

Radio Test Report for Permissive Change

*FCC Part 90
(150 MHz to 174 MHz)*

Model: SD1

COMPANY: GE MDS LLC
175 Science Parkway
Rochester, NY 14620

TEST SITE(S): NTS Silicon Valley
41039 Boyce Road.
Fremont, CA. 94538-2435

REPORT DATE: January 10, 2013

FINAL TEST DATES: January 5, 2011

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	01-10-2013	First release	

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SCOPE

Tests have been performed on the GE MDS LLC model SD1, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 90 (Private Land Mobile Radio Service)

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
ANSI TIA-603-C August 17, 2004

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the GE MDS LLC model SD1 and therefore apply only to the tested sample. The sample was selected and prepared by Dennis McCarthy of GE MDS LLC.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of GE MDS LLC model SD1 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC Part 90

FCC	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics				
§2.1033 (c) (5) §90.205	Frequency range(s)	No change from original approval		
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 §90.205	RF power output at the antenna terminals	No change from original approval		
§2.1033 (c) (4) §2.1047 §90.210	Emission types	F1D, F2D, F3D	-	Complied
	Emission mask	All emissions with mask	C	Complied
§2.1049 §90.209	99% / Occupied Bandwidth	16.5 kHz	20 kHz	Complied
§ 90.214	Transient Frequency Behavior	Within times required. Refer to plots.	t ₁ , 5ms t ₂ , 20ms t ₃ , 5ms	Complied
Transmitter spurious emissions				
§2.1051 §2.1057	At the antenna terminals	No change from original approval		
§2.1053 §2.1057	Field strength	No change from original approval		
Receiver spurious emissions				
15.109	Field strength	No change from original approval		
Other details				
§2.1055 § 90.213	Frequency stability	No change from original approval		
§2.1093	RF Exposure	No change from original approval		
§2.1033 (c) (8)	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	No change from original approval		
-	Antenna Gain	No change from original approval		

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7 x 10 ⁻¹

EQUIPMENT UNDER TEST (EUT) DETAILS**GENERAL**

The GE MDS LLC model SD1 is a licensed, half-duplex, narrow band data transceiver which operates in the VHF band. The EUT was treated as table-top equipment during testing to most closely simulate the end-user environment. The electrical rating of the EUT is 10-30 VDC (13.8V nominal), 2.2 Amps.

The sample was received on January 5, 2011 and tested on January 5, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
GE MDS	SD1	Data transceiver	FCC #1	E5MDS-SD1

OTHER EUT DETAILS

Any details including receiver class and power class, channel separation, frequency range or ranges, antennas used etc.

ENCLOSURE

The EUT enclosure is primarily constructed of cast aluminum. It measures approximately 16 cm wide by 12 cm deep by 3.5 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Power Designs	6150D	DC power supply	902012	-
db Products	15W Type N	50 ohm load	NA	-

The following equipment was used as remote support equipment for emissions testing:

Company	Model	Description	Serial Number	FCC ID
HP	Pavilion dv6000	Laptop	-	-
AirLink	ASW108/A4	Hub	-	-
-	-	Serial - USB adaptor	-	-

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
COM2	Serial - USB adaptor	Multiwire	Shielded	10
Serial - USB adaptor	Laptop	Multiwire	Shielded	0.3
LAN	Hub	Cat 7	Shielded	10
Antenna	50 ohm load	Coax	Shielded	2
DC Power	DC supply	2 wire	Unshielded	3
AC Power (DC supply)	AC mains	3 wire	Unshielded	2

Note: COM1 was not connected during testing. The manufacturer stated that this is for configuration purposes and therefore would not normally be connected.

EUT OPERATION

During emissions testing the EUT was set to transmit continuously on the selected channel and at the power level as required for the test performed.

PROPOSED MODIFICATION DETAILS

ADDITIONAL BANDWIDTH MODE

The GE MDS Model SD1 was certified with bandwidths for 6.25 and 12.5 kHz channel spacing. This permissive change is to add a bandwidth for 25 kHz channel spacing with 19200 bps data rate. This data only radio meets the efficiency requirements for 25 kHz channel spacing for a multi mode product in accordance with §90.203(j)(4)(iii) and KDB 579009 as it has a minimum 4800 bps/6.25 kHz data rate for all bandwidth modes. There has been no change in the radio hardware for the new bandwidth. The software will be modified to allow setting of the wider bandwidth.

