


CE Test Report

Equipment : Bluetooth 4.2 module (BLE only)
Model No. : BL652-SA, BL652-SC
(Refer to item 1.1.1 for more details)
Brand Name : Laird Technologies
Applicant : Laird Technologies
Address : W66N220 Commerce Court, Cedarburg,
Wisconsin 53012, USA
Standard : EN 300 330 V2.1.1 (2017-02)
Received Date : Jun. 22, 2016
Tested Date : Jul. 22, 2016

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:


James Fan / Assistant Manager

Approved by:


Gary Chang / Manager



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Release Record

| Report No. | Version | Description | Issued Date |
|-------------|---------|---------------|---------------|
| ER662202-02 | Rev. 01 | Initial issue | Jun. 21, 2017 |

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 | For receiver category 1 only | Note ² |
| 4.4.4 | Receiver Blocking Or Desensitization | For receiver category 1, 2 only | Note ² |

Note¹: This test item is not required since the NFC function is passive only.

Note²: This test item is not required since the receiver category is 3.

1 General Description

1.1 Information

1.1.1 Product Details

The following models are provided to this EUT.

| Brand Name | Model Name | Product Name | Description |
|--------------------|------------|---------------------------------|----------------------------------|
| Laird Technologies | BL652-SA | Bluetooth 4.2 module (BLE only) | with chip antenna |
| | BL652-SC | | with MHF4 connector type antenna |

1.1.2 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 |

1.1.3 Antenna Details

| Ant. No. | Type | Gain (dBi) | Connector | Remark |
|----------|-----------|------------|-----------|--------|
| 1 | Flexi PCB | --- | --- | --- |

1.1.4 EUT Operational Condition

| | |
|----------------|------------------|
| Supply Voltage | 3.3Vdc from host |
| SW Version | 28.5.0.35 |

1.1.5 Accessories

N/A

1.1.6 Receiver Category

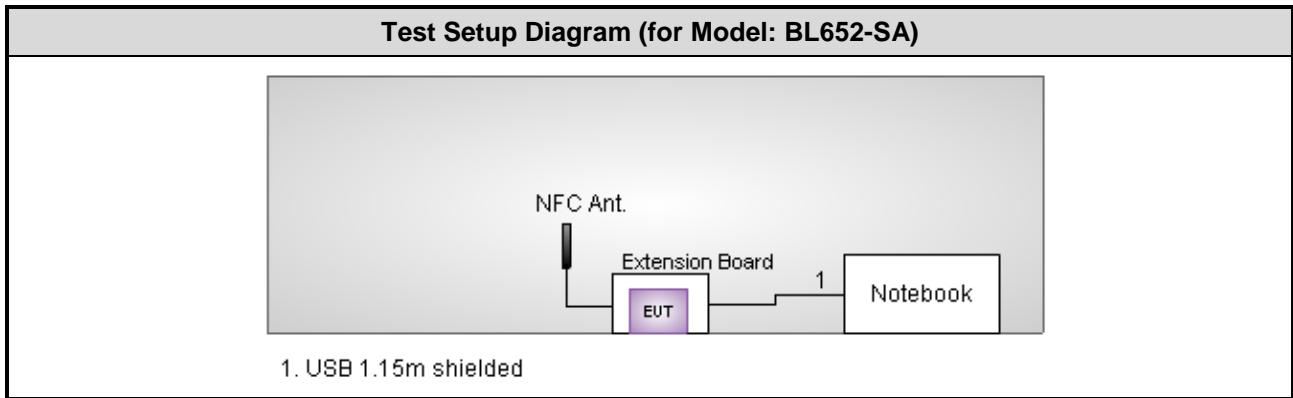
| Receiver Category | |
|-------------------------------------|---|
| <input type="checkbox"/> | 1 Highly reliable SRD communication media; e.g. serving human life inherent systems (may result in a physical risk to a person). |
| <input type="checkbox"/> | 2 Medium reliable SRD communication media e.g. causing Inconvenience to persons, which cannot simply be overcome by other means. |
| <input checked="" type="checkbox"/> | 3 Standard reliable SRD communication media e.g. Inconvenience to persons, which can simply be overcome by other means (e.g. manual). |

1.2 Local Support Equipment List

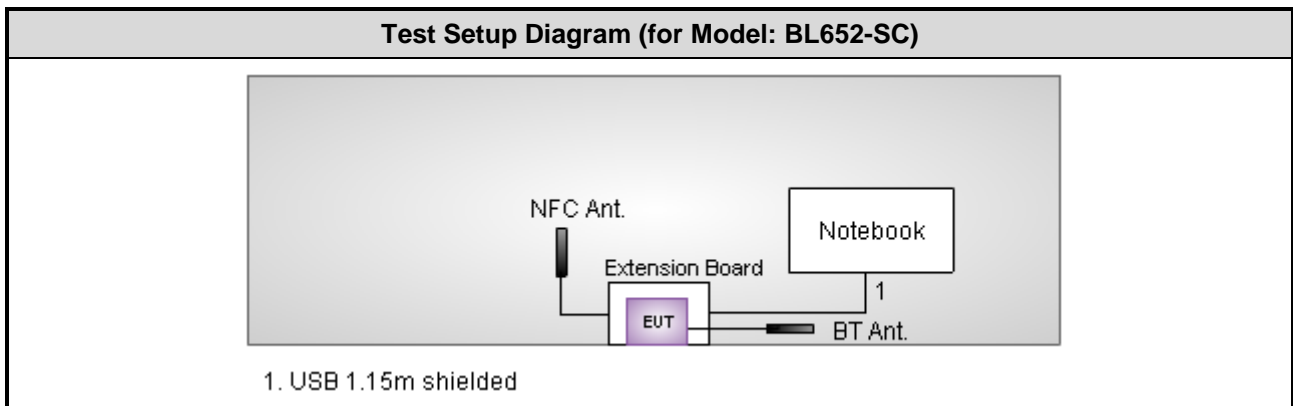
| Support Equipment List | | | | | |
|------------------------|-----------------|-------|----------------|------------|---------------------------|
| No. | Equipment | Brand | Model | S/N | Signal cable / Length (m) |
| 1 | Notebook | DELL | Latitude E6440 | 7MW3Z52 | USB, 1.15m shielded |
| 2 | Tablet | SONY | SGP511TW/B | CB5126VXTX | --- |
| 3 | Extension Board | Laird | DVK-BL652-A1 | --- | --- |

Note: Extension Board is provided by applicant.

1.3 Test Setup Chart



Note: The tablet is disconnected from EUT and removed from test table when EUT is set to receiving continuously.



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 | Aug. 24, 2015 | Aug. 23, 2016 |
| Bilog Antenna | SCHWARZBECK | VULB9168 | VULB9168-524 | Oct. 03, 2015 | Oct. 02, 2016 |
| Horn Antenna 1G-18G | SCHWARZBECK | BBHA 9120 D | BBHA 9120 D 1094 | Oct. 20, 2015 | Oct. 19, 2016 |
| Horn Antenna 18G-40G | SCHWARZBECK | BBHA 9170 | BBHA 9170508 | Jan. 04, 2016 | Jan. 03, 2017 |
| Preamplifier | Agilent | 83017A | MY39501310 | Dec. 11, 2015 | Dec. 10, 2016 |
| Preamplifier | EMC | EMC02325 | 980146 | Oct. 14, 2015 | Oct. 13, 2016 |
| Preamplifier | EMC | EMC184045B | 980192 | Sep. 01, 2015 | Aug. 31, 2016 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16609/4 | Dec. 04, 2015 | Dec. 03, 2016 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16608/4 | Dec. 04, 2015 | Dec. 03, 2016 |
| RF Cable | HUBER+SUHNER | SUCOFLEX104 | MY16617/4 | Dec. 04, 2015 | Dec. 03, 2016 |
| LF cable 3M | Woken | CFD400NL-LW | CFD400NL-005 | Dec. 04, 2015 | Dec. 03, 2016 |
| LF cable 10M | Woken | CFD400NL-LW | CFD400NL-006 | Dec. 04, 2015 | Dec. 03, 2016 |
| Measurement Software | AUDIX | e3 | 6.120210g | NA | NA |

Note: Calibration Interval of instruments listed above is one year.

| Test Item | Radiated Emissions | | | | |
|-------------------|-------------------------------------|------------------------|--------------|------------------|-------------------|
| Test Site | (10CH01-HY) | | | | |
| Instrument | Manufacturer | Model No. | Serial No. | Calibration Date | Calibration Until |
| Spectrum Analyzer | R&S | FSP7 | 838858/013 | Mar. 04, 2016 | Mar. 03, 2017 |
| Receiver | R&S | ESI7 | 838496/009 | Sep. 18, 2015 | Sep. 17, 2016 |
| Amplifier | Agilent | 8447D | 2944A10825 | Apr. 15, 2016 | Apr. 14, 2017 |
| Amplifier | Agilent | 8447D | 2944A10826 | Apr. 11, 2016 | Apr. 10, 2017 |
| Biconical Antenna | Schwarz beck | VHBB 9124 | 286 | Aug. 03, 2015 | Aug. 02, 2016 |
| Log Antenna | Schwarz beck | VUSLP 9111 | 206 | Aug. 03, 2015 | Aug. 02, 2016 |
| Turn Table | HD | DT 60 RPS | 1513/004/00 | N/A | N/A |
| Antenna Mast | HD | MA240 | 240/556/00 | N/A | N/A |
| Antenna Mast | HD | MA240 | 240/559/00 | N/A | N/A |
| RF Cable-R10m | BELDEN | RG8/U | CB023-INSIDE | Nov. 12, 2015 | Nov. 11, 2016 |
| RF Cable-R10m | Suhner Switzerland + Rosenberger | RG223/U + UAA220A-0 | CB022-DOOR | Nov. 12, 2015 | Nov. 11, 2016 |
| Software | Audix | E3 | 6.12.0210c | N/A | N/A |

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 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 |
| RF power, radiated | ±2.704 dB | ±6 dB |

2 Test Configuration

2.1 Testing Condition

| Testing Location | | | |
|-------------------------------------|---------------|--|------------------|
| <input checked="" type="checkbox"/> | 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 | |
| <input checked="" type="checkbox"/> | Sporton Lab | ADD : No. 52, Hwa Ya 1 st 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 / 63% | Tom Shu |
| Radiated Emission below 30MHz | 10CH01-HY* | 22°C / 65% | 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) |
|--|-----------|--------------------|
| Radiated Measurement | NFC | 13.56 |
| NOTE: | | |
| <ol style="list-style-type: none"> The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The X-plane result was found as the worst case and was shown in this report. The test configurations are listed as follows: Configuration 1: model: BL652-SA with antenna AT3216-B2R7HAA. Configuration 2: model: BL652-SC with antenna FlexPIFA 001-0022. Configuration 3: model: BL652-SC with antenna FlexNotch 001-0023. Configuration 4: model: BL652-SC with antenna EDA-8709-2G4C1-B27. Configuration 5: model: BL652-SC with antenna RFDPA870910EMAB302. | | |

3 Receiver Test Results

3.1 Receiver Spurious Emissions

3.1.1 Limit of Receiver Spurious Emissions

Measurement below 30 MHz

| Frequency $9 \text{ kHz} \leq f < 10 \text{ MHz}$ | Frequency $10 \text{ MHz} \leq f < 30 \text{ MHz}$ |
|---|--|
| 5,5 dB μ A/m at 9 kHz descending 3 dB/oct | -25 dB μ A/m |

Measurement above 30 MHz

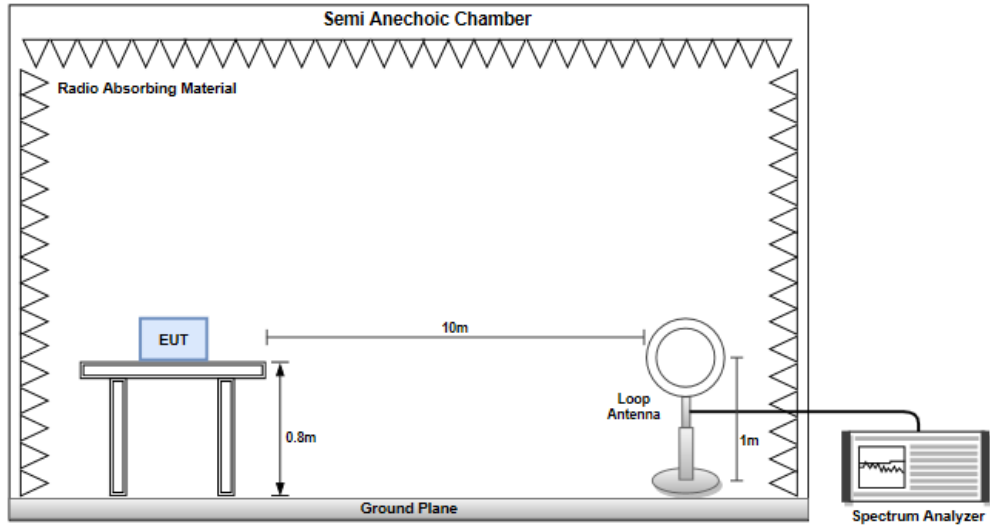
The measured values shall not exceed 2 nW e.r.p. (-57 dBm).

