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<b>Test Report By</b>	Michael Kirby
<b>FCC Test Firm Registration</b>	409640
<b>IC Site Registration</b>	IE0001
<b>Date</b>	4 <sup>th</sup> Jan 2021
<b>EUT Description</b>	Range Extender
<b>FCC ID</b>	2ATIMREX
<b>IC ID</b>	25094-REX
<b>Authorised by</b>	<b>Paul Reilly</b>
<b>Authorised Signature:</b>	

## TEST SUMMARY

The equipment complies with the requirements according to the following standards.

FCC Section	RSS Section	TEST PARAMETERS	Test Result
15.209	RSS Gen 7.3	Radiated Spurious Emissions	Pass

RSS Gen Issue5 Amd 1 (Mar 2019)

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF COMPLIANCE ENGINEERING IRELAND LTD

**Exhibit A – Technical Report**

Table of Contents

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1.0	EUT DESCRIPTION.....	4
1.1	EUT OPERATION .....	5
1.2	MODIFICATIONS.....	5
1.3	DATE OF TEST.....	5
1.4	DESCRIPTION OF TEST MODES .....	6
2.0	EMISSIONS MEASUREMENTS.....	6
3.0	RADIATED EMISSIONS.....	7
4.0	LIST OF TEST EQUIPMENT .....	8
	APPENDIX A SCANS FOR RADIATED EMISSIONS .....	9
	APPENDIX B TEST CONFIGURATIONS .....	14

## 1.0 EUT Description

<b>Model:</b>	REX
<b>Type:</b>	Range Extender
<b>Type of radio:</b>	Stand-alone
<b>Transmitter Type:</b>	802.15.4 (Thread)
<b>Operating Frequency Range(s):</b>	2.405 GHz - 2.480GHz (and 433.92MHz receiver)
<b>Number of Channels:</b>	16
<b>Antenna:</b>	Integral
<b>Power configuration:</b>	12 v Battery.
<b>Ports:</b>	None
<b>Classification:</b>	DTS,CYY
<b>HVIN:</b>	REX
<b>PMN:</b>	REX
<b>Test Standards:</b>	15.209 RSS-Gen
<b>Test Methodology:</b>	Measurements performed according to the procedures in ANSI C63.4-2014

The EUT was a Range Extender for use in automobiles. Its purpose was to relay packets received at 433.92MHz using Thread technology  
The unit also contained a receiver at 433.92MHz.

This report relates to test carried out on the 433.92MHz receiver with the Thread transmitter off.

## 1.1 EUT Operation

### Operating Conditions during Test:

The EUT was placed into receive mode (433.92MHz) with the Thread transmitter off. The EUT was powered from a bench PSU set to 12Vdc. for all tests

### Environmental conditions

	Temperature	Relative Humidity
<b>Test</b>	°C	%
Radiated Emissions <1GHz	21.1	56.9
Radiated Emissions >1GHz	23	49

## 1.2 Modifications

No modifications were required in order to pass the test specifications.

## 1.3 Date of Test

The tests were carried out on 22<sup>nd</sup> Sept and 2<sup>nd</sup> Dec 2020.

## 1.4. Measurement Uncertainty

The measurement uncertainty (with a 95% confidence level) for the conducted emissions test was  $\pm 3.5$  dB.

The measurement uncertainty (with a 95% confidence level) for the radiated emissions test was  $\pm 5.3$  dB (from 30 to 100 MHz),  $\pm 4.7$  dB (from 100 to 300 MHz),  $\pm 3.9$  dB (from 300 to 1000 MHz) and  $\pm 3.8$  dB (from 1 GHz to 40 GHz).

## 1.5 Special Test Software

Tests were performed manually and no special test software was used

## **2 Emissions Measurements**

### **2.2 Radiated Emissions Measurements**

Radiated Power measurements were made at the Compliance Engineering Ireland Ltd anechoic chamber located in Dunshaughlin, Co. Meath, Ireland to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

The EUT was centred on a motorized turntable, which allows 360 degree rotation.

Emissions below 1GHz were measured using a test antenna positioned at a distance of 3 metres from the EUT (as measured from the closest point of the EUT). The radiated emissions were maximised by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 metres. In this case the resolution bandwidth was 100kHz.

Emissions in the 1GHz-12.75GHz range were measured using a horn antenna located at 3 metres distance from the EUT in a fully anechoic chamber. The radiated emissions were maximised by configuring the EUT and by rotating the EUT, and by raising and lowering the test antenna from 1 to 4 metres.

The test table height was 0.8m for all tests

A pre-scan was performed to determine the worst case EUT orientation for the radiated measurements.

All tests were performed with the EUT in orientation O1 for Horizontal polarization measurements and with the EUT in orientation O2 for Vertical polarisation measurements.

Ref Appendix B for orientations.

### 3. Radiated Emissions Measurements

Frequency MHz	Quasi Peak Level dBuV/m	Antenna Polarity	Antenna Factor dB	Cable loss dB	Final Field Strength Quasi Peak dBuV/m	Quasi Peak Limit dBuV/m	Margin dB
45.08	8.8	Vertical	10.4	0.8	20	40.0	20.0
65.6	12.9	Vertical	9.6	1	23.5	40.0	16.5
93.52	7.7	Vertical	9.2	1.1	18	43.5	25.5
155.8	-0.5	Vertical	11.9	1.2	12.6	43.5	30.9
298.52	-1.9	Vertical	18.6	1.5	18.2	46.0	27.8
594.72	-0.7	Vertical	19.8	1.8	20.9	46.0	25.1
997.72	-0.9	Vertical	24.6	2.4	26.1	54.0	27.9
207.28	-3.5	Horizontal	14.6	1.4	12.5	43.5	31.0
299.6	-2	Horizontal	18.8	1.5	18.3	46.0	27.7
627.16	-1.5	Horizontal	19.8	2	20.3	46.0	25.7
978	-0.3	Horizontal	24.3	2.4	26.4	54.0	27.6

