LoRa® / LoRaWAN®
Test Solutions

LoRa Alliance Certified
as an en-device for EU and KR

May 2023

Contents

- **Summary of Key Features**

- Product Comparison
- PC Application Software
- RF Shielding Enclosure
- Production Test Solution
- Stand-alone Operation of 5020B

End-device Test Solutions

Key Features

5020B | 5020M | 5021P

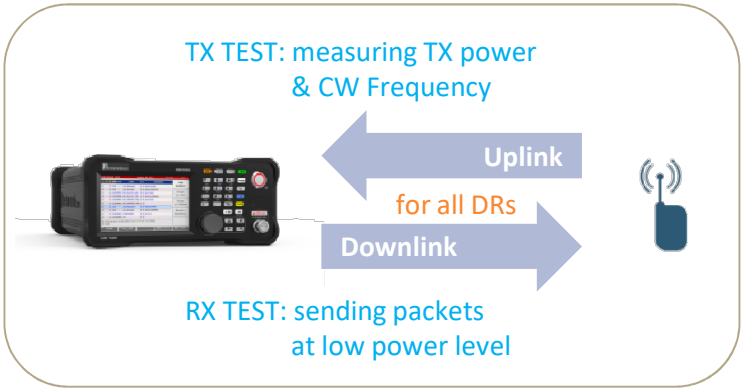
Protocol Conformance Tests

- LoRaWAN® Pre-Certification
  - *LW V1.0.2:*
    EU863-870, US/CA902-928, AS923, KR920-923, and IN865-867
  - *LW V1.0.4:*
    EU863-870, US/CA902-928, AS923-1/2/3/4, KR920-923, IN865-867, AU915-928, RU864-870, and EU433
    Class B/C Certification
- LoRaWAN® Protocol
  - Compatible with LoRaWAN® version of V1.0.2, 1.0.3, 1.0.4 and V1.1.0
  - Class A/B/C
  - support 64(125kHz)+8(500kHz) channel, 96(125kHz) channel
- Regional Parameters
  - *EU 868, US 915, EU 433, AU 915, CN 470, AS 923(1/2/3/4), KR 920, IN 865, and RU 864*
- Scenarios for MAC commands and application data
  - *Multiple MAC commands and MAC command script*

RF Performance Tests

- RX Sensitivity
  - Class A/B/C
- TX Power
- TX CW Frequency

5020B | 5020M



Gateway Test Solutions

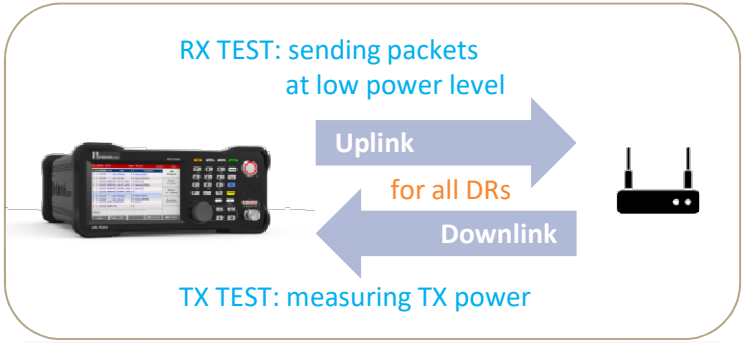
Key Features

Protocol Conformance Tests

- LoRaWAN® Protocol
  - Compatible with LoRaWAN® version of V1.0.2, 1.0.3, 1.0.4 and V1.1.0
  - Class A/B/C
- Regional Parameters
  - *EU 868, US 915, EU 433, AU 915, CN 470, AS 923, KR 920, IN 865, and RU 864*
- Scenarios for MAC commands and application data
  - *Multiple MAC commands and MAC command script*

RF Performance Tests

- RX Sensitivity
- TX Power
- GW Non-regression Tests (Semtech)
  - TX Output Power Measurement
  - Sensitivity
  - PER / RSSI / SNR
  - Frequency Error Tolerance
  - CW Interferer / Blocker Immunity



LBT Test Solution

Key Features

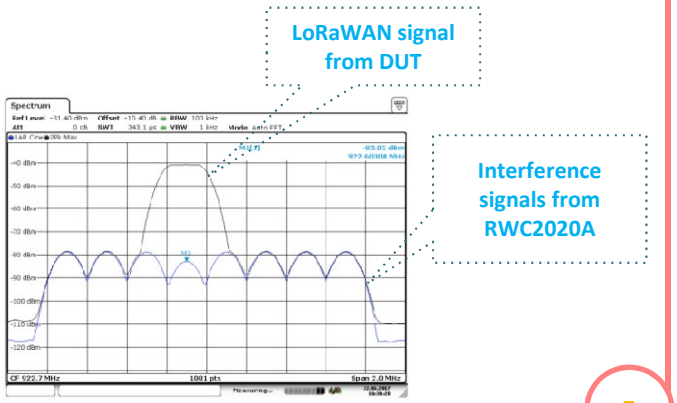
5020B | 5020M | 2020A

What is LBT?

