FCC LISTED, REGISTRATION NUMBER: 905266

IC LISTED REGISTRATION NUMBER IC 4621

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TEST REPORT

REFERENCE STANDARD:

USA FCC Part 15.249 and 15.109 / CANADA RSS-210

NIE .....:	28315RET.102
Approved by (name / position & signature) .....:	A. Llamas / RF Lab. Manager
Elaboration date .....:	15/09/2008
Identification of item tested .....:	USB transceiver dongle
Trademark .....:	Logitech
Model and/or type reference .....:	C-UBD58 (with antenna modification made by Yageo)
Serial number .....:	---
Other identification of the product .....:	FCC ID: DZLCUBD58 IC: 1807B- CUBD58
Features .....:	Operating frequency in the 2405-2474 MHz range, Channel Bandwidth 2MHz, 5.0 V_{DC} supplied by PC USB port.
Description .....:	USB transceiver for Logitech mice
Applicant .....:	Logitech Inc.
Address.....:	6505 Kaiser Drive / Fremont, CA 94555 / USA
CIF/NIF/Passport .....:	Not provided
Contact person:	Bharat Shah
Telephone / Fax.....:	+1-510-795 85 00 / +1-510-792 89 01
e-mail: .....:	Bharat_Shah@logitech.com
Test samples supplier .....:	Logitech Europe, S.A.
Address.....:	Z.I. Moulin du Choc D / Romanel Sur Morges, 1122 / Switzerland
CIF/NIF/Passport .....:	203037
Contact person:.....:	Pascal Bornel
Telephone / Fax.....:	+41 21 863 50 67 / +41 21 563 29 01
e-mail: .....:	pascal_bornel@eu.logitech.com
Manufacturer .....:	Logitech Technology Co. LTD
Address.....:	No. 3, Songshan Road / Suzhou New District / China
CIF/NIF/Passport .....:	---
Telephone / Fax.....:	+86 (0) 512 6662 2666 / +86 (0) 512 6662 2900

Test method requested .....:	See Standard
Standard .....:	USA FCC Part 15.249. Subclauses a) and d): Field strength of fundamental and spurious emissions for transmitter USA FCC Part 15.109. Radiated emissions for receiver CANADA RSS-210. Radiated emissions for transmitter and receiver
Test procedure .....:	PEET041: Medidas radioeléctricas en equipos de corto alcance y rango de frecuencias entre 1 GHz y 40 GHz
Non-standardized test method .....:	N/A
Used instrumentation .....:	1. Semianechoic Absorber Lined Chamber IR 11. BS. 2. Control Chamber IR 12.BC. 3. Antenna mast EM 1072 NMT. 4. Rotating table EM 1084-4. ON. 5. Multi device controller ETS 2090. 6. Hybrid Bilog antenna Sunol Sciences Corporation JB6. 7. Antenna tripod EMCO 11968C. 8. Double-ridge Guide Horn antenna 1-18 GHz HP 11966E. 9. Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J. 10. RF pre-amplifier Miteq JS4-12002600-30-5A. 11. RF pre-amplifier Miteq AFS5-04001300-15-10P-6. 12. Spectrum analyzer R&S ESIB 26. 13. Spectrum analyzer R&S ESU 40. 14. RF pre-amplifier Schaffner CPA 9231. 15. DC power supply R&S NGPE 40/40
Report template No. .....:	FDT08_08

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Competences and guarantees

Centro de Tecnología de las Comunicaciones (AT4 wireless), S.A. is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

Centro de Tecnología de las Comunicaciones (AT4 wireless), S.A. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance programme for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**.

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
28315//03	USB Dongle	C-UBD58	---	07/07/2008

1. Sample M/01 has undergone the test(s) specified in subclause "Test method requested".

Testing period

The performed test started on 2008-07-28 and finished on 2008-08-08.

The tests have been performed at AT4 wireless.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 25 ºC Max. = 26 ºC
Relative humidity	Min. = 60 % Max. = 61 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters), the following limits were not exceeded during the test.

Temperature	Min. = 25 ºC Max. = 26 ºC
Relative humidity	Min. = 60 % Max. = 61 %
Air pressure	Min. = 1019 mbar Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

Summary

Considering the results of the performed test according to standard USA FCC Parts 15.249 and 15.109, the item under test is **IN COMPLIANCE** with the requested specifications specified in the standard.

NOTE: The results presented in this Test Report apply only to the particular item under test established in page 1 of this document, as presented for test on the date(s) shown in section, "USAGE OF SAMPLES, TESTING PERIOD AND ENVIRONMENTAL CONDITIONS".

Remarks and comments

Testing verdicts

Not applicable .....: NA

Pass.....: P

Fail .....: F

Not measured.....: NM

FCC PART 15 PARAGRAPH		VERDICT			
		NA	P	F	NM
15.249 Subclause (a)	Field strength of fundamental and harmonics emissions.		P		
15.249 Subclause (d)	Emissions radiated outside of the specific frequency bands		P		
15.109	Radiated emissions limits for receiver		P		

APPENDIX A: Test result

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 5 Vdc

Type of power supply = DC voltage supplied by USB port.

Type of antenna = Integral antenna

Operating Temperature Range (ºC):

T_n = +15 to + 35

TEST FREQUENCIES:

Lowest channel: 2405 MHz

Close to middle channel: 2447 MHz

Highest channel: 2474 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.4: 2003.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Section 15.249 Subclause (a). Field strength of Fundamental

SPECIFICATION

The field strength of emissions from intentional radiators shall comply with the following

