SoMLabs
Connecting the Future

VisionSOM-RT
EM Radiation Test

Revision 1.0, 12/2021

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CERTIFIED ISO 9001:2015 COMPANY

CERTIFIED ISO 14001:2015 COMPANY

Document Revision History

Revision	Date	Notes
1.0	15.12.2021	Initial

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1. Introduction

This document presents the VisionSOM-RT 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

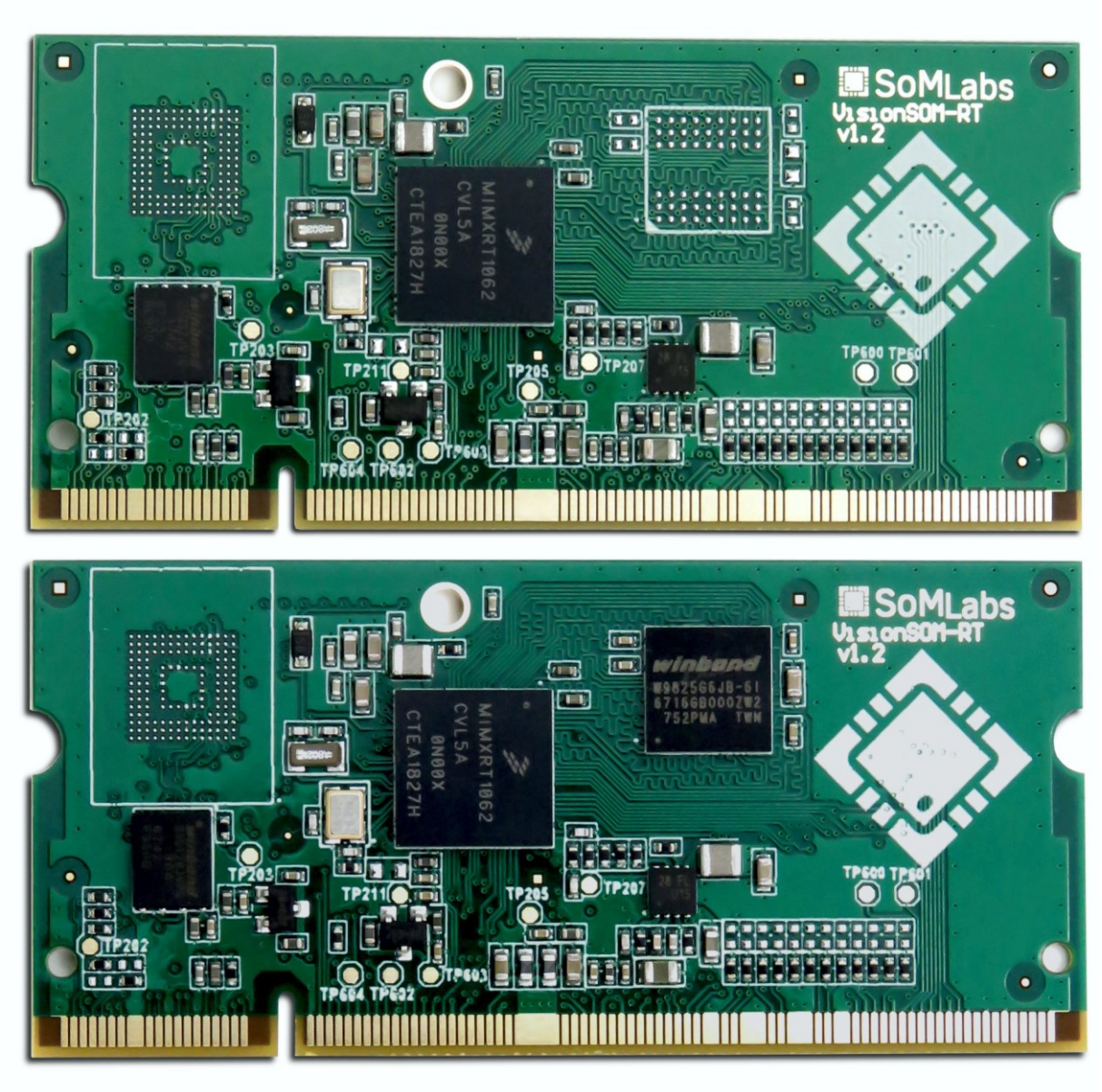
Test covered VisionSOM-RT in two hardware configurations (as on pictures below):

SLS12RT52_528C_xxR_yyQSPI_0SF_I

SLS12RT62_528C_xxR_yyQSPI_0SF_I

xx – means 0 or 32 (SDRAM memory capacity)

yy - means 04 or 16 (QSPI Flash memory capacity)



For testing purposes was prepared dedicated Linux two firmware images with simple application using UART transmitters (data transfer with 4Mb/s speed in 4 UART channels):

- *visionsom-rt-emc-fulluart* MCUxpresso project with CPU @24MHz and SDRAM in low power mode,

- *visionsom-rt-528-SDRAM_emc_fulluart* MCUxpresso project with CPU @528MHz and SDRAM read operations (RAM controller @163,86MHz, access to RAM: 262144 cycles R/W by 32 bits each).

