



Electromagnetic Compatibility Test Report

Test Report No: TMP 060617 Rev.2
Issued on: July 03, 2017

Product Name
Tempdrop Sensor

Tested According to
FCC Subpart C §15.249, §2.1049

Tests Performed for
Tempdrop Ltd.
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Test Report details:

Test commencement date: 19.04.2017
Test completion date: 26.04.2017
Customer's Representative: Michael Vardi
Issued on: 03.07.2017

Revision details:

Version	Date	Details/Reasons
Rev. 1	06.06.2017	-
Rev.2	03.07.2017	On page 6 added remarks regarding worst case test results according to TCB's requirement

Assessment Information:

This report contains an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was setup and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None

Modifications made to the Test Standard

None

Summary of Compliance Status:

FCC Part 15, Subpart C Part 15.249 – Intentional Radiators

Test Spec. Clause	Test Case	Remarks
FCC Part 15, Subpart C – Intentional Radiators		
§2.1049	Occupied Bandwidth	Pass
§15.249, §15.205 & §15.209	Field Strength of Fundamental & Harmonics & Restricted Bands & Outside of Frequency Bands	Pass



Table of Contents

1. GENERAL DESCRIPTION	6
1.1. Description of the EUT /test Item:	6
2. TEST FACILITY & UNCERTAINTY OF MEASUREMENT.....	7
2.1. Accreditation/ Registration reference:.....	7
2.2. Test Facility description	7
3. MEASUREMENTS & TEST RESULTS:	8
3.1. Occupied Bandwidth	8
3.2. Field Strength of Fundamental & Harmonics & Restricted Bands& Outside of Frequency Bands...	11
3.3. Antenna Connector Requirements.....	28
4. APPENDIX.....	29

1. General Description

1.1. Description of the EUT /test Item:

Product name: Tempdrop Sensor

FCC ID: 2AMAS-TD1

EUT Description:

Thermometer for sleeping temperature

Test setup:

Standalone setup.

The RF link characteristics are:

- RF protocol: Bluetooth Low Energy version 4.0
- Operating band: 2402 – 2480 MHz ISM band.
- Channel spacing: 2 MHz
- Modulation: GFSK
- Maximum transmitted power (transceiver output): 0dBm
- Antenna: Passive, printed Inverted F antenna (see layout below), Max gain < 0 dBi

1.2. Worst Case Results:

In order to determine the worst-case emissions for all modes/data rates/tests and EUT's position(three axis- x,y,z), all modes/data rates and position were investigated for each required test to determine which produces the worst- case data and then full testing was performed in that mode/data rate and position,

2. Test Facility & Uncertainty of Measurement

2.1. Accreditation/ Registration reference:

- A2LA Certificate Number: 1633.01
- VCCI Member no.: 1798 (C3775, R-3404, G-620, T1630)

2.2. Test Facility description

The tests were performed at the EMC Laboratory, QualiTech Division, ECI Telecom

Address: 30, Hasivim St., Petah Tikva, Israel.
Tel: 972-3-926-6994

3m Anechoic Chamber:

Two 3m-screened chambers are used in two configurations: the semi-anechoic chamber for Radiated Emission measurements and the full-anechoic chamber for Radiated Immunity tests.

Semi Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	9.5m x 6.5m x 5.2m
Antenna height	1 - 4m
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Emerson and Cuming absorbing material in selected positions on the walls
Normalized Site Attenuation measured at 5 positions	± 3.9 dB, 30MHz to 200MHz ± 3 dB, 200MHz to 1000MHz
Transmission Loss measured at 5 positions, at 1.5m height	± 3 dB, 1GHz to 18GHz

Full-Anechoic Configuration:

Measurement distance	3m
Chamber dimensions	7m x 4m x 3m
Antenna height	1.55m at Horizontal & Vertical polarizations
Shielding Effectiveness	Magnetic field ≥ 80 dB at 15 kHz ≥ 90 dB at 100 kHz Electric field > 120 dB from 1MHz to 1GHz > 110 dB from 1GHz to 10GHz
Absorbing material	Ferrite tiles on the walls and ceiling Emerson and Cuming absorbing material in selected positions on the walls and floor
Field Uniformity to EN61000-4-3	± 3 dB 80MHz to 18GHz

3. Measurements & Test Results:

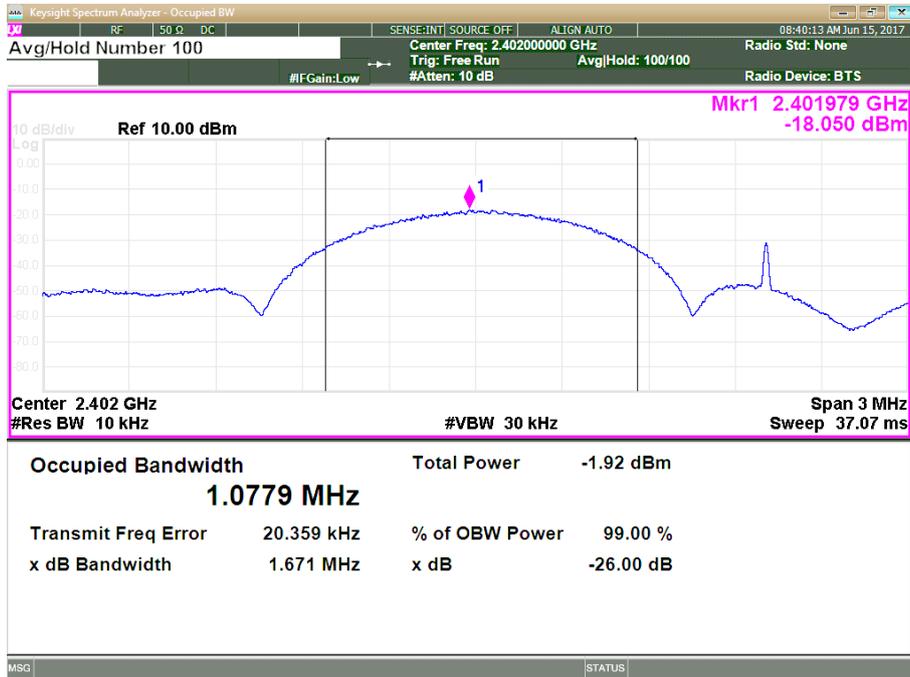
3.1. Occupied Bandwidth

Reference document:	§2.1049		
Test Requirements:	The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.		
Test setup:		Pass	
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1% to 3% of the 99% bandwidth		
Mode of operation:	Peak Detector Trace Mode : Max Hold		
Environment conditions:	Ambient Temperature: 22°C	Relative Humidity: 48%	Atmospheric Pressure: hPa
Test Result:	See below		

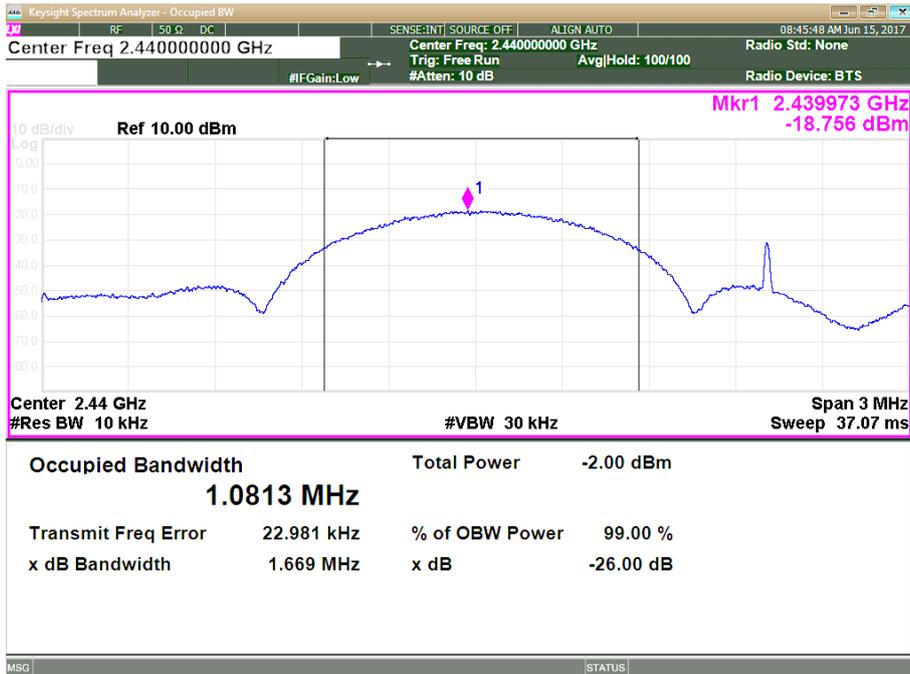
Test results:

