

Test Report No.8012306767

***For Phantom II production Ltd.
PC-MODEM***

Model: PC-MODEM

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



Certificate No.1487-01

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Title: Test on PC-MODEM

Model: PC-MODEM

Order placed by: Phantom II production Ltd.

Address: Kibutz Yakum 60972, Israel

Sample for test selected by: The orderer

The date of test: 05/06/2000

Description of Equipment Under Test (EUT): PC-MODEM

Model: PC-MODEM

Manufactured by: Phantom II production Ltd.

- ❖ **CFR 47 FCC** Rules and Regulations:
Part 15. Radio frequency devices.
Subpart B: Unintentional radiators.
Subpart C: Intentional radiators. Sec. 15.231

This Test Report contains 20 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:

Description of Equipment Under Test (EUT): PC-MODEM

Model: PC-MODEM

Manufactured by: Phantom II production Ltd.

The EUT is an adapter between the PC / MAC and the LEONARDO. The PC-Modem communicates with the PC/MAC via a cable, and with the LEONARDO by RF communication .

EUT's Fundamental frequency = 433.92 MHz.

The EUT's dimensions are: 5.5 x 12 x 3 cm approx.

The EUT's power consumption from 220/110 VAC to 9-12 VDC Adaptor.

The EUT's block diagram is shown in Figure 1.



Figure 1 :EUT's block diagram

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1.2. EUT's sub-assemblies list:

EUT's sub-assemblies list is detailed in table 1.

Table 1- Sub-assemblies list

Function	Marking/Serial No./ Model
Main PC-MODEM board	LEONARDO Ver: 3.0
Modem board	MODEM Ver: 4B
AC/DC Adaptor 110 VAC/12 VDC	Model STA-4112 C-9 mfr Knex

1.3. EUT connectors list:

A list of the EUT's connectors is detailed in table 2.

Table 2- Connector list

No.	Connector's name	Connector's type	Type of cable	Length (m)	Location	No. of identical connectors
1	DC Power jack	DS-210B	Typical	<3	Side	1
2	Stereo jack	3.5mm ST-2	PC Cable #92108 by Phantom II	1	Side	1

1.4. Auxiliary equipment used:

The auxiliary equipment used is detailed in table 3.

Table 3 - Auxiliary equipment used

Name	Manufacturer	Model	Serial No.	Remarks
Laptop	-	Twinhead Model SLMNOTE-5	FCC ID: FXGPG2	-

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1.5. EUT setup and operation:

The EUT was setup as shown in Figure 2 and operated in operation modes as detailed in table 5.

Table 5 - Modes of operations

No.	Mode of operation	Test setup	Emissions Measurements
1	Standby	Fig.2	per FCC Part 15 Subpart B
2	Transmission	Fig.2	per FCC Part 15 Subpart C

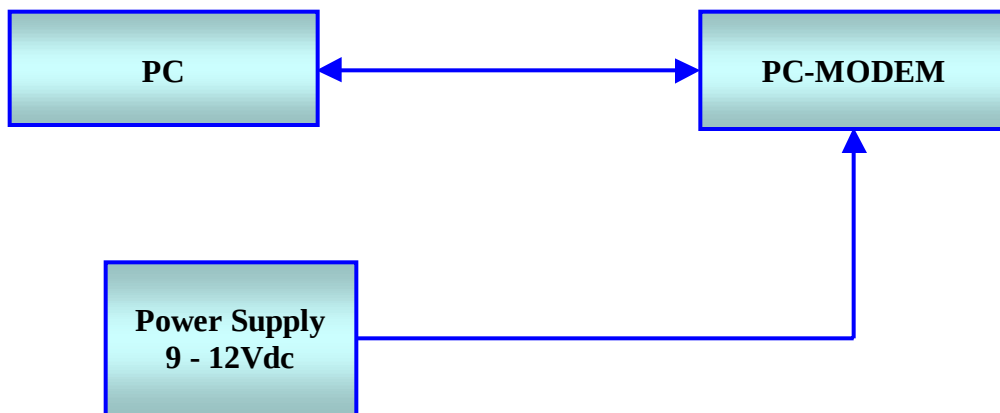


Figure 2 – EUT Test Setup

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2. Test specification, Methods and Procedures

Test Specification:

- ❖ **CFR 47 FCC** Rules and Regulations:
 - Part 15. Radio frequency devices.
 - Subpart B: Unintentional radiators.
 - Subpart C: Intentional radiators. Sec. 15.231

Methods and Procedures:

- ❖ **ANSI C63/4/1992:** "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

3. Additional deviations or exclusions from the test specifications

Not applicable.