3. Test equipment

3.1. Standard measurements devices

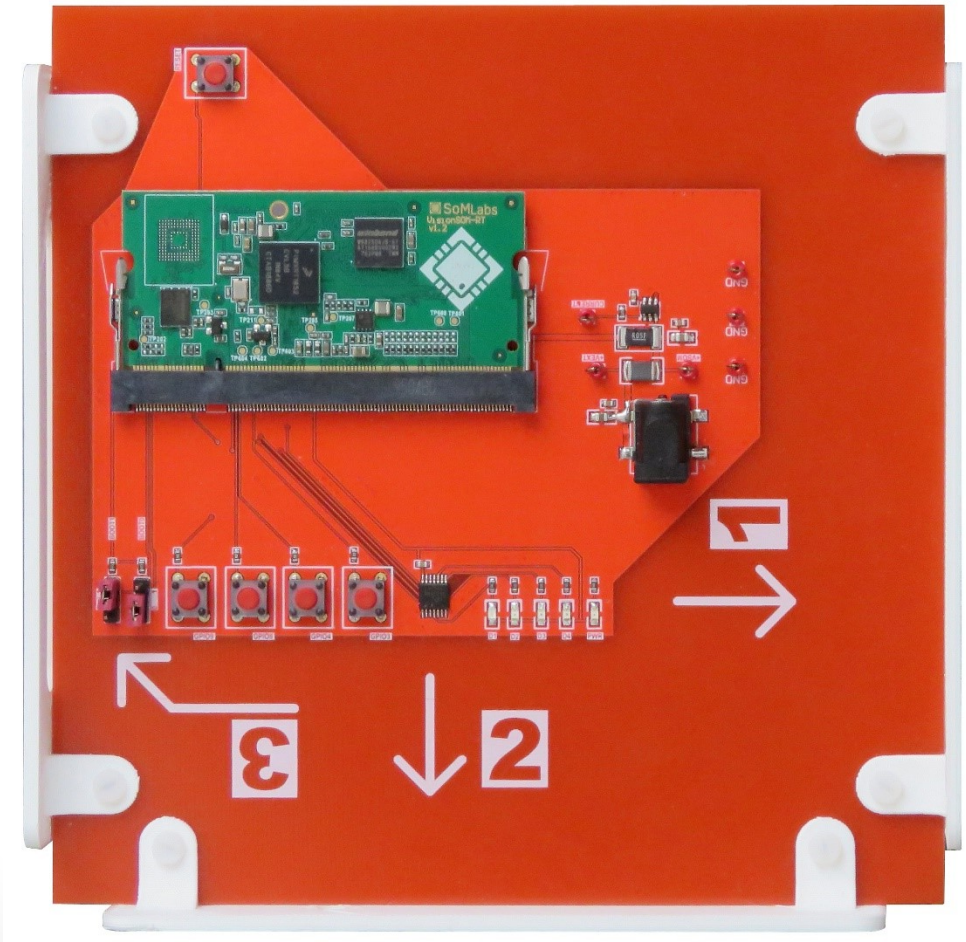
Test item	Radiated emission below 1GHz and 1-3GHz range			
Instrument	**Manufacturer**	**Model**	**Serial No.**	**Calibration date**
Spectrum analyzer	Rohde & Schwarz	FPL1003 B22, K54	102103	12.2020
GTEM chamber	Astat	GTEM250	1000007	3.2021
Coaxial cable	Bruel & Kjaer	AO-0015	23621	5.2021
Analog power 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.

