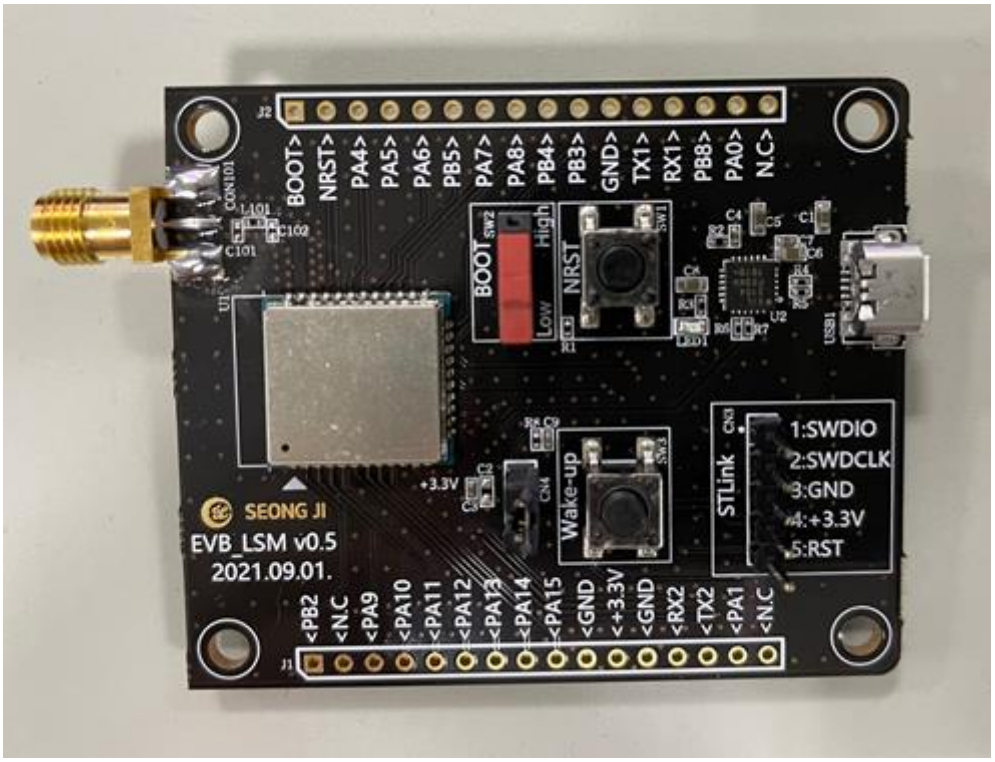
LSM100A - LoRa

RF Testing Setup Guide

▶ **CONTENTS**

1. 구성요소

(1) LSM100A



(2) Test용 Output

RF_TEST_LSML00A

(Open batch : LSM100A₩2_LSM100A_FW_Download_Tool₩LSM100A_ST_Link_List_Manual.bat)

2. LoRa Test Mode

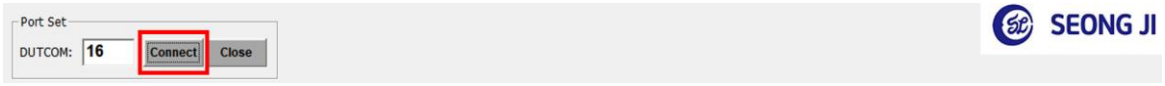
(1) Testing Tools

LSM_LoRa_CMD_v02.exe (01_20210916_LSM_LoRa_CMD_v02.zip)

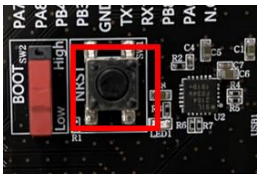
(2) 테스트 방법

1) EVB 전원인가

2) PC툴 연결 (Connect 버튼 클릭)



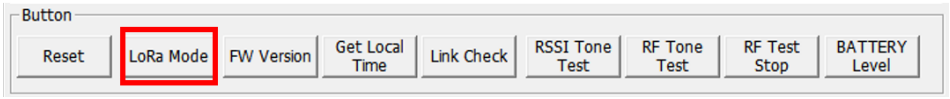
3) EVB 리셋 (NRST 버튼 클릭)



4) 툴 연결 확인

로그 확인 : Dut Com:X is Connected Baud[9600]

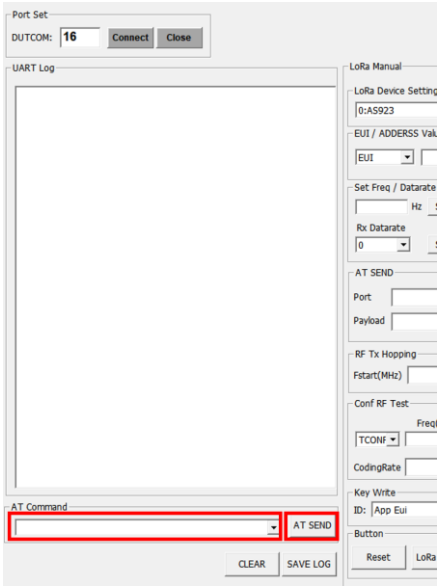
5) LoRa Mode 전환 (LoRa Mode 버튼 클릭)



