Prüfbericht-Nr.: *Test Report No.:*	**50255636 001**	**Auftrags-Nr.:** *Order No.:*	238105711	Seite 1 von 25 *Page 1 of 25*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	23-May-2019	
Auftraggeber: *Client:*	台灣森那美起亞股份有限公司, 台北市內湖區行愛路 151 號 2 樓之 1			
Prüfgegenstand: *Test item:*	VALVE-TPMS			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	52933C1100,52933D9100			
Auftrags-Inhalt: *Order content:*	NCC LP0002 Test report			
Prüfgrundlage: *Test specification:*	NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2018)			

Wareneingangsdatum: *Date of receipt:*	23-May-2019
Prüfmuster-Nr.: *Test sample No.:*	A000178390-001
Prüfzeitraum: *Testing period:*	29-Apr-2015 - 29-Apr-2015
Ort der Prüfung: *Place of testing:*	EMC/RF Laboratory Taipei
Prüflaboratorium: *Testing laboratory:*	TUV Rheinland Taiwan Ltd.
Prüfergebnis*: *Test result*:*	Pass

Report Date/ *tested by*:

Datum *Date(Report Date)*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*
23-May-2019	Mars Y.J. Lin/Project Engineer	

kontrolliert von / *reviewed by*:

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*
23-May-2019	Rene Charton/Expert	

Sonstiges / *Other*:
This copy report is based on original test report number:50048998 001

Zustand des Prüfgegenstandes bei Anlieferung:
Condition of the test item at delivery:

Prüfmuster vollständig und unbeschädigt
Test item complete and undamaged

* 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.
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.

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
RESULT: *Passed*

5.1.5 TRANSMISSION TIME
RESULT: *Passed*

5.1.6 SPURIOUS EMISSION
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: 50255636APPENDIX P)
Appendix D: Test Result of Radiated Emissions
(File Name: 50255636APPENDIX D)

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

Table 1: Applied Standard and Test Levels

Radio
NCC Low-power Radio-frequency Devices Technical Regulations LP0002(2018)(107 年1 月10 日)

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.: 365730
IC Canada Registration No.: 9465A-1
TAF Accredited NCC Test Lab. No.:0759
TAF ISO17025 Certification effective periods: 2013-Jul-1st to 2016-Jun-30th

Testing Laboratory
0759

2.2 List of Test and Measurement Instruments

Table 2: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
EMI Test Receiver	R&S	ESR7	101062	30-Aug-15
Bilog Antenna	TESEQ	CBL6111D	29802	4-Jul-15
Spectrum Analyzer	R&S	FSV 40	100921	16-Dec-15
Spectrum Analyzer	Agilent	N9010A	MY53470241	30-Mar-16
Horn Antenna	ETS-Lindgren	3117	138160	11-Jan-16
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	29-Oct-15
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	22-Aug-15
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	25-Aug-15
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM30180	60558	3-Nov-15
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	21-Oct-15
EMI Test Receiver	R&S	ESCI7	100797	27-Dec-15
LISN (1 phase)	R&S	ENV216	101243	30-May-15
LISN	Rolf Heine	NNB-2/16Z	99080	25-Aug-15

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 basics using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements are ±3dB.

Table 3: Emission Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	± 1 x 10^{-7}
RF power, conducted	± 1.5 dB
Adjacent channel power	± 3 dB
Radiated emission of transmitter, valid up to 26 GHz	± 6 dB
Radiated emission of receiver, valid up to 26 GHz	± 6 dB
Temperature	± 2 ºC
Humidity	± 10 %

3. General Product Information

3.1 Product Function and Intended Use

The EUT is a Tire pressure monitoring system. It can communicate with a Datacollector through a wireless interface.
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	VALVE-TPMS
Type Designation	52933C1100,52933D9100
Brand Name	Continental

Table 5: Technical Specification of EUT

Technical Specification	Value
Operating Frequency	433.92MHz
Channel Spacing	N/A
Channel number	1
Operation Voltage	3 V
Modulation	FSK
Channel number	1
Pulse Width	4 ms
Pulse Repetiton Scheme	random

3.3 Independent Operation Modes

Basic operation modes are:

A. Transmitting
   1. Low channel
   2. Middle channel
   3. High channel
B. Receiving
C. Standby
D. Off

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 contain a test software which makes it possible to control the EUT through the RF interface to set it to transmitting on set frequencies.

