

Prüfbericht-Nr.: <i>Test Report No.:</i>	50075140 001	Auftrags-Nr.: <i>Order No.:</i>	114061337	Seite 1 von 26 <i>Page 1 of 26</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	18-Feb-2017	
Auftraggeber: <i>Client:</i>	CUB ELECPARTS INC, No.6, Lane 546, Sec.6, Changlu Road, Fuhsin Township Changhua County, Taiwan			
Prüfgegenstand: <i>Test item:</i>	Dual frequency programmable universal TPMS			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	Refer to section 1.2			
Auftrags-Inhalt: <i>Order content:</i>	FCC Part 15C Test report RSS-210 Test report			
Prüfgrundlage: <i>Test specification:</i>	FCC CFR47 Part 15: Subpart C Section 15. 231(e) RSS-210 Issue 8, December 2010			
Wareneingangsdatum: <i>Date of receipt:</i>	23-Feb-2017			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000503737-005			
Prüfzeitraum: <i>Testing period:</i>	08-Mar-2017- 15-Mar-2017			
Ort der Prüfung: <i>Place of testing:</i>	EMC/RF Laboratory Taipei			
Prüflaboratorium: <i>Testing laboratory:</i>	TUV Rheinland Taiwan Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
2017-03-22 Amy S.R.Hsu /Engineer <i>Datum</i> <i>Name / Stellung</i> <i>Date</i> <i>Name / Position</i>		2017-03-22 Rene Charton/Senior Project Manager <i>Datum</i> <i>Name / Stellung</i> <i>Date</i> <i>Name / Position</i>		
<i>Unterschrift</i> <i>Signature</i>		<i>Unterschrift</i> <i>Signature</i>		
Sonstiges / Other:				
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 FIELD STRENGTH OF HARMONICS

RESULT: Passed

5.1.4 20dB BANDWIDTH AND 99% BANDWIDTH

RESULT: Passed

5.1.5 TRANSMISSION TIME /TX GAP

RESULT: Passed

5.1.6 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: 50075140APPENDIX P)

Appendix D: Test Result of Radiated Emissions

(File Name: 50075140APPENDIX D)

Test Specifications

The following standards were applied (in bold: product standards, otherwise: basic standards).

Table 1: Applied Standard and Test Levels

Radio
FCC CFR47 Part 15: Subpart C Section 15. 231(e) RSS-210 Issue 8, December 2010 RSS-Gen, Issue 4, November 2014 ANSI C63.10:2013

1.2 Model name

VS-62UXXX	VS-62UXXXX	VS-62UXXXXX	VS-62UXXXXXX
VS-62UXXX-X	VS-62UXXXX-X	VS-62UXXXXX-X	VS-62UXXXXXX-X
VS-62UXXX-XX	VS-62UXXXX-XX	VS-62UXXXXX-XX	VS-62UXXXXXX-XX
VS-62UXXX-XXXX	VS-62UXXXX-XXXX	VS-62UXXXXX-XXXX	VS-62UXXXXXX-XXXX
VS-6XWXXX	VS-6XWXXXX	VS-6XWXXXXX	VS-6XWXXXXXX
VS-6XWXXX-X	VS-6XWXXXX-X	VS-6XWXXXXX-X	VS-6XWXXXXXX-X
VS-6XWXXX-XX	VS-6XWXXXX-XX	VS-6XWXXXXX-XX	VS-6XWXXXXXX-XX
VS-6XWXXX-XXXX	VS-6XWXXXX-XXXX	VS-6XWXXXXX-XXXX	VS-6XWXXXXXX-XXXX

1. Main model name : DF-Unisensor
2. For the marketing purpose ,Where X may be any alpha character "a"- "z", "A"- "Z", or numeric character "0"- "9", or -, (,) , or blank or combination of alpha and numeric characters.

2. Test Sites

2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.
Taichung Branch Office

No.9, Lane 36, Minsheng Rd., Sec. 3, Daya District,
Taichung City 428
Taiwan (R.O.C.)