Frequency, [MHz]	99% power BW, [MHz]	Lower Frequency, [MHz]	Middle Frequency, [MHz]	Higher Frequency, [MHz]	Limit
2402.00	1.078	2402.010	NA	NA	NA
2440.00	1.081	NA	2440.002	NA	
2480.00	1.071	NA	N.A	2480.003	

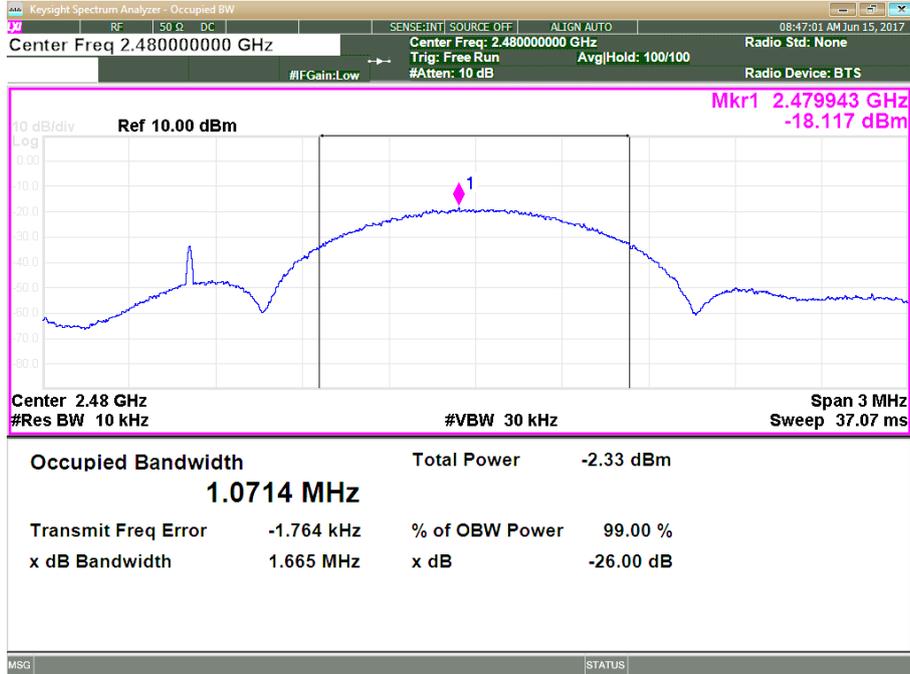
Plot 3.1.1 Occupied Channel Bandwidth test results, F = 2402 MHz



Plot 3.1.2 Occupied Channel Bandwidth test results, F = 2440 MHz



Plot 3.1.3 Occupied Channel Bandwidth test results, F = 2480 MHz



3.2. Field Strength of Fundamental & Harmonics & Restricted Bands & Outside of Frequency Bands

Reference document:	47 CFR §15.249 (a)(c)(d), 47 CFR §15.205(a)		
Test Requirements:	the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following, in addition emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation		
	Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics & (microvolts/meter)
	902-928 MHz	50	500
	2400-2483.5 MHz	50	500
	5725-5875 MHz	50	500
	24.0-24.25 GHz	250	2500
	-All other emission limits per § 15.209		
Operating conditions:	Under normal test conditions		Pass
Method of testing:	Radiated		
S.A. Settings:	RBW: 1GHz <120kHz, VBW: 300kHz 1GHz >1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 23°C	Relative Humidity: 45%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below		

Limit:

Frequency Range, MHz	Limit	
	Field strength of fundamental , Strength@3m, dBµV/m	Field strength of harmonics Strength@3m, dBµV/m
902-928 MHz	93.98	53.98
2400-2483.5 MHz	93.98	53.98
5725-5875 MHz	93.98	53.98
24.0-24.25 GHz	107.96	67.96
-All other emission limits per § 15.209		

Test Result:

Frequency [MHz]	Antenna polarization	Emission Type	PE Detector dB μ V/m	AV Detectord B μ V/m	Limit dB μ V/mA V	*Marge	Antenna Position [cm]	Turn-table Azimuth [°]	Pass/Fail
2402	H	fundamental	82.157	-	93.98	-11.823	149	237	Pass
2440	H	fundamental	80.390	-	93.98	-13.59	165	259	Pass
2480	H	fundamental	80.362	-	93.98	-13.618	161	247	Pass
4806.00	V	Harmonics	54.037	49.241	54	-4.759	155	233	Pass
4882.042	V	Harmonics	53.078	48.872	54	-5.128	160	274	Pass
4958.064	V	Harmonics	54.317	49.037	54	-4.963	156	240	Pass
2386.667	H	Restricted Bands	44.803	40.217	54	-13.783	175	242	Pass
2483.612	H	Restricted Bands	48.799	43.398	54	-10.602	181	245	Pass

*Compared to AV Limit which is the worst case scenario

Plot 3.2.1: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of fundamental, Fc -2402



Plot 3.2.2: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of fundamental, Fc -2402



Plot 3.2.3: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of fundamental, Fc -2440



Plot 3.2.4: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of fundamental, Fc -2440



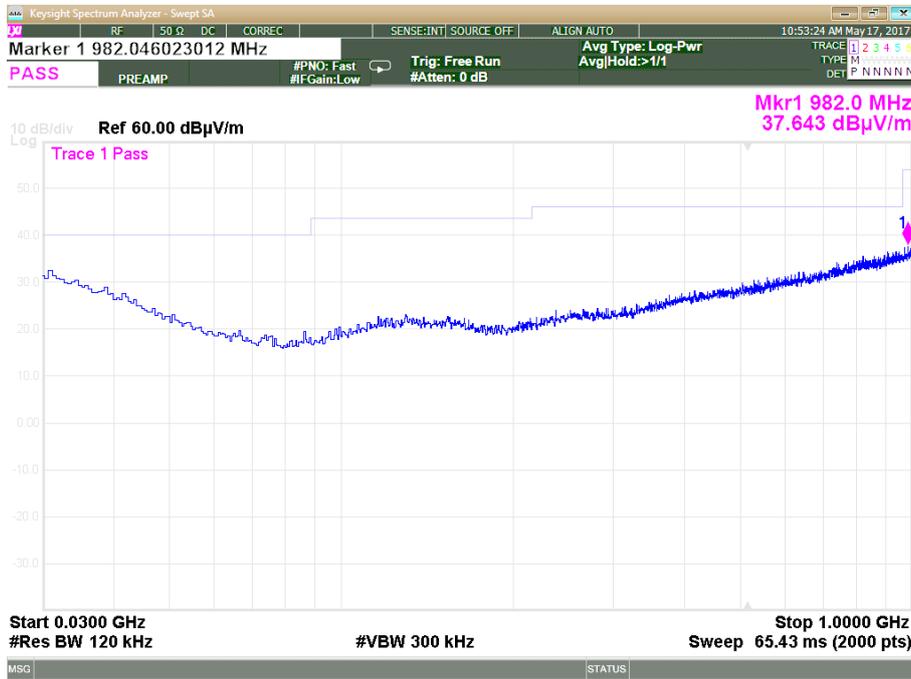
Plot 3.2.5: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of fundamental, Fc -2480



