




Test Report

Electromagnetic Compatibility

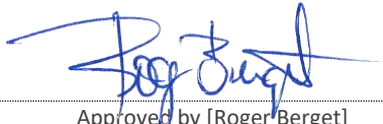
Product	Electronic Control Unit for Vehicle Integration
Name and address of the applicant	CPAC Systems AB Bergskroken 3 431 37 Mölndal, Sweden
Name and address of the manufacturer	CPAC Systems AB Bergskroken 3 431 37 Mölndal, Sweden
Model	SID 2.0MLTE
Rating	External power: 8 – 32 VDC Max power 12 VDC, 15 A and 24 VDC, 10 A
Trademark	CPAC Systems AB
Additional information	GSM UMTS, LTE, Ethernet LAN, Wifi, Bluetooth, GNSS, AM/FM/DAB, CAN, LIN FCC ID: AHV-SID2MLTE
Tested according to	FCC CFR 47 Subpart 15B
Project number	PRJ0035685
Tested in period	2023-08-14 to 2023-08-21
Issue date	2023-09-08
Name and address of the testing laboratory	Nemko Scandinavia AS Philip Pedersens vei 11, 1366 Lysaker, Norway

An accredited technical test executed under the Norwegian accreditation scheme



Prepared by [Tore Løvlien]



Approved by [Roger Berget]

Nemko Group

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REPORT REVISIONS

Report Edition	Date	Project	Description
REP015741A	2023-09-08	PRJ0035685	First issued



THIS REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATION(S) TESTED.

It is the manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is responsible to the authorities for any modifications made to the product, which result in non-compliance to the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither is opinions expressed regarding model variants covered by the testing performed in this report.

Deviations from, additions to, or exclusions from the test specifications are described in "Test Report Summary".

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DESCRIPTION OF TESTED ITEM(S)

Product description.....:	The tested item is an electronic control unit for vehicle integration.
Model/type	SID 2.0MLTE
Serial number	/
Operating voltage.....:	12-24V DC
Maximum power/current.....:	15A-10A
Insulation class	II
Highest clock frequency	5GHz
Hardware version	P01
Software version	Hydra_BTSW_1.0 WLAN: Hydra_WLANSW_1.0 LTE: Hydra_LTESW_1.0
Mounting position.....:	<input type="checkbox"/> Tabletop equipment <input type="checkbox"/> Wall/ceiling mounted equipment <input type="checkbox"/> Floor standing equipment <input type="checkbox"/> Handheld equipment <input type="checkbox"/> Rack mounted equipment <input type="checkbox"/> Console equipment <input checked="" type="checkbox"/> Other: Will be used in vehicle and chassis mounted.

CRITICAL MODULES/PARTS

Description	Manufacturer	Type
LTE modem	Quectel	Quectel EG 25-G
Wifi/BT modem	ALPS Alpine	UGCZ1
Processor	Qualcomm	SA8155P

ACCESSORIES USED DURING TEST

Description	Manufacturer	Type
USB – Ethernet dongle, 1Gbps	TP Link	/
USB – Ethernet dongle, 100Mbps	TP Link	/
1 USB hub	ICY BOX	/
1 BRR interface	Technica	USB 100Base-T1 Converter
USB to CAN+LIN interface	PEAK System	PCAN.USB Pro
Antenna module	Hirschmann Car Communication GmbH	VOLVO 23311779
Computer with Python software	Windows 10 computer with CPAC SW	/

INPUT/OUTPUT PORTS

Port name and description	Cable		
	Longer than 3m	Attached during test	Shielded
DC mains supply, 24 V	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Gigabit ethernet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
100Mbps Ethernet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Wifi antenna port	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
LTE antenna port	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
FM/AM/DAB antenna port	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
GNSS antenna port	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2x LIN bus	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6x CAN bus	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3x BRR (Automotive ethernet, 100BASE-T1)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Line out	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Camera (GMSL)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Screen datalink (FPD)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Display/USB 3m USB-C	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

This equipment has been tested with certain cable types and cable configurations. Any changes to these parameters when installed may influence the EMC properties of this equipment.