로그 확인 :

>> Device : LSM100A
>> Mode : LORA

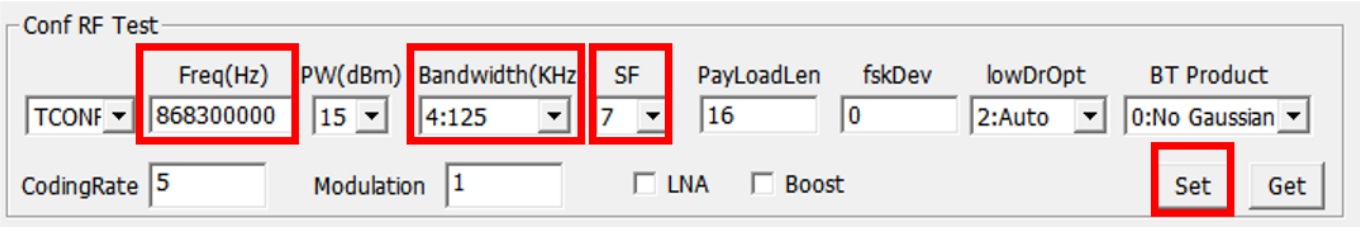
6) 커맨드 입력 및 Send



7) Modulation 테스트 세팅

a. 기본 설정

Conf RF Test 세팅(단말 리셋 시 마다 실행 필요)



- 상단 그림처럼 빈칸 없이 Parameter 입력 후 Set
- Frequency, Bandwidth, SF 변경 시 Set

AT+TCONF=<Freq>:<Power>:<LoRa Bandwidth>:<Lora SF>:<CodingRate>:<Lna>:<PA Boost>:<Modulation>:<PayloadLen>:<FskDeviation>: <LowDrOpt>:<BTproduct><CR>

- Frequency: [ex: 868300000]Hz
- Power: [-9 ~ 22]dBm Max 15dBm at Low Power
- Bandwidth: Lora [4: 125, 5: 250, 6: 500]kHz
- SF: [7 ~ 12]
- CodingRate: [4/5, 4/6, 4/7, 4/8]
- Lna: [0: Off, 1: On]
- PA Boost: [0: Off, 1: On]
- Modulation: [1: LoRa]
- PayloadLen: [1 ~ 256]
- FskDev: FSK Only [600 ~ 20000]
- LowDrOpt: Lora Only [0: off, 1: On, 2: Auto]
- BTproduct: [0: no Gaussian Filter Applied, 1: BT=0,3, 2: BT=0,5, 3: BT=0,7, 4: BT=1]

예제) AT+TCONF=868300000:10:4:5:4/5:0:0:1:16:0:0:0(CR)(LF)

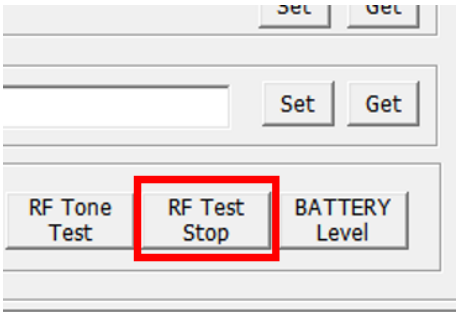
b. Modulation 테스트 방법

TX Start : Modulation RF TX TEST START

예제) AT+MTX

TX Stop : Modualtion RF TX TEST STOP

예제) AT+TOFF



RX Start : Modulation RF RX TEST START

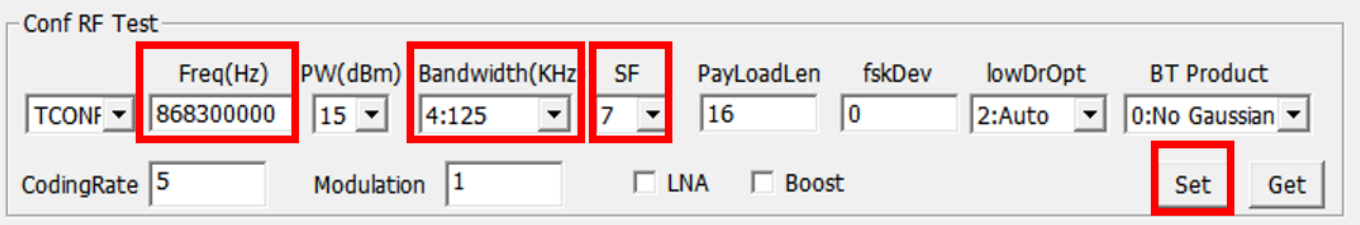
예제) AT+TRX

RX Stop : Modulation RF RX TEST STOP

8) CW 테스트 세팅

a. 기본 설정

*** Conf RF Test 세팅**(단말 리셋 시 마다 실행 필요)



- 상단 그림처럼 빈칸 없이 Parameter 입력 후 Set
- Frequency, Bandwidth, SF 변경 시 Set

AT+TCONF=<Frequency>:<Power>:<LoRa Bandwidth>:<Lora SF>:<CodingRate>:<Lna>:<PA Boost>:<Modulation>:<PayloadLen>:<FskDeviation>:<LowDrOpt >:<BTproduct:><CR>

