APPENDIX C - PROBE CALIBRATION

Probe ET3DV6

SN:1590

Manufactured:	March 19, 2001
Calibrated:	March 26, 2001

Calibrated for System DASY3

DASY3 - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space

NormX	**1.77**	$\mu V/(V/m)^2$
NormY	**1.91**	$\mu V/(V/m)^2$
NormZ	**1.67**	$\mu V/(V/m)^2$

Diode Compression

DCP X	**100**	mV
DCP Y	**100**	mV
DCP Z	**100**	mV

Sensitivity in Tissue Simulating Liquid

Head **450 MHz** e_r **= 43.5 ± 5%** s **= 0.87 ± 10% mho/m**

ConvF X	**7.36**	extrapolated	Boundary effect:	
ConvF Y	**7.36**	extrapolated	Alpha	**0.29**
ConvF Z	**7.36**	extrapolated	Depth	**2.72**

Head **900 MHz** e_r **= 42 ± 5%** s **= 0.97 ± 10% mho/m**

ConvF X	**6.83**	± 7% (k=2)	Boundary effect:	
ConvF Y	**6.83**	± 7% (k=2)	Alpha	**0.37**
ConvF Z	**6.83**	± 7% (k=2)	Depth	**2.48**

Head **1500 MHz** e_r **= 40.4 ± 5%** s **= 1.23 ± 10% mho/m**

ConvF X	**6.13**	interpolated	Boundary effect:	
ConvF Y	**6.13**	interpolated	Alpha	**0.47**
ConvF Z	**6.13**	interpolated	Depth	**2.17**

Head **1800 MHz** e_r **= 40 ± 5%** s **= 1.40 ± 10% mho/m**

ConvF X	**5.78**	± 7% (k=2)	Boundary effect:	
ConvF Y	**5.78**	± 7% (k=2)	Alpha	**0.53**
ConvF Z	**5.78**	± 7% (k=2)	Depth	**2.01**

Sensor Offset

Probe Tip to Sensor Center	**2.7**	mm
Optical Surface Detection	**1.2 ± 0.2**	mm

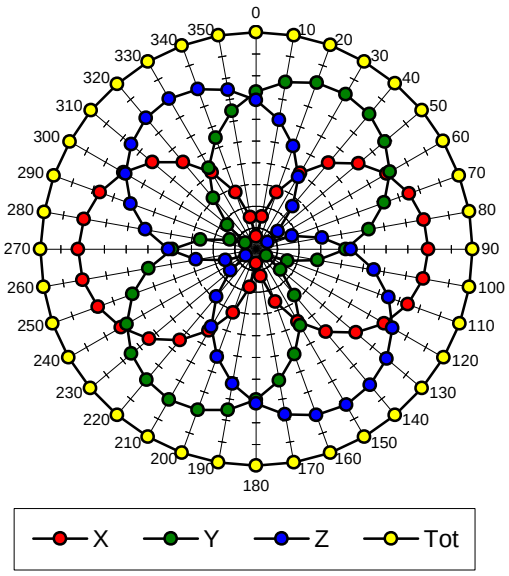
DASY3 - Parameters of Probe: ET3DV6 SN: 1590

Body	**450 MHz**		**ε_r = 56.7 ± 5%**	**σ = 0.94 ± 10% mho/m**	
	ConvF X	**7.23** extrapolated		Boundary effect:	
	ConvF Y	**7.23** extrapolated		Alpha	**0.30**
	ConvF Z	**7.23** extrapolated		Depth	**2.52**
Body	**900 MHz**		**ε_r = 55.0 ± 5%**	**σ = 1.05 ± 10% mho/m**	
	ConvF X	**6.61**	± 7% (k=2)	Boundary effect:	
	ConvF Y	**6.61**	± 7% (k=2)	Alpha	**0.47**
	ConvF Z	**6.61**	± 7% (k=2)	Depth	**2.25**
Body	**1500 MHz**		**ε_r = 54.0 ± 5%**	**σ = 1.30 ± 10% mho/m**	
	ConvF X	**5.78** interpolated		Boundary effect:	
	ConvF Y	**5.78** interpolated		Alpha	**0.69**
	ConvF Z	**5.78** interpolated		Depth	**1.88**
Body	**1800 MHz**		**ε_r = 53.3 ± 5%**	**σ = 1.52 ± 10% mho/m**	
	ConvF X	**5.36**	± 7% (k=2)	Boundary effect:	
	ConvF Y	**5.36**	± 7% (k=2)	Alpha	**0.81**
	ConvF Z	**5.36**	± 7% (k=2)	Depth	**1.70**

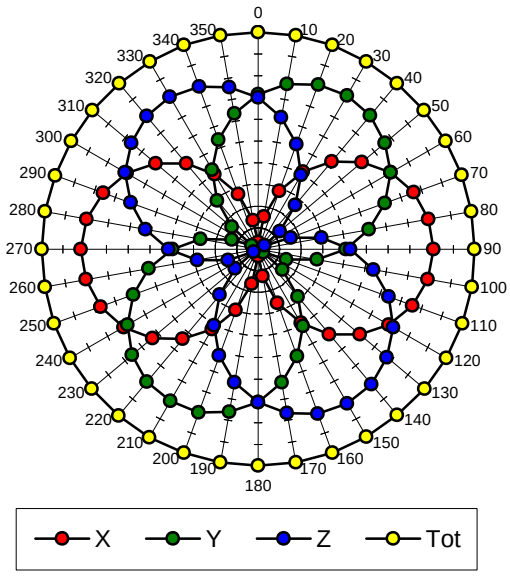
The E-field body conversion numbers were derived experimentally using the following setup. The system was first validated using head simulating tissue and probe conversion numbers supplied by the OEM for both 900MHz and 1800MHz. Using both 900MHz and 1800MHz validation dipoles the system was recorded to be within ± 5% of the target values required. The fluid in the planar phantom was then replaced with body parameter fluid for both 900MHz and 1800MHz. The E-field conversion numbers for the body parameter fluid were then adjusted in order to achieve the same target values as recorded previously. The body conversion numbers derived were slightly lower than 3% for 900MHz and approximately 8% lower for 1800MHz from the head conversion numbers derived by the system manufacturer. The 450MHz and 1500MHz body conversion numbers were derived in the same manner as the head conversion numbers by extrapolation and interpolation respectively. The system's user manual stipulates the frequency independent conversion between body and head conversion numbers to be approximately 3%.

