

RF TEST REPORT

Test item : Handheld Terminal
Model No. : D3-POS
Order No. : 1006-00266
Date of receipt : 2010-06-21
Test duration : 2010-07-21~2010-08-08
Date of issue : 2010-09-14
Use of report : FCC Original Grant

Applicant : Partner Tech Corporation
10F, No. 233-2, Pao Chiao Road, Shin Tien, Taipei, Taiwan

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification : FCC Part 15.225 Subpart C
ANSI C63.4-2003

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:

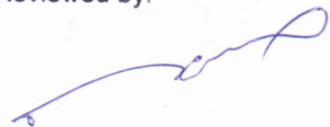
Witnessed by:

Reviewed by:



Engineer
B.G.HAN

N/A



Manager
W.J. Lee

CONTENTS

1. Equipment information	3
1.1 Equipment description	3
1.2 Ancillary equipment.....	3
2. Information about test items	4
2.1 Test mode.....	4
2.2 Auxiliary equipment.....	4
2.3 Tested frequency	4
2.4 Tested environment.....	4
2.5 EMI Suppression Device(s)/Modifications	4
3. Test Report	5
3.1 Summary of tests	5
3.2 Transmitter requirements	6
3.2.1 20dB Bandwidth Measurement (§2.1049).....	6
3.2.2 In-Band Radiated Spurious Emission (§15.225(a), (b), (c))	7
3.2.3 Radiated Spurious Emission Measurements, Out-of-Band (§15.225(d) / §15.205 and 209)	8
3.2.4 Frequency Stability (§15.225(e))	10
3.2.5 AC Line Conducted Emissions (§15.207/EN 55022).....	11
APPENDIX	12

1. Equipment information

1.1 Equipment description

FCC Equipment Class	Low Power Communications Device Transmitter(DXX)
Equipment type	Handheld Terminal
Equipment model name	D3-POS
Equipment add model name	MF-2350
Equipment serial no.	Identical prototype
Frequency band	13.56MHz
Modulation type	ASK
Channel	1
Supplied tag type	15693, Mifare
Power	Lithium Battery: DC 7.4V
Antenna type	Internal Type: PCB LOOP Antenna

1.2 Ancillary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
RFID Card	15693	N/A	NXP Semiconductors.	-
RFID Card	Mifare	N/A	NXP Semiconductors.	-

2. Information about test items

2.1 Test mode

Test Case 1	-
Test Case 2	-
Test Case 3	-

2.2 Auxiliary equipment

Equipment	Model No.	Serial No.	Manufacturer	Note
-	-	-	-	-
-	-	-	-	-

2.3 Tested frequency

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	13.56	13.56
Middle Channel	-	-
Highest Channel	-	-

2.4 Tested environment

Temperature	: 23 ℃
Relative humidity content	: 62 ~ 66 % R.H.
Details of power supply	: DC 7.4 V

2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing
 → None

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status Note 1
I. Test Items				
2.1049	20 dB Bandwidth	N/A	Radiated	C Note. 3
15.225 (a)	In-Band Emissions	15.848 $\mu V/m$ @ 30m 15.553 – 13.567 MHz		C Note. 3
15.225 (b)	In-Band Emissions	334 $\mu V/m$ @ 30m 13.410 – 13.553 MHz 13.567 – 13.710 MHz		C Note. 3
15.225 (c)	In-Band Emissions	106 $\mu V/m$ @ 30m 13.110 – 13.410 MHz 13.710 – 14.010 MHz		C Note. 3
15.225 (d) 15.205 15.209	Out-of Band Emissions	Emissions outside of the specified band (13.110-14.010 MHz) must meet the radiated limits detailed in 15.209		C Note. 3
15.225 (e)	Frequency Stability Tolerance	$\pm 0.001\%$ of operating frequency	Conducted	C Note. 3
15.207	AC Conducted Emissions	EN 55022	AC Line Conducted	NA Note. 2
Note 1: C=Comply NC=Not Comply NT=Not Tested NA=Not Applicable Note 2: Normally when this device is in the charging mode, the RFID function is not used. Note 3: 2 RFID tags were used for all test items. And the worst case data(Tag: Mifare) was reported.				

