InterLab®

FCC Measurement/Technical Report on

Vehicle remote keyless entry transmitter TFWB1U758 Nissan X61A

Report Reference: MDE_ALPS_0703_FCCa

Test Laboratory:

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Germany
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Deutscher Akkreditierungs Rat
DAR
DAT-P-192/99-01

CTIA Authorized Test Lab
LAB CODE 20011121-00

Note:
The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the testing laboratory.

Table of Contents

0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for an Intentional Radiator (Periodic operation in the band above 70 MHz)

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-06 Edition) and 15 (10-1-06 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.231 Periodic operation in the band 40.66-40.70 MHz, above 70 MHz

Note:
none

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.2 Measurement Summary.

0.2 Measurement Summary

FCC Part 15, Subpart C	§ 15.231		
Spurious Radiated Emissions			
The measurement was performed according to ANSI C63.4			2003
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 2	Setup_a01	Enclosure	passed

FCC Part 15, Subpart C	§ 15.231		
Duty cycle measurement (based on dwell time measurement)			
The measurement was performed according to FCC § 15.31			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	setup_a01	Enclosure	-

FCC Part 15, Subpart C	§ 15.231		
Peak power output			
The measurement was performed according to FCC § 15.31			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 2	Setup_a01	Enclosure	passed

FCC Part 15, Subpart C	§ 15.231		
Occupied Bandwidth			
The measurement was performed according to FCC § 15.31			10-1-06
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	setup_a01	Enclosure	passed

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Responsible for Accreditation Scope: B. Rethaa

Responsible for Test Report: Madsen

1 Administrative Data

1.1 Testing Laboratory

Company Name:	7 Layers AG
Address	Borsigstr. 11 40880 Ratingen Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

The test facility is also accredited by the following accreditation organisation:

- Deutscher Akkreditierungs Rat	DAR-Registration no. DAT-P-192/99-01
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Thomas Hoell
Report Template Version:	2006-12-18

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Robert Machulec
Date of Test(s):	2007-02-12 to 2007-03-29
Date of Report:	2007-04-20

1.3 Applicant Data

Company Name:	Alps Automotive, Inc.
Address:	1500 Atlantic Boulevard Auburn Hills, Michigan 48326 USA
Contact Person:	Mr. Joseph Keller

1.4 Manufacturer Data

Company Name:	please see applicant data
Address:	
Contact Person:	

2 Product labelling

2.1 FCC ID label

At the time of the report there was no FCC label available.

2.2 Location of the label on the EUT

see above

3 Test object Data

3.1 General EUT Description

Equipment under Test	Vehicle remote keyless entry transmitter
Type Designation:	TFWB1U758 Nissan X61A
Kind of Device:	315 MHz transmitter
(optional)	
Voltage Type:	DC
Voltage level:	3.0 V

General product description:

The vehicle remote keyless entry transmitter is a wireless handheld remote control unit(transmitter only, periodic operation in the band above 70 MHz). The operating frequency is 315 MHz. The transmitter is activated manually by a switch and is deactivated automatically within 5 seconds after release of the switch.

The EUT provides the following ports:

Ports
Enclosure

The main components of the EUT are listed and described in Chapter 3.2

3.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	Date of Receipt
EUT A (Code: 1H018b01)	vehicle remote keyless entry transmitter	TFWB1U758 Nissan X61A	Test sample 1	Coded in type designation	Coded in type designation	2007-02-12
Remark: EUT A is equipped with an integral antenna.						

NOTE: The short description is used to simplify the identification of the EUT in this test report.

3.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	HW Status	SW Status	Serial no.	FCC ID
–	–	–	–	–	–	–

3.4 EUT Setups

This chapter describes the combination of EUTs and ancillary equipment used for testing.

Setup No.	Combination of EUT's	Description
Setup_a01	EUT A	setup for measurements

3.5 Operating Modes

This chapter describes the operating modes of the EUT's used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	periodic operation	Transmitter is sending a pulse coded signal
op-mode 2	continuous operation	Transmitter is sending a CW signal continuously. Special op-mode for test purpose only.

4 Test Results

4.1 Spurious radiated emissions

Standard FCC Part 15, 10-1-06
Subpart C

The test was performed according to: ANSI C 63.4, 2003

4.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.
The radiated emissions measurements were made in a typical installation configuration.
The measurement procedure is implemented into the EMI test software ES-K1 from R&S.
1. Measurement up to 30 MHz
The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003. The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.
The radiated emissions measurements were made in a typical installation configuration.
The measurement procedure is implemented into the EMI test software ES-K1 from R&S.
The Loop antenna HFH2-Z2 is used.
Step 1: pre measurement
- Anechoic chamber
- Antenna distance: 10m
- Detector: Peak-Maxhold
- Frequency range: 0.009 - 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF–Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.
Step 2: final measurement
For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.
- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF–Bandwidth: 200 Hz - 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz
Step 1: Preliminary scan
Preliminary test to identify the highest amplitudes relative to the limit.
Settings for step 1:
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz

- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180 to 180 °
- Turntable step size: 90°
- Height variation range: 1 – 3m
- Height variation step size: 2m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: –180 to 180 °
- Turntable step size: 45°
- Height variation range: 1 – 4m
- Height variation step size: 0.5m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency the turntable azimuth and antenna height, which was determined in step 3, will be adjusted. The turntable azimuth will be slowly varied by +/- 22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined in step 3. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: –22.5° to + 22.5 ° around the value determined in step 2
- Height variation range: -0.25m to + 0.25m around the value determined in step 2

Step 4: final measurement with QP detector

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1s

Measurement above 1GHz
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The measurement distance was reduced to 1m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear distance for field strength measurements, inverse linear-distance squared for the power reference level measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18-25 GHz) are used, the steps 2-4 are omitted. Step 1 was performed with one height of the receiving antenna only.
EMI receiver settings:
- Detector: Peak, Average
- RBW = VBW = 100 kHz
After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

4.1.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.231(b)
(1) A radiated emission test applies to the fundamental frequency.

