EMC TEST REPORT

TEST STANDARD(S)	:	EN 301 489-1: V2.1.1 EN 301 489-3: V2.1.1 EN 301 489-17: V3.1.1 EN 301 489-52: V1.1.0
CLIENT / APPLICANT	:	Digital Matter SA (Pty) Ltd.
CLIENT ADDRESS	:	Ground Floor, Buffalo building The Oval Cnr. Meadowbrook Lane and Sloane Street Bryanston 2021
TEST SAMPLE (EUT)	:	Cellular Tracking Device
MODEL NUMBER	:	G120 4G
REPORT NUMBER	:	TRE00593-4/19
DATE ISSUED	:	12/09/2019
REVISION	:	1.0

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This test report was prepared by: ***Name:*** *CJ Deysel*
Title: *EMC Test Engineer*

This test report was approved by: ***Name:*** *R van den Berg*
Title: *Senior RF Engineer*

T0812

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DOCUMENT CONTROL

Revision	Date	Author	Pages affected	Change proposal
1.0	12/09/2019	CJ Deysel	All	N/A

TEST LABORATORY INFORMATION

Established in 2017, iSERT (Pty) Ltd. Provides EMC, RF & Safety testing services by our skilled Engineers. Our services employ a wide variety of advanced cutting-edge test equipment with one of the widest ranges of accredited standards in the country.

The site and apparatus are constructed in conformance with the requirements of CISPR 16-1-4, EN 50147-1 and other equivalent standards. The laboratory is compliant with the requirements of ISO/IEC 17025

It is our definite objective to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with the best EMC, RF & Safety services by knowledgeable and accommodating staff.

Our test site is located at 129 Khai-Apple street, Montana, Pretoria, South Africa 0186.

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DEFINITIONS & ACRONYMS

AE – Associated Equipment. Equipment needed to exercise and/or monitor the operation of the EUT.

AM – Amplitude Modulation

Antenna Port – Port, other than a broadcast receiver tuner port, for connection of an antenna used for intentional transmission and/or reception of radiated RF energy.

Broadcast Receiver Tuner Port – Port intended for the reception of a modulated RF signal carrying terrestrial, satellite and/or cable transmissions of audio and/or video broadcast and similar services.

Class A device – A device that is marketed for use in a commercial, industrial or business environment. A 'Class A' device should not be marketed for use by the general public. A 'Class A' device should contain the following warning in its user manual: "Warning: Operation of this equipment in a residential environment could cause radio interference."

Class B device – A device that is marketed for use in a residential environment and may also be used in a commercial, business or industrial environment. NOTE: A residential environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10m of the device concerned.

EMC – Electro-Magnetic Compatibility. The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

EMI – Electro-Magnetic Immunity. The ability to maintain a specified performance when the equipment is subjected to disturbance (unwanted) signals of specified levels.

EUT – Equipment Under Test. A device or system being evaluated for compliance that is representative of a product to be marketed.

ITE – Information Technology Equipment. Has a primary function of entry, storage, display, retrieval, transmission, processing, switching, or control of data and/or telecommunication messages and which may be equipped with one or more ports typically for information transfer.

LISN – Line Impedance Stabilization Network

NA – Not Applicable

NCR – No Calibration Required

NSA – Normalized Site Attenuation

Optical Fiber Port – Port at which an optical fiber is connected to an equipment.

RF – Radio Frequency

Signal/Control Port – Port intended for the interconnection of components of an EUT, or between an EUT and local AE and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it). (Examples include: RS-232, USB, HDMI, Fire Wire)

Wired Network Port – Point of connection for voice, data and signaling transfers intended to interconnect widely dispersed systems by direct connection to a single-user or multi-user communication network. (Examples include: CATV, PSTN, ISDN, xDSL, LAN and similar networks)

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1. INTRODUCTION

This report details the results of tests performed on the Digital Matter SA G120 4G Cellular Tracking device with model number: G120 4G. The testing was carried out between 11/09/2019 and 12/09/2019 at the iSERT laboratory. Testing was conducted by Johan Deysel.

2. STANDARDS APPLIED

1. ETSI EN 301 489-1 V2.1.1 (2017-02) 'Electromagnetic compatibility and Radio Spectrum Matters (ERM)
2. ETSI EN 301 489-3 V2.1.1 (2013-06) 'Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz'
3. ETSI EN 301 489-17 V3.1.1 (2017-02).'Specific conditions for Broadband data transmissions systems'
4. ETSI EN 301 489-52 V1.1.0 (2016-11) 'Specific conditions for Cellular Communications Mobile and portable (UE) radio and ancillary equipment.

3. SUMMARY OF TEST RESULTS

Test Standard	Description	Results
EN 55032 / CISPR 32	Radiated emissions	✓
EN 55032 / CISPR 32	Conducted emissions – DC Input	✓
EN / IEC 61000-4-2	Immunity to Electrostatic discharge	✓
EN / IEC 61000-4-3	Immunity to Radiated Electromagnetic Fields	✓
EN / IEC 61000-4-4	Immunity to Electrical Fast Transient	✓
EN / IEC 61000-4-6	Immunity to Conducted Disturbances	✓

4. CONCLUSION

Based on the results of our investigation, we have concluded that the EUT (in the configuration tested) complies with the requirements of the standard(s) indicated above. The results obtained in this test report are only valid for the item(s) tested. iSERT (Pty) Ltd. does not make any claims of compliance for samples or variants which were not tested.

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5. EMISSION CLASSES AND IMMUNITY CRITERIA

5.1 EMISSIONS

CISPR 32 / EN 55032 defines Class A equipment and Class B associated with two types of end-user environment.

The Class B requirements for equipment are intended to offer adequate protection to broadcast services within the residential environment.

Equipment intended primarily for use in a residential environment shall meet the Class B limits. All other equipment shall comply with the Class A limits.

Broadcast receiver equipment is class B equipment.

NOTE: Equipment meeting Class A requirements may not offer adequate protection to broadcast services within a residential environment.

Class A equipment shall have the following warning in the instructions for use, to inform the user of the risk of operating this equipment in a residential environment:

Warning:

This equipment is compliant with Class A of CISPR 32 / EN 55032. In a residential environment this equipment may cause interference

5.2 IMMUNITY

Description of performance criteria:

A: No loss of performance or function

B: Temporary loss of function or performance which is self-recoverable

C: Temporary loss of function or performance which requires operator intervention or system reset

D: Loss of function which is not recoverable

5.2.1 Classification of SRD equipment

The product family of short-range devices is divided by device type, each having its own set of performance criteria. This classification is based upon the impact on persons and / or goods in case the equipment does not operate above the specified performance level under EMC stress.

Device type	Risk assessment of communication link performance
1.	Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person)
2.	Medium reliable SRD communications media; e.g. causing inconvenience to persons, Which cannot simply be overcome by other means
3.	Standard reliable SRD communication media; e.g. inconvenience to persons, which Can simply be overcome by other means (e.g. manual)

5.3 ENVIRONMENTAL CONDITIONS DURING ESD TEST:

Temperature	Relative Humidity
23°C	38%

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5.4 CALIBRATION OF TEST EQUIPMENT

The computer-controlled EMI Measuring system is checked for amplitude and frequency accuracy with a signal generator (calibrated by a SANAS accredited laboratory and is traceable to the national standards maintained by NMISA) on a monthly basis. The calibration of the equipment is performed by Coral-i and Enterprise, University of Pretoria. All equipment Calibration Certificates are available on request.

