

RADIO TEST REPORT

No. 911149-2

EQUIPMENT UNDER TEST

Equipment: Radio transceiver module
Type / model: TR02 Low Power
Manufacturer: SCANRECO Industrietechnik AB
Tested by request of: SCANRECO Industrietechnik AB

SUMMARY

The equipment complies with the requirements of the following standards:

FCC 47 CFR part 15 (2008) Subpart C –Intentional Radiators; §15.209 Radiated emission limits



Date of issue: October 1, 2008

Tested by:

Stefan Andersson

Approved by:

Hans Kohlén

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company: SCANRECO Industri Elektronik AB
BOX 47144 / Årsta Skolgränd 22
S-100 74 Stockholm
Sweden

Name of contact: Ramin Fardi

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment: Radio transceiver
Type/Model: TR02 Low Power
Brand name: Scanreco
Serial number: No visible serial on EUT
Manufacturer: SCANRECO Industri Elektronik AB
Rating/Supplying voltage: 6.0 - 8.0 VDC, 7.2 VDC nominal
Rating RF output power: < 20 nW eirp
Antenna gain: < 2 dBi
External antenna connector: No
Operating temperature range: -10° - 55° C degrees
Frequency range: 433.1 – 434.7 MHz
Number of channels: 12
Channel separation: 25 kHz
Modulation characteristics: FSK
Stand by mode supported: No
Receiver mode supported: Yes

2.2 Peripheral equipment

During the test EUT was powered by external 7.2 V NiMH battery.

2.3 Modifications during the test

No modifications have been made during the tests.



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3. TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2008) Subpart C – Intentional Radiators; §15.209 Radiated emission limits

Measurements methods according to ANSI C63.4-2003 - Methods of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

3.3 Test set-up

Measurement set-ups for the spurious emissions test are described in corresponding sections.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature: 22 – 23 °C

Relative humidity: 23 – 53 %



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4. TEST SUMMARY

The results in this report apply only to the sample tested.

FCC reference	Test	Result	Note
15.209	Intentional radiators Radiated emission limits	Pass	1

1) The measured result is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.



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8. RADIATED EMISSIONS

8.1 Measurement uncertainty

Radiated disturbance electric field intensity, 30 – 1000 MHz: $\pm 4,6$ dB

Radiated disturbance electric field intensity, 1000 – 18000 MHz: $\pm 6,0$ dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.

The measurement uncertainty is given with a confidence of 95%.

8.2 Test equipment

Equipment	Manufacturer	Type	Inv. No.
<i>Test site: "Big Chamber", semi anechoic shielded chamber</i>			
Software:	Rohde & Schwarz	EMC 32 V5.10.99	
Measurement receiver:	Rohde & Schwarz	ESU 8	12866
Antenna, Ultra broadband:	Rohde & Schwarz	CBL 6111	8578
<i>Test site: "Bluetooth Chamber" anechoic shielded chamber</i>			
Software:	Rohde & Schwarz	ES-K1, V1.70	
Signal analyser:	Rohde & Schwarz	FSIQ 40	12793
Preamplifier:	MITEQ	AFS6/AFS44	12335
Antennas:			
Double Ridge Guide Horn:	EMCO	3115	4936



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8.3 Measurement set-up

Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with quasi-peak detector were carried out.

Test set-up photos:



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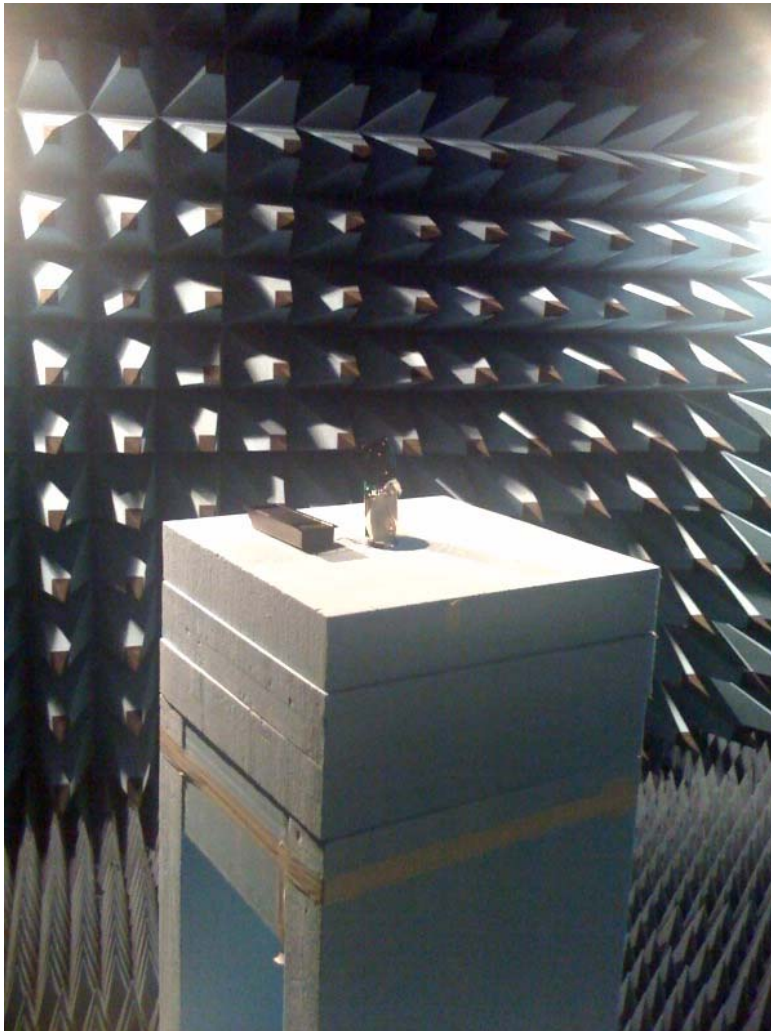
Test site: Radio anechoic shielded chamber (1 – 5 GHz)

In the Radio anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the spectrum analyser in max-hold and with the antenna placed 1,4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements with peak and average detectors were carried out.

Test set-up photo:



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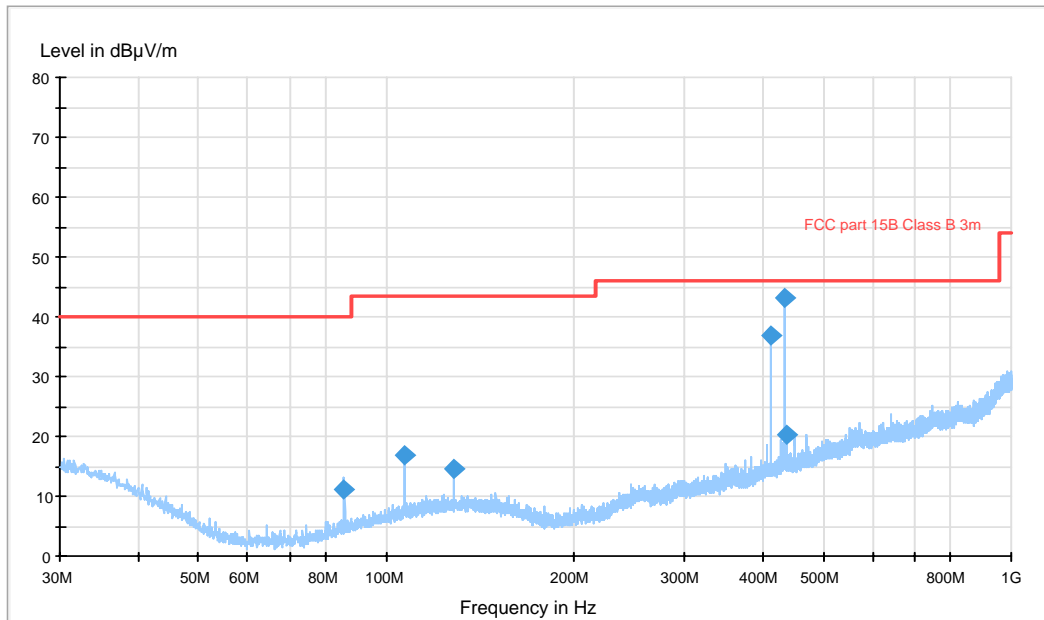
8.4 Test protocol

