# TEST REPORT
# FROM
# RADIO FREQUENCY
# INVESTIGATION LTD.

Test Of: Multitone Electronics PLC.
Radio Paging Receiver TLA 853

To: FCC Part 15: 1998 Class B
(Radiated Emissions Only)

**Test Report Serial No:**
RFI/EMCB1/RP41589ETF01A

| | |
|---|---|
| **This Test Report Is Issued Under The Authority Of Brian Watson Technical Director:**  | **Checked By:**  |
| **Tested By:**  | **Release Version No: PDF01** |
| **Issue Date: 27 November 2000** | **Test Date: 8 November 2000** |

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**Test Of:** **Multitone Electronics PLC.**
**Radio Paging Receiver TLA 853**
**To:** **FCC Part 15: 1998 Class B**
**(Radiated Emissions Only)**

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## 1. Client Information

| | |
|---|---|
| **Company Name:** | Multitone Electronics PLC. |
| **Address:** | Multitone House<br>Beggarwood Lane<br>Kempshot Hill<br>Basingstoke<br>RG23 7LL<br>Hampshire. |
| **Contact Name:** | Mr. Brian Merchant. |

## 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)

| | |
|---|---|
| **Brand Name** | Multitone (414.775 MHz version) |
| **Model Name or Number** | TLA 583 |
| **Unique Type Identification** | Not stated by client |
| **Serial Number** | 0111369W:03 |
| **Country Of Manufacture** | U.K. |
| **F.C.C. ID Number** | E86TLA853 |
| **Date Of Receipt** | 08 November 2000 |

| | |
|---|---|
| **Brand Name** | Multitone (430.35 MHz version) |
| **Model Name or Number** | TLA 853 |
| **Unique Type Identification** | Not stated by client |
| **Serial Number** | 0111370W:03 |
| **Country Of Manufacture** | U.K. |
| **F.C.C. ID Number** | E86TLA853 |
| **Date Of Receipt** | 08 November 2000 |

| | |
|---|---|
| **Brand Name** | Multitone (464.6875 MHz version) |
| **Model Name or Number** | TLA 853 |
| **Unique Type Identification** | Not stated by client |
| **Serial Number** | 0111368W:03 |
| **Country Of Manufacture** | U.K. |
| **F.C.C. ID Number** | E86TLA853 |
| **Date Of Receipt** | 08 November 2000 |

## 2.2. Description Of EUT

The EUT is an alpha-numeric Radio Paging Receiver, utilising the CCIR No1 radio-paging code format (POCSAG). The unit has tone-alert, vibrate and alpha-numeric display facilities.

## 2.3. Modifications Incorporated In EUT

The EUT incorporates the following modifications:

No physical changes have been made to the EUT build, but the operating software has been adjusted to a "test mode" which allows for "continuous calling" with a faster reset cycle time, in order to more easily assimilate worst case EMC conditions.

## 2.4. Additional Information Related To Testing

| | |
|---|---|
| **Power Supply Requirement:** | Internal battery supply of +1.5V nominal |
| **Intended Operating Environment:** | Domestic, Office & light industrial, Industrial, Hospital |
| **Weight:** | 62 g |
| **Dimensions:** | 75 x 50 x 16 mm |
| **Interface Ports:** | None |
| **Cycle Time:** | 3 secs |

## 2.5. Support Equipment: (Remotely Located)

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

| | |
|---|---|
| **Description** | POCSAG Encoder |
| **Brand Name** | Multitone |
| **Model Name or Number** | P645 |
| **Serial Number** | 3830:01 |
| **F.C.C. ID Number** | Not applicable |
| **Cable Length And Type** | Not applicable |
| **Connected to Port** | PC RS232 - RF Signal Generator DC Modulation I/P |

| | |
|---|---|
| **Description** | RF Signal Generator |
| **Brand Name** | Not stated by client |
| **Model Name or Number** | Not stated by client |
| **Serial Number** | Not stated by client |
| **F.C.C. ID Number** | Not Applicable |
| **Cable Length And Type** | < 10m, Coaxial |
| **Connected to Port** | RF |

| | |
|---|---|
| **Description** | Personal Computer |
| **Brand Name** | Not stated by client |
| **Model Name or Number** | Not stated by client |
| **Serial Number** | Not stated by client |
| **F.C.C. ID Number** | Not applicable |
| **Cable Length And Type** | 3m, RS232 |
| **Connected to Port** | RS 232 |

