

Date: 2001-09-18

TEST REPORT

Page 1 of 22

No.: HM105675

FCC PART 15 SUBPART C CERTIFICATION REPORT

FOR LOW POWER TRANSMITTER

TEST REPORT No.: HM105675

Equipment Under Test [EUT]:

Model Number:

Applicant:

FCC ID :

Robocam, Radio Control Digital Camera
20011

Playtech International (HK) Ltd.

PWI20011

Date: 2001-09-18

TEST REPORT

Page 2 of 22

No.: HM105675

CONTENT:

Cover	Page 1 of 22
Content	Page 2-3 of 22
Conclusion	Page 4 of 22

1.0 General Details

1.1	Test Laboratory	Page 5 of 22
1.2	Applicant Details	Page 5 of 22
	Applicant	
	HKSTC Code Number for Applicant	
	Manufacturer	
1.3	Equipment Under Test [EUT]	Page 6 of 22
	Description of EUT operation	
1.4	Date of Order	Page 6 of 22
1.5	Submitted Sample	Page 6 of 22
1.6	Test Duration	Page 6 of 22
1.7	Country of Origin	Page 6 of 22
1.8	Additional Information of EUT	Page 7 of 22

2.0 Technical Details

2.1	Investigations Requested	Page 8 of 22
2.2	Test Standards and Results Summary	Page 8 of 22

3.0 Test Results

3.1	Emission	Page 9-14 of 22
3.2	Bandwidth Measurement	Page 15-17 of 22

Date: 2001-09-18

TEST REPORT

Page 3 of 22

No.: HM105675

Appendix A

List of Measurement Equipment

Page 18 of 22

Appendix B

Duty Cycle Correction During 100 msec

Page 18-19 of 22

Appendix C

Modification Method

Page 20 of 22

Appendix D

Photographs

Page 21-22 of 22

Date: 2001-09-18

TEST REPORT

Page 4 of 22

No.: HM105675

CONCLUSION

The submitted product was deemed to have **COMPLIED** after modification with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Verify by

Patrick Wong
for Managing Director

Date: 2001-09-18

TEST REPORT

Page 5 of 22

No.: HM105675

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Applicant Details Applicant

PLAYTECH INTERNATIONAL (HK) LTD.
Fortis Bank Tower 6th Floor
77 Gloucester Road, Hong Kong

Telephone: 852 2520 2711
Fax: 852 2861 3634

HKSTC Code Number for Applicant

PLI002

Manufacturer

DONGGUAN CHANGAN SHEUNGSHA ORIENTAL FINZEL
ELECTRONIC FACTORY
Sheungsha Village, Changan Town, Dongguan City
Guangdong Province, China

Telephone: N/A
Fax: N/A

Date: 2001-09-18

TEST REPORT

Page 6 of 22

No.: HM105675

1.3 Equipment Under Test [EUT]

Description of Sample

Product: Robocam, Radio Control Digital Camera
Manufacturer: Dongguan Changan Sheungsha Oriental Finzel Electronic Factory
Brand Name: N/A
Model Number: 20011
Input Voltage: 9Vd.c ("6F22" size battery x 1)

1.3.1 Description of EUT Operation

The Equipment Under Test(EUT) is an Playtech International (HK) Ltd., 49.86MHz Robocam, Radio Control Digital Camera. The transmitter is a 2 button transmitter. The EUT continues to transmit while button is being pressed. It is voice transmission, Modulation by Mic. and tape is frequency modulation.

1.4 Date of Order

2001-08-16

1.5 Submitted Sample(s):

2 Samples per model

1.6 Test Duration

2001-09-11

1.7 Country of Origin

China

Date: 2001-09-18

TEST REPORT

Page 7 of 22

No.: HM105675

1.8 Additional Information of EUT

	Submitted	Not Available
User Manual	☒	☐
Part List	☒	☐
Circuit Diagram	☒	☐
Printed Circuit Board [PCB] Layout	☒	☐
Block diagram	☒	☐
FCC ID Label	☒	☐

Date: 2001-09-18

TEST REPORT

Page 8 of 22

No.: HM105675

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.4:1992 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.235	ANSI C63.4:1992	N/A	☒	☐	☐
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.209	ANSI C63.4:1992	Class B	☒	☐	☐
Conducted Emissions on AC, 0.45MHz to 30MHz	FCC 47CFR 15.207	ANSI C63.4:1992	Class B	☐	☐	☒

