

Produkte
Products

Prüfbericht-Nr.: <i>Test Report No.:</i>	CN21XYOS 001	Auftrags-Nr.: <i>Order No.:</i>	158238097	Seite 1 von 14 <i>Page 1 of 14</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	06.09.2021		
Auftraggeber: <i>Client:</i>	KONDO KAGAKU CO., LTD. 4-17-7 Higashi -Nippori, Arakawa-ku, Tokyo, Japan				
Prüfgegenstand: <i>Test item:</i>	Radio module - R14 Transceiver				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	R-14				
Auftrags-Inhalt: <i>Order content:</i>	FCC test				
Prüfgrundlage: <i>Test specification:</i>	FCC Part 15 Subpart C, ANSI C63.10-2013				
Wareneingangsdatum: <i>Date of receipt:</i>	06.09.2021				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A003115757-001				
Prüfzeitraum: <i>Testing period:</i>	14.09.2021-19.09.2021				
Ort der Prüfung: <i>Place of testing:</i>	Hong Kong				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Hong Kong Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:			kontrolliert von / reviewed by:		
					
20.09.2021	Felicia Chan / Assistant Engineer	20.09.2021	Sharon Li / Unit Senior Manager		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other: FCC ID: QH9R14MOD					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2404 - 2476MHz
Type of modulation	GFSK
Number of channels	37
Type of antenna	Fixed Integral wire antenna
Power level	fix
Connection to public utility power line	No
Nominal voltage	3.3 VDC

Product function and intended use

The equipment under test (EUT) is a modular transceiver of radio control toy operating at 2.4GHz. It is powered by battery only.

FCC ID: QH9R14MOD

Models	Product description
R-14	Radio module - R14 Transceiver

Submitted documents

- User Manual
- Circuit diagram
- BOM

Independent Operation Modes

The basic operation modes are:

- Transmitting mode.

For further information refer to User Manual

Related Submittal(s) Grants

This is a single application for certification of the transceiver.

Remark

The test results in this test report are only relevant to the tested sample and does not involve any assessment in the production.

Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

Test Operation and Test Software

Test operation should refer to test methodology.

- Test mode samples with maximum RF output power and duty cycle and capable to transmit continuously at the lowest, middle and highest frequency channels is provided by the applicant for the testing.

Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

- None

Countermeasures to achieve EMC Compliance

- None

Test Methodology

Radiated Emission

The radiated emission measurements of the transmitter part were performed according to the procedures in ANSI C63.10-2013.

For measurement below 1GHz - the equipment under test (EUT) was placed at the middle of the 80 cm height turntable. For measurement above 1GHz - the EUT was placed at the middle of the 1.5 m height turntable and RF absorbing material was placed on ground plane between turntable and measuring antenna. During the testing, the EUT was operated standalone and arranged for maximum emissions. The EUT was tested in three orthogonal planes.

The investigation is performed with the EUT rotated 360 °, the antenna height scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in particular parts of this test report.

Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

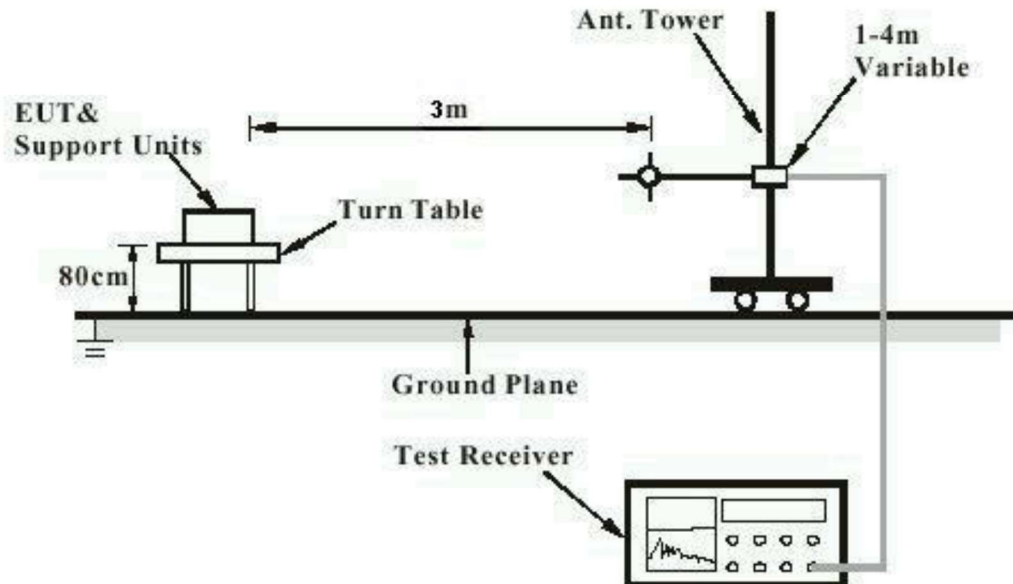
$$FS = R + AF + CF + FA - PA$$

Where FS = Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

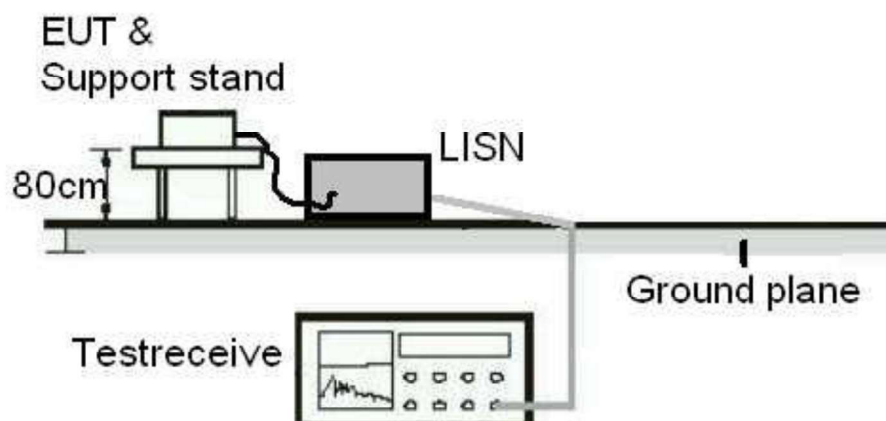
Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1 GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Mains Conduction Measurement (if applicable)



Test Facility

Test Laboratory Information

TÜV Rheinland Hong Kong Ltd.

Address: 3-4/F, Fou Wah Industrial Building, 10-16 Pun Shan Street, Tsuen Wan, N.T., Hong Kong

Tel.: +852 2192 1000

Fax: +852 2192 1001

Email service-gc@tuv.com

The test facility is recognized or accredited by the following organizations:

FCC

Test Firm Registration Number : 371735

List of Test and Measurement Instruments

Radiated Emission

Equipment	Manufacturer	Type	Cal. Date	Due Date
Semi-anechoic Chamber	Frankonia	Nil	5-Mar-21	5-Mar-22
Multi-functional Anechoic Chamber	Albatross	Nil	4-Jan-21	4-Jan-22
Test Receiver	R & S	ESU40	7-Oct-20	7-Oct-21
Active Loop Antenna	EMCO	6502	3-Nov-20	3-Nov-22
Bi-conical Antenna	R & S	HK116	15-Sep-20	15-Sep-22
Log Periodic Antenna	R & S	HL223	15-Sep-20	15-Sep-22
Standard Gain Horn	ETS-Lindgren	3160-07	24-Nov-20	24-Nov-22
Standard Gain Horn	ETS-Lindgren	3160-08	24-Nov-20	24-Nov-22
Standard Gain Horn	ETS-Lindgren	3160-10	30-Oct-20	30-Oct-22
Double-Ridged Waveguide Horn	EMCO	3116	30-Oct-20	30-Oct-22
Double-Ridged Waveguide Horn	EMCO	3117	11-Nov-20	11-Nov-22
Coaxial cable	Harbour	SF118/11n/11n/12000.0	3-Aug-20	3-Aug-22
High Frequency Cable	Pasternack	PE3VNA4001-3M	29-Jan-21	29-Jan-23
Microwave amplifier 0.5-26.5GHz, 25dB gain	COM-POWER Corporation	PAM-118A	5-Mar-21	5-Mar-22
Preamplifier 18GHz to 40GHz with cable (EMC656)	A.H. Systems, Inc.	PAM-1840VH	29-Jan-21	29-Jan-22
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	30-Oct-19	30-Oct-21

Radio Test

Equipment	Manufacturer	Type	Cal. Date	Due Date
Signal and Spectrum Analyzer	R & S	FSV40	3-Nov-20	3-Nov-21

Measurement Uncertainty

The estimated combined standard uncertainty for power-line conducted emissions measurements is ± 2.42 dB.

The estimated combined standard uncertainty for radiated emissions measurements is ± 4.81 dB (9kHz to 30MHz) and ± 4.62 dB (30MHz to 200MHz) and ± 5.67 dB (200MHz to 1000MHz) and is ± 5.07 dB (1GHz to 8.2GHz) and ± 4.58 dB (8.2GHz to 12.4GHz) and ± 4.78 dB (12.4GHz to 18GHz)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor of $k=2$, which for the level of confidence is approximately 95%.