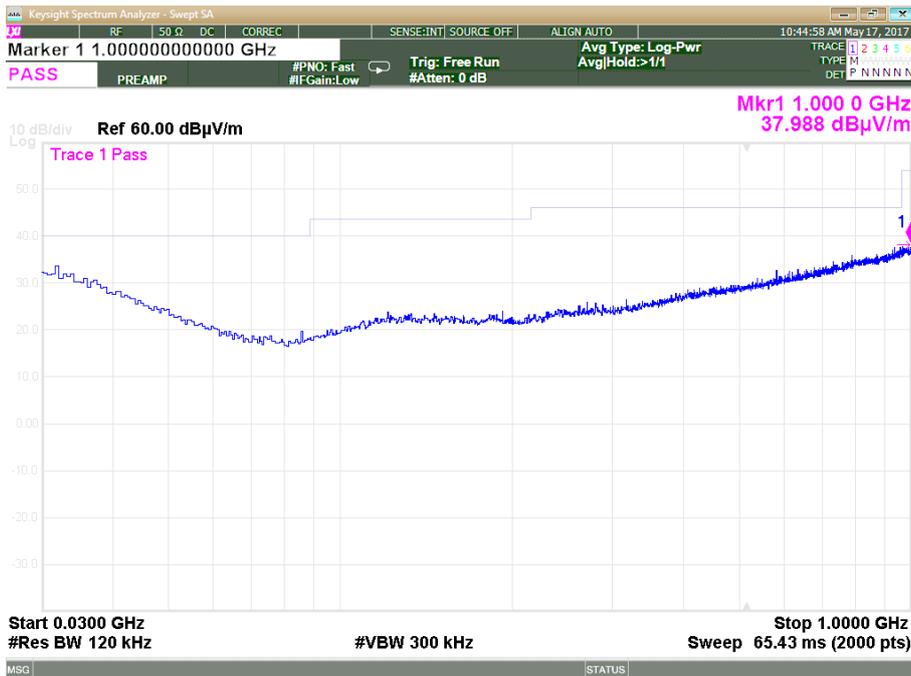
Plot 3.2.6: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of fundamental, Fc -2480



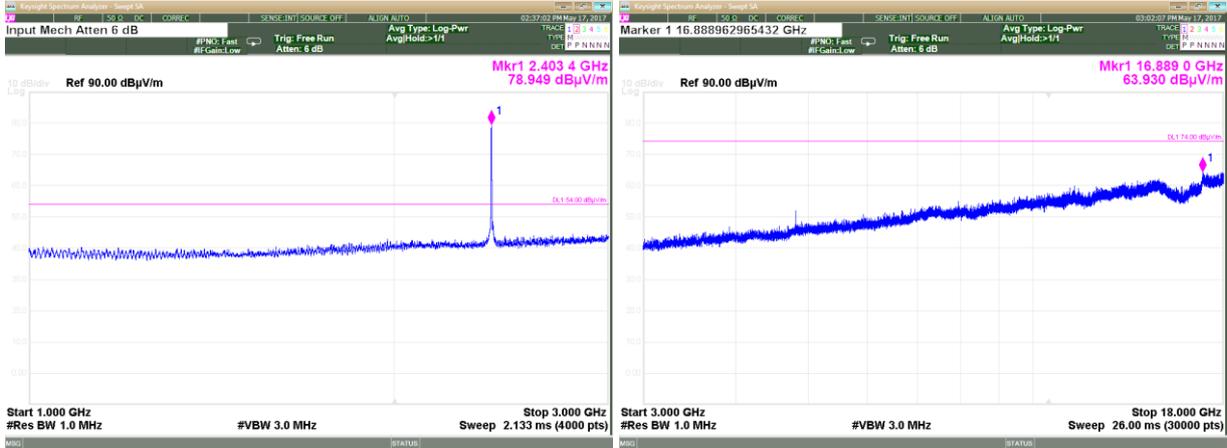
**Plot 3.2.7: Radiated Emissions test, Vertical Polarization, Tx Modulated, 30MHz-1GHz
Fc=2402 MHz**



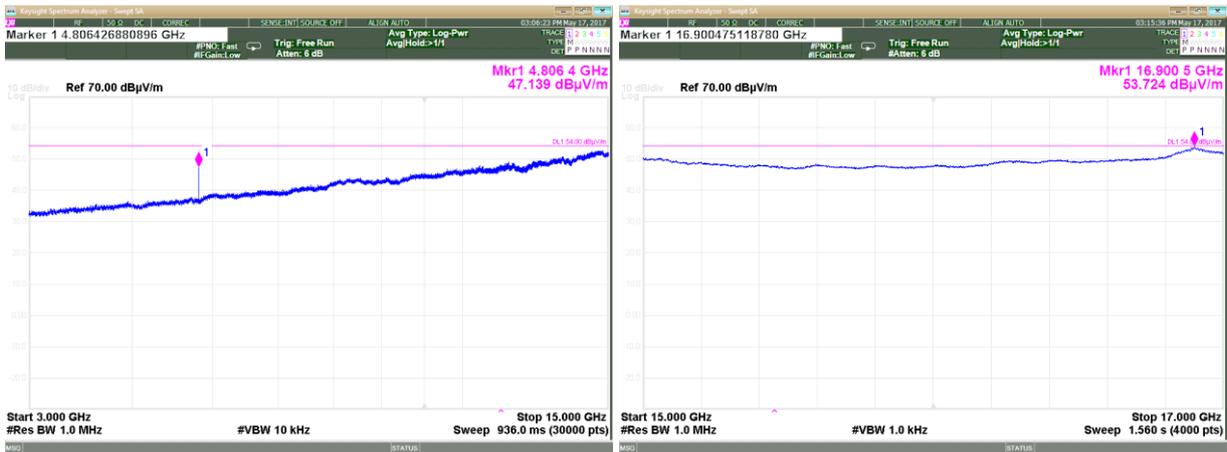
**Plot 3.2.8: Radiated Emissions test, Horizontal Polarization, Tx Modulated, 30MHz-1GHz
Fc=2402 MHz**



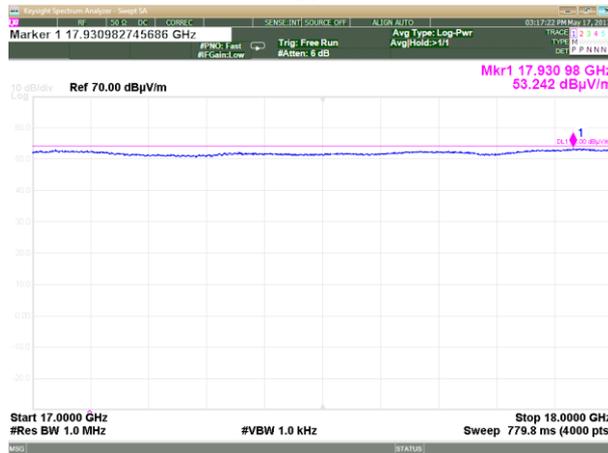
Plot 3.2.9: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of harmonics, Fc -2402, 1GHz -18GHz



