

# TEST REPORT FROM RADIO FREQUENCY INVESTIGATION LTD.

Test Of: Maynetronics Ltd.  
NTR102-2 Data Terminal.

To: FCC Part 15 Subpart C: 1998  
(Intentional Radiators)  
Section 15.249

**Test Report Serial No:**  
RFI/EMCB1/RP38896A

This Test Report Is Issued Under The Authority Of Brian Watson Technical Director:  	Checked By:  
Tested By:  	Release Version No: PDF01
Issue Date: 5 August 1999	Test Date: 21 May 1999 to 4 June 1999

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Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, ENGLAND. Tel: +44 (0) 1256 851193 Fax: +44 (0) 1256 851192	Registered in England, No. 211 7901. Registered Office: Ewhurst Park, Ramsdell, Basingstoke, Hampshire RG26 5RQ	 NAMAS TESTING 0644
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**EMC Department**

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**NTR102-2 Data Terminal.**  
**To:** **F.C.C. Part 15: 1998 Class B**

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## **1. Client Information**

<b>Company Name:</b>	Maynetronics Ltd.
<b>Address:</b>	34 St Thomas Street Ryde Isle of Wight PO33 2DL
<b>Contact Name:</b>	Mr G Mayne.

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## **2. Equipment Under Test (EUT)**

The following information (with the exception of the Date of Receipt) has been supplied by the client:

### **2.1. Identification Of Equipment Under Test (EUT)**

<b>Brand Name:</b>	Maynetronics Ltd
<b>Model Name or Number:</b>	NRT102-2
<b>Unique Type Identification:</b>	NRT102-2
<b>Serial Number:</b>	0497
<b>Country of Manufacture:</b>	None stated by client
<b>FCC ID Number:</b>	Awaiting Certification from the FCC.
<b>Date of Receipt:</b>	21 May 1999

## **2.2. Description Of EUT**

The NOMAD system comprises a PC, a controller, multiple link units and terminals. The controller connects to the PC via a RS232 link. A RS485 bus connects the controller to the link units. Each link unit has a low powered UHF transceiver which communicates with the terminals. The number of link units depends on the size of the site. The aim of the whole system is to get data from the terminals onto the PC.

The NRT102-2 terminal is a battery powered device consisting of a numeric keypad, a 2 line by 16 character reflective LC display and a wireless link to the NOMAD system. Data entry is guided by menus which are downloaded from the NOMAD system. The terminal is optimised for job logging of personnel and is essentially an electronic time sheet.

A small embedded processor with a 1MHz clock provides all the peripheral and control features. An on-chip UART interfaces to the RF section. Data and menus are stored in a 64k bit serial EEPROM with an I<sup>2</sup>C interface to the processor. The 4x4 matrix keypad is connected to the processor's peripheral pins with the strobe lines sharing the same pins as the data bus for the display. A piezo sounder provides audible response to keypad presses and other abbreviations.

Power is supplied from a 8.4 volt NiMH rechargeable battery which is recharged under the control of the processor. The battery is followed by a linear regulator which steps the voltage down to 5 volts. An op-amp and a few discrete components form the charging circuit which charges at 3mA or 22mA.

The wireless section is centred around a TR1000 hybrid transceiver from Radio Monolithics. This device contains all the necessary RF circuitry with just a few passive components, a 3.3V regulator, and a couple of transistors to perform level shifting of the logic signals. The antenna is a loop type integral to the PCB. Operating frequency is 916.5 MHz and the modulation type is OOK.

## **2.3. Modifications Incorporated In EUT**

None stated by client.

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#### **2.4. Additional Information Related To Testing**

<b>Power Supply Requirement:</b>	Internal 9V Battery External 12V DC Charging Supply
<b>Intended Operating Environment:</b>	Residential, Commercial and Light industry
<b>Weight:</b>	0.175 kg
<b>Dimensions:</b>	115mm (l) x 70mm (w) x 25mm (d)
<b>Interface Ports:</b>	None

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## **2.5. Support Equipment**

The following support equipment was used to exercise the EUT during testing:

<b>Description:</b>	Charger
<b>Brand Name:</b>	Hoogendoorn Nomad
<b>Model Name or Number:</b>	None stated by client
<b>Serial Number:</b>	None stated by client
<b>FCC ID Number:</b>	None stated by client
<b>Cable Length And Type:</b>	Direct Connection to EUT
<b>Connected to Port:</b>	DC Input to EUT

<b>Description:</b>	Power Supply Unit (for charger)
<b>Brand Name:</b>	EMS Power
<b>Model Name or Number:</b>	9090
<b>Serial Number:</b>	986723
<b>FCC ID Number:</b>	None stated by client
<b>Cable Length And Type:</b>	1m Twin
<b>Connected to Port:</b>	DC In

### **3. Test Specification, Methods And Procedures**

#### **3.1. Test Specification**

<b>Reference:</b>	FCC Part 15 Subpart C: 1998. Section 15.249
<b>Title:</b>	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices: Digital Devices.
<b>Comments:</b>	A description of the test facility used for this test is on file with, and has been accepted by, the Federal Communications Commission as required by Section 2.948 of Federal Rules.
<b>Purpose of Test:</b>	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

#### **3.2. Methods And Procedures**

The methods and procedures used were as detailed in:

ANSI C63.2 (1987)

Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (1992)

Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)

Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)

Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1 (1993)

Title: Specification for radio disturbance and immunity measuring apparatus and methods. Part 1. Radio disturbance and immunity measuring apparatus.

#### **3.3. Definition Of Measurement Equipment**

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

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#### **4. Deviations From The Test Specification**

None.

## **5. Operation Of The EUT During Testing**

### **5.1. Operating Conditions**

The EUT was tested in a normal laboratory environment.

During testing, when in a standalone configuration the EUT was powered by an internal 9v DC supply, and when connected to the charger, a 12v DC supply.

### **5.2. Operating Modes**

The EUT was tested in the following operating modes:

- 1) Continuous Transmit.
- 2) Continuous Standby / Receive.

The reason for choosing this mode was that it was defined by the client as being likely to be the worst case with regards EMC.

### **5.3. Configuration And Peripherals**

The EUT was tested in the following configurations:

- 1) Standalone.
- 2) Plugged into and operated via the designated charger.

The reason for choosing this configuration was that it was defined by the client as being likely to be the worst case with regards EMC.

NB Section 2 of this report contains a full list of support equipment used and Appendix 3 contains a schematic diagram of the test configuration.

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## **6. Summary Of Test Results**

### **6.1. Conducted Emissions**

<b>Range Of Measurements</b>	<b>Specification Reference</b>	<b>Compliance Status</b>
AC Powerline Conducted Emissions. 450 kHz to 30 MHz. Transmit Mode.	Section 15.249 of C.F.R. 47: 1998 (Section 15.207).	Complied
AC Powerline Conducted Emissions. 450 kHz to 30 MHz. Standby Mode.	Section 15.107 of C.F.R. 47: 1998 Class B	Complied

### **6.2. Radiated Emissions**

<b>Range Of Measurements</b>	<b>Specification Reference</b>	<b>Compliance Status</b>
Electric Field Strength. 30 MHz to 10000 MHz. Transmit Mode.	Section 15.249 of C.F.R. 47: 1998 (Section 15.209)	Complied
Electric Field Strength. 30 MHz to 5000 MHz. Standby Mode.	Section 15.109 of C.F.R. 47: 1998 Class B	Complied

### **6.3. Location Of Tests**

All the measurements described in this report were performed at the premises of Radio Frequency Investigation Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, England.

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## **7. Measurements, Examinations And Derived Results**

### **7.1. General Comments**

7.1.1. This section contains test results only. Details of the test methods and procedures can be found in Appendix 2 of this report.

7.1.2. The measurement uncertainties stated were calculated in accordance with the requirements of NAMAS Document NIS 81 with a confidence level of 95%. Please refer to Section 8 for details of measurement uncertainties.

7.1.3. When the EUT was tested in a standalone configuration, the EUT was operated with a new fully charged battery. When operated in a charging configuration, the internal battery was initially partly charged.

## **7.2. Test Results For AC Mains Conducted Emissions: Transmit Mode**

### **7.2.1. Quasi-Peak Detector Measurements On Live And Neutral Lines**

7.2.1.1. Measurements were performed to the limits specified in Section 15.207 of C.F.R.47: 1998.

7.2.1.2. Plots of the initial scans can be found in Appendix 4.

7.2.1.3. Conducted emission preliminary scans and final measurements were performed with the EUT operated in a transmit mode of operation whilst in a charge configuration as stated in section 5 of this test report.

7.2.1.4. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector:

Frequency (MHz)	Line	Q-P Level (dB <sub>m</sub> V)	Q-P Limit (dB <sub>m</sub> V)	Margin (dB)	Result
1.000	Live	13.1	48.0	34.9	Complied
1.000	Neutral	12.9	48.0	35.1	Complied
5.000	Live	10.4	48.0	37.6	Complied
5.000	Neutral	10.6	48.0	37.4	Complied
10.000	Live	10.4	48.0	37.6	Complied
10.000	Neutral	10.2	48.0	37.8	Complied
15.000	Live	9.9	48.0	38.1	Complied
15.000	Neutral	10.1	48.0	37.9	Complied
20.000	Live	9.7	48.0	38.3	Complied
20.000	Neutral	9.5	48.0	38.5	Complied
30.000	Live	10.4	48.0	37.6	Complied
30.000	Neutral	11.1	48.0	36.9	Complied

### **7.3. Test Results For AC Mains Conducted Emissions: Standby Mode**

#### **7.3.1. Quasi-Peak Detector Measurements On Live And Neutral Lines**

7.3.1.1. Measurements were performed to the limits specified in Section 15.107 Class B of C.F.R.47: 1998.

7.3.1.2. Plots of the initial scans can be found in Appendix 4.

7.3.1.3. Conducted emission preliminary scans were performed with the EUT operated in a standby mode of operation whilst in a charge configuration as stated in section 5 of this test report.

7.3.1.4. Preliminary scans showed that the emission levels in this mode of operation were of a lower level than when operated in a transmit mode. Therefore no final conducted emission measurements were performed.

## **7.4. Test Results For Radiated Emissions: Transmit Mode**

### **7.4.1. Fundamental Field Strength Measurements**

7.4.1.1. Section 15.249 (a) specifies that the maximum field strength level of the fundamental frequency between the range 902 and 928 MHz must not exceed a level of 50mV/m (94dB<sub>u</sub>V/m) at a distance of 3m.

7.4.1.2. Final radiated emission measurements were performed with the EUT operated in both a standalone and charging configuration. The highest levels were found when operating in a standalone configuration.

7.4.1.3. The following table lists the field strength level of the fundamental frequency. Measurements were performed using a Quasi-Peak and an Average detector at a test distance of 3m (results incorporate antenna factors and cable losses):

Frequency (MHz)	Ant. Pol.	Q-P Level (dB <sub>u</sub> V/m)	Q-P Limit (dB <sub>u</sub> V/m)	Margin (dB)	Result
916.500	Vert.	92.2	94.0	1.8	Complied

Frequency (MHz)	Ant. Pol.	Average Level (dB <sub>u</sub> V/m)	Average Limit (dB <sub>u</sub> V/m)	Margin (dB)	Result
916.500	Vert.	85.3	94.0	8.7	Complied

## **7.5. Test Results For Radiated Emissions: Transmit Mode**

### **7.5.1. Spurious Electric Field Strength Measurements: 30 to 1000 MHz**

7.5.1.1. Measurements were performed to the limits specified in Section 15.209 of C.F.R.47: 1998.

7.5.1.2. The client has stated that the highest clock frequency for the EUT was 916 MHz. Therefore tests were performed up to 10 GHz.

7.5.1.3. Radiated emission preliminary scans were performed with the EUT operated in both a standalone and charge configuration. These preliminary scans showed emission levels when in a charge configuration to be of a higher level than that in a standalone configuration. Therefore final radiated emission measurements were performed with the EUT operated in a charge configuration. Plots of the initial scans can be found in Appendix 4.

7.5.1.4. The following table lists frequencies at which emissions were measured using a Quasi-Peak detector (results incorporate antenna factors and cable losses):

Frequency (MHz)	Ant. Pol.	Q-P Level (dB <sub>m</sub> V/m)	Q-P Limit (dB <sub>m</sub> V/m)	Margin (dB)	Result
89.343	Vert.	24.6	43.5	18.9	Complied
103.768	Vert.	24.5	43.5	19.0	Complied
114.508	Vert.	21.9	43.5	21.6	Complied
127.797	Horiz.	22.8	43.5	20.7	Complied
133.220	Horiz.	23.0	43.5	20.5	Complied
151.920	Vert.	21.5	43.5	22.0	Complied

## **7.6. Test Results For Radiated Emissions: Standby Mode**

### **7.6.1. Electric Field Strength Measurements: 30 to 1000 MHz**

7.6.1.1. Measurements were performed to the limits specified in Section 15.107 Class B of C.F.R.47: 1998.

7.6.1.2. The client has stated that the highest clock frequency for the EUT was 915 MHz. Therefore tests were performed up to 5 GHz.

7.6.2. Radiated emission preliminary scans were performed with the EUT operated in both a standalone and charge configuration. These preliminary scans showed emission levels to be of a lower level than when in a transmit mode of operation. Therefore final radiated emission measurements in standby mode were not performed. Plots of the initial scans can be found in Appendix 4.

## **7.7. Test Results For Radiated Emissions: Transmit Mode**

### **7.7.1. Electric Field Strength Measurements: 1 to 10 GHz**

7.7.1.1. Measurements were performed to the limits specified in Section 15.249 of C.F.R.47: 1998.

7.7.1.2. The client has stated that the highest clock frequency for the EUT was 916 MHz. Therefore tests were performed up to 10 GHz.

7.7.1.3. Radiated emission preliminary scans were performed with the EUT operated in both a standalone and charge configuration. Plots of the initial scans can be found in Appendix 4.

