

Prüfbericht-Nr.: <i>Test Report No.:</i>	10052437 002	Auftrags-Nr.: <i>Order No.:</i>	114063612	Seite 1 von 17 <i>Page 1 of 17</i>
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date.:</i>	05 Apr. 2017	
Auftraggeber: <i>Client:</i>	Microchip Technology Inc. 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States			
Prüfgegenstand: <i>Test item:</i>	Bluetooth Module			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	BM78abcdefg, RN4678, BM78SPPS5MC2, BM78SPPS5NC2 (a, b, c, d, e, f, g and h= 0-9, A-Z)			
Auftrags-Inhalt: <i>Order content:</i>	TUV Rheinland - EMC service			
Prüfgrundlage: <i>Test specification:</i>	EN 301 489-1 V2.1.1, EN 301 489-17 V3.1.1 EN 301 489-1 V2.2.0, EN 301 489-17 V3.2.0			
Wareneingangsdatum: <i>Date of receipt:</i>	21 Apr. 2017			
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000528342-011			
Prüfzeitraum: <i>Testing period:</i>	Refer to test report			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland Taiwan Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Taiwan Ltd. Taichung Branch Office			
Prüfergebnis*: <i>Test result*:</i>	Pass			Please refer to 10052437 001 attachment photo documentation.
geprüft von / tested by:		kontrolliert von / reviewed by:		
 26 May 2017 Neil J. N. Tsai/ Project Manager Datum Name/Stellung Unterschrift Date Name/Position Signature		 26 May 2017 Max Y. C. Yao/ Technical Certifier Datum Name/Stellung Unterschrift Date Name/Position Signature		
Sonstiges / Other:				
BM78SPPS5MC2, BM78SPPS5NC2 and RN4678 are electrically identical to BM78abcdefg (a, b, c, d, e, f, g and h= A-Z, 0-9) - different Part no. is due to Market strategy.				
Reference original EMC test report: 10052437 001.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(pass) = entspricht o.g. Prüfgrundlage(n) F(fail) = 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(pass) = passed a.m. test specifications(s) F(fail) = failed a.m. test specifications(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>				
V04				

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1 Test Site

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.

Test Facility:

TÜV Rheinland Taiwan Ltd.
11F., No.758, Sec. 4, Bade Rd., Songshan Dist., Taipei City 105, Taiwan, R.O.C.

1.1 Measurement Uncertainty

Testing Item	Frequency Range	Uncertainty
Radiated Emission (966 Chamber: 3m)	30MHz - 1000MHz	2.82 dB
Radiated Emission (966 Chamber: 3m)	Above 1GHz	2.42 dB

Note:

The uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2 Description of the Test Sample

2.1 General Description of Equipment

The tested samples are "Bluetooth Module" with model number "BM78SPPS5MC2" and "BM78SPPS5NC2" for additional approval.

Due to new harmonized standards "EN 301 489-1 V2.1.1", "EN 301 489-17 V3.1.1", "EN 301 489-1 V2.2.0" and "EN 301 489-17 V3.2.0" for model "BM78abcdefgh" and "RN4678" update from existing report 10052437 001, only "Radiated emission" and "RS 1-6 GHz" were performed.

2.2 Rating and Physical Characteristics

Type Designation:	BM78SPPS5MC2, BM78SPPS5NC2
Rated Voltage:	Control host panel: DC 5V (via USB port)
Protection Class:	Control host panel: III
Wireless Frequency:	2.4 - 2.4835 GHz (BT function)

2.3 Sources of Interference

- 1) IC circuits

2.4 Noise Suppression Parts

Please refer to attachment documentation for details.

2.5 Submitted Documents

- 1) Product Specification

3 Measurement Conditions

3.1 Modes of Operation

The EUT was enabled the BT function to link with iPhone, then iPhone run the "mBIoT" software.

The basic operation mode is:

A. BT link

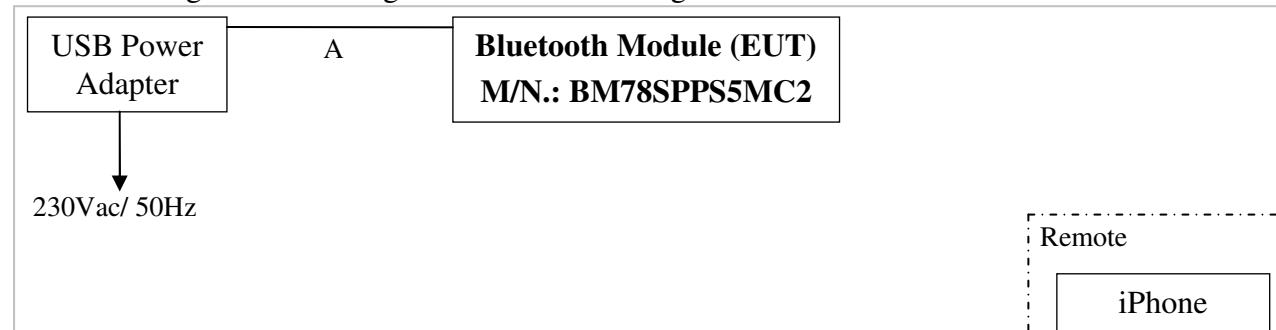
3.2 Additional Equipment

The subject sample was tested as an independent unit with the following equipment:

Description	Manufacturer	Model No.	Remark
iPhone 4S	Apple	A1387	C37HF4VQDTD2
USB Power Adapter	Apple	A1401	0012ADU00

3.3 Test Setup

The test arrangement is configured and set according to manufacturer's installations.



Signal Cable Type	Signal Cable Description
A USB cable	Shielded, 0.7m

3.4 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

For EMI/Radiation Measurement (Taipei: Semi-Anechoic Chamber B)

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
1	Test Receiver	Rohde & Schwarz	ESR7	101549	2016/09/22	2017/09/22
2	Spectrum Analyzer	Rohde & Schwarz	FSV-40	101112	2016/09/22	2017/09/22
3	Pre-Amplifier	Hewlett Packard	8447D	2944A09270	2016/08/09	2017/08/09
4	Pre-Amplifier	Com-Power	PAM-840	461257	2016/12/01	2017/12/01
5	Pre-Amplifier	EM Electronics	EM01G18G	060649	2016/07/29	2017/07/29
6	Bilog Antenna	TESEQ	CBL6111D	29804	2016/06/23	2017/06/23
7	Horn Antenna	ETS-Lindgren	3117	00201918	2016/08/12	2017/08/12
8	Horn Antenna	Com-Power	AH-840	101031	2016/11/22	2017/11/22
9	Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2016/05/11	2017/05/11
10	Test Software	Audix	e3	Ver. 9	N/A	N/A

For EMS/RF Field Strength Susceptibility Test (Taipei: Fully-Anechoic Chamber)

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due Date
1	Signal Generator	Rohde & Schwarz	SMB-100A	104167	2016/09/01	2017/09/01
2	Amplifier (20-1GHz)	FRANKONIA	FLH-200B	1088	N.C.R.	N.C.R.
3	Amplifier (1-6GHz)	Bonn	BLMA1060-50D	108052	N.C.R.	N.C.R.
4	Broadband Antenna (30M-3GHz)	FRANKONIA	BTA-M	08009	N.C.R.	N.C.R.
5	Horn Antenna (0.7-10.5GHz)	FRANKONIA	MAX-9	MAX-9-801	N.C.R.	N.C.R.
6	Power Meter	FRANKONIA	PMS_1084	108B1251	2016/04/18	2017/05/18
7	2 Directional Coupler	AR	DC6180A	334572	N.C.R.	N.C.R.
8	Relay Switching Unit	FRANKONIA	RSU1203	113B1224	N.C.R.	N.C.R.
9	Test Software	FRANKONIA	RF-LAB	Ver. 4.97	N/A	N/A

3.5 Abbreviations

PASS	: Complied with requirement	N/A	: Not applicable
FAIL	: Not complied	N.C.R.	: No calibration required

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4 Test Results EMISSION

Result:	PASS
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4.1 Continuous Interference

4.1.1 Radiated Emission (Below 1GHz)

Port: Enclosure
Basic Standard: EN 301 489-1, clause 8.2
EN 55032
Frequency Range: 30 - 1000 MHz
Limits: Table A.4, Class B (at 3m distance)

