RF ENERGY EMISSION TEST REPORT

OF THE

AGINFOLINK Inc.

Tag Tracker Base Station Receiver

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NARTE CERTIFICATION: EMC 001676

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12/02/99
aginfo2

FCC ID: ON2TTBASE01

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SUMMARY

The testing was performed under the provisions of ANSI C63.4/1992 and the OATS was calibrated in accordance with ANSI C63.4/1992.

The AGINFOLINK Host Interface (RECEIVER), is hereafter referred to as the UUT. The UUT, with test setup as described in the block diagrams of Appendix II, **PASSES** all the radiated requirements, the FCC Part 15, Subpart B, Class B regulations, pp 15.107 and 15.109 governing emissions limits for unintentional radiators..

The maximum electromagnetic field strength at 233.86 MHz was 43 db verses a spec limit of 46 db when measured with a quasi-peak detector at 120 KHz bandwidth.

The spurious radiated emissions of the receiver, which came closest to the limit are as follows, rounded to the nearest db:

FREQUENCY (MHz)	EMISSION LEVEL (dbμv/meter)	Polarization	MARGIN(db)	TABLES Appendix I
167	35	Horizontal	-9	1
233.86	43	Horizontal	-3	1
601.42	38	Horizontal	-8	1
233.86	41	Vertical	-5	2
601.42	40	Vertical	-6	2
668.15	38	Vertical	-8	2

For more details, see Appendix I, Tables 1 - 2 and GRAPHS 5 - 6. A negative margin means that the emissions are under the specified limit. All other emissions from Tables 1 - 2, not listed above, were at least 8 db under the applicable limits.

The peak power line conducted emissions were at least 10 db under the limit as shown in Appendix III, GRAPHS 1-4.

The (receiver)Host Interface antenna in connected internally to the unit enclosure and cannot be substitued by the user. Therefore no direct terminal measurements were required.

INFORMATION SUPPLIED TO THE USER

The manual contains a cautionary statement required by Section 15.21 of the FCC rules for an intentional radiator."

> ***CAUTION: Changes or modifications not expressly approved or authorized by the manufacturer may violate the compliance of this equipment to the Class B limits for a digital device and could, thereby, void the users authority to operate the equipment.***

The label on the outside of the equipment enclosure contains the FCC ID and the following text:

> **FCC ID:** ON2TTBASE01
> This device complies with Part 15 of the FCC Rules.
> Operation is subject to the following two conditions:
> (1) this device may not cause harmful interference,
> and (2) This device must accept any interference
> received, including interference that may cause
> undesired operation.

AGINFOLINK shall maintain the records listed in Section 2.938 of the FCC rules.

1.0 SCOPE AND OBJECTIVE OF TEST

To determine the degree of compliance of products to the Federal Communications Commission Part 15 Subpart B requirements for unintentional radiators which limit emissions of Receivers pursuant to pp 15.107 and 15.109 of the Rules through the certification process.

2.0 UNIT TESTED

The Host Interface (Receiver), manufactured by AGINFOLINK Inc., 1821 Left Hand Circle, Suite A, Longmont, CO 80501, hereafter referred to as the UUT, is intended to transfer the coding of a passive device ID TAG read by a companion transmitter and transferred to the computer through the serial port. Power is applied to the UUT throught the PS2 mouse port on the PC. The receiver is a direct conversion SAW (Surface Acoustic Wave) device and in and of itself contains no internal clocks or local oscillators.

3.0 FACILITY REQUIREMENTS

3.1 Site Attenuation

The radiated testing described herein was accomplished on the METRUM OATS which is located at 4800 E. Dry Creek Road, Littleton, CO 80122. This site meets the requirements of FCC 47 CFR rules, Section 2.948. Refer to FCC File # 31040/SIT/1300F2 for a detailed description of the site. The test area is free of reflecting objects in an area as defined in Figure 1, Appendix III.

3.2 Instrumentation

Measurements/Radiated:

Polarad ESV Receiver, #6003594, calibrated 2/10/99, calibration due 2/10/2000.

HP 8565A Spectrum Analyzer, s/n 2210A02349, 100 MHz - 18 GHz, Calibrated 9/27/99, Calibration Due 3/27/2000.

Ailtech 94455-1 Biconical Antenna, 30 -200 MHz, Cal'd 8/3/99, Cal Due 8/3/2000.

