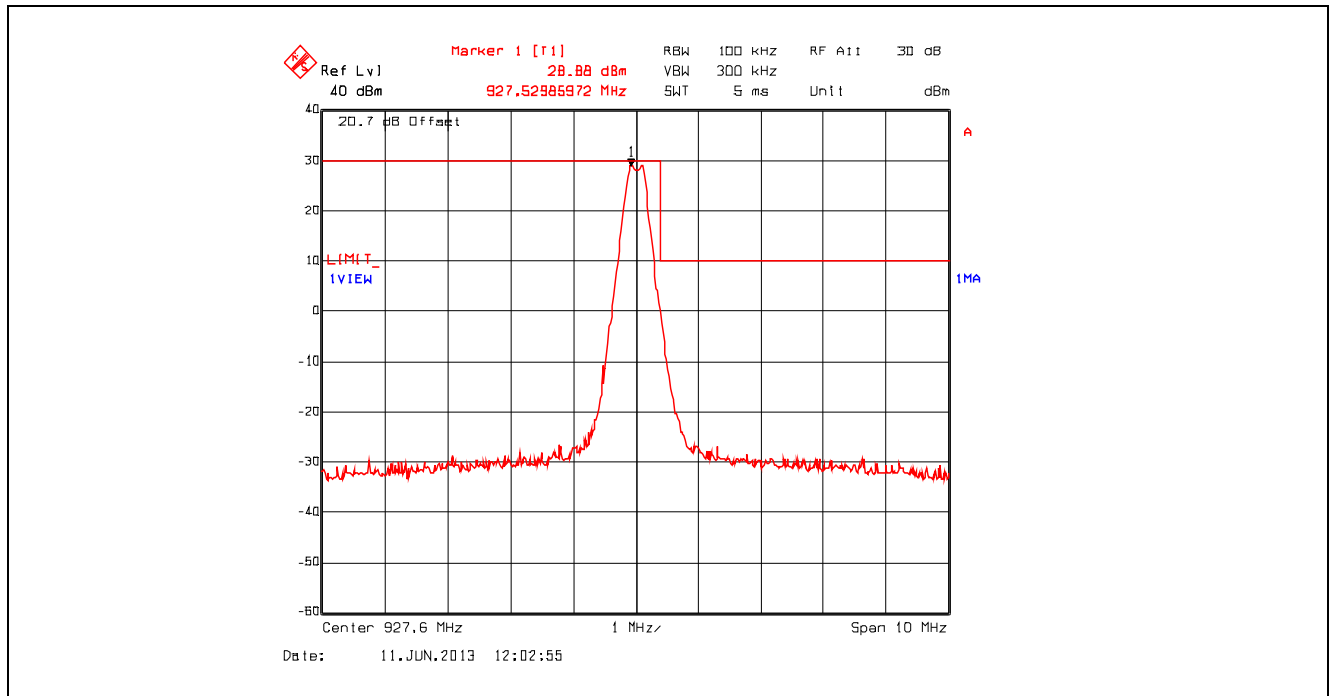
September 4, 2013

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

**Plot 5.5.4.1.5. Band-Edge RF Conducted Emissions at 230400 kbps Data Rate
Single Frequency Mode, Low End of Frequency Band**



**Plot 5.5.4.1.6. Band-Edge RF Conducted Emissions at 230400 kbps Data Rate
Single Frequency Mode, High End of Frequency Band**



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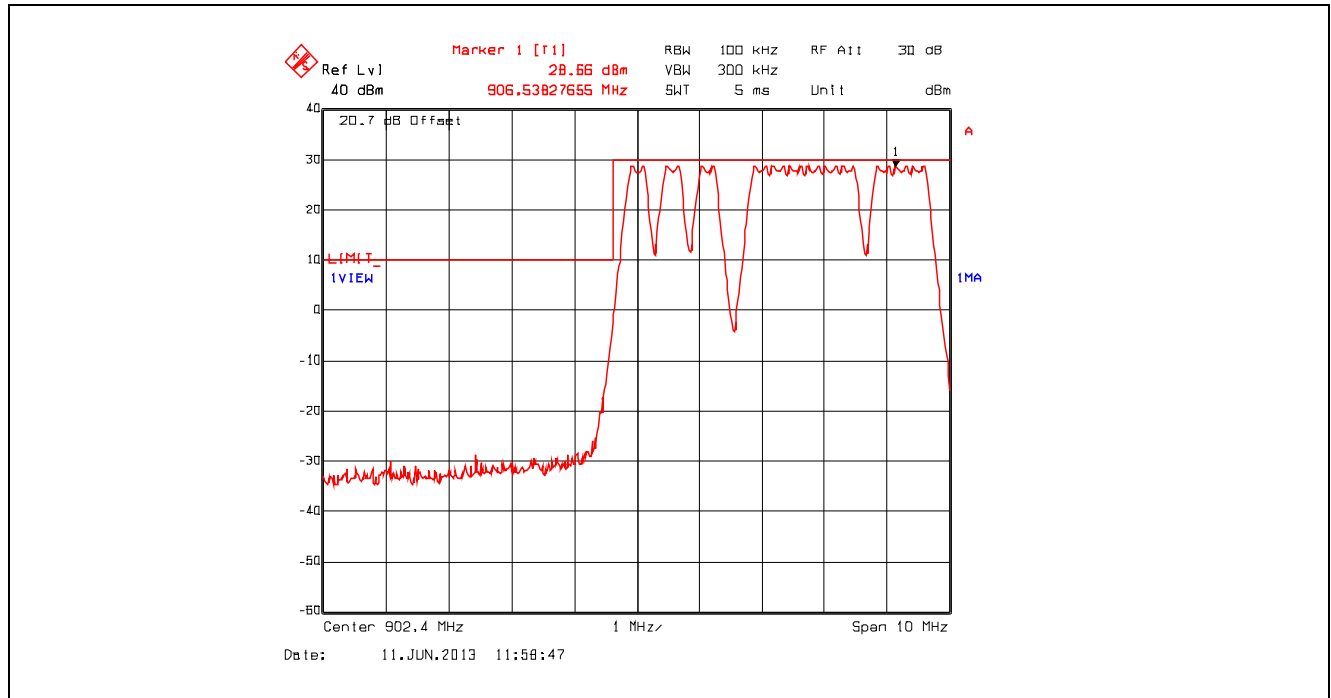
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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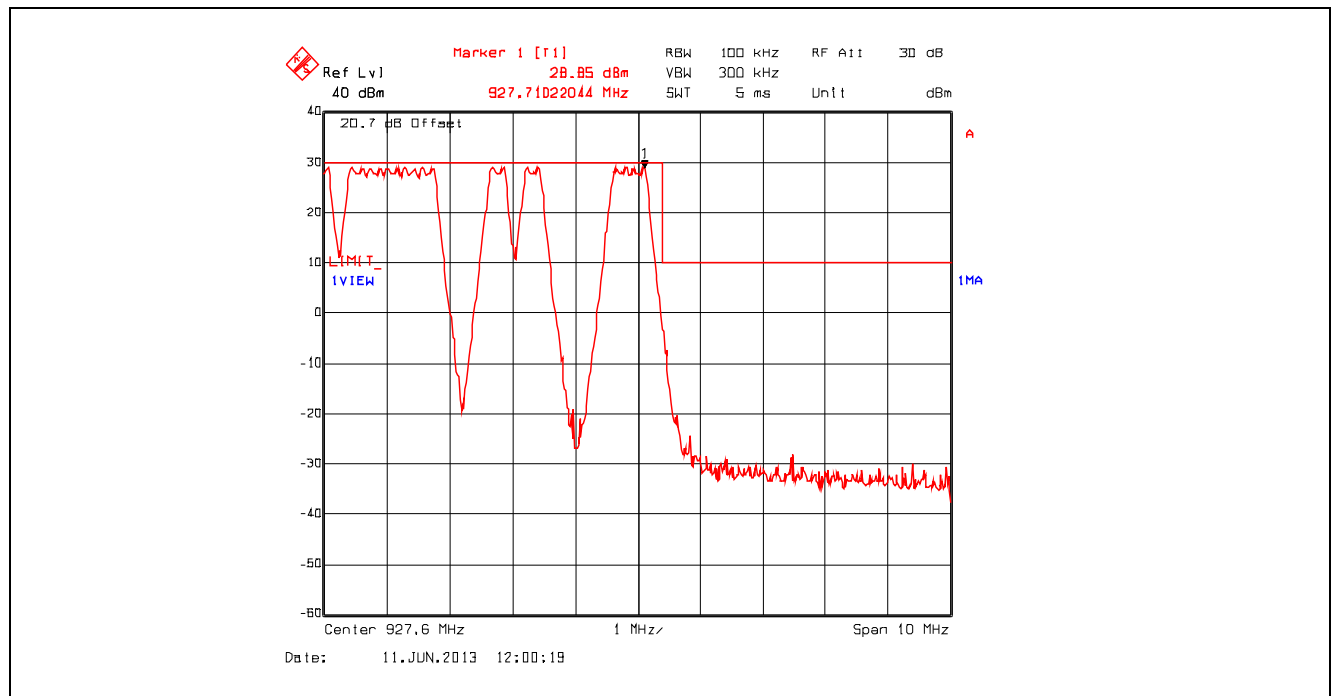
September 4, 2013

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

**Plot 5.5.4.1.7. Band-Edge RF Conducted Emissions at 230400 kbps Data Rate
Pseudorandom Channel Hopping Mode, Low End of Frequency Band**



**Plot 5.5.4.1.8. Band-Edge RF Conducted Emissions at 230400 kbps Data Rate
Pseudorandom Channel Hopping Mode, High End of Frequency Band**



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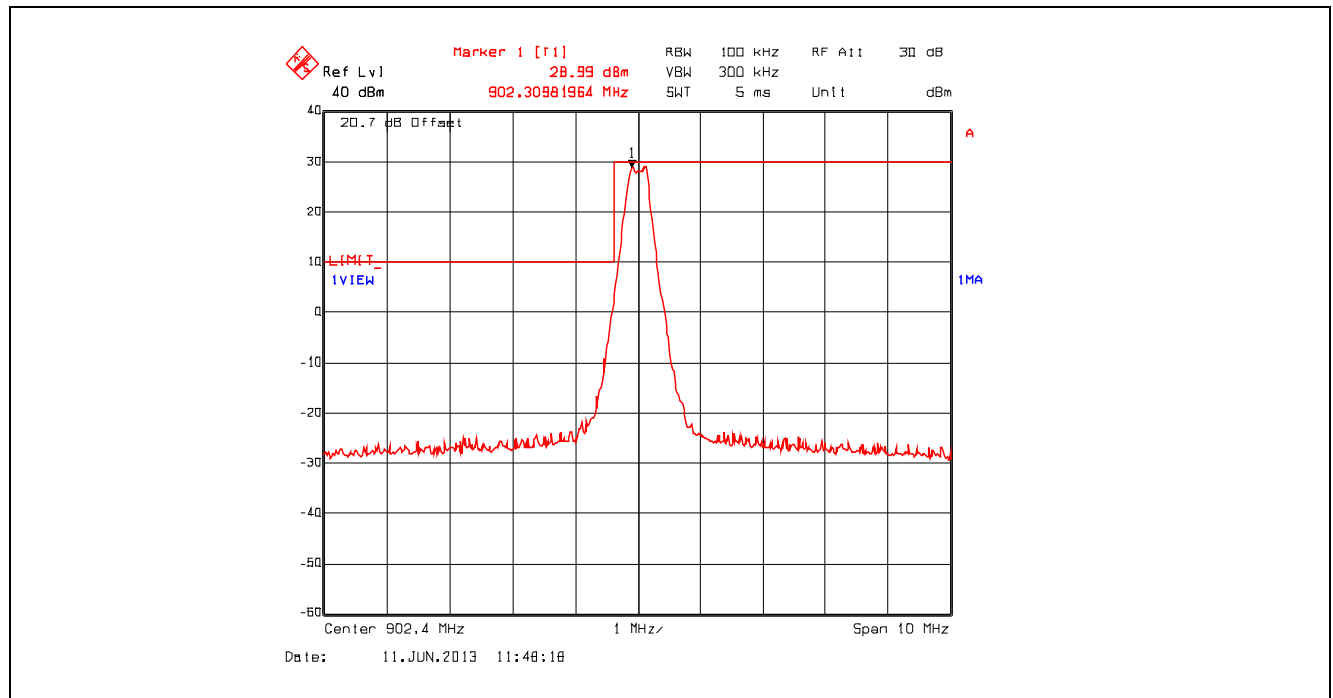
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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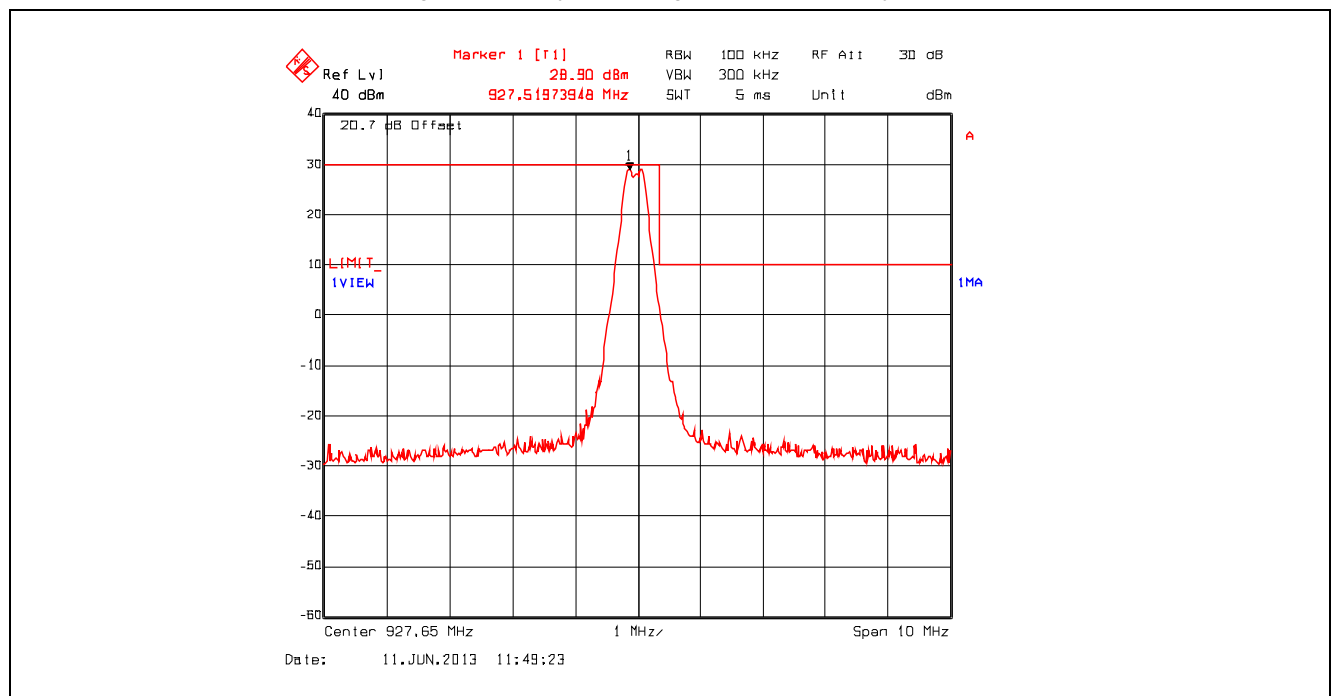
September 4, 2013

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

Plot 5.5.4.1.9. Band-Edge RF Conducted Emissions at 276480 kbps Data Rate
Single Frequency Mode, Low End of Frequency Band



Plot 5.5.4.1.10. Band-Edge RF Conducted Emissions at 276480 kbps Data Rate
Single Frequency Mode, High End of Frequency Band



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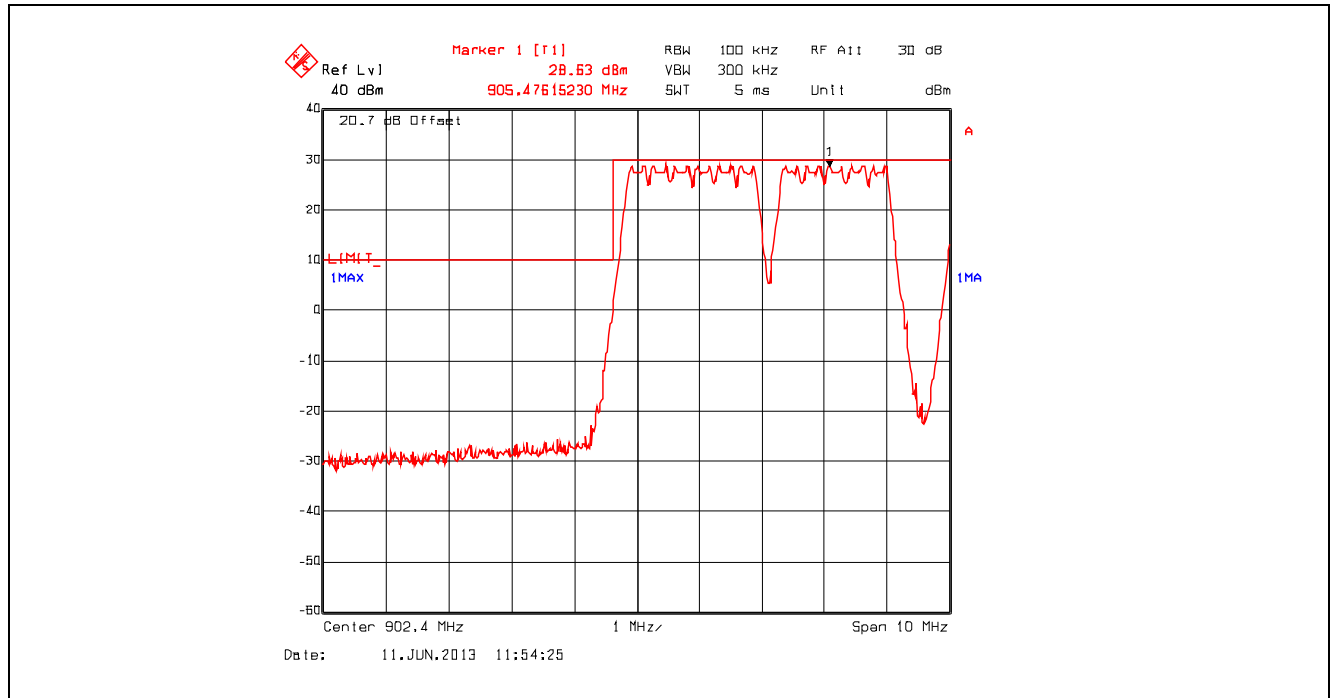
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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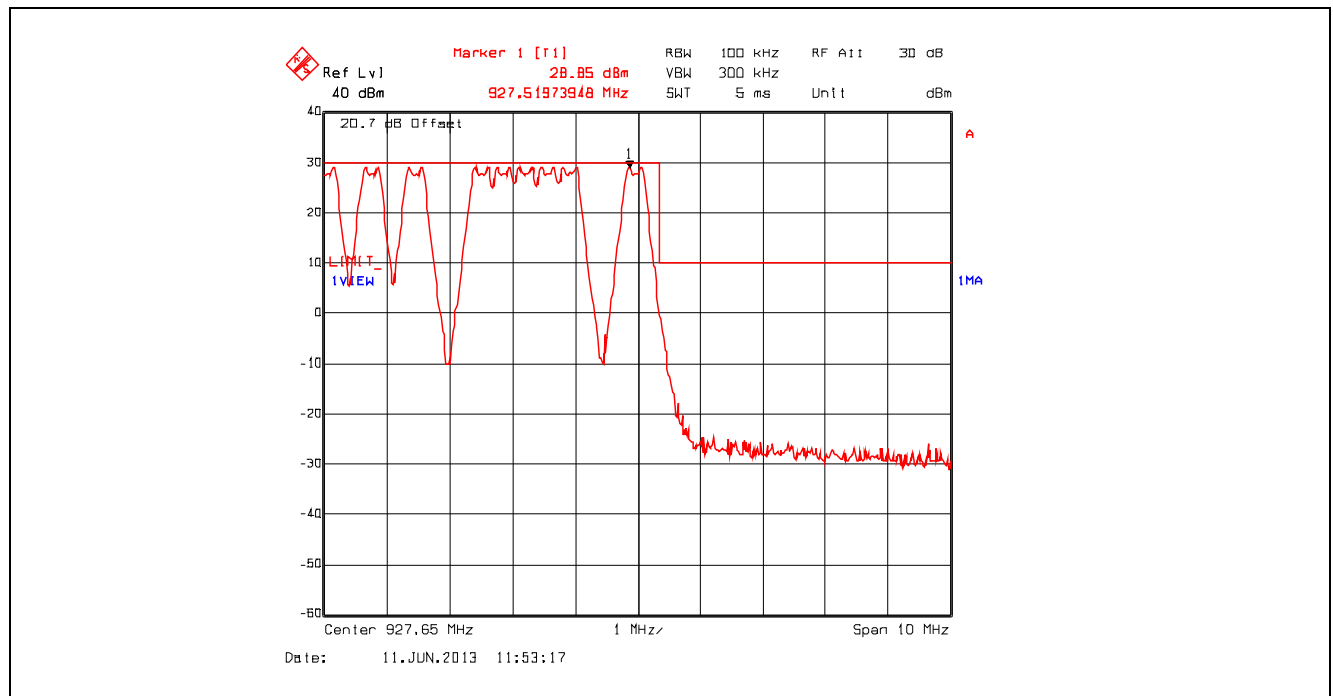
September 4, 2013

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

**Plot 5.5.4.1.11. Band-Edge RF Conducted Emissions at 276480 kbps Data Rate
Pseudorandom Channel Hopping Mode, Low End of Frequency Band**

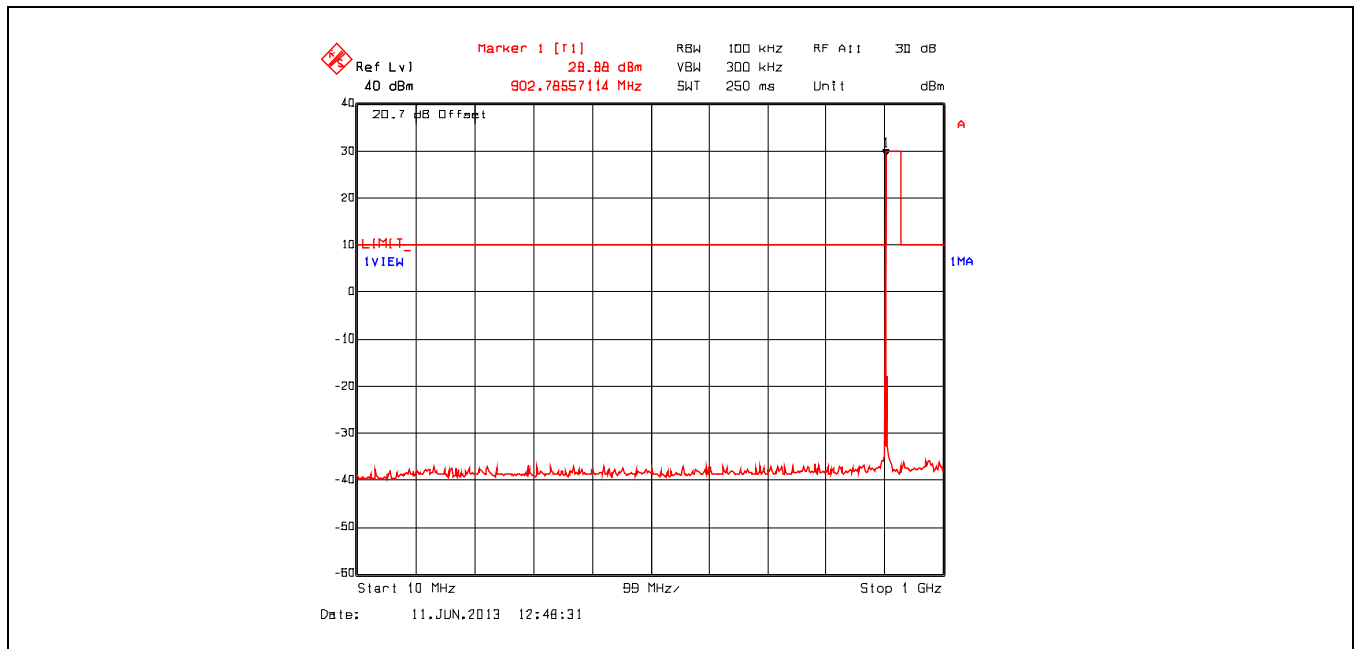


**Plot 5.5.4.1.12. Band-Edge RF Conducted Emissions at 276480 kbps Data Rate
Pseudorandom Channel Hopping Mode, High End of Frequency Band**

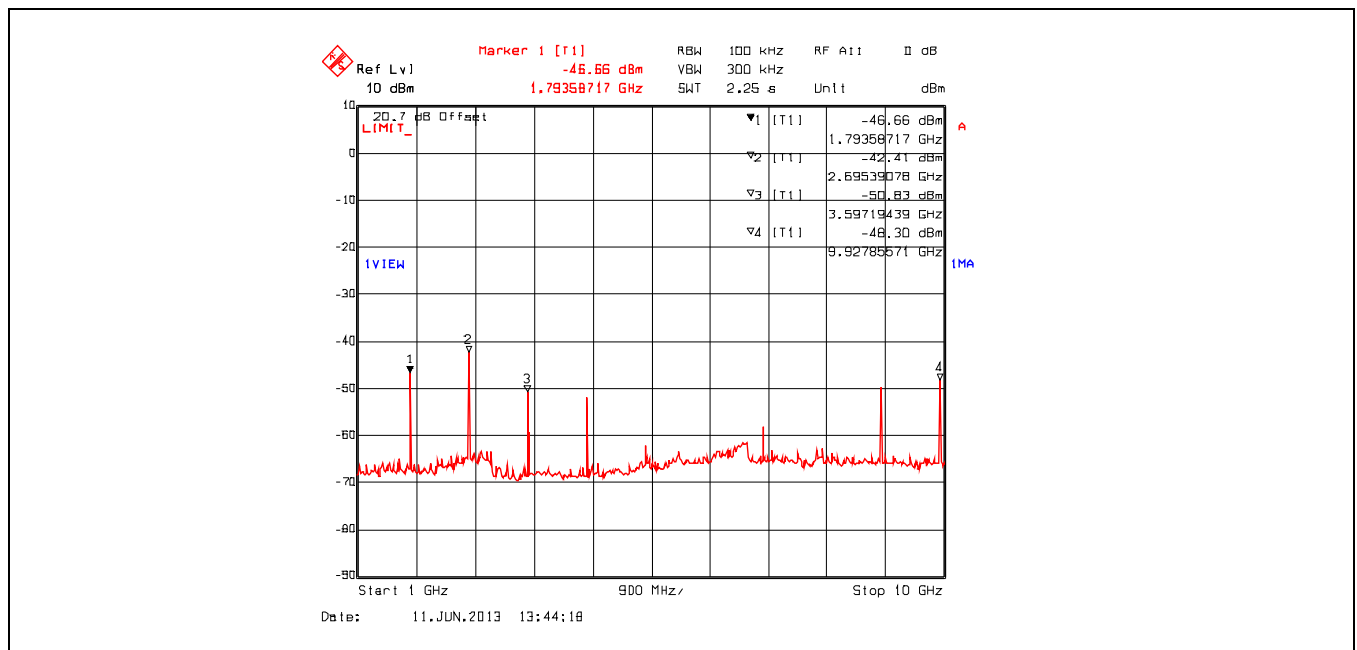


5.5.4.2. Spurious RF Conducted Emissions

Plot 5.5.4.2.1. Conducted Spurious Emissions
High Power, 902.40 MHz, Data Rate at 172800 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.2. Conducted Spurious Emissions
High Power, 902.40 MHz, Data Rate at 172800 kbps, 1 GHz – 10 GHz



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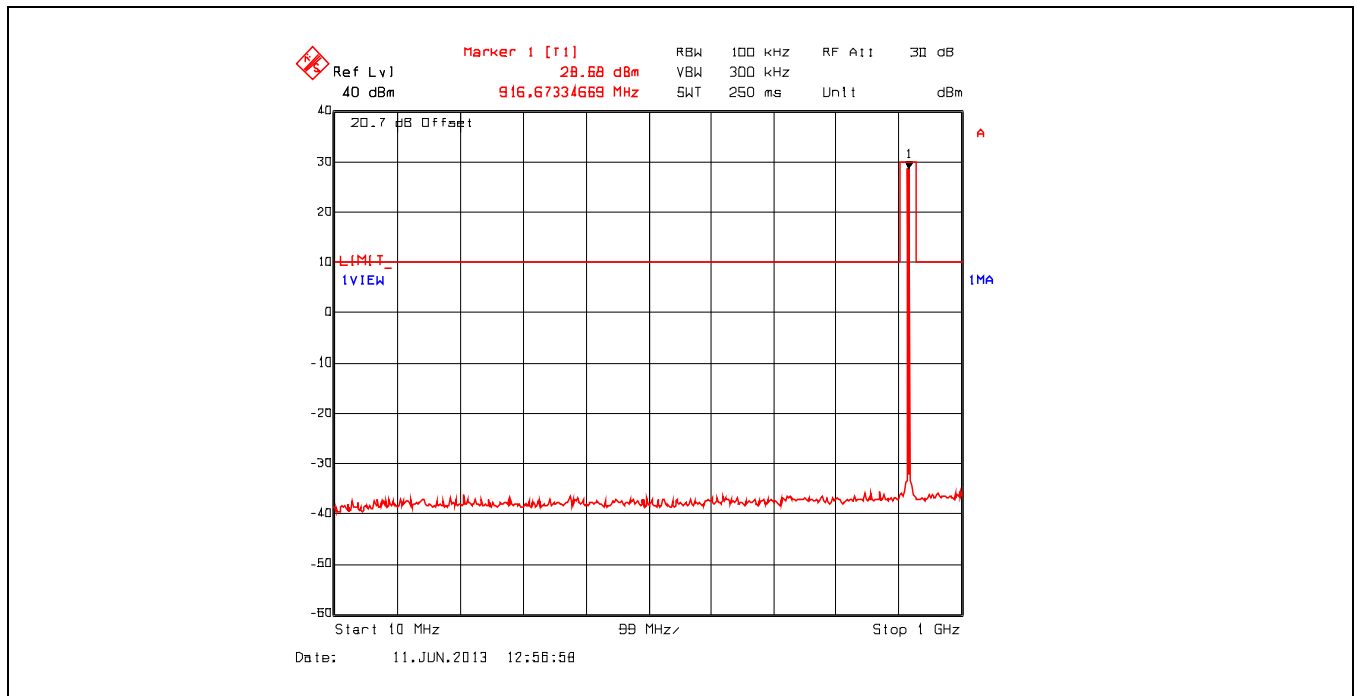
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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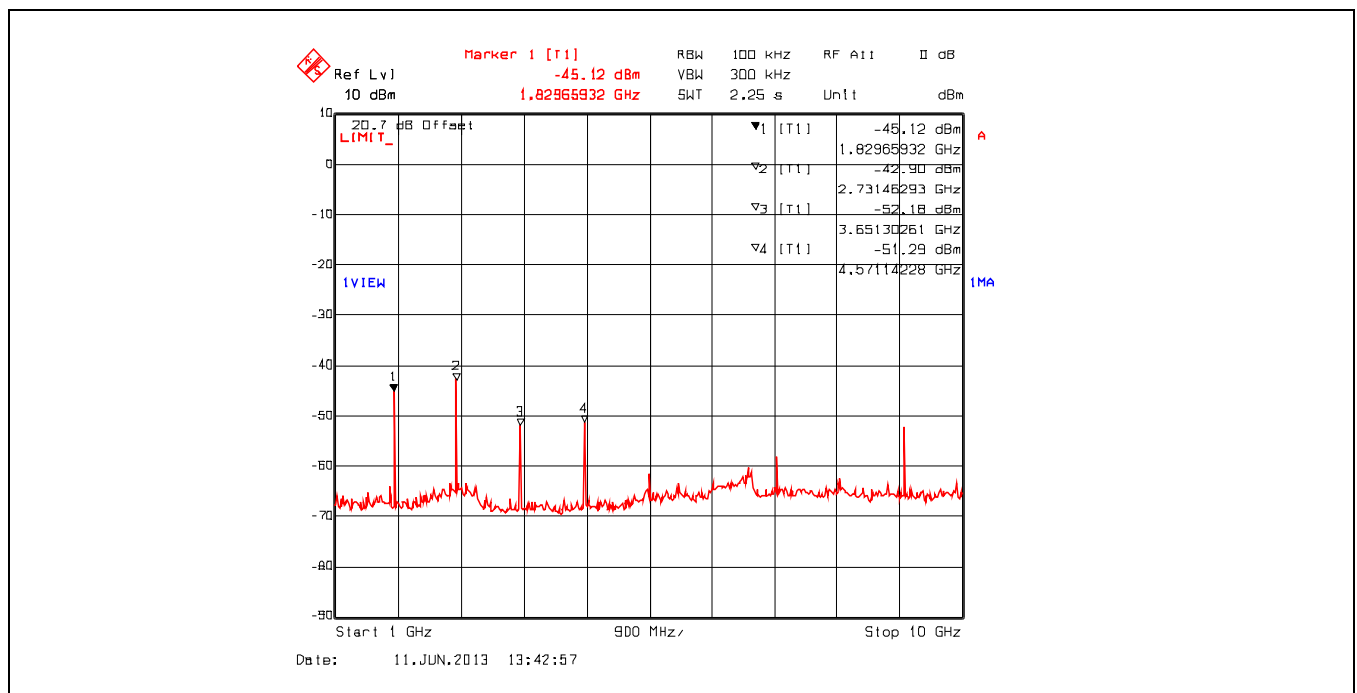
September 4, 2013

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Plot 5.5.4.2.3. Conducted Spurious Emissions
High Power, 914.90 MHz, Data Rate at 172800 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.4. Conducted Spurious Emissions
High Power, 914.90 MHz, Data Rate at 172800 kbps, 1 GHz – 10 GHz