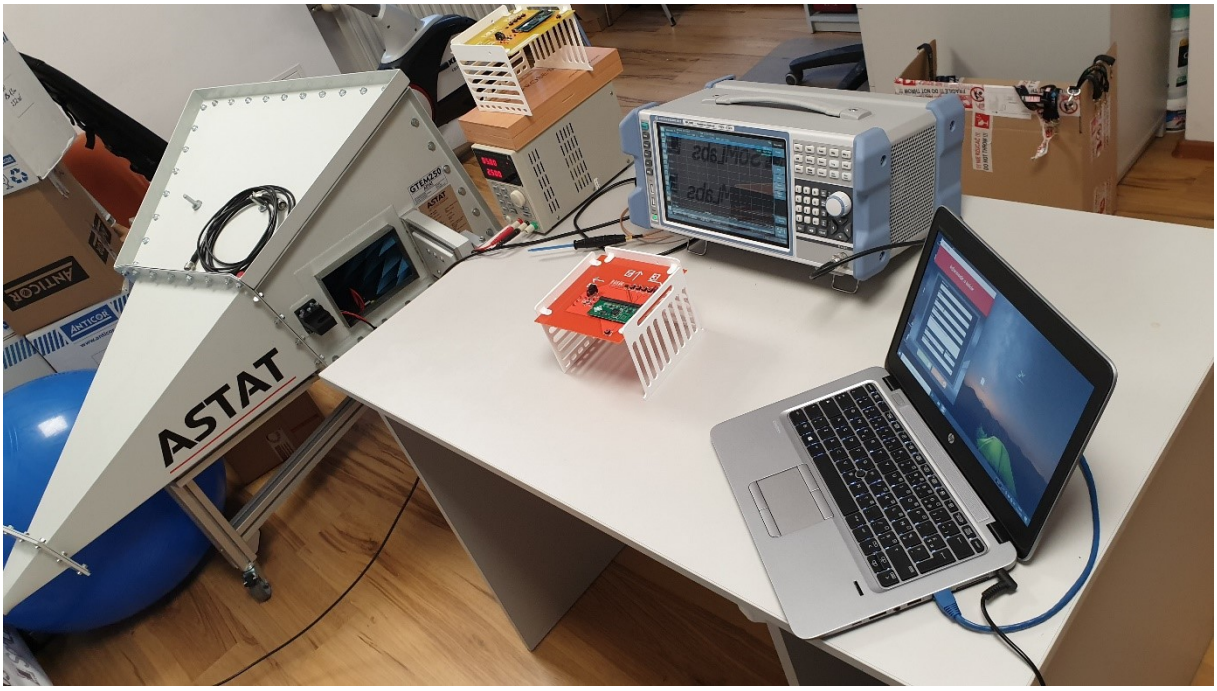
Dedicated carrier board (internally called RED) with mounted SoM is shown on picture below.



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. Reference mechanical base (shown on right part of picture) is permanently glued inside of GTEM250 chamber.

