

TEST REPORT

Test Report No. : UL-RPT-RP10833755JD08A V2

Manufacturer	:	Panasonic Mobile Communications Development of Europe Ltd
Model No.	:	P-01H
FCC ID	:	UCE115064A
Technology	:	RFID – 13.56 MHz
Test Standard(s)	:	FCC Parts 2.1049, 15.209(a) & 15.225

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- 2. The results in this report apply only to the sample(s) tested.
- 3. The sample tested is in compliance with the above standard(s).
- 4. The test results in this report are traceable to the national or international standards.
- 5. Version 2.0 Supersedes all previous versions

Date of Issue:

28 September 2015

Checked by:

Lever Eld

Steven White Project Lead, Radio Laboratory

Issued by :

John Newell Quality Manager, UL VS LTD



This laboratory is accredited by UKAS. The tests reported herein have been performed in accordance with its terms of accreditation.

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<u>1. Customer Information</u>

Company Name:	Panasonic Mobile Communications Development of Europe Ltd
Address:	Panasonic House Willoughby Road Bracknell Berkshire RG12 8FP United Kingdom

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.225
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) - Section 15.225
Specification Reference:	47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.209
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	14 September 2015 to 17 September 2015

2.2. Summary of Test Results

FCC Reference (47CFR) Measurement		Result
Part 15.225(a)(b)(c)(d)	Transmitter Fundamental Field Strength	
Part 15.209(a)/15.225(d)	Transmitter Radiated Emissions	
Part 15.209(a)/15.225(c)(d)	Transmitter Band Edge Radiated Emissions	
Part 2.1049	Transmitter 20 dB Bandwidth	
Part 15.225(e)	Transmitter Frequency Stability (Temperature & Voltage Variation)	
Key to Results		
Image: Second state of the second state of		

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	FCC KDB Publication Number 937606 Date: 10/10/2014
Title:	Test Site Requirements for Part 15 and 18 Devices Operating Below 30 MHz

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Docomo
Model Name or Number:	P-01H
Test Sample IMEI Number:	351772070004758
Hardware Version Number:	Rev D
Software Version Number:	ACPU: B-D52CS1-01.03.007 CCPU: D52CS1_Cv18122302
FCC ID:	UCE115064A

Description:	Rechargeable Li-ion Battery Pack
Brand Name:	NTT Docomo
Model Name or Number:	P32
Serial Number:	N/A

Description:	Stereo Earphone
Brand Name:	NTT Docomo
Model Name or Number:	01
Serial Number:	N/A

Description:	USB Cable with charge function
Brand Name:	NTT Docomo
Model Name or Number:	02
Serial Number:	N/A

3.2. Description of EUT

The equipment under test was a Single Mode UTRA Mobile Phone with Bluetooth and RFID technologies

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Tested Technology:	RFID	
Category of Equipment:	Transceiver	
Channel Spacing:	Single channe	I device
Transmit Frequency Range:	13.56 MHz	
Power Supply Requirement:	Nominal	3.7 VDC
	Minimum	3.4 VDC
	Maximum	4.2 VDC
Tested Temperature Range:	Minimum	-20°C
	Maximum	+50°C

3.5. Support Equipment

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

Description:	Dummy Battery
Brand Name:	N/A
Model Name or Number:	N/A
Serial Number:	N/A

Description:	Micro SD card
Brand Name:	Generic
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	USB Hub
Brand Name:	Belkin
Model Name or Number:	Not marked or stated
Serial Number:	D12-0047312

3.5.1. Operation and Monitoring of the EUT during Testing

3.6. Operating Modes

The EUT was tested in the following operating mode(s):

• Constantly transmitting at full power with a modulated carrier in RFID test mode.

3.7. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- The RFID transmitter test mode was enabled using a test SIM card and the manufacturer's test software that was installed on the EUT.
- AC conducted emissions tests not were performed because the EUT does not transmit when connected to the AC charger.
- Transmitter radiated spurious emissions test were performed with the PHF as this was found to be the worst case during pre-scans. All the accessories were individually connected and measurements made during the pre-scans to determine the worst case combination.
- A micro SD card was fitted to the EUT for all radiated measurements.
- Testing at voltage extremes was performed with a dummy battery fitted to the EUT, which was supplied by the customer.
- Refer to Appendix 1 of this test report for details of radiated tests on an open field test site.

