



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AP0028237(0) Date : 30 May 2012

Application No. : LP012966(2)

Applicant : Sanda Kan Industrial Hong Kong Limited
7/F, Kader Building,
22 Kai Cheung Road,
Kowloon Bay, Hong Kong.

Sample Description : One(1) item of submitted sample stated to be Remote Control of Model No. AA47999
Radio Frequency : 27.145MHz Transmitter
Rating : 1 x 9V size battery
No. of submitted sample : Two (2) Piece (s)
Sample registration No. : RP012061-001

Date Received : 05 Apr 2012.

Test Period : 07 Apr 2012 to 15 May 2012.

Test Requested : FCC Part 15 Certification.

Test Method : 47 CFR Part 15 (10-1-11 Edition)
ANSI C63.4 – 2009

Test Engineer : Mr. WONG Chi-sum, Sam

Test Result : See attached sheet(s) from page 2 to 19.

Conclusion : The submitted sample was found to comply with requirement of FCC Part 15 Subpart C.

Remark : There are three channels (A, B, C) and ten addresses (0-9); channel A (address 4) was tested. The three channels and ten addresses are used to change coding to prevent interference.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : 

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Mr. WONG Lap-pong, Andrew
Assistant Manager
Electrical Division

FCC ID: O52-AA47999



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1 General Information

1.1 General Description

The equipment under test (EUT) is a transmitter for Remote Control. It operates at 27.145MHz and the oscillation of radio control is generated by a crystal. The EUT is powered by 1 x 9V size battery. There are one on/off button, one reset button, three channel buttons (A, B, C) and ten address buttons (0-9) on the EUT. The channel buttons and address buttons are used to change coding to prevent interference for multi-control system. When the EUT switched on, channel selected and address buttons are pressed, it will transmit different radio control signal to receiver.

The antenna is permanently attached in EUT and the radio output power is unable to adjust.

The brief circuit description is listed as follows:

- Q6, Z1 and its associated circuit act as a voltage regulator.
- Y2, U1, Q4, Q5 and its associated circuit act as an encoder.
- Y1, Q1 and its associated circuit act as an RF oscillator.
- Q3 and its associated circuit act as an amplifier.



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1.2 Location of the test site

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
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1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date
EMI Test Receiver	R&S	ESCS30	100001	07 Jun 2012
Broadband Antenna	Schaffner	CBL6112B	2718	31 Oct 2012
Loop Antenna	EMCO	6502	00056620	15 Sep 2013
Coaxial Cable	Schaffner	RG 213/U	N/A	03 Aug 2012
Coaxial Cable	Suhner	RG 214/U	N/A	03 Aug 2012

1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U _{lab})
30MHz ~ 200MHz (Horizontal)	4.79dB
30MHz ~ 200MHz (Vertical)	4.80dB
200MHz ~1000MHz (Horizontal)	4.76dB
200MHz ~1000MHz (Vertical)	4.75dB

Conducted emissions

Frequency	Uncertainty (U _{lab})
150kHz ~ 30MHz	3.16dB



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2 Description of the radiated emission test

2.1 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009.

The equipment under test (EUT) was placed on a non-conductive turntable with dimensions of 1.5m x 1m and 0.8m high above the ground. 3m from the EUT, a broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was then moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement for Radiated Emission measurement.

2.2 Test Result

Peak Detector data was measured unless otherwise stated.

“#” means emissions appearing within the restricted bands shall follow the requirement of section 15.205.

The frequencies from fundamental up to the tenth harmonics were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next page (section 2.3).

The emissions meeting the requirement of section 15.209 are based on measurements employing the CISPR quasi-peak detector below 1000MHz and average detector for frequencies above 1000MHz.

It was found that the EUT meet the FCC requirement.

