TEST REPORT CONCERNING THE COMPLIANCE OF A TRANSMITTER FOR A REMOTE KEYLESS ENTRY SYSTEM (RKE), BRAND TRW, MODEL 29T, WITH 47 CFR PART 15 (2006-08-14).

FCC listed	: 90828
Industry Canada	: IC3501
VCCI registered	: R-1518, C-1598

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MEASUREMENT/TECHNICAL REPORT

TRW Automotive

Model : 29T

FCC ID: GQ4-29T

May 15, 2007

This report concerns:	Original grant/certification ~~Class 2 change~~ ~~Verification~~		
Equipment type:	Transmitter for a Remote Keyless Entry System (RKE)		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	~~Yes~~	~~No~~	n.a.

Report prepared by:		
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	Company name	: TNO Electronic Products & Services (EPS) B.V.
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The data taken for this test and report herein was done in accordance with 47 CFR Part 15 and the measurement procedures of ANSI C63.4-2003. TNO Electronic Products & Services (EPS) B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: May 15, 2007 Signature:

H.J. Pieters
Project Manager TNO Electronic Products & Services (EPS) B.V.

Description of test item

Test item	:	Transmitter for a Remote Keyless Entry System (RKE)
Manufacturer	:	TRW Automotive
Brand	:	TRW
Model	:	29T
Serial number(s)	:	-
Revision	:	Rev. A
Receipt date	:	April 27, 2007

Applicant information

Applicant's representative	:	Mr. M. Koskella
Company	:	TRW Automotive
Address	:	24175 Research Drive
Postal code	:	MI 48335-2642
City	:	Farmington Hills
PO-box	:	-
Postal code	:	-
City	:	-
Country	:	United States of America
Telephone number	:	+1 248 442 5304
Telefax number	:	+1 248 478 7241

Test(s) performed

Location	:	Niekerk
Test(s) started	:	May 2, 2007
Test(s) completed	:	May 14, 2007
Purpose of test(s)	:	Equipment Authorisation (Certification).
Test specification(s)	:	47 CFR Part 15 (2006-08-14)
Test engineers	:	O.H. Hoekstra
Report written by	:	O.H. Hoekstra
Report date	:	May 15 , 2007

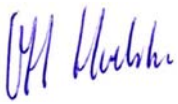


Table of contents

1 General information.

1.1 Product description.

1.1.1 Introduction.

The EUT is a Radio Frequency (RF) Remote Keyless Entry System (RKE) that allows the driver to remotely control the door locking and unlocking of his vehicle.

1.2 Related submittal(s) and/or Grant(s).

Not applicable.

1.3 Tested system details.

Details and an overview of the system and all of its components, as it has been tested, may be found below.

EUT	:	Transmitter for a Remote Keyless Entry System (RKE)
Manufacturer	:	TRW Automotive
Brand	:	TRW
Model	:	29T
Serial number	:	-
Voltage input rating	:	3 VDC (battery type CR2025)
Current input rating	:	--
Frequency	:	315 MHz (314.96 MHz to 315.04 MHz)
Antenna	:	internal
Remarks	:	none

Key with transmitter, brand TRW, model 29T

1.3.1 Description of input and output ports.

The EUT is battery operated only and there are no actual input and output ports present.

1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (2006-08-14), sections 15.205, 15.231 and 15.209.

The test methods, which have been used, are based on ANSI C63.4: 2003.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters.
Radiated emission tests below 30 MHz were performed at a measurement distance of 3 meters and if necessary at 10 and 30 meters. To calculate the field strength level from these results to the appropriate distance at which the limit is specified, the computation method in appendix 1 has been applied.

1.5 Test facility.

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (EPS) B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 2, section 2.948.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at http://www.fcc.gov.

1.6 Test conditions.

Normal test conditions.

Temperature (*)	: +15°C to +35°C
Relative humidity(*)	: 20 % to 75 %
Supply voltage	: not applicable, the equipment under test is battery operated
Air pressure	: 950 – 1050 hPa

* When is was impracticable to carry out the tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests are stated separately.

2 System test configuration.

2.1 Justification.

The justification and manipulation of cables and equipment in order to simulate a worst-case behavior of the test setup has been carried out as prescribed in ANSI C63.4: 2003.

2.2 EUT mode of operation.

The EUT has been tested in modulated transmit mode, i.e. the EUT is transmitting while continuously transmitting data.