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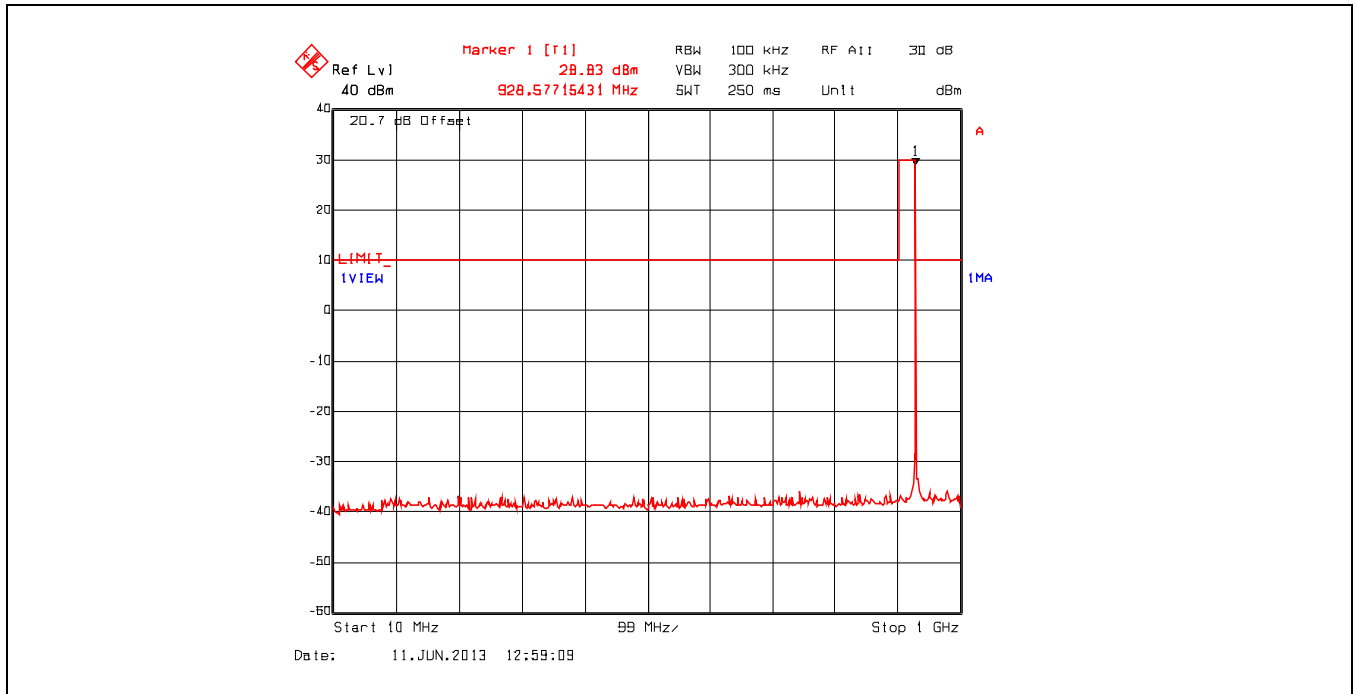
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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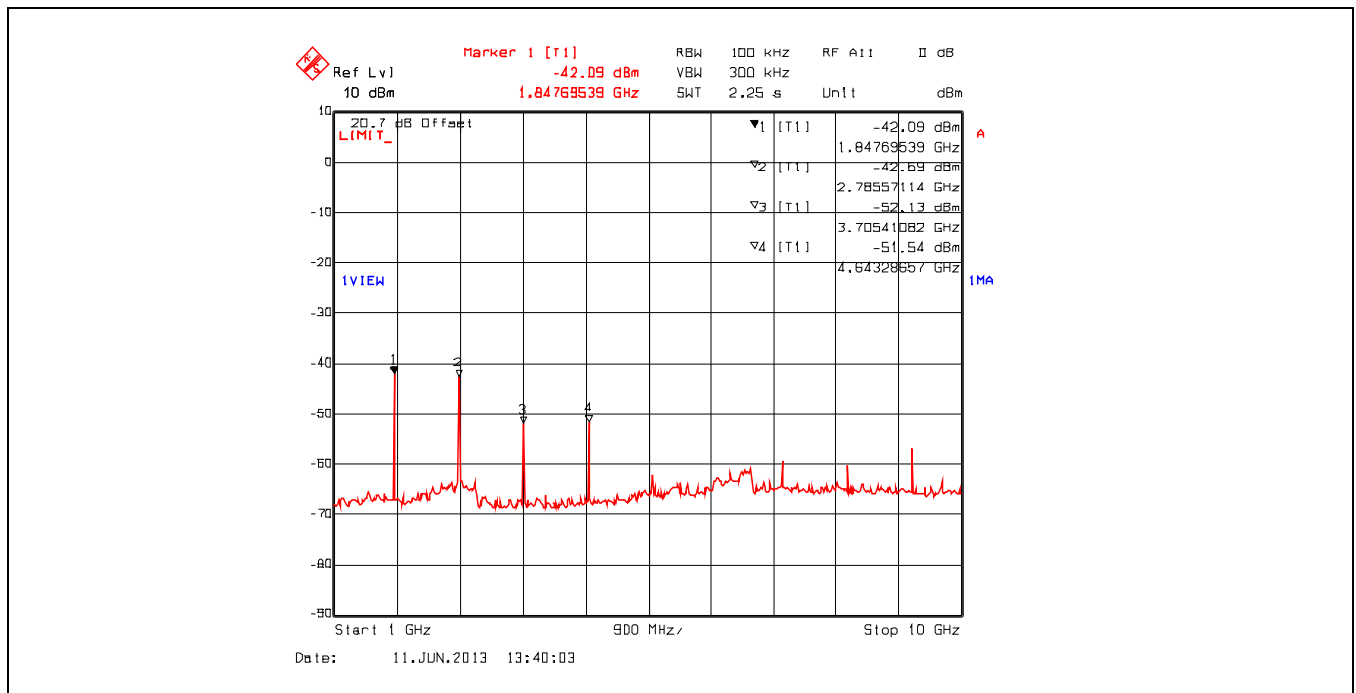
September 4, 2013

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

Plot 5.5.4.2.5. Conducted Spurious Emissions
High Power, 927.65 MHz, Data Rate at 172800 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.6. Conducted Spurious Emissions
High Power, 927.65 MHz, Data Rate at 172800 kbps, 1 GHz – 10 GHz



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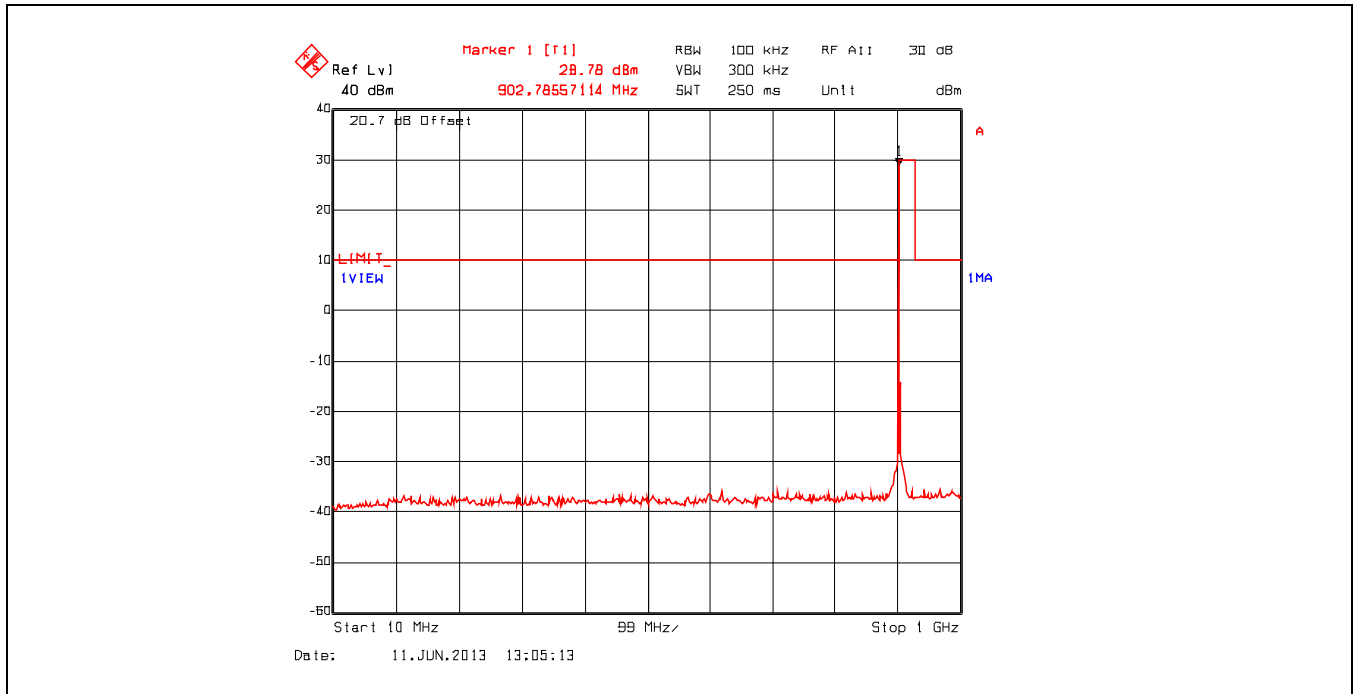
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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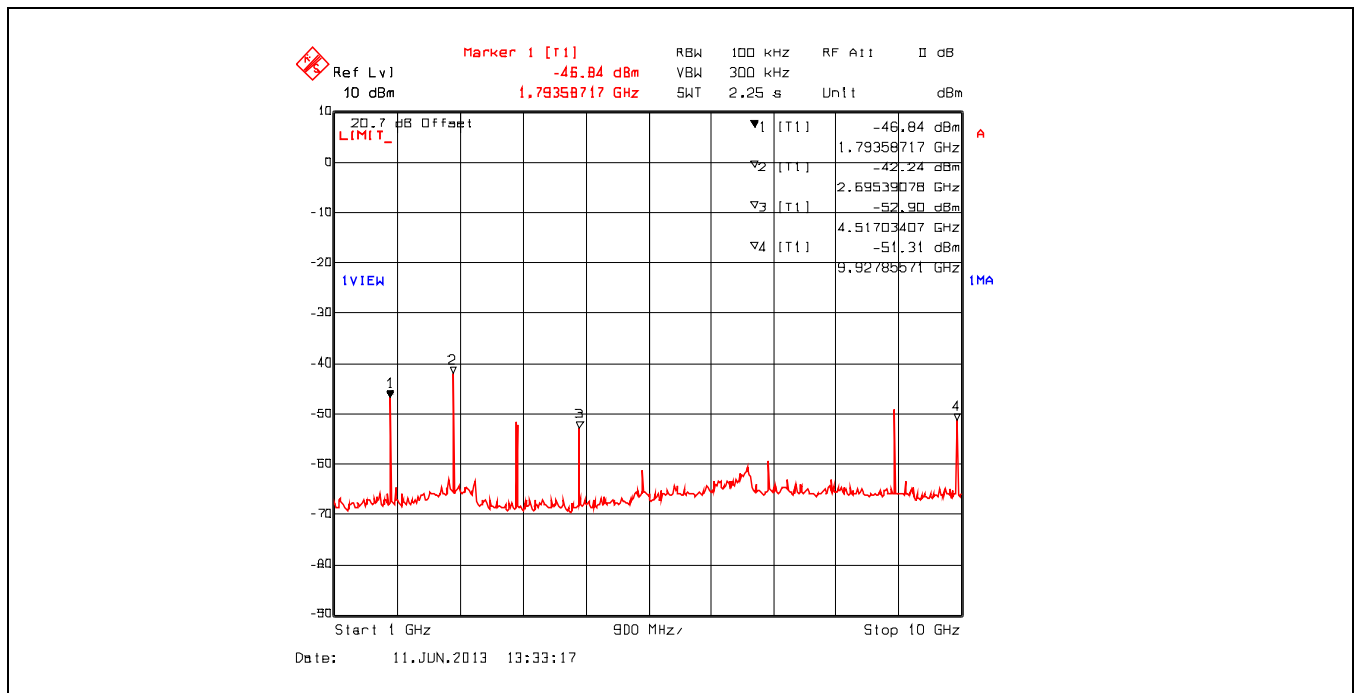
September 4, 2013

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

Plot 5.5.4.2.7. Conducted Spurious Emissions
High Power, 902.40 MHz, Data Rate at 230400 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.8. Conducted Spurious Emissions
High Power, 902.40 MHz, Data Rate at 230400 kbps, 1 GHz – 10 GHz



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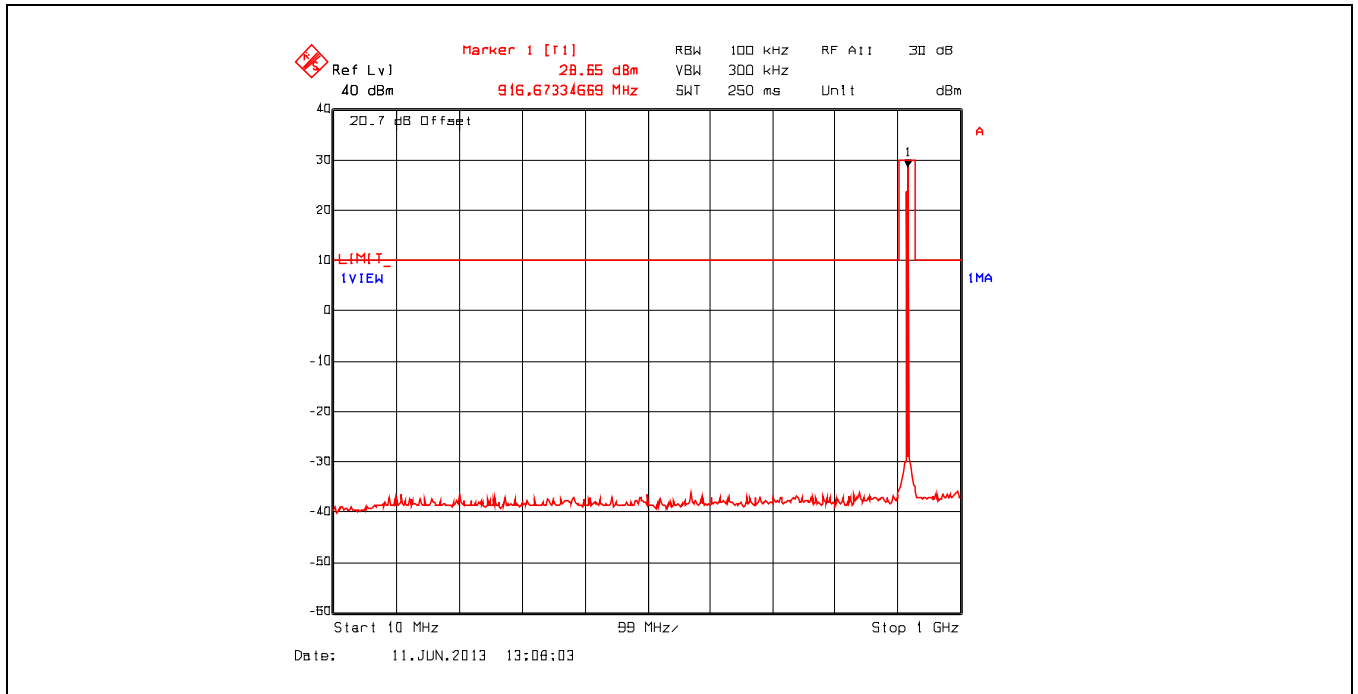
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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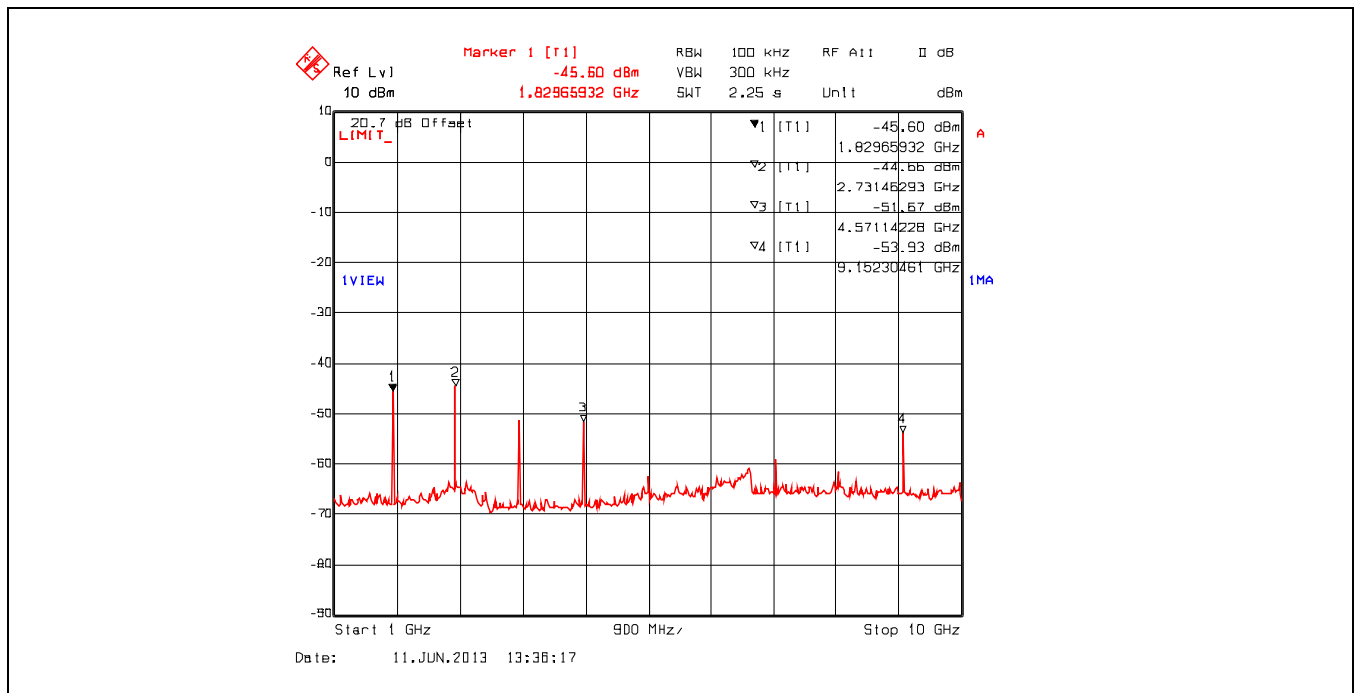
September 4, 2013

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

Plot 5.5.4.2.9. Conducted Spurious Emissions
High Power, 915.00 MHz, Data Rate at 230400 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.10. Conducted Spurious Emissions
High Power, 915.00 MHz, Data Rate at 230400 kbps, 1 GHz – 10 GHz



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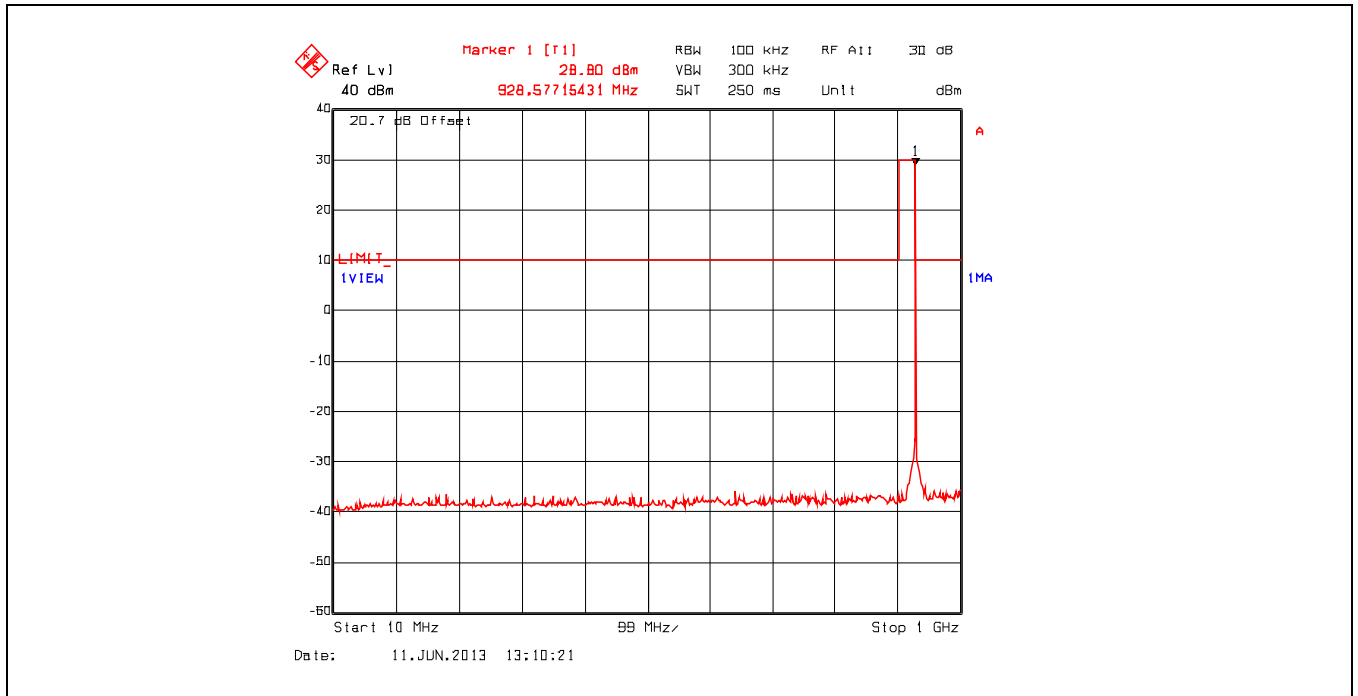
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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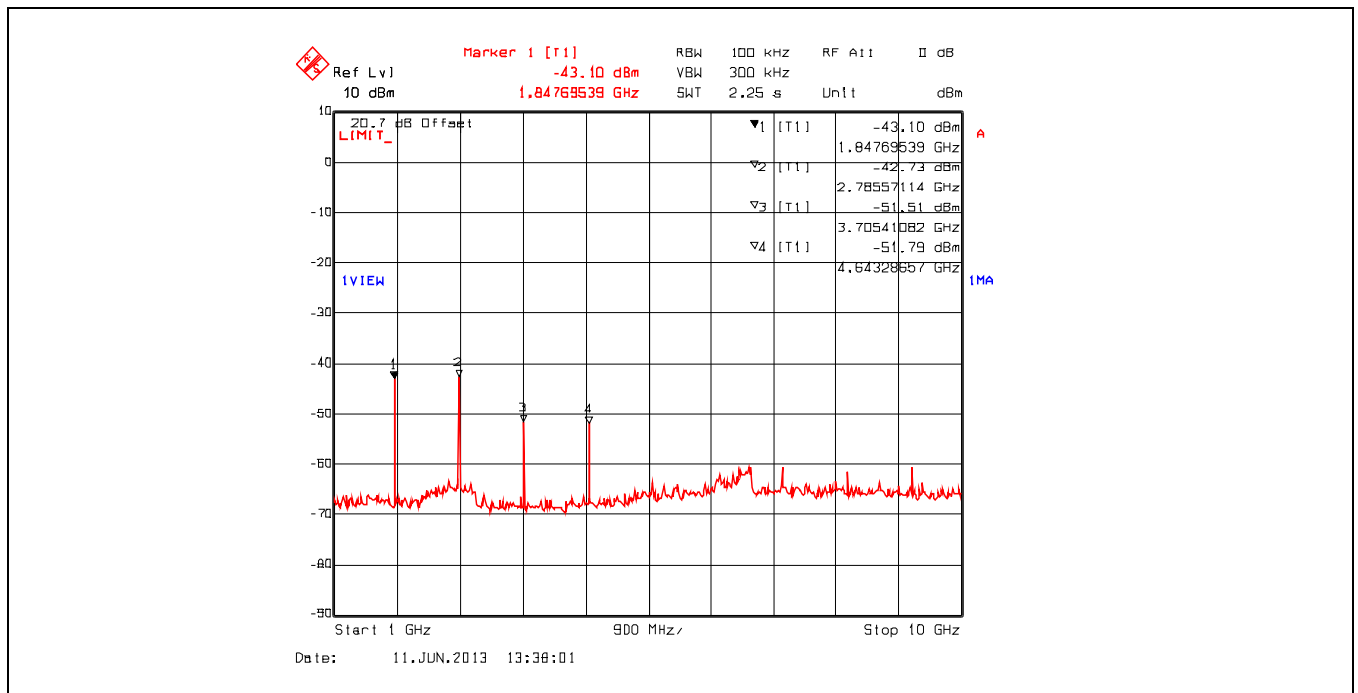
September 4, 2013

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

Plot 5.5.4.2.11. Conducted Spurious Emissions
High Power, 927.60 MHz, Data Rate at 230400 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.12. Conducted Spurious Emissions
High Power, 927.60 MHz, Data Rate at 230400 kbps, 1 GHz – 10 GHz



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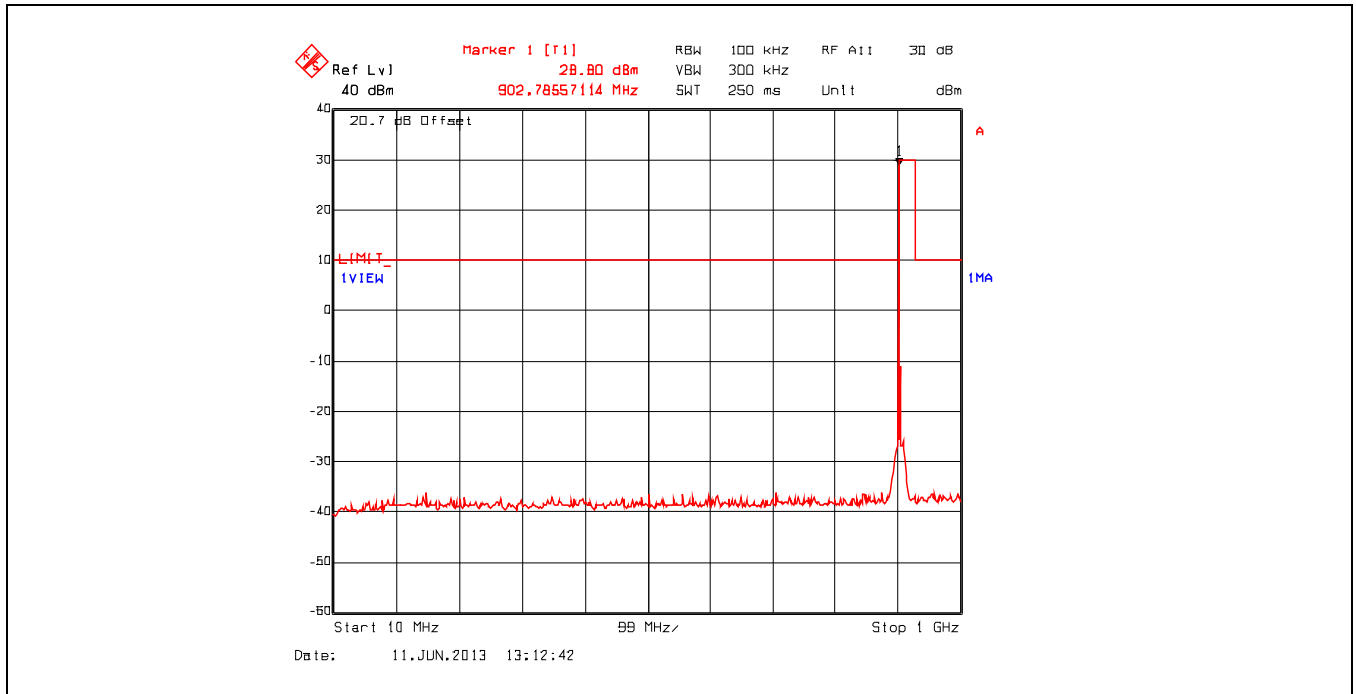
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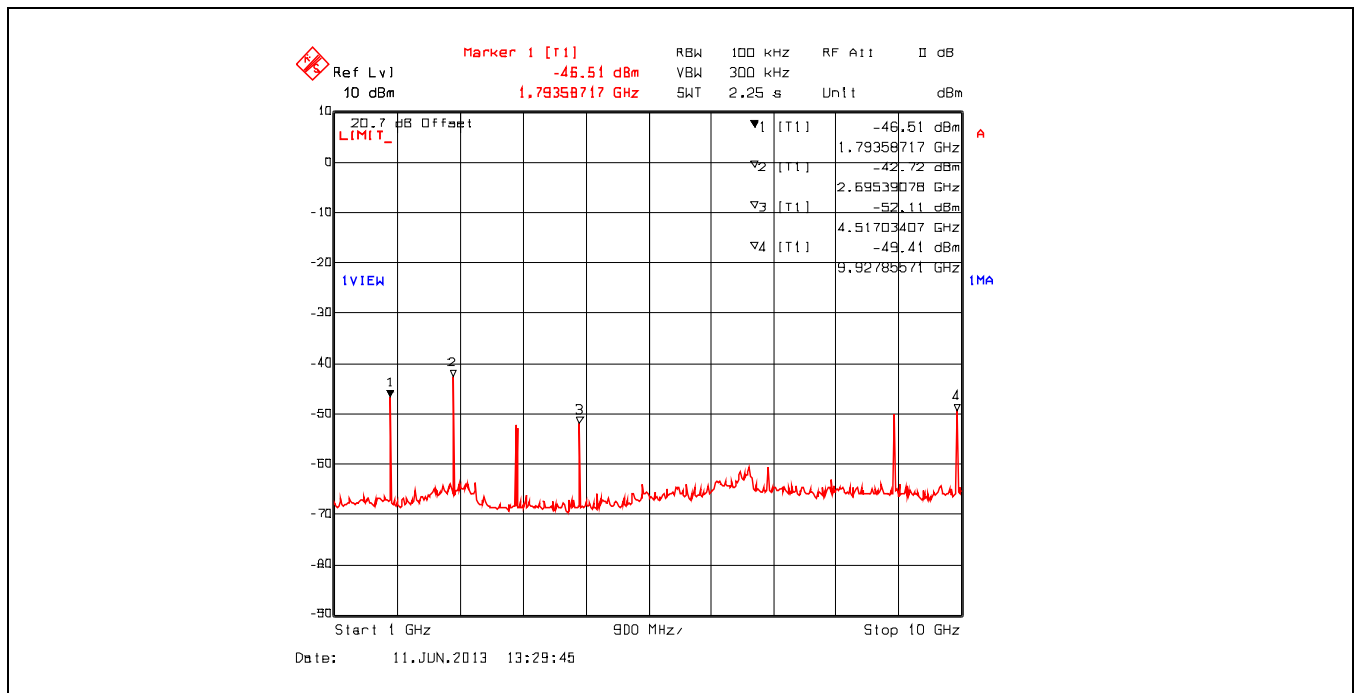
September 4, 2013

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

Plot 5.5.4.2.13. Conducted Spurious Emissions
High Power, 902.40 MHz, Data Rate at 276480 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.14. Conducted Spurious Emissions
High Power, 902.40 MHz, Data Rate at 276480 kbps, 1 GHz – 10 GHz



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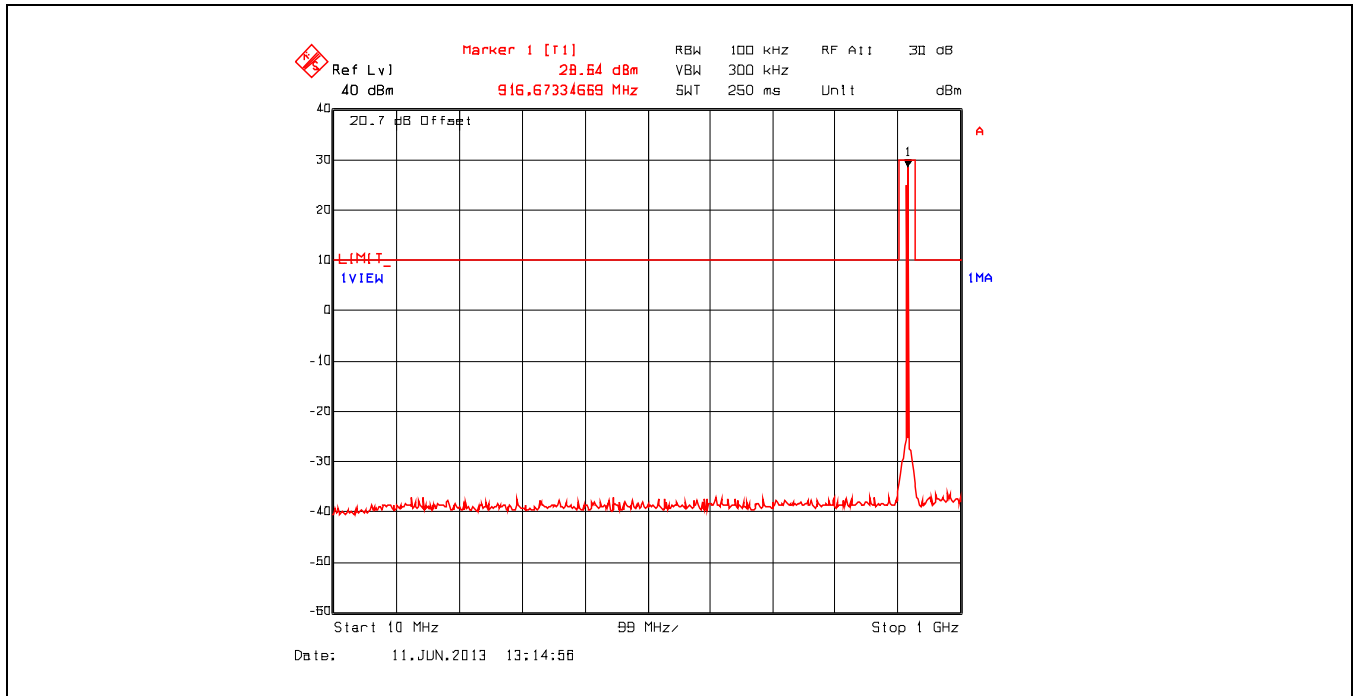
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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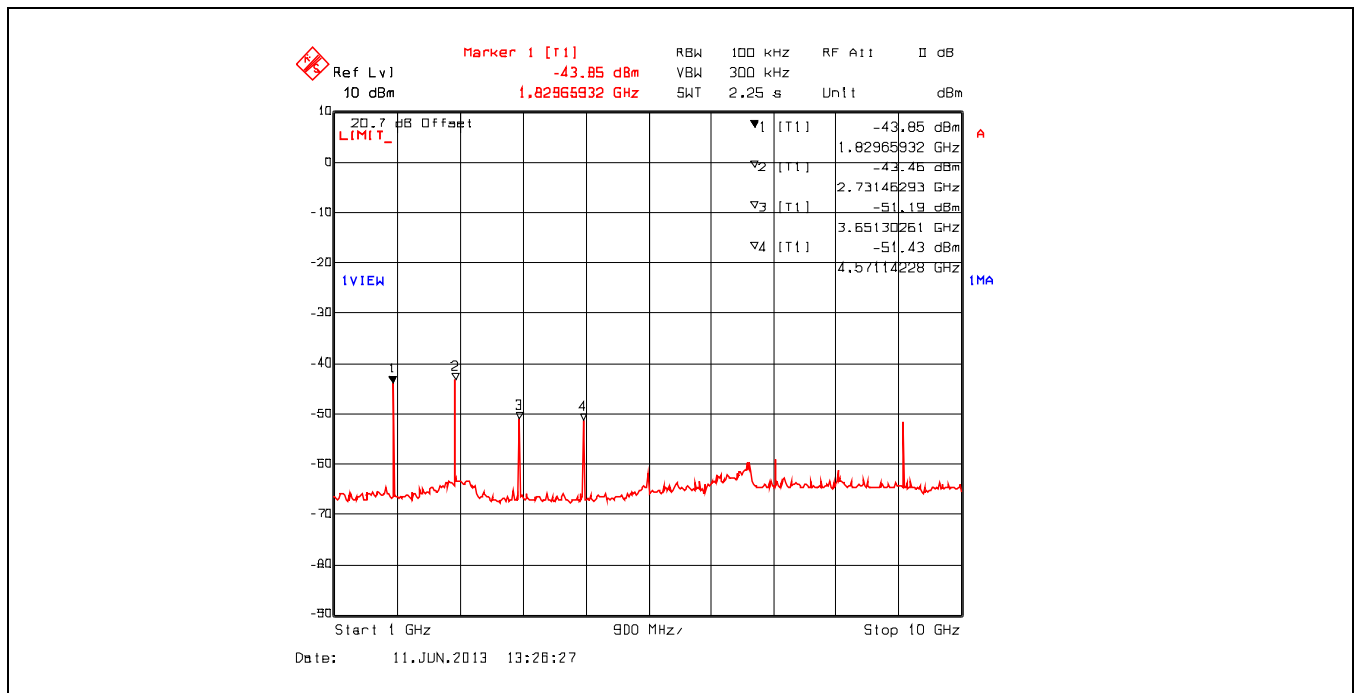
September 4, 2013

