Power Test for firmware version v1.7

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Date:	2020-11-17

目录

1. Introduction

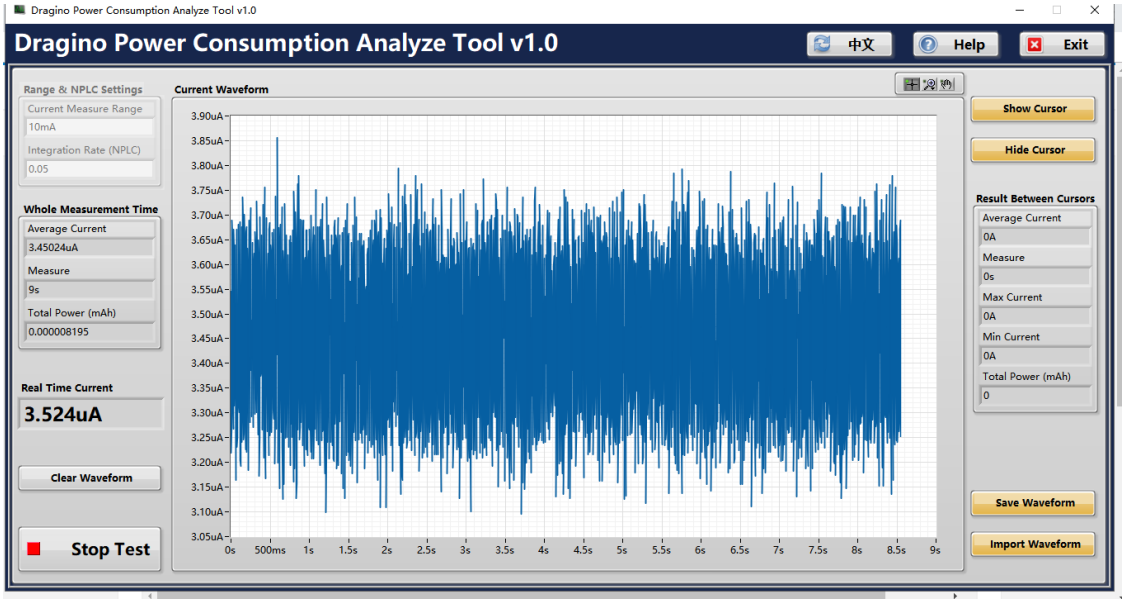
This article is a test report for Dragino LHT65 Sensor Node power consumption. It is to provide reference for system integrator to install the sensor node.
With the test result here, system integrator can estimate the battery life time for LHT65.

- **Hardware version：V1.3**
- **Software version：V1.7**

2. EU868 Power - Without external Sensor

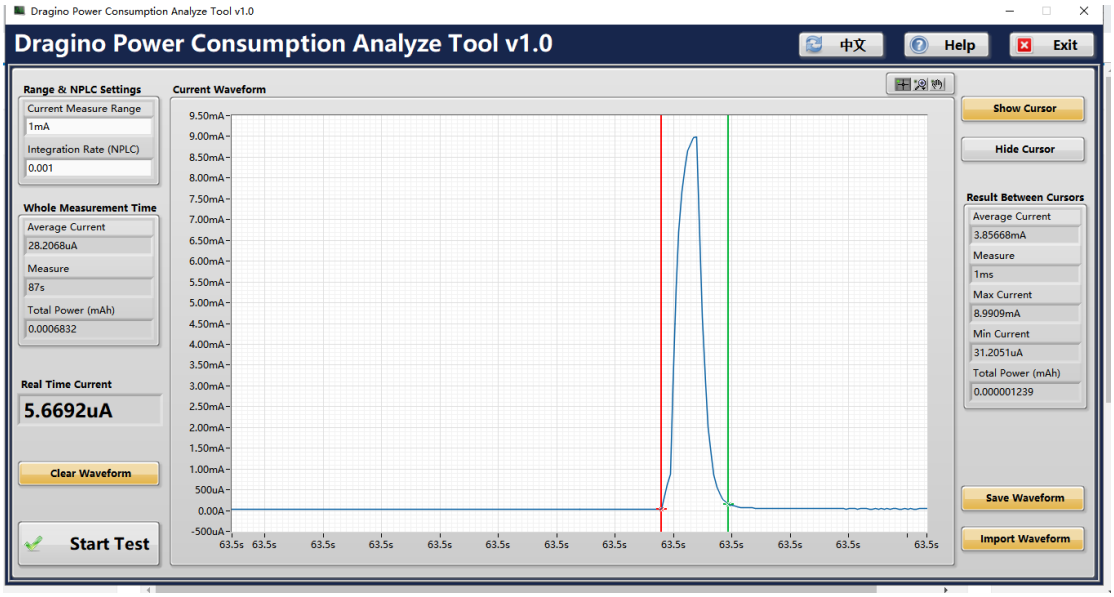
2.1 Deep Sleep Mode

Average: 3.6uA.



2.2 Watchdog Power

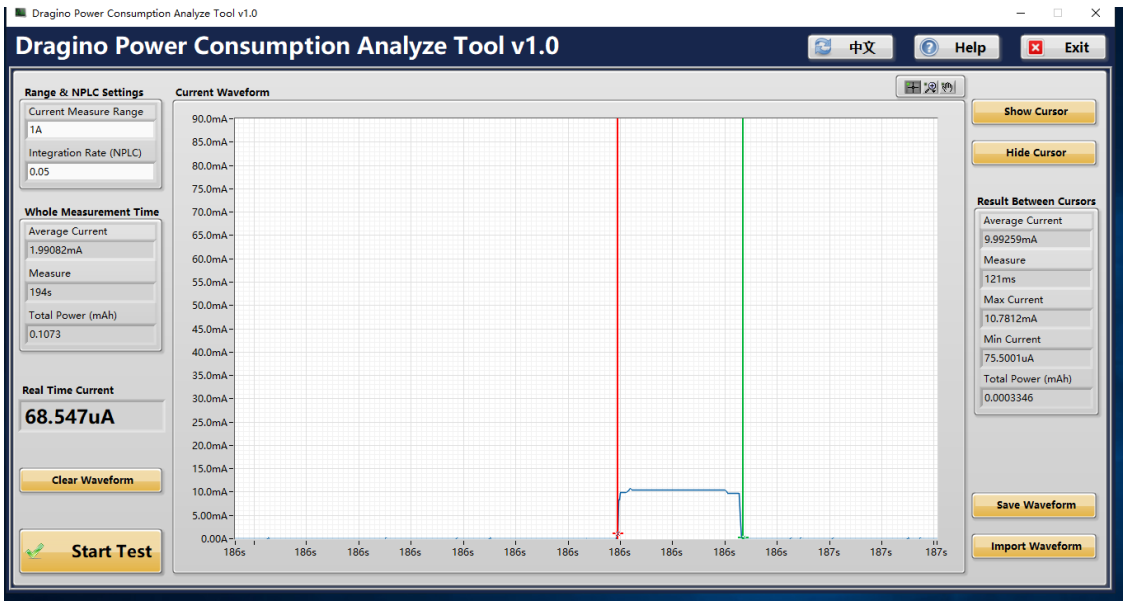
Max 9mA Average 3.85668mA in 1ms for every 18 seconds (watchdog period)



2.3 RTP current

Once in 20 minutes

MAX current: 10mA



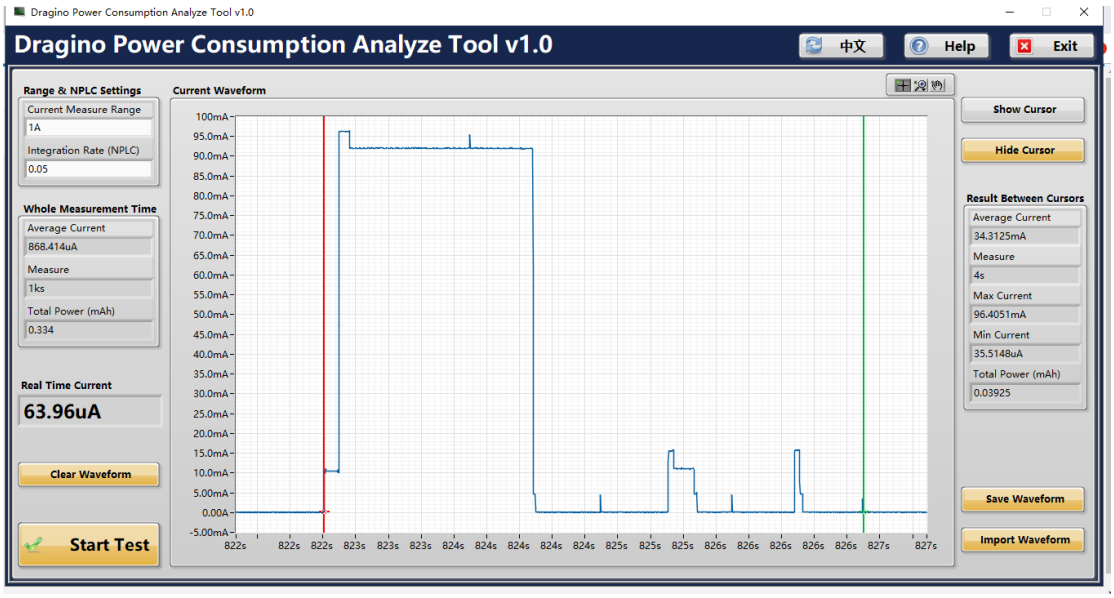
2.4 DR=0, TXP=0

Transmit: 4s

Average Current in transmit time: 34.3125mA

The total current to send a packet is

34.3125mA * 4s = 137.25mA *s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=0, TXP=0. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s =(4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.85668mA*(20*60s/18s)= (0.2571mA*s)
- ✓ The total current to send a packet is : 137.25mA*s
- ✓ RTP current : 10mA*0.121=1.21mA*s

So **total Average Current is :(4.32 + 0.2571 + 137.25+1.21)/(20*60)= 0.1192mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) = **0.1192**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.1192** * 8760+48) = 2.1(Years)

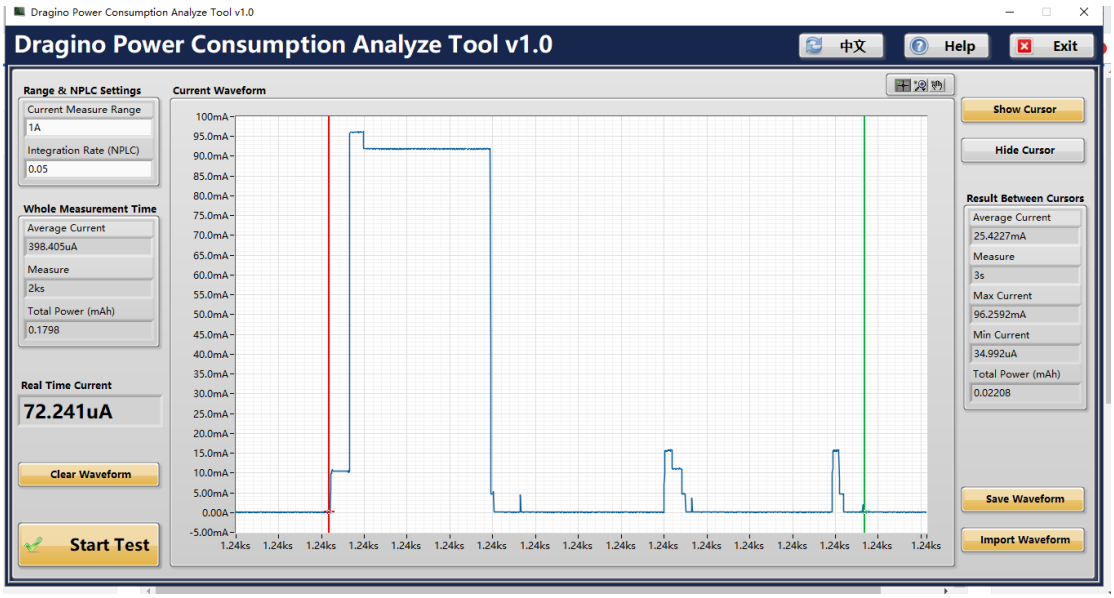
2.5 DR=1,TXP=0

Transmit Time: 3s

Average Current in transmit time: 25.4227mA

The total current to send a packet is:

25.4227**mA * 3s = 76.2681mA*s**



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=1. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s =(4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.85668mA*(20*60s/18s)= (0.2571mA*s)
- ✓ The total current to send a packet is : 76.2681mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 + 0.2571 + 76.2681+1.21)/(20*60)= 0.0684mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) = **0.0684**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0684** * 8760+48) = 3.7(Years)

