SoMLabs
Connecting the Future

SpaceSOM-8MPlus EM Radiation Test

Revision 1.0, 10/2023

Neural Processing Unit On Board

NATO OTAN
NCAGE 9B4LH

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Document Revision History

Revision	Date	Notes
1.0	5.10.2023	Initial

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1. Introduction

This document presents the SpaceSOM-8MPlus family modules EM emission/radiation tests, held at the precompliance SoMLabs EMC test lab.

Performed tests checked compatibility of EUT with emission requirements defined in standard EN 55032 class B (CISPR 32) in simulated open space environment (OATS) with 3 meters antenna distance.

Full test consists of three emission measurements in X, Y and Z axes and recalculation of the results of the obtained measurements according to the formula included in EN 55032 (CISPR 32) standard.

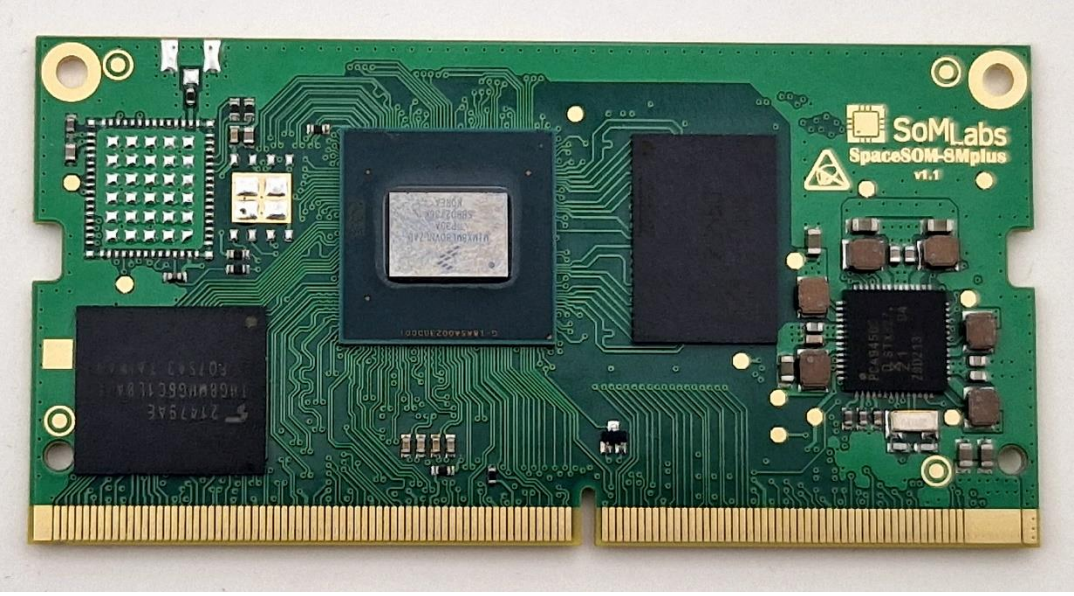
2. Tested hardware

Test covered SpaceSOM-8MPlus in the most extensive hardware configurations (as on picture below):

SLS35X8MPQC_xxxxC_yyGR_zzGE_qqq_r

Where:
xxxx – means 1600 or 1800 MHz
yy – means 01, 02, 04 GB of LPDDR4
zz – means 04, 08, 16 or 32 GB of eMMC
qqq – means 0SF or 1WB
r – means I, E or C

Measurements were made on the module SLS35X8MPQC_1800C_02GR_16GE_0SF_C (hardware v1.1).



For testing purposes was prepared dedicated Linux system image with simple application using UART transmitters (*spacesom-8mplus-cb-emc-test-full-UART* for eMMC memory).

