RF ENERGY EMISSION TEST REPORT

OF THE

AGINFOLINK Inc.

Tag Tacker Low Power Transmitter

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12/14/99
aginfo1

FCC ID: ON2TTREADER01

TABLE OF CONTENTS

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 TAG TRACKER TRANSMITTER with Base Station (RECEIVER), is hereafter referred to as the UUT. The UUT, with test setup as described in the block diagram of Appendix II, **PASSES** all the radiated requirements, the FCC Part 15, Subpart C regulations, pp 15.231 governing Low Power Intentional Radiators operating in the band above 70 MHz and 15.209 for operation below 160 KHz.

The maximum electromagnetic field strength at the transmit frequency of 418.009 MHz was 77 db verses a spec limit of 80.3 db when measured with a peak detector at 120 KHz bandwidth as explained in paragraph 5.0. The occupied bandwidth was .01% of the 418 MHz center frequency verses a spec of .25%.

The maximum field strength of the magnetic field emissions at 134.2 KHz of the ID Reader was 100 db verses a spec of 105 db since the measurement was performed at 3 meters. (a 40 db/decade correction factor was applied when going from 300 meters to 3 meters, yielding an 80 db increase in the 25 db limit at 300 meters). This is in accordance with Section 15.31F(2) of the Rules.

The spurious radiated emissions of the transmitter, 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
836.06	56	Horizontal	-4	1
1672	57	Horizontal	-3	1
2090	56	Horizontal	-4	1
2508	50	Horizontal	-10	1
2926	50	Horizontal	-10	1
836.06	48	Vertical	-12	2
2090	53	Vertical	-7	2
2926	52	Vertical	-8	2

For more details, see Appendix I, Tables 1 - 9 and GRAPHS 1 - 2. A negative margin means that the emissions are under the specified limit. All other emissions from Tables 1 - 9, not listed above, were at least 10 db under the applicable limits.

The Tag Tracker antennas are internal to the unit and not accessible to the user.

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:** ON2TTREADER01
> 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 C requirements for intentional radiators which limit emissions of Low Power Transmitter Devices pursuant to pp 15.209 and 15.231 through the certification process.

2.0 UNIT TESTED

The Tag Tracker Transmitter and Base Station (Receiver), manufactured by AGINFOLINK Inc., 1821 Left Hand Circle, Suite A, Longmont, CO 80501, hereafter referred to as the UUT, is intended to identify cows through an ID TAG worn by the animal.

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.

Polarad ESH2 Receiver, #6003696, calibrated 2/10/99, calibration due 2/10/2000.

Rhode & Schwarz HFH2-Z2 Magnetic Field Active Loop Antenna, 10 KHz - 30 MHz.

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 UUT was operated during the test as follows:

a. The UUT was reading a fixed responder tag.

b. The UUT was reading at its minimum system recycle time of 1.3 seconds which is a worst case test mode not normally used in the field due to system software turn around time.

c. When an ID tag is read, the serial information out of the ID reader is passed via a 418 MHz FM link to the Base Station (receiver)..

d. The Base Station 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 Base Station.

Four conditions were tested:

4.1.2.1 Tag Tracker Transmitter Wand and Measuring Antenna - horizontally polarized.

4.1.2.2 Tag Tracker Transmitter Wand and Measuring Antenna - vertically polarized.

4.1.2.3 Tag Tracker Transmitter Wand Vertically Polarized, measuring antenna- horizontally Polarized.

4.1.2.4 Tag Tracker Transmitter Wand Antenna Horizontally Polarized, Test Site Receive Antenna Vertically Polarized.

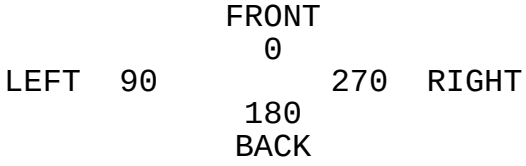
4.0 SPURIOUS RADIATED TEST PROCEDURE AND RESULTS (cont)

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 (4 setups as in 4.1.2) while tuning the ESV receiver in the alternate quasi-peak Mode, 120 KHz bandwidth, and the 8565A spectrum analyzer in peak mode from 30 MHz - 4.18 GHz in accordance with ANSI C63.4-1992, Appendix D procedure. Interface cables were adjusted at the frequencies shown in the Appendix I tables. The host Interface was placed on its feet with the antenna oriented vertically as it would be in actual operation.

