

## Universal Radio Communication Tester CMU200

## Audio measurements on mobile phones

**Audio measurements on mobile phones are highly important because voice transmission quality is a significant factor in the users' satisfaction with the day-to-day use of their mobiles. Moreover, an increasing number of mobile phones are fitted with additional audio components such as FM stereo radios, MP3 players or voice recorders. Using the CMU-B41 audio option, the Universal Radio Communication Tester CMU200 performs virtually all audio measurements on mobile phones quickly and precisely.**

## Voice codec for GSM and TDMA

The audio quality of digital mobile phones is mainly determined by the voice codec and the analog components such as microphone, loudspeaker and amplifier.

In digital mobile radio, voice transmission is, of course, digital. This means that a mobile phone has to convert the audio signals picked up by the microphone into digital signals before transmitting them to the base station. In the opposite direction, the mobile phone converts the digitally coded audio signal back into an analog signal for output via the loudspeaker. The voice codec converts analog into digital signals and vice versa. To carry out measurements on the voice codec, the tester must be also fitted with a voice codec to convert analog test signals to digital. To perform these measurements, the CMU200 can be equipped with various voice codecs, for instance with the CMU-B52 option for GSM and TDMA.

## Wide variety of test options with the CMU-B41 audio option

A two-channel audio analyzer and audio generator in the CMU-B41 option allow the evaluation of analog audio components. The two audio analyzer channels can be fitted with different filters, independently of each other. The block diagram of an individual channel illustrates the wide variety of test functions (FIG 1). All bandwidths relevant for audio measurements can be set via the input filter.

An optional weighting filter ensures the perceptive measurement of audio signals, with the weighting made either by a C message or CCITT filter. This measurement path enables parallel measurement of the rms and peak voltage values of the AC component and the distortion of the audio signal. The frequency to be used by the distortion meter is user-selectable between 20 Hz and 20 kHz.

Moreover, this measurement path contains a further test point with variable bandpass, the center frequency of which can be set between 20 Hz and 20 kHz, and its bandwidth between 10 Hz and 1 kHz. This additional test point provides the rms and peak voltage values of the signal filtered by the bandpass, parallel to the values mentioned above. Furthermore, each of the two audio analyzer channels is fitted with a frequency counter up to 200 kHz and a voltmeter to determine the DC voltage component. Both audio generators can be set independently of each other in the frequency range 20 Hz to 20 kHz and in the level range 10  $\mu$ V to 5 V.