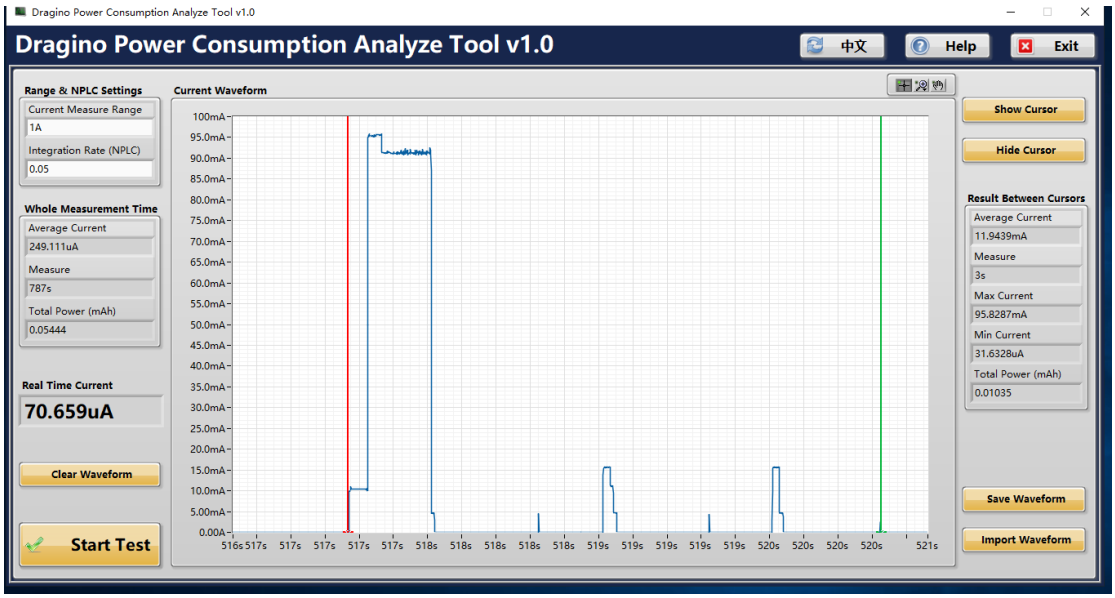
2.6 DR=2,TXP=0

Transmit Time: 3s

Average Current in transmit time: 11.9439A

The total current to send a packet is

11.9439mA * 3s =35.8317 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=2. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s =(4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.85668mA*(20*60s/18s)= (0.2571mA*s)
- ✓ The total current to send a packet is : 35.8317mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 + 0.2571 + 35.8317+1.21)/(20*60)= 0.0347mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) = **0.0347**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0347** * 8760+48) = 6.8(Years)

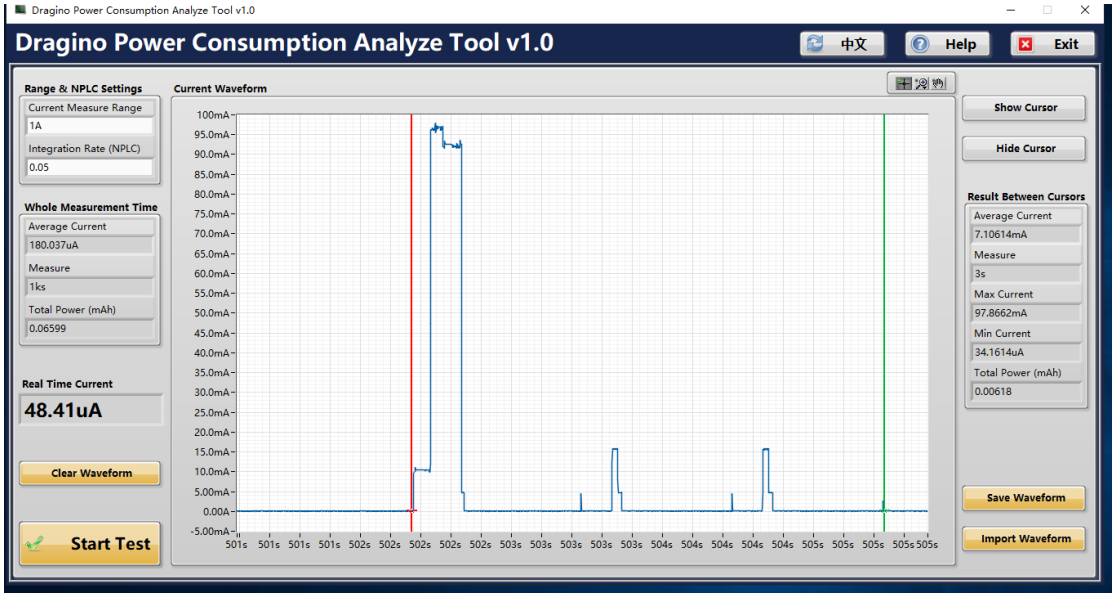
2.7 DR=3,TXP=0

Transmit Time: 3s

Average Current in transmit time: 7.10614mA

The total current to send a packet is

7.10614mA * 3s =21.31842 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=3. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s =(4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.85668mA*(20*60s/18s)= (0.2571mA*s)
- ✓ The total current to send a packet is : 21.3184mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 + 0.2571 + 21.3184+1.21)/(20*60)= 0.0226mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) = **0.0226**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0226*** 8760+48) = 9.7(Years)

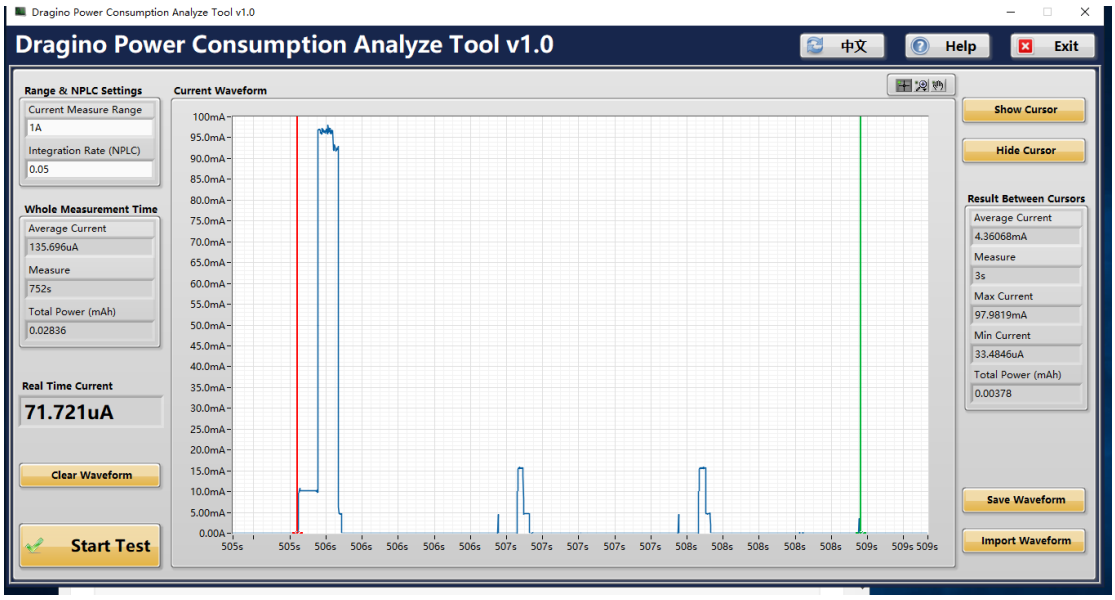
2.8 DR=4,TXP=0

Transmit Time: 3s

Average Current in transmit time:4.36068mA

The total current to send a packet is

4.36068mA * 3s =13.08204 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=4. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s =(4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.85668mA*(20*60s/18s)= (0.2571mA*s)
- ✓ The total current to send a packet is : 13.082mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 + 0.2571 + 13.082+1.21)/(20*60)= 0.0157mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) = **0.0157**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0157*** 8760+48) = 12.9(Years)

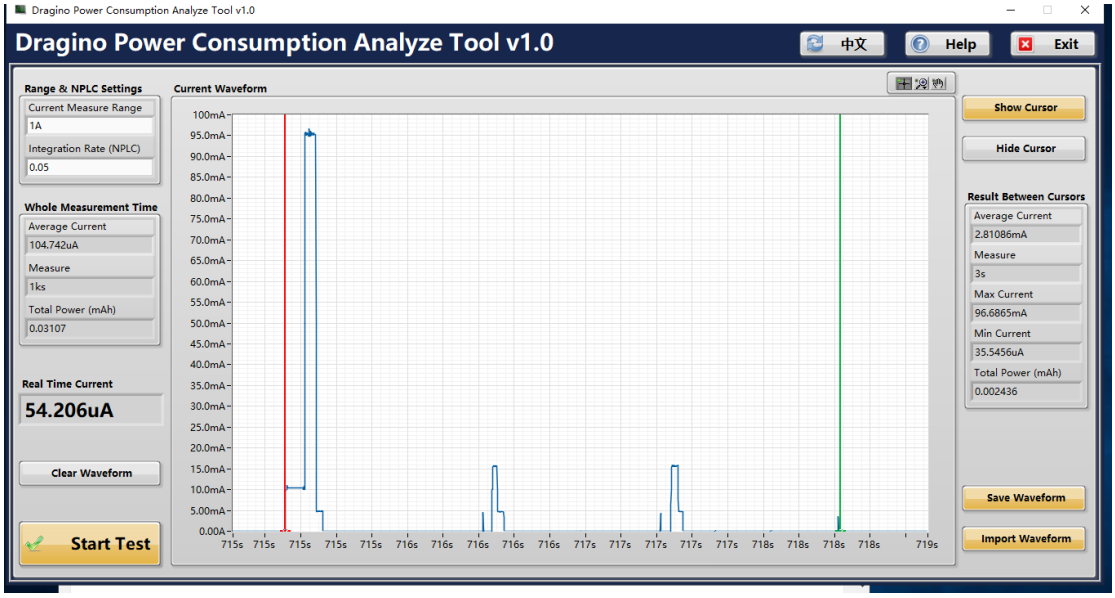
2.9 DR=5,TXP=0

Transmit Time: 3s

Average Current in transmit time: 2.81086mA

The total current to send a packet is

2.81086mA * 3s =8.43258 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=5. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s =(4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.85668mA*(20*60s/18s)= (0.2571mA*s)
- ✓ The total current to send a packet is : 8.4326mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 + 0.2571 + 8.4326+1.21)/(20*60)= 0.0118mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) = **0.0118**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

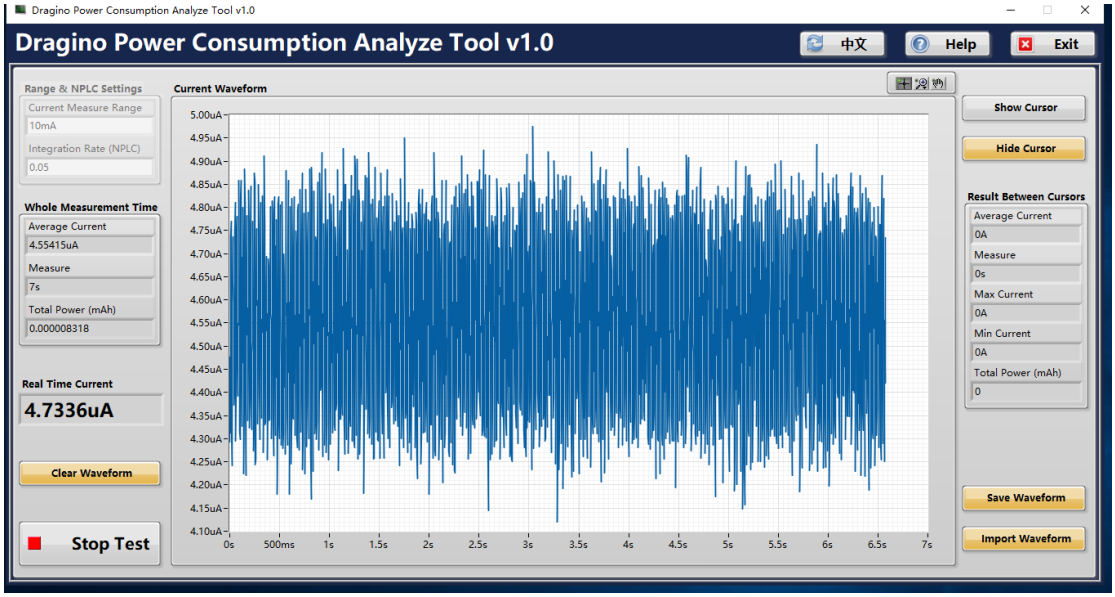
So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0118*** 8760+48) = 15.8(Years)