Ailtech 96005 Log Periodic Antenna, 200 MHz - 1 GHz, Cal'd 8/3/99, Cal Due 8/3/2000.

AH Systems Horn Antenna, model SAS-200/571, s/n 339, 1-18 GHz, Calibrated 4/14/99, No re-calibration required.

Avantek UTC 10-220-1 25 db Preamp, #211.093, Calibrated 3/8/99, calibration due 3/8/2000.

JCA Technology JCA 15-416, 40 db preamp, # 6010088, 1-5 GHz, Calibrated 9/3/99, Calibration Due 9/3/2000.

Measurements/Conducted:

HP 8568B Spectrum Analyzer, #6003693/94/95, 100 Hz - 1.5 GHz, Calibrated 3/10/99, Calibration Due 3/10/2000.

Solar 8028-50-TS-24-BNC UUT LISN, # 6009941/6009942, Calibrated 6/28/99, Calibration Due 6/28/2000.

Solar 7930-10 High Pass filter, #6009940, Calibrated 6/28/99, Calibration Due 6/28/2000.

HP 7550A Plotter, No Calibration Required.

4.0 SPURIOUS RADIATED TEST PROCEDURE AND RESULTS

4.1 Procedure

4.1.1 Setup of equipment on the test site, for detailed measurements, was according to Figure 2, Appendix III and the BLOCK DIAGRAM of Appendix II. **The ANSI C63.4/1992 measurement procedure was followed.**

4.1.2 The UUTs was operated during the test as follows:

a. A 418 MHz sinusoidal signal was transmitted from a signal generator at a distance of 33 meters to the UUT. The signal was FM modulated at a 20 KHz rate.

b. The UUT(Host Interface) is RF receive only. It receives the 418 MHz signal and conditions the level to be directly passed on to a host personal computer. There are no clock sources in the Host Interface. The "COMTEST1" program was run to allow the data to be transferred from the UUT to the PC at 1200 Baud via the COM1 Serial Link.

Two conditions were tested with the UUT resting on its feet and its antenna vertically polarized:

4.1.2.1 Measuring Antenna - horizontally polarized.
4.1.2.2 Measuring Antenna - vertically polarized.

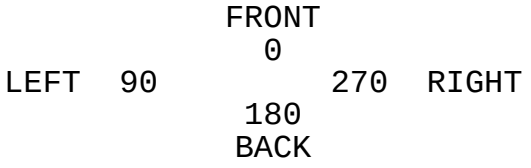
4.0 SPURIOUS RADIATED TEST PROCEDURE AND RESULTS (cont)

4.1 Procedure (cont)

4.1.3 Perform all measurements at 3 meters at the METRUM OATS. Adjust the antenna height between 1 - 4 meters and the UUT rotated to maximize the emissions during the survey. Perform a preliminary survey with each antenna and polarization (2 setups as in 4.1.2) while tuning the ESV receiver in the quasi-peak Mode, 120 KHz bandwidth from 30 MHz - 1 GHz, and the 8565A spectrum analyzer in peak mode from 1 - 2 GHz in accordance with ANSI C63.4-1992, Appendix D procedure. Interface cables were adjusted at the frequencies shown in the Appendix I tables.

4.1.4 At the conclusion of the preliminary survey for each antenna/polarization combination, the maximum field strength at each significant frequency found was recorded with the height of the antennas remotely and automatically varied between 1 and 4 meters off the ground plane. The orientation of the UUT which produced the maximum field strength was obtained by remotely rotating an automatic turntable and recording the angle as indicated in Tables 1 - 2. Only the frequencies which produced the highest emissions are reported.

UUT orientation in Tables 1 & 2 is defined as follows:



"Front" is defined as the side opposite the interface connectors.

4.1.7 The specified quasi-peak limit at 3 meters is shown below. At frequencies above 1000 MHz, the average level of the emissions is specified. Since the 8565A analyzer measures the peak level of the emissions, the resolution bandwidth was initially set to 1 MHz. If the limit is exceeded, reduce the resolution bandwidth to simulate the average level, but the analyzer cannot go below 100 Hz.

