CE Test Report

Equipment	:	**LTE Modem**
Model No.	:	**Pinnacle 100**
Brand Name	:	**Laird Connectivity**
Applicant	:	**Laird Connectivity, Inc.**
Address	:	**W66N220 Commerce Court, Cedarburg, Wisconsin 53012, USA**
Standard	:	**EN 300 330 V2.1.1 (2017-02)**
Received Date	:	**May 03, 2019**
Tested Date	:	**Jan. 10 ~ Jan. 13, 2020**

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by: **Approved by:**

James Fan / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
ER950303NF	Rev. 01	Initial issue	Jun. 02, 2020

Summary of Test Results

Ref. Std. Clause	Test Items	Measured	Result
4.3.1	Permitted Range of Operating Frequencies	Note[1]	Note[1]
4.3.2	Operating Frequency Ranges	Note[1]	Note[1]
4.3.3	Modulation Bandwidth	Note[1]	Note[1]
4.3.4	Transmitter H-Field Requirements	Note[1]	Note[1]
4.3.5	Transmitter RF Carrier Current	Note[1]	Note[1]
4.3.6	Transmitter Radiated E-Field	Note[1]	Note[1]
4.3.7	Transmitter Conducted Spurious Emissions	Note[1]	Note[1]
4.3.8	Transmitter Radiated Spurious Domain Emission Limits < 30 MHz	Note[1]	Note[1]
4.3.9	Transmitter Radiated Spurious Domain Emission Limits > 30 MHz	Note[1]	Note[1]
4.3.10	Transmitter Frequency Stability	Note[1]	Note[1]
4.4.2	Receiver Spurious Emissions	Meet the requirement of limit.	Pass
4.4.3	Adjacent Channel Selectivity	Only for channelized systems.	N/A
4.4.4	Receiver Blocking Or Desensitization	Not for tagging systems.	N/A

Note[1]: This test item is not required since the NFC function is passive only.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information			
Frequency Range (MHz)	**Modulation**	**Ch. Frequency (MHz)**	**Channel Number**
13.553 – 13.567	NFC-ASK	13.56	1

1.1.2 Antenna Details

For NFC

Ant. No.	Type	Gain (dBi)	Connector
1	NFC	N/A	N/A

For BT

Ant. No.	Brand	Model	Type	Gain (dBi)	Connector
1	LSR	001-0001	2.4GHz Dipole	2	RP-SMA Female with IPEX U.FL antenna cable
2	Laird	NanoBlue-IP04 (MAF94045)	PCB Dipole	2	IPEX U.FL
3	LSR	001-0014	2.4GHz Flex PIFA	2	IPEX U.FL
4	Laird	110-00665	Trace Monopole	2.6	NA

For LTE

Ant. No.	Brand / Model	Type	Connector	Gain (dBi)	Operating Band
1	Laird / DBA6927C1	Dipole	U.FL	2.2	LTE Band 1
				2.2	LTE Band 3
				0.5	LTE Band 8
				0.5	LTE Band 20
				0.5	LTE Band 28
2	Laird / EFF6925A3S	Flex	U.FL	3.7	LTE Band 1
				3.7	LTE Band 3
				1.9	LTE Band 8
				1.9	LTE Band 20
				1.9	LTE Band 28
3	Laird / 110-00665	Stamped Metal	N/A	2.6	LTE Band 1
				2.6	LTE Band 3
				1.3	LTE Band 20
				1.3	LTE Band 28

1.1.3 EUT Operational Condition

Supply Voltage	3.7 Vdc		
SW Version	BHL78xx.3.7.2.3		
Operational Climatic	☒ Tnom (20°C)	☒ Tmax (85°C)	☒ Tmin (-40°C)

1.1.4 Accessories

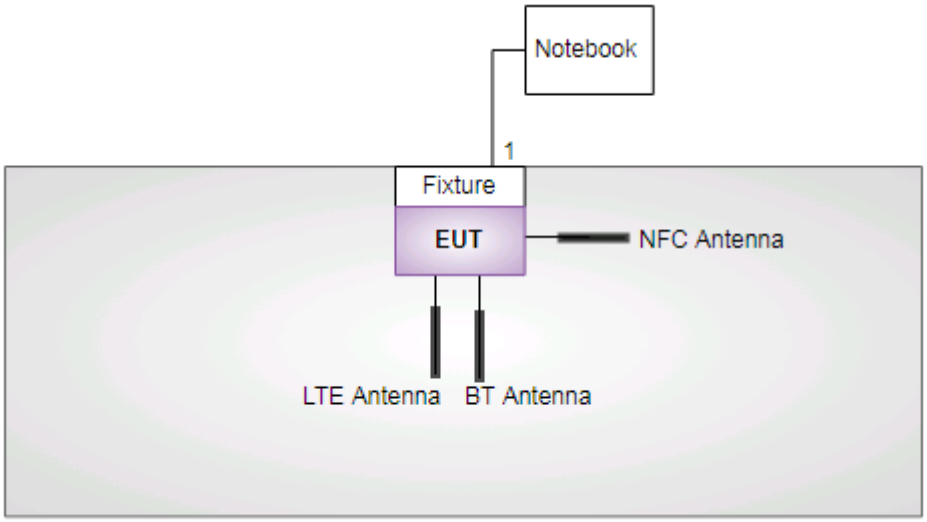
N/A

1.2 Local Support Equipment List

Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**S/N**	**Remarks**
1	Notebook	DELL	Latitude E6430	D3LNYW1	---
2	Fixture	---	---	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram



No.	Signal cable / Length (m)
1	USB, 1m shielded.