3. EU868 Power - with DS18B20

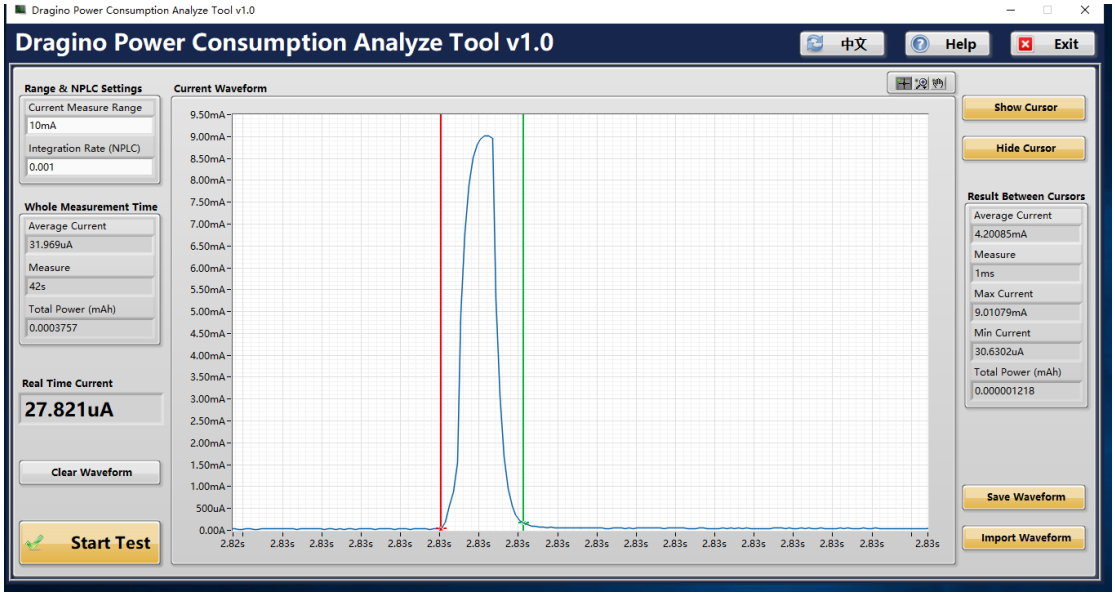
3.1 Deep Sleep Mode

Average: 4.8uA



3.2 Watchdog Power

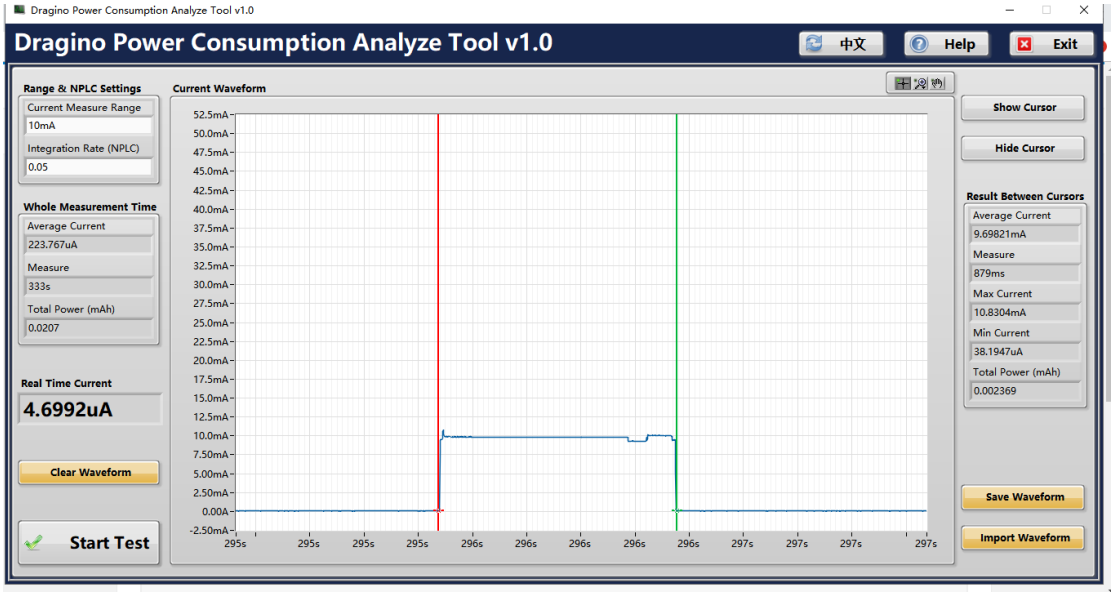
Max 9mA Average 4.20085mA in 1ms for every 18 seconds (watchdog period)



3.3 RTP current

Once in 20 minutes

MAX current : 11mA


Dragino Power Consumption Analyze Tool v1.0
Dragino Power Consumption Analyze Tool v1.0
中文
Help
Exit
Range & NPLC Settings
Current Measure Range
10mA
Integration Rate (NPLC)
0.05
Whole Measurement Time
Average Current
223.767uA
Measure
333s
Total Power (mAh)
0.0207
Real Time Current
4.6992uA
Clear Waveform
Start Test
Current Waveform
52.5mA
50.0mA
47.5mA
45.0mA
42.5mA
40.0mA
37.5mA
35.0mA
32.5mA
30.0mA
27.5mA
25.0mA
22.5mA
20.0mA
17.5mA
15.0mA
12.5mA
10.0mA
7.50mA
5.00mA
2.50mA
0.00A
-2.50mA
295s
296s
297s
Show Cursor
Hide Cursor
Result Between Cursors
Average Current
9.69821mA
Measure
879ms
Max Current
10.8304mA
Min Current
38.1947uA
Total Power (mAh)
0.002369
Save Waveform
Import Waveform

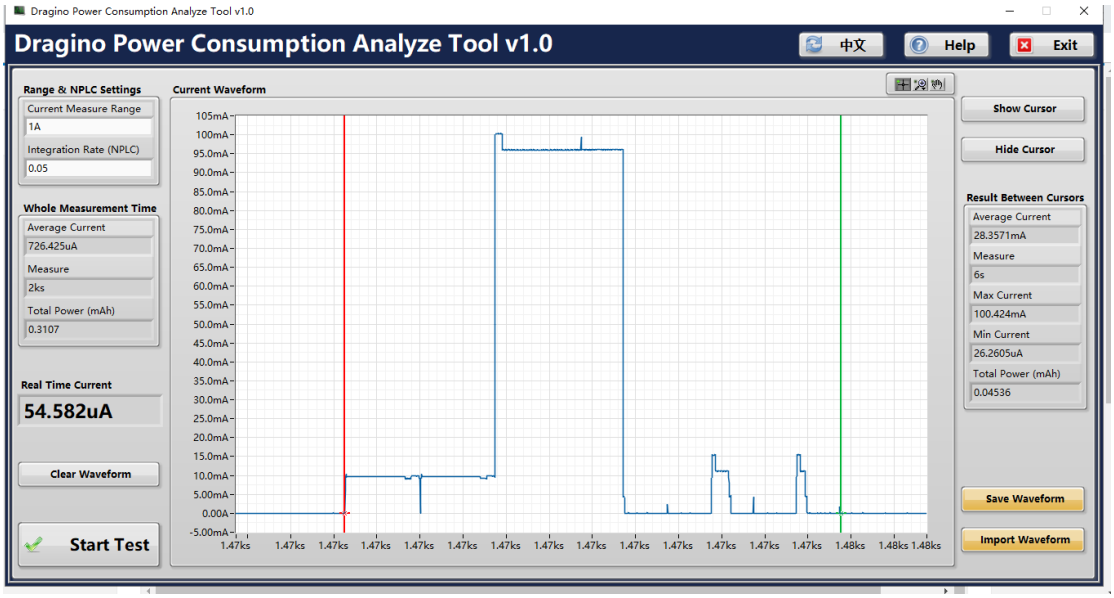
3.4 DR=0,TXP=0

Transmit Time: 6s

Average Current in transmit time: 28.3571mA

The total current to send a packet is

28.3571mA * 6s =170.1426 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

, and let is working in set up DR=0. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s =(5.76mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 170.1426mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.76 + 0.2801 + 170.1426+8.79)/(20*60)=0.1541 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.1541**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.1541** * 8760+48) = 1.7(Years)

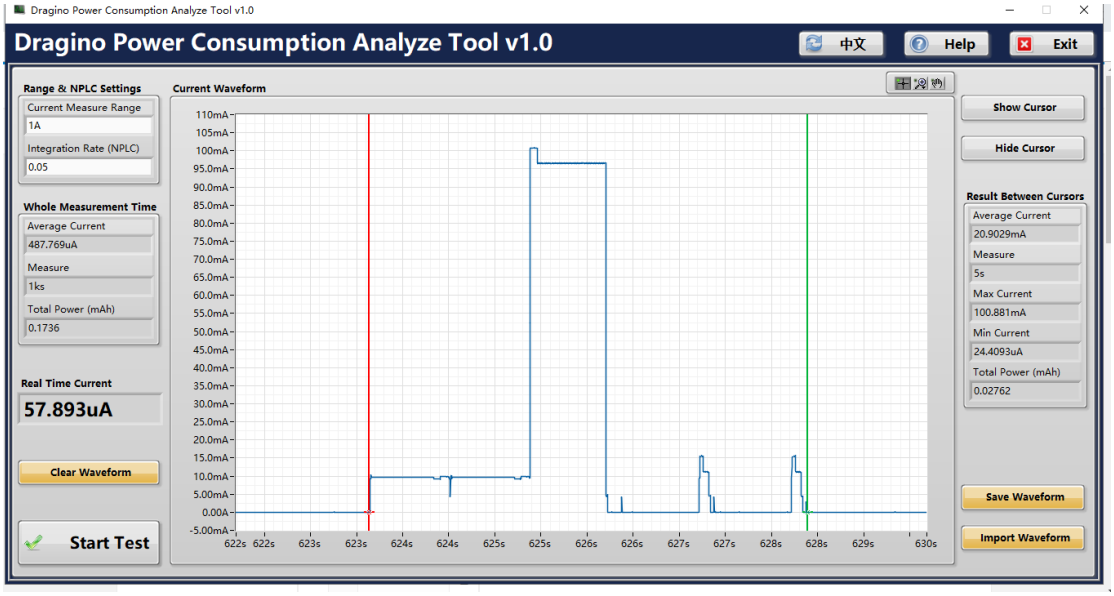
3.5 DR=1

Transmit Time: 5s

Average Current in transmit time: 20.9029mA

The total current to send a packet is

20.9029mA * 5s =104.5145 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=1. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s =(5.76mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 104.5145mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.76 + 0.2801 + 104.5145+8.79)/(20*60)=0.0995 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0995**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0995*** 8760+48) =2.6(Years)

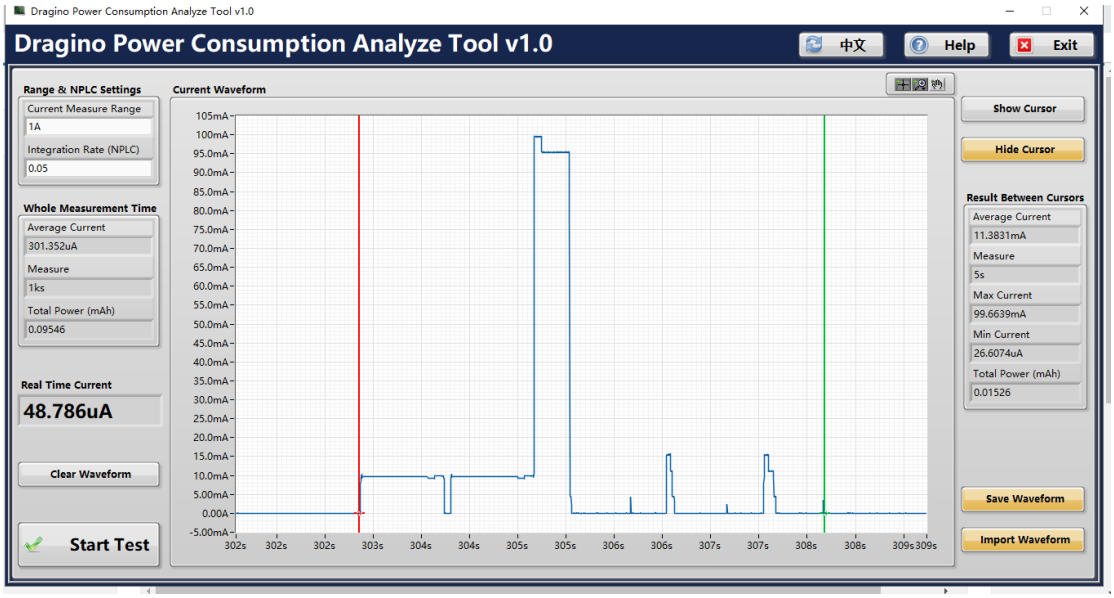
3.6 DR=2

Transmit Time: 5s

Average Current in transmit time: 11.3831mA

The total current to send a packet is

11.3831mA * 5s =56.9155 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=2. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s =(5.76mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 56.9155mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.76 + 0.2801 + 56.9155+8.79)/(20*60)=0.0598 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0598**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0598** * 8760+48) = 4.1(Years)

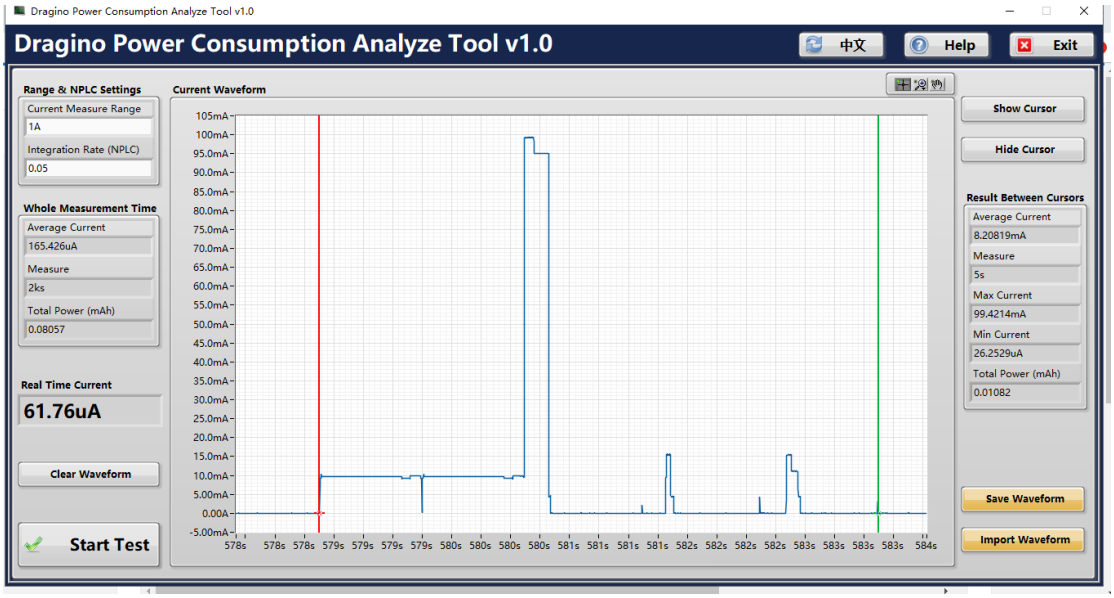
3.7 DR=3

Transmit Time: 5s

Average Current in transmit time: 8.20819mA

The total current to send a packet is

8.20819mA * 5s =41.04095 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=3. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s =(5.76mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 41.041mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.76 + 0.2801 + 41.041+8.79)/(20*60)=0.0466 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0466**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0466** * 8760+48) = 5.2(Years)

