

Party Requesting the Test

Company Name:	Radio Frame Networks
Address:	1120 112th Ave NE, Suite 600
City, State, Zip:	Bellevue, WA 98004
Test Requested By:	Dean Busch
Model:	DH2
First Date of Test:	09-10-2003
Last Date of Test:	09-10-2003
Receipt Date of Samples:	09-8-2003
Equipment Design Stage:	Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	25MHz, 50MHz, 100MHz
I/O Ports:	Serial, Ethernet

Functional Description of the EUT (Equipment Under Test):

802.11b radio blades installed in a pico base station.

Client Justification for EUT Selection:

Current software installed.

Client Justification for Test Selection

Client specified the tests required to complete the technical requirements for FCC Certification under 15.247. The radio had been tested in a stand-alone configuration previously. This testing was required to demonstrate compliance of the spurious radiated emissions while transmitting simultaneously with the maximum number of co-located radios.

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

802.11(b) radios transmitting simultaneously with iDEN radios on channels 1, 6, & 11

iDEN radios transmitting simultaneously with 802.11(b) radios on channels 24, 98, 428, & 834

Operating Modes Investigated:

Typical

Antennas Investigated:

Whip

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Power as set in DAC (see modifications document)

Power Input Settings Investigated:

DC from DCU (230VAC/50Hz)

Frequency Range Investigated

Start Frequency	12 GHz	Stop Frequency	25 GHz
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Software\Firmware Applied During Test

Exercise software	Standard Production Software	Version	RFN 3.1.004 Beta
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Description

The system was tested using standard operating production software to exercise the functions of the device during the testing.

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
EUT Antennas (3)	LINX	ANT-2.4-RCT-SS	N/A
iDEN radio terminations (4)	Unknown	Unknown	N/A
Backplane	Radio Frame Networks	RFU	N/A
EUT (802.11b radio)	Radio Frame Networks	DH2	02103360088
EUT (802.11b radio)	Radio Frame Networks	DH2	02103240001
EUT (802.11b radio)	Radio Frame Networks	DH2	0003E0000264
iDEN radio (FCC ID: PURRFU7)	Radio Frame Networks	iDEN	341
iDEN radio (FCC ID: PURRFU7)	Radio Frame Networks	iDEN	2862
iDEN radio (FCC ID: PURRFU7)	Radio Frame Networks	iDEN	2491
iDEN radio (FCC ID: PURRFU7)	Radio Frame Networks	iDEN	826

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
DCU	Radio Frame Networks	Digital Chassis Unit	E0032
PC	Dell	Inspiron 1100	07899029300023

*Note : Equipment isolated from the EUT so as not to contribute to the measurement results is considered to be outside the test setup boundary.

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
LAN	No	5.0	No	EUT	DCU
LAN	No	1.0	No	PC	DCU

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett-Packard	8566B	AAL	01/07/2003	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/06/2003	12 mo
Antenna, Horn	EMCO	3115	AHC	08/12/2002	15 mo
High Pass Filter	RLC Electronics	F-100-4000-5-R (HPF>4GHz up to	HFF	05/01/2003	12 mo
Antenna, Horn	EMCO	3160-08	AHK	06/20/2003	12 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	07/09/2002	15 mo
Antenna, Horn	EMCO	3160-09	AHG	01/15/2000	39 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	01/17/2000	39 mo
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

If the radio will be co-located, the following policy applies: (Reference the FCC / TCB Training Q & A, October 2002, Day 2, Question 7)

Assuming that the radios do not share an antenna, only radiated tests for simultaneous transmission is required. If the radios share an antenna, antenna conducted measurements would also be required. Only one set of worst case simultaneous transmission data is going to be requested to be submitted at this time. The test engineer should indicate the worst case condition and provide justification as to why the worst case condition was chosen. The grantee should be reminded that even if the FCC requests one set of data, they are responsible for compliance for all modes of simultaneous transmission.

Configuration for Simultaneous Transmission: The EUT (802.11(b) radio) can be co-located with up to two additional 802.11(b) radios, and up to 4 additional iDEN radios (FCC ID: PURRFU7). The radios can transmit simultaneously, but not on the same channel. Each radio transmits through its own antenna.