3. Test equipment

3.1. Standard measurements devices

Test item	Radiated emission below 1GHz and 1-3GHz range			
Instrument	**Manufacturer**	**Model**	**Serial No.**	**Calibration date**
Spectrum analyzer	Rohde & Schwarz	FPL1003 B22, K54	102103	4.2023
CISPR32 Standarization Software	Astat	V.12/2022	-	-
GTEM chamber	Astat	GTEM250	1000007	3.2023
Coaxial cable	Bruel & Kjaer	AO-0015	23621	7.2023
Analog power supply	Korad	KA3005D	-	-

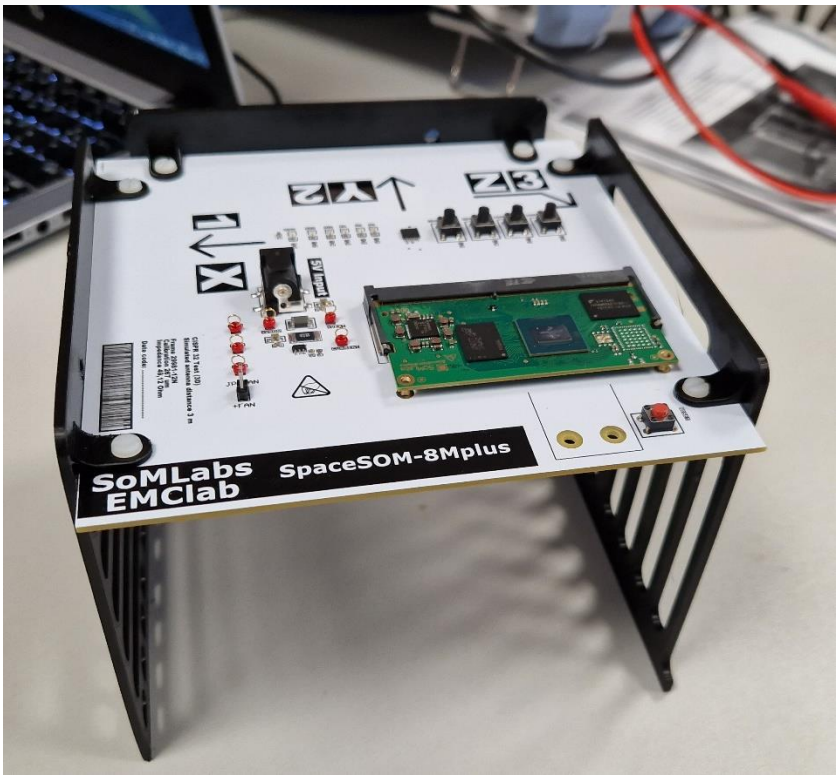
3.2. Dedicated measurement items

For the correct performance of measurements, it was necessary to develop two dedicated elements:

- carrier board for SoM module with basic peripherals and power supply monitor,
- mechanical stand ensuring correct module positioning inside of GTEM chamber.

Dedicated carrier board (internally called WHITE) with mounted SoM is shown on picture below.

Because of testing method base on three emission measurements in X, Y and Z axes and recalculation of the results of the obtained measurements according to the formula included in EN 55032 (CISPR 32) standard, dedicated stand was developed and produced using 3D printer as on picture below. The reference mechanical base is permanently glued inside of GTEM250 chamber.