5.5 MEASUREMENT OF UNCERTAINTY

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

Measurement Uncertainty		
Test Item	**Frequency**	**Uncertainty (dB)**
Conducted Emissions from the AC mains power ports	150kHz – 30MHz	3.4
Radiated Emissions - Horizontal	> 200 MHz	4.84
	< 200 MHz	4.84
Radiated Emissions - Vertical	> 200 MHz	4.96
	< 200 MHz	5.16

5.5.1 Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG

Where: FS = Field Strength in dBµV/m
RA = Receiver Amplitude (including preamplifier) in dBµV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBµV/m.

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6. EQUIPMENT UNDER TEST

EUT name:	G120 4G
Cellular Module:	UBlox SARA-R410M-02B-01
GPS Module:	UBlox EVA-M8Q
Bluetooth Module:	Silicon labs - BGM13P22F512GA-V2
Serial number:	None provided
Highest internal frequency:	1800MHz

6.1 EUT TEST SETUP DETAIL AND OPERATING CONDITION

The specific test methodology will be discussed under each relevant test if different to the general set-up guidelines below.

1. The EUT was switched on and operated in accordance with the manufacturer instructions.
2. Tests were performed while the device was fully operational.
3. Deviations from the above set-up will be noted in each specific case.

6.2 WORST CASE MEASUREMENT CONFIGURATION

The EUT was tested in the following modes of operation:

Radiated, Conducted Emissions & Immunity	
Test Mode	**Operating description**
1.	The EUT was tested while supplied with a 12Vdc and 24Vdc batteries for all tests. The GPS function of the EUT was exercised by the use of a GPS re-radiator. The EUT was connected to a Rohde & Schwartz CMW 500 base station simulator. The EUT was closely monitored for signs of susceptibility.

6.3 DEVICE IMAGES

Figures 1 & 2: G120 4G top and bottom view.

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6.4 TEST EQUIPMENT LIST

No.	Equipment description	Serial number	Cal Due date
1.	California Instruments Model 4503L AC Power system	HK50775	July 2020
2.	Bulk Current Injection Probe CLCI-100	581149	July 2022
3.	RF Current Injection Probe	561383	July 2022
4.	M2 & M3 Coupling / de-Coupling Network CDN-M325E	521169	July 2022
5.	Telecommunications Coupling / de-Coupling Network CDN-T8SE	511434	July 2022
6.	Combilog Antenna AC-200	061128	July 2022
7.	TESEQ NSG 3040 EMC Immunity Test System	6074	October 2019
8.	TESEQ CDN 3425 Capacitive clamp	3082	June 2020
9.	TESEQ NSG 435 ESD Gun	7184	August 2020
10.	RS Pro ICM 33II Clamp meter	74700018	May 2021
11.	Agilent 83620B Signal Generator (10MHz – 20GHz)	98091	September 2019
12.	Rohde & Schwarz Universal communication tester – CMU200	103025	September 2020
13.	Rohde & Schwarz Wideband Radio Communication Tester – CMW500	112781	August 2020
14.	Rohde & Schwarz SML02 Signal generator	100679	October 2019
15.	Narda EP-600 Electric Field probe	611WX70397	Inter-laboratory comparison
16.	AFJ LISN LS16C\10	16011850466	Inter-laboratory comparison
17.	Thurlby Thandar HA1600A Power & harmonics analyzer	479560	August 2020
18.	AH Systems SAS-571	2455	March 2021
19.	Kalmus 757LC 75Watt Amplifier (10kHz – 1GHz)	7591	No calibration required
20.	Fluke 115 Multi-meter	3451488WS	October 2019
21.	AFJ FFT3010 EMI analyzer	301017460136	May 2020
22.	Keysight N9020A EMI Signal analyzer: ATO-8599	MY52330018	May 2020
23.	Flus Humidity and temperature meter: ET-951W	2015106449	November 2019

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7. EMISSIONS

7.1 RADIATED EMISSIONS:

Method: Measurements were made in an 8-meter fully anechoic chamber that complies to CISPR 16. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3 meters. The limit line was adjusted accordingly. The EUT was rotated 360° about its azimuth with the receive antenna located at a fixed height in horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360°. All frequencies within 10 dB of the limit were investigated in both horizontal and vertical antenna polarity, where applicable.

7.1.1 Test set-up

a. The EUT was tested within its intended operating conditions as specified by the manufacturer.
b. Automated scans in the frequency band 30MHz to 6000MHz (radiated emissions) were done in order to determine compliance emission results for the EUT.
c. The EUT was tested in both horizontal and vertical polarizations.
d. The EUT was tested while in connected to a base station simulator.

