

TEST REPORT NO: RL1021/286

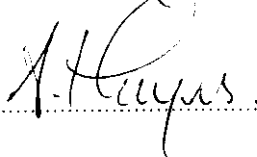
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**REPORT ON THE
CERTIFICATION TESTING OF A
RENISHAW METROLOGY LTD
RMP2-224, inc. MP3
RADIO PROBE TRANSMITTER
S/No's P68713 & E74889
WITH RESPECT TO
THE FCC 47CFR, Pt 15.209
INTENTIONAL RADIATOR
SPECIFICATION**

TEST DATE: 18 FEBRUARY 1999

TESTED BY:  R P I PARRY

APPROVED BY:  S P HAYES

ISSUE DATE: 23rd April 1999

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Notes:-		
1. Component failure during test	YES NO	[] [X]
2. If Yes, details of failure:-		
3. All measurement uncertainty calculations detailed in this report are carried out in accordance with UKAS Publication NIS 81, Edition 1, May 1994, for a 95% confidence level.		
4. The contents of the attached applicant's declarations and other supplied information are not covered by the scope of this laboratory's UKAS or FCC accreditations and is provided in good faith.		

APPLICANT'S SUMMARY

EQUIPMENT UNDER TEST (EUT): RMP2-224, inc. MP3

EQUIPMENT TYPE: RADIO PROBE TRANSMITTER

SERIAL NUMBER OF EUT: S/No's P68713 & E74889

PURPOSE OF TEST: FCC CERTIFICATION

TEST SPECIFICATION: FCC 47CFR Pt 15.209

RESULT OF TEST: COMPLIANT YES ☒
NO ☐

CATEGORY OF APPLICANT: (a) MANUFACTURER ☒
(b) IMPORTER ☐
(c) DISTRIBUTOR ☒
(d) AGENT ☐

APPLICANT'S ORDER NO: RM095794

APPLICANT'S CONTACT PERSON: MARTIN WOOLLETT

APPLICANT: RENISHAW METROLOGY LTD

ADDRESS: NEW MILLS
WOTTON-UNDER-EDGE
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ADDRESS: NEW MILLS
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EUT(s) COUNTRY OF ORIGIN: UNITED KINGDOM

TEST LABORATORY: TRL EMC LTD

UKAS ACCREDITATION NO: 0728

DATE OF TEST: 18 FEBRUARY 1999

TEST REPORT No: RL1021/286

CERTIFICATE OF CONFORMITY & COMPLIANCE

FCC IDENTITY: KGQ RMP2-224

PURPOSE OF TEST: FCC Certification

TEST SPECIFICATION: FCC 47CFR, Part 15.209

TEST RESULT: Compliant to Specification

EQUIPMENT UNDER TEST: RMP2-224, inc. MP3

EQUIPMENT SERIAL No: S/No's P68713 & E74889

ITU EMISSION CODE: 7K00F2DAN

EQUIPMENT TYPE: Radio Probe Transmitter

UTILISATION: Machine Tool Telemetry

CARRIER EMISSION: +43.9dB μ V/m @ 3m

ANTENNA TYPE: Fixed, or Integral

ALTERNATIVE AE: None, as per Part 15.203

BAND OF OPERATION: 224.5MHz to 225.475MHz

CHANNEL SPACING: 5kHz

No. of CHANNELS: 40

FREQUENCY GENERATION: SAW Resonator [] ; Crystal [] ; Synthesizer [X]

MODULATION METHOD: Amplitude [] ; Digital [] ; Angle [X]

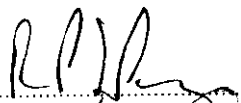
POWER SOURCE(s): +9Vdc, 6 x AA alkaline cells

TEST DATE: 18 FEBRUARY 1999

ORDER No: RM095794

APPLICANT: RENISHAW METROLOGY LTD
NEW MILLS
WOTTON-UNDER-EDGE
GLOUCESTERSHIRE
GL12 8JR
UNITED KINGDOM

TESTED BY:

 R P I PARRY

APPROVED BY:

 S P HAYES
EMC MANAGER

EQUIPMENT TEST CONDITIONS

1.

