



China

## RF - TEST REPORT

Report Number : **68/760.8.153.01** Date of Issue: 20 November 2008

Model : **SPM5801BB/27, SPM6813BB/27**

Product Type : **Dongle**

Applicant : **Philips Consumer Electronics B. V.**

Address : **B. U. Accessories Building SBP6**

: **PO Box 80002**

: **5600 JB Eindhoven, Netherlands**

Production Facility : **Dong Guan Hong Sheng Electronic Corp. (China)**

Address : **No. 28, Sha-Wu S. Ave., Sha-Wu, Tang-Xia,**

: **Dong-Guan, Guang-Dong, China**

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including  
Appendices : 24

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## 2 Details about the Test Laboratory

### Details about the Test Laboratory

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Company name: China Shenzhen Academy of Metrology and Quality Inspection,  
FCC Registration Number: 274801  
Metrology and Quality Inspection building,  
Central Section of LongZhu Road,  
Nan Shan,  
Shenzhen,

Telephone: 755 2694 1599  
Fax: 755 2694 1545

### 3 Description of the Equipment Under Test

#### Description of the Equipment Under Test

Product:	Dongle
Model no.:	SPM5801BB/27
Serial number:	NIL
Modulation:	GFSK
Rating:	Powered by USB port, DC 5V
Antenna:	Integral antenna inside enclosure of EUT, NOT accessible by end user Antenna gain: 3.0dBi
RF Transmission Frequency:	2400-2483.5MHz
Description of the EUT:	The EUT Consists 1 antennas for transmitter. The microprocessor of transmitter is nRF24L01.



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#### 4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
FCC Part 15 Subpart B	PART 15 - RADIO FREQUENCY DEVICES Subpart B - Unintentional Radiators

## 5 Summary of Test Results

Technical Requirements				
FCC Part 15 Subpart C				
Test Condition	Pages	Test Result		
		Pass	Fail	N/A
15.109 (a), 15.205, 15.209 Radiated Emission (Spurious Emission inclusive Restricted Band Requirement)	8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.249 (a), Radiated Emission (Fundamental and Harmonics)	11	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.249 (d) Band edge compliance of RF emission	14	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15.107, 15.207 Conducted Emission AC Power Port	20	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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## 6 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: OYMSPM5801D filing to comply with Section 15.205, 15.209, 15.249 of the FCC Part 15, Subpart C Rules.

SPM5801BB/27 and SPM6813BB/27 are identical except model No. So RF testing was applied on SPM5801BB/27, other model is deemed to fulfill relevant RF requirement without further testing.

### SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

□ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: Aug 27 2008

Testing Start Date: Aug 29 2008

Testing End Date: 7 Oct 2008

- TÜV SÜD CHINA SHENZHEN BRANCH -

Reviewed by:

Paul Yu  
EMC Project Manager

Prepared by:

Phoebe Hu  
EMC Test Engineer

## 7 Technical Requirement

### 7.1 Radiated Emission(Spurious Emission inclusive Restricted Bands Requirement)

#### Test Method

- 1 The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2 The turntable shall be rotated for 360 degrees to determine the position of maximum emission level
- 3 EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
- 5 Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6 each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

#### Limit

A FCC Part 15 Subpart C Paragraph 15.249(a) Limit

Field Strength of Fundamental Fundamental Frequency (3m) Field Strength of Harmonics (3m)  
(MHz) mV/m dBuV/m uV/m dBuV/m

2400-2483.5 50 94 (Average) 114 (Peak) 500 54 (Average) 74 (Peak)

Note: 1. RF Field Strength (dBuV) = 20 log RF Voltage (uV)

2.Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

Frequency MHz	Field Strength uV/m	Field Strength dBuV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK



# Radiated Emission(Spurious Emission inclusive Restricted Bands Requirement)

## CH1-2402MHz Test Result

Frequency MHz	Cable Loss dB	Antenna Factor dB/m	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBμV/m	Detector	Result
35.557	0.9	17.6	0.9	19.4	Vertical	40	QP	Pass
379.721	1.4	18.8	7.9	28.1	Horizontal	46	OP	Pass
Above 1000				No peak found	---	54	PK	Pass

## CH2-2439MHz Test Result

Frequency MHz	Cable Loss dB	Antenna Factor dB/m	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBμV/m	Detector	Result
36.500	0.9	17.6	1.6	20.1	Horizontal	40	QP	Pass
379.456	1.4	18.8	6.2	26.4	Vertical	46	OP	Pass
Above 1000				No peak found	---	54	PK	Pass