4. Measurements, Examinations and Derived Results

4.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6: Measurement Uncertainties* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

4.2. Test Results

4.2.1. Transmitter Fundamental Field Strength

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	15 September 2015 & 16 September 2015
Test Sample IMEI Number:	351772070004758		

FCC Reference: Part 15.225(a)(b)(c)(d)	
Test Method Used:	FCC KDB 937606 referencing ANSI C63.10 Section 6.4

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	48

Note(s):

- In accordance with FCC KDB 937606, a *bona fide* attempt was made to perform measurements at the distances specified in Part 15.209(a). However, it was not possible to determine the emission value at the test distances specified below 30 MHz on an open field test site, therefore in accordance with 47 CFR 15.31(f), measurements were made at closer distances. Background scans of the open field test, with further information are shown in Appendix 1 of this test report.
- 2. It was not possible to see the EUT carrier at 30 metres due to the low level of the carrier and high level of ambient emissions. The test was therefore repeated at a distance of 3 metres where the carrier was visible above the level of ambient emissions.
- 3. The limit is specified at a test distance of 30 metres. However, as specified by FCC Section 15.31 (f)(2), measurements may be performed at a closer distance and the measured level corrected to the specified measurement distance by using the square of an inverse linear distance extrapolation factor (40dB/decade).
- 4. Pre-scan measurements were performed using a spectrum analyser with a peak detector and measurement bandwidth of 10 kHz. The fundamental field strength was maximized by rotating the measurement antenna and EUT. A peak level of 51.7 dBµV/m at a measurement distance of 3 metres was recorded and shown on the pre-scan plot below. The spectrum analyser was then switched to test receiver mode and the final measurement on the maximized level was performed. In accordance with ANSI C63.10 Clause 4.2.3.2.1 and CISPR 16-1-1, with a quasi-peak detector, a measurement bandwidth of 9 kHz and a 0.2 second sweep time. A quasi-peak level of 51.4 dBµV/m was recorded.

The corrected level to the specified measurement distance (using a linear distance extrapolation factor of 40 dB/decade) is $11.4 \text{ dB}\mu\text{V/m}$.

Corrected level: $51.4 - 40 = 11.4 \text{ dB}\mu\text{V/m}$ at 3 metres

- 5. Due to the ambient emissions present on the open field test site, compliance with the spectrum mask is shown by measurements performed in a semi-anechoic chamber. For the field strength measurements in a semi-anechoic chamber, a reference level offset on the test receiver was used to replicate the measurements at 30 metres on the open field test site.
- 6. A transducer factor was used on the spectrum analyser during open field tests. This factor includes correction between the fixed gain of the magnetic loop antenna and the calibration values. It also includes the value of the RF cable used to connect the antenna to the spectrum analyser which was incorporated into the annual calibration of the magnetic loop antenna.
- 7. Several plots in this section are incorrectly dated as the (15 september 2044), these plots should read (15 september 2015)

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<u>Transmitter Fundamental Field Strength (continued)</u> <u>Test setup measurements on an open field test:</u>



Test setup for measurements in a Semi-Anechoic Chamber:



Transmitter Fundamental Field Strength (continued)

Frequency (MHz)	Measurement Antenna Position	Level (dBµV/m)	Limit at 30 m (dBµV/m)	Margin (dB)	Result
13.56	Tip at 90°to EUT	11.4	84.0	72.6	Complied



Fundamental field strength and spectrum mask / measured at 3 metres extrapolated to 30 metres / measured in a semi-anechoic chamber



Fundamental field strength / EUT operating / measured at 30 metres / measured on an open field test site





Transmitter Fundamental Field Strength (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Туре No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1945	ThermoHygrometer	JM Handelspunkt	30.5015.01	Not stated	23 Apr 2016	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	19 Mar 2016	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	19 Mar 2016	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	06 May 2016	12
M1783	ThermoHygrometer	JM Handelspunkt	30.5015.13	Not stated	23 Apr 2016	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB30	842659/016	11 Aug 2016	12

4.2.2. Transmitter Radiated Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	14 September 2015, 15 September 2015 & 16 September 2015
Test Sample IMEI Number:	351772070004758		

FCC Reference:	Parts 15.225(d) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4, 6.5 and FCC KDB 937606
Frequency Range:	9 kHz to 1000 MHz

Environmental Conditions:

Temperature (°C):	21 to 24
Relative Humidity (%):	42 to 58

Note(s):

 In accordance with FCC KDB 937606, a *bona fide* attempt was made to perform measurements at the distances specified in Part 15.209(a) on an open field test site. However, it was not possible to determine the spurious emission values at the test distances specified below 30 MHz on an open field test site, due to the presence of ambient emissions, therefore in accordance with 47 CFR 15.31(f), measurements were made at closer distances in a semi anechoic chamber.

Final measurement results from the semi-anechoic chamber tests are shown in this section, In addition to the open field test result plots for measurements between 9 kHz and 30 MHz. These measurement plots are identical to background scan plots of the open field test site shown in Appendix 1 of this test report.

