



***Test Report No. 9112303133***

***Applicant: Essence Security International Ltd.***

***Equipment Under Test:***

***Bi-directional wireless security system,  
Everguard Express Control Unit***

***Model: ES6500EGE***

***FCC ID: YXG-ES6500EGE***

***From The Standards Institution  
Of Israel  
Industry Division  
Electronics & Telematics Laboratory  
EMC Section***



***ACCLASS Accreditation Services***

***Certificate Number: AT-1359***

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<b>Applicant:</b>	Essence Security International Ltd.
<b>Address:</b>	11 Galgaley Haplada St., POB 2073, Herzliya, Israel
<b>Sample for test selected by:</b>	The customer
<b>The date of tests:</b>	6, 27 December 2009; 22 December 2010

<b>Description of Equipment Under Test (EUT):</b>	Bi-directional wireless security system, Everguard Express Control Unit.
<b>Model:</b>	ES6500EGE
<b>RF unit model.</b>	ES1100B
<b>Software version of radio unit</b>	V.01
<b>Hardware version of radio unit</b>	V.05
<b>Serial Number:</b>	N/A
<b>Manufactured by:</b>	Essence Security International (ESI) Ltd.

**Reference Documents:**

- ❖ CFR 47 FCC: Rules and Regulations; Part 15. "Radio frequency devices";
  - Subpart B: "Unintentional radiators" (2009).
    - Section 15.107. "Conducted limits".
    - Section 15.109. "Radiated emission limits".
  - Subpart C: "Intentional radiators" (2009).
    - Section 15.205. "Restricted bands of operations
    - Section 15.207. "Conducted limits".
    - Section 15.209. "Radiated emission limits, general requirements".
    - "Radiated Emission Limits, Additional Provisions";
    - Section 15.249. "Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz, 5725 – 5875 MHz and 24.0 24.25 GHz".

This Test Report contains 29 pages and may be used only in full.	This Test Report applies only to the specimen tested and may not be applied to other specimens of the same product.
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## 1. EUT Description and operation

### 1.1. General description:

\* Note: the customer supplied all information in clause below.

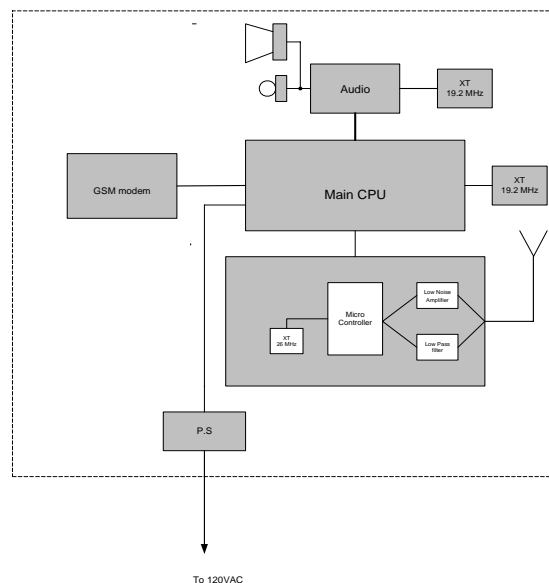
EverGuard is a unit of advanced end-to-end, bi-directional security, safety and home automation system. Among other functions, EverGuard also enables communicating with wireless devices at 916.5 MHz, from anywhere in the home or office: Door / Window Transmitters, Keypads / Key Fob Commanders , Passive Infrared Detector and Indoor Video PIR Transmitters. The EverGuard system is based on ESI's proprietary monitoring platform, which incorporates state-of-the art communication protocols, authentication software and applications for the maintenance and control of installed units.

Type of modulation:	FSK
Antenna type:	Internal Spring mod. ES6500VSF

The EUT power source: 100 – 230VAC power supply.

The EUT's block diagram is shown in Figures 1

The EUT external and internal views are presented in Photos #1.



**Figure 1. Transceiver block diagram.**

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## 2. Test summary

Parameter	FCC Part 15 Reference paragraph	Verdict
Conducted emission test on unintentional radiator.	Subpart B Section 15.107	Comply
Radiated emission test on unintentional radiator.	Subpart B Section 15.109	Comply
Radiated emission test in receive/stand-by mode	Subpart B Section 15.109	Comply
Test of field strength emission from intentional radiators	"Radiated Emission Limits, Additional Provisions"; Section 15.249.	Comply
Radiated emission from intentional radiators in restricted bands.	Subpart C Section 15.205	Comply
Conducted emission test.	Subpart C Section 15.207	Comply

Electronics &  
Telematics  
Laboratory

December 2010

Name: Eng. Yuri Rozenberg  
Position: Head of EMC BranchName: Michael Feldman  
Position: Test Technician

### Measurement uncertainty.

Were relevant, the following measurement uncertainty level have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

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

Test description	Expanded uncertainty
<b>Radiated emissions</b> in the open field test site at 3 m measuring distance: 30 MHz – 1.0 GHz 1.0 GHz – 18 GHz	2 Uc (E) = $\pm$ 4.32 dB 2 Uc (E) = $\pm$ 4.47 dB

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**Photo 1. EUT's external front and rear view**



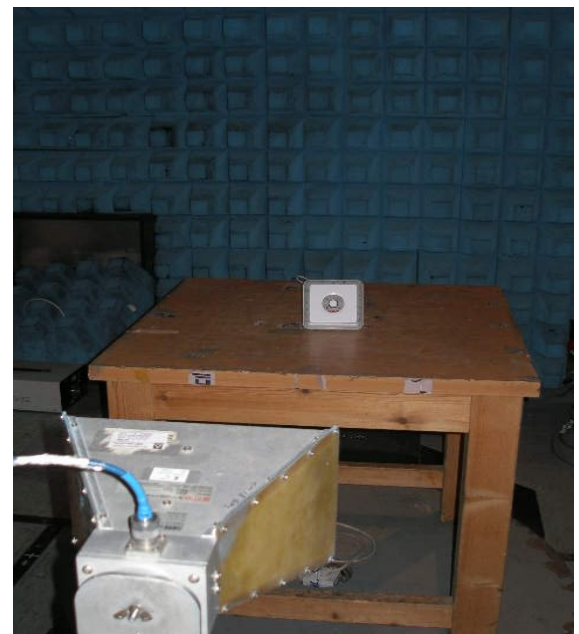
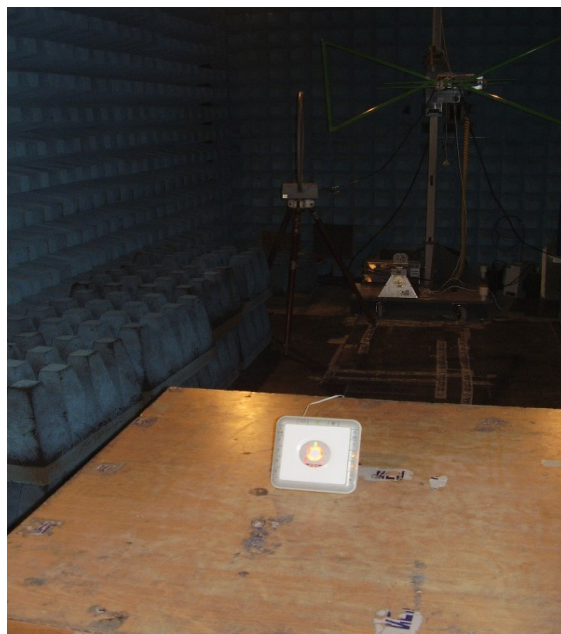
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**Photo 2. Spurious emissions test setups.**

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### 2.1. Potential emission sources:

The potential emission sources are detailed in Table 1.