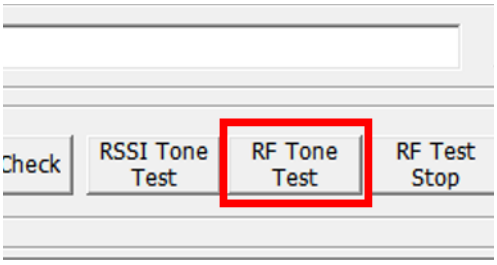
- Frequency: [ex: 868300000]Hz
- Power: [-9 ~ 22]dBm Max 15dBm at Low Power
- Bandwidth: Lora [4: 125, 5: 250, 6: 500]kHz
- SF: [7 ~ 12]
- CodingRate: [4/5, 4/6, 4/7, 4/8]
- Lna: [0: Off, 1: On]
- PA Boost: [0: Off, 1: On]
- Modulation: [0: FSK, 1: LoRa, 2: BPSK]
- PayloadLen: [1 ~ 256]
- FskDev: FSK Only [600 ~ 20000]
- LowDrOpt: Lora Only [0: off, 1: On, 2: Auto]
- BTproduct: [0: no Gaussian Filter Applied, 1: BT=0,3, 2: BT=0,5, 3: BT=0,7, 4: BT=1]

예제) AT+TCONF=868300000:10:4:5:4/5:0:0:1:16:0:0:0(CR)(LF)

b. CW 테스트 방법

Start RF CW test

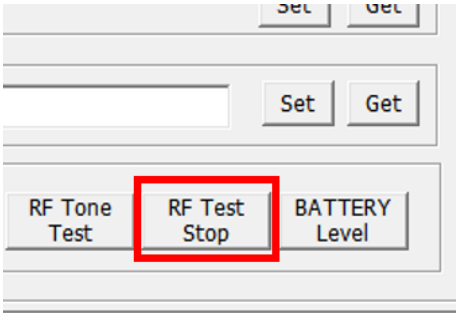
예제) AT+TTONE



c. OFF

Stop RF test.

