ETSI Compliance of STD-601 400 MHz

Application note

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CIRCUIT DESIGN, INC.

7557-1 Hotaka, Azumino
Nagano 399-8303 JAPAN
Tel: 0263-82-1024
Fax: 0263-82-1016

e-mail: info@circuitdesign.jp
http://www.circuitdesign.jp

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Important notice

This application note was written in line with the related regulations and standards as of November 2016.

1. Introduction

STD-601 400 MHz is designed to meet the requirements of ETSI Standard EN 300 220 based on ERC Recommendation 70-03 (Annex 1 non-specific SRD 434 MHz band plan).
This application note shows the parameter settings, conditions and some test results for STD-601 400 MHz to be compliant with the EN 300 220 standard.

Note: STD-601 400 MHz module doesn't have the CE marking. This application note only shows our own test results, and is not supposed to guarantee CE compliance with your product. You need to perform the test by yourself with your final product.

2. Parameter settings and conditions

Setting

- Frequency band: 434 MHz
- RF Power: 10 mW
- Frequency: 433.075 to 434.775 MHz
- RF bit rate: 9600 or 4800 bps

Table.1 Parameters

Command	EEPROM write	Value (Hex)	Remarks
@N	-	00	Frequency band
@P	@H	10	RF Power
@C	@D	00 to 88	RF Channel
@B	@G	96 or 48	RF bit rate

Conditions

- Channel spacing: 25 kHz
- Duty cycle: The requirements set in EN300 220 should be met.
- Protection of module setting: The customer's software should ensure that the frequency band other than 434 MHz and the RF power other than 10 mW are not selectable by the end user.
- Antenna: Use an antenna to ensure the RF power from the final product does not exceed 10 mW.

3. Test equipment

The test equipment used was our test board TB-STD601 400MHz or TB-STD302 + conversion board.
The test board TB-STD601 allows the STD-601 to be used in combination with Arduino MEGA 2560 for simple switching and packet tests. The pre-installed sample program was used for obtaining measurements outlined in this document.
For some tests, we also used the TB-STD302 test board with a conversion board allowing the STD-601 to be pin compatible with our STD-302. The details of the TB-STD601 and the TB-STD302 are on our web site.

Test board TB-STD601

4. Test result

The test results are shown below. The conditions involved an ambient temperature of 25C (+/- 5 degrees), a voltage supply of DC 3.3V and RF bit rate of 9600bps (max).

4.1 Frequency Error

The test was performed in conducted emission and the test board used was the TB-STD601.

Table.2 Frequency Error

Setting Freq.	Reading	Error	Limit
433.075 MHz	433.0748 MHz	-0.2 kHz	+/- 12 kHz
434.775 MHz	434.7751 MHz	+0.1 kHz	+/- 12 kHz

4.2 Transmitter Power

The test was performed in conducted emission and the test board used was the TB-STD601.

Table.3 Transmitter Power

Setting Freq.	Reading	Limit
433.075 MHz	7.36 mW	10 mW erp
434.775 MHz	7.37 mW	10 mW erp

4.3 Adjacent channel power

The test was performed in conducted emission and the test board used was the TB-STD601. PN9-9600bps.

