ADDITIONAL PRESENTATION FOR
SPURIOUS EMISSIONS MEASUREMEMTS

ADDENDUM TO CERTIFICATION
TEST REPORT FC99-027

FOR THE

TRA ASSY, TRX 1000S, FE, 1.4, 28GHZ [S1],
MODEL PTM 1000-28

FCC PART 101
COMPLIANCE

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ADMINISTRATIVE INFORMATION

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PURPOSE AND SUMMARY OF ADDENDUM:
To demonstrate the compliance of the TRA Assy, TRX 1000S, FE, 1.4, 28GHz [S1], Model PTM 1000-28, with the requirements for FCC Part 101 devices. This addendum contains a reformatted presentation of the spurious emissions data contained in the original report for the pages referenced. This presentation was prepared from the original data to satisfy the following FCC requests:

1. Reformat data to clearly express in dB attenuation as stated in Part 101.111(a)(2)(ii) and (iii).
2. Reformat data to show comparison to the emissions mask of Part 101.111(a)(2)(ii) and (iii) based on the special FCC interpretation of the emissions mask as percent removed (P) from the center of the Frequency Band, and not the "Carrier Frequency" as presently defined in Part 101.111(a)(2)(ii) and (iii).

The results of this revised presentation show the unit to be compliant, as original tested, with the spurious emissions requirements of 101.111(a)(2)(ii) and (iii), including demonstrated compliance with the FCC special interpretation of the emissions mask.

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Wavtrace
Report # **FC99-027 (28 GHz TRA)**

Radiated Spurious Emissions Measurements Recalculated
to show direct compliance with limits of 101.111(a) (2) (ii) and (iii)
(converted from original comparison to FCC Part 15.209 General Limits)

Parameters for Limit Calculations

P = Percent of Authorized Bandwidth (B)
Removed from Center of Frequency Band

Attenuation Requirements

P<50%	0 dB
P Between 50% and 250%	paragraph 101.111 (a) (2) (ii)
Beyond P=250%	paragraph 101.111 (a) (2) (iii)

Center of Frequency Band	27925 MHz
Maximum Authorized BW	850 MHz
Transmitter Rated Output	16 dBm

CKC Report #FC99-027, Page 24 Recalculation

Freq(MHz)	Reading (dBuV)	Reading (uV/M)	ERP (mW)	Polarity		Transmitter Rated Output (mW)	Measured Attenuation (dB)	Percent (P) Removed	Required Attenuation (dB)	Reference	Pass/Fail	Margin (dB)
486.8	38.5	84.14	0.000001295	Horiz		39.8	74.88	>250%	29	101.111(a)(2)(iii)	Pass	-45.88
486.44	37.2	72.44	0.000000960	Vert		39.8	76.18	>250%	29	101.111(a)(2)(iii)	Pass	-47.18
50.936	29.2	28.84	0.000000152	Vert		39.8	84.18	>250%	29	101.111(a)(2)(iii)	Pass	-55.18
1.168	55.5	595.66	0.000064905	Vert		39.8	57.88	>250%	29	101.111(a)(2)(iii)	Pass	-28.88
244.188	29.7	30.55	0.000000171	Horiz		39.8	83.68	>250%	29	101.111(a)(2)(iii)	Pass	-54.68
244.176	29.5	29.85	0.000000163	Vert		39.8	83.88	>250%	29	101.111(a)(2)(iii)	Pass	-54.88

CKC Report #FC99-027, Page 25 Recalculation

Freq(MHz)	Reading (dBuV)	Reading (uV/M)	ERP (mW)	Polarity		Transmitter Rated Output (mW)	Measured Attenuation (dB)	Percent (P) Removed	Required Attenuation (dB)	Reference	Pass/Fail	Margin (dB)
487.08	40.1	101.16	0.000001872	Vert		39.8	73.28	>250%	29	101.111(a)(2)(iii)	Pass	-44.28
486.56	39.2	91.20	0.000001522	Horiz		39.8	74.18	>250%	29	101.111(a)(2)(iii)	Pass	-45.18
53.32	29.3	29.17	0.000000156	Vert		39.8	84.08	>250%	29	101.111(a)(2)(iii)	Pass	-55.08
244.177	30.5	33.50	0.000000205	Vert		39.8	82.88	>250%	29	101.111(a)(2)(iii)	Pass	-53.88
244.168	30.1	31.99	0.000000187	Horiz		39.8	83.28	>250%	29	101.111(a)(2)(iii)	Pass	-54.28
1.168	25.2	18.20	0.000000061	Vert		39.8	88.18	>250%	29	101.111(a)(2)(iii)	Pass	-59.18

