

5.4 Conducted Out-of-band Emissions (cont.)

5.4.1 Results (cont.)

Frequency (GHz)	Emission Type	Level (dBm)	Avg. Level (dBm)	Limit (dBm) (*)	Margin (dB)
<i>Transmit on low channel</i>					
4.804	Harmonic	-41.3	-44.6	5	49.6
7.206	Harmonic	-42.1	-45.9	5	50.9
9.608	Harmonic	-52.1	-56.3	5	61.3
12.010	Harmonic	-54.6	-59.8	5	64.8
14.412	Harmonic	-61.7	-65.2	5	70.2
21.618	Harmonic	-69.2	-72.7	5	77.7
<i>Transmit on medium channel</i>					
4.880	Harmonic	-47.2	-51.3	5	56.3
7.320	Harmonic	-38.6	-42.5	5	47.5
9.760	Harmonic	-54.2	-57.4	5	62.4
12.200	Harmonic	-67.3	-70.8	5	75.8
14.640	Harmonic	-70.0	-73.7	5	78.7
21.960	Harmonic	-58.1	-62.4	5	67.4
<i>Transmit on high channel</i>					
4.960	Harmonic	-40.1	-44.9	5	49.9
7.440	Harmonic	-59.7	-63.4	5	68.4
9.920	Harmonic	-60.2	-63.4	5	68.4
12.480	Harmonic	-58.4	-62.7	5	67.7
22.320	Harmonic	-59.3	-63.6	5	68.6

(*) Limit for harmonics is 20 dB below the lowest fundamental signal. For all other emission the limit is given in Part 15 paragraph 209.

5.5 RADIATED SPURIOUS EMISSIONS

5.5.1.1 30 MHz - 1 GHz Band Procedure

With the EUT first in transmit mode, then in receive mode a prescan of the emissions in the 30 MHz – 1 GHz range was performed. Then suspicious peaks were closely measured while the antenna, table azimuth and EUT cabling were maximized for worst case emissions. The analyzer/receiver was programmed to compensate for all loss and gain factors (such as cables, antennas, preamplifiers etc.). The peak and quasi-peak readings were recorded. The limit used was FCC Part 15 class B radiated emissions limit.

5.5.1.2 30 MHz - 1 GHz Band Results

All emissions measured were below the limit. The following table shows the measured values, system loss/gain factors for those emissions and the position of the EUT and the measurement antenna.

Frequency (MHz)	Reading		Antenna Factor (dB)	System Loss (dB)	Limit (dBuV/m)	Azimuth Angle (°)	Antenna Height (m)	Polariz.	Margin (dB)
	Peak (dBuV/m)	QP (dBuV/m)							
123.00	38.66	33.49	12.40	12.09	43.50	25.00	1.5m	Horizontal	10.01
129.80	36.80	34.27	12.43	11.93	43.50	10.00	1.5m	Horizontal	9.23
158.70	38.63	33.24	11.76	11.26	43.50	65.00	1m	Vertical	10.26
182.40	39.28	34.52	9.82	10.54	43.50	170.00	1m	Vertical	8.98
232.10	41.64	37.79	12.84	10.22	46.00	175.00	1m	Vertical	8.21
363.30	42.11	37.67	15.19	21.23	46.00	220.00	1m	Horizontal	8.33
381.60	41.56	36.98	15.68	21.19	46.00	220.00	1m	Horizontal	9.02
907.30	43.66	39.12	22.36	19.34	46.00	260.00	1m	Horizontal	6.88
907.30	42.81	39.04	22.36	19.34	46.00	110.00	1.5m	Vertical	6.96

5.5.2.1 1 GHz - 10 GHz Band Procedure

With the transmitter in continuous transmit mode, a pre-scan of the EUT was performed at 1m by rotating the EUT 360° and changing the antenna height between 1m and 4m. All suspicious peaks were noted. Then with the average-peak detector at 1 MHz RBW all suspicious peaks were scanned in the maximized EUT direction and antenna height. Same measurements were made for both polarizations of the antenna. The analyzer / receiver was programmed to compensate for all loss and gain factors (such as cables, antennas, preamplifiers etc.). A 10 dB correction factor was added to the readings for the reduction of measurements distance. The peak and average readings were recorded. The limits used were the limits specified in paragraphs 205 (restricted bands), 209 (spurious emissions), 247 (c) (harmonic emissions) of Part 15.

5.5.2.2 1 GHz - 10 GHz Band Results

The tables on following pages show the measured values, system loss/gain factors for those emissions and the position of the EUT and the antenna. As can be seen all harmonics were within required limits. No detectable emissions were found in receive mode.