1.4 Test Equipment List and Calibration Data

Test Item	Radiated Emissions				
Test Site	Fully-anechoic chamber 1 / (05CH01-WS)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
Spectrum Analyzer	Agilent	N9010A	MY54200247	Oct. 07, 2019	Oct. 06, 2020
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-524	Nov. 04, 2019	Nov. 03, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1094	Nov. 04, 2019	Nov. 03, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Dec. 25, 2019	Dec. 24, 2020
Preamplifier	Agilent	83017A	MY39501310	Nov. 27, 2019	Nov. 26, 2020
Preamplifier	EMC	EMC02325	980146	Oct. 18, 2019	Oct. 17, 2020
Preamplifier	EMC	EMC184045B	980192	Aug. 01, 2019	Jul. 31, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY22626/4	Oct. 14, 2019	Oct. 13, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16608/4	Oct. 14, 2019	Oct. 13, 2020
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY15686/4	Oct. 14, 2019	Oct. 13, 2020
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-005	Oct. 14, 2019	Oct. 13, 2020
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-006	Oct. 14, 2019	Oct. 13, 2020
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emissions				
Test Site	(10CH02HY)				
Instrument	**Manufacturer**	**Model No.**	**Serial No.**	**Calibration Date**	**Calibration Until**
10m Semi Anechoic Chamber	TDK	SAC-10M	10CH02-HY	NA	NA
Receiver	R&S	ESU26	100422	Oct. 23,2019	Oct. 22, 2020
Loop Antenna	TESEQ	HLA 6120	31244	Mar, 15,2019	Mar. 14, 2020
Turn Table	EM Electronics	EM 1000	60546	NA	NA
RF Cable-R10m	HUBER+SUHNER	RG223/U + RG8/U	CB026-B30M	Mar. 09,2019	Mar. 08,2020
RF Cable-R10m	MTJ	RG223/U + RG8/U	CB026-DOOR	Sep. 20,2019	Sep. 19,2020
Software	Audix	E3	6.12 160809	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

EN 300 330 V2.1.1 (2017-02)

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

Measurement Uncertainty		
Test Item	**Uncertainty**	**Limit**
Radio Frequency	±0.34 x 10^{-7}	±1 x 10^{-7}
RF power, conducted	±2.2 dB	±1 dB
RF power, radiated	±2.59 dB	±6 dB
Temperature	±0.4 °C	±1 ^{o}C
Humidity	±3.3 %	±5 %

2 Test Configuration

2.1 Testing Condition

Testing Location							
☒	ICC Lab	ADD :	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan (R.O.C.)				
		TEL :	886-3-271-8666	FAX :	886-3-318-0155		
☒	Sporton Lab	ADD :	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.				
		TEL :	886-3-327-3456	FAX :	886-3-327-0973		

Test Condition	Test Site No.	Test Engineer	Test Environment
Radiated Emission above 30 MHz	05CH01-WS	24°C / 65	Ryan Lee
Radiated Emission below 30MHz	10CH01-HY*	20 / 62	Jack Li

Note: * ICC lab subcontracts this test item to Sporton Lab (TAF:1190).
Sporton Lab is a TAF accreditation test firm and also is an approved provider of ICC lab.

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode	Test Channel (MHz)	Test configuration
Radiated Measurement	NFC	13.56	1, 2, 3

NOTE:

1) The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Z-plane** result was found as the worst case and was shown in this report.
2) Test configurations are as below
   1) Test configurations 1: EPM6985-001 Antenna + NFC Antenna
   2) Test configurations 2: DBA6927C1 Antenna + 001-0001 Antenna + NFC Antenna
   3) Test configurations 3: EFF6925A3S Antenna + 001-0001 Antenna + NFC Antenna

3 Receiver Test Results

3.1 Receiver Spurious Emissions

3.1.1 Limit of Receiver Spurious Emissions

Measurement below 30 MHz

Frequency 9 kHz ≤ f < 10 MHz	Frequency 10 MHz ≤ f < 30 MHz
5,5 dBµA/m at 9 kHz descending 3 dB/oct	-25 dBµA/m

Measurement above 30 MHz

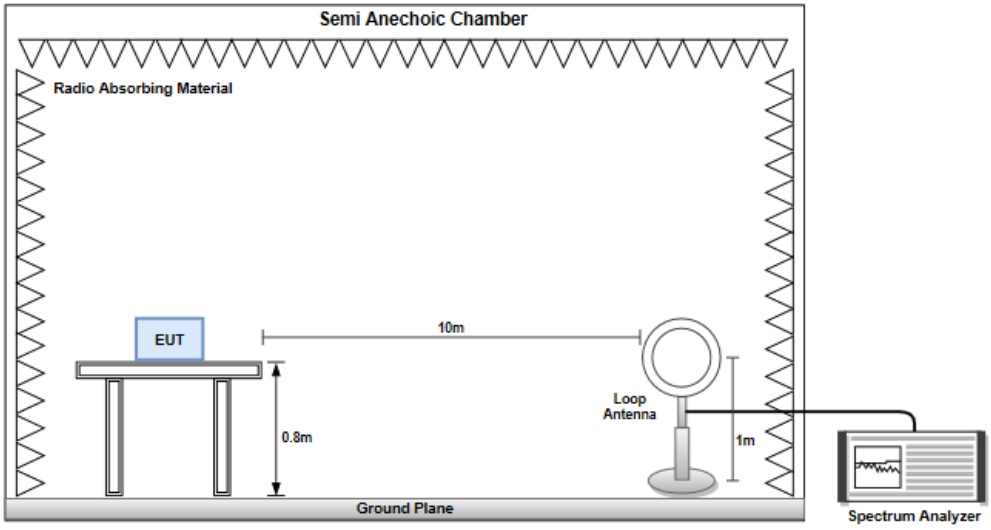
The measured values shall not exceed 2 nW e.r.p. (-57 dBm).

