

Produkte
Products

Prüfbericht - Nr.: 14028971 001			Seite 1 von 16 Page 1 of 16		
Test Report No.:					
Auftraggeber: Client:		XIRING SA River Seine 25 Quai Gallieni 92158 Suresnes Cedex France			
Gegenstand der Prüfung: Test Item:		Bluetooth Barcode Scanner			
Bezeichnung: Identification:	BOK-L, BOK-LE, BOK-FE, BOK-FS, BOK-LA	Serien-Nr.: Serial No.:	Engineering sample		
Wareneingangs-Nr.: Receipt No.:	00120215027-001	Eingangsdatum: Date of Receipt:	15.02.2012		
Prüfart: Testing Location:	Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong TÜV Rheinland Hong Kong Ltd. 8/F., First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong				
Prüfgrundlage: Test Specification:	FCC Part 15 Subpart C ANSI C63.4-2003 CISPR 22:1997				
Prüfresultat: Test Results:	Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage. The above mentioned product was tested and passed .				
Prüflaboratorium: Testing Laboratory:	TÜV Rheinland Hong Kong Ltd. 8-10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong				
geprüft/ tested by:		kontrolliert/ reviewed by:			
04.05.2012 Mika Chan Senior Project Engineer		04.05.2012 Sharon Li Section Manager			
Datum Date	Name/Stellung Name/Position	Unterschrift Signature	Datum Date	Name/Stellung Name/Position	Unterschrift Signature
Sonstiges: Other Aspects		FCCID: QSHAIOKTB			
Abkürzungen:		Abbreviations:			
P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet		P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested			
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>					

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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK; Pi/4 DQPSK; 8 DPSK
Number of channels	79
Channel separation	1 MHz
Type of antenna	Chip Antenna
Antenna gain (dBi)	2.0
Power level	fix
Type of equipment	stand alone, plug-in radio device
Connection to public utility power line	No
Nominal voltage	V _{nom} : 3.8V
Independent Operation Modes	Page scan Inquiry scan Connection state - ACL Link Connection state - RFCOMM Link

Main EUT

Product Name		orKan barcode			
Part Number	B40170100//xxx	B40170103//xxx	B40170201//xxx	B40170202//xxx	B40170102//xxx
Reference	BOK-L	BOK-LE	BOK-FE	BOK-FS	BOK-LA
Assembled component to get HW version : to connect the Scan-engine (FPC)		R7-R9 ; R17-R19 ; R28-R29 ; R122-R125			
	J4	J7	J8		J4
Housing		Flat window			Tilted window
Scan Engine	EV10 Lite Intermec	EV15 Intermec	Honeywell IT5180SR	Honeywell IT5180SF	SE950 Motorola

Product function and intended use

The test item is a Bluetooth Barcode Scanner based on the Bluetooth technology.

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4GHz. With the introduction of the enhanced data rate (EDR) feature, the data rates can be up to 3 Mb/s.

An increase in the peak data rate beyond the basic rate of 1 Mb/s is achieved by modulating the RF carrier using phase shift keying (PSK) techniques, resulting in an increase of two to three times the number of bits per symbol. The 2 Mb/s EDR packets use a Pi/4-DQPSK modulation and the 3 Mb/s EDR packets use 8DPSK modulation. The USB connector is for charging only, no data exchange supported.

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User Manual

Remark

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases.

Special accessories and auxiliary equipment

Additional accessory used for testing

The product has been tested together with the following additional accessory:

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List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

Equipment used	Manufacturer	Model No.	S/N	Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	25-May-12
Test Receiver	R & S	ESU40	100190	26-May-12
Bi-conical Antenna	R & S	HK116	100241	05-May-13
Log Periodic Antenna	R & S	HL223	841516/020	06-May-13
Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 001	15-Nov-13
Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	03-Oct-13
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	28-Oct-13
Horn Antenna	EMCO	3115	9002-3351	11-May-13
Active Loop Antenna	EMCO	6502	9107-2651	19-Apr-12
FSP 30 Spectrum Analyser	R & S	FSP 30	100007	16-Sep-12

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Conducted Emission

Equipment	Manufacturer	Type	S/N	Due Date
Test Receiver	Rohde & Schwarz	ESCS30	100201	13 Feb 13
LISN	Rohde & Schwarz	ESH3-Z5	100230	13 Feb 13

