

Produkte
Products



| | | | | | |
|--|--|--|-----------------------------------|--|---|
| Prüfbericht - Nr.: 14033372 001 | | | Seite 1 von 10 | | |
| <i>Test Report No.:</i> | | | <i>Page 1 of 10</i> | | |
| Auftraggeber: <i>Client:</i> | | Wellitec Development Ltd. 37/F., One Midtown No. 11 Hoi Shing Road Tsuen Wan Hong Kong | | | |
| Gegenstand der Prüfung: <i>Test Item:</i> | | 2.4GHz Dongle for Wireless Optical Mouse | | | |
| Bezeichnung: <i>Identification:</i> | N/A | Serien-Nr.: <i>Serial No.:</i> | Engineering sample | | |
| Wareneingangs-Nr.: <i>Receipt No.:</i> | 00130626014-001 00130723239-001 | Eingangsdatum: <i>Date of Receipt:</i> | 26.06.2013 23.07.2013 | | |
| Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of test item at delivery:</i> | | Test sample(s) is/are not damaged and suitable for testing. | | | |
| Prüfört: <i>Testing Location:</i> | | Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong TÜV Rheinland Hong Kong Ltd. 8/F., First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong | | | |
| Prüfgrundlage: <i>Test Specification:</i> | | FCC Part 15 Subpart C ANSI C63.4-2003 | | | |
| Prüfergebnis: <i>Test Results:</i> | | Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed . | | | |
| Prüflaboratorium: <i>Testing Laboratory:</i> | | TÜV Rheinland Hong Kong Ltd. 8 - 10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong | | | |
| geprüft/ tested by: | | | kontrolliert/ reviewed by: | | |
| 07.08.2013 | Joey Leung Test Engineer |  | 07.08.2013 | Sharon Li Section 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 Aspects | | FCCID: 2AAP9D | | | |
| Abkürzungen: | | Abbreviations: | | | |
| P(ass) = entspricht Prüfgrundlage | | P(ass) = passed | | | |
| F(ail) = entspricht nicht Prüfgrundlage | | F(ail) = failed | | | |
| N/A = nicht anwendbar | | N/A = not applicable | | | |
| N/T = nicht getestet | | N/T = not tested | | | |
| <p>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.</p> <p><i>This test report 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 safety mark on this or similar products.</i></p> | | | | | |

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Product information

Manufacturers declarations

| | Transceiver |
|---|--------------------------|
| Operating frequency range | 2408 - 2474 MHz |
| Type of modulation | FSK |
| Number of channels | 34 |
| Channel separation | 2 MHz |
| Type of antenna | PCB antenna |
| Antenna gain (dBi) | -2 |
| Power level | fix |
| Type of equipment | stand alone radio device |
| Connection to public utility power line | No |
| Nominal voltage | V _{nor} : 5.0V |

Product function and intended use

The equipment under test (EUT) is a Wireless optical mouse operating at 2.4GHz. It is powered by batteries only.

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User Manual
Label Artwork

Remark

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases.

Special accessories and auxiliary equipment

Additional accessory used for testing

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

Laptop computer
Brand: IBM
Model: T40
S/N: 99-PR656

AC adaptor
Brand: IBM
Model: 08K8202
Input rating: 100-240V ~ 1.5A-0.9A, 50/60Hz
Output rating: 16V, 4.5A

List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

Radiated Emission

| Equipment | Manufacturer | Model No. | S/N | Due Date |
|--|-----------------|--------------------|-------------------|-----------|
| Semi-anechoic Chamber | Frankonia | Nil | Nil | 12 Apr 14 |
| Cable | Hubersuhner | SUCOFLEX 104 | 72799 /6 | 30 Mar 14 |
| Test Receiver | R & S | ESU40 | 100190 | 19 Feb 14 |
| Bi-conical Antenna | R & S | HK116 | 100241 | 11 Jun 15 |
| Log Periodic Antenna | R & S | HL223 | 841516/017 | 10 Jun 15 |
| Coaxial cable 50ohm | Rosenberger | RTK081-05S-05S-10m | LA2-001-10M / 001 | 15 Nov 13 |
| Microwave amplifier 0.5-26.5GHz, 25dB gain | HP | 83017A | 3123A00437 | 03 Oct 13 |
| High Pass Filter (cutoff freq. =1000MHz) | Trilithic | 23042 | 9829213 | 28 Oct 13 |
| Horn Antenna | EMCO | 3115 | 9002-3347 | 11 Jun 15 |
| Active Loop Antenna | EMCO | 6502 | 9107-2651 | 21 Sep 13 |
| Spectrum Analyzer | Rohde & Schwarz | FSP30 | 10007/030 | 16 Sep 13 |

TÜV Rheinland Hong Kong Ltd.

