SENTON

EMV-Prüfzentrum ■ EMI/EMC-Testcenter ■

Straubing, August 3, 2000

T E S T - R E P O R T

No. 52209-00390-1

for

TOAD RK 30 Transmitter

Applicant:	Lite-On Automotive Corporation
Purpose of testing:	To show compliance with
	FCC Code of Federal Regulations, Part 15 Subpart C, Section §15.231
	Industry Canada Radio Standards Specification RSS-210 Issue 2, Section 6.1 (Category I Equipment)

Note:
The test data of this report relate only to the individual item which has been tested. This report shall not be reproduced except in full extent without the written approval of the testing laboratory.

Table of Contents

1. Administrative Data 3

2. Identification of Test Laboratory 4

3. Summary of Test Results 5

4. Operation Mode of EUT 6

5. Configuration of EUT and Peripheral Devices 7

6. Measuring Methods 8

6.1. Bandwidth of Emission(FCC §15.231.c / RSS-210 Section 6.1.1.c) 8

6.2. Radiated Emission 30 MHz - 1 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3) 9

6.3. Radiated Emission 1 GHz - 10 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3) 11

7. Equipment List 13

8. Photographs Taken During Testing 15

9. List of Measurements 20

9.1. List of Measurements According To FCC Part 15 Subpart C 21

9.2. List of Measurements According To Industry Canada RSS-210 22

10. Referenced Regulations 23

11. Test Results 24

1. Administrative Data

Equipment Under Test (EUT):	TOAD RK 30 Transmitter
Serial number(s):	R 118825
Version of EUT:	as received with modifications
Parts/accessories:	---
FCC-ID:	JLJ123456T
Applicant: (full address)	Lite-On Automotive Corporation 37 Chung Yang Road NEPZ Kaohsiung 811 Taiwan R.O.C.
Contract identification:	---
Contact person:	
Manufacturer:	Lite-On Automotive Corporation
Receipt of EUT:	July 2000
Date of test:	July/August 2000
Note:	---
Responsible for testing:	Rupert Kohlhäufl
Responsible for test report:	Rupert Kohlhäufl (cj)

2. Identification of Test Laboratory

Test Laboratory: (full address):	Senton GmbH EMI/EMC Test Center Aeussere Fruehlingstrasse 45 D-94315 Straubing Germany	
Contact person:	Mr. Johann Roidt	
Communication:	Telephone Fax eMail:	(+49) 0 94 21 / 55 22-0 (+49) 0 94 21 / 55 22-99 Office@senton.de
FCC file number:	31040/SIT 1300F2	
Industry Canada file number:	IC 3050	

3. Summary of Test Results

The tested sample complies with the requirements set forth in the

Code of Regulations Part 15 Subpart C, Section §15.231 (intentional radiators) of the Federal Communication Commission (FCC)

and the

Radio Standards Specification RSS-210 Issue 2, Section 6.1 for Low Power Licence-Exempt Radiocommuniction Devices of Industry Canada.

Johann Roidt
Technical Manager

Rupert Kohlhäufl
Test Engineer

4. Operation Mode of EUT

- transmitting continuously
- with battery supply 3.0 V DC

5. Configuration of EUT and Peripheral Devices

Configuration of cables of EUT

Not applicable

Configuration of peripheral devices connected to EUT

Not applicable

6. Measuring Methods

6.1. Bandwidth of Emission(FCC §15.231.c / RSS-210 Section 6.1.1.c)

The Bandwidth of Emission is measured with a spectrum analyzer connected to measuring antenna (radiated measurement) or test fixture while EUT is operating in transmit mode with modulation at the appropriate center frequency. To increase received signal level distance to EUT is reduced (appropriate level offset is included).
The spectrum analyzer was set to:
RBW = 10 kHz, VBW = 10 kHz, span = 1 MHz, sweep = 40 ms
See figure 1 for the measurement setup.

Test equipment used (see equipment list for details):
02, 55, 67

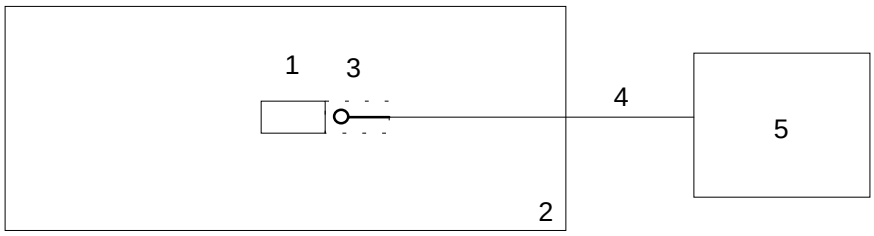


Figure 1: Measurement setup for bandwidth of emission test

1 Transmitter (EUT)
2 Wooden table
3 Test fixture
4 Test cable
5 Spectrum analyzer

6.2. Radiated Emission 30 MHz - 1 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3)

Radiated emissions are measured over the frequency range from 30 MHz to 1 GHz. The bandwidth of the EMI-receiver is set to 120 kHz and the detector-function is set to CISPR quasi-peak.
The test setup is made in accordance with ANSI C63.4-1992.
Measurements are made in both the horizontal and vertical planes of polarization. Preliminary scans are taken in a semi-anechoic room using a spectrum analyzer with the detector function set to peak. Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.
All tests are performed at a test-distance of 3 meters.
For final testing an open-area test-site is used. During the tests the EUT is rotated all around and the receiving-antenna is raised and lowered from 1 meter to 4 meters to find the maximum levels of emissions. The cables and equipment is placed and moved within the range of position likely to find their maximum emissions.

See figure 2 for the measurement setup.

Test equipment used (see equipment list for details):
01, 02, 05, 12, 38, 39, 40, 41, 58, 61, 64, 66

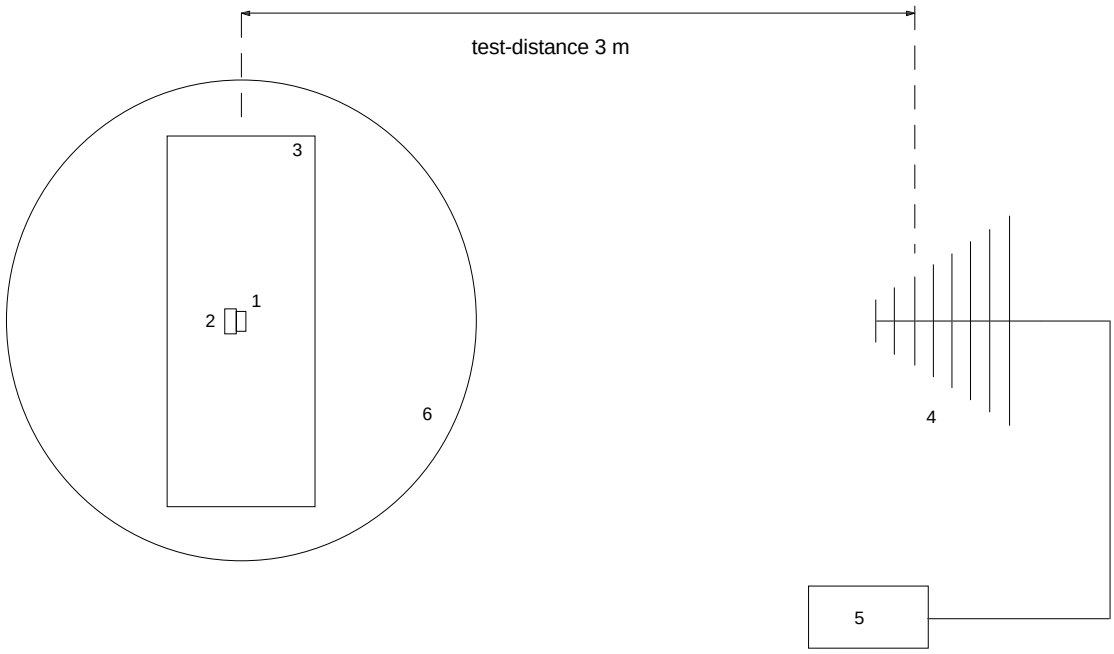


Figure 2: Measurement setup for radiated emission test below 1 GHz

1	Transmitter (EUT)	4	Measurement antenna
2	Wooden pedestal (if necessary)	5	Test receiver
3	Wooden table	6	Turn table

6.3. Radiated Emission 1 GHz - 10 GHz (FCC §15.205.a,b, §15.209, §15.231.b / RSS-210 Sections 6.1.1.b, 6.3)

Radiated emissions are measured in the frequency range 1 GHz to 10 GHz. Resolution and video bandwidth of the spectrum analyzer are set to 1 MHz.
Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.
Additional measurements are performed at critical frequencies with reduced span.
EUT is rotated all around and receiving antenna is raised and lowered to find the maximum levels of emission. The cables and equipment are placed and moved within the range of position likely to find their maximum emissions.
All tests are performed in a semi-anechoic chamber with a test-distance of 3 meters.
If possible preamplifiers are used for the whole frequency range. Special care is taken to avoid overload in transmit mode (using appropriate attenuators if necessary).

See figure 3 for the measurement setup.

