Test of Silver Spring Network NIC 451

To: FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: SSNT69-U2 Rev B

TEST REPORT

FROM

Test of Silver Spring Network NIC 451

To FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: SSNT69-U2 Rev B

This report supersedes: SSNT69-U2 Rev A

Manufacturer: Silver Spring Networks
555 Broadway Street
Redwood City
California 94063, USA

Product Function: Machine to machine communication

Copy No: pdf **Issue Date:** 11th November 2013

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
440 Boulder Court, Suite 200
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

ACCREDITED
TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

ilac-MRA

A2LA World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 27th day of March 2012.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2013

American Association for Laboratory Accreditation Corporate Seal 1978 District of Columbia A2LA

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.
Phase I - recognition for product testing
Phase II – recognition for both product testing and certification
N/A – Not Applicable

**EU MRA – European Union Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

United States of America – Telecommunication Certification Body (TCB)
TCB Identifier – US0159

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)
RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	7th November 2013	Initial release.
Rev B	11th November 2013	Page 11 – For ITU Emission Designator, changed to 400kbps, 300kHz to 300kbps, 400kHz Page 12 – Change of model number

1. TEST RESULT CERTIFICATE

Manufacturer:	Silver Spring Networks 555 Broadway Street Redwood City California 94063, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	Network Interface Card (NIC)	Telephone:	+1 925 462 0304
Model:	NIC 451-0103-04	Fax:	+1 925 462 0306
S/N:	00:13:50:02:00:A7:00:71		
Test Date(s):	8th to 18th October 2013	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part15.247 & IC RSS-210	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

ACCREDITED
TEST CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.247	2012	Code of Federal Regulations
(ii)	Industry Canada RSS-210	Issue 8 Dec 2010	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands)
(iii)	Industry Canada RSS-Gen	Issue 3 Jan 2012	General Requirements and Information for the Certification of Radiocommunication Equipment.
(iv)	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(v)	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(vi)	M 3003	Edition 2. Jan 2007	Expression of Uncertainty and Confidence in Measurements
(vii)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(viii)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(ix)	A2LA	July 2012	Reference to A2LA Accreditation Status – A2LA Advertising Policy

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the Silver Spring Network NIC 451 (451-0503) to FCC Part 15.247 and Industry Canada RSS-210 regulations
Applicant:	As Manufacturer
Manufacturer:	Silver Spring Networks 555 Broadway Street Redwood City California 94063, USA
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	SSNT69-U2 Rev B
Standard(s) applied:	FCC 47 CFR Part15.247 & IC RSS-210
Date EUT received:	8th October 2013
Dates of test (from - to):	8th to 18th October 2013
No of Units Tested:	One
Type of Equipment:	Network Interface Card (NIC)
Manufacturers Trade Name:	Silver Spring Networks
Model:	NIC 451-0103-04
Location for use:	Indoor/Outdoor
Declared Frequency Range(s):	902 – 928 MHz
Type of Modulation:	900 MHz: FSK & GFSK
Declared Nominal Output Power:	902-928 MHz :+30 dBm
EUT Modes of Operation:	FHSS
Transmit/Receive Operation:	Transceiver, Simplex
Rated Input Voltage:	Nominal Voltage 4 Vdc
Operating Temperature Range:	-40ºC to +70ºC (client declared range)
ITU Emission Designator(s):	900 MHz 100 kbps 200 kHz BW GFSK: 205KF1D 900 MHz 100 kbps 300 kHz BW FSK: 120KF1D 900 MHz 150 kbps 300 kHz BW GFSK: 169KF1D 900 MHz 300 kbps 400 kHz BW GFSK: 319KF1D
EUT Dimensions:	2.75” diameter by 0.75” high
EUT Weight :	50 grams
Primary function of equipment:	Machine to machine communication over 900 MHz FHSS

3.2. Scope of Test Program

The scope of the test program was to test the Silver Spring Network NIC 451 (**NIC 451-0103-04, NIC 451-0102-03, NIC 451-0101-03**) in the frequency ranges 902 - 928 against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications for radiated and conducted emissions for intentional radiators. The intentional radiator was tested in a simulated typical installation to demonstrate compliance with the stated standards.

Need Help with this

Model Number Differences

NIC 451-0103-04 – Internal Antenna, External Antenna, 1-10V Dimmer (this model sample was tested)
NIC 451-0101-03 – Internal antenna only
NIC 451-0102-03 – External antenna only

Antenna Options

The NIC 451 (NIC 451-0103-04) has two antenna options integral and external, both options were tested.

The NIC 451 (NIC 451-0103-04) operated with the following modulations and data rates, each modulation and data rate was tested during the program. Results for the external antenna are included in this report.

Frequency Band	Modulation	Data Rate / Bandwidth
902 – 928 MHz	FSK	100 kBit/s / 300 kHz
	GFSK	100 kBit/s / 200 kHz
	GFSK	150 kBit/s / 300 FSK
	GFSK	300 kBit/s / 400 kHz

3.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Network Interface Card	Silver Spring Network	NIC 451-0103-04	00:13:50:02:00:A7:00:71
Support	Laptop	IBM	ThinkPad	None

3.4. Antenna Details

Antenna type (dipole, chip, etc)	Antenna Gain (dBi)	Manufacturer	Internal/ External	Model No.	Additional information (Include angle of coverage)
Monopole	1.2	Taoglas	External	G30.B.108111	Omnidirectional
PCB	-1.18	Ethertronics	Internal	1002342	Omnidirectional (900MHz)

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. NONE

3.6. Test Configurations

Test configurations

Frequency Band	Modulation	Data Rate (kBit/s)	Channel Center Frequency (MHz)
902 – 928 MHz	FSK	100	902.3, 915.2, 927.5
	GFSK	100	902.2, 915.2, 927.8
	GFSK	150	902.3, 915.2, 927.5
	GFSK	300	902.4, 915.6, 927.6

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

3.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

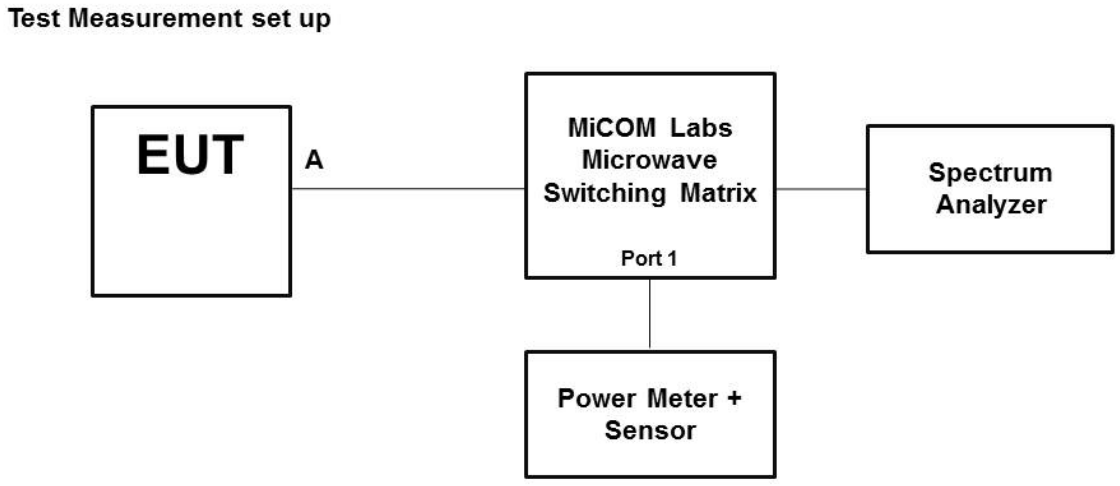
4. TEST EQUIPMENT CONFIGURATION(S)

4.1. Conducted RF Emission Test Set-up

The following tests were performed using the conducted test set-up shown in the diagram below.

1. Section 6.1.1. 20 dB and 99% Bandwidth
2. Section 6.1.2. Transmitter Channels – Channel Spacing
3. Section 6.1.3. Transmitter Channels
4. Section 6.1.4. Output Power

Conducted Test Set-Up Pictorial Representation



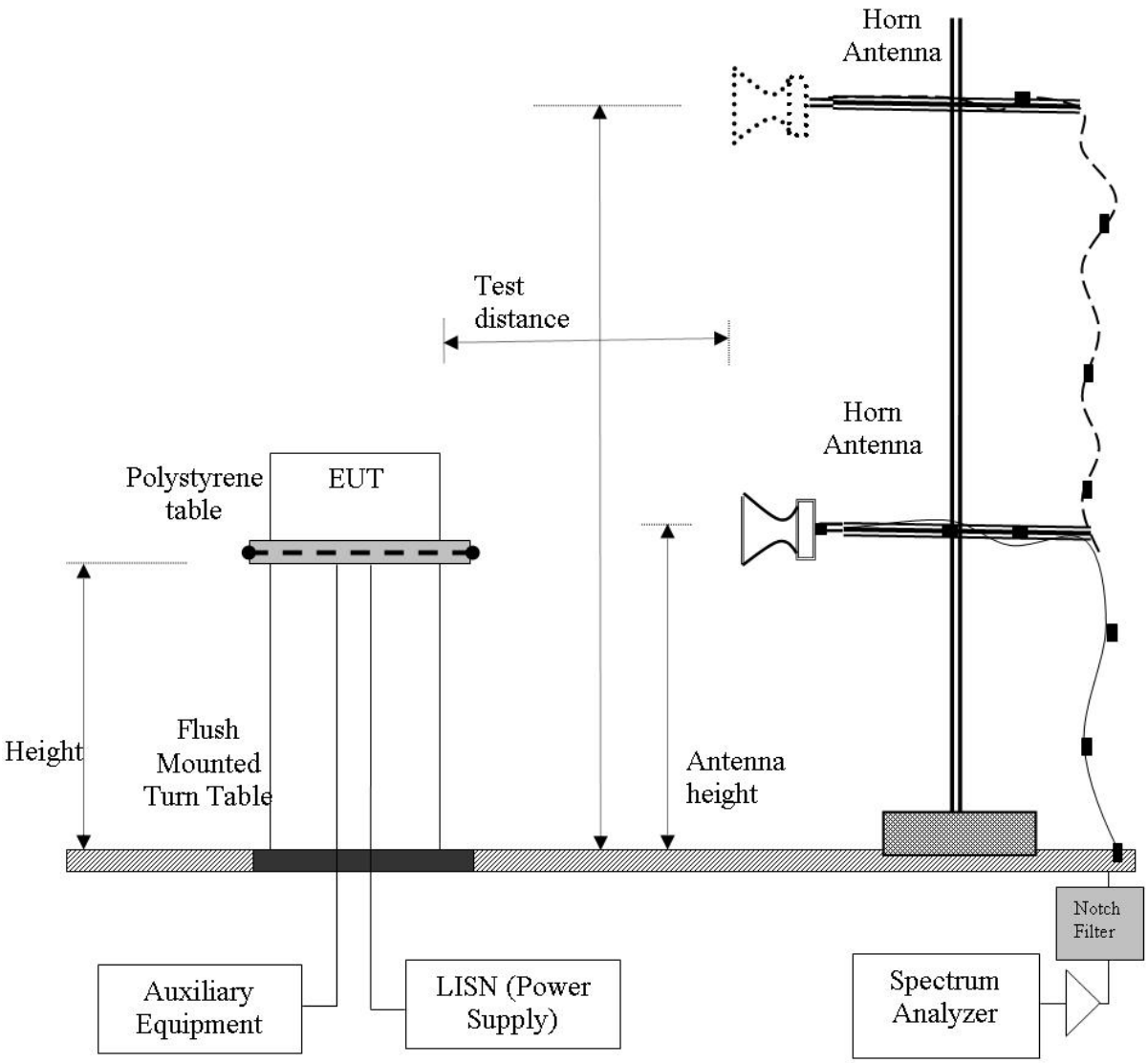
Conducted Test Measurement Setup

4.2. Radiated Spurious Emission Test Set-Up > 1 GHz

The following tests were performed using the conducted test set-up shown in the diagram below.

Section 6.1.8 Radiated Emissions

Radiated Emission Measurement Setup – Above 1 GHz

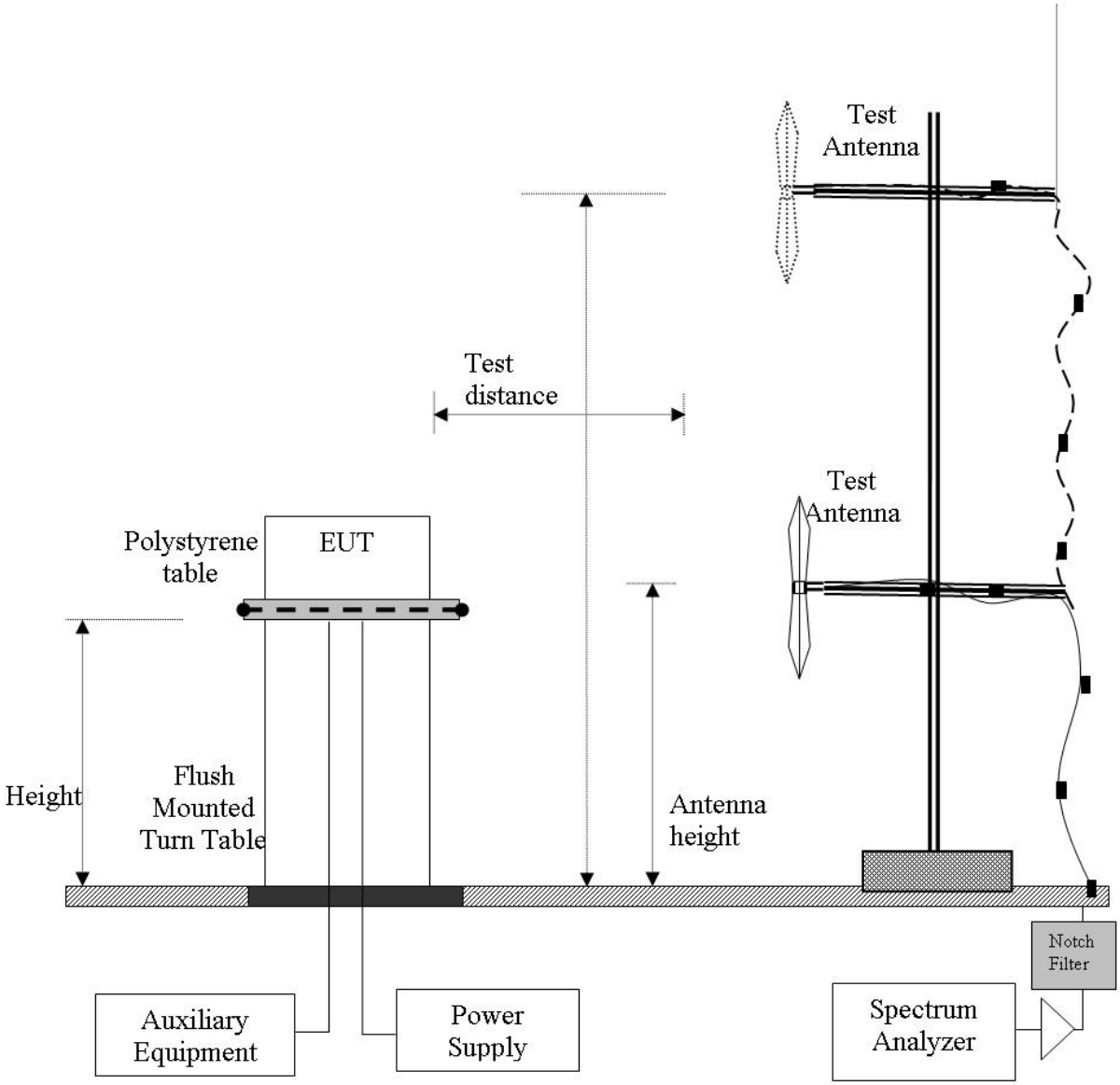


4.3. Digital Emissions Test Set-Up (0.03 – 1 GHz)

The following tests were performed using the conducted test set-up shown in the diagram below.

Section 6.1.9 Radiated Spurious Emissions – Digital Emissions (0.03 – 1 GHz)

Digital Emission Measurement Setup – Below 1 GHz



5. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247**, **Industry Canada RSS-210** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(1) A8.1	20 dB & 99% BW	Bandwidths	Conducted	Complies	6.1.1
15.247(a)(1) A8.1	Transmitter Channels	Channel Spacing	Conducted	Complies	6.1.2
15.247(a)(1) A8.1	Transmitter Channels	Number of Channels	Conducted	Complies	6.1.3.1
		Channel Occupancy	Conducted	Complies	6.1.3.2
15.247(b)(2) A8.4	Output Power	Transmit Power	Conducted	Complies	6.1.4
15.247(i) 5.5	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Conducted	Complies	6.1.5
15.247(d) A8.5	Conducted Spurious Emissions	Band Edge	Conducted	Complies	6.1.6
		Spurious Emissions Transmitter (1 to 10 GHz)	Conducted	Complies	

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247**, **Industry Canada RSS-210** and **Industry Canada RSS-Gen.**

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(d) **15.205** **15.209** **A8.5** **2.2** **2.6** **4.9**	Radiated Emissions above 1 GHz	Transmitter	Radiated	Complies	*6.1.7*
15.247(d) **15.205** **15.209** **A8.5** **2.2** **2.6**	Radiated Emissions below 1 GHz		Radiated	Complies	*6.1.8*
15.207 **7.2.2**	Conducted	AC Wireline Conducted Emissions	Conducted	Test not applicable EUT was dc powered	*6.1.9*

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 - Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

6. TEST RESULTS

Ambient conditions for all testing performed
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

6.1. Device Characteristics

6.1.1. 20 dB and 99% Bandwidth

FCC, Part 15 Subpart C §15.247(a)(1)
Industry Canada RSS-210 §A8.1

Test Procedure
The 20 dB and 99% bandwidth is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

Section 4.1 Conducted RF Emission Test Set-up identifies the test configuration

6.1.1.1. 900 MHz FHSS

Equipment Configuration for 20 dB & 99% Bandwidth			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (MHz) Port(s)				20 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	KHz	MHz
902.3	0.208	--	--	--	0.208	0.208	≤250.00	-0.42
915.2	0.209	--	--	--	0.209	0.209	≤250.00	-0.41
927.5	0.208	--	--	--	0.208	0.208	≤250.00	-0.42

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
902.3	0.204	--	--	--	0.204		
915.2	0.205	--	--	--	0.205		
927.5	0.205	--	--	--	0.205		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for 20 dB & 99% Bandwidth			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (MHz) Port(s)				20 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	KHz	MHz
902.2	0.122	--	--	--	0.122	0.122	≤250.00	-0.128
915.2	0.122	--	--	--	0.122	0.122	≤250.00	-0.128
927.8	0.123	--	--	--	0.123	0.123	≤250.00	-0.127

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
902.2	0.119	--	--	--	0.119		
915.2	0.120	--	--	--	0.120		
927.8	0.119	--	--	--	0.119		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for 20 dB & 99% Bandwidth

Variant:	150kbp/s	**Duty Cycle (%):**	100
Data Rate:	150kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (MHz) Port(s)				20 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	KHz	MHz
902.3	0.171	--	--	--	0.171	0.171	≤250.00	-0.79
915.2	0.171	--	--	--	0.171	0.171	≤250.00	-0.79
927.5	0.171	--	--	--	0.171	0.171	≤250.00	-0.79

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
902.3	0.167	--	--	--	0.167		
915.2	0.169	--	--	--	0.169		
927.5	0.169	--	--	--	0.169		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for 20 dB & 99% Bandwidth			
Variant:	300kbp/s	**Duty Cycle (%):**	100
Data Rate:	300kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna 400 KHz		

Test Measurement Results

Test Frequency	Measured 20 dB Bandwidth (MHz) Port(s)				20 dB Bandwidth (MHz)		Limit	Lowest Margin
MHz	a	b	c	d	Highest	Lowest	KHz	MHz
902.4	0.323	--	--	--	0.323	0.323	≤500.0	-0.18
915.6	0.323	--	--	--	0.323	0.323	≤500.0	-0.18
927.6	0.323	--	--	--	0.323	0.323	≤500.0	-0.18

Test Frequency	Measured 99% Bandwidth (MHz) Port(s)				Maximum 99% Bandwidth (MHz)		
MHz	a	b	c	d			
902.4	0.317	--	--	--	0.317		
915.6	0.317	--	--	--	0.317		
927.6	0.319	--	--	--	0.319		

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-03 MEASURING RF SPECTRUM MASK
Measurement Uncertainty:	±2.81 dB

Note: click the link in the above results matrix to view the plot

Specification

Limits

FCC §15.247 (a)(1)
Industry Canada RSS-210 §8.1(c)

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.

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

6.1.2. FHSS Transmitter Characteristics

FCC, Part 15 Subpart C §15.247(a)(1)
Industry Canada RSS-210 §A8.1

Test Procedure
The number of channels and channel occupancy is measured with a spectrum analyzer connected to the antenna terminal, while the EUT is operating in transmission mode at the appropriate center frequency and modulation.

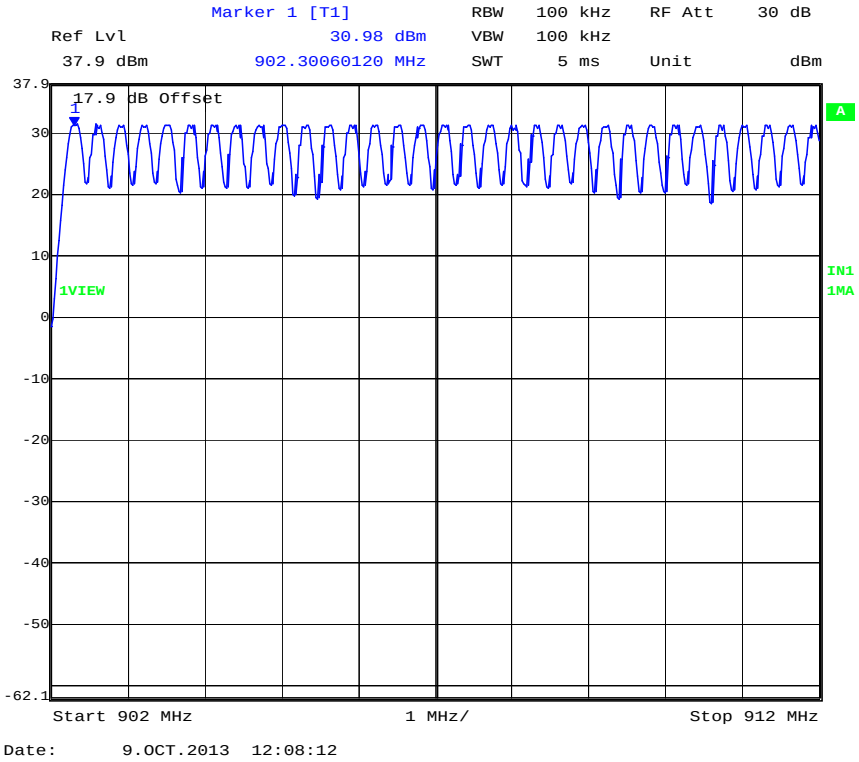
Section 4.1 Conducted RF Emission Test Set-up identifies the test configuration

6.1.2.1. Frequency Hopping – Number of Channels

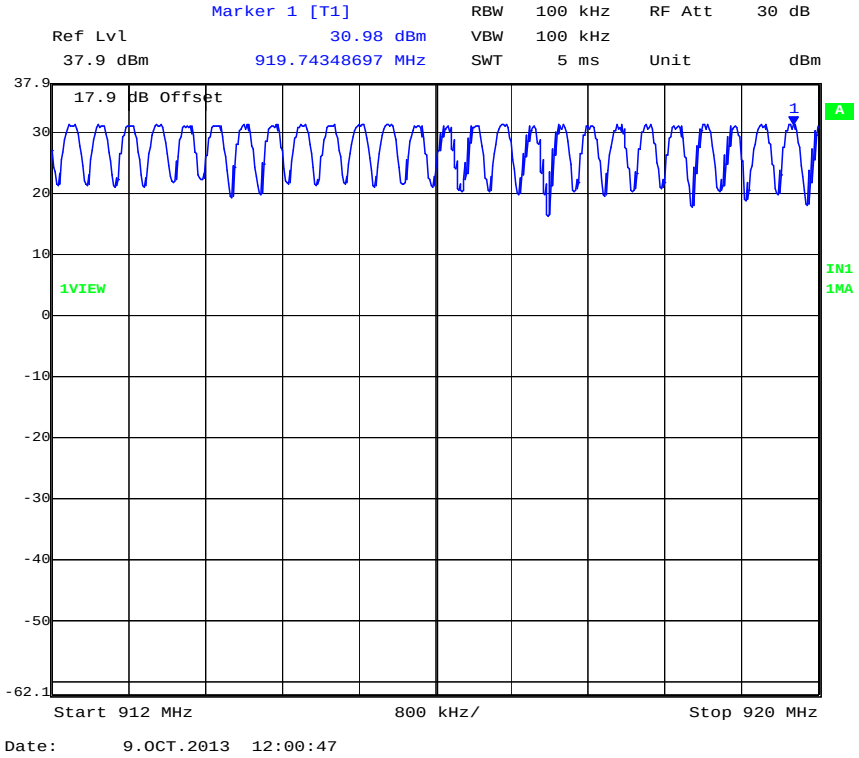
Number of Hopping Channels

Modulation	Frequency Range MHz	No. of Hopping Channels	Total Hopping Channels
FSK 100 kBit/s	902 - 912	33	85
	912 – 920	26	
	920 - 928	26	

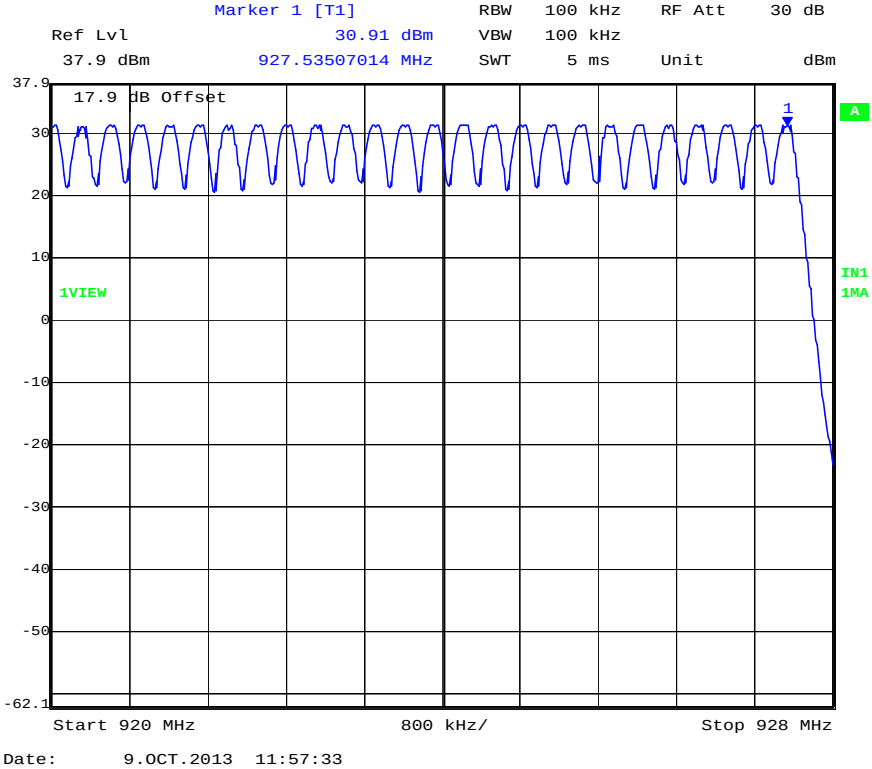
FSK 100 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 902-912 MHz



FSK 100 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 912-920 MHz



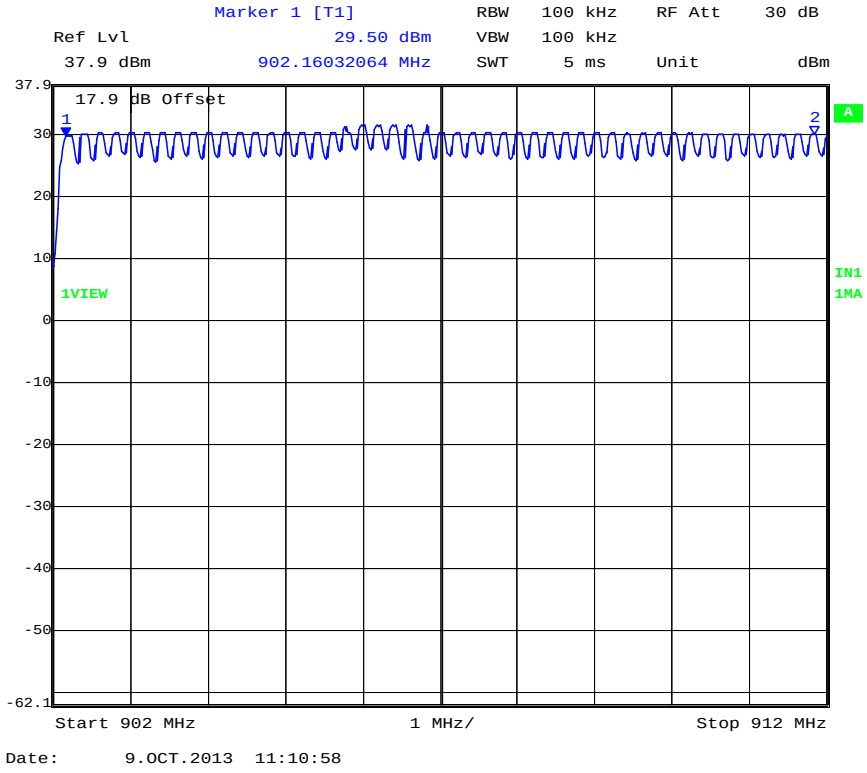
FSK 100 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 920-928 MHz



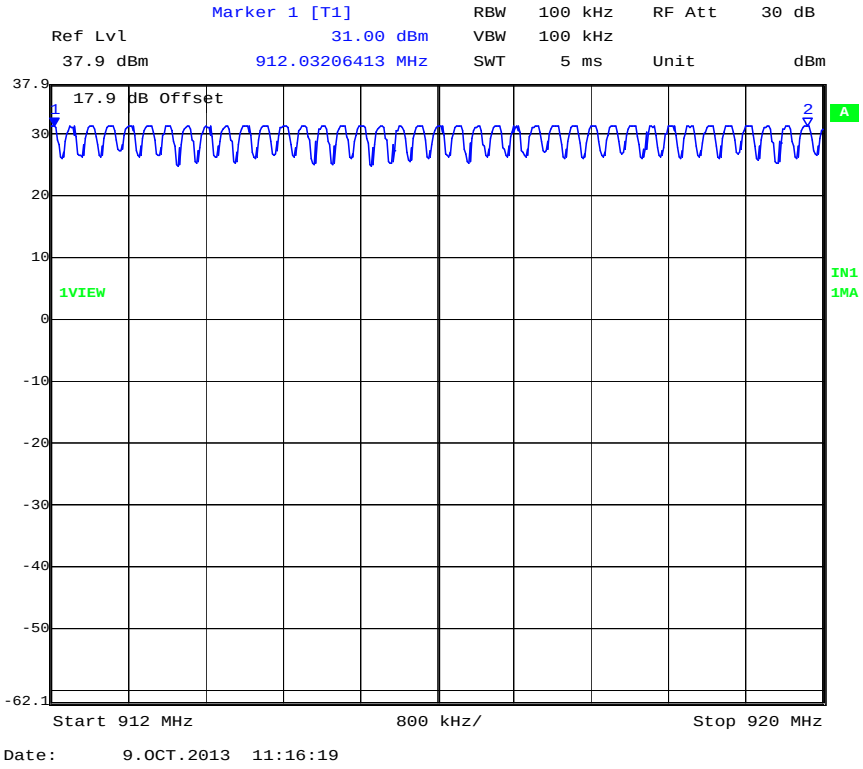
Number of Hopping Channels

Modulation	Frequency Range MHz	No. of Hopping Channels	Total Hopping Channels
GFSK 100 kBit/s	902 - 912	49	128
	912 – 920	40	
	920 - 928	39	

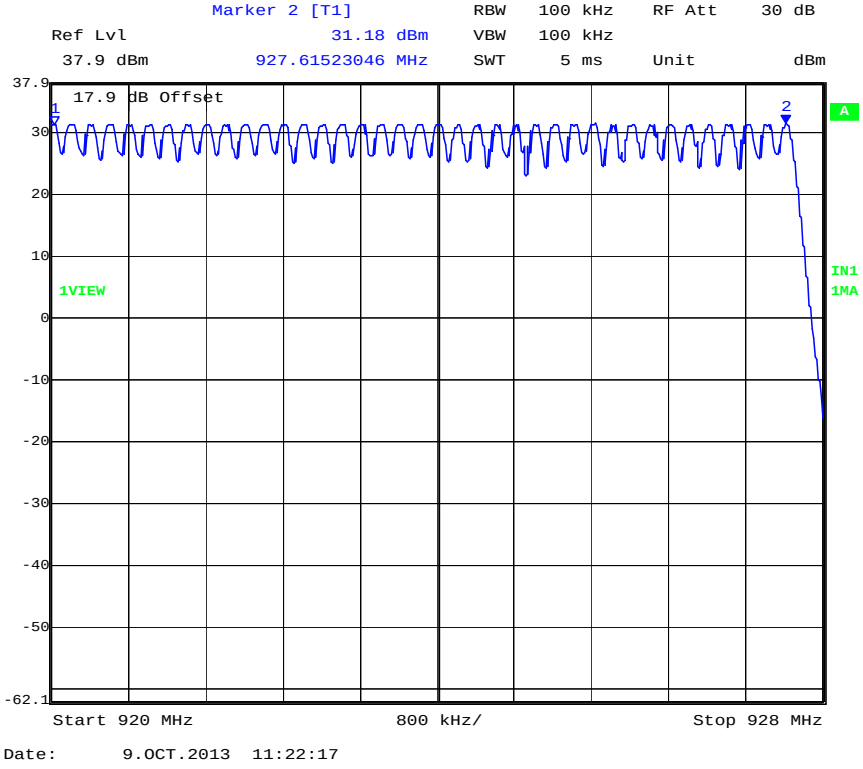
GFSK 100 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 902-912 MHz



GFSK 100 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 912-920 MHz



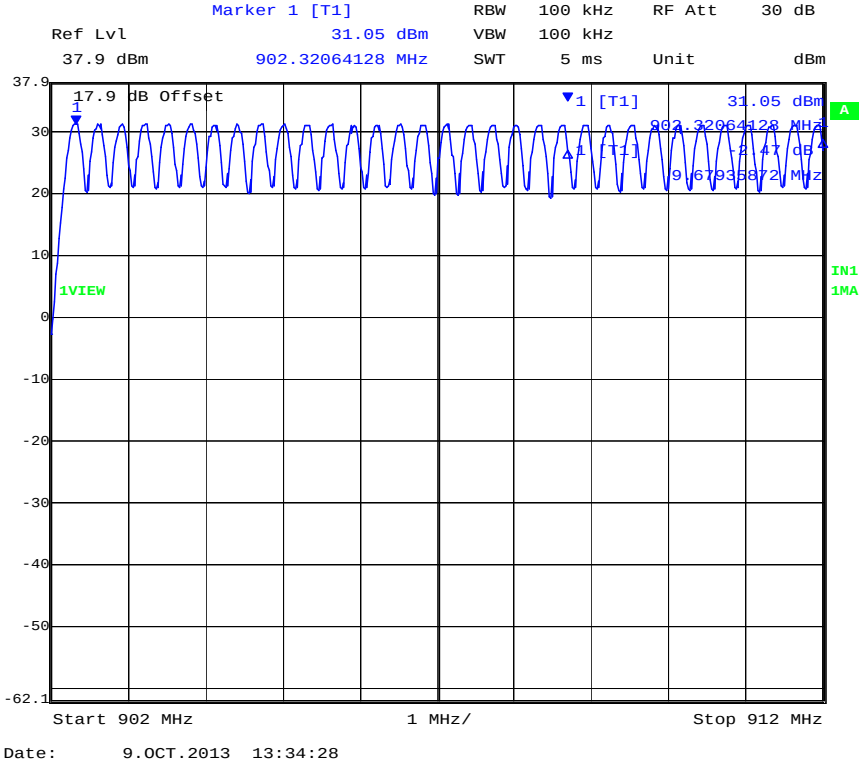
GFSK 100 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 920-928 MHz



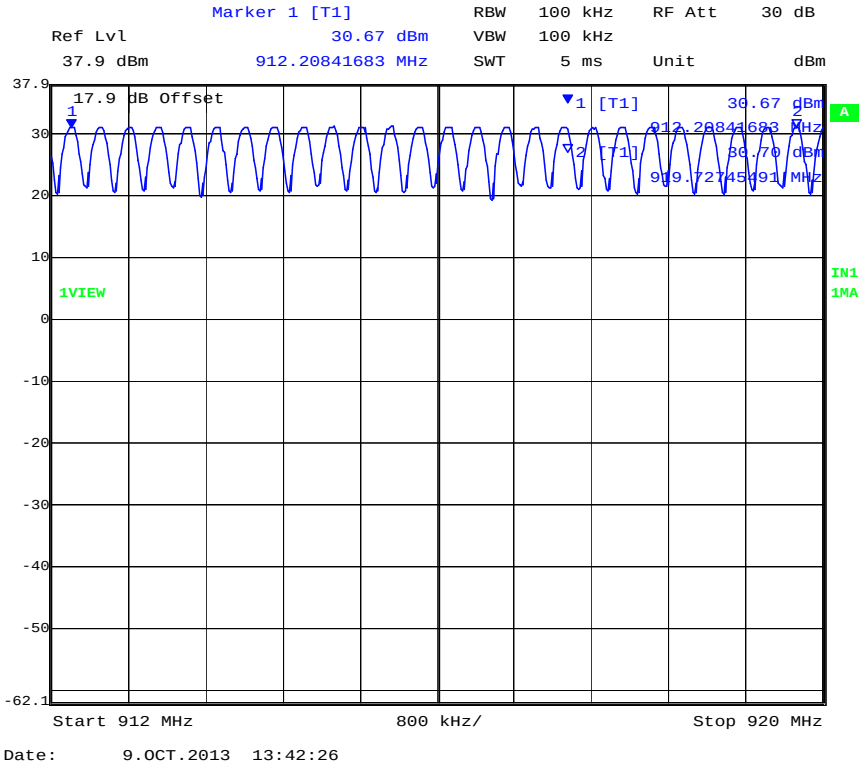
Number of Hopping Channels

Modulation	Frequency Range MHz	No. of Hopping Channels	Total Hopping Channels
GFSK 150 kBit/s	902 - 912	33	85
	912 – 920	27	
	920 - 928	25	

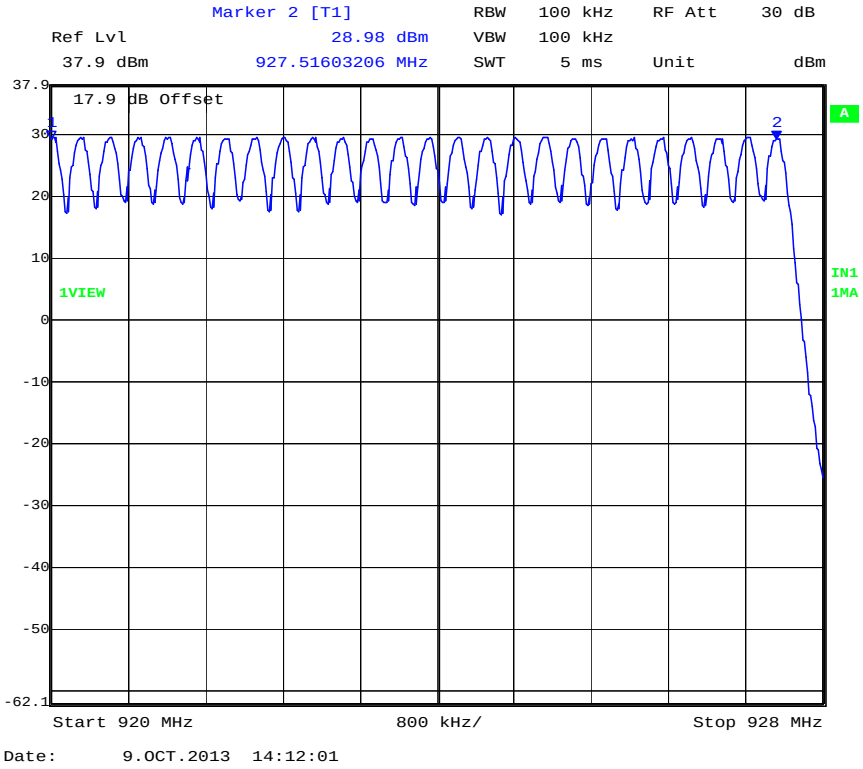
GFSK 150 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 902-912 MHz



GFSK 150 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 912-920 MHz



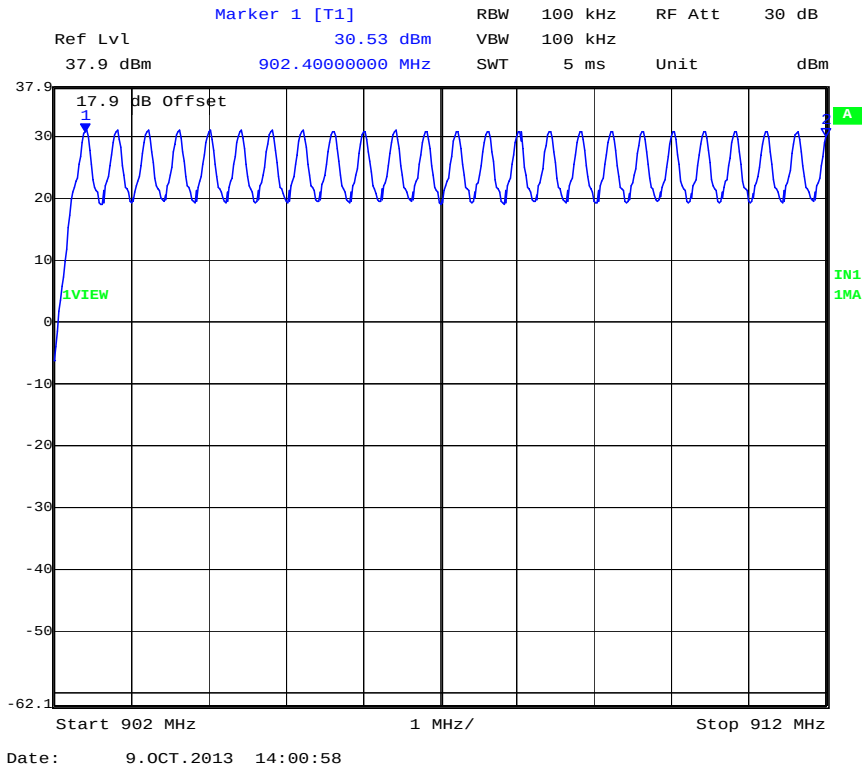
GFSK 150 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 920-928 MHz



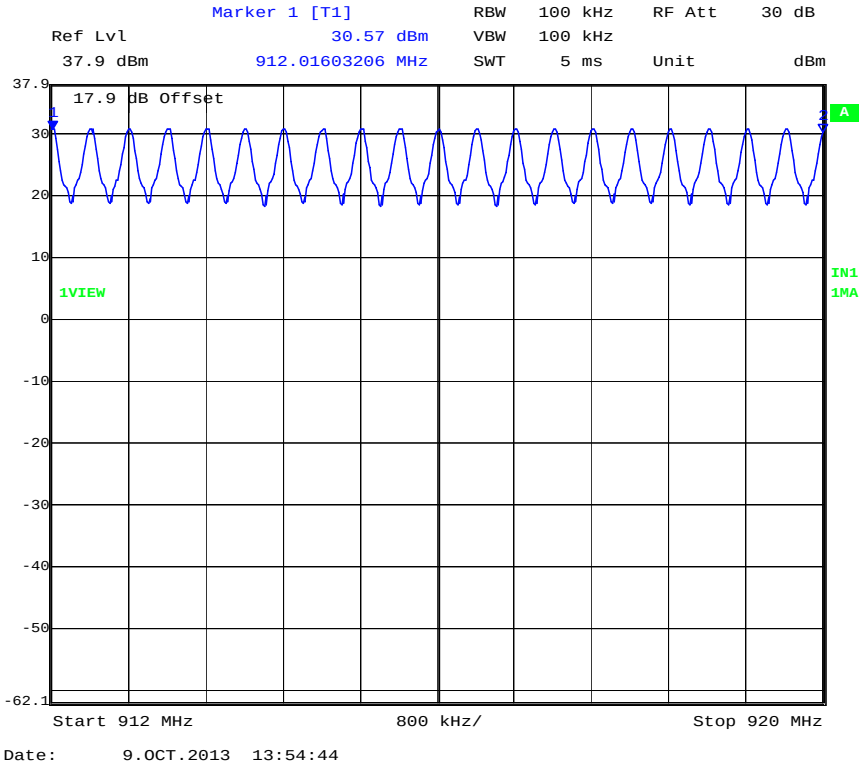
Number of Hopping Channels

Modulation	Frequency Range MHz	No. of Hopping Channels	Total Hopping Channels
GFSK 300 kBit/s	902 - 912	25	64
	912 – 920	20	
	920 - 928	19	

