Simultaneous Transmit of Co-located Transmitters

Applicant: ITRONIX, Corporation

FCC ID: KBCIX300AC750WLBT

Model: IX300

FCC REQUIREMENT FOR SIMULTANEOUS TRANSMISSION

Excerpt below from TCB Question 7 for FCC, FCC / TCB Workshop 10-23-02 Day 2.

"The radios must be tested individually. 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.

Aggregate power must be considered in RF exposure evaluation."

DISCUSSION:

The IX300 contains a Sierra Wireless AirCard 750, PCS 1900 transmitter co-located with an 802.11, WLAN, and a FHSS Bluetooth Intentional Radiator. The three radios can transmit simultaneously. Therefore, while simultaneously transmitting the spurious emissions from the above referenced device were compared to the Part 24.238(a) limits for the GPRS transmitter and to the Part 15.247(c) limit for the Bluetooth Intentional Radiators. The radios do not share antenna. The AirCard 750 has it's own external antenna. Both Intentional Radiators have there own antenna internally integrated within the IX300 terminal.

Initially measurements were made with the AC750 and WLAN and Bluetooth simultaneously transmitting on there respective low, mid and high channels. Then measurements were made with the WLAN and Bluetooth simultaneously transmitting on the same low, mid, and high RF channels, as well as the AC750 transmitting on it's low mid and high channel. The final measurement results are reported on pages 3 to 5 following.

Additionally, the various channel combinations for the PCS bands used by the GPRS transmitter and the WAN and Bluetooth Intentional Radiator channels were mathematically compared for any harmonic frequency combinations that happen to fall on exactly the same frequency. Additional measurements were made on these specific channel combinations to investigate the possibility of increased emission level with the simultaneous transmit. We expect that the likelihood of
a increase in the harmonic emission level would exist when the combined harmonic energy from two sources is present on the same frequency.

It appears that this situation could occur with at least the following two frequency combinations noted below. In this case however, levels are too low to be measurable.

WAN & Bluetooth set to 2412 MHz	7th harmonic),
with the PCS set to 1876 MHz	(9th harmonic)

16844 MHz — No emission was measurable at one half meter EUT to antenna distance, more than 20 below the 15.247 (c) limit.

WAN & Bluetooth set to 2437 MHz	(7th harmonic),
With the PCS set to 1896 MHz	(9th harmonic)

17066 MHz — No emission was measurable at one half meter EUT to antenna distance, more than 20 below the 15.247 (c) limit.

The following three pages report the other simultaneous transmission emissions findings discussed previously on page one.

Pages 3 & 4.)

Simultaneous Test Frequencies:	**Bluetooth**	**2412, 2437, & 2462**	**MHz**
Part 15.247(c)	**WAN**	**2412, 2437, & 2462**	**MHz**
	PCS band	**1850.2, 1880, & 1909.8**	**MHz**

Page 5.)

Simultaneous Test Frequencies:	**PCS band**	**1850.2, 1880, & 1909.8**	**MHz**
Part 24.238(a)	**Bluetooth**	**2412, 2437, & 2462**	**MHz**
	WAN	**2412, 2437, & 2462**	**MHz**

EXHIBIT 6 TEST: FIELD STRENGTH OF SPURIOUS RADIATED EMISSIONS

FCC ID: KBCIX300AC750WLBT
Applicant: ITRONIX Corp.
Model: IX300 with AirCard 750, (WAN), WM168b- Molex, (WLAN), & MUBTC2-TH, (Bluetooth)

Minimum Standard Specified: Part 15.247(c)
Authorization Procedure: Part 2.1053
Frequency Range Observed: 0 to 25 GHz Date: 2/12/04
Test Equipment Setup: See block diagram and photos in Exhibit 7

NOTE: Simultaneous co-location transmit on the identical low, mid & hi freq. with the WM168b-Molex, (WLAN) and the MUBTC2-TH, (Bluetooth), intentional radiators. AC750 was also transmitting on it's low, mid and high channels respectively (1850.2, 1880, 1909.8 MHz). The AC750 transmitter maximum power output was fed to a resistive coaxial termination.

