

Latest transmitter technology for VHF band III

Radio and television are celebrating a comeback in VHF band III as the UHF band is increasingly dedicated to other applications such as wireless communications. With the R&S®TMV9 medium-power transmitters and the R&S®THV9 high-power transmitters, network operators are now able to use the latest technology in this frequency band, too.

Broadcasting in VHF band III is gaining new momentum

Terrestrial broadcasting transmitters for UHF bands IV/V have somewhat overshadowed transmitters for VHF band III over the past few years. That's changing with the digital dividend, which has brought increased significance to band III for analog and digital TV as well as for digital audio broadcasting. This is because regulatory authorities in many countries have instructed broadcast network operators to release frequencies in the UHF band so that they can be available for other applications such as wireless communications. Free channels in VHF band III can be used for analog and digital TV. In addition, digital audio broadcasting in line with the DAB(+) standard will be implemented in this band. DAB(+) networks are being expanded in some regions, while new, nationwide networks are being built in others. Broadcasting in VHF band III is gaining momentum.

To accommodate this transition, Rohde&Schwarz has announced two new compact transmitter families that provide network operators with peak values in energy efficiency, power density and flexibility.

R&S®TMV9 and R&S®THV9 – from 350 W to 30 kW

The new air-cooled R&S®TMV9 medium-power VHF transmitter provides power levels from 350 W to 4.3 kW. The liquid-cooled R&S®THV9 is a high-power transmitter, offering power levels from 1.3 kW up to 15 kW in one rack (Fig. 1). Up to 30 kW is available by combining two racks. Both transmitters are suitable for the DAB, DAB+ and T-DMB standards in the VHF range, and they also support the DVB-T/DVB-H, DVB-T2, ISDB-T/ISDB-T_B, DTMB and ATSC digital TV standards as well as analog TV standards.

The new generation is based on the R&S®Tx9 transmitter platform, whose UHF models for analog and digital TV standards are successfully positioned on the market (see box at right for an example). The VHF transmitters now share their industry-unique characteristics:

- Exceptional efficiency through intelligent multiband Doherty technology
- MultiTX concept with multiple transmitters in a single rack
- Maximum power density in a single rack
- Versatile configuration options

Saving energy costs – efficiency up to 50 %

The liquid-cooled R&S®THV9 transmitter's efficiency has the greatest impact on operating costs. The increased energy efficiency saves operators a significant percentage of their operating costs. With an efficiency of up to 46 % including cooling

Fig. 1: Liquid-cooled R&S®THV9 high-power VHF transmitter featuring 5.2 kW output power from four amplifiers.



Rohde & Schwarz transmitters successful in many countries – one example:

Rohde & Schwarz transmitters in Spain: profitable, especially in times of crisis

Due to a resolution by the European Commission, EU member countries must release TV channels 60 to 69 in the UHF band by January 1, 2015. The intention is to use this frequency spectrum as a digital dividend for other purposes, e.g. for wireless communications.

In Spain, the government wanted to partially reimburse operators for the costs they incur as a result of the transition and during dual operation in transitional periods. However, one year later in 2011, a new government was elected that was forced by the economic crisis to cancel this planned financial support. In addition, the number of channels and multiplexers was to be reduced – decisions that, taken together, result in significant losses for large TV network operators. The Spanish operator Abertis, which has been using Rohde & Schwarz transmitters for years, then decided to put all planned investments on ice for the time being.

Despite this decision and the risks that could result from the loss of channels, Abertis resolved to replace transmitters that were more than ten years old, since the company knew about the improved efficiency of the new Rohde & Schwarz transmitters, due to the work of the local Rohde & Schwarz office. The local office had good arguments: At IBC in September 2011, Rohde & Schwarz had introduced the new 9000 TV transmitter family, whose energy-saving Doherty technology and small footprint significantly reduce operating costs. The transmitters convinced the Spanish network operator. Crucial factors for the new investments included the old transmitters' extremely high energy costs, which would continue to rise, and the increasing

maintenance effort to be expected in the future due to the age of the existing transmitter systems.