4.1.4 At the conclusion of the preliminary survey for each antenna/polarization combination at all four combinations. 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:



4.1.7 The specified limit is 60.3 db with the average detector used. Alternately, the quasi-peak detector may be used. The 60.3 db limit of 15.231 applies in the restricted bands of operation of 15.205 in accordance with 15.231b3. 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.

4.1.8 Harmonics of the 418 MHz Emissions

From Figure 4 of Appendix 3, the duration of the shortest "1" bit is .87 milliseconds. The pulse desensitization factor (PDF) from HP application note 150-2 page 15 is 0db for bandwidths of 1 MHz, 100 KHz and 10 KHz. Therefore, a bandwidth of 100 KHz was used to increase the signal to noise ratio without affecting the amplitude of the measurements above 1 GHz. (i.e. PDF = 0)

Also from Figures 3 & 4, the duty cycle over a 100 millisecond period when the data bits are high is measured to be 63% of the 100 millisecond period. Therefore 20 log(.63) = - 4 db. The average factor (AVF) which may be subtracted from the peak reading is 4 db.

4.1.9 Separation (Meters) is 3.

4.1.10 For the non-harmonic spurious emissions, 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*.

* The 8565A analyzer reads in dbm. This reading was converted to dbμV by adding 107 db.

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

4.1.10(Cont)

Calculation

As an example in Table 1 of Appendix I, the 58 dbμV/m level at 110.54 MHz was calculated using the formula above. From Appendix II, the antenna factor is 10.6 db. From Appendix II, the cable loss is 1 db. The receiver reading was 58 dbμV. The preamp gain is 25.1 db.

Emission Level (110.54 MHz) = 58 + 10.6 + 1 - 25.1 = 45.4 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 and analyzer take this into account so it does not enter into the calculation.

4.1.11 For the harmonic spurious emissions, 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*.

* The 8565A analyzer reads in dbm. This reading was converted to dbμV by adding 107 db.

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

Calculation

As an example in Table 1 of Appendix I, the 58 dbμV/m level at 836.06 MHz was calculated using the formula above. From Appendix II, the antenna factor is 22.4 db. From Appendix II, the cable loss is 3 db. The receiver reading was 59 dbμV. The preamp gain is 24.7 db. From 4.1.8 the PDF is 0 db and the AVF is -4 db.

Emission Level (836 MHz) = 59+22.4+3-24.7+0-4= 55.7 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 and analyzer take this into account so it does not enter into the calculation.

4.2 Results

Preliminary tests showed the 4.1.2.1 combination was the noisiest condition and the 4.1.2.2 condition was noisy. The emissions when testing per the 4.1.2.3 & 4.1.2.4 combinations were not found to be nearly as noisy as the 4.1.2.1 & 4.1.2.2 combinations. Only the level of the fundamental emission is noted in the cross polarization test results.

See Appendix I, Tables 1 - 2 and GRAPHS 1 & 2.

Table 1/Graph 1: Transmit and Receive Antenna Horizontal (condition 4.1.2.1)
Table 2/Graph 2: Transmit and Receive Antenna Vertical (condition 4.1.2.2)

See photographs of Exhibit 7.

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

110.24 MHz, Horizontal Polarization.(condition 4.1.2.1)
185.4 MHz, Vertical Polarization (condition 4.1.2.2)
195.4 MHz, Vertical Polarization (condition 4.1.2.2)
836.06 MHz, Horizontal Polarization.(condition 4.1.2.1)
836.06 MHz, Vertical Polarization.(condition 4.1.2.2)
2090 MHz, Horizontal Polarization (condition 4.1.2.1)
2090 MHz, Vertical Polarization (condition 4.1.2.2)
2508 MHz, Horizontal Polarization (condition 4.1.2.1)
2926 MHz, Vertical Polarization (condition 4.2.2.2)

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 80 ◦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 100 KHz since the PDF was calculated to be 0 db for 1 MHz or 100 KHz bandwidth.