Fundamental frequency (MHz)	Field strength of fundamental (mV/m)	Field strength (dBµV/m)	Measurement distance (m)
902 - 928	50	93.98	3
2400 – 2483.5	50	93.98	3
5725 - 5875	50	93.98	3
24000-24250	250	107.96	3

for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

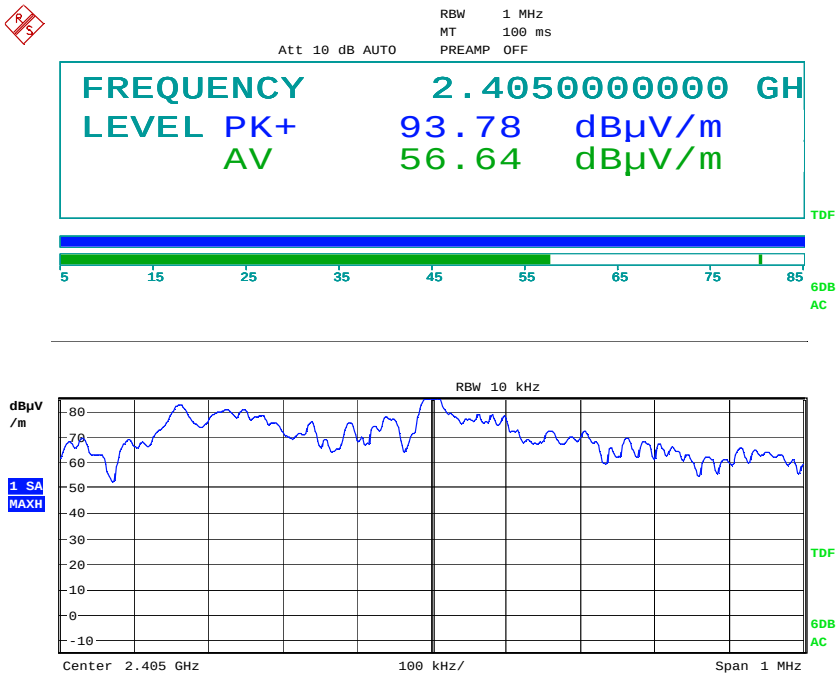
RESULTS

	Lowest frequency 2405 MHz	Middle frequency 2447 MHz	Highest frequency 2474 MHz
Field strength (dBµV/m) average	56.64	55.63	56.18
Field strength (dBµV/m) peak	93.78	92.42	92.58
Measurement uncertainty (dB)	±4.0		

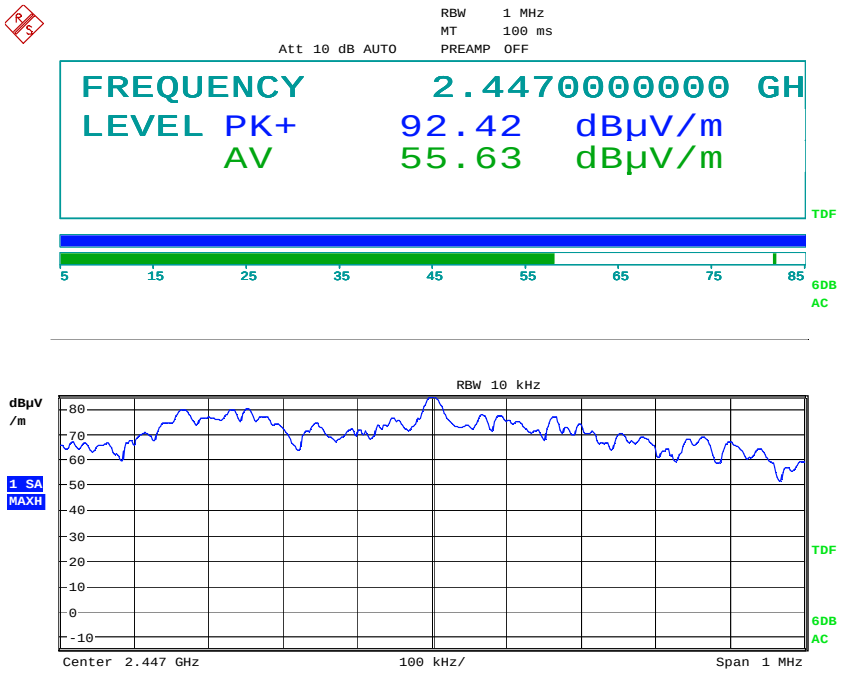
Verdict: PASS

FIELD STRENGTH

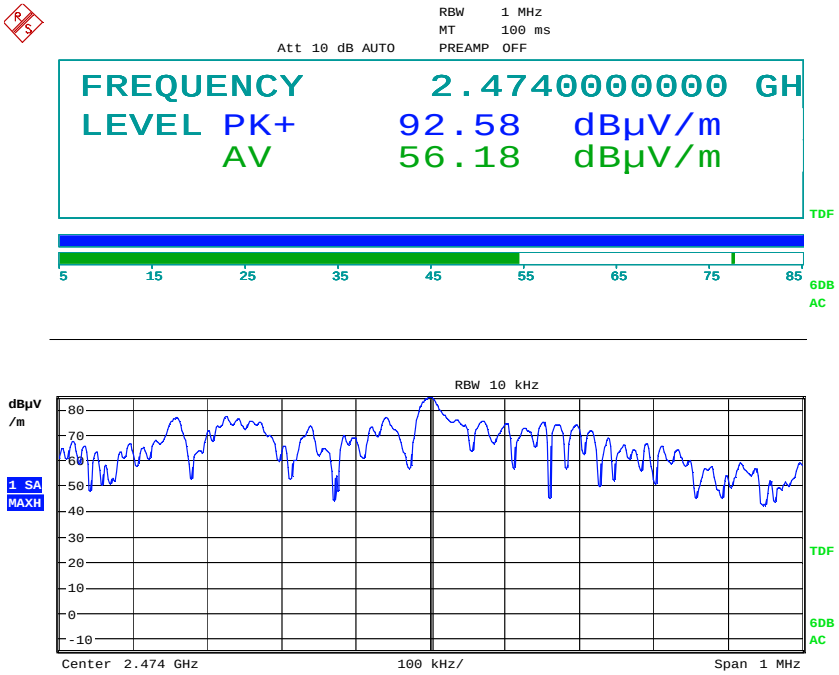
Lowest Channel: 2405 MHz.



Middle Channel: 2447 MHz.



Highest Channel: 2474 MHz.



Section 15.249 Subclause (a) and (d). Radiated emissions (Transmitter)

SPECIFICATION

The field strength of harmonics from intentional radiators shall comply with the following

Fundamental frequency (MHz)	Field strength of fundamental (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
902 - 928	500	53.98	3
2400 – 2483.5	500	53.98	3
5725 - 5875	500	53.98	3
24000-24250	2500	67.96	3

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

Whichever is the lesser attenuation

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in the three operating channels.