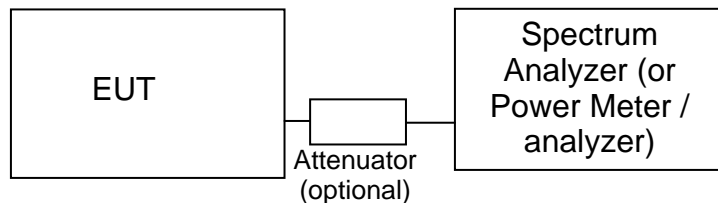
TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the NTS Silicon Valley test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

For devices with an integral antenna the output power and spurious emissions are measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using a substitution measurement (refer to **Error! Reference source not found.**). All other measurements are made as detailed below but with the test equipment connected to a measurement antenna directed at the EUT.

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

TRANSMITTER MASK MEASUREMENTS

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the unmodulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

TRANSIENT FREQUENCY BEHAVIOR:

The TIA/EIA 603 procedure is used to determine compliance with transient frequency timing requirements as the radio is keyed on and off.

The EUTs rf output is connected via a combiner/splitter to the test receiver/spectrum analyzer and to a diode detector. The test receiver or spectrum analyzer video output is connected to an oscilloscope, which is triggered by the output from the diode detector.

Plots showing Ton, T1, and T2 are made when turning on the transmitter and showing T3 when turning off the transmitter.

Appendix A Test Equipment Calibration Data

Radio Antenna Port (Power and Spurious Emissions), 05-Jan-11

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011
Tektronix	1 GHz, 4 CH, 5GS/s Oscilloscope	TDS5104	1435	4/26/2011

Appendix B Test Data

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EMC Test Data

Client:	GE MDS LLC	Job Number:	J81584
Model:	SD1	T-Log Number:	T82037
		Account Manager:	Susan Pelzl
Contact:	Dennis McCarthy		-
Emissions Standard(s):	FCC Parts 15 & 90, RSS-GEN and RSS-119	Class:	A
Immunity Standard(s):	-	Environment:	Radio

EMC Test Data

For The

GE MDS LLC

Model

SD1

Date of Last Test: 1/12/2011

Client:	GE MDS LLC	Job Number:	J81584
Model:	SD1	T-Log Number:	T82037
Contact:	Dennis McCarthy	Account Manager:	Susan Pelzl
Standard:	FCC Parts 15 & 90, RSS-GEN and RSS-119	Class:	N/A

**RSS 119 and FCC Part 90
Power, Occupied Bandwidth, Frequency Stability and Spurious Emissions**

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

With the exception of the radiated spurious emissions tests, all measurements are made with the EUT's RF port connected to the measurement instrument via an attenuator or dc-block if necessary. All amplitude measurements are adjusted to account for the attenuation between EUT and measuring instrument. For frequency stability measurements the EUT was placed inside an environmental chamber.

Radiated measurements are made with the EUT located on a non-conductive table, 3m from the measurement antenna.

Ambient Conditions: Temperature: 18 °C
 Rel. Humidity: 33 %

Summary of Results

Run #	Spacing	Test Performed	Limit	Pass / Fail	Result / Margin
2	25kHz	Spectral Mask	See plots below	Pass	-
3	25kHz	99% or Occupied Bandwidth	20 kHz	Pass	16.5 kHz
6	25kHz	Transient Frequency Behaviour	5 and 20 ms	Pass	Less than 5 and 20 ms

Modifications Made During Testing

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.