Semi-anechoic shielded chamber

Date of test: September 1, 2009

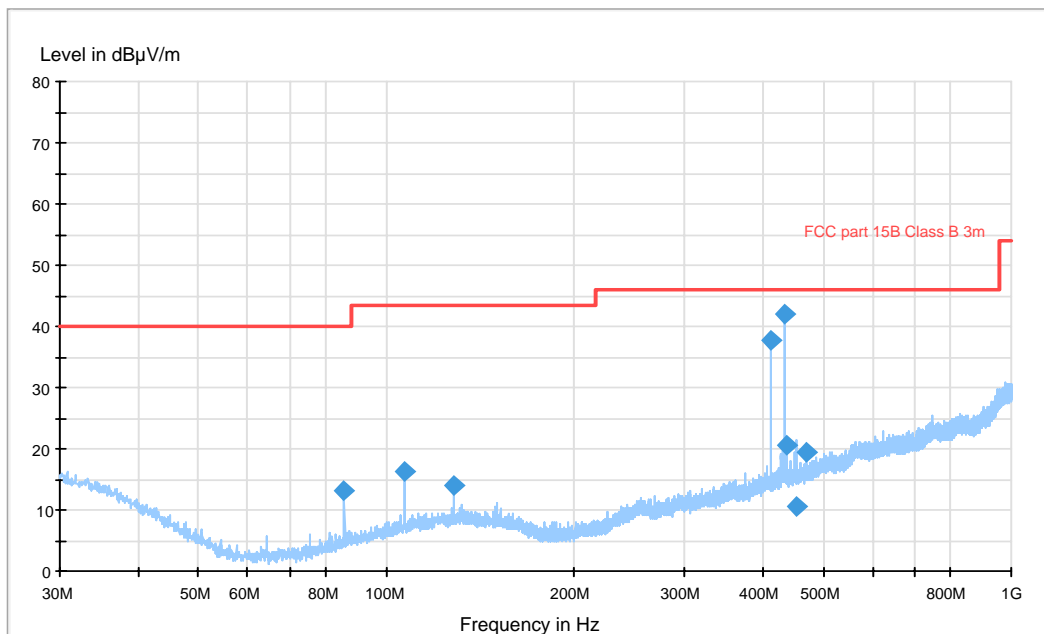
30 – 1000 MHz, max peak at a distance of 3 m, Lowest channel,

