

TEST REPORT # EMCC-850047.4CC, 2008-02-22

EQUIPMENT UNDER TEST:

Type: 3M(tm) Digital Media Detagger
3M Project Name: Red Fox
3M Model: M 1200
Serial No: None (pre-production unit)
Application: Inductive Application
Equipment Category: Short Range Device
Manufacturer: 3M Deutschland GmbH
Address: Carl-Schurz-Straße 1
41453 Neuss
Germany

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RELEVANT STANDARDS:

47 CFR Part 15C - Intentional Radiators
RSS-210 Issue 7 June 2007


MEASUREMENT PROCEDURE USED:

ANSI C63.4-2003 FCC/OET MP-5 (1986) Other

TEST REPORT PREPARED BY:

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Klaus Pfister

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**TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
TO 47 CFR PART 15C AND RSS-210**

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**TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
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1 GENERAL INFORMATION

1.1 Purpose

The purpose of this report is to show compliance to the FCC regulations for unlicensed devices operating under section 15.225 of the Code of Federal Regulations title 47 and to show compliance to the Industry Canada regulations for low-power licence-exempt radiocommunication devices (category I equipment) operating under section A2.6(a) of RSS-210.

1.2 Limits and Reservations

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report. This test report shall not be reproduced except in full without the written permission of EMCCons DR. RAŠEK.

1.3 Test Location

Company Name: EMCCons DR. RAŠEK
Address of Labs I, II, III and Head Office: Moggast, Boelwiese 8
91320 Ebermannstadt
Germany
Address of Labs IV and V: Stoernhofer Berg 15
91364 Unterleinleiter
Germany
Laboratories: Test Laboratories II and IV of EMCCons DR. RAŠEK
FCC Registration Numbers 90566 and 878769
These sites have been fully described in two reports submitted to the FCC and accepted in two letters dated 2005-DEC-15 and 2008-JAN-18, respectively
Industry Canada Registrations # IC 3464-4 and # 3464C-1
Phone: +49-9194-9016
Fax: +49-9194-8125
E-Mail: emc.cons@emcc.de
Web: www.emcc.de

1.4 Manufacturer

Company Name: 3M Deutschland GmbH
Street: Carl-Schurz-Straße 1
City: 41453 Neuss
Country: Germany
Name for contact purposes: Mr. Wolfgang Friedrichs
Phone: +49 2131 142092
Fax: +49 2131 1412
E-mail: wfriedrichs@mmm.com

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1.5 Dates

Date of receipt of EUT:

CW 3 / 2008

Test date:

CW 4 + 5 / 2008

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2 PRODUCT DESCRIPTION

2.1 Equipment Under Test (EUT)

| | |
|---|---|
| Description: | RFID Reader |
| Type: | 3M(tm) Digital Media Detagger |
| 3M Project Name: | Red Fox |
| 3M Project Model: | M 1200 |
| Serial Number: | None (pre-production unit) |
| Application: | Inductive Application |
| Equipment Category: | Short Range Device |
| Power Supply: | 100 – 240 V, 50 – 60 Hz |
| Operating frequency: | 13.560 MHz |
| Antenna: | Integral loop antenna |
| Interface ports: | AC mains power input |
| Intended use: | Provide a security solution on CDs / DVDs in libraries for self service process |
| Description of operation (submitted by manufacturer): | Library items like CDs/DVDs are accommodated in cases for protection against antitheft as long as they are not loan. For final patron lending of those items and accessing the CD/DVD inside the case an automatic unlocking of case is necessary for self service. RFID technology is used for detection concerning locking/unlocking the item case. |

2.2 Interface Cables

| Function / Type | Shielded or Unshielded | Max. length | Remarks |
|-----------------|------------------------|---------------|---------|
| AC Power | unshielded | not specified | |

2.3 EUT Peripherals

EUT peripherals used during the tests: None.

2.4 Mode of Operation During Testing

EUT on ↔ reader active ↔ transmitter operating.

2.5 Modifications Required for Compliance

None.