**Table 1. Potential emission sources**

Frequency	Location
19.2 MHz	Microcontroller oscillator
26.0 MHz	RF Lo oscillator
916.5 MHz	RF signal

### 2.2. EUT setup and operation:

Respective tests were performed in Transmission (Tx) and Receiving (Rx)/Stand by modes. Additional RE and CE tests were performed in initial setup mode. Radiated emission test was performed at carrier frequency -916.5 MHz. Measurements of transmitter were performed in continue transmission mode.

## 3. Measurements, examinations and derived results

### 3.1. Location of the Test Site:

Preliminary radiated test was conducted at the EMC laboratory of the Standards Institution of Israel in Tel-Aviv. Final tests were conducted in an Open Area Test Site located at Kibbutz Native Halamed Hai in Emek HaEla, Israel.

### 3.2. Test condition:

Temperature: 21 °C. Humidity: 59 %. Atmospheric pressure: 1010 mbar.

### 3.3. Initial visual check and functional test:

Initial visual check and brief built - in- test of the EUT was performed before testing. No external damages were found.



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### **3.4. Radiated emission test.**

#### **3.4.1. General:**

Per FCC Part 15 Subpart C Sections 15.209, 15.249.

- \* Initial scans were made using a peak detector but still using the appropriate ANSI IF bandwidth.
- \* A tolerance limit was set 10 dB below the specification limit. Levels above the tolerance limit were retested using the Peak, QP and Average detectors.

#### **3.4.2. Preliminary radiated emission tests:**

Preliminary investigation was performed from the lowest radio frequency signal generated in the equipment up to ten harmonic of a carrier frequency. Test was conducted in a semi-anechoic chamber at distance 1 and 3 meters. The EUT was setup in its typical configuration and operated in its various modes. For each mode of operation the frequency spectrum was monitored. EUT configuration, cable configuration and mode of operation, which produced the maximum level of emission, were documented. A list of frequencies to be tested was prepared.

#### **3.4.3. Final measurements:**

The final radiated emission measurements were performed at the Open Area Test Site at the 3 m test distance. The EUT was operated as described above. The EUT was installed on a turn - table. Biconilog and Double Ridged Guide antennas were used. The measurements were performed at each frequency that founded previously at which the signal level was 10 dB below the limit or less. The levels were maximized by rotating turntable through 360°, changing antenna height and changing antenna-to-EUT polarization from vertical to horizontal. The worse case result was noted in tables.

#### **3.4.4. Radiated emission test results:**

Final result measurements in transmit mode are presented in tables and plots ##1 - 11 in section 3.5.5.

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### 3.5. Test of field strength emission from intentional radiator.

#### 3.5.1. General:

Per FCC Part 15 Subpart C clause 15.249.

#### 3.5.2. Requirements:

The field strength emissions from intentional radiators operated according to section 15.249 (a) shall comply with the follow limits .

**Table 2. Section 15.249 limit.**

Fundamental Frequency MHz	Specified field strength limit of Fundamental dB $\mu$ V/m	Specified field strength limit of Harmonics dB $\mu$ V/m
916.5	94.0	54.0

Note: The field strength of emissions radiated on any frequency outside of the specified band, except for harmonics shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emissions limits in section 15.209 whichever is lesser attenuation.

#### 3.5.3. Test procedure:

The test was conducted according to clause 15.249.

#### 3.5.4. Test summary:

The tested unit meets the standard requirement.

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### 3.5.5. Test results:

**Table 3. Radiated emission result at carrier frequency.**

Carrier frequency MHz	Antenna polarization.	Peak Ampl. dB $\mu$ V/m	Specified limit dB $\mu$ V/m	Margin dB	Reference to plot #
916.5	Vertical	93.5	94.0	0.5	1

**Table 4. Spurious emission results up to 1.0 GHz.**

Freq. MHz	Antenna pol. V/H	Peak Ampl dB $\mu$ V/m	Peak Ampl limit, dB $\mu$ V/m	Margin dB	QP Ampl dB $\mu$ V/m	Specified @3m limit, dB $\mu$ V/m	Margin dB
211.2	Vertical	43.3	63.5	20.2	38.9	43.5	4.6
288.0	Vertical	40.5	66.0	25.5	37.2	46.0	8.8
307.2	Vertical	40.2	66.0	25.8	35.2	46.0	10.8
326.4	Horizontal	40.9	66.0	25.1	38.2	46.0	7.8

**Table 5. Spurious emission above 1.0 GHz.**

Freq. MHz	Antenna pol. V/H	Peak Ampl dB $\mu$ V/m	Peak Ampl limit, dB $\mu$ V/m	Margin dB	Avg Ampl. dB $\mu$ V/m	Specified @3m limit, dB $\mu$ V/m	Margin dB	Ref. to plot #
1833	Vertical	49.4	74.0	24.6	45.5	54.0	8.5	6, 7
5499	Horizontal	61.0	84.0*	23.0	59.5	64.0*	4.5	9, 10

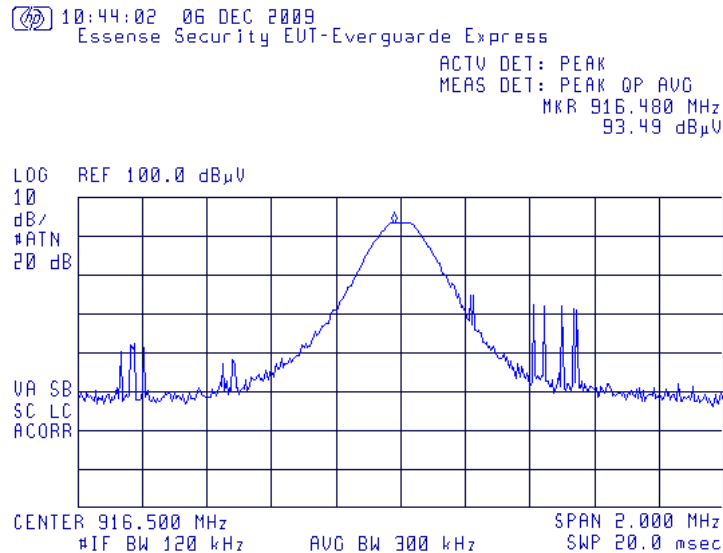
\*Limit at 1m test distance.



