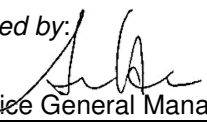


Prüfbericht-Nr.: <i>Test Report No.:</i>	50144188 001	Auftrags-Nr.: <i>Order No.:</i>	114076790	Seite 1 von 24 <i>Page 1 of 24</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	19-April-2018	
Auftraggeber: <i>Client:</i>	CUBTEK INC. Rm.7, 6F., No.38, Taiyuan St., Zhubei City, Hsinchu County, Taiwan(R.O.C)			
Prüfgegenstand: <i>Test item:</i>	24GHz BSD Radar			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Please refer page 9 for applied model list			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part15.249 test report			
Prüfgrundlage: <i>Test specification:</i>	FCC 47CFR Part 15: Subpart C Section 15.249			
Wareneingangsdatum: <i>Date of receipt:</i>	27-April-2018			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000732150-001 – A000732150-004			
Prüfzeitraum: <i>Testing period:</i>	3-May-2018 - 10-May-2018			
Ort der Prüfung: <i>Place of testing:</i>	EMC Laboratory Taipei			
Prüflaboratorium: <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
Report date / tested by:		kontrolliert von / reviewed by:		
2018-05-17 Mars Y.J. Lin/ Project Engineer		2018-05-17 Arvin Ho/ Vice General Manager		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>
				
Sonstiges / Other: There are two types of this 24G radar system, only the connector is different. Please refer the APPENDIXP for detailed information. The 24G radar system TX and RX sample use the same hardware.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable 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. <i>This test report only 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 test mark.</i>				

TEST SUMMARY

5.1.1 ANTENNA REQUIREMENT

RESULT: Passed

5.1.2 FIELD STRENGTH OF FUNDAMENTAL

RESULT: Passed

5.1.3 20dB BANDWIDTH

RESULT: Passed

5.1.4 SPURIOUS EMISSION

RESULT: Passed

6.1.1 ELECTROMAGNETIC FIELDS

RESULT: Passed

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1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix P: Photo Documentation

(File Name: 50144188APPENDIXP)

Appendix D: Test Result of Radiated Emissions

(File Name: 50144188APPENDIXD)

Test Specifications

The following standards were applied.

Table 1: Applied Standard and Test Levels

Radio
FCC 47CFR Part 15: Subpart C Section 15.249 ANSI C63.10:2013 KDB 447498 D01

2. Test Sites

2.1 Test Facilities

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.
Taipei City 105
Taiwan (R.O.C.)

FCC Registration No.: 340738
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective periods: 2016-Jul-1st to 2019-Jun-30th



Testing Laboratory
0759

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manu-facturer	Type	S/N	Last Calibration	Next Calibration
Test Software	Farad	EZ_EMC	Ver. TUV3A1	N/A	N/A
EMI Test Receiver	R&S	ESR 7	101549	2017/11/10	2018/11/10
Spectrum Analyzer	Agilent	N9010A	MY53470241	2018/05/23	2019/05/22
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2017/08/14	2018/08/14
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2018/01/18	2019/01/18
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	60558	2017/11/21	2018/11/21
Bilog Antenna	TESEQ	CBL6111D	29804	2017/08/18	2018/08/18
Horn Antenna	ETS-Lindgren	3117	201918	2017/08/18	2018/08/18
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101029	2017/11/28	2018/11/28
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2017/06/14	2018/06/14
EMI Test Receiver	R&S	ESR 7	101549	2017/11/10	2018/11/10
Spectrum Analyzer	R&S	FSL3	101943	2015/09/07	2018/09/07
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2017/03/09	2019/03/09
LISN (1 phase)	R&S	ENV216	101243	2017/06/18	2018/06/18
LISN	R&S	ENV216	101262	2017/06/22	2018/06/21
Harm. Mixer, 40-60 GHz	OML	WR-19	1601 1801	NCR	NCR
Harm. Mixer, 50-75 GHz	Keysight / VDI	N9029AV15	US54250104	NCR	NCR
Harm. Mixer, 75-110 GHz	Keysight / VDI	N9029AV10	US53250005	NCR	NCR
Signal Generator	Keysight	E8257D	SG53400472	2016/06/08	2018/06/08

