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TEST REF. NO: 04/2072
DATE: February 19, 2004

TEST REPORT

REPORT CERTIFICATE issued by a FCC listed Test Laboratory

Project No: 04220

CUSTOMER AND MANUFACTURER:
Q-Matic Sweden AB
Neongatan 8
SE-413 53 Mölndal
Sweden

EQUIPMENT UNDER TEST (EUT):
Remote Control Transmitter, "Wireless Terminal 315.00 MHz".
S/n: 31126-044. Nominal Center frequency: 315.0 MHz.

TEST SPEC.:
47 Cfr Ch. 1 (10-1-02 Edition):
Part 15, Subpart C.
Applicable Section: 15.231(a – d). Periodic operation in the band 40.66 – 40.70 and above 70 MHz.

DATE OF TEST:
February 5 - 6, 2004

TEST SITE:
Svenska EMC Lab AB, Karlskrona, Sweden.
FCC registration number: 90967.
Industry Canada registration number: IC 4328.

TEST RESULT:
The EUT (Equipment Under Test) did pass the above mentioned test.

Approved, Karlskrona February 19, 2004

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Hans Östergren
Manager Svenska EMC Lab AB

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DATE OF RECEIPT: February 5, 2004

CONDITION OF EUT: No remarks. Operates as intended.

TEST PERSONNEL: Svenska EMC Lab AB: Bo Gidlöw, Hans Östergren.

DESCRIPTION OF THE EUT:

The EUT is a hand held Short range remote control, used to ”Call forward” a new customer in a Queue System. With integral Antenna and without any Antenna contact. Powered from build-in batteries. No cables could be connected to the EUT.
EUT dimension: Approx. 20 mm thick and approx. diameter of 70 mm.

CALIBRATION DECLARATION:

The test equipment is calibrated as the calibration information in the Test Equipment list. Before starting of the tests the check points in the applicable Checklists were confirmed.

ESTIMATED UNCERTAINTY:

Expanded uncertainty (k = 2), Field Strength, emission 9 kHz – 1000 MHz:	± 2.4 dB
Expanded uncertainty (k = 2), Field Strength, emission 1 to 5 GHz:	± 3 dB
Frequency, 0.09 – 1000 MHz:	± 10 Hz
Frequency, 1 – 5 GHz:	± 10 kHz

The uncertainties are for a confidence level of not less than 95 %.

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TEST EQUIPMENT:

Type/Manufacturer/Bandwidth	s/n	Calibration information	
		Date	Interval
EMI Test System, Monitor EZM, Rohde & Schwarz EP-6, 20 Hz - 1300 MHz	860157/014	0308	12 months
Test Receiver, Rohde & Schwarz ESH-3, 9 kHz - 30 MHz	894979/013	0308	12 months
Test Receiver, Rohde & Schwarz ESVP, 20 - 1300 MHz	893497/006	0308	12 months
Plotter, Rohde & Schwarz DOP 2	893117/0008	0308	12 months
Biconical Antenna, Schwarzbeck BBA9106 30 - 300 MHz	93-92196.1	0308	12 months
Log-periodic Antenna, Schwarzbeck UHALP9107, 300 - 1000 MHz	91071205	0308	12 months
Double Ridged Guide Antenna, EMCO 3115, 1 - 18 GHz	2338	0308	36 months
Signal Amplifier, Mini-Circuits, ZHL-42 0.7 – 4.6 GHz	8607 01	0402	12 months
Spectrum Analyzer Tektronix 2712, 10 kHz – 1,8 GHz	B023361	0401	12 months
Spectrum Analyzer Tektronix 2755AP 10 kHz - 21 GHz	B010111	0307	12 months
Plotter, Tektronix HC-100	JP05851	NA	NA
Coaxial Cable, Sucoflex 104, l = 5 m	171288/4	0309	12 months
Coaxial Cable, Sucoflex 104, l = 0.5 m	180067/4	0309	12 months
Coaxial cable, Suhner RG214	93-1217	0309	12 months
Antenna Mast System, Jyske EMC, h = 1 - 4 m	93-90172	NA	NA
Turn Table, Jyske EMC	93-90171	NA	NA
Anechoic Chamber, 8 x 4.5 x 3 m	93-87151	0304	36 months
Open Area Test Site for 3 m antenna distance	-	0312	36 months
Oscilloscope, Tektronix 2230	B011088	0301	24 months
Digital Multimeter, Fluke 77	63430754R	0302	24 months

TEST SET-UP AND PROCEDURE:

As laid out in ANSI C.63.4:2001 Document.
Tested as hand-held equipment in 3 orthogonal directions.
See Appendix 1.

