

AUT report for NB-IoT & SRD operation of Kamstrup pit antenna				
Tested by		kamstrup A/S		
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Test specification		CTIA		
Device under test				
Antenna type		dipole		
Reference		6699664		
Use		The antenna is used with Kamstrup Water Meters KWM2220 and KWM3220 with NB-IoT and SRD radio.		
Test results		Frequency	698 - 928 MHz	1710 - 2200 MHz
		VSWR in free Space	< 4:1*	< 2:1*
		Antenna efficiency	-4 dB*	-2.5 dB*
		Max 3D Gain	1.5 dBi*	5.5 dBi*
		# port	1	
		Impedance	50 Ω	
		Polarization	Linear	
		Pattern Azimuth	Omnidirectional	
		DC short	Yes	
Test conditions				
Temperature		20 - 22 °C / 68 - 72 °F		
Date		2024.06.04		
Test by		Kamstrup A/S		
Report				
Date		2024.06.11		
Report by		Kamstrup A/S		

*Antenna measurement performed with 10cm cable and SMA connector.

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1 Equipment under test

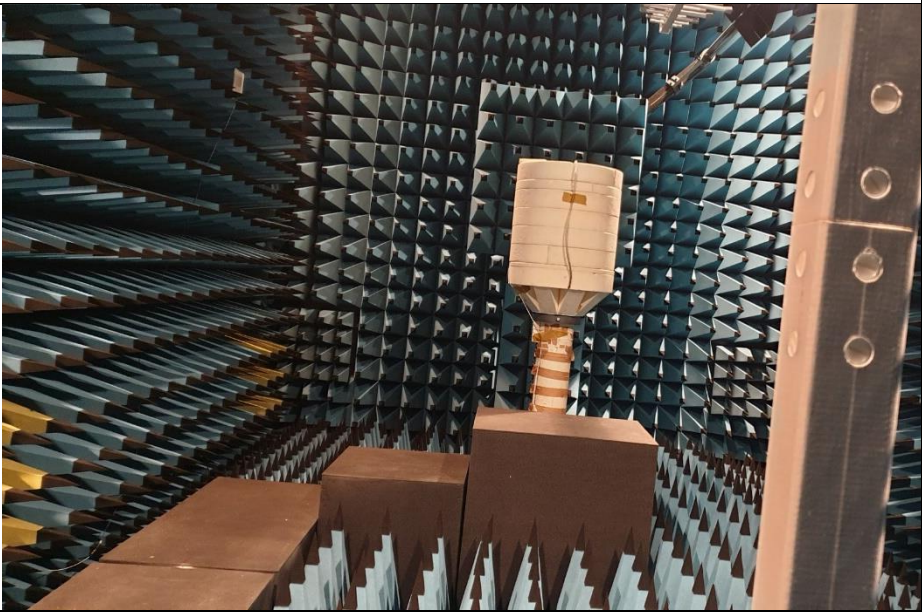
Description	Proprietary antenna for use if the meter is placed in a pit. It is designed specifically for Kamstrup KWM series water meters. The antenna comes with either 2 or 7.5-meter cable. Hence two reference numbers: 6699664 and 6699665 refer to this antenna. The highest values of gain are achieved by the pit antenna with the shortest cable.
Electric specification	
Frequency range:	698 - 928 MHz, 1710 - 2200 MHz
Impedance:	50 Ohm
VSWR:	4:1*, 2:1*
Gain:	1.5 dBi*, 5.5 dBi*
Radiation	Omnidirectional
Polarization	Linear
Mechanical specification	
Connector	Proprietary
Material	
Antenna elements	Metal
Dielectric	Poly Carbonate + Urethane
Temperature	
Operational	-40 °C - 70 °C / -40 °F - 158°F
Storage	-40 °C - 70 °C / -40 °F - 158°F
Design	

