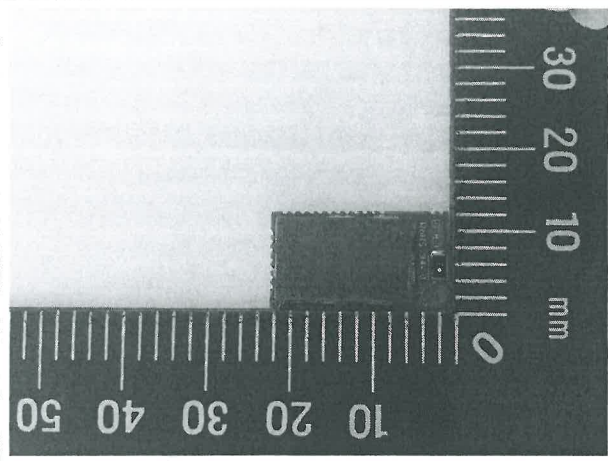

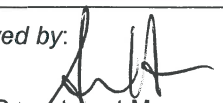


<b>Prüfbericht-Nr.:</b> Test Report No.:	<b>10052796 001</b>	<b>Auftrags-Nr.:</b> Order No.:	<b>114039665</b>	Seite 1 von 26 Page 1 of 26
<b>Kunden-Referenz-Nr.:</b> Client Reference No.:	<b>N/A</b>	<b>Auftragsdatum:</b> Order date:	<b>20-Aug-2015</b>	
<b>Auftraggeber:</b> Client:	Microchip Technology Inc., 2355 West Chandler Blvd. Chandler, Arizona 85224-6199, United States			
<b>Prüfgegenstand:</b> Test item:	Bluetooth module			
<b>Bezeichnung / Typ-Nr.:</b> Identification / Type No.:	BM78abcdefgh, RN4678			
<b>Auftrags-Inhalt:</b> Order content:	Test Report for CE compliance, R&TTE Directive (BLE)			
<b>Prüfgrundlage:</b> Test specification:	EN 300 328 V 1.9.1 EN 62479:2010			
<b>Wareneingangsdatum:</b> Date of receipt:	23-Aug-2015			
<b>Prüfmuster-Nr.:</b> Test sample No.:	A000244783-005			
<b>Prüfzeitraum:</b> Testing period:	2-Sep-2015 - 8-Sep-2015			
<b>Ort der Prüfung:</b> Place of testing:	EMC/RF Laboratory Taipei			
<b>Prüflaboratorium:</b> Testing laboratory:	TUV Rheinland Taiwan Ltd.			
<b>Prüfergebnis*:</b> Test result*:	Pass			



<b>geprüft von / tested by:</b>			<b>kontrolliert von / reviewed by:</b>		
2015-12-21	Ryan W. T. Chen / Project Manager		2015-12-21	Arvin Ho / Department Manager	
<b>Datum</b> Date	<b>Name / Stellung</b> Name / Position	<b>Unterschrift</b> Signature	<b>Datum</b> Date	<b>Name / Stellung</b> Name / Position	<b>Unterschrift</b> Signature

**Sonstiges / Other:**  
Model name: BM78abcdefgh (a,b,c,d,e,f,g,h=0~9,A~Z)  
The spurious emission test results found in the test report are more than 6 dB below the limits, therefore it can be assumed that this device also fulfils the requirements of the version EN 300 328 V 1.9.1. All other test items in v1.8.1 are equivalent to the version v1.9.1.

