

## Blazing trails with voice codecs: GSM-8PSK-AMR and WB-AMR

**The R&S® CMU 200 universal radio  
communication tester – the trailblazer  
when it comes to voice functionality  
– expands its position with two new  
voice codecs.**

### GSM-8PSK-AMR

The adaptive multirate (AMR) voice codec has established itself as a standard, since it allows data rate and error protection to be dynamically adapted to connection quality. The R&S® CMU 200 provided the necessary measurement equipment for this right from the start [1]. Currently eight full-rate and six half-rate voice codecs are specified for GSM-AMR. Half rate is used to reduce net-

work load in the short term, for example during large-scale events such as the Soccer World Cup, when many subscribers within one cell want to make calls at the same time.

A major disadvantage of the AMR half-rate voice codec is that up to now only the data rates from 4.75 kbit/s to 7.95 kbit/s can be used with it (FIG 1); however, the best voice quality is achieved at 12.2 kbit/s. This disadvan-

Data rates	Full-rate GMSK channels	Half-rate GMSK channels	Half-rate 8PSK channels
12.2 kbit/s	TCH_AFS_12.2	–	O-TCH_AHS_12.2
10.2 kbit/s	TCH_AFS_10.2	–	O-TCH_AHS_10.2
7.95 kbit/s	TCH_AFS_7.95	TCH_AHS_7.95	O-TCH_AHS_7.95
7.40 kbit/s	TCH_AFS_7.40	TCH_AHS_7.40	O-TCH_AHS_7.40
6.70 kbit/s	TCH_AFS_6.70	TCH_AHS_6.70	O-TCH_AHS_6.70
5.90 kbit/s	TCH_AFS_5.90	TCH_AHS_5.90	O-TCH_AHS_5.90
5.15 kbit/s	TCH_AFS_5.15	TCH_AHS_5.15	O-TCH_AHS_5.15
4.75 kbit/s	TCH_AFS_4.75	TCH_AHS_4.75	O-TCH_AHS_4.75
Traffic mode	AMR full-rate GMSK	AMR half-rate GMSK	AMR half-rate 8PSK

FIG 1 AMR data rates and channels.

► torage is now avoided with the higher 8PSK modulation mode known from the EGPRS standard, which makes enough bits available at the AMR data rates of 10.2 kbit/s and 12.2 kbit/s to provide sufficient error protection. You can thus enjoy optimal voice quality now even when making calls with a half-rate connection.

All measurements supported by the R&S®CMU200 mobile radio tester with GMSK-AMR are, of course, also available for 8PSK-AMR as well (FIGs 2 and 3). 8PSK-AMR is an expansion of the R&S®CMU-K45 option. The signaling test for the 8PSK-AMR voice codec requires the R&S®CMU-B21v14 and R&S®CMU-U65v04 hardware options. Together with the R&S®CMU-B52v14 and R&S®CMU-B41 options, audio measurements are also possible [2].

### Wideband AMR

Today's voice telephony is still burdened by its past. For example, the limited audio bandwidth of 300 Hz to 3.4 kHz was – due to the state of the art at the time – retained during the transition from analog to digital systems.

The new wideband AMR (WB-AMR) voice codec changes all this now. It uses an audio bandwidth of 50 Hz to

FIG 2 Example of the configuration of an 8PSK-AMR channel.

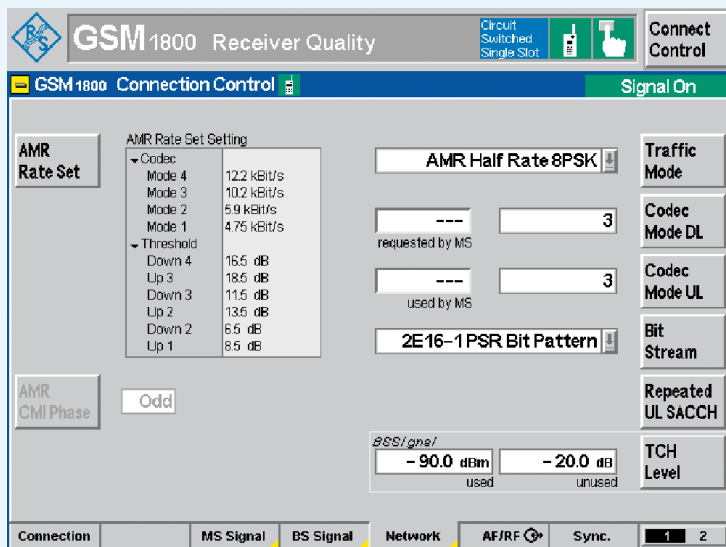
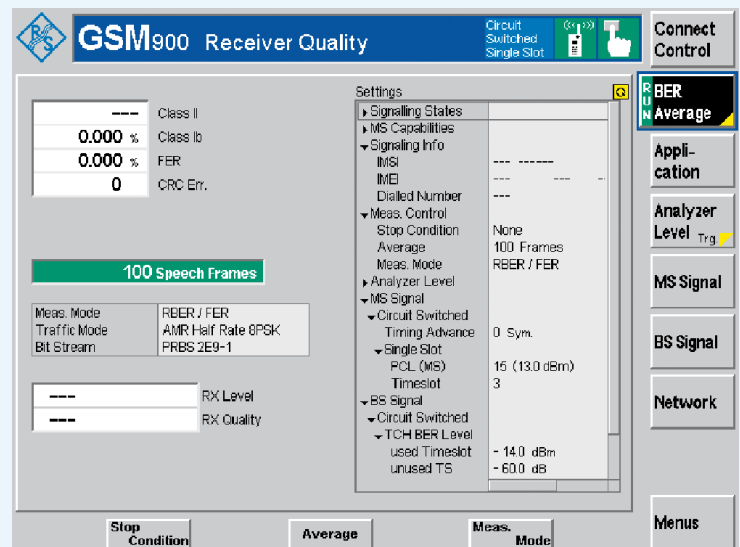