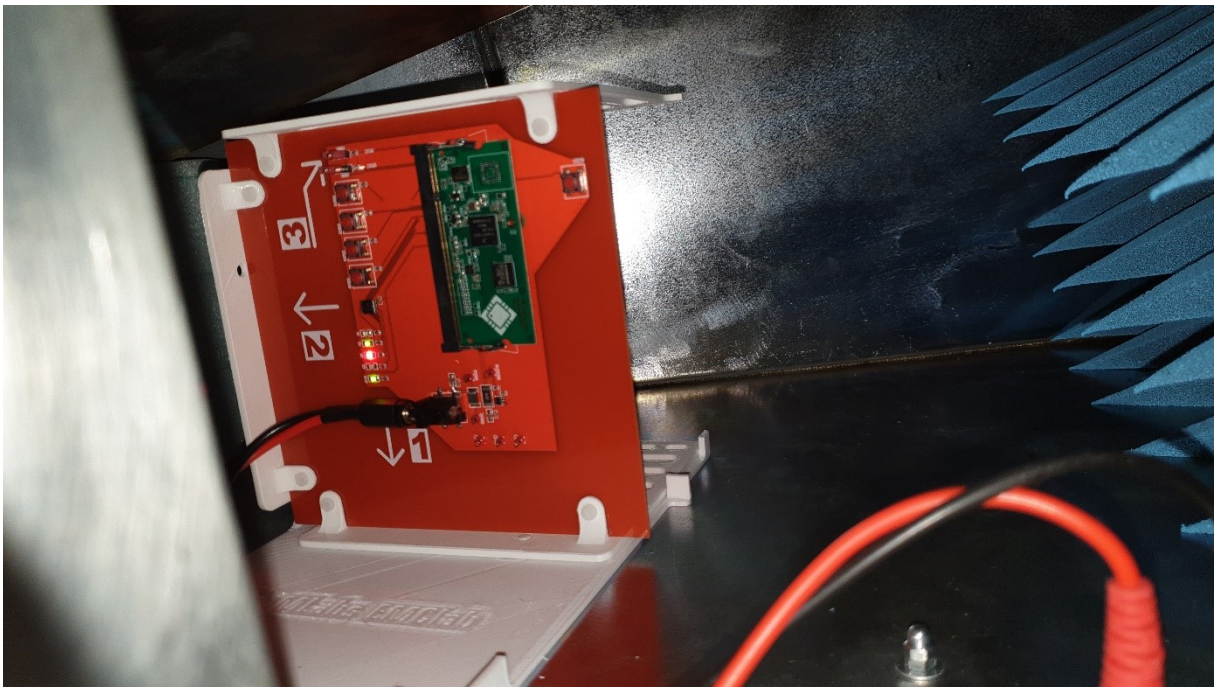
4. Measurement setup

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

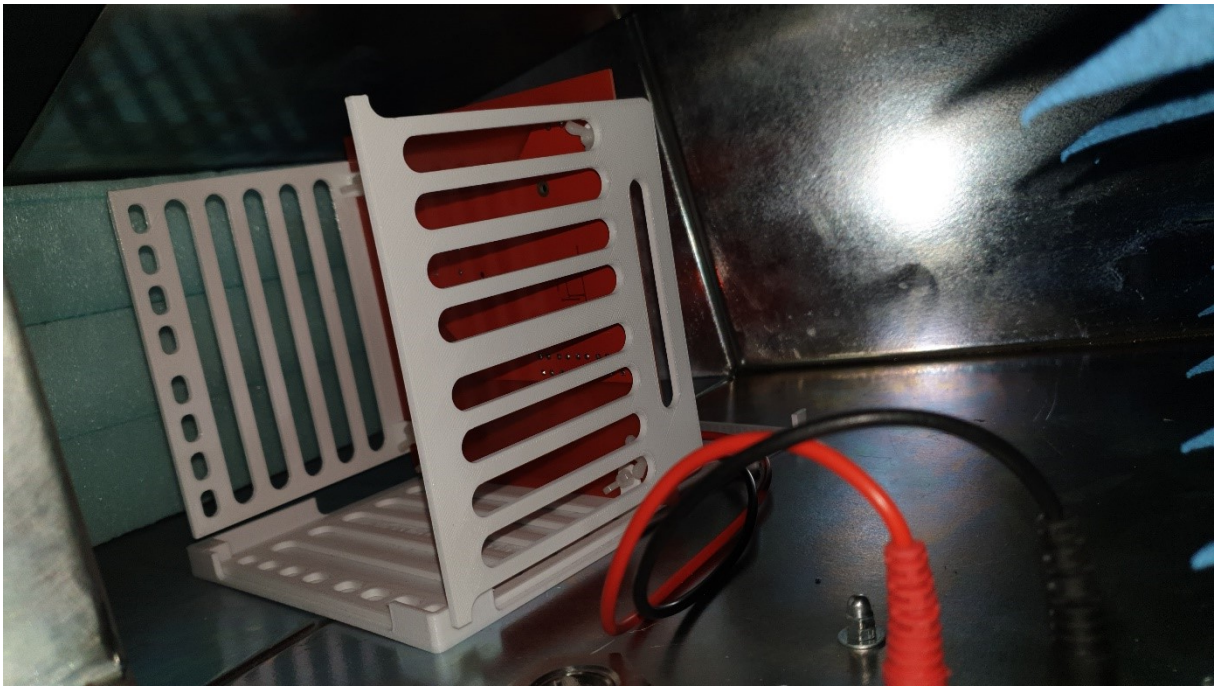


5. Test procedure

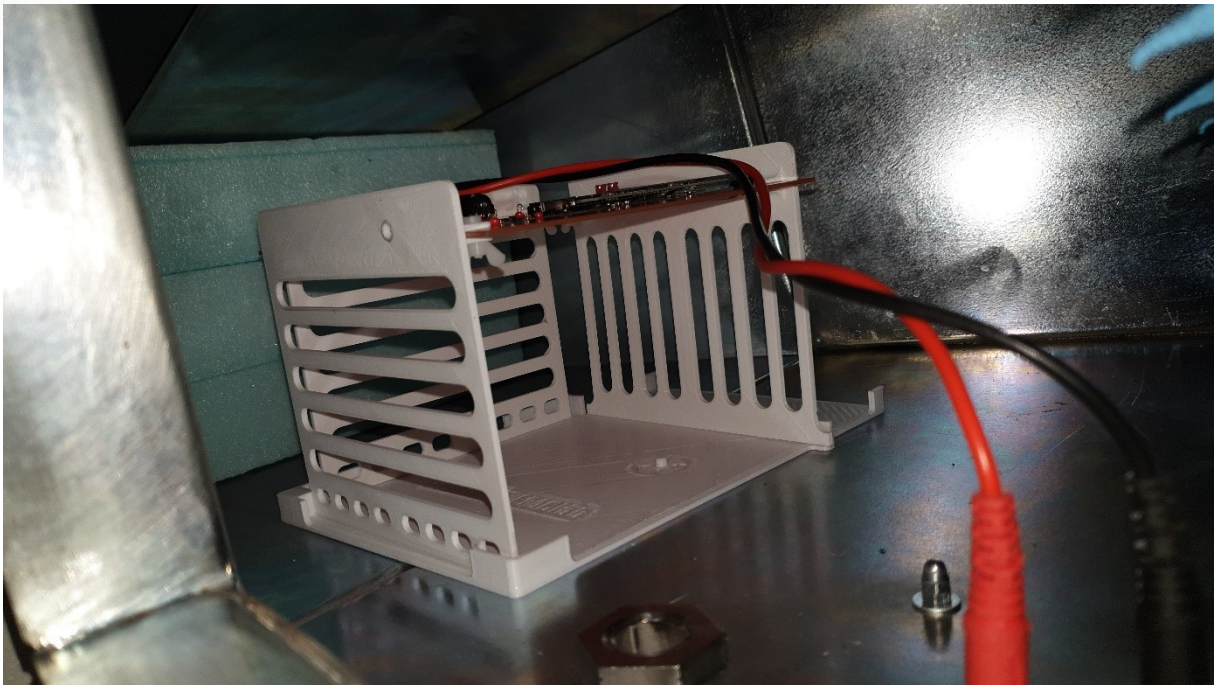
1. Spectrum analyzer was warmed up for 30 minutes since power supply on.
2. Power supply (+5V/100mA) was connected to GTEM filter.
3. The EUT was installed on RED testing carrier board
4. The ASTAT GTEM program was started and configured.
5. Power cables were attached to the connectors: mounted on carrier board and internal in GTEM (filtered).
6. The EUT installed on RED 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 RED 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 RED carrier board was changed to position 3 (Z) – as on picture below.



