ST50H
Validation Report

Product Name	**ST50H**
Version	**A**
Doc No	**907-12601**
Date	**2020/11/16**

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Document History

Date	Revised Contents	Revised By	Version
2020/11/16	Initial Version	Jack	A

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1. Description

The validation test measure the performance of ST50H transmit, receive, current consumption and frequency deviation.

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2. Transmit measurement

2-1. Test Equipment and setup

Spectrum analyzer x1set
Digital multimeter x1set
Computer x 1set
RF Cable with SMA connecter x 1set
ST50H test fixture x 1set

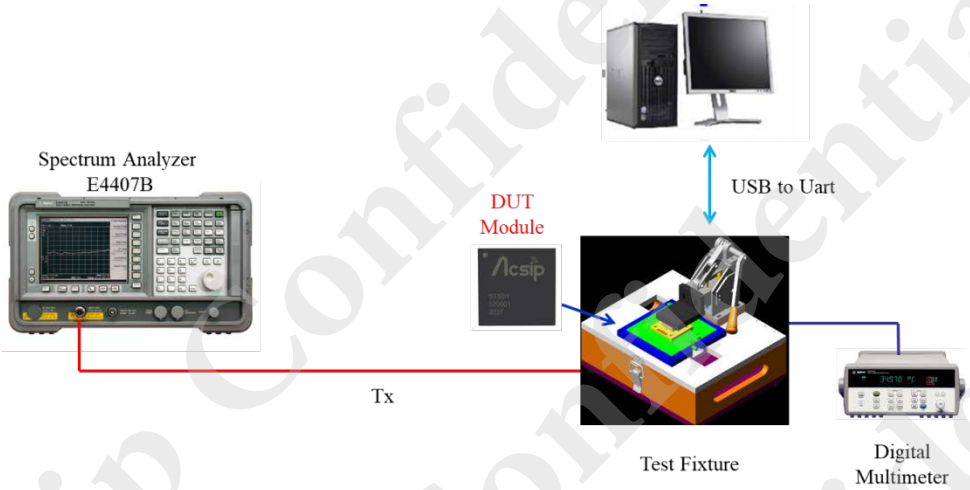

Figure1. Test setup of ST50H Transmit measurement

2-2. Transmit power and Harmonic

- **DUT setup :**

Set the radio in : FSK mode, frequency at 863, 915 and 930MHz
Set the power to 22 dBm

- **Analyzer setup :**

Set frequency point at 1st, 2nd,3rd,4th and 5th of the basic frequency, span is 200kHz , Ref amp is 25 dBm
Max Hold mode

- **AT Command:**

ATZ
AT+TCONF=863:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF
AT+TCONF=915:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF
AT+TCONF=930:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF

- **Test result**

ST50H TX Power						
Frequency (MHz)	Power Setting	1st (dBm)	2nd (dBm)	3rd (dBm)	4th (dBm)	5th (dBm)
863	22	21.654	-39.4	-44	-51.9	-65
915	22	21.303	-41	-46.2	-54.9	-65
930	22	21.178	-44.8	-44.9	-55	-65

Table1. TX power test result

2-3. Frequency Accuracy

- **DUT setup :**

Set the radio in : FSK mode, frequency at 863, 915 and 930MHz

Set the power to 22 dBm

- **Analyzer setup :**

Center frequency at 863, 915 and 930MHz, Span is 200 KHz

Ref amp is 25 dBm

Measure the CW frequency with the marker of the spectrum analyser

- **AT Command:**

ATZ
AT+TCONF=863:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF
AT+TCONF=915:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF
AT+TCONF=930:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF

- **Test result**

Center frequency	Frequency (MHz)	Offset_KHz	Offset_ppm
863	862.9984	-1.57	-1.78
915	914.9984	-1.64	-1.76
930	929.9983	-1.67	-1.77
Spec.		+/-5	+/-5

Table2. Frequency Accuracy

2-4. Transmit current consumption

- **DUT setup :**

Set the radio in : FSK mode, frequency at 863, 915 and 930MHz
Set the power to 22 dBm

- **Analyzer setup :**

Set frequency point at the basic frequency,
span is 200kHz , Ref amp is 25 dBm
Max Hold mode

- **AT Command:**

ATZ
AT+TCONF=863:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF
AT+TCONF=915:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF
AT+TCONF=930:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TTONE
AT+TOFF