CKC Report #FC99-027, Page 26 Recalculation

Freq(MHz)	Reading (dBuV)	Reading (uV/M)	ERP (mW)	Polarity		Transmitter Rated Output (mW)	Measured Attenuation (dB)	Percent (P) Removed	Required Attenuation (dB)	Reference	Pass/Fail	Margin (dB)
20028.67	47	223.87	0.000009168	Vert		39.8	66.38	>250%	29	101.111(a)(2)(iii)	Pass	-37.38
3445	45.4	186.21	0.000006343	Horiz		39.8	67.98	>250%	29	101.111(a)(2)(iii)	Pass	-38.98
1965.05	45.4	186.21	0.000006343	Horiz		39.8	67.98	>250%	29	101.111(a)(2)(iii)	Pass	-38.98
8860	44.7	171.79	0.000005399	Vert		39.8	68.68	>250%	29	101.111(a)(2)(iii)	Pass	-39.68
24134.73	44	158.49	0.000004595	Horiz		39.8	69.38	>250%	29	101.111(a)(2)(iii)	Pass	-40.38
1970	42.5	133.35	0.000003253	Vert		39.8	70.88	>250%	29	101.111(a)(2)(iii)	Pass	-41.88
22200.58	41.4	117.49	0.000002525	Horiz		39.8	71.98	>250%	29	101.111(a)(2)(iii)	Pass	-42.98
2696	39.4	93.33	0.000001593	Vert		39.8	73.98	>250%	29	101.111(a)(2)(iii)	Pass	-44.98
21020.13	38.9	88.10	0.000001420	Vert		39.8	74.48	>250%	29	101.111(a)(2)(iii)	Pass	-45.48
1086	37.3	73.28	0.000000982	Horiz		39.8	76.08	>250%	29	101.111(a)(2)(iii)	Pass	-47.08

CKC Report #FC99-027, Page 27 Recalculation

Freq(MHz)	Reading (dBuV)	Reading (uV/M)	ERP (mW)	Polarity		Transmitter Rated Output (mW)	Measured Attenuation (dB)	Percent (P) Removed	Required Attenuation (dB)	Reference	Pass/Fail	Margin (dB)
21357.33	49.6	302.00	0.000016683	Vert		39.8	63.78	>250%	29	101.111(a)(2)(iii)	Pass	-34.78
18085	48.2	257.04	0.000012086	Vert		39.8	65.18	>250%	29	101.111(a)(2)(iii)	Pass	-36.18
20040	47.9	248.31	0.000011279	Vert		39.8	65.48	>250%	29	101.111(a)(2)(iii)	Pass	-36.48
21017	47.6	239.88	0.000010526	Vert		39.8	65.78	>250%	29	101.111(a)(2)(iii)	Pass	-36.78
26259	47.2	229.09	0.000009600	Vert		39.8	66.18	-196.00	56	101.111(a)(2)(ii)	Pass	-10.18
20875.83	46.9	221.31	0.000008959	Vert		39.8	66.48	>250%	29	101.111(a)(2)(iii)	Pass	-37.48
25848.2	46.1	201.84	0.000007452	Horiz		39.8	67.28	-244.33	56	101.111(a)(2)(ii)	Pass	-11.28
24729.37	41.8	123.03	0.000002769	Vert		39.8	71.58	>250%	29	101.111(a)(2)(iii)	Pass	-42.58

Description of Calculations for Radiated Field Spurious Emissions Measurements :
The radiated electric field measurement obtained on the Open Area Test Site, in dBuV/m, is converted for converted for comparison to the attenuation requirements of 101.111(a)(2)(ii) and (iii) as follows :

1. Convert Reading to uV/m (linear units) : R(uV/m) = 10^(R(dBuV/m)/20)
2. Convert Reading to ERP (mW) :
   ERP (W) = (E*d)^2 / (30*G) where E is Electric field in V/m, d = distance in meters (3 meters for above), G=numeric Gain of a half wave dipole=1.64
   ERP(mW) = 1000*ERP(W)
3. Calculate Measured Attenuation compared to Transmitter Rated Output Power P (mW) :
   A (dB) = 10*log(P / ERP)

Attenuation Requirement Calculations (Emissions Mask)
-For Frequencies between 50% and 250% removed from the CENTER of the frequency band (paragraph 101.111(a)(2)(ii) :
A=11 + 0.4(P-50) + 10*log(B) where P=Percent removed from the center of the frequency band and B=maximum authorized bandwidth of 850 MHz.
A greater than 56 dB not required.

