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Prüfbericht - Nr.: *Test Report No.:*	**19660214 001**		**Seite 1 von 19** *Page 1 of 19*
Auftraggeber: *Client:*	**Honeywell International Inc.** **315 E Stephenson St, Plant 1** **A2-148, Freeport, IL, USA** **Zip code: 61032-4353**		
Gegenstand der Prüfung: *Test item:*	**Wireless Pressure Sensor**		
Bezeichnung: *Identification:*	**WPS1A12AGP1PFM1X**	**Serien-Nr.:** *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**1803128517**	**Eingangsdatum:** *Date of receipt:*	**07.03.2016**
Prüfort: *Testing location:*	**Refer Page 4 of 19 for test facilities**		
Prüfgrundlage: *Test specification:*	**FCC Part 15, Subpart C** **ANSI C63.10-2013**		
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test items passed the test specification(s).*		
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** 82/A, 3rd Main, West Wing, Electronic City Phase 1 Hosur Road, Bangalore – 560 100. India **FCC Registration No.: 176555**		

geprüft / *tested by:*			**kontrolliert** / *reviewed by:*		
15.03.2016	Saibaba Siddapur Sr.Engineer	Saibaba	30.03.2016	Raghavendra Kulkarni Sr.Manager	Kulkarni
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges /*Other Aspects:* **On receipt equipment was in good condition**

Abkürzungen:	***P(ass)***	=	***entspricht Prüfgrundlage***	***Abbreviations:***	***P(ass)***	=	***passed***
	F(ail)	=	***entspricht nicht Prüfgrundlage***		***F(ail)***	=	***failed***
	N/A	=	***nicht anwendbar***		***N/A***	=	***not applicable***
	N/T	=	***nicht getestet***		***N/T***	=	***not tested***

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.

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Test Result Summary

Clause	Test Item	Result
FCC 15.247(b) (3)	Maximum peak conducted output power	Pass
FCC 15.209 / FCC 15.205	Spurious Radiated Emissions and Restricted Bands of Operation	Pass

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List of Test and Measurement Instruments

Equipment	Manufacturer	Model Name	Serial Number	Calibration Due Date	Used for Test Items
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	02.07.2016	Spurious Radiated Emissions
Broadband Antenna	Frankonia	ALX-4000	ALX-4000-806	08.04.2016	
Active Loop Antenna	Frankonia	LAX-10	LAX-10-800	22.12.2016	
Horn Antenna	Frankonia	HAX-18	HAX18-802	02.12.2016	
Emission Horn Antenna	ETS Lindgren	116706	00107323	02.11.2016	
Anechoic Chamber	Frankonia	-	-	-	
EMI Test Receiver	Rohde & Schwarz	FSV 7			Antenna Port Measurement

Testing Facilities

1) TUV Rheinland (India) Private Limited
108 , Beside ISBR Business School,
Electronic city Phase I
Bangalore - 560 100.

General Product Information

Product Function and Intended Use

Honeywell Pressure Sensors are designed to perform in a predictable and repeatable manner when a pressure is applied. This pressure is translated into a signal voltage by the resistance change of strain gages, which are attached to the diaphragm of the sensor. The change in resistance indicates the degree of deformation, and in turn, the pressure applied to the port. The strain gages are connected in a 4 arm Wheatstone bridge configuration which acts as an adding and subtracting electrical network and allows compensation for temperature effects as well as cancellation of signals caused by extraneous loading.

Ratings and System Details

Operating Frequency	2405 – 2475MHz
No. of channel	15
Channel Spacing	5MHz
Modulation	DSSS
Transmit Power (ERP)	15.19dBm
Data Rate	250kbps
Antenna Type	External Antenna (Omni Directional)
Number of antenna	1
Antenna Gain	2 dBi
Supply Voltage	7.2VDC (Battery operated)
Dimension	L x W x H = 256 x 120 x 95 (all dimensions in mm)
Environmental	-40°C to +70°C

Test Conditions:

Voltage: 7.2VDC (Battery operated)

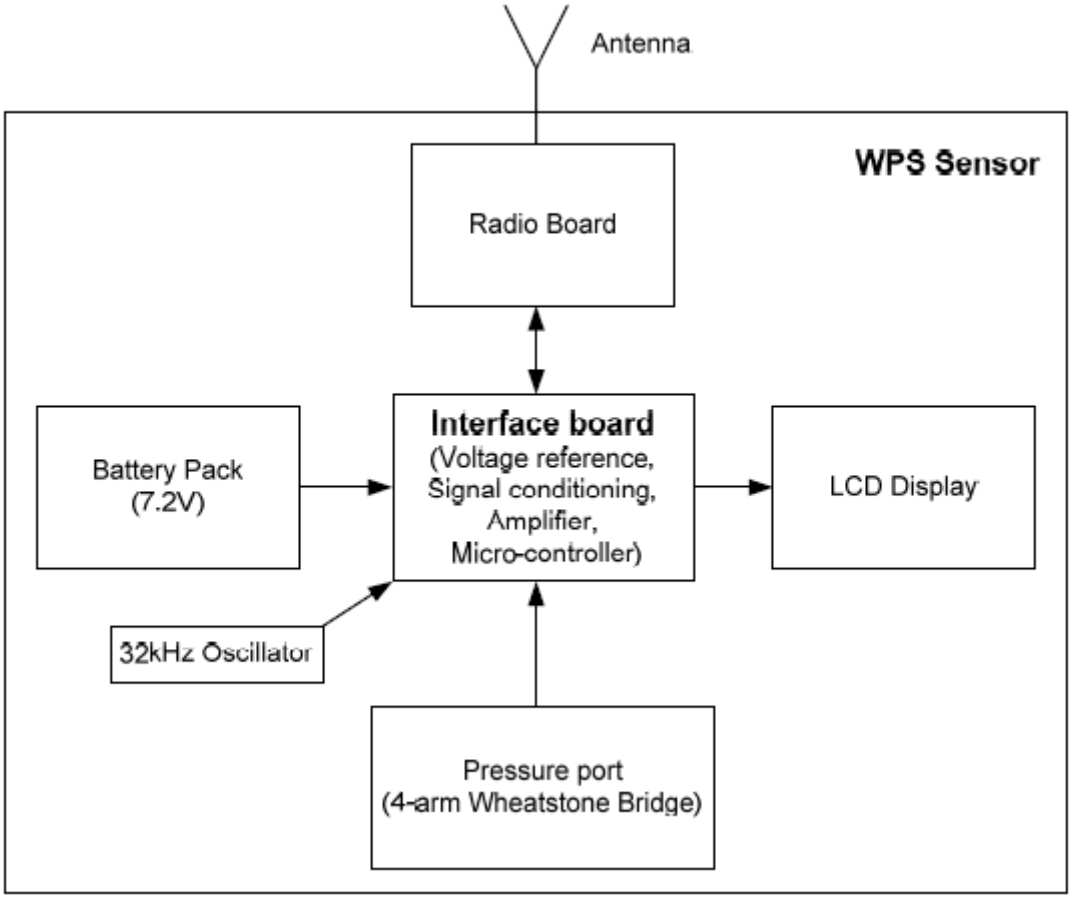
Environmental conditions:

Temperature: +23 º C **RH:** 62%

Operational Description

Interface board: Converts Analog pressure to digital signal, based on update rate data is sent over to LCD and radio board. This has micro-controller, ADC, switching regulator and reference voltage IC. Radio board: Based on protocol (ISA/P2P) data sent by interface board is sent over wireless Secondary board: Used for setting update rate (for P2P) and for reset of device. This has LED for showing indications

Block Diagram



Test Set-up and Operation Mode

Principle of Configuration Selection
Transmission was enabled with 100% duty cycle on low, mid and high channel.

Test Operation and Test Software
FlashPro430 (Fast USB-MSP430 Flash Programmer) used enable the transmission at maximum defined power level and to select channels low, mid and high in 2.4 GHz band on the EUT for the tests in this report.

Special Accessories and Auxiliary Equipment
- None

Countermeasures to achieve EMC Compliance
- None

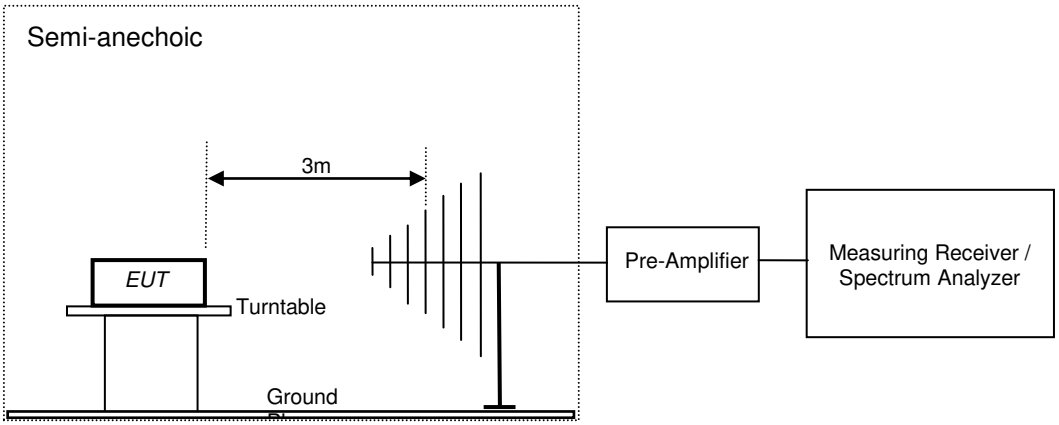
Table of frequencies

Frequency Band	Channel No.	Frequency (MHz)
2400-2483.5 MHz	01	2405
	02	2410
	03	2415
	04	2420
	05	2425
	06	2430
	07	2435
	08	2440
	09	2445
	10	2450
	11	2455
	12	2460
	13	2465
	14	2470
	15	2475

Test Methodology

Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.10-2013. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, and the EUT is 3 meters far from the measuring antenna for below 1GHz measurement & The equipment under test (EUT) was placed at the middle of the 1.5m high turntable, and the EUT is 3 meters far from the measuring antenna for above 1GHz measurement. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna.
The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



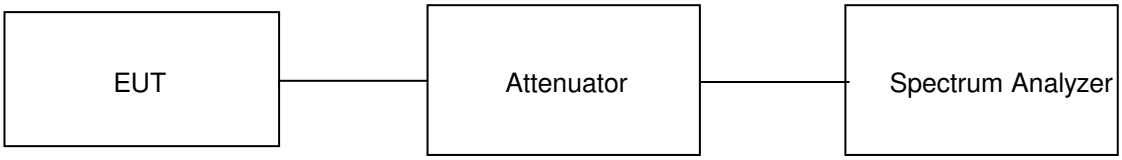
Test Results

Maximum peak conducted output power — Section 15.247(b) (3)

Result — **Pass**

Test Specification	FCC Part 15 Subpart C
Measurement Bandwidth (RBW)	1 MHz
Detector	Peak
Requirement	<1 watt (30dBm).

