



In Collaboration with

s p e a g
CALIBRATION LABORATORY

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DASY/EASY – Parameters of Probe: EX3DV4 – SN:3923

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz] ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unct. (k=2)
750	41.9	0.89	10.67	10.67	10.67	0.40	0.75	± 12.1%
835	41.5	0.90	10.35	10.35	10.35	0.17	1.16	± 12.1%
1750	40.1	1.37	8.90	8.90	8.90	0.22	1.13	± 12.1%
1900	40.0	1.40	8.55	8.55	8.55	0.24	1.09	± 12.1%
2300	39.5	1.67	8.29	8.29	8.29	0.50	0.69	± 12.1%
2450	39.2	1.80	7.95	7.95	7.95	0.55	0.69	± 12.1%
2600	39.0	1.96	7.70	7.70	7.70	0.37	0.89	± 12.1%
3300	38.2	2.71	7.36	7.36	7.36	0.42	0.91	± 13.3%
3500	37.9	2.91	7.03	7.03	7.03	0.40	0.98	± 13.3%
3700	37.7	3.12	6.73	6.73	6.73	0.41	1.00	± 13.3%
3900	37.5	3.32	6.75	6.75	6.75	0.35	1.41	± 13.3%
4100	37.2	3.53	6.70	6.70	6.70	0.40	1.15	± 13.3%
4400	36.9	3.84	6.47	6.47	6.47	0.30	1.50	± 13.3%
4600	36.7	4.04	6.30	6.30	6.30	0.40	1.35	± 13.3%
4800	36.4	4.25	6.22	6.22	6.22	0.40	1.45	± 13.3%
4950	36.3	4.40	5.90	5.90	5.90	0.40	1.45	± 13.3%
5250	35.9	4.71	5.45	5.45	5.45	0.40	1.70	± 13.3%
5600	35.5	5.07	4.92	4.92	4.92	0.50	1.30	± 13.3%
5750	35.4	5.22	4.91	4.91	4.91	0.50	1.47	± 13.3%

^C Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

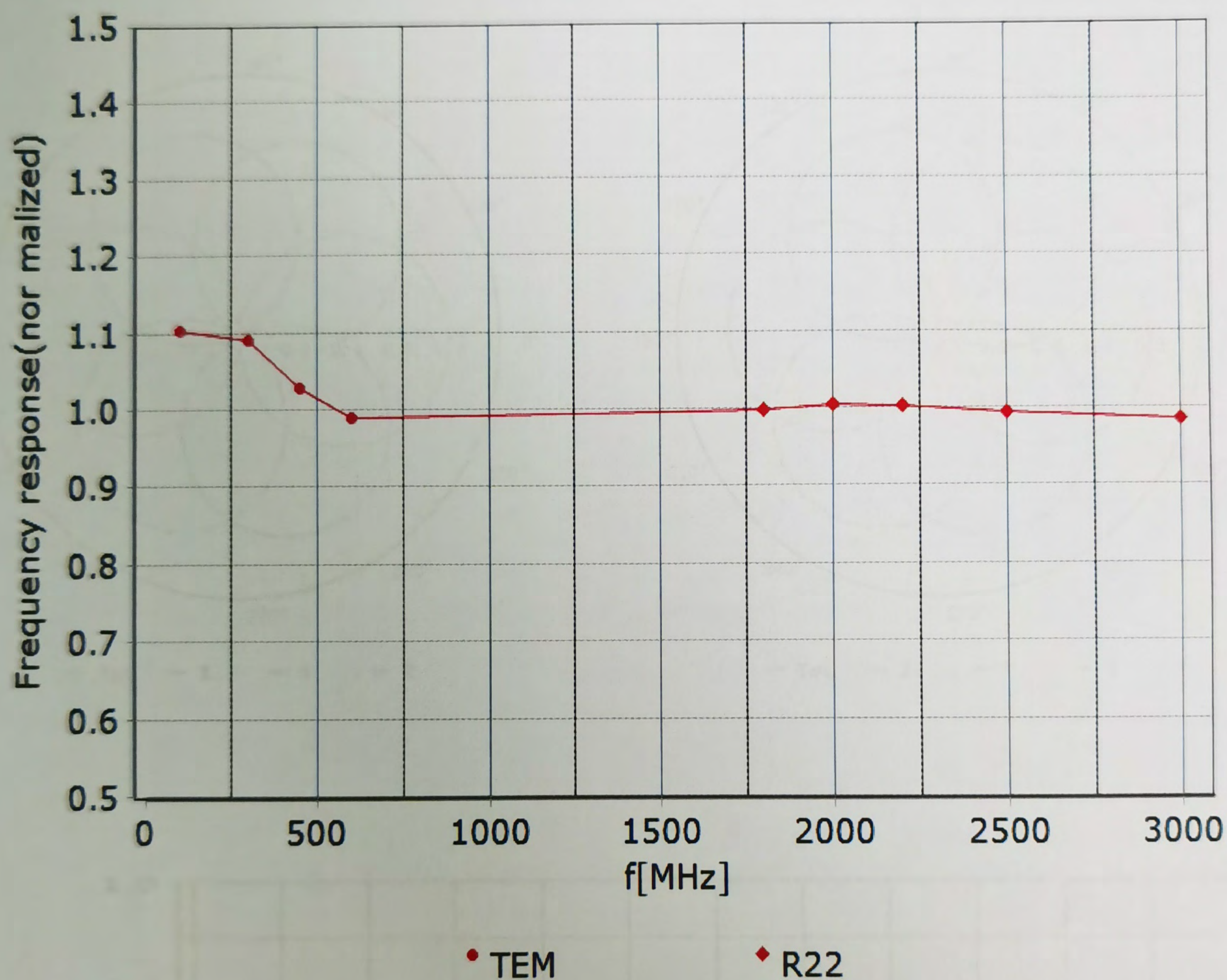
^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.



