

# Report on the Radio Testing of:

## BATTERY POWERED LOCATION TRACKING TAG

Model(s): STG-866B

In accordance with  
47 CFR FCC Part 15C



PSB Singapore

Add value.  
Inspire trust.

Prepared for:  
Cadi Scientific Pte. Ltd.  
31 Ubi Road 1  
#09-01 Annex Building  
Singapore 408694

### COMMERCIAL-IN-CONFIDENCE

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Approved By	Foo Kai Maun	24 Mar 2023	
Prepared By	Quek Keng Huat	23 Mar 2023	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD PSB document control rules.

#### EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the mentioned standard(s).



LA-2007-0380-A LA-2007-0386-C  
LA-2007-0381-F LA-2010-0464-D  
LA-2007-0382-B LA-2018-0702-B  
LA-2007-0383-G LA-2018-0703-G  
LA-2007-0384-G LA-2020-0747-L  
LA-2007-0385-E

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

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## 1 Report Summary

### 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	24 Mar 2023



## 1.2 Introduction

Applicant	:	Cadi Scientific Pte. Ltd. 31 Ubi Road 1 #09-01 Annex Building Singapore 408694
Manufacturer	:	Same as applicant
Factory	:	Same as applicant
Model Number(s)	:	STG-866B
Serial Number(s)	:	00217EBD4A86 (TX@2402MHz) 00217EBD4A39 (TX@2426MHz) 00217EBD4F32 (TX@2480MHz)
Number of Samples Tested	:	1
Test Sample(s) Condition	:	Good
Quotation Reference	:	5781707
Test Specification/Issue/Date	:	FCC 47 CFR Part 15C
Test Sample(s) Received Date	:	08 Mar 2023
Start of Test	:	08 Mar 2023
Finish of Test	:	08 Mar 2023

### 1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with specifications as shown below.

Specification Clause	Test Description	Result	Comments/Base Standard
<b>47 CFR FCC Part 15</b>			
15.107(a), 15.207	Conducted Emissions	Not Applicable *See Note 4	ANSI C63.4: 2014 ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2018
15.109(a), 15.205, 15.209	Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement)	Pass	ANSI C63.4: 2014 ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(a)(2)	Spectrum Bandwidth (6dB Bandwidth Measurement)	Not Tested *See Note 7	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(b)(3)	Maximum Peak Power	Not Tested *See Note 7	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(d)	RF Conducted Spurious Emissions (Non-Restricted Bands)	Not Tested *See Note 7	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(d)	RF Conducted Spurious Emissions (Restricted Bands)	Not Tested *See Note 7	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(d)	Band Edge Compliance (Conducted)	Not Tested *See Note 7	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(d)	Band Edge Compliance (Radiated)	Pass	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.247(e)	Peak Power Spectral Density	Not Tested *See Note 7	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
15.35(c)	Duty Cycle Factor Computation	Not Applicable *See Note 5	ANSI C63.10: 2013 KDB 558074 D01 DTS Measurement Guidance V05R02: 2019
2.1091	Maximum Permissible Exposure	Pass	447498 D04 Interim General RF Exposure Guidance v01: 2019

## Notes

1. All the measurements in section 15.247 were done based on conducted measurements except Band Edge Compliance (Radiated) test.
2. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.
3. The maximum measured RF power of the Equipment Under Test is 3.5dBm.
4. The Equipment Under Test (EUT) is a battery-operated device and contains no provision for public utility connections.
5. The EUT was operated in continuous transmission, ie 100% duty cycle.
6. The EUT was tested using fully charged batteries with DC voltage of 3.6V.
7. The Bluetooth Module, BlueMod+S50 from Telit Wireless Solutions GmbH has been certified to 47 CFR Part 15 and granted FCC ID: RFR-S50. Cadi Scientific Pte. Ltd. declares that no modifications were made in integrating this module to the Equipment Under Test (EUT). Please refer to Cadi Scientific Pte. Ltd. for more details.



## 1.4 Product Information

### 1.4.1 Technical Description

Description	:	The Equipment Under Test(s) (EUT(s)) is a <b>BATTERY POWERED LOCATION TRACKING TAG.</b>
Microprocessor	:	Microchip PIC18LF46K22
Operating Frequency	:	2402MHz – 2480MHz
Clock / Oscillator Frequency	:	16MHz
Modulation	:	Gaussian Frequency Shift Modulation (GFSK)
Antenna Gain	:	Internal integrated ceramic antenna, +3dBi
Port / Connectors	:	Nil
Rated Power	:	3.6V – 2.2Ah lithium battery
Accessories	:	Nil

#### 1.4.2 Test Configuration and Modes of Operation

Mode(s)	Description								
Maximum RF power transmission	The EUT was exercised in the mode, transmitting at lower, middle and upper channels as shown below one at a time with all supported modulation schemes were evaluated. For Band Edge Compliance, only lower and upper channels were evaluated.								
	<table><tr><th><u>Transmit Channel</u></th><th><u>Frequency (GHz)</u></th></tr><tr><td>Channel 37 (Lowest Channel)</td><td>2.402</td></tr><tr><td>Channel 38 (Middle Channel)</td><td>2.426</td></tr><tr><td>Channel 39 (Highest Channel)</td><td>2.480</td></tr></table>	<u>Transmit Channel</u>	<u>Frequency (GHz)</u>	Channel 37 (Lowest Channel)	2.402	Channel 38 (Middle Channel)	2.426	Channel 39 (Highest Channel)	2.480
	<u>Transmit Channel</u>	<u>Frequency (GHz)</u>							
	Channel 37 (Lowest Channel)	2.402							
	Channel 38 (Middle Channel)	2.426							
Channel 39 (Highest Channel)	2.480								





## 1.5 Deviations from the Standard

Nil.

## 1.6 EUT Modification Record

No modifications were made.

## 1.7 Test Location(s)

TÜV SÜD PSB Pte Ltd  
Electrical & Electronics Centre (EEC), Product Services,  
15 International Business Park  
TÜV SÜD @ IBP  
Singapore 609937

## 1.8 Test Facilities Registrations

Requirements	Registration Numbers
FCC	994109 (Test Firm Registration Number) SG0002 (Designation Number)
ISED	SGAP01 (CAB Identifier) 2932N-1 (10m Semi-Anechoic Chamber)
VCCI	R-13324 (10m ANC), G-10203 (10mANC) R-20151 (3m RF Chamber - Lab 7), G-20149 (3m RF Chamber - Lab 7) C-14933 (C.E @ CEIBP) T-12403 (Telecom Ports @ CEIBP)
BSMI	SL2-IS-E-6001R [CNS-13803 (ISM Equipment)] SL2-IN-E-6001R [CNS-13438 (IT Equipment)] SL2-R1/R2-E-6001R [CNS-13439 (Broadcast Receivers)] SL2-A1-E-6001R [CNS-13783-1 (Household Appliances)] SL2-L1-E-6001R [CNS-14115 (Lighting Equipment)]
SABS	SABS/A-LAB/0030/2018
ASCA	TL-86

## 1.9 Supporting Equipment

The EUT was tested as a stand-alone unit without any supporting equipment.



## 2 Test Details

### 2.1 Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement)

#### 2.1.1 Test Limits

Frequency Range (MHz)	Quasi-Peak Limit Values (dBμV/m)
0.009 - 0.490 *	20 log [2400 / F (kHz)] @ 300m
0.490 - 1.705	20 log [24000 / F (kHz)] @ 30m
1.705 - 30.0	30.0 @ 30m
30 – 88	40.0 @ 3m
88 – 216	43.5 @ 3m
216 – 960	46.0 @ 3m
Above 960 *	54.0 @ 3m

\* For frequency bands 9kHz – 90kHz, 110kHz – 490kHz and above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.