5.0 TRANSMIT FREQUENCY & OCCUPIED BANDWIDTH

5.1 PROCEDURE

5.1.1 Setup the UUT Transmitter on the OATS as in pp 4.0 of this procedure. The photographs of Appendix III are also applicable to these measurements. Perform measurements with each antenna polarization combination of pp 4.1.2. at a distance of 3 meters.

5.1.2 When measuring the maximum transmit field strength, set the ESV receiver detector function to "peak" and the resolution bandwidth to 120 KHz. Repeat the measurement in "average" mode with 120 KHz bandwidth if the "average" limit is not met in peak mode.

5.1.3 When measuring the field strength at the 20 db down frequencies on either side of the main 418 MHz emission, set the ESV receiver detector function to "peak" and the resolution bandwidth to 12 KHz. Slowly tune up and down from the main carrier and determine the emissions level which is 20 db lower than the maximum carrier level.

5.1.4 During the measurements of 5.1.2 and 5.1.3, the antenna is raised between 1 & 4 meters and the turntable is rotated 360◦ in order to maximize the emissions.

5.2 RESULTS

The "peak" level of all four polarization combinations listed in 4.1.2 are reported in Appendix I, Tables 3 - 6. The UUT met these requirements. When the center of the transmit frequency was measured in "peak" mode, the level was under the "average" limit by at least 4 db in all instances.

The sample calculations of pp 4.1.11 apply here as well.

6.0 RF ID Reader Magnetic Field Strength and Spurious Emissions

6.1 PROCEDURE

6.1.1 Setup the UUT Transmitter on the OATS as in pp 4.0 of this procedure in the following orientations:

6.1.1.1 UUT is horizontal on the narrow edge.
6.1.1.2 UUT is standing up vertically.
6.1.1.3 UUT is horizontal and flat on the table.

The photographs of Exhibit 7 showing the Rhode & Schwarz HFH2-Z2 magnetic loop are also applicable to these measurements. Perform measurements with each wand orientation at a distance of 3 meters. with the center of the loop 1 meter above the ground plane and the plane of the loop parallel to the 0 degree orientation of the UUT as shown. The turntable is rotated 360◦ to maximize the level.

6.1.2 When measuring the maximum transmit field strength, set the ESH2 receiver detector function to "average" and the resolution bandwidth to 10 KHz. Repeat the measurement in "peak" mode with 10 KHz bandwidth.

6.1.3 When measuring the field strength at the 20 db down frequencies on either side of the main 134 KHz emission, set the ESH2 receiver detector function to "average" and the resolution bandwidth to 200 Hz. Slowly tune up and down from the main carrier and determine the emissions level which is 20 db lower than the maximum carrier level.

6.1.4 Measure spurious magnetic field emissions, from 134 KHz to 30 MHz with the same setup as in 6.1.1 - 6.1.2 in accordance with the requirements of 15.209(d). Pay particular attention to the 134 KHz harmonics.

6.2 RESULTS

Refer to Appendix I, Tables 7 - 9. The UUT met these requirements. When the center of the transmit frequency was measured in "peak" mode, the level increased no more than 3 db above the average level in all instances.

The bandedges of the 134.2 KHz fundamental was 134.7 KHz on the upper end and 133.6 KHz on the lower end. Bandwidth is the points at which the transmit level is 20 db down from the maximum fundamental level.