<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged
---	---

* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor 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

**4.1.1 RF OUTPUT POWER***RESULT: PASS***4.1.2 MAXIMUM SPECTRAL POWER DENSITY***RESULT: PASS***4.1.3 DUTY CYCLE, TX-SEQUENCE, TX-GAP***RESULT: N/A***4.1.4 MEDIUM UTILISATION FACTOR***RESULT: PASS***4.1.5 ADAPTIVITY***RESULT: N/A***4.1.6 OCCUPIED CHANNEL BANDWIDTH***RESULT: PASS***4.1.7 TRANSMITTER UNWANTED EMISSIONS IN THE OOB DOMAIN***RESULT: PASS***4.1.8 TRANSMITTER UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN***RESULT: PASS***4.2.1 RECEIVER RADIATED SPURIOUS EMISSIONS***RESULT: PASS***4.2.2 RECEIVER BLOCKING***RESULT: N/A***5.1.1 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: IUT Photos**

(File Name: 10052796AppendixP)

**Appendix D: Test Result of Radiated Emissions**

(File Name: 10052796AppendixD)

**Table 1: Applied Standard and Test Levels**

Radio
EN 300 328 V 1.9.1

## 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.)

## 2.2 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**

Kind of Equipment	Manufacturer	Type	S/N	Last Calibration	Next Calibration
EMI Test Receiver	R&S	ESR7	101062	31-Aug-14	15-Sep-15
Bilog Antenna	TESEQ	CBL6111D	29802	4-Jul-14	3-Jul-16
Spectrum Analyzer	R&S	FSV 40	100921	17-Dec-14	16-Dec-15
Spectrum Analyzer	Agilent	N9010A	MY53470241	1-Apr-15	30-Mar-16
Horn Antenna	ETS-Lindgren	3117	138160	12-Jan-15	11-Jan-17
Horn Antenna (18GHz~40GHz)	COM-POWER	AH840	101031	30-Oct-13	29-Oct-15
Preamplifier (30MHz -1GHz)	HP	8447F	2805A03335	24-Dec-14	24-Dec-15
Preamplifier (18 GHz -40 GHz)	COM-POWER	PAM-840	461257	26-Aug-14	26-Aug-16
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM30180	60558	4-Nov-14	3-Nov-15
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	22-Oct-14	21-Oct-15
EMI Test Receiver	R&S	ESCI7	100797	28-Dec-14	27-Dec-15
Spectrum Analyzer	R&S	FSL3	101943	7-Sep-15	7-Sep-16
Temp. & Humid. Chamber	Giant Force	GCT-099-40-S	MAF0103-007	13-Jul-15	12-Jul-16
LISN (1 phase)	R&S	ENV216	101243	1-Jun-15	31-May-16
LISN	R&S	ENV216	101262	16-Jun-15	15-Jun-16
Power sensor	Agilent	U2021XA	MY53480013	11-Mar-15	9-Mar-16
Signal Generator	R&S	SMU200	104260	6-Sep-15	5-Sep-16
EXG-B RF Analog Signal Generator	Agilent	N5171B	MY53050377	15-Mar-15	13-Mar-16
MXG-B RF Vector Signal Generator	Agilent	N5182B	MY53050524	18-Mar-15	16-Mar-16

## 2.3 Measurement Uncertainty

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
Occupied Channel Bandwidth	$\pm 5 \%$
RF power, conducted	$\pm 1.5 \text{ dB}$
RF power density, conducted	$\pm 3 \text{ dB}$
unwanted emissions, conducted	$\pm 3 \text{ dB}$
all emissions, radiated	$\pm 6 \text{ dB}$
Temperature	$\pm 1 \text{ }^{\circ}\text{C}$
Humidity	$\pm 5 \%$
DC and low frequency voltages	$\pm 3 \%$
Time	$\pm 5 \%$
Duty Cycle	$\pm 5 \%$

## General Product Information

## 2.4 Product Function and Intended Use

The EUT is a Bluetooth module. It contains a Bluetooth 4.2 BLE/BR/EDR compatible module enabling the user to communicate data through a Wireless interface.  
For details refer to the User Guide, Data Sheet and Circuit Diagram.

## 2.5 System Details

**Table 4: Technical Specification of EUT**

Technical Specification	Value
Kind of Equipment	Bluetooth module
Operating Frequency	2402~2480 MHz
Channel Spacing	2 MHz
Channel number	40
Extreme Temperature Range	-20~70 °C
Operation Voltage	3.3Vdc
Modulation	GFSK
Antenna gain	1.63 dBi



## 2.6 Independent Operation Modes

Testing was performed at the lowest operating frequency (2412MHz), at the operating frequency in the middle of the specified frequency band (2440MHz) and at the highest operating frequency (2472MHz).