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2.3 Radiated Emission Measurement Data

Radiated emission

pursuant to

the requirement of FCC Part 15 subpart C

Environmental conditions:

Parameter	Recorded value
Ambient temperature:	22 °C
Relative humidity:	57 %

Frequency (MHz)	Polarity (H/V)	Reading at 3m (dB μ V)	Antenna Factor and Cable Loss (dB/m)	Average Factor (dB)	Field Strength at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
27.145	V	73.4	8.8	-9.1	73.1	80.0	-6.9
54.290	V	22.0	10.4	-	32.4	40.0	-7.6
81.435	V	15.9	7.9	-	23.8	40.0	-16.2
#108.593	H	11.8	11.8	-	23.6	43.5	-19.9
#135.738	H	11.1	13.7	-	24.8	43.5	-18.7
#162.884	H	12.2	11.6	-	23.8	43.5	-19.7
190.029	H	9.6	11.5	-	21.1	43.5	-22.4
217.175	H	12.8	11.0	-	23.8	46.0	-22.2
#244.323	H	15.1	11.0	-	26.1	46.0	-19.9
#271.467	H	12.0	14.9	-	26.9	46.0	-19.1

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3 Description of the Line-conducted Test

3.1 Test Procedure

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

No measurement is required as the EUT is a battery-operated product.

3.3 Graph and Table of Conducted Emission Measurement Data

Not Applicable

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4 Photograph

4.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

For electronic filing, the photos are saved with filename TSup1.jpg to TSup4.jpg.

4.2 Photographs of the External and Internal Configurations of the EUT

For electronic filing, the photos are saved with filename ExPho1.jpg to ExPho2.jpg and InPho1.jpg to InPho2.jpg.

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5 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

Document	Filename
Block Diagram	BlkDia.pdf
Schematic Diagram	Schem.pdf
Users Manual	UserMan.pdf
Operational Description	OpDes.pdf
PCB Layout	PCB.pdf
Part List	PartList.pdf

5.1 Bandwidth

The plot saved in Appendices A5. shows the fundamental emission is confined in the specified band. It also shows that the band edge met the 15.209 requirement at 26.9599 and 27.2801 MHz.

5.2 Duty cycle

The plot saved in Appendices A6.

The duty cycle is simply the on-time divided by the period:

$$\text{The duration of one cycle} = 38.68\text{ms}$$

$$\begin{aligned}\text{Effective period of the cycle} &= (520\mu\text{s} \times 12) + (1.02\text{ms} \times 5) + (1.52\text{ms} \times 1) + (680\mu\text{s} \times 1) \\ &= 13.54\text{ms}\end{aligned}$$

$$\begin{aligned}\text{Duty Cycle} &= 13.54 / 38.68 \\ &= 0.35\end{aligned}$$

Therefore, the average factor is found by $20 \log_{10} 0.35 = -9.1\text{dB}$

5.3 Transmission time

Not Applicable

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6 Appendices

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A2.	Photos of External Configurations	1	page
A3.	Photos of Internal Configurations	1	page
A4.	ID Label/Location	1	page
A5.	Bandwidth Plot	1	page
A6.	Average Factor	3	pages
A7.	Block Diagram	1	page
A8.	Schematics Diagram	1	page
A9.	User Manual	1	page
A10.	Operation Description	1	page
A11.	PCB Layout	1	page
A12.	Part List	1	page

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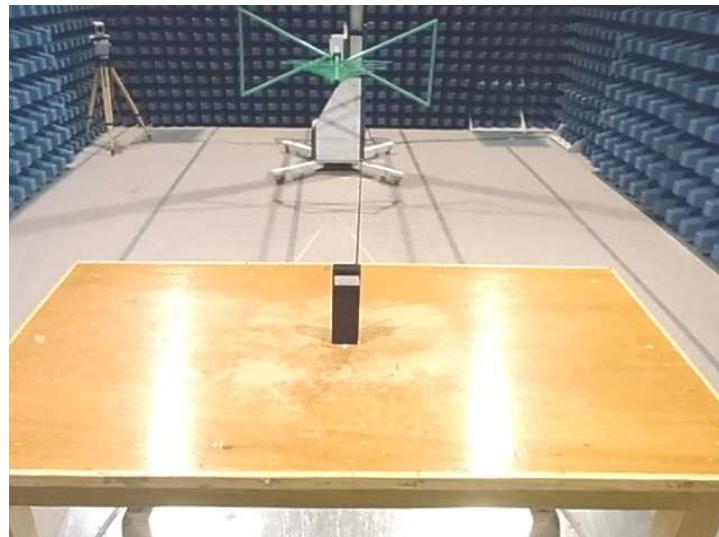
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A1. Photos of the set-up of Radiated Emissions (>30MHz)



