The international specification for the DAB (digital audio broadcasting) system (ETS300401), which was published in 1994, was prepared by renowned research institutes, sound broadcasting corporations and industrial companies as part of the European project EUREKA 147. From the very beginning Rohde & Schwarz played a decisive role in this work [1].

The L-band Transmitters NL5010 (100 W) and NL5020 (200 W) were developed on this basis and now complete the line of Rohde & Schwarz DAB transmitters. Thanks to their design, quality, and operating philosophy they fit perfectly into the range of well-proven Rohde & Schwarz transmitters [2]. The main components of the transmitters are COFDM Modulator MCM01 [3], Exciter SD100A2, Amplifier VL5010, primary-switched Power Supply IN916, power distribution and a high-pressure fan, which are all designed as plug-in units and accommodated in a transmitter rack (FIG 1).

Since a new type of amplifier is used in the transmitters, the output bandpass filter for limiting out-of-band transmissions may also be integrated in the rack. This was not possible with previous transmitter models. There is also ample space to accommodate a GPS frequency standard (option).

**Function**

Depending on the type of ETI (ensemble transport interface) to the transmitter site, the signal from the satellite demodulator or from another source is fed to COFDM Modulator MCM01 (FIG 2), which $\pi/4$ DQPSK-modulates the data onto carriers, the number of which is determined by the selected DAB mode. This baseband DAB signal with spectrum width of approx. 1.5 MHz and center frequency of 2.048 MHz is applied to Exciter SD100A2. After mixing to a fixed IF (38.902 MHz) the signal is amplitude- and phase-equalized and then finally converted to an L-band frequency in the range 1452 to 1492 MHz (setting increment 25 Hz). The RF signal is then amplified in the exciter and routed to the transmitter output stage, directly in the 100-W...
transmitter or via a power splitter in the 200-W transmitter.

Transmitter operation (e.g., on/off, power and frequency setting, deemphasis) is menu-guided and performed from the exciter using a backlit LCD and the keypad. The exciter also displays the status of all relevant transmitter functions and is used to monitor and control the transmitter. A remote-control unit includes floating contacts for transmitter switch-on and switch-off as well as for monitoring the operating status of the whole transmitter.

If the DAB transmitter is to be part of a single-frequency network (SFN), the required frequency stability of each transmitter (Δf/f = ±1 x 10⁻⁹) must be obtained from a highly accurate GPS frequency standard. This standard supplies a 10-MHz pilot frequency and makes the reference frequency available to any site within the network. A directional coupler at the antenna output feeds the RF test output and the forward and reflected power that is coupled out and displayed on the exciter.

The primary-switched power supply with self-engaging connectors provides all the voltages needed by the DAB transmitter. The power distributor contains a contactor for switching on the high-pressure fan and a phase monitor which sends the “power supply present” message for the transmitter’s three-phase power supply. The high-pressure fan provides adequate cooling for the power supply and amplifier. All components are designed so that a fairly small, coarse air filter is sufficient.

DAB transmitter amplifier

The DAB signal is a multicarrier signal with its information in the relative phase of the π/4 DQPSK-modulated carriers. With certain information it is possible for many carriers to have the same phase. Carrier amplitude reinforcement occurs and, in critical cases, an exceptionally high input signal is applied to the output amplifier for a short period. The output amplifier must, therefore, be highly linear over the entire voltage swing so that intermodulation products inside and outside the useful frequency range are minimized.

To meet these requirements Rohde & Schwarz developed the solid-state L-band DAB Transmitter Amplifier VL5010. Even without an output band-pass filter, the compensated amplifier has intermodulation suppression of 30 dB. The RF signal from the exciter is routed via a preamplifier, a power splitter and two further amplifier stages each with four parallel push-pull amplifiers (FIG 3). At the output of these parallel circuits, a proportion of the power is coupled out by a directional coupler and fed to the gain control in the preamplifier. If a transistor in a particular module fails, protection circuits in the module prevent a power increase in the
other modules. This ensures high reliability and a long service life for the whole amplifier. If the temperature at the specially designed aluminium heat-sink is too high, a temperature sensor in each of the two parallel amplifier modules can switch off the carrier. A circulator at the output of each 100-W module protects the transistors in the transmitter amplifier if there is excessive mismatch.

In autumn 1995, the first European DAB pilot project was launched in Bavaria [4]. Since then Rohde & Schwarz transmitters have been demonstrating their excellent quality and flexibility as stand-alone or as part of single-frequency networks far beyond the borders of Bavaria and Germany. Thanks to the company’s high level of expertise in the field of DAB, Rohde & Schwarz has participated as a system and component supplier in all DAB projects to date (ARD pilot project, Deutsche Telekom, Australia, Switzerland, Sweden, etc) and so has made a major contribution to their success.

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REFERENCE