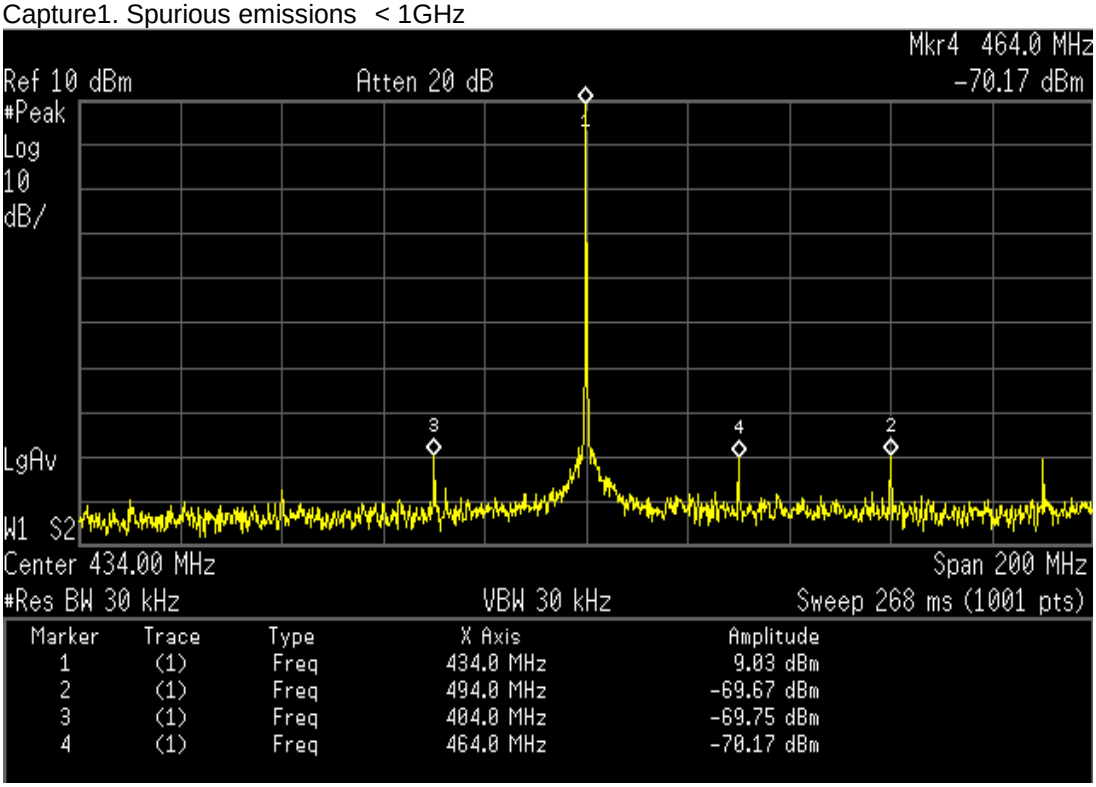
Table.4 Adjacent channel Power

Setting Freq.	Reading		Limit
	Lower (-25 kHz)	Upper (+25 kHz)	
433.075 MHz	62.37 nW (-42.05 dBm)	51.64 nW (-42.87 dBm)	200 nW
434.775 MHz	50.00 nW (-43.01 dBm)	57.28 nW (-42.42 dBm)	200 nW