Frequency range 1 GHz-25 GHz

1. CHANNEL: LOWEST (2405 MHz).

Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4809.9920	V	Peak	46.33	± 4.0
4809.9920	V	Average	43.92	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

2. CHANNEL: MIDDLE (2447 MHz).

Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4894.0321	V	Peak	46.11	± 4.0
4894.0321	V	Average	43.77	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

3. CHANNEL: HIGHEST (2474 MHz).

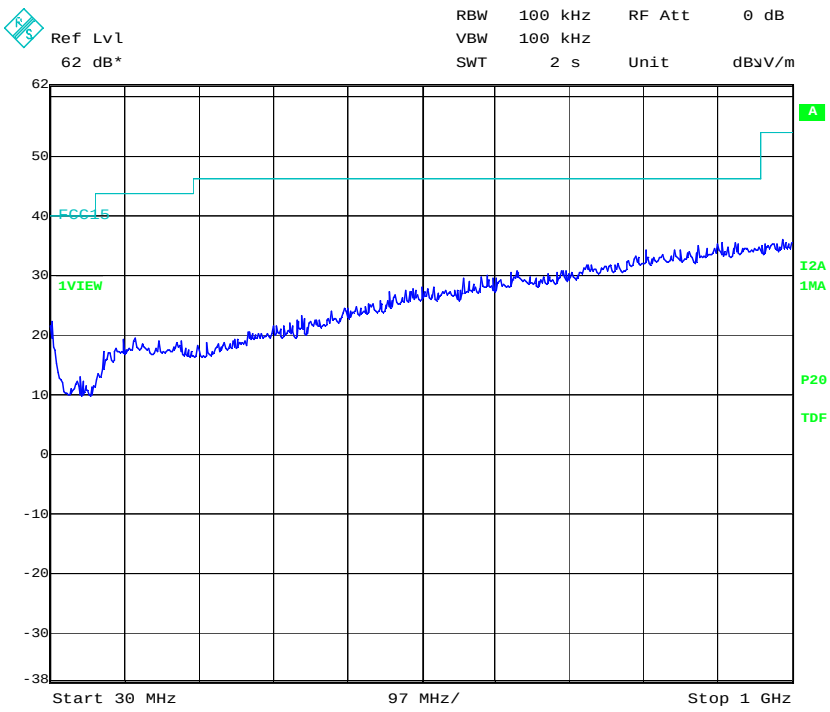
Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4947.9968	V	Peak	45.90	± 4.0
4947.9968	V	Average	43.42	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

Verdict: PASS

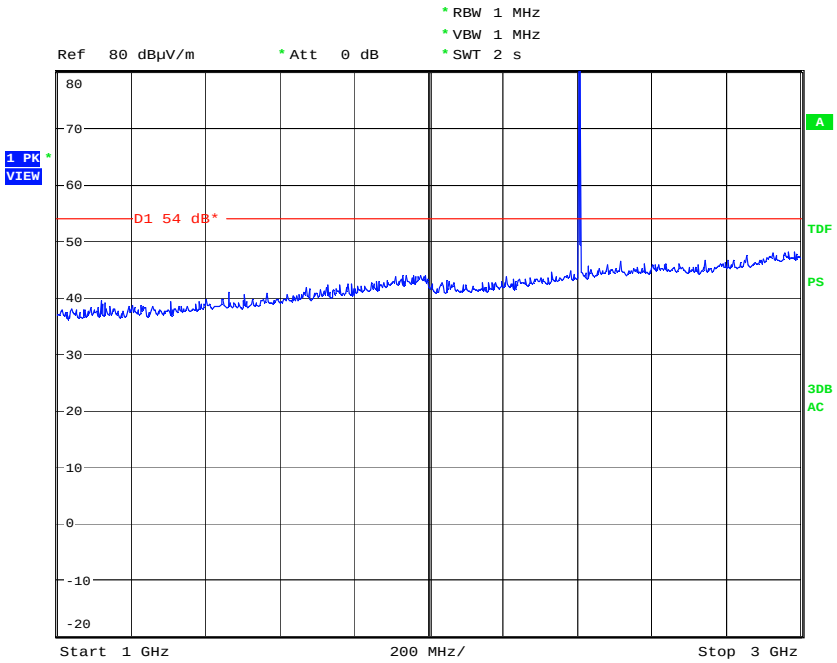
FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

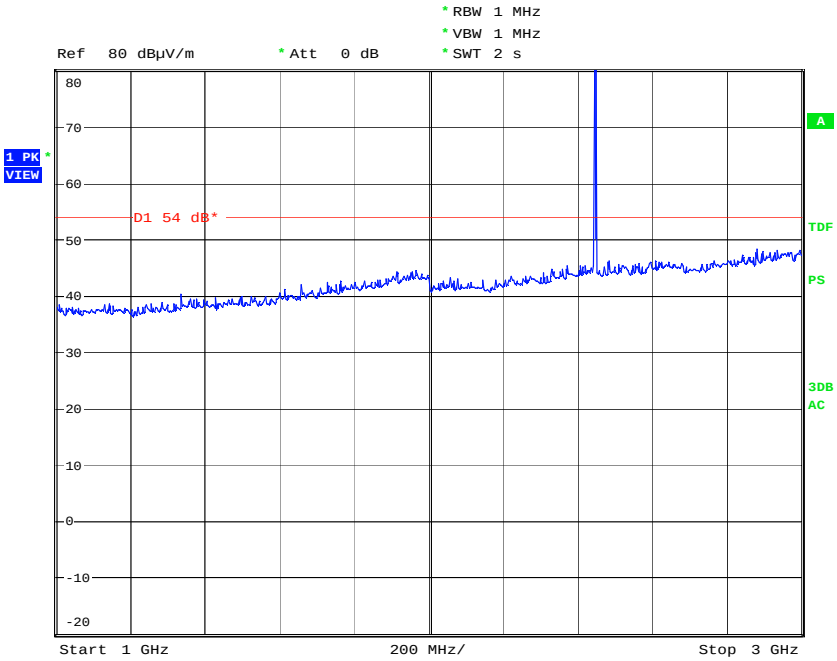
FREQUENCY RANGE 1 GHz to 3 GHz.

CHANNEL: Lowest (2402 MHz).



