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TÜV

Prüfbericht - Nr.: *Test Report No.*	**14004157 002**	Seite 1 von 13 *Page 1 of 13*

Auftraggeber: *Client:*	**Traxon Group Ltd.** **1702 Westin Centre,** **26 Hung To Road,** **Kwun Tung, Kowloon,** **Hong Kong**
Gegenstand der Prüfung: *Test item:*	**Lower Power Transmitter**
Bezeichnung: *Identification:*	**Mood- Light Panel ML-1098** **(FCCID:RKMML1098)**
Serien-Nr.: *Serial No.*	**Engineering Sample**
Wareneingangs-Nr.: *Receipt No.:*	**070803001**
Eingangsdatum: *Date of receipt:*	**07.08.2003**
Prüfort: *Testing location:*	**Refer to section 2.1**
Prüfgrundlage: *Test specification:*	**FCC Part 15, Subpart C**
Prüfergebnis: *Test Result*	**Der vorstehend beschriebene Prüfgegenstand wurde geprüft und entspricht oben genannter Prüfgrundlage.** The a. m. test item passed.

geprüft / *tested by:*	**kontrolliert** / *reviewed by*
P.Poon	**S.Wald**
30.10.2003	30.10.2003
Datum *Date*	**Datum** *Date*
Unterschrift *Signature*	**Unterschrift** *Signature*

Sonstiges / *Other Aspects:*

Abkürzungen:		Abbreviations:	
OK, Pass	= entspricht Prüfgrundlage	OK, Pass	= passed
Fail	= entspricht nicht Prüfgrundlage	Fail	= failed
N/A	= nicht anwendbar	N/A	= not applicable

Authorized format 16.12.1996, R.M.

TEST SUMMARY

7.1.1 RADIATED EMISSION OF CARRIER FREQUENCY

Resullt: Pass

7.1.2 SPURIOUS RADIATED EMISSIONS

Resullt: Pass

7.1.3 BANDWIDTH MEASUREMENT

Resullt: Pass

Contents

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix 1: Test Results
Appendix 2: Test Setup
Appendix 3: External Photographs of EUT
Appendix 4: Internal Photographs of EUT
Appendix 5: FCCID Label, Block Diagram and Schematics

2 Test Sites

2.1 Test Facilities

Hong Kong Productivity Council
HKPC Building
78 Tat Chee Avenue
Kowloon
Hong Kong

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

	Kind of Equipment	Manufacturer	Type	S/N
☐	Test Receiver	Rohde & Schwarz	ESH-3	890173/033
☐	L/I/S/N	Rohde & Schwarz	ESH 3-Z5	849876/026
☐	Oscilloscope	HP	54713B	US34510455
☐	Test Receiver	Rohde & Schwarz	ESVP	882402/033
☐	Absorbing Clamp	Rohde & Schwarz	MDS-21	979 3/4
☒	Test Receiver	Rohde & Schwarz	ESVS30	842807/009
☒	Biconical Antenna	Rohde & Schwarz	HK116	841489/015
☒	Log.-Periodic Antenna	Rohde & Schwarz	HL223	841516/017
☐	Universal Power Analyzer	Voltech	PM3000A	9915
☐	Reference Impedance Network	Voltech	IEC 555 Standard	9946
☐	AC Power Source	California Instr.	4500L	HK51895
☐	Trip-Loop Antenna	Chase	LLA6142	1019
☒	Double Ridge Horn Antenna	EMCO	3115	9002-3351
☐	Double Ridge Horn Antenna	EMCO	3116	9002-3347
☐	RF Comms Test Set	HP	8920B	US36492628
☒	Spectrum Analyser + Tracking Gen.	HP	8596E	3639A00758
☐	Signal Generator	Rohde & Schwarz	SMY 01	844146/024
☐	Signal Generator	Rohde & Schwarz	SMY 01	844146/023
☐	BiLog Antenna	EMCO	3143	9607-1287
☐	Isotropic Field Probe	Holladay	HI-4422	90956
☐	Power Amplifier	Kalmus	757-LC	7620-1
☐	Power Amplifier	Kalmus	122-FC	7620-2
☐	Coupling Clamp	Schaffner	CDN 126	312
☐	Couple Device Network	Fischer	CDN-M2	9604
☒	Spectrum Analyzer	Rohde & Schwarz	FSP30	1093.4495K30
☐	Temperature Chamber	Binder	MK 240	9020-0028
☐	EFT,ESD,SURGE, DIPS tester	Schaffner	Best 96	IN3796-011