FCC 30 - 1000 MHz FCC class B 3m



30 – 1000 MHz, max peak at a distance of 3 m, mid channel,

FCC 30 - 1000 MHz FCC class B 3m

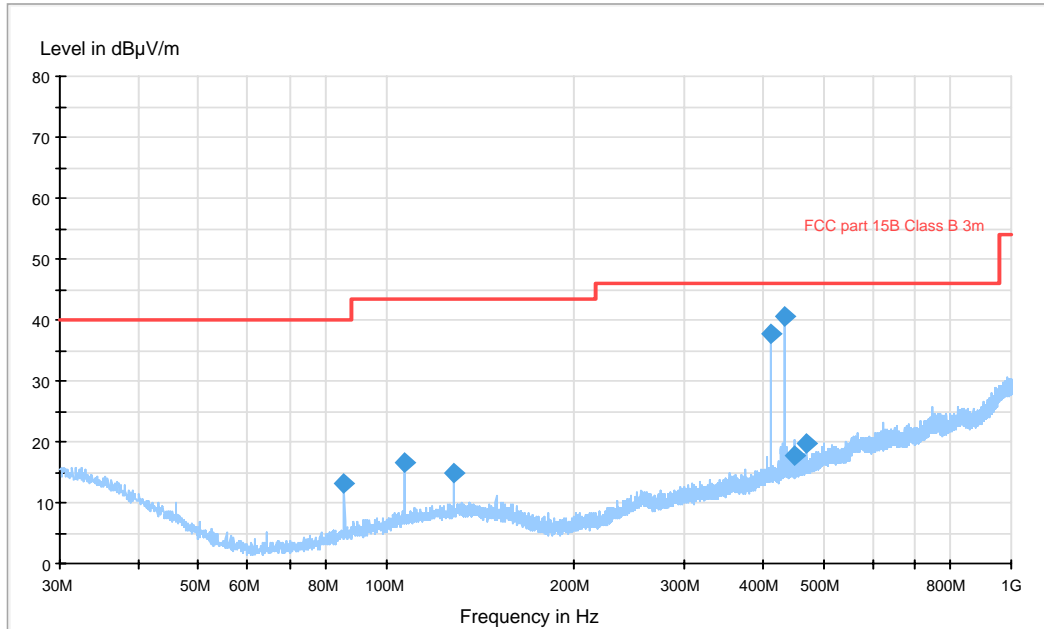


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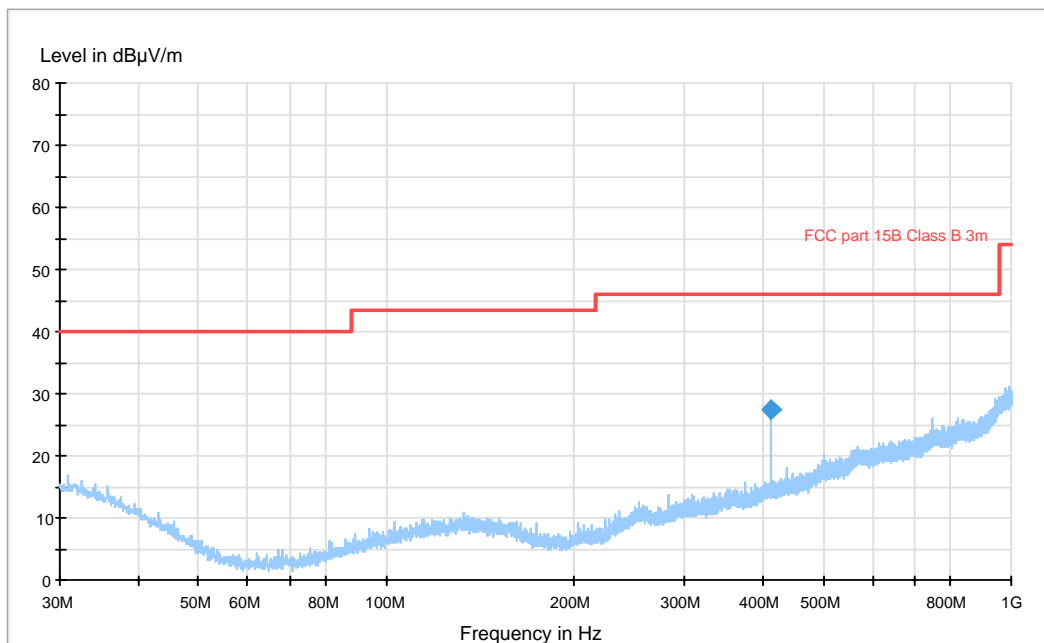
30 – 1000 MHz, max peak at a distance of 3 m, Highest channel,

