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FCC PART 15.247 & RSS-210 Section A8 (i8) DIRECT SEQUENCE SPREAD SPECTRUM SYSTEMS COMBINED TEST REPORT

Applicant	T&D CORPORATION
Address	817-1 SHIMADACHI MATSUMOTO 390-0852
FCC-ID	SRD10090
IC-Certification	5558A-10090
Model Number	RTR-500MBS-A
Product Description	MOBILE BASE STATION WITH GSM MODULE
Date Sample Received	1/5/2015
Date Tested	1/19/2015
Tested By	Cory Leverett
Approved By	Sid Sanders
Report Number	14AUT15TestReport.docx
Issue Date:	1/20/2015
Test Results	☒ PASS ☐ FAIL

**THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.**

TABLE OF CONTENTS

General Remarks	3
General Information	4
Report Summary.....	5
Power output	6
Power Spectral Density	7
Occupied Bandwidth	11
Spurious Emissions.....	15
Band Edge.....	25
AC Power Line Emissions.....	28
Test Equipment.....	33

GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

Summary

The device under test does:

- ☒ fulfill the general approval requirements as identified in this test report
☐ not fulfill the general approval requirements as identified in this test report

Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.
849 NW State Road 45
Newberry, FL 32669

Authorized Signatory Name:

Cory Leverett
Engineering Project Manager

Date: 1/20/2015



[TABLE OF CONTENTS](#)

APPLICANT: T&D CORPORATION
FCC ID: SRD10090
IC CERTIFICATION: 5558A-10090
REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

GENERAL INFORMATION

EUT Specification

Measurement Procedures	FCC KDB558074 D01 V03r02, ANSI C63.3 2003		
EUT Description	MOBILE BASE STATION WITH GSM MODULE (FCC ID: UDV-1103022011008)		
Test Frequencies	Low 902.9376 MHz, Middle 914.4576 MHz, High 927.1296 MHz		
Operating Frequency	TX: 902.93760 MHz	927.12960 MHz	
Number of channels	22		
Modulation:	FSK		
Bit Rate	8192 bps		
EUT Power Source	☒ 110-120Vac/50- 60Hz See Remarks		
	☒ DC Power See Remarks		
	☒ Battery Operated See Remarks		
Test Item	☐ Prototype	☒ Pre-Production	☐ Production
Type of Equipment	☐ Fixed	☐ Mobile	☒ Portable
Antenna Connector	Reverse SMA		
Antenna	Dipole		
Antenna Gain	0 dBi		
Test Facility	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.		
Test Conditions	Temperature: 26°C Relative humidity: 50%		
Test Exercise	The EUT was placed in continuous transmit mode of operation.		

Remarks: Power source options for EUT:

Either 4 AA alkaline batteries (LR3), a 5V only AC adapter, or external DC power (10-34V) is available as power supply. Power is converted to 4.0V by regulator and supplied to the circuit. It is possible to use the batteries in conjunction with the AC adapter or the external DC power. When batteries are installed in the device, if the AC adapter or external DC power is connected, power supply from the batteries is disabled by Solid state Switch (QF1).

[TABLE OF CONTENTS](#)

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

REPORT SUMMARY

Test Results

Specification – Rules Part No.	RESULTS Pass/Fail/NA
Power Output – FCC 15.247 (b) (3), RSS-210 (i8) A8.4 (4)	Pass
Power Spectral Density – FCC 15.247 (e), RSS-210 (i8) A8.2(b)	Pass
Occupied Bandwidth – FCC 15.247 (a)(2), RSS-210(i8) A8.2(a)	Pass
Spurious Emissions – FCC 15.247 (d) 15.209, RSS-210 (i8) A8.5 RSS-Gen (i8)	Pass
Band Edge – FCC 15.247 (d), RSS-210 (i8) A8.5	Pass
Radiated Spurious Emissions Adj Restricted Band – 15.209, RSS-Gen (i8)	NA
AC Power Line Emissions – FCC 15.207 (c), RSS-Gen (i8)	Pass

EUT Test Modes

The EUT was tested in a continuous transmit and receive mode. Control of the tuned frequency was done through engineering test software provided by the applicant. The software allowed the EUT to be tuned to the lowest, middle, and highest frequencies with and without modulation. A receive only mode was also available at the lowest, middle, and highest frequencies used in the 902-928 MHz band.

EUT Supporting Peripheral Equipment

Supporting Device	Manufacturer	Model / FCC ID	Serial Number
PC	Dell	PP18L / QDS-BRCM1019	38176127281
AC Power Adapter	TandD Corp	AD-0605	NA
Test Software	TandD Corp	RTR500 Debugger V1.0	NA

[TABLE OF CONTENTS](#)

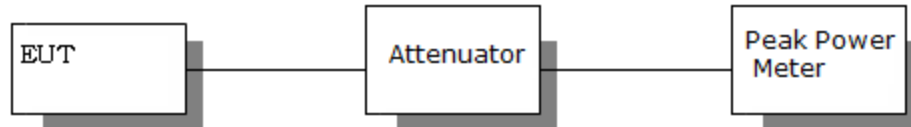
POWER OUTPUT

Rule Part: FCC 15.247 (b)(3), IC RSS-210 (i8) A8.4(4)

Requirements: For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt

Test Procedure: KDB 558074 D01 DTS Meas Guidance v03r02 pg6, 9.1.2 PKPM1

Setup Diagram:



EUT Mode: Transmitter tuned to tree places in the band with modulation off

Test Results:

Frequency MHz	Po dBm	Po mW	Limit mW	Margin mW
902	6.9	49	1000	951
915	6.7	47	1000	953
927	6.3	42	1000	958

Results Meet Requirements

[TABLE OF CONTENTS](#)

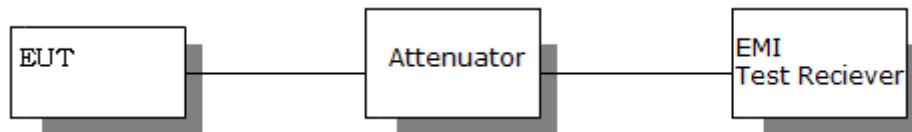
POWER SPECTRAL DENSITY

Rule Part: FCC 15.247(a)(2), IC RSS-210(i8) A8.2(b)

Requirements: The peak level measured must be less than +8.0 dBm.

Test Procedure: KDB 558074 D01 DTS Meas Guidance v03r02 pg11 10.2 PKPSD

Setup Diagram:



EUT Mode: The EUT was tuned to three places in the band with modulation

Test Results: Table of Peak Power Spectral Density

Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Margin (dBm)
902.9376	5.49	8	2.51
914.4576	6.14	8	1.86
927.1296	5.03	8	2.97

Meets All Requirements

[TABLE OF CONTENTS](#)

POWER SPECTRAL DENSITY

Test Results: Low End of Band Conducted Plots

902.9376 MHz PLOT



Results Meet Requirements

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

POWER SPECTRAL DENSITY

Test Results: Middle of Band Conducted Plots

914.4576 MHz PLOT



Results Meet Requirements

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

POWER SPECTRAL DENSITY

Test Results: High End of Band Conducted Plots

927.1296 MHz PLOT



Results Meet Requirements

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

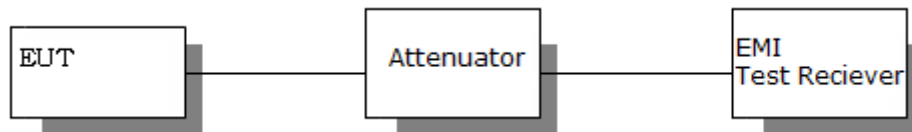
OCCUPIED BANDWIDTH

Rule Part: FCC 15.247(a)(2), IC RSS-210(i8) A8.2(a)

Requirements: The 6 dB bandwidth must be greater than 500 kHz.

Test Procedure: KDB 558074 D01 DTS Meas Guidance v03r02 pg5 8.1 Option1

Setup Diagram:



EUT Mode: Tuned to three places in the band with modulation

Test Results: Table of Occupied Bandwidth Measurements.

Tuned Frequency	Measured 6 dB BW	6 dB BW Limit	6 dB BW Margin
902.9376	581.16 KHz	> 500 KHz	81.16 KHz
914.4576	577.15 KHz	> 500 KHz	77.15 KHz
927.1296	585.17 KHz	> 500 KHz	85.17 KHz

Results Meet Requirements

[TABLE OF CONTENTS](#)