Results FCC Part 15 – Subpart C

FCC 15.203 – Antenna Requirement 1		Pass
FCC Requirement: No antenna other than that furnished by the responsible party shall be used with the device		
Results:	a) Antenna type: Fixed Integral wire antenna b) Manufacturer and model no: N/A c) Peak Gain: 0 dBi	
Verdict:	Pass	

FCC 15.204 – Antenna Requirement 2		Pass
FCC Requirement: An intentional radiator may be operated only with the antenna with which it is authorized. If an antenna is marketed with the intentional radiator, it shall be of a type which is authorized with the intentional radiator.		
Results:	Only one integral antenna can be used.	
Verdict:	Pass	

FCC 15.207 – Conducted Emission on AC Mains		N/A
There is no AC power input or output ports on the EUT.		

Subclause 15.215 (c) – 20 dB Bandwidth				Pass
Test Specification : ANSI C63.10 – 2013 Test date : 19.09.2021 Mode of operation : Tx mode Port of testing : Antenna port Supply voltage : 3.3 VDC Temperature : 23°C Humidity : 50%				
Requirement:		The intentional radiators must be designed to ensure that the 20dB bandwidth of the emission, is contained within the frequency band designated in the rule section under which the equipment is operated.		
Results:		Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1.		
Frequency (MHz)	20 dB left (MHz)	Limit (MHz)	20 dB right (MHz)	Limit (MHz)
2404	2403.190	> 2400	2404.795	< 2483.5
2440	2439.190	> 2400	2440.796	< 2483.5
2476	2475.190	> 2400	2476.796	< 2483.5

Subclause 15.249(a) – Field Strength of Fundamental and Harmonics		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 14.09.2021 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.3 VDC Temperature : 24°C Humidity : 52%		
Requirement: The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit.		
Results: PASS.		
Fundamental Frequency 2404MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2403.983	92.3	114.0 / PK
2403.983	70.7	94.0 / AV
Fundamental Frequency 2404MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2403.983	99.0	114.0 / PK
2403.983	77.4	94.0 / AV
Harmonics 2404MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4807.967	50.0	74.0 / PK
4807.967	36.8	54.0 / AV
7210.451	51.9	74.0 / PK
7210.451	33.0	54.0 / AV
Harmonics 2404MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4807.967	54.1	74.0 / PK
4807.967	41.6	54.0 / AV
7210.451	56.9	74.0 / PK
7210.451	36.0	54.0 / AV
Fundamental Frequency 2440MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2439.983	91.7	114.0 / PK
2439.983	70.1	94.0 / AV
Fundamental Frequency 2440MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2439.983	98.6	114.0 / PK
2439.983	76.9	94.0 / AV

Harmonics 2440MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4879.961	50.1	74.0 / PK
4879.961	36.9	54.0 / AV
7319.961	52.8	74.0 / PK
7319.961	32.3	54.0 / AV
Harmonics 2440MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4879.961	56.7	74.0 / PK
4879.961	40.6	54.0 / AV
7319.961	59.0	74.0 / PK
7319.961	35.1	54.0 / AV
Fundamental Frequency 2476MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2475.479	90.0	114.0 / PK
2475.479	67.6	94.0 / AV
Fundamental Frequency 2476MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2475.479	97.7	114.0 / PK
2475.479	75.2	94.0 / AV
Harmonics 2476MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4951.943	49.3	74.0 / PK
4951.943	35.1	54.0 / AV
7427.994	54.0	74.0 / PK
7427.944	32.7	54.0 / AV
Harmonics 2476MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4951.943	53.7	74.0 / PK
4951.943	40.4	54.0 / AV
7427.994	56.8	74.0 / PK
7427.944	33.9	54.0 / AV

Subclause 15.249(d),15.205 – Out Of Band Radiated Emission		Pass
Test Specification : ANSI C63.10 – 2013 Test date : 14.09.2021 Mode of operation : Tx mode Port of testing : Enclosure Frequency range : 9kHz – 25GHz Supply voltage : 3.3 VDC Temperature : 24°C Humidity : 55%		
Requirement:	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.	
Results:	All three transmit frequency modes comply with the field strength limit of section 15.209. There is no spurious found below 30MHz.	
Tx frequency 2404MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	41.1	74.0 / PK
2400.000	26.7	54.0 / AV
Tx frequency 2404MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2400.000	43.4	74.0 / PK
2400.000	26.7	54.0 / AV
Tx frequency 2440MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Tx frequency 2440MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	---	74.0 / PK
No peak found	---	54.0 / AV
Tx frequency 2476MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	40.6	74.0 / PK
2483.500	26.8	54.0 / AV
Tx frequency 2476MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
2483.500	45.5	74.0 / PK
2483.500	27.0	54.0 / AV