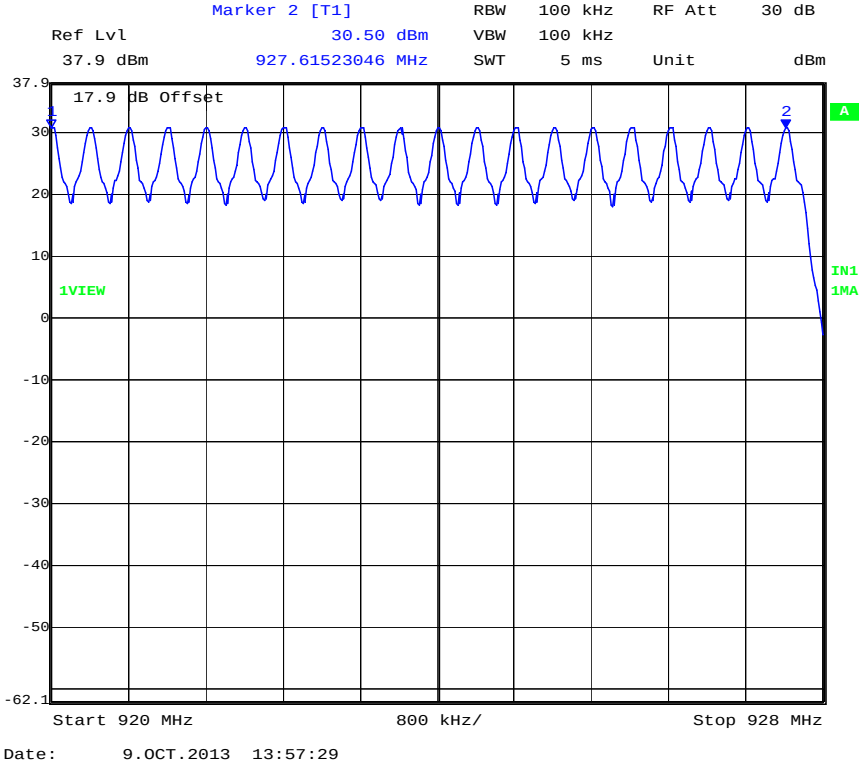
GFSK 300 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 902-912 MHz



GFSK 300 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 912-920 MHz



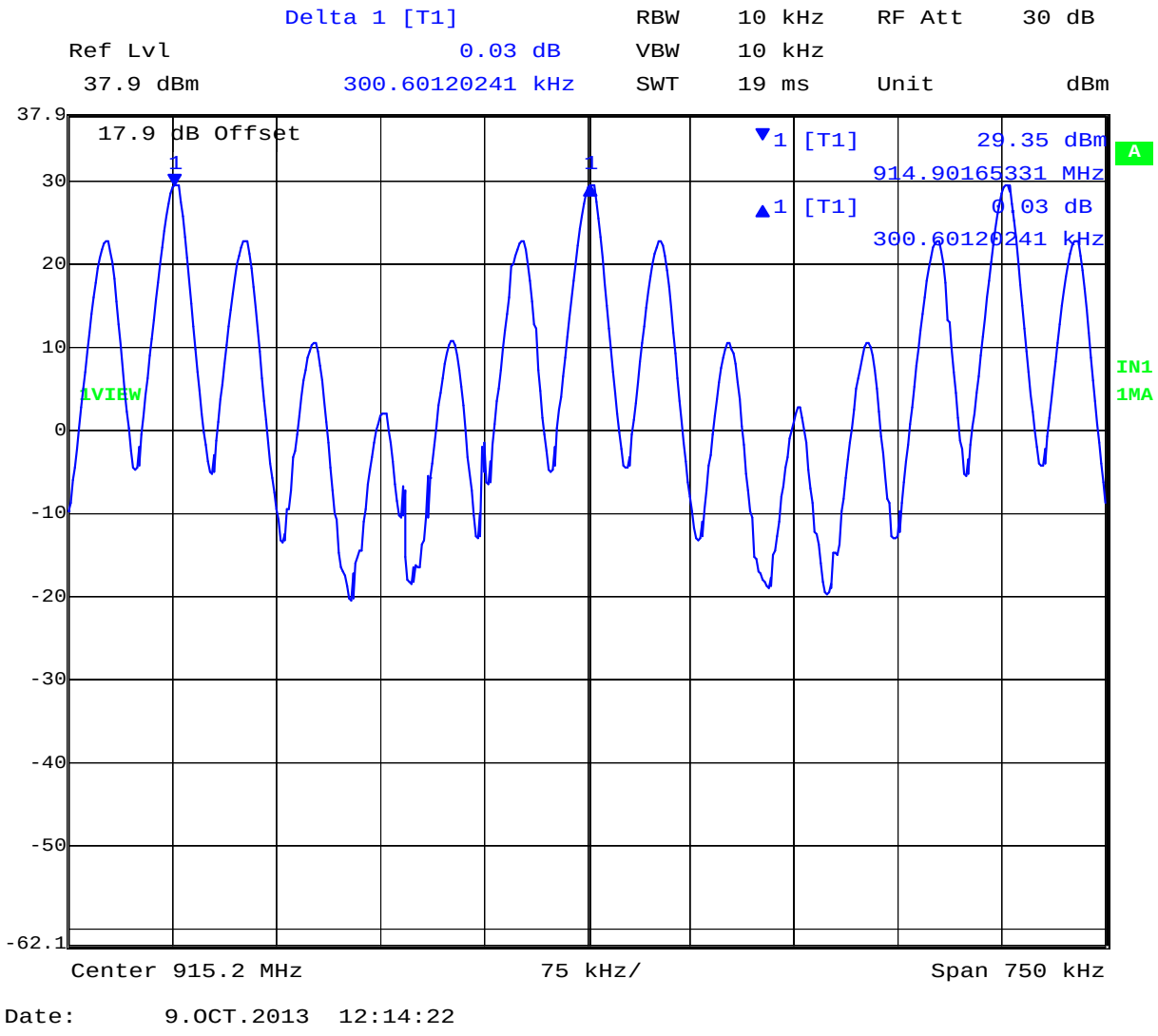
GFSK 300 KBit/s NUMBER OF FREQUENCY HOPPING CHANNELS 920-928 MHz



6.1.2.2. Channel Spacing

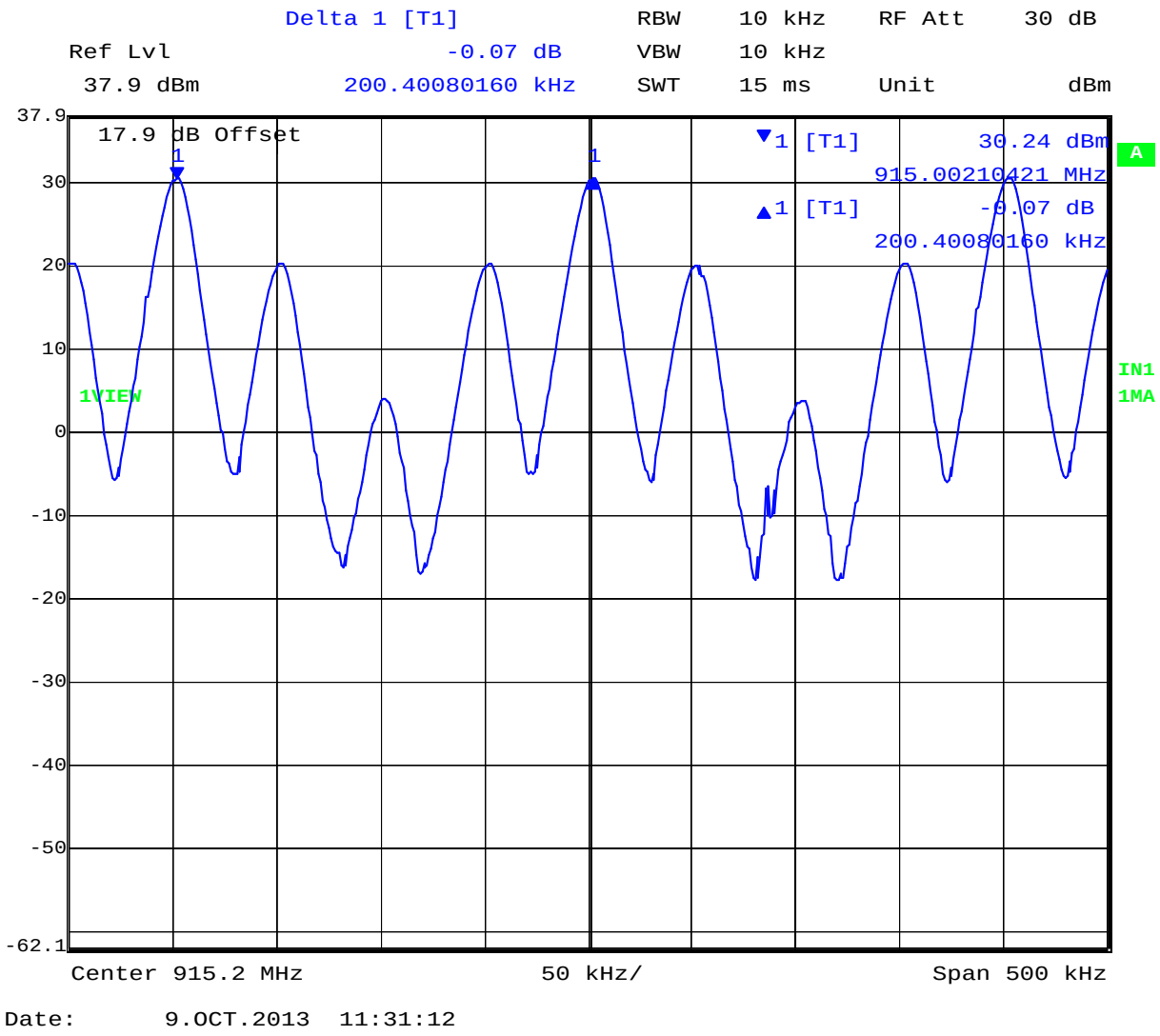
Modulation	Channel Spacing (kHz)	Maximum 20 dB Bandwidth (kHz)	Specification	Compliant
FSK 100 Kbit/s	300.6	171.0	Greater than maximum 20 dB Bandwidth	√

FSK 100 kBit/s Channel Spacing



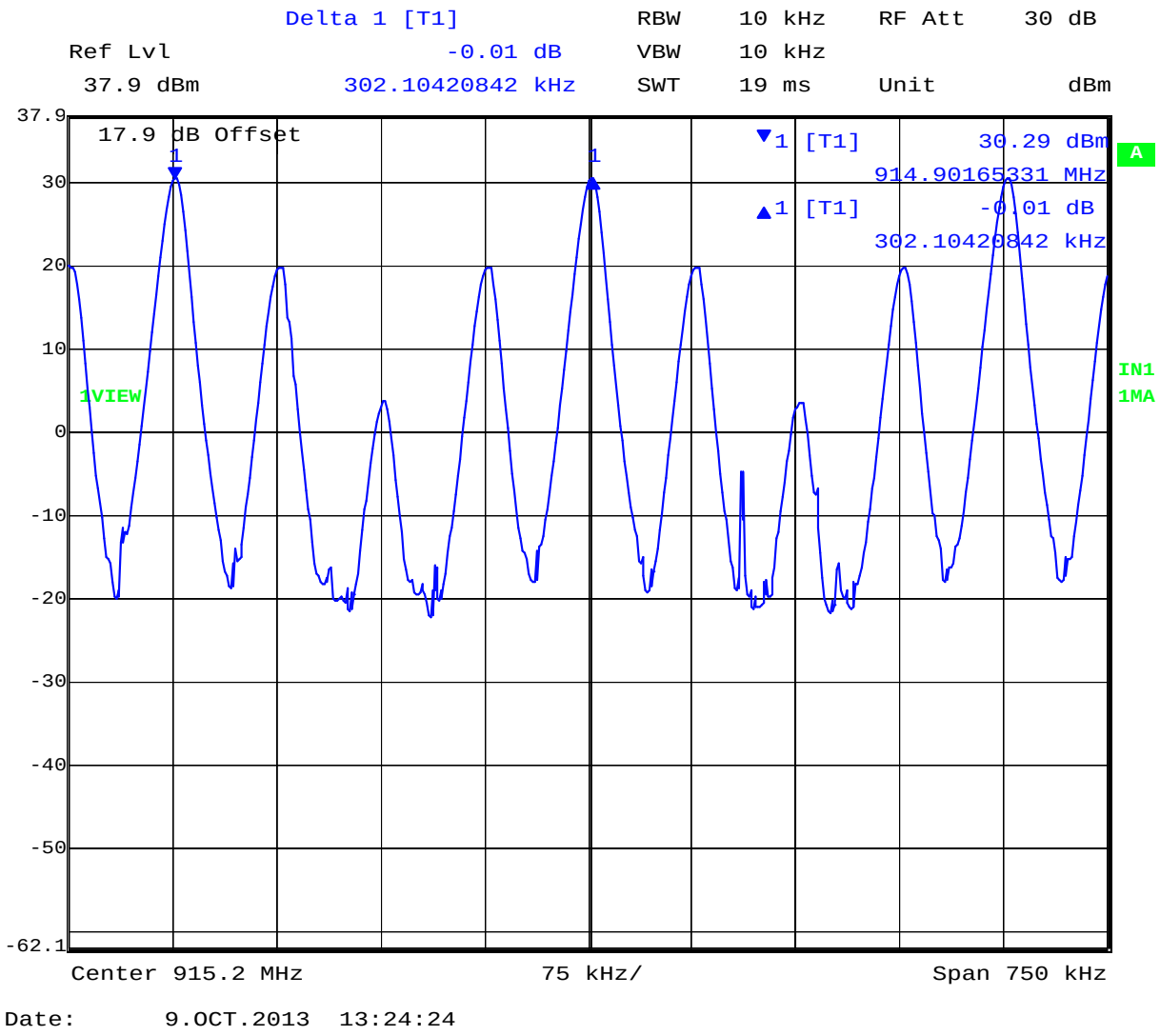
Modulation	Channel Spacing (kHz)	Maximum 20 dB Bandwidth (kHz)	Specification	Compliant
GFSK 100 Kbit/s	200.4	123.0	Greater than maximum 20 dB Bandwidth	√

GFSK 100 kBit/s Channel Spacing



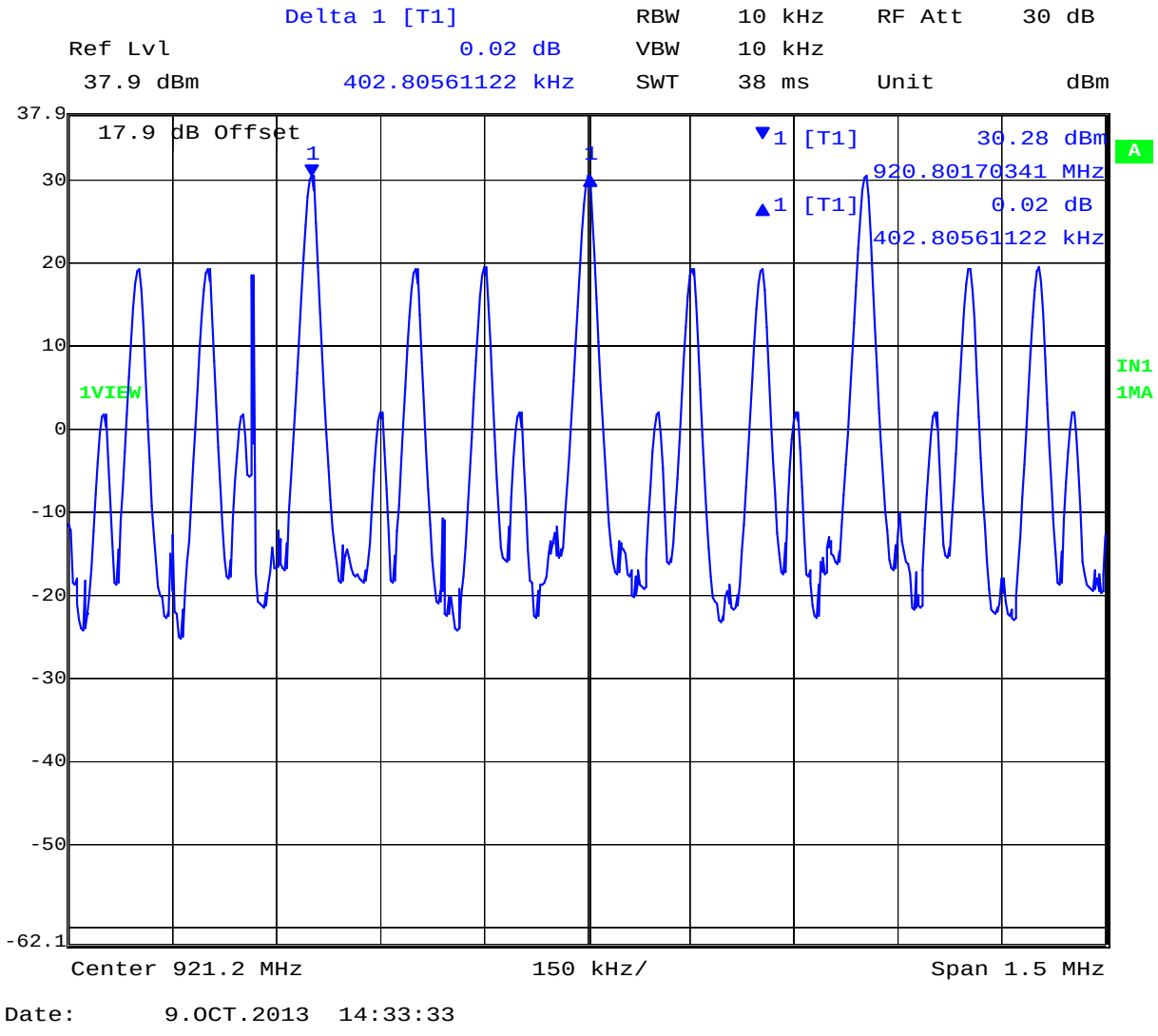
Modulation	Channel Spacing (kHz)	Maximum 20 dB Bandwidth (kHz)	Specification	Compliant
GFSK 150 Kbit/s	302.1	123.0	Greater than maximum 20 dB Bandwidth	√

GFSK 150 kBit/s Channel Spacing



Modulation	Channel Spacing (kHz)	Maximum 20 dB Bandwidth (kHz)	Specification	Compliant
GFSK 300 Kbit/s	402.8	323.0	Greater than maximum 20 dB Bandwidth	√

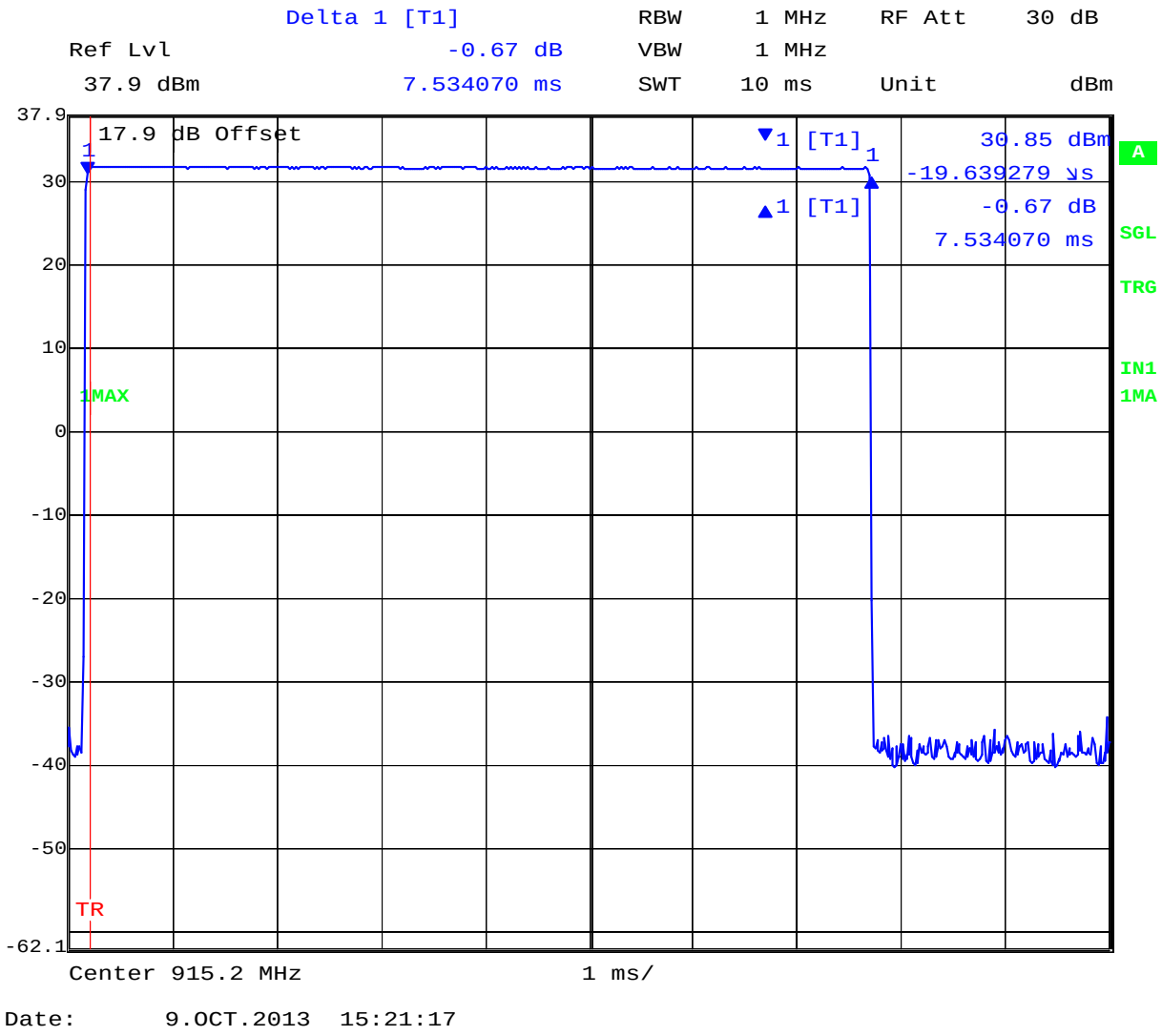
GFSK 300 kBit/s Channel Spacing



6.1.2.3. Dwell Time

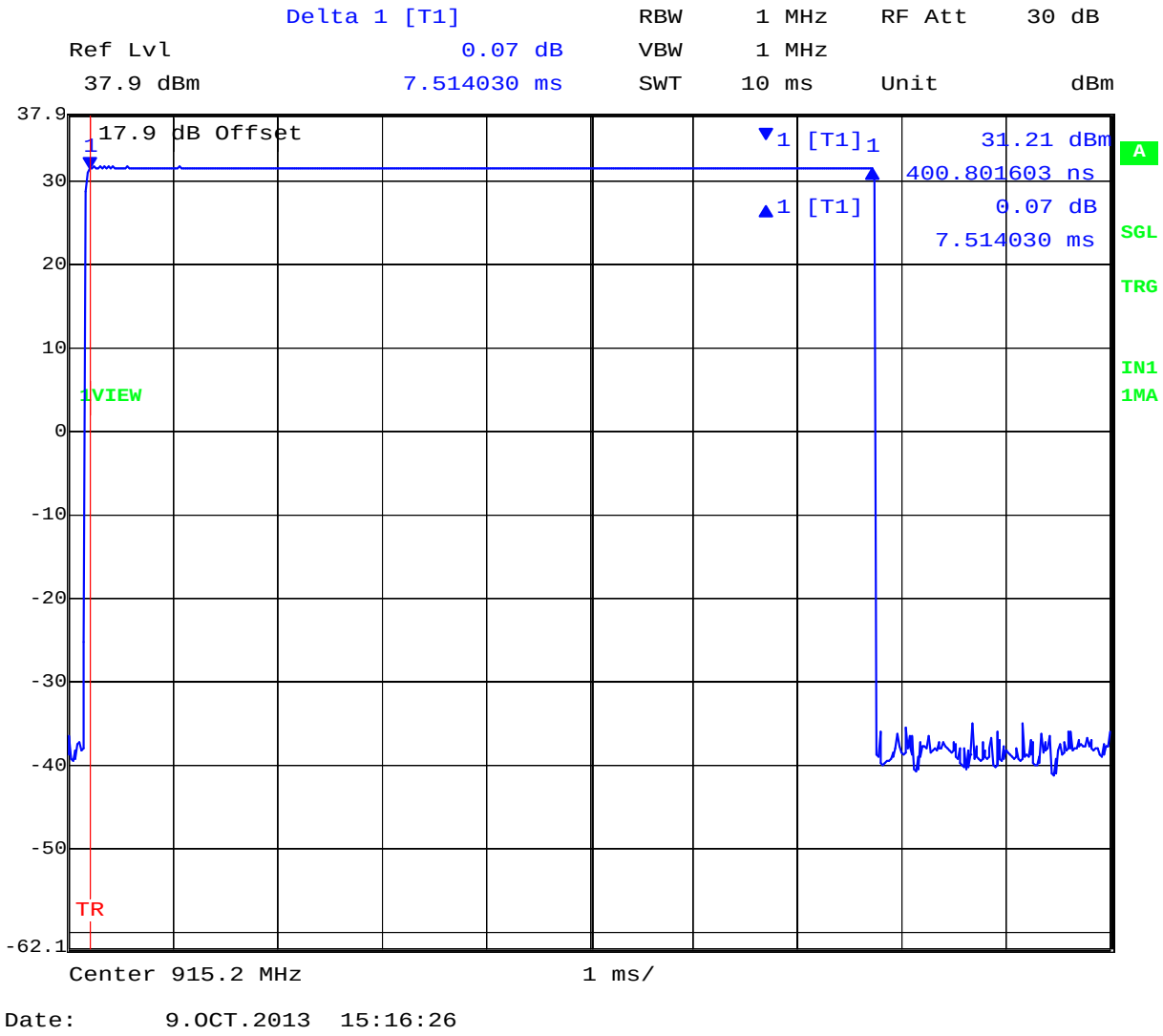
Modulation	Dwell Time (mS)
FSK 100 Kbit/s	7.534

FSK 100 Kbit/s Dwell Time



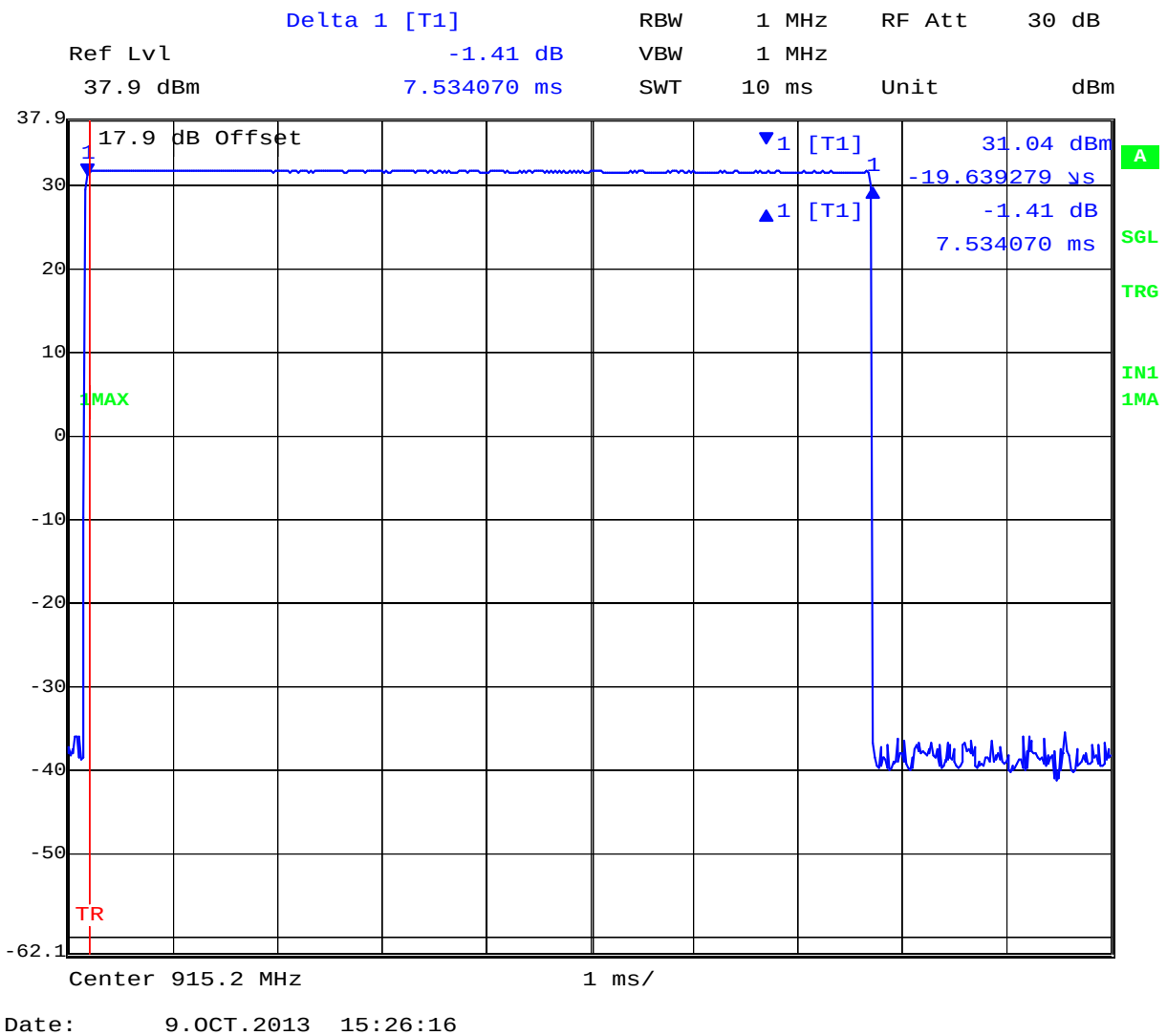
Modulation	Dwell Time (mS)
GFSK 100 Kbit/s	7.514

GFSK 100 Kbit/s Dwell Time



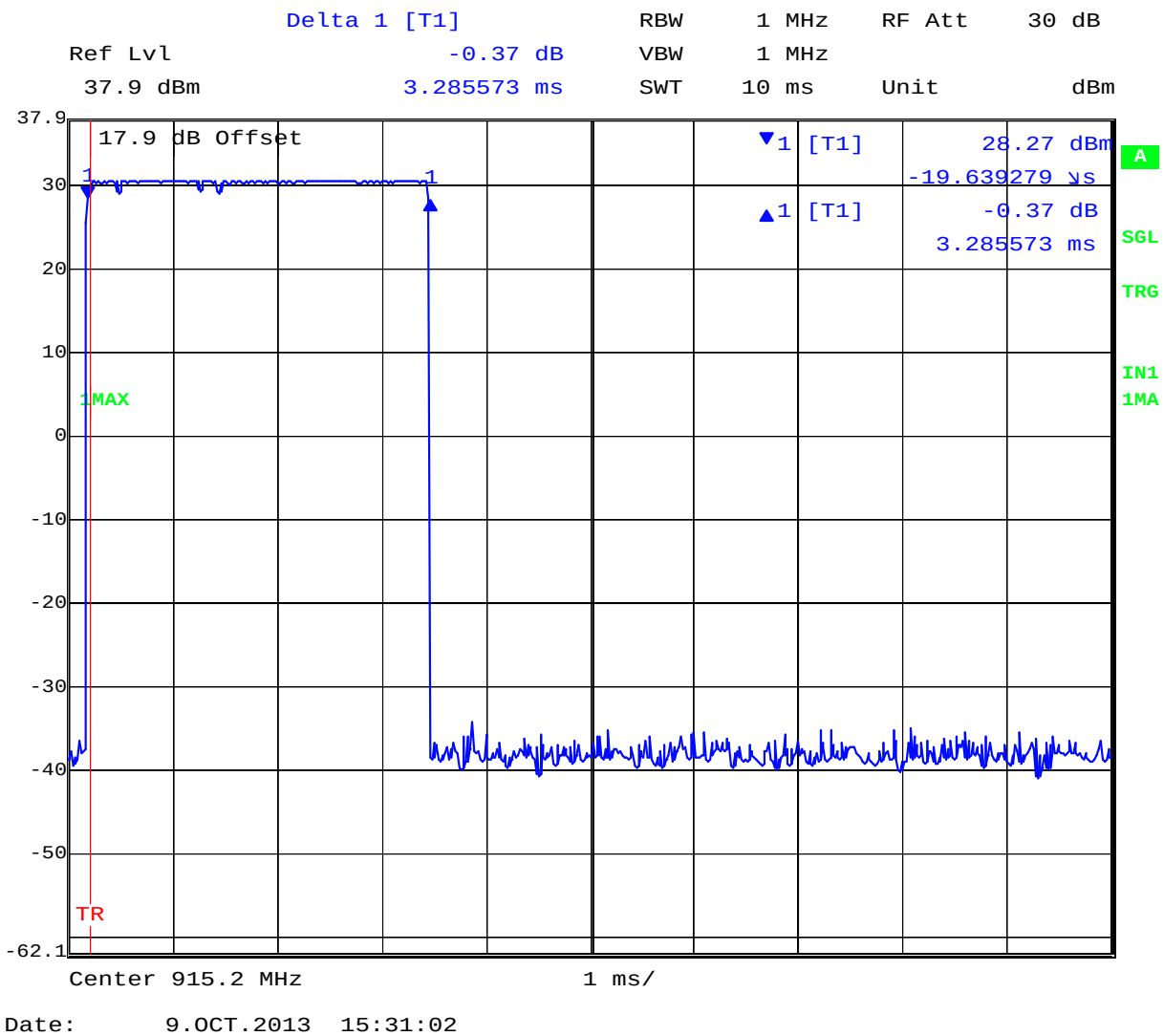
Modulation	Dwell Time (mS)
GFSK 150 Kbit/s	7.534

GFSK 150 Kbit/s Dwell Time



Modulation	Dwell Time (mS)
GFSK 300 Kbit/s	3.286

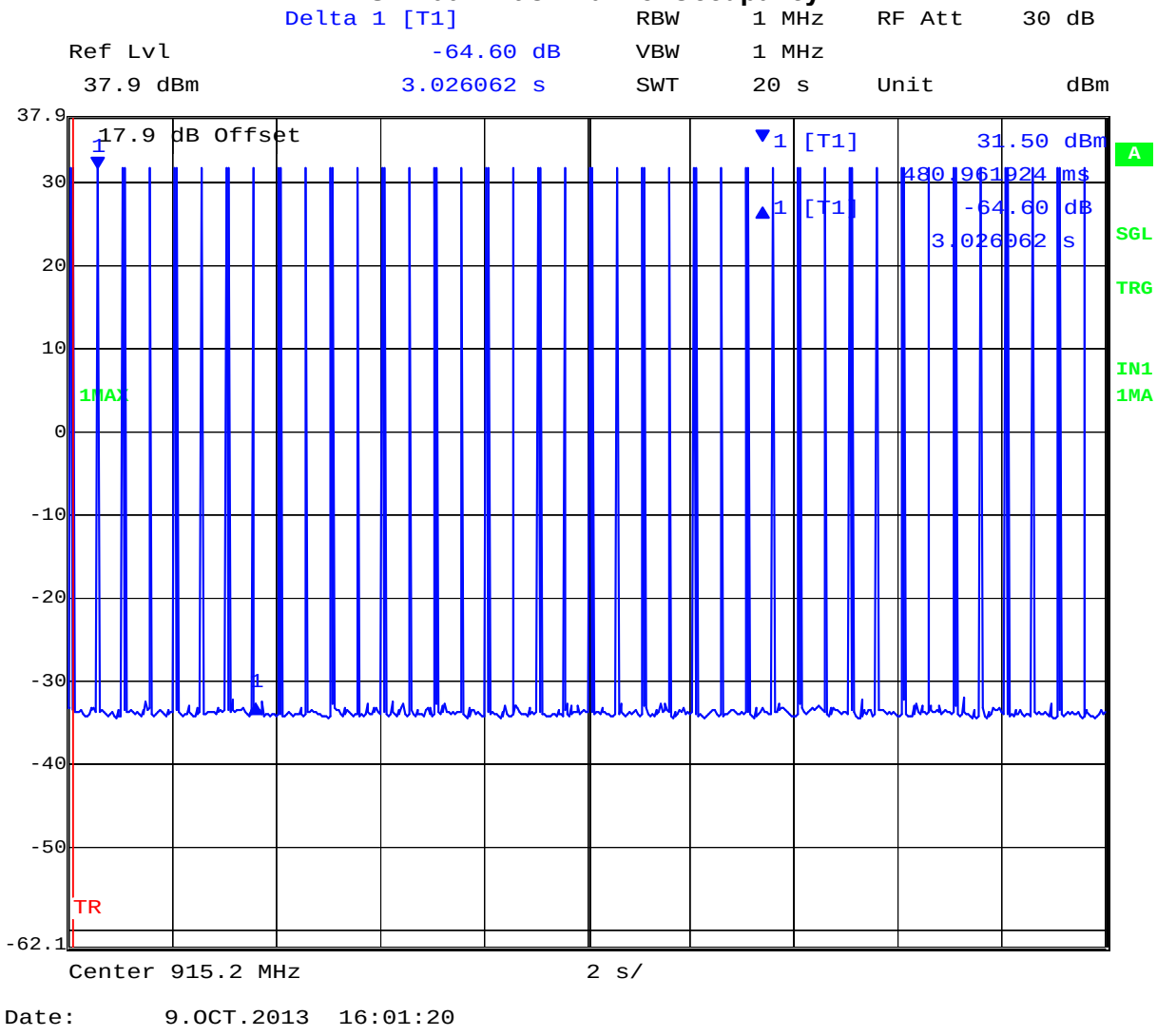
GFSK 300 Kbit/s Dwell Time



6.1.2.4. Channel Occupancy

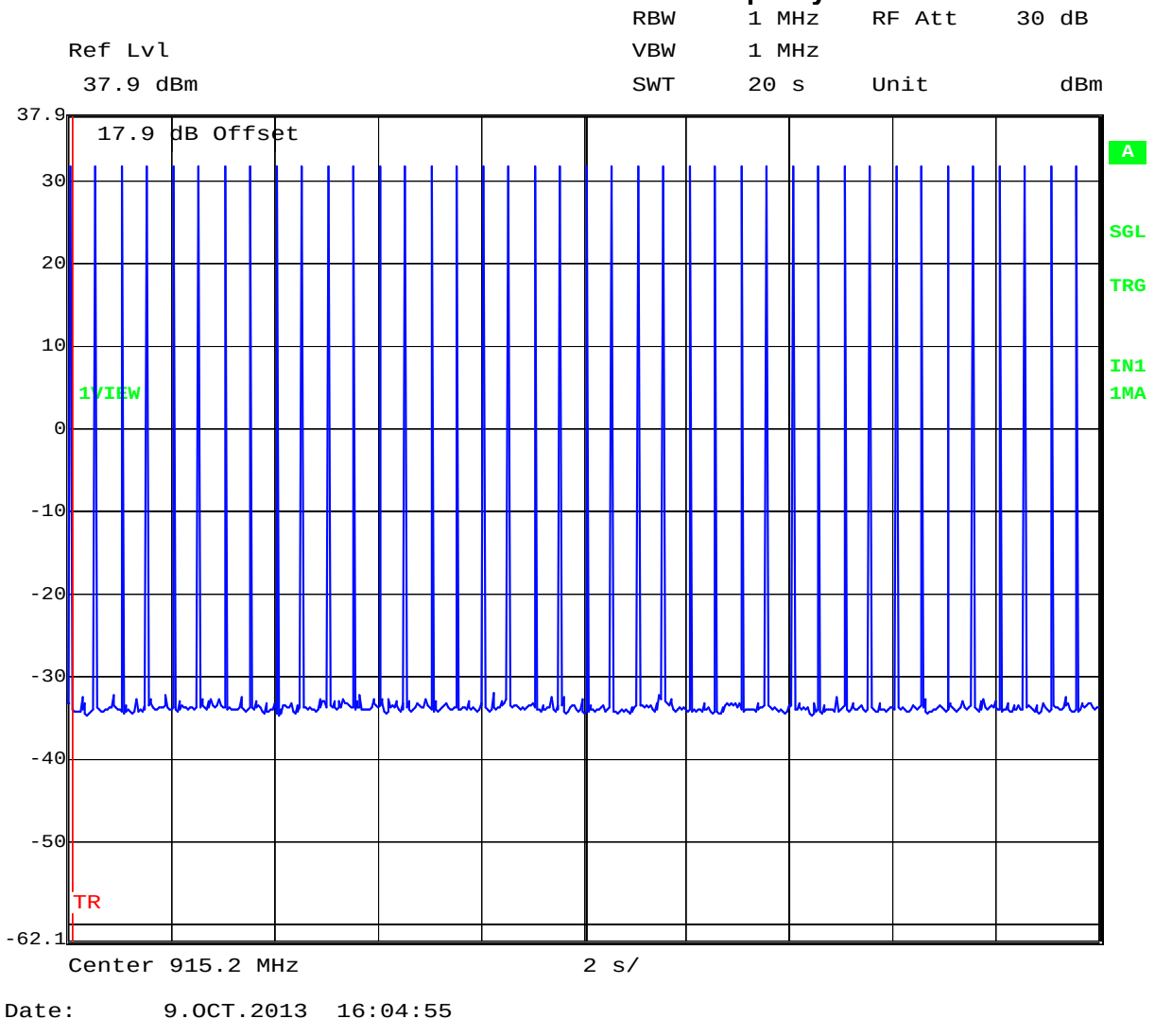
Modulation	# of Hops in 10 Secs	Dwell Time (mS)	Channel Occupancy (mS)	Limit (mS)	Compliant
FSK 100kBit/s	39	7.534	294.0	400.0	√

FSK 100 kBit/s Channel Occupancy



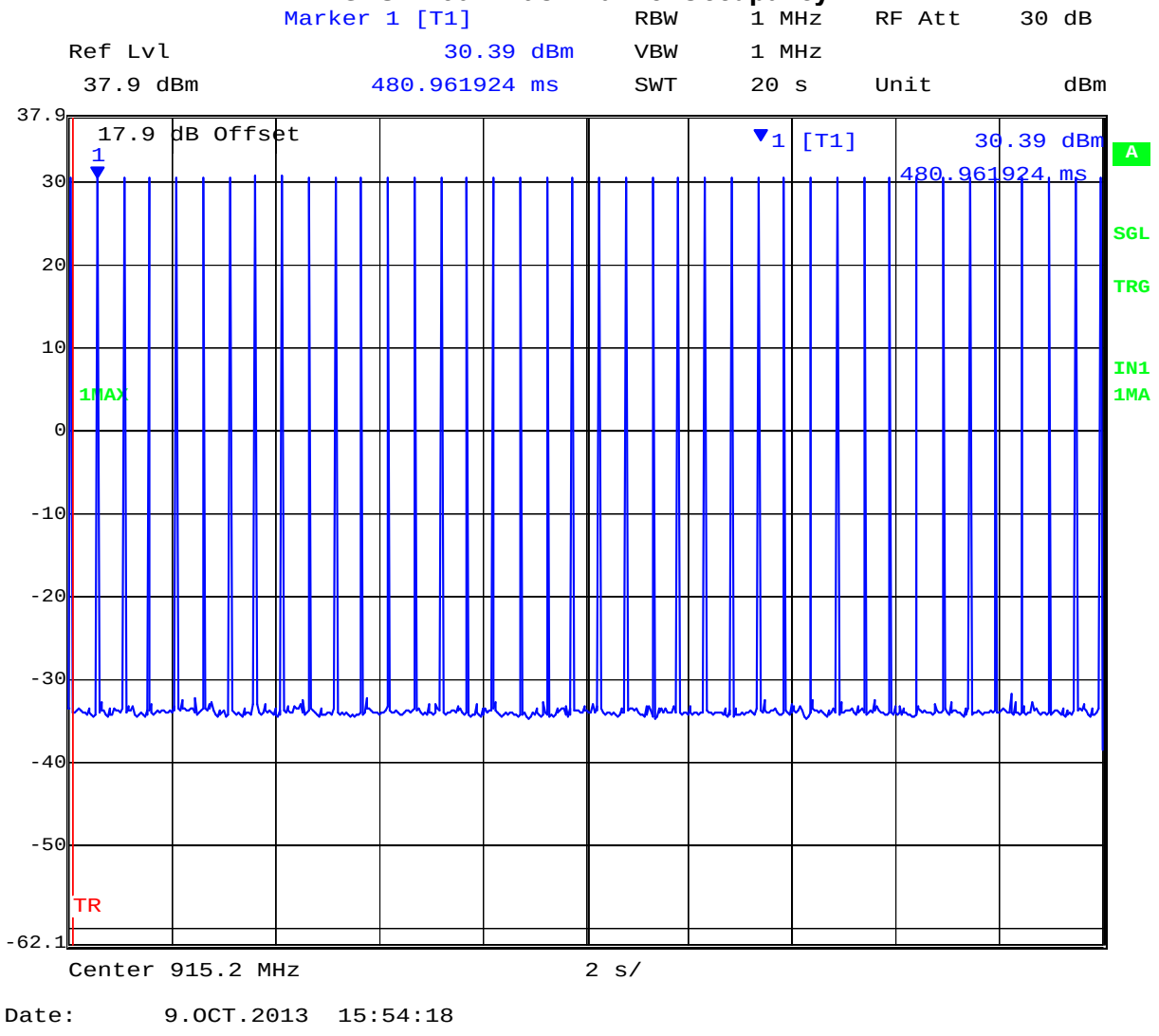
Modulation	# of Hops in 10 Secs	Dwell Time (mS)	Channel Occupancy (mS)	Limit (mS)	Compliant
GFSK 100kBit/s	39	7.514	293.0	400.0	√

GFSK 100 kBit/s Channel Occupancy



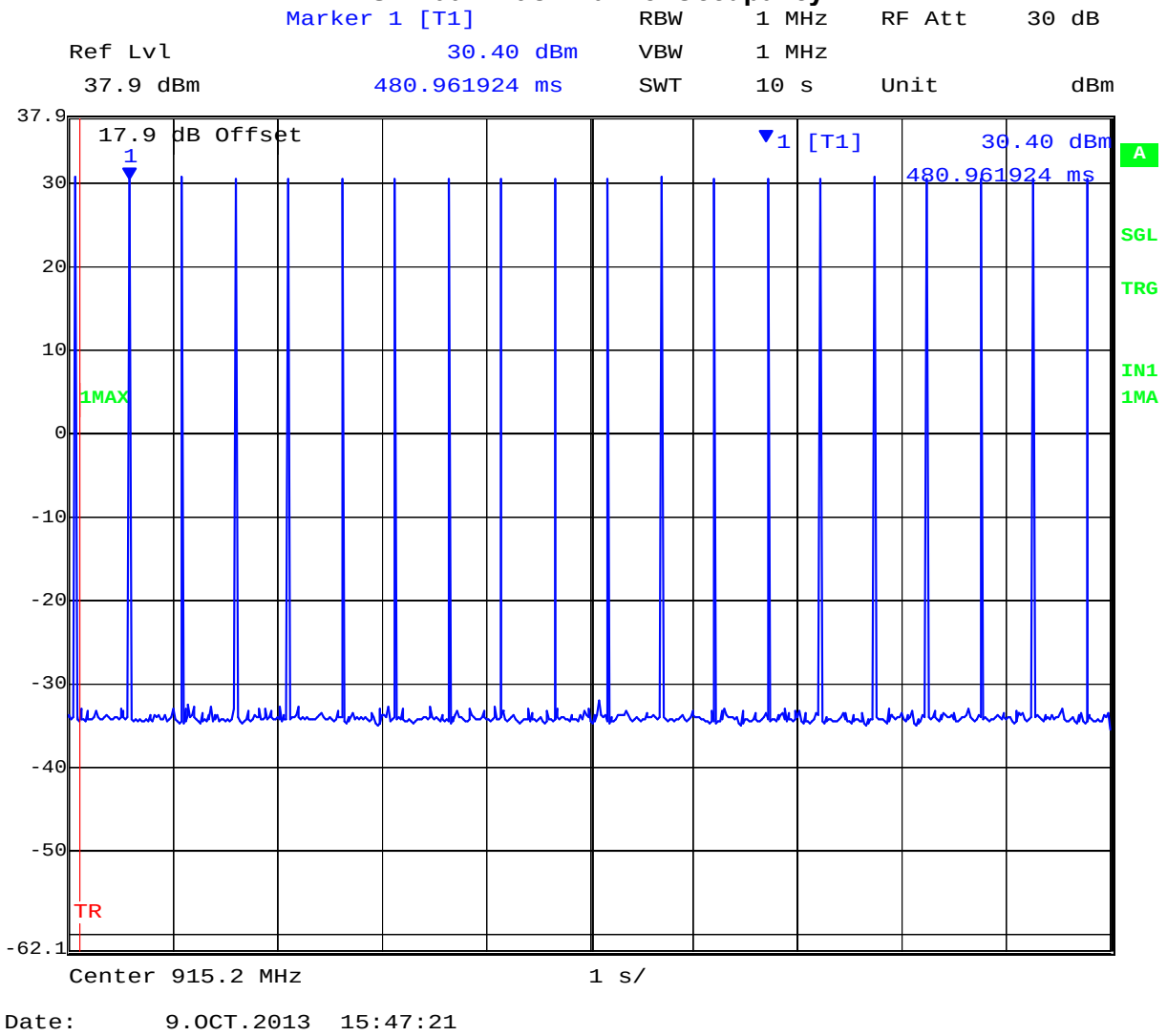
Modulation	# of Hops in 10 Secs	Dwell Time (mS)	Channel Occupancy (mS)	Limit (mS)	Compliant
GFSK 150kBit/s	39	7.534	294.0	400.0	√

GFSK 150 kBit/s Channel Occupancy



Modulation	# of Hops in 10 Secs	Dwell Time (mS)	Channel Occupancy (mS)	Limit (mS)	Compliant
GFSK 300kBit/s	19	3.286	62.4	400.0	√

FSK 100 kBit/s Channel Occupancy



Specification for Number of Channels and Channel Occupancy

Limits

FCC, Part 15 Subpart C §15.247(a)(1)
Industry Canada RSS-210 §A8.1

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

(iii) Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
.