OCCUPIED BANDWIDTH

Test Results: Conducted plots of Occupied Bandwidth

902.9376 MHz PLOT



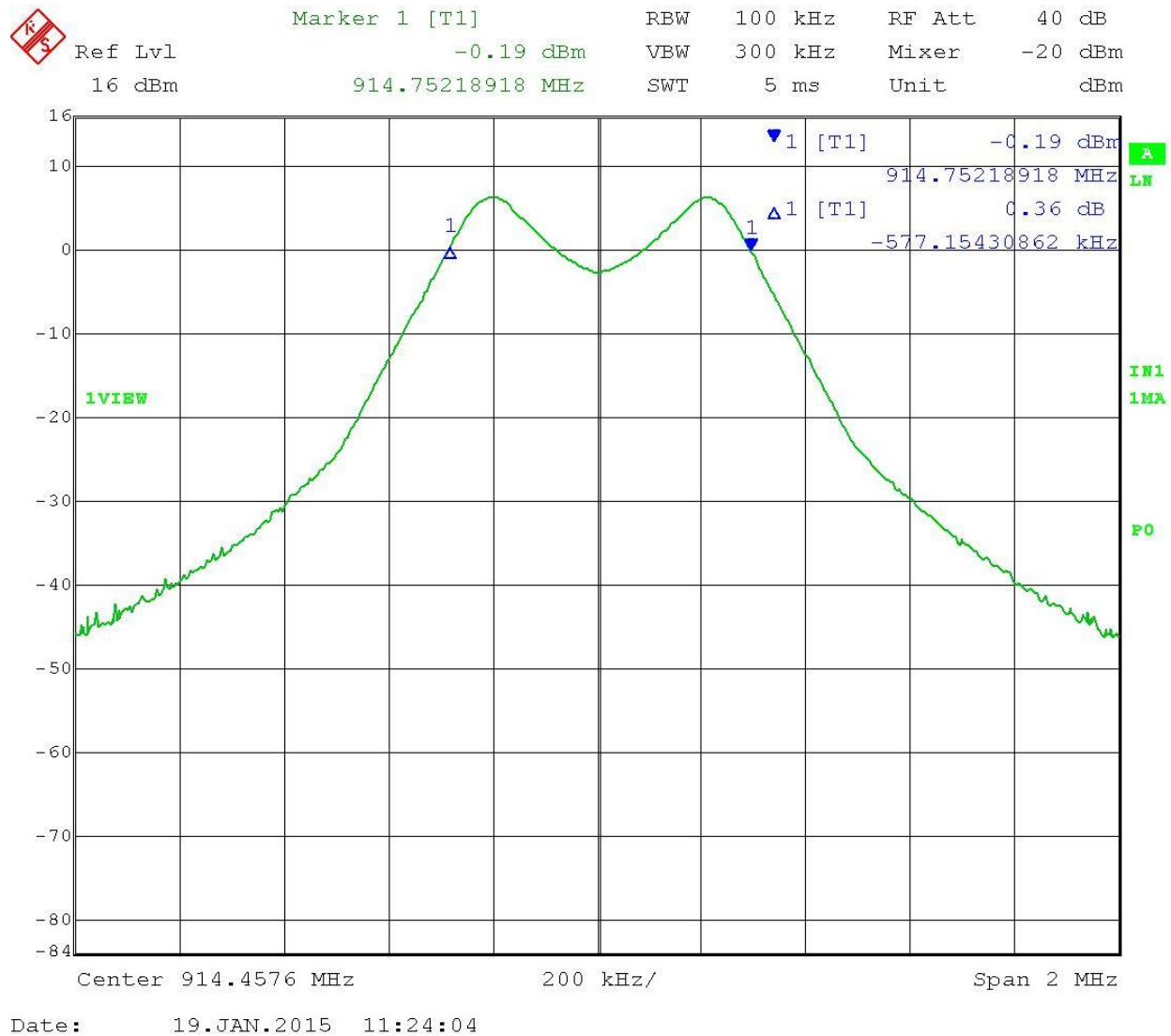
Results Meet Requirements

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

OCCUPIED BANDWIDTH

Test Results: Conducted plots of Occupied Bandwidth

914.4576 MHz PLOT



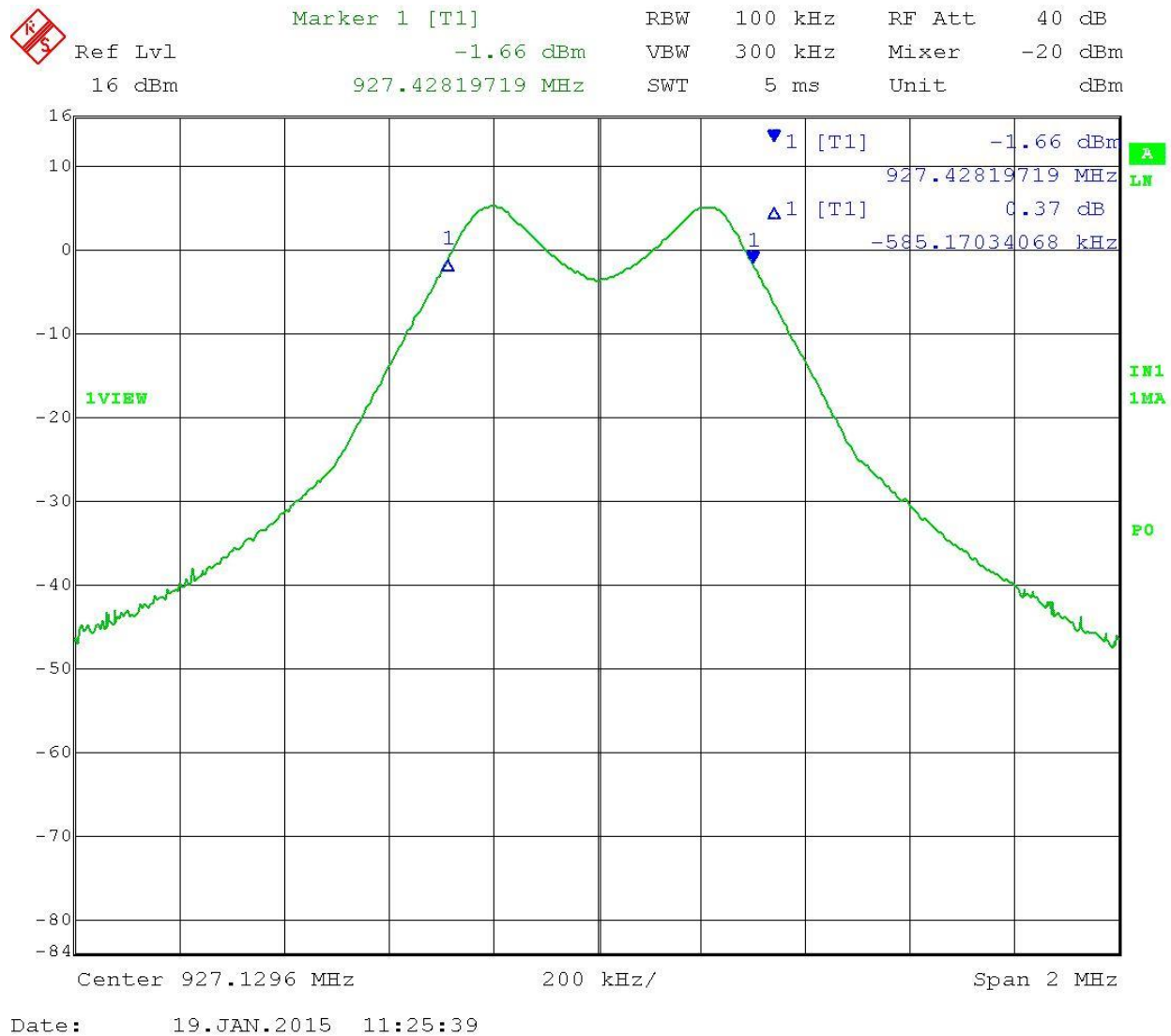
Results Meet Requirements

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

OCCUPIED BANDWIDTH

Test Results: Conducted plots of Occupied Bandwidth

927.1296 MHz PLOT



Results Meet Requirements

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

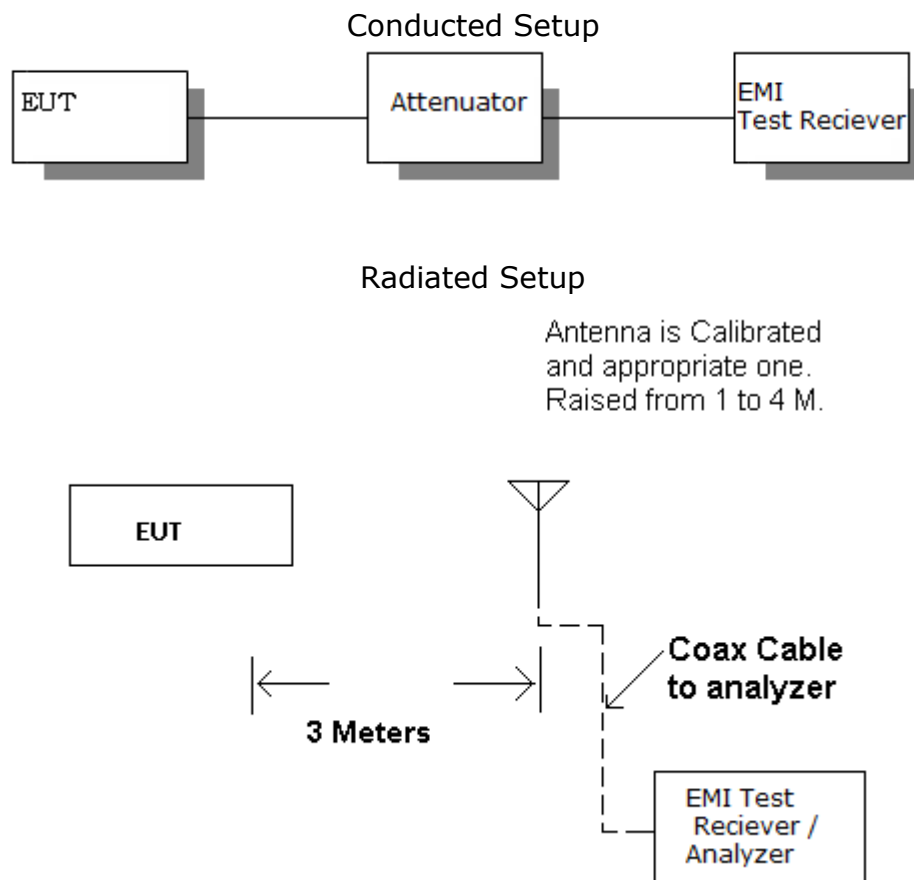
SPURIOUS EMISSIONS

Rule Part: FCC 15.247(d), FCC 15.209, IC RSS-210(i8) RSS-Gen(i8)

Requirements: Spurious emissions not in a restricted band must be 20 dBc. Harmonics were checked through the 10th harmonic. Any emissions that fall in the restricted bands (15.205) must be less than or equal to 54 dB μ V/m.