FCC 30 - 1000 MHz FCC class B 3m



30 – 1000 MHz, max peak at a distance of 3 m, receiving mode

FCC 30 - 1000 MHz FCC class B 3m



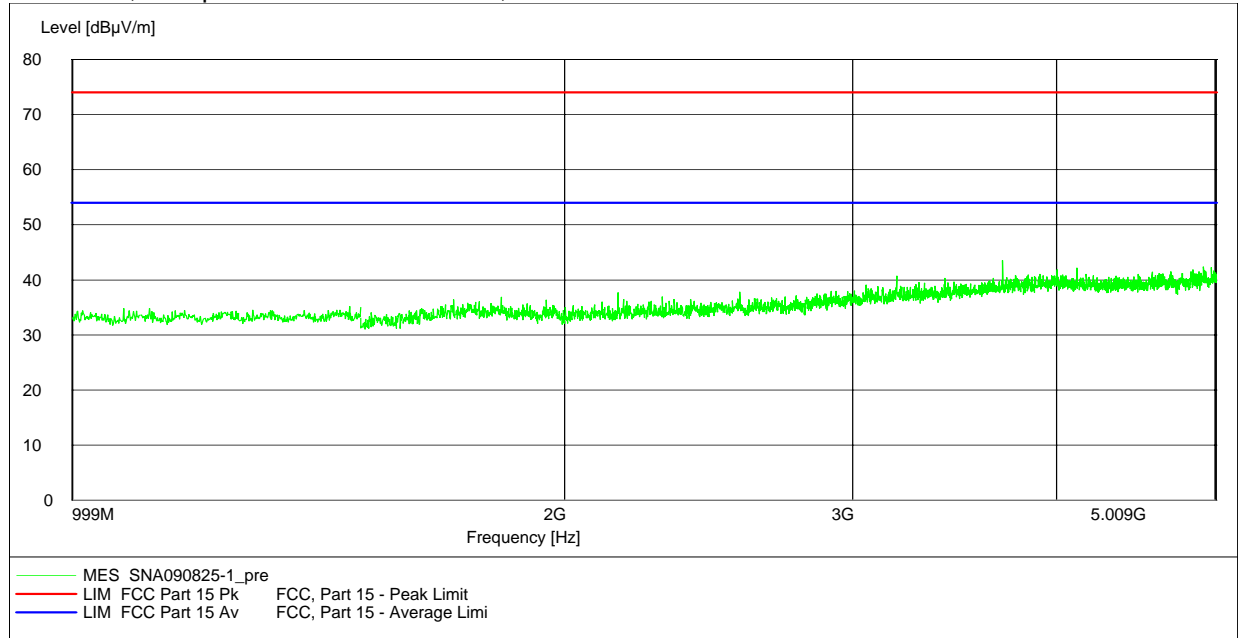
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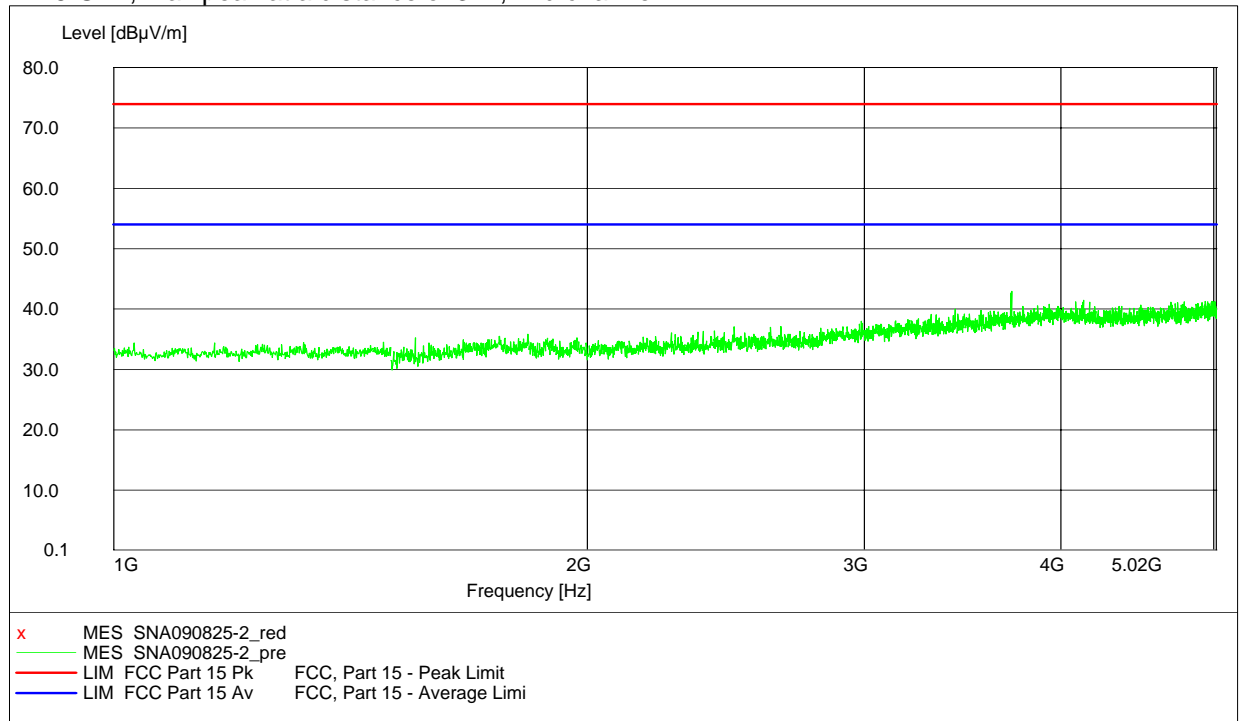
Radio anechoic shielded chamber

