Electromagnetic Compatibility Test Report

Test Report No: POT 160620
Issued on: June 16, 2020

Product Name
Cellotrack Nano
with MultiSense and Cellosense

Tested According to
RTCA/DO-160G
Section 21

Tests Performed for
Pointer Telocation Ltd.
14 Hamelacha Street, Rosh-Ha'ayin 48091, Israel
Tel: 972-3-5723111

QualiTech EMC Laboratory
30 Hasivim St,
Petah-Tikva, 49517, Israel
Tel: 972-3-926 8443
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ACCREDITED
1633.01

Test Personnel

Tests Performed By: ----------

Nissim Bitan Agi Yizhak

Report Prepared By: ----------

Bina Talkar

Report Approved By: ----------

Rami Nataf
EMC Lab. Manager
QualiTech EMC Laboratory

Test Report details:

Test commencement date:	08.06.2020
Test completion date:	08.06.2020
Customer's Representative:	Itamar Gohary
Issued on:	16.06.2020

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 set up 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

The EUT was tested according to the following test method.
Test results are given in full in section 4.

Test method	Description of the Test Method/Requirement	Category	Test Results
Section 21	Emission of Radio Frequency Energy		
	Radiated RF Emissions (100 MHz – 6 GHz)	**H**	**Pass**

Table of Contents

1. Applicable Documents:

The following documents form a part of this procedure to the extent specified herein. Unless listed by date as of a particular issue, the issue in effect on the date of the test shall be applicable. In the event of conflict between documents referenced herein and the contents of this procedure, this procedure shall be a superseding requirement.

1.1. Referenced documents:

RTCA/DO-160G	Environmental conditions and test procedures for airborne equipment

2. Description of the EUT:

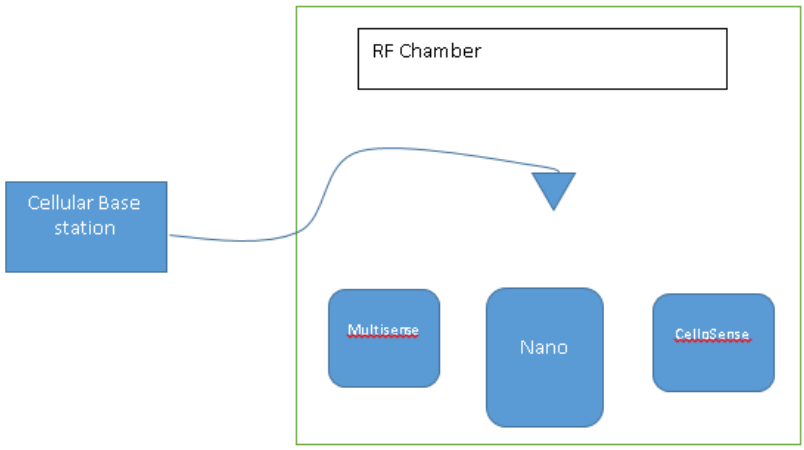
General description of the EUT, configuration used for Emission and Immunity testing, and the method of performance verification were defined by the manufacturer. The acceptance performance criterion was declared by the manufacture.

2.1. General Description:

The CelloTrack Nano device provides precisely the knowledge to manage cargo and mobile assets effectively. It enables real-time as well as offline monitoring of the location and condition of cargo, assets and goods, including specific alerts related to issues and delays, using its internal sensors and the capability to track a wide area of remote wireless sensors MultiSenses and CelloSense around it

2.2. EUT Configuration:

EUT Configuration for Emissions Testing:



2.3. EUT Cards/Modules List:

No	Hardware Component	Manufacturer's Catalog Number	Serial Number	Hardware Revision	Quantity
1	Cellotrack Nano	GC9771004-000	24435	B	1
2	MultiSense TH	715-50200	208880	D	1
3	CelloSense	715-50600	260000	A	1

2.4. Cables Identification:

Port/Line Name @ EUT	Type	Indoor/ outdoor	Impedance [Ohm]	Typical Length [m]	Tested Length [m]	# of ports/ boards available	# of ports/ boards connected	From	To
Not applicable									

2.5. Clock Frequencies Table:

Frequency [MHz]	Location
16MHz	Cellotrack Nano micro processor

3. Test Facility & Uncertainty of Measurement

3.1. Accreditation/Registration reference:

- *A2LA Certificate Number: 1633.01*

3.2. 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 ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB 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	±3.9dB, 30MHz to 200MHz ±3dB, 200MHz to 1000MHz
Transmission Loss measured at 5 positions, at 1.5m height	±3dB, 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 ≥80dB at 15 kHz ≥90dB at 100 kHz Electric field >120dB from 1MHz to 1GHz >110dB 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	±3dB 80MHz to 18GHz

3.3. The measurement software used:

Software Name	Software Version
Test Software "TILE	Version 7.1.4.1

3.4. Uncertainty of Measurement:

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements ". Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Test Name	Range	Expanded U lab Uncertainty	U CISPR Uncertainty
Radiated Emission	30MHz-200MHz, Horizontal Polarization	± 4.20 dB	±5.06
	30MHz-200MHz, Vertical Polarization	± 4.89 dB	±5.17
	200MHz-1000MHz, Horizontal Polarization	± 5.23 dB	±5.34
	200MHz-1000MHz, Vertical Polarization	± 6..29 dB	±6.32
	1.0GHz -6.0GHz	± 5.11 dB	±5.18
	6.0GHz-18.0GHz	± 5.17 dB	±5.48

Note: QualiTech EMC labs expanded measurement instrumentation has less uncertainty than the industry norm and compliance is deemed to occur as no measured disturbance exceeds the disturbance limit.

Note: The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

4. Radiated Emissions, Electric Field (100 MHz – 6 GHz)

Date of Test: 08.06.2020
Relative Humidity: 47%
Ambient Temperature: 22.9 °C
Atmospheric Pressure: 1011.4 hPa
Test Engineer: Agi Yizhak

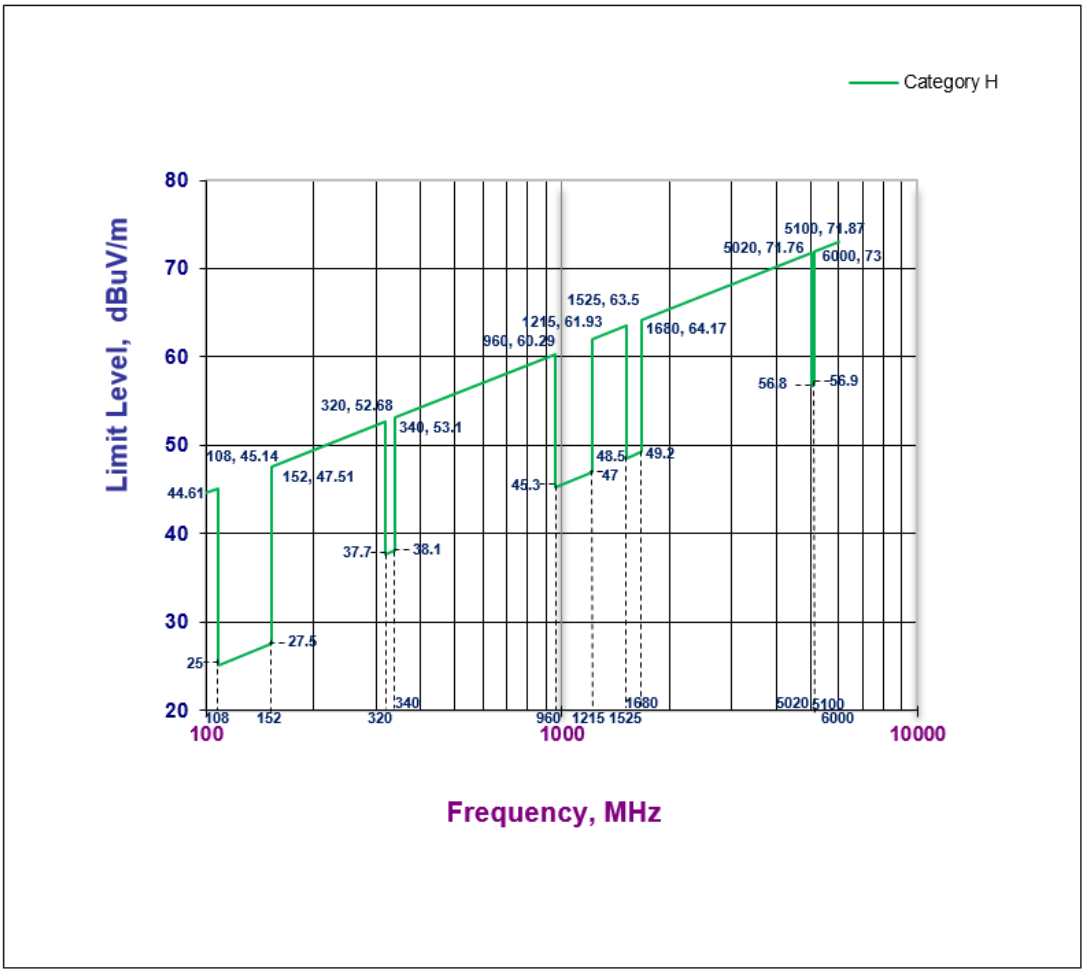
Test Method: **RTCA/DO-160G, Section 21.5**