EQUIPMENT SERIAL / MODEL IDENTITY	CHANNEL NUMBER	Tx NOMINAL FREQUENCY MHz	TESTS REQUIRED	REMARKS
RMP2-224, inc. MP3	1	224.5	emissions	Pt 15.209

2. Equipment category: Single channel ☐
 Two channel ☐
 Multi-channel ☒

3. Supply voltages: Vnom = +9.0Vdc

Note:- Vnom voltages are as stated above unless otherwise shown on the test report page.

4. Temperatures: Tnom = [see test]

5. Maximum bit or pulse rate & level: bps = 1000
 Level = internal

6. Channel spacing: kHz = 25
 Narrowband ☒
 Wideband ☐

7. Frequency deviation or shift: kHz = 5

TESTS REQUIRED

TRANSMITTER TESTS

Transmitter Spurious Emissions - Powerline - Part 15.207	[n/a]
Transmitter Carrier Emission - Radiated - Part 15.209.a	[X]
Transmitter Spurious Emissions - Radiated - Part 15.209.c - <30MHz	[X]
Transmitter Spurious Emissions - Radiated - Part 15.209.c - >30MHz	[X]

Notes:-

1. Equipment tested for (mains ac) 110V powerline emissions. [n/a]
2. Equipment tested as (fixed) integral antenna configuration. [X]
3. All tests were carried out with new batteries, as per Part 15.31.e. [X]

SAMPLE CALCULATIONS

Part 15.207 - Powerline.

Frequency (MHz)	Rx (dB μ V)	LISN Correction (dB)	Cable loss (dB)	Powerline (dB μ V)
n/a				

Part 15.209 - Radiated.

Frequency (MHz)	Rx (dB μ V)	3m Correction (dB)	Ae AF & Cable loss (dB/m & dB)	Field Strength @ 3m (dB μ V/m)
224.500	+24.7	n/a	+19.2	+43.9
898.000	-17.7	n/a	+32.5	+14.8
n/a				

TRANSMITTER TESTS

TRANSMITTER CARRIER EMISSION - RADIATED - PART 15.209.a

Ambient temperature	=	+12°C	3m measurements <30MHz	[]
Relative humidity	=	68%	1m measurements >1GHz	[]
Conditions	=	Open Area Test Site (OATS)	300m extrapolated from 3m	[]
Supply voltage	=	Vnom	30m extrapolated from 3m	[]
Channel number	=	1	3m extrapolated from 1m	[]

Frequency & Level		224.500MHz	+43.9dBμV/m @ 3m
Limit	216MHz to 960MHz	+46.0dBμV/m @ 3m	
Measurement Uncertainty		±4.2dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Extrapolation factor @ 40dB/decade from 300m to 30m, as per Part 15.31f.
- Extrapolation factor @ graph values from 30m to 3m, as per Annex D.
- Extrapolation factor @ 9.5dB from 1m to 3m, as per Part 15.31f.
- Measurements <490kHz @ 3m, as per Part 15.31f (2).
- Measurements <1705kHz @ 3m, as per Part 15.31f (2).
- Measurements <30MHz @ 3m, as per Part 15.31f (2).
- Measurements >1GHz @ 1m, as per Part 15.31f (1).
- Receiver detector <30MHz = CISPR, Quasi-Peak, 10kHz bandwidth.
- Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
- Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1 to 7 (inc) above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

- Full description at Annex B.
- TRL190, TRL191, TRL08, TRL415, TRL251.