Produkte

Products

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Kind of Equipment	Manu-facturer	Type	S/N	Last Calibration	Next Calibration
RF Detector	Millitech	DET-15RPFW0	065	NCR	NCR
Low Pass Filter, 10 MHz	Woken	WFIL-L10F	WR366WC2B1	NCR	NCR
Pre-Amplifier	Spacek Labs	SLV-20-4	16E12	NCR	NCR
Oscilloscope	Tektronix	TDS430A	B060509	NCR	NCR
Power Meter	Keysight	N1911A	MY56020004	2016/06/14	2018/06/14
Power Sensor coax 50GHz	Keysight	8487D	MY55500010	2016/06/14	2018/06/14
Power Sensor Waveguide 50-75 GHz	Keysight	V8486A	MY56110003	2016/06/14	2018/06/14
Source 50-75 GHz	Keysight / VDI	E8257DV15	US54250110	NCR	NCR
Source 75-110 GHz	Keysight / VDI	E8257DV10	US53250015	NCR	NCR
Source 90-140 GHz	Keysight / VDI	E8257DV08	US53250005	NCR	NCR

2.3 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are $\pm 3\text{dB}$.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
RF power, conducted	$\pm 1.5 \text{ dB}$
Adjacent channel power	$\pm 3 \text{ dB}$
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6 \text{ dB}$
Radiated emission of receiver, valid up to 26 GHz	$\pm 6 \text{ dB}$
Temperature	$\pm 2 \text{ }^{\circ}\text{C}$
Humidity	$\pm 10 \text{ \%}$

3. General Product Information

3.1 Product Function and Intended Use

The EUT is Vehicle Blind Spot Detection. It is designed to aid in detecting vehicles that may entered the blind spot zone.
 For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 Ratings and System Details

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment	24GHz BSD Radar
Type Designation	VS-91A002
Brand	CubTEK

Applied Model list:

VS-92XXXX	VS-92XXXXX	VS-92XXXXXX
VS-92XXXXXXX	VS-92XXXX-X	VS-92XXXXX-X
VS-92XXXXXX-X	VS-92XXXXXXX-X	VS-92XXXX-XX
VS-92XXXXX-XX	VS-92XXXXXX-XX	VS-92XXXXXX-XX
VS-92XXXX-XXXX	VS-92XXXX-XXXX	VS-92XXXXXX-XXXX
VS-92XXXXXX-XXXX		
VS-95XXXX	VS-95XXXXX	VS-95XXXXXX
VS-95XXXXXXX	VS-95XXXX-X	VS-95XXXXX-X
VS-95XXXXXX-X	VS-95XXXXXXX-X	VS-95XXXX-XX
VS-95XXXXX-XX	VS-95XXXXXX-XX	VS-95XXXXXX-XX
VS-95XXXX-XXXX	VS-95XXXX-XXXX	VS-95XXXXXX-XXXX
VS-95XXXXXX-XXXX		

All models electrical constructions are similar, as described on the cover page, with various models numbers for different marketing purpose. The suffix "X" can be 0-9, A-Z, a-z, "-", ",", or blank, which is for difference marketing purpose.

One representative set of samples with model "VS-91A002" was tested and recorded in this report.

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequencies	24.03GHz to 24.23GHz
Channel number	1
Operation Voltage	12Vdc
Modulation	FMCW
Antenna Gain	7dBi

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
 - 1. 24.125GHz
- B. Receiving
 - 1. 24.125GHz

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description
- Block Diagram
- Antenna report

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum emission level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Setup for testing: EUT is modified by manufacturer at a test mode firmware. It can transmit and receive continuously when powered on.

Full test was applied on all test modes, but only worst case was shown.