3 General Product Information

3.1 Product Function and Intended Use

The equipment under test (EUT) is a transmitter for a mood light panel operating at 433MHz. The EUT has some functional keys to control the colour light sequence of the associated receiver.

Periodic condition of the manually operated EUT:

Intermittent Duty: Transmitter on = 150ms
Transmitter off = 5s

The EUT ceases the transmission within 200ms after activated by the operator.

3.2 Circuit Description

1. MCU W741 and the ASK transmitter module is powered up by 3V supply(AAA Battery X2 pcs).
2. When any function key of the key matrix connected to the MCU is pressed, the MCU will output a stream of data corresponding to the pressed key to the transmitter module.
3. The transmitter module using a 433.92MHz SAW resonator then will emit the signal out for the RX section.

3.3 Ratings and System Details

		Transmitter
Frequency range	:	433.910 MHz
Number of channels	:	1
Type of antenna	:	Integral antenna
Power supply	:	Battery operated 3V (2 x1.5V “AA”sizes batteries)
Ports	:	none
Protection Class	:	III

3.4 Independent Operation Modes

The basic operation key/modes are:

- Power on/ off
- Function keys

For further information refer to User Manual.

3.5 Submitted Documents

The submitted documents are listed as follow:

- Circuit diagram
- Block diagram
- FCCID label
- User manual

3.6 Related Submittal(s) Grants

This is a single application for certification of the transmitter, the receiver for this transmitter is authorized by the Certification procedure.

4 Test Set-up and Operation Mode

4.1 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.

4.2 Test Operation and Test Software

Test operation should refer to Section 5 and 7.

- There was no special software to exercise the device.

4.3 Special Accessories and Auxiliary Equipment

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

-none

4.4 Countermeasures to achieve EMC Compliance

The test sample, which has been tested, contained the noise suppression parts as described in the Circuit Diagram or the Technical Construction File. No additional measures were employed to achieve compliance.

5 Test Methodology

Radiated Emission

The radiated emission measurements were performed according to the procedures in ANSI C63.4-1992.

The equipment under test (EUT) was placed at the middle of the 80cm height turntable, and the turntable is 3 meters far from the 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.

The frequency range scanned is from the lowest radio frequency signal generated in the device which greater than 9 KHz to the tenth harmonic of the higest fundamental frequency or 40GHz, whichever is lower.

All radiated tests were performed at an antenna to EUT with 3 meters distance, unless stated otherwise in section 7.1.1 and 7.1.2 of this test report.

6 Field Strength Calculation

The field strength at 3m 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/m.
CF = Cable Attentuation Factor in dB.
FA = Filter Attenutaion Factor in dB.
PA = Preamplifier Factor in dB.

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

7 Test Results

7.1.1 Radiated Emission of Carrier Frequency

RESULT: **Pass**

Test Specification : FCC Part 15 section 15.231(b2)
Test Method : ANSI 63.4-1992
Measurement Location: Semi Anechoic Chamber
Measurement Distance: 3m
Detector Function : Peak and average
Measurement BW : 100KHz
Supply Voltage : DC 3V

Polarization: Vertical

Detector function	Frequency (MHz)	Reading (dBuV)	Antenna Factor (dB/m)	Attentuation of cable (dB)	Measured Field strength at 3m (dBuV/m)	Delta to Limit (dB)
Peak	433.93	42.20	16.3	1.8	60.3	-40.5
Average	433.93	41.30	16.3	1.8	59.4	-21.4

Polarization: Horizontal

Detector function	Frequency (MHz)	Reading (dBuV)	Antenna Factor (dB/m)	Attentuation of cable (dB)	Measured Field strength at 3m (dBuV/m)	Delta to Limit (dB)
Peak	433.93	51.80	16.3	1.8	69.9	-30.9
Average	433.93	50.80	16.3	1.8	68.9	-11.9

Limit **Section 15.231 (b)**

Fundamental Frequency (MHz)	Peak Field Strength (microvolts / meter)	dBµV/m	Average Field Strength dBµV/m
433.910	10996.2648	100.8	80.8

According to section 15.35(b), When average radiated emission measurements are specified, including emission measeurement below 1000MHz, there also is limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated.