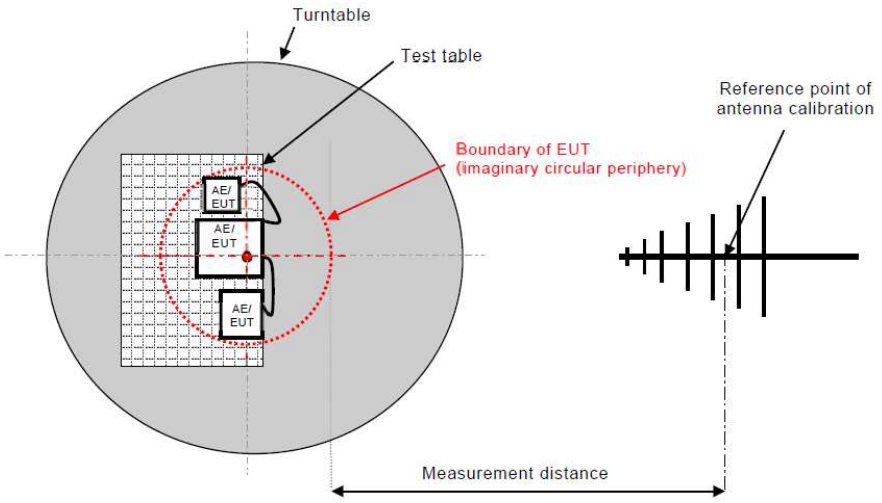

Figure 3: Typical Radiated emissions setup

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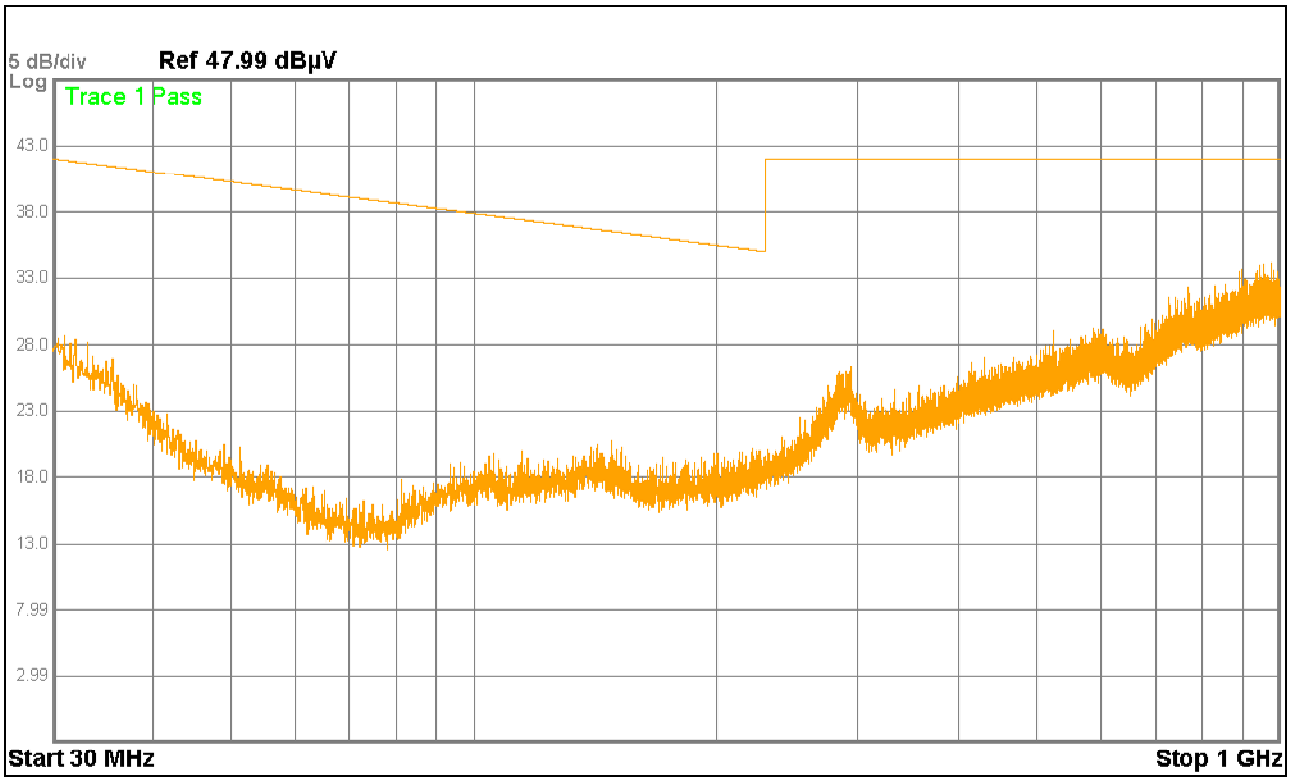
7.1.2 Radiated Emission: 30MHz– 1000MHz

Graph 1: Represents radiated emissions measured from the EUT in the horizontal polarization



Graph 1: Radiated emissions results

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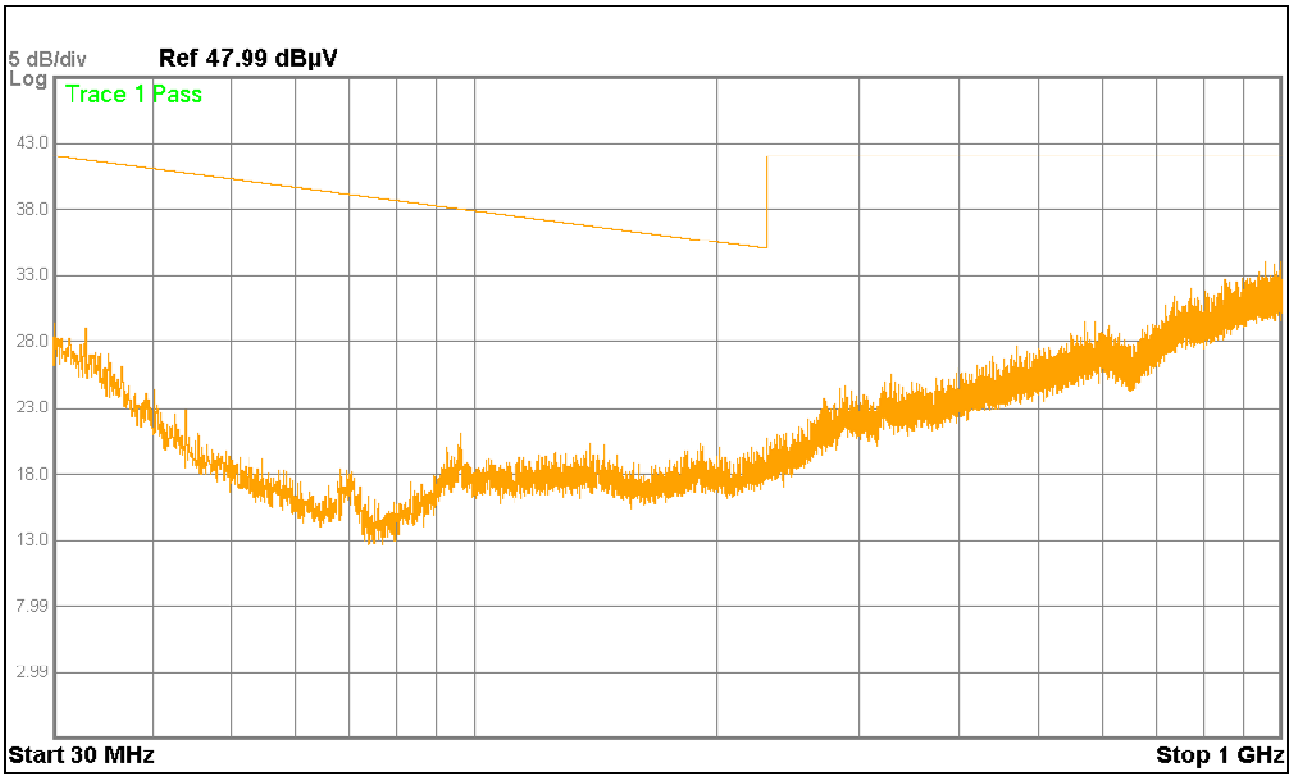
7.1.3 Radiated Emission: 30MHz – 1000MHz

Graph 2: Represents radiated emissions measured from the EUT in the vertical polarization.