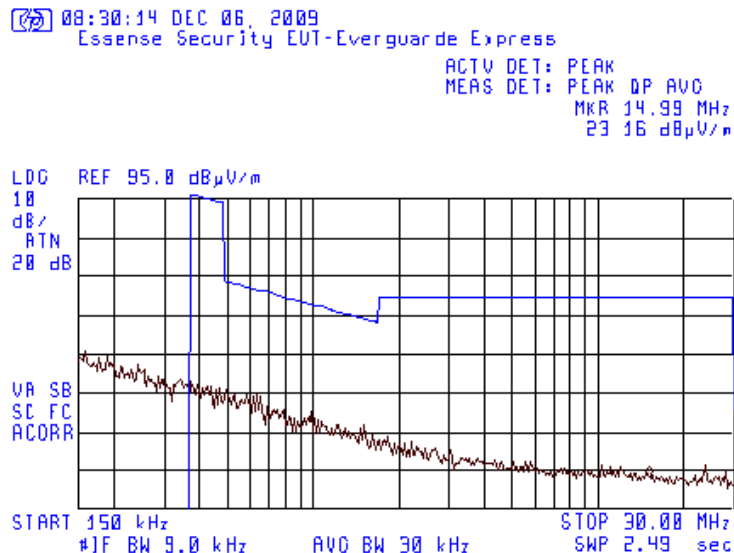
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Plot # 1. Field strength of fundamental frequency 916.5 MHz.



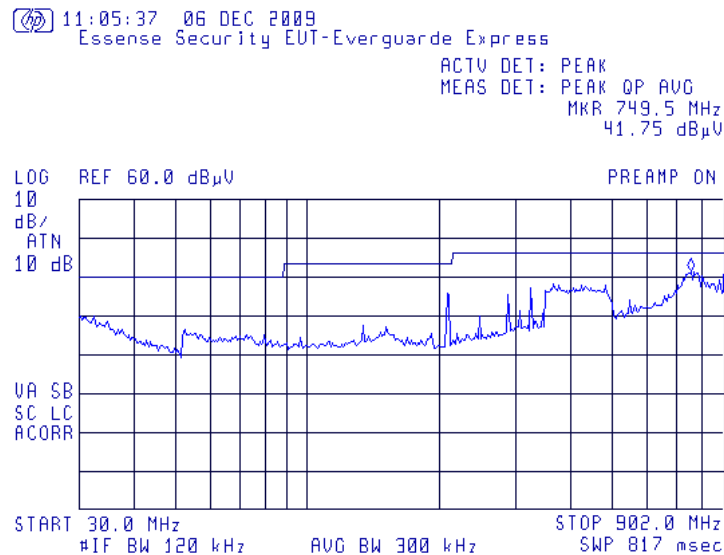
Plot # 2. Spurious emissions scan 0.15 MHz – 30 MHz. Test distance =3m.



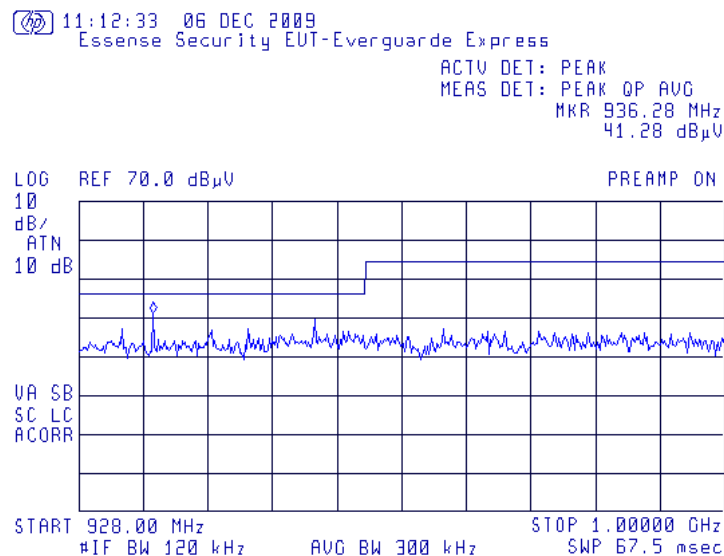
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Plot # 3. Spurious emissions scan 30 MHz – 902 MHz. Test distance =3m.



Plot # 4. Emission scan at 928.0 – 1000 MHz frequency range.

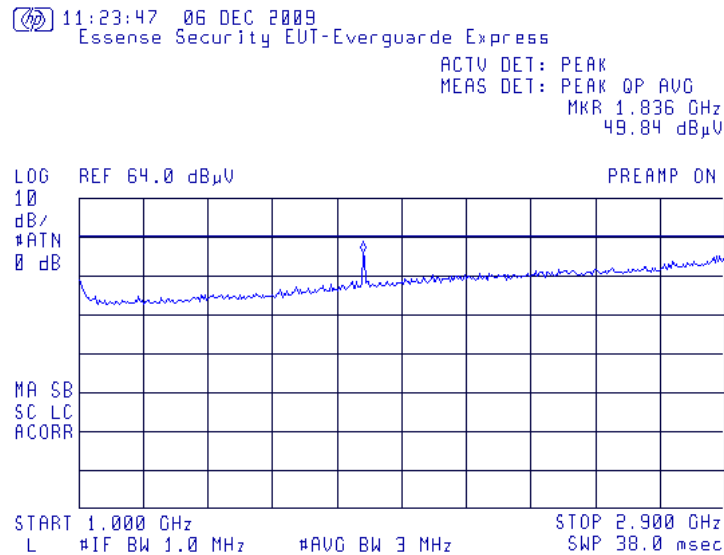




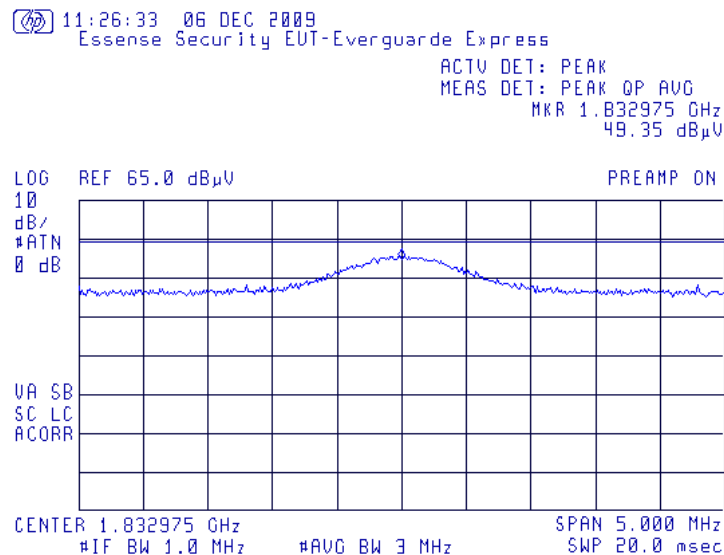
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Plot # 5. Emissions scan at 1.0 – 2.9 GHz frequency range.



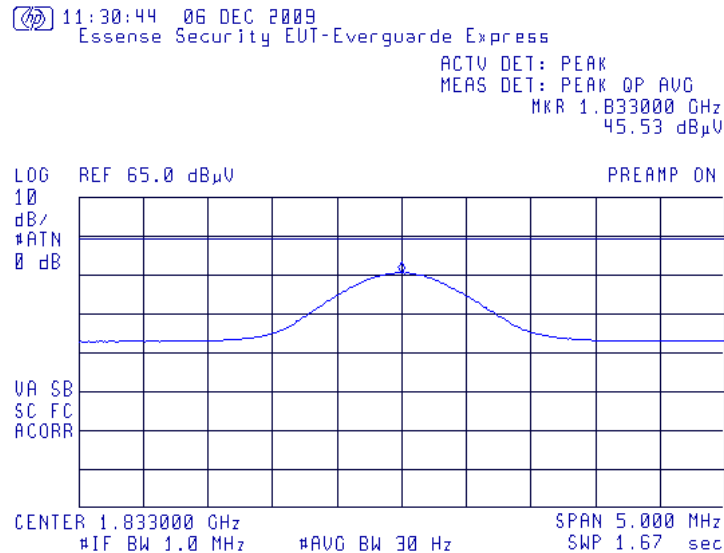
Plot # 6. The second harmonic of the carrier. Detector peak..