Test Method:

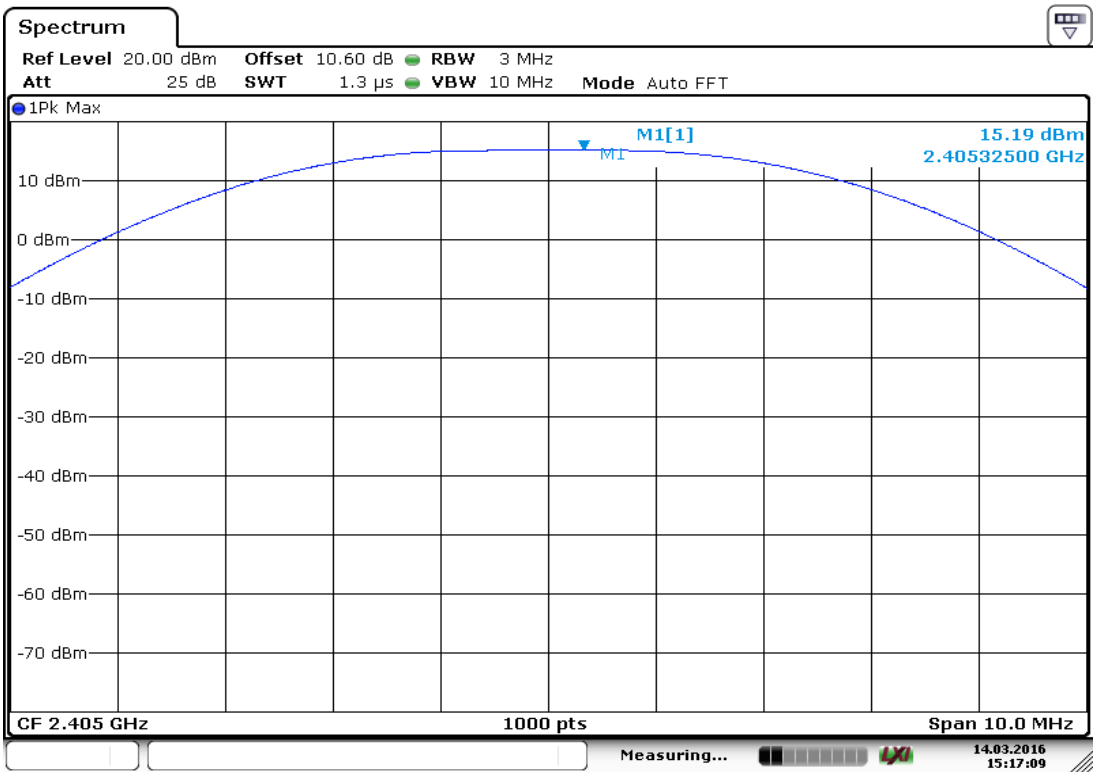


Attenuator + Cable Loss: 10.6dB (Included in the test results)

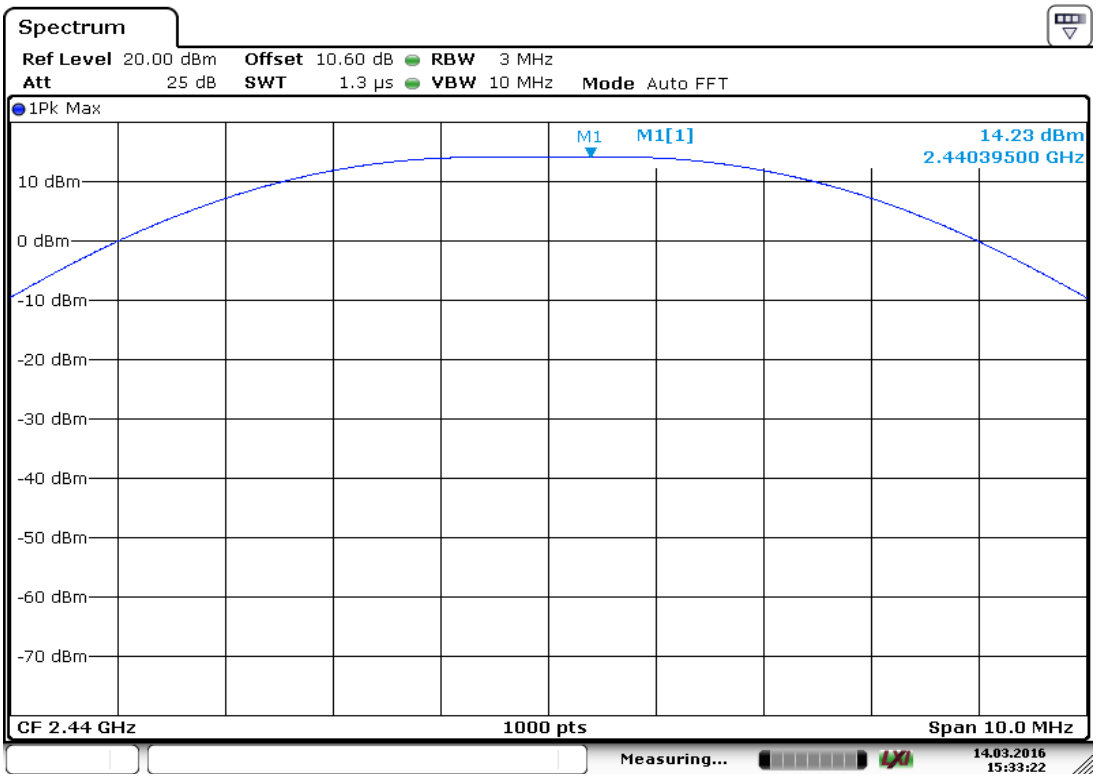
Note: Maximum peak conducted output power was performed according to the procedure given in KDB No. 558074 D01 DTS Meas Guidance v03r04

Test Result:

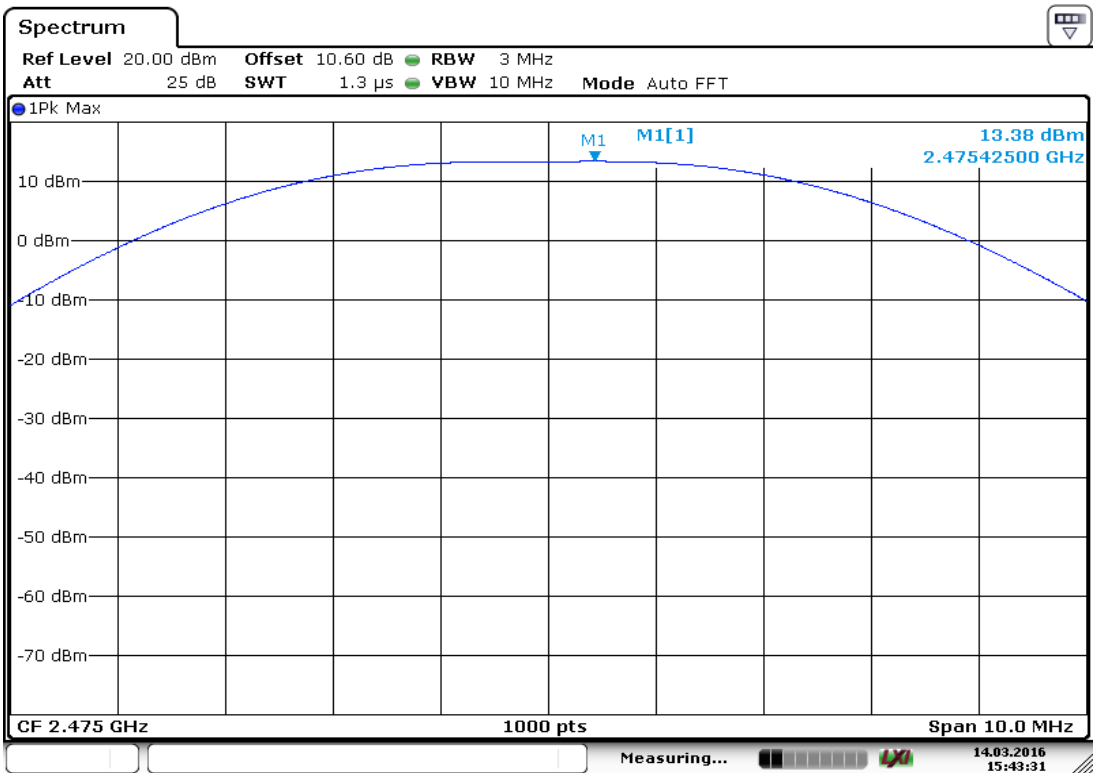
Frequency (MHz)	Total Peak Output power (dBm)	Limit (dBm)
2405	15.19	30.00
2440	14.23	30.00
2475	13.38	30.00



Channel Frequency: 2405 MHz



Channel Frequency: 2440 MHz



Channel Frequency: 2475 MHz

Spurious Radiated Emissions and Restricted Bands of Operation

Section 15.209 and 15.205

Result **Pass**

Test Specification	FCC Part 15 Subpart C
Test Method	ANSI C63.10-2013
Measurement Location	Semi Anechoic Chamber
Measuring Distance	3m
Detection	QP for frequency below 1GHz, Peak and Average for frequency above 1GHz
Requirement	As per the limits mentioned in the bellow table

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Distance of Measurement (m)
0.009 – 0.490	2400/F(kHz)	48.50 – 13.80	300*
0.490 – 1.705	24000/F(kHz)	33.80 – 23.00	30*
1.705 -30	30	29.54	30*
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Remark: * the limit shows in the table above of frequency range 0.009 – 0.490, 0.490 – 1.705 MHz and 1.705-30MHz is at 300 meter, 30 meter and 30 meter range respectively, which corresponds to 88, 50 – 53.80, 53.80 – 43.00 and 49.5dBµV/m at 3m range by extrapolation calculation and the measurement of loop antenna.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz Radiated emission limits in these three bands are based on measurements employing an average detector.

Note: The Radiated Emission Test carried out with 100% duty Cycle. And the Practical (declared) Duty Cycle is 20msec so; the Peak readings were extrapolated to arrive at the average readings by using the following calculation.

Duty Cycle = 20/100 = 0.2

Duty Cycle Correction Factor = 20*log (duty cycle)

=20*log (0.2)

= -13.9794

Average Value = Measured Peak Value + (-13.9794)

Duty Cycle Reference values (20msec) taken from the value mentioned in the test report for the model No.: WPS1B121AGP1A1N & Report No.: EMC-0055-2.

Test results:

For frequency range 9 KHz to 1 GHz

No emission found.