Frequency Range (MHz)	Limit (dBµV/m)
40.66 – 40.70	67.04
70 – 130	67.04
130 – 174	67.04 – 71.48
174 – 260	71.48
260 – 470	71.48 – 81.93
above 470	81.93

(2) A radiated emission test applies to harmonic/spurs that fall in the restricted bands as listed in § 15.205(a). The maximum permitted QP (< 1GHz) and average (> 1GHz) field strength is listed in § 15.209(a).
(3) FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency Range (MHz)	Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

§15.35(b)..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

4.1.3 Test Protocol

Temperature: 21..23 °C
Air Pressure: 1013..1025 hPa
Humidity: 32..38 %

4.1.3.1 Measurement up to 30 MHz

Op. Mode	Setup	Port
op-mode 2	Setup_a01	Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
0°	–								
90°	–								

Remark: Because of the kind of EUT, especially the size, which is small related to the wavelength (1/100 lambda), no relevant emissions are expected in the frequency range 9 kHz to 30 MHz (theoretical not possible). Nevertheless a check using a near field probe was performed. No relevant emissions have been observed. Consequently no final measurement was performed.

4.1.3.2 Measurement above 30 MHz

Op. Mode	Setup	Port
op-mode 2	Setup_a01	Enclosure

Polarisation	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Vertical + horizontal	315	71.44			75.6			4.16	
	630	42.04			55.6			13.56	
	945	39.64			55.6			15.96	
	1260		49.36	39.80		75.6	55.6	26.24	15.80
	1575		54.12	44.56		74.0	54.0	19.88	9.44
	1890		56.65	47.09		75.6	55.6	18.95	8.51
	2205		59.67	50.11		74.0	54.0	14.33	3.89
	2520		59.96	50.40		75.6	55.6	15.64	5.20
	2835		61.11	51.55		74.0	54.0	12.89	2.45
	3150		61.21	51.65		75.6	55.6	14.39	3.95

Remark: No (further) spurious emissions in the range 20 dB below the limit found. The test was performed in the frequency range from 30 MHz to 3.2 GHz. For this test the EUT sending a CW signal was used. The values listed above include the correction factor of the test system and the duty cycle determined by the test "Dwell Time measurement to determine the duty cycle".

4.1.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 2	passed

4.2 Duty cycle measurement (based on dwell time measurement)

Standard FCC Part 15, 10-1-06
Subpart C

The test was performed according to: FCC §15.31, 10-1-06

4.2.1 Test Description

The Equipment Under Test (EUT) was setup in a shielded room to perform the dwell time measurements.
For analyzer settings please see measurement plots in annex.

4.2.2 Test Limits

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
This test is also performed to determine the duty cycle of the transmitter and calculate the correction factor for pulse modulated transmitter. This factor is used as a correction factor for the field strength measurement.
Duty cycle = ((L1*N1) + (L2*N2) + ... + (Ln*Nn)) / 100 or T, whichever is less
Correction factor = 20 * LOG (Duty cycle)

4.2.3 Test Protocol

Temperature: 21 °C
Air Pressure: 996 hPa
Humidity: 41 %

During testing two different signals were detected. The first one is a wake-up signal and the second one contains coded information for the receiver. Both signals were measured.

Op. Mode	Setup	Port
op-mode 1	setup_a01	Enclosure

Wake-up signal

Step 1	holdover time	Less than 5s
Step 2	cycle to determine the on/off ratio within a cycle (period T)	100 ms
Step 3	sweep of a data word to determine the on time within a data word (L1..LN)	L1=0.396 ms
Step 4	determine the number of pulses (N1..NN)	N1=84

Coded signal

Step 1	holdover time	Less than 5s
Step 2	cycle to determine the on/off ratio within a cycle (period T)	100 ms
Step 3	sweep of a data word to determine the on time within a data word (L1..LN)	L1=0.396 ms L2=0.804 ms L3=4.032 ms
Step 4	determine the number of pulses (N1..NN)	N1=18 N2=23 N3=1

4.2.4 Test result: Duty cycle / correction factor

Wake-up signal

T=100ms; L1=0.396 ms; N1=84;
Duty cycle = (84*0.396 ms) / 100 ms = 0.33264
Correction factor = 20*LOG(0.33264) = –9.56 dB

Coded signal

T=100ms; L1=0.396 ms; L2=0.804 ms; L3=4.032 ms; N1=18; N2=23; N3=1
Duty cycle = ((18*0.396 ms)+(23*0.804 ms) +(1*4.032 ms))/100 ms = 0.29652
Correction factor = 20*LOG(0.29652) = –10.56 dB

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	This test has no result. It is performed to find the correction factor for the test spurious emissions radiated. The wake-up signal leads to the worst case correction factor. Therefore it will be used as spurious emission correction factor.

4.3 Peak power output

Standard FCC Part 15, 10-1-06
Subpart C

The test was performed according to: FCC §15.31, 10-1-06

4.3.1 Test Description

The result is obtained during the test "Spurious radiated emissions".

4.3.2 Test Limits

§15.35(b)..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....
Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

4.3.3 Test Protocol

Temperature: 23 °C
Air Pressure: 1025 hPa
Humidity: 38 %

Op. Mode	Setup	Port
op-mode 2	Setup_a01	Enclosure

Output power dBµV/m	Remarks
71.44	The Limit for 315 MHz devices is 75.6 dBµV/m for the field strength of the fundamental frequency

Remark: Please see annex for the measurement plot.

4.3.4 Test result: Peak power output

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 2	passed

4.4 Occupied bandwidth

Standard FCC Part 15, 10-1-06
Subpart C

The test was performed according to: FCC §15.31, 10-1-06

4.4.1 Test Description

The Equipment Under Test (EUT) was setup in a shielded room to perform the occupied bandwidth measurements.
For analyzer settings please see measurement plots in annex.

4.4.2 Test Limits

FCC Part 15, Subpart C, §15.231 (c)The maximum 20 dB bandwidth of a transmitter operating at a frequency range:
70 MHz to 900 MHz is 0.25% of the centre frequency
above 900 MHz is 0.5% of the centre frequency

4.4.3 Test Protocol

Temperature: 21 °C
Air Pressure: 996 hPa
Humidity: 41 %

Op. Mode	Setup	Port
op-mode 1	setup_a01	Enclosure

99% bandwidth kHz	20 dB bandwidth kHz	Remarks
23	8.8	The limit for 20 dB bandwidth is 315MHz * 0.25% = 787.5 kHz

Remark: Please see annex for the measurement plot.