Note: N/A - Not Applicable

3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

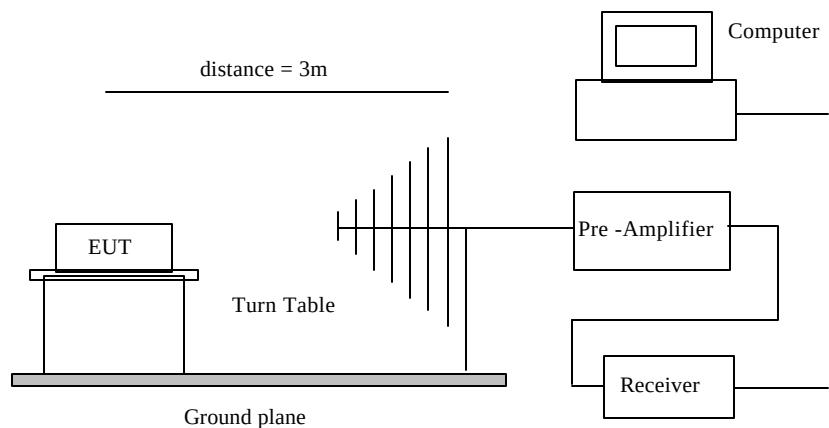
Test Requirement:	FCC 47CFR 15.235
Test Method:	ANSI C63.4:1992
Test Date:	2001-09-11
Mode of Operation:	On mode

Test Method:

The sample was placed 0.8m above the ground plane on the OATS *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigate all operating modes, rotated about all 3 axis (X, Y & Z) to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*: OATS [Open Area Test Site] located at HKSTC with a metal ground plane on filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 90657.

Test Setup:



Date: 2001-09-18

TEST REPORT

Page 10 of 22

No.: HM105675

Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.235]:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Peak] [μV/m]	Field Strength of Fundamental Emission [Average] [μV/m]
49.82-49.90	100,000	10,000

Results:

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit ** @3m μV/m	Antenna Polarity
49.86	48.4	15.0	63.4	1,479.1	100,000	Horizontal

According to FCC 47CFR15.35, the 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 unless a different peak emission limit is otherwise specified in the rules.

Remarks:

*: Linear interpolations

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 300MHz ±3.7dB
300MHz to 1GHz +3.0dB / -2.7dB

No.: HM105675

TEST REPORT

Page 11 of 22

Results:

Field Strength of Fundamental Emissions Average Value *						
Frequency MHz	Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit ** @3m μV/m	Antenna Polarity
49.86	43.7	15.0	58.7	861.9	100,00	Horizontal

Remarks:

For effective averaging, the bandwidth of the video filter must be smaller than the resolution bandwidth. The higher the ratio of resolution bandwidth to video bandwidth, the greater the averaging will be recorded. Below setting for HP8572A EMI Receiver.

Resolution Bandwidth = 3MHz
Video Bandwidth = 1Hz

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	=	30MHz to 300MHz	±3.7dB
		300MHz to 1GHz	+3.0dB / -2.7dB

Date: 2001-09-18

TEST REPORT

Page 12 of 22

No.: HM105675

Limited for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [$\mu\text{V}/\text{m}$]
30-88	100
88-216	150
216-960	200
Above 960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Results :Transmitter

Radiated Emissions Quasi-Peak						
Frequency MHz	Level @3m $\text{dB}\mu\text{V}$	Correction Factor dB/m	Field Strength $\text{dB}\mu\text{V}/\text{m}$	Field Strength $\mu\text{V}/\text{m}$	Limit @3m $\mu\text{V}/\text{m}$	Antenna Polarity
99.7	<1.0	12.2	<13.2	<4.6	150	Vertical
149.5	<1.0	9.8	<10.8	<3.5	150	Vertical
199.3	<1.0	11.5	<12.5	<4.2	150	Vertical
249.2	<1.0	15.9	<16.9	<7.0	200	Vertical
299.0	25.3	17.0	42.3	130.3	200	Horizontal
348.8	20.1	17.2	37.3	73.3	200	Vertical
398.6	<1.0	18.8	<19.8	<9.8	200	Horizontal
448.5	<1.0	19.7	<20.7	<10.8	200	Horizontal
498.6	<1.0	20.6	<21.6	<12.0	200	Horizontal