#### Restricted Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	Above 38.6
13.36 - 13.41			

## 2.1.2 Test Setup

- 2.1.2.1 The EUT and supporting equipment were set up in accordance with the requirements of the standard as shown in the setup photos.
- 2.1.2.2 The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
- 2.1.2.3 The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

## 2.1.3 Test Method

- 2.1.3.1 The EUT was switched on and allowed to warm up to its normal operating condition.
- 2.1.3.2 A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
- 2.1.3.3 The test was carried out at the selected frequency points obtained from the pre-scan. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission
- 2.1.3.4 A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point in range of 9kHz – 90kHz, 110kHz – 490kHz and above 1GHz, both Peak and Average measurements were carried out.
- 2.1.3.5 The measurements were repeated for the next frequency point, until all selected frequency points were measured.
- 2.1.3.6 The frequency range covered was from the lowest radio frequency signal generated from the EUT, without going below 9kHz to 10<sup>th</sup> harmonics of the EUT fundamental frequency, using the loop antenna for frequency below 30MHz, Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

### Sample Calculation Example

At 300 MHz

Q-P limit = 46.0 dB $\mu$ V/m

Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dB $\mu$ V/m

(Calibrated level including antenna factors & cable losses)

Therefore, Q-P margin = 46.0 - 40.0 = 6.0

i.e. 6.0 dB below Q-P limit

## 2.2.5 Test Results

Test Input Power	3.6Vdc internal battery	Temperature	23°C
Test Distance	10m (<30MHz) 3m (≥30MHz – 25GHz)	Relative Humidity	55%
Mode	Continuous Transmit	Atmospheric Pressure	1019mbar
		Tested By	Chang Wai Kit Dylan Lin
		Test Date	08 Mar 2023

Spurious Emissions ranging from 9kHz – 30MHz (for 9kHz – 90kHz, 110kHz – 490kHz) \*See Note 4 & 5

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
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Spurious Emissions ranging from 9kHz – 30MHz \*See Note 4 & 5

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Limit (dBμV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel
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Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Limit (dBμV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel (Worst)
30.8630	21.2	40.0	18.8	127	248	H	Low
63.4960	10.8	40.0	29.2	400	224	H	Low
314.4310	11.5	46.0	34.5	400	127	V	Low
392.4470	13.3	46.0	32.7	391	353	H	Low
604.8500	17.8	46.0	28.2	400	113	V	Low
618.0950	17.8	46.0	28.2	262	106	V	Low

#### Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
3.2121	31.3	74.0	42.7	20.4	54.0	33.6	299	300	V	Lo
4.5641	36.7	74.0	37.3	25.6	54.0	28.4	101	290	V	Lo
5.5436	40.9	74.0	33.1	29.7	54.0	24.3	200	318	V	Lo
12.8440	49.3	74.0	24.7	37.6	54.0	16.4	300	325	H	Lo
17.9430	55.5	74.0	18.5	41.2	54.0	12.8	101	284	V	Lo
17.9556	55.6	74.0	18.4	42.8	54.0	11.2	101	306	V	Lo

#### Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
1.2293	24.7	74.0	49.3	14.9	54.0	39.1	299	41	V	Mid
2.8864	29.8	74.0	44.2	18.7	54.0	35.3	101	348	H	Mid
5.4463	40.5	74.0	33.5	29.5	54.0	24.5	200	92	H	Mid
5.7854	40.3	74.0	33.7	30.4	54.0	23.6	299	179	H	Mid
13.9593	50.4	74.0	23.6	39.7	54.0	14.3	101	226	H	Mid
14.6485	48.8	74.0	25.2	39.4	54.0	14.6	300	228	H	Mid

#### Spurious Emissions above 1GHz – 25GHz

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
1.2608	23.9	74.0	50.1	15.0	54.0	39.0	101	122	V	Hi
2.2030	28.3	74.0	45.7	17.8	54.0	36.2	299	277	H	Hi
5.8165	41.3	74.0	32.7	30.6	54.0	23.4	101	292	H	Hi
7.4395	40.9	74.0	33.1	32.4	54.0	21.6	101	247	H	Hi
8.8606	43.3	74.0	30.7	33.6	54.0	20.4	101	136	V	Hi
12.8103	47.7	74.0	26.3	36.9	54.0	17.1	101	115	V	Hi

## Notes

1.	All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2.	A "positive margin" indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative margin" indicates a FAIL.
3.	EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings: <u>9kHz – 150kHz</u> RBW: 200Hz                      VBW: 1kHz <u>150kHz – 30MHz</u> RBW: 9kHz                      VBW: 30kHz <u>30MHz - 1GHz</u> RBW: 120kHz                      VBW: 1MHz <u>&gt;1GHz</u> RBW: 1MHz                      VBW: 3MHz
4.	"--" indicates no emissions were found and shows compliance to the limits
5.	The measurement was done at 10m. The measured results were extrapolated to the specified test limits as specified in § 15.209 (a) based on 40dB/decade.
6.	Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
7.	The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33 (a) for intentional radiators & Section 15.33 (b) for unintentional radiators.
8.	The channel in the table refers to the transmit channel of the EUT.

## **2.2 Band Edge Compliance (Radiated)**

### **2.2.1 Test Limits**

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands shall comply to the radiated emission limits specified in 15.209.

### **2.2.2 Test Setup**

2.2.2.1 The EUT and supporting equipment were set up as shown in the setup photo.

2.2.2.2 The power supply for the EUT was connected to a filtered mains.

2.2.2.3 The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz to show compliance of spurious at band edges are at least 20dB below the carriers. For restricted band spurious at band edges, peak and average measurement plots were taken using the following setting:

- a. Peak Plot:  
RBW = 1MHz, VBW = 3RBW
- b. Average Plot  
RBW = 1MHz, VBW = 10Hz

2.2.2.4 All other supporting equipment were powered separately from another filtered mains.

### **2.2.3 Test Method**

2.2.3.1 The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode.

2.2.3.2 The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.

2.2.3.3 The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.

2.2.3.4 The measurements were repeated if the EUT supports more than one modulation and data rate.

2.2.3.5 The measurements were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.



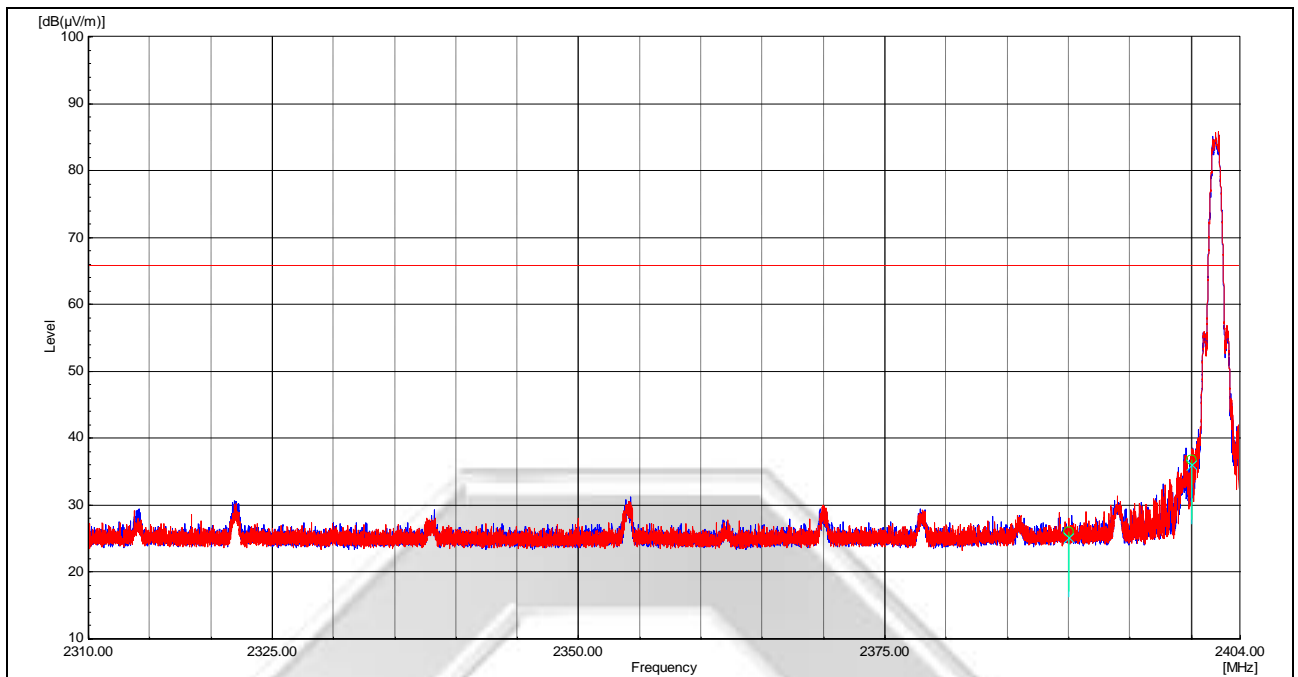
#### 2.2.4 Test Results

Test Input Power	3.6Vdc internal battery	Temperature	23°C
Attached Plots	1 – 6	Relative Humidity	55%
		Atmospheric Pressure	1019mbar
		Tested By	Hussen Muqri Dylan Lin
		Test Date	08 Mar 2023