OPERATING MODES

OP no.	Description	Applied for testing
OP1	Normal operation mode with CAN communication	<input checked="" type="checkbox"/>

POWER SUPPLY CONDITIONS

The following nominal power supply conditions have been tested:

PC no.	Voltage	Frequency	Type	Ground terminal
PC1	12 V	<input type="checkbox"/> AC 50Hz / <input type="checkbox"/> AC 60Hz / <input checked="" type="checkbox"/> DC	<input type="checkbox"/> 3AC / <input type="checkbox"/> 3ACN / <input type="checkbox"/> PoE	<input type="checkbox"/> PE / <input type="checkbox"/> GND / <input checked="" type="checkbox"/> None

- ☐ The power supply voltage has been selected after a maximum disturbance investigation over the product's rated voltage range.
- ☒ Additional chassis grounding was applied.

PHOTOS AND DRAWINGS



Copy of marking label..... :	<p> Model name: SID 2.0MLTE Manufacturer: CPAC Systems AB Box 217 SE-40123 Gothenburg, SWEDEN Brand name: CPAC Country of origin: SLOVAKIA </p> <p> Rating: 12-24VDC \approx 15-10A </p> <p> FCC ID: AHV-SID2MLTE IC:10111-SID2MLTE Contains FCC ID:XMR201903EG25G Contains IC:10224A-201903EG25G HVIN:SID2MLTE </p>	<p> VOLVO PENTA GENERIC DISPLAY MODULE 24330009P01 23050010 24261 MADE IN SLOVAKIA </p>  <p> P24330009#T23050010# P-004431 </p>
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Photo of the test item	
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OTHER INFORMATION

Modifications	None
Additional information	None

TEST ENVIRONMENT

Test laboratory	<input checked="" type="checkbox"/> KJELLER (Instituttveien 6, N-2007 Kjeller, Norway) <input type="checkbox"/> LYSAKER (Philip Pedersens vei 11, N-1366 Lysaker, Norway)						
Laboratory accreditation	 Norsk Akkreditering – TEST 033 P06 – Electromagnetic Compatibility						
Environmental conditions	<p>The climatic conditions during the tests are within limits specified by the manufacturer for the operation of the product and the test equipment.</p> <p>The climatic conditions during tests are within the following limits:</p> <table border="0"> <tr> <td>Ambient temperature:</td> <td>15 – 35 °C</td> </tr> <tr> <td>Relative humidity:</td> <td>25 – 75 %RH</td> </tr> <tr> <td>Atmospheric pressure:</td> <td>86 – 106 kPa</td> </tr> </table> <p>If explicitly required by the test standard, or the requirements are tighter than the above; the climatic conditions are recorded and documented separately in this test report.</p>	Ambient temperature:	15 – 35 °C	Relative humidity:	25 – 75 %RH	Atmospheric pressure:	86 – 106 kPa
Ambient temperature:	15 – 35 °C						
Relative humidity:	25 – 75 %RH						
Atmospheric pressure:	86 – 106 kPa						
Calibration	<p>All instruments used in the tests of this test report are calibrated and traceable to national or international standards. Between calibrations test set-ups are controlled and verified on a regular basis by intermediate checks to ensure, with 95% confidence that the instruments remain within their calibrated levels.</p> <p>The instrumentation accuracy is within limits agreed by the IECEE/CTL and defined by Nemko.</p>						
Measurement uncertainties	<p>Uncertainty in EMC emission measurements stated in this report are calculated from the standard measurement uncertainties multiplied by the coverage factor k=2. It was determined in accordance with ANSI C63.4. The true value is in the corresponding interval with a probability of 95%.</p> <p><i>Further information about measurement uncertainties is provided on request.</i></p>						

TEST REPORT SUMMARY

APPLIED STANDARDS

Standards	Titles
FCC CFR 47 Subpart 15B	Digital devices - Unintentional radiators, Class B Digital Device