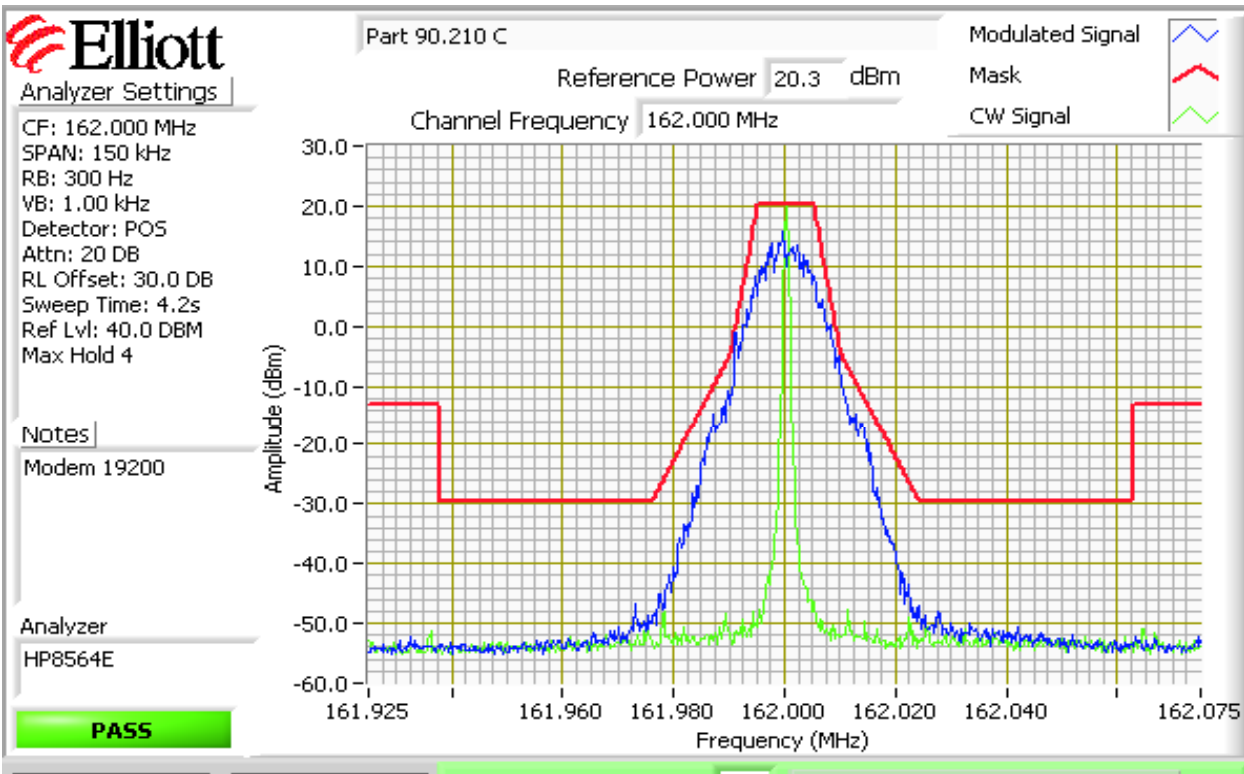
Client: GE MDS LLC	Job Number: J81584
Model: SD1	T-Log Number: T82037
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 15 & 90, RSS-GEN and RSS-119	Class: N/A

