



- e. DCCF = -24.76 dB
- f. We applied DCCF in the test result which hopping channel number is 20.
- 8. We have done Normal Mode and EDR Mode test.
- 9. This test is performed with hopping off.
- 10. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1306FR02	Date of Issue: June 05, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth4.0, WIFI802.11 a/b/g/n(2.4/5GHz)/NFC	FCC ID: ZNFE989

Operation Mode: CH High(GFSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [HV]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4960	49.60	0.50	V	0	50.10	74	23.90	PK
4960	35.70	0.50	V	-24.76	11.44	54	42.56	AV
7440	53.20	8.95	V	0	62.15	74	11.85	PK
7440	43.41	8.95	V	-24.76	27.60	54	26.40	AV
4960	49.63	0.50	H	0	50.13	74	23.87	PK
4960	35.74	0.50	H	-24.76	11.48	54	42.52	AV
7440	53.95	8.95	H	0	62.90	74	11.10	PK
7440	46.12	8.95	H	-24.76	30.31	54	23.69	AV

Operation Mode: CH High(8DPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [HV]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4960	49.41	0.50	V	0	49.91	74	24.09	PK
4960	35.61	0.50	V	-24.76	11.35	54	42.65	AV
7440	51.05	8.95	V	0	60.00	74	14.00	PK
7440	37.92	8.95	V	-24.76	22.11	54	31.89	AV
4960	49.44	0.50	H	0	49.94	74	24.06	PK
4960	35.71	0.50	H	-24.76	11.45	54	42.55	AV
7440	52.86	8.95	H	0	61.81	74	12.19	PK
7440	38.97	8.95	H	-24.76	23.16	54	30.84	AV

Operation Mode: CH High ($\pi/4$ DQPSK)

Frequency [MHz]	Reading dBuV	※A.F+CL-AMP GAIN [dB]	ANT. POL [HV]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
4960	49.50	0.50	V	0	50.00	74	24.00	PK
4960	35.64	0.50	V	-24.76	11.38	54	42.62	AV
7440	51.10	8.95	V	0	60.05	74	13.95	PK
7440	37.92	8.95	V	-24.76	22.11	54	31.89	AV
4960	49.41	0.50	H	0	49.91	74	24.09	PK
4960	35.71	0.50	H	-24.76	11.45	54	42.55	AV
7440	51.69	8.95	H	0	60.64	74	13.36	PK
7440	39.01	8.95	H	-24.76	23.20	54	30.80	AV

※ A.F: ANTENNA FACTOR
C.L: CABLE LOSS
AMP GAIN: AMPLIFIER GAIN

Notes:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin > 20 dB from the applicable limit) and considered that's already beyond the background noise floor.
- Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- Total = Reading Value + Antenna Factor + Cable Loss - Amp Gain + Duty Cycle Correction Factor
- Spectrum setting:
 - Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
We performed using a reduced video BW method was done with the analyzer in linear mode.
- FYI : Duty Cycle Correction Factor (79 channel hopping)
 - Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 228.468 ms, where τ = pulse width
 - $100 \text{ ms} / \Delta t$ [ms] = $H \rightarrow$ Round up to next highest integer, $H' = 1$
 - Worst Case Dwell Time = τ [ms] x $H' = 2.892$ ms
 - Duty Cycle Correction = $20\log(\text{Worst Case Dwell Time} / 100\text{ms})$ dB = -30.776 dB
- Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
 - Time to cycle through all channels= $\Delta t = \tau$ [ms] x 20 channels = 57.84 ms, where τ = pulse width
 - $100 \text{ ms} / \Delta t$ [ms] = $H \rightarrow$ Round up to next highest integer, $H' = 2$
 - Worst Case Dwell Time = τ [ms] x $H' = 5.784$ ms
 - Duty Cycle Correction(AFH) = $20\log(\text{Worst Case Dwell Time} / 100\text{ms})$ dB = -24.7554 dB

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Test Report No. HCTR1306FR02	Date of Issue: June 05, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth4.0, WIFI802.11 a/b/g/n(2.4/5GHz)/NFC	FCC ID: ZNF989