3.1.2 Test Procedures

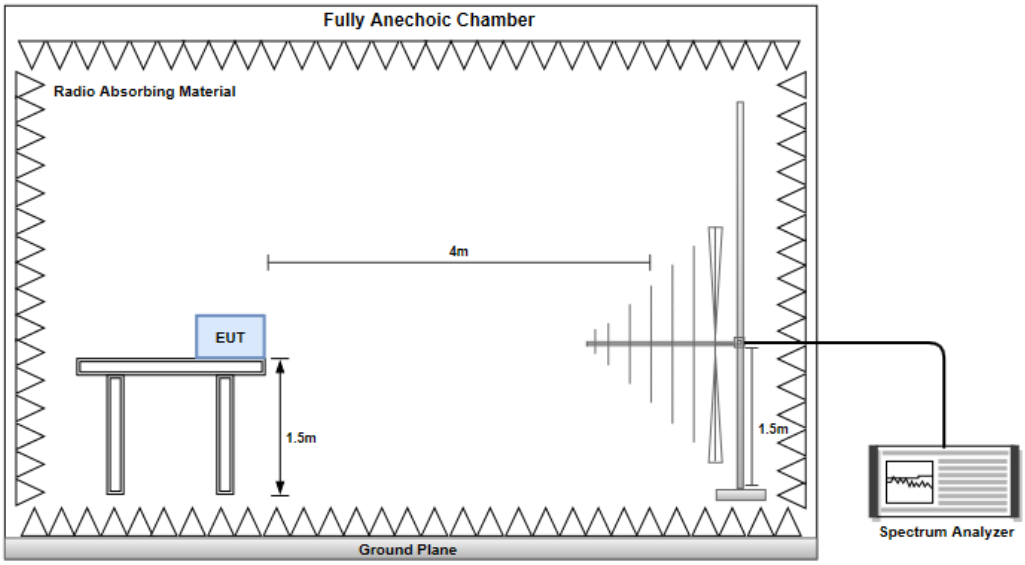
Reference to clause 6.3.1 of EN 300 330 V2.1.1 (2017-02).

3.1.3 Test Setup

Below 30MHz



Above 30MHz



3.1.4 Receiver Spurious Emissions (Below 30MHz)

Test configurations 1: EPM6985-001 Antenna + NFC Antenna

Receiver Emissions in the Range from 9kHz~30MHz Result						
Emission Freq. (MHz)	Correction factor (dB)	H-filed@3m (dBuA/m)	H-filed@10m (dBuA/m)	H-field Limit@10m (dBuA/m)	Level Type	Margin (dB)
10.717	13.49	-51.5	-38.0	-25.00	PK	13.01

Note1: H-filed@10m = H-Filed@10m - Correction factor.

Note2: Correction factor refers to Figure H.2 of Annex H of EN 300 330.

Test configurations 2: DBA6927C1 Antenna + 001-0001 Antenna + NFC Antenna

Receiver Emissions in the Range from 9kHz~30MHz Result						
Emission Freq. (MHz)	Correction factor (dB)	H-filed@3m (dBuA/m)	H-filed@10m (dBuA/m)	H-field Limit@10m (dBuA/m)	Level Type	Margin (dB)
6.448	22.90	-51.5	-28.6	-3.98	PK	24.62

Note1: H-filed@10m = H-Filed@10m - Correction factor.

Note2: Correction factor refers to Figure H.2 of Annex H of EN 300 330.

Test configurations 3: EFF6925A3S Antenna + 001-0001 Antenna + NFC Antenna

Receiver Emissions in the Range from 9kHz~30MHz Result						
Emission Freq. (MHz)	Correction factor (dB)	H-filed@3m (dBuA/m)	H-filed@10m (dBuA/m)	H-field Limit@10m (dBuA/m)	Level Type	Margin (dB)
13.762	12.38	-51.5	-39.1	-25.00	PK	14.12

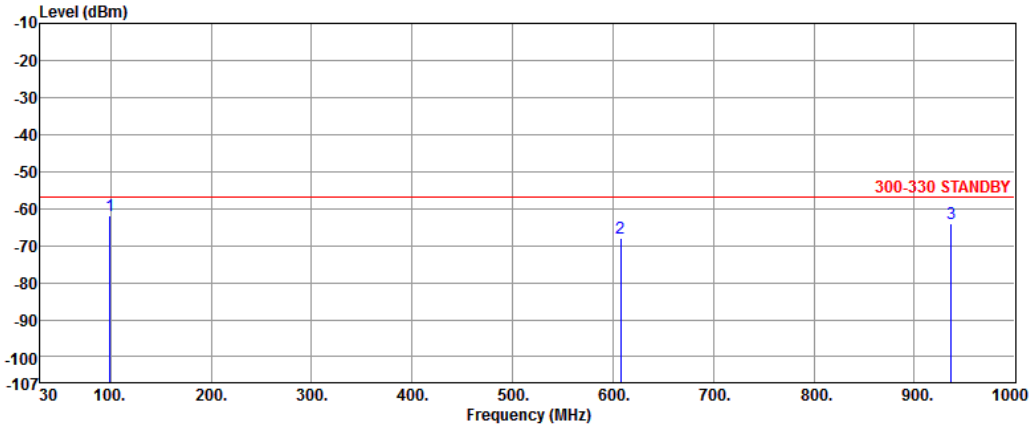
Note1: H-filed@10m = H-Filed@10m - Correction factor.

Note2: Correction factor refers to Figure H.2 of Annex H of EN 300 330.

Test configurations 1: EPM6985-001 Antenna + NFC Antenna

3.1.5 Receiver Spurious Emissions (Above 30MHz)

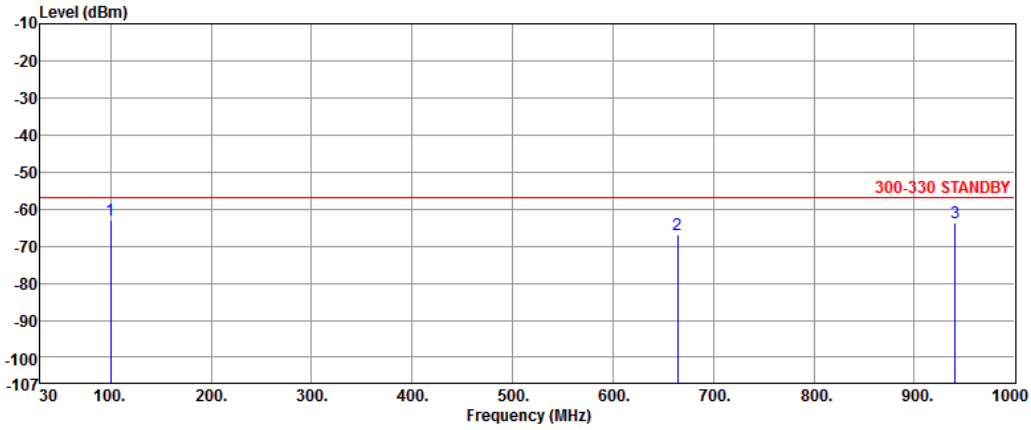
Polarization	Horizontal



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.21	-61.87	-57.00	-4.87	-5.86	-56.01
2	607.51	-67.99	-57.00	-10.99	6.72	-74.71
3	936.51	-63.88	-57.00	-6.88	11.76	-75.64