Run #2: Spectral Mask, FCC Part 90

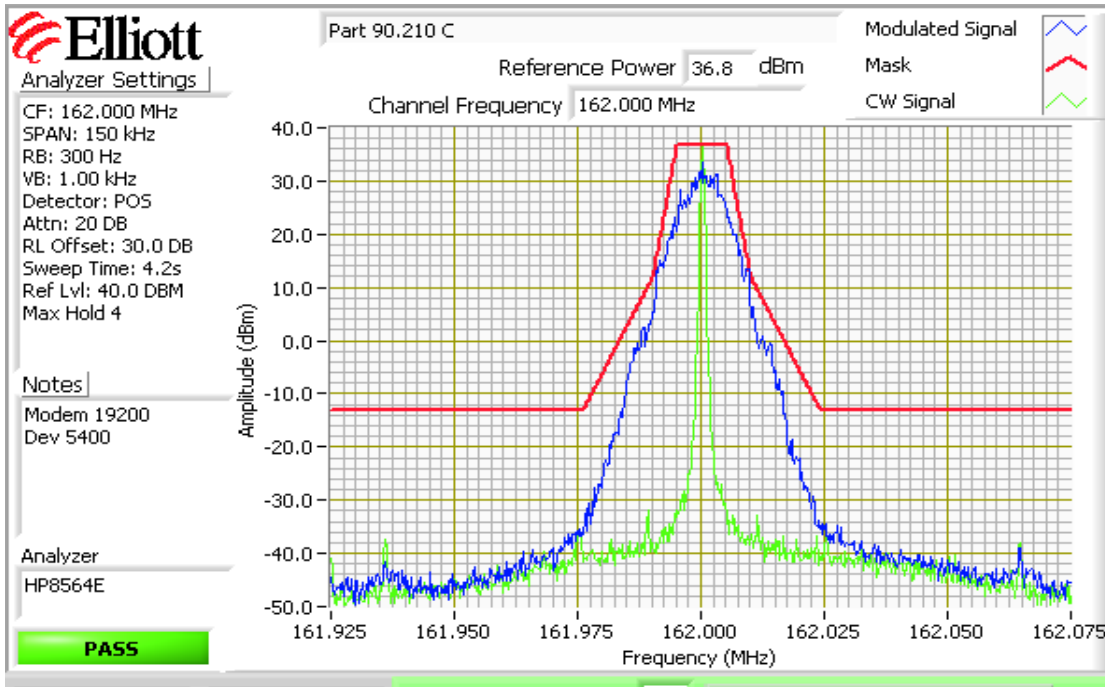
Date: 1/5/2011 Engineer: John Caizzi FT7

Note 1: For Mask C, RB=300 Hz and VB=1KHz. The mask reference was established using the peak amplitude of the unmodulated transmitter output.

Note 2: For Mask C, use Modem 19200.



Client: GE MDS LLC	Job Number: J81584
Model: SD1	T-Log Number: T82037
Contact: Dennis McCarthy	Account Manager: Susan Pelzi
Standard: FCC Parts 15 & 90, RSS-GEN and RSS-119	Class: N/A



Client: GE MDS LLC	Job Number: J81584
Model: SD1	T-Log Number: T82037
Contact: Dennis McCarthy	Account Manager: Susan Pelzl
Standard: FCC Parts 15 & 90, RSS-GEN and RSS-119	Class: N/A

Run #3: Signal Bandwidth

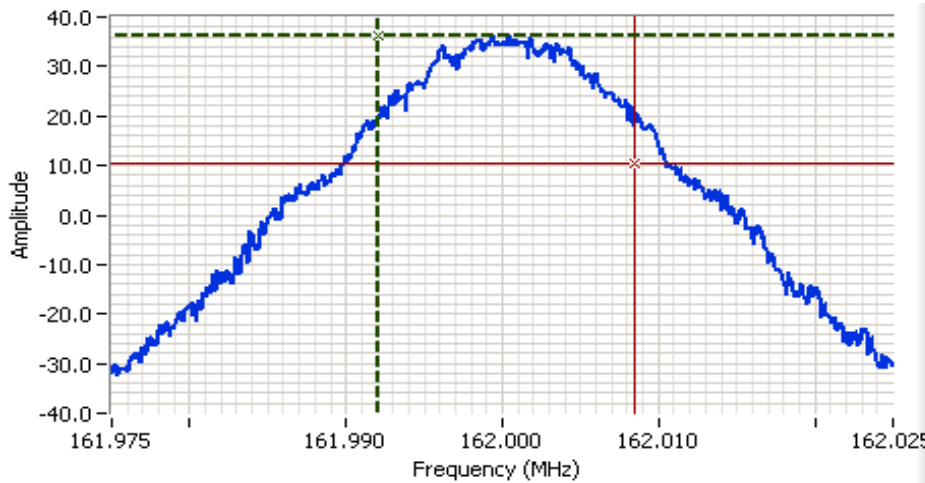
Date: 1/5/2011

Engineer: John Caizzi

Location: FT7

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (kHz)		Limit (kHz)
				99%	
37	162	1 kHz	19200	16.5	20

Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB



Analyzer Settings

HP8564E
CF: 162.000 MHz
SPAN: 50.0 kHz
RB: 1.00 kHz
VB: 3.00 kHz
Detector: POS
Attn: 20 DB
RL Offset: 30.0 DB
Sweep Time: 200.0ms
Ref Lvl: 40.0 DBM

