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Antenna Coupler/RF Shielding Cover/Bluetooth® Antenna/ USB Feedthrough R&S® CMU-Z10/-Z11/-Z12/-Z13

Simple coupling and interference-free testing of mobile phones in all frequency bands

Anyone engaged in mobile phone testing knows how difficult it is to obtain a suitable RF adapter, suppress RFI that would otherwise corrupt measurement results, and overcome other such problems.

The R&S® CMU-Z10/-Z11/-Z12/-Z13 set-up from Rohde & Schwarz provides the solution to these problems for all mobile phones – whether GSM, US Cellular or WCDMA.

The broadband Antenna Coupler R&S® CMU-Z10 can be used alone or combined with the RF Shielding Cover R&S® CMU-Z11 to create a fully enclosed RF shielded chamber.

Antenna Coupler R&S®CMU-Z10

The miniaturization of mobile phones has led to the antenna being concealed inside the enclosure. In the latest mobile phone models, the antenna has been replaced by a metallic-printed ceramic rod on the PC board or a printed structure in the cover. This radiating element is usually accommodated in the upper rear part of the phone. The emitted fields can ideally be picked up by an extensive coupling structure such as the R&S®CMU-Z10.

Polarization

A $\lambda/4$ radiator vertically mounted on the mobile phone generates a vertically polarized electromagnetic field. The coupling element in the R&S®CMU-Z10 is arranged such that a mobile phone with a vertically mounted $\lambda/4$ radiator achieves minimum coupling attenuation. The coupler is of asymmetric design so that measurements can also be performed on mobile phones with horizontal polarization.

Position

The blue circle in Fig. 3 shows the active coupling zone for frequencies from 770 MHz to 960 MHz, the green circle that for frequencies from 1.7 GHz to 2.2 GHz. Depending on the radiation center of the phone, the optimum position is different for each model. Since the coupling zone is a defined area, the phone can be shifted somewhat out of the optimum position without dramatically increasing coupling attenuation (see Fig. 1). These zones are marked on the coupler by means of the antenna elements, which are visible through the transparent base plate.

To facilitate the handling of DUTs, the mounted transparent flat base plate has a grid with numbers from 1 to 26 and alphabetic characters from A to R. The grid contains holes at all intersection points to make it easy to fixate an

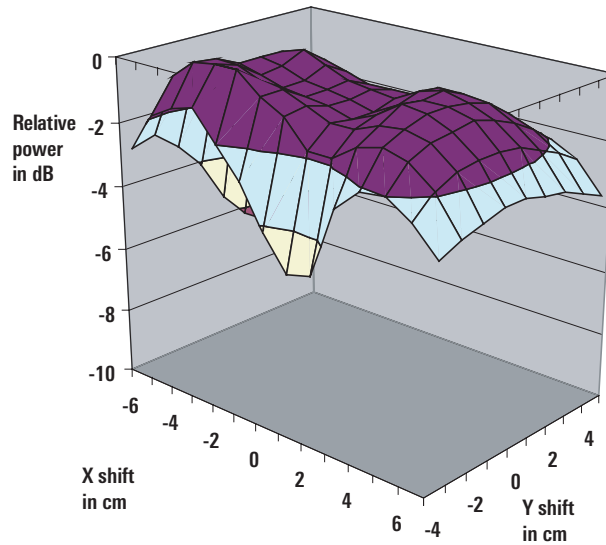


Fig. 1: Power measurement at different positions of antenna adapter without the R&S®CMU-Z11 in the GSM 900 band

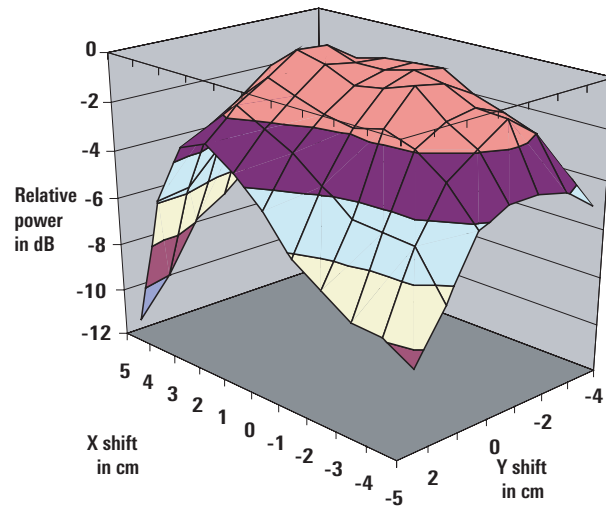


Fig. 2 Power measurement at different positions of antenna adapter without the R&S®CMU-Z11 in the GSM 1800 band