2.2 Test Facility

TUV Rheinland Taiwan Ltd.
Taipei Office

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

FCC RegistrationNo.: 799772
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective period: 2016-Jul-1st to 2019-Jun-30th



Testing Laboratory
0759

2.3 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	ESR7	101062	2016/09/12	2017/09/12
Spectrum Analyzer	R&S	FSV 40	100921	2016/04/21	2017/04/21
Spectrum Analyzer	Agilent	N9010A	MY53470241	2016/04/25	2017/04/24
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	2016/07/29	2017/07/29
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	2016/12/01	2017/12/01
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	060558	2016/11/17	2017/11/17
Bilog Antenna	TESEQ	CBL6111D	29804	2016/06/23	2017/06/23
Horn Antenna	ETS-Lindgren	3117	138160	2016/05/03	2017/05/03
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101029	2016/10/11	2017/10/11
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2016/05/11	2017/05/11
EMI Test Receiver	R&S	ESC17	100797	2016/12/30	2017/12/30
Spectrum Analyzer	R&S	FSL3	101943	2015/09/07	2017/09/07
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	2015/07/13	2017/07/12
LISN (1 phase)	R&S	ENV216	101243	2016/06/02	2017/06/02
LISN	R&S	ENV216	101262	2016/06/16	2017/06/16
Test Software	Audix	e3	Ver. 9	N/A	N/A

2.4 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.

2.5 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.

2.6 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
Radio Frequency	$\pm 1 \times 10^{-7}$
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	$\pm 10 \%$

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Tire Pressure Monitoring System. It contains a wireless 315MHz and 433MHz Transmitter chip enabling the user to send Tyre pressure data to a remote receiver
For details refer to the User Guide, Data Sheet and Circuit Diagram.

3.2 System Details and Ratings

Table 4: Basic Information of EUT

Item	EUT information
Kind of Equipment	Dual frequency programmable universal TPMS
Type Designation	DF-Unisensor
FCC ID	ZPNDFUNISENSOR
Canada ID	9959A-DFUNISENSOR
Canada HVIN	DF-Unisensor

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequency	315MHz, 433.92MHz
Channel number	1
Operation Voltage	3Vdc
Modulation	ASK (Pulse) & FSK
Pulse Width	10.4 ms

3.3 Independent Operation Modes

Basic operation modes are:

- A. Transmitting
- B. Standby

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

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: Test samples are provided with a test mode firmware which makes it possible to transmit signal when switched on the power.

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

4.3 Auxiliary Equipment

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

N/A

4.4 1.1 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.

5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:**Passed**

Standard	:	Part 15.203 and RSS-Gen 8.3
Requirement	:	Manufacturer must ensure approved antenna is used

The antenna is loop antenna 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. 231(e)
RSS-210 A1.1, Table B

Basic standard : ANSI C63.10:2013

Test setup

Test Channel : 433.92 MHz,
Operation Mode : Pulse Transmission

Atmospheric pressure : 100-103 kPa

The EUT employs pulsed operation.
The pulse width is: 10.4 msec.