Altogether 37 R&S®TMU9 MultiTX transmitters were installed at 14 sites. At the time of delivery the allocation of frequencies was still not finalized, so the transmitters must be switched to new channels later. Thanks to their broadband architecture (470 MHz to 862 MHz) and the patented Doherty Tunit frequency option, the transmitters

can be used in the entire frequency range without exchanging amplifiers. Integrating the new transmitters into the existing n + 1 system was a particularly challenging task. But due to their flexible mechanical design and the new software platform, this integration required no great additional effort.

The transmitters delivered to Abertis were the first of the new family. They are operating to the customer's utmost satisfaction.

Reinhard Scheide; Juan Castellanos

The Montserrat site has also been equipped with latest-generation transmitters.



Photo: Abertis

*** Doherty**

The basic principle behind Doherty technology is to split signal amplification into two paths. The main amplifier amplifies only the average signal and no power reserves for peak signals are required in this path. The peak amplifier is active only when peaks occur in the signal.

See NEWS (2013) No. 209, pp. 44–47 (“Optimizing efficiency of high-power TV transmitters”) for a detailed description of the Doherty concept.

for COFDM standards, the energy costs are less than one-half those of conventional transmitters. With ATSC, the efficiency is even up to 50 %.

This high degree of efficiency is made possible by implementing the Doherty technology* in the R&S®PMV901 and R&S®PHV902 VHF power amplifiers. The amplifiers can easily be configured for various frequency ranges in Doherty mode. If no time is available for this optimization, the amplifiers will automatically switch to a broadband mode as needed. The maximum output power for the air-cooled R&S®PMV901 VHF amplifier (Fig. 2) is 750 W for COFDM standards, while the liquid-cooled R&S®PHV902 (Fig. 3) achieves up to 1.35 kW.

MultiTX maximizes power density

A compact design and high power density save rack space. The maximum output power available from a single rack is up to 4.3 kW for the air-cooled R&S®TMV9 and up to 15 kW for the liquid-cooled R&S®THV9. The MultiTX concept makes it possible to fit multiple transmitters in a single rack, with plenty of space for other components such as the pump unit for liquid cooling. Complete $n + 1$ systems can be implemented in a single rack, providing a flexibility that meets almost any requirement. A variety of options is available for expanding the transmitters, including bandpass filters, directional couplers, dual drive and power supply redundancy, for example.

Fig. 2: The air-cooled R&S®PMV901 VHF amplifier supplies up to 750 W in the COFDM standard.



Fig. 3: The liquid-cooled R&S®PHV902 amplifier achieves a maximum output power of 1.35 kW in the COFDM standard.

**Synergies simplify spare parts inventory management**

The use of the flexible R&S®TCE900 transmitter control exciter for all R&S®Tx9 transmitter families simplifies and improves spare parts inventory management. By inserting supplementary specific plug-in boards, the base unit can be configured as a transmitter control unit or as an exciter for various standards, resulting in unprecedented flexibility for network operators. To reconfigure the R&S®TCE900 on site for another application, the user simply needs to exchange the modules. The platform also offers free option slots for expanding its functionality, e.g. for integrating a satellite receiver. And a further advantage: By using the common transmitter control exciter, all R&S®Tx9 high-power and medium-power UHF and VHF transmitter families are based on a single software platform, which means expanded functionality.

Summary

The new R&S®TMV9 and R&S®THV9 VHF transmitters are gaining attention on the market. Network operators appreciate their potential for saving energy, their small footprint and their high degree of flexibility. As such, it was no surprise that several orders had already been placed before the transmitters were officially presented at IBC in Amsterdam in September 2013. Deliveries on those first orders started in October 2013. For example, the Bayern Digital Radio GmbH (BDR), headquartered in Munich, Germany, was the first company globally to use the R&S®THV9 in a transmitter network for DAB / DAB+.

Johannes Sinnhuber