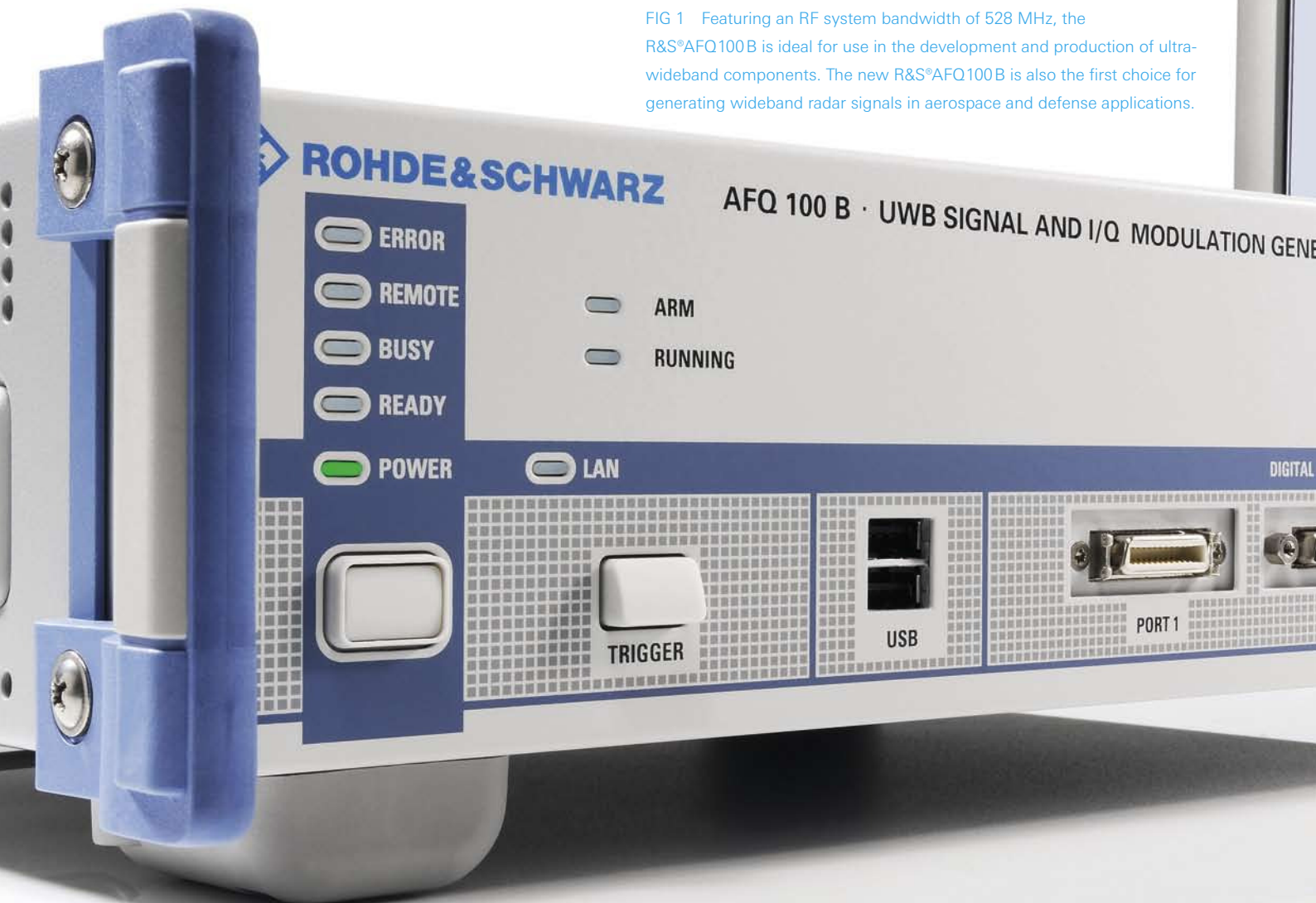