- The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss. Only spurious emissions in the range 30 MHz to 1 GHz were recorded. Markers were placed on the peaks of the prescan plot and final measurements were performed using a quasi peak detector.
- 3. All other emissions were greater than 20 dB below the applicable limit, below the noise floor of the measurement system or ambient.
- 4. Measurements in a semi-anechoic chamber (UL VS LTD Asset Number K0001) were performed at a distance of 3 metres. The EUT loop was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Between 30 MHz and 1 GHz, maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
- 5. Measurement plots in this section for tests between 9 kHz and 30 MHz on an open field test site have markers placed on the highest level ambient emissions. This is for information only.
- 6. Limit lines shown on open field test site plots from 9 kHz to 490 kHz have been extrapolated using a factor of 40 dB/decade to a test distance of 30 metres and are for indication only.
- 7. A transducer factor was used on the spectrum analyser during open field tests. This factor includes correction between the fixed gain of the magnetic loop antenna and the calibration values. It also includes the value of the RF cable used to connect the antenna to the spectrum analyser which was incorporated into the annual calibration of the magnetic loop antenna.
- Several plots in this section are incorrectly dated as the (15 september 2044), these plots should read (15 september 2015)

Test setup for radiated spurious emissions measurements on an open field test site:



<u>Test setup for radiated spurious emissions measurements in a Semi-Anechoic Chamber</u> < 30MHz



Test setup for radiated spurious emissions measurements in a Semi-Anechoic Chamber > 30 MHz:



Results: Quasi Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
81.349	Vertical	22.4	40.0	17.6	Complied
186.302	Vertical	24.5	43.5	19.0	Complied
338.994	Horizontal	31.5	46.0	14.5	Complied
352.557	Horizontal	33.2	46.0	12.8	Complied
366.120	Horizontal	31.0	46.0	15.0	Complied

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Transmitter Radiated Spurious Emissions (continued)













9 kHz to 150 kHz / average detector / EUT operating / measured at 300 metres on an open field test site

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.











¹⁵⁰ kHz to 490 kHz / average detector / EUT operating / measured at 3 metres on an open field test site



150 kHz to 490 kHz / average detector / EUT operating / measured at 300 metres on an open field test site

Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.









Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying table.



490 kHz to 30 MHz / peak detector / EUT operating / measured at 30 metres on an open field test site

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Туре No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1945	ThermoHygrometer	JM Handelspunkt	30.5015.01	Not stated	23 Apr 2016	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	19 Mar 2016	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	19 Mar 2016	12
A490	Bilog Antenna	Chase	CBL6111A	1590	30 Apr 2016	12
G0543	Amplifier	Sonoma	310N	230801	06 Nov 2015	3
A1834	Attenuator	Hewlett Packard	8491B	10444	05 Mar 2016	12
M1783	ThermoHygrometer	JM Handelspunkt	30.5015.13	Not stated	23 Apr 2016	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB30	842659/016	11 Aug 2016	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	06 May 2016	12

4.2.3. Transmitter Band Edge Radiated Emissions

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	15 September 2015 & 16 September 2015	
Test Sample IMEI Number:	351772070004758			

FCC Reference:	Parts 15.225(c)(d) & 15.209(a)	
Test Method Used:	As detailed in ANSI C63.10 Section 6.4	

Environmental Conditions:

Temperature (°C):	20 to 22
Relative Humidity (%):	41 to 58

Note(s):

 In accordance with FCC KDB 937606, a *bona fide* attempt was made to perform measurements at the distances specified in Part 15.209(a). However, It was not possible to determine the band edge emission values at the test distances specified below 30 MHz on an open field test site due to the presence of ambient emissions, therefore in accordance with 47 CFR 15.31(f), measurements were made at closer distances in a semi-anechoic chamber

Results from the semi-anechoic chamber tests are shown in this section of the test report. Background scans of the open field test site are shown in Appendix 1.

2. For the field strength measurements in a semi-anechoic chamber, a transducer factor on the measuring instrument was used to extrapolate the results at 3 metres to a distance of 30 metres where required. A distance extrapolation factor of 40 dB was used.

