

## **EXHIBIT 12:**

### **OCCUPIED BANDWIDTH DATA -----**

**Pursuant 47 CFR part 2 section 2.989 and part 22, section 22.917.**

Measured data on occupied bandwidth per 47CFR part 2 section 2.989 and part 22, section 22.917 is the subject of attached Technical Report No.9ELS029B.

## **ELECTROMAGNETIC COMPATIBILITY TEST REPORT**

### **Compliance with Occupied Bandwidth and Conducted Harmonics and Spurious Emissions Requirements of 47CFR Part 22**

**Company Name:**  
**Equipment Under Test:**

**Elisra Electronic Systems Ltd.**  
**Series MW-CBDA-ESMR-1W60 BDA**

**Report I.D.Number:**

**9ELS029B.DOC**

**Total number of pages  
(including this page):**

**19**

**Date:**

**29 March, 1999**

**EMI TEST Ltd. EMC Test Laboratory**

**Moshav Hanniel, D.N.Lev Hasharon, Israel, 42865**

**Phone:(972) 9-8987382 Fax:(972) 9-8987383**

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**1. General Information.**

<b>Applicant:</b>	Elisra Electronic Systems Ltd.
<b>Applicant Address:</b>	48 Mivtza Kadesh St., Bene Beraq 51203, Israel 972-3-6175639
<b>Telephone:</b>	
<b>FAX:</b>	972-3-6175299
<b>The testing was observed by the following applicant's personnel:</b>	Mr. Shmuel Auster
<b>Date of reception for testing:</b>	February 12, 1999
<b>Date of testing:</b>	February 22, 1999
<b>Test Laboratory Location:</b>	EMI TEST Ltd., Moshav Hanniel, D.N.Lev Hasharon, Israel, 42865
<b>Equipment Under Test:</b>	MW-CBDA-ESMR-1W60 BDA Bi-Directional Amplifier
<b>Series Number:</b>	99021001
<b>Mode of Operation:</b>	Up-Link and Down-Link Receiving and Transmitting modes
<b>Year of Manufacture:</b>	1999
<b>Applicable EMC Specification:</b>	Federal Communication Commission (FCC), <b>Occupied Bandwidth:</b> CFR 47, Part 2 Section 2.989 and Part 22, Section 22.917.

## **2. Applicable Documents.**

- 2.1** Federal Communication Commission (FCC), Code of Federal Regulations 47, Ch.1, Parts 2 and 22.
- 2.2** American National Standard, "Specifications for Electromagnetic Noise and Field Strength Instrumentation, 10KHz to 1 GHz", ANSI C63.2, 1987.
- 2.3** American National Standard, "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9KHz to 40GHz", ANSI C63.4, 1992.

### **3. Detailed Applicable Technical Requirements and Limits.**

Requirements of Federal Communications Commission (FCC), Parts 2 and 22 are applicable for the tested equipment. All tests must be performed in the Up-Link and Down-Link Transmit operational mode.

#### **3.1 Occupied Bandwidth Requirements.**

In accordance with 47CFR Section 2.989, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission.

Type of modulation used during the occupied bandwidth tests is specified in Para.2.989. Definition of 47CFR Section 2.989(h) and is applicable for the tested equipment. Specific modulation used during the tests is described in Para.4 of this test report.

47CFR Section 22.917 specifies the emission masks for cellular public mobile transmitters. F3E/F3D emission mask specified in the Section 22.917(b) is applicable for MW-CBDA-ESMR-1W60 BDA Bi-Directional Amplifier:

##### **3.1.1 F3E/F3D Emission Mask for Use with Audio Filter pursuant to 47CFR Section 22.917:**

For F3E/F3D emissions, the mean power of emissions must be attenuated below the mean power of the unmodulated carrier wave (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45kHz:

At least 26dB.

(2) On any frequency removed from the carrier frequency by more than 45kHz, up to the first multiple of the carrier frequency:

At least 60dB or  $43+10\log P$ dB,

whichever is lesser attenuation.

### **3.1.2 Out of Band Emissions.**

In accordance with 47CFR Section 22.917(e), the mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by:

At least  $43 + 10\log(P)$  dB.