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4. Measurements, examinations and derived results

4.1. *Location of the Test Site:*

Conducted emission test was carried out in the EMC laboratory of the Standards Institution of Israel in Tel-Aviv.

Radiated emission tests were conducted in an Open Area Test Site located at Kibbutz Native Halamed Hai in Emek HaEla, Israel.

4.2. *Test condition:*

Temperature: 22 °C

Humidity: 60 %

4.3. *Emission tests:*

- ★ For both radiated and conducted measurements, initial scans were made using a peak detector but still using the appropriate CISPR (Quasi-Peak) detector IF bandwidth.
- ★ For conducted emissions, a tolerance limit was set 6 dB below the specification limit. Levels above the tolerance limit were retested using the Quasi-Peak detector or an average detector.
- ★ For radiated emissions, a tolerance limit was set 10 dB below the specification limit. Levels above the tolerance limit were retested using the Quasi-Peak detector.
- ★ If the result with a Quasi-Peak detector exceeds the specification limit, it is marked with "Fails" in the margin, if it is within the limits of uncertainty for the measurement, it is marked with a "★".

4.4. *Initial visual check and functional test :*

Initial visual check of the EUT was performed before testing. No external damages were found.

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4.5. Conducted emission tests (Sec.15.207):

4.5.1. Test Configuration:

The EUT was placed on a non-metallic table in a shielded chamber at a height of 80 cm from the floor of the shielded chamber and 40 cm from the wall of the shielded chamber.

4.5.2. Test procedure:

The EUT was operated in standby mode according to clause 1.7.
First, initial scan were performed. Final measurements were performed for emission which exceeded the tolerance limit.

Test equipment (EMI receiver) setup was as follow:

Initial scan:

Detector type	Peak
Mode	Max hold
Bandwidth	9 kHz
Step size	Continuous sweep
Sweep time	100 msec

Measurements

Detector type	Quasi-peak (CISPR)
Bandwidth	9 kHz
Measurement time	200 seconds/MHz
Observation	>15 seconds

4.5.3. Test results:

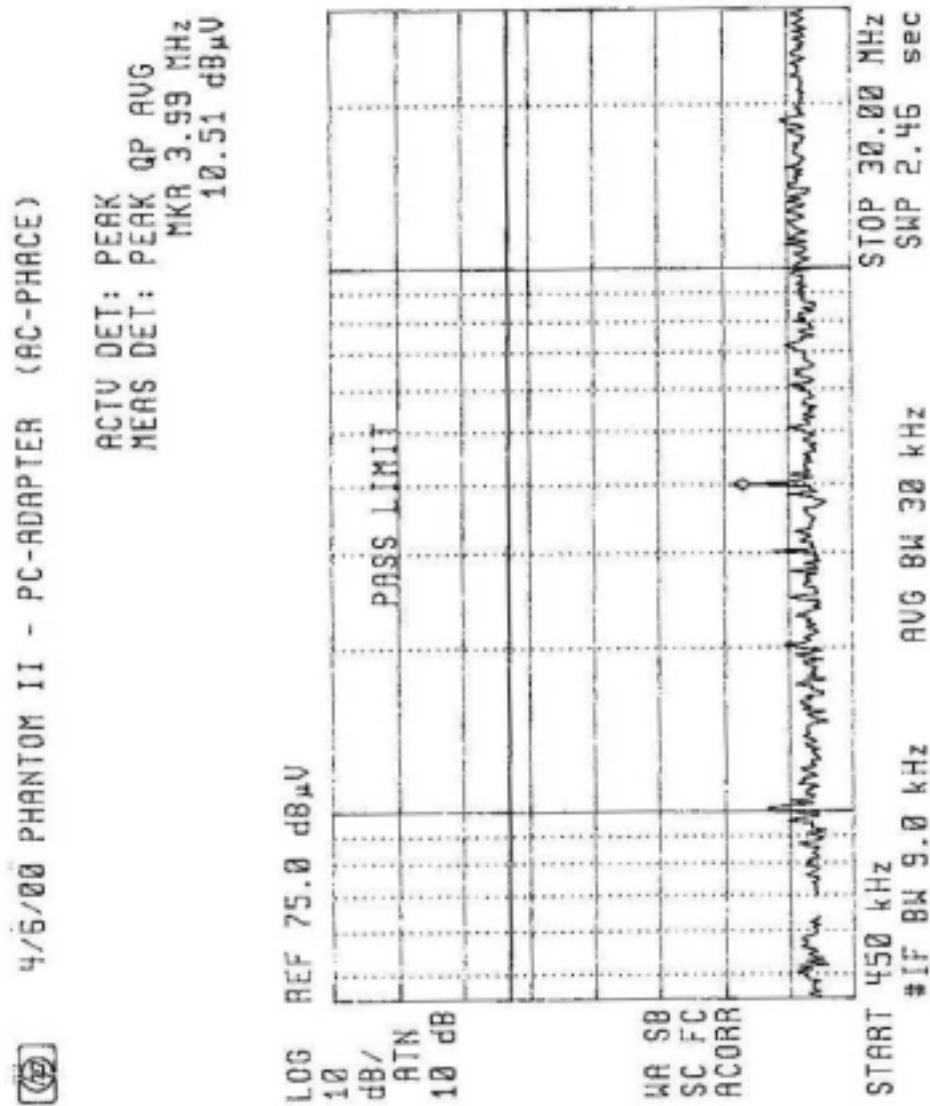
Test results of conducted emissions are shown in Plot #1, #2.

