RADIO TEST REPORT

No. 1406200STO-001 Ed. 1

RF performance

EQUIPMENT UNDER TEST

Equipment :	13.56 MHz RFID reader
Type / model :	T2
Manufacturer :	Lepic Arcontia AB
Tested by request of :	Lepic Arcontia AB

SUMMARY

Referring to the emission limits and the operating mode during the tests specified in this report the equipment complies with the requirements according to 47 CFR Part 15, Subpart C, Intentional radiators, section 15.209 provided that modifications mentioned in section 2.6 are implemented.

Test methods according to ANSI C63.10-2009

Date of issue: 2014-06-23

Tested by: Matti Virkki

Approved by: Stefan Andersson

Revision History

Edition	Date	Description
1	**2014-06-23**	**First release**

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1 CLIENT INFORMATION

The EUT has been tested by request of

Company:	Lepic Arcontia AB Gruvgatan 35 A 421 30 Västra Frölunda Sweden
Name of contact:	Tommy Eriksson

2 EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	13.56 MHz RFID reader
Type/Model:	T2
Brand name:	Arcontia
Serial number:	No visible serial number on EUT
Manufacturer:	Lepic Arcontia AB Gruvgatan 35 A 421 30 Västra Frölunda Sweden
Transmitter frequency range:	13.561 MHz
Receiver frequency range:	13.561 MHz

Frequency agile or hopping:	☐ Yes	☒ No
Antenna:	☒ Internal antenna	☐ External antenna
Antenna connector:	☒ None, internal antenna	☐ Yes, type
Type of modulation:	No modulation or pulse modulation	
Temperature range:	☒ Category I (General): -20°C to +55°C ☐ Category II (Portable equipment): -10°C to +55°C ☐ Category III (Equipment for normal indoor use): +5°C to +35°C ☐ Other:	
Transmitter stand by mode supported:	☐ Yes	☒ No

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2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	Part number	Revision	Serial number
RFID reader	N/A	A	N/A

Following cables were connected to EUT

Cable	Type	Length
DC cable	2x0,05 mm^2 with Würth 742 744 426 ferrite	1,5 m
Ethernet	Cat 5 STP	3 m
Serial	USB	1 m
Serial	Cat 5 UTP	1 m

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software revision A

2.4 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT during the tests, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type	Inventory number
DC power supply	TTi / QL564	31044

2.5 Test signals

Continuous carrier wave

2.6 Modification during the tests

Following changes were made during testing
R17, R18 = 100 ohm to R17, R18 = 124 ohm.

No other modifications have been made during the tests.

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3 TEST SPECIFICATIONS

3.1 Standards

47 CFR Part 15, Subpart C, Intentional radiators, section 15.209

Test methods in:

ANSI C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Test site

Measurements were performed at:

Intertek Semko AB.
Torshamnsgatan 43,
P.O. Box 1103
SE-164 22 Kista

Intertek Semko AB is a FCC listed test site with site registration number 90913
Intertek Semko AB is a Industry Canada listed test facility with IC assigned code 2042G

Measurement chambers

Measurement Chamber	Type of chamber	IC Site filing #
STORA HALLEN a.k.a. BIG CHAMBER	Semi-anechoic 10m and 3m	2042G-2

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3.4 Test set-up

Prior to test EUT was configured to send continuous carrier wave.
All EUT ports had a suitable cable connected to them.

3.5 Test conditions

If not additionally specified, the tests were performed under the following environmental conditions:

Parameter	Normal	Extreme
Supplying voltage, V	12 V	10.2 – 13.8
Air temperature, ^{o}C	21 °C	-

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4 TEST SUMMARY

The results in this report apply only to the tested sample:

Test	Result	Section in report	Note
Standard test methods			
AC power-line conducted tests	NA		
Radiated test below 30 MHz	Pass		
Radiated emissions measurements from 30 to 1000 MHz	Pass		1
Determination of radiated and antenna conducted emissions above 1 GHz	NA		
Carrier output stability Test	Pass		

NT = Not Tested, by request of the Client
NA = Not Applicable

Notes:

1. The measured result is below the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance is more probable than non-compliance.

2. The measured result is above the upper limit, but by a margin less than half of the uncertainty interval. It is therefore not possible to state non-compliance based on the 95% level of confidence. However, the result indicates that non-compliance is more probable than compliance.