Date of test: August 25, 2009

1 – 5 GHz, max peak at a distance of 3 m, Lowest channel.



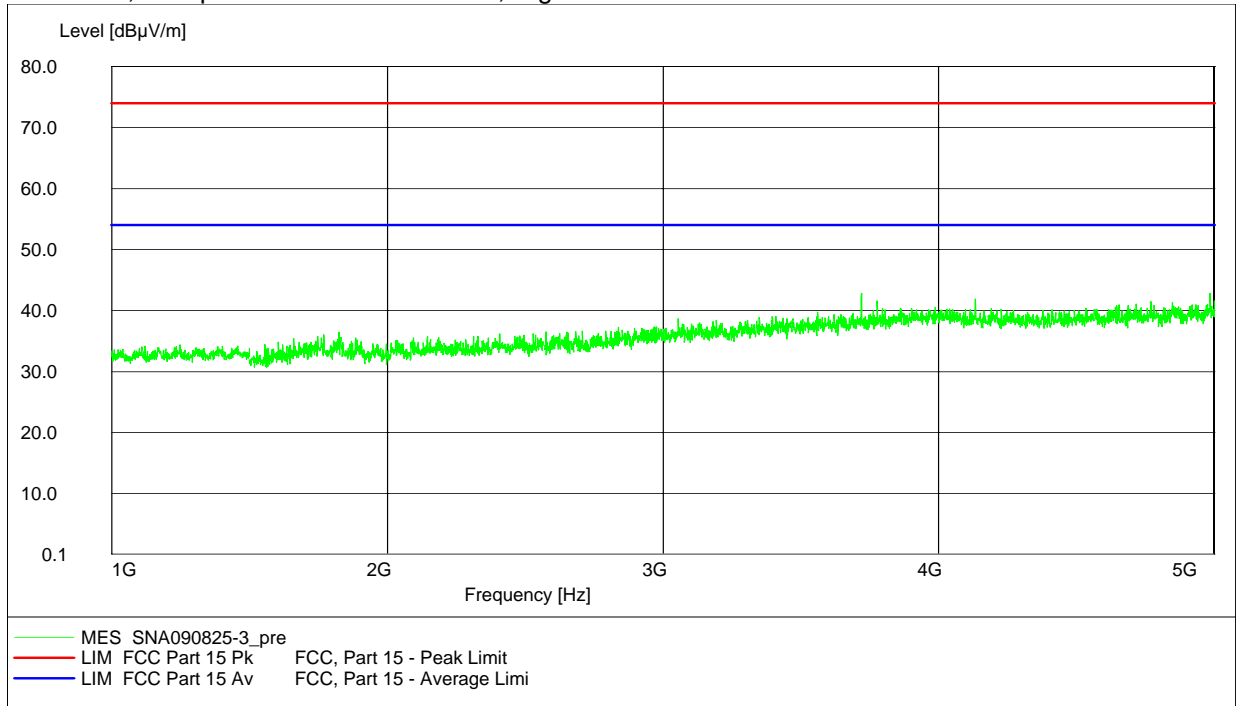
1 – 5 GHz, max peak at a distance of 3 m, mid channel.