- e. DCCF = -24.76 dB
- f. We applied DCCF in the test result which hopping channel number is 20.
- 8. We have done Normal Mode and EDR Mode test.
- 9. This test is performed with hopping off.
- 10. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

FCC PT.15.247 TEST REPORT	FCC CERTIFICATION REPORT		www.hct.co.kr
Test Report No. HCTR1306FR02	Date of Issue: June 05, 2013	EUT Type: GSM/WCDMA Phone with Bluetooth4.0, WIFI802.11 a/b/g/n(2.4/5GHz)/NFC	FCC ID: ZNFE989

8.6.3 RADIATED RESTRICTED BAND EDGES

Test Requirements and limit, §15.247(d), §15.205, §15.209

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 15.205(c)).

Operation Mode Normal(GFSK)
 Operating Frequency 2402 MHz
 Channel No CH 0

Frequency [MHz]	Reading dBuV	※A.F+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2390.0	25.02	33.90	H	58.92	74	15.08	PK
2390.0	11.68	33.90	H	45.58	54	8.42	AV
2390.0	24.55	33.90	V	58.45	74	15.55	PK
2390.0	11.79	33.90	V	45.69	54	8.31	AV

Operation Mode EDR(8DPSK)
 Operating Frequency 2402 MHz
 Channel No CH 0

Frequency [MHz]	Reading dBuV	※A.F+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2390.0	24.76	33.90	H	58.66	74	15.34	PK
2390.0	11.78	33.90	H	45.68	54	8.32	AV
2390.0	24.68	33.90	V	58.58	74	15.42	PK
2390.0	11.81	33.90	V	45.71	54	8.29	AV

Operation Mode EDR($\pi/4$ DQPSK)
 Operating Frequency 2402 MHz
 Channel No CH 0

Frequency [MHz]	Reading dBuV	※A.F+CL [dB]	ANT. POL [H/V]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2390.0	25.07	33.90	H	58.97	74	15.03	PK
2390.0	11.80	33.90	H	45.70	54	8.30	AV
2390.0	24.96	33.90	V	58.86	74	15.14	PK
2390.0	11.83	33.90	V	45.73	54	8.27	AV

※ A.F: ANTENNA FACTOR
 C.L: CABLE LOSS

Notes:

- 1.. Frequency range of measurement = 2310 MHz ~ 2900 MHz
2. Total = Fundamental Reading Value + Antenna Factor + Cable Loss
3. Spectrum setting:
 - a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
 We performed using a reduced video BW method was done with the analyzer in linear mode.
4. We have done Normal Mode and EDR Mode.
5. This test is performed with hopping off.
6. We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna

Operation Mode Normal(GFSK)
 Operating Frequency 2480 MHz
 Channel No CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2483.5	29.37	33.99	H	0	63.36	74	10.64	PK
2483.5	24.81	33.99	H	-24.76	34.04	54	19.96	AV
2483.5	26.40	33.99	V	0	60.39	74	13.61	PK
2483.5	21.04	33.99	V	-24.76	30.27	54	23.73	AV

Operation Mode EDR(8DPSK)
 Operating Frequency 2480 MHz
 Channel No CH 78

Frequency [MHz]	Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2483.5	30.98	33.99	H	0	64.97	74	9.03	PK
2483.5	24.23	33.99	H	-24.76	33.46	54	20.54	AV
2483.5	27.93	33.99	V	0	61.92	74	12.08	PK
2483.5	20.37	33.99	V	-24.76	29.60	54	24.40	AV

Operation Mode EDR($\pi/4$ DQPSK)
 Operating Frequency 2480 MHz
 Channel No CH 78

Frequency [MHz]	*Fund. Reading dBuV	※ A.F.+CL [dB]	Ant. Pol. [H/V]	Duty Cycle Correction [dB]	Total [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Detect
2483.5	31.39	33.99	H	0	65.38	74	8.62	PK
2483.5	24.04	33.99	H	-24.76	33.27	54	20.73	AV
2483.5	29.00	33.99	V	0	62.99	74	11.01	PK
2483.5	20.41	33.99	V	-24.76	29.64	54	24.36	AV

※ A.F: ANTENNA FACTOR
 C.L: CABLE LOSS
 AMP GAIN: AMPLIFIER GAIN

Notes:

- Frequency range of measurement = 2483.5 MHz ~ 2485.5 MHz
- Total = Fundamental Reading Value + Antenna Factor + Cable Loss – Delta Value + Duty Cycle Correction Factor
- Spectrum setting:
 - Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
 - AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 kHz $\geq 1/\tau$ Hz, where τ = pulse width in seconds.
 We performed using a reduced video BW method was done with the analyzer in linear mode.
- FYI : Duty Cycle Correction Factor (79 channel hopping)
 - Time to cycle through all channels= $\Delta t = \tau$ [ms] x 79 channels = 228.468 ms, where τ = pulse width
 - $100 \text{ ms} / \Delta t$ [ms] = $H \rightarrow$ Round up to next highest integer, $H' = 1$
 - Worst Case Dwell Time = τ [ms] x $H' = 2.892$ ms
 - Duty Cycle Correction = $20\log(\text{Worst Case Dwell Time} / 100\text{ms})$ dB = -30.776 dB
- Duty Cycle Correction Factor(AFH mode – minimum channel number case - 20 channels)
 - Time to cycle through all channels= $\Delta t = \tau$ [ms] x 20 channels = 57.84 ms, where τ = pulse width
 - $100 \text{ ms} / \Delta t$ [ms] = $H \rightarrow$ Round up to next highest integer, $H' = 2$
 - Worst Case Dwell Time = τ [ms] x $H' = 5.784$ ms
 - Duty Cycle Correction(AFH) = $20\log(\text{Worst Case Dwell Time} / 100\text{ms})$ dB = -24.7554 dB
 - We applied DCCF in the test result which hopping channel number is 20.
- We have done Normal Mode, EDR Mode.
- This test is performed with hopping off.
- We have done x, y, z planes in EUT and horizontal and vertical polarization in detecting antenna.

8.7 POWERLINE CONDUCTED EMISSIONS

LIMIT

For an intentional radiator which 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 250 microvolt (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to a test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.
5. This test is performed with hopping on.



■ RESULT PLOTS

Conducted Emissions (Line 1)

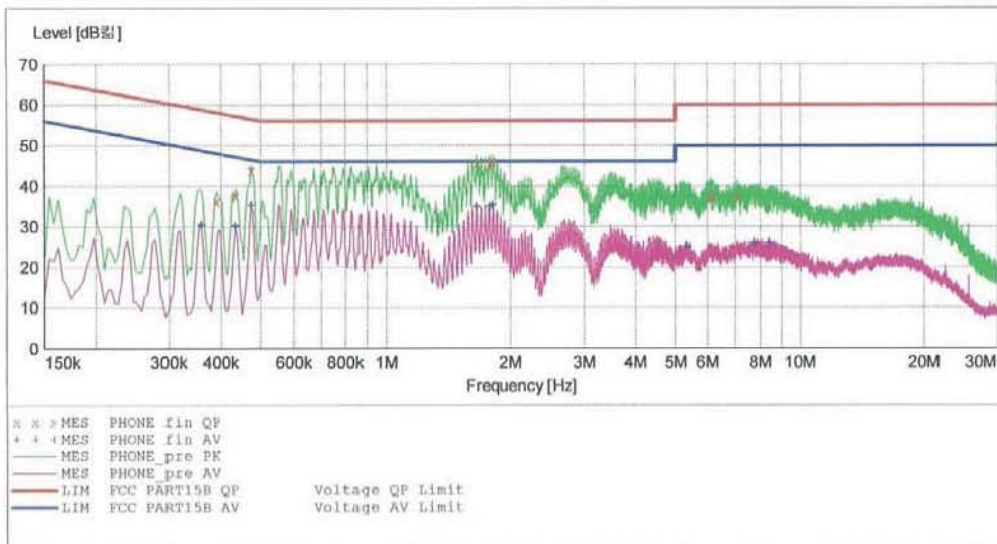
HCT

EMC

EUT: LG-E989
 Manufacturer: LG
 Operating Condition: BT 3.0
 Test Site: SHIELD ROOM
 Operator: JS LEE
 Test Specification: FCC PART15 B
 Comment: H

SCAN TABLE: "FCC CLASS B(H)"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "PHONE_fin QP"