3.1.2 Test Procedures

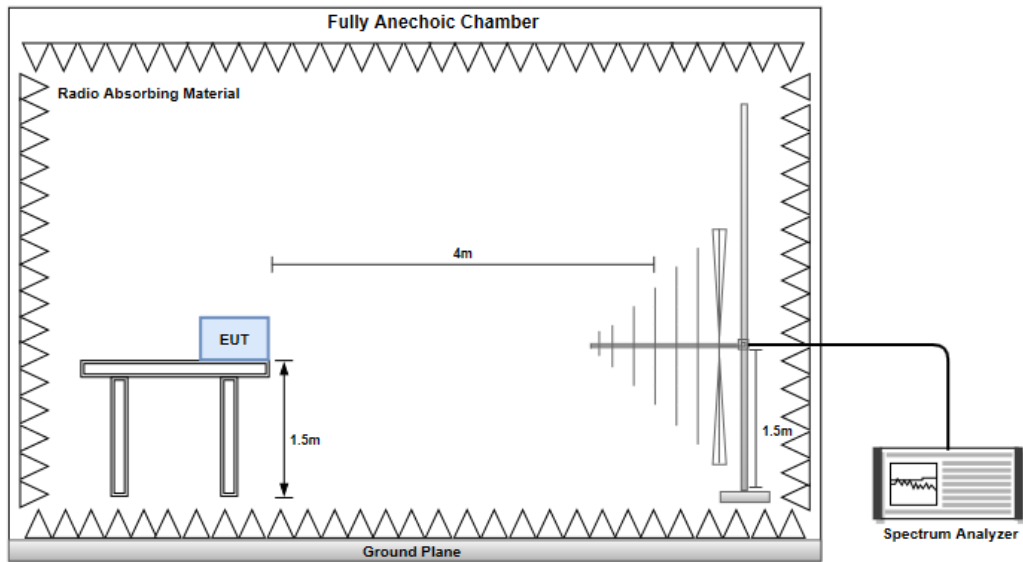
Reference to clause 6.3.1 of EN 300 330 V2.1.1 (2017-02).

3.1.3 Test Setup

Below 30MHz



Above 30MHz



3.1.4 Receiver Spurious Emissions (Below 30MHz)

Configuration 1 : model: BL652-SA

| Frequency (MHz) | Maximum Emission (dBuA/m) | Limit (dBuA/m) | Margin (dB) | Result |
|-----------------|---------------------------|----------------|-------------|--------|
| 13.5720 | -27.27 | -25.00 | -2.27 | Pass |

Configuration 2 : model: BL652-SC (FlexPIFA 001-0022)

| Frequency (MHz) | Maximum Emission (dBuA/m) | Limit (dBuA/m) | Margin (dB) | Result |
|-----------------|---------------------------|----------------|-------------|--------|
| 13.5720 | -26.68 | -25.00 | -1.68 | Pass |

Configuration 3 : model: BL652-SC (FlexNotch 001-0023)

| Frequency (MHz) | Maximum Emission (dBuA/m) | Limit (dBuA/m) | Margin (dB) | Result |
|-----------------|---------------------------|----------------|-------------|--------|
| 13.5720 | -29.04 | -25.00 | -4.04 | Pass |

Configuration 4 : model: BL652-SC (EDA-8709-2G4C1-B27)

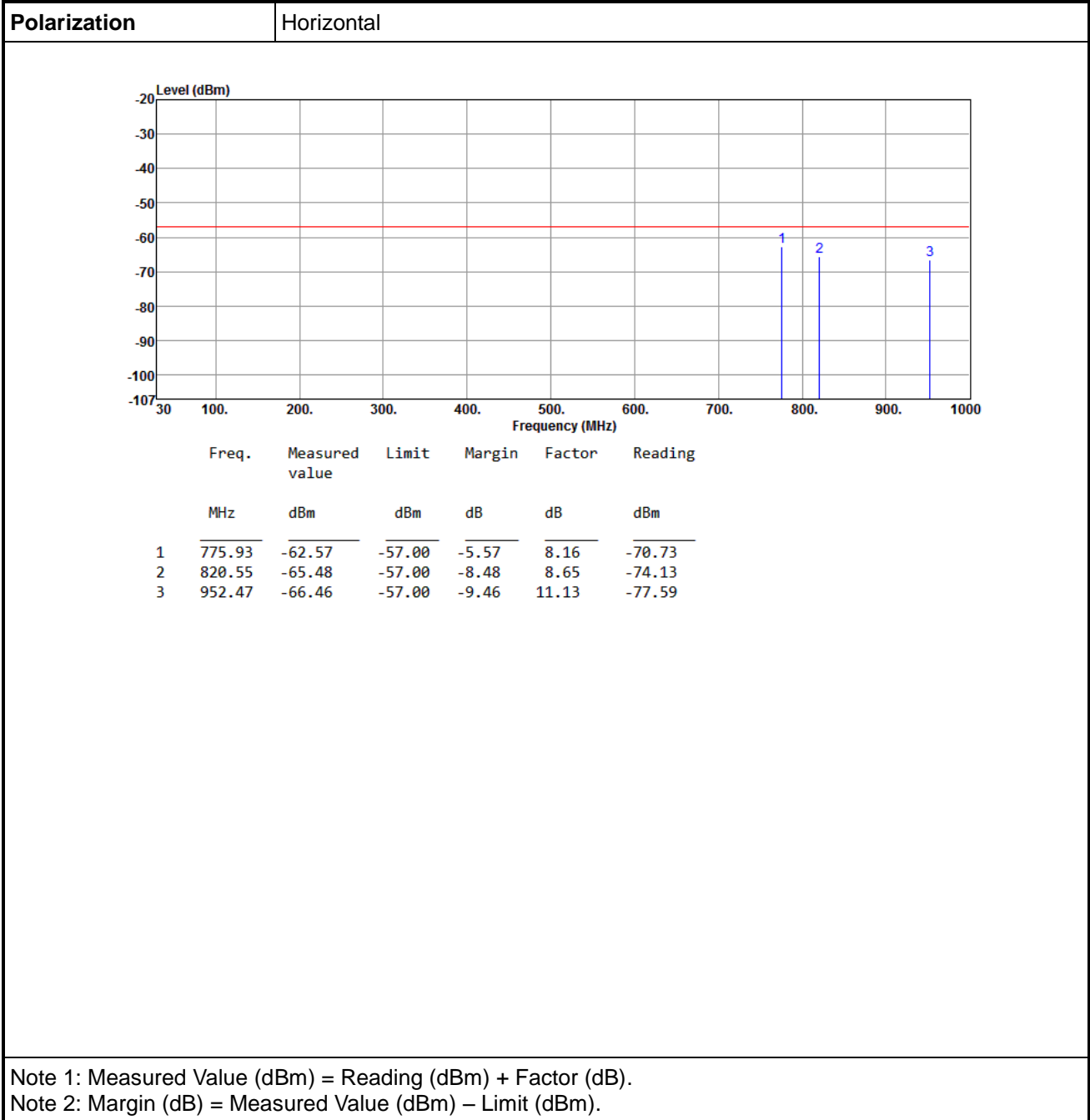
| Frequency (MHz) | Maximum Emission (dBuA/m) | Limit (dBuA/m) | Margin (dB) | Result |
|-----------------|---------------------------|----------------|-------------|--------|
| 13.5720 | -28.19 | -25.00 | -3.19 | Pass |

Configuration 5 : model: BL652-SC (RFDPA870910EMAB302)

| Frequency (MHz) | Maximum Emission (dBuA/m) | Limit (dBuA/m) | Margin (dB) | Result |
|-----------------|---------------------------|----------------|-------------|--------|
| 13.5720 | -28.00 | -25.00 | -3.00 | Pass |

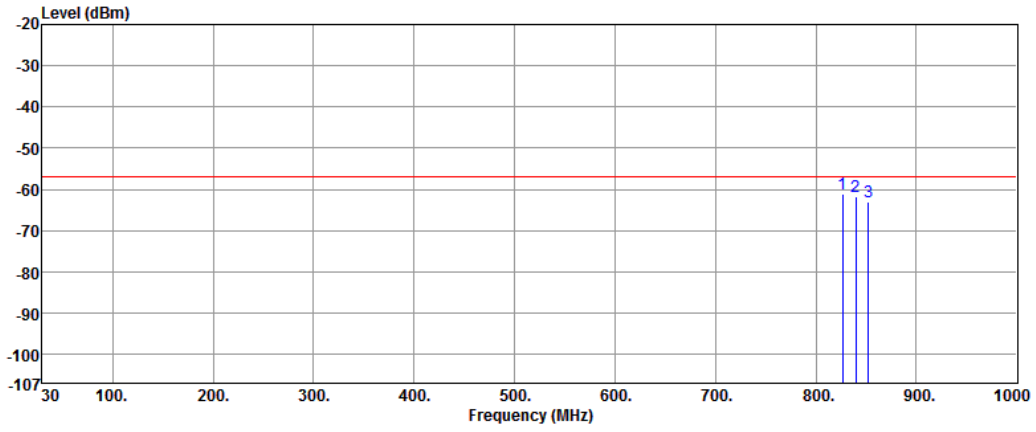
3.1.5 Receiver Spurious Emissions (Above 30MHz)

Configuration 1 : model: BL652-SA



Polarization

Vertical

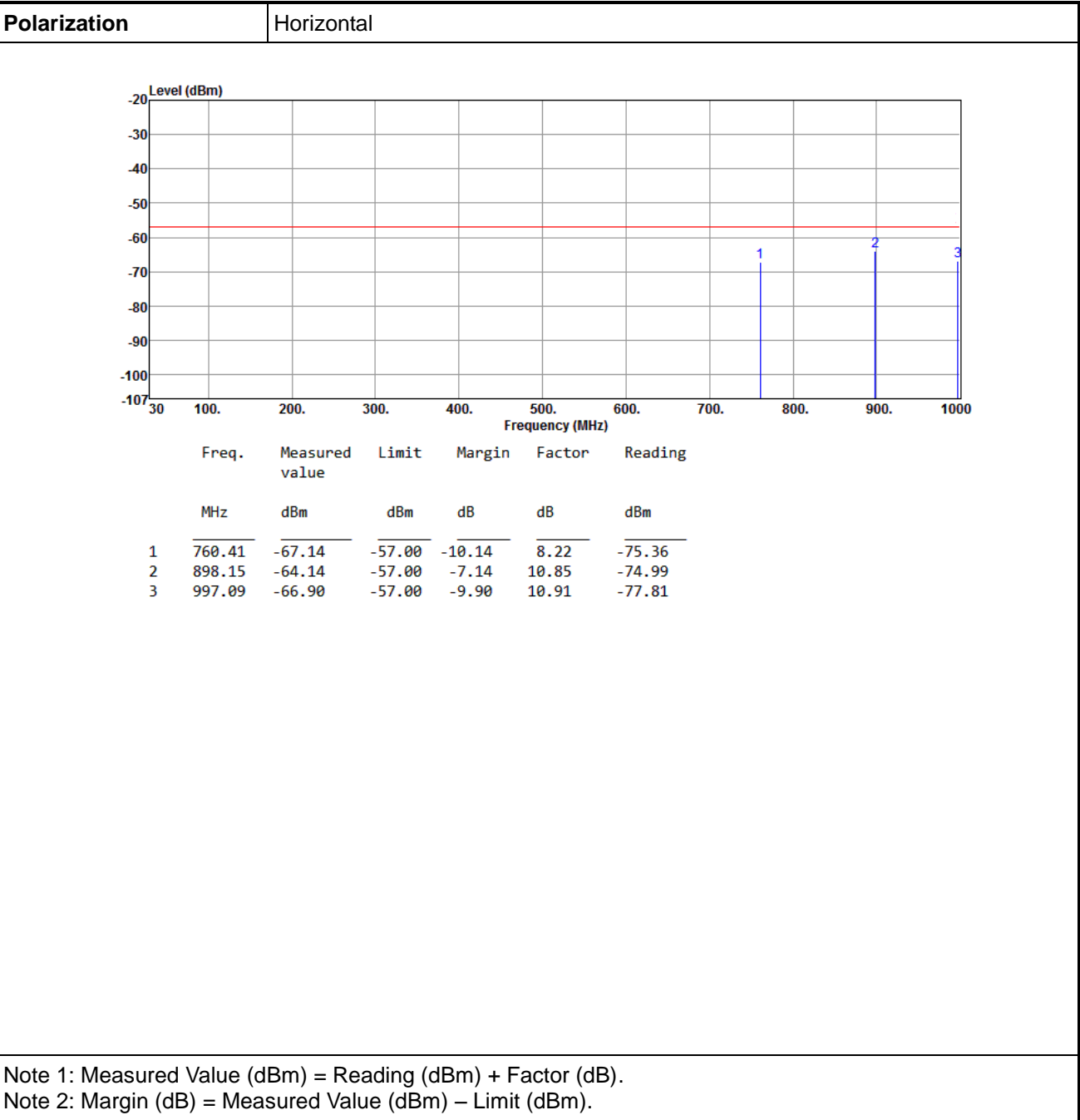


| | Freq. | Measured value | Limit | Margin | Factor | Reading |
|---|--------|----------------|--------|--------|--------|---------|
| | MHz | dBm | dBm | dB | dB | dBm |
| 1 | 826.37 | -61.19 | -57.00 | -4.19 | 9.31 | -70.50 |
| 2 | 839.95 | -61.88 | -57.00 | -4.88 | 9.25 | -71.13 |
| 3 | 852.56 | -63.18 | -57.00 | -6.18 | 9.03 | -72.21 |

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).