All test set ups have been documented in pictures in the documentation package which will be submitted to the Commission

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance with the applicable sections of 47 CFR Part 15.

2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance with the appropriate sections of 47 CFR Part 15.

2.5 Block diagram of the EUT.

The block diagram is available in the technical documentation package which will be submitted to the Commission.

2.6 Schematics of the EUT.

The schematics are available in the technical documentation package which will be submitted to the Commission.

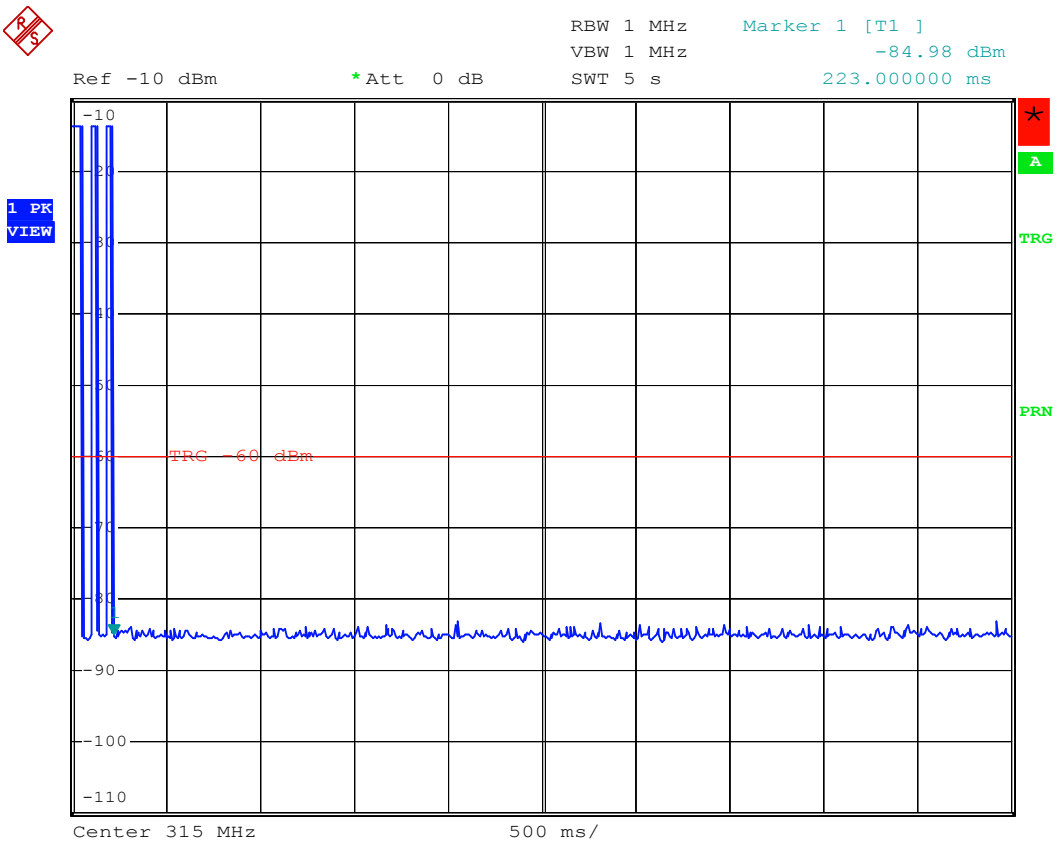
2.7 Part list of the EUT.

The part list is available in the technical documentation package which will be submitted to the Commission.

3 Shut off time of the transmitter.

The shut off time of the transmitter shall be less than 5 seconds after release.

The shut off time is less than 223 ms.



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Test engineer

Signature :

Name : O.H. Hoekstra

Date : May 5, 2007

4 Radiated emission data.

4.1 Radiated field strength measurements (30 MHz – 3150 MHz, E-field).

4.1.1 Average and Quasi peak values of the emissions

Frequency (MHz)	Measurement results dB(µV)/m @ 3 metres		Detector	Limits dB(µV)/m @ 3 metres	Margin (dB)		Result
	Vertical	Horizontal			Vertical	Horizontal	
30-315	< 20.0	< 20.0	QP	40.0-55.6	< -20.0	< -20.0	PASS
315	55.2	60.1	AV	75.6	-20.4	-15.5	PASS
630	50.3	51.7	AV	55.6	-5.3	-3.9	PASS
945	46.1	45.3	AV	55.6	-9.5	-10.3	PASS
1260	49.2	49.8	AV	55.6	-6.4	-5.8	PASS
1575	46.7	49.2	AV	54.0	-7.3	-4.8	PASS
1890	34.0	35.0	AV	55.6	-21.6	-20.6	PASS
2205	32.6	34.7	AV	54.0	-21.4	-19.3	PASS
2520	50.2	50.9	AV	55.6	-5.4	-4.7	PASS
2835	39.6	40.9	AV	54.0	-14.4	-13.1	PASS
3150	38.4	40.8	AV	55.6	-17.2	-14.8	PASS