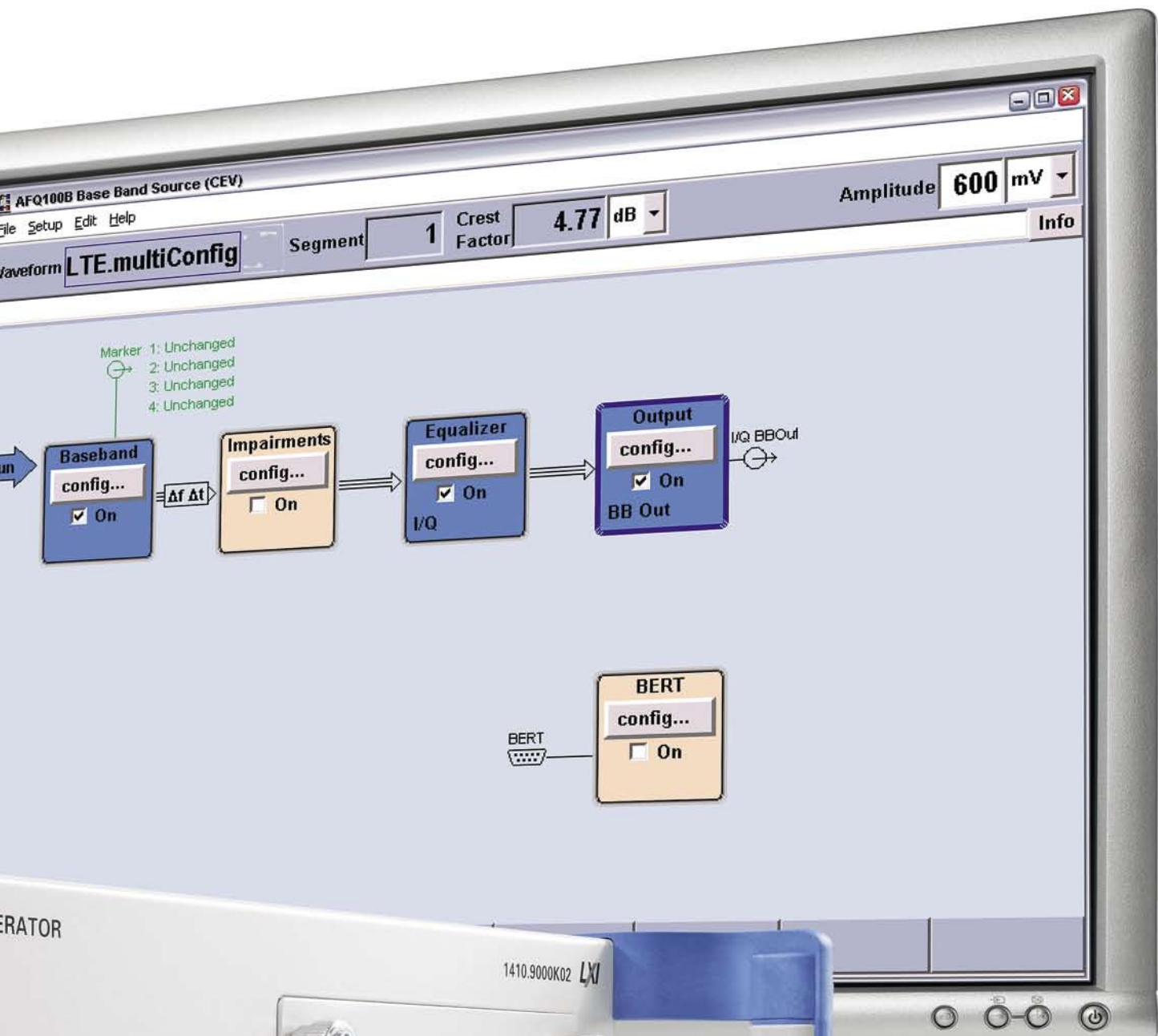