Compliance Status: The EUT complies with the **Category H** requirements.

Requirements

The test shall be performed RTCA/DO-160G, Section 21.4. E-Field emissions shall not be radiated in excess of the applicable limit shown in **Figure 4.1**

Figure: 4.1: Radiated RF Emissions, Electric Field – Category H



The test procedures shall be as follows:
1. Maintain testing setup.
2. Turn on the measurement equipment and allow a sufficient time for stabilization
3. Verify that the ambient fields at least 6 dB below the specified limit. Take plots of the ambient fields.
4. EUT Testing: Perform the following test using the measuring system block diagram shown in Figures 4.2:
   a) Turn on the EUT and allow a sufficient time for stabilization.
   b) Scan the spectrum for each frequency range using the following settings:

Frequency range, MHz	NB Res. Bandwidth	NB Video Bandwidth	Minimum measurement time	Minimum Sweep time, s
100-200	10 kHz	30 kHz	1.5 s/MHz	12.5
200-400	10 kHz	30 kHz	1.5 s/MHz	12.5
400-960	100 kHz	300 kHz	0.15 s/MHz	120.0
960-6000	1 MHz	3 MHz	15 s/GHz	255.0

List of Test Equipment:

Measurement receiver Agilent E7405A
Data recording device
Antennas:
30 MHz to 200 MHz, Biconical, 137 cm tip to tip Schwarzbeck VHBB9124 w/BBA9106
200 MHz to 1 GHz, Double Ridged Horn, EMCO 3106
1 GHz – 6 GHz, Double Ridged Horn, A.R.A. DRG-118/A
Low Noise Amplifier 1 GHz – 6 GHz, MITEQ AMF-5D-010180-30-10P- GW

Test Results:

Table 4.1: Radiated emission ambient noise measurement results

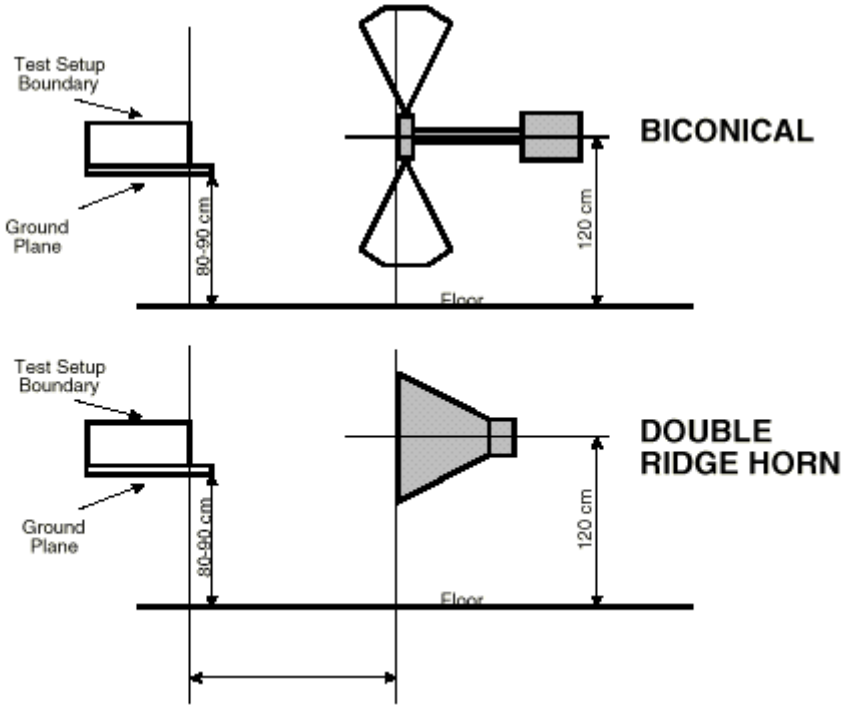
Frequency, MHz	Antenna Polarization	Measured Level, dBµV/m	Limit, dBµV/m	Delta*, dB	Pass/Fail
Ambient noise was at least 10 dB below the limit.					Pass

*Delta = Measured Level - Limit

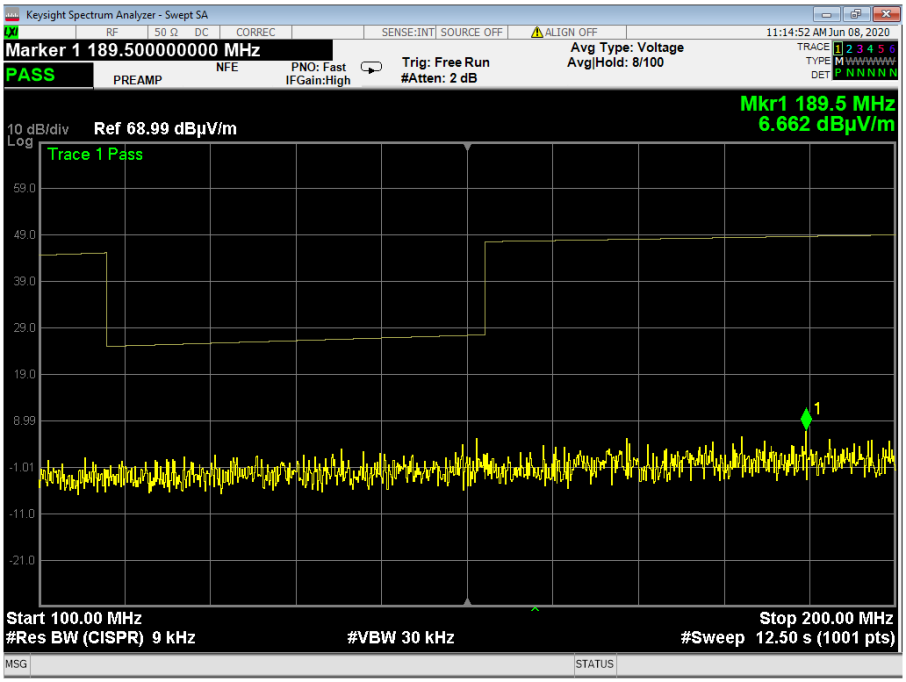
Table 4.2: Radiated emission test results: Receive mode

Frequency, MHz	Antenna Polarization	Measured Level, dBµV/m	Limit, dBµV/m	Delta*, dB	Pass/Fail
965	H	39.03	45.5	5.47	Pass
961	V	40	45.5	5.5	Pass