# 3. Test Specification, Methods & Procedures

## 3.1. Test Specification

| | |
|---|---|
| **Reference:** | FCC Part 15: 1998 Class B |
| **Title:** | Code of Federal Regulations, Part 15 (47CFR15)<br>Radio Frequency Devices: Digital Devices. |
| **Comments:** | 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. |
| **Purpose of Test:** | 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.

## 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, the EUT was powered by Internal battery supply of +1.5V nominal

## 5.2. Operating Modes

The EUT was tested in the following operating mode:

The EUT continually paged from the remotely located support equipment, (Signal Generator) and therefore continually receiving, decoding and displaying paging calls.

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 configuration:

Standalone unit.

The reason for choosing this configuration was that it was defined by the client as being typical of normal use and likely to be a worst case with regard to 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.

# 6. Summary Of Test Results

## 6.1. Summary Of Tests

| Test Name | Specification Reference (Clause Number) | Port Type | Compliancy Status |
|---|---|---|---|
| Electric Field Strength Emissions | Section 15 of C.F.R. 47: 1998 | Enclosure (414.775 MHz version) | Complied |
| Electric Field Strength Emissions | Section 15 of C.F.R. 47: 1998 | Enclosure (430.35 MHz version) | Complied |
| Electric Field Strength Emissions | Section 15 of C.F.R. 47: 1998 | Enclosure (464.6875 MHz version) | Complied |

## 6.2. 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.

# 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 UKAS Document NIS 81 with a confidence level of 95%. Please refer to Section 8 for details of measurement uncertainties.

7.1.3. It should be noted that this report covers 3 different versions of the TLA 853 unit. Each unit is set to receive at different frequencies, 464.6875 MHz, 430.35 MHz and 414.775 MHz.