Date: 2001-09-18

TEST REPORT

Page 13 of 22

No.: HM105675

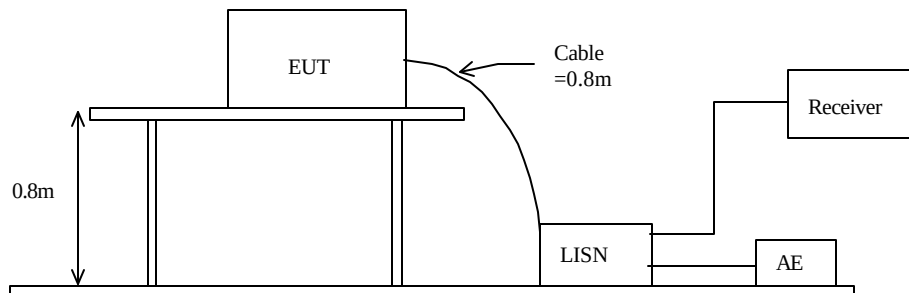
3.1.1 Conducted Emissions (0.45MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.4:1992
Test Date:	2001-09-11
Mode of Operation:	On mode

Test Method:

The test was performed in accordance with ANSI C63.4:1992, with the following: an initial measurement was performed in peak and average detection mode on the live line. Any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Test Setup:



Date: 2001-09-18

TEST REPORT

Page 14 of 22

No.: HM105675

Limit for Conducted Emissions (FCC 47 CFR 15.207):

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.45-30	250

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram labelled as (QP and AV).

Results:	N/A
The EUT is operated by internal battery power only, therefore power line conducted emission was deemed unnecessary.	

Remarks:

Calculated measurement uncertainty = $\pm 2.3\text{dB}$

3.2 26dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.235
Test Method:	ANSI C63.4:1992 (Section 13.1.7)
Test Date:	2001-09-11
Mode of Operation:	On mode

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Date: 2001-09-18

TEST REPORT

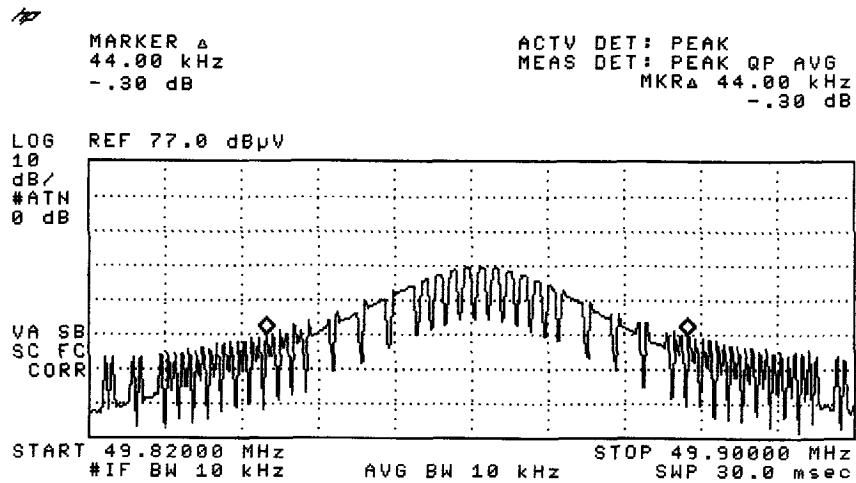
Page 16 of 22

No.: HM105675

Limits for 26 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	26dB Bandwidth [KHz]	FCC Limits * [KHz]
49.86	44.0	within 49.82-49.90