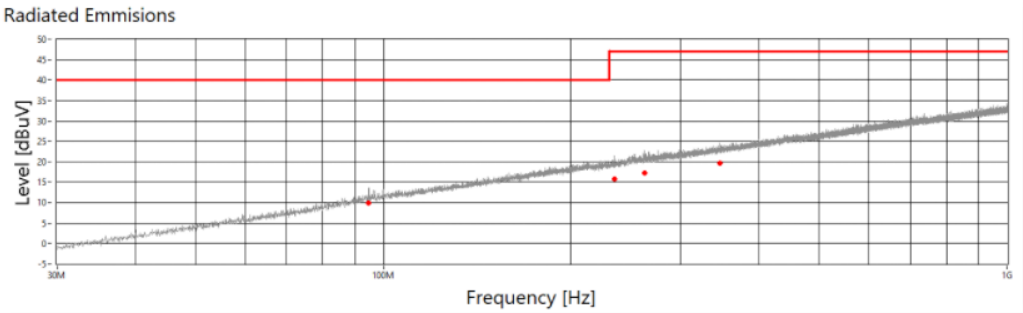
11. Third measurement was started from ASTAT GTEM menu (for Z axis).
12. After completing the third measurement, ASTAT software calculates correlated results.

6. Results

6.1. MCU @12MHz, SDRAM not active, 4xUARTs @4Mb/s

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

RT-full-UART-QP	
Operator	Piotr Zbysiński
EUT	VisionSOM-RT1052
Uwagi	Fimware: visionsom-rt-emc-fulluart
Nazwa Firmy	SoMLabs
Limit	55032 30M-1G klasa B 3m QP
Symulowany dystans	3m

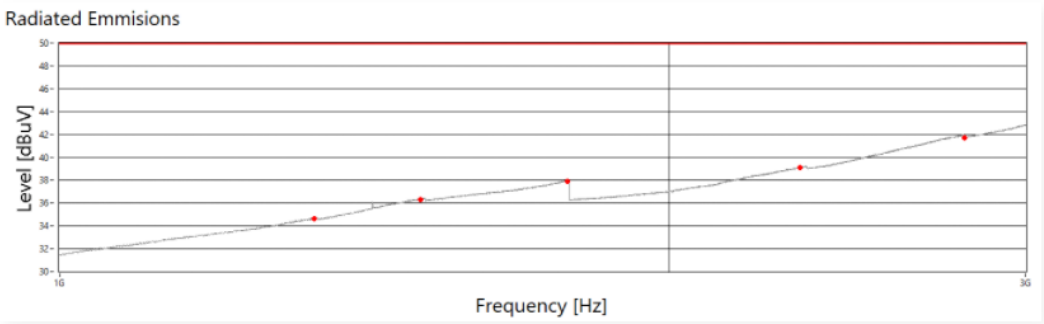


Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	94,80M	9,89	40,00	30,11	QP	120k	pass
2	235,02M	15,72	47,00	31,28	QP	120k	pass
3	262,20M	17,21	47,00	29,79	QP	120k	pass
4	346,02M	19,62	47,00	27,38	QP	120k	pass