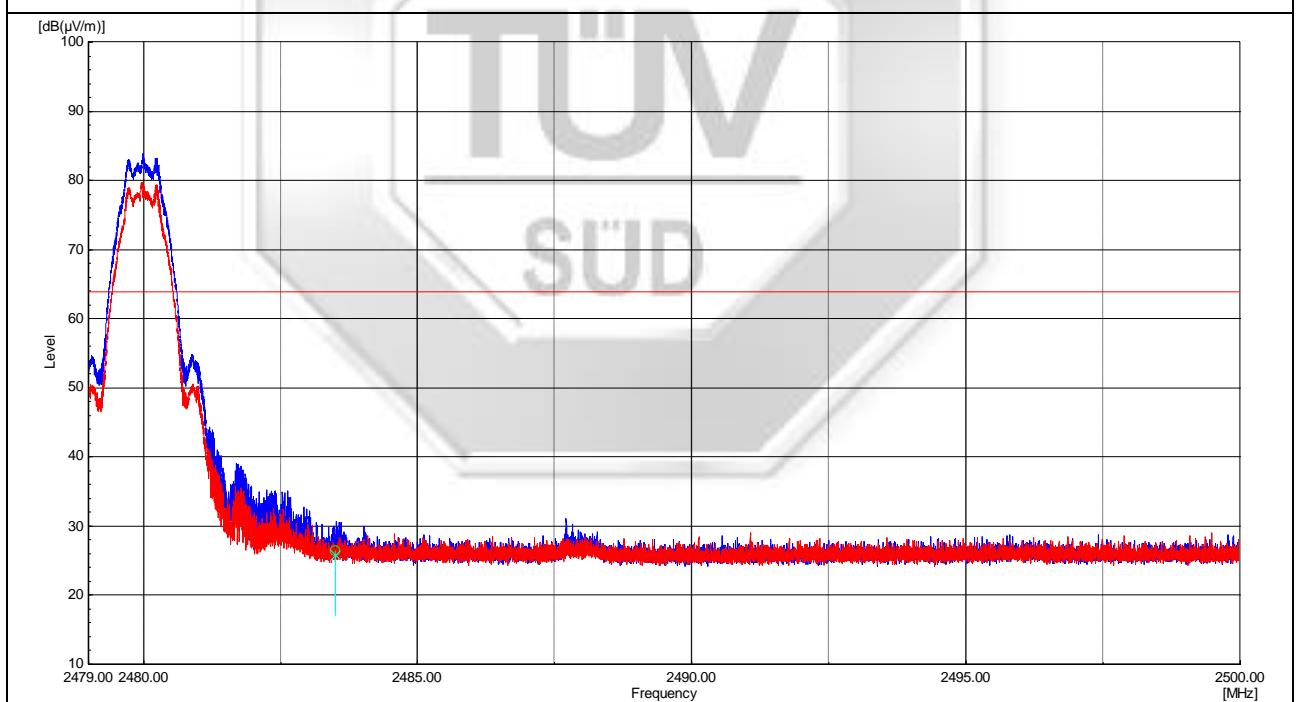
No significant signal was found and they were below the specified limit.



### Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge)

