Direct Communication Solutions

Application
For
Certification

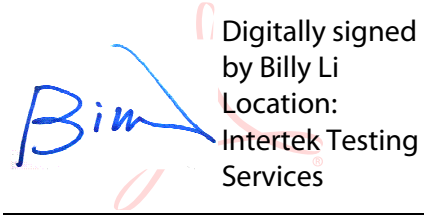
FCC ID: 2ABPW-DCS559-R

Router

Model: DCS-559

Computer peripheral

Report No.: 131105006SZN-001

Prepared and Checked by:	Approved by:
Sign on file	 Digitally signed by Billy Li Location: Intertek Testing Services
Harry Wu Assistant Engineer	Billy Li Supervisor Date: February 10, 2014

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LIST OF EXHIBITS

MEASUREMENT / TECHNICAL REPORT

Direct Communication Solutions
MODEL: DCS-559
FCC ID: 2ABPW-DCS559-R

This report concerns (check one:) Original Grant ___X___ Class II Change _____

Equipment Type: JBP-Part 15 Class B Computing Device Peripheral

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Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes _____ No ___X___

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date
of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes _____ No ___X___

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-13 Edition] provision.

Report prepared by:

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List of attached file

Exhibit Type	File Description	Filename
Test Report	Test Report	report.pdf
Test Setup Photo	Radiated photos	radiated photos.pdf
Test Setup Photo	Conducted photos	conducted photos.pdf
External Photo	External Photos	external photos.pdf
Internal Photo	Internal Photos	internal photos.pdf
Block Diagram	Block Diagram	block.pdf
ID Label / Location	Label Artwork and Location	label.pdf
User Manual	User Manual	manual.pdf
Cover Letter	Letter of Agency	agency.pdf
Cover Letter	Confidentiality Letter	request.pdf
Cover Letter	Agreement	agreement.pdf

EXHIBIT 1

GENERAL DESCRIPTION

1.0 General Description

1.1 Product Description

The Equipment Under Test (EUT) is a Router. The device can be used to transfer data connecting PC by LAN ports. It is powered by AC/DC Adapter (model: GFP181U-090200B-2) with input of 100-240VAC, 50/60Hz and output of DC9V, 2A. For more detailed features description, please refer to the user's manual.

1.2 Related Submittal(s) Grants

This is an application for certification of a computer peripheral.

Remaining portions are subject to the following procedures:
1. Transmitter portion of WiFi (Part 15C Digital Transmission Systems): 131105006SZN-002
2. Receiver portion of WiFi: exempt from technical requirement of this Part.
3. Router (3G): 131105006SZN-003.

1.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). Radiated emission measurement was performed in Semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The Semi-anechoic chamber and shielding room used to collect the radiated data and conducted data are **Intertek Test Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC (Registration Number: 242492).

EXHIBIT 2

SYSTEM TEST CONFIGURATION

2.0 System Test Configuration

2.1 Justification

The system was configured for Test in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2009).

The device is powered by AC/DC adaptor through 120V/60Hz during the test. The worst case data was reported in this report.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. The step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The rear of unit shall be flushed with the rear of the table.

The equipment under test (EUT) was configured for Test in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

The frequency range from 30MHz to 2.0GHz was searched for spurious emissions from the device. Only those emissions reported were detected. All other emissions were at least 20 dB below the applicable limits.

2.2 EUT Exercising Software

The EUT exercise program (provided by client) used during radiated and conducted Test was designed to exercise the various system components in a manner similar to a typical use. The worst case configuration is used in all specified Test.

2.3 Special Accessories

N/A

2.4 Equipment Modification

Any modifications installed previous to Test by Direct Communication Solutions will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Test Services Shenzhen Ltd. Kejiyuan Branch.

2.5 Measurement Uncertainty

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
AC/DC Adapter	Direct Communication Solutions	GFP181U-090200B-2
Laptop	Lenovo	X1
Hard Disk	Smart.drive	HD-003
USB Cable	Smart.drive	Unshielded, Length 155cm
1394 Cable	Smart.drive	Unshielded, Length 180cm
USB Disk	SanDisk	U210
3 * Router	TP-Link	TL-MR11U
5 * Network Cable	N/A	Unshielded, Length: 100cm

EXHIBIT 3

EMISSION RESULTS

3.0 Emission Results

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

FS = RA + AF + CF – AG + PD + AV

where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
PD = Pulse Desensitization in dB
AV = Average Factor in –dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

FS = RA + AF + CF – AG + PD + AV

Example

Assume a receiver reading of 62.0dBμV is obtained. The antenna factor of 7.4dB and cable factor of 1.6dB is added. The amplifier gain of 29dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0dB, and the resultant average factor was –10dB. The net field strength for comparison to the appropriate emission limit is 32dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 62.0dBμV
AF = 7.4dB
CF = 1.6dB
AG = 29.0dB
PD = 0dB
AV = –10dB

FS = 62 + 7.4 + 1.6 – 29 + 0 + (–10) = 32dBμV/m

Level in μV/m = Common Antilogarithm [(32dBμV/m)/20] = 39.8μV/m

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission
At
357.238MHz (communicate with PC Mode)

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos.pdf.

