PLASMA SONICS LTD. CO. TEST REPORT

FOR THE

ISM OVER MODULATED TRANSMITTER (27.12 MHZ)

FCC PART 18 SUBPART C SECTION 18.305

COMPLIANCE

DATE OF ISSUE: MARCH 30, 2004

PREPARED FOR:

Plasma Sonics Ltd. Co.
8005 Marble Ave. NE
Albuquerque, NM 87110

P.O. No.:
W.O. No.: 82029

PREPARED BY:

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Date of test: March 26, 2004

Report No.: FC04-028

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	March 26, 2004
DATE OF RECEIPT:	March 26, 2004
PURPOSE OF TEST:	To demonstrate the compliance of the ISM Transmitter, ISM Over Modulated Transmitter (27.12 MHz) with the requirements for FCC Part 18 Subpart C Section 18.305 devices.
TEST METHOD:	MP-5 (1987)
FREQUENCY RANGE TESTED:	20-30 MHz
MANUFACTURER:	Plasma Sonics Ltd. Co. 8005 Marble Ave. NE Albuquerque, NM 87110
REPRESENTATIVE:	James Bare
TEST LOCATION:	CKC Laboratories, Inc. 5473A Clouds Rest Mariposa, CA 95338

SUMMARY OF RESULTS

As received, the Plasma Sonics Ltd. Co. ISM Over Modulated Transmitter (27.12 MHz) was found to be fully compliant with the following standards and specifications:

United States

- FCC Part 18 Subpart C Section 18.305
- MP-5 (1987) method

FCC Site No. 90477

CONDITIONS FOR COMPLIANCE

No modifications to the EUT were necessary to comply.

APPROVALS

Steve Behm, Director of Engineering Services

QUALITY ASSURANCE:	TEST PERSONNEL:
Joyce Walker, Quality Assurance Administrative Manager	Mike Wilkinson, Lab Manager

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The EUT tested by CKC Laboratories was representative of a production unit.

EQUIPMENT UNDER TEST

ISM Transmitter

Manuf: Plasma Sonics LTD
Model: ISM Over Modulated Transmitter (27.12 MHz)
Serial: NA
FCC ID: RKYOM-1

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Power Supply (EUT)

Manuf: Tripp Lite
Model: PR-4.5A
Serial: PR0285

Matched Load

Manuf: MFJ Enterprises
Model: MFJ 949E
Serial: NA

Frequency Generator

Manuf: Kinnaman
Model: F1-A
Serial: NA

SPECIFICATIONS AND REQUIREMENTS

The following summarizes the specifications and requirements for the emission tests performed on the EUT. If the actual test levels are higher or different than required, these levels are listed in the appropriate tables.

Test	Specification	Requirement
Radiated Emissions	FCC Part 18.305	MP-5 (1987)

MEASUREMENT UNCERTAINTY

TEST	HIGHEST UNCERTAINTY
Radiated Emissions	+/- 2.94 dB

Note: Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Statements of compliance are based on the nominal values only.

REPORT OF MEASUREMENTS

The following tables report the worst case emissions levels recorded during the tests performed on the EUT. All readings taken were peak readings unless otherwise stated. The data sheets from which the emissions tables were compiled are contained in Appendix C.

Table 1: Six Highest Radiated Emission Levels

FREQUENCY MHz	METER READING dBµV	CORRECTION FACTORS Ant dB	Amp dB	Cable dB	Dist dB	CORRECTED READING dBµV/m	SPEC LIMIT dBµV/m	MARGIN dB	NOTES
21.460	44.6	6.7		0.7	-59.0	-7.0	27.9	-34.9	N
22.380	34.0	6.4		0.7	-59.0	-17.9	27.9	-45.8	N
23.300	33.2	6.2		0.7	-59.0	-18.9	27.9	-46.8	N
26.140	27.8	5.3		0.8	-59.0	-25.1	27.9	-53.0	N
27.130	51.7	4.9		0.8	-59.0	-1.6	27.9	-29.5	N
28.280	28.0	4.6		0.7	-59.0	-25.7	27.9	-53.6	N

Test Method: MP-5 (1987)
Spec Limit: FCC Part 18 Subpart C Sections 18.305
Test Distance: 10 Meters

NOTES: N = No Polarization

COMMENTS: EUT is transmitting continuously into the matched load and is modulated at 3.0 kHz by the frequency generator. Spectrum analyzer res BW and video BW set to 100 kHz. Frequency range investigated was 20 to 30 MHz. The temperature was 71°F. Data represents worst case of H & E field orientations of the mag loop antenna.