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

RT-full-UART-AVG	
Operator	Piotr Zbysiński
EUT	VisionSOM-RT1052
Uwagi	Fimware: visionsom-rt-emc-fulluart
Nazwa Firmy	SoMLabs
Limit	55032 1G-3G klasa B 3m AV
Symulowany dystans	3m

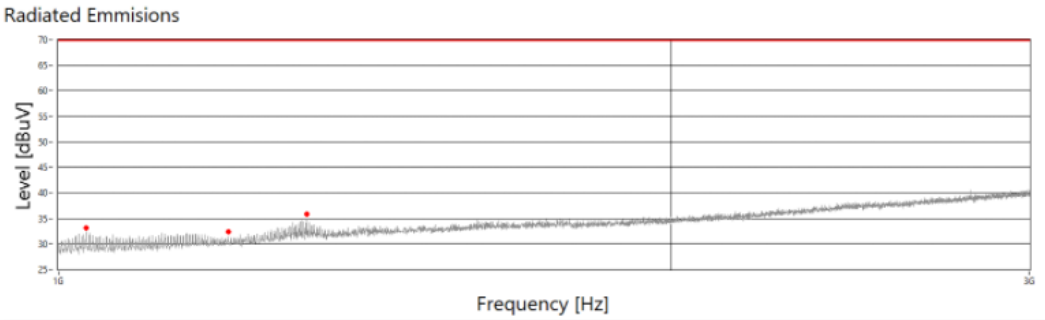


Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	1,34G	34,60	50,00	15,40	AVG	1M	pass
2	1,51G	36,26	50,00	13,74	AVG	1M	pass
3	1,78G	37,92	50,00	12,08	AVG	1M	pass
4	2,32G	39,07	50,00	10,93	AVG	1M	pass
5	2,80G	41,69	50,00	8,31	AVG	1M	pass

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

RT-full-UART-PK	
Operator	Piotr Zbysiński
EUT	VisionSOM-RT1052
Uwagi	Fimware: visionsom-rt-emc-fulluart
Nazwa Firmy	SoMLabs
Limit	55032 1G-3G klasa B 3m PK
Symulowany dystans	3m



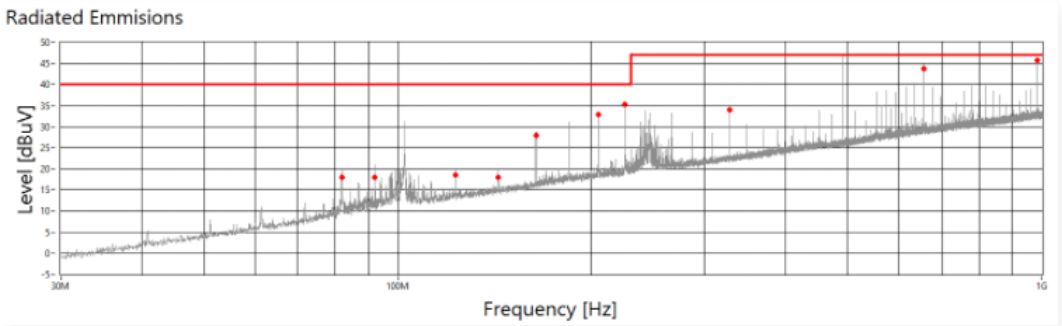
Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	1,03G	33,11	70,00	36,89	PK	1M	pass
2	1,21G	32,44	70,00	37,56	PK	1M	pass
3	1,32G	35,87	70,00	34,13	PK	1M	pass

6.2. MCU @528MHz, SDRAM active (R/W) @163,86MHz, 4xUARTs @4Mb/s

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

VisionSOM-RT1052-full-UART-QP	
Operator	Piotr Zbysiński
EUT	VisionSOM-RT1052
Uwagi	Firmware: visionsom-rt-528-SDRAM_emc_fulluart
Nazwa Firmy	SoMLabs
Limit	55032 30M-1G klasa B 3m QP
Symulowany dystans	3m