Result:	PASS
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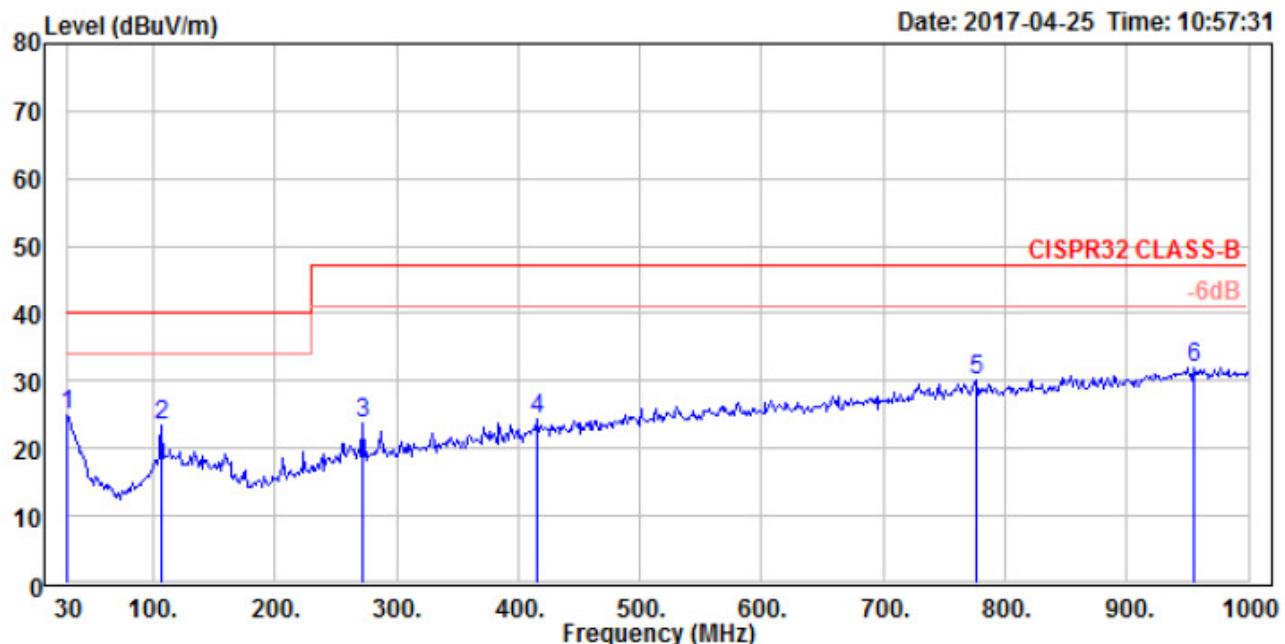
Test Setup

Date of Test: 25 Apr. 2017
Input Voltage: See 2.2
Operational Mode: See 3.1
Temperature 23 °C
Relative Humidity 49 %

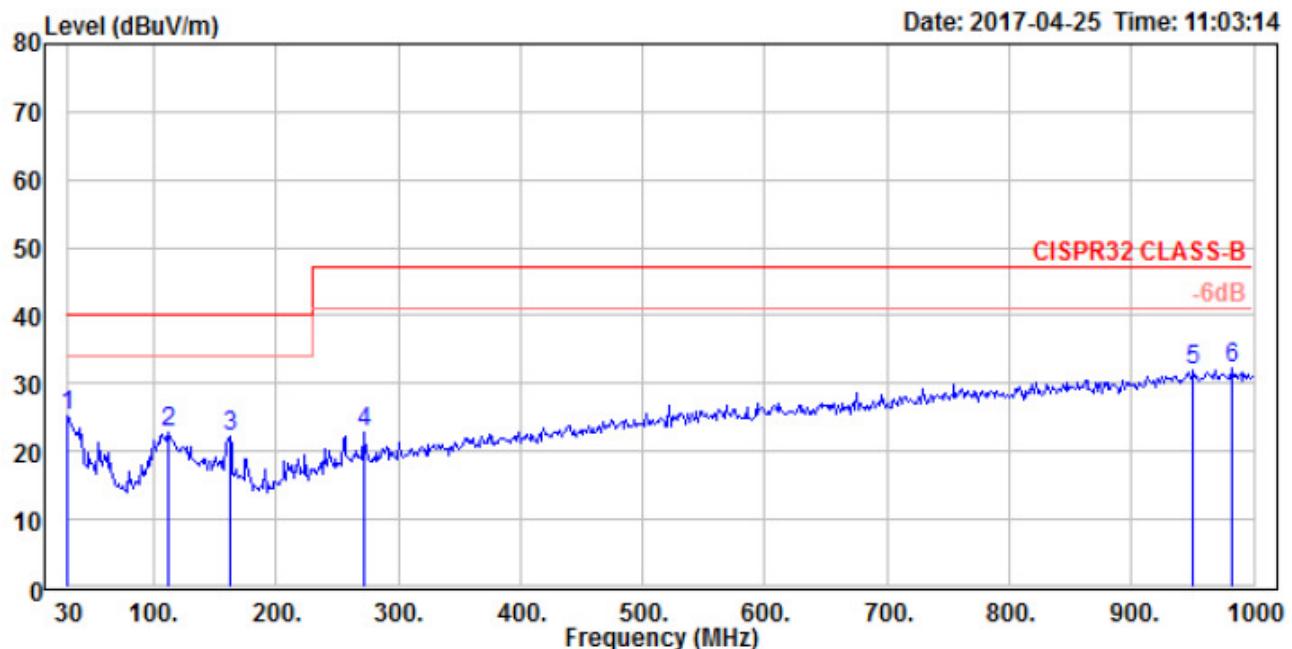
Table 2: Radiated Emission; 30 - 1000 MHz
Setting:

Frequency		Settings	
Start	Stop	IF Bandwidth	Detector
30 MHz	1 GHz	120 kHz	QP

Note: Level = Reading + Factor;
Margin = Level - Limit.