For Frequencies Greater than 250% removed from the CENTER of the frequency band (paragraph 101.111(a)(2)(iii) :
A=43 + 10log(P) where P transmitter output Power in Watts

Wavtrace
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Antenna Port Conducted Spurious Emissions Measurements Recalculated to limits of 101.111(a) (2) (ii) and (iii)

Parameters for Limit Calculations

P = Percent of Authorized Bandwidth (B) Removed from Center of Frequency Band

Attenuation Requirements
P Between 50% and 250% paragraph 101.111 (a) (2) (ii)
Beyond P=250% paragraph 101.111 (a) (2) (iii)

Channel 0 Data
Carrier Frequency 27504.22 MHz
Center of Authorized Band 27925 MHz
Maximum Authorized BW=B 850 MHz

	Limit Calcuation			Spurious Emissions Measurement					
Frequency (MHz)	P= Percent Removed (%)	Limit Paragraph	Required Attenuation (dB)	Measurement (dBuV)	Masurement (dBm)	Mean Operating Power (dBm)	Measured Attenuation (dB)	RESULT (Pass/Fail)	MARGIN (dB)
28288.93	42.8153	101.111(a)(2)ii	**0.00**	53.9	-53.1	15.90	**69.00**	**PASS**	**-69.00**
50133.33	2612.7447	101.111(a)(2)iii	**28.90**	75	-32	15.90	**47.90**	**PASS**	**-19.00**
40066.67	1428.4318	101.111(a)(2)iii	**28.90**	74.9	-32.1	15.90	**48.00**	**PASS**	**-19.10**
56433.33	3353.9212	101.111(a)(2)iii	**28.90**	70.9	-36.1	15.90	**52.00**	**PASS**	**-23.10**
49333.34	2518.6282	101.111(a)(2)iii	**28.90**	70	-37	15.90	**52.90**	**PASS**	**-24.00**
57333.34	3459.8047	101.111(a)(2)iii	**28.90**	69.2	-37.8	15.90	**53.70**	**PASS**	**-24.80**

Channel 51 Data
Carrier Frequency 27929.2 MHz
Center of Authorized Band 27925 MHz
Maximum Authorized BW=B 850 MHz

	Limit Calcuation			Spurious Emissions Measurement					
Frequency (MHz)	P= Percent Removed (%)	Limit Paragraph	Required Attenuation (dB)	Measurement (dBuV)	Masurement (dBm)	Mean Operating Power (dBm)	Measured Attenuation (dB)	RESULT (Pass/Fail)	MARGIN (dB)
28423.31	58.6247	101.111(a)(2)ii	**43.74**	74.5	-32.5	16.00	**48.50**	**PASS**	**-4.76**
27435.26	-57.6165	101.111(a)(2)ii	**43.34**	62	-45	16.00	**61.00**	**PASS**	**-17.66**
50900	2702.9412	101.111(a)(2)iii	**29.00**	69.7	-37.3	16.00	**53.30**	**PASS**	**-24.30**
40066.67	1428.4318	101.111(a)(2)iii	**29.00**	69.5	-37.5	16.00	**53.50**	**PASS**	**-24.50**
50166.66	2616.6659	101.111(a)(2)iii	**29.00**	66.9	-40.1	16.00	**56.10**	**PASS**	**-27.10**
38221.76	1211.3835	101.111(a)(2)iii	**29.00**	63.4	-43.6	16.00	**59.60**	**PASS**	**-30.60**