30-88 MHz	40 dbμV/meter
88-216 MHz	43.5 dbμV/meter
216 - 960 MHz	46 dbμV/meter
Above 960 MHz	54 dbμV/meter

4.1.8 The radiated signal level, in dbμV vs. frequencies found, was determined from the correction factors found in Appendix II. The receiver reads directly in dbμV*.

Emission level = Receiver/Analyzer reading (dbμV) + antenna factor + cable loss - Preamp Gain.

* the analyzer reads in dbm so the conversion factor of 107 dbμV + dbm reading was applied to convert to dbμV units above 1 GHz.

4.1.9 Calculation

As an example in Table 2 of Appendix I, the 35 dbμV/m level at 167 MHz was calculated using the formula in paragraph 4.1.5. From Appendix II, the antenna factor is 15.9 db. From Appendix II, the cable loss is 1.2 db. The receiver reading was 43 dbμV. The preamp gain is 24.9 db.

Emission Level(167 MHz) = 43 + 15.9 + 1.2 - 24.9 = 35.2 dbμV/m.

There were no other factors involved such as external attenuators which would modify the calculations. The internal RF attenuation of the ESV receiver and the 8565A analyzer was kept at 10 db minimum, but the receiver reading takes this into account so it does not enter into the calculation.

4.2 Results

See Appendix I, Tables 1 - 2 and GRAPHS 5 & 6.
Data are rounded to the nearest db.

Table 1/Graph 5:	Receive Antenna Horizontal (condition 4.1.2.1)
Table 2/Graph 6:	Receive Antenna Vertical (condition 4.1.2.2)

There were no measurable emissions detected above the second harmonic of 836 MHz out to 2 GHz. All emissions found were either attributed to the frequencies generated inside the PC or the 418 MHz transmitted signal and its second harmonic.

See photographs of Exhibit 7.

Cables were adjusted to maximize spurious emission at the following frequencies and polarizations:

167 MHz, Horizontal Polarization.(condition 4.1.2.1)
167 MHz, Vertical Polarization (condition 4.1.2.2)
233.86 MHz, Horizontal Polarization (condition 4.1.2.1)
233.86 MHz, Vertical Polarization.(condition 4.1.2.2)

A "CT" next to the frequency in the tables indicates the cables were re-positioned to maximize the emission level.

The temperature at the time the final radiated measurements were taken was around 68 ◦F.

The measurement bandwidth was 120 KHz with the quasi-peak detector selected from 30 MHz - 1 GHz. Above 1 GHz, the bandwidth on the 8565A analyzer was 1 MHz.

5.0 CONDUCTED EMISSIONS TESTS

5.1 Power Line Conducted Noise

5.1.1 Test Equipment Set-up

5.1.1.1 The power line conducted noise was measured using 50 ohm/50 μhenry LISNs. The circuits are as shown in Figures 3 & 4. ANSI C63.4-1992 Test Setup per Appendix E, pp E1 and test procedures per Appendix E, pp E2 were followed.

5.1.1.2 The UUT was placed on a 1.5 x 1.0 meter table inside the shielde room. The LISNs were grounded to the ground plane. The UUT, which includes all support equipment, was connected to the set of LISNs. 120VAC, 60 Hz power was applied to the UUT through the LISNs. See Block Diagram of Appendix II.

5.1.2 Data Measurement Scan

5.1.2.1 A scan of the applicable frequency range with the 8568B spectrum analyzer was made to identify the frequencies and levels. The output of the LISN which was wired to the hot side of the line was connected to input 1 on the 8568B analyzer. The signal output of the unused LISN was terminated into 50 ohms. S1 was closed.

Analyzer Set-up

SPAN	FREQUENCY RANGE	SYSTEM BANDWIDTH	VIDEO/ RESOLUTION BANDWIDTH
350 KHz	150 KHz - 500 KHz	9 KHz	100KHz
29.5 MHz	500 KHz - 30 MHz	9 KHz	100KHz

5.1.2.2 The RF voltage in dbμv was plotted with the 8568B analyzer in the peak mode over the frequency range of 450 KHz - 30 MHz. The specified FCC "B" limit is 48 db.

5.1.2.4 Perform 5.1.2.1 - 5.1.2.4 with the UUT IDLE.

5.1.2.5 Paragraphs 5.1.2.1 - 5.1.2.4 were repeated with the analyzer connected to the neutral LISN.

5.1.2.6 5.1.2.1 - 5.1.2.6 were repeated with the UUT operating as in 4.1.2.