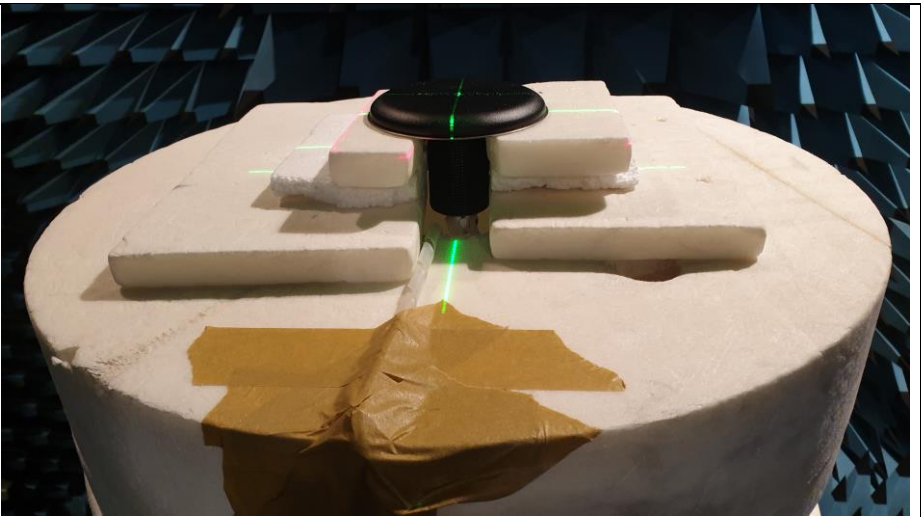
*Antenna measurement performed with 10cm cable and SMA connector.

2 Support Equipment

NA	
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3 Test setup

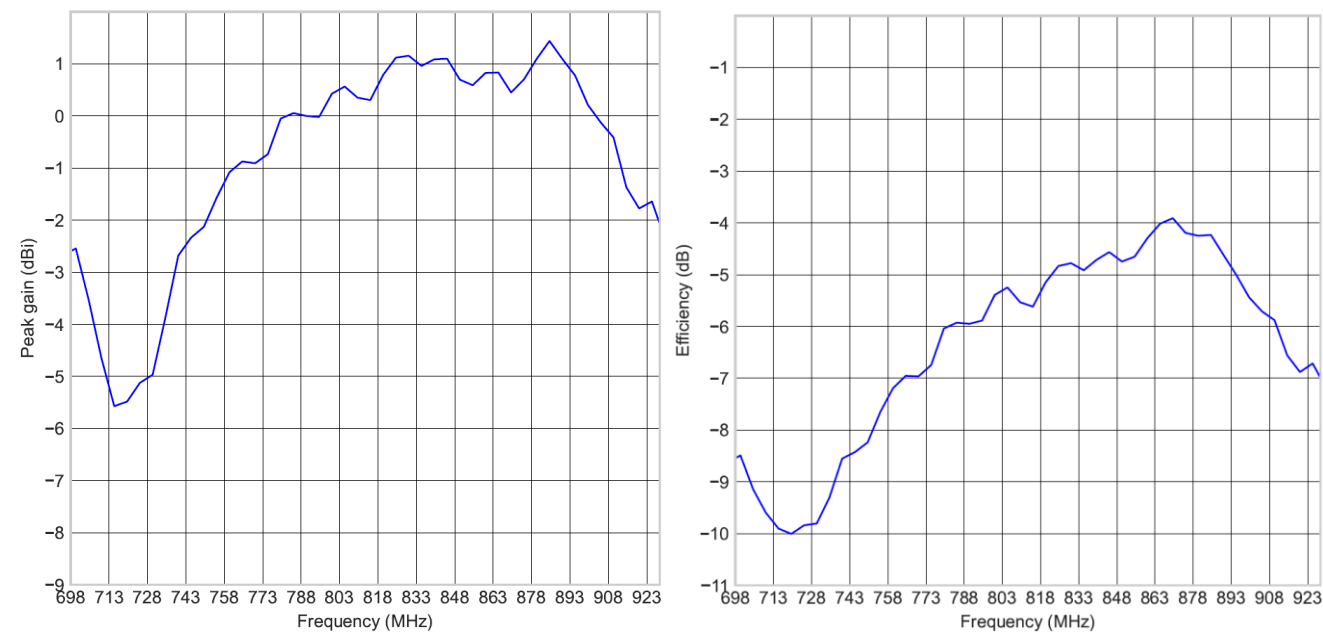
Method	Full 3D antenna measurements in the anechoic chamber
Chamber certification	Shielding Efficiency: EN 50147-1
Site/equipment information:	
Test Chamber	Antenna Chamber AC, Albatross Projects 003-008-017/14E
Test Equipment:	
Network analyzer	Rohde & Schwarz, ZVL6
Antenna	The Howland Company, QR-3A
Theta Axis Boom	Maturo
Phi Axis Turntable	Maturo
Antenna/equipment calibration status:	
ZVL6:	Calibrated 2023-01-27, by Rohde & Schwarz Certificate number 0001-300683390
Antenna	Verified on 2023-02-13 by Kamstrup technical personnel
Boom	Verified on 2023-02-13 by Kamstrup technical personnel
Turntable	Verified on 2023-02-13 by Kamstrup technical personnel
Full system	Verified on 2023-02-13 by Kamstrup technical personnel
Test software	AMS32 antenna test suit from Rohde & Schwarz
Test setup	
Anechoic chamber	

