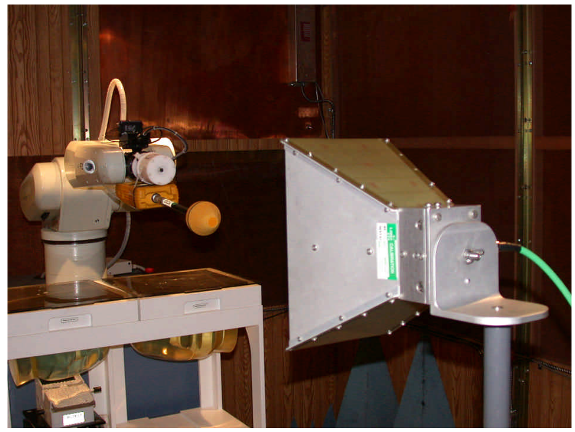
FREESPACE CALIBRATION SETUP

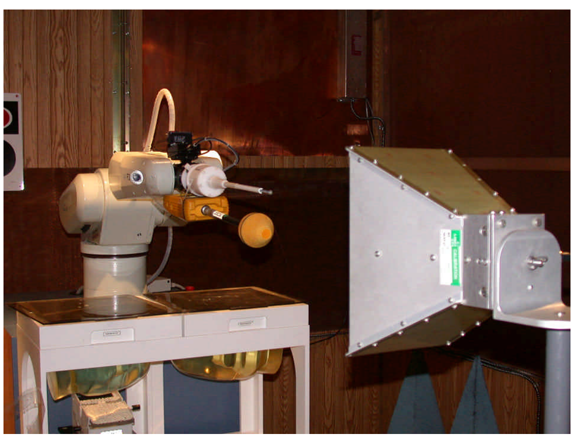
Horn/Freespace Setup (Normal)
Probe Reading: 1 mW/cm^2

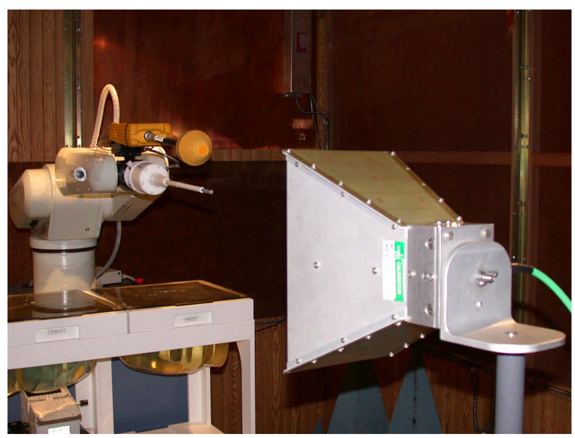
Horn/Freespace Setup
(without E-field Probe)
Monitor Reading 1 mW/cm^2



Verification of field homogeneity at position 1
(with EMR-20 Radiation Monitor)
Probe Reading: 1 mW/cm^2
Monitor Reading: 1 mW/cm^2

Verification of field homogeneity at position 2
(with EMR-20 Radiation Monitor)
Probe Reading: 1 mW/cm^2
Monitor Reading: 1 mW/cm^2