## CH3-2479MHz Test Result

Frequency MHz	Cable Loss dB	Antenna Factor dB/m	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBμV/m	Detector	Result
37.541	0.9	17.6	1.7	20.2	Horizontal	40	QP	Pass
378.301	1.4	18.8	5.4	25.6	Vertical	46	OP	Pass
Above 1000				No peak found	---	54	PK	Pass

Remark: Emission Level= Cable Loss(include amplifier factor) + Antenna Factor + Reading



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## Test Equipment

### Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL.DUE.DATE
EMI Test Receiver	Rohde & Schwarz	ESI26	838786/013	2009-12-30
Bilog Antenna	Chase	CBL6112B	2591	2009-12-30
Signal Generator	Rohde & Schwarz	SMR20	100047	2009-12-30
Antenna	Schwarzbeck	VUBA9117	115	2009-12-30
Horn Antenna	Rohde & Schwarz	HF906	100013	2009-12-30

## 7.2 Radiated Emission(Fundamental and Harmonics)

### Test Method

- 1 The EUT is placed on a turntable, which is 0.8m above ground plane.
- 2 The turntable shall be rotated for 360 degrees to determine the position of maximum emission level
- 3 EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. The frequency spectrum from 30 MHz to 1 GHz was investigated. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 kHz. All readings are above 1 GHz, peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
- 5 Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6 each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

### Limit

A FCC Part 15 Subpart C Paragraph 15.249(a) Limit

Field Strength of Fundamental Fundamental Frequency (3m) Field Strength of Harmonics (3m)  
(MHz) mV/m dBuV/m uV/m dBuV/m

2400-2483.5 50 94 (Average) 114 (Peak) 500 54 (Average) 74 (Peak)

Note: 1. RF Field Strength (dBuV) = 20 log RF Voltage (uV)

2.Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

Frequency MHz	Field Strength of Fundamental dBuV/m	Field Strength of Harmonics dBuV/m	Detector
902-928	94.0	54.0	QP
2400-2483.5	94.0	54.0	AV
5725-5875	94.0	54.0	AV
24000-24250	108.0	68.0	AV

# Radiated Emission(Fundamental and Harmonics)

Frequency MHz	Cable Loss dB	Antenna Factor dB/m	Reading dBuV	Emission Level dBuV/m	Polarization	Limit dBuV/m	Detector	Result
2402.89	5.6	28.5	46.0	80.1	Horizontal	114	PK	Pass
2402.89	5.6	28.5	45.6	79.7	Horizontal	94	AV	Pass
2402.14	5.6	28.5	45.2	79.3	Vertical	114	PK	Pass
2402.14	5.6	28.5	44.8	78.9	Vertical	94	AV	Pass
Harmonics				No peak found	---	54	AV	Pass
2439.21	5.6	28.5	46.5	80.6	Horizontal	114	PK	Pass
2439.21	5.6	28.5	45.0	79.1	Horizontal	94	AV	Pass
2439.33	5.6	28.5	44.9	79.0	Vertical	114	PK	Pass
2439.33	5.6	28.5	44.5	78.6	Vertical	94	AV	Pass
Harmonics				No peak found	---	54	AV	Pass
2479.12	5.6	28.5	44.6	78.7	Horizontal	114	PK	Pass
2479.12	5.6	28.5	44.0	78.1	Horizontal	94	AV	Pass
2479.08	5.6	28.5	44.1	78.2	Vertical	114	PK	Pass
2479.08	5.6	28.5	43.2	77.3	Vertical	94	AV	Pass
Harmonics				No peak found	---	54	AV	Pass

Remark: Emission Level= Cable Loss(include amplifier factor) + Antenna Factor + Reading



China

## Test Equipment

### Radiated Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL.DUE.DATE
EMI Test Receiver	Rohde & Schwarz	ESI26	838786/013	2009-12-30
Bilog Antenna	Chase	CBL6112B	2591	2009-12-30
Signal Generator	Rohde & Schwarz	SMR20	100047	2009-12-30
Antenna	Schwarzbeck	VUBA9117	115	2009-12-30
Horn Antenna	Rohde & Schwarz	HF906	100013	2009-12-30

## 7.3 Band edge compliance of RF emissions

### Test Method

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW and VBW to 1MHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength.