TESTING

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available I/O ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. I/O cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

EMISSIONS

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables. The corrected data was then compared to the applicable emission limits to determine compliance.

The radiated emissions data was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in Table A.

Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

TABLE A: SAMPLE CALCULATIONS

	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Appendix B were used to collect the radiated emissions data. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dBµV, and a vertical scale of 10 dB per division.

TABLE B: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE

TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
RADIATED EMISSIONS	20 MHz	30 MHz	100 kHz

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual was followed.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

RADIATED EMISSIONS

The EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters.

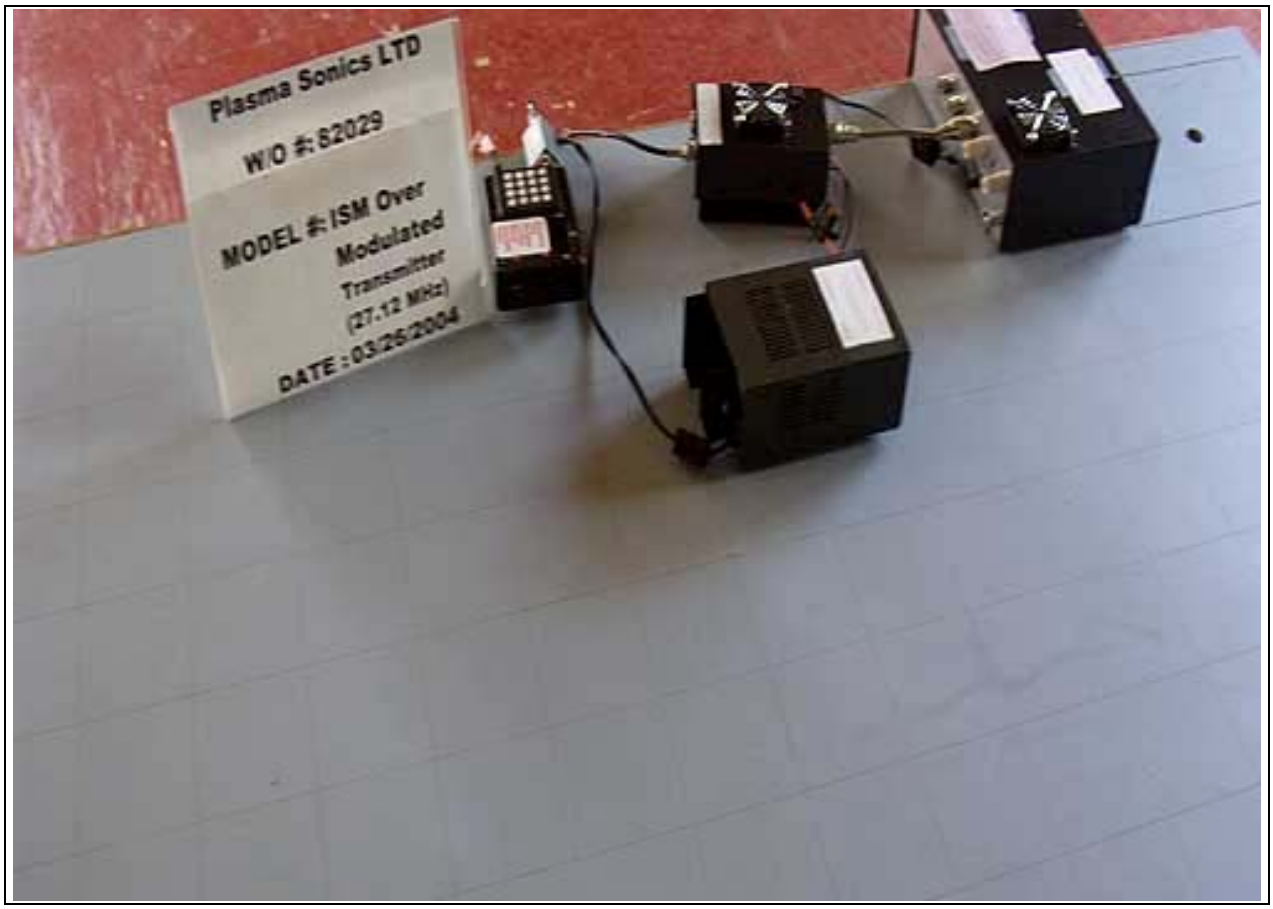
During the preliminary radiated scan, the EUT was powered up and operating in its defined test mode. For radiated measurements from 20 MHz to 30 MHz, the magnetic loop antenna was used. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