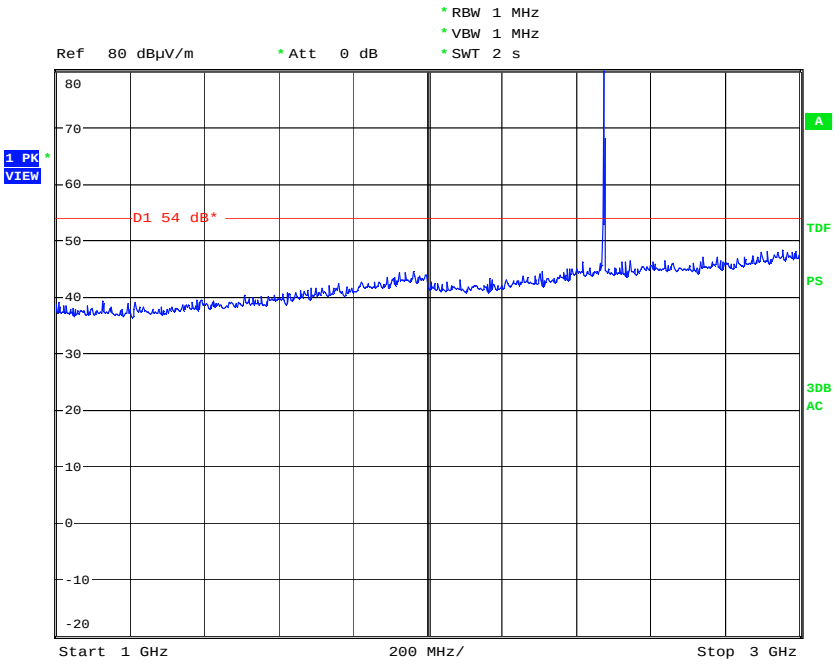
Note: The peak shown in the plot is the carrier frequency.

CHANNEL: Middle (2448 MHz).



Note: The peak shown in the plot is the carrier frequency.

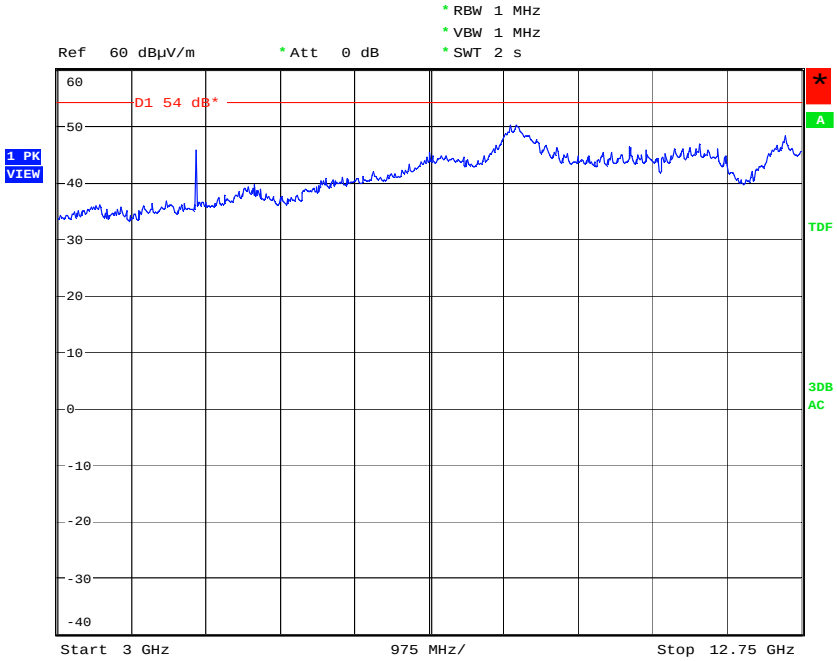
CHANNEL: Highest (2479 MHz).



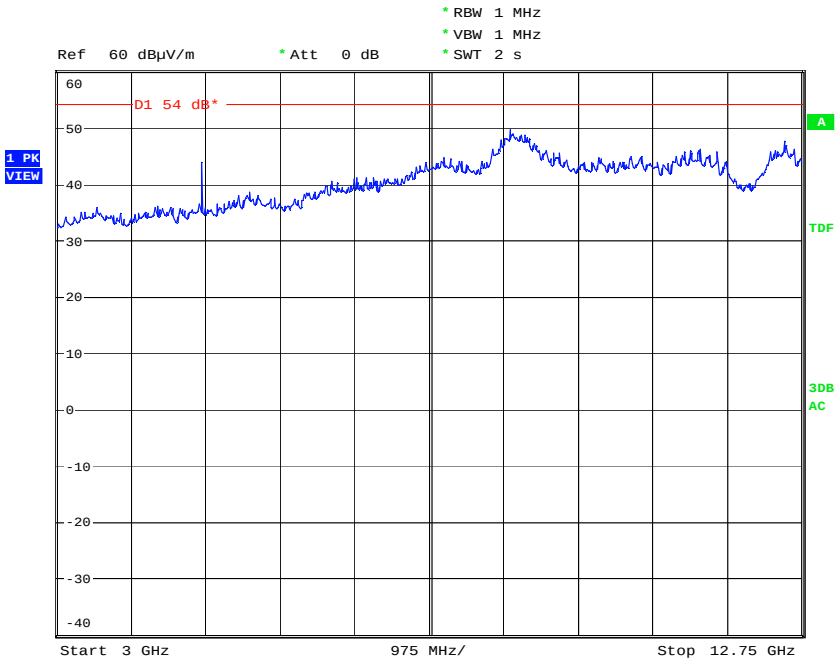
Note: The peak shown in the plot is the carrier frequency.

FREQUENCY RANGE 3 GHz to 12.75 GHz.

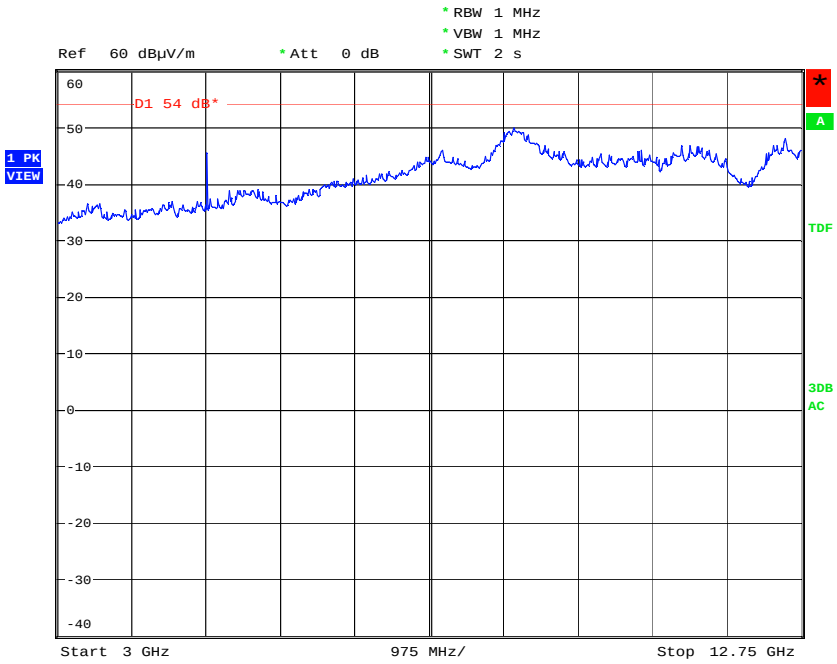
CHANNEL: Lowest (2405 MHz).