Appendix I

TABLE 1

Polarization: Horizontal
Antennas: AilTech Biconical & Log Periodic, AH Systems Horn.
Test Distance: 3 Meters
Product: AG Info Link Tag Tracker and Base Station Receiver
Mode: Transmitting Continuously with data and carrier.
Date: 10/13/99; spurious radiated

degrees dbuv dbuv/m FCC 15.231

Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
60	54	148	-17	37	-23
65	48	171	-18	30	-30
110.24 CT	58	155	-13	45	-15
115	54	155	-14	40	-20
120	43	140	-13	30	-30
125	47	164	-12	35	-25
130	46	97	-11	35	-25
135	46	97	-10	36	-24
140	48	258	-9	39	-21
145	50	248	-8	42	-18
165	45	240	-8	37	-23
180	53	125	-10	43	-17
185	53	264	-10	43	-17
190	50	145	-10	40	-20
200	50	83	-12	38	-22
210	49	83	-12	37	-23
215	48	120	-13	35	-25
221	52	108	-13	39	-21
224	44	111	-13	31	-29
226	52	94	-13	39	-21
231	46	110	-12	34	-26
236	48	84	-12	36	-24
241	49	360	-12	37	-23
249	35	63	-11	24	-36
251	43	80	-11	32	-28

FCC ID: ON2TTREADER01

Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
60	54	148	-17	37	-23
256	43	80	-11	32	-28

TABLE 1 (cont)

Polarization: Horizontal
Antennas: AilTech Biconical & Log Periodic, AH Systems Horn.
Test Distance: 3 Meters
Product: AG Info Link Tag Tracker and Base Station Receiver
Mode: Transmitting Continuously with data and carrier.
Date: 10/13/99; spurious radiated

degrees dbuv dbuv/m FCC 15.235

Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
267	42	291	-10	32	-28
300	39	264	-8	31	-29
311	36	360	-8	28	-32
333	42	248	-8	34	-26
343	44	360	-8	36	-24
361	40	0	-8	32	-28
371	35	360	-8	27	-33
400	40	138	-7	33	-27
433	40	113	-6	34	-26
467	39	0	-5	34	-26
521	38	43	-5	33	-27
561	34	26	-4	30	-30
666	34	202	-2	32	-28
800	35	214	-1	34	-26
836.06 CT	59	305	-3*	56	-4
910	25	231	1	26	-34
1254	64	180	-21*	43	-17
1672	77	72	-20*	57	-3
2090 CT	73	39	-17*	56	-4

FCC ID: ON2TTREADER01

Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
267	42	291	-10	32	-28
2508 CT	65	29	-15*	50	-10
2,926	63	170,230	-13*	50	-10
3,762	52	335	-10*	42	-18
4,180	47	83	-8*	39	-21

Negative margin indicates emission is under the specified limit.
* Correction Factor from Appendix 2 Tables plus the -4db Average Factor from 4.1.8.

TABLE 2

Polarization: Vertical
Antennas: AilTech Biconical & Log Periodic, AH Systems Horn.
Test Distance: 3 Meters
Product: AG Info Link Tag Tracker Transmitter and Base Station Receiver
Mode: Transmitting Continuously with data and carrier.
Date: 10/13/99; spurious radiated

		degrees	dbuv	dbuv/m	FCC 15.231
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
35	34	231	-11	23	-37
50	38	204	-14	24	-36
60	55	190	-17	38	-22
65	44	181	-18	26	-34
135	43	66	-10	33	-27
140	40	56	-9	31	-29
150	48	59	-8	40	-20
155	47	0	-7	40	-20
165	41	160	-8	33	-27
180	51	189	-10	41	-19
185.4 CT	56	166	-10	46	-14
190	52	176	-7	45	-15
195.4 CT	52	176	-7	45	-15
200	45	162	-12	33	-27
211	50	148	-12	38	-22
216	43	161	-13	30	-30
221	47	189	-13	34	-26
226	45	195	-13	32	-28
231	44	210	-12	32	-28
241	47	144	-12	35	-25
251	38	145	-11	27	-33
256	40	120	-11	29	-31

Negative margin indicates emission is under the specified limit.