26dB Bandwidth of Fundamental Emission



Date: 2001-09-18

TEST REPORT

Page 17 of 22

No.: HM105675

Appendix A

Test Equipment Audit

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL.
EM007	SPECTRUM ANALYZER	HEWLETT PACKARD	HP85660B	3144A21192	07/09/01
EM008	SPECTRUM ANALYZER DISPLAY	HEWLETT PACKARD	HP85662A	3144A20514	07/09/01
EM009	QUASI PEAK ADAPTOR	HEWLETT PACKARD	HP85650A	3303A01702	07/09/01
EM010	RF PRESELECTOR	HEWLETT PACKARD	HP85685A	3221A01410	07/09/01
EM011	ATTENUATOR/SWITCH	HEWLETT PACKARD	HP11713A	2508A10595	07/09/01
EM012	PRE-AMPLIFIER	HEWLETT PACKARD	HP8449B	3008A00262	07/09/01
EM013	CONTROLLER (COMPUTER), COLOR MONITOR, KEYBOARD & MOUSE FLOPPY DRIVE	HEWLETT PACKARD HEWLETT PACKARD HEWLETT PACKARD	HP9000 HP A1097C HP9133L	6226A60314 3151J39517 2623A02468	CM
EM131	PORTABLE SPECTRUM ANALYSER	HEWLETT PACKARD	8595EM	3710A00155	10/07/00
EM017	ANTENNA	ARA INC.	LPB-2513/A	1069	17/02/00
EM020	HORN ANTENNA	EMCO	3115	4032	09/08/00
EM072	SIGNAL GENERATOR	HEWLETT PACKARD	8640B	1948A11892	30/03/98
EM083	HKSTC OPEN AREA TEST SITE	HKSTC	N/A	N/A	15/02/01
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	31/05/00

Conducted Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL
EM078	VARIAC	SHANGHAI VOLTAGE	TDGC-3/0.5	N/A	CM
EM081	SMALL SCREENED ROOM	MIKO INST HK	N/A	N/A	10/09/00
EM002	LISN	EMCO	3825-2	9005-1657	27/07/99
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	31/08/00
EM145	EMI TEST RECEIVER	R & S	ESCS 30	830245/021	31/05/00
EM120	EMI TEST RECEIVER	R&S	ESHS10	1004.0401.10	04/09/00
EM127	ISOLATION TRANSFORMER 220 TO 300	WING SUN	N/A	N/A	N/A
EM142	PLUSE LIMITER	R & S	ESH3Z2	357.8810.52	29/01/00

Remarks:

CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined

No.: HM105675

Appendix B**Duty Cycle Correction During 100msec**

Each function key sends a different series of characters, but each packet period (9.9msec) never exceeds a series of 4 long (800µsec) and 10 short (250µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered $4 \times 800\mu\text{sec} + 10 \times 250\mu\text{sec}$ per $28\mu\text{sec} = 58\%$ duty cycle. Figure A through C show the characteristics of the pulses train for one of these function.

Remarks:

$$\text{Duty Cycle Correction} = 20\text{Log}(0.58) = -4.7\text{dB}$$

The following figures [Figure A to Figure C] showed the characteristics of the pulse train for one of these functions.

Figure A [Pulse Train]

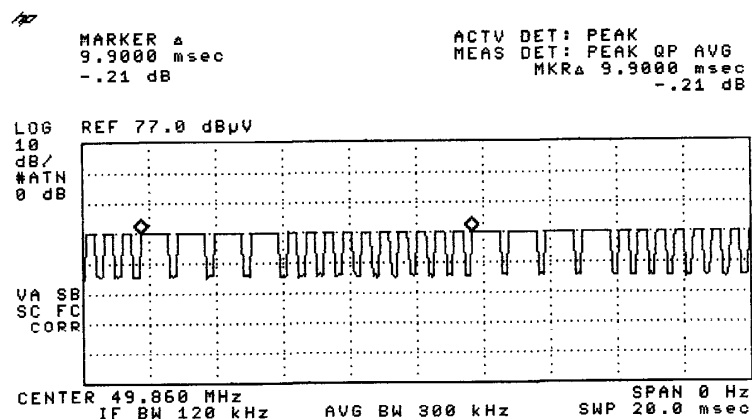


Figure B [Long Pulse]