Receiving Pattern (ϕ , θ = 0°

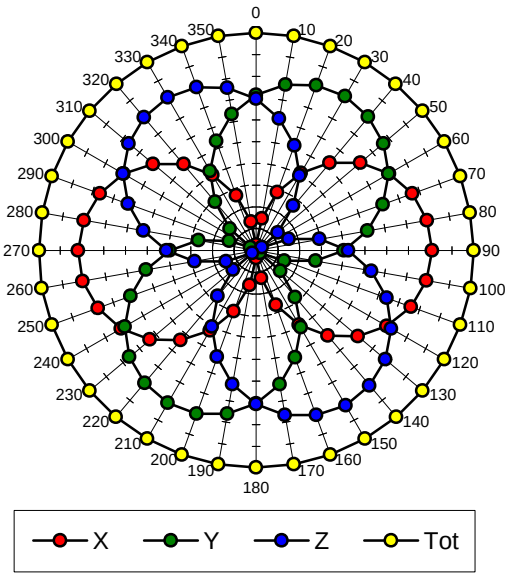
f = 30 MHz, TEM cell ifi110



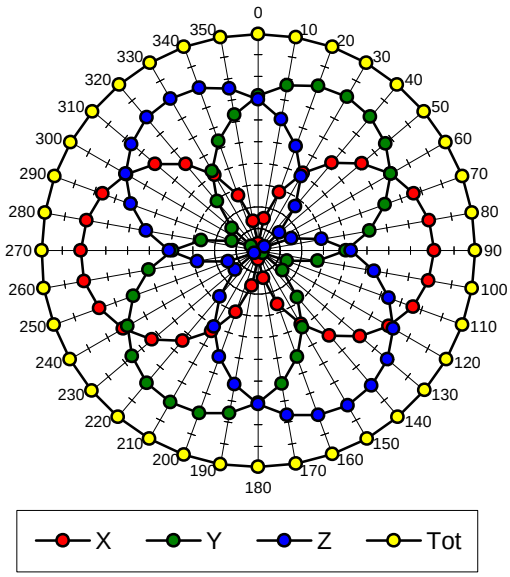
f = 100 MHz, TEM cell ifi110



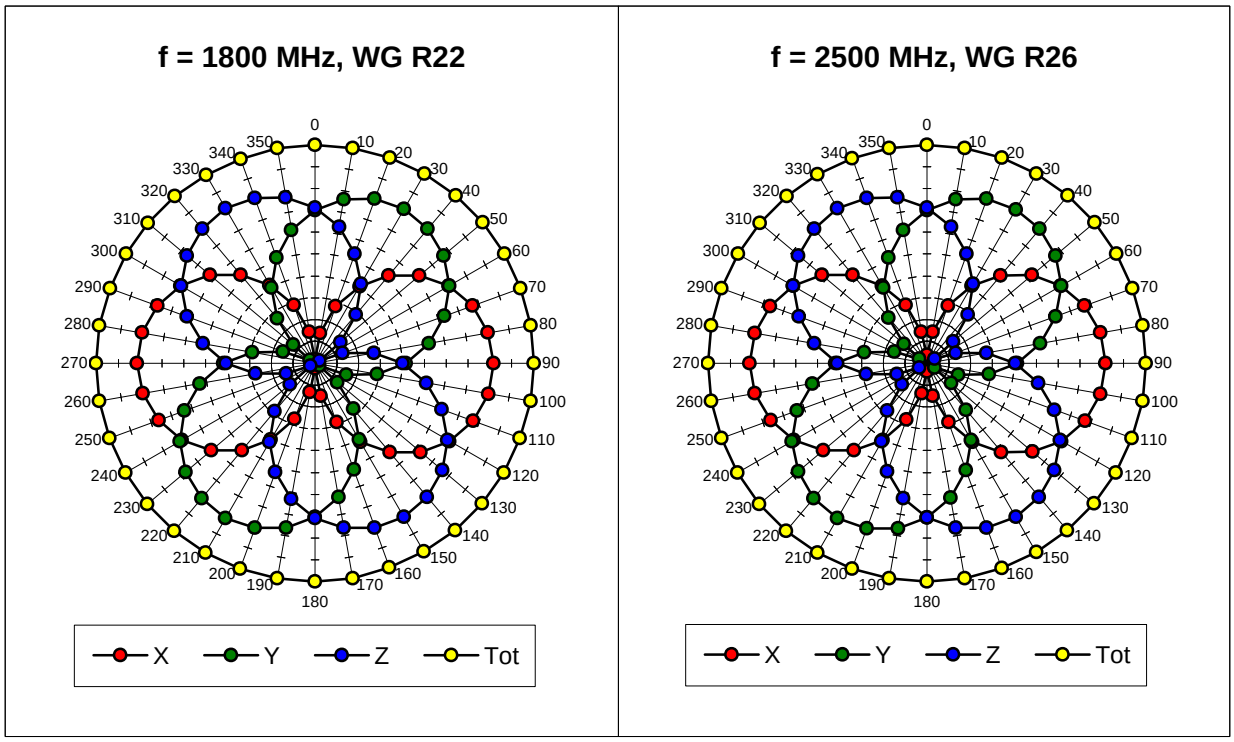
f = 300 MHz, TEM cell ifi110



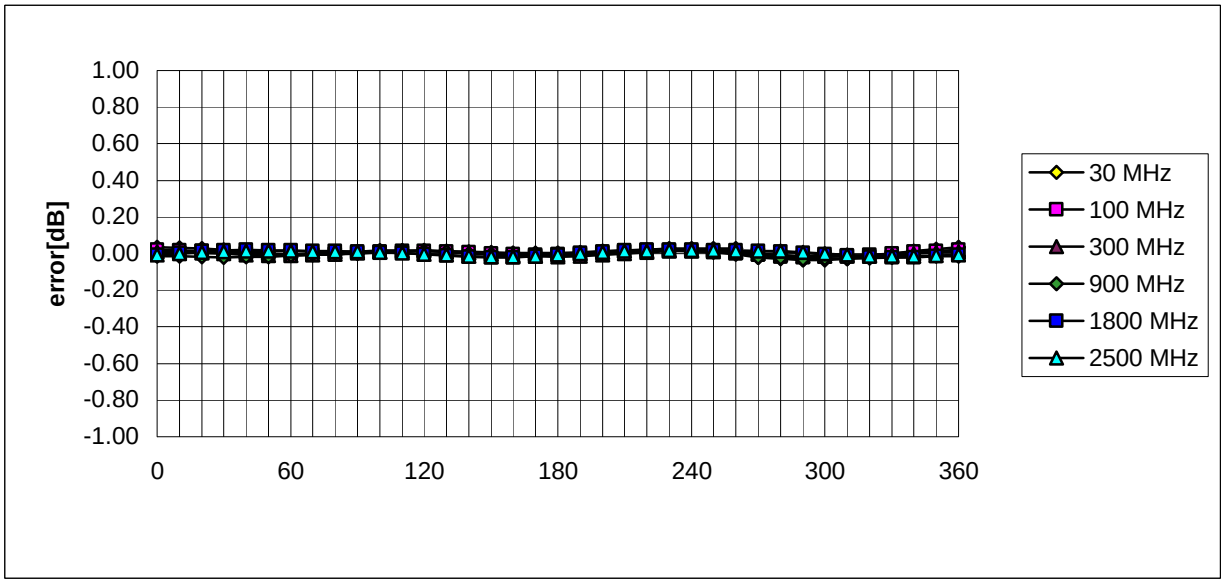
f = 900 MHz, TEM cell ifi110



ET3DV6 SN:1590

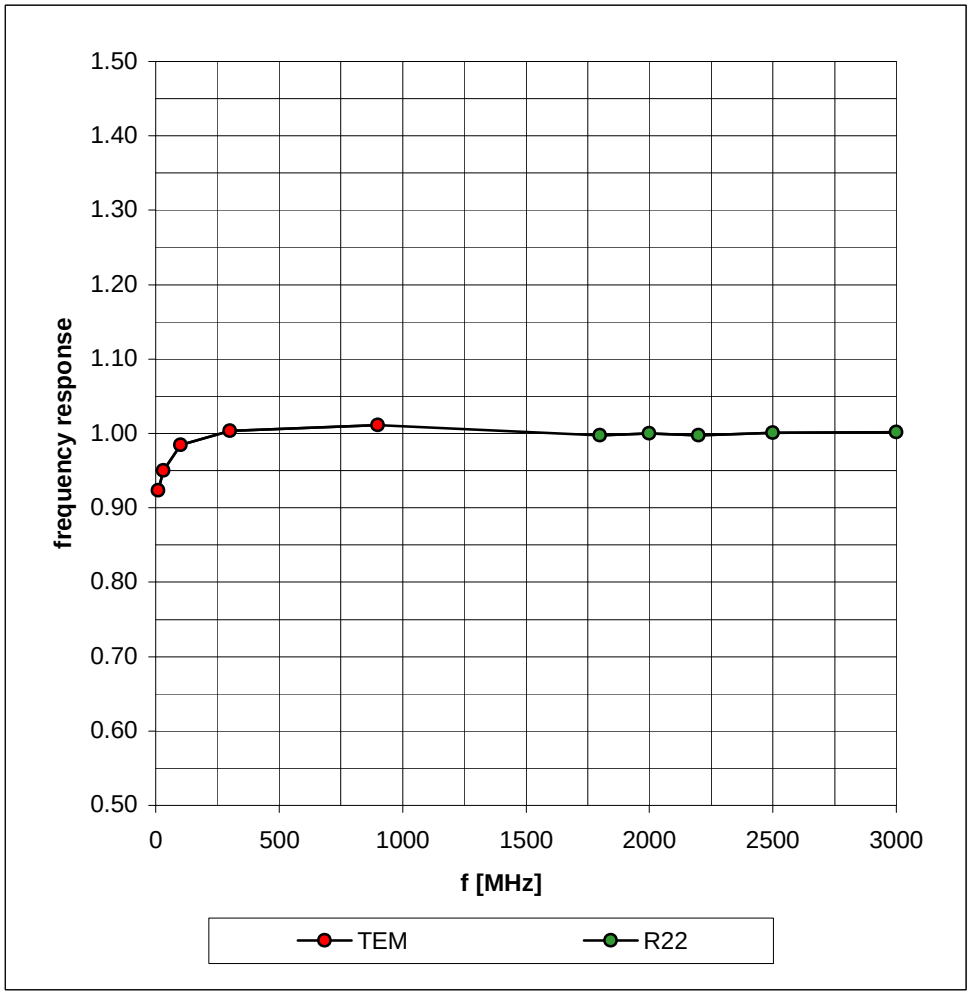


Isotropy Error (f), q = 0°



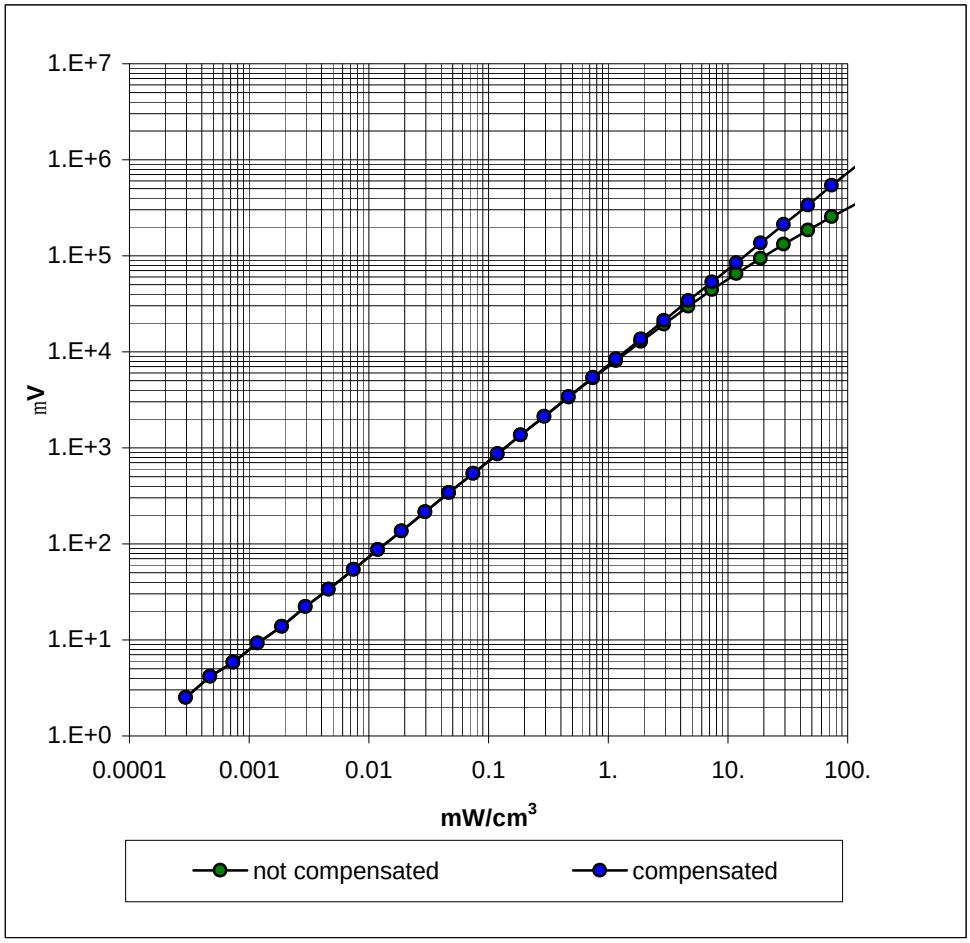
Frequency Response of E-Field

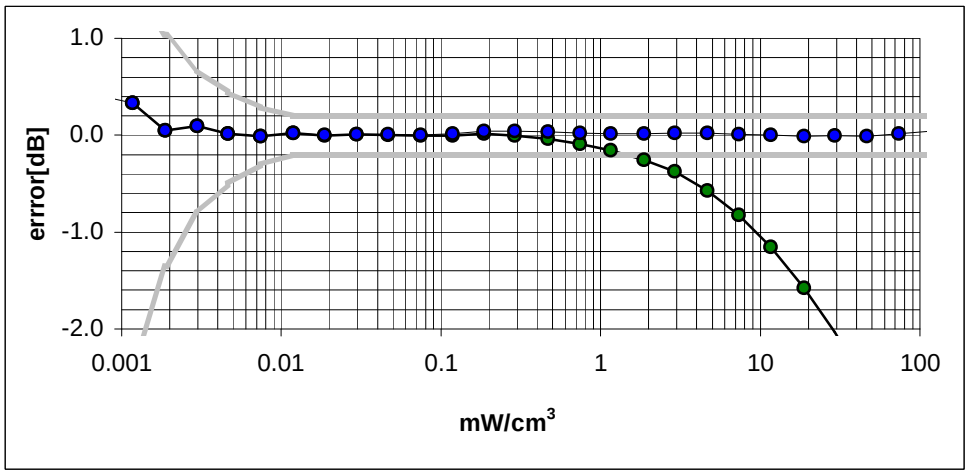
(TEM-Cell:ifi110, Waveguide R22)