Graph 2: Radiated emissions results

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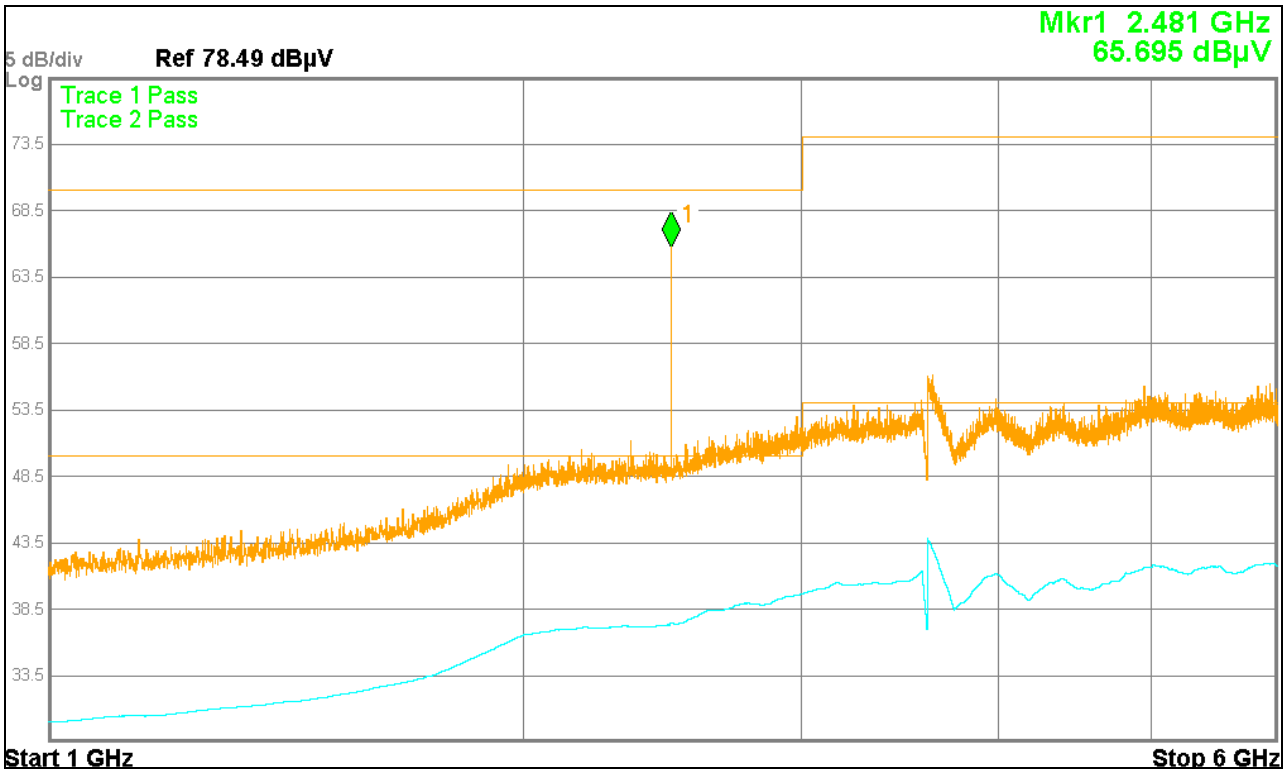
7.1.4 Radiated Emission: 1000MHz – 6000MHz

Graph 3: Represents peak and average radiated emissions measured from the EUT in the Horizontal polarization.



Graph 3: Radiated emissions results

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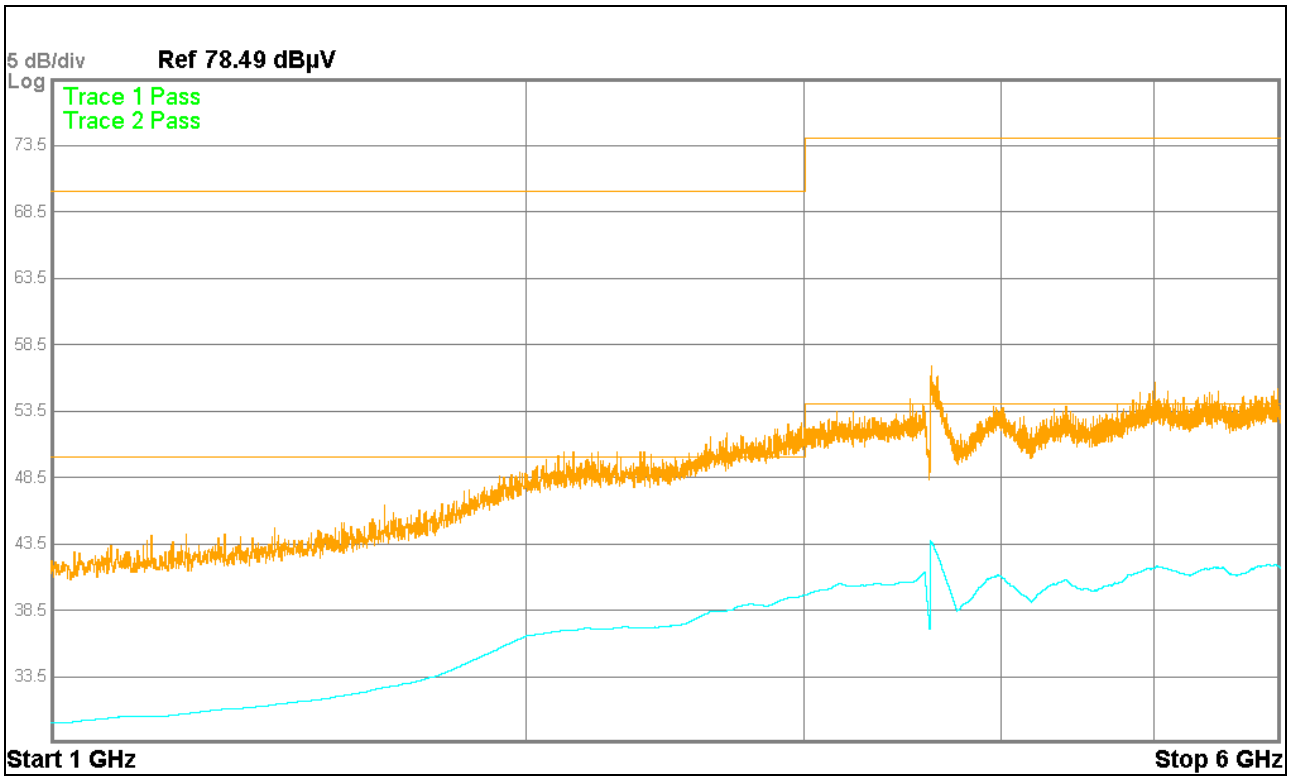
7.1.5 Radiated Emission: 1000MHz – 6000MHz

Graph 4: Represents peak and average radiated emissions measured from the EUT in the vertical polarization



Graph 4: Radiated emissions results

7.1.6 Conclusion

- The EUT complies with the radiated emissions requirements of EN 55032 / CISPR 32.

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7.2 CONDUCTED EMISSIONS:

Method: The LISN was placed 0.8m from the boundary of the unit under test and bonded to a ground reference plane. This distance was the closest points of the LISN and the EUT. All other parts of the EUT and associated equipment were at least 0.8m from the LISN. The input power of the EUT was connected to the system through a LISN. Conducted voltage measurements on the mains lines were made at the output of the LISN. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurements with the average detector is unnecessary.

7.2.1 Test set-up

a. The EUT was tested within its intended operating conditions as specified by the manufacturer.
b. Automated scans in the frequency band 150kHz to 30MHz (radiated emissions) were done in order to determine compliance emissions results for the EUT.
c. Conducted emissions were tested while the EUT was supplied with 12Vdc and 24Vdc.
d. Both side of the power line were checked for maximum conducted interference.