TEST CONDITIONS:

Rating: 6 VDC. (4 x 1.5 V batteries).
Voltage at test: 6.3 VDC.
Peripherals: No peripherals.
Cables: Not possible to connect any cable.
Configuration: See photos in Appendix 2 to 4. Resistor R1 = 4.7 kilo-ohm.
Operating Frequency: 315.0 MHz nominal.
Effective radiated power: Less than 1 mW.
Modulation: No external modulation possible. The manufacturers normal modulation was used. Minimum pulse repetition frequency = 7.6 Hz.
Modulation data: See Appendix 5 and 6.
Modifications: No modifications.
Operating Condition: The normal operating mode with deactivation time of 60 seconds was disabled. The transmitter switch was mechanical looked to get continuously transmitting at 100 % duty cycle. The normal operating mode is a short activation of the transmitter. An auto-shutoff function automatically stops the device from transmitting after 60 seconds if a button inadvertently gets pressed for a long period of time.
Ambient Humidity: 49 % RH
Ambient temperature: 21 °C.

DESENSITIZATION FACTOR:

Not applicable.

TEST PERFORMANCE:

Section 15.231.
Applicable tests:
15.231(a)(1). Deactivation time.
After releasing the manual switch the transmitter was automatic deactivated in less than 0.1 seconds. Test instrument: Oscilloscope Tektronix 2230.

15.231(b). Field strength of emission.
Pre-test: A pretest was performed in the Anechoic Chamber to determine the radiated frequencies. Measured frequency range 30 – 1000 MHz. The EUT was measured at an Antenna distance of 3 m. The antenna polarization was both vertical and horizontal during the test. The EUT was fixed in position by a wooden fixture and measured in 3 orthogonal directions to find the direction generating the highest emission. This position was then used at the final measurements. The only emission from EUT was from the fundamental and its harmonics. No sub harmonics or spurious emission was found. The emission was checked with a Peak detector. See Appendix 7 and 8.
Final Test:
Measured on the open area test site with EUT - Antenna distance of 3 m. The EUT was in the fixture and positioned to give maximum emission. on a wooden table at 0.8 m height. The emission was maximized by varying the antenna height and the antenna polarization. Sec. 15.213(b)(2) specifies an Average detector (or as an alternative a Quasi-peak detector). Sec. 15.35(a) specifies a peak detector if the repetition frequency is lower than 20 Hz. Peak limit is in this case the same as the Av.limit.
1. Fundamental (f0) and harmonics 2 x f0 and 3 x f0. < 1000 MHz.
The emission was measured with a Peak detector and also with an Average detector (RBW = 120 kHz, Av. time = 100 ms). The limit in 15.231(b) is compared to the measured level with a Peak detector in accordance with 15.35(a). See Appendix 11. Test instruments: Test Receiver, Rohde & Schwarz ESVP, 30 MHz - 1300 MHz. Antenna, Schwarzbeck UHALP9107, 300 - 1000 MHz.
2. Harmonics, (4 to 10) x f0. > 1000 MHz.
The emission was measured with the Spectrum Analyzer in max. hold and with a Peak Detector (RBW = 1 MHz, VBW = 1 MHz). The limit at 3 m distance is in this case the same as the Av.limit. See Appendix 11. Test instruments: S/A Tektronix 2755AP, 10 kHz – 21 GHz. Signal Amplifier, Mini-Circuits, ZHL-42, 0.8 – 4.5 GHz. Antenna: Double Ridged Guide, EMCO 3115, 1 – 18 GHz.

15.231(c). Bandwidth.
The bandwidth was measured as dBc at the points carrier minus 20 dB. The available frequency range is 285 -322 MHz. Spectrum Analyzer in max. hold and with Peak Detector (RBW = 120 kHz, VBW = 300 kHz). See Appendix 9. Test instruments: Spectrum Analyzer Tektronix 2712, 10 kHz – 1.8 GHz. Antenna: Double Ridged Guide Antenna, EMCO 3115, 1 – 18 GHz.

Section 2.1049
2.1049(i). Occupied bandwidth.
The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Spectrum Analyzer in max. hold and with Peak Detector (RBW = 120 kHz, VBW = 300 kHz). The bandwidth was measured at ± 0.5 % points (= 99 % power as shown in diagram). See Appendix 10. Test instruments: Spectrum Analyzer Tektronix 2712, 10 kHz – 1.8 GHz. Antenna: Double Ridged Guide Antenna, EMCO 3115, 1 – 18 GHz.

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TEST RESULTS:

15.231(a)(1). Deactivation time.
The limit is 5 seconds and the measured deactivation time is less than 0.1 second.

15.231(b). Field strength of emission.
Fundamental:
Margin to limit was with peak detector – 3.5 dB as worst case.
See Appendix 11.