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3 TEST RESULTS SUMMARY

Summary of Test Results for the following EUT:

Manufacturer: 3M Deutschland GmbH
Type: 3M(tm) Digital Media Detagger
Serial Number: None (pre-production unit)

| Requirement | CFR Section | RSS-210 Section | Report Section | Test Result |
|---|-------------|--------------------|----------------|-------------|
| Antenna Requirement | 15.203 | -- | 4 | Pass |
| AC Line Conducted Emissions | 15.207 | -- | 5 | Pass |
| Field Strength Limit (Fundamental) | 15.225 | A2.6(a) | 6 | Pass |
| Transmitter Radiated Spurious Emissions (including Harmonics) | 15.209 | 2.7 Tables 2 and 3 | 6 | Pass |
| Frequency Tolerance / Stability | 15.225 | A2.6 | 7 | Pass |

The client has made the determination that EUT Condition, Characterization, and Mode of Operation are representative of production units, and meet the requirements of the specifications referenced herein.

Consistent with Industry practice, measurement and test equipment not directly involved in obtaining measurement results but having an impact on measurements (such as cable loss, antenna factors, etc.) are factored into the "Correction Factor" documented in certain test results. Instrumentation employed for testing meets tolerances consistent with known Industry Standards and Regulations.

The measurements contained in this report were made in accordance with the procedure ANSI C63.4-2003 and all applicable Public Notices received prior to the date of testing. All emissions from the device were found to be within the limits outlined in this report.

The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in this report.

Test Personnel: Klaus Pfister
Issuance Date: 2008-02-22

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4 ANTENNA REQUIREMENT

Test Requirement: FCC 47 CFR section 15.203

4.1 Regulation

47 CFR section 15.203: Antenna requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of Part 15C. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

4.2 Result

Manufacturer: 3M Deutschland GmbH
Type: 3M(tm) Digital Media Detagger
Serial Number: None (pre-production unit)

The antenna is an integral and permanently attached antenna.
The EUT meets the requirements of this section.

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5 CONDUCTED EMISSIONS TEST

Test Requirement: FCC 47 CFR section 15.207

Test Procedure: ANSI C63.4-2003

5.1 Regulation

47 CFR section 15.207: Conducted limits

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of Emission (MHz) | Conducted Limit (dB μ V) | |
|-----------------------------|------------------------------|--------------|
| | Quasi-peak (QP) | Average (AV) |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

(b) The shown limit in paragraph (a) of this Section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30 MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:

(1) For carrier current systems containing their fundamental emission within the frequency band 535-1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.

(2) For all other carrier current systems: 1000 μ V = 60 dB μ V within the frequency band 535-1705 kHz, as measured using a 50 μ H/50 ohms LISN.

(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in Section 15.205 and Section 15.209, 15.221, 15.223, 15.225 or 15.227, as appropriate.

(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provision for, the use of battery chargers which permit operating while charging, AC adaptors or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

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5.2 Test Equipment

| Type | Manufacturer/ Model No. | Serial No. | Last Calibration | Calibration Interval |
|---|--|---|------------------|----------------------|
| EMI Receiver (150 kHz – 30 MHz) | Rohde & Schwarz ESS | 832808/004 | 2007-07 | 18 months |
| Protector Limiter (150 kHz – 30MHz, 10 dB) | Rohde & Schwarz ESH3Z2 | 844.165/033 | 2007-08 | 12 months |
| V-LISN 50 ohms / (50 μ H + 5 ohms) | Schwarzbeck NSLK8126 | 8126228 | 2006-08 | 24 months |
| AC Power Source | CALIFORNIA INSTRUMENTS HGA with 3 pcs. 5001ih-400 | X 70982 HK 51879 HK 51880 HK 51881 | n.a. | n.a. |

5.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Ceiling or wall-mounted devices are also positioned on a tabletop for testing purposes. Floor standing equipment is placed either directly on the groundplane or on insulating material if normally placed on a nonconducting floor. The EUT is connected to its associated peripherals, with any excess I/O cabling folded back and forth forming a 30 to 40 cm long bundle in the center, to an overall length of the bundled cable of max. 1 m. The EUT is connected to a dedicated LISN and all peripherals are connected to a second separate LISN. The LISNs are bonded to the groundplane.

Conducted measurements are made on each current carrying conductor with respect to ground.

The initial step in collecting conducted data is a peak scan of the measurement range with an EMI test receiver. The significant peaks are then measured with quasi-peak and average detector. Worst case conducted emissions are listed under chapter "test results".

Remark: The EUT was tested as tabletop equipment.

5.4 Test Results

Manufacturer: 3M Deutschland GmbH
Type: 3M(tm) Digital Media Detagger
Serial Number: None (pre-production unit)
Test Date: 2008-01-24
Test Personnel: Klaus Pfister

The EUT meets the requirements of this section (see detailed results on following pages).

