FCC/IC TEST REPORT

Test report No.:	EMC- FCC- R0156
FCC ID:	SY5YPFGE04
IC:	8325A-YPFGE04
Type of equipment:	Smart Key Fob
Basic Model Name:	SVI-YPFGE04
Applicant:	Continental Automotive Systems Corporation
Max.RF Output Power:	74.6 dBμV/m
FCC Rule Part(s):	FCC Part 15 Subpart C Section 15.209, Section 15.231
IC Rule:	IC RSS-210, Issue 8: 2010
Frequency Range:	433.92 ㎒ (Tx), 125 ㎑ (Rx)
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 receipt: 2014. 02. 07

Date of test: 2014. 02. 20 ~ 21

Issued date: 2014. 02. 28

Tested by: AHN, BYUNG WOO

Approved by: YU, SANG HOON

[Contents]

1. Client information

Applicant:	Continental Automotive Systems Corporation
Address:	29, Siemens-Road, Icheon-City, Gyeonggi-Do, 467-080, Korea
Telephone number:	82-31-645-4864
Facsimile number:	82-31-637-0371
Contact person:	SungMin Jang / Sungmin.Jang@continental-corporation.com

Manufacturer:	Continental Automotive Systems Corporation
Address:	29, Siemens-Road, Icheon-City, Gyeonggi-Do, 467-080, Korea

2. Laboratory information

Address

EMC compliance Ltd.
65, Sinwon-ro, Yeongtong-gu, Suwon- si, Gyeonggi-do, 443-390, Korea
Telephone Number: 82-31-336-9919 Facsimile Number: 82-505-299-8311

Certificate

KOLAS No.: 231
FCC Site Registration No.: 687132
VCCI Site Registration No.: R-3327, G-198, C-3706, T-1849
IC Site Registration No.:8035A-2

SITE MAP

3. Description of E.U.T.

3.1 Basic description

Applicant	Continental Automotive Systems Corporation
Address of Applicant	29, Siemens-Road, Icheon-City, Gyeonggi-Do, 467-080, Korea
Manufacturer	Continental Automotive Systems Corporation
Address of Manufacturer	29, Siemens-Road, Icheon-City, Gyeonggi-Do, 467-080, Korea
Type of equipment	Smart Key Fob
Basic Model	SVI-YPFGE04
Serial number	N/A

3.2 General description

Frequency Range	433.92 ㎒ (Tx), 125 ㎑ (Rx)
Type of Modulation	FSK
Number of Channels	1 channel
Type of Antenna	PCB Antenna
Antenna Gain	-24.14 dBi
Power supply	DC 3 V