RADIATED HARMONIC AND SPURIOUS EMISSIONS & RESTRICTED BANDS									
Frequency GHz	**Max. SA Rdg. dBu/V**	**Ant. Vert. or Horz.**	**Peak or Average Detector**	**Antenna Factor dB**	**Cable & filter loss dB**	**Amp Gain**	**Corrected Reading dBuV/m**	**Limit 74 Peak 54 Avg. dBu/V**	**Margin in dB below LIMIT**
Fo - 2.412									
4.824	39.47	H	Peak	32.45	3.97	23.2	52.69	74	21.31
4.824	32.31	H	Average	32.45	3.97	23.2	45.51	54	8.49
7.236	39.04	H	Peak	36.77	3.42	25.9	53.33	74	20.67
7.236	29.21	H	Average	36.77	3.42	25.9	43.50	54	10.50
9.648	40.53	H	Peak	37.55	4.86	24.5	58.44	74	15.56
9.648	32.61	H	Average	37.55	4.86	24.5	50.52	54	3.48
Fo – 2.437									
4.874	39.95	H	Peak	32.45	3.97	23.2	53.17	74	20.83
4.874	32.28	H	Average	32.45	3.97	23.2	45.50	54	8.50
7.311	40.09	H	Peak	36.77	3.42	25.9	54.38	74	19.62
7.311	30.35	H	Average	36.77	3.42	25.9	44.64	54	9.36
9.748	40.25	H	Peak	37.55	4.86	24.7	57.96	74	16.04
9.748	31.88	H	Average	37.55	4.86	24.7	49.59	54	4.41
Fo – 2.462									
4.924	38.91	H	Peak	32.45	3.97	23.2	52.13	74	21.87
4.924	31.23	H	Average	32.45	3.97	23.2	44.43	54	9.57
7.386	40.19	H	Peak	36.77	3.42	25.9	54.48	74	19.52
7.386	29.55	H	Average	36.77	3.42	25.9	43.84	54	10.16
9.848	38.52	H	Peak	37.55	4.86	24.7	56.23	74	17.77
9.848	29.66	H	Average	37.55	4.86	24.7	47.37	54	6.63

Harmonic emissions on all three channels (low, mid & high) 5Fo – 10Fo at or below noise floor

Channel	**Frequency in GHz**	**Harmonics Observed**	**Limit 74 dBuV/m Peak & 54 dBuV/m Average**
Low Ch.	2.412		
5Fo – 10Fo	12.060 – 24.120	None -at or < noise floor @3m	All emissions < 54 dBuV/m
Mid Ch.	2.437		
5Fo – 10Fo	12.185 – 24.370	None -at or < noise floor @3m	All emissions < 54 dBuV/m
High Ch.	2.4620		
5F o- 10Fo	12.400 – 24.620	None -at or < noise floor @3m	All emissions < 54 dBuV/m

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Applicant: ITRONIX Corp.
Model: IX300 with AirCard 750, (WAN), WM168b- Molex, (WLAN), & MUBTC2-TH, (Bluetooth)

Minimum Standard Specified: Part 15.247(c)
Authorization Procedure: Part 2.1053
Frequency Range Observed: 0 to 25 GHz Date: 2/12/04
Test Equipment Setup: See block diagram and photos in Exhibit 7

NOTE: Simultaneous co-location transmit on the identical low, mid & hi freq. with the WM168b-Molex, (WLAN) and the MUBTC2-TH, (Bluetooth), intentional radiators. AC750 was also transmitting on it's low, mid and high channels respectively (1850.2, 1880, 1909.8 MHz). The AC750 transmitter maximum power output was fed to a resistive coaxial termination.

RADIATED HARMONIC AND SPURIOUS EMISSIONS & RESTRICTED BANDS									
Frequency GHz	**Max. SA Rdg. dBu/V**	**Ant. Vert. or Horz.**	**Peak or Average Detector**	**Antenna Factor dB**	**Cable & filter loss dB**	**Amp Gain**	**Corrected Reading dBuV/m**	**Limit 74 Peak 54 Avg. dBu/V**	**Margin in dB below LIMIT**
Fo - 2.412									
4.824	38.06	V	Peak	32.45	3.97	23.2	51.28	74	22.72
4.824	29.68	V	Average	32.45	3.97	23.2	42.90	54	11.10
7.236	39.66	V	Peak	36.77	3.42	25.9	53.95	74	20.05
7.236	29.18	V	Average	36.77	3.42	25.9	43.47	54	10.58
9.648	39.09	V	Peak	37.55	4.86	24.5	57.00	74	17.00
9.668	31.08	V	Average	37.55	4.86	24.5	48.99	54	5.01
Fo – 2.437									
4.874	38.83	V	Peak	32.45	3.97	23.2	52.05	74	21.95
4.874	29.85	V	Average	32.45	3.97	23.2	43.07	54	10.93
7.311	39.84	V	Peak	36.77	3.42	25.9	54.13	74	19.87
7.311	29.86	V	Average	36.77	3.42	25.9	44.15	54	9.85
9.748	40.07	V	Peak	37.55	4.86	24.7	57.78	74	16.22
9.748	30.40	V	Average	37.55	4.86	24.7	48.11	54	5.89
Fo – 2.462									
4.924	38.87	V	Peak	32.45	3.97	23.2	52.09	74	21.91
4.924	30.48	V	Average	32.45	3.97	23.2	43.70	54	10.30
7.386	40.45	V	Peak	36.77	3.42	25.9	54.74	74	19.26
7.386	29.26	V	Average	36.77	3.42	25.9	43.55	54	10.45
9.848	38.37	V	Peak	37.55	4.86	24.7	56.08	74	17.92
9.848	29.24	V	Average	37.55	4.86	24.7	46.95	54	7.05