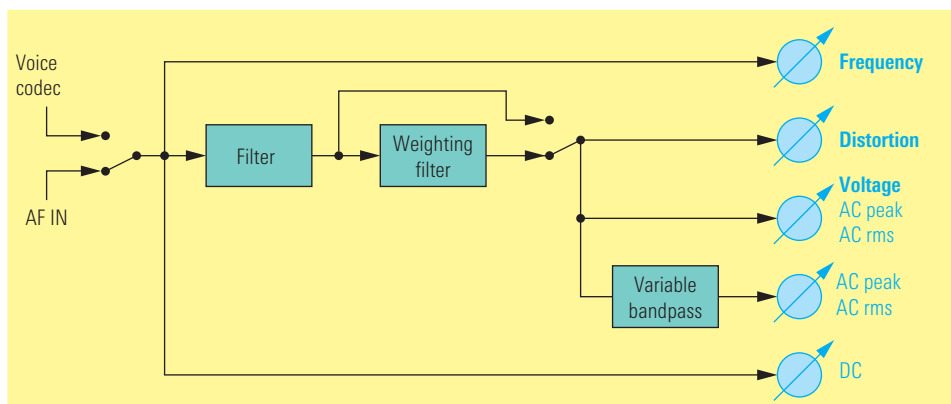


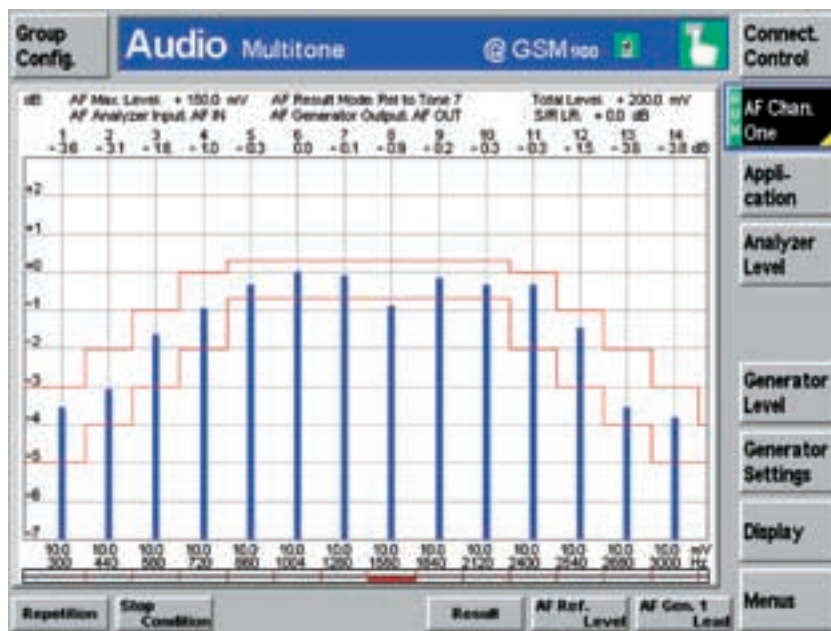
FIG 1 Block diagram of an analyzer channel of the CMU-B41 audio option

## Multitone audio analysis

Besides these basic measurements, the CMU-B41 audio option generates and analyzes multitone audio signals. In the multitone audio measurement, the CMU200 creates up to 20 sinewave signals simultaneously with user-definable frequencies and levels. At the same time, the tester analyzes an audio signal applied with up to 20 narrowband filters, whose center frequencies comply with the frequencies produced by the generator.

For fast and easy determination of the frequency response, the generator output should be connected to the input, and the analyzer to the output of the DUT. The CMU200 compares the measured values to the user-specified tolerance limits and marks out-of-tolerance values (FIG 2). The tolerance limit is user-definable for each individual test frequency.

The new test functions of the CMU200 are rounded off by a facility for adapting audio signals not only externally via audio connectors, but also by connecting generator and analyzer directly to the voice codec within the tester.



**FIG 2** The multitone audio measurement allows very fast measurement of the audio frequency response with up to 20 user-definable frequencies. Values exceeding the user-specified tolerance limits are marked in red at the bottom of the screen.

A glance at the specifications of the CMU-B41 audio option (see box below) shows that, with the CMU-B41, the CMU200 performs not only extensive, but also high-end audio measurements which optimally meet the requirements of the mobile radio market as regards quality, measurement range and speed, and combine short test times with high-

quality measurement results in mobile phone production.

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### Specifications Audio Option CMU-B41

#### Generator

Frequency range/resolution	20 Hz to 20 kHz/0.1 Hz
Level range/resolution	10 $\mu$ V to 5 V/0.1% for levels $\geq$ 10 mV
Level error	$\leq$ 1.5% (for levels $\geq$ 1 mV and frequencies $\leq$ 10 kHz)
Distortion	$\leq$ 0.05% (for levels $\geq$ 100 mV and 600 $\Omega$ load, measurement bandwidth 21.9 kHz)

#### Voltmeter

Frequency range	50 Hz to 20 kHz
Level range/resolution	50 $\mu$ V to 30 V/0.1% for levels $\geq$ 1 mV
Level error	$\leq$ 1.0% + resolution at 1 mV $\leq$ level $\leq$ 2 V

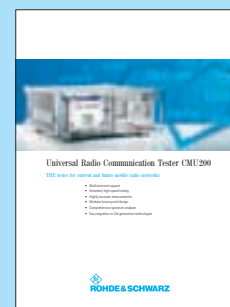
#### Distortion meter

Measurement bandwidth	21 kHz
Frequency range	100 Hz to 10 kHz
Level range	10 mV to 30 V
Resolution	0.01% distortion

#### Frequency counter

Frequency range	10 Hz to 200 kHz
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More information and data sheets at  
[www.rohde-schwarz.com](http://www.rohde-schwarz.com)  
 (search word: CMU200)



#### REFERENCES

Rohde & Schwarz is constantly adapting the Universal Radio Communication Tester CMU200 to technical developments. Since its first presentation in News from Rohde & Schwarz No. 165 (1999), the test options and innovations surrounding this state-of-the-art radio tester have featured in almost all editions.