

Nemko Korea Co., Ltd.

155 & 159, Osan-Ro, Mohyeon-Eup, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 16885 KOREA, REPUBLIC OF
TEL:+82 31 330-1700 FAX:+82 31 322 2332

FCC and IC EVALUATION REPORT FOR CLASS II PERMISSIVE CHANGE

Applicant :**Samsung Electronics Co., Ltd.****129,Samsung-ro, Yeongtong-gu, Suwon-si,****Gyeonggi-do, 16677, Korea****Attn. : SUNLYEONG HWANG****Dates of Issue : May 03, 2019****Test Report No. : NK-19-R-114****Test Site : Nemko Korea Co., Ltd.****FCC ID
IC****A3LSMR370****649E-SMR370****Brand Name****Samsung Electronics Co., Ltd.****Contact Person**

Samsung Electronics Co., Ltd.
129,Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 16677, Korea
SUNLYEONG HWANG
Telephone No. : 82-10-9530-5722

Applied Standard: FCC 47 CFR Part 15.225 and IC RSS-210 Issue 9**Classification:** Part 15 Low Power Communication Device Transmitter (DXX)**EUT Type:** Galaxy Fit

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013. The client should not use it to claim product endorsement by TAF or any government agencies. The test results in the report only apply to the tested sample.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

 May 03. 2019

Tested By : Yonghwan Kim
Engineer

 May 03. 2019

Reviewed By : Seungyong Shin
Technical Manager

Revision History

Rev.	Issue Date	Revisions	Revised By
00	April 04, 2019	Initial issue	
01	April 15, 2019	Class I Permissive Change 1. Software(FVIN) change 2. Changes on PCB (Basic Report : Intial Report NK-18-R-192)	
02	May 03, 2019	Class II Permissive Change 1. Software(FVIN) change 2. Enabling new RF function by software (Basic Report : C1PC Report NK-19-R-089)	

TABLE OF CONTENTS

1. Scope	5
2. Introduction (Site Description)	6
2.1 Test facility	6
2.2 Accreditation and listing	7
3. Test Conditions & EUT Information	8
3.1 Operation During Test	8
3.1.1 Table of test power setting	8
3.1.2 Table of test channels	8
3.1.3 Antenna information	8
3.1.4 Additional Information Related to Testing	8
3.1.5 Table of test modes	9
3.2 Support Equipment	9
3.3 Setup Drawing	10
3.4 EUT Information	11
4. Summary of Test Results	12
5. Recommendation / Conclusion	12
6. Antenna Requirements	12
7. Description of Test	13
7.1 Radiated Emissions	13
7.2 20 dB Bandwidth	14
7.3 Frequency tolerance	14
8. Test Data (NTAG for Wireless Charging)	15
8.1 Radiated Emissions	15
8.2 The field strength of any emission within the band 13.110~14.010 MHz	17
8.3 20 dB Modulated Bandwidth	19
8.4 Frequency tolerance	21

9.	Test Data (PN553 for Tagging Communication)	22
9.1	Radiated Emissions	22
9.2	The field strength of any emission within the band 13.110~14.010 MHz	24
9.3	20 dB Modulated Bandwidth	26
9.4	Frequency tolerance	28
10.	Test Equipment	29
11.	Accuracy of Measurement	30

1. SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15 and IC RSS-210 Issue 9.

Responsible Party :	Samsung Electronics Co., Ltd. 129,Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Contact Person :	SUNLYEONG HWANG
Manufacturer :	Samsung Electronics Co., Ltd. 129,Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

- FCC ID: A3LSMR370
- IC: 649E-SMR370
- Model: SM-R370
- HVIN: SM-R370
- Brand Name: Samsung Electronics Co., Ltd.
- EUT Type: Galaxy Fit
- Classification: Part 15 Low Power Communication Device Transmitter (DXX)
- Applied Standard: FCC 47 CFR Part 15.225 and IC RSS-210 Issue 9
- Test Procedure(s): ANSI C63.10-2013
- Dates of Test: April 29, 2019
- Place of Tests: Nemko Korea Co., Ltd.

2. INTRODUCTION

2.1 Test facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2014), the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.10-2013) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd. FCC ID : A3LSMR370** and **IC : 649E-SMR370**.

These measurement tests were conducted at **Nemko Korea Co., Ltd. EMC Laboratory**.

The site address 155 & 159, Osan-Ro, Mohyeon-Eup, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 16885, KOREA, REPUBLIC OF.

The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 km (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 km (18miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of ANSI C63.4-2014 according to §2.948.



Nemko Korea Co., Ltd.
EMC Lab.
155 & 159, Osan-Ro, Mohyeon-Eup,
Cheoin-Gu, Yongin-Si, Gyeonggi-Do
16885 KOREA, REPUBLIC OF
Tel)+82-31-330-1700
Fax)+82-31-322-2332

Fig. 1. The map above shows the Seoul in Korea vicinity area.

The map also shows Nemko Korea Corporation Ltd. EMC Lab. and Incheon Airport.

2.2 Accreditation and listing

Accreditation type		Accreditation number
	CAB Accreditation for DOC	Designation No. KR0026
	KOLAS Accredited Lab. (Korea Laboratory Accreditation Scheme)	Registration No. 155
	Canada IC Registered site	Site No. 2040E
	VCCI registration site(RE/CE/Telecom CE)	Member No. 2118
	EMC CBTL	-
	KCC(RRL)Designated Lab.	Registration No. KR0026

3. TEST CONDITIONS & EUT INFORMATION

3.1 Operation During Test

The EUT is the RFID device.

The EUS was set to transmit the wanted TX channel continuously.

The operating voltage of EUT is 3.85 Vdc (Rechargeable Lithium polymer battery).

The worst data were recorded in the report.

3.1.1 Table of test power setting

Frequency (MHz)	Mode	Power setting Level
13.56	RFID	Default

3.1.2 Table of test channels

Frequency band (MHz)	Frequency (MHz)
13.110~14.010	13.56

3.1.3 Antenna information

Frequency band (MHz)	Antenna TX mode	Support CDD	Support MIMO
13.110~14.010	■ 1TX, □ 2TX	□ Yes, ■ No	□ Yes, ■ No

3.1.4. Additional Information Related to Testing

Enabling new RF function by software		
13.56MHz NFC	Before	After
	One 13.56MHz NFC function 1. NTAG for Wireless Charging	Two 13.56MHz NFC function 1. NTAG for Wireless Charging 2. PN553 for Tagging Communication
	NFC(PN553) was disabled by software.	NFC(PN553) is enabled by software
	FVIN : SC9	FVIN : SC9(NFC)
	The device is identical to the previous device except for enabling new RF function by software as above.	