### **3.2 Conducted Spurious Emissions Requirements.**

Measurements of spurious emissions at antenna terminals must be performed in accordance with the requirements of 47CFR Section 2.991.

The frequency spectrum which must be investigated is specified in 47CFR Section 2.997. The spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9kHz, up to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower. In the case of the tested MW-CBDA-ESMR-1W60 BDA Bi-Directional Amplifier the frequency band up to 8660MHz must be investigated.

Limit for Out-of-Band conducted spurious emissions are specified in 47CFR Section 22.917(e), and are copied in Para. 3.1.2 of this report.

Test results of conducted spurious emissions at antenna ports are not given in this report, since they are given in the technical report 9ELS029S.



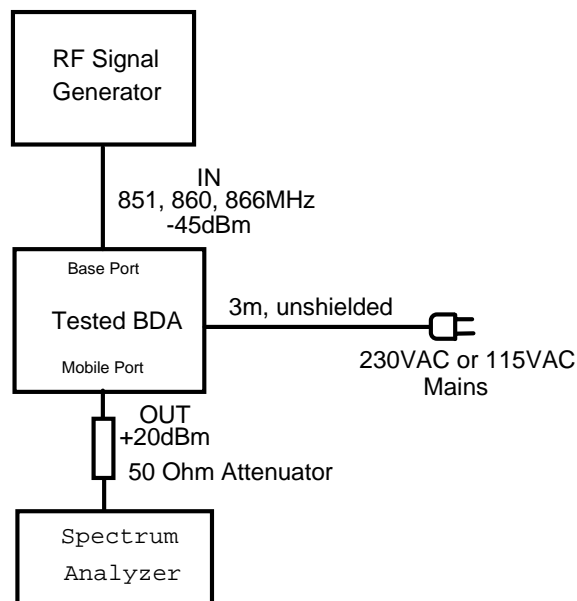
## 4. Test Setups and Test Procedures.

### 4.1 Occupied Bandwidth Measurements.

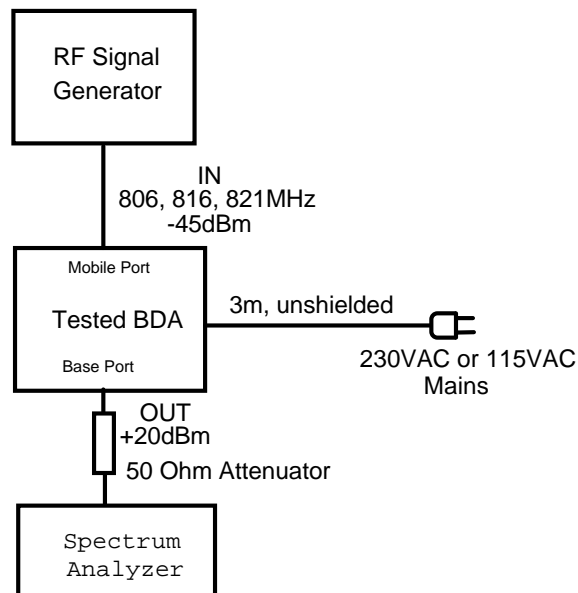
Procedure specified in ANSI C63.4:1992 Para.13.1.7 was used during the tests. The bandwidth was measured relative to the reference level, which is equal to power (P) of unmodulated carrier.

The test setup is shown in the following figure:

#### a) Down-Link Configuration.



#### b) Up-Link Configuration.



The tested equipment was conditioned with typical modulating signals to produce the worst case (i.e. the widest) bandwidth. In the case of MW-CBDA-ESMR-1W60 BDA 64kbps Per Second Pseudo-Random Digital Modulation was used.

The tests were performed at two levels of output radiated power (P): 100mWatt (+20dBm) and 120mWatts.

The spectrum analyzer was set for:

Reference Level = Maximum Output Radiated Power (P)

Horizontal: 10kHz/div

Vertical: 10dB/div.

Two traces were plotted on the screen of the spectrum analyzer:

- trace 1 (reference level), measured with resolution bandwidth of 30kHz, and
- trace 2 (transmitter performance), measured with resolution bandwidth of 300Hz.

The tested BDA was configured, installed and operated in a manner typical for its application. The BDA was tested in Up-Link and Down-Link operational modes. In both cases the input signals were at level -45dBm resulting in maximum output power of +20dBm. The output port was loaded with 50Ohm matched load.

The BDA was placed on a non-conducting table, the top of which is 80cm above the ground plane.

The BDA was supplied with 230VAC nominal ac voltage.

Step 1. The BDA was turned-on, and the unmodulated signal was applied to the Base input power port at Up-Link 806MHz test frequency at -45dBm level to produce +20dBm output power at Mobile output port. Trace #1 was recorded by the spectrum analyzer using 30kHz resolution bandwidth.

Step 2. The signal generator was set to generate modulated signal, without changing setting of frequency and output power. Trace #2 was recorded by the spectrum analyzer using 300Hz resolution bandwidth.

Step 3. Steps 1 and 2 were repeated for 816MHz and 821MHz Up-Link test frequencies at 100mWatts and 120mWatts (+20% above the nominal 100mWatts) levels of output power.

Step 4. The BDA was turned-on, and the unmodulated signal was applied to the Mobile input power port at Down-Link 851MHz test frequency at -45dBm level to produce +20dBm output power at the Base output port. Trace #1 was recorded by the spectrum analyzer using 30kHz resolution bandwidth.

Step 5. The signal generator was set to generate modulated signal, without changing setting of output power. Trace #2 was recorded by the spectrum analyzer using 300Hz resolution bandwidth.

Step 6. Steps 1 and 2 were repeated for 860 and 866MHz Down-Link test frequencies at 100mWatts and 120mWatts (+20% above the nominal 100mWatts) levels of output power.

#### **4.2 Measurements of Conducted Spurious Emissions at Antenna Ports.**

Spurious conducted emission tests covered out-of-band harmonics and spurious emissions and in-band two-tone intermodulation emissions. Description of the test methods for measurement of these conducted emissions is given in technical report 9ELS029S.

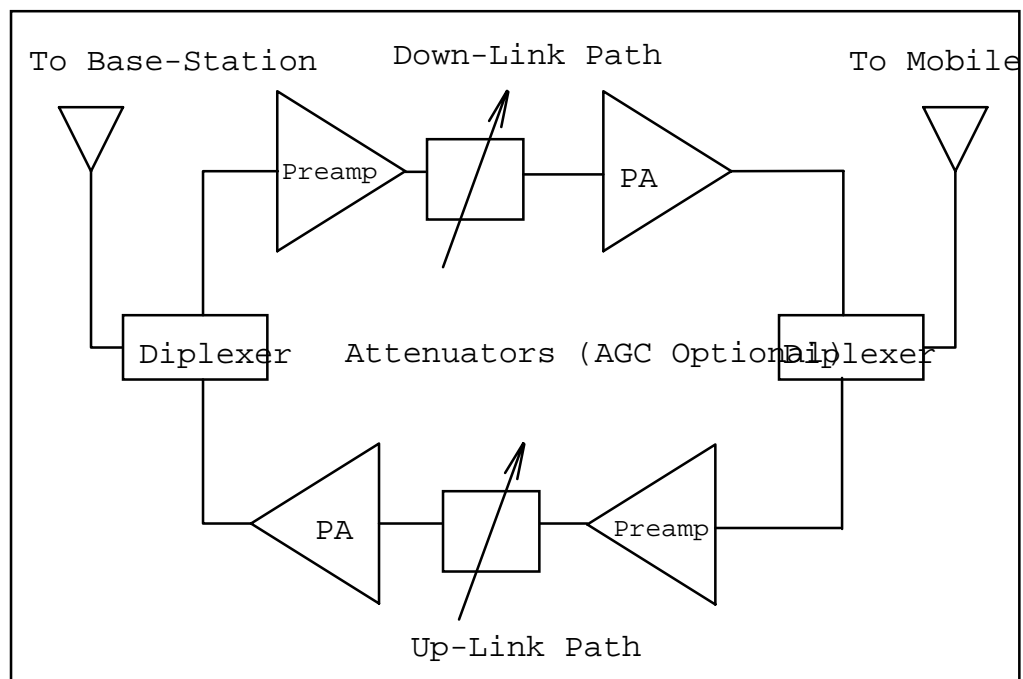
## 5. Description of Equipment Under Test.