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Polarization	Vertical



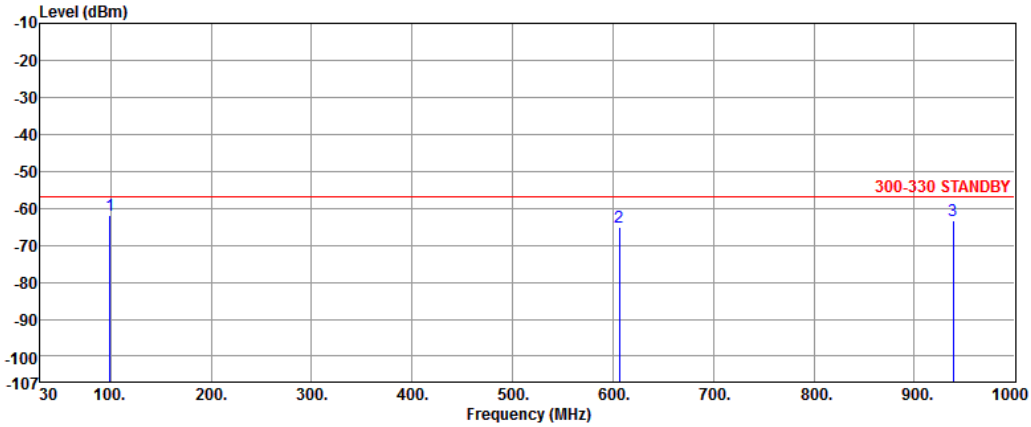
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.61	-62.87	-57.00	-5.87	-4.53	-58.34
2	664.54	-66.88	-57.00	-9.88	6.80	-73.68
3	940.51	-63.74	-57.00	-6.74	11.56	-75.30

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Test configurations 2: DBA6927C1 Antenna + 001-0001 Antenna + NFC Antenna

3.1.6 Receiver Spurious Emissions (Above 30MHz)

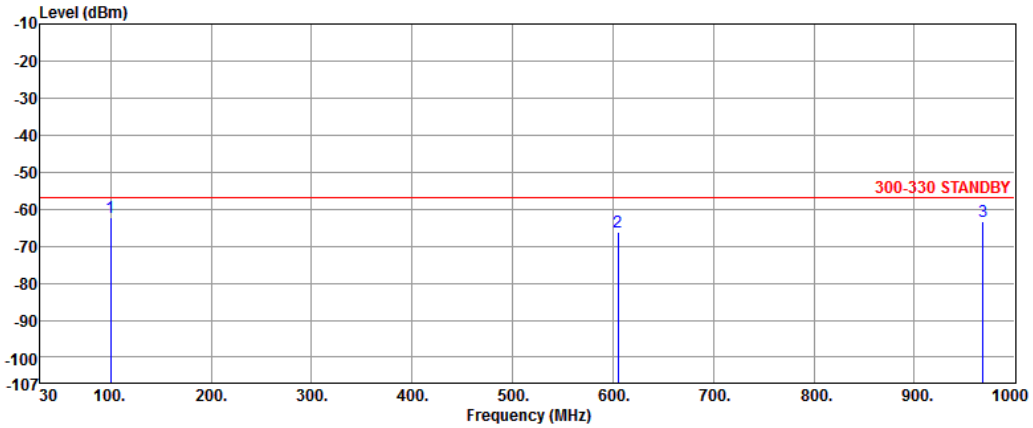
Polarization	Horizontal



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.22	-61.88	-57.00	-4.88	-5.86	-56.02
2	606.54	-65.12	-57.00	-8.12	6.67	-71.79
3	938.87	-63.16	-57.00	-6.16	11.90	-75.06

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Polarization	Vertical



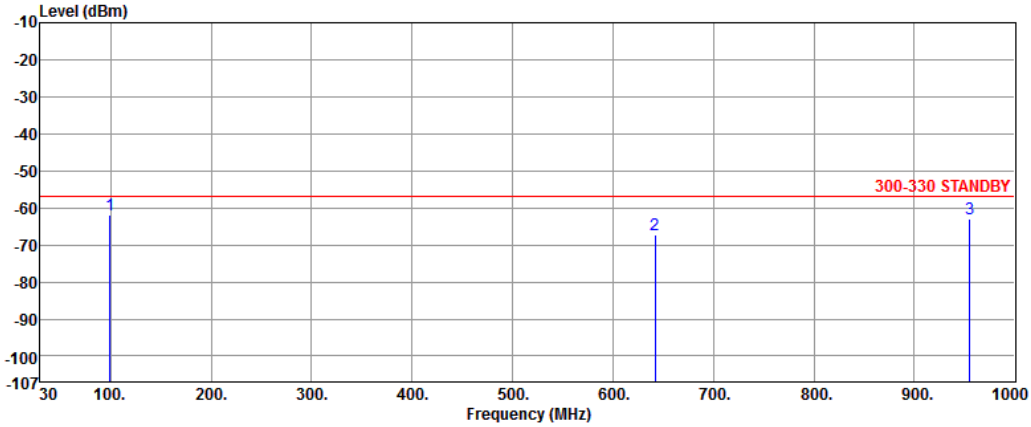
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.85	-62.11	-57.00	-5.11	-4.51	-57.60
2	604.80	-66.10	-57.00	-9.10	6.91	-73.01
3	968.51	-63.41	-57.00	-6.41	11.73	-75.14

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Test configurations 3: EFF6925A3S Antenna + 001-0001 Antenna + NFC Antenna

