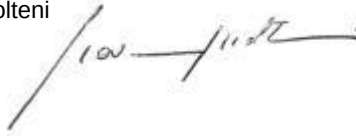


OGGETTI SOTTOPOSTI A VERIFICHE / ITEMS UNDER TESTS

Descrizione <i>Description</i>	Antenna		
Modelli <i>Model type</i>	MWR (integrated antenna) – DELTA12C/X/BNCM/S/S/17– AS868		
Identificativo interno <i>Storage No.</i>	170495 (sampled by the applicant)		
Richiedente <i>Applicant</i>	TÜV Rheinland LGA Products GmbH		
Indirizzo <i>Address</i>	Tillystrasse 2 - 90431 Nürnberg		
Prove effettuate presso <i>Test carried out by</i>	TÜV Rheinland Italia Srl Via E. Mattei, 3 – 20010 Pogliano Milanese (Italia)		
Scopo delle prove <i>Scope of the tests</i>	Measurement antenna pattern		
Risultati di prova <i>Test Results</i>	COMPLIANT		
Data ricevimento campioni <i>Date of samples receiving</i>	21/12/2017		
Data inizio prove <i>Date of tests start</i>	21/12/2017	Data fine prove <i>Date of tests end</i>	21/12/2017
Rapporto composto da <i>Test report composed by</i>	20 Pages		
Provato da / Tested by <i>(name + signature)</i>	Approvato da / Approved by <i>(name + signature)</i>		
Firmato da: Andrea Bortolotti Motivo: 	Firmato da: Giovanni Molteni Motivo: 		
Data: 03/01/2018 18:18:07 Andrea Bortolotti (Laboratory Technician)	Data: 03/01/2018 13:30:14 Giovanni Molteni (Technical & laboratory manager)		

The results referred in this report are only relevant to the samples tested and described in this report.
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TÜV Rheinland Italia – Via Enrico Mattei, 3 – 20010 Pogliano Milanese (MI) – Italy Tel. +39 02 9396871 Fax. +39 02 93968723

RELEASE CONTROL RECORD

TEST REPORT NUMBER	REASON OF CHANGE	DATE OF ISSUE
28111088-001	Original release	21/12/2017
28111088-002	Editorial change	27/12/2017
28111088-003	Added specification for antenna type DELTA 12 with BNC connector	03/01/2018
28111088-004	Editorial change	03/01/2018

OGGETTO SOTTOPOSTO A PROVE / ITEM UNDER TEST

Descrizione

Description

Antennas

Marca

Brand



Costruttore

Manufacturer

Atlas Copco S.p.a.

Modelli

Models / Type reference

- | | |
|------------------------------------|------------|
| 1. MWR (integrated antenna on PCB) | Page 9-11 |
| 2. DELTA12C/X/BNCM/S/S/17 | Page 12-14 |
| 3. AS868 | Page 15-17 |

Frequenza di lavoro

Working frequency

920MHz

Dati di targa

Ratings

Internal battery powered (rechargeable 1,2V battery for dynamometric torch wrench)

230Vac 50Hz for the controller (auxiliary equipment)

COMPONENTI AUSILIARI / AUXILIARY EQUIPMENT

Description	Manufacturer	Model
Controller for external antenna DELTA12C/X/BNCM/S/S/17 & AS868	Atlas Copco S.p.a.	FOCUS 61



DATI TECNICI ANTENNE / ANTENNA DATASHEET

AS868

Vertical Antenna for Outdoor use



Description

Vertical type antenna for outdoor use. Available frequencies : 433.92 MHz or 868.3 MHz. Supplied with 2.50 mt 50 Ohm coaxial cable RG58MIL-C17. (On request: BNC at user side).
On request: mounting bracket (256 x 140 x 40 mm).

Descrizione

Antenna VERTICALE per uso esterno. Fornita con 2,50 m di cavo coassiale 50 Ohm RG58 MIL-C17 (Su richiesta: terminato con connettore BNC dal lato utilizzatore). Su richiesta: staffa di fissaggio (256x140x40 mm).

Technical Specification

Ta = 25 °C

CHARACTERISTICS		MIN	TYP	MAX	UNIT
F _w	Working frequency • Frequenza di lavoro		433.92 or 868.3		MHz
Z _i	Impedance • Impedenza		50		Ω
	Bracket base • Base		black PVC • PVC nero		
	Stylus • Stilo		black inox steel • acciaio nero		
	50 Ω Coaxial cable • Cavo coassiale 50 Ω		2.5		mt
	BNC connector • Connettore BNC		on request		
T _{op}	Operating temperature range • Temperatura di lavoro	-20		+80	°C

DELTA 12



Key Features

- Range of ISM frequency bands available
- 3dBi gain
- ¼ wave radiating element
- 130mm whip antenna

General Description

The Delta 12s are a range of ¼ wave ISM whip antennas. This style of antenna is offered in a number of different frequencies that meets all the popular ISM bands. Great quality and affordable pricing, this antenna is perfect for high volume ISM applications within the mobile applications world.

The Delta 12s can be tuned to the ISM (Industrial, Scientific and Medical) radio frequency bands of 151/173, 433/458, 869 and 915MHz. 151/173MHz and 433/458MHz dictate combined frequencies into one antenna. The same style and dimensions of the housing/casing is used for each antenna regardless of its frequency.

Key Specifications - Electrical

Frequency:	151/173, 433/458, 869, 915MHz
Impedance:	50 ohm
VSWR:	<2
Gain:	3dBi
Polarization:	Vertical ¼ wave
Radiation:	Omnidirectional
Max input power:	50W

Key Specifications - Mechanical

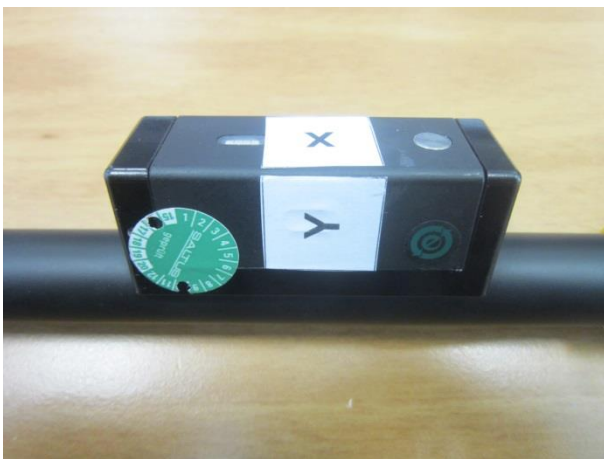
Dimensions:	130mm (Length)
Connector:	SMA male
Mounting method:	Direct connect

DELTA 12 details

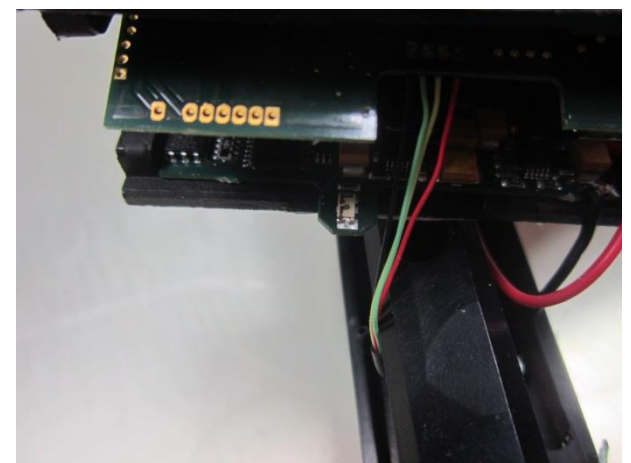
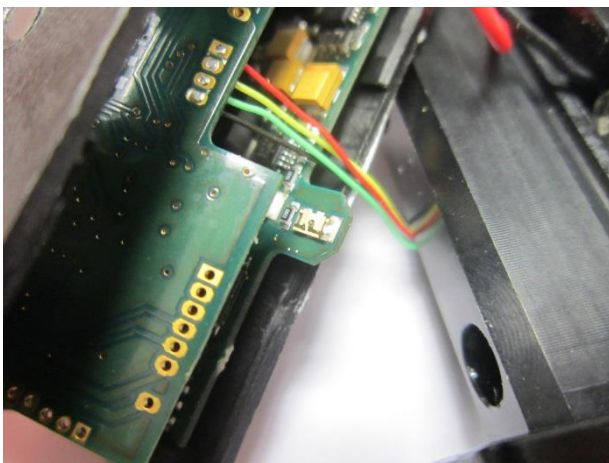
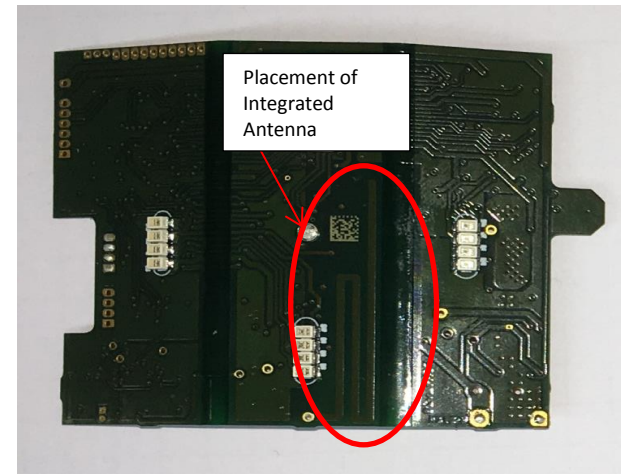
Ordering Details:

Part number	Description
DELTA12/X/SMAM/S/S/17	151/173MHz Whip Antenna, SMA Male Connector (130mm Long)
DELTA12/X/BNCM/S/S/17	151/173MHz Whip Antenna, BNC Male Connector (130mm Long)
DELTA12A/X/SMAM/S/S/17	433/458MHz Whip Antenna, SMA Male Connector (130mm Long)
DELTA12A/X/BNCM/S/S/17	433/458MHz Whip Antenna, BNC Male Connector (130mm Long)
DELTA12B/X/SMAM/S/S/17	869MHz Whip Antenna, SMA Male Connector (130mm Long)
DELTA12B/X/BNCM/S/S/17	869MHz Whip Antenna, BNC Male Connector (130mm Long)
DELTA12C/X/SMAM/S/S/17	915MHz Whip Antenna, SMA Male Connector (130mm Long)
DELTA12C/X/BNCM/S/S/17	915MHz Whip Antenna, BNC Male Connector (130mm Long)

MWR (integrated antenna)



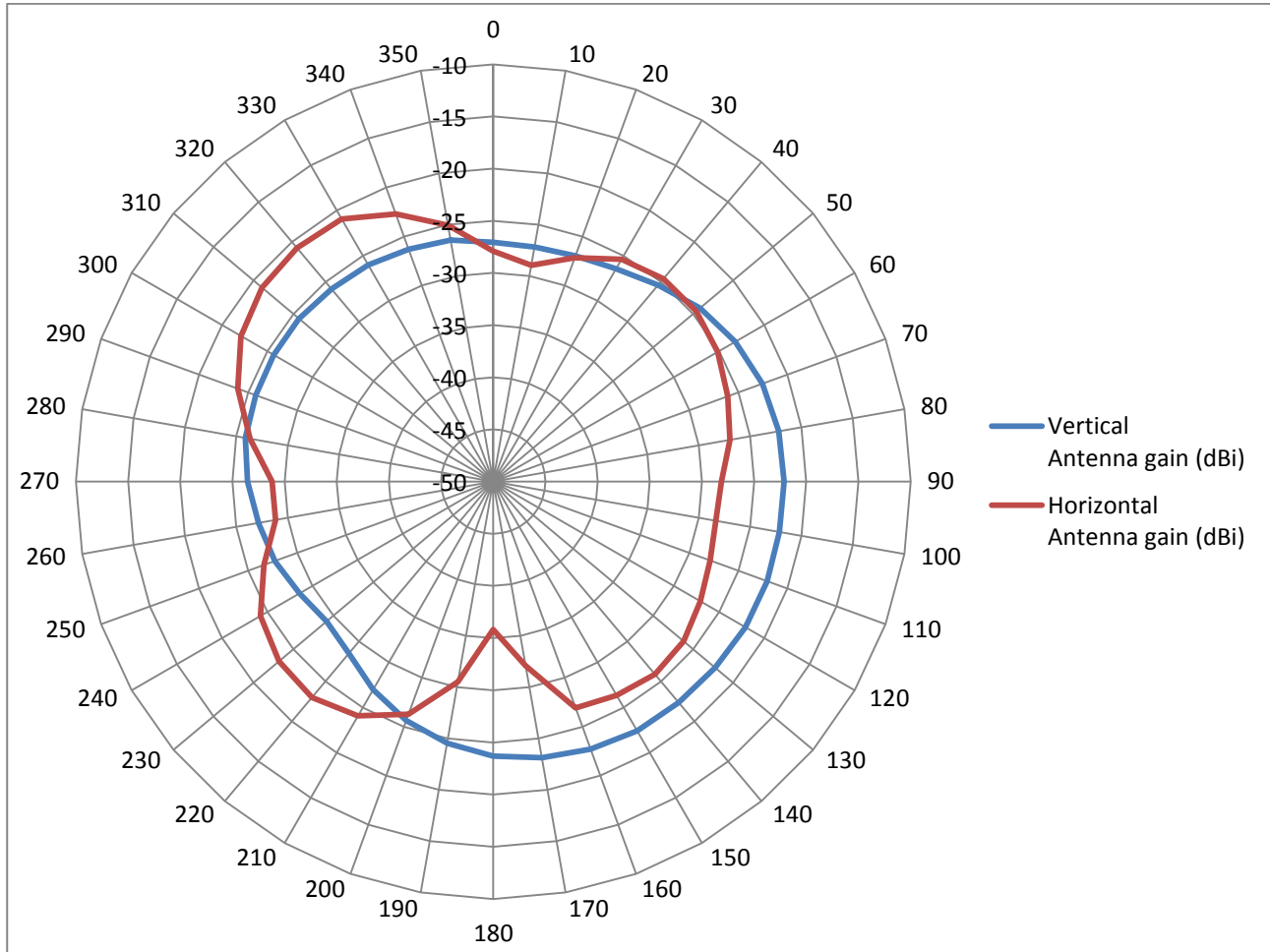
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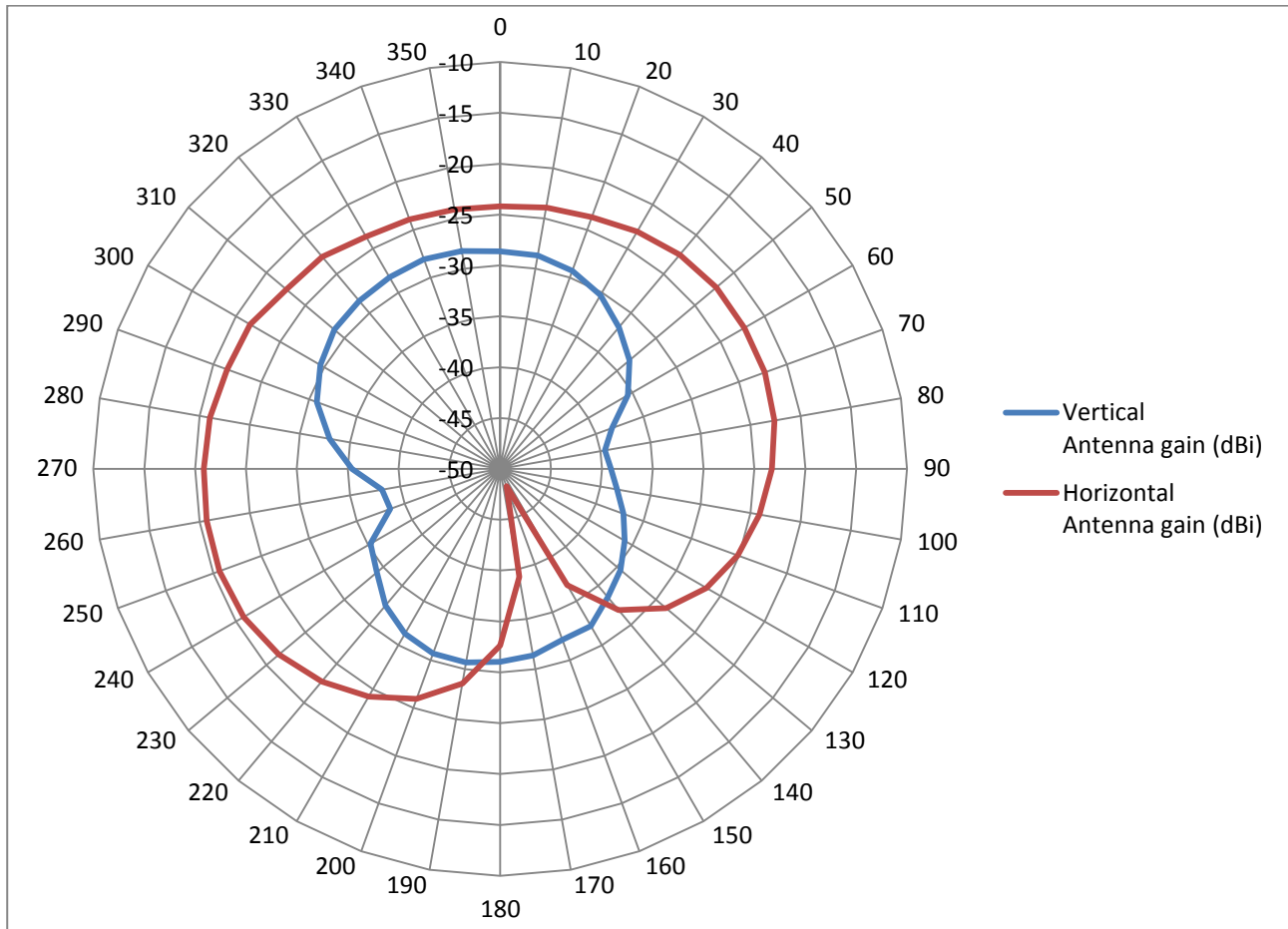
1) Result for MWR integrated antenna @ 920MHz working frequency

Deg TT	Vertical polarization		Horizontal polarization	
	X-Z axes	Y axes	X-Z axes	Y axes
	Antenna gain (dBi)	Antenna gain (dBi)	Antenna gain (dBi)	Antenna gain (dBi)
0	-27,06	-28,62	-28,62	-24,18
10	-27,17	-28,71	-28,71	-23,91
20	-26,96	-29,27	-29,27	-23,66
30	-26,45	-30,29	-30,29	-23,07
40	-25,41	-31,85	-31,85	-22,53
50	-24,14	-33,4	-33,4	-22,27
60	-23,21	-35,49	-35,49	-22,28
70	-22,55	-38,31	-38,31	-22,3
80	-22,21	-39,54	-39,54	-22,62
90	-22,12	-39,11	-39,11	-23,3
100	-22,14	-38,34	-38,34	-24,11
110	-22,08	-37,12	-37,12	-25,14
120	-22,09	-35,86	-35,86	-26,57
130	-22,24	-34,54	-34,54	-28,69
140	-22,36	-33,53	-33,53	-31,87
150	-22,42	-32,15	-32,15	-36,81
160	-22,72	-32,14	-32,14	-48,18
170	-23,12	-31,39	-31,39	-39,21
180	-23,69	-31,02	-31,02	-32,64
190	-24,54	-30,69	-30,69	-28,57
200	-25,63	-30,69	-30,69	-25,95
210	-26,96	-31,28	-31,28	-24,15
220	-28,49	-32,47	-32,47	-22,71
230	-29,16	-34,16	-34,16	-21,6
240	-28,56	-35,28	-35,28	-20,89
250	-27,73	-38,5	-38,5	-20,63
260	-27,16	-38,18	-38,18	-20,7
270	-26,46	-35,41	-35,41	-20,86
280	-25,88	-32,97	-32,97	-21,02
290	-25,78	-30,8	-30,8	-21,42
300	-25,71	-29,57	-29,57	-21,6
310	-25,7	-28,7	-28,7	-22,56
320	-25,89	-28,43	-28,43	-22,79
330	-26,01	-28,25	-28,25	-23,64
340	-26,3	-28,08	-28,08	-23,92
350	-26,48	-28,25	-28,25	-24,1

Graphical representation of antenna gain for X-Z axes (MWR integrated Antenna)



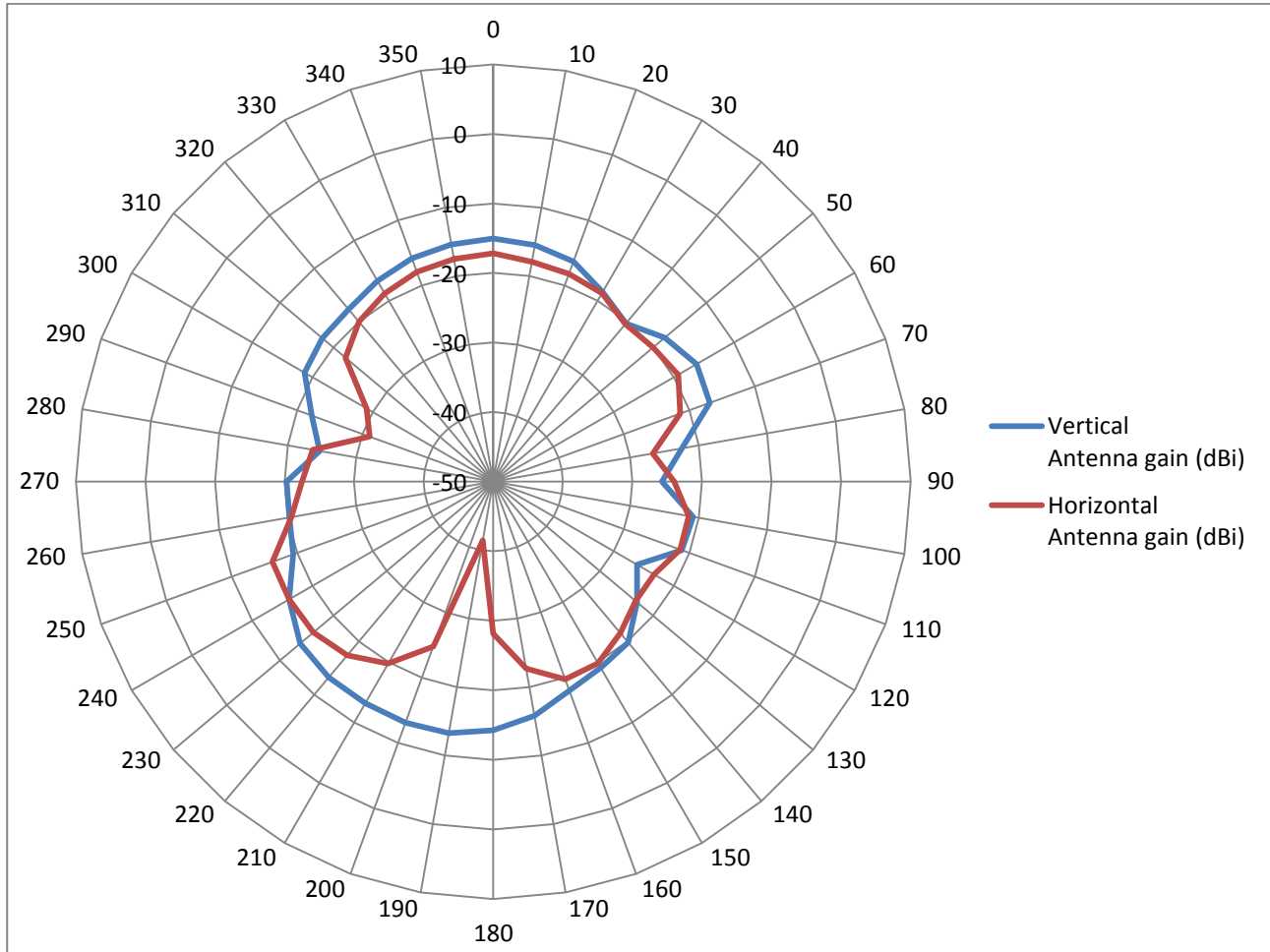
Graphical representation of antenna gain for Y axes (MWR integrated Antenna)



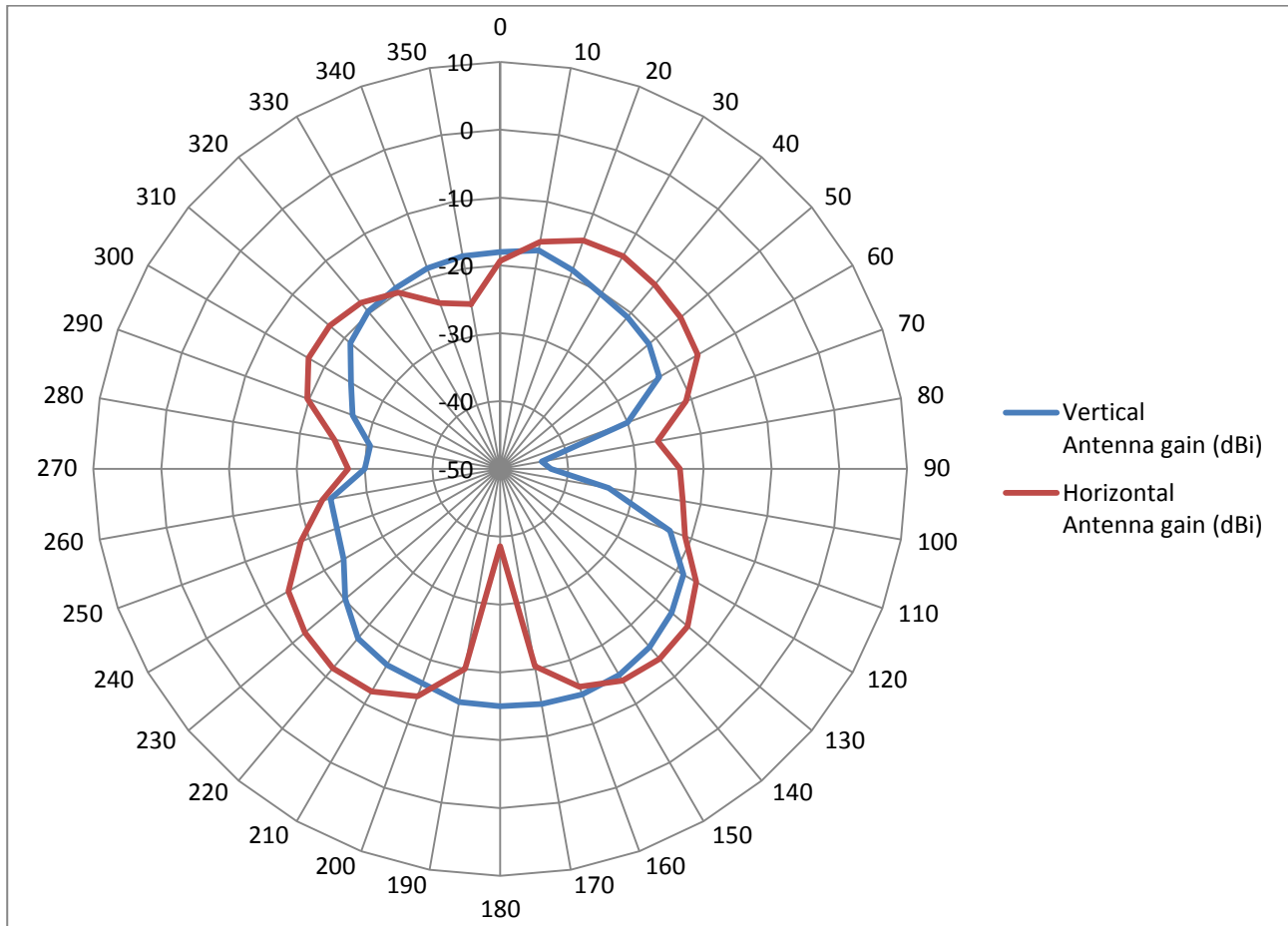
2) Result for DELTA12C/X/BNCM/S/S/17 antenna @ 920MHz working frequency

Deg TT	Vertical polarization		Horizontal polarization	
	X-Z axes	Y axes	X-Z axes	Y axes
	Antenna gain (dBi)	Antenna gain (dBi)	Antenna gain (dBi)	Antenna gain (dBi)
0	-15,04	-18	-17,18	-19,34
10	-15,45	-17,29	-17,92	-16,02
20	-16,31	-18,81	-18,22	-14,17
30	-18,54	-20,25	-18,73	-13,76
40	-20,33	-20,77	-20,43	-14,54
50	-17,81	-21,34	-20,01	-15,25
60	-16,26	-22,91	-19,3	-16,34
70	-16,85	-30,02	-21,42	-20,82
80	-22,48	-43,78	-26,7	-26,42
90	-25,73	-42,52	-24	-23,49
100	-20,8	-33,73	-21,47	-22,64
110	-21,15	-23,35	-21,38	-21
120	-26,1	-18,82	-23,29	-16,63
130	-23,02	-17,01	-23,28	-13,91
140	-19,79	-15,72	-21,6	-13,42
150	-19,09	-14,92	-19,83	-13,92
160	-18,02	-14,6	-19,75	-15,84
170	-15,8	-14,79	-22,7	-20,46
180	-14,23	-14,99	-28,13	-38,61
190	-13,3	-15,08	-41,39	-20,04
200	-13,12	-16,36	-24,76	-14,31
210	-13,23	-16,59	-19,77	-12,09
220	-13,24	-17,38	-17,37	-11,61
230	-13,78	-20,17	-16,26	-12,41
240	-16,14	-23,32	-16,13	-13,92
250	-19,41	-24,39	-16,24	-18,7
260	-20,25	-24,61	-20,52	-23,37
270	-20,27	-30,02	-22,52	-27,58
280	-24,64	-30,53	-23,67	-25,19
290	-22,25	-26,82	-31,1	-19,73
300	-18,67	-24,57	-28,99	-17,34
310	-17,92	-21,13	-22,28	-17,16
320	-17,66	-19,69	-19,98	-18,04
330	-16,68	-19,22	-18,77	-19,97
340	-15,86	-18,53	-17,91	-24,01
350	-15,39	-18,16	-17,48	-25,33

Graphical representation of antenna gain for X-Z axes (DELTA12C/X/BNCM/S/S/17 antenna)



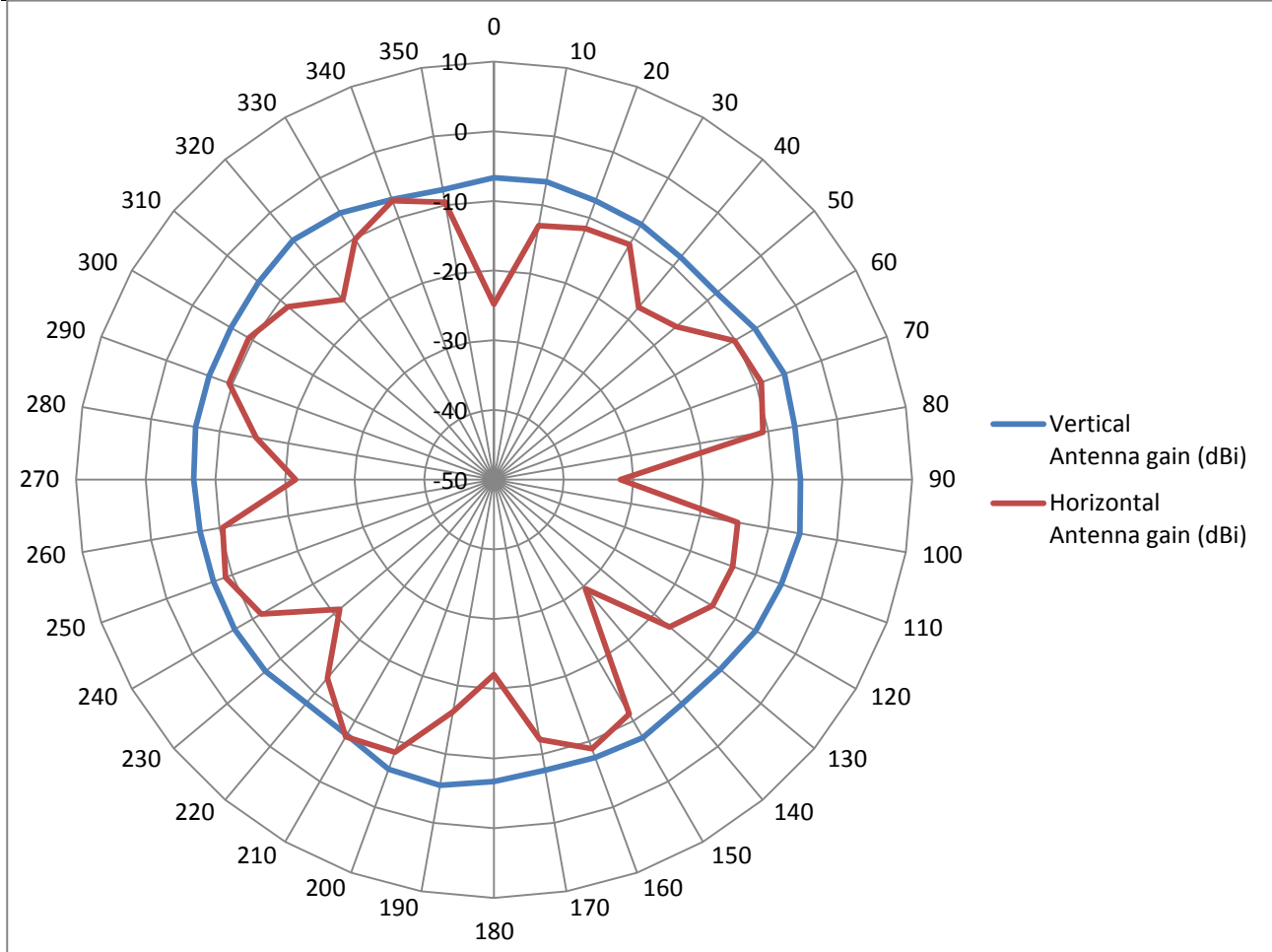
Graphical representation of antenna gain for Y axes (DELTA12C/X/BNCM/S/S/17 antenna)



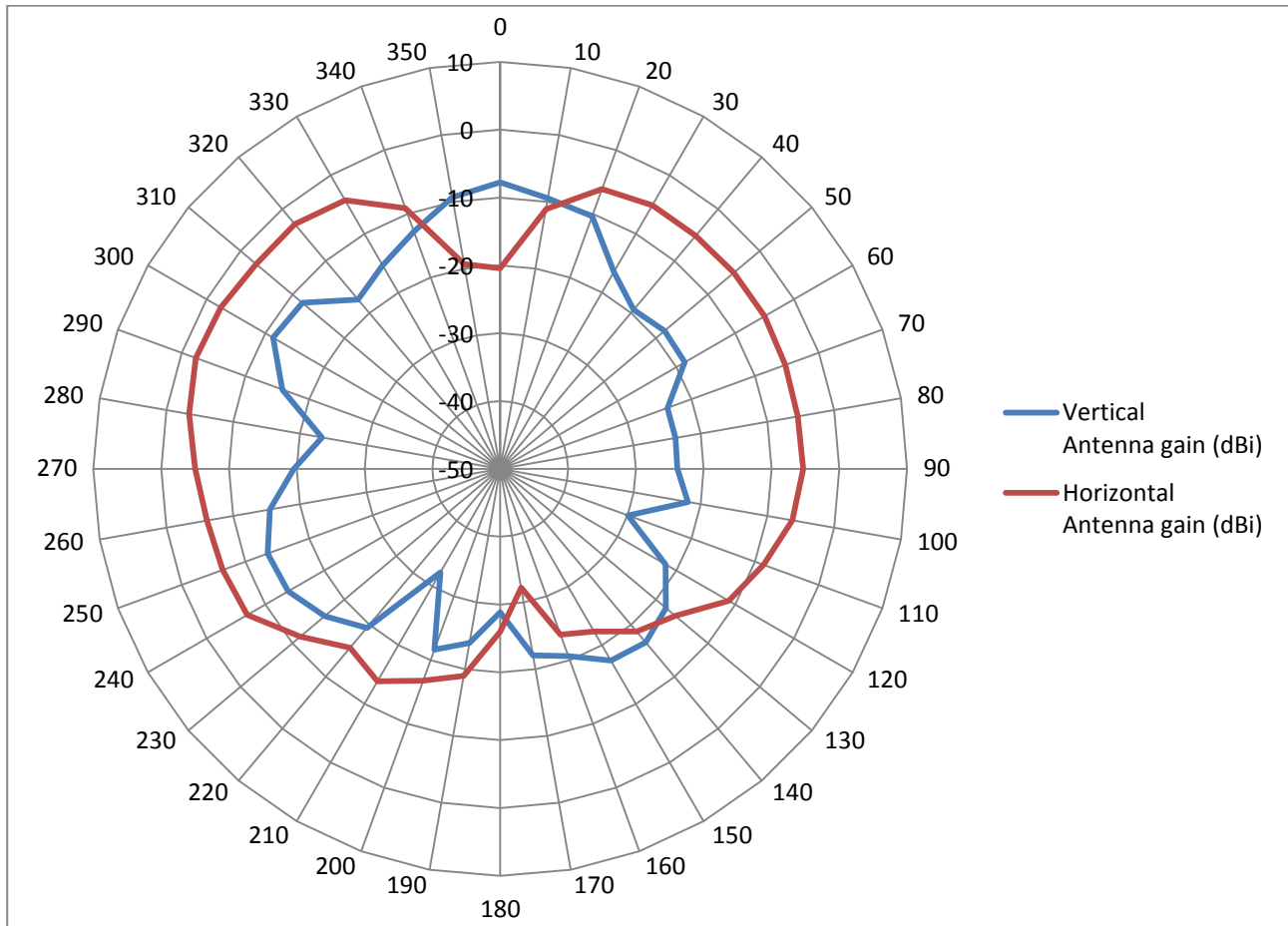
3) Result for AS868 antenna @ 920MHz working frequency

Deg TT	Vertical polarization		Horizontal polarization	
	X-Z axes	Y axes	X-Z axes	Y axes
	Antenna gain (dBi)	Antenna gain (dBi)	Antenna gain (dBi)	Antenna gain (dBi)
0	-6,69	-7,75	-24,84	-20,42
10	-6,6	-9,47	-12,98	-11,12
20	-7,41	-10,37	-11,63	-6,07
30	-7,72	-16,46	-11,06	-5,12
40	-8,31	-19,41	-17,72	-5,14
50	-8,27	-18,38	-15,86	-5
60	-6,73	-18,58	-10,13	-4,97
70	-5,66	-23,77	-9,17	-5,25
80	-6,17	-23,77	-10,81	-5,44
90	-6	-23,89	-31,84	-5,31
100	-5,41	-21,88	-14,48	-6,25
110	-6,11	-29,96	-13,55	-8,67
120	-6,64	-21,82	-13,81	-11,07
130	-7,63	-18,09	-17,11	-16,28
140	-7,98	-16,6	-29,56	-18,69
150	-7,27	-17,38	-11,19	-22,31
160	-7,56	-20,65	-8,9	-23,99
170	-7,65	-22,09	-12,12	-32,23
180	-6,68	-28,83	-22,01	-25,97
190	-5,48	-23,95	-16,17	-19
200	-5,8	-21,61	-8,4	-16,79
210	-7,7	-32,4	-7,39	-13,81
220	-8,13	-19,4	-12,8	-15,57
230	-7,2	-16,24	-21,09	-11,52
240	-7,03	-13,88	-11,43	-6,91
250	-7,14	-13,52	-8,97	-6,42
260	-7,16	-15,49	-10,45	-6,09
270	-6,87	-19,55	-21,5	-5,03
280	-6,52	-23,31	-15,32	-3,43
290	-6,48	-15,8	-9,51	-2,2
300	-6,41	-11,33	-9,37	-2,42
310	-5,92	-11,9	-11,39	-3,03
320	-5,13	-17,4	-16,24	-2,88
330	-5,84	-15,33	-10,16	-4,27
340	-7,22	-12,75	-7,41	-9,09
350	-7,75	-9,34	-9,6	-19,36

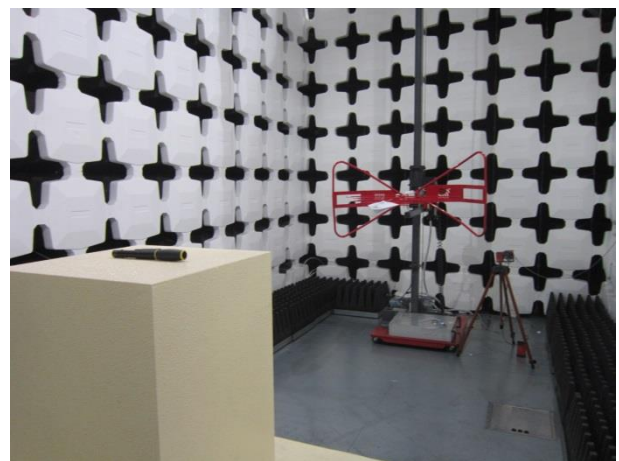
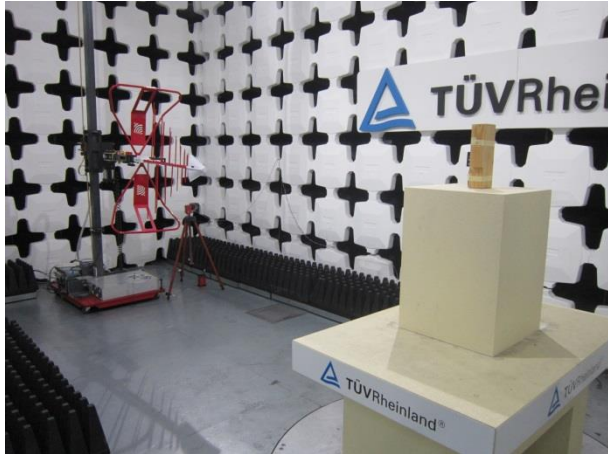
Graphical representation of antenna gain for X-Z axes (AS868 antenna)



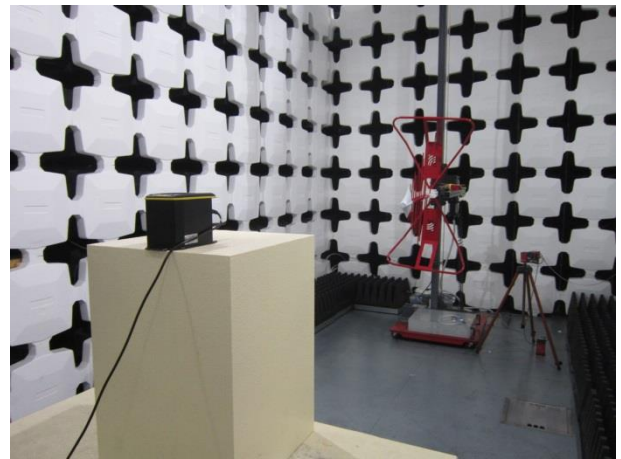
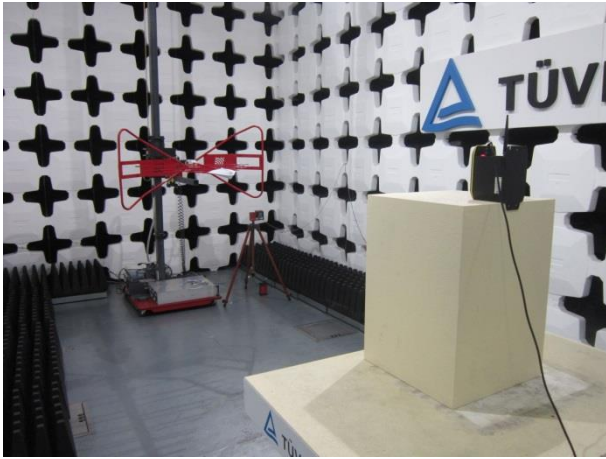
Graphical representation of antenna gain for Y axes (AS868 antenna)



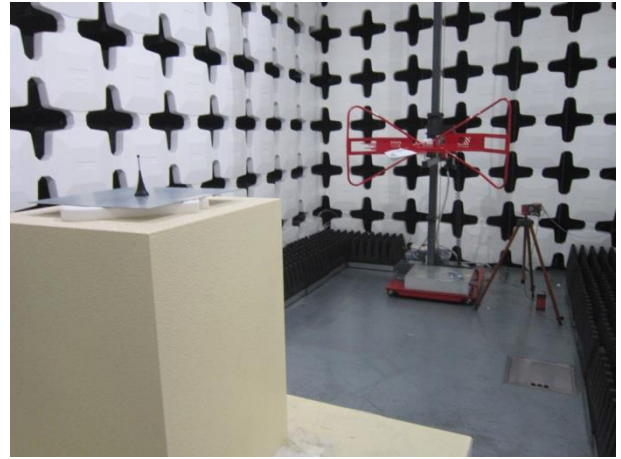
PHOTOGRAPHIC DOCUMENTATION – Test setup 1 (MWR integrated antenna)



PHOTOGRAPHIC DOCUMENTATION – Test setup 2 (DELTA12C/X/BNCM/S/S/17 antenna)



PHOTOGRAPHIC DOCUMENTATION – Test setup 3 (AS868 with ground reference plane 35x35cm)



END OF TEST REPORT