

Test Report

Electromagnetic Compatibility

Product	DECT Wireless Microphone
Name and address of the applicant	Panasonic Corporation of North America Two Riverfront Plaza, 9 th Floor Newark, 07102-5490, NJ, USA
Name and address of the manufacturer	Panasonic Connect Co., Ltd. 4-1-62 Minoshima, Hakata-ku Fukuoka 812-8531, JAPAN
Model	K-SHH24
Rating	3.7V _{DC} (Li-Ion Battery)
Trademark	Audio Enhancement
Additional information	DECT 6.0
Tested according to	FCC CFR 47 Subpart 15B ISED Canada ICES-003, Issue 7
Project number	PRJ0039924
Tested in period	2023-10-16 to 2023-10-18
Issue date	2023-11-02
Name and address of the testing laboratory	Nemko Scandinavia AS Philip Pedersens vei 11, 1366 Lysaker, Norway
  An accredited technical test executed under the Norwegian accreditation scheme	
 Prepared by [Frode Sveinsen]  Approved by [Jan G Eriksen]	

Nemko Group

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REPORT REVISIONS

Report Edition	Date	Project	Description
A	2023-11-02	PRJ0039924	First issued



THIS REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATION(S) TESTED.

It is the manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is responsible to the authorities for any modifications made to the product, which result in non-compliance to the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither is opinions expressed regarding model variants covered by the testing performed in this report.

Deviations from, additions to, or exclusions from the test specifications are described in "Test Report Summary".

This report was originally distributed electronically with digital signatures. For more information contact Nemko.

DESCRIPTION OF TESTED ITEM(S)

Product description..... :	The EUT is a DECT Wireless Microphone and is an initiating device as described in ANSI C63.17 and is designed to operate together with a DECT Wireless Antenna, which is the responding device. US and Canadian models are identical.
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Model/type	K-SHH24
Serial number	PRJ00399240021
Operating voltage..... :	3.7V DC
Maximum power/current..... :	150 mA
Highest clock frequency	/
Hardware version	PULB1097ZA-GL
Software version	Ver1.00R00
Other information	FCC ID: ACJ9TAK-SHH24

Mounting position..... :	☒ Handheld equipment
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CRITICAL MODULES/PARTS

Description	Manufacturer	Type
DECT Wireless Microphone	Panasonic	K-SHH24

ACCESSORIES USED DURING TEST

Description	Manufacturer	Type
USB Charger with 2x USB-A Outputs	Audio Enhancement	360539 Vivid2.4

INPUT/OUTPUT PORTS

Port name and description	Cable		
	Longer than 3m	Attached during test	Shielded
USB-C Charging Port	☐	☒	☐

OPERATING MODES

OP no.	Description	Applied for testing	
		Emissions	Immunity
OP1	Charging	☒	☐

POWER SUPPLY CONDITIONS

The following nominal power supply conditions have been tested:

PC no.	Voltage	Frequency	Type	Ground terminal
PC1	120 V AC	☐ AC 50Hz / ☒ AC 60Hz / ☐ DC	☐ 3AC / ☐ 3ACN / ☐ PoE	☐ PE / ☐ GND / ☒ None

- ☐ The power supply voltage has been selected after a maximum disturbance investigation over the product's rated voltage range.
- ☐ Additional chassis grounding was applied.

Drawing of test setup..... :

Semi-Anechoic Chamber



Test Set-Up 1

This test setup is used for all radiated emissions tests. Measuring distance is 3m.

A pre-amplifier is used for all measurements and a Low-Pass or Band-Reject filter is used for all frequencies between 30 MHz and 12 GHz.