Harmonics:
Margin to limit were with peak detector – 17.6 dB at 629.848 MHz as worst case.
See Appendix 11.

15.231(c). Bandwidth.
The bandwidth was 376 kHz at – 20 dBc.
See Appendix 9.

2.1049(i). Occupied bandwidth.
The occupied bandwidth was 845 kHz.
See Appendix 10.

CONCLUSION:

The Remote Control Transmitter, "Wireless Terminal 315.00 MHz", s/n: 31126-044 with nominal Center frequency: 315.0 MHz, did pass the above mentioned tests in Part 15, Subpart C.

Karlskrona February 19, 2004

Hans Östergren
Manager Svenska EMC Lab AB
Sr. EMC Engineer

Bo Gidlöw
Test Engineer

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List over Appendixes.

Appendix No	Note
1	Test set-up, photo
2	Configuration, photo
3	Configuration, photo
4	Configuration, photo
5	Modulation data
6	Modulation data
7	Pre-test radiated emission
8	Pre-test radiated emission
9	Bandwidth
10	Occupied bandwidth
11	Calculation of field strength

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Test set-up, EUT with wooden fixture

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Configuration

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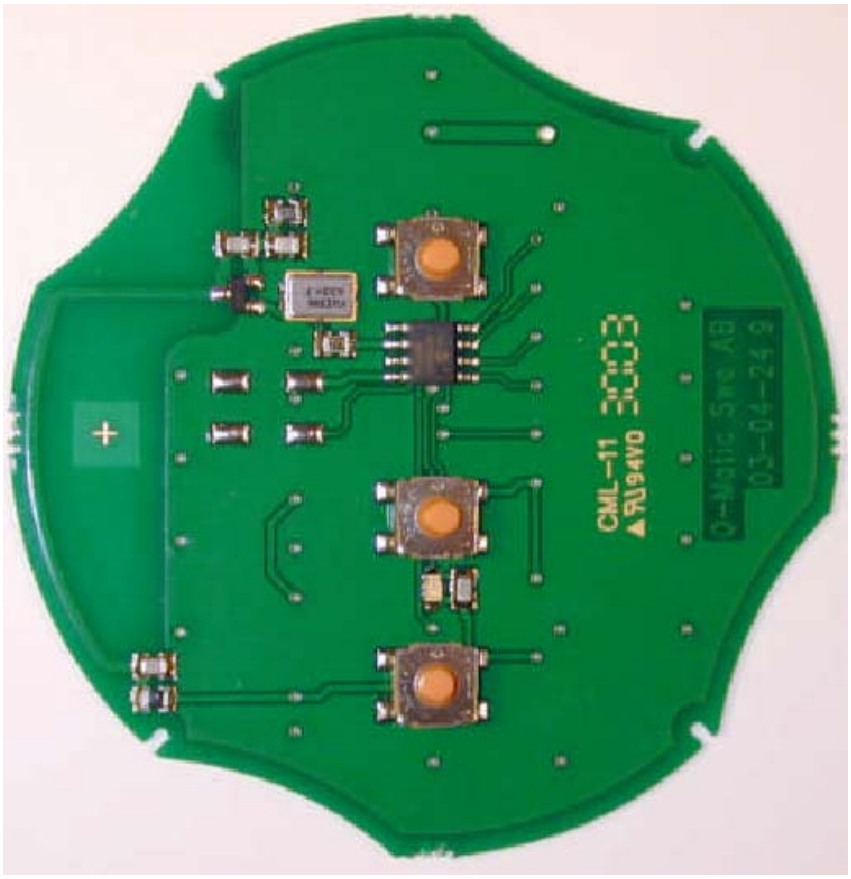
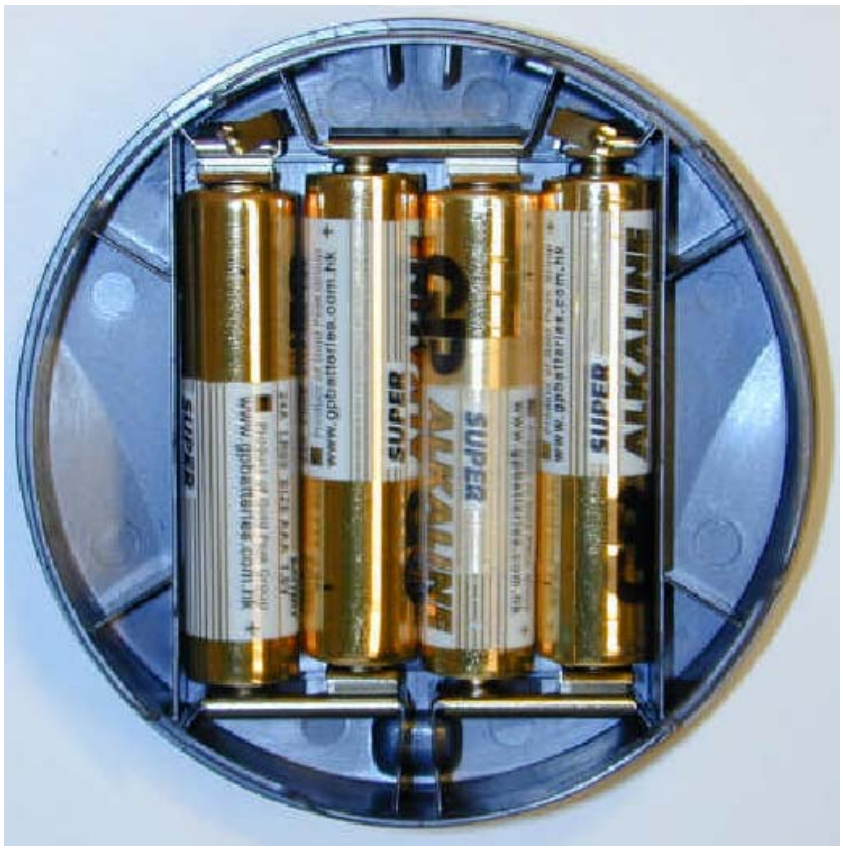
Configuration