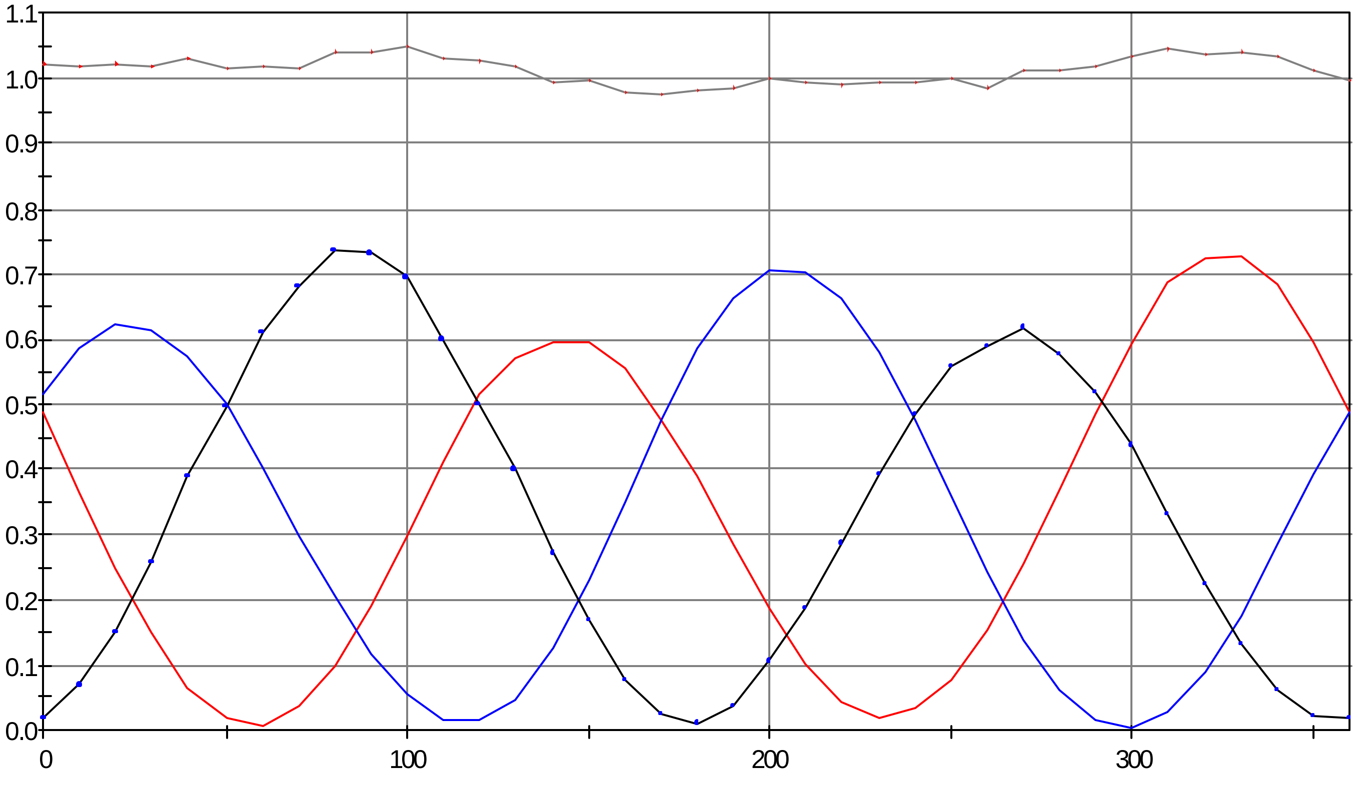




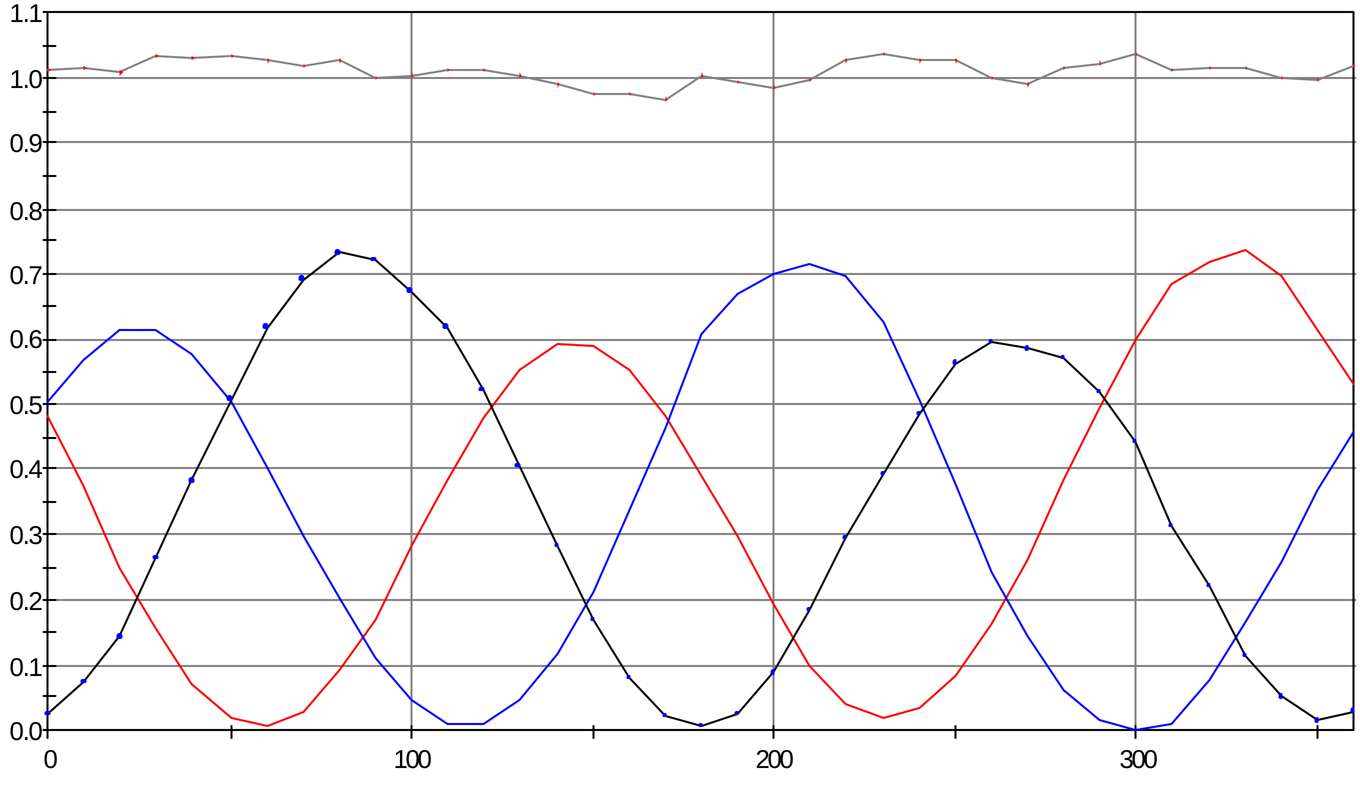
FCC ID: ACJ96NKX-TG5110
EA466126
CRN-24861

