EMI TEST REPORT

Test report No. : **EMC- FCC- 0066**

Type of equipment : **Tele-switch**

Model No. : **QDR-TELS**

FCC ID. : **QFMQDRTELS**

Applicant : **WOOJU Communications Co., Ltd.**

Test standards : **FCC part 15 subpart B, Class B**

Test Procedure and Items :

- AC Power Line Conducted Emissions Measurement: ANSI C63.4-1992
- Radiated Emissions Measurement : ANSI C63.4-1992

Test result : **Complied**

The above equipment was tested by EMC compliance Testing Laboratory for compliance with the requirements of FCC Rules and Regulations.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Date of test: 2003. 4. 26 Issued date: 2003 . 4. 29

Tested by : Kim, Jung-Soo

Approved by: Chung, Min-Seok

82-1, JEIL-RI, YANGJI-MYUN, YONGIN-CITY, KYUNGGI-DO, KOREA
TEL: 82 31 336 9919 FAX : 82 31 336 4767

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1. Client information

Applicant	: WOOJU COMMUNICATIONS CO., Ltd.
Address	: 446-3 Nonhyun-Dong, Namdong-GU, Incheon 405-300Korea
Telephone number	: 82-32-819-6025
Facsimile number	: 82-32-819-6022
President	: Hyung-Tae Kim
Contact person	: Dong-Moon Lem

Applicant	: WOOJU COMMUNICATIONS CO., Ltd.
Address	: 446-3 Nonhyun-Dong, Namdong-GU, Incheon 405-300Korea
Telephone number	: 82-32-819-6025
Facsimile number	: 82-32-819-6022

2. Laboratory information

Address

EMC compliance Ltd.

82-1, JEIL-RI, YANGJI-MYUN, YOUNGIN-CITY, KYUNGGI-DO, KOREA

Telephone Number : 82 31 336 9919

Facsimile Number : 82 31 336 4767

FCC Filing No. : 793334

VCCI Registration No. : C-1713, R-1606

SITE MAP

3. Test system configuration

3.1 Operation Environment

		Temperature	Humidity	Pressure
OATS	:	21 °C	36 %	1014 hPa
Shielded room	:	25 °C	32 %	1014 hPa

Test site

These testing were performed following locations;

Shielded room: Conducted emission,
OATS (10m) : Radiated emission

3.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMI. The factors contributing to uncertainties are test receiver, Cable Loss, antenna factor calibration, Antenna directivity, antenna factor Variation with height, antenna phase center variation, antenna Frequency interpolation, measurement distance variation, Site imperfection, mismatching, and system repeatability.

Based on NIS 80, 81, the measurement uncertainty level with a 95% confidence level was applied.

3.3 Sample calculation

Conducted emission

The field strength is calculated by adding the LISN factor, cable loss tr the measured reading.
The sample calculation is as follows :

FS = MR + LF + CL

MR = Meter Reading
LF = LISN Factor
CL = Cable Loss

If MR is 30dB, LISN Factor 1dB, CL 1dB
The result (MR) is
30 + 1 + 1 = 32dBuV

Radiated emission

The field strength is calculated adding the antenna Factor, cable loss and, Antenna pad adding, subtracting the amplifier gain from the measured reading.
The sample calculation is as follows :

FS = MR + AF + CL + AT -AG

MR = Meter Reading
AF = Antenna Factor
CL = Cable Loss
AP = Antenna Pad
AG=Amplifier Gain

If MR is 30dB, AF 12dB, CL 5dB, AP 10dB, AG 35dB
The result (MR) is
30 + 12 + 5 + 10 –35 = 22dBuV/m

4. Description of EUT

4.1 Product Description

Manufactured by:	**WOOJU COMMUNICATION CO., LTD.**
Address:	446-3 Nonhyun-dong, Namdong-ku, Incheon 405-300 Korea
Type of equipment:	Tele-switch
Model:	QDR-TELS
Serial number:	N/A
Power supply:	9V, 300mA

4.2 Peripherals

Description	Model / Part #	Serial Number	Manufacture
PC	EVO	6F28JYFZ7138	COMPAQ
MONITOR	77E	P225HVCT413264	SEC
KEYBOARD	KB-9963	B28AC0NGANB1DI	COMPAQ
MOUSE	M-S69	F466B0MN3NG1CH0	COMPAQ
Telephone	ST-902	N/A	COMMAX