Table 1: Radiated emissions of the EUT, Average and Quasi peak values.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, section 15.231, are depicted in table 1.

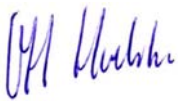
Notes:

1. (AV) average detector
2. (QP) quasi peak detector
3. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.
4. Up to the 10 th harmonic of the transmit frequency of 315 MHz

Calculation of average values:

Average values are calculated from measurements with a peak detector and a correction factor of –12.57 dB. Information about the calculation of the worst case correction factor can be found in the document: “ON TIME calcs 01-27-2007_1.pdf”.

Test engineer

signature : 

Name : O.H. Hoekstra

Date : May 2, 2007

4.1.2 Peak values of the emissions

Frequency (MHz)	Measurement results dB(µV)/m @ 3 metres		Detector	Limits dB(µV)/m @ 3 metres	Margin (dB)		Result
	Vertical	Horizontal			Vertical	Horizontal	
315	65.8	72.7	PK	95.6	-29.8	-22.9	PASS
630	62.9	64.3	PK	75.6	-12.7	-11.3	PASS
945	58.7	57.9	PK	75.6	-16.9	-17.7	PASS
1260	61.8	62.4	PK	75.6	-13.8	-13.2	PASS
1575	59.3	61.8	PK	74.0	-14.7	-12.2	PASS
1890	46.6	47.6	PK	75.6	-29.0	-28.0	PASS
2205	45.2	47.3	PK	74.0	-28.8	-26.7	PASS
2520	62.8	63.5	PK	75.6	-12.8	-12.1	PASS
2835	52.2	53.5	PK	74.0	-21.8	-20.5	PASS
3150	51.0	53.4	PK	75.6	-24.6	-22.2	PASS

Table 2: Radiated emissions of the EUT, Peak values.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, section 15.35, are depicted in table 2.

Notes:

1. (PK) peak detector.
2. Only for frequencies where average radiated emission measurements are specified.
3. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.
4. Up to the 10 th harmonic of the transmit frequency of 315 MHz.

Test engineer

signature : 

Name : O.H. Hoekstra

Date : May 2, 2007

4.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).

Frequency (MHz)	Measurement results dBµV/m		Limits Part 15.209 (µV)/m
	3 meters	10 meters	
0.009 - 0.490	n.i.	n.i.	2400/F(kHz) (300 m)
0.490-1.705	n.i.	n.i.	24000/F(kHz) (30 m)
1.705 - 30.0	n.i.	n.i.	30 (30 m)

Table 3: Radiated emissions of the EUT.

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, sections 15.205 and 15.209, are depicted in table 3.

Notes:

1. Frequency range: 9-90 kHz and 110-490 kHz: Average detector (AV) used during measurements. Other frequencies: Quasi peak detector (QP) is used.
2. n.i. indicates that no field strength values related to the EUT could be measured for the listed frequency or for the listed frequency range.
3. The reported field strength values are the worst case values at the indicated frequency, obtained by rotation of the EUT and orientation of the antenna.

Test engineer

signature : 

Name : O.H. Hoekstra

Date : May 2, 2007

5 Conducted emission data.

5.1 Conducted emission data of the EUT (full configuration).

Not applicable, the EUT is battery operated only.

6 Carrier stability under special conditions.

6.1 Carrier stability with respect to the operating frequency.

6.1.1 Frequency stability (on 315 MHz) in accordance with 47 CFR Part 15:

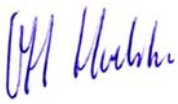
No particular requirements other than in section 3 of this report.
From measurements performed as indicated below, the frequency stability will not cause non-compliant situations with respect to exclusion bands or emissions outside permissible bands (band edges).