## 7.2. Test Results For Radiated Emissions (414.775 MHz version)

### 7.2.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

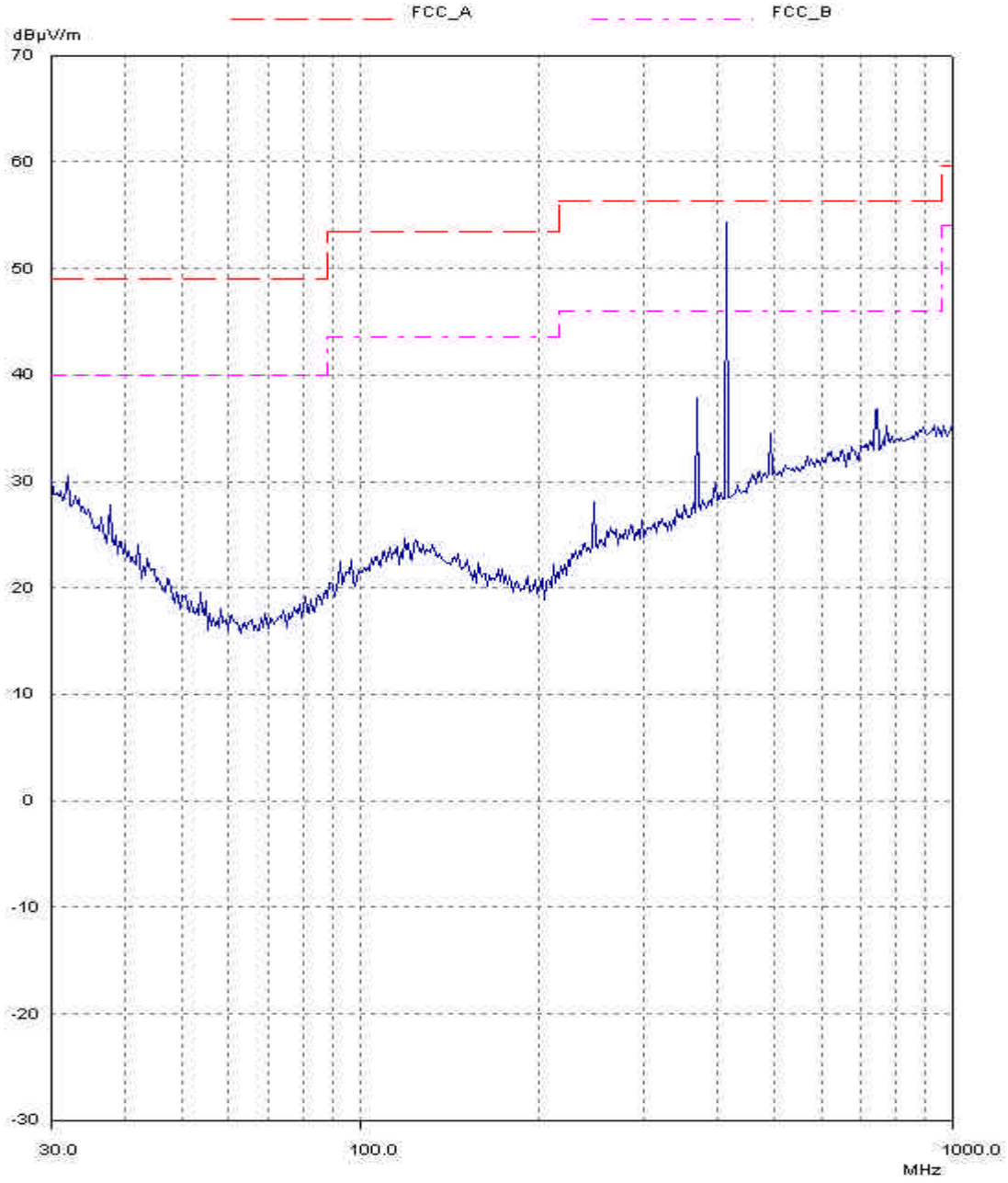
7.2.1.1. Plots of the initial scans can be found in Section 7.3.

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

| Frequency (MHz) | Ant. Pol. | Q-P Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 31.953 | Vert. | 25.800 | 40.000 | 14.200 | Complied |
| 37.777 | Vert. | 24.300 | 40.000 | 15.700 | Complied |
| 246.539 | Vert. | 18.300 | 46.000 | 27.700 | Complied |
| 369.771 | Vert. | 25.300 | 46.000 | 20.700 | Complied |
| 493.031 | Horiz. | 26.000 | 46.000 | 20.000 | Complied |
| 742.136 | Horiz. | 35.700 | 46.000 | 10.300 | Complied |

## 7.3.Scan of Radiated Emissions (414.775 MHz version)

7.3.1.The following graph was produced as a result of the initial preliminary exploratory scans. These scans were performed at a 3 metre test distance to all four sides of the EUT in both polarisations. The scans were performed in a shielded enclosure using a max hold mode incorporating a Peak detector.