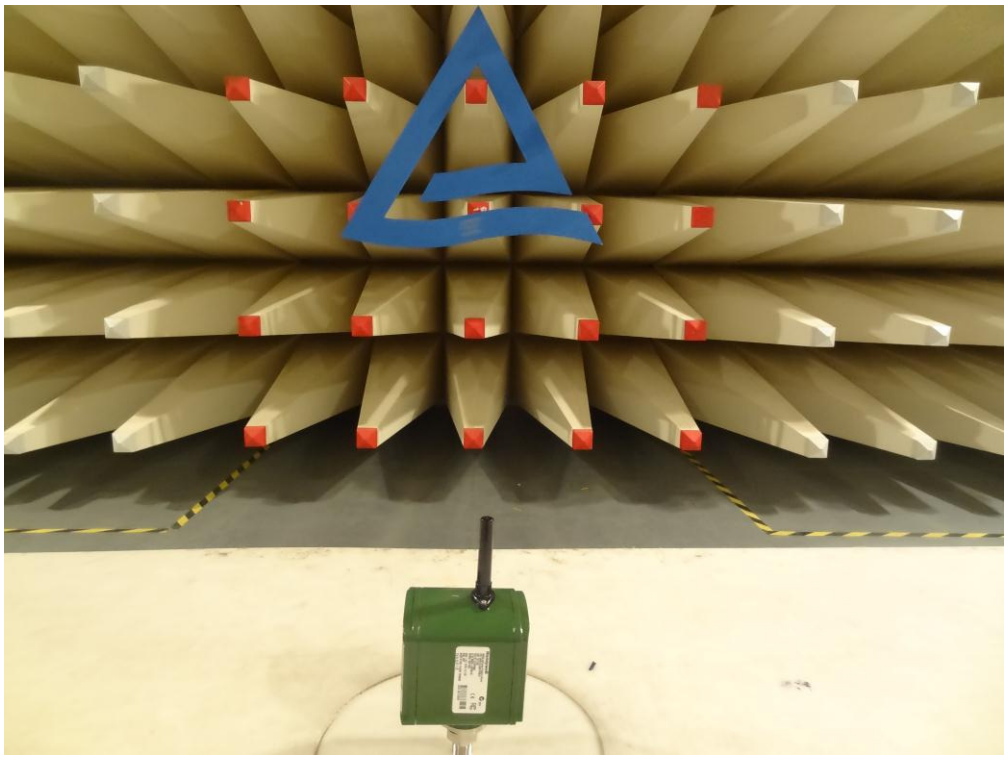
Frequencies above 1GHz

IEEE 802.15.4 & Data Rate 250kbps					
Channel No.	**Polarization**	**Frequency (MHz)**	**Field Strength Values (dBµV/m)**	**Limit (dBuV)**	**Margin (dB)**
11	Vertical	2341 (Pk)	62.07	74.00	-11.93
		2341 (Av)	48.09	54.00	-5.91
		2405 (Pk)	111.37	*	-
		2405 (Av)	97.39	*	-
		4810 (Pk)	50.33	74.00	-23.67
		4810 (Av)	36.35	54.00	-17.65
		7215 (Pk)	57.28	74.00	-16.72
		7215 (Av)	43.30	54.00	-10.70
		9620(Pk)	62.12	74.00	-11.88
		9620(Av)	48.14	54.00	-05.86
	Horizontal	2341 (Pk)	50.40	74.00	-23.60
		2341 (Av)	36.42	54.00	-17.58
		2405 (Pk)	100.66	*	-
		2405 (Av)	86.68	*	-
		4810 (Pk)	52.08	74.00	-21.92
		4810 (Av)	38.10	54.00	-15.90
		7215 (Pk)	57.52	74.00	-16.48
		7215 (Av)	43.54	54.00	-10.46
		9620(Pk)	62.22	74.00	-11.78
		9620(Av)	48.24	54.00	-05.76
18	Vertical	2376(Pk)	62.59	74.00	-11.41
		2376(Av)	48.61	54.00	-05.39
		2440 (Pk)	111.51	*	-
		2440 (Av)	97.53	*	-
		4880 (Pk)	56.67	74.00	-17.33
		4880 (Av)	42.69	54.00	-11.31
		7320 (Pk)	57.04	74.00	-16.96
		7320 (Av)	43.06	54.00	-10.94
		9760(Av)	63.39	74.00	-10.61
		9760(Av)	49.41	54.00	-04.59
	Horizontal	2376(Pk)	51.47	74.00	-22.53
		2376(Av)	37.49	54.00	-16.51

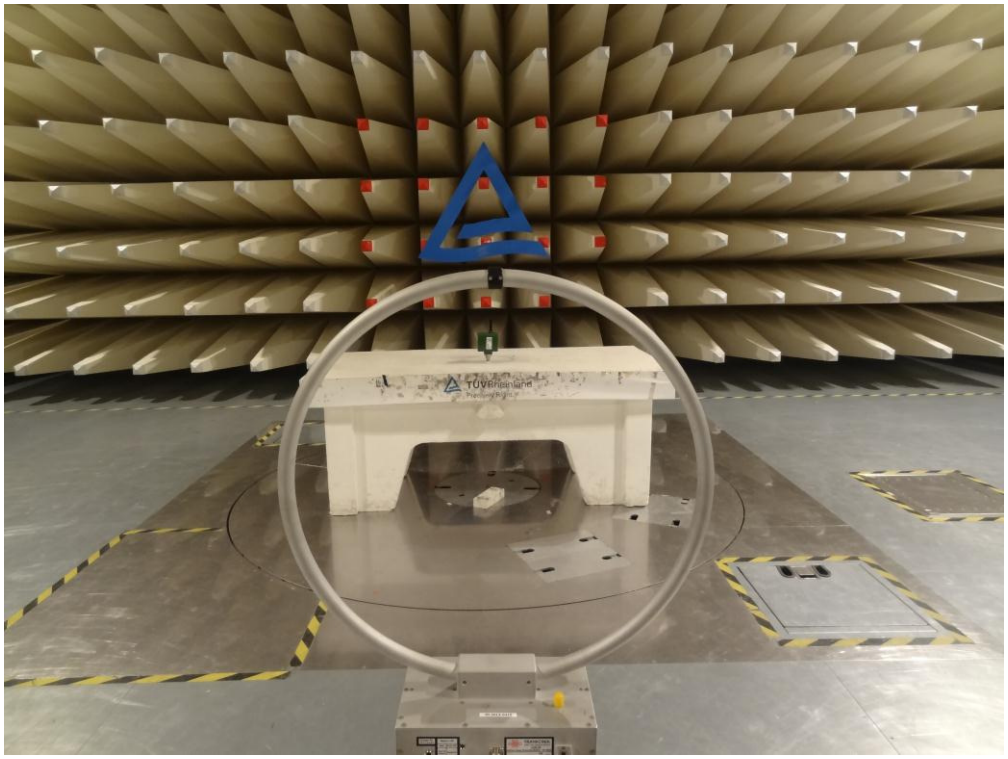
		2440 (Pk)	98.87	*	-
		2440 (Av)	84.89	*	-
		4880 (Pk)	58.57	74.00	-15.43
		4880 (Av)	44.59	54.00	-09.41
		7320 (Pk)	56.56	74.00	-17.44
		7320 (Av)	42.58	54.00	-11.42
		9760(Av)	62.68	74.00	-11.32
		9760(Av)	48.70	54.00	-05.30
25	Vertical	2475 (Pk)	109.52	*	-
		2475 (Av)	95.54	*	-
		2483.5 (Pk)	56.37	74.00	-17.63
		2483.5 (Av)	42.39	54.00	-11.61
		4950 (Pk)	53.08	74.00	-20.92
		4950 (Av)	39.10	54.00	-14.90
		7425 (Pk)	58.23	74.00	-15.77
		7425 (Av)	44.25	54.00	-09.75
		9900(Pk)	62.83	74.00	-11.17
		9900(Av)	48.85	54.00	-05.15
	Horizontal	2475 (Pk)	102.27	*	-
		2475 (Av)	88.29	*	-
		2483.5 (Pk)	49.02	74.00	-24.98
		2483.5 (Av)	35.04	54.00	-18.96
		4950 (Pk)	55.42	74.00	-18.58
		4950 (Av)	41.44	54.00	-12.56
		7425 (Pk)	58.46	74.00	-15.54
		7425 (Av)	44.48	54.00	-09.52
		9900(Pk)	62.44	74.00	-11.56
		9900(Av)	48.46	54.00	-05.54