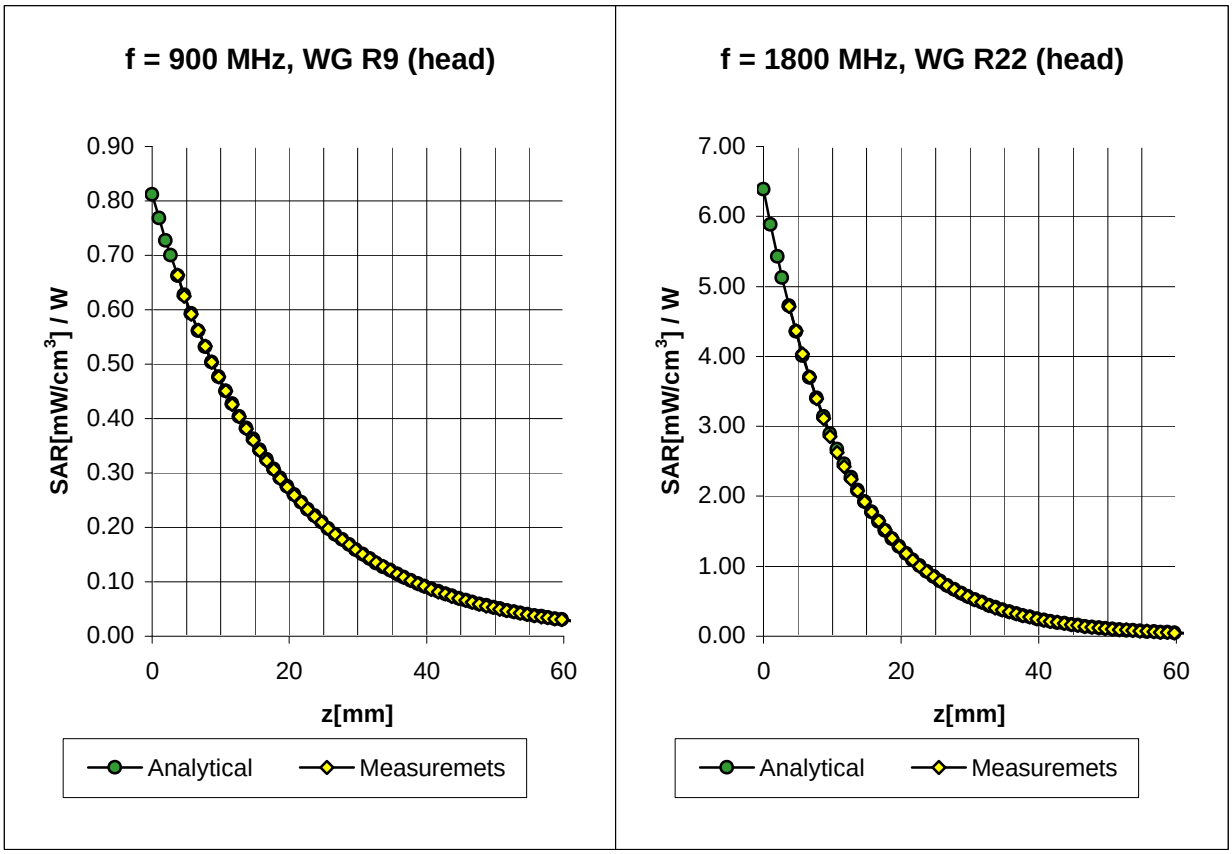
Dynamic Range f(SAR_{brain})

(TEM-Cell:ifi110)





Conversion Factor Assessment



Head **900 MHz** e_r **= 42 ± 5%** s **= 0.97 ± 10% mho/m**

ConvF X	**6.83** ± 7% (k=2)	Boundary effect:	
ConvF Y	**6.83** ± 7% (k=2)	Alpha	**0.37**
ConvF Z	**6.83** ± 7% (k=2)	Depth	**2.48**

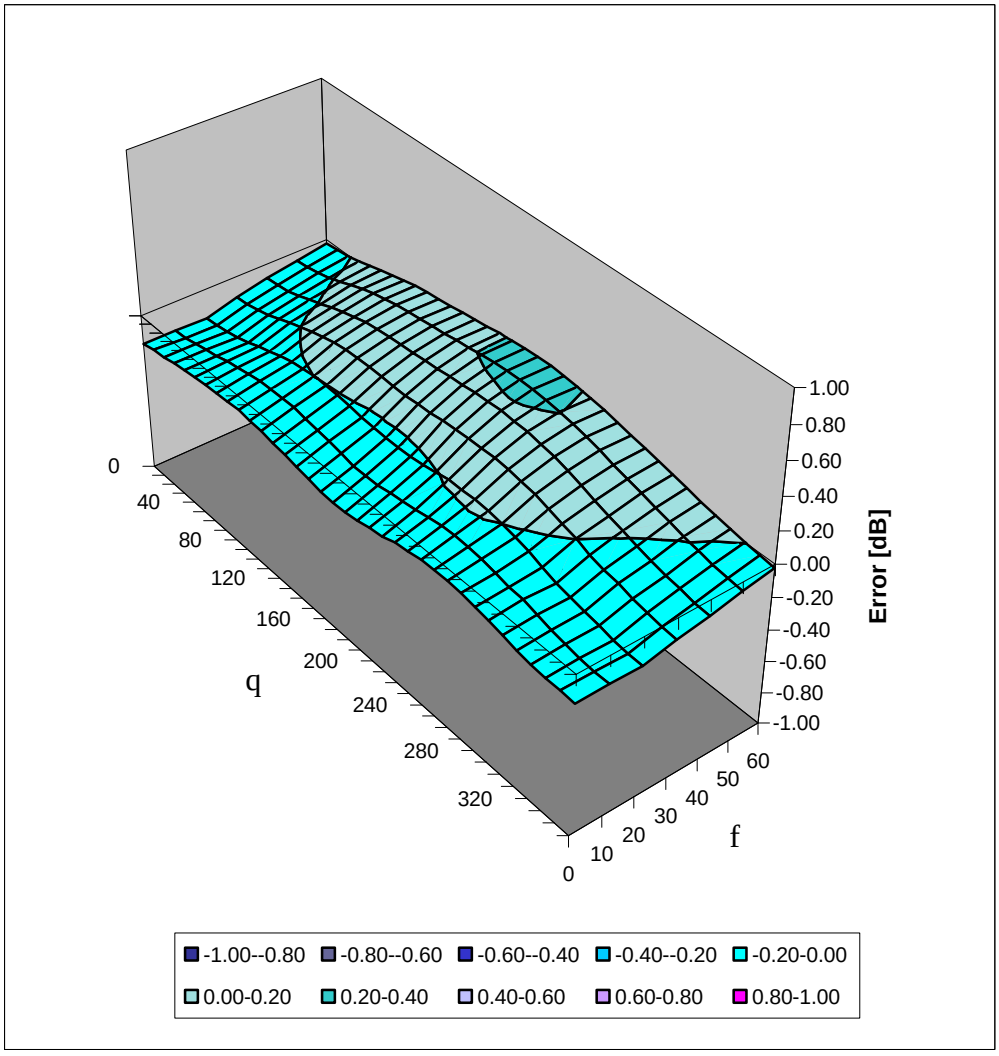
Head **1800 MHz** e_r **= 40 ± 5%** s **= 1.40 ± 10% mho/m**

ConvF X	**5.78** ± 7% (k=2)	Boundary effect:	
ConvF Y	**5.78** ± 7% (k=2)	Alpha	**0.53**
ConvF Z	**5.78** ± 7% (k=2)	Depth	**2.01**

ET3DV6 SN:1590

Deviation from Isotropy in HSL

Error (q,f), f = 900 MHz



APPENDIX D - SAR SENSITIVITIES

Application Note: SAR Sensitivities

Introduction

The measured SAR-values in homogeneous phantoms depend strongly on the electrical parameters of the liquid. Liquids with exactly matching parameters are difficult to produce; there is always a small error involved in the production or measurement of the liquid parameters. The following sensitivities allow the estimation of the influence of small parameter errors on the measured SAR values. The calculations are based on an approximation formula [1] for the SAR of an electrical dipole near the phantom surface and a adapted plane wave approximation for the penetration depth. The sensitivities are given in percent SAR change per percent change in the controlling parameter:

$$S(x) = \frac{d\,SAR / SAR}{d\,x / x}$$

The controlling parameters x are:

- ε : permitivity
- σ : conductivity
- ρ : brain density (= one over integration volume)

For example: If The liquid permitivity increases by 2 percent and the sensitivity of the SAR to permitivity is -0.6 then the SAR will decrease by 1.2 percent.

The sensitivities are given for surface SAR values and averaged SAR values for 1 g and 10 g cubes and for dipole distances d of 10mm (for frequencies below 1000 MHz) and 15mm (for frequencies above 1000 MHz) from the liquid surface.

Liquid parameters are as proposed in the new standards (e.g., IEEE 1528).