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set spectrum analyzer's span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW and VBW to 100kHz, to measure the Radiated peak band edge.
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

### Limits

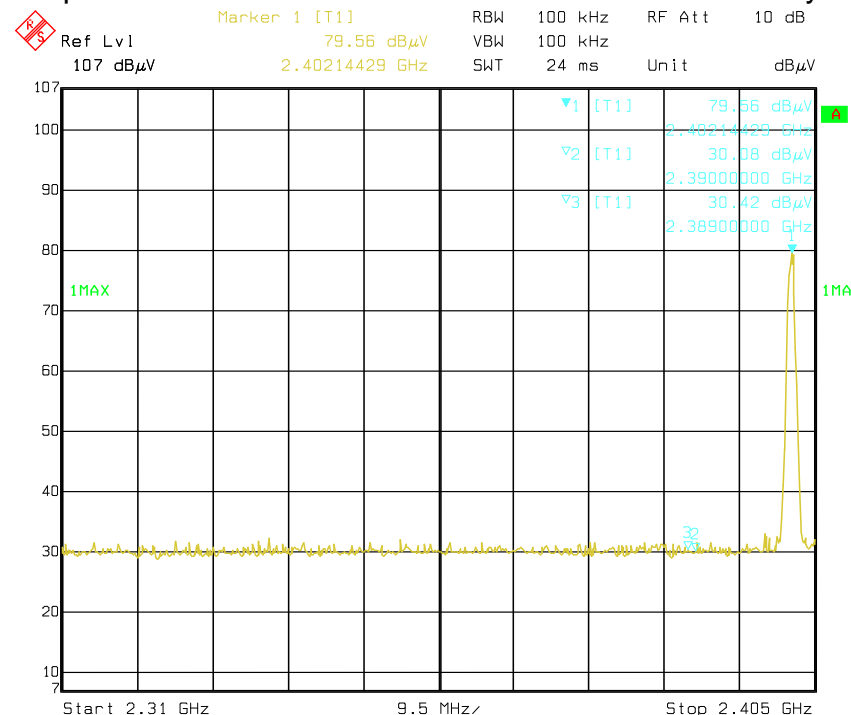
According to §15.249(d), the EUT shows compliance to the requirement of this section, which states emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or the general radiated emission in section 15.209, whichever is lesser attenuation.

Frequency MHz	Limit Average dBuV/m	Limit Peak dBuV/m
Below 2390 Above 2483.5	54	74