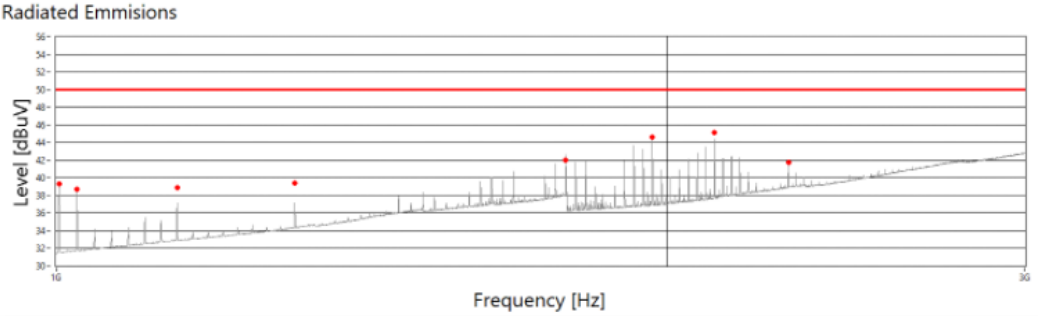


Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	81,90M	18,00	40,00	22,00	QP	120k	pass
2	92,16M	18,02	40,00	21,98	QP	120k	pass
3	122,88M	18,49	40,00	21,51	QP	120k	pass
4	143,34M	17,99	40,00	22,01	QP	120k	pass
5	163,86M	28,00	40,00	12,00	QP	120k	pass
6	204,78M	32,85	40,00	7,15	QP	120k	pass
7	225,30M	35,30	40,00	4,70	QP	120k	pass
8	327,72M	34,04	47,00	12,96	QP	120k	pass
9	655,50M	43,71	47,00	3,29	QP	120k	pass
10	983,22M	45,74	47,00	1,26	QP	120k	pass

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

VisionSOM-RT1052-full-UART-AVG	
Operator	Piotr Zbysiński
EUT	VisionSOM-RT1052
Uwagi	Firmware: visionsom-rt-528-SDRAM_emc_fulluart
Nazwa Firmy	SoMLabs
Limit	55032 1G-3G klasa B 3m AV
Symulowany dystans	3m

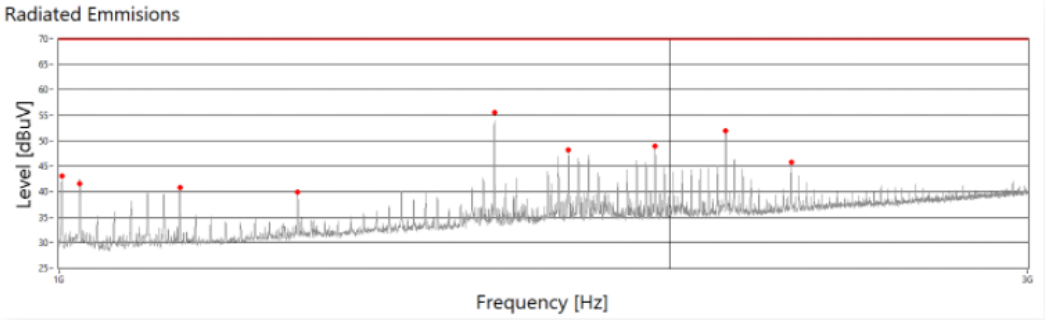


Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	1,00G	39,30	50,00	10,70	AVG	1M	pass
2	1,02G	38,73	50,00	11,27	AVG	1M	pass
3	1,15G	38,89	50,00	11,11	AVG	1M	pass
4	1,31G	39,41	50,00	10,59	AVG	1M	pass
5	1,78G	41,98	50,00	8,02	AVG	1M	pass
6	1,97G	44,58	50,00	5,42	AVG	1M	pass
7	2,11G	45,10	50,00	4,90	AVG	1M	pass
8	2,29G	41,76	50,00	8,24	AVG	1M	pass