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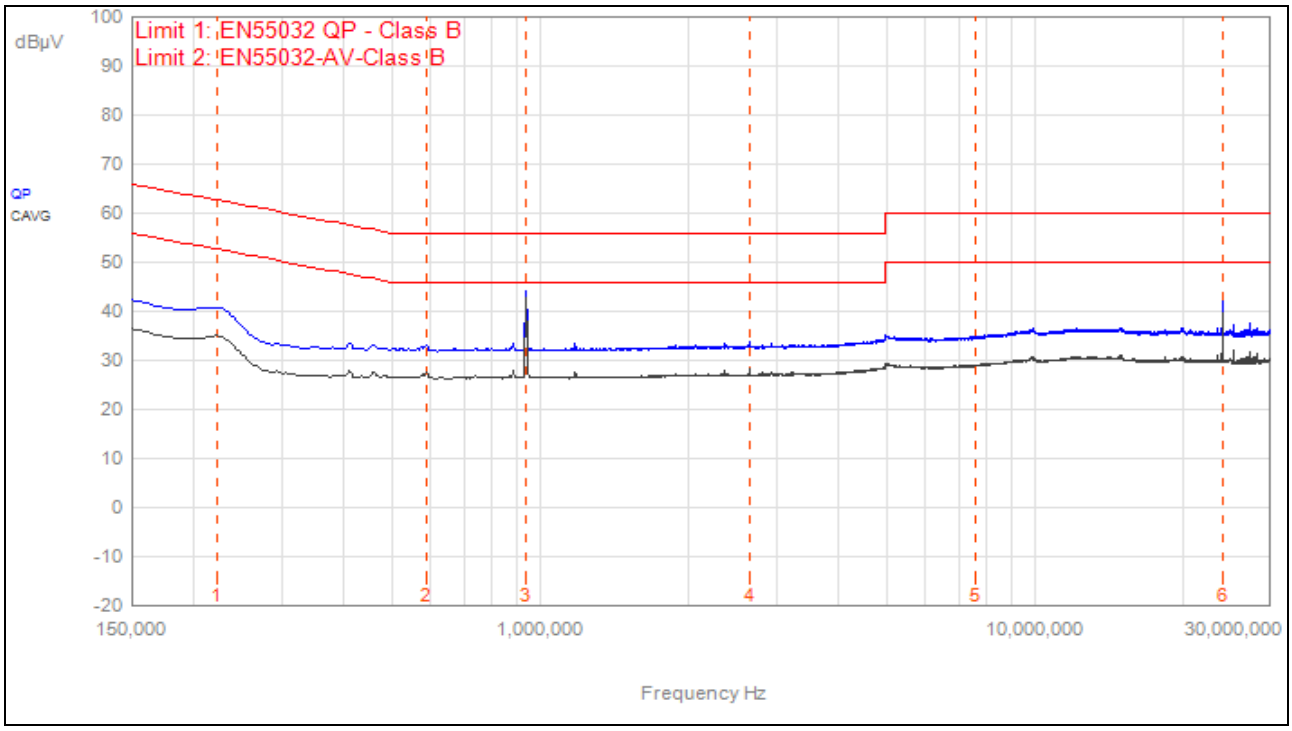
7.2.2 DC Input – Positive (12Vdc)

Graph CE1: peak and Average Conducted emissions measured on the Positive lead of the EUT was below the Class B quasi peak and Average limit.



ID.	Frequency (MHz)	Detector	Measured Level (dBµV)	Limit (dBµV)	Δ Limit (dB)
1	222kHz	QPeak	40.8	Lim1 62.7 Lim2 52.7	Lim1 -21.9 Lim2 -11.9
2	591kHz	QPeak	33.0	Lim1 56.0 Lim2 46.0	Lim1 -23.0 Lim2 -13.0
3	939kHz	QPeak	44.0	Lim1 56.0 Lim2 46.0	Lim1 -12.0 Lim2 -2.0
4	2.655MHz	QPeak	33.8	Lim1 56.0 Lim2 46.0	Lim1 -22.2 Lim2 -12.2
5	7.602MHz	QPeak	34.8	Lim1 60.0 Lim2 50.0	Lim1 -25.2 Lim2 -15.2
6	24.033MHz	QPeak	42.2	Lim1 60.0 Lim2 50.0	Lim1 -17.8 Lim2 -7.8
1	222kHz	C_AVG	35.1	Lim1 62.7 Lim2 52.7	Lim1 -27.7 Lim2 -17.7
2	591kHz	C_AVG	27.5	Lim1 56.0 Lim2 46.0	Lim1 -28.5 Lim2 -18.5
3	939kHz	C_AVG	42.9	Lim1 56.0 Lim2 46.0	Lim1 -13.1 Lim2 -3.1
4	2.655MHz	C_AVG	28.2	Lim1 56.0 Lim2 46.0	Lim1 -27.8 Lim2 -17.8
5	7.602MHz	C_AVG	28.9	Lim1 60.0 Lim2 50.0	Lim1 -31.1 Lim2 -21.1
6	24.033MHz	C_AVG	39.7	Lim1 60.0 Lim2 50.0	Lim1 -20.3 Lim2 -10.3

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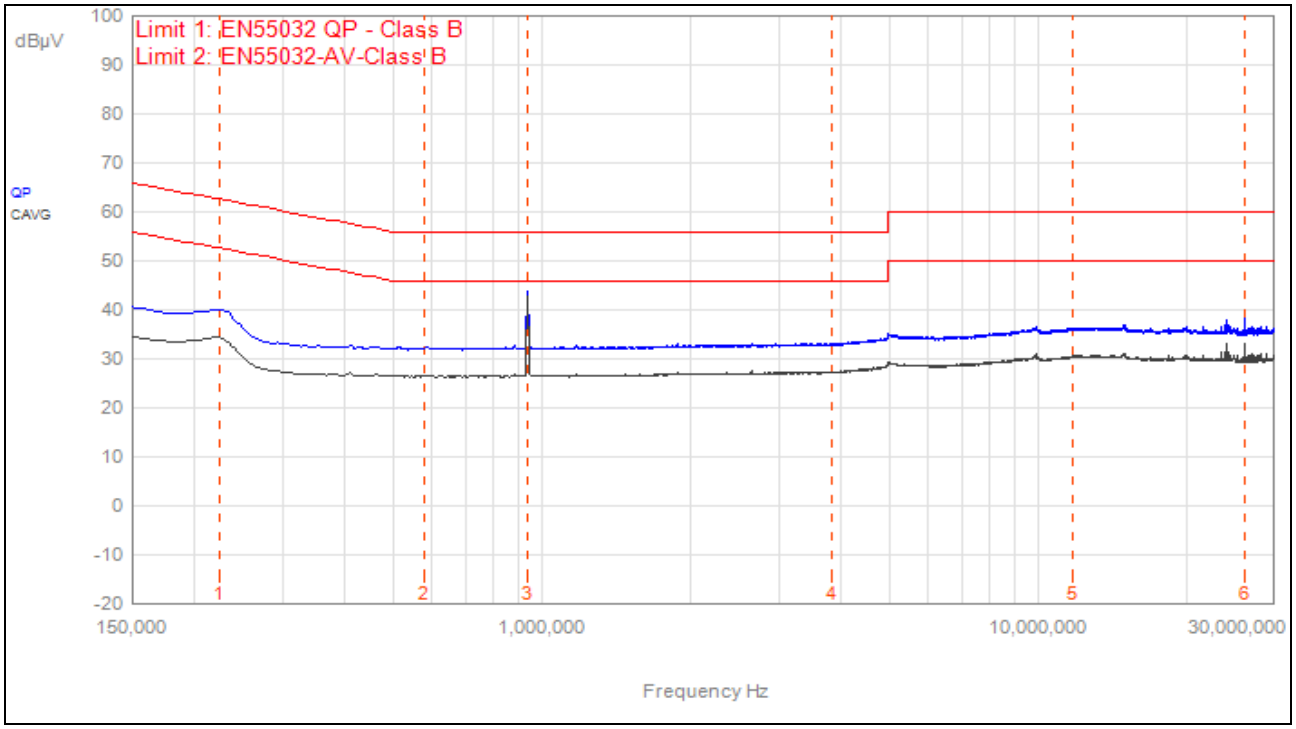
7.2.3 DC Input – Negative (12Vdc)

Graph CE2: Peak and Average Conducted emissions measured on the Negative lead of the EUT was below the Class B quasi peak and Average limit.