The sample was tested according to the following specification:
FCC Part 15.225; ANSI C-63.4-2003

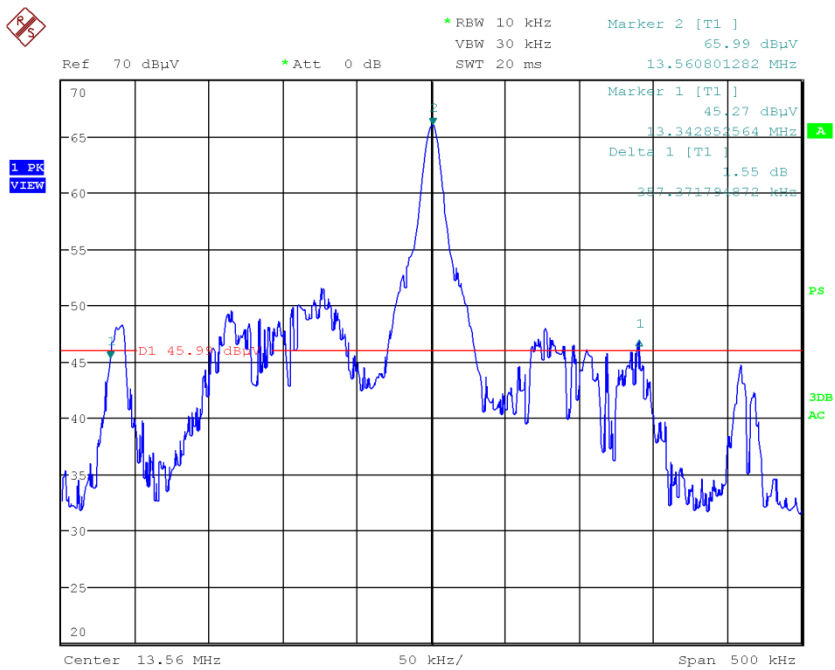
3.2 Transmitter requirements

3.2.1 20dB Bandwidth Measurement (§2.1049)

- **Procedure:**
The 20dB Bandwidth is measured with a spectrum analyzer connected via a receive antenna placed near the EUT while the EUT is operating in transmission mode.

- **Measurement Data:** **Comply**

Tested Frequency(MHz)	Test Results(KHz)
13.56	357.372



- **Minimum Standard:**

None

3.2.2 In-Band Radiated Spurious Emission (§15.225(a), (b), (c))

- Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

- Measurement Data: Comply

Frequency Band [MHz]	Frequency [MHz]	ANT Pol	Reading [dBuV]	T.F [dB/m]	Field Strength @ 3m [dBuV/m]	Field Strength @ 30m [dBuV/m]	Limit [dBuV/m]	Margin [dB]
13.110 ~ 13.410	13.356	V	26.40	-12.89	13.51	-26.49	40.51	67.00
13.410 ~ 13.553	13.553	V	48.60	-12.90	35.70	-4.30	50.47	54.77
13.553 ~ 13.567	13.560	V	64.90	-12.90	52.00	12.00	84.00	72.00
13.567 ~ 13.710	13.567	V	52.40	-12.90	39.50	-0.50	50.47	50.97
13.710 ~ 14.010	13.770	V	28.10	-12.91	15.19	-24.81	40.51	65.32

Note 1. This test item was performed using a loop antenna.