## 7.4. Test Results For Radiated Emissions (430.35 MHz version)

### 7.4.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

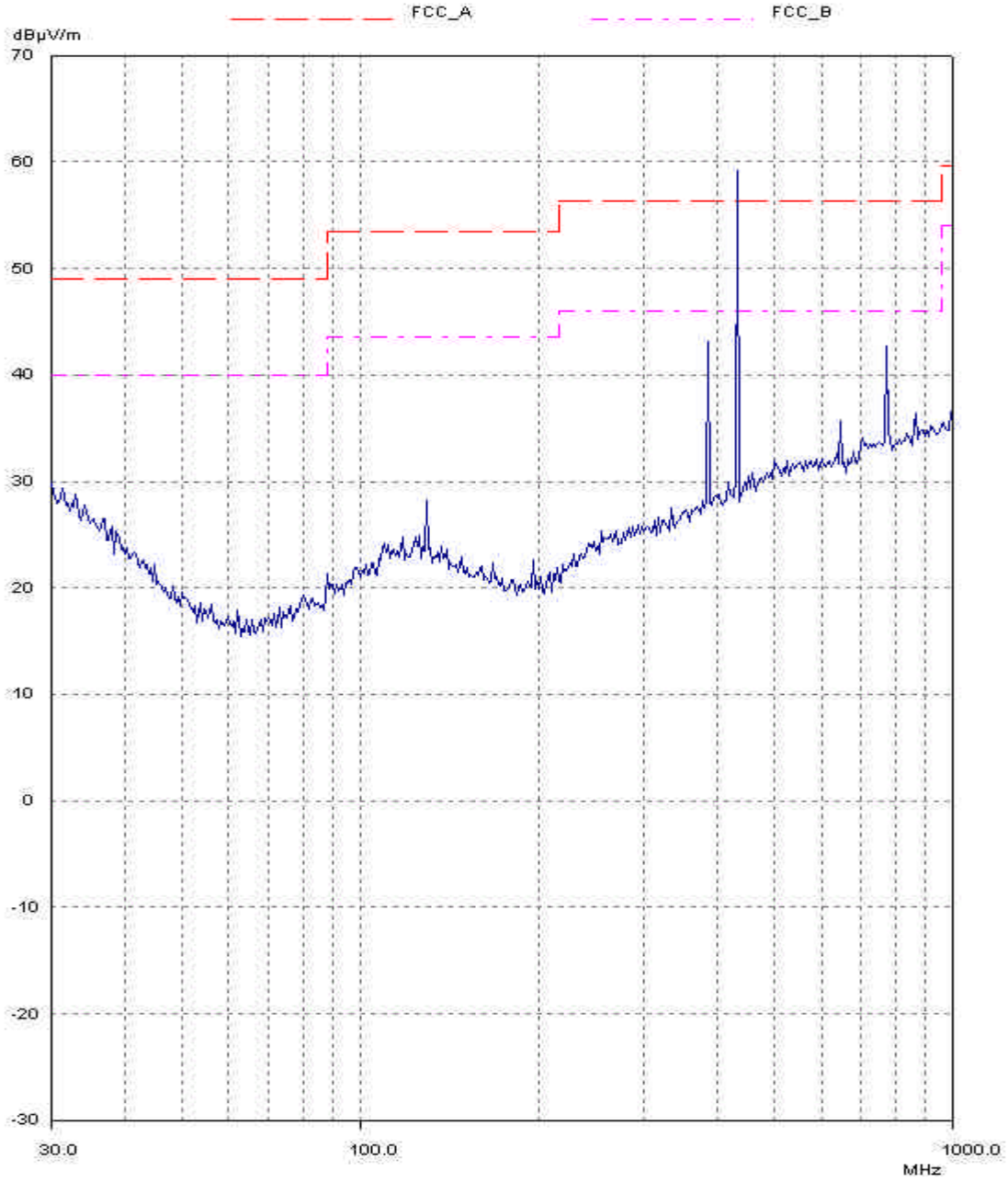
7.4.1.1. Plots of the initial scans can be found in Section 7.5.

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

| Frequency (MHz) | Ant. Pol. | Q-P Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 31.328 | Vert. | 23.000 | 40.000 | 17.000 | Complied |
| 129.453 | Vert. | 14.400 | 43.500 | 29.100 | Complied |
| 385.349 | Horiz. | 28.900 | 46.000 | 17.100 | Complied |
| 646.500 | Vert. | 38.000 | 46.000 | 8.000 | Complied |
| 770.707 | Horiz. | 35.300 | 46.000 | 10.700 | Complied |
| 863.900 | Horiz. | 36.100 | 46.000 | 9.900 | Complied |

## 7.5.Scan of Radiated Emissions (430.35 MHz version)

7.5.1.The following graph was produced as a result of the initial preliminary exploratory scans. These scans were performed at a 3 metre test distance to all four sides of the EUT in both polarisations. The scans were performed in a shielded enclosure using a max hold mode incorporating a Peak detector.