Pk -> Peak Detector
Av -> Average Detector

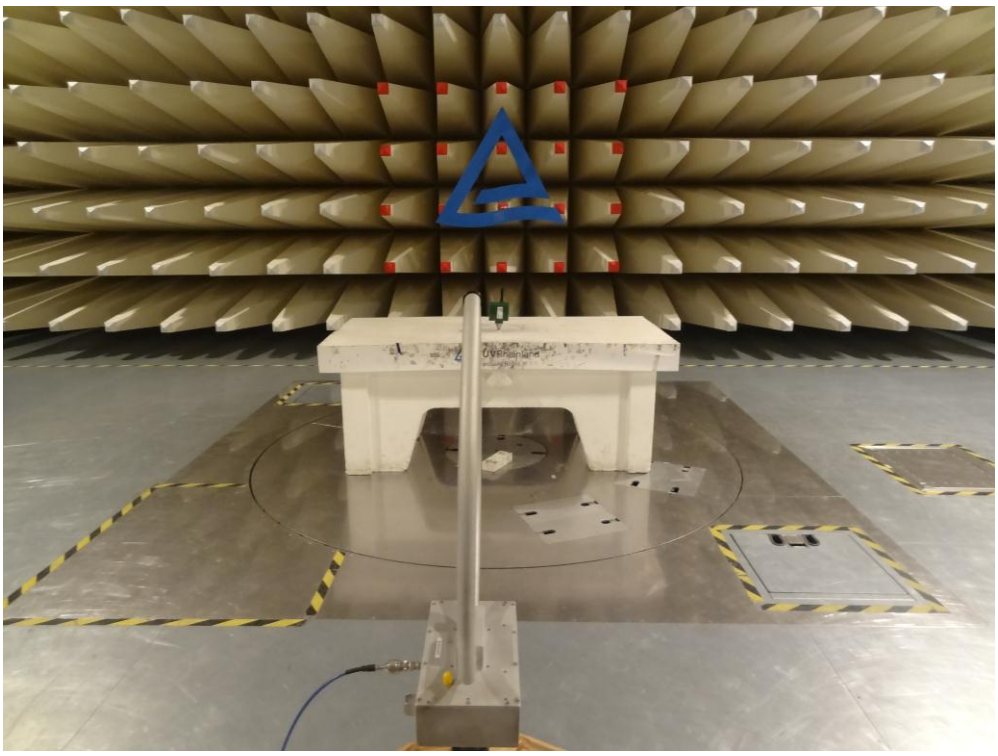
*- -> Fundamental frequency



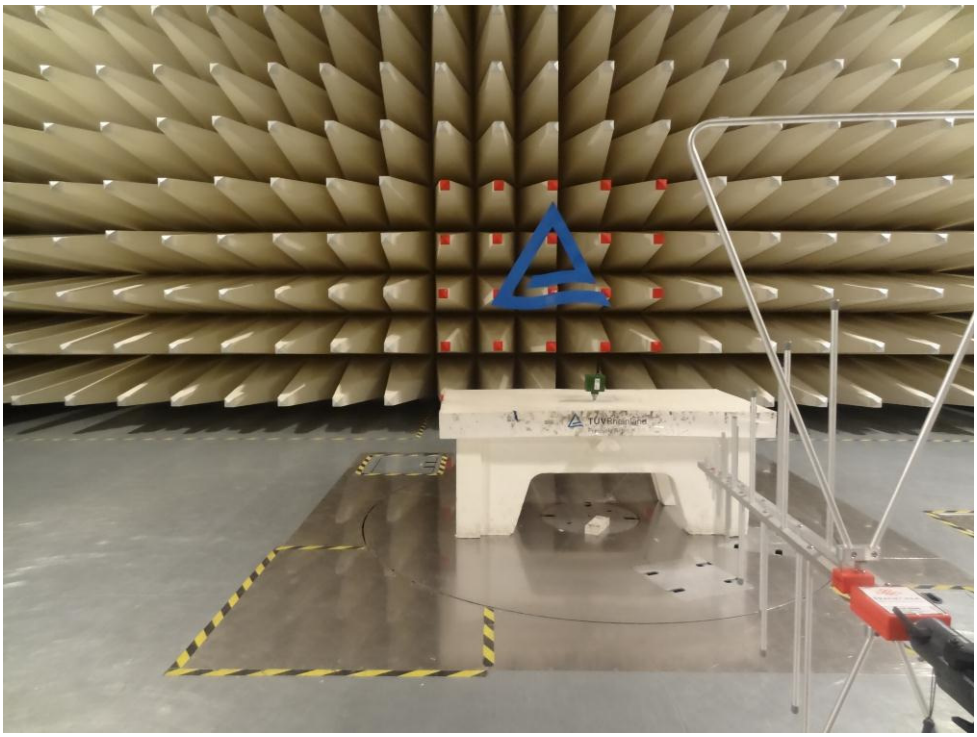
Test setup- Product on the Table