Figure 1: Radiated Emission; 30 – 1000 MHz
Horizontal


Freq	Level	Read	Factor	Limit	Over	Remark	Note
		Level		Factor	Line		
MHz	dB _{UV} /m	dB _{UV}	dB/m	dB _{UV} /m	dB		
1 30.000	24.88	28.05	-3.17	40.00	-15.12	QP	
2 107.319	23.32	34.77	-11.45	40.00	-16.68	QP	
3 271.797	23.58	32.13	-8.55	47.00	-23.42	QP	
4 415.188	24.32	30.12	-5.80	47.00	-22.68	QP	
5 776.478	30.02	30.04	-0.02	47.00	-16.98	QP	
6 955.015	31.97	28.88	3.09	47.00	-15.03	QP	

Vertical


Freq	Level	Read		Limit Factor	Line	Over Limit	Remark	Note
		MHz	dB _B U/m					
1	30.000	25.25	28.42	-3.17	40.00	-14.75	QP	
2	111.536	22.94	33.83	-10.89	40.00	-17.06	QP	
3	162.145	22.14	33.52	-11.38	40.00	-17.86	QP	
4	271.797	22.93	31.48	-8.55	47.00	-24.07	QP	
5	950.797	31.95	28.85	3.10	47.00	-15.05	QP	
6	981.725	32.26	29.19	3.07	47.00	-14.74	QP	

4.1.2 Radiated Emission (Above 1GHz)

Port: Enclosure
Basic Standard: EN 301 489-1, clause 8.2
EN 55032
Frequency Range: 1 - 6 GHz
Limits: EN 55032, Table A.5, Class B

Result:	PASS
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The highest internal source of the EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

- highest frequency is less than 108MHz, measurement shall only be made up to 1GHz
- highest frequency is between 108 & 500MHz, measurement shall only be made up to 2GHz
- highest frequency is between 500 & 1GHz, measurement shall only be made up to 5GHz
- highest frequency is above 1GHz, measurement shall be made up to 5 times the highest frequency or 6GHz, whichever is less.

Test Setup

Date of Test: 25 Apr. 2017
Input Voltage: See 2.2
Operational Mode: See 3.1
Temperature 23 °C
Relative Humidity 49 %

Table 3: Radiated Emission, Above 1 GHz
Setting:

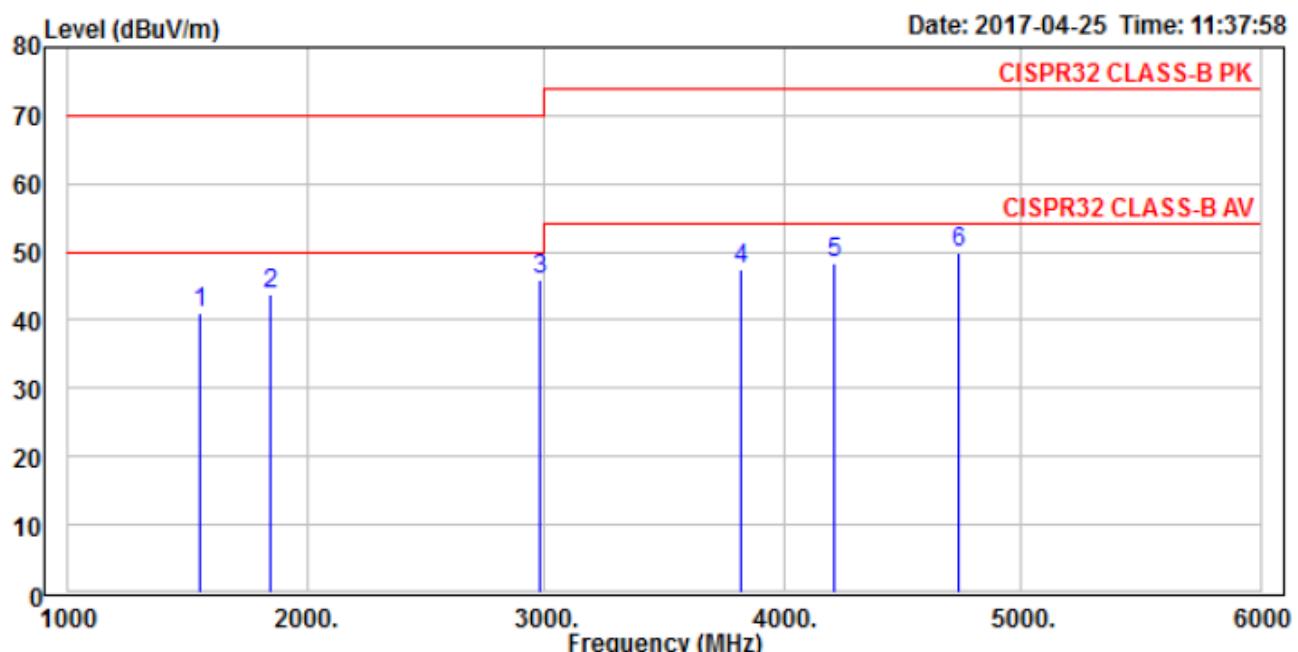
Frequency		Settings	
Start	Stop	IF Bandwidth	Detector
1 GHz	6 GHz	1 MHz	Peak/Average

