



TEST REPORT

KCTL Inc. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-31-285-0894 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR18-SRF0019 Page (1) of (20)	
1. Client - Name : IDP Corp., Ltd. - Address : (Guro-Dong, Buycksan digital vally 7), 601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea - Date of Receipt : 2018-01-29 2. Use of Report : - 3. Name of Product and Model : Card Printer / SMART-31 4. Manufacturer and Country of Origin : IDP Corp., Ltd. / Korea 5. FCC ID : VU2-SMART-31 6. Date of Test : 2018-02-22 to 2018-02-23 7. Test Standards : FCC Part 15 Subpart C 15.225 8. Test Results : Refer to the test result in the test report		
Affirmation	Tested by Name : Jaehyong Lee (Signature)	Technical Manager Name : Jongha Choi (Signature)
	2018-03-08	
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REPORT REVISION HISTORY

Date	Revision	Page No
2018-03-08	Originally issued	-

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1. Client information

Applicant: IDP Corp., Ltd.
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Manufacturer: IDP Corp., Ltd.
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2. Laboratory information

Address

KCTL Inc.

65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea

Telephone Number: 82 31 285 0894

Facsimile Number: 82 505 299 8311

FCC Site Designation No: KR0040, FCC Site Registration No: 687132

VCCI Registration No. : R-3327, G-198, C-3706, T-1849

Industry Canada Registration No. : 8035A

KOLAS NO.: KT231

SITE MAP



3. Description of E.U.T.

3.1 Basic description

Applicant	IDP Corp., Ltd.
Address of Applicant	(Guro-Dong, Buycksan digital vally 7), 601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea
Manufacturer	IDP Corp., Ltd.
Address of Manufacturer	(Guro-Dong, Buycksan digital vally 7)601, 50, Digital-ro33-gil, Guro-gu, Seoul, Korea
Type of equipment	Card Printer
Basic Model	SMART-31
Variant Model I ¹⁾	SMART-31S, SOLID-310S
Variant Model II ²⁾	SMART-31D, SOLID-310D, GRASYS ID170W, IDP-31D, ID-31D, CP-31D, P-31D, SMART-31R, GRASYS ID170, GRASYS ID170R, IDP-31S, ID-31S, CP-31S, P-31S
Serial number	N/A

¹⁾ : No Flipper

²⁾ : Simplified derivation based on buyer's model name and there is difference of color for each model.

3.2 General description

Frequency Range	13.56 MHz
Type of Modulation	ASK
The number of channels	1 ch
Type of Antenna	Loop Antenna
Power supply	DC 24 V
Product SW/HW version	smart51_app_1_01_07_SPI.bin / MAIN BD,31 PRT,V0.1
Radio SW/HW version	smart51_app_1_01_07_SPI.bin / MAIN BD,31 PRT,V0.1
Test SW Version	CardPrinterFirmware Downloader v2.1.1.2
RF power setting in TEST SW	default

Note : The above EUT information was declared by the manufacturer.

3.3 Test frequency

Frequency	13.56 MHz
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4. Summary of test results

4.1 Standards & results

Rule Reference	Parameter	Status
15.203	Antenna Requirement	C
15.225 (a)	In-band Fundamental Emission	C
15.225 (b)	In-band Spurious Emission	C
15.225 (c)	In-band Spurious Emission	C
15.225 (d) 15.209	Out-of-band Spurious Emission	C
15.225 (e)	Frequency Stability Tolerance	C
15.207	Conducted Emissions	C
Note ₁): C = Complies, NC = Not Complies, NT = Not Tested, NA = Not Applicable		

4.2 Uncertainty

Measurement Item	Expanded Uncertainty $U = kU_c (k = 2)$	
Radiated Spurious Emissions	30 MHz ~ 300 MHz:	+4.94 dB, -5.06 dB
		+4.93 dB, -5.05 dB
	300 MHz ~ 1 000 MHz:	+4.97 dB, -5.08 dB
		+4.84 dB, -4.96 dB
Conducted Emissions	1 GHz ~ 25 GHz:	+6.03 dB, -6.05 dB
	9 kHz ~ 150 kHz:	3.75 dB
	150 kHz ~ 30 MHz:	3.36 dB

5. Test results

5.1 Antenna Requirement

5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

5.1.2 Result

-Complied

The Loop antenna is permanantly attached on PCB board.

