# R&S®RF PORTS ALIGNMENT SOFTWARE

## Specifications


Specifications
Version 03.00

ROHDE&SCHWARZ
Make ideas real

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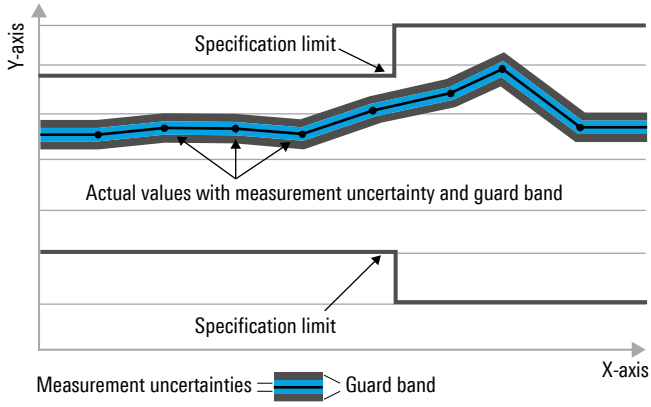
# Definitions

**General**
Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

**Specifications with limits**
Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as <, ≤, >, ≥, ±, or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.




**Non-traceable specifications with limits (n. trc.)**
Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

**Specifications without limits**
Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

**Typical data (typ.)**
Characterizes product performance by means of representative information for the given parameter. When marked with <, > or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

**Nominal values (nom.)**
Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

**Measured values (meas.)**
Characterize expected product performance by means of measurement results gained from individual samples.

**Uncertainties**
Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

# Introduction

The R&S®RF Ports Alignment Software and its respective instrument keycode options for Rohde & Schwarz signal generators have been specifically developed for easy alignment of vector signal generator RF ports. The R&S®RF Ports Alignment Software together with the keycode options automate the generation of alignment data of multiple RF signals. This data is used by the R&S®SMW-K545 RF port alignment option to align the RF signals of at least two RF ports of an R&S®SMW200A vector signal generator with respect to:

- Amplitude
- Phase
- Time delay
- Frequency response over modulation bandwidth

The RF signals are generated by one or several R&S®SMW200A vector signal generators. By controlling a vector network analyzer, the R&S®RF Ports Alignment Software measures the deviation between two RF ports. In a setup containing more than two RF ports, the deviations are measured relative to a single reference port.

In combination with a Rohde & Schwarz power sensor, the R&S®RF Ports Alignment Software can also provide absolute power deviations.

## Notations and abbreviations

The R&S®RF Ports Alignment Software is abbreviated as RFPAL.

## Minimum configurations

A PC with Windows 10, 64 bit operating system is required to run the RFPAL.

To use the RFPAL with R&S®SMW200A vector signal generators, the following minimum configuration is required:

- R&S®SMW-B1003 frequency option, RF path A, frequency range from 100 kHz to 3 GHz
- R&S®SMW-B9 [1] wideband baseband generator with ARB
- R&S®SMW-B13XT wideband signal routing and baseband main module, two I/Q paths to RF
- R&S®SMW-B90 phase coherence
- R&S®SMW-K61 [1] multicarrier CW signal generation
- R&S®SMW-K544 [1] user-defined frequency response correction
- R&S®SMW-K545 [2] RF port alignment

If only standard baseband bandwidth signals are required, the R&S®SMW-B9 and R&S®SMW-B13XT options can be replaced by the R&S®SMW-B10 and R&S®SMW-B13 options.

[1] Option required for each RF port.

[2] Option required for each device.

# Calibration setup

The RFPAL controls via LAN a calibration setup which contains at least two RF ports and a vector network analyzer. For setups with more than one R&S®SMW200A vector signal generator, one signal generator must be designated as primary.

## Supported measurement instruments

The RFPAL controls a vector network analyzer to measure the deviation between two RF ports. Optionally, a power sensor can be controlled to measure the absolute power level. The following devices are supported.

### Vector signal generator

- R&S®SMW200A

### Vector network analyzers

A vector network analyzer with at least 2 ports is required. No further options are needed.

- R&S®ZNA
- R&S®ZNB
- R&S®ZVA (direct receiver access can be used if the R&S®ZVA-B16 option is available)
- R&S®ZNBT

### Vector network analyzers calibration units

- R&S®ZN-Z52
- R&S®ZN-Z54
- R&S®ZN-Z33

### Power sensors

- R&S®NRP18S(N)
- R&S®NRP-Z81

## RF path switching

The RFPAL supports switch and control units to automatically connect the signal generator RF outputs to the measurement instrument during calibration. In manual mode, the user has to connect the cables on demand.

| **Parameter type** | | |
|---|---|---|
| RF path switching | | manual, automatic |

The following open switch and control units are supported by the RFPAL:

- R&S®OSP120
- R&S®OSP320

## LO/REF configuration for the vector signal generators

The RFPAL allows the user to specify the source of the LO signal and its distribution. It also allows the source of the REF signal of the primary signal generator to be specified.

| **Parameter type** | | |
|---|---|---|
| LO distribution | | star, daisy chain |
| LO source | | internal, external |
| REF source of primary signal generator | secondary devices always use an external reference | internal, external |

### Supported external LO sources

- R&S®SMA100B RF and microwave signal generator

# Calibration parameters

The RFPAL allows the user to specify a range of carrier frequencies for which alignment data is obtained. Similarly, a range of RF power levels can be specified. The alignment data is valid for the points of the matrix defined by the two ranges. Furthermore, the modulation bandwidth can be specified. Actual limits are determined by the hardware capabilities of the used source and measurement instruments.

## Frequency

| **Parameter type** | | |
|---|---|---|
| Input mode | | range, list |
| **Range** | | |
| Start, stop | | 250 kHz to 65 GHz |
| Step | | 100 kHz to 10 GHz |
| **List** | | file with comma separated values in GHz |
| **Modulation bandwidth** | | 80 MHz to 2 GHz |

## Level

| **Parameter type** | | |
|---|---|---|
| Input mode | | range, list |
| **Range** | | |
| Start, stop | | –145 dBm to +30 dBm |
| Step | | 0.01 dB to 30 dB |
| **List** | | file with comma separated values in dBm |

# Ordering information

| Designation | Type | Order No. |
|---|---|---|
| RF Ports Alignment Software for R&S®SMW-K545 | R&S®RF Ports Alignment Software | available for download from the Rohde & Schwarz website www.rohde-schwarz.com |

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R&S®RF Ports Alignment Software
Data without tolerance limits is not binding | Subject to change


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