

TEST REPORT

of

FCC Part 15 Subpart C §15.249

FCC ID : WU2SMRSFLASHWAVE4

Equipment Under Test : Digital Radio Slave
Model Name : FLASHWAVE4
(Alt. : FLASHWAVE4-TTL, POWERSYNC80)
Serial No. : N/A
Applicant : SMDV
Manufacturer : SMDV
Date of Test(s) : 2013. 09. 02 ~ 2013. 11. 01
Date of Issue : 2013. 11. 04

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Youngmin Park

Date:

2013. 11. 04

Approved By:



Feel Jeong

Date:

2013. 11. 04

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1. General information

1.1 Testing laboratory

SGS Korea Co., Ltd.

- 400-2, Gomae-dong, Giheoung-gu, Yongin-si, Gyeonggi-do, Korea, 446-901
- Wireless Div. 3FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040

All SGS services are rendered in accordance with the applicable SGS conditions of service available on request and accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>.

Telephone : +82 31 428 5700

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1.2 Details of applicant

Applicant : SMDV

Address : 1532 Nakdongdae-Ro, Sasang-Gu, Busan, Korea

Contact Person : Ji Young, Kim

Phone No. : +82 051 324 0788

1.3. Description of EUT

Kind of Product	Digital Radio Slave
Model Name	FLASHWAVE4 (Alt. : FLASHWAVE4-TTL, POWERSYNC80)
Serial Number	N/A
Power Supply	DC 3 V
Frequency Range	2402 MHz ~ 2481 MHz
Modulation Technique	GFSK
Number of Channels	80
Antenna Type	Wire Antenna
H/W version	Version 1.0
S/W version	Version 1.0

1.4 Details of modification

-N/A

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RTT5041-20(2013.07.27)(1)

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A4(210mm x 297mm)

1.5. Test equipment list

Equipment	Manufacturer	Model	S/N	Cal Date	Cal Interval	Cal Due.
Signal Generator	R&S	SMR40	100540	Jan. 08, 2013	Annual	Jan. 08, 2014
Signal Generator	R&S	SMJ 100A	100882	Jul. 03, 2013	Annual	Jul. 03, 2014
Spectrum Analyzer	R&S	FSV30	101004	Jul. 20, 2013	Annual	Jul. 20, 2014
Band Rejection Filter	Wainwright	WRCT2402/2480-2400/2483.5-30/20SS	22	Jul. 02, 2013	Annual	Jul. 02, 2014
High Pass Filter	Wainwright	WHK3.0/18G-6SS	4	Jul. 02, 2013	Annual	Jul. 02, 2014
Low Pass Filter	Mini circuits	NLP-1200+	V9500401023-1	Jul. 02, 2013	Annual	Jul. 02, 2014
DC Power Supply	Agilent	U8002A	MY48490027	Jan. 08, 2013	Annual	Jan. 08, 2014
Preamplifier	H.P.	8447D	2727A05143	Aug.08, 2013	Annual	Aug.08, 2014
Preamplifier	MITEQ Inc.	JS44-18004000-35-8P	1546891	Jun. 13, 2013	Annual	Jun. 13, 2014
Preamplifier	R & S	SCU 18	10070	Jun. 21, 2013	Annual	Jun. 21, 2014
Test Receiver	R & S	ESC17	100778	Aug. 07, 2013	Annual	Aug. 07, 2014
Turn Table	DT-3000S-3T	INN-CO	N/A	N.C.R.	N.C.R.	N.C.R.
Horn Antenna	R & S	HF906	100608	Aug. 13, 2012	Biennial	Aug. 13, 2014
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170431	May 15, 2012	Biennial	May 15, 2014
Antenna Master	MA4000-EP	INN-CO	N/A	N.C.R.	N.C.R.	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (21.5 m x 13.0 m x 9.0 m)	N/A	N.C.R.	N.C.R.	N.C.R.

1.6. Support equipment

Equipment	Manufacturer	Model name	S/N
-	-	-	-

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1.7. Summary of test results

The EUT has been tested according to the following specifications:

Applied Standard : FCC Part15, Subpart C		
Standard Section	Test Item	Result
15.209(a) 15.249(a) 15.249(d) 15.205	Fundamental, Spurious emission and edge band radiated emission	Complied

1.8. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL007019	Initial
1	F690501/RF-RTL007019-1	Added band edge test, Described 3 data rates and the worst case

