Solid-state VHF FM Transmitters SR6..E1

Classic VHF sound broadcasting at its very best

Despite digital audio and video broadcasting, forecasts still anticipate an attractive market ahead for analog FM transmitter technology over the next 15 to 20 years. Rohde & Schwarz responded to these prospects and revised its highly successful, tried and tested generation of solid-state transmitters. The result is even more compact transmitters for an excellent price/performance ratio.

Characteristics

These VHF transmitters for FM sound broadcasting operate in the frequency band 87.5 MHz to 108 MHz and generate a nominal output power of 10 kW, 5 kW or 2.5 kW into 50 Ω at an efficiency of over 60 %. They can transmit AF, RDS (radio data system) and SCA (subsidiary channel authorization) signals, eg DARC (data radio channel), and can work in stereo, mono and composite mode. The power is amplified by combined 2.7 kW VHF amplifiers.

Operation is menu-guided by means of control and display elements on the front panel of the exciter. Remote control is performed using an external remote control unit as standard or from a PC via the bitbus interface or an optional parallel interface. Internal communication in the VHF FM transmitter uses a rugged serial CAN bus (controller area network [2]). This bus is an open system, ie there are many suppliers of modules and software, protocol specifications are fully documented and no licencing fees are required [3]. So systems can very easily be configured or integrated, even using standard equipment, to fulfill specific customer requirements.

Design and function

10 kW VHF FM Transmitter SR610E1 (FIG 1) is taken as an example to explain transmitter design and function. It comprises the following main modules (FIG 2):
- VHF FM Transmitter SU135 (exciter),
- four VHF Amplifiers VU320,
- 4-way splitter,
- 4:1 combiner,
- high-power supply unit with two transformers, rectifier block, filtering and four DC converters of 3 kW each,
- fan assembly.

The exciter generates a frequency-modulated RF signal in the range 87.5 MHz to 108 MHz at an RF output power of 20 W. AF, RDS or SCA signals are fed to the exciter as modulation signals. An additional module allows digital data according to the bitserial AES/EBU protocol to be applied instead of AF signals.

The 4-way splitter breaks the modulated RF signal down into four identical RF signals of a power of 5 W each and then applies them to the VHF amplifiers, which boost the signal to approx. 2.7 kW. The RF output power is set and controlled by varying the operating voltage of the amplifier output stages. The harmonic filters of the amplifiers provide harmonic attenuation of typically 76 dB. The four signals...
are then summed by the 4:1 combiner to produce the overall output, i.e. 10 kW into 50 Ω in the case of SR610E1.

**Operation and monitoring**

Transmit frequency, RF output power, operating and modulation mode, RF thresholds, module parameters, interfaces, system control, etc. can be set on the exciter under menu guidance. To monitor and control the VHF FM transmitter, various operating states are collected, evaluated by the exciter and can be displayed, e.g. differential air pressure, inlet and outlet temperatures as well as excessive absorber temperature. Measured values of the exciter, exciter status (e.g. operating hours, system events), modulation values (e.g. frequency deviation, AF level), RF output power, reflected power and operating voltage of the individual VHF amplifiers are also evaluated and displayed. Monitoring functions are supported by an error table. If transmitter control breaks down, the transmitter switches to a defined, failsafe state.

**Power supply**

A three-phase line voltage of 230 V or 400 V (50 Hz or 60 Hz) is required to supply the transmitter. The high-power supply unit consists of two identical modules for voltage conditioning. If one of these modules fails, the other will continue to operate. The four DC converters connected to the high-power supply unit generate the operating voltages required for the VHF amplifiers. The principle of controlling the output power via the operating voltage of the power transistors yields an efficiency of at least 60% even in faulty operation or operation at less than the nominal power.

Andreas Buschke

**REFERENCES**


---

**Condensed data of solid-state VHF FM Transmitter SR610E1**

- **Frequency range**: 87.5 MHz to 108 MHz
- **Output power**: 10 kW
- **Power supply**: 230/400 V (50/60 Hz)
- **Power consumption with integrated fan**: 16.6 kW
- **Power factor to DIN 40110**: >95
- **Cooling air**: 15.5 m³/min
- **Operating temperature range**: –10 °C to 50 °C
- **Dimensions (W x H x D)**: 580 mm x 2026 mm x 1000 mm
- **Weight**: 700 kg

**Reader service card 159/07**