Frequency (GHz)	Peak (*) (dB μ V/m)	Avg. (*) (dB μ V/m)	Gain/Loss (dB)	Polar.	Ant. Ht. (m)	Limit (dB μ V/m)	Margin (Db)
Low Channel							
4.804	45.1	41.2	30.7	V	1	54	12.8
7.206	50.8	47.7	34.8	V	1.25	107	59.3
9.608	48.3	45.2	35.6	V	1	107	61.8
12.010	46.6	41.8	36.2	V	1	54	12.2
Medium Channel							
4.880	45.3	41.4	30.7	V	1	54	12.6
7.320	51.8	48.7	34.8	V	1.25	54	5.3
9.760	47.7	43.9	35.6	V	1	107	63.1
12.200	45.9	40.7	36.2	V	1	54	13.3
High Channel							
4.960	44.6	40.1	30.7	V	1	54	13.9
7.440	52.1	49.4	34.8	V	1	54	4.6
9.920	48.5	43.2	35.6	V	1	107	63.8
12.480	46.3	41.9	36.2	V	1	54	12.1

(*) corrected measurements (all factors included)

5.6 CONDUCTED POWERLINE EMISSIONS

5.6.1 Measurement Procedure

The power line conducted emissions were measured at 110 V. In each case the EUT was put into a hopping mode. The source of the emissions (digital circuitry or transmitter) was confirmed by turning the transmitter off. The emissions were measured in the hot and neutral sides of the power line.

5.6.2 Measurement Results

All emissions were caused by the digital circuitry and all were below the limit. CISPR 22 Class B limits were used. The plots are in the following page. The emissions found are listed below.

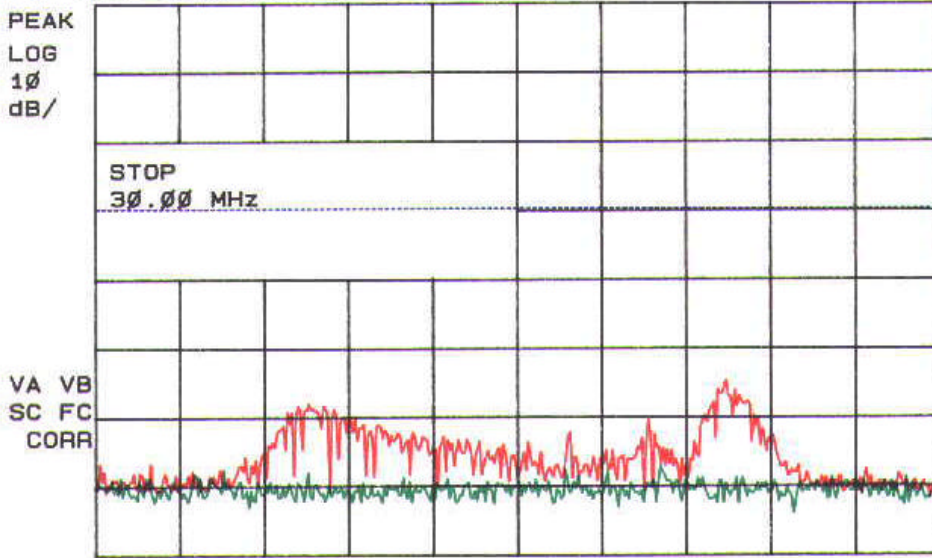
Line	Frequency (MHz)	Peak Level (dB μ V)	QP -Level (dB μ V)	Avg. Level (dB μ V)	Limit (*) (dB μ V)	Margin (dB)
Neutral	.155	56.7	39.5	33.2	56	22.8
Neutral	.180	47.4	34.3	27.7	55	27.3
Neutral	.635	33.3	27.2	24.5	46	21.5
Neutral	11.2	32.2	23.7	22.4	60	37.6
Neutral	18.7	30.1	24.3	23.8	60	36.2
Neutral	22.1	32.4	23.2	22.7	60	37.3
Neutral	23.8	36.6	22.8	22.4	60	37.6
Hot	.155	51.3	37.4	33.6	56	22.4
Hot	.180	44.2	31.5	26.3	55	28.7
Hot	.580	32.7	22.9	22.1	46	23.9
Hot	11.8	31.8	23.7	22.4	60	37.6
Hot	21.3	29.6	24.1	23.6	60	36.4
Hot	23.2	35.1	25.4	23.1	60	36.9