Results FCC Part 15 – Subpart C

Subclause 15.203 – Antenna Information		Pass
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Permanent attached antenna	
Verdict:	Pass	
Subclause 15.204 – Antenna Information		Pass
Requirement:	Provide information for every antenna proposed for the use with the EUT	
Results:	a) Antenna type: Chip Antenna b) Manufacturer and model no: N.A. c) Gain with reference to an isotropic radiator: 2.0 dBi	
Verdict:	Pass	
Subclause 15.207 – Disturbance Voltage on AC Mains		N/A
Test Port: AC mains input port of the charger Applied voltage: -- Adaptor Model: -- Mode of operation: EUT did not operate during battery charging		
Subclause 15.247 (a)(1) – Carrier Frequency Separation		Pass
Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), 8DPSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%		
Results:	Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. The centre frequencies of the hopping channels are separated by more than the 2/3*20dB bandwidth. For test Results plots refer to Appendix 1, page 2.	
Verdict:	Pass	

Subclause 15.247 (a)(1)(iii) – Number of hopping channels		Pass
Requirement:	Frequency hopping systems operating in the 2400MHz-2483.5MHz bands shall use at least 15 hopping frequencies.	
Test Specification	: FCC Part 15 Subpart A – Subclause 15.31	
Mode of operation	: Tx mode (hopping on), GFSK	
Port of testing	: Temporary antenna port	
Detector	: Peak	
RBW/VBW	: 1 MHz / 3 MHz	
Supply voltage	: 3.8VDC from DC power supply	
Temperature	: 23°C	
Humidity	: 50%	
Results:	The total number of hopping frequencies is more than 15. For test Results plots refer to Appendix 1, page 3.	
Verdict:	Pass	

Subclause 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)		Pass
Requirement:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), DH5 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%		
Results: Time period calculation = $0.4 \times 79 = 31.6\text{s}$ Dwell time = $64 \times 2.904 \times 10^{-3} = 185.856 \times 10^{-3}$ $\leq 400 \times 10^{-3} \text{ s}$		
For test protocols please refer to Appendix 1, page 4.		
Verdict:	Pass	

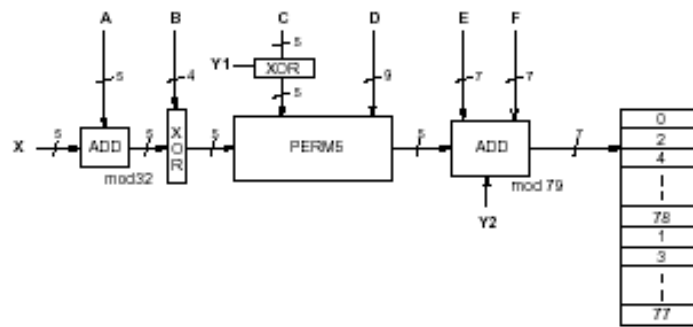
Subclause 15.247 (a) – 20 dB Bandwidth		Pass	
Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.		
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 30 kHz / 100 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%			
Results:	Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. For test protocols refer to Appendix 1, page 5-7.		
GFSK Modulation			
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.462	0.492	0.954
2441	0.462	0.492	0.954
2480	0.468	0.486	0.954
8DPSK Modulation			
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.642	0.654	1.284
2441	0.816	0.492	1.230
2480	0.822	0.492	1.272

Subclause 15.247 (a) – Hopping Sequence**Pass**

Requirement: The hopping sequence is generated and provided with an example.

Hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



Example data:

Hop sequence {k} for CONNECTION STATE:

CLK start: 0x0000010

ULAP: 0x00000000

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

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0x0000010: 08 66 | 10 70 | 12 19 | 14 23 | 16 01 | 18 05 | 20 33 | 22 37 |
0x0000030: 24 03 | 26 07 | 28 35 | 30 39 | 32 72 | 34 76 | 36 25 | 38 29 |
0x0000050: 40 74 | 42 78 | 44 27 | 46 31 | 48 09 | 50 13 | 52 41 | 54 45 |
0x0000070: 56 11 | 58 15 | 60 43 | 62 47 | 32 17 | 36 19 | 34 49 | 38 51 |
0x0000090: 40 21 | 44 23 | 42 53 | 46 55 | 48 33 | 52 35 | 50 65 | 54 67 |
0x00000b0: 56 37 | 60 39 | 58 69 | 62 71 | 64 25 | 68 27 | 66 57 | 70 59 |
0x00000d0: 72 29 | 76 31 | 74 61 | 78 63 | 01 41 | 05 43 | 03 73 | 07 75 |
0x00000f0: 09 45 | 13 47 | 11 77 | 15 00 | 64 49 | 66 53 | 68 02 | 70 06 |
0x0000110: 01 51 | 03 55 | 05 04 | 07 08 | 72 57 | 74 61 | 76 10 | 78 14 |
0x0000130: 09 59 | 11 63 | 13 12 | 15 16 | 17 65 | 19 69 | 21 18 | 23 22 |
0x0000150: 33 67 | 35 71 | 37 20 | 39 24 | 25 73 | 27 77 | 29 26 | 31 30 |
0x0000170: 41 75 | 43 00 | 45 28 | 47 32 | 17 02 | 21 04 | 19 34 | 23 36 |
0x0000190: 33 06 | 37 08 | 35 38 | 39 40 | 25 10 | 29 12 | 27 42 | 31 44 |
0x00001b0: 41 14 | 45 16 | 43 46 | 47 48 | 49 18 | 53 20 | 51 50 | 55 52 |
0x00001d0: 65 22 | 69 24 | 67 54 | 71 56 | 57 26 | 61 28 | 59 58 | 63 60 |
0x00001f0: 73 30 | 77 32 | 75 62 | 00 64 | 49 34 | 51 42 | 57 66 | 59 74 |
0x0000210: 53 36 | 55 44 | 61 68 | 63 76 | 65 50 | 67 58 | 73 03 | 75 11 |
0x0000230: 69 52 | 71 60 | 77 05 | 00 13 | 02 38 | 04 46 | 10 70 | 12 78 |
0x0000250: 06 40 | 08 48 | 14 72 | 16 01 | 18 54 | 20 62 | 26 07 | 28 15 |
0x0000270: 22 56 | 24 64 | 30 09 | 32 17 | 02 66 | 06 74 | 10 19 | 14 27 |
0x0000290: 04 70 | 08 78 | 12 23 | 16 31 | 18 03 | 22 11 | 26 35 | 30 43 |
0x00002b0: 20 07 | 24 15 | 28 39 | 32 47 | 34 68 | 38 76 | 42 21 | 46 29 |
0x00002d0: 36 72 | 40 01 | 44 25 | 48 33 | 50 05 | 54 13 | 58 37 | 62 45 |
0x00002f0: 52 09 | 56 17 | 60 41 | 64 49 | 34 19 | 36 35 | 50 51 | 52 67 |
0x0000310: 38 21 | 40 37 | 54 53 | 56 69 | 42 27 | 44 43 | 58 59 | 60 75 |
0x0000330: 46 29 | 48 45 | 62 61 | 64 77 | 66 23 | 68 39 | 03 55 | 05 71 |
0x0000350: 70 25 | 72 41 | 07 57 | 09 73 | 74 31 | 76 47 | 11 63 | 13 00 |
0x0000370: 78 33 | 01 49 | 15 65 | 17 02 | 66 51 | 70 67 | 03 04 | 07 20 |
0x0000390: 68 55 | 72 71 | 05 08 | 09 24 | 74 59 | 78 75 | 11 12 | 15 28 |
0x00003b0: 76 63 | 01 00 | 13 16 | 17 32 | 19 53 | 23 69 | 35 06 | 39 22 |
0x00003d0: 21 57 | 25 73 | 37 10 | 41 26 | 27 61 | 31 77 | 43 14 | 47 30 |
0x00003f0: 29 65 | 33 02 | 45 18 | 49 34 | 19 04 | 21 08 | 23 20 | 25 24 |

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Subclause 15.247 (a) – Equal Hopping Frequency Use**Pass**

Requirement: Each of the transmitter's hopping channels is used equally on average.

Equal hopping frequency use

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (a) – Receiver Input Bandwidth**Pass**

Requirement: The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.

Receiver input bandwidth

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.

Subclause 15.247 (a) – Receiver Hopping Capability**Pass**

Requirement: The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.

Receiver hopping Capability

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (b)(1) – Peak Output Power**Pass**

Test Specification : FCC Part 15 Subpart A – Subclause 15.31
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz)
 Port of testing : Temporary antenna port
 Detector : Peak
 RBW/VBW : 3 MHz / 10 MHz
 Supply voltage : 3.8VDC from DC power supply
 Temperature : 23°C
 Humidity : 50%

Requirement: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt. For all other frequency hopping systems in the 2400 – 2483.5 MHz band: 0.125 Watts.

