Stereo/RDS Coder R&S SML-B5

For generating FM stereo signals with R&S SML or R&S SMV03

- ◆ Stereo coder with analog and digital audio inputs
- ◆ RDS signals with user-programmable content
- ◆ Traffic area identification
- ◆ Switchable stereo pilot tone
- ◆ Versatile test system consisting of R&S SML with R&S SML-B5 and Audio Analyzer R&S UPL

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FM stereo broadcasting still is the major audio medium. Especially in the automobile sector, where millions of car radios are produced every year. With its integration into mobile radio telephones, FM broadcasting becomes even more significant. For testing FM stereo receivers, audio test signals are modulated onto an RF carrier and measured after demodulation by the device under test. For the car radio sector, automotive radio information (ARI) has to be generated in addition. Test signals are also needed for the radio data system (RDS), which has been established in many countries for a long time.

Stereo/RDS Coder R&S SML-B5

The optional Stereo/RDS Coder R&S SML-B5 meets all the above requirements. Built into instruments of the Signal Generator Family R&S SML (data sheet PD 0757.5550) or the Vector Signal Generator R&S SMV03 (data sheet PD 0757.7175), the solution is based on equipment featuring excellent price/performance as well as top-class specifications and providing full coverage of the frequency range in question.
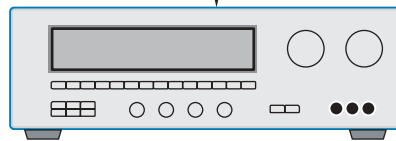
Audio signals produced by internal LF generator

The internal LF generator, which is suitable for simple receiver tests, is part of the basic configuration of the R&S SML or R&S SMV03. It generates sinusoidal signals at fixed frequencies. So basic functional tests can be carried out without an external signal (see Fig. 1).

Signal Generator R&S SML+Stereo/RDS Coder R&S SML-B5

RF-modulated test signal including ARI and RDS

FM stereo tuner

Fig. 1: Audio signals produced by the built-in LF generator of the R&S SML

Combination with Audio Analyzer R&S UPL

The stereo/RDS coder can also work with external signals applied to its analog and digital modulation inputs. Combining the Signal Generator R&S SML and the Audio Analyzer R&S UPL (data sheet PD 0757.2238) creates a general-purpose test system for FM tuners (see Fig. 2).

The great advantage is the automatic synchronization of measurement results. Just as in other two-port audio measurements, the test signals are produced in the generator section of the Audio Analyzer R&S UPL, routed through the modulator and the DUT, and measured in the analyzer section of the R&S UPL.
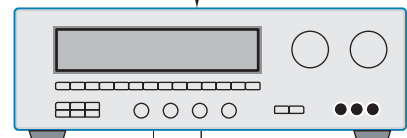
Since generation and analysis are optimally timed, measurement times are considerably shorter than with separately operating instruments.

Use in production

Combination of the Signal Generator R&S SML and the Audio Analyzer R&S UPL enables automation of measurements. The Universal Sequence Control R&S UPL-B10 allows complete test programs to be generated and run on the R&S UPL, the Signal Generator R&S SML with the R&S SML-B5 option being remote-controlled via the IEC 625 or RS-232-C interface. In most production environments, the complete test set can be run under an external controller. All functions of the Stereo/RDS Coder R&S SML-B5 can of course be remote-controlled.

Use of the Audio Switcher R&S UPZ is recommended for measurements on car radios or surround receivers with more than two audio outputs, as shown in Fig. 3. For more information about the Audio Switcher R&S UPZ, see data sheet PD 0757.6985.