Frequency	Measured Peak Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Peak Level	Average Limit +20dB	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
3.473	46.0	31.3	37.8	4.5	Vertical	0.00	44.0	74	30.0
6.627	44.2	37.9	37.1	6.0	Vertical	0.00	51.0	74	23.0
5.494	47.7	34.3	37.5	5.7	Horizontal	0.00	50.2	74	23.8
3.473	49.0	31.3	37.8	4.5	Horizontal	0.00	47.0	74	27.0
10.770	43.1	38.8	36.6	7.7	Vertical	0.00	53.0	74	21.0
11.974	44.0	40.3	36.5	7.8	Vertical	0.00	55.6	74	18.4
10.092	43.1	38.2	36.1	7.8	Horizontal	0.00	53.0	74	21.0
11.916	45.4	39.6	36.6	7.6	Horizontal	0.00	56.0	74	18.0

Frequency	Measured Average Level	Antenna Factor	Preamp Gain	Cable Loss	Antenna Polarity	Duty Cycle Correction	Final Average Level	Average Limit	Margin
GHz	dBuV/m	dB	dB	dB	V/H	dB	dBuV/m	dBuV/m	dB
11.974	30.4	40.3	36.5	7.8	Vertical	0.00	42.00	54	12.0
11.916	32.4	39.6	36.6	7.6	Vertical	0.00	43.0	54	11.0

Ref Appendix A for Scans

Test Result: - Pass

#### 4 List of Test Equipment

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Due Date	Cal Interval Months
Spectrum Analyser 30Hz-40GHz	Rohde & Schwarz	FSP40	100053	850	11-Dec-21	36
Test Receiver 3.6GHz	Rohde & Schwarz	ESR	1316.3003k03-101625-s	869	28-May-23	36
Antenna Biconical	Schwarzbeck	VHBB 9124	9124 667	871	03-Sep-21	36
Antenna Horn	EMCO	3115	9905-5809	655	14-Mar-21	24
Anechoic Chamber	CEI	SAR 10M	845	845	16-May-22	36
Antenna Log Periodic	Chase	UPA6108	1072	609	03-Sep-21	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	22-Mar-21	36
Microwave Preamplifier	Hewlett Packard	83017A	3123A00175	805	30-Sep-21	12
Antenna Horn Standard Gain 18-26.5GHz	A-Info	LB-42-25-C-KF	J2021091103028	877	05-Oct-21	12



