Antenna Gain R E P O R T

- 315 MHz, 433 MHz -

Deutsche Akkreditierungsstelle D-PL-12030-01-01

Test Report No. : T36036-01-01HS	27. June 2012 Date of issue

Type / Model Name : Window antenna S212

Product Description : Dedicated antenna for keyless entry system

Applicant : Delphi Deutschland GmbH

Address : TecCenter

31162 BAD SALZDETFURTH, GERMANY

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Contents

1 SUMMARY

1.1 GENERAL REMARKS:

Variants of the EUT

The EUT is always the same only the output impedance is matched to the appropriate antenna.

Operation frequency

The Antenna gain is evaluated at 315 MHz and 433 MHz.

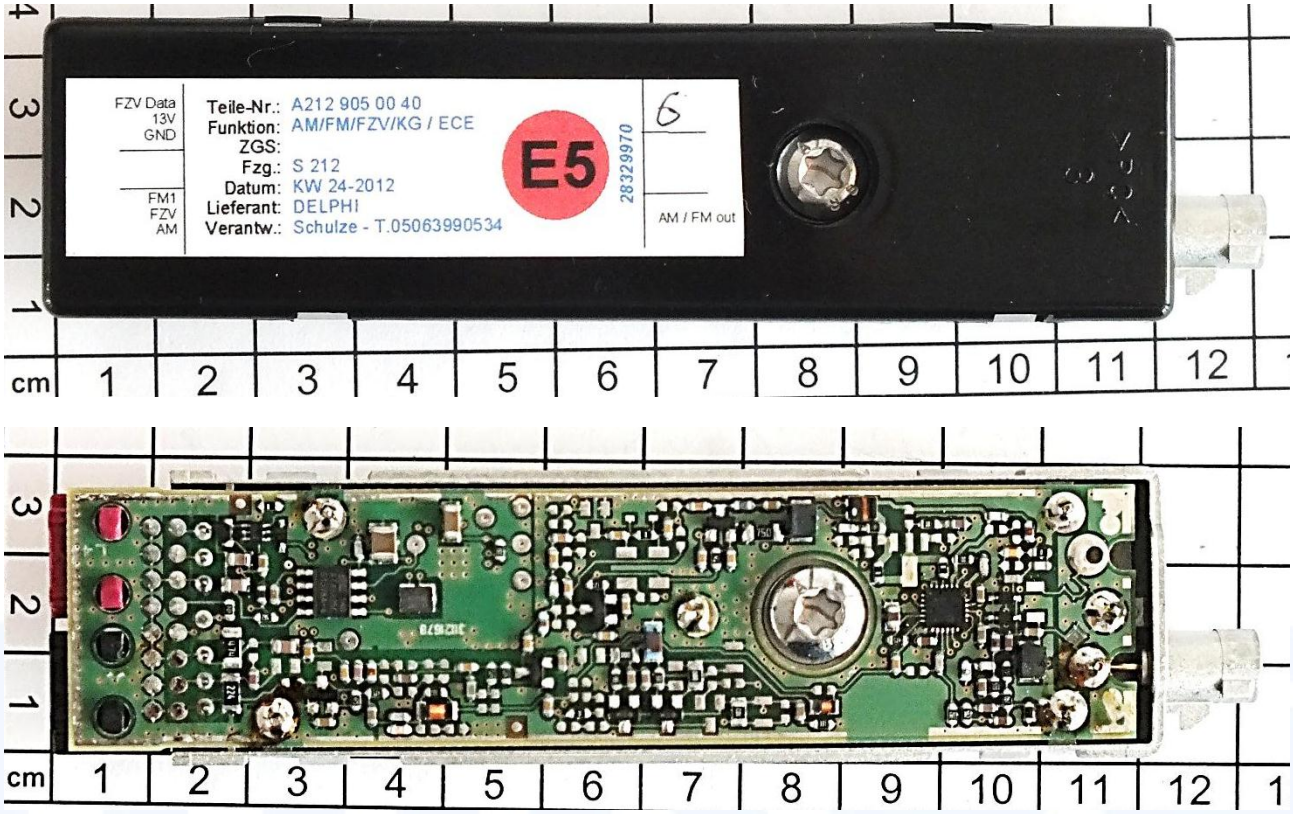
Antenna

The dedicated antenna is realised as side window antenna.
The EUT has individual impedance for the special antenna to optimise the transmission ability.