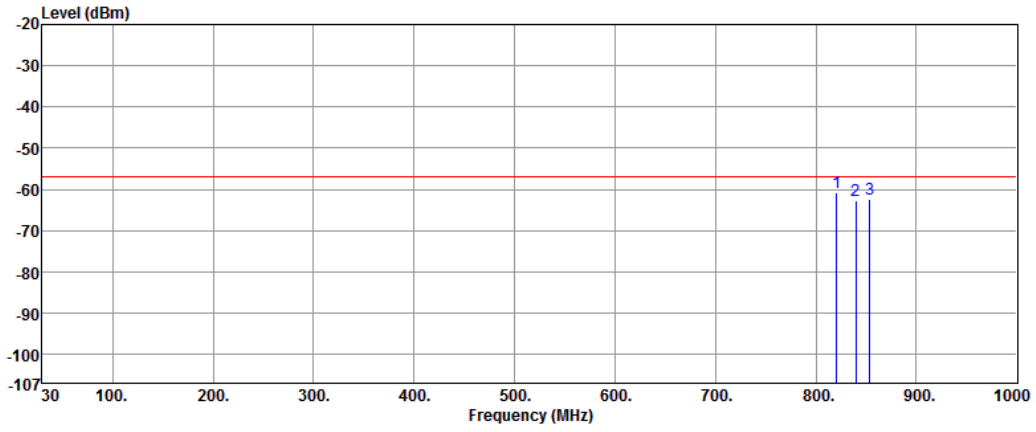
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Configuration 2 : model: BL652-SC (FlexPIFA 001-0022)



Polarization

Vertical

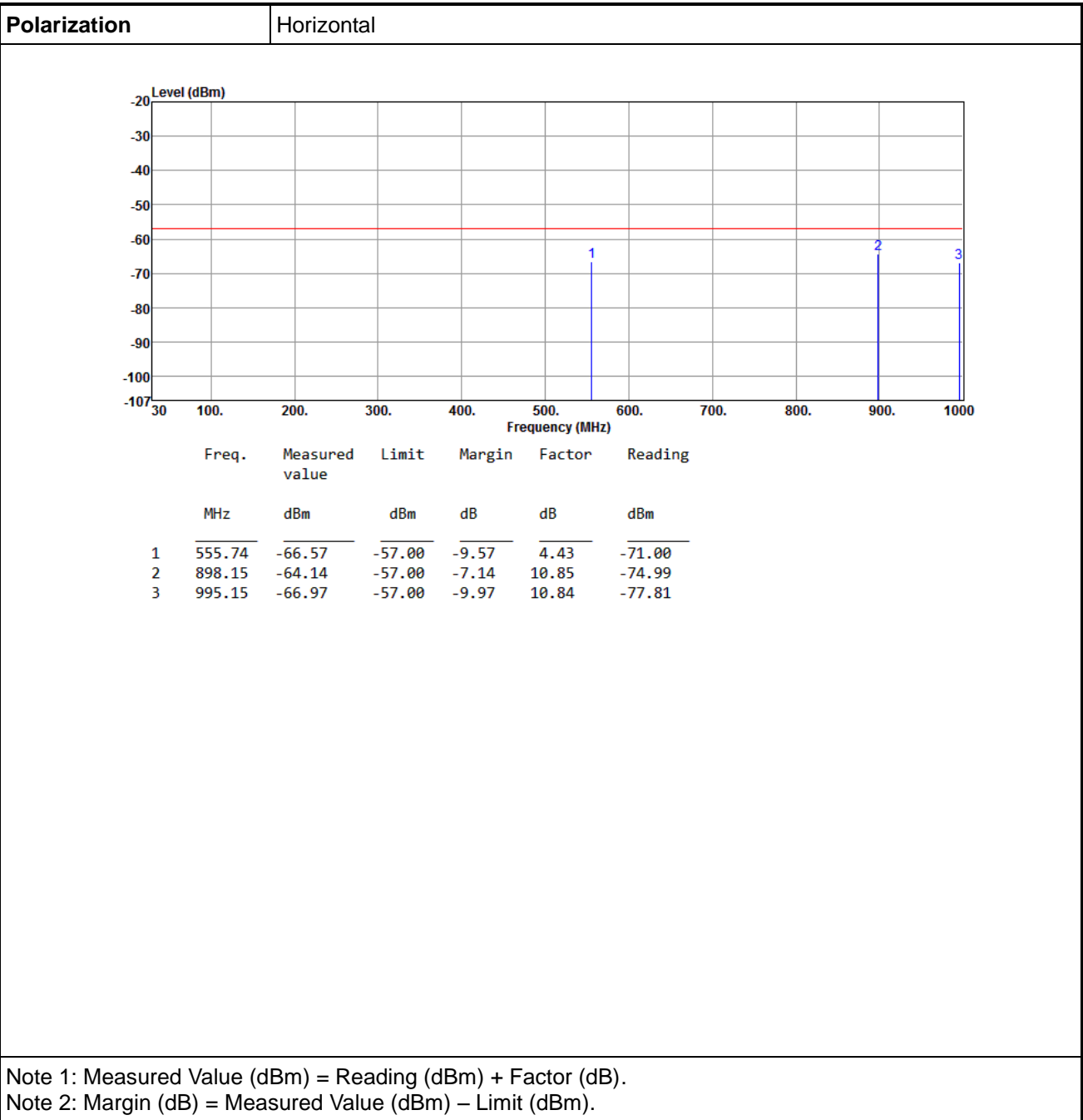


| | Freq. | Measured value | Limit | Margin | Factor | Reading |
|---|--------|----------------|--------|--------|--------|---------|
| | MHz | dBm | dBm | dB | dB | dBm |
| 1 | 820.55 | -60.83 | -57.00 | -3.83 | 9.25 | -70.08 |
| 2 | 839.95 | -62.85 | -57.00 | -5.85 | 9.25 | -72.10 |
| 3 | 853.53 | -62.45 | -57.00 | -5.45 | 9.03 | -71.48 |

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).

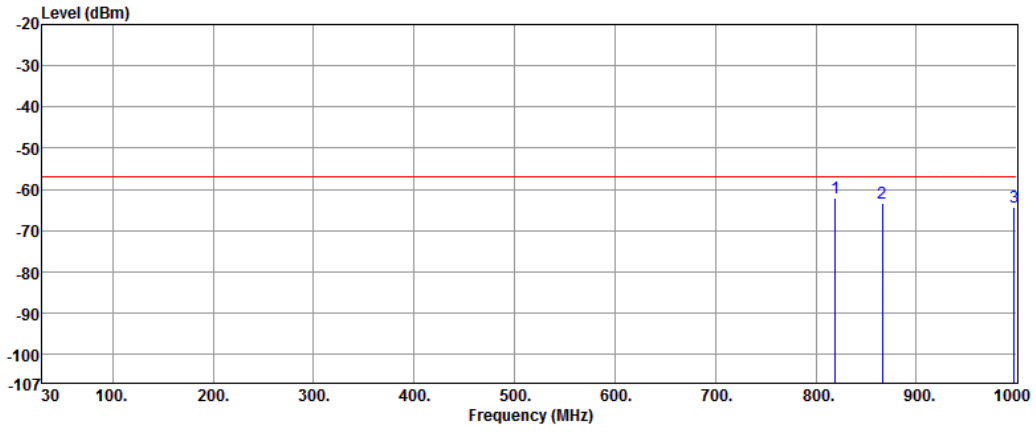
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Configuration 3 : model: BL652-SC (FlexNotch 001-0023)



Polarization

Vertical

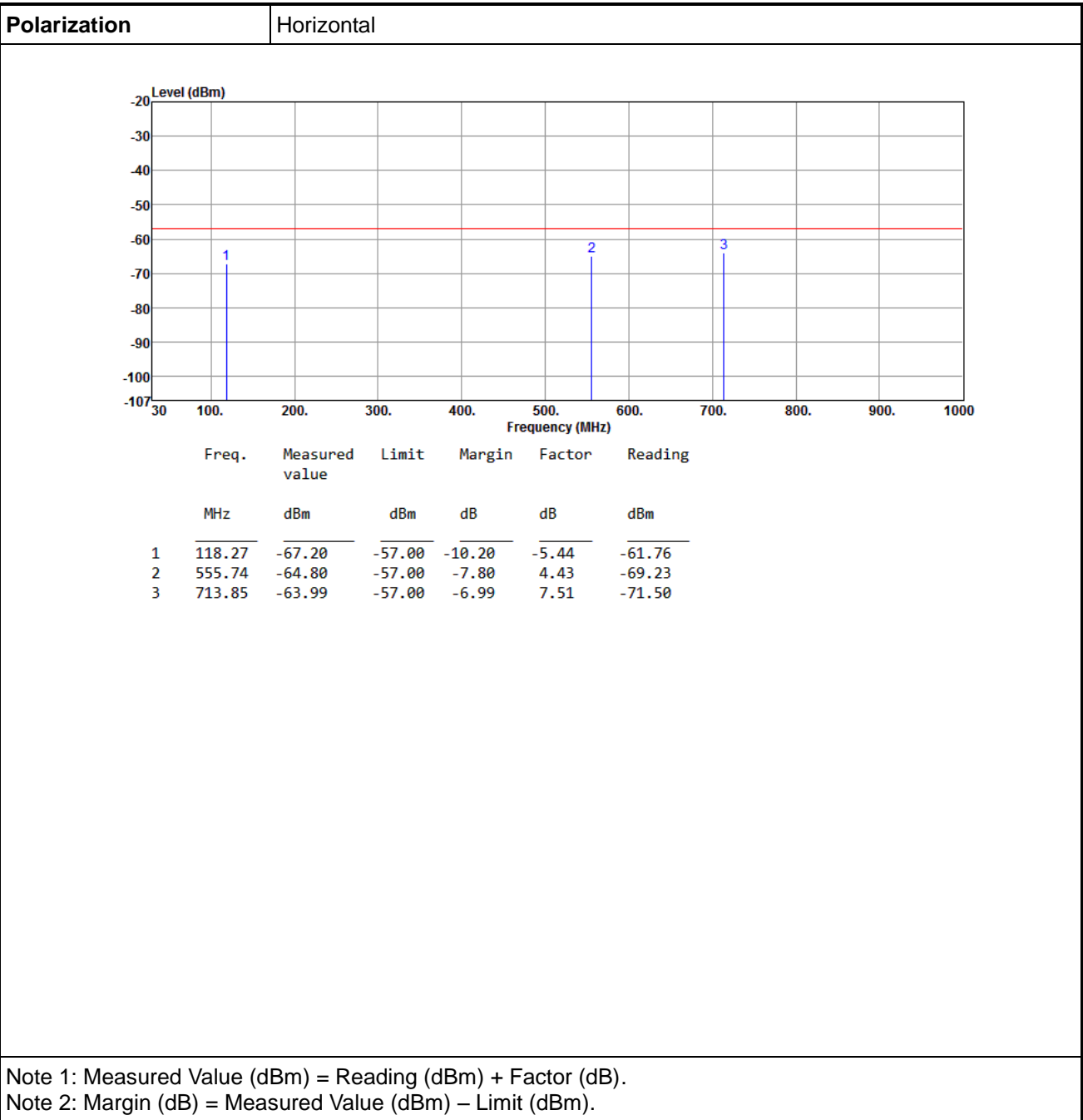


| | Freq. | Measured value | Limit | Margin | Factor | Reading |
|---|--------|----------------|--------|--------|--------|---------|
| | MHz | dBm | dBm | dB | dB | dBm |
| 1 | 819.58 | -61.93 | -57.00 | -4.93 | 9.23 | -71.16 |
| 2 | 866.14 | -63.42 | -57.00 | -6.42 | 9.16 | -72.58 |
| 3 | 997.09 | -64.39 | -57.00 | -7.39 | 11.20 | -75.59 |

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).