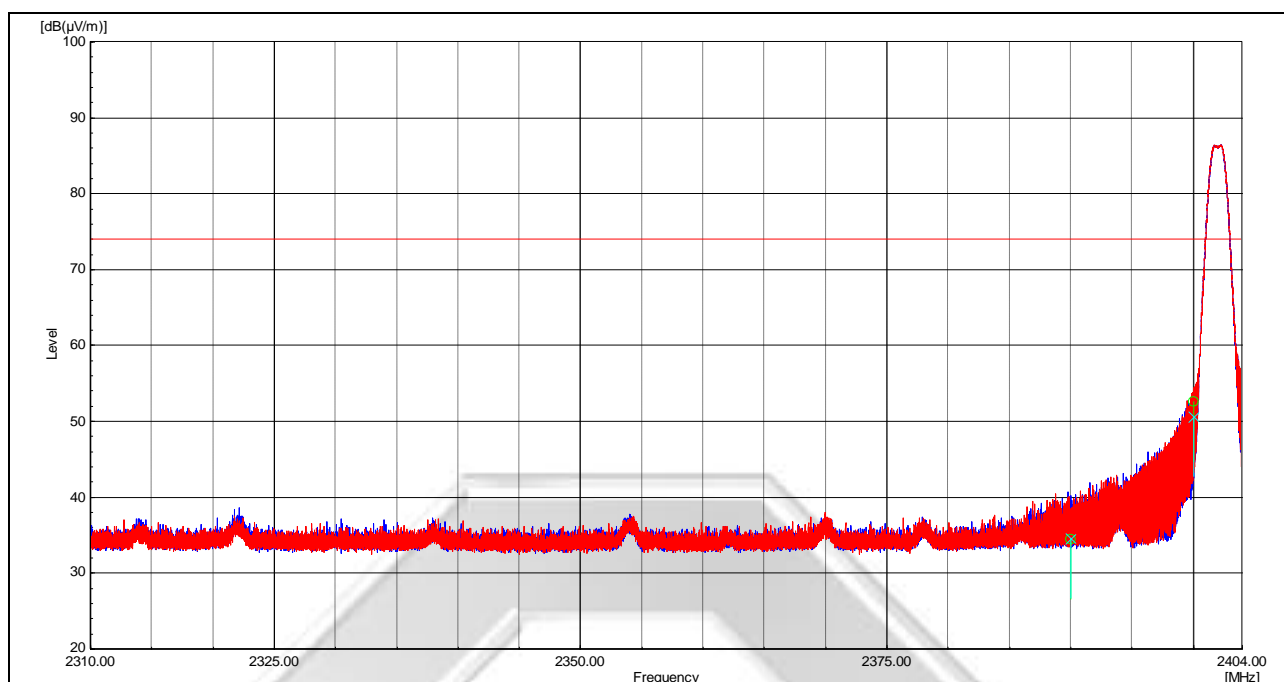


Plot 1 – Lower Band Edge at 2.4000GHz

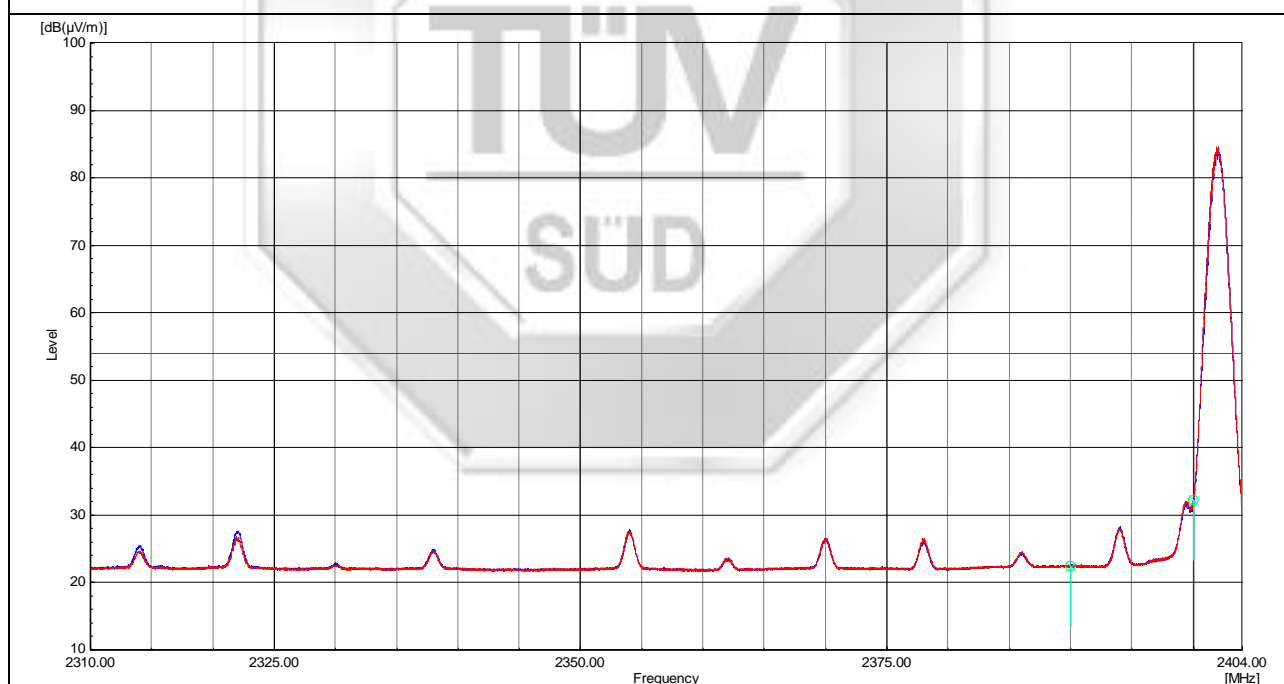


Plot 2 – Upper Band Edge at 2.4835GHz

### Band Edge Compliance (Radiated) Plots (Restricted Band)

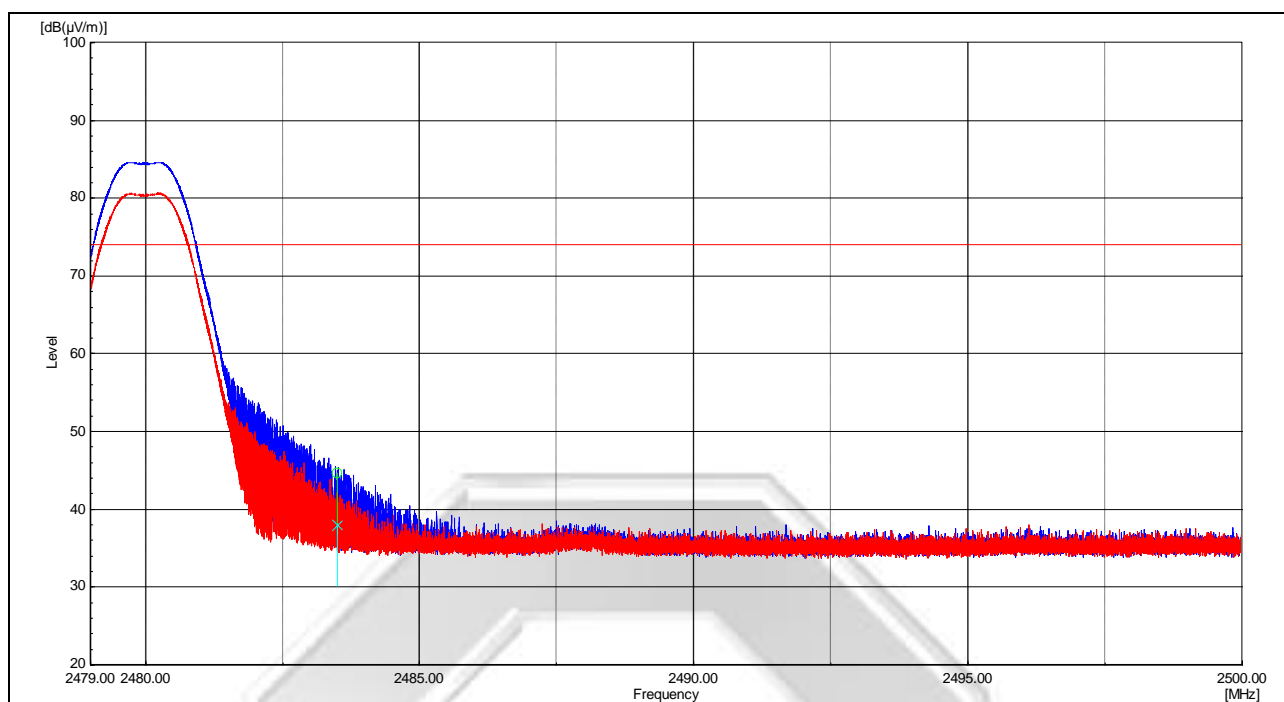


**Plot 3 – Peak Plot at Lower Band Edge at 2.4000GHz**

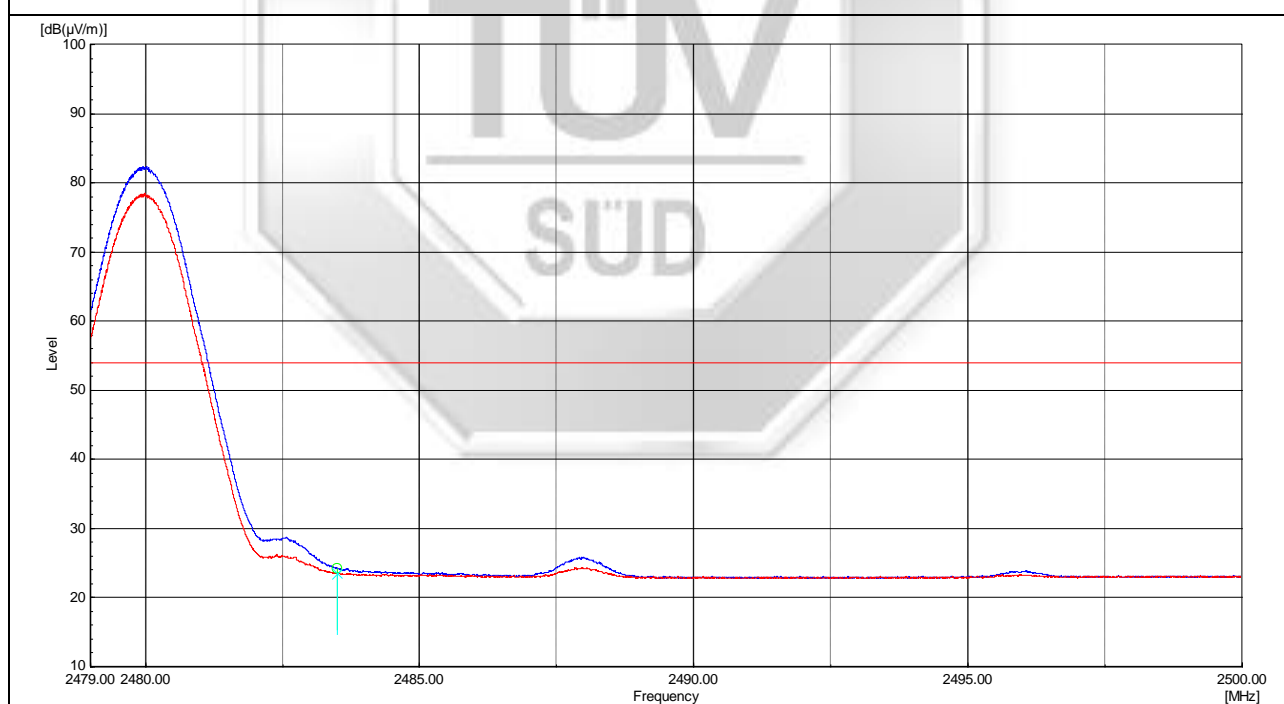


**Plot 4 – Average Plot at Lower Band Edge at 2.4000GHz**

### Band Edge Compliance (Radiated) Plots (Restricted Band)



**Plot 5 – Peak Plot at Upper Band Edge at 2.4835GHz**



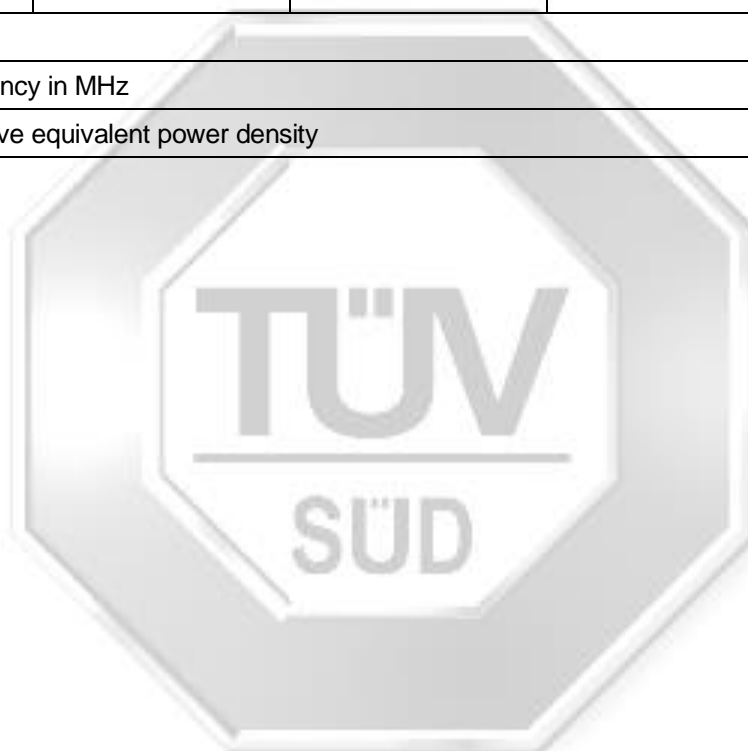
**Plot 6 – Average Plot at Upper Band Edge at 2.4835GHz**

## 2.3 Maximum Permissible Exposure (MPE)

### 2.3.1 Test Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (min)
0.3 - 1.34	614	1.63	100 <sup>Note 2</sup>	30
1.34 - 30	824 / f	2.19 / f	180 / f <sup>2</sup> <sup>Note 2</sup>	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	f / 1500	30
1500 - 100000	-	-	1.0	30
Notes				
1. f = frequency in MHz				
2. Plane wave equivalent power density				



### 2.3.2 Maximum Permissible Exposure Exemptions

#### Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied.