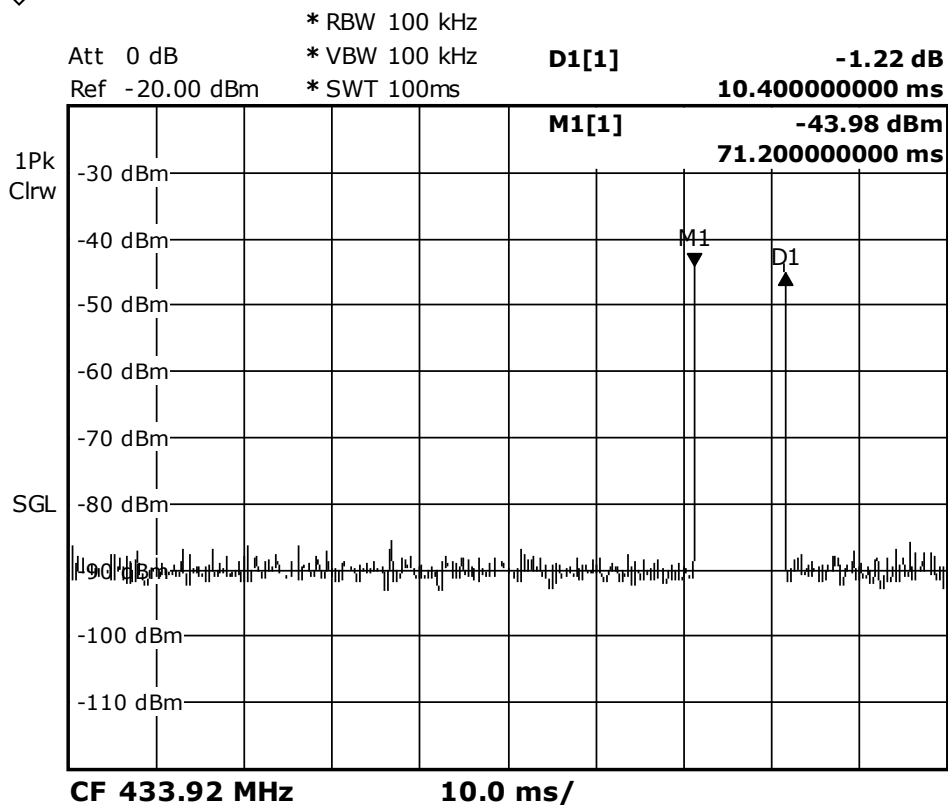
The Tables below show calculated average values from the pulsed emissions measurement 315MHz, corrected with the worst case duty cycle factor over 100 msec.

The average values noted are calculated through the application of a duty cycle correction, according to part 15.35c

Duty cycle calculation:

Duty cycle correction (dB) = $20 \log (10.4 \text{ msec} / 100 \text{ msec}) = -19.65 \text{ dB}$.

Test Plot pulse width



Date: 15.MAR.2017 10:04:07

Table 6: Test result of Field strength of fundamental

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Antenna orientation	Detector or calculated value
433.92	74.03	92.86	Horizontal	Peak
433.92	62.51	72.86		Average
433.92	73.64	92.86	Vertical	Peak
433.92	60.5	72.86		Average

5.1.3 Field strength of harmonics

RESULT:
Passed

Test standard : FCC Part 15. 231(e)
 RSS-210 A1.1, Table B
 LP0003 3.4.2 (5.2)

Basic standard : ANSI C63.10:2013

Test setup

Test Channel : 433.92 MHz
 Operation Mode : A

Atmospheric pressure : 100-103 kPa

Table 7: Test result of Field strength of harmonics, maximum

Frequency (MHz)	Test result			
	Level (dBuV/m)	Limit (dBuV/m)	Antenna orientation	Detector
867.8400	48.00	52	Horizontal	QP
867.8400	39.22	52	Vertical	QP
3908.000	48.12	74	Horizontal	Peak
3908.000	<48.12	54		Average
4516.000	41.16	74	Vertical	Peak
4516.000	<41.16	54		Average

Remark: The maximum results found are reported. For detailed results of all frequencies tested, please refer to Appendix D.

5.1.4 20dB Bandwidth and 99% Bandwidth

RESULT:
Passed

Test standard : FCC Part 15.231(c), A1.1.3, RSS Gen
 Basic standard : ANSI C63.10:2013,
 Kind of test site : Shielded room

Test setup

Test Channel : 433.92MHz (20dB BW)
 433.92MHz (99% OBW)
 Operation Mode : A

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier..

Ambient temperature : 22-26 °C
 Relative humidity : 50-65 %
 Atmospheric pressure : 100-103 kPa