7.7.1.4. The following tables list frequencies at which emissions were measured using Peak and Average detector functions:

#### **Highest Average Level:**

Frequency (GHz)	Antenna Polarity (H/V)	Average Detector level (dBmV)	Antenna factor (dB)	Cable loss (dB)	Actual Average Level (dBmV/m)	Average Limit (dBmV/m)	Average Margin (dB)	Result
1.8330	Vert.	19.5	21.7	1.0	42.2	54.0	11.8	Complied
1.8330	Horiz.	26.2	21.7	1.0	48.9	54.0	5.1	Complied
2.7495	Vert.	15.6	22.0	1.3	38.9	54.0	15.1	Complied
2.7495	Horiz.	15.6	22.0	1.3	38.9	54.0	15.1	Complied
3.6660	Vert.	14.7	21.2	1.5	37.4	54.0	16.6	Complied
3.6660	Horiz.	14.7	21.2	1.5	37.4	54.0	16.6	Complied

#### **Highest Peak Level:**

Frequency (GHz)	Antenna Polarity (H/V)	Peak Detector level (dBmV)	Antenna factor (dB)	Cable loss (dB)	Actual Peak Level (dBmV/m)	Peak Limit (dBmV/m)	Peak Margin (dB)	Result
1.8330	Vert.	22.6	21.7	1.0	45.0	74.0	29.0	Complied
1.8330	Horiz.	28.1	21.7	1.0	50.8	74.0	23.2	Complied
2.7495	Vert.	26.2	22.0	1.3	49.5	74.0	24.5	Complied
2.7495	Horiz.	26.2	22.0	1.3	49.5	74.0	24.5	Complied
3.6660	Vert.	24.9	21.2	1.5	47.6	74.0	26.9	Complied
3.6660	Horiz.	24.9	21.2	1.5	47.6	74.0	26.4	Complied

## **7.8. Test Results For Radiated Emissions: Standby Mode**

### **7.8.1. Electric Field Strength Measurements: 1 to 5 GHz**

7.8.1.1. Measurements were performed to the limits specified in Section 15.107 of C.F.R.47: 1998.

7.8.1.2. The client has stated that the highest clock frequency for the EUT was 916 MHz. Therefore tests were performed up to 5 GHz.

7.8.1.3. Radiated emission preliminary scans were performed with the EUT operated in both a standalone and charge configuration. These preliminary scans showed emission levels to be of a lower level than when in a transmit mode of operation. Therefore final radiated emission measurements in standby mode were not performed. Plots of the initial scans can be found in Appendix 4.

## **8. Measurement Uncertainty**

8.1. Company Policy, as based on the NAMAS Accreditation Standard, M10, paragraph 12.11 (o), states that Test Reports shall include estimated uncertainty of the calibration or test result (this information need only appear in test reports and test certificates where it is relevant to the validity or application of the test result, where a client's instructions so require or where uncertainty affects compliance to a specification or limit).

8.2. The global uncertainties have been calculated in accordance with NAMAS NIS 81 (Edition 1, May 1994) as follows:

<b>Measurement Type</b>	<b>Range</b>	<b>Confidence Level</b>	<b>Calculated Uncertainty</b>
Conducted Emissions	0.15 MHz to 30 MHz	95%	+/- 2.2 dB
Radiated Emissions	30 MHz to 1000 MHz	95%	+/- 4.9 dB
Radiated Emissions	1 GHz to 10 GHz	95%	+/- 4.4 dB

8.3. Measurement uncertainties have been applied in accordance with NAMAS document NIS 81 (edition 1, May 1994), and in the absence of any specification criteria, guidance, or code of practice, compliance has been judged on the basis of shared risk.

8.4. In the case of emissions tests, the measured value of the disturbance from the product sample shall be compared directly with the limits. If the measured value is equal to or less than the limit the product is deemed to pass the test.

8.5. In the case of immunity tests, the equipment is deemed to pass the test if it fulfils the stated performance criteria at the required or a higher severity level. The measurement uncertainty has been taken into account in the calibration procedures stated in the relevant basic standard.

8.6. The methods used to calculate the above uncertainties are in line with those used for calibration laboratories contained in NAMAS document NIS 3003 Edition 8 "The Expression of Uncertainty and Confidence in Measurement" May 1995, which align with international recommendations "Guide to the Expression of Uncertainty in Measurement" ISO/IEC/OIML/BIPM (Prepared by ISO/TAG 4: January 1993).

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## Appendix 1. Test Equipment Used

Instrument	Manufacturer	Model	RFI No.
L.I.S.N.	R & S	ESH2-Z5	A002
1 to 2 GHz Horn Antenna	Eaton	9188-2	A027
2 to 4 GHz Horn Antenna	Eaton	91889-2	A031
Bilog Antenna	Chase	CBL6111	A259
ESH3-Z2 Pulse Limiter	Rohde & Schwarz	ESH3-Z2	A287
6.0 to 8.2 GHz Horn	Flann	14240-20	A427
8.2 to 12.0 GHz Horn	Narda	640	A437
4.0 to 6.0 GHz Horn	Narda	643	A440
Cable	Rosenberger	UFA210A-1-1181-70x70	C160
Cable	Rosenberger	UFA210A-1-1181-70x70	C222
Cable	Rosenberger	UFA210A-1-1181-70x70	C344
Receiver / Spectrum Analyser System	Rohde & Schwarz	ESMI	M069
Receiver / Spectrum Analyser System	Rohde & Schwarz	ESBI	M088

**NB** In accordance with NAMAS requirements, all the measurement equipment is on a calibration schedule.

## **Appendix 2. Measurement Methods**

### **A2.1. AC Mains Conducted Emissions: FCC Part 15**

A2.1.1. AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.1.2. The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane and with the EUT powered via a 60 Hz AC mains supply.

A2.1.3. Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.1.4. Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

A2.1.5. The test equipment settings for conducted emissions measurements were as follows:

<b>Receiver Function</b>	<b>Initial Scan</b>	<b>Final Measurements</b>
Detector Type:	Peak	Quasi-Peak (CISPR)*
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz	9 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

\* In some instances an Average detector function may also have been used.

## **A2.2. Radiated Emissions: FCC Part 15**

A2.2.1. Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

A2.2.2. Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

A2.2.3. The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested on the open area test site, at the appropriate distance, using a measuring receivers with a Quasi-Peak detector (below 1000 MHz), where applicable, for measurements above 1000 MHz average and peak detectors were used.

A2.2.4. For the main (final) measurements the EUT was arranged on a non-conducting table on an open area test site, as detailed in the specification.

A2.2.5. All measurements on the open area test site were performed using broadband antennas.

A2.2.6. On the open area test site, at each frequency where a signal was found, the levels were maximised by initially rotating the turntable through 360°. For frequencies below 1000 MHz the antenna height was also varied between 1 and 4m. For frequencies above 1000 MHz, the antenna was positioned at a fixed height of 1.5m. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

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A2.2.7. The test equipment settings for radiated emissions measurements were as follows:

<b>Receiver Function</b>	<b>Initial Scan Below 1000 MHz</b>	<b>Final Measurements Below 1GHz</b>
Detector Type:	Peak	Quasi-Peak (CISPR)
Mode:	Max Hold	Not applicable
Bandwidth:	120 kHz	120 kHz
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

<b>Receiver Function</b>	<b>Initial Scan Above 1000 MHz</b>	<b>Final Measurements Above 1000 MHz</b>
Detector Type:	Peak	Peak/Average
Mode:	Max Hold	Not applicable
Bandwidth:	1 MHz	1 MHz
Amplitude Range:	60 dB	20 dB (typical)
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

**RADIO FREQUENCY INVESTIGATION LTD.**

**EMC Department**

**Test Of:** **Maynetronics Ltd.**  
**NTR102-2 Data Terminal.**  
**To:** **F.C.C. Part 15: 1998 Class B**

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**TEST REPORT**

**S.No: RFI/EMCB1/RP38896A**

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**Issue Date: 5 August 1999**

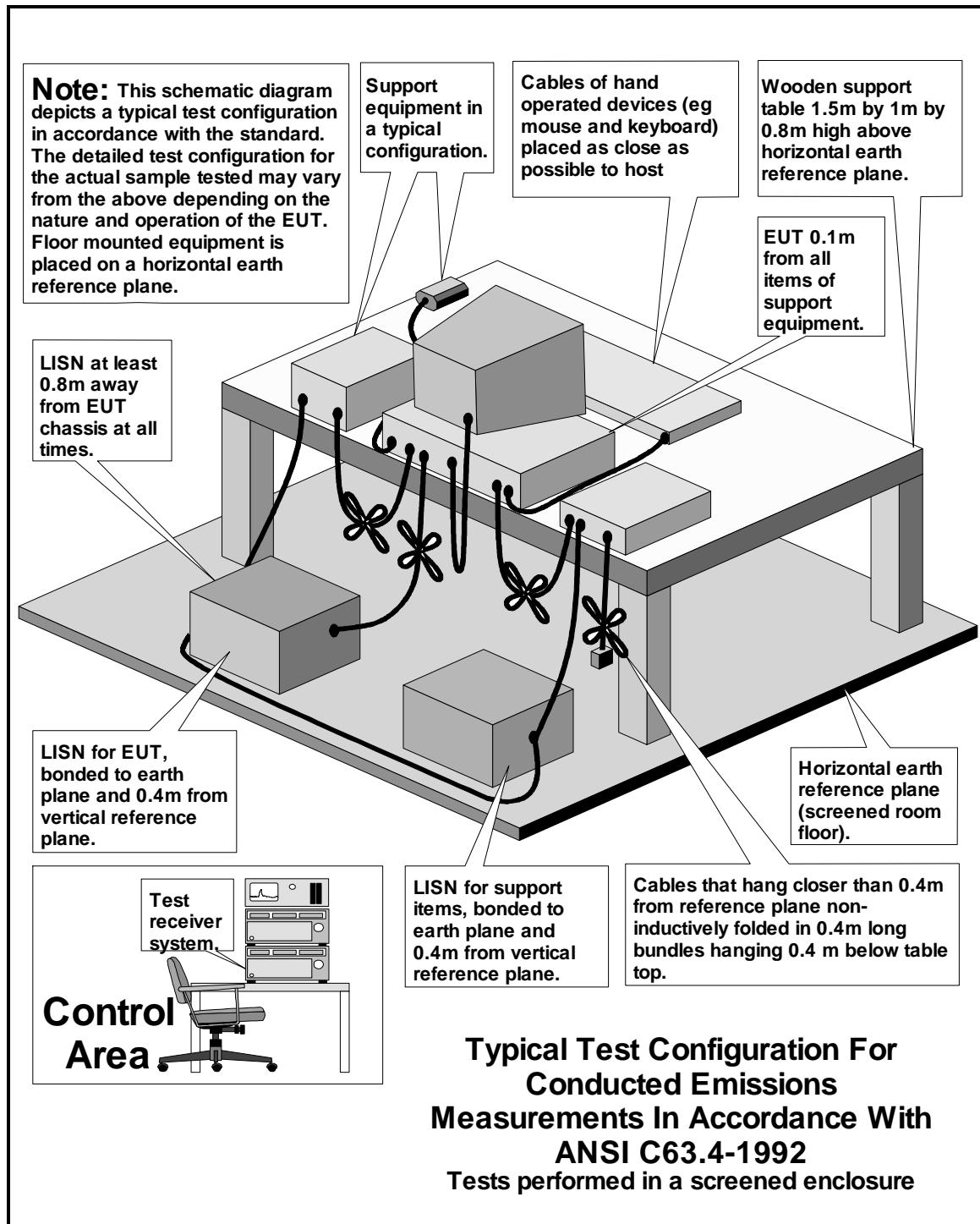
### **Appendix 3. Test Configuration Drawings**

This appendix contains the following drawings:

<b>Drawing Reference Number</b>	<b>Title</b>
DRG\38896ETF03\EMICON	Test configuration for measurement of conducted emissions
DRG\38896ETF03\EMIRAD	Test configuration for measurement of radiated emissions
DRG\38896ETF03\001	Schematic diagram of the EUT, support equipment and interconnecting cables used for the test

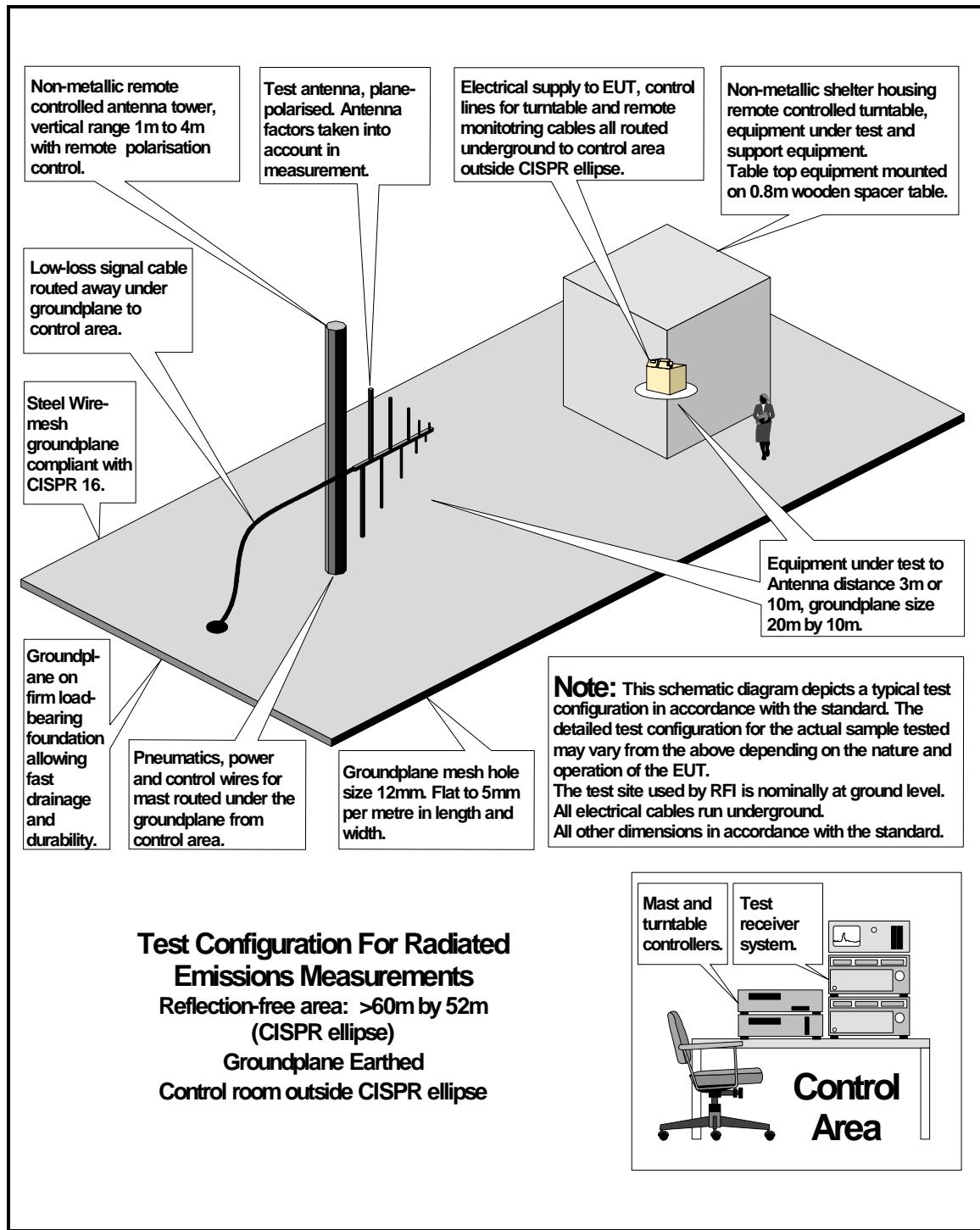
Test Of: **Maynetronics Ltd.**  
**NTR102-2 Data Terminal.**  
To: **F.C.C. Part 15: 1998 Class B**