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Configuration

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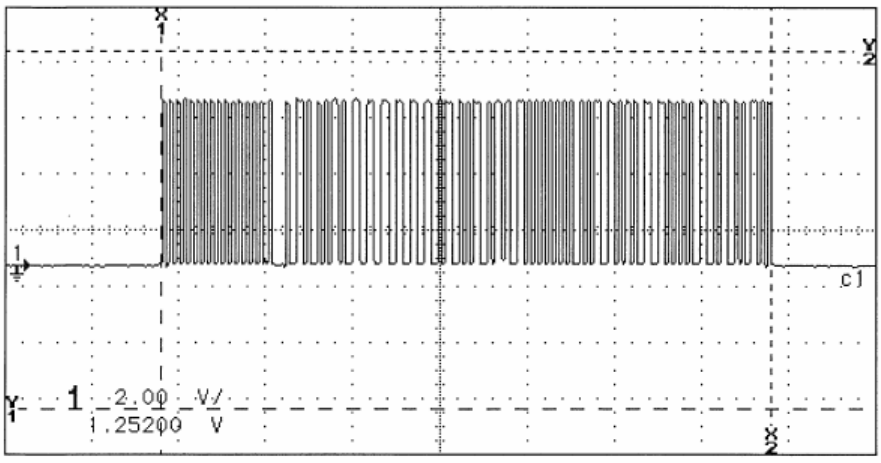
hp running-awaiting trigger



10.0 ms/div repetitive Trigger Mode: Edge

y2(1)	7.65200 V	x2(1)	70.0000 ms	
y1(1)	-5.14800 V	x1(1)	0.00000 s	
delta y	12.8000 V	delta x	70.0000 ms	1 1.677 V
		1/delta x	14.2857 Hz	

	Sensitivity	Offset	Probe	Coupling	Impedance
Channel 1	2.00 V/div	1.25200 V	10:1	dc	1M ohm

Trigger Mode: Edge
On the Positive Edge of Channel1
Trigger Level(s)
Channel1 = 1.67700 V (noise reject OFF, coupling DC)
Holdoff = 40.000 ns

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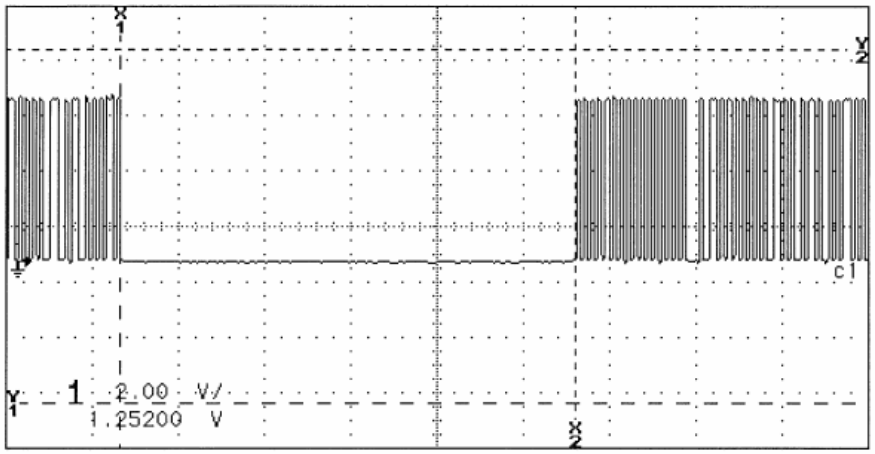
hp running-awaiting trigger