FCC ID: ON2TTREADER01

TABLE 2 (cont)

Polarization: Vertical
Antennas: AilTech Biconical & Log Periodic, AH Systems Horn.
Test Distance: 3 Meters
Product: AG Info Link Tag Tracker Transmitter and Base Station Receiver
Mode: Transmitting Continuously with data and carrier.
Date: 10/13/99; spurious radiated

		degrees	dbuv	dbuv/m	FCC 15.231
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
267	40	79	-10	30	-30
275	40	79	-9	31	-29
300	41	55	-8	33	-27
333	39	288	-8	31	-29
400	41	178	-7	34	-26
434	54	308	-6	48	-12
521	36	8	-5	31	-29
561	37	230	-4	33	-27
600	39	274	-3	36	-24
667	39	85	-2	37	-23
800	33	18	-1	32	-28
836.06 CT	52	44	-4*	48	-12
925	23	194	1	24	-36
1,254	63	272	-21*	42	-18
1,672	59	0	-20*	39	-21
2090*	70	144	-17*	53	-7
2508*	59	115	-15*	44	-16
2926* CT	65	227	-13*	52	-8
3,344	49	0	-11*	38	-22
3,762	47	296	-10*	37	-23
4,180	52	0	-8*	44	-16

Negative margin means the emissions are under the specified limit.

* Correction Factor from Appendix 2 Tables plus the -4db Average Factor from 4.1.8.

FCC ID: ON2TTREADER01

TABLE 3

Polarization: Horizontal Receive, Horizontal Tag Tracker
Antennas: AilTech
Test Distance: 3 Meters
Product: Wand
Mode: Transmitting Continuously with data and carrier bursts.
Date: 10/13/99; Fundamental level and bandwidth.

		degrees	dbuv	dbuv/m	FCC 15.231
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Avrage Limit (db)
418.009 a	87	127	-11*	76	80
417.97 b*	62	127	-11*	49	60
417.95 b	51	127	-11*	40	60
418.035b*	70	127	-11*	59	80
418.06 b	50	127	-11*	39	60

* Upper and lower bandwidth points.

a ESV Receiver set to 120 KHz Bandwidth, Peak Detector
b ESV Receiver set to 12 KHz Bandwidth, Peak Detector
c Correction Factor from Appendix 2 Tables plus the -4db Average Factor from 4.1.8.

The above table shows that the bandwidth is +26 KHz and - 12 KHz or .01% of the center frequency verses a spec of .25%.

Table 4

Polarization: Vertical Receive, Vertical Tag Tracker
Antennas: AilTech
Test Distance: 3 Meters
Product: Wand
Mode: Transmitting Continuously with data and carrier bursts.
Date: 10/13/99; Fundamental level and bandwidth.

		degrees	dbuv	dbuv/m	FCC 15.231
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Avrage Limit (db)
418.009 a	87	40	-11c	76	80
417.97 b*	65	40	-11c	54	60
417.95b	45	40	-11c	34	60
418.035b*	65	40	-11c	54	60
418.06b	45	40	-11c	34	60

* Upper and lower bandwidth points.

a ESV Receiver set to 120 KHz Bandwidth, Peak Detector
b ESV Receiver set to 12 KHz Bandwidth, Peak Detector
c Correction Factor from Appendix 2 Tables plus the -4db Average Factor from 4.1.8.

The above table shows that the bandwidth is +26 KHz and - 12 KHz or .01% of the center frequency verses a spec of .25%.

Table 5

Polarization: Horizontal Receive, Vertical Tag Tracker
Antennas: AilTech
Test Distance: 3 Meters
Product: Wand
Mode: Transmitting Continuously with data and carrier bursts.
Date: 10/13/99; Fundamental level.

		degrees	dbuv	dbuv/m	FCC 15.231
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Avrage Limit (db)
418.009 a	76	263	-11*	65	80

a ESV Receiver set to 120 KHz Bandwidth, Peak Detector

* Correction Factor from Appendix 2 Tables plus the -4db Average Factor from 4.1.8.

Table 6

Polarization: Vertical Receive, Horizontal Tag Tracker
Antennas: AilTech
Test Distance: 3 Meters
Product: Wand
Mode: Transmitting Continuously with data and carrier bursts.
Date: 10/13/99; Fundamental level.

		degrees	dbuv	dbuv/m	FCC 15.231
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Avrage Limit (db)
418.009 a	75	263	-11*	64	80

a ESV Receiver set to 120 KHz Bandwidth, Peak Detector

* Correction Factor from Appendix 2 Tables plus the -4db Average Factor from 4.1.8.