Signal Generator R&S SML+Stereo/RDS Coder R&S SML-B5

RF-modulated test signal including ARI and RDS

Analog or digital audio signals

FM stereo tuner

Signal generation and analysis with Audio Analyzer R&S UPL

Analog audio signals

Fig. 2: Audio signals are generated and measured in the Audio Analyzer R&S UPL; automatic synchronization substantially reduces the measurement time

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Audio Switcher R&S UPZ

Analog audio signals
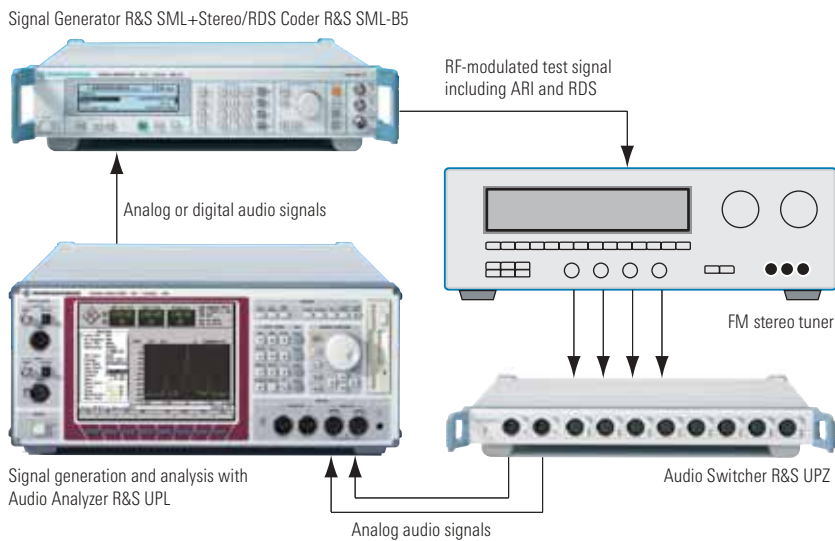
Fig. 3: Audio Switcher R&S UPZ for automated measurements on more than two audio outputs

## Generation of ARI and RDS signals

The R&S SML-B5 option outputs stereo multiplex as well as ARI and RDS signals. It is possible to choose between traffic announcement identification and standardized area identification A to F. The RDS traffic program or RDS traffic announcement can be switched on and off. Up to five different RDS sequences can be loaded. With a length of up to 64000 characters per sequence, future RDS applications (e.g. radio text) can also be tested.

Interruption-free pilot tone

The R&S SML-B5 option was designed especially for use in test systems. With other signal generators, the stereo pilot tone is briefly interrupted if the output data has to be recalculated (e.g. when the audio frequency changes). The connected tuner loses synchronization and has to switch to the stereo mode again with each frequency change, so overall measurement time may increase dramatically. This disadvantage does not occur with the R&S SML-B5 since the audio signal is modulated onto the RF carrier independently of pilot tone generation, and consequently the pilot tone is not switched off.

Analog and digital audio inputs

The R&S SML-B5 has separate analog inputs for left and right. In combination with the Audio Analyzer R&S UPL, measurements are possible in the operating modes L, R, R = L, and R = –L. A digital audio input in S/P DIF format is available alternatively. The R&S UPL can additionally generate different signals for left and right in this format. It is possible to set one channel to a fixed frequency while sweeping the second channel through a frequency band, for example.
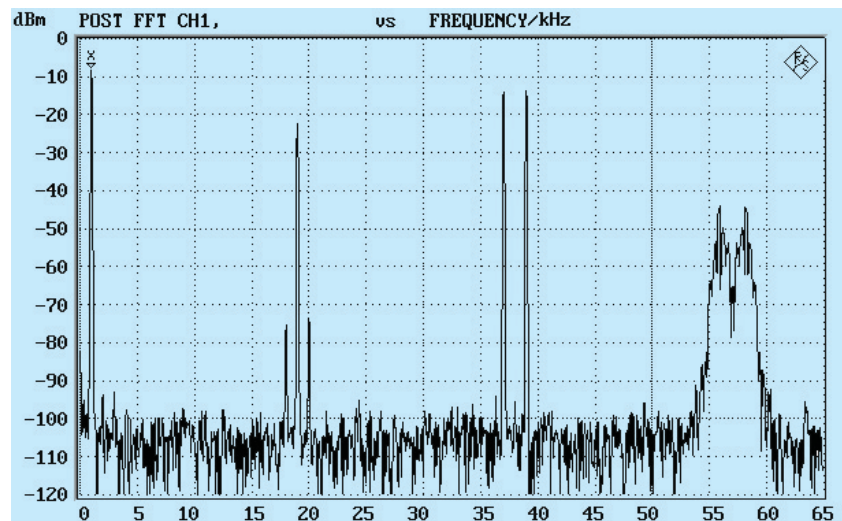
Fig. 4: Signal output by the stereo/RDS coder prior to FM modulation with ARI and RDS information