The basic operation modes are:

- A. EUT transmits (TX mode), with full power, at lowest channel (2412MHz), a continuous modulated signal streaming with 100% duty cycle.
- B. EUT transmits (TX mode), with full power, at lowest channel (2440MHz), a continuous modulated signal streaming with 100% duty cycle.
- C. EUT transmits (TX mode), with full power, at highest channel (2472MHz), a continuous modulated signal streaming with 100% duty cycle.
- D. EUT receives (RX mode), at lowest channel (2412MHz), continuously.
- E. EUT receives (RX mode), at highest channel (2472MHz), continuously.
- F. Transmitter is in stand-by.
- G. EUT transmits on pseudo-random sequence on all channels (hopping mode).

## 2.7 Noise Suppressing Parts

Nothing mentioned explicitly.

## 3 Test Set-up and Operation Modes

### 3.1 Principle of Configuration Selection

**Radio:** The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

### 3.2 Test Operation and Test Software

Software used for testing: Test samples are provided with a USB interface which makes it possible to control them through a test software installed on a notebook computer.

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, the connection laptop was removed when performing the testing.

Test operation please refer to test setup in chapter 6.

### 3.3 Special Accessories and Auxiliary Equipment

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

Kind of Equipment	Manufacturer	S/N
Laptop	HP	CNF0339QBM

## 4 Test Results RADIO

### 4.1 Transmitter Parameters

#### 4.1.1 RF output power

**RESULT:****PASS**

Date of testing: 2-Sep-2015

Atmospheric pressure: 100-103 kPa

Test requirement: EN 300 328 V 1.8.1, clause 4.3.1.1

Test procedure: EN 300 328 V 1.8.1, clause 5.3.2

Test modes applied: A, B, C

**Note:**

The output power of this device is below 10 dBm.. Adaptivity and Tx-Gap are not required. Therefore the timing information of a Burst is not required and the testing can be done with the EUT set to a continuous signal, with a non-sampling power sensor.

The output power (conducted) was measured at the antenna port with a Power Meter. The final measurement takes into account the loss generated by all the involved cables.

EIRP was then determined at normal and extreme conditions at the above mentioned data rate.

**Table 5: Equivalent Isotropically Radiated Power**

Antenna Assembly Gain:				1.63
Cable Loss=				1.6
TEST CONDITIONS		TRANSMITTER POWER (dBm)		
		-20 °C	25 °C	70 °C
Frequency		3.3 V		
2402	Read Power	2.10	-1.85	-5.47
	e.i.r.p.	5.33	1.38	-2.24
2440	Read Power	2.31	-1.61	-5.44
	e.i.r.p.	5.54	1.62	-2.21
2480	Read Power	2.20	-1.99	-5.73
	e.i.r.p.	5.43	1.24	-2.50
Limit = 20 dBm				

**AVG Conducted Power**

25	3.3 V	Max Power	-0.01	(dBm)
----	-------	-----------	-------	-------

## 4.1.2 Maximum Spectral Power Density

**RESULT:**
**PASS**

Date of testing: 2-Sep-2015

Ambient temperature: 22-26 °C

Relative humidity: 50-65 %

Atmospheric pressure: 100-103 kPa

Test requirement: EN 300 328 V 1.8.1, clause 4.3.2.2

Test procedure: EN 300 328 V 1.8.1, clause 5.3.3

Test mode applied: A, B, C

**Table 6: Maximum Spectral Power Density**

TEST CONDITIONS	25 °C		3.3 V
Frequency (MHz)	Reading (dBm/MHz)	Factor (dB)	Measured Result (dBm/MHz)
2402	-1.91	3.23	1.32
2440	-1.67	3.23	1.56
2480	-2.05	3.23	1.18
Limit = 10 dBm/MHz			

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### 4.1.3 Duty Cycle, Tx-sequence, Tx-gap

**RESULT:****N/A**

Test requirement:

EN 300 328 V 1.8.1, clause 4.3.1.2

Note:

The output power of this device is below 10 dBm.. Adaptivity and Tx-Gap are not required.