- Listen Before Talk; to prevent interference or collision between devices on common frequency channels

How to test LBT?

- Use RWC2020A Interference Generator as an interferer
  - Automatically controlled by RWC5020x via a serial communication
- For details, refer to the Local Regulations of Japan and Korea



Manufacturing Test Solutions

Key Features

5020B  5020M 

SOL #1: Separate TX/RX Test

- Non-signaling test (one-way test)
- Signal Analyzer function for TX Test
  - Measuring TX power and CW frequency
- Signal Generator function for RX Test
  - Measuring RX sensitivity with predefined test packets
- A wired control of DUT might be required

SOL #2: Simultaneous TX/RX Test

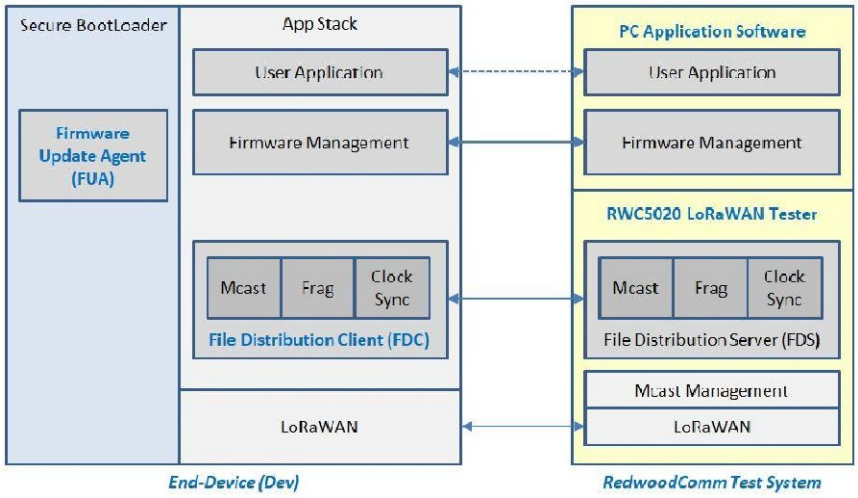
- Combining the advantages of signaling test and non-signaling test
- Simple test protocol is defined between DUT and the tester
- A wired control of DUT might not be necessary