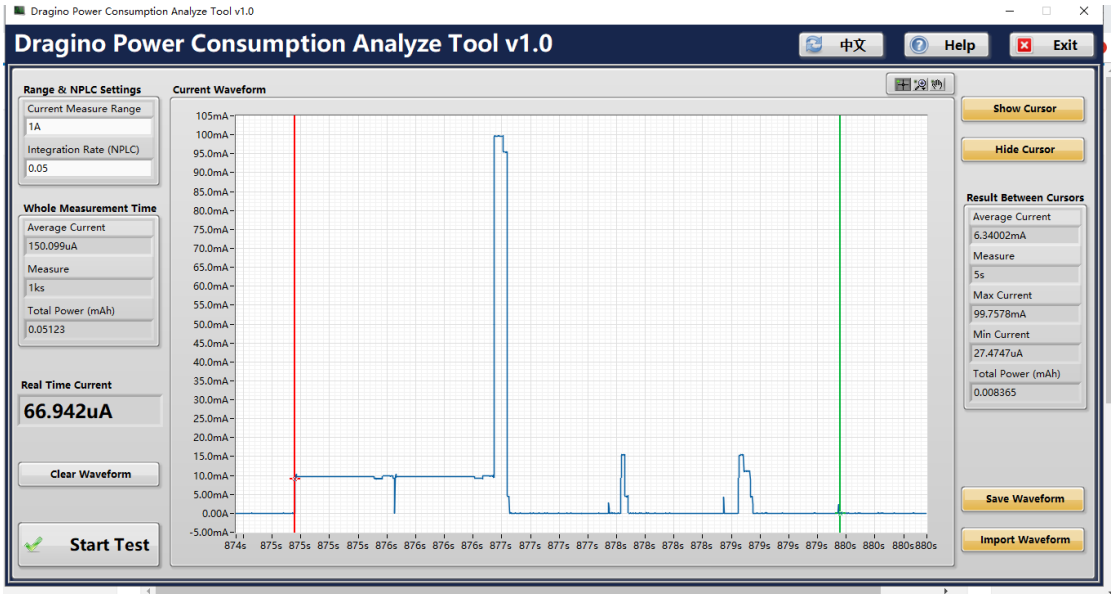
3.8 DR=4

Transmit Time: 5s

Average Current in transmit time: 6.34002mA

The total current to send a packet is

6.34002mA * 5s =31.7001 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=4. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s =(5.76mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 31.7001mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.76 + 0.2801 + 31.7001+8.79)/(20*60)=0.0388 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0388**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0388** * 8760+48) = 6.1(Years)

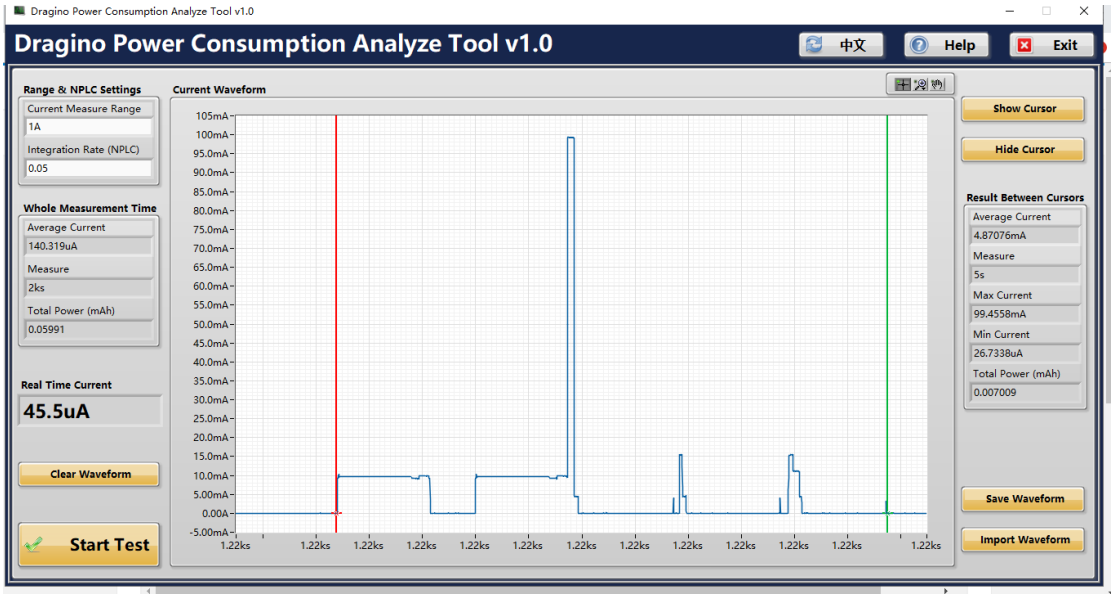
3.9 DR=5

Transmit Time: 5s

Average Current in transmit time: 4.87076mA

The total current to send a packet is

4.87076mA * 5s =24.3538 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

Fand let is working in set up DR=5. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s =(5.76mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 24.3538mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.76 + 0.2801 +24.3538+8.79)/(20*60)=0.0327 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0327**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

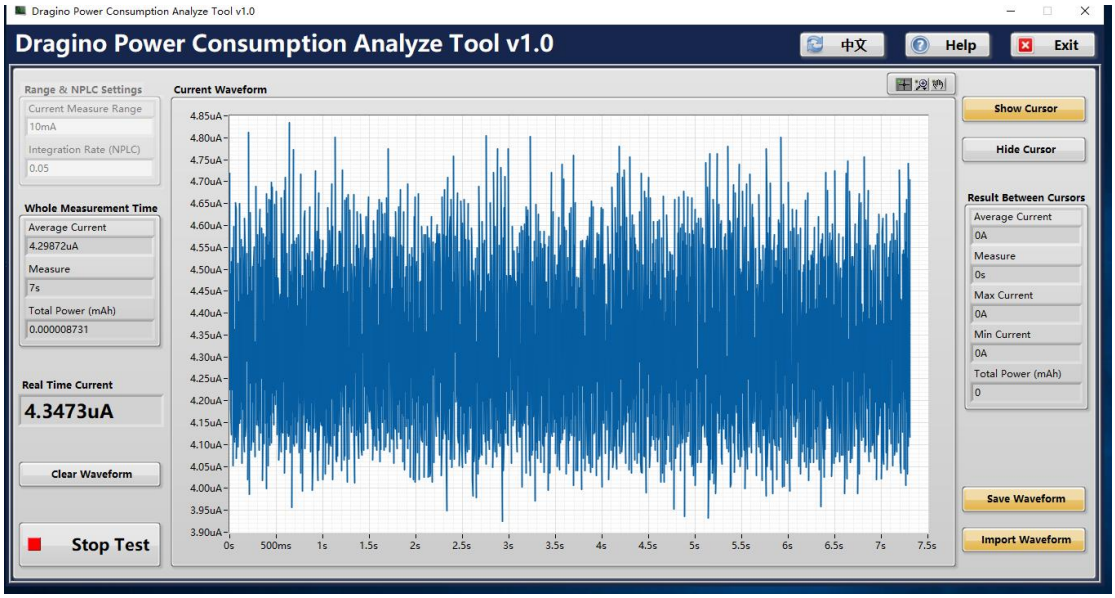
So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0327** * 8760+48) = 8.3(Years)

4. EU868 Power - with interrupt sensor (EU868)

Without considering the power consumption to power external sensor

4.1 Deep Sleep Mode

Average: 4.5uA



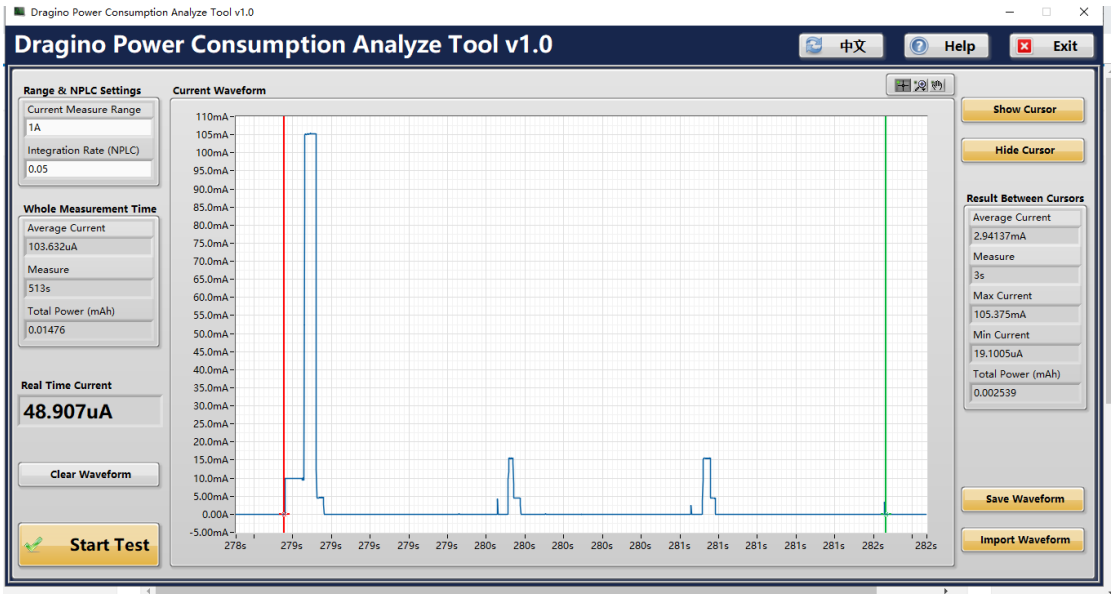
send data

Transmit Time: 3s

Average Current in transmit time: 2.94137mA

The total current to send a packet is

2.94137mA * 3s =8.82411 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=5. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0045mA*20*60s =(5.4mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 8.8241mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(5.4 + 0.2801 + 8.8241+8.79)/(20*60)=0.0194 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0194**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

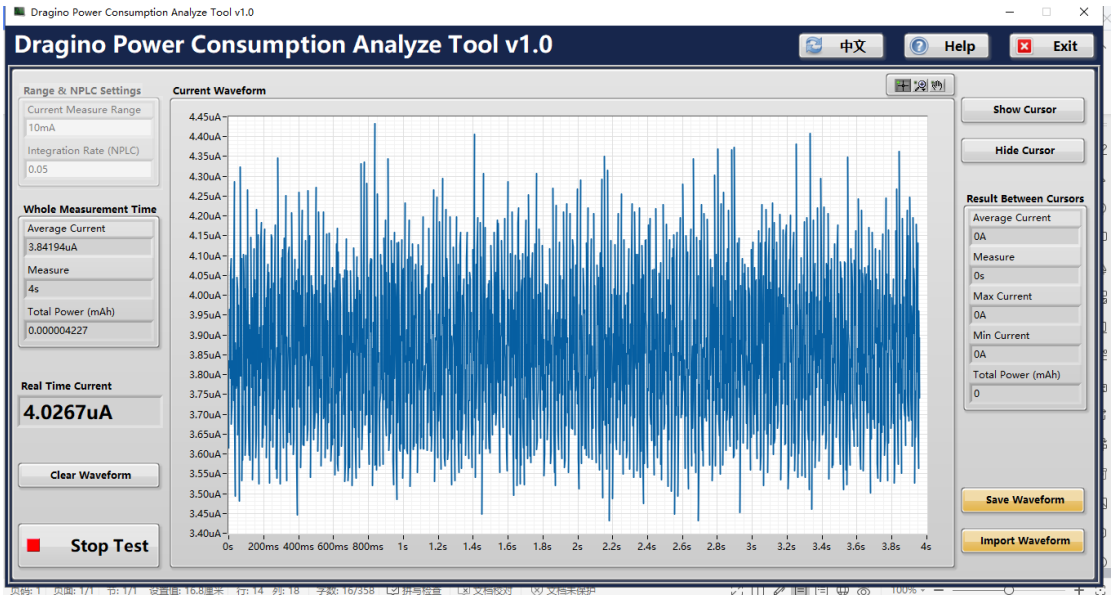
So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0194** * 8760+48) = 11(Years)