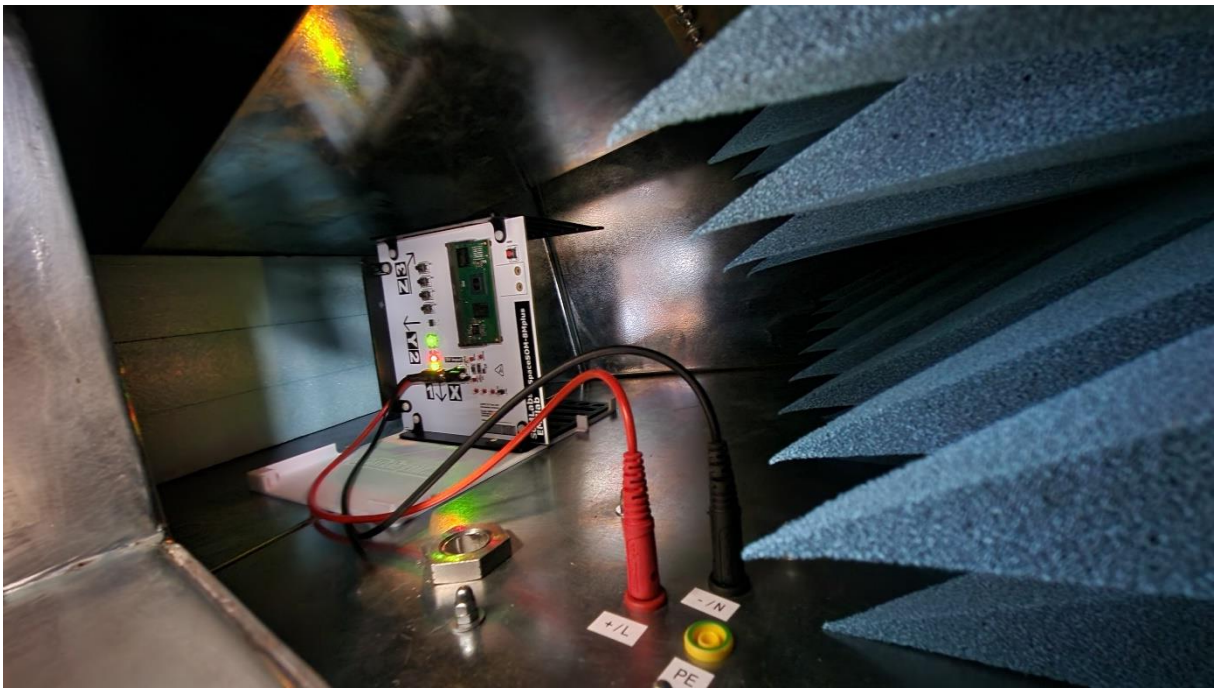
SpaceSOM-8MPlus EM Radiation Test rev. 1.0

4. Measurement setup

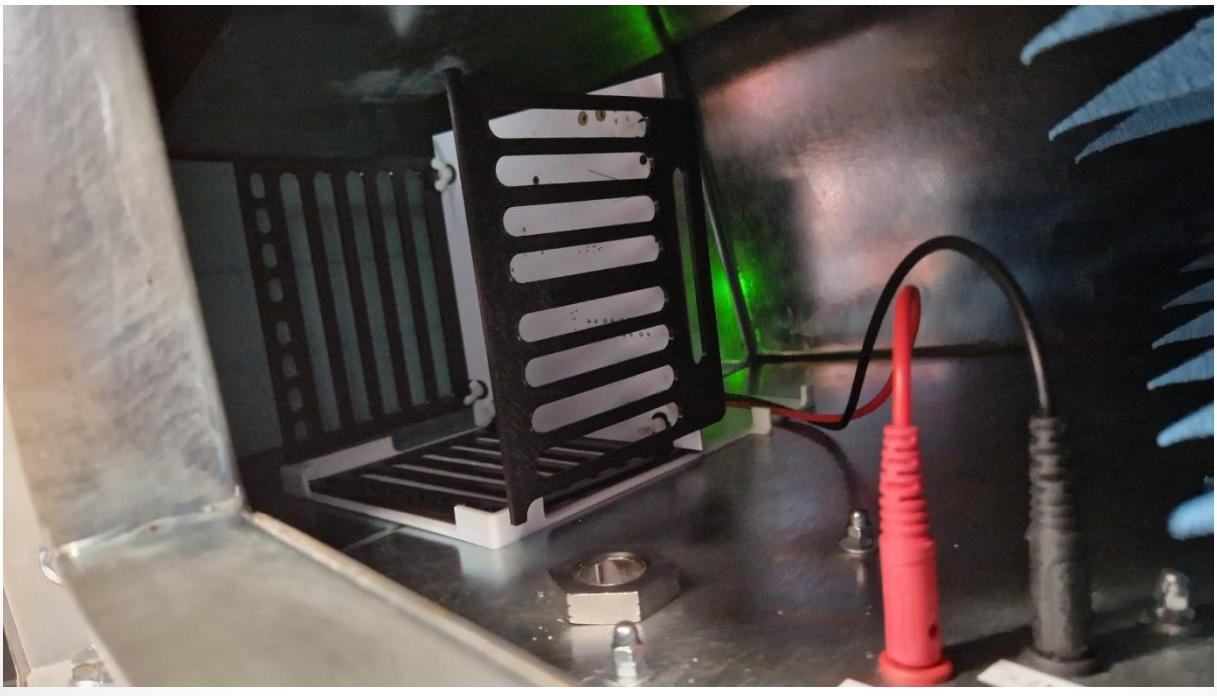
The general view of the measuring station with the instruments used for measurements is presented below.