4.4.4 Test result: Occupied bandwidth

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed

5 Test Equipment

EUT Digital Signalling System

Equipment	Type	Serial No.	Manufacturer
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz
Signalling Unit for Bluetooth Spurious Emissions	PTW60	100004	Rohde & Schwarz
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz

EMI Test System

Equipment	Type	Serial No.	Manufacturer
Comparison Noise Emitter	CNE III	99/016	York
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz
Signal Generator	SMR 20	846834/008	Rohde & Schwarz

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel
Biconical dipole	VUBA 9117	9117108	Schwarzbeck
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32	849785	Miteq
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35	896037	Miteq
Broadband Amplifier 45MHz-27GHz	JS4-00102600-42	619368	Miteq
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 + W38.01-2	Kabel Kusch
Cable "ESI to Horn Antenna"	UFB311A + UFB293C	W18.02-2 + W38.02-2	Rosenberger-Microcoax
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic
KUEP pre amplifier	Kuep 00304000	001	7layers
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz

Auxiliary Test Equipment

Equipment	Type	Serial No.	Manufacturer
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel
Digital Multimeter 01	Voltcraft M-3860M	IJ096055	Conrad
Digital Multimeter 02	Voltcraft M-3860M	IJ095955	Conrad
Digital Oscilloscope	TDS 784C	B021311	Tektronix
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz
Notch Filter ultra stable	WRCA800/960-6E	24	Wainwright
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz
Temperature Chamber	VT 4002	58566002150010	Vötsch
Temperature Chamber	KWP 120/70	59226012190010	Weiss
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH

Anechoic Chamber

Equipment	Type	Serial No.	Manufacturer
Air Compressor (pneumatic)			Atlas Copco
Controller	CO 2000	CO2000/328/12470406 /L	Innco innovative constructions GmbH
EMC Camera	CE-CAM/1		CE-SYS
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter telephone systems / modem	B84312-C40-B1		Siemens&Matsushita
Filter Universal 1A	B84312-C30-H3		Siemens&Matsushita
Fully/Semi AE Chamber	10.58x6.38x6		Frankonia
Turntable	DS 420S	420/573/99	HD GmbH, H. Deisel
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H. Deisel

Equipment	Type	Serial No.	Manufacturer
10 MHz Reference	MFS	5489/001	Efratom
Power Meter 832025/059	NRVD	832025/059	Rohde & Schwarz
Power Sensor A 832279/013	NRV-Z1	832279/013	Rohde & Schwarz
Power Sensor B 832279/015	NRV-Z1	832279/015	Rohde & Schwarz
Power Supply	E3632A	MY40003776	Agilent
Power Supply	PS-2403D	-	Conrad
RF Step Attenuator 833695/001	RSP	833695/001	Rohde & Schwarz
Rubidium Frequency Normal	MFS	002	Efratom
Signal Analyzer FSIQ26 832695/007	FSIQ26	832695/007	Rohde & Schwarz
Signal Generator 833680/003	SMP 03	833680/003	Rohde & Schwarz
Signal Generator A 834344/002	SMIQ03B	834344/002	Rohde & Schwarz
Signal Generator B 832870/017	SMIQ03B	832870/017	Rohde & Schwarz
Signal Switching and Conditioning Unit	SSCU	338826/005	Rohde & Schwarz
Signalling Unit PTW60 838312/014	PTW60 for TS8960	838312/014	Rohde & Schwarz
System Controller 829323/008	PSM12	829323/008	Rohde & Schwarz

6 Photo Report

Photo 1: Test setup for radiated measurements

Photo 2: EUT (front side)

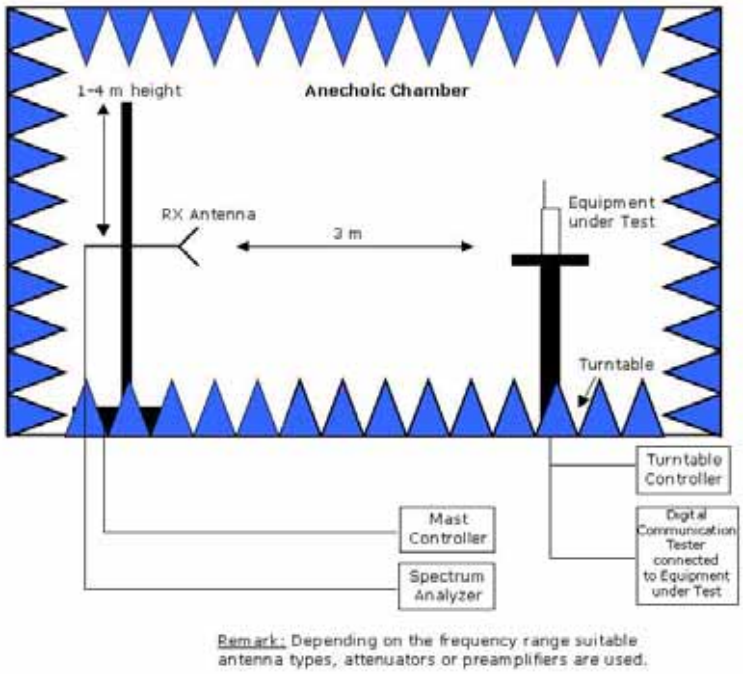
Photo 3: EUT (rear side)

Photo 4: EUT (enclosure)

Photo 5: EUT (PCB front side)

Photo 6: EUT (PCB bottom side)