PE

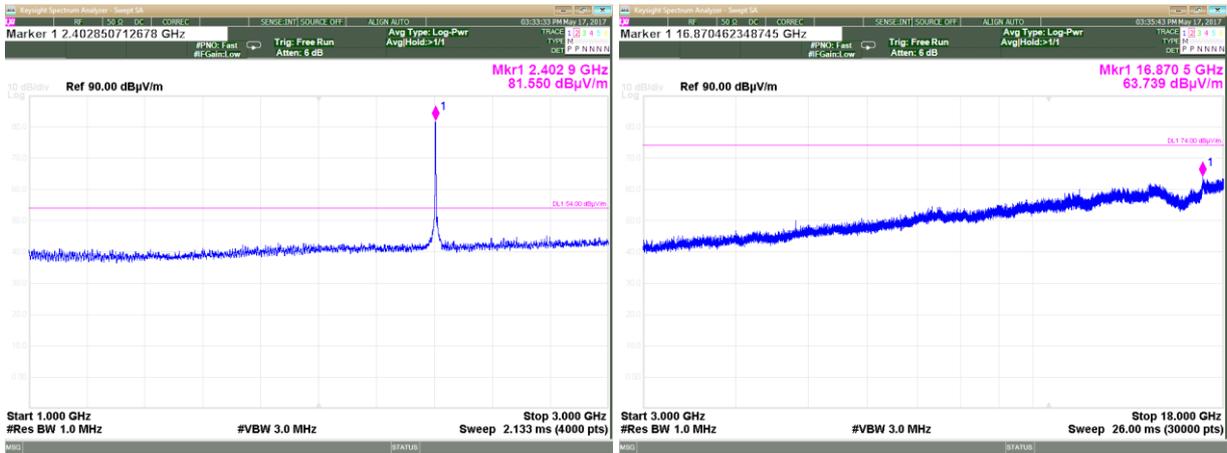


AV

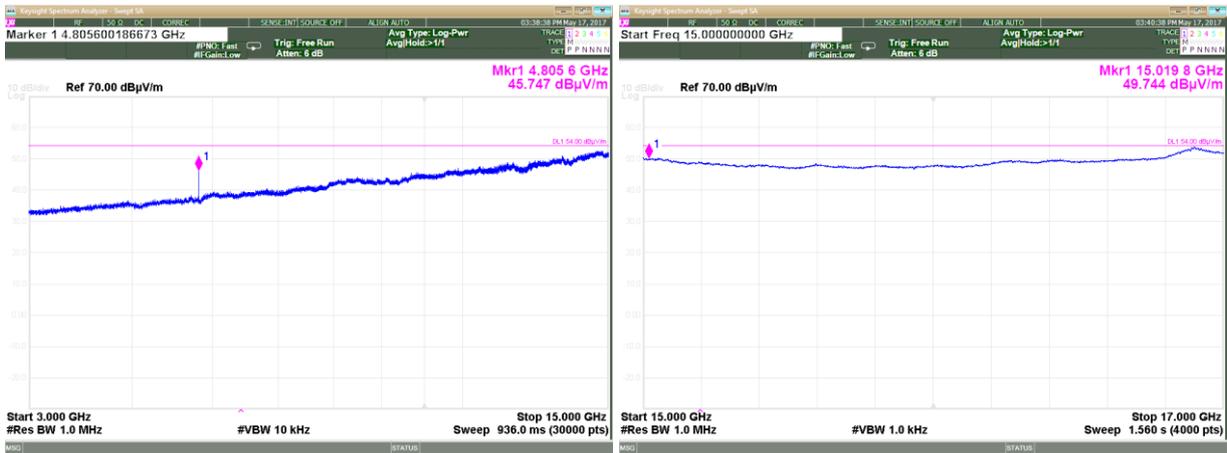


AV

Plot 3.2.10: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of harmonics, Fc -2402, 1GHz -18GHz



PE

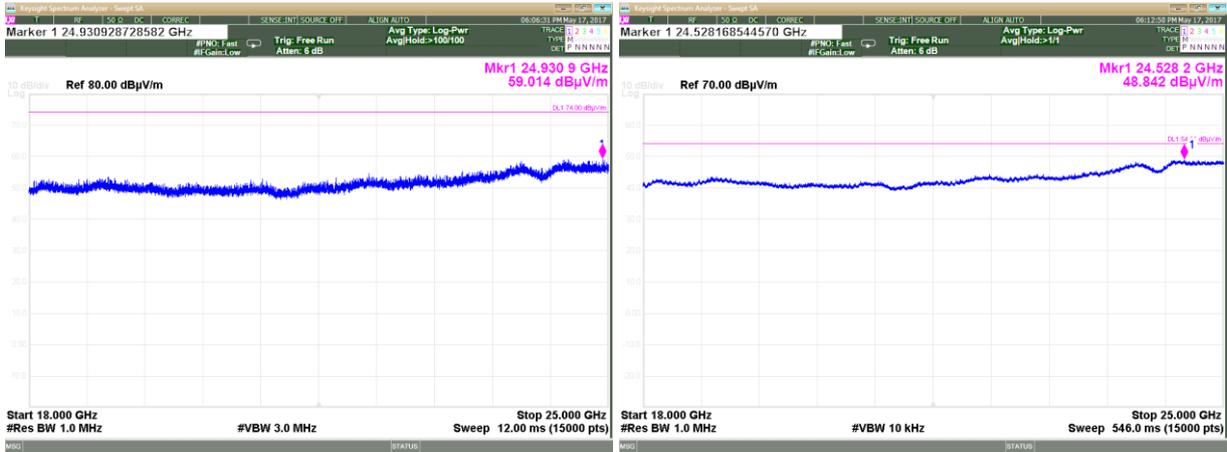


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AV

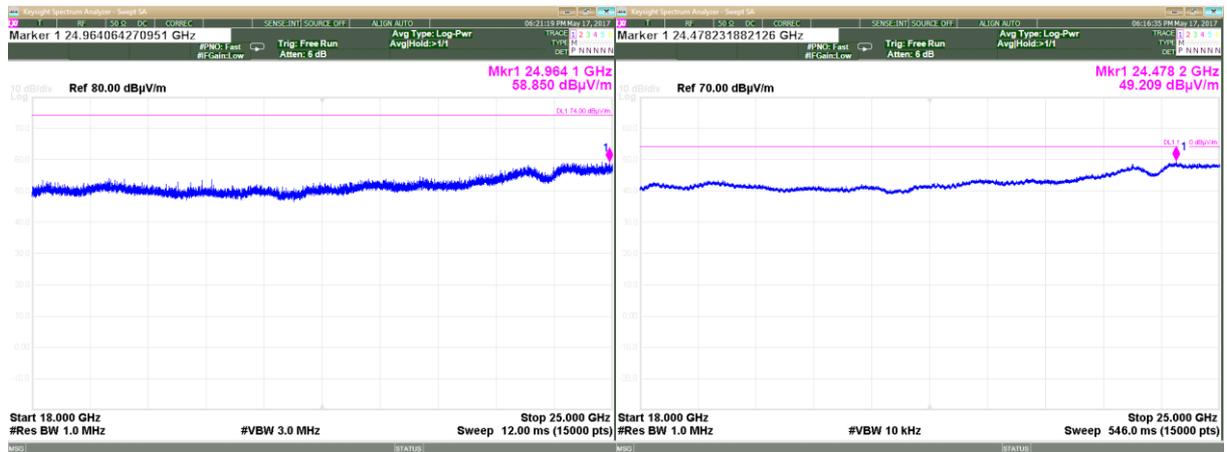
Plot 3.2.11: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of harmonics, Fc -2402, 18GHz -25GHz



PE

AV

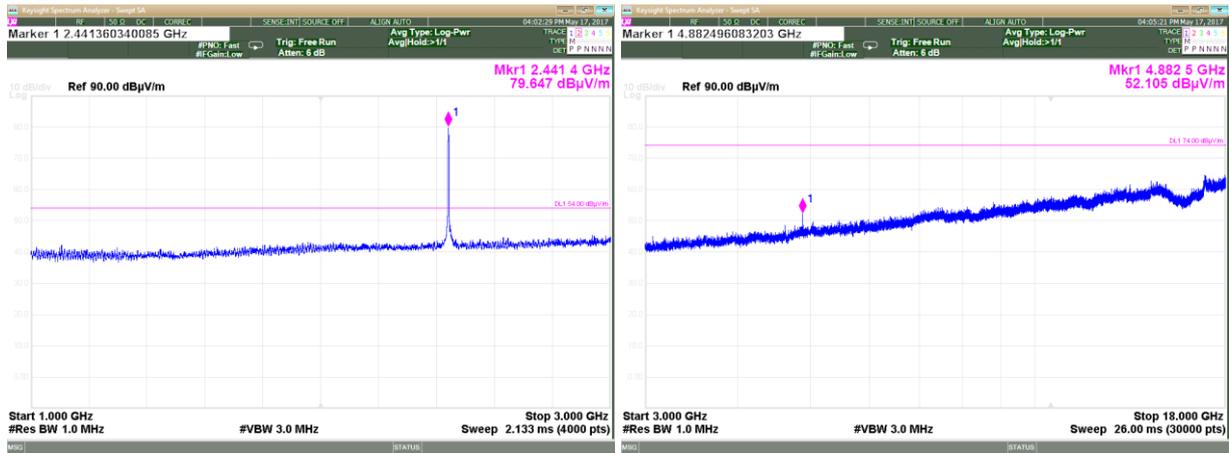
Plot 3.2.12: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of harmonics, Fc -2402, 18GHz -25GHz