## Appendix A

### Radiated Spurious Emissions

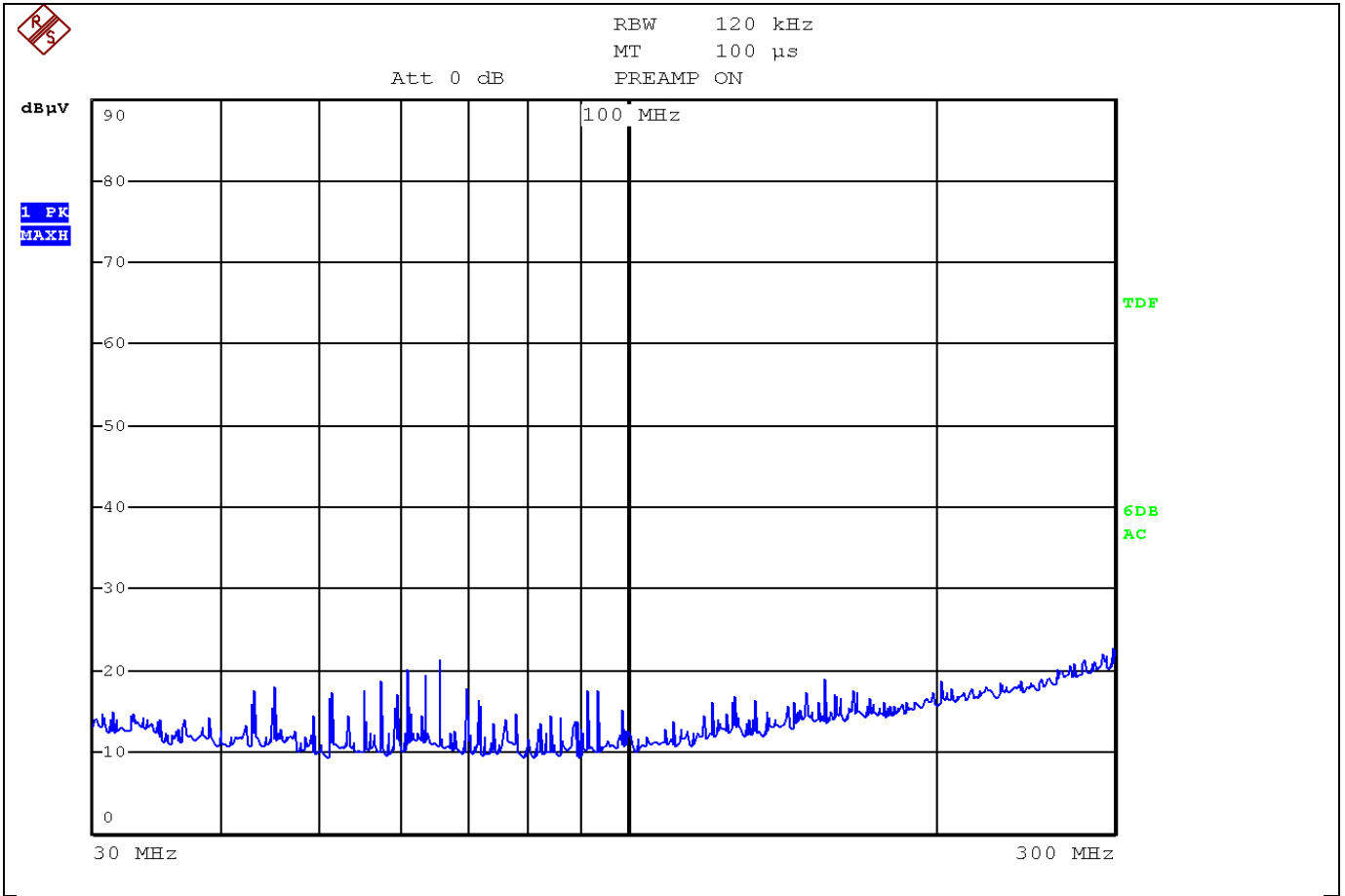


Fig A1 Radiated