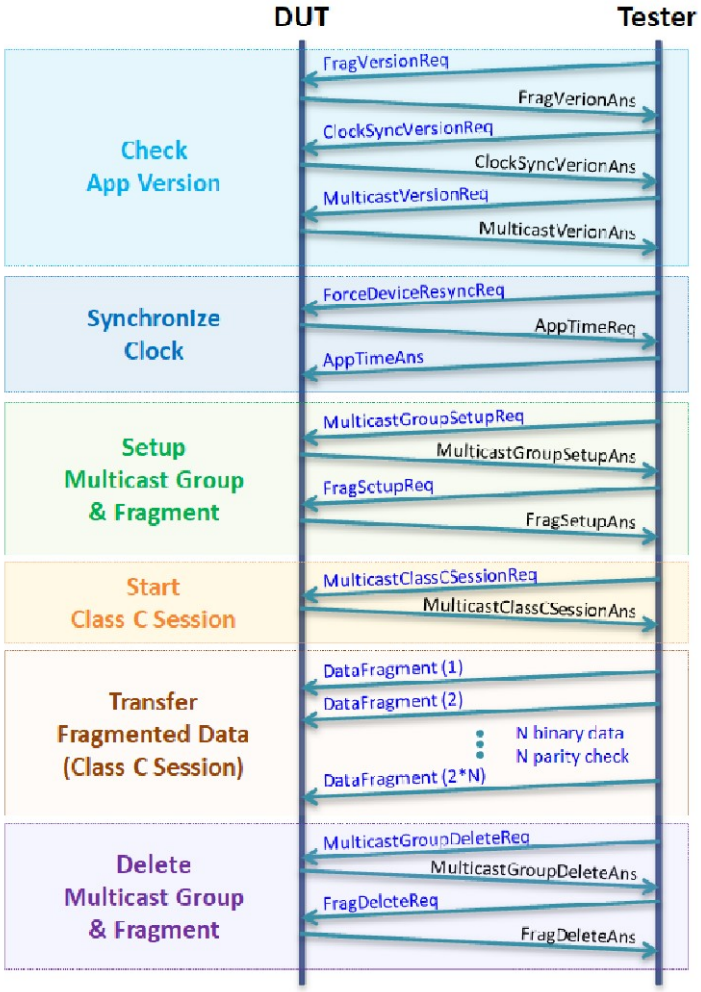
FUOTA Test Solution

Key Features

- Fully Automated Test Scenario
  → Easy to use
- Users can use their own binary files for testing