3 options are available to compute the SAR Test Exclusion Threshold condition(s).

**(A)** The available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

**(B)** Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

(C) Or using Table 1 below and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of  $\lambda/4$  or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

Table 1 to § 1.1307(b)(3)(i)(C)—Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3–1.34	$1,920 R^2$ .
1.34–30	$3,450 R^2/f^2$ .
30–300	$3.83 R^2$ .
300–1,500	$0.0128 R^2 f$ .
1,500–100,000	$19.2 R^2$ .

### SAR Test Exclusion Threshold Computation

Applying Option (B), the threshold power,  $P^{th}$  at 20cm distance was computed from the following formula:

$$\begin{aligned}
 P^{th} &= ERP_{20}(d/20)^x \text{ for } d \leq 20\text{cm} \\
 \text{where } P^{th} &= \text{Threshold Power, mW} \\
 ERP_{20} &= 3060 \text{ for } 1.5\text{GHz} \leq f \leq 6\text{GHz} \\
 f &= \text{Centre Frequency of EUT, 2.45GHz} \\
 x &= -\log_{10} [60 / (ERP_{20} \times \sqrt{f})] \\
 d &= \text{Test distance at 20cm} \\
 P &= 2.3\text{mW} \\
 G &= \text{Numerical isotropic gain, 2.00 (3.0dBi)}
 \end{aligned}$$

Substituting the relevant parameters into the formula:

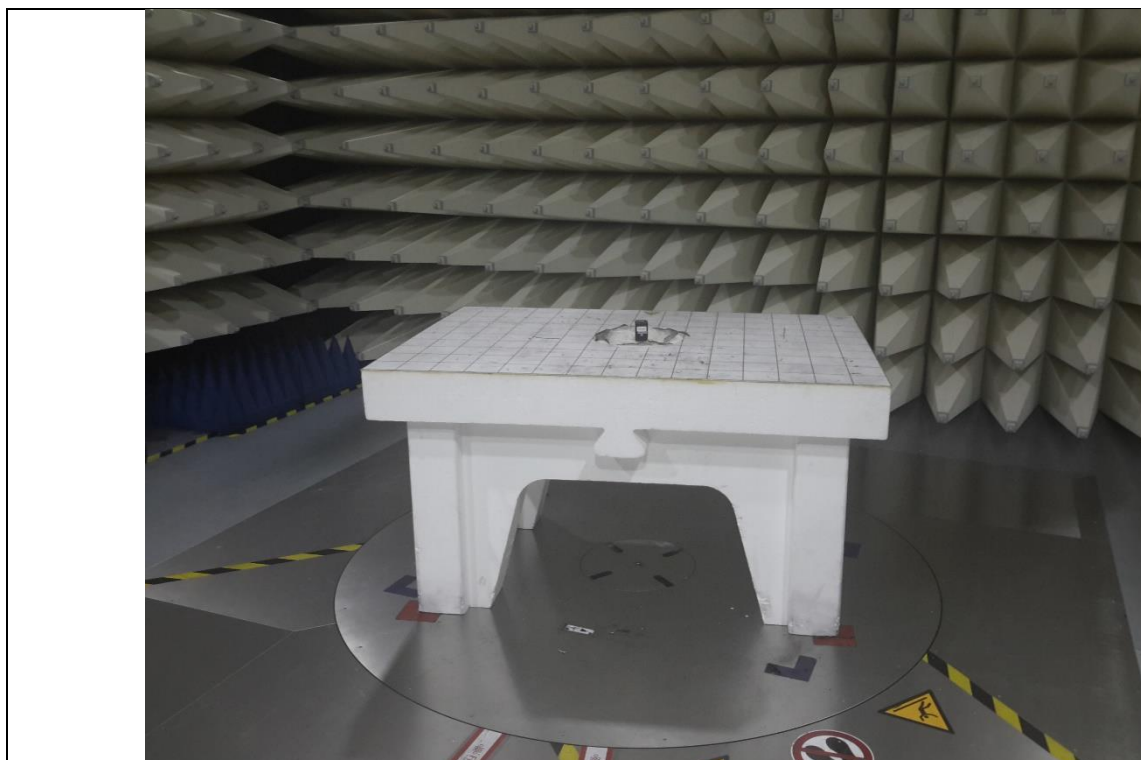
$$\begin{aligned}
 P^{th} &= ERP_{20}(d/20)^x \\
 &= 3060\text{mW} \\
 \text{Effective Radiated Power (EIRP)} &= P \times G \\
 &= 4.6\text{mW} \\
 \text{Effective Radiated Power (ERP)} &= 2.8\text{mW}
 \end{aligned}$$

The threshold power,  $P^{th}$  of the EUT at 20cm distance is 3060mW based on the above computation and the Effective Radiated Power (ERP) of the EUT is 2.8mW which is lower than the threshold power  $P^{th}$ .

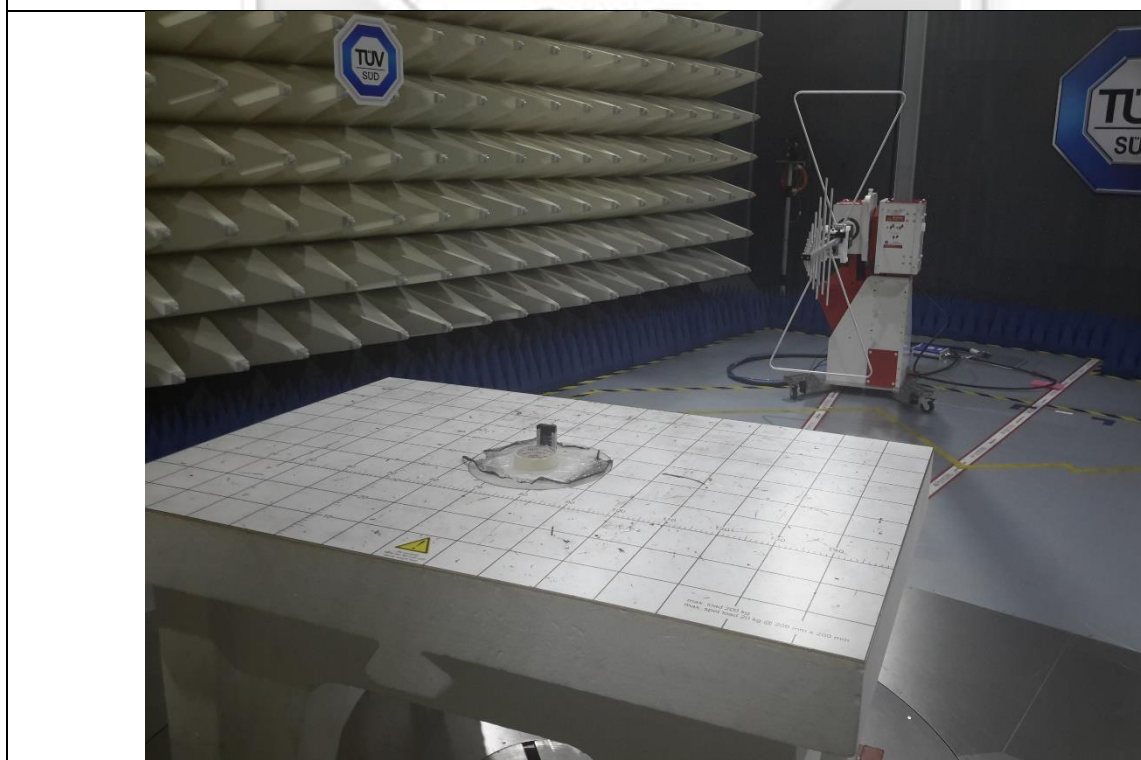
∴ SAR evaluation is not required since the Effective Radiated Power is below the threshold limit.