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS - RADIATED - PART 15.209.c - <30MHz

Ambient temperature	=	+12°C	3m measurements <30MHz	[X]
Relative humidity	=	68%	300m extrapolated from 3m	[X]
Conditions	=	Open Area Test Site (OATS)	30m extrapolated from 3m	[X]
Supply voltage	=	Vnom		
Channel number	=	1		

Frequency & Level 9kHz to 490kHz		nil emissions	>10dB below limit
Frequency & Level 490kHz to 1705kHz		nil emissions	>10dB below limit
Frequency & Level 1705kHz to 30MHz		nil emissions	>10dB below limit
Limits	9kHz to 490kHz	$20\text{Log}_{10}[2400/F(\text{kHz})]\text{dB}\mu\text{V/m @ 300m}$	
	490kHz to 1705kHz	$20\text{Log}_{10}[24000/F(\text{kHz})]\text{dB}\mu\text{V/m @ 30m}$	
	1705kHz to 30MHz	+29.5dB $\mu\text{V/m @ 30m}$	
Measurement Uncertainty		±4.2dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Emissions were searched to:- (x) 2500MHz inclusive, as per Part 15.33a.
- Extrapolation factor @ 40dB/decade from 300m to 30m, as per Part 15.31f.
- Extrapolation factor @ graph values from 30m to 3m, as per Annex D.
- Measurements <490kHz @ 3m, as per Part 15.31f (2).
- Measurements <1705kHz @ 3m, as per Part 15.31f (2).
- Measurements <30MHz @ 3m, as per Part 15.31f (2).
- Receiver detector <30MHz = CISPR, Quasi-Peak, 10kHz bandwidth.
- Nil emissions sensitivity of +36dB $\mu\text{V/m @ 3m}$.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1 to 7 (inc) above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

- Full description at Annex B.
- TRL190, TRL191, TRL08, TRL07, TRL237.

TRANSMITTER TESTS

TRANSMITTER SPURIOUS EMISSIONS - RADIATED - PART 15.209.c - >30MHz

Ambient temperature	=	+12°C (<1GHz), +21°C (>1GHz)	3m measurements <1GHz	[X]
Relative humidity	=	68% (<1GHz), 66% (>1GHz)	1m measurements >1GHz	[X]
Conditions	=	Open Area Test Site (OATS)	3m extrapolated from 1m	[X]
Supply voltage	=	Vnom		
Channel number	=	1		

Frequency & Level 30MHz to 88MHz		nil emissions	>10dB below limit
Frequency & Level 88MHz to 216MHz		nil emissions	>10dB below limit
Frequency & Level 216MHz to 960MHz		449.000MHz 673.500MHz 898.000MHz	+7.7dBµV/m @ 3m +12.1dBµV/m @ 3m +14.8dBµV/m @ 3m
Frequency & Level 960MHz to (x) MHz		nil emissions	>10dB below limit
Limits	30MHz to 88MHz	+40.0dBµV/m @ 3m	
	88MHz to 216MHz	+43.5dBµV/m @ 3m	
	216MHz to 960MHz	+46.0dBµV/m @ 3m	
	960MHz to (x) MHz	+54.0dBµV/m @ 3m	
Measurement Uncertainty		±4.1dB	

Notes:-

- Results quoted are extrapolated as indicated.
- Emissions were searched to:- (x) 2500MHz inclusive, as per Part 15.33a.
- Extrapolation factor @ 9.5dB from 1m to 3m, as per Part 15.31f.
- Measurements >1GHz @ 1m, as per Part 15.31f (1).
- Receiver detector <1GHz = CISPR, Quasi-Peak, 120kHz bandwidth.
- Receiver detector >1GHz = Peak Hold, 1MHz resolution bandwidth.
- Sample calculation, see page 6.

Test Method:-

- As per Radio - Noise Emissions, ANSI C63.4: 1992.
- Measuring distances as Notes 1 to 4 above.
- EUT 0.8 metre above ground plane.
- Emissions maximised by rotation of EUT, on an automatic turntable, raising and lowering the receiver antenna between 1m & 4m in horizontal and vertical polarisations, with worst case results recorded.

Test Equipment Used:-

- Full description at Annex B.
- TRL190, TRL191, TRL08, TRL415, TRL164, TRL251, TRL203, TRL138, TRL279.