Harmonic emissions on all three channels (low, mid & high) 5Fo – 10Fo at or below noise floor

Channel	**Frequency in GHz**	**Harmonics Observed**	**Limit 74 dBuV/m Peak & 54 dBuV/m Average**
Low Ch.	2.412		
5Fo – 10Fo	12.060 – 24.120	None -at or < noise floor @3m	All emissions < 54 dBuV/m
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EXHIBIT 6 TEST: FIELD STRENGTH OF SPURIOUS RADIATED EMISSIONS

FCC ID: KBCIX300AC750WLBT
Applicant: ITRONIX Corp.
Model: IX300 with AirCard 750, WLAN, & Bluetooth
Frequency Range Observed: 0 to 25 GHz Date: 02/13/04

NOTE: Simultaneous co-location transmit with Part 24 PCS and two Part 15 devices. The Part 15 WLAN and the Bluetooth transmitters were centered on the same RF channels for worst case.

RADIATED HARMONIC AND SPURIOUS EMISSIONS & RESTRICTED BANDS									
Frequency GHz	Max. SA Rdg. dBu/V	Ant. Vert. or Horz.	Peak or Average Detector	Antenna Factor dB	Cable & filter loss dB	Amp Gain	Corrected Reading dBuV/m	Corrected Reading dBm	Margin in dB Below -13 dBm LIMIT
Fo-1850.2									
3700.4	43.32	V	Peak	31.58	2.37	23.2	54.07	-52.93	39.93
3700.4	40.78	H	Peak	31.58	2.37	23.2	51.53	-55.47	42.47
5551.6	44.39	V	Peak	34.24	2.85	25.9	55.58	-51.42	38.42
5551.6	42.30	H	Peak	34.24	2.85	25.9	53.49	-53.51	40.51
* 7400.8	45.72	V	Peak	36.77	3.28	24.5	61.27	-45.73	32.73
7400.8	41.98	H	Peak	36.77	3.28	24.5	57.53	-49.47	36.47
Fo-1880.0									
3760.0	41.98	V	Peak	31.58	2.37	23.2	52.73	-54.27	41.27
3760.0	38.57	H	Peak	31.58	2.37	23.2	44.58	-62.42	49.42
5640.0	46.27	V	Peak	34.24	2.85	25.9	57.46	-49.54	36.54
5640.0	42.67	H	Peak	34.24	2.85	25.9	53.86	-53.17	40.17
* 7520.0	44.52	V	Peak	36.77	3.28	24.7	59.87	-47.13	34.13
7520.0	38.70	H	Peak	36.77	3.28	24.7	54.05	-52.95	39.95
Fo-1909.8									
3819.6	42.67	V	Peak	31.84	2.37	23.2	53.68	-53.32	40.32
3819.6	40.71	H	Peak	31.84	2.37	23.2	51.72	-55.28	42.28
5729.4	45.67	V	Peak	34.36.	2.85	25.9	56.98	-50.02	37.02
5729.4	46.52	H	Peak	34.36	2.85	25.9	57.83	-49.17	36.17
* 7639.2	46.64	V	Peak	36.87	3.28	24.7	62.09	-44.94	31.94
7639.2	41.43	H	Peak	36.87	3.28	24.7	56.68	-50.32	37.32

Harmonic emissions on all three channels (low, mid & high) 5Fo – 10Fo at or below noise floor			
Channel	**Frequency in GHz**	**Harmonics Observed**	**Limit 43 + 10 Log(P)**
Low Ch.	2.402		
5Fo – 10Fo	12.085 – 24.170	None -at or < noise floor @3m	All emissions < 54 dBuV/m
Mid Ch.	2.441		
5Fo – 10Fo	12.205 – 24.410	None -at or < noise floor @3m	All emissions < 54 dBuV/m
High Ch.	2.480		
5F o- 10Fo	12.400 – 24.800	None -at or < noise floor @3m	All emissions < 54 dBuV/m

* Worst case spurious emissions were re-tested using signal substitution and are reported in a separate test report for submitted the AC750.

End of Report