Comments

99% power BW: 16.5 kHz
Modem 19200 dev5400

Cursor 1	161.9921	36.33	↕	↔	🔒
Cursor 2	162.0085	10.33	↕	↔	🔒

Delta Freq. 16.5 kHz
Delta Amplitude 26.00



Client: GE MDS LLC	Job Number: J81584
Model: SD1	T-Log Number: T82037
Contact: Dennis McCarthy	Account Manager: Susan Pelzl
Standard: FCC Parts 15 & 90, RSS-GEN and RSS-119	Class: N/A

Run #6: Transient Frequency Behavior

Date: 1/5/11

Engineer: John Caizzi

Location: FT7

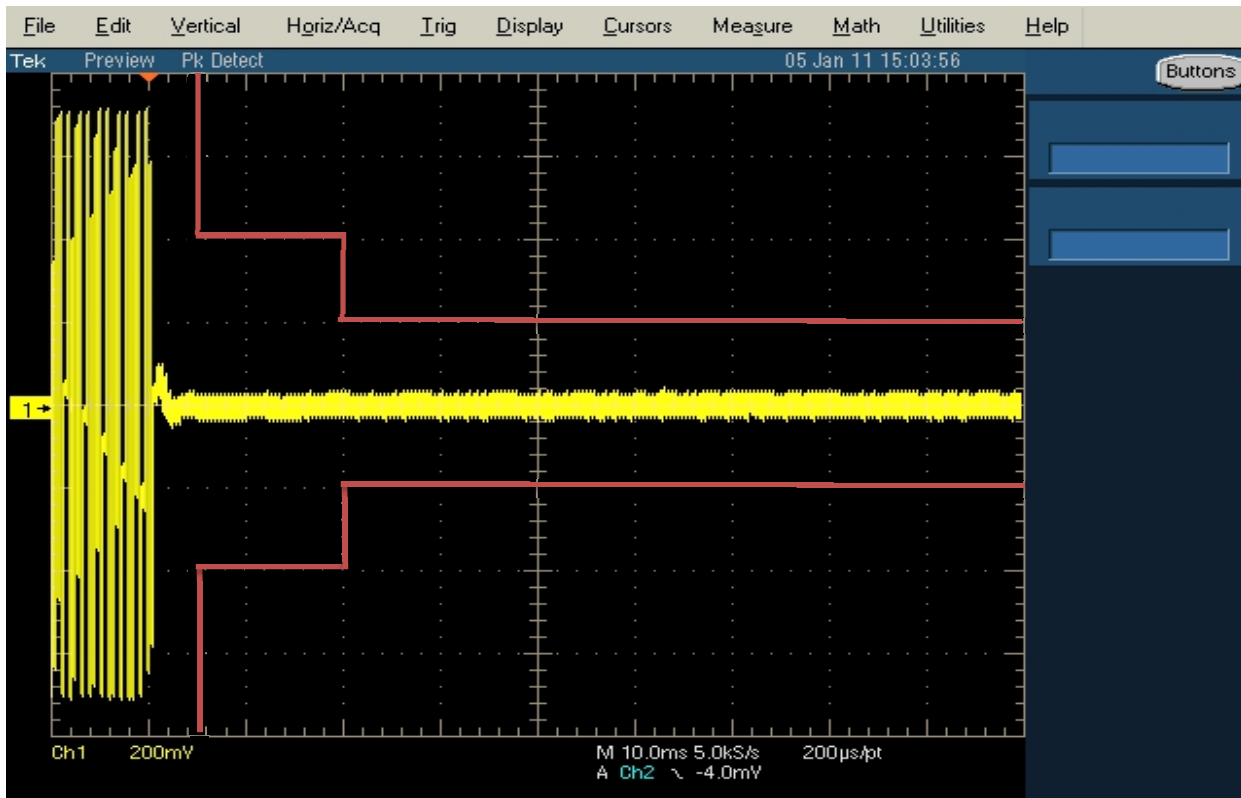
Run #6e

Carrier Frequency: 162.0125 MHz

Channel Spacing: 25 kHz

Modulation: Modem 19200, dev 5400

Description: Switch on condition ton, t1, and t2



Client: GE MDS LLC	Job Number: J81584
Model: SD1	T-Log Number: T82037
Contact: Dennis McCarthy	Account Manager: Susan Pelzl
Standard: FCC Parts 15 & 90, RSS-GEN and RSS-119	Class: N/A