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Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: $\pm 7.4\%$ ($k=2$)



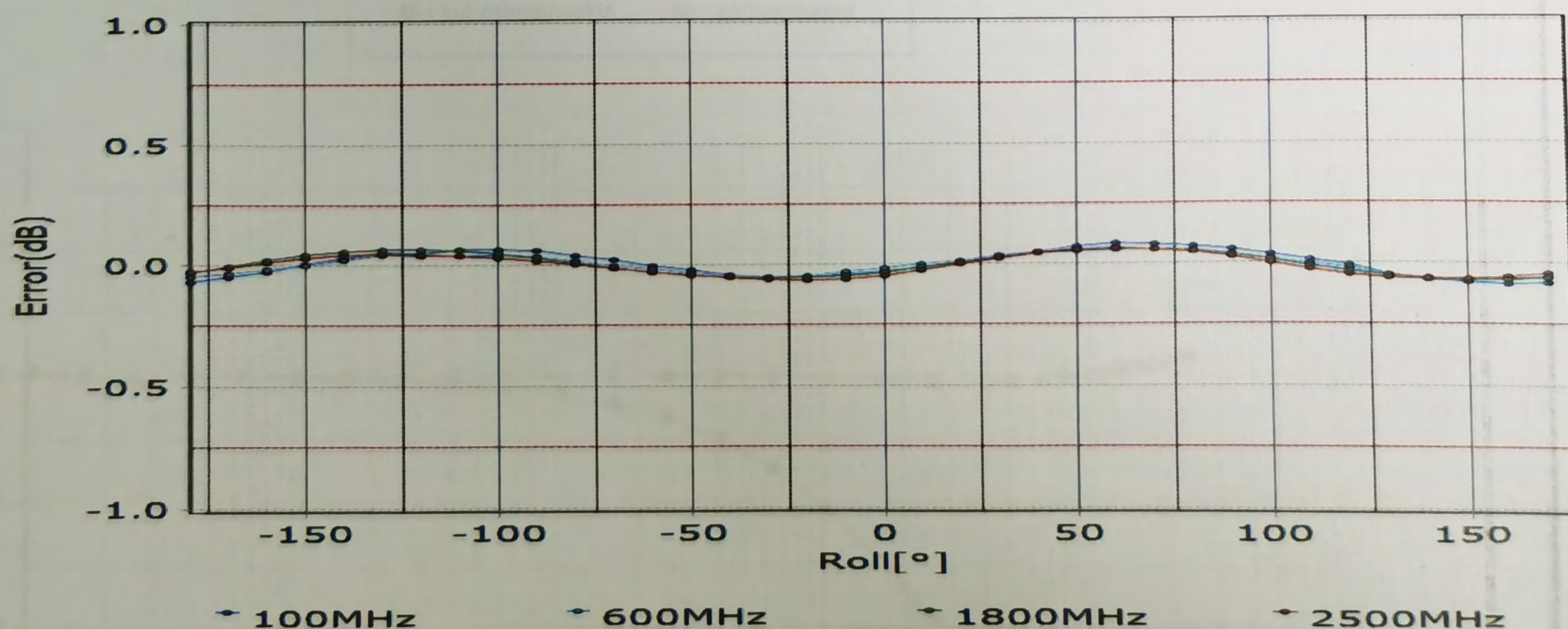