DRG\38896ETF03\EMICON



Test Of: **Maynetronics Ltd.**  
**NTR102-2 Data Terminal.**  
To: **F.C.C. Part 15: 1998 Class B**

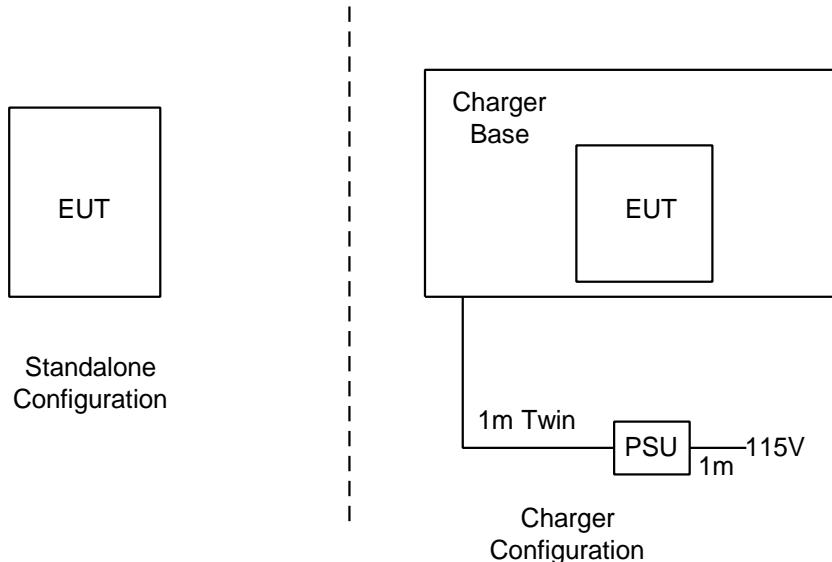
DRG\38896ETF03\EMIRAD



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DRG\38896ETF03\001

### Configuration of EUT and Local Support Equipment



### Configuration of Remote Support Equipment

## Appendix 4. Graphical Test Results

This appendix contains the following graphs:

Graph Reference Number	Title
GPH\38896ETF03\001	Scan of Radiated Electric Field: 4000 to 5000 MHz Standby Mode. Standalone and Charge Configuration.
GPH\38896ETF03\002	Scan of Radiated Electric Field: 5000 to 6000 MHz Standby Mode. Standalone and Charge Configuration.
GPH\38896ETF03\003	Scan of Radiated Electric Field: 30 to 1000 MHz Standby Mode. Charge Configuration.
GPH\38896ETF03\004	Scan of Radiated Electric Field: 30 to 1000 MHz Standby Mode. Standalone Configuration.
GPH\38896ETF03\005	Scan of Radiated Electric Field: 1000 to 2000 MHz Standby Mode. Standalone Configuration.
GPH\38896ETF03\006	Scan of Radiated Electric Field: 1000 to 2000 MHz Standby Mode. Charge Configuration.
GPH\38896ETF03\007	Scan of Radiated Electric Field: 2000 to 4000 MHz Standby Mode. Charge Configuration.
GPH\38896ETF03\008	Scan of Radiated Electric Field: 2000 to 4000 MHz Standby Mode. Standalone Configuration.
GPH\38896ETF03\009	Scan of Conducted Emissions: 0.450 to 30 MHz Standby Mode. Charge Mode. Live Line.
GPH\38896ETF03\010	Scan of Conducted Emissions: 0.450 to 30 MHz Standby Mode. Charge Mode. Neutral Line.
GPH\38896ETF03\101	Scan of Radiated Electric Field: 4000 to 5000 MHz Transmit Mode. Standalone and Charge Configuration.
GPH\38896ETF03\102	Scan of Radiated Electric Field: 5000 to 6000 MHz Transmit Mode. Standalone and Charge Configuration.
GPH\38896ETF03\103	Scan of Radiated Electric Field: 6000 to 8200 MHz Transmit Mode. Standalone and Charge Configuration.
GPH\38896ETF03\104	Scan of Radiated Electric Field: 8200 to 10000 MHz Transmit Mode. Standalone and Charge Configuration.
GPH\38896ETF03\105	Scan of Radiated Electric Field: 30 to 1000 MHz Transmit Mode. Standalone Configuration.
GPH\38896ETF03\106	Scan of Radiated Electric Field: 30 to 1000 MHz Transmit Mode. Charge Configuration.
GPH\38896ETF03\107	Scan of Radiated Electric Field: 1000 to 2000 MHz Transmit Mode. Charge Configuration.
GPH\38896ETF03\108	Scan of Radiated Electric Field: 1000 to 2000 MHz Transmit Mode. Standalone Configuration.

**Graphical Test Results (continued)**

Graph Reference Number	Title
GPH\38896ETF03\109	Scan of Radiated Electric Field: 2000 to 4000 MHz Transmit Mode. Standalone Configuration.
GPH\38896ETF03\110	Scan of Radiated Electric Field: 2000 to 4000 MHz Transmit Mode. Charge Configuration.
GPH\38896ETF03\111	Scan of Conducted Emissions: 0.450 to 30 MHz Transmit Mode. Charge Mode. Neutral Line.
GPH\38896ETF03\112	Scan of Conducted Emissions: 0.450 to 30 MHz Transmit Mode. Charge Mode. Live Line.

**These pages are not included in the total number of pages for this report.**

**RADIO FREQUENCY INVESTIGATION LTD.**

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**Test Of:** **Maynetronics Ltd.**  
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**TEST REPORT**

**S.No: RFI/EMCB1/RP38896A**

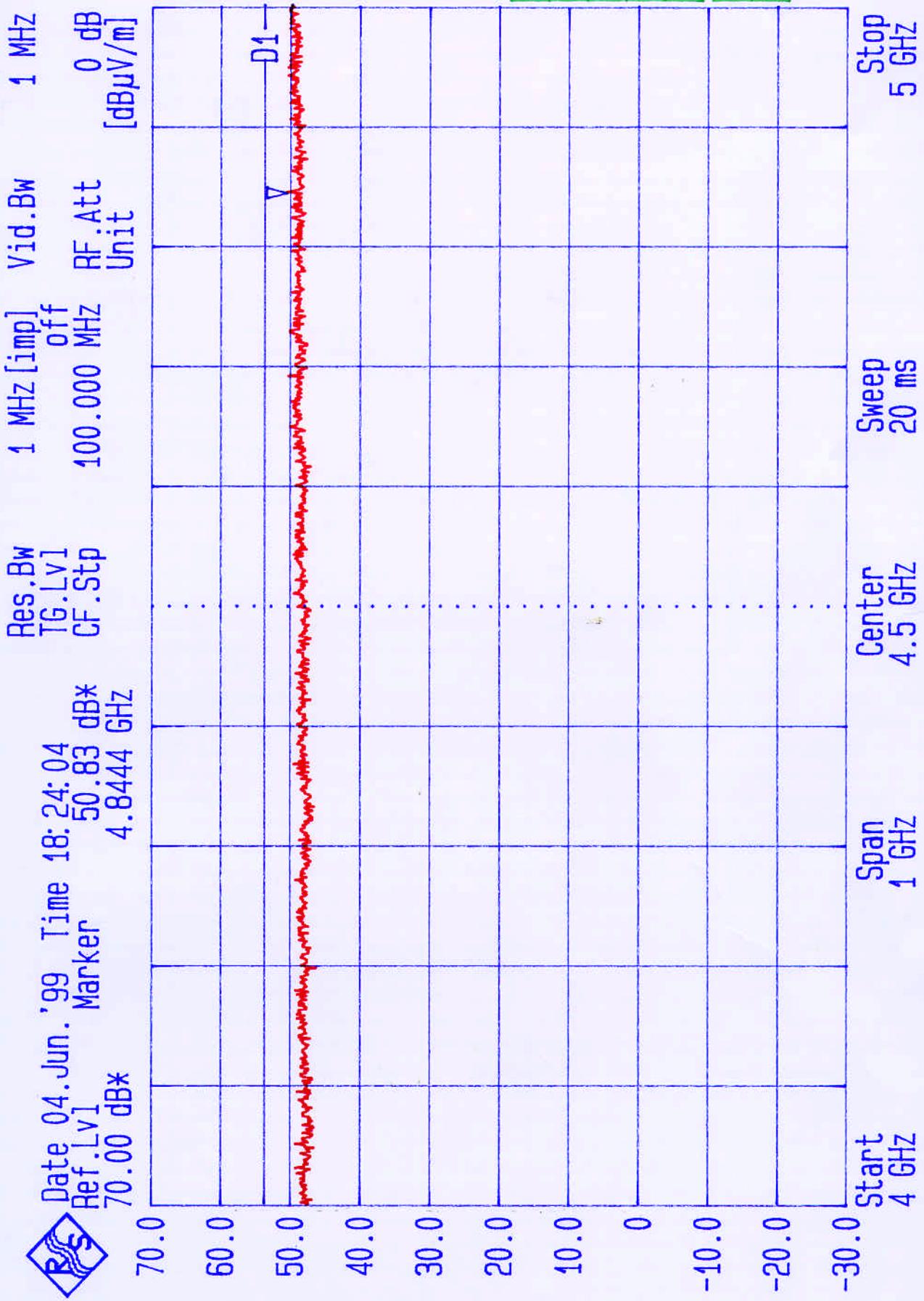
**Page 32 of 34**

**Issue Date: 5 August 1999**

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Date 04.Jun. '99 Time 18:24:04  
Ref Lv1 50.83 dB\*  
Ref Lv1 70.00 dB\*



Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.109 Class B. RX Mode.

