Agilent Technologies

Certificate of Calibration

Agilent Calibration
Certificate Number: 1-5128814817-1

Manufacturer: Agilent Technologies Inc
Model Number: N4000A
Serial Number: MY44420135

Customer:
Ericsson AB
Strömögatan 3
164 40 KISTA
Sweden

Description: 10 MHz to 18 GHz SNS Noise Source nominal ENR 6dB (MAIN)
Options Installed: 001
Customer Asset No: BAMS-1000635875
Location of Calibration:
Agilent Technologies Sweden AB
Igelbäcksgatan 20, Lastkaj 6
Kista 164 46
Sweden

Procedure: STE-50114453-A.02.00
Date of Calibration: 20 May 2013
Temperature: (23 ± 5) °C

Product Firmware Revision:
Customer PO Number:
Humidity: 5 to 80 %RH

This calibration certificate documents the ISO/IEC 17025:2005 compliant calibration of the instrument for the parameters and at the test points specified in the relevant Agilent Technologies calibration procedure as defined for this instrument. Our quality management system is ISO 9001:2008 certified.

As Received Conditions:
Initial testing found the equipment to be IN SPECIFICATION at the points tested.

As Completed Conditions:
At the completion of the calibration, the measured values of the equipment were IN SPECIFICATION at the points tested.

Remarks or Special Requirements:

The test limits stated in the measurement report correspond to the published specifications of the equipment, at the points tested.

Edgar Leckel

Edgar Leckel - European Operations Manager

Issue date: 20 May 2013

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Traceability Information

Technician ID Number: 00410718

Measurements are traceable to the SI Units (International System of Units) via national metrology institutes (i.e. NPL, PTB, NIST, NMIJ) that are signatories to the CIPM Mutual Recognition Arrangement.

Supporting documentation relative to traceability is available for review by appointment.

This certificate shall not be reproduced except in full.

Calibration Equipment Used

Model Number	Model Description	Trace Number	Cal Due Date	Certificate Number
346B	10 MHz to 18 GHz 346 series noise source nominal ENR 15dB	SES0216	25 May 2013	1-4312165683-1
346C	10 MHz to 26.5 GHz 346 Series Noise Source nominal ENR 15dB	SEP0197	9 Jan 2014	1-4889004073-1
85054B	Standard mechanical calibration kit, DC to 18 GHz, type-N	SE3452	4 Jun 2014	1-4767359544-1
N5230C	PNA-L network analyzer	SE3477	3 Oct 2013	1-4659018270-1
N8975A	10MHz to 26.5GHz NFA Series Noise Figure Analyzer	SE3499	10 Jul 2013	1-4312048764-1

Traceability Table

	Model	Model Description	ID Number	Certificate Number	Trace Value
W,R	346B	10 MHz to 18 GHz 346 series noise source nominal ENR 15dB	SES0216	1-4312165683-1-ACLASS:AC-1498	Excess Noise Ratio
W,R	346C	10 MHz to 26.5 GHz 346 Series Noise Source nominal ENR 15dB	SEP0197	1-4889004073-1-ACLASS:AC-1498	Excess Noise Ratio
W	85054B	Standard mechanical calibration kit, DC to 18 GHz, type-N	SE3452	1-4767359544-1	
R	85056A	2.4 MM CALIBRATION KIT	UK14428	1-3273362916-1-A2LA:2079.01	Reflection Coefficient
W	N5230C	PNA-L network analyzer	SE3477	1-4659018270-1	
R	85056A	2.4 MM CALIBRATION KIT	SES0214	1-3656653455-1-A2LA:2079.01	Reflection Coefficient
W	N8975A	10MHz to 26.5GHz NFA Series Noise Figure Analyzer	SE3499	1-4312048764-1	
R	346C	NOISE SOURCE	SEP0197	1-4038028033-1-A2LA:1920.01	Excess Noise Ratio

Legend:

W - Working standard. Measurement standard that is used routinely to calibrate or verify measuring instruments or measuring systems.
R - Reference standard. Measurement standard designated for the calibration of working standards for quantities of a given kind in a given organization or at a given location.

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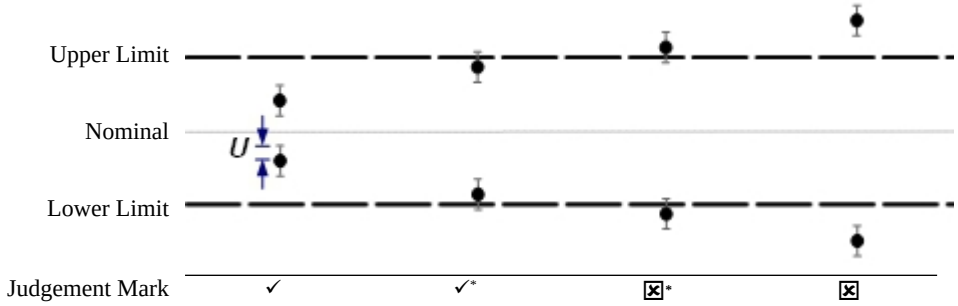
Compliance With Specification

In the assessment of compliance with specification, the uncertainty of measurement has been taken into account. If the uncertainty of measurement overlaps the specification limit (upper limit or lower limit), it is not possible to state compliance/non-compliance based on a 95% level of confidence. However, where a confidence level less than 95% is acceptable, a compliance/non-compliance statement may be possible.

The status of compliance with the acceptance criteria is reported as:

- ✓ - Compliant with specification.
- ✓* - Compliance with specification providing a lower level of confidence is acceptable.
- ☒* - Non-compliance with specification providing a lower level of confidence is acceptable.
- ☒ - Not compliant with specification.



The diagram above shows the typical compliance status for measured values as defined by this service. The vertical bar (*U*) above and below each measurement value represents the uncertainty of measurement.

As Received Conditions/As Completed Conditions
A compilation for all performed tests of the status as received (before any adjustment/repair) and the status as completed (after any adjustment/repair) is reported on the first page of this report. The compliance with typical (non-warranted) specifications will not affect the status as received or the status as completed reported on the first page.

The status summaries relate to the tested item only. A final decision about whether the item's performance actually satisfies requirements of the user can only be made by the user.

Uncertainty of Measurement
The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98. The reported expanded uncertainty of measurement is the standard uncertainty multiplied by the coverage factor k=2 (for a normal distribution) or k=1.65 (for a uniform distribution), which corresponds to a coverage probability of approximately 95%. Where this is not the case, the distribution, coverage factor (k), effective degrees of freedom (veff) and coverage probability (p) are stated.

Any quoted measurement uncertainty applies only to the measured value and does not imply anything regarding the long-term stability of the equipment.

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Performance Test Results Summary

Test Name	As Received Status
REFLECTION	PASSED
ENR	PASSED
WRITE CAL DATA TO SNS	DONE

Certificate Number: 1-5128814817-1

Model Number: N4000A **Serial:** MY44420135 **Firmware Rev:** NA **Cal Date:** 20 May 2013
Options Tested: 001 **Condition:** As Received

REFLECTION PASSED

The PHASE column is the measured PHASE(Degree).
The MEASURED column is the measured MAGNITUDE.
The MAXIMUM column is the specification of MAGNITUDE.
The UNCERT column (if it is present) is the uncertainty for MAGNITUDE.

FREQUENCY	PHASE	MEASURED	MAXIMUM	UNCERT.	
SOURCE ON					
10 MHz	-103.22°	0.0026	0.0300	0.0053	✓
100 MHz	-145.09°	0.0011	0.0300	0.0049	✓
1 GHz	148.74°	0.0050	0.0300	0.0049	✓
2 GHz	90.22°	0.0077	0.0300	0.0049	✓
3 GHz	34.84°	0.0142	0.0300	0.0088	✓
4 GHz	-45.05°	0.0141	0.0600	0.0088	✓
5 GHz	-150.43°	0.0070	0.0600	0.0088	✓
6 GHz	55.57°	0.0107	0.0600	0.0093	✓
7 GHz	-30.60°	0.0151	0.0600	0.0093	✓
8 GHz	-110.83°	0.0162	0.1000	0.0093	✓
9 GHz	145.83°	0.0160	0.1000	0.0096	✓
10 GHz	44.41°	0.0207	0.1000	0.0096	✓
11 GHz	-41.79°	0.0258	0.1000	0.0096	✓
12 GHz	-131.18°	0.0240	0.1000	0.0096	✓
13 GHz	130.60°	0.0246	0.1000	0.0096	✓
14 GHz	23.27°	0.0328	0.1000	0.0097	✓
15 GHz	-64.66°	0.0421	0.1000	0.0097	✓
16 GHz	-159.45°	0.0436	0.1000	0.0097	✓
17 GHz	102.06°	0.0395	0.1000	0.010	✓
18 GHz	-2.15°	0.0422	0.1000	0.010	✓
SOURCE OFF					
10 MHz	-59.46°	0.0031	0.0300	0.0053	✓
100 MHz	-44.82°	0.0017	0.0300	0.0049	✓
1 GHz	164.84°	0.0068	0.0300	0.0049	✓
2 GHz	75.87°	0.0093	0.0300	0.0049	✓
3 GHz	33.64°	0.0116	0.0300	0.0088	✓
4 GHz	-34.62°	0.0141	0.0600	0.0088	✓
5 GHz	-141.47°	0.0092	0.0600	0.0088	✓
6 GHz	59.86°	0.0129	0.0600	0.0093	✓
7 GHz	-37.07°	0.0165	0.0600	0.0093	✓
8 GHz	-116.81°	0.0146	0.1000	0.0093	✓
9 GHz	148.81°	0.0139	0.1000	0.0096	✓
10 GHz	50.40°	0.0205	0.1000	0.0096	✓
11 GHz	-40.23°	0.0278	0.1000	0.0096	✓
12 GHz	-135.08°	0.0253	0.1000	0.0096	✓
13 GHz	126.32°	0.0236	0.1000	0.0096	✓
14 GHz	23.32°	0.0307	0.1000	0.0097	✓
15 GHz	-61.90°	0.0418	0.1000	0.0097	✓
16 GHz	-158.39°	0.0453	0.1000	0.0097	✓
17 GHz	100.20°	0.0408	0.1000	0.010	✓
18 GHz	-4.07°	0.0415	0.1000	0.010	✓
SOURCE ON-SOURCE OFF					
10 MHz	-3.66°	0.0022	0.0100	0.00054	✓
100 MHz	-15.10°	0.0022	0.0100	0.00013	✓
1 GHz	-160.37°	0.0024	0.0100	5.8E-005	✓

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Options Tested: 001 **Condition:** As Received

REFLECTION (cont.)

FREQUENCY	PHASE	MEASURED	MAXIMUM	UNCERT.	
2 GHz	29.83°	0.0027	0.0100	5.8E-005	✓
3 GHz	-139.83°	0.0026	0.0100	0.00013	✓
4 GHz	50.17°	0.0026	0.0100	0.00013	✓
5 GHz	-115.97°	0.0025	0.0100	5.8E-005	✓
6 GHz	79.60°	0.0024	0.0100	0.00013	✓
7 GHz	-85.74°	0.0023	0.0100	0.00020	✓
8 GHz	111.34°	0.0023	0.0100	0.00023	✓
9 GHz	-53.00°	0.0022	0.0100	0.00016	✓
10 GHz	142.71°	0.0022	0.0100	5.8E-005	✓
11 GHz	-20.96°	0.0021	0.0100	0.00013	✓
12 GHz	174.63°	0.0021	0.0100	0.00013	✓
13 GHz	9.42°	0.0021	0.0100	0.00016	✓
14 GHz	-157.46°	0.0021	0.0100	0.00016	✓
15 GHz	35.16°	0.0020	0.0100	5.8E-005	✓
16 GHz	-133.10°	0.0019	0.0100	0.00016	✓
17 GHz	56.05°	0.0018	0.0100	0.00016	✓
18 GHz	-119.63°	0.0016	0.0100	5.8E-005	✓

PHASE uncertainty can be determined from
k * Arcsin((UNCERT/k) / MEASURED) degree,
except if MEASURED is less than (UNCERT/k),
in which case the PHASE uncertainty is +/- 180 degree.
Where k = 2 for normal distribution with 95.45% confidence level.

ENR PASSED

TEST COND.	MINIMUM	MEASURED	MAXIMUM	UNCERT.	
10 MHz	4.500 dB	5.335 dB	6.500 dB	0.16 dB	✓
100 MHz	4.500 dB	5.259 dB	6.500 dB	0.14 dB	✓
1 GHz	4.500 dB	5.235 dB	6.500 dB	0.13 dB	✓
2 GHz	4.500 dB	5.350 dB	6.500 dB	0.14 dB	✓
3 GHz	4.500 dB	5.249 dB	6.500 dB	0.12 dB	✓
4 GHz	4.500 dB	5.220 dB	6.500 dB	0.12 dB	✓
5 GHz	4.500 dB	5.240 dB	6.500 dB	0.12 dB	✓
6 GHz	4.500 dB	5.236 dB	6.500 dB	0.14 dB	✓
7 GHz	4.500 dB	5.277 dB	6.500 dB	0.14 dB	✓
8 GHz	4.500 dB	5.321 dB	6.500 dB	0.14 dB	✓
9 GHz	4.500 dB	5.373 dB	6.500 dB	0.15 dB	✓
10 GHz	4.500 dB	5.383 dB	6.500 dB	0.15 dB	✓
11 GHz	4.500 dB	5.337 dB	6.500 dB	0.20 dB	✓
12 GHz	4.500 dB	5.398 dB	6.500 dB	0.18 dB	✓
13 GHz	4.500 dB	5.442 dB	6.500 dB	0.16 dB	✓
14 GHz	4.500 dB	5.515 dB	6.500 dB	0.14 dB	✓
15 GHz	4.500 dB	5.652 dB	6.500 dB	0.15 dB	✓
16 GHz	4.500 dB	5.734 dB	6.500 dB	0.17 dB	✓
17 GHz	4.500 dB	5.745 dB	6.500 dB	0.14 dB	✓
18 GHz	4.500 dB	5.442 dB	6.500 dB	0.15 dB	✓

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Options Tested: 001 **Condition:** As Received

WRITE CAL DATA TO SNS DONE

TEST CONDITIONS	STATUS
SNS ENR Data File updated.	DONE