

# ANTENNA GAIN REPORT

315 MHz

<b>Report No. :</b> T33689-00-08HS	29. October 2009 Date of issue
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**Type / Model Name** : Rear window antenna F07 and F11

**Product Description** : Dedicated antenna for keyless entry system

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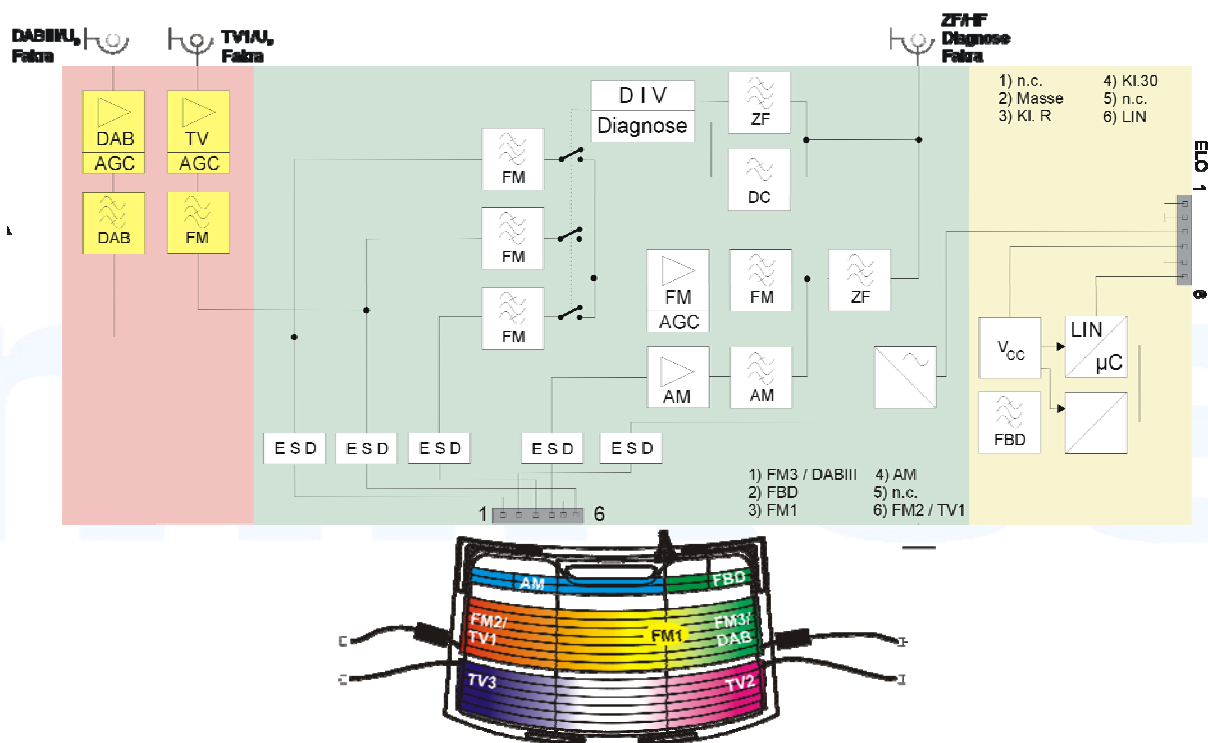
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# 1 Description

The antenna is realised as a special structure in the rear window defroster of a car. The conductor ribbon to the connector is part of the antenna and is not an antenna cable. The window antenna structure is segmented and supports the receiving of AM, FM, DAB, TV and the transceiving of the signals for the keyless entry systems (FBD2). Only the part for the keyless entry system is subject of further discussion. The performance measurement of the antenna was made using an original installed window antenna in a cars trunk door in order to get real circumstances for the radiating structure. The electrical device for testing is also an original transceiver for keyless entry systems FBD2\_315, output power setting is "17" in a hex range from 1 to 1F (Software version: 49, Hardware version: 13).The transceiver is working on Ch1 314.60 MHz, CH2 315.00 MHz and is constructed for this dedicated antennas.