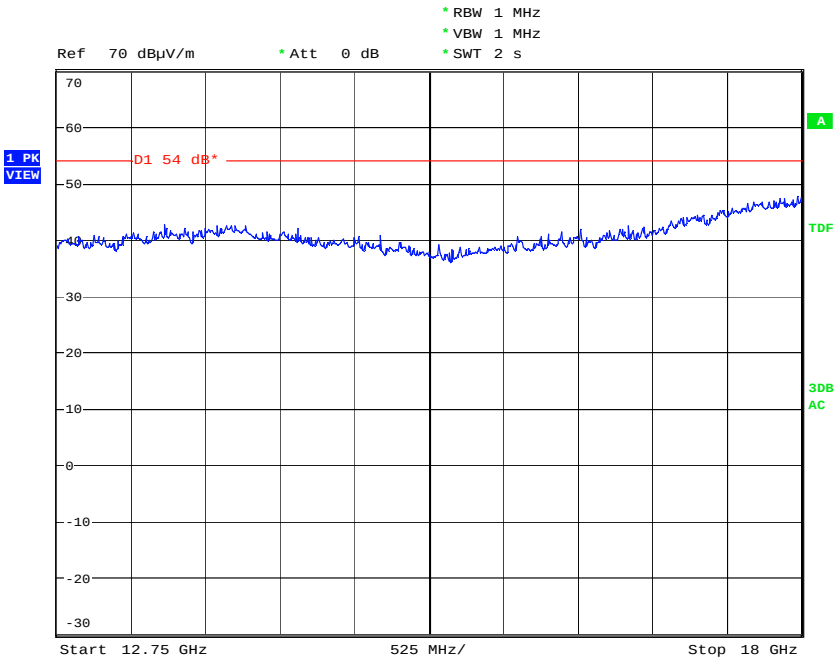
CHANNEL: Middle (2447 MHz).



CHANNEL: Highest (2474 MHz).

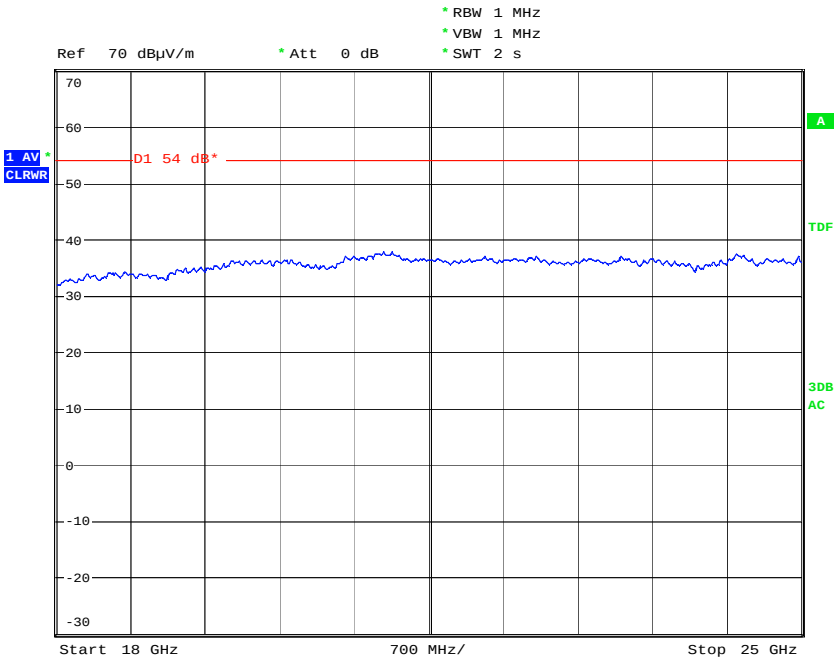


FREQUENCY RANGE 12.75 GHz to 18 GHz.



(This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz to 25 GHz.



(This plot is valid for all three channels).

Section 15.109. Receiver spurious radiation

SPECIFICATION

The field strength shall not exceed the following values:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-25 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz-1000 MHz.

No spurious signals were found in the three operating channels.

Frequency range 1 GHz-25 GHz

1. CHANNEL: LOWEST (2405 MHz).

Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2750.9135	H	Peak	38.15	± 4.0
2750.9135	H	Average	36.47	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

2. CHANNEL: MIDDLE (2447 MHz).

Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2798.8013	H	Peak	40.59	± 4.0
2798.8013	H	Average	38.73	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

3. CHANNEL: HIGHEST (2474 MHz).

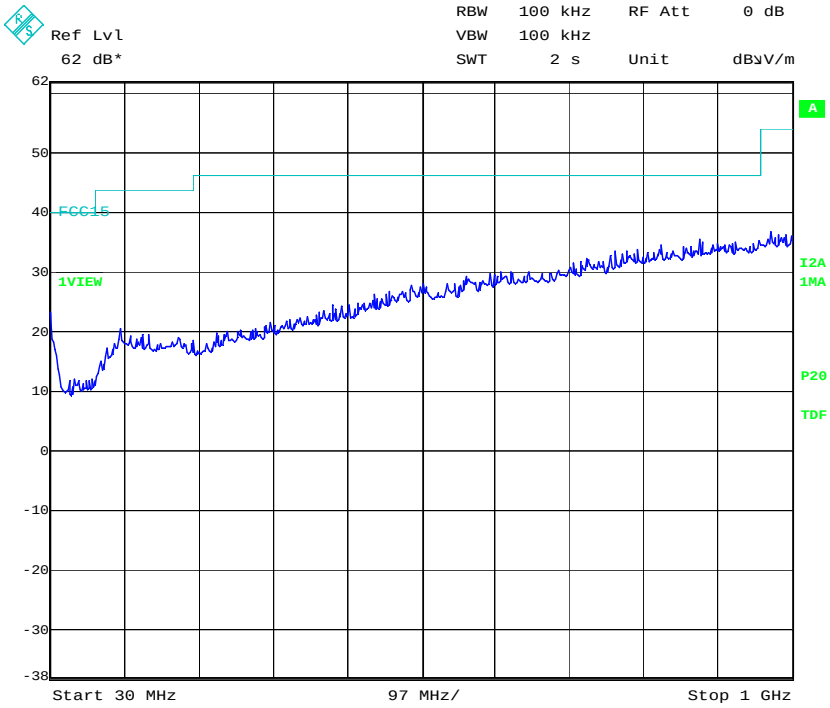
Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
2829.6571	H	Peak	41.75	± 4.0
2829.6571	H	Average	39.89	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

Verdict: PASS.