Stability under special conditions Temperature (°C)	Measured frequency (kHz)	Frequency deviation kHz
+21.0	315015.6 (reference)	N.A.
-20.0	314995.8	-19.8
+50.0	315013.8	-1.8

6.1.2 Amplitude stability (on 315 MHz) in accordance with 47 CFR Part 15, section 15.31 (e).

Not applicable, the EUT is battery operated only.
Measurement data has been derived using new batteries.

Test engineer

Signature : 

Name : O.H. Hoekstra

Date : May 11, 2007

7 Bandwidth of the emission.

The bandwidth of emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Temperature (°C)	Minimum frequency (kHz)	Maximum frequency (kHz)	Bandwidth of the emission	
			(kHz)	%
+21.0	315003.0	315026.4	23.4	0.007
-20.0	314983.8	315003.6	19.8	0.006
+50.0	315001.8	315024.0	22.2	0.007

Test engineer

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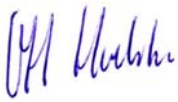
Date : May 11, 2007

8 Plots of measurement data

For reference purposes and visualization of spectrum analyzer settings during the measurements, a selection of plots of measurement data is included in this test report.

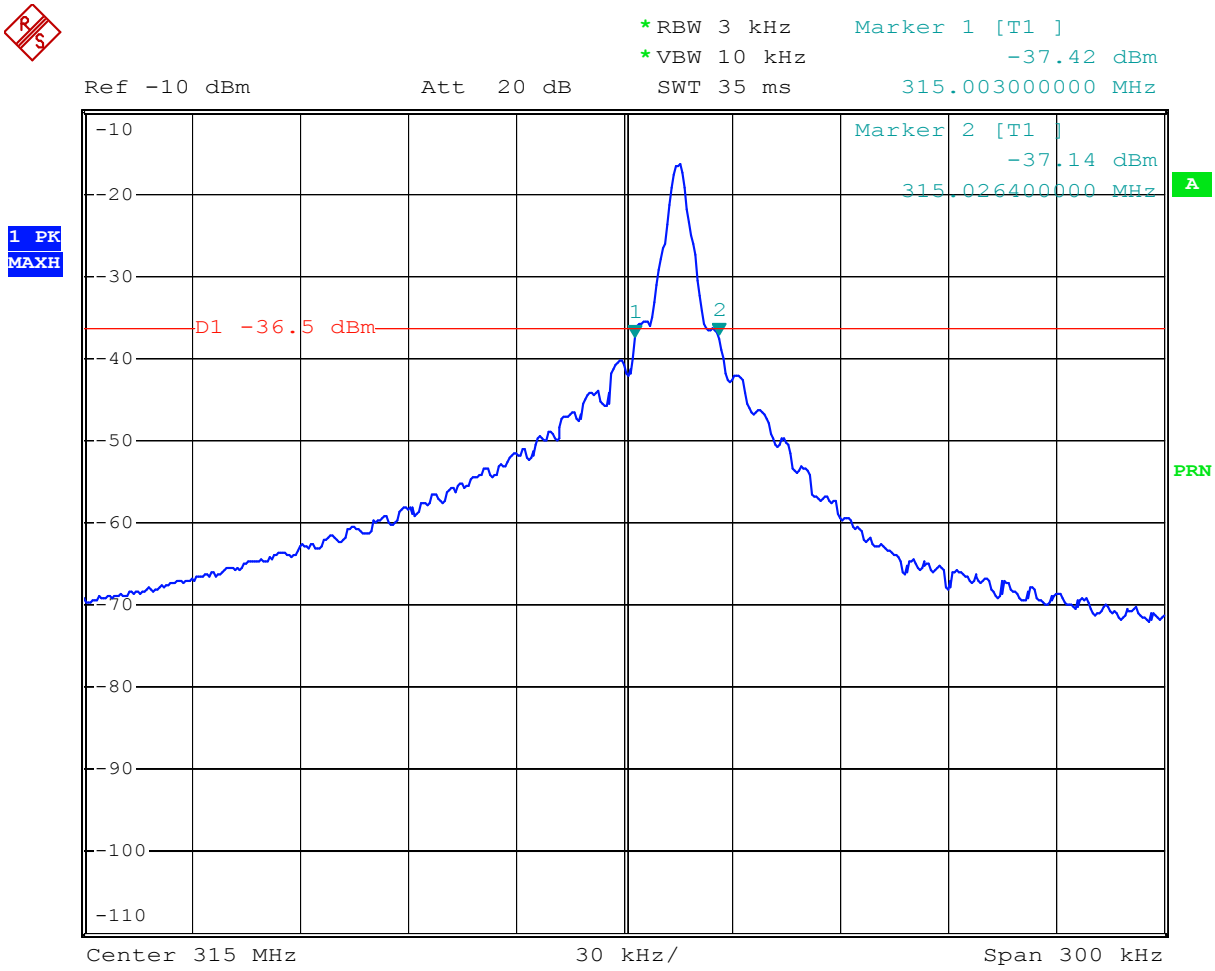
Test engineer

Signature : 