Table 8: Test result of 20 dB Bandwidth,

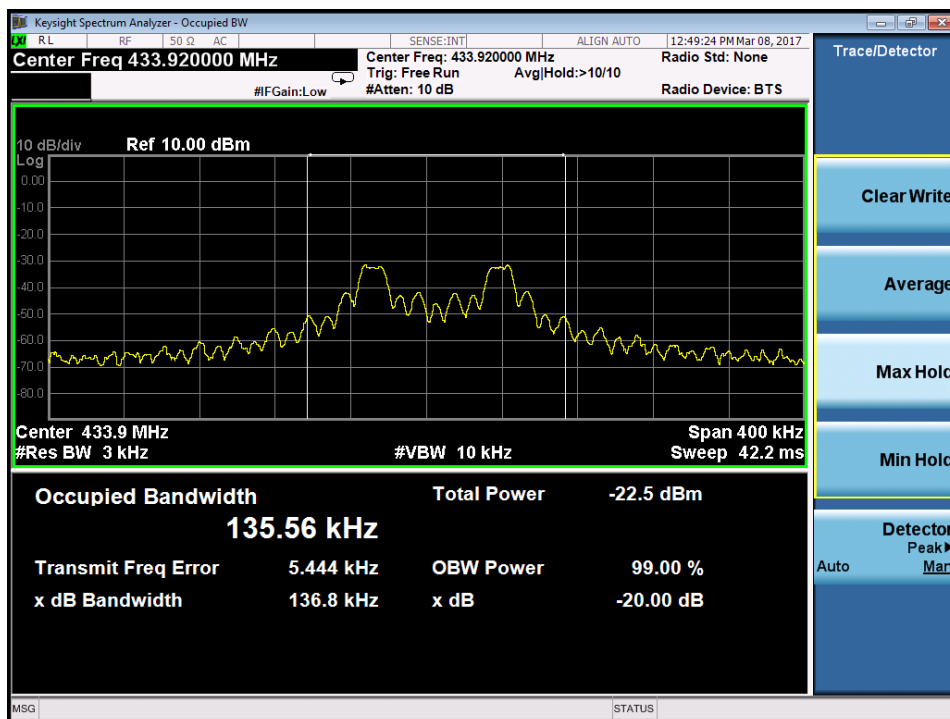
Channel	Channel Frequency (MHz)	-20 dB BW (kHz)	Limit (kHz)	Result
1 Channel	433.92MHz	138.8	1084.8	Pass

Table 9: Test result of 99% Bandwidth

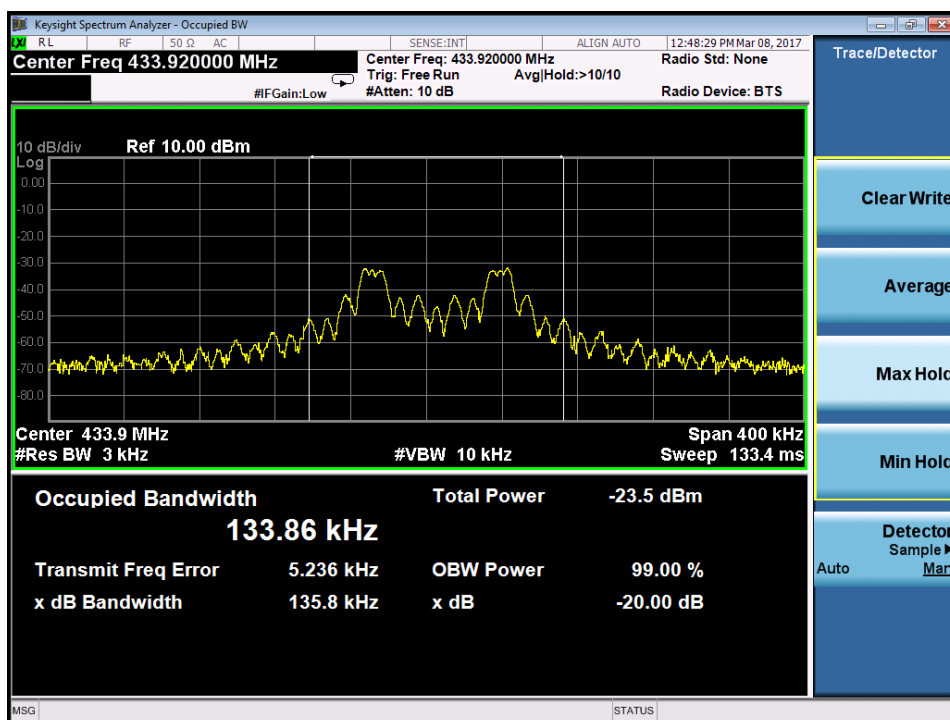
Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)
1 Channel	433.92MHz	133.86