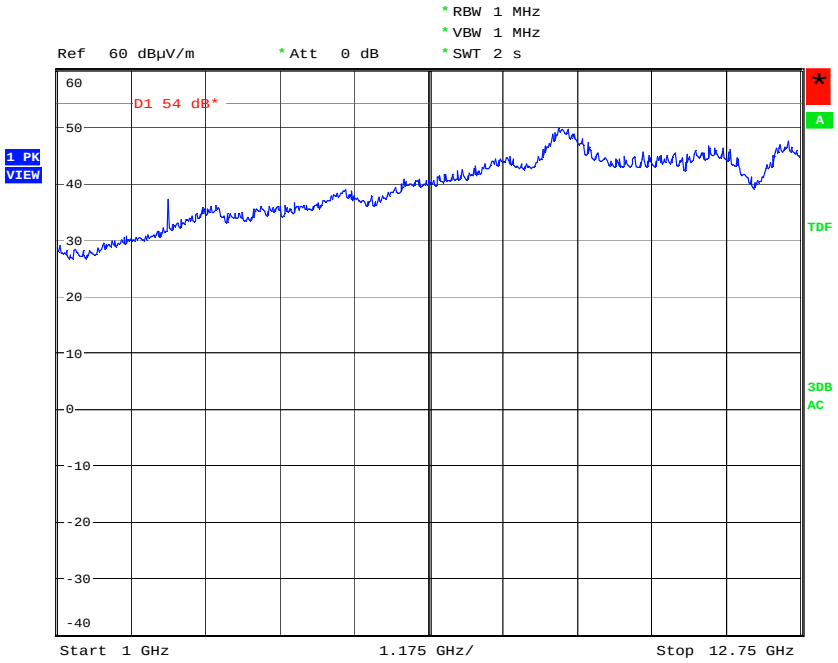
FREQUENCY RANGE 30 MHz-1000 MHz.



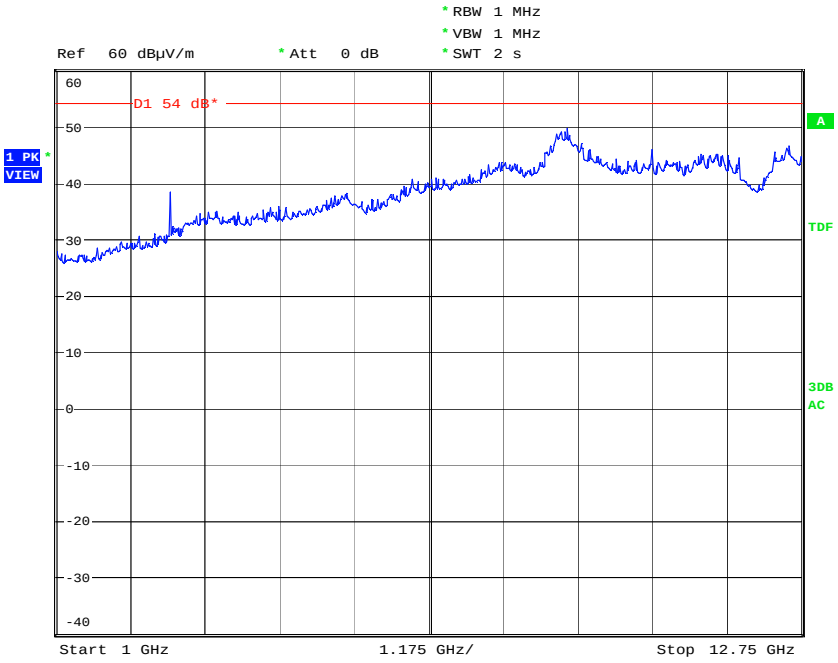
(This plot is valid for all three channels).

FREQUENCY RANGE 1 GHz-12.75 GHz.

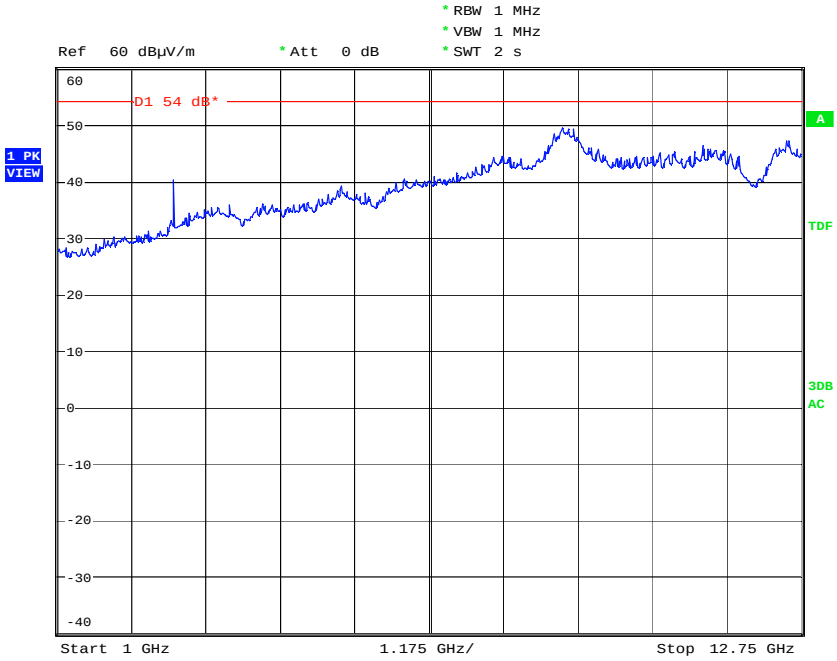
CHANNEL: Lowest (2405 MHz).