4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

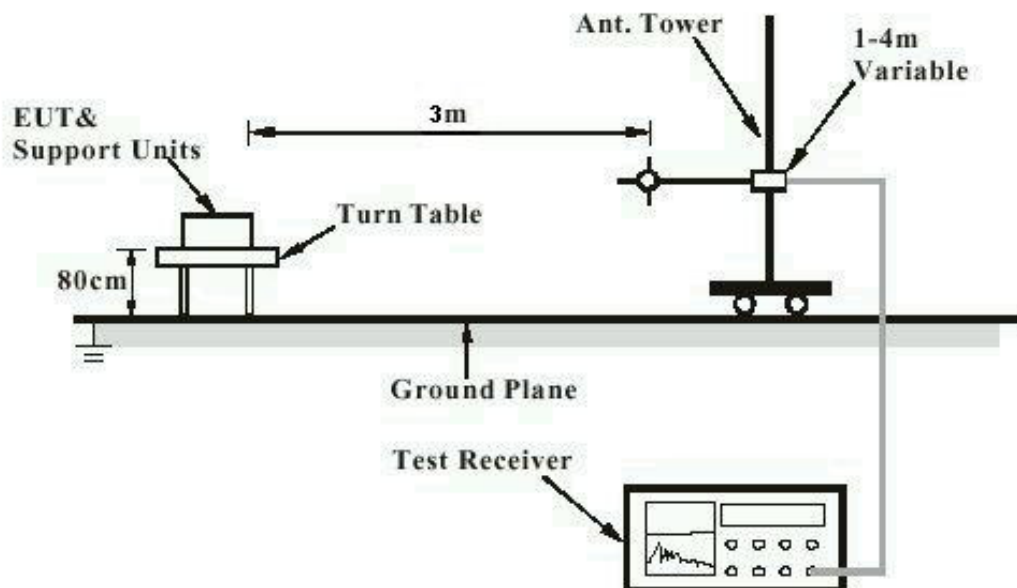
None

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m

40G-110G spurious emissions measurement:

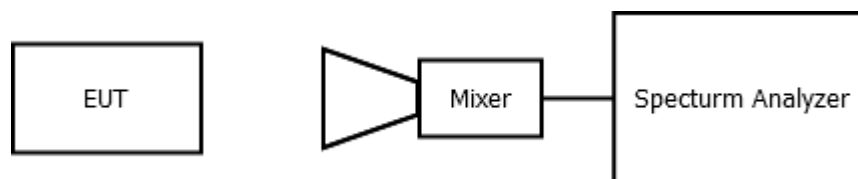
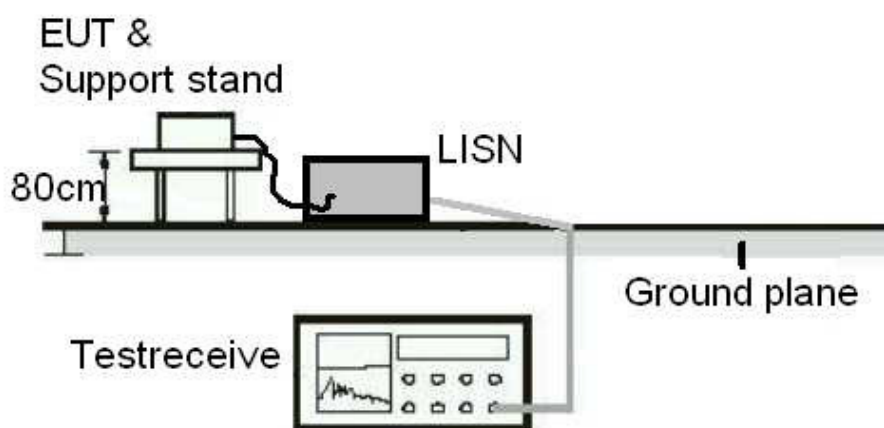


Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)



4.6 Test Environment

Ambient temperature	:	18-25 °C
Relative humidity	:	45-65 %

5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Passed**

Standard : Part 15.203

Requirement : Use of approved antennas only

The antenna is Antenna Array with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.

5.1.2 Field strength of fundamental

RESULT:

Passed

Test standard : FCC Part 15.249
 Basic standard : ANSI C63.10:2013
 Kind of test site : Semi-Anechoic Chamber
 Operation Modes : A

In the table below the maximum results found are reported.

For detailed results of all frequencies tested, please refer to Appendix D.

Table 6: Test result of Field strength of fundamental

TX Frequency (MHz)	Antenna Orientation	Detector Mode	Peak power Frequency (MHz)	Peak power Level (dBuV/m)	Limit (dBuV/m)	Result
24125	Horizontal	Peak	24028.100	87.22	128.00	PASS
		Average	24028.100	45.59	108.00	PASS
	Vertical	Peak	24173.000	111.39	128.00	PASS
		Average	24173.000	62.78	108.00	PASS

Remark: For details refer to Appendix D.