#### 4.1.4 Medium Utilisation Factor

**RESULT:** **PASS**

Test requirement: EN 300 328 V1.8.1, clause 4.3.1.5

The output power is less than 10 dBm. Therefore, assessment of the Medium Utilisation Factor is not required. This device may transmit continuously.

#### 4.1.5 Adaptivity

**RESULT:** **N/A**

Requirement: EN 300 328 V1.8.1, clause 4.3.1.6

The output power is less than 10 dBm. Therefore, an implementation of an adaptivity through LBT or DAA implementation is not required. May use the full available band.

#### 4.1.6 Occupied Channel Bandwidth

**RESULT:****PASS**

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

Test requirement: EN 300 328 V 1.8.1, clause 4.3.1.7  
Test procedure: EN 300 328 V 1.8.1, clause 5.3.8

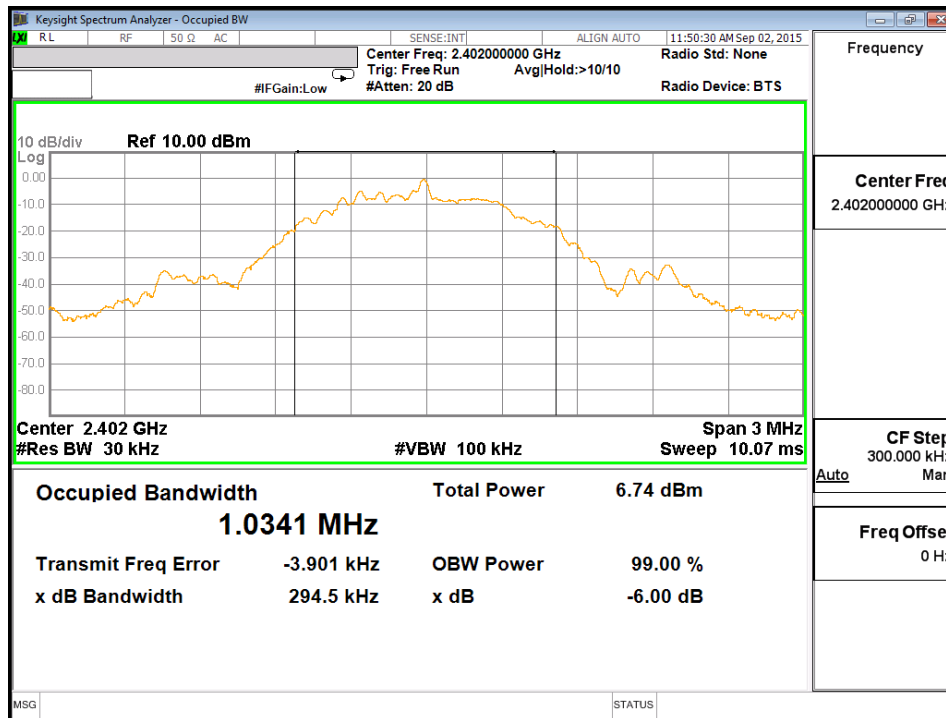
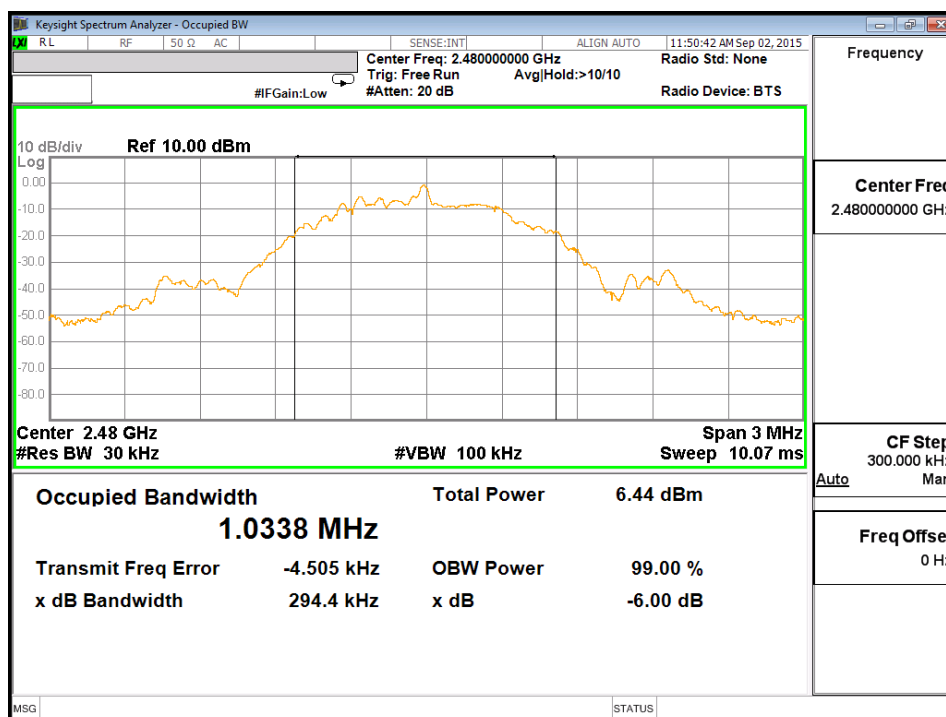
Test modes applied: A, C

