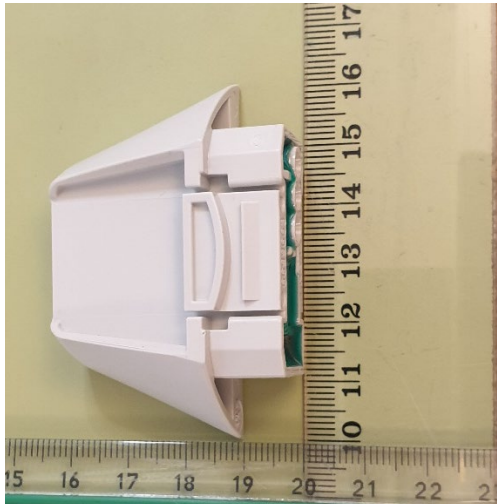


AUT report for NB-IoT & SRD operation of Kamstrup ClickOn antenna				
Tested by		kamstrup A/S		
Address		Industrivej 28, Stilling dk-8660 Skanderborg		
Contact		TEL: +45 89 93 10 00 FAX: +45 89 93 10 01 E-MAIL: kamstrup@kamstrup.dk WEB: www.kamstrup.com		
Test specification		CTIA		
Device under test				
Antenna type		monopole		
Reference		6699663		
Use		The antenna is used with Kamstrup Water Meters KWM2220 and KWM3220 with NB-IoT and SRD radio.		
Test results		Frequency	617 - 960 MHz	1710 - 2200 MHz
		VSWR in free Space	< 4:1	< 5:1
		Antenna efficiency	-4 dB	-5.5 dB
		Max 3D Gain	0 dBi	0 dBi
		# port	1	
		Impedance	50 Ω	
		Polarization	Linear	
		Pattern Azimuth	Omnidirectional	
		DC short	Yes	
Test conditions				
Temperature		20 - 22 °C / 68 - 72 °F		
Date		2023.08.23		
Test by		Kamstrup A/S		
Report				
Date		2023.10.25		
Report by		Kamstrup A/S		

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## 1 Equipment under test

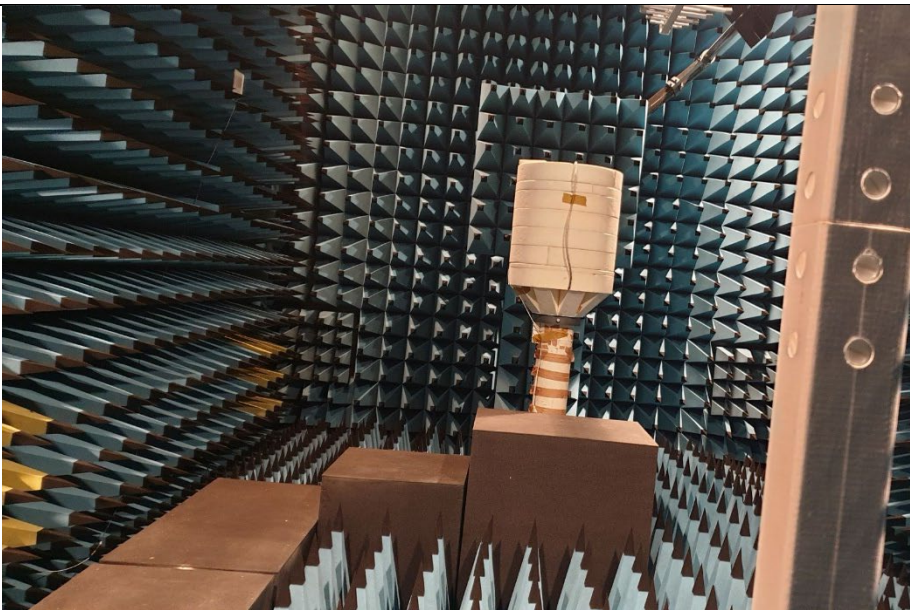
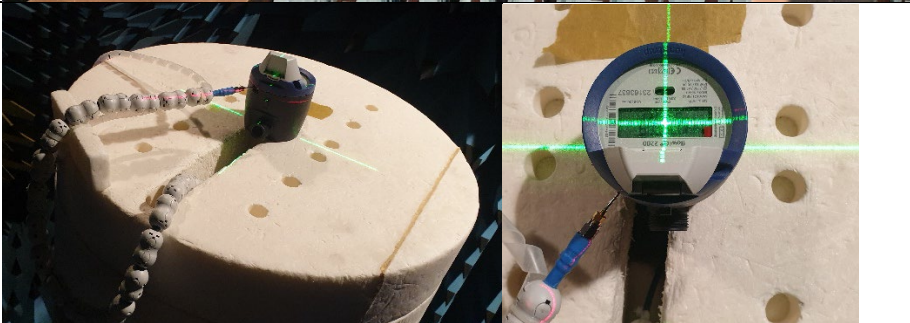
<b>Description</b>	Proprietary ClickOn antenna designed specifically for Kamstrup KWM series water meters
<b>Electric specification</b>	
Frequency range:	617 - 960 MHz, 1710 - 2200 MHz
Impedance:	50 Ohm
VSWR:	5:1
Gain:	0 dBi
Radiation	Omnidirectional
Polarization	Linear
<b>Mechanical specification</b>	
Connector	Proprietary
Material	
Antenna elements	Metal
Dielectric	Poly Carbonate
Temperature	
Operational	-20 °C - 55 °C / -4 °F - 131°F
Storage	-20 °C - 55 °C / -4 °F - 131°F
<b>Design</b>	
<b>Antenna information used for conformity with limits</b>	