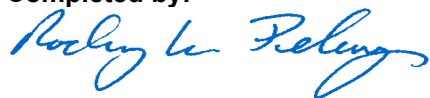
The minimum channel spacing between co-located 802.11(b) radios is 5 channels. Therefore, for three co-located 802.11(b) radios, only channels 1, 6, and 11 can be used. All possible combinations of harmonic emissions from the EUT radios and the iDEN radios were compared numerically. It was determined that only iDEN channels 24 (851.3 MHz), 98 (852.225 MHz), 428 (856.35 MHz), and 834 (861.425 MHz) could have harmonic emissions that coincide with the center frequency of harmonic emissions from the EUT transmitting at channels 1 (2412 MHz), 6 (2437 MHz), and 11 (2462 MHz). The frequency range from 12 to 25 GHz was investigated for these channel combinations. There were no possible coincidental harmonics below 12 GHz. Compliance with the restricted band at 2483.5 – 2500 MHz was also measured.

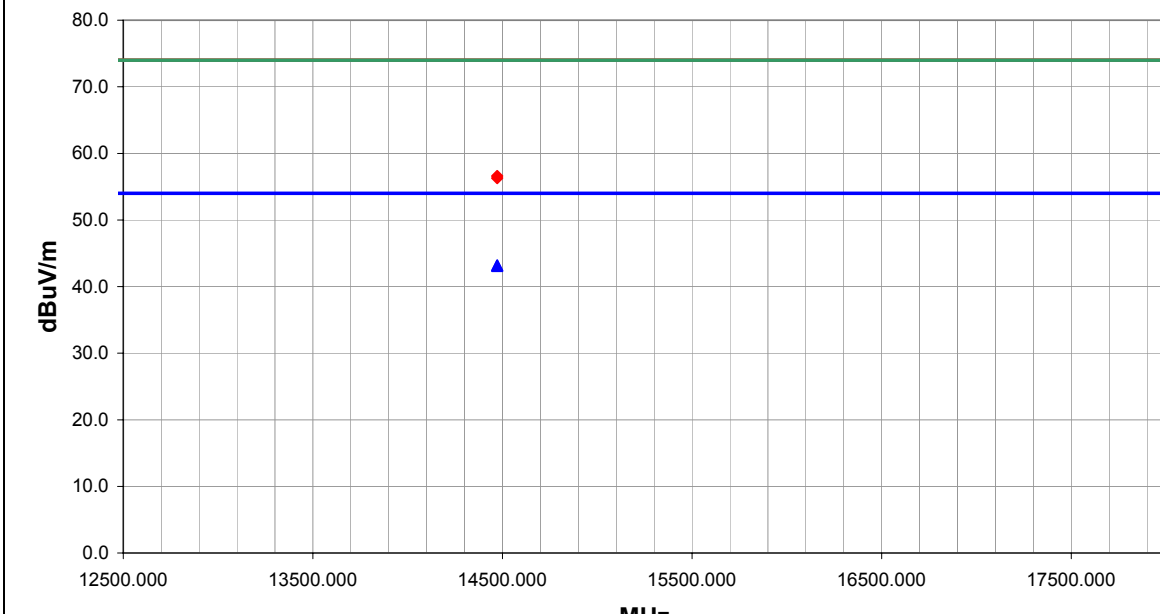
The three EUT radios (802.1(b)) radios were tested with the highest gain antennas. The four iDEN radios were terminated with resistive loads on the antenna port. All the radios were configured for simultaneous transmission at the channels specified above. The spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axes, and adjusting the measurement antenna height and polarization (per ANSI C63.4:1992). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