**Table 7: Test result of 99% Bandwidth, GFSK modulation**

Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)	Limit
Low Channel	2402	1.0341	4 MHz (Ch2402)
High Channel	2480	1.0338	7 MHz (Ch2480)

Note: For the channels in the middle range of the band the limit is 20 MHz.



**Figure 1: 99% Bandwidth Low Channel GFSK**

**Figure 2: 99% Bandwidth High Channel GFSK**


**4.1.7 Transmitter unwanted emissions in the OOB domain****RESULT:****PASS**

Test requirement: EN 300 328 V 1.8.1, clause 4.3.1.8

Test procedure: EN 300 328 V 1.8.1, clause 5.3.9

Frequency range: 30MHz - 12.75GHz

Measurement distance: 3m

Kind of test site: Semi Anechoic Chamber

Test mode applied: A, C, F

## Note:

Outside the 2400 – 2483.5 MHz band all unwanted emissions are below -30 dBm

Temperature Low:	-20	°C
Temperature Normal:	25	°C
Temperature High:	70	°C

Antenna Assembly Gain: (dBi)	1.63
Cable Loss: (dB)	1.6

<b>LE</b>	
Ton of Duty Cycle:	0.433
Tall of Duty Cycle:	0.622
Duty factor: (dB)	1.57

<b>Temperature Low</b>			
Freq.(MHz)	Read(dBm)	e.i.r.p.(dBm)	Limit(dBm)
2398.46	-59.66	-54.86	-20
2398.48	-59.29	-54.49	-20
2399.48	-49.31	-44.51	-10
2399.5	-48.89	-44.09	-10
2484	-62.84	-58.04	-10
2484.02	-63.17	-58.37	-10
2485.02	-68.46	-63.66	-20
2485.04	-68.61	-63.81	-20

<b>Temperature Normal</b>			
Freq.(MHz)	Read(dBm)	e.i.r.p.(dBm)	Limit(dBm)
2398.46	-64.57	-59.77	-20
2398.48	-64.17	-59.37	-20
2399.48	-54.24	-49.44	-10
2399.5	-53.72	-48.92	-10
2484	-68.96	-64.16	-10
2484.02	-69.34	-64.54	-10
2485.02	-73.76	-68.96	-20
2485.04	-73.83	-69.03	-20

<b>Temperature High</b>			
Freq.(MHz)	Read(dBm)	e.i.r.p.(dBm)	Limit(dBm)
2398.46	-68.40	-63.60	-20
2398.48	-68.18	-63.38	-20
2399.48	-59.21	-54.41	-10
2399.5	-58.66	-53.86	-10
2484	-71.13	-66.33	-10
2484.02	-71.28	-66.48	-10
2485.02	-74.77	-69.97	-20
2485.04	-74.86	-70.06	-20