5.1.3 Results

See Appendix III, Graphs 1 - 4.
Photographs of Exhibit 7 show the conducted test setup.

Explanation of Graph Symbols:

L Hot Conductor

N Neutral Conductor

I UUT Idle (power up state)

T/R Transmit and Receive Signals Active

120 120 VAC and 60 Hz line voltage applied

An offset of 1.5 db was added to the emissions as shown on the graphs to account for the worst case insertion loss of the LISNs of 1.3 db above 25 MHz.

Appendix I

TABLE 1

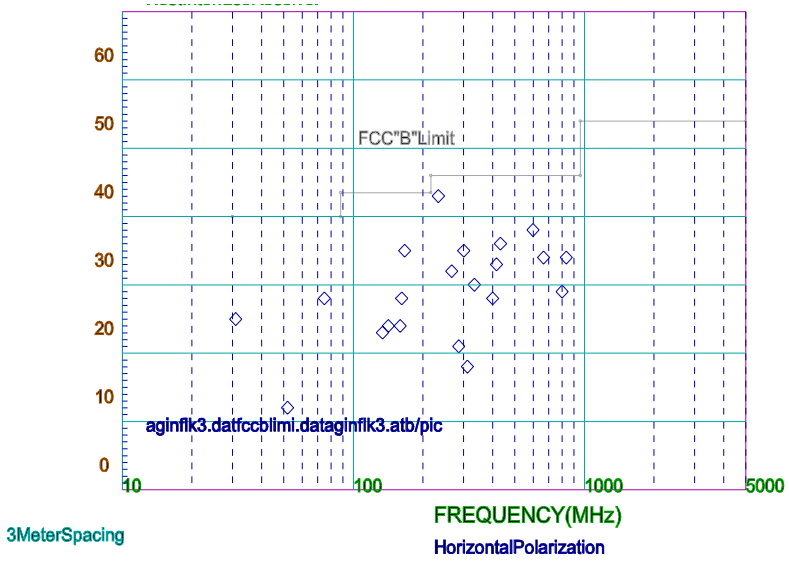
Polarization: Horizontal
Antennas: AilTech Biconical & Log Periodic, AH Systems Horn.
Test Distance: 3 Meters
Product: AG Info Link Host Interface Receiver
Mode: Receiving an FM signal and sending data to a PC.
Date: 11/30/99; spurious radiated

	degrees	dbuv	dbuv/m	FCC 15.109
Frequency (MHz)	Uncorrected Level (db)	Azimuth	Correction Factor (db)	Corrected Level (dbμV/m)	Margin (db)
30.6	37	0	-12	25	-15
52.4	26	70,333	-14	12	-28
74.5	45	111,180	-17	28	-12
133.6	33	164	-10	23	-21
142	33	97	-9	24	-20
160	31	300	-7	24	-20
161.9	35	241	-7	28	-16
167 CT	43	52	-8	35	-9
233.86 CT	55	108	-12	43	-3
267.28	42	169	-10	32	-14
286.37	30	141	-9	21	-25
300.7	43	158	-8	35	-11
312	27	41	-9	18	-28
334.18	38	170	-8	30	-16
400.9	35	179	-7	28	-18
418	40	90	-7	33	-13
434.34	42	33	-6	36	-10
601.42	41	0	-3	38	-8
668.15	35	0	-1	34	-12
801.87	30	0	-1	29	-17
836	33	0	1	34	-12

TABLE 2

Polarization: Vertical
Antennas: AilTech Biconical & Log Periodic, AH Systems Horn.
Test Distance: 3 Meters
Product: AG Info Link Host Interface Receiver
Mode: Receiving an FM signal and sending data to a PC.
Date: 11/30/99; spurious radiated