This software was running on the laptop computer connected to the EUT. It was used to enable the operation modes listed in section 3.3 as appropriate.

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:

Kind of Equipment	Manufacturer	Model Name	S/N
Laptop	HP	HSTNN-Q78C-3	CNF0339QBM

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

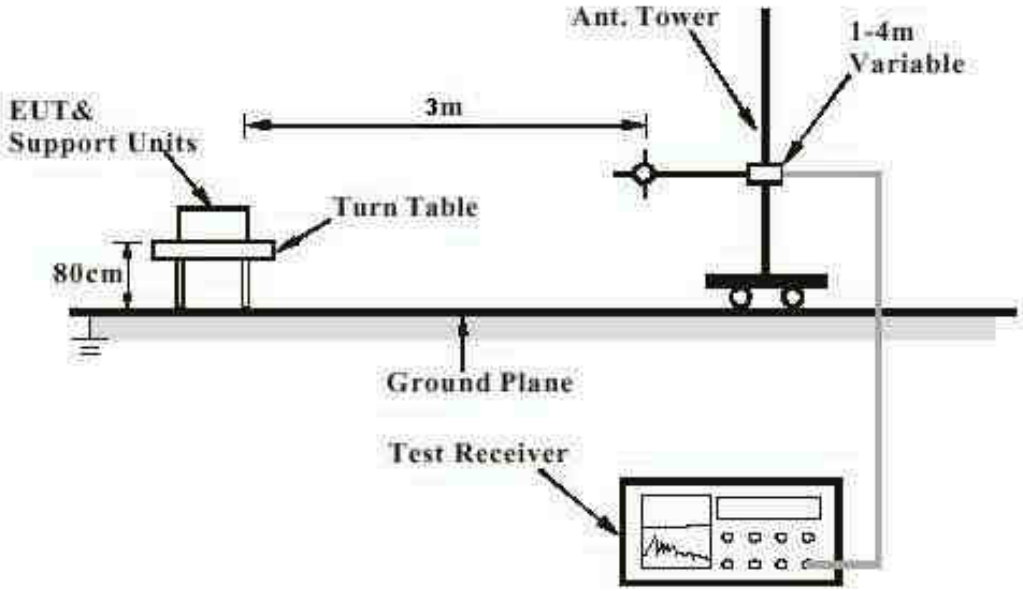
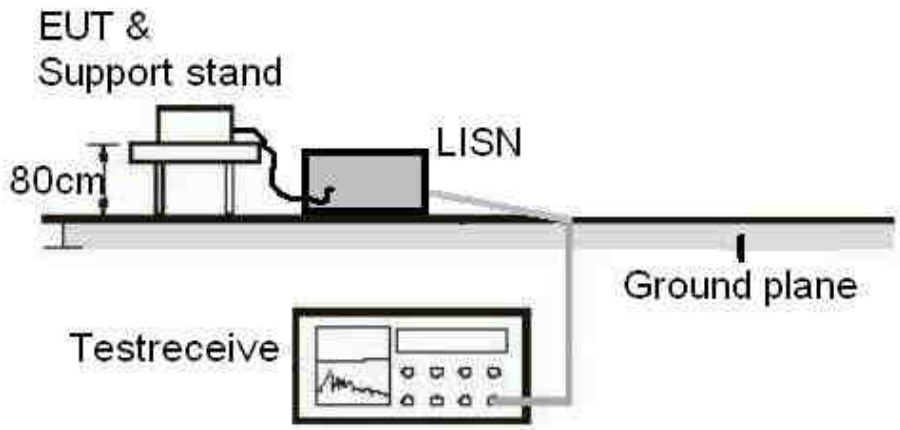


Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)



5. Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT: **Passed**

Standard	:	LP0002(2018): 2.2 Part 15.203 and RSS-Gen 7.1.4
Requirement	:	Manufacturer must

The antenna is Integral 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 LP0002 3.4.2 (5.1)
Basic standard	:	ANSI C63.10:2009

Test setup

Test Channel	:	433.92MHz
Operation Mode	:	Pulse Transmission
Atmospheric pressure	:	100-103 kPa

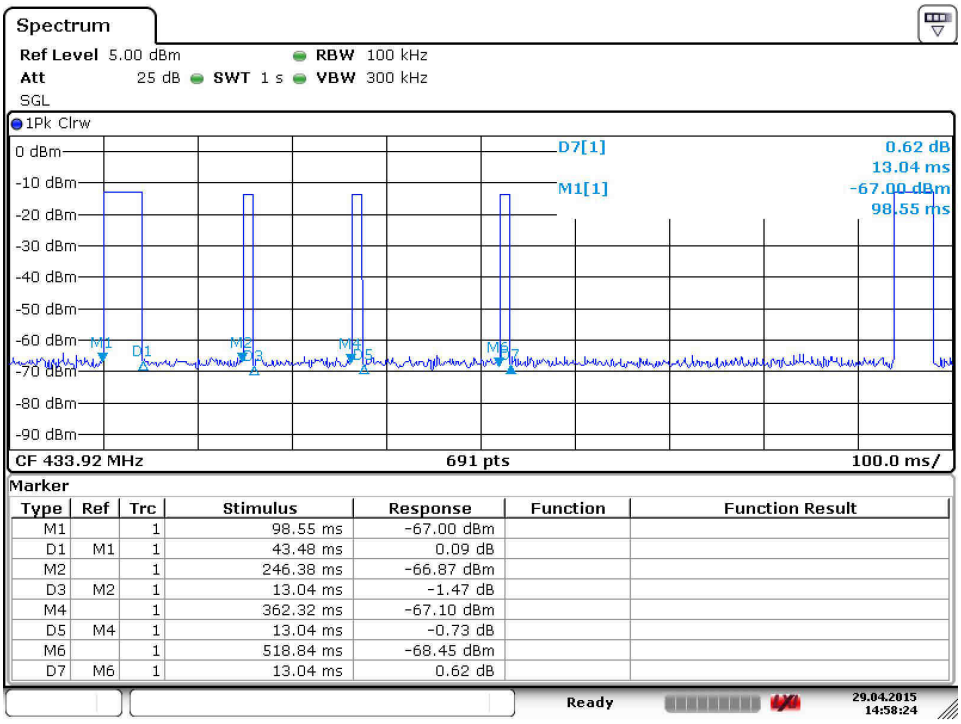
The EUT employs pulsed operation.
The pulse width is: 82.6 msec.

The Tables below show calculated average values from the pulsed emissions measurement data MHz, corrected with the worst case duty cycle factor over 1000 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 (82.6 msec / 1000msec) = - 21.66dB.

Test Plot pulse width



Marker

Type	Ref	Trc	Stimulus	Response	Function	Function Result
M1		1	98.55 ms	-67.00 dBm		
D1	M1	1	43.48 ms	0.09 dB		
M2		1	246.38 ms	-66.87 dBm		
D3	M2	1	13.04 ms	-1.47 dB		
M4		1	362.32 ms	-67.10 dBm		
D5	M4	1	13.04 ms	-0.73 dB		
M6		1	518.84 ms	-68.45 dBm		
D7	M6	1	13.04 ms	0.62 dB		

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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	86.94	100.8	Horizontal	Peak
433.92	65.28	80.8		Average
433.92	86.21	100.8	Vertical	Peak
433.92	64.55	80.8		Average

5.1.3 Field strength of harmonics

RESULT: **Passed**

Test standard : FCC Part 15. 231(e)
RSS-210 A1.1, Table B
LP0002 3.4.2 (5.1)
Basic standard : ANSI C63.10:2009

