OBZOR-304/1

NETWORK ANALYZER

DATA SHEET

- Frequency range: 300 kHz to 3.2 GHz
- Measured parameters S_{11}, S_{21}, S_{12}, S_{22}
- Dynamic range of transmission measurement magnitude 135 dB
- Measurement time per point 125 µs
- Output power adjustment range -55 dBm to +10 dBm

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OBZOR-304/1 Network Analyzer is designed for use in the process of development, adjustment and testing of various electronic devices in industrial and laboratory facilities, including operation as a component of an automated measurement system. OBZOR-304/1 is designed for operation with external PC, which is not supplied with the Analyzer.

To learn more about the software functions, download the program from our website and install it on your PC in demo mode.

MEASUREMENT RANGE

Impedance	50 Ω (75 Ω connectors via adapters)
Test port connector	N-type, female
Number of test ports	2
Frequency range	300 kHz to 3.2 GHz
Full CW frequency accuracy	$\pm 5 \times 10^{-6}$
Frequency setting resolution	1 Hz
Number of measurement points	1 to 10001
Measurement bandwidths	1 Hz to 30 kHz (with 1/1.5/2/3/5/7 steps)
Dynamic range (IF bandwidth 10 Hz)	130 dB, typ. 135 dB

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MEASUREMENT ACCURACY

Accuracy of transmission measurements (magnitude / phase)[1]	
+5 dB to +15 dB	0.2 dB / 2°
-50 dB to +5 dB	0.1 dB / 1°
-70 dB to -50 dB	0.2 dB / 2°
-90 dB to -70 dB	1.0 dB / 6°

Accuracy of reflection measurements (magnitude / phase) [1]	
-15 dB to 0 dB	0.4 dB / 4°
-25 dB to -15 dB	1.5 dB / 7°
-35 dB to -25 dB	4.0 dB / 22°

Trace stability	
Trace noise magnitude (IF bandwidth 3 kHz)	1 mdB rms
Temperature dependence (per one degree of temperature variation)	0.02 dB

EFFECTIVE SYSTEM DATA[1]

Effective directivity	45 dB
Effective source match	40 dB
Effective load match	45 dB

TEST PORT

Directivity (without system error correction)	25 dB

[1] applies over the temperature range of 23°C ± 5 °C after 40 minutes of warming-up, with less than 1 °C deviation from the one-path two-port calibration temperature, at output power of -5 dBm, and IF bandwidth 10 Hz.

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TEST PORT OUTPUT

Match (without system error correction)	15 dB
Power range	-55 dBm to +10 dBm
Power accuracy	±1.0 dB
Power resolution	0.05 dB
Harmonics distortion	-30 dBc
Non-harmonic spurious	-30 dBc

TEST PORT INPUT

Match (without system error correction)	25 dB
Damage level	+26 dBm
Damage DC voltage	35 V
Noise level (defined as the rms value of the specified noise floor, IF bandwidth 10 Hz)	-120 dBm

MEASUREMENT SPEED

Measurement time per point	125 µs
Source to receiver port switchover time	10 ms

Typical cycle time versus number of measurement points

Number of points	**51**	**201**	**401**	**1601**
Start 300 kHz, stop 10 MHz, IF bandwidth 30 kHz				
Uncorrected	13 ms	52 ms	104 ms	413 ms
Full two-port calibration	46 ms	123 ms	226 ms	844 ms
Start 10 MHz, stop 3.2 GHz, IF bandwidth 30 kHz				
Uncorrected	7 ms	27 ms	53 ms	207 ms
Full two-port calibration	34 ms	73 ms	125 ms	434 ms

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GENERAL DATA

External reference frequency	10 MHz
Input level	2 dBm ± 2 dB
Input impedance at «10 MHz»	50 Ω
input Connector type	BNC female
Output reference signal level at 50 Ω impedance	3 dBm ± 2 dB
«OUT 10 MHz» connector type	BNC female
Operating temperature range	+5 °C to +40 °C
Storage temperature range	-45 °C to +55 °C
Humidity	90% at 25 °C
Atmospheric pressure	84 to 106.7 kPa
Calibration interval	3 years
Power supply	220 ± 22 V (AC), 50 Hz
Power consumption	30 W
Dimensions (L x W x H)	324 x 415 x 96 mm
Weight	7 kg

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MEASUREMENT CAPABILITIES

Measured parameters	S_{11}, S_{21}, S_{12}, S_{22} Absolute power of the reference and received signals at the port.
Number of measurement channels	Up to 16 independent logical channels. Each logical channel is represented on the screen as an individual channel window. A logical channel is defined by such stimulus signal settings as frequency range, number of test points, power level, etc.
Data traces	Up to 16 data traces can be displayed in each channel window.A data trace represents one of such parameters of the DUT asS-parameters, response in time domain, input power response.
Memory traces	Each of the 16 data traces can be saved into memory for further comparison with the current values.
Data display formats	Logarithmic magnitude, linear magnitude, phase, expanded phase, group delay, SWR, real part, imaginary part, Smith chart diagram and polar diagram.

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SWEEP FEATURES

Measured points per sweep	Set by the user from 1 to 10001.
Sweep type	Linear frequency sweep, logarithmic frequency sweep, and segment frequency sweep, when the stimulus power is a fixed value; and linear power sweep when frequency is a fixed value.
Segment sweep features	A frequency sweep within several independent user-defined segments. Frequency range, number of sweep points, source power, and IF bandwidth should be set for each segment.
Power	Source power from –55 dBm to +10 dBm with resolution of 0.05 dB. In frequency sweep mode the power slope can be set to up to 2 dB/GHz for compensation of high frequency attenuation in connection wires.
Sweep trigger	Trigger modes: continuous, single, hold. Trigger sources: internal, manual, external, bus.

TRACE FUNCTIONS

Trace display	Data trace, memory trace, or simultaneous indication of data and memory traces.
Trace math	Data trace modification by math operations: addition, subtraction, multiplication or division of measured complex values and memory data.
Autoscaling	Automatic selection of scale division and reference level value to have the trace most effectively displayed.
Electrical delay	Calibration plane moving to compensate for the delay in low-loss test setup. Compensation for electrical delay in a DUT during measurements of deviation from linear phase.
Phase offset	Phase offset defined in degrees.

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ACCURACY ENHANCEMENT

Calibration	Calibration of a test setup (which includes the Analyzer, cables, and adapters) significantly increases the accuracy of measurements. Calibration allows for correction of the errors caused by imperfections in the measurement system: system directivity, source and load match, tracking and isolation.
Calibration methods	Calibration methods of various sophistication and accuracy enhancement level are available. The most accurate among them are full one-port calibration and full two-port calibration.
Reflection and transmission normalization	The simplest calibration method. It provides low accuracy.
Full one-port calibration	Method of calibration performed for one-port reflection measurements.It ensures high accuracy.
One-path two-port calibration	Method of calibration performed for reflection and one-way transmission measurements, for example for measuring S_{11} and S_{21} only. It ensures high accuracy for reflection measurements, and mean accuracy for transmission measurements.
Full two-port calibration	Method of calibration performed for full S-parameter matrix measurement of a two-port DUT. It ensures high accuracy.
Mechanical Calibration Kits	The user can select one of the predefined calibration kits of various manufacturers or define own calibration kits.
Electronic Calibration Modules	Electronic calibration modules offered by PLANAR make the Analyzer calibration faster and easier than traditional mechanical calibration.
Sliding load calibration standard	The use of sliding load calibration standard allows significant increase in calibration accuracy at high frequencies compared tothe fixed load calibration standard.

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Defining of calibration standards	Different methods of calibration standard defining are available: - standard defining by polynomial model; - standard defining by data (S-parameters).
Error correction interpolation	When the user changes such settings as start/stop frequencies and number of sweep points, compared to the settings at the moment of calibration, interpolation or extrapolation of the calibration coefficients will be applied.

SUPPLEMENTAL CALIBRATION METHODS

Power calibration	Method of calibration, which allows more stable maintaining of the power level setting at the DUT input. An external power meter should be connected to the USB port directly or via USB/GPIB adapter.
Receiver calibration	Method of calibration, which calibrates the receiver gain at absolute signal power measurement.

MARKER FUNCTIONS

Data markers	Up to 16 markers for each trace. Reference marker available for delta marker operation. Smith chart diagram supports 5 marker formats: linear magnitude/phase, log magnitude/phase, real/imaginary, R + jX and G + jB. Polar diagram supports 3 marker formats: linear magnitude/phase, log magnitude/phase, and real/imaginary.
Reference marker	Enables indication of any maker values as relative to the reference marker.
Marker search	Search for max, min, peak, or target values on a trace.
Marker search additional features	User-definable search range. Functions of specific condition tracking or single operation search.
Setting parameters by markers	Setting of start, stop and center frequencies by the stimulus value of the marker and setting of reference level by the response value of the marker.
Marker math functions	Statistics, bandwidth, flatness, RF filter.
Statistics	Calculation and display of mean, standard deviation and peak-to-peak in a frequency range limited by two markers on a trace.
Bandwidth	Determines bandwidth between cutoff frequency points for an active marker or absolute maximum. The bandwidth value, center frequency, lower frequency, higher frequency, Q value, and insertion loss are displayed.
Flatness	Displays gain, slope, and flatness between two markers on a trace.
RF filter	Displays insertion loss and peak-to-peak ripple of the passband, and the maximum signal magnitude in the stopband. The passband and stopband are defined by two pairs of markers.

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DATA ANALYSIS

Port impedance conversion	The function of conversion of the S-parameters measured at 50 Ω port into the values, which could be determined if measured at a test port with arbitrary impedance.
De-embedding	The function allows to mathematically exclude fromthe measurement result the effect of the fixture circuit connected between the calibration plane and the DUT. This circuit should be described by an S-parameter matrix in a Touchstone file.
Embedding	The function allows to mathematically simulate the DUT parameters after virtual integration of a fixture circuit between the calibration plane and the DUT. This circuit should be described by anS-parameter matrix in a Touchstone file.
S-parameterconversion	The function allows conversion of the measured S-parameters tothe following parameters: reflection impedance and admittance, transmission impedance and admittance, and inverse S-parameters.
Time domain transformation	The function performs data transformation from frequency domain into response of the DUT to various stimulus types in time domain. Modeled stimulus types: bandpass, lowpass impulse, and lowpass step. Time domain span is set by the user arbitrarily from zero to maximum, which is determined by the frequency step. Windows of various forms are used for better tradeoff between resolution and level of spurious sidelobes.
Time domaingating	The function mathematically removes unwanted responses in time domain what allows for obtaining frequency response without influence from the fixture elements. The function applies reverse transformation back to frequency domain after cutting out the user-defined span in time domain. Gating filter types: bandpass or notch. For better tradeoff between gate resolution and level of spurious sidelobes the following filter shapes are available: maximum, wide, normal and minimum.

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MIXER / CONVERTER MEASUREMENTS

Scalar mixer / converter measurements	The scalar method allows measuring magnitude only of transmission coefficient of mixer and other frequency translating devices. No external mixers or other devices are required. The scalar method employs port frequency offset when there is difference between source port frequency and receiver port frequency.
Vector mixer / converter measurements	The vector method allows measuring both magnitude and phase of the mixer transmission coefficient. The method requires an external mixer and a LO common for both the external mixer and the mixer under test.
Scalar mixer / converter calibration	The most accurate method of calibration applied for measurements of mixers in frequency offset mode. The OPEN, SHORT, and LOAD calibration standards are used. An external power meter should be connected to the USB port directly or via USB/GPIB adapter.
Vector mixer /converter calibration	Method of calibration applied for vector mixer measurements. OPEN, SHORT and LOAD calibration standards are used.
Automatic frequency offset adjustment	The function performs automatic frequency offset adjustment when the scalar mixer / converter measurements are performed to compensate for internal LO setting inaccuracy in the DUT.

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OTHER FEATURES

Analyzer control	Using external personal computer, which runs the Analyzer software.
Familiar graphical user interface	Graphical user interface based on Windows operating system ensures fast and easy Analyzer operation by the user.
Diagram printout/saving	The diagram and data printout function has preview feature.The preview, saving and printout can be performed using MS Word, Image Viewer for Windows, or Analyzer Print Wizard.

REMOTE CONTROL AND DATA EXCHANGE

COM/DCOM	COM/DCOM automation is used for remote control and data exchange with the user software. The Analyzer program runs as COM/DCOM server. The user program runs as COM/DCOM client. The COM client runs on Analyzer PC. The DCOM client runs ona separate PC connected via LAN.

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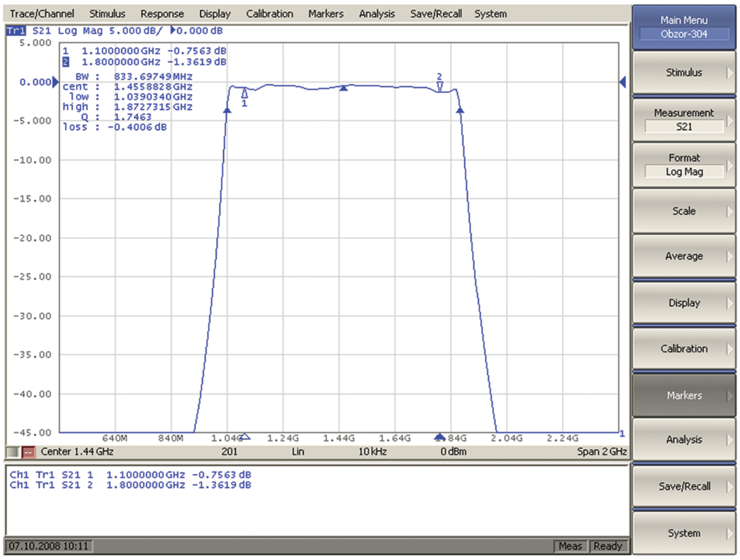
Trace/Channel Stimulus Response Display Calibration Markers Analysis Save/Recall System
Tr1 S21 Log Mag 5.000 dB/ 0.000 dB
1 1.1000000 GHz -0.7563 dB
2 1.8000000 GHz -1.3619 dB
BW : 833.69749 MHz
cent : 1.4558828 GHz
low : 1.0390340 GHz
high : 1.8727315 GHz
Q : 1.7463
loss : -0.4006 dB
Center 1.44 GHz
201
Lin
10 kHz
0 dBm
Span 2 GHz
Ch1 Tr1 S21 1 1.1000000 GHz -0.7563 dB
Ch1 Tr1 S21 2 1.8000000 GHz -1.3619 dB
07.10.2008 10:11
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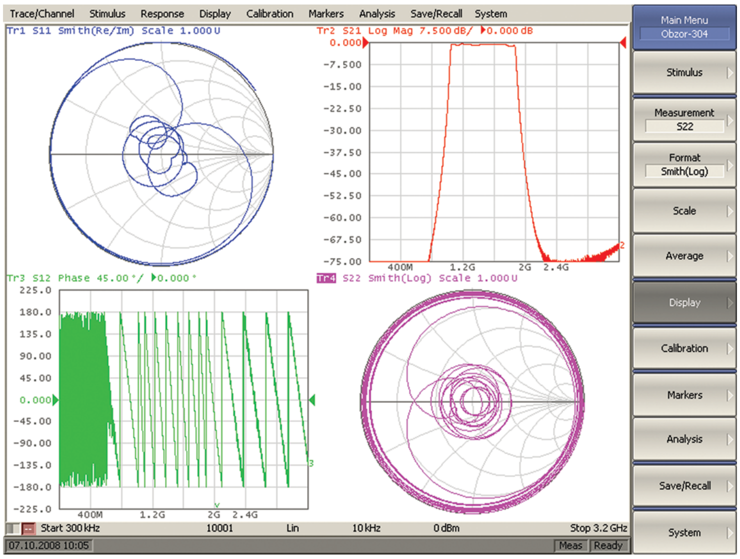
Ready
Main Menu
Obzor-304
Stimulus
Measurement
S21
Format
Log Mag
Scale
Average
Display
Calibration
Markers
Analysis
Save/Recall
System


Trace/Channel Stimulus Response Display Calibration Markers Analysis Save/Recall System
Tr1 S11 Smith(Re/Im) Scale 1.000 U
Tr2 S21 Log Mag 7.500 dB/ 0.000 dB
Tr3 S12 Phase 45.00 °/ 0.000 °
Tr4 S22 Smith(Log) Scale 1.000 U
Start 300 kHz
10001
Lin
10 kHz
0 dBm
Stop 3.2 GHz
07.10.2008 10:05
Meas
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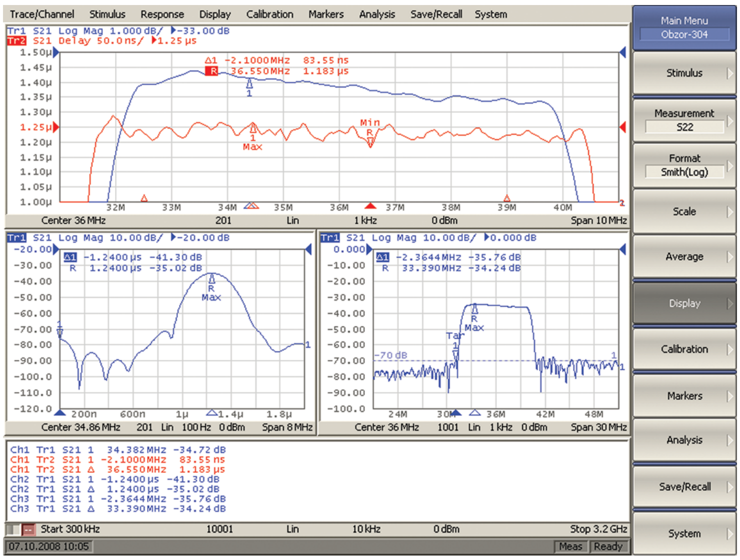
Trace/Channel Stimulus Response Display Calibration Markers Analysis Save/Recall System
Tr1 S21 Log Mag 1.000 dB/ -33.00 dB
Tr2 S21 Delay 50.0 ns/ 1.25 µs
Δ1 -2.1000 MHz 83.55 ns
R 36.550 MHz 1.183 µs
Center 36 MHz
201
Lin
1 kHz
0 dBm
Span 10 MHz
Tr1 S21 Log Mag 10.00 dB/ -20.00 dB
Δ1 -1.2400 µs -41.30 dB
R 1.2400 µs -35.02 dB
Center 34.86 MHz 201 Lin 100 Hz 0 dBm Span 8 MHz
Tr1 S21 Log Mag 10.00 dB/ 0.000 dB
Δ1 -2.3644 MHz -35.76 dB
R 33.390 MHz -34.24 dB
Center 36 MHz 1001 Lin 1 kHz 0 dBm Span 30 MHz
Ch1 Tr1 S21 1 34.382 MHz -34.72 dB
Ch1 Tr2 S21 1 -2.1000 MHz 83.55 ns
Ch1 Tr2 S21 Δ 36.550 MHz 1.183 µs
Ch2 Tr1 S21 1 -1.2400 µs -41.30 dB
Ch2 Tr1 S21 Δ 1.2400 µs -35.02 dB
Ch3 Tr1 S21 1 -2.3644 MHz -35.76 dB
Ch3 Tr1 S21 Δ 33.390 MHz -34.24 dB
Start 300 kHz
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Lin
10 kHz
0 dBm
Stop 3.2 GHz
07.10.2008 10:05
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