	degrees	dbuv	dbuv/m	FCC 15.109
Frequency (MHz)	Uncorrected Level (db)	Azimuth	Correction Factor (db)	Corrected Level (dbμV/m)	Margin (db)
30.6	38	0	-12	26	-14
66.8	40	138	-18	22	-18
74.5	42	138	-17	25	-15
133.6	43	159	-10	33	-11
142	34	360	-9	25	-19
167 CT	41	62	-8	33	-11
200.48	44	0	-12	32	-12
233.86 CT	53	311	-12	41	-5
267.28	35	220	-10	25	-21
300.7	42	175	-8	34	-12
312	34	183	-9	25	-21
334.18	34	188	-8	26	-20
367.5	40	178	-8	32	-14
400.9	30	30	-7	23	-23
418	41	190	-7	34	-12
434.34	43	145	-6	37	-9
501.2	38	322	-4	34	-12
601.42	43	319	-3	40	-6
668.15	39	50	-1	38	-8
836	30	45	1	31	-15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HorizontalPolarization
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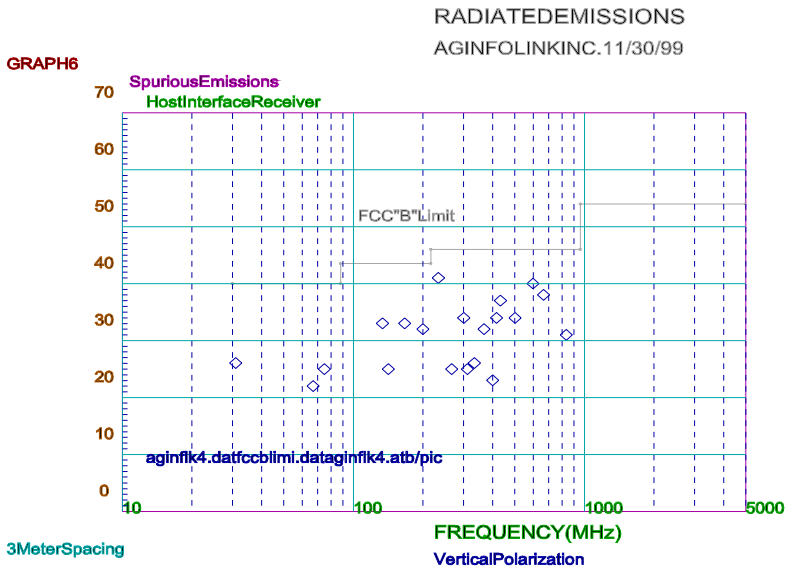
RADIATEDEMISSIONS
AGINFOLINKINC.11/30/99
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HostInterfaceReceiver
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50
40
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5000
FREQUENCY(MHz)
3MeterSpacing
VerticalPolarization
FieldStrength(dbuv/m)

Appendix II

3 Meter Spacing/ AilTech Antennas 8/3/99

FREQ. (MHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
30	13	25.3	.5	-11.8
35	13.3	25.3	.5	-11.5
40	13.3	25.2	.6	-11.3
45	12	25.2	.7	-12.5
50	10.7	25.2	.8	-13.7
55	9.2	25.2	.8	-15.2
60	7.8	25.2	.8	-16.6
65	6.4	25.2	.8	-18.0
70	5.8	25.2	.8	-18.6
75	6.9	25.1	.9	-17.3
80	8.3	25.1	.9	-15.9
85	9.6	25.1	.9	-14.6
90	10.8	25.1	.9	-13.4
95	10.9	25.1	1	-13.2
100	10.6	25.1	1	-13.5
105	10.8	25.1	1	-13.3
110	10.6	25.1	1	-13.5
115	10.2	25	1	-13.8
120	10.8	25	1	-13.2
125	12	25	1	-12.0
130	12.8	25	1.1	-11.1
135	13.8	25	1.1	-10.1
140	15.1	24.9	1.1	-8.7
145	15.9	24.9	1.1	-7.9
150	16.3	24.9	1.1	-7.5
155	16.8	24.9	1.2	-6.9
160	16.7	24.9	1.2	-7.0
165	16.1	24.9	1.2	-7.6