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

Plot 5.5.4.2.15. Conducted Spurious Emissions
High Power, 915.00 MHz, Data Rate at 276480 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.16. Conducted Spurious Emissions
High Power, 915.00 MHz, Data Rate at 276480 kbps, 1 GHz – 10 GHz



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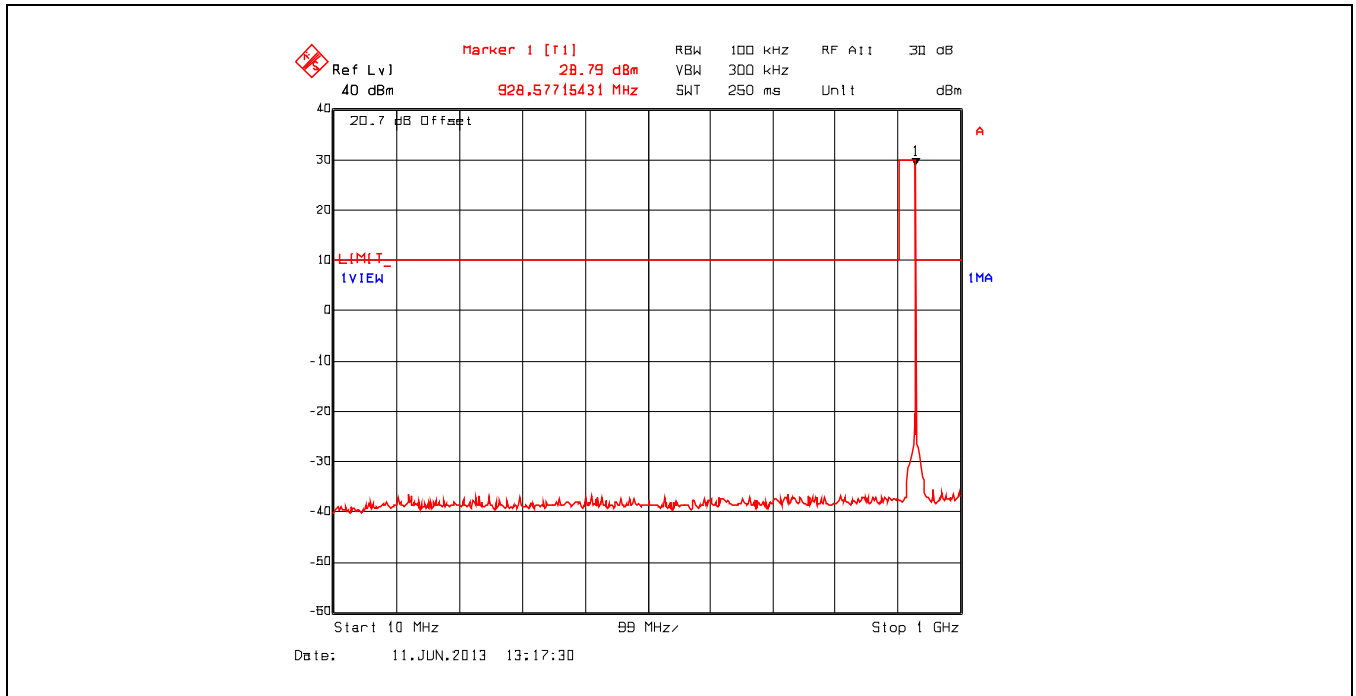
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

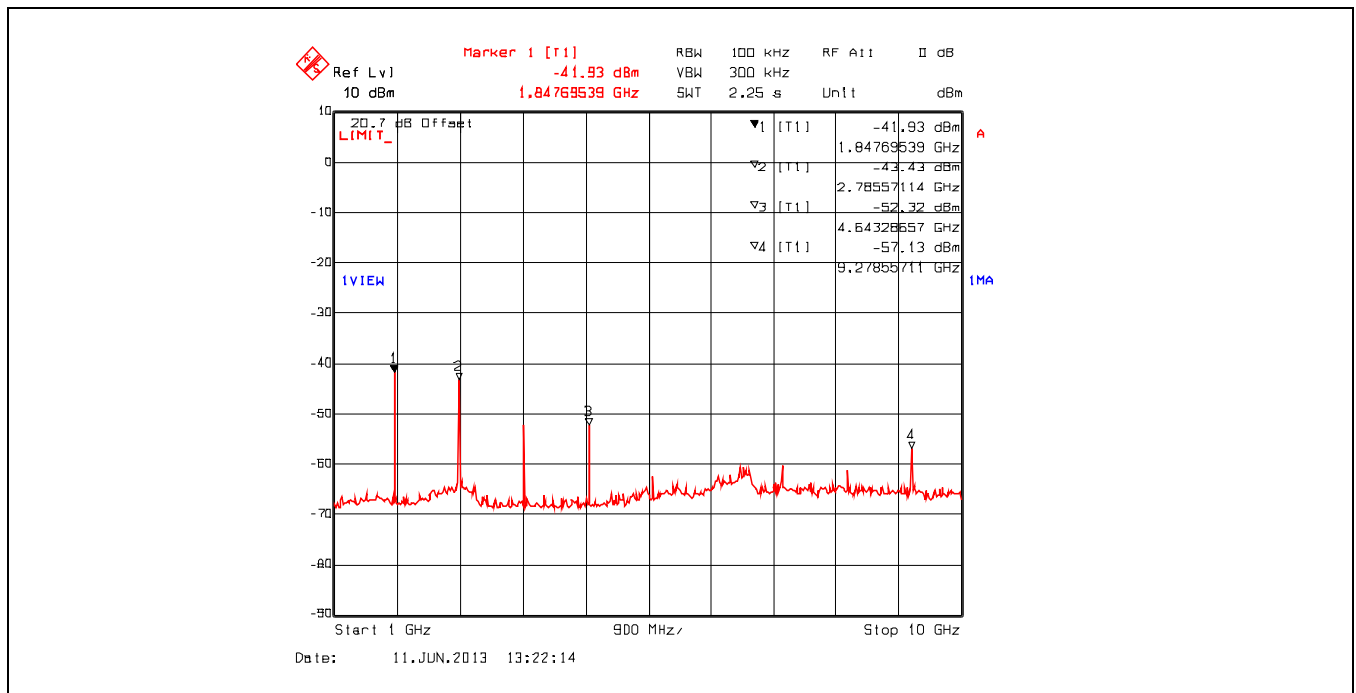
September 4, 2013

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

Plot 5.5.4.2.17. Conducted Spurious Emissions
High Power, 927.60 MHz, Data Rate at 276480 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.18. Conducted Spurious Emissions
High Power, 927.60 MHz, Data Rate at 276480 kbps, 1 GHz – 10 GHz



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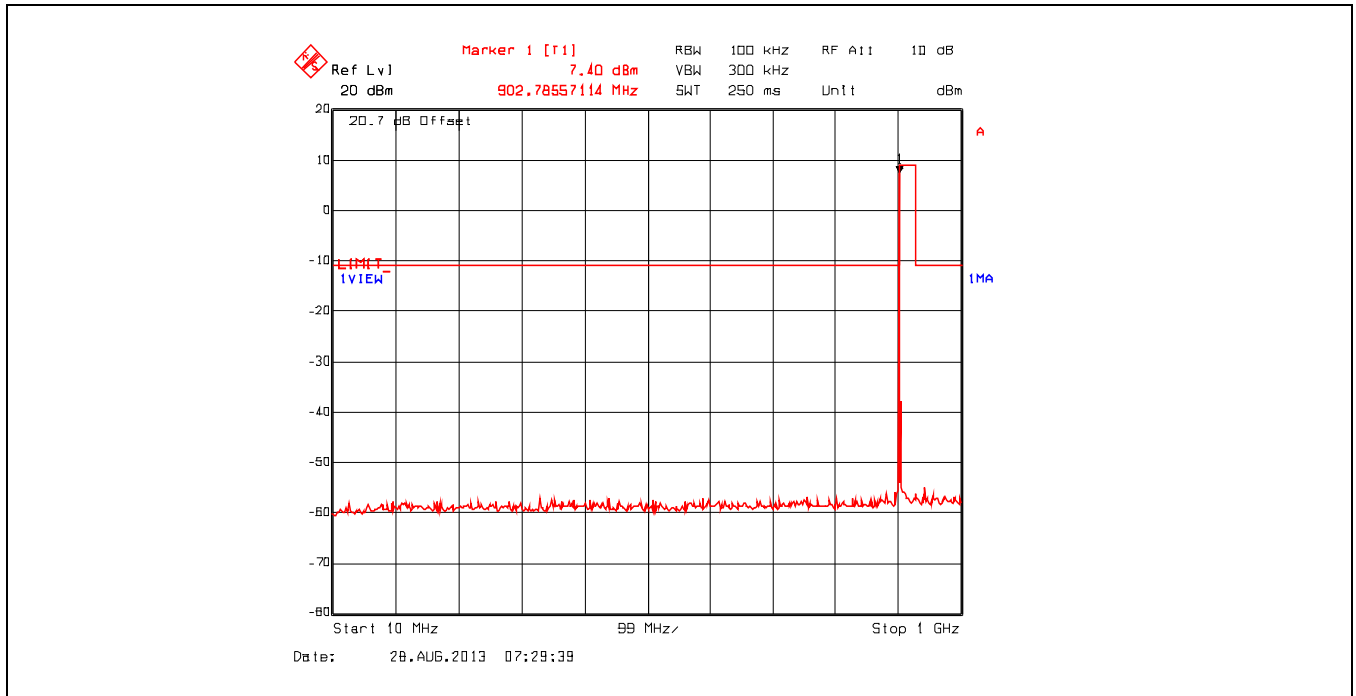
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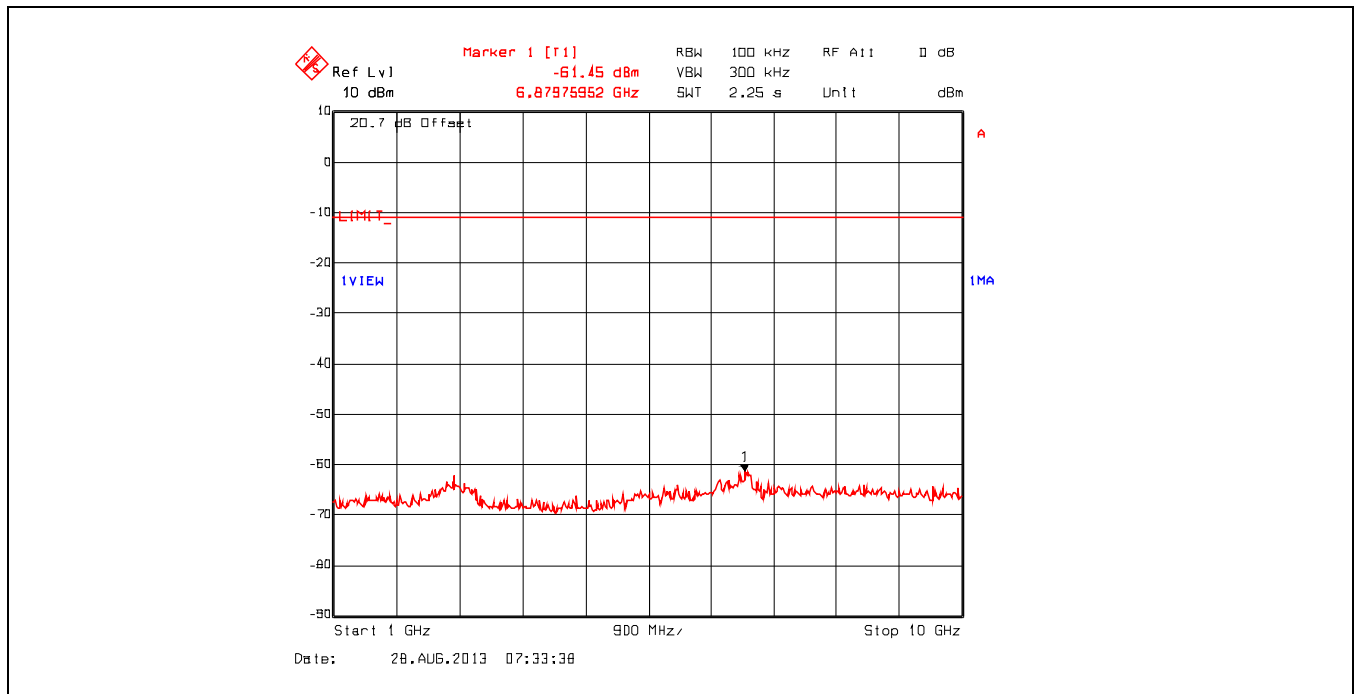
September 4, 2013

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

Plot 5.5.4.2.19. Conducted Spurious Emissions
Low Power, 902.40 MHz, Data Rate at 172800 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.20. Conducted Spurious Emissions
Low Power, 902.40 MHz, Data Rate at 172800 kbps, 1 GHz – 10 GHz



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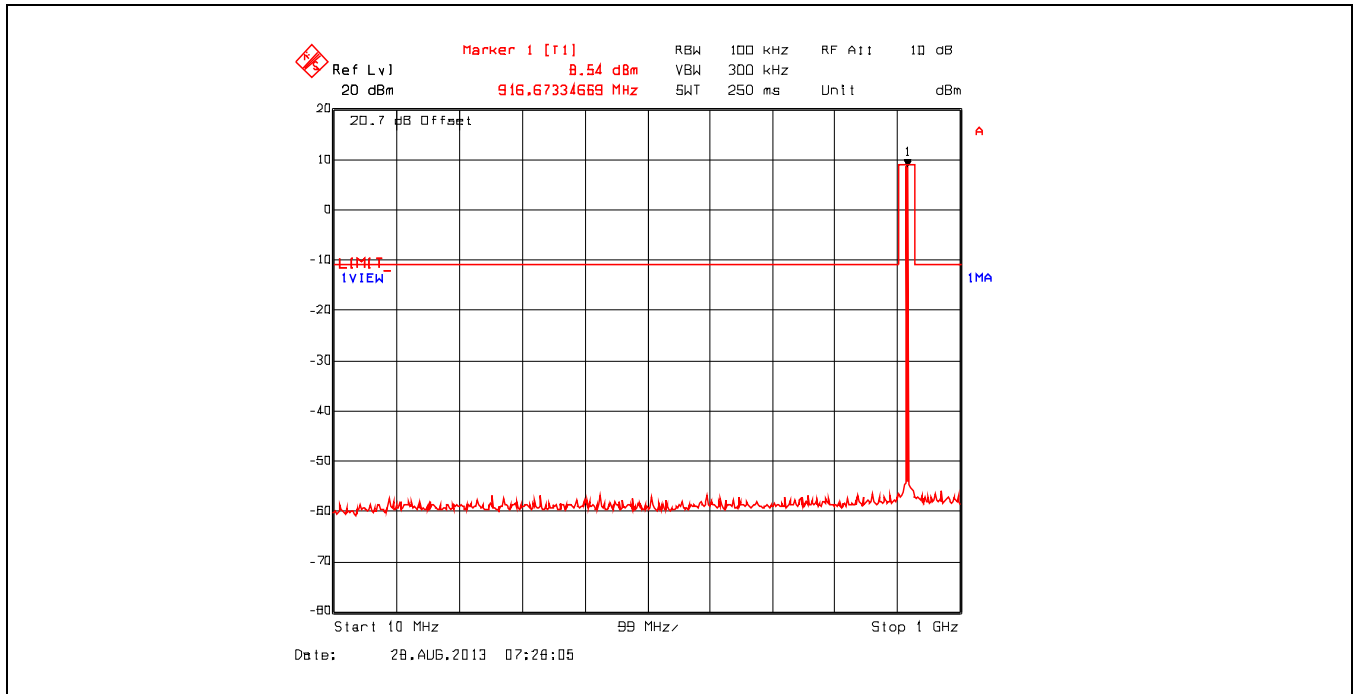
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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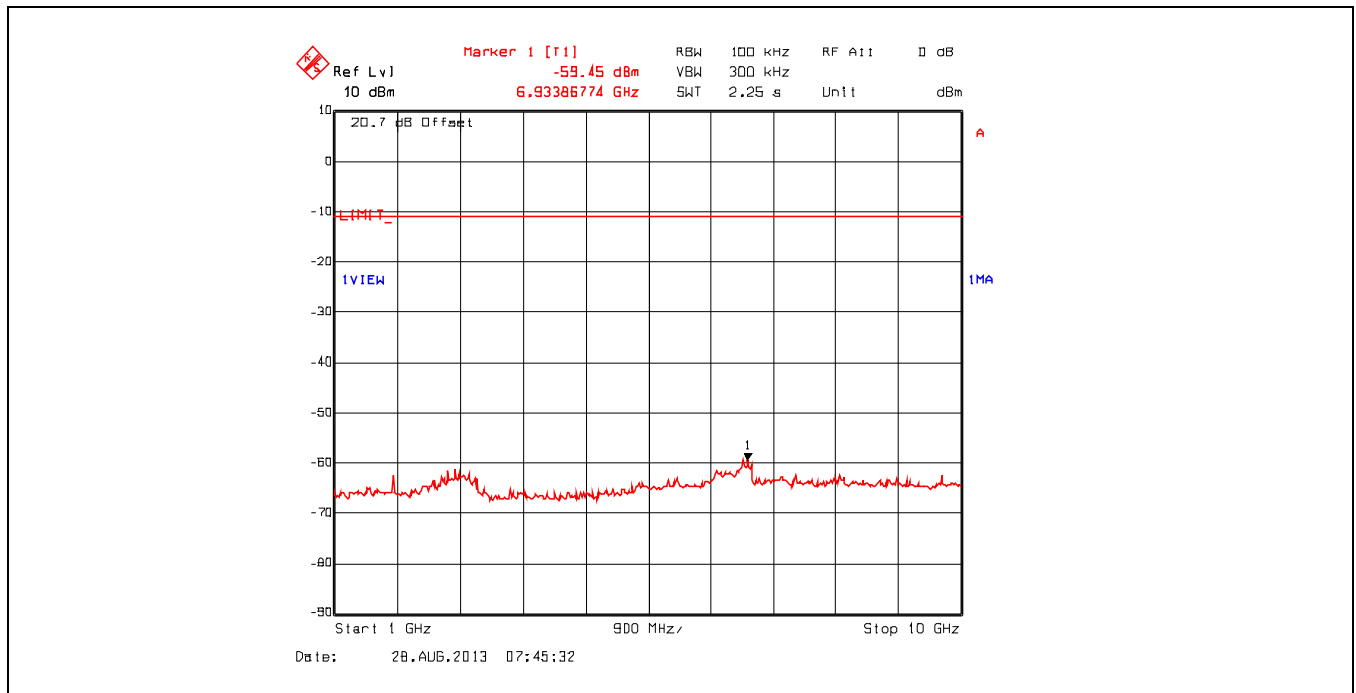
September 4, 2013

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

Plot 5.5.4.2.21. Conducted Spurious Emissions
Low Power, 914.90 MHz, Data Rate at 172800 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.22. Conducted Spurious Emissions
Low Power, 914.90 MHz, Data Rate at 172800 kbps, 1 GHz – 10 GHz



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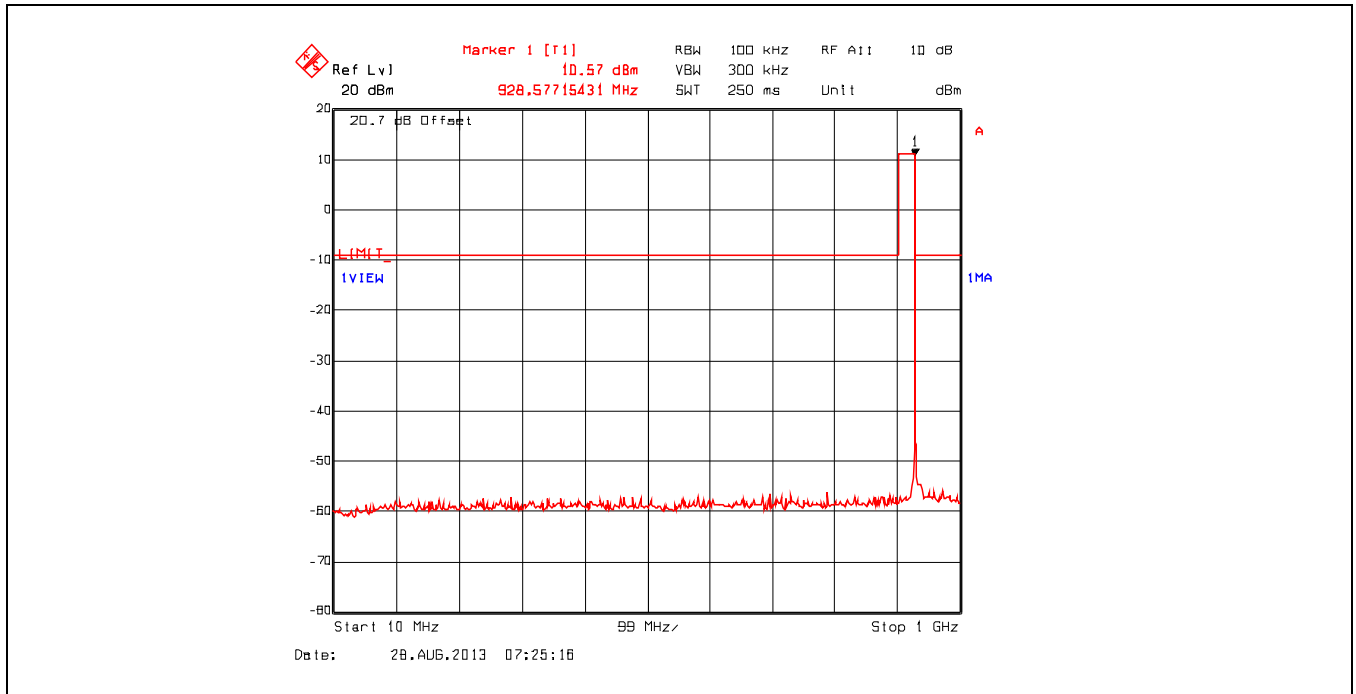
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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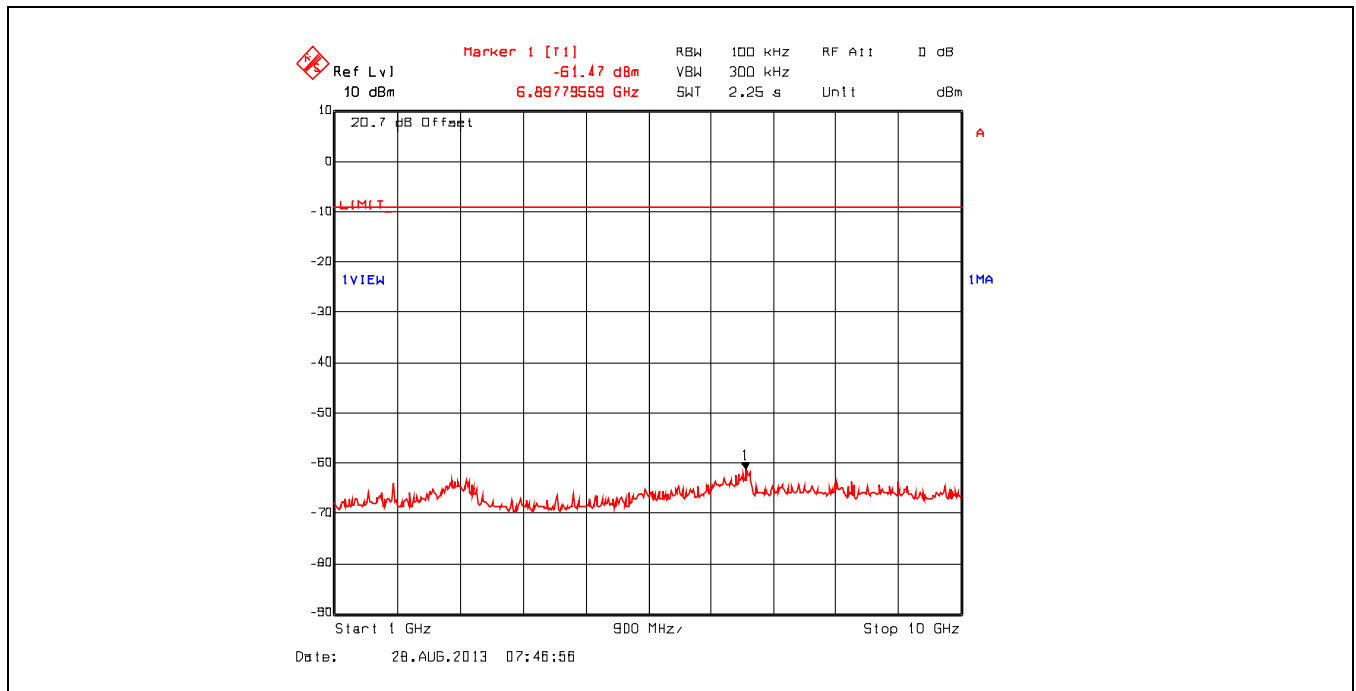
September 4, 2013

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

Plot 5.5.4.2.23. Conducted Spurious Emissions
Low Power, 927.65 MHz, Data Rate at 172800 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.24. Conducted Spurious Emissions
Low Power, 927.65 MHz, Data Rate at 172800 kbps, 1 GHz – 10 GHz



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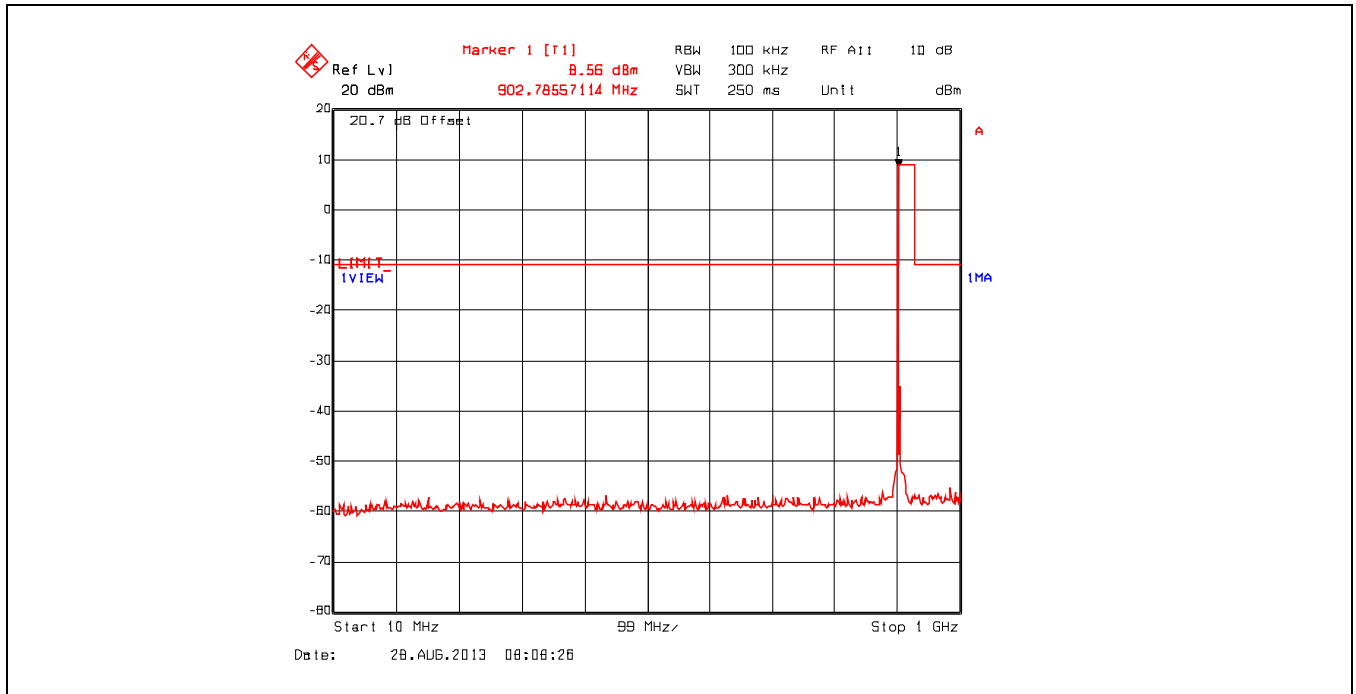
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

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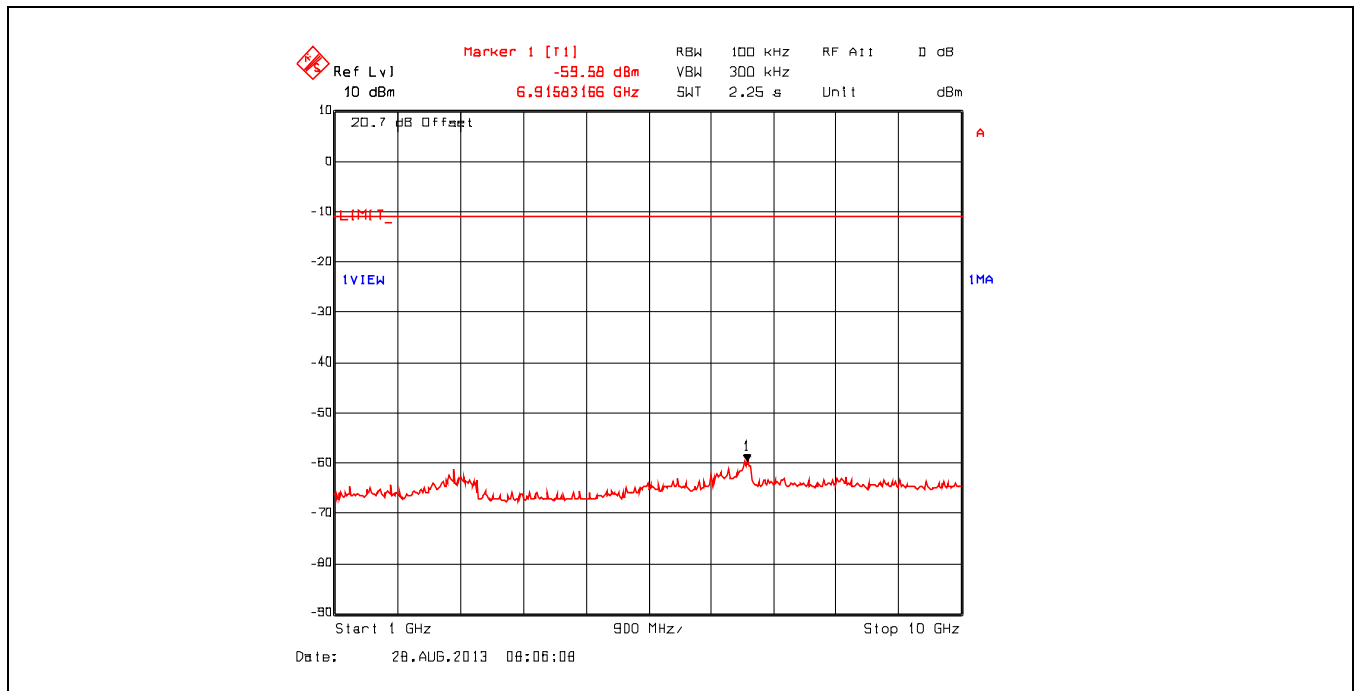
September 4, 2013

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

Plot 5.5.4.2.25. Conducted Spurious Emissions
Low Power, 902.40 MHz, Data Rate at 230400 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.26. Conducted Spurious Emissions
Low Power, 902.40 MHz, Data Rate at 230400 kbps, 1 GHz – 10 GHz