Note1: The highest frequency is 2.4GHz for BT function, measuring up to 6GHz.

Note2: Level = Reading + Factor;
Margin = Level - Limit.

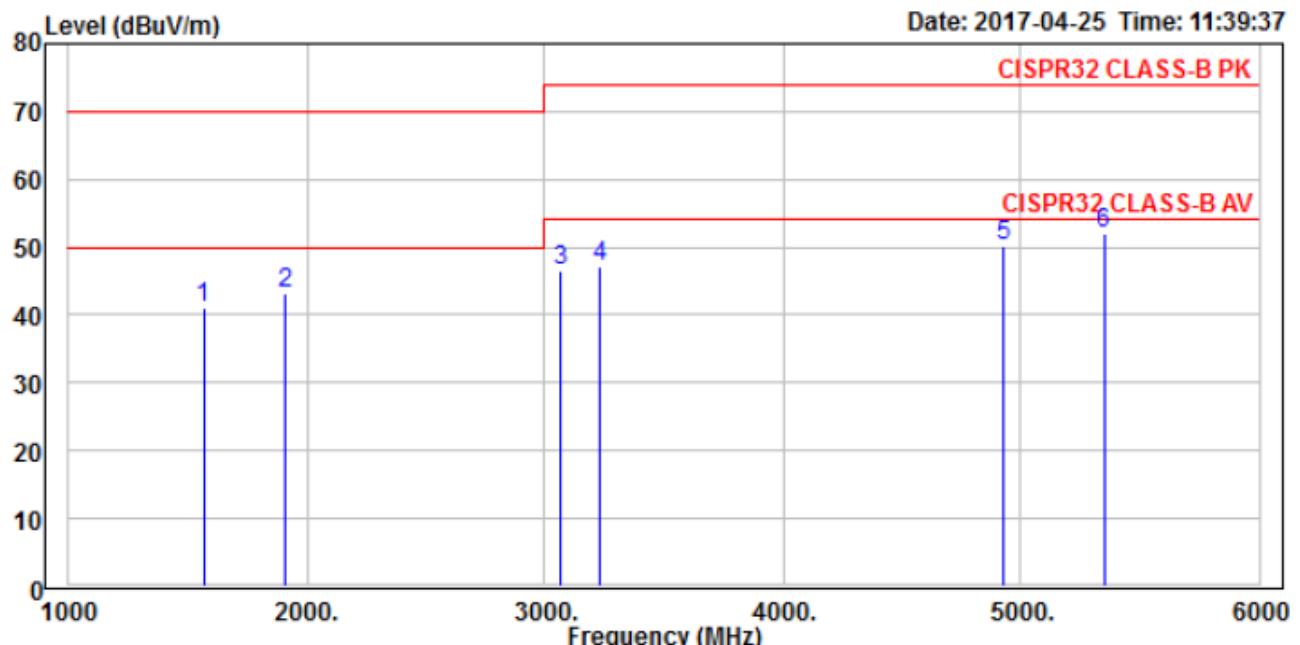
Figure 2: Radiated Emission; Above 1 GHz

Horizontal



Freq	Level	Read		Limit	Over	Remark	Note
		Level	Factor				
MHz	dB _{UV} /m	dB _{UV}	dB/m	dB _{UV} /m	dB		
1	1550.725	41.00	48.26	-7.26	70.00	-29.00	Peak
2	1847.826	43.83	48.25	-4.42	70.00	-26.17	Peak
3	2978.261	45.88	45.23	0.65	70.00	-24.12	Peak
4	3818.841	47.53	45.23	2.30	74.00	-26.47	Peak
5	4217.391	48.27	44.64	3.63	74.00	-25.73	Peak
6	4739.130	49.85	44.10	5.75	74.00	-24.15	Peak

Note: The peak readings were below average limit, thus no average measuring required for those.