Avantek UTC10-220-1 Preamp

FCC ID: ON2TTBASE01

106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4

FREQ. (MHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
170	15.7	24.9	1.2	-8.0
175	15	24.8	1.2	-8.6
180	13.6	24.8	1.2	-10
185	13.5	24.8	1.2	-10.1
190	14	24.8	1.3	-9.5
195	16.4	24.8	1.3	-6.9
200	16.4	24.8	1.3	-7.1
200	11.2	24.8	1.3	-12.3
210	11.0	24.7	1.3	-12.4
220	10.2	24.7	1.3	-13.2
230	11.0	24.7	1.4	-12.3
240	11.4	24.6	1.4	-11.8
250	11.9	24.6	1.4	-11.3
260	12.3	24.6	1.4	-10.9
270	13.3	24.5	1.5	-9.7
280	13.9	24.5	1.5	-9.1
290	14.4	24.5	1.5	-8.6
300	15.3	24.4	1.6	-7.5
310	14.4	24.4	1.6	-8.4
320	13.9	24.4	1.6	-8.9
330	14.3	24.4	1.7	-8.4
340	14.6	24.4	1.7	-8.1
350	14.6	24.4	1.7	-8.1
360	14.5	24.4	1.8	-8.1
370	14.5	24.3	1.8	-8.0
380	14.8	24.3	1.8	-7.7
390	15	24.3	1.9	-7.4
400	15.6	24.3	1.9	-6.8

Avantek UTC 10-220-1 Preamp

FCC ID: ON2TTBASE01

106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4

3 Meter Spacing/Ailtech Antennas 8/3/99

FREQ. (MHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
425	15.6	24.3	2	-6.7
450	16.5	24.4	2.1	-5.8
475	17.6	24.5	2.1	-4.8
500	18.1	24.5	2.2	-4.2
525	17.7	24.6	2.2	-4.7
550	17.8	24.6	2.3	-4.5
575	18.5	24.6	2.4	-3.7
600	18.7	24.6	2.5	-3.4
625	19.1	24.7	2.5	-3.1
650	19.9	24.7	2.6	-2.2
675	20.8	24.7	2.6	-1.3
700	20.8	24.7	2.7	-1.2
725	20.6	24.8	2.7	-1.5
750	20.5	24.8	2.8	-1.5
775	20.7	24.8	2.9	-1.2
800	21.3	24.8	2.9	-0.6
825	22.1	24.7	2.9	0.3
850	22.9	24.7	3	1.2
875	23	24.6	3	1.4
900	22.8	24.6	3.1	1.3
925	22.8	24.5	3.1	1.4
950	23.3	24.5	3.1	1.9
975	23.9	24.3	3.2	2.8
1000	24.5	24.2	3.2	3.5

Avantek UTC 10-220-1 Preamp
106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4

FCC ID: ON2TTBASE01

3 Meter Spacing/AH Systems Antenna 8/3/99

FREQ. (GHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
1.0	23.2	43.8	3.2	-17.4
1.1	23.4	44.1	3.4	-17.3
1.2	23.7	44.4	3.5	-17.2
1.3	23.8	44.6	3.7	-17.1
1.4	23.9	45	3.9	-17.2
1.5	24.2	45.2	4.1	-16.9
1.6	24.6	45.2	4.2	-16.4
1.7	25	45.3	4.4	-15.9
1.8	25.7	45.4	4.5	-15.2
1.9	26.9	45.4	4.7	-13.8
2	27.8	45.5	4.8	-12.9
2.1	27.9	45.2	4.8	-12.5
2.2	28	44.8	4.9	-11.9
2.3	28.1	44.5	5.1	-11.3
2.4	28.2	44.1	5.2	-10.7
2.5	28.2	43.8	5.3	-10.3
2.6	28.5	43.6	5.4	-9.7
2.7	28.8	43.6	5.5	-9.3
2.8	29.1	43.6	5.6	-8.9
2.9	29.4	43.5	5.8	-8.3
3.0	29.7	43.4	6	-7.7