## 7.6. Test Results For Radiated Emissions (464.6875 MHz version)

### 7.6.1. Electric Field Strength Measurements (Frequency Range: 30 to 1000 MHz)

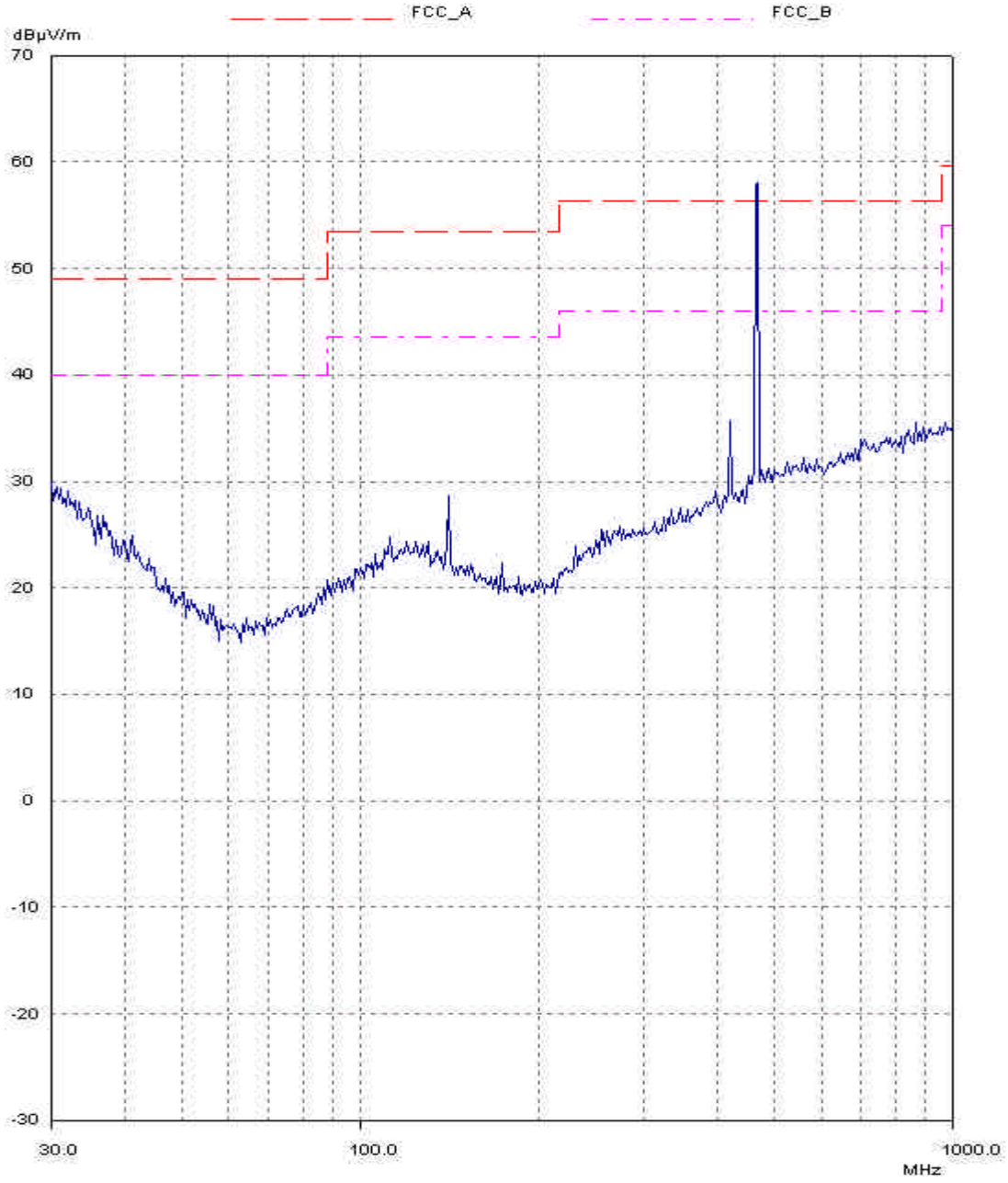
7.6.1.1. Plots of the initial scans can be found in Section 7.7.