Stop 5 GHz  
FCC Part 15: 1997  
6PH/388896/JD03/001



RCS Date 04.Jun.'99 Time 18:41:03

Ref.Lv1 Marker 48.62 dB\*  
70.00 dBX 5.6433 GHz

1 MHz

1 MHz [imp] Vid.Bw

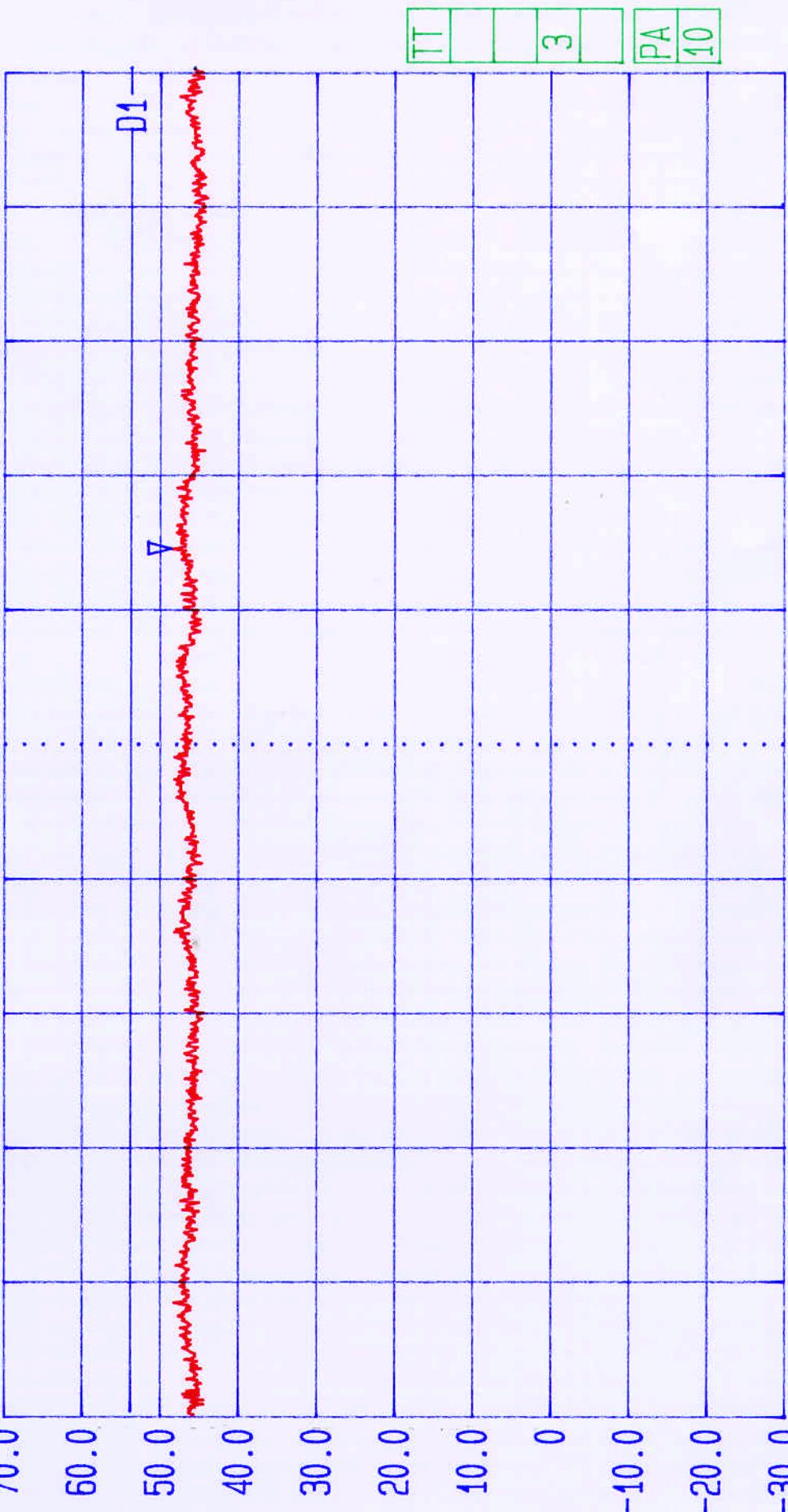
TG.[Lv1 off

0.00 MHz

GF.Stp

Unit

0 dB

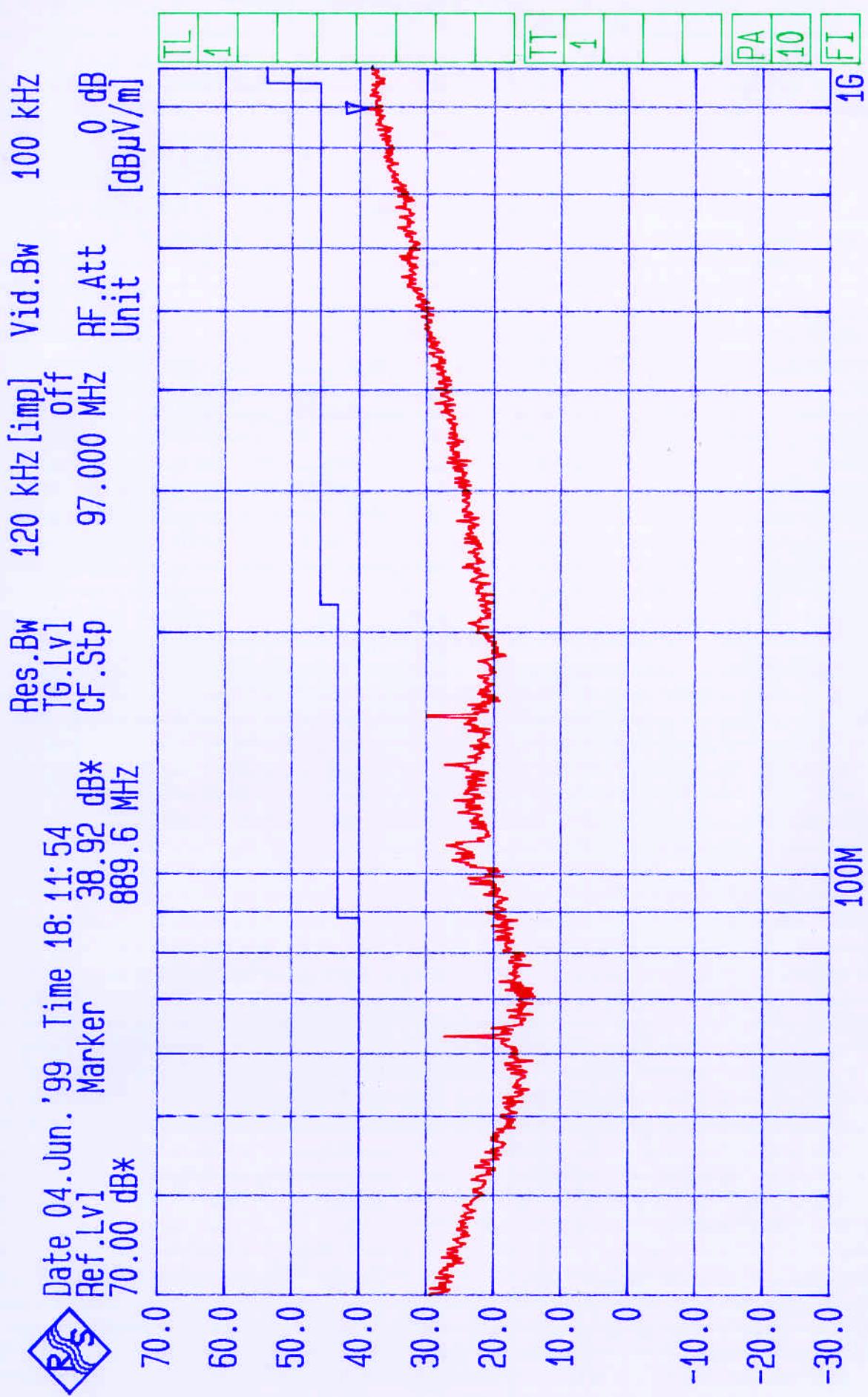
[dB $\mu$ V/m]

TT		
	3	
		PA
		10

Stop 6 GHz  
FCC Part 15: 1997  
GPH/388896/JD03/002Sweep 20 ms  
Center 5.5 GHz  
Span 1 GHz  
Start 5 GHz  
Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.109 Class B. Rx Mode.



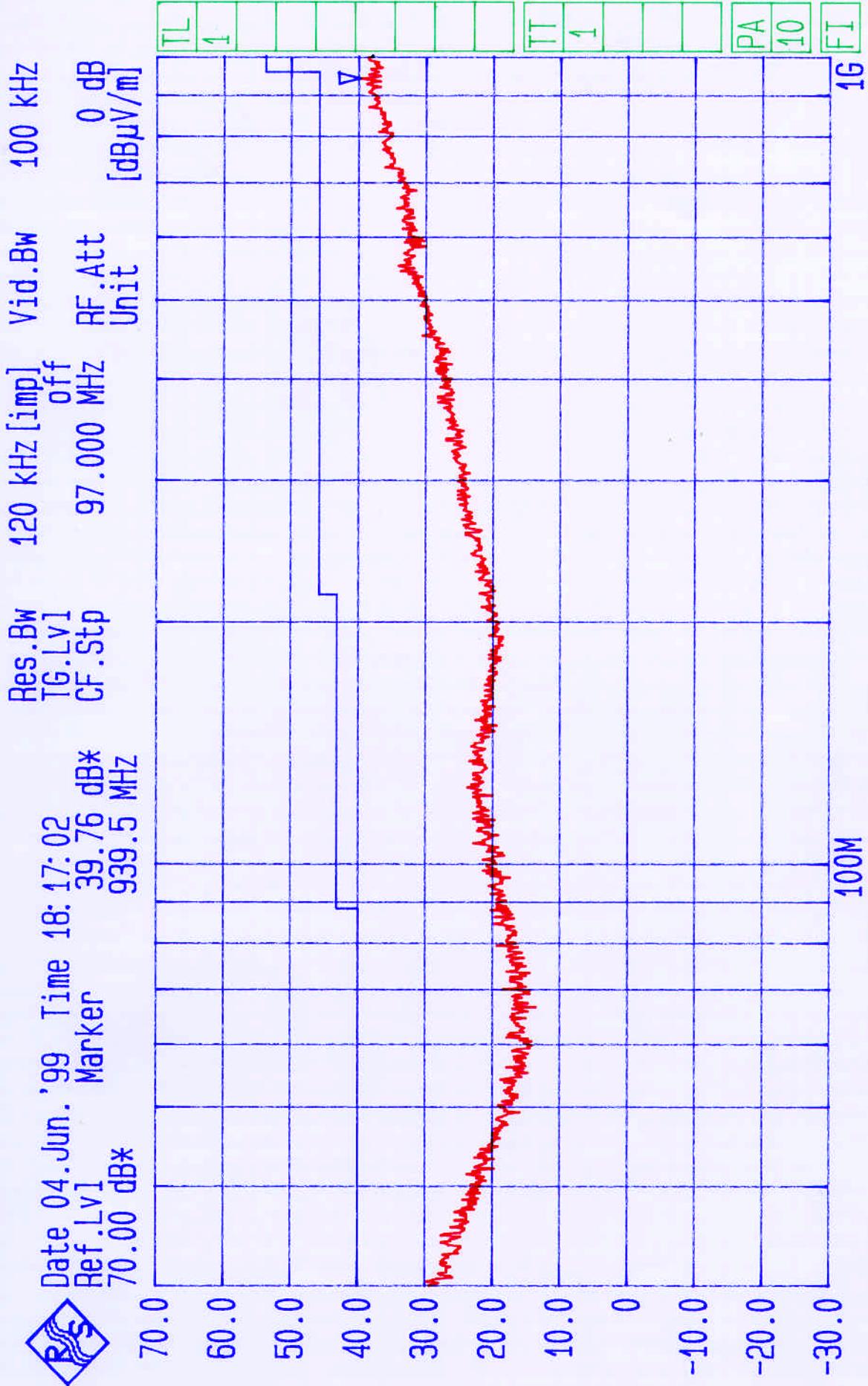
Date 04.Jun.'99 Time 18:11:54  
Ref.Lv 1 Marker 38.92 dBX  
70.00 dBX



Start 30 MHz  
Span 970 MHz  
Center 173.2 MHz  
Sweep 80 ms  
Stop 1 GHz  
15:1997  
FCC Part 6PH/388896/JD03/003  
Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.109. RX Mode. Charging.



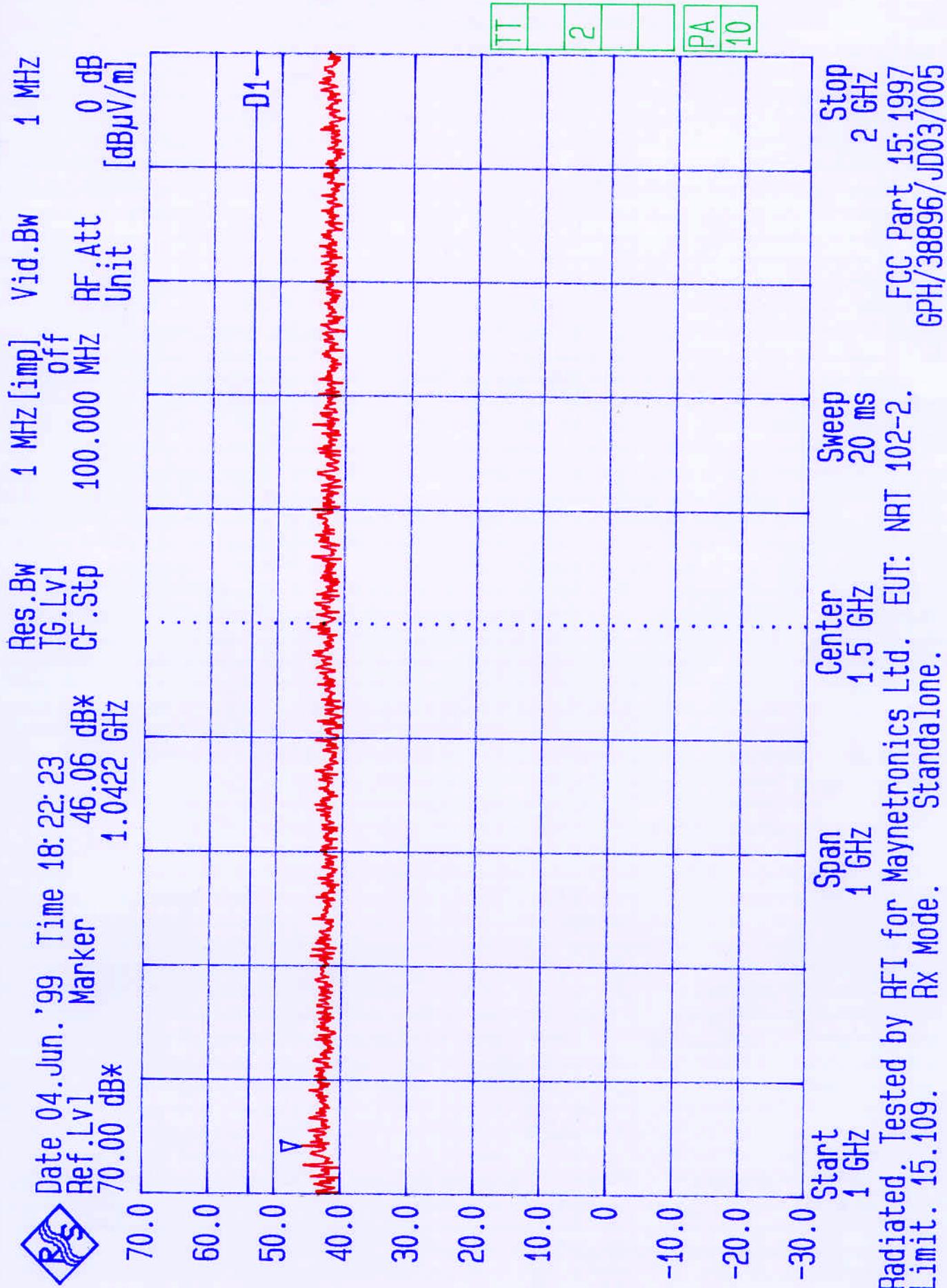
Date 04.Jun.'99 Time 18:17:02  
Ref.Lv1 Marker 39.76 dB\*  
70.00 dBX



Start 30 MHz 970 MHz Center 173.2 MHz Sweep 380 ms Stop 1 GHz FCC Part 15: 1997 GPH/38896/JD03/004  
Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.109. Rx Mode.

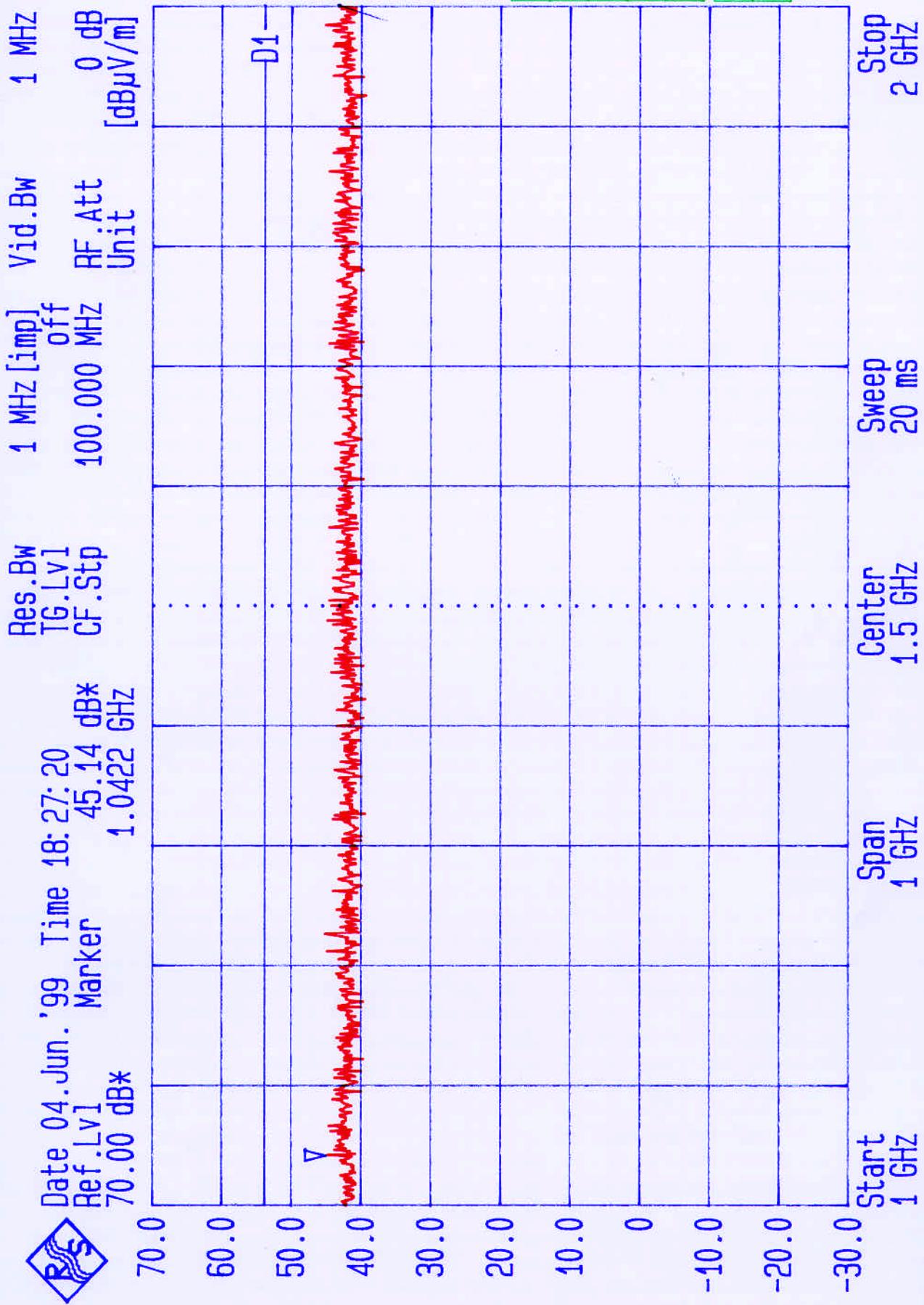


1 MHz 1 MHz  
1 MHz [imp] Vid.BW  
off off RF Att  
100.000 MHz RF Att  
Unit Unit  
Res.BW TG.Lv1  
TG.Lv1 CF.Stp  
CF.Stp 1.0422 GHz  
Marker 46.06 dB\*  
Ref.Lv1 70.00 dB\*  
Date 04. Jun. '99 Time 18: 22: 23