Channel 101 Data									
Carrier Frequency	28345.97 MHz								
Center of Authorized Band	27925 MHz								
Maximum Authorized BW=B	850 MHz								
	Limit Calcuation			**Spurious Emissions Measurement**					
Frequency (MHz)	**P= Percent Removed (%)**	**Limit Paragraph**	**Required Attenuation (dB)**	**Measurement (dBuV)**	**Masurement (dBm)**	**Mean Operating Power (dBm)**	**Measured Attenuation (dB)**	**RESULT (Pass/Fail)**	**MARGIN (dB)**
38849.92	1285.2847	101.111(a)(2)iii	**29.00**	80.9	-26.1	16	**42.1**	**PASS**	**-13.10**
48633.33	2436.2741	101.111(a)(2)iii	**29.00**	80.3	-26.7	16	**42.7**	**PASS**	**-13.70**
47866.67	2346.0788	101.111(a)(2)iii	**29.00**	80.2	-26.8	16	**42.8**	**PASS**	**-13.80**
27377.25	-64.4412	101.111(a)(2)ii	**46.07**	64.7	-42.3	16	**58.3**	**PASS**	**-12.23**
54733.33	3153.9212	101.111(a)(2)iii	**29.00**	77.7	-29.3	16	**45.3**	**PASS**	**-16.30**
55666.67	3263.7259	101.111(a)(2)iii	**29.00**	77.5	-29.5	16	**45.5**	**PASS**	**-16.50**

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Transducer Key and Sample Calculations

Pages 24-25, transducers appearing between column Raw "Reading" and Corrected Reading "Corr" :

1. Amp-A = Emission Pre-Amplifier Insertion Loss (dB, -Gain)
2. Bilog = Antenna Factor for Bilog Antenna (dB/m)
3. Cb10a= Cable Insertion Loss (dB)
4. 3301B=Antenna Factor for Rod Antenna (dB/m) (use exclusive of Bilog
5. Dist= Distance extrapolation (if applicable)

Transducers 1-3 were used for the frequency range of 27 MHz - 1 GHz
Transducer 4 for readings <27 MHz

The Corrected E-Field Reading "Corr" in dBuV/m measured by the antenna at a 3 meter distance is obtained from the raw reading on the spectrum analyzer (in dBuV) as follows:

27 MHz - 1 GHz:

Reading + AmpA + Bilog + cb10a

Example: Page 24, Reading #1 at 486.8 MHz= 42.8 dBuV

Corrected Reading = 42.8+(-27.6)+17.8+5.5=38.5 dBuV/m

<27 MHz:

Reading + 3301B

Example, Page 24, Reading #4 at 1.168 MHz=51 dBuV

Corrected Reading = 51+4.5= 55.5 dBuV/m

These readings were compared on the original data sheets for the purpose of demonstrating compliance to the general radiated field requirements of 47 CFR FCC Part 15.209 (the "limit" column). All radiated spurious emissions measurements have been recalculated to specifically also show compliance with Part 101.111(a)(2)(ii) and (iii) attenuation requirements.

CKC Report #FC99-027 (28 GHz TRA)
Transducer Key and Sample Calculations

Pages 26-27, transducers appearing between column Raw "Reading" and Corrected Reading "Corr" :

Used in the Frequency Range 1-18 GHz
1. "26.5" = Emissions Pre-Amplifier insertion Loss (dB, -Gain)
2. Cable = Cable Insertion Loss (dB)
3. Cbl-2 = Cable Insertion Loss (dB)
4. Horn = Horn Antenna Factor (dB/m)

Used in the Frequency Range of 18-40 GHz
5. High = Emissions Pre-Amplifier insertion Loss (dB, -Gain)
6. Horn = Horn Antenna Factor (dB/m)

The Corrected E-Field Reading "Corr" in dBuV/m measured by the antenna at a 3 meter distance is obtained from the raw reading on the spectrum analyzer (in dBuV) as follows:

1 - 18 GHz:

Corr (dBuV/m) = Reading (dBuV) + "26.5"+ Cable(dB) + Cbl-2 (dB)+Horn (dB/m)
Example: Page 26, Raw Reading #2 at 3445 MHz = 46.2 dBuV
Corrected Reading (dBuV/m)=46.2 dBuV + (-33.8) + 1.3 + 1.6 + 30.1
= 45.4 dBuV/m

18 - 40 GHz:

Corr (dBuV/m) = Reading + Horn + High
Example: Page 26, Raw Reading #1 at 20028.67 MHz = 51.8 dBuV
Corrected Reading (dBuV/m)=51.8 dBuV + 40.5 + (-45.3)
=47 dBuV/m

These readings were compared on the original data sheets for the purpose of demonstrating compliance to the general radiated field requirements of 47 CFR FCC Part 15.209 (the "limit" column). All radiated spurious emissions measurements have been recalculated to specifically also show compliance with Part 101.111(a)(2)(ii) and (iii) attenuation requirements.