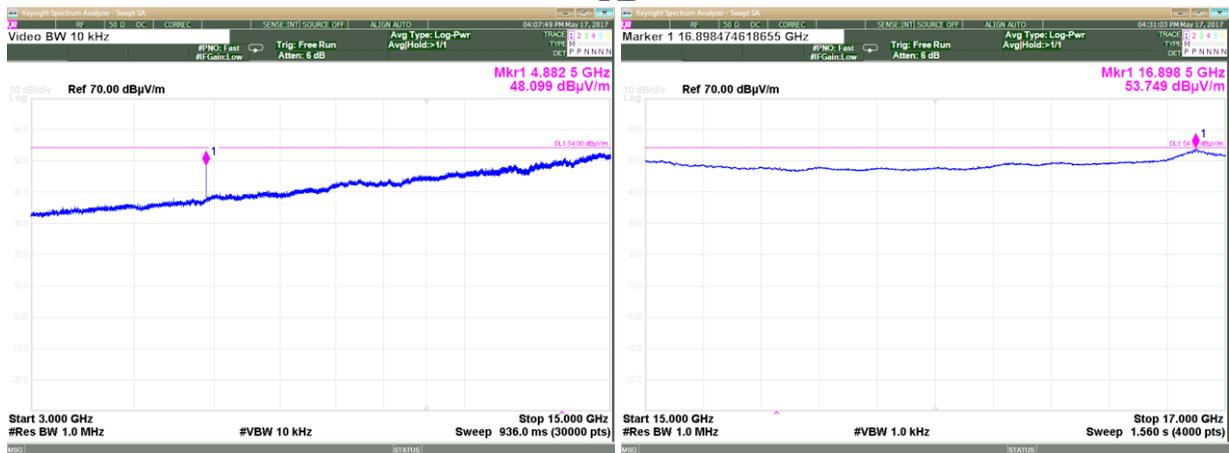
PE

AV

Plot 3.2.13: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of harmonics, Fc -2440, 1GHz -18GHz



PE

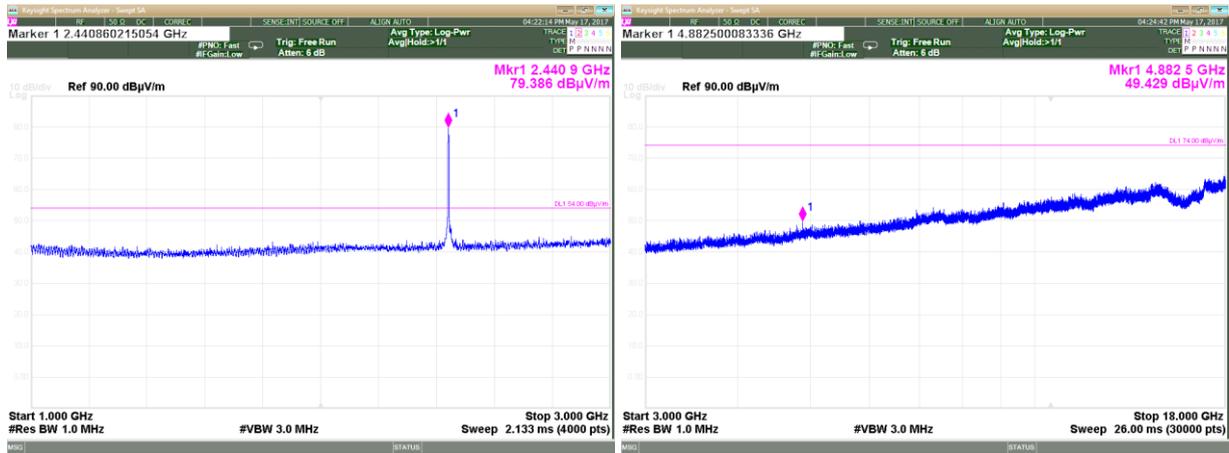


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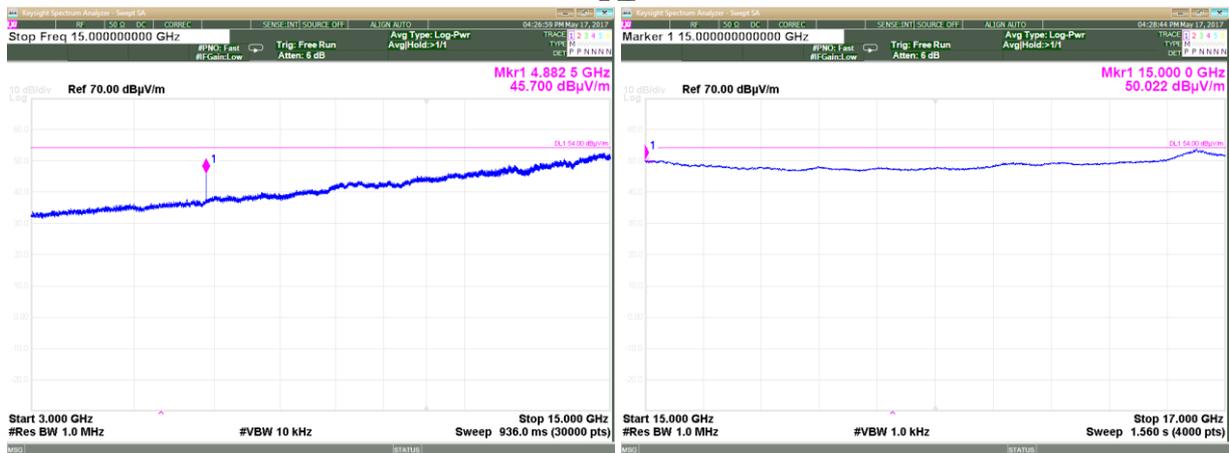


AV

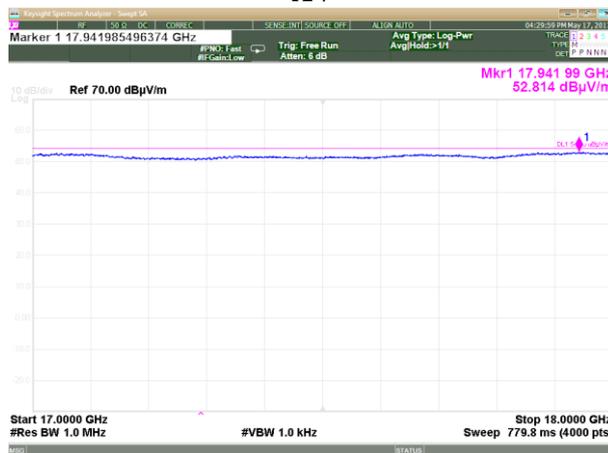
Plot 3.2.14: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of harmonics, Fc -2440, 1GHz -18GHz