## 2 Support Equipment

<b>Housing</b>	KWM 2220-meter
----------------	----------------

## 3 Test setup

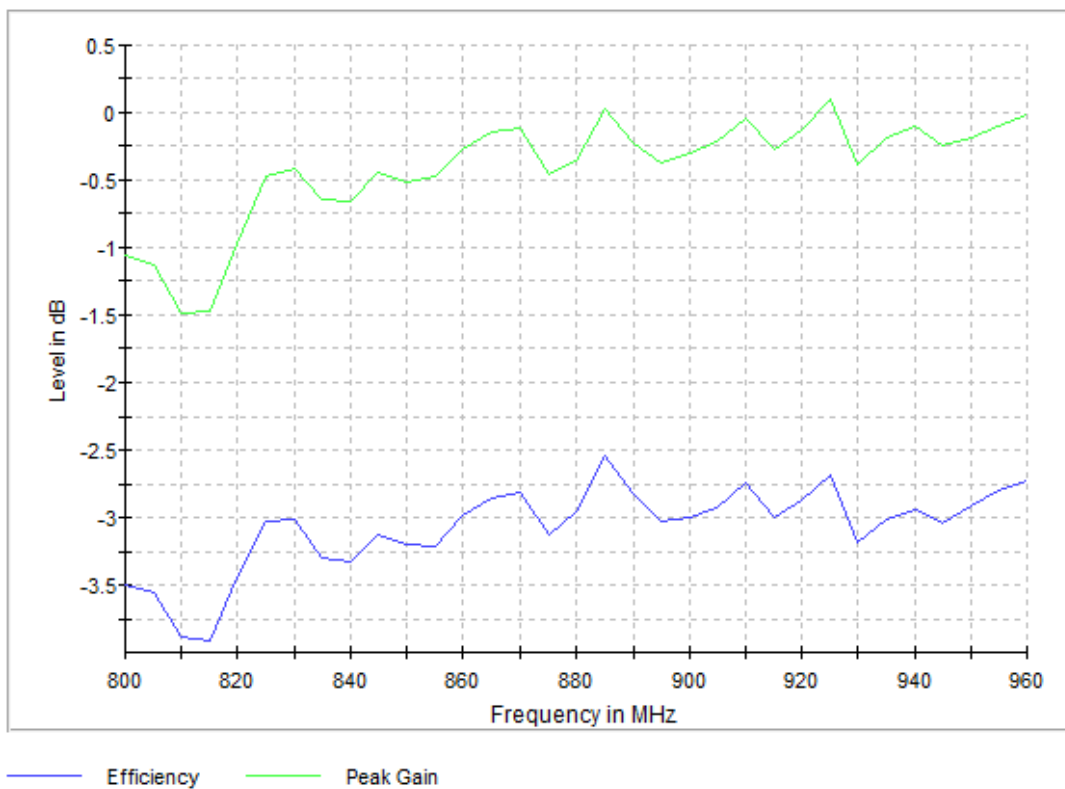
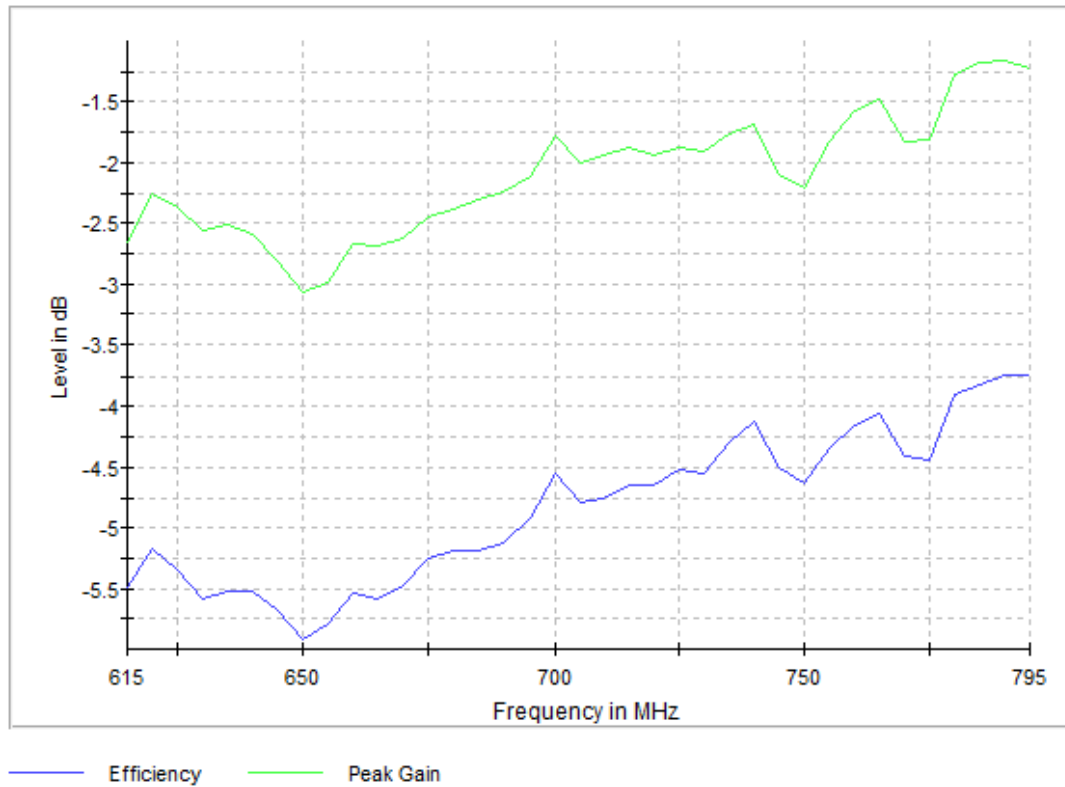
<b>Method</b>	Full 3D antenna measurements in the anechoic chamber
<b>Chamber certification</b>	Shielding Efficiency: EN 50147-1
<b>Site/equipment information:</b>	
Test Chamber	Antenna Chamber AC, Albatross Projects 003-008-017/14E

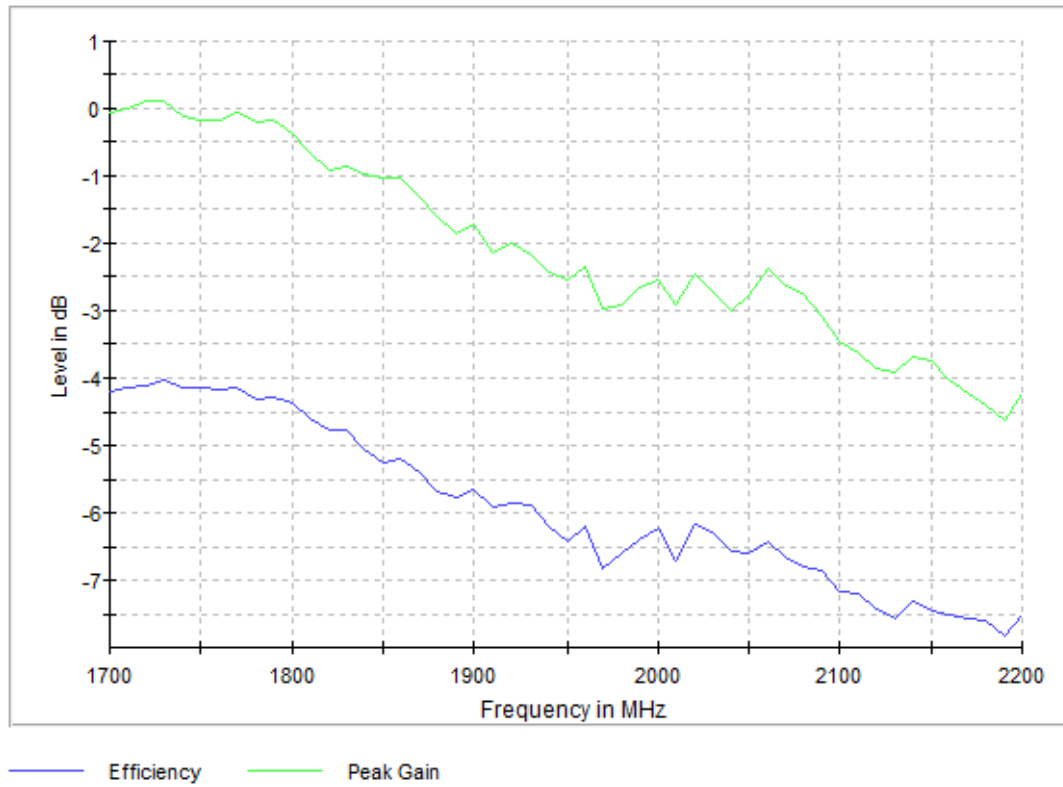
Test Equipment:	
Network analyzer	Rohde & Schwarz, ZVL6
Antenna	The Howland Company, QR-3A
Theta Axis Boom	Maturo
Phi Axis Turntable	Maturo
<b>Antenna/equipment calibration status:</b>	
ZVL6:	Calibrated 2023-01-27, by Rohde & Schwarz Certificate number 0001-300683390
Antenna	Verified on 2023-02-13 by 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
<b>Test software</b>	AMS32 antenna test suit from Rohde & Schwarz
<b>Test setup</b>	
Anechoic chamber	
Antenna Placement	
Additional equipment	The antenna was mounted on a KWM meter, where the signal to the antenna was fed through a coaxial cable.

## 4 Results

### 4.1 Source of antenna gain information

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

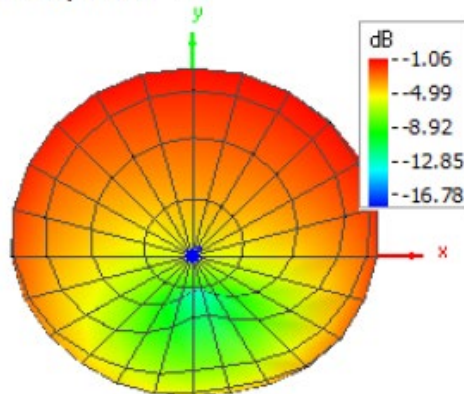




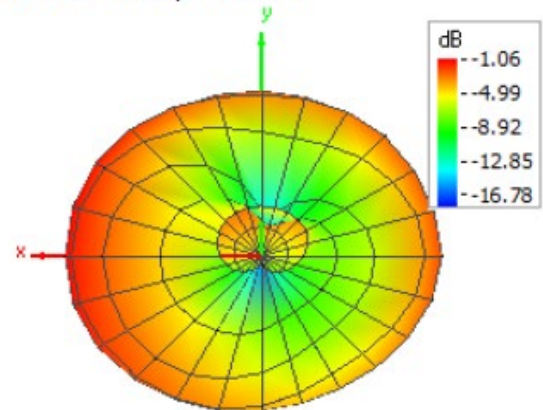
## 4.2 Max gain, polarization, $\theta$ , $\phi$ and radiation plots for max gain plane