Trigger Mode: Edge

y2(1)	7.65200 V	x2(1)	0.00000 s		
y1(1)	-5.14800 V	x1(1)	-52.8000 ms		
delta y	12.8000 V	delta x	52.8000 ms		
		1/delta x	18.9394 Hz		

1 1.677 V

	Sensitivity	Offset	Probe	Coupling	Impedance
Channel 1	2.00 V/div	1.25200 V	10:1	dc	1M ohm

Trigger Mode: Edge
On the Positive Edge of Channel1
Trigger Level(s)
Channel1 = 1.67700 V (noise reject OFF, coupling DC)
Holdoff = 40.000 ns

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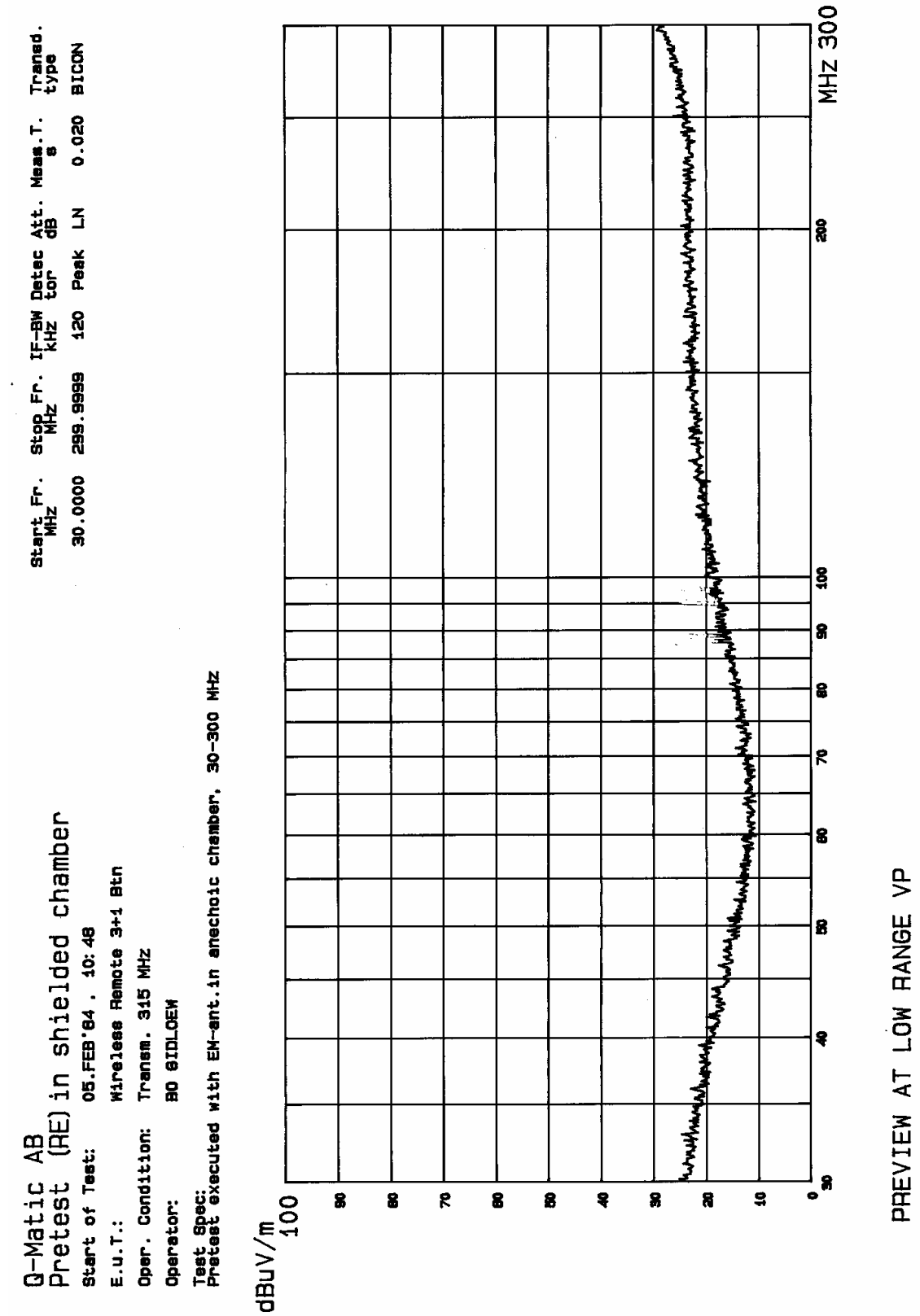
Pre-test, radiated emission