POWER LINE CONDUCTED EMISSIONS TEST

Shielded Room



Test Set-Up 2

OTHER INFORMATION

Modifications	None
Additional information	None

TEST ENVIRONMENT

Test laboratory	☒ KJELLER (Instituttveien 6, N-2007 Kjeller, Norway) ☐ LYSAKER (Philip Pedersens vei 11, N-1366 Lysaker, Norway)
Laboratory accreditation	 Norsk Akkreditering – TEST 033 P06 – Electromagnetic Compatibility
Environmental conditions	The climatic conditions during the tests are within limits specified by the manufacturer for the operation of the product and the test equipment. The climatic conditions during tests are within the following limits: Ambient temperature: 15 – 35 °C Relative humidity: 25 – 75 %RH Atmospheric pressure: 86 – 106 kPa If explicitly required by the test standard, or the requirements are tighter than the above; the climatic conditions are recorded and documented separately in this test report.
Calibration	All instruments used in the tests of this test report are calibrated and traceable to national or international standards. Between calibrations test set-ups are controlled and verified on a regular basis by intermediate checks to ensure, with 95% confidence that the instruments remain within their calibrated levels. The instrumentation accuracy is within limits agreed by the IECEE/CTL and defined by Nemko.
Measurement uncertainties	Uncertainty in EMC emission measurements stated in this report are calculated from the standard measurement uncertainties multiplied by the coverage factor $k=2$. It was determined in accordance with CISPR 16-4-2. The true value is in the corresponding interval with a probability of 95%. Uncertainties for continuous immunity tests are calculated based on the same principles as for EMC emission uncertainties. For Harmonics and Flicker measurements the measurement uncertainty is calculated based on the same principles as for EMC emission uncertainties. Uncertainties for transient immunity are kept within the requirements of the relevant basic standard. <i>Further information about measurement uncertainties is provided on request.</i>
Decision rules	As specified by CISPR 16-4-2; if our measurement uncertainty U_{LAB} is less than or equal to U_{CISPR}, compliance is deemed to occur if no measured disturbance level exceeds the limit hence “PASS” is indicated, and non-compliance is deemed to occur if any measured disturbance level exceeds the limits hence “FAIL” is indicated. For continuous immunity tests, uncertainties are not considered when applying the calibrated test levels. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen. For transient immunity tests, uncertainties are not considered if the test equipment is kept within the requirements of the relevant basic standard. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen. For Harmonics and Flicker measurements the measurement uncertainty is considered, and measurements are marked if necessary. In doing so, the associated uncertainty of measurement has been considered. <i>Further information about decision rules is provided on request.</i>

TEST REPORT SUMMARY

APPLIED STANDARDS

Standards	Titles
FCC CFR 47 Subpart 15B	<i>Digital devices - Unintentional radiators, Class B Digital Device</i>
ISED Canada ICES-003, Issue 7	<i>Spectrum Management and Telecommunications Policy. Interference-Causing Equipment Standard. Information Technology Equipment (Including Digital Apparatus - Limits and Methods of Measurement (Issue 7, June 2020)</i>

TEST SUMMARY

Requirements – Tests	Reference standards	Verdict
Conducted Emissions	FCC CFR 47 Subpart 15B ISED Canada ICES-003, Issue 7 FCC Part 12.107 per ANSI C63.4-2014	PASS
Radiated Emissions (Below 1GHz)	FCC CFR 47 Subpart 15B ISED Canada ICES-003, Issue 7 FCC Part 12.109 per ANSI C63.4-2014	PASS

PASS	: Tested and complied with the requirements
FAIL	: Tested and failed the requirements
N/A	: Test not relevant to this specimen (evaluated by the test laboratory)
—	: Test not performed (instructed by the applicant)
*	: An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
#	: A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

ABOUT REFERENCE STANDARDS AND TEST LEVELS

Product standards with dated references to basic standards may have been performed according to the newest edition of the basic standard. This may impact the compliance criteria or technical performance of the test, still this is adequate if the test is expected to confirm compliance to the intention of the product standard. The table above lists the actual editions of the basic standards which have been used during testing.

NOTES

None

Test Results

CONDUCTED EMISSIONS

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

The measurement was performed at the power supply terminal of the specimen. Nominal supply voltage was provided. The specimen was energized and in normal operating mode during the measurement.