Test setup

Test Channel : 433.92MHz
Operation Mode : Pulse Transmission

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
2432	49.79	74	Horizontal	Peak
2432	<49.79	54		Average
2432	48.34	74	Vertical	Peak
2432	<48.34	54		Average
3908	47.87	74	Horizontal	Peak
3908	<47.87	54		Average
3908	53.58	74	Vertical	Peak
3908	<53.58	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

RESULT: **Passed**

Test standard	:	FCC Part 15.231(c), A1.1.3, RSS Gen
Basic standard	:	ANSI C63.10:2009,
Kind of test site	:	Shielded room

Test setup

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

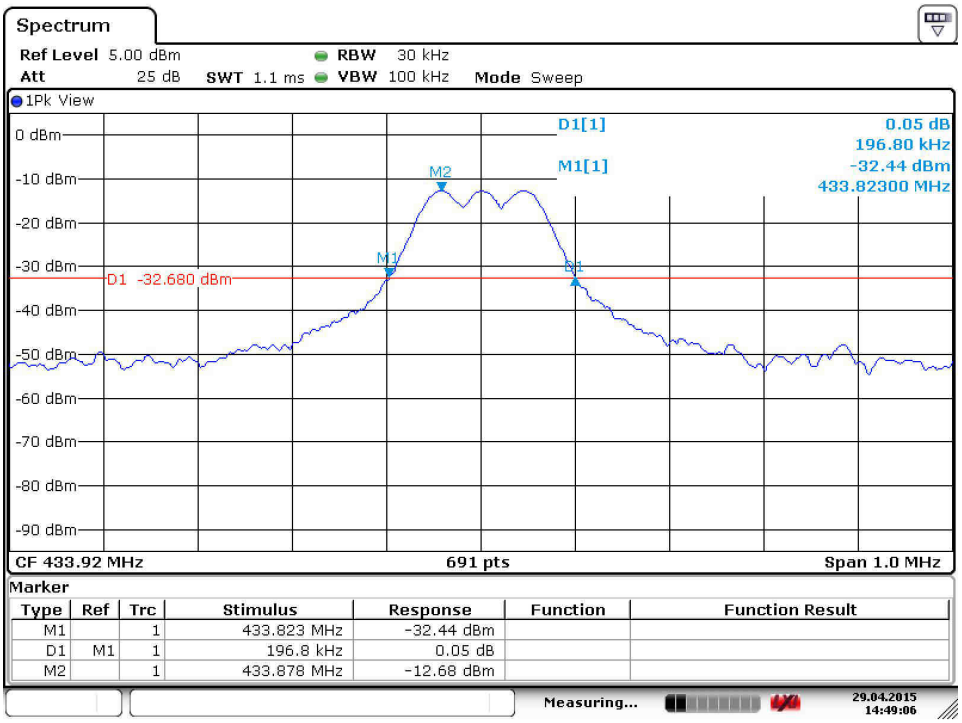
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated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

Atmospheric pressure	:	100-103 kPa

Table 8: Test result of 20 dB Bandwidth,

Channel	Channel Frequency (MHz)	-20 dB BW (MHz)	Limit (MHz)	Result
1 Channel	433.92	196.8	1.0848	Pass

Test Plot of -20 dB Point



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5.1.5 Transmission time

RESULT: **Passed**

Test standard	:	LP0002(2018) 3.4.2 (4.1)
Basic standard	:	LP0002,
Kind of test site	:	Anechoic Chamber

Test setup

Test Channel	:	433.92MHz
Operation Mode	:	A

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.