Emissions 30MHz -300MHz Vertical 3metres

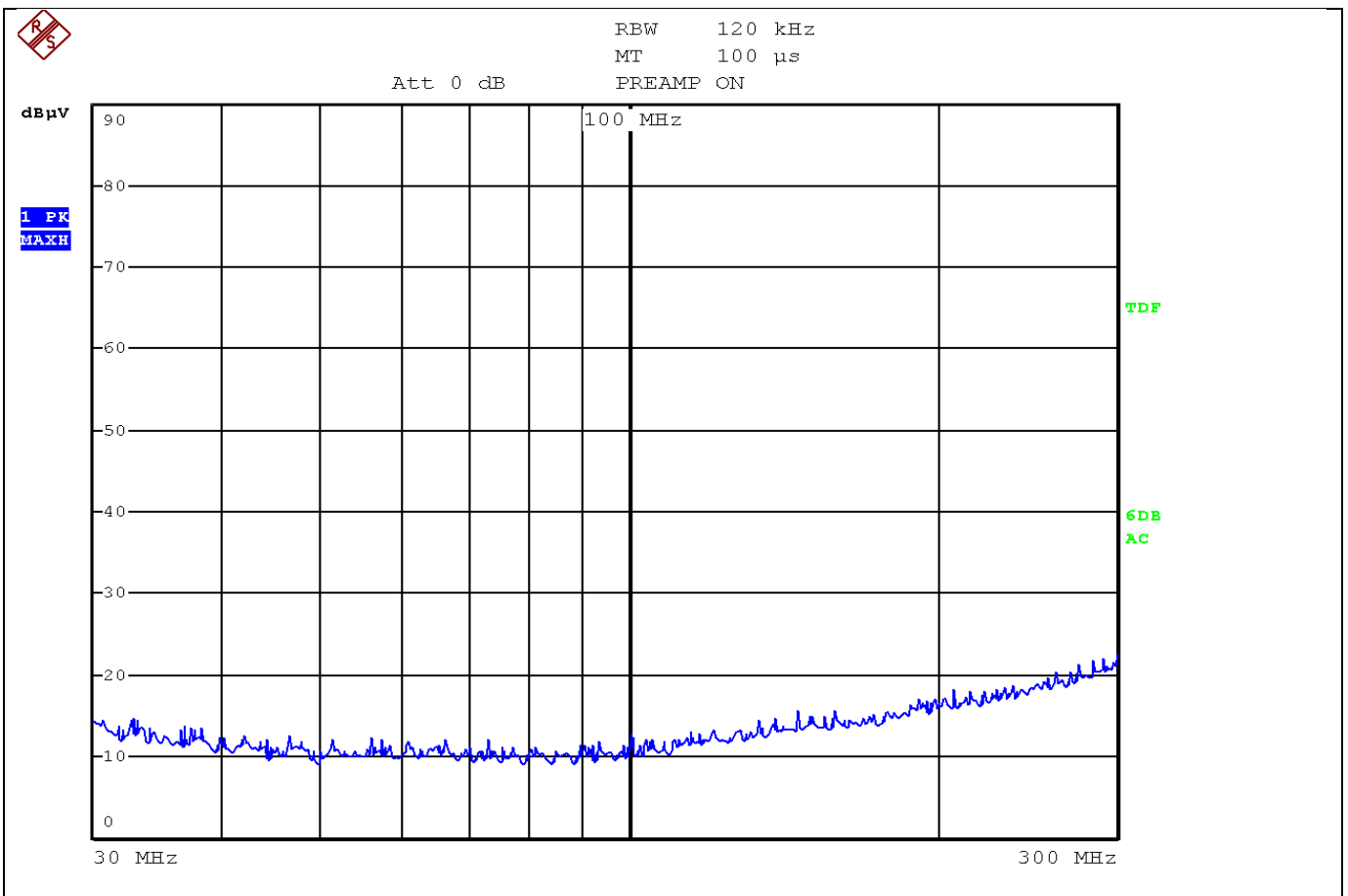


Fig A2 Radiated Emissions 30MHz -300MHz Horizontal 3metres

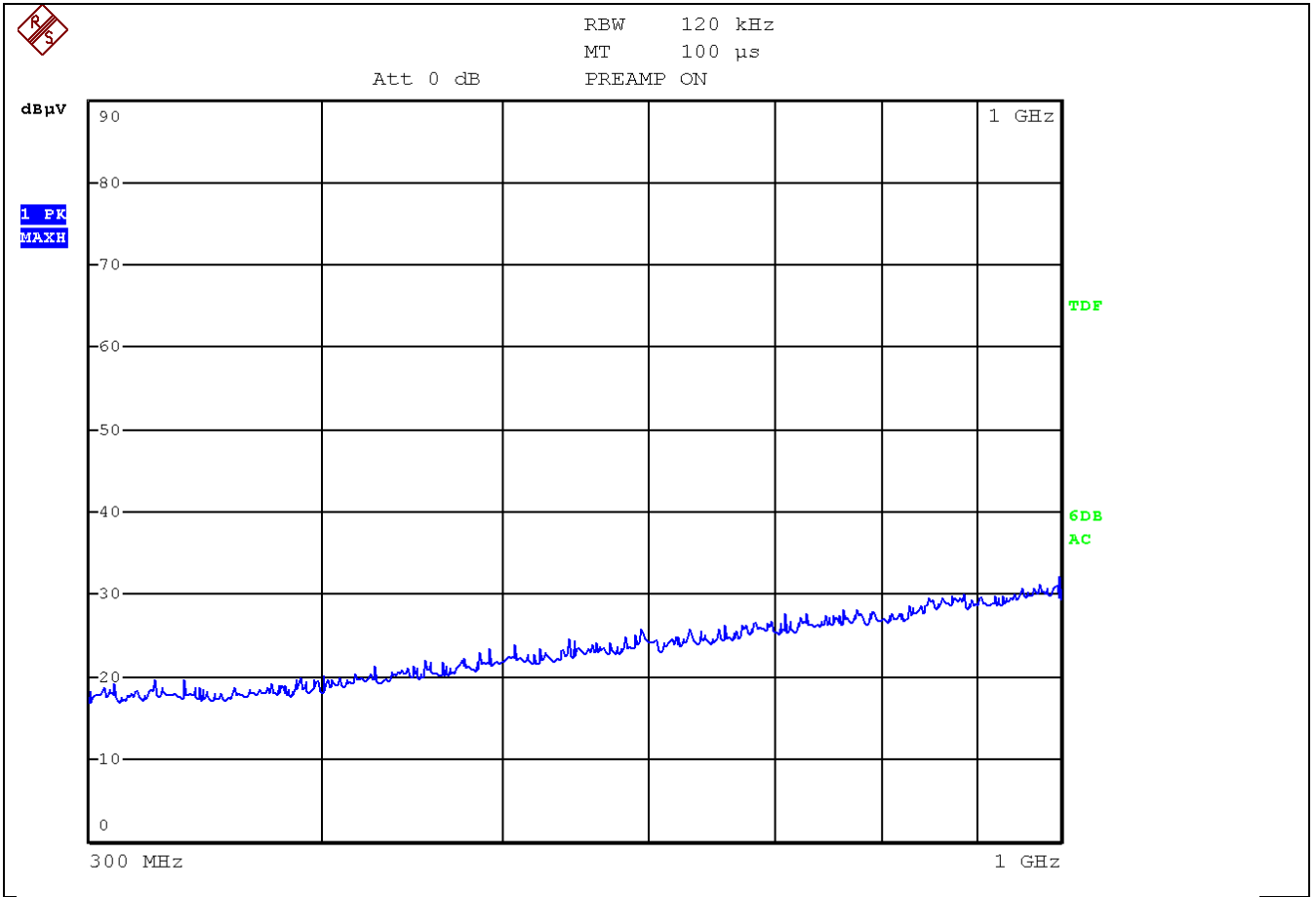


Fig A3 Radiated Emissions 300MHz -1GHz Vertical 3metres