5.2 In-band Fundamental Emission

5.2.1 Regulation

15.225 (a) The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

5.2.2 Measurement Procedure

Test Procedure The Radiated Electric Field Strength intensity has been measured on semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9 kHz to 30 MHz at distance 3m The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

Frequency : From 30 MHz to 1 GHz at distance 3m The measuring antenna height varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization.

Measurements were performed with a QP, PK, and AV detector. The radiated emission measurements were made with the following detector function of the test receiver (below 1 GHz).

Frequency	9 - 90 kHz	90 - 110 kHz	110 - 490 kHz	490 kHz - 30 MHz	30 MHz -1 GHz
Detector type	PK/AV	QP	PK/AV	QP	QP
IF bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz

- Part 15 Section 15.31 (f)(2) (9 kHz - 30 MHz)

[Limit at 3m]=[Limit at 300m]-40 x log(3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

Note : Axis among X, Y and Z plans (Please refer to the "Test setup photos" to check X, Y, Z configuration).

5.2.3 Test Result

- Complied

- Basic model (SMART-31)

Voltage [V]	Frequency [MHz]	Reading [dBμV]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dBμV/m at 3 m]	Limit [dBμV/m at 3 m]	Margin [dB]
QP DATA.									
24.0	13.56	77.10	1.51	-32.67	19.56	-11.60	65.50	124.00	58.50

- Variant model (SMART-31S)

Voltage [V]	Frequency [MHz]	Reading [dBμV]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dBμV/m at 3 m]	Limit [dBμV/m at 3 m]	Margin [dB]
QP DATA.									
24.0	13.56	73.30	1.51	-32.67	19.56	-11.60	61.70	124.00	62.30

[Result = Reading + Amp Gain + AF + CL]

1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss
3. Factor = CL+AF+AG

5.3 In-band Spurious Emission

5.3.1 Regulation

15.225 (b) With in the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

15.225 (c) With in the bands 13.110-13.410 MHz and 13.710-14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

5.3.2 Test Result

- Complied

Measurement Distance: 3 m

- Basic model (SMART-31)

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
QP DATA.										
13.39	9	36.00	V	1.51	-32.67	19.56	-11.60	24.40	80.50	56.10
13.55	9	60.90	H	1.51	-32.67	19.56	-11.60	49.30	90.50	41.20
13.57	9	59.10	H	1.51	-32.67	19.56	-11.60	47.50	90.50	43.00
14.00	9	35.60	V	1.53	-32.67	19.54	-11.60	24.00	80.50	56.50

- Variant model (SMART-31S)

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
QP DATA.										
13.33	9	35.40	V	1.50	-32.67	19.57	-11.60	23.80	80.50	56.70
13.55	9	58.20	H	1.51	-32.67	19.56	-11.60	46.60	90.50	43.90
13.57	9	55.50	H	1.51	-32.67	19.56	-11.60	43.90	90.50	46.60
13.74	9	35.50	H	1.52	-32.67	19.55	-11.60	23.90	80.50	56.60

[Result = Reading + Amp Gain + AF + CL]

1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss
3. Factor = CL+AF+AG

5.4 Out-of-band Spurious Emission

5.4.1 Regulation

15.225 (d) The Field Strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in 15.209

Frequency (MHz)	Field Strength ($\mu V/m$)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30(29.54 dB $\mu V/m$)	30
30.0-88.0	100(40 dB $\mu V/m$)	3
88-216	150(43.5 dB $\mu V/m$)	3
216-960	200 (46 dB $\mu V/m$)	3
Above 960	500 (53.98 dB $\mu V/m$)	3

5.4.2 Measurement Procedure

The spurious emissions from the EUT will be measured on an 10 m Anechoic chamber in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna.

The antenna was positioned 3, 10 or 30 meters horizontally from the EUT.

Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions.

In the case where larger measuring distances are required the results will be extrapolated based on the values measuring on the closer distances according to Section 15.31 (f) (2) [2].

The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209 (d) [2].

The final level, expressed in dB $\mu V/m$, is arrived at by taking the reading from the EMI receiver (Level dB μV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has to be compared with the relevant FCC limit. The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: ResBW: 200 Hz

150 kHz – 30 MHz: ResBW: 9 kHz

The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.

