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Tested by:



Pekka Kälviäinen, Test Engineer



Reviewed by:



Janne Nyman, Compliance Specialist

SORT OF EQUIPMENT:

7signal Sapphire Eye WLAN Unit

MARKETING NAME:

7signal Sapphire Eye

TYPE:

7signal Sapphire Eye (ver. 2.0)

MANUFACTURER:

7signal Ltd

CLIENT:

7signal Ltd

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TEST LABORATORY:

Nemko Oy

FCC REG. NO.

ID 359859 November 26, 2008**SUMMARY:**

In regard to the performed tests the equipment under test fulfils the requirements defined in the test specifications, see page 2 for details

The test results are valid for the tested unit only. Without a written permission of Nemko Oy it is allowed to copy this report as a whole, but not partially.

Summary of performed tests and test results

<i>Section in CFR 47</i>		<i>Result</i>
15.207	AC power line conducted emissions	PASS , margin 1.8 dB
15.209 / 15.247	Radiated emissions	PASS , margin 1.5 dB

Explanations:

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.

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1. EUT and Accessory Information

1.1 EUT description

The EUT is a 7signal Sapphire Eye WLAN unit. The transmitting frequency of the EUT was 2437 MHz.

1.2 EUT and accessories

	<i>unit</i>	<i>type</i>	<i>S/N</i>
EUT	7signal Sapphire Eye	7signal Sapphire Eye (ver. 2.0)	ED2 / 10.1.19.52
	Ethernet node	D-link Model: DES-1008P	F3EX197000034
	AC power unit	D-link Model: VAN90C-480B	1309200809-0D

Cables:

From	To	Type	Length [m]
7signal Sapphire Eye	Ethernet node	unshielded	4.0
Ethernet node	AC power unit	unshielded	2.0
AC power unit	AC mains	unshielded	2.0

2. Standards and measurement methods

The test were performed in guidance of the CFR 47 Part 15, Subpart B, Class B, ANSI C63.4 and EN 55022.

3. Test results

3.1 AC power line conducted emissions

The test was performed as a compliance test. The test parameters concerned were as follows:

<i>Site name</i>	Nemko Oy/ Perkkaa
<i>Date of testing</i>	10.01.2011
<i>Test equipment</i>	694, 168, 348, 371
<i>Test conditions</i>	22 °C, 35 % RH
<i>Test result</i>	PASS

3.1.1 Test method and limit

The test was performed inside a shielded room where the floor and one of the walls of the test site comprised the reference ground plane (RGP). For the duration of the test the EUT was placed on a non-conductive table 0.8 m high standing on the reference ground plane (see photograph 1). The power input cable of the EUT was connected to an artificial mains network. The test was performed separately on the phase and also on the neutral wire.

The disturbances were first examined by performing a spectrum scan by using a peak detector. The general procedure in the conducted disturbance emission test is that no further measurements are necessary if the disturbance levels measured by using the peak detector are below the limit value defined for the measurement performed by using an average detector.

If not, then at the test frequencies concerned the measurement is performed also by using a quasi-peak detector. If the disturbance levels measured by using the quasi-peak detector are below the limit value defined for the measurement performed by using an average detector, then measurements by using the average detector are not necessary.

<i>Frequency band MHz</i>	<i>Quasi-peak limit dB(μV)</i>	<i>Average limit dB(μV)</i>
0.15 – 0.5	66 – 56	56 – 46
0.5 – 5	56	46
5 - 30	60	50

3.1.2 EUT operation mode

<i>EUT operation mode</i>	TX on (2437 MHz)
<i>EUT operation voltage</i>	115 V / 60 Hz