## Band edge compliance of RF emissions

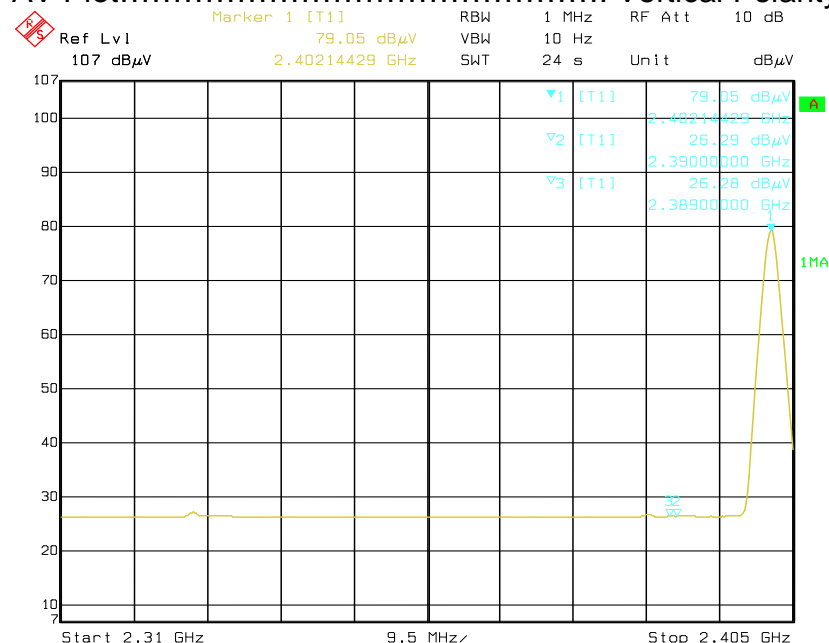
### Lower Edge

### PK plot ..... Vertical Polarity



Date: 14.NOV.2008 19:03:13

### AV Plot..... Vertical Polarity



Date: 14.NOV.2008 19:04:11

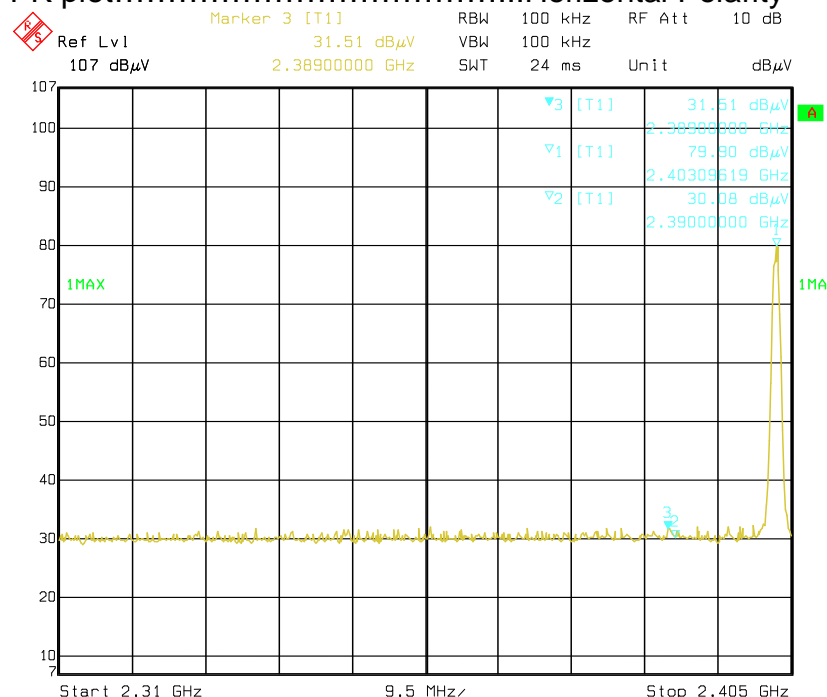
Max carrier field strength PK 79.3dBuV/m, AV 78.9dBuV/m

At 2.390GHz, the deviation of PK plot is 49.48dB, AV plot is 52.76dB

The field strength at 2.390GHz PK 29.82dBuV/m, AV 26.14dBuV/m

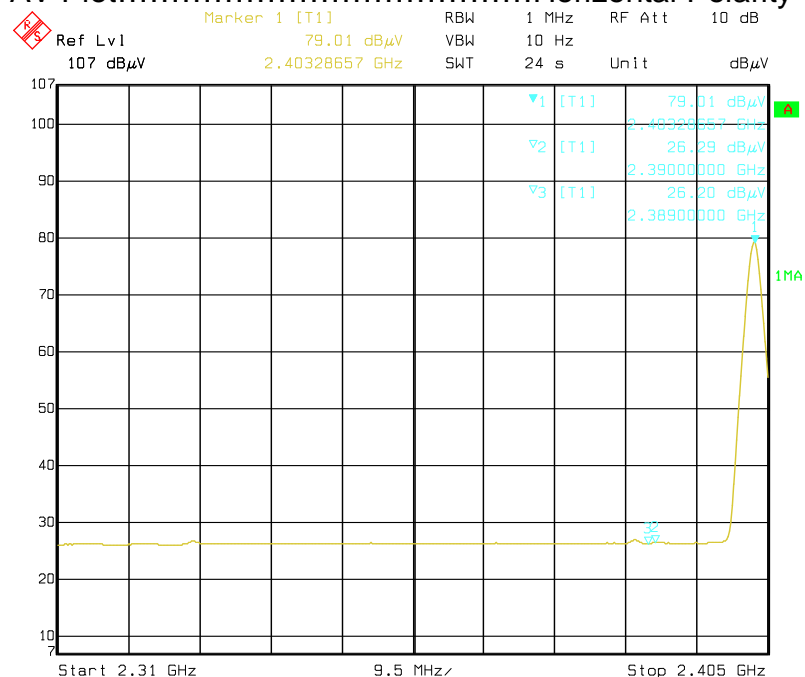
Which fulfills the requirement of PK 74dBuV/m and AV 54dBuV/m