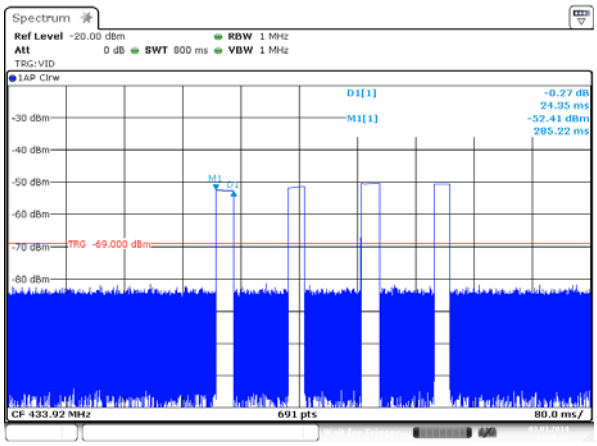
3.3 Test frequency

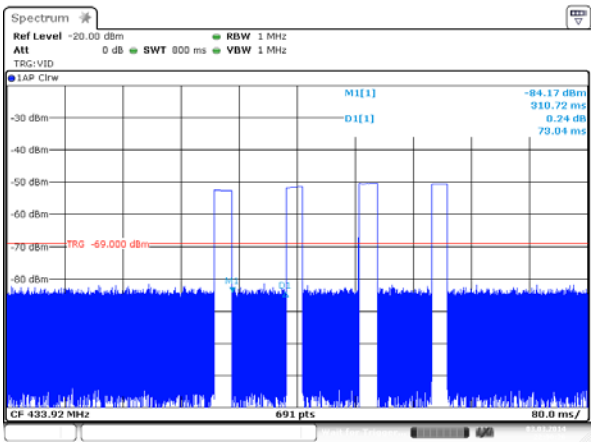
Frequency	433.920 ㎒

3.4 Test Voltage

mode	Voltage
Norminal voltage	DC 3 V

*** Duty Cycle**





Tx ontime : 24.35 ㎳

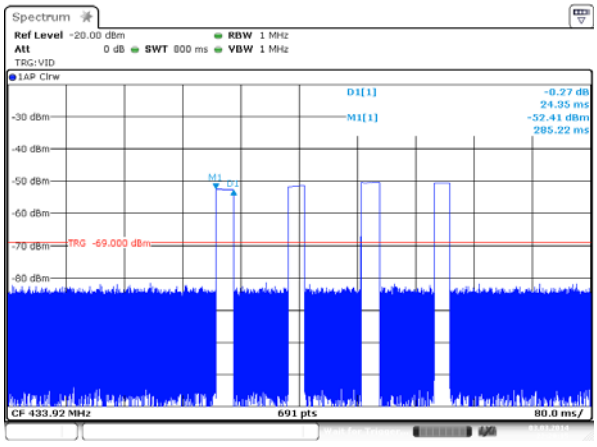
Tx on+off time: 97.39 ㎳

Duty cycle(x) =(Tx ontime)/(Tx on+off time) = 0.25

Duty cycle factor = 20log(x/1) = -12 ㏈

***PDCF**

1/PW < RBW = 40㎐ < 120 ㎑
*RBW (1 ㎓ below = 120 ㎑, 1 ㎓ above = 1 ㎒)
1/PW = 1/0.025 s =40 ㎐
PW=24.35 ㎳



4. Summary of test results

4.1 Standards & results

FCC Rule	IC Rule	Parameter	Test Result
15.209(a) 15.231(b)	RSS-210, Issue 8, Table B	Radiated emission, Spurious Emission and Field Strength of Fundamental	C
15.231(c)	RSS-210, Issue 8, A1.1.3	Bandwidth of Operation frequency	C
15.231(a)	RSS-210, Issue 8, A1.1.1	Transmission Time	C
-	RSS-Gen, Issue 3, 4.6.1	Occupied Bandwidth	C

Note: C = complies
NC = Not complies
NT = Not tested
NA = Not Applicable

4.2 Uncertainty

Measurement Item	Combined Standard Uncertainty Uc	Expanded Uncertainty U = KUc (K = 2)
Conducted RF power	± 0.68 dB	± 1.36 dB
Radiated disturbance	30 MHz ~ 300 MHz : + 2.43 dB, - 2.44 dB 300 MHz~1 000 MHz : + 2.49 dB, - 2.50 dB 1 GHz ~ 6 GHz : + 3.10 dB, - 3.10 dB 6 GHz ~ 18 GHz : + 3.21 dB, - 3.27 dB	30 MHz ~ 300 MHz : + 4.86 dB, - 4.88 dB 300 MHz ~ 1 000 MHz + 4.98 dB, - 4.99 dB 1 GHz ~ 6 GHz : + 6.19 dB, - 6.20 dB 6 GHz ~ 18 GHz : + 6.41 dB, - 6.53 dB

5. Test results

5.1 Field strength of Fundamental

5.1.1 Regulation

According to §15.209(a),
Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: 83

Frequency (㎒)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241..

According to §15.231(b)
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (㎒)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

Where F is the frequency in ㎒, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 ㎒, ㎶/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 ㎒, ㎶/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 ㏈ below the maximum permitted fundamental level.

5.1.2 Test procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

h. normally, output is measured with average result. but in this case, average result is calculated by measuring peak result and applying DCCF.