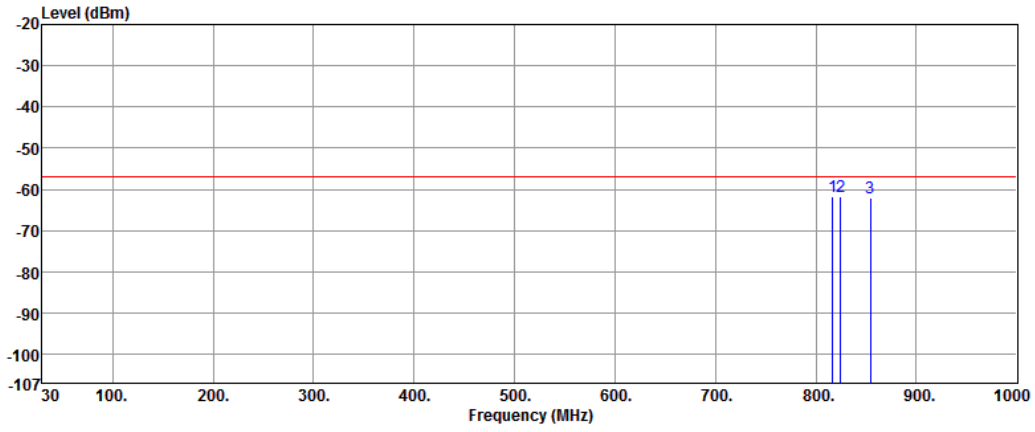
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Configuration 4 : model: BL652-SC (EDA-8709-2G4C1-B27)



Polarization

Vertical

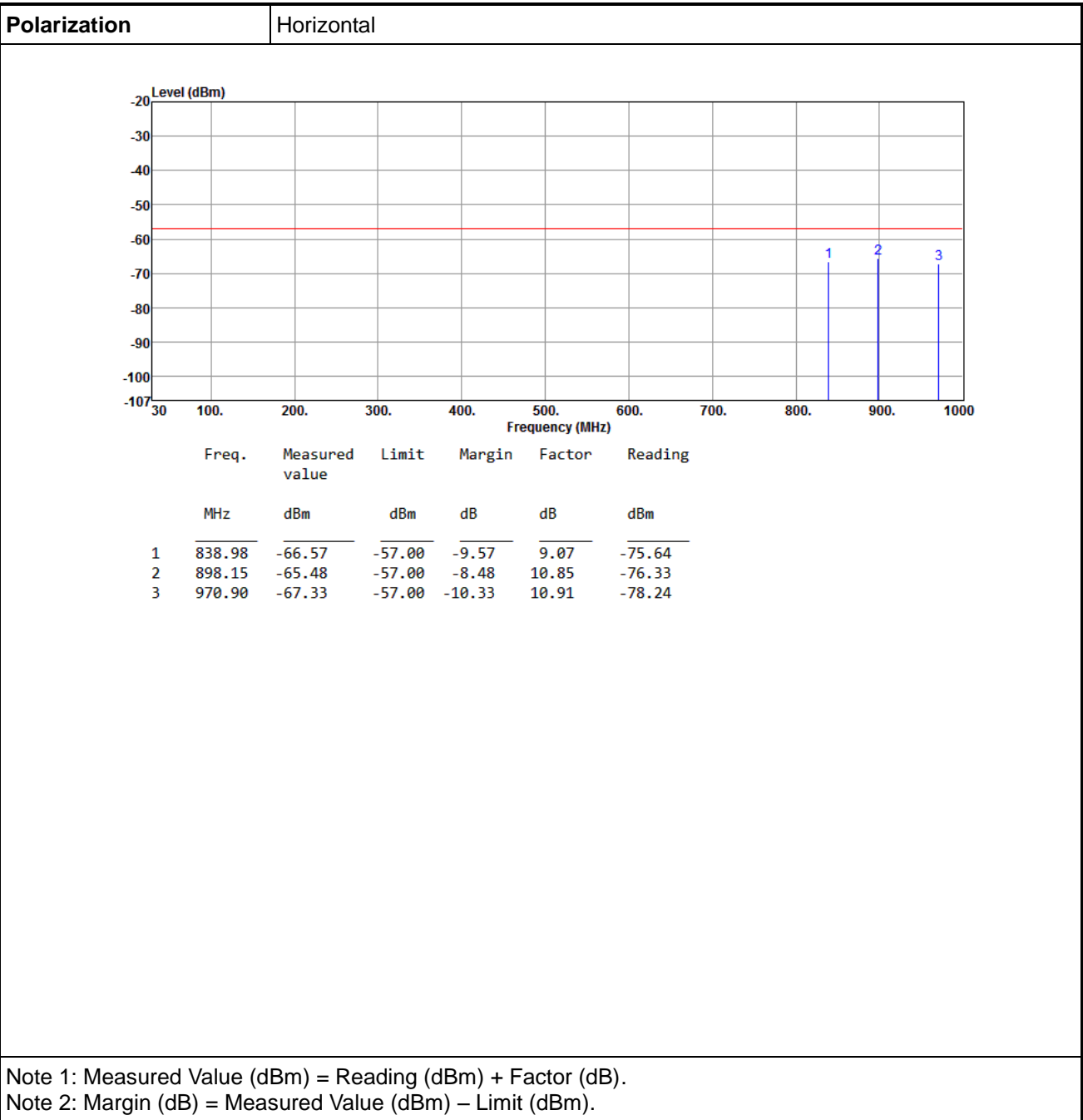


| | Freq. | Measured value | Limit | Margin | Factor | Reading |
|---|--------|----------------|--------|--------|--------|---------|
| | MHz | dBm | dBm | dB | dB | dBm |
| 1 | 816.67 | -61.73 | -57.00 | -4.73 | 9.17 | -70.90 |
| 2 | 824.43 | -61.84 | -57.00 | -4.84 | 9.31 | -71.15 |
| 3 | 854.50 | -62.12 | -57.00 | -5.12 | 9.02 | -71.14 |

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).

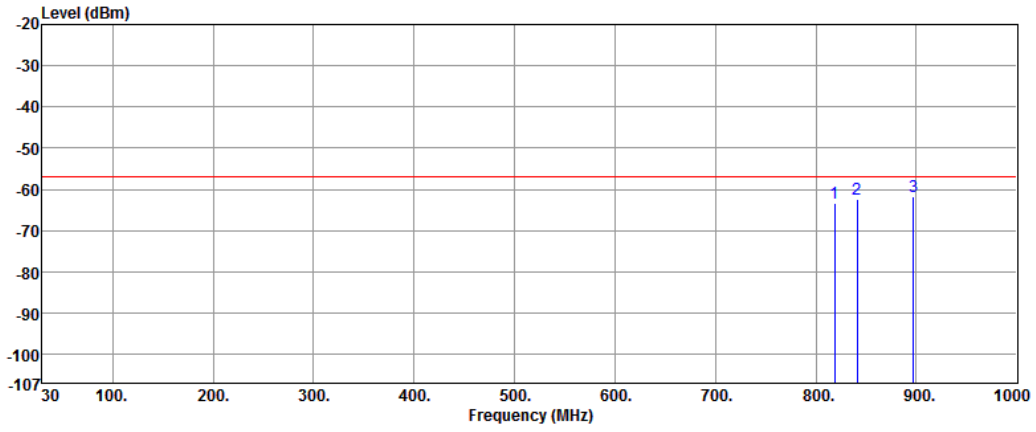
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

Configuration 5 : model: BL652-SC (RFDP A870910EMAB302)



Polarization

Vertical



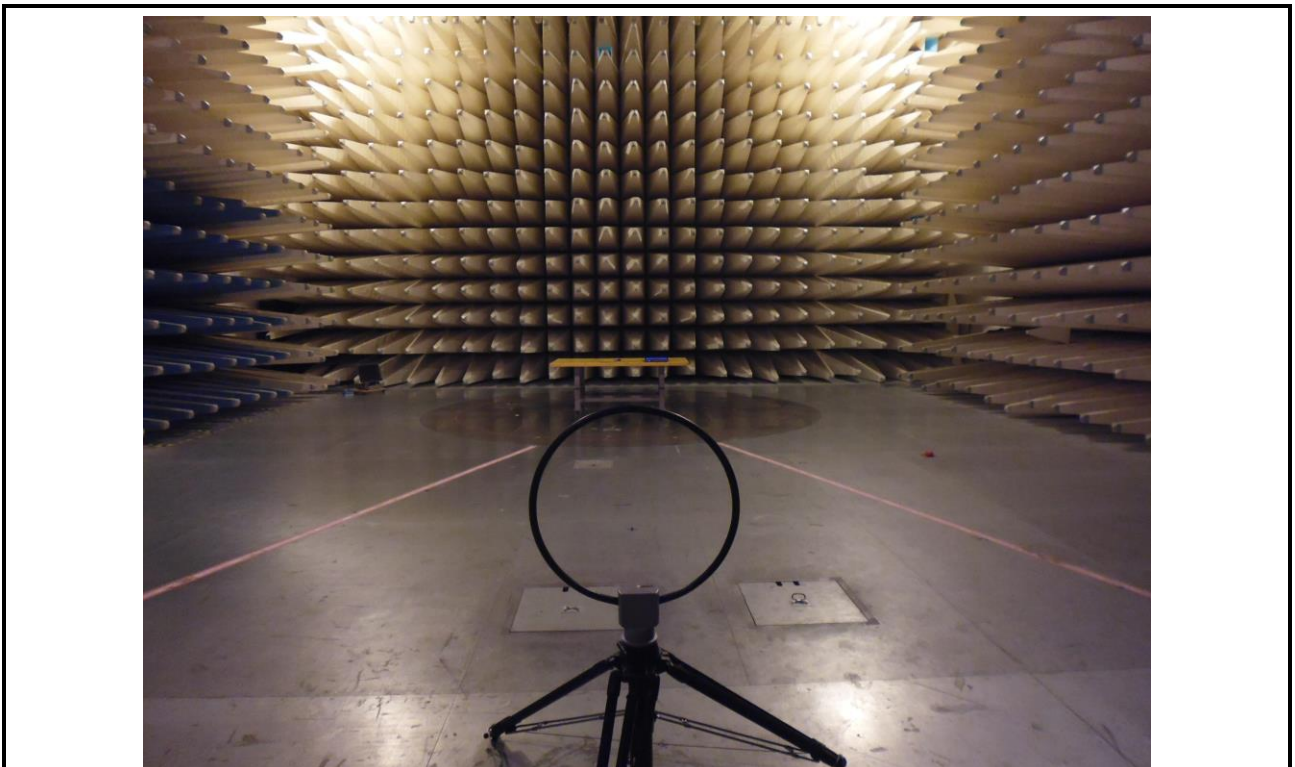
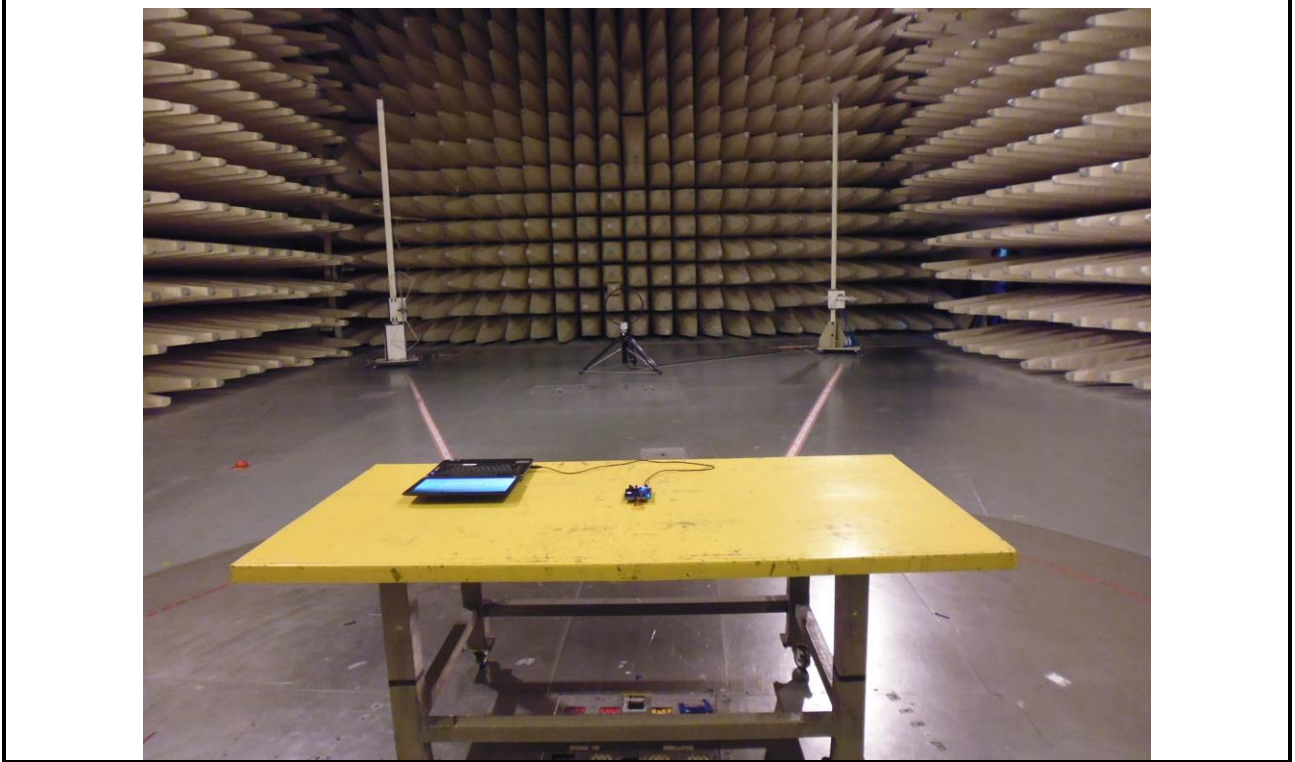
| | Freq. | Measured value | Limit | Margin | Factor | Reading |
|---|--------|----------------|--------|--------|--------|---------|
| | MHz | dBm | dBm | dB | dB | dBm |
| 1 | 818.61 | -63.24 | -57.00 | -6.24 | 9.21 | -72.45 |
| 2 | 840.92 | -62.53 | -57.00 | -5.53 | 9.23 | -71.76 |
| 3 | 897.18 | -61.86 | -57.00 | -4.86 | 10.12 | -71.98 |

Note 1: Measured Value (dBm) = Reading (dBm) + Factor (dB).

