Prüfbericht - Nr.: *Test Report No.:*	**14023871 001**	**Seite 1 von 16** *Page 1 of 16*

| **Auftraggeber:** *Client:* | Shenzhen Roman Technology Co., Ltd. Floor 4, Building C, Feng Men Ao Industrial Park GangTou, BanTian, Longgang District Shenzhen, Guangdong, China | |

| **Gegenstand der Prüfung:** *Test Item:* | **Bluetooth Headset** | | |

| **Bezeichnung:** *Identification:* | **ROMAN R200, ROMAN R95, ROMAN R5800, ROMAN R6800, ROMAN R108, ROMAN R208, ROMAN R6230, ROMAN WEP200, ROMAN N95, ROMAN N97i, ROMAN BH32, ROMAN F76** | **Serien-Nr.:** *Serial No.:* | **Engineering sample** |

| **Wareneingangs-Nr.:** *Receipt No.:* | 00100518086-001 | **Eingangsdatum:** *Date of Receipt:* | **18.05.2010** |

| **Prüfort:** *Testing Location:* | **TÜV Rheinland (Guangdong) Ltd. EMC Laboratory** Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou, 510650, P.R. China |

| **Prüfgrundlage:** *Test Specification:* | **FCC Part 15 Subpart C** **ANSI C63.4-2003** **CISPR 22:1997** |

| **Prüfergebnis:** *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.** 9-10/F., Emperor International Square , 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong |

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
10.06.2010	Mika Chan Project Engineer		10.06.2010	Sharon Li Project Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

| **Sonstiges:** Other Aspects | **FCCID: YGKLM-R200** |

| **Abkürzungen:** | P(ass) F(ail) N/A N/T | = = = = | entspricht Prüfgrundlage entspricht nicht Prüfgrundlage nicht anwendbar nicht getestet | **Abbreviations:** | P(ass) F(ail) N/A N/T | = = = = | passed failed not applicable 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.

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.

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Appendix 4 – Product documentation .... **10 pages**

Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK
Number of channels	79
Channel separation	1 MHz
Type of antenna	Integral
Antenna gain (dBi)	0
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	V_{nor}: 3.7 V
Independent Operation Modes	Page scan Inquiry scan Connection state - ACL Link Connection state - SCO Link

Product function and intended use

The test item is a Mono Headset 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 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, 79 RF channels spaced 1 MHz apart are defined.
The channel is represented by a pseudo-random hopping sequence through the 79 channels. The channel is divided into time slots, with a nominal slot length of 625 µs, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s. The symbol rate on the channel is 1 Ms/s.

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual

Remark

Device cannot be operated (BT does not transmits) while being connected to AC Powerlines for charging.

Special accessories and auxiliary equipment

Nil

List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model No.	S/N	Due Date
☒	Semi-anechoic Chamber	Albatross Projects GmbH	Nil	9460000.9	16-Mar-11
☒	EMI Test Receiver	R & S	ESCI	100216	16-Mar-11
☒	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	209	21-Aug-11
☒	Double-Ridged Waveguide Horn Antenna	R & S	HF 906	100407	16-Mar-11
☒	Pre-Amplifier	MITEQ	AFS42-00101800-25S-42	1101599	16-Mar-11
☒	Pre-Amplifier	MITEQ	AFS42-00101800-25S-44	1108282	16-Mar-11
☒	Band Reject Filter	Micro-Tronics	BRM50702	023	16-Mar-11
☒	Horn Antenna	EMCO	3160-09	21642	26-Jun-14
☒	FSP 30 Spectrum Analyser	R & S	FSP 30	100286	16-Mar-11
☒	EMI Test Receiver	R & S	ESCS 30	100316	16-Mar-11
☒	Artificial Mains Network	R & S	ESH3-Z5	100114	16-Mar-11
☒	Pulse Limiter	R & S	ESH3-Z2	100701	16-Mar-11
☒	Loop Antenna	R & S	HFH2-Z2	9107-2651	16-Mar-11
☒	Power Meter	R & S	NRVS	836333/062	03-Nov-10

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: Integral	
b) Manufacturer and model no: N.A.	
c) Gain with reference to an isotropic radiator: 0 dBi	
Verdict: Pass	
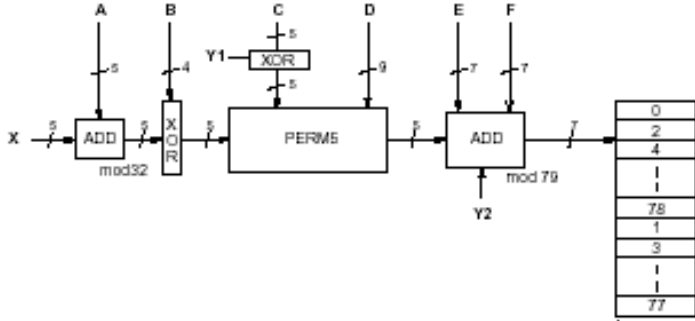
Subclause 15.247 (a)(1) – Carrier Frequency Separation	Pass
Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.	