TEST SUMMARY

Requirements – Tests	Reference standards	Verdict
Conducted Emissions	FCC CFR 47 Subpart 15B FCC Part 12.107 per ANSI C63.4-2014	N/A
Radiated Emissions (Below 1GHz)	FCC CFR 47 Subpart 15B FCC Part 12.109 per ANSI C63.4-2014	PASS
Radiated Emissions (Above 1GHz)	FCC CFR 47 Subpart 15B FCC Part 12.109 per ANSI C63.4-2014	PASS

PASS	: Tested and complied with the requirements
FAIL	: Tested and failed the requirements
N/A	: Test not relevant to this specimen (evaluated by the test laboratory)
–	: Test not performed (instructed by the applicant)
*	: An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
#	: A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

NOTES

None

Test Results

RADIATED EMISSIONS (BELOW 1GHZ)

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

The measurements were performed in a semi-anechoic chamber (SAC). Nominal supply voltage was provided.

The specimen was energized and in normal operating mode during the measurement.

- ☐ The specimen and its cables were elevated 10 cm above the site ground plane and placed in the centre of the turntable.
- ☒ The specimen and its cables were placed on a table 80 cm above the site ground plane and placed in the centre of the turntable.
- ☐ Ferrite clamps type CMAD were applied to cables leaving the test volume.
- ☐ A CDNE was applied to the power supply cable.

Antenna type = Hybrid bilog antenna

Antenna elevation = 100-400 cm above the ground reference plane.

Specimen rotation = 0-360°.

- ☐ Band-stop filter(s) was used to suppress the wanted RF transmission band to protect the measurement equipment.

Frequency range:

☐ 30-300MHz

☒ 30-1000MHz

☐ Other:

Measurement distance:

☒ 3m

☐ 5m

☐ 10m

Conditions

The measuring bandwidth is 120 kHz in the frequency range 30 MHz – 1000 MHz. Frequency sweeps with RBW = 120 kHz and VBW = 1 MHz was applied with a sweep time of 20 ms (step size resolution < 60 kHz).

Measurement uncertainty: ± 4.9 dB (3m distance in SAC10); ± 4.6 dB (3m distance in SAC3); ± 4.6 dB (10m distance in SAC10)

Instruments used during measurement

Instrument list: Antenna, Hybrid: Sunol / JB3 (N-4525) (04/2025)
EMI Receiver: R&S / ESU40 (LR-1639) (01/2024)
Preamplifier: Sonoma / 310N (LR-1686) (08/2023)

Conformity

Verdict:

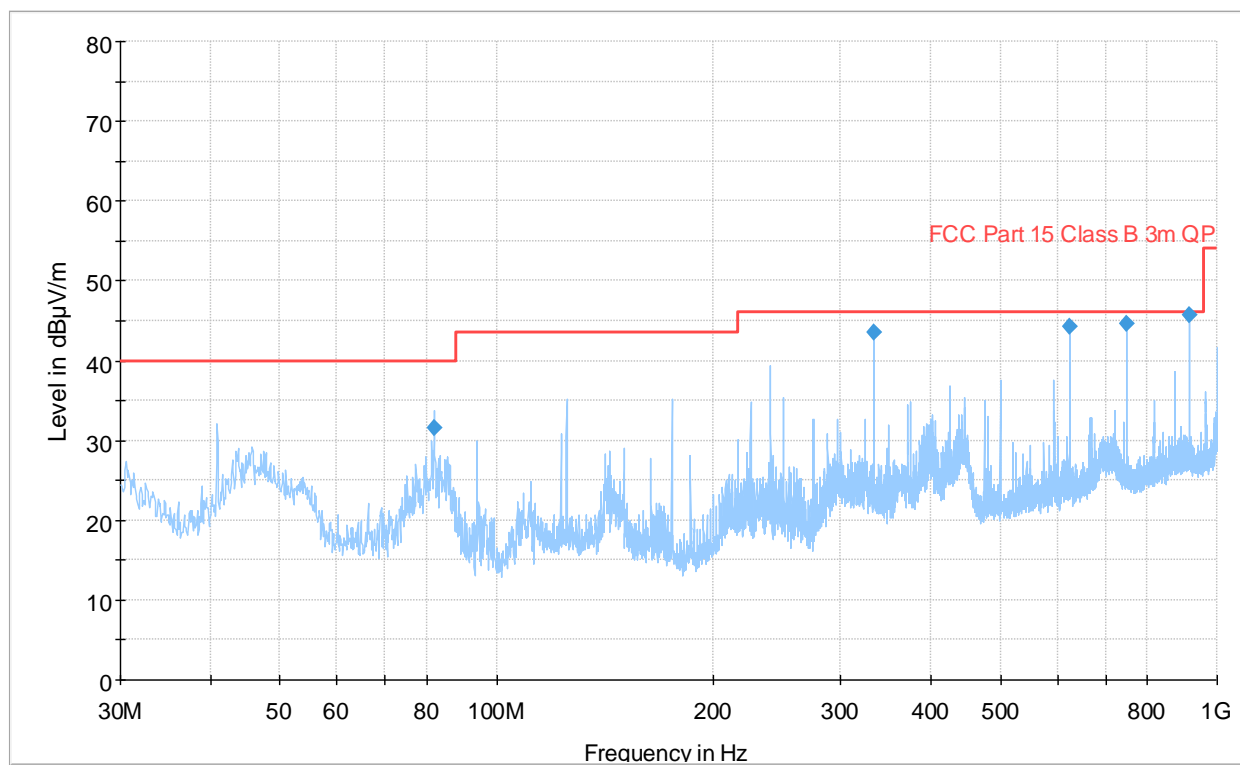
PASS

Test engineer:

TLO

EMISSION SPECTRUM SID 2MLTE

Full Spectrum



MEASUREMENTS DATA

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
81.843000	31.56	40.00	8.44	15000.0	120.000	100.0	V	246.0	-17.4
333.329818	43.59	46.00	2.41	15000.0	120.000	104.0	H	217.0	-9.7
625.019850	44.32	46.00	1.68	15000.0	120.000	400.0	H	171.0	-3.8
750.021622	44.67	46.00	1.33	15000.0	120.000	118.0	H	302.0	-1.3
916.702758	45.63	46.00	0.37	15000.0	120.000	100.0	H	224.0	1.5

It should be noted that some of the measured values has a margin which is less than the labs measurement uncertainty

RADIATED EMISSIONS (ABOVE 1GHZ)

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

Nominal supply voltage was provided. The specimen was energized and in normal operating mode during the measurement.

- ☐ The specimen and its cables were elevated 10 cm above the floor and placed in the centre of the turntable.
☒ The specimen and its cables were placed on a table 80 cm above the floor and placed in the centre of the turntable.

Facility:

- ☐ 3m semi-anechoic chamber (SAC3) with extra floor absorbers* (calibrated volume: D=2.0m / H=2.0m).
☒ 10m semi-anechoic chamber (SAC10) with extra floor absorbers* (calibrated volume: D=1.5m / H=2.0m).
☐ 3m fully anechoic room (FAR3) (calibrated volume: D=1.2m / H=2.0m).

* The reference ground plane was covered with ferrite absorbers in the reflecting area between the specimen and the measuring antenna.

Measurement distance = ☒ 3m.

Antenna elevation = fixed at centre of specimen height.

Specimen rotation = 0-360°.

Measurements were performed with a double-ridged guide horn antenna.

- ☐ Band-stop filter(s) was used to suppress the wanted RF transmission band to protect the measurement equipment.

Frequency range:

- ☐ 1-2GHz
☐ 1-5GHz
☐ 1-6GHz
☒ 1-12GHz

Highest internal frequency of specimen:

- ☐ Below 108MHz
☐ Between 108MHz and 500MHz
☐ Between 500MHz and 1000MHz
☐ Above 1000MHz

The measuring bandwidth is 1 MHz in the above frequency range. Frequency sweeps with RBW = 1 MHz and VBW = 1 MHz was applied with a sweep time of 100 ms (proper segmentation of the frequency range was applied to obtain step size resolution < 500 kHz).