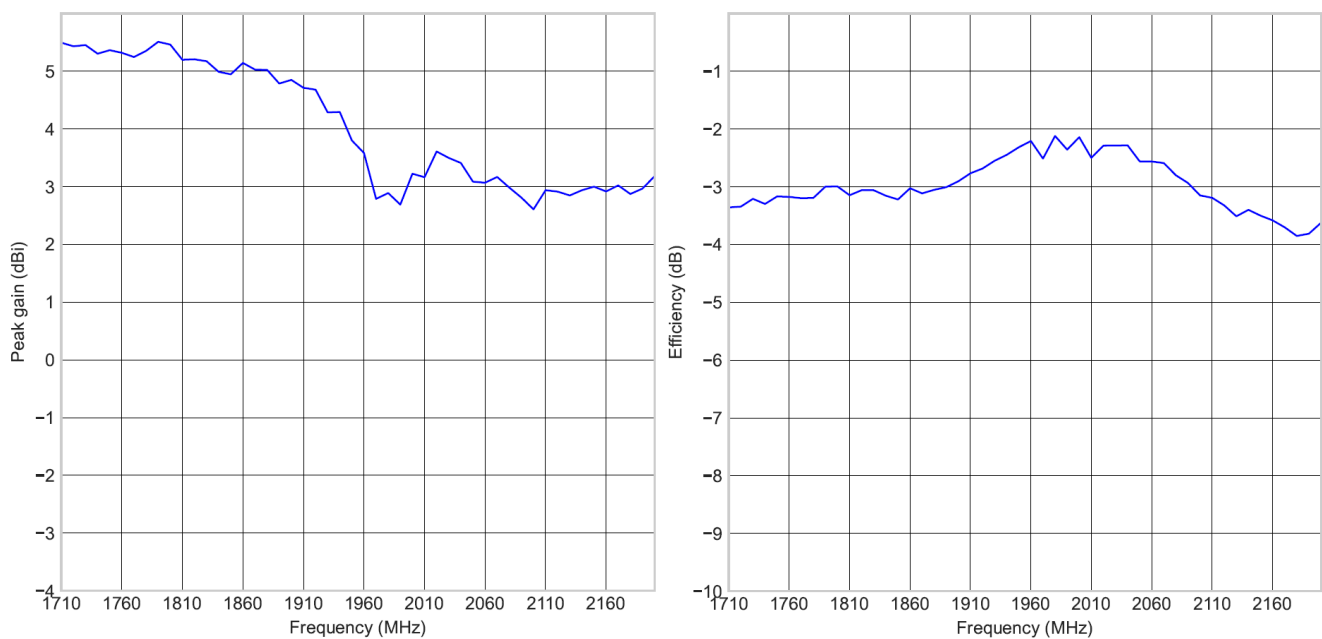
Antenna Placement	
Additional equipment	NA

4 Results

4.1 Source of antenna gain information

The antenna gain was characterized by 3D measurements performed with the system and methods described in section above.