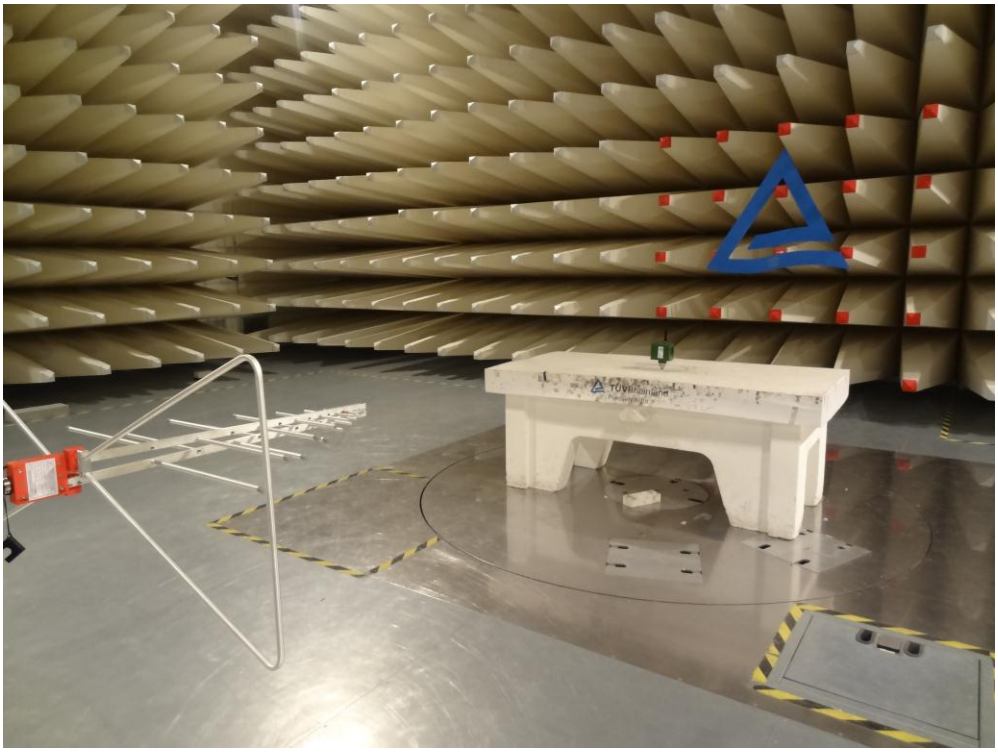
Test setup 9kHz -30MHz



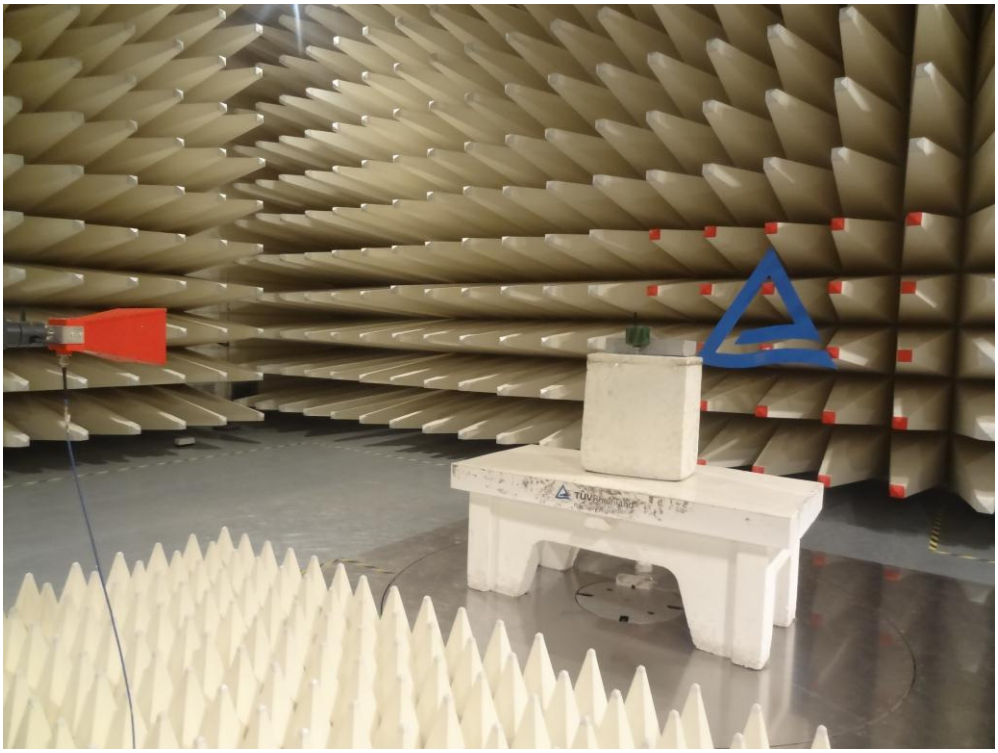
Test setup 9kHz -30MHz



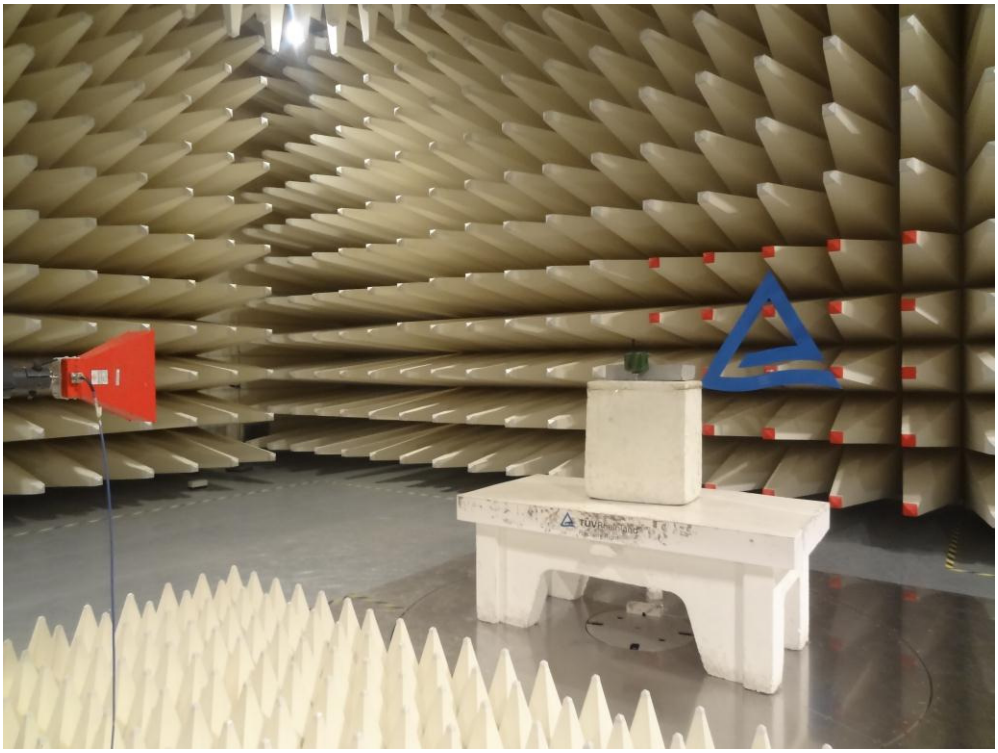
Test setup 30MHz -1GHz



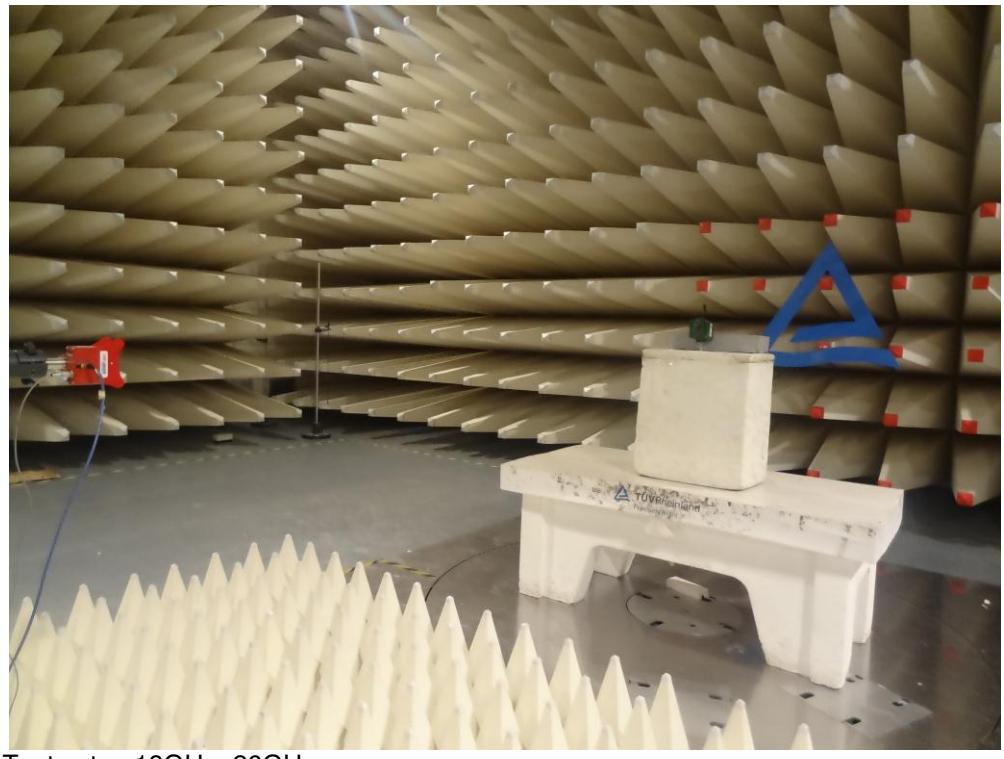