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**EMCC DR.RASEK
 Conducted Emissions**

24. Jan 08 21:00

EUT: Red Fox
 Manuf: 3M Deutschland GmbH
 Op Cond: Reader active
 Operator: Pfister
 Test Spec: 47 CFR section 15.207
 Comment: 115V 60Hz, test on line L

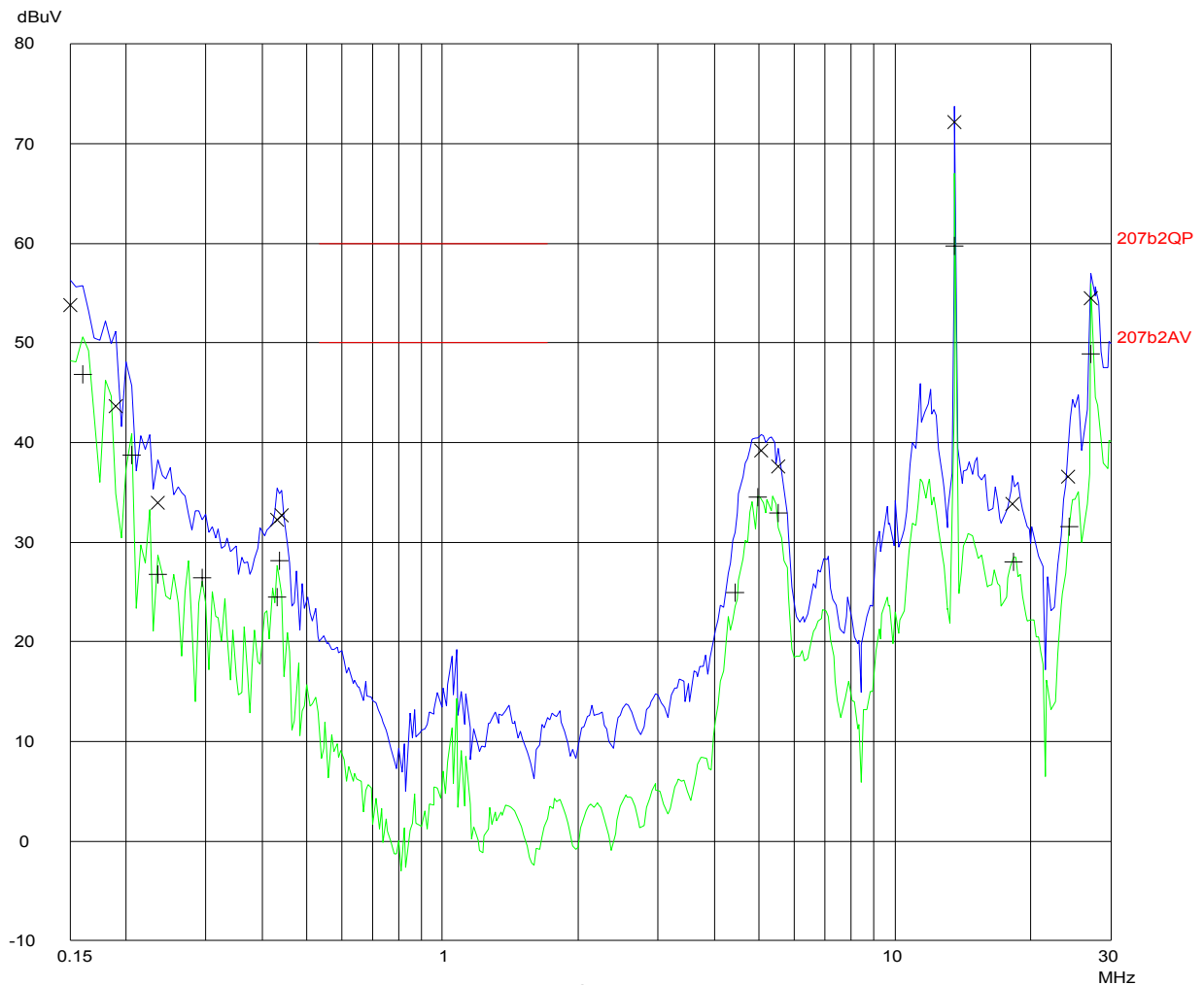
Scan Settings (1 Range)

| Frequencies | | | Receiver Settings | | | | | |
|-------------|------|------|-------------------|----------|--------|-------|--------|-------|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp | OpRge |
| 150k | 30M | 5k | 10k | PK+AV | 10ms | AUTO | LN OFF | 60dB |