Laboratory Uncertainty for Frequency Measurements

Measurement uncertainty	±0.86ppm

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-02 'Frequency Measurement"	0078, 0134, 0158, 0184, 0193, 0250, 0252 0310, 0312.

6.1.3. Output Power

FCC, Part 15 Subpart C §15.247(b)(2)
Industry Canada RSS-210 §A8.4

Test Procedure
The transmitter terminal of EUT was set for CW (continuous wave) operation and connected to the input of the power meter which was calibrated to measure power. The value of measured power including antenna cable loss was reported.

15.247 (c) Operation with directional antenna gains greater than 6 dBi.
If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Model	Frequency Band	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)	Maximum EIRP (dBm)
PCB	900 MHz	-2.5	+30.0	+27.5
Taoglas		1.2		+31.2

Section 4.1 Conducted RF Emission Test Set-up identifies the test configuration

6.1.3.1. Integral Antenna

Equipment Configuration for Peak Output Power			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	-2.5
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.3	29.761	--	--	--	29.761	30.00	-0.24	41.00
915.2	29.761	--	--	--	29.761	30.00	-0.24	41.00
927.5	29.960	--	--	--	29.960	30.00	-0.04	41.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±.33 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Peak Output Power			
Variant:	100kbp/s	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	-2.5
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.2	29.674	--	--	--	29.674	30.00	-0.33	41.00
915.2	29.674	--	--	--	29.674	30.00	-0.33	41.00
927.8	29.588	--	--	--	29.588	30.00	-0.41	41.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Peak Output Power			
Variant:	150kbps	**Duty Cycle (%):**	100
Data Rate:	150kbits/s	**Antenna Gain (dBi):**	-2.5
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.3	29.761	--	--	--	29.761	30.00	-0.24	41.00
915.2	29.674	--	--	--	29.764	30.00	-0.24	41.00
927.5	29.764	--	--	--	29.764	30.00	-0.24	41.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Peak Output Power			
Variant:	300kbp/s	**Duty Cycle (%):**	100
Data Rate:	300kbits/s	**Antenna Gain (dBi):**	-2.5
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.4	29.674	--	--	--	29.674	30.00	-0.33	41.00
915.2	29.674	--	--	--	29.674	30.00	-0.33	41.00
927.6	29.674	--	--	--	29.674	30.00	-0.33	41.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

6.1.3.2. External Antenna

Equipment Configuration for Peak Output Power

Variant:	100kbp/s	**Duty Cycle (%):**	100
Data Rate:	100KBit/s	**Antenna Gain (dBi):**	1.2
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.3	29.674	--	--	--	29.674	30.00	-0.33	45.00
915.2	29.674	--	--	--	29.674	30.00	-0.33	45.00
927.5	29.588	--	--	--	29.588	30.00	-0.41	45.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Peak Output Power			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100KBit/s	**Antenna Gain (dBi):**	1.2
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.2	29.674	--	--	--	29.674	30.00	-0.33	45.00
921.2	28.545	--	--	--	28.545	30.00	-1.46	45.00
927.8	29.588	--	--	--	29.588	30.00	-0.41	45.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Peak Output Power			
Variant:	150kbp/s	**Duty Cycle (%):**	100
Data Rate:	150KBit/s	**Antenna Gain (dBi):**	1.2
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.3	29.674	--	--	--	29.674	30.00	-0.33	45.00
915.2	29.674	--	--	--	29.674	30.00	-0.33	45.00
927.5	29.674	--	--	--	29.674	30.00	-0.33	45.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Peak Output Power			
Variant:	300KBit/s	**Duty Cycle (%):**	100
Data Rate:	300KBit/s	**Antenna Gain (dBi):**	1.2
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Measured Output Power (dBm) Port(s)				Calculated Total Power Σ Port(s)	Limit	Margin	EUT Power Setting
MHz	a	b	c	d	dBm	dBm	dBm	
902.4	29.674	--	--	--	29.674	30.00	-0.33	45.00
915.6	29.674	--	--	--	29.674	30.00	-0.33	45.00
927.6	29.674	--	--	--	29.674	30.00	-0.33	45.00

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-01 MEASURING RF OUTPUT POWER
Measurement Uncertainty:	±1.33 dB

Note: click the link in the above results matrix to view the plot

Specification

Limits

FCC, Part 15 Subpart C §15.247 (b)(2)

The maximum output power of the intentional radiator shall not exceed the following:

(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.

(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.

Industry Canada RSS-210 §A8.1

(b) 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 band 2400-2483.5 MHz 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 that the systems operate with an output power no greater than 0.125 W. 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.

(c) For frequency hopping systems operating in the band 902–928 MHz, the maximum peak conducted output power shall not exceed 1.0 W, and the e.i.r.p. shall not exceed 4 W if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W, and the e.i.r.p. shall not exceed 1 W if the hopset uses less than 50 hopping channels.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117

6.1.4. Conducted Spurious Emissions Transmitter

FCC, Part 15 Subpart C §15.247(d)
Industry Canada RSS-210 §A8.5

Test Procedure
Conducted emissions were measured at a limit of 20 dB below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Emissions at the band edge were measured and recorded. Measurements were made while EUT was operating in transmit mode of operation at the appropriate center frequency.

Section 4.1 Conducted RF Emission Test Set-up identifies the test configuration

6.1.4.1. Integral Antenna

Equipment Configuration for Transmitter Conducted Spurious Emissions			
Variant:	100kbp/s	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Conducted Spurious Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
902.3	30 - 10000	-34.156	8.92	--	--	--	--	--	--
915.2	30 - 10000	-33.590	9.14	--	--	--	--	--	--
927.5	30 - 10000	-33.899	9.44	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
902.3	902.0	-2.635	9.27	--	--	--	--	--	--
927.5	928.0	-21.162	9.54	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
902.2	902.0	7.928	9.32	--	--	--	--	--	--
927.8	928.0	6.60*	8.60	--	--	--	--	--	--

*Further evaluation was required in order to prove compliance (EUT was found to be compliant)

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	150kbp/s	**Duty Cycle (%):**	100
Data Rate:	150kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna 300 KHz		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
902.3	902.0	-4.014	9.29	--	--	--	--	--	--
927.5	928.0	-21.681	9.01	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	300kbp/s	**Duty Cycle (%):**	100
Data Rate:	300kbits/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	Internal Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
902.4	902.0	-7.548	8.92	--	--	--	--	--	--
927.6	928.0	-4.735	8.80	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

6.1.4.2. External Antenna

Equipment Configuration for Transmitter Conducted Spurious Emissions			
Variant:	100KBit/s	**Duty Cycle (%):**	100
Data Rate:	100KBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Frequency Range	Transmitter Conducted Spurious Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	SE	Limit	SE	Limit	SE	Limit	SE	Limit
902.3	30 - 10000	-33.808	8.73	--	--	--	--	--	--
915.2	30 - 10000	-33.861	8.94	--	--	--	--	--	--
927.5	30 - 10000	-34.153	9.15	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	100kbps	**Duty Cycle (%):**	100
Data Rate:	100KBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	FSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	**MHz**	**BE**	**Limit**	**BE**	**Limit**	**BE**	**Limit**	**BE**	**Limit**
902.3	902.0	-2.023	9.12	--	--	--	--	--	--
927.5	928.0	-21.575	9.20	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	100KBit/s	**Duty Cycle (%):**	100
Data Rate:	100KBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	**MHz**	**BE**	**Limit**	**BE**	**Limit**	**BE**	**Limit**	**BE**	**Limit**
902.2	902.0	8.144	9.25	--	--	--	--	--	--
927.8	928.0	7.30	9.05	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	150KBit/s	**Duty Cycle (%):**	100
Data Rate:	150KBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	External Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
902.3	902.0	-3.314	9.05	--	--	--	--	--	--
927.5	928.0	-21.703	9.12	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Equipment Configuration for Transmitter Band-Edge Emissions			
Variant:	300KBit/s	**Duty Cycle (%):**	100
Data Rate:	300KBit/s	**Antenna Gain (dBi):**	Not Applicable
Modulation:	GFSK	**Beam Forming Gain (Y):**	Not Applicable
TPC:	Not Applicable	**Tested By:**	JMH
Engineering Test Notes:	400KHz, External Antenna		

Test Measurement Results

Test Frequency	Band-Edge Frequency	Transmitter Conducted Band-Edge Emissions (dBm)							
		Port a		Port b		Port c		Port d	
MHz	MHz	BE	Limit	BE	Limit	BE	Limit	BE	Limit
902.4	902.0	-7.994	8.78	--	--	--	--	--	--
927.6	928.0	-4.298	8.75	--	--	--	--	--	--

Traceability to Industry Recognized Test Methodologies	
Work Instruction:	WI-05 MEASUREMENT OF SPURIOUS EMISSIONS
Measurement Uncertainty:	≤ 40 GHz ±2.37 dB, > 40 GHz ±4.6 dB

Note: click the link in the above results matrix to view the plot

Specification

Limits Band-Edge

Lower Limit Band-edge	Upper Limit Band-edge	Limit below highest level of desired power
902 MHz	928 MHz	≥ 20 dB
2400 MHz	2483.5 MHz	≥ 20 dB

FCC, Part 15 Subpart C §15.247(d)

Industry Canada RSS-210 §A.5

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.

Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0287, 0158, 0193, 0252, 0313, 0314, 0070, 0116, 0117.

6.1.5. Radiated Spurious Emissions > 1 GHz

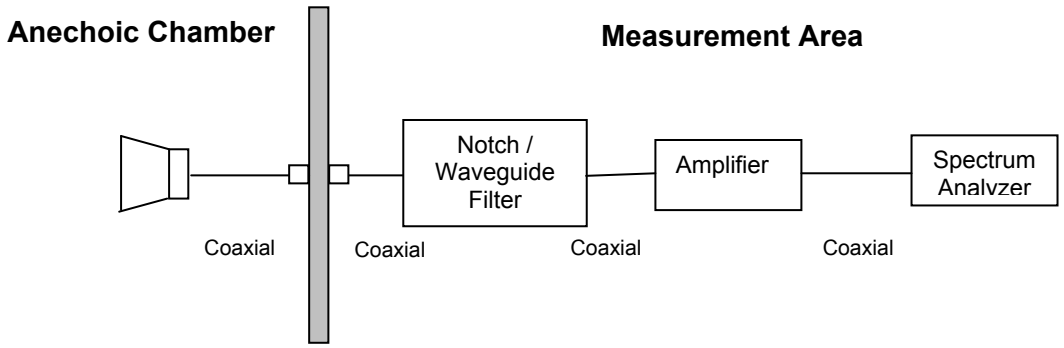
FCC, Part 15 Subpart C §15.247(d)
Industry Canada RSS-210 §A8.5

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

For example:
Given receiver input reading of 51.5 dBμV; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

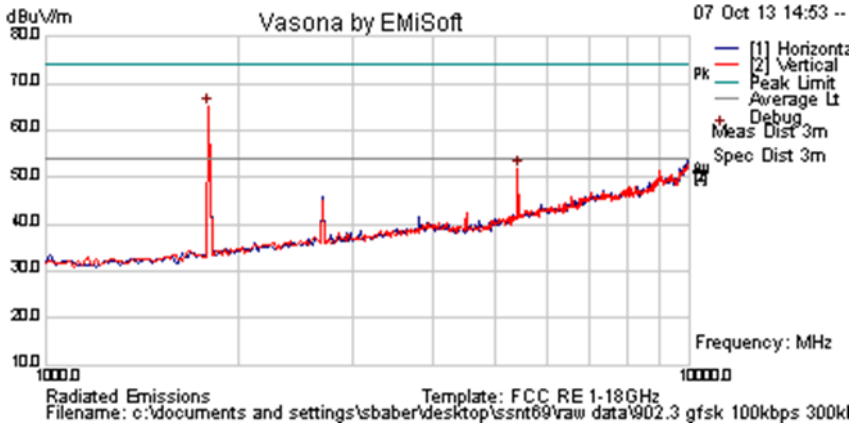
Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100 μV/m
48 dBμV/m = 250 μV/m

6.1.5.1. Integral Antenna - Radiated Spurious Emissions

Test Freq.	902.3 MHz	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	20.5
Freq. Range	1000 MHz - 10000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		

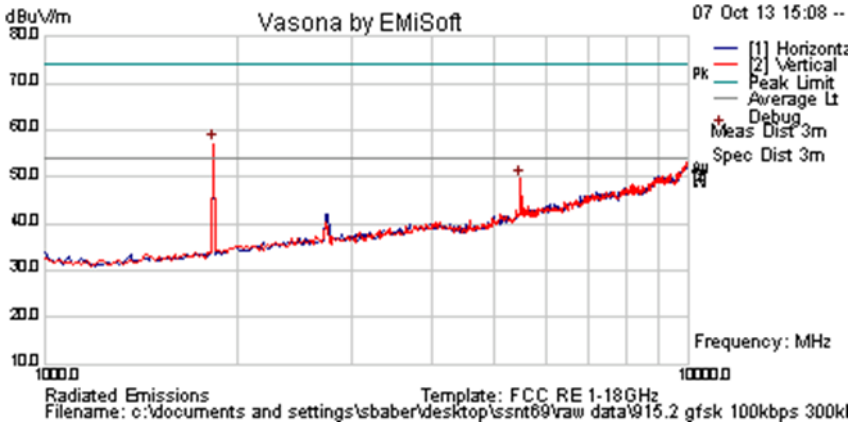


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5413.287	57.5	4.9	-8.1	54.3	Peak Max	V	136	245	74	-19.7	Pass	RB
5413.287	53.9	4.9	-8.1	50.7	Average Max	V	136	245	54	-3.32	Pass	RB
1793.587	77.5	2.8	-15.3	64.9	Peak [Scan]	V						NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	915.2 MHz	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	20.5
Freq. Range	1000 MHz - 10000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		

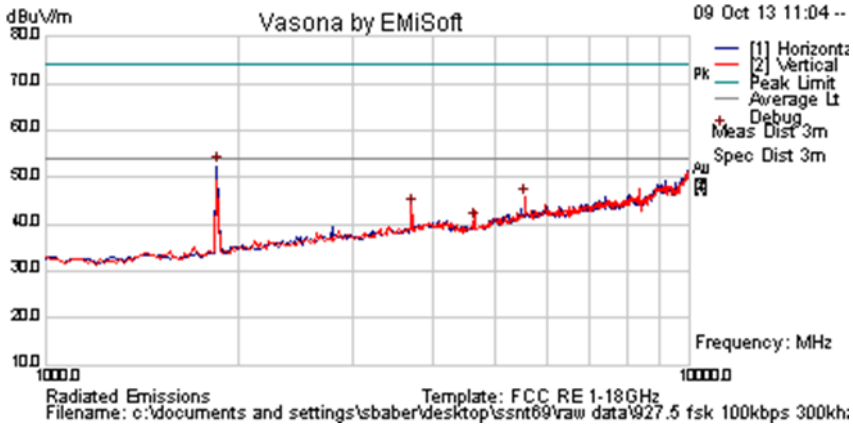


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5490.962	55.3	5.0	-7.9	52.4	Peak Max	V	146	257	74	-22	Pass	RB
5490.962	49.4	5.0	-7.9	46.5	Average Max	V	146	257	54	-8	Pass	RB
1829.659	69.5	2.8	-15.1	57.2	Peak [Scan]	H	150					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	927.5 MHz	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	20.5
Freq. Range	1000 MHz - 10000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing;FSK;		
Test Notes 2	4VDC		



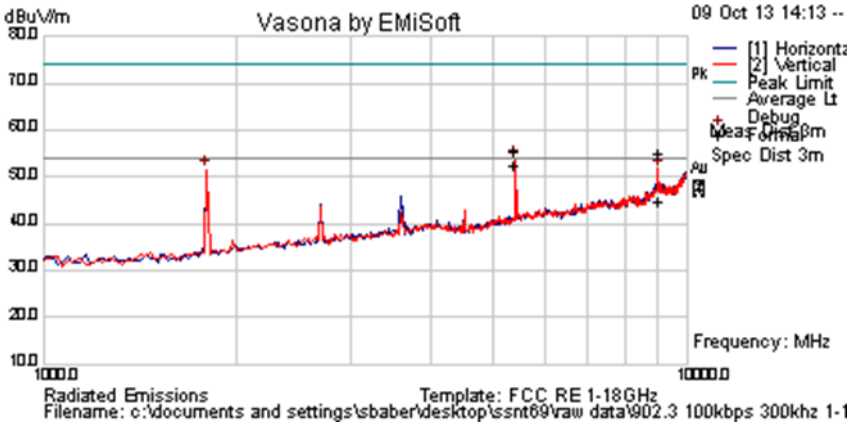
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1847.695	64.6	2.8	-15.1	52.4	Peak [Scan]	H	150					NRB
3710.841	50.5	4.0	-10.9	43.6	Peak [Scan]	V	98	0	54	-10	Pass	RB
5562.388	48.7	5.0	-7.8	45.8	Peak [Scan]	V	98	0	54	-8	Pass	RB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

6.1.5.2. External Antenna - Radiated Spurious Emissions

Test Freq.	902.3 MHz	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	20.5
Freq. Range	1000 MHz - 10000 MHz	**Rel. Hum.(%)**	24
Power Setting	55	**Press. (mBars)**	1004
Antenna	Taoglas G30.B.108111 (1.2dBi)		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		

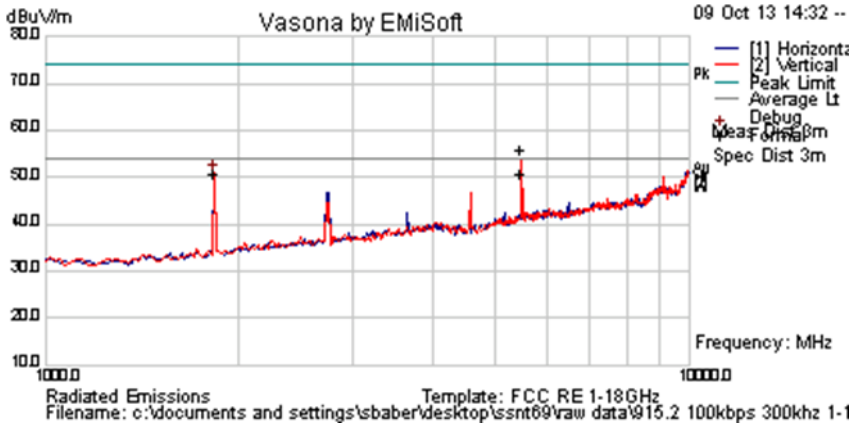


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5413.908	58.8	4.9	-8.1	55.6	Peak Max	V	98	225	74	-18	Pass	RB
9023.367	47.9	6.4	0.5	54.9	Peak Max	V	165	276	74	-19	Pass	RB
5413.908	55.5	4.9	-8.1	52.3	Average Max	V	98	225	54	-2	Pass	RB
9023.367	38.0	6.4	0.5	45.0	Average Max	V	165	276	54	-9	Pass	RB
1793.587	66.1	2.8	-15.3	53.5	Peak [Scan]	H	100					FUND

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	915.2 MHz	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	20.5
Freq. Range	1000 MHz - 10000 MHz	**Rel. Hum.(%)**	24
Power Setting	55	**Press. (mBars)**	1004
Antenna	Taoglas G30.B.108111 (1.2dBi)		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		

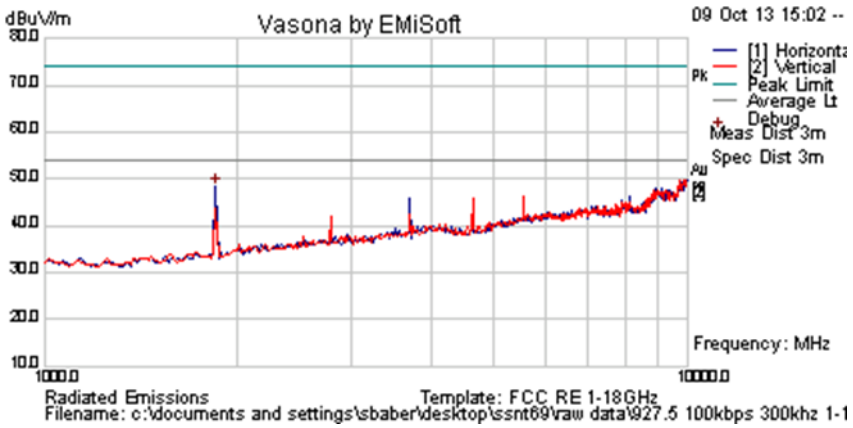


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5491.463	58.8	5.0	-7.9	55.9	Peak Max	V	98	249	74	-18	Pass	RB
5491.463	53.7	5.0	-7.9	50.8	Average Max	V	98	249	54	-3	Pass	RB
1829.659	63.3	2.8	-15.1	51.0	Peak [Scan]	H	100					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	927.5 MHz	**Engineer**	SB
Variant	Cont Tx	**Temp (ºC)**	20.5
Freq. Range	1000 MHz - 10000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Taoglas G30.B.108111 (1.2dBi)		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1847.695	60.6	2.8	-15.1	48.4	Peak [Scan]	H						NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Specification

Limits

FCC Part 15 Subpart C §15.247(d)

Industry Canada §A8.5

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.

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0287, 0335, 0338, 0158, 0134, 0304, 0311, 0315, 0310, 0312

6.1.6. Radiated Emissions – Digital Emissions (0.03-1 GHz)

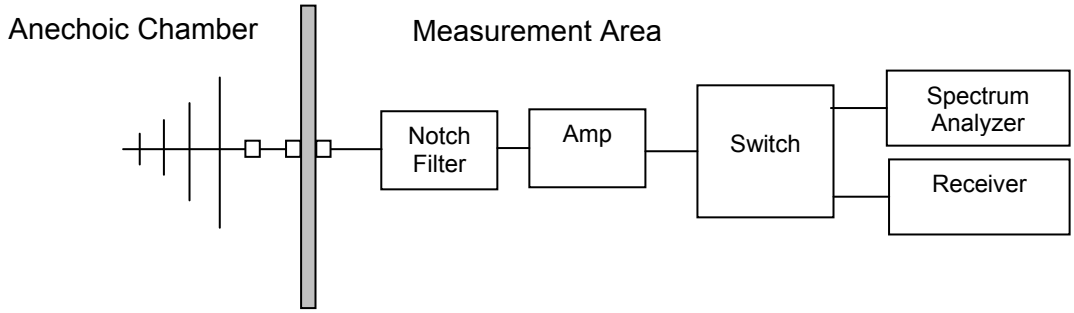
FCC, Part 15 Subpart C §15.247(d), §15.205, 15.209
Industry Canada RSS-Gen §6.1

Test Procedure

Preliminary radiated emissions were measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarity. The emissions are recorded with a CISPR compliant spectrum analyzer in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. A photograph of the test set-up in the anechoic chamber in Section 6 Test Set-Up Photographs.

A notch filter with >70 dB of rejection was used to remove the fundamental frequency.

Test Measurement Set up



Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

For example:
Given a Receiver input reading of 51.5dBμV; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

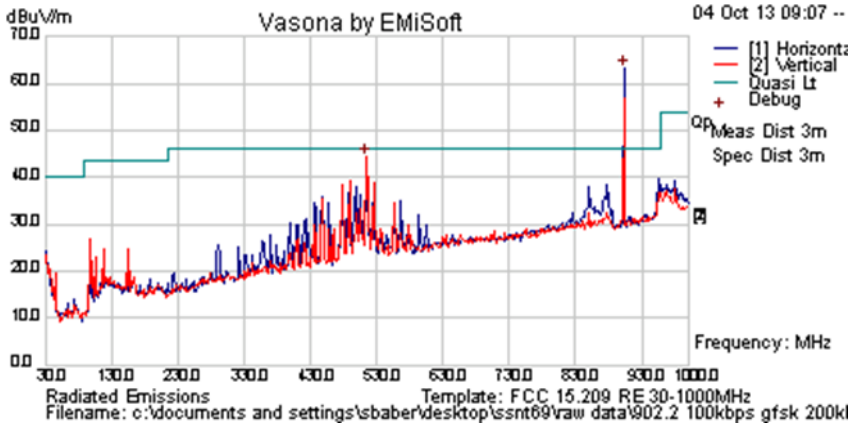
Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

6.1.6.1. Radiated Digital Emissions

Test Freq.	902.2 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 200KHz spacing; GFSK;		
Test Notes 2	4VDC		



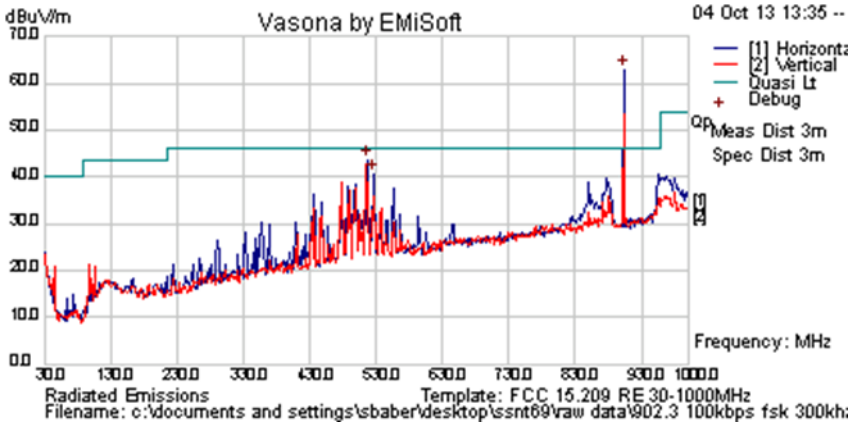
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
513.525	40.1	5.9	-12.8	33.2	Quasi Max	V	236					NRB
902.806	62.0	9.0	-7.8	63.3	Peak [Scan]	H	100					FUND

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	902.3 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		



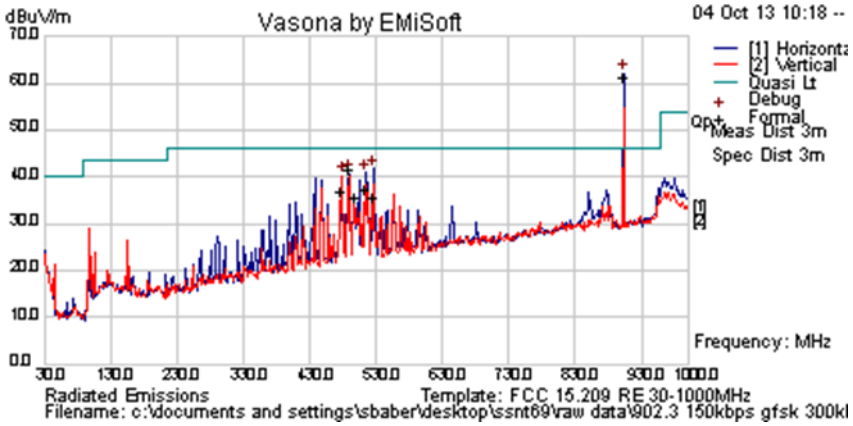
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
514.927	33.4	5.9	-12.8	26.5	Quasi Max	H						NRB
954.337	40.8	7.3	-7.1	41.0	Quasi Max	H	98	346	46	-5.04	Pass	RB
527.133	24.1	5.9	-12.4	17.6	Quasi Max	H						NRB
556.407	33.5	6.1	-12.0	27.7	Quasi Max	H						NRB
478.384	24.0	5.8	-12.9	16.9	Quasi Max	V						NRB
902.806	61.8	9.0	-7.8	63.0	Peak [Scan]	H						FUND

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	902.3 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;150kbps; 300KHz spacing; GFSK;		
Test Notes 2	4VDC		



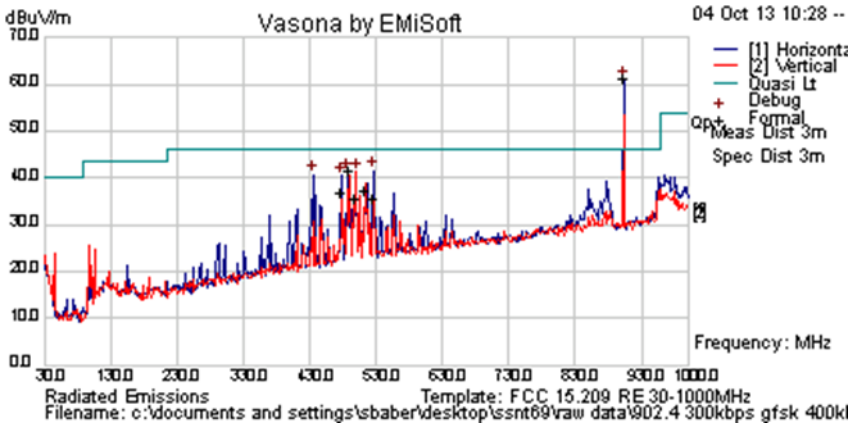
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
902.806	60.9	9.0	-7.8	62.2	Peak [Scan]	H	100					FUND
525.691	48.2	5.9	-12.5	41.7	Peak [Scan]	H	200					NRB
514.028	47.7	5.9	-12.8	40.8	Peak [Scan]	H	200					NRB
488.758	47.7	5.8	-12.9	40.7	Peak [Scan]	H	200					NRB
479.038	47.3	5.8	-12.9	40.2	Peak [Scan]	V	150					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;300kbps; 400KHz spacing; GFSK;		
Test Notes 2	4VDC		



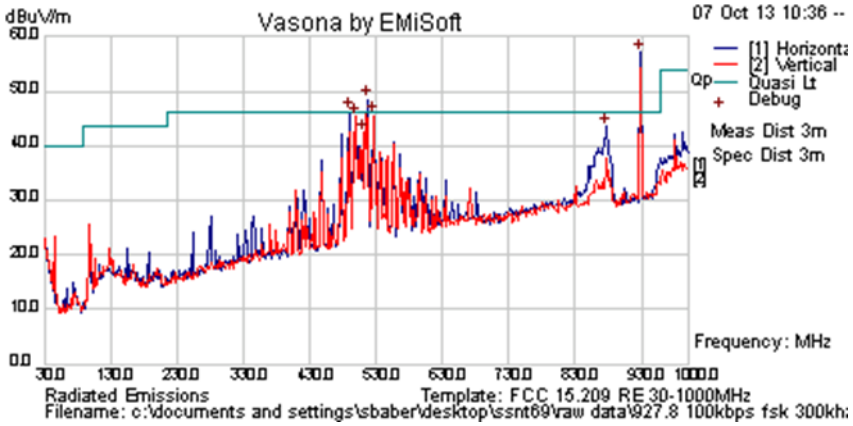
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
902.806	59.9	9.0	-7.8	61.1	Peak [Scan]	H	100					FUND
525.691	48.1	5.9	-12.5	41.5	Peak [Scan]	H	200					NRB
500.421	48.4	5.8	-12.8	41.4	Peak [Scan]	V	150					NRB
486.814	48.2	5.8	-12.8	41.1	Peak [Scan]	H	200					NRB
436.273	49.2	5.6	-14.2	40.7	Peak [Scan]	H	100					NRB
477.094	47.8	5.8	-13.0	40.6	Peak [Scan]	H	200					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	927.8 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 300KHz spacing; FSK;		
Test Notes 2	4VDC		



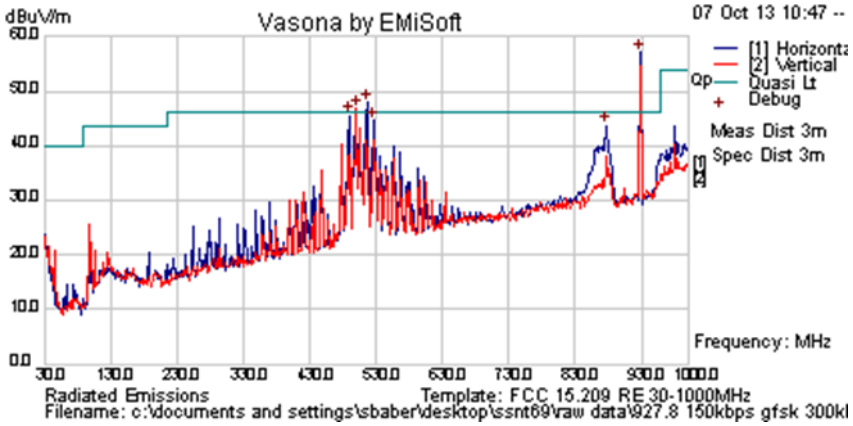
Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
928.076	57.4	7.2	-7.5	57.1	Peak [Scan]	H	100					FUND
515.972	52.7	5.9	-12.8	45.8	Quasi Max	V	154	189	46	-0.2	Pass	NRB
488.758	53.4	5.8	-12.9	46.3	Peak [Scan]	H	200					NRB
525.691	52.2	5.9	-12.5	45.6	Peak [Scan]	H	200					NRB
498.477	52.3	5.8	-12.9	45.3	Peak [Scan]	V	100					NRB
877.535	44.5	7.1	-8.1	43.4	Peak [Scan]	H	100					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

NOTE: The emission breaking the limit line is the fundamental frequency. A notch filter was used to attenuate the fundamental frequency

Test Freq.	927.8 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;150kbps; 300KHz spacing; GFSK;		
Test Notes 2	4VDC		

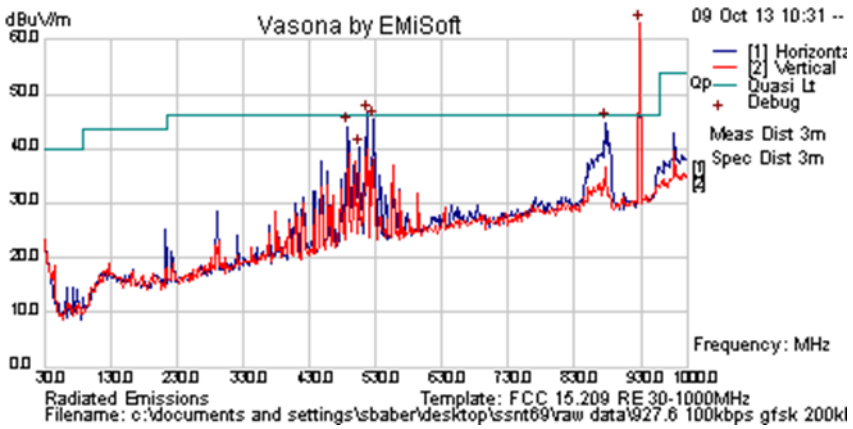


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
928.076	57.4	7.2	-7.5	57.2	Peak [Scan]	H	100					FUND
515.972	52.7	5.9	-12.8	45.8	Quasi Max	V	154	189	46	-0.2	Pass	NRB
500.421	48.0	5.8	-12.8	41.0	Quasi Max	H	240	255	46	-5.0	Pass	NRB
488.758	31.6	5.8	-12.9	24.6	Quasi Max	V	255	336	46	-21.4	Pass	NRB
525.691	51.2	5.9	-12.5	44.7	Peak [Scan]	H	200					NRB
877.535	44.8	7.1	-8.1	43.7	Peak [Scan]	H	100					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	927.6 MHz	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	20.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	24
Power Setting	60	**Press. (mBars)**	1004
Antenna	Integral		
Test Notes 1	Model: NIC451-0503;MAC: 00:13:50:02:00:A7:00:71;100kbps; 200KHz spacing; GFSK;		
Test Notes 2	4VDC		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
928.076	63.1	7.2	-7.5	62.9	Peak [Scan]	V	100					FUND
515.972	52.7	5.9	-12.8	45.8	Quasi Max	V	154	189	46	-0.2	Pass	NRB
525.691	52.0	5.9	-12.5	45.4	Peak [Scan]	H	200					NRB
875.591	45.8	7.1	-8.1	44.8	Peak [Scan]	H	100					NRB
486.814	51.1	5.8	-12.8	44.0	Peak [Scan]	H	200					NRB
504.309	47.2	5.8	-12.8	40.2	Peak [Scan]	H	200					NRB

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Specification

Limits

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

§15.209 (a) and **RSS-Gen §6.1** Limit Matrix

Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0287, 0335, 0338, 0158, 0134, 0304, 0311, 0315, 0310, 0312, 0341

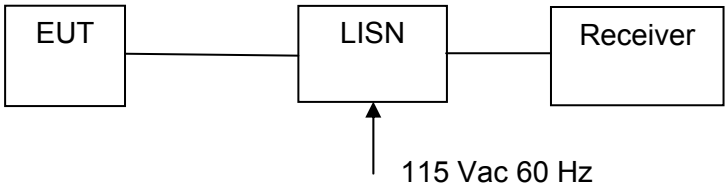
6.1.7. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

NOTE: Test not applicable EUT was dc powered

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-Gen §7.2.4

Test Procedure
The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

RSS-Gen §7.2.4
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and **RSS-Gen §7.2.2** Limit Matrix
The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

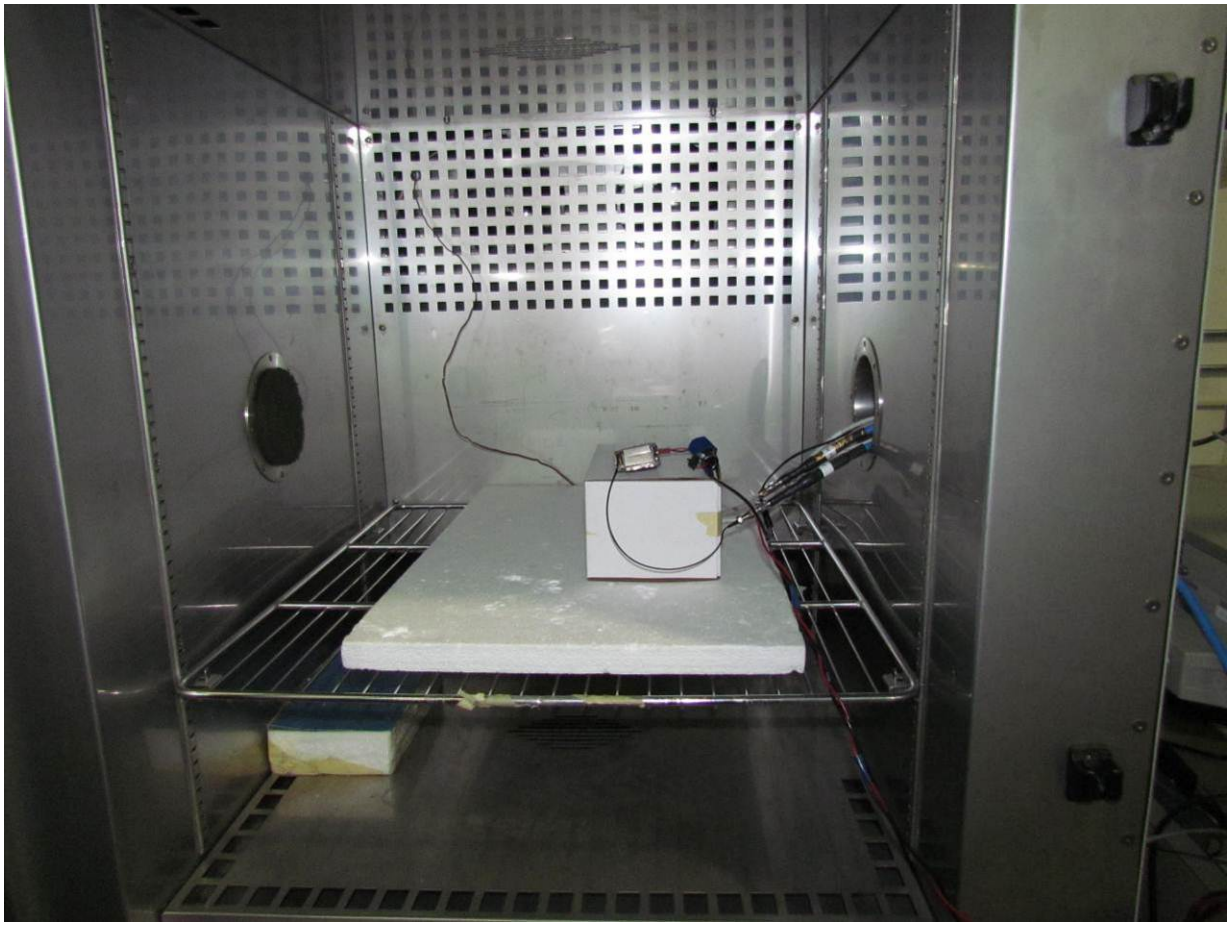
Measurement uncertainty	±2.64 dB

Traceability

Method	Test Equipment Used
Measurements were made per Sanmina work instruction	0190, 0193