3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 4.5dB margin (ccommunicate with PC Mode)

TEST PERSONNEL:

Sign on file

Harry Wu Assistant Engineer
Typed/Printed Name

December 30, 2013
Date

Company: Direct Communication Solutions Date of Test: December 30, 2013
Model: DCS-559
Worst Operating Mode: communicate with PC

Radiated Emissions (30MHz~2.0GHz)

Polarization	Frequency (MHz)	Reading (dBµV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
Horizontal	92.437	37.0	20.0	8.1	25.1	43.5	-18.4
Horizontal	250.484	43.4	20.0	13.8	37.2	46.0	-8.8
Horizontal	357.238	45.7	20.0	15.8	41.5	46.0	-4.5
Vertical	58.975	47.3	20.0	8.0	35.3	40.0	-4.7
Vertical	94.124	49.8	20.0	8.1	37.9	43.5	-5.6
Vertical	98.503	50.4	20.0	8.3	38.7	43.5	-4.8
Vertical	1250.873	28.5	20.0	30.0	38.5	54.0	-15.5

NOTES:

1. Quasi-Peak detector is used for frequency up to 1GHz and PEAK detector is used for frequency from 1.0-2.0GHz.

2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3 meter distances were measured at 0.3- meter and an inverse proportional extrapolation was performed to compare the signal level to the 3 meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

3. Negative value in the margin column shows emission below limit.

4. All emissions up to 1GHz are below the QP limit and all emissions between 1.0-2.0GHz are below the AV limit.

Test Engineer: Harry Wu

3.4 Conducted Emission Configuration Photograph

Worst Case Neutral-Conducted Configuration
at
0.518 MHz (communicate with PC Mode)

For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

3.5 Conducted Emission Data

Judgement: Passed by 17.1 dB margin (communicate with PC Mode)

TEST PERSONNEL:

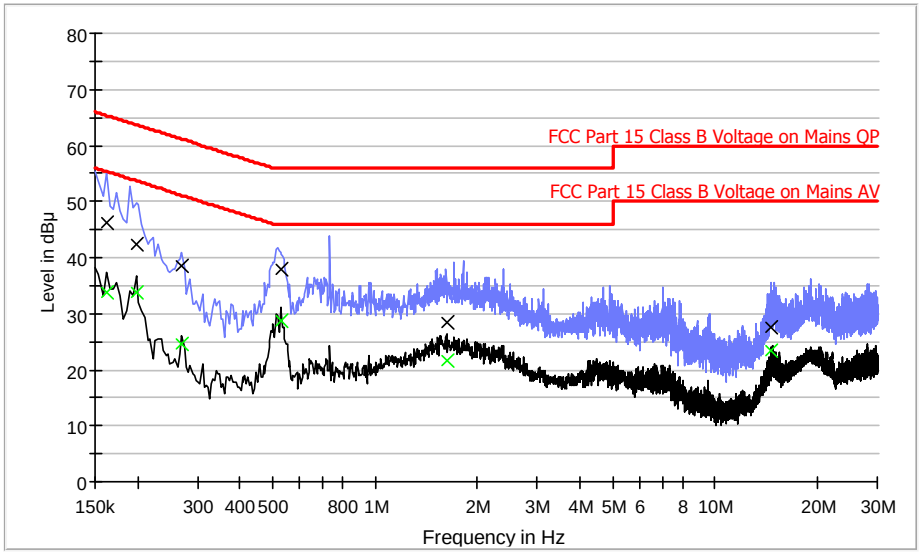
Sign on file

Harry Wu Test Engineer
Typed/Printed Name

December 30, 2013
Date

Company: Direct Communication Solutions Date of Test: December 30, 2013
Model: DCS-559
Worst Operating Mode: communicate with PC

Conducted Emission Test – FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.162000	46.3	L1	9.6	19.1	65.4
0.198000	42.5	L1	9.6	21.2	63.7
0.270000	38.4	L1	9.6	22.7	61.1
0.526000	37.8	L1	9.6	18.2	56.0
1.622000	28.4	L1	9.7	27.6	56.0
14.620000	27.5	L1	9.6	32.5	60.0