Final Measurement: x QP / + AV
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 25dB

| Transducer No. | Start | Stop | Name |
|----------------|-------|------|---------|
| 1 | 10k | 30M | LIMITER |

No limit between 150 kHz and 535 kHz and 1.705 MHz and 30 MHz, see 15.207(b)(2)



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**EMCC DR.RASEK
Conducted Emissions**

24. Jan 08 21:00

EUT: Red Fox
Manuf: 3M Deutschland GmbH
Op Cond: Reader active
Operator: Pfister
Test Spec: 47 CFR section 15.207
Comment: 115V 60Hz, test on line L

Scan Settings (1 Range)

| Frequencies | | | Receiver Settings | | | | | |
|-------------|------|------|-------------------|----------|--------|-------|--------|----------|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp | OpRge |
| 150k | 30M | 5k | 10k | PK+AV | 10ms | AUTO | LN | OFF 60dB |

Final Measurement Results:

| Frequency MHz | QP Level dBuV |
|------------------|------------------|
| 0.15000 | 53.7 |
| 0.19000 | 43.7 |
| 0.23500 | 33.9 |
| 0.43000 | 32.3 |
| 0.44000 | 32.7 |
| 5.07500 | 39.2 |
| 5.52500 | 37.5 |
| 13.56000 | 72.1 |
| 18.22500 | 33.8 |
| 24.15000 | 36.5 |
| 27.12000 | 54.4 |

| Frequency MHz | AV Level dBuV |
|------------------|------------------|
| 0.16000 | 46.8 |
| 0.20500 | 38.7 |
| 0.23500 | 26.8 |
| 0.29500 | 26.4 |
| 0.43000 | 24.4 |
| 0.43500 | 28.1 |
| 4.42500 | 24.9 |
| 4.97500 | 34.5 |
| 5.52500 | 33.0 |
| 13.55500 | 59.7 |
| 18.30000 | 28.0 |
| 24.22500 | 31.6 |
| 27.12000 | 48.8 |

* limit exceeded

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**EMCC DR.RASEK
 Conducted Emissions**

24. Jan 08 20:50

EUT: Red Fox
 Manuf: 3M Deutschland GmbH
 Op Cond: Reader active
 Operator: Pfister
 Test Spec: 47 CFR section 15.207
 Comment: 115V 60Hz, test on line N

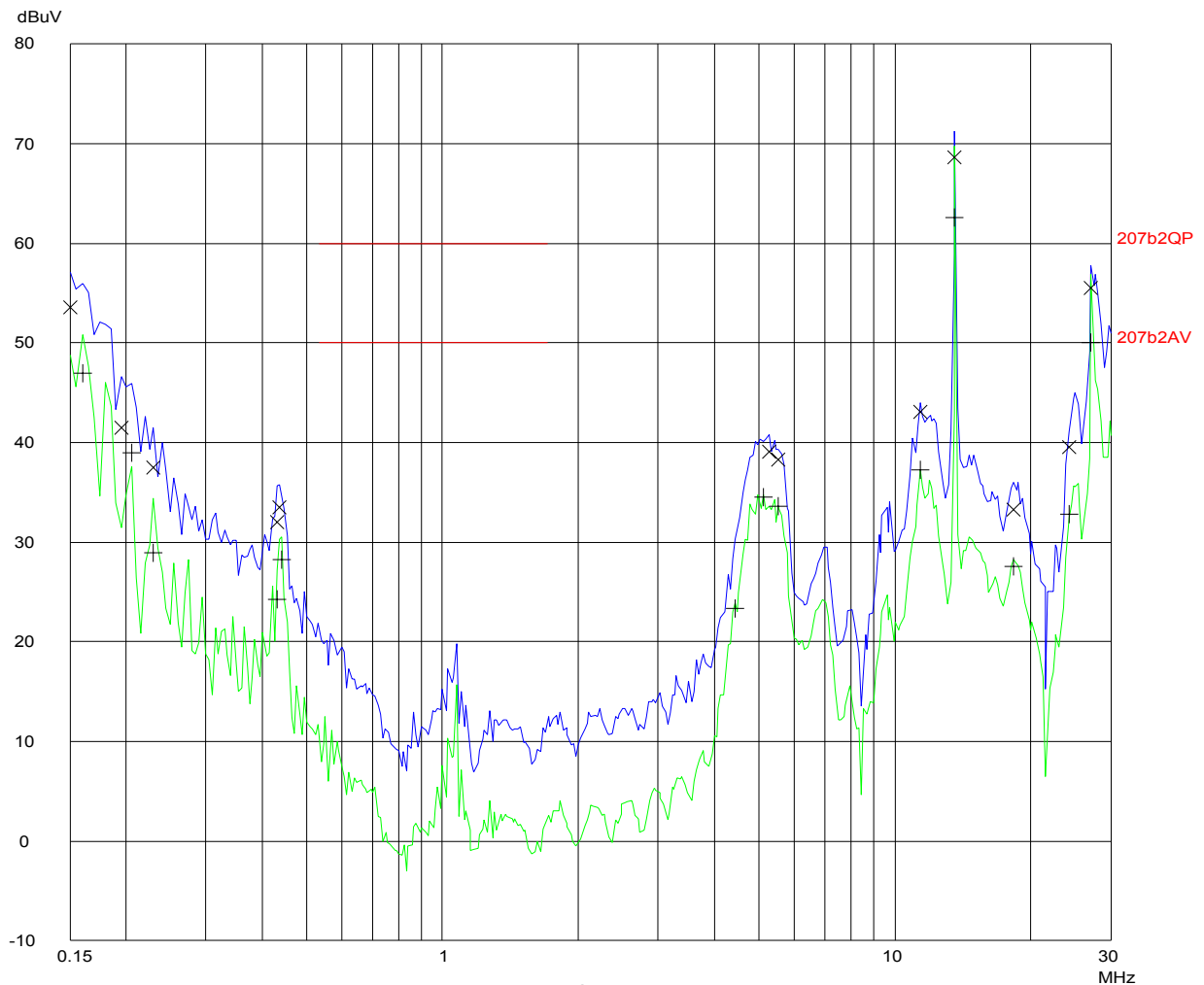
Scan Settings (1 Range)