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

| Frequency (MHz) | Ant. Pol. | Q-P Level (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Result |
|---|---|---|---|---|---|
| 32.066 | Vert. | 20.400 | 40.000 | 19.600 | Complied |
| 41.345 | Vert. | 18.400 | 40.000 | 21.600 | Complied |
| 139.880 | Vert. | 26.800 | 43.500 | 16.700 | Complied |
| 255.000 | Vert. | 18.000 | 46.000 | 28.000 | Complied |
| 421.040 | Vert. | 27.800 | 46.000 | 18.200 | Complied |
| 867.373 | Horiz. | 36.100 | 46.000 | 9.900 | Complied |

## 7.7.Scan of Radiated Emissions (464.6875 MHz version)

7.7.1.The following graph was produced as a result of the initial preliminary exploratory scans. These scans were performed at a 3 metre test distance to all four sides of the EUT in both polarisations. The scans were performed in a shielded enclosure using a max hold mode incorporating a Peak detector.



## 8. Measurement Uncertainty

8.1. Company Policy, as based on the UKAS 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 reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. The uncertainty evaluation has been carried out in accordance with UKAS requirements:

| **Measurement Type** | **Range** | **Confidence Level (%)** | **Calculated Uncertainty** |
|---|---|---|---|
| Radiated Emissions | 30 MHz to 1000 MHz @ 10 m | 95% | +/- 5.1 dB |

8.3. Measurement uncertainties have been applied in accordance with UKAS 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 UKAS document M 3003 Edition 1“The Expression of Uncertainty and Confidence in Measurement” December 1997, which align with international recommendations “Guide to the Expression of Uncertainty in Measurement” ISO/IEC/OIML/BIPM (Prepared by ISO/TAG 4: January 1993).

## Appendix 1. Test Equipment Used

| Instrument | Manufacturer | Model Number | RFI No. |
|---|---|---|---|
| Chase Bilog Antenna | Chase EMC Ltd | CBL6112B | A1037 |
| Bilog Antenna | Chase | CBL6111 | A259 |
| OATS Positioning Controller | Rohde & Schwarz | HCC | A276 |
| 3 dB attenuator (9) | Suhner | 6803.17.B | A392 |
| Cable | RFI | None | C049 |
| Cable | RFI | None | C055 |
| Cables | Rosenberger | UFA210A-1-1181-70x70 | C160 |
| Cable | Andrews | None | C341 |
| Cable | Rosenberger | UFA210A-1-1182-704704 | C459 |
| Spectrum Monitor | Rohde & Schwarz | EZM | M003 |
| ESVP Receiver | Rohde & Schwarz | ESVP | M023 |
| Turntable Controller | R.H.Electrical Services | RH351 | M173 |
| Thermo/hygro meter | RS Components Ltd | RS212-124 | M210 |
| Analyser Display Unit | Rohde & Schwarz | ESAI-D | M505 |
| RF unit | Rohde & Schwarz | ESBI-RF | M506 |
| Site 1 | RFI | 1 | S201 |
| Site 12 | RFI | 12 | S212 |

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

# Appendix 2. Measurement Methods

## A2.1. Radiated Emissions

A2.1.1. Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for a Quasi-Peak detector.

A2.1.2. 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.

A2.1.3. 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 receiver with a Quasi-Peak detector.

A2.1.4. 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.

A2.1.5. All measurements on the open area test site were performed using broadband antennas.

A2.1.6. 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° and then varying the antenna height between 1 m and 4 m. 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.

A2.1.7. The test equipment settings for radiated emissions measurements were as follows:

| **Receiver Function** | **Initial Scan** | **Final Measurements** |
|---|---|---|
| Detector Type: | Peak | Quasi-Peak (CISPR) |
| Mode: | Max Hold | Not applicable |
| Bandwidth: | 100 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 |

## Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

| Drawing Reference Number | Title |
|---|---|
| DRG\41589ETF01\EMIRAD | Test configuration for measurement of radiated emissions |
| DRG\41589ETF01\001 | Schematic Diagram of the EUT, support equipment and interconnecting cables used for the test |