Measurement uncertainty: ± 5.1 dB

Instruments used during measurement

Instrument list: Antenna, Horn: ETS / 3117 (LR-1717) (12/2027)
 EMI Receiver: R&S / ESU40 (LR-1639) (01/2024)
 Preamplifier: ETS / 3117-PA (LR-1757) (08/2024)

Conformity

Verdict:

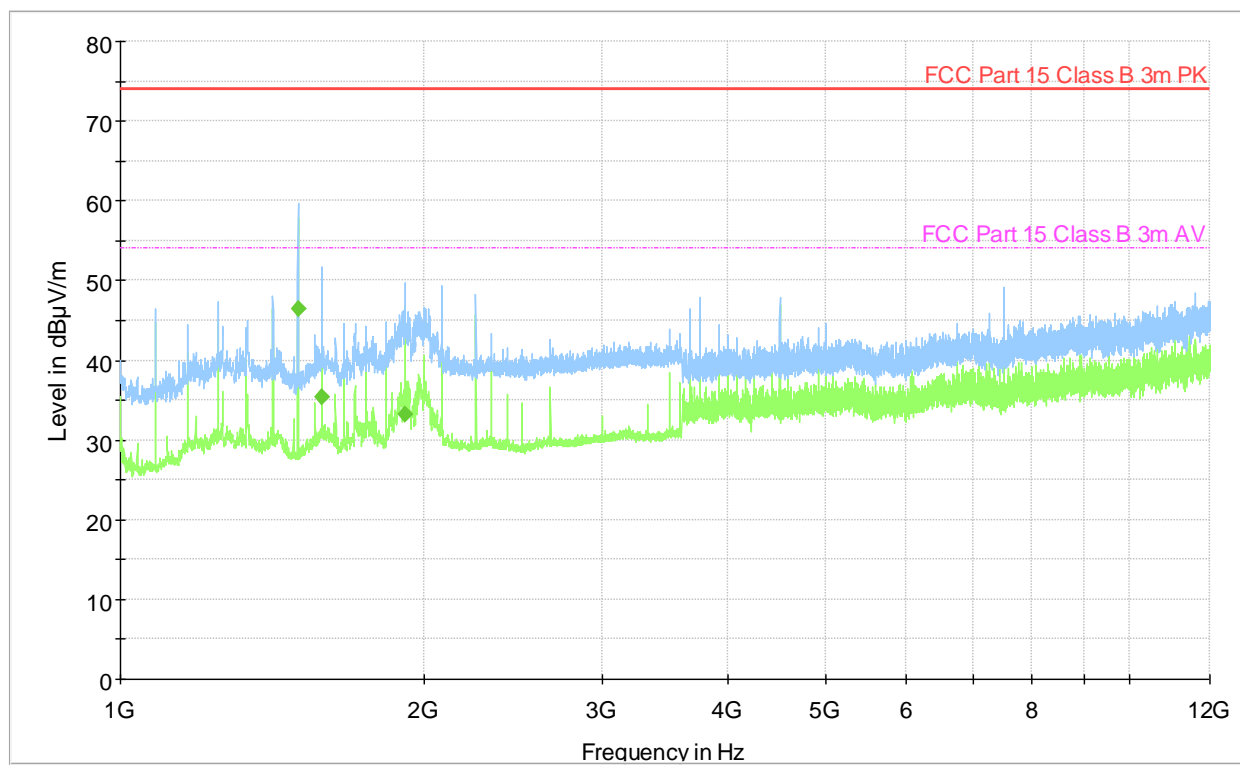
PASS

Test engineer:

TLO

EMISSION SPECTRUM (HORIZONTAL POLARIZATION) SID2MLTE

Full Spectrum

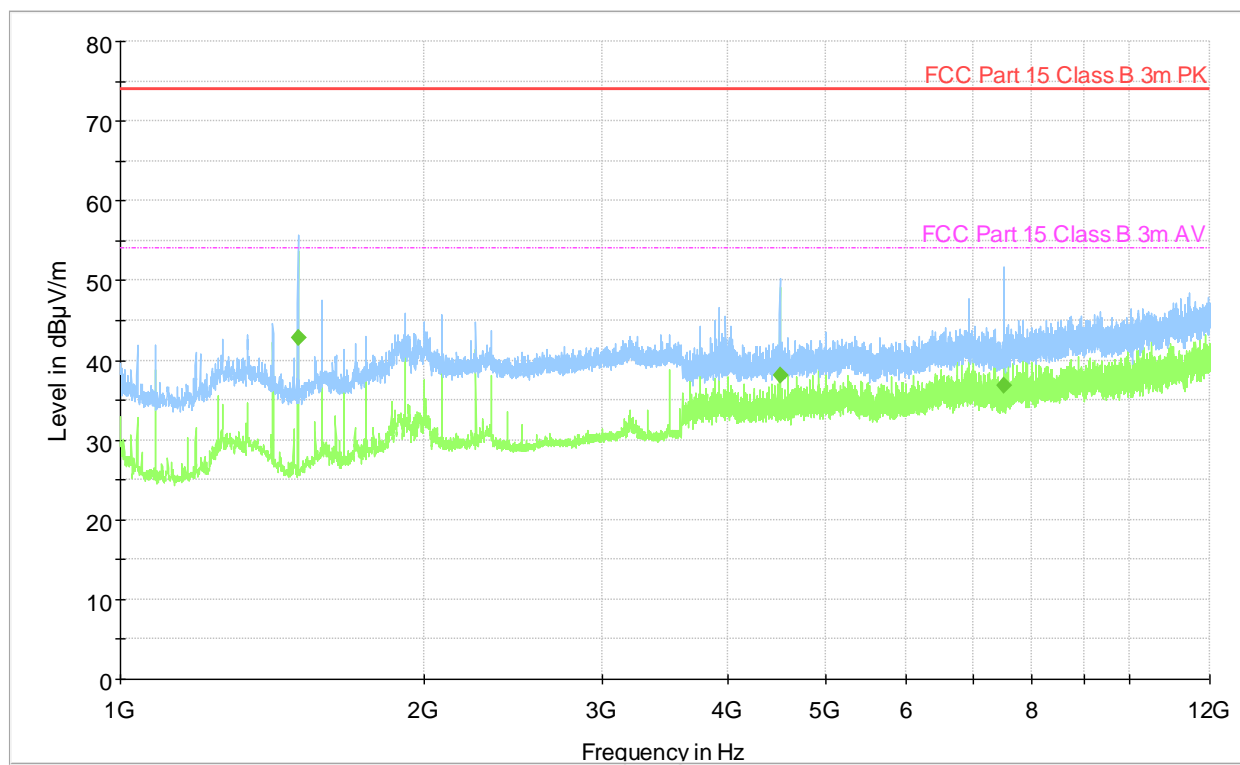


MEASUREMENTS DATA

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1499.950000	---	46.44	54.00	7.56	15000.0	1000.000	100.0	H	310.0	-15.0
1583.000000	---	35.36	54.00	18.64	15000.0	1000.000	100.0	H	290.0	-14.2
1916.300000	---	33.14	54.00	20.86	15000.0	1000.000	100.0	H	137.0	-11.4

EMISSION SPECTRUM (VERTICAL POLARIZATION) SID2MLTE

Full Spectrum



MEASUREMENTS DATA

Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
1499.950000	---	42.89	54.00	11.11	15000.0	1000.000	100.0	V	162.0	-15.0
4499.650000	---	38.11	54.00	15.89	15000.0	1000.000	100.0	V	349.0	-1.6
7499.900000	---	36.89	54.00	17.11	15000.0	1000.000	100.0	V	195.0	2.7

Annexes

Test set-up for EMC emissions measurements