5020B 5020M

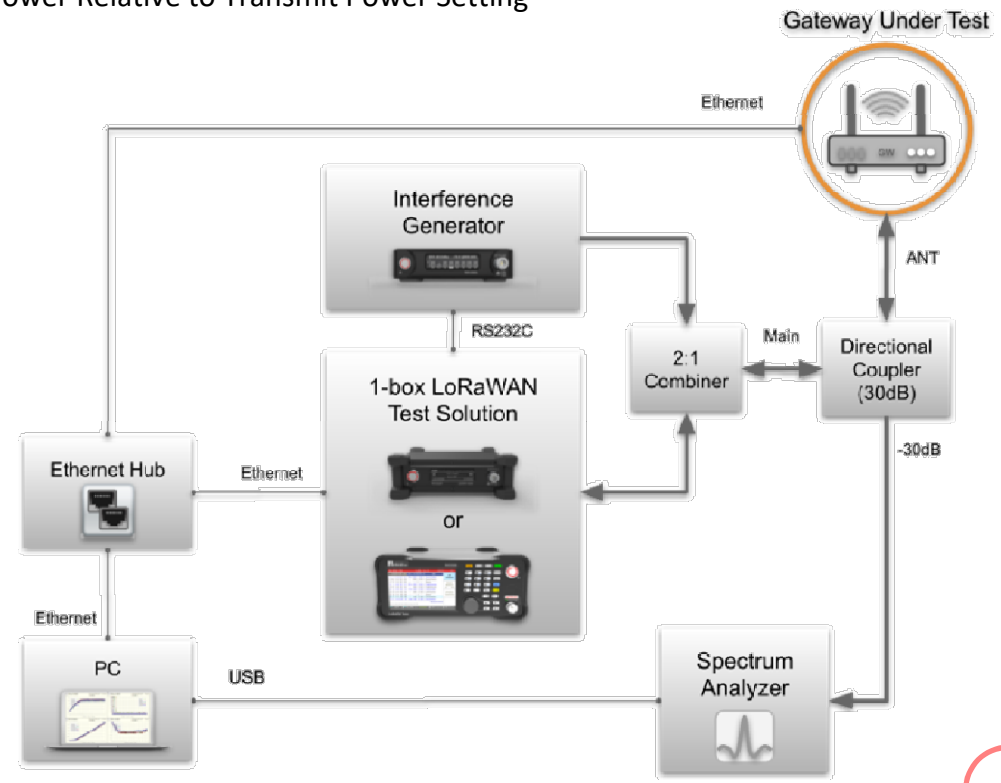




GW Test & Measurement Guidelines

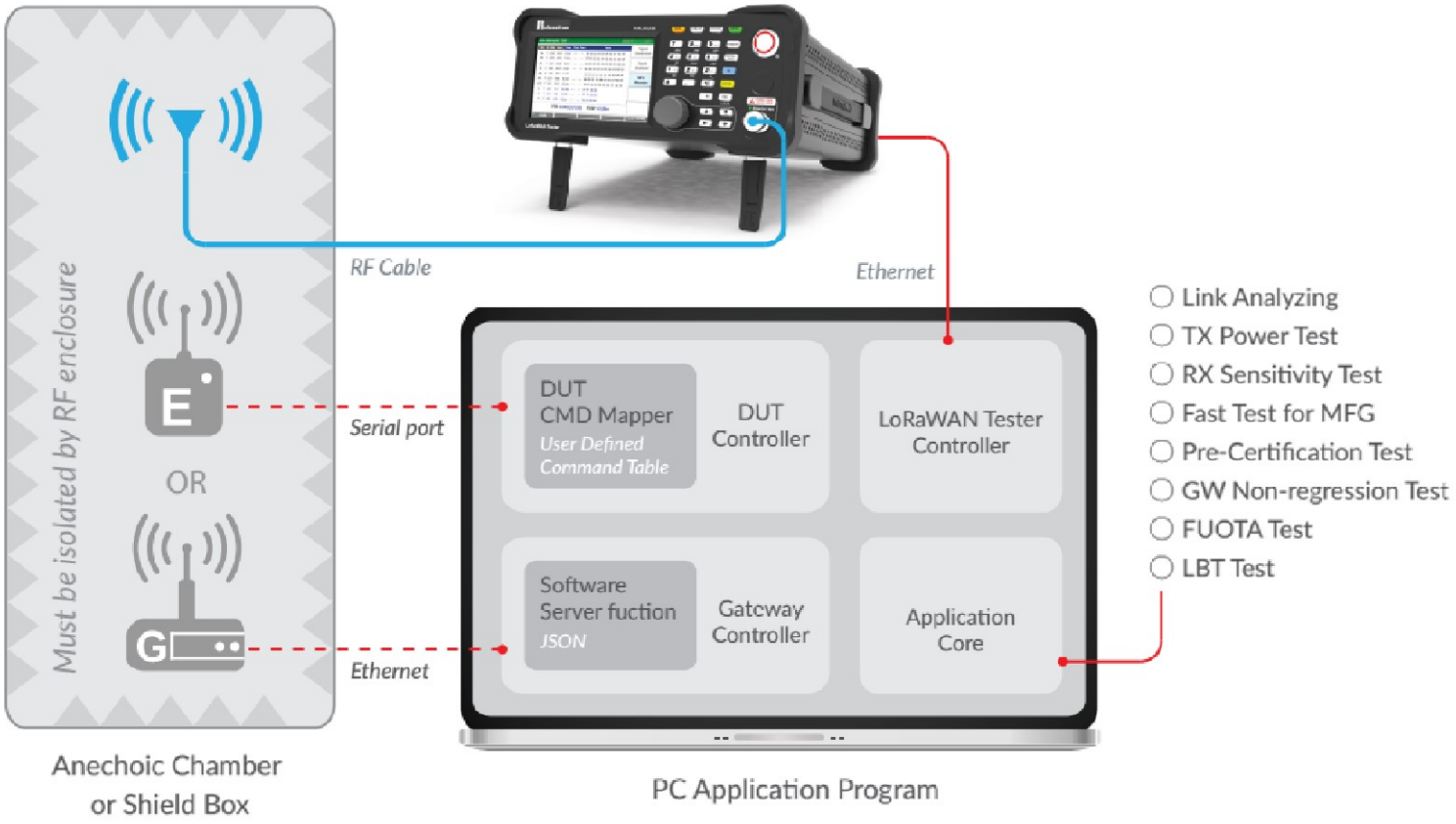
Related Document

- Download from the LoRa Alliance
  - Recommended instruments: RWC5020B (or M) and RWC2020A
    - Tx & Rx Operation and Survival with Open/Short Load
    - Measured and Reported RF Transmit Power Relative to Transmit Power Setting
    - Tx Conducted Emissions Out-of-Band
    - Tx Intermodulation
    - Tx Frequency Error
    - Rx Sensitivity
    - Rx Dynamic Range
    - Rx In-Band Blocking/Selectivity
    - Rx Out-of-Band Blocking/Selectivity
    - Rx Intermodulation
    - Cold Start
    - Time Accuracy



Typical Test Setup

Automated PC Software and Example of Test Setup



NEW

Latest Updates

Key Features

5020B

5020M

New Features for Next Version of RF Board

- 64(125kHz) + 8(500kHz) Channel Support
- SF5/SF6 Support
- Simultaneous emulation of End-device (ED) and Gateway (GW) for "Relay" test

New Features Added

- Update of LoRaWAN Pre-Certification Test for Class B Devices
- Update of LoRaWAN Pre-Certification Test for Class C Devices
- Update of new version of FUOTA test procedures

Contents

- Summary of Key Features
- **Product Comparison**

- PC Application Software
- RF Shielding Enclosure
- Production Test Solution
- Stand-alone Operation of 5020B

RWC5020B

Product Comparison

- **Fully operable in both stand-alone and remote control mode**
  - User interface: 5” LCD and keypads
  - Remote control interface: Ethernet, RS-232C
- **Operation mode**
  - End-device Test / Gateway Test / Non-signaling Test
- **Target**
  - R&D, QC
- **Output Power**
  - 0 to -150dBm
- **Testing capability**
  - Protocol conformance
  - RF performance