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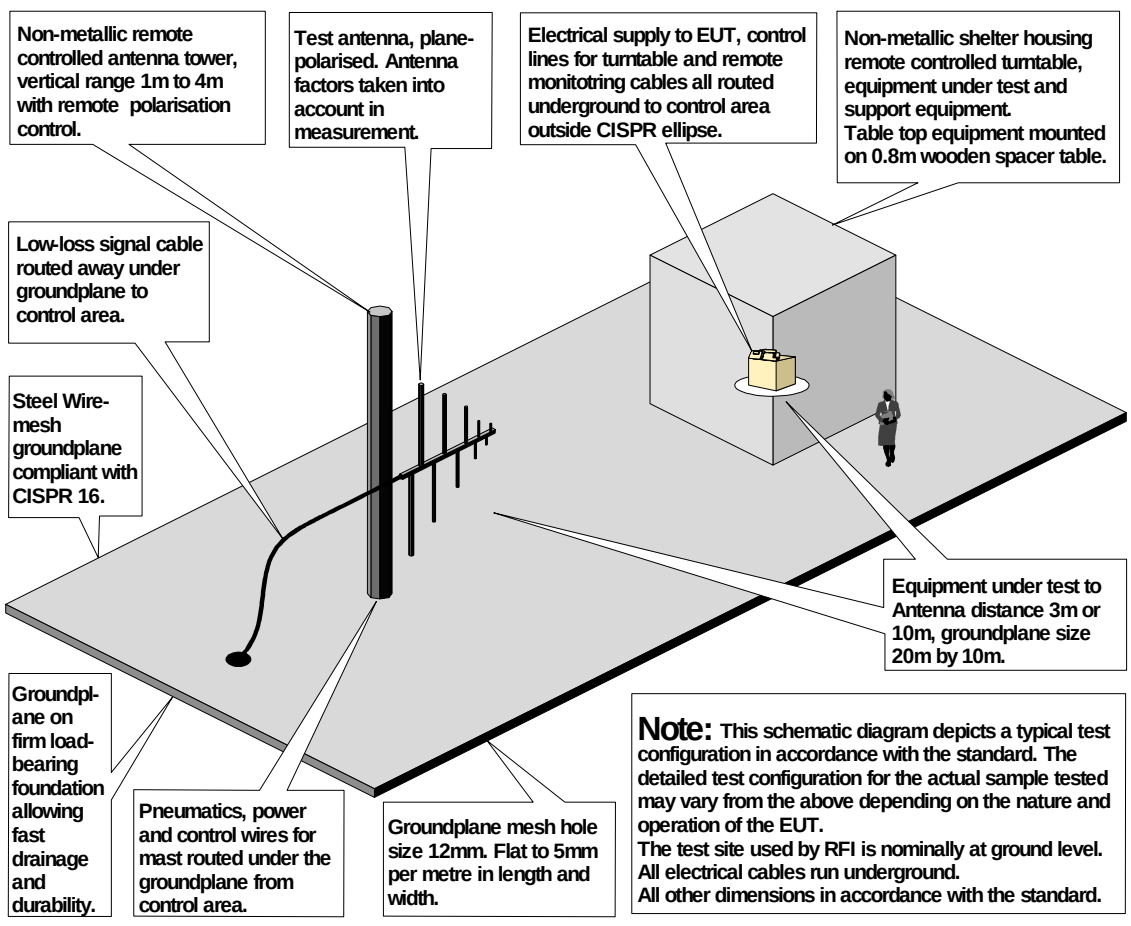
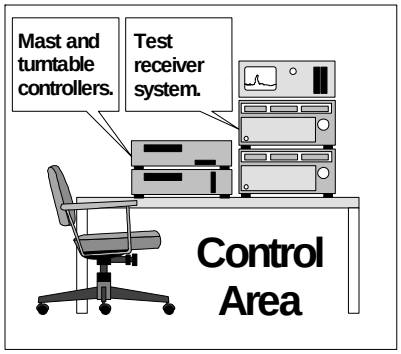
**DRG\41589ETF01\EMIRAD**




