

## Microwave Signal Generator SMR

# SMR as tracking generator for Vector Network Analyzer ZVM

The four models of the SMR family of signal sources cover the frequency range up to 20 GHz (SMR 20), 27 GHz (SMR 27), 30 GHz (SMR 30) and 40 GHz (SMR 40, FIG 1). All have a lower limit frequency of 1 GHz, which can optionally be extended down to 10 MHz. The immediate advantages of SMR are small size, light weight, high performance and an extremely attractive price [1]. The brand-new Vector Network Analyzer ZVM extends the frequency range of the successful ZVR analyzer family up to 20 GHz. The two units together – SMR and ZVM – are an ideal combination to make complex RF measurements child's play.



Photo 43 264/3

FIG 1 Microwave Signal Generator SMR40: a sought-after signal source in research, development, production and EMC measurements

The ZVR family [2] already includes units for 9 kHz to 4 GHz (ZVR, ZVRE, ZVRL) and 20 kHz to 8 GHz (ZVC, ZVCE) and with the new member now also 10 MHz to 20 GHz. Like all vector network analyzers of the family, ZVM too has outstanding features (see box and FIG 2).

But why does such a versatile and sophisticated network analyzer like ZVM need one or even two external generators? After all, it is already fitted with a microwave source whose characteristics meet any requirements. The answer can be found in FIG 3, where a frequency-converting DUT is shown with a receive section for 200 MHz to 7 GHz and an output at the fixed IF of

741 MHz. The test setup allows measurement of mixer gain as a function of receive frequency, for instance, which is a standard measurement on receive units. The following frequency settings have to be made for the purpose (all RF levels have to be selected so that the DUT operates correctly of course):

- Set SMR at mixer 2 to fixed frequency of 3.6 GHz.
- Set receive section of ZVM to test frequency of 741 MHz.
- Set generator of ZVM to frequency sweep from 200 MHz to 7 GHz.
- Set SMR at mixer 1 to frequency sweep from 8.141 GHz to 14.941 GHz.

All these settings are performed via the convenient user interface of the vector network analyzer. This also applies to the generator settings, remotely controlled by ZVM via the IEC/IEEE-bus connection.

For a measurement to run properly, the ZVM generator and SMR have to be synchronously tuned at mixer 1. In the example this is done with a frequency offset of 7.941 GHz, corresponding to the first IF of the receive section. In the simplest case, ZVM sets SMR to the required frequencies at mixer 1 via the IEC/IEEE bus. But this method is too slow, especially if DUT alignments are to be made. Luckily things can be done much faster, the network analyzer only has to be fitted with option ZVR-B4, and terminals TRIGGER and BLANK on ZVM and SMR have to be linked with the appropriate cable. Using this special interface, SMR becomes a real tracking generator for ZVM, or any other network analyzer of the ZVR family, since the generator's maximum tuning speed of approx. 1 GHz/ms now comes into play. That is more than enough for all conceivable adjustments of common DUTs.

So where does this big boost in speed come from? You need look no further than the List mode provided in every SMR. For this mode, you first create a list with frequencies and the associated levels. SMR can subsequently step through this list, in the auto mode or externally triggered. If there are ascending frequencies for constant level, a digital step sweep of crystal accuracy is performed, which can be accomplished extremely fast. Up to ten lists can be created in SMR, either manually or via the IEC/IEEE bus. So a maximum of 2003 frequency points

can be stored (up to 2001 of them being used by ZVM to resolve the frequency axis). With SMR used as a tracking generator, ZVM automatically generates the required list and loads it in SMR via the IEC/IEEE bus – it is all done for you. ZVM then activates the List mode of SMR via the IEC/IEEE bus with the external trigger and sends a trigger pulse to SMR. Every time SMR finishes a frequency step, it acknowledges by resetting the BLANK signal, and then ZVM triggers again. This method also works with the microwave signal generators of the SMP family and the RF sources SME and SMIQ.