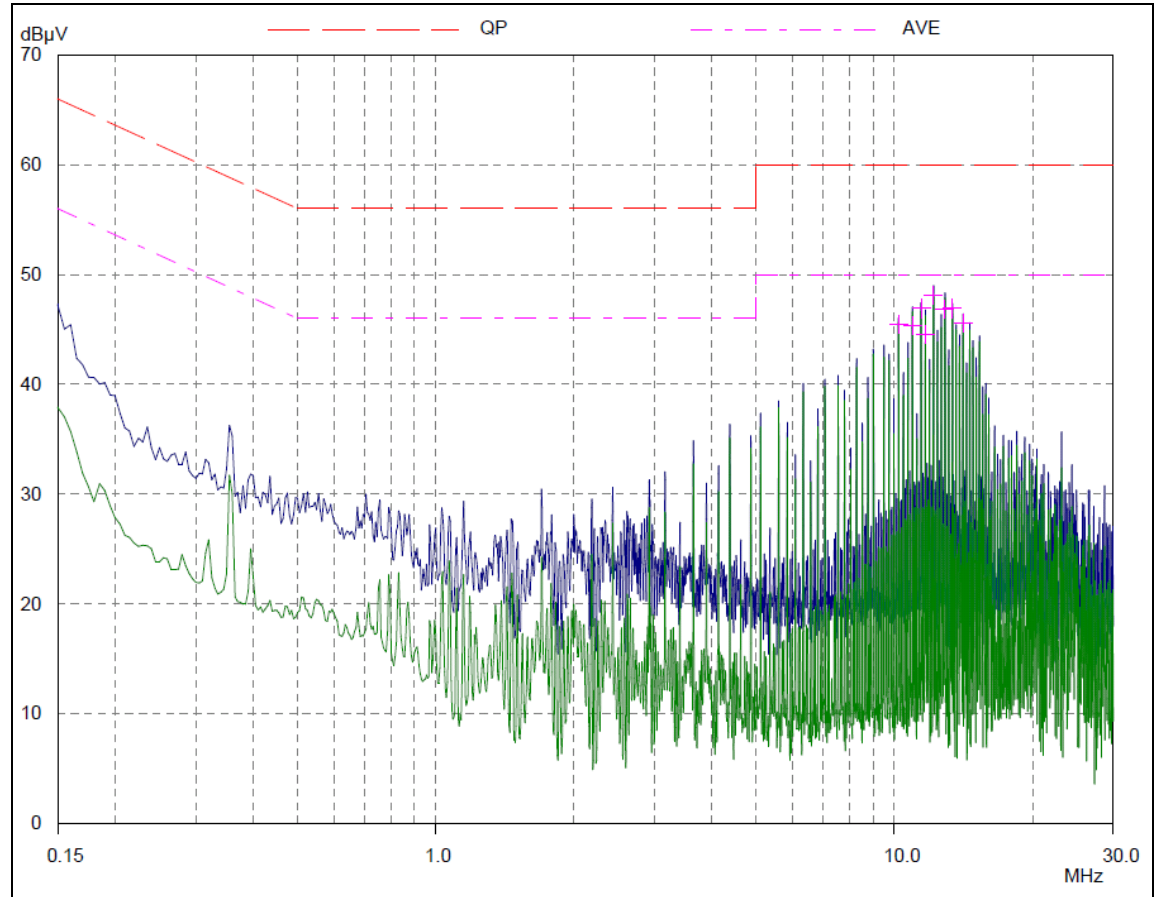
3.1.3 EUT test setup



Photograph 1. AC power line conducted emissions test setup

3.1.4 Test data

line N



Final Measurement Results

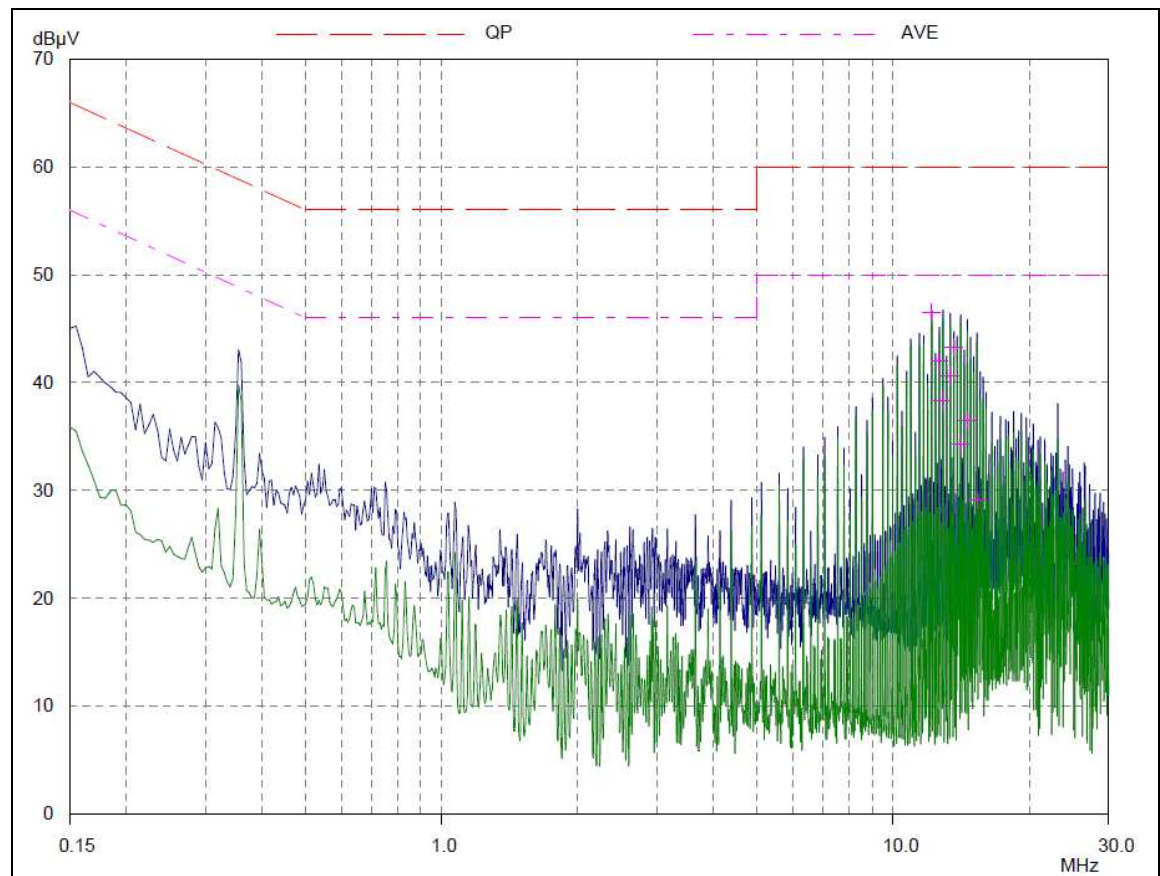
Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB
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No results

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
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10.21	45.44	50.00	4.56
10.94	45.31	50.00	4.69
11.425	46.91	50.00	3.09
11.67	44.59	50.00	5.41
12.155	48.14	50.00	1.86
12.885	46.81	50.00	3.19
13.37	46.91	50.00	3.09
14.1	45.60	50.00	4.40

line L



Final Measurement Results

Frequency MHz	QP Level dBμV	QP Limit dBμV	QP Delta dB
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No results

Frequency MHz	AV Level dBμV	AV Limit dBμV	AV Delta dB
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12.15	46.50	50.00	3.50
12.64	41.99	50.00	8.01
12.885	38.38	50.00	11.62
13.37	40.59	50.00	9.41
13.61	43.31	50.00	6.69
14.1	34.24	50.00	15.76
14.585	36.46	50.00	13.54
15.315	29.10	50.00	20.90

3.2 Radiated emissions

<i>Site name</i>	Nemko / Perkkaa
<i>Date of testing</i>	07.01.2011
<i>Test equipment</i>	350, 338, 566, 544, 564, 319, 525, 559, 371
<i>Test conditions</i>	22 °C, 30 % RH
<i>Test result</i>	PASS

3.2.1 Test method and limit

The test was performed in a semi-anechoic shielded room. The EUT was placed on a non-conductive 0.8 m high table standing on the turntable (photographs 2 and 3). During the test in the frequency range 30-1000 MHz the distance from the EUT to the measuring antenna was 10 m and in the frequency range 1000-18000 MHz the distance from the EUT to the measuring antenna was 3 m. The excess length of the cables of the EUT were made into bundles 30-40 cm in length. In order to find the maximum levels of the disturbance radiation the angle of the turntable, the height of the measuring antenna and the lay-out of the EUT cables were varied during the tests. The test was performed with the measuring antenna being both in horizontal and vertical polarizations.

