Numerous DVB-T transmitter networks have already started regular operation. New networks are continuously being added. The amount of money spent on transmitter technology is — and has been — significant, whereas investments in monitoring T&M equipment are often considered of minor importance. However, downtime can be very expensive.

Why invest in monitoring T&M equipment?

Usually, DVB-T transmitters are models of the latest generation, fully digitized and modular in design. Signals are generally applied to them via IP networks with a redundancy design, resulting in suitably high reliability. So why should you invest in monitoring T&M equipment?

Even the most state-of-the-art technology is subject to aging, resulting in altered signal quality or transmitter failure. Operation beyond the specified parameters or outright incorrect operation cannot always be avoided. As a result, program providers may claim recourse, or the number of viewers may drastically decrease — consequences which may prove very expensive.

Advanced monitoring T&M equipment from Rohde & Schwarz cuts down on these dangerous effects by informing network operators early on about problems and immediately signaling down-times.

Visionary due to a wide dynamic range

The DTV Monitoring Receiver R&S®ETX-T (FIG 1) has been specially designed for DVB-T signals. The R&S®ETX-T controls the most important signal parameters and provides accurate information about the quality of an applied DVB-T signal. The receiver can inform network operators at a very early stage about looming disruptions, thus providing a glance into the future. This capability can be compared to driving at night.
The brighter the headlights of a car, the better the driver’s vision—and the earlier possible obstacles can be detected. The R&S®ETX-T has a similar concept: Due to its wide dynamic range, infinitesimal changes in the monitored transmitter parameters can be detected at a very early stage. Thus, conclusions can be drawn. This helps to save time and take appropriate countermeasures.

Versatile applications

Unlike simple receive modules, the R&S®ETX-T provides you with a wide variety of measurements and functions, reflecting its versatile applications. The R&S®ETX-T primarily records all major RF parameters of an emitted DVB-T signal on the transmitter and internally stores the measurement data. This makes it easier for transmitter operators to furnish proof of quality of service (QoS), for example. The receiver outputs alarm messages if one or several selected parameters exceed the specified limits.

Both its measurement capabilities and its previously mentioned dynamic range match those of a high-end TV test receiver. And since the R&S®ETX-T can be remote-controlled, problems can be narrowed down from anywhere; there is no need for a measurement technician to visit the site with additional measuring equipment.

The monitoring receiver is equipped with a selective RF input section. An internal preamplifier and optional SAW filters ensure excellent receive characteristics; used with a common receiving antenna, these characteristics make the R&S®ETX-T also ideal for use as a monitoring receiver within a coverage area. A combined monitoring and measurement receiver in a single instrument, the R&S®ETX-T is a favorably priced solution for current and future tasks.

Setup details

The incoming DVB-T signal passes through an input attenuator (which can be switched manually or automatically) before it is applied to the receiver section (FIG 2). The receive section is narrowband; using SAW filters, selectivity can be optionally increased, for example if the receiver is not to be used directly on the transmitter. The OFDM demodulator provides the analysis section with the data required for evaluation; the demodulated MPEG-2 transport stream is applied at the TS-ASI output.

The R&S®ETX-T can be upgraded with an MPEG-2 decoder, which is optionally supplied with or without audio and video outputs. Both versions allow easy MPEG-2 monitoring of the main parameters in accordance with TR 101 290. Each decoder has two external inputs. You can switch between these inputs and the internally demodulated transport stream for MPEG-2 monitoring. You can thus also monitor the transport streams applied at the transmitter.

Operation and communications

The receiver is controlled and operated only via its LAN interface (TCP/IP), so the front panel is very straightforward. LEDs indicate the operating state and the LAN connection and signal alarm messages.

The R&S®ETX-T can be accessed in two different ways. An Internet-capable terminal such as a PC, notebook or PDA is required for direct access. You don’t need special software; a common web browser is sufficient. You have to log on to the receiver, specifying your user name and password. The receiver manages access and user rights, which can be assigned as required: from the right to see just a few parameters through to full administration rights. The user interface is automatically adapted to reflect the rights assigned.

But the receiver can also be accessed via the standardized SNMP protocol, which allows you to easily integrate the receiver into management programs. An SNMP agent integrated into the
R&S®ETX-T handles communications. In the case of a failure, the SNMP agent sends SNMP traps to the management program to raise an alarm, or it raises the alarm directly via the Internet.

The R&S®ETX-T comes equipped with seven floating relay contacts as standard, which are provided at its rear panel; it can thus be used in conjunction with older, contact-based monitoring systems. Each relay contact can be user-assigned to one or more RF alarm messages.

Monitoring functions

The R&S®ETX-T monitors all parameters that thoroughly describe the quality of a DVB-T signal: level, synchronization, modulation error ratio (MER), bit error ratio before and after the Viterbi decoder plus data errors in the MPEG-2 transport stream. To get an overview of all measurement values, view the main page of the R&S®ETX-T (FIG 3). Symbols and coloring indicate whether the individual parameters are in the permissible or non-permissible range. Auxiliary information and statistics complement the overview.

You decide which of the parameters are to be monitored. The receiver records the states and the subsequent alarm messages of the selected parameters in separate reports. The reports can be viewed (FIG 4) or exported at any time. This simplifies handling if a higher-level management program is involved since the values need not be continuously and explicitly queried.

Attractive Scan mode

Several multiplexes are usually broadcast at a transmitter site on different frequencies, each of which needs to be monitored. As a rule, a separate monitoring receiver should be used for each multiplex. This is where the R&S®ETX-T comes in, offering an attractive, cost-efficient solution: In the Scan mode, the R&S®ETX-T sequentially processes any frequency table the user may compile and is thus able to systematically check all the multiplexes to be monitored. The R&S®ETX-T covers measurement values and alarm messages separately according to frequency.

Measurement functions

The R&S®ETX-T provides measurement functions far exceeding the requirements of common measurements; it opens up comprehensive solutions to analyze disruptions and pin down their causes. For example, the receiver displays the frequency spectrum, measures shoulder attenuation and shows the CCDF without requiring a spectrum analyzer. The displays of constellation and MER versus all OFDM carriers help to locate modulator errors or disruptions in the transmission path.

Single frequency networks – a special case

DVB-T networks can also be operated as single frequency networks (SFN). To ensure interruption-free operation of these SFNs, all transmitters must have exactly the same phase angle. The monitoring receiver provides a precise display of the channel impulse response, thus furnishing an exact overview of the SFN status. The inserted guard interval display is highly useful; it presents the accurate time domain depending on the selected modulation parameters (FIG 5). The individual impulses are recorded with <0.5 dB precision in the level range, and <20 ns in the time domain. The R&S®ETX-T is thus more than ready for monitoring the impulse response.

Summary

The DTV Monitoring Receiver R&S®ETX-T is outstanding with its superior dynamic range and versatility – characteristics that help network operators to detect and analyze problems early on. Thus, disruptions can be completely avoided or at least swiftly remedied. This makes the R&S®ETX-T an investment that will quickly break even.

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More information and data sheet at www.rohde-schwarz.com (search term: ETX-T)
FIG 3 Information about selected DVB-T channel, status and error statistics at a glance.

FIG 4 Reports of measurement values and alarm messages (top) and (right) measurement results of level (blue) and MER (orange).

FIG 5 The impulse response is the main display to control SFNs. This page can only be accessed by maintenance staff or the operator.