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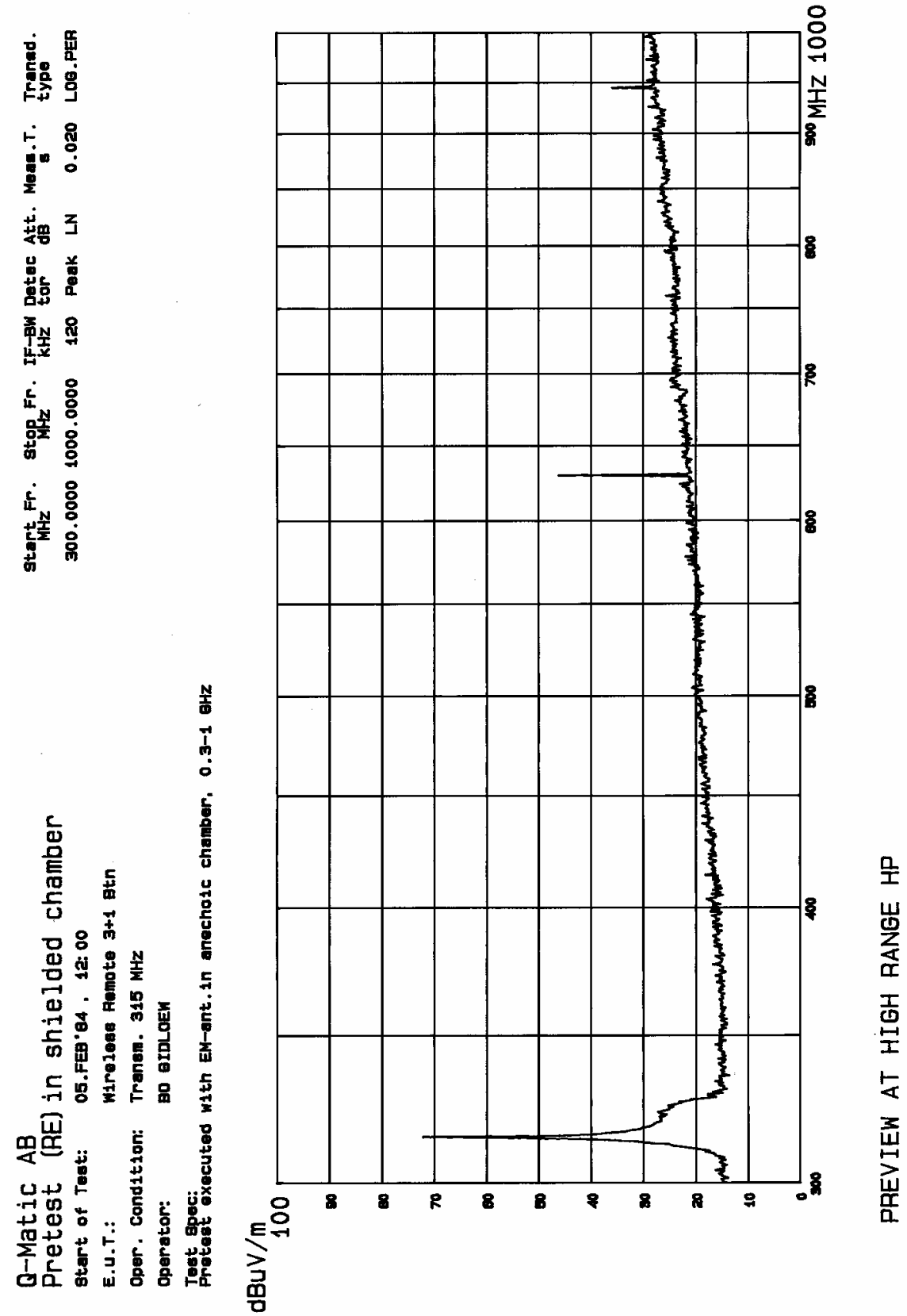
Pre-test, radiated emission