PE

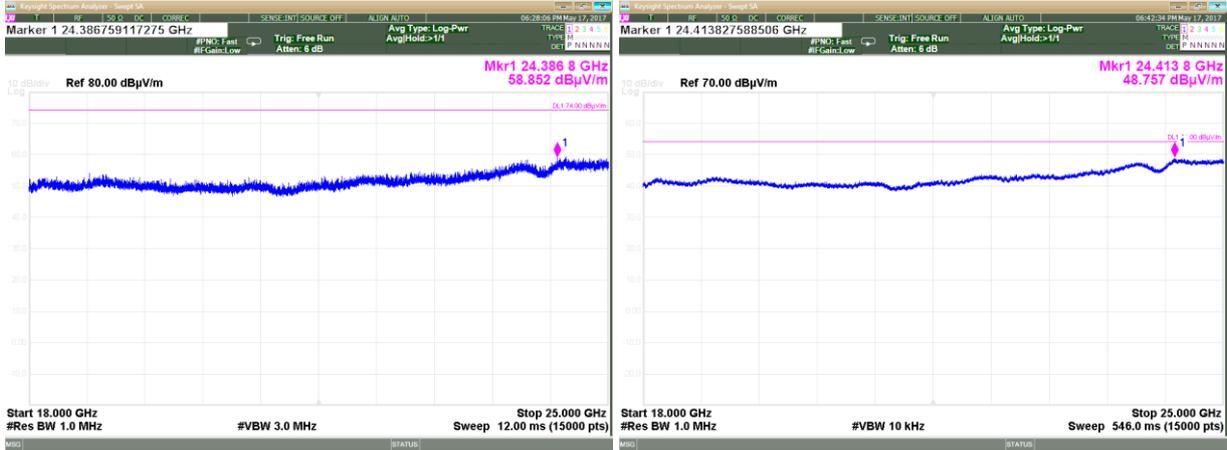


AV



AV

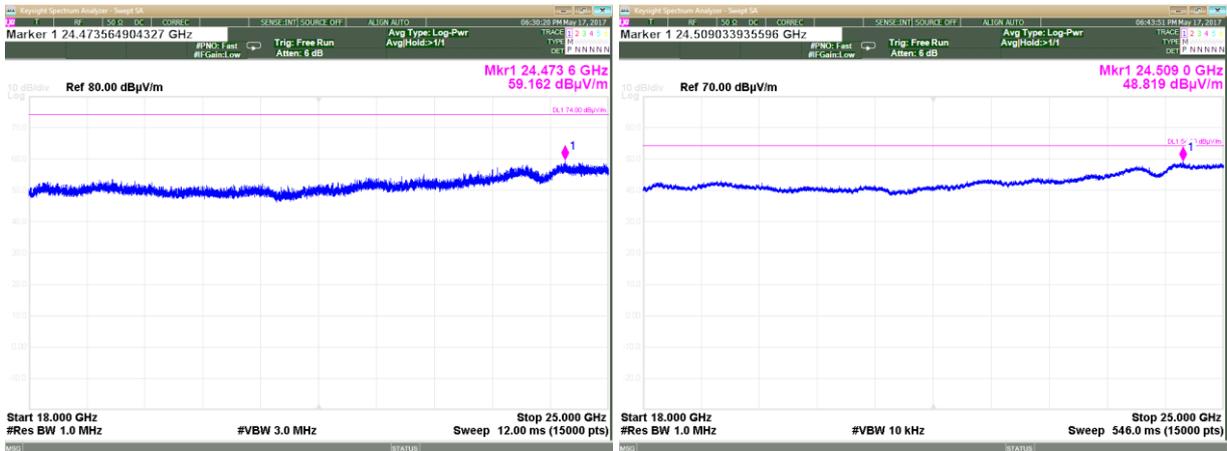
Plot 3.2.15: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of harmonics, Fc -2440, 18GHz -25GHz



PE

AV

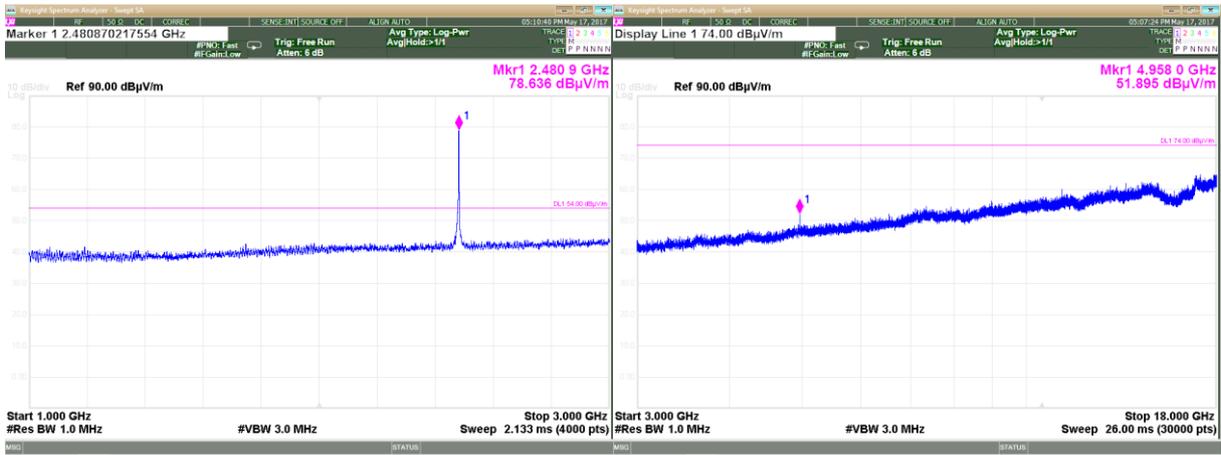
Plot 3.2.16 Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of harmonics, Fc -2440, 18GHz -25GHz



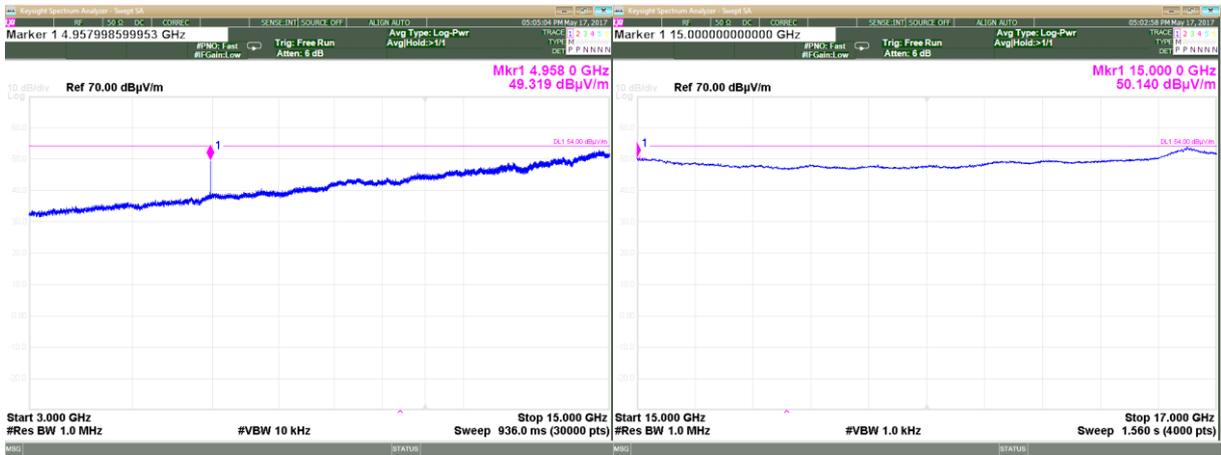
PE

AV

Plot 3.2.17: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of harmonics , Fc -2480, 1GHz -18GHz



PE

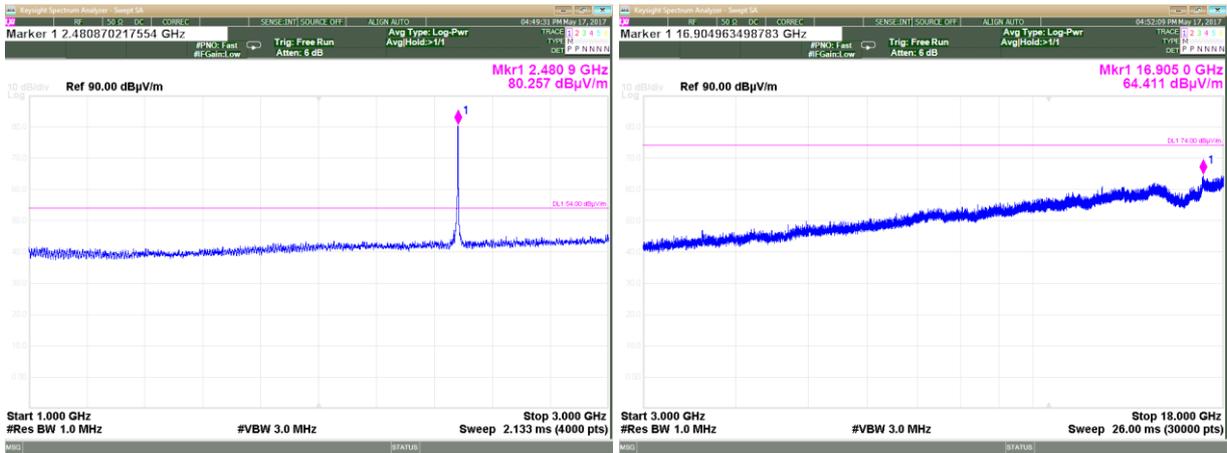


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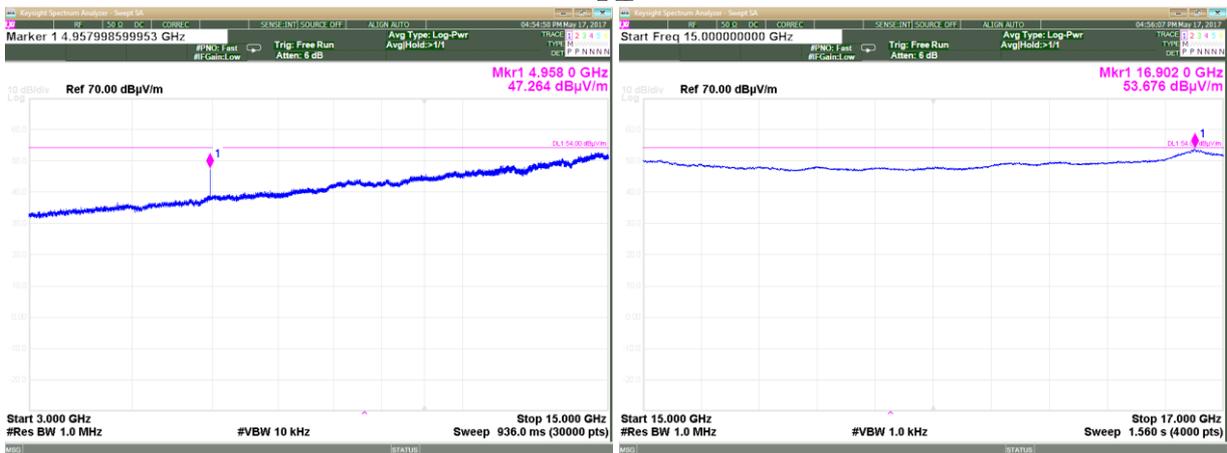


