New functions for the R&S®SMF100A microwave signal generator

Two new options add further exceptional capabilities to the R&S®SMF100A microwave signal generator, enhancing its unique position on the market. The R&S®SMF-K27 pulse train option allows complex, user-configurable pulse scenarios to be generated for the first time. The R&S®SMF-K28 power analysis option opens up applications that previously required a network analyzer or a peak power analyzer.

R&S®SMF-K27 pulse train option

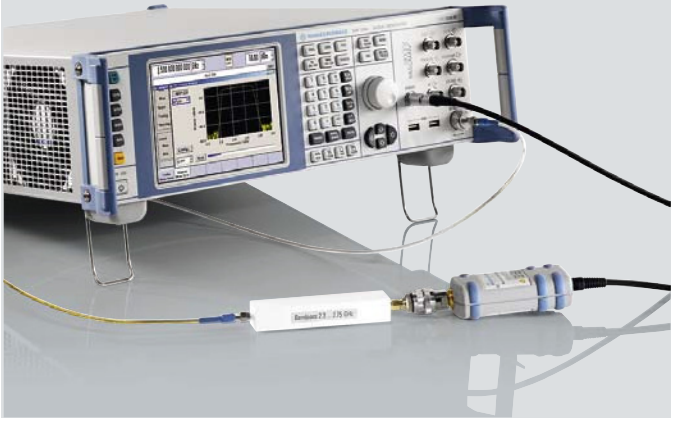
Conventional signal generators can generate single and double pulses and allow definition of the pulse width and pulse spacing. Recently, especially in the aerospace & defense (radar) sector, there has been an increasing demand for creating more complex scenarios such as:

- Jittered pulse widths and/or spacings
- Increasing pulse widths and/or spacings
- Sequences of pulses with different widths and spacings, e.g. 100 pulses of 10 ns width followed by 200 pulses of 20 ns width

Previously, ARB-based vector signal generators have been used for simulating complex signals of this type. These, however, have the following disadvantages:

- High costs (extremely complex hardware)
- Low dynamic range (i.e. insufficient carrier suppression in the gaps between the pulses)
- Limited edge steepness (due to the limited sampling rate)

Signal quality, speed and flexibility – three key criteria at which the R&S®SMF100A microwave signal generator excels (see News from Rohde&Schwarz (2007) No. 192, pp 21–24).



The new R&S®SMF-K27 pulse train option combines the advantages of a classic pulse modulator with the flexibility of memory-based solutions, allowing users to freely define the modulator control signal while profiting at the same time from the excellent characteristics of the R&S®SMF-K3 pulse modulator in the R&S®SMF100A:

- Pulse widths and spacings selectable between 5 ns and 5 ms
- Rise time <10 ns
- On/off ratio >80 dB

More than 2000 single pulses can be combined in a pulse train, with the capability to output each individual pulse as many times as necessary. Pulse trains can be conveniently configured and edited in a table. FIG 1 shows a configuration example for a signal consisting of two bursts of ten single pulses each. A graphical preview function is also available, allowing you to check the signal before it is output (FIG 2).

In addition to the manual configuration of pulse trains, lists can be imported from Excel or in text format. It is thus possible to meet even more sophisticated requirements – e.g. to generate jittered pulse widths controlled by specific probability density functions – without crowding the signal generator display.

An unmodulated signal (CW) is normally transmitted during the on-phase of the pulse. The high flexibility of the R&S®SMF100A microwave signal generator also allows pulse modulation to be combined with other types of modulation and operating modes. An option of particular interest here is combining the pulse train with FM modulation synchronized to the edges of the pulse modulator output signal. If an LF sawtooth signal is applied, chirps are transmitted during the on-phase of the pulse, i.e. the carrier signal quickly sweeps a predefined frequency range.

R&S®SMF-K28 power analysis option

The R&S®SMU200A, R&S®SMA100A, R&S®SMB100A and R&S®AMU200A signal generators from Rohde&Schwarz have for some time already provided the capability of directly connecting a power sensor of the R&S®NRP-Zxx family, e.g. for correcting the frequency response of the test setup or for power measurement.

The new R&S®SMF-K28 power analysis option now also provides R&S®NRP-Zxx power sensor connectivity for the R&S®SMF100A, allowing the signal generator to perform tasks that previously required a scalar network analyzer or a pulse analyzer. Customers who do not need high-end performance or flexibility and use an R&S®SMF100A thus already have an inexpensive alternative.