### 4.2.1 Radiation plots at 800 MHz

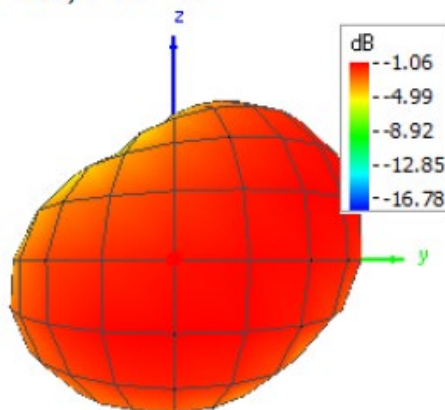
Theta = 0, Phi = 0



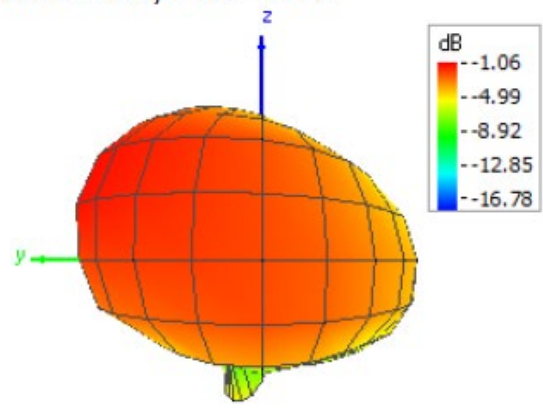
Theta = 180, Phi = 0



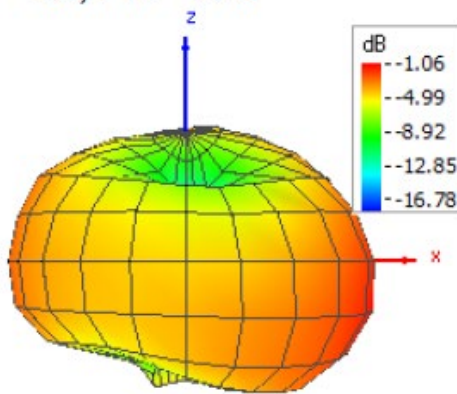
Theta = 90, Phi = 0



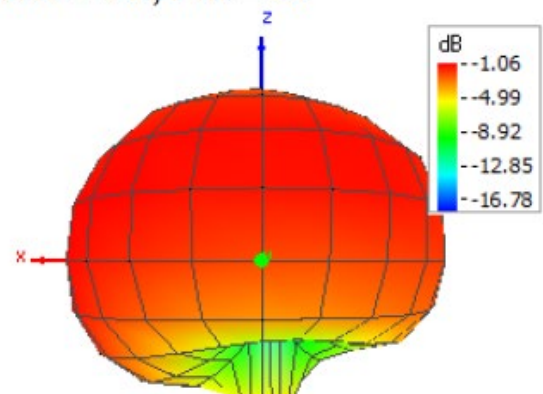
Theta = 90, Phi = 180



Theta = 90, Phi = 270



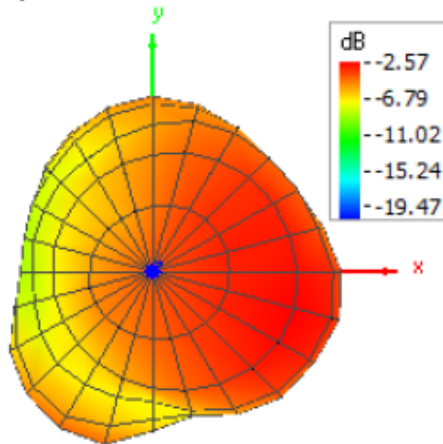
Theta = 90, Phi = 90



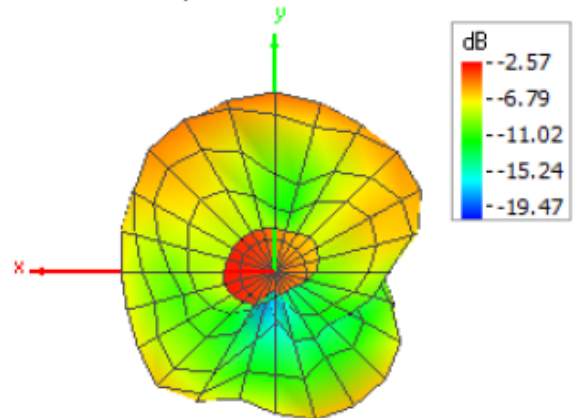


## 4.2.2 Radiation plots at 1950 MHz

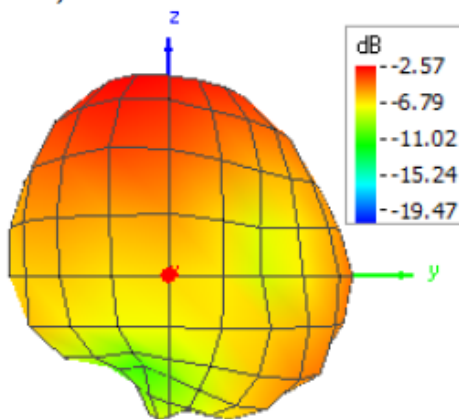
Theta = 0, Phi = 0



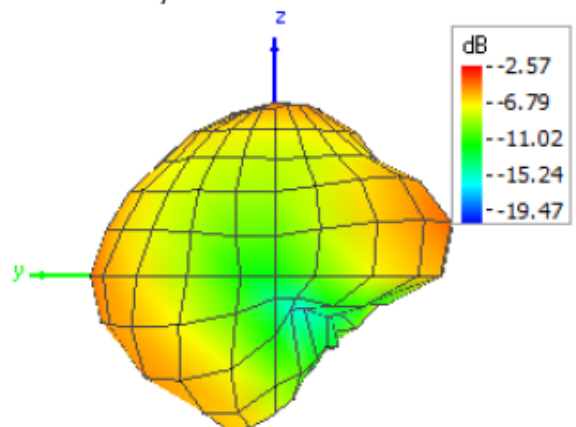
Theta = 180, Phi = 0



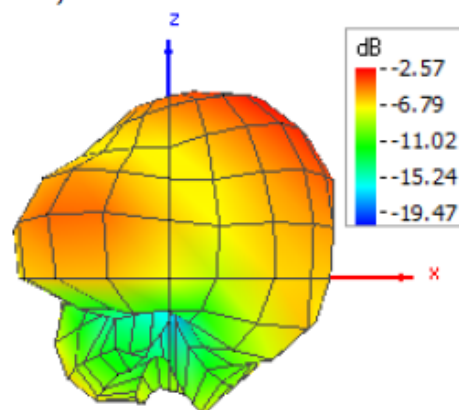
Theta = 90, Phi = 0



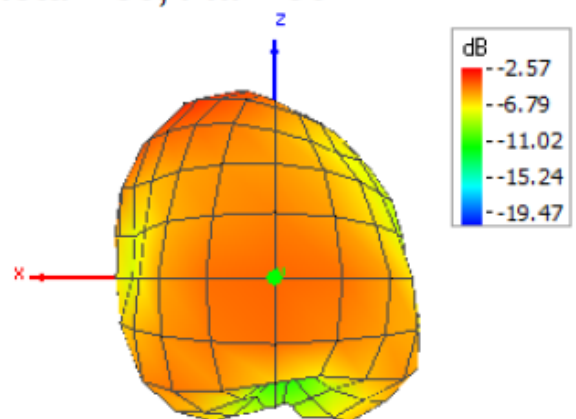
Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90





**5 Signature**

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