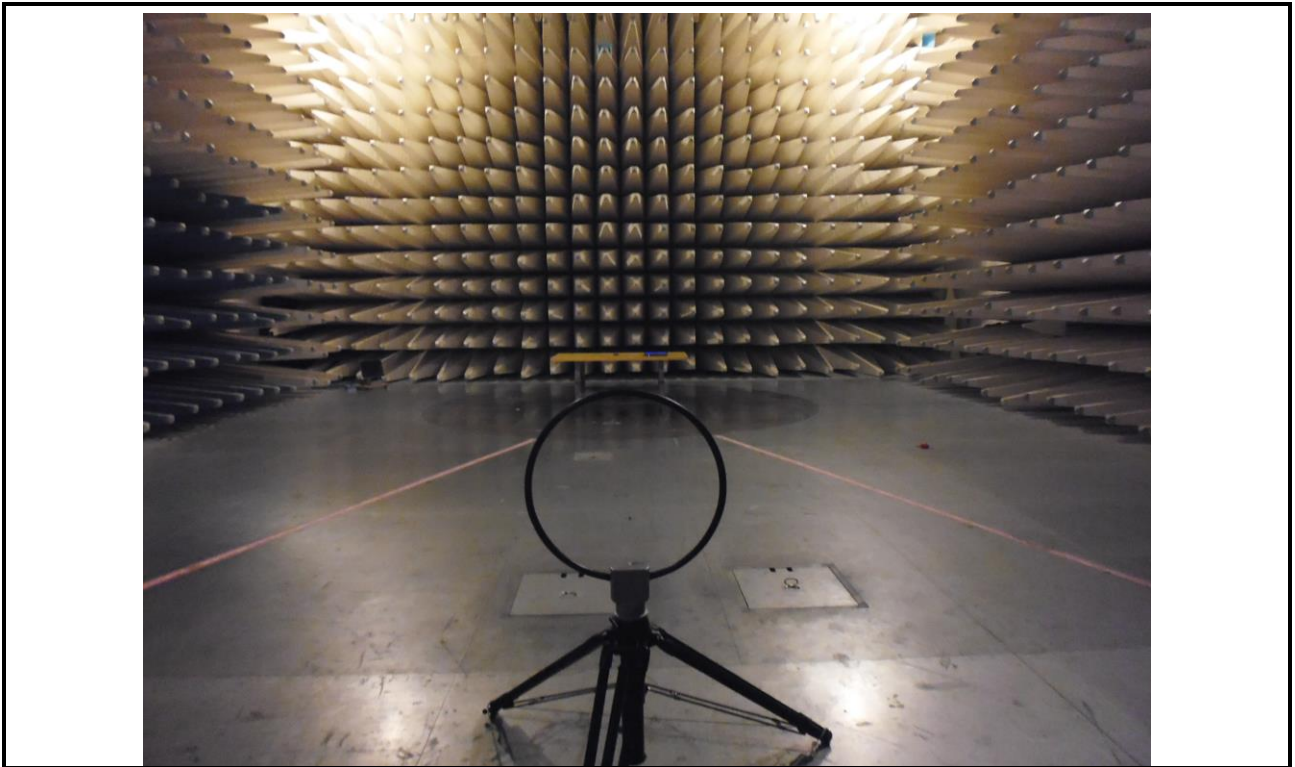
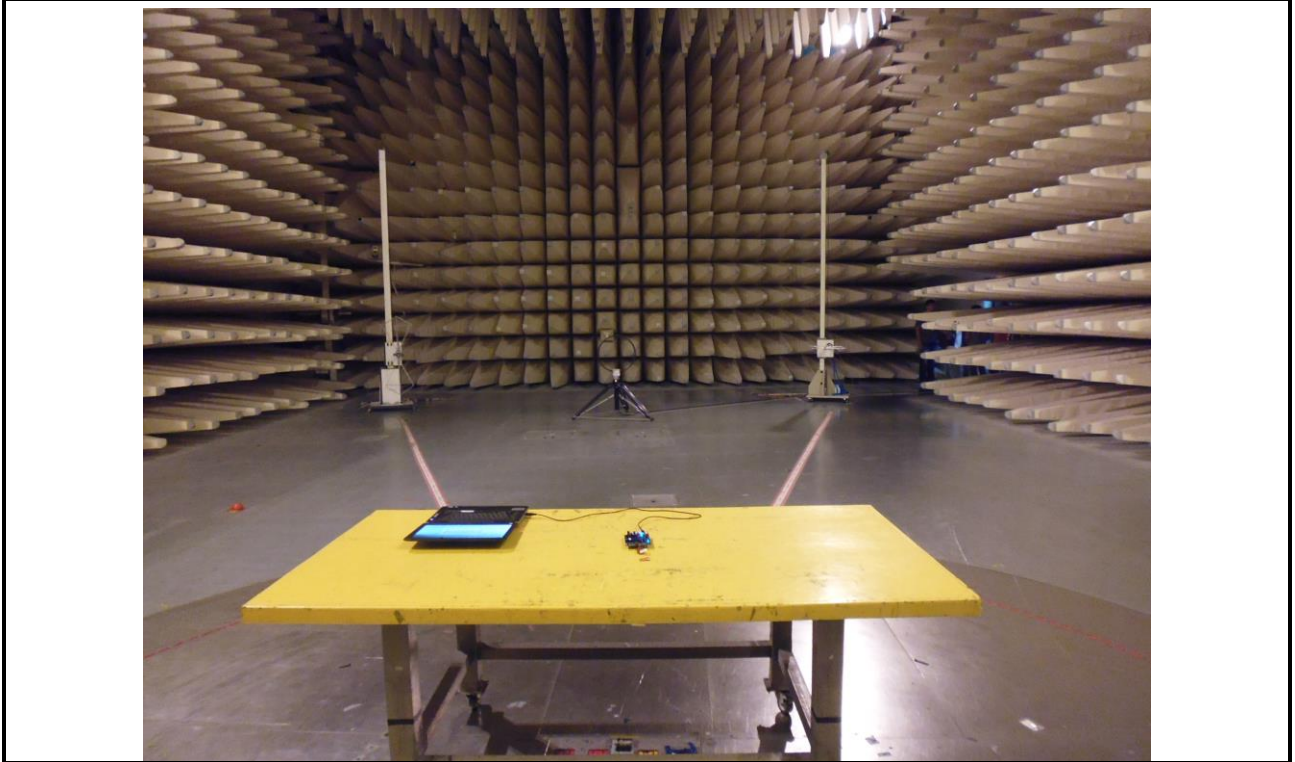
Note 2: Margin (dB) = Measured Value (dBm) – Limit (dBm).

4 Photographs of the Test Configuration

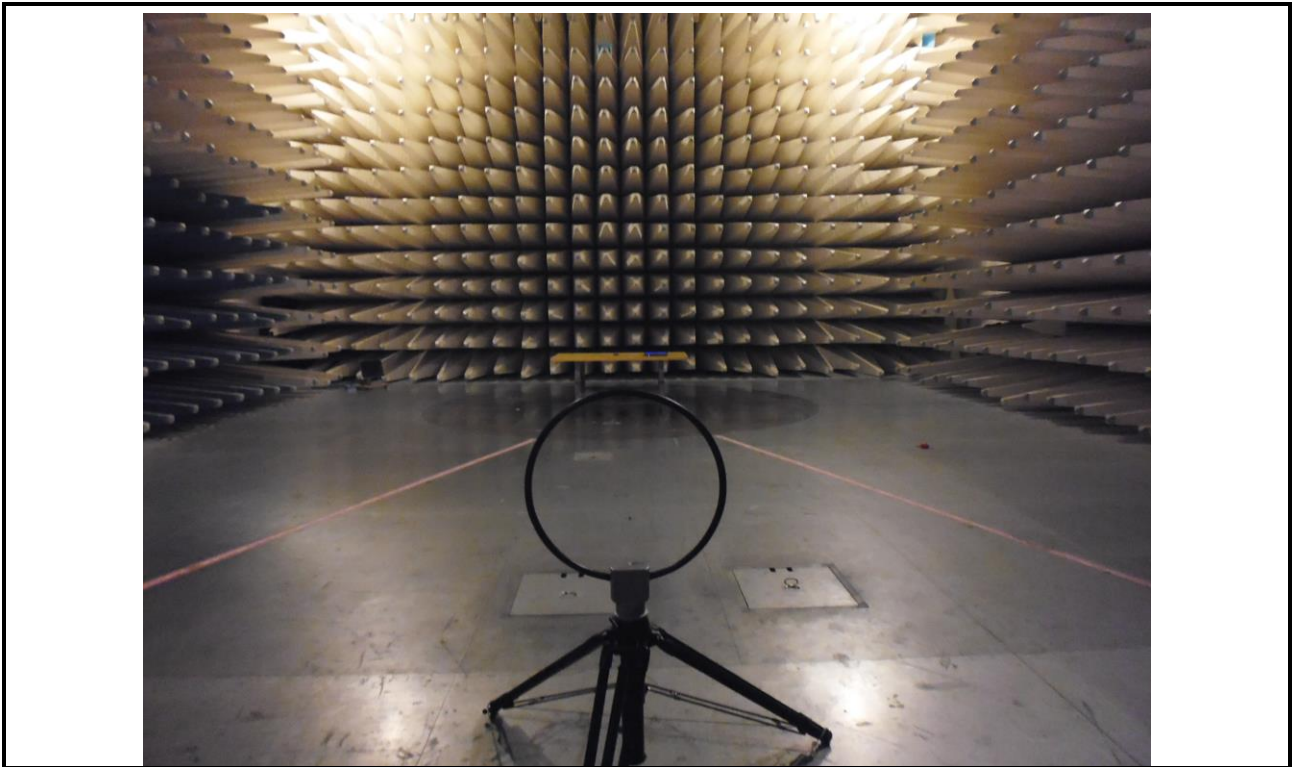
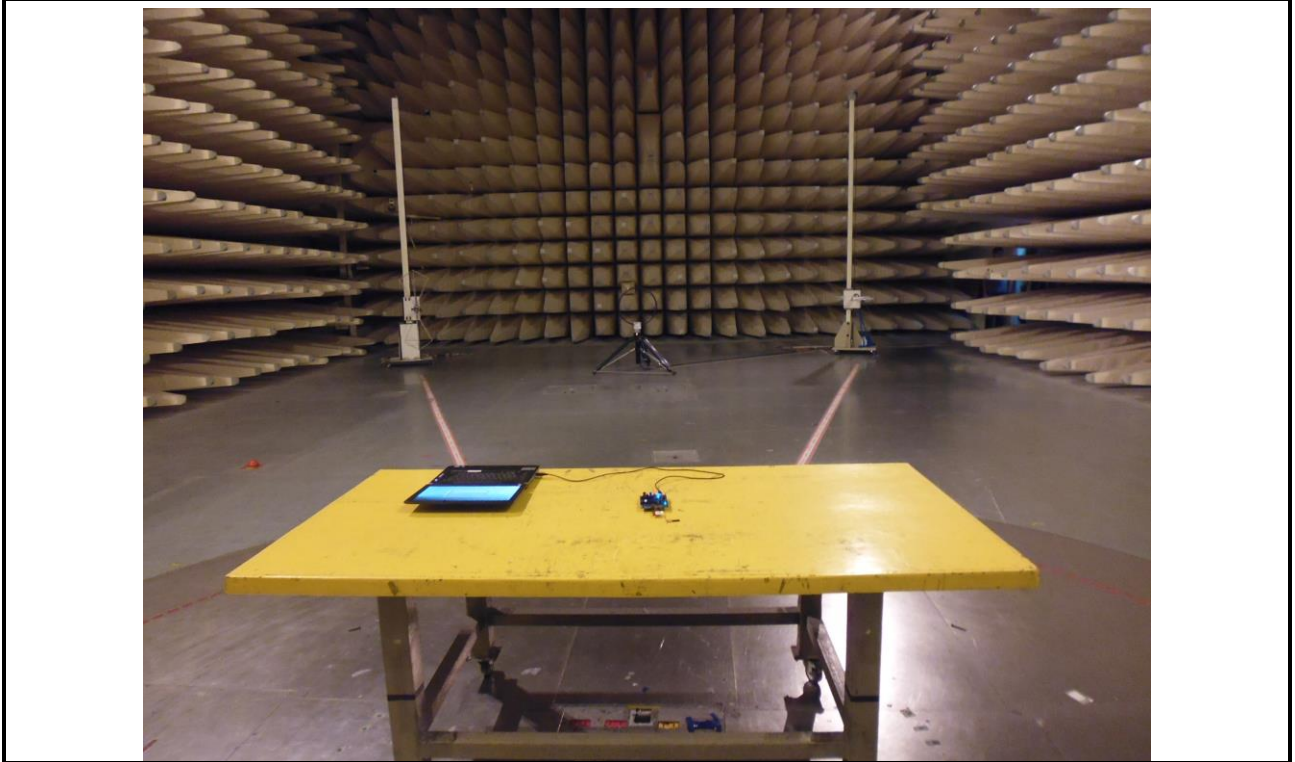
Below 30MHz (Configuration 1: model: BL652-SA)