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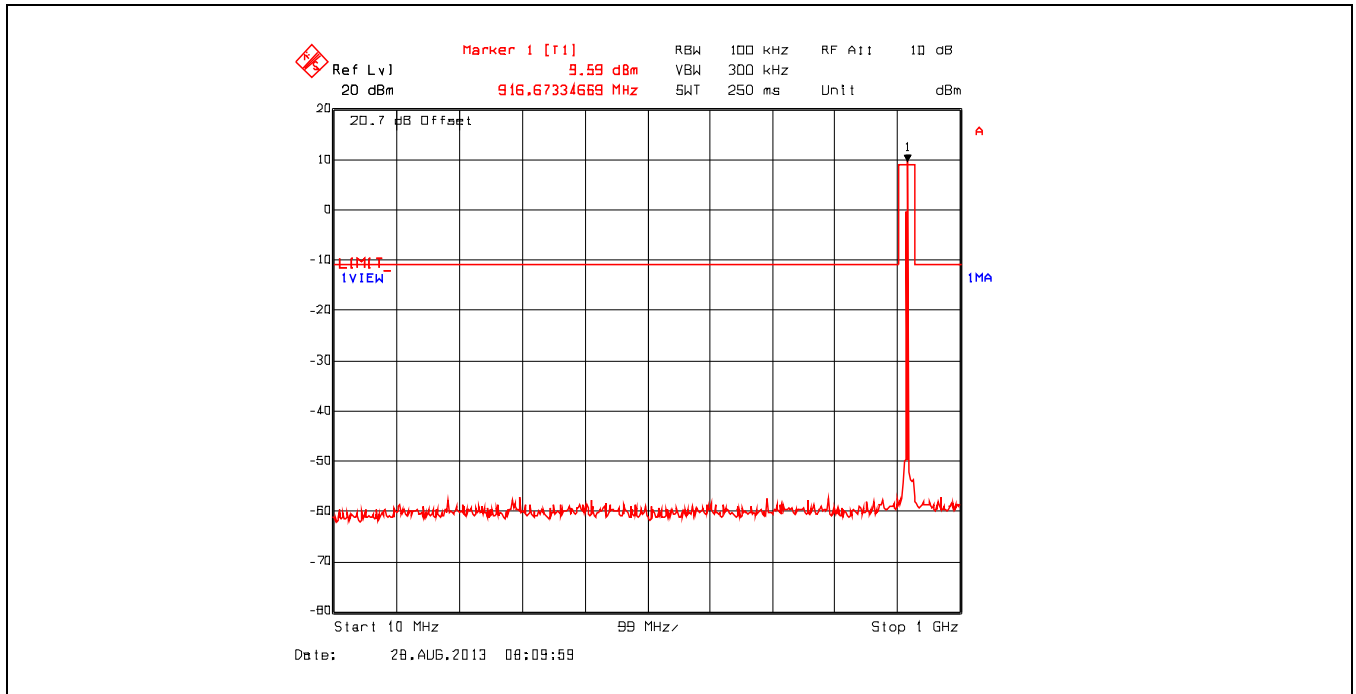
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

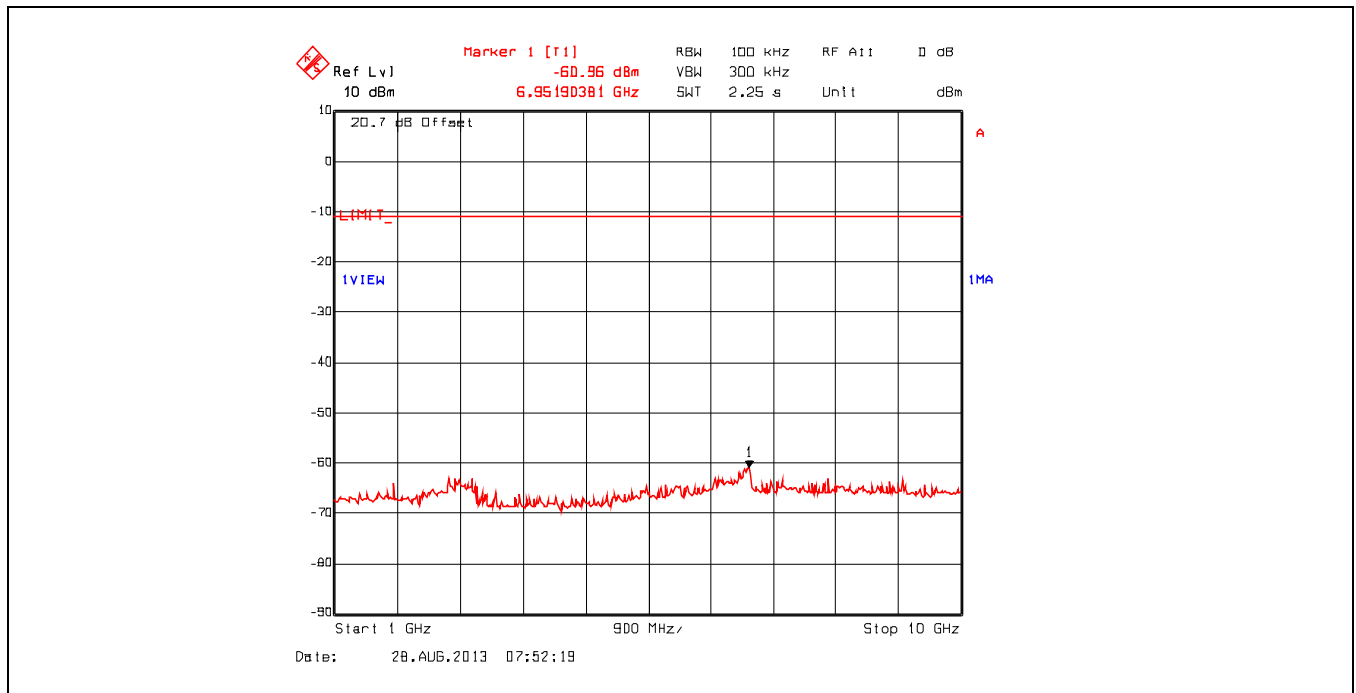
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Plot 5.5.4.2.27. Conducted Spurious Emissions
Low Power, 915.00 MHz, Data Rate at 230400 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.28. Conducted Spurious Emissions
Low Power, 915.00 MHz, Data Rate at 230400 kbps, 1 GHz – 10 GHz



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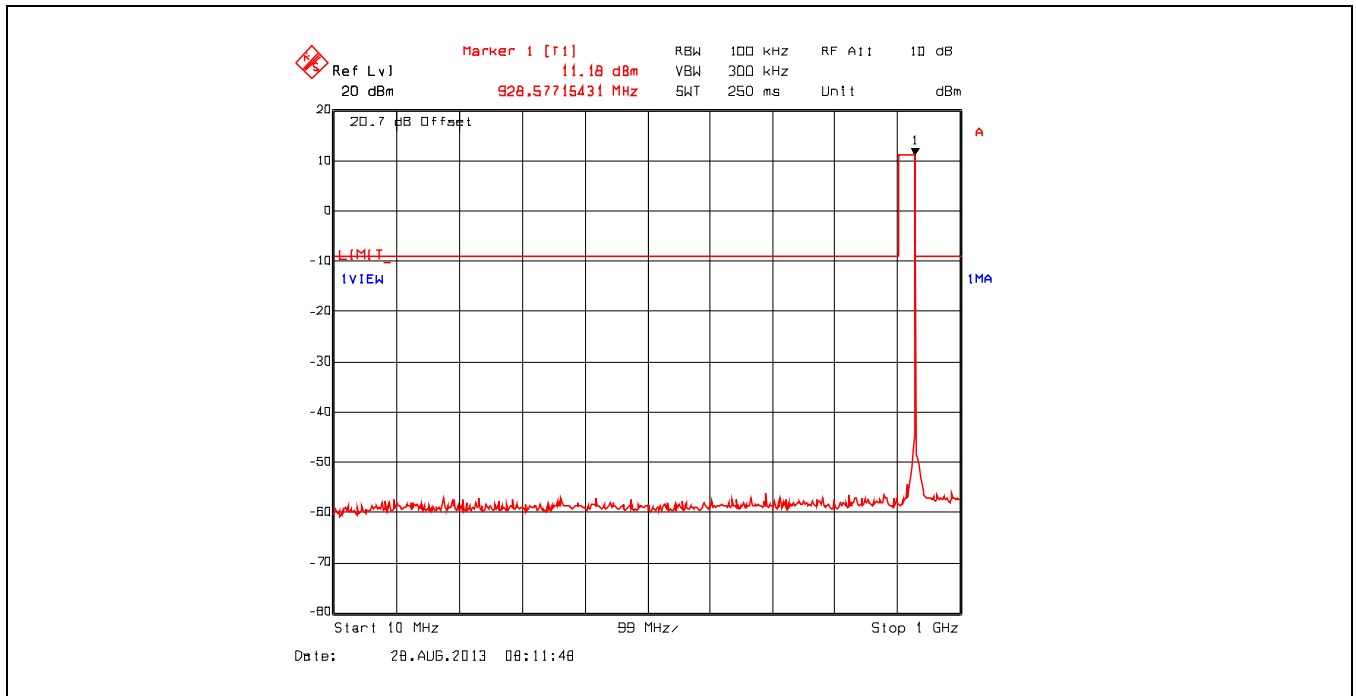
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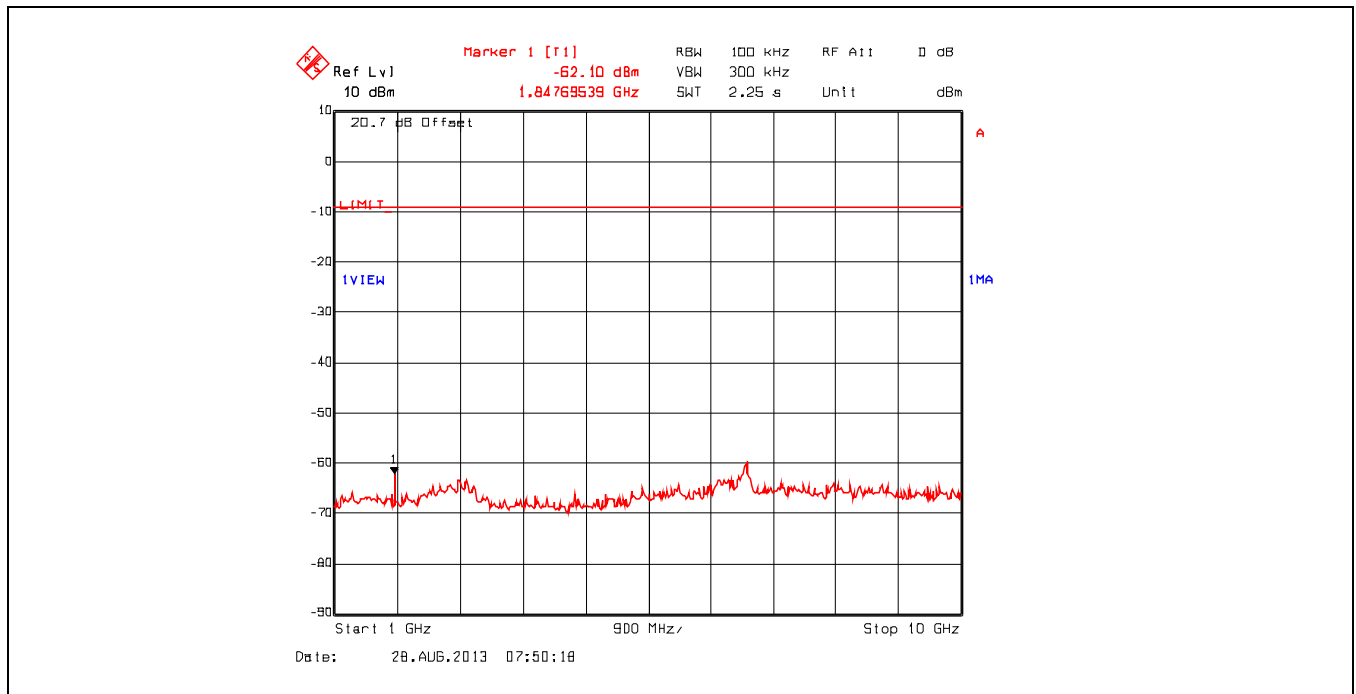
September 4, 2013

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Plot 5.5.4.2.29. Conducted Spurious Emissions
Low Power, 927.60 MHz, Data Rate at 230400 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.30. Conducted Spurious Emissions
Low Power, 927.60 MHz, Data Rate at 230400 kbps, 1 GHz – 10 GHz



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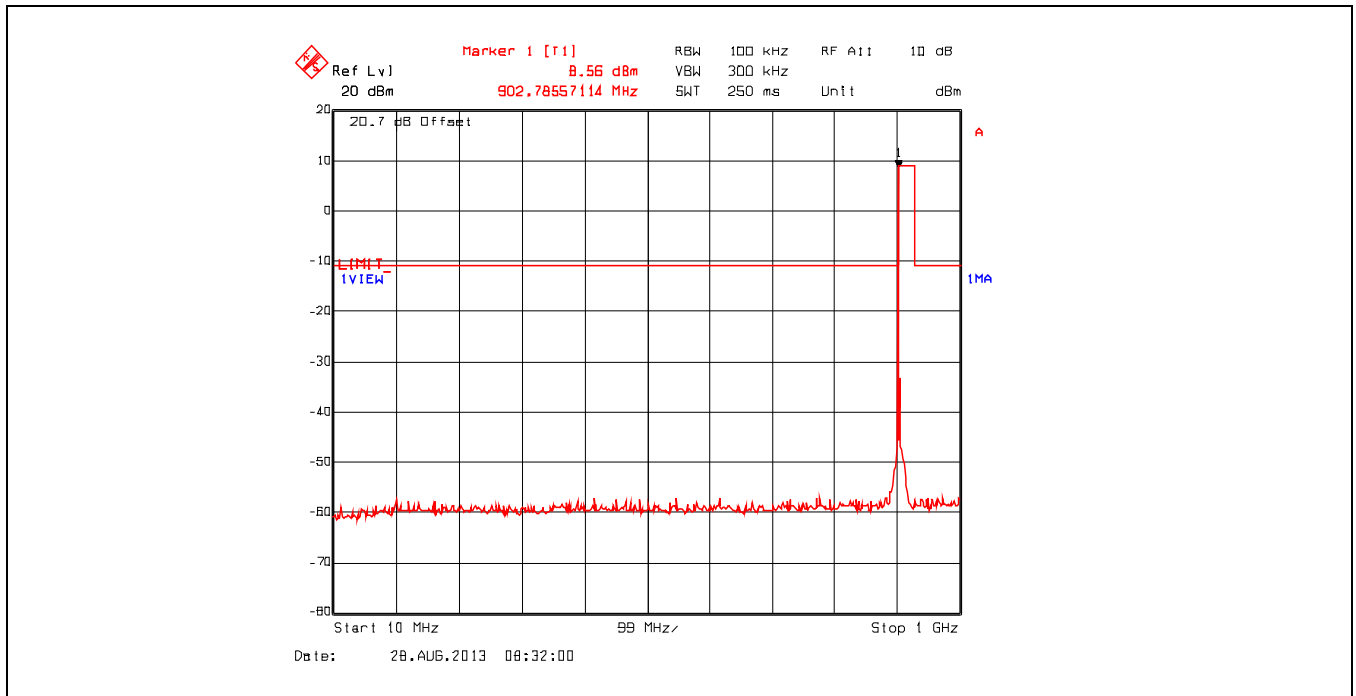
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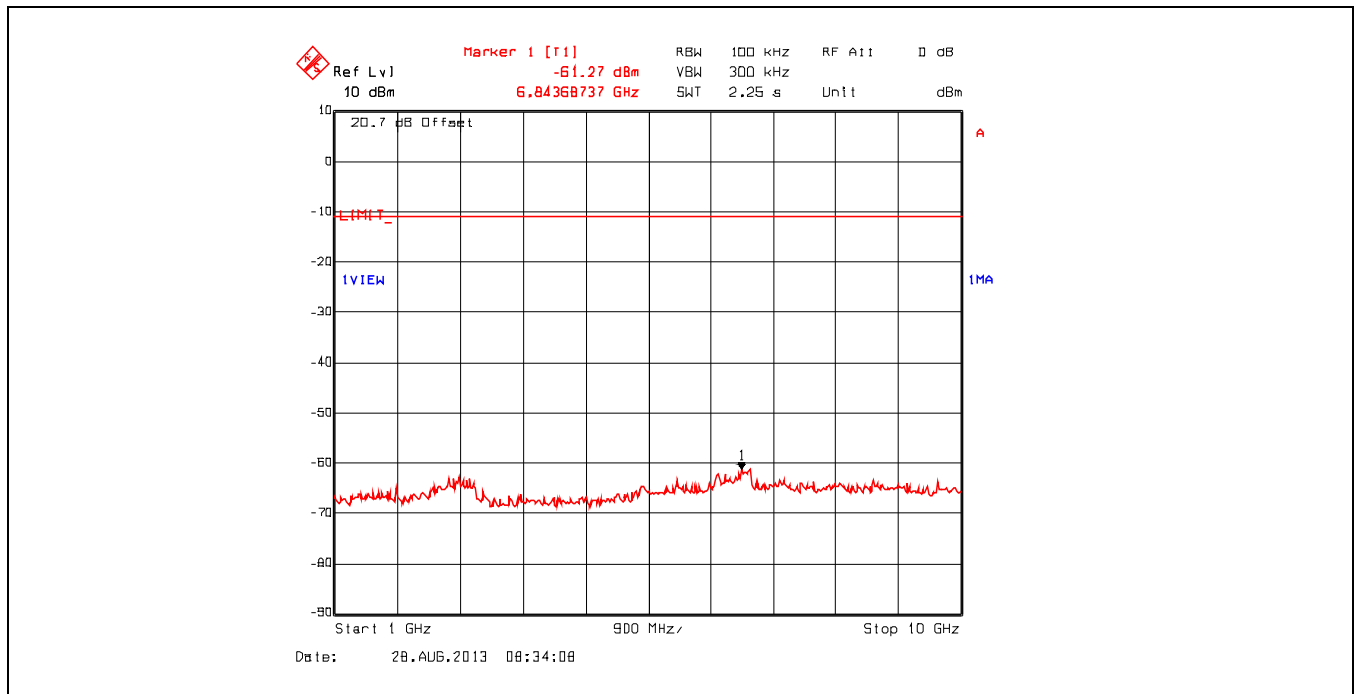
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Plot 5.5.4.2.31. Conducted Spurious Emissions
Low Power, 902.40 MHz, Data Rate at 276480 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.32. Conducted Spurious Emissions
Low Power, 902.40 MHz, Data Rate at 276480 kbps, 1 GHz – 10 GHz



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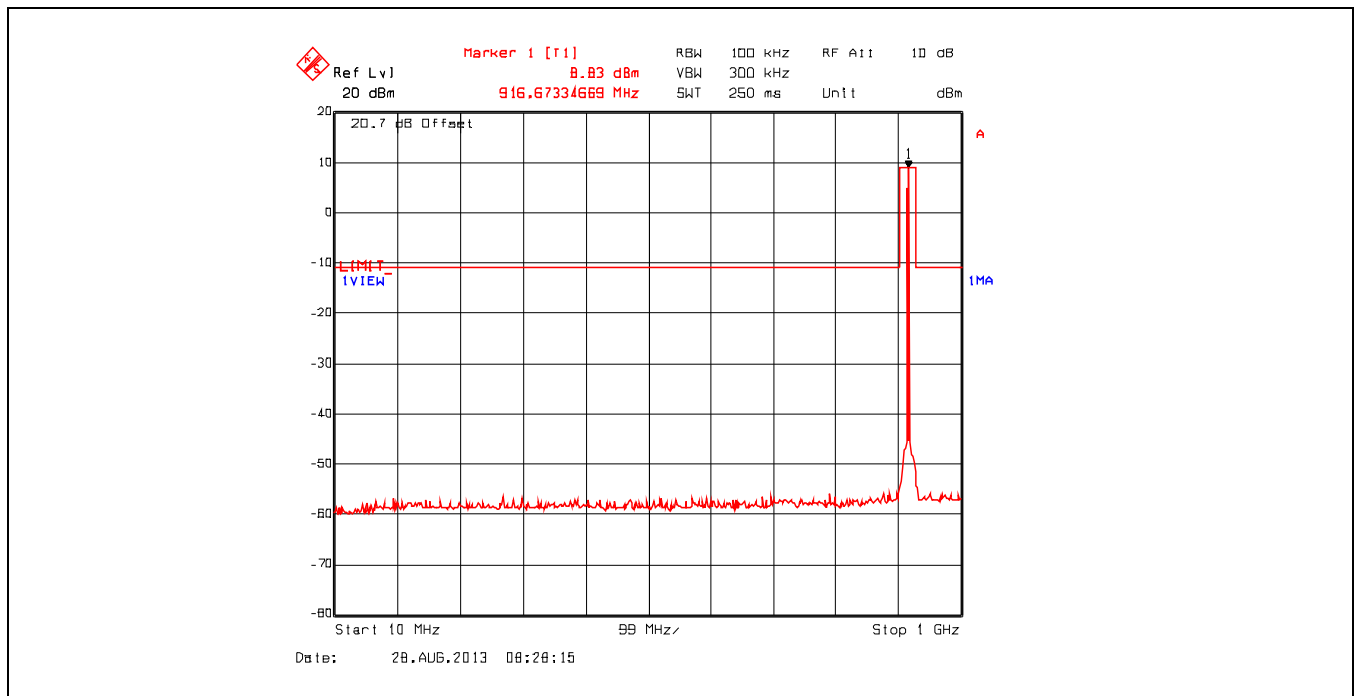
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

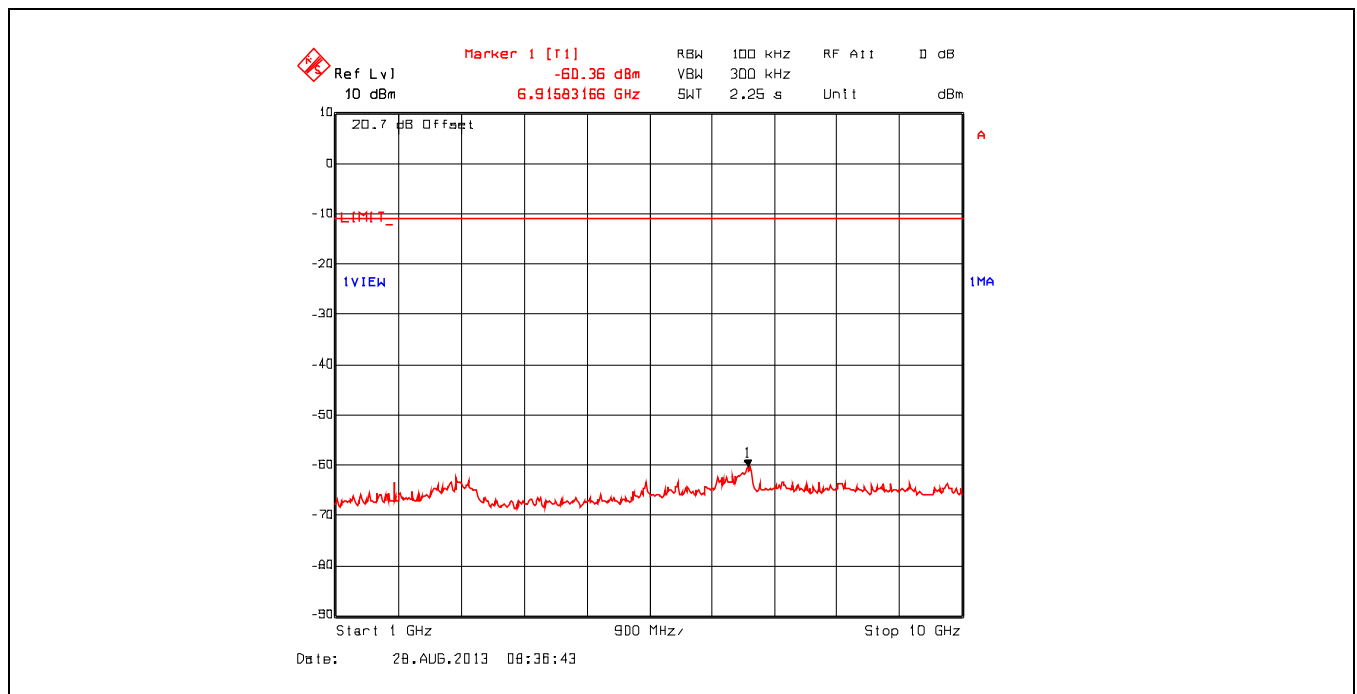
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Plot 5.5.4.2.33. Conducted Spurious Emissions
Low Power, 915.00 MHz, Data Rate at 276480 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.34. Conducted Spurious Emissions
Low Power, 915.00 MHz, Data Rate at 276480 kbps, 1 GHz – 10 GHz



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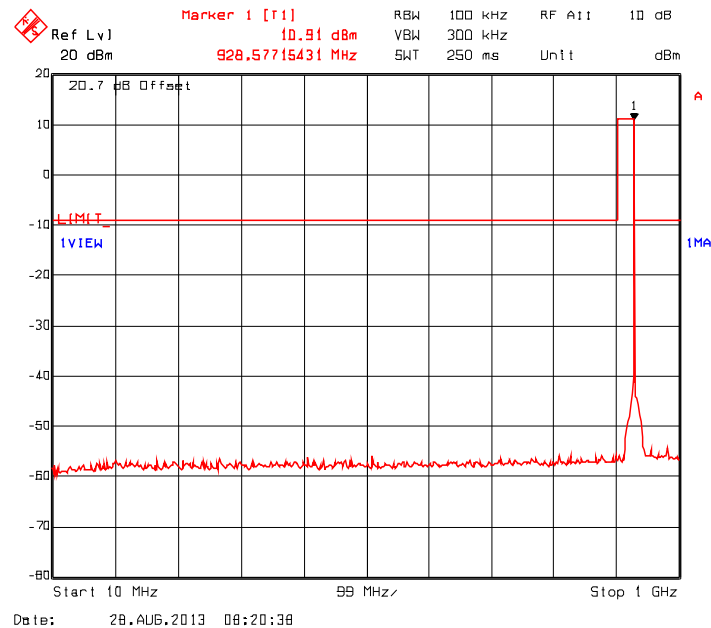
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

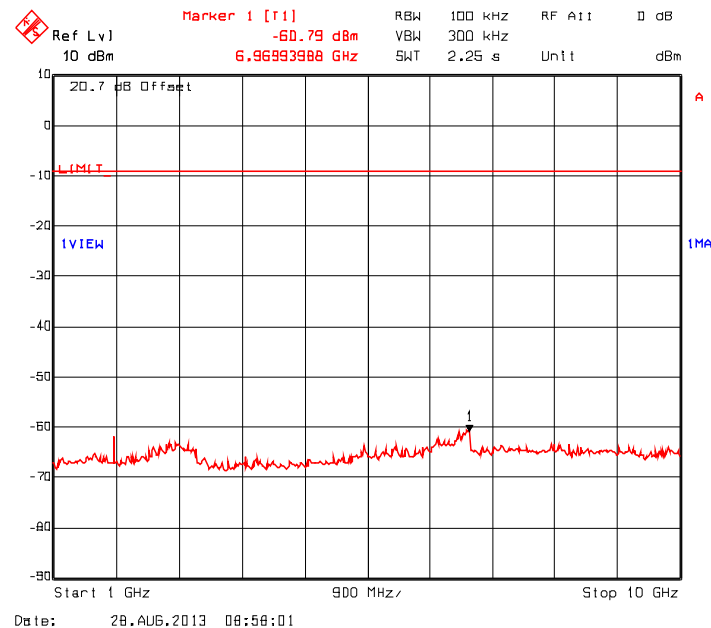
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Plot 5.5.4.2.35. Conducted Spurious Emissions
Low Power, 927.60 MHz, Data Rate at 276480 kbps, 10 MHz – 1 GHz



Plot 5.5.4.2.36. Conducted Spurious Emissions
Low Power, 927.60 MHz, Data Rate at 276480 kbps, 1 GHz – 10 GHz



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5.6. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.6.1. Limit

§ 15.247 (d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41			

¹ Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

² Above 38.6

Section 15.209(a) - Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement 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

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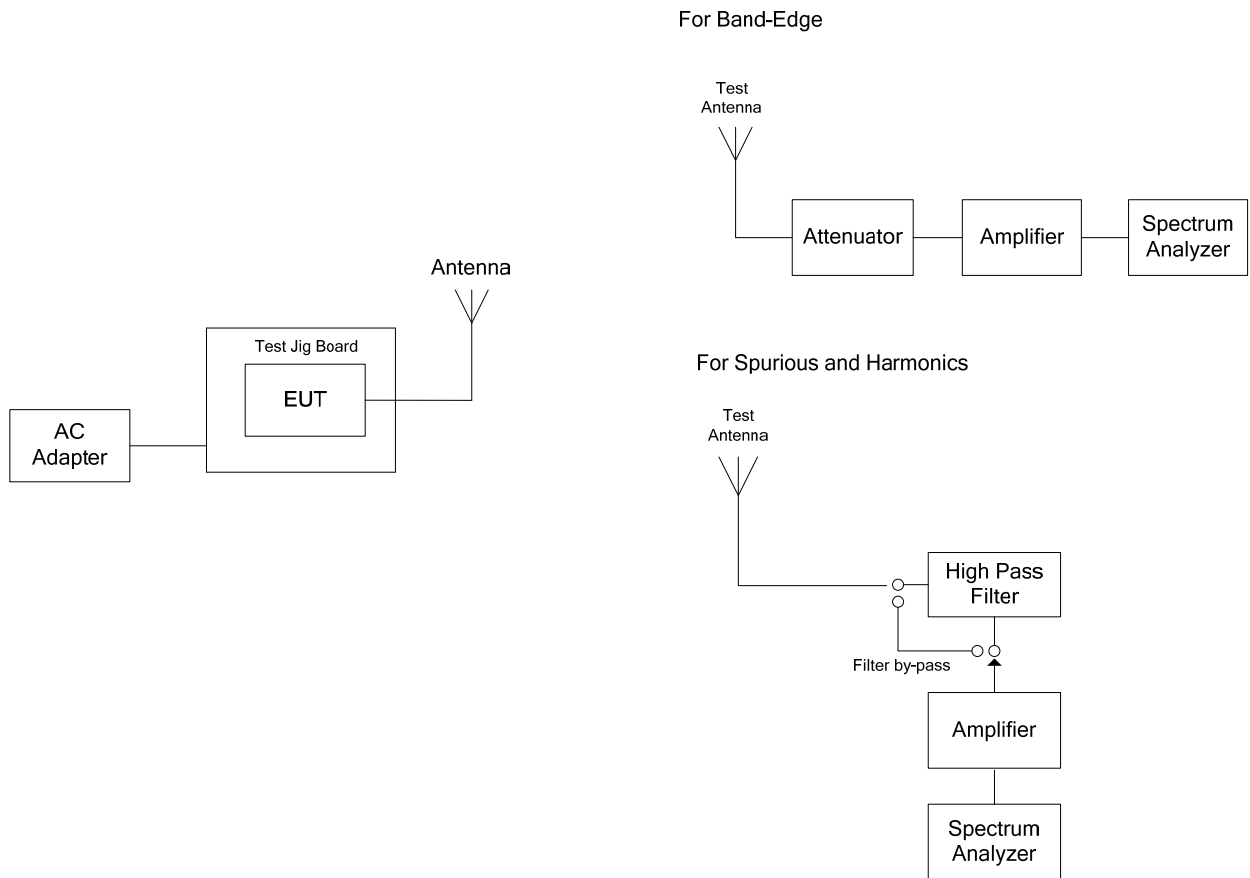
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5.6.2. Method of Measurements

FCC Public Notice DA 00-705, ANSI C63.10 and ANSI 63.4 procedures.

5.6.3. Test Arrangement



5.6.4. Test Data

Remark(s):

- All spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- EUT shall be tested in three orthogonal positions.
- The following test results are the final worst-case measurements derived from exploratory tests, performed with EUT modulated at 172800 kbps data rate.

