
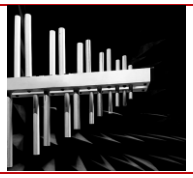
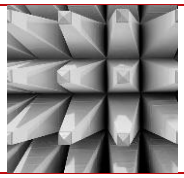

CETECOM™
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consulting - testing - certification

TEST REPORT

Test report no.: 1-0585/15-01-07-B

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12076-01-00

Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6 – 10
66117 Saarbruecken / Germany
Phone: + 49 681 5 98 - 0
Fax: + 49 681 5 98 - 9075
Internet: http://www.cetecom.com
e-mail: ict@cetecom.com

Accredited Testing Laboratory:
The testing laboratory (area of testing) is accredited according to DIN EN ISO/IEC 17025 (2005) by the Deutsche Akkreditierungsstelle GmbH (DAkkS)
The accreditation is valid for the scope of testing procedures as stated in the accreditation certificate with the registration number: D-PL-12076-01-00

Applicant

Neratec Solutions AG
Rosswiesstrasse 29
8608 Bubikon / SWITZERLAND
Phone: +41 55 253 20 78
Fax: +41 55 253 20 70
Contact: Michael Aeschbacher
e-mail: michael.aeschbacher@neratec.com
Phone: +41 55 253 20 73

Manufacturer

Neratec Solutions AG
Rosswiesstrasse 29
8608 Bubikon / SWITZERLAND

Test standard/s

47 CFR Part 15	Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

For further applied test standards please refer to section 3 of this test report.

Test Item

Kind of test item:	**WLAN Modul**
Model name:	**DT50RF MK2**
FCC ID:	**2AEJD-103902-DT50RF**
IC:	**9301A-103902DT50**
Frequency:	5250 MHz to 5350 MHz & 5500 MHz to 5725 MHz
Technology tested:	WLAN (DFS only)
Antenna:	External antennas
Power supply:	3.3 V DC by external power supply
Temperature range:	-40°C to +85°C

This test report is electronically signed and valid without handwriting signature. For verification of the electronic signatures, the public keys can be requested at the testing laboratory.

Test report authorized:

cn=Stefan Boes, o=CETECOM ICT Services GmbH, ou=BOE-111011, email=Stefan.Boes@cetecom.com, c=DE
2016.06.10 13:25:06 +02'00'

Stefan Bös
Lab Manager
Radio Communications & EMC

Test performed:

David Lang
cn=David Lang, o=CETECOM ICT Services GmbH, ou=LNG-141031, email=david.lang@cetecom.com, c=DE
2016.06.10 12:04:30 +02'00'

David Lang
Lab Manager
Radio Communications & EMC

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2 General information

2.1 Notes and disclaimer

The test results of this test report relate exclusively to the test item specified in this test report. CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.
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This test report replaces the test report with the number 1-0585/15-01-07-A and dated 2016-01-14

2.2 Application details

Date of receipt of order:	2015-12-02
Date of receipt of test item:	2015-12-14
Start of test:	2015-12-21
End of test:	2015-12-21
Person(s) present during the test:	-/-

3 Test standard/s

Test standard	Date	Test standard description
47 CFR Part 15		Title 47 of the Code of Federal Regulations; Chapter I; Part 15 - Radio frequency devices
RSS - 247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence - Exempt Local Area Network (LE-LAN) Devices

3.1 Measurement guidance

Guidance	Version	Description
UNII: KDB 789033 D02	v01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E
UNII: KDB 905462 D04	v01	Operational Modes suggested for DFS Testing
UNII: KDB 905462 D02	v01r01	Compliance measurement procedures for unlicensed - national information infrastructure devices operating in the 5250 - 5350 MHz and 5470 - 5725 MHz bands incorporating dynamic frequency selection
UNII: KDB 905462 D02	v01r02	Compliance measurement procedures for unlicensed - national information infrastructure devices operating in the 5250 - 5350 MHz and 5470 - 5725 MHz bands incorporating dynamic frequency selection
KDB 662911 D01	V02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

4 Test environment

Temperature	:	T_{nom} T_{max} T_{min}	+20 °C during room temperature tests +85 °C during high temperature tests -40 °C during low temperature tests
Relative humidity content	:		55 %
Barometric pressure	:		not relevant for this kind of testing
Power supply	:	V_{nom} V_{max} V_{min}	3.3 V DC by external power supply 3.63 V 2.97 V

5 Test item

5.1 General description

Kind of test item	:	WLAN Modul
Type identification	:	DT50RF MK2
HMN	:	-/-
PMN	:	DT50RF_MK2
HVIN	:	DT50RF_MK2
FVIN	:	6.6.0
S/N serial number	:	Companion (Master device): 0060010001030018 DUT (Client device): 0060010001030005
HW hardware status	:	Companion (Master device): Rev03 DUT (Client device): Rev03
SW software status	:	Companion (Master device): 6.6.0 DUT (Client device): 6.6.0
Frequency band	:	5250 MHz to 5350 MHz & 5500 MHz to 5725 MHz
Type of radio transmission Use of frequency spectrum	: :	OFDM
Type of modulation	:	QPSK, 16 – QAM, 64 – QAM
Number of channels	:	Channel plan according IEEE 802.11 Channels tested: HT20-Mode: 60 (5300 MHz) HT40-Mode: 62 (5310 MHz)
Antenna	:	External antennas; The DUT is equipped with three antenna ports. Hence, tests were performed in a conducted way without antennas connected. For possible antenna configurations please refer to the manufacturer specifications.
Power supply	:	3.3 V DC by external power supply
Temperature range	:	-40°C to +85°C

5.2 Additional information

The content of the following annexes is defined in the QA. It may be that not all of the listed annexes are necessary for this report, thus some values in between may be missing.

Test setup- and EUT-photos are included in test report: 1-0585/15-01-01_AnnexA
1-0585/15-01-01_AnnexB
1-0585/15-01-01_AnnexH

6 Test laboratories sub-contracted

None

7 Summary of measurement results

☐	No deviations from the technical specifications were ascertained
☐	There were deviations from the technical specifications ascertained
☒	This test report is only a partial test report. The content and verdict of the performed test cases are listed below.

TC Identifier	Description	Verdict	Date	Remark
DFS-Testing	CFR Part 15	Pass	2016-06-10	DFS only

Test Report Clause	Test Case	Temperature / Voltage	C	NC	NA	NP	Remark
§15.407 (h)(2) (iii) & 7.8.2*1	Channel move time and channel closing transmission time	nominal / nominal	☒	☐	☐	☐	Client device
§15.407 (h)(2) (iv) & 7.8.3*1	Non-Occupancy Period	nominal / nominal	☒	☐	☐	☐	Client device

Abbreviations/References:

C Compliant
NC Not compliant
NA Not applicable
NP Not performed
*1 See KDB publication *905462 D02 UNII DFS Compliance Procedures New Rules*

8 RF measurements

8.1 Description of test setup

8.1.1 Conducted measurements

Setup

Figure 1 shows a setup whereby the UUT is a RLAN device operating in slave mode, without Radar Interference Detection function. This setup also contains a RLAN device operating in master mode. The radar test signals are injected into the master device. The UUT (slave device) is associated with the master device.

Figure 1 shows an example

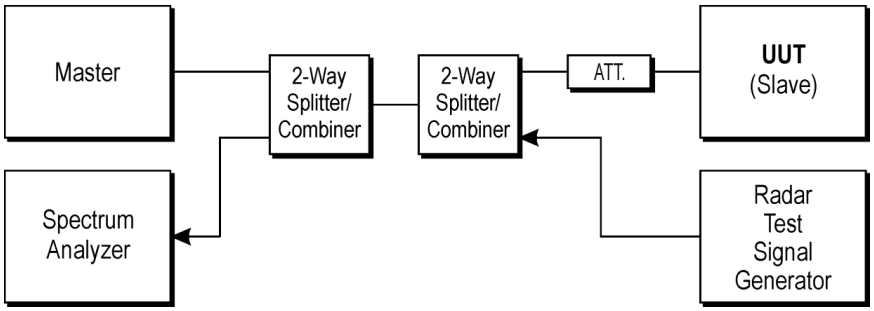


Figure 1: Setup

RPP = SG - CA
(RPP-radar pulse power; SG-signal generator power; CA-loss signal path)

Example calculation:
RPP [dBm] = -30.0 [dBm] – 33.0 [dB] = -63.0 [dBm]

Equipment table:

No.	Lab / Item	Equipment	Type	Manufacturer	Serial No.	INV. No Cetecom	Kind of Calibration	Last Calibration	Next Calibration
1	A	Spectrum Analyzer 9kHz to 30GHz - 140..+30dBm	FSP30	R&S	100886	300003575	k	26.08.2014	26.08.2016
2	A	Notebook	Latitude 15 6000 Series	Dell	100886	300004737	ne	-/-	-/-
3	A	Vektor Signal Generator	SMU200A	R&S	101633	300003496	k	07.04.2014	07.04.2017
4	A	DFS-test site	div. Splitter, Cables, Attenuators	Mini-Circuits	na	300004557	ev	-/-	-/-
5	A	RF-Cable WLAN-Tester Port 1	ST18/SMAm/SMAm/36	Huber & Suhner	Batch no. 601494	400001216	ev	-/-	-/-
6	A	RF-Cable WLAN-Tester Port 2	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 54877	400001217	ev	-/-	-/-
7	A	RF-Cable WLAN-Tester Port 3	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 54877	400001218	ev	-/-	-/-
8	A	RF-Cable WLAN-Tester Port 4	ST18/SMAm/SMAm/48	Huber & Suhner	Batch no. 1273777	400001219	ev	-/-	-/-
9	A	RF-Cable WLAN-Tester Analyzer	ST18/SMAm/SMAm/36	Huber & Suhner	Batch no. 54876	400001220	ev	-/-	-/-
10	A	RF-Cable WLAN-Tester Vector Signal Generator	ST18/SMAm/SMAm/60	Huber & Suhner	Batch no. 606844	400001222	ev	-/-	-/-
11	A	Master device	DT50	Neratec Solutions AG	0060010001030018	Provided by customer	ne	-/-	-/-

Agenda: Kind of Calibration

k	calibration / calibrated	EK	limited calibration
ne	not required (k, ev, izw, zw not required)	zw	cyclical maintenance (external cyclical maintenance)
ev	periodic self verification	izw	internal cyclical maintenance
Ve	long-term stability recognized	g	blocked for accredited testing
vlkl!	Attention: extended calibration interval		
NK!	Attention: not calibrated	*)	next calibration ordered / currently in progress

8.1.2 Parameters of DFS test signals

1. Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	Value (see note)
≥ 200 mW	-64 dBm
< 200 mW	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

2. DFS Response requirement values

Parameter	Value
Non-occupancy period	minimum 30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds See Note 1.
Channel Closing Transmission Time	200 milliseconds + an aggregate of 60 milliseconds over remaining 10 second period. See Notes 1 and 2.
U-NII Detection Bandwidth	Minimum 80% of the 99% transmission power bandwidth See Note 3.
Note 1: The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows: • For the Short pulse radar Test Signals this instant is the end of the Burst. • For the Frequency Hopping radar Test Signal, this instant is the end of the last radar Burst generated. • For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. Note 2: The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate Channel changes (an aggregate of 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions. Note 3: During the U-NII Detection Bandwidth detection test, radar type 1 is used and for each frequency step the minimum percentage of detection is 90%. Measurements are performed with no data traffic.	

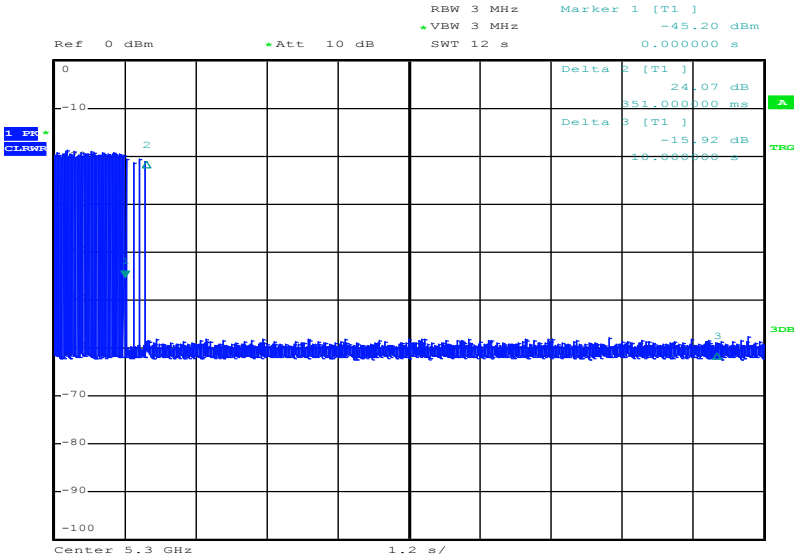
8.2 DFS test results

8.2.1 Channel move time / channel closing transmission time

After a radar's presence is detected, all transmissions shall cease on the operating channel within 10 seconds. Transmissions during this period shall consist of normal traffic for a maximum of 200 ms after detection of the radar signal. In addition, intermittent management and control signals can be sent during the remaining time to facilitate vacating the operating channel not exceeding 60ms.

The test is performed during normal operation with the highest bandwidth supported by the DUT.

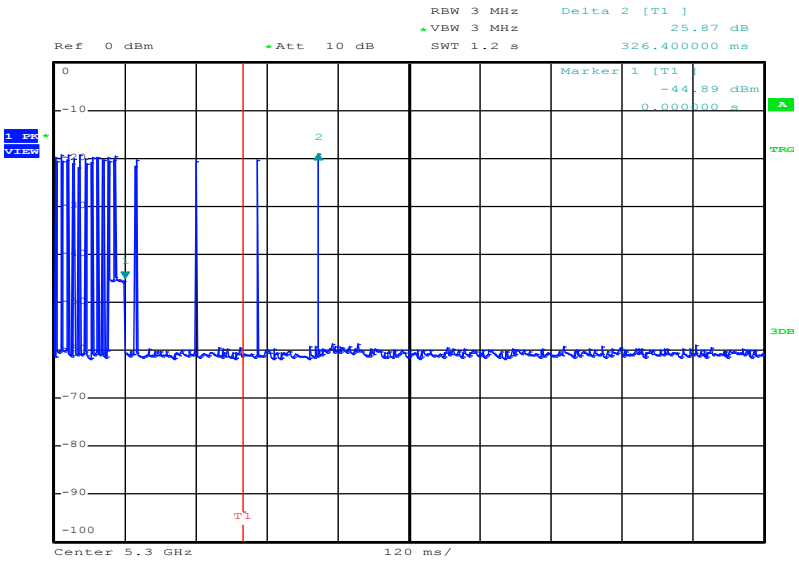
Channel Closing Time



Plot 1

Note: With Marker 1 at the end of the radar pulse (*t = 0ms*) and Marker 3 at 10 seconds it is shown that the channel is closed 10 seconds after the radar pulse.

Channel Closing Transmission Time

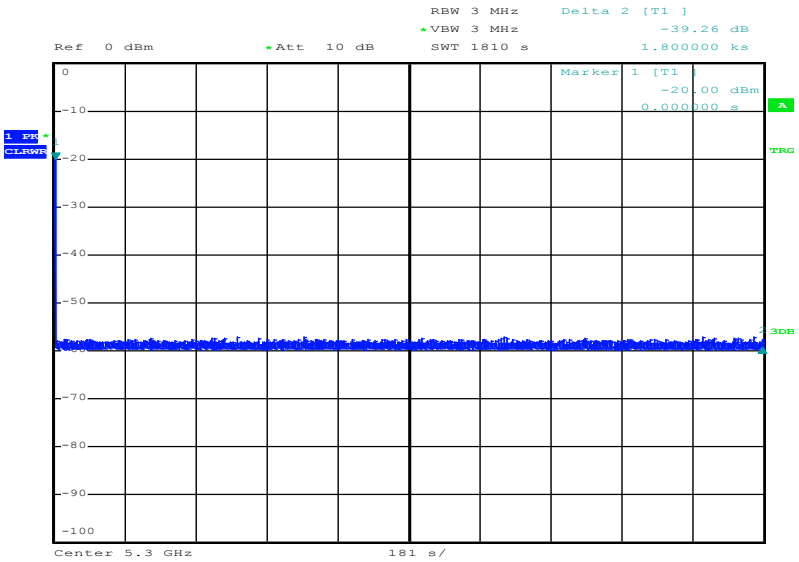


Plot 2

Note: The accumulated transmission time is calculated by the number of bins (occurring after *t = 0ms)* multiplied with the Time-per-sweep point-factor resulting from the Sweep Time and number of Sweep Points of the Spectrum Analyser.
The aggregate Channel Closing Transmission Time after *t = 200ms* is 5 ms.

8.2.1 Non-Occupancy Period

A channel that has been flagged as containing a radar system, either by a channel availability check or in-service monitoring, is subject to a non-occupancy period of at least 30 minutes. The non occupancy period starts at the time when the radar system is detected.



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Plot 3

Annex A Document history

Version	Applied changes	Date of release
	Initial release	2016-01-07
-A	Editorial changes (Model name, FVIN)	2016-01-14
-B	IC ID corrected	2016-06-10

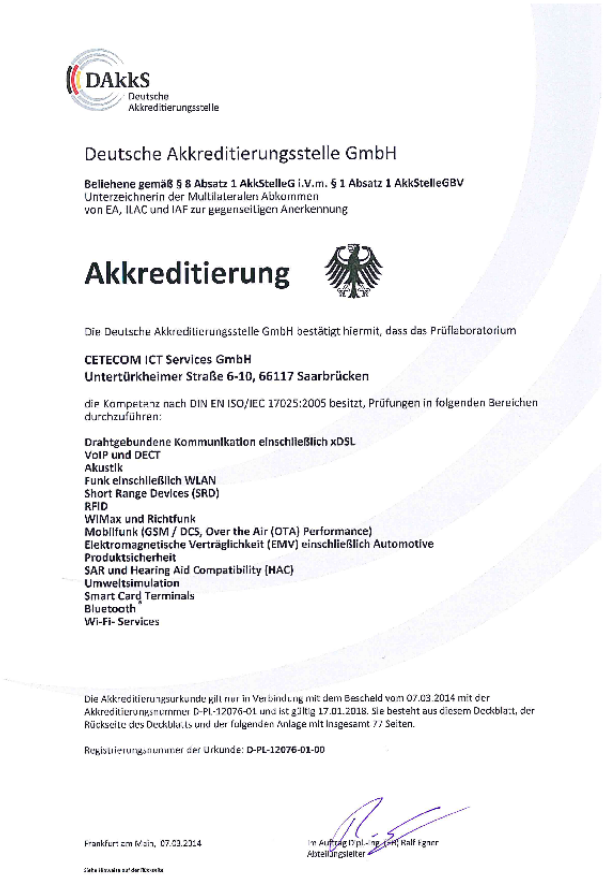
Annex B Further information

Glossary

AVG	-	Average
DUT	-	Device under test
EMC	-	Electromagnetic Compatibility
EN	-	European Standard
EUT	-	Equipment under test
ETSI	-	European Telecommunications Standard Institute
FCC	-	Federal Communication Commission
FCC ID	-	Company Identifier at FCC
HW	-	Hardware
IC	-	Industry Canada
Inv. No.	-	Inventory number
N/A	-	Not applicable
PP	-	Positive peak
QP	-	Quasi peak
S/N	-	Serial number
SW	-	Software
PMN		Product marketing name
HMN		Host marketing name
HVIN		Hardware version identification number
FVIN		Firmware version identification number

Annex C Accreditation Certificate

Front side of certificate



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Deutsche Akkreditierungsstelle

Deutsche Akkreditierungsstelle GmbH

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Akkreditierung

Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium

CETECOM ICT Services GmbH
Untertürkheimer Straße 6-10, 66117 Saarbrücken

die Kompetenz nach DIN EN ISO/IEC 17025:2005 besitzt, Prüfungen in folgenden Bereichen durchzuführen:

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RFID
WiMax und Richtfunk
Mobilfunk (GSM / DCS, Over the Air (OTA) Performance)
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Produktsicherheit
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Umweltsimulation
Smart Card Terminals
Bluetooth
Wi-Fi- Services

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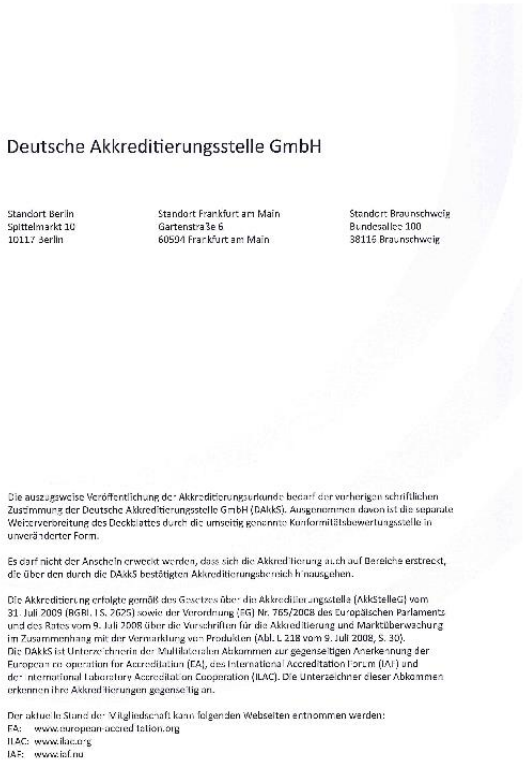
Registrierungsnummer der Urkunde: **D-PL-12076-01-00**

Frankfurt am Main, 07.03.2014

Im Auftrag Dipl.-Ing. (FH) Ralf Egner
Abteilungsleiter

Back side of certificate



Deutsche Akkreditierungsstelle GmbH

Standort Berlin
Spittelmarkt 10
10117 Berlin

Standort Frankfurt am Main
Gartenstraße 6
60594 Frankfurt am Main

Standort Braunschweig
Bundesallee 100
38116 Braunschweig

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