Test equipment used (see equipment list for details):
02, 13, 14, 16, ,42, 44, 45, 57, 64

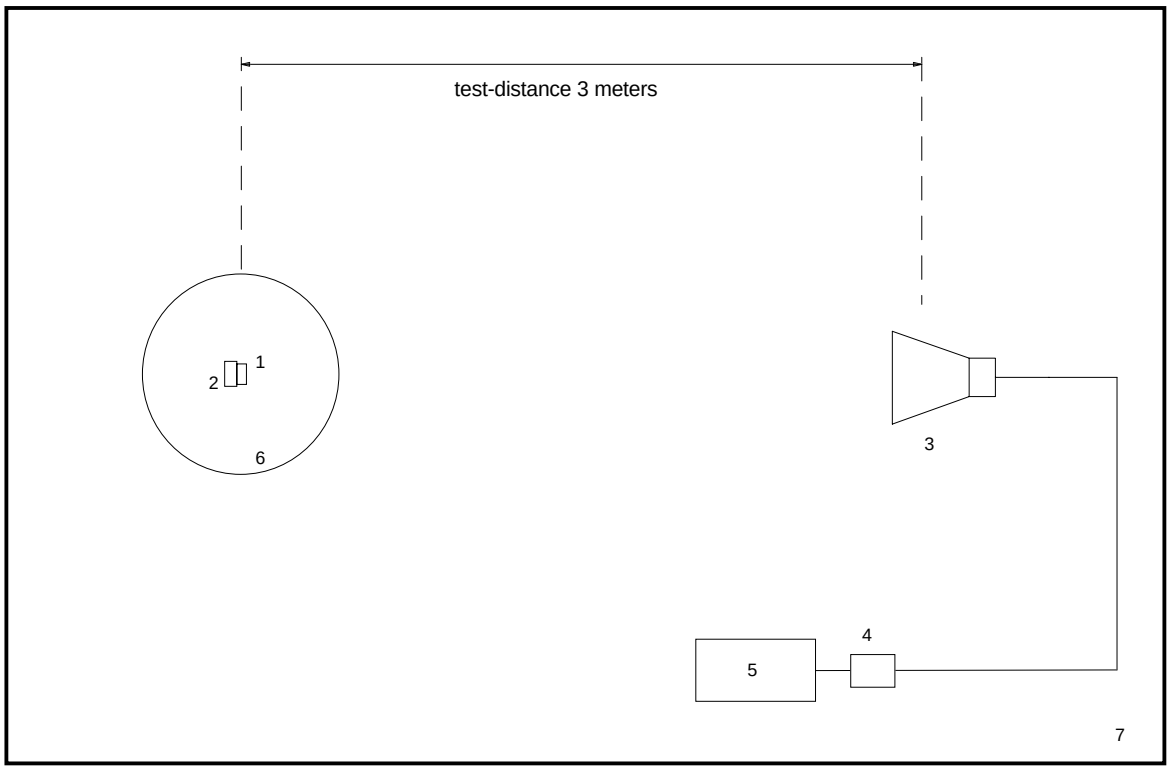


Figure 3: Measurement setup for radiated emission test above 1 GHz

1 Transmitter (EUT)
2 Wooden pedestal (if necessary)
3 Measurement antenna
4 Preamplifier (if applicable)
5 Spectrum analyzer
6 Turn table
7 Semi anechoic room

7. Equipment List

To facilitate reference to test equipment used for related tests, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory.

No.	Type	Model	Serial Number	Manufacturer
01	Spectrum Analyzer	R 3271	05050023	Advantest
02	EMI Test Receiver	ESMI	839379/013 839587/006	Rohde & Schwarz
03	Test Receiver	ESH 3	880112/032	Rohde & Schwarz
04	Test Receiver	ESHS 10	860043/016	Rohde & Schwarz
05	Test Receiver	ESV	881414/009	Rohde & Schwarz
06	Test Receiver	ESVP	881120/024	Rohde & Schwarz
07	Audio Analyzer	UPA	862954	Rohde & Schwarz
08	Power Meter	NRVS	836856/015	Rohde & Schwarz
09	Power Sensor	NRV-Z52	837901/030	Rohde & Schwarz
10	Power Sensor	NRV-Z4	863828/015	Rohde & Schwarz
11	Preamplifier	ESV-Z3	860907/004	Rohde & Schwarz
12	Preamplifier	R14601		Advantest
13	Preamplifier	ACX/080-3030	32640	CTT
14	Preamplifier	ACO/180-3530	32641	CTT
15	Signal Generator	SMS	872166/039	Rohde & Schwarz
16	Signal Generator	HP 8673 D	2930A00966	Hewlett Packard
17	Waveform Generator	HP 33120 A	US34005375	Hewlett Packard
18	Attenuator 20 dB	4776-20	9503	Narda
19	Attenuator 10 dB	4776-10	9412	Narda
20	Pulse Limiter	ESH 3-Z2	1144	Rohde & Schwarz
21	Pulse Limiter	11947 A	3107A00566	Hewlett Packard
22	V-Network	ESH 3-Z5	862770/018	Rohde & Schwarz
23	V-Network	ESH 3-Z5	894785/005	Rohde & Schwarz
24	V-Network	ESH 3-Z5	830952/025	Rohde & Schwarz
25	V-Network	ESH 3-Z6	830722/010	Rohde & Schwarz
26	V-Network	NSLK 8127	8127152	Schwarzbeck
27	V-Network	NNLA 8119	8119148	Schwarzbeck
28	V-Network	SE 01	01	Senton
29	T-Network	ESH 3-Z4	890602/011	Rohde & Schwarz
30	T-Network	ESH 3-Z4	890602/012	Rohde & Schwarz
31	High Impedance Probe	TK 9416	01	Schwarzbeck
32	High Impedance Probe	TK 9416	02	Schwarzbeck
33	Current Probe	ESH 2-Z1	863366/18	Rohde & Schwarz
34	Current Probe	ESV-Z1	862553/3	Rohde & Schwarz

No.	Type	Model	Serial Number	Manufacturer
35	Absorbing Clamp	MDS 21	80911	Lüthi
36	Absorbing Clamp	MDS 21	79690	Lüthi
37	Loop Antenna	HFH2-Z2	882964/1	Rohde & Schwarz
38	Biconical Antenna	HK 116	842204/001	Rohde & Schwarz
39	Biconical Antenna	HK 116	836239/02	Rohde & Schwarz
40	Log. Periodic Antenna	HL 223	841516/023	Rohde & Schwarz
41	Log. Periodic Antenna	HL 223	834408/12	Rohde & Schwarz
42	Horn Antenna	3115	9508-4553	Emco
43	Horn Antenna	3160-03	9112-1003	Emco
44	Horn Antenna	3160-04	9112-1001	Emco
45	Horn Antenna	3160-05	9112-1001	Emco
46	Horn Antenna	3160-06	9112-1001	Emco
47	Horn Antenna	3160-07	9112-1008	Emco
48	Horn Antenna	3160-08	9112-1002	Emco
49	Horn Antenna	3160-09	9403-1025	Emco
50	Digital multimeter	199	463386	Keithley
51	DC Power Supply	NGSM 32/10	203	Rohde & Schwarz
52	DC Power Supply	NGB	2455	Rohde & Schwarz
53	DC Power Supply	NGA	386	Rohde & Schwarz
54	Temperature Test Chamber	HT4010	07065550	Heraeus
55	Cable	RG214	1309	Senton
56	Cable	200CM_001	1357	Rosenberger
57	Cable	150CM_001	1479	Rosenberger
58	Cable Set EG1	RG214	1189 - 1191	Senton
59	Cable Set Cabine 1	RG214		Senton
60	Cable Set Cabine 2	RG214		Senton
61	Cable Set Cabine 3	RG214		Senton
62	Shielded Room	No. 1	1451	Senton
63	Shielded Room	No. 2	1452	Senton
64	Semi-anechoic Chamber	No. 3	1453	Siemens
65	Shielded Room	No. 4	1454	Euroshield
66	Open Area Test Site	EG 1		Senton
67	Test fixture			Senton

8. Photographs Taken During Testing

Photos No. 8.1 - 8.2

Test setup for radiated emission pre-test 30 MHz - 1 GHz and measurement above 1 GHz (semi anechoic room)

Photos No. 8.3 - 8.4

Test setup for radiated emission pre-test 30 MHz - 1 GHz and measurement above 1 GHz (semi anechoic room) - continued -

Photos No. 8.5 - 8.6

Test setup for radiated emission pre-test 30 MHz - 1 GHz and measurement above 1 GHz (semi anechoic room) - continued

Photos No. 8.7 - 8.8

Test setup for radiated emission final test 30 MHz - 1 GHz (open area test site)

9. List of Measurements

9.1. List of Measurements According To FCC Part 15 Subpart C

FCC Part 15 Subpart C			
Section(s):	**Test**	**Page(s)**	**Result**
	Transmit mode (TX):		
§15.231.c	Bandwidth of emission		Passed
§15.207	Conducted emission test 450 kHz - 30 MHz	---	Not Applicable
§15.231.b **§15.209** **§15.205.a,b**	Radiated emission test 9 kHz - 30 MHz	---	Not Applicable (acc. to §15.33)
§15.231.b **§15.209** **§15.205.a,b**	Radiated emission test 30 MHz - 1 GHz		Passed
§15.231.b **§15.209** **§15.205.a,b**	Radiated emission test 1 GHz - 4.5 GHz		Passed

9.2. List of Measurements According To Industry Canada RSS-210

Industry Canada RSS-210 Issue 2			
Section(s):	**Test**	**Page(s)**	**Result**
	Transmit mode (TX):		
6.1.1.c	Bandwidth		Passed
6.6	Conducted emission test 450 kHz - 30 MHz	---	Not Applicable
6.1.1.b **6.3**	Radiated emission test 9 kHz - 30 MHz	---	Not Applicable (acc. to 6.3.e)
6.1.1.b **6.3**	Radiated emission test 30 MHz - 1 GHz		Passed
6.1.1.b **6.3**	Radiated emission test 1 GHz - 4.5 GHz		Passed

10. Referenced Regulations

All tests were performed with reference to the following regulations and standards:

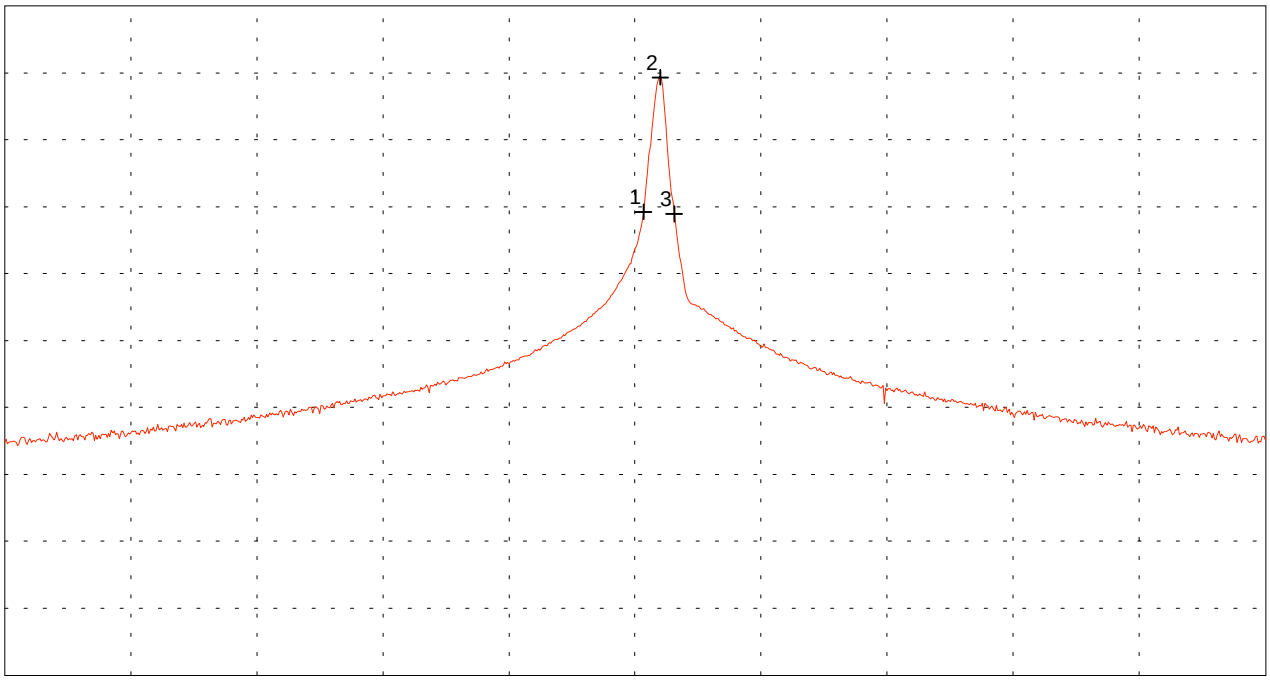
☒	FCC Part 15 Subpart A	Code of Regulations Part 15 (Radio Frequency Devices), Subpart A (General) of the Federal Communication Commission (FCC)	October 20, 1997
☐	FCC Part 15 Subpart B	Code of Regulations Part 15 (Radio Frequency Devices), Subpart B (Unintentional Radiators) of the Federal Communication Commission (FCC)	October 20, 1997
☒	FCC Part 15 Subpart C	Code of Regulations Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators) of the Federal Communication Commission (FCC)	October 20, 1997
☒	ANSI C63.4	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz - 40 GHz	October, 1992
☒	RSS-210	Radio Standards Specification RSS-210 Issue 2 for Low Power Licence-Exempt Radiocommuniction Devices of Industry Canada	February 24, 1996