5.1.3 Test Result

- Complied

Frequency [㎒]	Receiver Bandwidth [㎑]	Detector	Pol. [V/H]	Reading [㏈ (㎶)]	Factor [㏈]	DCCF [㏈]	Result [㏈ (㎶/m)]	Limit [㏈ (㎶/ m)]	Margin [㏈]
433.920	120	Peak	H	95.5	-8.9	0.0	86.6	100.82	14.22
433.920	120	Average	H	95.5	-8.9	-12.0	74.6	80.82	6.22

NOTE:
1. Avg Limit = 20log(41.666 7(F) - 7 083.333 3) = 80.82 / PK Limit = 80.82 + 20 = 100.82 ㏈
2. Factor(㏈) = ANT Factor - Amp Gain + Cable Loss
3. DCCF(Duty Cycle Correction Factor)
   DCCF = 20 Log(Tx ontime / 1) ㏈= 20 Log(0.25/ 1) = -12 ㏈

5.2 Spurious Emission

5.2.1 Regulation

According to §15.209(a),
Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: 83

Frequency (㎒)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 ㎒, 76-88 ㎒, 174-216 ㎒ or 470-806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241..

According to §15.231(b)
In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (㎒)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

Where F is the frequency in ㎒, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 ㎒, ㎶/m at 3 meters = 56.818 18(F) - 6 136.363 6; for the band 260-470 ㎒, ㎶/m at 3 meters = 41.666 7(F) – 7 083.333 3. The maximum permitted unwanted emission level is 20 ㏈ below the maximum permitted fundamental level.

5.2.2 Measurement Procedure

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. During performing radiated emission below 1 ㎓, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 ㎓, the EUT was set 3 meter away from the interference-receiving antenna.

c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10 ㏈ lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 ㏈ margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. It tested x,y and z – 3 axis each, mentioned only worst case data at this report.

Note

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 ㎑ for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1 ㎓.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 ㎒ for Peak detection and frequency above 1 ㎓.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 ㎒ and the video bandwidth is 1/T for Average detection (AV) at frequency above 1 ㎓. (where T = pulse width)
4. The radiated restricted band edge and Spurious radiated emissions average measurements use a duty cycle correction factor (DCCF).

5.2.3 Test Result

- Complied

*** Below 1 ㎓ data**

Frequency [㎒]	Receiver Bandwidth [㎑]	Pol. [V/H]	Reading [dB(㎶)]	Factor [dB]	Result [dB(㎶/m)]	Limit [dB(㎶/m)]	Margin [dB]
Quasi-Peak DATA. Emissions below 30 ㎒							
Below 30.000	Not Detected	-	-	-	-	-	-
Quasi-Peak DATA. Emissions below 1 ㎓							
867.813	120	H	39.8	-0.6	39.2	61.0	21.8
Above 900.000	Not Detected	-	-	-	-	-	-

*** Above 1 ㎓ data**

Frequency [㎒]	Receiver Bandwidth [㎑]	Pol. [V/H]	Reading [dB (㎶)]	Factor [dB]	DCCF [dB]	Result [dB (㎶ /m)]	Limit [dB (㎶ /m)]	Margin [dB]
Peak DATA. Emissions above 1 ㎓								
1 301.875	1 000	H	65.2	-5.6	-12.0	47.6	74.0	26.4
1 735.750	1 000	H	50.9	-1.8	-12.0	37.1	81.0	43.9
2 169.625	1 000	H	62.1	-0.1	-12.0	50.0	81.0	31.0
2 603.500	1 000	H	47.3	0.1	-12.0	35.4	81.0	45.6
3 037.375	1 000	H	47.5	0.7	-12.0	36.2	81.0	44.8
3 471.625	1 000	V	47.8	2.3	-12.0	38.1	81.0	42.9
3 905.500	1 000	V	46.3	4.1	-12.0	38.4	74.0	35.6
Above 4 000.00	Not Detected	-	-	-	-	-	-	-
Average DATA. Emissions above 1 ㎓								
1 301.875	1 000	H	64.7	-5.6	-12.0	47.1	54.0	6.9
1 735.750	1 000	H	50.3	-1.8	-12.0	36.5	61.0	24.5
2 169.625	1 000	H	61.5	-0.1	-12.0	49.4	61.0	11.6
2 603.500	1 000	H	46.6	0.1	-12.0	34.7	61.0	26.3
3 037.375	1 000	H	47.1	0.7	-12.0	35.8	61.0	25.2
3 471.625	1 000	V	47.5	2.3	-12.0	37.8	61.0	23.2
3 905.500	1 000	V	45.7	4.1	-12.0	37.8	54.0	16.2
Above 4 000.00	Not Detected	-	-	-	-	-	-	-