Additional testing for only 13.56MHz NFC(PN553 for Tagging Communication) was performed.

Test results of NTAG for Wireless Charging in basic test report (NK-19-R-089) were used in this report.

For the testing, EUT is set to NFC(PN553) operation when EUT power is on.

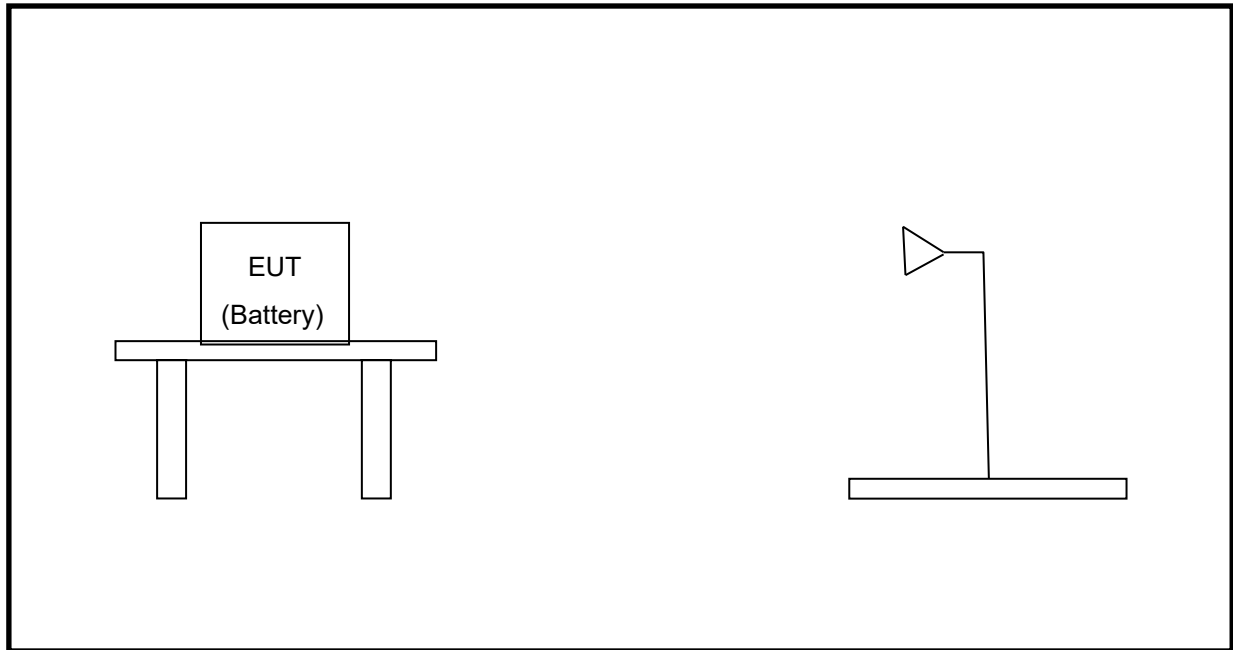
3.1.5 Table of test modes

Test Items	Modulation	Test channel (CH)
Radiated emissions	ASK	1
The field strength of any emission within the band 13.110~14.010 MHz	ASK	1
20 dB bandwidth	ASK	1
Frequency tolerance	ASK	1

3.2 Support Equipment

EUT	Samsung Electronics Co., Ltd. Model : SM-R370	S/N: N/A
Laptop Computer	HP Model : G62-355TU 1.5 m shielded pin connector cable	FCC DOC S/N : CNF0489WDT
AC/DC Adapter	HP Model : PPP009D 1.5 m unshielded power cable	FCC DOC S/N : WBGSV0ACXZH162

3.3 Setup Drawing



3.4 EUT Information

The EUT is the **Samsung Electronics Co., Ltd. Galaxy Fit** FCC ID : **A3LSMR370** and IC : **649E-SMR370**.

Specifications:

EUT Type	Galaxy Fit
Model Name	SM-R370
Brand Name	Samsung Electronics Co., Ltd.
RF Frequency	13.110 MHz ~ 14.010 MHz
Field Strength of Fundamental	-1.5 dBuV/m (0.84 uV/m) @ 30m
FCC Classification	Part 15 Low Power Communication Device Transmitter (DXX)
Channel Number	1 ch
Modulation	ASK
Antenna Setup	1TX
Voltage	Operating Voltage : 3.85 Vdc Test Voltage : 3.85 Vdc
Temperature Range	-20℃ ~ +55℃
Size (W x H x D)	About 16.0 mm x 23.0 mm x 10.0 mm
Weight	About 24 g
HVIN (Hardware version number)	SM-R370
FVIN (Firmware Version Identification Number)	SC9(NFC)
Remarks	-

4. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Test Requirement	FCC Paragraph No.	IC Paragraph No.	Result	Remark
Radiated emissions	15.209	RSS-GEN Issue 4 8.9	Complies	
The field strength of any emission within the band 13.110~14.010 MHz	15.225(a),(b),(c)	RSS-210 Issue 9 Annex B.6	Complies	
20 dB bandwidth	15.215(c)	RSS-210 Issue 9 Annex B.6	Complies	
Frequency tolerance	15.225(e)	RSS-210 Issue 9 Annex B.6	Complies	

5. RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Electronics Co., Ltd. Galaxy Fit FCC ID : A3LSMR370** and **IC : 649E-SMR370** is in compliance with FCC 47 CFR Part 15.225 and IC RSS-210 Issue 9.

6. ANTENNA REQUIREMENTS

§15.203 of the FCC Rules part 15 Subpart C

: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The antenna of the **Samsung Electronics Co., Ltd. Galaxy Fit FCC ID : A3LSMR370** and **IC : 649E-SMR370** is **permanently attached** and there are no provisions for connection to an external antenna. It complies with the requirement of §15.203.

7. DESCRIPTION OF TESTS

7.1 Radiated Emissions

The measurement was performed at the test site that is specified in accordance with ANSI C63.10-2013.

The spurious emission was scanned from 9 kHz to 30 MHz using Loop Antenna (Rohde&Schwarz, HFH2-Z2) and 30 to 1000 MHz using Trilog broadband test antenna(Schwarzbeck, VULB 9163).

For emissions testing at below 1GHz, The test equipment was placed on turntable with 0.8 m above ground. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The EUT, cable, wire arrangement and mode of operation that has the highest amplitude relative to the limit was selected. Then, the turn table was rotated from 0° to 360° and an antenna mast was moved from 1 m to 4 m height to maximize the suspected highest amplitude signal. The final maximized level was recorded.

