

Frequency multiplier family up to 110 GHz with built-in attenuator

Wouldn't it be nice to only have to set the frequency and level and immediately have precise output levels up to 110 GHz available for measurements. It's now possible. Just connect the new R&S®SMZ frequency multipliers to the R&S®SMF100A microwave signal generator via USB. No complicated setups and no calibration required – simply start measuring.

When extremely high frequencies are needed: frequency multipliers

In the everyday world of test and measurement, extremely high frequency signals – well over 50 GHz – are in greater demand than ever. The reason: The “lower” frequency ranges are now packed with so many services and transmission methods that it has become necessary in many cases to shift applications “up” to escape overcrowding. Basis for this upconversion are CW signals, such as those needed for local oscillators. For example, signals used in radar applications lie in the upper U band (50 GHz to 60 GHz) and V band (50 GHz to 75 GHz) and signals used in satellite and automotive applications lie in the W band (75 GHz to 110 GHz).

Frequency multipliers are generally used to generate signals in the upper frequency bands. They exploit the nonlinearity of diode characteristics to produce harmonics in the desired frequency range. In conventional setups, significant expertise is required to accurately generate the desired frequency and level. The new R&S®SMZ frequency multipliers greatly simplify this process (see blue box).

High frequencies with precise levels ...

The family consists of the R&S®SMZ75, R&S®SMZ90 and R&S®SMZ110 frequency multipliers (FIG 1), covering the ranges 50 GHz to 75 GHz, 60 GHz to 90 GHz and 75 GHz to 110 GHz. Unique is that they are the only frequency multipliers on the market that can be delivered with a built-in mechanically or electronically adjustable attenuator for precise setting of the output level. Together with the high-performance R&S®SMF100A microwave signal generator with its low single sideband phase noise, they support very demanding applications in these frequency ranges (FIG 2).

... and minimum cost and effort

Conventional setups use frequency multipliers that require separate attenuators to set the desired level. This is a time-consuming and expensive undertaking since attaining the desired level requires measuring the actual level with a level detector or a power sensor using costly directional couplers and then setting the attenuator accordingly. The entire system is “calibrated” and corrected in this manner – a procedure



FIG 1 Front and rear view of the R&S®SMZ110 frequency multiplier (left with mechanically adjustable attenuator, right with electronically adjustable attenuator).

Why make things complicated if they don't have to be that way.

Unsurpassed ease of use

- Minimalistic setup: combination of the R&S®SMF100A microwave signal generator and the R&S®SMZ frequency multiplier (with optional built-in mechanically or electronically adjustable attenuator)
- The R&S®SMF100A automatically detects the frequency multiplier and controls it via USB
- Easy setting of the desired frequency and level on the generator if an R&S®SMZ with an electronically adjustable attenuator is connected (if the R&S®SMZ has a mechanically adjustable attenuator, the setting screw must be set to the value displayed on the generator)
- The R&S®SMF100A automatically corrects the frequency response on the precalibrated R&S®SMZ with attenuator
- Suitable for frequency-, phase- and pulse-modulated signals

Wide frequency and dynamic range

- Frequency range from 50 GHz to 75 GHz, 60 GHz to 90 GHz or 75 GHz to 110 GHz, depending on the model. Two models (R&S®SMZ75 and R&S®SMZ110) cover the wide frequency range from 50 GHz to 110 GHz
- Electronically adjustable attenuator with a dynamic range of 15 dB, mechanically adjustable attenuator with a dynamic range of 25 dB

High signal quality

- Outstanding single sideband phase noise when the R&S®SMF100A microwave signal generator is used as the source
- High accuracy of the set output level
- Excellent matching

that might need to be repeated each time the frequency or level is changed. The result is high-priced test setups (due to waveguide technology) as well as time-consuming, complex measurements.

All of this can be eliminated. The new frequency multiplier family now lets users conveniently set the desired frequency and level as usual on the R&S®SMF100A microwave signal generator. The requested parameters are then passed via the USB interface to the R&S®SMZ frequency multiplier and its built-in, electronically adjustable attenuator – measurements can start immediately.

The frequency multipliers can, of course, also be used in conventional setups with any other microwave generator that fulfills the level and frequency requirements.

Summary

When high microwave frequencies between 50 GHz and 110 GHz, simple setups, fast handling and precise output levels are needed, the new R&S®SMZ frequency multiplier family is the right choice. Even a level sweep – including automatic frequency response correction – is easy to perform using the combination of the R&S®SMF100A and the R&S®SMZ with the electronically adjustable attenuator.

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FIG 2 Test setup with the R&S®SMF100A microwave signal generator and the R&S®SMZ110 frequency multiplier.