Note.

1. Margin (dB) = Limit - Result
2. Result = Reading + Factor + DCCF
3. Factor(dB) = ANT Factor - Amp Gain + Cable Loss
4. DCCF(Duty Cycle Correction Factor)
   DCCF = 20 Log(Dwell Time / 100 ㎳) dB= 20 Log(25 ㎳/ 100 ㎳) = -12 dB

5.3 Bandwidth of Operation Frequency

5.3.1 Regulation

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 ㎒ and below 900 ㎒. Bandwidth is determined at the points 20 ㏈ down from the modulated carrier.

5.3.2 Measurement Procedure

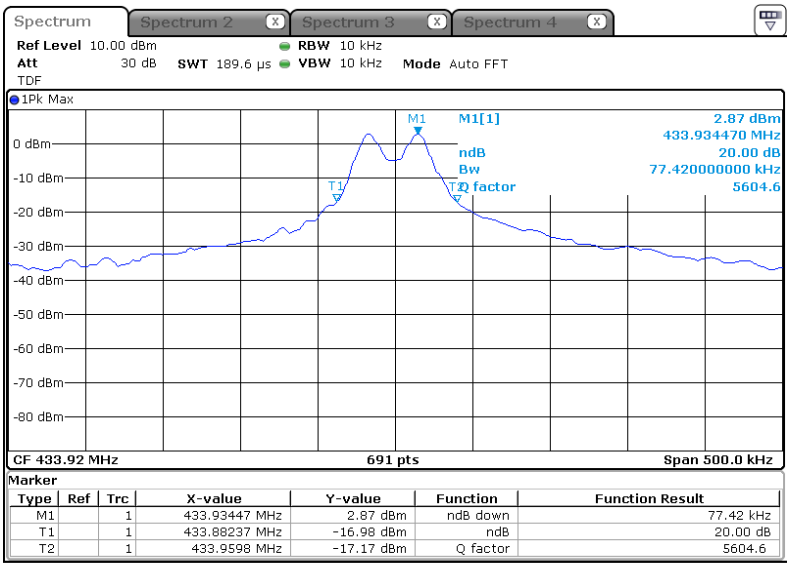
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequencywas measured with the spectrum analyzer using RBW=10 ㎑,VBW=10 ㎑ and Span= 500 ㎑.
3. The bandwidth of fundamental frequency was measured and recorded.

5.3.3 Test Result

- Complied

Frequency [㎒]	Bandwidth of the emission [㎑]	Limit [㎑]
433.920	77.420	787.500

5.3.4 Test plot



5.4 Transmission Time

5.4.1 Regulation

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

5.4.2 Measurement Procedure

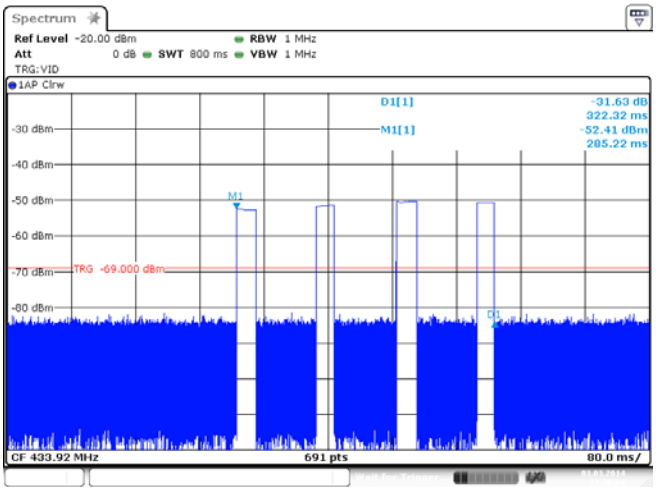
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequencywas measured with the spectrum analyzer using RBW=1 ㎒,VBW=1 ㎒, Span=0 ㎐, Sweep Time=10 sec
3. The bandwidth of fundamental frequency was measured and recorded.