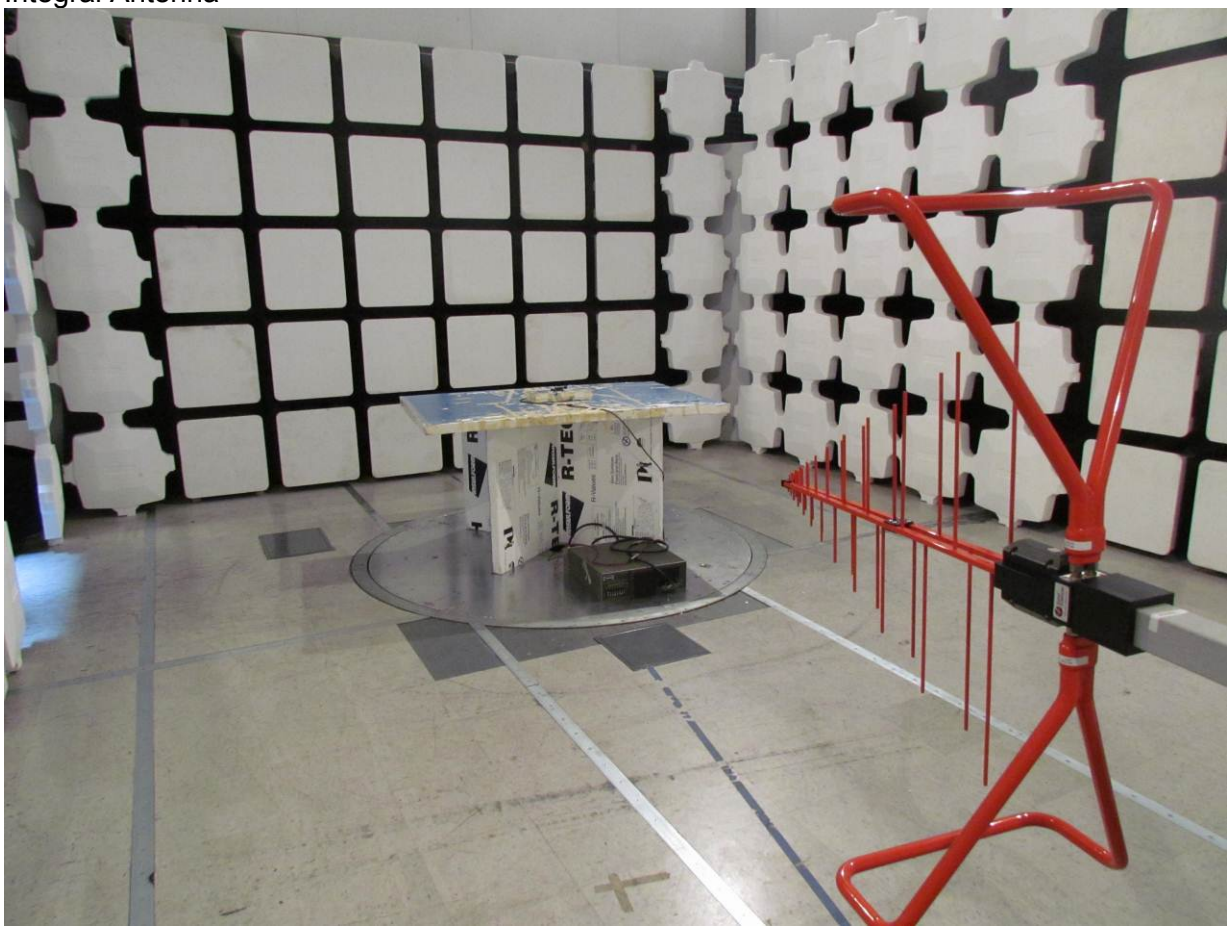
7. PHOTOGRAPHS

7.1. General Measurement Test Set-Up

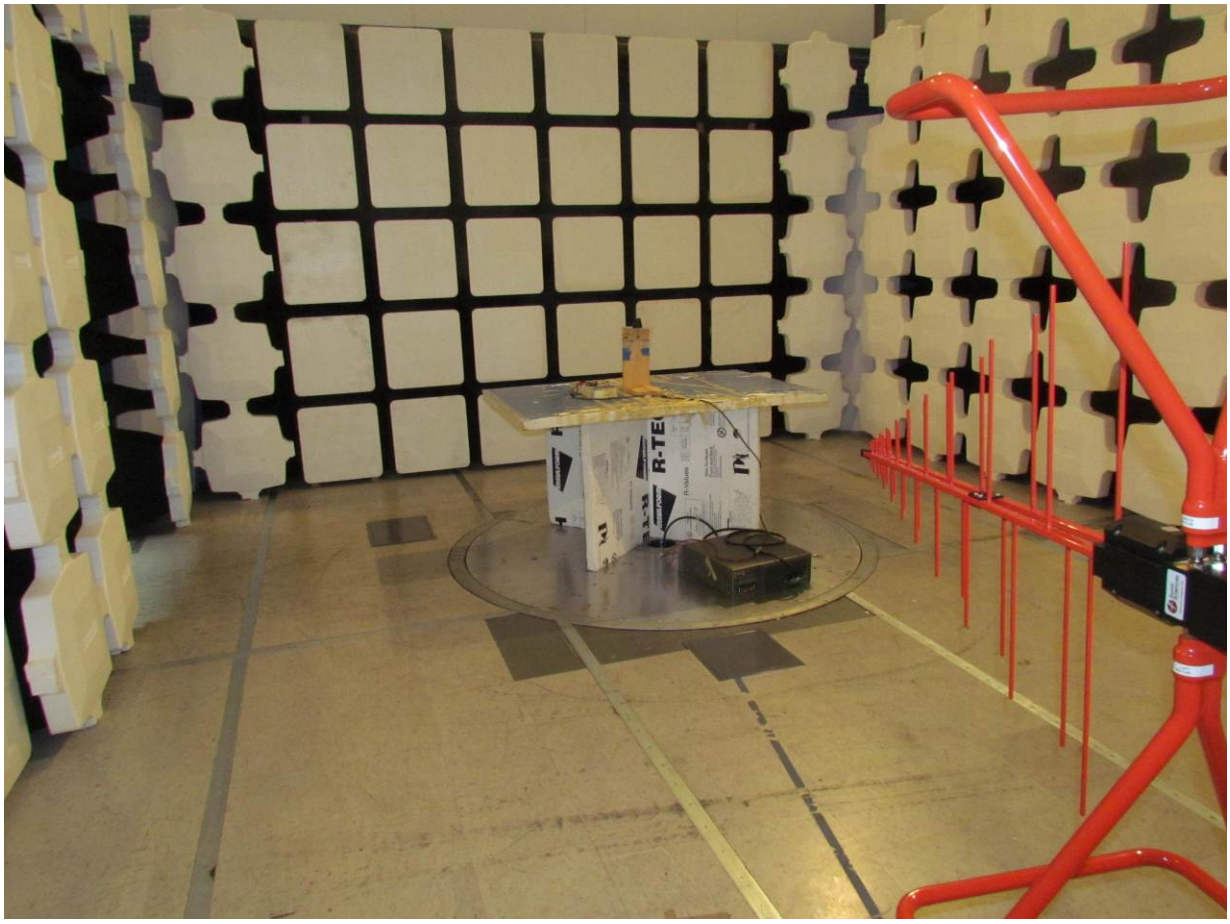


7.2. Radiated Emissions <1 GHz

Integral Antenna

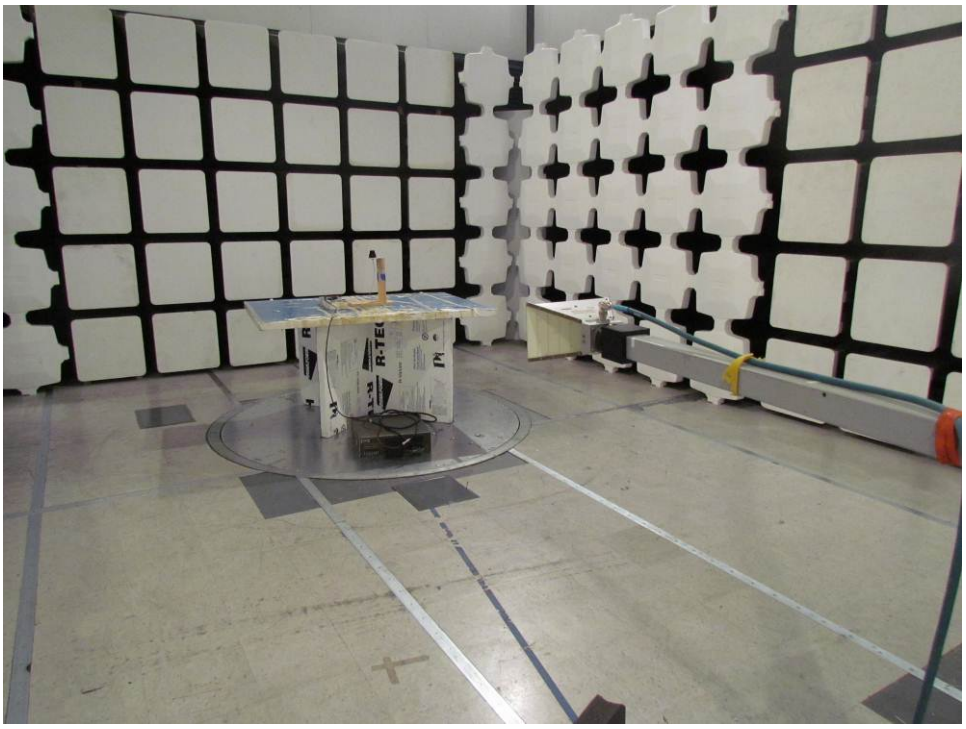


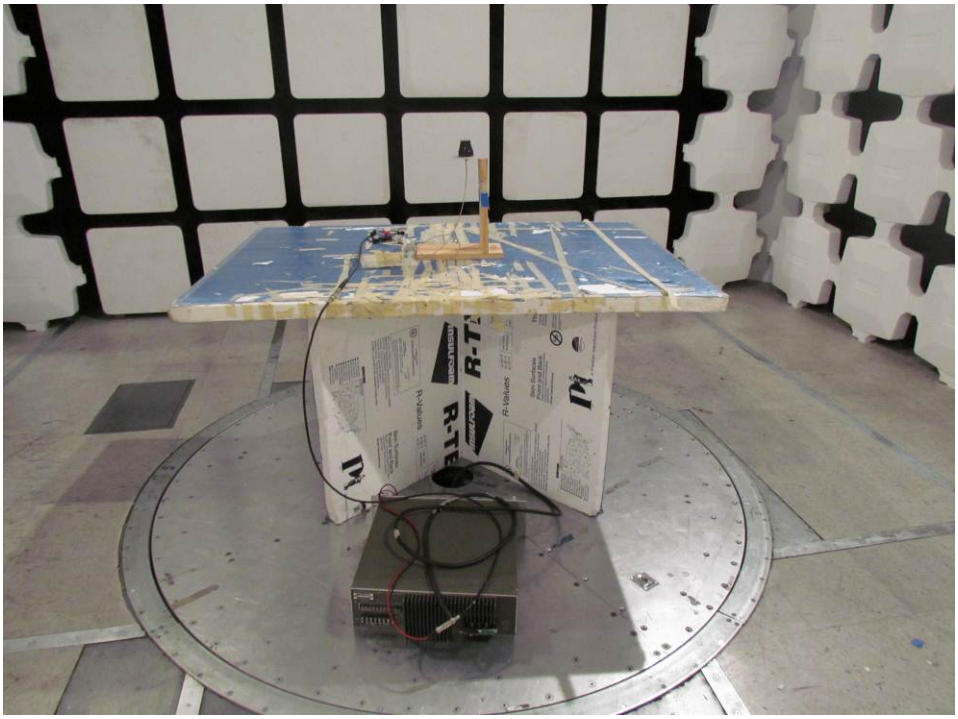
External Antenna



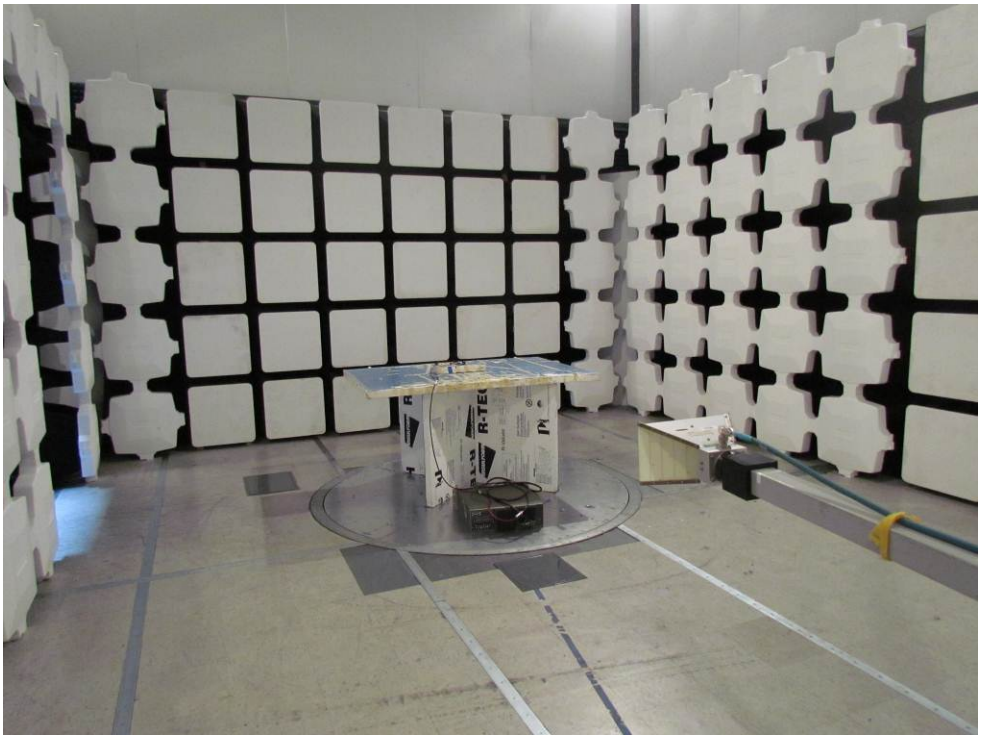
7.3. Radiated Emissions >1 GHz

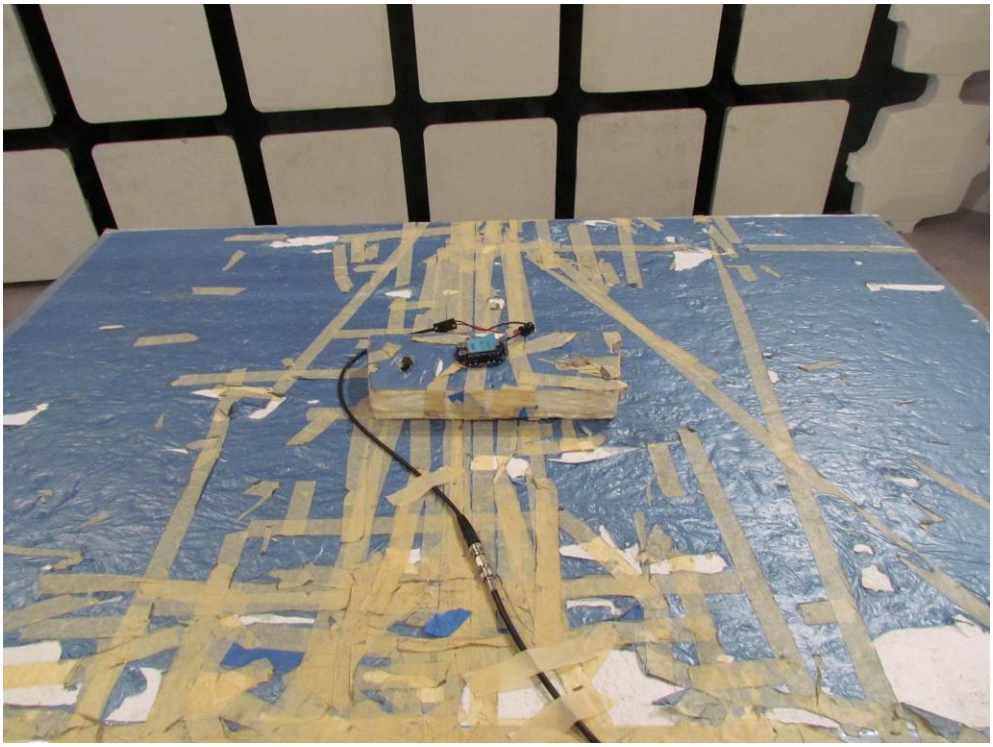
External Antenna





Integral Antenna





8. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28th Nov 13
0117	Power Sensor	Hewlett Packard	8487D	3318A00371	15th Nov 13
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	15th Nov 13
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29th Nov 13
0376	Power Sensor	Agilent	U2000A	MY51440005	8th Dec 13
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Dec 13
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 13
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 13
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 13
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 13
0252	SMA Cable	Megaphase	Sucoflex 104	None	N/A
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001	N/A
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002	N/A
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	N/A
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001	N/A
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623	N/A
	EMC Test Software	EMISoft	Vasona	5.0051	N/A
	RF Conducted Test Software	National Instruments	Labview	Version 8.2	N/A
	RF Conducted Test Software	MiCOM Labs ATS		Version 1.5	N/A

APPENDIX

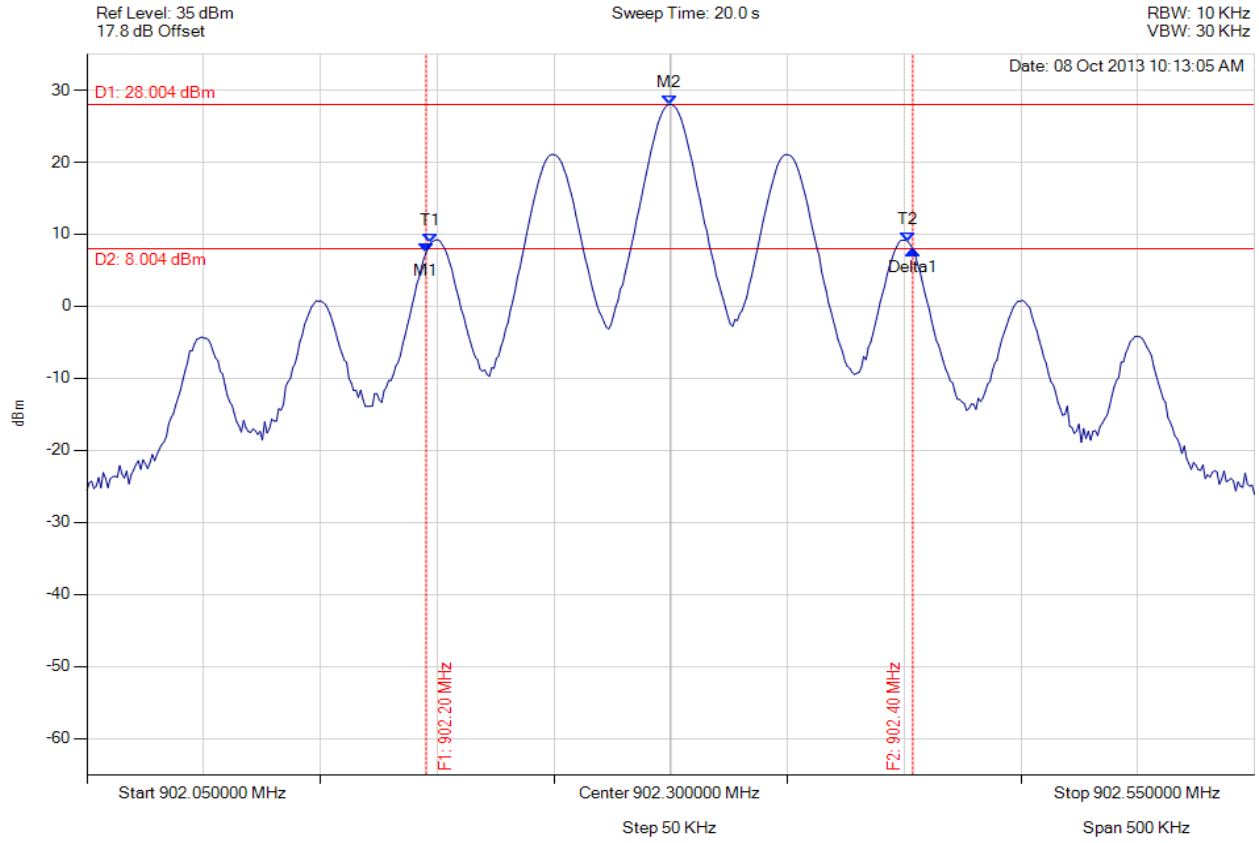
A. SUPPORTING INFORMATION

A.1. CONDUCTED TEST PLOTS

A.1.1. 20 dB & 99% Bandwidth

20 dB & 99% BANDWIDTH

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

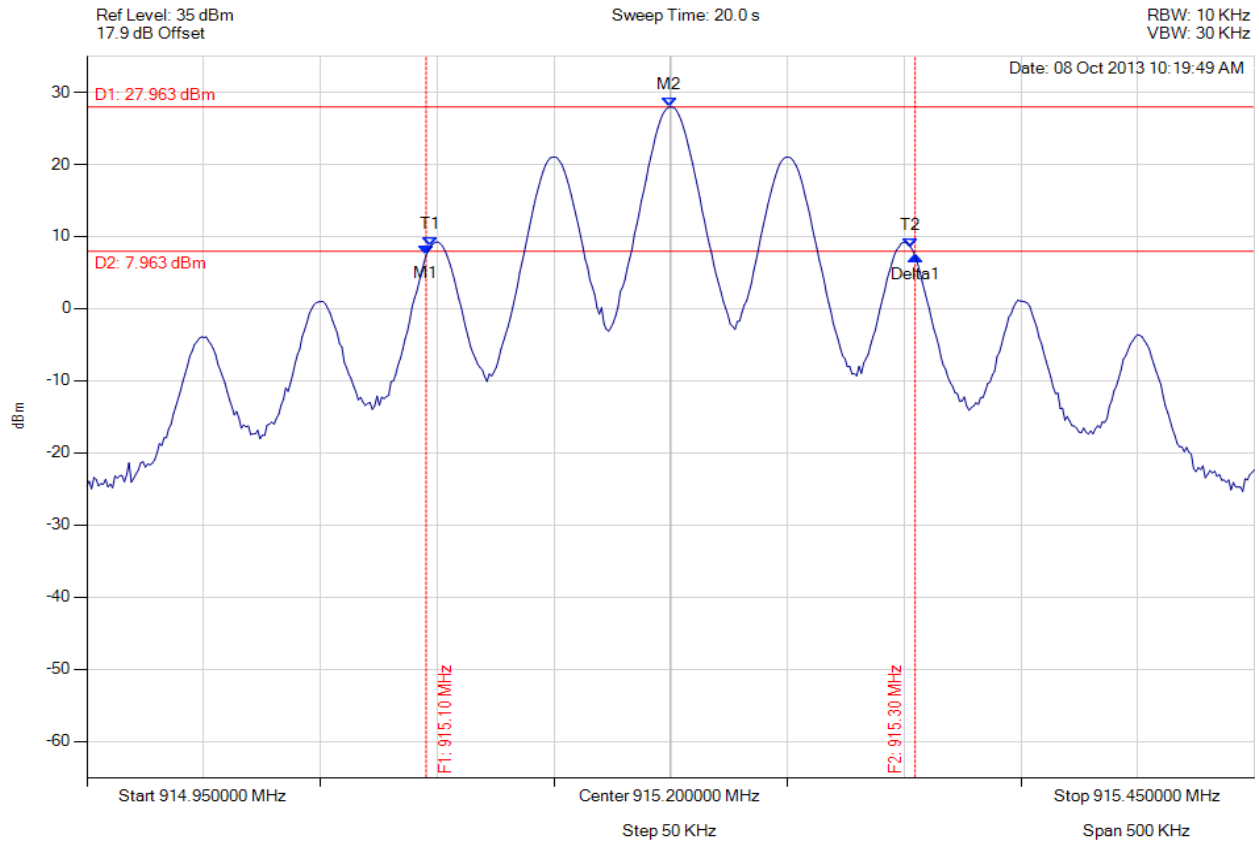


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.195 MHz : 7.441 dBm M2 : 902.299 MHz : 28.004 dBm Delta1 : 208 KHz : 0.439 dB T1 : 902.197 MHz : 8.818 dBm T2 : 902.402 MHz : 8.942 dBm OBW : 204 KHz	Measured 20 dB Bandwidth: 0.208 MHz Limit: ≥500.0 kHz Margin: 0.29 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: FSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

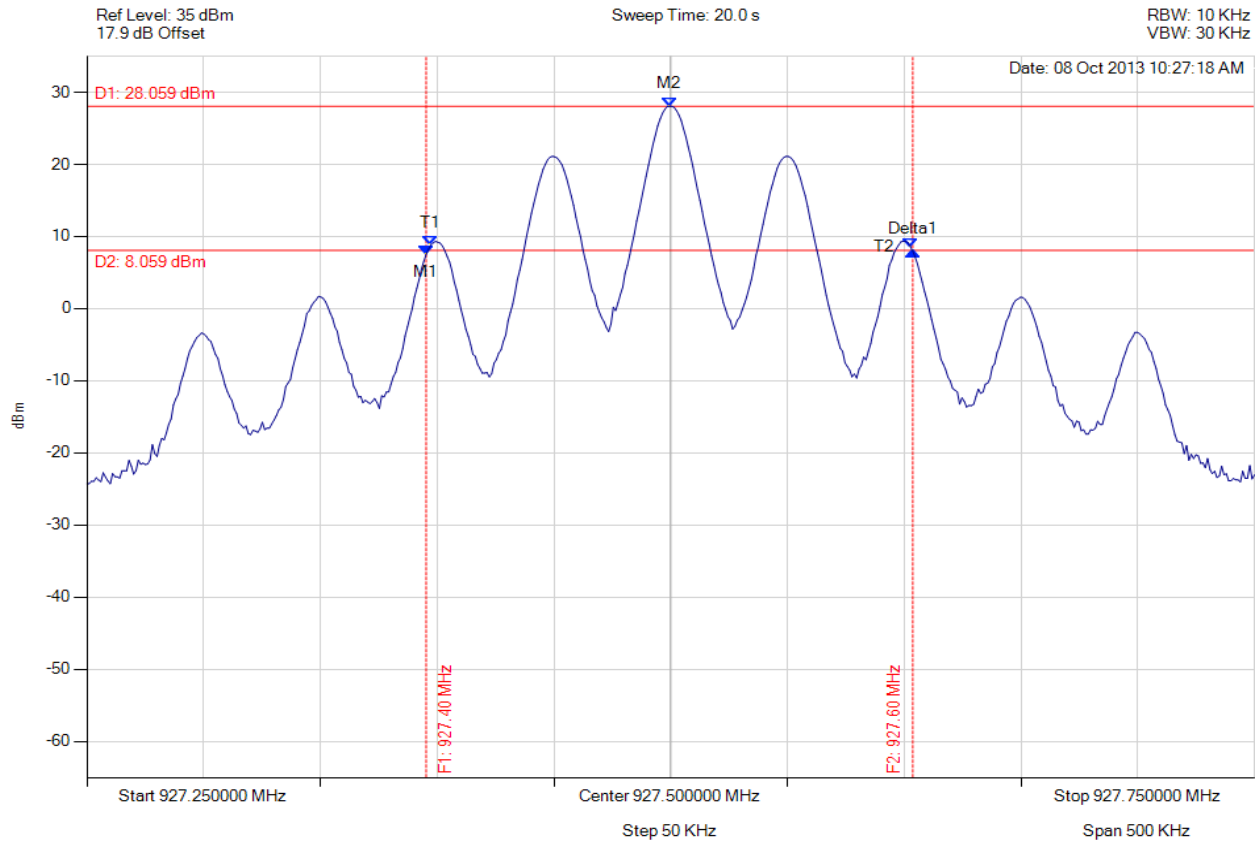


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.095 MHz : 7.429 dBm M2 : 915.199 MHz : 27.963 dBm Delta1 : 209 KHz : -0.1220 dB T1 : 915.097 MHz : 8.565 dBm T2 : 915.303 MHz : 8.537 dBm OBW : 205 KHz	Measured 20 dB Bandwidth: 0.209 MHz Limit: ≥500.0 kHz Margin: 0.29 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

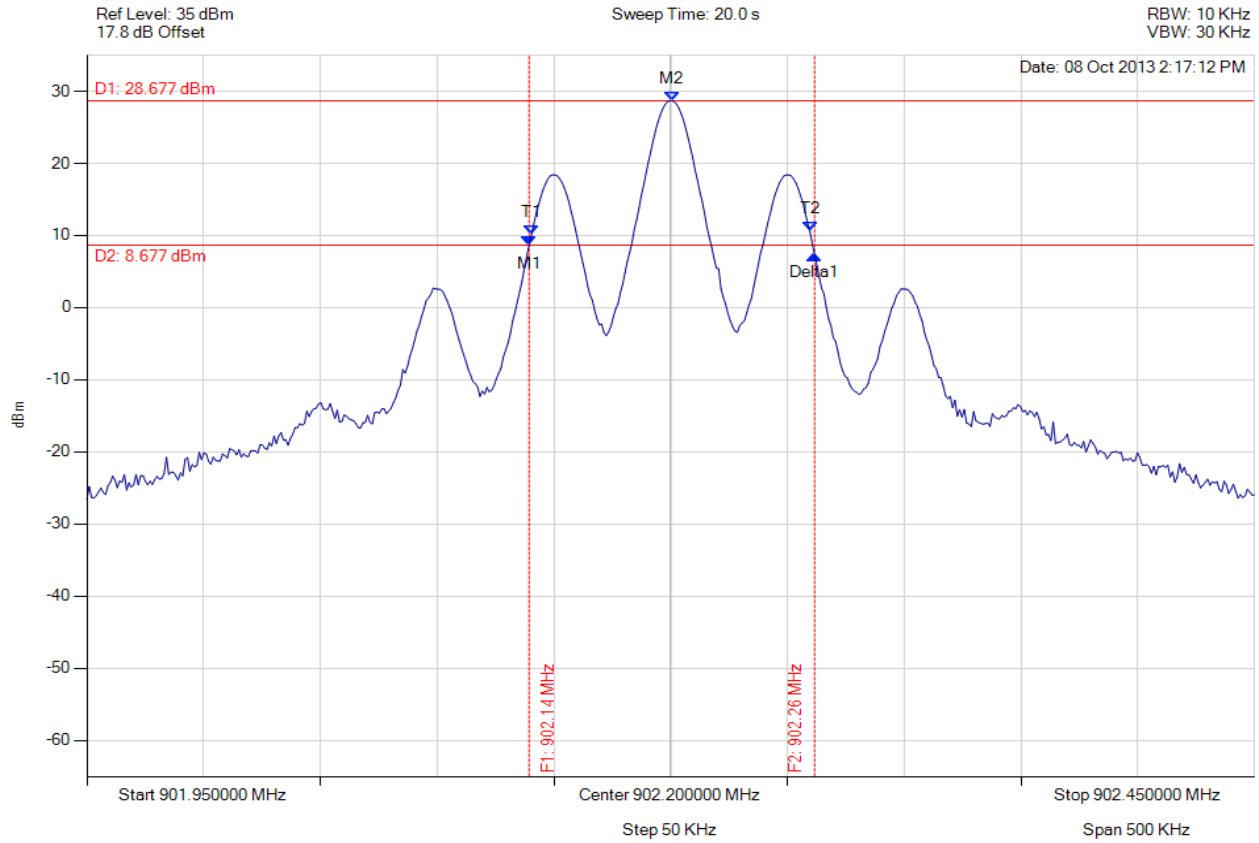


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.395 MHz : 7.5020 dBm M2 : 927.499 MHz : 28.059 dBm Delta1 : 208 KHz : 0.4520 dB T1 : 927.397 MHz : 8.799 dBm T2 : 927.603 MHz : 8.549 dBm OBW : 205 KHz	Measured 20 dB Bandwidth: 0.208 MHz Limit: ≥500.0 kHz Margin: 0.29 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 100kbps, Channel: 902.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

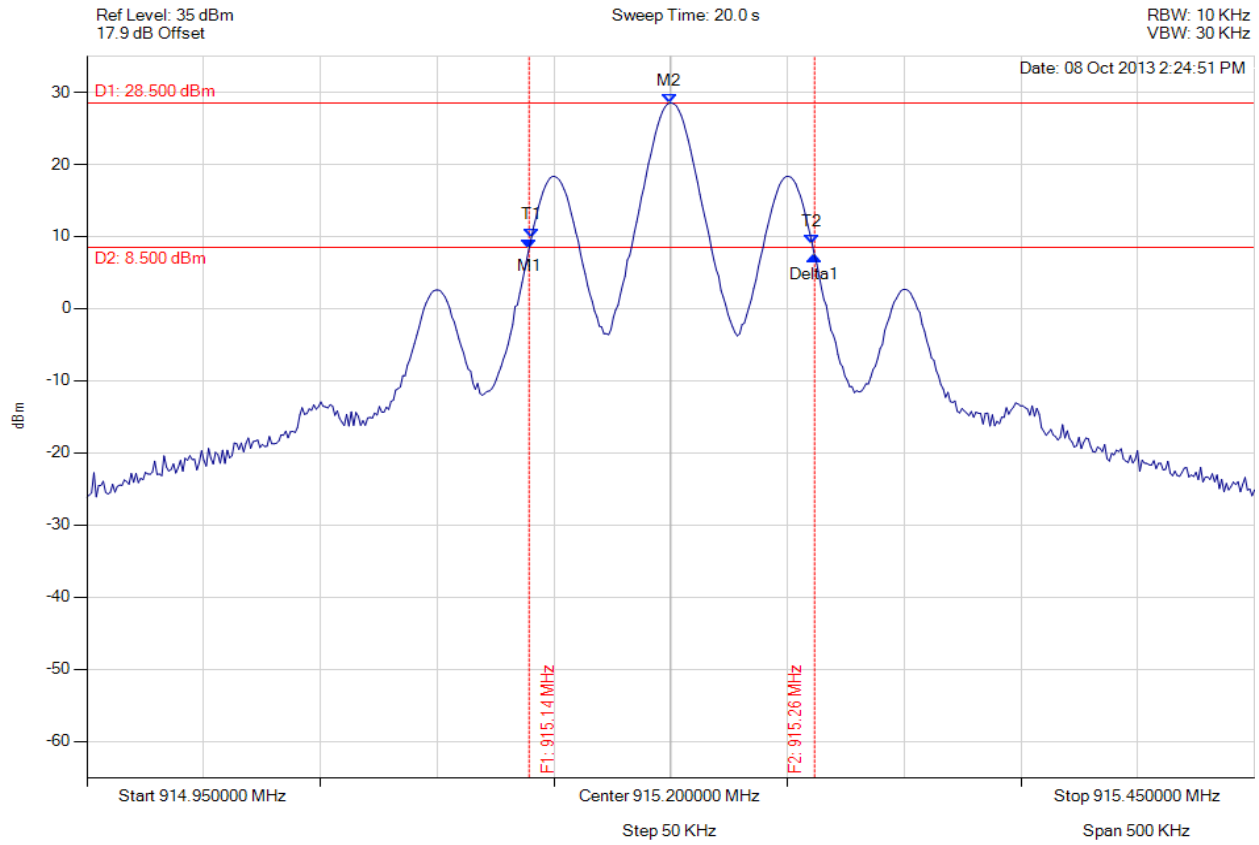


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.139 MHz : 8.655 dBm M2 : 902.201 MHz : 28.677 dBm Delta1 : 122 KHz : -1.322 dB T1 : 902.140 MHz : 10.131 dBm T2 : 902.260 MHz : 10.567 dBm OBW : 119 KHz	Measured 20 dB Bandwidth: 0.122 MHz Limit: ≥500.0 kHz Margin: 0.38 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

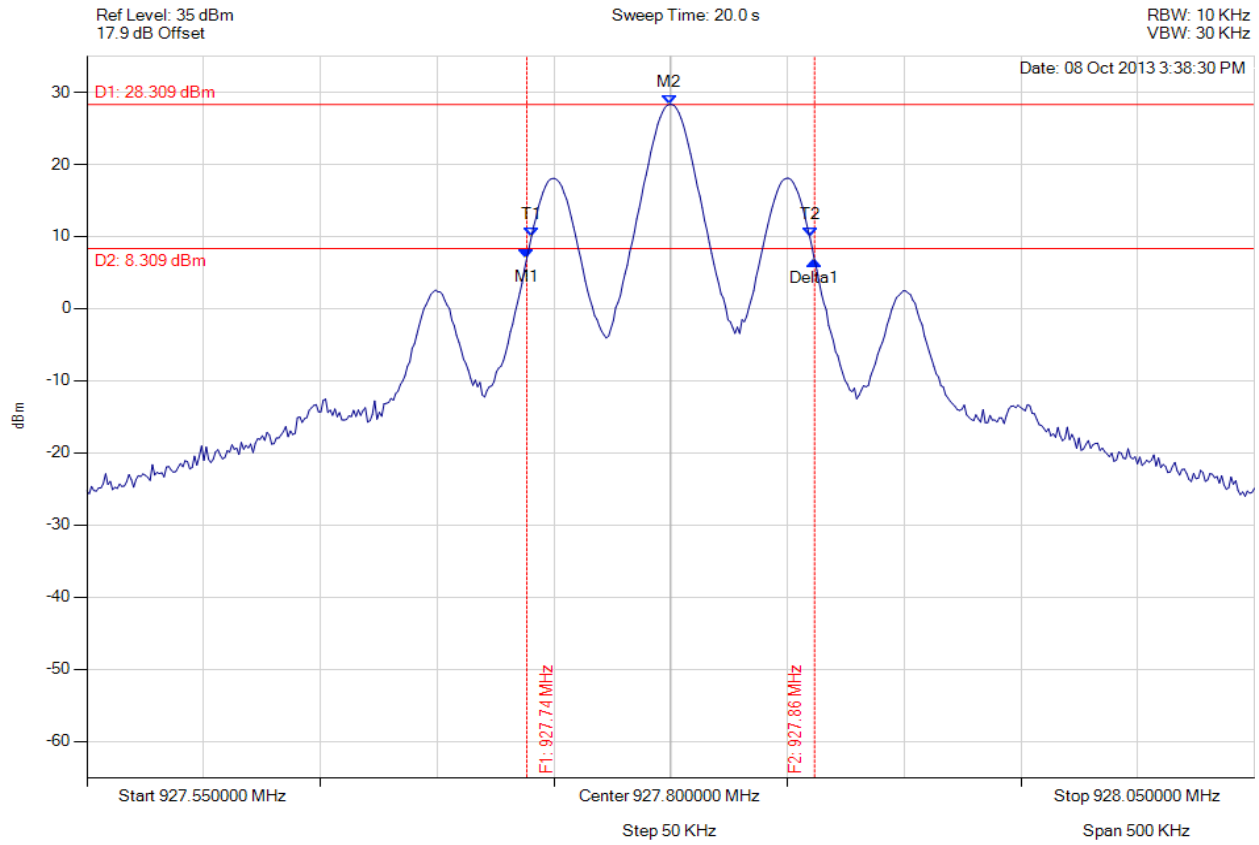


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.139 MHz : 8.374 dBm M2 : 915.199 MHz : 28.500 dBm Delta1 : 122 KHz : -1.051 dB T1 : 915.140 MHz : 9.887 dBm T2 : 915.261 MHz : 8.962 dBm OBW : 120 KHz	Measured 20 dB Bandwidth: 0.122 MHz Limit: ≥500.0 kHz Margin: 0.38 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 100kbps, Channel: 927.80 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

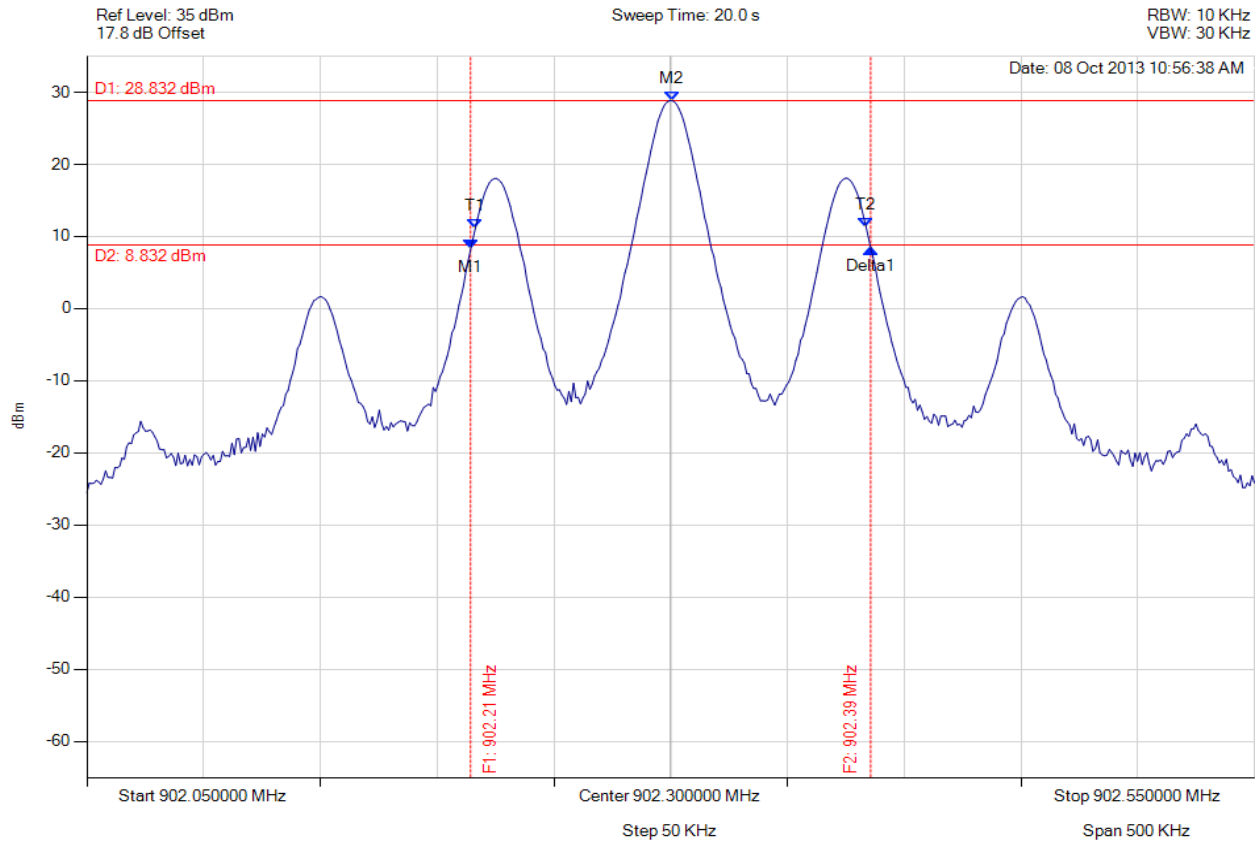


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.738 MHz : 6.985 dBm M2 : 927.799 MHz : 28.309 dBm Delta1 : 123 KHz : -0.311 dB T1 : 927.740 MHz : 9.999 dBm T2 : 927.860 MHz : 9.889 dBm OBW : 119 KHz	Measured 20 dB Bandwidth: 0.123 MHz Limit: ≥500.0 kHz Margin: 0.38 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 150kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

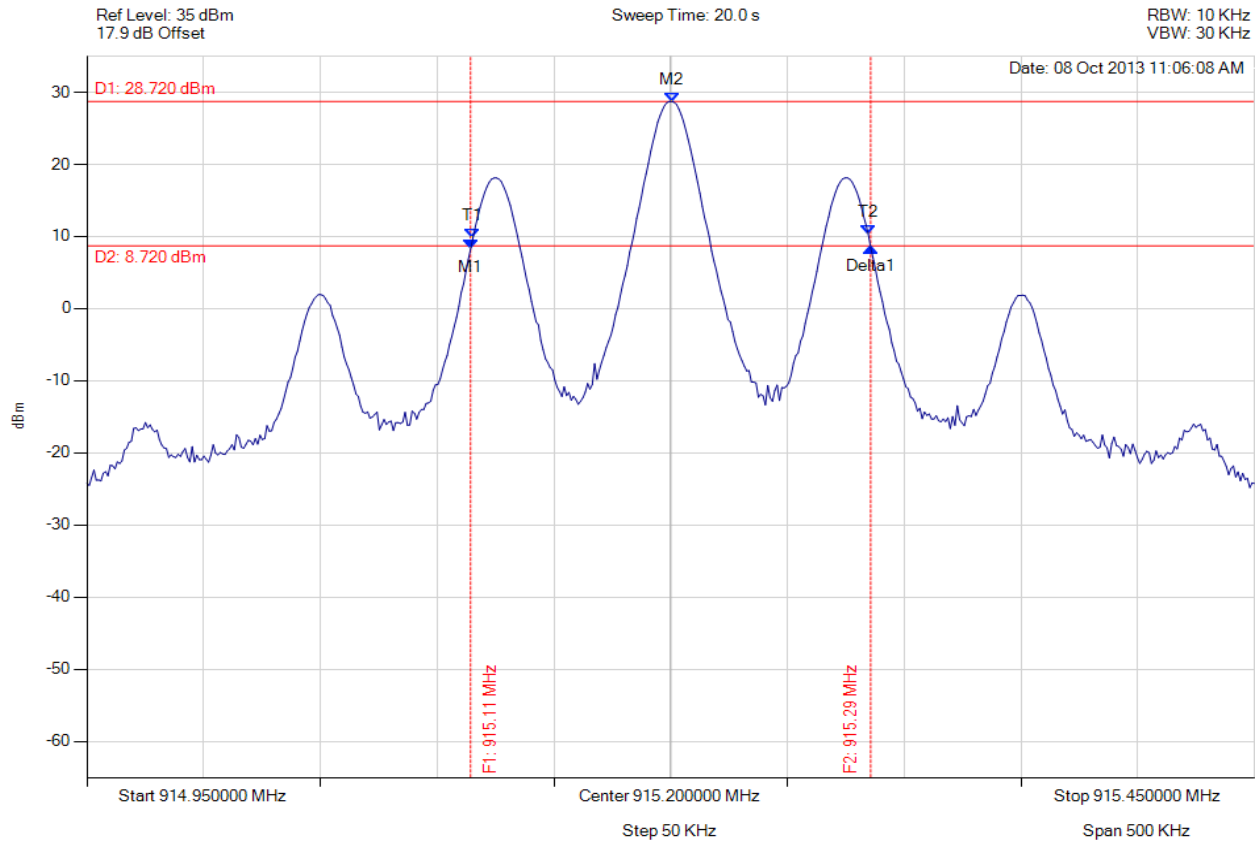


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.214 MHz : 8.228 dBm M2 : 902.301 MHz : 28.832 dBm Delta1 : 171 KHz : 0.1220 dB T1 : 902.216 MHz : 11.1320 dBm T2 : 902.384 MHz : 11.350 dBm OBW : 167 KHz	Measured 20 dB Bandwidth: 0.171 MHz Limit: ≥500.0 kHz Margin: 0.33 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 150kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