Test Plot of -20 dB Point

Channel 1



Test Plot of 99% BW



5.1.5 Transmission time /TX gap

RESULT:
Passed

Test standard : FCC Part 15.231(e), A1.1.3, RSS Gen LP0003 3.4.2
 Basic standard : ANSI C63.10:2013,
 Kind of test site : Anechoic Chamber

Test setup

Test Channel : 433.92MHz
 Operation Mode : Pulse Transmission

The device has automatic control mechanism such that each transmission time(Pulse width) is shorter than 1 second, and stop duration of a transmission period(TX gap) is longer than 10 seconds and is not shorter than transmission time multiplied by 30.

Atmospheric pressure : 100-103 kPa

Table 10: Transmission time

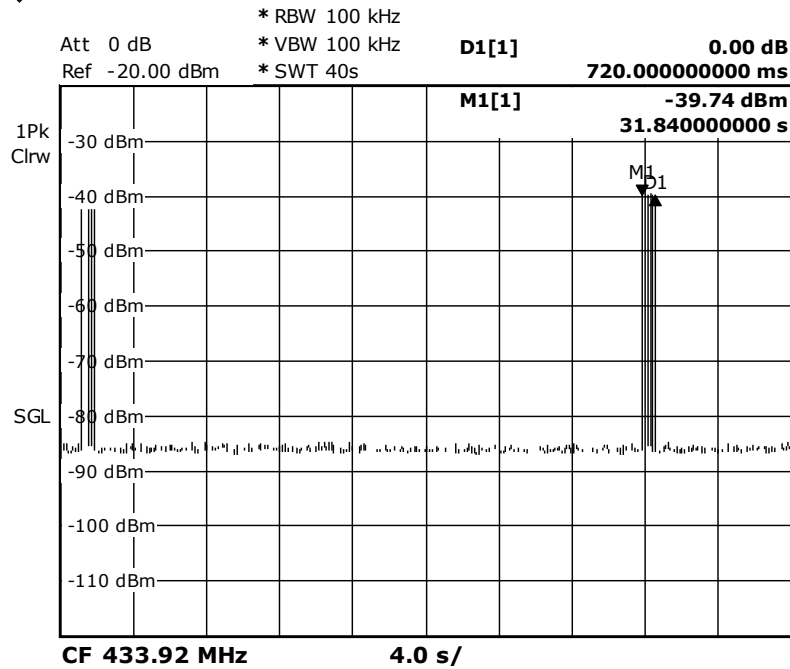
Channel Frequency (MHz)	Pulse Width (ms)	Limit (Second)	Result
433.92	720	1	PASS

Table 11: TX gap

Channel Frequency (MHz)	TX gap (Second)	Limit (Second)	Result
433.92	29.84	>21.6	PASS

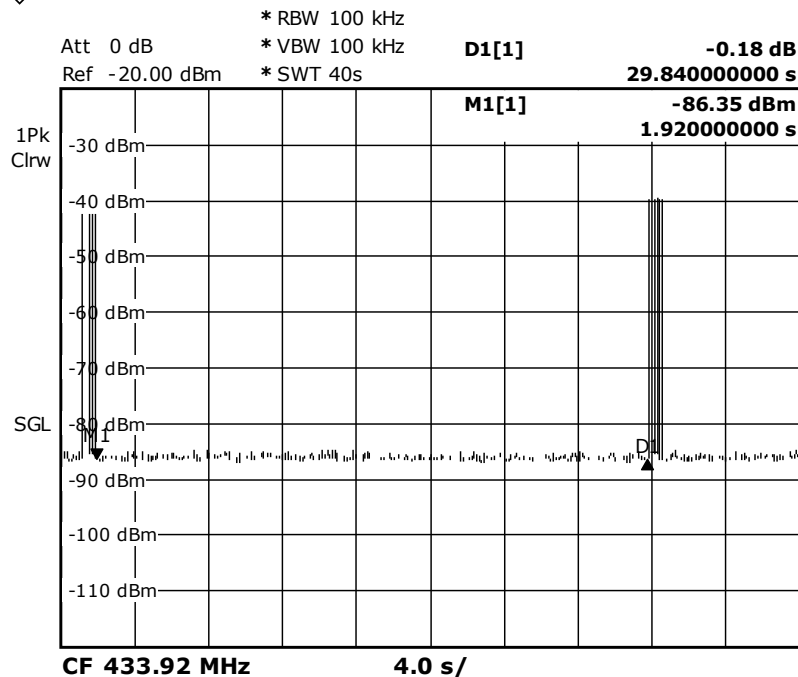
30 times of transmission time = 720ms * 30 = 21.6s