5. Test procedure

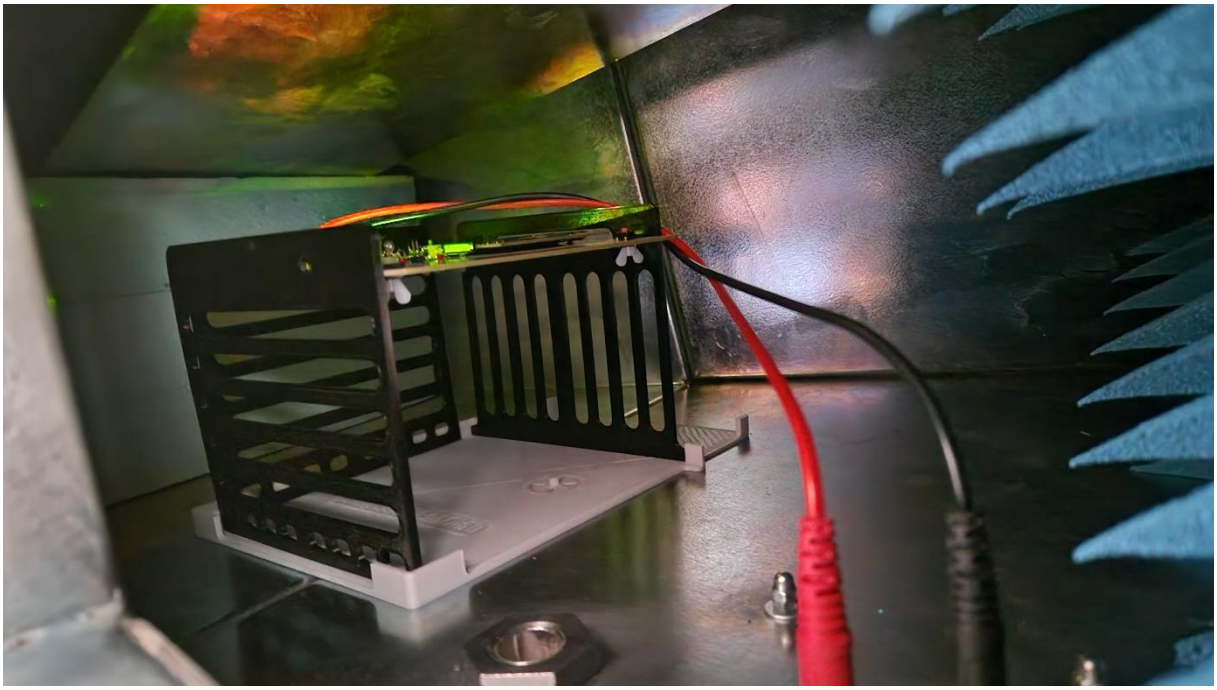
1. Spectrum analyzer was warmed up for 30 minutes since power supply on.
2. Power supply (+5V/250mA) was connected to GTEM filter.
3. The EUT was installed on WHITE testing carrier board
4. The ASTAT GTEM program was started and configured.
5. Power cables were attached to the connectors: mounted on carrier board and internal in GTEM (filtered).
6. The EUT installed on WHITE carrier board was mounted on a dedicated stand inside of GTEM in position 1 (X) – as on picture below.