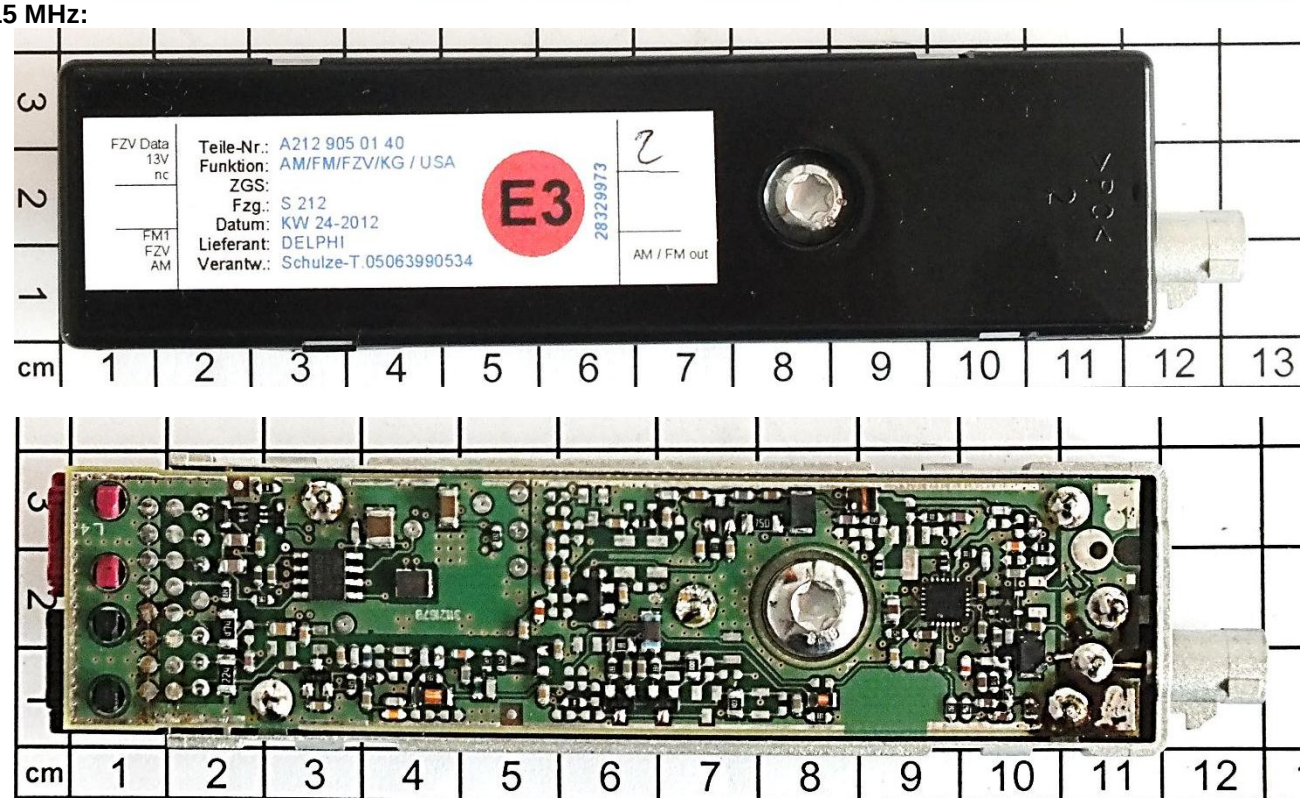
2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT

433 MHz:



315 MHz:



2.2 Photo documentation of side antenna

UT connected to the dedicated window antenna in the original integration of a car.

3 TEST CONDITIONS AND RESULTS

3.1 Equivalent isotropic radiated power

For test instruments and accessories used see section 6 Part **CPR2**.

3.1.1 Description of the test location

Test location: OATS 1

3.1.1 Description of measurement

The radiated power of the fundamental wave from the EUT is measured in the frequency range of 30 to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas at an OATS. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and peak detection. The antenna was positioned 10 m horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 m, measurement scans are made in horizontal and vertical antenna polarization and the EUT is rotated 360 degrees. The higher value is recorded.
The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: RBW: 120 kHz

3.1.2 Test result

Polarisation of the antenna for the highest emission level: Vertical
Type of signal: Unmodulated
Power setting 0x1E

Test conditions		Transmitter power EIRP (dBm)		
			315 MHz	
T_{nom} (20°C)	V_{nom} (12 V)		-5.6	
Measurement uncertainty		± 0.75 dB		