| Frequencies | | | Receiver Settings | | | | | |
|-------------|------|------|-------------------|----------|--------|-------|--------|-------|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp | OpRge |
| 150k | 30M | 5k | 10k | PK+AV | 10ms | AUTO | LN OFF | 60dB |

Final Measurement: x QP / + AV
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 25dB

| Transducer No. | Start | Stop | Name |
|----------------|-------|------|---------|
| 1 | 10k | 30M | LIMITER |

No limit between 150 kHz and 535 kHz and 1.705 MHz and 30 MHz, see 15.207(b)(2)



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**EMCC DR.RASEK
 Conducted Emissions**

24. Jan 08 20:50

EUT: Red Fox
 Manuf: 3M Deutschland GmbH
 Op Cond: Reader active
 Operator: Pfister
 Test Spec: 47 CFR section 15.207
 Comment: 115V 60Hz, test on line N

Scan Settings (1 Range)

| Frequencies | | | Receiver Settings | | | | |
|-------------|------|------|-------------------|----------|--------|---------|--------------|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp OpRge |
| 150k | 30M | 5k | 10k | PK+AV | 10ms | AUTO LN | OFF 60dB |

Final Measurement Results:

| Frequency MHz | QP Level dBuV |
|------------------|------------------|
| 0.15000 | 53.6 |
| 0.19500 | 41.5 |
| 0.23000 | 37.4 |
| 0.43000 | 31.9 |
| 0.43500 | 33.5 |
| 5.27500 | 39.1 |
| 5.52500 | 38.2 |
| 11.40000 | 43.0 |
| 13.56500 | 68.6 |
| 18.30000 | 33.3 |
| 24.22500 | 39.5 |
| 27.12000 | 55.5 |

| Frequency MHz | AV Level dBuV |
|------------------|------------------|
| 0.16000 | 47.0 |
| 0.20500 | 38.9 |
| 0.23000 | 28.9 |
| 0.43000 | 24.2 |
| 0.44000 | 28.3 |
| 4.42500 | 23.3 |
| 5.12500 | 34.5 |
| 5.52500 | 33.6 |
| 11.40000 | 37.2 |
| 13.56500 | 62.5 |
| 18.30000 | 27.6 |
| 24.22500 | 32.8 |
| 27.12000 | 50.1 |

* limit exceeded

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6 RADIATED EMISSIONS

Test Requirement: FCC 47 CFR sections 15.209 and 15.225, RSS-210 sections A2.6 and 2.7
Test Procedure: ANSI C63.4-2003

6.1 Regulation

47 CFR section 15.33: Frequency range of radiated measurements.

(a) Unless otherwise noted in the specific rule section under which the equipment operates for an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

- (1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
- (2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.
- (3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.
- (4) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a)(1)-(a)(3) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this Section, whichever is the higher frequency range of investigation.