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Plot 1.

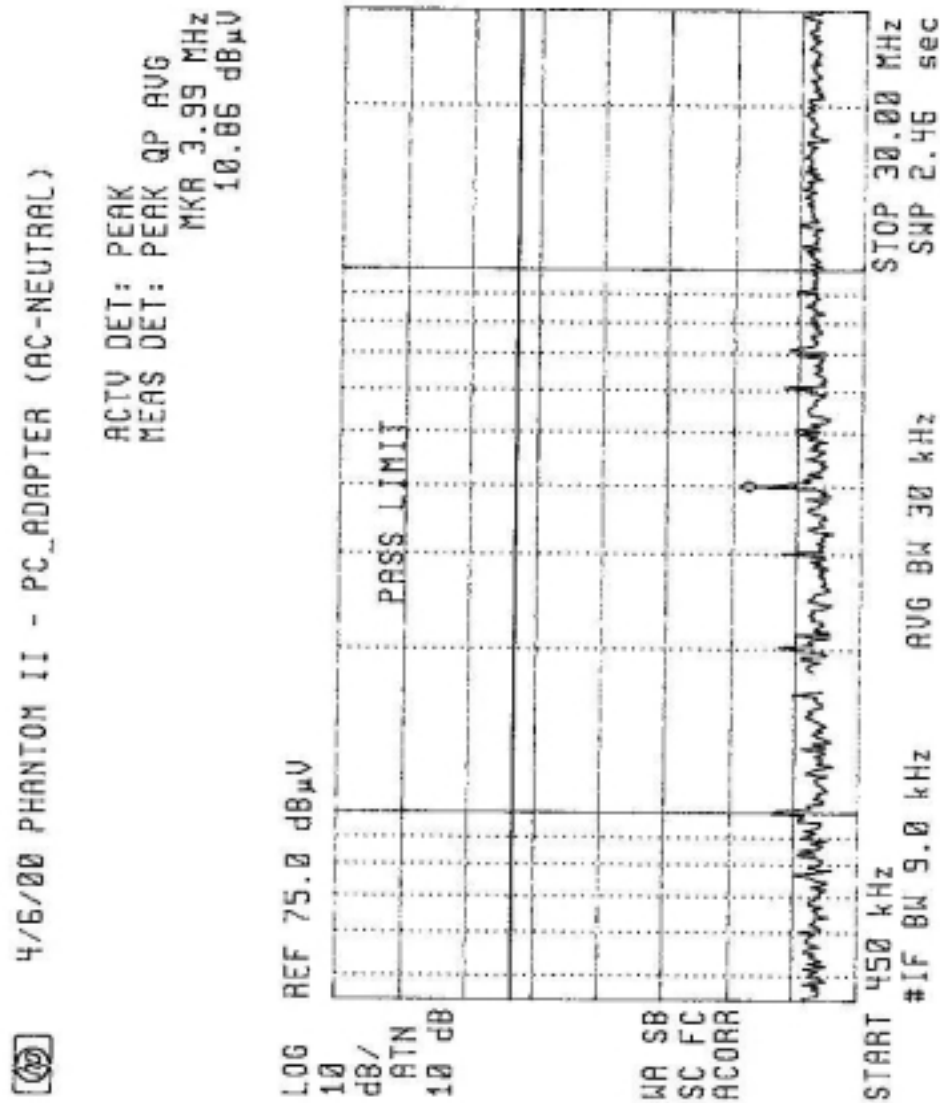
Conducted emission test result
Reference standard FCC Part 15 Subpart B
Line: Phase Detector: Peak