Figure 4.2: Radiated Emissions, Electric Field



Plot 4.1: RE ambient noise within 100 – 200 MHz, vertical polarization



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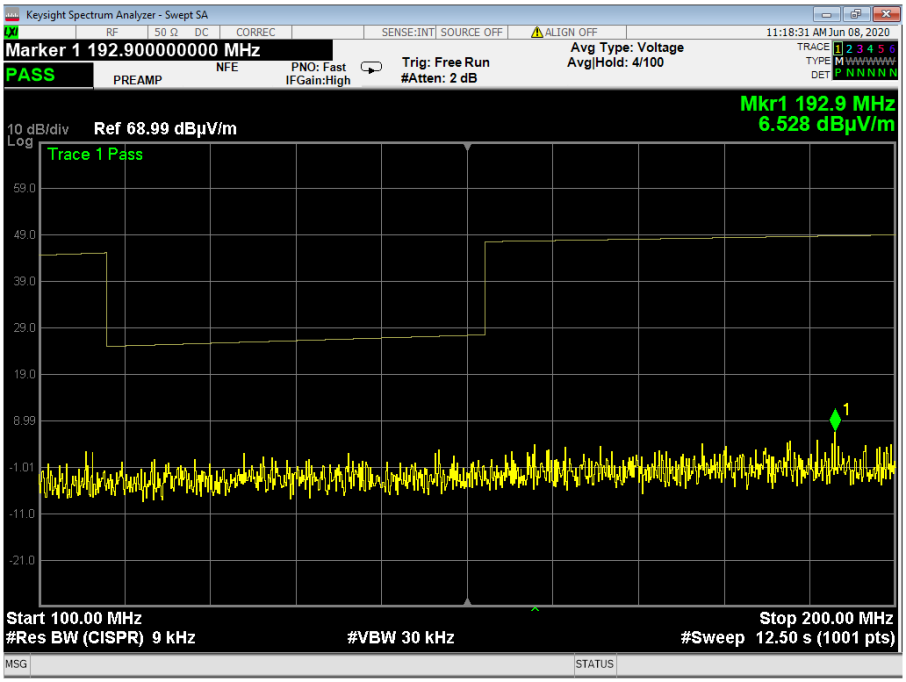
Plot 4.2: RE test results within 100 – 200 MHz, vertical polarization



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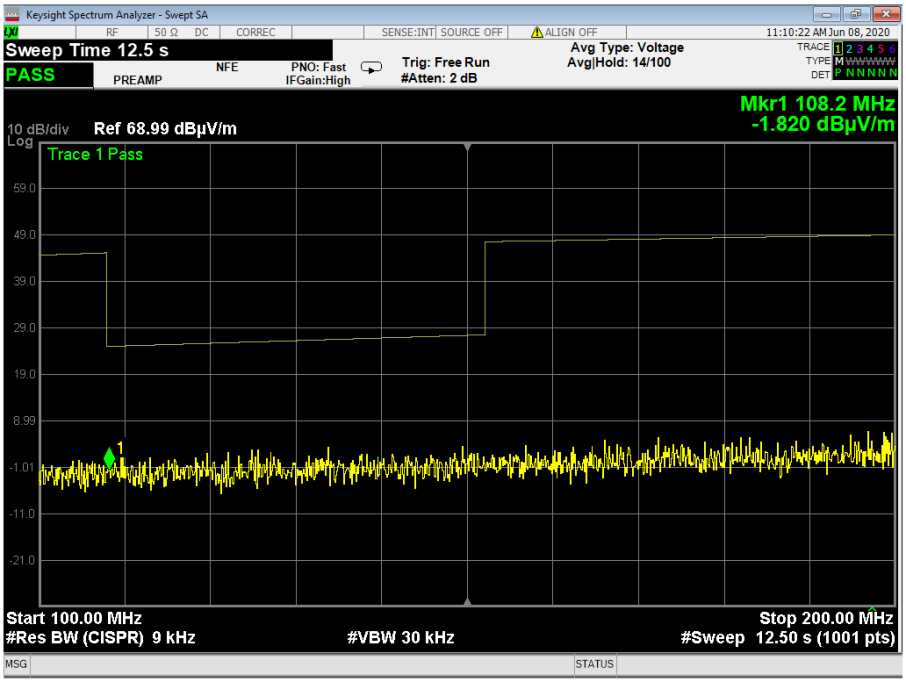
Plot 4.3: RE ambient noise within 100 – 200 MHz, horizontal polarization



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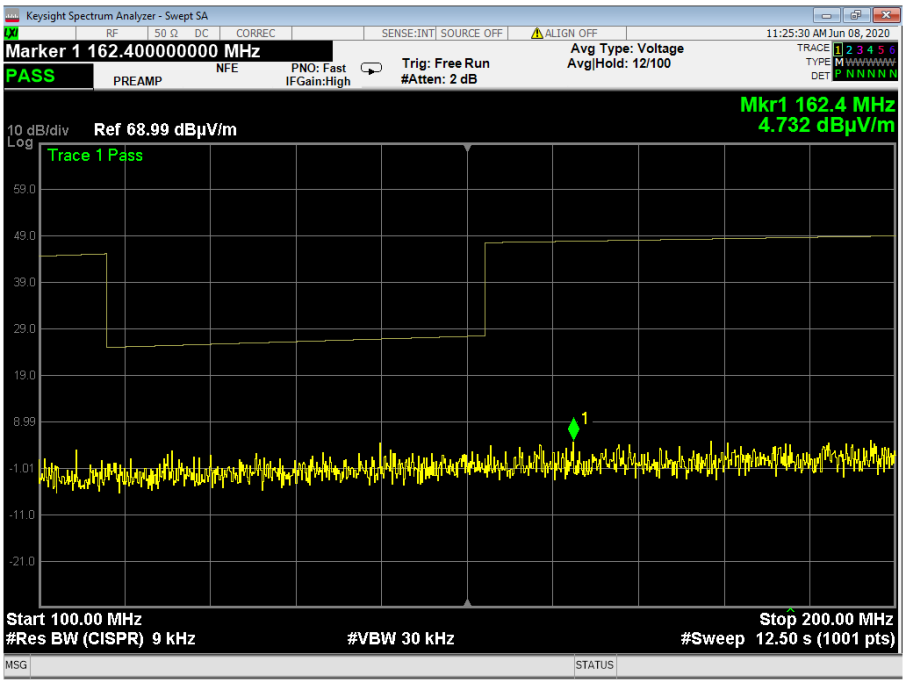
Plot 4.4: RE test results within 100 – 200 MHz, horizontal polarization



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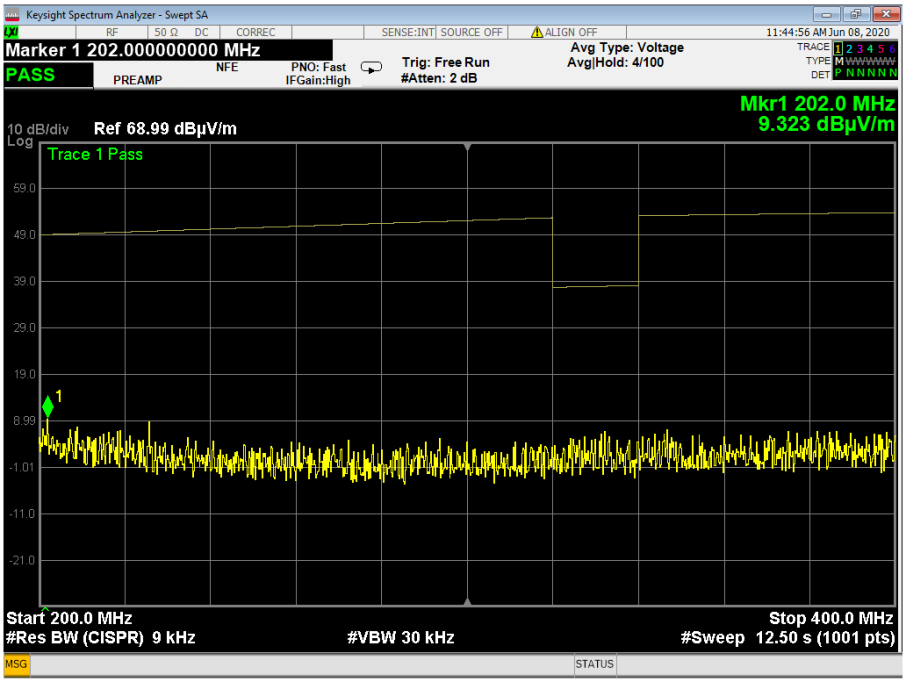
Plot 4.5: RE ambient noise within 200 – 400 MHz, vertical polarization



