CERTIFICATE OF COMPLIANCE
FCC PART 15C Certification

Applicant Name:	Date of Testing
CanTops	August 22, 2012 to January 14, 2013
	Test Site/Location
Address:	BWS TECH Inc. #611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do 449-853, Korea
A-1208 Digital Empire B/D 980-3 Yeongtong-dong Yeongtong-gu Suwon-city Gyeonggi-do Korea 443-702	**Test Report No.:** BWS-13-RF-0001
	BWS FRN: 00099636881

FCC ID:	**RMN-CTS-RFID-LF03**
APPLICANT:	**CanTops**

Model(s):	CTS-RFID-LF03
EUT Type:	RFID Reader
Frequency Range:	134.2 kHz
Modulation Type	ASK
FCC Classification:	DCD Low Power Transmitter Below 1705 kHz
FCC Rule Part(s):	FCC Part 15 Subpart C

Engineering Statement:

The measurements shown in this report were made in accordance with the procedures indicated. And the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them.
BWS TECH Inc. Certifies that no party to this application has been denied FCC benefits pursuant to section 5301 of the Anti-Drug Abuse Act of 1998,21 U.S C.862

(Date) 1/14/2013

Tested by **KwanHeon, Lee**

(Date)1/14/2013

Reviewed by **JungSik, Song**

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FCC TEST REPORT

Scope – *Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

1. General Information

Applicant

Company Name	:CanTops
Company Address	:A-1208 Digital Empire B/D 980-3 Yeongtong-dong Yeongtong-gu Suwon-city Gyeonggi-do Korea 443-702.
Phone/Fax	:Phone : +82-31-303-5231 Fax : +82-31-303-5233

Manufacturer

Company Name	: CanTops
Company Address	:A-1208 Digital Empire B/D 980-3 Yeongtong-dong Yeongtong-gu Suwon-city Gyeonggi-do Korea 443-702.
Phone/Fax	: Phone : +82-31-303-5231 Fax : +82-31-303-5233

● **EUT Type**	:RFID Reader
● **Model Name**	:CTS-RFID-LF03
● **FCC ID**	:RMN-CTS-RFID-LF03
● **S/N**	:Prototype
● **Freq. Range**	: 134.2 kHz
● **Number of Channels**	:Single Channel
● **Modulation Method**	:ASK
● **FCC Rule Part(s)**	:Part 15 Subpart C
● **Test Procedure**	:ANSI C63.4-2009
● **Dates of Tests**	:August 22, 2012 to January 14, 2013
● **Place of Tests**	:BWS TECH Inc.(FCC Registration Number : 553281) #611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-853, Korea TEL: +82 31 333 5997 FAX: +82 31 333 0017
● **Test Report No.**	:BWS-13-RF-0001

2. Description of Test Facility

The measurement for radiated emission test were conducted at the open area test site of BWS TECH Inc. Measurement for conducted emission test were practiced at the semi EMC Anechoic Chamber test site of BWS TECH Inc. facility located at #611-1 Maesan-Ri, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-853, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2009 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-1992 and registered to the Federal Communications Commission (Registration Number : 553281).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2009) was used in determining radiated emissions from the CanTops. Model : CTS-RFID-LF03.

3. Product Information

3.1 Equipment Description

The Equipment Under Test (EUT) is RF transmitter by the CanTops.
Model : CTS-RFID-LF03. (FCC ID :RMN-CTS-RFID-LF03).

3.2 General Specification

The system specifications are subject to change without notice. For detailed system specifications, refer to the product catalog.

Product name	**RFID Reader**
Model name	**CTS-RFID-LF03**
Detailed specification	**1) RF** **Frequency: 134.2 KHz** **Number of Antennas: 4 channel** **Connection connector: BNC** **Antenna capacity: 47 uH** **Antenna cable: Coaxial cable** **2) Interface** **Communication type: TCP/IP** **Connection connector: RJ45** **3) Power** **Input power: +24Vdc** **Consumed current: During a wait – 50mA or less,** **During a read -200 mA or less** **4)Case** **176(W) x 93.4(H) x 30(D) mm** **Material: Metal** **5) Performance** **Reading distance: 80mm or more** **Reading time: 460 ms / 1page** **Writing distance: 35 mm or more** **Writing time: 170 ms / 1page**

FCC Part 15.203 Antenna requirement

The EUT has an external antenna connector, but it is installed by the professionals. Therefore, the equipment complies with the antenna requirement of Section 15.203.