At frequencies below 1000 MHz, measurements performed using the CISPR quasi-peak detection. The limit of field strength of any emission within the band 13.110~14.010 MHz is below.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
13.553-13.567	15,848	30
13.410-13.553 13.567-13.710	334	30
13.110-13.410 13.710-14.010	106	30

Radiated Emissions Limits per 47 CFR 15.225(a)(b)(c) and RSS-210 Annex B.6(a)(b)(c)

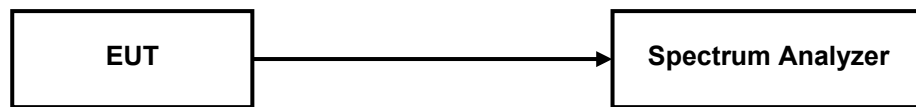
The limit of field strength of any emission outside of the band 13.110~14.010 MHz is below.

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88–216	150	3
216–960	200	3
Above 960	500	3

Radiated Emissions Limits per 47 CFR 15.209(a) and RSS-GEN issue 4 8.9

7.2 20 dB Bandwidth

Test Setup



Test Procedure

The EUT is set to the wanted TX channel and connected to the spectrum analyzer.

The spectrum analyzer setting is as follows.

Span = approximately 2 to 5 times the 20 dB bandwidth, centered on TX channel

RBW = 1% to 5% of the OBW

VBW = approximately 3 x RBW

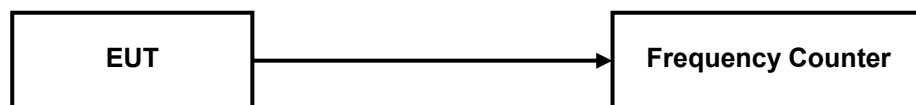
Sweep = auto

Detector function = peak

Trace = max hold

7.3 Frequency tolerance

Test Setup



Test Procedure

The EUT is set to the wanted TX channel and connected to the Frequency Counter.

8. TEST DATA (NTAG for Wireless Charging)

8.1 Radiated Emissions

FCC §15.209, RSS-Gen Issue 4 8.9

Test Mode : Set to wanted TX channel

Frequency	Reading	Pol*	Antenna Heights	Turntable	AF+CL+Amp**	Result	Limit***	Margin
(MHz)	(dBμV/m)	(H/V)	(cm)	Angles (°)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
0.02	73.25	V	100	0	-22.9	50.4	121.4	71.1
0.05	66.02	V	100	193	-22.9	43.1	114.4	71.3
2.05	61.86	V	100	184	-23.4	38.5	69.5	31.1
40.67	49.67	V	100	85	-23.2	26.5	40.0	13.5
81.36	59.35	H	400	351	-29.0	30.4	40.0	9.7
94.88	52.61	H	400	0	-25.1	27.5	43.5	16.0
203.36	50.69	V	100	29	-25.0	25.7	43.5	17.8
216.94	53.19	V	100	304	-24.6	28.6	46.0	17.4

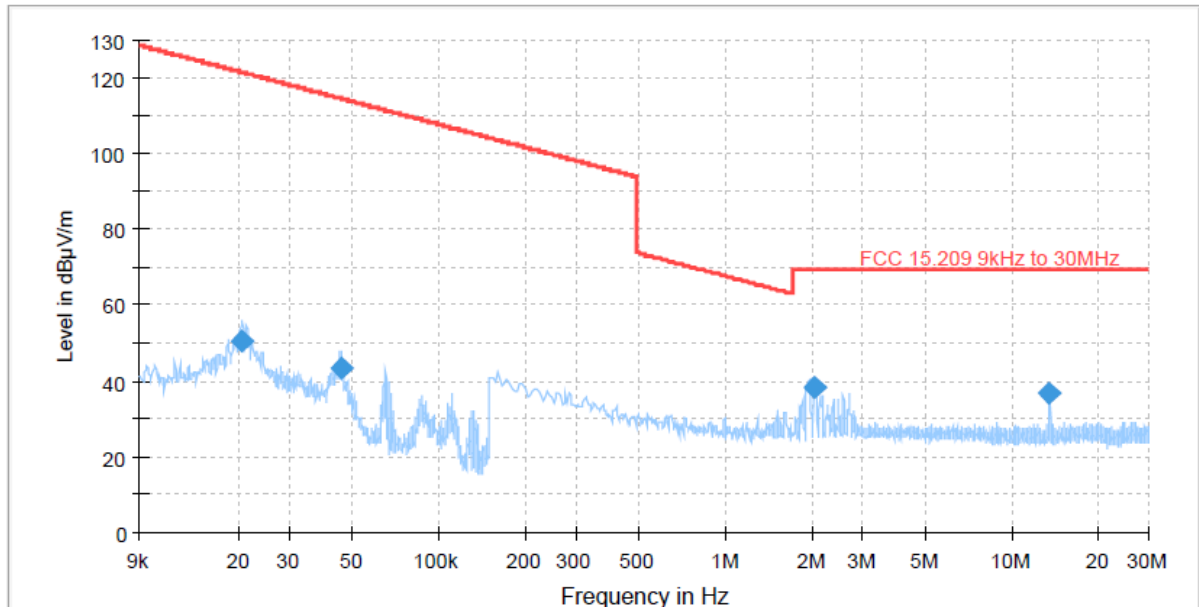
Radiated Measurements at 3meters

Notes:

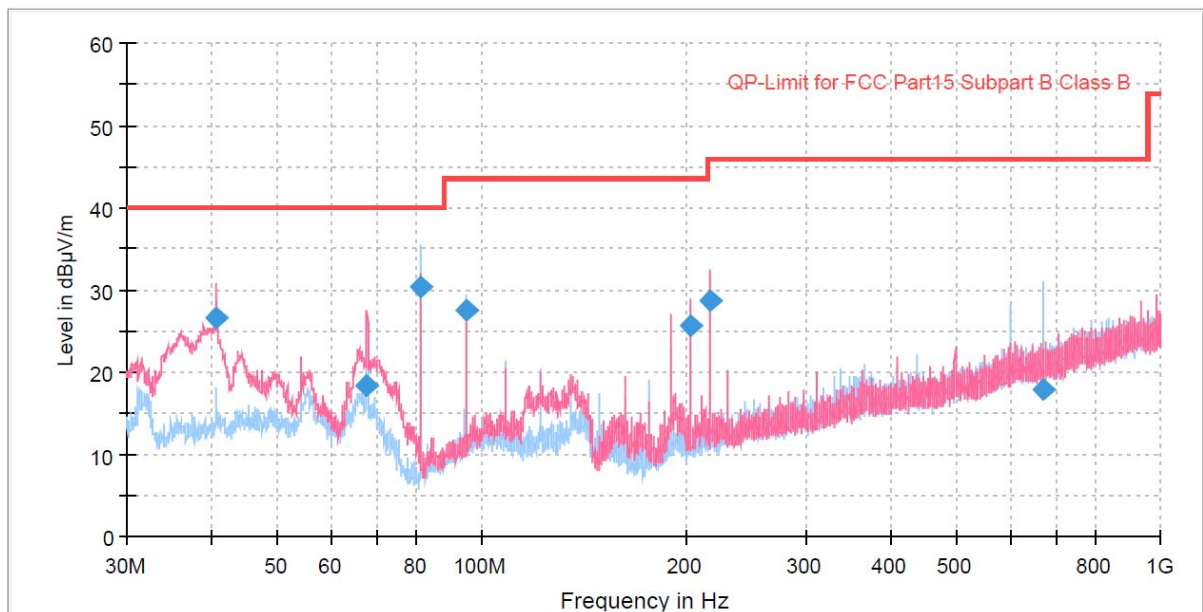
- *Pol. H = Horizontal, V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- ***At frequencies below 30MHz, the limits are extrapolated to 3m measurement distance with correction factor (40 dB/decade) according FCC 15.31(f)(2).
- Measurements using CISPR quasi-peak mode below 1 GHz.
- Measured using RBW = 9 kHz, VBW = 30 kHz below 30 MHz.
- Measured using RBW = 120 kHz, VBW = 300 kHz above 30 MHz.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- The limit is on the FCC §15.209 and RSS-Gen Issue4 8.9.

PLOTS OF EMISSIONS (NTAG for Wireless Charging)

Radiated emission_ 9kHz to 30MHz_13.56MHz



Radiated emission_ 30MHz to 1GHz_13.56MHz



TEST DATA (NTAG for Wireless Charging)

8.2 The field strength of any emission within the band 13.110~14.010 MHz

FCC §15.225(a)(b)(c), RSS-210 Annex B.6(a)(b)(c)

Test Mode : Set to wanted TX channel

Frequency	Reading	Pol*	Antenna Heights	Turntable	AF+CL+Amp**	Result	Limit***	Margin
(MHz)	(dB μ V/m)	(H/V)	(cm)	Angles (°)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
13.56	61.37	H	100	167	-22.9	38.5	123.8	85.3

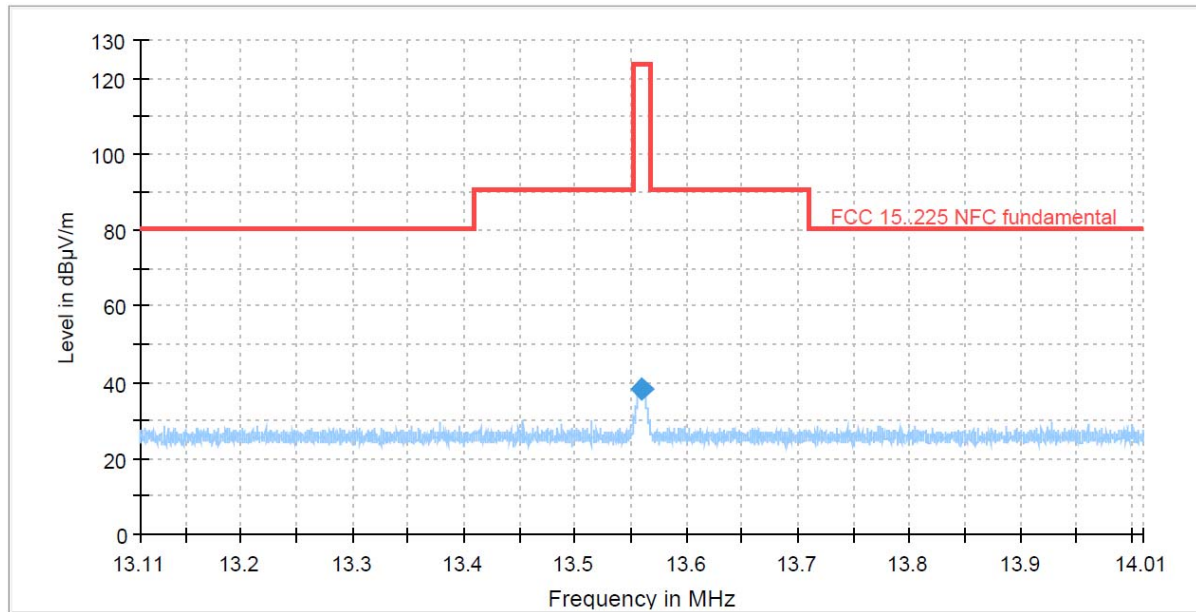
Radiated Measurements at 3meters

Notes:

1. *Pol. H = Horizontal, V = Vertical
2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
3. ***At frequencies below 30MHz, the limits are extrapolated to 3m measurement distance with correction factor (40 dB/decade) according FCC 15.31(f)(2).
4. Measurements using CISPR quasi-peak mode below 1 GHz.
5. Measured using RBW = 9 kHz, VBW = 30 kHz below 30 MHz.
- 6 The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
7. The limit is on the FCC §15.209 and RSS-Gen Issue4 8.9..

PLOTS OF EMISSIONS (NTAG for Wireless Charging)

The field strength of any emission within the band 13.110~14.010 MHz_13.56MHz



TEST DATA (NTAG for Wireless Charging)