ID.	Frequency (MHz)	Detector	Measured Level (dBµV)	Limit (dBµV)	Δ Limit (dB)
1	225kHz	QPeak	40.1	Lim1 62.6 Lim2 52.6	Lim1 -22.5 Lim2 -12.5
2	579kHz	QPeak	32.2	Lim1 56.0 Lim2 46.0	Lim1 -23.8 Lim2 -13.8
3	939kHz	QPeak	43.9	Lim1 56.0 Lim2 46.0	Lim1 -12.1 Lim2 -2.1
4	3.852MHz	QPeak	33.1	Lim1 56.0 Lim2 46.0	Lim1 -22.9 Lim2 -12.9
5	11.799MHz	QPeak	36.3	Lim1 60.0 Lim2 50.0	Lim1 -23.7 Lim2 -13.7
6	26.289MHz	QPeak	38.4	Lim1 60.0 Lim2 50.0	Lim1 -21.6 Lim2 -11.6
1	225kHz	C_AVG	34.4	Lim1 62.6 Lim2 52.6	Lim1 -28.2 Lim2 -18.2
2	579kHz	C_AVG	26.6	Lim1 56.0 Lim2 46.0	Lim1 -29.4 Lim2 -19.4
3	939kHz	C_AVG	42.8	Lim1 56.0 Lim2 46.0	Lim1 -13.2 Lim2 -3.2
4	3.852MHz	C_AVG	27.3	Lim1 56.0 Lim2 46.0	Lim1 -28.7 Lim2 -18.7
5	11.799MHz	C_AVG	30.4	Lim1 60.0 Lim2 50.0	Lim1 -29.6 Lim2 -19.6
6	26.289MHz	C_AVG	33.2	Lim1 60.0 Lim2 50.0	Lim1 -26.8 Lim2 -16.8

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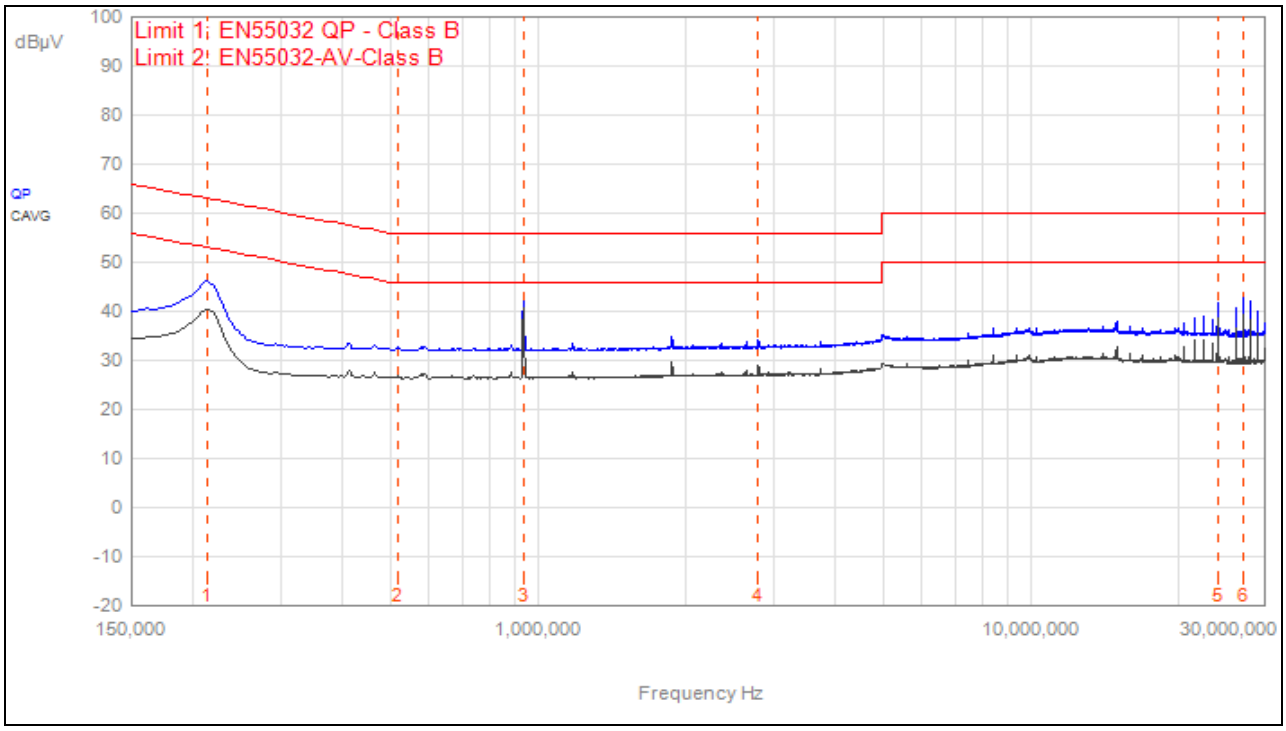
7.2.4 DC Input – Positive (24Vdc)

Graph CE3: peak and Average Conducted emissions measured on the Positive lead of the EUT was below the Class B quasi peak and Average limit.



ID.	Frequency (MHz)	Detector	Measured Level (dBµV)	Limit (dBµV)	Δ Limit (dB)
1	213kHz	QPeak	46.1	Lim1 63.1 Lim2 53.1	Lim1 -16.9 Lim2 -6.9
2	522kHz	QPeak	32.6	Lim1 56.0 Lim2 46.0	Lim1 -23.4 Lim2 -13.4
3	936kHz	QPeak	42.2	Lim1 56.0 Lim2 46.0	Lim1 -13.8 Lim2 -3.8
4	2.811MHz	QPeak	34.3	Lim1 56.0 Lim2 46.0	Lim1 -21.7 Lim2 -11.7
5	24.030MHz	QPeak	40.3	Lim1 60.0 Lim2 50.0	Lim1 -19.7 Lim2 -9.7
6	27.162MHz	QPeak	41.2	Lim1 60.0 Lim2 50.0	Lim1 -18.8 Lim2 -8.8
1	213kHz	C_AVG	40.5	Lim1 63.1 Lim2 53.1	Lim1 -22.6 Lim2 -12.6
2	522kHz	C_AVG	26.7	Lim1 56.0 Lim2 46.0	Lim1 -29.3 Lim2 -19.3
3	936kHz	C_AVG	40.8	Lim1 56.0 Lim2 46.0	Lim1 -15.2 Lim2 -5.2
4	2.811MHz	C_AVG	29.0	Lim1 56.0 Lim2 46.0	Lim1 -27.0 Lim2 -17.0
5	24.030MHz	C_AVG	36.8	Lim1 60.0 Lim2 50.0	Lim1 -23.2 Lim2 -13.2
6	27.162MHz	C_AVG	36.1	Lim1 60.0 Lim2 50.0	Lim1 -23.9 Lim2 -13.9