47 CFR section 15.35: Measurement detector functions and bandwidths.

The conducted and radiated emission limits shown in this Part are based on the following, unless otherwise specified elsewhere in this Part:

(a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrument using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Interference (CISPR) of the International Electrotechnical Commission. As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, as long as the same bandwidths as indicated for CISPR quasi-peak measurements are employed.

Note: For pulse modulated devices with a pulse-repetition frequency of 20 Hz or less and for which CISPR quasi-peak measurements are specified, compliance with the regulations shall be demonstrated using measuring equipment employing a peak detector function, properly adjusted for such factors as pulse desensitization, using the same measurement bandwidths that are indicated for CISPR quasi-peak measurements.

(b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level

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of the radio frequency emissions. Unless otherwise specified, e.g., see §§ 15.250, 15.252, 15.255, and 15.509-15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

(c) Unless otherwise specified, e.g. Section 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

47 CFR section 15.209 (RSS-210 section 2.7 tables 2 and 3): Radiated emission limits, general requirements.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement distance (meters) |
|--------------------|--------------------------------------|----------------------------------|
| 0.009–0.490 | 2400/F(kHz) | 300 |
| 0.490–1.705 | 24000/F(kHz) | 30 |
| 1.705–30.0 | 30 | 30 |
| 30–88 | 100 ** | 3 |
| 88–216 | 150 ** | 3 |
| 216–960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

(b) In the emission table above, the tighter limit applies at the band edges.

(c) The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

(d) The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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- (e) The provisions in Sections 15.31, 15.33, and 15.35 for measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this Part.
- (f) In accordance with Section 15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in Section 15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in Section 15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit. Emissions which must be measured above the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator and which fall within the restricted bands shall comply with the general radiated emission limits in Section 15.109 that are applicable to the incorporated digital device.
- (g) Perimeter protection systems may operate in the 54-72 MHz and 76-88 MHz bands under the provisions of this section. The use of such perimeter protection systems is limited to industrial, business and commercial applications.

47 CFR section 15.225 (RSS-210 section A2.6): Operation within the band 13.110 - 14.010 MHz.

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.
- (e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
- (f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.

**TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
TO 47 CFR PART 15C AND RSS-210**

6.2 Test Equipment

| Type | Manufacturer/ Model No. | Serial No. | Last Calibration | Calibration Inter- val |
|------------------------------------|--|---|------------------|---------------------------|
| Antenna (150 kHz – 30 MHz) | Rohde & Schwarz HFH 2-Z2 | 892665/004 | 2007-09 | 36 months |
| EMI Receiver (150 kHz – 30 MHz) | Rohde & Schwarz ESS | 832808/004 | 2007-07 | 18 months |
| Antenna (30 MHz – 1 GHz) | EMCO Model 3143 | 9604-1269 | 2007-09 | 24 months |
| Receiver (30 MHz – 1 GHz) | Rohde & Schwarz ESS | 825132/015 | 2007-08 | 12 months |
| AC Power Source | CALIFORNIA INSTRUMENTS HGA with 3 pcs. 5001ih-400 | X 70982 HK 51879 HK 51880 HK 51881 | n.a. | n.a. |

6.3 Test Procedures

For tabletop equipment, the EUT is placed on a 1 meter by 1.5 meters wide and 0.8 meter high nonconductive table that is placed above the groundplane. Ceiling or wall-mounted devices are also positioned on a tabletop for testing purposes. Floor standing equipment is placed either directly on the groundplane or on insulating material if normally placed on a nonconducting floor. The EUT is connected to its associated peripherals, with any excess I/O cabling folded back and forth forming a 30 to 40 cm long bundle in the center, to an overall length of the bundled cable of max. 1 m.

Preview tests are performed to determine the "worst case" mode of operation. With the EUT operating in "worst case" mode, emissions from the unit are maximized by adjusting the polarization and height of the receive antenna and rotating the EUT on the turntable. Manipulating the system cables also maximizes EUT emissions.