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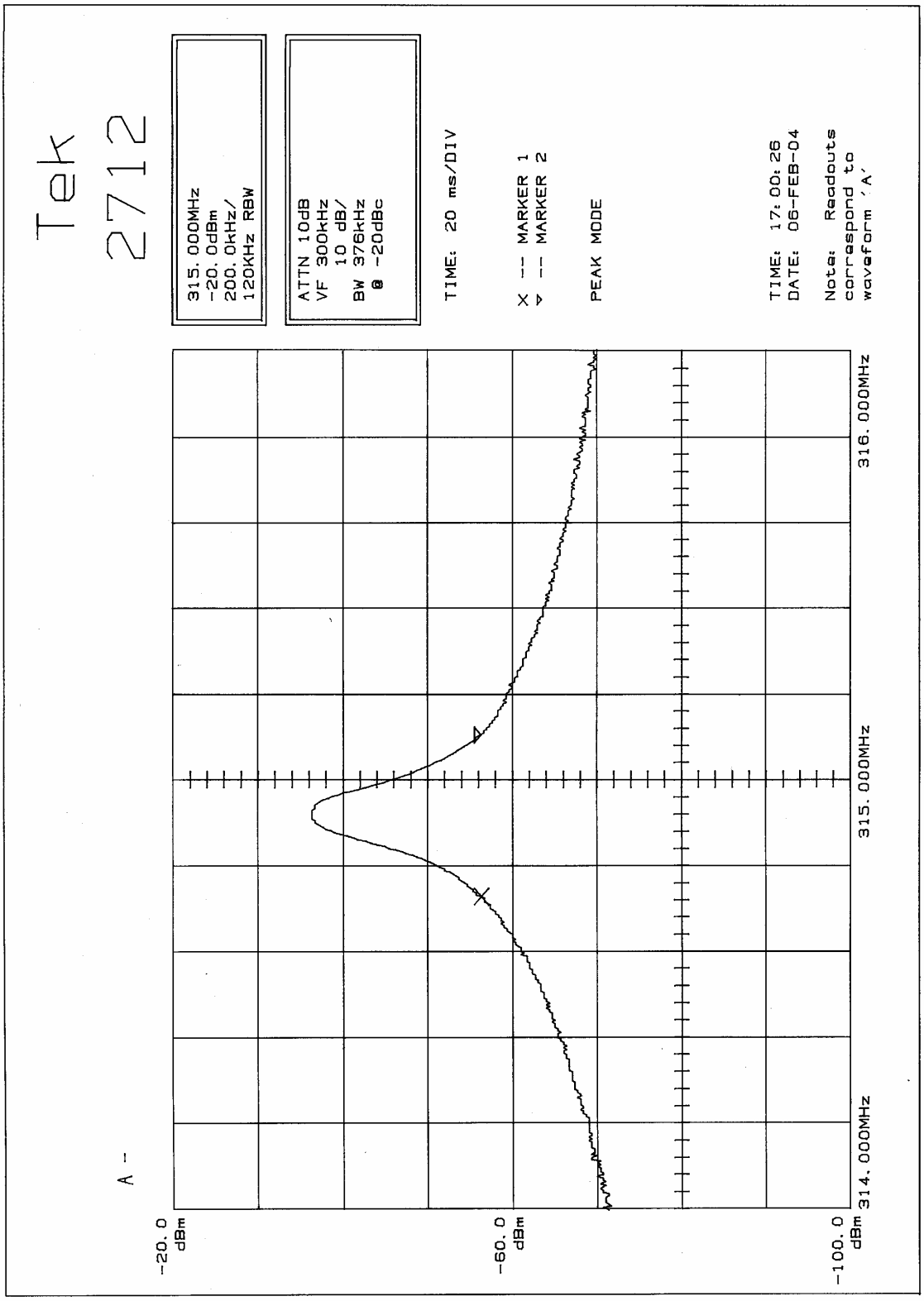
Bandwidth