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Plot 2. Conducted emission test result
 Reference standard FCC Part 15 Subpart B
 Line: Neutral Detector: Peak

4.6. Radiated emission test (Sec. 15.109; 15.231):**4.6.1. Preliminary radiated emission tests:**

Preliminary radiated measurements were performed in a shielded chamber at a distance of 3 meters.

Operation modes: transmission, standby.

The EUT was setup in its typical configuration and operated in its various modes. For each mode of operation the frequency spectrum was monitored.

4.6.2. Final measurements:

The EUT was arranged on a wooden table placed on the turntable at the Open Area Test Site. The test layout is presented in Appendix 2.

All measurements at the Open Area Test Site were performed at a 10 m measurement distance. The antennas used for this measurement were:

1. Antenna biclog - in the frequency range 30-1000 MHz.
2. Antenna Double Ridge - above 1000 MHz.

The frequency range was investigated up to 5 th harmonic. In order to find maximum emissions the EUT was rotated in three orthogonal planes.

The measuring equipment settings were:

Initial scan:

Detector type	Peak
Mode	Max hold
Bandwidth	120 kHz
Step size	Continuous sweep
Sweep time	>1 seconds/MHz

Measurements:

Detector type	Quasi-peak (CISPR)
Bandwidth	120 kHz
Measurement time	20 seconds/MHz
Observation	>15 seconds
Sweep time	>1 seconds/MHz

4.6.3. Radiated emission test results:

1. Standby mode: No emissions from the EUT were found.
2. Transmission mode: Test results are presented in table #6.

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Table 6- Radiated emission test results
FCC Part 15 Subpart C Sec.15.231 (b)

Frequency (MHz)	Emission Level (dB μ V/m)	Limit of fundamental @ 3 meter distance (dB μ V/m)	Margin (dB)	Results
433.92	61.8	80.8	19.0	Complies

Frequency (MHz)	Emission Level (dB μ V/m)	Limit of spurious @ 3 meter distance (dB μ V/m)	Margin (dB)	Results
868	50.8	60.8	10.0	Complies

Note 1: Emission level = E Reading (dB μ V) + Cable loss (dB) + Antenna Factor (dB/m) For Cable Loss and Antenna Factor refer to Appendix 2.

Note 2: The measurements were performed at 10 m distance and the results were extrapolated to 3 m distance.

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4.6.4. Bandwidth measurements (Sec. 15.231 (c)):

The bandwidth of the emission shall be no wider than 0.25% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

The measurements were performed on modulated carrier signal, the result is presented in plot #1.

The required 0.25% bandwidth from 434 MHz equal to 1.085 MHz.

The bandwidth obtained graphically in the plots # 3, #4 was found equal to 423 kHz.

4.6.5. Signal duration (Sec.15.231 (a) (1), (2), (3))

The following signal duration were measured:

One) The transmitter operated through the customer software transmits the signals:

The longest signal duration = 32 msec

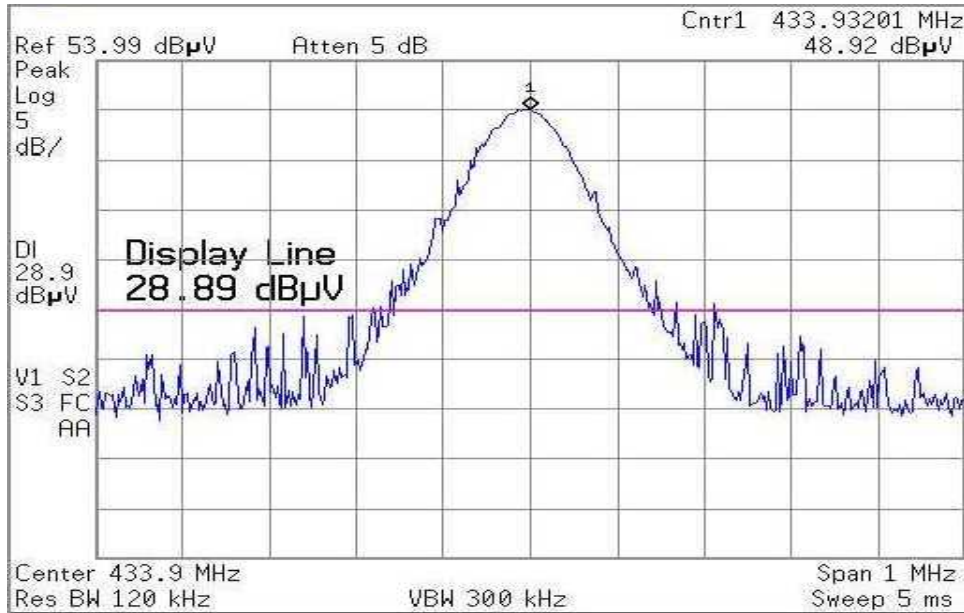
The shortest signal duration = 4 msec.

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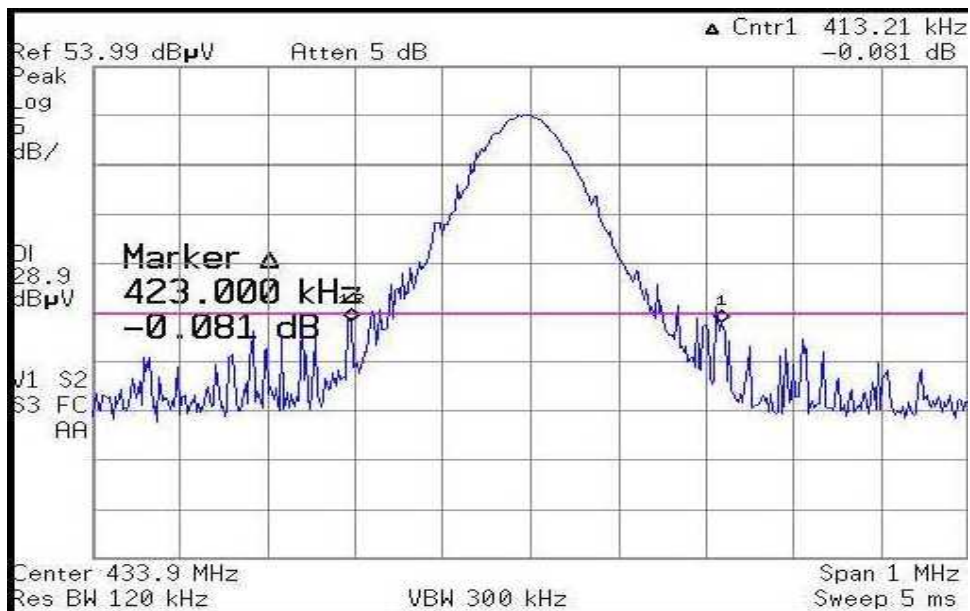
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Plot #3. The bandwidth of fundamental emissions.
Display line 20 dB down from the modulated carrier.



Plot #4. The bandwidth of fundamental emissions is equal to 423 kHz.

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5. Compliance with specification

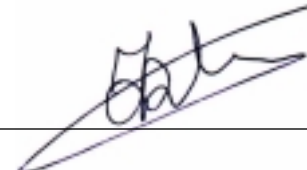
Test	Standard	Class	Test result
Conducted emission on mains terminal Frequencies range of 450 kHz to 30 MHz	FCC Part 15 Subpart B Sec.15.207	Class B	Complies
Radiated emission Frequencies range of 30-1000 MHz	FCC Part 15 Subpart B	Class B	Complies
Radiated emission from fundamental and spurious	FCC Part 15 Subpart C Sec.15.231 (b)	-	Complies
The bandwidth of the emission	FCC Part 15 Subpart C Sec.15.231 (c)	-	Complies