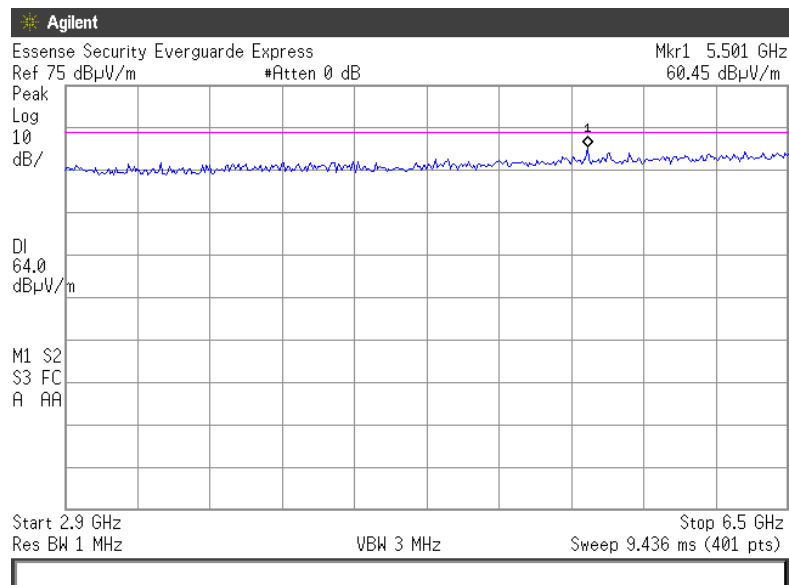
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Plot # 7. The second harmonic of the carrier. Detector average.



Plot # 8. Emissions scan at 2.9 – 6.5 GHz frequency range.



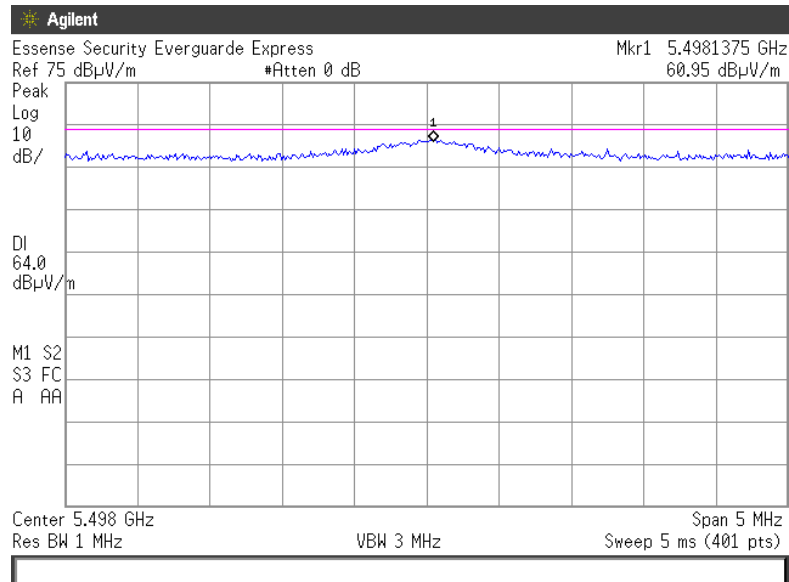
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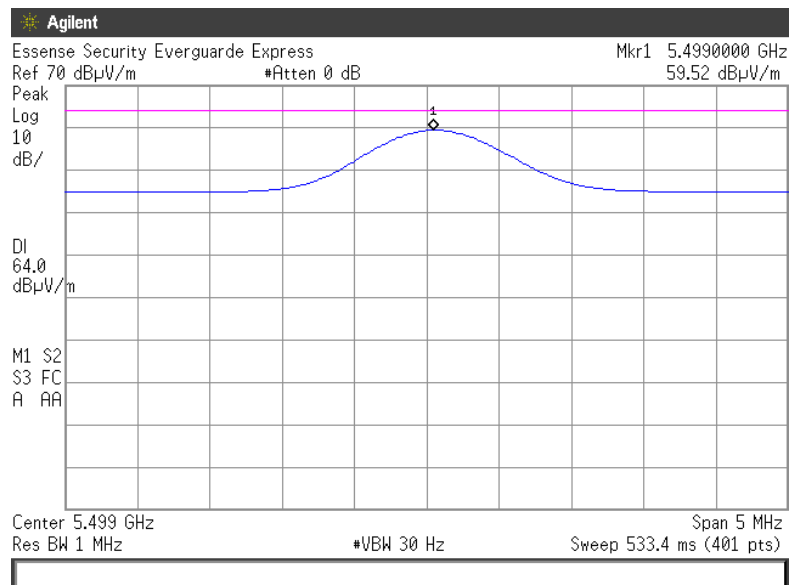
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Plot # 9. Sixths harmonic of the carrier. Detector peak.



Plot # 10. Sixths harmonic of the carrier. Detector average.



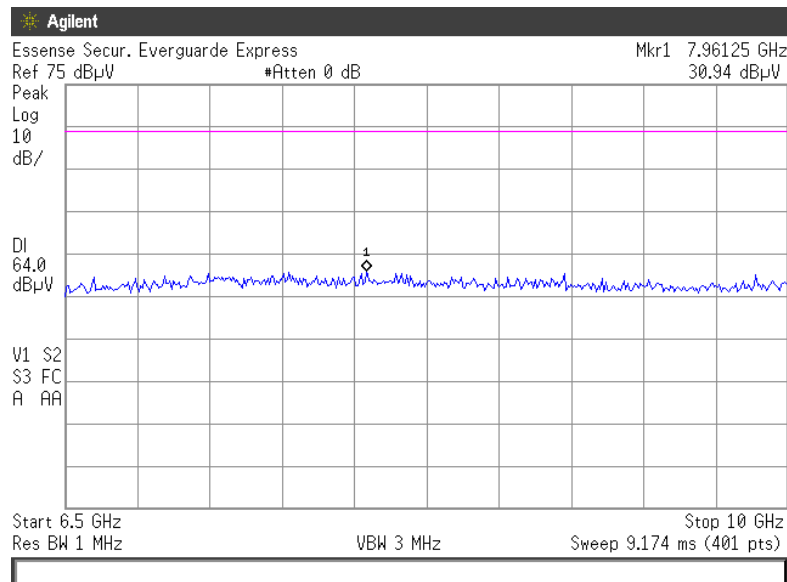
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Plot # 11. Emissions scan at 6.5 – 10.0 GHz frequency range. Detector peak.