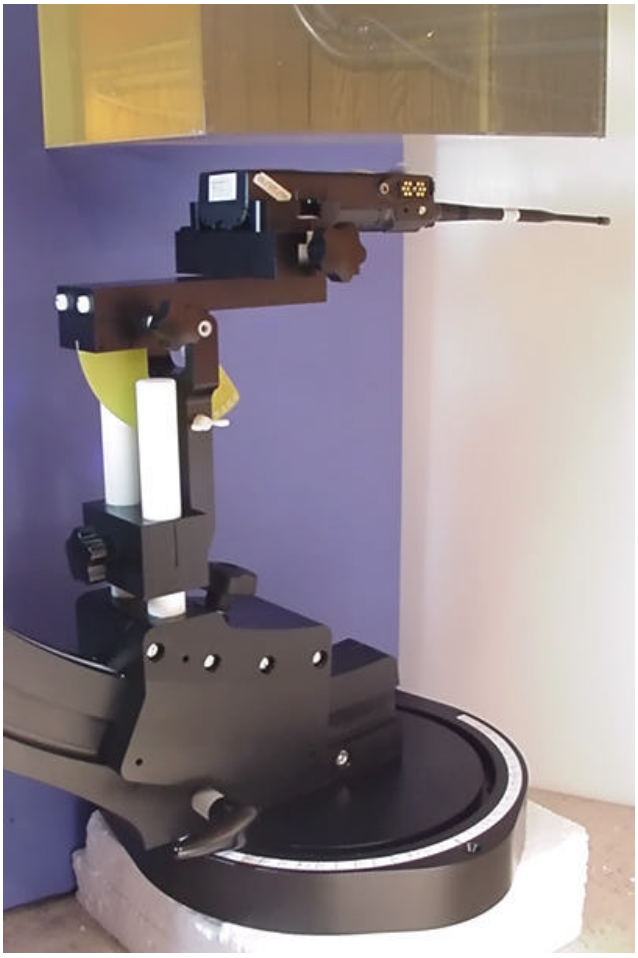
References

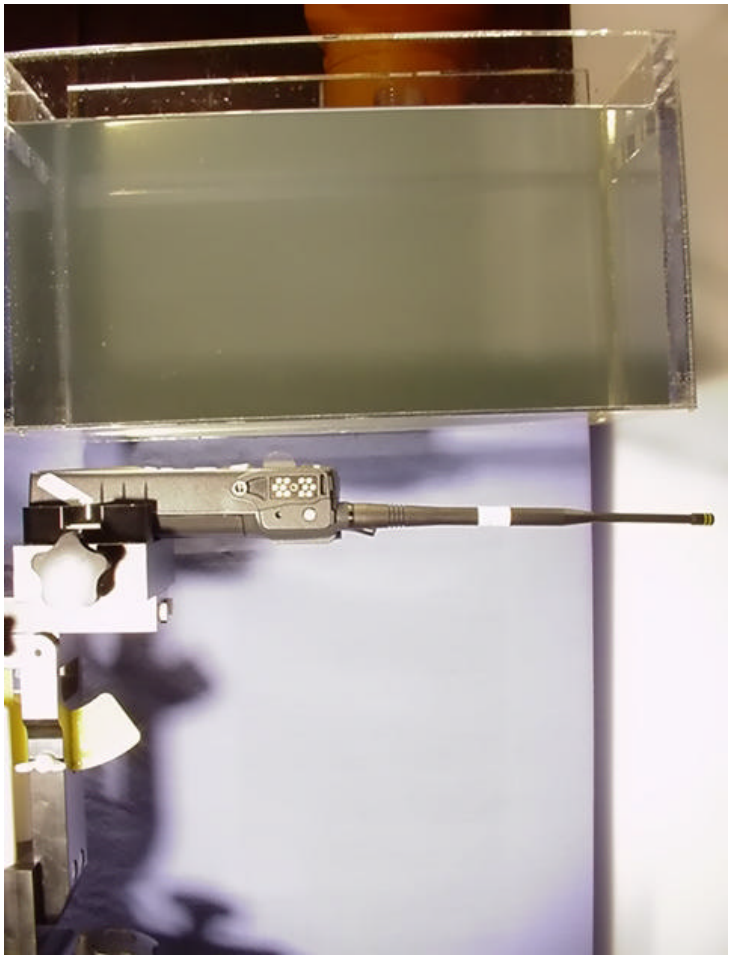
[1] N. Kuster and Q. Balzano, “Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz”, *IEEE Transacions on Vehicular Technology*, vol. 41(1), pp. 17-23, 1992.

Parameter	ε	σ	ρ
f=300 MHz (εr=45.3, σ=0.87S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.41	+ 0.48	—
1 g	- 0.33	+ 0.28	0.08
10 g	- 0.26	+ 0.09	0.16
f=450 MHz (εr=43.5, σ=0.87S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.56	+ 0.67	—
1 g	- 0.46	+ 0.43	0.09
10 g	- 0.37	+ 0.22	0.17
f=835 MHz (εr=41.5, σ=0.90S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.70	+ 0.86	—
1 g	- 0.57	+ 0.59	0.10
10 g	- 0.45	+ 0.35	0.18
f=900 MHz (εr=41.5, σ=0.97S/m, ρ=1g/cm³)			
d=15mm: Surface	- 0.69	+ 0.86	—
1 g	- 0.55	+ 0.57	0.10
10 g	- 0.44	+ 0.32	0.19
f=1450 MHz (εr=40.5, σ=1.20/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.91	—
1 g	- 0.55	+ 0.55	0.12
10 g	- 0.42	+ 0.27	0.22
f=1800 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.92	—
1 g	- 0.52	+ 0.51	0.14
10 g	- 0.38	+ 0.21	0.24
f=1900 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.73	+ 0.93	—
1 g	- 0.53	+ 0.51	0.14
10 g	- 0.39	+ 0.22	0.24
f=2000 MHz (εr=40.0, σ=1.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.74	+ 0.94	—
1 g	- 0.53	+ 0.52	0.14
10 g	- 0.39	+ 0.22	0.24
f=2450 MHz (εr=39.2, σ=1.80S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.74	+ 0.93	—
1 g	- 0.49	+ 0.41	0.17
10 g	- 0.34	+ 0.12	0.28
f=3000 MHz (εr=38.5, σ=2.40S/m, ρ=1g/cm³)			
d=10mm: Surface	- 0.75	+ 0.90	—
1 g	- 0.45	+ 0.28	0.21
10 g	- 0.32	+ 0.02	0.31

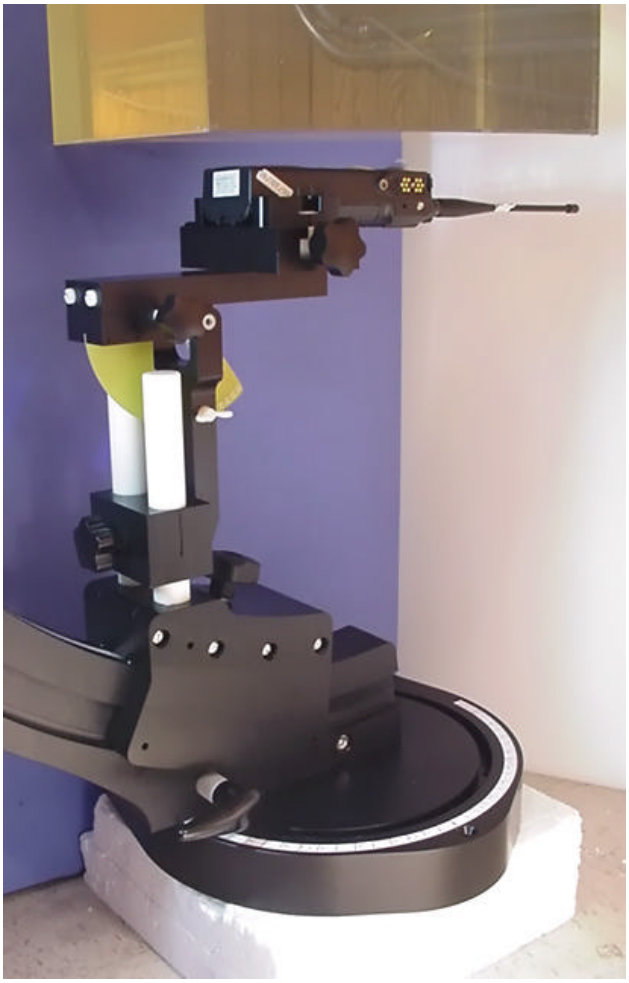
APPENDIX E - SAR TEST SETUP PHOTOGRAPHS

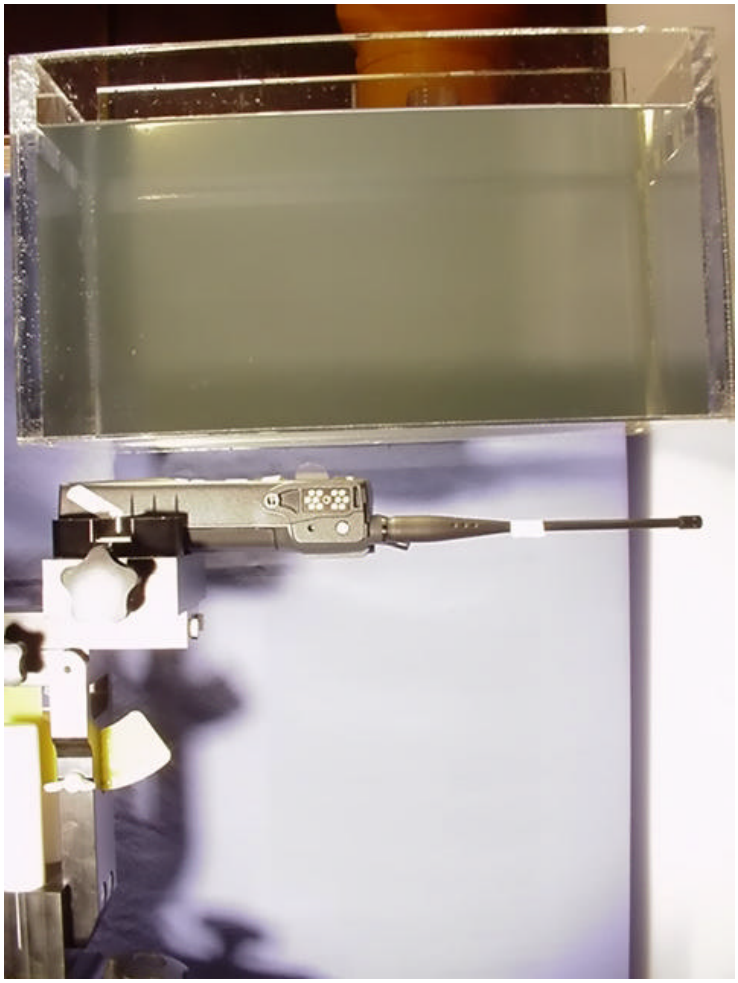
FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Elevated Feed Gain Antenna (KRE1011216/01)
2.5cm Separation Distance