VERIFICATION OF RF TRANSPARENCY OF THERMAL PROBE

Isotropy Verification
Date: 5-Mar-03 07:38:53 pm
Probe Name: PCT002
Frequency: 5800
Note: With Thermistor
Isotropicity: 3.59% 0.15 db Min=0.976 Max=1.047



Isotropy Verification
Date: 5-Mar-03 07:10:31 pm
Probe Name: PCT002
Frequency: 5800
Note: Without Thermistor
Isotropicity: 3.48% 0.15 db Min=0.968 Max=1.038



From Kuster and Balzano[1] (1),

$$SAR_{surface} = \frac{s}{r}\frac{mw}{\sqrt{s^2+e^2w^2}}\left(1+c_{corr}g_{pw}\right)^2 H_{tinc}^{\;2} = \frac{s}{r}\frac{mw}{\sqrt{s^2+e_o^{\,2}e_r^{\,2}w^2}} H_{tinc}^{\;2}\cdot\left(1+c_{corr}g_{pw}\right)^2$$

$$= \frac{s}{r}\frac{mw}{\sqrt{s^2+e_r^2e_0^2w^2}} H_{tinc}^2 \cdot \begin{cases} \left[1+\left(\dfrac{2\left|\sqrt{e_re_0 - s/iw}\right|}{\left|\sqrt{e_re_0-s/iw}+\sqrt{e_0}\right|}-1\right)\right]^2, & d \ge \dfrac{2}{25}\dfrac{l_0}{g_{pw}} \\ \left\{1+\left(\dfrac{2\left|\sqrt{e_re_0 - s/iw}\right|}{\left|\sqrt{e_re_0-s/iw}+\sqrt{e_0}\right|}-1\right)\sin\left[\dfrac{p}{2}\dfrac{25}{2}\dfrac{d}{l_0}\left(\dfrac{2\left|\sqrt{e_re_0 - s/iw}\right|}{\left|\sqrt{e_re_0-s/iw}+\sqrt{e_0}\right|}-1\right)\right]\right\}^2, & d < \dfrac{2}{25}\dfrac{l_0}{g_{pw}} \end{cases}$$

$m_o = 1.257\times10^{-6}\,kg.m/A^2s^2$

$w = 2p.f = 2p.(5.8\times10^9) = 3.644\times10^{10}\,s^{-1}$

$g_{pw} = 0.7236m$

$s = 5.27 \quad s^3A^2/m^3kg$

$e_o = 8.85\times10^{-12}\,s^4A^2/kg.m^3$

$e_r = 35.3$

$l_o = 0.0517m$

Since $d \ge 0.08\dfrac{l_o}{g_{pw}}$, and $H_{tinc} = \dfrac{I_{fp}}{2pd}$:

$$SAR_{surface} = \frac{s}{r}\frac{mwH_{tinc}^{\;2}}{\sqrt{s^2+e_o^{\,2}e_r^{\,2}w^2}}\cdot\left(\frac{2\left|\sqrt{e_oe_r-\frac{s}{w}i}\right|}{\left|\sqrt{e_oe_r-\frac{s}{w}i}+\sqrt{e_o}\right|}\right)^2$$

$$= \frac{s}{2rpd}\frac{mwI_{fp}^{\;2}}{\sqrt{s^2+e_o^{\,2}e_r^{\,2}w^2}}\cdot\left(\frac{2\left|\sqrt{e_oe_r-\frac{s}{w}i}\right|}{\left|\sqrt{e_oe_r-\frac{s}{w}i}+\sqrt{e_o}\right|}\right)^2$$

[1] Adopted from N. Kuster and Q. Balzano, "Experimental and Numerical Dosimetry," *Mobile Communications Safety*, London: Chapman & Hall, 1997.