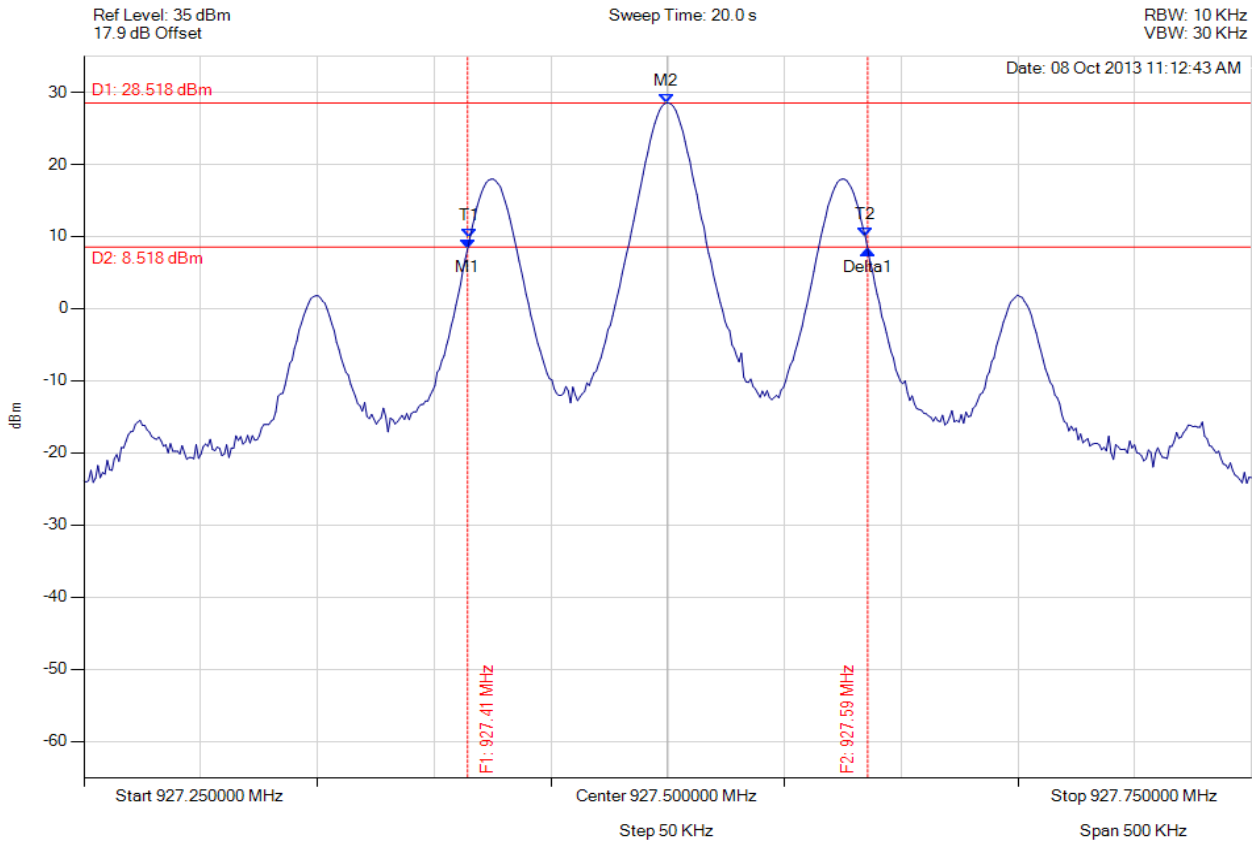


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.114 MHz : 8.264 dBm M2 : 915.201 MHz : 28.720 dBm Delta1 : 171 KHz : 0.148 dB T1 : 915.115 MHz : 9.775 dBm T2 : 915.285 MHz : 10.284 dBm OBW : 169 KHz	Measured 20 dB Bandwidth: 0.171 MHz Limit: ≥500.0 kHz Margin: 0.33 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 150kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.414 MHz : 8.301 dBm M2 : 927.499 MHz : 28.518 dBm Delta1 : 171 KHz : -0.110 dB T1 : 927.415 MHz : 9.808 dBm T2 : 927.585 MHz : 10.015 dBm OBW : 169 KHz	Measured 20 dB Bandwidth: 0.171 MHz Limit: ≥500.0 kHz Margin: 0.33 MHz

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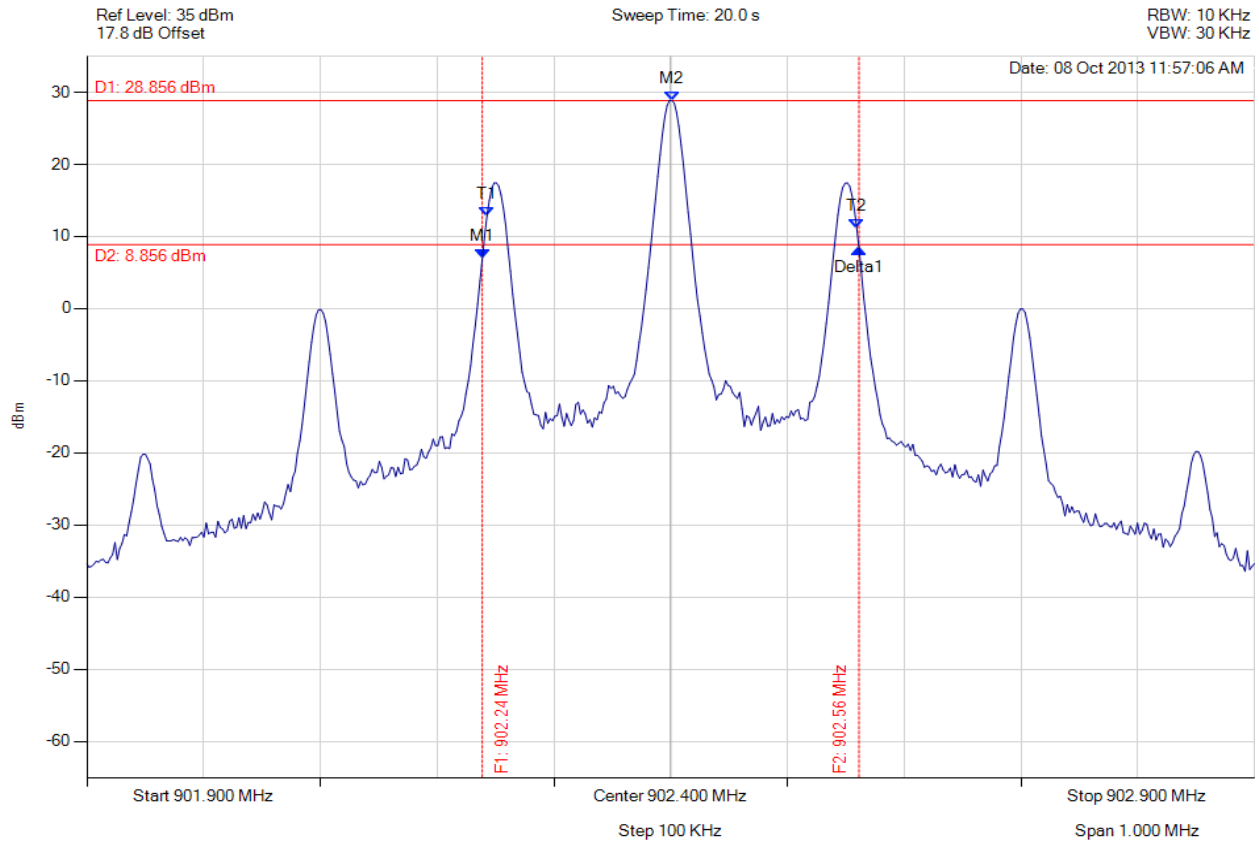
20 dB & 99% BANDWIDTH

Variant: GFSK 300kbps, Channel: 902.40 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc

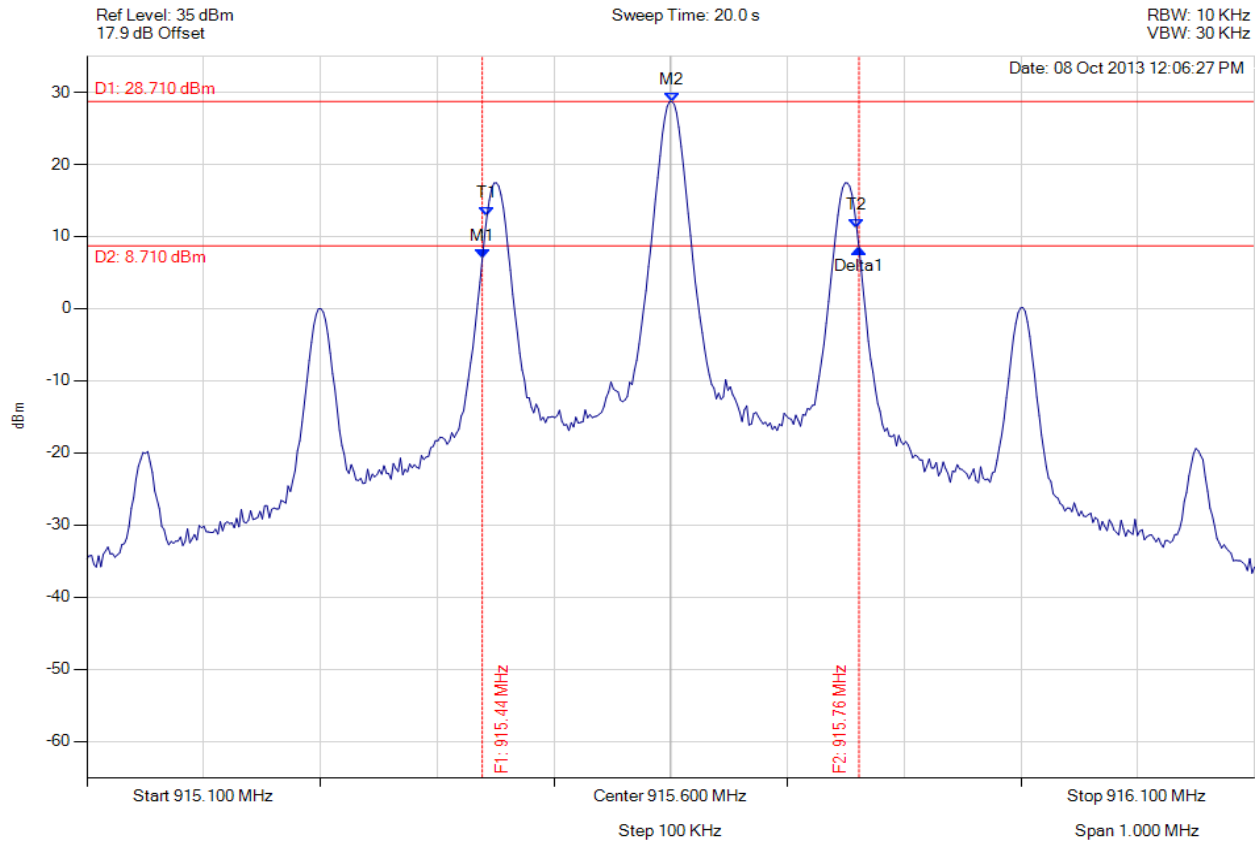


Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.239 MHz : 6.932 dBm M2 : 902.401 MHz : 28.8520 dBm Delta1 : 323 KHz : 1.365 dB T1 : 902.243 MHz : 12.871 dBm T2 : 902.559 MHz : 11.197 dBm OBW : 317 KHz	Measured 20 dB Bandwidth: 0.323 MHz Limit: ≥500.0 kHz Margin: 0.18 MHz

Back to the Matrix

20 dB & 99% BANDWIDTH

Variant: GFSK 300kbps, Channel: 915.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.439 MHz : 6.942 dBm M2 : 915.601 MHz : 28.710 dBm Delta1 : 323 KHz : 1.393 dB T1 : 915.443 MHz : 12.889 dBm T2 : 915.759 MHz : 11.211 dBm OBW : 317 KHz	Measured 20 dB Bandwidth: 0.323 MHz Limit: ≥500.0 kHz Margin: 0.18 MHz

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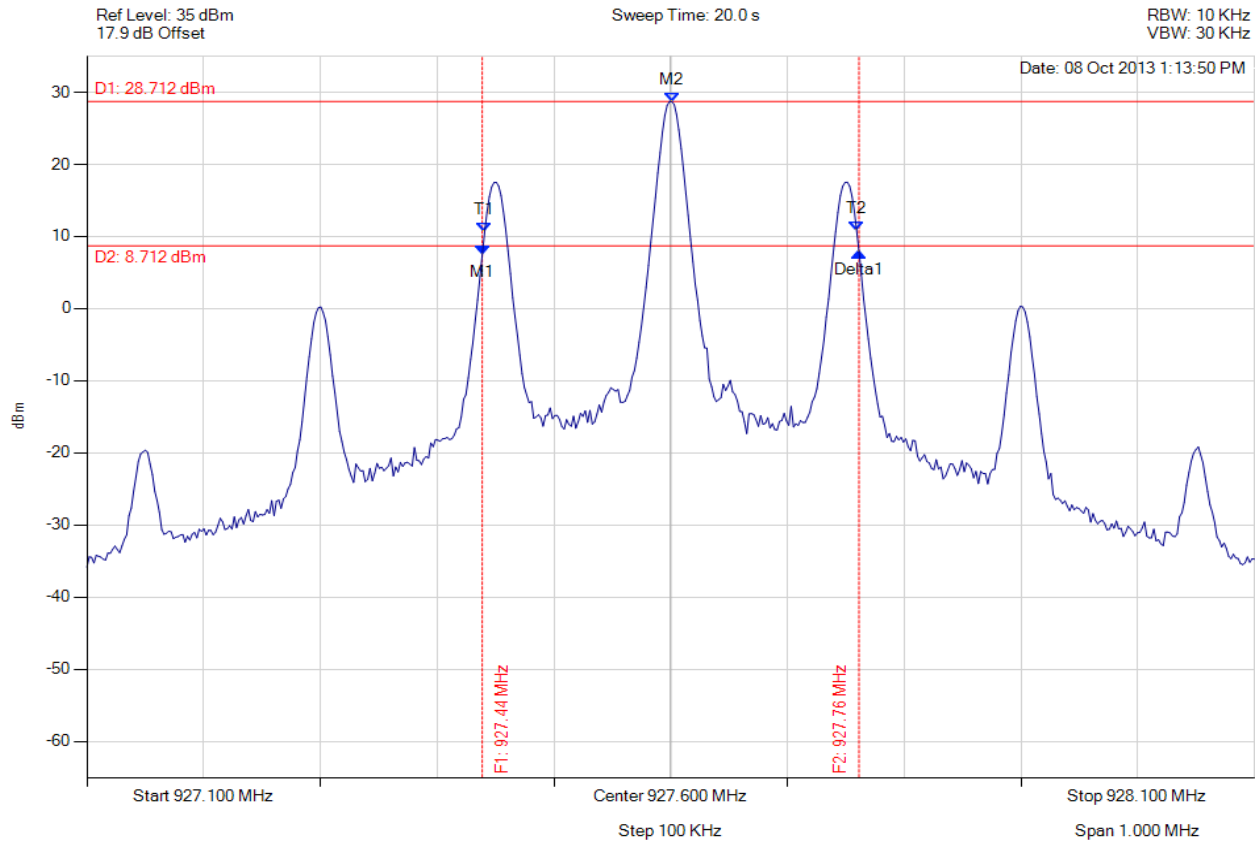
20 dB & 99% BANDWIDTH

Variant: GFSK 300kbps, Channel: 927.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.439 MHz : 7.5420 dBm M2 : 927.601 MHz : 28.712 dBm Delta1 : 323 KHz : 0.301 dB T1 : 927.441 MHz : 10.658 dBm T2 : 927.759 MHz : 10.760 dBm OBW : 319 KHz	Measured 20 dB Bandwidth: 0.323 MHz Limit: ≥500.0 kHz Margin: 0.18 MHz

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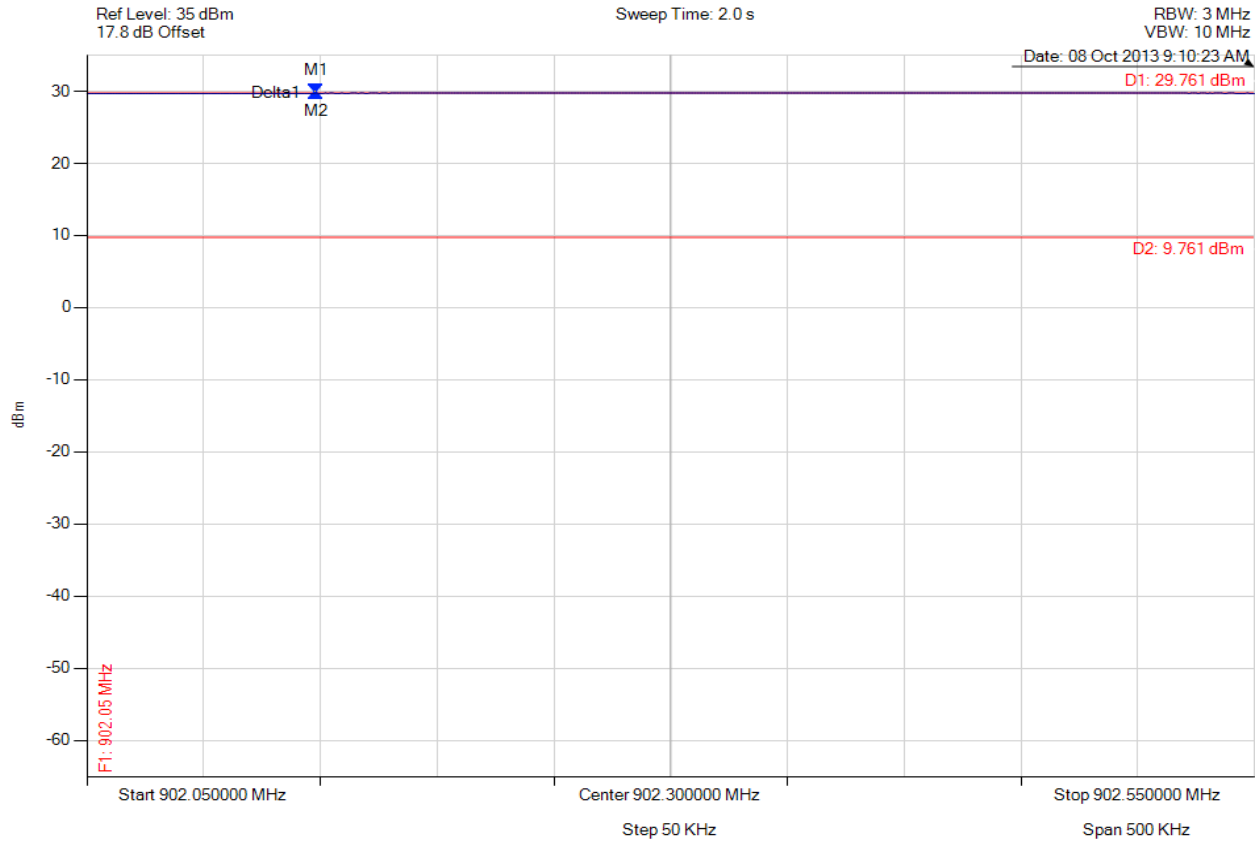
A.1.2. Peak Output Power

PEAK OUTPUT POWER

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.148 MHz : 29.761 dBm M2 : 902.148 MHz : 29.761 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.761 dBm Limit: 30.00 dBm Margin: -0.24 dB

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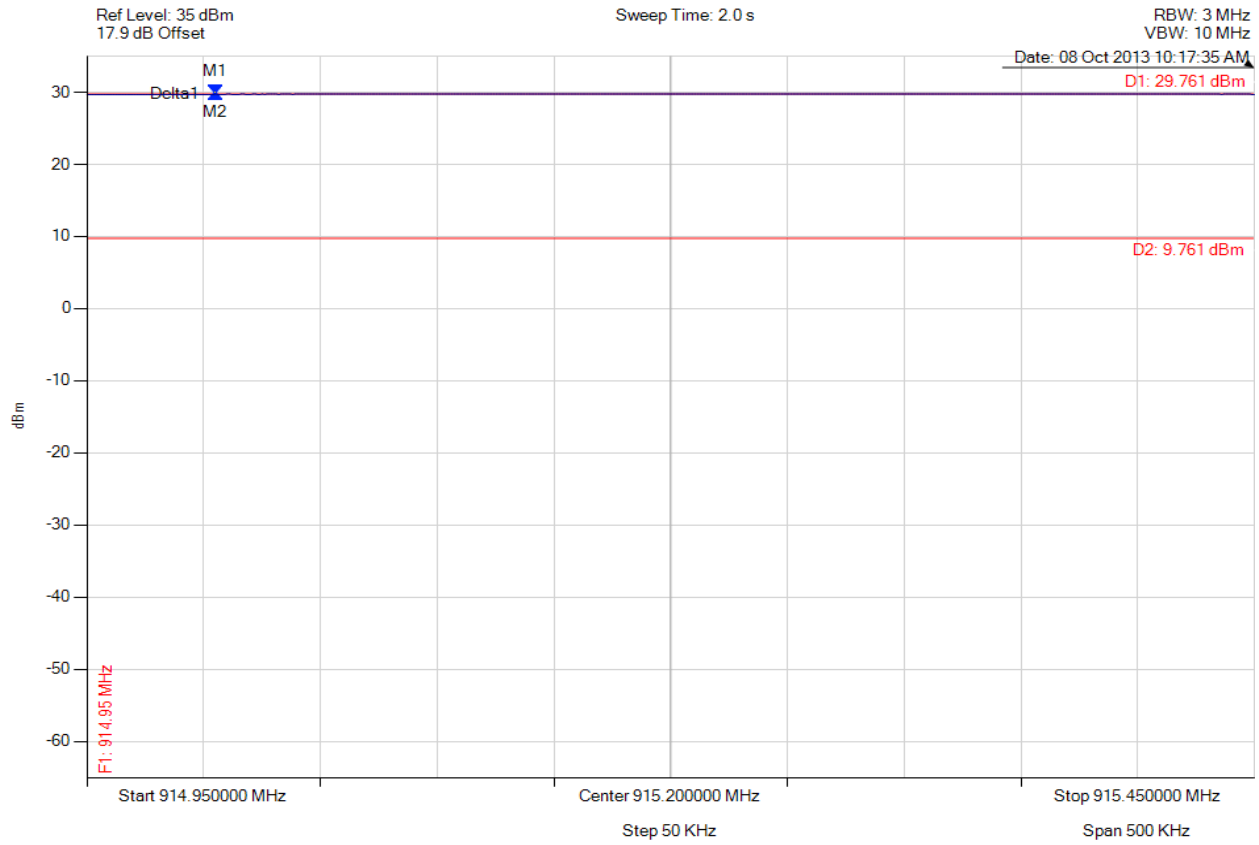
PEAK OUTPUT POWER

Variant: FSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.005 MHz : 29.761 dBm M2 : 915.005 MHz : 29.761 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.761 dBm Limit: 30.00 dBm Margin: -0.24 dB

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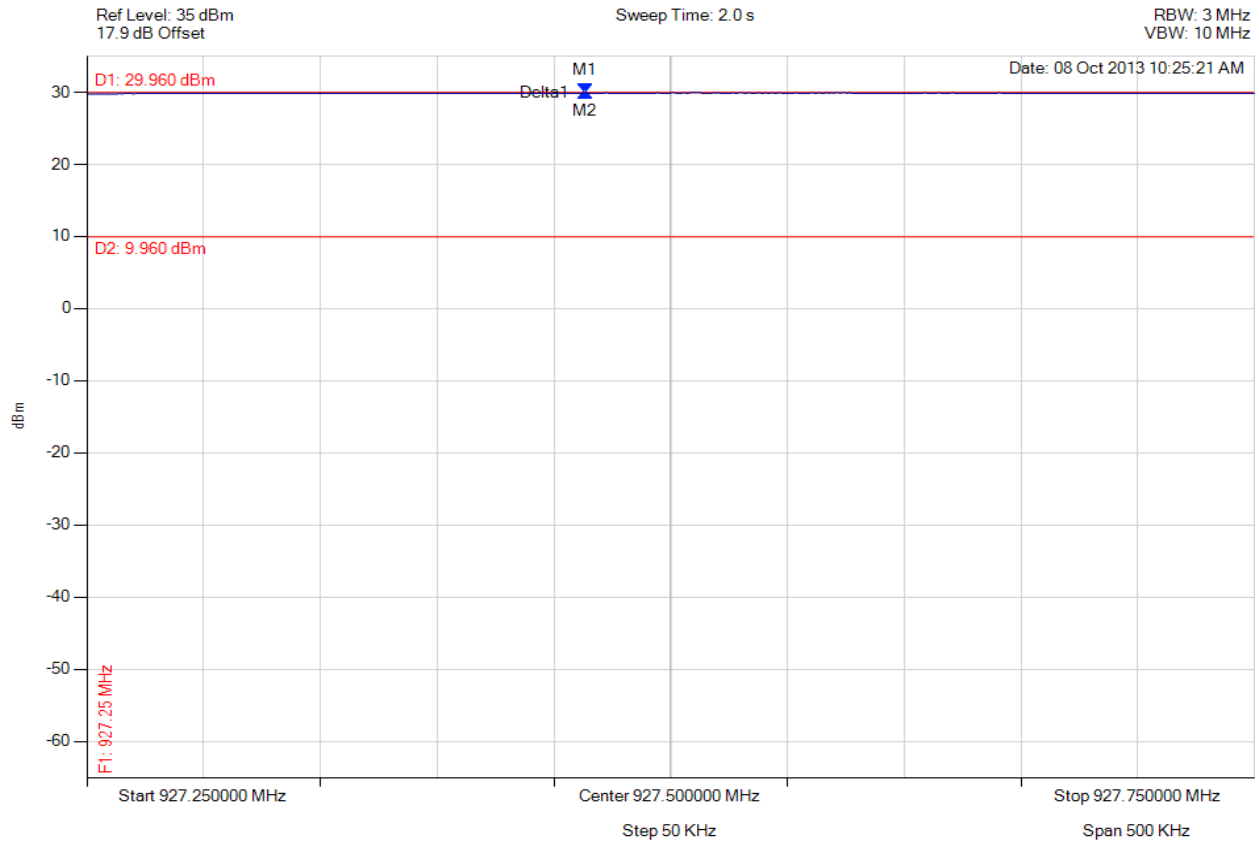
PEAK OUTPUT POWER

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.463 MHz : 29.960 dBm M2 : 927.463 MHz : 29.960 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.96 dBm Limit: 30.00 dBm Margin: -0.04 dB

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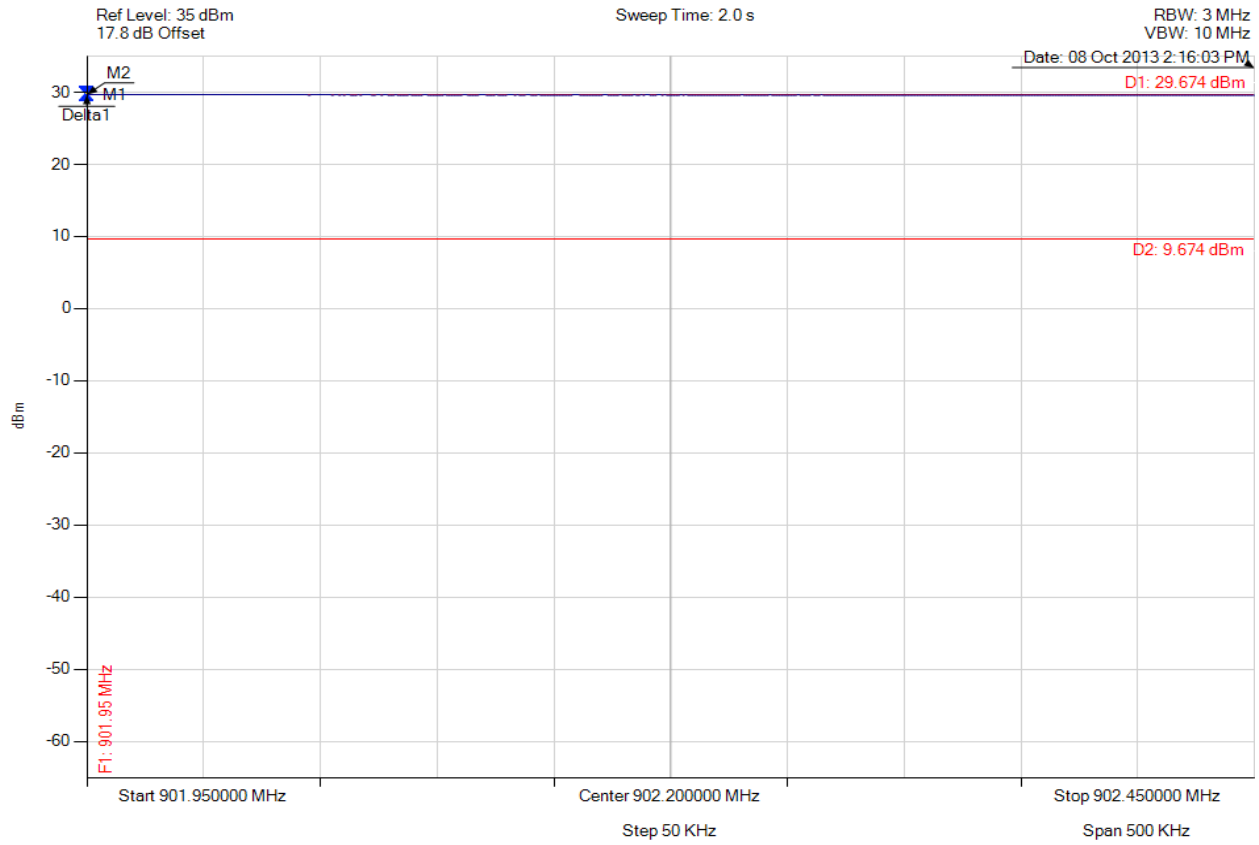
PEAK OUTPUT POWER

Variant: GFSK 100kbps, Channel: 902.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 901.950 MHz : 29.674 dBm M2 : 901.950 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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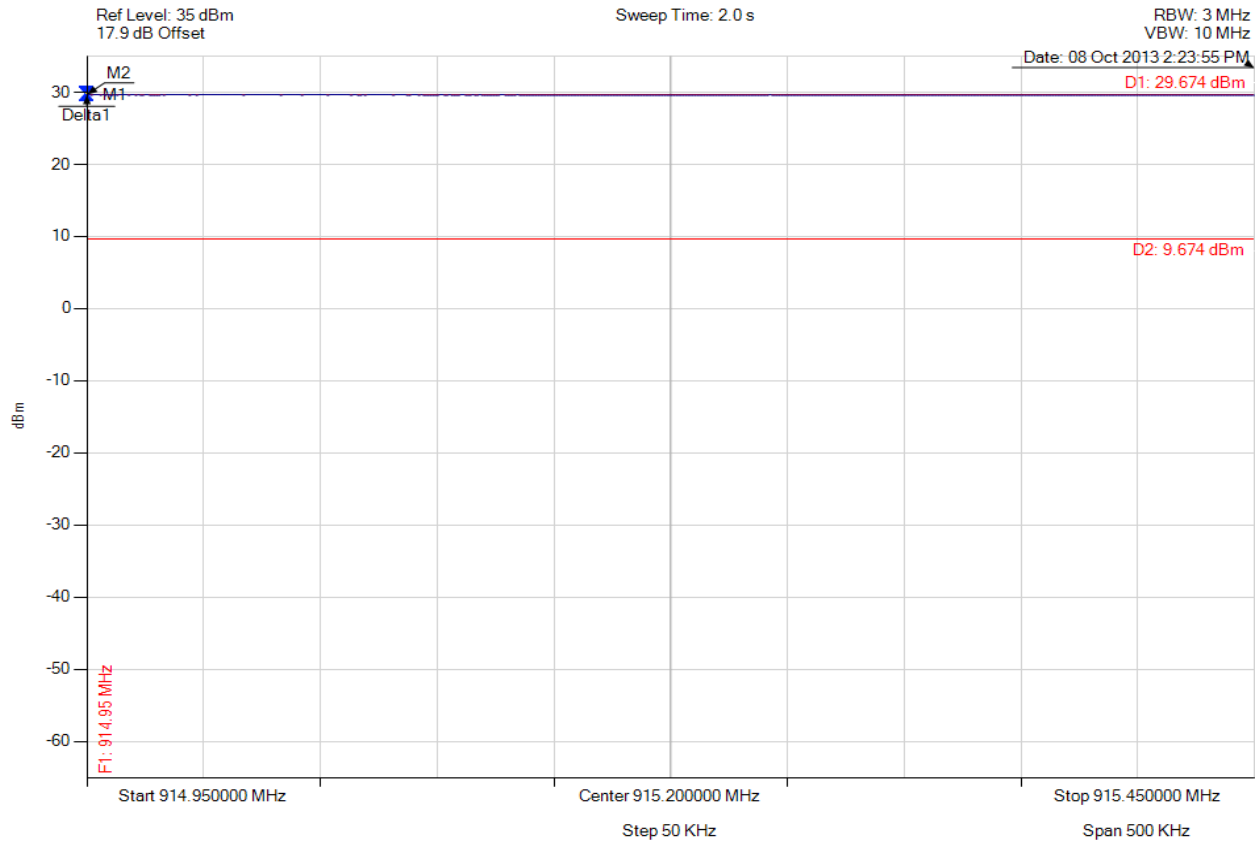
PEAK OUTPUT POWER

Variant: GFSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 914.950 MHz : 29.674 dBm M2 : 914.950 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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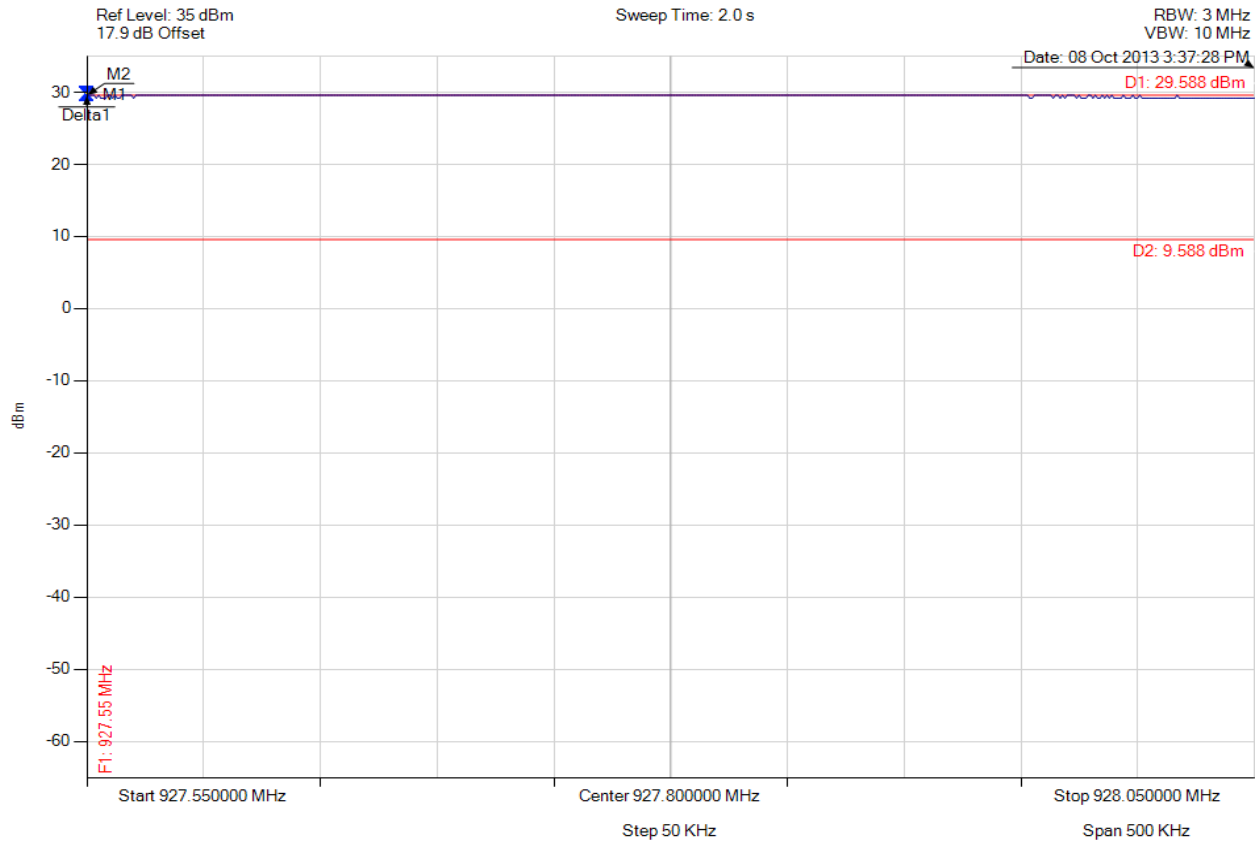
PEAK OUTPUT POWER

Variant: GFSK 100kbps, Channel: 927.80 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.550 MHz : 29.588 dBm M2 : 927.550 MHz : 29.588 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.588 dBm Limit: 30.00 dBm Margin: -0.441 dB

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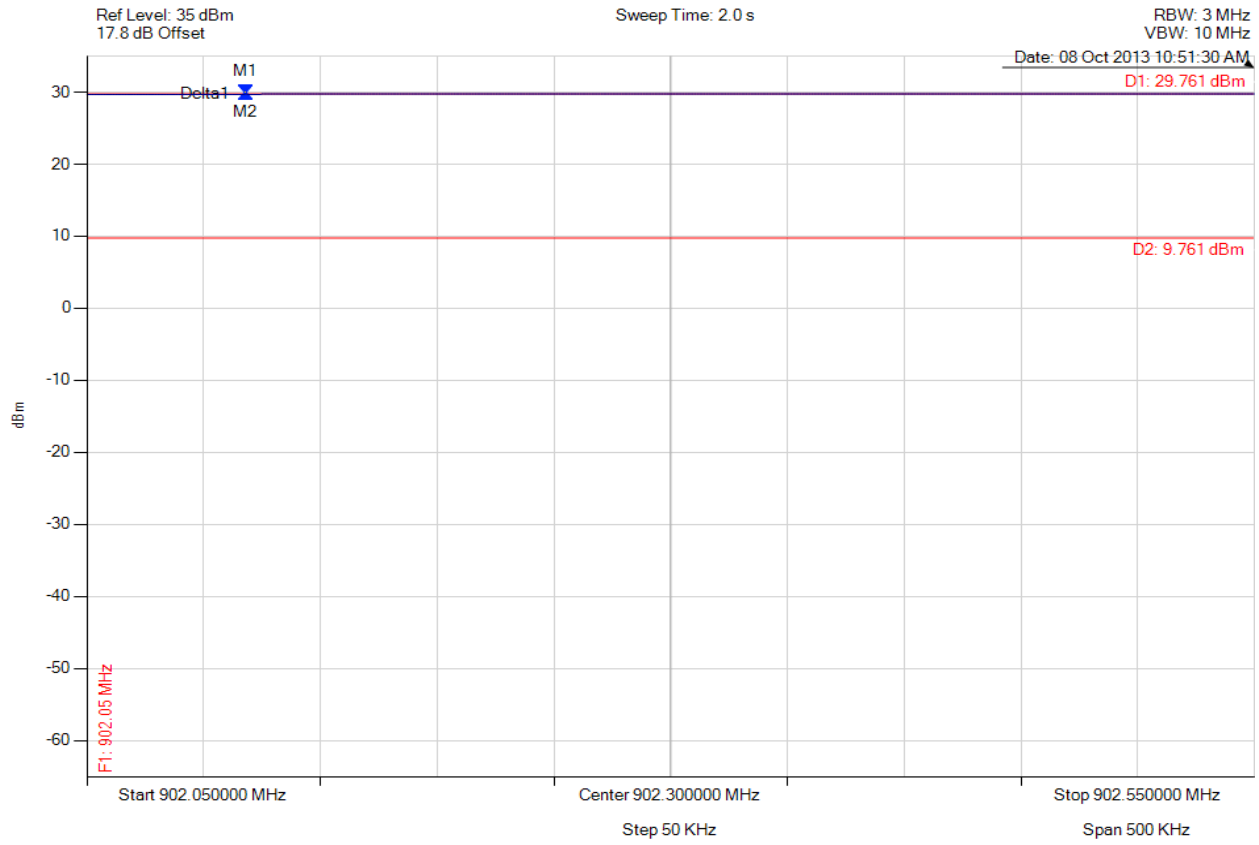
PEAK OUTPUT POWER

Variant: GFSK 150kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.118 MHz : 29.761 dBm M2 : 902.118 MHz : 29.761 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.761 dBm Limit: 30.00 dBm Margin: -0.24 dB

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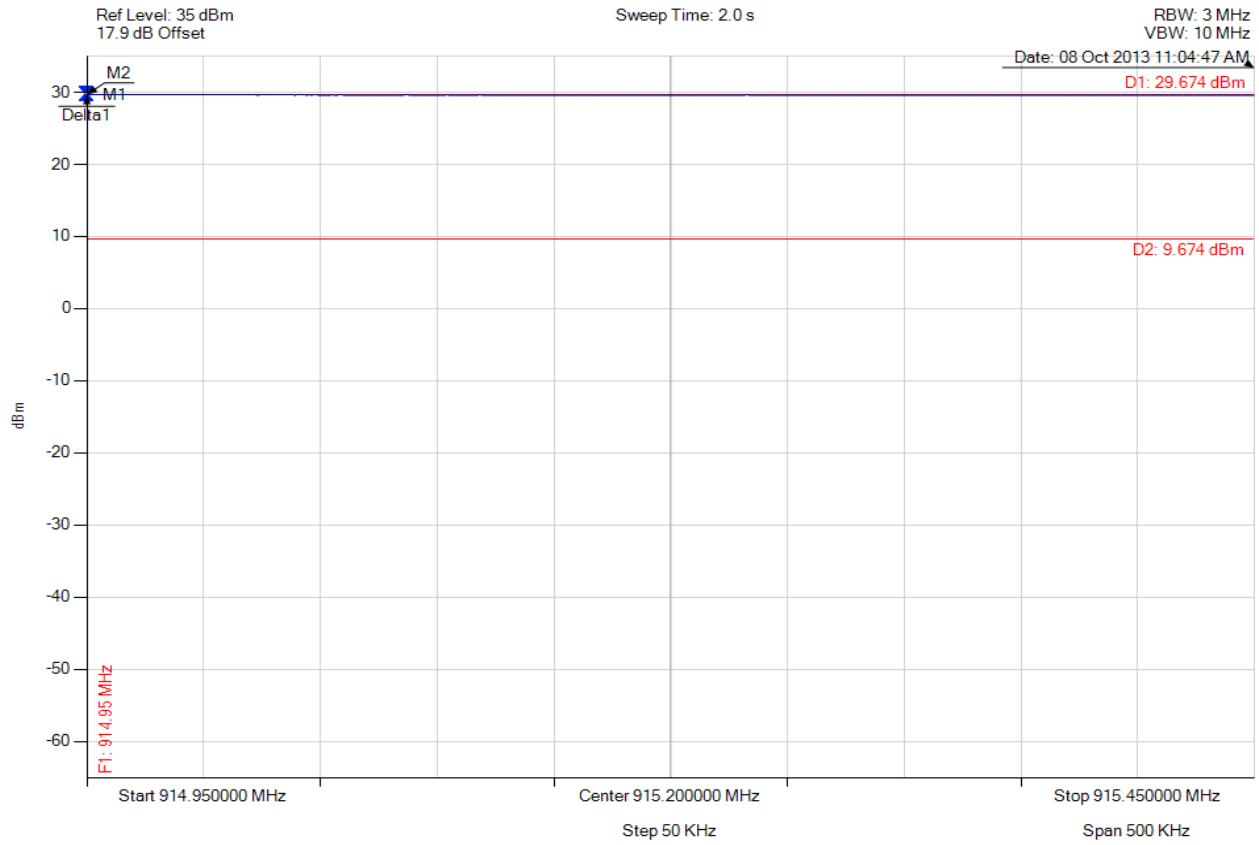
PEAK OUTPUT POWER

Variant: GFSK 150kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 914.950 MHz : 29.674 dBm M2 : 914.950 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.24 dB

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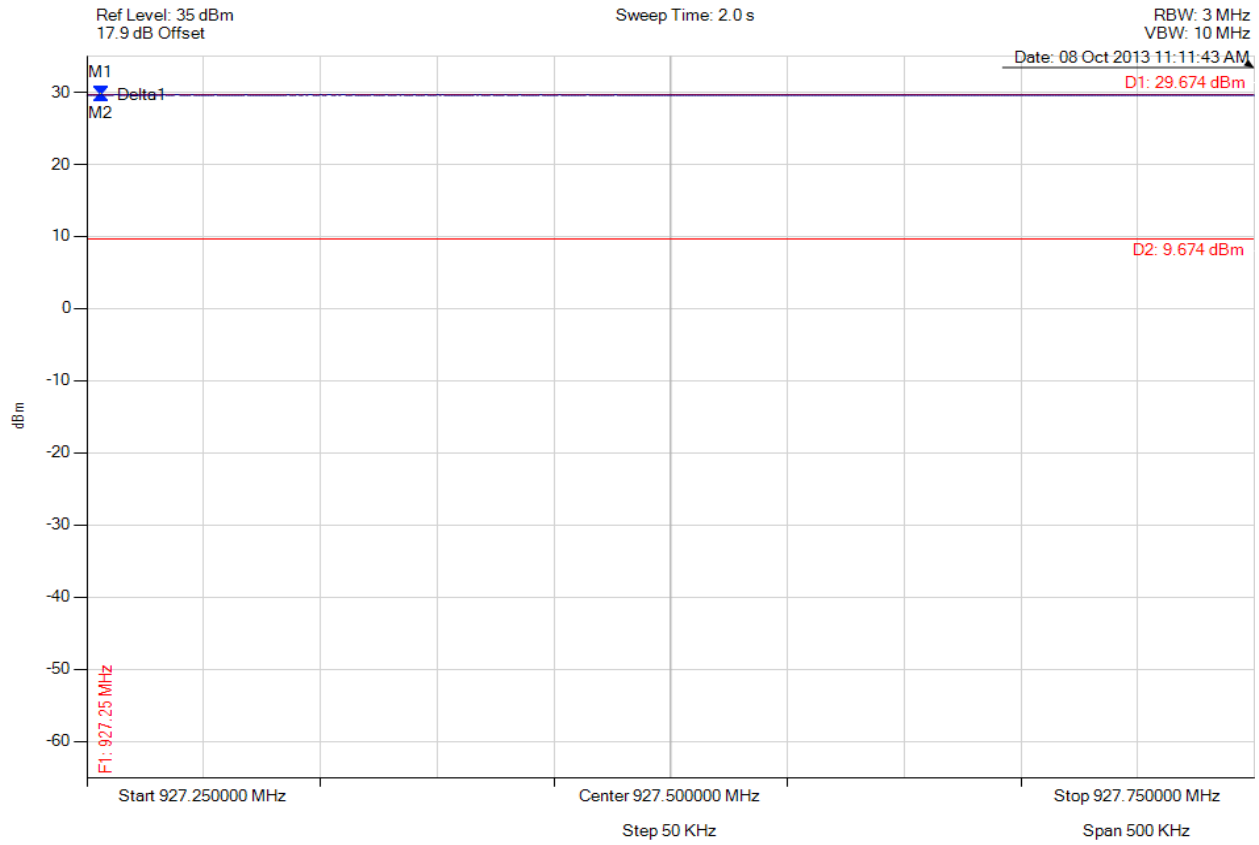
PEAK OUTPUT POWER