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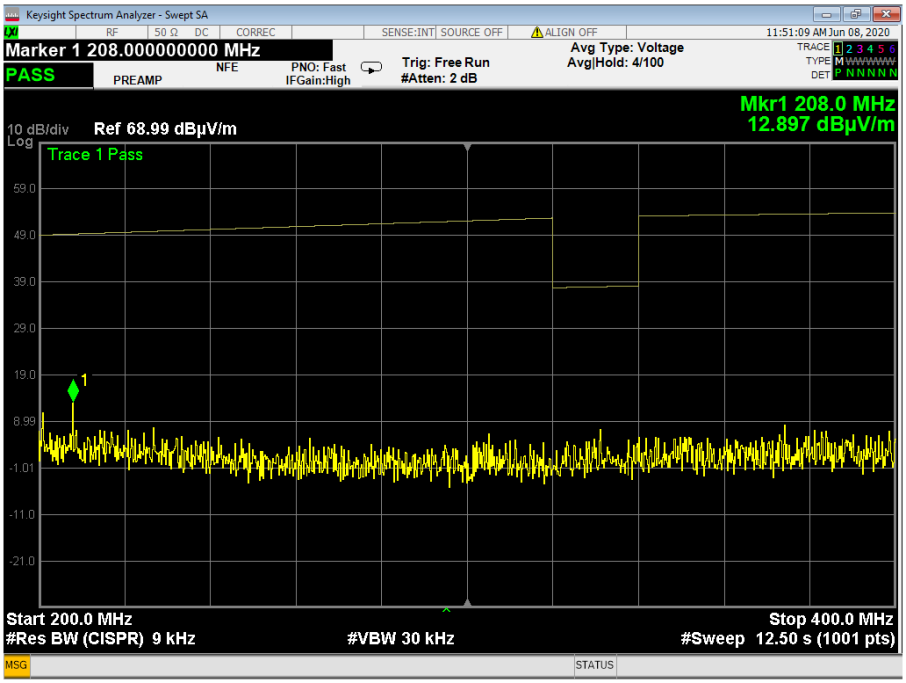
Plot 4.6: RE test results within 200 – 400 MHz, vertical polarization



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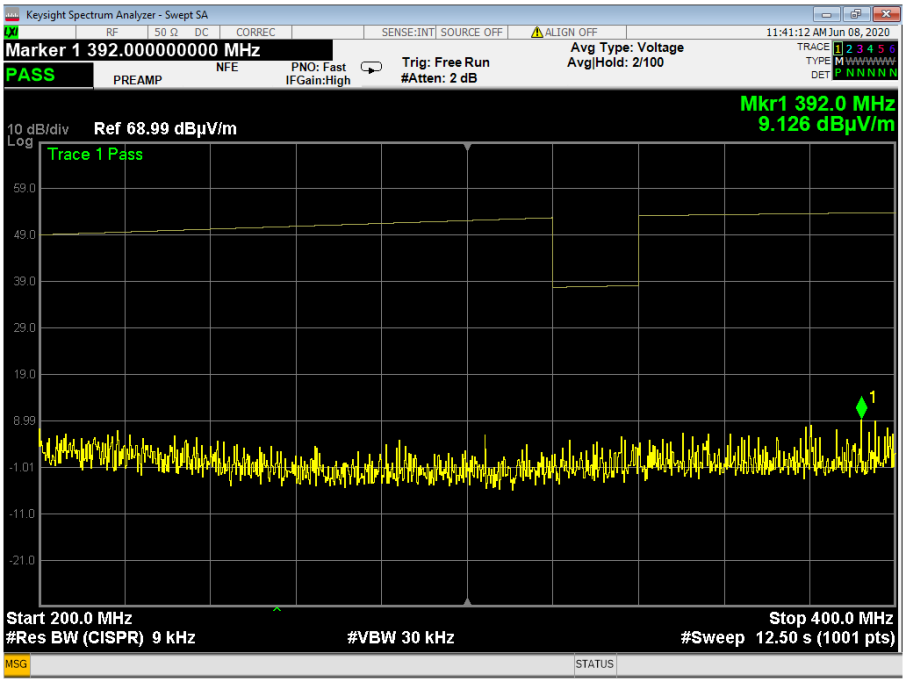
Plot 4.7: RE ambient noise within 200 – 400 MHz, horizontal polarization



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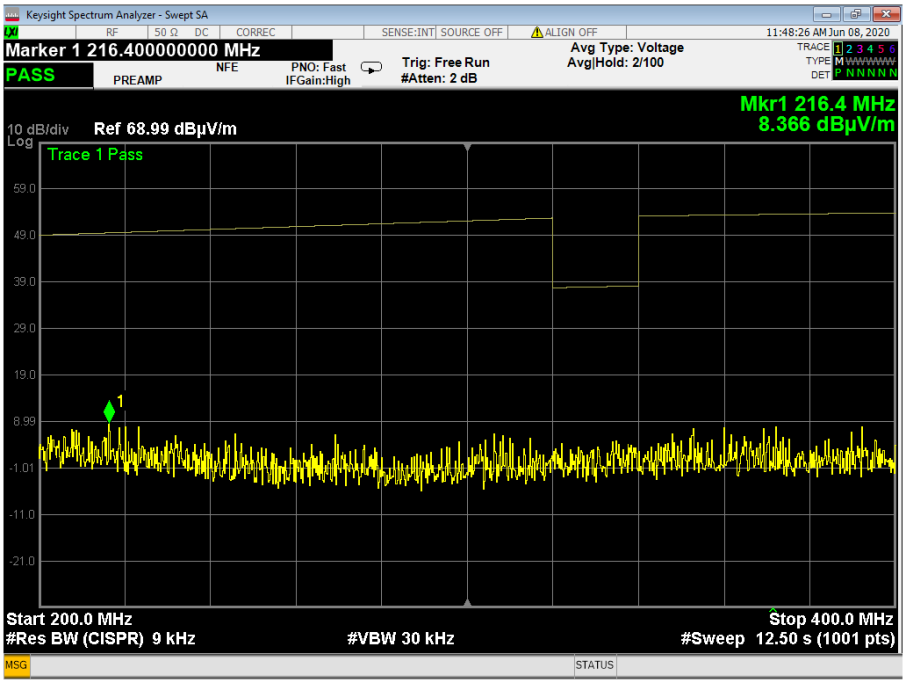
Plot 4.8: RE test results within 200 – 400 MHz, horizontal polarization



