8 Checking the Specifications

8.1 Introduction

This chapter describes methods for checking important specifications and functions. Specifications and functions which can be checked by the user without special instructions or which are automatically checked by test routines built-in to the instrument are excluded.

Unless stated otherwise, the tests should be carried out in a temperate laboratory climate at an ambient temperature of 23 °C ± 3 °C after allowing the instrument to warm up for the specified period.

The checking of the specification serves to establish whether the indicated or displayed measurement value is within the specified error limits. This can only be established without reservation if the error in the measuring equipment used is negligible. The error in the measuring equipment used is added to the error of the device under test when assessing conformance to the specified error limits (IEC Publication 359).

This can be illustrated using symmetrical error limits as an example:

If the error in the measuring equipment used is ± (m) and the specified error limits for the device under test are ± (e), then:

- if the limit ± (e + m) is exceeded, the specified error limits have certainly been exceeded;
- if the limit ± (e - m) is not exceeded, the specified error limits have certainly not been exceeded.

Adjustment of the device under test should only be made if the specified error limits (e) have definitely been exceeded when the measurement error (m) is taken into account.

Safety test

First check the protective ground connector and the insulation resistance. See chapter 2.1.1.

8.2 Measuring Equipment

Recommended measuring equipment for standard checks

Instrument	Requirements	Recommended type	Manufacturer
Frequency counter	Accuracy at 10 MHz: < 0.03 Hz	Any	Any
Synthesizer	10 MHz to (3.2) 26.5 GHz	SNA-(20)/23 + TG-(20)/23 or 83640	W&G HP
Milliwatt power meter	Frequency range DC to 300 MHz with 50 Ω N adapter	EPM-1 (BN 564/01) with TK-10 probe (BN 572/01)	W&G
Level generator	Z_0 = 50 Ω and 75 Ω 1 to 22 MHz; +9 dBm	PSM-39 or PS-19 with ZA-5075	W&G
Power meter with Power Sensor 1	10 MHz to 26.5 GHz 0 to -30 dBm; PC 3.5	438A 8485A	HP HP
Precision attenuator pads	5, 10, 20, 30, 40 dB 3 to 30 MHz N connectors Z_0 = 75 Ω	DG-1405 DG-1410 DG-1420 DG-1430 DG-1440	W&G
Attenuator pad	10 dB; 50 Ω; to 22 GHz; PC 3.5	8493C; Option 010	HP
Terminating resistor	50 Ω; 0 to 26.5 GHz PC 3.5 (f)	909D; Option 011	HP
Z_0 matching pad	N 75 Ω (f) to N 50 Ω (m)	ZA-5075, BN 925/03	W&G
Adapter	EPC to N(f)	S 895	W&G
Adapter	EPC to PC 3.5 (m)	S 896	W&G
Adapter	PC 3.5 (f) to PC 3.5 (f)	S 864	W&G
Adapter	N(f) to N(f), 50 Ω	53 K 101-K00 A3	Rosenberger
Adapter	N(m) to BNC(f), 50 Ω	S 846	W&G
Adapter	N(f) to BNC(m), 50 Ω	51 S 153-K00	Rosenberger
Adapter	N(m) to BNC(f), 75 Ω	73 S 171-K00	Rosenberger
Cable, 61 cm	PC 3.5to PC 3.5 (m - m)	11500E	HP
Cables	N 50 Ω: BNC 75 Ω	K xxx	W&G
1 Power Meter and Power Sensors must be calibrated together.			

Further measuring equipment required for the additional tests in chapter 8.10

Instrument	Requirements	Recommended type	Manufacturer
Network analyzer	Scalar	8757E	HP
2nd synthesizer	10 MHz to 26.5 GHz	83640	HP
Return loss bridge	with calibrated standards	85027B	HP
Directional coupler	1.7 GHz to 26.5 GHz	Type no. 4227-16	NARDA
Power splitter	50 Ω; N connectors 18 GHz	Type 1870A	Weinschel
Low-pass filter	f_{lim}: 900 MHz; a = 60 dB/octave	Type 2001.17F 987-6500.340	Suhner W&G
Low-pass filter	f_{lim}: 1400 MHz; a = 60 dB/octave	Type 2001.17G 987-6500.353	Suhner W&G
Low-pass filter	f_{lim}: 2100 MHz; a = 60 dB/octave	Type 2002.17B 987-6500.337	Suhner W&G
Low-pass filter	f_{lim}: 14 MHz; a = 60 dB/octave	0987-6500.324	W&G
2 Attenuator pads	10 dB / 50 Ω (m/f)	Type 44; 0 to 18 GHz	Weinschel
Attenuator pad	6 dB; SMA	4138060000 0000-7668.351	Radiall W&G
2 Isolators	20 dB isolation; 4 to 8 GHz	Type no. 4914	NARDA
2 Isolators	16 dB isolation; 8 to 18 GHz	Type no. 4946	NARDA

Adapters

The adapters required between the various connector systems (BNC, N, PC3.5, EPC) are not specially indicated in the following test setups (diagrams and text). Various combinations can often be used. If certain adapter types are stated, these adapters should be used.

8.3 Frequency Accuracy

Method 1

Test setup

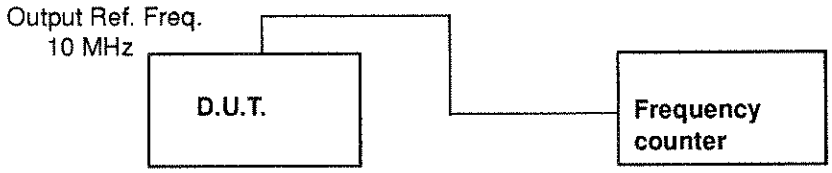

Fig. 8-1 Test setup 1 for frequency accuracy

Equipment required

1 frequency counter (accuracy at 10 MHz: < ± 0.03 Hz)

Measurement

Measure the 10 MHz output. Specified error limit (e) after adjustment: 10 MHz ± 0.1 Hz
Specified error limit (e) after 1 year: 10 MHz ± 0.6 Hz

Method 2

Equipment required

1 Oscilloscope, 2-channel, $f_{lim} \geq 10$ MHz
1 Frequency standard f = 10 MHz ± 0.01 Hz

Test setup

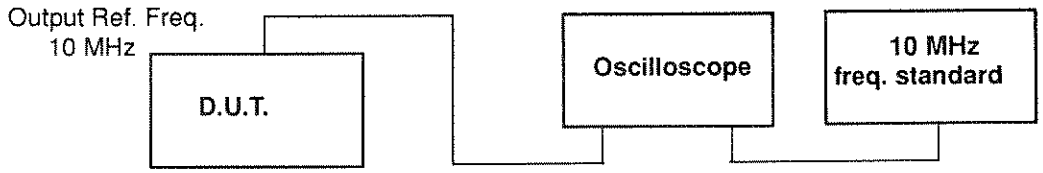

Fig. 8-2 Test setup 2 for frequency accuracy

Connect the 10 MHz standard frequency output of the D.U.T. to channel A of the oscilloscope. Connect the 10 MHz frequency standard to channel B of the oscilloscope.

Instrument settings

Oscilloscope: XY mode

Measurement

Select the sensitivity of channel A and channel B of the ocilloscope such that the display is as close to a circle as possible. The apparent rotation of the displayed Lissajous figure should not be more than one revolution in 10 s after adjustment or one revolution in 2 s after one year.

8.4 External CAL Output Level Accuracy

Equipment required

1 Milliwatt power meter (50 Ω)	EPM-1; 564/01	W&G
with probe (50 Ω)	TK-10; 572/01	W&G
1 Level generator	PSM-39	W&G
1 30 dB attenuator pad	DG-1430	W&G
1 Z_0 matching pad	ZA5075;925/03	W&G

Test setup 1

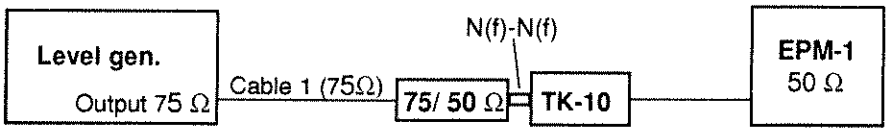

Fig. 8-3 Test setup 1 for external CAL output level accuracy

Test setup 2

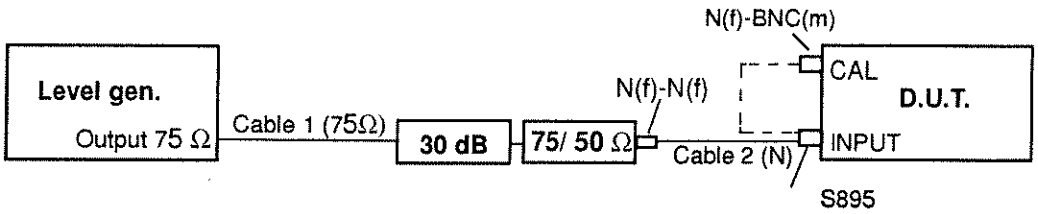

Fig. 8-4 Test setup 2 for external CAL output level accuracy

Initial instrument settings

EPM-1, 50 Ω: 0 dBm, R_{in} = 50 Ω

Level generator:21.99 MHz, +5.8 dBm, R_{out} = 75 Ω

D.U.T.: PRESET, SPECTRUM ANALYSIS (CW)

Set permanent operation of CAL output:

- Connect an external PC keyboard to the D.U.T. [1].
- Press Alt + F10, then press ENTER (switch to DOS mode)
- If necessary, change the keyboard driver (see chapter 4.10).
- Further entries: set calout = 1 ENTER
  k ENTER (returns to measurement program)

--> Permanent operation is now available but not activated.

Further D.U.T. settings:

FCENT:	21.99 MHz
FSPAN:	0 Hz
REFERENCE:	-29.5 dBm
SCALE:	10 dB
RBW:	1 kHz
VBW:	10 Hz
SWT:	25 ms
ATTN:	10 dB

Measurement

Provide a reference signal:

Calibrate the EPM-1.
Test setup 1 as in figure 8-3.
Adjust the output level of the level generator so that the EPM-1 displays a value as near as possible to 0.00 dBm. Note the difference between the displayed value and 0.00 dBm as "X_1".

Measure the reference signal:

Test setup 2 as in figure 8-4, with connection from ZA-5075 to the INPUT of the D.U.T. The same ZA-5075 must be used as was used in test setup 1 !
Activate the ABS and REL markers (Press "MKR" key twice).
The screen displays the reference signal as a line at about -30 dBm.
Use the MARKER / MARKER UPDATE softkeys to set the ABS marker to HOLD. Press "RTN" to return to the main menu.
The reference signal is now stored.

Measure the calibration source:

Connect the CAL output [11] of the D.U.T to the INPUT using cable 2 (N). The same cable must be used as was used for the reference measurement!
Activate the CAL output permanently from the CAL menu: Press "CAL.OUTPUT ACTIVE" then "RTN".
The screen display shows the CAL output signal as a relative value at about -30 dBm.
Note the relative value as "X_2".

-> Nominal value = $X_2 - X_1$

Specified error limit (e): $\leq \pm 0.10$ dB

8.5 Scaling Error

Equipment required

1 level generator 10 MHz	PSM-39	W&G
1 5 dB attenuator pad:	DG-1405	W&G
1 10 dB attenuator pad:	DG-1410	W&G
1 20 dB attenuator pad:	DG-1420	W&G
1 30 dB attenuator pad:	DG-1430	W&G
1 40 dB attenuator pad:	DG-1440	W&G
1 Z_0 matching pad 50 Ω/75 Ω	ZA 5075, BN925/03	W&G

Test setup

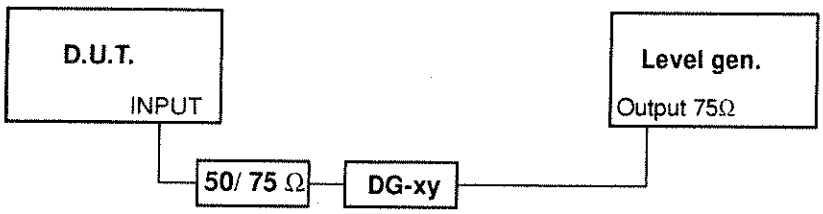

Fig. 8-5 Test setup for scaling error

Instrument settings

Level generator:Z_0: 75 Ω
Frequency: 10 MHz
Level: +9 dBm

D.U.T.: PRESET, SPECTRUM ANALYSIS (CW)
FCENT: 10 MHz
FSPAN: 0 Hz
REFERENCE: 5 dBm
SCALE: 100 dB
RBW: 1 kHz
VBW: 10 Hz
SWT: 100 ms
ATTN: 30 dB

DG-xy: 0 ... 60 dB (as specified below)

Measurement

Reference measurement:
Make a measurement without an attenuator pad (DG-xy = 0 dB).
Measured value: approx. 2 dBm.
Use the MARKER TRANSF / ABS-->REF softkeys to set the line to the reference line.
Activate the ABS and REL markers (press "MKR" twice).
Use the MARKER / MARKER UPDATE softkeys to set the ABS marker to HOLD. Press "RTN" to return to the main menu.
The reference signal is now stored.

Scaling:
Insert the attenuator pads corresponding to the X values in the table and compare the REL level displayed by the D.U.T. with the specified error limits. Up to two attenuator pads may be connected in series.

X / dB	5	10	15	20	30	40	50	60
Error limits* (e) / dB	0.2	0.4	0.5	0.5	0.5	0.5	0.5	0.5

*Valid for T_{amb} = 20 to 26 °C

8.6 Attenuator Error

Equipment required

1 level generator PSM-39 W&G

Test setup

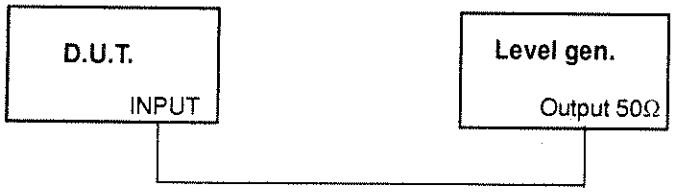

Fig. 8-6 Test setup for attenuator error

Instrument settings

Level generator: Z_0: 50 Ω
Frequency: 10 MHz
Level: -20 dBm

D.U.T.: PRESET, SPECTRUM ANALYSIS (CW)
FCENT: 10 MHz
FSPAN: 0 Hz
REFERENCE: -19 dBm
SCALE: 10 dB
RBW: 1 kHz
VBW: 10 Hz
SWT: 25 ms
ATTN: 10 dB
AUTO CAL: OFF

Measurement

Reference measurement:

Make a measurement using the above test setup and settings
Activate the ABS and REL markers (press "MKR" twice).
Use the MARKER TRANSF / ABS-->REF softkeys to set the line to the reference line.
Use the MARKER / MARKER UPDATE softkeys to set the ABS marker to HOLD.
The reference signal is now stored.

Attenuator measurement:

Set the input attenuator ATTN to the X values given in the table (use the arrow keys, except for 0 dB: "0" "ENTER") and compare the REL level displayed by the D.U.T with the specified error limits.

X (ATTN / dB)	0	10	20	30	40	50	60	65
Error limits (e) / dB	0.5	Ref.	1.1	0.6	0.9	2.0	1.5	2.0

8.7 Frequency Response

Equipment required

1 Synthesizer	TG-20 /-23	W&G
	or 83640	HP
1 Power Meter with	438A	HP
1 Power Sensor	8485A	HP
1 10 dB attenuator pad	8493C; Option 010	HP
1 Cable, 61 cm	11500 E	HP
1 Adapter PC3.5 for SNA	S896	W&G

Test setup

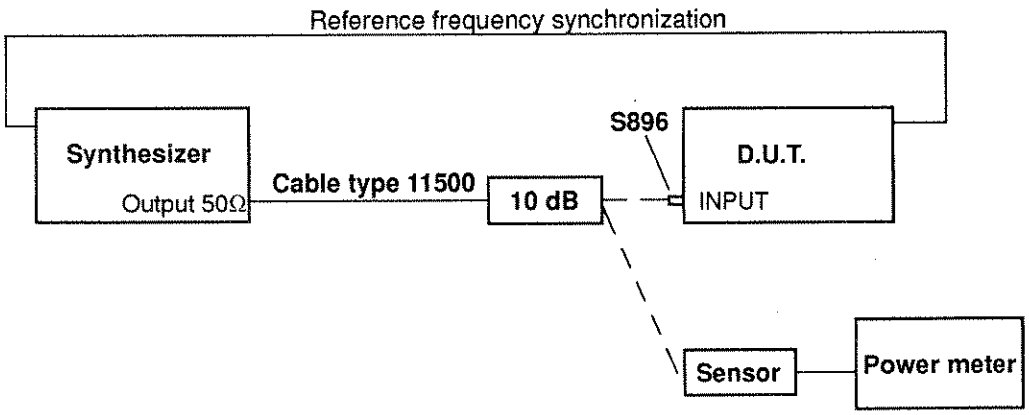

Fig. 8-7 Test setup for frequency response measurement

Instrument settings

Power Meter:	Mode:	dBm
Synthesizer:	FREQUENCY CENTER:	see f in table
	FREQUENCY SPAN:	0 Hz
	SWEEP:	SINGL
	POWER LEVEL:	approx. -7 dBm
D.U.T.:	PRESET, SPECTRUM ANALYSIS (CW)	
	FCENT:	see f in table
	FSPAN:	0 Hz
	REFERENCE:	-17 dBm
	SCALE:	10 dB
	RBW:	30 kHz
	VBW:	1 kHz
	SWT:	2 s
	ATTN:	10 dB

Test setup calibration

Before starting the measurement calibrate the Power Meter using its built in source and adjust the zero with no input level.
Perform external calibration of the D.U.T. and disable the internal automatic calibration (AUTO CAL = OFF).

Measurement

The frequency response measurement must be performed using PC 3.5 connectors!
Test setup as in figure 8-7; instrument settings as above.

Recording the reference values:
Connect the 10 dB attenuator pad directly to the Sensor (without adapter or cable).
Set the synthesizer to the measurement frequency (see table).
Enter the appropriate CAL. FACTOR for the Power Sensor in the Power Meter (use the average of intermediate values).
Execute a single calibration of the D.U.T. (EXECUTE SINGLE CAL).
Offset the synthesizer level so that the Power Sensor indicates -20 dBm ± 0.5 dB.
Note this level as P_{PS}.

Measuring the D.U.T.:
Now connect the 10 dB attenuator pad directly to the D.U.T. (without adapter or cable).
Set the D.U.T. to the measurement frequency (see table). Make the measurement and press "PEAK".
Use the MARKER TRANSF / ABS-->REF softkeys to set the line to the reference line.
Subtract the previously noted value P_{PS} with correct sign from the reference value for the D.U.T. and compare the result with the specified error limit.

Repeat the procedure starting from "Measurement" for each frequency f .
The measurement can be speeded up by first measuring the reference value P_{PS} for each of the frequencies and then testing the D.U.T.

f	Specified error limit(e)
50 MHz	± 0.5 dB
100 MHz	± 0.5 dB
1.5 GHz	± 0.5 dB
3.1 GHz	± 0.5 dB
3.2 GHz	± 2.3 dB
5.3 GHz	± 2.3 dB
7.4 GHz	± 2.3 dB
7.5 GHz	± 2.5 dB
11.2 GHz	± 2.5 dB
14.9 GHz	± 2.5 dB
15.1 GHz	± 2.8 dB
20.8 GHz	± 2.8 dB
22.0 GHz	± 2.8 dB
26.5 GHz	± 2.8 dB

Frequencies above 3.2 GHz apply to SNA-23 and SNA-33 only.

8.8 Resolution Bandwidths (RBW)

Equipment required

Synthesizer	SNA-20/23 with TG-20/23	W&G
	or 83640	HP

Test setup

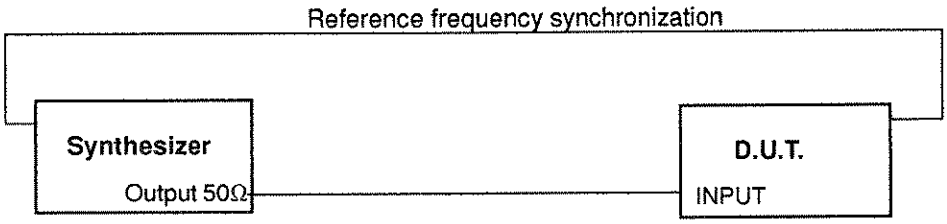

Fig. 8-8 Test setup for measuring the resolution bandwidths

Instrument settings

Synthesizer:	FREQUENCY:	100 MHz
	LEVEL:	-10 dBm
D.U.T.:	PRESET SPECTRUM ANALYSIS (CW)	
	FCENT:	100 MHz
	FSPAN:	see table
	REFERENCE:	-5 dBm
	SCALE:	10 dB
	RBW:	see table
	VBW:	100 Hz
	SWT:	see table
	ATTN:	10 dB

Measurement

Perform an internal calibration (using the CAL ; EXECUTE SINGLE CAL softkeys) before each measurement (after changing the RBW).

Set the D.U.T. as above, and select TRACE AVERAGE (using the TRACE; TRACE PROCESS softkeys).

Measurement of 3 dB bandwidth:
Activate the ABS marker and press "PEAK" (to measure the highest point on the filter curve). Activate the REL marker and move it to the lower edge with the rotary control until the level displayed is exactly -3 dB (for RBW = 10 MHz: -6 dB).
Note the frequency value . Now move the REL marker to the upper edge until the level displayed is exactly -3 dB (for RBW = 10 MHz: -6 dB). Compare the difference of the two frequency values with the maximum permitted difference [± B (3 dB)] stated in the table.

Measurement of 60 dB bandwidth:
Set SCALE = 100 dB. Then use the same procedure as for the 3 dB bandwidth to measure the 60 dB bandwidth.

The quotient B(60 dB) / B(3 dB) = Shape Factor (Sf) of the filter must not exceed the value Sf_{max} stated in the table.

Notes on the measurement:

- The 6 dB bandwidth is checked for RBW = 10 MHz.
- The 60 dB bandwidth (and thus Sf) cannot be measured for the SNA-20/-23 at RBW = 1 kHz, due to the phase noise of the D.U.T.
- It is normally sufficient to check the 3 kHz, 100 kHz and 10 MHz bandwidths.

RBW	VBW	FSPAN (3 dB / 60 dB)	SWT (3 dB / 60 dB)	± B (3 dB)	Sf_{max}
1 kHz	30 Hz	2 kHz / 20 kHz	5 s / 5 s	10%	11
3 kHz	100 Hz	6 kHz / 60 kHz	1 s / 1 s	10%	11
10 kHz	300 Hz	20 kHz / 200 kHz	1 s / 1 s	10%	11
30 kHz	1 kHz	60 kHz / 600 kHz	1 s / 1 s	10%	11
100 kHz	3 kHz	200 kHz / 2 MHz	1 s / 1 s	10%	11
300 kHz	10 kHz	600 kHz / 6 MHz	1 s / 1 s	10%	11
1 MHz	30 kHz	2 MHz / 20 MHz	1 s / 1 s	10%	11
2 MHz	100 kHz	6 MHz / 30 MHz	500 ms / 500 ms	10%	11
10 MHz	300 kHz	20 MHz / 50 MHz	500 ms / 500 ms	20% (6 dB)	3 (60 dB/6 dB)

"Narrow Filters" option, BN 2101/00.03

- The following RBWs can be set on the SNA-30/-33, and on the SNA-20/-23 if fitted with the "Narrow Filters" option, BN 2101/00.03. The 60 dB bandwidth (and thus Sf) cannot be measured for the SNA-20/-23 due to the phase noise of the D.U.T.
- The narrow bandwidths are software-generated using FFT. It is normally sufficient to checkjust one bandwidth (e.g. 300 Hz).

RBW	VBW	FSPAN (3 dB / 60 dB)	SWT (3 dB / 60 dB)	± B (3 dB)	Sf_{max}
300 Hz	10 Hz	600 Hz / 6 kHz	10 s / AUTO ON*	2%	10.2
100 Hz	3 Hz	200 Hz / 2 kHz	20 s / AUTO ON*	2%	10.2
30 Hz	3 Hz	60 Hz / 600 Hz	20 s / AUTO ON*	2%	10.2
10 Hz	3 Hz	20 Hz / 200 Hz	20 s / AUTO ON*	2%	10.2
3 Hz	3 Hz	6 Hz / 60 Hz	20 s / AUTO ON*	2%	10.2
1 Hz	3 Hz	2 Hz / 20 Hz	50 s / AUTO ON**	2%	10.2

* = 33.3 s ** = 100 s

8.9 Intrinsic Spurious Signals without Input Signal

8.9.1 Intrinsic Noise

Equipment required

1 terminating resistor 50 Ω 909D HP

Test setup

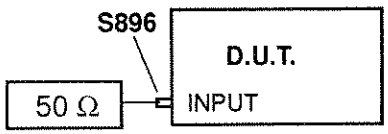

Fig. 8-9 Test setup for measuring intrinsic noise

Instrument settings

D.U.T.: PRESET, SPECTRUM ANALYSIS (CW)
FCENT: see table
FSPAN: 0 Hz
REFERENCE: -60 dBm
RBW: 1 kHz
VBW: 10 Hz
SWT: 100 ms
ATTN: 0 dB

Measurement

Set the D.U.T. as above and select TRACE AVERAGE (using the TRACE; TRACE PROCESS softkeys).
After about 5 sweeps (averages) press "PEAK" and compare the level value of the ABS marker with the corresponding typical value in the table.
Press "PEAK" again each time FCENT is changed to update the level value.

FCENT	ABS (typical)
99.9 MHz	-127 dBm
999.9 MHz	-127 dBm
2.999 GHz	-124 dBm
13.999 GHz	-118 dBm
22.999 GHz	-115 dBm
26.499 GHz	-108 dBm

8.9.2 Discrete Spurious Signals

For equipment required and test setup, see chapter 8.9.1.

Instrument settings

D.U.T.: PRESET, SPECTRUM ANALYSIS (CW)
FCENT: see table
FSPAN: 10 kHz
REFERENCE: -60 dBm
RBW: 1 kHz
VBW: 100 Hz
SWT: AUTO ON (500 ms)
ATTN: 0 dB
TRACE PROCESS:AVERAGE

Make the settings given in the table and use the PEAK function to hold the level maximum after at least 5 sweeps. Compare the measured value with the corresponding typical value in the table.

FCENT	ABS (typical)
16 MHz	-110 dBm
20.209 MHz	-110 dBm
421.99 MHz	-110 dBm
631.7128571 MHz	-110 dBm
1.789005 GHz	-110 dBm
3.367015 GHz	-105 dBm
4.42199 GHz	-105 dBm
5.2 GHz	-105 dBm
11.2 GHz	-100 dBm
12.8 GHz	-100 dBm
14.8 GHz	-100 dBm

Frequencies above 3.2 GHz apply to SNA-23 and SNA-33 only.

8.10 Additional Tests

The following additional tests are not part of a normal check.
It will not normally be necessary to perform these tests.
Some tests require a large quantity of measuring equipment.

8.10.1 Intrinsic Spurious Signals with Input Signal

8.10.1.1 Harmonic Attenuation

Equipment required

1 Synthesizer (up to 1.6 GHz)	SNA-20/ -23 with TG-20/ -23	W&G
	or 83640	HP
1 Low-pass filter f_{lim} = 900 MHz	Type 2001.17F	Suhner
1 Low-pass filter f_{lim} = 1400 MHz	Type 2001.17G	Suhner
1 Low-pass filter f_{lim} = 2100 MHz	Type 2001.17B	Suhner

Test setup

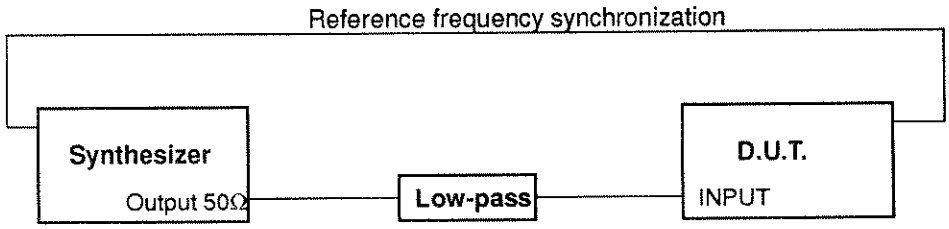

Fig. 8-10 Test setup for harmonic attenuation

Instrument settings

Synthesizer:
FCENT: = f_{meas}
FSPAN: 0 Hz
SEND LEVEL: -30 dBm

D.U.T.:
PRESET, SPECTRUM ANALYSIS (CW)
FCENT: f_{meas}, 2 x f_{meas}, 3 x f_{meas}
FSPAN: 0 Hz
REFERENCE: -25 dBm
SCALE: 100 dB
RBW: 1 kHz
VBW: 10 Hz
SWT: 100 ms
ATTN: 10 dB
TRACE AVERAGE (select using TRACE; TRACE PROCESS softkeys).

Technical note

The harmonic attenuation values are very dependent on the Q of the low-pass filters used.

Measurement (a_{k2})

Reference measurement:
Externally calibrate the D.U.T.
Set the desired fundamental f_{meas} for the generator and the D.U.T..
Activate the ABS and REL markers (press "MKR" twice).
Adjust the synthesizer level so that the D.U.T. displays -30 dBm.
Use the MARKER TRANSF / ABS-->REF softkeys to set the level to the reference line.
Use the MARKER / MARKER UPDATE softkeys to set the ABS marker to HOLD.
The reference value is now stored.

Measuring a_{k2}:
Set the D.U.T. to FCENT = 2 f_{meas} .
The level value of the REL marker gives the harmonic attenuation. Compare this value with the corresponding value in the table below.

f_{meas}	$2f_{meas}$	Low-pass filter	a_{k2} (typical)
500 MHz 700 MHz	1000 MHz 1400 MHz	900 MHz 900 MHz	75 dB 75 dB
900 MHz 1200 MHz	1800 MHz 2400 MHz	1400 MHz 1400 MHz	75 dB 75 dB
1400 MHz 1600 MHz	2800 MHz 3200 MHz	2100 MHz 2100 MHz	75 dB 75 dB

Measurement (a_{k3})

Reference measurement:
Use the same procedure as for a_{k2}.

Measuring a_{k3}:
Set the D.U.T. to ATTN = 0 dB (mixer level -30 dBm) and FCENT = 3 f_{meas}.
The level value of the REL marker gives the harmonic attenuation. Compare this value with the corresponding value in the table below.

f_{meas}	$3f_{meas}$	Low-pass filter	a_{k3} (typical)
500 MHz 750 MHz 1 GHz	1.5 GHz 2.25 GHz 3 GHz	900 MHz 900 MHz 1400 MHz	70 dB 70 dB 70 dB

8.10.1.2 Sideband Noise Power Level

Equipment required

1 level generator	PSM-39	W&G

Test setup

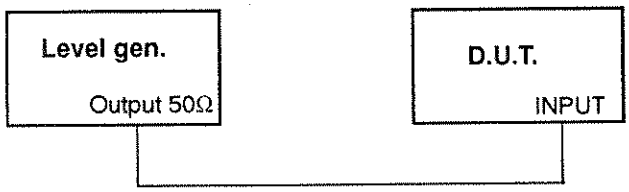

Fig. 8-11 Test setup for measuring sideband noise power

Instrument settings

Level generator: Z_0: 50 Ω
Frequency: 10 MHz
Level: -20 dBm

D.U.T.: PRESET, SPECTRUM ANALYSIS (CW)
FCENT: 10,005 MHz
FSPAN: 11 kHz
REFERENCE: +10 dBm
SCALE: 100 dB
RBW: 1 kHz
VBW: 30 Hz
SWT: AUTO ON
ATTN: 20 dB
TRACE AVERAGE (select using TRACE; TRACE PROCESS softkeys).
"dBm/Hz" (select via DISPLAY/ LEVEL/ UNITS)

Measurement

The sideband noise power level is measured at a spacing of 10 kHz from the carrier.

Make the settings as above.
Activate the ABS marker and press "PEAK" to measure the carrier peak value.
Use the MARKER TRANSF / ABS-->REF softkeys to set the level to the reference line.
Activate the REL marker and set it to +10 kHz.

After at least 5 sweeps (averages) compare the REL marker level value with the following value:

SNA-20/-23: typically -93 dBc/Hz
SNA-30/-33: typically -108 dBc/Hz

8.10.1.3 Intermodulation Attenuation

Equipment required

1 Synthesizer 1	SNA-20/-23 with TG-20/-23	W&G
	or 83640	HP
1 Synthesizer 2	83640	HP
1 Power Splitter	Type 1870A	Weinschel
2 10 dB attenuator pads	Type 44	Weinschel
1 Low-pass filter f_{lim}:14 MHz	0987-6500.324	W&G
1 Z_0 matching pad 50 Ω<->75 Ω	ZA 5075	W&G
1 Directional coupler	Type no. 4227-16	NARDA
1 Attenuator pad	4138060000	Radiall
2 Isolators	Type no. 4914	NARDA
2 Isolators	Type no. 4946	NARDA

Checking Band 0

Test setup

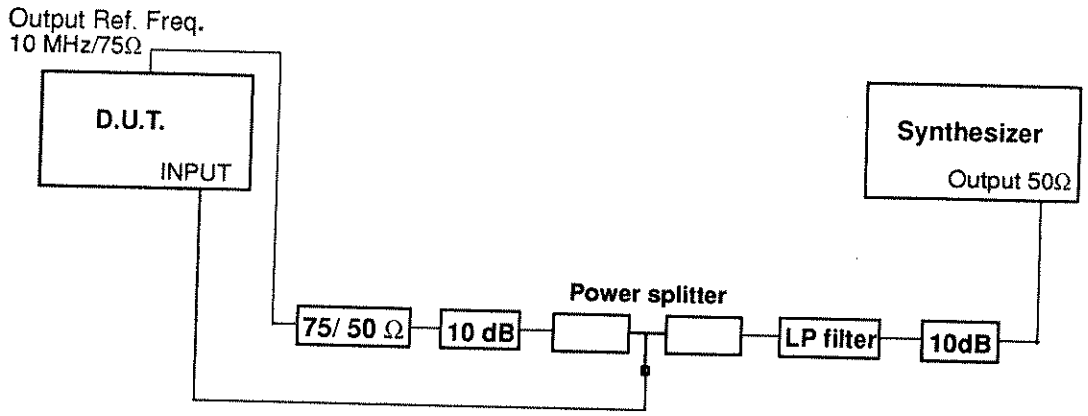

Fig. 8-12 Test setup for intermodulation attenuation, Band 0

Instrument settings for Band 0

Synthesizer:	Frequency:	10,1 MHz
	Level:	-2 dBm
D.U.T.:	PRESET, SPECTRUM ANALYSIS (CW)	
	FCENT:	10 MHz
	FSPAN:	50 kHz
	REFERENCE:	-15 dBm
	RBW:	AUTO ON
	VBW:	AUTO ON
	SWT:	AUTO ON
	ATTN:	**10 dB**

Seting the reference level

Test setup and settings as described above.
Activate the ABS marker and set it to the maximum of the 10 MHz signal (press PEAK)
Use the MARKER TRANSF / ABS-->REF to set the trace maximum at 10 MHz to the reference line.

Use the MARKER / MARKER UPDATE softkeys to set the ABS marker to HOLD.
Note the level value of the ABS marker as "X_1".
Set the REL marker to +100 kHz (10.1 MHz).
Now adjust the synthesizer level so that the REL marker level displays 0 dB.

Measurement

D.U.T.:	FCENT:	10.2 MHz
	VBW:	100 Hz

Select TRACE AVERAGE (using the TRACE; TRACE PROCESS softkeys).
Set the REL marker to +200 kHz (10.2 MHz).
Note the level value of the ABS marker as "X_2".
-> X_2 should typically be less than -30 + (2 X_1).

D.U.T.:	FCENT:	9.9 MHz

Note the level value of the ABS marker as "X_3".
-> X_3 should typically be less than -30 + (2 X_1).

Example:

X_1 = -20 dBm
-> X_2 or X_3 = < -30 + (2 x -20 dBm) = < -70 dB

Checking Bands1,2 and 3 (SNA-23/-33 only)

Test setup

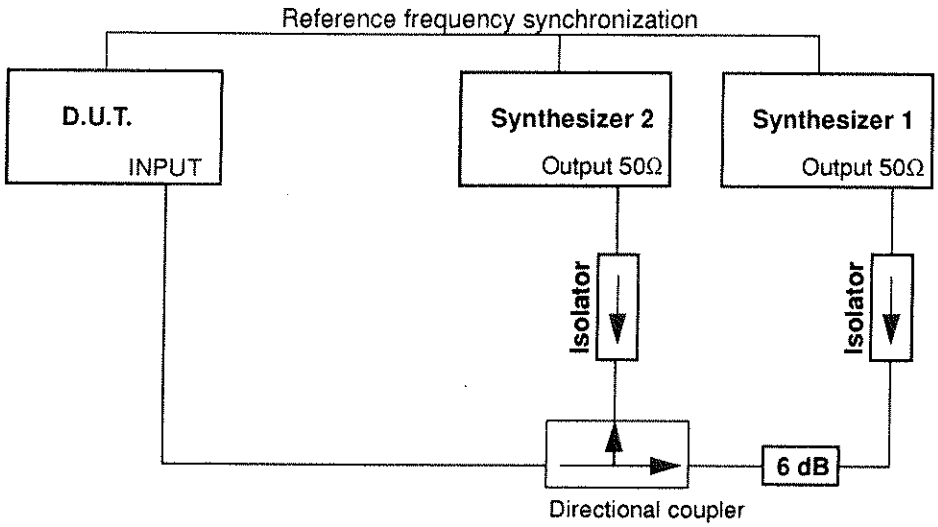

Fig. 8-13 Test setup for intermodulation attenuation, Bands 1, 2, 3

Instrument settings for Bands 1, 2, 3

Synthesizer 1:	Frequency:	see table
	Send level:	0 dBm
Synthesizer 2:	Frequency:	see table
	Send level:	8 dBm
Power Meter:	Mode:	dBm
D.U.T.:	PRESET, SPECTRUM ANALYSIS (CW)	
	FCENT:	see table
	FSPAN:	20 kHz
	REFERENCE:	-10 dBm
	SCALE:	100 dB
	RBW:	AUTO ON (1 kHz)
	VBW:	100 Hz
	SWT:	AUTO ON (1 s)
	ATTN:	10 dB

Test setup calibration

Externally calibrate the D.U.T..

Setting the reference level

Test setup and settings as described above.
Set the D.U.T. to FCENT = $F_{Synthesizer\ 1}$.
Set synthesizer 2 to "SEND LEVEL OFF" and adjust synthesizer 1 to give a D.U.T. receive level of -10 dBm 0.2 dB.
Activate the ABS marker and set it to the maximum of the signal (press PEAK).
Use the MARKER TRANSF / ABS-->REF to set the trace maximum to the reference line.
Use the MARKER / MARKER UPDATE softkeys to set the ABS marker to HOLD.

Set synthesizer 2 to "SEND LEVEL ON" and set the D.U.T. to FCENT = $F_{Synthesizer\ 2}$.
Set the REL marker to +100 kHz ($F_{Synthesizer\ 2}$).
Now set the level of synthesizer 2 so that the REL marker displays 0 dB.

Measurement

D.U.T.: TRACE AVERAGE
FCENT: see table

After at least 5 sweeps, use the HIGHEST PEAK marker function to set the REL marker to the trace maximum.
Note the level value of the REL marker as X.

F Synthesizer 1	F Synthesizer 2	FCENT D.U.T.	Isolator
6.0001 GHz 11.0001 GHz 18.0001 GHz	6.0002 GHz 11.0002 GHz 18.0002 GHz	6 GHz and 6.0003 GHz 11 GHz and 11.0003 GHz 18 GHz and 18.0003 GHz	No. 4914 No. 4946 No. 4946

Nominal value of X: typically >70 dB.

8.10.2 Checking the Return Loss

Equipment required

1 Scalar network analyzer	8757E	HP
1 Synthesizer	83640A	HP
1 Return loss bridge with standards	85027B	HP

Test setup

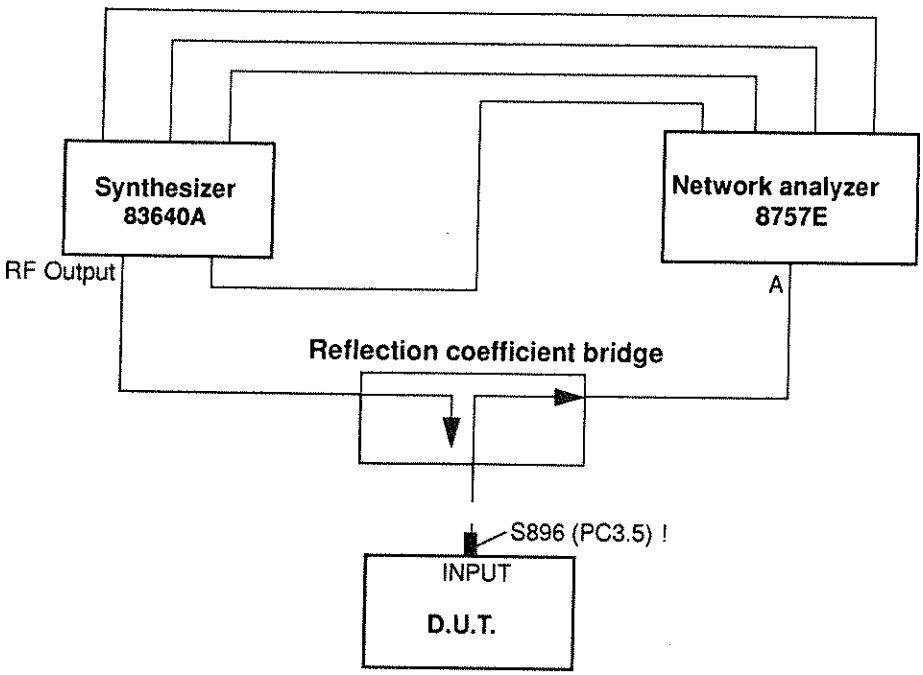

Fig. 8-14 Test setup for measuring return loss

Instrument settings

Network analyzer and synthesizer:

PRESET	
CHAN2:	OFF
SCALE:	5 dB
START FREQUENCY:	see table
STOP FREQUENCY:	see table

D.U.T.:

PRESET, SPECTRUM ANALYSIS (CW)	
FCENT:	2 GHZ (4 GHz)
FSPAN:	0 Hz
REFERENCE:	-20 dBm
ATTN:	10 dB
other settings:	AUTO ON

Test setup calibration

Calibrate the test port of the reflectometer bridge in short- and open-circuit using the CAL function of the network analyzer (refer to the operating instructions for these instruments).

Measurement

Connect the test port of the reflectometer bridge directly to the input of the D.U.T. Now read off the maximum displayed value on the network analyzer using the cursor function. Compare the magnitude of this value with the specified error limit given in the table.

FCENT D.U.T.	Frequency range, synthesizer	Typical return loss value	Note
2 GHz	10 - 3200 MHz	20 dB	
4 GHz	3200 - 12400 MHz	15 dB	for SNA-23/-33 only
4 GHz	12400 - 26500 MHz	12 dB	for SNA-23/-33 only