8.3 20 dB Bandwidth

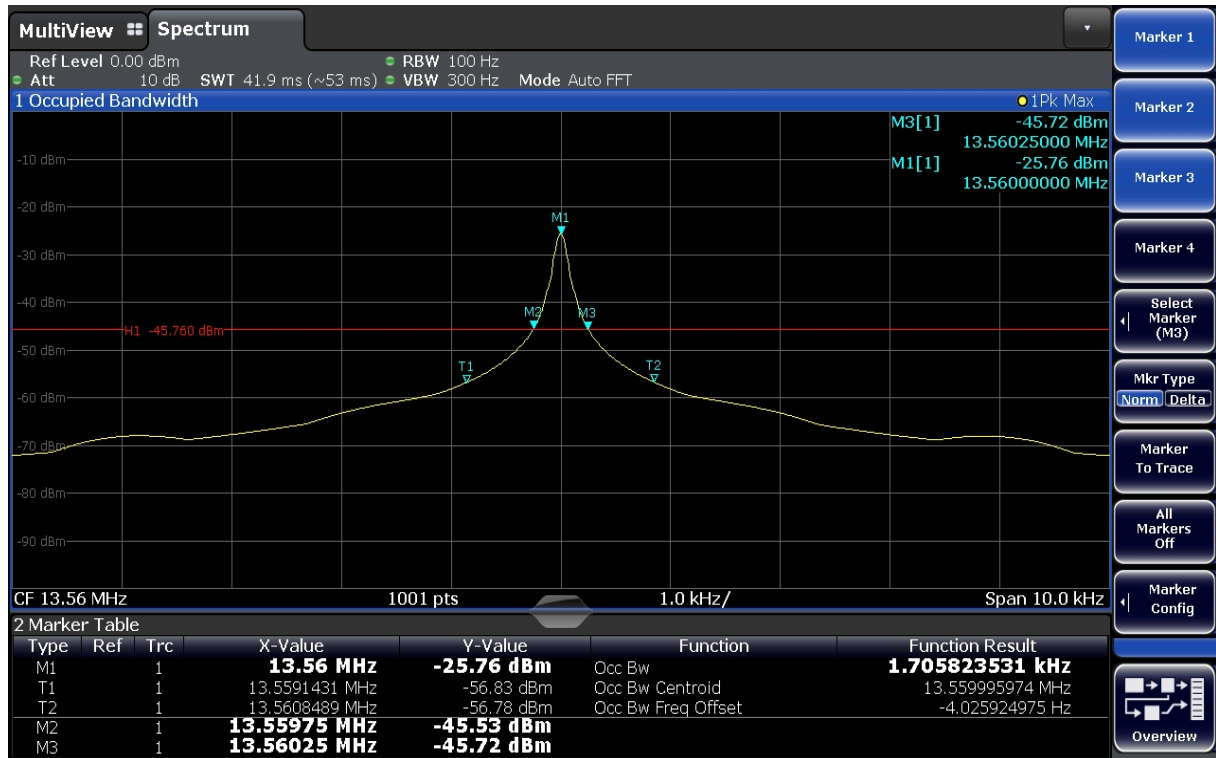
FCC §15.215(c)

Test Mode : Set to wanted TX channel

Frequency	20 dB Bandwidth		Limit	Margin	99% emission Bandwidth
(MHz)	(MHz)		(MHz)	(MHz)	(kHz)
13.56	Lowest Edge	13.55975	13.110	0.450	1.706
	Highest Edge	13.56025	14.010	0.450	

PLOTS OF EMISSIONS (NTAG for Wireless Charging)

20 dB Bandwidth_13.56MHz



TEST DATA (NTAG for Wireless Charging)

8.4 Frequency tolerance

FCC §15.225(e) RSS-210 Annex B.6

Test Mode : Set to wanted TX channel

Frequency (MHz)	Temperature (°C)	Voltage (V)	Time (m)	Measured value (Hz)	Tolerance (Hz)	Limit (Hz)	Result
13.56	50	3.85	0	13559208	792	1356	Pass
			2	13559197	803	1356	Pass
			5	13559231	769	1356	Pass
			10	13559234	766	1356	Pass
	40	3.85	0	13559231	769	1356	Pass
			2	13559341	659	1356	Pass
			5	13559338	662	1356	Pass
			10	13559376	624	1356	Pass
	30	3.85	0	13559567	433	1356	Pass
			2	13559653	347	1356	Pass
			5	13559712	288	1356	Pass
			10	13559643	357	1356	Pass
	20	4.43	0	13559265	735	1356	Pass
			2	13559275	725	1356	Pass
			5	13559278	722	1356	Pass
			10	13559274	726	1356	Pass
	20	3.85	0	13559231	769	1356	Pass
			2	13559245	755	1356	Pass
			5	13559213	787	1356	Pass
			10	13559201	799	1356	Pass
	20	3.27	0	13559256	744	1356	Pass
			2	13559248	752	1356	Pass
			5	13559247	753	1356	Pass
			10	13559242	758	1356	Pass
	10	3.85	0	13559312	688	1356	Pass
			2	13559321	679	1356	Pass
			5	13559331	669	1356	Pass
			10	13559316	684	1356	Pass
	0	3.85	0	13559345	655	1356	Pass
			2	13559343	657	1356	Pass
			5	13559321	679	1356	Pass
			10	13559332	668	1356	Pass
	-10	3.85	0	13559387	613	1356	Pass
			2	13559392	608	1356	Pass
			5	13559401	599	1356	Pass
			10	13559400	600	1356	Pass
	-20	3.85	0	13559356	644	1356	Pass
			2	13559432	568	1356	Pass
			5	13559425	575	1356	Pass
			10	13559427	573	1356	Pass

9. TEST DATA (PN553 for Tagging Communication)

9.1 Radiated Emissions

FCC §15.209, RSS-Gen Issue 4 8.9

Test Mode : Set to wanted TX channel

Frequency	Reading	Pol*	Antenna Heights	Turntable	AF+CL+Amp**	Result	Limit***	Margin
(MHz)	(dBμV/m)	(H/V)	(cm)	Angles (°)	(dB)	(dBμV/m)	(dBμV/m)	(dB)
0.02	77.15	V	100	30	-22.9	54.3	121.5	67.2
0.04	72.32	V	100	270	-22.9	49.4	114.6	65.2
0.07	65.49	V	100	120	-22.9	42.6	111.3	68.8
2.06	68.18	V	100	210	-23.4	44.8	69.5	24.8
2.69	69.56	H	400	0	-23.3	46.3	69.5	23.3
35.28	33.29	H	300	8	-25.4	7.9	40.0	32.1
46.11	53.81	V	100	156	-22.9	30.9	40.0	9.1
92.24	45.63	V	100	11	-25.7	19.9	43.5	23.6
138.42	44.30	V	200	103	-28.4	15.9	43.5	27.6
184.55	49.16	V	300	106	-26.1	23.1	43.5	20.4
369.18	41.45	V	100	170	-18.8	22.7	46.0	23.4