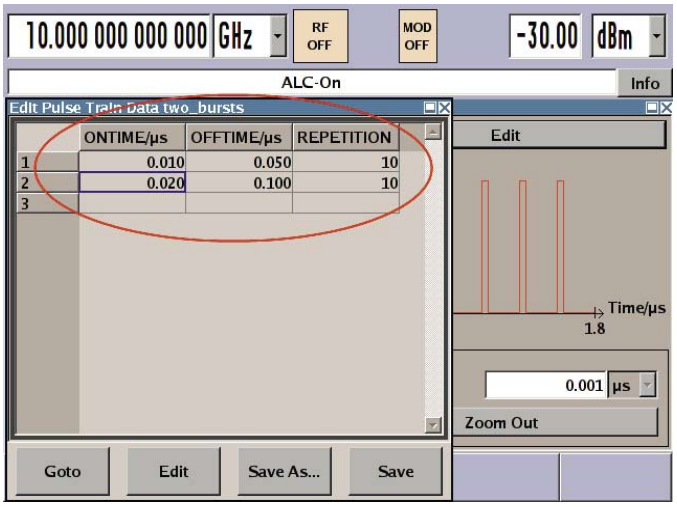


FIG 1 Configuration of a pulse train.

Frequency response measurements

To measure the frequency response, the RF output of the signal generator is connected to the input of the device under test (DUT), e.g. a filter or an amplifier. The output of the DUT is connected to the power sensor, which measures the DUT signal and transmits the measured power to the signal generator (FIG 3). If the generator now sweeps across a predefined frequency range, the measured power versus frequency describes the DUT's frequency response.

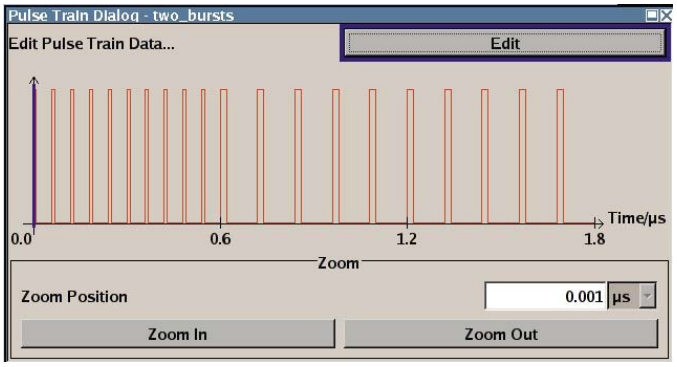
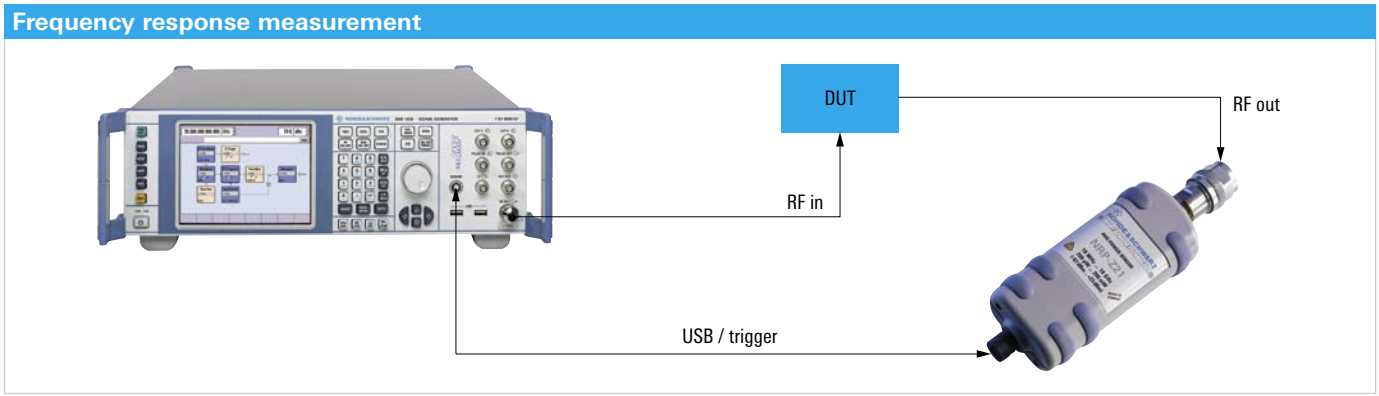


FIG 2 Preview of the envelope of the pulse train configured in FIG 1.

Four markers are available to read out the power at any desired points of the frequency response trace. Moreover, traces can be saved as diagrams or as Excel files. To optimally adapt the R&S®SMF100A screen display to the measurement task, users can choose among several different screen layouts. FIG 4, for example, shows a measurement diagram displayed together with a setting window.