The EUT was placed on the top of the 0.8 meter height, 1 x 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.

The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1 000 MHz using the BILOG antenna. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 10 m chamber. The EUT was tested at a distance 3 meters.

Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.

5.4.3 Test Result

- Complied

Measurement Distance: 3 m

- Basic model (SMART-31)

-Below 30 MHz

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
QP DATA.										
0.64	9	46.20	V	0.23	-32.73	19.60	-12.90	33.30	72.40	39.10
22.33	9	36.70	H	2.83	-32.68	19.25	-10.60	26.10	69.50	43.40

-Above 30 MHz

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μV)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
QP DATA.										
33.27	120	45.40	V	1.15	-29.58	12.43	-16.00	29.40	40.00	10.60
162.65	120	37.70	H	3.65	-34.36	17.61	-13.10	24.60	43.50	18.90
248.98	120	42.10	H	5.32	-39.98	21.06	-13.60	28.50	46.00	17.50
352.65	120	40.10	H	4.24	-28.60	14.66	-9.70	30.40	46.00	15.60
623.76	120	34.10	V	6.10	-28.72	20.62	-2.00	32.10	46.00	13.90
989.94	120	24.50	H	8.60	-31.88	28.68	5.40	29.90	54.00	24.10

[Result = Reading + Amp Gain + AF + CL]

1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss
3. Factor = CL+AF+AG

- Variant model (SMART-31S)

-Below 30 MHz

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μ V)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μ V/m)]	Limit [dB(μ V/m)]	Margin [dB]
QP DATA.										
0.63	9	42.80	V	0.23	-32.73	19.60	-12.90	29.90	72.60	42.70
20.54	9	39.10	H	2.59	-32.68	19.29	-10.80	28.30	69.50	41.20

-Above 30 MHz

Frequency [MHz]	Receiver Bandwidth [kHz]	Reading [dB(μ V)]	Pol. [V/H]	Cable Loss [dB]	Amp Gain [dB]	Antenna Factor [dB]	Factor [dB]	Result [dB(μ V/m)]	Limit [dB(μ V/m)]	Margin [dB]
QP DATA.										
33.27	120	45.20	V	1.15	-29.58	12.43	-16.00	29.20	40.00	10.80
245.95	120	41.50	H	5.27	-40.01	20.94	-13.80	27.70	46.00	18.30
325.49	120	44.10	H	6.81	-41.43	24.12	-10.50	33.60	46.00	12.40
542.40	120	34.00	V	5.38	-28.17	18.79	-4.00	30.00	46.00	16.00
583.14	120	30.10	V	5.62	-28.07	19.65	-2.80	27.30	46.00	18.70
976.36	120	23.80	V	7.93	-30.73	27.90	5.10	28.90	54.00	25.10

[Result = Reading + Amp Gain + AF + CL]

1. H = Horizontal, V = Vertical Polarization
2. AF/CL = Antenna Factor and Cable Loss
3. Factor = CL+AF+AG

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5.5 Frequency tolerance

5.5.1 Regulation

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of -20 degrees to $+50$ degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.5.2 Test Result

- Complied

- Basic model (SMART-31)

VOLTAGE [%]	POWER [W]	TEMP [°C]	FREQ [Hz]	FREQ.DEV [Hz]	Deviation [%]
100	24.0	-20	13 560 314	313.7	0.002 31
		-10	13 560 332	331.7	0.002 45
		0	13 560 328	327.7	0.002 42
		10	13 560 326	325.7	0.002 40
		20	13 560 314	313.7	0.002 31
		25	13 560 258	257.7	0.001 90
		30	13 560 288	287.7	0.002 12
		40	13 560 278	277.7	0.002 05
		50	13 560 266	265.7	0.001 96
85	20.4	20	13 560 258	257.7	0.001 90
115	27.6	20	13 560 256	255.7	0.001 89

- Variant model (SMART-31S)

VOLTAGE [%]	POWER [W]	TEMP [°C]	FREQ [Hz]	FREQ.DEV [Hz]	Deviation [%]
100	24.0	-20	13 560 330	329.7	0.002 43
		-10	13 560 306	305.7	0.002 25
		0	13 560 292	291.7	0.002 15
		10	13 560 278	277.7	0.002 05
		20	13 560 254	253.7	0.001 87
		25	13 560 212	211.8	0.001 56
		30	13 560 198	197.8	0.001 46
		40	13 560 196	195.8	0.001 44
		50	13 560 198	197.8	0.001 46
85	20.4	20	13 560 214	213.8	0.001 58
115	27.6	20	13 560 216	215.8	0.001 59

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5.6 Conducted Emission

5.6.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN).

Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

* Decreases with the logarithm of the frequency.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

5.6.2 Measurement Procedure

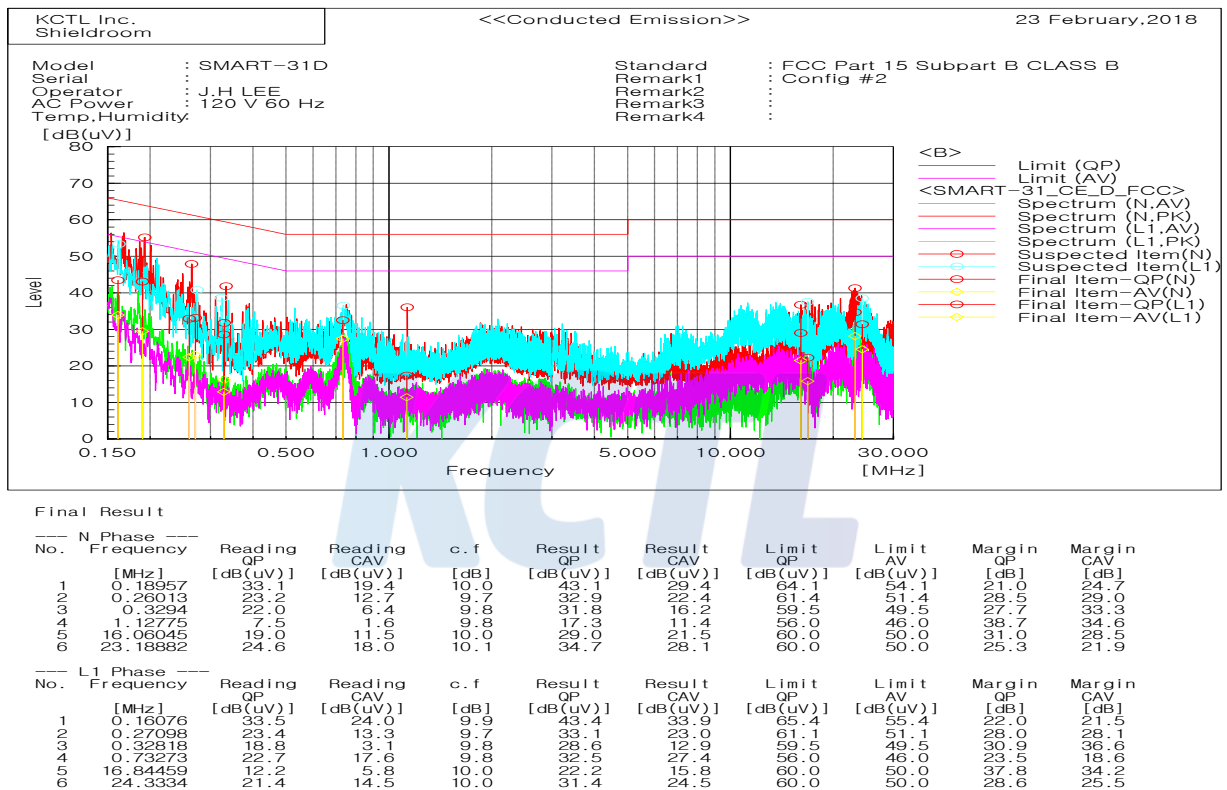
- 1) The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
- 2) Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50µH LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
- 3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
- 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
- 5) The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.