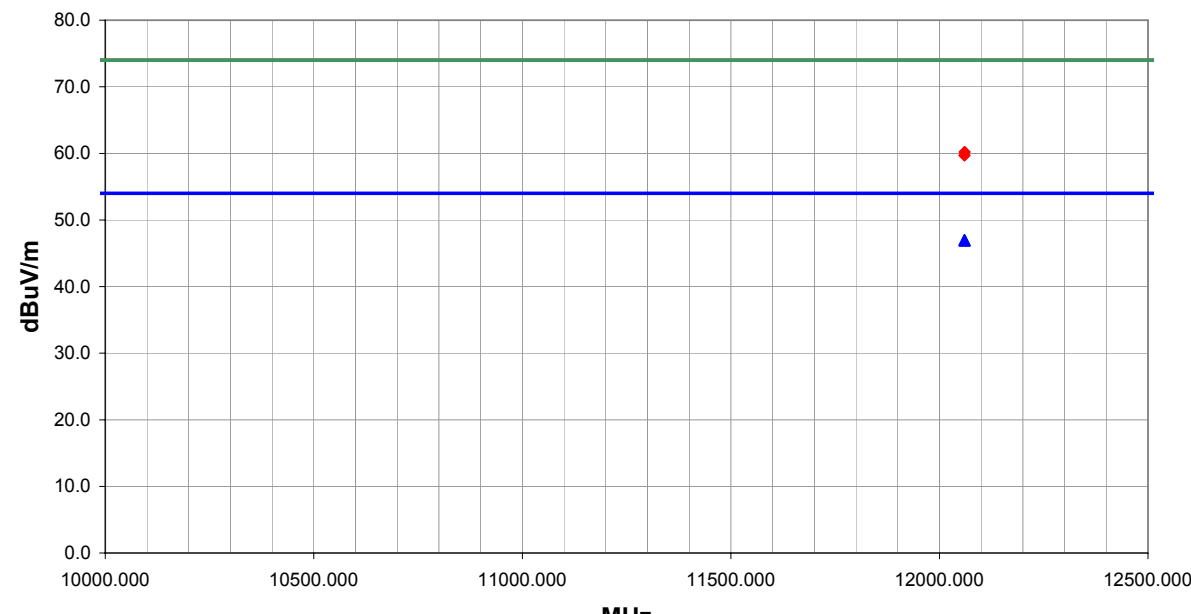
Bandwidths Used for Measurements

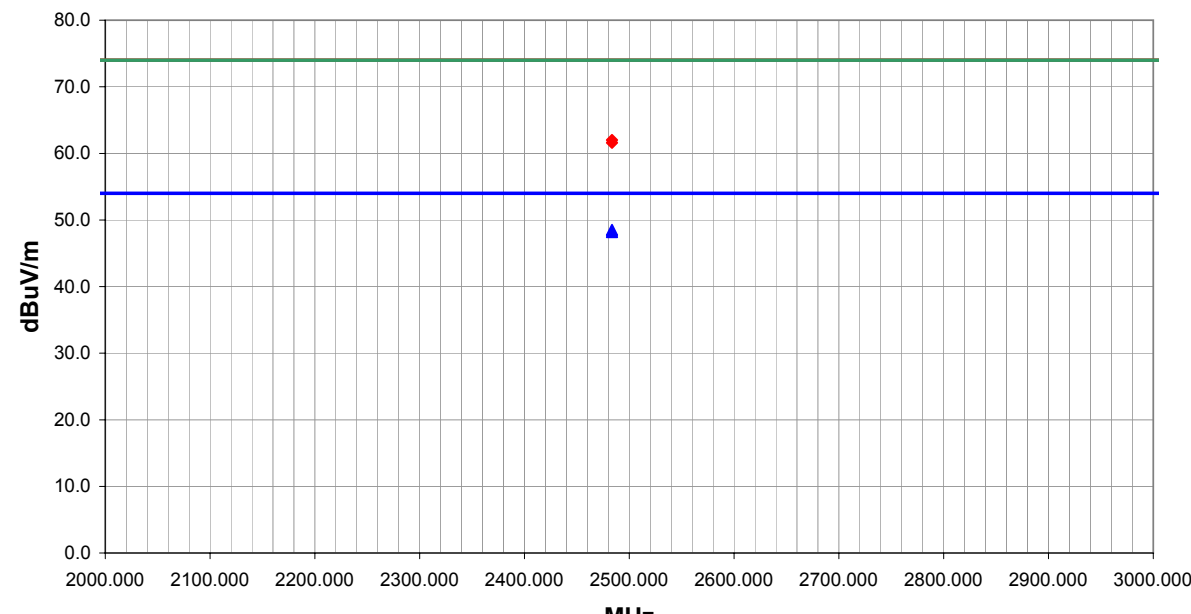
Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
<i>Measurements were made using the bandwidths and detectors specified. No video filter was used.</i>			