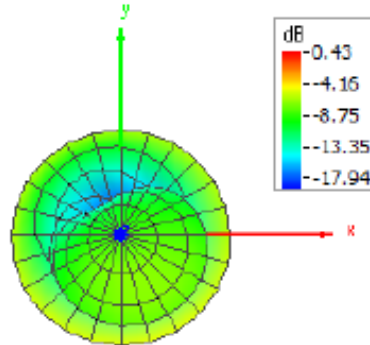




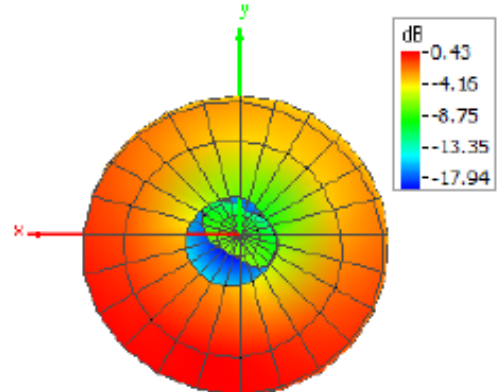
4.2 Max gain, polarization, θ , ϕ and radiation plots for max gain plane

4.2.1 Radiation plots at 800 MHz

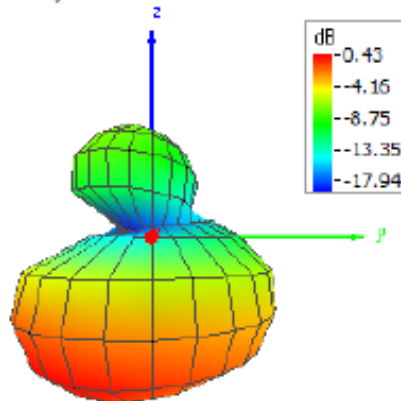
Theta = 0, Phi = 0



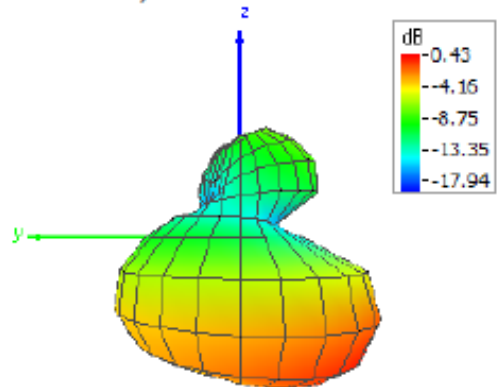
Theta = 180, Phi = 0



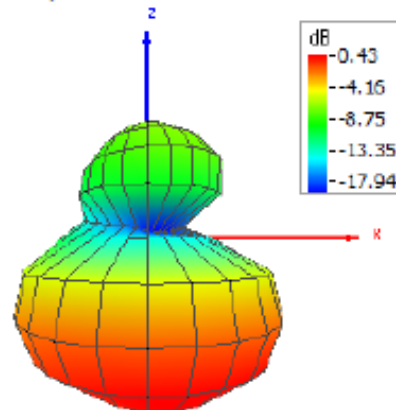
Theta = 90, Phi = 0



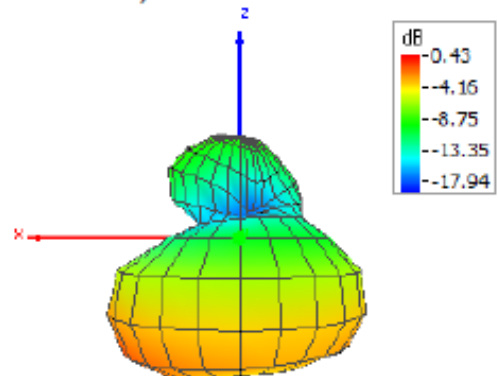
Theta = 90, Phi = 180