Name : O.H. Hoekstra

Date : May 14, 2007

8.1 Bandwidth of the emission



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Plot 1 – Bandwidth of the emission

9 List of utilized test equipment.

Inventory number	Description	Brand	Model	Last cal.	Next cal.
12476	Antenna mast	EMCO	TR3	-	-
12477	Antenna mast 1-4 mtr	Poelstra	--	-	-
12482	Loop antenna	EMCO	6507	04/2007	04/2008
12483	Guidehorn	EMCO	3115	03/2007	03/2008
12484	Guidehorn	EMCO	3115	03/2007	03/2008
12533	Signalgenerator	MARCONI	2032	03/2007	03/2008
12605	Calibrated dipole 28MHz-1GHz	EMCO	3121c	09/2002	09/2007
12640	Temperature chamber	Heraeus	VEM03/500	01/2007	01/2008
13664	Spectrum analyzer	HP	HP8593E	08/2006	08/2007
13886	Open Area testsite	Comtest	--	07/2005	07/2007
14051	Anechoic room	Comtest	--	-	-
15633	Biconilog Testantenna	Chase	CBL 6111B	02/2007	02/2008
15667	Measuring receiver	R&S	ESCS 30	04/2007	04/2008
99596	Preamplifier 0.5 GHz - 18 GHz	Miteq	AMF-5D-005180-28-13p	07/2006	07/2007

VARIABLE PULSE WIDTH MODULATION **Nominal Condition - Encrypt 50% "1"'s and 50% "0"'s**

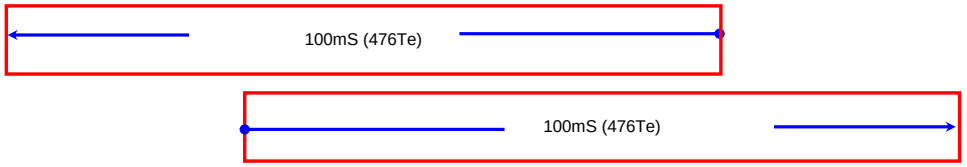
Martin Koskella

1/26/2007

Te =	2.10E-04	seconds

MAX, 200uS + 5%

TOTAL # of Te's in 100mS = 476.1904762



	WAKE UP	DEAD TIME	PREAMBLE	SYNC	ENCRYPT	FIXED	GUARD BAND	PREAMBLE	SYNC	ENCRYPT	FIXED
ON TIME	33%	0%	33%	0%	50%	50%	0%	33%	0%	50%	50%
DURATION	50.4mS (240 Te)	51.2mS (243 Te)	30Te	10Te	33 BITS 99 Te	35 BITS 105 Te	51.2mS (243 Te)	30Te	10Te	33 BITS 99 Te	35 BITS 105 Te
			CODE WORD					CODE WORD			

	Te	Te	Te	ON	OFF	DUTY	# of Te's	TOT TIME (S)	ON TIME (S)
	ONE BIT								
	200uS	200uS	200uS						
WAKE UP	1	0	0	1	2	33%	240	0.050400	0.016800
DEAD TIME	0	0	0	0	3	0%	243	0.051030	0.000000
PREAMBLE	1	0	0	1	2	33%	30	0.006300	0.002100
SYNC	0	0	0	0	3	0%	10	0.002100	0.000000
ENCRYPT	1	0 / 1	0	1.5	1.5	50%	99	0.020790	0.010395
FIXED	1	0 / 1	0	1.5	1.5	50%	105	0.022050	0.011025
					Te's in CODE WORD		244	0.051240	0.023520
					Remaining Te's in DEAD TIME (or GUARD BAND) within 100 mS		232.1904762	0.048760	0.000000
						SUM	**476.19**	**0.100**	**0.02352**

	24% ON TIME IN 100mS	
dB_{AVG} = 20 LOG (T_{ON}/0.1)	-12.57	dB