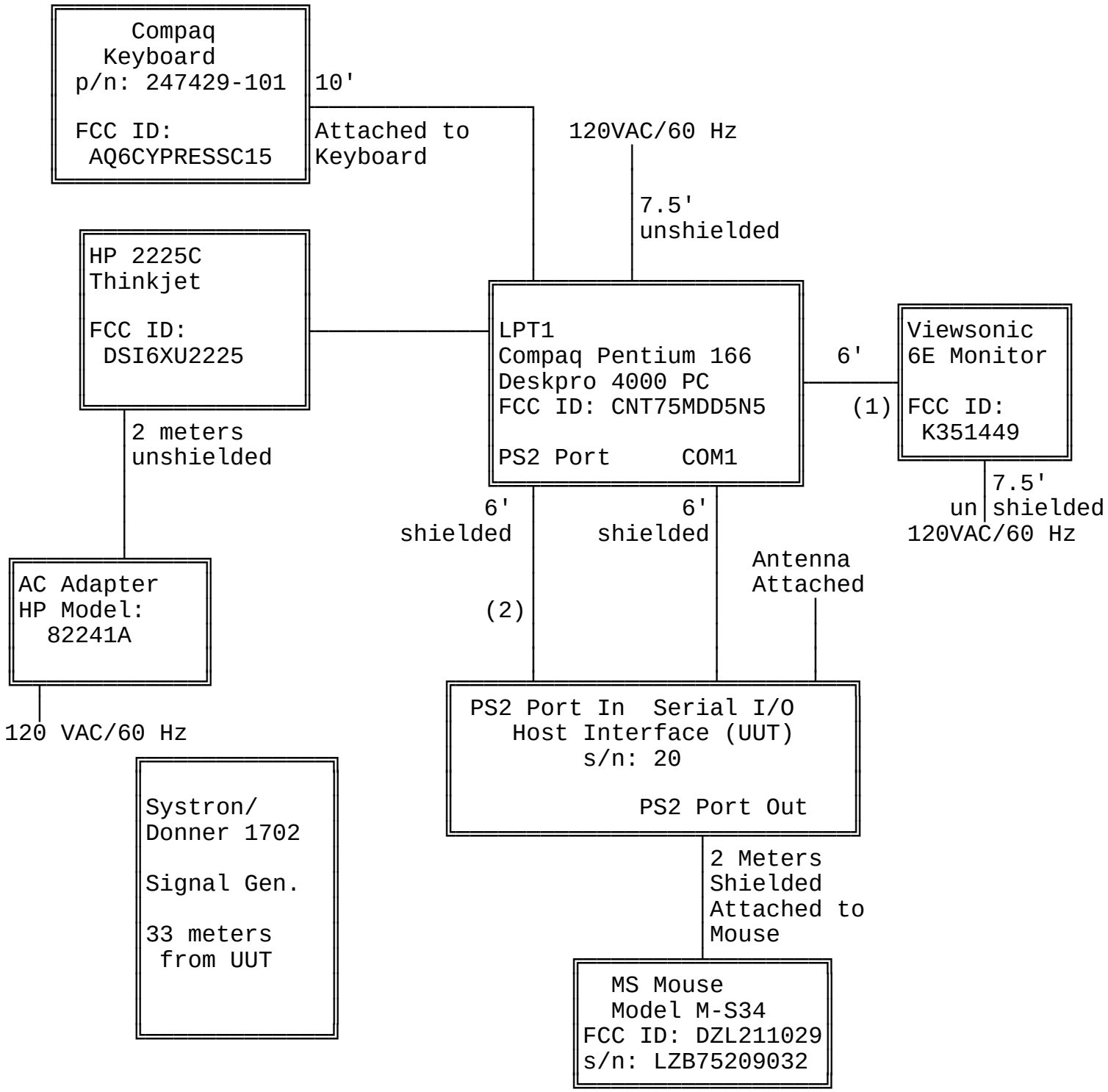
JCA Technology JCA15-416 Preamp
106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4

3 Meter Spacing/AH Horn Antenna 8/3/99

FREQ. (GHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
3.1	29.9	43.4	6.1	-7.4
3.2	30	43.3	6.2	-7.1
3.3	30.1	43.3	6.3	-6.9
3.4	30.1	43.3	6.4	-6.8
3.5	30.2	43.2	6.5	-6.5
3.6	30.6	43.2	6.6	-6.0
3.7	31	43.2	6.7	-5.5
3.8	31.4	43.2	6.8	-5.0
3.9	31.8	43.2	6.9	-4.5
4.0	32.3	43.2	7	-3.9
4.1	32.3	43.2	7.1	-3.8
4.2	32.4	43.2	7.2	-3.6
4.3	32.4	43.2	7.3	-3.5
4.4	32.5	43.2	7.5	-3.2
4.5	32.5	43.2	7.6	-3.1
4.6	32.7	43	7.7	-2.6
4.7	33	42.8	7.8	-2.0
4.8	33.2	42.7	7.9	-1.6
4.9	33.5	42.5	8	-1.0
5.0	33.7	42.4	8.1	-0.6
5.0*	33.7	46.3	13.3	0.7

JCA Technology JCA15-416 Preamp
106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4
*LDF1-50 vs. LDF5-50A

UUT BLOCK DIAGRAM
RADIATED EMISSIONS



' Symbol for feet
(1) Attached to the monitor
(2) This cable sold and supplied with the UUT.