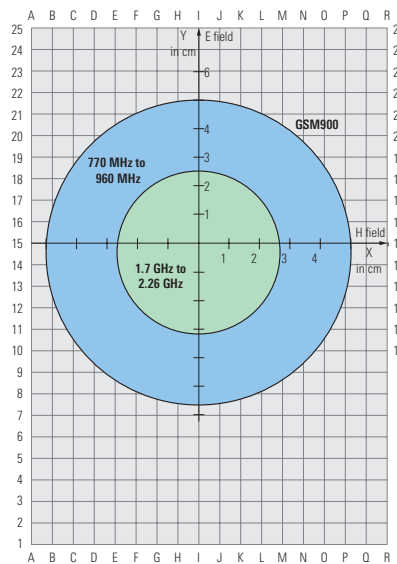


Fig. 3: Active coupling zone above the coupling antenna of the R&S®CMU-Z10/-Z11 in reference to the shift in the x- and y-axis, shown in the figures above

L-shaped bracket. The ideal position for the bracket is usually the position with minimum coupling factors.



Grid fixation system for reliable measurement results and greater flexibility in placing mobile phones with diverse designs

You can move and turn the bracket to determine the ideal position for each mobile phone type and note the coordinates of the corresponding reference points. Stabilization pieces are also supplied if better fixation of the mobile phone on the plate is necessary. This base plate can accommodate DUTs of up to 280 mm × 50 mm × 200 mm in size.

Placing the mobile phone directly above the antenna within the coordinate system offers several advantages including:

- ◆ Coupling loss reduction between coupler and mobile phone antenna due to the minimum distance between both
- ◆ Definable and reproducible results since the mobile phone can be exactly positioned with minimum coupling loss; the grid can be used to define the position of the mobile phone at 10 mm accuracy in both the vertical and horizontal axes
- ◆ The grid fixation system makes it possible to create a database for several mobile phones and their positions in the R&S®CMU-Z10/-Z11/-Z12/-Z13 with minimum coupling factors

Mismatch

To minimize RF power loss en route to the radiocommunications tester (e.g. the R&S®CMU 200), the high-quality cable that comes with the R&S®CMU-Z10 should be used.

Radiated interference

Interference from other transmitters corrupts the measurement results. Interfering transmitters may be neighboring base stations as well as other mobile phones and test sets in the same service shop or repair line. Distinctly differing results of bit error ratio (BER) measurements in different channels are a clear sign of interference. Therefore the antenna coupler should be used in combination with the Shielding Cover R&S®CMU-Z11.

Country-specific regulations may stipulate that the test set be protected against unwanted radiated emissions. Please check the regulations in your country or use the shielding cover for all your measurements.

Shielding Cover R&S®CMU-Z11

If the antenna coupler and shielding cover are closed, a standing wave may be generated between the floor of the coupler and the ceiling of the shielding cover. To reduce this effect, the ceiling of the shielding cover is lined with a foam material to attenuate the magnetic field, which is at its maximum at the metal surface. In addition the electric

field component is attenuated by a pyramid-shaped absorber. The shielding cover upgrades the antenna coupler to a high-grade RF shielded chamber that prevents interference radiated by base stations or other neighboring test and service sets from affecting the measurement results of the DUT. This is particularly important in BER measurements. The closing mechanism can easily be operated with only one hand and ensures very high shielding effectiveness of >50 dB by producing a defined contact pressure.

Bluetooth® Antenna R&S®CMU-Z12

The Bluetooth® Antenna R&S®CMU-Z12 is designed as a universal antenna to cover the frequency range from 2.4 GHz to 2.5 GHz with a VSWR of <2.5. Some wireless LAN applications are also performed within this frequency range. The R&S®CMU-Z12 can, therefore, also be used for wireless LAN applications.

USB Feedthrough R&S®CMU-Z13

There are two ways to control a DUT in the shielding system: by means of a 15-pin through connector or the USB Feedthrough R&S®CMU-Z13. Both connectors can be mounted together. However, if the Bluetooth® Antenna R&S®CMU-Z12 is used, only one of the connectors can be mounted.