Test Procedure: KDB 558074 D01 DTS Meas Guidance v03r02 pg 16 11.1 & 12.1

Setup Diagram:

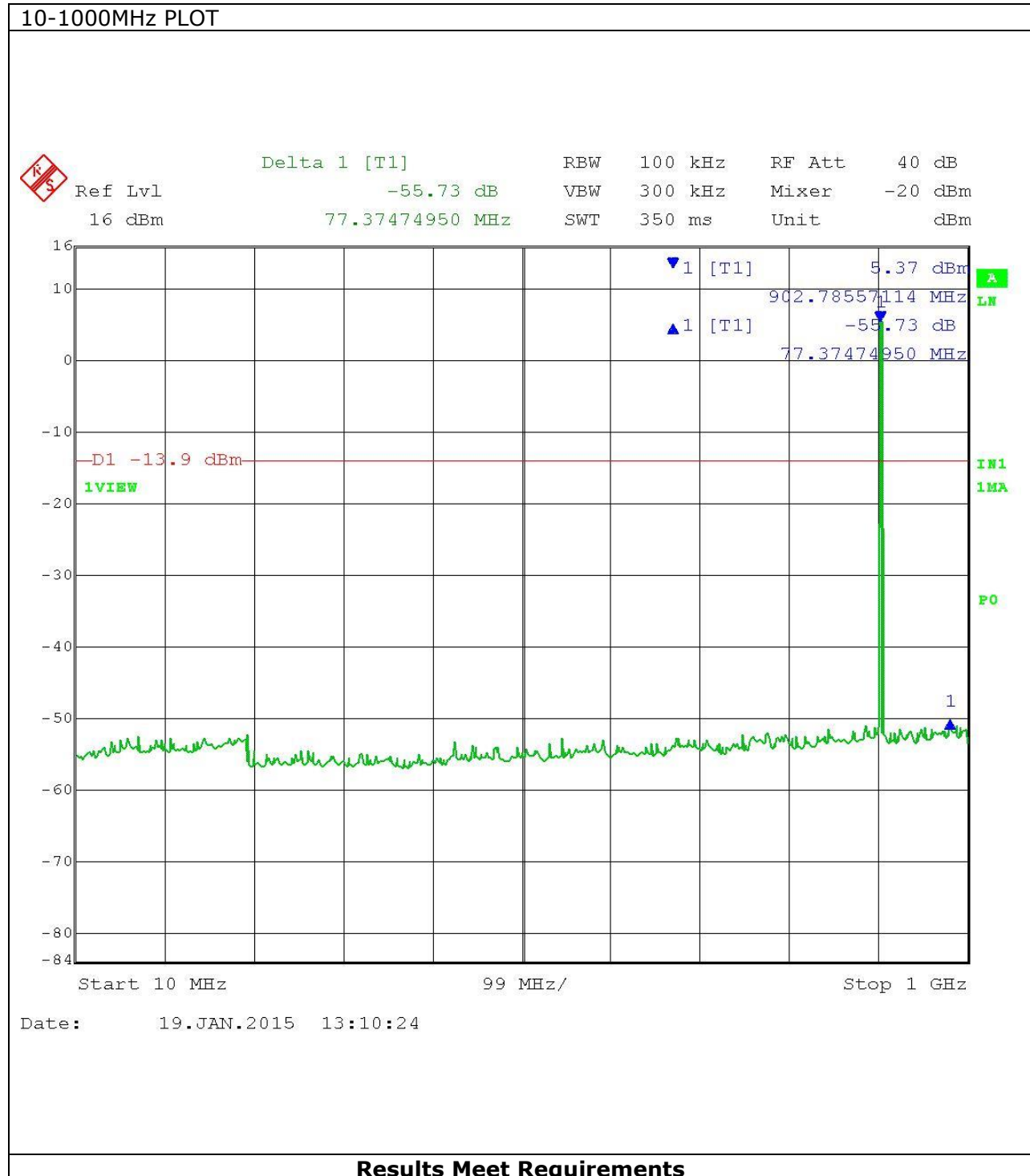


EUT Mode: The EUT transmitter was modulated and tuned to three places in the band with modulation

[TABLE OF CONTENTS](#)

SPURIOUS EMISSIONS

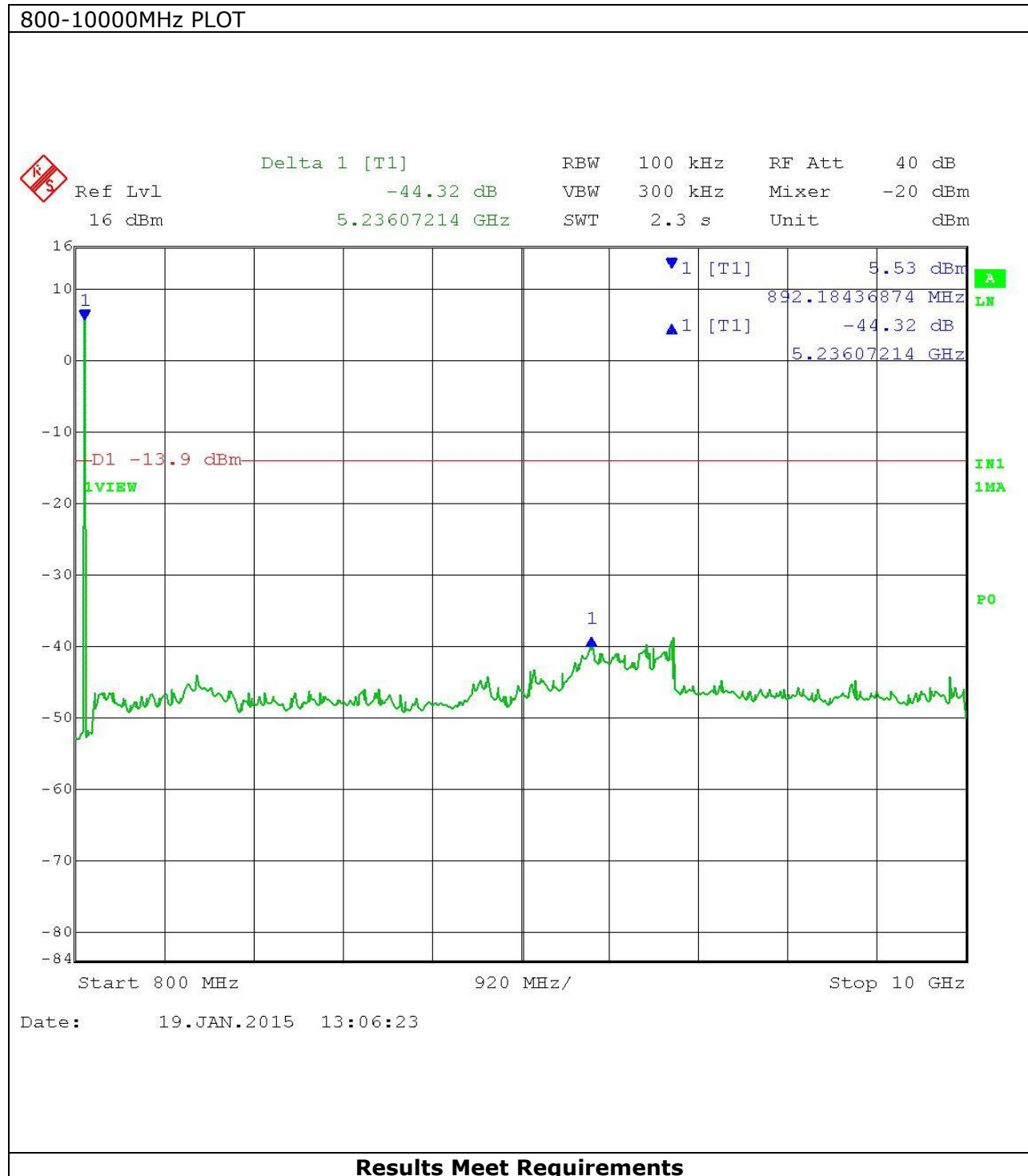
Conducted Test Results: Low End of Band 902.9376 MHz Antenna
Conducted Plots, a limit line is shown to verify compliance.



APPLICANT: T&D CORPORATION
FCC ID: SRD10090
IC CERTIFICATION: 5558A-10090
REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