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

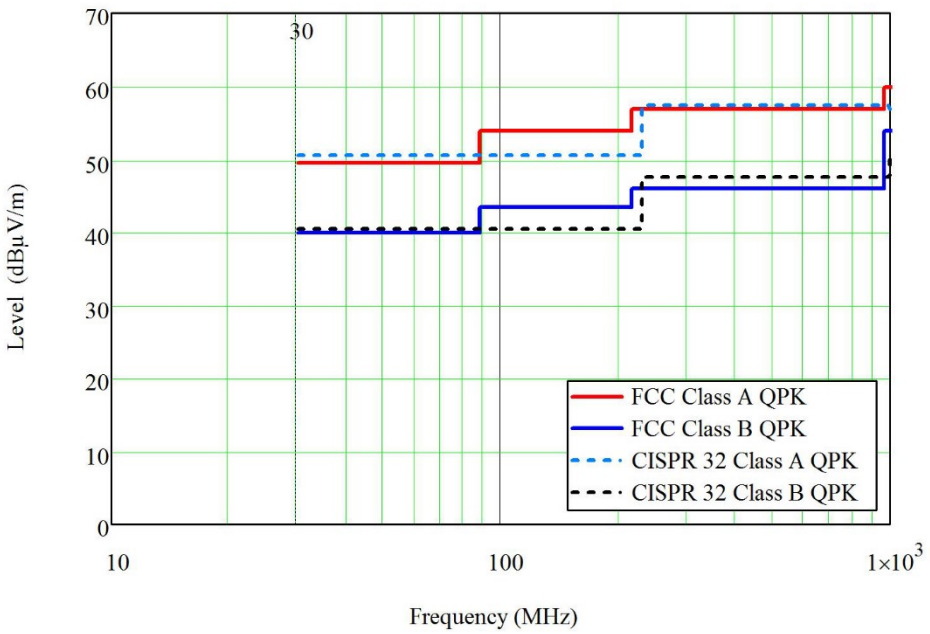
RT-full-UART-PK	
Operator	Piotr Zbysiński
EUT	VisionSOM-RT1052
Uwagi	Firmware: visionsom-rt-528-SDRAM_emc_fulluart
Nazwa Firmy	SoMLabs
Limit	55032 1G-3G klasa B 3m PK
Symulowany dystans	3m



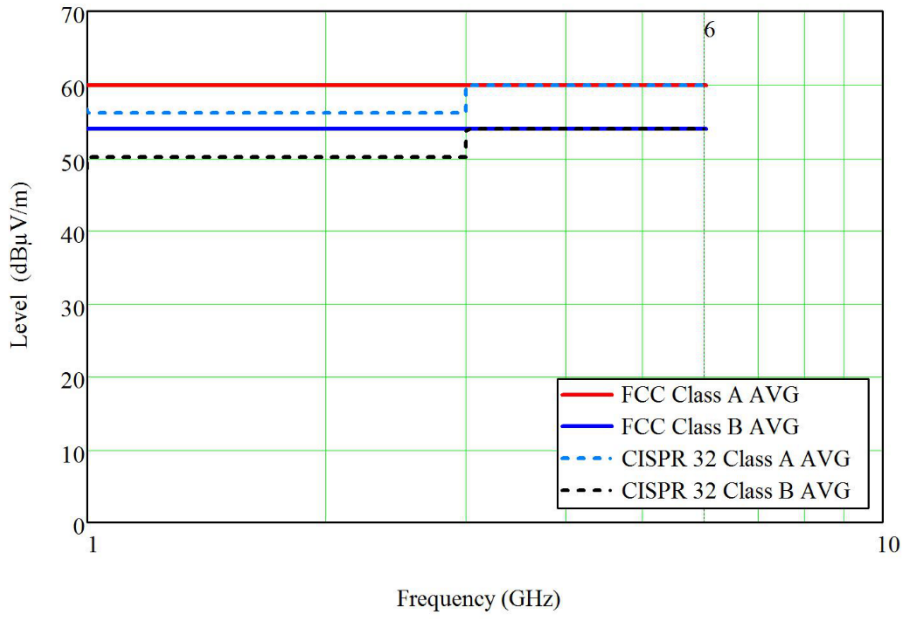
Final Scan Correlated Data

LP	Frequency[Hz]	Level[dBuV/m]	Limit[dBuV/m]	Difference[dBm]	Detector	RBW[Hz]	Pass/Failed
1	1,00G	43,04	70,00	26,96	PK	1M	pass
2	1,02G	41,61	70,00	28,39	PK	1M	pass
3	1,15G	40,81	70,00	29,19	PK	1M	pass
4	1,31G	39,83	70,00	30,17	PK	1M	pass
5	1,64G	55,54	70,00	14,46	PK	1M	pass
6	1,78G	48,21	70,00	21,79	PK	1M	pass
7	1,97G	49,00	70,00	21,00	PK	1M	pass
8	2,13G	51,98	70,00	18,02	PK	1M	pass
9	2,29G	45,72	70,00	24,28	PK	1M	pass

6.3. 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 SoMLabs 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 SoMLabs Sp. z o. o. be liable for any incidental or consequential damages that you may suffer directly or indirectly from use of any product.