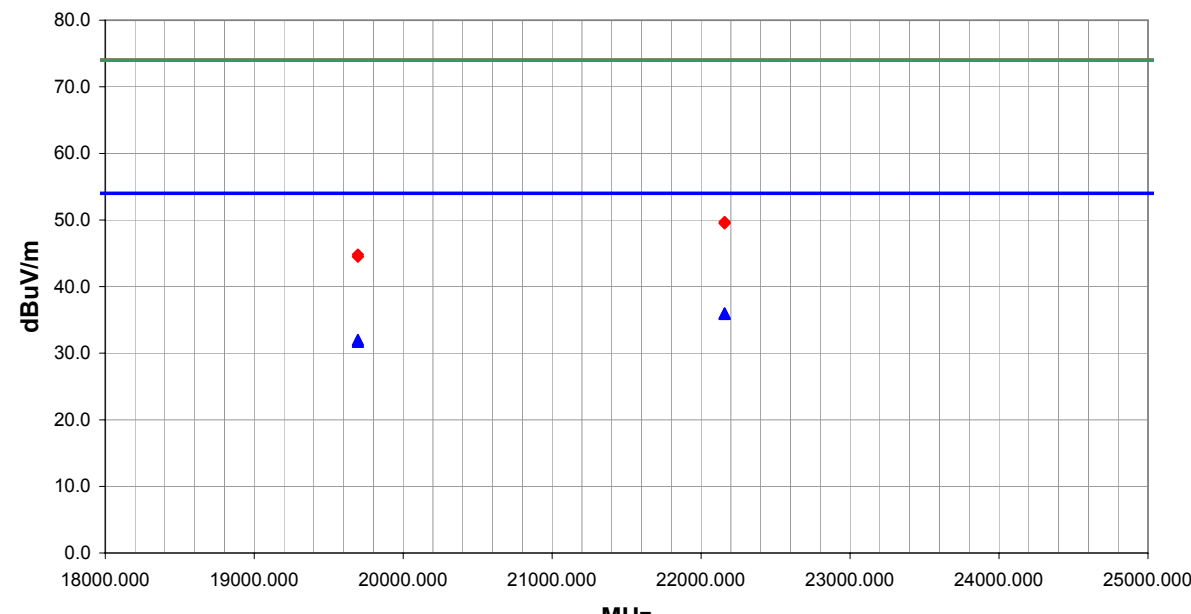
Completed by:



NORTHWEST EMC										RADIATED EMISSIONS DATA SHEET				REV d14.00 08/12/2003	
EUT: DH2										Work Order: RAFN0033					
Serial Number: Various										Date: 09/10/03					
Customer: Radio Frame Networks										Temperature: 75					
Attendees: Dean Busch										Humidity: 44%					
Cust. Ref. No.:										Barometric Pressure: 30.12					
Tested by: Rod Peloquin					Power: 120VAC/60Hz					Job Site: EV01					
TEST SPECIFICATIONS															
Specification: FCC Part 15.247(c) Class B										Year: 2001					
Method: ANSI C63.4										Year: 1992					
SAMPLE CALCULATIONS															
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation															
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator															
COMMENTS															
EUT OPERATING MODES															
3 802.11b radios channels 1/6/11, 4 IDEN radios channels 24/98/428/834															
DEVIATIONS FROM TEST STANDARD															
No deviations.															
RESULTS															
Pass														Run #	
														3	
Other															
										 Tested By:					
															
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)			
14472.000	27.2	16.0	0.0	1.0	3.0	0.0	V-Horn	AV	0.0	43.2	54.0	-10.8			
14472.000	27.1	16.0	0.0	1.5	3.0	0.0	H-Horn	AV	0.0	43.1	54.0	-10.9			
14472.000	40.6	16.0	0.0	1.5	3.0	0.0	H-Horn	PK	0.0	56.6	74.0	-17.4			
14472.000	40.3	16.0	0.0	1.0	3.0	0.0	V-Horn	PK	0.0	56.3	74.0	-17.7			

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Customer: Radio Frame Networks					Temperature: 75								
Attendees: Dean Busch					Humidity: 44%								
Cust. Ref. No.:					Barometric Pressure: 30.12								
Tested by: Rod Peloquin					Power: 120VAC/60Hz					Job Site: EV01			
TEST SPECIFICATIONS													
Specification: FCC Part 15.247(c) Class B										Year: 2001			
Method: ANSI C63.4										Year: 1992			
SAMPLE CALCULATIONS													
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation													
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator													
COMMENTS													
EUT OPERATING MODES													
3 802.11b radios channels 1/6/11, 4 IDEN radios channels 24/98/428/834													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS										Run #			
Pass										5			
Other													
										 Tested By:			
													