Specifications

The specifications apply to RF frequencies in the range 66 MHz to 110 MHz.

Stereo modes	
Internal with modulation generator	L, R, R = L, R = −L
External analog (via L and R inputs) or external digital (via S/P DIF input)	L, R, R = L, R = −L, R ≠ L internal generation of ARI/RDS signals, 5 user-selectable RDS data sets, simultaneous generation of MPX, ARI and RDS signals possible
MPX frequency deviation	0 Hz to 80 kHz
Resolution	10 Hz
L, R signal	
AF Frequency range	20 Hz to 15 kHz
AF Frequency response (referred to 500 Hz) AF = 20 Hz to 40 Hz AF = 40 Hz to 15 kHz	<0.3 dB <0.2 dB
Stereo crosstalk (at AF = 1 kHz)	>50 dB
Distortion (at 67.5 kHz MPX frequency deviation, AF = 1 kHz)	<0.1%, 0.05% typ.
S/N ratio[1] (stereo/RDS signal) ITU-R weighted (quasi-peak) ITU-R unweighted (rms) A-weighted (rms)	>60 dB, 63 dB typ. >70 dB, 74 dB typ. >70 dB, 76 dB typ.
Preemphasis	off, 50 µs, 75 µs
Pilot tone	
Frequency	19 kHz ±2 Hz
Deviation Resolution	0 Hz to 10 kHz 10 Hz
Phase (relative to 38 kHz phase) Resolution	0° to ±5° 0.1°
ARI/RDS subcarrier frequency	57 kHz ±6 Hz
ARI frequency deviation Resolution	0 Hz to 10 kHz 10 Hz
RDS frequency deviation Resolution	0 Hz to 10 kHz 10 Hz

ARI/RDS functions (directly selectable by menu or remote control)	
ARI identification	selection of traffic announcement identification (DK) or area identification (BK), OFF, DK, BK, DK + BK
ARI BK	selection of standardized area identification A to F
RDS traffic program	traffic program off/on
RDS traffic announcement	traffic announcement off/on
RDS data set Maximum data length	selection of RDS data set 1 to 5 64 kByte, can be loaded via IEC625 or RS-232-C interface
Analog modulation inputs L, R	2 x BNC
Input impedance	600 Ω or 100 kΩ
Input voltage V_p for selected deviation (nominal value)	1 V
Digital modulation input S/P DIF	BNC
Input impedance	75 Ω
Input voltage V_{pp}	1 V (400 mV to 5 V)

[1] Generator without preemphasis, receiver with deemphasis.

Ordering information

Designation	Type	Order No.
Stereo/RDS Coder	R&S SML-B5	1147.8805.02
Signal Generator	R&S SML01	1090.3000.11
Signal Generator	R&S SML02	1090.3000.12
Signal Generator	R&S SML03	1090.3000.13
Vector Signal Generator	R&S SMV03	1147.7509.13

For more information, see the following data sheets:

Signal Generator R&S SML	PD 0757.5550
Vector Signal Generator R&S SMV03	PD 0757.7175
Audio Analyzer R&S UPL	PD 0757.2238
Audio Switcher R&S UPZ	PD 0757.6985

Certified Environmental System
ISO 14001
REG. NO 1954

Certified Quality System
ISO 9001
DQS REG. NO 1954

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