Remark: The EUT was tested as tabletop equipment.

| Radiated Emissions Test Characteristics | |
|--|---|
| Frequency range | 9 kHz – 1 GHz |
| Test distance * | 3m (9 kHz – 1 GHz) |
| Test instrumentation resolution bandwidth | 200 Hz (9 kHz – 150 kHz) 10 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1 GHz) |
| Receive antenna scan height | 1 m – 4 m (30 MHz – 1 GHz) |
| Receive antenna polarization | Horizontal and vertical (30 MHz – 1 GHz) |

* According to Sections 15.31(f)(1) and 15.31(f)(2):

At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

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At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

6.4 Calculation of Field Strength Limits

E.g. field strength limit for the band 13.553-13.567 MHz:
Limit at a distance of 30 meters: 15,848 $\mu\text{V/m}$.
15,848 $\mu\text{V/m}$ corresponds to 84.0 dB($\mu\text{V/m}$).

6.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. The basic equation with a sample calculation is as follows:

$$\text{FST} = \text{RA} + \text{AF} + \text{CF}$$

where

FST = Field Strength at Test Distance in dB($\mu\text{V/m}$)

RA = Receiver Amplitude in dB(μV)

AF = Antenna Factor in dB(1/m)

CF = Cable Attenuation Factor in dB

Assume a receiver reading of 50.1 dB(μV) is obtained. The Antenna Factor of 20.0 dB(1/m) and a Cable Factor of 0.3 dB are added, giving a field strength of 70.4 dB($\mu\text{V/m}$). The 70.4 dB($\mu\text{V/m}$) value can be mathematically converted to its corresponding level in $\mu\text{V/m}$.

$$\text{FST} = 50.1 \text{ dB}(\mu\text{V}) + 20.0 \text{ dB}(1/\text{m}) + 0.3 \text{ dB} = 70.4 \text{ dB}(\mu\text{V}/\text{m})$$
$$\text{FST} = 10^{(70.4/20)} \mu\text{V}/\text{m} = 3,311.3 \mu\text{V}/\text{m}$$

In case of field strength measurements at frequencies below 30 MHz, for test distances other than that specified, the field strength is calculated by adding an extrapolation factor of 40 dB/decade (square of an inverse linear distance extrapolation factor), additionally. The basic equation with a sample calculation is as follows:

$$\text{FS} = \text{FST} + \text{DF}$$

where

FS = Field Strength in dB($\mu\text{V/m}$)

FST = Field Strength at Test Distance in dB($\mu\text{V/m}$)

DF = Distance Extrapolation Factor in dB

[DF = $40 \log_{10}(d_{\text{test}}/d_{\text{spec}})$ with d_{test} = Test Distance and d_{spec} = Specified Distance]

Assume the tests are performed at a reduced Test Distance of 3 m instead of the Specified Distance of 30 m. This results in a Distance Extrapolation Factor of $\text{DF} = 40 \log_{10}(3\text{m}/30\text{m}) = -40.0 \text{ dB}$.

Assume a field strength level of 70.4 dB($\mu\text{V/m}$) is obtained. The Distance Extrapolation Factor of -40.0 dB is added, resulting in a field strength of 30.4 dB($\mu\text{V/m}$). The 30.4 dB($\mu\text{V/m}$) value can be mathematically converted to its corresponding level in $\mu\text{V/m}$.

$$\text{FS} = 70.4 \text{ dB}(\mu\text{V}/\text{m}) - 40.0 \text{ dB} = 30.4 \text{ dB}(\mu\text{V}/\text{m})$$
$$\text{FS} = 10^{(30.4/20)} \mu\text{V}/\text{m} = 33.1 \mu\text{V}/\text{m}$$

**TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
TO 47 CFR PART 15C AND RSS-210**

6.6 Test Results

Manufacturer: 3M Deutschland GmbH
Type: 3M(tm) Digital Media Detagger
Serial Number: None (pre-production unit)
Test Date: 2008-01-24,-29
Test Personnel: Klaus Pfister

The EUT meets the requirements of this section (see detailed results below).