- ☐ The specimen and its cables were elevated 10 cm above a ground plane.
- ☐ The specimen and its cables were elevated 40 cm above a ground plane.
- ☒ The specimen and its cables were placed 40 cm from a vertical ground plane, 80 cm over ground plane.
- ☐ The specimen was mounted directly on, and bonded to a ground plane. Cables and auxiliary equipment were elevated by 1 cm

- ☒ The specimen was connected to an Artificial Mains Network (AMN) by its power supply cable, which was adjusted to 100cm length by folding.
- ☐ The specimen was connected to an Artificial Mains Network (AMN) by a 0.8 m shielded power supply cable directly connected to the AMN

Conditions

- ☐ Frequency range was 9kHz – 30MHz.
- ☐ Frequency range was 10kHz – 30MHz.
- ☒ Frequency range was 150kHz – 30MHz.

The measuring bandwidth is 200Hz in the frequency range 9 kHz – 150 kHz. Measurement was made with a 100 Hz step size and 100 ms dwell time.

The measuring bandwidth is 9 kHz in the frequency range 150 kHz – 30 MHz. Measurement was made with a 4.5 kHz step size and 20 ms dwell time.

Measurement uncertainty: ± 3.7 dB (9 kHz – 150 kHz); ± 3.3 dB (150 kHz – 30 MHz)

Instruments used during measurement

Instrument list: AMN: R&S / ENV216 (LR-1665) (11/2023)
 EMI Receiver: R&S / ESCI 3 (N-4259) (10/2023)
 Power Source: Agilent / 6812B (LR 1515) (11/2024)