Test setup 30MHz -1GHz



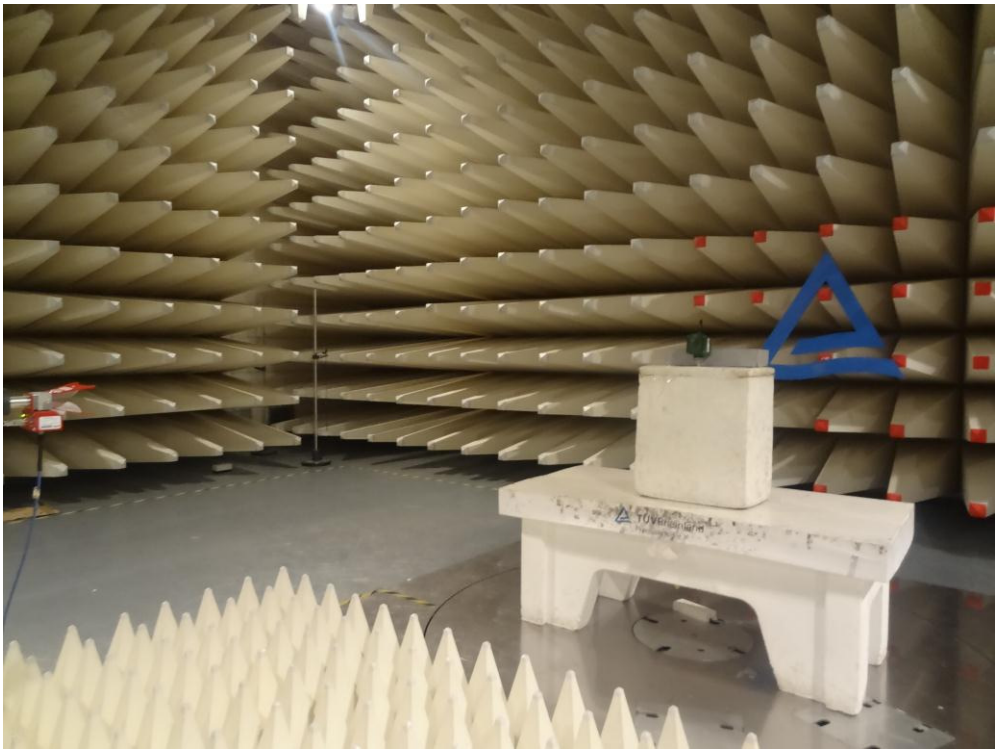
Test setup 1GHz -18GHz



Test setup 1GHz -18GHz



Test setup 18GHz -26GHz



Test setup 18GHz -26GHz

*****END OF TEST REPORT*****