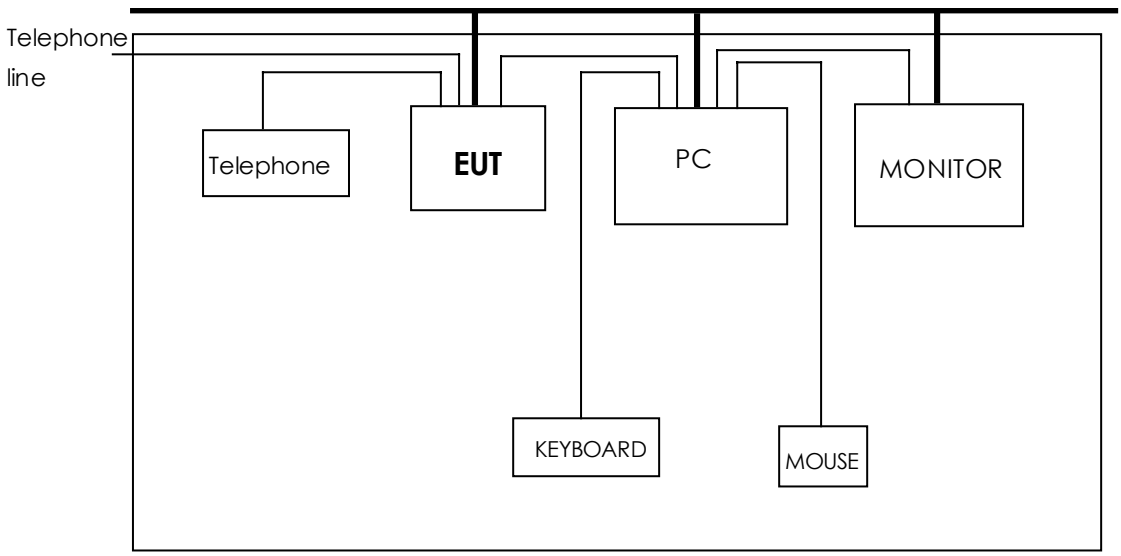
4.3 Used cables

EUT Port	Type	Shield (Y/N)	Length (m)	Connection point 1	Connection point 2
IN	RJ11	N	2.0	EUT	Telephone line
OUT	RJ11	N	2.0		Telephone
USB	USB	Y	1.2		PC(Remote in)
VGA	D-Sub	Y	1.8	PC	MONITOR
PS/2	PS/2	Y	1.8		MOUSE
PS/2	PS/2	Y	1.8		KEYBOARD

4.4 Operating conditions

Operating : 1. Make a call mode
- The system was configured in typical fashion (as a customer would normally use it) for testing.

4.5 EUT test configuration



5. Summary of test results

5.1 Modification to the E.U.T.

None

5.2 Standards & results

FCC Part 15 Subpart B (Class B)
ANSI C63.4 – 1992

Test items	Test methods	Result
Conducted emission	ANSI C63.4-1992	Pass
Radiated emission	ANSI C63.4-1992	Pass

6. Test results

6.1 Conducted emission

6.1.1 Measurement procedure

Mains

The measurements were performed in a shielded room.
EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.
The rear of tabletop was located 0.4m to the vertical conducted plane.
All other surfaces of tabletop were at least 0.8m away from any other grounded conducting surface.
Cables were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.
Each EUT power lead, except ground (safety) lead, was individually connected through a LISN to input power source.
Both lines of power cord, hot and neutral were measured.

6.1.2 Used equipments

Equipment	Model	Serial no.	Makers	Next Cal. date	Used
Test receiver	ESHS 10	843276/003	R&S	03.05.08	X
L.I.S.N.	L2-16A	0000J10705	PMM	04.04.03	X
	L3-32A	0120J20305	PMM	04.04.03	X
Test site	Shield room	-	-	-	X

6.1.3 Measurement uncertainty

Conducted emission measurement : ± 2.4 (K=2)

6.1.4 Test data

Frequency	Correction Factor		Line	Quasi-peak			Average		
				Limit	Reading	Result	Limit	Reading	Result
[MHz]	LISN	Cable		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.756	0.5	0.1	H	56.00	24.52	25.12	46.00	22.89	23.49
2.034	0.1	0.1	H		16.90	17.10		14.11	14.31
11.840	0.2	0.2	N	60.00	31.73	32.13	50.00	29.14	29.54
12.290	0.2	0.2	H		33.08	33.48		31.14	31.54
21.440	0.3	0.3	H		31.07	31.67		30.20	30.80
21.670	0.3	0.3	N		35.73	36.33		34.32	34.92
23.010	0.3	0.3	N		33.01	33.61		31.00	31.60

- Note. QP = Quasi-Peak, AV= Average
- <5 : mean less than 5 dB
- Loss = LISN Loss + Cable Loss
- Measurement time : 1 s

6.1.5. Result

Complied

6.2 Radiated emission

6.2.1 Measurement procedure

A pretest was performed at 3m distance in a semi-anechoic chamber for searching correct frequency. The final test was done at a 10m open area test site with a quasi-peak detector.
EUT was placed on a non-metallic table height of 0.8m above the reference ground plane.
Cables were folded back and forth forming a bundle 0.3m to 0.4m long and were hanged at a 0.4m height to the ground plane.
Cables connected to EUT were fixed to cause maximum emission.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

6.2.2 Used equipments

Equipment	Model no.	Serial no.	Makers	Next Cal. date	Used
Test receiver	ESVS10	827864/006	R&S	03.05.08	X
Spectrum	SA-9270A	01080005	LG	03.05.10	X
TRILOG Broadband Ant.	VULB 9160	3138	SCHWARZBECK	04.03.26	X
Antenna Mast	A109	N/A	DEAIL	-	X
Turn Table	TS14	N/A	DEAIL	-	X
10m OATS	-	-	EMC Compliance	-	X