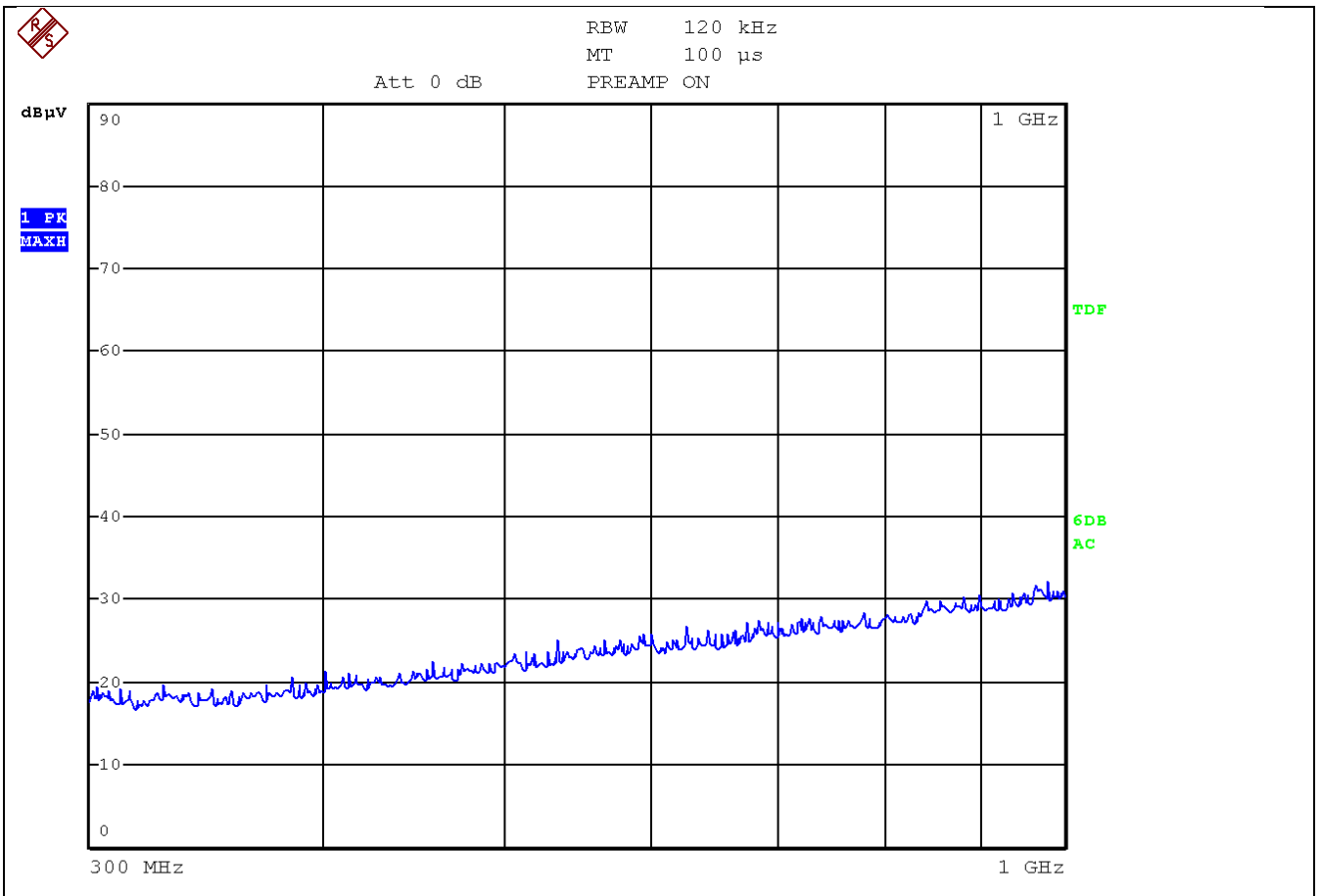
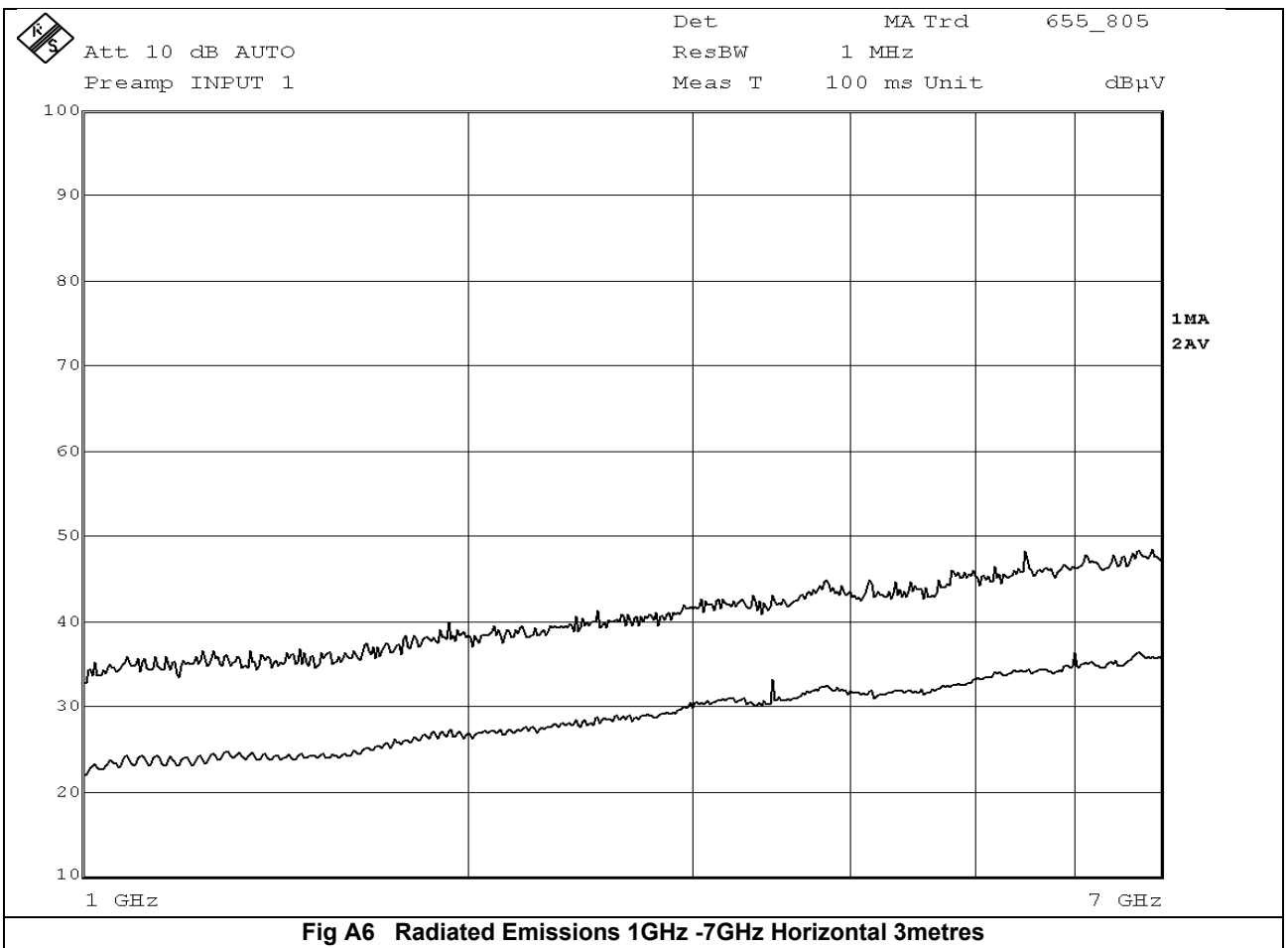