Conducted Emission

| Equipment | Manufacturer | Type | S/N | Cal. due date |
|---------------|-----------------|--------|--------|---------------|
| Test Receiver | Rohde & Schwarz | ESCS30 | 100201 | 26 Feb 14 |
| LISN | Rohde & Schwarz | ENV216 | 100273 | 06 Mar 14 |

Results FCC Part 15 – Subpart C

| Subclause 15.207 – Disturbance Voltage on AC Mains | | | | | | Pass |
|---|-----------------|-----------------|--------------|-----------------|-----------------|---------|
| Test Port: AC mains input port of the adaptor Applied Voltage: 120VAC Adaptor Model: 08K8202 Mode of operation: Transmitting mode | | | | | | |
| Live measurement | | | | | | |
| Frequency range (MHz) | Frequency (MHz) | Quasi-peak dBµV | Average dBµV | Limit QP (dBµV) | Limit AV (dBµV) | Verdict |
| 0,15 – 0,5 | 0.150 | 61.4 | 40.7 | 66 - 56 | 56 - 46 | Pass |
| | 0.262 | 49.8 | 28.8 | 66 - 56 | 56 - 46 | Pass |
| > 0,5 - 5 | No peak found | --- | --- | 56 | 46 | Pass |
| > 5 - 30 | No peak found | --- | --- | 60 | 50 | Pass |
| Neutral measurement | | | | | | |
| Frequency range (MHz) | Frequency (MHz) | Quasi-peak dBµV | Average dBµV | Limit QP (dBµV) | Limit AV (dBµV) | Verdict |
| 0,15 – 0,5 | 0.150 | 62.2 | 44.5 | 66 - 56 | 56 - 46 | Pass |
| | 0.278 | 49.1 | 27.1 | 66 - 56 | 56 - 46 | Pass |
| > 0,5 - 5 | No peak found | --- | --- | 56 | 46 | Pass |
| > 5 - 30 | No peak found | --- | --- | 60 | 50 | Pass |
| Results: The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test Results plots refer to Appendix 1, page 2-3. | | | | | | |

| Subclause 15.205 – Band edge compliance of radiated emissions | | Pass |
|---|-----------------|---------------------------|
| Test Specification : ANSI C63.4 – 2003 Mode of operation : Tx mode Port of testing : Enclosure Detector : Peak RBW/VBW : 100 kHz / 300 kHz for $f < 1$ GHz 1 MHz / 3 MHz for $f > 1$ GHz Supply voltage : 5.0VDC, USB port of laptop computer Temperature : 23°C Humidity : 50% | | |
| Requirement: Radiated emissions which fall in the restricted bans, as defined in 15.205 (a), must also comply with the radiated emission limits specified in 15.209(a). | | |
| Results: For test protocols refer to Appendix 1, page 6-13. | | |
| Tx frequency 2408MHz Vertical Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |
| Tx frequency 2408MHz Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |
| Tx frequency 2474MHz Vertical Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |
| Tx frequency 2474MHz Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |

| Subclause 15.215 (c) – 20 dB Bandwidth | | Pass | | |
|---|--|-------------|-------------------|-------------|
| 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. | | | |
| Test Specification : ANSI C63.4 – 2003 Mode of operation : Tx mode Port of testing : Enclosure RBW/VBW : 100 kHz / 300 kHz Supply voltage : 5.0VDC, USB port of laptop computer Temperature : 23°C Humidity : 50% | | | | |
| Results: For test protocols refer to Appendix 1, page 4-5. | | | | |
| Frequency (MHz) | 20 dB left (MHz) | Limit (MHz) | 20 dB right (MHz) | Limit (MHz) |
| 2408 | 2407.110 | > 2400 | 2408.800 | < 2483.5 |
| 2440 | 2439.100 | > 2400 | 2440.790 | < 2483.5 |
| 2474 | 2473.110 | > 2400 | 2474.800 | < 2483.5 |