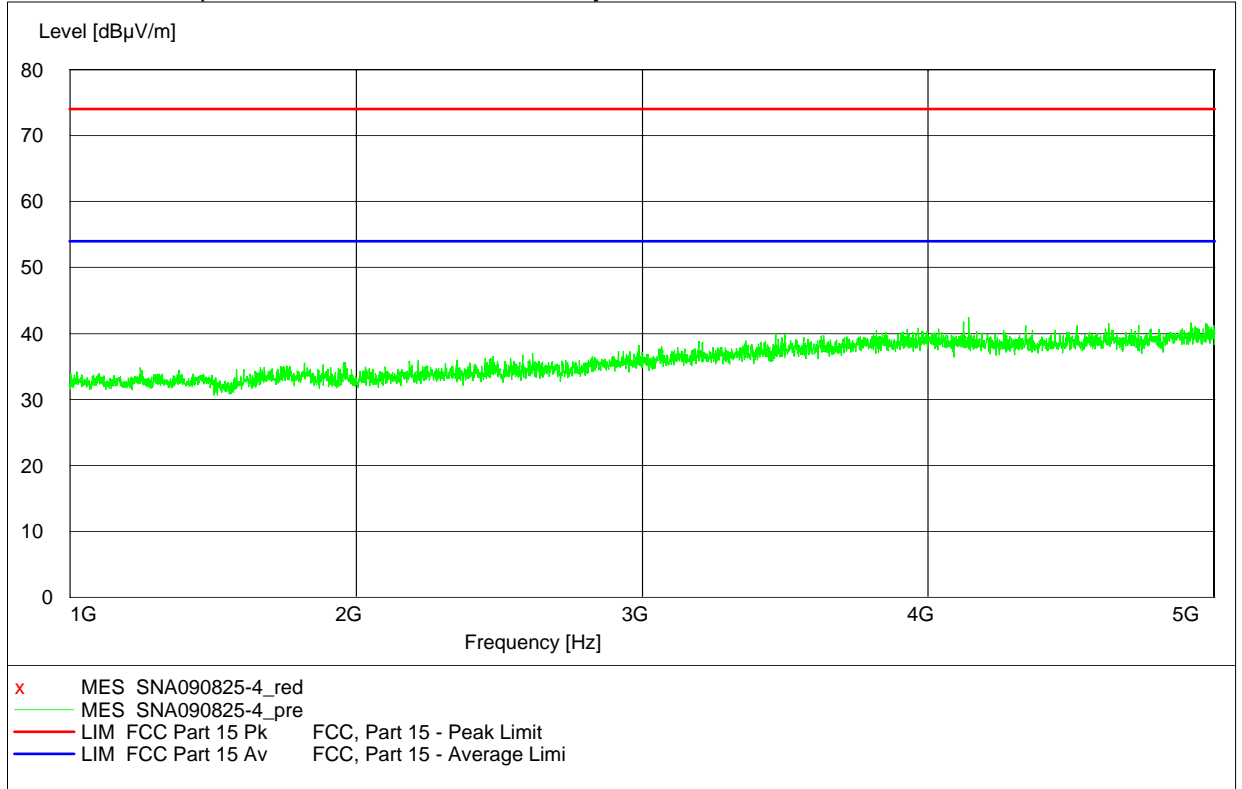
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1 – 5 GHz, max peak at a distance of 3 m, Highest channel.