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5 RADIATED TEST BELOW 30 MHZ

Date of test:	2014-05-26	Test location:	Big Chamber
EUT Serial:	No serial	Ambient temp.	21 °C
Tested by:	Matti Virkki	Relative humidity	40 %
Test result:	Pass	Margin:	6.6

5.1 Requirement

Reference: FCC §15.209, IC RSS-210 Table 3
The limits below 30 MHz are given for different measurement distances. The limits below 30 MHz are converted to 10 m by using the extrapolation factor 40 dB/decade (according to §15.31)

The field strength limits below 30Mhz are converted to magnetic field units, dBμA/m, by subtracting with 51.5 dB (20*LOG(377)) since it is measured with a magnetic loop antenna.

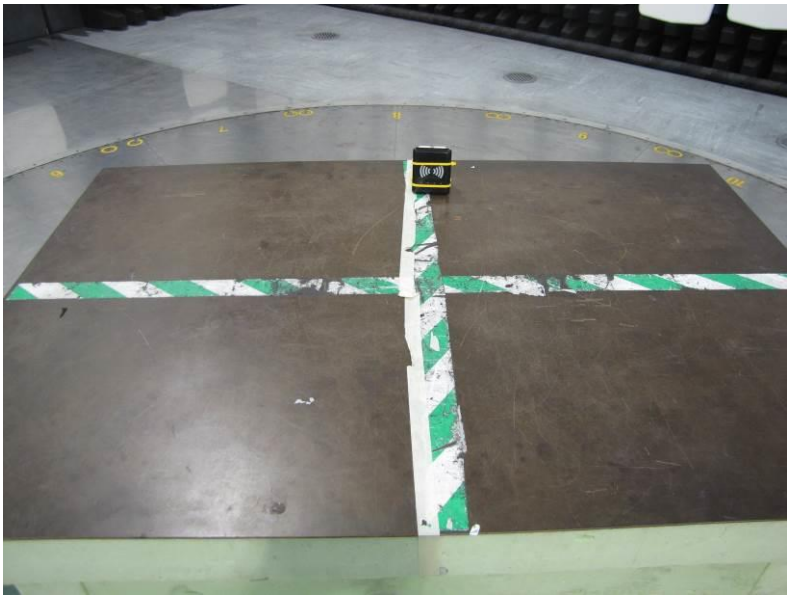
Frequency (MHz)	Field strength (dBμV/m)	Field strength (dBμA/m)	Measurement distance (m)
0.009 – 0.490	107.6 – 72.9	56.1 – 21.4	10
0.490 – 1.705	52.9 – 42.1	1.4 – -9.4	10
1.705 – 30.0	48.6	-2.9	10

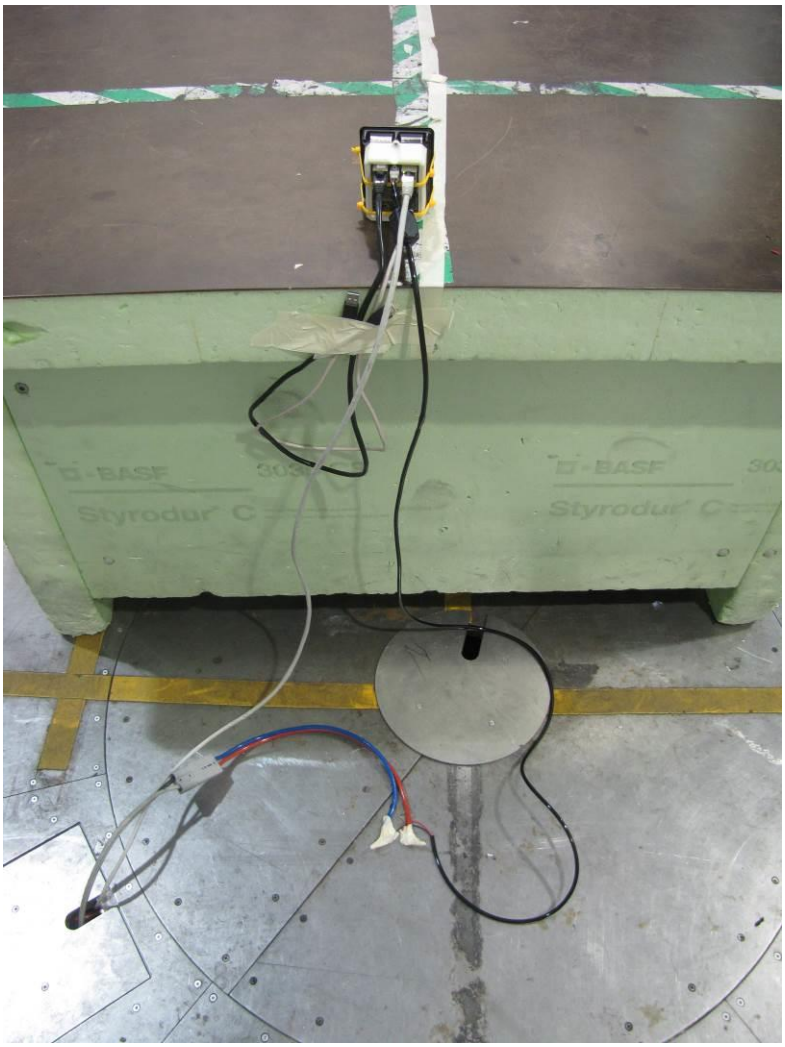
Additionally level of un wanted signal must be lower than level of wanted signal.