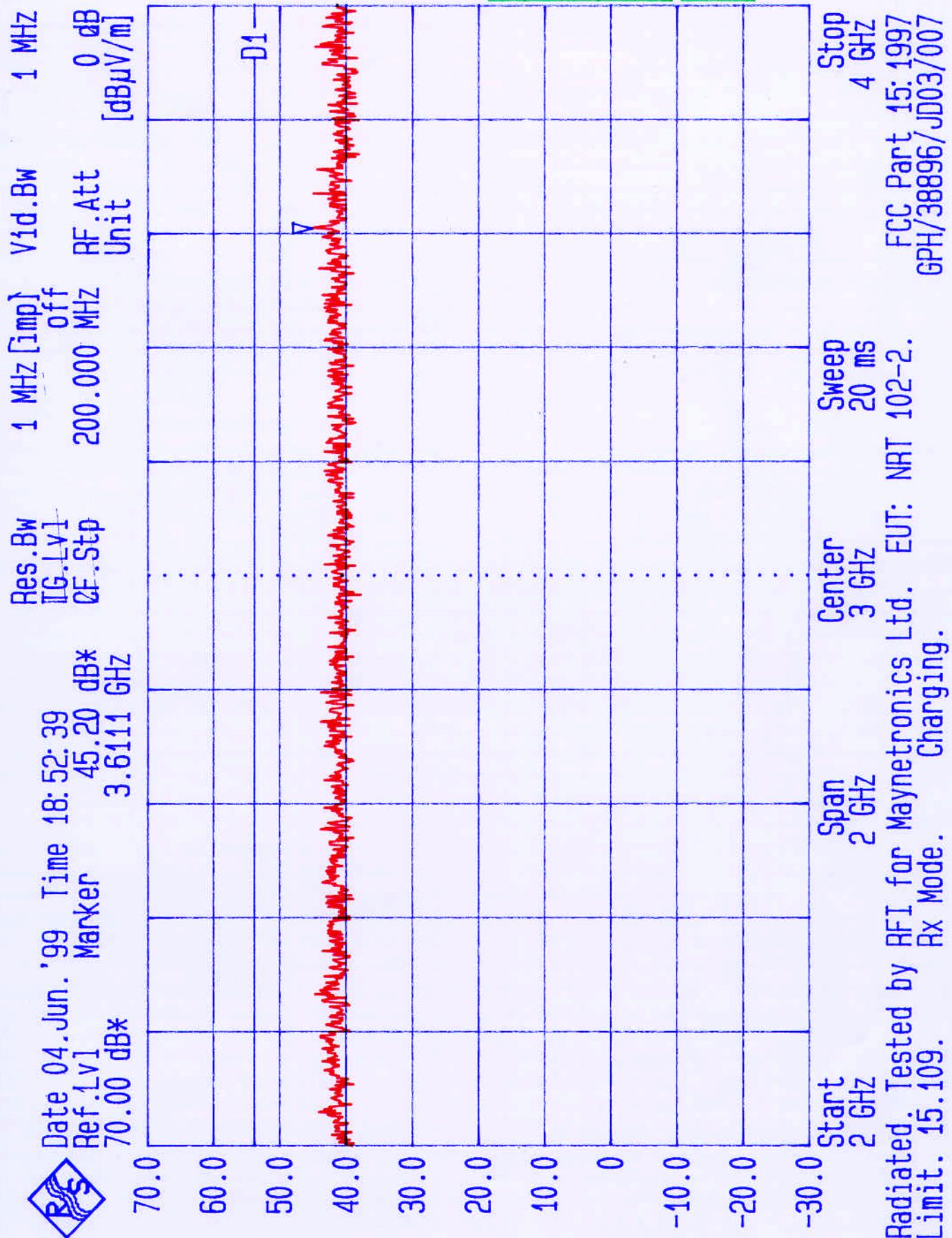




Date 04.Jun.'99 Time 18:27:20  
Ref.Lv1 TG.Lv1 1 MHz [imp] Vid.Bw 1 MHz  
Ref.Lv1 CF.Stp 100.000 MHz RF Att 0 dB  
70.00 dB\* 1.0422 GHz Unit [dB $\mu$ V/m]



Start 1 GHz Span 1 GHz Center 1.5 GHz Sweep 20 ms Stop 2 GHz  
Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.109. FCC Part 15: 1997  
GPH/38896/JD03/006 Charging.





Res.Bw 1 MHz [imp off]

TG.[Lv]

1 MHz

CF.Stp

Vid.Bw

200.000 MHz

RF Att

Unit

0 dB

[dB $\mu$ V/m]

Date 04.Jun.'99 Time 18:57:36

Ref.Lv1 Marker

45.20 dB\*

3.6111 GHz

D1-

V

70.00 dB\*

Start 2 GHz

Span 2 GHz

3 GHz

Center 3 GHz

20 ms

Sweep

Stop 4 GHz

4 GHz

TT 2 PA 10

Radiated Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.

Limit. 15.109.

FCC Part 15: 1997  
GPH/388896/JD03/008

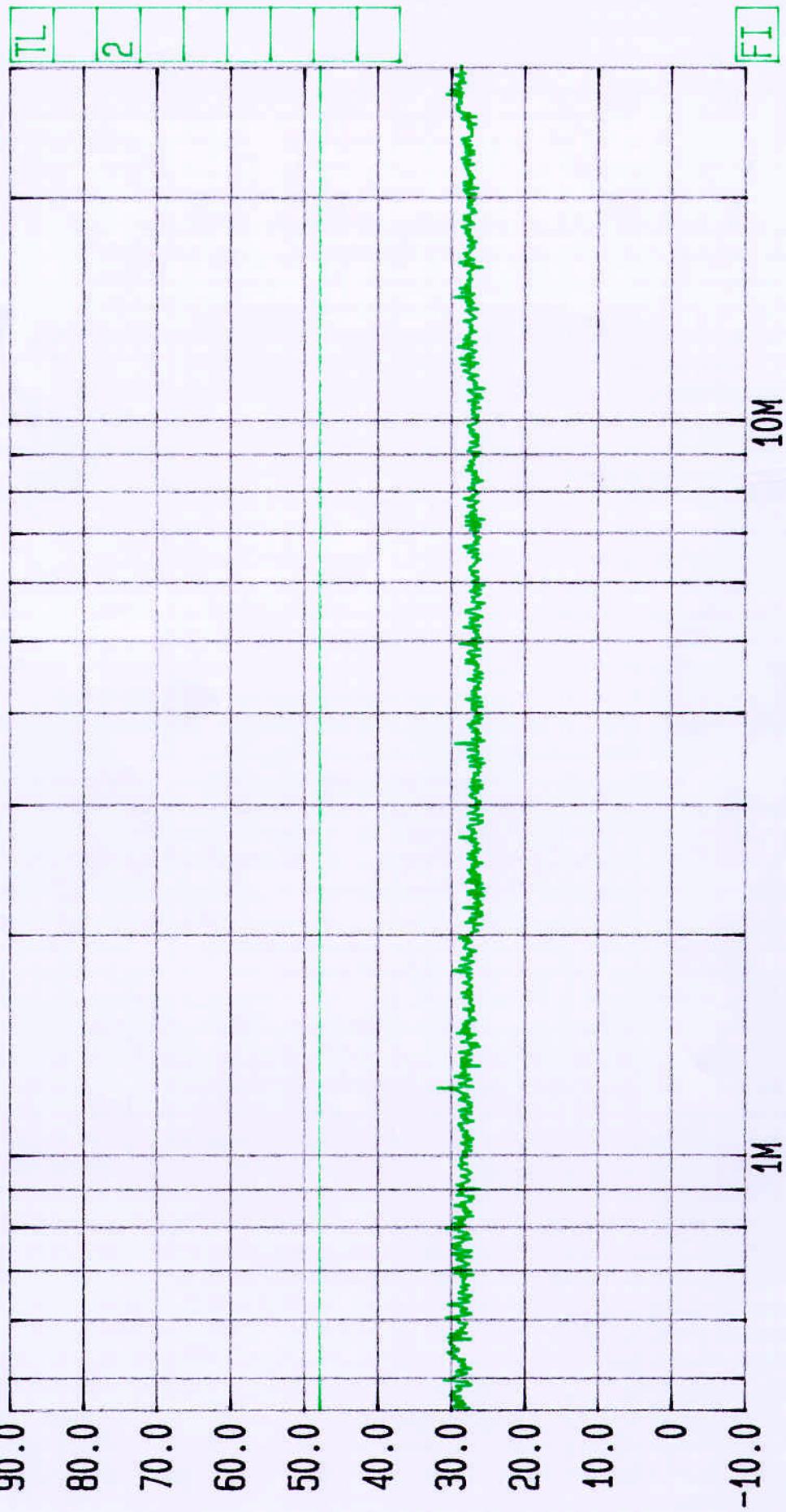
Standalone.



Date 25. May. '99 Time 13: 25: 27

Ref.Lv1  
90.00 dB $\mu$ V

Res.Bw 9 kHz [imp]  
T6.Lv1 Vid.Bw 100 kHz  
CF.Stp off  
2.955 MHz RF Att 20 dB  
CF.Stp [dB $\mu$ V] Unit [dB $\mu$ V]



Conducted Emissions LIVE Tested by RFI for Maynetronics EUT: NRT 102-2 FCC Part 15: 97  
Section 15.207 Cont. RX Op in charge mode GPH/38896/JD03/009 Rev.  
Start 450 kHz Span 29.55 MHz Center 3.67423 MHz Sweep 260 ms Stop 30 MHz