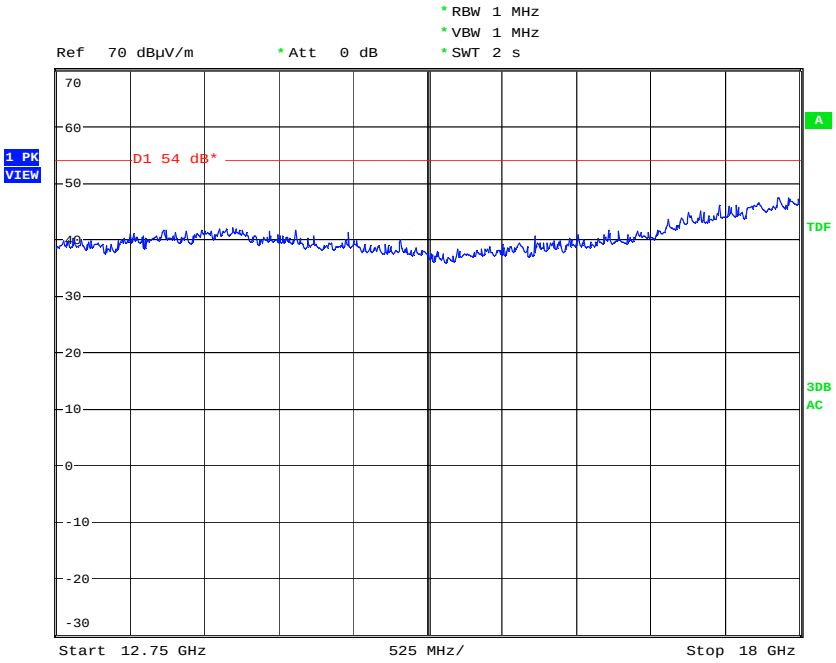
CHANNEL: Middle (2447 MHz).



CHANNEL: Highest (2474 MHz).

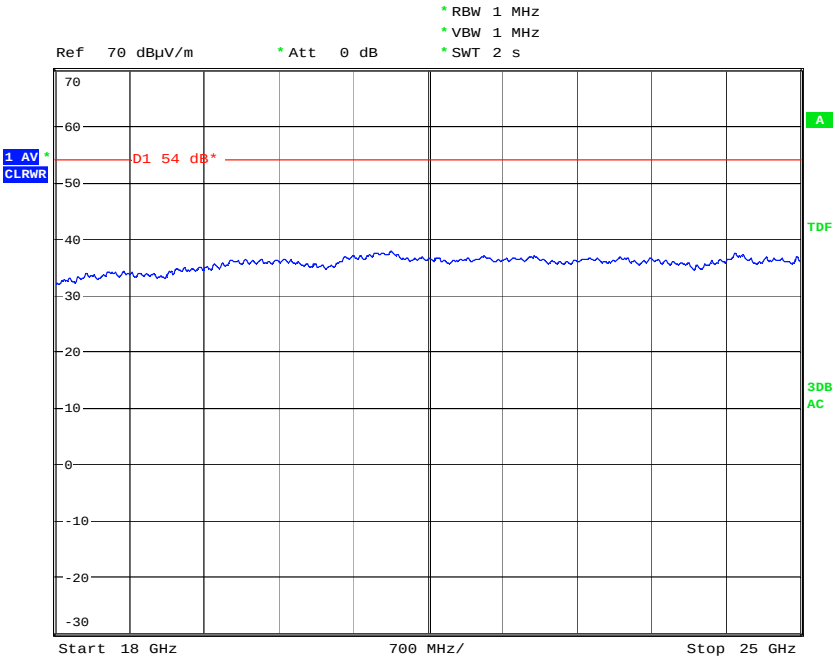


FREQUENCY RANGE 12.75 GHz-18 GHz.



(This plot is valid for all three channels).

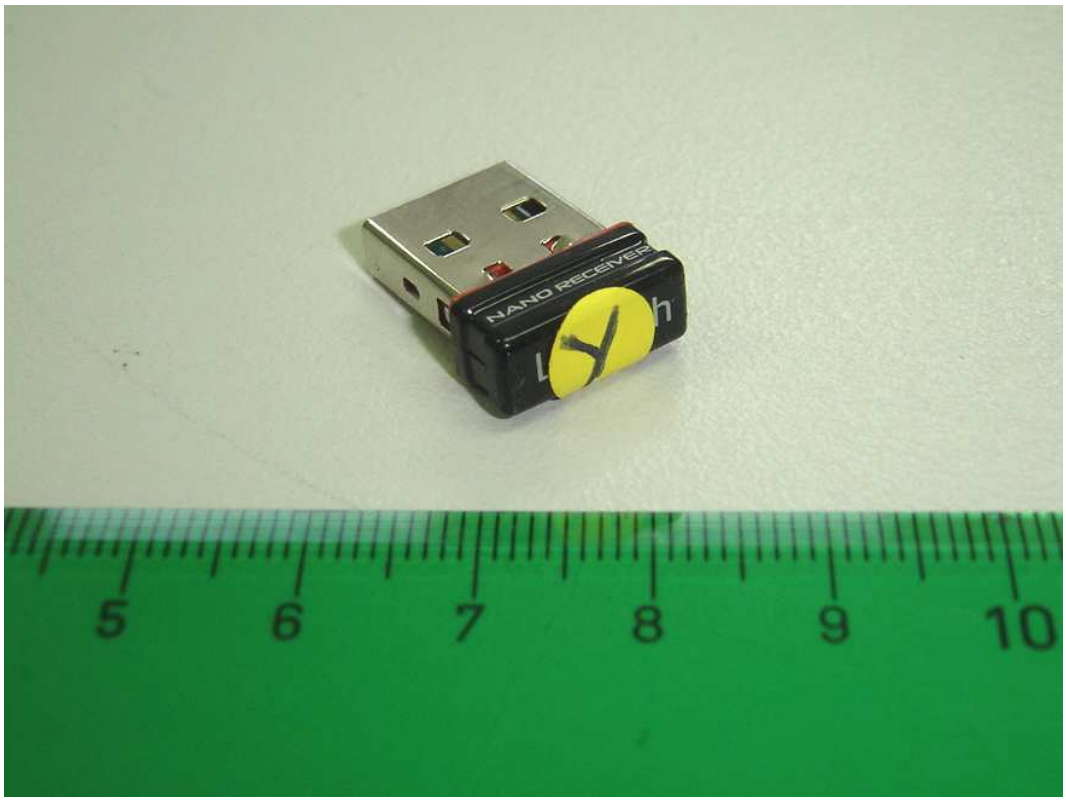
FREQUENCY RANGE 18 GHz-25 GHz.