TABLE 7

Polarization: Vertical
Antennas: Rhode & Schwarz HFH2-Z2 Magnetic Loop
Test Distance: 3 Meters
Product: Wand Tag Reader
Mode: Horizontal Transmit(Wand lying down on narrow edge)
Transmit Level and Spurious Emissions
Date: 10/13/99

		degrees	dbuv	dbuv/m	FCC 15.209
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
.1342** a	77	0	20	97	105*
.2684 a	13	0	20	33	99
.4026 a	38	0	20	58	95
.5368	13	0	20	33	73
.9394 b	26	0	20	46	68
1.0728 b	14	0	20	34	67

* Using the 40 db/decade near field correction since the measurements were made at a distance of 3 meters.

** Center Frequency of the Intentional Transmit Signal. The peak level with a 10 KHz bandwidth was 3 db higher than the indicated average level.

a ESH2 receiver set to average detector, 10 KHz bandwidth.
b ESH2 receiver set to quasi peak detector, 9 KHz bandwidth.

TABLE 8

Polarization: Vertical
Antennas: Rhode & Schwarz HFH2-Z2 Magnetic Loop
Test Distance: 3 Meters
Product: Wand Tag Reader
Mode: Vertical Transmit(Wand Standing Up)
Transmit Level and Spurious Emission
Date: 10/13/99

		degrees	dbuv	dbuv/m	FCC 15.209
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
.1342**	78	0	20	98	105
.4026	39	0	20	59	95

* Using the 40 db/decade near field correction since the measurements were made at a distance of 3 meters.

** Center of Intentional Transmit Peak

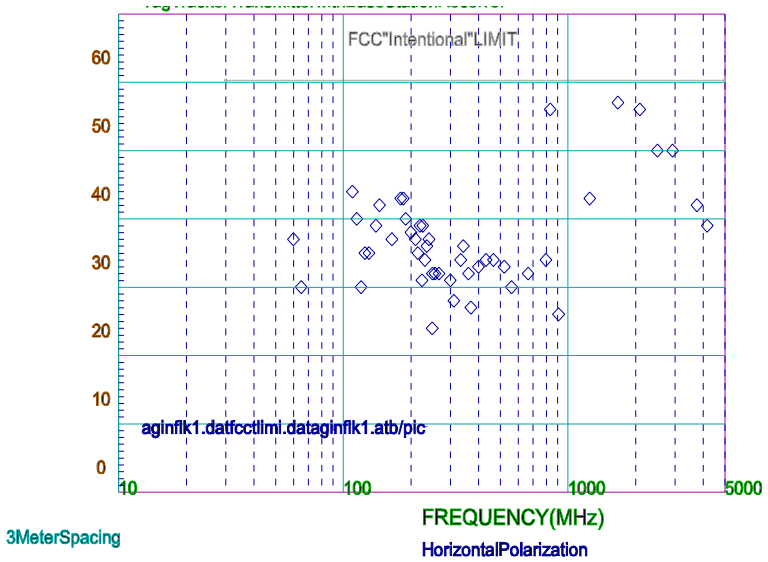
TABLE 9

Polarization: Vertical
Antennas: Rhode & Schwarz HFH2-Z2 Magnetic Loop
Test Distance: 3 Meters
Product: Wand Tag Reader
Mode: Horizontal (Wand lying down on wide edge)
Transmit Level
Date: 10/13/99

		degrees	dbuv	dbuv/m	FCC 15.209
Freq(MHz)	Uncorrected	Azimuth	Correction Factor(db)	Corrected Level(db)	Margin (db)
.1342**	67	0	20	87	105

* Using the 40 db/decade near field correction since the measurements were made at a distance of 3 meters.