7 Setup Drawings



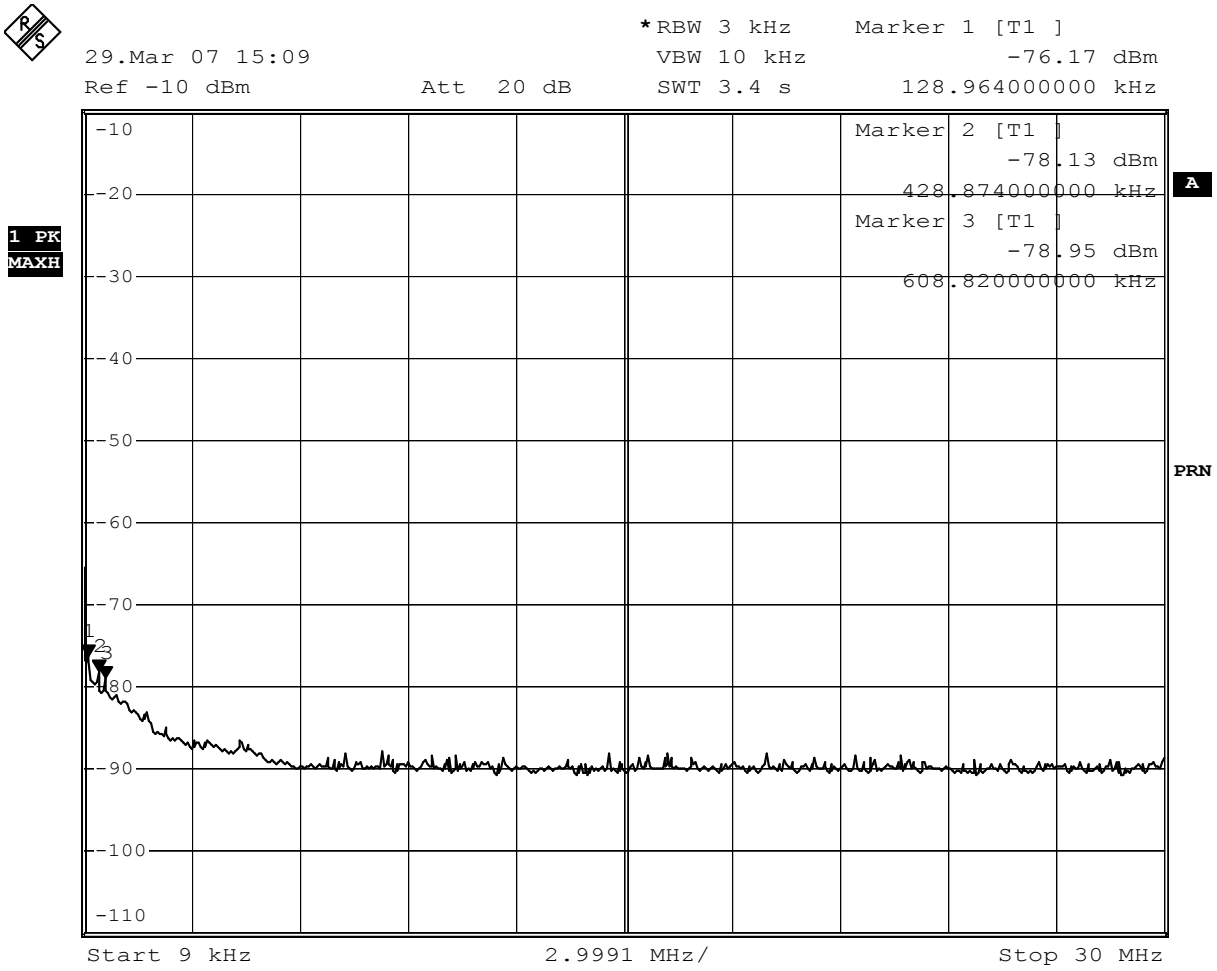
Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

8 Annex measurement plots

8.1 Radiated emissions (f<30MHz)

Op. Mode

op-mode 2



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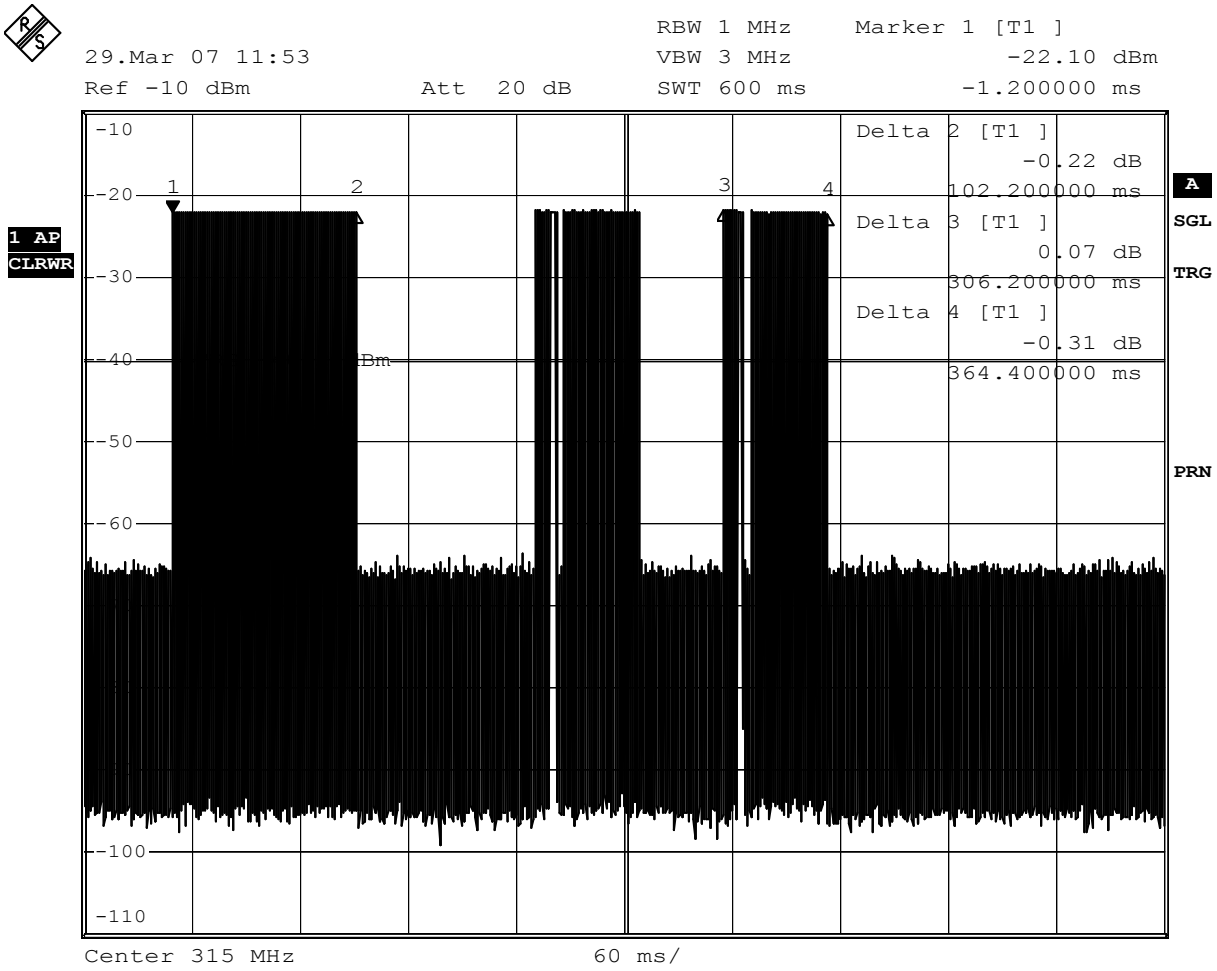
8.2 Duty cycle measurement (based on dwell time measurement)