예제) AT+TOFF



3. LoRa – RWC5020x Test

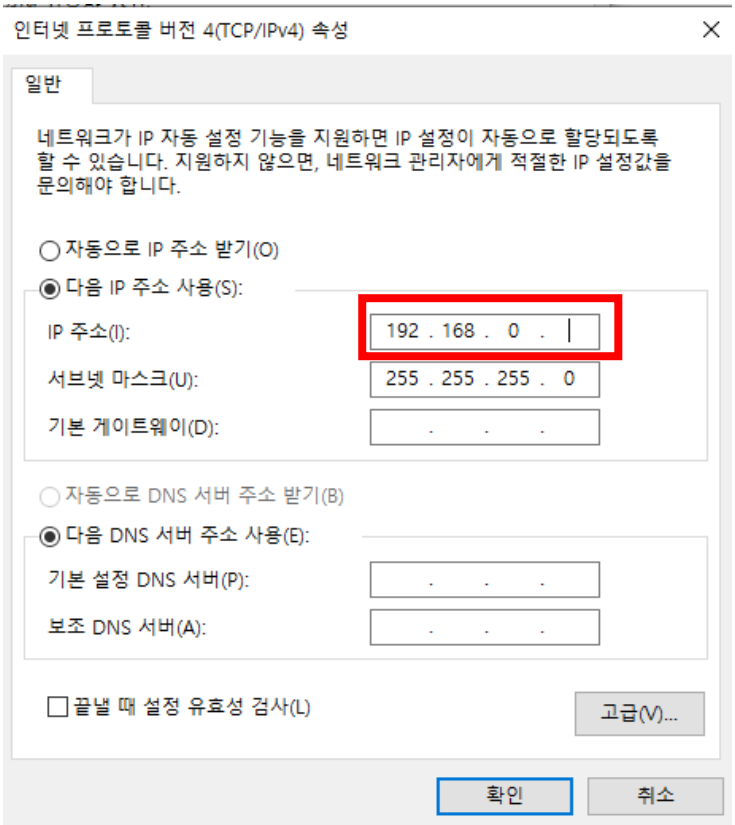
(1) RWC5020 장비 설정

1) 장비 interface IP 설정

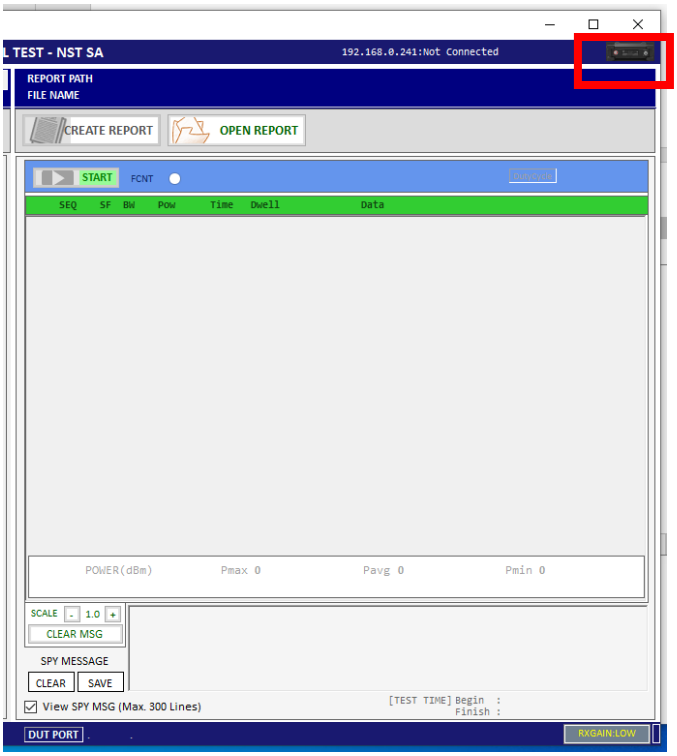
a. RWC5020 모니터 우측상단에 출력되는 IP확인

b. RWC5020와 동일하게 PC의 IP설정 192.168.0.XX

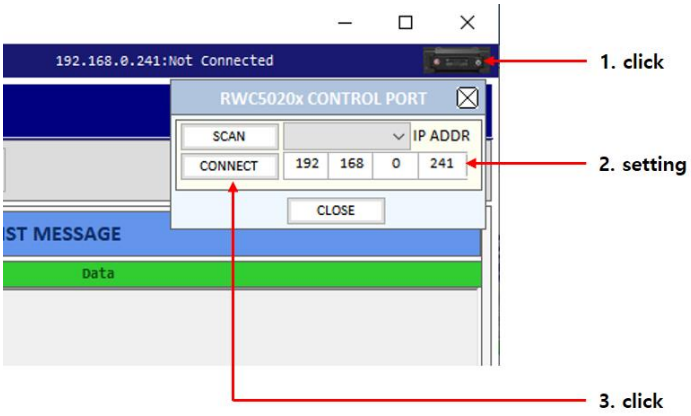
(XX는 RWC5020의 IP와 다른 임의의 수 입력)



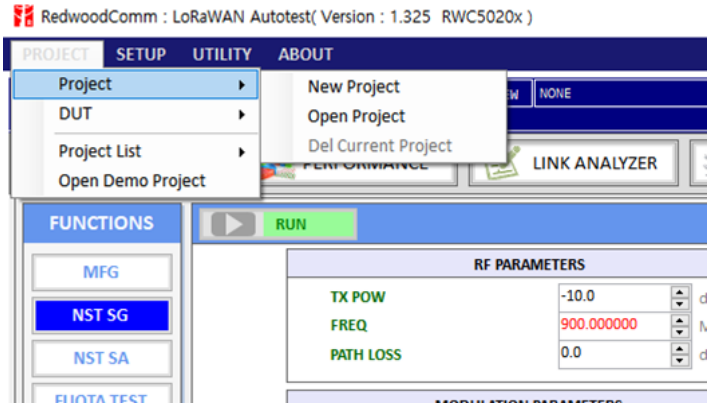
c. RWC5020x_App.exe를 실행하여 우측 상단의 RWC5020모양 버튼 클릭