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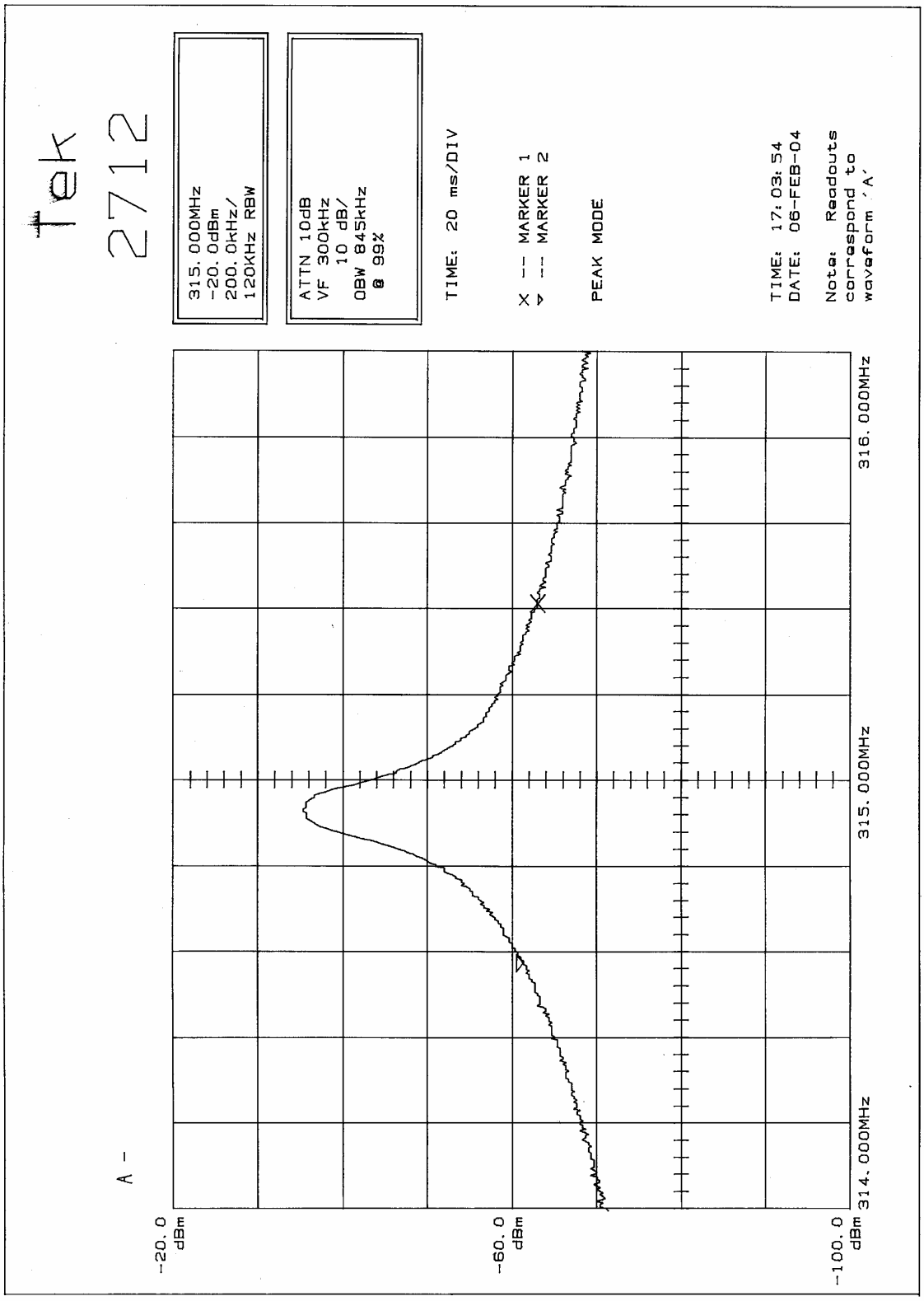
Occupied bandwidth



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Radiated Fieldstrength Test. Calculation of Final Emission Levels.

EUT: Remote Control Transmitter, "Wireless Terminal 315.00 MHz".
S/n: 31126-044. Nominal Center frequency: 315.0 MHz.

Test spec.: 47 Cfr Ch. 1 (10-1-02 Edition):
Part 15, Subpart C.
§ 15.231(b): Field strength of emission.
Open Area Test Site, 3 m antenna distance.

Date of Test: February 5 - 6, 2004

Operation: The EUT was configured to continuously transmit at 100% duty cycle.

Field strength (dBµV/m) = Amplitude (dBµV) + Antenna factor (dB/m) + cable loss (dB) + Gain (dB)

Tested frequency range: 300 - 3200 MHz
Measured maximum values.

Frequency MHz	Amplitude Peak dBµV	Amplitude Average dBµV		Antenna factor dB/m	Preamplifier gain dB	Cable Loss dB	Field Strength dBµV/m	Limit dBµV/m	Margin to limit dB	Detector type
314.924 (f0)	-	14.3		16.2	-	0.5	31.0	75.0	- 44.0	AV.
314.924 (f0)	54.8			16.2	-	0.5	71.5	75.0	**- 3.5**	P
629.848		5.0		21.2	-	0.9	27.1	62	- 34.9	AV.
629.848	22.3			21.2	-	0.9	44.4	62	**- 17.6**	P
944.772		1.2		24.6	-	1.3	27.1	62	- 34.9	AV.
944.772	14.0*			24.6	-	1.3	39.9	62	- 22.1*	P
1259.696	- 19.0	-		25.1	30.0	1.3	37.4	62	- 24.6	P
1574.620	- 23.2	-		26.7	30.0	1.3	34.8	62	- 27.2	P
1889.544	- 3.0*	-		27.3	30.0	1.4	55.7	62	- 6.3*	P
2204.468	- 21.2	-		28.6	31.0	1.4	39.8	62	- 22.2	P
2519.392	- 19.2	-		29.4	31.0	1.5	42.7	62	- 19.3	P
2834.316	- 22.0	-		29.8	31.0	1.6	40.4	62	- 21.6	P
3149.240	- 23.2	-		30.4	30.5	1.7	39.4	62	- 22.6	P

* Ambient