Variant: GFSK 150kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.256 MHz : 29.674 dBm M2 : 927.256 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.24 dB

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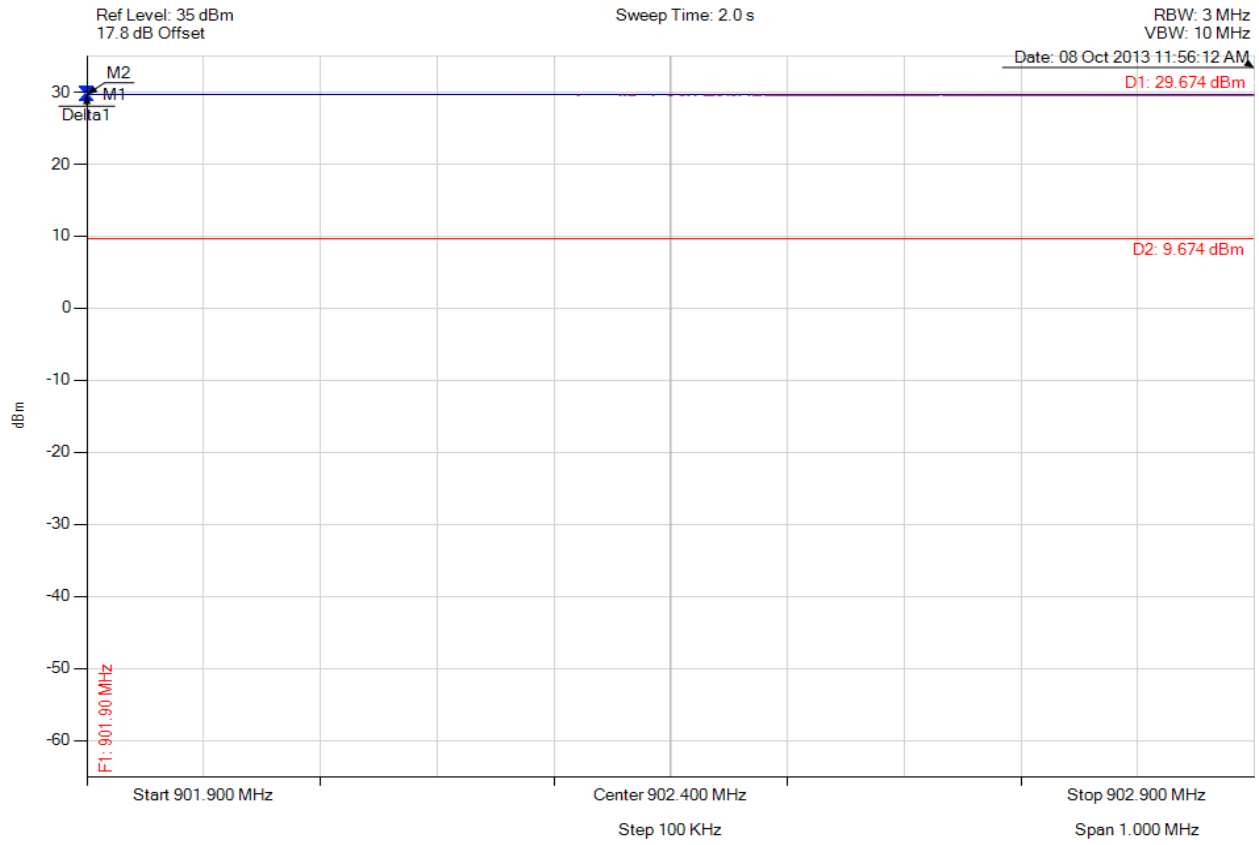
PEAK OUTPUT POWER

Variant: GFSK 300kbps, Channel: 902.40 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 901.900 MHz : 29.674 dBm M2 : 901.900 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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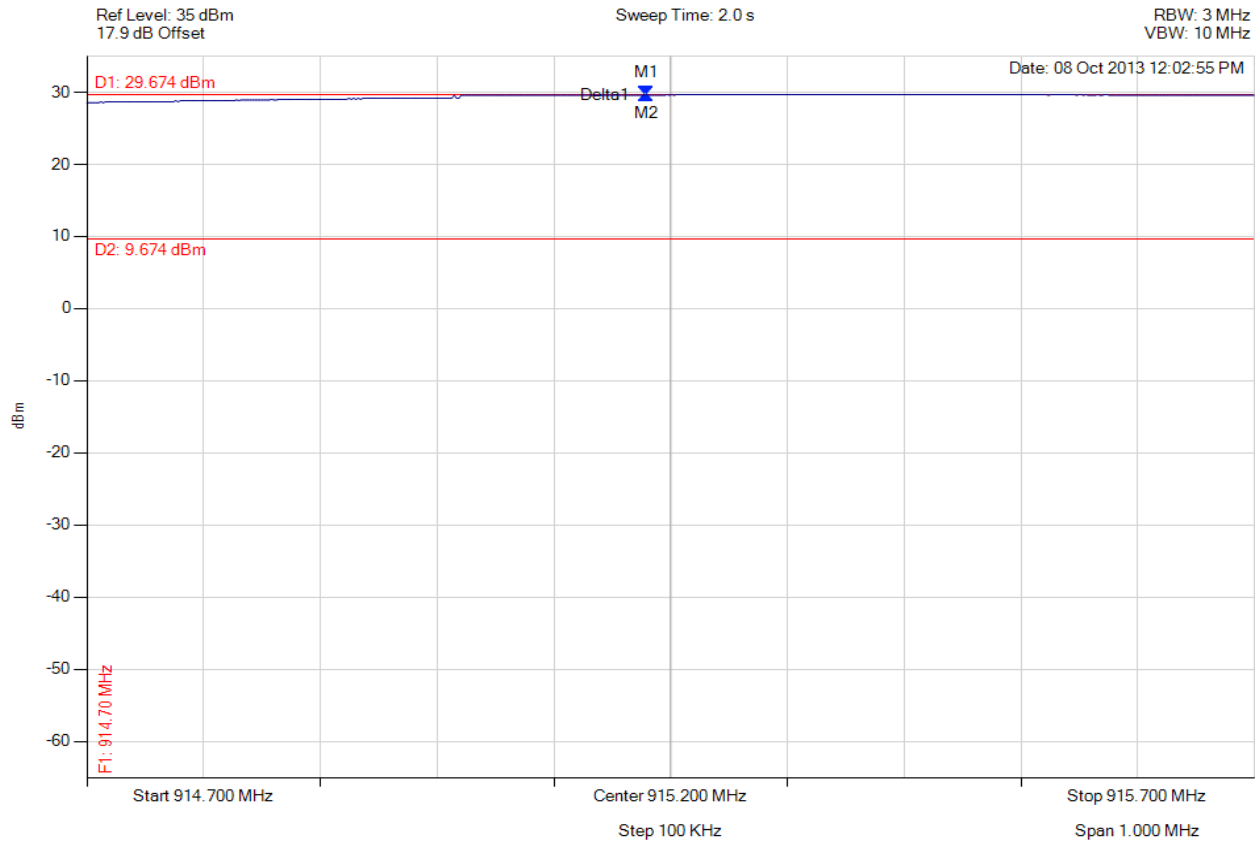
PEAK OUTPUT POWER

Variant: GFSK 300kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.179 MHz : 29.674 dBm M2 : 915.179 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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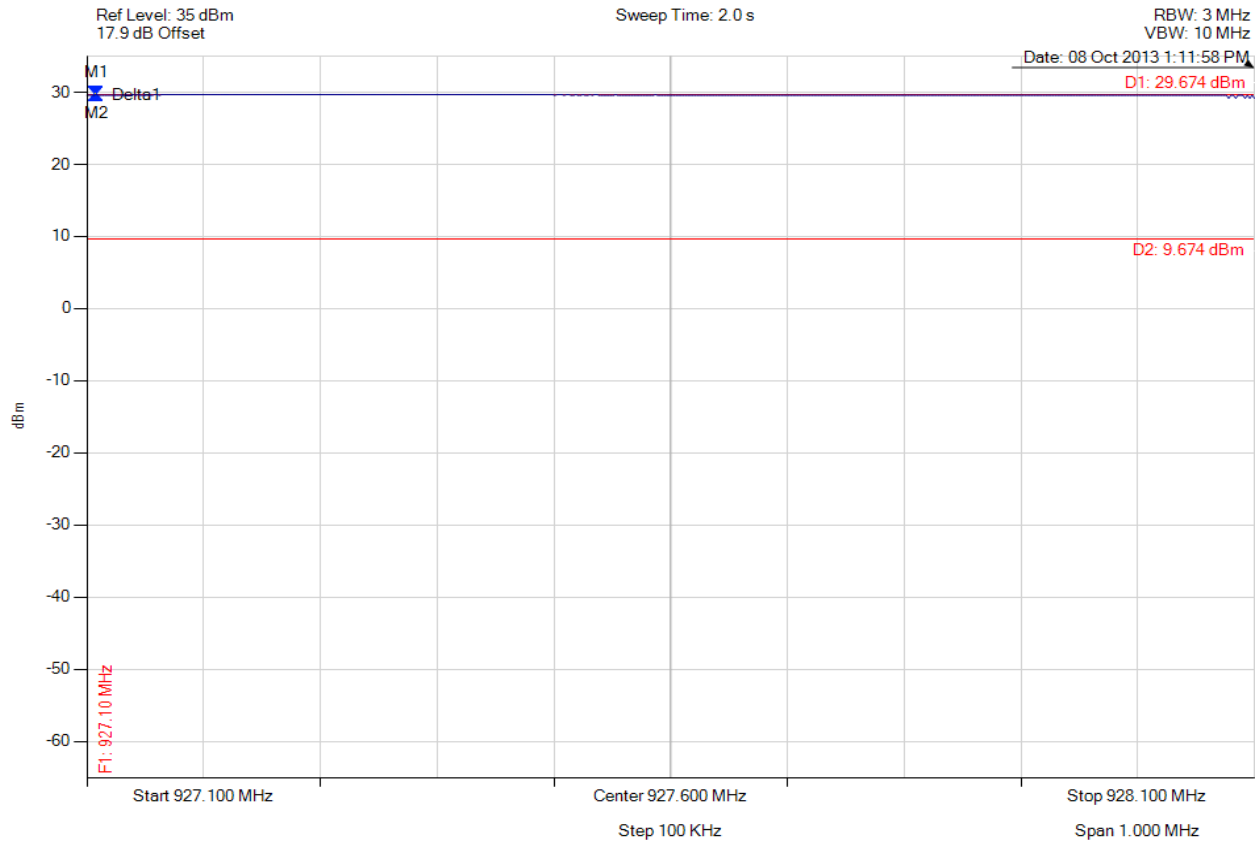
PEAK OUTPUT POWER

Variant: GFSK 300kbps, Channel: 927.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.108 MHz : 29.674 dBm M2 : 927.108 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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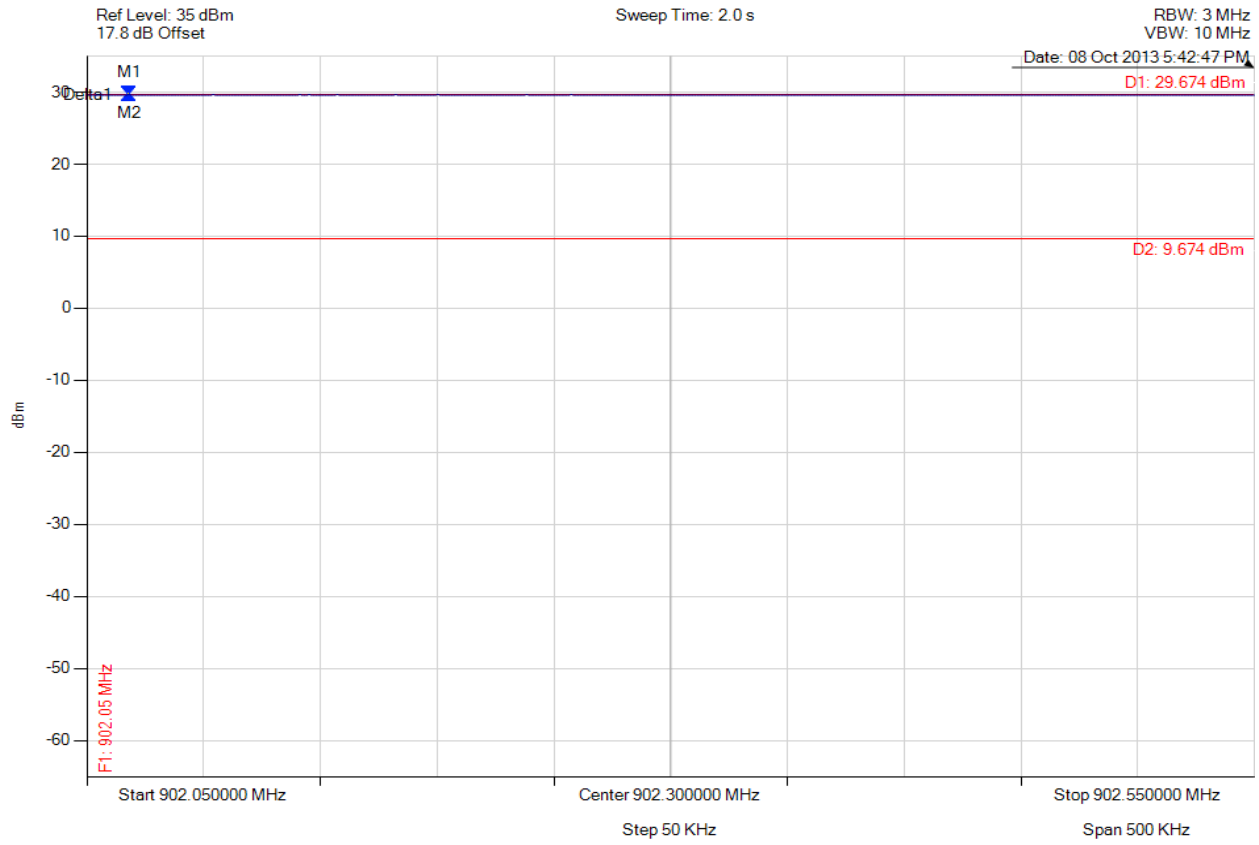
PEAK OUTPUT POWER

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.068 MHz : 29.674 dBm M2 : 902.068 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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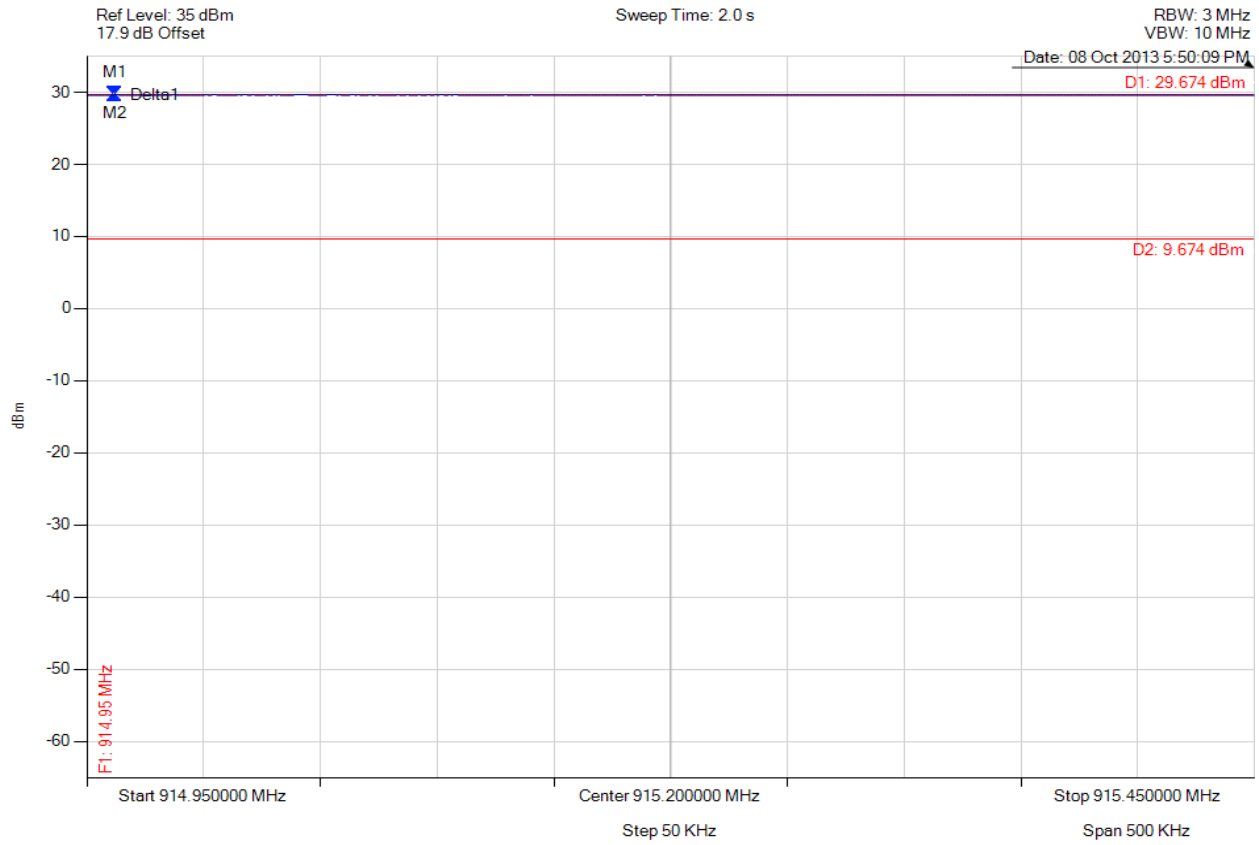
PEAK OUTPUT POWER

Variant: FSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 914.962 MHz : 29.674 dBm M2 : 914.962 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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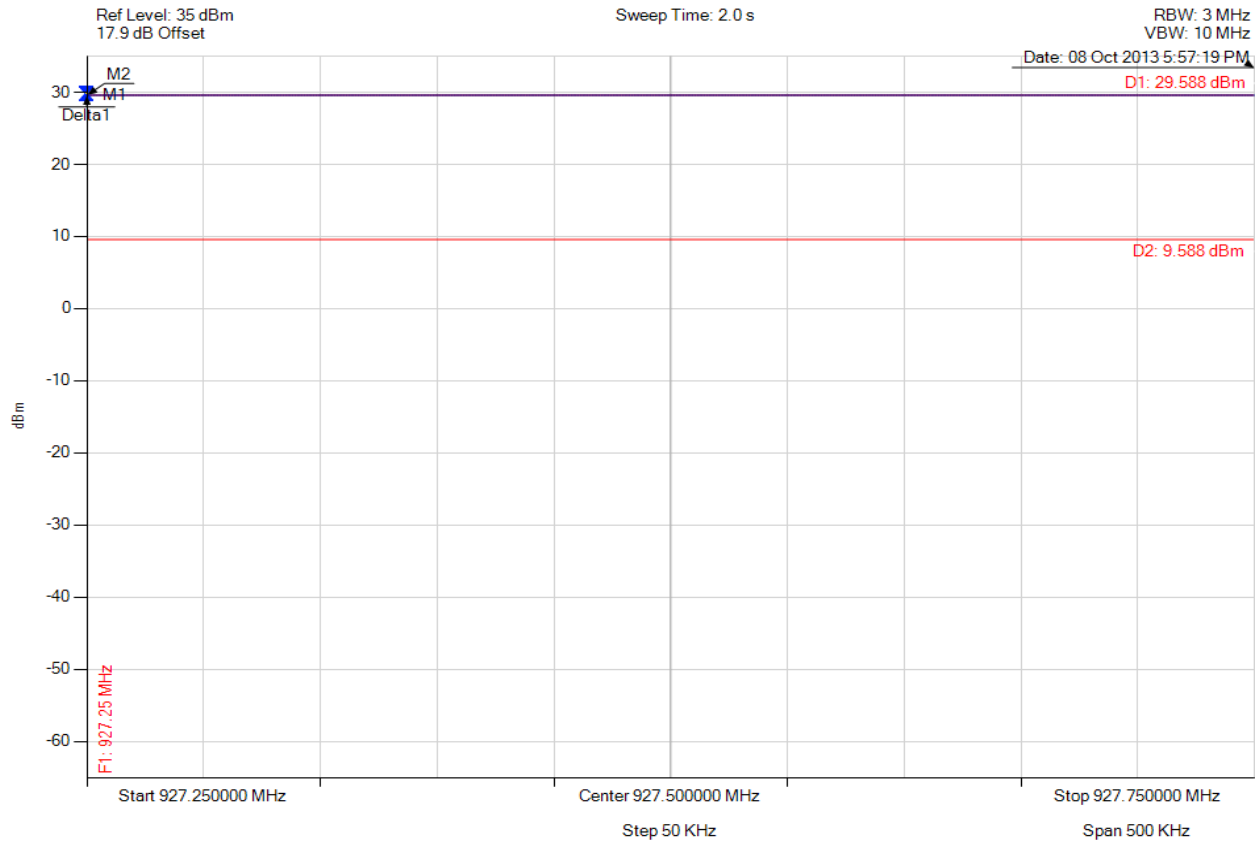
PEAK OUTPUT POWER

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.250 MHz : 29.588 dBm M2 : 927.250 MHz : 29.588 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.588 dBm Limit: 30.00 dBm Margin: -0.41 dB

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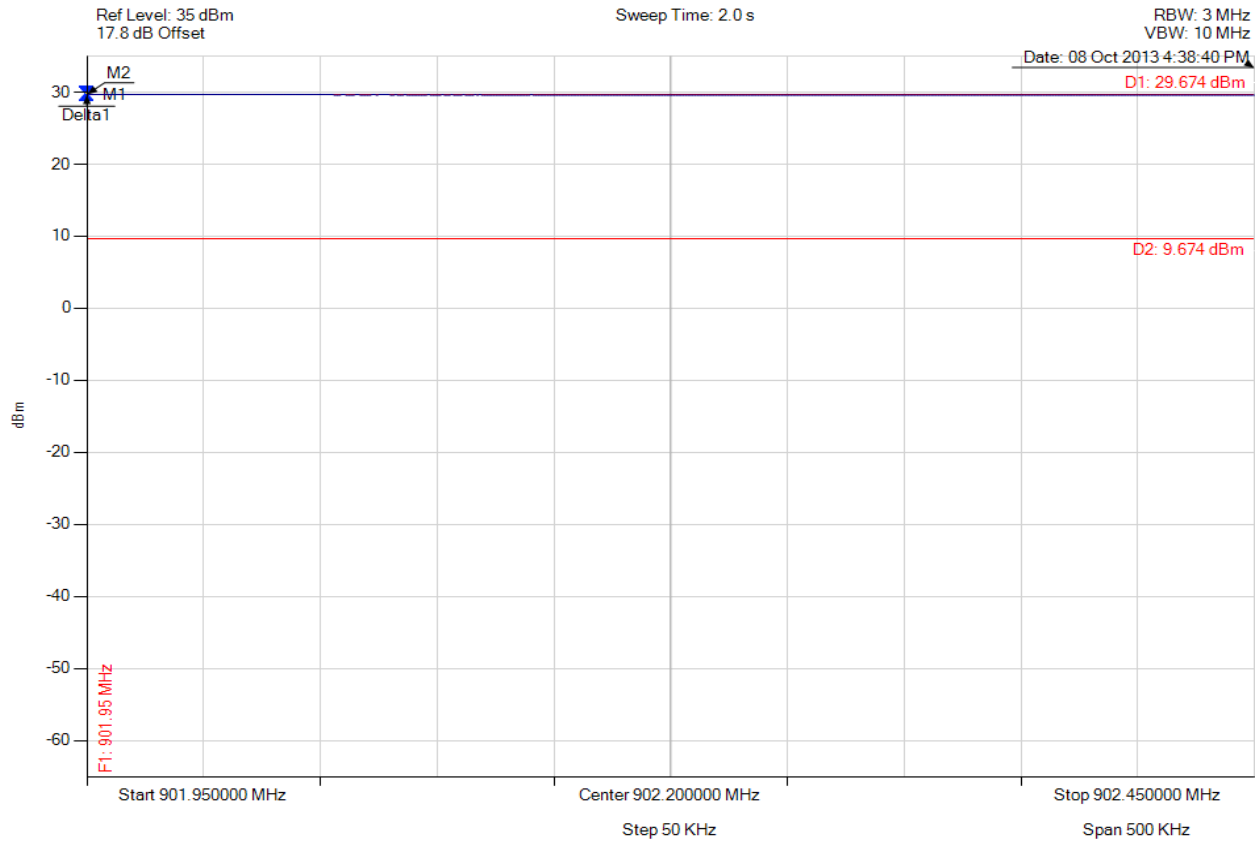
PEAK OUTPUT POWER

Variant: GFSK 100kbps, Channel: 902.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 901.950 MHz : 29.674 dBm M2 : 901.950 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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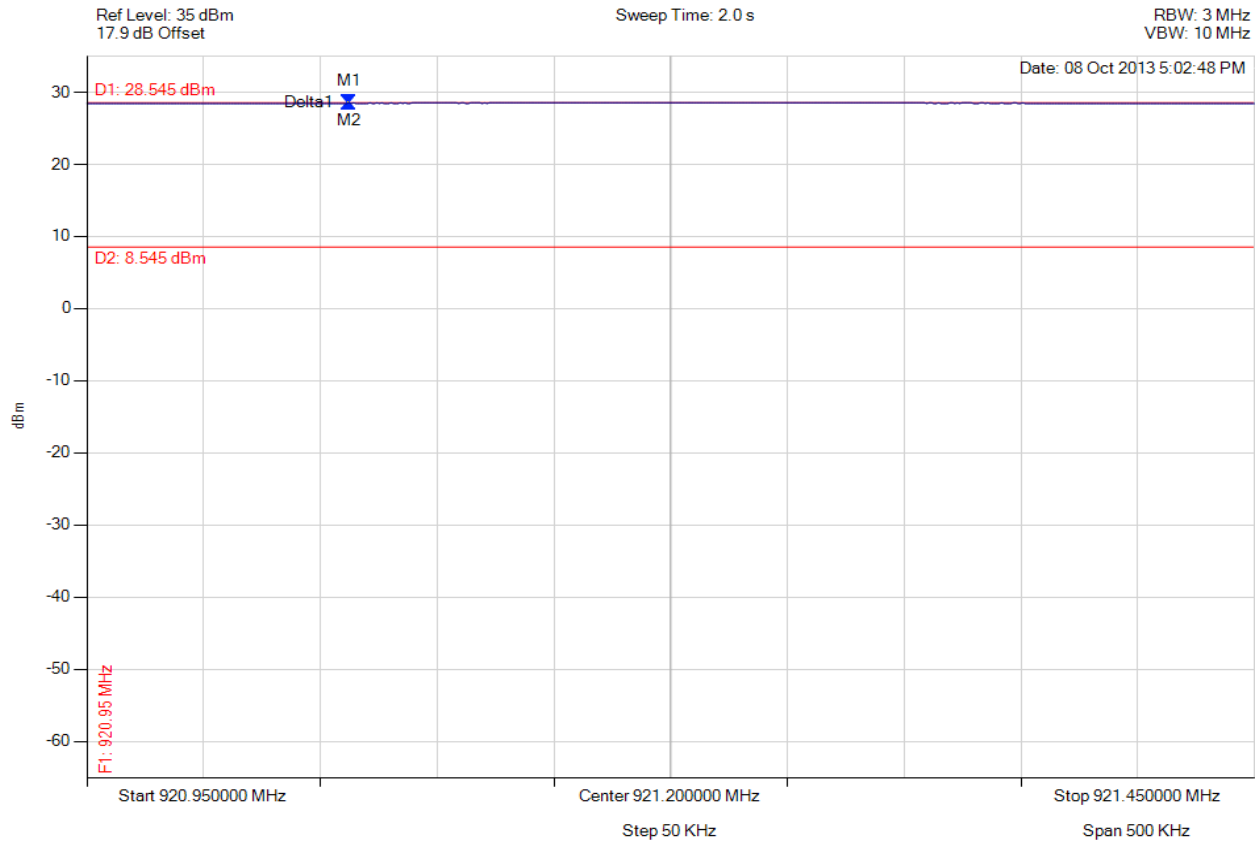
PEAK OUTPUT POWER

Variant: GFSK 100kbps, Channel: 921.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 921.062 MHz : 28.545 dBm M2 : 921.062 MHz : 28.545 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 28.545 dBm Limit: 30.00 dBm Margin: -1.46 dB

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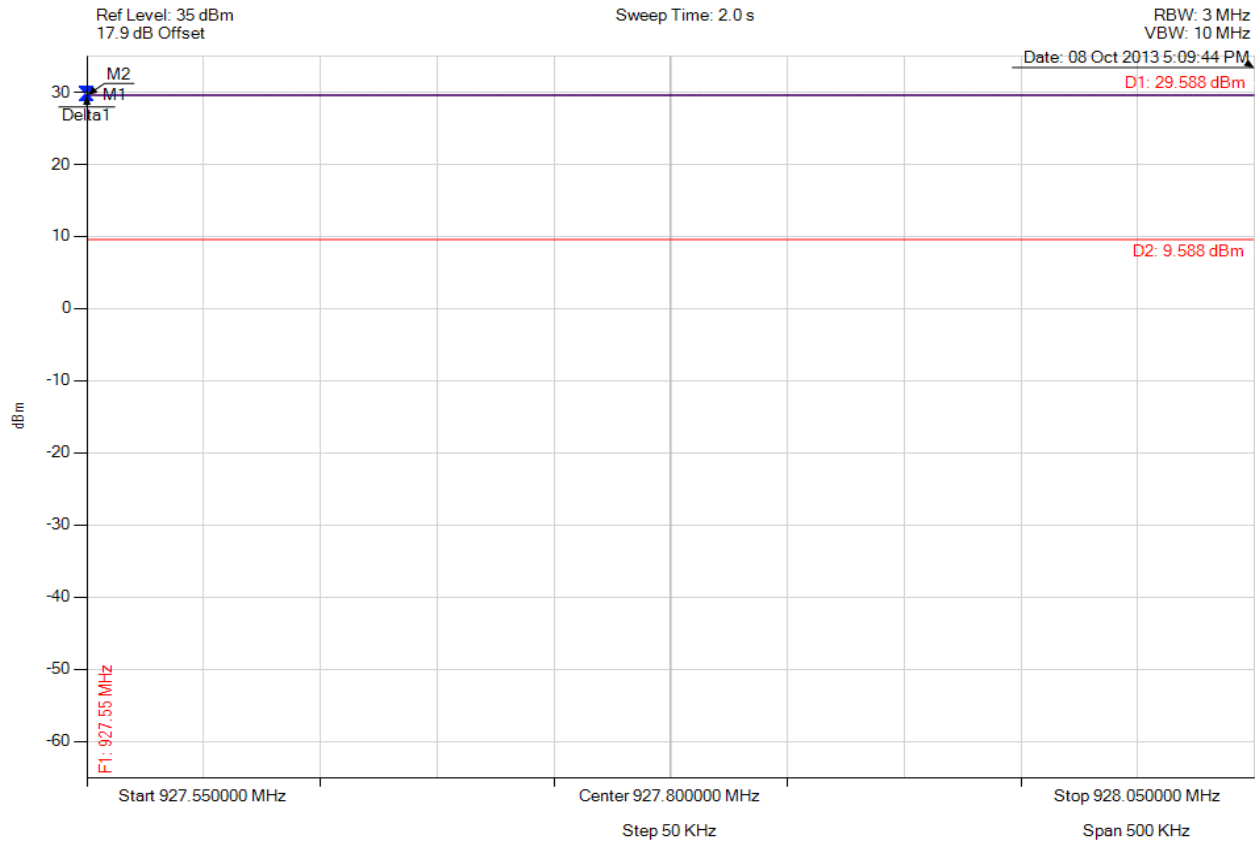
PEAK OUTPUT POWER

Variant: GFSK 100kbps, Channel: 927.80 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.550 MHz : 29.588 dBm M2 : 927.550 MHz : 29.588 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.588 dBm Limit: 30.00 dBm Margin: -0.41 dB

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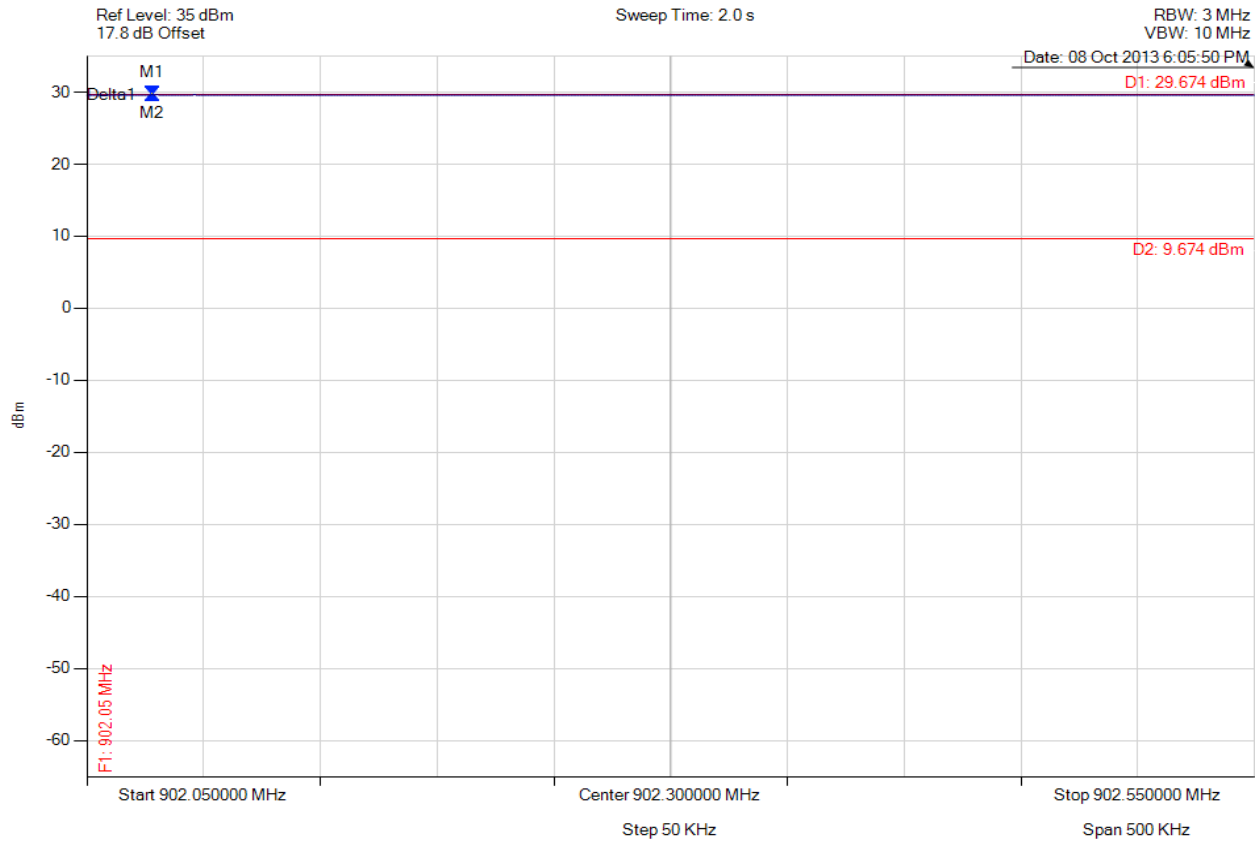
PEAK OUTPUT POWER

Variant: GFSK 150kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.078 MHz : 29.674 dBm M2 : 902.078 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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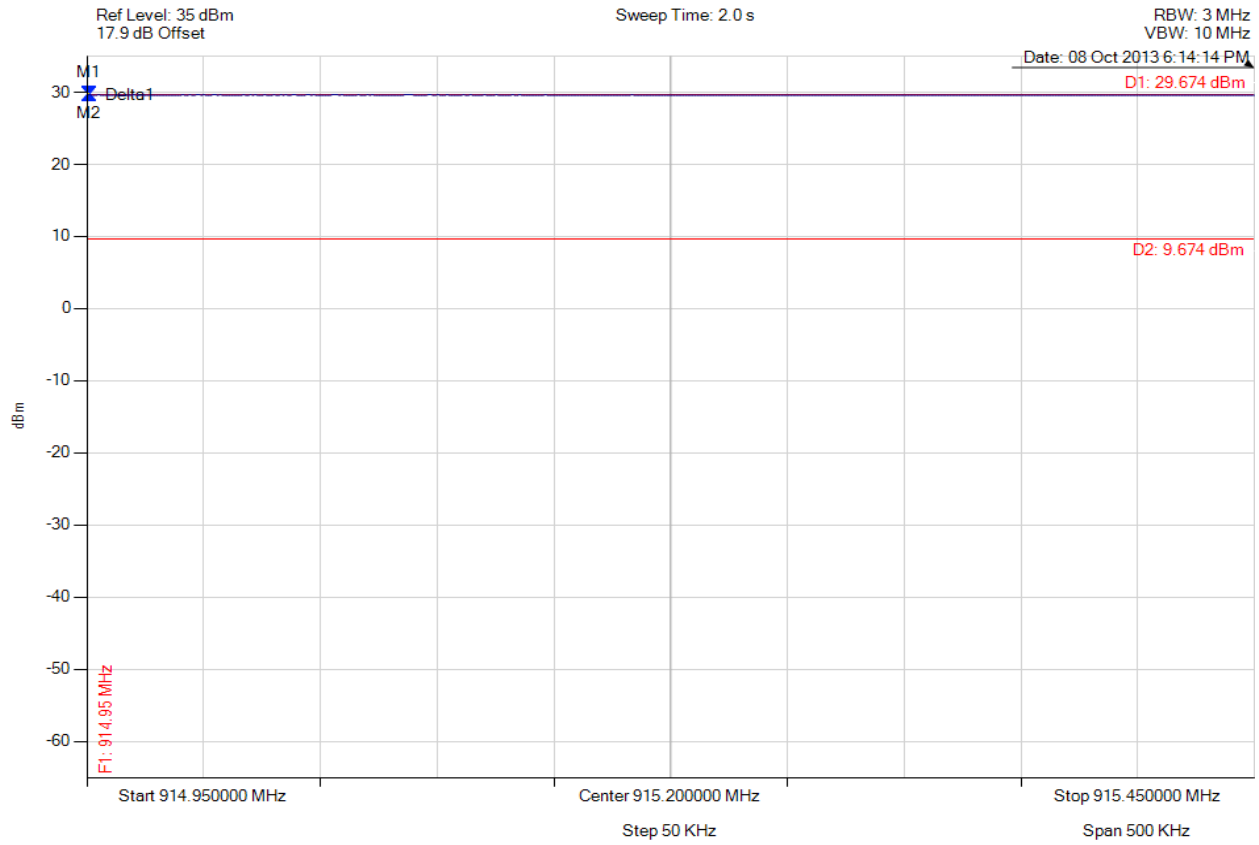
PEAK OUTPUT POWER

Variant: GFSK 150kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 914.951 MHz : 29.674 dBm M2 : 914.951 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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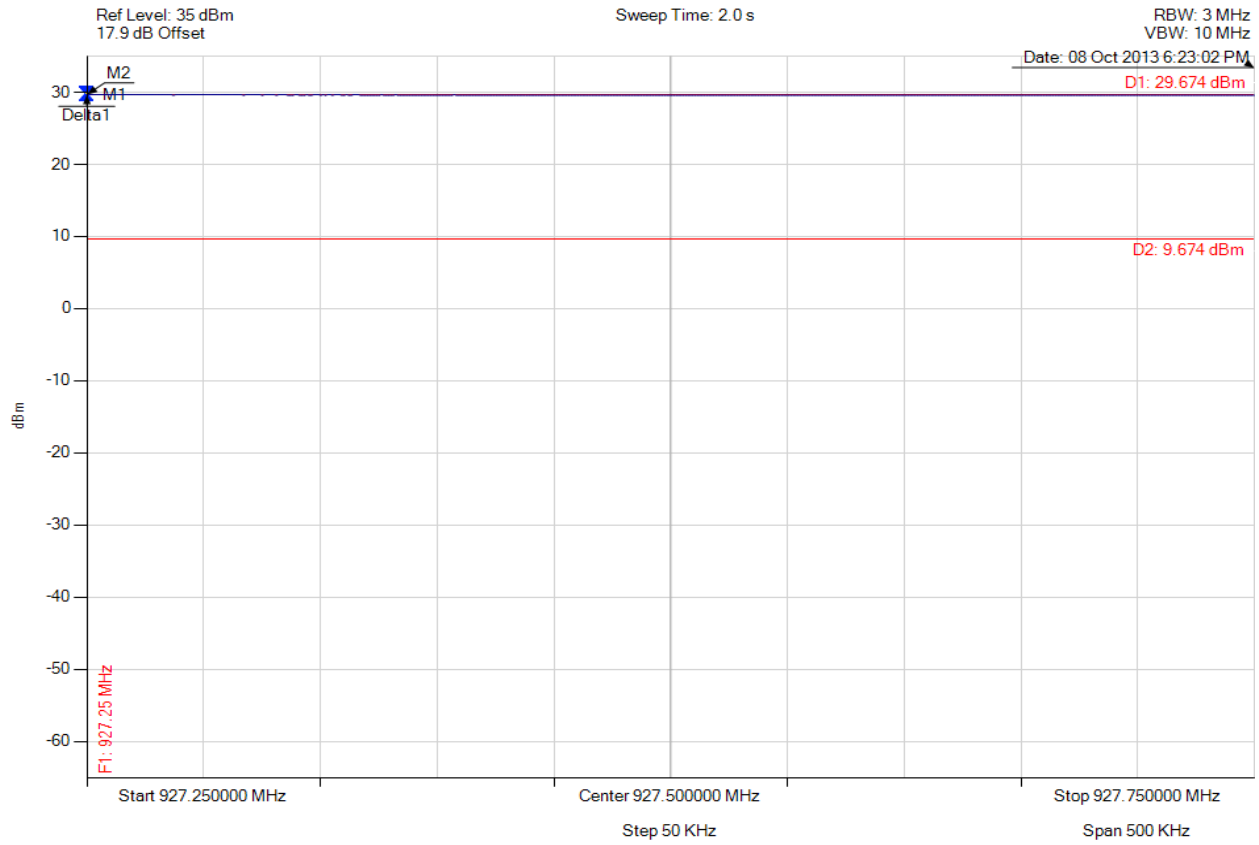
PEAK OUTPUT POWER

Variant: GFSK 150kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.250 MHz : 29.674 dBm M2 : 927.250 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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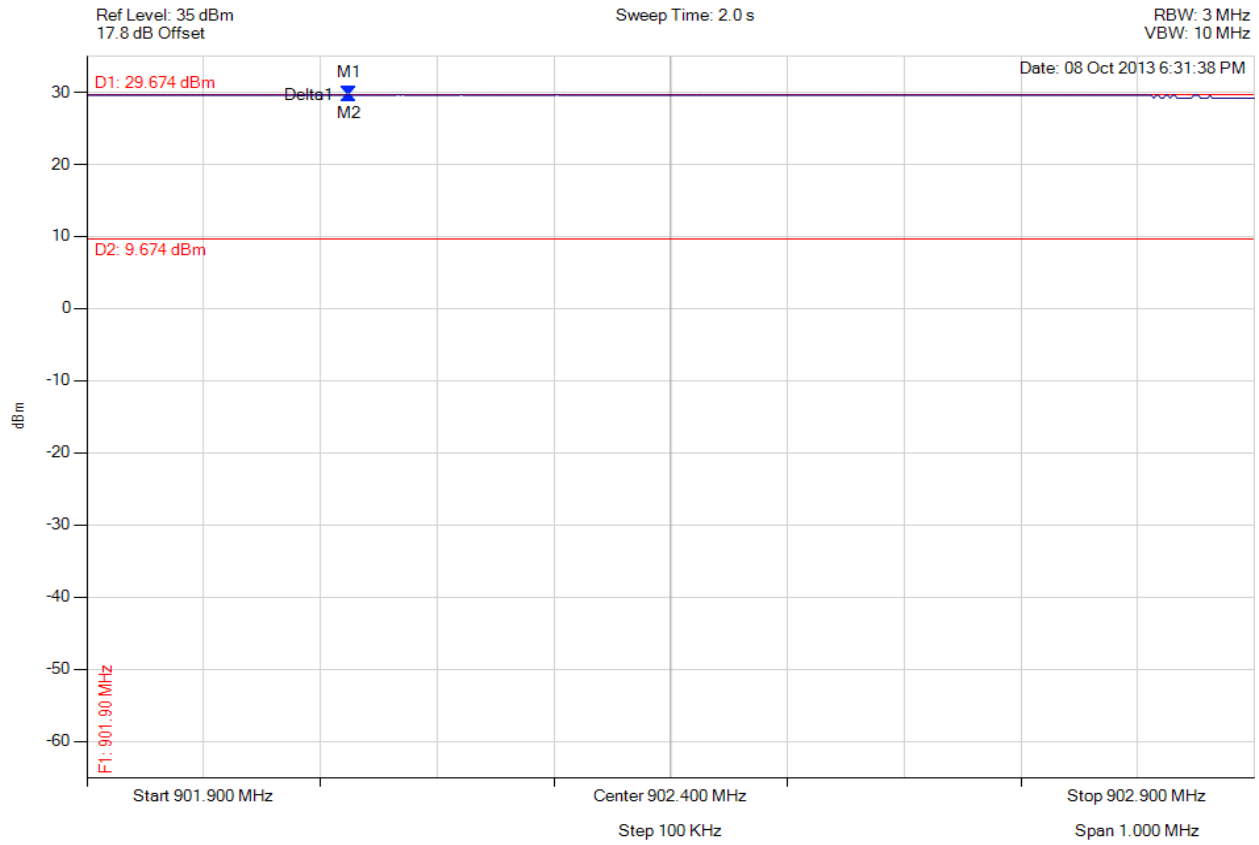
PEAK OUTPUT POWER