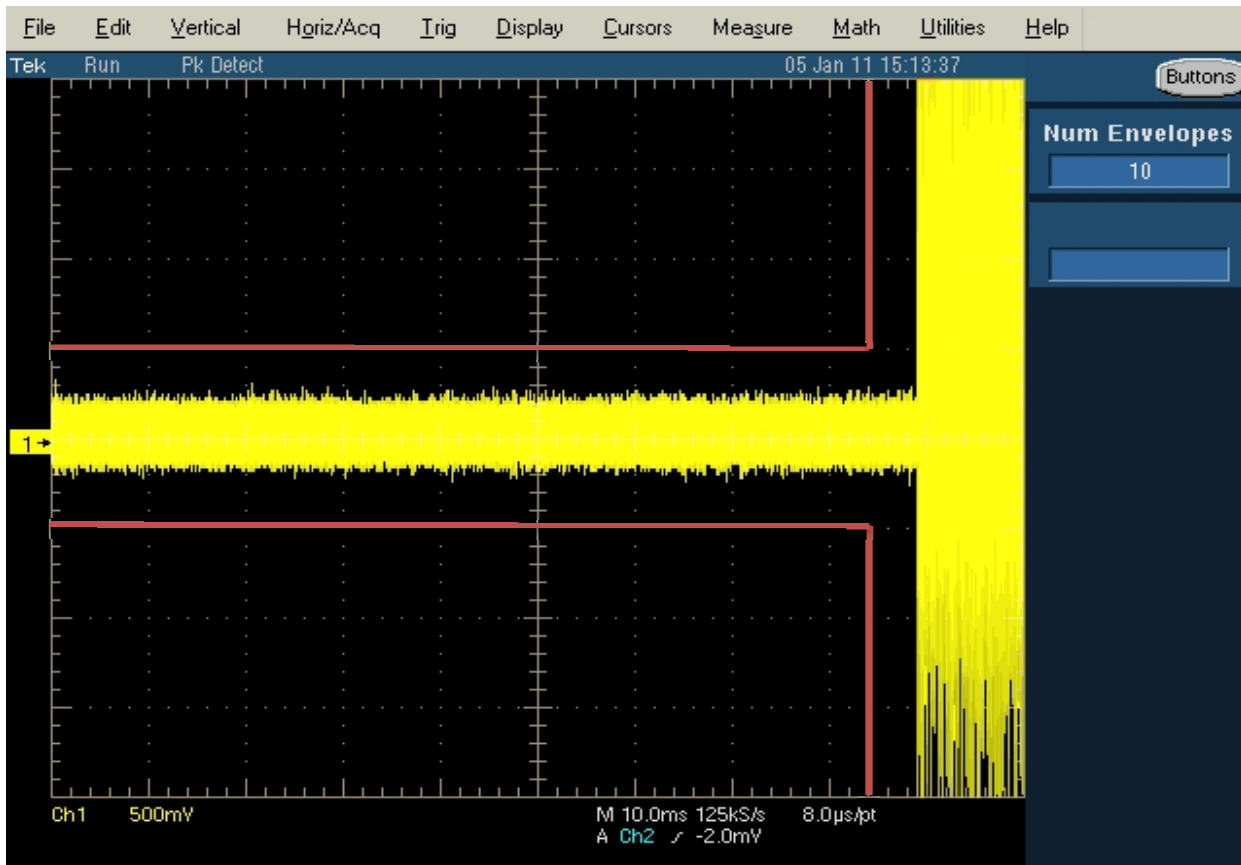
Run #6f

Carrier Frequency: 162.0125 MHz

Channel Spacing: 25 kHz

Modulation: Modem 192600, dev 5400

Description: Switch off condition t3 and toff



End of Report

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