Vertical


Freq	Level	Read		Limit Factor	Line	Over Limit	Remark	Note
		MHz	dB _B U/m	dB _B V	dB/m			
1	1565.217	40.95	48.08	-7.13	70.00	-29.05	Peak	
2	1913.043	43.21	46.99	-3.78	70.00	-26.79	Peak	
3	3065.217	46.43	45.57	0.86	74.00	-27.57	Peak	
4	3231.884	47.08	46.01	1.07	74.00	-26.92	Peak	
5	4927.536	50.26	43.69	6.57	74.00	-23.74	Peak	
6	5347.826	51.87	44.36	7.51	74.00	-22.13	Peak	

Note: The peak readings were below average limit, thus no average measuring required for those.

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5 Test Results IMMUNITY

Result:	PASS
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5.1 Enclosure Port

5.1.1 Radiated Susceptibility

Port: Enclosure
 Basic IEC/EN 61000-4-3
 Standard:
 Performance Transmitters: CT
 Criteria: Receivers: CT
 Test EN 301 489-1
 Specification Frequency Range: 80 - 6000 MHz
 : Field Strength 3 V/m (unmodulated)
 Modulation: 1 kHz AM 80%

Result:	PASS
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Test Setup

Date of Test: 25 Apr. 2017
 Input Voltage: See 2.2
 Operational Mode: See 3.1
 Temperature 22 °C
 Relative Humidity 49 %

Table 4: Radiated Susceptibility Setting:

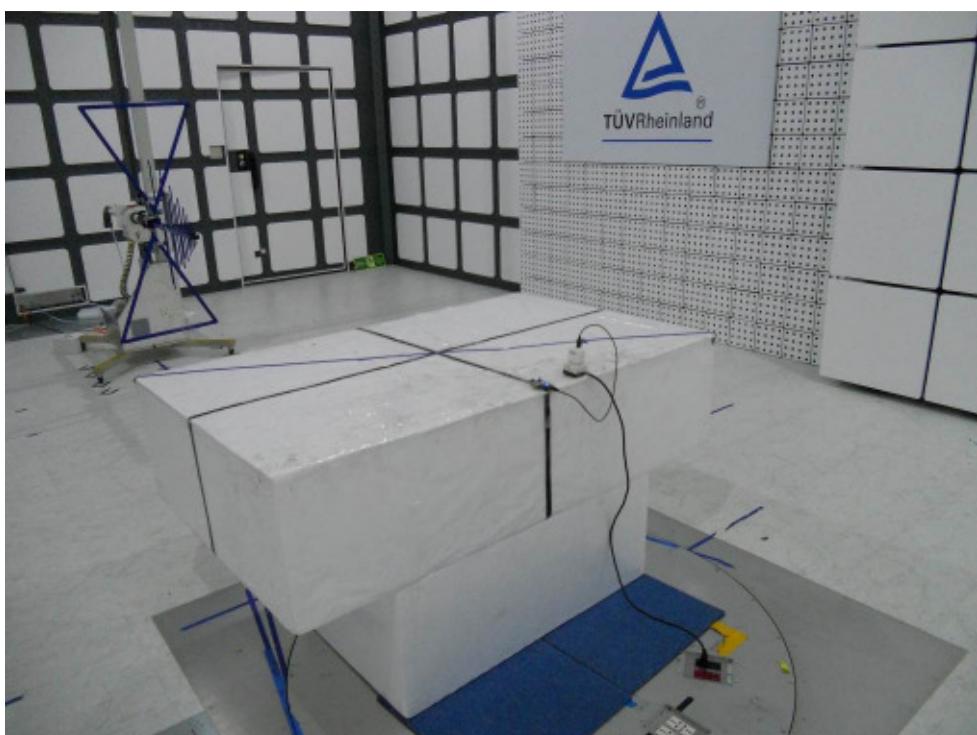
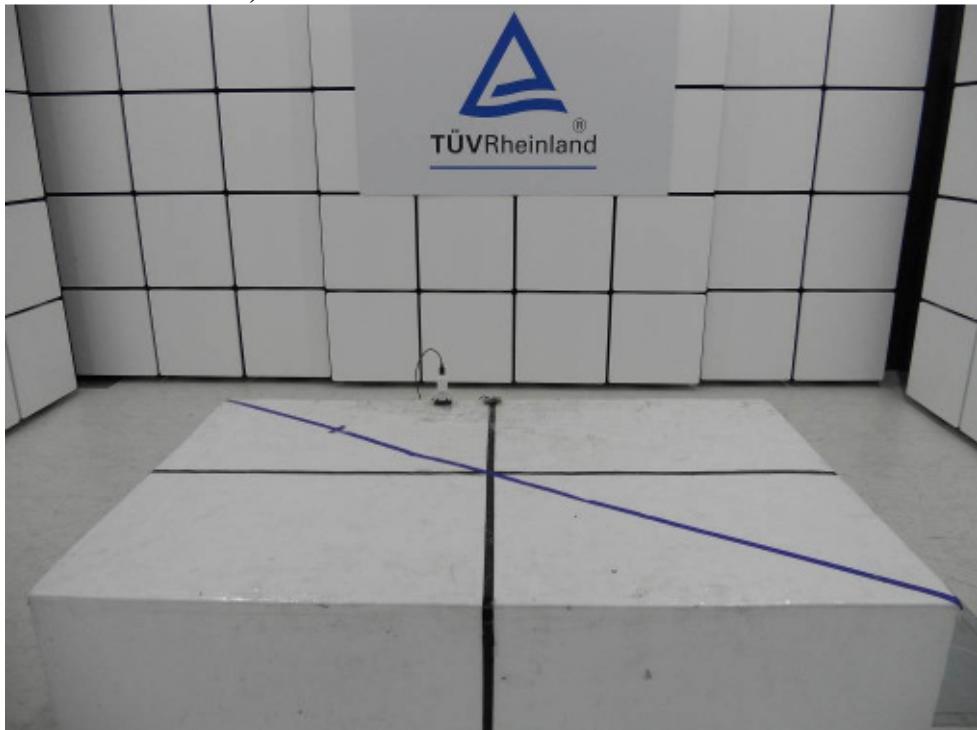
Freq.	Freq. Step	Field Strength	Sweep mode	Meas. Time	Modulation	Observation	Result
1000 – 6000 MHz	1% of the Preceding freq.	3 V/m	auto	3000 ms	1 kHz, AM 80%	Normal function	PASS