**Note:** This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

## Test Configuration For Radiated Emissions Measurements

**Reflection-free area: >60m by 52m**
**(CISPR ellipse)**
**Groundplane Earthed**
**Control room outside CISPR ellipse**



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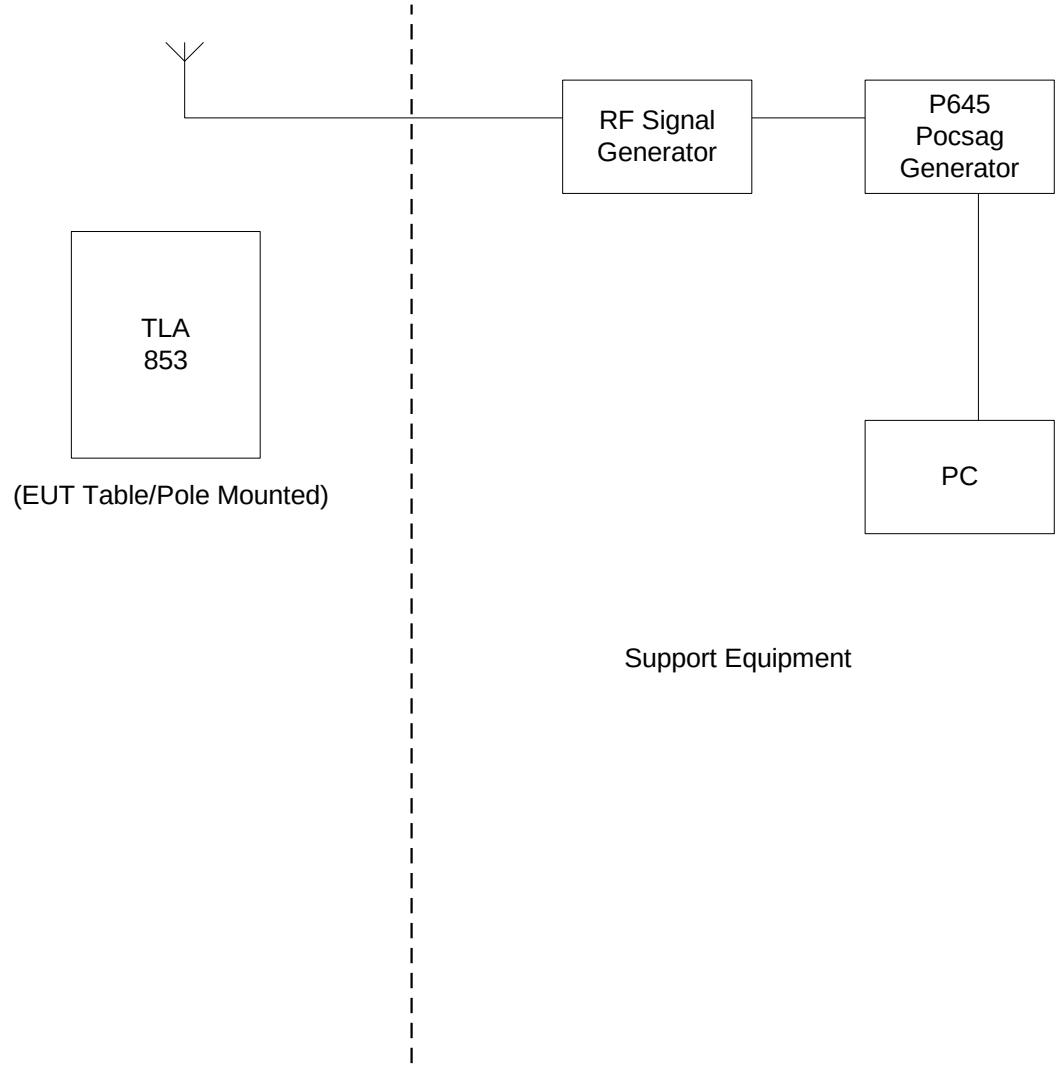
**DRG\41589ETF01\001**

## Configuration of EUT and Support Equipment



## Appendix 4. Photographs of EUT

This appendix contains the following photographs:

| Photo Reference Number | Title |
|---|---|
| PHT\41589ETF01\001 | Front view of Radiated Emissions |
| PHT\41589ETF01\002 | Rear view of Radiated Emissions |

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

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## PHT\41589ETF01\001 Front view of Radiated Emissions

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## PHT\41589ETF01\002 Rear view of Radiated Emissions