Baseband signal generator for UWB and aerospace and defense applications

The R&S®AFQ100B is an ideal baseband signal source for use in the development and production of ultra-wideband (UWB) components. When equipped with the R&S®AFQ-K264 software option, the instrument generates all test signals required for a WiMedia UWB band. The R&S®AFQ100B is also an ideal choice for aerospace and defense applications as it can generate signals with modulated pulses or wide, nonlinear chirps for state-of-the-art radar systems, for example.

FIG 1 Featuring an RF system bandwidth of 528 MHz, the R&S®AFQ100B is ideal for use in the development and production of ultra-wideband components. The new R&S®AFQ100B is also the first choice for generating wideband radar signals in aerospace and defense applications.





Excellent signal quality and high flexibility

Whether in the commercial or military field, excellent signal quality and high flexibility are of utmost importance when selecting a signal source. The new R&S®AFQ100B ideally meets these requirements. Featuring an RF system bandwidth of 528 MHz, the ARB-based signal source is ideal for use in the development and production of UWB components. The R&S®AFQ100B is also the first choice when it comes to generating wideband radar signals for use in aerospace and defense (A&D) applications.

Tailor-made for ultra-wideband technology

The UWB technology (see box on right) will be implemented in the next generation of Bluetooth® and in wireless USB. The development and production of UWB RF and baseband components (e.g. receivers or I/Q modulators) call for signal sources offering very large bandwidths. The R&S®AFQ100B perfectly meets this requirement. WiMedia UWB signals to be delivered by the generator can be easily and intuitively configured by means of the R&S®AFQ-K264 option. The graphical structure of the configuration menus helps the user define the packet setup and the hopping sequence, for example (FIG 2). The R&S®AFQ-K264 option comes with predefined, standard-conforming signal configurations suitable for simple tests. In addition, numerous parameters can be user-defined for configuring more complex tests.

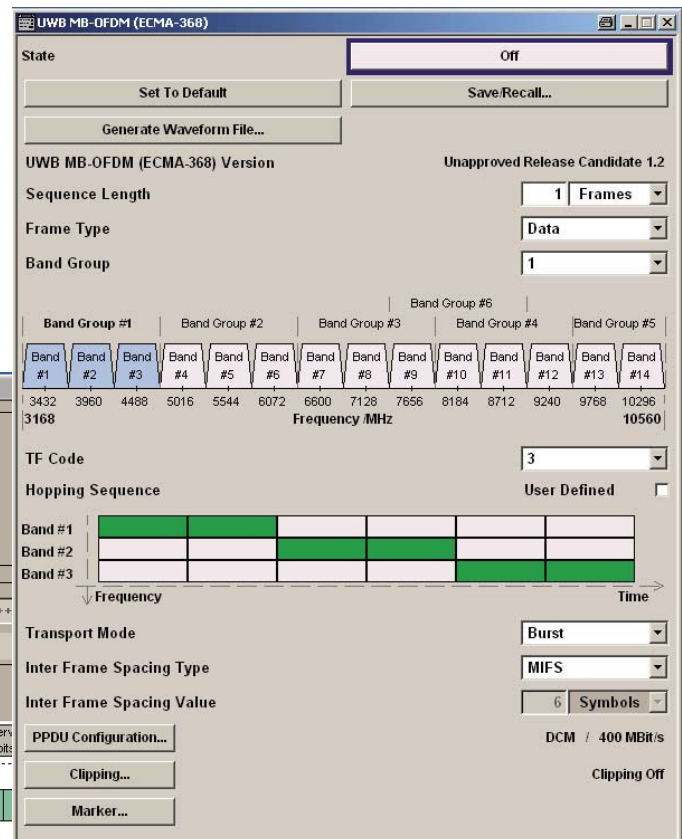
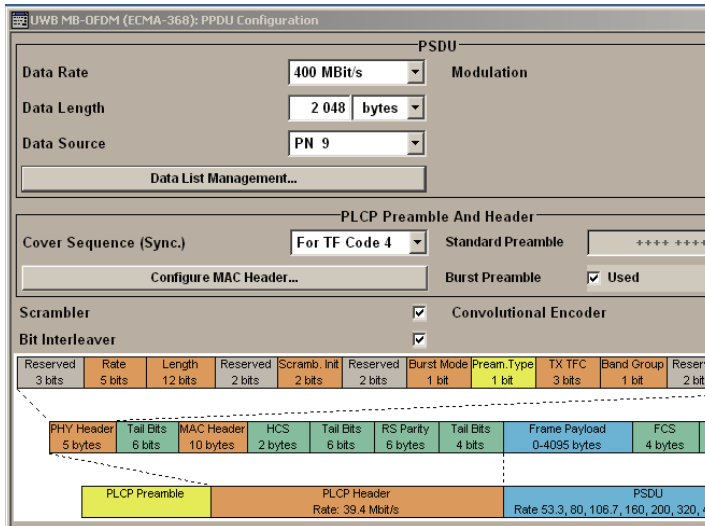
To upconvert baseband signals generated by the R&S®AFQ100B to the RF, a vector signal generator such as the R&S®SMBV100A is required (see page 36). The I/Q modulator of the R&S®SMBV100A features an RF bandwidth of 528 MHz for externally fed signals. This permits the generation of a full WiMedia UWB band at the RF (FIG 3).