Block diagram:



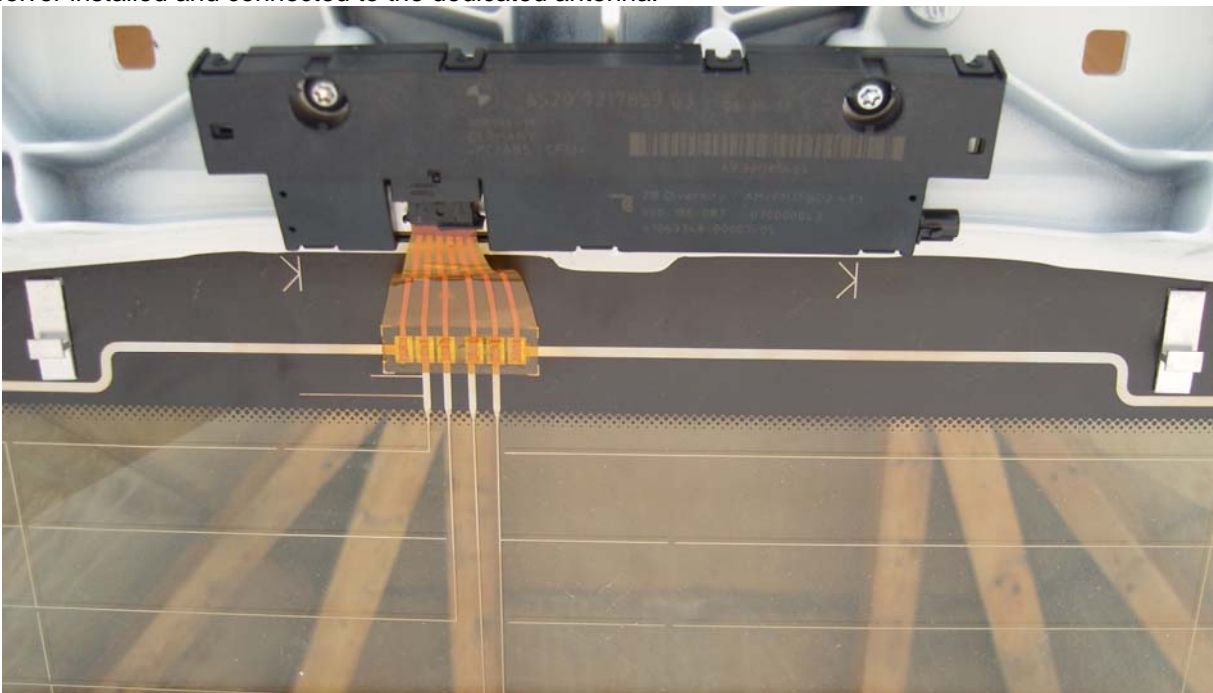
## 2 EQUIPMENT

### 2.1 Photo documentation

Antenna unit F07 (Rear window with metal frame integrated in a trunk door)



Transceiver installed and connected to the dedicated antenna.



Antenna unit F11:



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



### 3 TEST 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



##### 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 measurement was performed under normal conditions in unmodulated TX continuous mode

The resolution bandwidth during the measurement is as follows:

30 MHz – 1000 MHz:      RBW:                      120 kHz

##### 3.1.2 Test result

Test conditions		Transmitter power (dBm) EIRP	
		F07 (314.92 MHz)	F11 (314.92 MHz)
$T_{nom}$ (20°C)	$V_{nom}$ (12 V)	-8.9	-13.6
Measurement uncertainty		± 3 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 while the EUT is set to output power 17hex. The measurement is performed in TX continuous mode without modulation.

### 3.2.3 Test result

Test conditions		Transmitter power (dBm)	
		CH1 (314.60 MHz)	
$T_{nom}$ (20°C)	$V_{nom}$ (12 V)	-3.9	
Measurement uncertainty		± 0.75 dB	

**Remarks:** A cable loss of 0.2 dB @ 315 MHz is taken into account.

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### 3.3 Determination of the antenna gain

For the calculation of the antenna gain (315 MHz) the following formula is used:

$$G = P_R - P_C;$$

Where:

G is the antenna gain of the EUT (dBi)  
 $P_C$  is the output power conducted (dBm)  
 $P_R$  is the output power radiated (EIRP)

Antenna unit F07:

$$G = -3.9 \text{ dBm} - (-8.9) \text{ dBm};$$

$$G = -5.0 \text{ dBi};$$

Antenna unit F11:

$$G = -3.9 \text{ dBm} - (-13.6) \text{ dBm};$$

$$G = -9.7 \text{ dBi};$$

## 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	Kind of Equipment	Manufacturer	Equipment No.
CPR 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog Broad Band Antenna	Schwarzbeck Mess-Elektronik	02-02/24-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
	6543A	Power Supply	HP Hewelett-Packard	02-02/50-05-157
CPC 2	FSP 30	Spectrum Analyser	Rohde & Schwarz München	02-02/11-05-001
	6543A	Power Supply	HP Hewelett-Packard	02-02/50-05-157