11. Test Results

Bandwidth of emission according to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC Maximum bandwidth: 0.25% of center frequency = 1.08 MHz Measured bandwidth: 0.049 MHz
Serial No.: R118825	
Applicant: Lite-On Automotive Corporaton	

Ref.Level 90 dBµV/m ATT 15 dB
10 dB/Div.



Start 432.900 MHz Stop 434.900 MHz
RBW 10 kHz VBW 10 kHz SWP 60 ms

Multi Marker List

No. 1	433.913333 MHz	59.23 dBµV/m
No. 2	433.940000 MHz	79.34 dBµV/m
No. 3	433.962222 MHz	58.92 dBµV/m

Tested by: Rupert Kohlhäufl	Project-No.: 52209-00390
Date: 07/31/2000	Page 25 of 47 Pages

Radiated Emission 30 MHz - 1 GHz (Final Test)
according to FCC Part 15 Subpart C, §15.231.b

Model: TOAD RK 30
Type: Transmitter
Serial No.: R118825
Applicant: Lite-On Automotive Corporation
Test-site: Open area test-site I
Test distance: 3 meters
Date of test: 07/31/2000
Operator: R. Kohlhäufl
Mode: - transmitting continuously
- with battery supply 3 V DC

EUT in vertical position front on top

Detector: Peak
Polarization: horizontal

Frequency [MHz]	Receiver reading [dBµV]	Correction factor [dB]	Fieldstrength Peak [dBµV/m]	Limit Peak [dBµV/m]	Duty cycle correction [dB]	Fieldstrengt Average [dBµV/m]	Limit Average [dBµV/m]	Limit exceeded
433.90	57.3	23.0	80.3	100.8	5.8	74.5	80.8	
867.86	28.7	32.6	61.3	80.8	5.8	55.5	60.8	

Result: The limits are kept.

Radiated Emission 30 MHz - 1 GHz (Final Test)
according to FCC Part 15 Subpart C, §15.231.b

Model: TOAD RK 30
Type: Transmitter
Serial No.: R118825
Applicant: Lite-On Automotive Corporation
Test-site: Open area test-site I
Test distance: 3 meters
Date of test: 07/31/2000
Operator: R. Kohlhäufl
Mode: - transmitting continuously
- with battery supply 3 V DC

EUT in vertical position front on top

Detector: Peak
Polarization: vertical

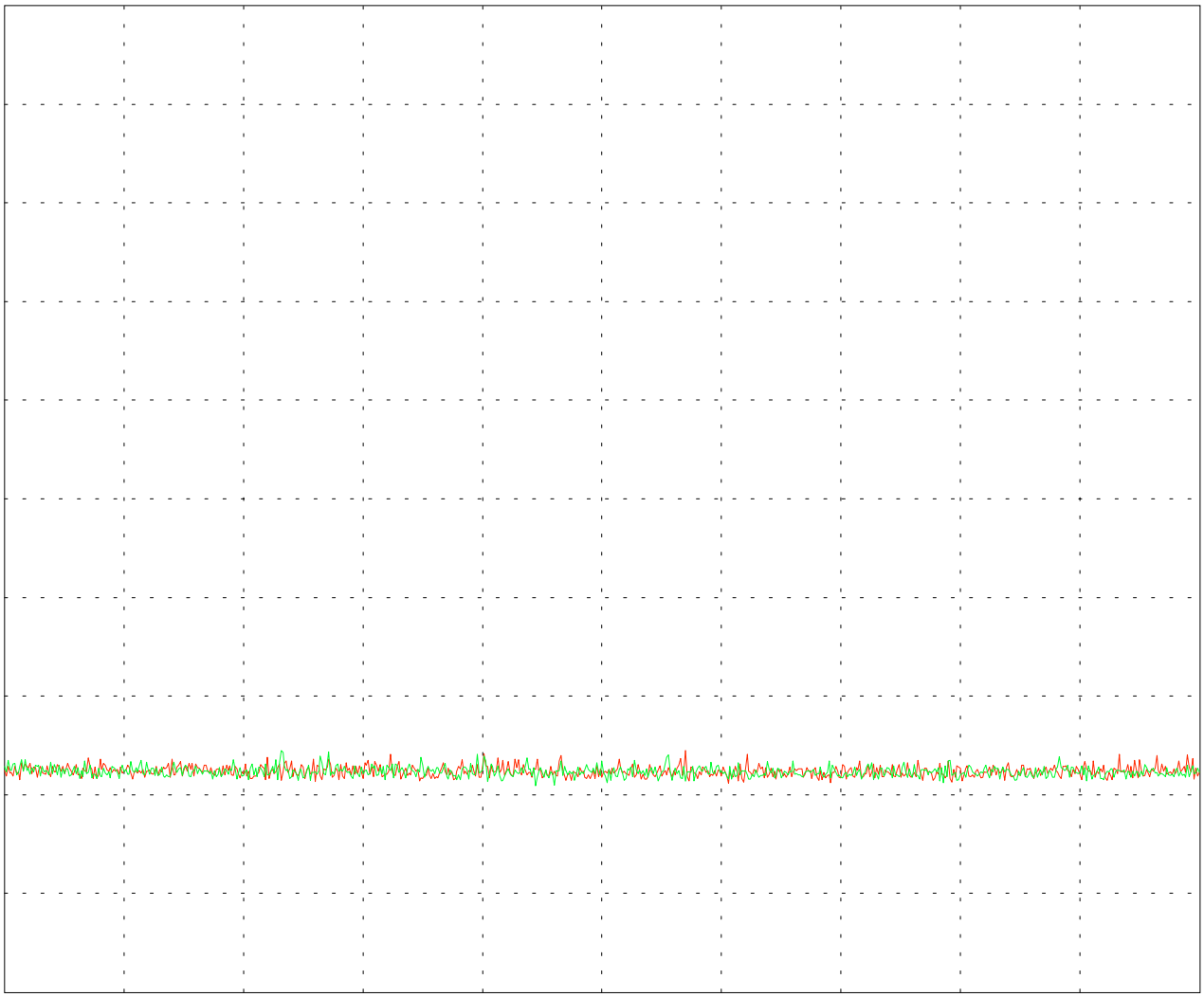
Frequency [MHz]	Receiver reading [dBµV]	Correction factor [dB]	Fieldstrength Peak [dBµV/m]	Limit Peak [dBµV/m]	Duty cycle correction [dB]	Fieldstrengt Average [dBµV/m]	Limit Average [dBµV/m]	Limit exceeded
433.90	60.5	23.0	83.5	100.8	5.8	77.7	80.8	
867.86	26.5	32.6	59.1	80.8	5.8	53.3	60.8	

Result: The limits are kept.

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in horizontal position LED on top Test distance : 3 meters Channel A: Horizontal polarization Channel B: vertical polarization PRESCAN WITHOUT ANY CORRECTIONS
Serial No.: R 118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 97 dBuV ATT 0 dB
10 dB/Div.



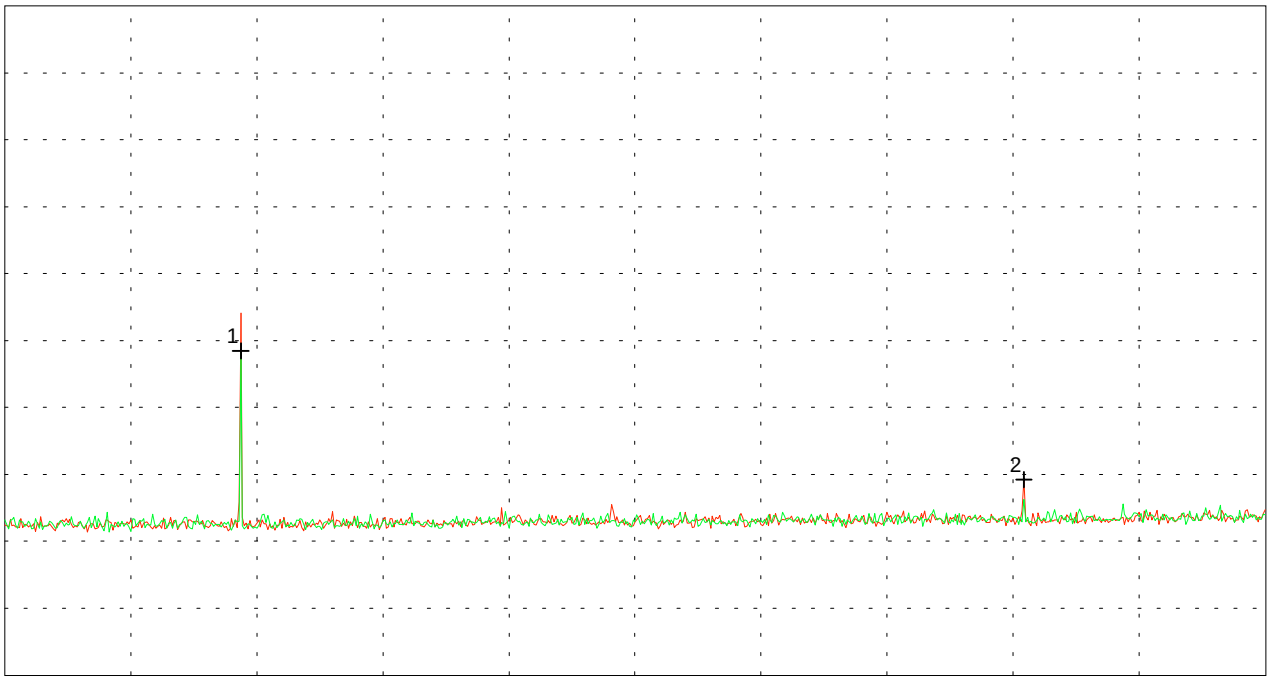
Start 30.000 MHz Stop 300.000 MHz
RBW 100 kHz VBW 100 kHz SWP 140 ms

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 28 of 47 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in horizontal position LED on top Test distance : 3 meters Channel A: Horizontal polarization Channel B: vertical polarization PRESCAN WITHOUT ANY CORRECTIONS
Serial No.: R 118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 97 dBuV ATT 0 dB
10 dB/Div.