### 5.1 Description of the Tested Equipment.

MW-CBDA-ESMR-1W60 BDA is cellular repeater/booster, and may be used in order to enlarge coverage of cellular base stations. The MW-CBDA-ESMR-1W60 BDA incorporates high-linear power amplifiers and diplexers with sharp out-of band rejection, which assists in avoiding interfering signals and intermodulations. MW-CBDA-ESMR-1W60 BDA operates without AGC.

The tested MW-CBDA-ESMR-1W60 BDA operated without AGC provisions.

The block-diagram of the MW-CBDA-ESMR-1W60 BDA is given in the following figure:



**5.2 Cables Used During the Tests:**

No.	Description	Length (m)	Shielding
1	50Ohm coaxial cable from Signal Generator to the EUT.	1.0	85-95% braided + foil overall shield
2	50Ohm coaxial cable from the EUT to 50Ohm matched load.	0.5	85-95% braided + foil overall shield
3	Power cable	3.0	Unshielded

**5.3 Modifications Required for Compliance.**

The MW-CBDA-ESMR-1W60 BDA in its original design complied with the occupied bandwidth and conducted spurious and harmonics emission requirements of 47CFR Parts 2 and 22. Therefore no corrective actions were required.

**6. List of Test Equipment Used.**

No.	Description	Manufacturer and Model Number	Series No.
Occupied Bandwidth Test			
1	Spectrum Analyzer 9KHz to 26.5GHz	HP Model 8563E	3821A09026
2	ESG-D Series Signal Generator, Opt.1E5, H60, UN8, UN9, 250kHz - 2.0GHz	HP Model E4431B	US38440181
3	Power Meter	Gigatronics Model 8541C, Opt.11	1834386
4	Sensor 0.01-18GHz	Gigatronics Model 80401A	1831947
5	Plotter	HP, Model 7440A	2929A17765
Conducted Spurious and Harmonics Emissions Test			
6	RF Signal Generator 0.1-990MHz	HP Model 8656A	
7	Microwave Sweep Generator Mainframe	HP, Model 8350B	2517U01367
8	Microwave Sweep Generator Plug In Unit 0.01-20GHz	HP Model 83592B	2509A00667
9	Dual Directional Coupler -20dB, 0.1-2.0GHz	HP Model 778D	1144A05983
10	Dual Directional Coupler -20dB, 2.0-18GHz	HP Model 11692D, Opt.001	1212/00839
11	Power Splitter DC-18GHz	HP Model 11667A	00182
12	Tunable Bandpass Filter 500-1000MHz	N/A	N/A

## **7. Summary of Test Results.**

### **7.1 Occupied Bandwidth Test.**

Occupied bandwidth tests in Up-Link and Down-Link transmit operational modes demonstrated full compliance of the MW-CBDA-ESMR-1W60 BDA with the requirements of 47CFR Parts 2 and 22.

### **7.2 Conducted Spurious and Harmonics Emissions in Antenna Ports:**

#### **Out-Of-Band Products.**

No spurious or harmonic emission exceeding the limit of  $43+10\log(P)$  below the unmodulated carrier power (P), or -13dBm, were detected. In general, conducted emissions at harmonic frequencies were below the noise floor of the spectrum analyzer.

### **7.3 Conducted Spurious Emissions in Antenna Ports:**

#### **In-Band Two-Tone Intermodulation Products.**

Third and higher order two-tone intermodulation products were detected during the tests. All emissions were below the limit of -13dBm. The lowest safety margin of 1.4dB was measured in the case of 3-ed order intermodulation during Up-Link transmission @ F1=806MHz and F2=807MHz.