7. First measurement was started from ASTAT GTEM menu (for X axis).
8. After completing the first measurement, position of EUT with WHITE carrier board was changed to position 2 (Y) – as on picture below.



9. Second measurement was started from ASTAT GTEM menu (for Y axis).
10. After completing the second measurement, position of EUT with WHITE carrier board was changed to position 3 (Z) – as on picture below.

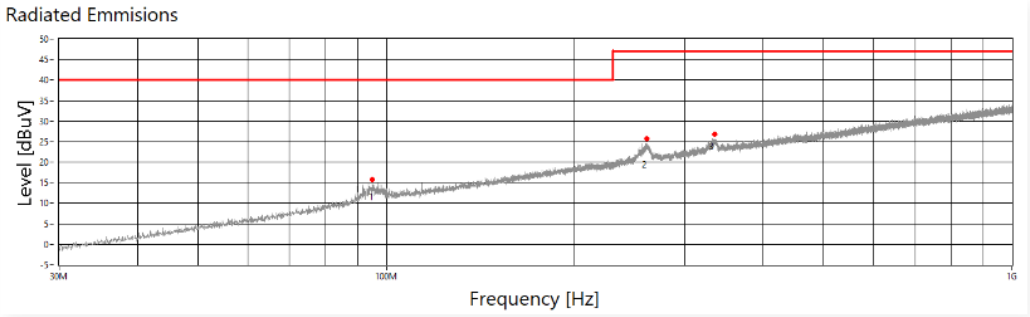


11. Third measurement was started from ASTAT GTEM menu (for Z axis).
12. After completing the third measurement, ASTAT software calculates correlated results.

6. Results

6.1. Results for 30MHz-1GHz frequency range (quasi-peak)

SpaceSOM-8MPlus-full-UART-QP	
Operator	Andrzej Gawryluk
EUT	SpaceSOM-8MPlus
Uwagi	Firmware: spacesom-8mplus-cb-emc-test-full-UART
Nazwa Firmy	SoMLabs
Limit	55032 30M-1G klasa B 3m QP
Symulowany dystans	3m

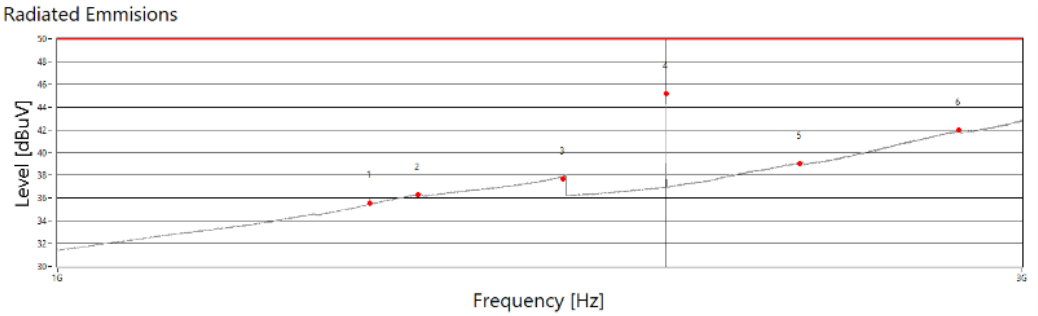


Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Detector	RBW[Hz]	Pass/Failed
1	94,92M	15,01	40,00	QP	120k	pass
2	259,32M	24,03	47,00	QP	120k	pass
3	331,68M	25,37	47,00	QP	120k	pass