Note 2. This test item was performed at 3m and the data were extrapolated to the specified measurement distance of 30m using the square of an inverse linear distance extrapolation factor (40 dB/decade) as specified in §15.31(f)2.

$$\text{Extrapolation Factor} = 20 \log_{10}(30/3)^2 = 40\text{dB}$$

Note 3. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Field Strength @ 30m} \quad / \quad \text{Field Strength @ 30m} = \text{Field Strength @ 3m} - 40$$

$$\text{Field Strength @ 3m} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

- Minimum Standard

Frequency Band [MHz]	Limit	
	[uV/m]	[dBuV/m]
13.553-13.567	15,848	84.00
13.410-13.553 13.567-13.710	334	50.47
13.110-13.410 13.710-14.010	106	40.51

3.2.3 Radiated Spurious Emission Measurements, Out-of-Band (§15.225(d) / §15.205 and 209)

- Procedure:

The EUT was tested from 9kHz up to the 1GHz excluding the band 13.110-14.010MHz. All measurements were recorded with spectrum analyzer employing a peak detector for emissions below 30MHz. Above 30MHz a Quasi-peak detector was used. All out-of-band emissions must not exceed the limits §15.209. A loop antenna was used for searching for emissions below 30MHz.

- Measurement Data: **Comply** (refer to the next page)

- Minimum Standard

• FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	3.6 ~ 4.4	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	4.5 ~ 5.15	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	5.35 ~ 5.46	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	7.25 ~ 7.75	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	8.025 ~ 8.5	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.0 ~ 9.2	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	9.3 ~ 9.5	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	10.6 ~ 12.7	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900	13.25 ~ 13.4	
8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		

• FCC Part 15.205(b):

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

• FCC Part 15.209(a):

Frequency [MHz]	Field Strength [uV/m]	Measurement Distance [Meters]
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	200	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

• FCC Part 15.209(b):

In the emission table above, the tighter limit applies at the band edges.

- Measurement Data:

Operating Frequency : 13.56MHz
 Measurement Distance : 3 meters

Frequency [MHz]	ANT Pol	Reading [dBuV]	T.F [dB/m]	Distance factor	Field Strength [dBuV/m]	Limit [dBuV/m]	Margin [dB]
40.681	H	32.30	-8.60	N/A	23.70	40.00	16.30
40.681	V	39.40	-8.60	N/A	30.80	40.00	9.20
256.974	V	36.50	-8.40	N/A	28.10	46.00	17.90
257.650	H	41.00	-8.40	N/A	32.60	46.00	13.40
389.980	H	45.50	-6.20	N/A	39.30	46.00	6.70
389.985	V	34.20	-6.20	N/A	28.00	46.00	18.00
519.988	H	33.20	-3.90	N/A	29.30	46.00	16.70
718.710	H	30.30	-1.90	N/A	28.40	46.00	17.60

Note 1. Both Vertical and Horizontal polarities of the receiver antenna were evaluated with the worst case emissions being reported.

Note 2. The worst-case emissions are reported.

Note 3. Emissions were not reported greater than below 20dB of the limit.

Note 4. Sample calculation

Margin = Limit – Field Strength / T.F = AF + CL – AG

Distance factor = 20log(Measurement distance / The measured distance)

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

3.2.4 Frequency Stability (§15.225(e))

- Procedure:

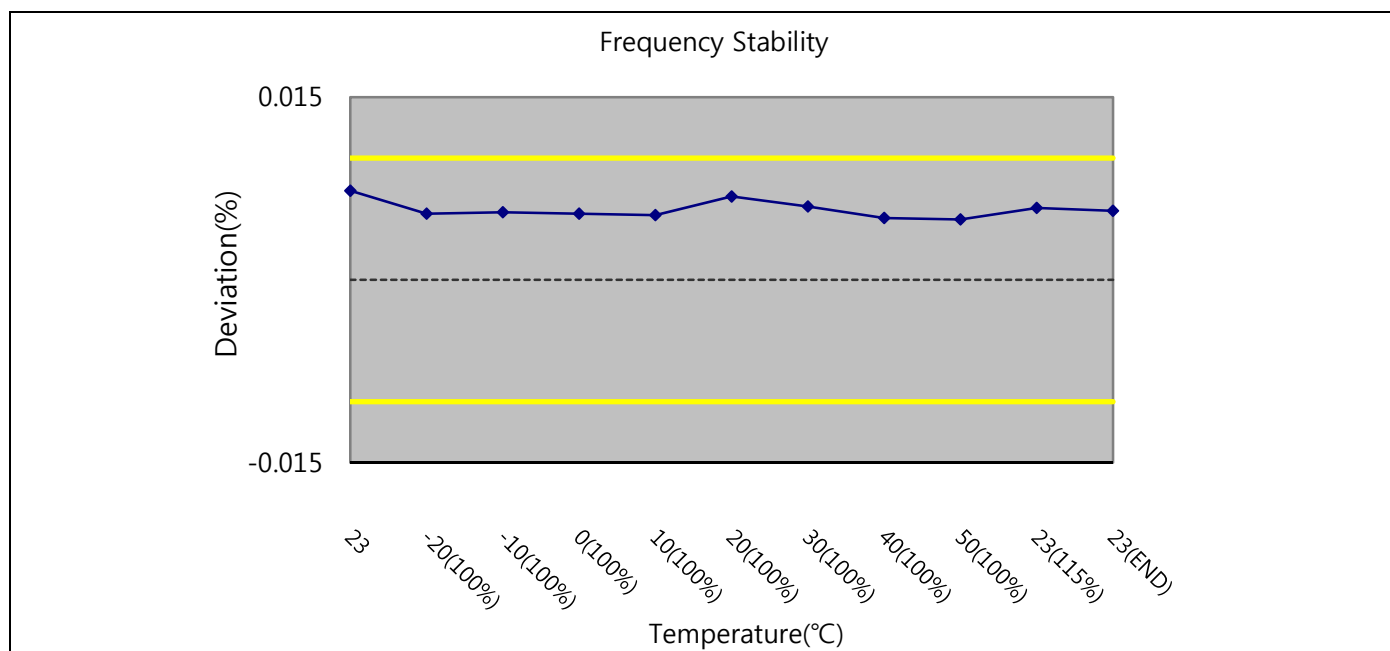
Part 15.225 requires that devices operating in the 13.553 – 13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20 degrees to + 50 degrees C at normal supply voltage.

- Measurement Data: **Comply**

Operating Frequency : 13560000 Hz
Reference Voltage : 7.4 V DC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	7.4	+23(ref)	13,560,993	993	0.007322
100%		-20	13,560,737	737	0.005435
100%		-10	13,560,753	753	0.005553
100%		0	13,560,737	737	0.005435
100%		+10	13,560,721	721	0.005317
100%		+20	13,560,929	929	0.006851
100%		+30	13,560,817	817	0.006025
100%		+40	13,560,689	689	0.005081
100%		+50	13,560,673	673	0.004963
85%	6.290	+23	-	-	-
115%	8.510	+23	13,560,801	801	0.005907
BATT.ENDPOINT	7.000	+23	13,560,769	769	0.005671

Note 1: This device is not operated at 6.29V(85%).



- Minimum Standard

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency.

3.2.5 AC Line Conducted Emissions (§15.207/EN 55022)

- Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.21(m). Emissions closest to the limit are measured in the quasi-peak and average detector mode with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

- Measurement Data: NA

Note: When this device is in the charging mode, the RFID function is not used normally.

- Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range (MHz)	Conducted Limit (dBuV)	
	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