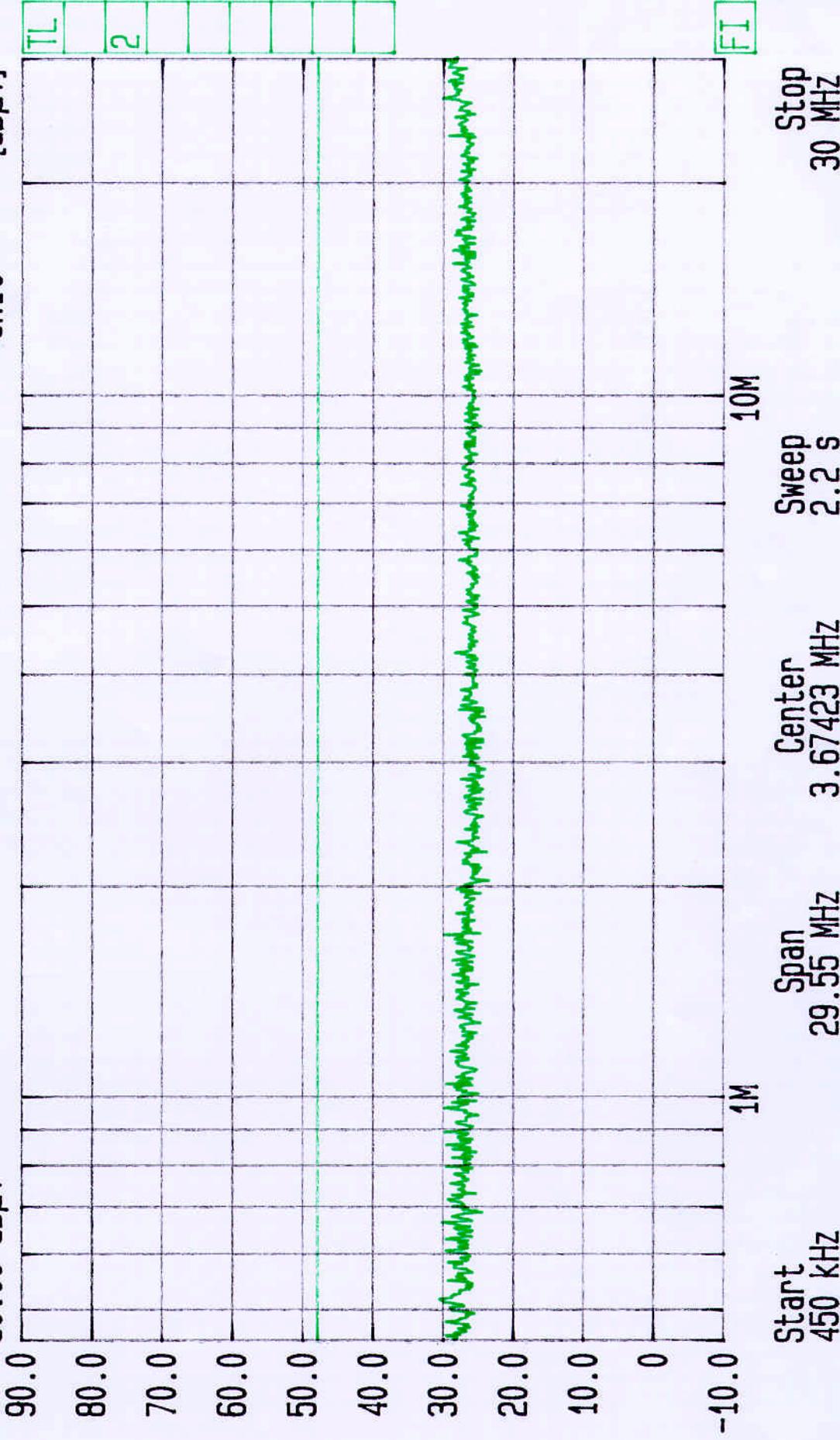


Date 25. May. '99 Time 13: 33: 58

Ref.Lv1  
TG.Lv1  
CF.Stp

Res.BW  
9 kHz [imp]  
off  
2.955 MHz  
Vid.BW  
100 kHz  
Ref.Lv1  
CF.Stp

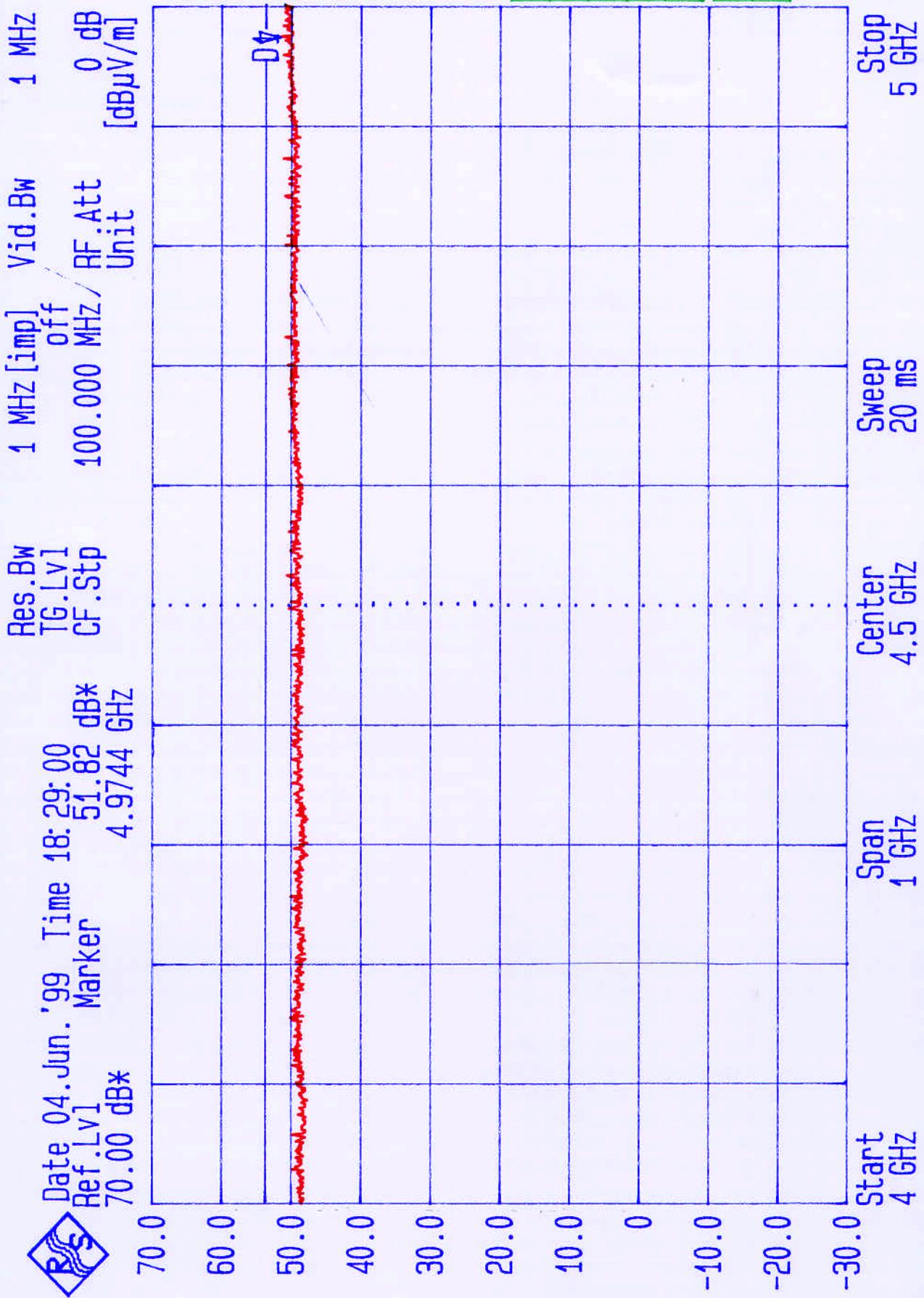
90.00 dB $\mu$ V



Conducted Emission NEUTRAL Tested by RFI for Maynetronics EUT: NRT 102-2 FCC Part15: 97  
Section 15.207 Cont. RX Op in charge mode  
GPH/38896/JD03/002 010 Rev.



Date 04.Jun. '99 Time 18:29:00  
Ref. LV1 Marker 51.82 dB\*  
70.00 dB\*

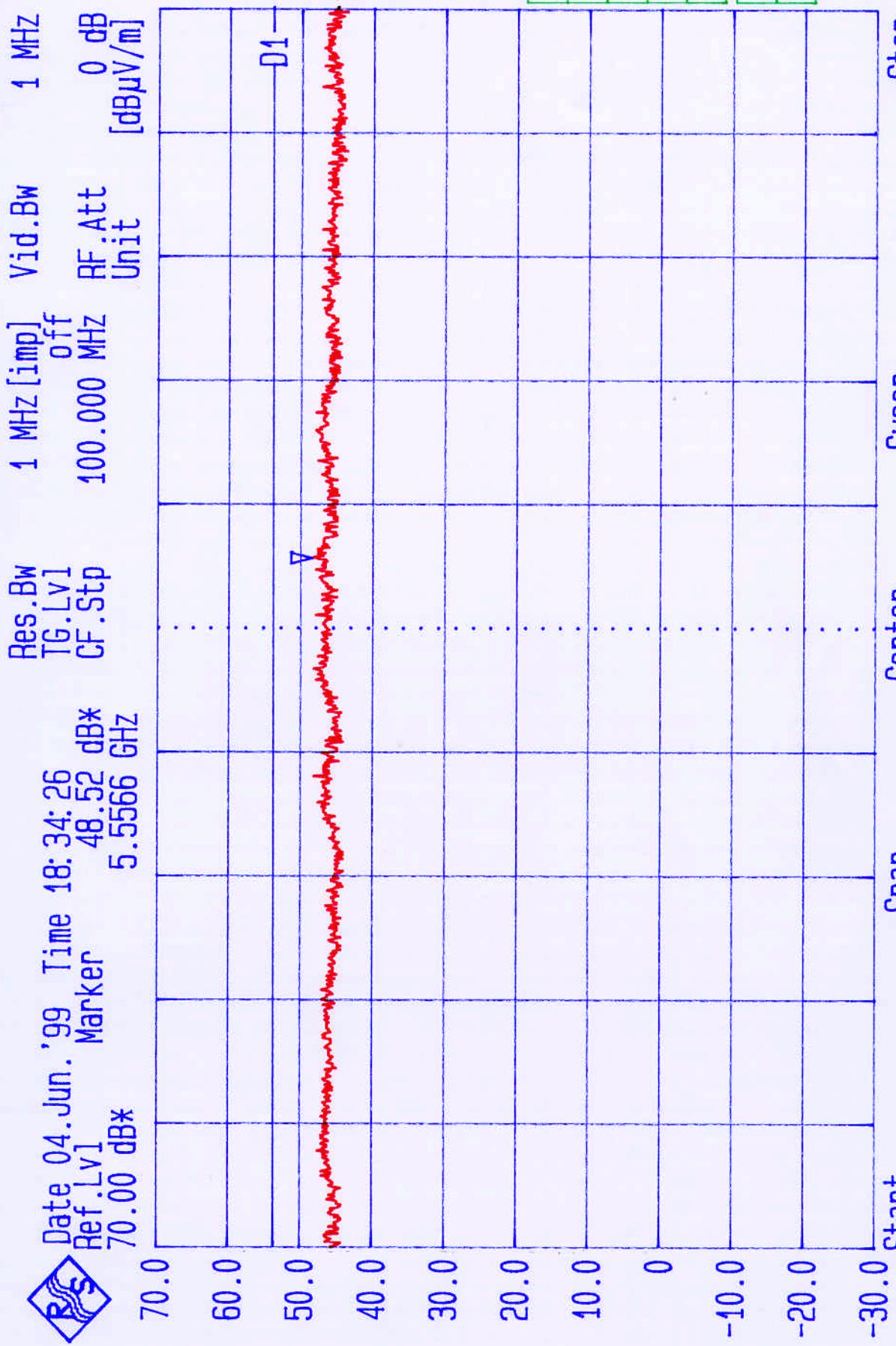


Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. Tx Mode.

Stop 5 GHz  
FCC Part 15: 1997  
GPH/388896/JD03/101



Date 04.Jun.'99 Time 18:34:26  
Ref. LV1 Marker 48.52 dB\*  
Ref. LV1 5.5566 GHz  
70.00 dB\*



Radiated: Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. Tx Mode.  
FCC Part 15: 1997  
GPH/38896/JD03/102



Date 04. Jun. '99 Time 18:46:05  
Ref. Lv1 Marker 49.13 G  
70.00 dB\*

Res.BW 1 MHz [imp]  
TG.Lv1 off  
CF.Stp 220.000 MHz

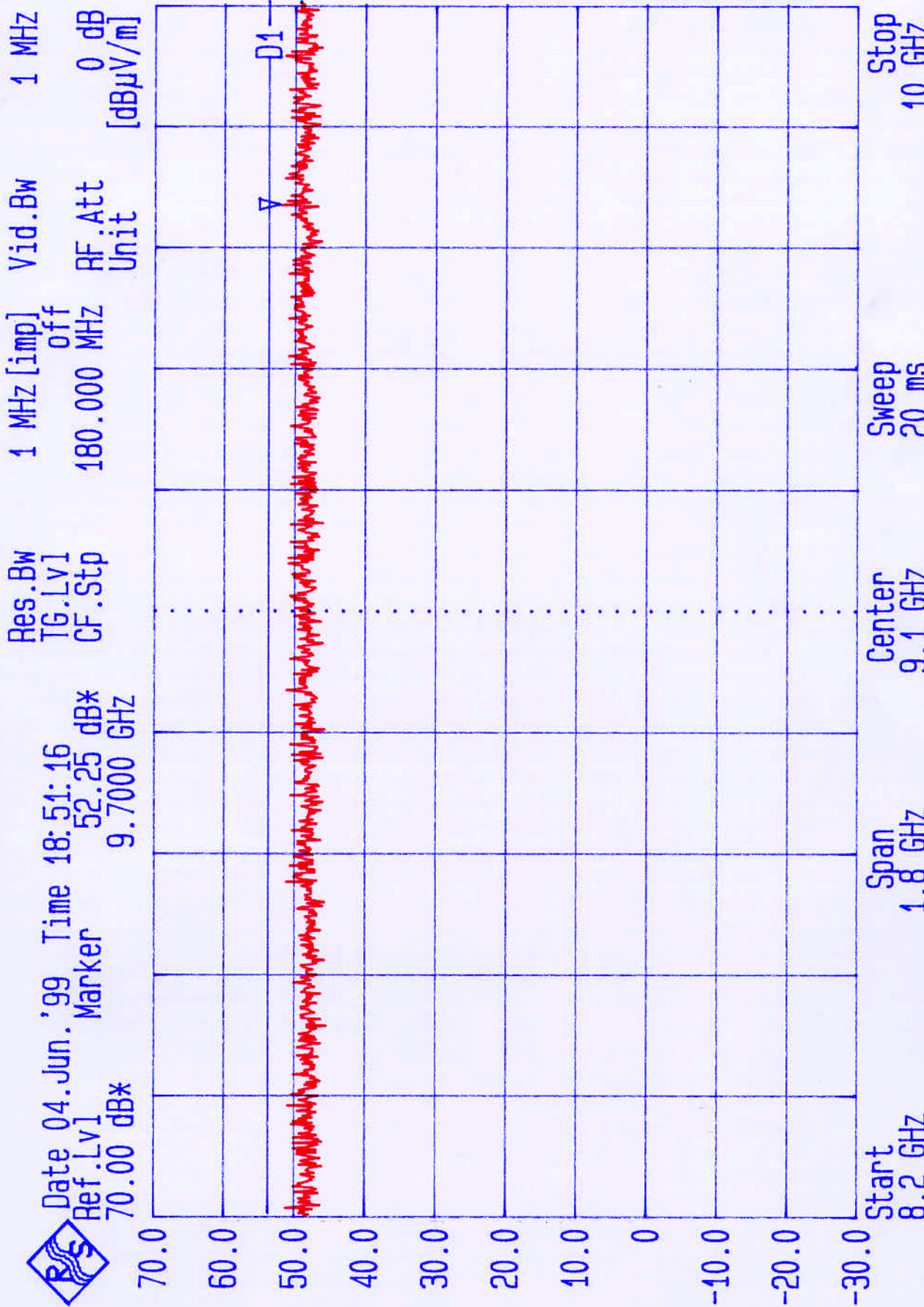
A blank graph grid with a red vertical axis label 'D1' at the top left. The grid consists of 10 horizontal and 10 vertical lines, creating a 9x9 grid of squares. The vertical axis is labeled 'D1' in red at the top left corner. The horizontal axis is labeled with numerical values from 0.0 to -30.0 in increments of 10.0, with 0.0 at the top and -30.0 at the bottom. The grid is bounded by a black frame.

Start: 6 GHz Span: 2.2 GHz Center: 7.1 GHz Sweep: 20 ms  
Radiated Limit: 15.249. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2. TX Mode.

GP/H/38896/JD03/103  
ECC Part 15.4997  
8.2 GHz  
Stop



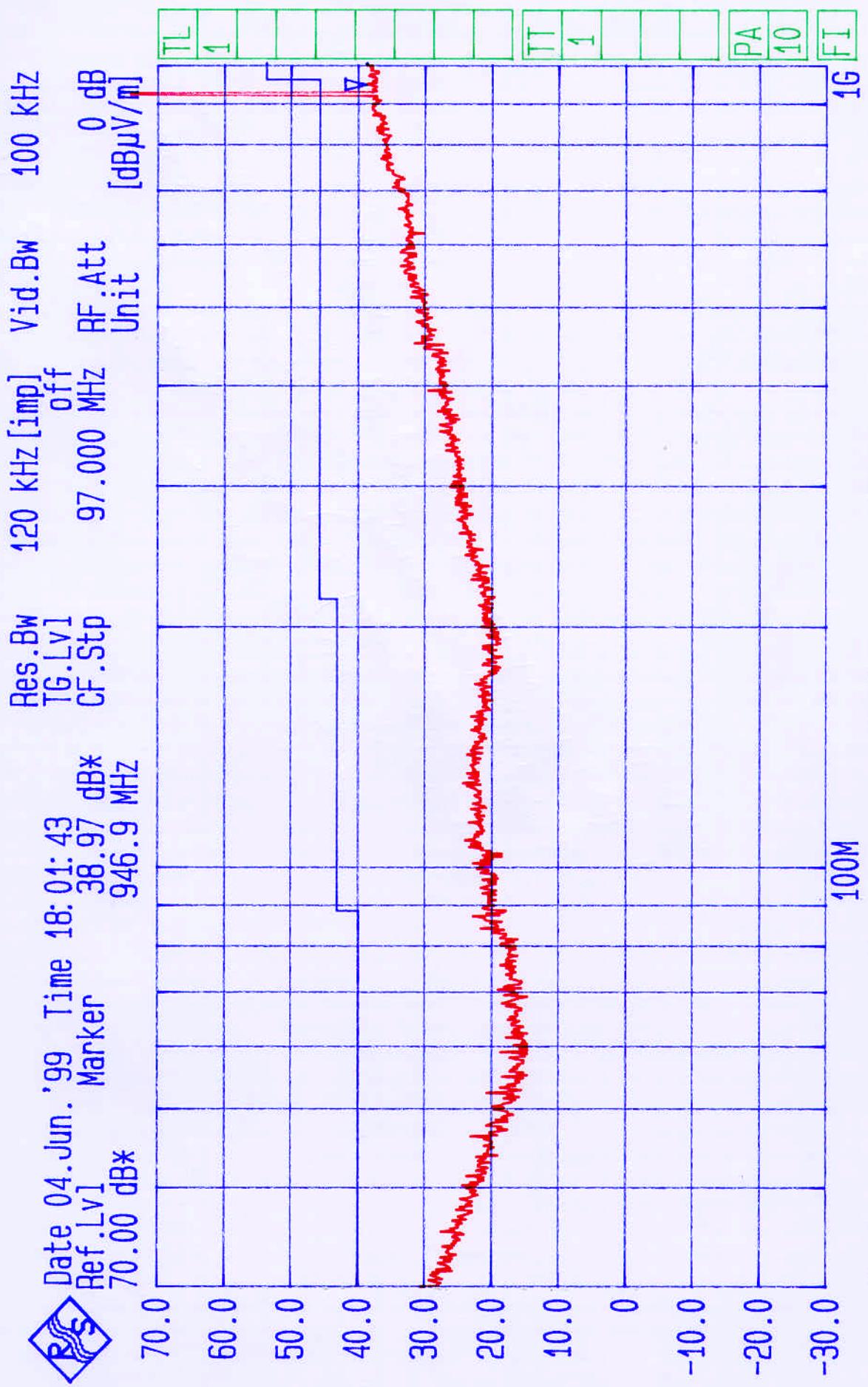
Date 04. Jun. '99 Time 18:51:16  
Ref.Lv1 TG.Lv1  
70.00 dB\* CF.Stp  
Marker 52.25 dB\*  
9.7000 GHz



Start 8.2 GHz Span 1.8 GHz Center 9.1 GHz Sweep 20 ms Stop 10 GHz  
Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. FCC Part 15: 1997  
6PH/388896/JD03/104 Tx Mode.