- **Test result**

ST50H Transmit current consumption		
Frequency (MHz)	Power Setting	Current consumption
863	22	120.57
915	22	120.50
930	22	122.67

Table3. Transmit current consumption

3. RX Measurement

3-1. Test Equipment and setup

VNA vector signal generator x1set
Digital multimeter x1set
Computer x 1set
RF Cable with SMA connecter x 1set
ST50H test fixture x 1set
Shielding BOX x1set

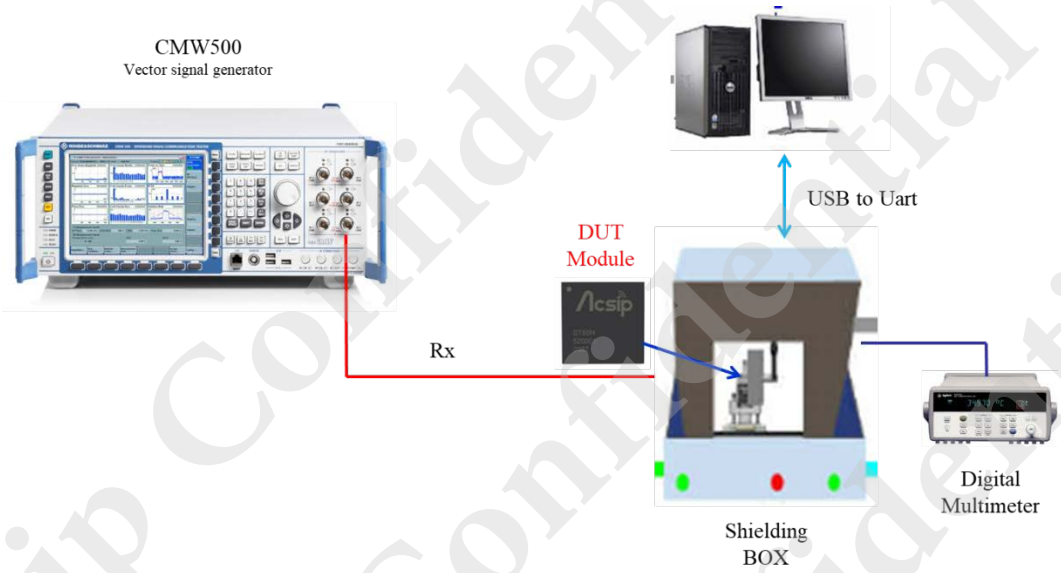

Figure2. Test setup of ST50H receive measurement

3-2. Receive Sensitivity and SNR

- **DUT setup :**

Set the radio in: LoRa RX test mode, frequency at 863, 915 and 930MHz

Set the power to 22 dBm

Measure the SNR threshold

- **Analyzer setup :**

Set Generator to: Load related waveform for different SF.

- **AT Command:**

ATZ
AT+TCONF=863:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TRLRA
AT+TOFF
AT+TCONF=915:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+ TRLRA
AT+TOFF
AT+TCONF=930:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+ TRLRA
AT+TOFF

- **Test result**

SF and BW	Sensitivity	SNR limit
SF=7,BW=125KHz	-125	-7
SF=7,BW=250KHz	-122	-7
SF=12,BW=125KHz	-138	-20
SF=12,BW=250KHz	-135	-20

Table4. Receive Sensitivity and SNR

Note: Check Packet lost occur or PER (package error rate) < = 1%

3-3. Receive current consumption

- **DUT setup :**

Set the radio in: LoRa RX test mode, frequency at 863, 915 and 930MHz

Set the power to 22 dBm

Measure the current consumption.

- **AT Command:**

ATZ
AT+TCONF=863:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+TRLRA
AT+TOFF
AT+TCONF=915:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+ TRLRA
AT+TOFF
AT+TCONF=930:22:125:12:4/5:0:0:1:25000:2:3:12:1:0
AT+ TRLRA
AT+TOFF

- **Test result**

Frequency	Receive current consumption(mA)
863	6.78
915	6.75
930	6.74
Spec.	Min.=6mA, Max.=8mA

Table5. Receive current consumption
Note: without RF signal input

3-4. Sleep current consumption

- **DUT setup :**

Set the DUT to stop2 mode

Idle is equal to stop2 mode.

- **Test result**

Sleep current consumption(mA)	Stop 2 mode
Typical	1.2
Spec.	Min.=0.1uA, Max.=3uA

Table6. Sleep current consumption

Note: without RF signal input