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**4.1.8 Transmitter unwanted emissions in the spurious domain****RESULT:****PASS**

Test requirement: EN 300 328 V 1.8.1, clause 4.3.1.9  
Test procedure: EN 300 328 V 1.8.1, clause 5.3.10

Frequency range: 30MHz - 12.75GHz  
Measurement distance: 3m  
Kind of test site: Semi Anechoic Chamber

Test mode applied: A, C, F

**Please refer to Appendix D: Test result of Radiated Emissions**

## 4.2 Receiver Parameters

### 4.2.1 Receiver Radiated Spurious Emissions

**RESULT:** **PASS**

Test requirement:	EN 300 328 V 1.8.1, clause 4.3.1.10
Test procedure:	EN 300 328 V 1.8.1, clause 5.3.11
Frequency range:	30MHz - 12.75GHz
Measurement distance:	3m
Kind of test site:	Semi Anechoic Chamber
Test mode applied:	D, E

**Please refer to Appendix D: Test result of Radiated Emissions**

### 4.2.2 Receiver Blocking

**RESULT:** **N/A**

Test requirement:	EN 300 328 V 1.8.1, clause 4.3.1.11
Test procedure:	EN 300 328 V 1.8.1, clause 5.3.7

The output power is less than 10 dBm. Therefore, adaptivity is not required for this device and this test item does not apply.

## 5 Safety Human exposure

### 5.1 Radio Frequency Exposure Compliance

#### 5.1.1 Electromagnetic Fields

**RESULT:****Passed**

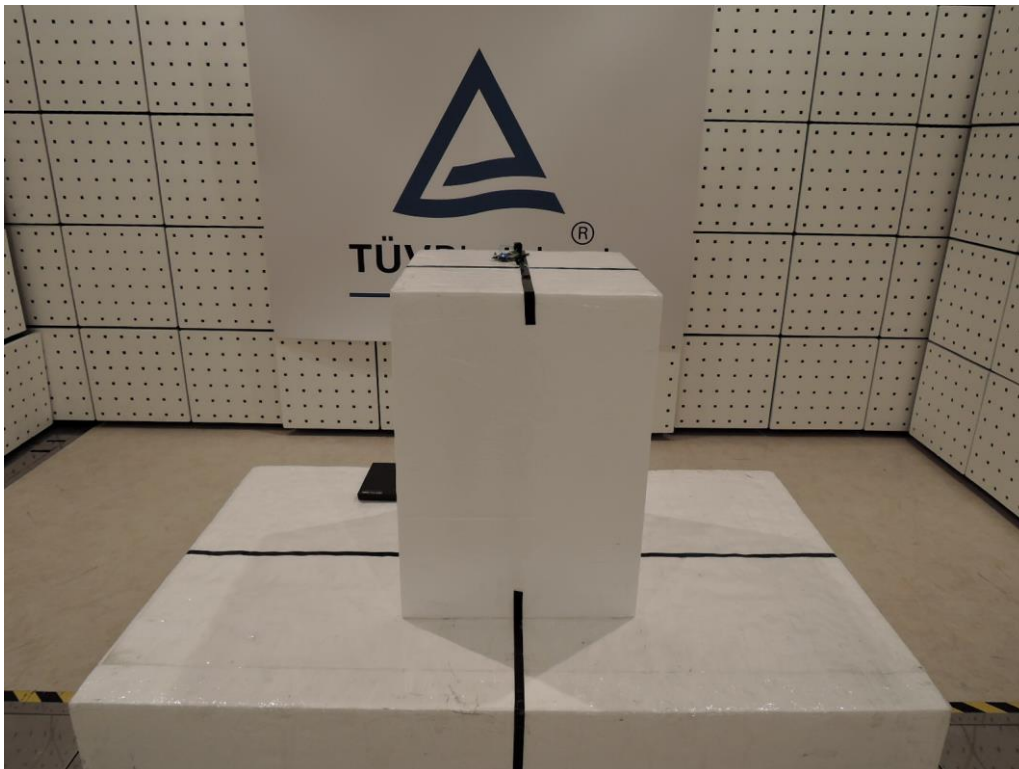
Test standard : EN 62479:2010, A.3.