Product Spurious Emissions Data 9 kHz to 1 GHz

Supply voltage: 117 V, 60 Hz

| No | Emission Frequency [MHz] | Receiver Bandwidth and Detector [kHz] | Test Distance [m] | Receiver Reading RA [dB(μV)] | Correction Factor AF+CF [dB(1/m)] | Distance Extrapol. Factor DF [dB] | Result = Corrected Reading FS [dB(μV/m)] | Spec Limit [dB(μV/m)] | Polarization Ant. | Margin [dB] | Remarks |
|----|-----------------------------|--|----------------------|------------------------------------|---|---|--|--------------------------|-------------------|----------------|--------------------------|
| 1 | 13.56 | 10, PK | 3 | 51.0 | 20.0 | -40.0 | 31.0 | 84.0 | n.a. | 53.0 | Fundamental |
| | 13.56 | 10, QP | 3 | 49.1 | 20.0 | -40.0 | 29.1 | 84.0 | n.a. | 54.9 | |
| 2 | 27.12 | 10, QP | 3 | 27.3 | 20.0 | -40.0 | 7.3 | 29.5 | n.a. | 22.2 | 2 nd harmonic |
| 3 | 40.7 | 120, QP | 3 | 16.0 | 10.5 | 0 | 26.5 | 40.0 | v | 13.5 | |
| 4 | 135.6 | 120, QP | 3 | 23.8 | 10.5 | 0 | 34.3 | 43.5 | h | 9.2 | |
| 5 | 203.4 | 120, QP | 3 | 16.3 | 12.1 | 0 | 28.4 | 43.5 | h | 15.1 | |
| 6 | 298.3 | 120, QP | 3 | 18.4 | 18.7 | 0 | 37.1 | 46.0 | h | 8.9 | |
| 7 | 433.9 | 120, QP | 3 | 11.9 | 19.6 | 0 | 31.5 | 46.0 | v | 14.5 | |
| 8 | 718.7 | 120, QP | 3 | 10.0 | 24.9 | 0 | 34.9 | 46.0 | v | 11.1 | |

TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
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7 FREQUENCY TOLERANCE / STABILITY

Test Requirement: FCC 47 CFR section 15.225, RSS-210 section A2.6

7.1 Regulation

47 CFR section 15.225 (RSS-210 section A2.6): Operation within the band 13.110 - 14.010 MHz.

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

(f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.

7.2 Test Procedures

The frequency was measured using a spectrum analyzer and a pick-up loop antenna. The spectrum analyzer's resolution bandwidth was set to 1 kHz

7.3 Test Equipment

| Type | Manufacturer/ Model No. | Serial No. | Last Calibration | Calibration Interval |
|----------------------------------|--|---|------------------|----------------------|
| Spectrum Analyzer / EMI Receiver | Rohde & Schwarz ESAI-D ESMI-RF ESMI-B1 | 833771/008 833827/002 832504/005 | 2007-03 | 18 months |
| Pick-up Loop Antenna | EMCC DR. RAŠEK MAG 50-0.135R | 001 | n.a. | n.a. |
| AC Power Source | CALIFORNIA INSTRUMENTS HGA with 3 pcs. 5001ih-400 | X 70982 HK 51879 HK 51880 HK 51881 | n.a. | n.a. |
| Digital Multimeter | Voltcraft VC 840 | 1060718982 | 2007-03 | 24 months |
| Climate Test Chamber | Feutron 3433/16 | 017 | 2007-02 | 12 months |

**TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
TO 47 CFR PART 15C AND RSS-210**

7.4 Test Results

Manufacturer: 3M Deutschland GmbH
Type: 3M(tm) Digital Media Detagger
Serial Number: None (pre-production unit)
Test Date: 2008-01-25
Test Personnel: Klaus Pfister

The EUT meets the requirements of this section (see results below).

| Temperature [°C] | Voltage [V] | Lower -10dBc frequency [MHz] | Upper -10dBc frequency [MHz] | Middle frequency [MHz] * |
|----------------------------|-------------|------------------------------|------------------------------|--------------------------|
| 20 | 117 | 13.5588 | 13.5612 | 13.56000 |
| 20 | 99 | 13.5588 | 13.5612 | 13.56000 |
| 20 | 135 | 13.5588 | 13.5611 | 13.55995 |
| 50 | 117 | 13.5588 | 13.5611 | 13.55995 |
| 40 | 117 | 13.5588 | 13.5611 | 13.55995 |
| 30 | 117 | 13.5588 | 13.5611 | 13.55995 |
| 20 | 117 | 13.5588 | 13.5611 | 13.55995 |
| 10 | 117 | 13.5588 | 13.5611 | 13.55995 |
| 0 | 117 | 13.5588 | 13.5612 | 13.56000 |
| -10 | 117 | 13.5589 | 13.5612 | 13.56005 |
| -20 | 117 | 13.5589 | 13.5612 | 13.56005 |
| Max. frequency drift [kHz] | | ± 0.05 | | |
| Max. frequency drift [%] | | ± 0.00037 | | |

* calculated as (lower -10dBc frequency + upper -10dBc frequency)/2

**TEST OF 3M DEUTSCHLAND GMBH TYPE 3M(TM) DIGITAL MEDIA DETAGGER
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8 MISCELLANEOUS COMMENTS AND NOTES

None.