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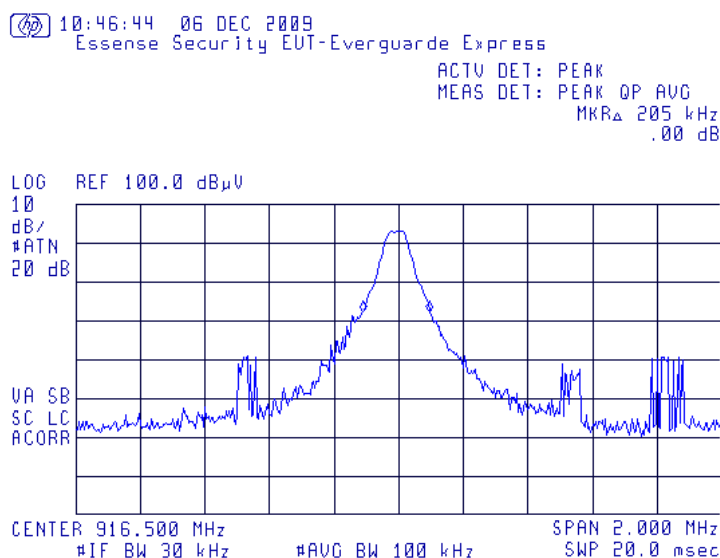
### 3.6. Test of occupied bandwidth per 15.215(c)

#### 3.6.1. Requirements:

Intentional radiator must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band.

#### 3.6.2. Test results:

Test result is presented in plot # 12 below.



**Plot # 12. Occupied bandwidth test result**

#### 3.6.3. Test summary:

20 dB occupied bandwidth is 205 kHz.  
The tested unit meets the standard requirement.



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### 3.7. Test of conducted emission at main terminal.

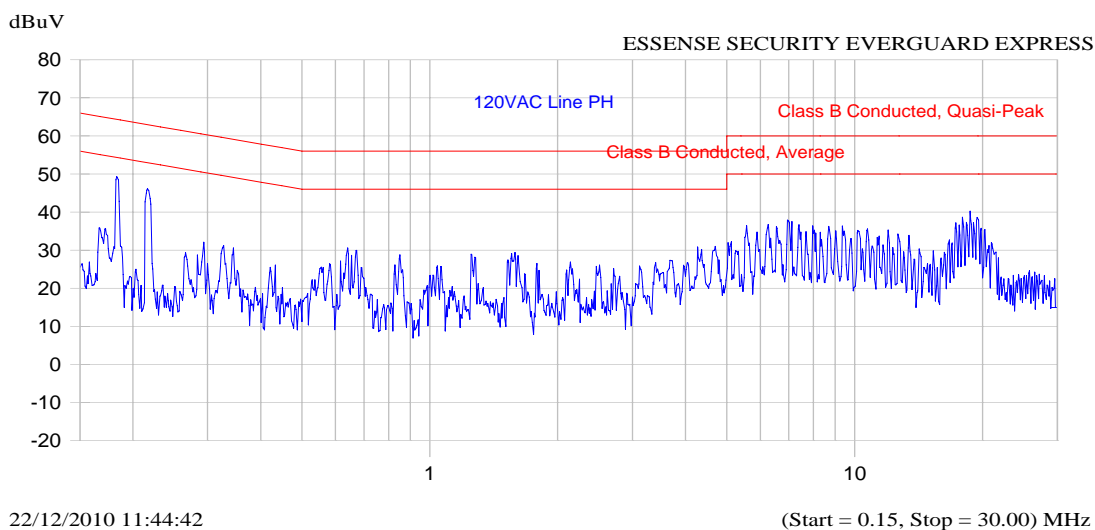
#### 3.7.1. General

Per FCC Part 15 Subpart B clause 15.107 (a) and Subpart C clause 15.207 (a)  
The Conducted emission test was performed in two options:

1. Normal operation mode (to comply with 15.207): ES6500EGE was powered from 120 VAC / 12 VDC via AC/DC Adaptor.
2. Data transmitting mode (to comply with 15.107): ES6500EGE was connected via data transmitting cable (with data transmitting) between the EUT and the auxiliary PC.

#### 3.7.2. Test results:

Subpart C clause 15.207 (a).



**Table 6. Test result. Line Phase.**

Frequency	QP Ampl.	QP Limit	Margin	Avg Ampl.	Average Limit	Margin
MHz	dBuV	dB	dB	dBuV	dB	dB
0.176	48.6	64.7	16.1	33.1	54.7	21.6
0.291	39.5	60.5	21.0	29.6	50.5	20.9
0.545	26.9	56.0	29.1	19.4	46.0	26.6
6.486	33.4	60.0	26.6	17.9	50.0	32.1
7.896	33.4	60.0	26.6	22.7	50.0	10.3
18.663	37.0	60.0	23.0	32.3	50.0	17.7



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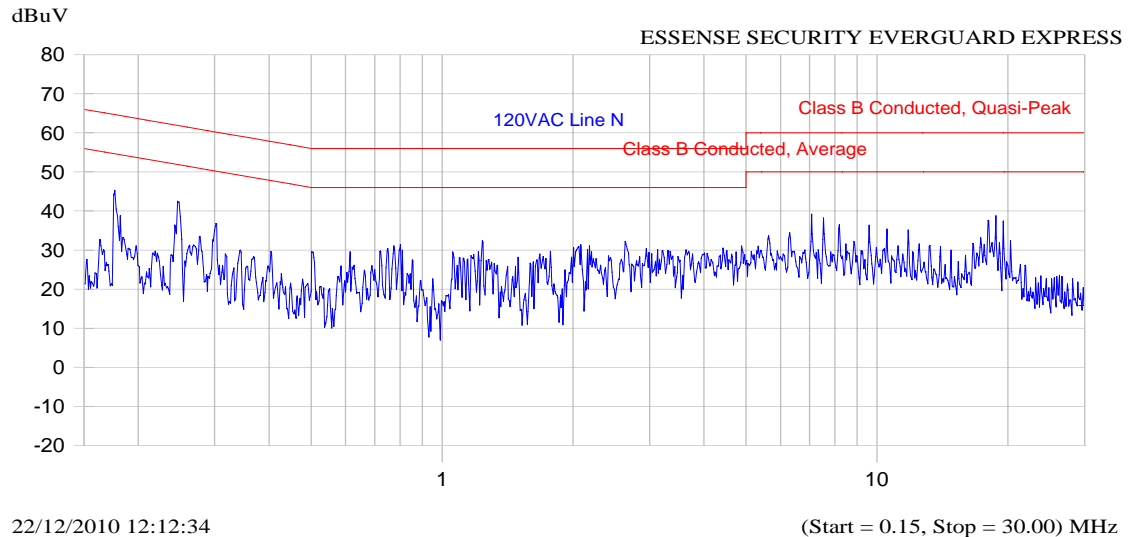


Table 7. Test result. Line Neutral.

Frequency	QP Ampl.	QP Limit	Margin	Avg Ampl.	Average Limit	Margin
MHz	dB $\mu$ V	dB	dB	dB $\mu$ V	dB	dB
0.172	48.6	64.9	16.2	18.4	54.9	36.5
0.284	40.7	60.7	20.0	17.9	50.7	32.8
0.539	26.3	56.0	29.7	17.7	46.0	28.3
7.891	30.8	60.0	29.2	18.0	50.0	32.0
18.670	33.1	60.0	26.9	18.5	50.0	31.5
19.175	32.9	60.0	27.1	18.0	50.0	32.0



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Subpart B clause 15.107 (a).