5.6.4.1. EUT with 3 dBi Rubber Ducky Antenna and 0.77 dB Assembly Cable Loss

5.6.4.1.1. Spurious Radiated Emissions

Fundamental Frequency:		902.40 MHz					
Software Power Setting:		40					
Measured Conducted Power:		29.98 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBμV/m)	RF Avg Level (dBμV/m)	Antenna Plane (H/V)	Limit 15.209 (dBμV/m)	Limit 15.247 (dBμV/m)	Margin (dB)	Pass/Fail
902.40	127.98	--	V	--	--	--	--
902.40	125.37	--	H	--	--	--	--
2707.20	54.89	52.37	V	54.0	108.0	-1.6	Pass*
2707.20	51.63	48.20	H	54.0	108.0	-5.8	Pass*
3609.60	49.44	42.85	V	54.0	108.0	-11.2	Pass*
3609.60	47.45	37.85	H	54.0	108.0	-16.2	Pass*
4512.00	49.42	41.93	V	54.0	108.0	-12.1	Pass*
4512.00	48.72	40.66	H	54.0	108.0	-13.3	Pass*
5414.40	52.06	43.36	V	54.0	108.0	-10.6	Pass*
5414.40	50.61	39.93	H	54.0	108.0	-14.1	Pass*
8121.60	53.94	41.72	V	54.0	108.0	-12.3	Pass*
8121.60	55.19	44.16	H	54.0	108.0	-9.8	Pass*
9024.00	59.63	51.44	V	54.0	108.0	-2.6	Pass*
9024.00	60.03	52.26	H	54.0	108.0	-1.7	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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September 4, 2013

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Fundamental Frequency:		914.90 MHz					
Software Power Setting:		40					
Measured Conducted Power:		29.98 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
914.90	127.42	--	V	--	--	--	--
914.90	126.35	--	H	--	--	--	--
2744.70	54.16	51.85	V	54.0	107.4	-2.2	Pass*
2744.70	52.38	49.60	H	54.0	107.4	-4.4	Pass*
3659.60	46.55	35.06	V	54.0	107.4	-18.9	Pass*
3659.60	47.37	38.03	H	54.0	107.4	-16.0	Pass*
4574.50	51.73	44.89	V	54.0	107.4	-9.1	Pass*
4574.50	51.00	44.72	H	54.0	107.4	-9.3	Pass*
7319.20	52.26	40.14	V	54.0	107.4	-13.9	Pass*
7319.20	52.47	41.06	H	54.0	107.4	-12.9	Pass*
8234.10	55.21	44.12	V	54.0	107.4	-9.9	Pass*
8234.10	55.39	44.22	H	54.0	107.4	-9.8	Pass*
9149.00	57.39	47.35	V	54.0	107.4	-6.7	Pass*
9149.00	58.46	48.91	H	54.0	107.4	-5.1	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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September 4, 2013

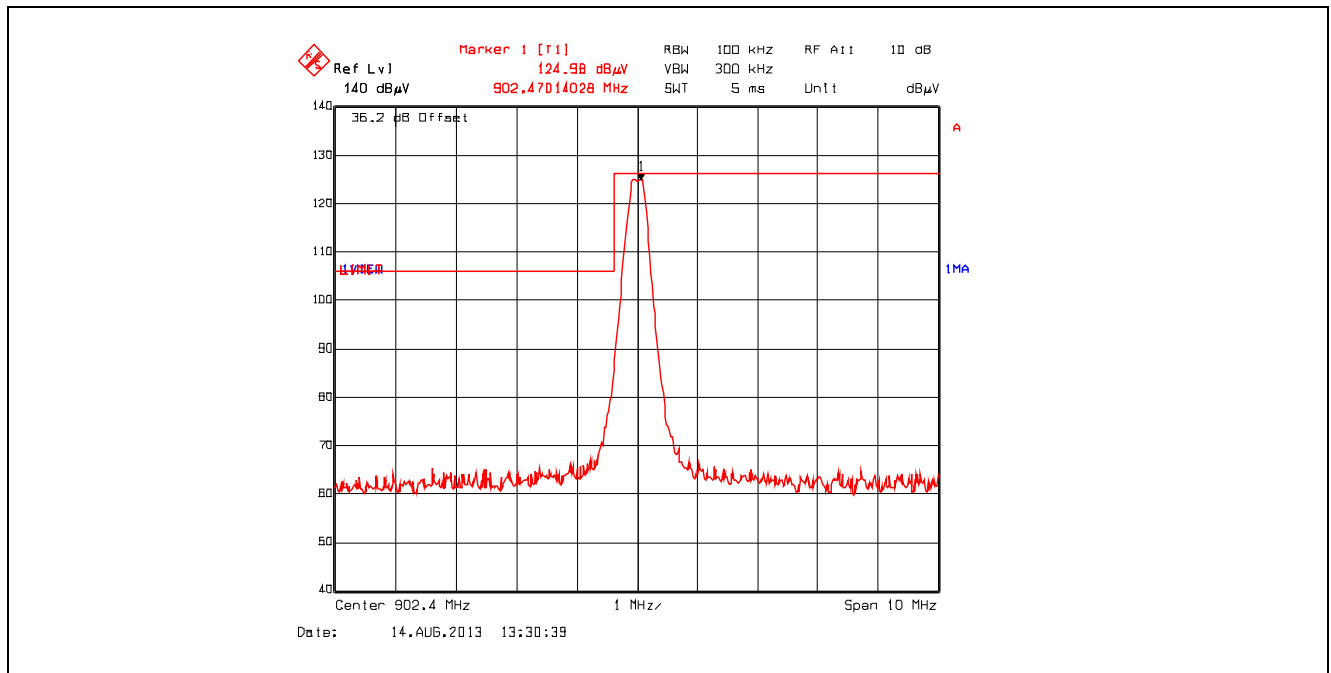
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Fundamental Frequency: 927.65 MHz							
Software Power Setting: 40							
Measured Conducted Power: 29.98 dBm							
Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
927.65	126.73	--	V	--	--	--	--
927.65	126.70	--	H	--	--	--	--
2782.95	53.29	50.91	V	54.0	106.7	-3.1	Pass*
2782.95	54.52	52.81	H	54.0	106.7	-1.2	Pass*
3710.60	47.47	35.96	V	54.0	106.7	-18.0	Pass*
3710.60	46.58	34.66	H	54.0	106.7	-19.3	Pass*
4638.25	49.17	41.24	V	54.0	106.7	-12.8	Pass*
4638.25	47.89	39.52	H	54.0	106.7	-14.5	Pass*
5565.90	48.66	36.85	V	54.0	106.7	-17.2	Pass*
5565.90	49.57	38.18	H	54.0	106.7	-15.8	Pass*
8348.85	55.37	44.65	V	54.0	106.7	-9.4	Pass*
8348.85	57.23	49.23	H	54.0	106.7	-4.8	Pass*
9276.50	55.53	47.53	V	54.0	106.7	-6.5	Pass*
9276.50	57.64	48.64	H	54.0	106.7	-5.4	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

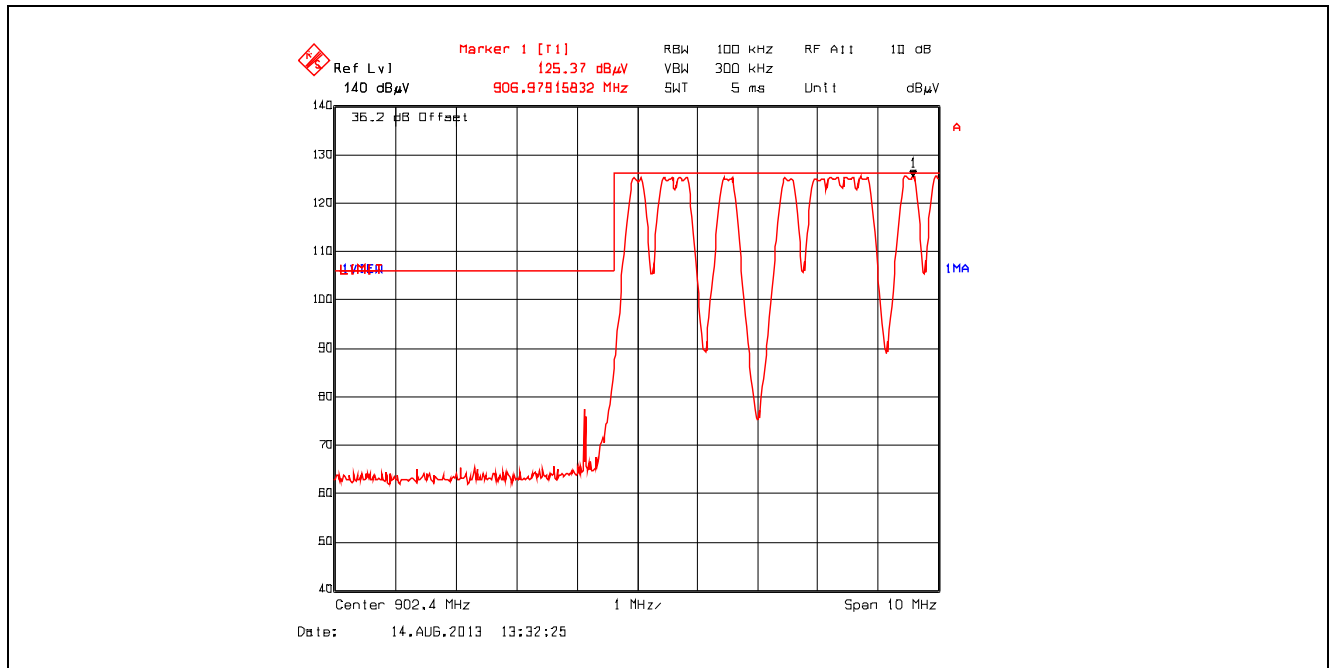
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.6.4.1.2. Band-Edge RF Radiated Emissions

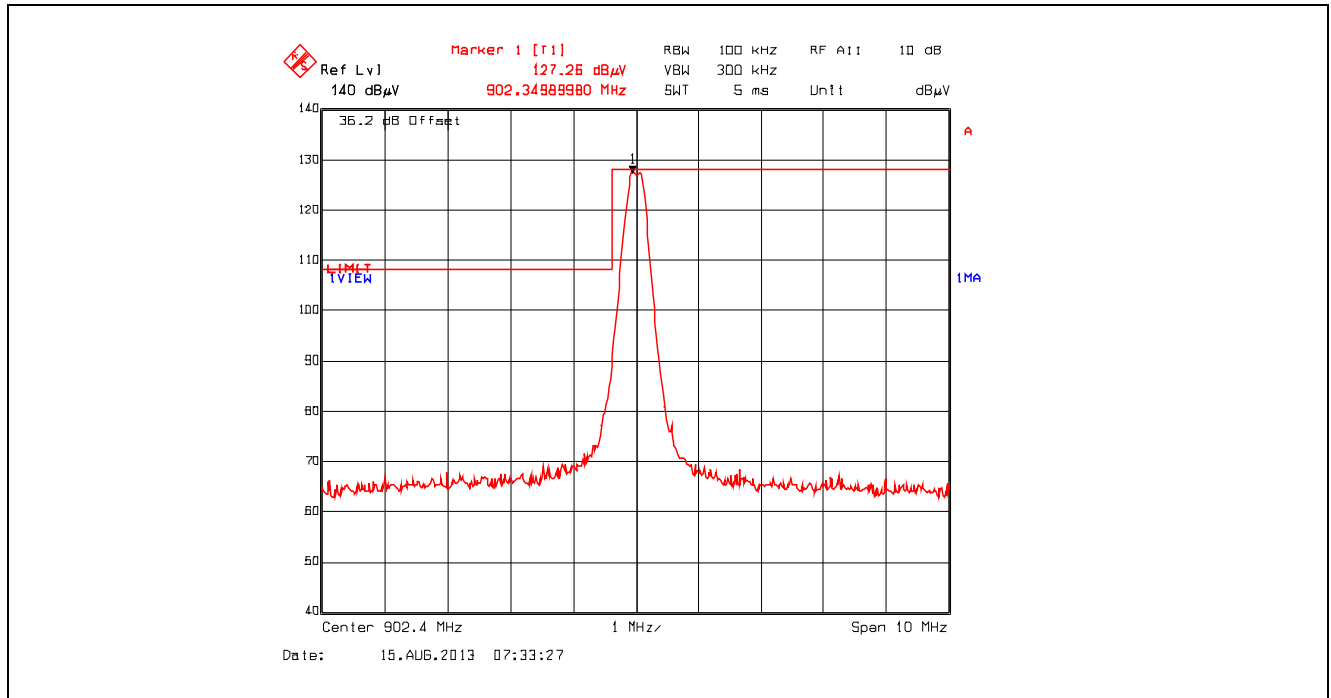
Plot 5.6.4.1.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



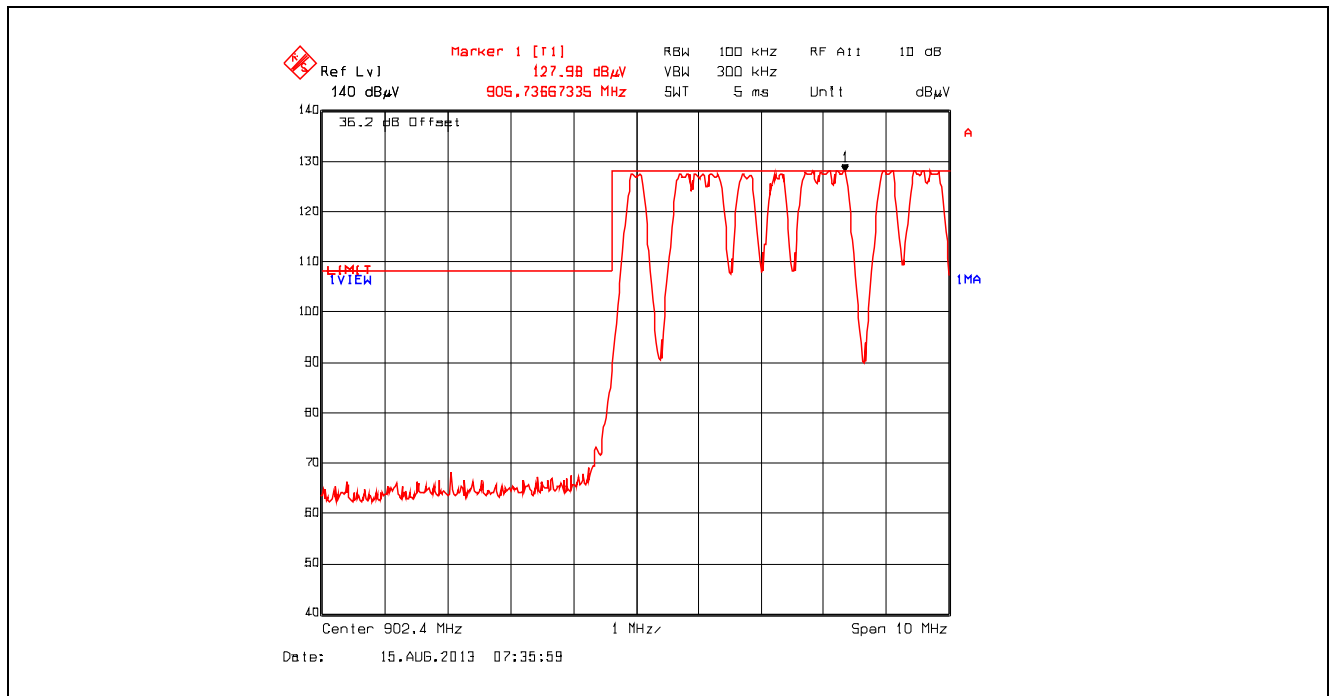
Plot 5.6.4.1.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.1.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.1.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



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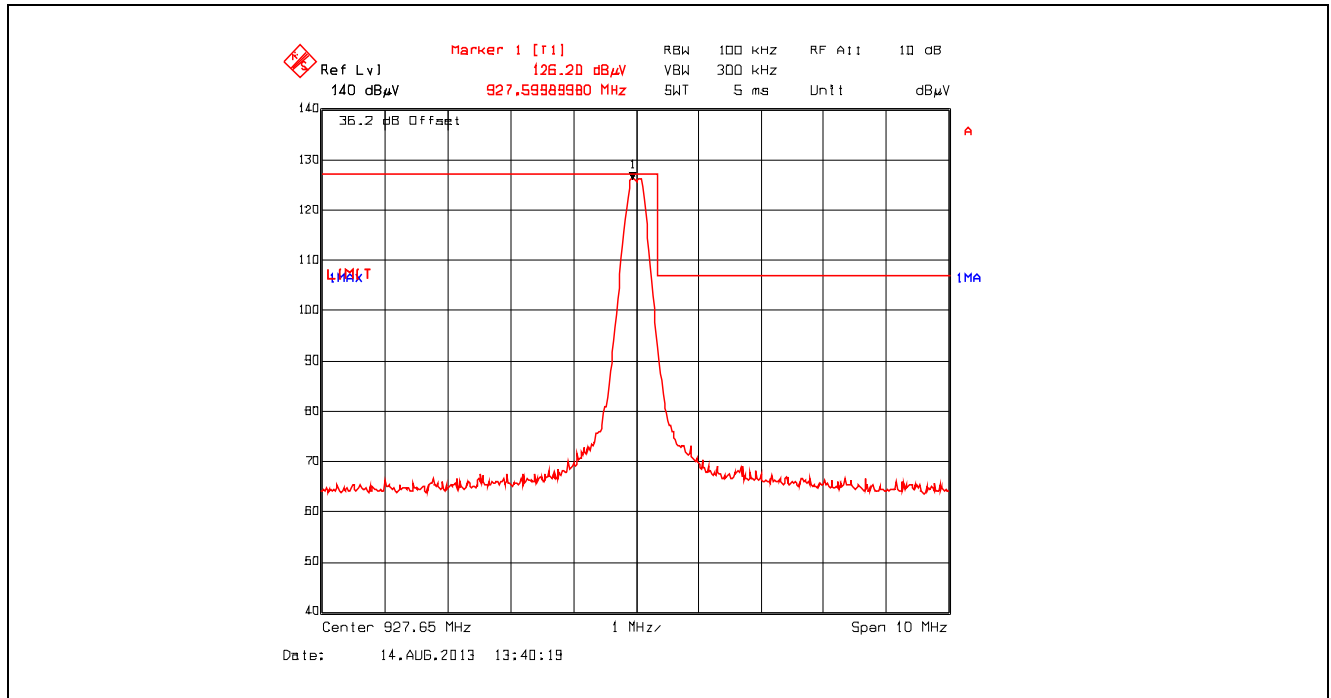
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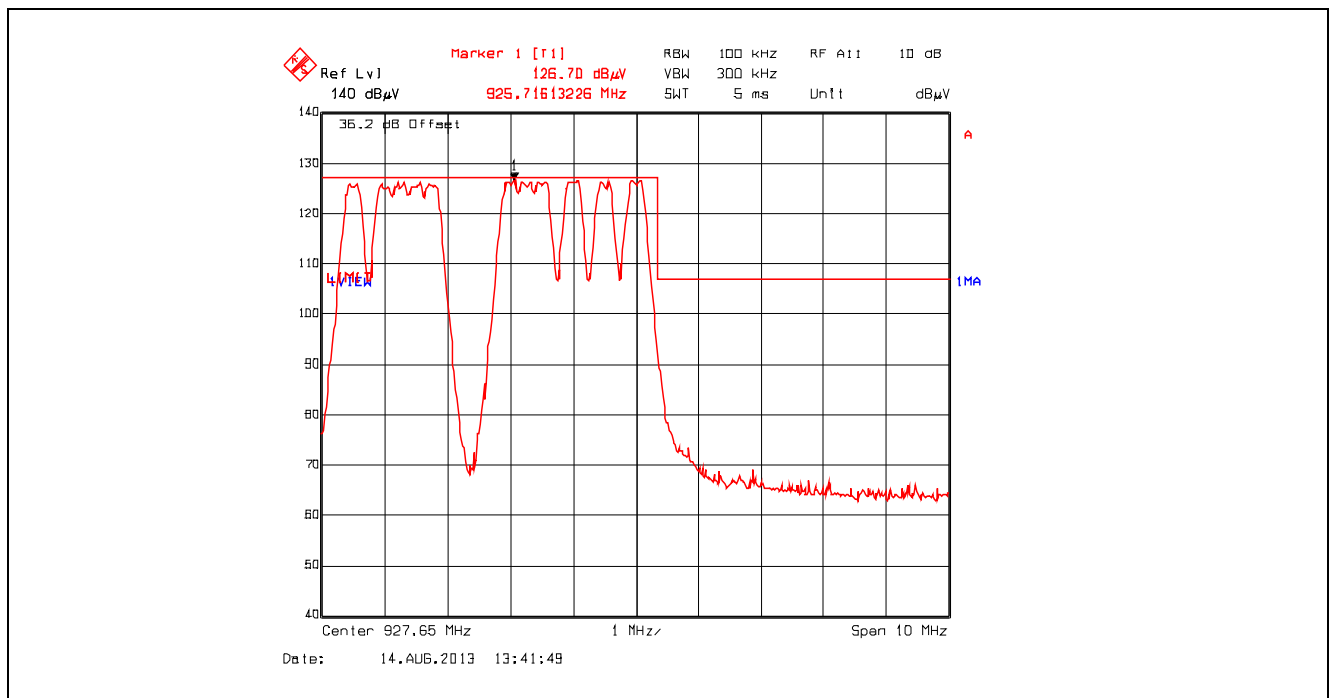
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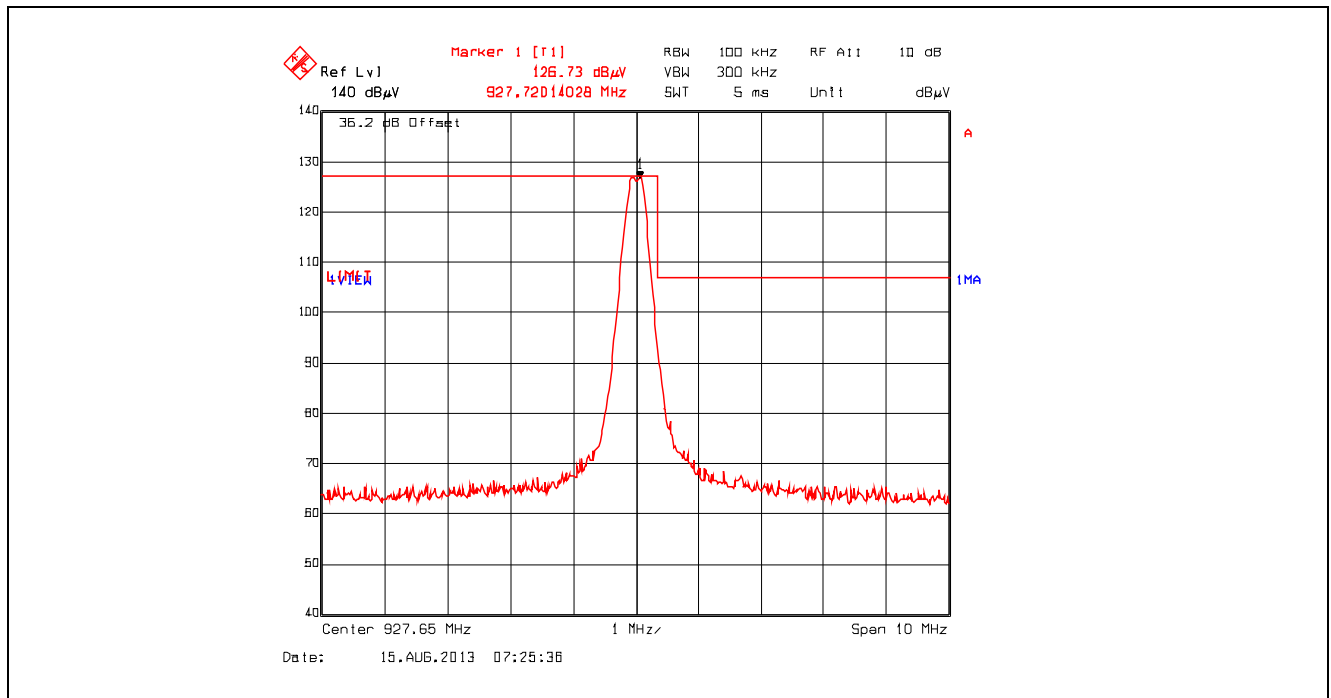
Plot 5.6.4.1.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, High End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



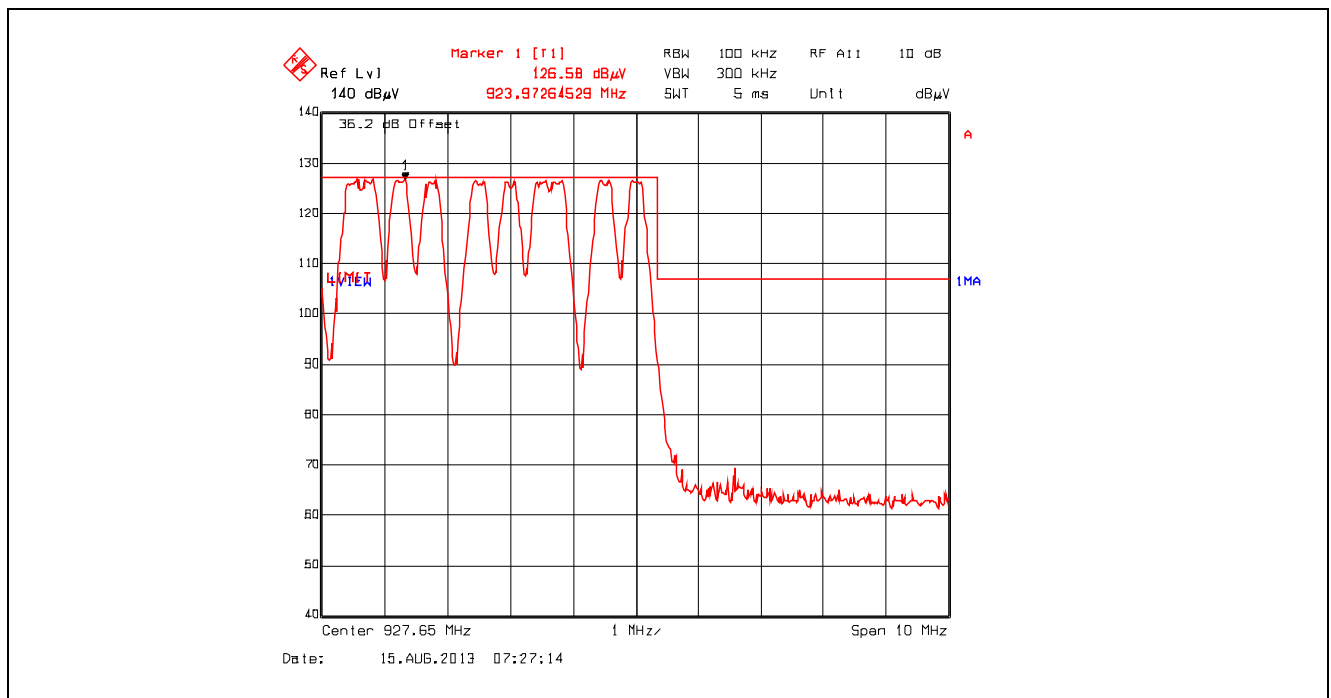
Plot 5.6.4.1.2.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.1.2.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, High of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.1.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



5.6.4.2. EUT with 3 dBi Low Profile Vertical Transit Antenna and 0.29 dB Assembly Cable Loss

5.6.4.2.1. Spurious Radiated Emissions

Fundamental Frequency:		902.40 MHz					
Software Power Setting:		40					
Measured Conducted Power:		29.98 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
902.40	125.86	--	V	--	--	--	--
902.40	123.22	--	H	--	--	--	--
2707.20	51.16	47.65	V	54.0	105.9	-6.4	Pass*
2707.20	52.36	50.51	H	54.0	105.9	-3.5	Pass*
3609.60	46.92	35.91	V	54.0	105.9	-18.1	Pass*
3609.60	50.16	42.75	H	54.0	105.9	-11.3	Pass*
4512.00	51.24	41.71	V	54.0	105.9	-12.3	Pass*
4512.00	50.14	40.13	H	54.0	105.9	-13.9	Pass*
5414.40	52.12	40.44	V	54.0	105.9	-13.6	Pass*
5414.40	50.09	38.05	H	54.0	105.9	-16.0	Pass*
8121.60	55.35	45.11	V	54.0	105.9	-8.9	Pass*
8121.60	56.71	46.20	H	54.0	105.9	-7.8	Pass*
9024.00	58.15	48.48	V	54.0	105.9	-5.5	Pass*
9024.00	64.19	53.59	H	54.0	105.9	-0.4	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:		914.90 MHz					
Software Power Setting:		40					
Measured Conducted Power:		29.98 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
914.90	123.47	--	V	--	--	--	--
914.90	122.98	--	H	--	--	--	--
2744.70	49.42	45.89	V	54.0	103.5	-8.1	Pass*
2744.70	51.66	49.1	H	54.0	103.5	-4.9	Pass*
3659.60	47.51	38.75	V	54.0	103.5	-15.3	Pass*
3659.60	49.53	42.28	H	54.0	103.5	-11.7	Pass*
4574.50	50.6	43.09	V	54.0	103.5	-10.9	Pass*
4574.50	49.94	43.37	H	54.0	103.5	-10.6	Pass*
7319.20	54.33	43.72	V	54.0	103.5	-10.3	Pass*
7319.20	53.39	41.88	H	54.0	103.5	-12.1	Pass*
8234.10	55.68	45.66	V	54.0	103.5	-8.3	Pass*
8234.10	56.76	49.98	H	54.0	103.5	-4.0	Pass*
9149.00	57.87	48.67	V	54.0	103.5	-5.3	Pass*
9149.00	59.53	51.47	H	54.0	103.5	-2.5	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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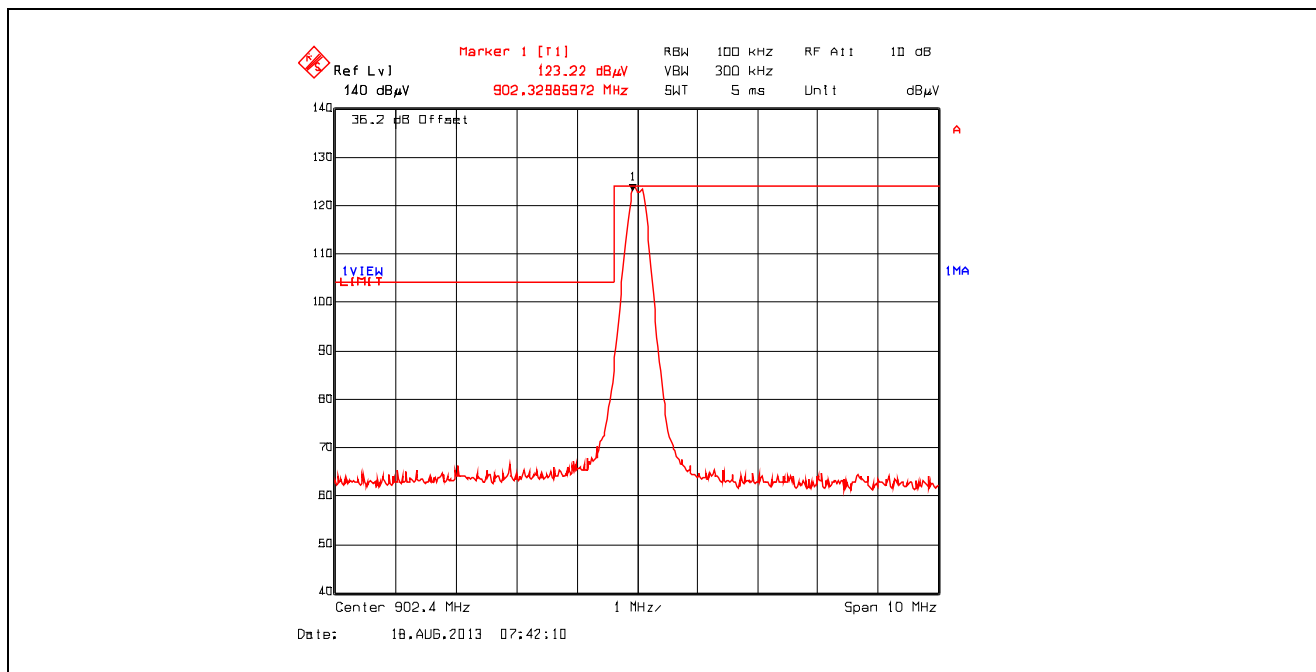
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Fundamental Frequency: 927.65 MHz							
Software Power Setting: 40							
Measured Conducted Power: 29.98 dBm							
Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
927.65	122.14	--	V	--	--	--	--
927.65	122.45	--	H	--	--	--	--
2782.95	49.00	44.75	V	54.0	102.5	-9.3	Pass*
2782.95	52.47	50.64	H	54.0	102.5	-3.4	Pass*
3710.60	46.70	35.99	V	54.0	102.5	-18.0	Pass*
3710.60	48.79	40.13	H	54.0	102.5	-13.9	Pass*
4638.25	50.87	43.35	V	54.0	102.5	-10.7	Pass*
4638.25	51.26	44.56	H	54.0	102.5	-9.4	Pass*
5565.90	49.97	38.26	V	54.0	102.5	-15.7	Pass*
5565.90	51.01	41.44	H	54.0	102.5	-12.6	Pass*
8348.85	57.30	47.32	V	54.0	102.5	-6.7	Pass*
8348.85	58.12	50.14	H	54.0	102.5	-3.9	Pass*
9276.50	61.82	53.09	V	54.0	102.5	-0.9	Pass*
9276.50	61.16	53.04	H	54.0	102.5	-1.0	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

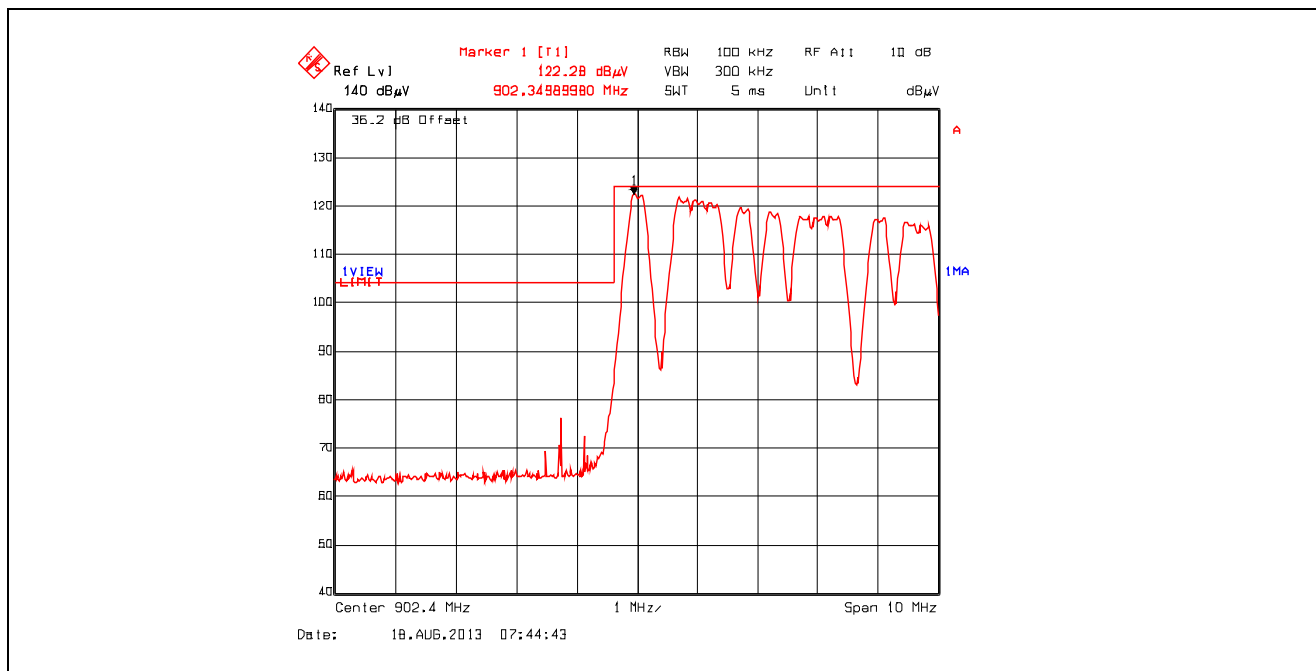
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.6.4.2.2. Band-Edge RF Radiated Emissions

Plot 5.6.4.2.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.2.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