## PK plot.....Horizontal Polarity



Date: 14.NOV.2008 18:33:36

## AV Plot.....Horizontal Polarity



Date: 14.NOV.2008 18:34:44

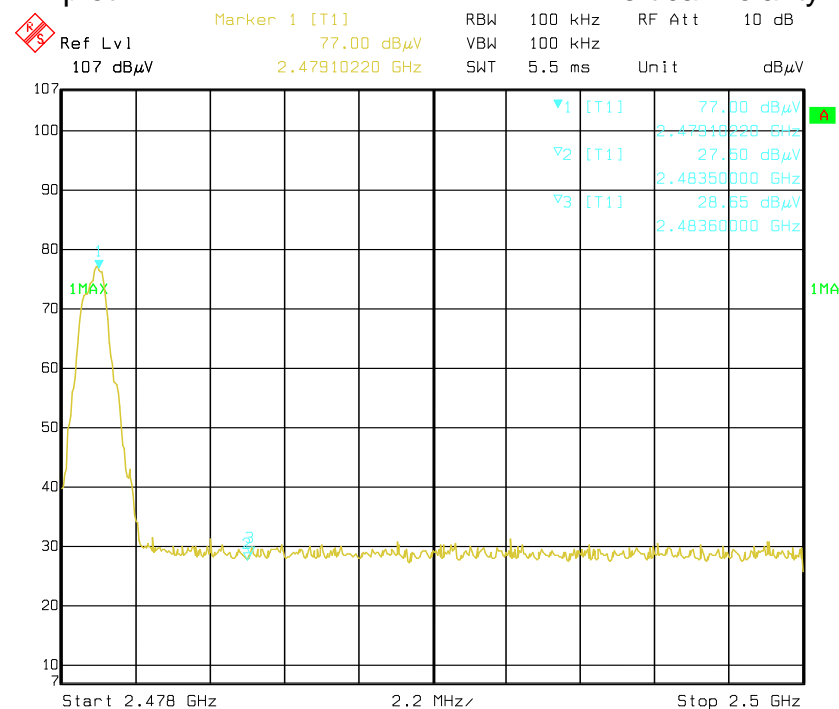
Max carrier field strength PK 80.1dBuV/m, AV 79.7dBuV/m  
 At 2.390GHz, the deviation of PK plot is 49.82dB, AV plot is 52.72dB  
 The field strength at 2.390GHz PK 30.28dBuV/m, AV 26.98dBuV/m  
 Which fulfills the requirement of PK 74dBuV/m and AV 54dBuV/m