5.4.3 Test Result

- Complied

Frequency [㎒]	Transmission Time [ms]	Limit [s]
433.920	322.320	5.000

5.4.4 Test plot



5.5 Occupied Bandwidth

5.5.1 Regulation

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 ㎒ and below 900 ㎒. Bandwidth is determined at the points 20 ㏈ down from the modulated carrier.

5.5.2 Measurement Procedure

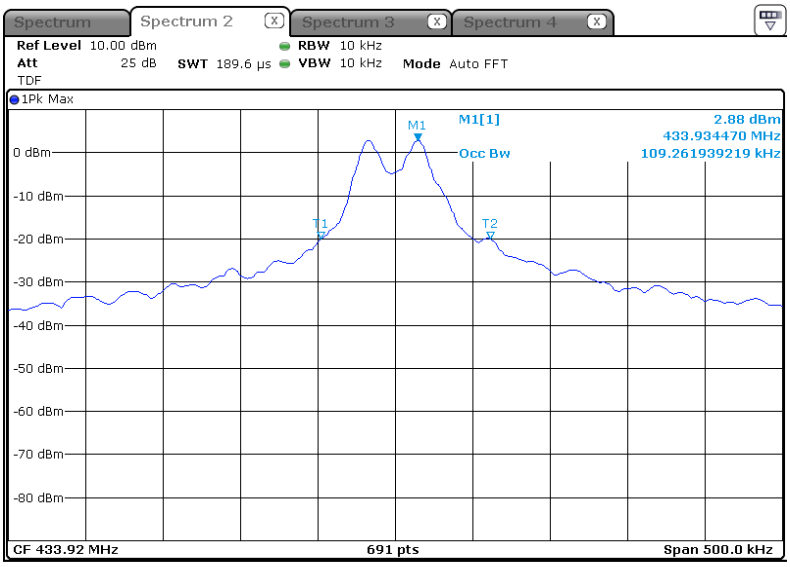
1. The transmitter output is connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW≥1 % of Span,VBW to 3 times RBW.
3. The bandwidth of fundamental frequency was measured and recorded.

5.5.3 Test Result

- Complied

Frequency [㎒]	Occupied Bandwidth [㎑]	Limit [㎑]	Remark
433.920	109.262	787.500	99% Occupied Bandwidth

5.5.4 Test plot



6. Test equipment used for test

	Description	Manufacture	Model No.	Serial No.	Next Cal Date.
■	Temp & humidity chamber	ESPEC CORP.	SH-661	92004048	14.03.18
■	Spectrum Analyzer	R&S	FSP40	100988	15.01.29
■	DC Power Supply	Agilent	E3632A	MY40004399	15.01.09
■	Signal Generator	R&S	SMR40	100007	14.06.11
■	Loop Antenna	R&S	HFH2-Z2	100355	15.06.19
■	Bi-Log Antenna	Schwarzbeck	VULB9163	552	14.07.18
■	Horn Antenna	ETS-Lindgren	3115	86706	14.08.20
■	Amplifier	Sonoma	310N	186280	15.01.27
■	Amplifier	Schwarzbeck	BBV9718	233	14.05.03
■	Attenuator	HP	8491A	16861	14.07.08
■	Antenna Mast	Innco Systems	MA4000-EP	303	-
■	Turn Table	Innco Systems	DT2000S-1t	79	-

normally, output is measured with average result.
but in this case, average result is calculated by measuring peak result and applying DCCF.