5.1.3 20dB Bandwidth

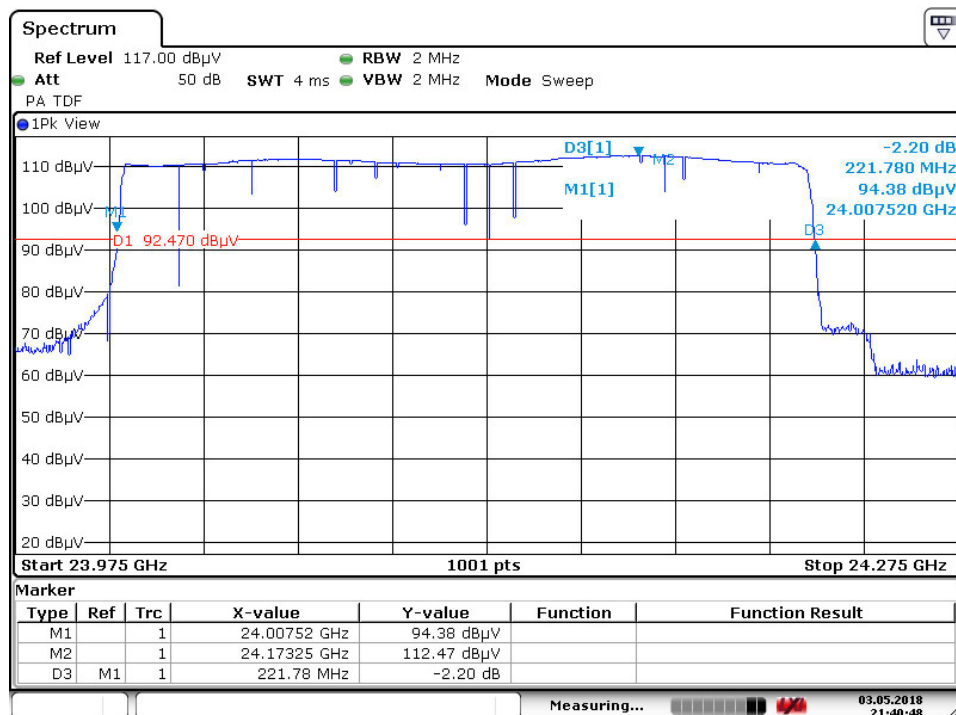
RESULT:
Passed

Test standard : Part 15.249
 Basic standard : ANSI C63.10:2013
 Kind of test site : Semi-Anechoic Chamber
 Operation Modes : A

Table 7: Test result of 20dB Bandwidth

Frequency(MHz)	20dB Bandwidth (MHz)
24125	221.78

Test Plot of 20dB Bandwidth



Date: 3.MAY.2018 21:40:49

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5.1.4 Spurious Emission

RESULT:**Passed**

Test standard	:	Part 15.249
Basic standard	:	ANSI C63.10:2013
Limits	:	Part 15.249(a)
Kind of test site	:	3m Semi-Anechoic Chamber
		Semi-Anechoic Shielded Room (40GHz to 100 GHz)
Operation Modes	:	A

Remark: Testing was carried out within frequency range 9kHz to 100GHz.

For details refer to Appendix D.

The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

6. Safety Human exposure

6.1 Radio Frequency Exposure Compliance

6.1.1 Electromagnetic Fields

RESULT:**Passed**Test standard : 47CFR 1.1310
47CFR 2.1091

Separation distance is more than 20 cm, thus mobile device exposure limits can be applied

Maximum Exposure:

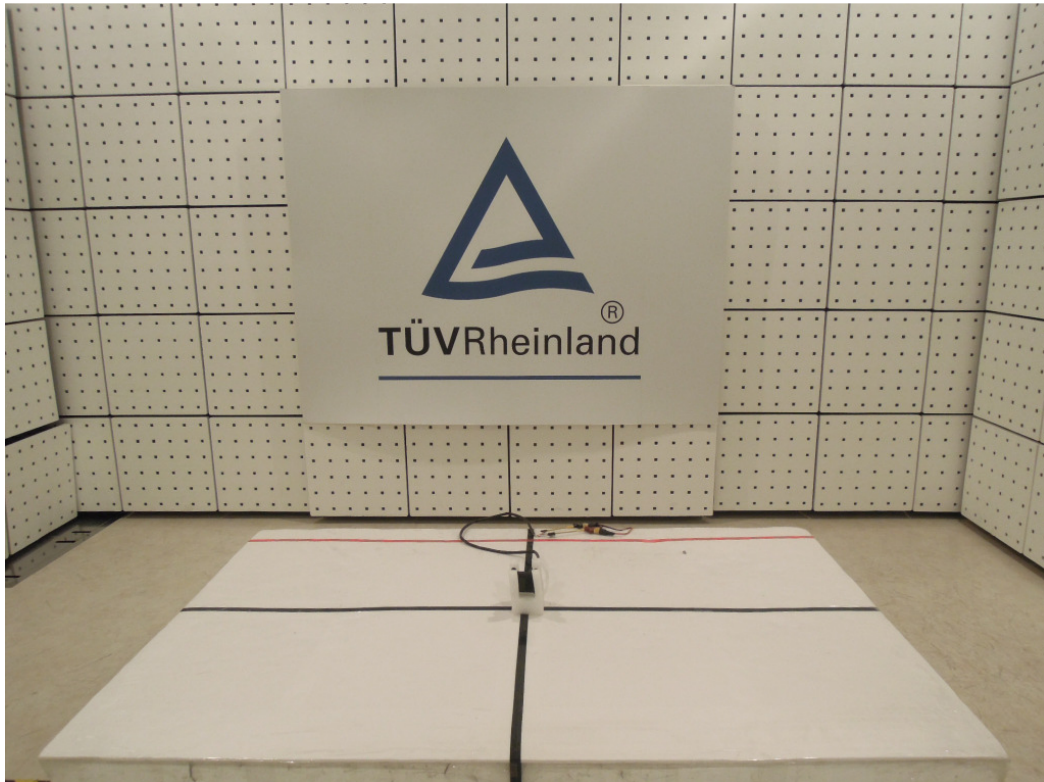
Power to Antenna (mW)	2.76 mW
Power to Antenna (dBm)	4.4 dBm
Antenna Gain	7 dBi
Power+Ant Gain	13.8 mW
Distance	20 cm
S=	0.003 mW/cm ²

Limit FCC: 1.0 mW/cm²FCC:

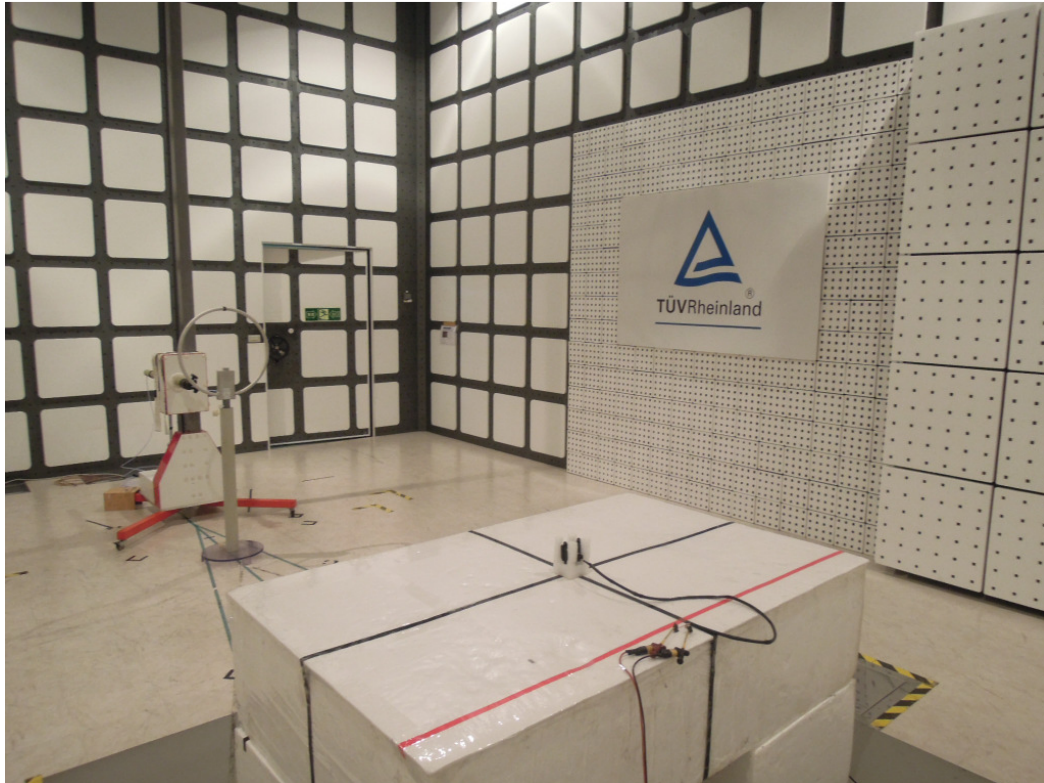
0.3-1.34 MHz	(100) mW/cm ²
1.34-30 MHz	(180/f ²) mW/cm ²
30-300 MHz	0.2 mW/cm ²
300-1500 MHz f/1500	mW/cm ²
1500-100,000 MHz	1.0 mW/cm ²