Maximum available Power:

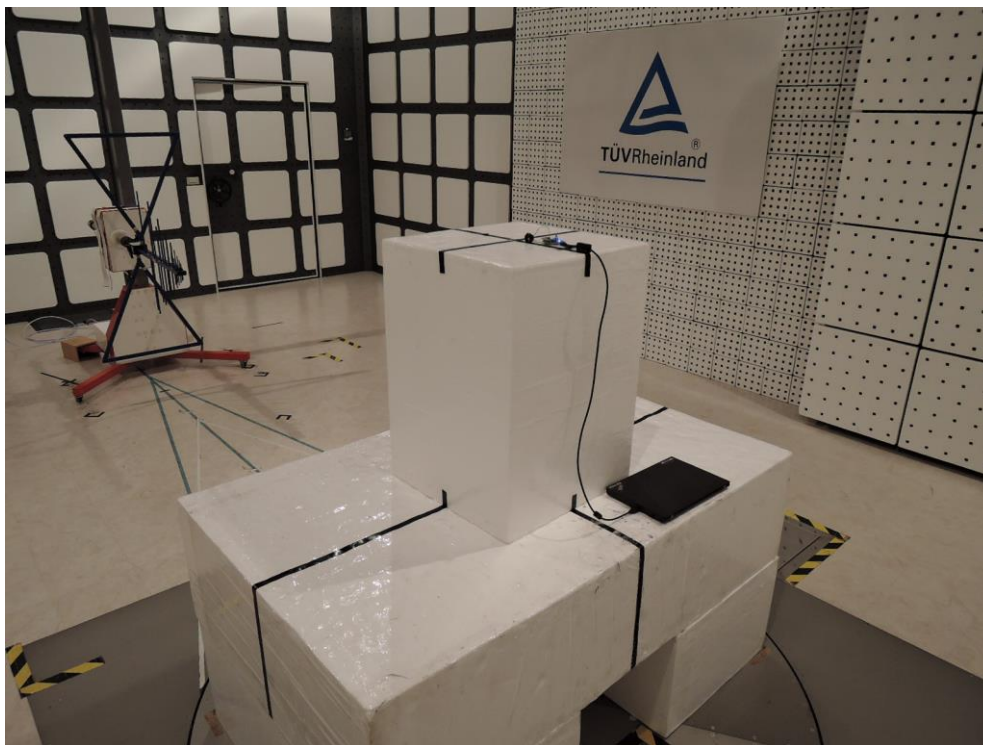
Max Power (dBm)	Power (mW)	Head and Body Power Limit in (mW)	Pass/Fail
-0.01	1.00	20	PASS