### 3 Photographs

#### TEST SETUP (30MHz to 1GHz)



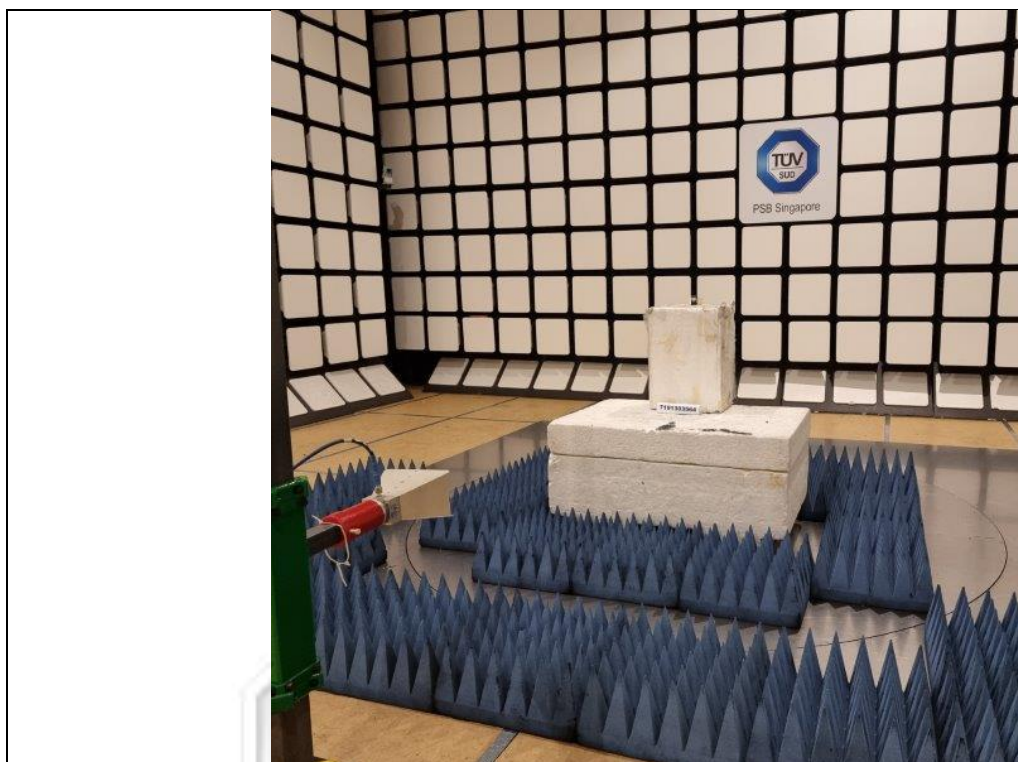
**Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement) Test Setup  
(Front View)**



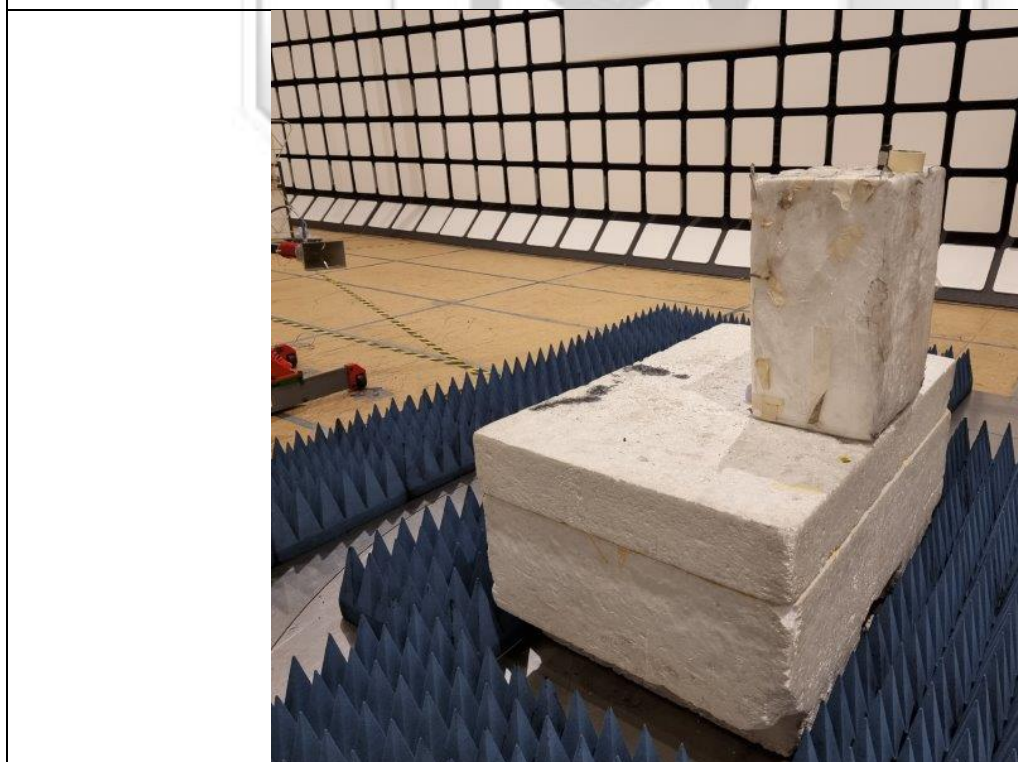
**Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement) Test Setup  
(Rear View)**