7. Photographs of the Test Set-Up

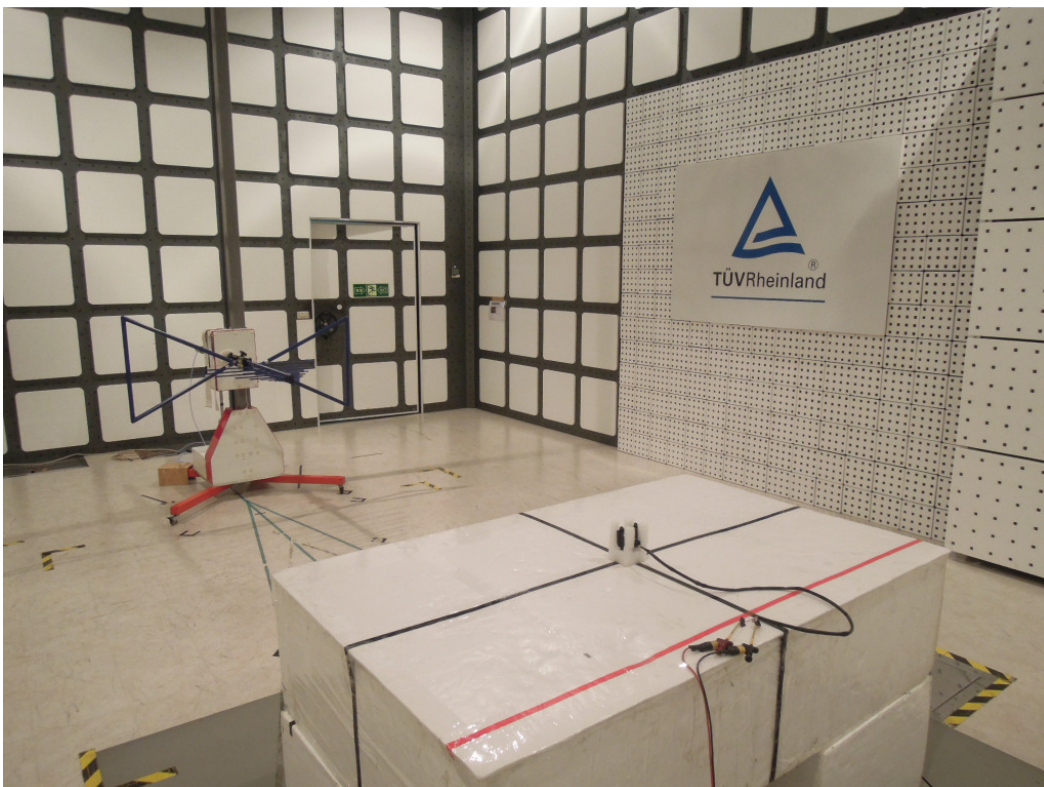
Photograph 1: Set-up for Spurious Emissions (Front View)