3.1.7 Receiver Spurious Emissions (Above 30MHz)

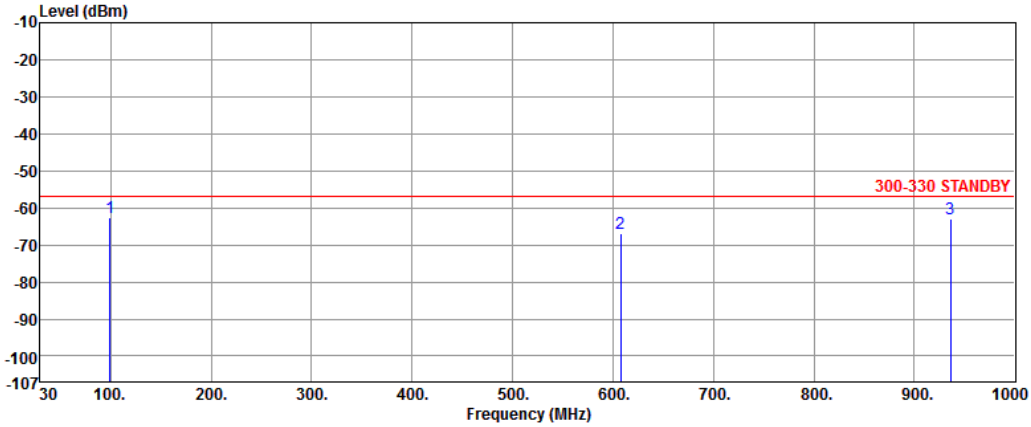
Polarization	Horizontal



	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.15	-61.80	-57.00	-4.80	-5.86	-55.94
2	641.69	-67.11	-57.00	-10.11	6.77	-73.88
3	954.99	-63.12	-57.00	-6.12	11.83	-74.95

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Polarization	Vertical



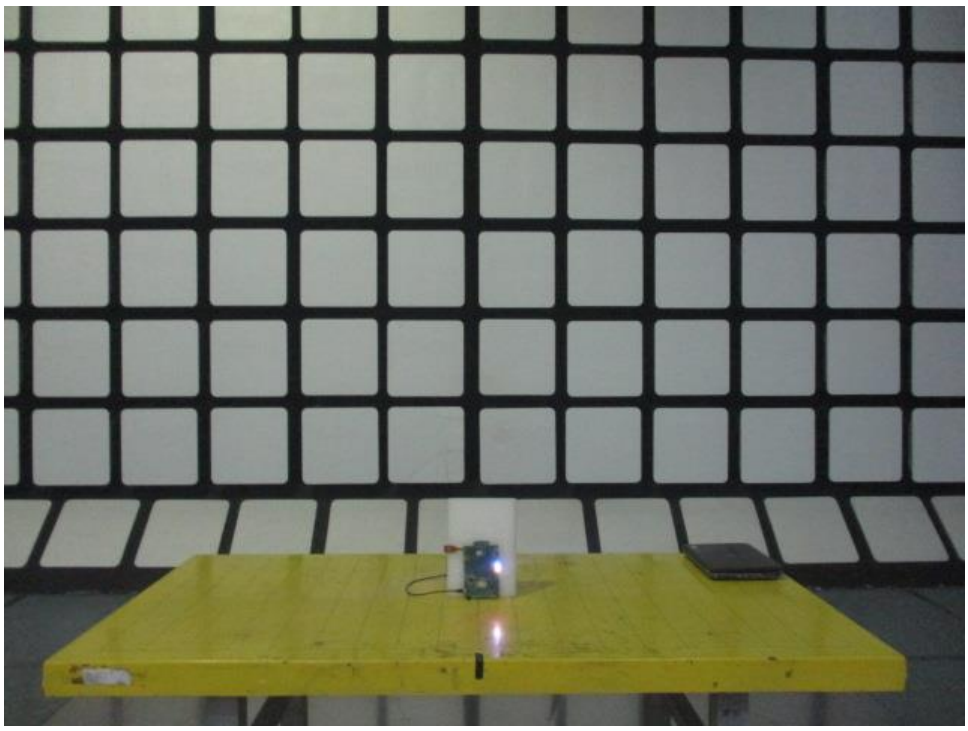
	Freq.	Measured value	Limit	Margin	Factor	Reading
	MHz	dBm	dBm	dB	dB	dBm
1	99.32	-62.77	-57.00	-5.77	-4.56	-58.21
2	607.56	-66.98	-57.00	-9.98	7.04	-74.02
3	936.12	-63.11	-57.00	-6.11	11.40	-74.51

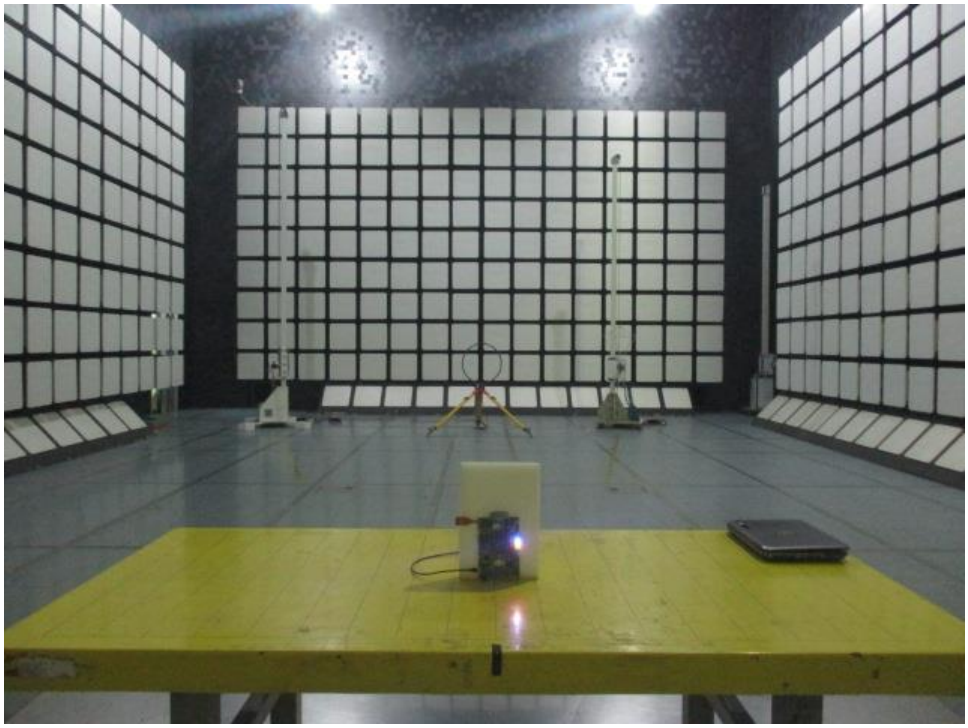
Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