Modern wireless terminals support many different standards. UWB, WiMAX™ and 3GPP are often implemented in the same device, for example. The variety of tests that are required is just as comprehensive. The new R&S®AFQ100B therefore offers considerable versatility, because apart from generating WiMedia UWB signals, it supports numerous other digital communications standards. Among the available options are WCDMA, HSPA+, WiMAX™, WLAN and LTE.

Specialist also for A&D applications

A&D applications are also using digital baseband signals to an increasing extent. For example, state-of-the-art radar systems employ short modulated pulses or wide nonlinear chirps. The R&S®AFQ100B demonstrates its strengths in this field as well as it can generate complex radar signals with pulses of short widths and short rise and fall times. The pulse sequencer

FIG 2 Convenient configuration of all parameters for WiMedia UWB using the R&S®AFQ-K264 option. Below: configuring the packet setup; right: configuring the hopping sequence.



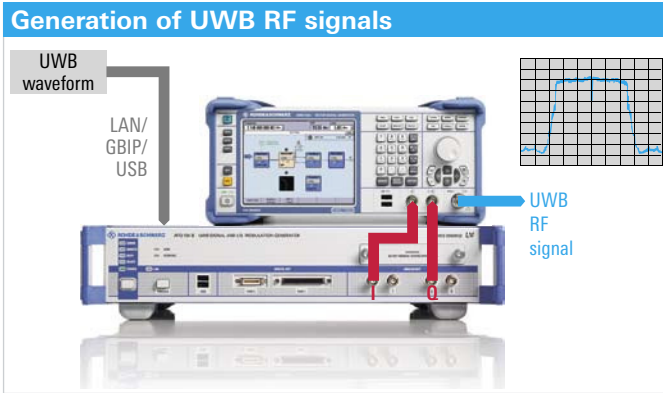
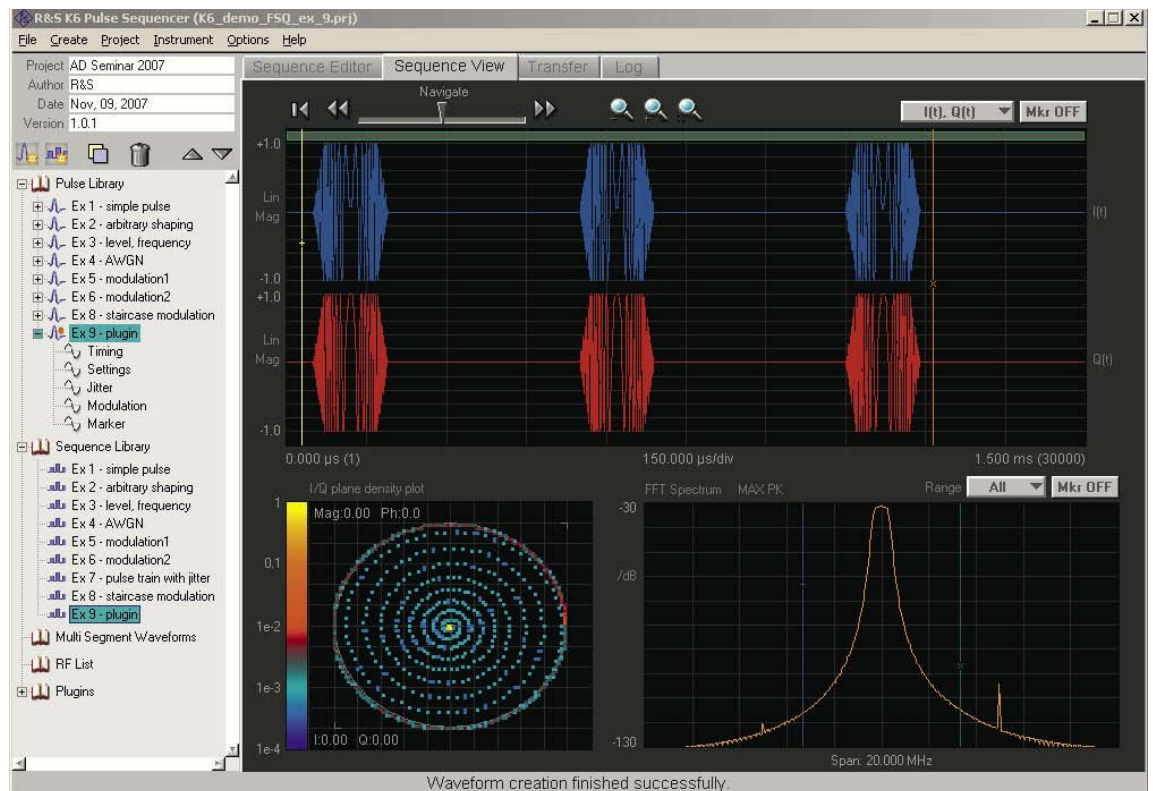