RWC5020M

Product Comparison

- **Operable in remote control mode**
  - 2.8” OLED display for monitoring status
  - Remote control interface: Ethernet, RS-232C
- **Operation mode**
  - End-device Test / Gateway Test / Non-signaling Test
- **Target**
  - R&D, QC, production
- **Output Power**
  - 0 to -150dBm
- **Testing capability**
  - Protocol conformance
  - RF performance
- **Supply Power**
  - 12V/3A adapter provided

RWC5021P

Product Comparison

- **Operable in remote control mode**
  - 4 LED status indicators
  - Remote control interface: Ethernet, USB-C (VCOM)
- **Operation mode**
  - End-device Test
- **Target**
  - R&D, QC
- **Output Power**
  - 0 to -30dBm
- **Testing capability**
  - Protocol conformance
- **Supply Power**
  - 5V/0.5A USB-C powered

Comparison Table 1/2

Product Comparison

	5020B	5020M	5021P
Stand-alone Capability	YES	NO	NO
Exterior			
- Dimensions	250(w)x110(h)x348(d) mm	200(w)x70(h)x220(d) mm	100(w)x30(h)x140(d) mm
- Weight	5 kg	2.2 kg	0.5 kg
- Display	5", 800x480, 16M color, TFT LCD	2.8", 256x64, 16 gray, OLED	4 LED indicators
- Front Keypad	YES	NO	NO
- Power Input	100 to 240 VAC, 50/60Hz	12V/3A VDC (AC/DC adapter provided)	5V/0.5A (USB-C)
- Control Interface	Ethernet, RS-232C	Ethernet, RS-232C	Ethernet, USB-C (VCOM)
Frequency Bands			
- 400MHz to 510MHz	Included	Selectable by Band	Selectable by Region
- 862MHz to 960MHz	Included	Selectable by Band	Selectable by Region
RF Power Level			
- Output Power	0dBm to -150dBm	0dBm to -150dBm	0dBm to -30dBm
- Input for Power Measurement	+30dBm to -80dBm	+30dBm to -80dBm	+30dBm to -80dBm
- Input for Frequency Measurement	+30dBm to -50dBm	+30dBm to -50dBm	Not available
Operational Modes			
- End-device Test	Selectable	Selectable	Included
- Gateway Test	Selectable	Selectable	Not available
- Non-signaling Test	Included	Selectable	Not available

Comparison Table 2/2

Product Comparison

	5020B	5020M	5021P
Protocol Compliance Tests (end-device only)			
- LoRaWAN Pre-Certification Tests	Optional	Optional	Optional
- Operator Pre-Certification Tests	Optional	Optional	NO
RF Performance Tests			
- Receiver Sensitivity Test	YES	YES	NO
- Output Power Measurement	YES	YES	NO
- Carrier Frequency Measurement	YES	YES	NO
- LBT Test	YES (2020A required)	YES (2020A required)	NO
- Gateway Non-regression Test	YES (2020A required partly)	YES (2020A required partly)	NO
Link Analyzer			
- Message Logging and Analysis	YES	YES	YES
- MAC Commands Transmission	YES	YES	YES
- Application/User Data Transmission	YES	YES	YES
- User Script Generation	YES	YES	YES
Functionalities			
- FUOTA Test	YES	YES	NO
- Manufacturing Test (MFG/NST)	YES	YES	NO
Compatibility with 5020x PC Application Software			
- Pre-Certification Test	YES	YES	YES
- RF Performance Test	YES	YES	NO
- Link Analyzer	YES	YES	YES
- Functions: NST, MFG, FUOTA	YES	YES	NO

Hardware Specification 1/2

Product Comparison

	RWC5020B	RWC5020M
Frequency	• Range : 400MHz to 510MHz, 862MHz to 960MHz • Resolution : 100Hz • Stability vs. +25℃ : ±0.5ppm standard • Stability vs. Aging : ±1ppm/1st year	
Output Level	• Range : 0dBm to -150dBm • Resolution : 0.1dB • Accuracy : ±1dB • Impedance : 50Ω	
Input Level	• +30dBm to -80dBm for Power Measurement • +30dBm to -50dBm for Frequency Measurement	
Measurement Accuracy	• ±1dB for Power • ±1KHz for Frequency (Single Tone)	
VSWR	• Better than 1:1.5	
External Reference Frequency Input	• Frequency : 10MHz • Power Range : 0dBm to +20dBm	
Remote Programming Ports	• RJ45(Ethernet) • RS-232C	
Miscellaneous	• Operating temperature : 5 to 40℃ • Line Voltage : 100 to 240 VAC, 50/60Hz • Dimension : 250(w) x 110(h) x 348(d) mm • Weight : 5kg	• Operating temperature : 5 to 40℃ • Input : 12V/3A VDC • Dimension : 200(w) x 70(h) x 220(d) mm • Weight : 2.2kg