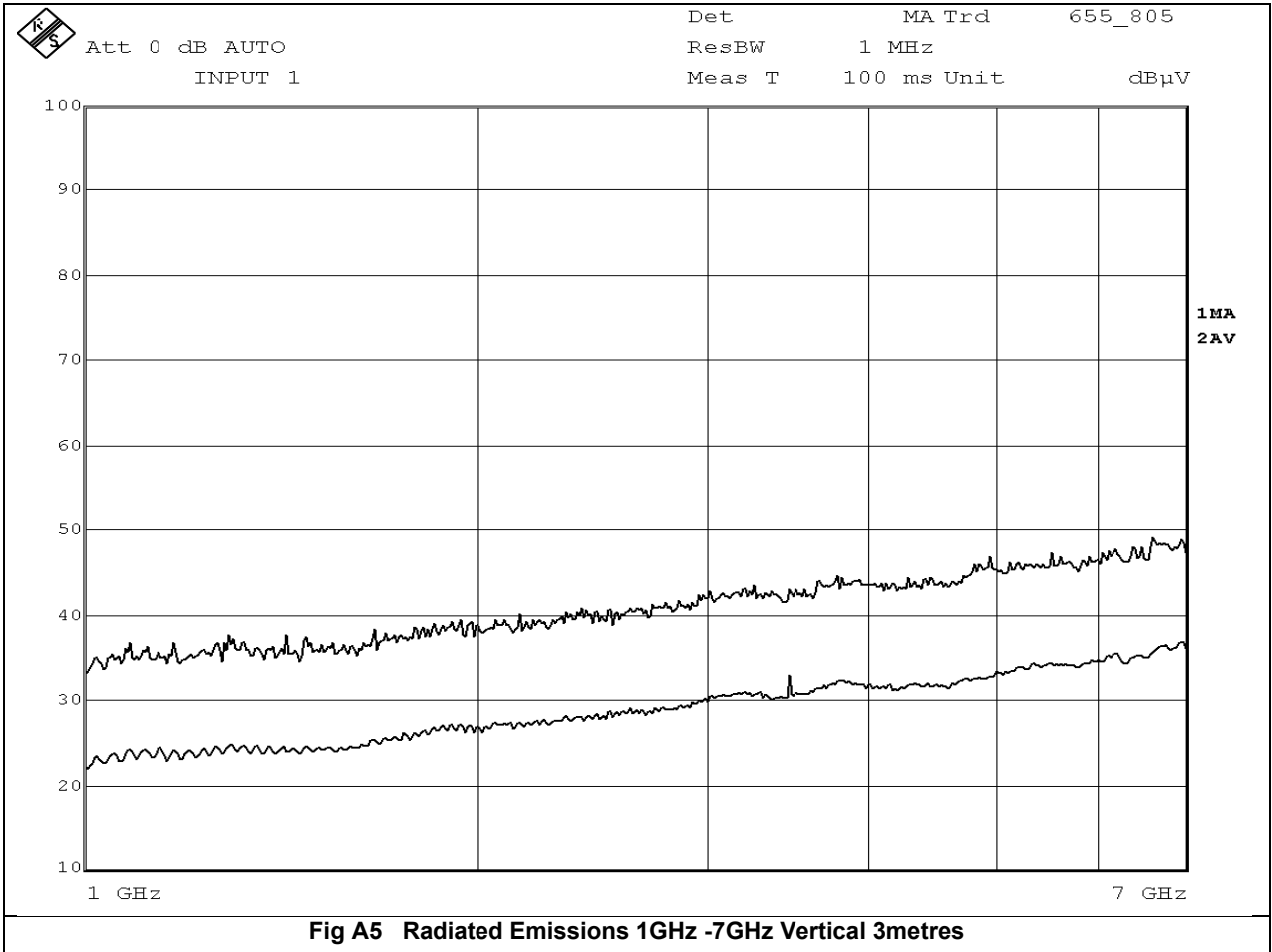
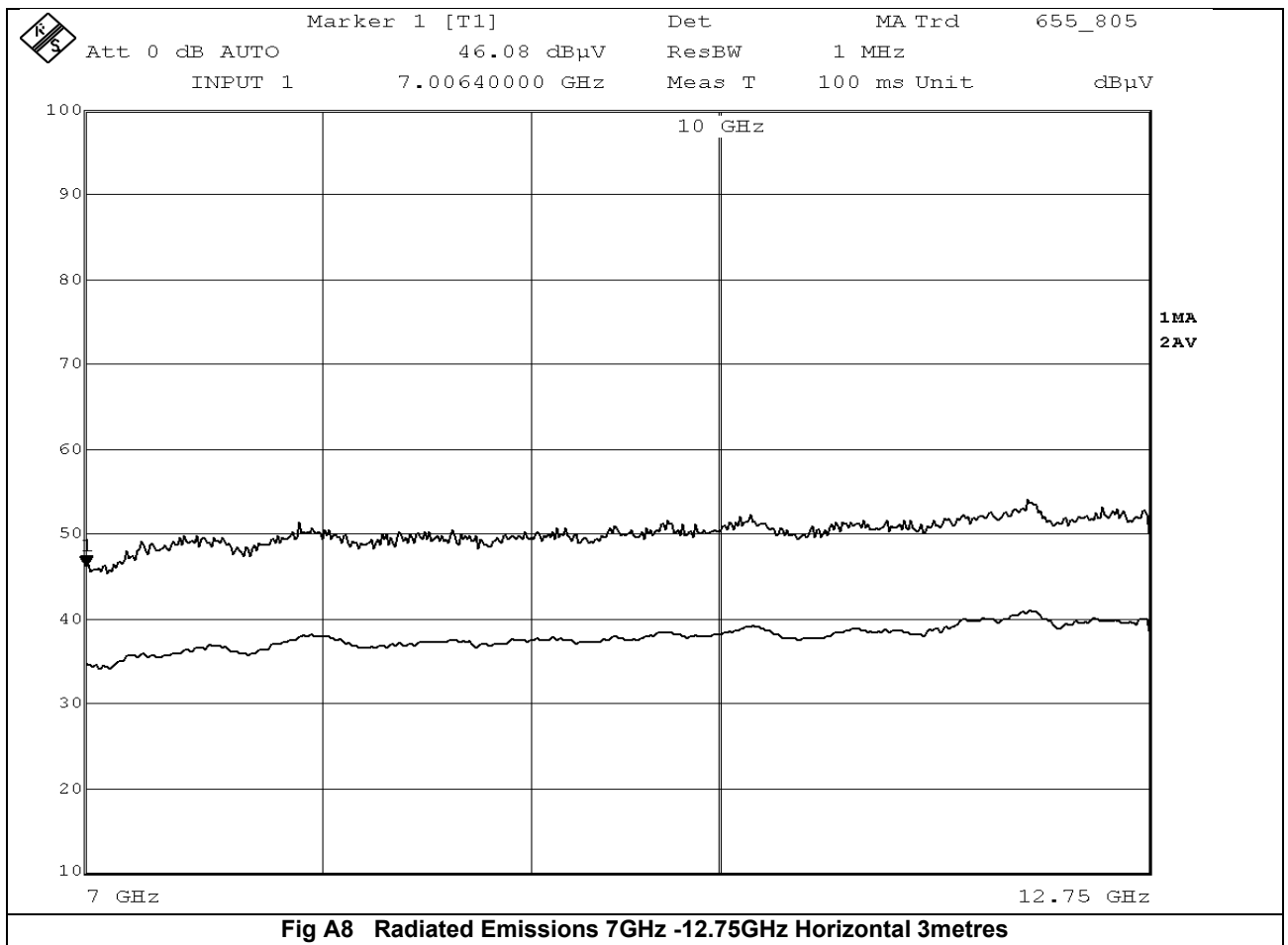
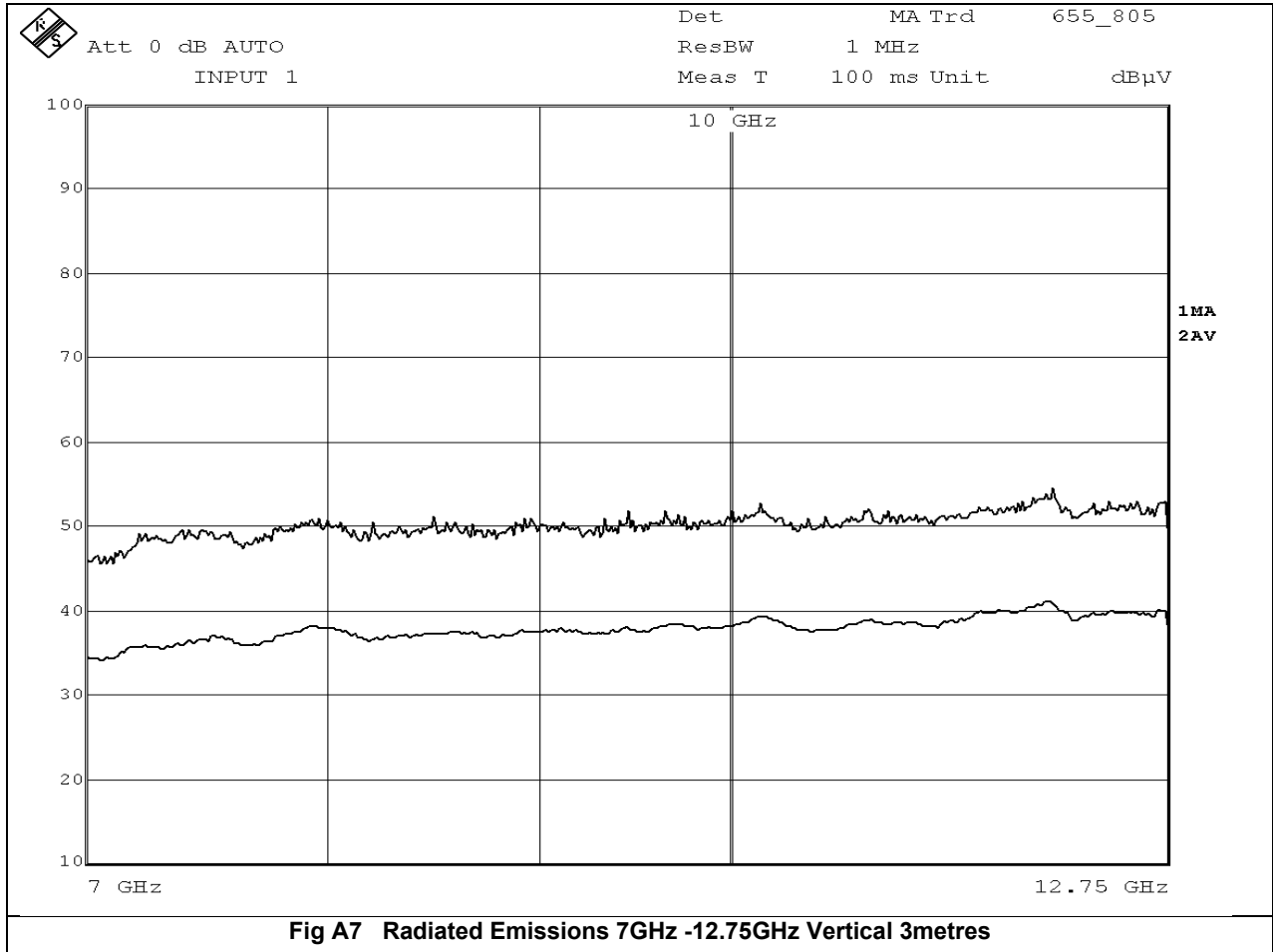