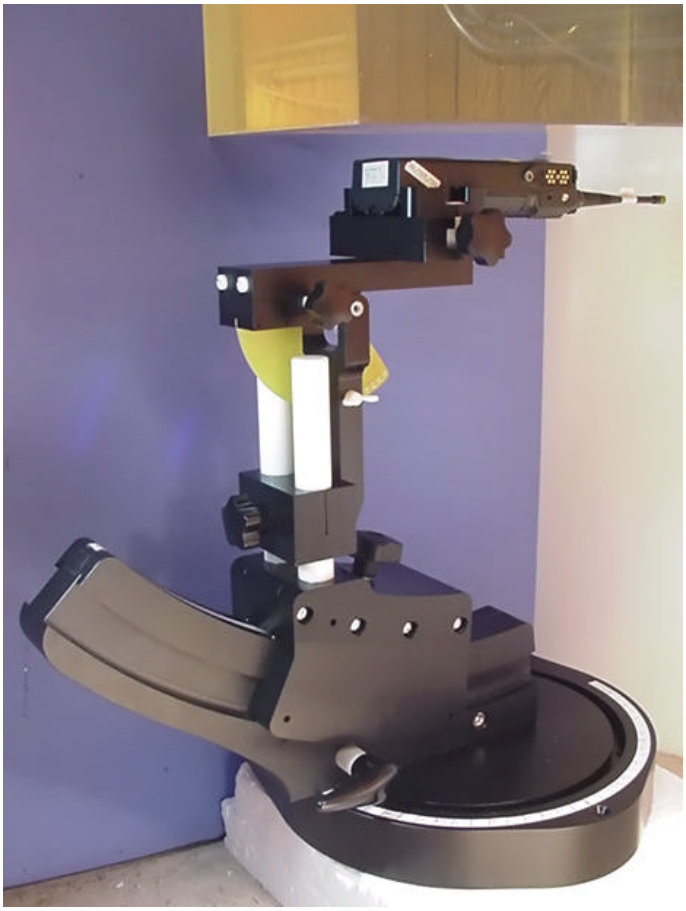


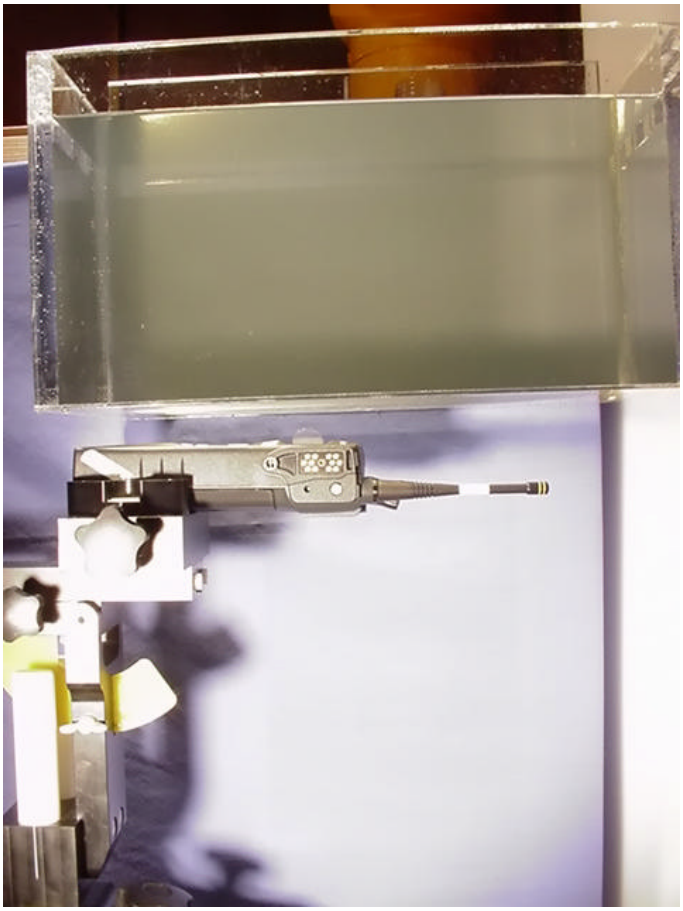
FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Flexible Gain Antenna (KRE1011506/01)
2.5cm Separation Distance



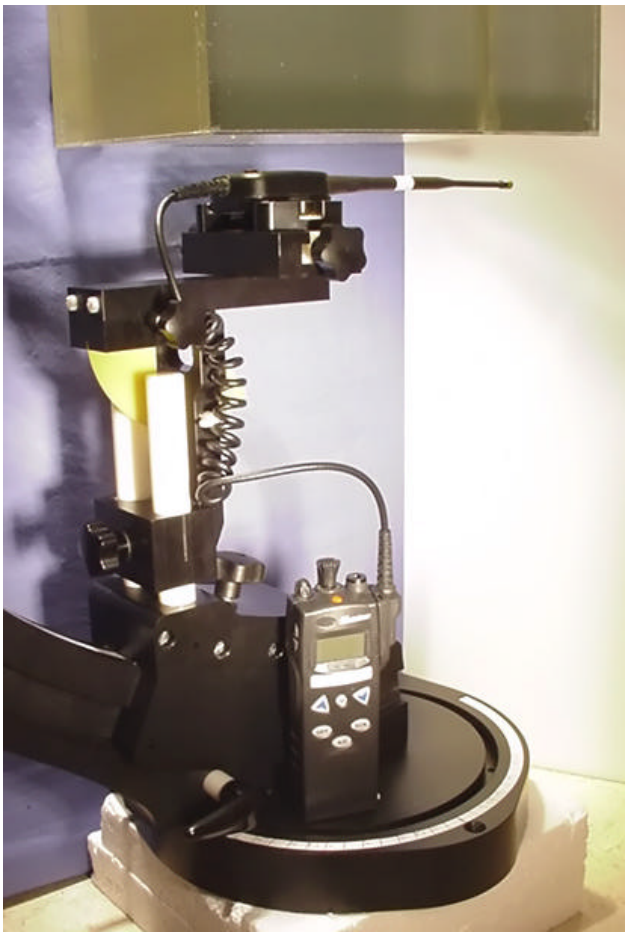


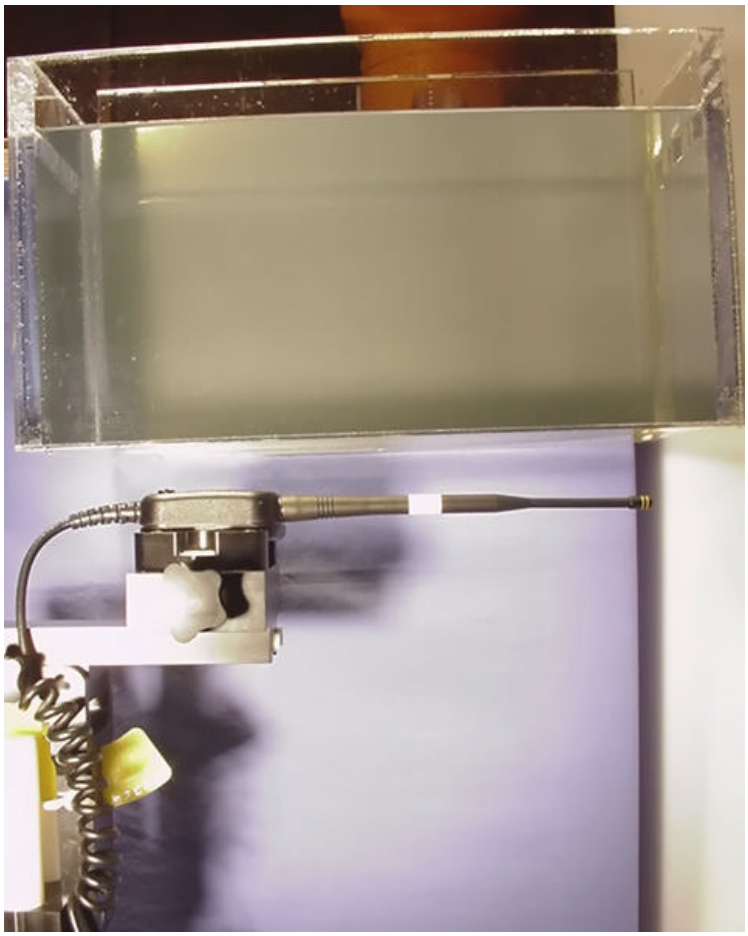
FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Whip Antenna (KRE1011223/01)
2.5cm Separation Distance