APPENDIX

TEST EQUIPMENT FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
☒	Spectrum Analyzer	Agilent	E4440A	25/09/09	25/09/10	MY45304199
☐	Spectrum Analyzer	Rohde Schwarz	FSQ26	25/02/10	25/02/11	200445
☐	Spectrum Analyzer(RE)	H.P	8563E	13/10/09	13/10/10	3551A04634
☐	Power Meter	H.P	EPM-442A	01/07/10	01/07/11	GB37170413
☐	Power Sensor	H.P	8481A	01/07/10	01/07/11	3318A96332
☐	Power Divider	Agilent	11636B	13/10/09	13/10/10	56471
☐	Power Splitter	Anritsu	K241B	13/10/09	13/10/10	20611
☐	Power Splitter	Anritsu	K241B	01/07/10	01/07/11	017060
☐	Frequency Counter	H.P	5342A	01/07/10	01/07/11	2119A04450
☒	TEMP & HUMIDITY Chamber	JISCO	KR-100/J-RHC2	10/10/09	10/10/10	30604493/021031
☒	Digital Multimeter	H.P	34401A	12/03/10	12/03/11	3146A13475, US36122178
☐	Multifunction Synthesizer	HP	8904A	06/10/09	06/10/10	3633A08404
☐	Signal Generator	Rohde Schwarz	SMR20	12/03/10	12/03/11	101251
☐	Signal Generator	H.P	ESG-3000A	01/07/10	01/07/11	US37230529
☐	Vector Signal Generator	Rohde Schwarz	SMJ100A	11/01/10	11/01/11	100148
☐	Vector Signal Generator	Rohde Schwarz	SMBV100A	23/02/10	23/02/11	255571
☐	Audio Analyzer	H.P	8903B	02/07/10	02/07/11	3011A09448
☐	Modulation Analyzer	H.P	8901B	01/07/10	01/07/11	3028A03029
☐	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	02/07/10	02/07/11	GB43461134
☐	Universal Radio communication Tester	Rohde Schwarz	CMU 200	12/03/10	12/03/11	106760
☐	Bluetooth Tester	TESCOM	TC-3000B	01/07/10	01/07/11	3000B000268
☐	Thermo hygrometer	BODYCOM	BJ5478	28/01/10	28/01/11	090205-3
☒	Thermo hygrometer	BODYCOM	BJ5478	28/01/10	28/01/11	090205-2
☐	Thermo hygrometer	BODYCOM	BJ5478	28/01/10	28/01/11	090205-4
☐	AC Power supply	DAEKWANG	5KVA	12/03/10	12/03/11	20060321-1
☒	DC Power Supply	HP	6622A	12/03/10	12/03/11	3448A03760
☐	DC Power Supply	HP	6633A	12/03/10	12/03/11	3524A06634
☐	BAND Reject Filter	Microwave Circuits	N0308372	06/10/09	06/10/10	3125-01DC0352
☐	BAND Reject Filter	Wainwright	WRCG1750	06/10/09	06/10/10	2
☐	High-Pass Filter	ANRITSU	MP526D	06/10/09	06/10/10	M27756
☐	High-pass filter	Wainwright	WHNX2.1	N/A	N/A	1
☐	High-pass filter	Wainwright	WHNX3.0	N/A	N/A	9
☐	High-pass filter	Wainwright	WHNX5.0	N/A	N/A	8
☐	High-Pass Filter	Wainwright	WHKX8.5	N/A	N/A	1
☐	Tunable Notch Filter	Wainwright	WRCT800.0 /960.0-0.2/40-8SSK	N/A	N/A	32
☐	Tunable Notch Filter	Wainwright	WRCD1700.0 /2000.0-0.2/40-10SSK	N/A	N/A	53
☐	Tunable Notch Filter	Wainwright	WRCT1900.0/ 2200.0-5/40-10SSK	N/A	N/A	30
☐	HORN ANT	ETS	3115	23/09/09	23/09/10	21097
☐	HORN ANT	ETS	3115	14/07/10	14/07/11	6419
☐	HORN ANT	A.H.Systems	SAS-574	10/06/09	10/06/11	154
☐	HORN ANT	A.H.Systems	SAS-574	10/06/09	10/06/11	155