Front View



Back View

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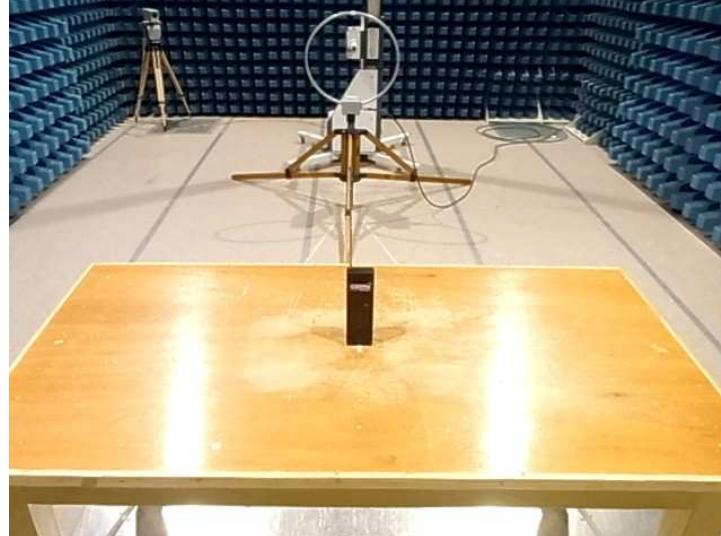
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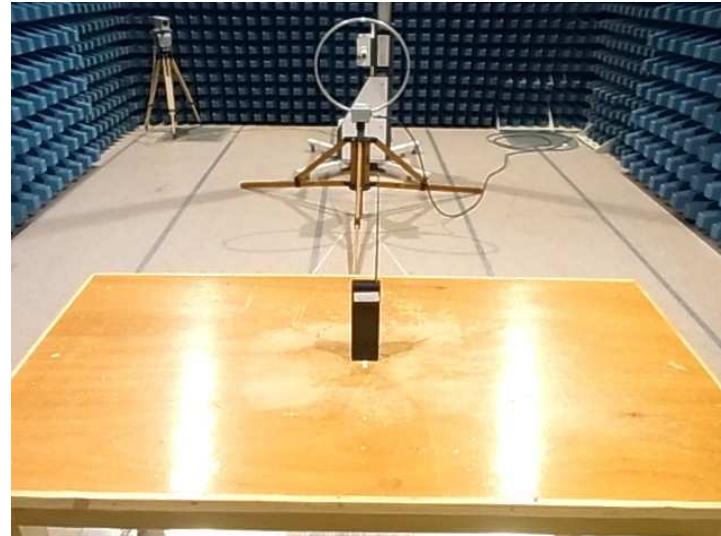
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A1. Photos of the set-up of Radiated Emissions (<30MHz)



Front View



Back View

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A2. Photos of External Configurations



External Configuration 1



External Configuration 2

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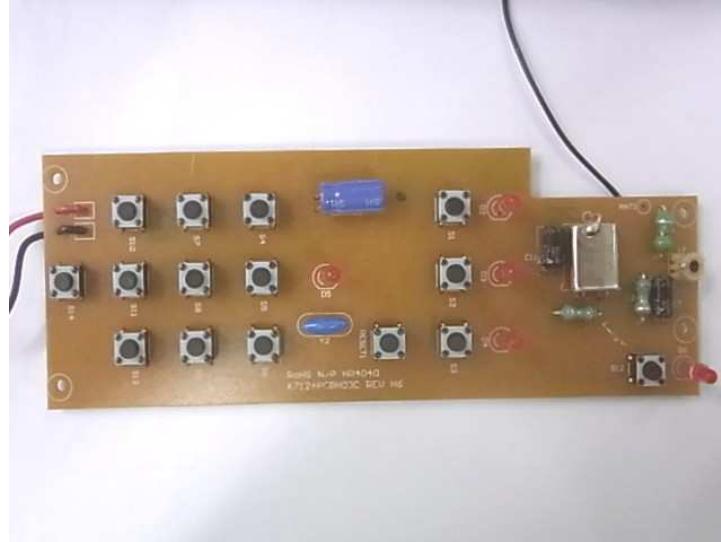
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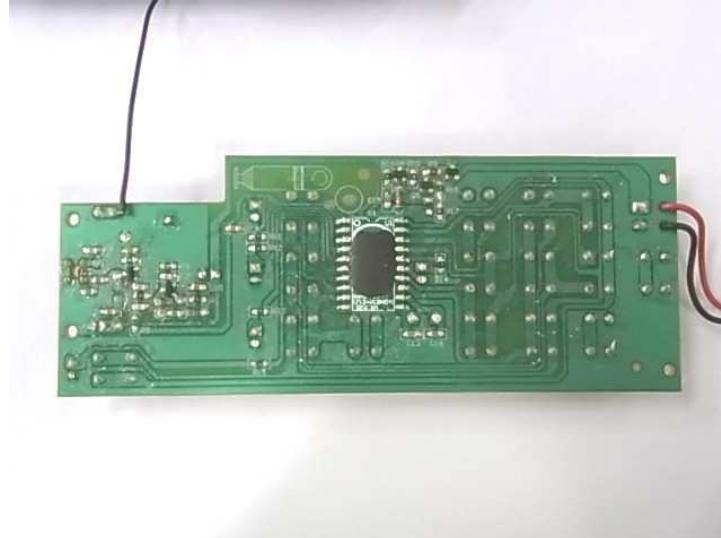
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A3. Photos of Internal Configurations