5. EU868 Power - With Counting Sensor

Without considering the power consumption to power external sensor

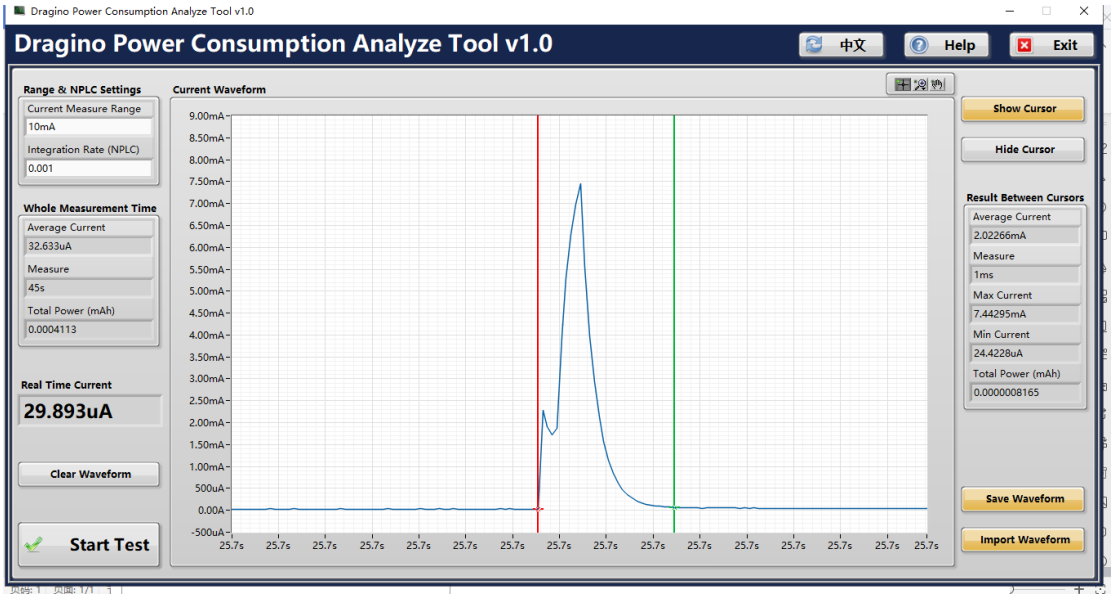
5.1 Deep Sleep Mode

Average: 4.1uA



5.2 Trigger Count

Max 7.5mA Average 2.02266mA in 1ms for Trigger 200 times within 20 minutes



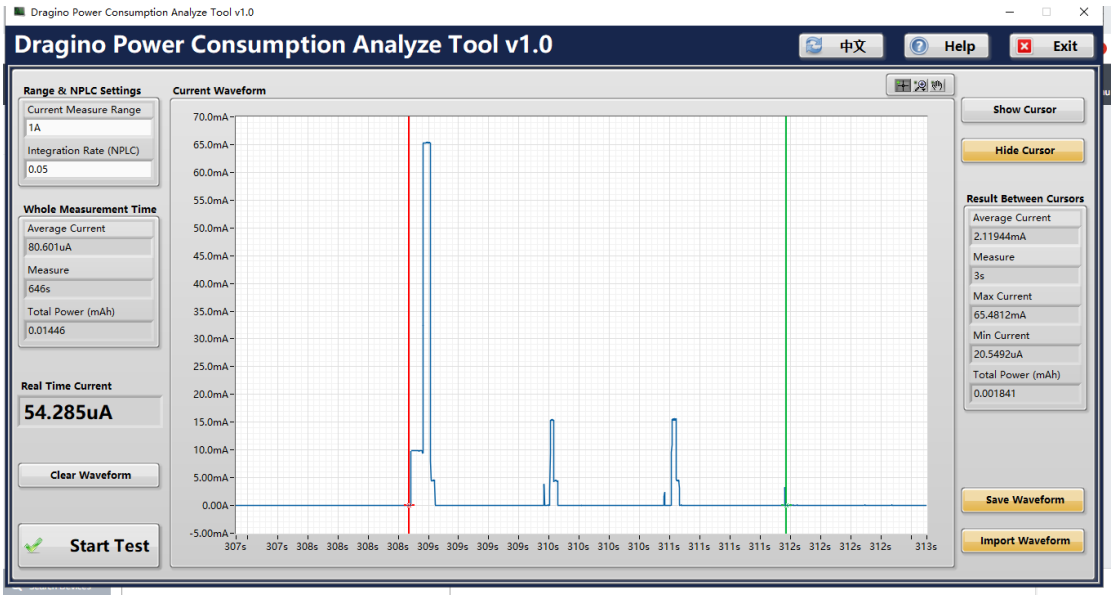
send data

Transmit Time: 3s

Average Current in transmit time: 2.11944mA

The total current to send a packet is

2.11944mA * 3s =6.35832 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=5. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0041mA*20*60s =(4.92mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is : 6.35832mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s
- ✓ Trigger interrupt count :0.001s*2.0227mA*20*60s*(1200s/200s) =(14.5634mA*s)

So **total Average Current is :(4.92 + 0.2801 +6.3583+8.79+14.5634)/(20*60)= 0.0291mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0291**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

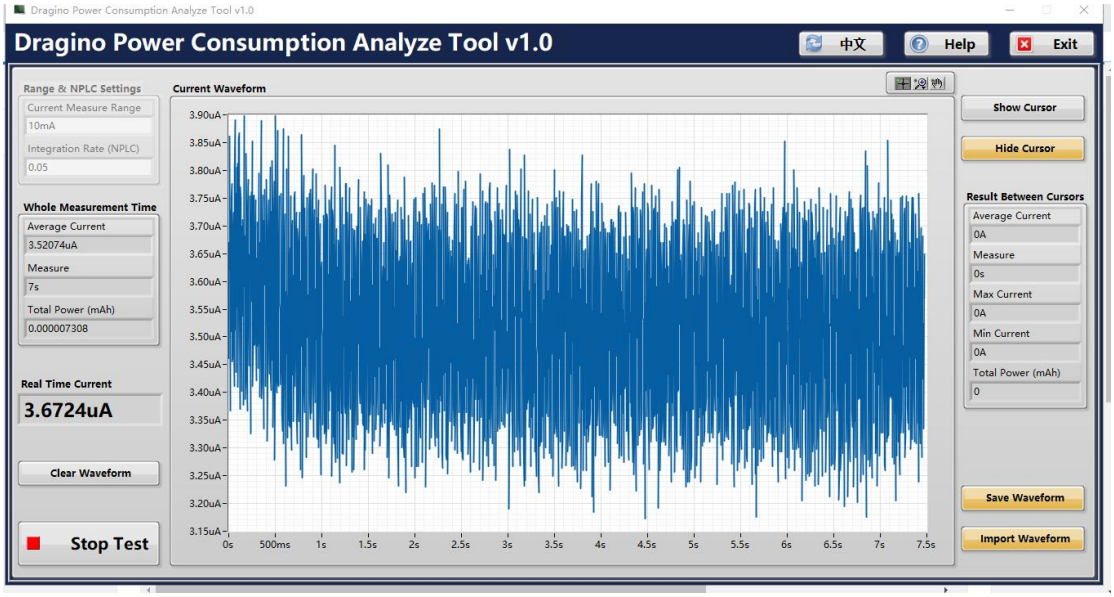
So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0291** * 8760+48) = 7.9(Years)

6. EU868 Power - ADC sensor

Without considering the power consumption to power external sensor

6.1 Deep Sleep Mode

Average: 3.7uA



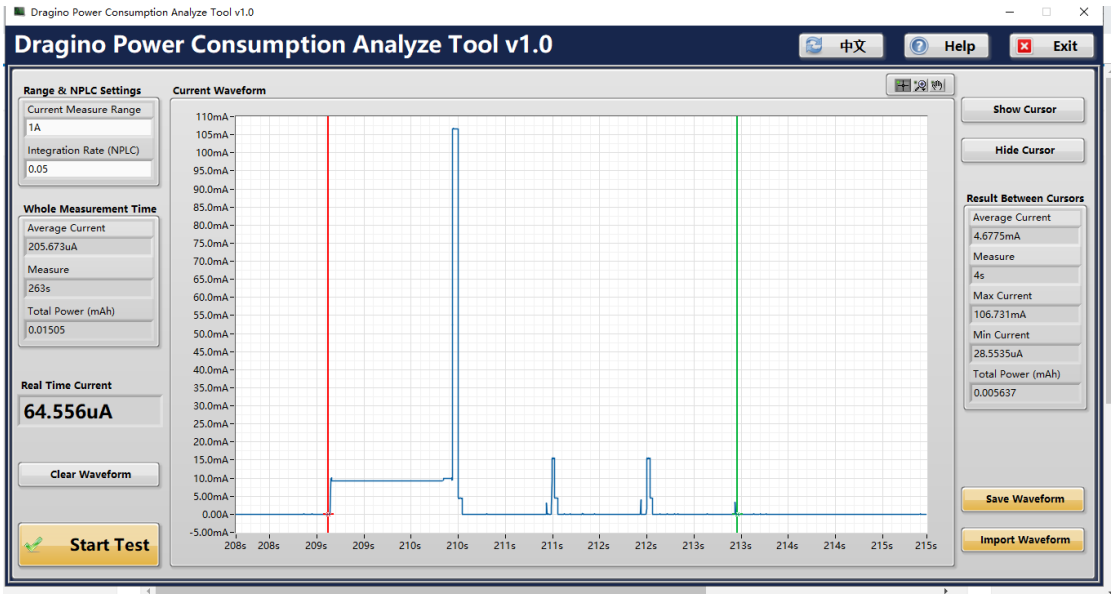
send data

Transmit Time: 3s

Average Current in transmit time: 4.6775mA

The total current to send a packet is

4.6775mA * 3s =14.0325 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=5. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0037mA*20*60s= (4.44mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is :14.0325mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(4.44 + 0.2801 +14.0325+8.79)/(20*60)= 0.023mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.023**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

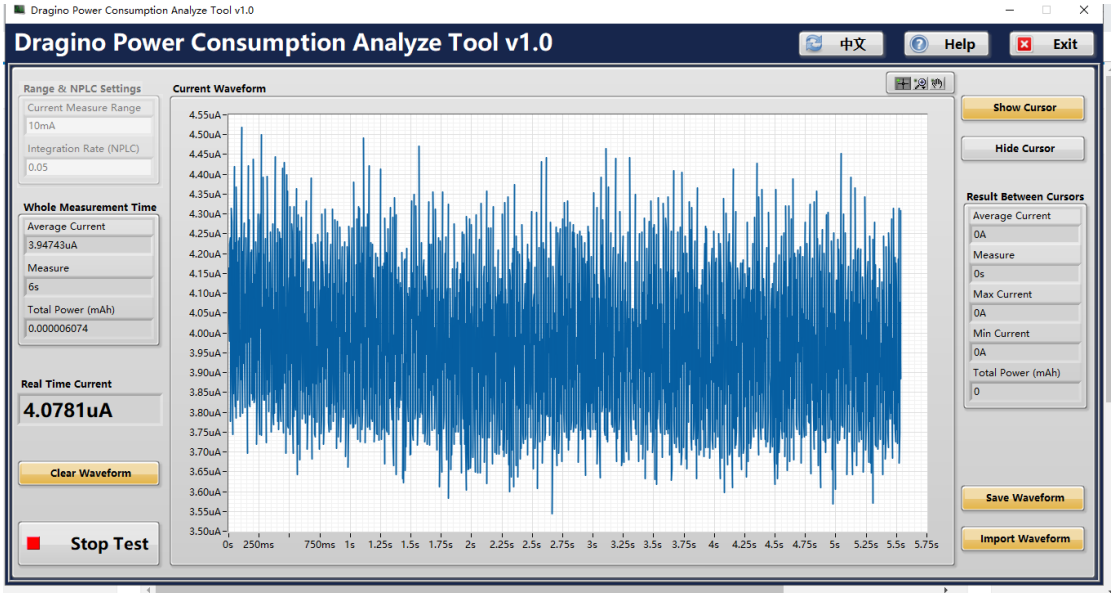
So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.023** * 8760+48) = 9.6(Years)