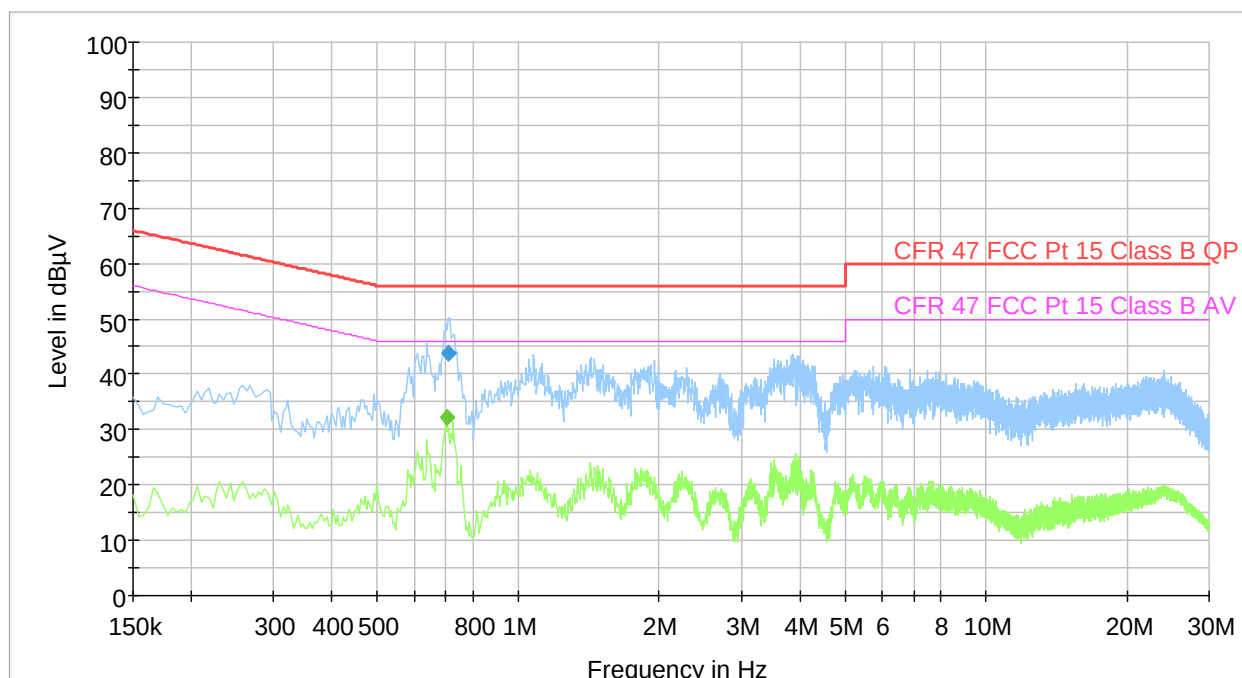
Conformity

Verdict: **PASS**

Test engineer: **FS**

EMISSION SPECTRUM

Full Spectrum



— Preview Result 2-AVG — Preview Result 1-PK+
— CFR 47 FCC Pt 15 Class B QP — CFR 47 FCC Pt 15 Class B AV
◆ Final_Result QPK ◆ Final_Result CAV

MEASUREMENT DATA

Frequency (MHz)	QuasiPeak (dBμV)	CAverage (dBμV)	Limit (dBμV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.702000	---	32.17	46.00	13.83	15000.0	9.000	L1	OFF	9.6
0.710000	43.82	---	56.00	12.18	15000.0	9.000	L1	OFF	9.6

RADIATED EMISSIONS (BELOW 1GHZ)

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Set-up

The measurements were performed in a semi-anechoic chamber (SAC). Nominal supply voltage was provided.

The specimen was energized and in normal operating mode during the measurement.

- ☐ The specimen and its cables were elevated 10 cm above the site ground plane and placed in the centre of the turntable.
- ☒ The specimen and its cables were placed on a table 80 cm above the site ground plane and placed in the centre of the turntable.
- ☐ Ferrite clamps type CMAD were applied to cables leaving the test volume.
- ☐ A CDNE was applied to the power supply cable.

Antenna type = Hybrid bilog antenna

Antenna elevation = 100-400 cm above the ground reference plane.

Specimen rotation = 0-360°.

- ☒ Low-Pass filter was used to suppress any RF transmission above 1 GHz.

Frequency range:

- ☐ 30-300MHz
- ☒ 30-1000MHz
- ☐ Other:

Measurement distance:

- ☒ 3m
- ☐ 5m
- ☐ 10m

Conditions

The measuring bandwidth is 120 kHz in the frequency range 30 MHz – 1000 MHz. Frequency sweeps with RBW = 120 kHz and VBW = 1 MHz was applied with a sweep time of 20 ms (step size resolution < 60 kHz).

Measurement uncertainty: ± 4.9 dB (3m distance in SAC10); ± 4.6 dB (3m distance in SAC3); ± 4.6 dB (10m distance in SAC10)

Instruments used during measurement

Instrument list: Antenna, BiLog: Sunol / JB3 (N-4525) (04/2023)
EMI Receiver: R&S / ESU40 (LR-1639) (01/2024)
Preamplifier: Sonoma / 310N (LR-1686) (08/2023)
Power Source: Agilent / 6812B (LR 1515) (11/2024)

Conformity

Verdict:

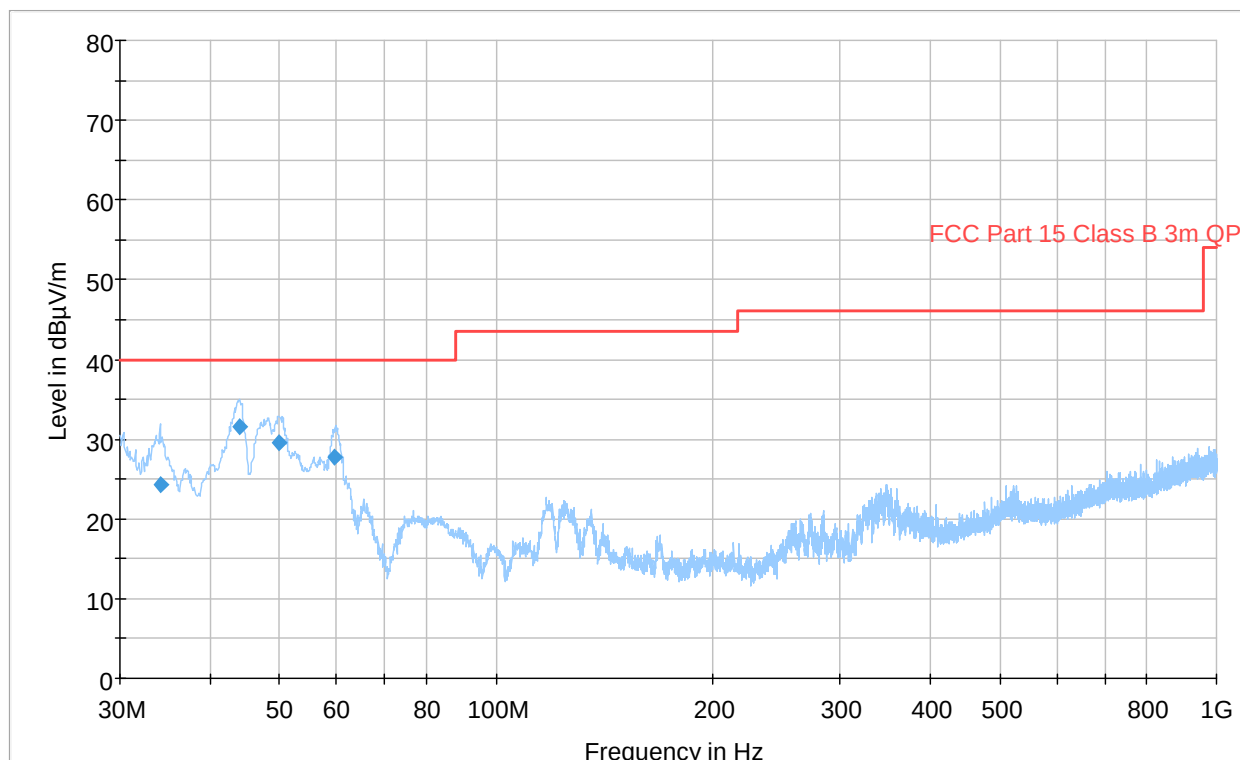
PASS

Test engineer:

FS

EMISSION SPECTRUM

Full Spectrum



MEASUREMENT DATA

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
34.111906	24.34	40.00	15.66	15000.0	120.000	150.0	V	98.0	-7.5
44.095006	31.62	40.00	8.38	15000.0	120.000	110.0	V	233.0	-13.3
49.918118	29.50	40.00	10.50	15000.0	120.000	118.0	V	344.0	-15.1
59.717010	27.70	40.00	12.30	15000.0	120.000	104.0	V	211.0	-17.8

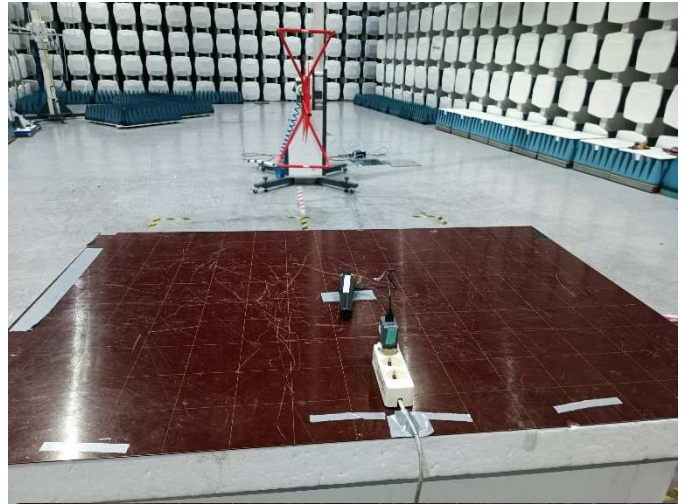
Annexes

PHOTOS

Test set-up for EMC emissions measurements



Conducted emission



Radiated emission