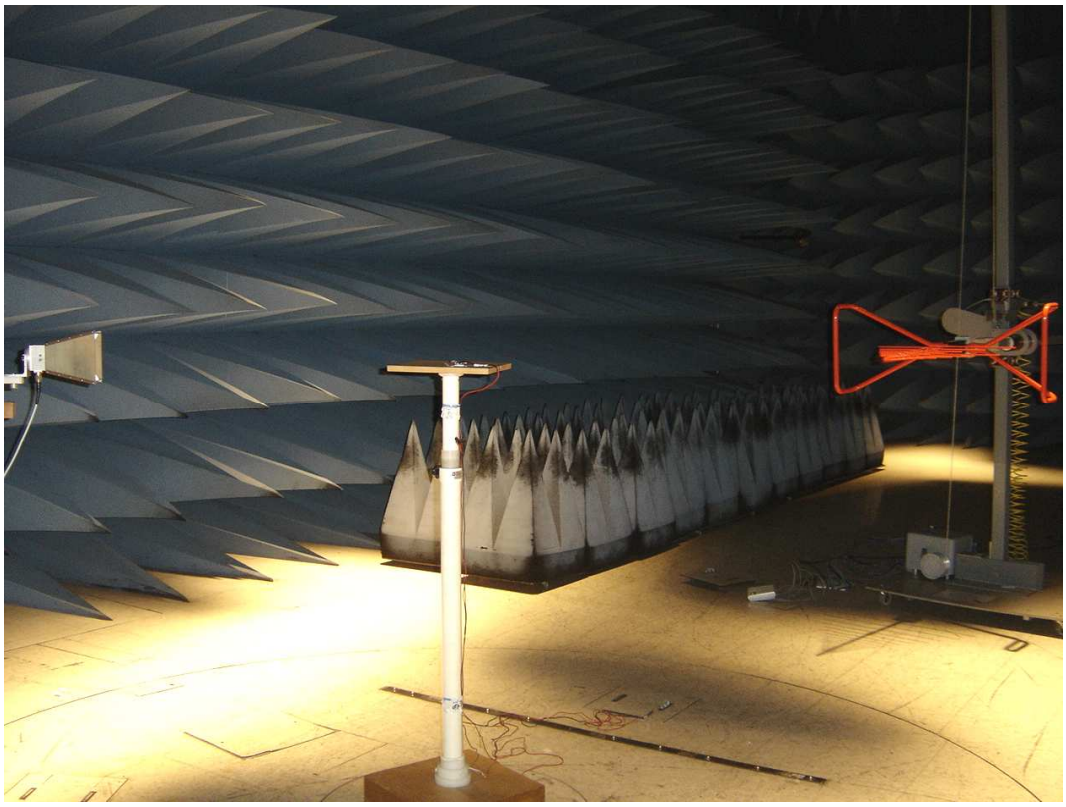
(This plot is valid for all three channels).

APPENDIX B: Photographs

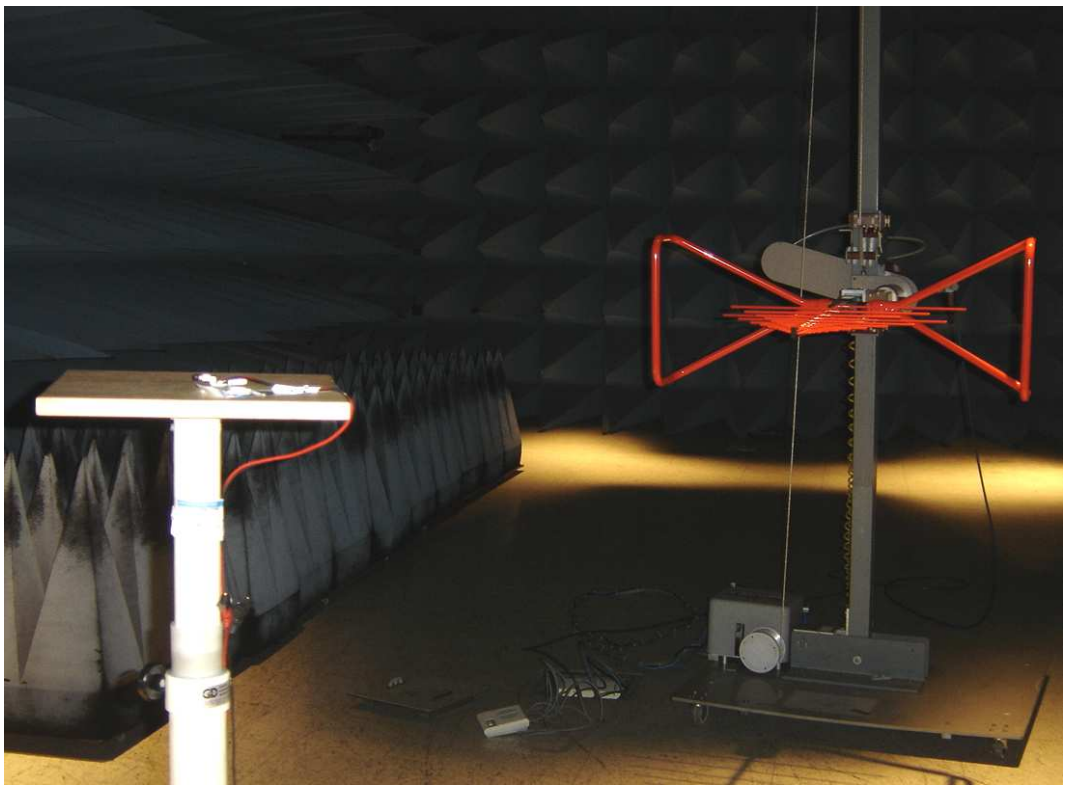
EQUIPMENT FOR RADIATED MEASUREMENTS



GENERAL SET-UP FOR RADIATED MEASUREMENTS



TEST SET-UP FOR RADIATED MEASUREMENTS BELOW 1 GHz



TEST SET-UP FOR RADIATED MEASUREMENTES ABOVE 1GHz