Transmitter Band Edge Radiated Emissions (continued)

Test setup for band edge radiated emissions measurements on an open field test:



Test setup for band edge radiated emissions measurements in a Semi-Anechoic Chamber:



Transmitter Band Edge Radiated Emissions (continued)

Results: Lower Band Edge

Frequency	Level	Limit	Margin	Result
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	
13.11	-5.5	29.5	35.0	Complied

Results: Upper Band Edge

Frequency	Level	Limit	Margin	Result
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	
14.01	-4.7	29.5	34.2	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Туре No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1945	ThermoHygrometer	JM Handelspunkt	30.5015.01	Not stated	23 Apr 2016	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	19 Mar 2016	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	19 Mar 2016	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	06 May 2016	12
M1783	ThermoHygrometer	JM Handelspunkt	30.5015.13	Not stated	23 Apr 2016	12
M127	Spectrum Analyser	Rohde & Schwarz	FSEB30	842659/016	11 Aug 2016	12

4.2.4. Transmitter 20 dB Bandwidth

Test Summary:

Test Engineer:	Andrew Edwards	Test Date:	16 September 2015
Test Sample IMEI Number:	351772070004758		

FCC Reference:	Part 2.1049
Test Method Used:	As detailed in ANSI C63.10 Section 6.9.2

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	41

Test setup:



Transmitter 20 dB Bandwidth (continued)

Results:

20 dB Bandwidth (kHz)
34.669



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Transmitter 20 dB Bandwidth (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Туре No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1945	ThermoHygrometer	JM Handelspunkt	30.5015.01	Not stated	23 Apr 2016	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	19 Mar 2016	12
M1273	Test Receiver	Rohde & Schwarz	ESIB26	100275	19 Mar 2016	12
M1568	Magnetic Loop Antenna	Rohde & Schwarz	HFH2-Z2	879284/2	06 May 2016	12

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4.2.5. Transmitter Frequency Stability (Temperature & Voltage Variation)

Test Summary:

Test Engineer:	David Doyle Test Date: 17 September				
Test Sample IMEI Number:	351772070005144				
FCC Reference:	Part 15.225(e)				
Test Method Used:	As detailed in ANSI C63.10 Section 6.8.1 and 6.8.2				
Environmental Conditions:					
Ambient Temperature (°C):	25				

Note(s):

Ambient Relative Humidity (%):

- 1. Testing at voltage extremes was performed with the EUT powered by an external DC power supply. The EUT's battery was removed and the power supply was connected to the EUT's battery terminals. The manufacturer declared the minimum and maximum primary supply voltages as 3.4 and 4.2.
- 2. Frequency error was measured using a calibrated Rohde & Schwarz spectrum analyser.
- 3. Temperature was monitored throughout the test with a calibrated digital thermometer.
- 4. Voltage was monitored throughout the test with a calibrated digital voltmeter.

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<u>Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)</u> <u>Test setup for environmental measurements:</u>



Transmitter Frequency Stability (Temperature & Voltage Variation) (continued)

Results: Maximum frequency error of the EUT with variations in ambient temperature

Temperature (°C)	Time after Start-up					
	0 minutes	2 minutes	5 minutes	10 minutes		
-20	13.560066 MHz	13.560066 MHz	13.560063 MHz	13.560051 MHz		
20	13.560052 MHz	13.560050 MHz	13.560047 MHz	13.560045 MHz		
50	13.559972 MHz	13.559975 MHz	13.559975 MHz	13.559976 MHz		

Frequency with Worst Case Deviation (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
13.560066	66	0.000487	0.01	0.009513	Complied

<u>Results: Maximum frequency error of the EUT with variations in nominal operating voltage</u> <u>at an ambient temperature of 20°C</u>

Supply Voltage (V)	Nominal Frequency (MHz)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (%)	Limit (%)	Margin (%)	Result
3.4	13.56	13.560046	44	0.000339	0.01	0.009661	Complied
3.7	13.56	13.560045	45	0.000332	0.01	0.009661	Complied
4.2	13.56	13.560046	44	0.000339	0.01	0.009661	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Туре No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1783	Thermohygrometer	JM Handelspunkt	30.5015.13	None Stated	23 Apr 2016	12
E013	Environmental Chamber	Sanyo	MTH- 4200PR	None Stated	Calibrated before use	-
S021	DC Power Supply	Thurlby Thander Instruments	CPX 200	061034	Calibrated before use	-
M122	Multimeter	Fluke	77	64910017	22 Apr 2016	12
M1642	Thermometer	Fluke	5211	18890119	23 Apr 2016	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046	06 Oct 2015	12

5. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

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. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
20 dB Bandwidth	13 MHz to 14 MHz	95%	±3.92 %
Frequency Stability	13 MHz to 14 MHz	95%	±0.92 ppm
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±3.73 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	±5.65 dB
Transmitter Fundamental Field Strength	13 MHz to 14 MHz	95%	±3.73 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

6. Report Revision History

Version	Revision Det	ails	
Number	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Correction of typographical errors, and the addition of a note which clarifies the date on some emissions plots.