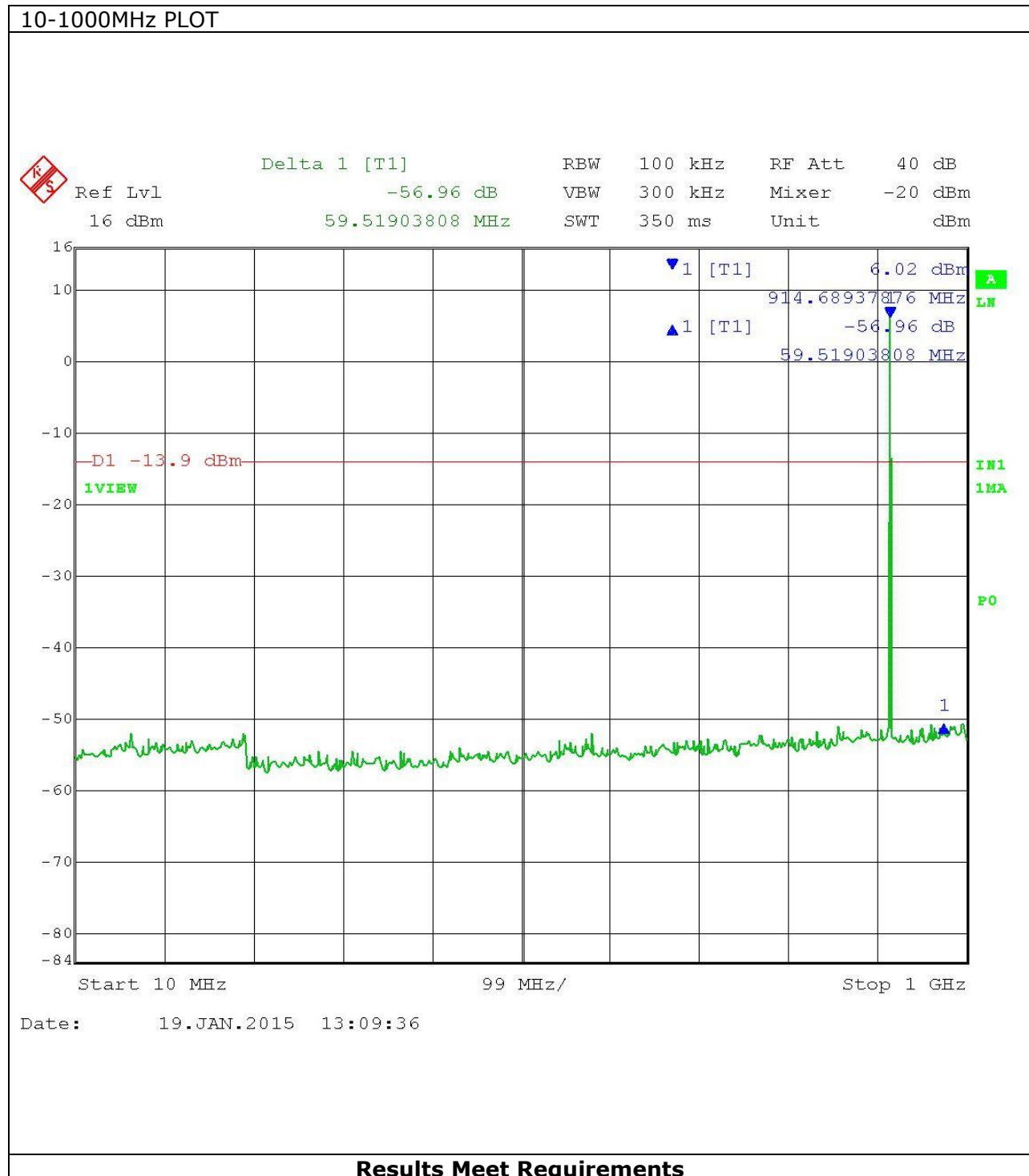
Conducted Test Results: Low End of Band 902.9376 MHz Antenna
Conducted Plots, a limit line is shown to verify compliance.



APPLICANT: T&D CORPORATION
FCC ID: SRD10090
IC CERTIFICATION: 5558A-10090
REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

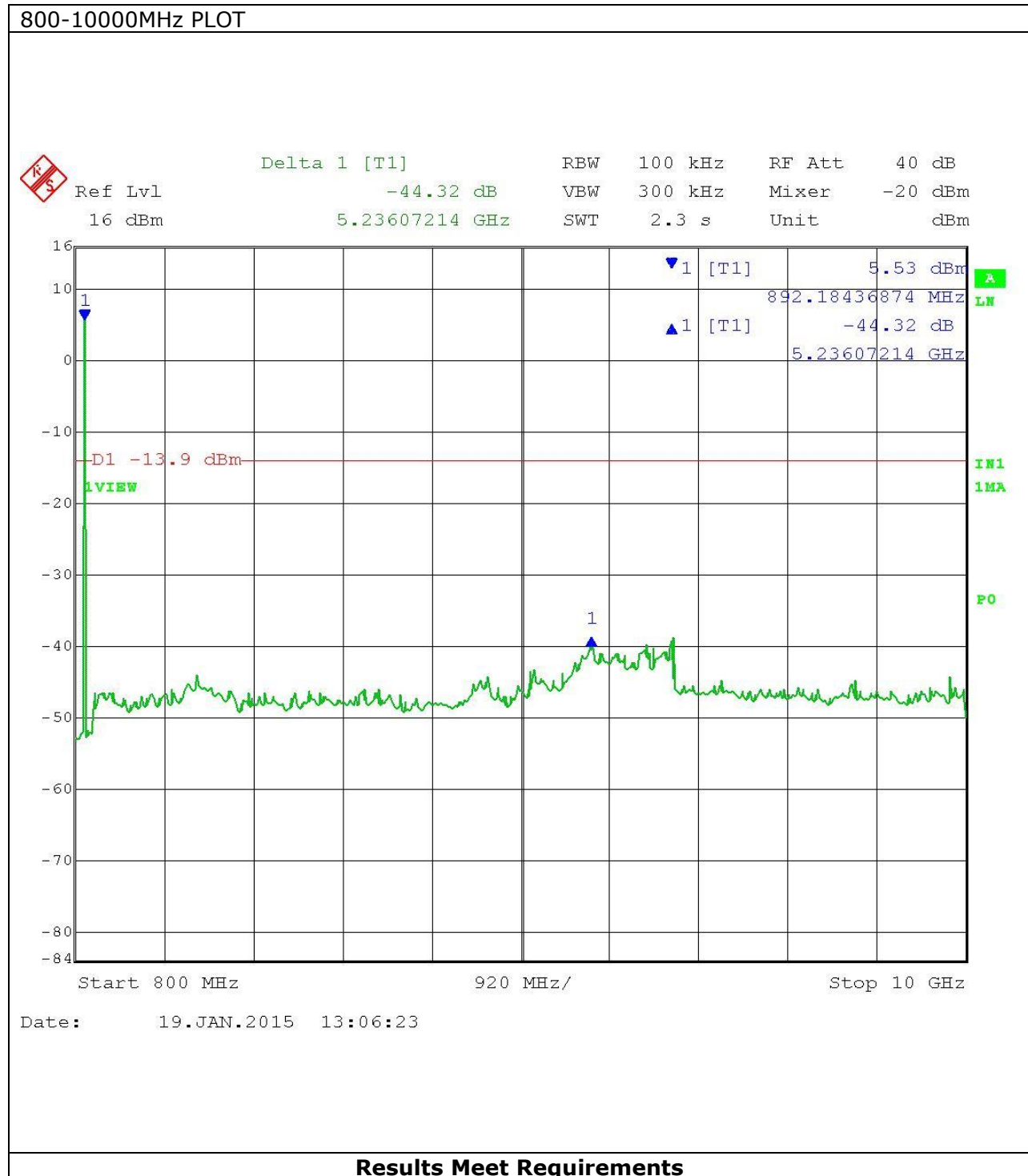
Conducted Test Results: Middle of Band 914.4576 MHz Antenna Conducted Plots, a limit line is shown to verify compliance.



APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

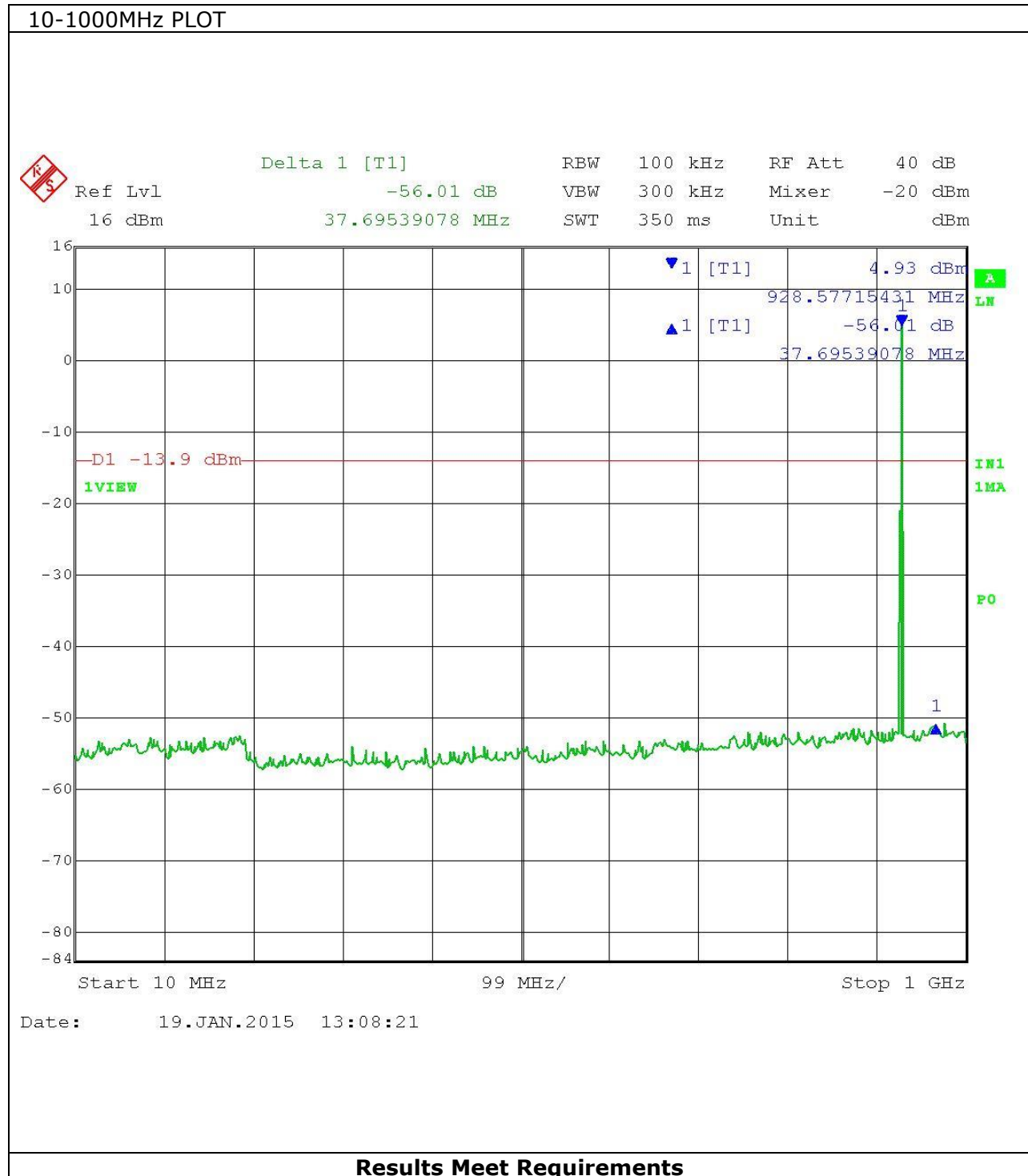
Conducted Test Results: Middle of Band 914.4576 MHz Antenna Conducted Plots, a limit line is shown to verify compliance.



APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

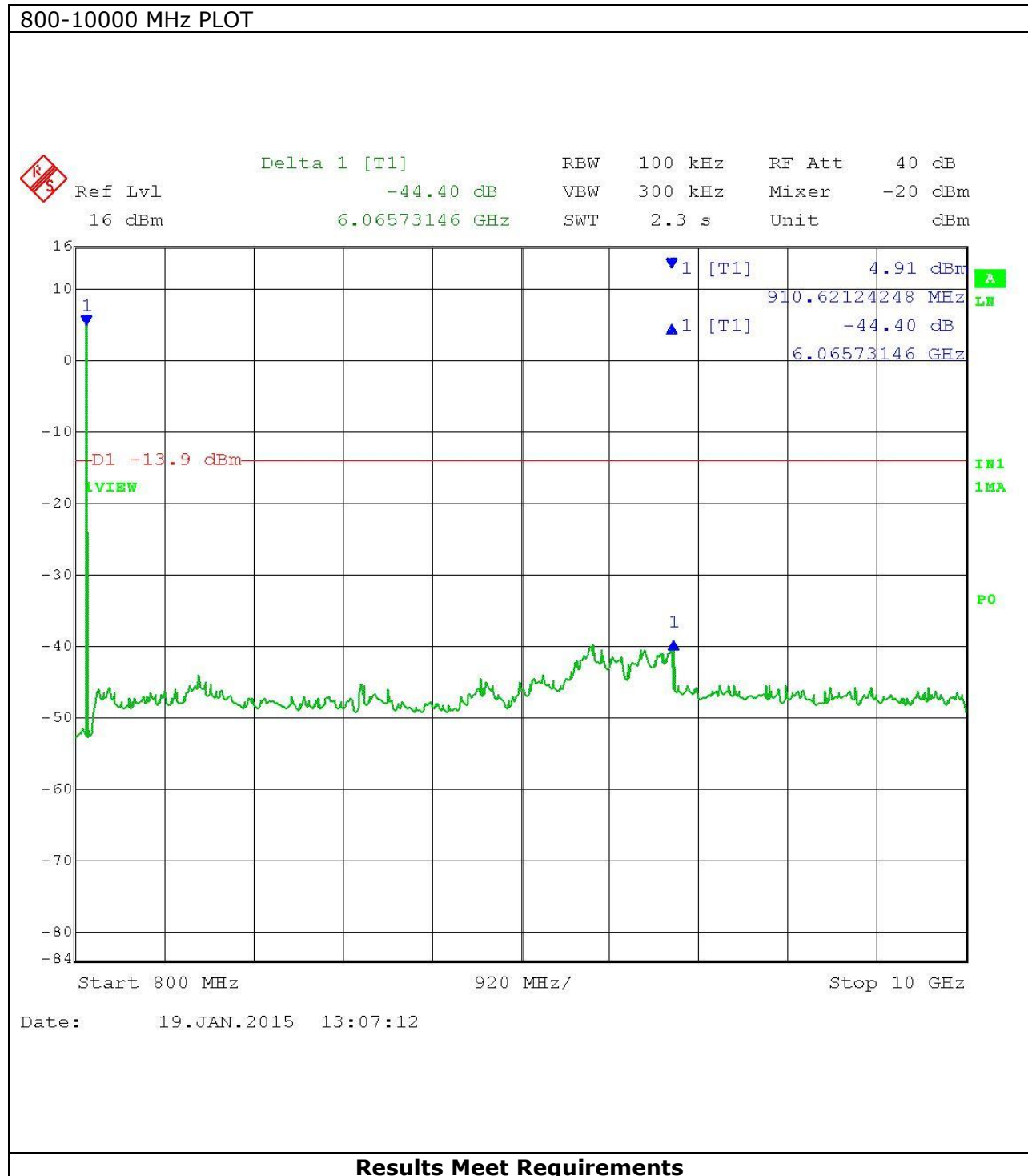
Conducted Test Results: High End of Band 927.1296 MHz, Antenna
Conducted Plots, a limit line is shown to verify compliance.



APPLICANT: T&D CORPORATION
FCC ID: SRD10090
IC CERTIFICATION: 5558A-10090
REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

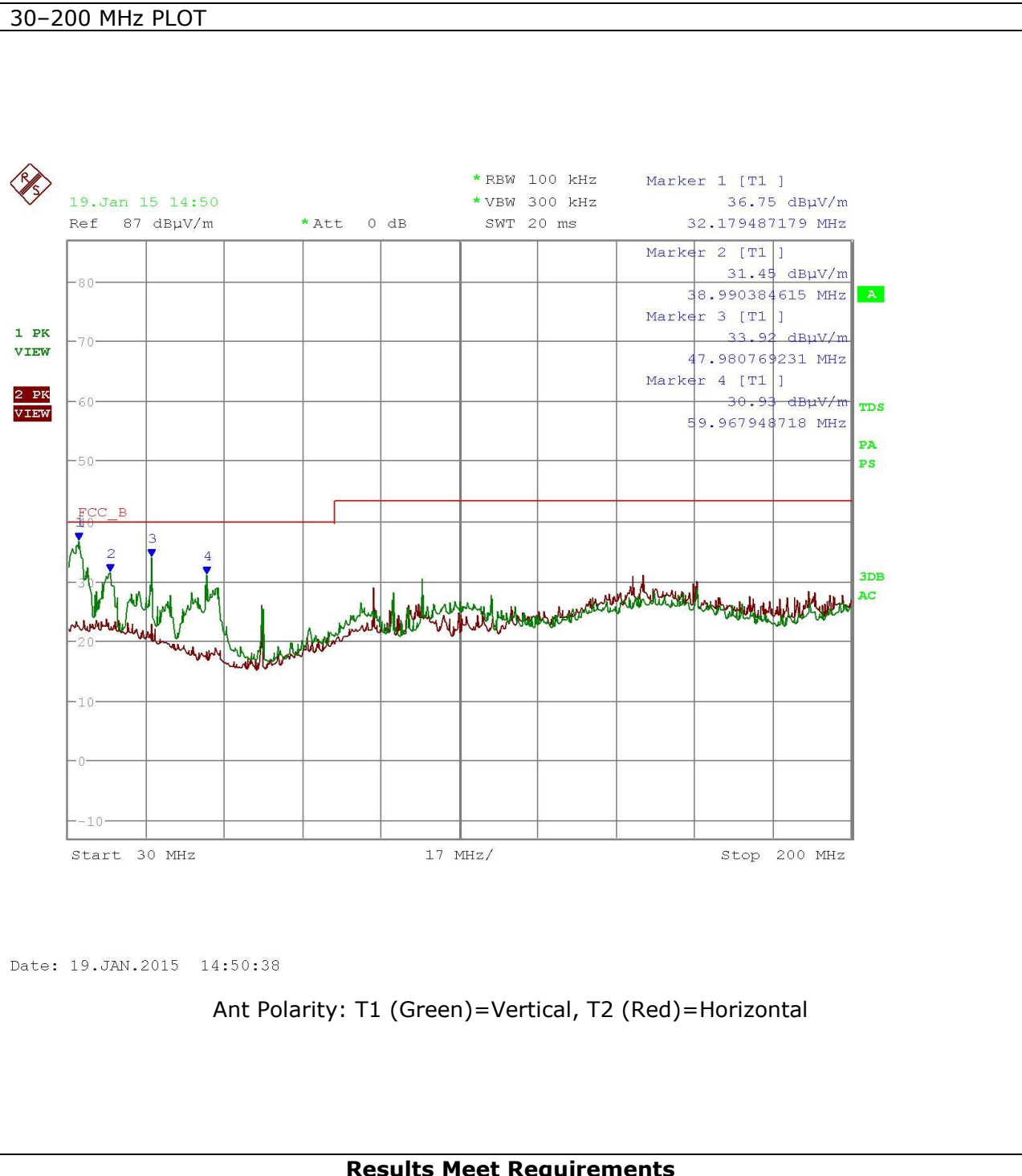
Conducted Test Results: High End of Band 927.1296 MHz, Antenna
Conducted Plots, a limit line is shown to verify compliance.



APPLICANT: T&D CORPORATION
FCC ID: SRD10090
IC CERTIFICATION: 5558A-10090
REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

Radiated Test Results: Middle of Band 914.45760 MHz Radiated Field Strength Plots, a limit line is shown to verify compliance.



SPURIOUS EMISSIONS

Test Results: Middle of Band 914.45760 MHz Radiated Field Strength Plots, a limit line is shown to verify compliance.