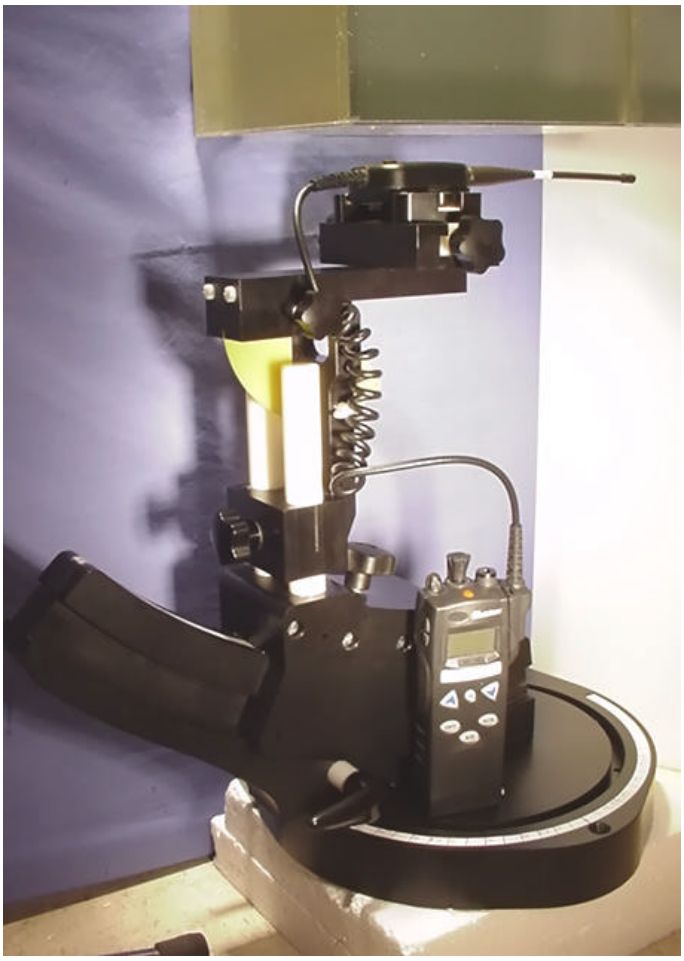


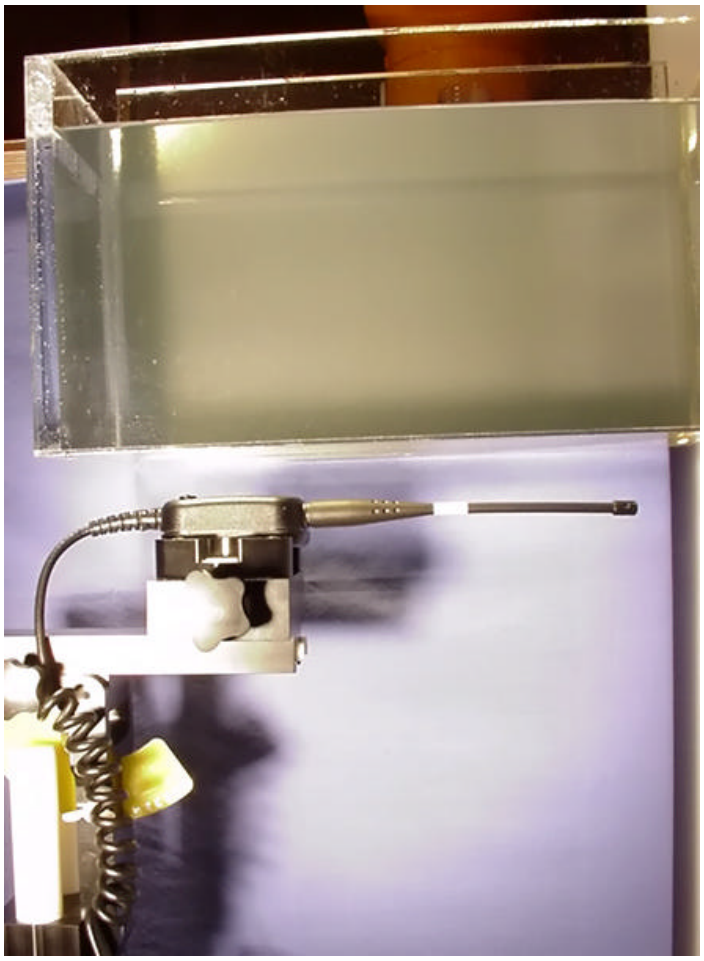
FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Speaker Microphone Antenna Version Plus (OT-V2-10120)
Elevated Feed Gain Antenna (KRE1011216/01)
2.5cm Separation Distance



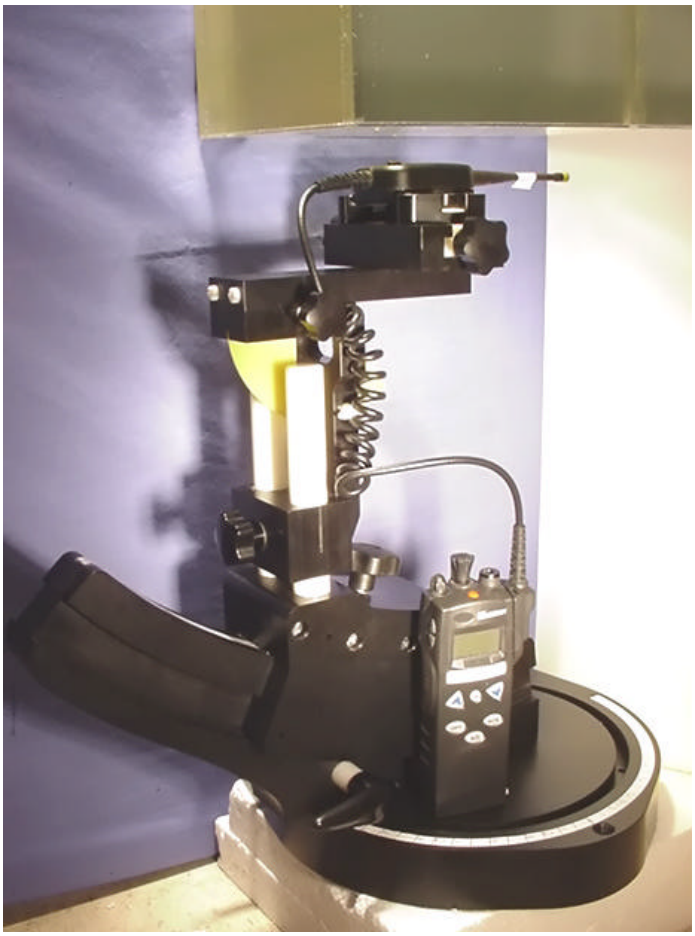


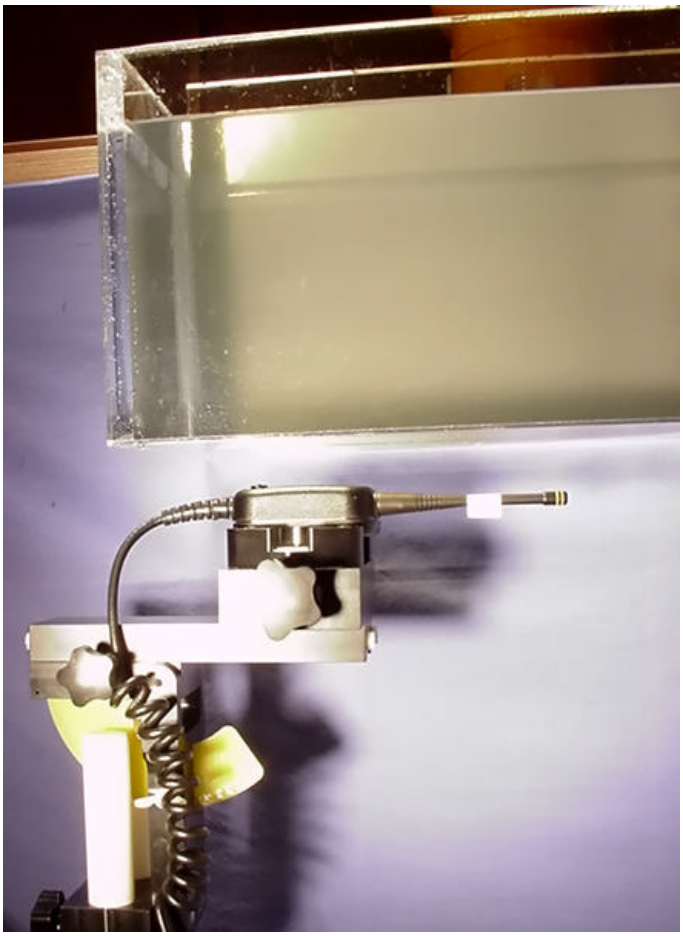
FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Speaker Microphone Antenna Version Plus (OT-V2-10120)
Flexible Gain Antenna (KRE1011506/01)
2.5cm Separation Distance



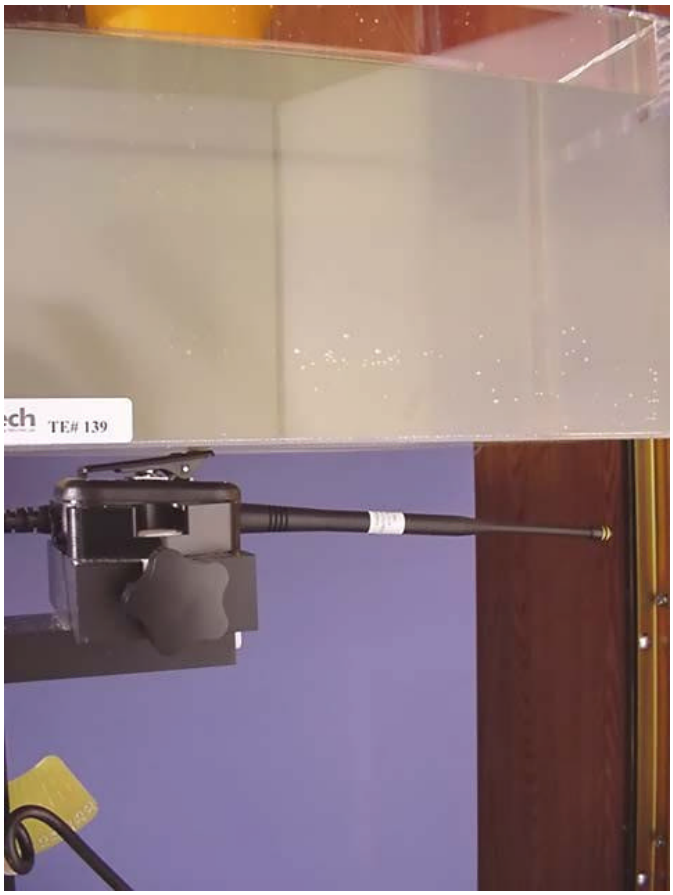


FACE-HELD SAR TEST SETUP PHOTOGRAPHS
Speaker Microphone Antenna Version Plus (OT-V2-10120)
Whip Antenna (KRE1011223/01)
2.5cm Separation Distance