	Type	Manufacturer	Model	Cal.Due.Date (dd/mm/yy)	Next.Due.Date (dd/mm/yy)	S/N
☐	Dipole Antenna	Schwarzbeck	VHA9103	06/10/09	06/10/10	2116
☐	Dipole Antenna	Schwarzbeck	VHA9103	06/10/09	06/10/10	2117
☐	Dipole Antenna	Schwarzbeck	UHA9105	05/10/09	05/10/10	2261
☐	Dipole Antenna	Schwarzbeck	UHA9105	05/10/09	05/10/10	2262
☒	LOOP Antenna	ETS	6502	05/11/09	05/11/10	3471
☐	Coaxial Fixed Attenuators	Agilent	8491B	01/07/10	01/07/11	MY39260700
☒	Attenuator (3dB)	WEINSCHTEL	56-3	16/12/09	16/12/10	Y2342
☐	Attenuator (3dB)	WEINSCHTEL	56-3	16/12/09	16/12/10	Y2370
☐	Attenuator (10dB)	WEINSCHTEL	23-10-34	01/10/09	01/10/10	BP4386
☐	Attenuator (10dB)	WEINSCHTEL	23-10-34	11/01/10	11/01/11	BP4387
☐	Attenuator (10dB)	WEINSCHTEL	31696	06/10/09	06/10/10	446
☐	Attenuator (10dB)	WEINSCHTEL	31696	06/10/09	06/10/10	408
☐	Attenuator (20dB)	WEINSCHTEL	86-20-11	06/10/09	06/10/10	432
☐	Attenuator (30dB)	JFW	50FH-030-300	12/03/10	12/03/11	060320-1
☐	Attenuator (40dB)	WEINSCHTEL	57-40-33	01/10/09	01/10/10	NN837
☐	Termination	H.P	HP-909D	02/07/10	02/07/11	02750
☐	Termination	H.P	HP-909D	02/07/10	02/07/11	02702
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0088CAN	01/07/10	01/07/11	788
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0185CAN	01/07/10	01/07/11	790
☐	Type N Coaxial CIRCULATOR	NOVA MICROWAVE	0215CAN	01/07/10	01/07/11	112
☐	Amplifier (30dB)	Agilent	8449B	23/04/10	23/04/11	3008A01590
☐	Amplifier (30dB)	H.P	8449B	13/05/10	13/05/11	3008A00370
☐	Amplifier	EMPOWER	BBS3Q7ELU	02/11/09	02/11/10	1020
☐	RF Power Amplifier	OPHIRRF	5069F	01/07/10	01/07/11	1006
☒	EMI TEST RECEIVER	R&S	ESU	29/01/10	29/01/11	100014
☒	BILOG ANTENNA	SCHAFFNER	CBL 6112D	28/10/09	28/10/10	22609
☒	Amplifier (22dB)	H.P	8447E	29/01/10	29/01/11	2945A02865
☐	EMI TEST RECEIVER	R&S	ESCI	12/05/10	12/05/11	100364
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP 9108 A-1	07/10/09	07/10/10	1098
☐	BICONICAL ANT.	Schwarzbeck	VHA 9103	06/10/09	06/10/10	91031946
☐	LOG-PERIODIC ANT.	Schwarzbeck	UHALP9108A	07/07/10	07/07/11	590
☐	Low Noise Pre Amplifier	TSJ	MLA-100K01-B01-2	12/03/10	12/03/11	1252741
☐	Amplifier (25dB)	Agilent	8447D	12/03/10	12/03/11	2944A10144
☐	Amplifier (25dB)	Agilent	8447D	01/07/10	01/07/11	2648A04922
☐	Spectrum Analyzer(CE)	H.P	8591E	12/03/10	12/03/11	3649A05889
☐	LISN	Kyoritsu	KNW-407	29/01/10	29/01/11	8-317-8
☐	LISN	Kyoritsu	KNW-242	29/01/10	29/01/11	8-654-15
☐	CVCF	NF Electronic	4420	12/03/10	12/03/11	304935/337980
☐	50 ohm Terminator	HME	CT-01	12/01/10	12/01/11	N/A
☐	RFI/FIELD Intensity Meter	Kyoritsu	KNM-2402	02/07/10	02/07/11	4N-170-3