200-1000 MHz PLOT



Date: 19.JAN.2015 15:16:49

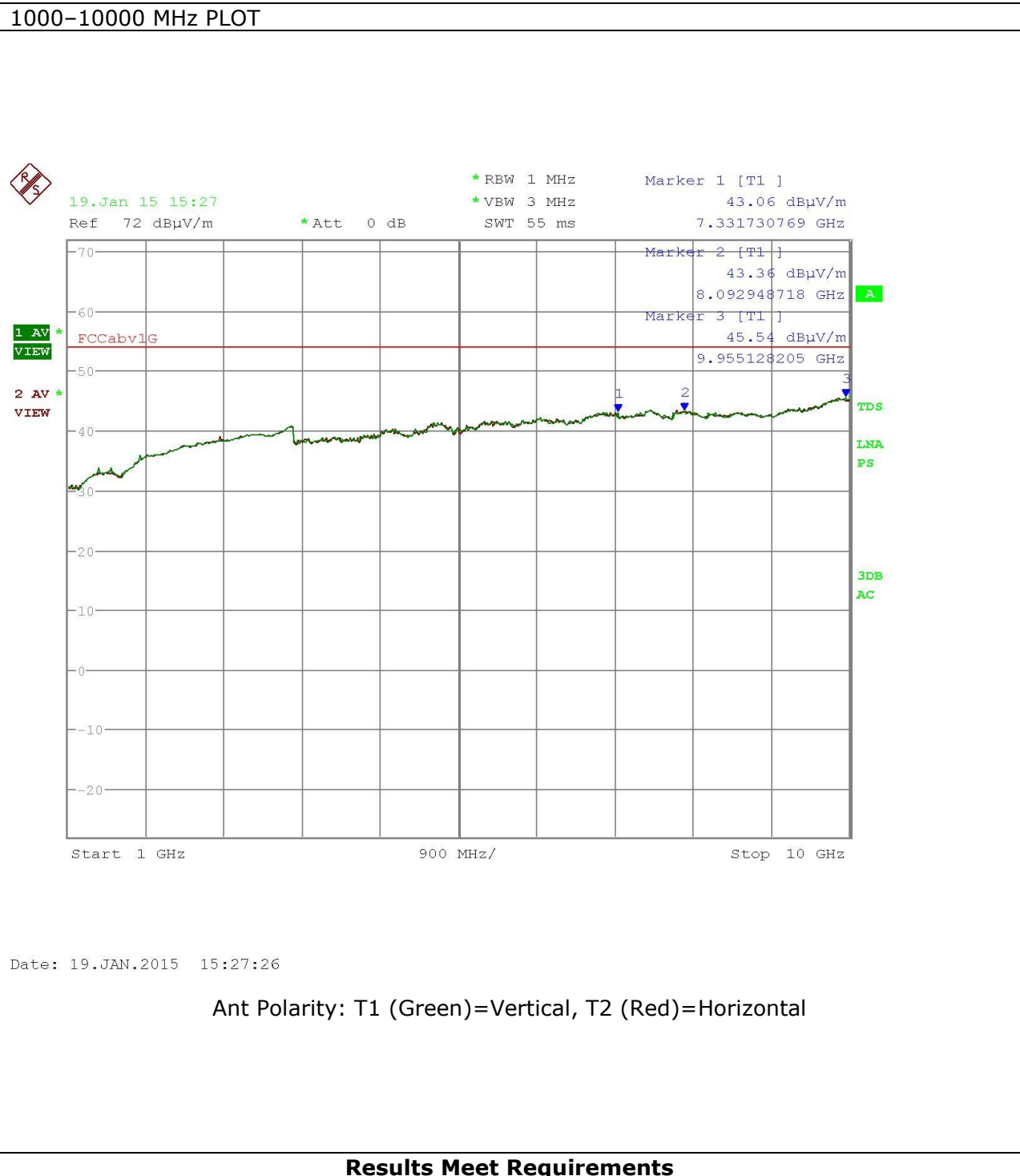
Ant Polarity: T1 (Green)=Vertical, T2 (Red)=Horizontal

Results Meet Requirements

APPLICANT: T&D CORPORATION
FCC ID: SRD10090
IC CERTIFICATION: 5558A-10090
REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

SPURIOUS EMISSIONS

Test Results: Middle of Band 914.45760 MHz Radiated Field Strength Plots, a limit line is shown to verify compliance.



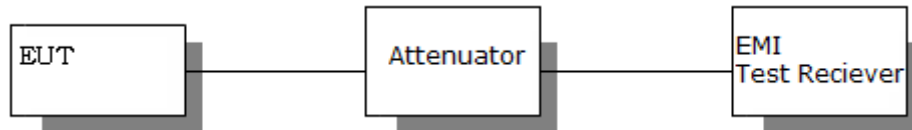
BAND EDGE

Rule Part: FCC 15.247(d), IC RSS-210(i8) A8.5

Requirements: must meet the 20 dBc requirement, unless in a restricted band

Test Procedure: KDB 558074 D01 DTS Meas Guidance v03r02 pg21 13.3.1

Setup Diagram:



EUT Mode: Tuned to the lowest and the highest frequency used with modulation

Test Results: Table of measured emission at band edge of 902-928 MHz

Tuned Frequency (MHz)	Measured Level at Band Edge (dBc)	Limit (dBc)	Margin (dB)
902.9376	46.10	20	26.10
927.1296	47.12	20	27.12

Results Meet Requirements

[TABLE OF CONTENTS](#)

BAND EDGE

Test Results: Conducted Plots of Band Edge

Lower Band Edge Plot Tuned to 902.9376



Date: 19.JAN.2015 13:32:21

Results Meet Requirements

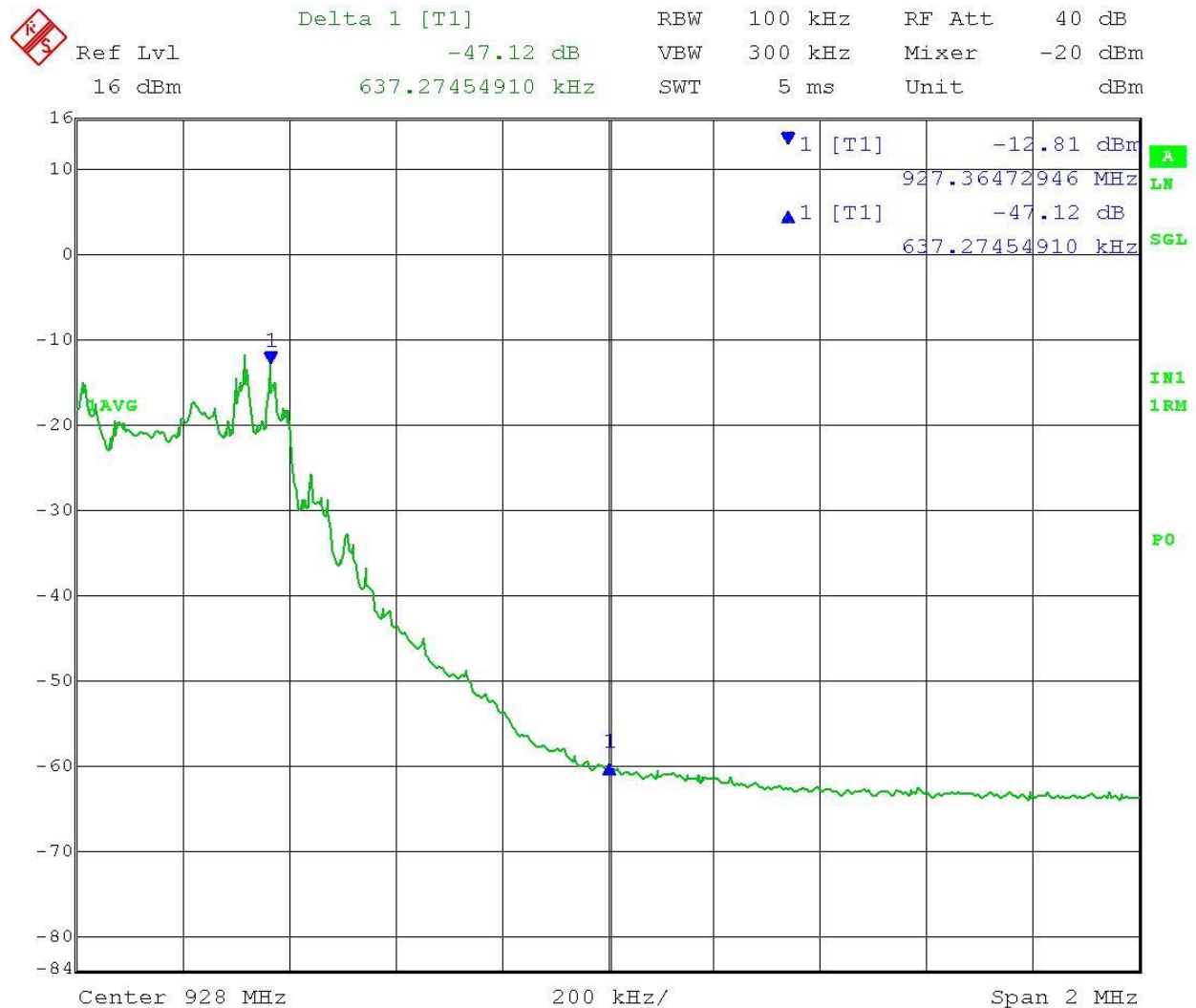
[TABLE OF CONTENTS](#)

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

BAND EDGE

Test Results: Conducted Plots of Band Edge

Upper Band Edge Plot Tuned to 927.1296



Date: 19.JAN.2015 13:33:22

Results Meet Requirements

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 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