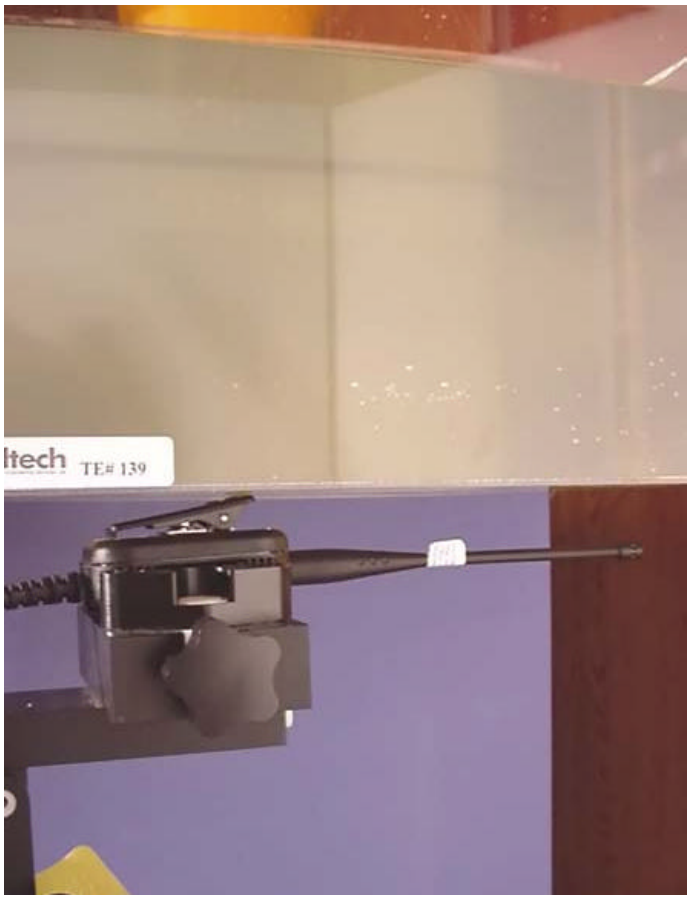




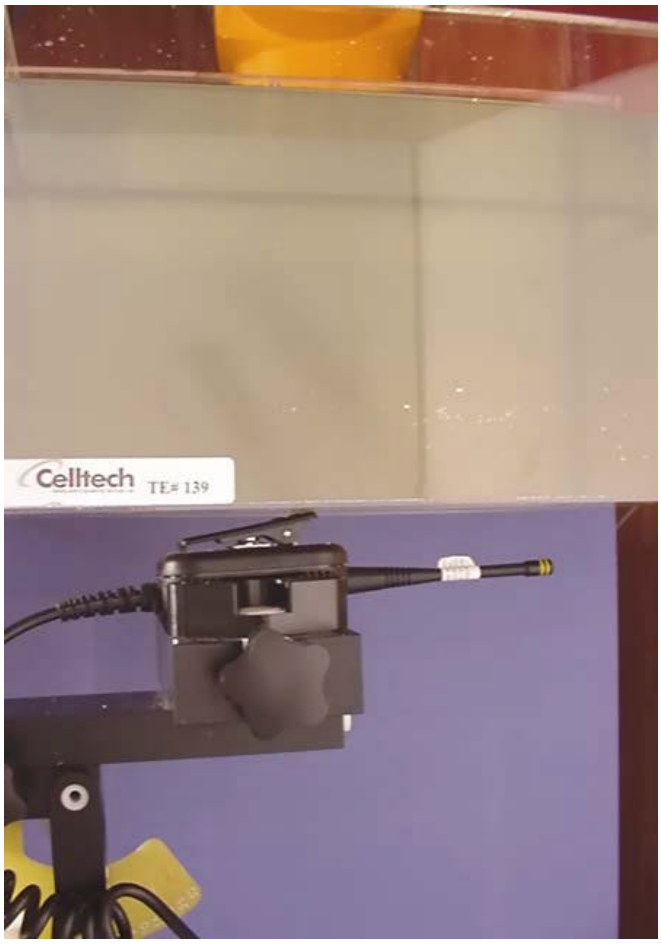
BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Speaker Microphone Antenna Version Plus (OT-V2-10120)
Elevated Feed Gain Antenna (KRE1011216/01)
1.4cm Metal Clip Separation Distance



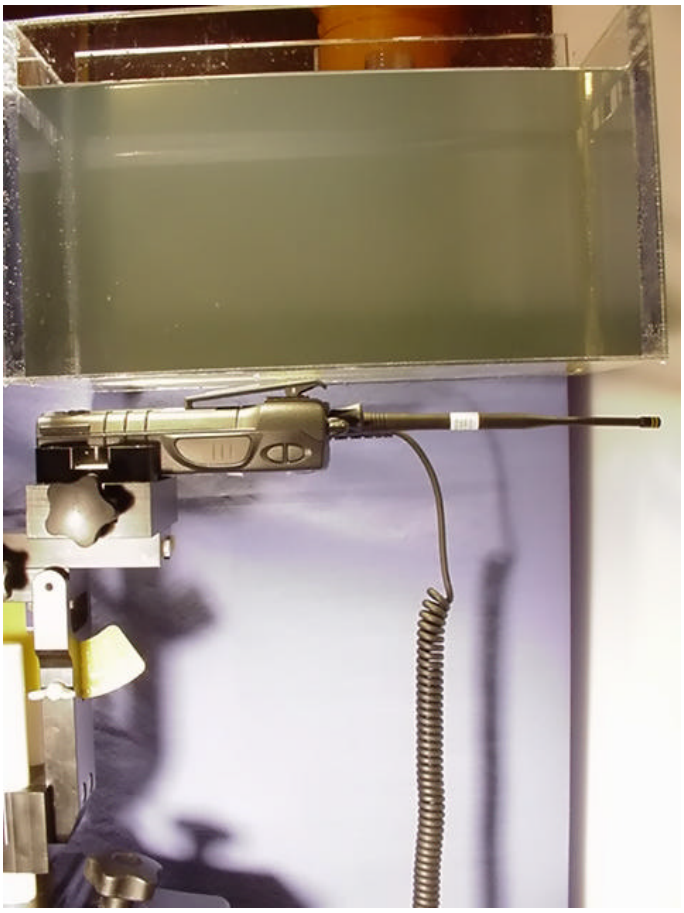
BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Speaker Microphone Antenna Version Plus (OT-V2-10120)
Flexible Gain Antenna (KRE1011506/01)
1.4cm Metal Clip Separation Distance



BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Speaker Microphone Antenna Version Plus (OT-V2-10120)
Whip Antenna (KRE1011223/01)
1.4cm Metal Clip Separation Distance

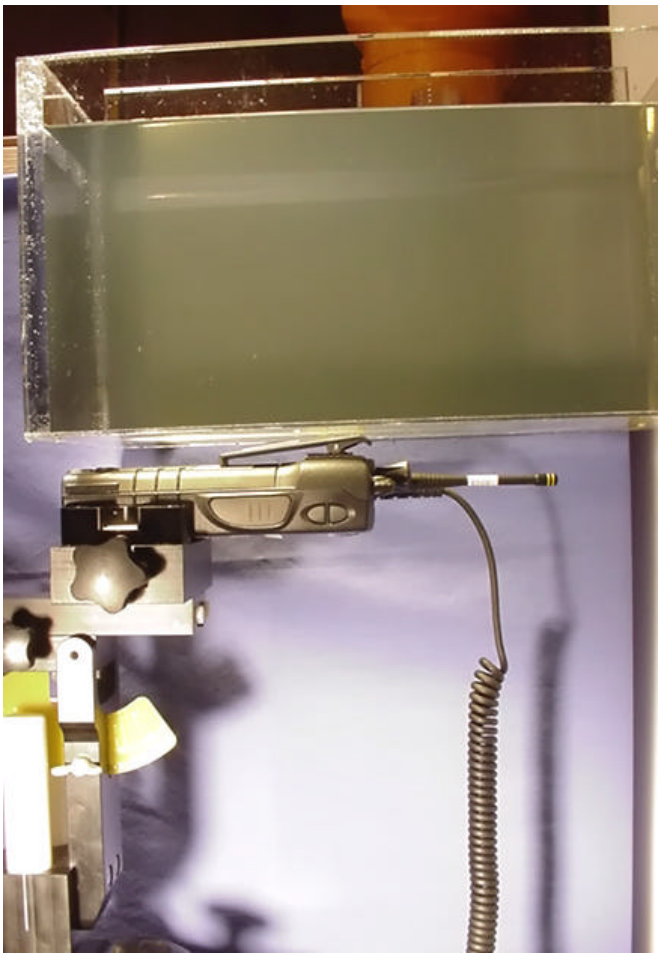


BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Elevated Feed Gain Antenna (KRE1011216/01)
Metal Belt-Clip (KRY1011647/1)
1.1cm Separation Distance

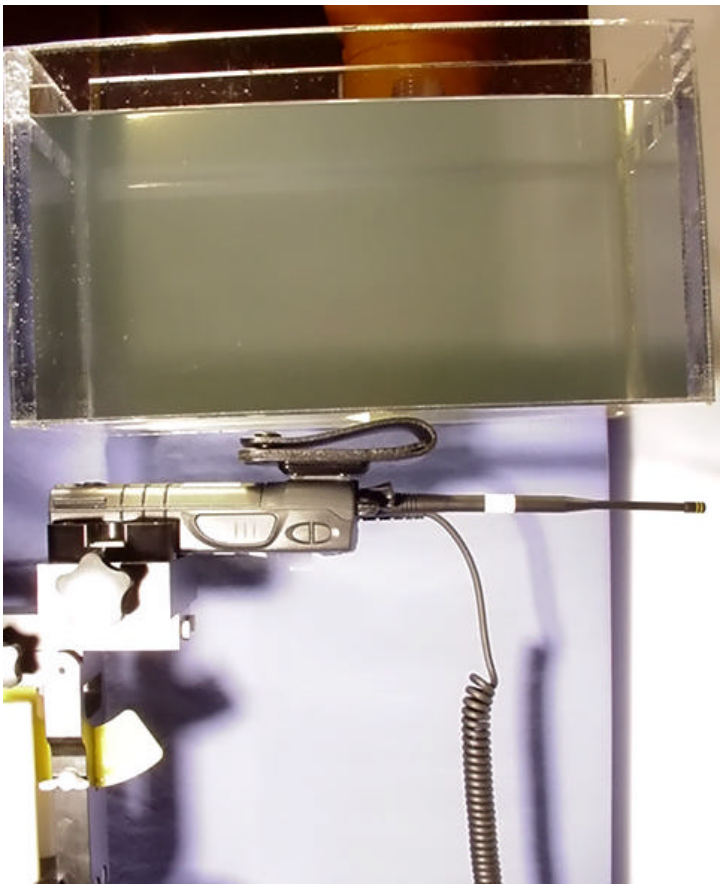


BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Flexible Gain Antenna (KRE1011506/01)
Metal Belt-Clip (KRY1011647/1)
1.1cm Separation Distance

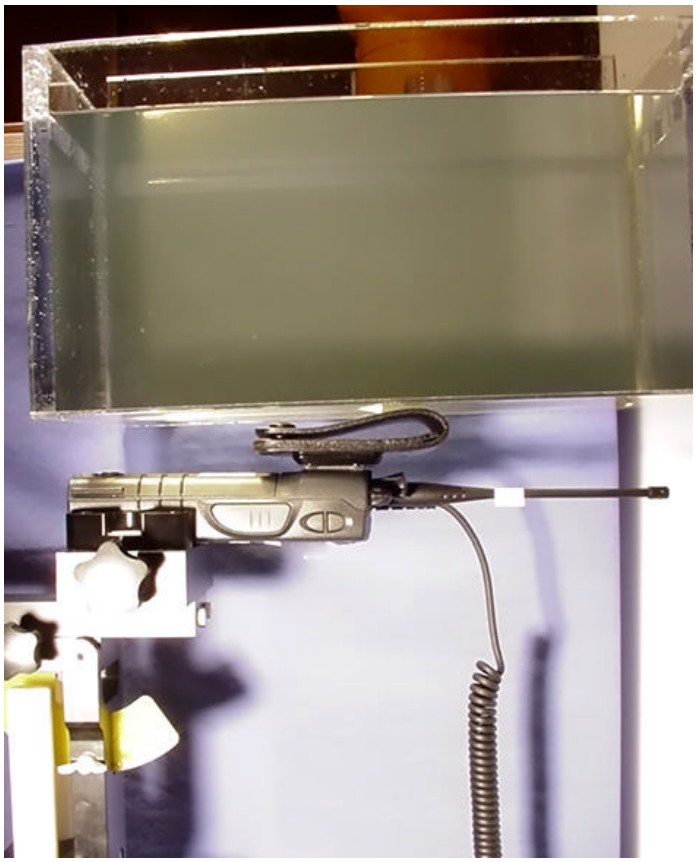
BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Whip Antenna (KRE1011223/01)
Metal Belt-Clip (KRY1011647/1)
1.1cm Separation Distance