Telematics Laboratory

08 August 2000

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6. Appendix 1: Test equipment used

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

Instrument	Manufacturer	Model	Serial No.	Last calibration date	Next calibration date
EMI Receiver	HP	8546A+85460A	SII 4068	11/00	11/01
LISN 9 kHz – 30 MHz	FCC	LISN- 50/250-32-4-16	SII 5023	05/01	05/02
Transient limiter 0.009-200 MHz	HP	11947A	31074A3105	05/01	05/02
Antenna Bilog 30 – 2000 MHz	Schaffner- Chase	CBL6112B	S/N 2714 SII 5119	12/00	12/01
Antenna Double Ridge	EMCO	3115	SII4873	10/00	10/01
Antenna Mast	R&S	HCM	100002	NA	NA
Metallic turntable	R&S	HCT12	100001	NA	NA
Positioning controller	R&S	HCC	100002	NA	NA

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7. 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	3.201	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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Antenna Factor

Antenna Bilog mfr Schaffner Chase EMC Ltd.

Model CBL6112B S/N 2714

Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)
30	18.00	125	11.35	350	14.30	750	20.00	1300	23.10
32	16.90	130	11.00	360	14.50	760	20.00	1320	23.10
34	15.80	135	10.65	370	14.70	770	20.00	1340	23.30
36	14.80	140	10.40	380	14.80	780	20.00	1360	23.40
38	13.70	145	10.15	390	15.15	790	19.90	1380	23.80
40	12.60	150	9.70	400	15.70	800	19.90	1400	24.10
42	11.60	155	9.35	410	16.40	810	19.95	1420	24.40
44	10.60	160	9.10	420	16.70	820	20.20	1440	24.50
46	9.60	165	8.90	430	16.40	830	20.35	1460	24.70
48	8.80	170	8.80	440	16.30	840	20.40	1480	24.70
50	7.90	175	8.75	450	16.35	850	20.40	1500	25.00
52	7.20	180	8.60	460	16.70	860	20.30	1520	25.10
54	6.60	185	8.50	470	17.00	870	20.30	1540	25.10
56	6.00	190	8.40	480	17.20	880	20.30	1560	25.20
58	5.60	185	8.50	490	17.35	890	20.30	1580	25.20
60	5.20	200	8.70	500	17.40	900	20.30	1600	25.20
62	5.00	205	8.95	510	17.45	910	20.35	1620	25.30
64	4.80	210	8.80	520	17.50	920	20.40	1640	25.50
66	4.80	215	8.55	530	17.95	930	20.40	1660	25.70
68	4.90	220	8.90	540	18.80	940	20.60	1680	25.90
70	5.00	225	9.30	550	19.05	950	20.60	1700	25.90
72	5.30	230	9.80	560	18.80	960	20.60	1720	26.00
74	5.60	235	10.40	570	18.70	970	20.60	1740	25.90
76	6.10	240	10.90	580	18.60	980	20.70	1760	25.90
78	6.40	245	11.25	590	18.60	990	20.80	1780	25.70
80	6.90	250	11.70	600	18.80	1000	20.90	1800	25.80
82	7.30	255	12.20	610	19.10	1020	21.30	1820	25.90
84	7.60	260	12.80	620	19.20	1040	21.50	1840	26.10
86	8.00	265	12.80	630	19.20	1060	21.70	1860	26.30
88	8.40	270	12.40	640	19.20	1080	21.90	1880	26.50
90	8.80	275	12.30	650	19.10	1100	21.90	1900	26.80
92	9.20	280	12.30	660	19.10	1120	22.00	1920	27.00
94	9.60	285	12.35	670	19.00	1140	22.20	1940	27.00
96	9.90	290	12.40	680	18.90	1160	22.30	1960	27.10
98	10.40	295	12.60	690	18.95	1180	22.40	1980	27.20
100	10.70	300	12.70	700	19.10	1200	22.50	2000	27.30
105	11.15	310	13.15	710	19.35	1220	22.70		
110	11.40	320	13.50	720	19.60	1240	22.90		
115	11.50	330	13.60	730	19.90	1260	23.00		
120	11.50	340	13.80	740	20.00	1280	12.80		

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8. Appendix 3: Test configuration illustration



Photo #1
Radiated emission test setup

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Photo #2
Radiated emission test setup