7. EU868 Power - With Illumination sensor

Without considering the power consumption to power external sensor

7.1 Deep Sleep Mode

Average: 4.1uA



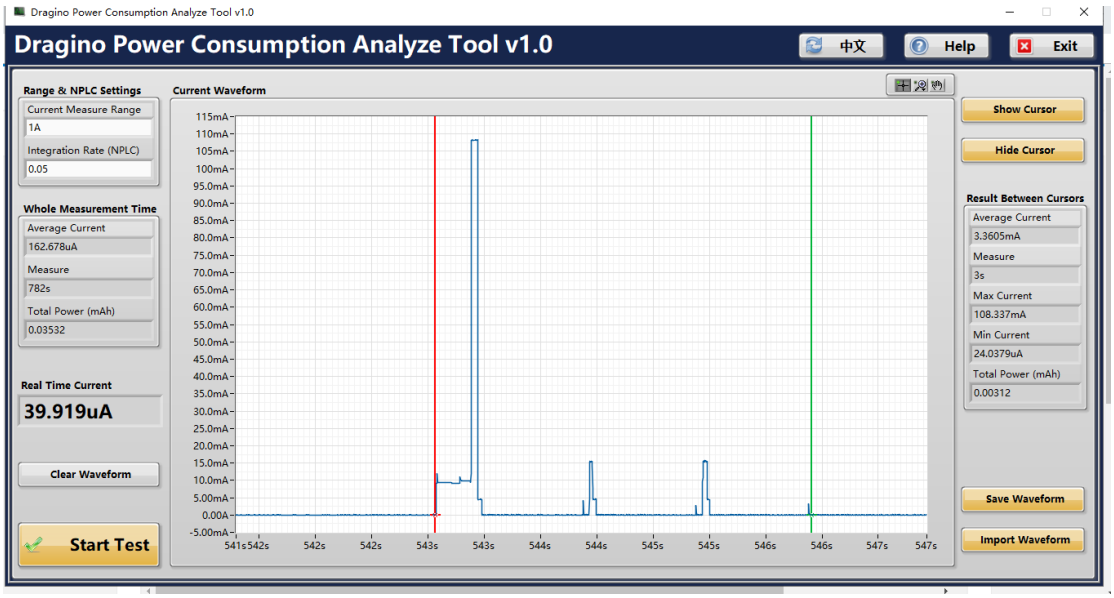
send data

Transmit Time: 3s

Average Current in transmit time: 3.3605mA

The total current to send a packet is

3.3605mA * 3s =10.0815 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=5. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0041mA*20*60s= (4.92mA*s)
- ✓ Watch Dog Current: 0.001s*4.2009mA*(20*60s/18s)= (0.2801mA*s)
- ✓ The total current to send a packet is :10.0815mA*s
- ✓ RTP current : 10mA*0.879s=8.79mA*s

So **total Average Current is :(4.92 + 0.2801 +10.0815+8.79)/(20*60)= 0.0201mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0201**mA * 24 * 365 * y

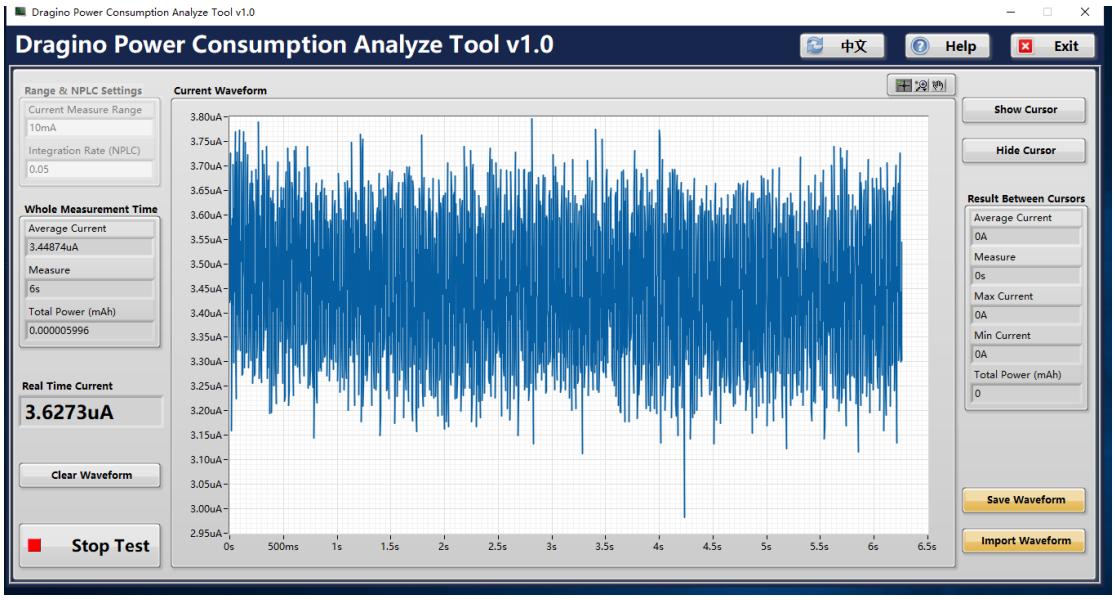
So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0201** * 8760+48) = 10.7(Years)

Default mode

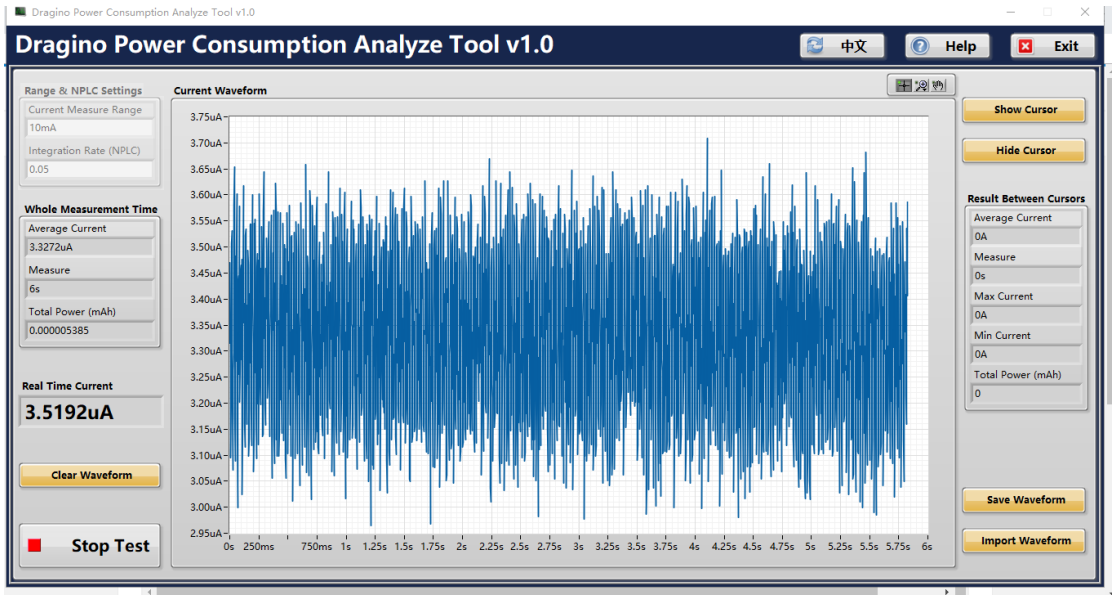
Average: 3.7uA



8. US915 Power – Without Sensor

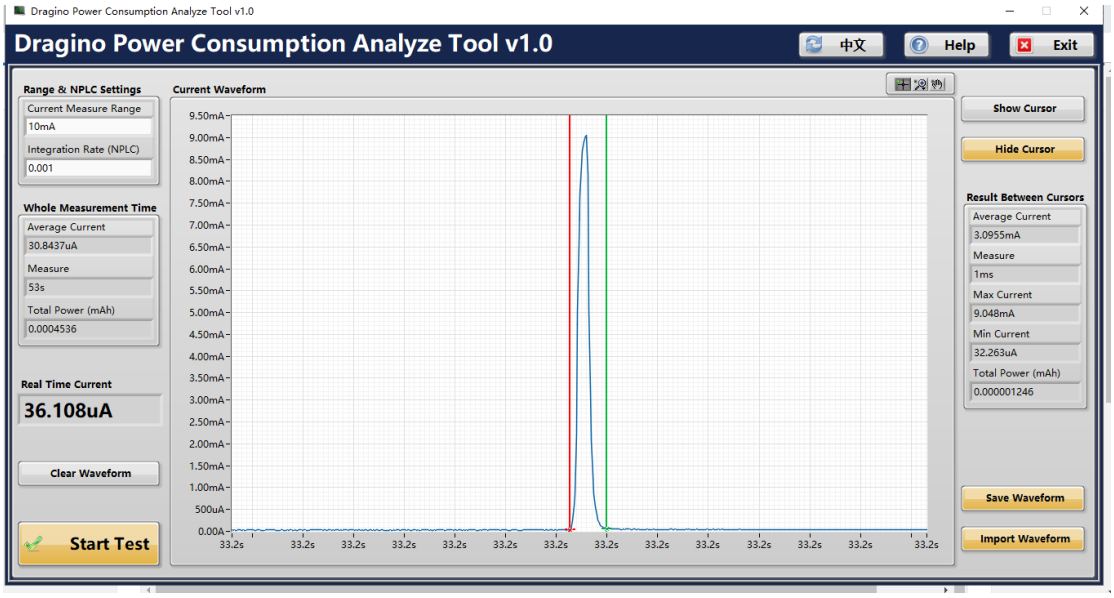
8.1 Deep Sleep Mode

Average: 3.6uA.



8.2 Watchdog Power

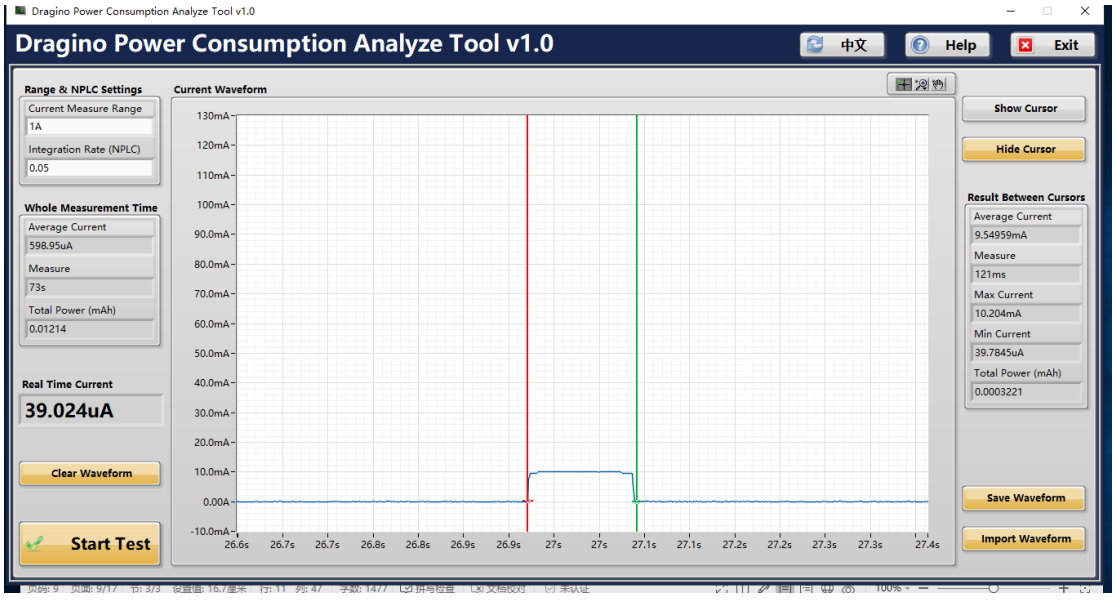
Max 9mA Average 3.0955mA in 1ms for every 18 seconds (watchdog period)



8.3 RTP current

Once in 20 minutes

MAX current: 10mA



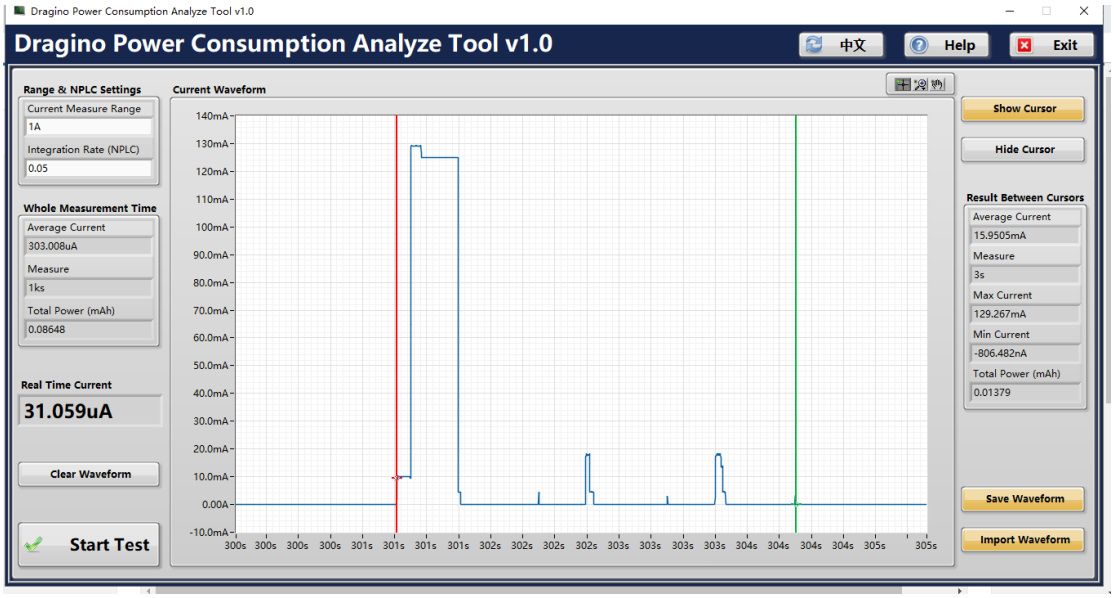
8.4 DR=0,TXP=0

Transmit Time：3s

Average Current in transmit time: 15.9505mA

The total current to send a packet is

15.9505mA * 3s = 47.8515mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=0. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s= (4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.0955mA*(20*60s/18s) = (0.2064mA*s)
- ✓ The total current to send a packet is : 47.8515mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 +0.2064+ 47.8515+1.21)/(20*60)= 0.0447mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0447**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0447*** 8760+48) = 5.4(Years)

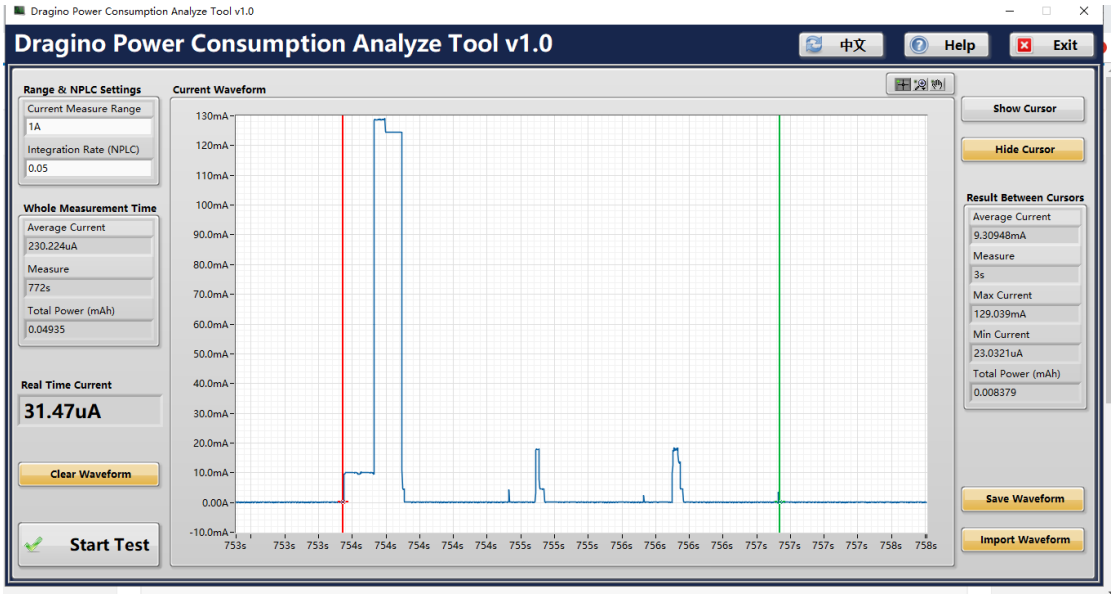
8.5 DR=1,TXP=0

Transmit Time: 3s

Average Current in transmit time: 9.30948mA

The total current to send a packet is:

9.30948mA * 3s = 27.92844mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=1. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s= (4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.0955mA*(20*60s/18s) = (0.2064mA*s)
- ✓ The total current to send a packet is : 27.9284mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 +0.2064+ 27.9284+1.21)/(20*60)= 0.0281mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0281**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0281*** 8760+48) = 8.1(Years)

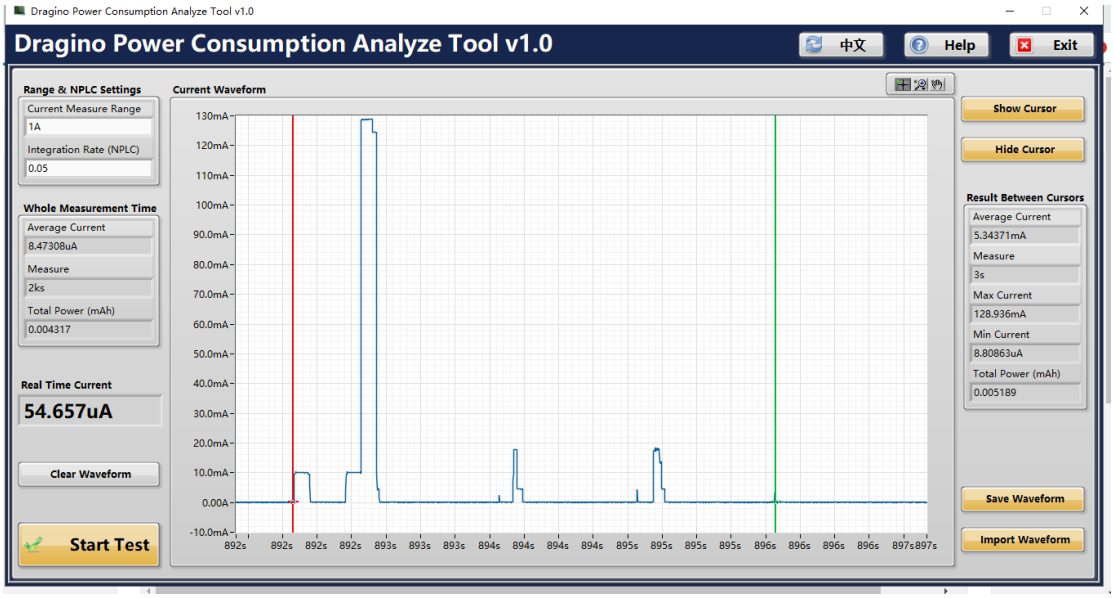
8.6 DR=2,TXP=0

Transmit Time: 3s

Average Current in transmit time: 5.34371mA

The total current to send a packet is

5.34371mA * 3s =16.03113 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=2. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s= (4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.0955mA*(20*60s/18s) = (0.2064mA*s)
- ✓ The total current to send a packet is : 16.0311mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 +0.2064+ 16.0311+1.21)/(20*60)= 0.0181mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0181**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0181*** 8760+48) = 11.6(Years)

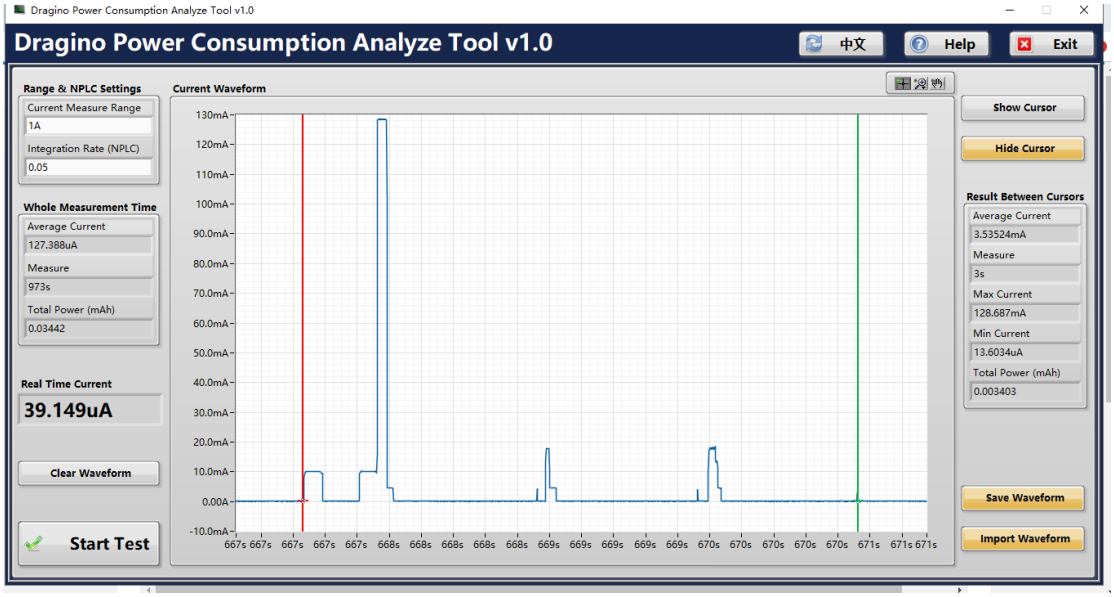
8.7 DR=3,TXP=0

Transmit Time: 3s

Average Current in transmit time: 3.53524mA

The total current to send a packet is

3.53524mA * 3s =10.60572 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=3. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0036mA*20*60s= (4.32mA*s)
- ✓ Watch Dog Current: 0.001s*3.0955mA*(20*60s/18s) = (0.2064mA*s)
- ✓ The total current to send a packet is : 10.6057mA*s
- ✓ RTP current : 10mA*0.121s=1.21mA*s

So **total Average Current is :(4.32 +0.2064+10.6057+1.21)/(20*60)= 0.0136mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0136**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

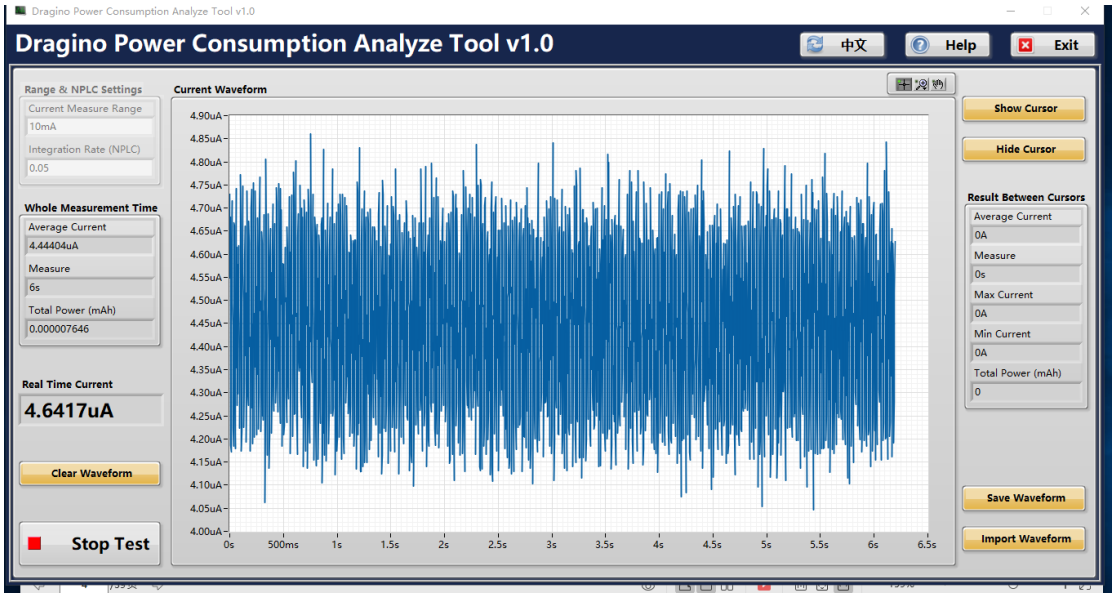
So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0136*** 8760+48) = 14.3(Years)

9. US915 Power - With DS18B20

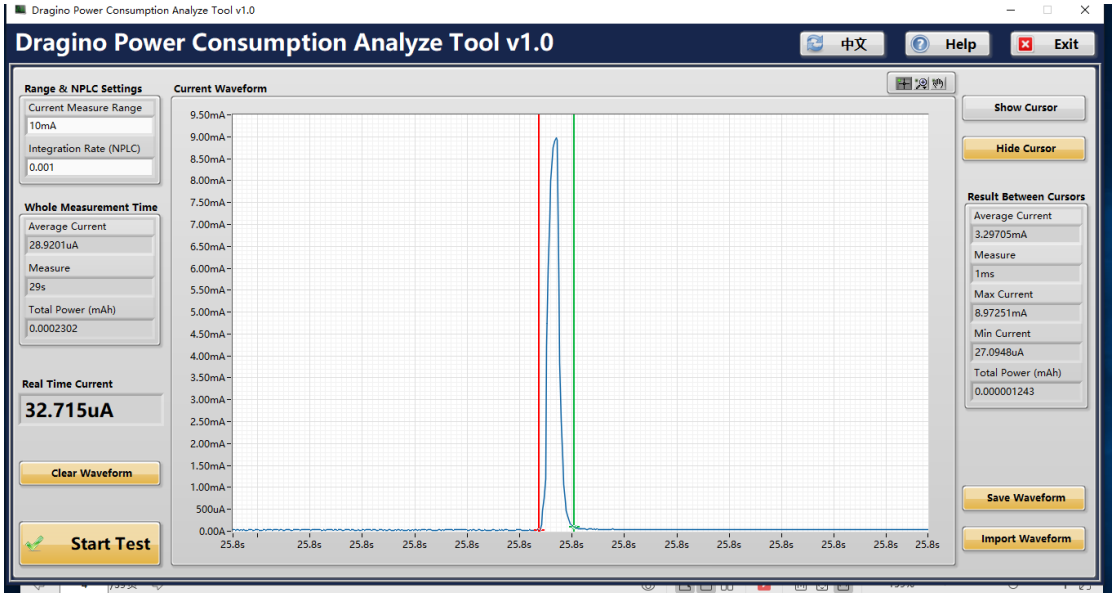
9.1 Deep Sleep Mode

Average: 4.8uA



9.2 Watchdog Power

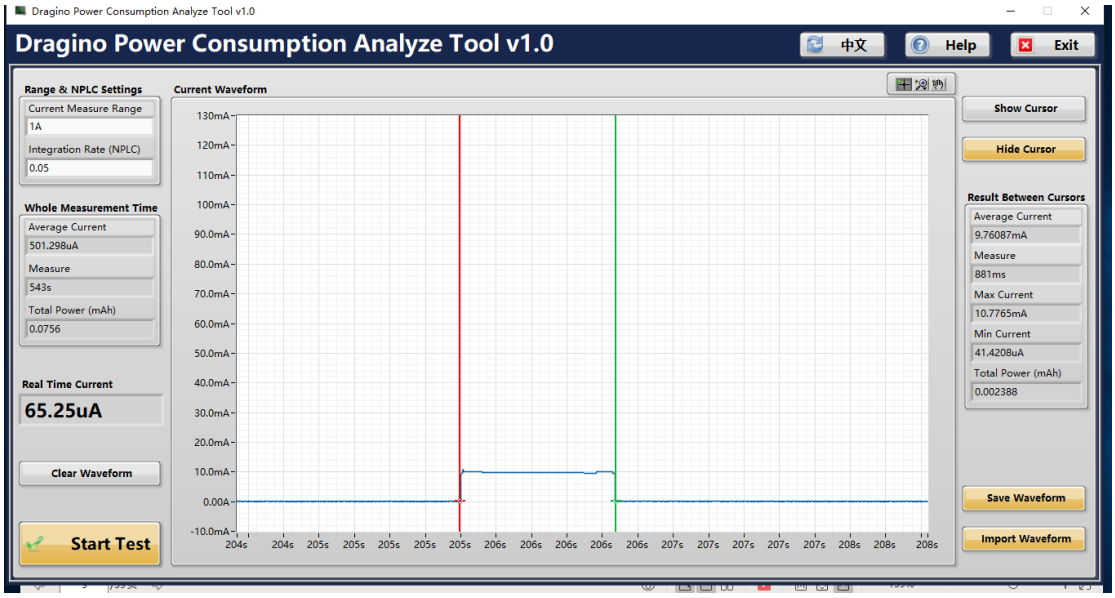
Max 9mA Average 4.20085mA in 1ms for every 18 seconds (watchdog period)



9.3 RTP current

Once in 20 minutes

MAX current : 11mA



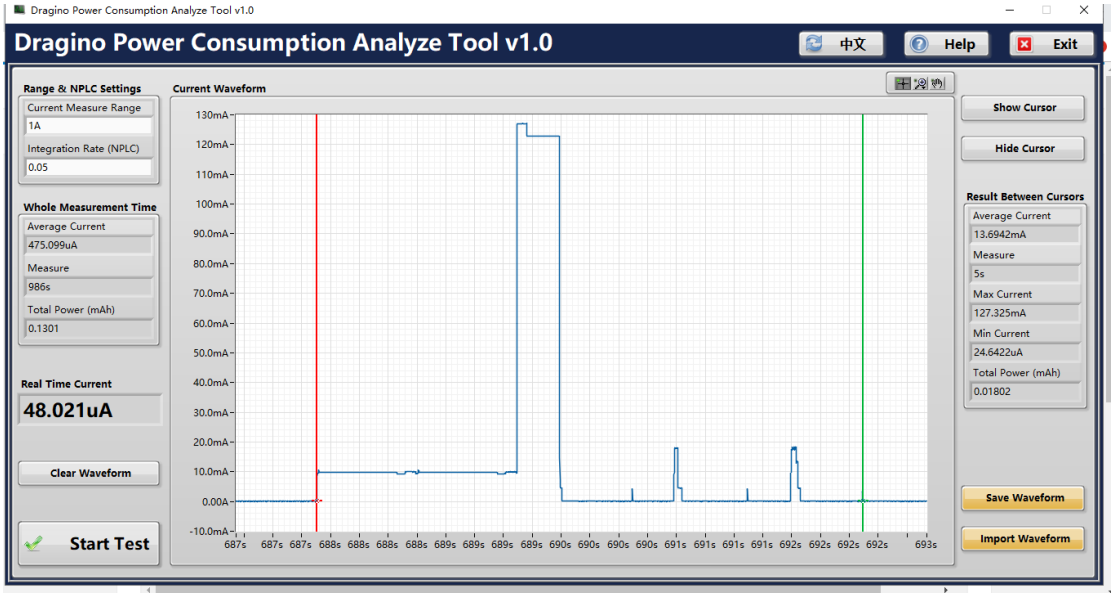
9.4 DR=0,TXP=0

Transmit Time: 5s

Average Current in transmit time: 13.6942mA

The total current to send a packet is

13.6942mA * 5s =68.471 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=0. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s= (5.76mA*s)
- ✓ Watch Dog Current: 0.001s*3.2971mA*(20*60s/18s)= (0.2198mA)
- ✓ The total current to send a packet is : 68.471mA*s
- ✓ RTP Current : 11mA*0.879s=9.669mA*s

So **total Average Current is :(5.76 + 0.2198 + 68.471+9.669)/(20*60)=0.0701 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0701**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0701** * 8760+48) = 3.6(Years)

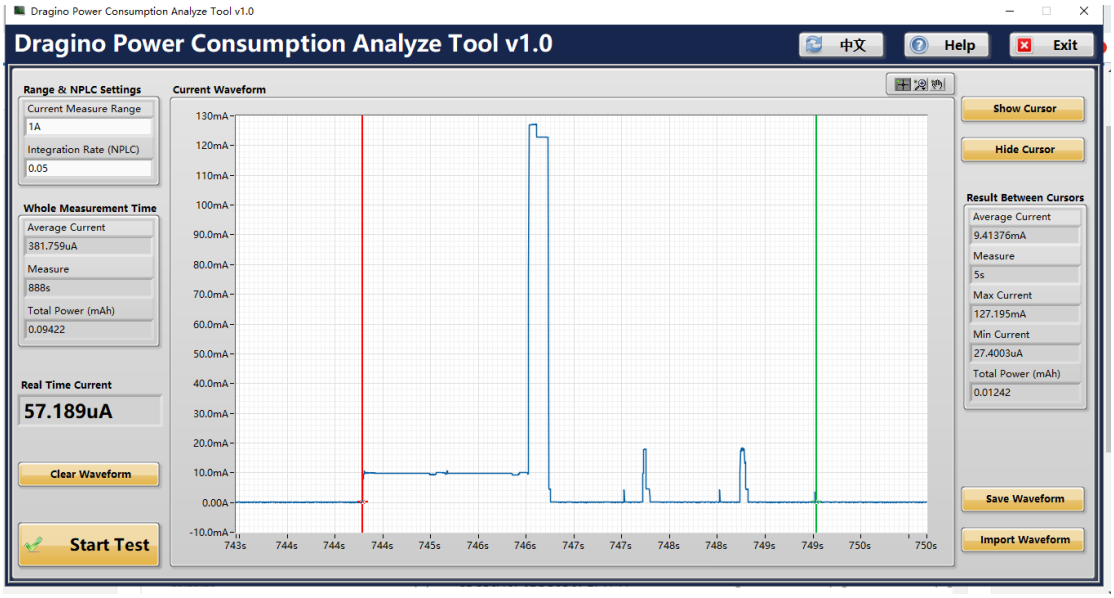
9.5 DR=1,TXP=0

Transmit Time: 5s

Average Current in transmit time: 9.41376mA

The total current to send a packet is

9.41376mA * 5s =47.0688 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=1. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s= (5.76mA*s)
- ✓ Watch Dog Current: 0.001s*3.2971mA*(20*60s/18s)= (0.2198mA)
- ✓ The total current to send a packet is : 47.0688mA*s
- ✓ RTP Current : 11mA*0.879s=9.669mA*s

So **total Average Current is :(5.76 + 0.2198 + 47.0688+9.669)/(20*60)=0.0498 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0498**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0498*** 8760+48) = 4.9(Years)

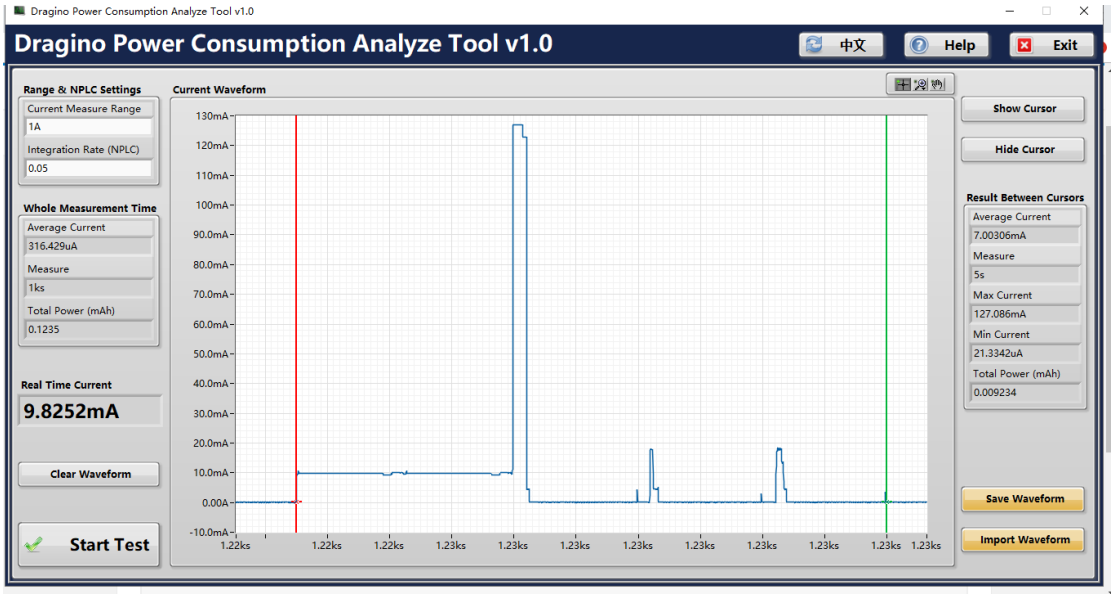
9.6 DR=2,TXP=0

Transmit Time: 5s

Average Current in transmit time: 7.00306mA

The total current to send a packet is

7.00306mA * 5s =35.0153 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=2. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s= (5.76mA*s)
- ✓ Watch Dog Current: 0.001s*3.2971mA*(20*60s/18s)= (0.2198mA)
- ✓ The total current to send a packet is : 35.0153mA*s
- ✓ RTP Current : 11mA*0.879s=9.669mA*s

So **total Average Current is :(5.76 + 0.2198 +35.0153+9.669)/(20*60)=0.0422 mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0422**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0422** * 8760+48) = 5.7(Years)

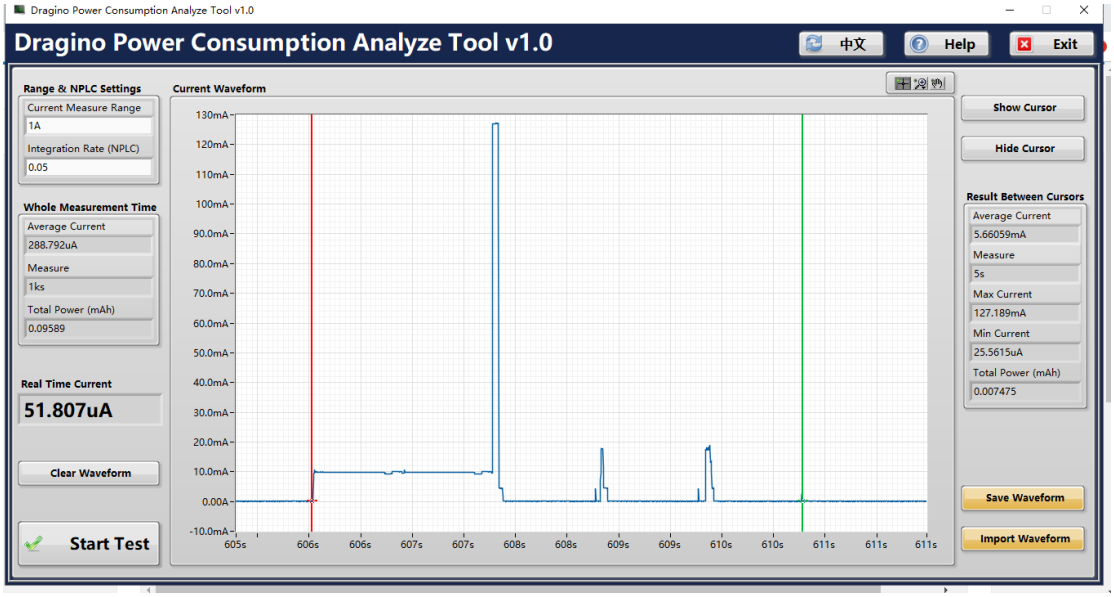
9.7 DR=3,TXP=0

Transmit Time: 5s

Average Current in transmit time: 5.66059mA

The total current to send a packet is

5.66059mA * 5s =28.30295 mA*s



Analyze Result

With Above test result and battery info, we can estimate the battery life.

and let is working in set up DR=3. Transmit one uplink every 20 minutes.

- ✓ Deep Sleep Mode Current : 0.0048mA*20*60s= (5.76mA*s)
- ✓ Watch Dog Current: 0.001s*3.2971mA*(20*60s/18s)= (0.2198mA)
- ✓ The total current to send a packet is : 28.303mA*s
- ✓ RTP Current : 11mA*0.879s=9.669mA*s

So **total Average Current is :(5.76 + 0.2198 + 28.303+9.669)/(20*60)=0.0366mA.**

The battery used inLHT65 is 2400mAh and of stable voltage in the most of life. With considering a max 2% discharge rate from the battery spec.So the battery life is y. so

2400(1 - 2%*y) =**0.0366**mA * 24 * 365 * y

So 2400 – 48*y = **AV_CURRENT** * 8760 *y

So 2400 =(**AV_CURRENT** * 8760 +48) * Y

So Y = 2400/ (**AV_CURRENT** * 8760+48) = 2400 / (**0.0366** * 8760+48) = 6.5(Years)