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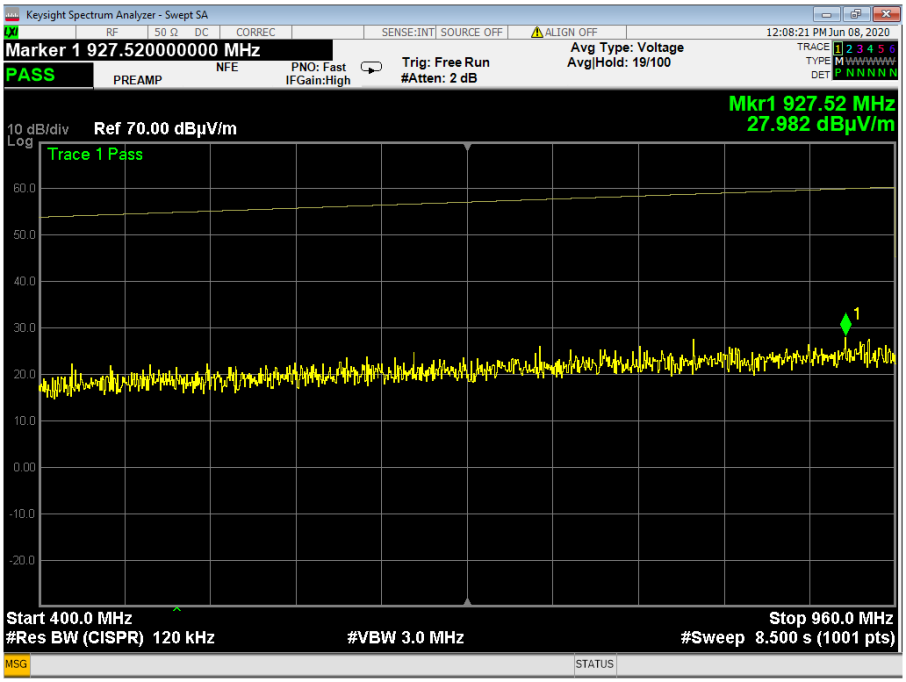
Plot 4.9: RE ambient noise within 400 – 960 MHz, vertical polarization



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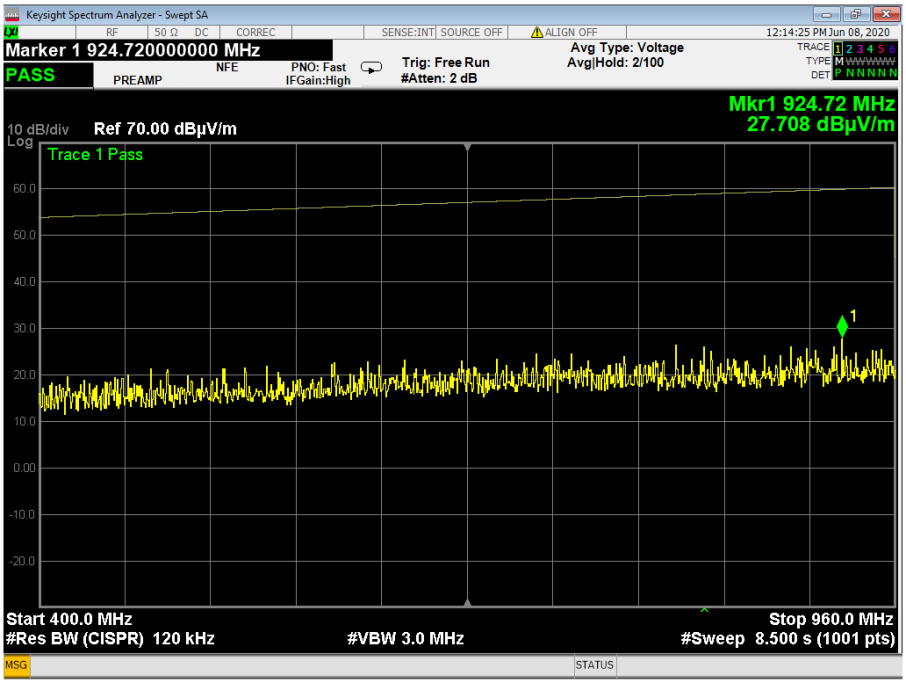
Plot 4.10: RE test results within 400 – 960 MHz, vertical polarization



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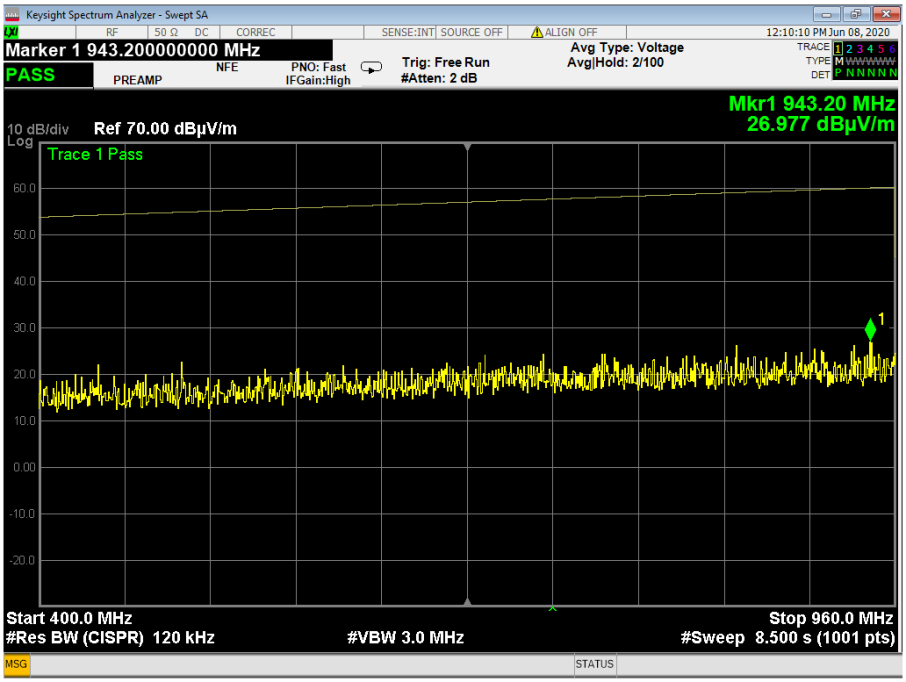
Plot 4.11: RE ambient noise within 400 – 960 MHz, horizontal polarization



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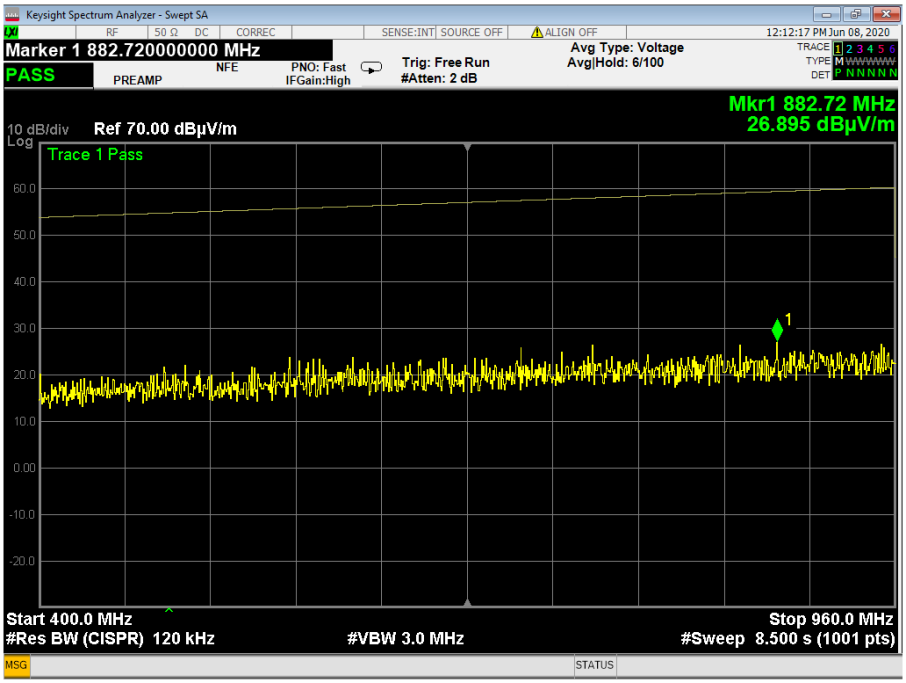
Plot 4.12: RE test results within 400 – 960 MHz, horizontal polarization