## 6 Photographs of the Test Setup

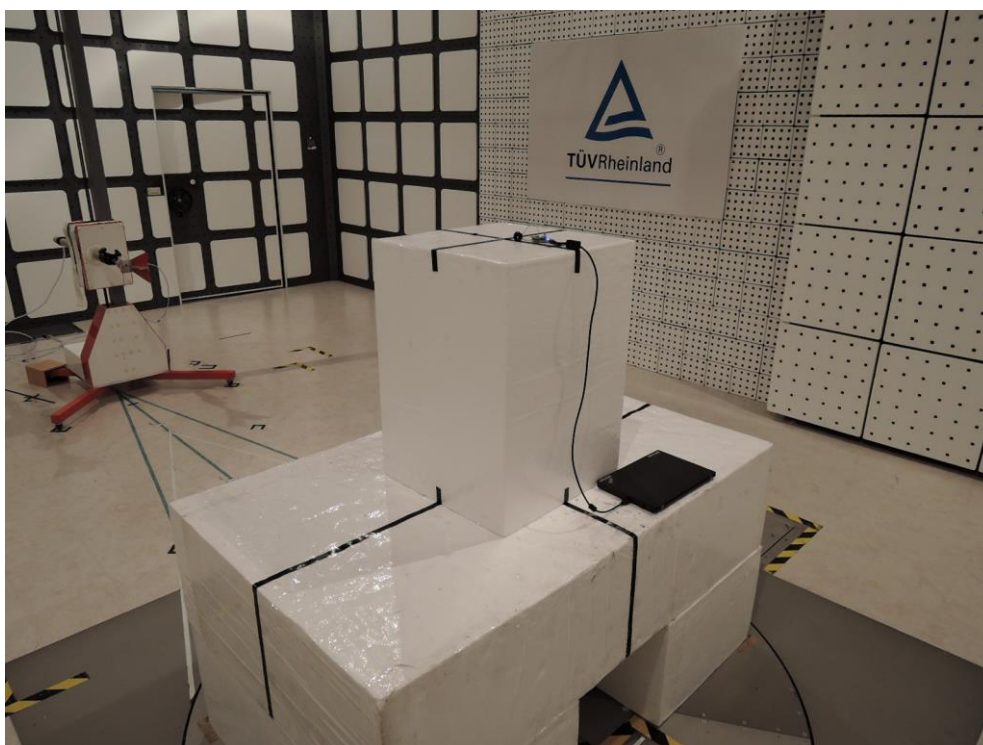
**Photograph 1: Set-up for Radiated Emission (front)**



**Photograph 2: Set-up for Radiated Emission (30 MHz-1GHz)**

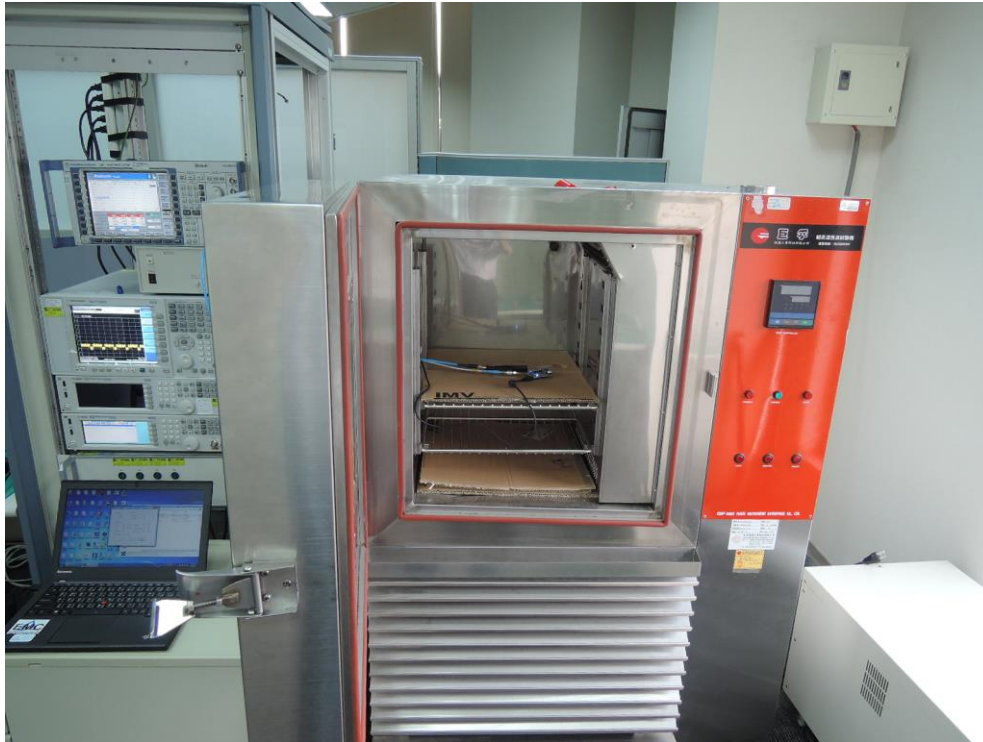


**Photograph 3: Set-up for Radiated Emission (Rear View 2)**





**Photograph 4: Setup for Radio Frequency Conducted Tests**



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