1.9. Alternative models

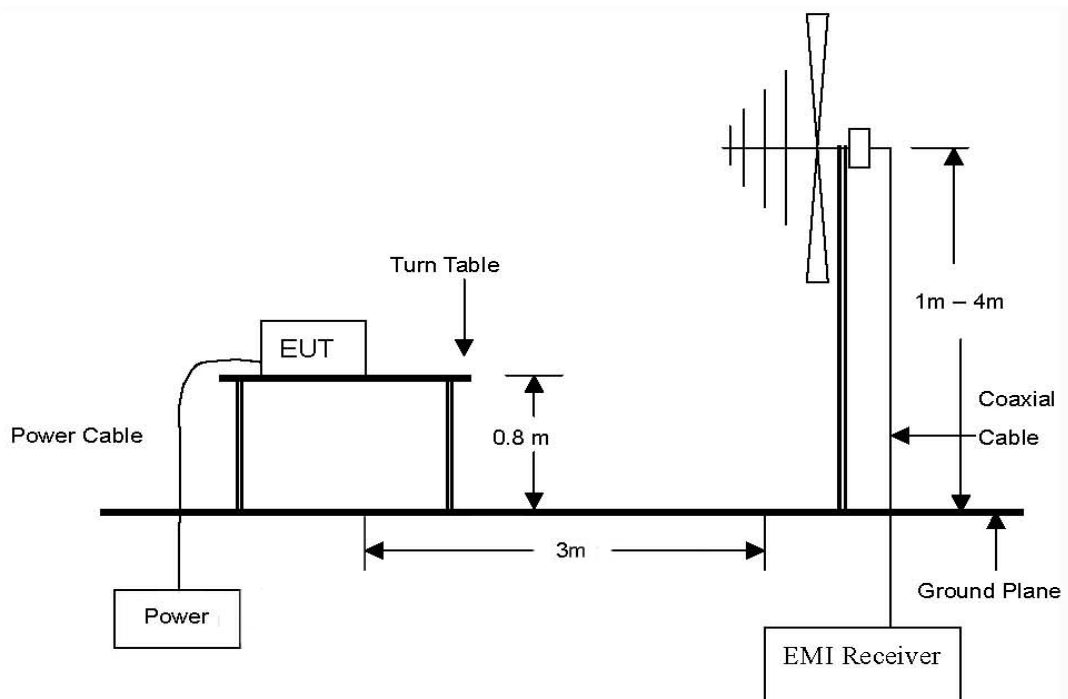
Model name	Information
FLASHWAVE4	- Basic model.
FLASHWAVE4-TTL	- Same to basic model. - There are no difference Electrical and electronic properties, circuits, components, features, appearance, structure.
POWERSYNC80	- Same to basic model. - There are no difference Electrical and electronic properties, circuits, components, features, appearance, structure.

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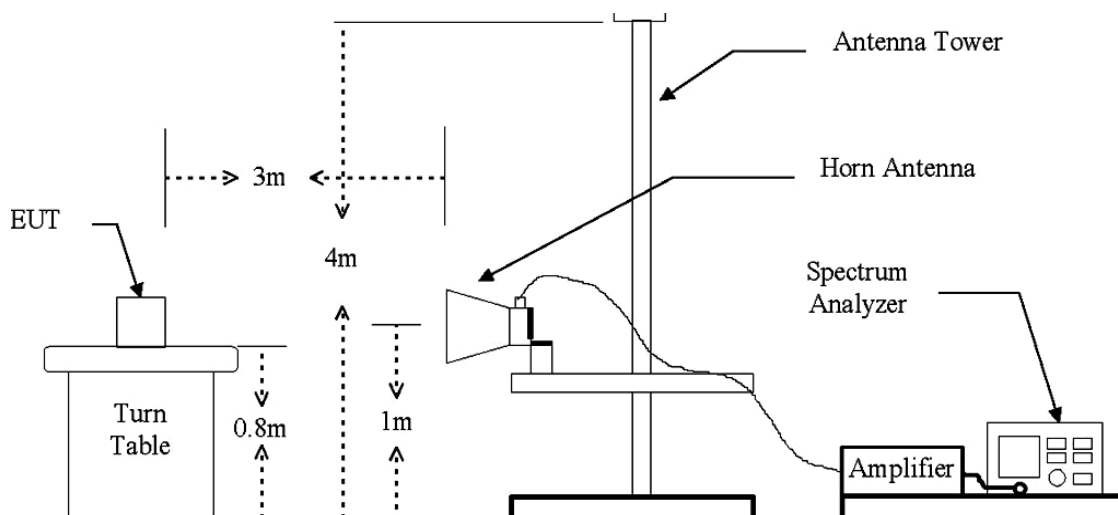
2. Fundamental, Spurious emission and edge band radiated emission

2.1. Test setup

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission. The spurious emissions were investigated from 1 GHz to the 10th harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.



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2.2. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic Chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Note :

All data rates were investigated for radiated spurious emissions. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section. (The worst case : 2 Mbps)

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.