FCC ID: ON2TTBASE01

UUT BLOCK DIAGRAM
POWER LINE CONDUCTED EMISSIONS

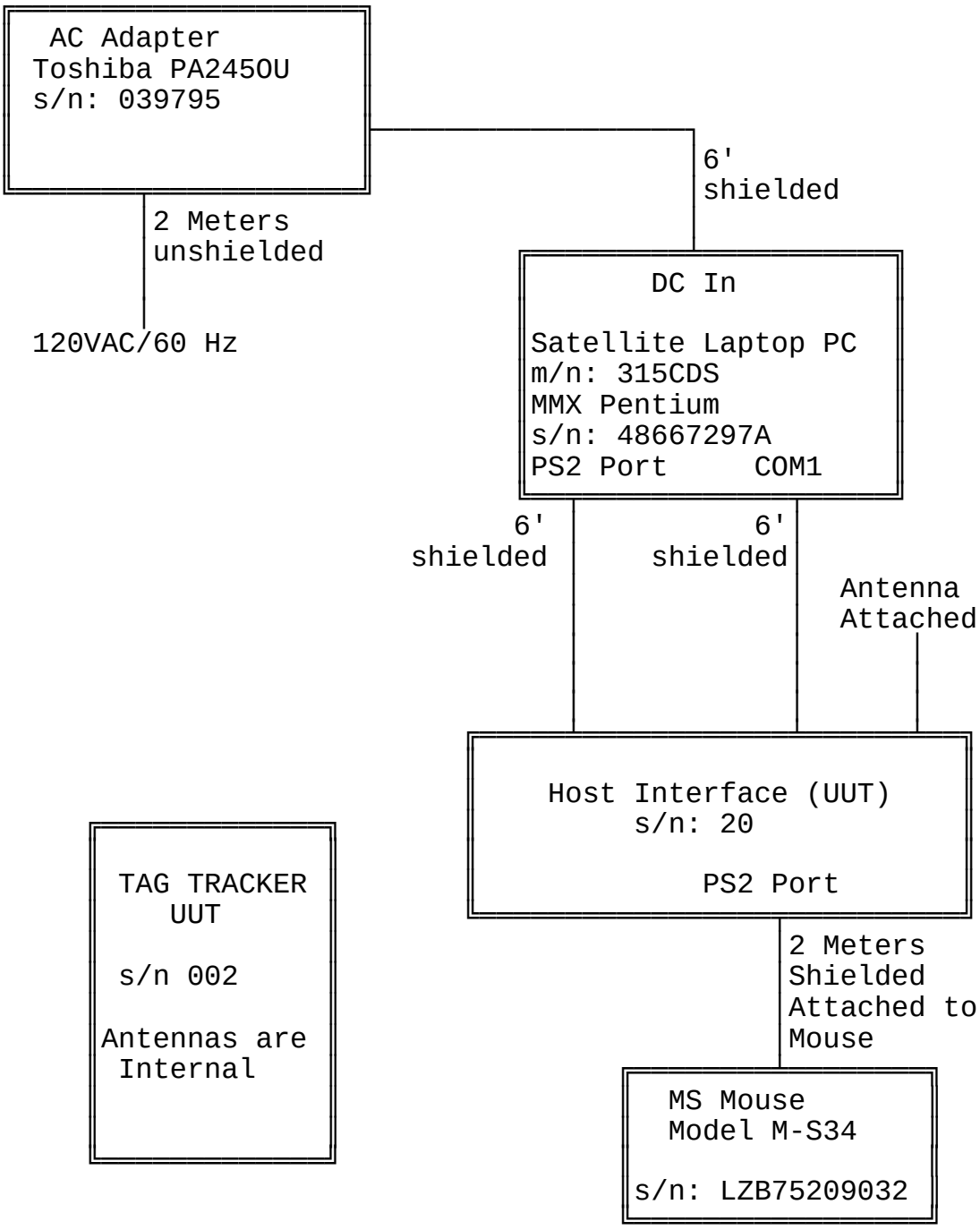


Table of Oscillator Frequencies

Receiver (Host Interface): None. Uses 418 MHz from the Transmitter