4. Summary of Test Results

TEST REQUIREMENTS	FCC Paragraph	Result
5.1 Power Line Conducted Emission	§15.207	Pass
5.2 Radiated Emission	§15.209	Pass
5.3 Occupied Bandwidth	§15.215	Pass

5. Test Data

5.1 Power Line Conducted Emissions

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz on the 230V AC power and return leads of the EUT according to the methods defined in FCC Part 15.207. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 3.1.5. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

5.1.1 Test Condition

Frequency Range of Test : 150 kHz to 30 MHz

Test Standard : FCC Part 15.207

5.1.2 Test Standard

Frequency Range (MHz)	Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

5.1.3 Test Result of Power Line Conducted Emission

EUT : CTS-RFID-LF03

Power Line Conducted Emission Test Result : PASS

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Tabulated Conducted Emission Test Data

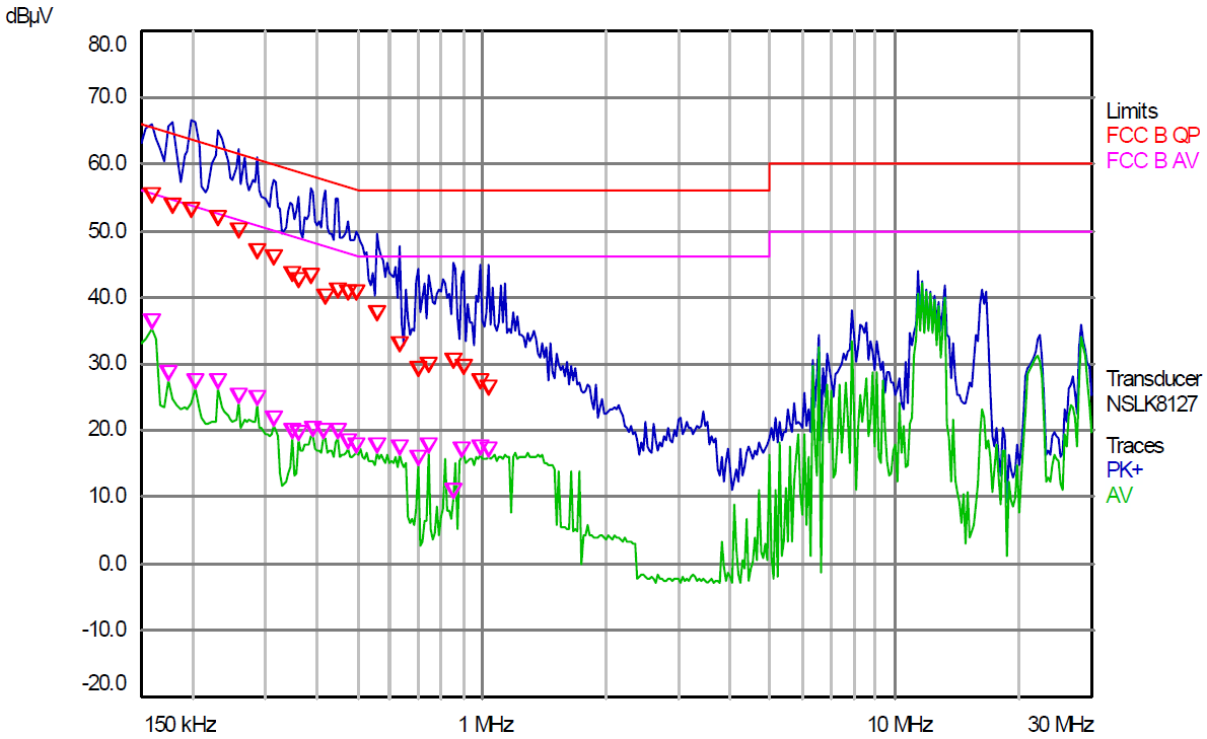
Detector Mode ; CISPR Quasi Peak mode (6dB Bandwidth : 9kHz).