Wilhelm Kraemer

FIG 2 New Vector Network Analyzer ZVM in one of its special applications: patented calibration methods from Rohde & Schwarz allow easy and highly precise measurements on wafers

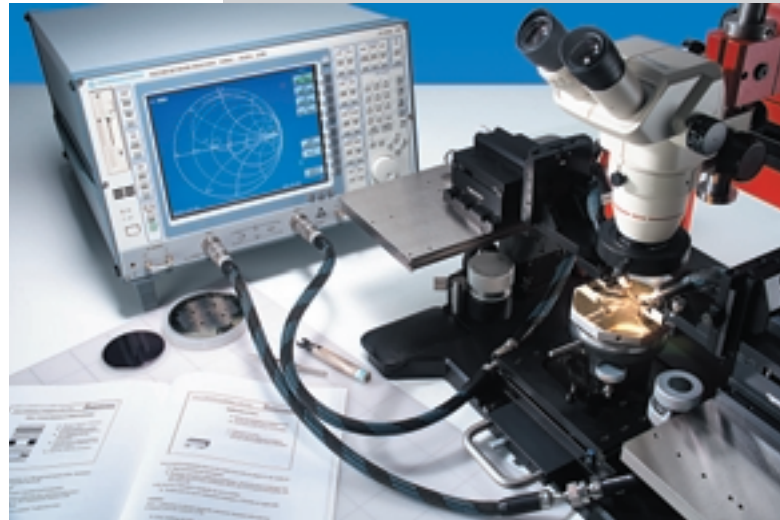


Photo 43 453/6

REFERENCES

- [1] Kraemer, Wilhelm: Microwave Signal Generator SMR: Microwave in handy size. News from Rohde & Schwarz (1999) No. 162, pp 4–6
- [2] Ostwald, Olaf; Evers, Christian: Vector Network Analyzer ZVC: Double frequency and benefit. News from Rohde (1998) No. 158, pp 4–6
- Application Note 1EZ31\_0E: Measurements on Frequency-Converting DUTs using Vector Network Analyzer ZVR

Reader service card 166/09

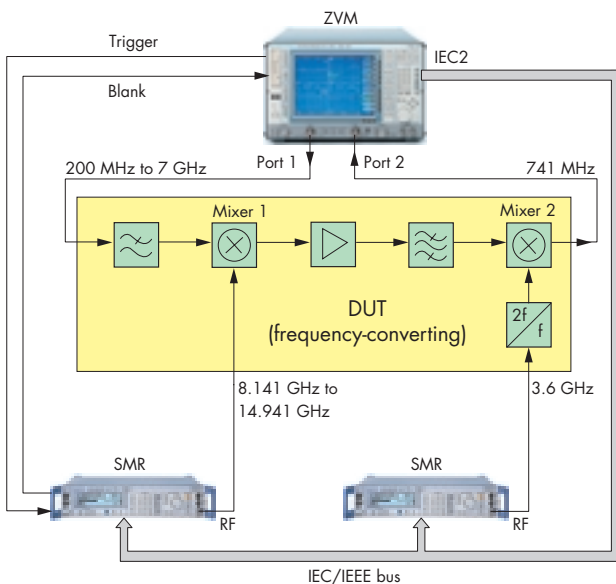


FIG 3 Measurement of double frequency-converting receiver front-end

The new Vector Network Analyzer ZVM

- **Frequency range**  
10 MHz to 20 GHz
- **Excellent dynamic range** >115 dB (IF bandwidth 10 Hz)
- **High measurement speed**  
<500  $\mu$ s per test point
- **Short IEC/IEEE-bus access and transfer times**  
Transfer time <15 ms (200 test points)
- **Low inherent noise**  
<110 dBm (IF bandwidth 10 Hz)
- **Internal PC with Windows NT™**
  - Control and evaluation programs
  - Ethernet connection
  - Easy integration of peripherals (printer, streamer, etc)
- **Fundamental mixing**
  - Easy test setup and wide dynamic range
  - Ideal for mixer measurements
- **Universal calibration methods**
  - TOM, TRM, TRL, TNA, TOM-X
  - Precise calibration in test fixtures and on wafers
- **Embedding of virtual networks**
  - Compatible with CAE
  - Simulation of matching networks (eg with SAW filters and wafer probers)