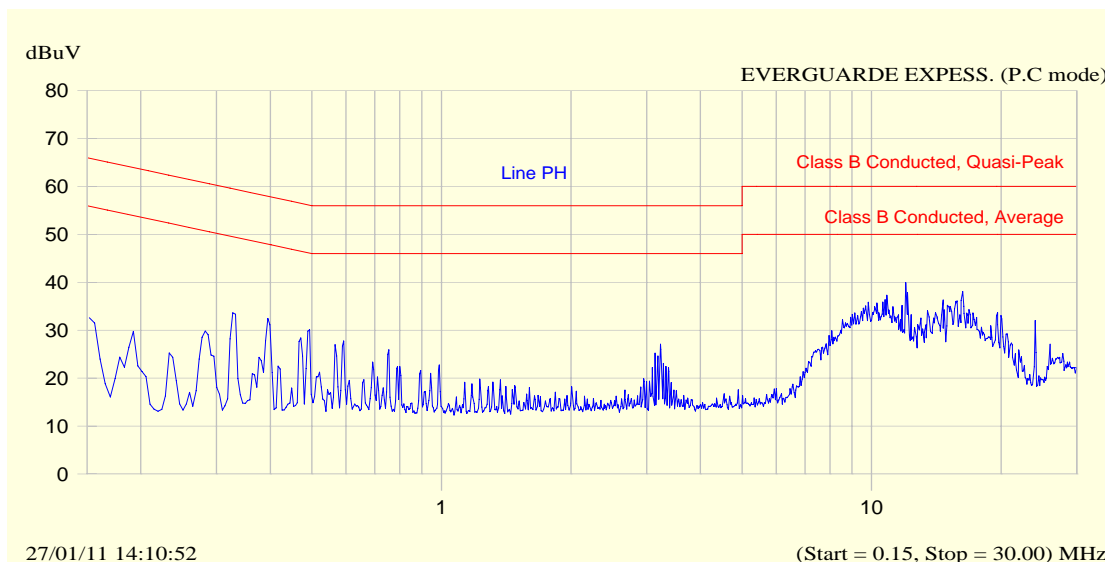


Table 8. Test result. Line Phase.

Frequency	QP Ampl.	QP Limit	Margin	Avg Ampl.	Average Limit	Margin
MHz	dB $\mu$ V	dB	dB	dB $\mu$ V	dB	dB
10.855	34.9	60.0	25.1	28.0	50.0	22.0
12.000	39.5	60.0	20.5	33.8	50.0	16.2
14.655	32.8	60.0	27.2	26.1	50.0	23.9
14.998	31.8	60.0	28.2	25.9	50.0	24.1
15.809	34.6	60.0	25.4	27.4	50.0	22.6
16.273	35.6	60.0	24.4	28.9	50.0	21.1

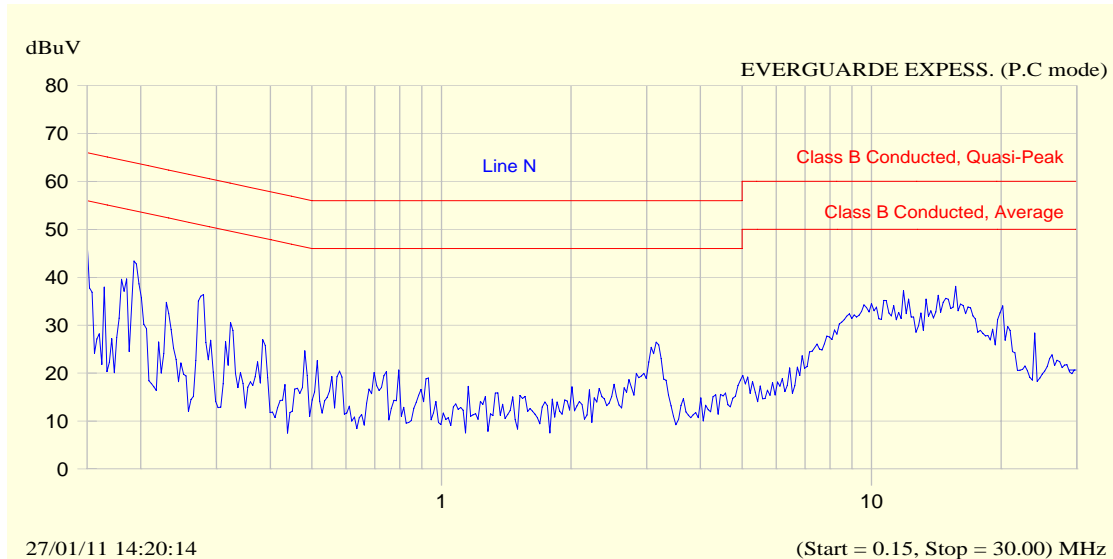
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**Table 9. Test result. Line Neutral.**

Frequency	QP Ampl.	QP Limit	Margin	Avg Ampl.	Average Limit	Margin
MHz	dB $\mu$ V	dB	dB	dB $\mu$ V	dB	dB
10.856	35.7	60.0	24.3	28.5	50.0	21.5
12.000	40.3	60.0	19.7	34.8	50.0	15.2
14.655	33.5	60.0	26.5	27.5	50.0	22.5
14.998	31.7	60.0	28.3	29.2	50.0	20.8
15.809	35.9	60.0	24.1	29.0	50.0	21.0
16.273	21.9	60.0	38.1	14.4	50.0	35.6

### 3.7.3. Test summary:

The tested unit meets the standard requirement.

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### 3.8. Test of field strength emission in Initialisation, Stand by/receive modes.

#### 3.8.1. General

Per FCC Part 15 Subpart B clause 15.109 (a)

#### 3.8.2. Test procedure:

The test was conducted according to clause 15.109.

Preliminary radiated emission measurements in the frequency range from 30 MHz to 1 GHz were conducted in 3 m anechoic chamber in two operational modes: normal (as standalone device) and Data transmitting mode (connecting to the auxiliary PC with data transmitting). Final radiated emission measurements in the frequency range from 30 MHz to 1 GHz were conducted at 10 m open test site for the normal operational mode (worst case).

**Table 10. Radiated emissions test results**

Frequency (MHz)	Antenna Polariz. V/H	Antenna Height m	Turn- table Angle (°)	QP emission level @ 3 m dB $\mu$ V/m	Limit @ 3 m dB $\mu$ V/m	Margin dB	Results
196.7	V	1.0	214	35.2	43.5	8.3	Complies
211.2	V	1.0	217	38.9	43.5	4.6	Complies
288.0	V	1.0	269	37.2	46.0	8.8	Complies
326.4	H	2.0	57	38.2	46.0	7.8	Complies
761.6	H	1.2	296	37.3	46.0	9.7	Complies

**Note:** Emission level = E Reading (dB $\mu$ V) + Cable loss (dB) + Antenna Factor (dB/m)  
For Cable Loss and Antenna Factor refer to Appendix 2.