## **8. Details of Test Results.**

### **8.1 Occupied Bandwidth Test.**

Occupied bandwidth tests were performed in Up-Link operational mode at frequencies 806, 816 and 821MHz and in Down-Link operational mode at frequencies 851, 858 and 866MHz.

The test results were compared with B-Mask (pursuant 47CFR 22.917(b)).

Experimental plots of the occupied bandwidth test are given in Appendix A.

#### **8.1.1 Up-Link (Mobile-to-Base) Transmit Mode.**

Test results In Up-Link (Mobile-to-Base) transmit mode for the center frequency 816MHz are given in Figures A-1 for the test performed at 120mWatts level of output power. All emissions were at levels below the B-mask specified in 47CFR 22.917(b).

### **8.1.2 Down-Link (Base-to-Mobile) Transmit Mode.**

Test results In Down-Link (Base-to-Mobile) transmit mode for the center frequency 858MHz are given in Figures A-2 for the test performed at 120mWatts level of output power. All emissions were at levels below the B-mask specified in 47CFR 22.917(b).

## **8.2 Conducted Spurious and Harmonics Emissions in Antenna Ports:**

### **Out-Of-Band Products.**

The tests were conducted in Up-Link and Down-Link operational modes. All details and experimental plots are given in technical report 9ELS029S.

## **8.3 Conducted Spurious Emissions in Antenna Ports:**

### **In-Band Two-Tone Intermodulation Products.**

Two-tone intermodulation test was conducted in Up-Link and Down-Link transmission operational modes at three frequencies for each mode.

All details and experimental plots are given in technical report 9ELS029S (= Exhibit 10).



## 9. Signatures.

Test measurements were  
performed by:

Dr. A. Axelrod  
(EMI Test Ltd.)

29 March 1999

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(Date, Signature)

Test report was prepared by:

Dr. A. Axelrod  
(EMI Test Ltd.)

29 March 1999

-----  
(Date, Signature)

Approved by:

Dr. Alexander Axelrod  
(EMI Test Ltd.)

29 March 1999

-----  
(Date, Signature)

The testing was observed by:

Mr. Shmuel Auster  
(Elisra Electronic Systems Ltd.)

12 April 1999

-----  
(Date, Signature)

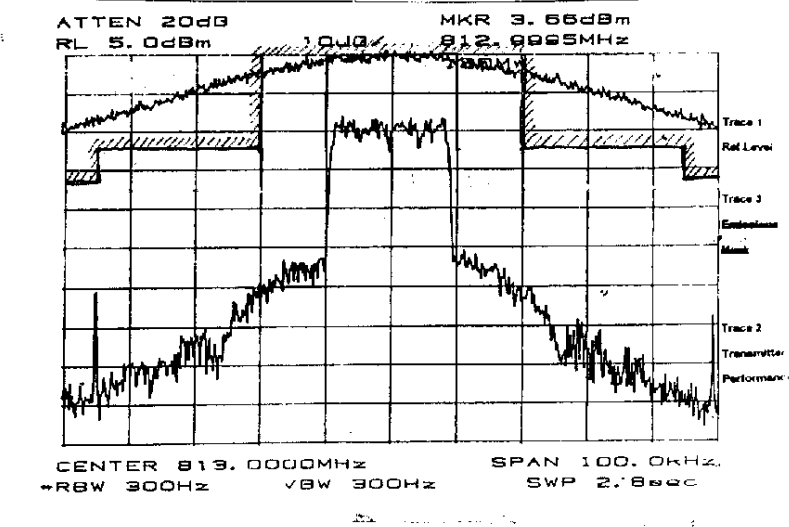
# **Appendix A**

## **Experimental Results of Occupied Bandwidth Test.**

Test Report No.9ELS029B

**Figure A-1**

Occupied Bandwidth Test in Up-Link Transmission Mode.  
F=813MHz, Pout = 100mWatt+20% = 120mWatt  
Performance relative to B-Mask per 47 CFR 22.917(b)

**Figure A-2**

Occupied Bandwidth Test in Down-Link Transmission Mode.  
F=858MHz, Pout = 100mWatt+20% = 120mWatt  
Performance relative to B-Mask per 47 CFR 22.917(b)