d. RWC5020에서 확인한 IP입력 후 CONNECTED를 눌러 연결

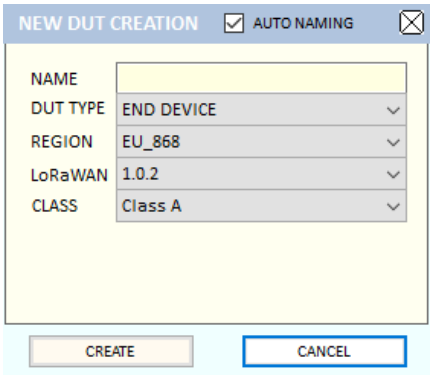


e. 좌측 상단의 PROJECT -> Project -> New Project 클릭하여 프로젝트 생성



f. 좌측 상단의 PROJECT -> DUT -> New DUT 클릭

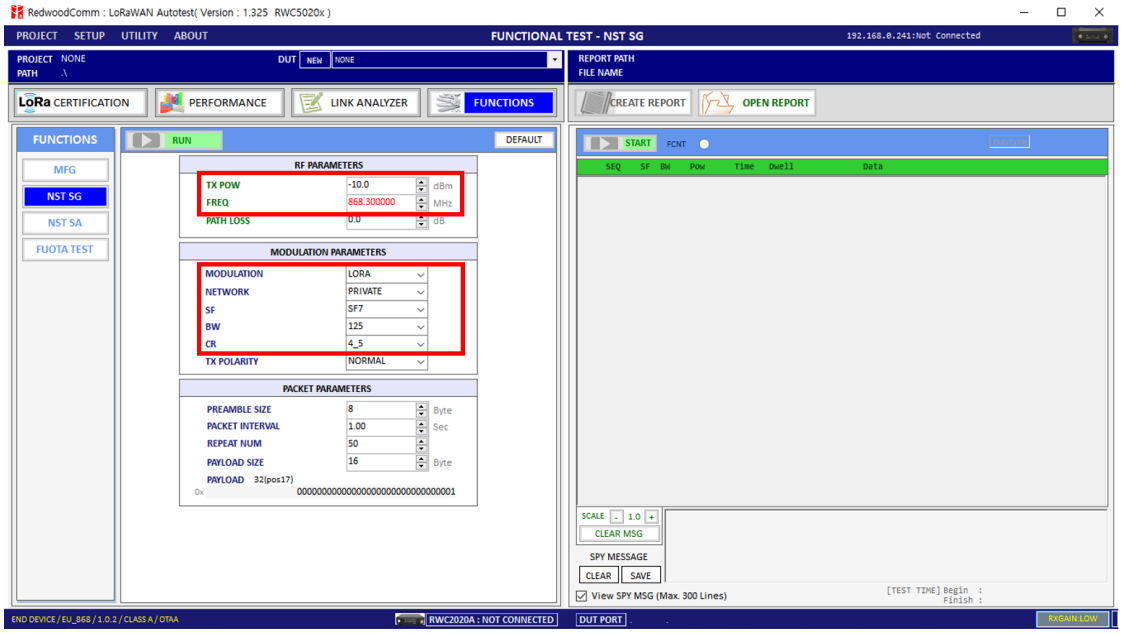
g. 사용자 임의로 설정 후 CREATE를 클릭하여 DUT 생성



(2) LoRa Rx test

1) RWC5020x 장비 setting

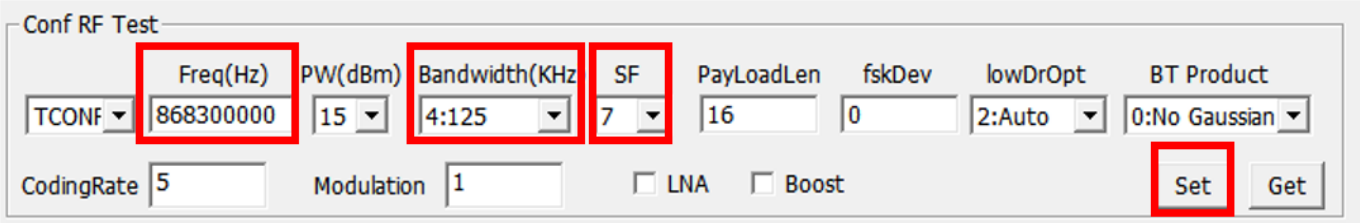
- TX POW를 test할 값으로 설정.
- MODULATION을 LORA로 변경.
- LSM100A 모듈과 FREQ, SF, BW, CR를 동일하게 설정.
- NETWORK는 Private으로 설정.



2) LoRa cmd tool

- 기본 설정

*** Conf RF Test 세팅**(단말 리셋 시 마다 실행 필요)



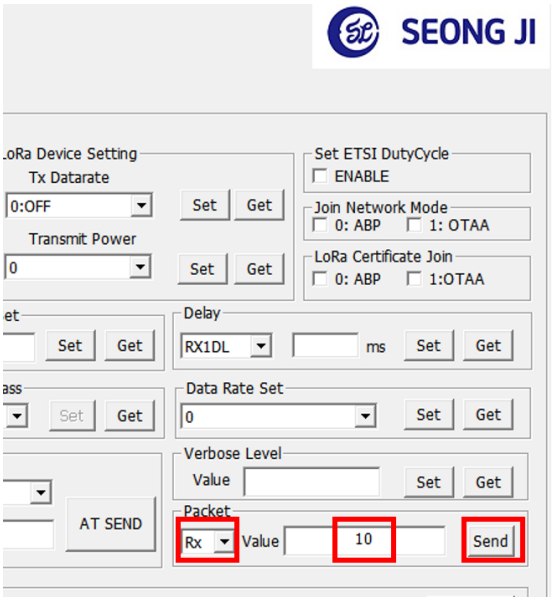
- 상단 그림처럼 빈칸 없이 Parameter 입력 후 Set
- Frequency, Bandwidth, SF 변경 시 Set