Variant: GFSK 300kbps, Channel: 902.40 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.124 MHz : 29.674 dBm M2 : 902.124 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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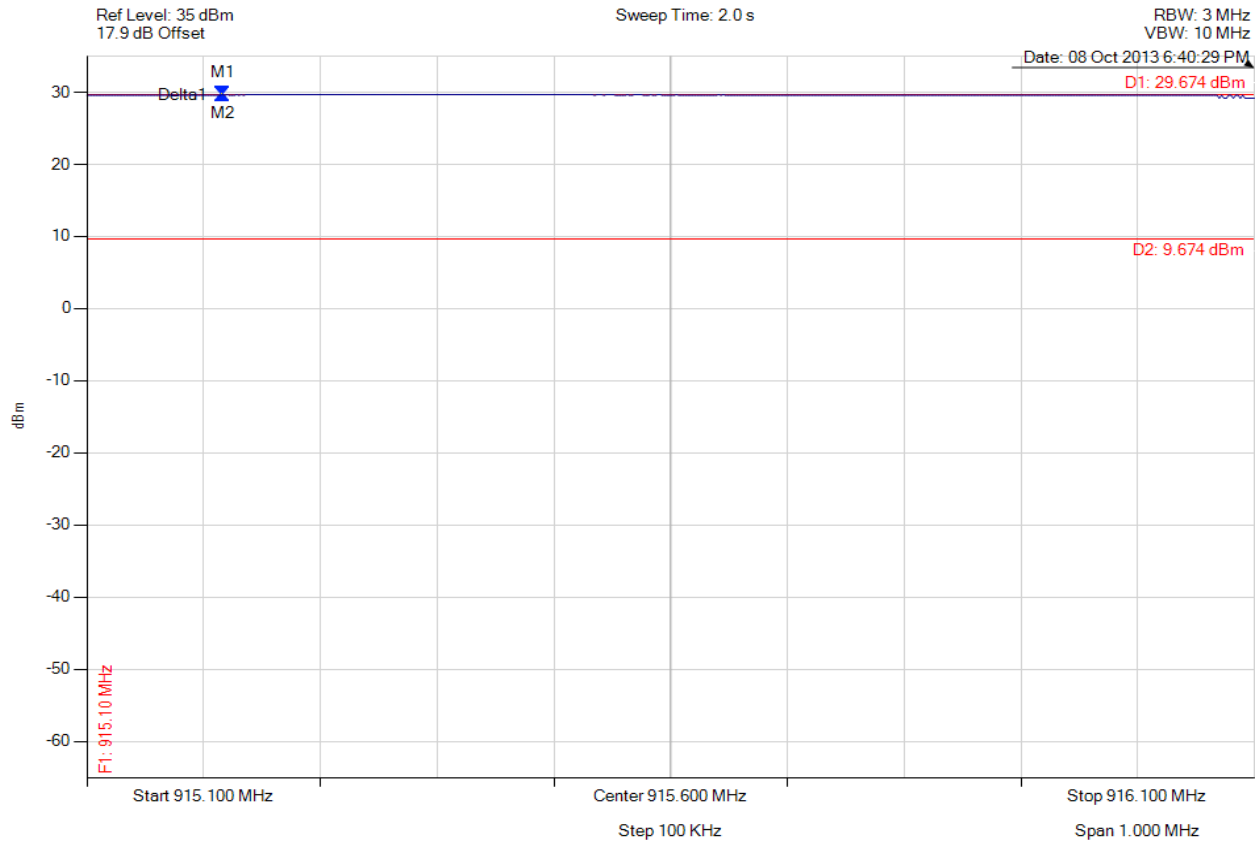
PEAK OUTPUT POWER

Variant: GFSK 300kbps, Channel: 915.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 915.216 MHz : 29.674 dBm M2 : 915.216 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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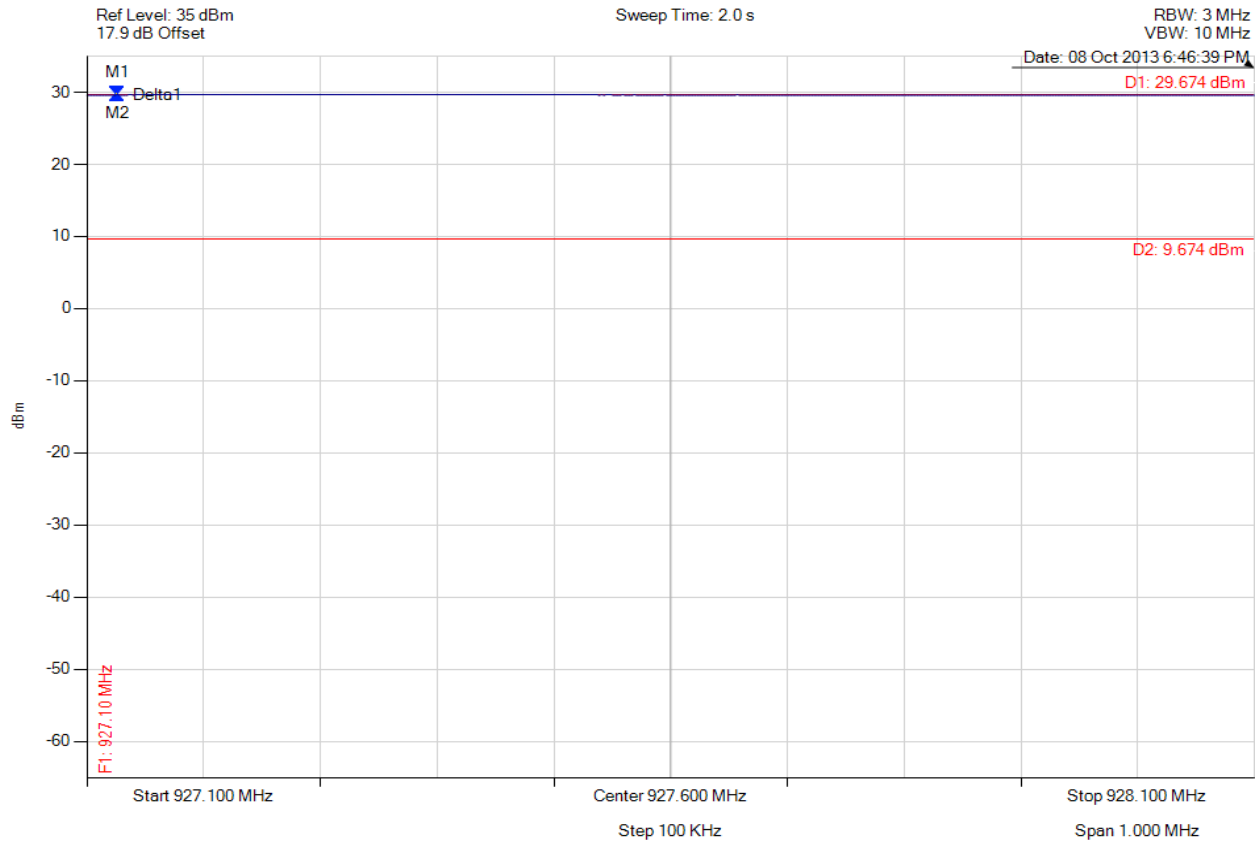
PEAK OUTPUT POWER

Variant: GFSK 300kbps, Channel: 927.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.126 MHz : 29.674 dBm M2 : 927.126 MHz : 29.674 dBm Delta1 : 0 Hz : 0.000 dB	Channel Power: 29.674 dBm Limit: 30.00 dBm Margin: -0.33 dB

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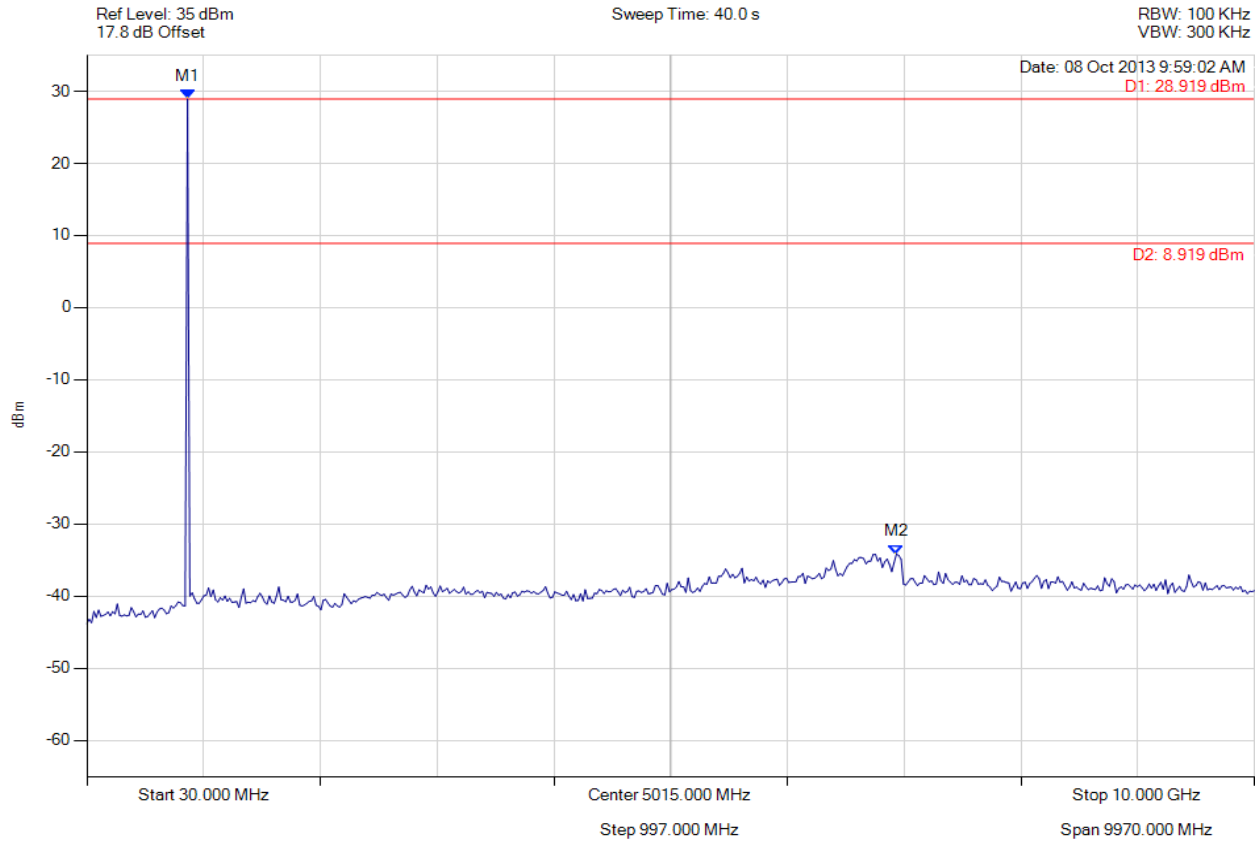
A.1.3. Conducted Spurious and Band-Edge Emissions

CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 889.138 MHz : 28.919 dBm M2 : 6943.066 MHz : -34.156 dBm	Limit: 8.92 dBm Margin: -43.08 dB

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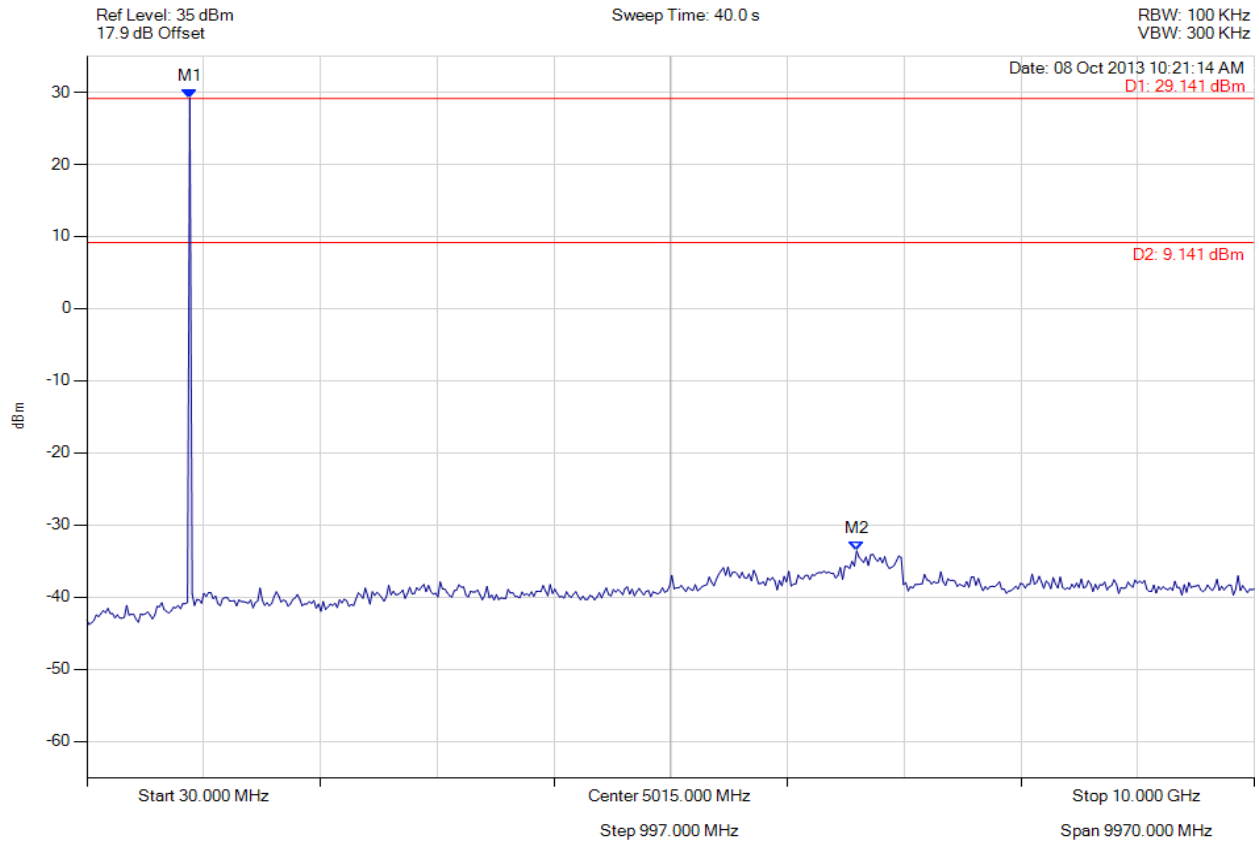
CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: FSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 909.118 MHz : 29.141 dBm M2 : 6603.407 MHz : -33.590 dBm	Limit: 9.14 dBm Margin: -42.73 dB

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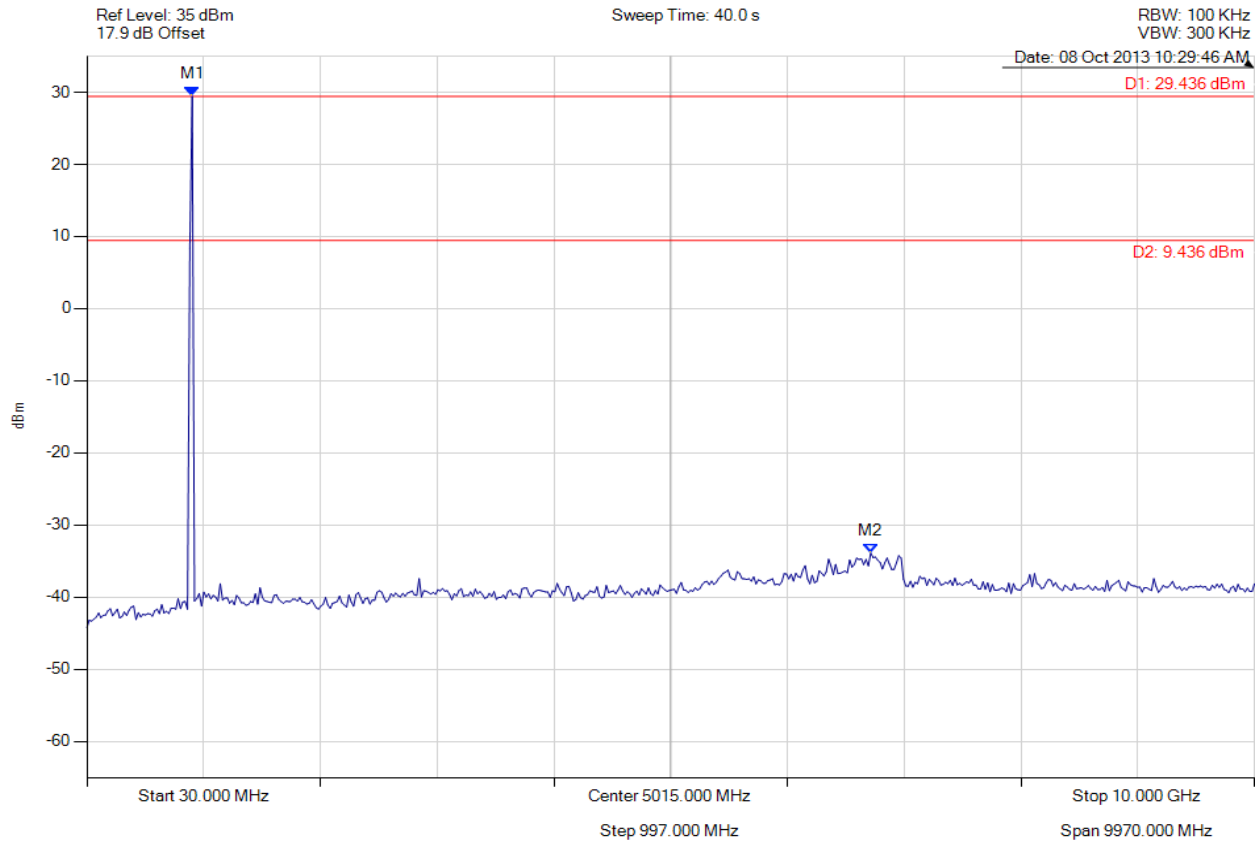
CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 929.098 MHz : 29.436 dBm M2 : 6723.287 MHz : -33.899 dBm	Limit: 9.44 dBm Margin: -43.34 dB

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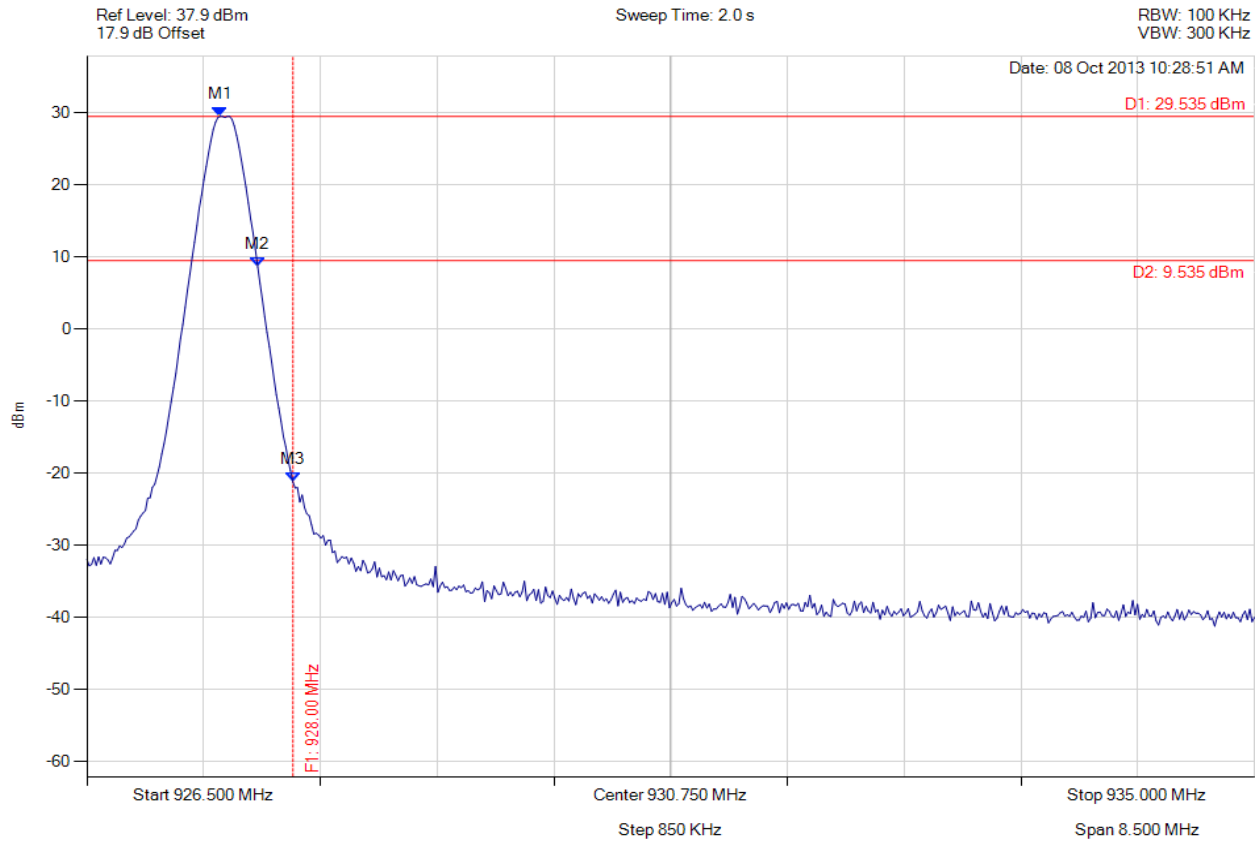
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.471 MHz : 29.535 dBm M2 : 927.743 MHz : 8.641 dBm M3 : 928.000 MHz : -21.162 dBm	Limit: 9.54 dBm Margin: -30.70 dB

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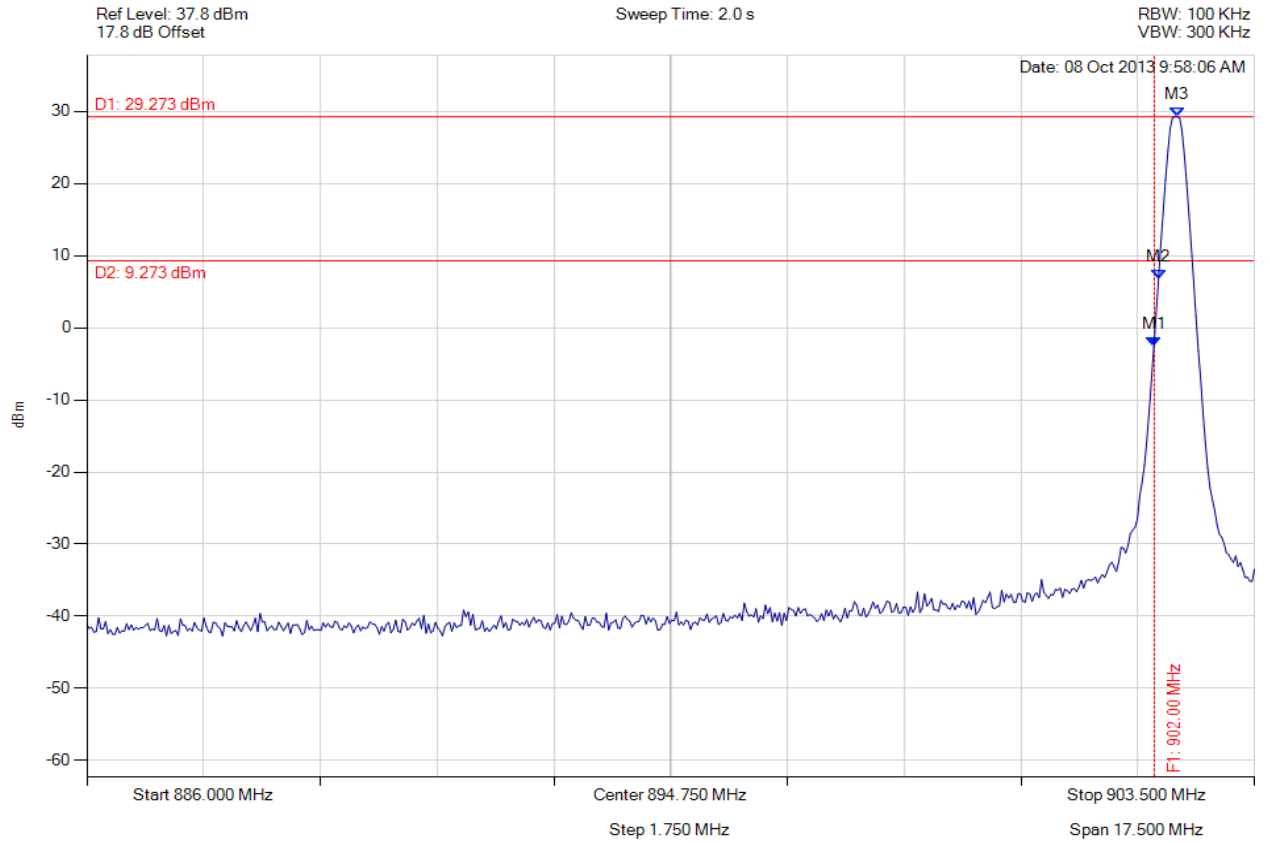
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -2.635 dBm M2 : 902.062 MHz : 6.751 dBm M3 : 902.343 MHz : 29.273 dBm	Limit: 9.27 dBm Margin: -11.90 dB

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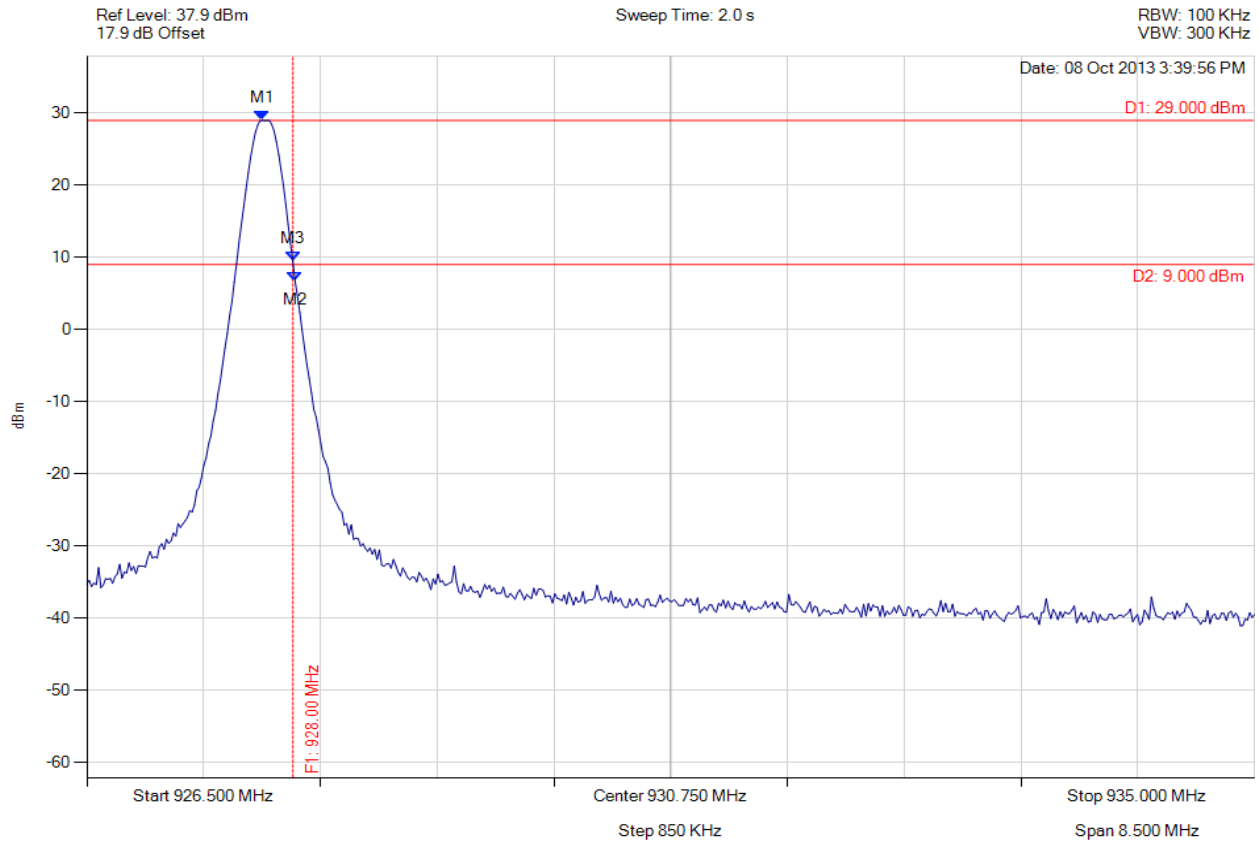
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 100kbps, Channel: 927.80 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.778 MHz : 29.000 dBm M2 : 928.016 MHz : 6.633 dBm M3 : 928.000 MHz : 9.533 dBm	Limit: 9.00 dBm Margin: 20.00 dB

Further Evaluation Required (see following page)

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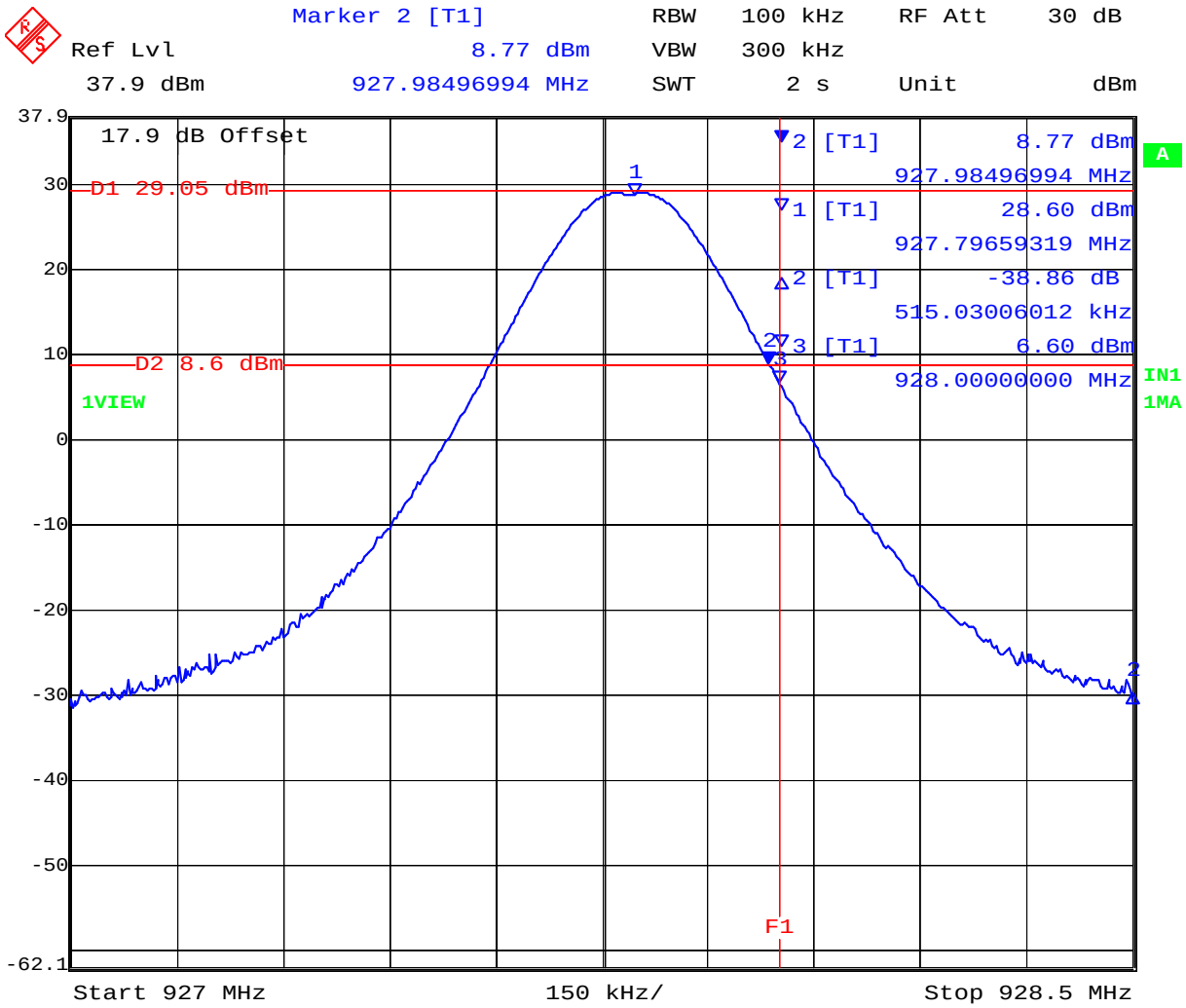
Further Evaluation:

CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 100kbps, Channel: 927.80 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.778 MHz : 28.60 dBm M2 : 927.984 MHz : 8.77 dBm M3 : 928.000 MHz : 6.60 dBm	Limit: 8.60 dBm Margin: -2.0 dB

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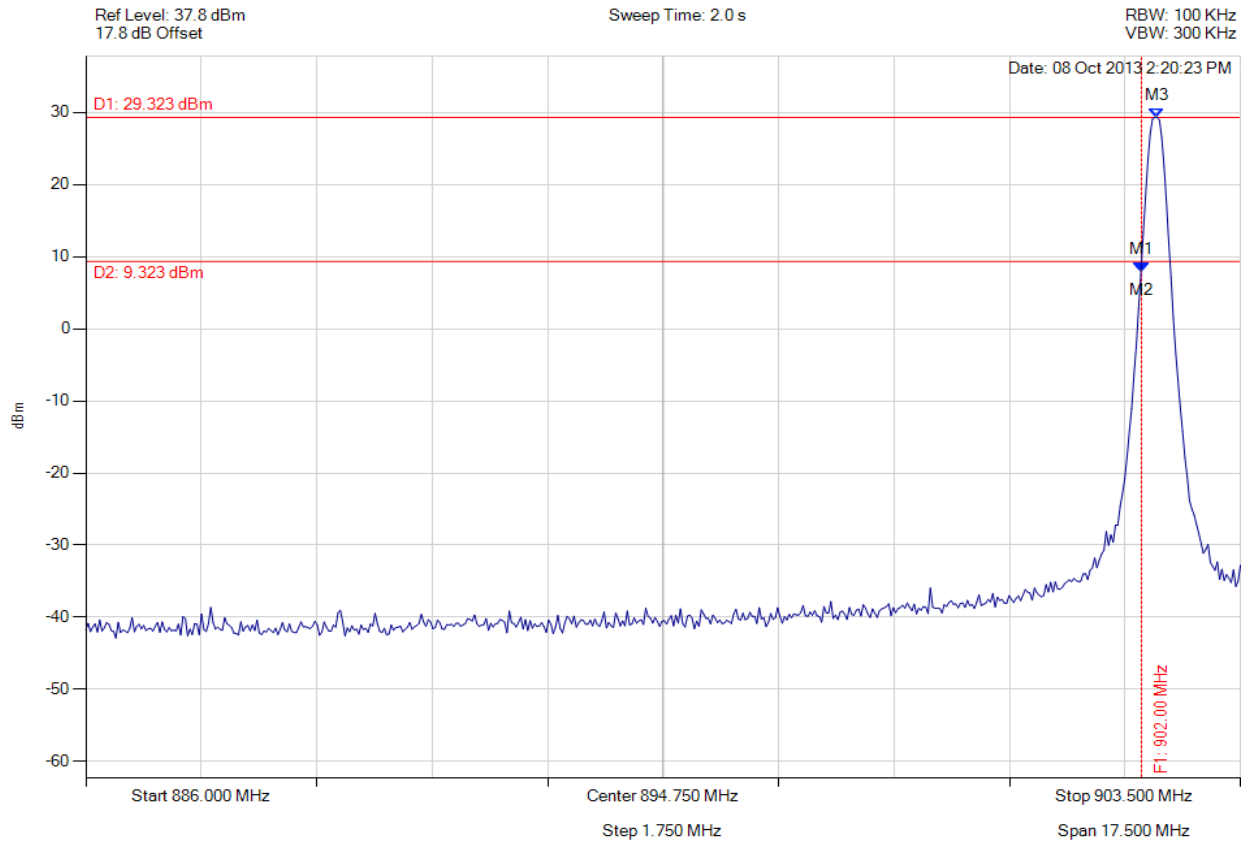
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: GFSK 100kbps, Channel: 902.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : 7.928 dBm M2 : 902.002 MHz : 7.928 dBm M3 : 902.237 MHz : 29.323 dBm	Limit: 9.32 dBm Margin: -1.39 dB

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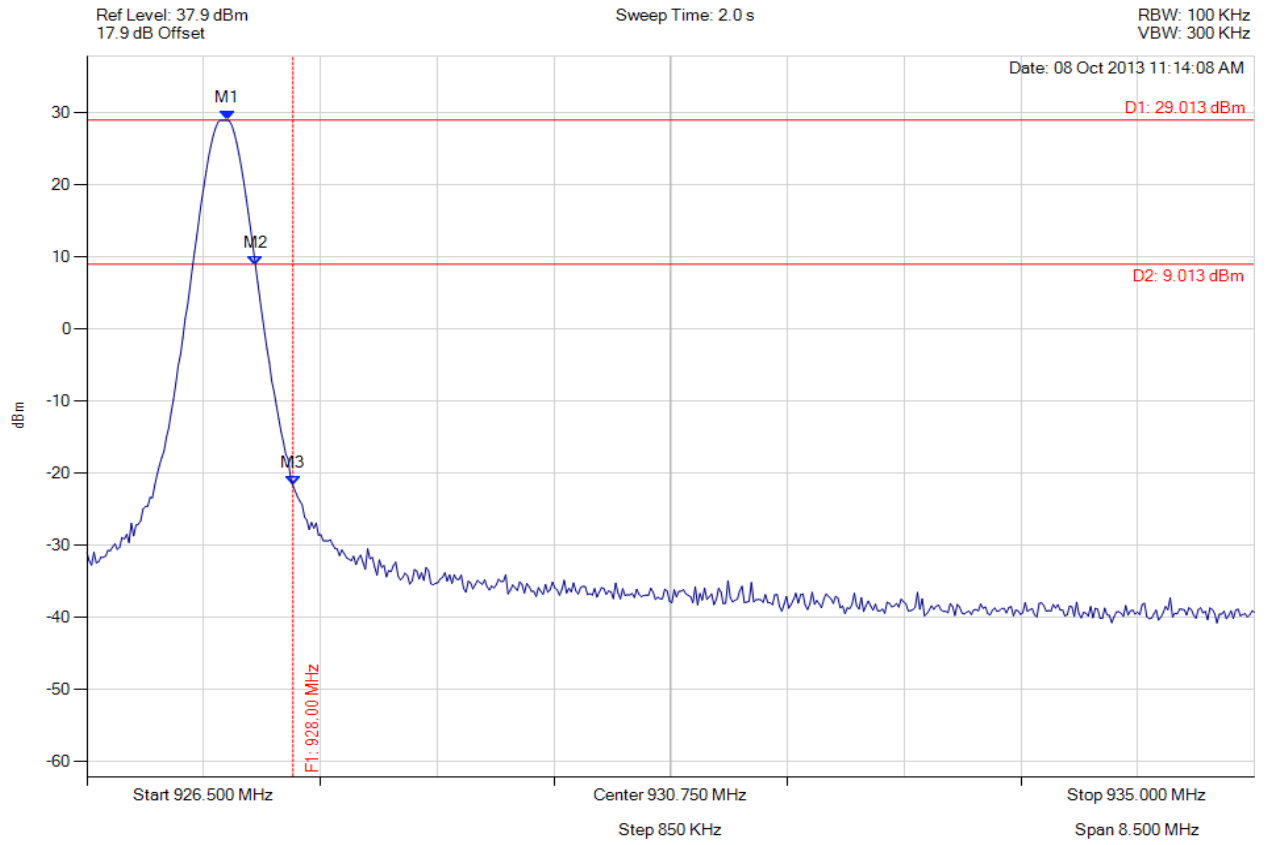
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 150kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.522 MHz : 29.013 dBm M2 : 927.726 MHz : 8.935 dBm M3 : 928.000 MHz : -21.681 dBm	Limit: 9.01 dBm Margin: -30.694 dB

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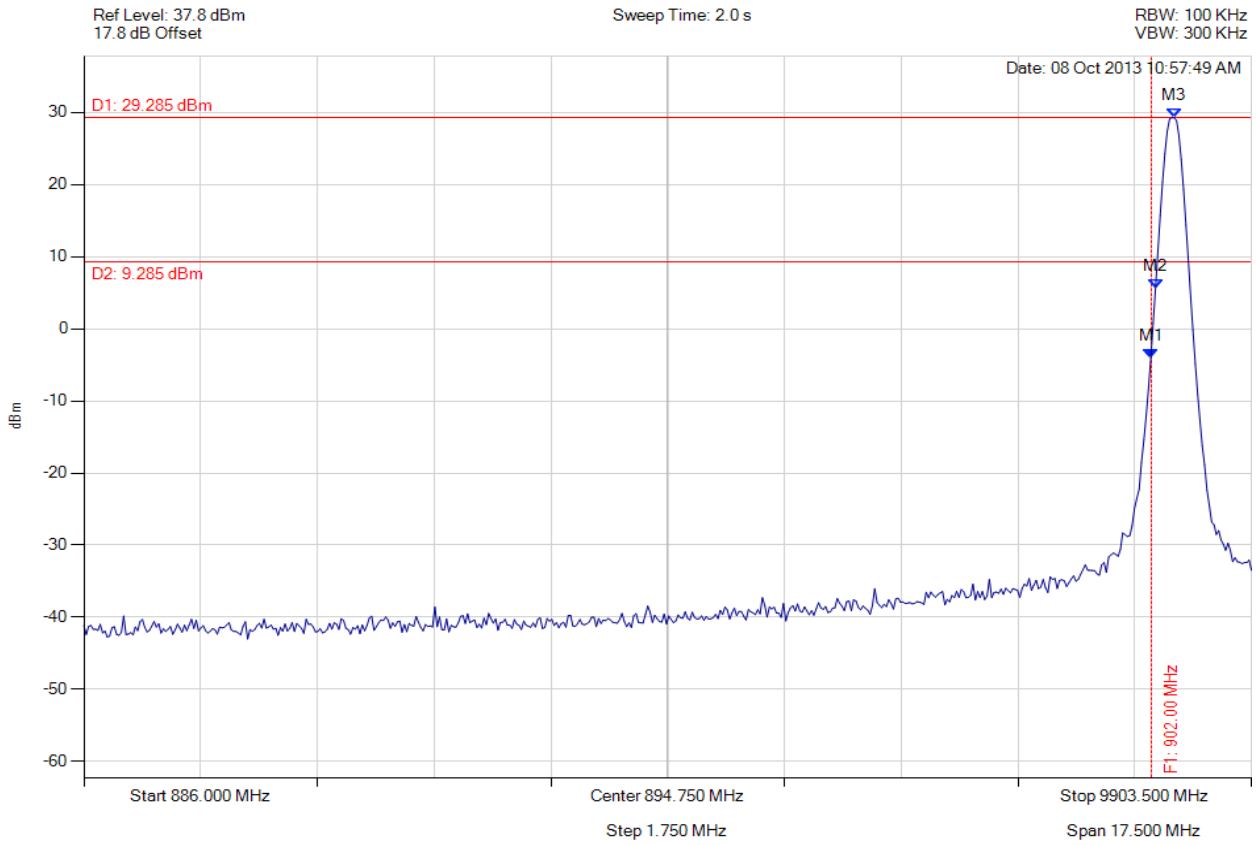
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: GFSK 150kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -4.014 dBm M2 : 902.062 MHz : 5.667 dBm M3 : 902.343 MHz : 29.285 dBm	Limit: 9.29 dBm Margin: -13.304 dB