## Upper Edge

### PK plot

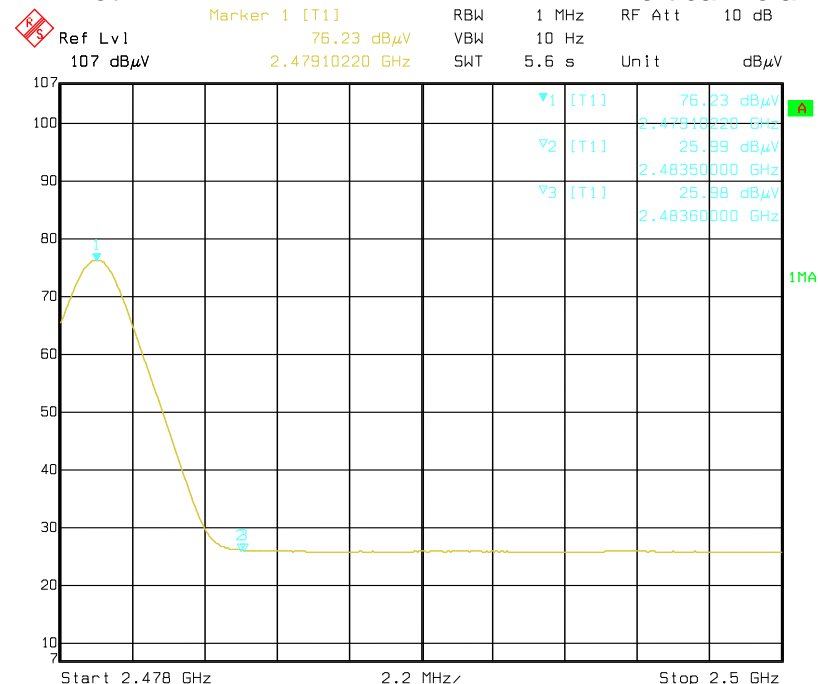
### Vertical Polarity



Date: 14.NOV.2008 18:59:32

### AV Plot

### Vertical Polarity



Date: 14.NOV.2008 18:56:53

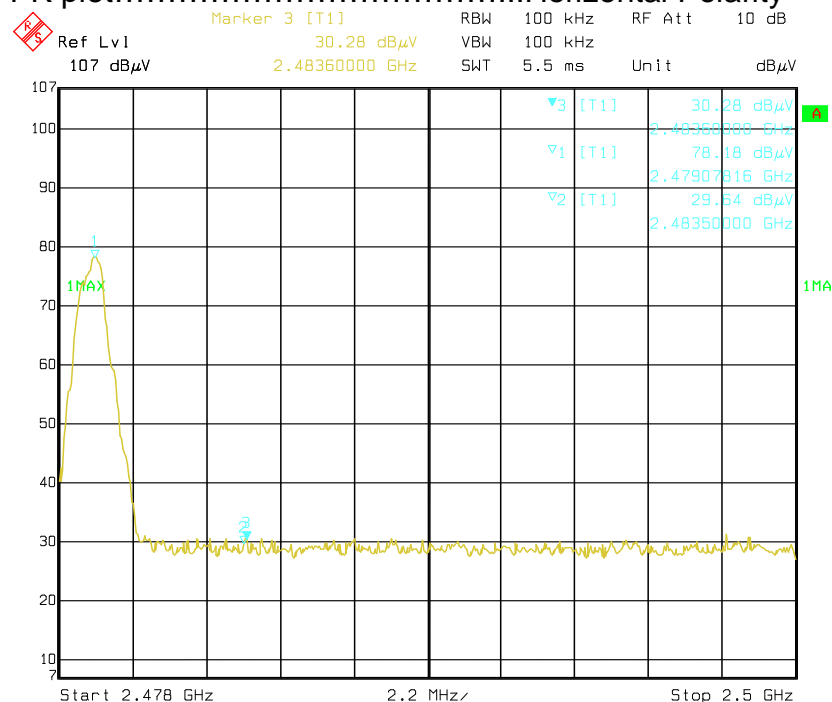
Max carrier field strength PK 78.2dBuV/m, AV 77.3dBuV/m

At 2.4835GHz, the deviation of PK plot is 49.5dB, AV plot is 50.24dB

The field strength at 2.4835GHz PK 28.7dBuV/m, AV 27.06dBuV/m

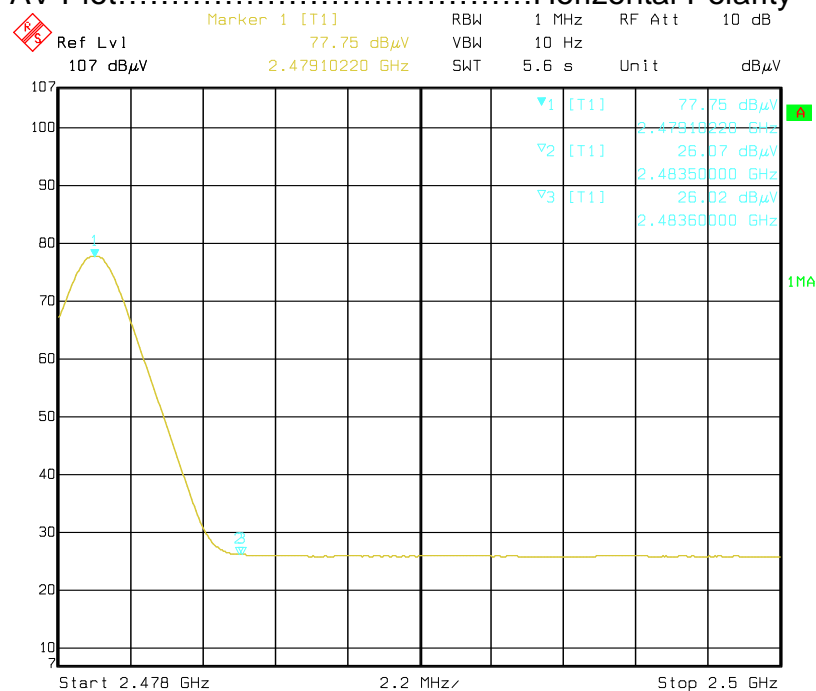
Which fulfills the requirement of PK 74dBuV/m and AV 54dBuV/m