Date 04. Jun. '99 Time 18: 01: 43  
Ref Lv 1 Marker 38.97 dB\*  
70.00 dB\* 946.9 MHz



Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. Tx Mode.

16 FI

Stop 1 GHz

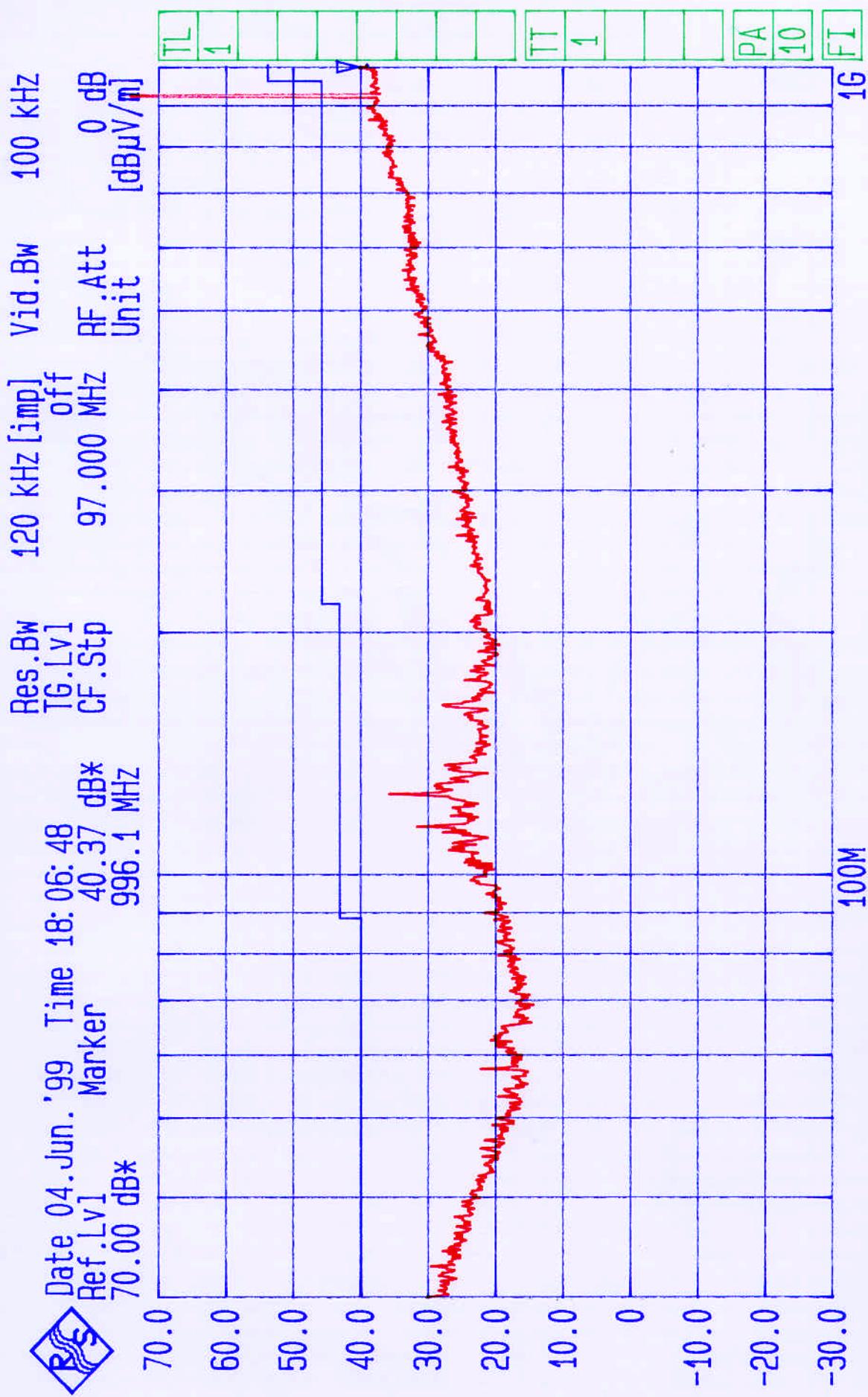
15: 1997

FCC Part 15: 1997

GPH/38896/JD03/105



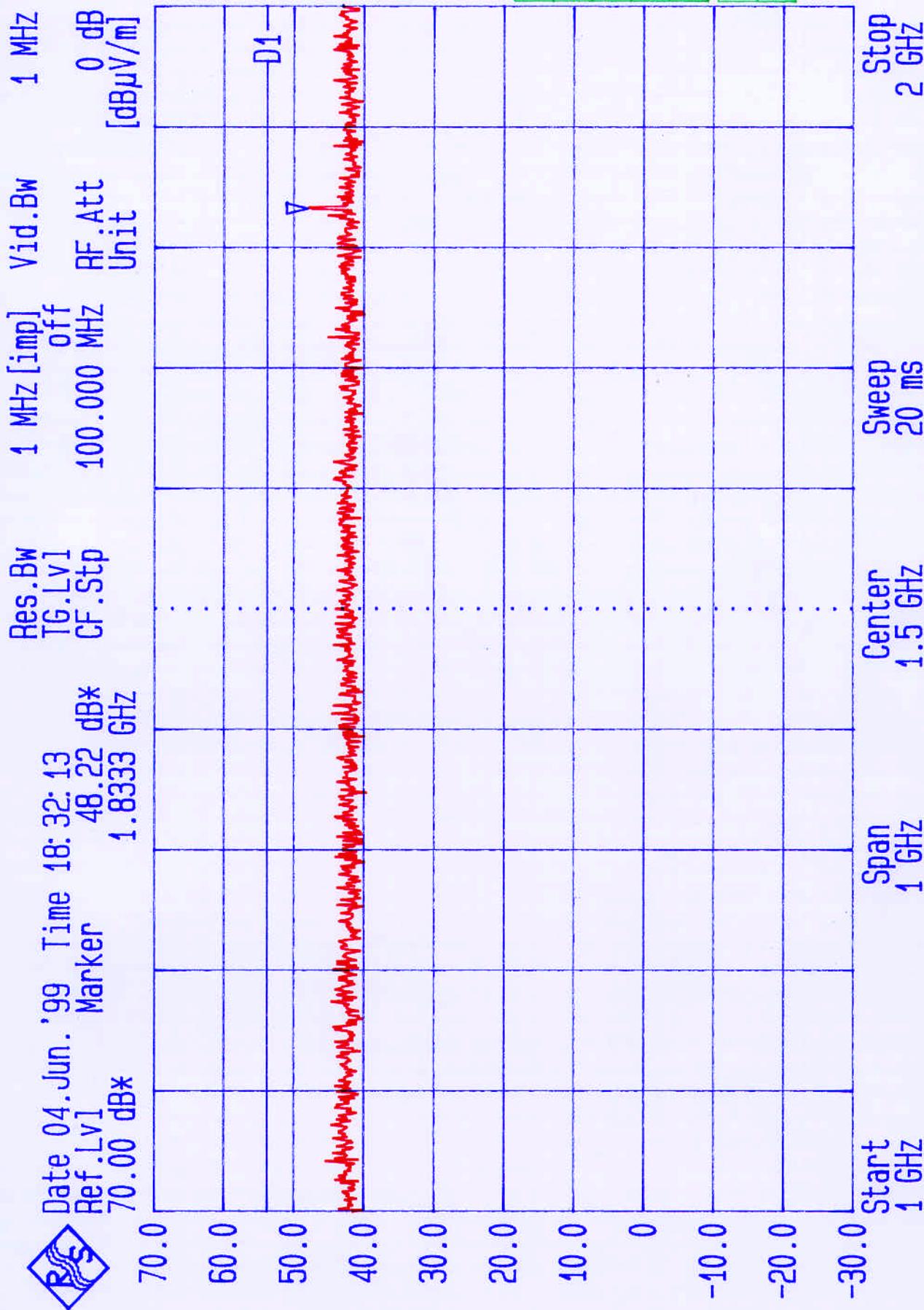
Date 04. Jun. '99 Time 18: 06: 48  
Ref.Lv 1 dB\*  
TG.[LV] off  
70.00 dB\*  
CF.Stp 996.1 MHz



Start 30 MHz 970 MHz 173.2 MHz Sweep 380 ms Stop 1 GHz 15: 1997 FCC Part 15: 1997 GPH/38896/ JD03/106  
Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. Tx Mode. Charging.



Date 04.Jun.'99 Time 18:32:13  
Ref.Lv1 TG.[LV]  
70.00 dBx CF.Stp  
1.8333 GHz



Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. Tx Mode. Charging.

FCC Part 15: 1997  
GPH/38896/JD03/107



RF Spectrum Analysis Report

Date: 04. Jun. '99 Time: 18: 37: 06

Ref. Lv1: 70.00 dB\* Marker: 48.57 dB\* CF. Stp: 1.8333 GHz

Res. BW: 1 MHz Vid. BW: 1 MHz

TG. Lv1: 0 off

RF Att: 0 dB Unit: dB $\mu$ V/m

Start: 1 GHz Span: 1 GHz Center: 1.5 GHz Sweep: 20 ms

Stop: 2 GHz

PA: 2

10

15: 1997

FCC Part: 15

CPH/38896/JD03/108

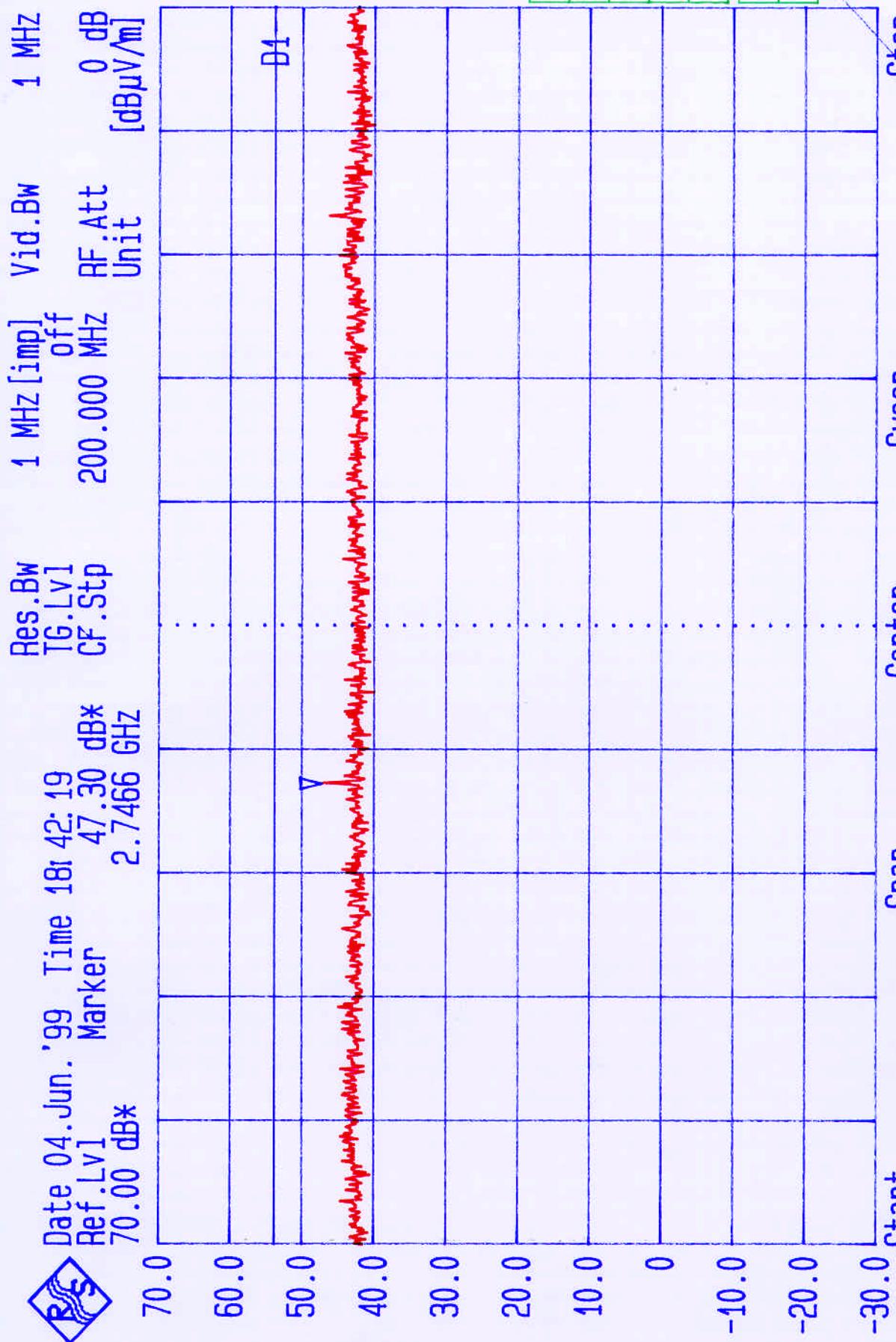
Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.

Radiated. TX Mode. Limit: 15.249.

The plot shows a noisy signal centered at 1.5 GHz. The y-axis represents power in dB $\mu$ V/m, ranging from -30.0 to 70.0. The x-axis represents frequency in MHz, ranging from 1 GHz to 2 GHz. A red line represents the signal, and a blue line represents the noise floor. A vertical red arrow points to a peak at 48.57 dB\*.