Freq [MHz]	Correction		Phase [H/N]	Quasi-Peak Mode				Average Mode			
	AMN	C.L		Limit	Reading	Emission Level	Margin	Limit	Reading	Emission Level	Margin
				[dBuV]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dB]
0.158	0.14	0.02	N	65.90	54.52	54.68	-11.22	55.90	34.81	34.97	-20.93
0.166	0.14	0.02	N	65.60	53.98	54.14	-11.46	55.60	27.69	27.85	-27.75
0.194	0.14	0.02	N	64.90	52.29	52.45	-12.45	54.90	26.55	26.71	-28.19
0.230	0.12	0.02	H	63.70	50.58	50.72	-12.98	53.70	26.28	26.42	-27.28
0.258	0.12	0.02	H	63.00	48.67	48.81	-14.19	53.00	23.96	24.10	-28.90
0.278	0.12	0.02	N	62.40	46.92	47.06	-15.34	52.40	20.45	20.59	-31.81
0.314	0.11	0.02	H	61.40	44.72	44.85	-16.55	51.40	20.67	20.80	-30.60
0.346	0.11	0.02	H	60.40	42.17	42.30	-18.10	50.40	18.72	18.85	-31.55
0.358	0.11	0.02	N	60.10	41.62	41.75	-18.35	50.10	12.52	12.65	-37.45
0.386	0.11	0.02	H	59.30	41.86	41.99	-17.31	49.30	19.12	19.25	-30.05
0.422	0.10	0.02	N	58.30	40.06	40.18	-18.12	48.30	13.87	13.99	-34.31
0.446	0.10	0.02	H	57.60	39.70	39.82	-17.78	47.60	18.66	18.78	-28.82
0.474	0.10	0.02	H	57.00	39.56	39.68	-17.32	47.00	17.15	17.27	-29.73
0.498	0.10	0.02	H	57.30	39.41	39.53	-17.77	47.30	16.40	16.52	-30.78
0.560	0.10	0.02	H	56.00	36.49	36.61	-19.39	46.00	16.66	16.78	-29.22
0.632	0.10	0.02	H		31.63	31.75	-24.25		16.30	16.42	-29.58
0.692	0.10	0.02	N		28.41	28.53	-27.47		6.01	6.13	-39.87
0.744	0.10	0.02	H		28.79	28.91	-27.09		16.52	16.64	-29.36
0.852	0.10	0.02	H		29.28	29.40	-26.60		9.83	9.95	-36.05
0.900	0.10	0.02	N		28.72	28.84	-27.16		9.47	9.59	-36.41
0.992	0.10	0.02	H		26.12	26.24	-29.76		16.15	16.27	-29.73
1.040	0.10	0.02	N		26.85	26.97	-29.03		9.70	9.82	-36.18

NOTES:

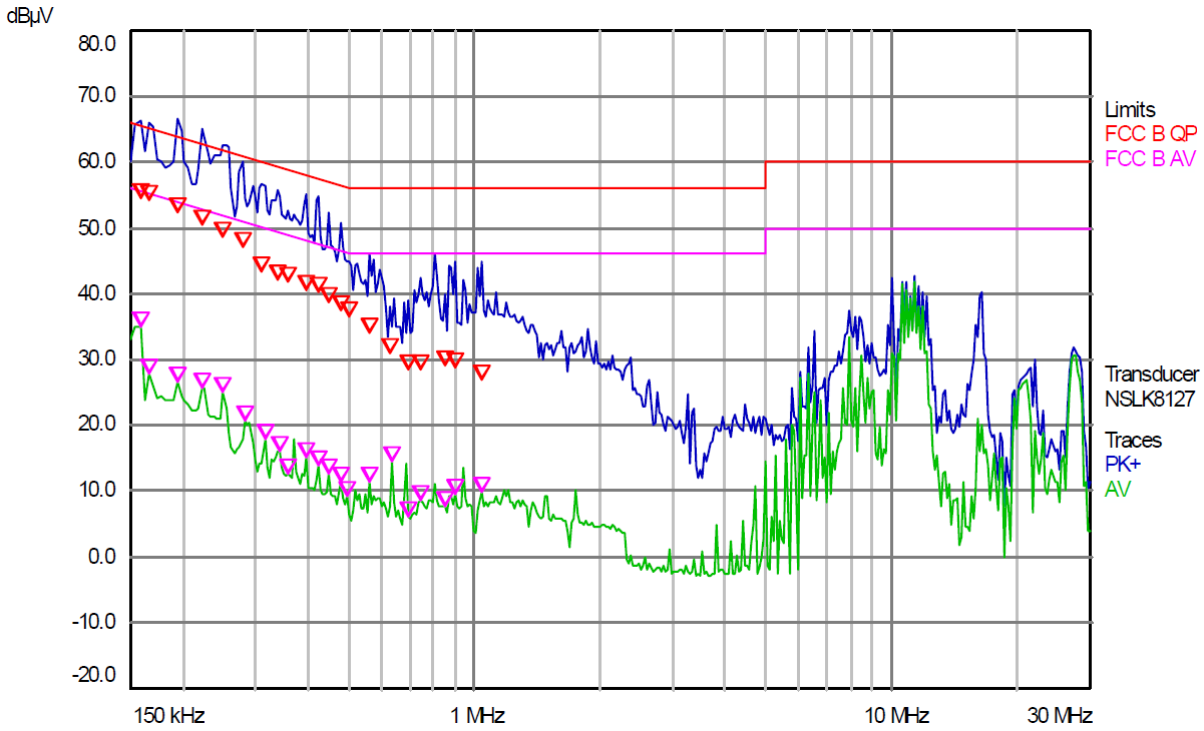
1. H : Hot Line , N :Neutral Line
2. Emission Level = Reading + Correction Factor
3. Margin = Limit - Emission Level
4. Measurements were performed at the AC Power Inlet of the host PC with the EUT plugged in the frequency band of 150kHz ~30MHz
5. Measurement uncertainty estimated at ±3.500 dB.
   The measurement uncertainty is given with a confidence of 95.00 % with the coverage factor, k=2.

Plots of Conducted Emission Test



Test Mode: Hot
Model Name: CTS-RFID-LF03
Classification: FCC Part 15 Subpart C

Plots of Conducted Emission Test



Test Mode: Neutral
Model Name: CTS-RFID-LF03
Classification: FCC Part 15 Subpart C

5.2 Radiated Emissions

Radiated emissions form 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in FCC Part 15.209. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

5.2.1 Test Condition

Frequency Range of Test : 9 kHz to 1000 MHz

Test Standard : FCC Part 15.209

5.2.2 Test Standard

Frequency Range (MHz)	Field Strength (uV/m)	Distance (m)
0.009 ~ 0.490	2400 / F	300
0.490 ~ 1.705	24000 / F	30
1.705 ~ 30	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Distance Correction for Measurements Below 30 MHz – Part 15.31

Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

Limits 9 kHz to 490 kHz
Distance correction factor (300m Specified Test Distance) = 40*Log (Test Distance/300)
= 40*Log (3/300)
= - 80 dB

Limits 490 kHz to 30 MHz
Distance correction factor (30m Specified Test Distance) = 40*Log (Test Distance/30)
= 40*Log (3/30)
= - 40 dB

5.2.3 Test Result of Radiated Emission

EUT : CTS-RFID-LF03

Test distance : 3 m

Radiated Emission Test Result : PASS

Radiated Emission Test Data (Below 30 MHz)