** Center of Intentional Transmit Peak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30
20
10
0
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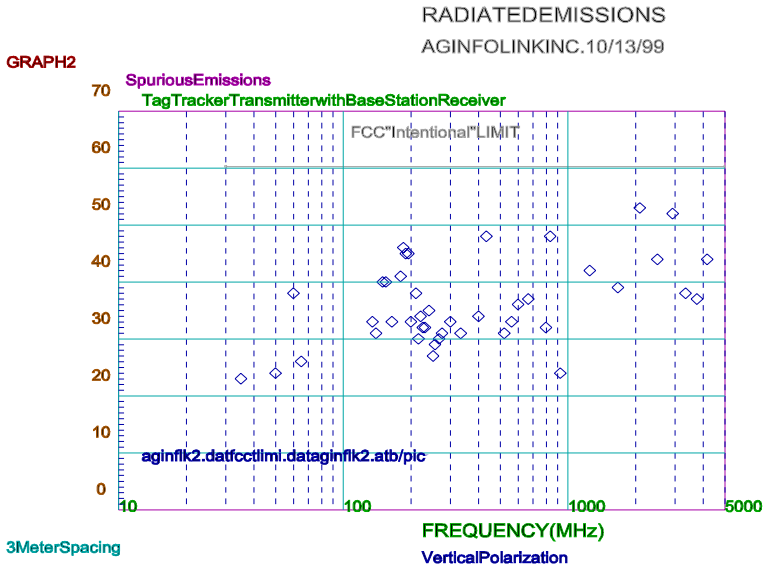
10
100
1000
5000
FREQUENCY(MHz)
3MeterSpacing
HorizontalPolarization
FieldStren


RADIATEDEMISSIONS
AGINFOLINKINC.10/13/99
GRAPH2
SpuriousEmissions
TagTrackerTransmitterwithBaseStationReceiver
FCC"Intentional"LIMIT
70
60
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40
30
20
10
0
aginflk2.datfcctlimi.dataginflk2.atb/pic
10
100
1000
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

Avantek UTC10-220-1 Preamp
106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4

FCC ID: ON2TTREADER01

FREQ. (MHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
165	16.1	24.9	1.2	-7.6
170	15.7	24.9	1.2	-8.0
175	15	24.8	1.2	-8.6
180	13.6	24.8	1.2	-10.0
185	13.5	24.8	1.2	-10.1
190	14	24.8	1.3	-9.5
195	16.6	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

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

FCC ID: ON2TTREADER01

3 Meter Spacing/Ailtech Antennas 8/3/99

FREQ. (MHz)	Antenna Factor (db)	Preamp Gain(db)	Cable Loss(db)	Total Factor
390	15	24.3	1.9	-7.4
400	15.6	24.3	1.9	-6.8
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: ON2TTREADER01