6.2.3 Measurement uncertainty

Radiated Emission measurement : (K=2)
30-300 MHz ; 3 m: ±3.67, 10 m: ±4.4
300-1000 MHz ; 3 m:+4.6/-2.92, 10 m:+2.94/-2.88

6.2.4 Test data

Frequency	Reading	Pol.	Height	Angle	Correction Factor		Limits	Result	Margin
[MHz]	[dBuV]		[m]		Antenna	Cable	[dBuV/m]	[dBuV/m]	[dB]
85.92	9.2	V	1.6	100	7.62	2.10	30.0	18.92	11.08
365.75	1.3	H	4.0	212	14.59	4.60	37.0	20.49	16.51
400.90	2.0	H	4.0	274	15.51	4.80		22.31	14.69
500.03	5.6	V	1.4	114	17.46	5.70		28.76	8.24
687.24	1.4	V	1.4	94	20.63	6.60		28.63	8.37

* Receiving Antenna Mode : *Horizontal, Vertical*

* 10 m OATS

* <5 : mean less than 5dB

* Note : Reading = Test Receiver meter,

* P= Polarization → POL H = Horizontal, POL V = Vertical

* Result = Field Strength (Antenna factor + Cable factor + Reading)

6.2.5. Result

Complied

7. Test Graph

Conducted Emission test graph

EMC Compliance LTD 26 Apr 2003 11:

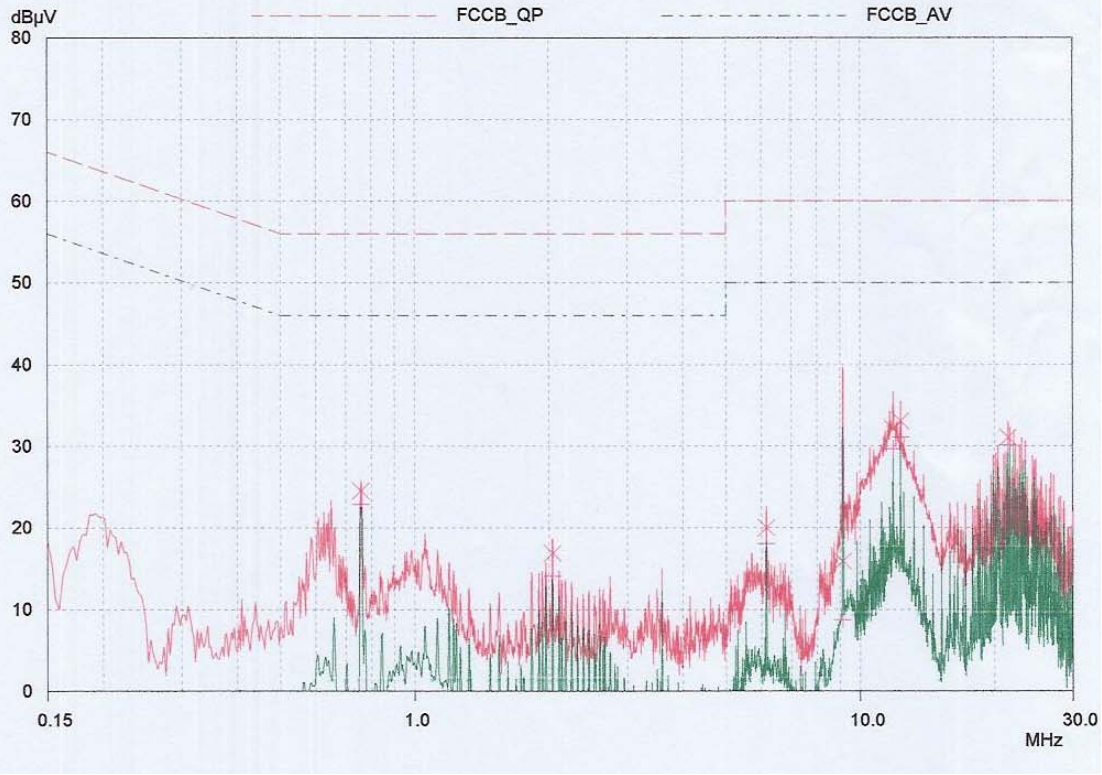
EUT: WTEL-100
Manuf: WOOJU
Op Cond: HOT
Operator:
Test Spec: FCC Class B Conducted Emission
Comment:

Result File: 030446H.dat : WTEL-100 HOT

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	3MHz	3kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB
3MHz	30MHz	10kHz	10kHz	PK+AV	5msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB



EMC Compliance LTD 26 Apr 2003 12:

EUT: WTEL-100
Manuf: WOOJU
Op Cond: N
Operator:
Test Spec: FCC Class B Conducted Emission
Comment:

Result File: 030446N.dat : WTEL-100 N

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	3MHz	3kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB
3MHz	30MHz	10kHz	10kHz	PK+AV	5msec	Auto	OFF	60dB

Final Measurement:
Detectors: X QP / + AV
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB