

Product datasheet of Audi DDA Gen2 MLB 4K0.035.503.D roof antenna with 5G, SDARS, GNSS and Bluetooth

History

Date	Version	Description of modification
25.09.2024	1.0	Initial version
10.10.2024	1.1	Updates in description, model numbers, values

Table of contents

History.....	1
Table of contents	2
1 General description	3
1.1 Bluetooth.....	3
1.2 Cellular phone.....	3
1.3 Satellite radio	3
1.4 Navigation.....	3
1.5 Views	4
1.6 Block diagram	5
1.7 Pin configuration	6
2 Model numbering.....	6
3 Specification	7
3.1 General specification	7
3.2 SDARS specification	7
3.2.1 Antenna performance	7
3.2.2 LNA performance.....	8
3.2.3 Overall performance	8
3.3 GNSS specification.....	9
3.3.1 Antenna performance	9
3.3.2 LNA performance.....	9
3.3.3 Overall performance	10
3.4 Cellular phone specification.....	11
3.5 Bluetooth specification.....	12
3.5.1 Antenna performance	12
4 Dimensions.....	13
5 Measurements cellular	15
Index of Tables and Figures	16

1 General description

The DDA MLB Gen2 is a compact roof antenna series applied to the MLBevo platform vehicles.

This Audi DDA roof antenna comprises the services:

- Passive Bluetooth antenna (BLE).
- cellular phone,
- satellite radio
- navigation,

This roof antenna is designed to be screwed to a metal roof at the rear end of the vehicle.

1.1 Bluetooth

The Bluetooth (BLE) is a passive circuit which covers the BLE frequency range.

1.2 Cellular phone

The cellular phone is a passive circuit which covers the frequency ranges 3G LTE and 4G LTE and 5G bands.

1.3 Satellite radio

The SDARS path comprises a ceramic patch and a two-stage LNA receiving the S-Band SIRIUS as well as XM frequencies.

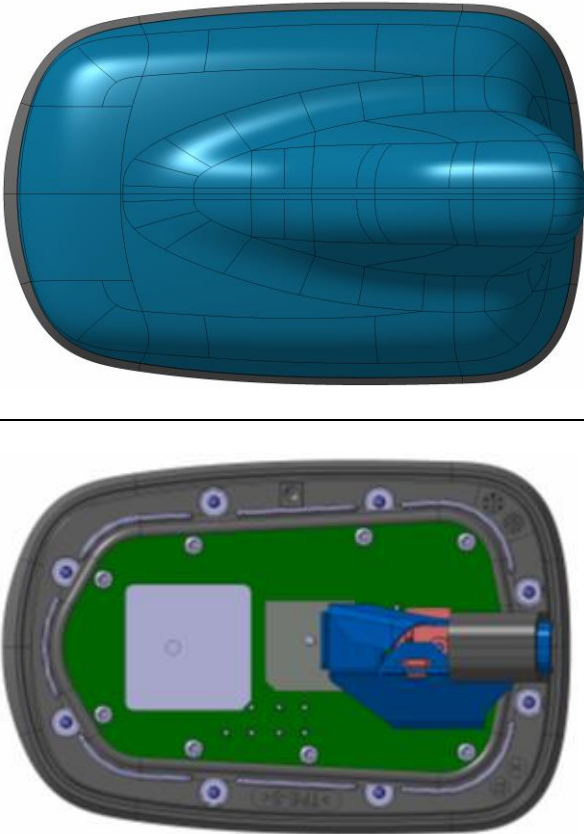
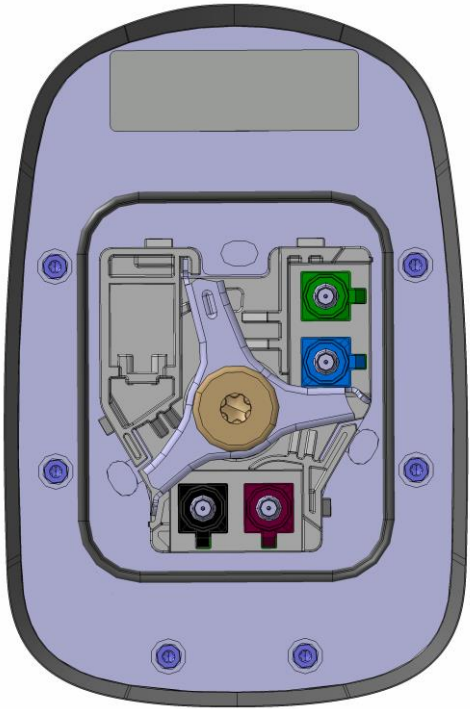
The SDARS circuit must be supplied with power via phantom feed.

1.4 Navigation

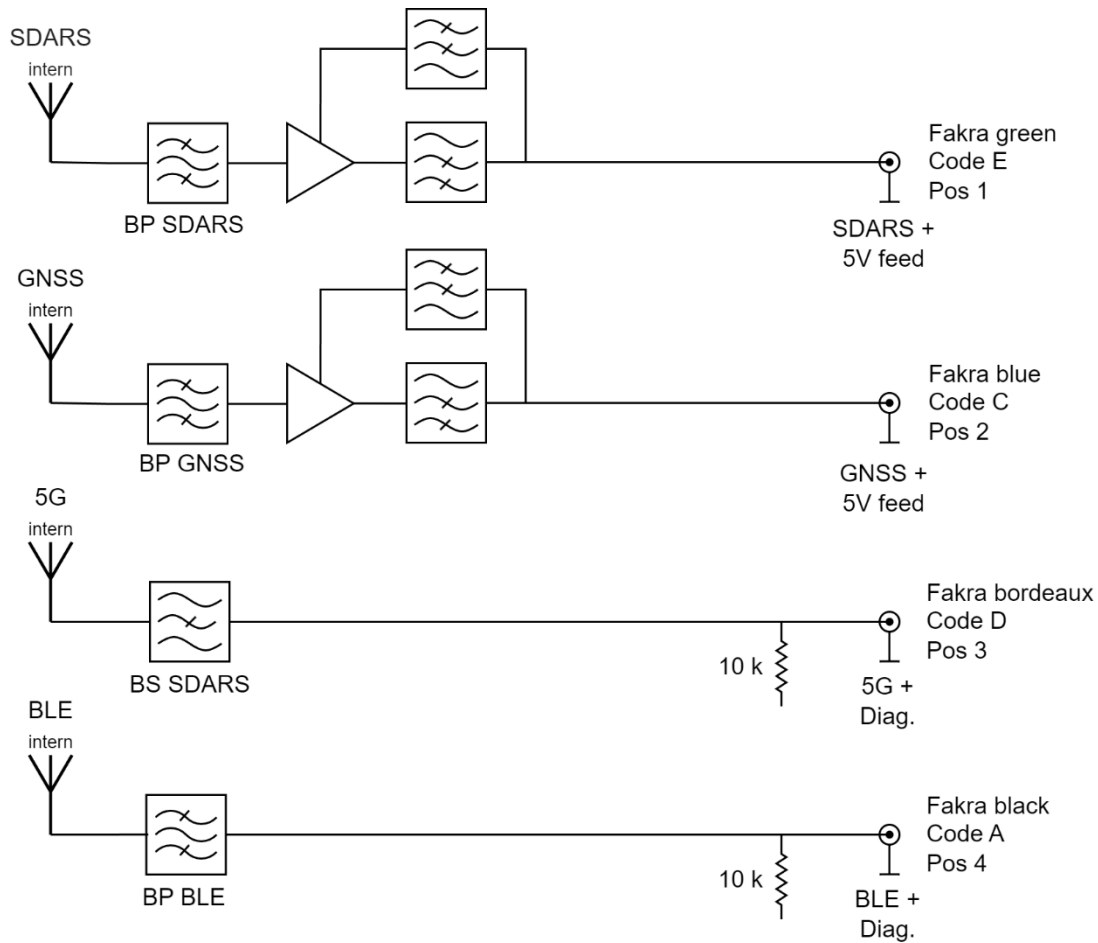
A ceramic patch and a two-stage low noise amplifier (LNA) build up the GNSS antenna providing reception for the upper L-band signals GPS L1, GLONASS G1, Beidou B1 and Galileo G1 as well as associated augmentation signals like WAAS, EGNOS and MSAS (1559 ... 1606 MHz).

The GNSS circuit must be supplied with power via phantom feed.

1.5 Views

Top view	Bottom view
 The top view shows the device from above. The upper half displays the blue, textured outer casing. The lower half shows the internal green printed circuit board (PCB) with various electronic components, including a large blue component on the right and a white square component on the left.	 The bottom view shows the internal mechanical and electrical components. A central grey mechanical assembly is visible, featuring a large gold-colored circular component. To the right, there are green and blue connectors. At the bottom, there are two black and red square components. The entire assembly is mounted on a light purple base with several blue screws around the perimeter.

1.6 Block diagram



1.7 Pin configuration

Pin	Connector	Pin acc. to drawing	Description	Potential in car
1	Fakra green (E)	Inner contact	SDARS (RF / UB+)	+5V
		Outer contact	Ground (RF / DC)	0V
2	Fakra blue (C)	Inner contact	GNSS (RF / UB+)	+5V
		Outer contact	Ground (RF / DC)	0V
3	Fakra bordeaux (D)	Inner contact	LTE (RF)	
		Outer contact	Ground (RF)	
4	Fakra black (A)	Inner contact	BT (RF)	
		Outer contact	Ground (RF)	

2 Model numbering

OEM part number	4K0.035.503.D
Supplier part number	52525484

Further supplier part numbers:						
52525756	52525757	52525758	52525759	52525760	52525761	52525762
52525763	52525764	52525765	52525766	52525767	52525768	52525769
52525770	52525771	52525772	52525773	52525774	52525775	52525776
52525777	52525778	52525779	52525780	52525781	52525782	52525783
52525784	52525785	52525786	52525787	52525788	52525789	52525790
52525791	52525792	52525793	52525794	52525795	52525796	52525797
52525798	52525799					

3 Specification

3.1 General specification

Table 3-1: Environmental conditions

Operating temperature	-40 °C ... +95 °C
Storage temperature	-40 °C ... +95 °C
Validation tests	compliant to VW80000, VW80101 and LAH 4M0.035.G
EMC tests	compliant to VW81000 and EMV-LAH-Module 2.16

3.2 SDARS specification

3.2.1 Antenna performance

Table 3-2: Typical electrical properties of the passive SXM adapter

Parameter	Condition	Value
Patch dimensions	Width x Length x Height	25 mm x 25 mm x 4 mm
Frequency range		2320 ... 2345 MHz
Return loss	2320 ... 2345 MHz	min. 15 dB
Linear Average Gain	at Zenith, on 1 m ground plane	typ. 4,7 dBic
Peak gain	on 1 m ground plane	7,1 dBic
Impedance		50 Ω
Polarization		LHCP

3.2.2 LNA performance

Table 3-3: RF LNA performance (SXM)

Parameter	Condition	Value
Supply voltage		4,0 ... 5,5 V
Current consumption	5,5 V / -40 °C	193 mA (max)
	5,0 V / +25 °C	142 mA (typ)
	4,0 V / +90 °C	94 mA (min)
Operating temperature		-40 °C ... +95 °C ¹
Noise figure	4 – 5 V / 2320 ... 2345 MHz	typ. 0,9 dB
Gain		typ. 29 dB
Output return loss		min. 10 dB
Gain ripple		max. 1,5 dB
Input 1dB Compression Point		min. -9,4 dBm
Out of Band 1dB Compression Point	4 V / 698 ... 894 MHz	2,7 ... 10,3 dBm
	4 V / 1710 ... 2155 MHz	3,7 ... 23,6 dBm
	4 V / 2400 ... 2690 MHz	14,9 ... 23,1 dBm
Input Third Order Intercept	f ₁ / f ₂ = 2331,5 MHz / 2333,5 MHz	min. 3,1 dBm
Narrowband Selectivity	2305 ... 2310 / 2355 ... 2360 MHz	min. 22 dB
	2310 ... 2315 / 2350 ... 2355 MHz	min. 4,2 dB
Wideband Selectivity	< 2155 MHz	min. 45,3 dB
	> 2400 MHz	min. 50,2 dB
Intermodulation Rejection Ratio	4 V / 3 rd order case 1 – 3	min. 81,7 dB
	4 V / 3 rd order case 4 – 5	min. 77,6 dB
	4 V / 2 nd order	min. 72,3 dB

3.2.3 Overall performance

Table 3-4: Isolation (SXM) to other services of the active antenna

Parameter	Condition	Value
SDARS (Rx) and cellular phone (Tx)	698 ... 894 MHz	min. 60 dB
	1710 ... 1990 MHz	min. 32,6 dB
	2110 ... 2155 MHz	min. 49 dB
	2400 ... 2484 MHz	min. 27,6 dB
	2496 ... 2690 MHz	min. 28 dB
SDARS (Rx) and Bluetooth (Tx)	2400 ... 2484 MHz	min. 36,3 dB

¹ Performance compliant to SiriusXM specification SX-9845-0105-03

3.3 GNSS specification

3.3.1 Antenna performance

Table 3-5: Typical electrical properties of the passive GNSS adapter

Parameter	Condition	Value
Patch dimensions	Width x Length x Height	18 mm x 18 mm x 4 mm
Frequency ranges	Beidou	1559,052 ... 1563,144 MHz
	GPS/Galileo	1571,42 ... 1579,4 MHz
	Glonass	1598,0625 ... 1605,375 MHz
Return loss	GPS/Galileo	min. 10 dB
Linear Average Gain	Zenith, on 1 m ground plane, GPS/Galileo	typ. 2,9 dBic
Axial ratio	GPS/Galileo	typ. 4,1 dB
Peak gain		3,9 dBic
Impedance		50 Ω
Polarization		RHCP

Radiated measurement has been performed in the center of the turntable on conducting ground.

3.3.2 LNA performance

Table 3-6: RF LNA performance (GNSS)

Parameter	Condition	Value
Supply voltage		4,5 ... 5,5 V
Current consumption	4,5 V / -40 °C	20,3 mA (min)
	5,0 V / +30 °C	24,1 mA (typ)
	5,5 V / +100 °C	27,5 mA (max)
Noise figure	5,0 V / 1559 ... 1605 MHz	max. 2,4 dB
Gain		typ. 29,6 dB
Output return loss		min. 13,7 dB
Gain ripple		max. 1,8 dB
Input 1dB Compression Point	5,0 V / 1575 MHz	typ. -21,6 dBm
Output Third Order Intercept	f1 / f2 = 1574,9 MHz / 1575,1 MHz	typ. 18,1 dBm
Selectivity	800 ... 1000 MHz	min. 54,1 dB
	1700 ... 2700 MHz	min. 35 dB
	100 ... 1450 MHz	min. 42,1 dB
	1450 ... 1525 MHz	min. 37,1 dB
	1650 ... 2100 MHz	min. 27,3 dB
	2100 ... 2400 MHz	min. 48,6 dB
	2400 ... 2700 MHz	min. 63,5 dB

3.3.3 Overall performance

Table 3-7: Typical electrical properties of the active GNSS antenna

Parameter	Condition	Value
Return loss	GPS/Galileo	min. 9,8 dB
Linear Average Gain	Zenith, on 1 m ground plane, GPS/Galileo	typ. 32,5 dBic
Axial ratio	Zenith, GPS/Galileo	typ. 5,4 dB
Peak gain		33,5 dBic
Impedance		50 Ω
Polarization		RHCP

Radiated measurement has been performed in the center of the turntable on conducting ground.

Table 3-8: Isolation (GNSS) to other services of the active antenna

Parameter	Condition	Value
GNSS (Rx) and cellular phone (Tx)	698 ... 894 MHz	min. 51,9 dB
	1710 ... 1990 MHz	min. 15,8 dB
	2110 ... 2155 MHz	min. 31,1 dB
	2400 ... 2484 MHz	min. 40,2 dB
	2496 ... 2690 MHz	min. 41,3 dB
GNSS (Rx) and Bluetooth (Tx)	2400 ... 2484 MHz	min. 36,4 dB

3.4 Cellular phone specification

Table 3-9: Typical electrical properties (cellular phone)

Parameter	Condition		Value
Frequency ranges	Low-band (n71)		617 - 698 MHz
	Low-band (n20 n28 n8)		698 - 960 MHz
	JP-Band		1427,9 MHz – 1510,9 MHz
	Mid-Band (n3 n2)		1710 MHz – 1990 MHz
	Mid-Band (n1)		1990 MHz – 2170 MHz
	Mid-Band (n41)		2500 MHz – 2690 MHz
	High-band (n77)		3300 MHz – 4200 MHz
	High-band (n78 n79)		4400 MHz – 5000 MHz
Return loss	617 - 698 MHz		Typ. -6 dB
	698 - 960 MHz		Typ. -8 dB
	1427,9 MHz – 1510,9 MHz		Typ. -6 dB
	1710 MHz – 1990 MHz		Typ. -8 dB
	1990 MHz – 2170 MHz		Typ. -8 dB
	2500 MHz – 2690 MHz		Typ. -8 dB
	3300 MHz – 4200 MHz		Typ. -10 dB
	4400 MHz – 5000 MHz		Typ. -8 dB
Linear Average Gain	617 - 698 MHz	on 1 m ground plane; $\Delta\Phi = 0 \dots 359^\circ$ and $\Delta\theta = 60 \dots 90^\circ$	typ. -1.5 dBi ; max. 2.8 dBi
	698 - 960 MHz		typ. 1 dBi; max. 4.9 dBi
	1427,9 MHz – 1510,9 MHz		typ. 1 dBi; max. 5.3 dBi
	1710 MHz – 1990 MHz		typ. 1 dBi ; max. 6.0dBi
	1990 MHz – 2170 MHz		typ. 1,5 dBi; max. 6.9 dBi
	2500 MHz – 2690 MHz		typ. 1 dBi; max. 7.8 dBi
	3300 MHz – 4200 MHz		typ. 0 dBi; max. 8.2 dBi
	4400 MHz – 5000 MHz		typ. 0 dBi ; max. 8,5 dBi
Peak gain	@ 4450 MHz		max. 8,5 dBi
Impedance			50 Ω
Polarization	Combination of vertical and horizontal		Linear H + V
Diagnosis resistance			typ. 10 k Ω

Radiated measurement has been performed in the center of the turntable on conducting ground.

3.5 Bluetooth specification

3.5.1 Antenna performance

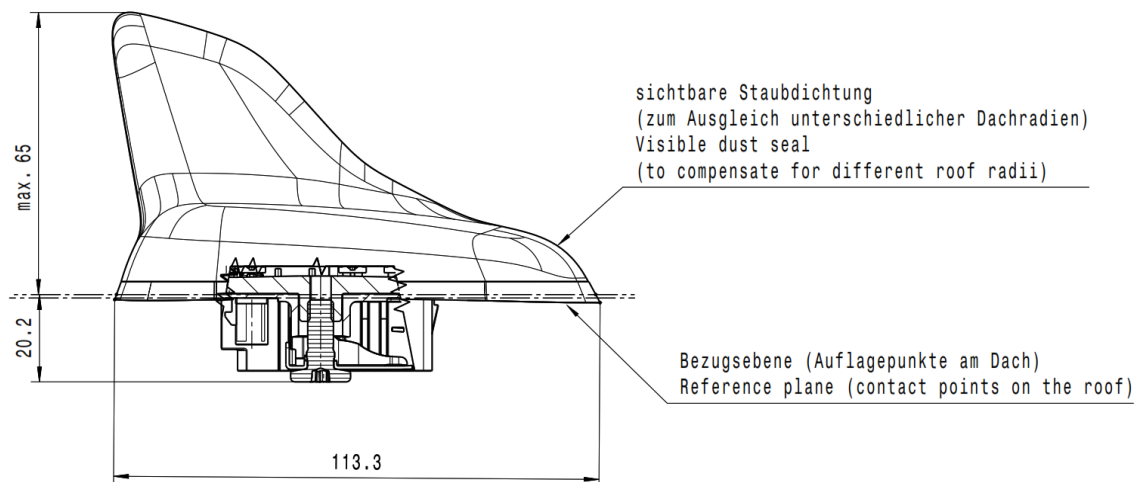
Table 3-10: Typical electrical properties (Bluetooth) passive

Parameter	Condition	Value
Frequency range		2400 ... 2483,5 MHz
Linear Average Gain	on 1 m ground plane, $\Delta\Phi = 0 \dots 359^\circ$ and $\Delta\theta = 80 \dots 90^\circ$	typ. -1 dBi
Peak gain		max. 5 dBi
Polarization	Combination of vertical and horizontal	Linear H + V
Impedance		50 Ω
Polarization	Combination of vertical and horizontal	Linear H + V
Diagnosis resistance		typ. 10 k Ω

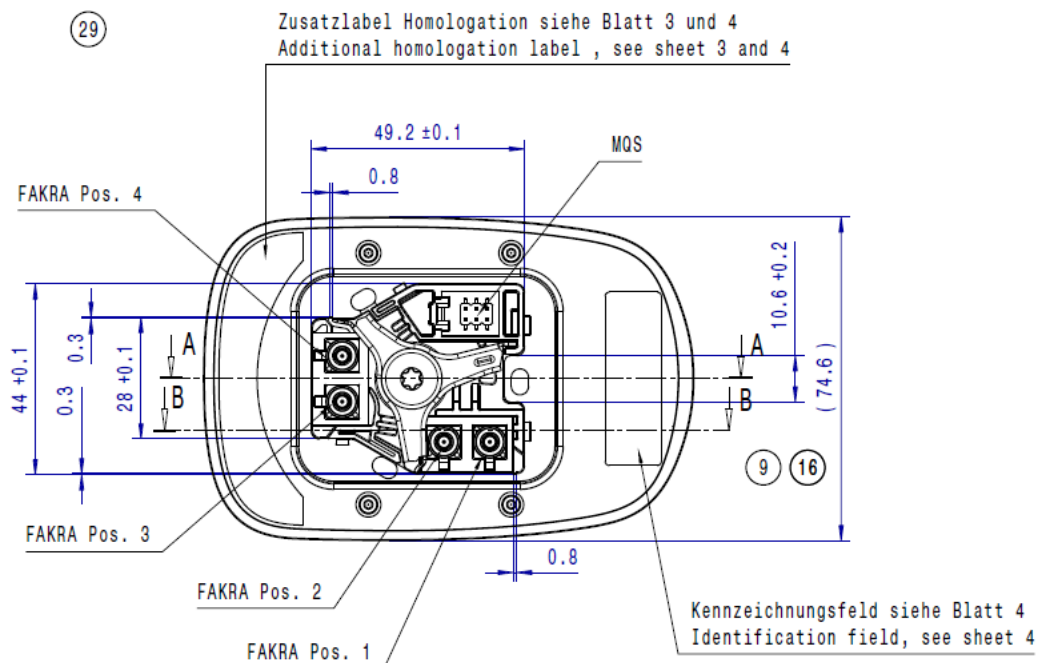
Radiated measurement has been performed in the center of the turntable on conducting ground.

4 Dimensions

As-received condition



Bottom view



Roof hole

Dachloch, Ansicht von oben
Roof hole, view from above

2:1

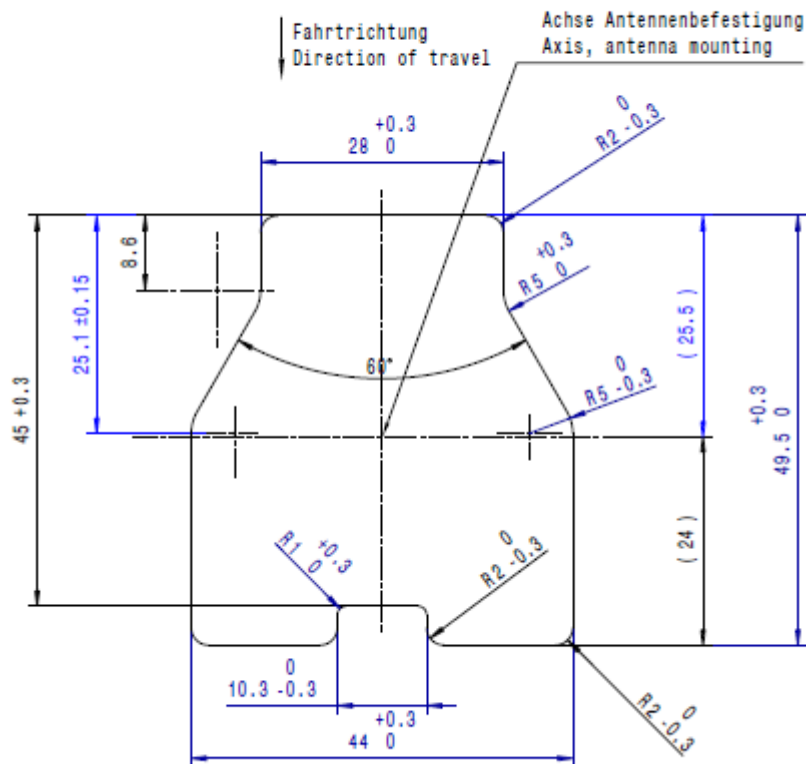


Figure 4-1: Mechanical drawing

5 Measurements cellular

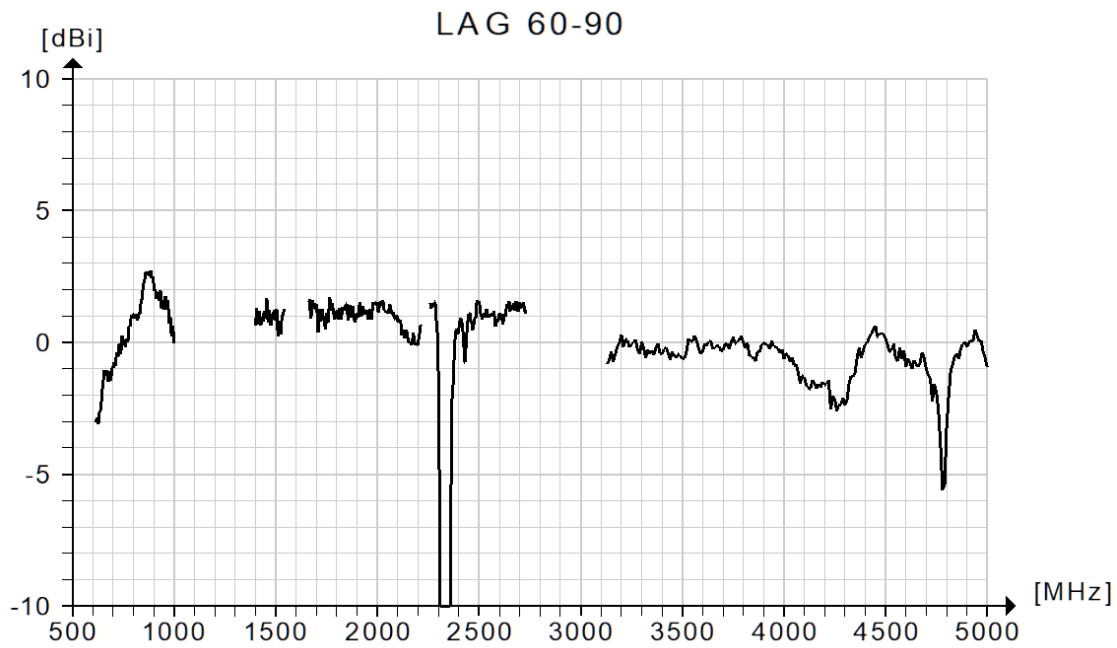


Figure 5-1: Linear Average Gain (60°- 90°)

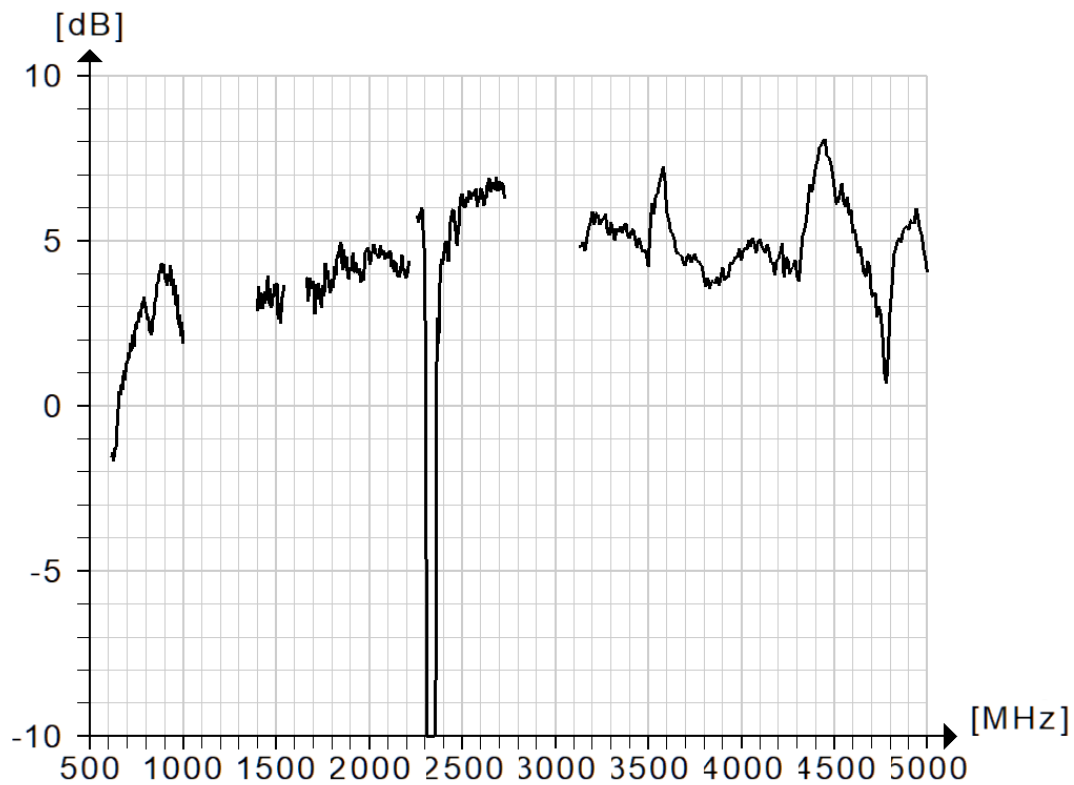


Figure 5-2: max peak (0°-95°)

Index of Tables and Figures

Table 3-1: Environmental conditions	7
Table 3-2: Typical electrical properties of the passive SXM adapter	7
Table 3-3: RF LNA performance (SXM)	8
Table 3-4: Isolation (SXM) to other services of the active antenna.....	8
Table 3-5: Typical electrical properties of the passive GNSS adapter	9
Table 3-6: RF LNA performance (GNSS).....	9
Table 3-7: Typical electrical properties of the active GNSS antenna.....	10
Table 3-8: Isolation (GNSS) to other services of the active antenna	10
Table 3-9: Typical electrical properties (cellular phone).....	11
Table 3-10: Typical electrical properties (Bluetooth) passive.....	12
Figure 4-1: Mechanical drawing	14
Figure 5-1: Linear Average Gain (60°- 90°)	15
Figure 5-2: max peak (0°-95°)	15