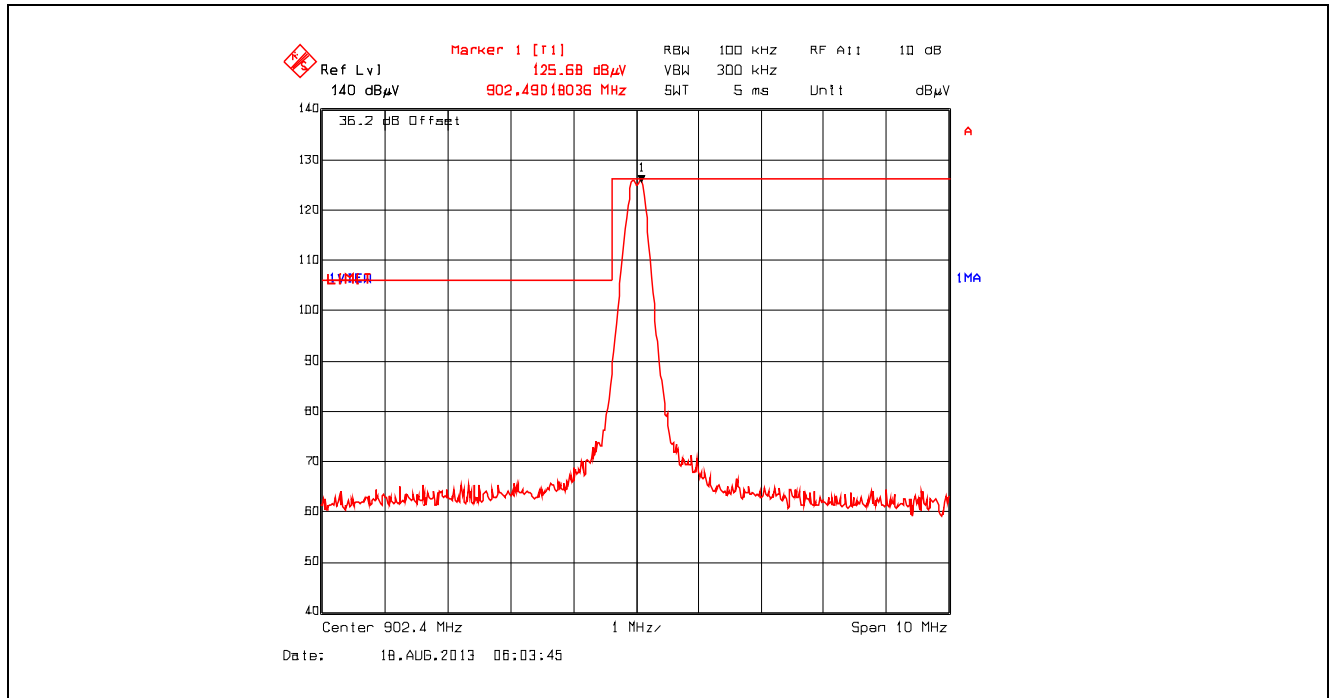
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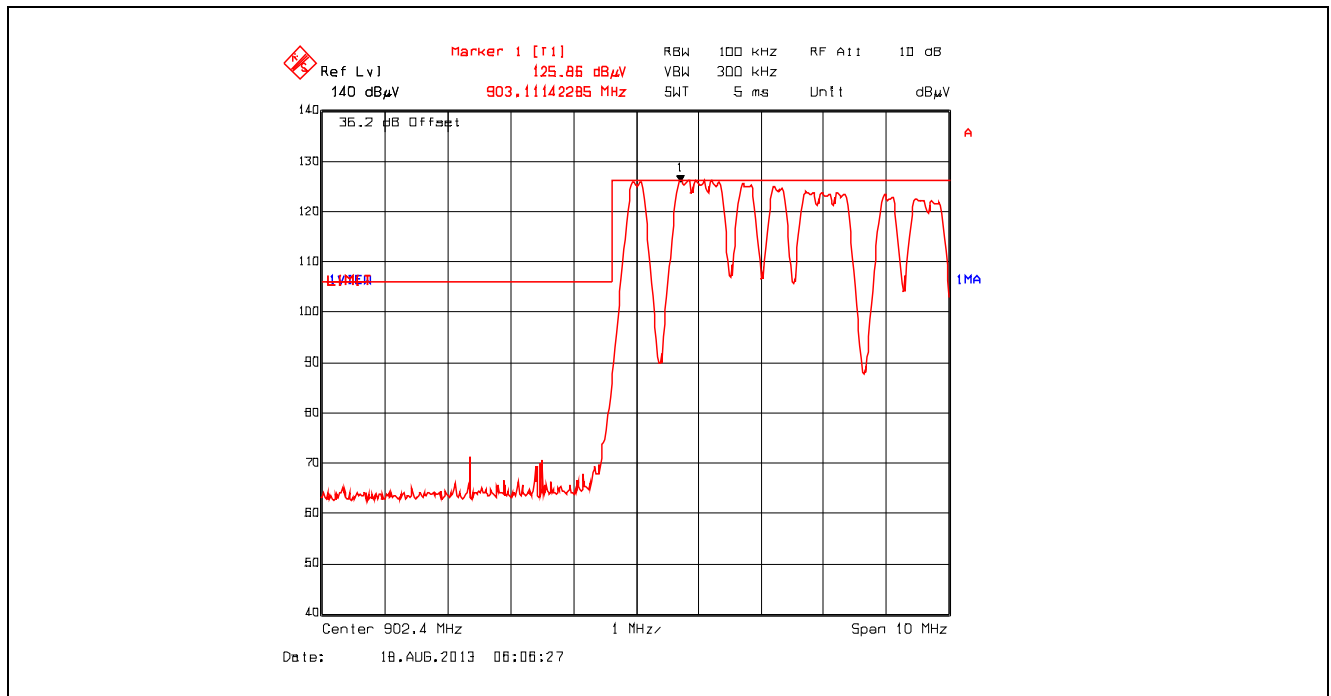
File #: MCRS-061F15C247DSS
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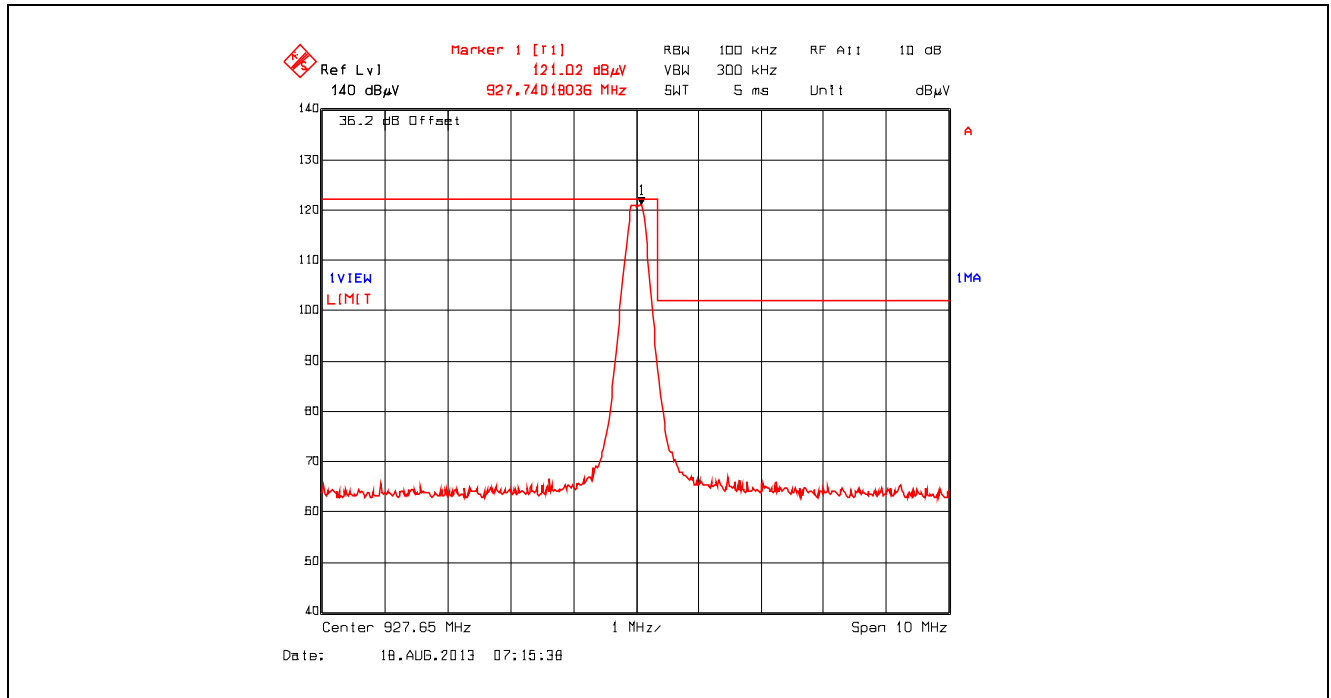
Plot 5.6.4.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



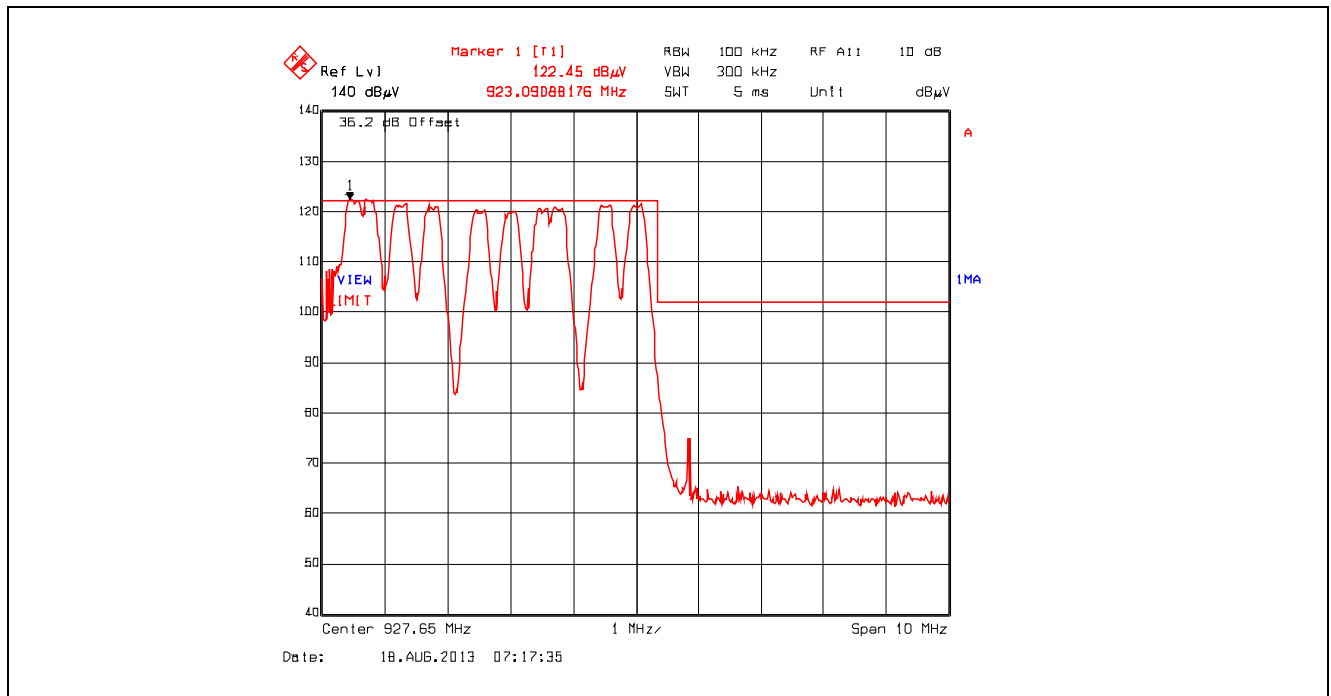
Plot 5.6.4.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.2.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, High End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.2.2.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



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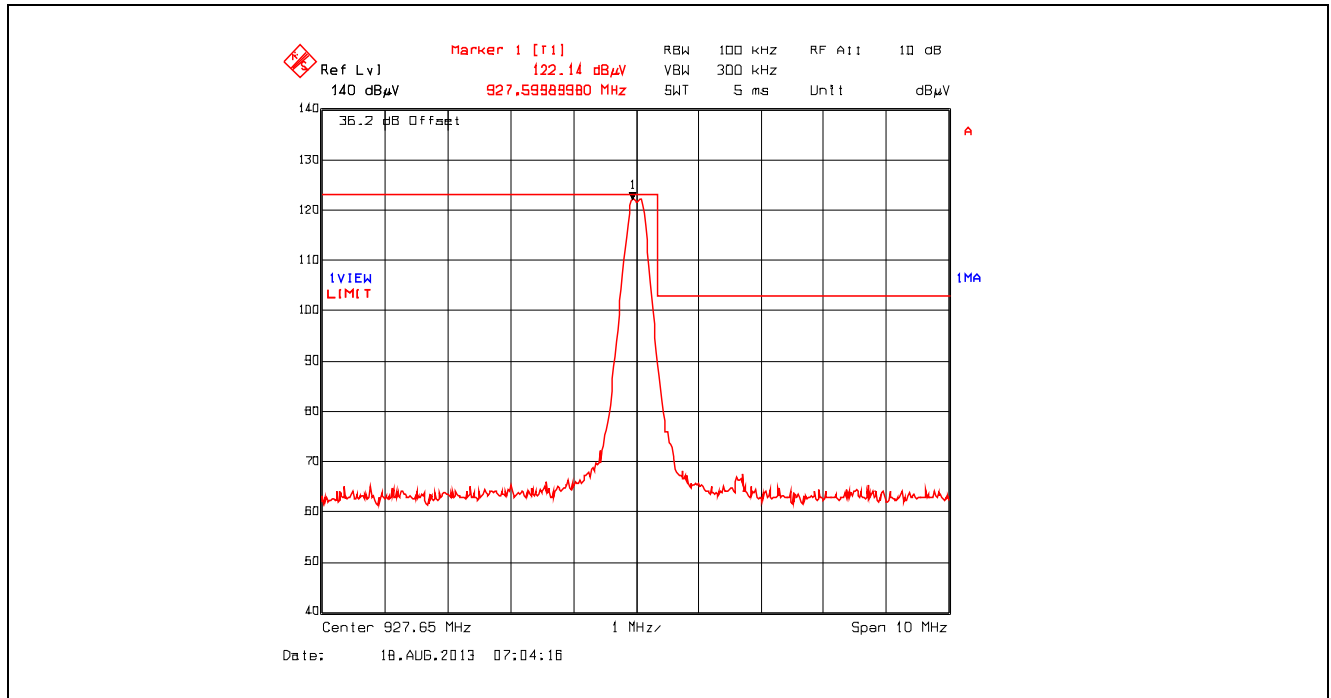
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: MCRS-061F15C247DSS

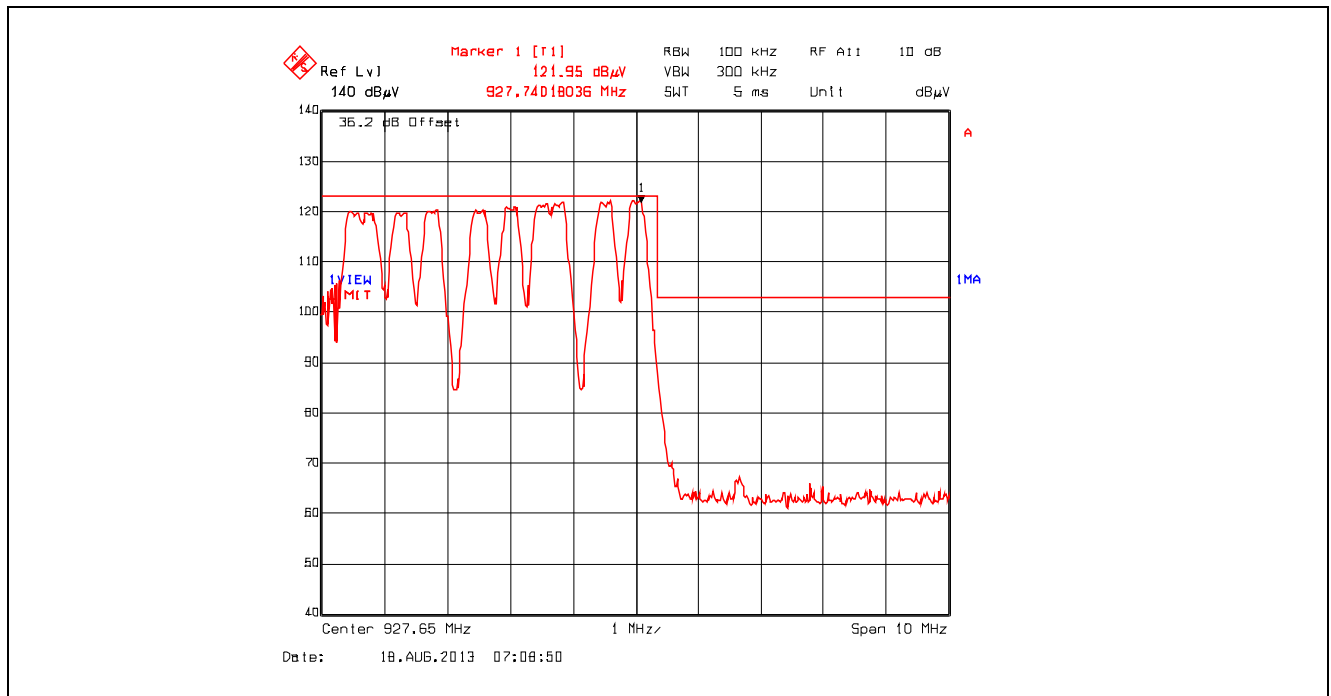
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Plot 5.6.4.2.2.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, High of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



Plot 5.6.4.2.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 40, Data Rate at 172800 kbps



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5.6.4.3. EUT with 8 dBi Flat Patch Antenna and 0.29 dB Assembly Cable Loss

5.6.4.3.1. Spurious Radiated Emissions

Fundamental Frequency:		902.40 MHz					
Software Power Setting:		26					
Measured Conducted Power:		27.91 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
902.40	131.01	--	V	--	--	--	--
902.40	130.46	--	H	--	--	--	--
2707.20	55.16	52.84	V	54.0	111.0	-1.2	Pass*
2707.20	57.46	50.39	H	54.0	111.0	-3.6	Pass*
3609.60	46.49	34.53	V	54.0	111.0	-19.5	Pass*
3609.60	47.17	36.10	H	54.0	111.0	-17.9	Pass*
4512.00	48.97	38.63	V	54.0	111.0	-15.4	Pass*
4512.00	48.56	37.42	H	54.0	111.0	-16.6	Pass*
5414.40	47.65	36.79	V	54.0	111.0	-17.2	Pass*
5414.40	49.24	38.15	H	54.0	111.0	-15.9	Pass*
8121.60	56.11	44.33	V	54.0	111.0	-9.7	Pass*
8121.60	55.06	45.17	H	54.0	111.0	-8.8	Pass*
9024.00	57.11	48.75	V	54.0	111.0	-5.3	Pass*
9024.00	61.55	53.17	H	54.0	111.0	-0.8	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:		914.90 MHz					
Software Power Setting:		26					
Measured Conducted Power:		28.15 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
914.90	130.57	--	V	--	--	--	--
914.90	130.29	--	H	--	--	--	--
2744.70	51.56	47.64	V	54.0	110.6	-6.4	Pass*
2744.70	54.59	51.94	H	54.0	110.6	-2.1	Pass*
3659.60	44.38	39.06	V	54.0	110.6	-14.9	Pass*
3659.60	49.25	42.34	H	54.0	110.6	-11.7	Pass*
4574.50	49.88	41.66	V	54.0	110.6	-12.3	Pass*
4574.50	49.96	41.76	H	54.0	110.6	-12.2	Pass*
7319.20	49.54	39.11	V	54.0	110.6	-14.9	Pass*
7319.20	53.84	43.58	H	54.0	110.6	-10.4	Pass*
8234.10	50.21	41.85	V	54.0	110.6	-12.2	Pass*
8234.10	56.21	47.85	H	54.0	110.6	-6.2	Pass*
9149.00	58.93	49.97	V	54.0	110.6	-4.0	Pass*
9149.00	59.89	51.54	H	54.0	110.6	-2.5	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

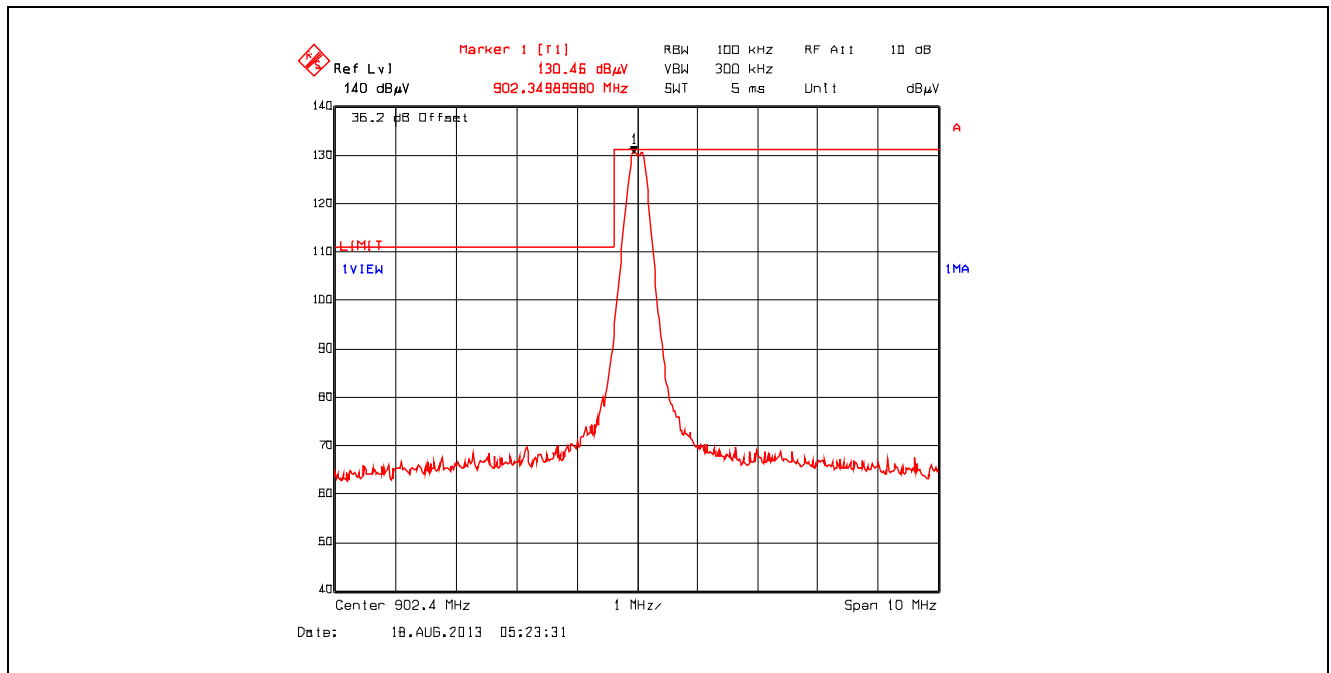
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency: 927.65 MHz							
Software Power Setting: 26							
Measured Conducted Power: 28.28 dBm							
Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
927.65	130.98	--	V	--	--	--	--
927.65	130.94	--	H	--	--	--	--
2782.95	49.24	44.95	V	54.0	111.0	-9.1	Pass*
2782.95	52.81	48.73	H	54.0	111.0	-5.3	Pass*
3710.60	45.47	34.25	V	54.0	111.0	-19.8	Pass*
3710.60	46.58	35.02	H	54.0	111.0	-19.0	Pass*
4638.25	49.57	39.91	V	54.0	111.0	-14.1	Pass*
4638.25	49.19	39.80	H	54.0	111.0	-14.2	Pass*
5565.90	46.25	36.40	V	54.0	111.0	-17.6	Pass*
5565.90	48.23	38.78	H	54.0	111.0	-15.2	Pass*
8348.85	50.81	40.75	V	54.0	111.0	-13.3	Pass*
8348.85	54.28	45.55	H	54.0	111.0	-8.5	Pass*
9276.50	60.69	52.65	V	54.0	111.0	-1.4	Pass*
9276.50	57.70	47.74	H	54.0	111.0	-6.3	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

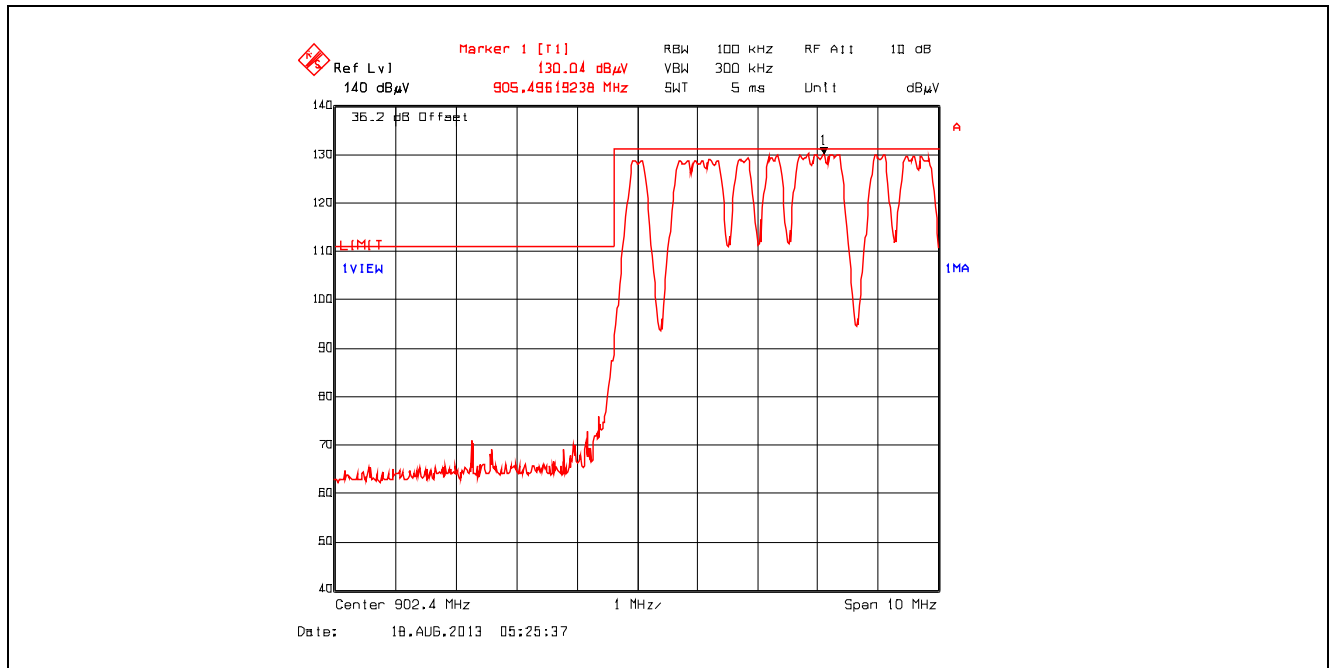
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.6.4.3.2. Band-Edge RF Radiated Emissions

Plot 5.6.4.3.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



Plot 5.6.4.3.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



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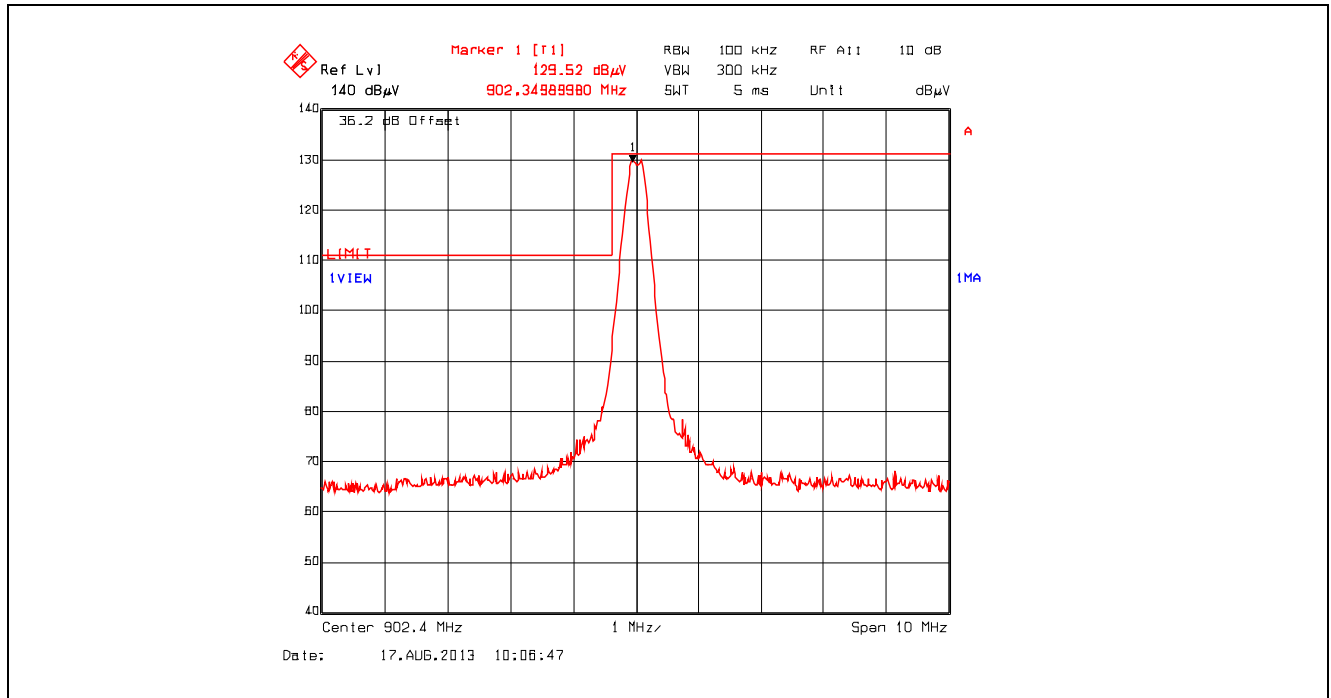
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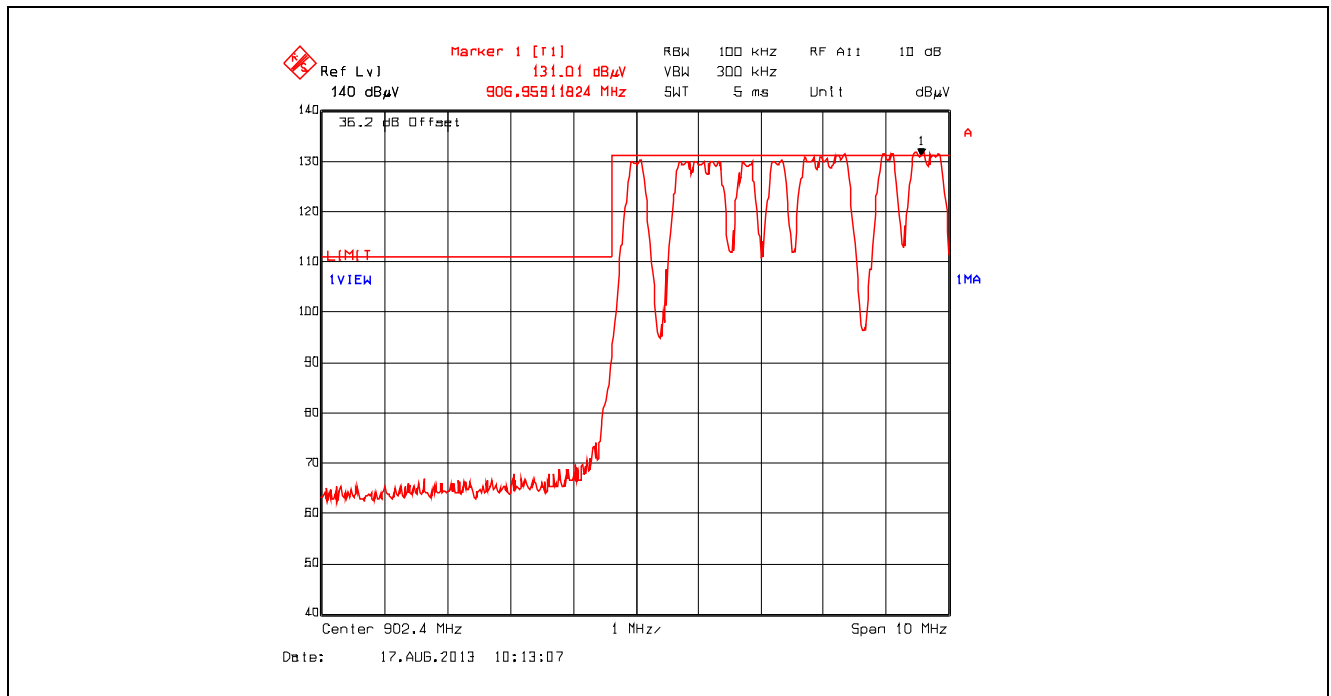
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Plot 5.6.4.3.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



Plot 5.6.4.3.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



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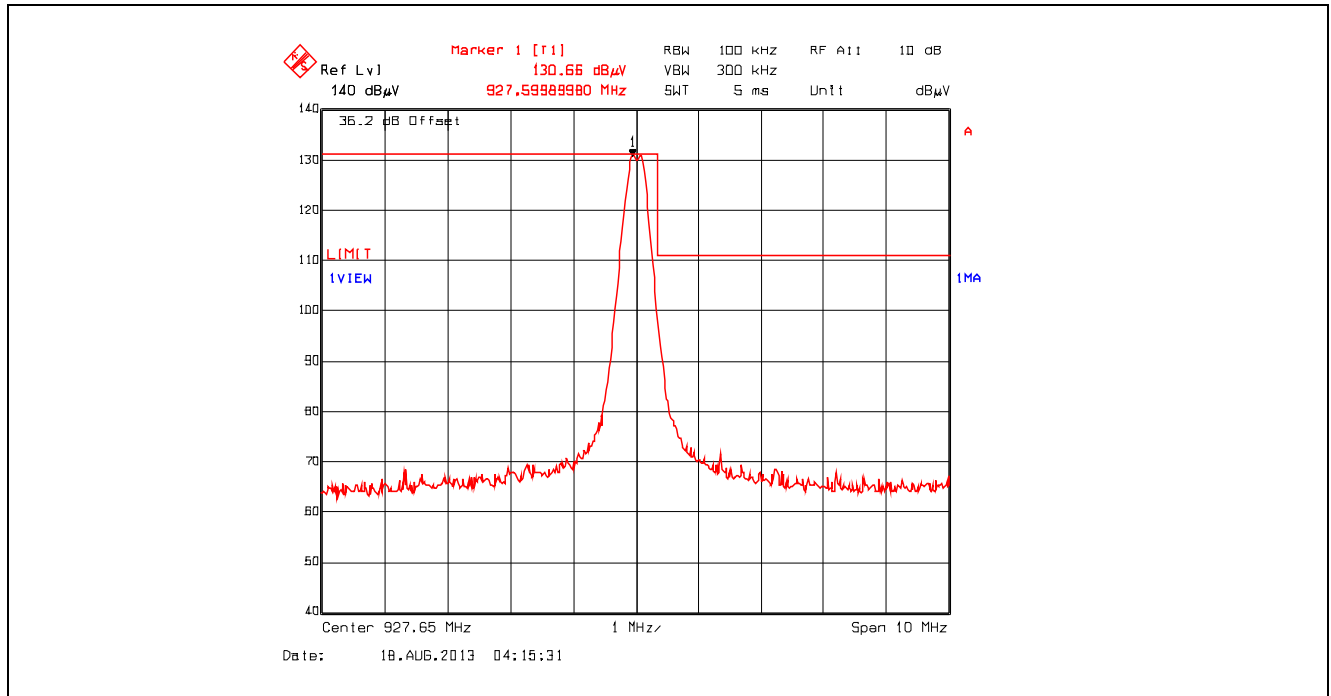
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File #: MCRS-061F15C247DSS