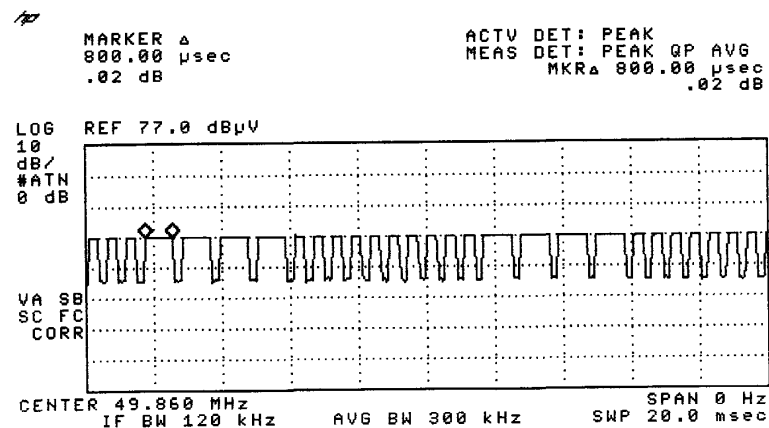
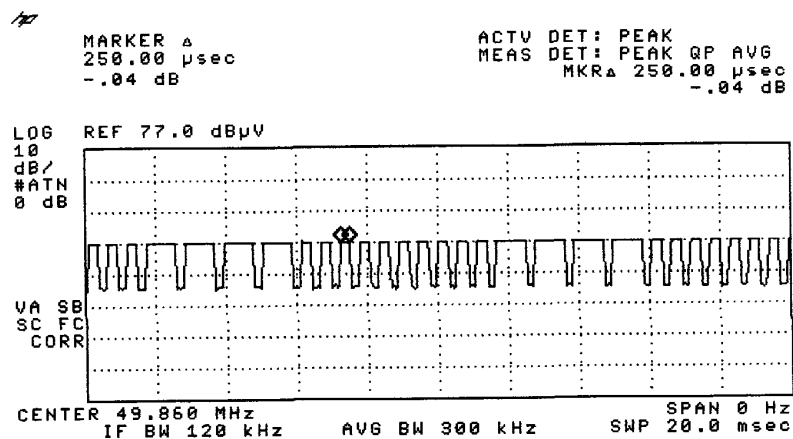


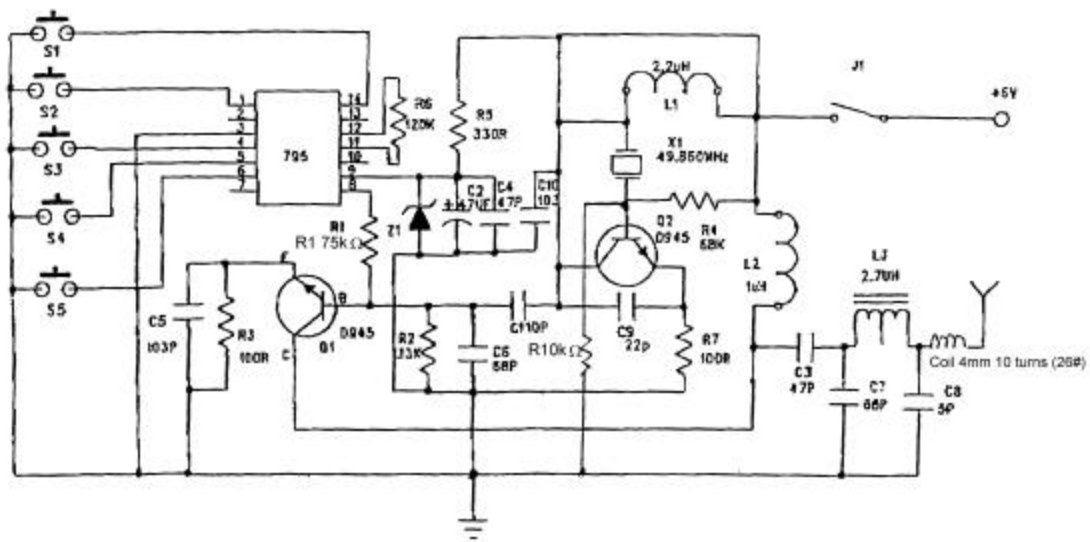
Figure C [Short Pulse]



No.: HM105675

Appendix C**Modification Method**

1. The resistance of R1 should be changed from 5.6k Ω .
2. Added R 10k Ω between the b pole of the Q2 and ground.
3. Added a coil $\varnothing$ 4mm 10 Turns with 26# copper wire between antenna and C8.
(The above modification is shown in attached circuit diagram.



Date: 2001-09-18

TEST REPORT

Page 21 of 22

No.: HM105675

Appendix D

Photographs of EUT

Front View of the product

Rear View of the product

Inner Circuit Top View

Inner Circuit Bottom View

Date: 2001-09-18

TEST REPORT

Page 22 of 22

No.: HM105675

Photographs of EUT

Measurement of Radiated Emission Test Set Up

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