## TEST SETUP (Above 1GHz)

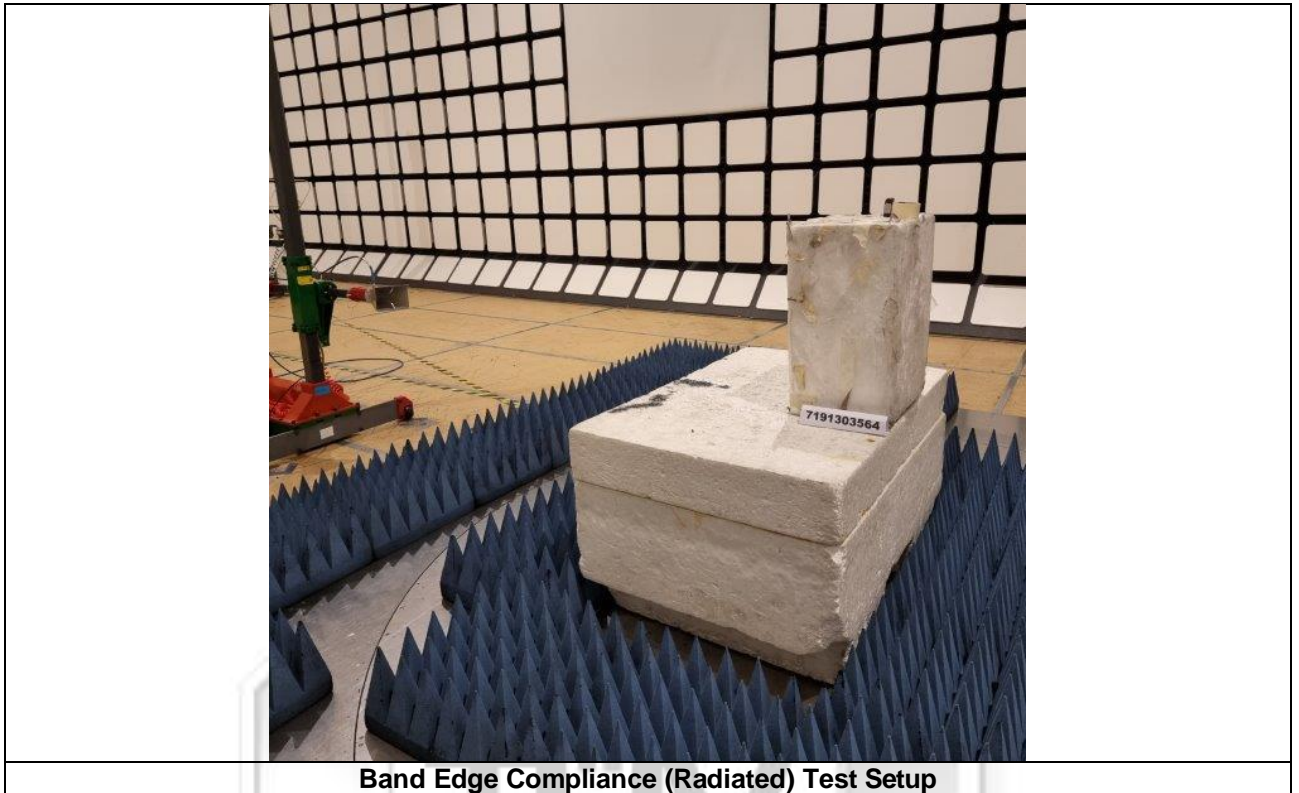


**Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement) Test Setup  
(Front View)**



**Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement) Test Setup  
(Rear View)**

## TEST SETUP



## EUT PHOTOGRAPHS



View 1



View 2

## EUT PHOTOGRAPHS



View 3



View 4



## EUT PHOTOGRAPHS



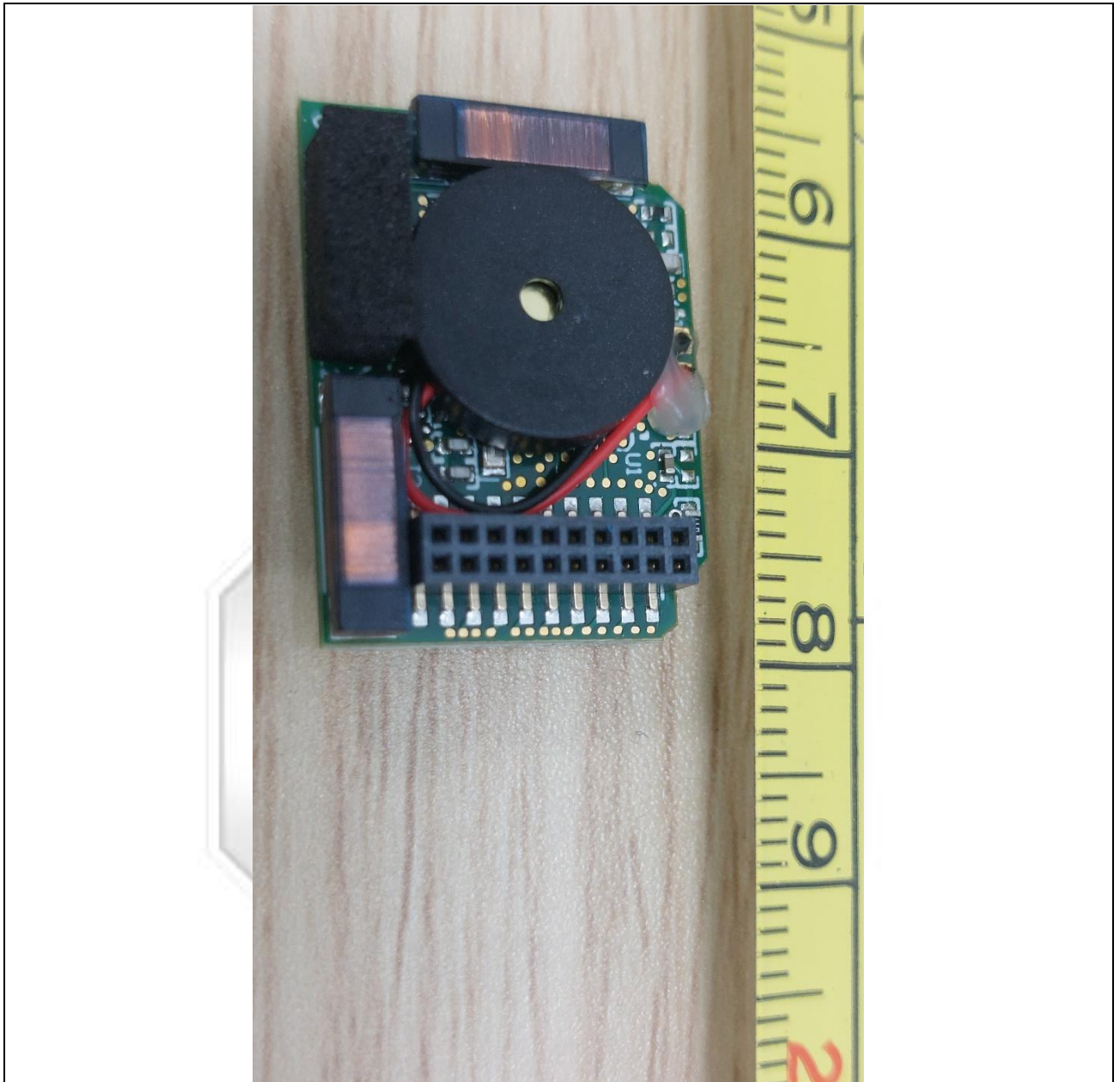
Internal View 1

## EUT PHOTOGRAPHS



Internal View 2

## EUT PHOTOGRAPHS



Internal View 3



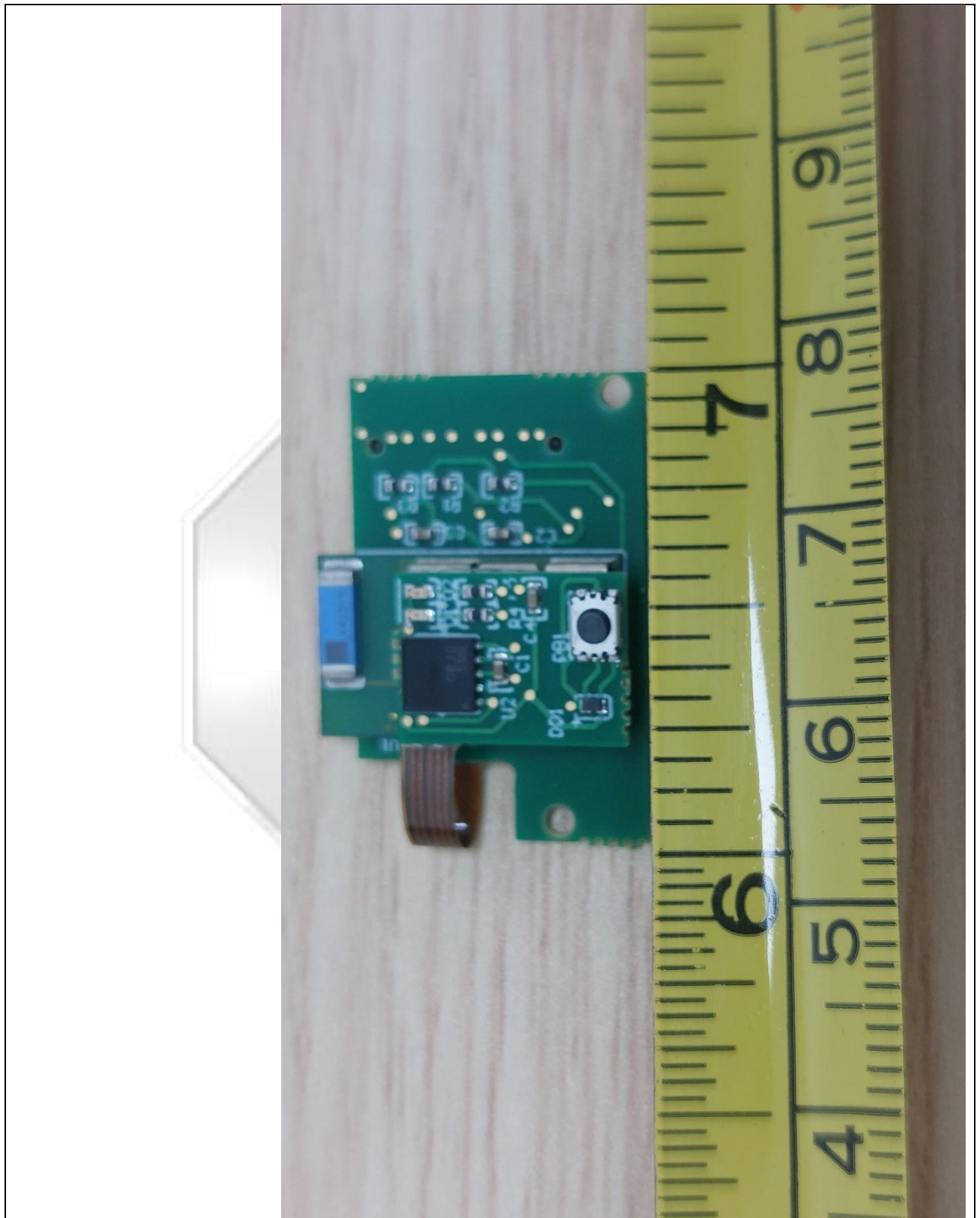
## EUT PHOTOGRAPHS



Internal View 4

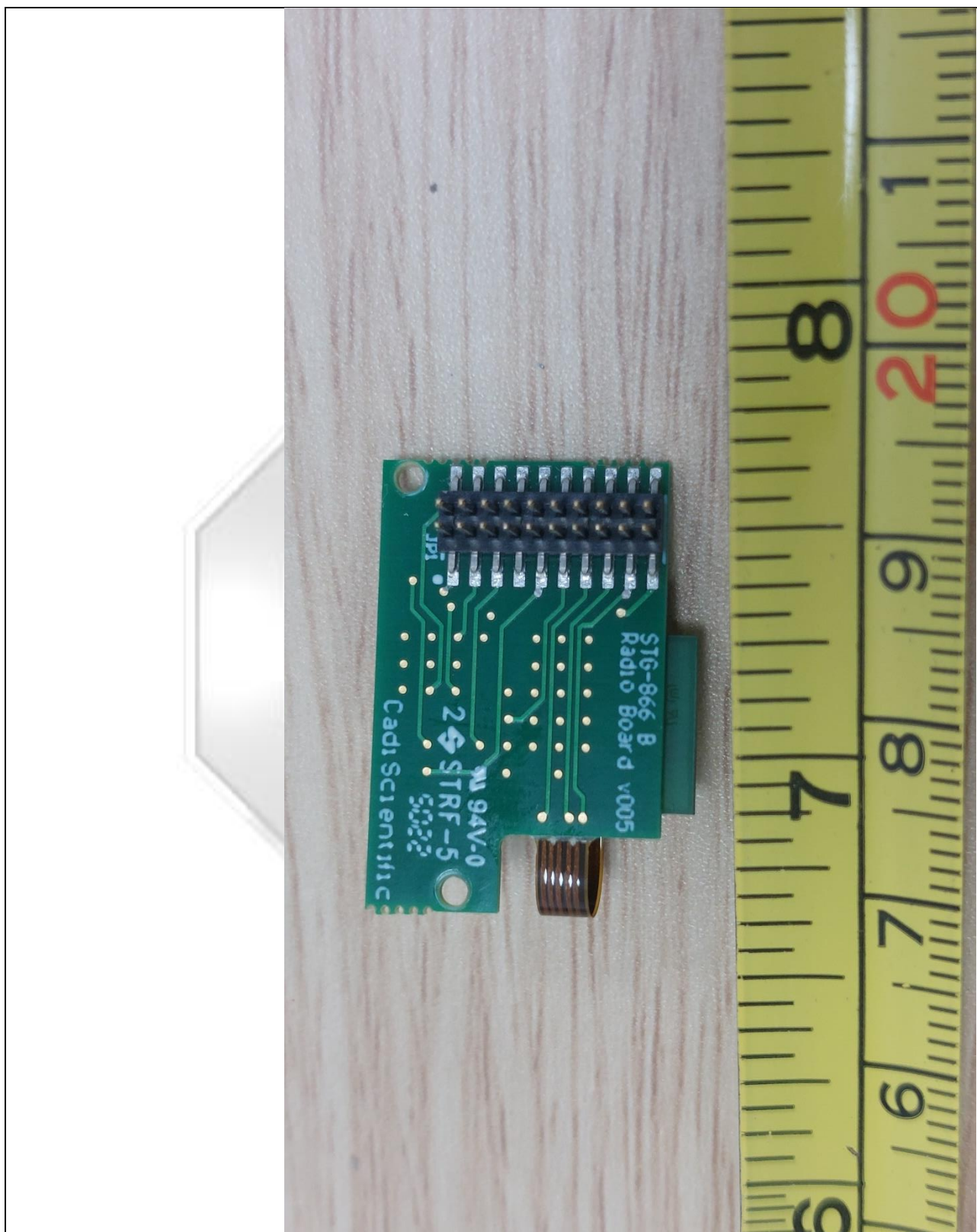


## EUT PHOTOGRAPHS



Internal View 5

## EUT PHOTOGRAPHS



Internal View 6

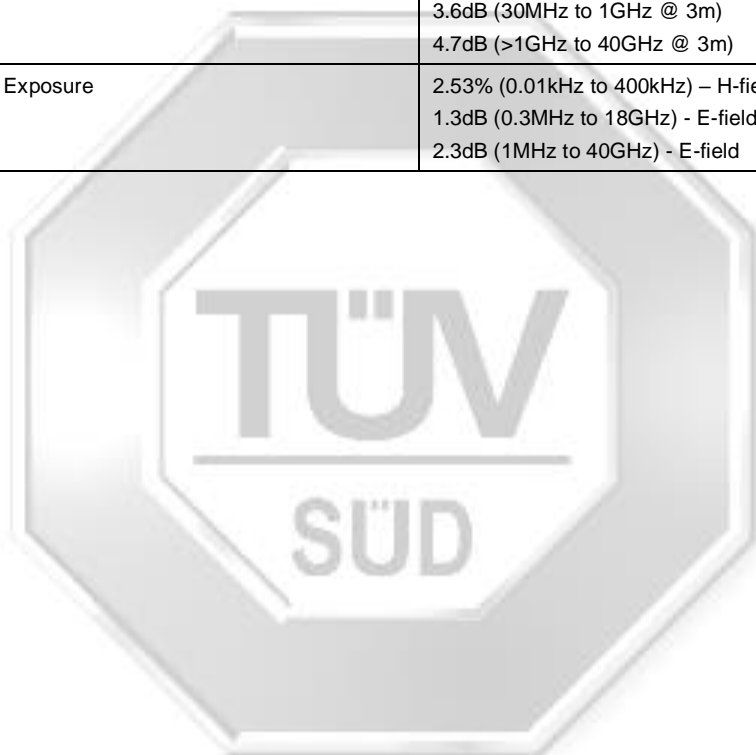
## 4 Test Equipment

Instrument	Model	S/No	Cal Due Date
Radiated Emissions (Spurious Emissions Inclusive Restricted Bands Requirement)			
R&S EMI Test Receiver (9kHz - 26.5GHz)	ESR26	101714	01 Jul 2023
Schwarzbeck Active Loop Antenna	FMZB1519B	196	02 Nov 2023
Com-Power Preamplifier (1MHz - 1GHz)	PAM-103	441162	16 Feb 2023
Schwarzbeck Hybrid Antenna (30MHz – 1GHz)	VULB9168	1430	06 Apr 2023
Miteq Preamplifier (1GHz – 6GHz)	AMF-2D-00500800-25-13P	2011153	19 Oct 2023
HP Preamplifier (1GHz - 26.5GHz)	8449B	3008A1078	01 Jun 2023
Electro-Metrics Horn Antenna (1GHz - 18GHz)	EM-6961	6553	16 Mar 2023