4 Photographs of the Test Configuration

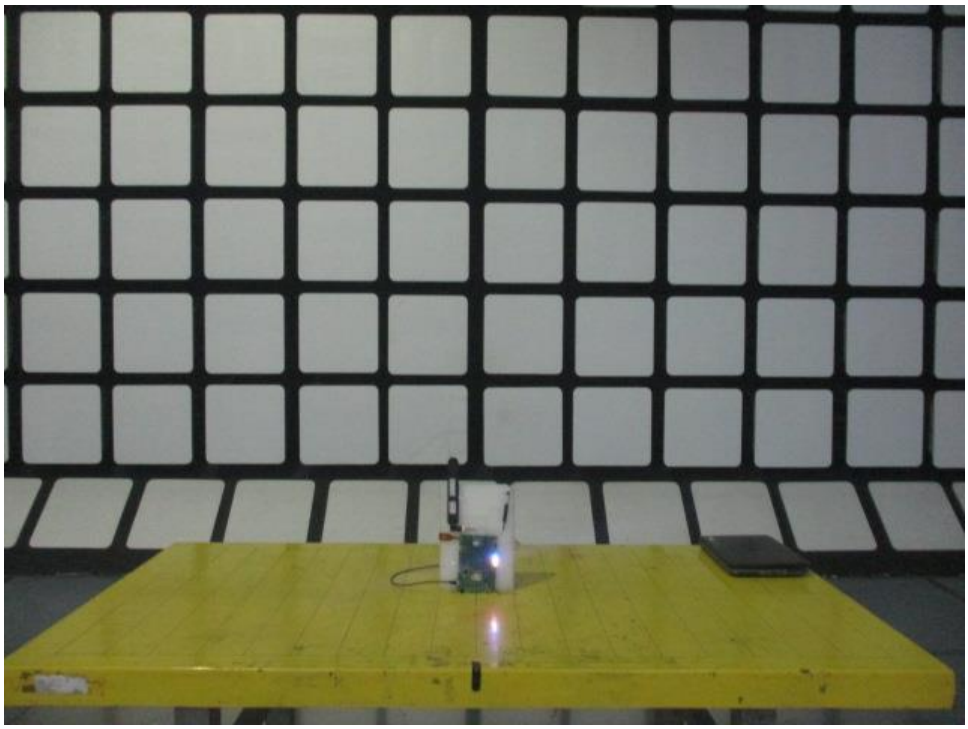
Below 30MHz

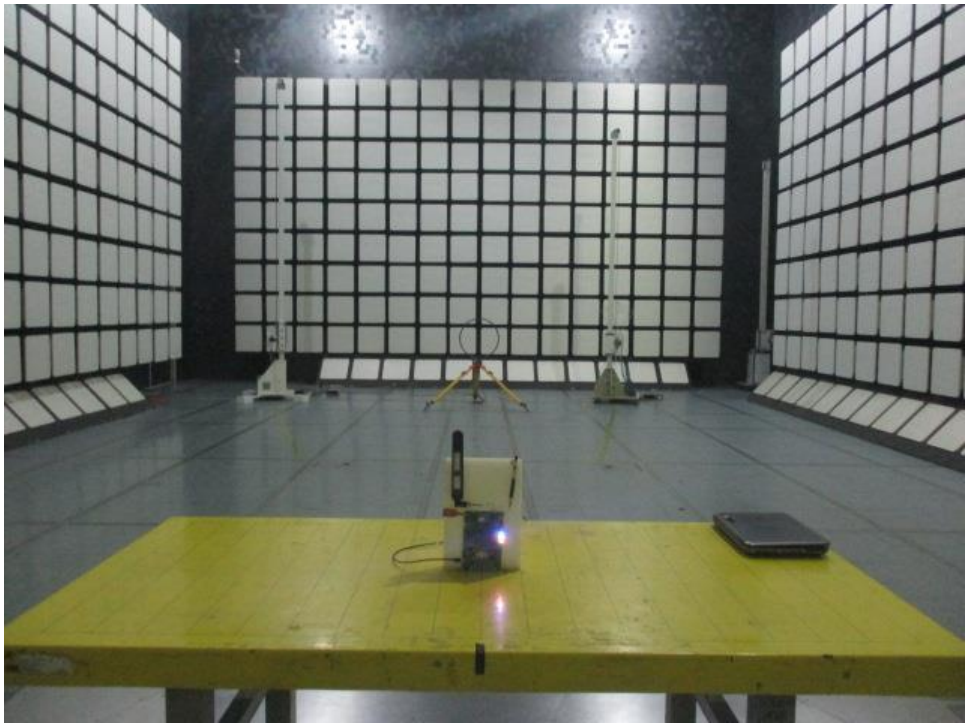
Test configurations 1: EPM6985-001 Antenna + NFC Antenna