Fig A4 Radiated Emissions 300MHz -1GHz Horizontal 3metres





**Appendix B**

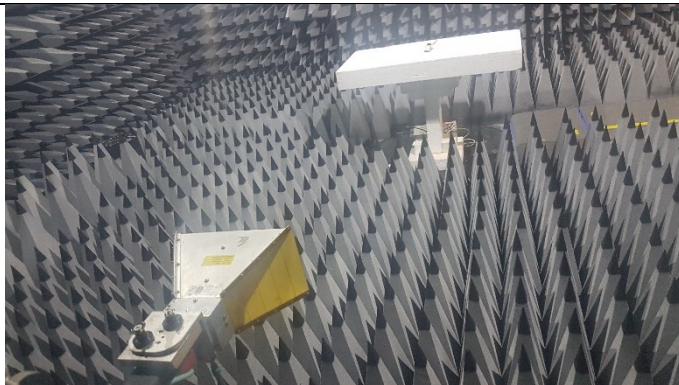
**Test Configurations:**



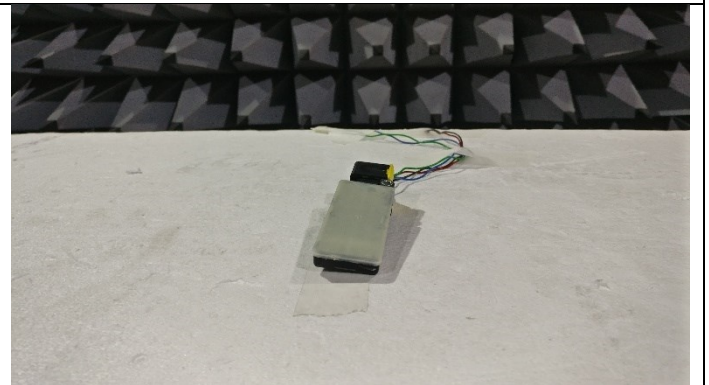
**Fig B1 Spurious Emissions 30MHz-300MHz 3 metres**



**Fig B2 Radiated Emissions 300MHz-1GHz 3metres**



**Fig B3 Radiated Emissions 1GHz-12.75GHz 3metres**



**Fig B4 Radiated Emissions EUT close up**

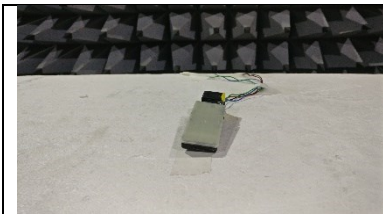


Fig B5 EUT orientation "O1"

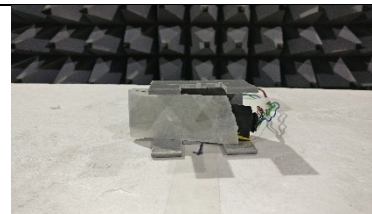


Fig B6 EUT orientation "O2"

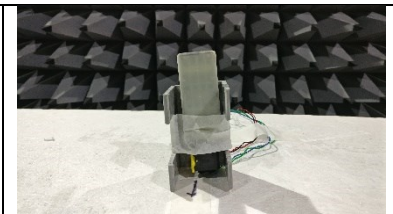
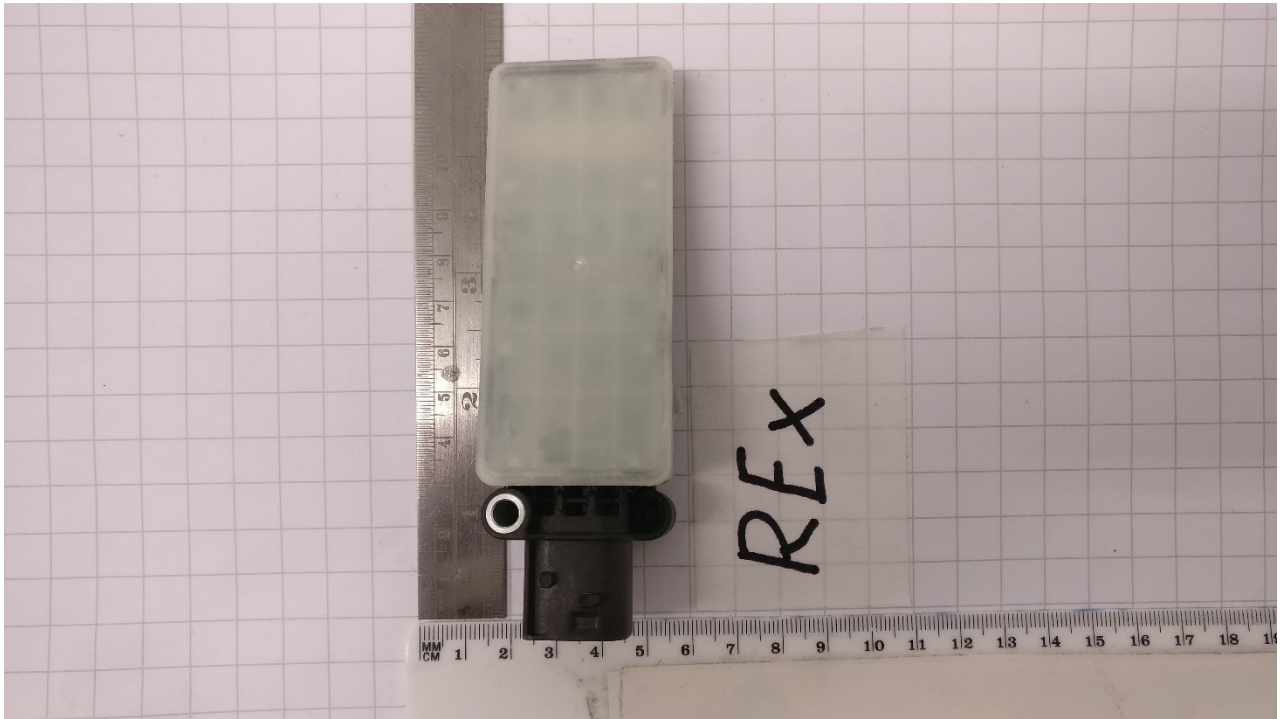


Fig B7 EUT orientation "O3"

**Orientations for Radiated Emissions**



End of Report