#### 3.8.3. Test summary

The tested unit meets the standard requirement.



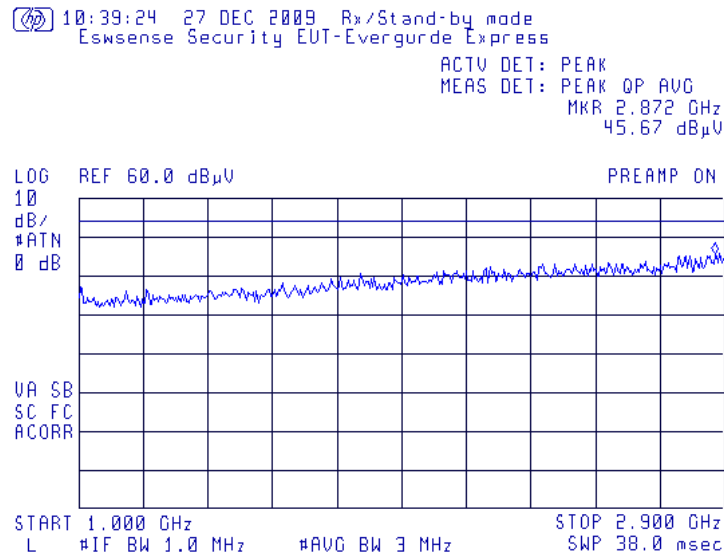
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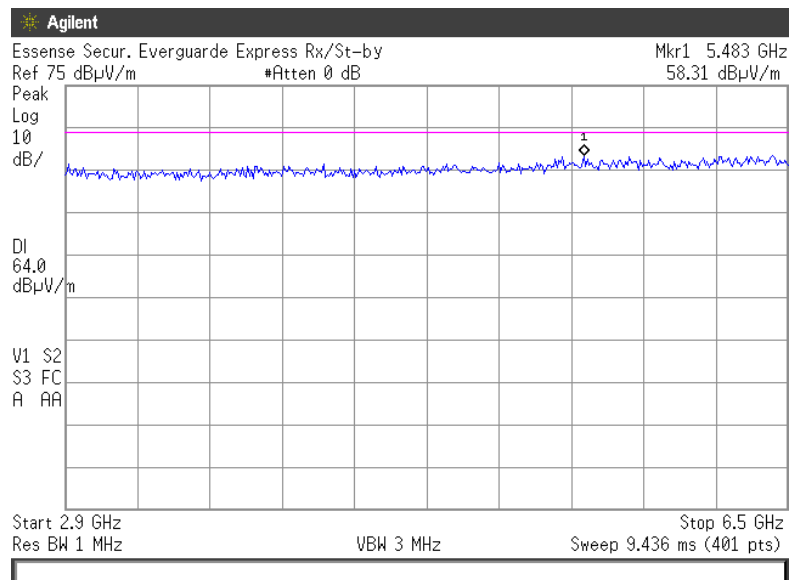
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Plot # 13. Radiated emissions scan at 1.0 – 2.9 GHz frequency range.  
Stand-by/Receive mode.



Plot # 14. Emissions scan at 2.9 – 6.5 GHz frequency range. Stand-by/Receive mode.

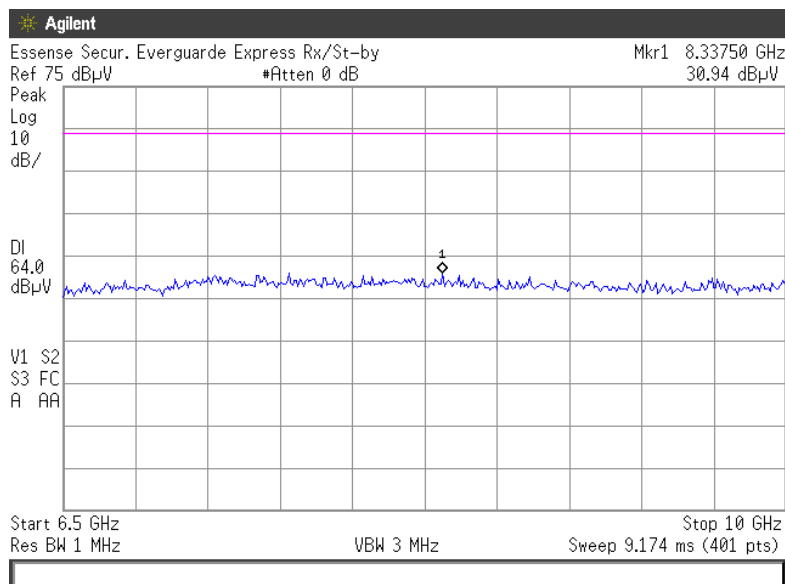
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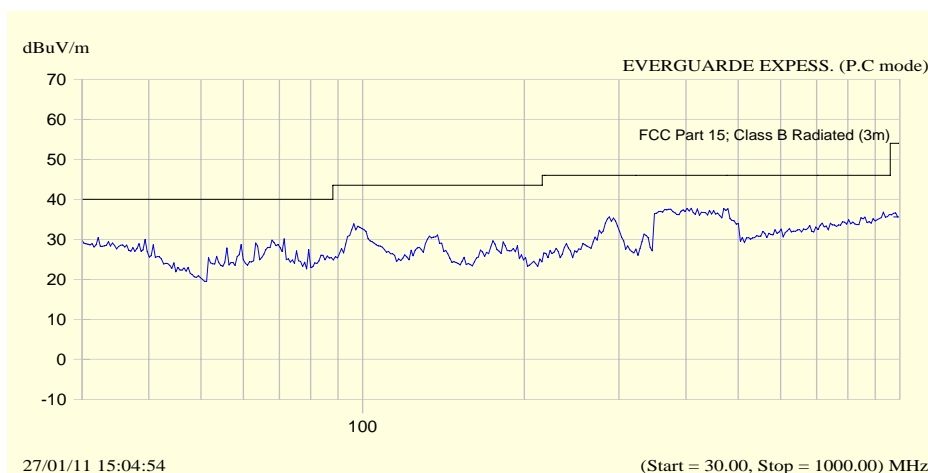
**Title:** Test on Bi-directional wireless security system, Everguard Express Control Unit

**Model:** ES6500EGE

**FCC ID:** YXG-ES6500EGE



**Plot # 15. Emission scan at 6.5 – 10.0 GHz frequency range. Stand-by/Receive mode.**



**Plot # 16. Radiated emissions scan at 30MHz-1GHz frequency range. Data transmitting mode (informative only).**

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#### 4. Appendix 1. Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not exceeding one year.