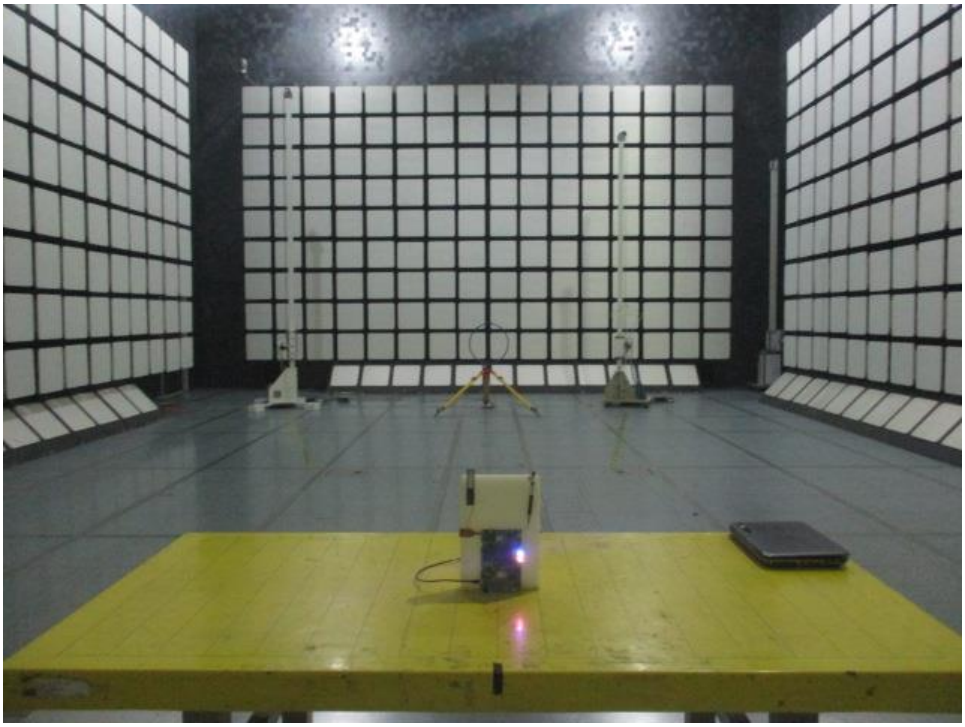


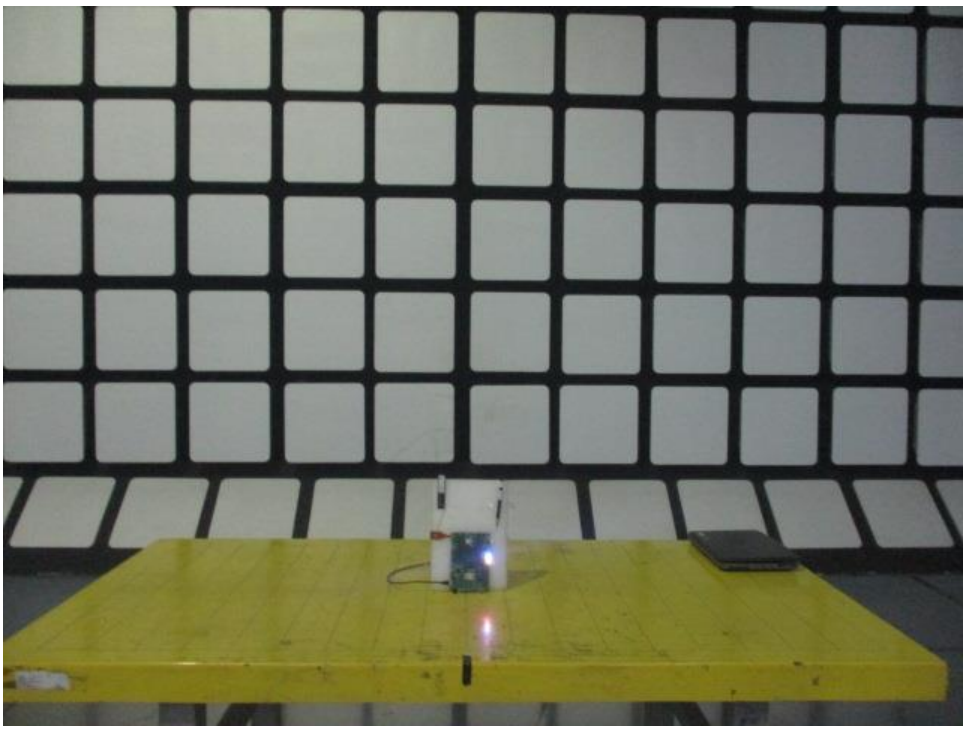
Test configurations 2: DBA6927C1 Antenna + 001-0001 Antenna + NFC Antenna





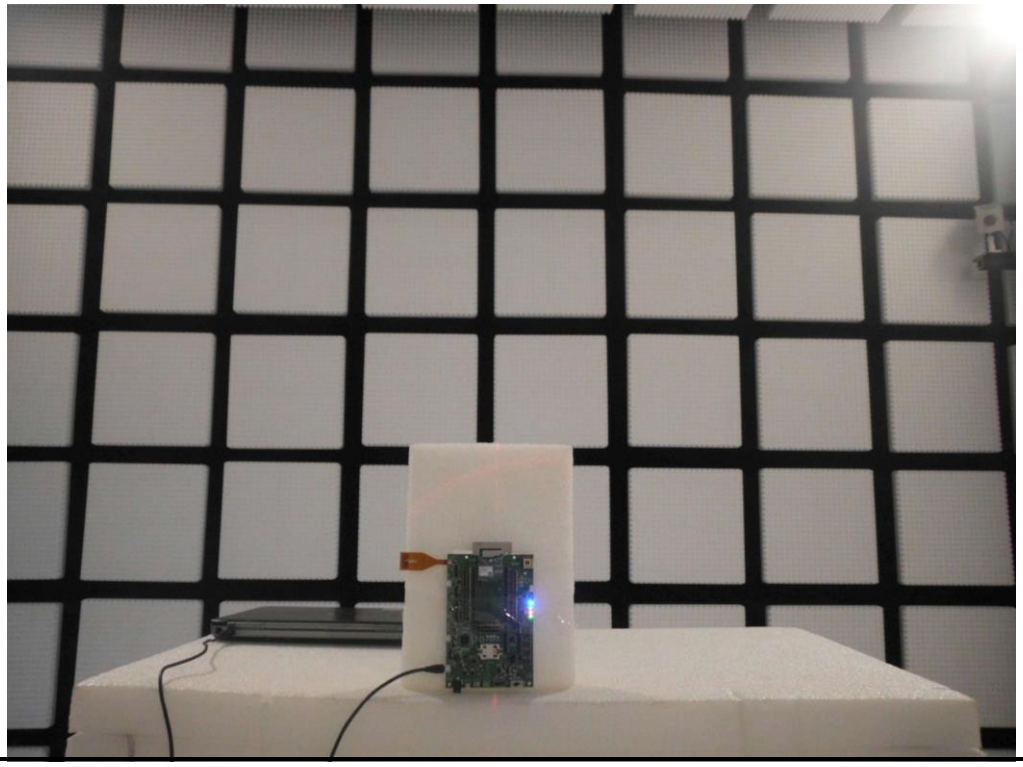
Test configurations 3: EFF6925A3S Antenna + 001-0001 Antenna + NFC Antenna