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2.3. Limit

In the section 15.249(a) :

Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental ($\mu\text{V/m}$)	Field strength of harmonics ($\mu\text{V/m}$)
902 ~ 928 MHz	50	500
2 400 ~ 2 483.5 MHz	50	500
5 725 ~ 5 875 MHz	50	500
24.0 ~ 24.25 GHz	250	2 500

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in the section 15.209(a), whichever is the lesser attenuation.

In the section 15.209(a) :

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Fundamental frequency (MHz)	Field strength ($\mu\text{V/m}$)	Measurement distance (m)
30 ~ 88	100*	3
88 ~ 216	150*	3
216 ~960	200*	3
Above 960	500	3

Remark:

Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

In the above emission table, the tighter limit applies at the band edges.

Fundamental frequency (MHz)	Field strength ($\mu\text{V/m}$ at 3 meter)	Field strength (dB $\mu\text{V/m}$ at 3 meter)
30 ~ 88	100	40
88 ~ 216	150	43.5
216 ~960	200	46
Above 960	500	54

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2.4. Test result

Ambient temperature : (23 ± 1) °C
Relative humidity : 47 % R.H.

2.4.1. Below 1 GHz

The frequency spectrum from 30 MHz to 1 000 MHz was investigated. Emission levels are not reported much lower than the limits by over 30 dB. All reading values are quasi-peak values. (Worst case : Low channel)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP + CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
32.13	35.14	Peak	V	12.32	-26.20	21.26	40.00	18.74
136.12	34.79	Peak	V	8.63	-25.25	18.17	43.50	25.33
Below 200.00	Not detected	-	-					

Remark

1. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. XY plane is worst case.
2. All spurious emission at channels are almost the same below 1 GHz, so that the channel was chosen at representative in final test.

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2.4.2. Above 1 GHz

A. Low Channel (2 402 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 402.00	63.81	Peak	V	28.32	10.41	102.54	114.00	11.46
2 402.00	50.68	Average	V	28.32	10.41	89.41	94.00	4.59
*2 390.00	16.59	Peak	V	28.30	10.37	55.26	74.00	18.74
*2 390.00	4.08	Average	V	28.30	10.37	42.75	54.00	11.25
2 400.00	25.80	Peak	V	28.32	10.40	64.52	74.00	9.48
2 400.00	10.02	Average	V	28.32	10.40	48.74	54.00	5.26
Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 803.13	55.28	Peak	V	33.20	-31.74	56.74	74.00	17.26
*4 803.13	35.56	Average	V	33.20	-31.74	37.02	54.00	16.98
7 205.47	44.79	Peak	V	35.67	-27.77	52.69	74.00	21.31
7 205.47	23.78	Average	V	35.67	-27.77	31.68	54.00	22.32
Above 7 300.00	Not Detected	-	-	-	-	-	-	-

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B. Middle Channel (2 441 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2 441.00	63.58	Peak	V	28.42	10.52	102.52	114.00	11.48
2 441.00	50.54	Average	V	28.42	10.52	89.48	94.00	4.52
Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dB μ V)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
*4 882.46	53.36	Peak	V	33.29	-31.72	54.93	74.00	19.07
*4 882.46	43.23	Average	V	33.29	-31.72	44.80	54.00	9.20
*7 326.69	44.72	Peak	V	35.77	-27.58	52.91	74.00	21.09
*7 326.69	34.71	Average	V	35.77	-27.58	42.90	54.00	11.10
Above 7 400.00	Not Detected	-	-	-	-	-	-	-

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C. High Channel (2 481 MHz)

Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2 481.00	63.47	Peak	V	28.51	10.64	102.62	114.00	11.38
2 481.00	50.49	Average	V	28.51	10.64	89.64	94.00	4.36
*2 483.50	16.88	Peak	V	28.52	10.65	56.05	74.00	17.95
*2 483.50	4.14	Average	V	28.52	10.65	43.31	54.00	10.69
Radiated Emissions			Ant	Correction Factors		Total	FCC Limit	
Frequency (MHz)	Reading (dBμV)	Detect Mode	Pol.	AF (dB/m)	AMP+CL (dB)	Actual (dBμV/m)	Limit (dBμV/m)	Margin (dB)
*4 961.13	50.75	Peak	V	33.38	-31.71	52.42	74.00	21.58
*4 961.13	35.73	Average	V	33.38	-31.71	37.40	54.00	16.60
*7 442.54	44.33	Peak	V	35.88	-27.39	52.82	74.00	21.18
*7 442.54	29.86	Average	V	35.88	-27.39	38.35	54.00	15.65
Above 7 500.00	Not Detected	-	-	-	-	-	-	-

Remarks ;

1. “*” means the restricted band.
2. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. XY plane is worst case
3. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
4. Radiated emissions measured in frequency above 1 000 MHz were made with an instrument using peak/average detector mode.
5. Average test would be performed if the peak result were greater than the average limit.
6. Actual = Reading + AF - Amp Gain + CL

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