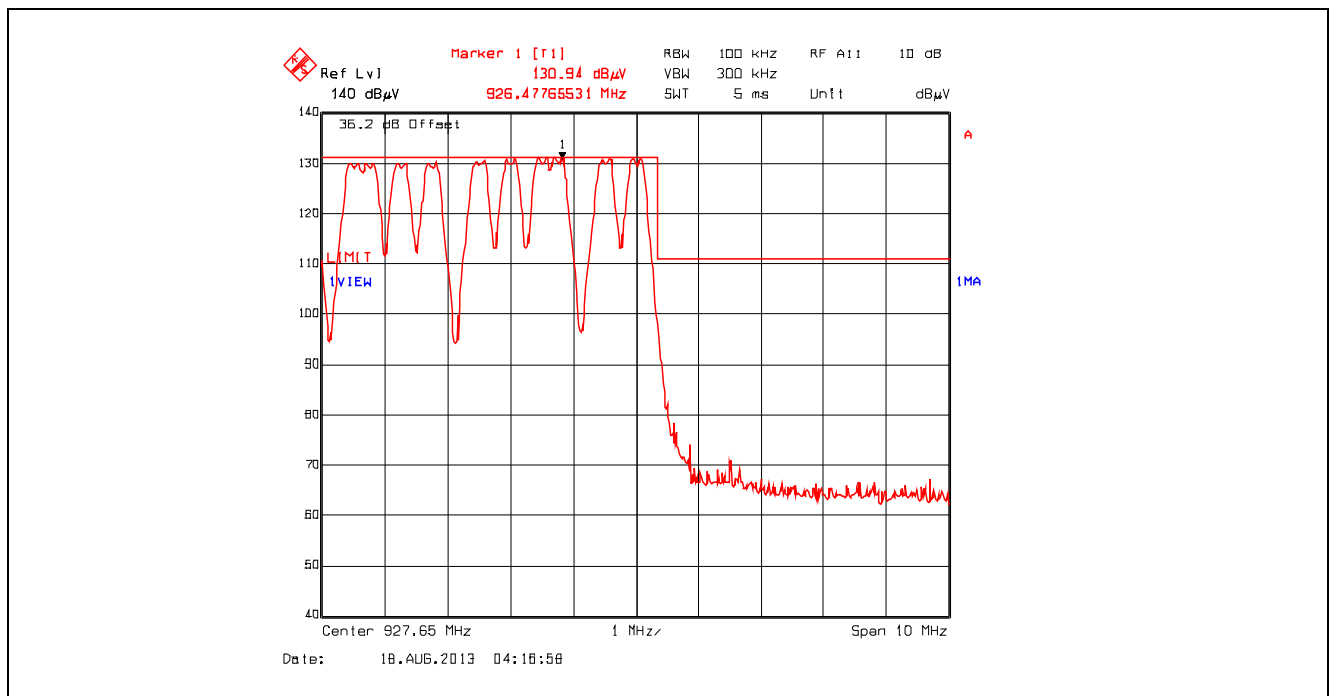
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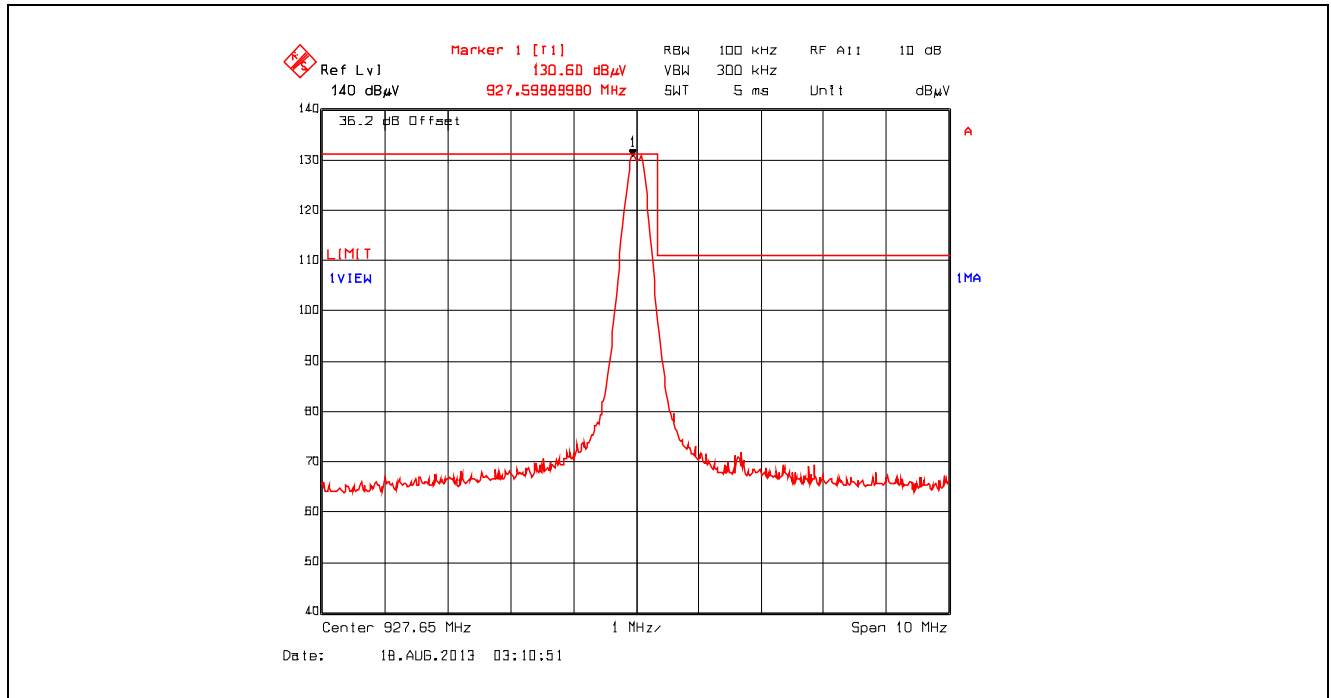
Plot 5.6.4.3.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, High End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



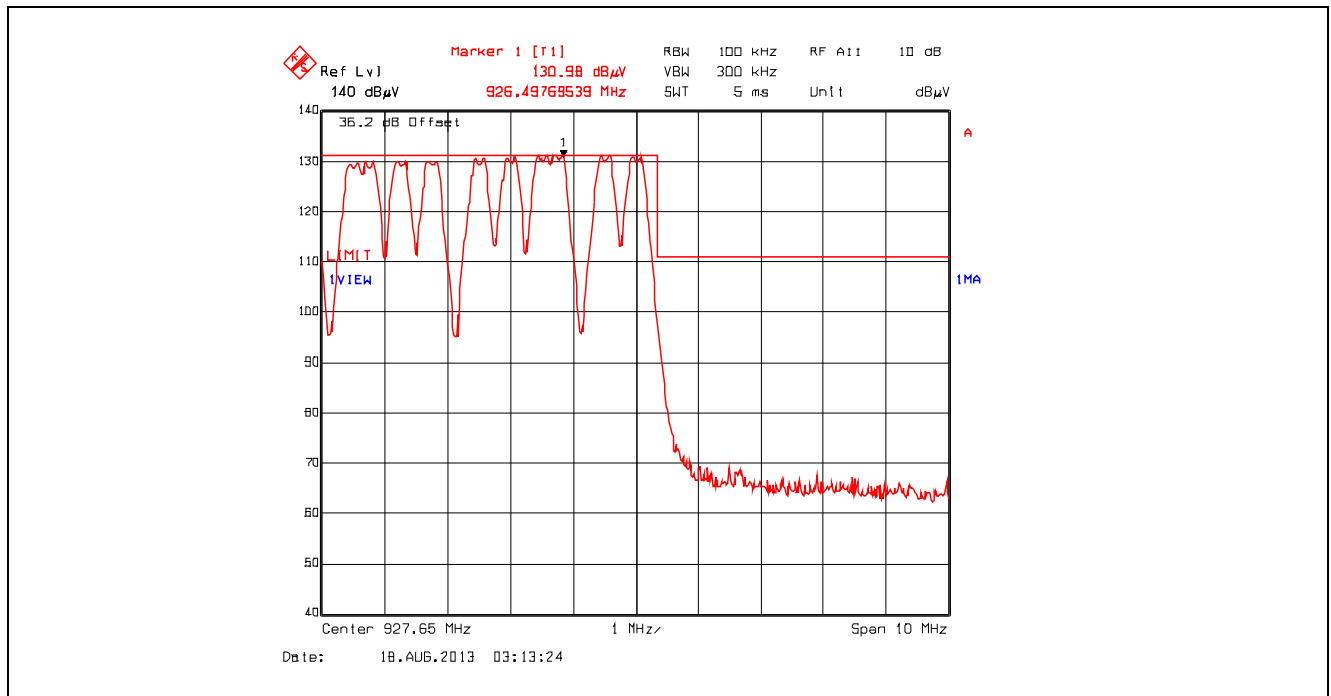
Plot 5.6.4.3.2.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



Plot 5.6.4.3.2.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, High of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



Plot 5.6.4.3.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 26, Data Rate at 172800 kbps



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5.6.4.4. EUT with 8.15 dBi Omni Directional Antenna and 1.38 dB Assembly Cable Loss

5.6.4.4.1. Spurious Radiated Emissions

Fundamental Frequency:		902.40 MHz					
Software Power Setting:		30					
Measured Conducted Power:		28.45 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
902.40	130.93	--	V	--	--	--	--
902.40	129.89	--	H	--	--	--	--
2707.20	50.43	46.31	V	54.0	110.9	-7.7	Pass*
2707.20	53.44	51.03	H	54.0	110.9	-3.0	Pass*
3609.60	48.22	40.34	V	54.0	110.9	-13.7	Pass*
3609.60	47.28	36.98	H	54.0	110.9	-17.0	Pass*
4512.00	47.49	35.74	V	54.0	110.9	-18.3	Pass*
4512.00	49.49	40.39	H	54.0	110.9	-13.6	Pass*
5414.40	48.60	37.79	V	54.0	110.9	-16.2	Pass*
5414.40	48.70	37.08	H	54.0	110.9	-16.9	Pass*
8121.60	54.72	44.84	V	54.0	110.9	-9.2	Pass*
8121.60	55.52	45.62	H	54.0	110.9	-8.4	Pass*
9024.00	56.93	47.61	V	54.0	110.9	-6.4	Pass*
9024.00	61.42	52.58	H	54.0	110.9	-1.4	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:		914.90 MHz					
Software Power Setting:		30					
Measured Conducted Power:		28.70 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
914.90	129.13	--	V	--	--	--	--
914.90	128.22	--	H	--	--	--	--
2744.70	50.99	47.17	V	54.0	109.1	-6.8	Pass*
2744.70	51.89	49.82	H	54.0	109.1	-4.2	Pass*
3659.60	48.70	40.92	V	54.0	109.1	-13.1	Pass*
3659.60	47.02	36.31	H	54.0	109.1	-17.7	Pass*
4574.50	49.23	39.10	V	54.0	109.1	-14.9	Pass*
4574.50	48.64	38.60	H	54.0	109.1	-15.4	Pass*
7319.20	53.67	43.20	V	54.0	109.1	-10.8	Pass*
7319.20	54.22	45.10	H	54.0	109.1	-8.9	Pass*
8234.10	56.17	42.73	V	54.0	109.1	-11.3	Pass*
8234.10	56.01	47.07	H	54.0	109.1	-6.9	Pass*
9149.00	57.40	47.95	V	54.0	109.1	-6.1	Pass*
9149.00	59.90	51.73	H	54.0	109.1	-2.3	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

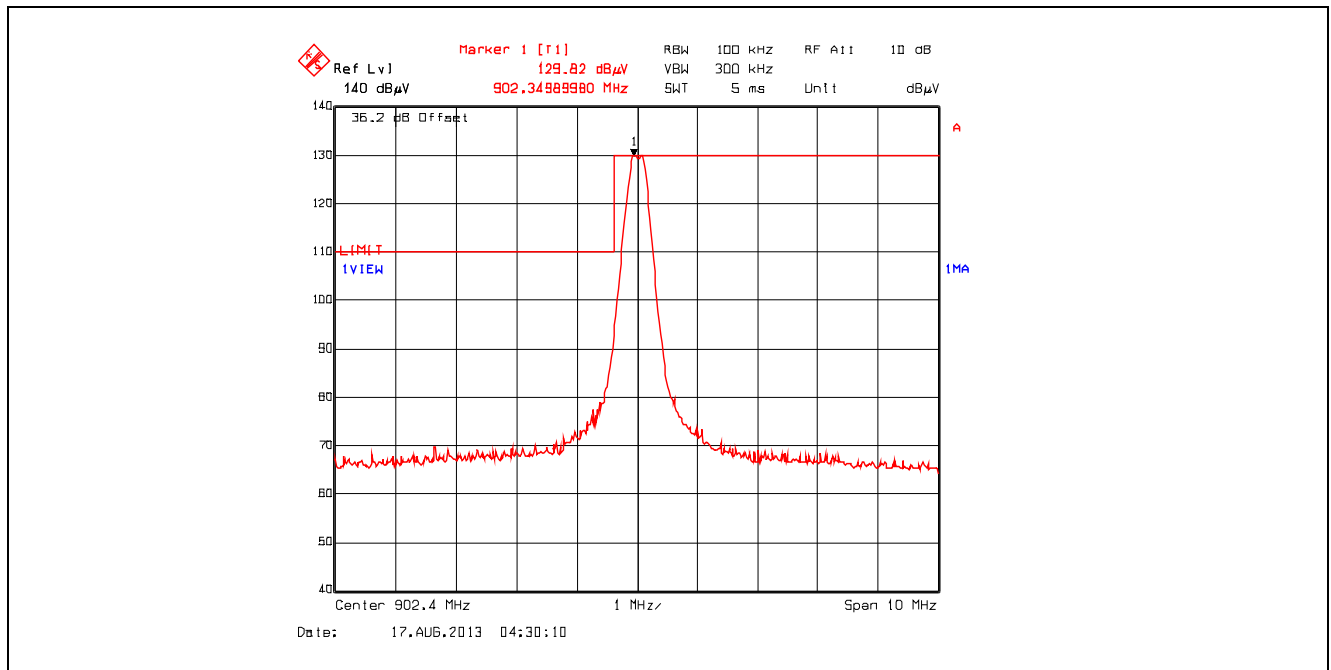
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency: 927.65 MHz							
Software Power Setting: 30							
Measured Conducted Power: 29.20 dBm							
Frequency Test Range: 30 MHz – 10 GHz							
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
927.65	128.32	--	V	--	--	--	--
927.65	128.52	--	H	--	--	--	--
2782.95	49.18	45.30	V	54.0	108.5	-8.7	Pass*
2782.95	52.73	50.06	H	54.0	108.5	-3.9	Pass*
3710.60	46.67	35.69	V	54.0	108.5	-18.3	Pass*
3710.60	46.23	35.29	H	54.0	108.5	-18.7	Pass*
4638.25	48.06	38.48	V	54.0	108.5	-15.5	Pass*
4638.25	48.42	39.02	H	54.0	108.5	-15.0	Pass*
5565.90	49.94	37.04	V	54.0	108.5	-17.0	Pass*
5565.90	50.18	40.61	H	54.0	108.5	-13.4	Pass*
8348.85	54.27	42.84	V	54.0	108.5	-11.2	Pass*
8348.85	54.62	45.27	H	54.0	108.5	-8.7	Pass*
9276.50	60.72	52.81	V	54.0	108.5	-1.2	Pass*
9276.50	60.98	52.92	H	54.0	108.5	-1.1	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

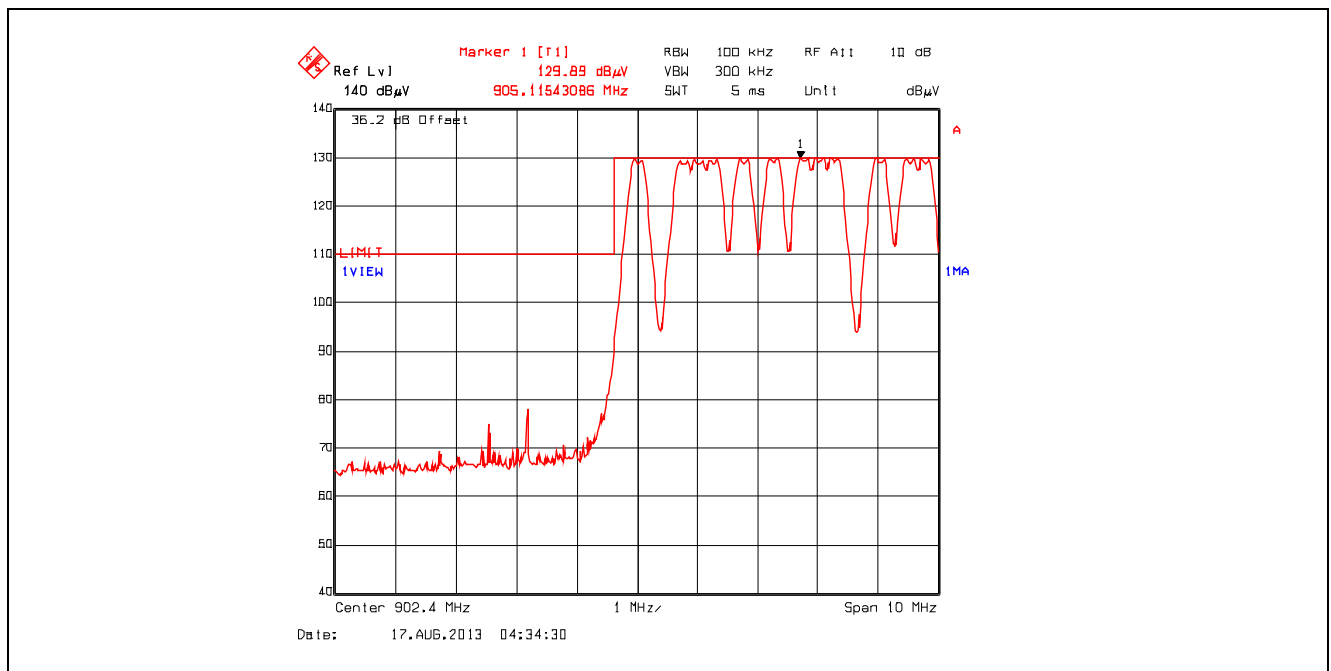
*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

5.6.4.4.2. Band-Edge RF Radiated Emissions

Plot 5.6.4.4.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



Plot 5.6.4.4.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



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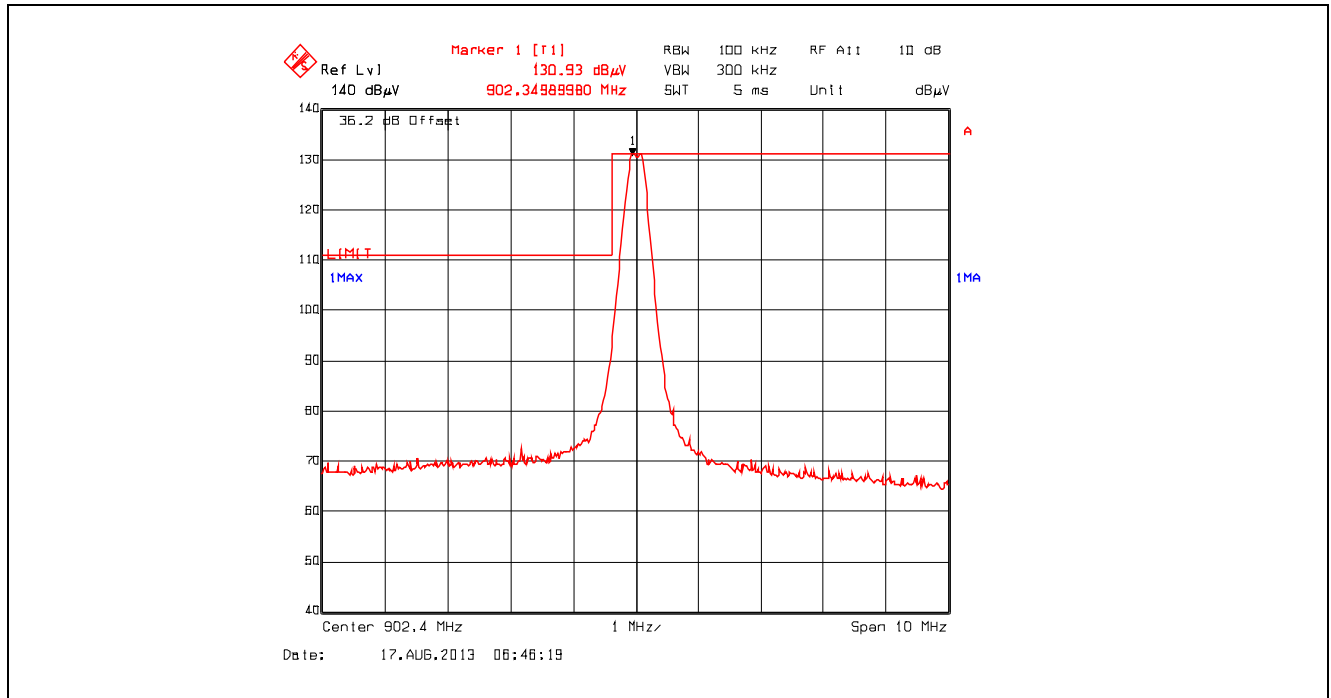
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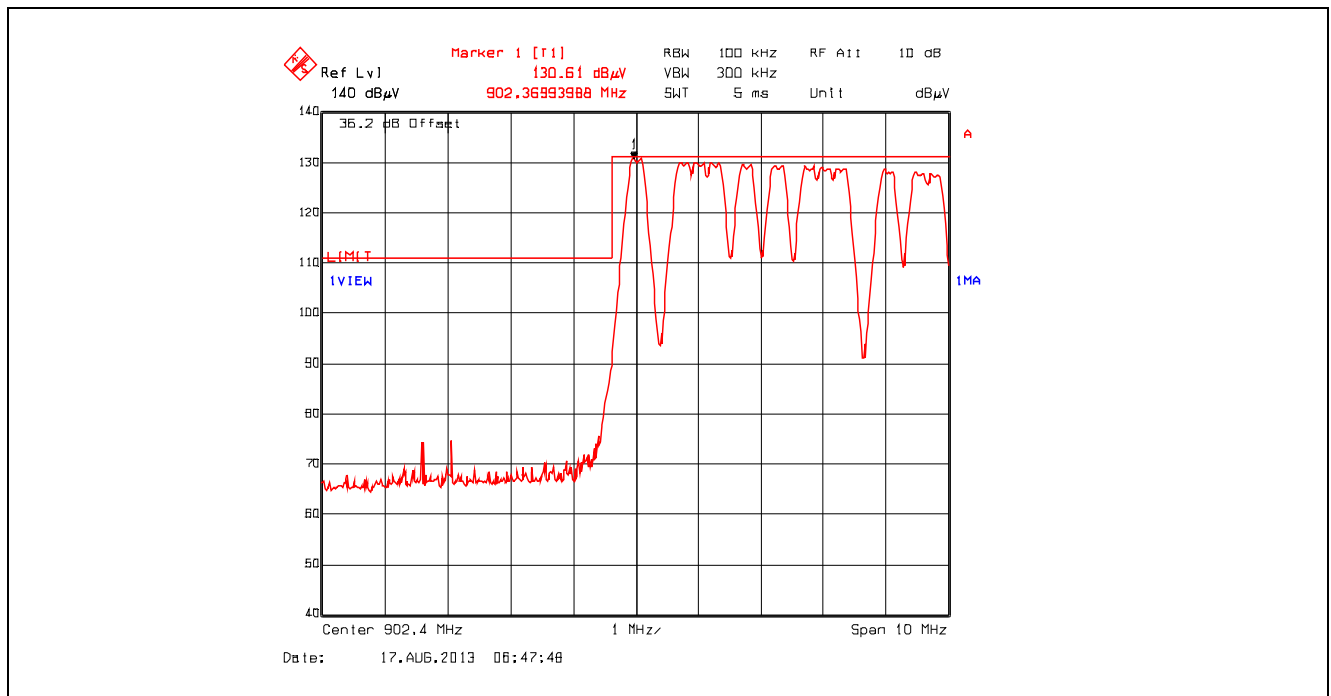
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Plot 5.6.4.4.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



Plot 5.6.4.4.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



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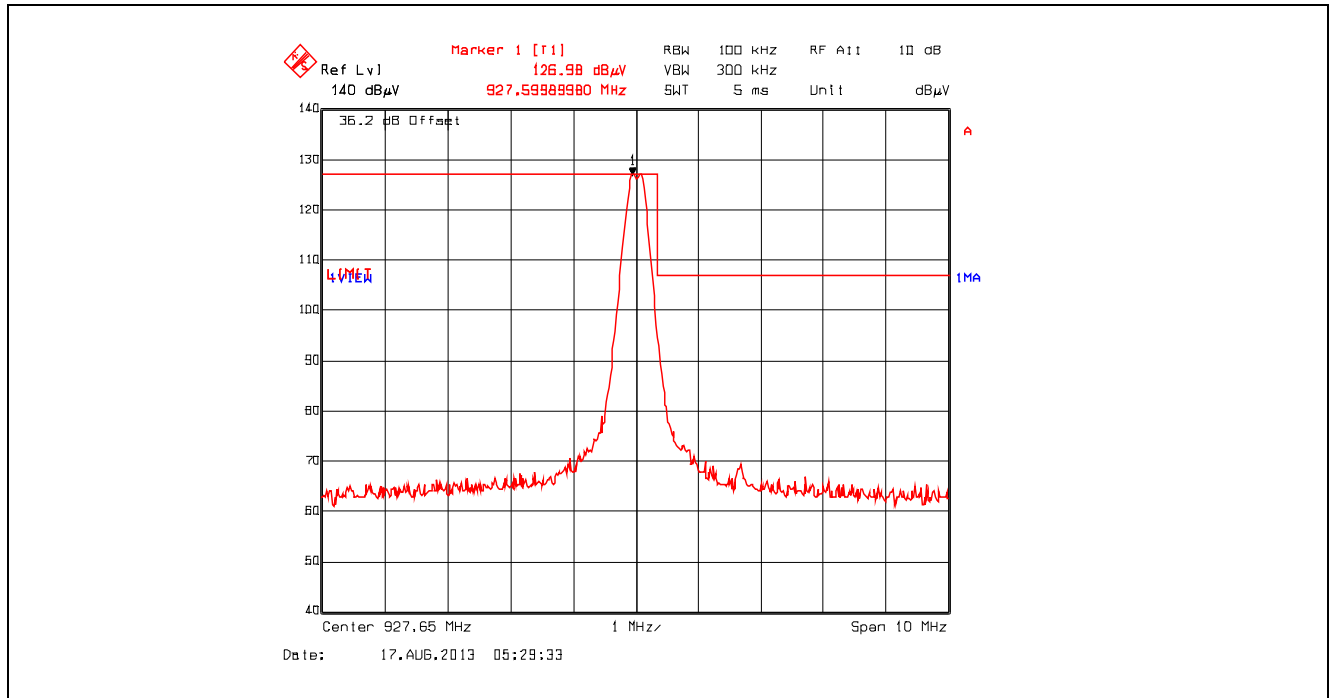
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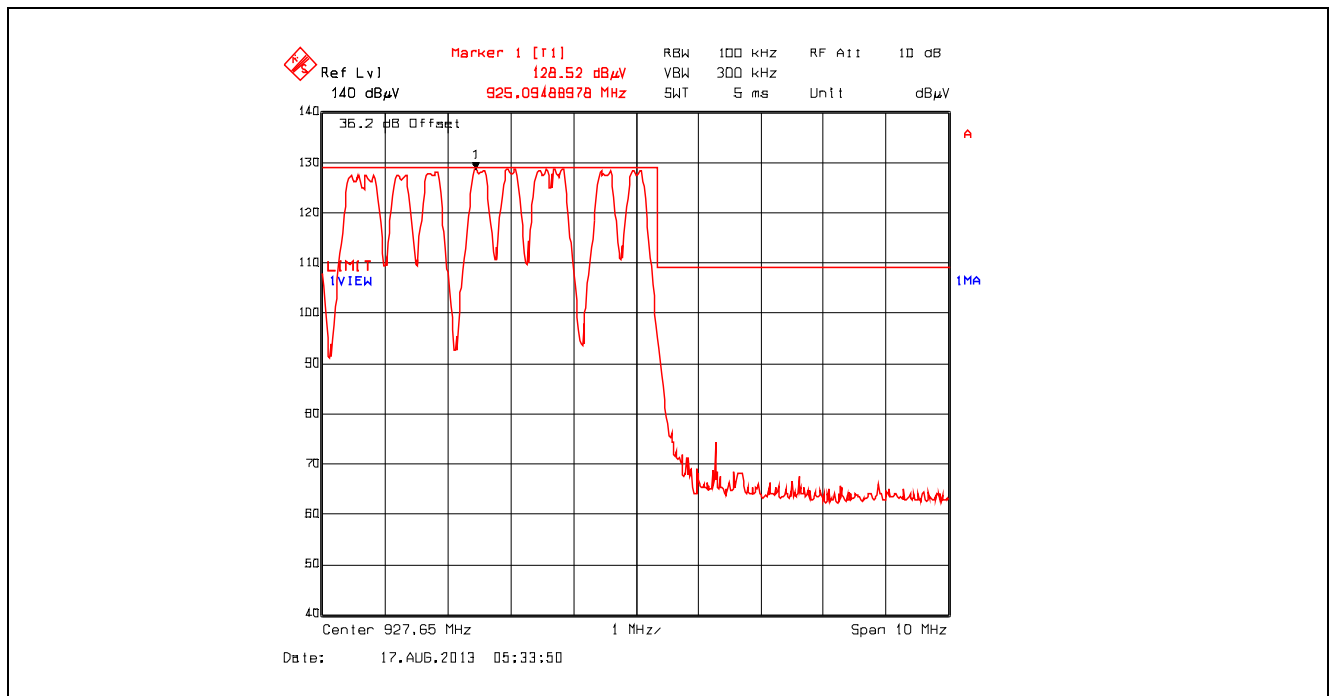
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Plot 5.6.4.4.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, High End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