No abnormalities were observed during and after the tests.

Note: Below 1GHz testing was passed at existing report 10052437 001.

6 Photographs of the Test Set-up

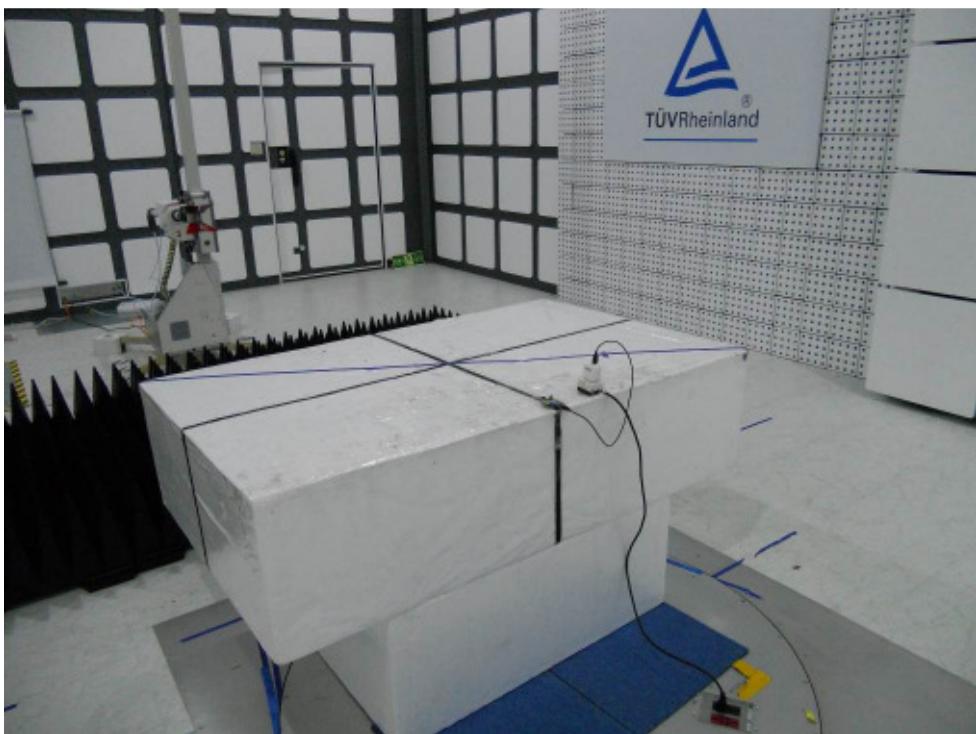
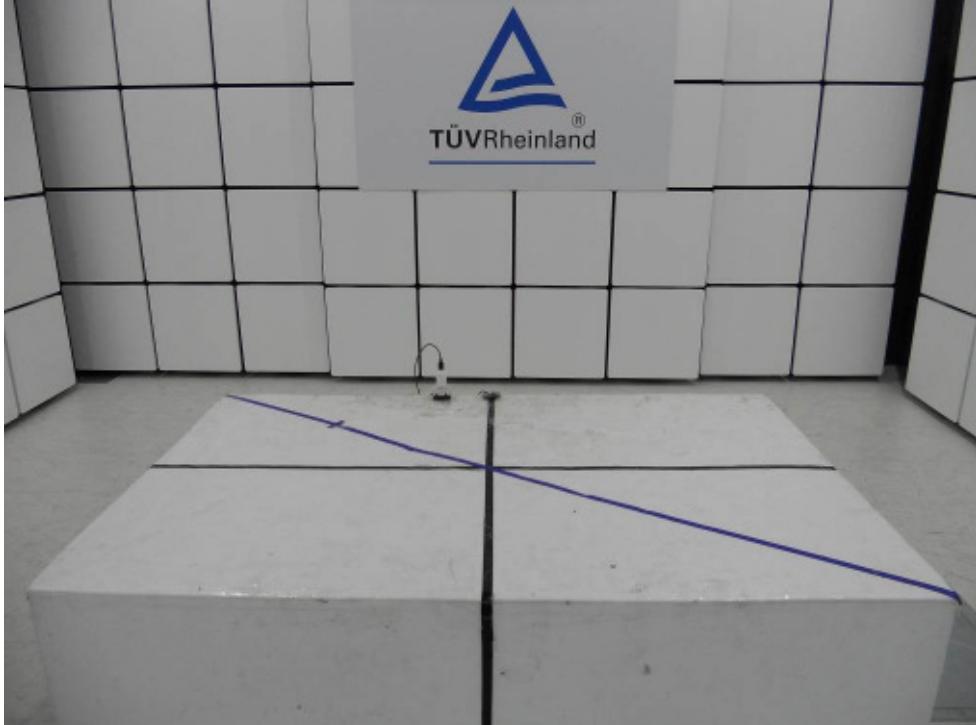
Picture 1: Radiated Emission, 30 - 1000 MHz