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	
12060.000	25.8	21.2	29.0	1.6	3.0	0.0	V-Horn	AV	0.0	47.0	54.0	-7.0	
12060.380	25.7	21.2	269.0	1.7	3.0	0.0	H-Horn	AV	0.0	46.9	54.0	-7.1	
12060.380	39.0	21.2	269.0	1.7	3.0	0.0	H-Horn	PK	0.0	60.2	74.0	-13.8	
12060.000	38.5	21.2	29.0	1.6	3.0	0.0	V-Horn	PK	0.0	59.7	74.0	-14.3	

NORTHWEST EMC										REV d14.00 08/12/2003			
RADIATED EMISSIONS DATA SHEET													
EUT: DH2					Work Order: RAFN0033								
Serial Number: Various					Date: 09/10/03								
Customer: Radio Frame Networks					Temperature: 75								
Attendees: Dean Busch					Humidity: 44%								
Cust. Ref. No.:					Barometric Pressure: 30.12								
Tested by: Rod Peloquin					Power: 120VAC/60Hz					Job Site: EV01			
TEST SPECIFICATIONS													
Specification: FCC Part 15.247(c) Class B										Year: 2001			
Method: ANSI C63.4										Year: 1992			
SAMPLE CALCULATIONS													
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation													
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator													
COMMENTS													
EUT OPERATING MODES													
3 802.11b radios channels 1/6/11, 4 iDEN radios channels 24/98/428/834													
DEVIATIONS FROM TEST STANDARD													
No deviations.													
RESULTS												Run #	
Pass												7	
Other													
										 Tested By:			
													
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	
2483.500	27.5	1.0	163.0	1.2	3.0	20.0	V-Horn	AV	0.0	48.5	54.0	-5.5	
2483.500	27.2	1.0	118.0	1.4	3.0	20.0	H-Horn	AV	0.0	48.2	54.0	-5.8	
2483.500	41.0	1.0	163.0	1.2	3.0	20.0	V-Horn	PK	0.0	62.0	74.0	-12.0	
2483.500	40.6	1.0	118.0	1.4	3.0	20.0	H-Horn	PK	0.0	61.6	74.0	-12.4	

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		REV d14.00 08/12/2003								
EUT: DH2			Work Order: RAFN0033									
Serial Number: Various			Date: 09/10/03									
Customer: Radio Frame Networks			Temperature: 74									
Attendees: Dean Busch			Humidity: 45%									
Cust. Ref. No.:			Barometric Pressure: 30.12									
Tested by: Rod Peloquin		Power: 120VAC/60Hz		Job Site: EV01								
TEST SPECIFICATIONS												
Specification: FCC Part 15.247 Class B			Year: 2001									
Method: ANSI C63.4			Year: 1992									
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
EUT OPERATING MODES												
3 802.11b radios channels 1/6/11, 4 IDEN radios channels 24/98/428/834												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS					Run #							
Pass					2							
Other												
					Tested By:							
												
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
22158.000	26.2	9.8	360.0	1.1	3.0	0.0	I-High Horr	AV	0.0	36.0	54.0	-18.0
22158.000	26.1	9.8	0.0	1.0	3.0	0.0	V-High Horr	AV	0.0	35.9	54.0	-18.1
19696.000	23.3	8.7	174.0	1.0	3.0	0.0	I-High Horr	AV	0.0	32.0	54.0	-22.0
19696.000	23.0	8.7	0.0	1.0	3.0	0.0	V-High Horr	AV	0.0	31.7	54.0	-22.3
22158.000	39.9	9.8	0.0	1.0	3.0	0.0	V-High Horr	PK	0.0	49.7	74.0	-24.3
22158.000	39.7	9.8	360.0	1.1	3.0	0.0	I-High Horr	PK	0.0	49.5	74.0	-24.5
19696.000	36.1	8.7	0.0	1.0	3.0	0.0	V-High Horr	PK	0.0	44.8	74.0	-29.2
19696.000	35.8	8.7	174.0	1.0	3.0	0.0	I-High Horr	PK	0.0	44.5	74.0	-29.5