AT+TCONF=<Frequency>:<Power>:<LoRa Bandwidth>:<Lora SF>:<CodingRate>:<Lna>:<PA Boost>:<Modulation>:<PayloadLen>:<FskDeviation>:<LowDrOpt >:<BTproduct:><CR>

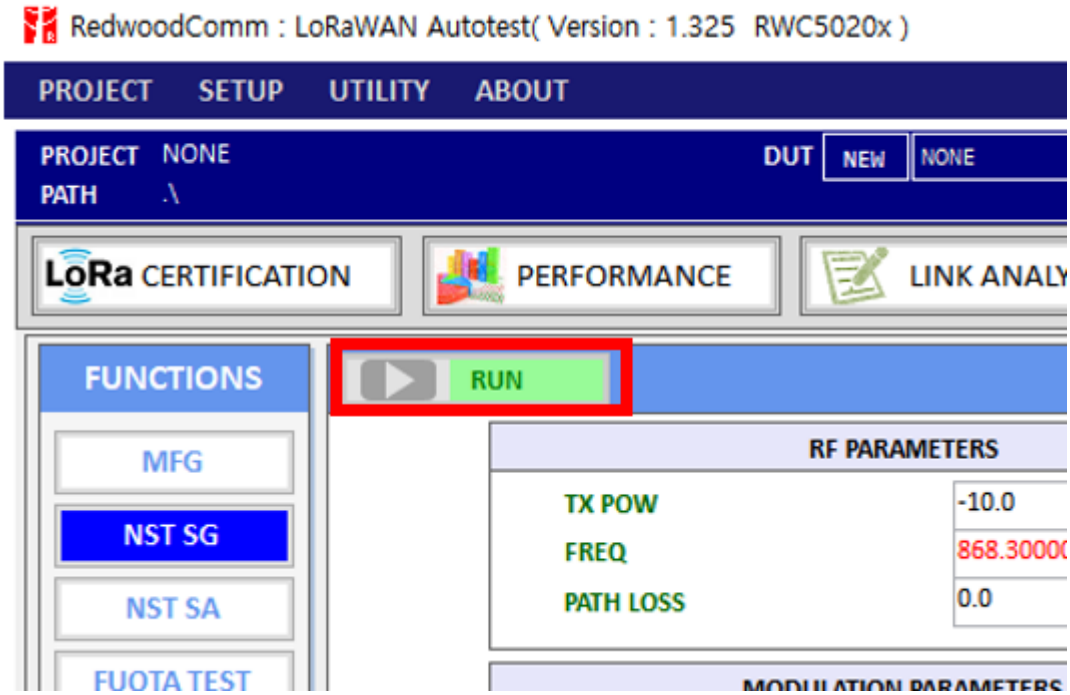
- Frequency: [ex: 868300000]Hz
- Power: [-9 ~ 22]dBm Max 15dBm at Low Power
- Bandwidth: Lora [4: 125, 5: 250, 6: 500]kHz
- SF: [7 ~ 12]
- CodingRate: [4/5, 4/6, 4/7, 4/8]
- Lna: [0: Off, 1: On]
- PA Boost: [0: Off, 1: On]
- Modulation: [0: FSK, 1: LoRa, 2: BPSK]
- PayloadLen: [1 ~ 256]
- FskDev: FSK Only [600 ~ 20000]
- LowDrOpt: Lora Only [0: off, 1: On, 2: Auto]
- BTproduct: [0: no Gaussian Filter Applied, 1: BT=0,3, 2: BT=0,5, 3: BT=0,7, 4: BT=1]

예제) AT+TCONF=868300000:10:4:5:4/5:0:0:1:16:0:0:0(CR)(LF)

- Packet 부분에서 Rx 선택 후 Value를 반복할 횟수만큼 설정 후 Send.



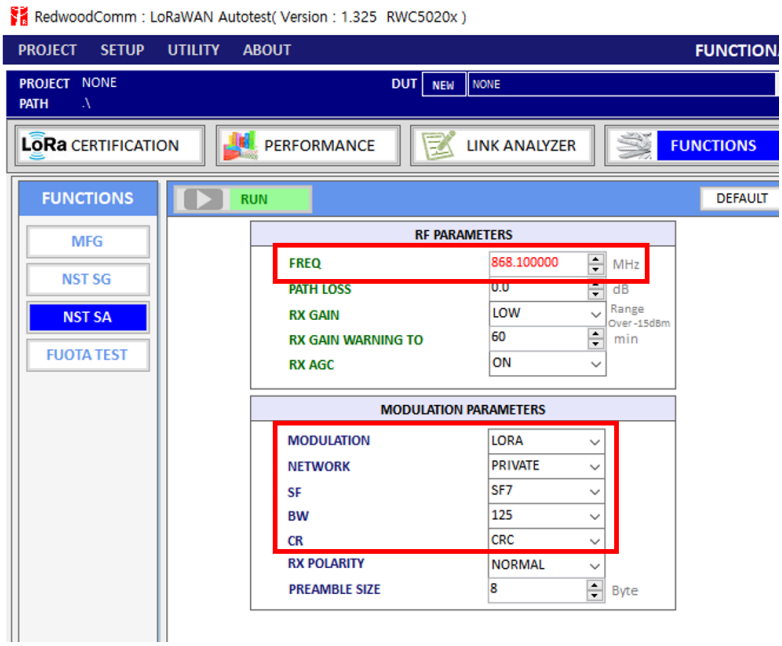
3) RWC5020x tool에서 Run 클릭



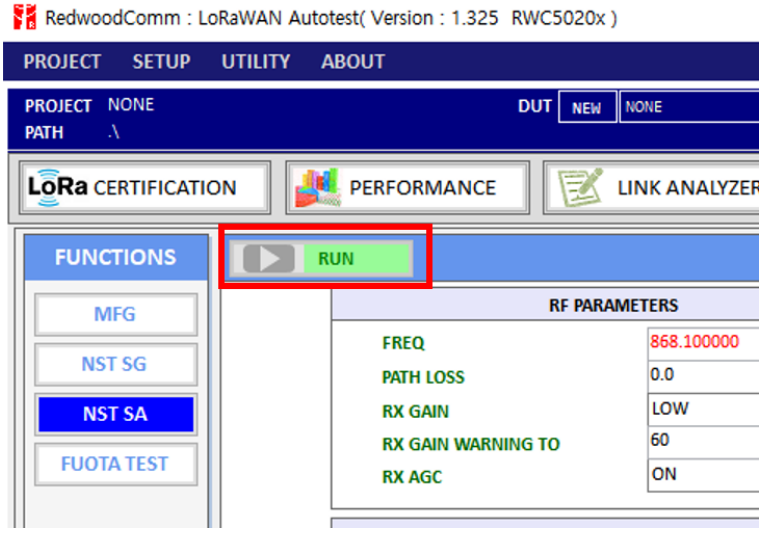
(3) LoRa Tx test

1) RWC5020x 장비 setting

- MODULATION을 LORA로 변경.
- LSM100A 모듈과 FREQ, SF, BW, CR를 동일하게 설정.
- NETWORK는 Private으로 설정.
- Redwood program에서 Run을 누름.



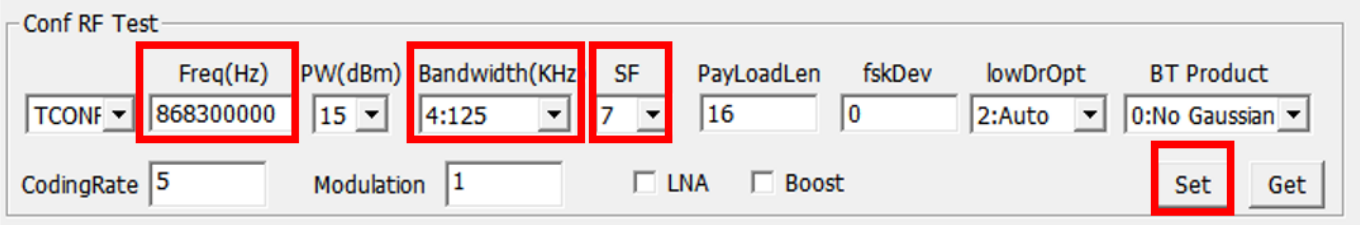
2) RWC5020x tool에서 Run 클릭



3) LoRa cmd tool

- 기본 설정

*** Conf RF Test 세팅**(단말 리셋 시 마다 실행 필요)



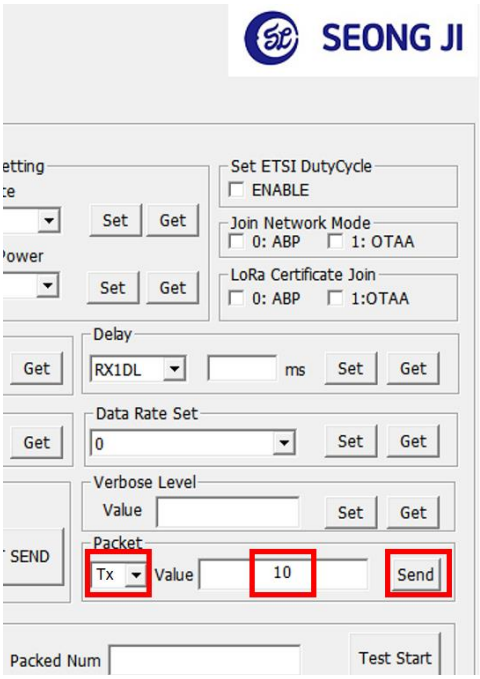
- 상단 그림처럼 빈칸 없이 Parameter 입력 후 Set
- Frequency, Bandwidth, SF 변경 시 Set

AT+TCONF=<Frequency>:<Power>:<LoRa Bandwidth>:<Lora SF>:<CodingRate>:<Lna>:<PA Boost>:<Modulation>:<PayloadLen>:<FskDeviation>:<LowDrOpt >:<BTproduct:><CR>

- Frequency: [ex: 868300000]Hz
- Power: [-9 ~ 22]dBm Max 15dBm at Low Power
- Bandwidth: Lora [4: 125, 5: 250, 6: 500]kHz
- SF: [7 ~ 12]
- CodingRate: [4/5, 4/6, 4/7, 4/8]
- Lna: [0: Off, 1: On]
- PA Boost: [0: Off, 1: On]
- Modulation: [0: FSK, 1: LoRa, 2: BPSK]
- PayloadLen: [1 ~ 256]
- FskDev: FSK Only [600 ~ 20000]
- LowDrOpt: Lora Only [0: off, 1: On, 2: Auto]
- BTproduct: [0: no Gaussian Filter Applied, 1: BT=0,3, 2: BT=0,5, 3: BT=0,7, 4: BT=1]

예제) AT+TCONF=868300000:10:4:5:4/5:0:0:1:16:0:0:0(CR)(LF)

- Packet 부분에서 Tx 선택 후 Value를 반복할 횟수만큼 설정 후 Send.
- 통신 확인.

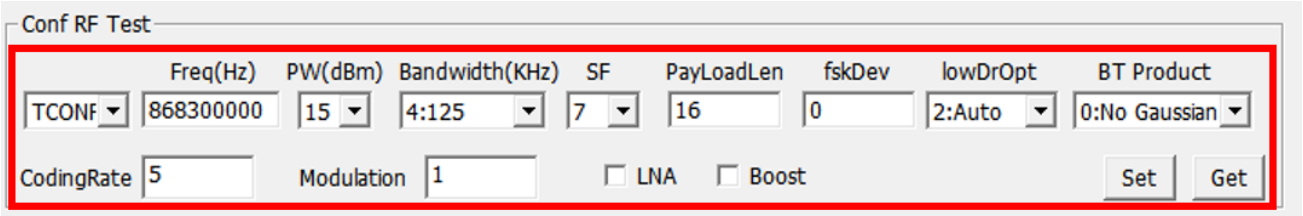


4. TX, RX 테스트

장비 없이 LSM100A 2대로 TX, RX 테스트 방법을 설명

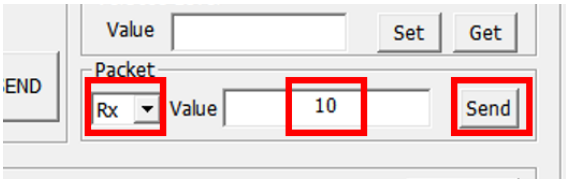
(1) LSM100A 2대 (TX 1대, RX 1대)를 준비

(2) LSM100A 2대 (TX 1대, RX 1대)의 설정 값을 똑같이 SET



(3) RX로 사용하는 LSM100A에 다음 명령을 입력

AT+TRX=PacketNb



예제)

AT+TRX=10

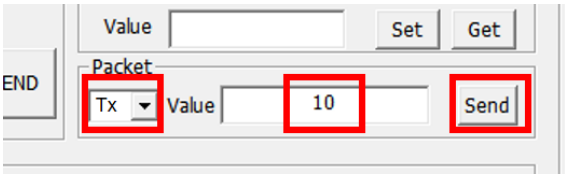
TRxStart

.....

TRxEnd

(4) TX로 사용하는 LSM100A에 다음 명령을 입력

AT+TTX=PacketNb



예제)

AT+TTX=10

TTxStart
109s603:Tx LoRa Test

109s767:Tx 1 of 10

110s125:OnTxDone

110s625:Tx 2 of 10

110s831:OnTxDone
.....
115s565:Tx 9 of 10

115s771:OnTxDone

116s271:Tx 10 of 10

116s477:OnTxDone
TTxEnd
OK

(5) TX 명령 입력 시 RX 수신 부분에서 다음과 같이 수신 확인 가능

예제)

```
AT+TRX=10
  TRxStart

  107s112:OnRxDone

  107s112:RssiValue=0 dBm, SnrValue=13dB

  107s112:Rx 1 of 10   >>> PER= 0 %

  107s818:OnRxDone

  107s818:RssiValue=0 dBm, SnrValue=13dB

  107s818:Rx 2 of 10   >>> PER= 0 %

  108s524:OnRxDone

  108s524:RssiValue=0 dBm, SnrValue=13dB

  108s524:Rx 3 of 10   >>> PER= 0 %

  109s229:OnRxDone

  ......

  112s758:RssiValue=0 dBm, SnrValue=13dB

  112s758:Rx 9 of 10   >>> PER= 0 %

  113s464:OnRxDone

  113s464:RssiValue=0 dBm, SnrValue=13dB

  113s464:Rx 10 of 10   >>> PER= 0 %

  TRxEnd

  OK
```