FIG 3 The R&S®AFQ100B generates UWB signals up to 6 GHz together with the R&S®SMBV100A vector signal generator.

software from Rohde&Schwarz in conjunction with the R&S®AFQ-K6 option permits easy configuration of pulsed signals, including any type of analog or digital intra-pulse modulation (FIG 4). Users can insert classified contents into pulses by means of plug-ins. Many users, especially in the A&D sector, generate the required signals themselves by means of MATLAB™, for example. Rohde&Schwarz offers a wide range of tools that make it easy to transfer such signals to the R&S®AFQ100B.

FIG 4 Pulse sequencer software from Rohde & Schwarz for generating complex pulse scenarios.



Facts about UWB

UWB is an ultra-wideband radio technology designed for short-range, high-data-rate transmissions at very low power levels. By definition, UWB signals have a bandwidth of at least 500 MHz. One example of how UWB is implemented is WiMedia UWB, which is defined by the ECMA-368 standard. The WiMedia specification divides the 7.5 GHz UWB spectrum (3.1 GHz to 10.6 GHz) into 14 bands of 528 MHz each. The 14 bands are subdivided into six band groups, each of which consists of two or three adjacent frequency bands. Switchover from one band to another in a group can be made after a symbol (length 312.5 ns) in accordance with a predefined scheme. To transmit the information, multiband OFDM (MB-OFDM) with 122 carriers per band is used. WiMedia UWB will be employed as the physical layer for the next Bluetooth® generation or for wireless USB, for example.

For users in the military sector, it is essential that no user-specific data is removed from a secured area when the instrument is sent in for calibration or repair. The R&S®AFQ100B's internal hard disk can therefore be removed whenever required to make sure that confidential data will always remain in a secured area (FIG 5). Rohde&Schwarz also offers sanitizing routines in line with the U.S. DOD-5220.22-M guideline, which can be used to permanently delete all user data.

Excellent signal quality and versatile additional functions

A universal I/Q source must provide high signal quality. The R&S®AFQ100B excels also in this respect. Owing to an optimized design and the use of state-of-the-art components, the instrument features a spurious-free dynamic range of typ. 78 dBc and an extremely flat frequency response – characteristics that are vital in wideband and multicarrier applications. The R&S®AFQ100B can also generate ultra-pure sinewave signals up to 250 MHz, as are required for testing high-grade components such as A/D converters or mixers.



FIG 5 The removable hard disk is a must for military applications so that confidential data remains in a secured area when the generator is being serviced.