Test Specification : FCC Part 15 Subpart A – Subclause 15.31
Mode of operation : Tx mode (hopping on), GFSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 3.7VDC from DC power supply
Temperature : 23ºC
Humidity : 50%

Results:	Pre-scan has been conduced 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 : 3.7VDC from DC power supply
Temperature : 23ºC
Humidity : 50%

Results:	The total number of hopping frequencies is more than 15. For test Results plots refer to Appendix 1, page 3-4.
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 : 3.7VDC from DC power supply
Temperature : 23ºC
Humidity : 50%

Results: Time period calculation = $0.4 \times 79 = 31.6s$
Dwell time = $96 \times 3.04 \times 10^{-3} = 291.84 \times 10^{-3}$
$<= 400 \times 10^{-3}$ s

For test protocols please refer to Appendix 1, page 4-5.

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), (GFSK)
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 30 kHz / 100 kHz
Supply voltage : 3.7VDC from DC power supply
Temperature : 23ºC
Humidity : 50%

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

For test protocols refer to Appendix 1, page 9-11.

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.462	0.480	0.942
2441	0.300	0.642	0.942
2480	0.480	0.456	0.936

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 |

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 |

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 : 3.7VDC from DC power supply
Temperature : 23ºC
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 8-9.

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	-9.02	3.52	-5.500	1 / 30.0	Pass
2441	-9.18	3.65	-5.530	1 / 30.0	Pass
2480	-9.67	3.60	-6.070	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), GFSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 100 kHz / 300 kHz
Supply voltage : 3.7VDC from DC power supply
Temperature : 23ºC
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 conduced 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 10-11.

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), GFSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 1 MHz / 3 MHz
Supply voltage : 3.7VDC from DC power supply
Temperature : 23ºC
Humidity : 50%

Requirement:	Radiated emissions which fall in the restricted bans, 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 12-15.

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), GFSK
Port of testing   : Temporary antenna port
Detector   : Peak
RBW/VBW   : 100 kHz / 300 kHz
Supply voltage   : 3.7VDC from DC power supply
Temperature   : 23 ºC
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 conduced 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 16-17. |

Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	No peak found	-	-	-	Pass
2441	No peak found	-	-	-	Pass
2480	No peak found	-	-	-	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 : internal batteries has been activated
Temperature : 23ºC
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 section15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).

Results:	Pre-scan has been conduced 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
45.750	25.3	40.0 / QP
118.500	28.3	43.5 / QP
257.800	31.6	46.0 / QP
372.300	35.2	46.0 / QP
1497.000	54.7	74.0 / P
1497.000	38.8	54.0 / A
2993.000	53.3	74.0 / P
2993.000	35.6	54.0 / A
3745.500	46.2	74.0 / P
3745.500	32.4	54.0 / A
4804.000	40.9	74.0 / P
4804.000	28.0	54.0 / A

Tx frequency 2402MHz   Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
143.200	16.8	43.5 / QP
399.800	34.9	46.0 / QP
636.950	35.6	46.0 / QP
749.400	42.3	46.0 / QP
1495.000	45.7	74.0 / P
1495.000	23.7	54.0 / A
2993.000	49.2	74.0 / P
2993.000	34.6	54.0 / A
3745.500	50.3	74.0 / P
3745.500	32.8	54.0 / A
4804.000	41.1	74.0 / P
4804.000	27.5	54.0 / A

Tx frequency 2441MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
45.800	25.8	40.0 / QP
157.500	29.5	43.5 / QP
372.300	34.8	46.0 / QP
429.600	34.4	46.0 / QP
1497.000	54.8	74.0 / P
1497.000	40.3	54.0 / A
2997.500	53.6	74.0 / P
2997.500	36.5	54.0 / A
3747.500	50.5	74.0 / P
3747.500	32.7	54.0 / A
4882.000	42.2	74.0 / P
4882.000	27.6	54.0 / A

Tx frequency 2441MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
157.500	15.8	43.5 / QP
398.200	35.0	46.0 / QP
636.950	36.7	46.0 / QP
749.400	42.3	46.0 / QP
1495.000	44.6	74.0 / P
1495.000	30.5	54.0 / A
2991.000	51.4	74.0 / P
2991.000	35.4	54.0 / A
4882.000	41.0	74.0 / P
4882.000	28.1	54.0 / A
5993.500	50.8	74.0 / P
5993.500	32.5	54.0 / A

Tx frequency 2480MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
60.200	18.5	40.0 / QP
157.200	30.1	43.5 / QP
372.300	36.4	46.0 / QP
429.600	34.5	46.0 / QP
1497.000	55.5	74.0 / P
1497.000	38.9	54.0 / A
2997.500	54.7	74.0 / P
2997.500	35.8	54.0 / A
3747.500	50.2	74.0 / P
3747.500	31.4	54.0 / A
4960.000	42.6	74.0 / P
4960.000	28.7	54.0 / A

Tx frequency 2480MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
44.200	21.6	40.0 / QP
399.800	33.3	46.0 / QP
636.950	35.9	46.0 / QP
749.400	37.8	46.0 / QP

1497.000	45.1	74.0 / P
1497.000	30.2	54.0 / A
2995.500	54.6	74.0 / P
2995.500	31.5	54.0 / A
4960.000	42.0	74.0 / P
4960.000	29.2	54.0 / A
5989.500	50.1	74.0 / P
5989.500	32.3	54.0 / A