Plot 5.6.4.4.2.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



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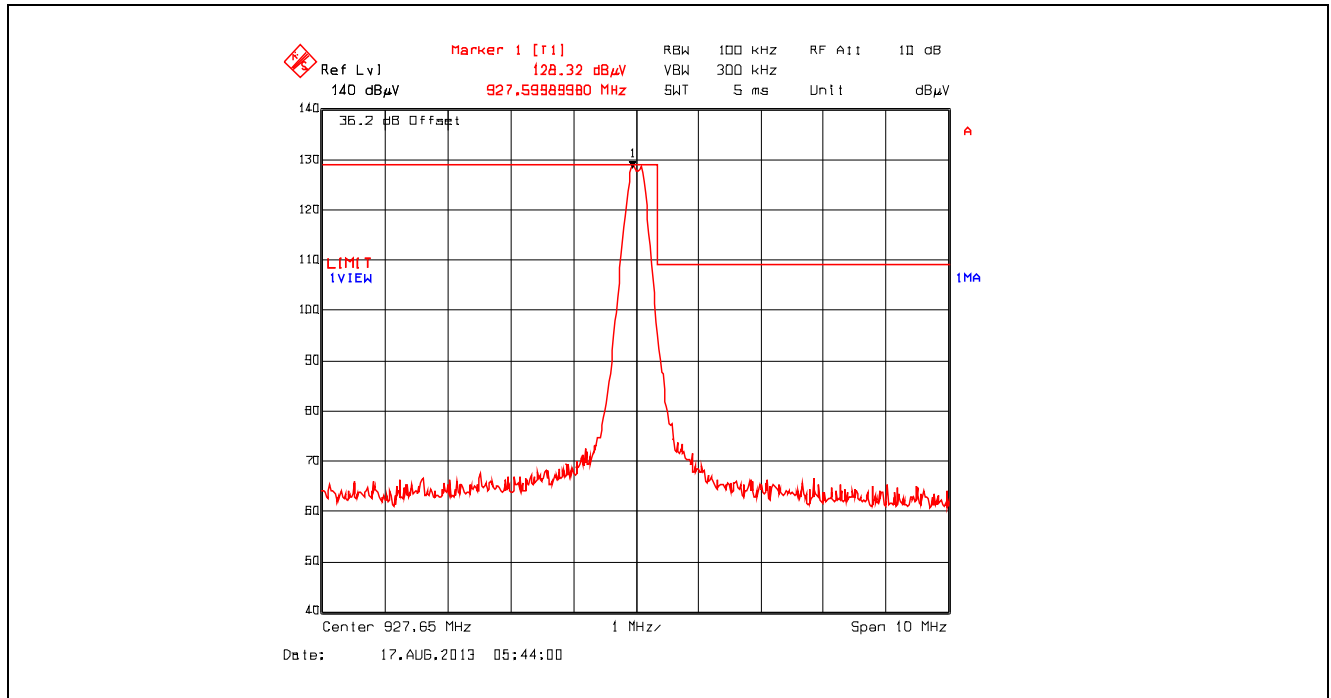
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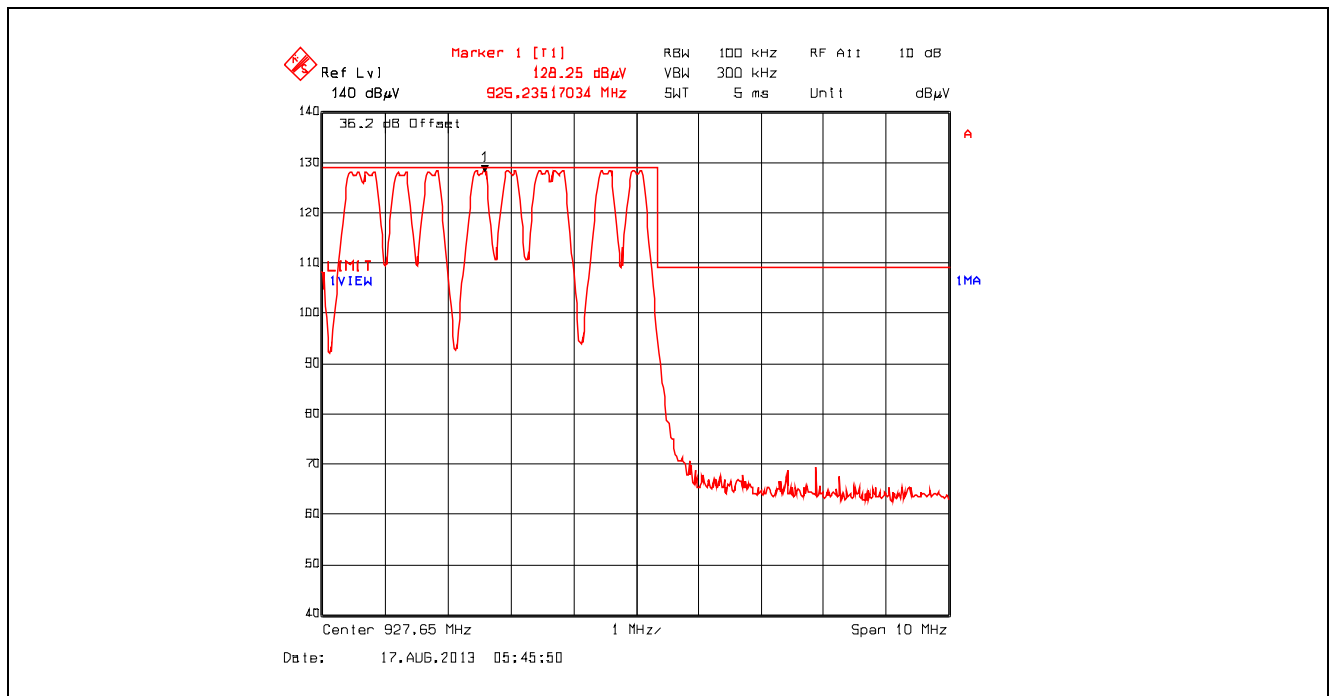
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Plot 5.6.4.4.2.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, High of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



Plot 5.6.4.4.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 30, Data Rate at 172800 kbps



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5.6.4.5. EUT with 13.15 dBi Yagi Antenna and 1.38 dB Assembly Cable Loss

5.6.4.5.1. Spurious Radiated Emissions

Fundamental Frequency:		902.40 MHz					
Software Power Setting:		20					
Measured Conducted Power:		22.69 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
902.40	128.78	--	V	--	--	--	--
902.40	128.91	--	H	--	--	--	--
2707.20	52.76	49.61	V	54.0	108.9	-4.4	Pass*
2707.20	48.03	43.56	H	54.0	108.9	-10.4	Pass*
4512.00	47.76	35.00	V	54.0	108.9	-19.0	Pass*
4512.00	47.29	34.25	H	54.0	108.9	-19.8	Pass*
5414.40	46.81	34.81	V	54.0	108.9	-19.2	Pass*
5414.40	47.35	35.12	H	54.0	108.9	-18.9	Pass*
8121.60	52.11	39.43	V	54.0	108.9	-14.6	Pass*
8121.60	52.71	40.35	H	54.0	108.9	-13.7	Pass*
9024.00	53.25	42.54	V	54.0	108.9	-11.5	Pass*
9024.00	57.79	48.77	H	54.0	108.9	-5.2	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

Fundamental Frequency:		914.90 MHz					
Software Power Setting:		20					
Measured Conducted Power:		23.08 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
914.90	129.12	--	V	--	--	--	--
914.90	129.87	--	H	--	--	--	--
2744.70	50.22	46.78	V	54.0	109.9	-7.2	Pass*
2744.70	46.61	41.01	H	54.0	109.9	-13.0	Pass*
4574.50	47.44	34.68	V	54.0	109.9	-19.3	Pass*
7319.20	51.39	38.71	V	54.0	109.9	-15.3	Pass*
7319.20	51.87	38.96	H	54.0	109.9	-15.0	Pass*
8234.10	51.05	39.11	V	54.0	109.9	-14.9	Pass*
8234.10	52.83	40.86	H	54.0	109.9	-13.1	Pass*
9149.00	55.37	43.96	V	54.0	109.9	-10.0	Pass*
9149.00	56.82	46.74	H	54.0	109.9	-7.3	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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Fundamental Frequency:		927.65 MHz					
Software Power Setting:		20					
Measured Conducted Power:		24.11 dBm					
Frequency Test Range:		30 MHz – 10 GHz					
Frequency (MHz)	RF Peak Level (dBµV/m)	RF Avg Level (dBµV/m)	Antenna Plane (H/V)	Limit 15.209 (dBµV/m)	Limit 15.247 (dBµV/m)	Margin (dB)	Pass/Fail
927.65	130.93	--	V	--	--	--	--
927.65	130.60	--	H	--	--	--	--
2782.95	47.65	42.70	V	54.0	110.9	-11.3	Pass*
2782.95	45.47	40.08	H	54.0	110.9	-13.9	Pass*
4638.25	46.66	35.05	V	54.0	110.9	-19.0	Pass*
4638.25	46.42	34.45	H	54.0	110.9	-19.6	Pass*
5565.90	47.61	35.46	V	54.0	110.9	-18.5	Pass*
5565.90	47.93	34.84	H	54.0	110.9	-19.2	Pass*
8348.85	52.14	39.85	V	54.0	110.9	-14.2	Pass*
8348.85	53.08	41.35	H	54.0	110.9	-12.7	Pass*
9276.50	56.52	45.45	V	54.0	110.9	-8.6	Pass*
9276.50	57.36	48.70	H	54.0	110.9	-5.3	Pass*
All other spurious emissions and harmonics are more than 20 dB below the applicable limit.							

*Field strength of emissions appearing within restricted frequency bands shall not exceed the limits in § 15.209.

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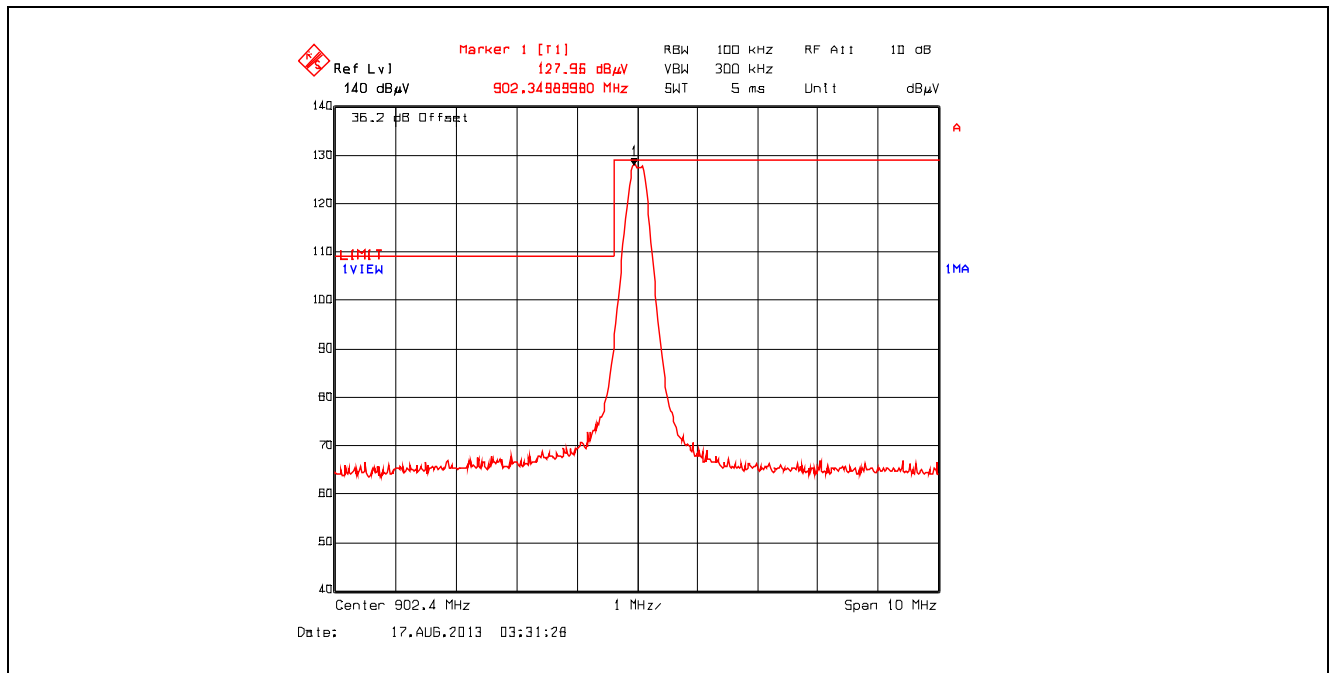
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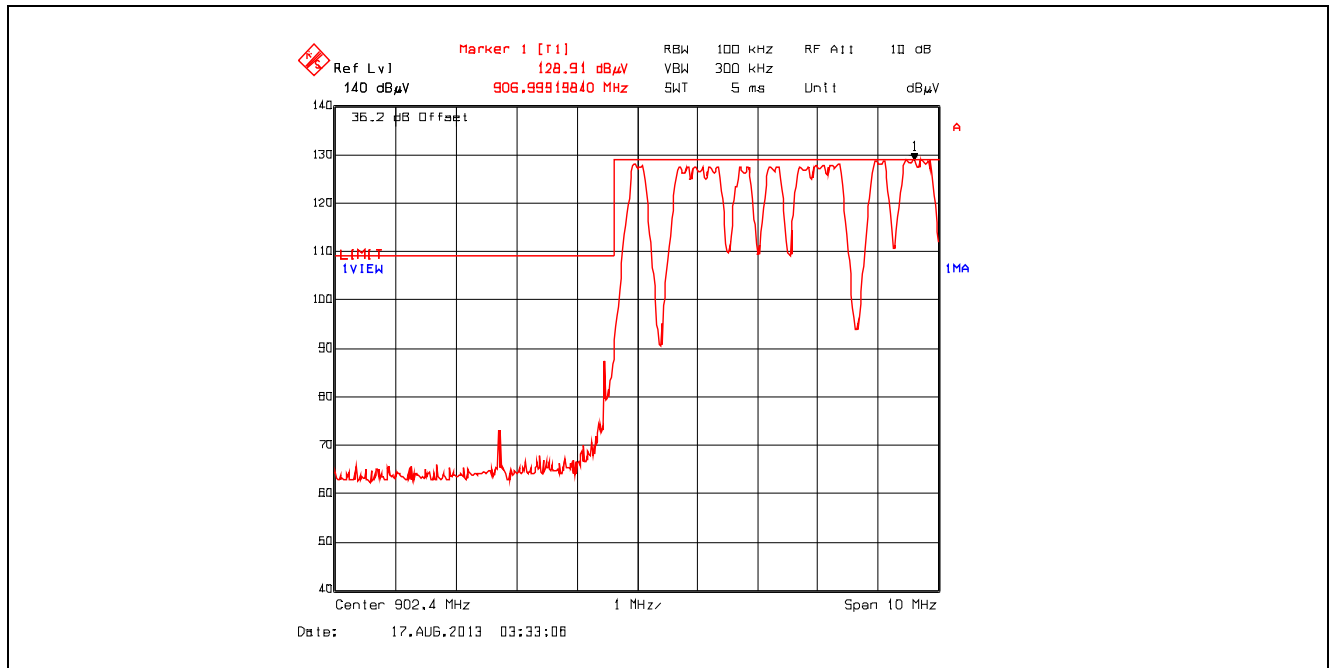
All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

5.6.4.5.2. Band-Edge RF Radiated Emissions

Plot 5.6.4.5.2.1. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



Plot 5.6.4.5.2.2. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



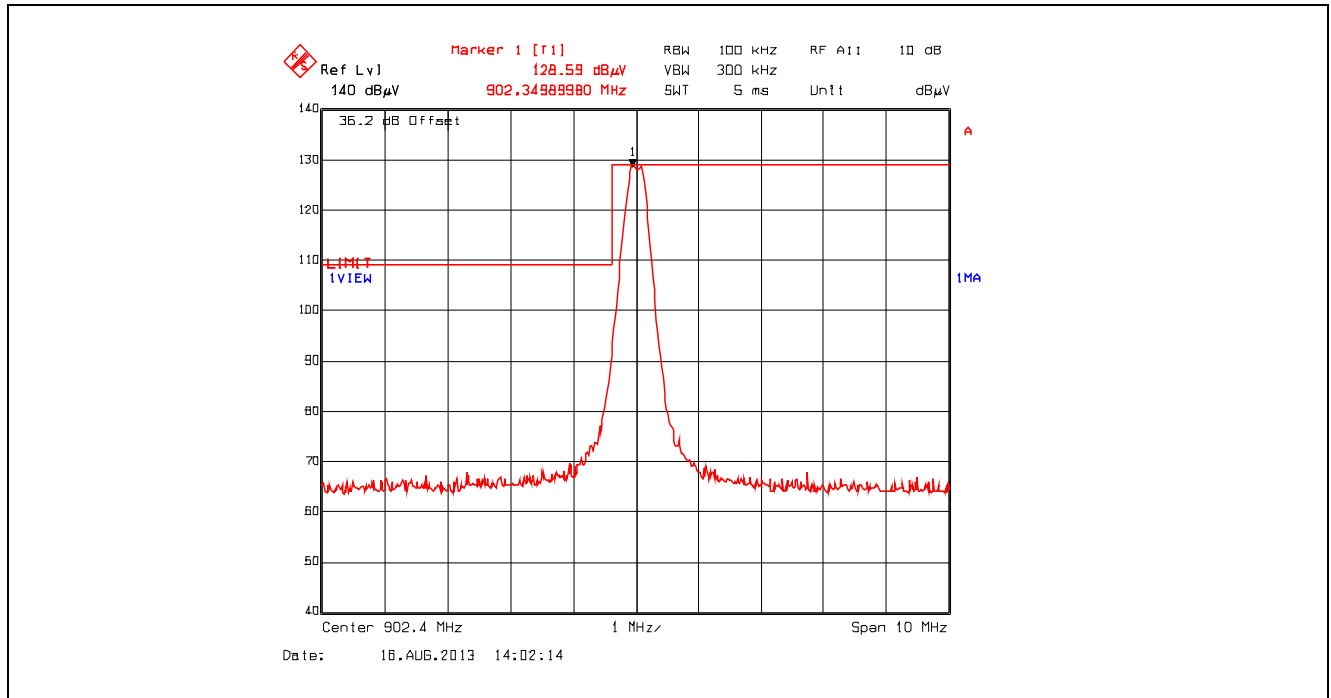
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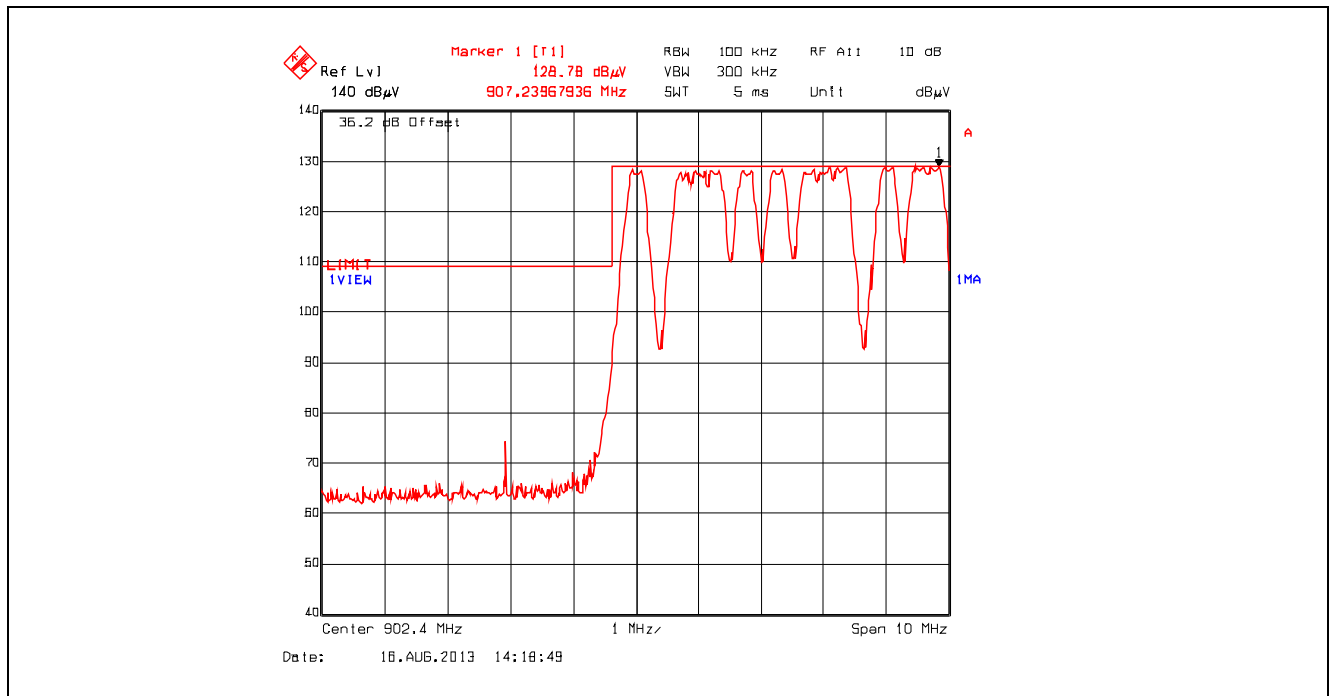
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Plot 5.6.4.5.2.3. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, Low End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



Plot 5.6.4.5.2.4. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, Low End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



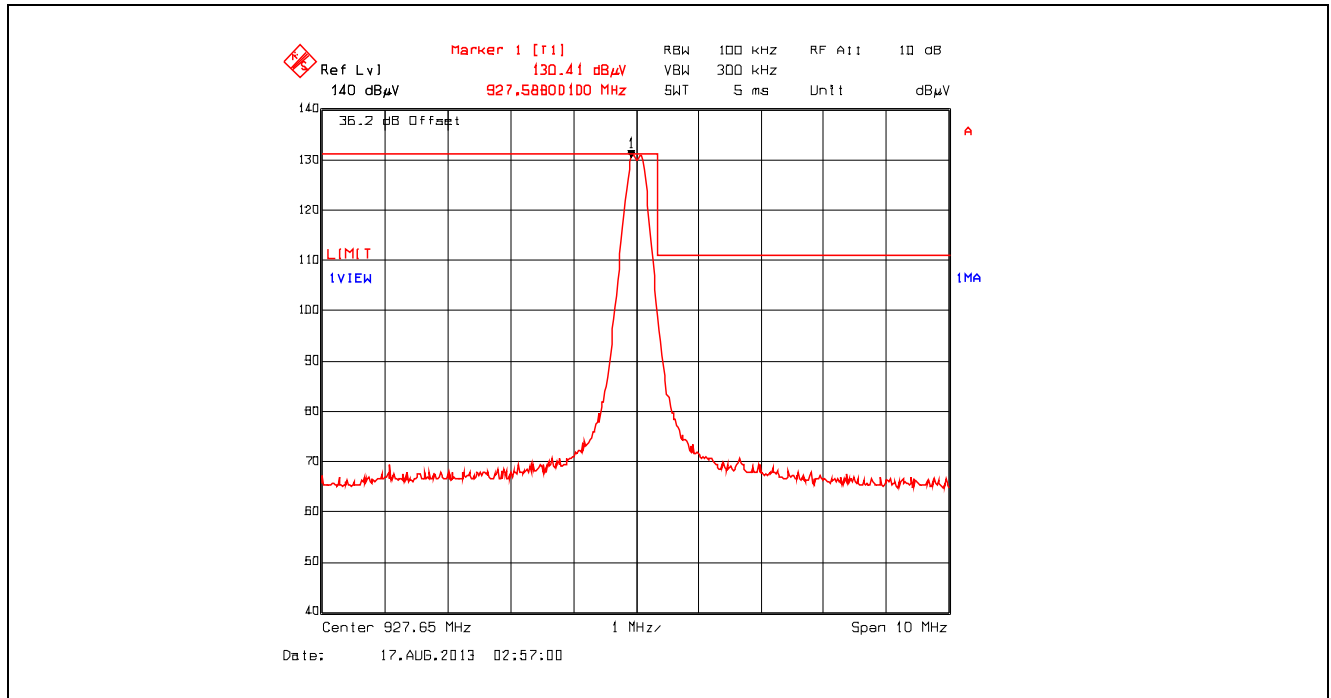
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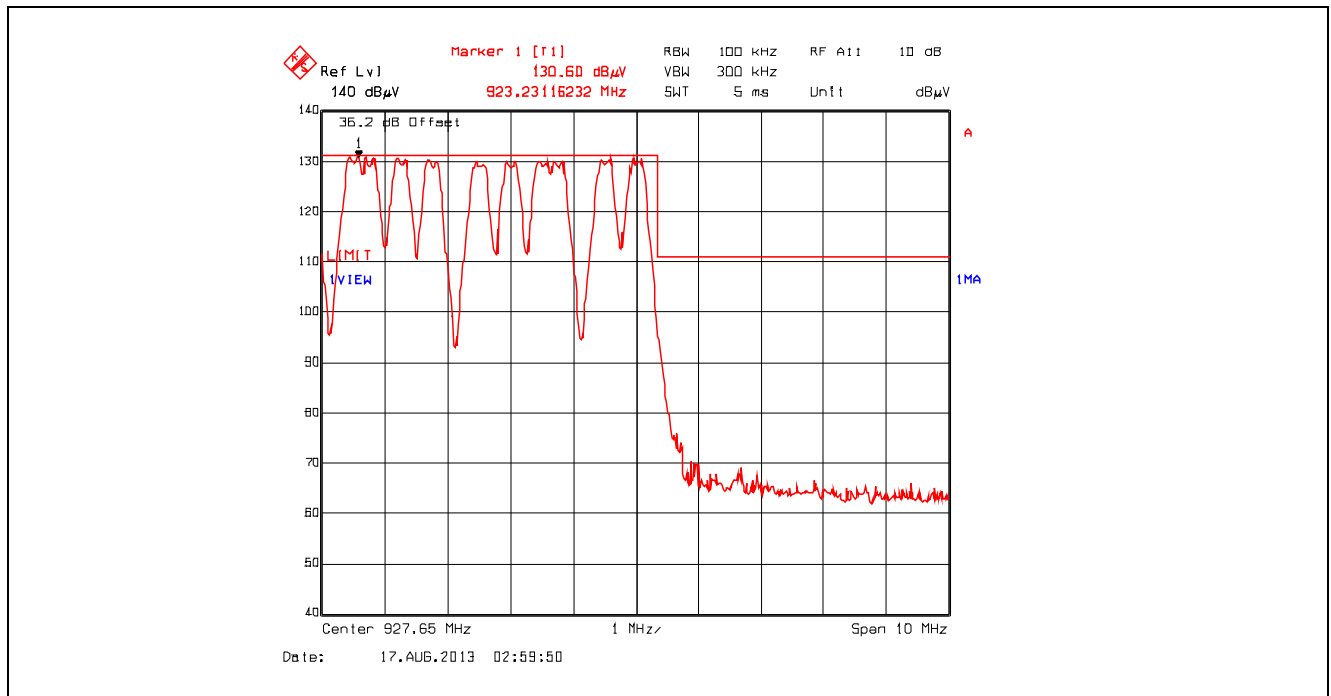
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Plot 5.6.4.5.2.5. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Single Frequency Mode, High End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



Plot 5.6.4.5.2.6. Band-Edge RF Radiated Emissions at 3 m, Horizontal Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



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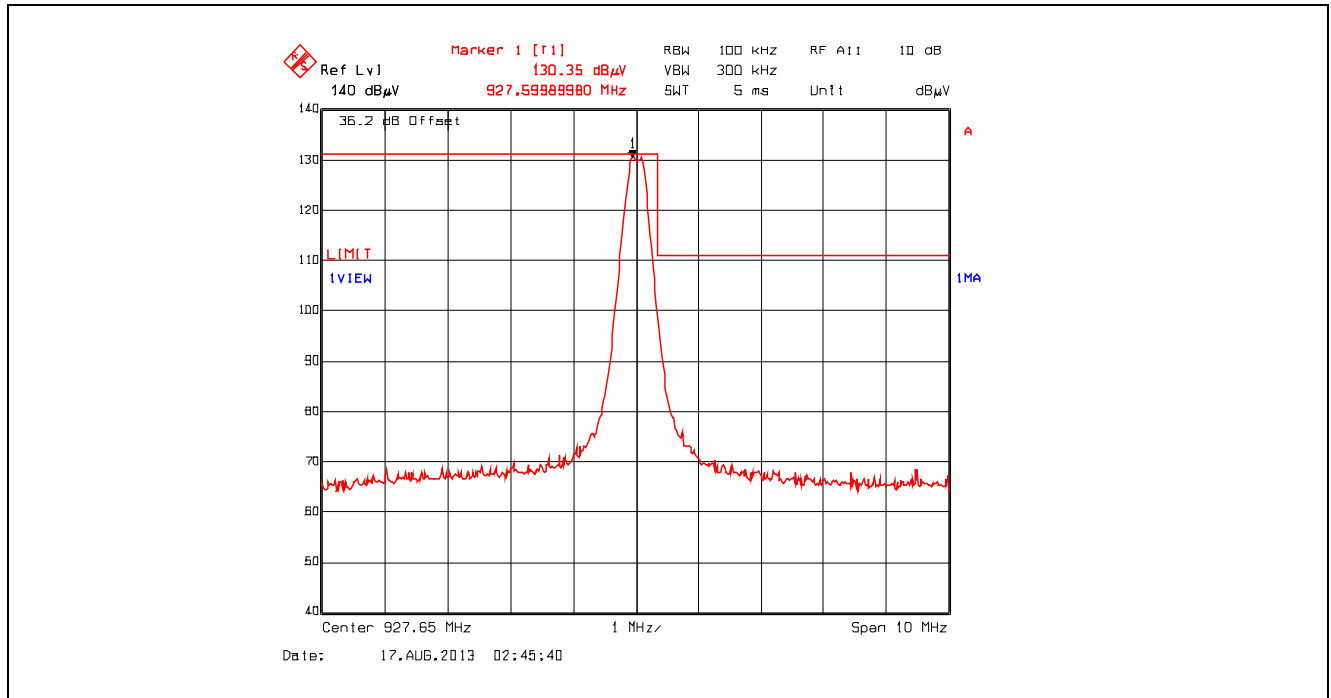
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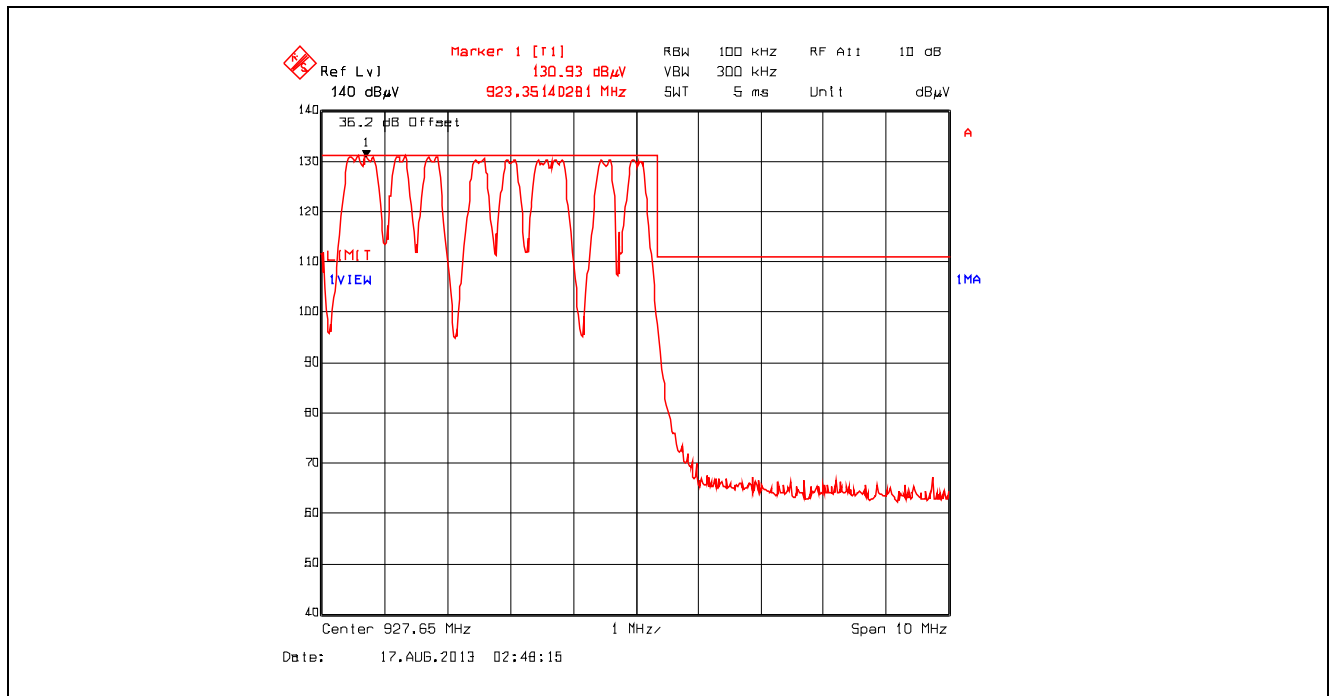
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Plot 5.6.4.5.2.7. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Single Frequency Mode, High of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



Plot 5.6.4.5.2.8. Band-Edge RF Radiated Emissions at 3 m, Vertical Polarization
Pseudorandom Channel Hopping Mode, High End of Frequency Band, Power Setting 20, Data Rate at 172800 kbps



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5.7. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091]

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation.

FCC 47 CFR § 1.1310:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.7.1. Method of Measurements

Refer to Sections 1.1310, 2.1091

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:

$$S = \frac{P \cdot G}{4 \cdot \pi \cdot r^2} = \frac{EIRP}{4 \cdot \pi \cdot r^2}$$

Where:
P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

5.7.2. RF Evaluation

Evaluation of RF Exposure Compliance Requirements	
RF Exposure Requirements	Compliance with FCC Rules
Minimum calculated separation distance between antenna and persons required: *23 cm	Manufacturer' instruction for separation distance between antenna and persons required: 23 cm.
Antenna installation and device operating instructions for installers (professional/unskilled users), and the parties responsible for ensuring compliance with the RF exposure requirement	Antenna installation and device operating instructions shall be provided to installers to maintain and ensure compliance with RF exposure requirements.
Caution statements and/or warning labels that are necessary in order to comply with the exposure limits	Refer to User's Manual for RF Exposure Information.
Any other RF exposure related issues that may affect MPE compliance	None.

*The minimum separation distance between the antenna and bodies of users are calculated using the following formula:

RF EXPOSURE DISTANCE LIMITS

$$r = \sqrt{\frac{P \cdot G}{4 \cdot \pi \cdot S}} = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}}$$

$S = f/1500 = 902.4/1500 = 0.6 \text{ mW/cm}^2$
 $EIRP = 36.0 \text{ dBm} = 10^{36/10} \text{ mW} = 3981 \text{ mW}$ (Worst Case)

$$(\text{Minimum Safe Distance, } r) = \sqrt{\frac{EIRP}{4 \cdot \pi \cdot S}} = \sqrt{\frac{3981}{4 \cdot \pi \cdot (0.6)}} \approx 23 \text{ cm}$$

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EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Spectrum Analyzer	Hewlett Packard	HP 8593EM	3412A00103	9 kHz–26.5 GHz	06 Feb 2014
Attenuator	Pasternack	PE7010-20	-	DC–2 GHz	11 Jan 2014
L.I.S.N	EMCO	3825/2	8907-1531	0.01 -100 MHz	14 May 2014
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20Hz–40 GHz	02 Nov 2013
Attenuator	Pasternack	PE7024-20	6	DC–26.5 GHz	Cal on use
DC Block	Hewlett Packard	11742A	12460	0.045–26.5 GHz	Cal on use
High Pass Filter	K & L	11SH10-1500/T8000	2	Cut off 900 MHz	Cal on use
Spectrum Analyzer	Rohde & Schwarz	ESU40	100033	20 Hz – 40 GHz	07 Mar 2014
RF Amplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	25 Mar 2014
RF Amplifier	Hewlett Packard	84498	3008A00769	1 – 26.5 GHz	25 Jun 2014
Biconi-Log Antenna	ETS Lindgren	3142C	00034792	26 – 3000 MHz	26 Jun 2014
Horn Antenna	ETS Lindgren	3115	6570	1 -18 GHz	07 June 2014
High Pass Filter	K & L	11SH10-1500/T8000	2	Cut off 900 MHz	Cal on use
Band Reject Filter	Micro-Tronics	BRC50722	001	Cut off 902-928 MHz	Cal on use
Attenuator	Pasternack	PE7024-10	4	DC–26.5 GHz	Cal on use
Horn Antenna	EMCO	3155	5955	1 – 18 GHz	07 Mar 2014

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EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (9 kHz – 30 MHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.44	± 1.8
U	Expanded uncertainty U: $U = 2u_c(y)$	± 2.89	± 3.6

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.79	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured (dB)	Limit (dB)
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration