Rapid automatic multi-port calibration box "RapACal"

Features

- Fast and easy one- or multi-port (n-port) calibration DC to 18 GHz
- Accurate calibration
- Simple purpose through a graphical user interface
- RF connector:
  - N or 3.5mm
- View directly error correction data

Fig. 1: Rapid Auto Calibration box (RapACal) with N-connectors from HHF

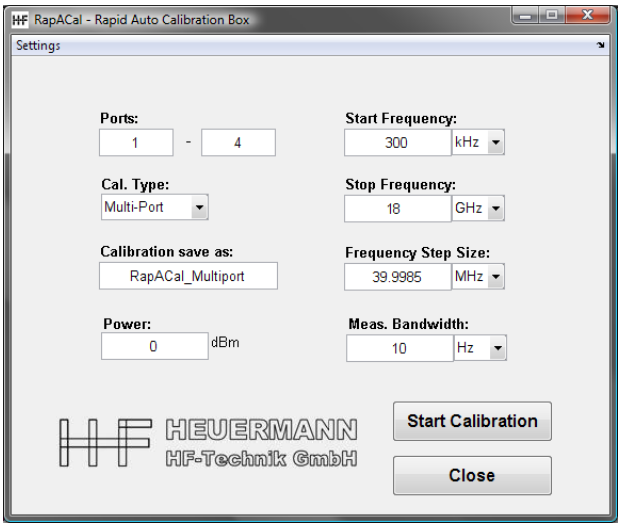

Fig. 2: Graphical user interface of RapACal

Application

- **Rohde & Schwarz one- and multi-port vector network analyzer**

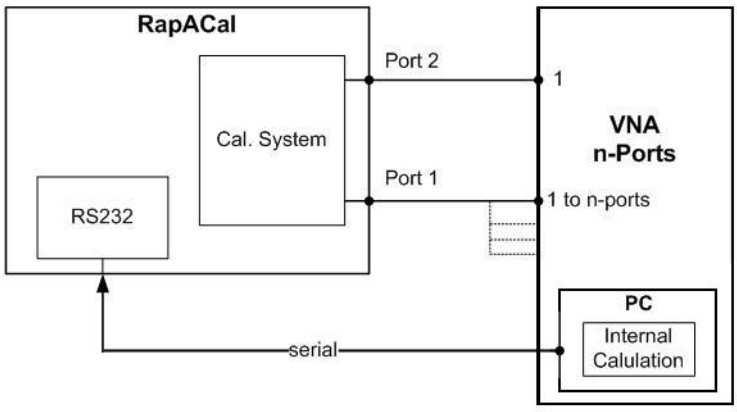

Fig. 3: Functional block diagram of RapACal

Product description

Rapid **A**utomatic multi-port **Cal**ibration box (**RapACal**) allows an easy and rapid one- or multi-port (n-port, n = 1, 2, 3…) calibration of Vector Network Analyzers (VNA) up to 18 GHz. The calibration is quite simple. The users just need to make "n+1" connections to calibrate n-ports. The number of ports is unlimited. RapACal will be controlled over VNA-internal PC interface (LAN and USB) with a graphical user interface from a windows operating system (NT, XP, Vista).

RapACal supports one-port-, two-port- as well as multi-port-VNAs from all popular manufactors (Agilent, Anritsu, Rohde&Schwarz, Advantest, Ballmann, ...).

Specifications

Type-N (50 Ω)

Frequency range	Directivity (dB)	Source match (dB)	Reflection tracking (±dB)	Transmission tracking (±dB)	Load match (dB)
DC to 2 GHz	>37	>37	<0.1	<0.1	>37
2 GHz to 5 GHz	>33	>35	<0.15	<0.1	>33
5 GHz to 8 GHz	>32	>33	<0.25	<0.1	>32
8 GHz to 18 GHz	>30	>30	<0.25	<0.2	>30

Type-3.5 mm

Frequency range	Directivity (dB)	Source match (dB)	Reflection tracking (±dB)	Transmission tracking (±dB)	Load match (dB)
DC to 2 GHz	>35	>34	<0.2	<0.1	>35
2 GHz to 5 GHz	>32	>33	<0.2	<0.1	>32
5 GHz to 8 GHz	>33	>32	<0.2	<0.1	>32
8 GHz to 18 GHz	>30	>30	<0.3	<0.2	>30

General data

Operating temperature range: +5 °C to +40 °C
Permissible temperature range: 0 °C to +50 °C
Storage temperature range: -10°C to +70 °C
Sufficient warm up time: 5 min
Calibration interval: 1 year

Electrical specification

Input power supply:	85 – 264 VAC
Input frequency:	50 – 60 Hz
Power consumption:	20 W

Physical properties

Height x width x depth:	85 x 250 x 260 (mm³)
Weight:	2 kg

Typical performance

The performance of RapACal is demonstrated on measurements on a Rohde & Schwarz vector network analyzer ZVM (2-port) and a ZVB 8 (4-port) as following.
The ripple test for error-estimation is presented in Fig. 4 and Fig. 5. The DUT is a Rosenberger high-end 50Ω air line, terminated with a short. The ripple delivers a source match of the system better than 36 dB.

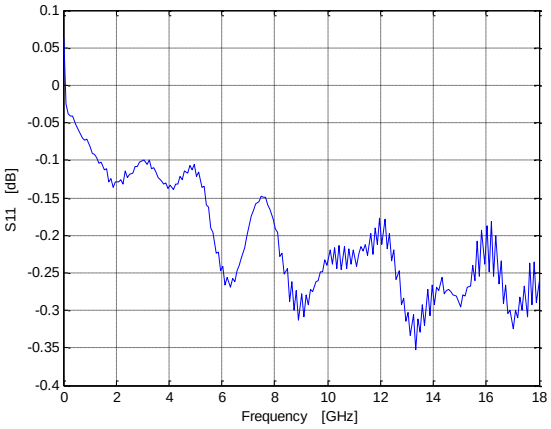

Fig. 4: Reflection of a matched line terminated with a short error-corrected with RapACal to 18GHz (Rohde & Schwarz ZVM 2-port VNA)

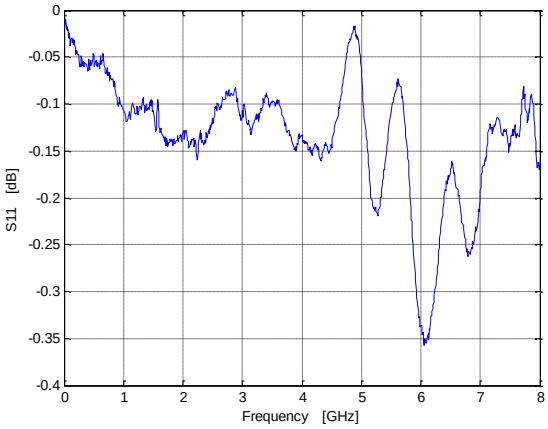

Fig. 5: Reflection of a matched line terminated with a short error-corrected with RapACal to 8GHz (Rohde & Schwarz ZVB 8 4-port VNA)

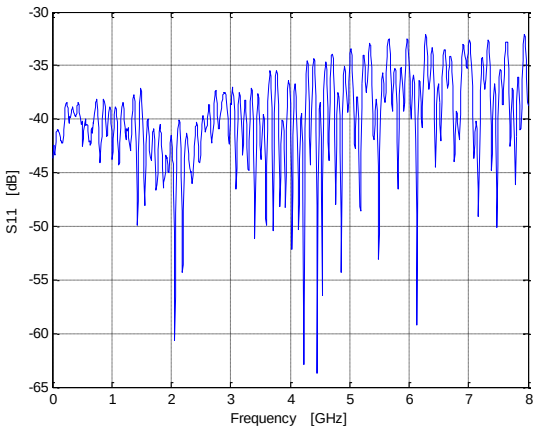

Fig. 6: Reflection of a thru-connection with an offset length of 46.1mm error-corrected with RapACal to 8 GHz (Rohde & Schwarz ZVB 8 4-port VNA)

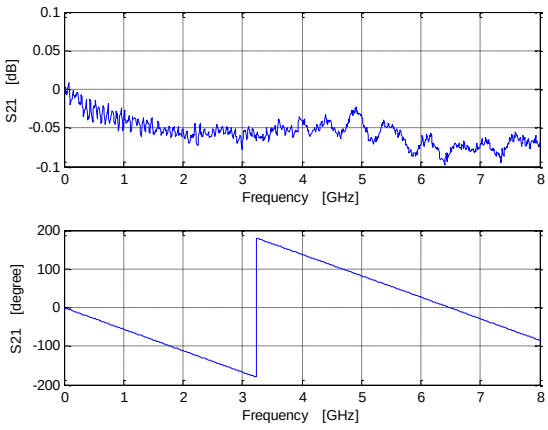

Fig. 7: Transmission of a thru-connection with an offset length of 46.1mm error-corrected with RapACal to 8 GHz (Rohde & Schwarz ZVB 8 4-port VNA)

Fig. 6 shows the load match of the system, which is better than 32 dB. The transmission results of the thru-connection with an offset length of 46.1 mm are shown in Fig. 7.

To demonstrate the accuracy for multi-port measurements a mismatched T-power splitter was used. Fig. 8 and Fig. 9 show the high measurement performance by using RapACal.

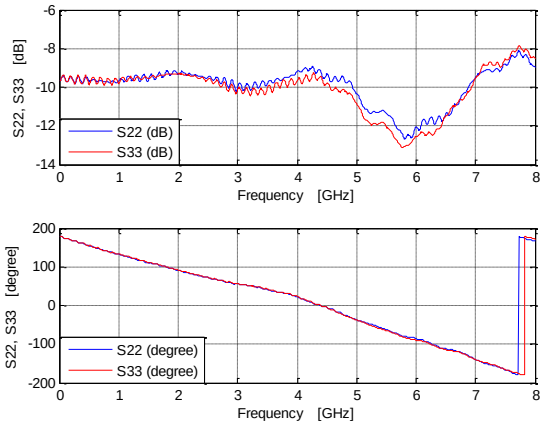

Fig. 8: Reflection of a mismatched T-power splitter error-corrected with RapACal to 8 GHz (Rohde & Schwarz ZVB 8 4-port VNA)

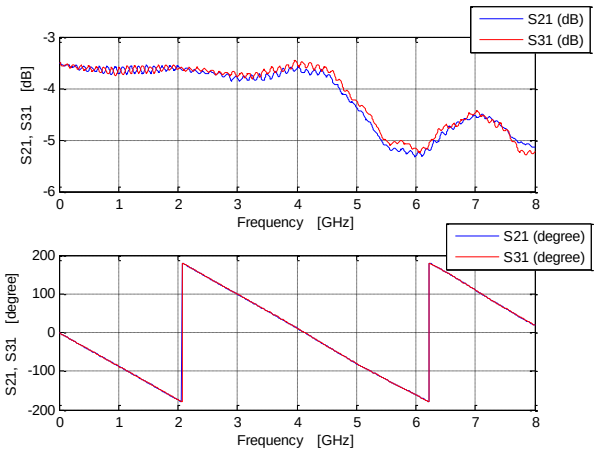

Fig. 9: Transmission of a mismatched T-power splitter error-corrected with RapACal to 8 GHz (Rohde & Schwarz ZVB 8 4-port VNA)

The advantage of RapACal is that there is no limit for the number of ports. Only with "n+1"-connections RapACal calibrates quickly and with a high precision one-, or n-ports.

Ordering number

Model: NA-RC1

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