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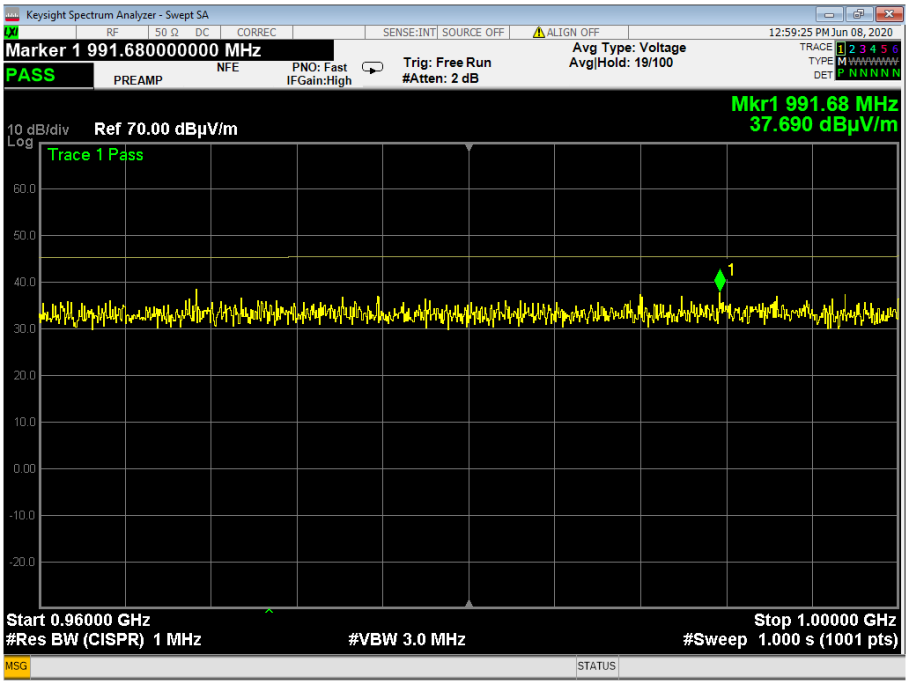
Plot 4.13: RE ambient noise within 960 – 1000 MHz, vertical polarization



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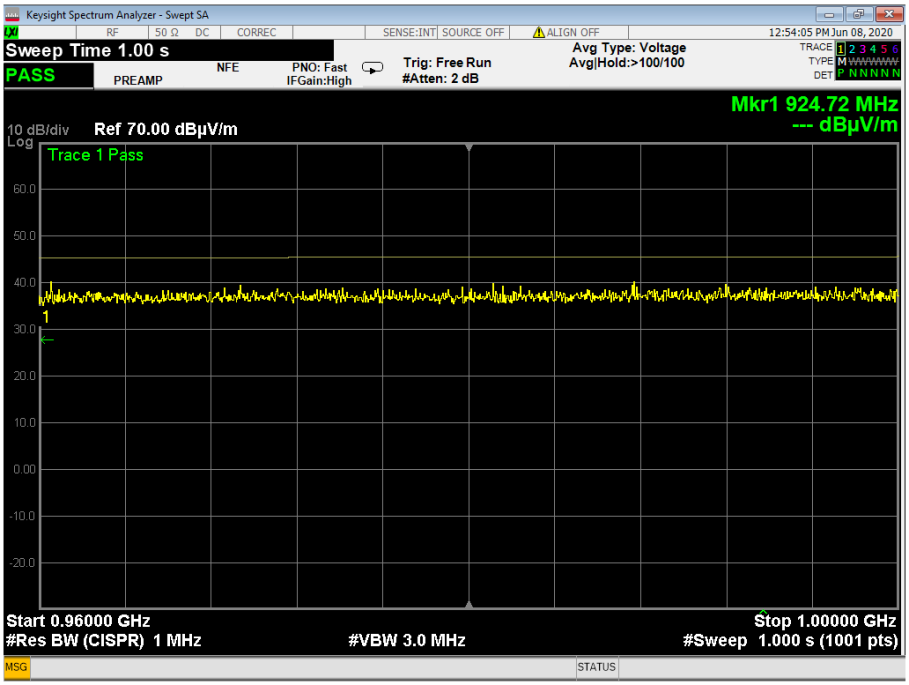
Plot 4.14: RE test results within 960 – 1000 MHz, vertical polarization



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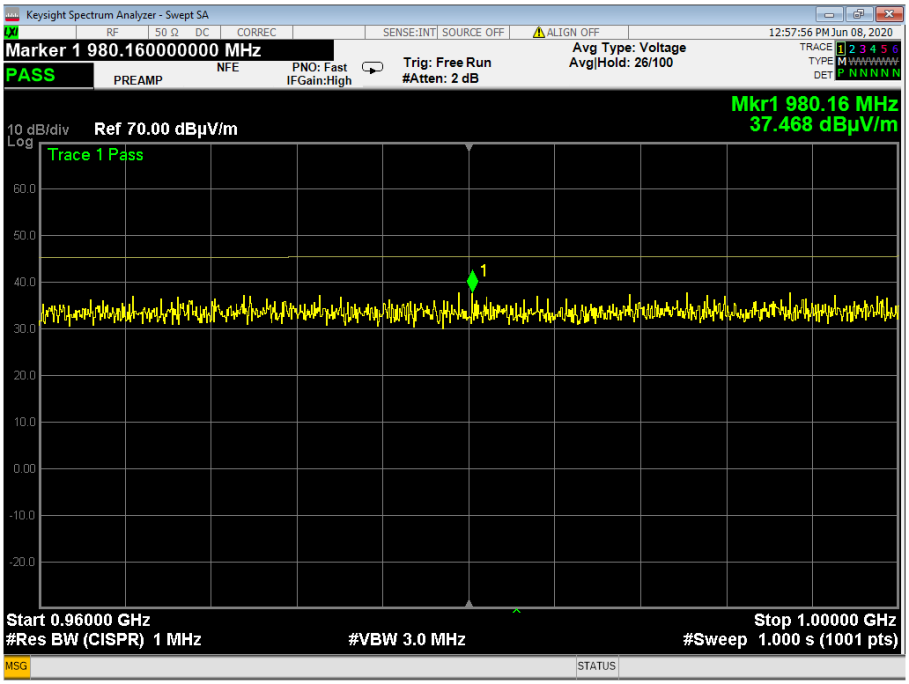
Plot 4.15: RE ambient noise within 960 – 1000 MHz, horizontal polarization



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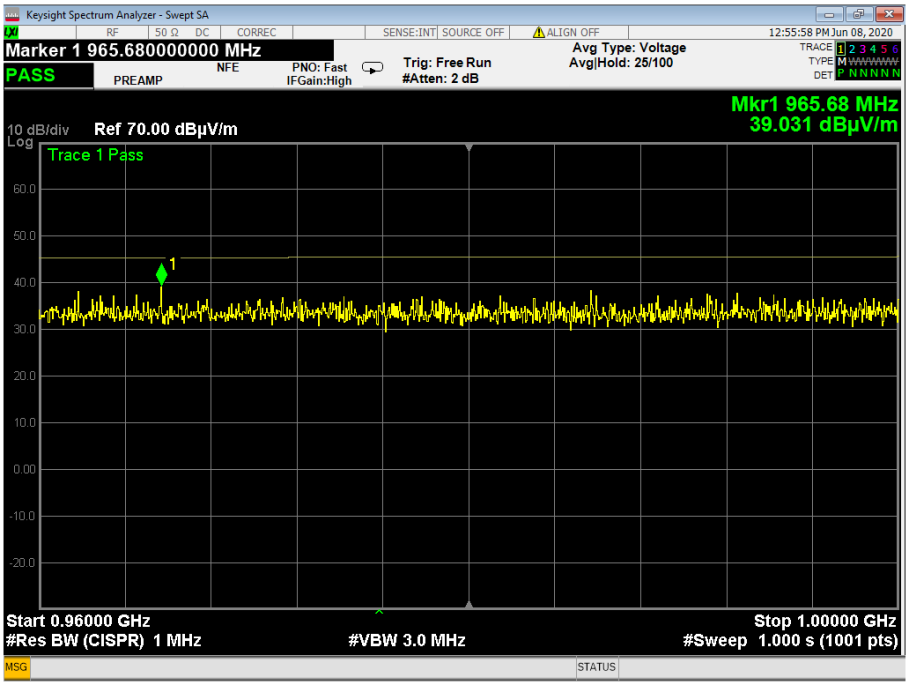
Plot 4.16: RE test results within 960 – 1000 MHz, horizontal polarization



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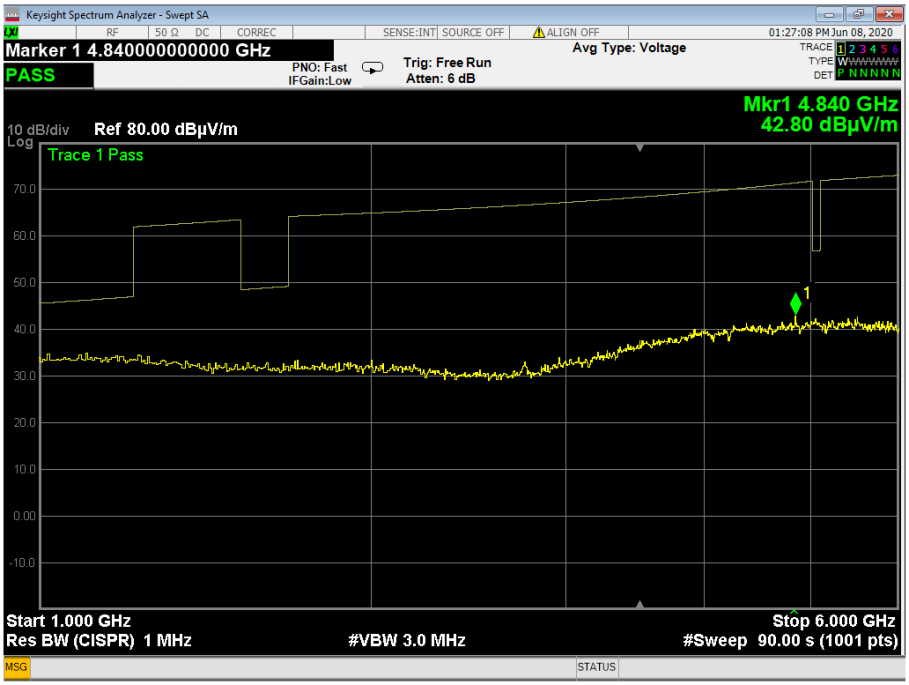
Plot 4.17: RE ambient noise within 1000 – 6000 MHz, vertical polarization



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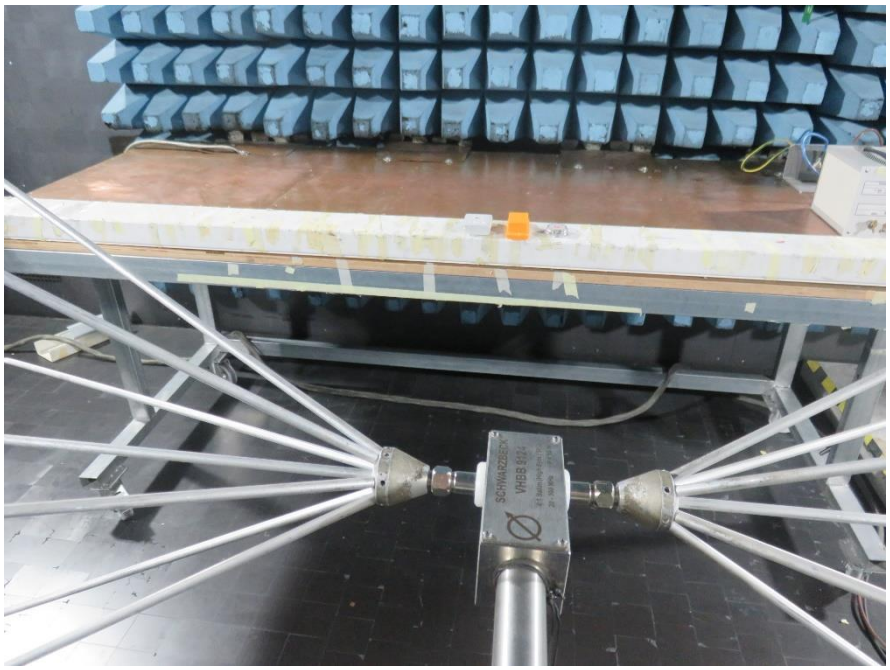
Photograph 4.1: RE Antenna positioning, Biconical antenna 100MHz – 200MHz



Photograph 4.2: RE Antenna positioning, Horn antenna, 200MHz – 1GHz

Photograph 4.3: RE Antenna positioning, Horn antenna, 1GHz – 6GHz

5. Appendix

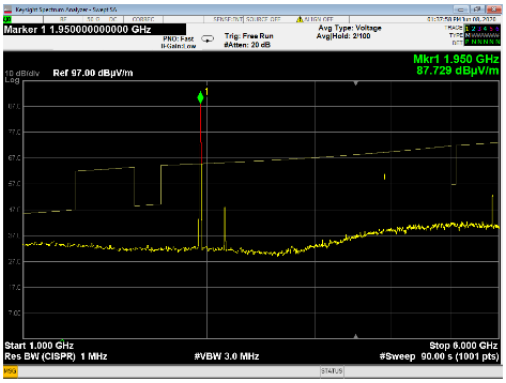
Appendix A: Per customer's request, EUT was tested in Transmit mode, Frequency Transmit mode 1.95 GHz DL BS, 2.140GHz UP BS. Test results as follows.

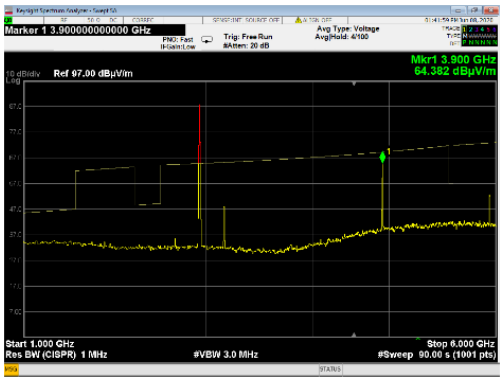
Radiated emission test results: Transmit mode

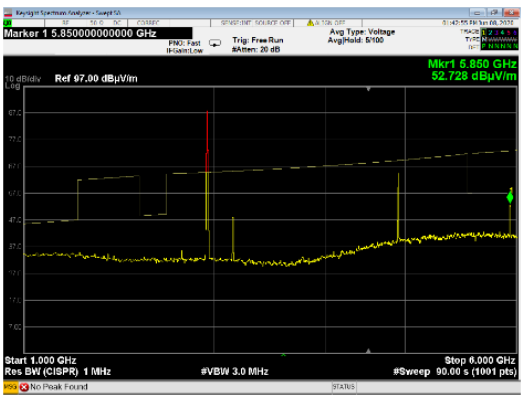
Frequency, GHz	Antenna Polarization	Measured Level, dBµV/m	Limit, dBµV/m	Delta*, dB	Pass/Fail
1.95	V	87.72	65	22.72	NA
3.9	V	64.38	69	-4.62	NA
1.95	H	94.088	65	29.912	NA
3.9	H	66.45	69	-2.55	NA
5.85	H	74	73	1	NA