Frequency [MHz]	Level [dBμV]	Transd [dB]	Limit [dBμV]	Margin [dB]	Line	PE
0.390001	36.20	9.8	58	21.9	---	---
0.434001	37.90	9.8	57	19.3	---	---
0.474001	43.80	9.8	56	12.7	---	---
1.660000	45.70	9.9	56	10.3	---	---
1.780000	45.40	9.9	56	10.6	---	---
1.816000	46.00	9.9	56	10.0	---	---
6.116000	37.60	10.2	60	22.4	---	---
6.160000	37.20	10.2	60	22.8	---	---
7.068000	37.40	10.3	60	22.6	---	---

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MEASUREMENT RESULT: "PHONE_fin AV"

2013-05-25 2:44오후

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.358001	30.40	9.8	49	18.3	---	---
0.434001	30.20	9.8	47	17.0	---	---
0.474001	35.30	9.8	46	11.2	---	---
1.660000	34.90	9.9	46	11.1	---	---
1.780000	34.90	9.9	46	11.1	---	---
1.816000	35.30	9.9	46	10.7	---	---
5.332000	24.90	10.2	50	25.1	---	---
7.740000	26.00	10.3	50	24.0	---	---
8.416000	25.90	10.4	50	24.1	---	---

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Conducted Emissions (Line 2)

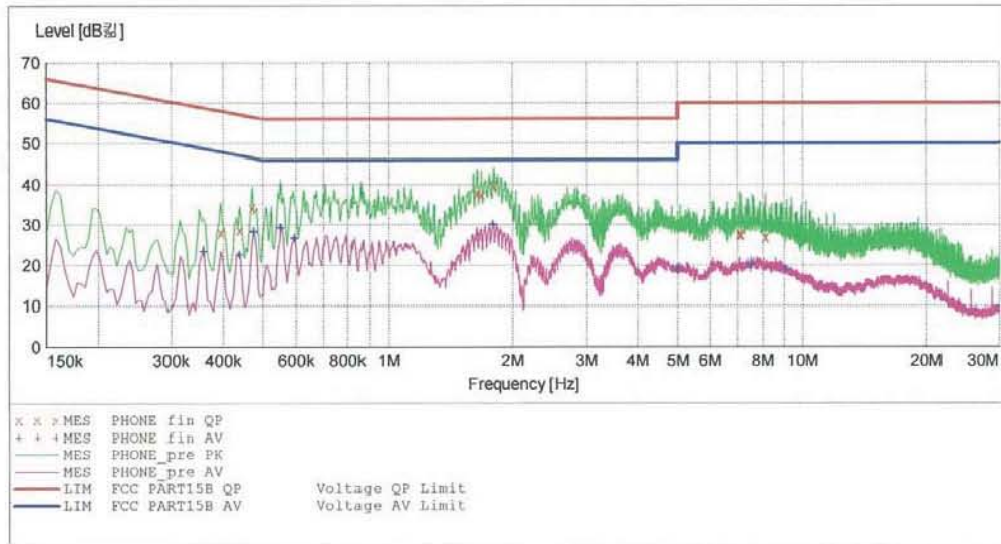
HCT

EMC

EUT: LG-E989
 Manufacturer: LG
 Operating Condition: BT 3.0
 Test Site: SHIELD ROOM
 Operator: JS LEE
 Test Specification: FCC PART15 B
 Comment: N

SCAN TABLE: "FCC CLASS B(N)"

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	500.0 kHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
500.0 kHz	5.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			
5.0 MHz	30.0 MHz	4.0 kHz	MaxPeak	10.0 ms	9 kHz	None
			Average			



MEASUREMENT RESULT: "PHONE_fin QP"

2013-05-25 2:06오-후

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Line	PE
0.394001	28.20	10.0	58	29.8	---	---
0.438001	28.80	10.0	57	28.3	---	---
0.470001	34.30	10.0	57	22.3	---	---
1.644000	37.80	10.1	56	18.2	---	---
1.684000	37.40	10.1	56	18.6	---	---
1.800000	39.70	10.1	56	16.3	---	---
7.076000	27.70	10.5	60	32.3	---	---
7.148000	27.50	10.5	60	32.5	---	---
8.132000	26.80	10.6	60	33.2	---	---