Theta = 90, Phi = 270

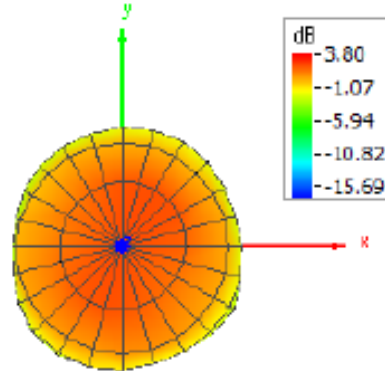


Theta = 90, Phi = 90

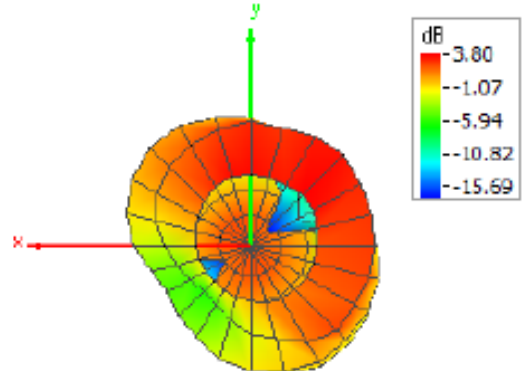


4.2.2 Radiation plots at 1950 MHz

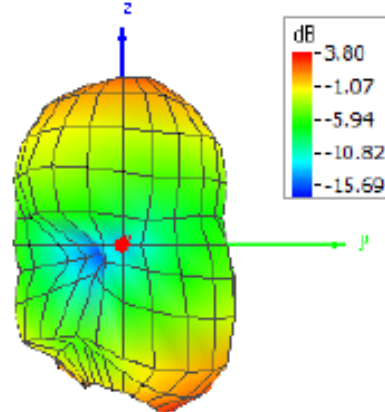
Theta = 0, Phi = 0



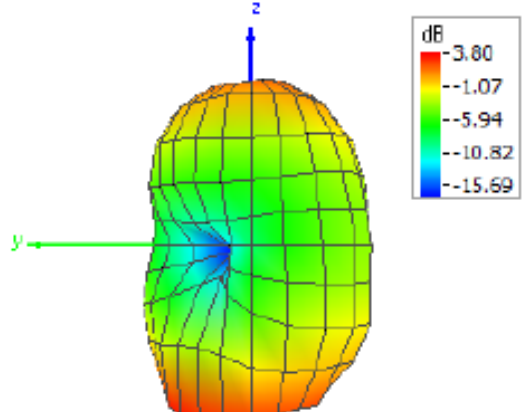
Theta = 180, Phi = 0



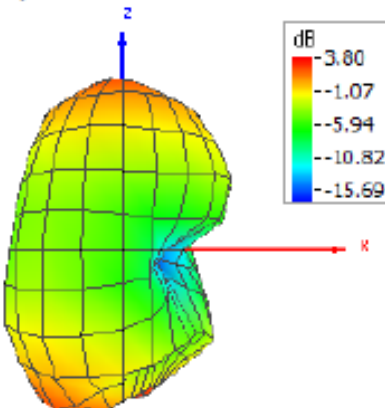
Theta = 90, Phi = 0



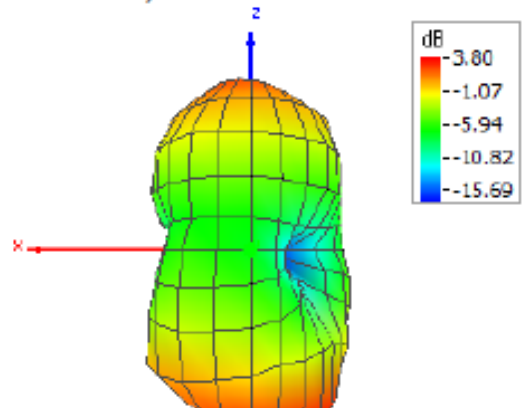
Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90



5 Signature