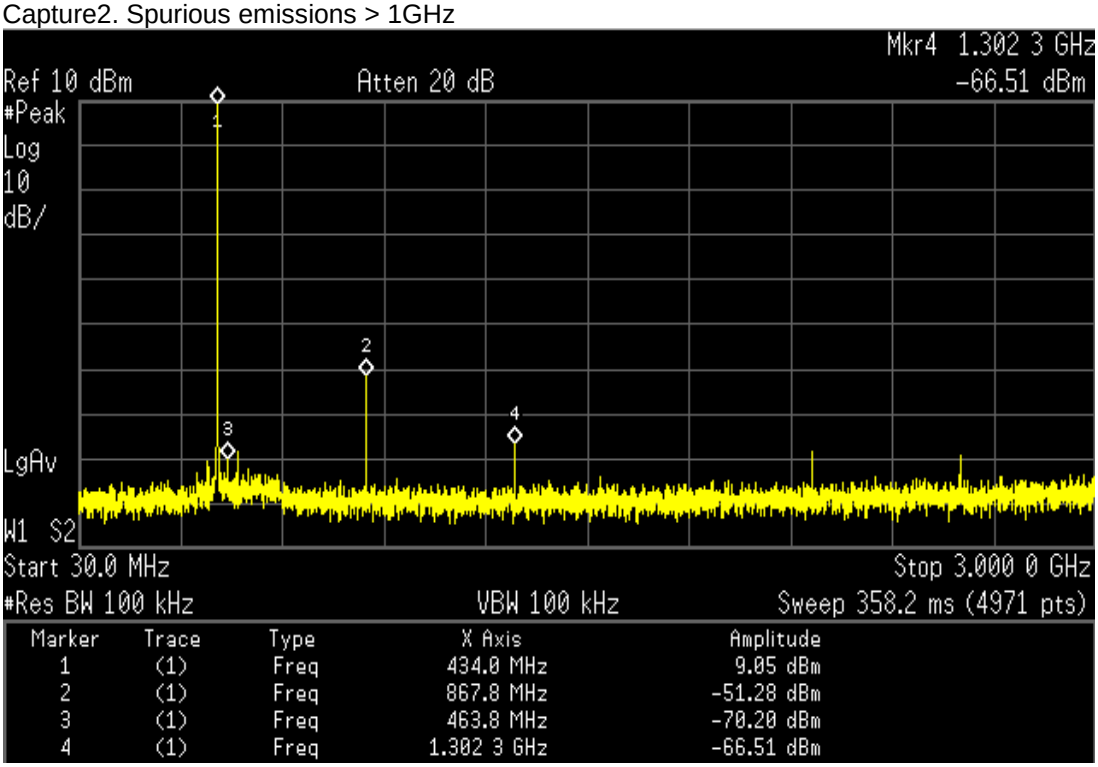
4.4 Transmitter spurious emissions

The test was performed in conducted emission and the test board used is TB-STD601. PN9-9600bps.

Capture1. Spurious emissions < 1GHz



Capture2. Spurious emissions > 1GHz



4.5 Transient Power

The transmitter was operated by powering it on-and-off (Switching TXSEL on-and-off) 5 times, for 1sec respectively, using TB-STD302 + conversion board. The test result is shown below (conducted).

Table.5 Transient Power 433.075 MHz (Upper side)

Frequency Upper side	Reading		Limit	Result
	Step1	Step2		
433.135 MHz	2.68 dBm	2.65 dBm	-36 dBm	Step2 OK
433.255 MHz	-49.85 dBm	-49.83 dBm	-36 dBm	Step1 OK

Table.6 Transient Power 433.075 MHz (Lower side)

Frequency Upper side	Reading		Limit	Result
	Step1	Step2		
433.015 MHz	2.82 dBm	2.81 dBm	-36 dBm	Step2 OK
432.895 MHz	-49.65 dBm	-49.07 dBm	-36 dBm	Step1 OK

Table.7 Transient Power 434.775 MHz (Upper side)

Frequency Upper side	Reading		Limit	Result
	Step1	Step2		
434.835 MHz	2.86 dBm	2.85 dBm	-36 dBm	Step2 OK
434.955 MHz	-49.73 dBm	-49.69 dBm	-36 dBm	Step1 OK

Table.8 Transient Power 434.775 MHz (Lower side)

Frequency Upper side	Reading		Limit	Result
	Step1	Step2		
434.715 MHz	2.74 dBm	2.74 dBm	-36 dBm	Step2 OK
434.595 MHz	-49.77 dBm	-49.55 dBm	-36 dBm	Step1 OK

Detector : E4445A Quasi Peak(CISPR), BW : 120 kHz
Step1 : Transmitter was operated with powering on and off 5 times, for 1sec respectively.
If the step 1 level exceeds the limit, the emission level in continuous transmission was measured as in step2. The step1 level shall not exceed the continuous transmission level by more than 3dB.

4.6 Receiver blocking

The desired signal is +3 dB at 1% data error signal (PN9-9600bps). The undesired signal is not modulated. Used with TB-STD302 + conversion board. The test result is shown below (conducted).

Table.9 Blocking 433.075 MHz

Frequency offset	Reading	Limit Category 2
-2MHz	74 dB	35 dB
+2MHz	75 dB	35 dB
-10MHz	79 dB	60 dB
+10MHz	81 dB	60 dB

Table.10 Blocking 434.775 MHz

Frequency offset	Reading	Limit Category 2
-2MHz	74 dB	35 dB
+2MHz	74 dB	35 dB
-10MHz	79 dB	60 dB
+10MHz	80 dB	60 dB

Revision history

Version	Date	Description	Remark
1.0	Nov. 2016	First issue	