6.2. Results for 1-3GHz frequency range (average)

SpaceSOM-8MPlus-full-UART-AVG	
Operator	Andrzej Gawryluk
EUT	SpaceSOM-8MPlus
Uwagi	Firmware: spacesom-8mplus-cb-emc-test-full-UART
Nazwa Firmy	SoMLabs
Limit	55032 1G-3G klasa B 3m AV
Symulowany dystans	3m

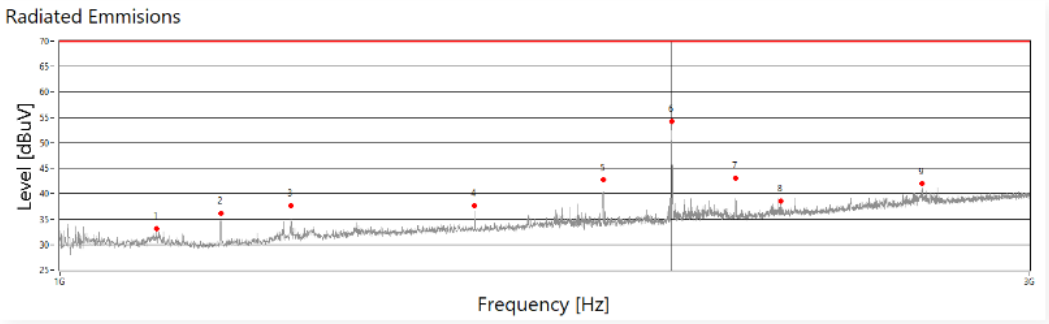


Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	1,43G	35,57	50,00	14,43	AV	1M	pass
2	1,51G	36,27	50,00	13,73	AV	1M	pass
3	1,78G	37,67	50,00	12,33	AV	1M	pass
4	2,00G	45,16	50,00	4,84	AV	1M	pass
5	2,33G	39,02	50,00	10,98	AV	1M	pass
6	2,79G	41,97	50,00	8,03	AV	1M	pass

6.3. Results for 1-3GHz frequency range (peak)

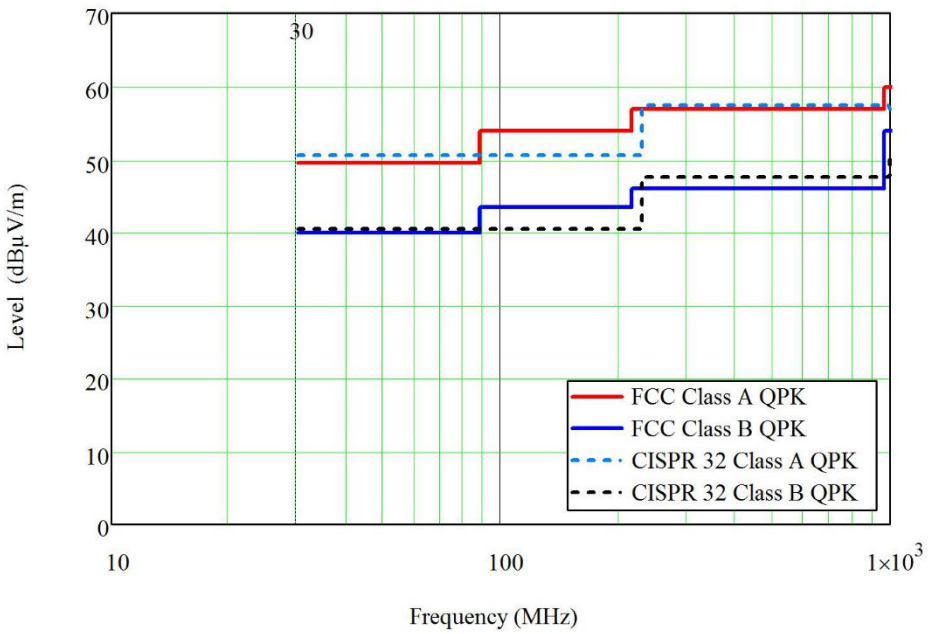
SpaceSOM-8MPlus-full-UART-PK	
Operator	Andrzej Gawryluk
EUT	SpaceSOM-8MPlus
Uwagi	Firmware: spacesom-8mplus-cb-emc-test-full-UART
Nazwa Firmy	SoMLabs
Limit	55032 1G-3G klasa B 3m PK
Symulowany dystans	3m