7.1.2 Spurious Radiated Emissions

RESULT: **Pass**

Test Specification : FCC Part 15 section 15.231(b3)
Test Method : ANSI 63.4-1992
Measurement Location : Semi Anechoic Chamber
Measurement Distance : 3m
Detector Function : Quasi Peak
Measurement BW : 100KHz
Supply Voltage : DC 3V
Measuring Frequency Range : 30-5000MHz

Polarization: Vertical

Frequency (MHz)	Reading (dBuV)	Antenna Factor (dB/m)	System Factor (dB)	Field strength at 3m (dBuV/m)	Limit at 3m (dBuV/m)	Delta to Limit (dB)
867.87	12.65	22.3	2.65	37.60	60.8	-23.20
1301.84	53.56	24.9	-33.70	44.76	61.9	-17.14
1735.92	42.49	26.5	-33.30	35.69	61.9	-26.21
2169.70	40.06	27.8	-32.80	35.06	61.9	-26.84
2603.64	40.39	28.9	-31.50	37.79	61.9	-24.11
3037.56	45.44	30.0	-29.73	45.71	61.9	-16.19
3471.52	46.11	31.3	-31.09	46.32	61.9	-15.58
3905.44	42.67	32.5	-30.35	44.82	61.9	-17.08
4339.40	41.68	32.5	-29.91	44.27	61.9	-17.63
4773.35	40.32	32.8	-29.21	43.91	61.9	-17.99

Here System Factor = CF + FA – PA.

Polarization: Horizontal

Frequency (MHz)	Reading (dBuV)	Antenna Factor (dB/m)	Attentuation of cable (dB)	Field strength at 3m (dBuV/m)	Limit at 3m (dBuV/m)	Delta to Limit (dB)
867.87	19.85	22.3	2.65	44.80	60.8	-16.00
1301.84	52.71	24.9	-33.70	43.91	61.9	-17.99
1735.78	54.93	26.5	-33.30	48.13	61.9	-13.77
2169.74	43.81	27.8	-32.80	38.81	61.9	-23.09
2603.66	44.63	28.9	-31.50	42.03	61.9	-19.87
3471.54	44.46	31.3	-31.09	44.67	61.9	-17.23
3905.44	43.17	32.5	-30.35	45.32	61.9	-16.58
4339.40	40.99	32.5	-29.91	43.58	61.9	-18.32
4773.35	40.25	32.8	-29.21	43.84	61.9	-18.06

Limit **Section 15.231(b)**

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

Frequency (MHz)	Field strength (microvolts/meter)	Field strength (dBµV/m)
40.66-40.70	225	47.0
70-130	125	41.9
130-174	125 to 375**	41.9 to 51.4
174-260	375	51.4
260-470	375 to 1250**	51.4 to 61.9
Above 470	1250	61.9

** Linear interpolations

According to section 15.35(b), on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurements are specified in this part, including emission measurements below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated.

7.1.3 Bandwidth Measurement

RESULT: **Pass**

Test Specification	:	FCC Part 15 section 15.231(c)
Port of Testing	:	Antenna port
Detector Function	:	Peak
Supply Voltage	:	DC 3V
Temperature	:	22°C
Humidity	:	50%

From the graph, the two markers represent the edge points of 20dB down from the modulated carrier. Marker 2 and marker 3 are located at 35.5KHz and 23.4KHz respectively far from the 433.91MHz center frequency, which comply the bandwidth requirement of no wider than 0.25% (in this case is equal to ± 1.08MHz) of the centre frequency.

For test results refer to Appendix 1, page 1-2

Limit **Section 15.231 (c)**

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.