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

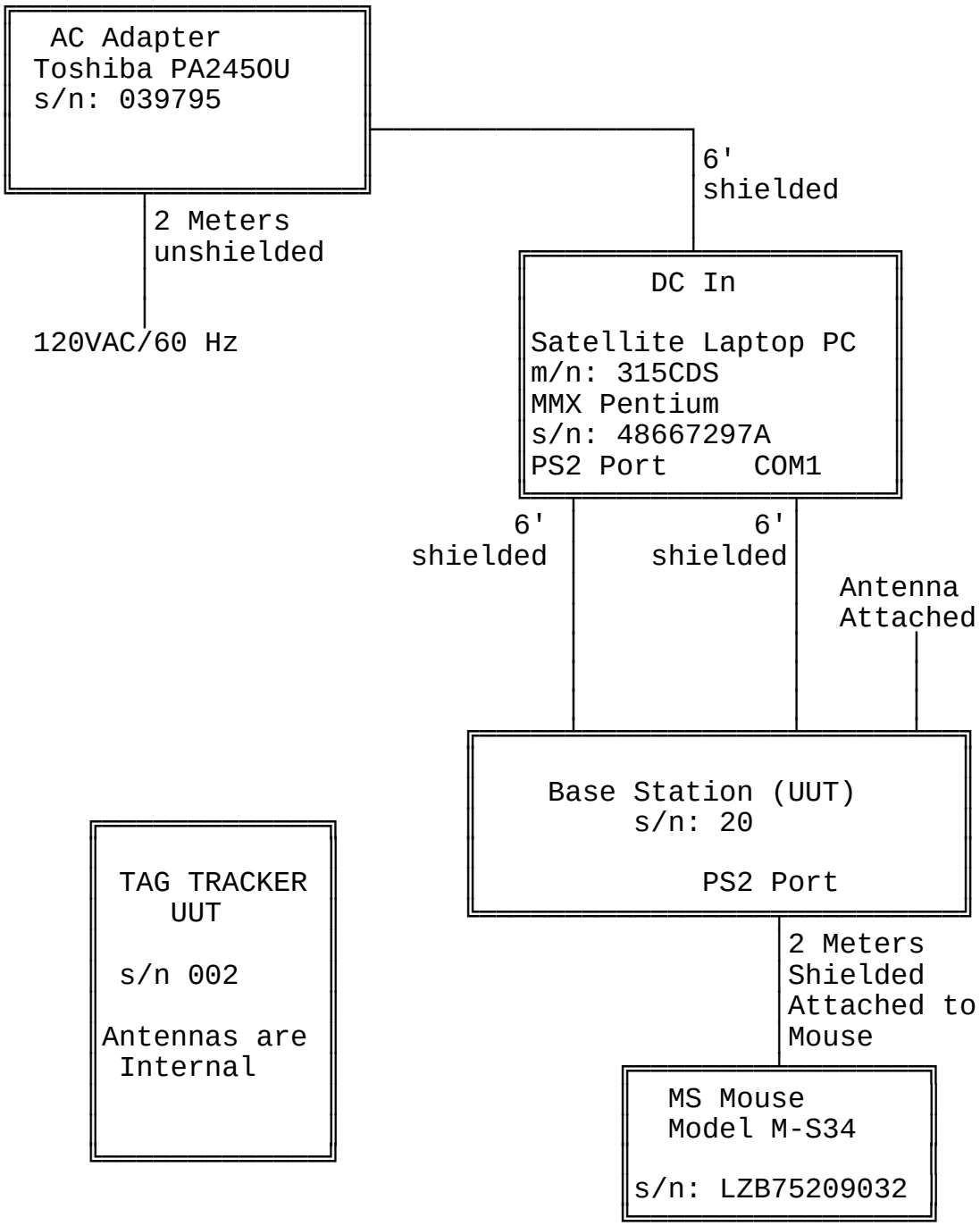
JCA Technology JCA15-416 Preamp
106' of LDF5-50A + 20' of FSJ1 + 20' of FSJ4
*LDF1-50 vs. LDF5-50A

Appendix III

Table of Oscillator Frequencies

Tag Reader Wand: 418.009 MHz, 17 MHz, 32 KHz, 134.2 KHz.

UUT BLOCK DIAGRAM



FCC ID: ON2TTREADER01

STATEMENT OF ACCURACY OF TEST DATA

All testing was performed by Markian Lapchak of Mark Lapchak & Associates using the prescribed procedures called out in ANSI Document C63.4-1992. The test site used is located at METRUM in Littleton, Colorado which is in compliance with Section 2.948 of the FCC Rules and complies with the radiated and AC line conducted criteria in ANSI C63.4-1992. The information with regard to the METRUM site may be found in FCC file 31040/SIT/1300F2. All equipment used was calibrated by the Bell Technology Services Division, an ISO 9002 registered metrology laboratory, whose standards are traceable to the National Institute of Standards and Technology. Certificates of calibration are available upon request.

Signed_____ Date_____

Markian Lapchak
NARTE Certification: EMC 001676-NE

RESPONSIBILITY OF THE GRANTEE

I, _____ , the undersigned, as a duly
print or type name

duly authorized representative of AG INFOLINK INC, do hereby warrant that each unit of equipment that is marketed and/or sold which bears the same equipment marking of this report(FCC ID:ON2TTREADER01)will be essentially the same as the unit that was measured and that the data (design and related operational characteristics) in this report, which is filed with the application for certification, will continue to be representative of the equipment being produced, bearing the same FCC ID, within the variation which can be expected due to quantity of production and testing on a statistical basis.

_____ _____
Signed Date