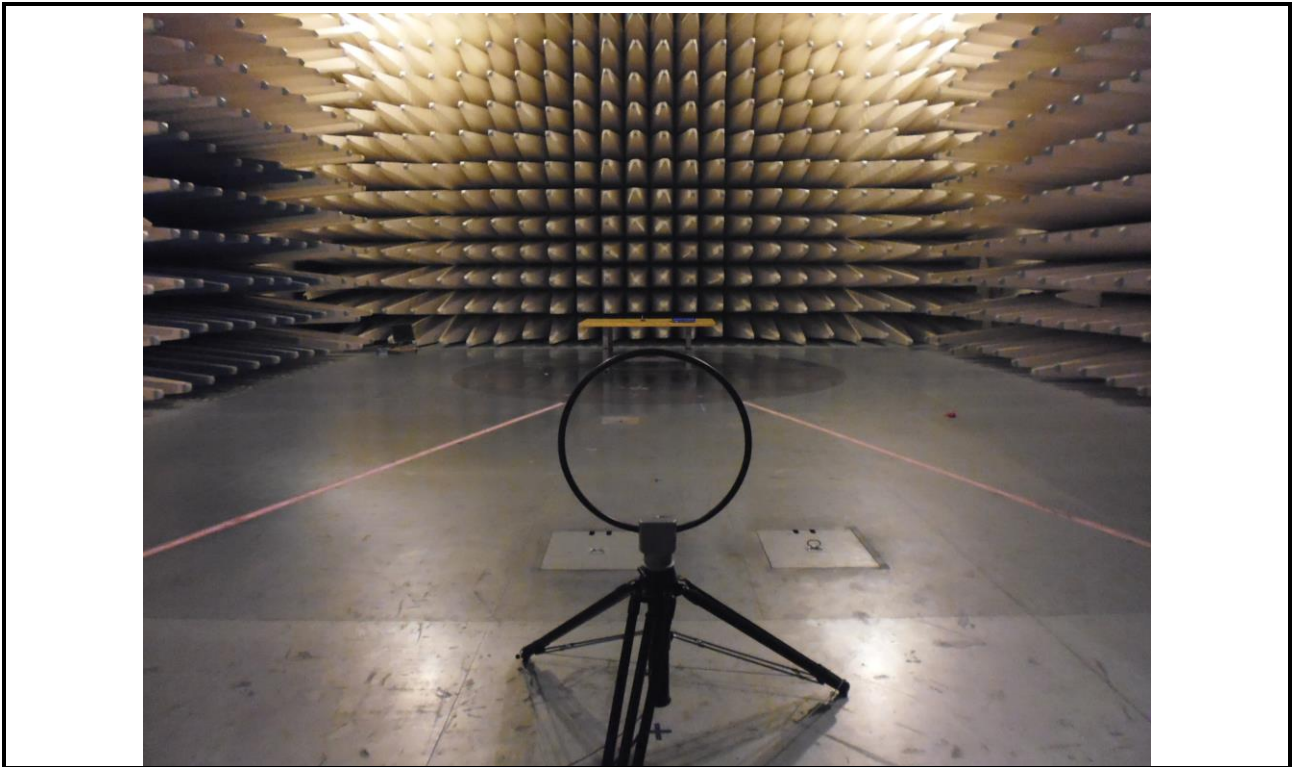
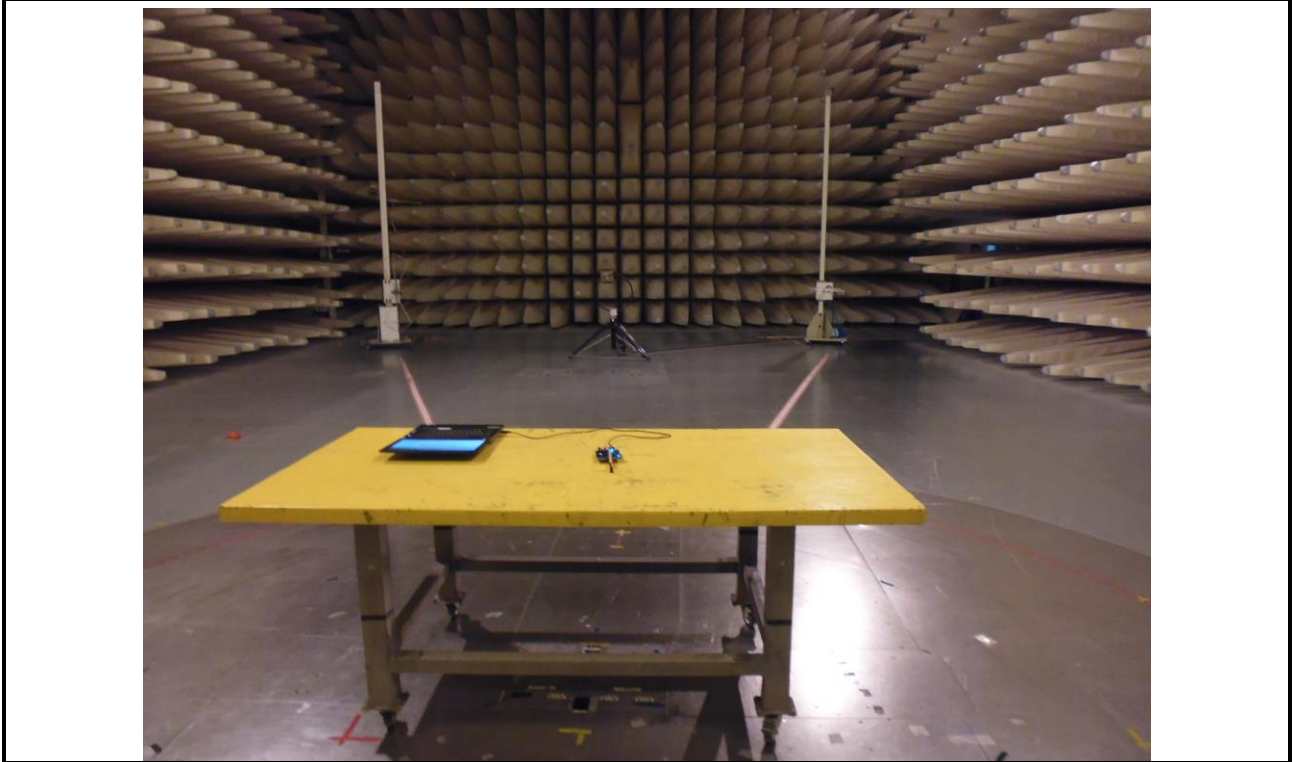
Below 30MHz (Configuration 2: model: BL652-SC (FlexPIFA 001-0022))



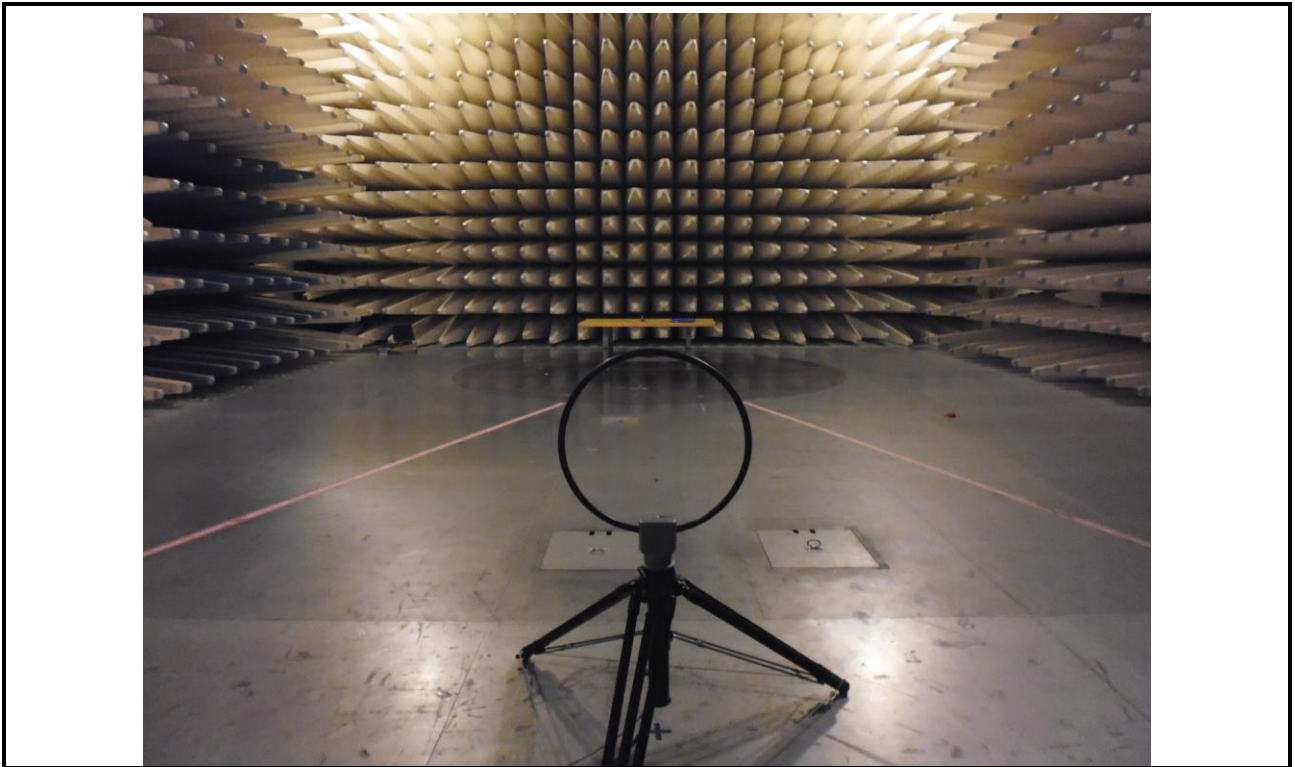
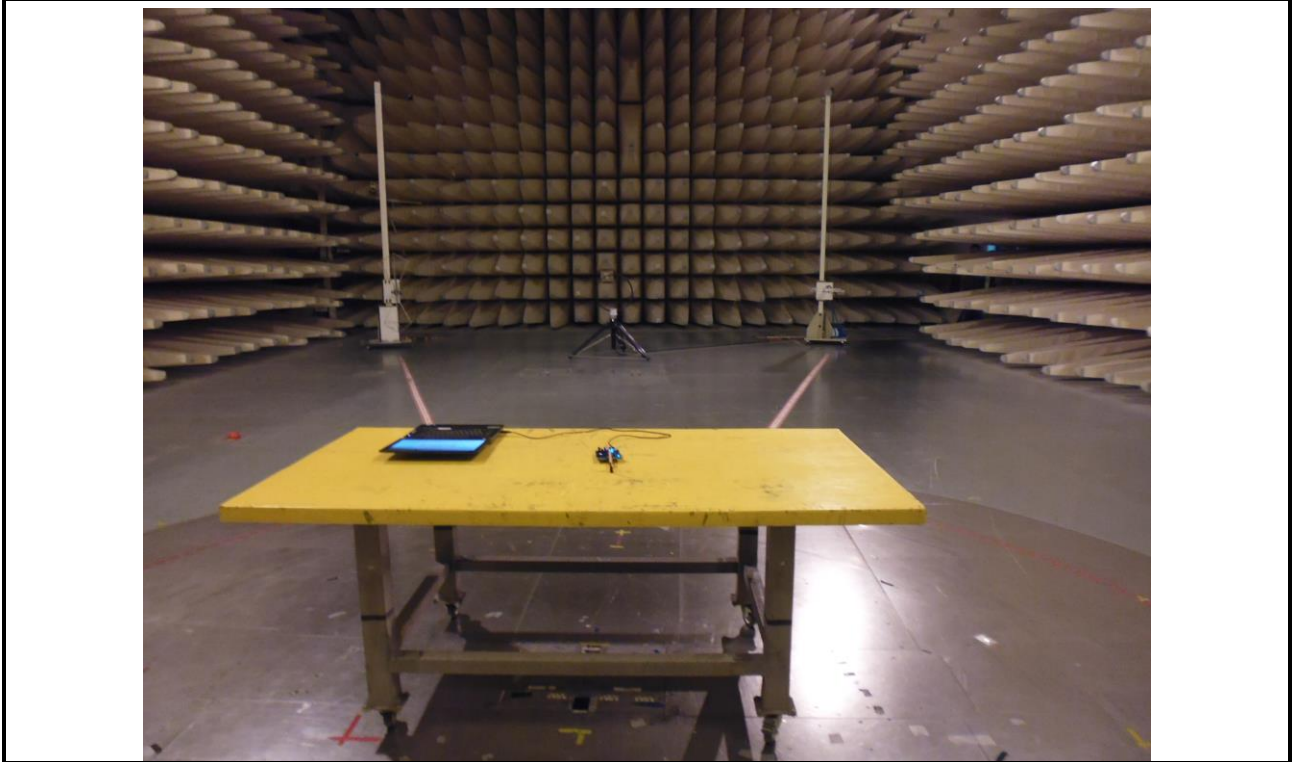
Below 30MHz (Configuration 3: model: BL652-SC (FlexNotch 001-0023))