Start 300.000 MHz Stop 1.000 GHz
RBW 100 kHz VBW 100 kHz SWP 140 ms

Multi Marker List

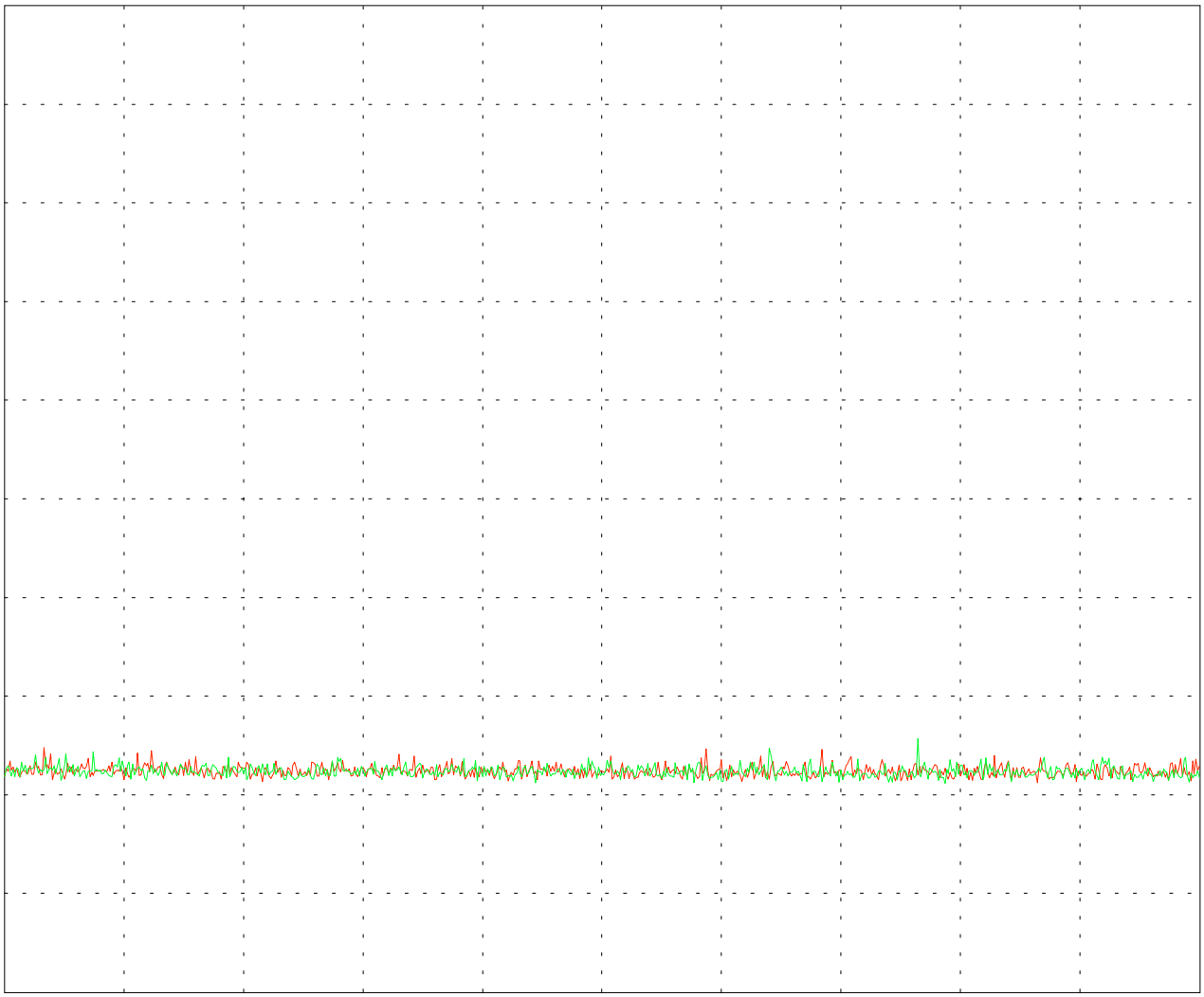
No. 1	431.000000 MHz	45.44 dBuV
No. 2	866.000000 MHz	26.19 dBuV

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 29 of 47 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in horizontal position right side on table Test distance : 3 meters Channel A: Horizontal polarization Channel B: vertical polarization PRESCAN WITHOUT ANY CORRECTIONS
Serial No.: R 118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 97 dBuV ATT 0 dB
10 dB/Div.



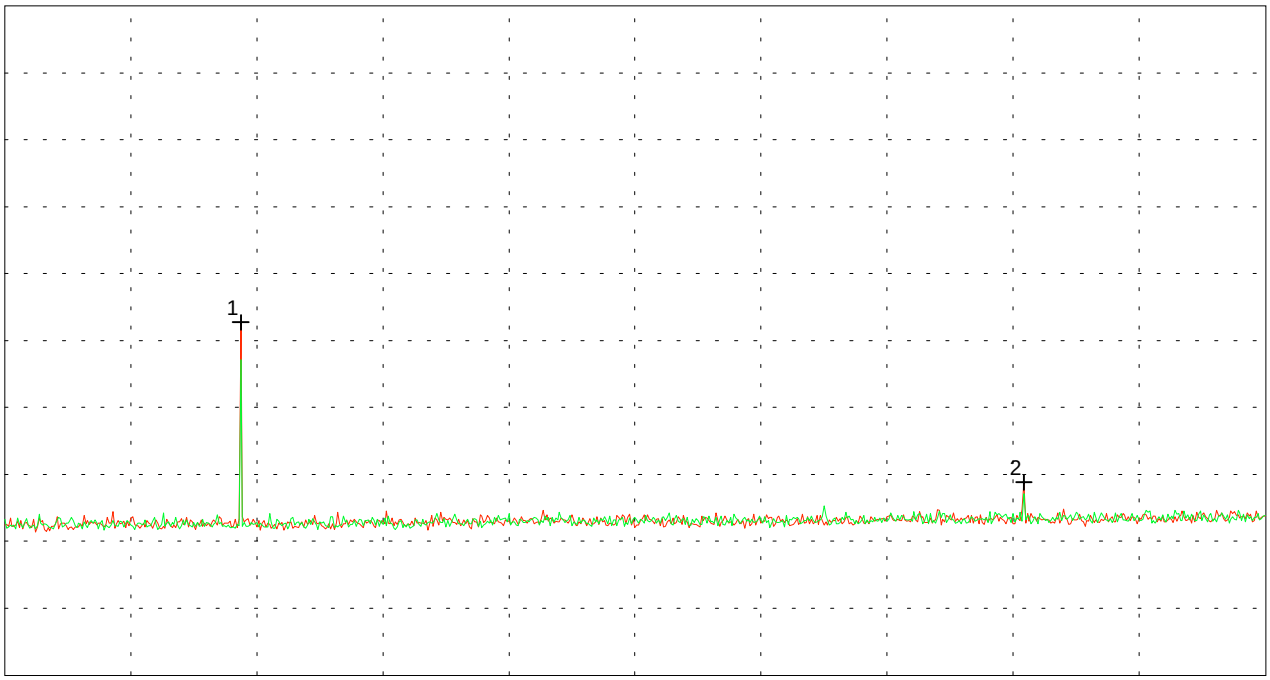
Start 30.000 MHz Stop 300.000 MHz
RBW 100 kHz VBW 100 kHz SWP 140 ms

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 30 of 47 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in horizontal position right side on table Test distance : 3 meters Channel A: Horizontal polarization Channel B: vertical polarization PRESCAN WITHOUT ANY CORRECTIONS
Serial No.: R 118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 97 dBuV ATT 0 dB
10 dB/Div.