(*) Limits for average measurement

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08: 47: 48 06 OCT 1999

REF 90.0 dB μ V #ATTEN 10 dB PG -10.0 dB



Powerline
Conducted
Emissions
Measurement

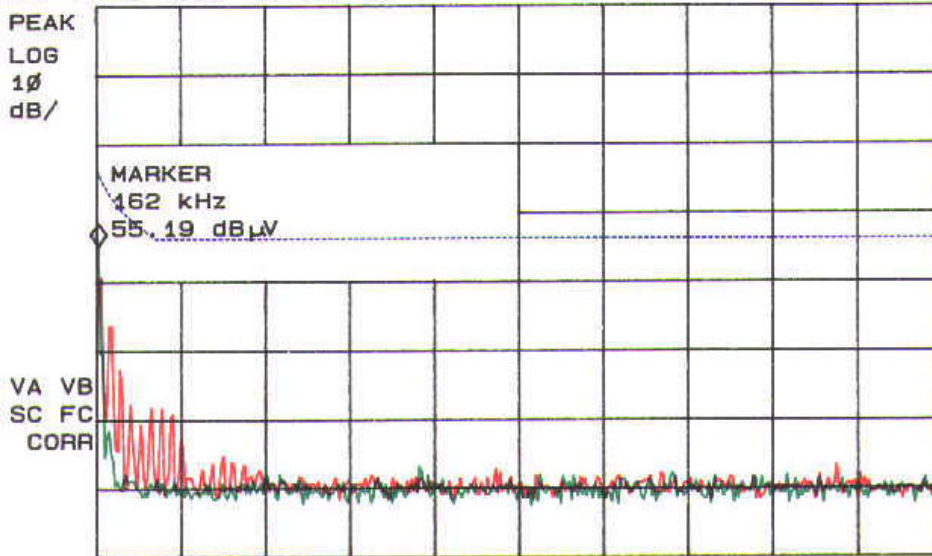
Hot
Line

START 5.00 MHz #RES BW 9.0 kHz VBW 30 kHz STOP 30.00 MHz SWP 926 msec

08: 46: 10 06 OCT 1999

REF 90.0 dB μ V #ATTEN 10 dB PG -10.0 dB

MKR 162 kHz
55.19 dB μ V

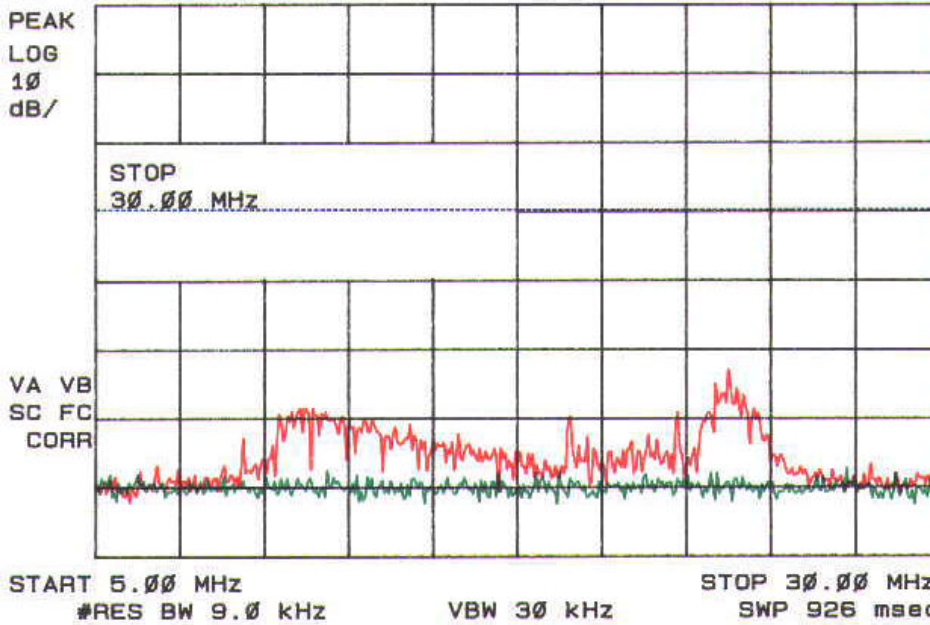


START 150 kHz #RES BW 9.0 kHz VBW 30 kHz STOP 5.000 MHz SWP 180 msec

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08: 43: 48 06 OCT 1999

REF 90.0 dB μ V #ATTEN 10 dB PG -10.0 dB



Powerline
 Conducted
 Emissions
 Measurement

Neutral
 Line

08: 42: 16 06 OCT 1999

REF 90.0 dB μ V #ATTEN 10 dB PG -10.0 dB

MKR 162 kHz
 55.19 dB μ V