Frequency [MHz]	Reading [dBuV]	Polarization [*H/**V]	Ant.Factor+CableLoss +AMP Gain [dB]	Limit [dBuV/m]	Emission Level [dBuV/m]
0.0354	27.91	H	-6.6	116.62	21.31
0.0668	22.11	V	-6.9	111.11	15.21
0.0733	21.77	H	-6.9	110.30	14.87
0.1156	21.74	V	-7.0	106.35	14.74
0.1196	22.40	H	-7.0	106.05	15.40
0.1340	69.01	H	-7.0	105.06	62.01
0.1738	36.79	H	-7.0	102.80	29.79
0.1996	37.28	V	-7.0	101.60	30.28
0.6671	26.02	H	-7.1	71.12	18.92
1.9655	27.24	H	-7.1	69.54	20.14

***Frequency Rage: 9kHz~90kHz PK/AV DETECT**
***Frequency Rage: 90kHz~110kHz QP DETECT**
***Frequency Rage: 110kHz~150kHz PK/AV DETECT**
***Frequency Rage: 150kHz~490kHz PK/AV DETECT**
***Frequency Rage: 490kHz~30MHz QP DETECT**

Radiated Emission Test Data (Above 30 MHz)

Frequency [MHz]	Reading [dBuV]	Polarization [*H/**V]	Ant.Factor+CableLoss +AMP Gain [dB]	Limit [dBuV/m]	Emission Level [dBuV/m]
122.83	22.61	H	14.78	43.50	37.39
245.95	28.20	H	14.93	46.00	43.13
325.60	19.63	H	17.42	46.00	37.05
369.40	22.44	V	18.59	46.00	41.03
375.01	21.68	H	18.72	46.00	40.40
449.56	16.88	H	20.22	46.00	37.10
616.37	17.64	V	23.19	46.00	40.83
624.97	16.62	H	23.38	46.00	40.00
742.26	15.67	V	25.41	46.00	41.08
749.99	14.53	H	25.48	46.00	40.01

5.3 Occupied Bandwidth

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio.

5.3.1 Specification

Test Standard : FCC Part 15.215

5.3.2 Test Result of Occupied Bandwidth

Occupied Bandwidth Test Data

Frequency (kHz)	99% Bandwidth (Hz)	20 dB Bandwidth (Hz)
134.2 kHz	668 Hz	788 Hz

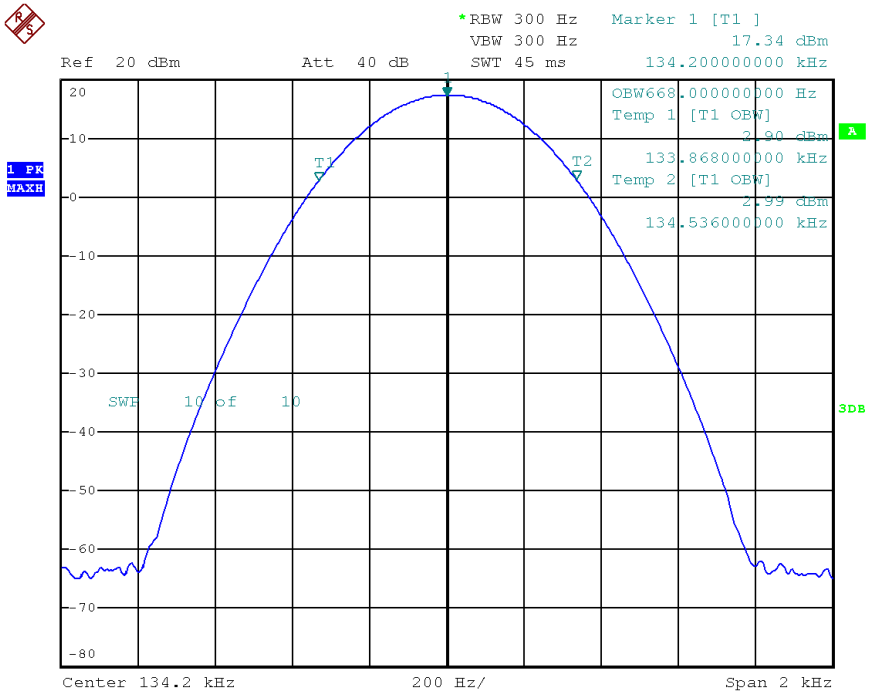
NOTES:

1. Peak Detector
2. RBW = VBW 300 Hz.

5.3.3 99% Bandwidth

Plot

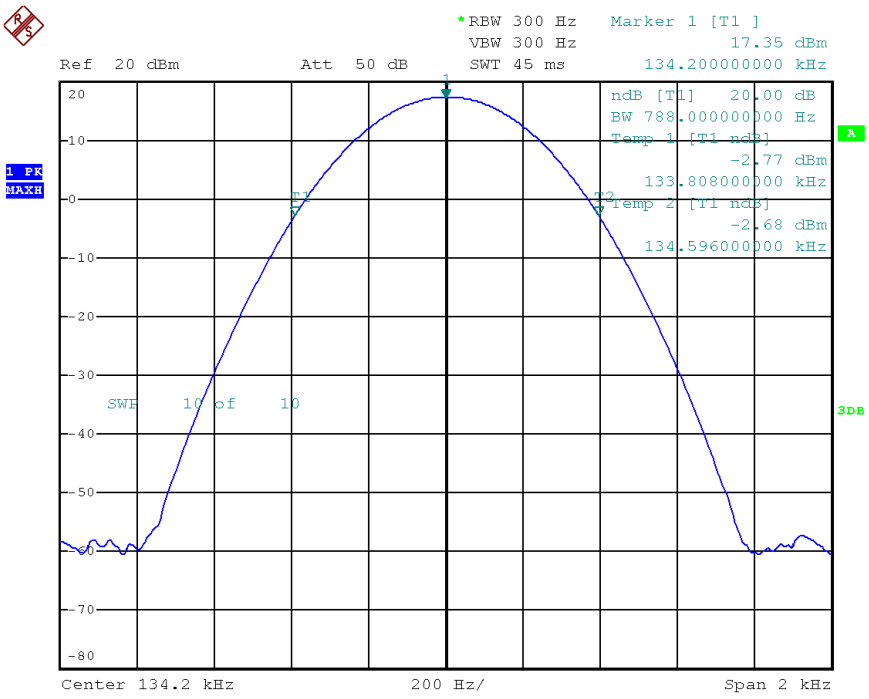
FCC Rules : Part 15.215
Operating Frequency : 134.2 kHz
Emission Mask : 99% Bandwidth
Reference Voltage : 24.0 Vdc
Bandwidth : 668 Hz



5.3.4 20 dB Bandwidth

Plot

FCC Rules : Part 15.215
Operating Frequency : 134.2 kHz
Emission Mask : 99% Bandwidth
Reference Voltage : 24.0 Vdc
Bandwidth : 788 Hz



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6. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

	EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date
1	Test Receiver	ESPI	ROHDE & SCHWARZ	100063	01. 19. 2013
2	Spectrum Analyzer	FSP13SE/K93	ROHDE & SCHWARZ	100303	10. 22. 2013
3	#2 Conducted Cable_2.7m	N/A	N/A	N/A	N/A
4	LISN	NSLK 8127	SCHWARZBECK	8127-414	01. 19. 2013
5	Impuls-Begrenzer Pulse Limiter	ESH3-Z2	ROHDE & SCHWARZ	100092	01. 19. 2013
6	Loop Antenna	HFH2-Z2	ROHDE & SCHWARZ	881056/6	12. 11. 2014
7	Bilog Antenna	VULB 9160	SCHWARZBECK	9160-3122	11. 22. 2013
8	EMI Receiver	ESVN30	ROHDE & SCHWARZ	832854/010	01. 19. 2013
9	AMPLIFIER	8447F	H.P	2805A02893	01. 18. 2013
10	Open Site Cable_0.5m	RG 214/U	SUHNER SWITZERLAND	509794	N/A
11	Open Site Cable_35m	SUCOTEST 18A	Hubersuhner	8400/18A	N/A
12	Antenna Master	JAC-3	DAILEMC	N/A	N/A
13	Antenna Turntable Controller	JAC-2	JAEMC	N/A	N/A