A thorough scan of all frequencies was made manually using a small frequency span, rotating the turntable as needed. The test engineer maximized the readings with respect to the table rotation and configuration of EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor.

APPENDIX A

TEST SETUP PHOTOGRAPHS

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS

Radiated Emissions - Back View

APPENDIX B

TEST EQUIPMENT LIST

Radiated Emissions

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8566B SA	2209A01404	02/26/2003	02/26/2005	00490
HP 8566B SA Display	2403A08241	02/26/2003	02/26/2005	00489
HP 85650A QPA	2811A01267	02/26/2003	02/26/2005	00478
EMCO Loop Antenna	1074	05/21/2003	05/21/2005	00226

APPENDIX C

MEASUREMENT DATA SHEETS

Test Location: CKC Laboratories •5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Plasma Sonics LTD Co**
Specification: **FCC pt18.305 (Misc. Equip. for ISM freq.)**
Work Order #: **82029** Date: 03/26/2004
Test Type: **Maximized Emissions** Time: 11:13:46
Equipment: **ISM Transmitter** Sequence#: 1
Manufacturer: Plasma Sonics LTD Tested By: Mike Wilkinson
Model: ISM Over Modulated Transmitter (27.12 MHz)
S/N: N/A

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
ISM Transmitter*	Plasma Sonics LTD	ISM Over Modulated Transmitter (27.12 MHz)	N/A

Support Devices:

Function	Manufacturer	Model #	S/N
Power Supply (EUT)	Tripp Lite	PR-4.5A	PR0285
Frequency Generator	Kinnaman	F1-A	None
Matched Load	MFJ Enterprises	MFJ 949E	N/A

Test Conditions / Notes:

EUT is transmitting continuously into the matched load and is modulated at 3.0 kHz by the frequency generator. Spectrum analyzer res BW and video BW set to 100 kHz. Frequency range investigated was 20 to 30 MHz. The temperature was 71°F. Data represents worst case of H & E field orientations of the mag loop antenna.

Transducer Legend:

T1=Mag Loop - Site B - AN 00226 - 9kHz-30M	T2=Cable - 10 Meter

Measurement Data: Reading listed by margin. Test Distance: 10 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	27.130M	51.7	+4.9	+0.8			-59.0	-1.6	27.9 Fundamental	-29.5	None
2	21.460M	44.6	+6.7	+0.7			-59.0	-7.0	27.9	-34.9	None
3	22.380M	34.0	+6.4	+0.7			-59.0	-17.9	27.9	-45.8	None
4	23.300M	33.2	+6.2	+0.7			-59.0	-18.9	27.9	-46.8	None
5	26.140M	27.8	+5.3	+0.8			-59.0	-25.1	27.9	-53.0	None
6	28.280M	28.0	+4.6	+0.7			-59.0	-25.7	27.9	-53.6	None
7	29.180M	26.0	+4.3	+0.7			-59.0	-28.0	27.9	-55.9	None