The number of test points and the level accuracy can be selected. The measurement time and dynamic range depend on the power sensor used. The R&S®NRP-Z21 is ideal for use with the R&S®SMF100A, as it provides level accuracy better than 0.1 dB at a level of –40 dBm and a sweep time of approx. two seconds.

FIG 3 Test setup with the R&S®SMF-K28 power analysis option for frequency response measurements using the R&S®NRP-Z21 power sensor.



Compression measurement

It is also possible to characterize a DUT, e.g. an amplifier, in terms of its compression characteristics. The test setup is identical. For this measurement, the signal generator performs a level sweep instead of a frequency sweep.

Measurement of the RF envelope

If the power levels are measured in quick succession, the envelope of the measured signal will be displayed. The R&S®NRP-Z81 power sensor, which provides high-resolution display even for pulses as narrow as 150 ns (FIG 5), is an ideal choice for this application.

Summary

The new R&S®SMF-K27 pulse train and R&S®SMF-K28 power analysis options provide the R&S®SMF100A microwave signal generator with measurement capability that no competitor can offer. Both options will shortly also be available for the R&S®SMA100A signal generator.

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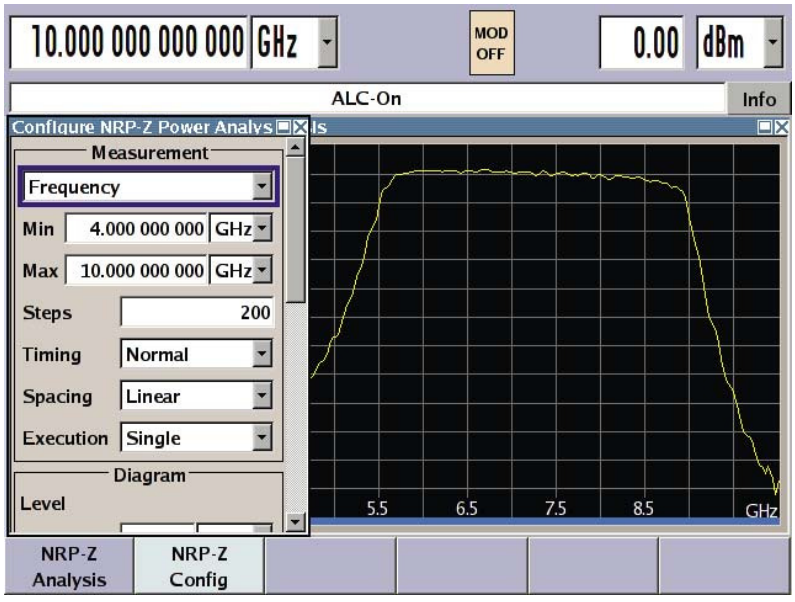

FIG 4 Measurement of the frequency response of a bandpass filter.

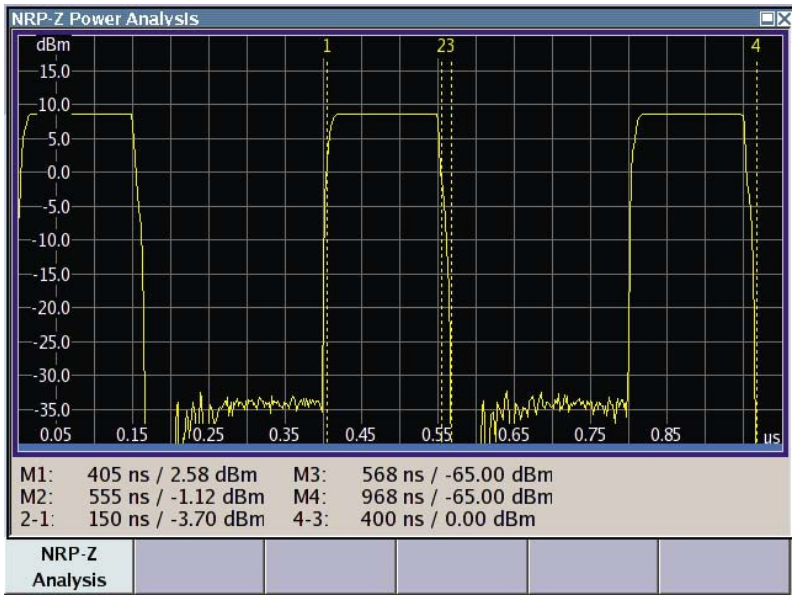

FIG 5 High-resolution display of an RF signal envelope measured with an R&S®NRP-Z81 power sensor.