Start 300.000 MHz Stop 1.000 GHz
RBW 100 kHz VBW 100 kHz SWP 140 ms

Multi Marker List

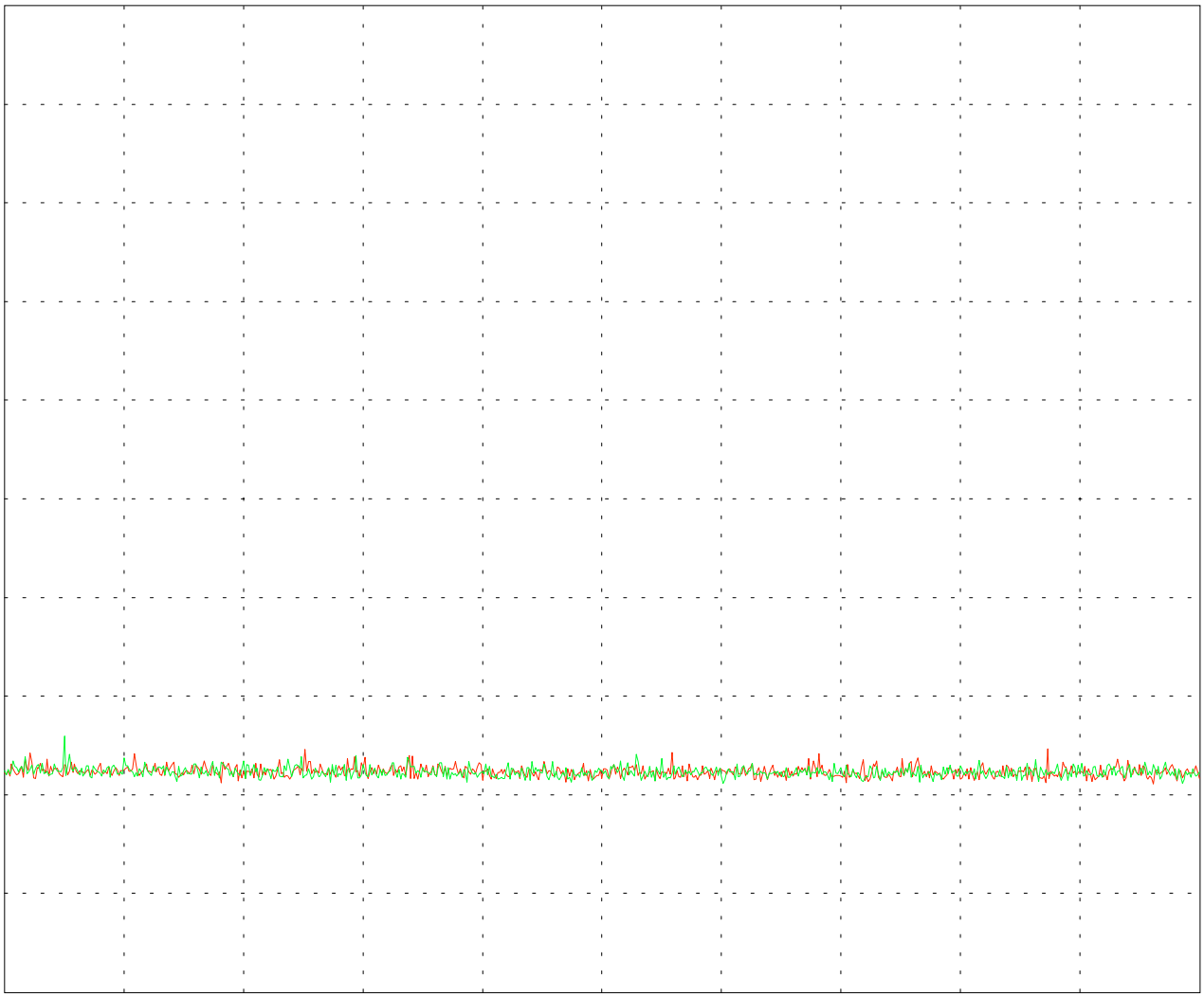
No. 1	431.000000 MHz	49.69 dBuV
No. 2	866.000000 MHz	25.78 dBuV

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 31 of 47 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in verticall position front on top Test distance : 3 meters Channel A: Horizontal polarization Channel B: vertical polarization PRESCAN WITHOUT ANY CORRECTIONS
Serial No.: R 118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 97 dBuV ATT 0 dB
10 dB/Div.



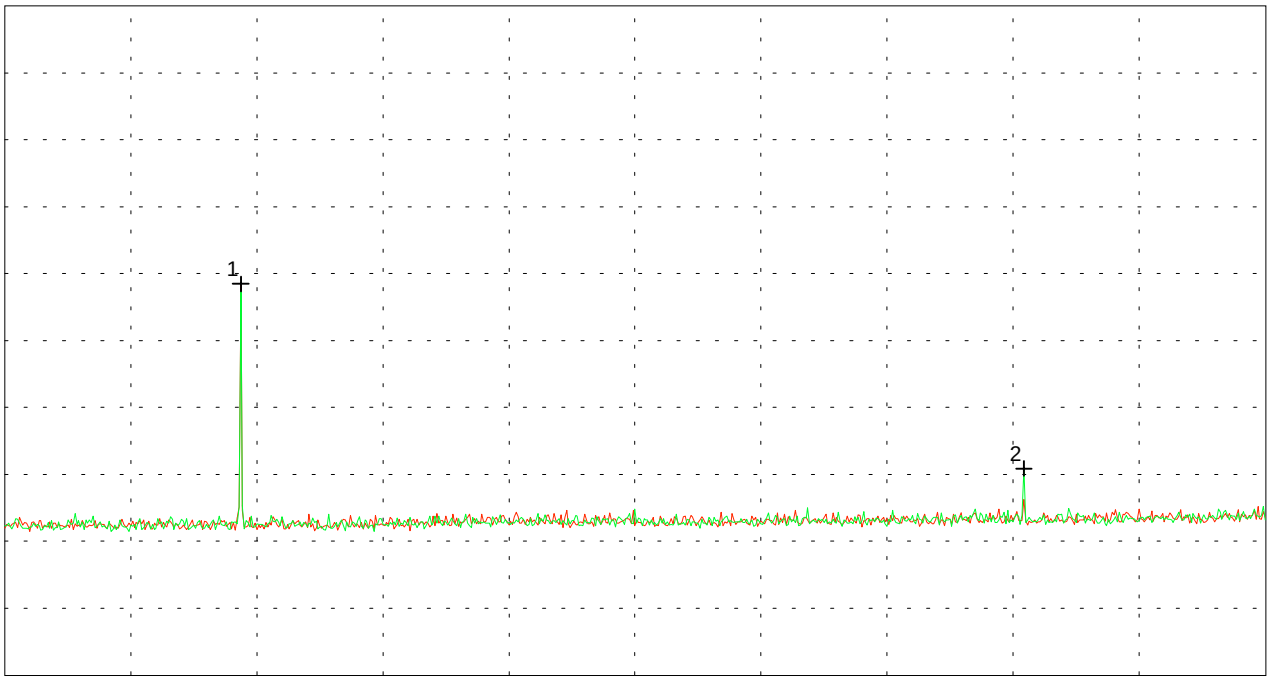
Start 30.000 MHz Stop 300.000 MHz
RBW 100 kHz VBW 100 kHz SWP 140 ms

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 32 of 47 Pages

Radiated emission 30 MHz - 1 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in verticall position front on top Test distance : 3 meters Channel A: Horizontal polarization Channel B: vertical polarization PRESCAN WITHOUT ANY CORRECTIONS
Serial No.: R 118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 97 dBuV ATT 0 dB
10 dB/Div.



Start 300.000 MHz Stop 1.000 GHz
RBW 100 kHz VBW 100 kHz SWP 140 ms

Multi Marker List

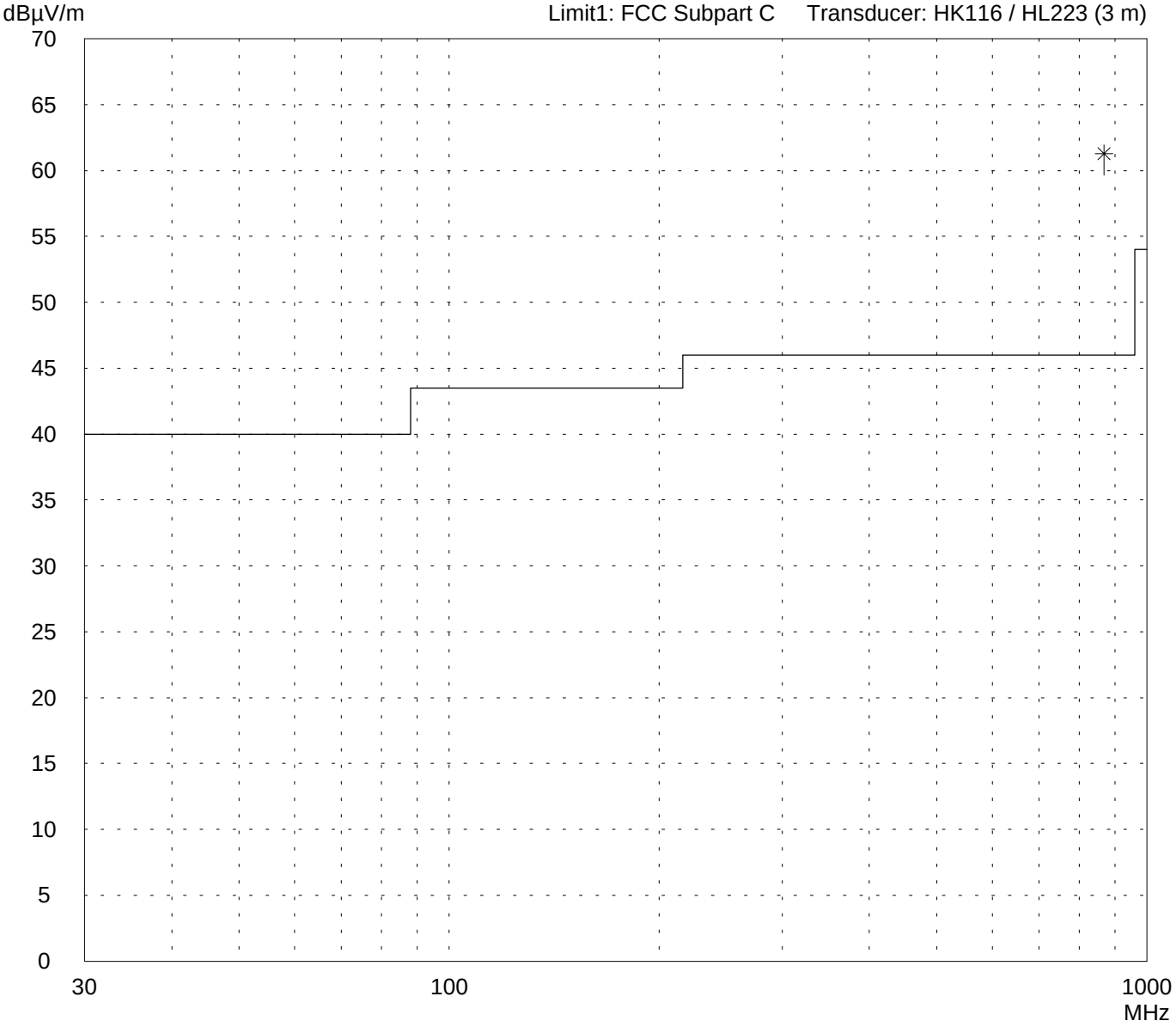
No. 1	431.000000 MHz	55.47 dBuV
No. 2	866.000000 MHz	27.84 dBuV

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 33 of 47 Pages

Radiated Emission Test 30 MHz - 1 GHz
according to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in vertical position front on top
Serial no.: R118825	
Applicant: Lite-On Automotive Corporaton	
Test site: Open area test-site I	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: 07/31/2000 Operator: R. Kohlhäufl	
Test performed: by hand File name:	