Test Pulse Width



Date: 15.MAR.2017 10:24:05

TX Gap



Date: 15.MAR.2017 10:23:15

5.1.6 Spurious Emission

RESULT:**Passed**

Test standard	:	FCC part 15. 231(b) AND FCC 15.205, FCC 15.209, RSS-210 A1.1.5(3) AND RSS-Gen
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a), must comply with the radiated emission limits specified in FCC 15.209(a). Emission radiated outside the specified frequency bands must comply with the radiated emission limits specified in FCC 15.209(a) or FCC 15. 231(b).
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	433.92MHz
Operation mode	:	A.

Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

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 : FCC KDB Publication 447498 D01 v06
RSS-102 issue 5, Table 1

FCC:

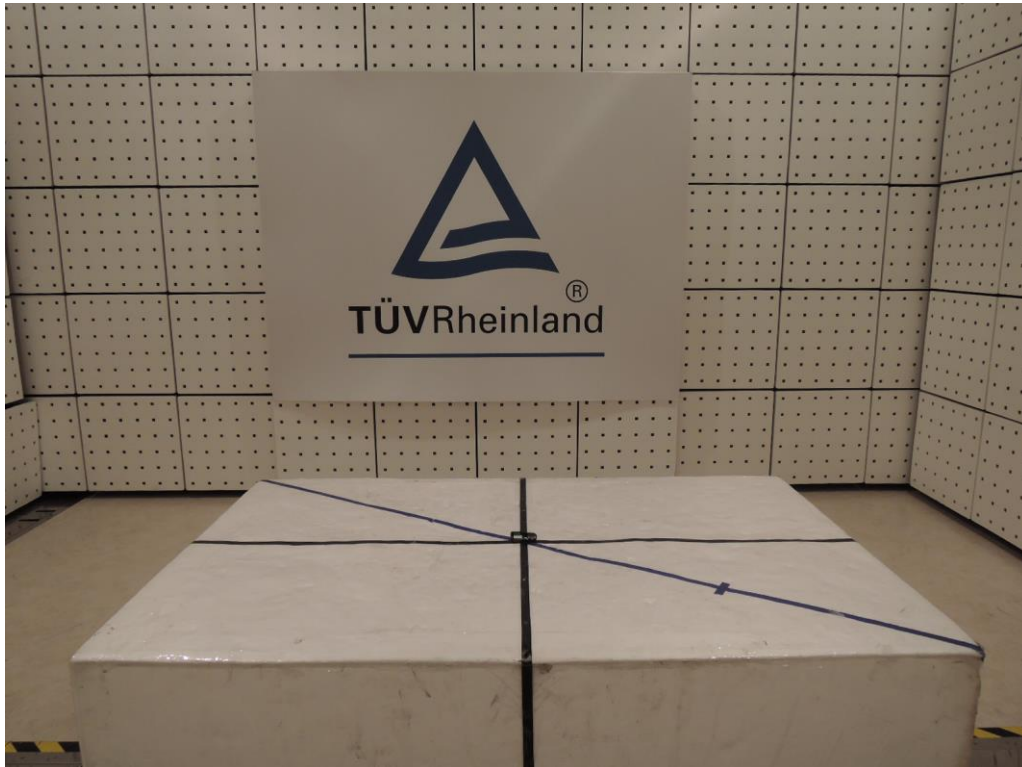
Since maximum peak output power of the transmitter is $0.00763 \text{ mW} < 10 \text{ mW}$, hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498: Mobile Portable RF Exposure

Canada:

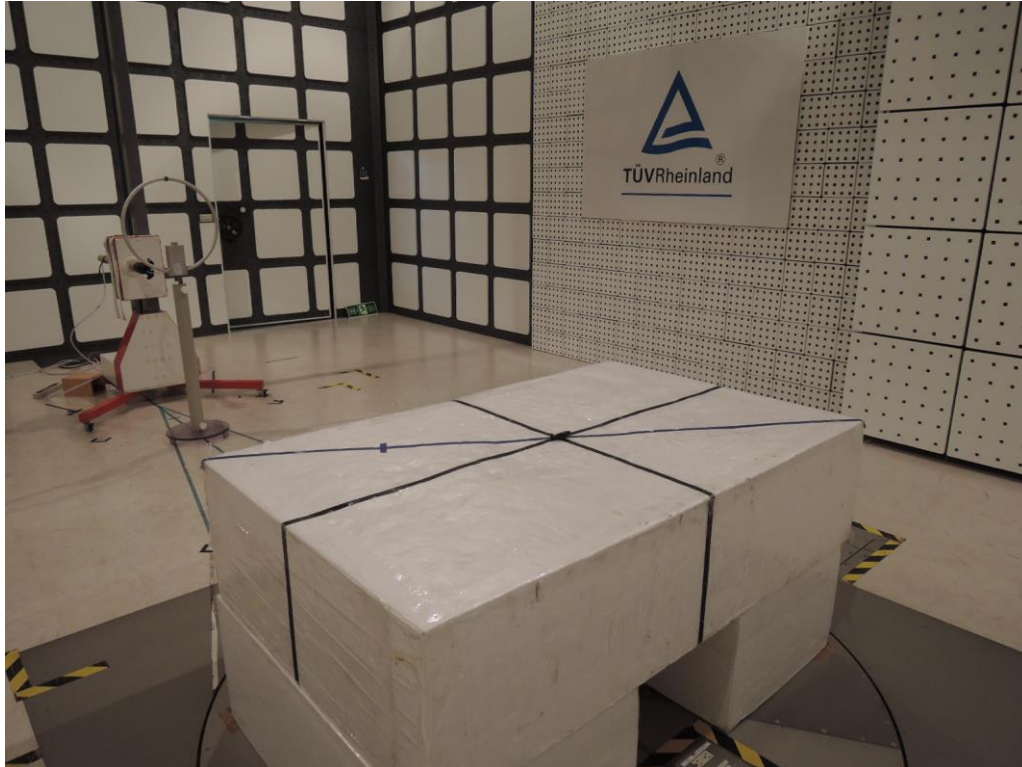
Since maximum output power, of the transmitter $0.00763 < 90 \text{ mW}$ (at 10mm), hence the EUT is excluded from SAR evaluation according to Table 1 in RSS-102