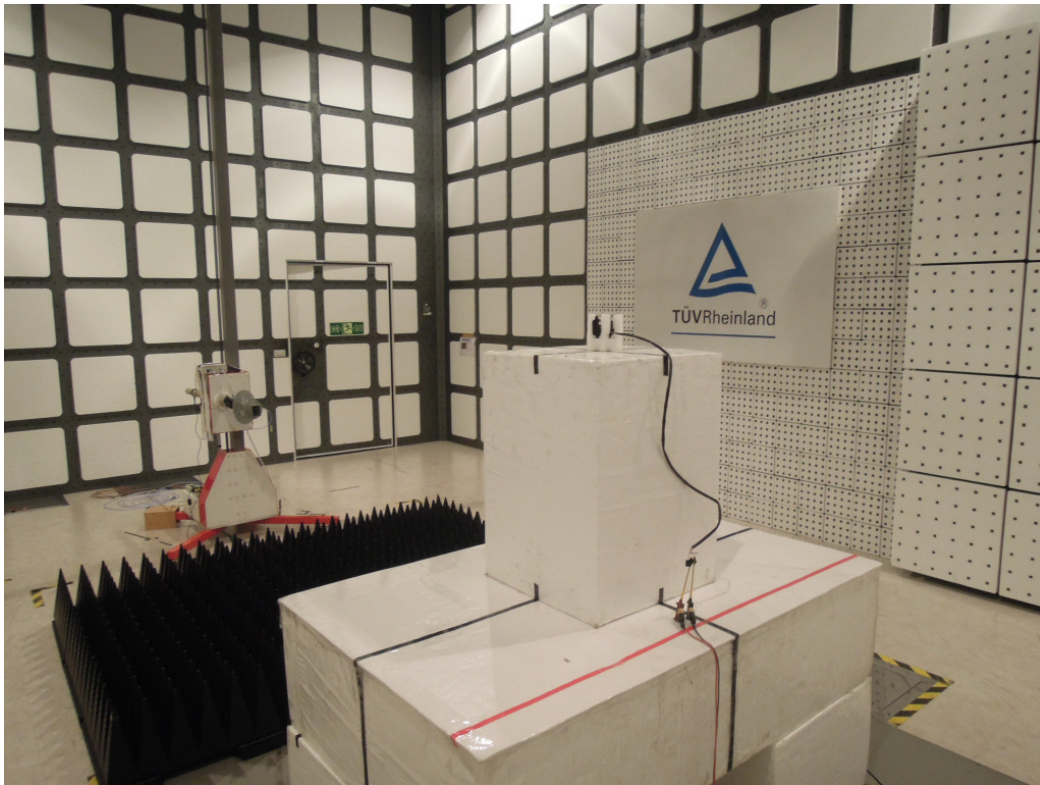
Photograph 2: Set-up for Spurious Emissions (Back View 1 TX)



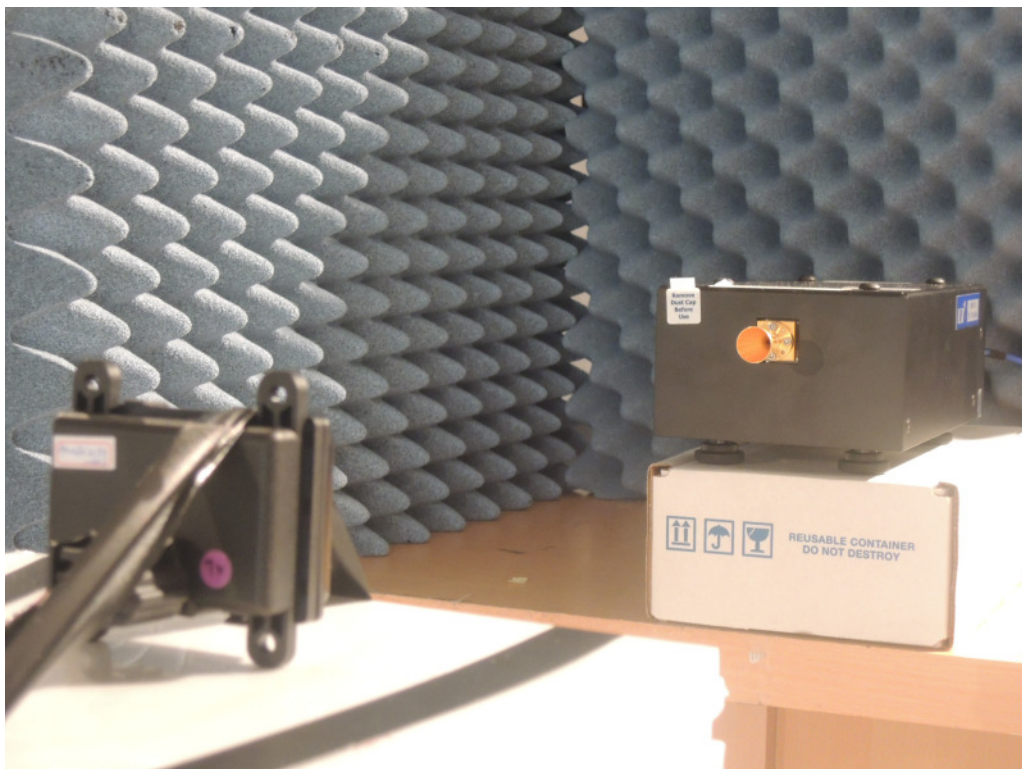
Photograph 3: Set-up for Spurious Emissions (Back View 2 TX)



Photograph 4: Set-up for Spurious Emissions (Back View 3 TX)



Photograph 5: Set-up for Spurious Emissions (40-100GHz)



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