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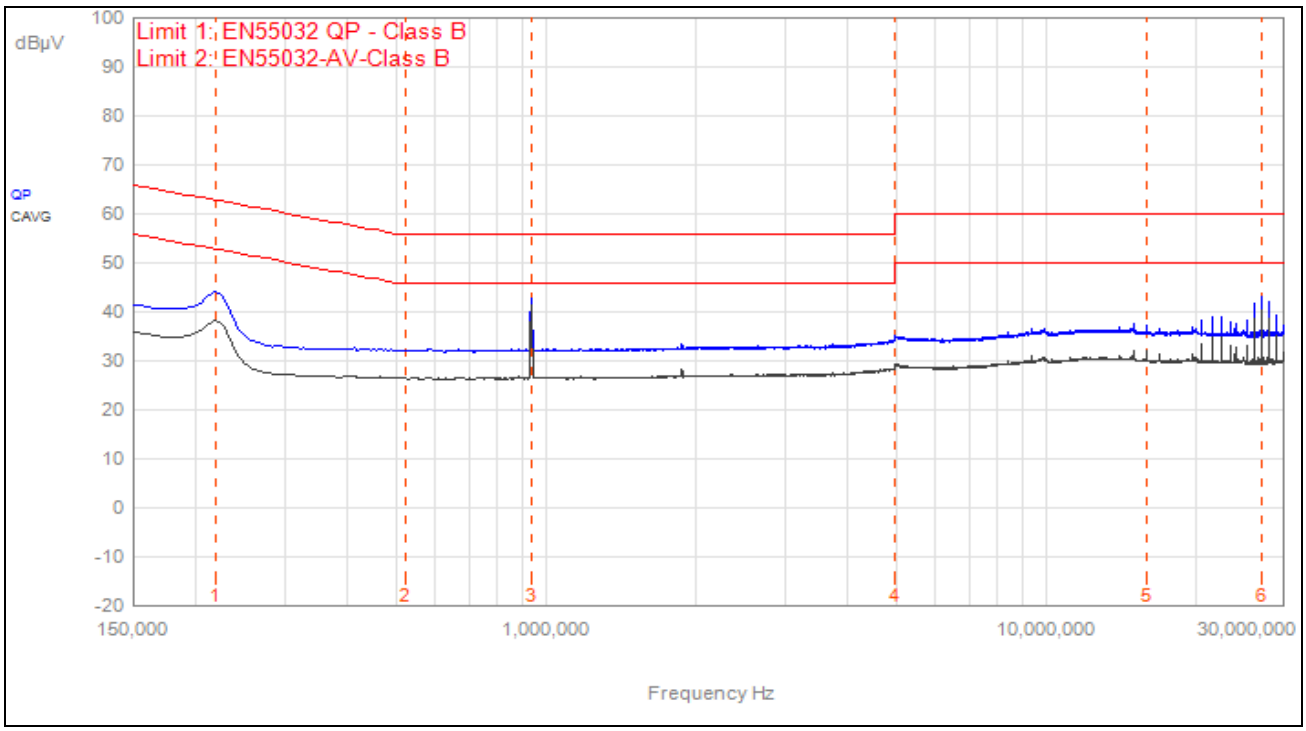
7.2.5 DC Input – Negative (24Vdc)

Graph CE4: Peak and Average Conducted emissions measured on the Negative lead of the EUT was below the Class B quasi peak and Average limit.



ID.	Frequency (MHz)	Detector	Measured Level (dBµV)	Limit (dBµV)	Δ Limit (dB)
1	219kHz	QPeak	44.0	Lim1 62.9 Lim2 52.9	Lim1 -18.8 Lim2 -8.8
2	525kHz	QPeak	32.2	Lim1 56.0 Lim2 46.0	Lim1 -23.8 Lim2 -13.8
3	939kHz	QPeak	42.7	Lim1 56.0 Lim2 46.0	Lim1 -13.3 Lim2 -3.3
4	5.010MHz	QPeak	35.0	Lim1 60.0 Lim2 50.0	Lim1 -25.0 Lim2 -15.0
5	15.936MHz	QPeak	37.3	Lim1 60.0 Lim2 50.0	Lim1 -22.7 Lim2 -12.7
6	27.183MHz	QPeak	43.2	Lim1 60.0 Lim2 50.0	Lim1 -16.8 Lim2 -6.8
1	219kHz	C_AVG	38.2	Lim1 62.9 Lim2 52.9	Lim1 -24.6 Lim2 -14.6
2	525kHz	C_AVG	26.4	Lim1 56.0 Lim2 46.0	Lim1 -29.6 Lim2 -19.6
3	939kHz	C_AVG	41.4	Lim1 56.0 Lim2 46.0	Lim1 -14.6 Lim2 -4.6
4	5.010MHz	C_AVG	29.3	Lim1 60.0 Lim2 50.0	Lim1 -30.7 Lim2 -20.7
5	15.936MHz	C_AVG	31.9	Lim1 60.0 Lim2 50.0	Lim1 -28.1 Lim2 -18.1
6	27.183MHz	C_AVG	40.2	Lim1 60.0 Lim2 50.0	Lim1 -19.8 Lim2 -9.8

7.2.6 Conclusion

- The EUT complies with the conducted emissions requirements of the standard.

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8. IMMUNITY

8.1 EN / IEC 61000-4-2: ESD IMMUNITY

Method: The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The table top equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP), 1.6 x 0.8 m, is placed on the table. The EUT and the cables are isolated from the coupling plane by an insulating support 0.5 mm thick. The floor standing equipment is isolated from the ground reference plane by an insulating support about 0.1 m thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT.

8.1.1 Set-up

a. The EUT was tested within its intended operating conditions as specified by the manufacturer.
b. The EUT was tested as tabletop equipment.

Figures 4 & 5: ESD discharge application points

8.1.2 Results

Discharge Point	Contact discharge voltage	Discharges	Result	Criteria
HCP	± 4kV	10	No effect	A
VCP	± 4kV	10	No effect	A
C1 – C8	± 4kV	10	No effect	A
Discharge Point	**Air discharge voltage**	**Discharges**	**Result**	**Criteria**
A1 – A4	± 8kV	10	No effect	A
A5 – A7	± 8kV	10	No effect	A

8.1.3 Performance criteria

A: No loss of performance or function
B: Temporary loss of function or performance which is self-recoverable
C: Temporary loss of function or performance which requires operator intervention or system reset

Note 1: The EUT was unaffected by the applied ESD pulses.

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8.2 EN / IEC 61000-4-3: RADIATED IMMUNITY

Method: The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80MHz to 6000MHz. The interference is applied on the enclosure of the equipment by using transmitting antennas that was placed 3m from the front of the EUT and support system.