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Plot 3.2.18: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of harmonics, Fc -2480, 1GHz -18GHz



PE

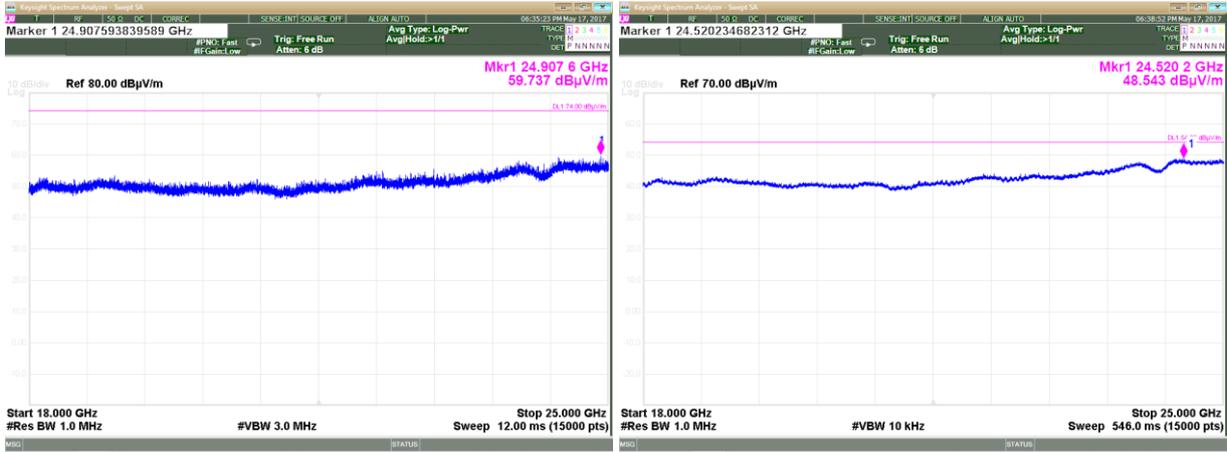


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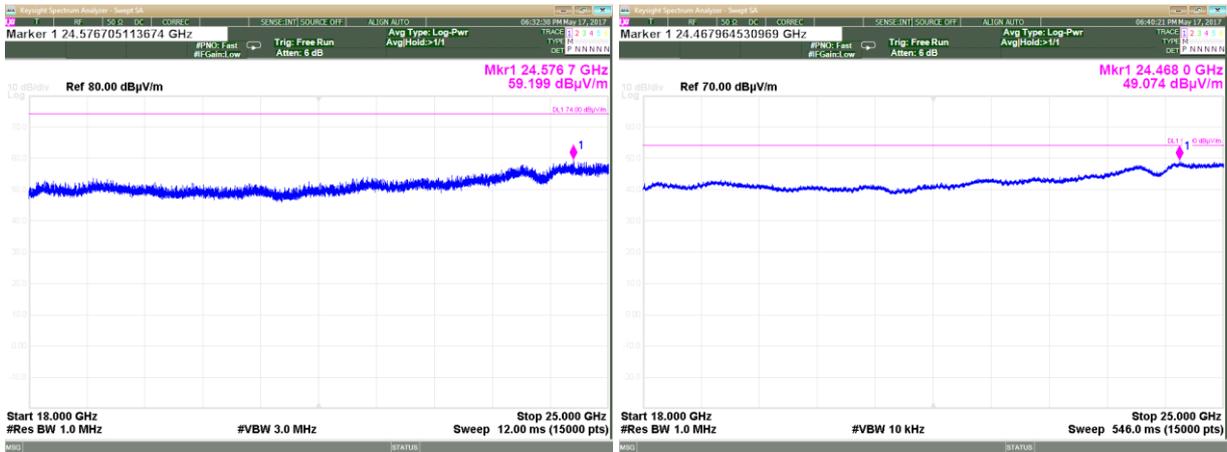
Plot 3.2.19: Radiated Emissions test, Vertical Polarization, Tx Modulated, Field strength of harmonics, Fc -2480, 18GHz -25GHz



PE

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Plot 3.2.20: Radiated Emissions test, Horizontal Polarization, Tx Modulated, Field strength of harmonics, Fc -2480, 18GHz -25GHz

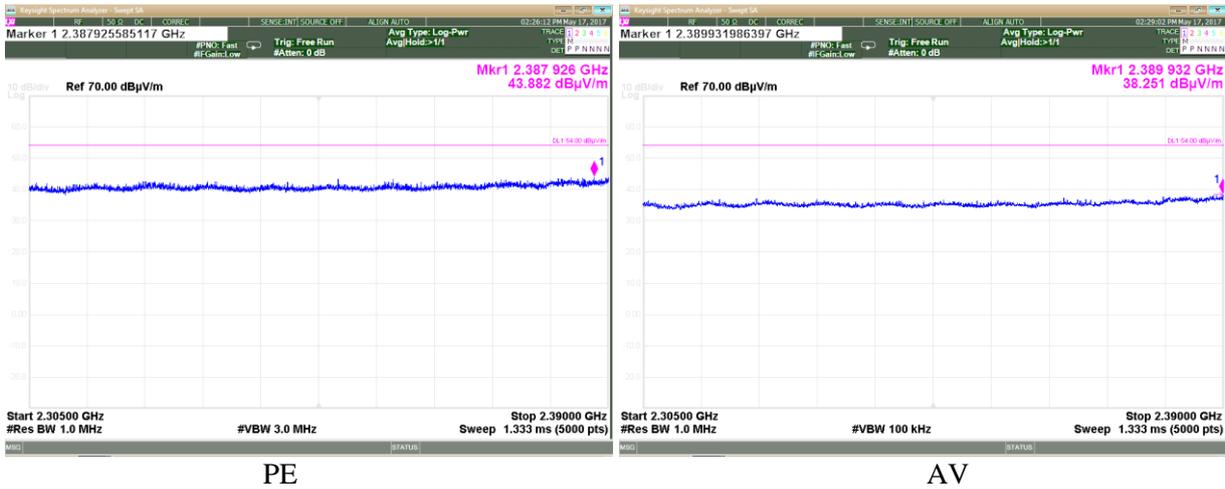


PE

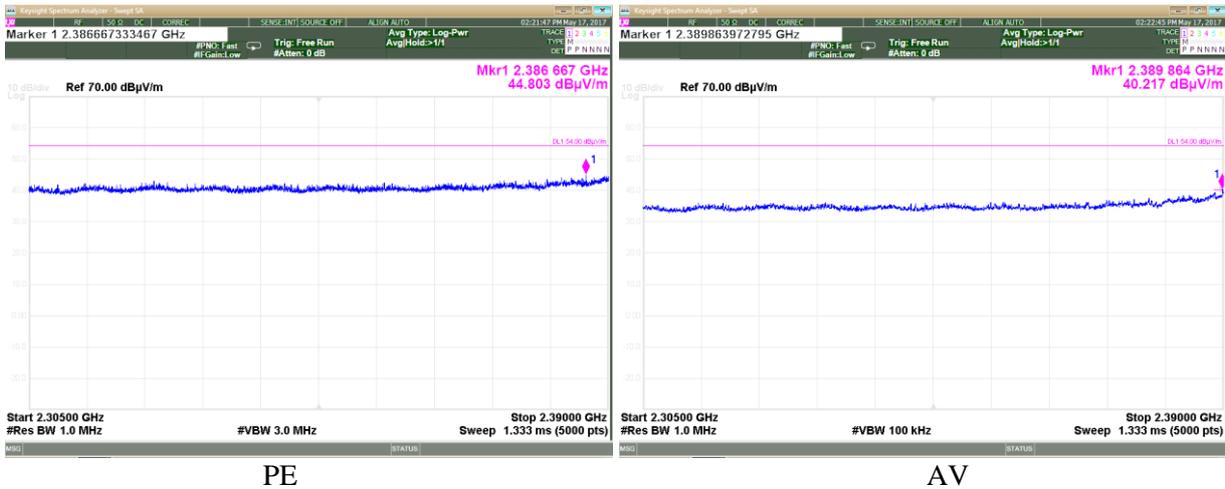
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Restricted Bands according to §15.205(a) and § 15.209.