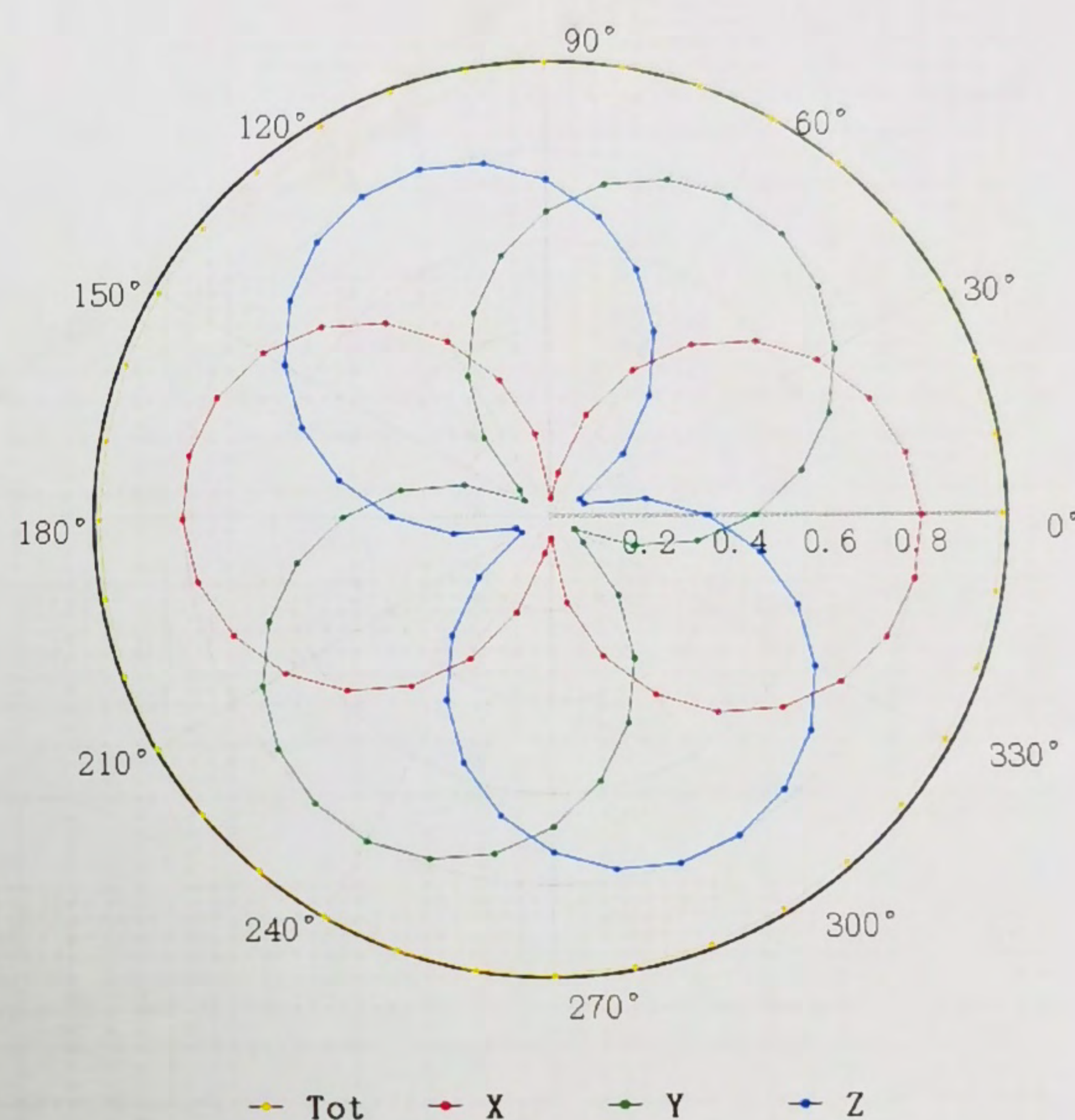
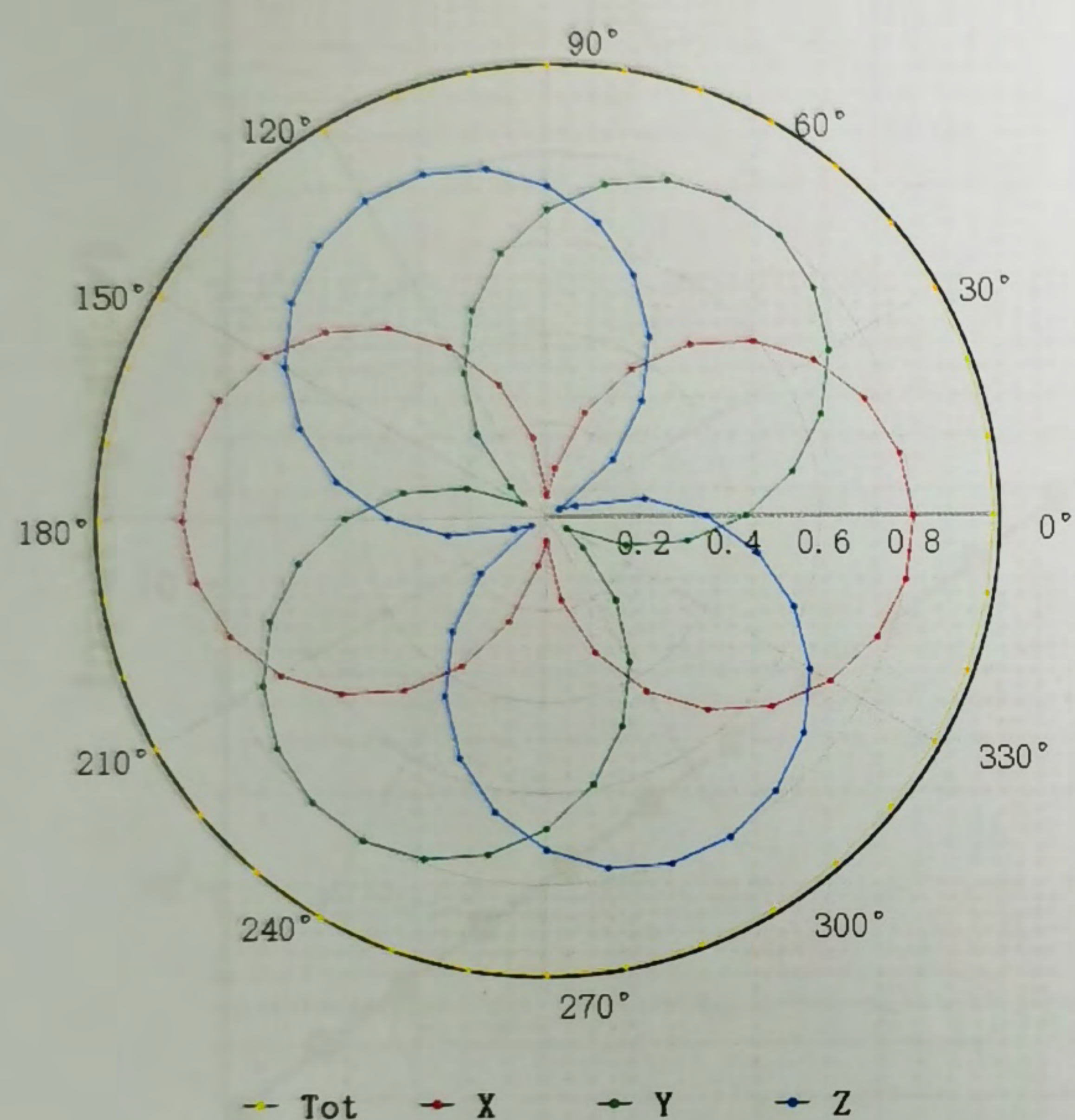
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Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22