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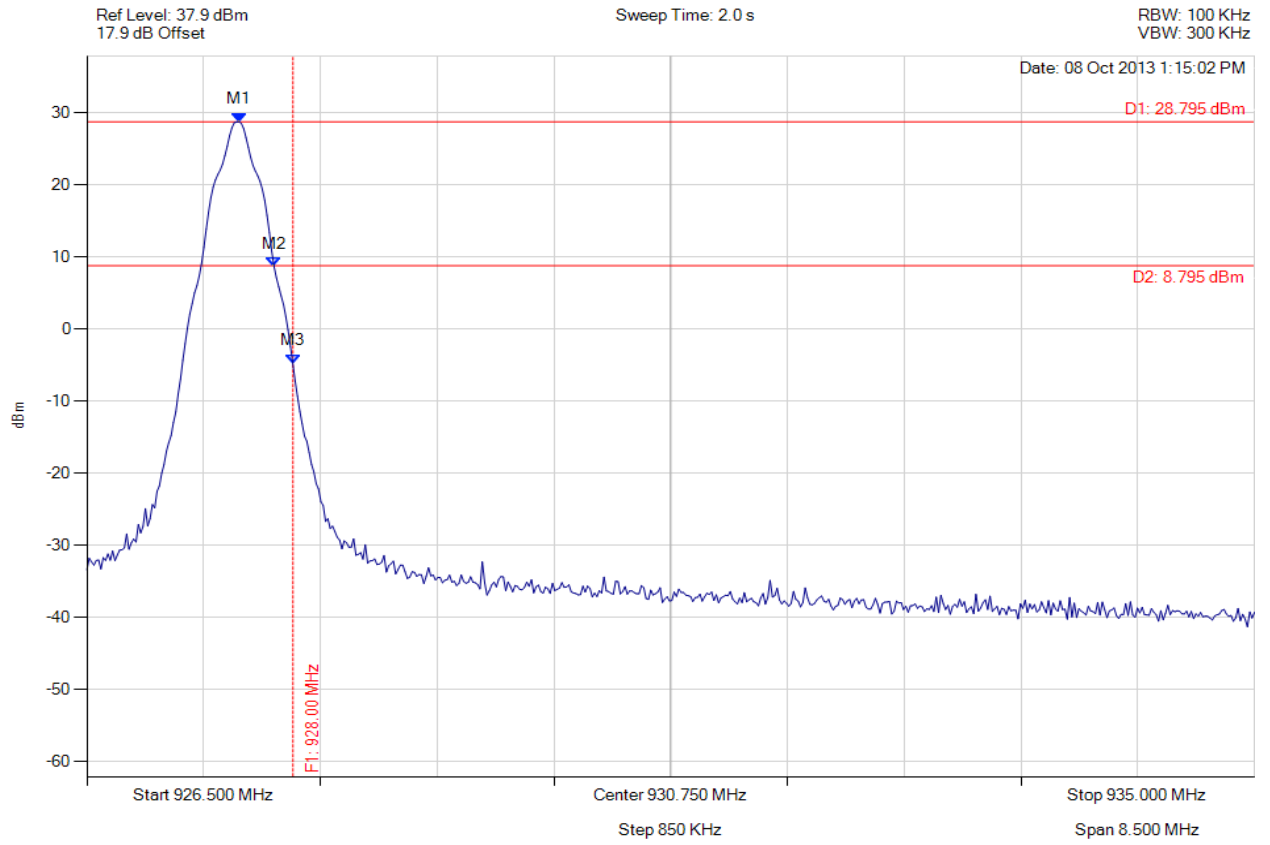
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 300kbps, Channel: 927.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.607 MHz : 28.795 dBm M2 : 927.863 MHz : 8.675 dBm M3 : 928.000 MHz : -4.735 dBm	Limit: 8.80 dBm Margin: -13.54 dB

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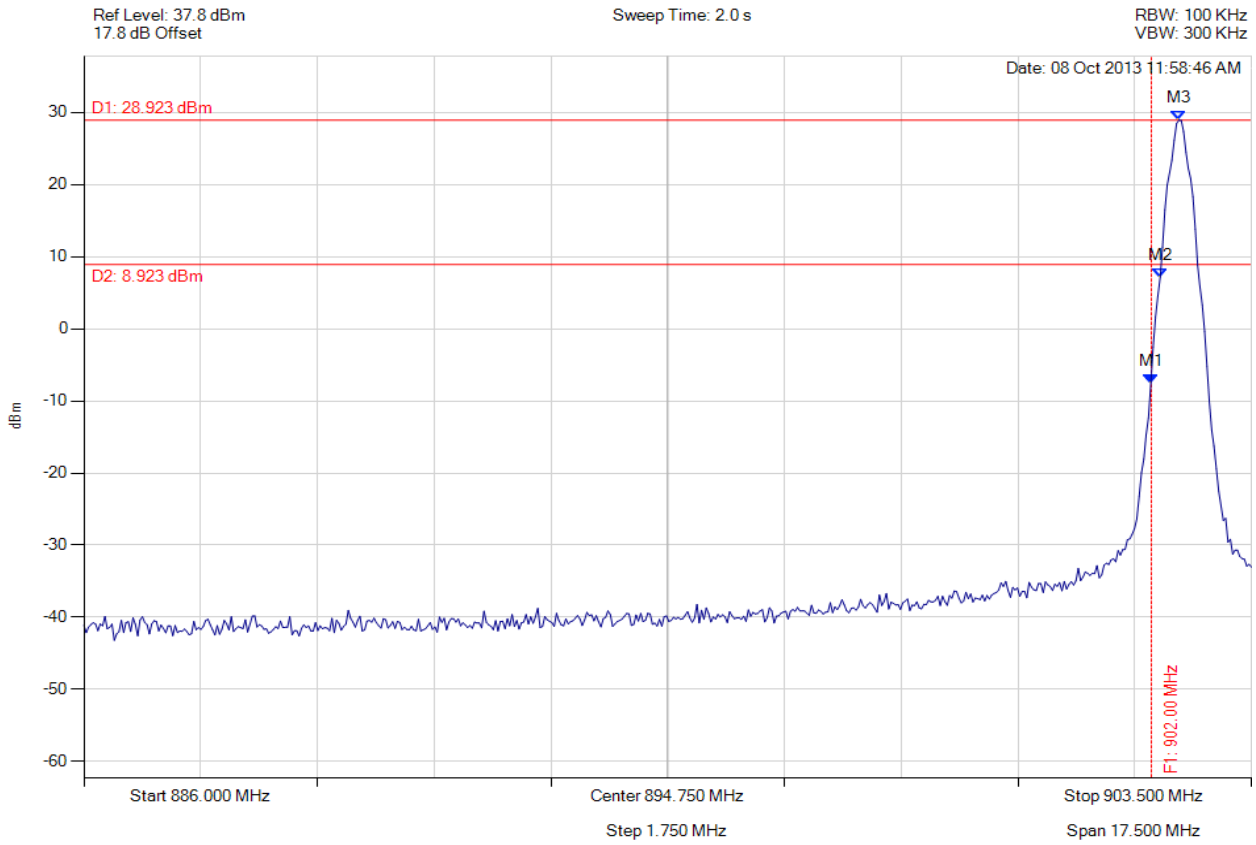
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: GFSK 300kbps, Channel: 902.40 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -7.548 dBm M2 : 902.132 MHz : 7.143 dBm M3 : 902.413 MHz : 28.923 dBm	Limit: 8.92 dBm Margin: -16.47 dB

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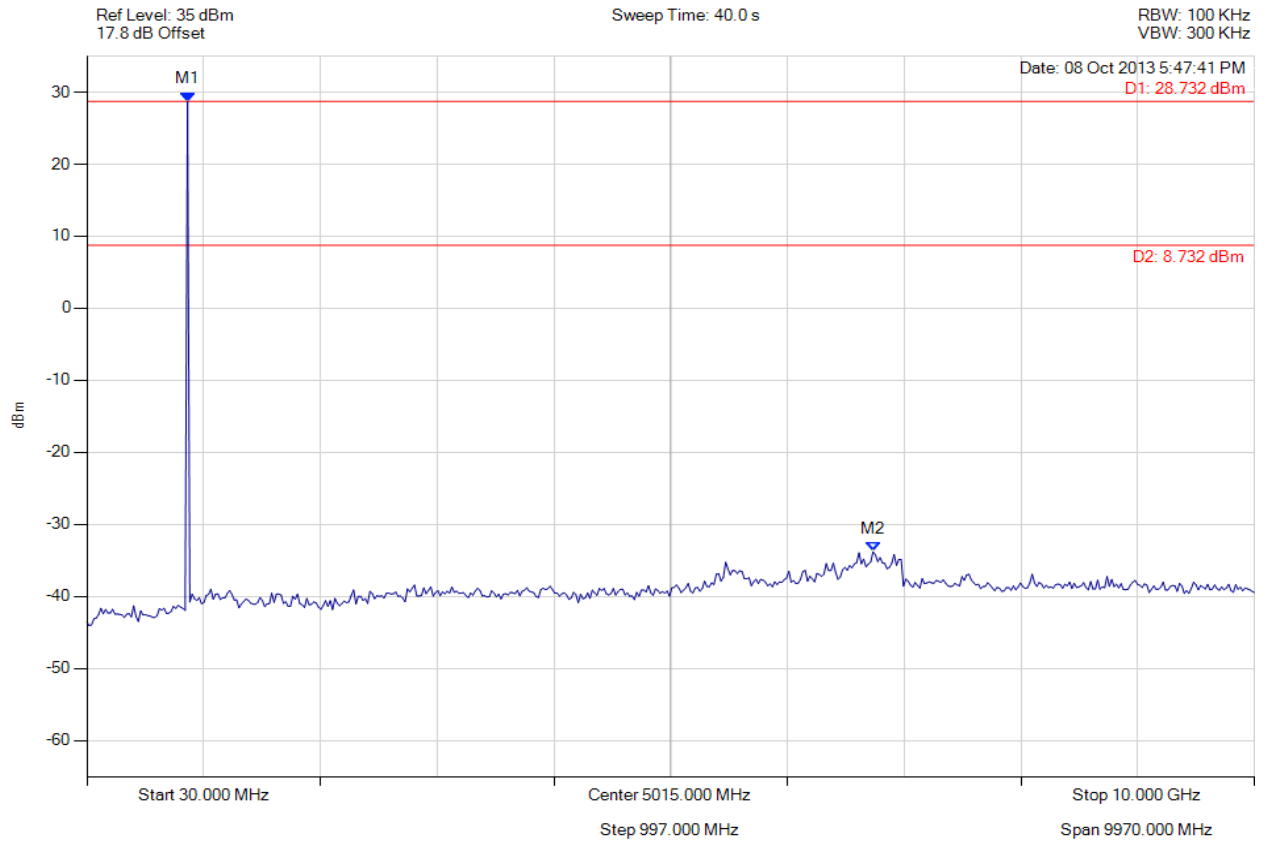
CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 889.138 MHz : 28.732 dBm M2 : 6743.267 MHz : -33.808 dBm	Limit: 8.73 dBm Margin: -42.54 dB

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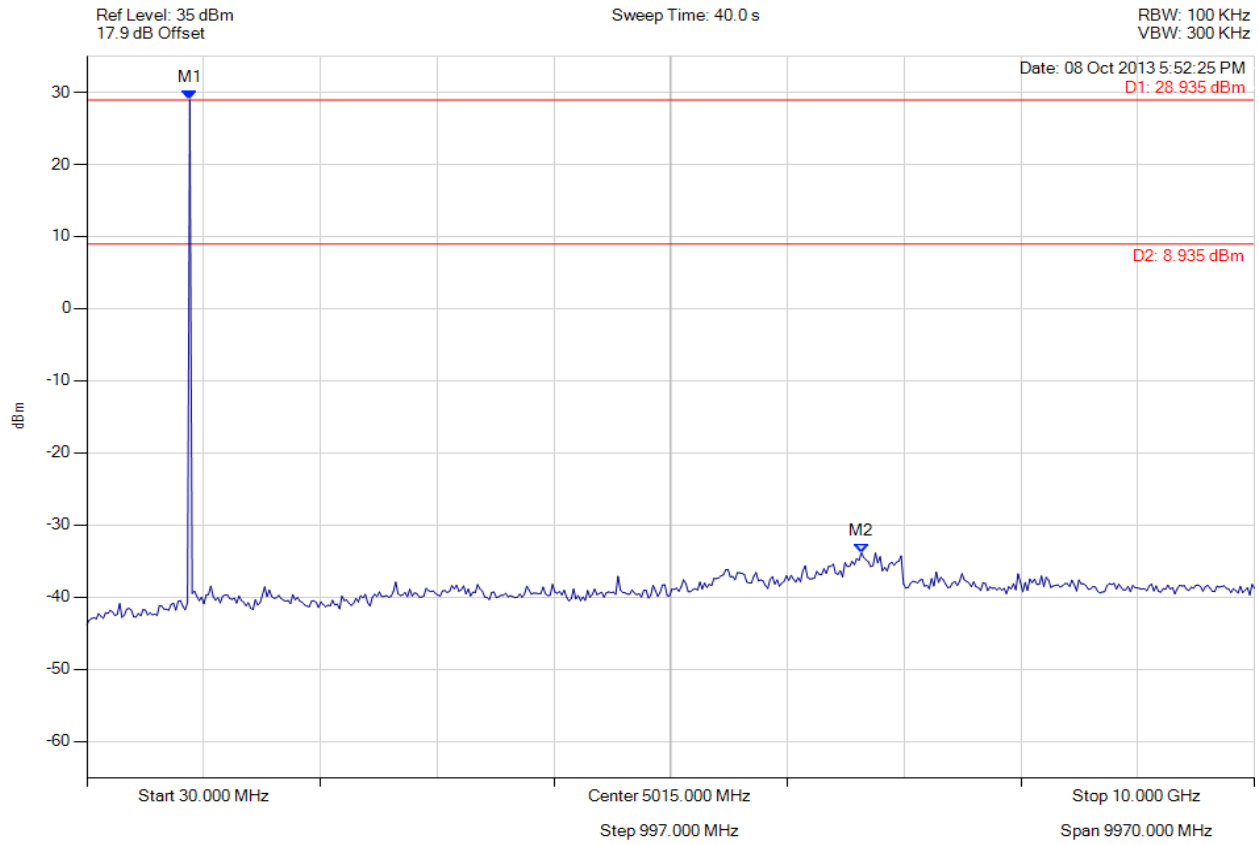
CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: FSK 100kbps, Channel: 915.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 909.118 MHz : 28.935 dBm M2 : 6643.367 MHz : -33.861 dBm	Limit: 8.94 dBm Margin: -42.80 dB

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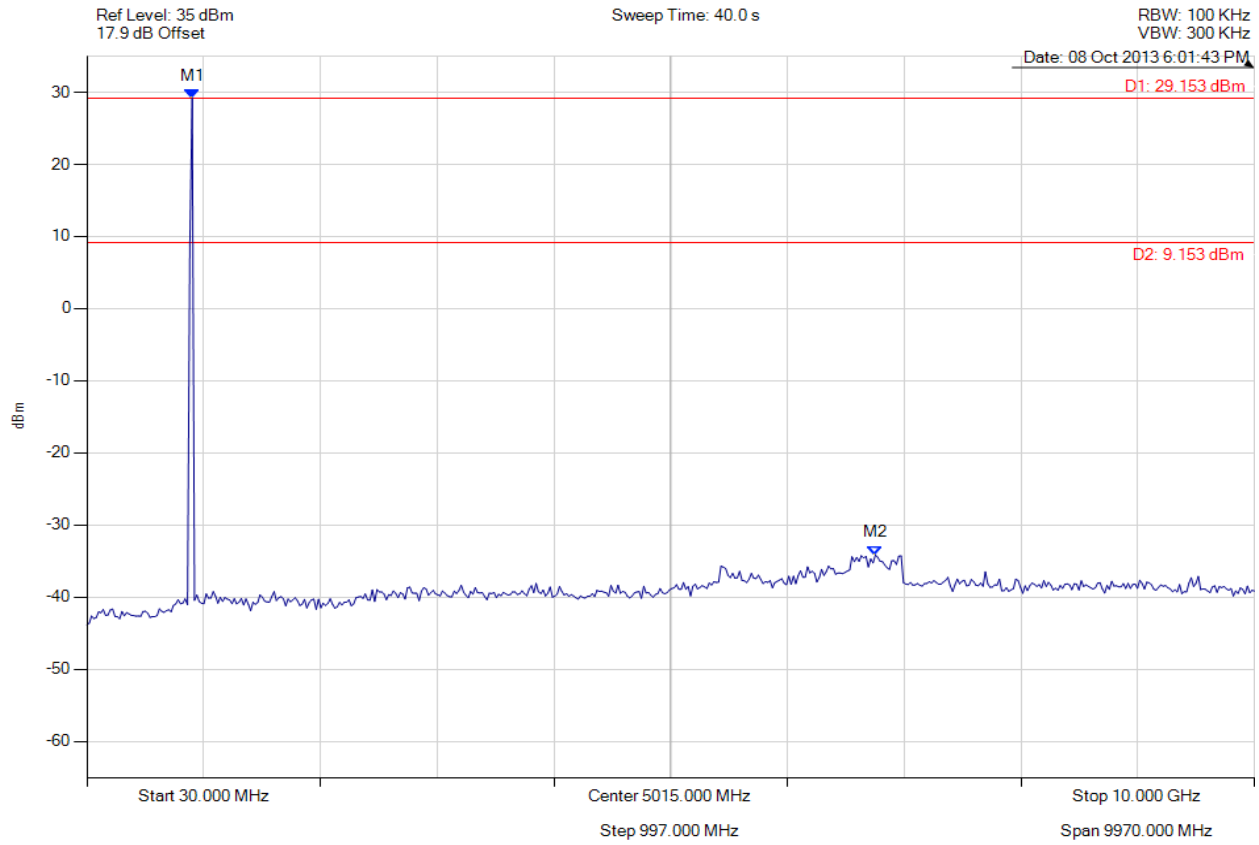
CONDUCTED SPURIOUS EMISSIONS - PEAK

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 929.098 MHz : 29.153 dBm M2 : 6763.246 MHz : -34.153 dBm	Limit: 9.15 dBm Margin: -43.30 dB

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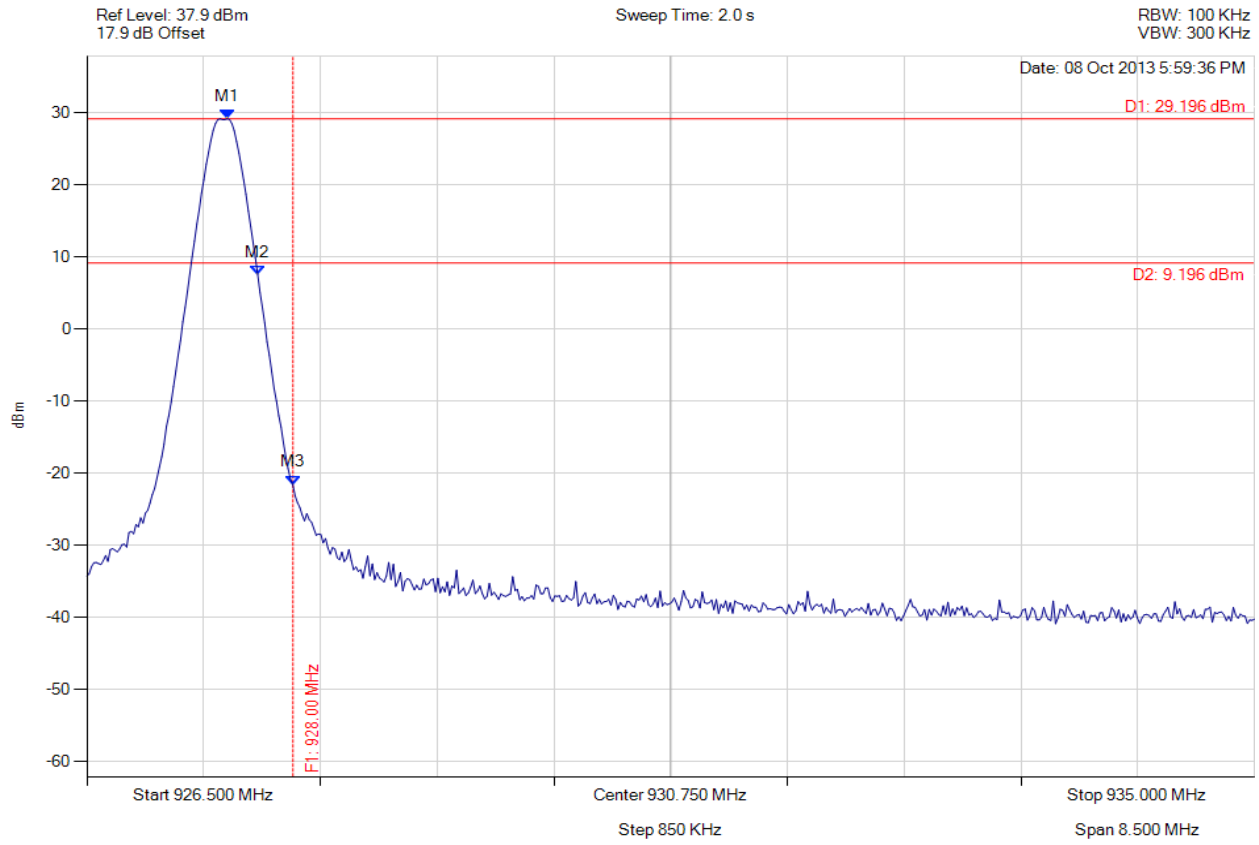
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: FSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.522 MHz : 29.196 dBm M2 : 927.743 MHz : 7.536 dBm M3 : 928.000 MHz : -21.575 dBm	Limit: 9.20 dBm Margin: -30.77 dB

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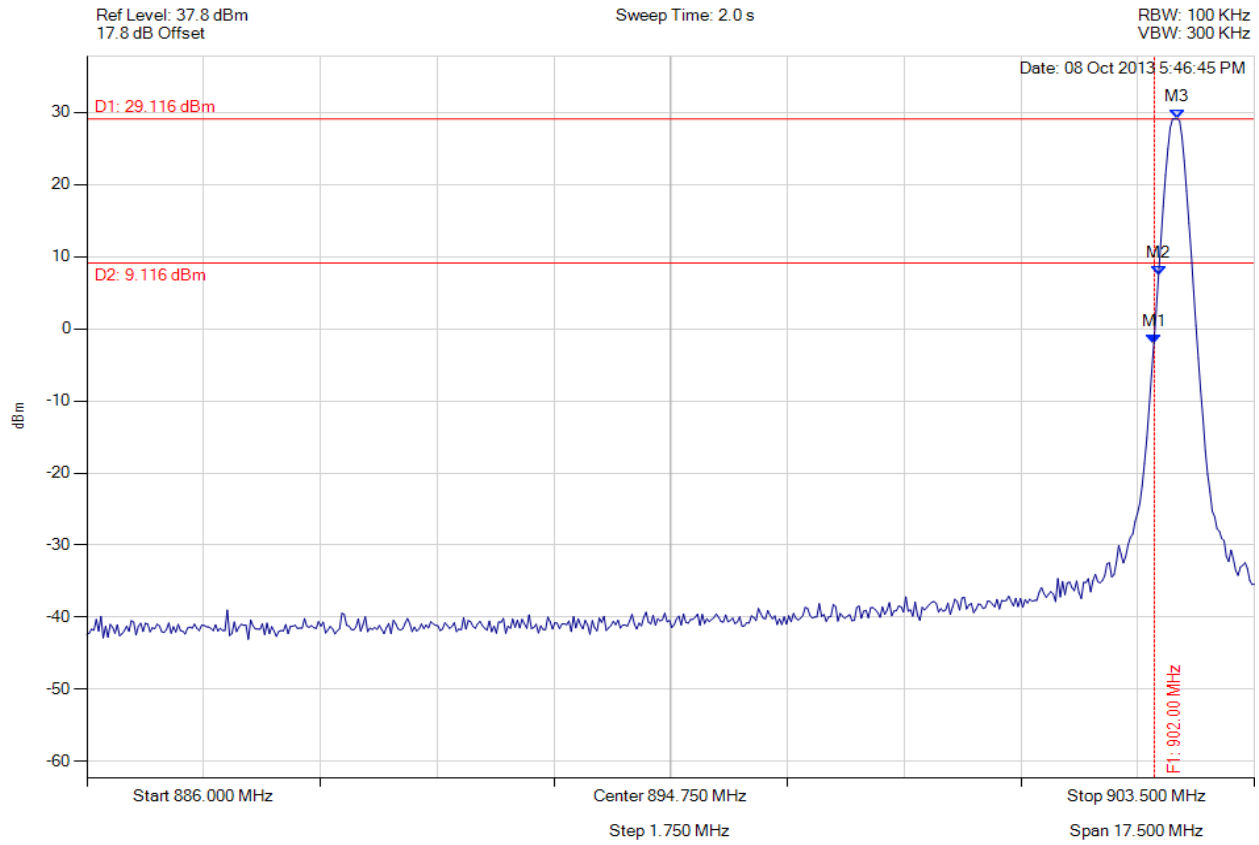
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: FSK 100kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -2.023 dBm M2 : 902.062 MHz : 7.448 dBm M3 : 902.343 MHz : 29.116 dBm	Limit: 9.12 dBm Margin: -11.14 dB

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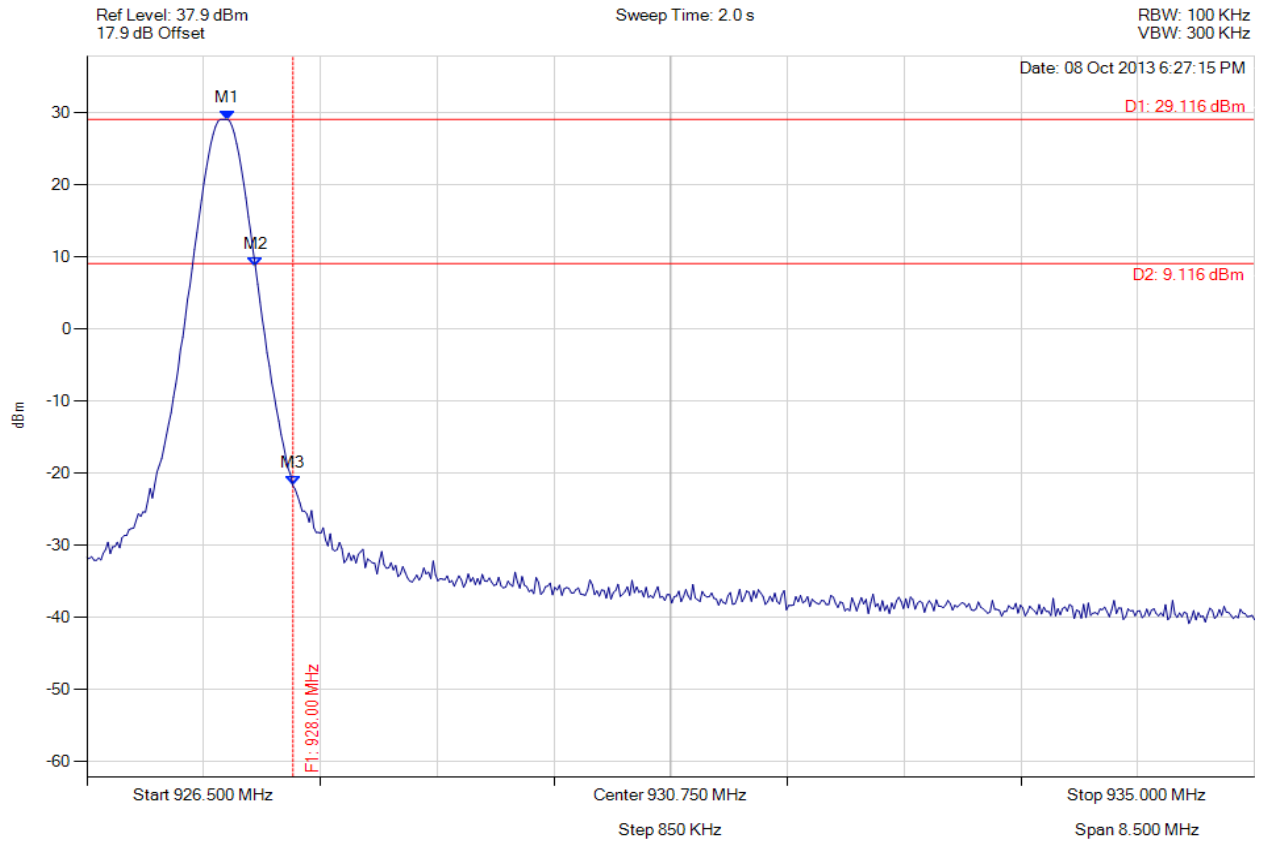
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 150kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.522 MHz : 29.116 dBm M2 : 927.726 MHz : 8.744 dBm M3 : 928.000 MHz : -21.703 dBm	Limit: 9.12 dBm Margin: -30.82 dB

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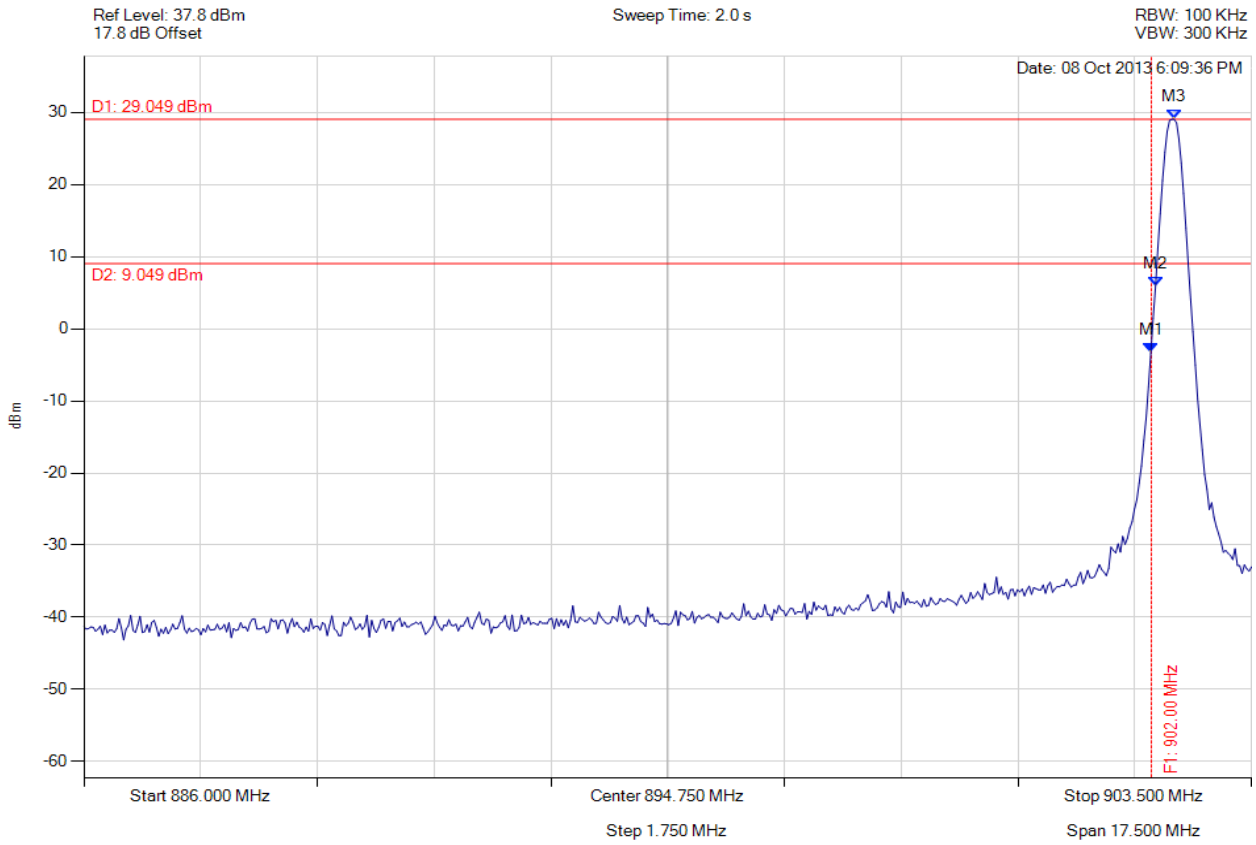
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: GFSK 150kbps, Channel: 902.30 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -3.314 dBm M2 : 902.062 MHz : 5.899 dBm M3 : 902.343 MHz : 29.049 dBm	Limit: 9.05 dBm Margin: -12.36 dB

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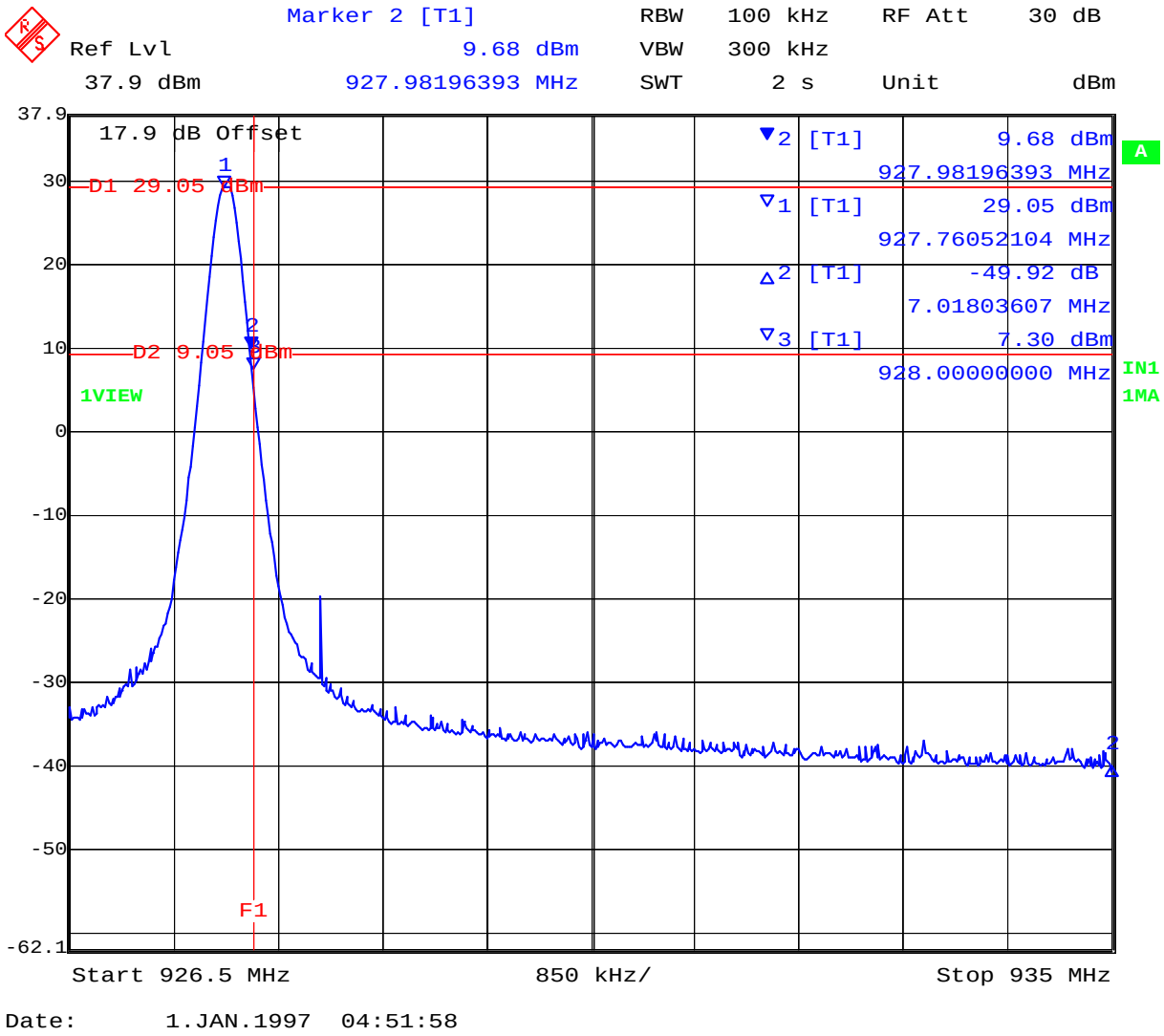
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 100kbps, Channel: 927.50 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.760 MHz : 29.05 dBm M2 : 927.981 MHz : 9.68 dBm M3 : 928.000 MHz : 7.30 dBm	Limit: 9.05 dBm Margin: -1.75 dB

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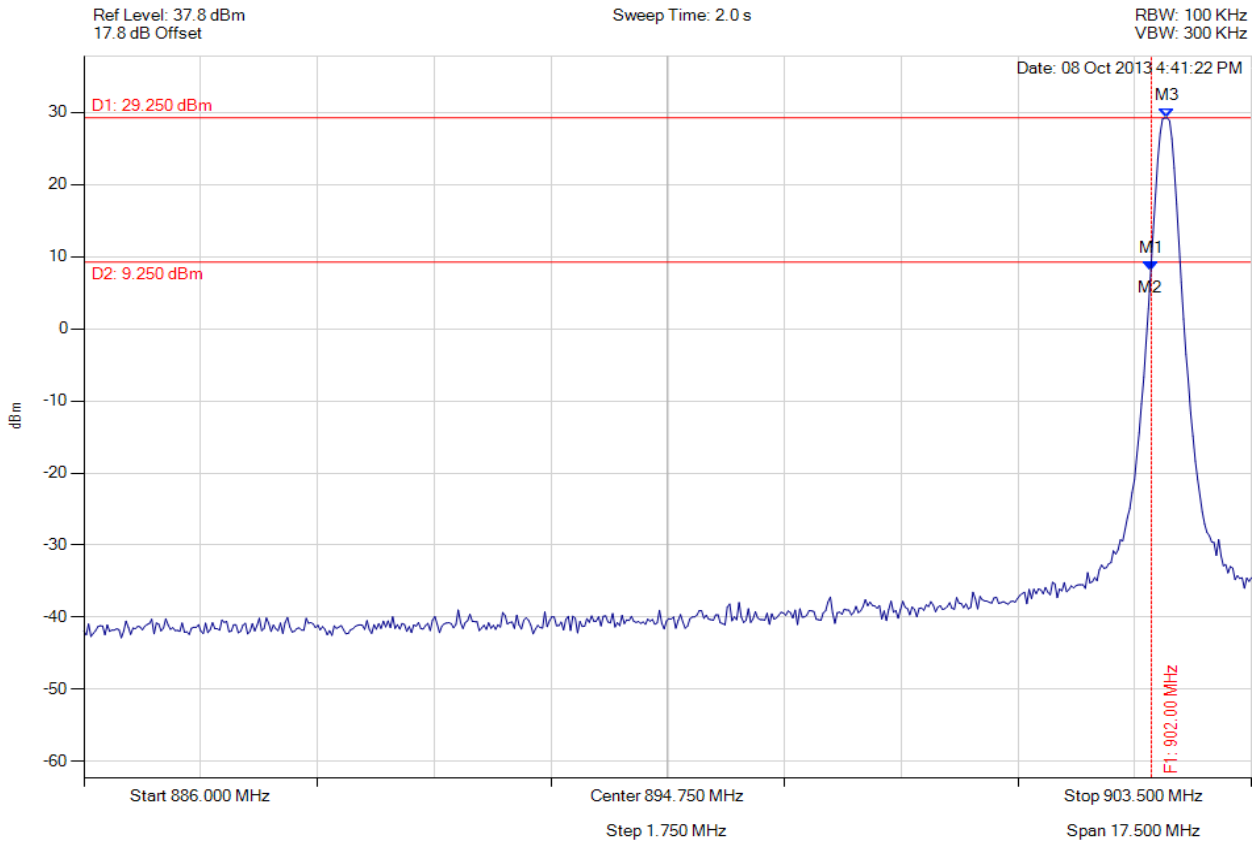
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: GFSK 100kbps, Channel: 902.20 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : 8.144 dBm M2 : 901.992 MHz : 8.144 dBm M3 : 902.237 MHz : 29.250 dBm	Limit: 9.25 dBm Margin: -1.11 dB

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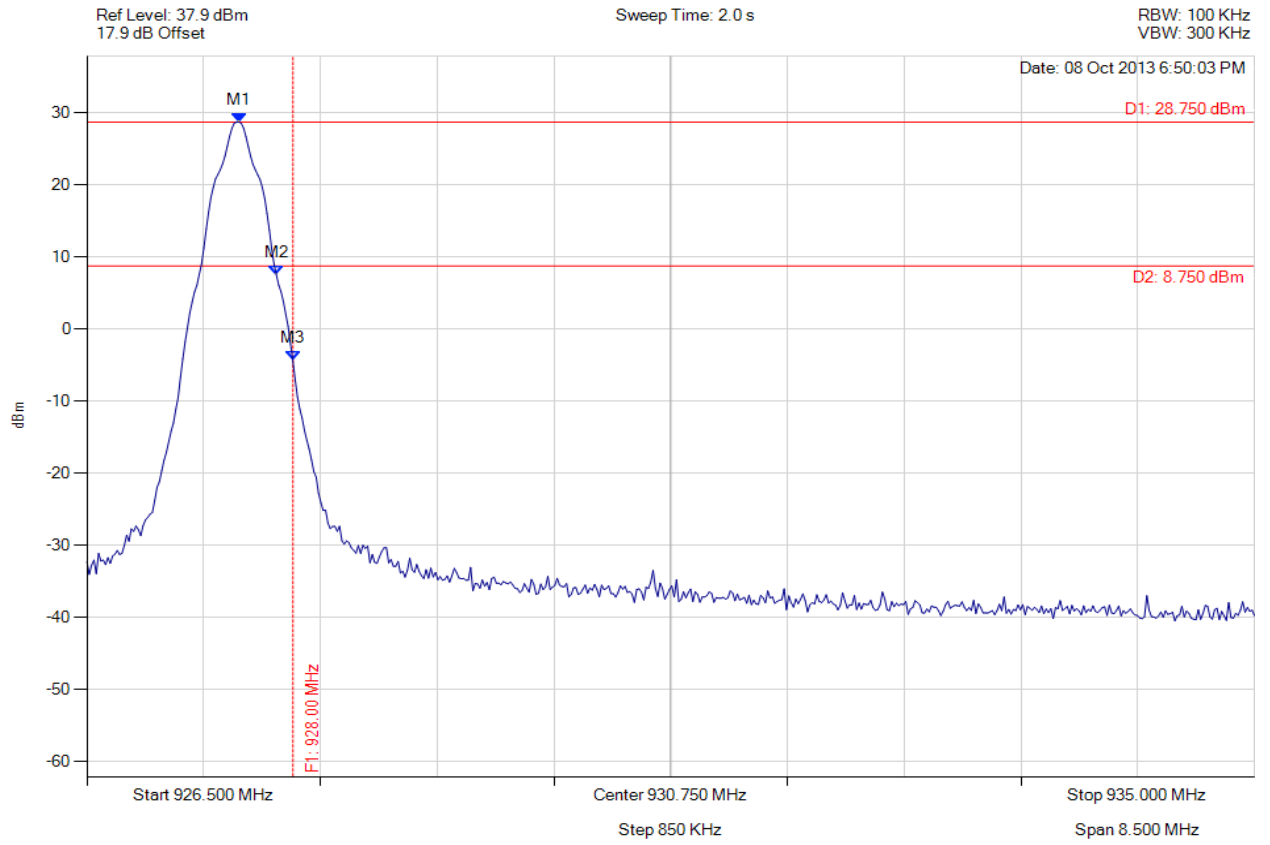
CONDUCTED HIGH BAND-EDGE EMISSION - PEAK

Variant: GFSK 300kbps, Channel: 927.60 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 927.607 MHz : 28.750 dBm M2 : 927.880 MHz : 7.508 dBm M3 : 928.000 MHz : -4.298 dBm	Limit: 8.75 dBm Margin: -13.05 dB

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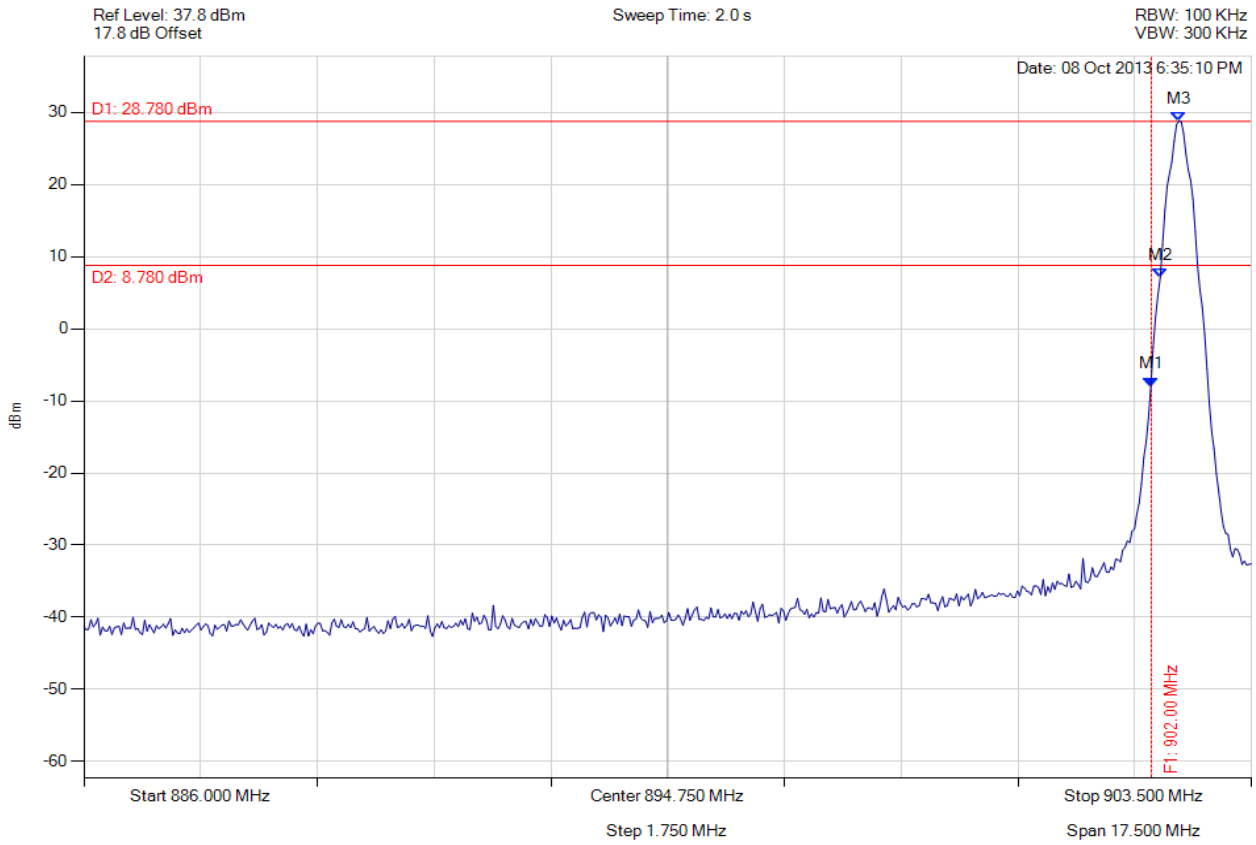
CONDUCTED LOW BAND-EDGE EMISSION - PEAK

Variant: GFSK 300kbps, Channel: 902.40 MHz, Chain a, Temp: Ambient, Voltage: 4 Vdc



Analyser Setup	Marker : Frequency : Amplitude	Test Results
Detector = MAX PEAK Sweep Count = 0 RF Atten (dB) = 30 Trace Mode = VIEW	M1 : 902.000 MHz : -7.994 dBm M2 : 902.132 MHz : 7.086 dBm M3 : 902.413 MHz : 28.780 dBm	Limit: 8.78 dBm Margin: -16.77 dB

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