## PK plot.....Horizontal Polarity



Date: 14.NOV.2008 18:48:17

## AV Plot.....Horizontal Polarity



Date: 14.NOV.2008 19:09:34

Max carrier field strength PK 78.7dBuV/m, AV 78.1dBuV/m

At 2.4835GHz, the deviation of PK plot is 48.54dB, AV plot is 51.68dB

The field strength at 2.4835GHz PK 30.16dBuV/m, AV 26.42dBuV/m

Which fulfills the requirement of PK 74dBuV/m and AV 54dBuV/m



China

## Test Equipment List

### Band edge compliance of RF emissions

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL.DUE.DA TE
EMI Test Receiver	Rohde & Schwarz	ESI26	838786/013	2009-12-30
Horn Antenna	Rohde & Schwarz	HF906	100013	2009-12-30
3m Semi-anechoic chamber	Albatross Projects	9X6X6	----	2009-12-30

## 7.4 Conducted Emission

### Test Method

- 1 The EUT was placed on a table, which is 0.8m above ground plane
- 2 The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
- 3 Maximum procedure was performed to ensure EUT compliance
- 4 A EMI test receiver (R&S Test Receiver ESCS30) is used to test the emissions from both sides of AC line

### Test Mode

#### Run Test Program

-The test program BIT.exe exercises all the drive and ports of the EUT, and displaying scrolling H on the screen.

### Limit

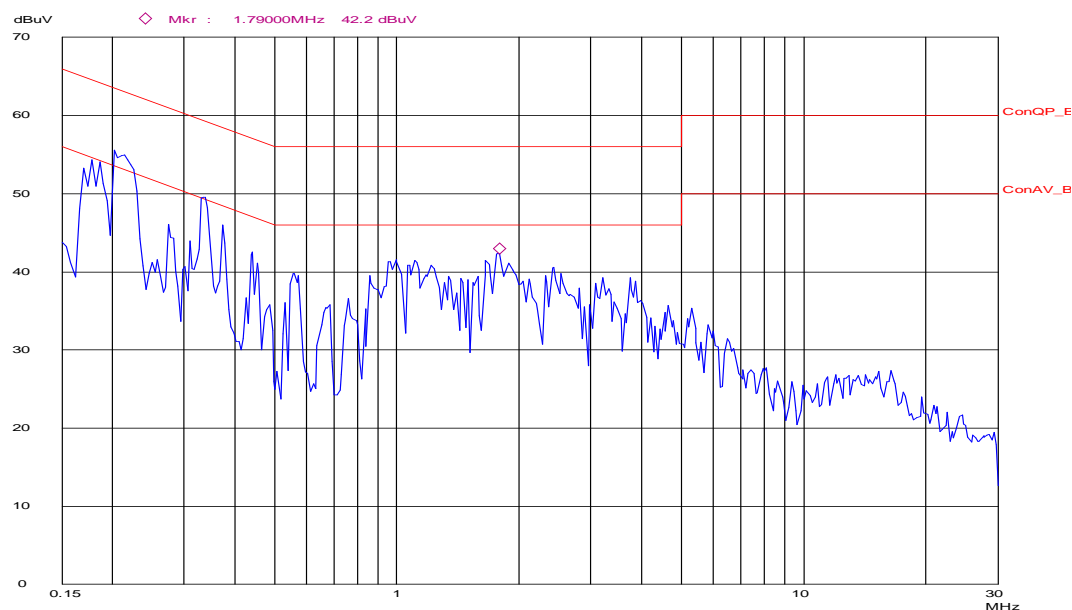
Frequency MHz	QP Limit dB $\mu$ V	AV Limit dB $\mu$ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linearly with logarithm of the frequency

# Conducted Emission

## Conducted Disturbance

EUT: SPM5801BB/27  
Op Cond: Connect PC  
Test Spec: L  
Comment: AC120V/60Hz



Frequency MHz	Cable Loss dB	Reading dBμV	QP Test result dBμV	QP Limit dBμV	Margin dB
0.178	9.8	33.1	42.9	64.5	21.6
0.202	9.8	41.2	51.0	63.5	12.5
0.338	9.8	35.2	45.0	59.2	14.2
0.374	9.8	32.7	42.5	58.4	15.9
1.105	9.9	30.7	40.6	56	15.4
1.790	9.9	29.4	39.3	56	16.7