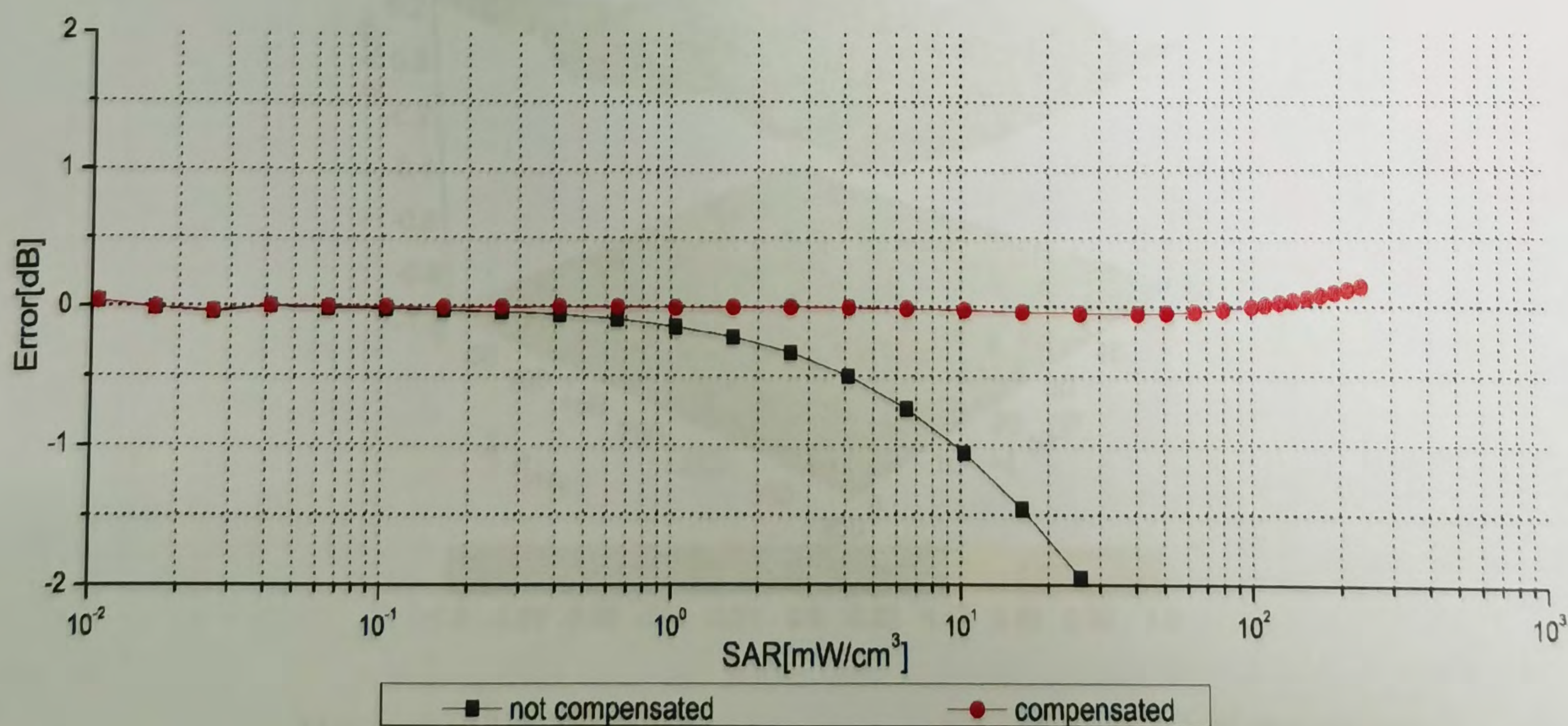
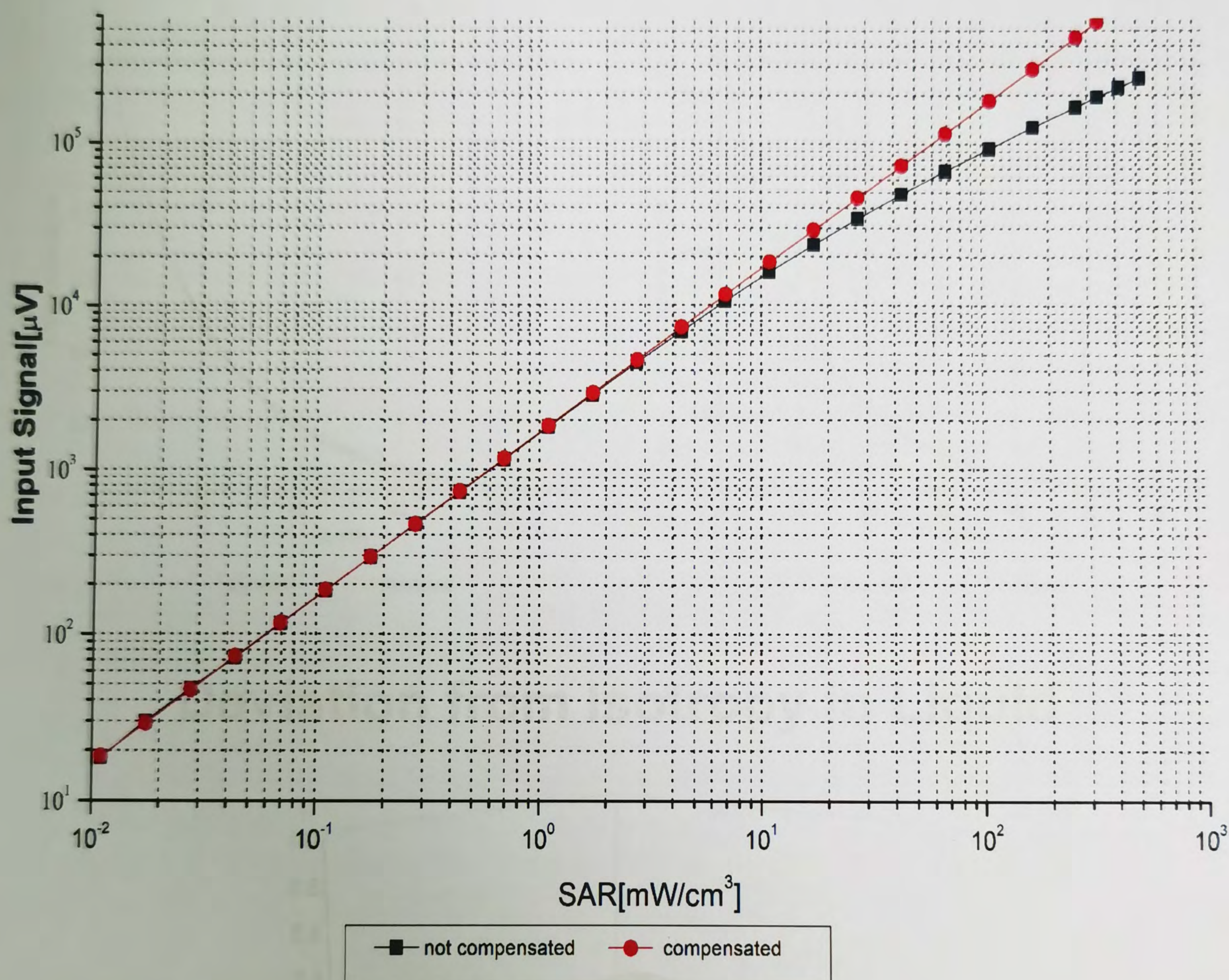
Uncertainty of Axial Isotropy Assessment: $\pm 1.2\%$ ($k=2$)