Op. Mode

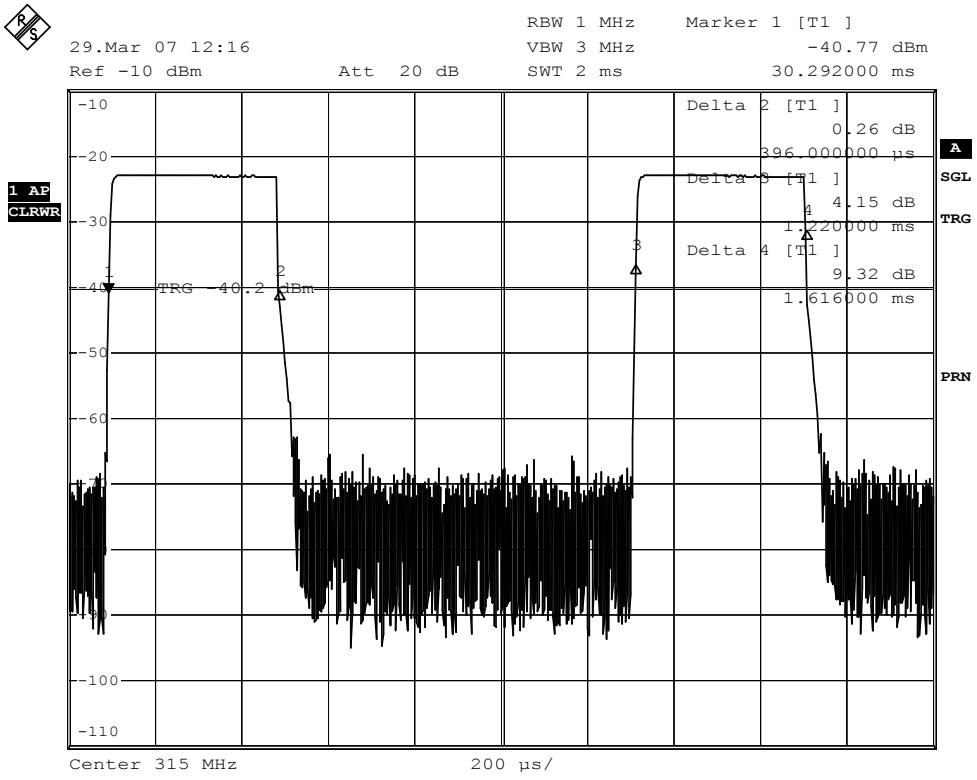
op-mode 1



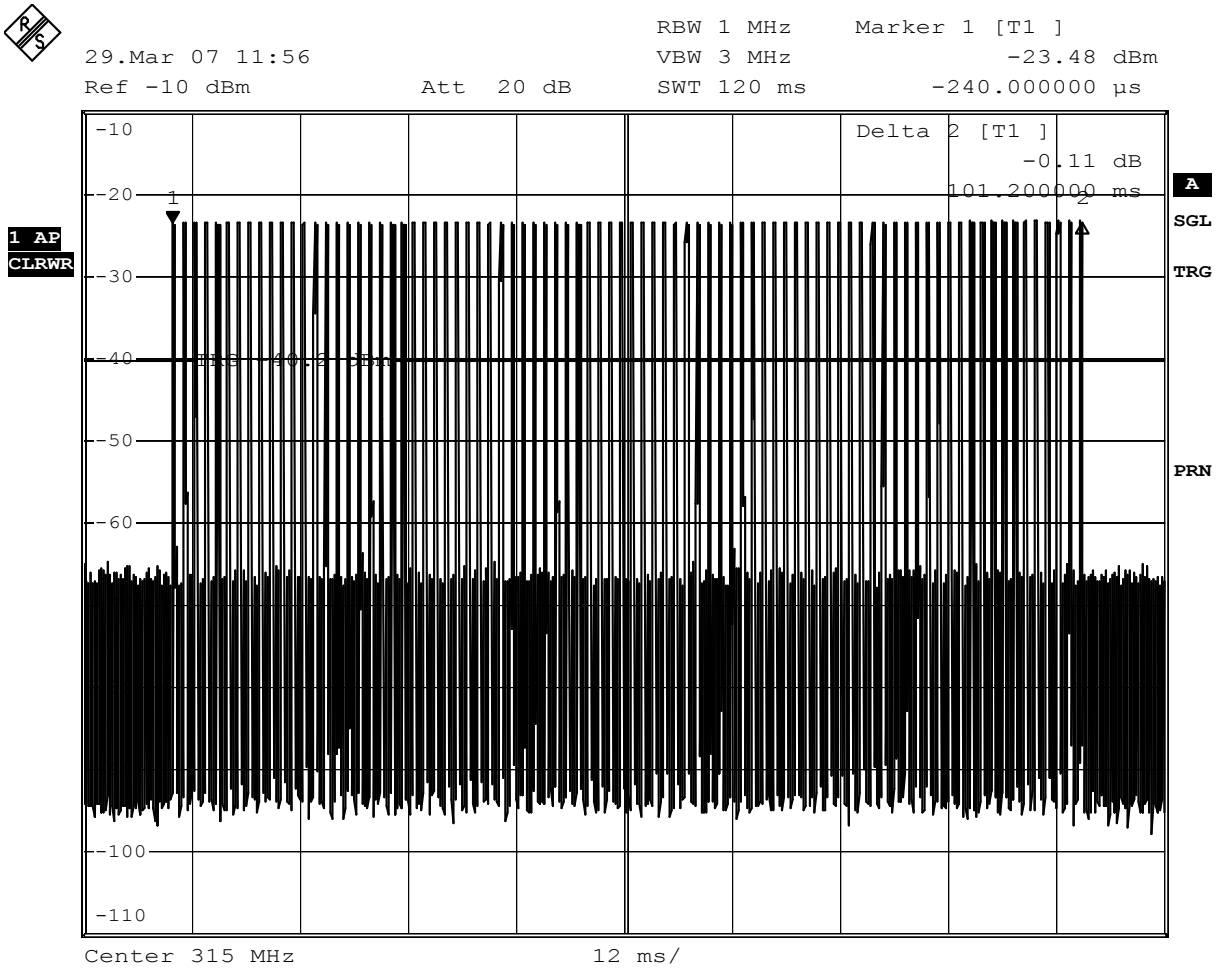
Date: 29.MAR.2007 11:53:28

Step 1: holdover time. First part is the Wake-up signal, next are two coded signals.

Wake-up signal



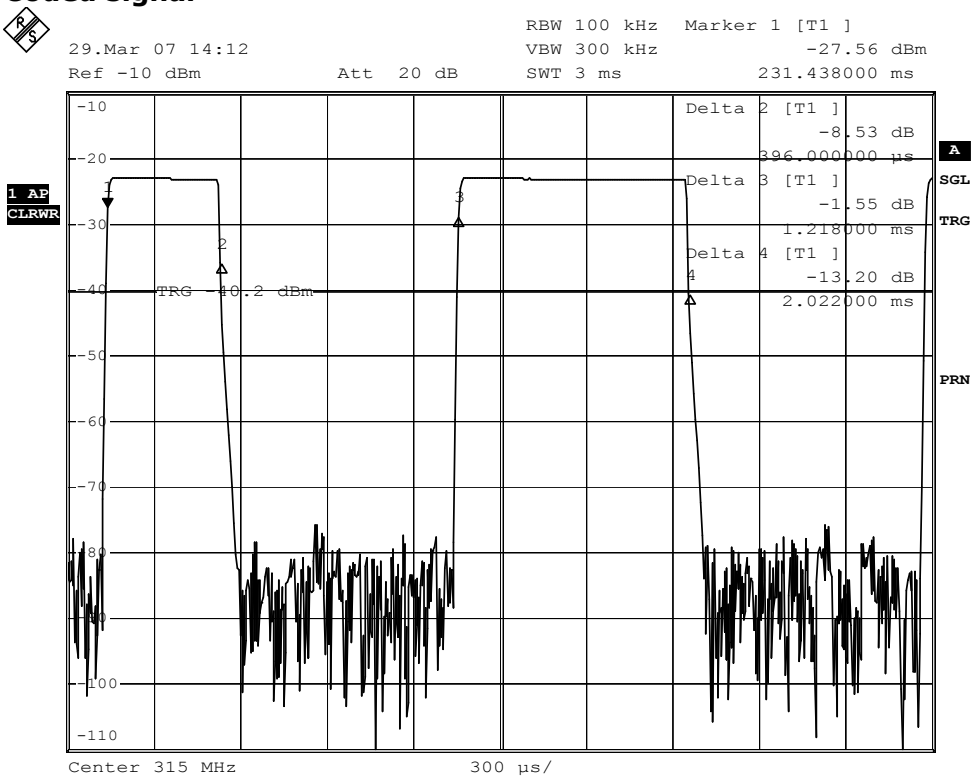
Step 2: sweep of a data word to determine the on time within a data word (L1 to LN).



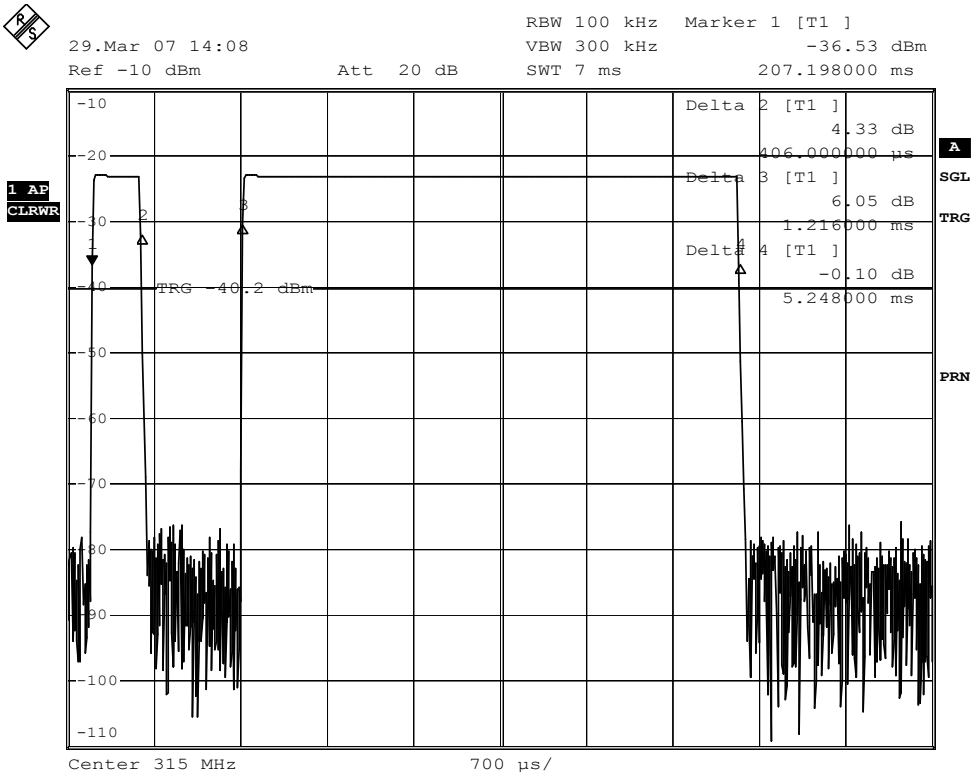
Date: 29.MAR.2007 11:56:29

Step 3: determine the number of pulses (N1-NN).