FIG 3 BER measurement on an 8PSK-AMR channel.



7 kHz, which provides a much more natural sound than previous methods. This voice codec is therefore especially suitable for phone conferences. It can even transmit music in an acceptable quality. Like the AMR voice codec, which is also referred to as narrowband AMR (NB-AMR), WB-AMR is specified across systems. The R&S<sup>®</sup>CMU 200 supports this voice codec initially for WCDMA. As in the case of NB-AMR, several data rates – altogether nine between 6.60 kbit/s and 23.85 kbit/s – are specified with WB-AMR. WB-AMR is based on the same principle as NB-AMR; as the connection quality becomes poorer, the data rate decreases and error protection increases.

To test the WB-AMR voice codec, the R&S<sup>®</sup>CMU 200 applies the successful, well-known operating concept also used for NB-AMR. Calls can thus be set up using only a single data rate or a rate set (FIGs 4 and 5).

A big advantage for users is that no new hardware is needed for an R&S<sup>®</sup>CMU 200 that is already equipped for WCDMA. With the R&S<sup>®</sup>CMU-K46 software option, the instrument can perform all WB-AMR signaling tests. And with the R&S<sup>®</sup>CMU-B41 and R&S<sup>®</sup>CMU-B52v14 options, audio measurements on the WB-AMR voice codec are also possible. Together with the R&S<sup>®</sup>UPV audio analyzer, the acoustic characteristics of mobile phones can also be measured [3].

### Summary

It is still to be seen whether the two new voice codecs will establish themselves on the market. WB-AMR in particular provides manufacturers of UMTS telephones with an excellent means of distinguishing their systems from others by delivering better voice quality. The R&S<sup>®</sup>CMU 200 is now the first mobile radio tester to offer the necessary test applications for both voice codecs.

Peter Sterly

More information and data sheet at [www.rohde-schwarz.com](http://www.rohde-schwarz.com) (search term: CMU200)

#### REFERENCES

- [1] Universal Radio Communication Tester R&S<sup>®</sup>CMU 200: Signalling and measurements on GSM-AMR mobile phones. News from Rohde & Schwarz (2003) No. 178, pp. 28–29
- [2] Universal Radio Communication Tester R&S<sup>®</sup>CMU 200: Audio measurements on mobile phones. News from Rohde & Schwarz (2001) No. 172, pp. 18–19
- [3] Audio Analyzer R&S<sup>®</sup>UPL: Measuring the acoustic characteristics of 3G mobile phones. News from Rohde & Schwarz (2002) No. 173, pp. 15–17

FIG 4 Example of the configuration of a WB-AMR WCDMA channel with several data rates.

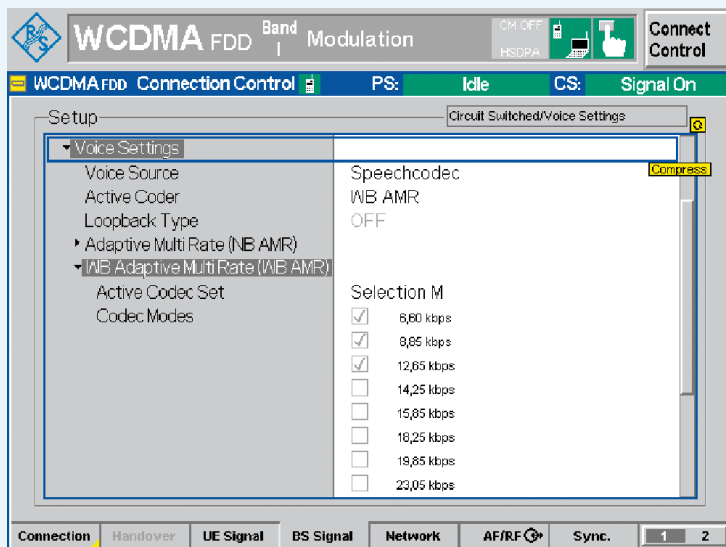


FIG 5 Example of the configuration of a WB-AMR WCDMA channel with 23.85 kbit/s.

