

AUT report for SDR operation of Kamstrup pit antenna
As per "35-Part-15-Antenna-Updates-TCB_Oct_2022.pdf"

Tested by	kamstrup a/s				
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Test specification	EN/IEC 61000-4-3 (M-CDC)				
Device under test					
Antenna type	PIFA				
Reference	6697902 and 6697903				
Use	The antenna is used with Kamstrup meters KWM2220 and KWM3220 both approved under FCC id OUY-KWMX220.				
Test results		Frequency	902 MHz	916 MHz	928 MHz
		Peak Gain	0 dBi	2 dBi	2 dBi
		Total efficiency	-7 dB	-5 dB	-4 dB
		Directivity	7 dBi	7 dBi	6 dBi
Test conditions					
Temperature	20 oC - 22 oC / 68 oF - 72 oF				
Date	2019.09.17				
Test by	Kamstrup				
Report					
Date	2023.07.12				
Report by	Kamstrup				

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1 Equipment under test

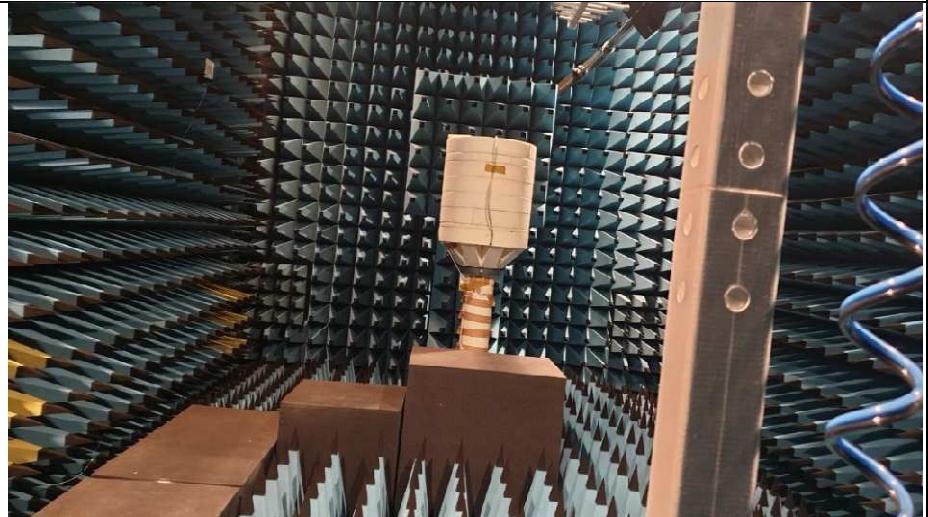
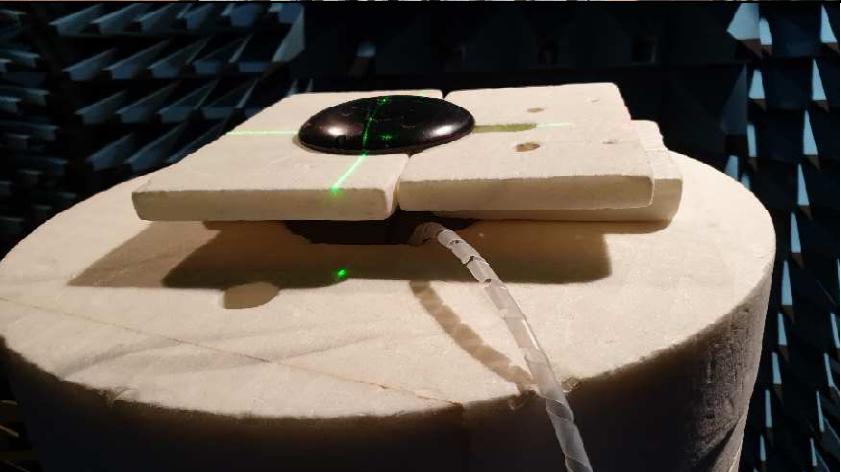
Description	Proprietary antenna for use if the meter is placed in a pit. It is designed specifically for Kamstrup KWM series water meters. The antenna comes with either 2- or 7.5-meter cable, hence two references numbers 6697902 and 6697903 refer to this antenna. The test is performed with a shortened cable.
Electric specification	
Frequency range:	902 - 928 MHz
Impedance:	50 Ohm
VSWR:	1:3
Gain:	3.5 dBi
Radiation	Omnidirectional
Polarization	Linear
Mechanical specification	
Connector	Proprietary
Material	
Radiator	Metal
Dielectric	Polycarbonate
Temperature	
Operational	-20 °C - 55 °C / 32 °F - 131°F
Storage	-20 °C - 55 °C / 68°F - 131°F
Design	
Antenna information used for conformity with limits	Spurious emission measurements were performed with the antenna mounted on the DUT in reports G0M-2211-1783-EF0115B and G0M-2211-1783-TFC247DT. The maximal in-band gain is used for calculations of exposure in report G0M-2211-1783-TFC91MP.

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 (M-CDC, AR and AC) Field Uniformity: EN 61000-4-3 (M-CDC) FS-NSA and VSWR: CISPR 16-1-4 (M-CDC)

Site/equipment information:	
Test Chamber	Antenna Chamber AC and Pre-Compliance EMC Chamber M-CDC, AlbatrossProjects 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 2019-01-30, by Rohde & Schwarz Certificate number 1500-409-775
Antenna	Verified on 2019-07-11 by Kamstrup technical personnel
Boom	Verified on 2019-07-11 by Kamstrup technical personnel
Turntable	Verified on 2019-07-11 by Kamstrup technical personnel
Full system	Verified on 2019-07-11 by Kamstrup technical personnel
Test software	AMS32 antenna test suit from Rohde & Schwarz
Test setup	
Anechoic chamber	 A photograph showing an antenna mounted on a turntable in a large anechoic chamber. The chamber walls are covered in dark, triangular acoustic absorbent panels. The antenna is a white, cylindrical device mounted on a wooden base. A vertical metal pole with a circular connector is visible on the right side.
Antenna Placement	 A photograph showing the antenna mounted on the turntable. A green laser beam is visible, pointing from the antenna towards the center of the turntable. The turntable is a large, light-colored circular platform.
Additional equipment	NA
Signal feed	The signal was fed through an SMA adaptor

4 Results

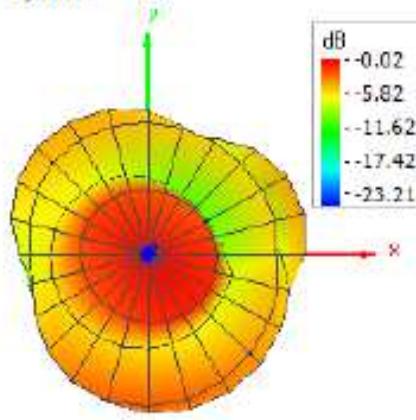
4.1 Source of antenna gain information

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

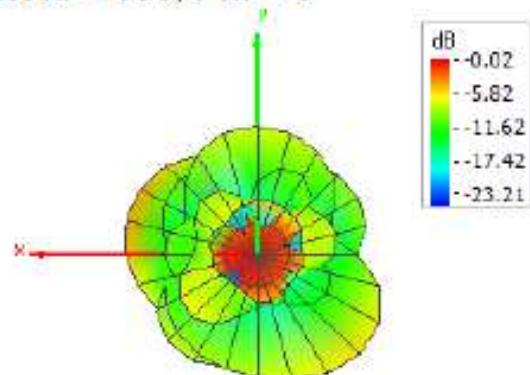
4.2 Max gain, polarization, θ , ϕ and radiation plots for max gain plane

4.2.1 Radiation plots at 902 MHz

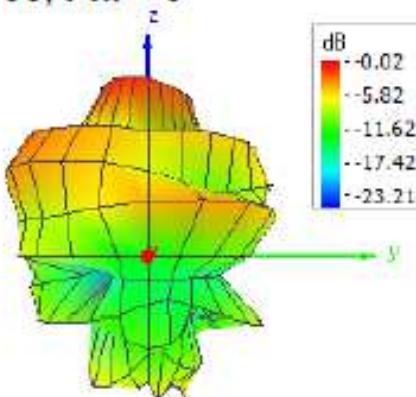
Theta = 0, Phi = 0



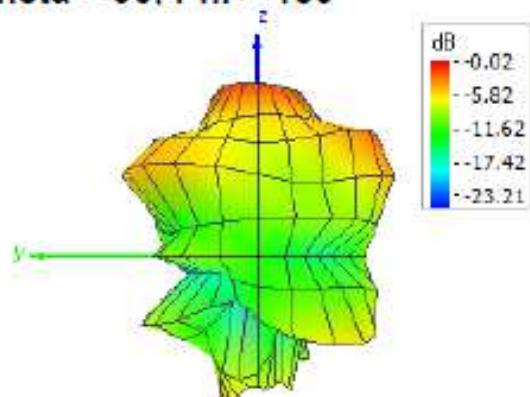
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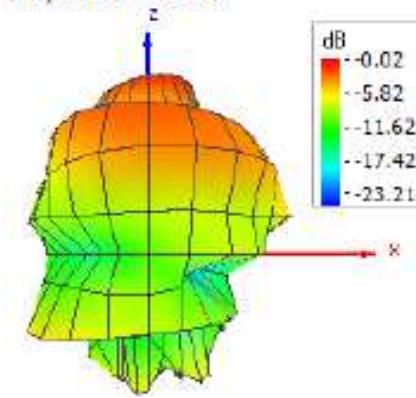
Theta = 90, Phi = 0



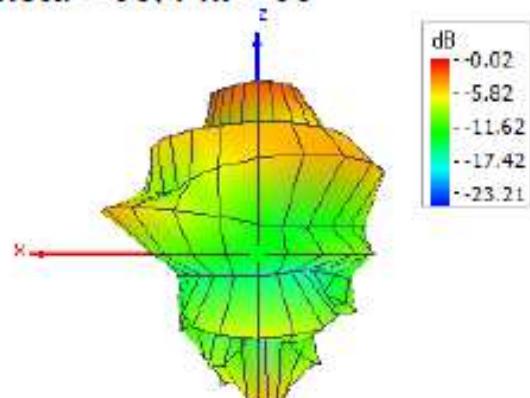
Theta = 90, Phi = 180



Theta = 90, Phi = 270

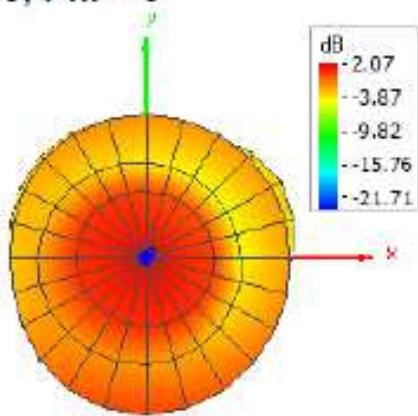


Theta = 90, Phi = 90

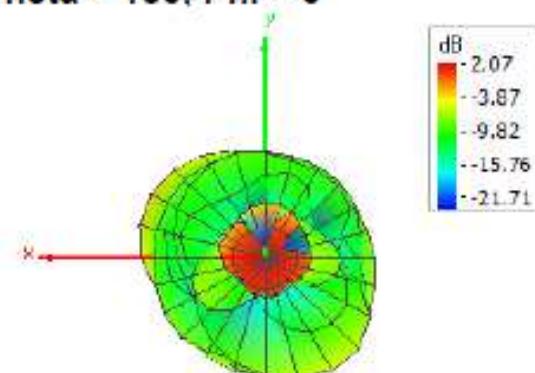


4.2.2 Radiation plots at 916 MHz

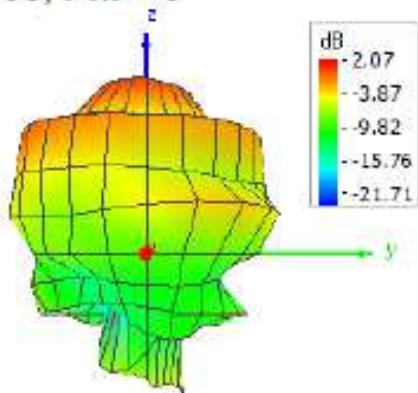
Theta = 0, Phi = 0



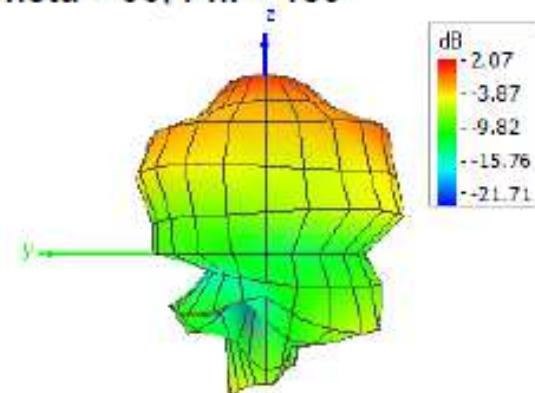
Theta = 180, Phi = 0



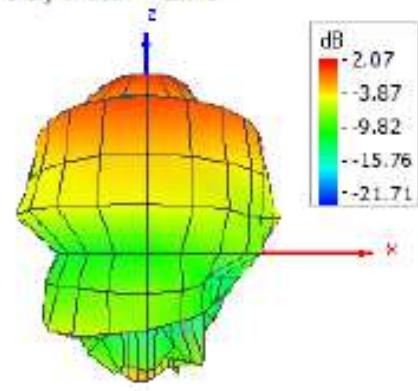
Theta = 90, Phi = 0



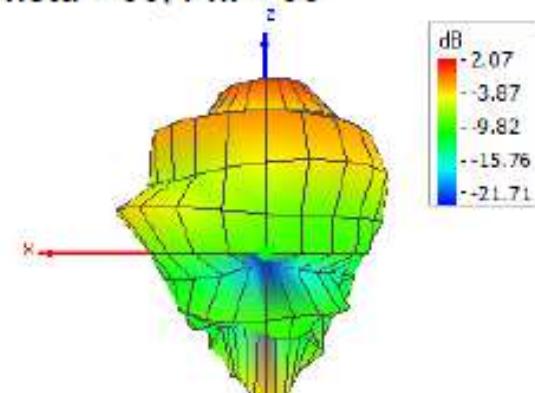
Theta = 90, Phi = 180



Theta = 90, Phi = 270

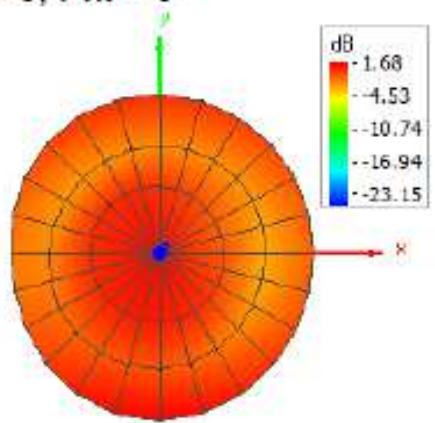


Theta = 90, Phi = 90

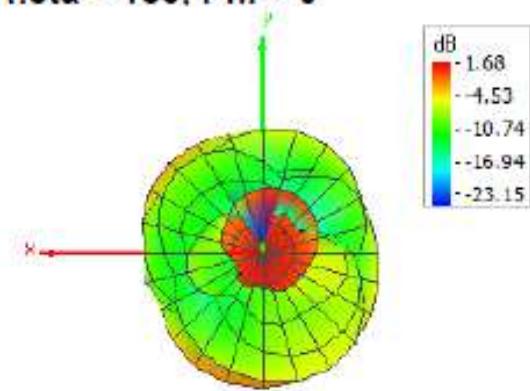


4.2.3 Radiation plots at 928 MHz

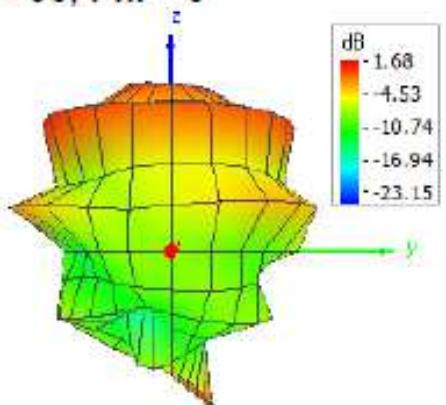
Theta = 0, Phi = 0



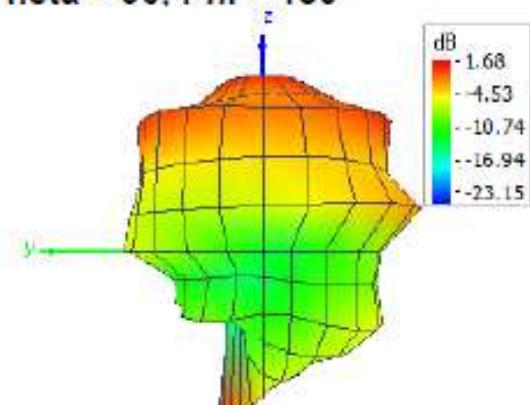
Theta = 180, Phi = 0



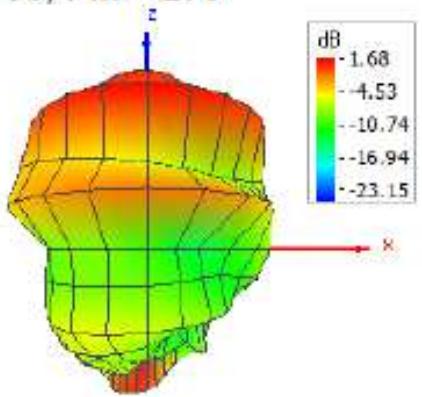
Theta = 90, Phi = 0



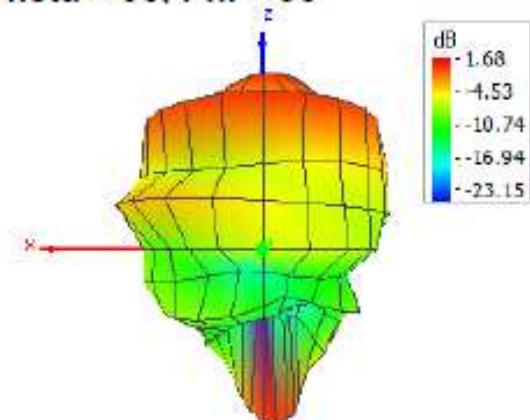
Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90



5 Signature



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