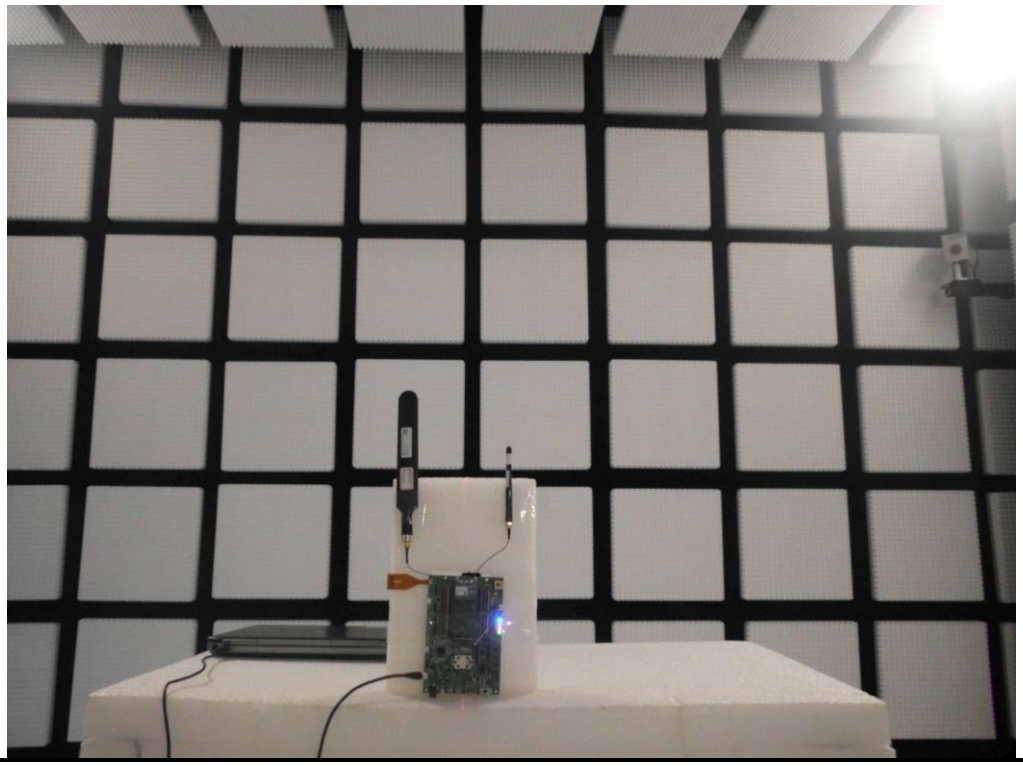


Above 30MHz

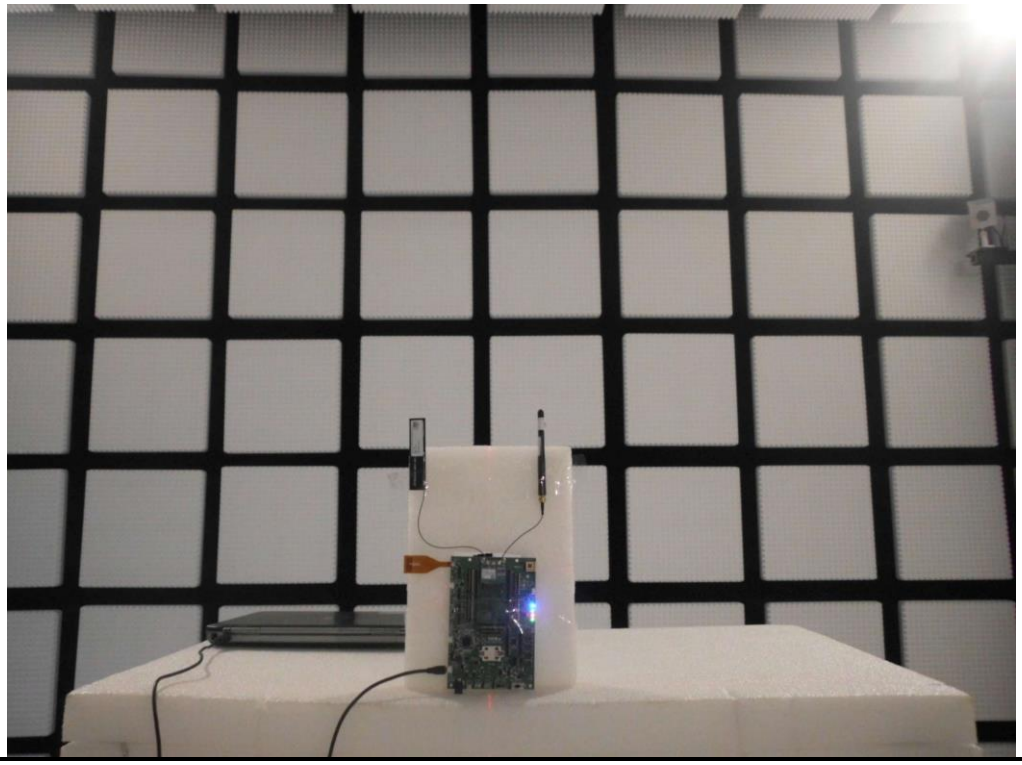
Test configurations 1: EPM6985-001 Antenna + NFC Antenna



Test configurations 2: DBA6927C1 Antenna + 001-0001 Antenna + NFC Antenna



Test configurations 3: EFF6925A3S Antenna + 001-0001 Antenna + NFC Antenna



5 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666
Fax: 886-3-318-0155
Email: ICC_Service@icertifi.com.tw

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