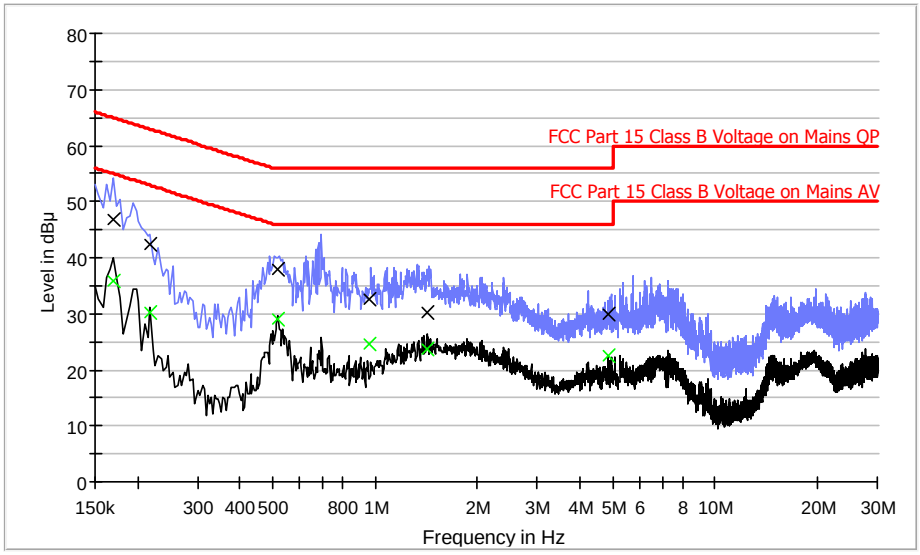
Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.162000	33.8	L1	9.6	21.6	55.4
0.198000	33.8	L1	9.6	19.9	53.7
0.270000	24.6	L1	9.6	26.5	51.1
0.526000	28.6	L1	9.6	17.4	46.0
1.622000	21.6	L1	9.7	24.4	46.0
14.620000	23.5	L1	9.6	26.5	50.0

Test Engineer: Harry Wu

Company: Direct Communication Solutions Date of Test: December 30, 2013
Model: DCS-559
Worst Operating Mode: communicate with PC

Conducted Emission Test - FCC



Result Table QP

Frequency (MHz)	QuasiPeak (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.170000	46.8	N	9.6	18.2	65.0
0.218000	42.5	N	9.5	20.4	62.9
0.518000	38.0	N	9.6	18.0	56.0
0.964000	32.5	N	9.4	23.5	56.0
1.418000	30.3	N	9.8	25.7	56.0
4.842000	29.8	N	9.6	26.2	56.0

Result Table AV

Frequency (MHz)	Average (dB µ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.170000	35.8	N	9.6	19.2	55.0
0.218000	30.2	N	9.5	22.7	52.9
0.518000	28.9	N	9.6	17.1	46.0
0.964000	24.5	N	9.4	21.5	46.0
1.418000	23.6	N	9.8	22.4	46.0
4.842000	22.5	N	9.6	23.5	46.0

Test Engineer: Harry Wu

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 Equipment Photographs

For electronic filing, photographs of the tested EUT are saved with filename: external photos.pdf and internal photos.pdf.

EXHIBIT 5

PRODUCT LABELLING

5.0 **Product Labelling**

For electronics filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

EXHIBIT 6

TECHNICAL SPECIFICATIONS

6.0 Technical Specifications

For electronic filing, the block diagram of the tested EUT is saved with filename: block.pdf.

EXHIBIT 7

INSTRUCTION MANUAL

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold / leased in the United States.

EXHIBIT 8

MISCELLANEOUS INFORMATION

8.0 **Miscellaneous Information**

This miscellaneous information includes emission measuring procedure.

8.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Test Services in the measurements of computer peripheral operating under Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2009.

The computer peripheral equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The antenna height and polarization are varied during the Test to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions are in QP mode from the frequency band 30MHz to 1GHz with RBW setting 120kHz. Detector function for radiated emissions are in PK&AV mode from the frequency band above 1GHz with RBW setting 1MHz. Detector function for conducted emissions are in QP & AV mode and IFBW setting is 9kHz from the frequency band 150kHz to 30MHz.

For radiated emission, the frequency range scanned is 30MHz to 2.0GHz. For line-conducted emissions, the range scanned is 150kHz to 30MHz.

8.1 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

Conducted measurements are made as described in ANSI C63.4 - 2009.

EXHIBIT 9

TEST EQUIPMENT LIST

9.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	29-Jun-13	29-Jun-14
SZ185-01	EMI Receiver	R&S	ESCI	100547	12-Mar-13	12-Mar-14
SZ061-07	Pyramidal Horn Antenna	ETS	3160-09	00083067	20-Jul-13	20-Jan-14
SZ061-08	Horn Antenna	ETS	3115	00092346	26-Oct-13	26-Oct-14
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	12-Mar-13	12-Mar-14
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	12-Mar-13	12-Mar-14
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	02-Mar-13	02-Mar-14
SZ062-02	RF Cable	RADIALL	RG 213U	--	20-Jul-13	20-Jan-14
SZ062-06	RF Cable	RADIALL	0.04-26.5GHz	--	20-Jul-13	20-Jan-14
SZ062-12	RF Cable	RADIALL	0.04-26.5GHz	--	17-Oct-13	17-Apr-14
SZ067-04	Notch Filter	Micro-Tronics	BRM50702-02	--	21-May-13	21-May-14
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	9-Nov-13	9-Nov-14
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	9-Nov-13	9-Nov-14
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	9-Nov-13	9-Nov-14
SZ188-03	Shielding Room	ETS	RFD-100	4100	23-Aug-13	23-Aug-14