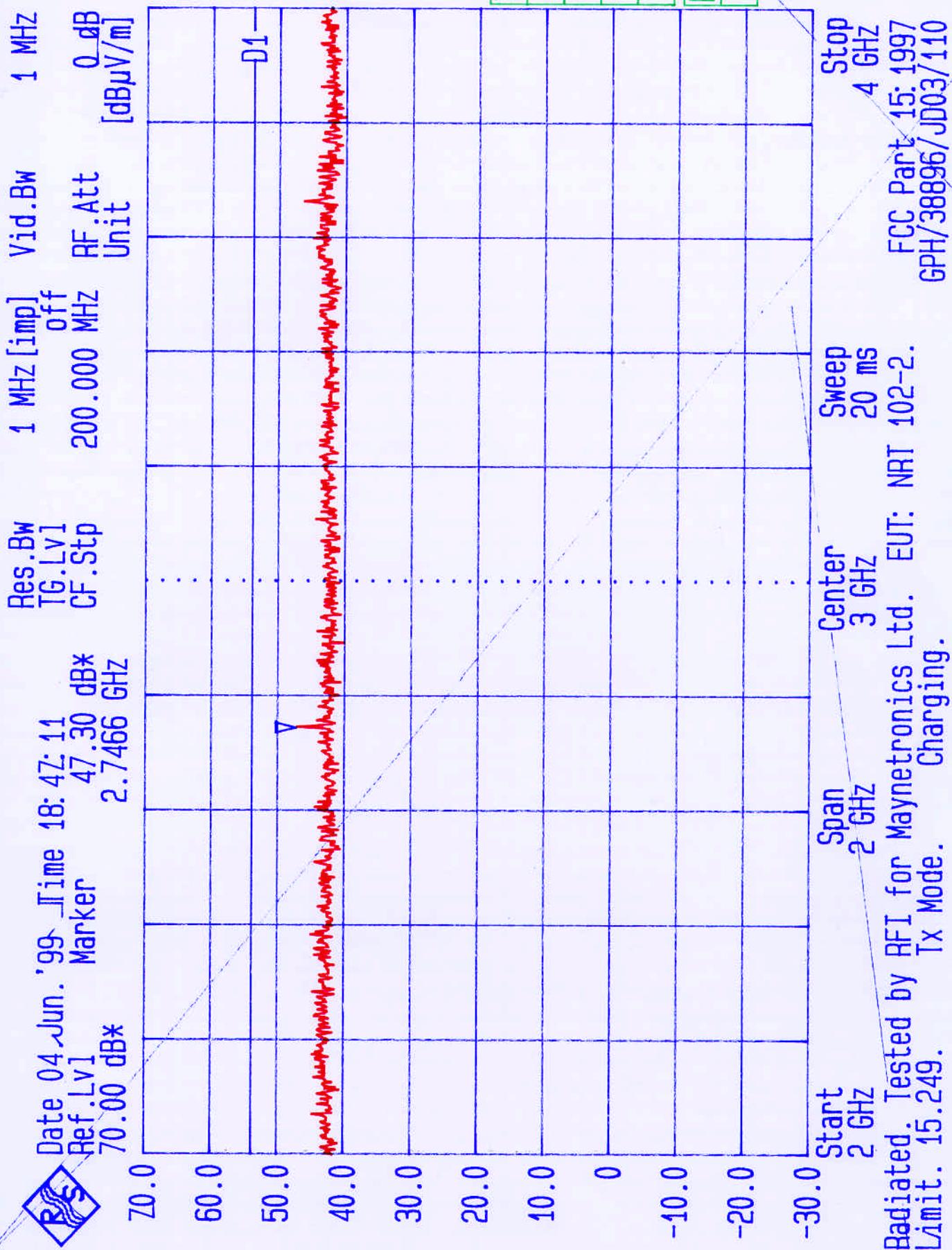
Date 04. Jun. '99 Time 18:42:19  
 Ref. LV1 Marker 47.30 dB\*  
 70.00 dB\* 2.7466 GHz



TT 2 PA 10

Stop 4 GHz  
 Sweep 20 ms  
 Center 3 GHz  
 Span 2 GHz  
 Start 2 GHz  
 Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
 Limit. 15.249. Tx Mode. Standalone.

FCC Part 15: 1997  
 GPH/38896/JD03/109

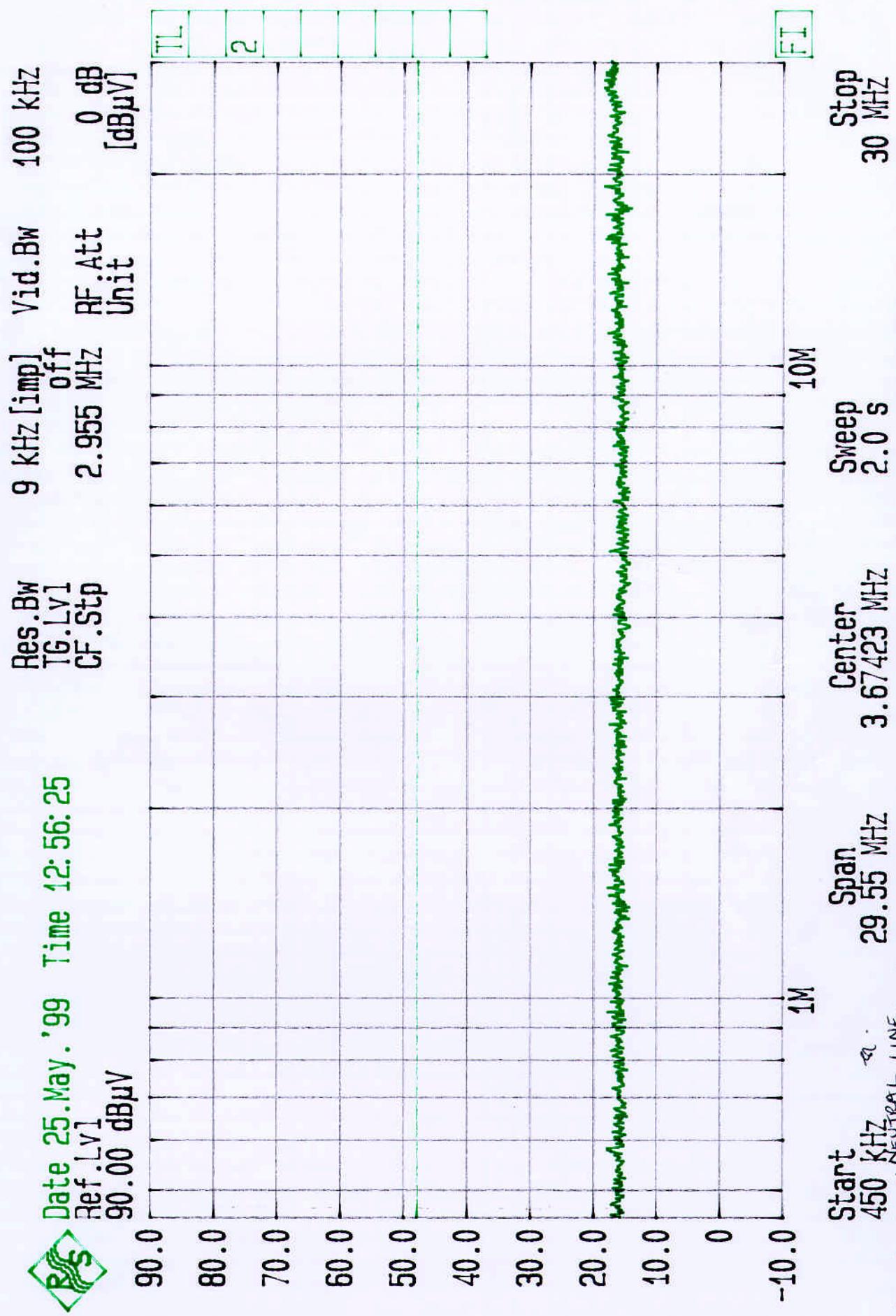


Radiated. Tested by RFI for Maynetronics Ltd. EUT: NRT 102-2.  
Limit. 15.249. Tx Mode. Charging.

FCC Part 15: 1997  
GPH/38896/JD03/110



Date 25. May. '99 Time 12: 56: 25  
Ref. Lv1 90.00 dB $\mu$ V  
TG. Lv1  
CF. Stp

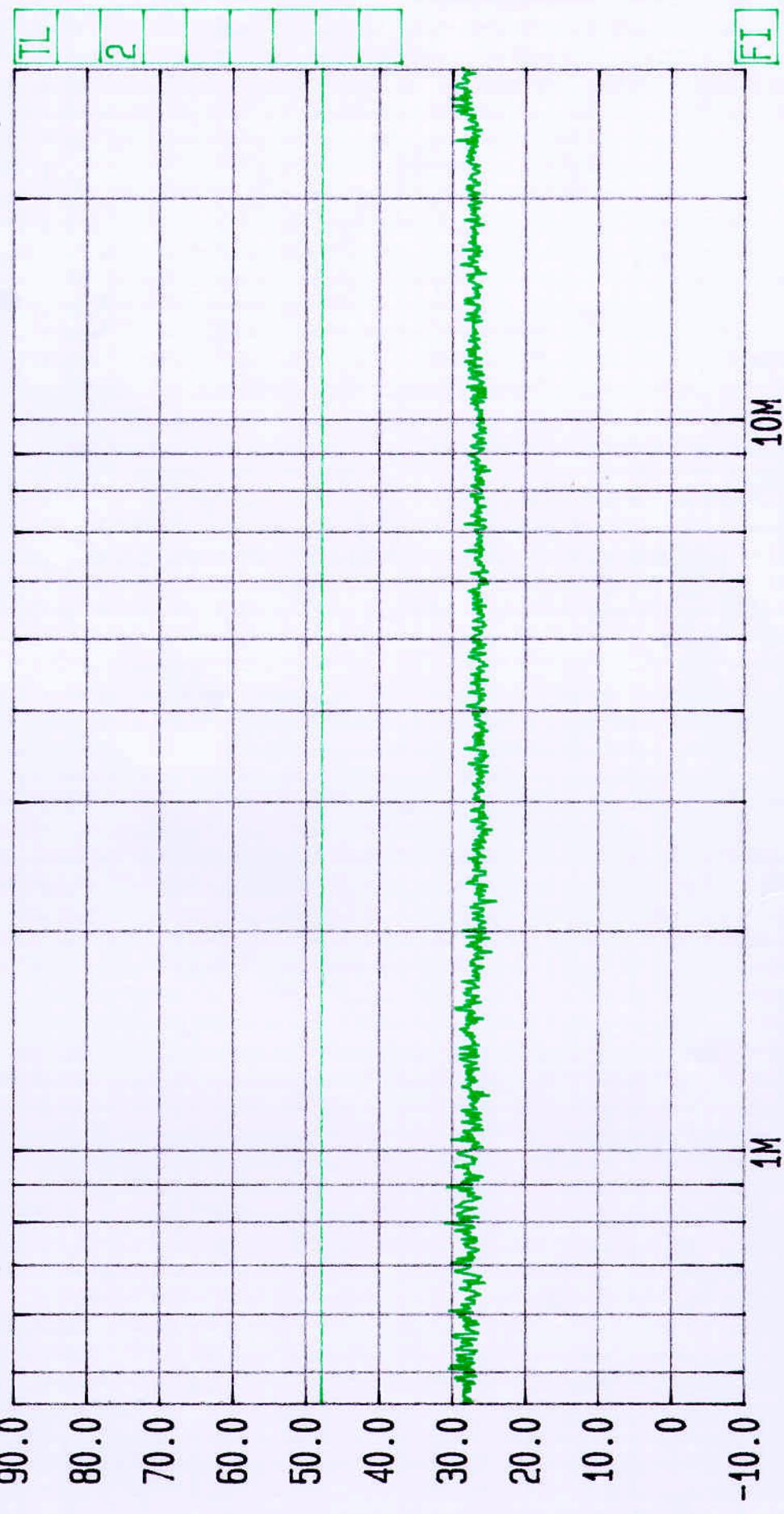


Conducted Emissions Tested by RFI for Maynetronics EUT: NRT 102-2 FCC Part 15: 97  
Section 15.207 Cont. TX Op in charge mode GPH/38896/JD03/009 111 Rev.



Date 25. May. '99 Time 13: 13: 14

Ref. Lvl 1  
90.00 dB $\mu$ V  
Res. Bw 9 kHz [imp]  
TG. Lvl 2.955 MHz  
CF. Stp 100 kHz  
T.G. off  
CF. Stp



Start 450 kHz  
Span 29.55 MHz  
Center 3.67423 MHz  
Sweep 260 ms  
Stop 30 MHz  
EUT: NRT 102-2 FCC Part 15: 97  
Conducted Emissions LIVE Tested by RFI for Maynetronics GPH/38896/JD03/000 Section 15.207 Cont. TX Op in charge mode 112 dB.

**Test Of:** **Maynetronics Ltd.**  
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## **Appendix 5 Photographs of EUT**

This appendix contains the following photographs

<b>Photo Reference Number</b>	<b>Title</b>
PHT\38896ETF03\001	Side View of Conducted Emissions: Charge Configuration
PHT\38896ETF03\002	Front View of Conducted Emissions: Charge Configuration
PHT\38896ETF03\003	Rear View of Radiated Emissions: Standalone Configuration
PHT\38896ETF03\004	Front View of Radiated Emissions: Standalone Configuration
PHT\38896ETF03\005	Rear View of Radiated Emissions: Charge Configuration
PHT\38896ETF03\006	Front View of Radiated Emissions: Charge Configuration

These pages are not included in the total number of pages for this report.

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**EMC Department**

**Test Of:** **Maynetronics Ltd.**  
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**PHT\38896ETF03\001. Side View of Conducted Emissions: Charge Configuration**



RADIO FREQUENCY INVESTIGATION LTD.

EMC Department

TEST REPORT  
Photograph Section

Test Of: Maynetronics Ltd.  
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PHT\38896ETF03\002. Front View of Conducted Emissions: Charge Configuration



Test Of: Maynetronics Ltd.  
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To: F.C.C. Part 15: 1998 Class B

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**PHT\38896ETF03\003. Rear View of Radiated Emissions: Standalone Configuration**



Test Of: Maynetronics Ltd.  
NTR102-2 Data Terminal.  
To: F.C.C. Part 15: 1998 Class B

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**PHT\38896ETF03\004. Front View of Radiated Emissions: Standalone Configuration**



Test Of: Maynetronics Ltd.  
NTR102-2 Data Terminal.  
To: F.C.C. Part 15: 1998 Class B

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**PHT\38896ETF03\005. Rear View of Radiated Emissions: Charge Configuration**



Test Of: Maynetronics Ltd.  
NTR102-2 Data Terminal.  
To: F.C.C. Part 15: 1998 Class B

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**PHT\38896ETF03\006. Front View of Radiated Emissions. Charge Configuration**