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Specifications

R&S®CMU-Z10

VSWR without the R&S®CMU-Z11, without DUT, with cable supplied

0.77 GHz to 0.87 GHz	<5.0
0.87 GHz to 0.96 GHz	<3.5
1.7 GHz to 2.0 GHz	<3.5
2.0 GHz to 2.2 GHz	<3.5

Coupling factor

770 MHz to 960 MHz	5 dB to 8 dB ¹⁾
1.7 GHz to 2.2 GHz	10 dB to 15 dB ¹⁾

Connectors

RF IN/OUT	N female/N female
RF THROUGH	N female/N female
DATA THROUGH	15-pin HDD female filter adapter/ 15-pin HDD male filter adapter

R&S®CMU-Z11

Shielding effectiveness (R&S®CMU-Z10 and R&S®CMU-Z11 closed)

Antenna coupler	>50 dB
In conjunction with	
Bluetooth® Antenna R&S®CMU-Z12	>30 dB
USB Feedthrough R&S®CMU-Z13	>50 dB

R&S®CMU-Z12

VSWR

2.4 GHz to 2.5 GHz	<2.5
Connector	N female

The Bluetooth® Antenna R&S®CMU-Z12 can be integrated into the R&S®CMU-Z10 or used separately.

R&S®CMU-Z13²⁾

Connector inside antenna coupler	USB-A
Connector outside antenna coupler	USB-B
Data rate	full/low speed ³⁾

¹⁾ The specified coupling factor is based on measurements carried out on several mobile phones from different manufacturers. The values cannot be warranted since they also depend on the antenna pattern of the mobile phone.

²⁾ The 15-pin data through-connector has to be removed if the R&S®CMU-Z12 and R&S®CMU-Z13 are mounted simultaneously.

³⁾ The R&S®CMU-Z13 supports the data rates specified in the USB 1.1 standard. At present, USB 2.0 is not supported.

General data

Operating temperature range	-10 °C to +45 °C
Dimensions (W × H × D)	
R&S®CMU-Z10	230 mm × 100 mm × 320 mm
R&S®CMU-Z10 with R&S®CMU-Z11	250 mm × 180 mm × 430 mm
Usable test space	280 mm × 50 mm × 200 mm
R&S®CMU-Z12	56 mm × 56 mm × 50 mm
R&S®CMU-Z13	38 mm × 32 mm × 52 mm
Weight	
R&S®CMU-Z10	2.7 kg
R&S®CMU-Z10 with R&S®CMU-Z11	4.8 kg
R&S®CMU-Z12	0.1 kg
R&S®CMU-Z13	0.25 kg

Ordering information

Antenna Coupler	R&S®CMU-Z10	1150.0801.10
RF Shielding Cover for R&S®CMU-Z10	R&S®CMU-Z11	1150.1008.02
Bluetooth® Antenna	R&S®CMU-Z12	1150.1043.02
USB Feedthrough	R&S®CMU-Z13	1159.1200.02
Spare RF sealing cord for R&S®CMU-Z11		1158.9514.00
Spare parts for mobile phone fixation for R&S®CMU-Z10:		
Grid positioning plate		1158.9789.00
L-shaped bracket		1158.9808.00
Stabilizing pieces		1158.9820.00

If you order the Antenna Coupler R&S®CMU-Z10 plus the Shielding Cover R&S®CMU-Z11 and/or the Bluetooth® Antenna R&S®CMU-Z12, the shielded chamber comes ready-mounted. All components are also available individually for upgrading. If the R&S®CMU-Z11 and/or R&S®CMU-Z12 are not to be factory-fitted on the Antenna Coupler R&S®CMU-Z10, please order these options separately. The R&S®CMU-Z13 is always delivered separately.

Equipment supplied

R&S®CMU-Z10	coupler (base for shielded chamber), cable RG-214 with two N male connectors, length approx. 120 cm, 2nd base plate made of plexiglass with a fixed holder for optional use instead of the mounted plate provided with grid positioning system
R&S®CMU-Z11	shielding cover for the antenna coupler, hinges for fastening it to the coupler



www.rohde-schwarz.com

Europe: +49 1805 12 4242, customersupport@rohde-schwarz.com
 USA and Canada: 1-888-837-8772, customer.support@rsa.rohde-schwarz.com
 Asia: +65 68463710, customersupport.asia@rohde-schwarz.com