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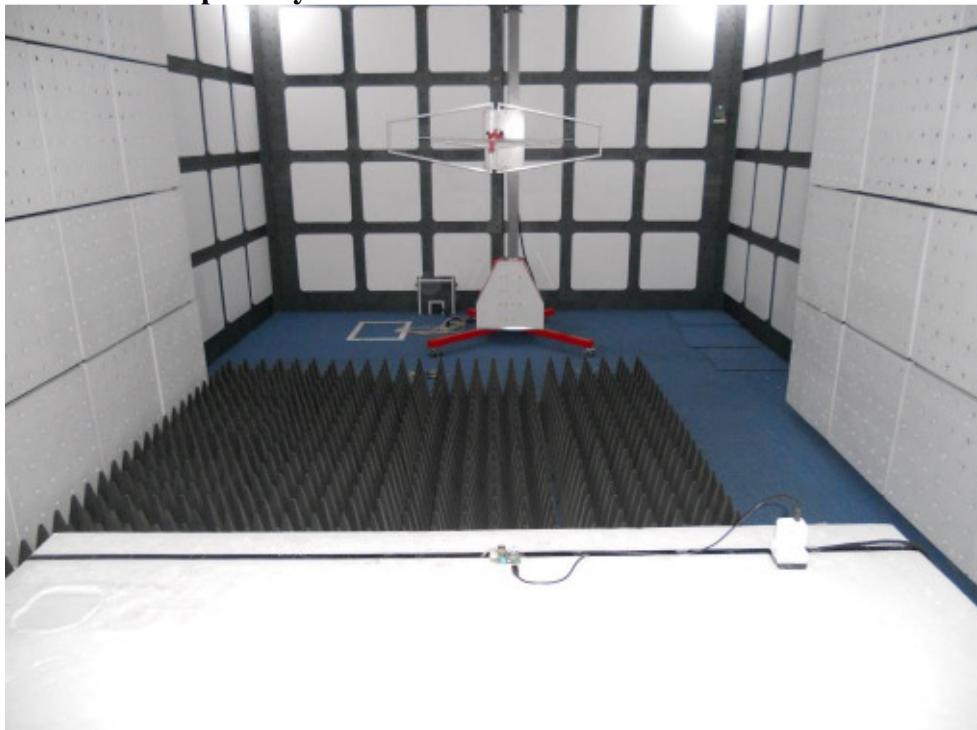
Picture 2: Radiated Emission, Above 1 GHz



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Picture 3: Radiated Susceptibility



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