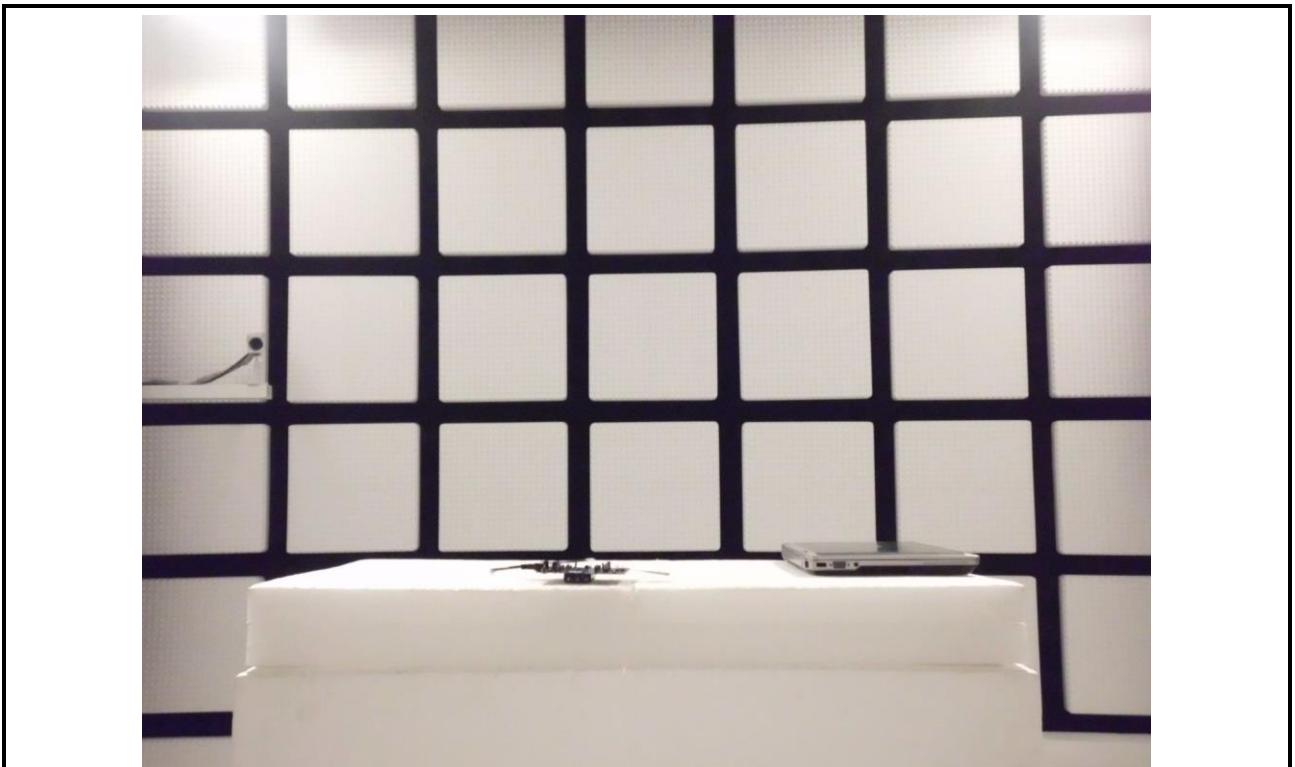
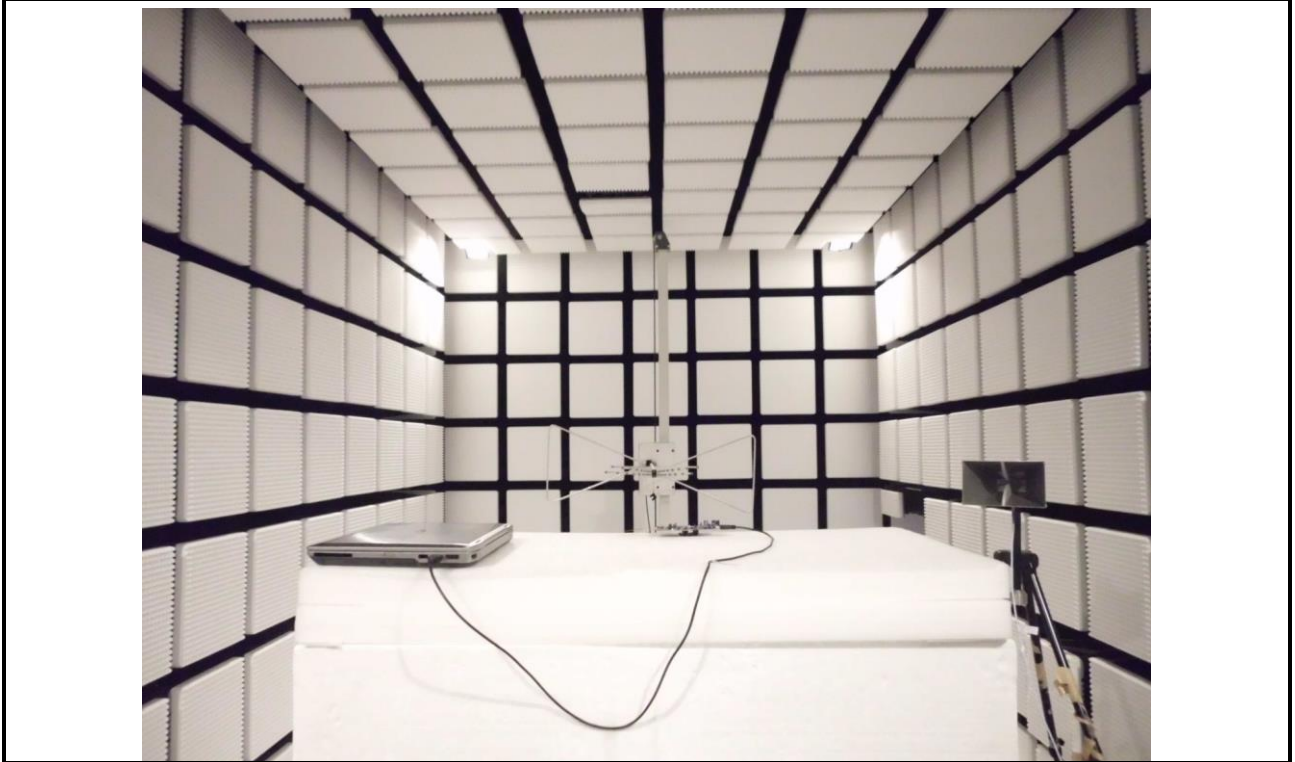
Below 30MHz (Configuration 4: model: BL652-SC (EDA-8709-2G4C1-B27))



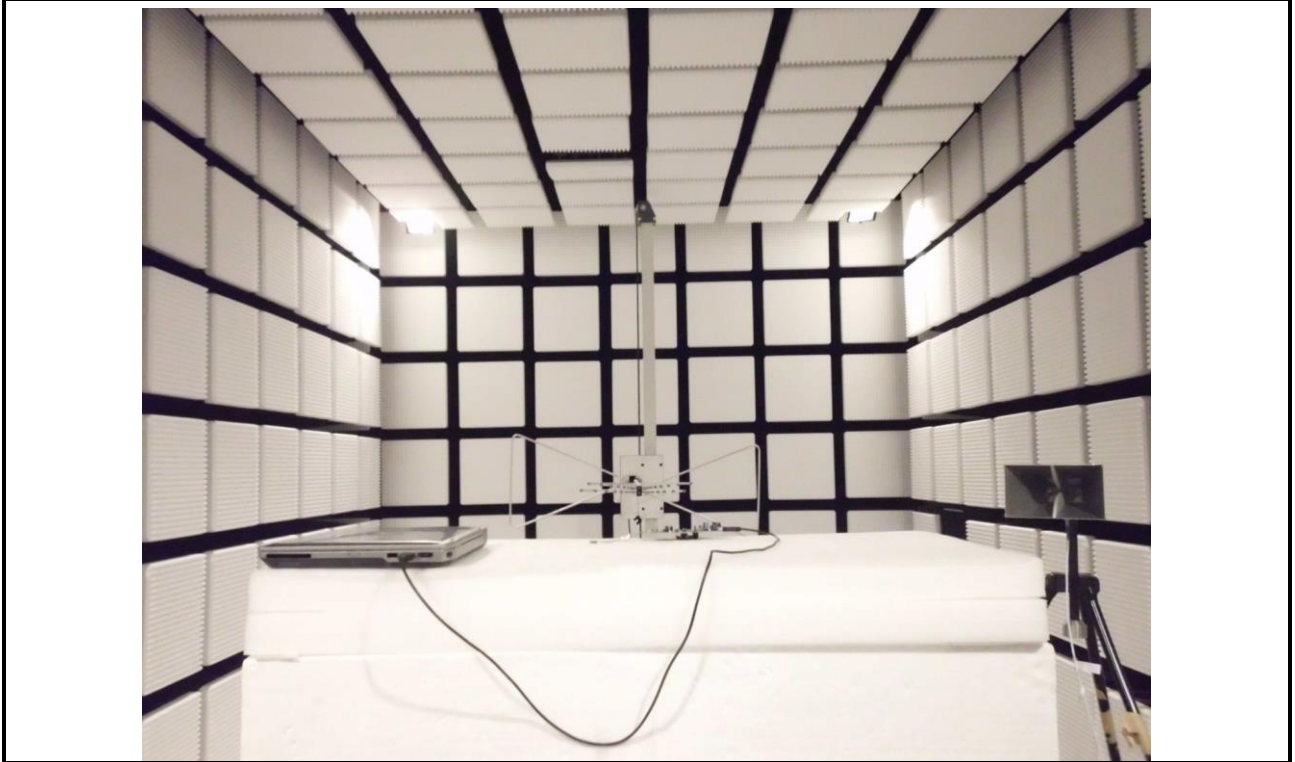
Below 30MHz (Configuration 5: model: BL652-SC (RFDPA870910EMAB302))



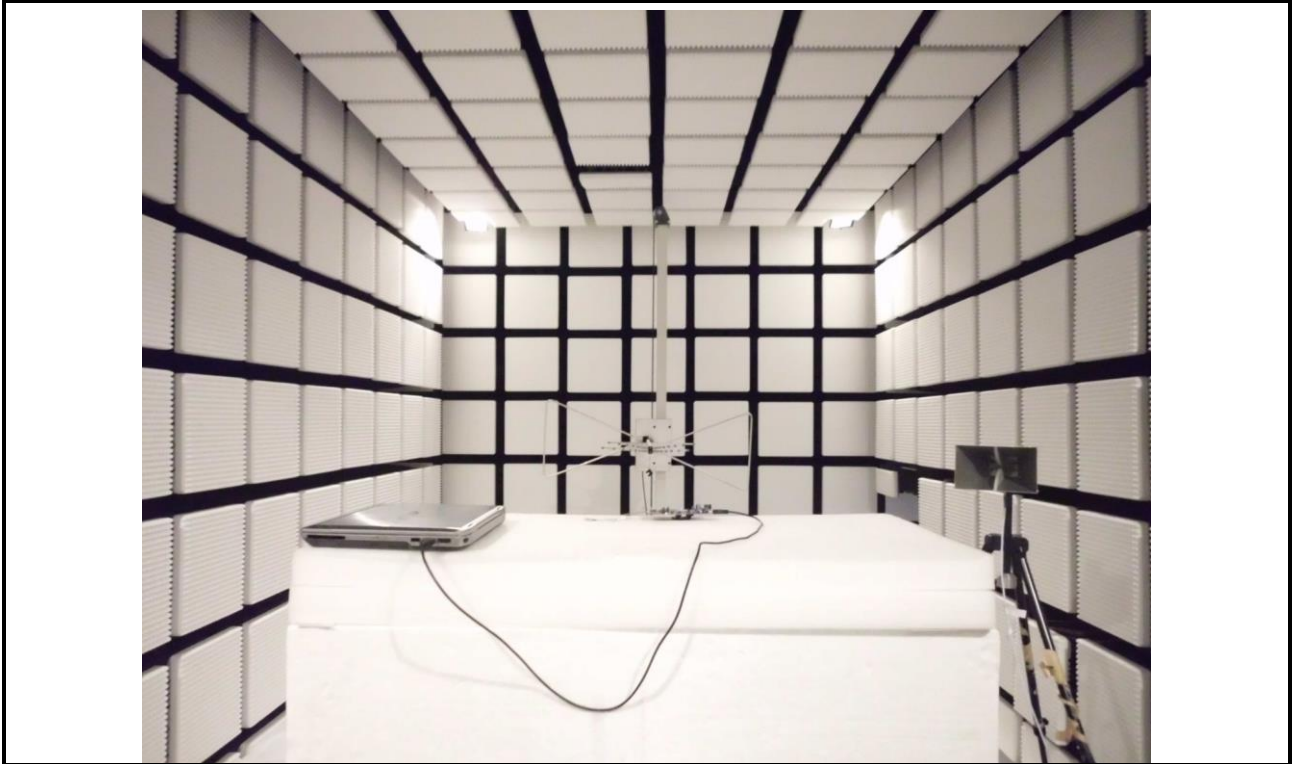
Above 30MHz (Configuration 1: model: BL652-SA)