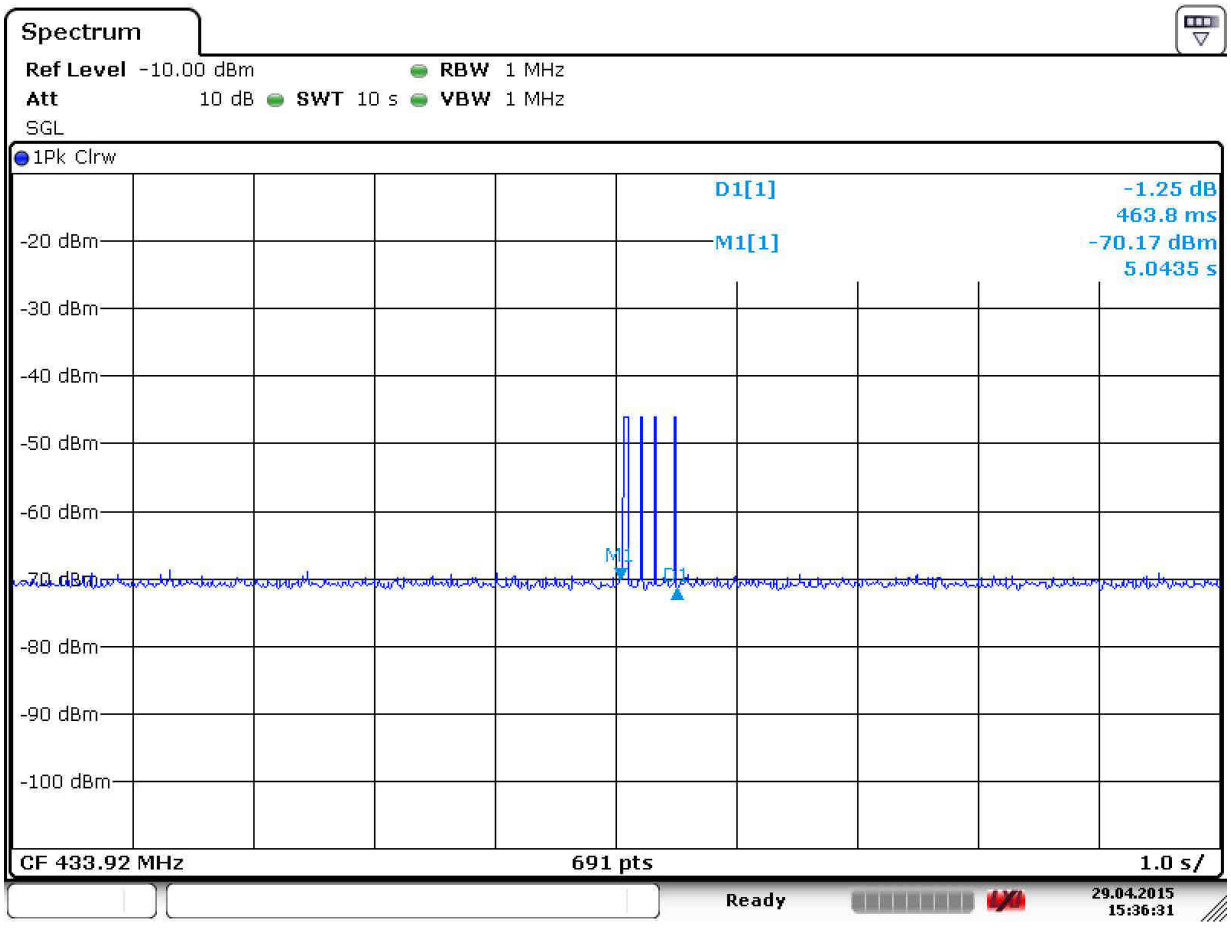
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

Atmospheric pressure	:	100-103 kPa

Table 9: Test result of transmission time

Channel	Channel Frequency (MHz)	Pulse Width (ms)	Limit (ms)	Result
1Channel	433.92	463.8	5000	Pass

Test Plot of Transmission time



Date: 29.APR.2015 15:36:32

5.1.6 Spurious Emission

RESULT: **Passed**

Test standard	:	LP0002(2018) 3.4.2 (5.1) 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: 2009
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, C