Coded signal

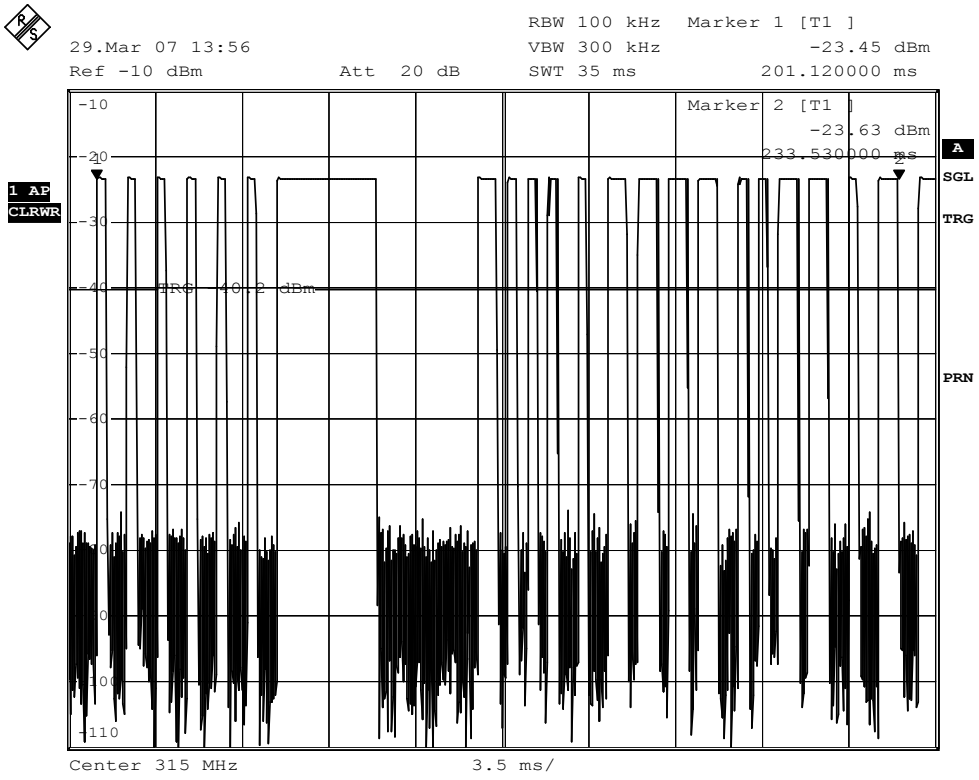


Date: 29.MAR.2007 14:12:42

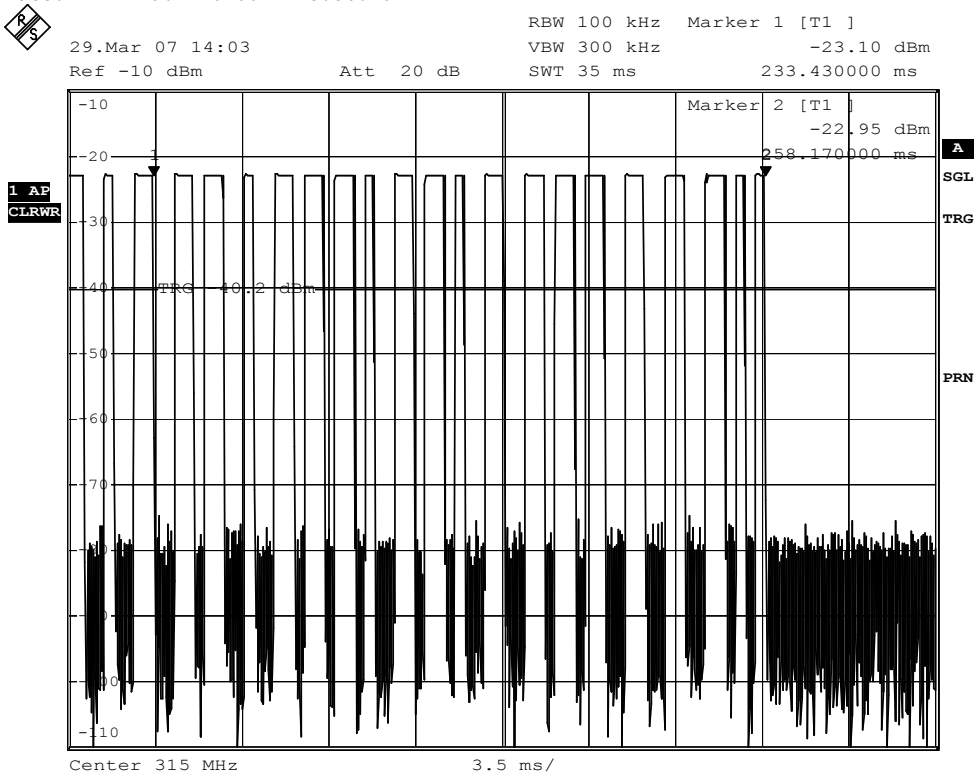


Date: 29.MAR.2007 14:08:29

Step 2: sweep of a data word to determine the on time within a data word (L1 to LN).