ETS Horn Antenna (18GHz - 40GHz)	3116	0004-2474	08 Oct 2023
Micro-tronics Bandstop Filter (2.4GHz)	BRM50701-02	007	13 Aug 2023
Band Edge Compliance (Radiated)			
R&S EMI Test Receiver (9kHz - 26.5GHz)	ESR26	101714	01 Jul 2023
Miteq Preamplifier (1GHz – 6GHz)	AMF-2D-00500800-25-13P	2011153	19 Oct 2023
Electro-Metrics Horn Antenna (1GHz - 18GHz)	EM-6961	6553	16 Mar 2023

## 5 Measurement Uncertainty

All measured results are traceable to the SI units. The uncertainty of the measurement is at a confidence level of approximately 95%, with a coverage factor of 2.

Test Name	Measurement Uncertainty
Conducted Emissions at Mains Terminals	1.1dB (9kHz to 30MHz)
Radiated Emissions	<u>10m Anechoic Chamber (Lab 4)</u> 2.2dB (9kHz to 30MHz @ 10m) 3.1dB (30MHz to 1GHz @ 10m) 3.7dB (30MHz to 1GHz @ 3m) 4.7dB (>1GHz to 40GHz @ 3m)  <u>3m RF Chamber (Lab7)</u> 3.6dB (30MHz to 1GHz @ 3m) 4.7dB (>1GHz to 40GHz @ 3m)
Maximum Permissible Exposure	2.53% (0.01kHz to 400kHz) – H-field 1.3dB (0.3MHz to 18GHz) - E-field 2.3dB (1MHz to 40GHz) - E-field





## 6 Annex A – FCC Label and Position

Labelling requirements per Section 2.925 & 15.19

The label shown will be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.



Sample Label



Physical Location of FCC Label on EUT



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Effective 26 January 2021