1 – 5 GHz, max peak at a distance of 3 m, standby mode



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Data summary

Stand by mode

Field strength of radiated emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
411.721	120	-	27.5	-	46.0	
1000 - 5000	1000	-	-	-	-	1

Lowest channel

Field strength of radiated emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
85.596	120	-	11.1	-	40.0	
107.003	120	-	16.9	-	43.5	
128.385	120	-	14.7	-	43.5	
411.721	120	-	36.8	-	46.0	
433.104	120	-	43.2	-	46.0	Carrier, 2
437.536	120	-	20.4	-	46.0	
1000 - 5000	1000	-	-	-	-	1

Mid channel

Field strength of radiated emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
85.596	120	-	13.0	-	40.0	
107.018	120	-	16.4	-	43.5	
128.361	120	-	14.1	-	43.5	
412.496	120	-	37.6	-	46.0	
433.919	120	-	42.1	-	46.0	Carrier, 2
437.536	120	-	20.7	-	46.0	
452.219	120	-	10.5	-	46.0	
470.830	120	-	19.4	-	46.0	
1000 - 5000	1000	-	-	-	-	1



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Highest channel

Field strength of radiated emissions						
Frequency [MHz]	RBW [kHz]	Measured level		Limit		Note
		Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	Peak [dB(μV/m)]	QP/AV [dB(μV/m)]	
85.596	120	-	13.0	-	40.0	
107.003	120	-	16.5	-	43.5	
128.385	120	-	15.0	-	43.5	
413.311	120	-	37.7	-	46.0	
434.719	120	-	40.7	-	46.0	Carrier
449.303	120	-	17.7	-	46.0	
470.821	120	-	19.8	-	46.0	
1000 - 5000	1000	-	-	-	-	1

1) No significant peaks above the noise floor were found.

2) The measured result is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

Example calculation:

Measured level [dBμV/m] = Analyser reading [dBμV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]



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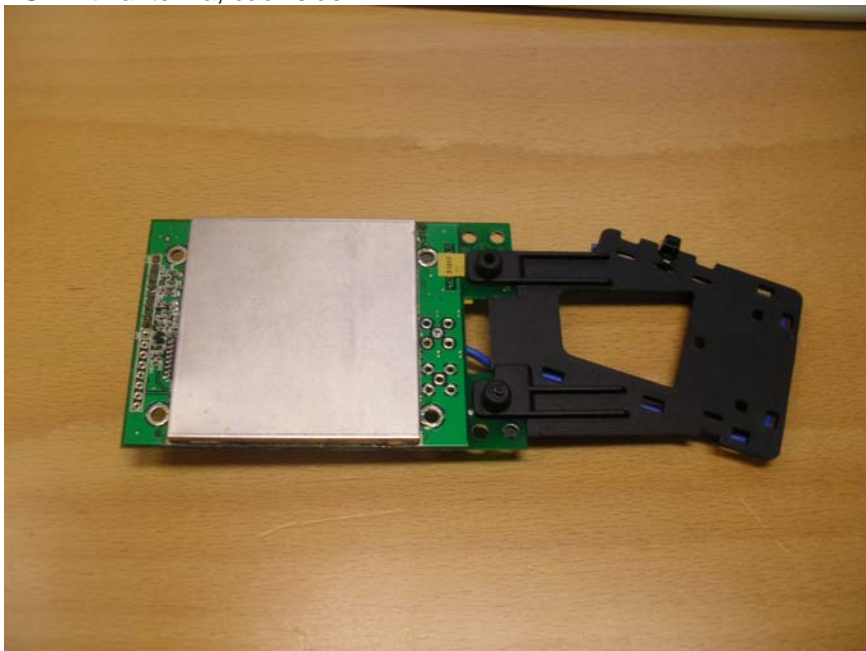
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APPENDIX I – PHOTOS OF THE EUT

EUT with antenna, front side



EUT with antenna, back side



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