Detector: Peak	List of values: Selected by hand



Result:	Project file: 52209-00390

Radiated Emission Test 30 MHz - 1 GHz
according to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in vertical position front on top
Serial no.: R118825	
Applicant: Lite-On Automotive Corporaton	
Test site: Open area test-site I	
Tested on: Test distance 3 meters Horizontal Polarization	
Date of test: 07/31/2000 Operator: R. Kohlhäufl	
Test performed: by hand File name:	

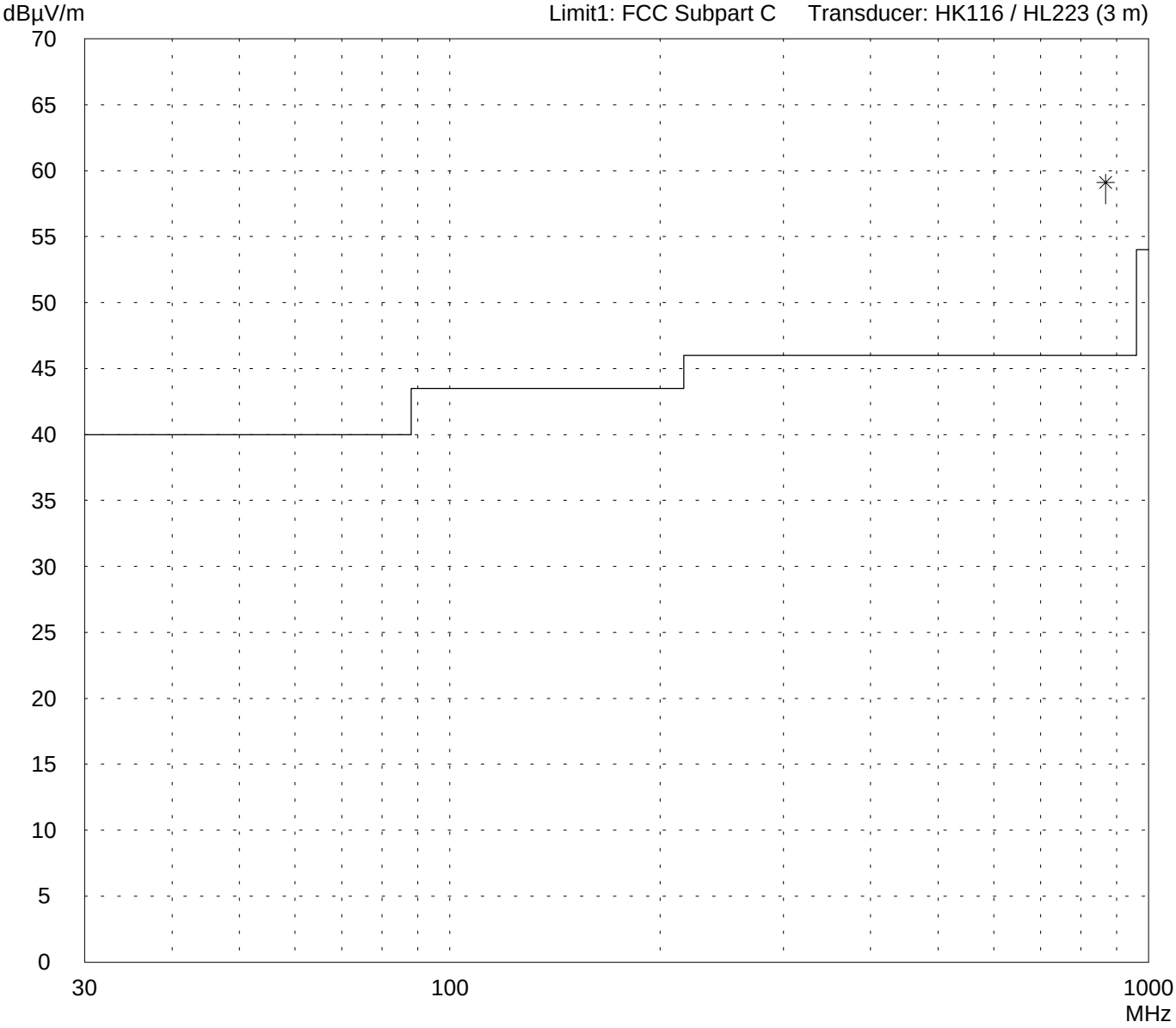
Detector: Peak	List of values: Selected by hand

Frequency MHz	*Reading dBµV*	*Correction factor dB*	*Value dBµV/m*	*Limit dBµV/m*	*Limit exceeded*
433.90	57.3	23.0	80.3	46.0	*
867.86	28.7	32.6	61.3	46.0	*

Result:	Project file: 52209-00390

Radiated Emission Test 30 MHz - 1 GHz
according to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC
Serial no.: R118825	
Applicant: Lite-On Automotive Corporaton	- EUT in vertical position front on top
Test site: Open area test-site I	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: 07/31/2000 / Operator: R. Kohlhäufl	
Test performed: by hand / File name:	
Detector: Peak	List of values: Selected by hand



Result:

Project file: 52209-00390

Senton GmbH / EMI/EMC Laboratories / Aeussere Fruehlingsstrasse 45 / D-94315 Straubing / Tel. +49 9421 55220

Radiated Emission Test 30 MHz - 1 GHz
according to FCC Part 15 Subpart C

Model: TOAD RK 30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC
Serial no.: R118825	
Applicant: Lite-On Automotive Corporaton	- EUT in vertical position front on top
Test site: Open area test-site I	
Tested on: Test distance 3 meters Vertical Polarization	
Date of test: 07/31/2000 / Operator: R. Kohlhäufl	
Test performed: by hand / File name:	

Detector: Peak	List of values: Selected by hand

Frequency MHz	*Reading dBµV*	*Correction factor dB*	*Value dBµV/m*	*Limit dBµV/m*	*Limit exceeded*
433.90	60.5	23.0	83.5	46.0	*
867.86	26.5	32.6	59.1	46.0	*

Result:	Project file: 52209-00390

Senton GmbH / EMI/EMC Laboratories / Aeussere Fruehlingsstrasse 45 / D-94315 Straubing / Tel. +49 9421 55220

Radiated Emission 1 GHz - 5 GHz
according to FCC Part 15 Subpart C, §15.231.b

Model: TOAD RK 30
Type: Transmitter
Serial No.: R118825
Applicant: Lite-On Automotive Corporation
Test-site: Semi anechoic room
Test distance: 3 meters
Date of test: 07/24/2000
Operator: T. Eberl
Mode: - transmitting continuously
- with battery supply 3 V DC

- EUT in horizontal position with LED on top
Detector: Peak

Frequency [GHz]	Polarization	Analyzer-reading [dBµV]	Antenna-correction [dB]	Cable-correction [dB]	Fieldstrength Peak [dBµV/m]	Limit Peak [dBµV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBµV/m]	Limit Average [dBµV/m]	Limit exceeded
1.3017	vertical	22.3	26.4	0.5	49.2	74.0	5.8	43.4	54.0	
1.7356	vertical	13.9	27.9	0.5	42.3	80.8	5.8	36.5	60.8	

Note: Frequency error of markers is depending on span of analyzer. Therefore exact frequency values are calculated as harmonics of fundamental frequency.
Result: The limits are kept.

Radiated Emission 1 GHz - 5 GHz
according to FCC Part 15 Subpart C, §15.231.b

Model: TOAD RK 30
Type: Transmitter
Serial No.: R118825
Applicant: Lite-On Automotive Corporation
Test-site: Open area test-site I
Test distance: 3 meters
Date of test: 07/24/2000
Operator: T. Eberl
Mode: - transmitting continuously
- with battery supply 3 V DC

- EUT in horizontal position with right hand side on table
Detector: Peak

Frequency [GHz]	Polarization	Analyzer-reading [dBµV]	Antenna-correction [dB]	Cable-correction [dB]	Fieldstrength Peak [dBµV/m]	Limit Peak [dBµV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBµV/m]	Limit Average [dBµV/m]	Limit exceeded
1.3017	vertical	26.1	26.4	0.5	53.0	74.0	5.8	47.2	54.0	
1.7356	vertical	16.4	27.9	0.5	44.8	80.8	5.8	39.0	60.8	

Note: Frequency error of markers is depending on span of analyzer. Therefore exact frequency values are calculated as harmonics of fundamental frequency.
Result: The limits are kept.

Radiated Emission 1 GHz - 5 GHz
according to FCC Part 15 Subpart C, §15.231.b

Model: TOAD RK 30
Type: Transmitter
Serial No.: R118825
Applicant: Lite-On Automotive Corporation
Test-site: Open area test-site I
Test distance: 3 meters
Date of test: 07/24/2000
Operator: T. Eberl
Mode: - transmitting continuously
- with battery supply 3 V DC

- EUT in vertical position with front on top
Detector: Peak

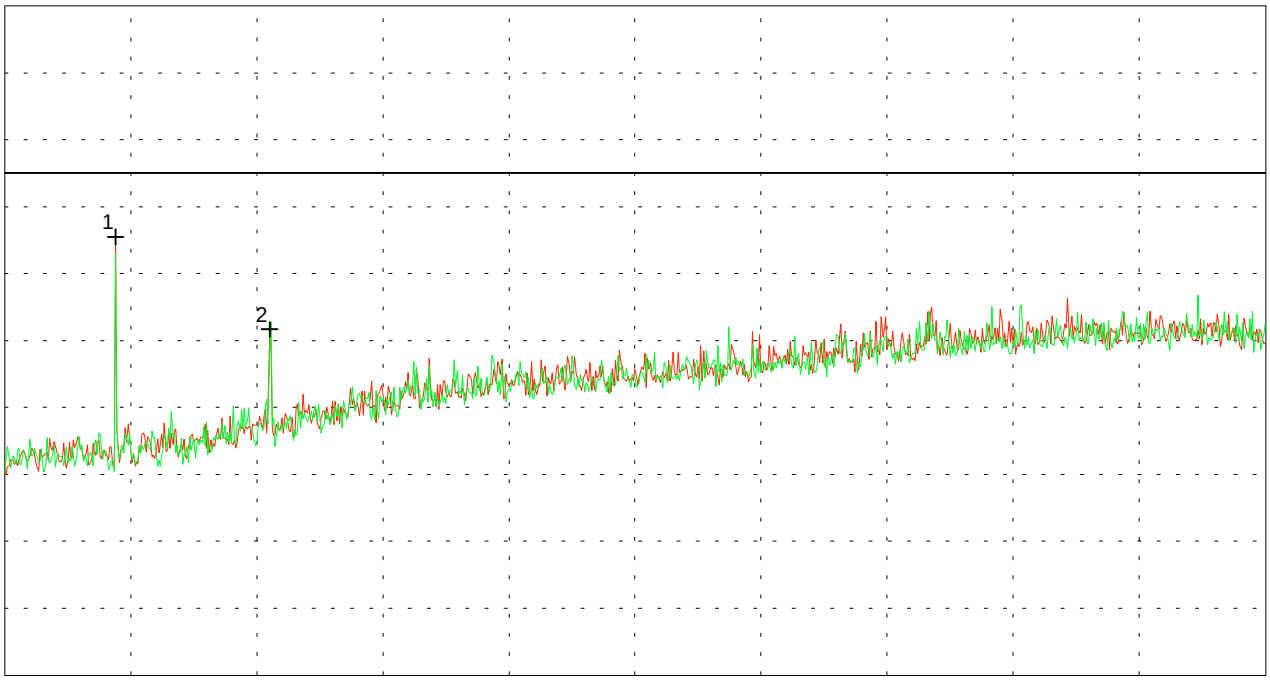
Frequency [GHz]	Polarization	Analyzer-reading [dBµV]	Antenna-correction [dB]	Cable-correction [dB]	Fieldstrength Peak [dBµV/m]	Limit Peak [dBµV/m]	Duty cycle correction [dB]	Fieldstrength Average [dBµV/m]	Limit Average [dBµV/m]	Limit exceeded
1.3017	vertical	17.2	26.4	0.5	44.1	74.0	5.8	38.3	54.0	

Note: Frequency error of markers is depending on span of analyzer. Therefore exact frequency values are calculated as harmonics of fundamental frequency.
Result: The limits are kept.