For 1 Watt feedpoint power,

$$SAR_{surface} = \frac{5.27}{2 \cdot 3.1416 \cdot 0.00571} \cdot \frac{1.257\times10^{-6} \cdot 3.64\times10^{10} \cdot 0.1414}{\sqrt{5.27^2 + (8.85\times10^{-12})(35.3)^2(3.64\times10^{10})}} \cdot \left(\frac{2\sqrt{\sqrt{(8.85\times10^{-12})^2(35.3)^2 + \frac{(5.27)^2}{(3.64\times10^{10})^2}}}}{\left| \sqrt{(8.85\times10^{-12})(35.3) - \frac{(5.27)}{3.64\times10^{10}} i} + \sqrt{8.85\times10^{-12}} \right|} \right)^2$$

$SAR_{surface}$= **289.62 W/kg** (local SAR at surface above feedpoint via Kuster-Balzano)

A linear extrapolation from 10 known frequencies and validation targets (IEEE Std P1528, Table 7.1) were used as an approximation of the validation target at 5.8 GHz. At the surface above the feedpoint, the local SAR (validation target from linearity approximation) was **274.10 W/kg**. This deviated from that of the Kuster-Balzano derivation by –5.4%.

The SAR system was validated at a normalized value of 265.2 W/kg (-8.4% from the Kuster-Balzano derived validation target). Therefore, the SAR measurements taken for FCC ID: ACJ96NKX-TG5110 validated within the $\pm$10% specification. In future applications this new target will be used until further guidance/standards are established.

MEASUREMENT UNCERTAINTIES

a	b	c	d	e= f(d,k)	f	g	h = cxf/e	i = cxg/e	k
Uncertainty Component	**Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i (1 - g)**	**c_i (10 - g)**	**1 - g u_i (± %)**	**10 - g u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E1.1	7.4	N	1	1	1	7.4	7.4	∞
Axial Isotropy	E1.2	4.88	R	$\sqrt{3}$	0.5	0.5	1.4	1.4	∞
Hemishperical Isotropy	E1.2	9.6	R	$\sqrt{3}$	0.5	0.5	2.8	2.8	∞
Boundary Effect	E1.3	11.0	R	$\sqrt{3}$	1	1	6.4	6.4	∞
Linearity	E1.4	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
System Detection Limits	E1.5	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	E1.6	1.0	R	1	1	1	1.0	1.0	∞
Response Time	E1.7	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
Integration Time	E1.8	1.7	R	$\sqrt{3}$	1	1	1.0	1.0	∞
RF Ambient Conditions	E5.1	1.2	R	$\sqrt{3}$	1	1	0.7	0.7	∞
Probe Positioner Mechanical Tolerance	E5.2	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
Probe Positioning w/ respect to Phantom Shell	E5.3	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Extrapolation, Interpolation & Integration Algorithms for Max. SAR Evaluation	E4.2	3.9	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E3.2.1	10.6	R	$\sqrt{3}$	1	1	6.1	6.1	11
Device Holder Uncertainty	E3.1.1	8.7	R	$\sqrt{3}$	1	1	5.0	5.0	8
Output Power Variation - SAR drift measurement	5.6.2	5.0	R	$\sqrt{3}$	1	1	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E2.1	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E2.2	5.0	R	$\sqrt{3}$	0.7	0.5	2.0	1.4	∞
Liquid Conductivity - measurement uncertainty	E2.2	10.0	R	$\sqrt{3}$	0.7	0.5	4.0	2.9	∞
Liquid Permittivity - deviation from target values	E2.2	5.0	R	$\sqrt{3}$	0.6	0.5	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E2.2	5.0	R	$\sqrt{3}$	0.6	0.5	1.7	1.4	∞
Combined Standard Uncertainty (k=1)			RSS				14.4	14.0	
Expanded Uncertainty (k=2) (95% CONFIDENCE LEVEL)							28.8	28.0	

The above measurement uncertainties are according to IEEE Std. 1528-200X (January, 2002)

DEVICE MEASUREMENT UNCERTAINTY

Uncertainty Component	a Tol. (± %)	Probability Distribution	b Divisor	c c_i	$u_i = (a/b) \times c$ Standard Uncertainty (± %)	v_i or v_{eff}
Test Sample Positioning	10.6	R	$\sqrt{3}$	1	6.1	11
Device Holder Uncertainty	8.7	R	$\sqrt{3}$	1	5.0	8
Output Power Variation – SAR drift measurement	5.0	R	$\sqrt{3}$	1	2.9	∞
					8.40	

SYSTEM VERIFICATION UNCERTAINTY

Uncertainty Component	a Tol. (± %)	Probability Distribution	b Divisor	c c_i	$u_i = (a/b) \times c$ Standard Uncertainty (± %)	v_i or v_{eff}
Repeatability	2.5	N	1	1	2.50	4
Validation Target Estimation	5.4	R	$\sqrt{3}$	1	3.12	∞
Signal Generator-drift, linearity, etc.	0.5	R	$\sqrt{3}$	1	0.29	∞
Dipole Positioning	2.0	N	1	1	2.00	
					4.48	
Expanded Uncertainty (k=2)					8.44	