Date: 29.MAR.2007 13:56:20



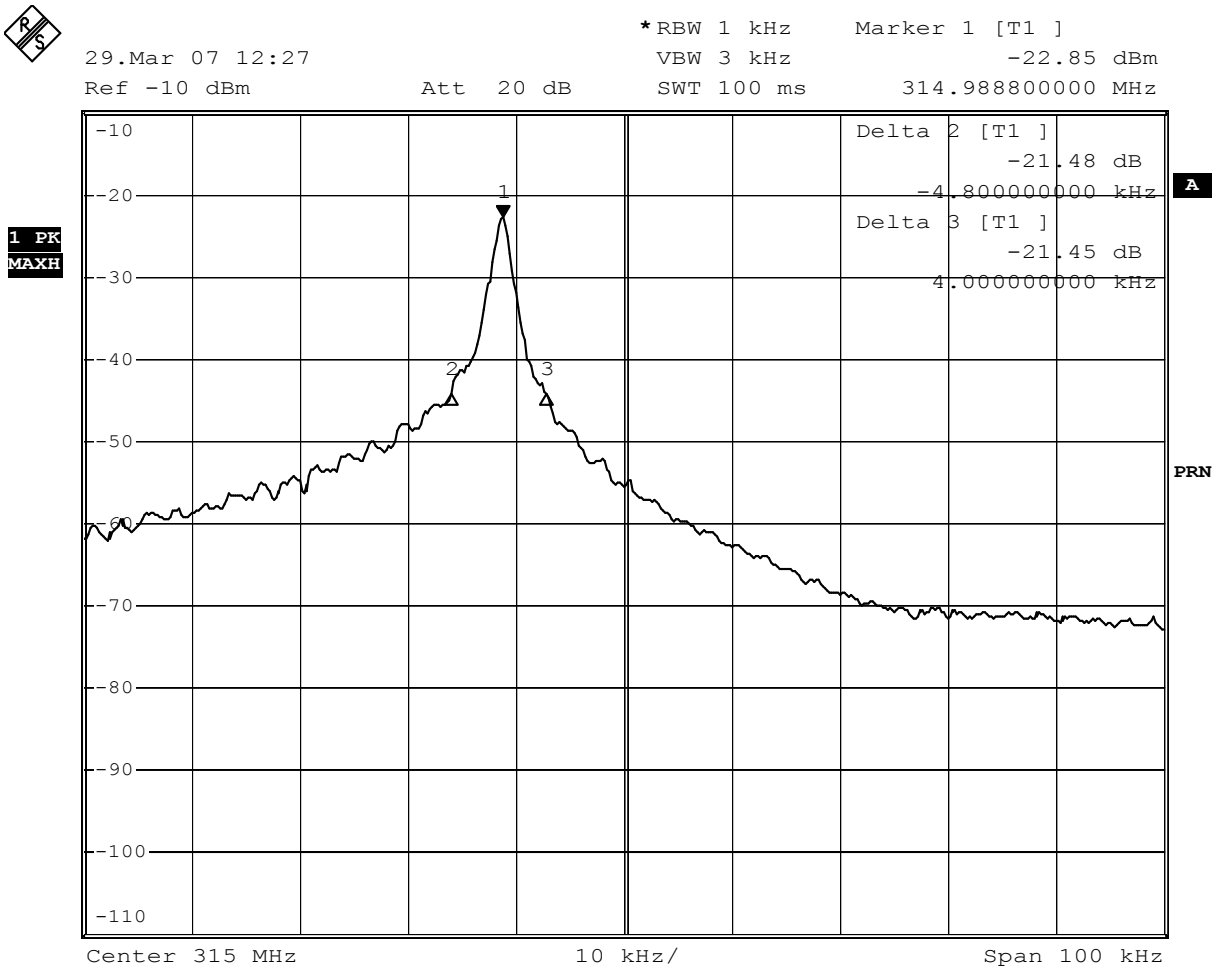
Date: 29.MAR.2007 14:03:19

Step 3: determine the number of pulses (N1-NN).

8.2.1 Occupied bandwidth operating mode 1

Op. Mode **20 dB bandwidth**

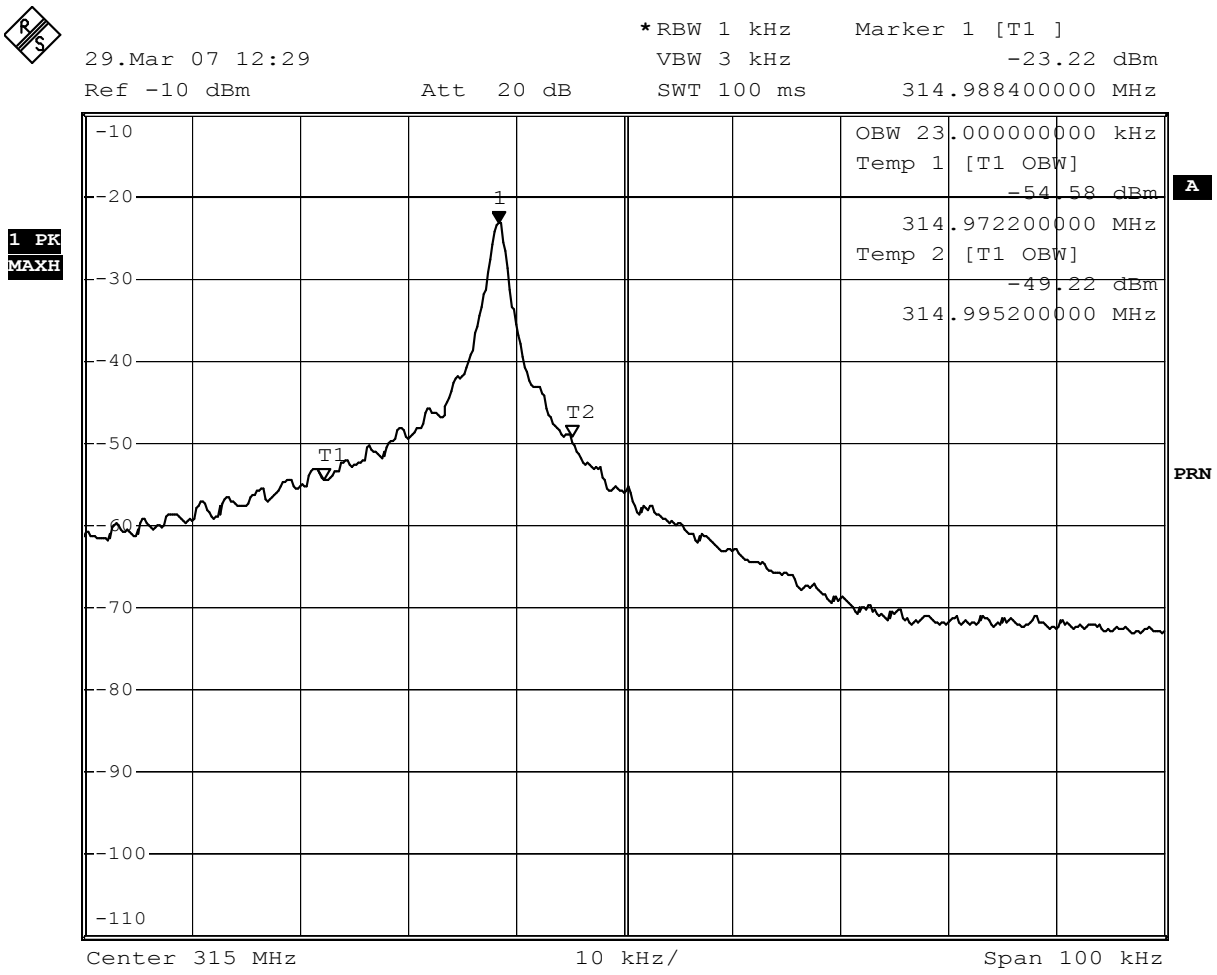
op-mode 1



Date: 29.MAR.2007 12:27:39

Op. Mode **99% bandwidth**

op-mode 1



Date: 29.MAR.2007 12:29:54