MEASUREMENT RESULT: "PHONE_fin AV"

2013-05-25 2:06오.후

Frequency MHz	Level dB _{μV}	Transd dB	Limit dB _{μV}	Margin dB	Line	PE
0.358001	23.40	10.0	49	25.4	---	---
0.438001	22.50	10.0	47	24.6	---	---
0.474001	28.30	10.0	46	18.2	---	---
0.552000	29.30	10.0	46	16.7	---	---
0.596000	26.70	10.0	46	19.3	---	---
1.792000	30.00	10.1	46	16.0	---	---
5.000000	18.90	10.4	46	27.1	---	---
7.488000	20.20	10.5	50	29.8	---	---
9.112000	19.00	10.6	50	31.0	---	---

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9. LIST OF TEST EQUIPMENT

Manufacturer	Model / Equipment	Calibration Interval	Calibration Due	Serial No.
Rohde & Schwarz	ENV216/ LISN	Annual	02/06/2014	100073
Schwarzbeck	VULB 9160/ TRILOG Antenna	Biennial	12/17/2014	3150
Rohde & Schwarz	ESI 40 / EMI TEST RECEIVER	Annual	04/16/2014	831564103
Agilent	E4440A/ Spectrum Analyzer	Annual	04/25/2014	US45303008
Agilent	N9020A/ SIGNAL ANALYZER	Annual	05/14/2014	MY51110063
HD	MA240/ Antenna Position Tower	N/A	N/A	556
EMCO	1050/ Turn Table	N/A	N/A	114
HD GmbH	HD 100/ Controller	N/A	N/A	13
HD GmbH	KMS 560/ SlideBar	N/A	N/A	12
Rohde & Schwarz	SCU-18/ Signal Conditioning Unit	Annual	09/11/2013	10094
MITEQ	AMF-6B-180265-35-10P / POWER AMP	Annual	04/16/2014	667624
CERNEX	CBL26405040 / POWER AMP	Annual	04/16/2014	19660
Schwarzbeck	BBHA 9120D/ Horn Antenna	Biennial	10/17/2013	937
Schwarzbeck	BBHA9170 / Horn Antenna(15 GHz ~ 40 GHz)	Biennial	10/30/2014	BBHA9170124
Rohde & Schwarz	FSP / Spectrum Analyzer	Annual	02/08/2014	839117/011
Agilent	E4416A /Power Meter	Annual	11/07/2013	GB41291412
Agilent	E9327A /POWER SENSOR	Annual	04/16/2014	MY4442009
Wainwright Instrument	WHF3.0/18G-10EF / High Pass Filter	Annual	02/08/2014	F6
Wainwright Instrument	WHNX6.0/26.5G-6SS / High Pass Filter	Annual	04/16/2014	1
Wainwright Instrument	WHNX7.0/18G-8SS / High Pass Filter	Annual	04/16/2014	29
Wainwright Instrument	WRCJ2400/2483.5-2370/2520-60/14SS / Band Reject Filter	Annual	03/19/2014	1
Hewlett Packard	11636B/Power Divider	Annual	11/07/2013	11377
Agilent	87300B/Directional Coupler	Annual	12/24/2013	3116A03621
Hewlett Packard	11667B / Power Splitter	Annual	05/29/2014	05001
DIGITAL	EP-3010 /DC POWER SUPPLY	Annual	11/07/2013	3110117
ITECH	IT6720 / DC POWER SUPPLY	Annual	11/07/2013	010002156287001199
TESCOM	TC-3000C / BLUETOOTH TESTER	Annual	04/24/2014	3000C000276
Rohde & Schwarz	CBT / BLUETOOTH TESTER	Annual	04/25/2014	100422
EMCO	6502.LOOP ANTENNA	Biennial	01/11/2014	9009-2536
CERNEX	CBLU1183540 / POWER AMP	Annual	07/27/2013	21691
Agilent	8493C / Attenuator(10 dB)	Annual	07/30/2013	76649
WEINSCHTEL	2-3 / Attenuator(3 dB)	Annual	11/07/2013	BR0617