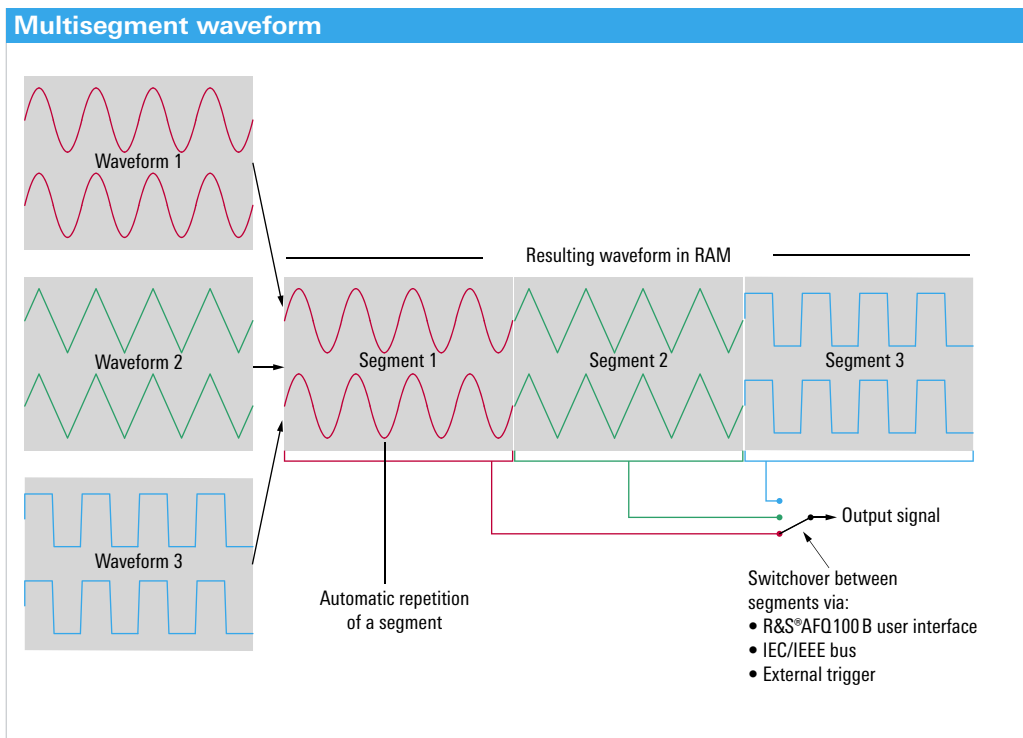


FIG 6 How a multisegment waveform is generated.

With a memory depth of up to 1 Gsample, signals of extended duration can be generated even at high bandwidths. The large memory depth also allows storing several different signals as parts of a multisegment waveform and switching between the individual waveforms within only a few microseconds (FIG 6). This boosts throughput in production tests of multistandard modules designed for GSM and UMTS, for example.

Another unique advantage of the R&S®AFQ100B is its integrated equalizer function. This function compensates for frequency response caused by connected components such as cables, filters or the DUT itself. The frequency response of the entire setup is measured by means of a power meter or spectrum analyzer and transferred to the R&S®AFQ100B. During signal output, inverse FIR filters are used to linearize the frequency response of the setup (FIG 7).

The R&S®AFQ100B also features extensive functionality for configuring the level, phase, delay and gain of the I and Q signals. These parameters can be used not only to compensate for various effects caused by external components, but also to test the performance of modulation methods and receivers by applying defined, non-ideal input signals.

The R&S®AFQ100B features balanced and unbalanced analog I/Q outputs with flexible level setting capabilities and a bias of ± 2.5 V, as well as optional digital I/Q outputs. Versatile trigger and marker functions make it possible to synchronize the R&S®AFQ100B with other instruments.

The modern graphical user interface, which uses a block diagram as its central element, can be accessed via an external monitor. The space-saving signal source (two height units only) can then be easily operated via a USB mouse or keyboard.

The Remote Desktop software displays the graphical user interface on any PC in the network, allowing operation of the R&S®AFQ100B without requiring an operating manual or a remote control command set. The R&S®AFQ100B can be remotely controlled via a LAN, GPIB or USB interface. Remote control drivers for all established development platforms can be downloaded at no charge from the Rohde&Schwarz website.

Sylvia Reitz; Wolfgang Kufer

FIG 7 Above: without equalizer function. At the output of the R&S®AFQ100B, the frequency response is still flat. The output of the DUT shows a noticeable frequency response caused by the connecting cables and the DUT itself.

Below: with equalizer function. Inverse filters in the R&S®AFQ100B compensate for frequency response, yielding a signal with a flat frequency response (at the RF in this case) at the output of the DUT.