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Dynamic Range f(SAR_{head}) (TEM cell, f = 900 MHz)



Uncertainty of Linearity Assessment: $\pm 0.9\%$ ($k=2$)



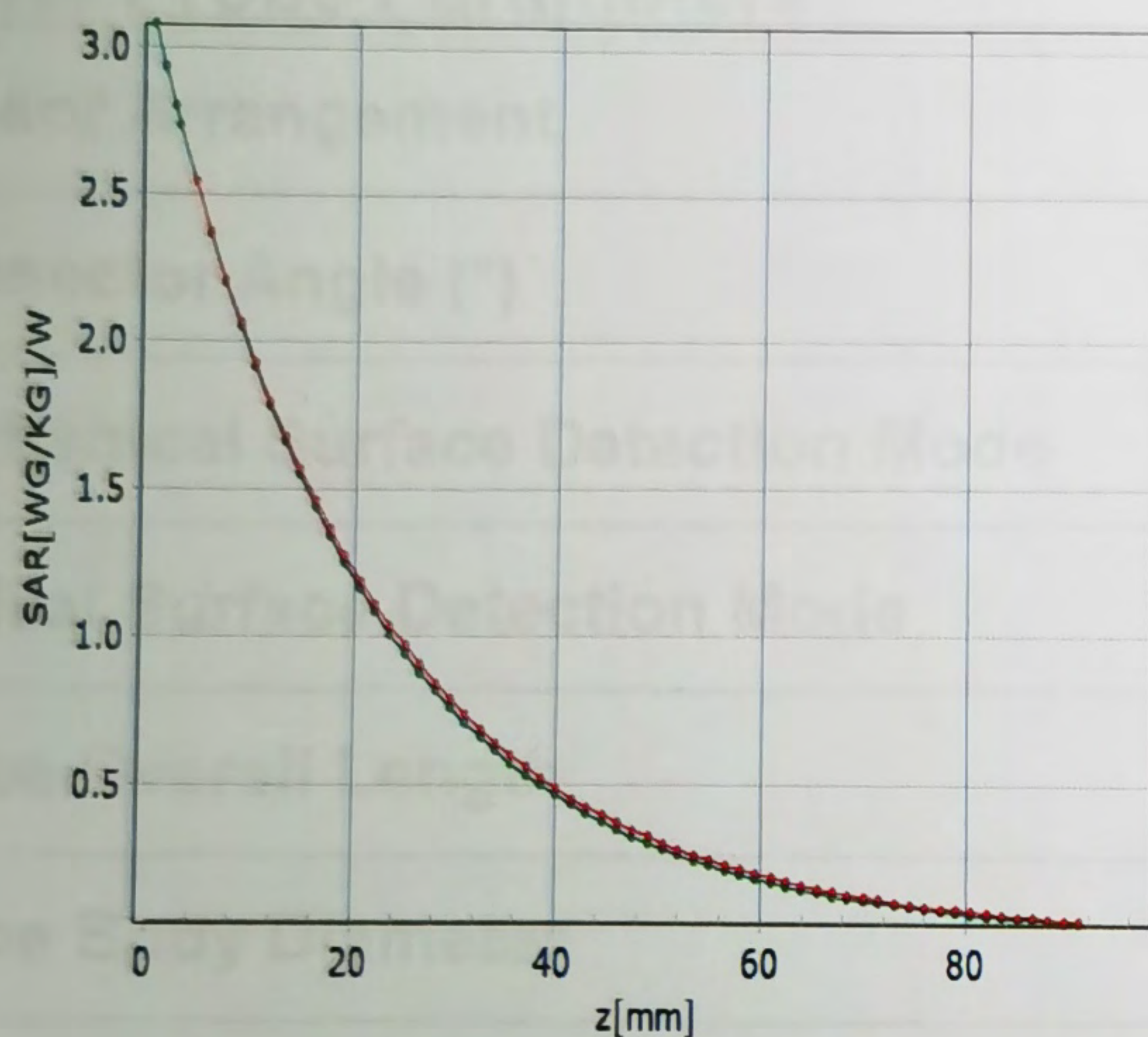
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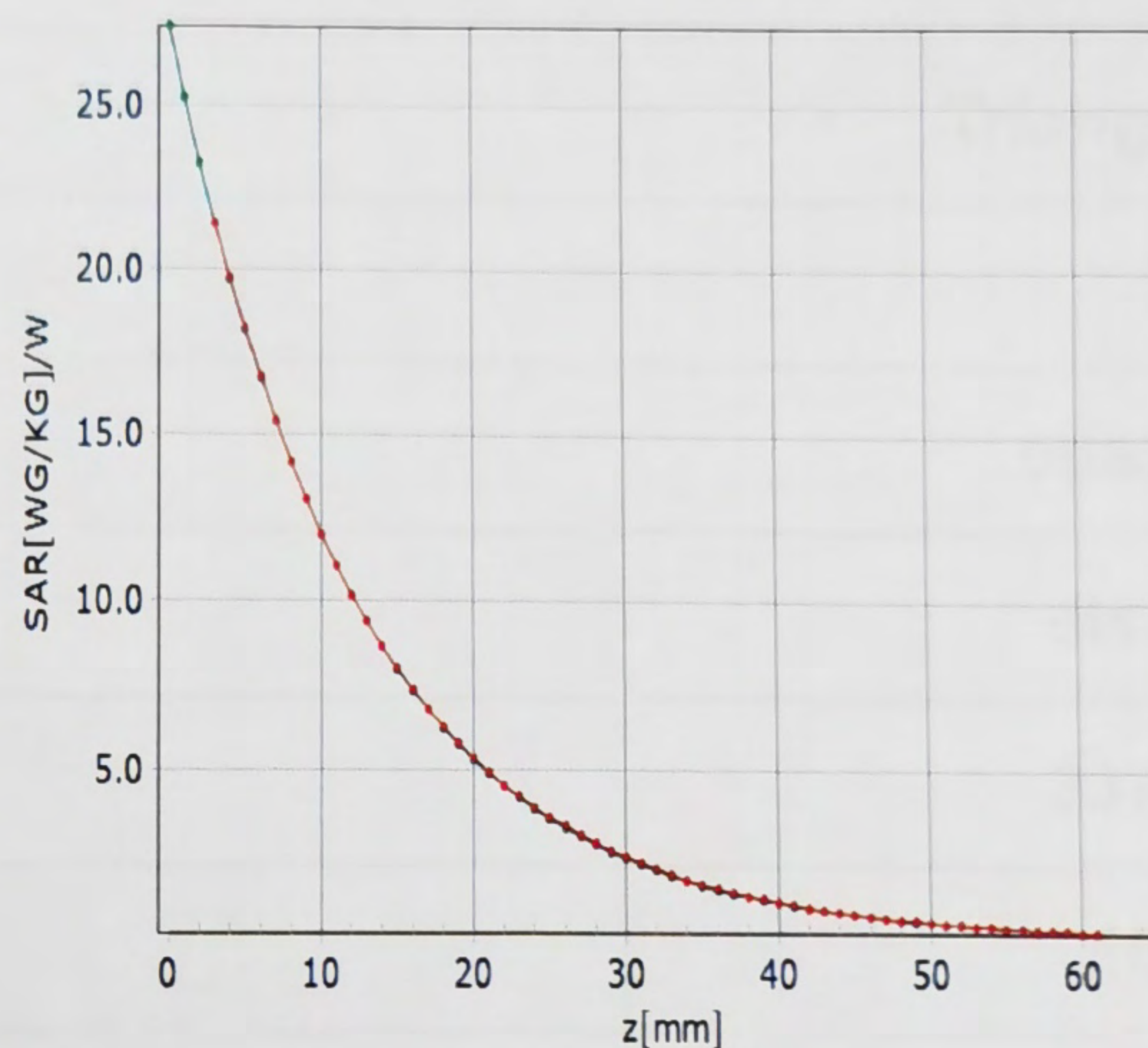
Conversion Factor Assessment