AC POWER LINE EMISSIONS

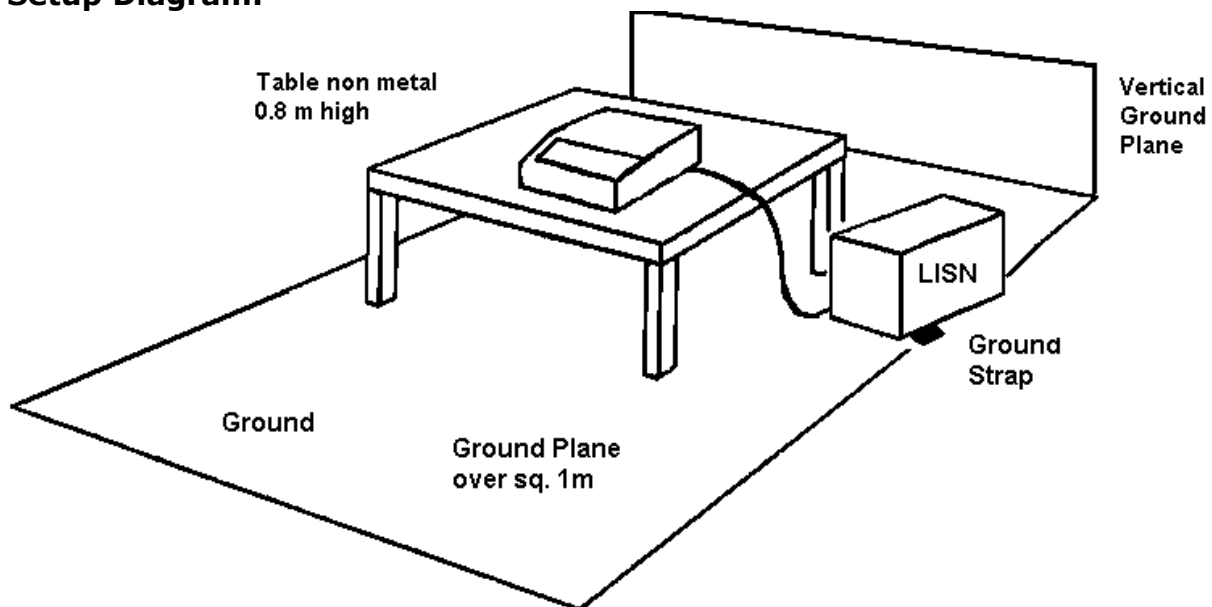
Rule Part: FCC 15.207(c), IC RSS-Gen (i8)

Requirements:

Frequency (MHz)	Quasi Peak Limits (dB μ V)	Average Limits (dB μ V)
0.15 – 0.5	66 – 56 *	56 – 46 *
0.5 – 5.0	56	46
5.0 – 30	60	50
* Decrease with logarithm of frequency		

Test Procedure: ANSI C63.3 2003

Setup Diagram:

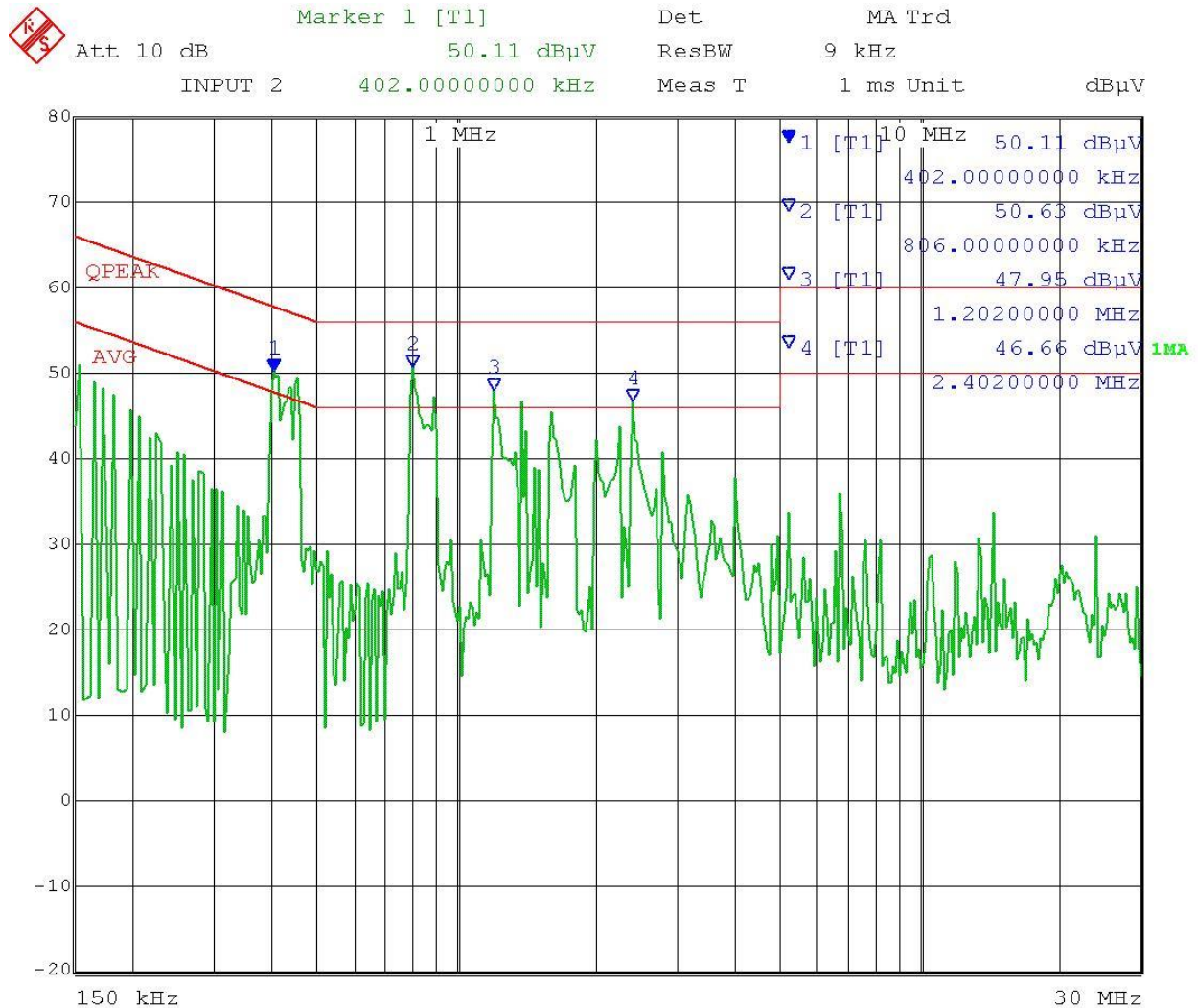


EUT Mode: The EUT was put into a continuous transmit mode, and receive only mode. Using the manufacturers supplied AC adapter the following plots represent the worst case emissions read for power line conducted. Both lines were observed and a limit line is shown on the plots to verify the compliance.

[TABLE OF CONTENTS](#)