| Subclause 15.249 (a) – Radiated Emission (Fundamental and Harmonics) | | Pass |
|--|---|---------------------------|
| Test Specification : ANSI C63.4 – 2003 Mode of operation : Tx mode Port of testing : Enclosure RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 5.0VDC, USB port of laptop computer Temperature : 23°C Humidity : 50% | | |
| Requirement: | The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following limit. | |
| Results: | PASS | |
| Fundamental Frequency 2408MHz | | Vertical Polarization |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 2408.494 | 94.81 | 114.0 / P |
| 2408.013 | 92.74 | 94.0 / A |
| Fundamental Frequency 2408MHz | | Horizontal Polarization |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 2407.532 | 95.89 | 114.0 / P |
| 2408.013 | 93.56 | 94.0 / A |
| Harmonics 2408MHz | | Vertical Polarization |

| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
|---|-------------------------|-----------------------------------|
| 4816.987 | 53.62 | 74.0 / P |
| 4816.699 | 43.60 | 54.0 / A |
| 7225.497 | 59.05 | 74.0 / P |
| 7225.321 | 49.14 | 54.0 / A |
| Harmonics 2408MHz Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 4814.952 | 55.62 | 74.0 / P |
| 4816.635 | 45.87 | 54.0 / A |
| 7225.481 | 58.50 | 74.0 / P |
| 7225.288 | 48.41 | 54.0 / A |
| Fundamental Frequency 2440MHz Vertical Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 2439.487 | 94.94 | 114.0 / P |
| 2439.968 | 92.72 | 94.0 / A |
| Fundamental Frequency 2440MHz Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 2439.481 | 95.88 | 114.0 / P |
| 2440.042 | 93.65 | 94.0 / A |
| Harmonics 2440MHz Vertical Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 4878.974 | 55.10 | 74.0 / P |
| 4880.625 | 45.44 | 54.0 / A |
| 7318.429 | 59.31 | 74.0 / P |
| 7321.282 | 48.35 | 54.0 / A |
| Harmonics 2440MHz Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 4878.994 | 55.70 | 74.0 / P |
| 4880.692 | 45.69 | 54.0 / A |
| 7321.423 | 58.58 | 74.0 / P |
| 7321.279 | 48.13 | 54.0 / A |
| Fundamental Frequency 2474MHz Vertical Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 2473.494 | 94.01 | 114.0 / P |
| 2473.974 | 91.41 | 94.0 / A |
| Fundamental Frequency 2474MHz Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 2473.462 | 93.88 | 114.0 / P |
| 2474.022 | 91.84 | 94.0 / A |

| Harmonics 2474MHz | | | Vertical Polarization | | |
|-------------------|-----------------|---------------------------|-------------------------|-----------------|---------------------------|
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m | Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 4948.686 | 52.23 | 74.0 / P | 4948.686 | 42.07 | 54.0 / A |
| 7423.365 | 60.03 | 74.0 / P | 7423.301 | 50.08 | 54.0 / A |
| Harmonics 2474MHz | | | Horizontal Polarization | | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m | Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| 4949.054 | 55.03 | 74.0 / P | 4948.538 | 45.00 | 54.0 / A |
| 7423.317 | 58.99 | 74.0 / P | 7423.365 | 48.80 | 54.0 / A |

| Subclause 15.249 (d) – Spurious Radiated Emissions | | Pass |
|---|---|---------------------------|
| Test Specification : ANSI C63.4 - 2003 Mode of operation : Tx mode Port of testing : Enclosure Detector : Peak RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : 5.0VDC, USB port of laptop computer Temperature : 23°C Humidity : 50% | | |
| 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 within the restricted bands. There is no spurious found below 30MHz. | |
| Tx frequency 2408MHz | | Vertical Polarization |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |
| Tx frequency 2408MHz | | Horizontal Polarization |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |
| Tx frequency 2440MHz | | Vertical Polarization |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m |
| No peak found | --- | 74.0 / P |
| No peak found | --- | 54.0 / A |

| | | | |
|----------------------|-----------------|---------------------------|--|
| Tx frequency 2440MHz | | Horizontal Polarization | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m | |
| No peak found | --- | 74.0 / P | |
| No peak found | --- | 54.0 / A | |
| Tx frequency 2474MHz | | Vertical Polarization | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m | |
| No peak found | --- | 74.0 / P | |
| No peak found | --- | 54.0 / A | |
| Tx frequency 2474MHz | | Horizontal Polarization | |
| Freq MHz | Level dBuV/m | Limit/ Detector dBuV/m | |
| No peak found | --- | 74.0 / P | |
| No peak found | --- | 54.0 / A | |