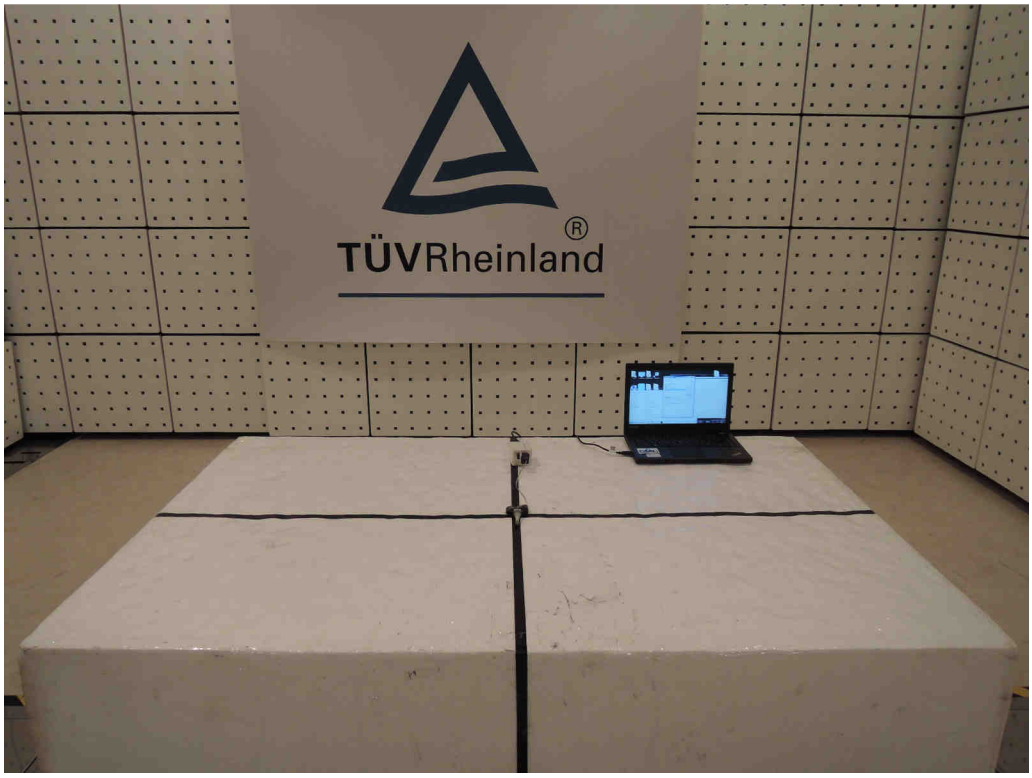
Remark: Testing was carried out within frequency range 30MHz to the tenth harmonic.

For details refer to Appendix D.

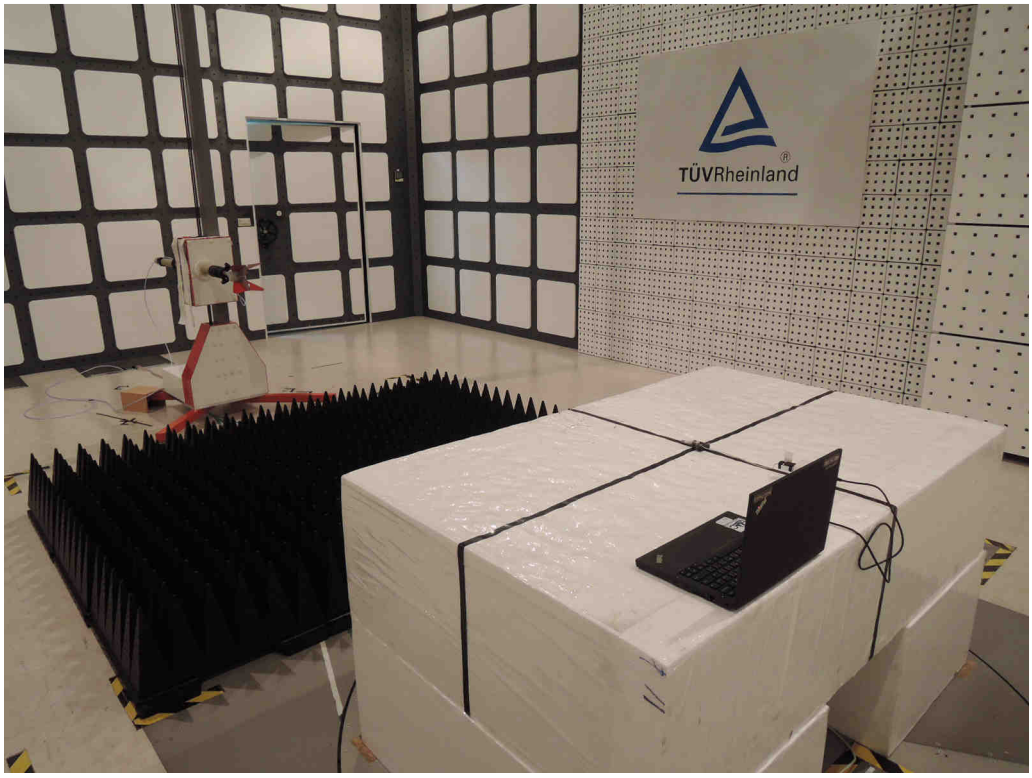
The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The X Axis orientation is the worst-case and recorded in this test report. Due to the small size of the product and that there are no inductive components of significant size, 9kHz to 30MHz frequency range is not tested based on technical judgment.