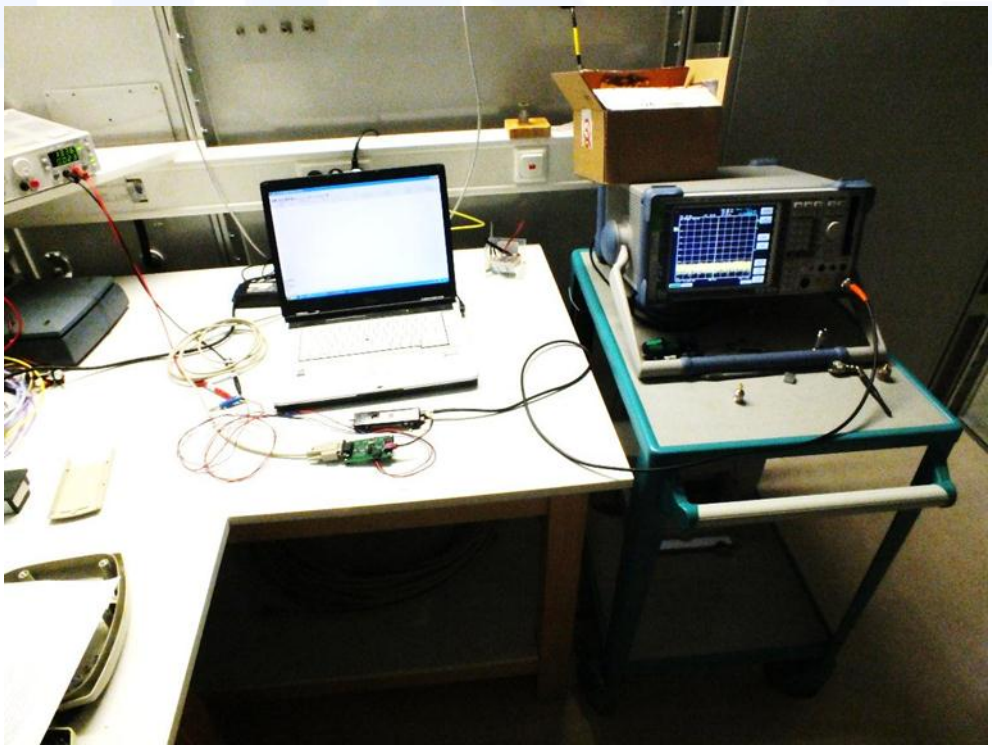
Polarisation of the antenna for the highest emission level: Vertical
Type of signal: Unmodulated
Power setting 0x26

Test conditions		Transmitter power EIRP (dBm)		
			433 MHz	
T_{nom} (20°C)	V_{nom} (12 V)		0.5	
Measurement uncertainty		± 0.75 dB		

3.2 Carrier power conducted

For test instruments and accessories used see section 6 Part **CPC2**.

3.2.1 Description of the test location



3.2.2 Description of measurement

The carrier power have been measured conducted at the antenna connector using a spectrum analyser as an artificial antenna producing a smaller VSWR than 1.2:1. The marker is set to peak determining the output power. The measurement is performed in TX continuous mode without modulation.

3.2.3 Test result

Type of signal: Unmodulated
Power setting 0x1E

Test conditions		Transmitter power (dBm)		
			315 MHz	
T_{nom} (20°C)	V_{nom} (12 V)		7.3	
Measurement uncertainty		± 0.75 dB		

Type of signal: Unmodulated
Power setting 0x26

Test conditions		Transmitter power (dBm)		
			433 MHz	
T_{nom} (20°C)	V_{nom} (12 V)		1.1	
Measurement uncertainty		± 0.75 dB		

Remarks: A cable loss of 1.0 dB is taken into account.

3.3 Determination of the antenna gain

3.3.1 Description of measurement procedure

The antenna gain is determined in the OATS with the substitution method. First the antenna power was measured in the original setup than the substitution antenna and a signal generator was used to generate the same power level. This power level is used to calculate the antenna gain.

3.3.2 Calculation of the antenna gain

Substitution antenna: UHALP 9108 Gain G_s = 6.6 dBi at 325 MHz
Substitution antenna: UHALP 9108 Gain G_s = 6.5 dBi at 425 MHz

For the determination of the antenna gain the following formula is used:

$$\mathbf{G = (P_s + G_s) – (P_c + Ic);}$$

Where
G is the antenna gain of the EUT (dBi).
G_s is the antenna gain of the substitution antenna.
P_c is the output power conducted.
P_s is the output power of the generator at the same output power level as the original setup.
Ic is an impedance correction factor due to the mechanical design of the antenna.

Side antenna unit:

f (MHz)	Ic (dB)	**P_c (dBm)**	**Gs (dBi)**	**P_s (dBm)**	**G (dBi)**
315	1.0	-6.3	6.6	-11.7	2.2
433	-0.9	0.2	6.5	-2.8	2.6

4 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPC 2	FSP 30	02-02/11-05-001	05/10/2012	05/10/2011		
CPR 2	ESVS 30	02-02/03-05-006	20/06/2012	20/06/2011		
	VULB 9168	02-02/24-05-005	16/03/2013	16/03/2012	16/09/2012	16/03/2012
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				