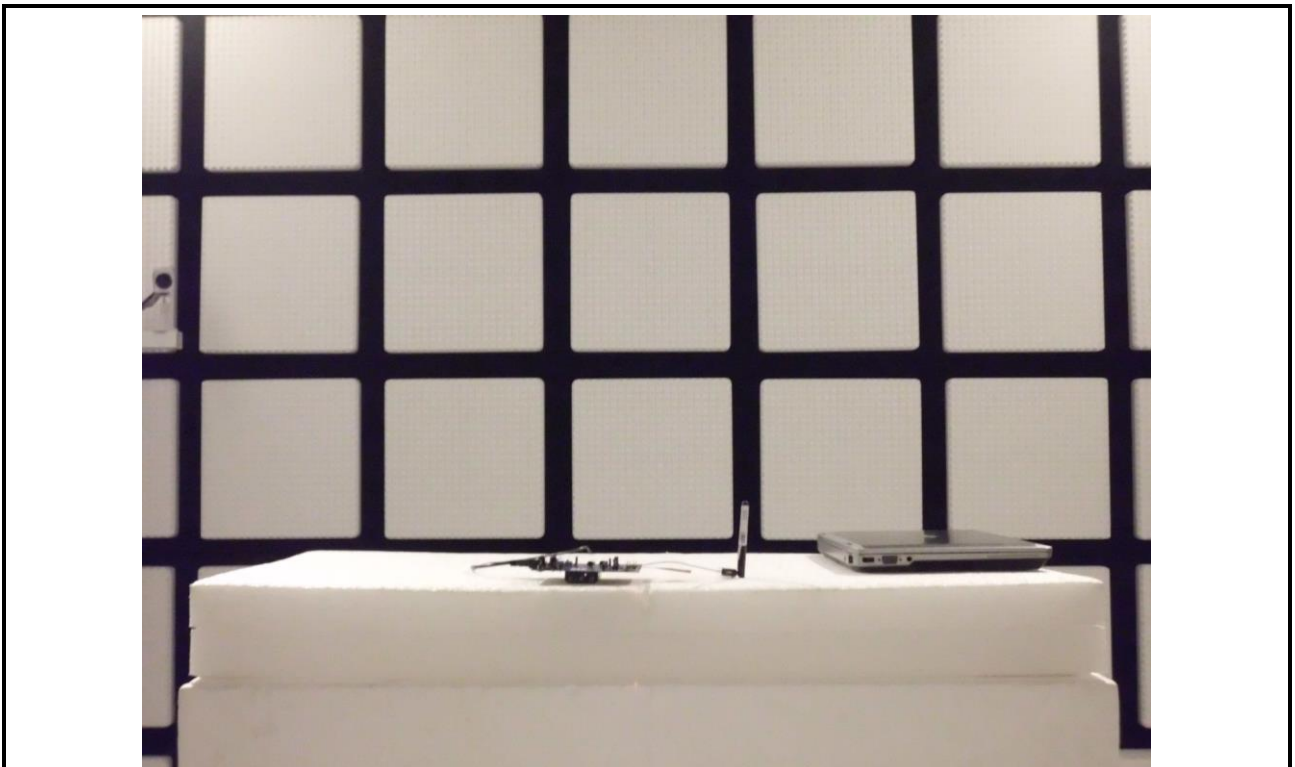
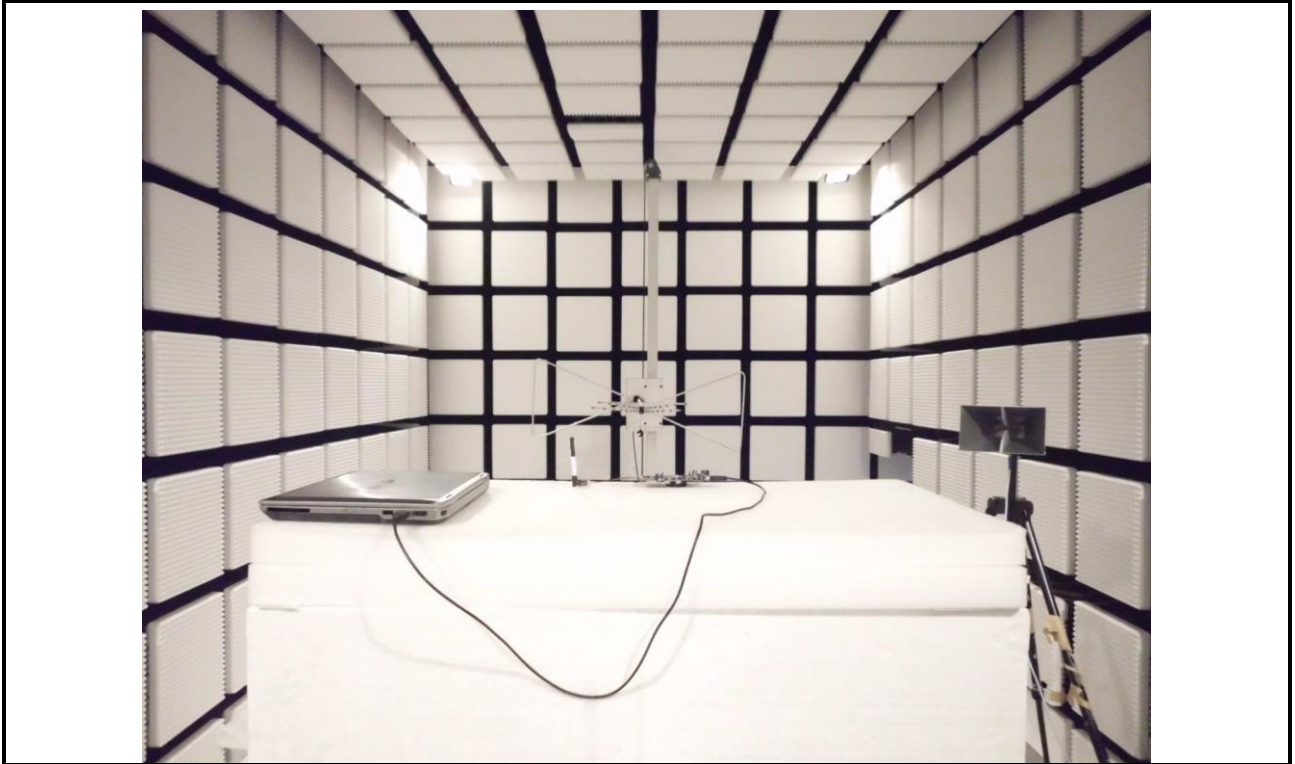
Above 30MHz (Configuration 2: model: BL652-SC (FlexPIFA 001-0022))



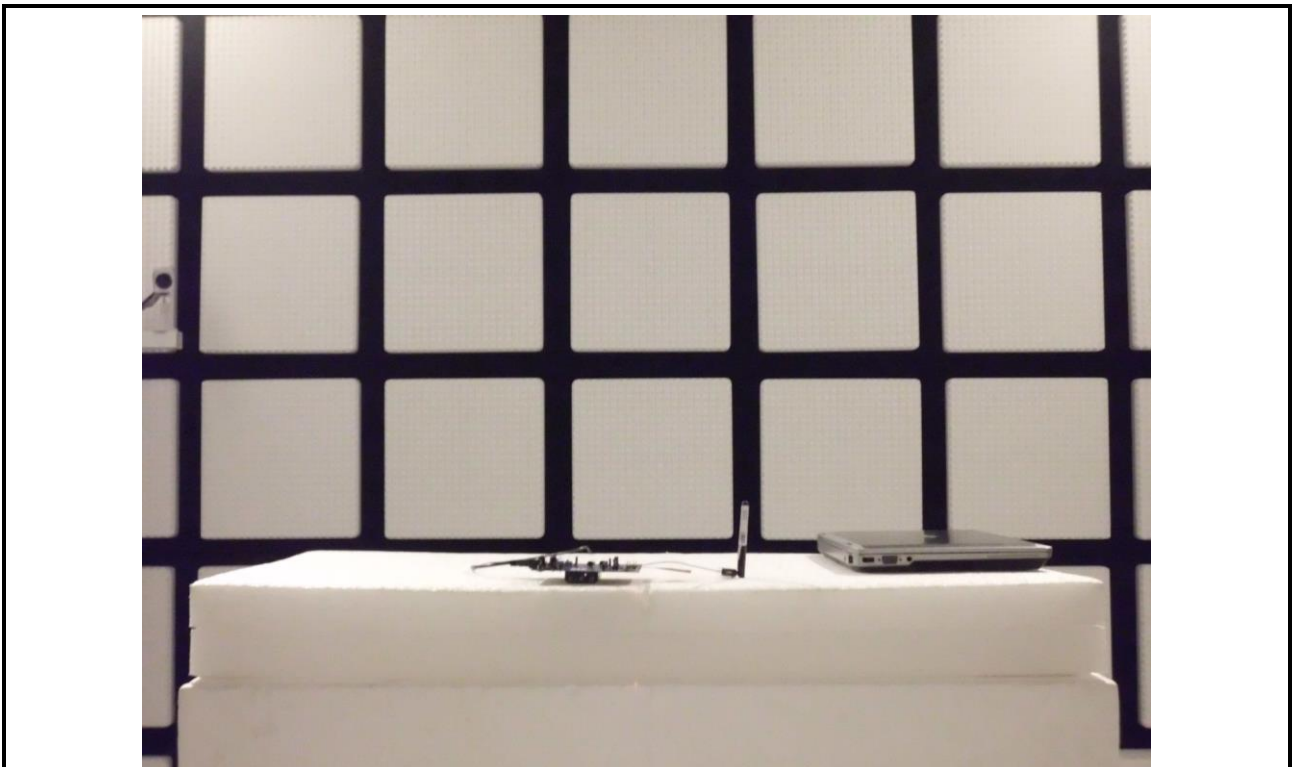
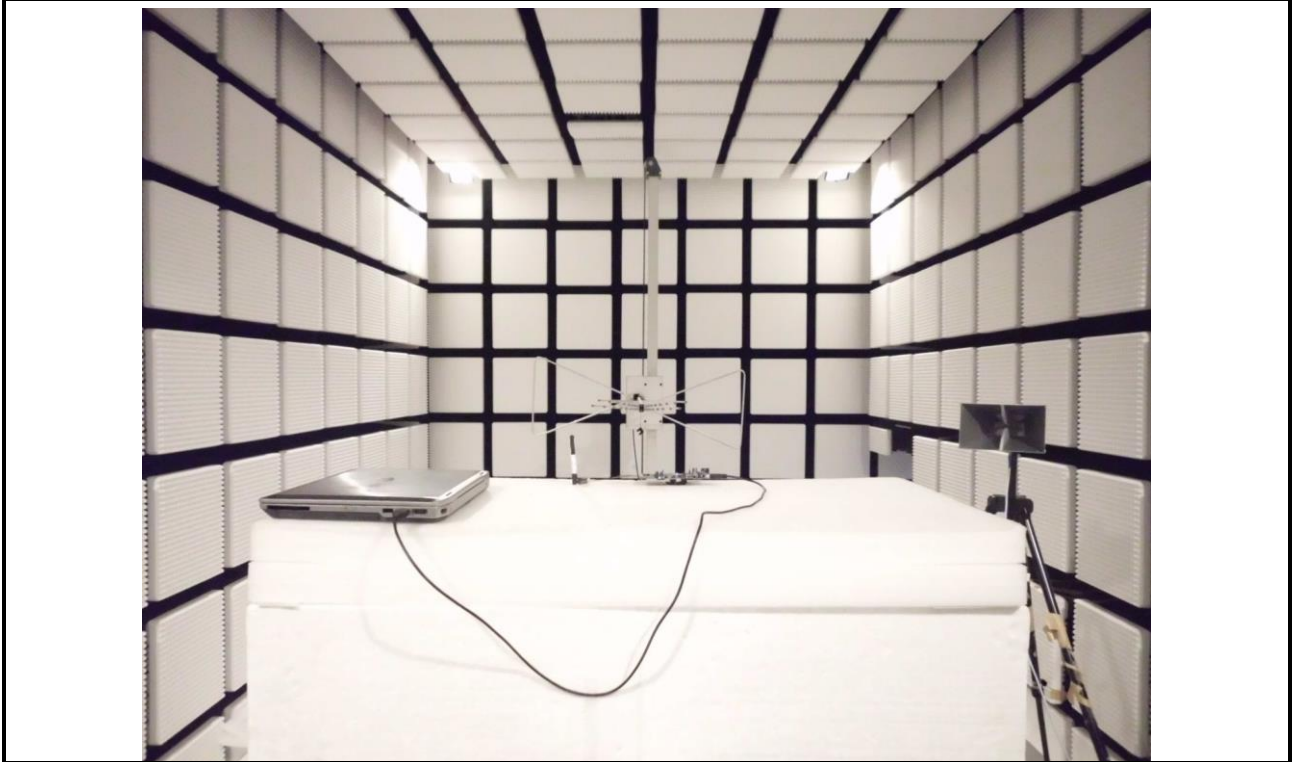
Above 30MHz (Configuration 3: model: BL652-SC (FlexNotch 001-0023))



Above 30MHz (Configuration 4: model: BL652-SC (EDA-8709-2G4C1-B27))



Above 30MHz (Configuration 5: model: BL652-SC (RFDPA870910EMAB302))



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

Tel: 886-2-2601-1640

No. 30-2, Ding Fwu Tsuen, Lin
Kou District, New Taipei City,
Taiwan, R.O.C.

Kwei Shan

Tel: 886-3-271-8666

No. 3-1, Lane 6, Wen San 3rd St.,
Kwei Shan District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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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