Internal Configurations 1



Internal Configurations 2

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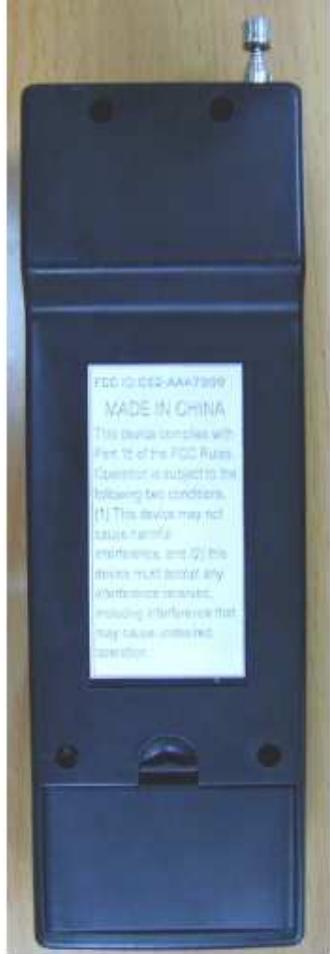
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A4. ID Label/Location



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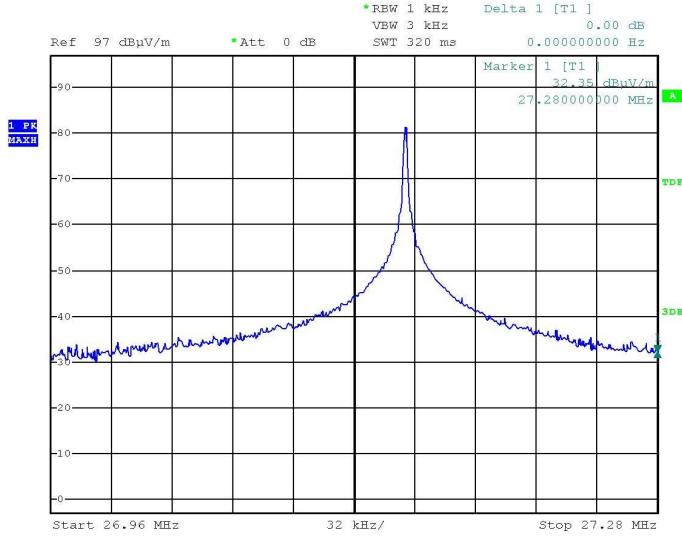
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A5. Bandwidth Plot