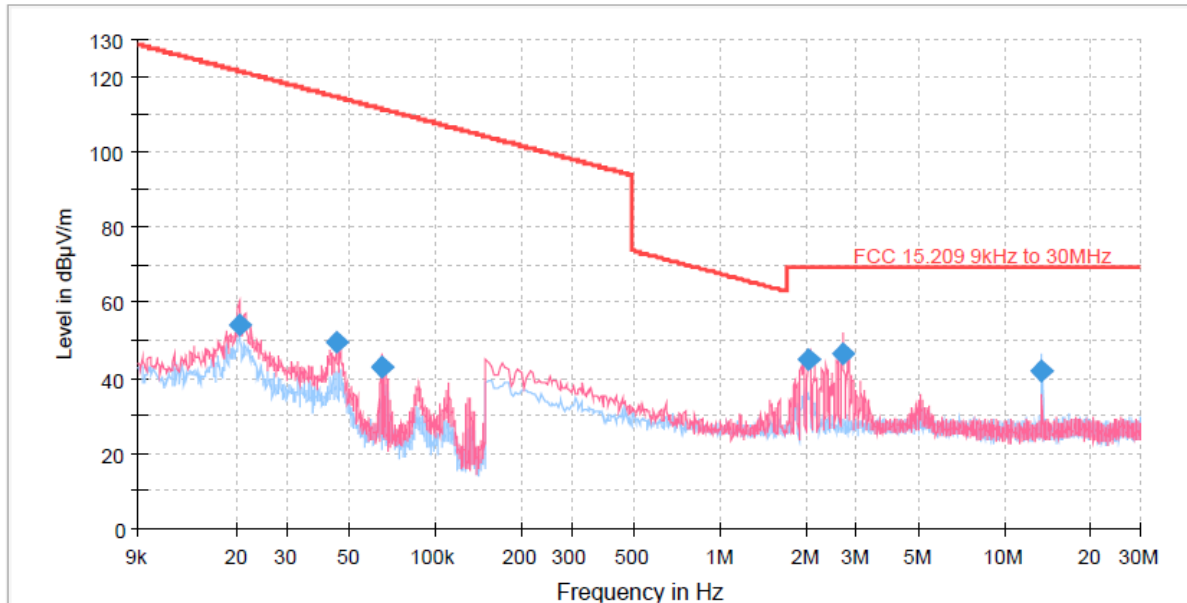
Radiated Measurements at 3meters

Notes:

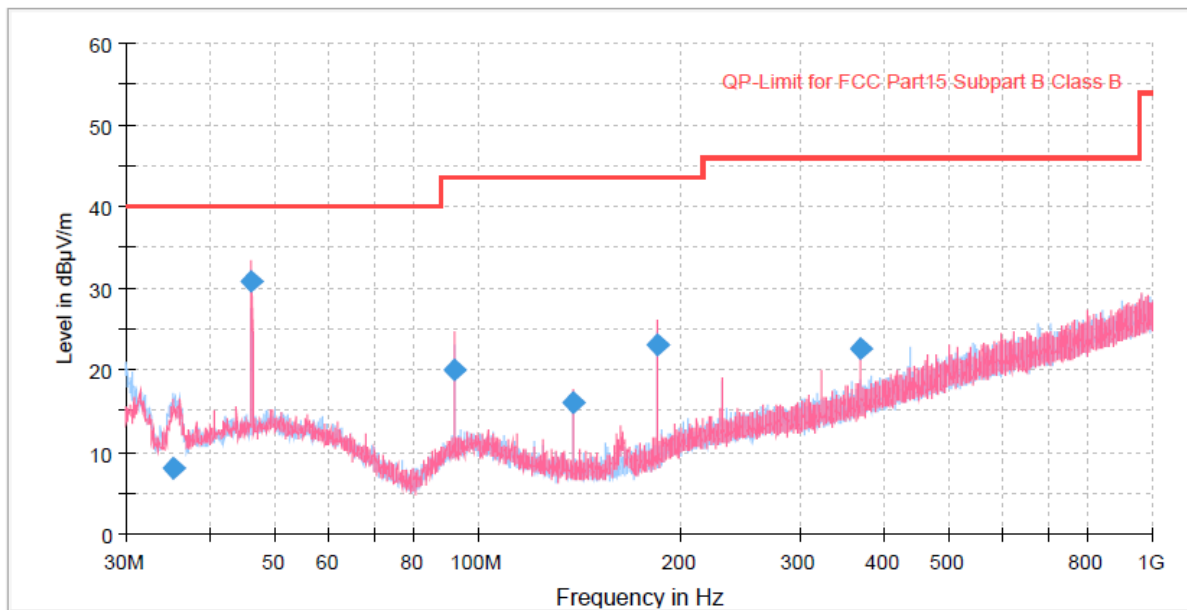
- *Pol. H = Horizontal, V = Vertical
- **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
- ***At frequencies below 30MHz, the limits are extrapolated to 3m measurement distance with correction factor (40 dB/decade) according FCC 15.31(f)(2).
- Measurements using CISPR quasi-peak mode below 1 GHz.
- Measured using RBW = 9 kHz, VBW = 30 kHz below 30 MHz.
- Measured using RBW = 120 kHz, VBW = 300 kHz above 30 MHz.
- The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
- The limit is on the FCC §15.209 and RSS-Gen Issue4 8.9.

PLOTS OF EMISSIONS (PN553 for Tagging Communication)

Radiated emission_ 9kHz to 30MHz_13.56MHz



Radiated emission_ 30MHz to 1GHz_13.56MHz



TEST DATA (PN553 for Tagging Communication)

9.2 The field strength of any emission within the band 13.110~14.010 MHz

FCC §15.225(a)(b)(c), RSS-210 Annex B.6(a)(b)(c)

Test Mode : Set to wanted TX channel

Frequency	Reading	Pol*	Antenna Heights	Turntable	AF+CL+Amp**	Result	Limit***	Margin
(MHz)	(dB μ V/m)	(H/V)	(cm)	Angles (°)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)
13.56	53.35	H	100	8	-22.9	30.5	123.8	93.4

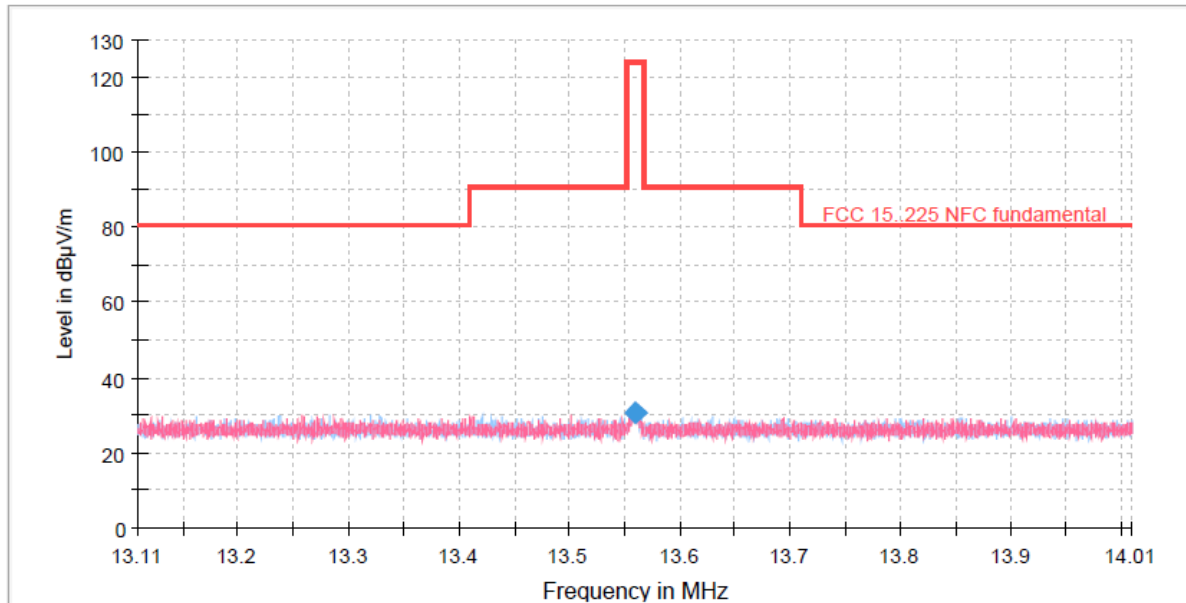
Radiated Measurements at 3meters

Notes:

1. *Pol. H = Horizontal, V = Vertical
2. **AF + CL + Amp. = Antenna Factor + Cable Loss + Amplifier.
3. ***At frequencies below 30MHz, the limits are extrapolated to 3m measurement distance with correction factor (40 dB/decade) according FCC 15.31(f)(2).
4. Measurements using CISPR quasi-peak mode below 1 GHz.
5. Measured using RBW = 9 kHz, VBW = 30 kHz below 30 MHz.
- 6 The radiated emissions testing were made by rotating EUT through three orthogonal axes and rotating the receive antenna with horizontal, Vertical polarization. The worst data was recorded.
7. The limit is on the FCC §15.209 and RSS-Gen Issue4 8.9..

PLOTS OF EMISSIONS (PN553 for Tagging Communication)

The field strength of any emission within the band 13.110~14.010 MHz_13.56MHz



TEST DATA (PN553 for Tagging Communication)

9.3 20 dB Bandwidth

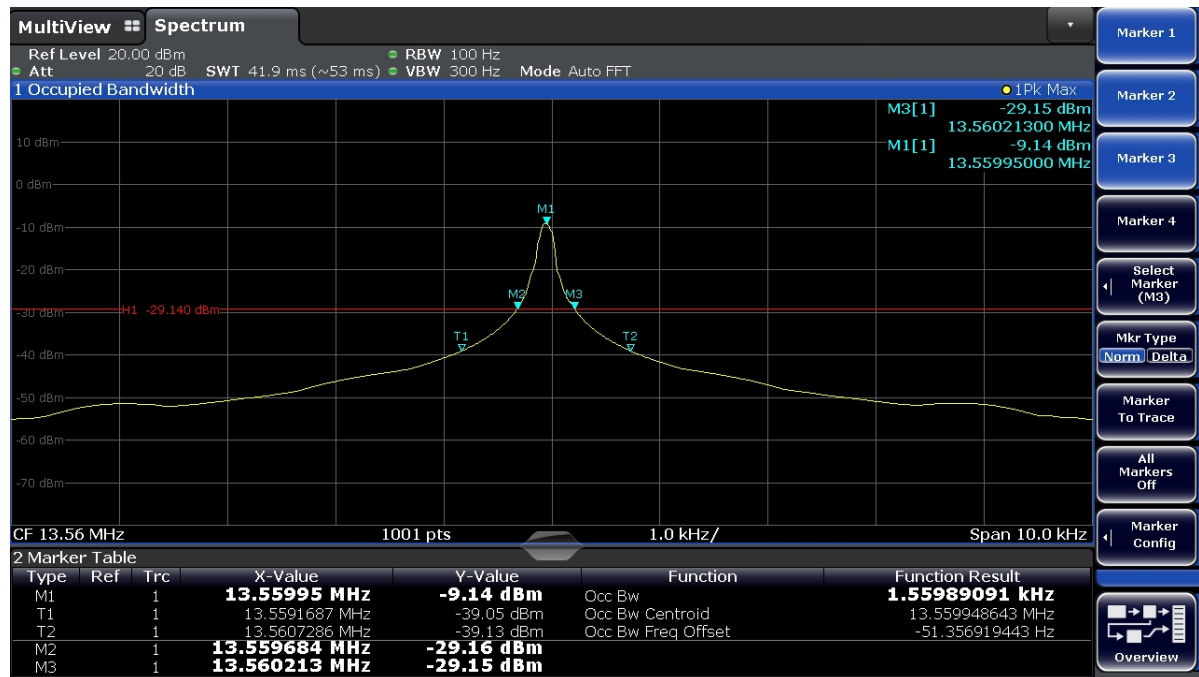
FCC §15.215(c)

Test Mode : Set to wanted TX channel

Frequency	20 dB Bandwidth		Limit	Margin	99% emission Bandwidth
(MHz)	(MHz)		(MHz)	(MHz)	(kHz)
13.56	Lowest Edge	13.559684	13.110	0.450	1.560
	Highest Edge	13.560213	14.010	0.450	

PLOTS OF EMISSIONS (PN553 for Tagging Communication)

20 dB Bandwidth_13.56MHz



TEST DATA (PN553 for Tagging Communication)

9.4 Frequency tolerance

FCC §15.225(e) RSS-210 Annex B.6

Test Mode : Set to wanted TX channel

Frequency (MHz)	Temperature (°C)	Voltage (V)	Time (m)	Measured value (Hz)	Tolerance (Hz)	Limit (Hz)	Result
13.56	50	3.85	0	13559982	18	1356	Pass
			2	13559985	15	1356	Pass
			5	13559843	157	1356	Pass
			10	13559823	177	1356	Pass
	40	3.85	0	13559903	97	1356	Pass
			2	13559909	91	1356	Pass
			5	13559832	168	1356	Pass
			10	13559789	211	1356	Pass
	30	3.85	0	13559854	146	1356	Pass
			2	13559843	157	1356	Pass
			5	13559864	136	1356	Pass
			10	13559867	133	1356	Pass
	20	4.43	0	13560150	-150	1356	Pass
			2	13560274	-274	1356	Pass
			5	13560293	-293	1356	Pass
			10	13560308	-308	1356	Pass
	20	3.85	0	13560221	-221	1356	Pass
			2	13560243	-243	1356	Pass
			5	13560315	-315	1356	Pass
			10	13560301	-301	1356	Pass
	20	3.27	0	13560263	-263	1356	Pass
			2	13560245	-245	1356	Pass
			5	13560278	-278	1356	Pass
			10	13560357	-357	1356	Pass
	10	3.85	0	13560175	-175	1356	Pass
			2	13560094	-94	1356	Pass
			5	13560012	-12	1356	Pass
			10	13560032	-32	1356	Pass
	0	3.85	0	13559965	35	1356	Pass
			2	13559953	47	1356	Pass
			5	13559919	81	1356	Pass
			10	13559865	135	1356	Pass
	-10	3.85	0	13559842	158	1356	Pass
			2	13559818	182	1356	Pass
			5	13559779	221	1356	Pass
			10	13559751	249	1356	Pass
	-20	3.85	0	13559782	218	1356	Pass
			2	13559687	313	1356	Pass
			5	13559716	284	1356	Pass
			10	13559756	244	1356	Pass

10. TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Calibration Date	Calibration Interval
1	*Test Receiver	R & S	ESU 40	100202	May. 24 2018	1 year
2	Test Receiver	R & S	ESCS30	100302	Oct. 11 2018	1 year
3	Attenuator	PASTERNAK	PE7395-10	1441-1	Jul. 07 2018	1 year
4	Attenuator	FAIRVIEW	SA3N5W-06	N/A	Jun. 14 2018	1 year
5	Attenuator	FAIRVIEW	SA3N5W-10	N/A	Apr. 03 2019	1 year
6	*Attenuator	WEINSCHEL	56-10	58765	Oct. 12 2018	1 year
7	*Amplifier	R & S	SCU 01	10029	Apr. 02 2019	1 year
8	Amplifier	R & S	SCU18F	180025	Apr. 02 2019	1 year
9	Amplifier	R & S	SCU26D	1984522	Apr. 02 2019	1 year
10	Amplifier	R & S	SCU40	100380	Jul. 16 2018	1 year
11	Pre Amplifier	HP	8449B	3008A00107	Jan. 08 2019	1 year
12	*Spectrum Analyzer	R & S	FSW43	100732	Apr. 02 2019	1 year
13	Spectrum Analyzer	Agilent	E4440A	MY44022567	Oct. 11 2018	1 year
14	Spectrum Analyzer	R & S	FSW43	104084	Apr. 02 2019	1 year
15	*Loop Antenna	R & S	HFH2-Z2	100279	Feb.13 2019	2 year
16	Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-474	Jun. 28 2017	2 year
17	Horn Antenna	Q-par Angus	QSH20S20	8179	Aug. 01 2017	2 year
18	Horn Antenna	Q-par Angus	QSH22K20	8180	Aug. 02 2017	2 year
19	*Trilog-Broadband Antenna	SCHWARZBECK	VULB 9163	946	May. 18 2017	2 year
20	LISN	R & S	ESH3-Z5	833874/006	Oct. 12 2018	1 year
21	Position Controller	INNCO	CO2000	12480406/L	N/A	N/A
22	*Controller	INNCO	CO3000	CO3000/937/38330516/L	N/A	N/A
23	Turn Table	INNCO	DS1200S	N/A	N/A	N/A
24	*Turn Table	INNCO	DT2000-2t	N/A	N/A	N/A
25	Antenna Mast	INNCO	MA4000	N/A	N/A	N/A
26	*TILT Antenna Mast	INNCO	MA4640-XP-EP	N/A	N/A	N/A
27	Open Switch And Control Unit	R & S	OSP-120	100081	N/A	N/A
28	*Open Switch And Control Unit	R & S	OSP-120	101766	N/A	N/A
29	*Shielded Room	Seo-Young EMC	N/A	N/A	N/A	N/A
30	Anechoic Chamber	Seo-Young EMC	N/A	N/A	N/A	N/A
31	WiFi Filter Bank	R & S	U083	N/A	N/A	N/A
32	*WiFi Filter Bank	R & S	U082	N/A	N/A	N/A

*) Test equipment used during the test

11. ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95%

1. Conducted Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Receiver reading	RI	± 0.1	normal 1	1.000	0.1	1	0.1
Attenuation AMN-Receiver	LC	± 0.08	normal 2	2.000	0.04	1	0.04
AMN Voltage division factor	LAMN	± 0.8	normal 2	2.000	0.4	1	0.4
Sine wave voltage	dVSW	± 2.00	normal 2	2.000	1.00	1	1.00
Pulse amplitude response	dVPA	± 1.50	rectangular	1.732	0.87	1	0.87
Pulse repetition rate response	dVPR	± 1.50	rectangular	1.732	0.87	1	0.87
Noise floor proximity	dVNF	± 0.00	-	-	0.00	1	0.00
AMN Impedance	dZ	± 1.80	triangular	2.449	0.73	1	0.73
Ⓐ Mismatch	M	+ 0.70	U-Shaped	1.414	0.49	1	0.49
Ⓑ Mismatch	M	- 0.80	U-Shaped	1.414	- 0.56	1	- 0.56
Measurement System Repeatability	RS	0.05	normal 1	1.000	0.05	1	0.05
Remark	Ⓐ: AMN-Receiver Mismatch : + Ⓑ: AMN-Receiver Mismatch : -						
Combined Standard Uncertainty	Normal			± 1.88			
Expanded Uncertainty U	Normal ($k = 2$)			± 3.76			

2. Radiation Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Measurement System Repeatability	RS	0.34	normal 1	1.00	0.34	1	0.34
Receiver reading	Ri	± 0.02	normal 2	2.00	0.01	1	0.01
Sine wave voltage	dVsw	± 0.17	normal 2	2.00	0.09	1	0.09
Pulse amplitude response	dVpa	± 0.92	normal 2	2.00	0.46	1	0.46
Pulse repetition rate response	dVpr	± 0.35	normal 2	2.00	0.18	1	0.18
Noise floor proximity	dVnf	± 0.50	normal 2	2.00	0.25	1	0.25
Antenna Factor Calibration	AF	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Cable Loss	CL	± 1.00	normal 2	2.00	0.50	1	0.50
Antenna Directivity	AD	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
Antenna Factor Height Dependence	AH	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Antenna Phase Centre Variation	AP	± 0.20	rectangular	$\sqrt{3}$	0.12	1	0.12
Antenna Factor Frequency Interpolation	Ai	± 0.25	rectangular	$\sqrt{3}$	0.14	1	0.14
Site Imperfections	Si	± 4.00	triangular	$\sqrt{6}$	1.63	1	1.63
Measurement Distance Variation	DV	± 0.60	rectangular	$\sqrt{3}$	0.35	1	0.35
Antenna Balance	Dbal	± 0.90	rectangular	$\sqrt{3}$	0.52	1	0.52
Cross Polarisation	DCross	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.18
Mismatch	M	+ 0.98 - 1.11	U-Shaped	$\sqrt{2}$	0.74	1	0.74
EUT Volume Diameter	Vd	0.33	normal 1	1.00	0.33	1	0.11
Remark							
Combined Standard Uncertainty	Normal						
Expended Uncertainty U	Normal ($k = 2$)						