5.2 Test setup details

The EUT was placed on Styrofoam table 80 cm above the floor.
The EUT was configured to transmit continuous carrier signal

Test set-up photos:





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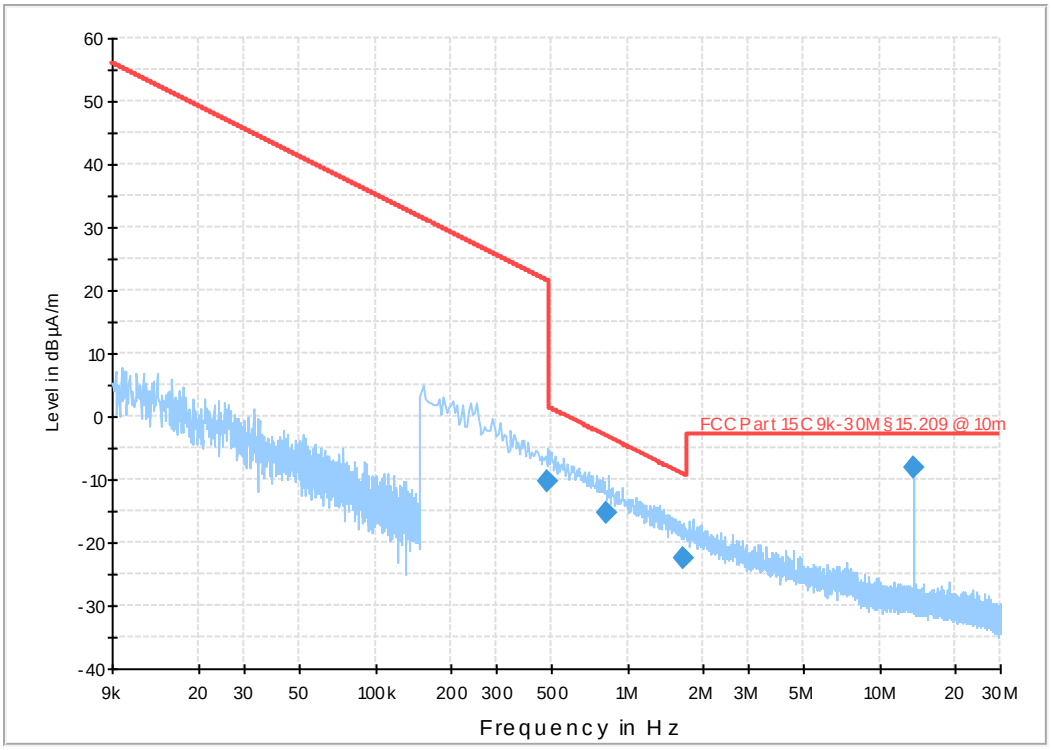
5.3 Test data

Overview sweeps performed with peak detectors Antenna position 1.

FCC H-field 9kHz - 30MHz 10m



Frequency MHz	Disturbance Level dBµA/m	Disturbance Level dBµV/m	RBW kHz	Detector QP / AVG / Peak	Azimuth	Limit dBµA/m	Margin dB
0.481	-10.2	41.3	9	QP	142.0	21.6	31.8
0.825	-15.2	36.3	9	QP	247.0	-3.1	12.1
1.649	-22.4	29.1	9	QP	49.0	-9.1	13.3
13.561	-8.2	43.3	9	QP	288.0	-2.9	5.3

Measured level [dBµA/m] = Analyser reading [dBµV] + cable loss [dB] + antenna factor [dB(S/m)]

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] + antenna factor [dB(S/m)] + 51,5

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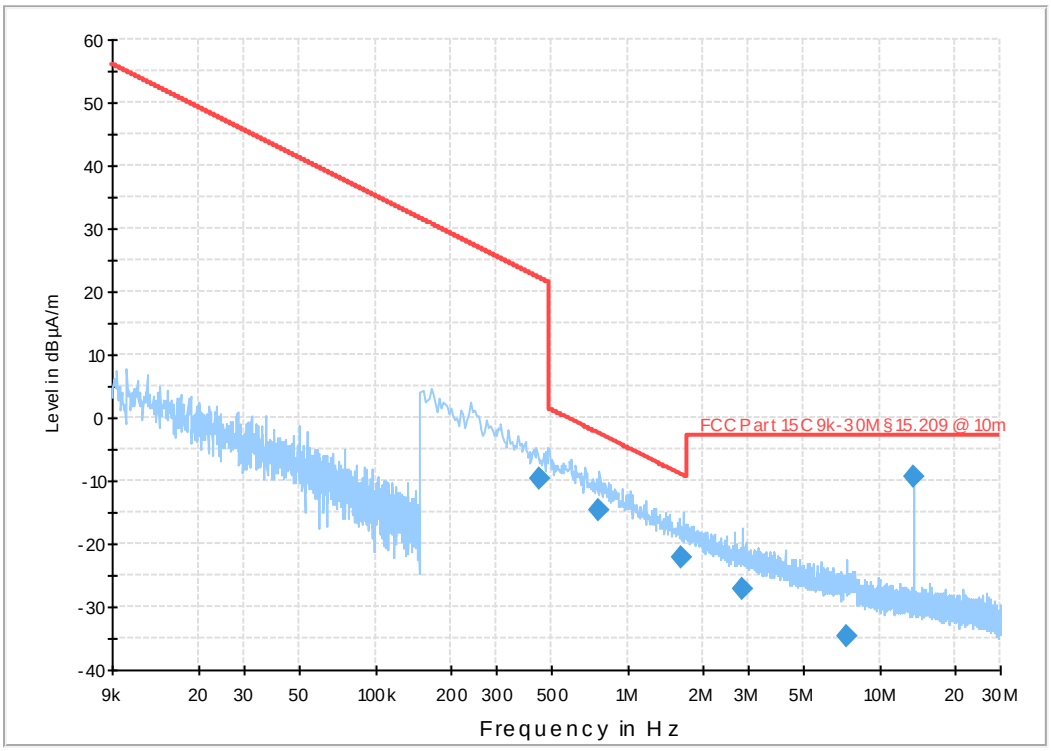
Overview sweeps performed with peak detectors Antenna position 2.

FCC H-field 9kHz - 30MHz 10m



Frequency MHz	Disturbance Level dBµA/m	Disturbance Level dBµV/m	RBW kHz	Detector QP / AVG / Peak	Azimuth	Limit dBµA/m	Margin dB
0.449	-9.7	41.8	9	QP	300.0	22.2	31.9
0.761	-14.6	36.6	9	QP	254.0	-2.4	12.2
1.625	-22.2	29.3	9	QP	325.0	-9.0	13.2
2.849	-27.2	24.3	9	QP	298.0	-2.9	30.1
7.389	-34.7	16.8	9	QP	146.0	-2.9	31.8
13.561	-12.5	39.0	9	QP	152.0	-2.9	10.0

Measured level [dBµA/m] = Analyser reading [dBµV] + cable loss [dB] + antenna factor [dB(S/m)]

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] + antenna factor [dB(S/m)] + 51,5

5.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	7/2014
Active Loop antenna	EMCO	6502	8853	8/2015

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6 RADIATED EMISSIONS MEASUREMENTS FROM 30 MHZ TO 1000MHZ

Date of test:	2014-05-26	Test location:	Big Chamber
EUT Serial:	No serial	Ambient temp.	21 °C
Tested by:	Matti Virkki	Relative humidity	40 %
Test result:	Pass	Margin:	0.2

6.1 Requirement

Reference: FCC §15.209, IC RSS-210 Table 3

Frequency (MHz)	Field strength (dBμV/m)	Measurement distance (m)
30 – 88	29.5	10
88 – 216	33.0	10
216 – 960	35.6	10
960 –	43.5	10

6.2 Test setup details

Test set-up photo:

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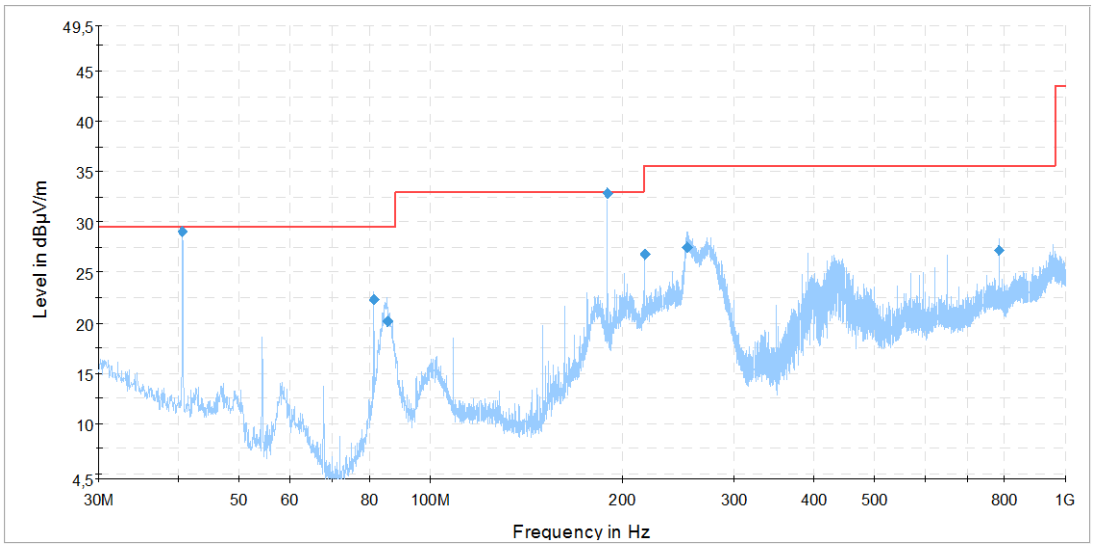
6.3 Test data

Overview sweeps performed with peak detectors,



Frequency MHz	Disturbance Level dBµV/m	RBW kHz	Detector QP / AVG / Peak	Limit dBµV/m	Pol.	Azimuth deg	Antenna height cm	Margin dB
40.659	29.1	120	QP	29.5	V	66.0	100.0	0.4
81.357	22.3	120	QP	29.5	V	288.0	133.0	7.2
85.491	20.2	120	QP	29.5	V	327.0	121.0	9.3
189.820	32.8	120	QP	33.0	V	-8.0	100.0	0.2
216.952	26.8	120	QP	35.6	V	294.0	100.0	8.8
253.199	27.4	120	QP	35.6	V	38.0	127.0	8.2
785.481	27.2	120	QP	35.6	H	275.0	374.0	8.4

Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [dB/m]

6.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Measurement software	Rohde & Schwarz	EMC 32	--	--
Receiver	Rohde & Schwarz	ESU 8	12866	7/2014
Log periodic antenna	Chase	CBL6111A	971	9/2015

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7 CARRIER OUTPUT STABILITY MEASUREMENTS

Date of test:	2014-05-26	Test location:	Big Chamber
EUT Serial:	No serial	Ambient temp.	21 °C
Tested by:	Matti Virkki	Relative humidity	40 %
Test result:	Pass	Margin:	6.6

7.1 Requirement

Reference: FCC §15.31 (e)
Nominal operating voltage ±15 %.

7.2 Test setup details

Same set up as in section 5.2

7.3 Test data

Test Conditions		Carrier level dBµV/m	Limit dBµV/m
Temperature °C	Voltage V AC		
Nominal (22)	85% of nominal = 10.2	43.3	48.6
	Nominal = 12	43.3	48.6
	85% of nominal = 13.8	43.3	48.6

7.4 Test equipment

Equipment type	Manufacturer	Model	Inv. No.	Cal. due date
Receiver	Rohde & Schwarz	ESU 8	12866	7/2014
Active Loop antenna	EMCO	6502	8853	8/2015

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8 UNCERTAINTIES SUMMARY

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.
Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95% (k=2).

Radiated disturbance, field strength, 30 MHz - 1000 MHz

30 to 300 MHz at 1 m and at a fixed height ≤ 1,5 m	± 5,3 dB
200 to 1000 MHz at 1 m	± 6,2 dB
30 to 300 MHz at 3 m	± 4,7 dB
200 to 1000 MHz at 3 m	± 4,8 dB
30 to 300 MHz at 10 m	± 4,6 dB
200 to 1000 MHz at 10 m	± 4,6 dB

Radiated disturbance, field strength, 1 to 40 GHz in Semi Anechoic Chambers "Stora Hallen"and "Björkhallen"

1 to 18 GHz with filter or attenuator	± 5,4 dB
1 to 18 GHz without filter or attenuator	± 5,2 dB
18 to 26 GHz without filter or attenuator	± 5,5 dB
26 to 40 GHz without filter or attenuator	± 5,6 dB

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9 PHOTO OF THE EUT

-- END OF REPORT --

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