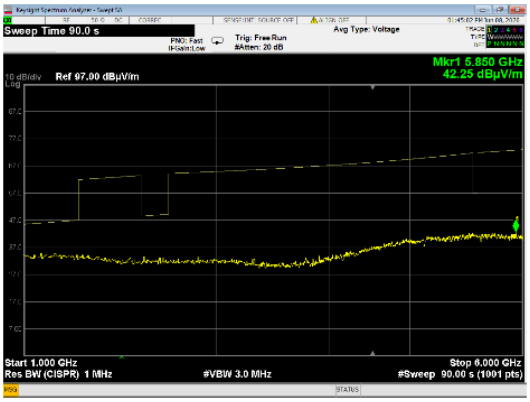
*Delta = Measured Level - Limit

RE test results within 1000 – 6000 MHz, vertical polarization









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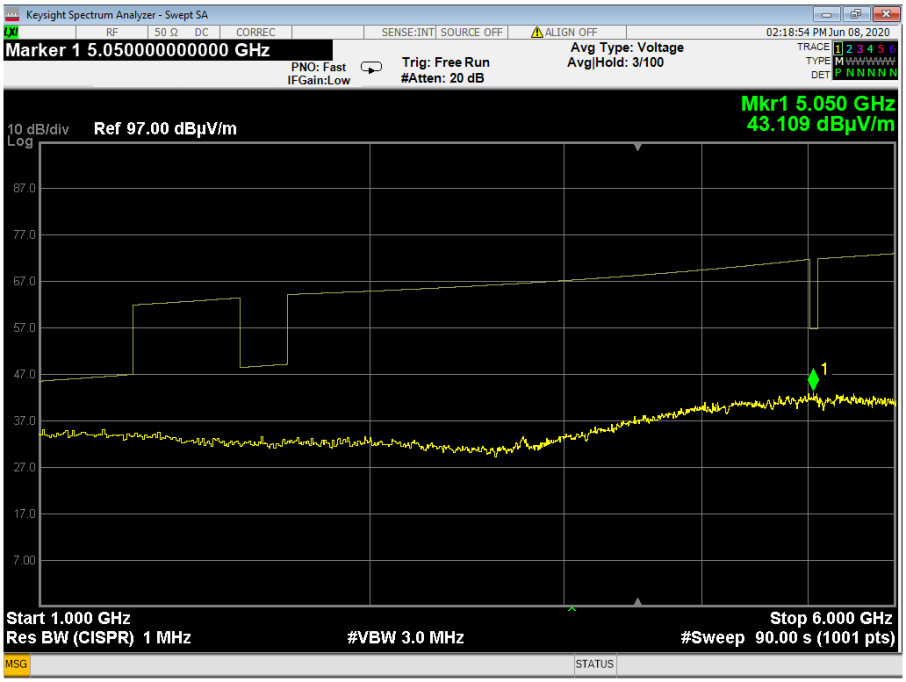
RE ambient noise within 1000 – 6000 MHz, horizontal polarization



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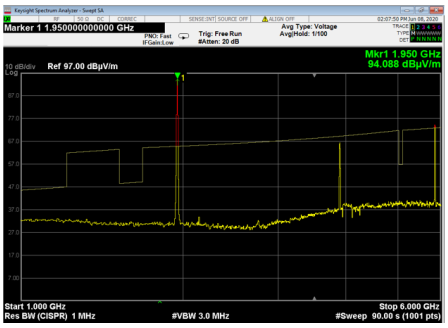
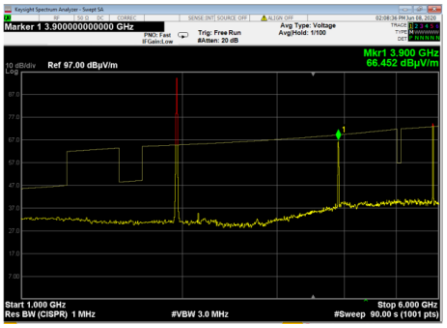
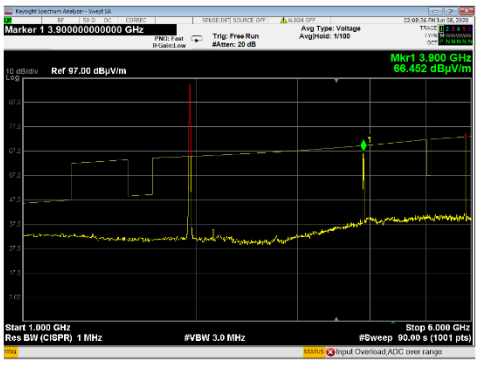
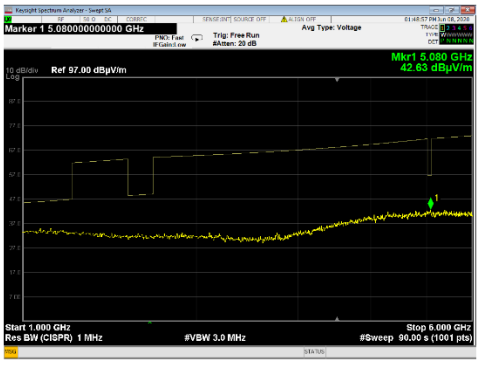
RE test results within 1000 – 6000 MHz, horizontal polarization Transmit mode









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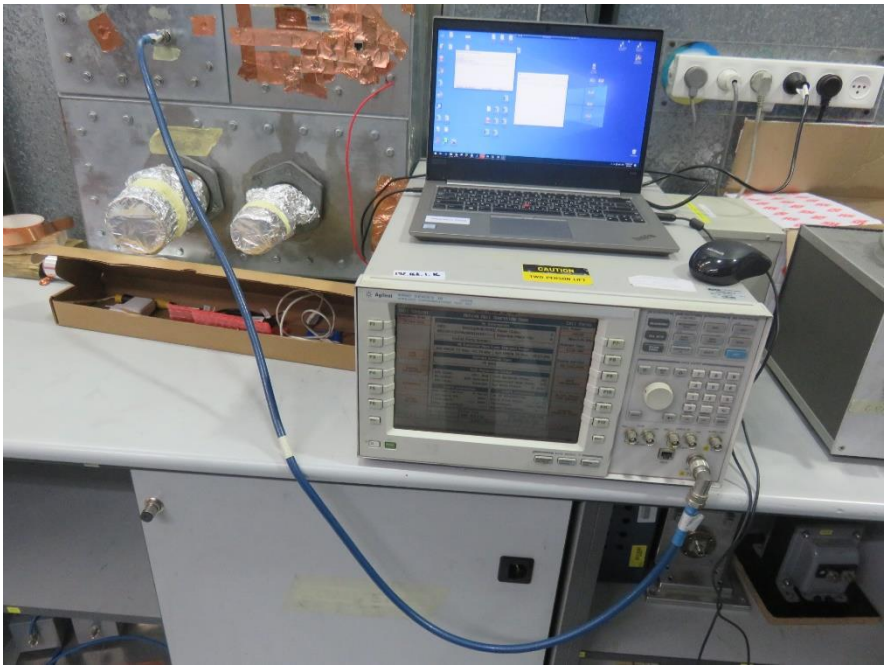
Appendix B: Additional test photographs

Photograph 1:Auxiliary Set Up



Photograph 2:Cellular Base station

Appendix C: List of test equipment used

Description	Manufacturer	Model	Serial No.	Cal Due
EMC Analyzer	Agilent	E7405A	US41160436	04/09/2020
Current Probe	FCC	F-35A	44	10/10/2020
Biconical Antenna 30MHz to 300MHz	Schwarzbeck	VHBB 9124	9124-595	21/04/2022
Double Ridged antenna 200 MHz -1 GHz	EMCO	3106	62700	16/11/2020
Horn Antenna (EMM) 1-18GHz	A.R.A	DRG-118/A	17188	17/09/2020
Low-Noise Amplifier 1GHz to 18GHz	MITEQ	AMF-5D-010180-30-10P-GW	618653	31/09/2020
LISN-Automotive	Schwarzbeck	NNBM 8124	8124-223	16/09/2020
LISN-Automotive	Schwarzbeck	NNBM 8124	8124-648	16/09/2020

Appendix D: 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 17025:2017 *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 April 2017*).

Presented this 31st day of May 2018.

President and CEO
For the Accreditation Council
Certificate Number 1633.01
Valid to October 31, 2020
Revised June 2, 2020

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

End of the Test Report