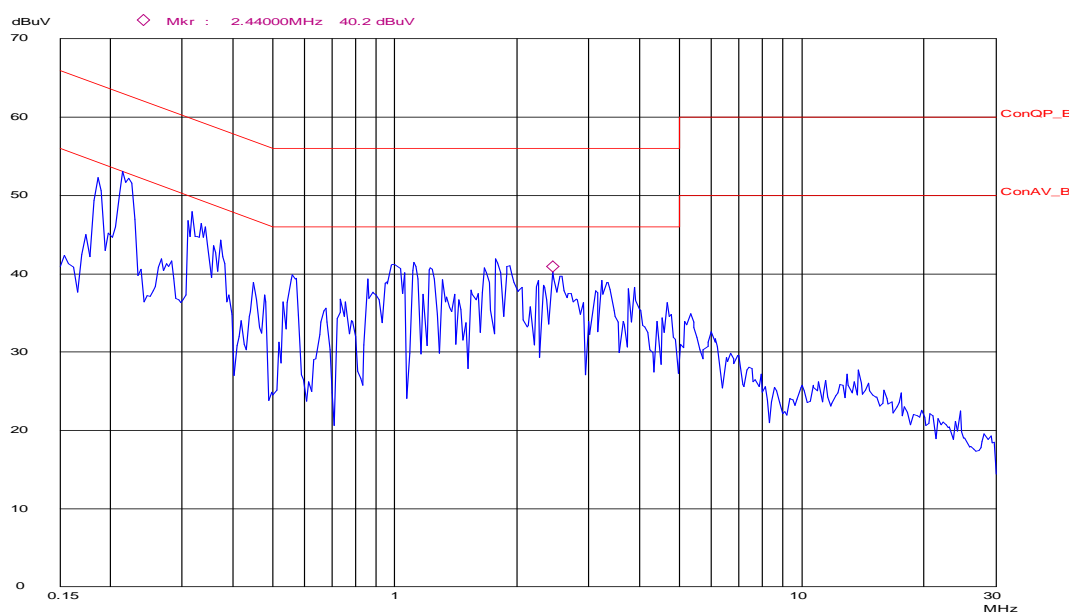
Frequency MHz	Cable Loss dB	Reading dBμV	AV Test result dBμV	AV Limit dBμV	Margin dB
0.178	9.8	15.9	25.7	54.5	28.8
0.202	9.8	18.0	27.8	53.5	25.7
0.338	9.8	27.4	37.2	49.2	12.0
0.374	9.8	14.9	24.7	48.4	23.7
1.105	9.9	23.7	33.6	46	12.4
1.790	9.9	17.1	27.0	46	19.0

Remark: Test Result= Reading + Cable Loss

# Conducted Emission

## Conducted Disturbance

EUT: SPM5801BB/27  
Op Cond: Connect PC  
Test Spec: N  
Comment: AC120V/60Hz



Frequency MHz	Cable Loss dB	Reading dBμV	QP Test result dBμV	QP Limit dBμV	Margin dB
0.186	9.8	37.4	47.2	64.2	17.0
0.214	9.8	33.2	43.0	63.0	20.0
0.318	9.8	27.4	37.2	59.7	22.5
1.115	9.9	30.3	40.2	56	15.8
1.770	9.9	30.8	40.7	56	15.3
2.440	9.9	29.2	39.1	56	16.9

Frequency MHz	Cable Loss dB	Reading dBμV	AV Test result dBμV	AV Limit dBμV	Margin dB
0.186	9.8	14.9	24.7	54.2	29.5
0.214	9.8	15.9	25.7	53.0	27.3
0.318	9.8	7.6	17.4	49.7	32.3
1.115	9.8	22.7	32.5	46	13.5
1.770	9.9	21.8	31.7	46	14.3
2.440	9.9	21.7	31.6	46	14.4

Remark: Test Result= Reading + Cable Loss



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## Test Equipment List

### Conducted Emission Test

DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESCS30	100003	2009-12-30
AMN	Rohde & Schwarz	ESH3-Z5	100229	2009-12-30
AMN	Rohde & Schwarz	ENV216	100042	2009-12-30

## 8 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

**System Measurement Uncertainty**

Items		Extended Uncertainty
RE	Field strength (dB $\mu$ V/m)	U=3.5dB; k=2(30MHz-1GHz)
CE	Disturbance Voltage (dB $\mu$ V)	U=2.8dB; k=2