Instrument	MFR	Model	Serial No.	Due calibration date
EMI Receiver 9 kHz – 6.5 GHz	HP	8546A+85460A	SII 4068	April 2011
Biconilog Antenna 30 – 2000 MHz	Teseq GmbH	CBL 6112D	S/N 23181	Sept 2010
EMI Analyser 9 kHz - 26.5 GHz	HP	E7405A	SII 4944	Nov 2010
Antenna Double Ridged Guide, 1-18 GHz	EMCO	3115	SII4873	Sept 2010
Active Loop antenna 10 kHz – 30 MHz	EMCO	6502	SII 4874	Oct 2010
LISN 9 kHz – 30 MHz	FCC	LISN 250-32-4-16	SII5023	Oct 2011
Transient limiter 0.009-200 MHz	HP	11947A	3107105	Oct 2011
Oscilloscope	HP	54610B	US37340682	May 2010
RF cable, 4m	Sucoflex	104PE	21329/4PE	Oct 2010
Antenna Mast	R&S	HCM	100002	N/A
Metallic turntable	R&S	HCT12	100001	N/A
Positioning controller	R&S	HCC	100002	N/A

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## 5. Appendix 2: Antenna Factor and Cable Loss

**Cable Loss (10m cable + Mast)**

Point	Frequency (MHz)	Cable Loss (dB)	Point	Frequency (MHz)	Cable Loss (dB)
1	30	0.53	21	1000	3.68
2	50	0.75	22	1100	3.82
3	100	1.08	23	1200	4.07
4	150	1.39	24	1300	4.24
5	200	1.61	25	1400	4.43
6	250	1.752	26	1500	4.6
7	300	2.00	27	1600	4.7
8	350	2.15	28	1700	4.85
9	400	2.26	29	1800	4.98
10	450	2.383	30	1900	5.19
11	500	2.52	31	2000	5.34
12	550	2.606	32	2100	5.51
13	600	2.75	33	2200	5.69
14	650	2.856	34	2300	5.89
15	700	3.06	35	2400	6.07
16	750	3.20	36	2500	6.22
17	800	3.27	37	2600	6.28
18	850	3.38	38	2700	6.41
19	900	3.46	39	2800	6.53
20	950	3.55	40	2900	6.84

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**Table 11. Antenna Factor**  
**For Biconilog Antenna, Model Number: CBL 6112D, S/N: 23181**

No.	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m
1	30	17.90	170	9.40	530	17.70	1040	22.20
2	32	16.70	175	9.00	540	18.25	1060	22.50
3	34	15.55	180	8.50	550	18.60	1080	22.50
4	36	14.35	185	8.45	560	14.45	1100	22.40
5	38	13.30	190	8.60	570	18.40	1120	22.60
6	40	12.20	195	8.85	580	18.50	1140	22.45
7	42	11.05	200	8.95	590	18.60	1160	22.50
8	44	9.95	205	8.80	600	18.60	1180	22.40
9	46	8.90	210	8.50	610	18.80	1200	22.80
10	48	8.05	215	8.20	620	18.99	1220	22.95
11	50	7.30	220	8.50	630	19.05	1240	23.10
12	52	6.80	225	9.00	640	19.23	1260	23.40
13	54	6.45	230	9.65	650	19.10	1280	23.35
14	56	6.00	235	10.30	660	19.13	1300	23.62
15	58	5.70	240	11.00	670	19.04	1320	23.64
16	60	5.45	245	11.60	680	19.00	1340	23.86
17	62	5.30	250	12.00	690	19.17	1360	23.95
18	64	5.20	255	12.45	700	19.28	1380	23.90
19	66	5.30	260	12.85	710	19.25	1400	24.45
20	68	5.30	265	12.50	720	19.45	1420	24.74
21	70	5.35	270	12.45	730	19.75	1440	24.93
22	72	5.50	275	12.40	740	19.95	1460	25.03
23	74	5.80	280	12.55	750	20.07	1480	25.45
24	76	6.00	285	12.65	760	19.85	1500	25.30
25	78	6.60	290	12.75	770	19.80	1520	25.25
26	80	6.70	295	12.95	780	19.85	1540	25.36
27	82	7.15	300	13.00	790	19.95	1560	25.58
28	84	7.60	310	13.35	800	20.05	1580	25.50
29	86	8.10	320	13.75	810	20.10	1600	25.65
30	88	8.50	330	13.85	820	20.35	1620	25.60
31	90	8.90	340	14.10	830	20.40	1640	25.70
32	92	9.20	350	14.50	840	20.35	1660	25.83
33	94	9.75	360	14.70	850	20.46	1680	25.97
34	96	9.95	370	14.90	860	20.39	1700	26.10
35	98	10.20	380	15.10	870	20.29	1720	26.25
36	100	10.50	390	15.45	880	20.24	1740	26.04
37	105	11.25	400	16.00	890	20.35	1760	26.14
38	110	11.70	410	16.40	900	20.55	1780	26.20
39	115	11.70	420	16.70	910	20.45	1800	26.40
40	120	11.80	430	16.35	920	20.60	1820	26.64
41	125	11.80	440	16.30	930	20.60	1840	26.86
42	130	11.70	450	16.30	940	20.66	1860	27.12
43	135	11.35	460	16.70	950	20.88	1880	27.00
44	140	10.95	470	17.05	960	21.11	1900	27.25
45	145	10.35	480	17.20	970	20.93	1920	27.36
46	150	10.05	490	17.30	980	21.03	1940	27.68
47	155	9.70	500	17.40	990	21.05	1960	27.10
48	160	9.70	510	17.50	1000	21.10	1980	27.06
49	165	9.45	520	17.60	1020	21.40	2000	27.25





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**Antenna factor**  
**Active Loop antenna mfr.EMCO mod. 6502 S/N 3424**

<b>Frequency (MHz)</b>	<b>Magnetic Antenna factor (dBS/m)</b>	<b>Electric Antenna factor (dB/m)</b>
0.009	-31.46	20.07
0.010	-32.34	19.18
0.020	-36.15	15.38
0.050	-38.57	12.96
0.075	-38.78	12.75
0.100	-39.07	12.46
0.150	-39.07	12.45
0.250	-39.18	12.35
0.500	-39.29	12.24
0.750	-39.38	12.14
1.000	-39.57	11.95
2.000	-39.84	11.69
3.000	-40.09	11.44
4.000	-40.13	11.40
5.000	-40.24	11.28
10.000	-40.26	11.27
15.000	-40.70	10.83
20.000	-41.02	10.51
25.000	-41.94	9.59
30.000	-43.39	8.14

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Point	Frequency (MHz)	Antenna Factor (dB/m)
1	1000	23.9
2	2000	28.3
3	3000	31.0
4	4000	33.1
5	4500	32.5
6	5000	32.4
7	6000	53.7
8	6500	35.6
9	7000	36.4
10	7500	36.9
11	8000	37.0
12	8500	38.0
13	9000	38.6
14	9500	38.4
15	10000	38.4
16	10500	38.4
17	11000	38.9
18	11500	39.6
19	12000	39.4
20	12500	39.2
21	13000	40.3
22	13500	41.0
23	14000	41.2
24	14500	41.3
25	15000	40.0
26	15500	38.0
27	16000	38.1
28	16500	40.3
29	17000	42.2
30	17500	44.6
31	18000	46.2

**Cable Loss****Type: Sucoflex 104PE; Ser.No.21329/4PE; 4 m length**

Point	Frequency (GHz)	Cable Loss (dB)
1	0.0-1.0	1.7
2	1.0- 3.5	3.2
3	3.5- 5.5	4.0
4	5.5 - 7.5	4.7
5	7.5 - 9.5	5.3
6	9.5 - 10.5	5.6
7	10.5 - 12.5	6.2
8	12.5 - 14.5	6.8
9	14.5 - 16.5	7.5
10	16.5 - 18.0	8.1