Radiated emission test 1GHz - 4.5 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in horizontal position with LED on top Test distance: 3 m Channel A : Horizontal polarization Channel B : vertical polarisation
Serial No.: R118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 66.5 dBµV/m ATT 0 dB Ref. Offset -30.5 dB
5 dB/Div.



Start 1.000 GHz Stop 4.500 GHz
RBW 1 MHz VBW 1 MHz SWP 20 ms

Multi Marker List

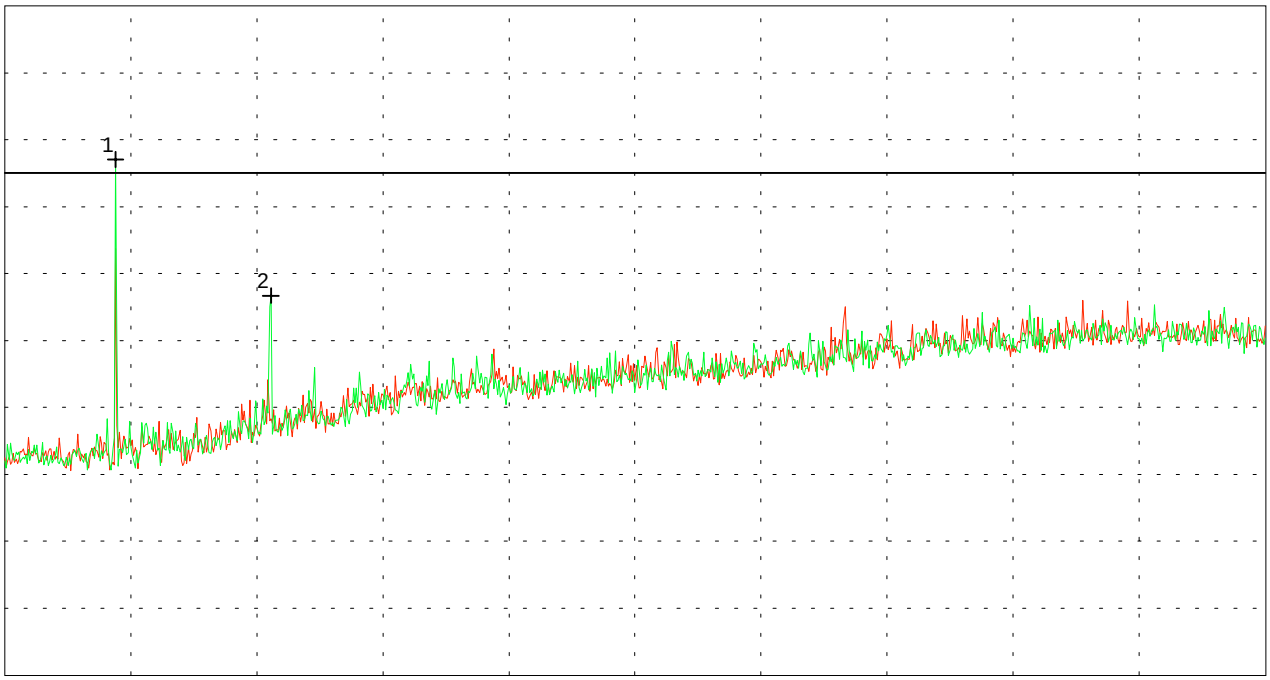
No. 1	1.307222 GHz	49.24 dBµV/m	B
No. 2	1.735000 GHz	42.33 dBµV/m	B

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 41 of 47 Pages

Radiated emission test 1GHz - 4.5 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in horizontal position with right side on table Test distance: 3 m Channel A : Horizontal polarization Channel B : vertical polarisation
Serial No.: R118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 66.5 dBµV/m ATT 0 dB Ref. Offset -30.5 dB
5 dB/Div.



Start 1.000 GHz Stop 4.500 GHz
RBW 1 MHz VBW 1 MHz SWP 20 ms

Multi Marker List

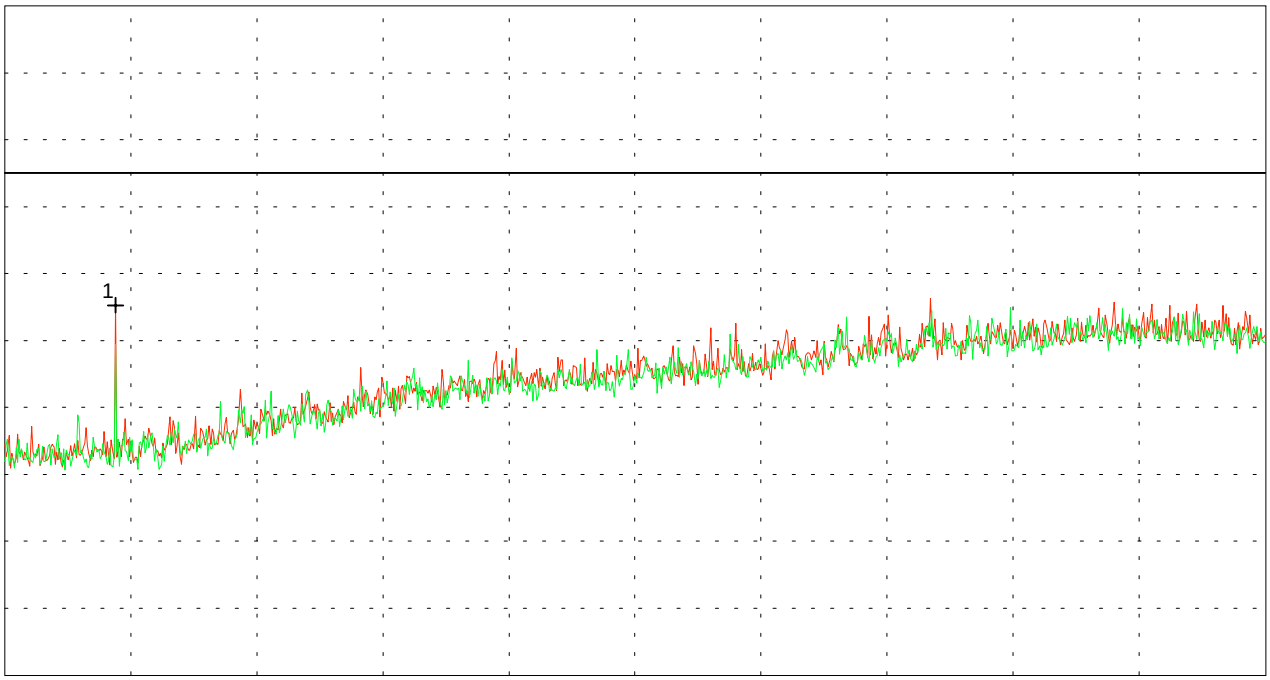
No. 1	1.307222 GHz	55.03 dBµV/m	B
No. 2	1.738889 GHz	44.84 dBµV/m	B

Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 42 of 47 Pages

Radiated emission test 1GHz - 4.5 GHz acc. to FCC Part 15 Subpart C

Model: TOAD RK30 transmitter	Mode: - transmitting continuously - with battery supply 3.0 V DC - EUT in vertical position with front on top Test distance: 3 m Channel A : Horizontal polarization Channel B : vertical polarisation
Serial No.: R118825	
Applicant: Lite-On Automotive Corporation	

Ref.Level 66.5 dBµV/m ATT 0 dB Ref. Offset -30.5 dB
5 dB/Div.