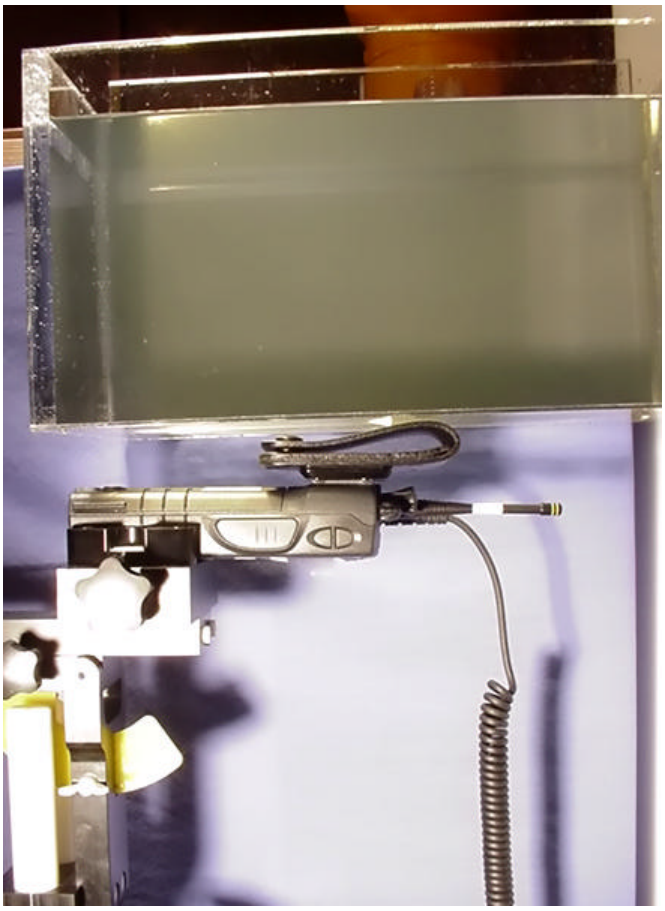
BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Elevated Feed Gain Antenna (KRE1011216/01)
Belt-Loop (19B226627G2) & Swivel Socket (19B233243G3)
3.3cm Separation Distance



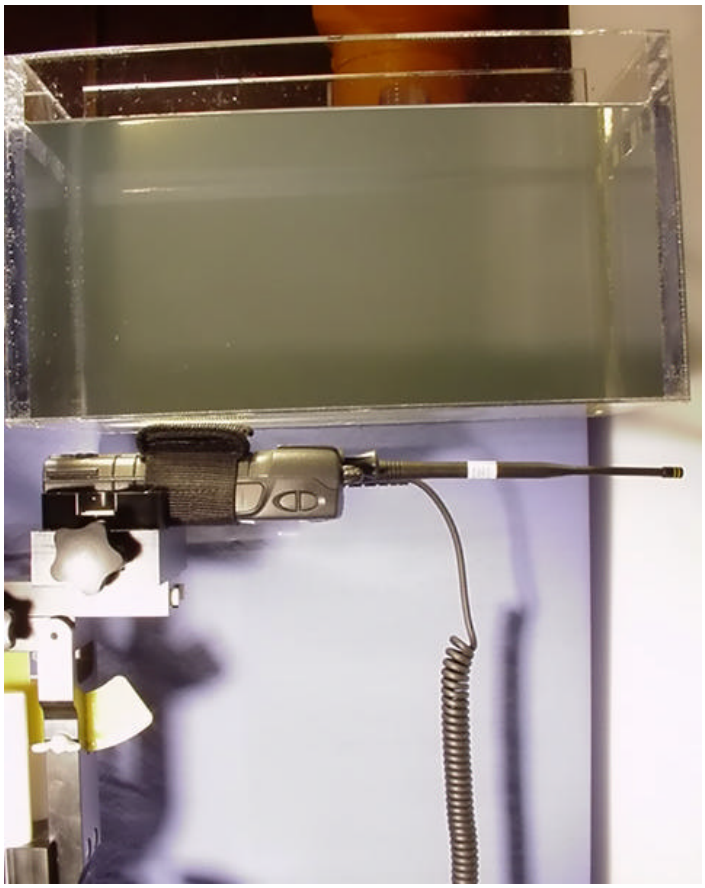
BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Flexible Gain Antenna (KRE1011506/01)
Belt-Loop (19B226627G2) & Swivel Socket (19B233243G3)
3.3cm Separation Distance



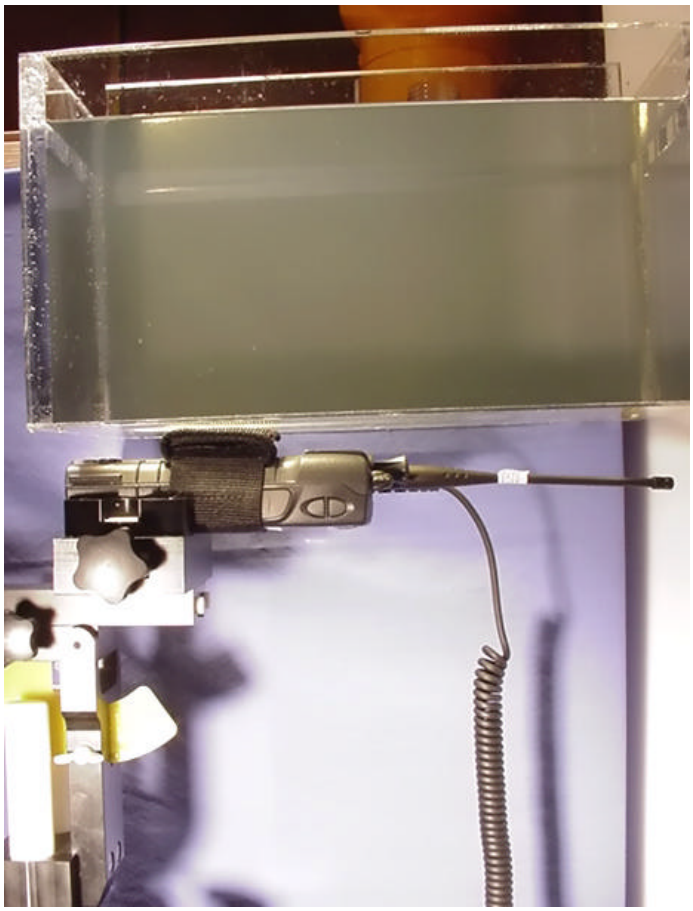
BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Whip Antenna (KRE1011223/01)
Belt-Loop (19B226627G2) & Swivel Socket (19B233243G3)
3.3cm Separation Distance



BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Elevated Feed Gain Antenna (KRE1011216/01)
T-Strap (KRY1011656/1)
1.6cm Separation Distance



BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Flexible Gain Antenna (KRE1011506/01)
T-Strap (KRY1011656/1)
1.6cm Separation Distance



BODY-WORN SAR TEST SETUP PHOTOGRAPHS
Whip Antenna (KRE1011223/01)
T-Strap (KRY1011656/1)
1.6cm Separation Distance

APPENDIX F - EUT PHOTOGRAPHS

EUT PHOTOGRAPHS

with Elevated Feed Gain Antenna (KRE1011216/01)

with Flexible Gain Antenna (KRE1011506/01)

with Whip Antenna (KRE1011223/01)

EUT PHOTOGRAPHS

Left Side of EUT

Back of EUT

Right Side of EUT

EUT WITH METAL BELT-CLIP (KRY1011647/1)

EUT WITH BELT-LOOP (19B226627G2) & SWIVEL SOCKET (19B233243G3)

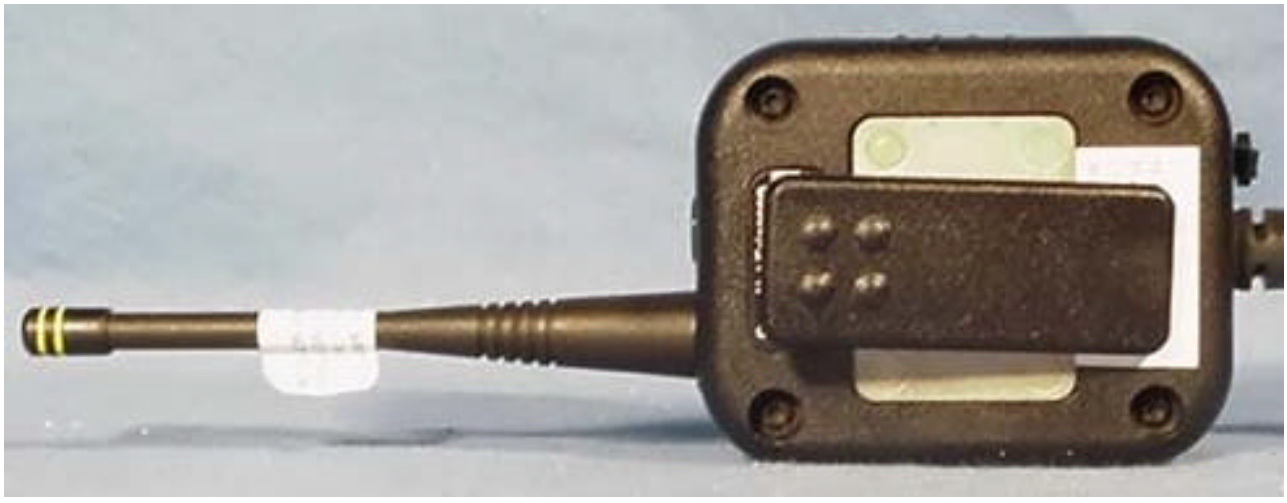
EUT WITH T-STRAP (KRY1011656/1)

EUT WITH ANTENNA VERSION PLUS SPEAKER MICROPHONE (OT-V2-10120)

ANTENNA VERSION PLUS SPEAKER MICROPHONE & BELT-CLIP (OT-V2-10120)

With Elevated Feed Gain Antenna (KRE1011216/01)

With Flexible Gain Antenna (KRE1011506/01)



With Whip Antenna (KRE1011223/01)