7. Photographs of the Test Set-Up

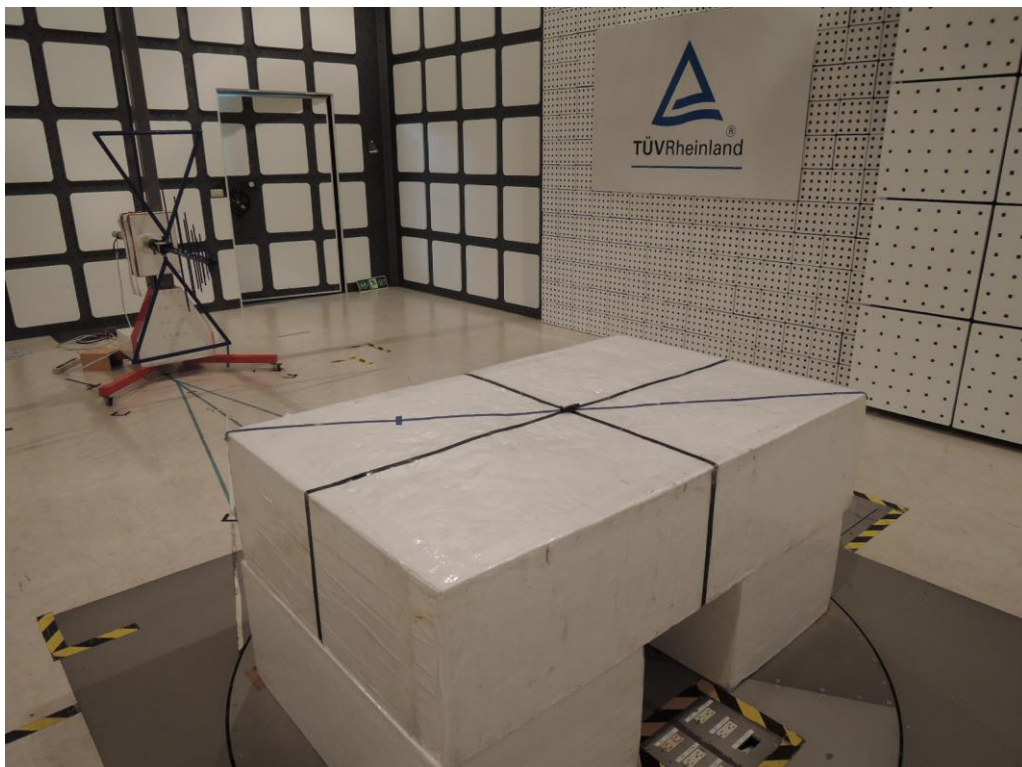
Photograph 1: Set-up for Spurious Emissions (Front View)



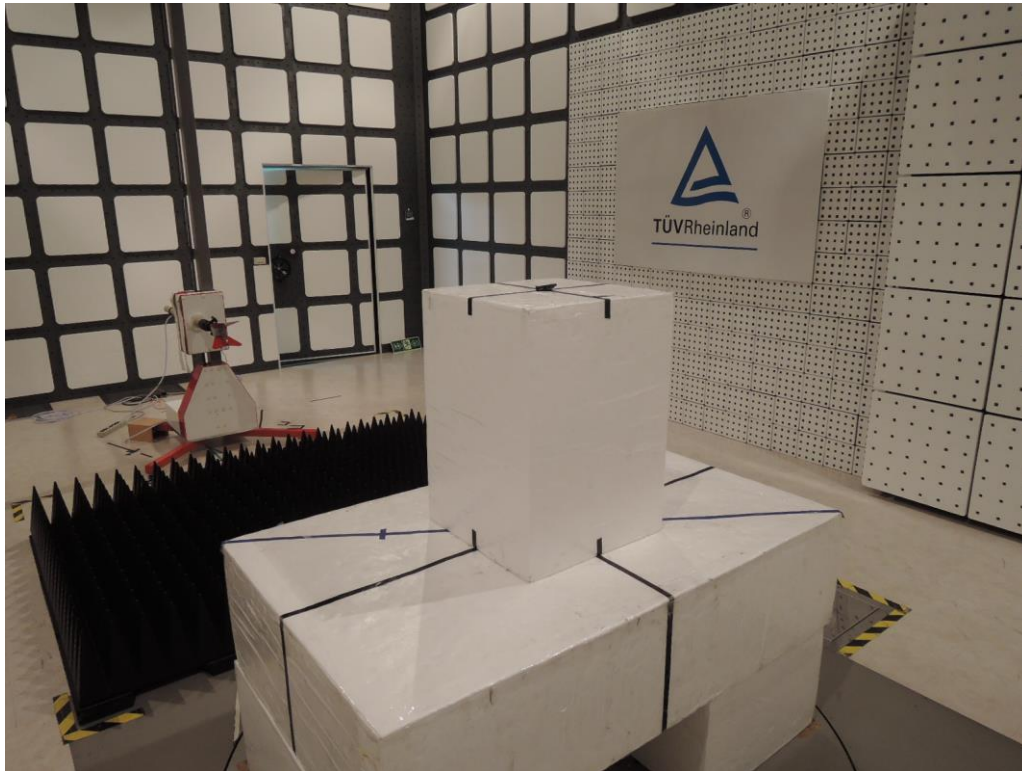
Photograph 2: Set-up for Spurious Emissions (Back View 1)



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



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



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