Photographs of the Test Set-Up

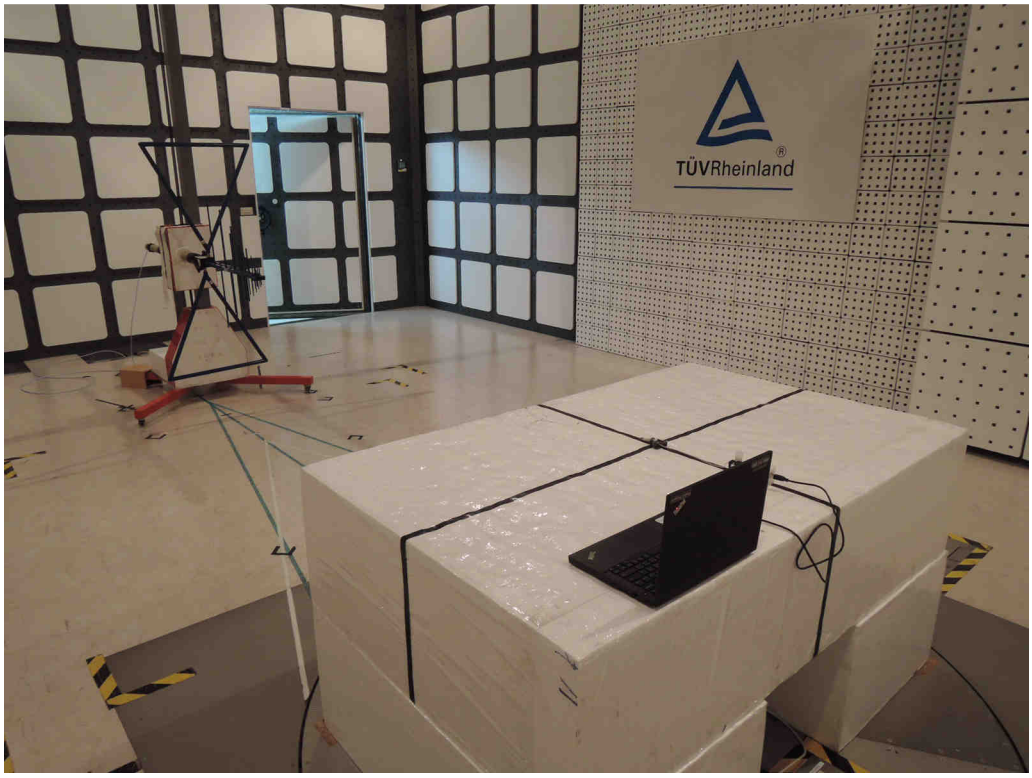
Photograph 1: Set-up for Spurious Emissions (Front View)



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



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



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