AC POWER LINE EMISSIONS

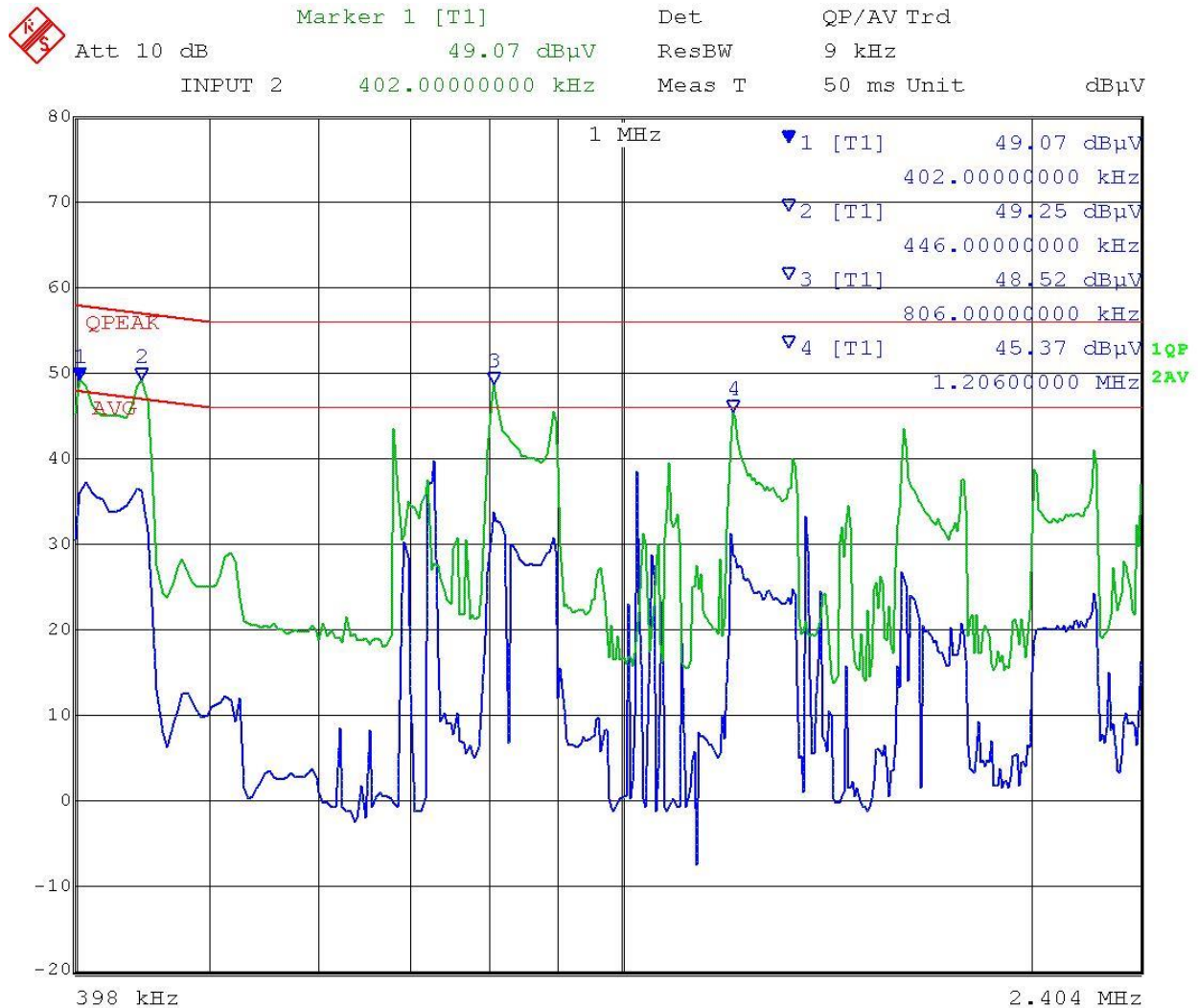
Test Results: Line 1 Peak Scan



Date: 19.JAN.2015 09:59:22

AC POWER LINE EMISSIONS

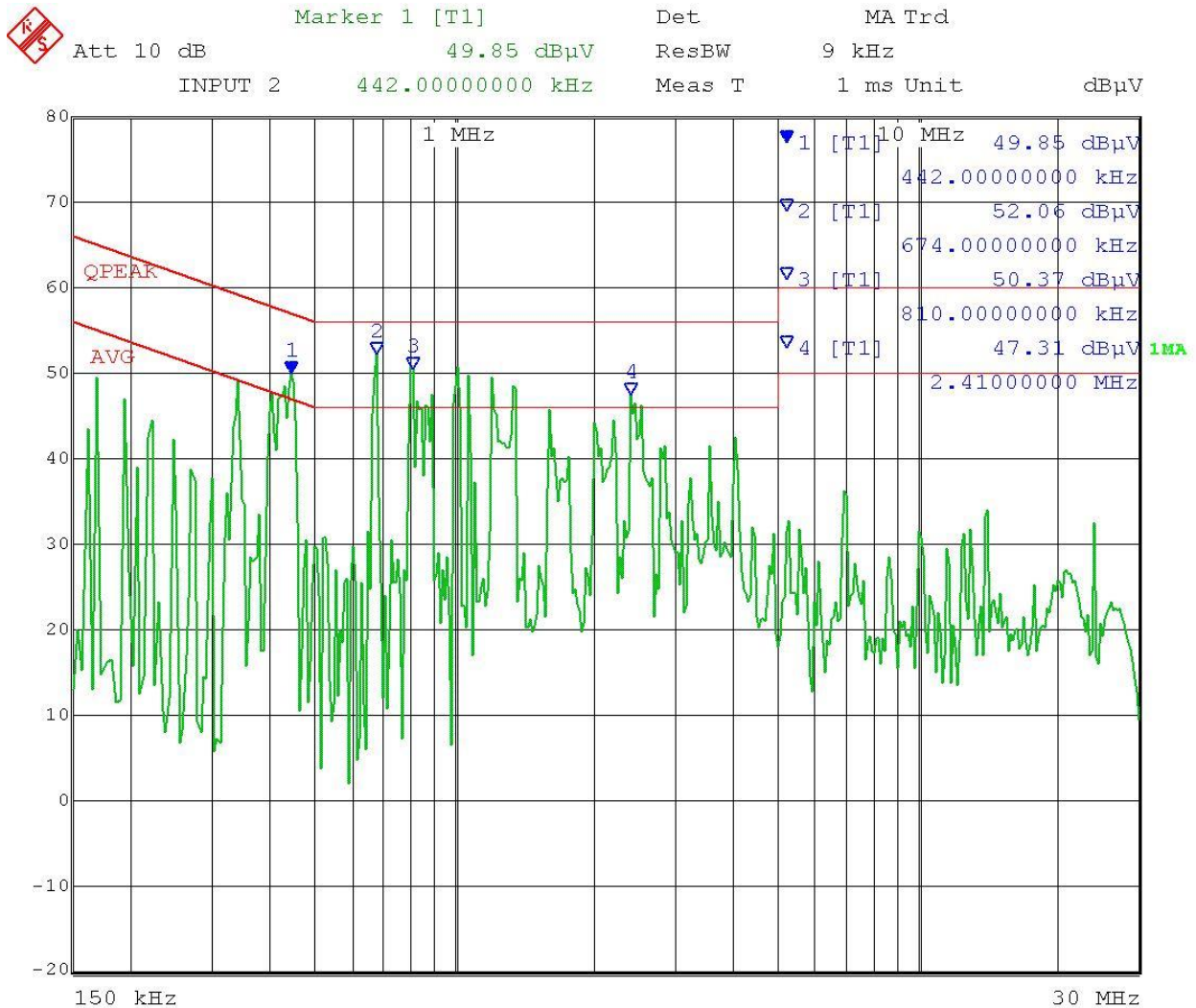
Test Results: Line 1 Quasi-Peak / Average Scan



Date: 19.JAN.2015 10:10:45

AC POWER LINE EMISSIONS

Test Results: Line 2 Peak Scan

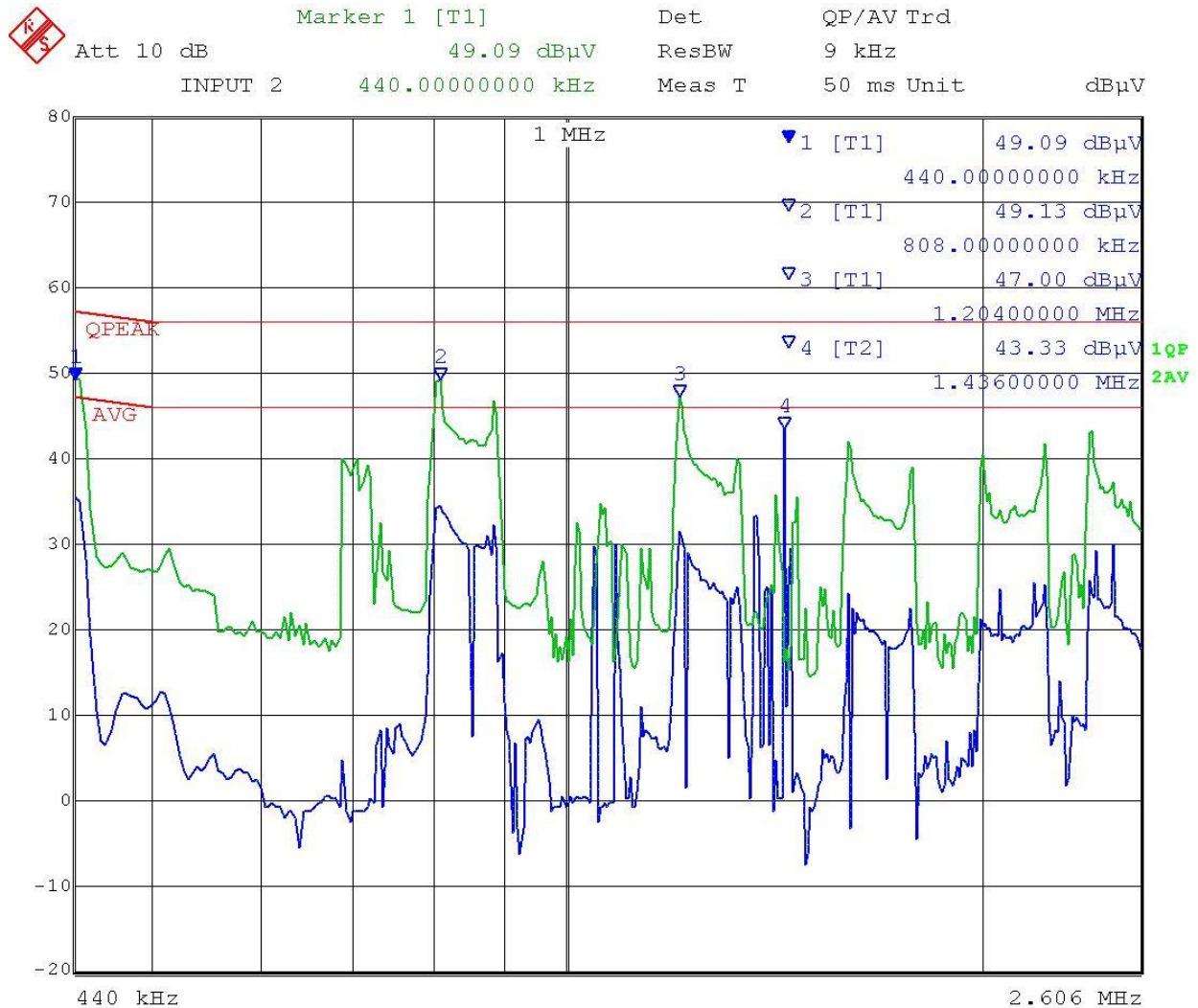


Date: 19.JAN.2015 10:14:00

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

AC POWER LINE EMISSIONS

Test Results: Line 2 Quasi-Peak / Average Scan



Date: 19.JAN.2015 10:30:19

APPLICANT: T&D CORPORATION
 FCC ID: SRD10090
 IC CERTIFICATION: 5558A-10090
 REPORT: T\T&D CORP_SRD\14AUT15\14AUT15TestReport.docx

TEST EQUIPMENT

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
Antenna: Biconnical Chamber	Eaton Chamber	94455-1	1057	06/14/13	06/14/15
Antenna: Log- Periodic Chamber	Eaton	96005	1243	05/31/13	05/31/15
LISN	Electro-Metrics	ANS-25/2	2604	01/07/14	01/07/16
3-Meter Semi- Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Ant: Double- Ridged Horn/ETS Horn 1 Ch	ETS-Lindgren Chamber	3117	00035923	06/13/14	06/13/16
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16
USB Peak Wideband Power Sensor	Boonton	55318	9224	11/6/14	11/6/2016

*EMI RECEIVER SOFTWARE VERSION

The receiver firmware used was version 4.43 Service Pack 3