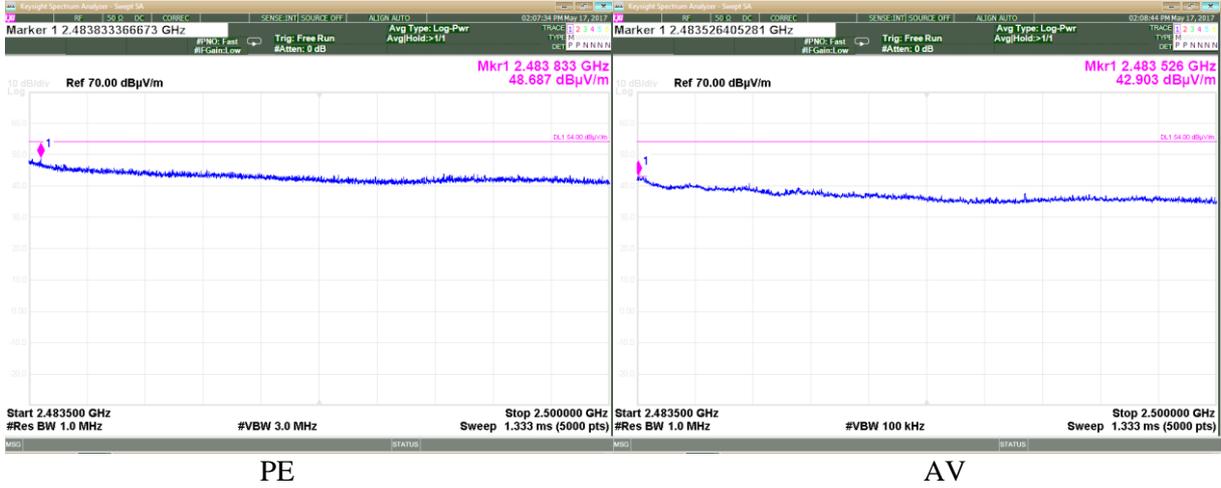
Plot 3.2.21: Radiated Emissions test, Vertical Polarization, Tx Modulated, 2310MHz-2390MHz, Fc -2402



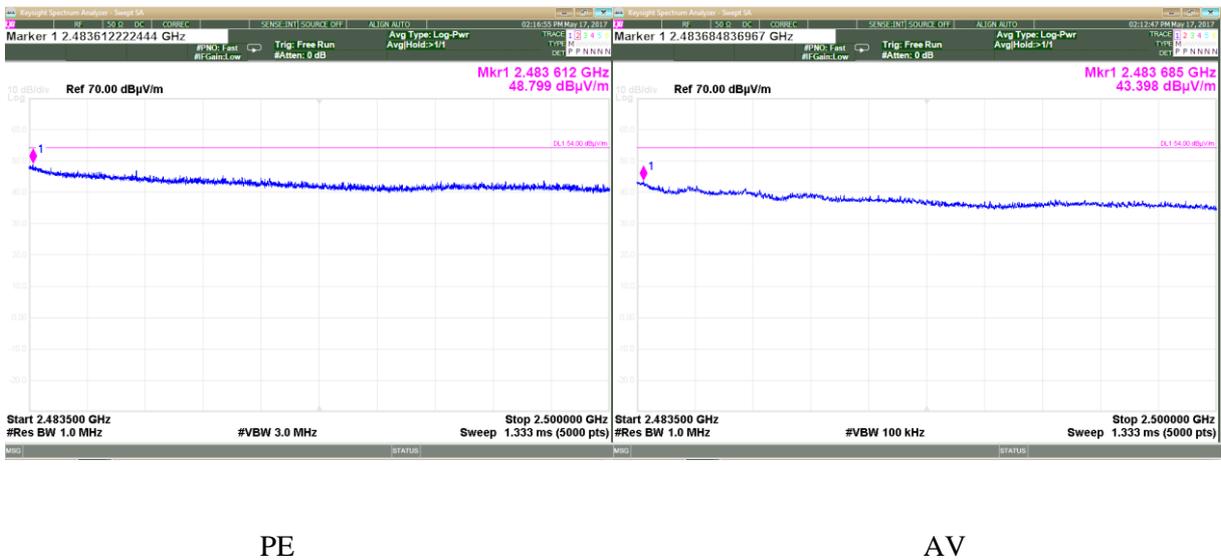
Plot 3.2.22: Radiated Emissions test, Horizontal Polarization, Tx Modulated, 2310MHz-2390MHz, Fc -2402



Plot 3.2.23: Radiated Emissions test, Vertical Polarization, Tx Modulated, 2483.50MHz-2500MHz, Fc -2480



Plot 3.2.24: Radiated Emissions test, Horizontal Polarization, Tx Modulated, 2483.5MHz-2500MHz, Fc -2480



3.3. Antenna Connector Requirements

Reference document:	47 CFR §15.203	
Test Requirements:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Test Result:	The EUT had integral antenna.	Pass

4. Appendix

Appendix A: List of Measuring Equipment used:

Description	Manufacturer	Model	Serial No.	Last Cal	Cal Due
RF Filter Section (2.9GHz)	HP	85460A	3448A00282	5/23/2016	8/23/2017
EMI Receiver (2.9GHz)	HP	8546A	3617A00318	5/23/2016	8/23/2017
RF Filter Section (6.5GHz)	HP	85460A	3704A00366	4/9/2017	4/9/2018
EMI Receiver (6.5GHz)	HP	8546A	3710A00392	4/9/2017	4/9/2018
EMC Analyzer	Agilent	E7405A	US41160436	9/18/2016	9/18/2017
Signal Generator	Marconi	2025	202301940	2/26/2017	2/26/2018
Signal Generator	Marconi	2024	1122681029	1/17/2017	1/17/2018
Bilog Antenna	Teseq	CBL 6141B	34119	7/3/2016	7/3/2017
Horn Antenna (EMM) 1-18GHz	A.R.A	DRG-118/A	17188	5/18/2016	8/18/2017
Line impedance stabilization network, 9 kHz to 30 MHz, 3-Phase	Schwarzbeck	NNLK 8121	8121-526	4/19/2017	4/19/2018
DCAMN (LISN) 150 kHz to 30 MHz	Schwarzbeck	PVDC 8300	30	4/25/2017	4/25/2020
Horn Antenna (for IMM) 1-18GHz	EMCO	3115	9602-4677	7/6/2016	7/6/2019
Isotropic Probe (10MHz-40GHz)	ETS-Lindgren	HI-6153	168752	12/26/2016	12/26/2017
LISN	Schwarzbeck	NNBL 8226-2	8226120	2/1/2017	2/1/2018
LISN	FCC	50/250-25-2	9705	1/26/2017	1/26/2018
Horn Antenna 15-40 GHz	Schwarzbeck	BBHA 9170	BBHA9170214	3/6/2015	3/6/2018
RF Transient Limiter	Agilent	11947A	3107A04119	1/26/2017	1/26/2018
RF Transient Limiter	Agilent	11947A	3107A04121	2/1/2017	2/1/2018
Spectrum Analyzer 3Hz-44GHz	Agilent	E4446A	MY46180602	12/16/2016	12/16/2018
Absorbing Clamp	FCC	F201	248	1/31/2017	1/31/2020
Spectrum Analyzer 9KHz-22GHz	HP	8593EM	3536A00131	8/24/2015	8/24/2017
LNA Amplifier 1 GHz to 18 GHz	AMP	7D-010180-30-10P-GW	618653	2/23/2017	2/23/2018
Low-Noise Amplifier 18 - 26.5 GHz	Miteq	AMF-5F-18002650-30-10P	945372	2/23/2017	2/23/2018
Anechoic old (small) chamber	-----	-----	-----	3/10/2016	3/10/2018

Appendix B: Accreditation Certificate



Accredited Laboratory

A2LA has accredited

QUALITECH

Petah-Tikva, Israel

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 28th day of June 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 1633.01
Valid to June 30, 2018

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

End of the Test Report