8.2.1 Set-up

a. The EUT was tested within its intended operating conditions as specified by the manufacturer.
b. The signal source was stepped through the applicable frequency range at a rate of 1% of the fundamental. The dwell time was set to 1 second.
c. The 1kHz sine wave was amplitude modulated to a depth of 80% over the entire frequency band.
d. The EUT was connected to a Rohde & Schwartz CMU 200 base station simulator.
e. The EUT was closely monitored for signs of susceptibility during testing.

8.2.2 Results

EUT Position	Frequency (MHz)	Polarization	Level (V/m)	Result	Criterion
Front	80 – 1000	H	3	Pass	A
		V	3	Pass	A
Left	80 – 1000	H	3	Pass	A
		V	3	Pass	A
Right	80 – 1000	H	3	Pass	A
		V	3	Pass	A
Rear	80 – 1000	H	3	Pass	A
		V	3	Pass	A

EUT Position	Frequency (GHz)	Polarization	Level (V/m)	Result	Criterion
Front	1 - 6	H	3	Pass	A
		V	3	Pass	A
Left	1 - 6	H	3	Pass	A
		V	3	Pass	A
Right	1 - 6	H	3	Pass	A
		V	3	Pass	A
Rear	1 - 6	H	3	Pass	A
		V	3	Pass	A

8.2.3 Performance criterion

A: No loss of performance or function
B: Temporary loss of function or performance which is self-recoverable
C: Temporary loss of function or performance which requires operator intervention or system reset

Note 1: The EUT was unaffected by the applied RF between 80 – 6000MHz

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8.3 EN / IEC 61000-4-4 FAST TRANSIENT IMMUNITY

Method: Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. Mains power tests were conducted with the product connected to a Coupling/Decoupling Network (CDN). I/O lines were tested in a Capacitive Coupling Clamp. One of each unique interface was tested for a period of one (1) minute per polarity.

8.3.1 Set-up and levels

a. The EUT was tested within its intended operating conditions as specified by the manufacturer.
a. The EUT was supplied with the required voltage and subjected to a direct injected 5 kHz repetition rate 5/50nS wave interference signal.
b. The EUT was tested as table top equipment.

DC Power Port

Injection Method	Voltage	Repetition rate	Result
Positive to Negative	+1kV	5kHz	No Effect
	-1kV	5kHz	No Effect
Positive and Negative to Ground reference	+1kV	5kHz	No Effect
	-1kV	5kHz	No Effect

I/O Ports

Injection Method	Voltage	Repetition rate	Result
Harness	+0.5kV	5 / 100kHz	No Effect
	-0.5kV	5 / 100kHz	No Effect

8.3.2 Performance criterion

A: No loss of performance or function
B: Temporary loss of function or performance which is self-recoverable
C: Temporary loss of function or performance which requires operator intervention or system reset

Note 1: The EUT was unaffected by the applied fast transients.

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8.4 EN / IEC 61000-4-6 CONDUCTED IMMUNITY

Method: Measurements were made on a ground plane that extends at least 0.5-meter minimum beyond all sides of the system under test. The EUT was located 10cm above the reference ground plane and any associated I/O cables attached to the EUT were located between 30mm and 50mm above the ground plane. The indicated field was pre-calibrated prior to placement of the system under test.

8.4.1 Set-up and Test Levels

a. The EUT was tested within its intended operating conditions as specified by the manufacturer.
b. The signal source was stepped through 150kHz to 80MHz at a rate of 1% of the fundamental.
c. The 1kHz sine wave was amplitude modulated to a depth of 80% over the entire frequency band.
d. The EUT was closely monitored for signs of susceptibility during testing.

8.4.2 Result

Injection line	Coupling method	Voltage (Vrms)	Dwell time (s)	Result	Criterion
DC Input	BCI	3	1	Pass	A
Harness	BCI	3	1	Pass	A

8.4.3 Performance criteria

A: No loss of performance or function
B: Temporary loss of function or performance which is self-recoverable
C: Temporary loss of function or performance which requires operator intervention or system reset

Note 1: The EUT was unaffected by the interfering signal.

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9. APPENDIX A: NORMATIVE REFERENCES

1. ETSI EN 301 489-1 V2.1.1 (2017-02) ‘Electromagnetic compatibility and Radio Spectrum Matters (ERM)

2. ETSI EN 301 489-3 V2.1.1 (2013-06) 'Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz'

3. ETSI EN 301 489-17 V3.1.1 (2017-02).'Specific conditions for Broadband data transmissions systems'

4. ETSI EN 301 489-52 V1.1.0 (2016-11) 'Specific conditions for Cellular Communications Mobile and portable (UE) radio and ancillary equipment.

5. EN 55032 (2015) / CISPR 32 (2015): ‘Electromagnetic compatibility of multimedia equipment – Emissions requirements

6. EN 61000-4-2 (2009) / IEC 61000-4-2 (2008): Testing and measurement techniques – Electrostatic discharge immunity test

7. EN 61000-4-3 (2006+A2:2010) / IEC 61000-4-3 (2006+A1:2007+A2:2010): Testing and measurement techniques –Radiated, radio-frequency, electromagnetic field immunity test

8. EN 61000-4-4 (2012) / IEC 61000-4-4 (2012): Testing and measurement techniques – Electrical Fast Transient / Burst

9. EN 61000-4-6 (2014) / IEC 61000-4-6 (2013): Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

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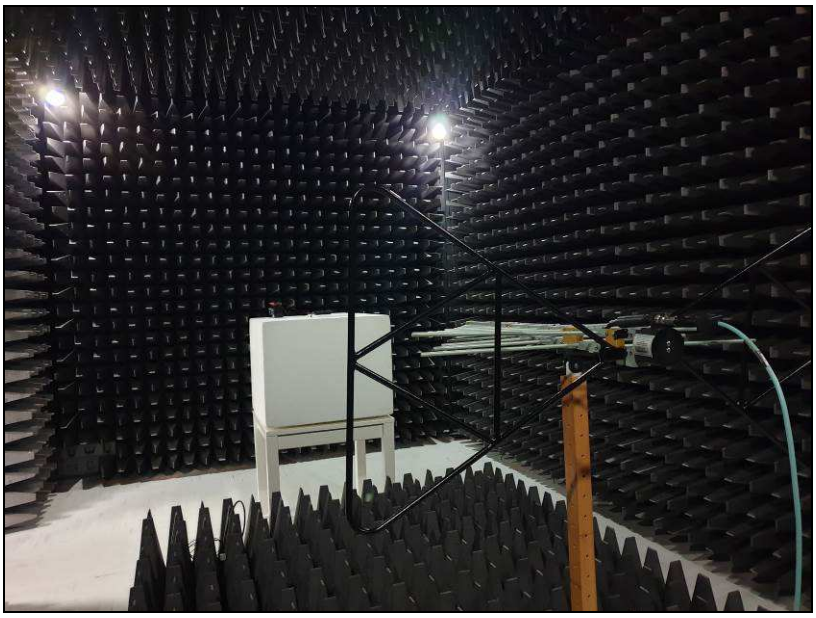
10. APPENDIX B: Test images



EN 55032 / CISPR 32: Radiated emissions test set-up

EN / IEC 61000-4-2: ESD immunity test set-up

*** END OF REPORT ***

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