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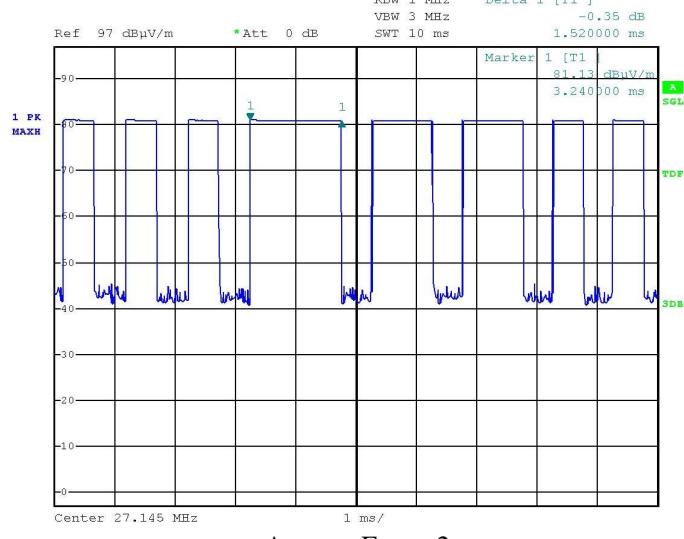
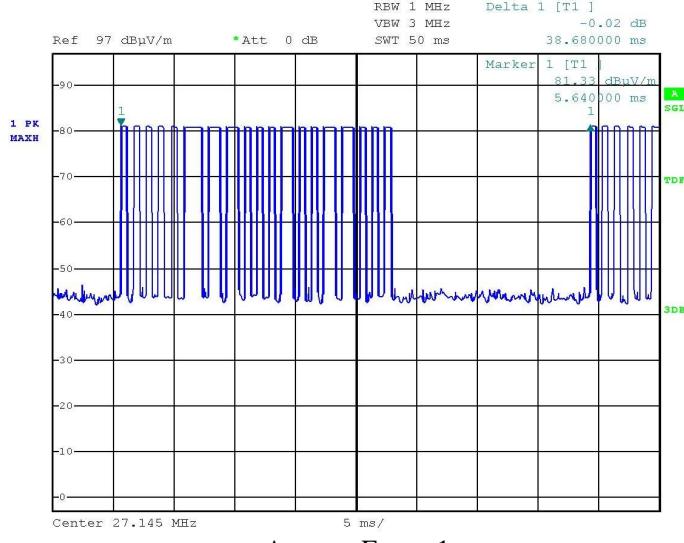
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A6. Average Factor



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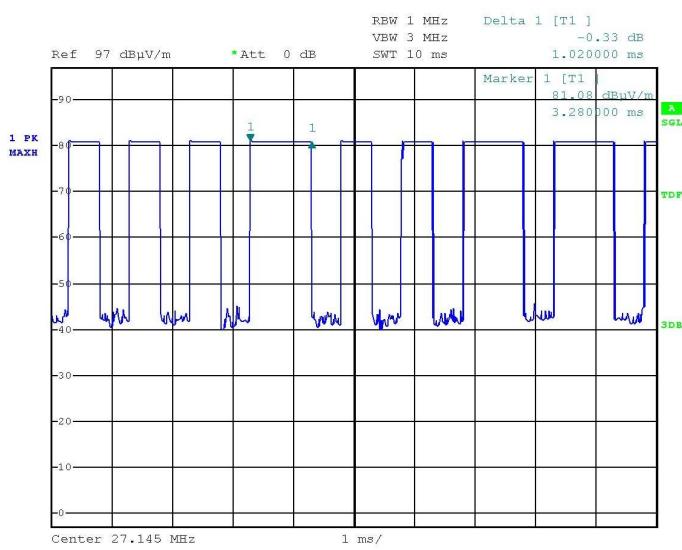
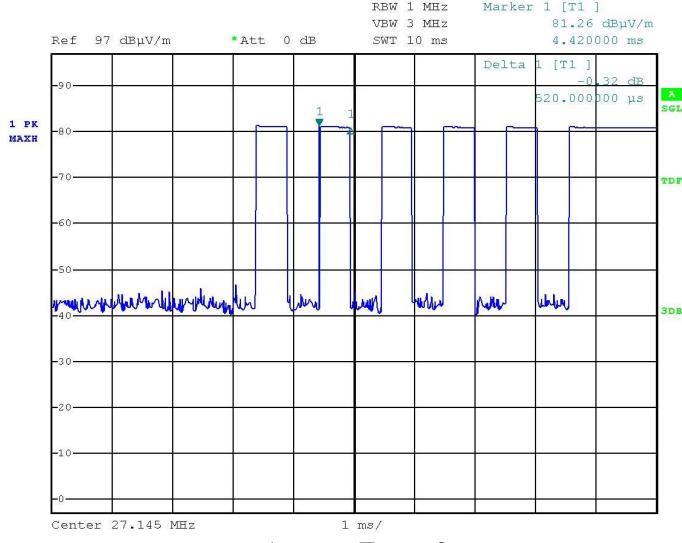
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A6. Average Factor



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