Start 1.000 GHz Stop 4.500 GHz
RBW 1 MHz VBW 1 MHz SWP 20 ms

Multi Marker List

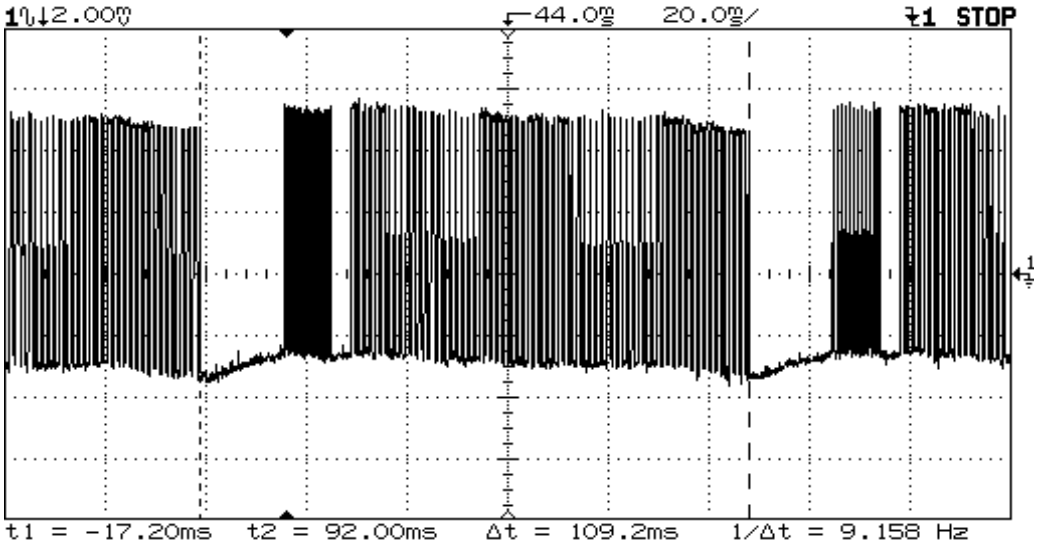
No. 1	1.307222 GHz	44.13 dBµV/m	B

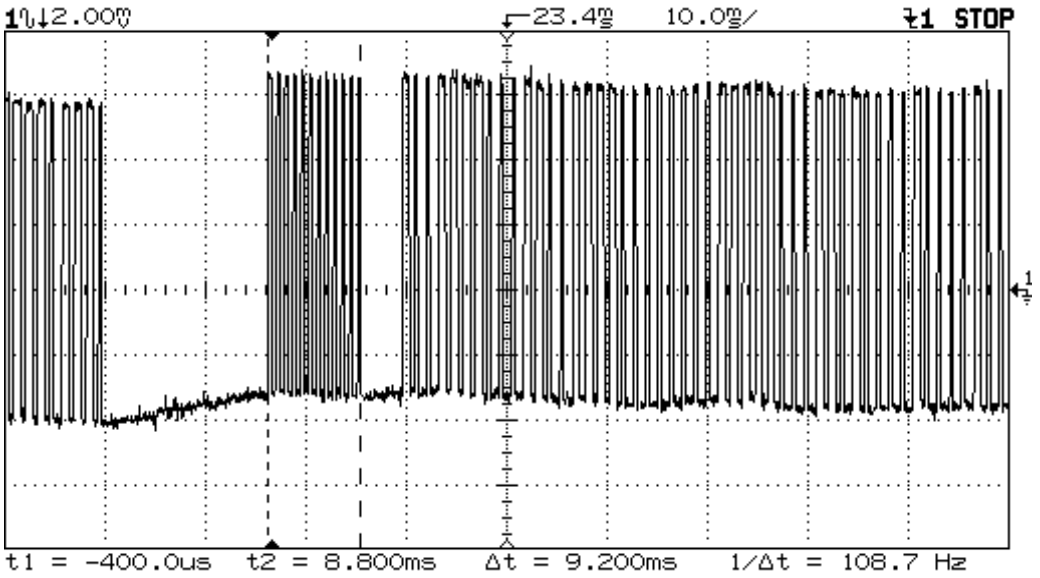
Tested by: Thomas Eberl	Project-No.: 52209-00390
Date: 07/24/2000	Page 43 of 47 Pages

Duty Cycle Test
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (I4.10)

Model:	TOAD RK 30
Type:	Transmitter
Serial No.:	R118825
Applicant:	Lite-On Automotive Corporation
Test-site:	Shielded room No.5

Date of test:	07/31/2000
Operator:	R. Kohlhäufl
Mode:	- transmitting continuously - with battery supply 3 V DC

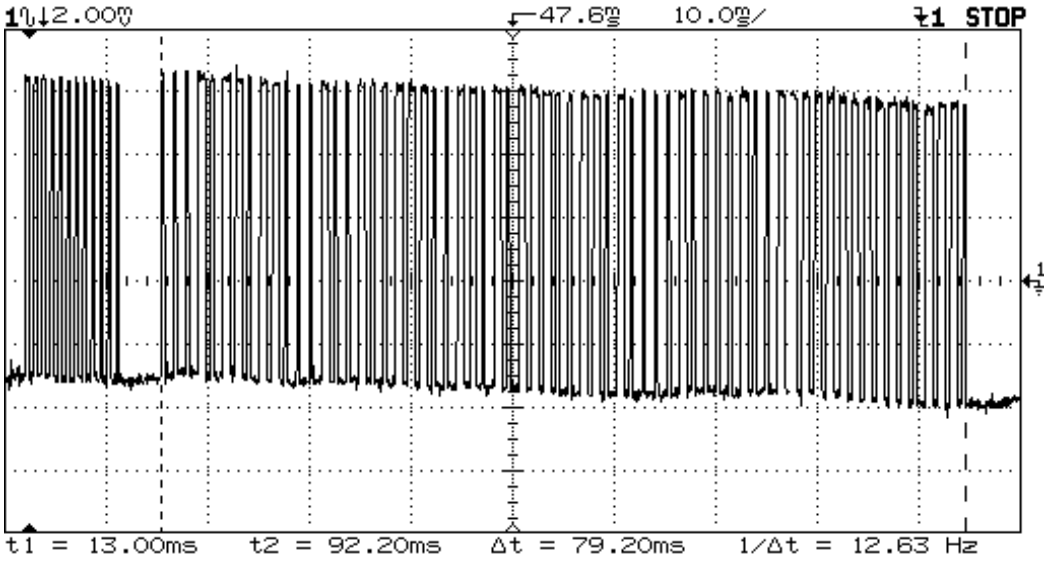


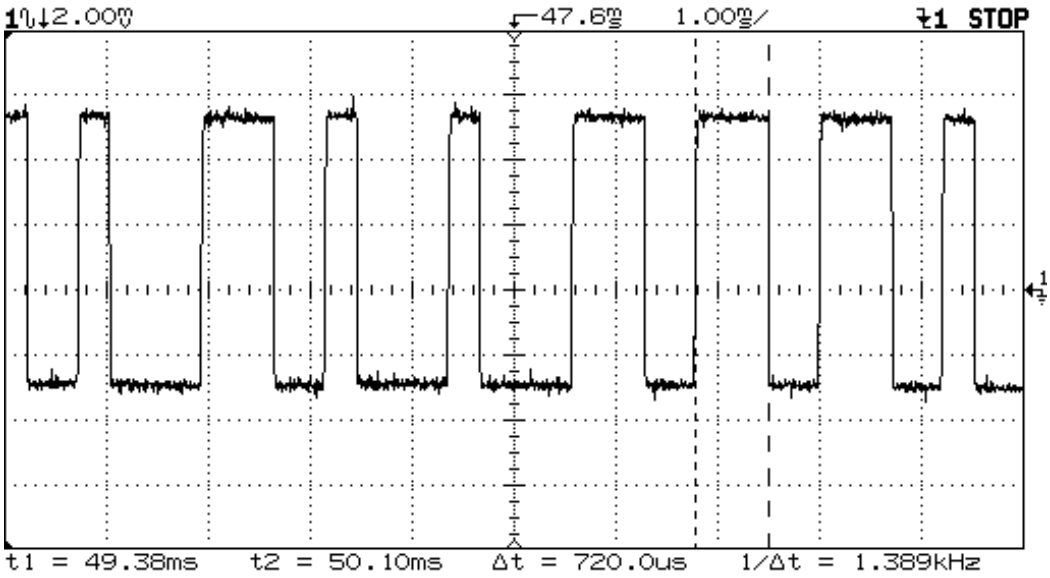


Duty Cycle Test (continued)
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (I4.10)

Model:	TOAD RK 30
Type:	Transmitter
Serial No.:	R118825
Applicant:	Lite-On Automotive Corporation
Test-site:	Shielded room No.5

Date of test:	07/31/2000
Operator:	R. Kohlhäufl
Mode:	- transmitting continuously - with battery supply 3 V DC

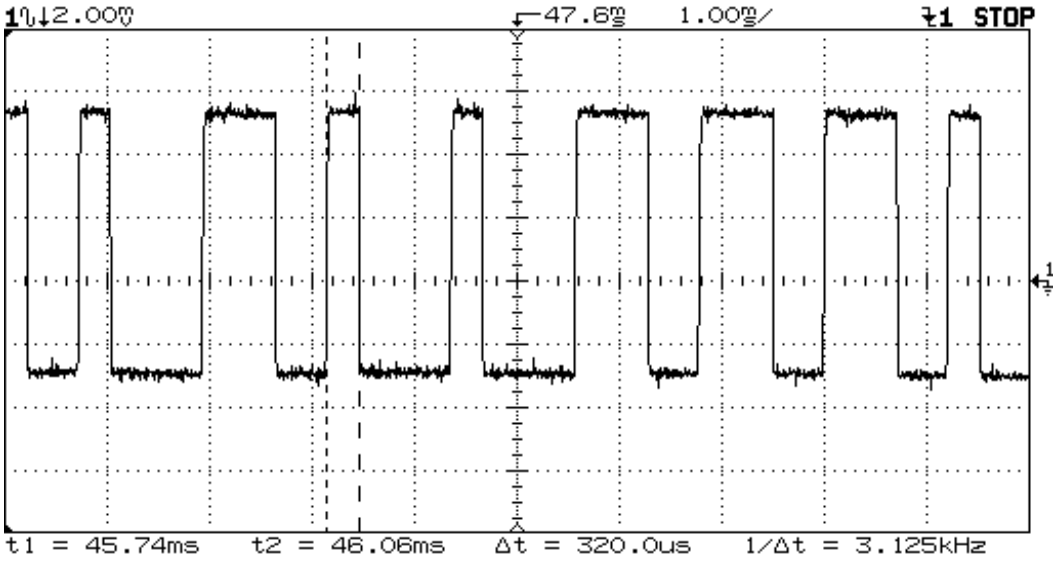




Duty Cycle Test (continued)
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (I4.10)

Model:	TOAD RK 30
Type:	Transmitter
Serial No.:	R118825
Applicant:	Lite-On Automotive Corporation
Test-site:	Open area test-site I

Date of test:	07/31/2000
Operator:	R. Kohlhäufl
Mode:	- transmitting continuously - with battery supply 3 V DC



Duty Cycle Test (continued)
according to FCC Part 15 Subpart C, §15.231 / ANSI C63.4-1992 (I4.10)

Model:	TOAD RK 30
Type:	Transmitter
Serial No.:	R118825
Applicant:	Lite-On Automotive Corporation
Test-site:	Shielded room No.5
Date of test:	07/31/2000
Operator:	R. Kohlhäufl
Mode:	- transmitting continuously - with battery supply 3 V DC

(standard mode)

	Number of pulses	T [ms]	Duty Cycle	Duty Cycle Correction [dB]
Pulse Train		109.200	0.399	-8.0
Transmitter ON (long time)	1	9.200		
Transmitter ON (long time)	33	0.720		
Transmitter ON (short time)	33	0.320		

(worst case mode)

	Number of pulses	T [ms]	Duty Cycle	Duty Cycle Correction [dB]
Pulse Train		109.200	0.516	-5.8
Transmitter ON (long time)	1	9.200		
Transmitter ON (long time)	65	0.720		
Transmitter ON (short time)	1	0.320		