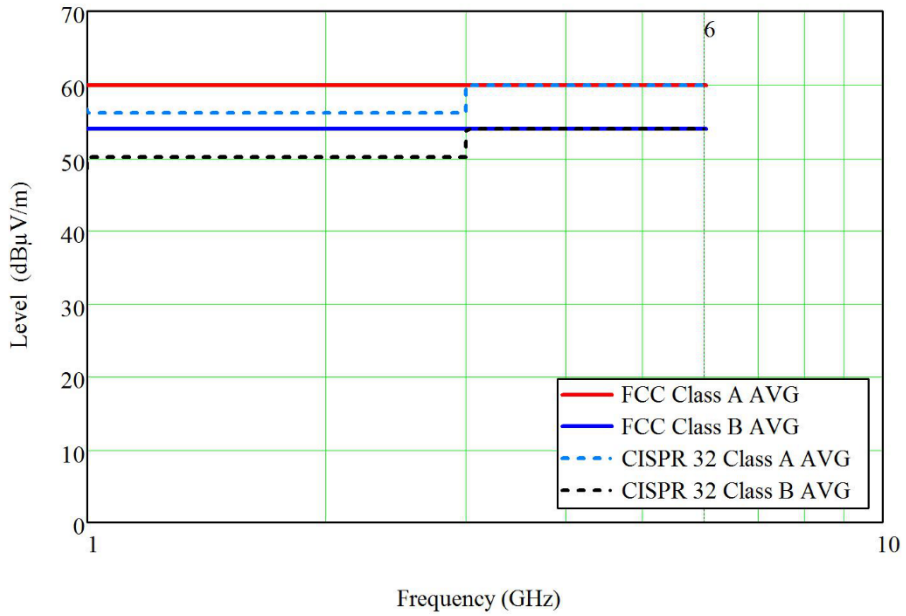
Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	1,12G	33,17	70,00	36,83	Pos. Peak	1M	pass
2	1,20G	36,15	70,00	33,85	Pos. Peak	1M	pass
3	1,30G	37,69	70,00	32,31	Pos. Peak	1M	pass
4	1,60G	37,71	70,00	32,29	Pos. Peak	1M	pass
5	1,85G	42,70	70,00	27,30	Pos. Peak	1M	pass
6	2,00G	54,24	70,00	15,76	Pos. Peak	1M	pass
7	2,15G	43,07	70,00	26,93	Pos. Peak	1M	pass
8	2,26G	38,62	70,00	31,38	Pos. Peak	1M	pass
9	2,66G	41,96	70,00	28,04	Pos. Peak	1M	pass

6.4. Reference charts



CISPR 32/FCC radiated limits for Class A and Class B in frequency range up to 1 GHz



CISPR 32/FCC radiated limits for Class A and Class B in frequency range above 1 GHz

7. Summary

The conducted and documented measurements confirm that the tested modules fully meet the requirements of EN 55032 class B (CISPR 32) emission standard.

8. Limitation on Liability

Under no circumstances shall BTC Korporacja Sp. z o. o. be liable for any loss, damage or expense suffered or incurred with respect to any defective product.

In no event shall BTC Korporacja Sp. z o. o. be liable for any incidental or consequential damages that you may suffer directly or indirectly from use of any product.