5.6.3 Test Result

- Complied

Figure 4. The plot of Conducted Emission

- Basic model (SMART-31)



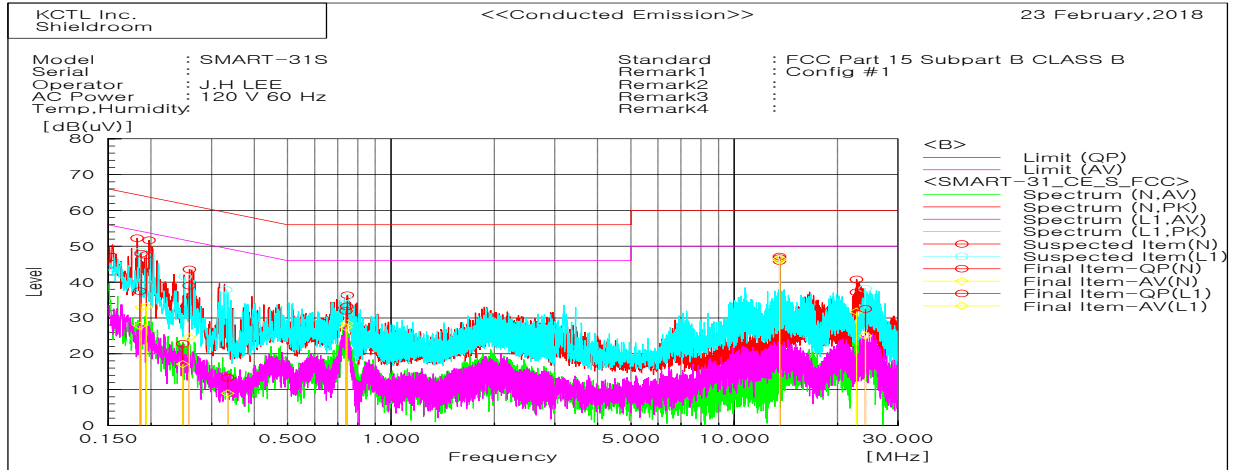
KCTL Inc.

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- Variant model (SMART-31S)



Final Result

--- N Phase ---									
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c. f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]
1	0.18691	37.9	22.9	10.0	47.9	32.9	64.2	54.2	16.3
2	0.19351	37.6	23.2	9.9	47.5	33.1	63.9	53.9	16.4
3	0.25827	29.3	14.9	9.7	39.0	24.6	61.5	51.5	22.5
4	0.74331	23.3	18.5	9.9	33.2	28.4	56.0	46.0	22.8
5	13.5605	35.9	36.0	10.0	45.9	46.0	60.0	50.0	14.1
6	22.72386	27.1	21.7	10.1	37.2	31.8	60.0	50.0	22.8

--- L1 Phase ---									
No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c. f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]
1	0.18549	27.5	17.8	10.0	37.5	27.8	64.2	54.2	26.7
2	0.24757	13.2	7.5	9.6	22.8	17.1	61.8	51.8	39.0
3	0.33452	3.5	-0.9	9.8	13.3	8.9	59.3	49.3	46.0
4	0.74019	22.1	17.6	9.8	31.9	27.4	56.0	46.0	24.1
5	13.55986	37.2	36.6	9.9	47.1	46.5	60.0	50.0	12.9
6	24.08514	22.5	15.0	10.0	32.5	25.0	60.0	50.0	27.5

6. Test equipment used for test

	Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
■	SPECTRUM ANALYZER	R&S	FSW50	101013	18.06.22
■	DC Power Supply	Agilent	E3632A	MY40017108	18.05.15
■	Temp & Humid Chamber	ESPEC CORP.	PL-2KP	14020657	19.01.05
■	SIGNAL GENERATOR	R&S	SMB100A	176206	19.01.31
■	Vector Signal Generator	R&S	SMBV100A	257566	19.01.05
■	Loop Antenna	R&S	HFH2-Z2	100355	20.01.31
■	EMI Test Receiver	R&S	ESCI7	100732	18.08.24
■	Amplifier	SONOMA	310N	344922	18.08.25
■	Bilog Antenna	VULB9168	SCHWARZBECK	440	18.08.05
■	COAXIAL FIXED ATTENUATOR	8491A	Agilent	MY52461848	18.08.24
■	Antenna Mast	MA4000-EP	Innco Systems	303	-
■	Turn Table	DT2000	Innco Systems	79	-
■	EMI Test Receiver	R&S	ESCI	100154	18.05.02
■	Two Line V-Network	R&S	ENV216	101718	18.09.19
■	Two Line V-Network	R&S	ESH2-Z5	842966/014	18.09.20
■	Cable Assembly	Gigalane	RF-400	-	-
■	Cable Assembly	Radiall	2301762000PJ	1724.661	-