The CFR 47 Part 15, Subpart B, Class B limit of 500 $\mu\text{V/m}$ has been calculated to correspond 54 $\text{dB}(\mu\text{V/m})$ as follows: $[\text{dB}(\mu\text{V/m})]=20\log[\mu\text{V/m}]$.

EN 55022 Class B limit (10m measuring distance)

<i>Frequency band MHz</i>	<i>Quasi-peak limit $\text{dB}(\mu\text{V/m})$</i>
30 - 230	30
230 - 1000	37

The CFR 47 Part 15, Subpart B, Class B limit (3m measuring distance)

<i>Frequency band MHz</i>	<i>Average limit $\text{dB}(\mu\text{V/m})$</i>	<i>Peak limit $\text{dB}(\mu\text{V/m})$</i>
1000 - 18000	54	74

3.2.2 EUT operation mode

<i>EUT operation mode</i>	TX on (2437 MHz)
<i>EUT operation voltage</i>	115 V / 60 Hz

3.2.3 EUT test setup



Photograph 2. Radiated emissions test setup



Photograph 3. Radiated emissions test setup

3.2.4 Test data

The measurement results were obtained as described below.

$$E [\mu V/m] = U_{RX} + A_{CABLE} + AF - G_{PREAMP}$$

Where

U_{RX} receiver reading

A_{CABLE} attenuation of the cable

AF antenna factor

G_{PREAMP} gain of the preamplifier

Highest emissions (Quasipeak):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarisation
81.20	25.6	30	4.4	397	111	VERTICAL
86.12	28.5	30	1.5	112	56	VERTICAL
87.64	28.1	30	1.9	141	4	VERTICAL
145.28	25.5	30	4.5	397	4	VERTICAL
400.60	32.0	37	5.0	182	35	HORIZONTAL
433.28	28.1	37	8.9	200	255	HORIZONTAL

Highest emissions (Peak):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarisation
4870.59	71.4	74	2.6	109	18	VERTICAL
7307.34	58.4	74	15.6	103	138	HORIZONTAL
7635.44	47.1	74	26.9	157	270	HORIZONTAL

Highest emissions (Average):

Frequency MHz	Level dBμV/m	Limit dBμV/m	Margin dB	Height cm	Azimuth deg	Polarisation
4870.59	43.8	54	10.2	109	18	VERTICAL
7307.34	36.9	54	17.1	103	138	HORIZONTAL
7635.44	32.9	54	21.1	157	270	HORIZONTAL

4. List of test equipment

Each active test equipment is calibrated once a year, antennas every 18 months and other passive equipment every 24 months.

Nr.	Equipment	Type	Manufacturer	Serial number
694	EMI Test Receiver	ESPC	Rohde & Schwarz	842888/023
338	Test receiver	ESS	Rohde & Schwarz	847151/009
566	Spectrum analyzer	E4448A	Agilent	US42510236
544	RF-amplifier	ZFL-2000VH2	Mini-Circuits	D01080
564	RF amplifier	CA018-4010	CIAO Wireless	101
168	Artificial Mains	NSLK 8127	Schwartzbeck	8127162
559	Highpass filter	WHKX3.0/18G-10ss	Wainwright	1
319	Antenna	CBL6112	Chase	2018
525	Double-Ridged Horn	3115	Emco	6691
348	Shielded room	RFSD-100	Euroshield Oy	1320
350	Semianechoic shielded room	RFD-F-100	Euroshield Oy	1327
371	AC Power source	500i-400	California Instr.	HK 52064