f=750 MHz, WGLS R9(H_convF)

f=1750 MHz, WGLS R22(H_convF)

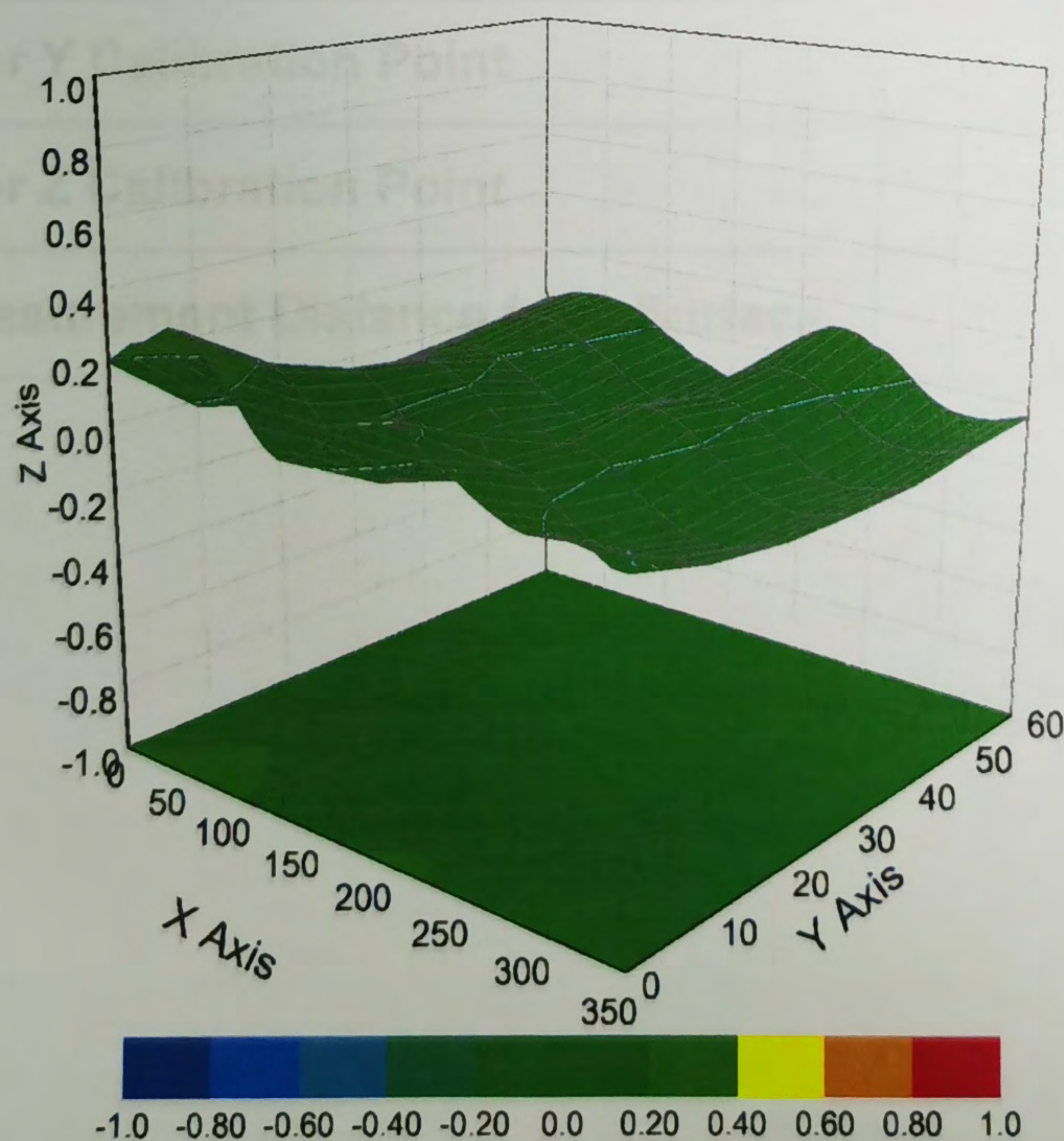


* analytical * measured



* analytical * measured

Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 3.2\%$ ($k=2$)



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Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	25.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	2.5mm
Probe Tip to Sensor X Calibration Point	1mm
Probe Tip to Sensor Y Calibration Point	1mm
Probe Tip to Sensor Z Calibration Point	1mm
Recommended Measurement Distance from Surface	1.4mm

Dipole D750V3 SN 1160				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-05-22	-29.1	/	51.8	/
2020-05-21	-29.4	1.03%	52.2	0.4 Ω

Dipole D835V2 SN 4d105				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-12-17	-26.0	/	49.5	/
2020-12-16	-27.0	3.85%	51.4	1.9 Ω

Dipole D1750V2 SN 1149				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-05-21	-31.8	/	47.6	/
2020-05-20	-32.3	1.57%	48.9	1.3 Ω

Dipole D1900V2 SN 5d028				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-12-17	-22.2	/	51.2	/
2020-12-16	-23.0	3.60%	53.3	2.1 Ω

Dipole D2450V2 SN 733				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-12-17	-27.2	/	52.2	/
2020-12-16	-27.8	2.21%	53.4	1.2 Ω

Dipole D2600V2 SN 1125				
Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-05-20	-25.7	/	48.9	/
2020-05-19	-26.6	3.50%	50.8	1.9 Ω

Dipole D5GHzV2 SN 1165				
5250MHz Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-12-20	-25.5	/	45.2	/
2020-12-19	-26.3	3.14%	47.1	1.9 Ω
5600MHz Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-12-20	26.8	/	52.0	/
2020-12-19	-27.6	2.99%	53.7	1.7 Ω
5750MHz Head Liquid				
Date of Measurement	Return Loss(dB)	Δ %	Impedance (Ω)	$\Delta\Omega$
2019-12-20	-27.5	/	50.0	/
2020-12-19	-28.4	3.27%	52.6	2.6 Ω