Results: For test protocols please refer to Appendix 1, page 8-12.

GFSK Modulation

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	15.60	0	15.600	1 / 30.0	Pass
2441	15.14	0	15.140	1 / 30.0	Pass
2480	13.80	0	13.800	1 / 30.0	Pass

Pi/4 DQPSK Modulation

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	6.23	0	6.230	1 / 30.0	Pass
2441	4.70	0	4.700	1 / 30.0	Pass
2480	3.27	0	3.270	1 / 30.0	Pass

8DPSK Modulation

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	6.56	0	6.560	1 / 30.0	Pass
2441	5.10	0	5.100	1 / 30.0	Pass
2480	3.39	0	3.390	1 / 30.0	Pass

Subclause 15.247 (d) – Band edge compliance of conducted emissions**Pass**

Test Specification : FCC Part 15 Subpart A – Subclause 15.31
 Mode of operation : Tx mode (2402MHz, 2480MHz), 8DPSK
 Port of testing : Temporary antenna port
 Detector : Peak
 RBW/VBW : 100 kHz / 300 kHz
 Supply voltage : 3.8VDC from DC power supply
 Temperature : 23°C
 Humidity : 50%

Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator 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.

Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

 There is no peak found outside any 100 kHz bandwidth of the operating frequency band. For test protocols refer to Appendix 1, page 13-14.

Subclause 15.205 – Band edge compliance of radiated emissions**Pass**

Test Specification : FCC Part 15 Subpart A – Subclause 15.31
 Mode of operation : Tx mode (2402MHz, 2480MHz), 8DPSK
 Port of testing : Temporary antenna port
 Detector : Peak
 RBW/VBW : 1 MHz / 3 MHz
 Supply voltage : 3.8VDC from DC power supply
 Temperature : 23°C
 Humidity : 50%

Requirement: Radiated emissions which fall in the restricted bands, as defined in 15.205 (a), must also comply with the radiated emission limits specified in 15.209(a).

Results: There is no peak found in the restricted bands. For test protocols refer to Appendix 1, page 15-23.

Subclause 15.247 (d) – Spurious Conducted Emissions					Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), 8DPSK Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23 °C Humidity : 50 %					
Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator 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.					
Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types. There is no peak found outside any 100kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1, page 21-22.					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	3200	-36.55	15.08	-51.63	Pass
2441	9450	-38.30	14.49	-52.79	Pass
2480	21250	-30.66	12.47	-43.13	Pass

Subclause 15.247 (c) – Spurious Radiated Emissions**Pass**

Test Specification : ANSI C63.4 – 2003
 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK
 Port of testing : Enclosure
 Detector : Peak
 RBW/VBW : 100 kHz / 300 kHz for $f < 1$ GHz
 1 MHz / 3 MHz for $f > 1$ GHz
 Supply voltage : 3.8VDC from DC power supply
 Temperature : 23°C
 Humidity : 50%

Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. 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 15.205(c).

Results: Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.

All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.

Tx frequency 2402MHz

Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
446.979	37.60	46.0 / QP
471.812	36.50	46.0 / QP
4804.022	72.90	74.0 / PK
4803.926	43.77	54.0 / AV

Tx frequency 2402MHz

Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
397.315	39.70	46.0 / QP
446.980	44.50	46.0 / QP
471.812	41.70	46.0 / QP
3203.256	59.51	74.0 / PK
3203.304	37.44	54.0 / AV
4803.958	69.59	74.0 / PK
4803.990	42.69	54.0 / AV

Tx frequency 2441MHz

Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
471.812	36.30	46.0 / QP
4881.634	66.57	74.0 / PK
4881.987	41.31	54.0 / AV

Tx frequency 2441MHz

Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
397.314	43.00	46.0 / QP
446.980	42.60	46.0 / QP

3255.371	55.37	74.0 / PK
3255.243	36.09	54.0 / AV
4882.035	65.21	74.0 / PK
4881.955	41.03	54.0 / AV
Tx frequency 2480MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
620.805	28.60	46.0 / QP
4959.903	66.68	74.0 / PK
4959.935	41.69	54.0 / AV
Tx frequency 2480MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
397.314	40.30	46.0 / QP
446.980	45.00	46.0 / QP
3307.371	54.35	74.0 / PK
3307.339	35.44	54.0 / AV
4959.663	62.09	74.0 / PK
4960.016	36.87	54.0 / AV