Hardware Specification 2/2

Product Comparison

	RWC5021P	RWC2020A
Frequency	• Range : 400MHz to 510MHz, 862MHz to 960MHz • Resolution : 100Hz • Stability vs. +25℃ : ±5 ppm • Stability vs. Aging : ±2.5ppm/year	• Range : 400MHz to 1000MHz • Resolution : 100Hz • Accuracy : ±2ppm/year@operating temperature
Output Level	• Range : 0dBm to -30dBm • Resolution : 0.1dB • Accuracy : ±2dB • Impedance : 50Ω	• Range : -10dBm to -100dBm • Resolution : 0.1dB • Accuracy : ±1dB • Impedance : 50Ω
Input Level	• +30dBm to -80dBm for Power Measurement	N/A
Measurement Accuracy	• ±3dB for Power	N/A
VSWR	• Better than 1:1.5	• Better than 1:1.5
Phase Noise (Single tone mode)	N/A	• -103dBc @ 1kHz • -110dBc @ 10kHz • -110dBc @ 100kHz • -138dBc @ 1MHz
Remote Programming Ports	• RJ45 (Ethernet) • USB-C (VCOM)	• RJ45 (Ethernet) • RS-232C
Miscellaneous	• Operating temperature : 5 to 40℃ • Input : 5V/0.5A (USB-C) • Dimension : 100(w) x 30(h) x 140(d) mm • Weight : 0.5kg	• Operating temperature : 5 to 40℃ • Input : 12V/3A VDC • Dimension : 166(w) x 50(h) x 194(d) mm • Weight : 0.95kg

Ordering Information (5020B)

Product Comparison

Main Product

Order Code	Part Name
C5020B-00	EDT+GWT+NST
C5020B-01	EDT+GWT
C5020B-02	NST
C5020B-03	EDT
C5020B-04	GWT
C5020B-05	EDT+NST
C5020B-06	GWT+NST

Options

Order Code	Part Name
O5020B-01	LoRaWAN Pre-Cert EU868
O5020B-03	LoRaWAN Pre-Cert US915
O5020B-04	LoRaWAN Pre-Cert AS923
O5020B-05	LoRaWAN Pre-Cert KR920
O5020B-06	LoRaWAN Pre-Cert IN865
O5020B-09	LoRaWAN Pre-Cert AU915
O5020B-11	LoRaWAN Pre-Cert RU864
O5020B-12	LoRaWAN Pre-Cert EU433
O5020B-98	Calibration
O5020B-99	SW/FW Maintenance

** All regional parameters of the LoRaWAN® specification are provided in EDT or GWT.*
** Pre-Certification Tests are add-on options for EDT only.*
** The default PC software is provided with purchasing of C5020B-xx.*

Ordering Information (5020M)

Product Comparison

Main Product

Order Code	Part Name
C5020M-X0	EDT+GWT+NST
C5020M-X1	EDT+GWT
C5020M-X2	NST
C5020M-X3	EDT
C5020M-X4	GWT
C5020M-X5	EDT+NST
C5020M-X6	GWT+NST
X: H or L	Select Freq Band: High or Low
O5020M-10	Multiple Freq Band Option

Options

Order Code	Part Name
O5020M-01	LoRaWAN Pre-Cert EU868
O5020M-03	LoRaWAN Pre-Cert US915
O5020M-04	LoRaWAN Pre-Cert AS923
O5020M-05	LoRaWAN Pre-Cert KR920
O5020M-06	LoRaWAN Pre-Cert IN865
O5020M-09	LoRaWAN Pre-Cert AU915
O5020M-11	LoRaWAN Pre-Cert RU864
O5020M-12	LoRaWAN Pre-Cert EU433
O5020M-98	Calibration
O5020M-99	SW/FW Maintenance

** All regional parameters of the LoRaWAN® specification are provided in EDT or GWT.*
** Pre-Certification Tests are add-on options for EDT only.*
** The default PC software is provided with purchasing of C5020M-xx.*

Ordering Information (5021P)

Product Comparison

Main Product

Order Code	Part Name
C5021P-00	EDT

Options

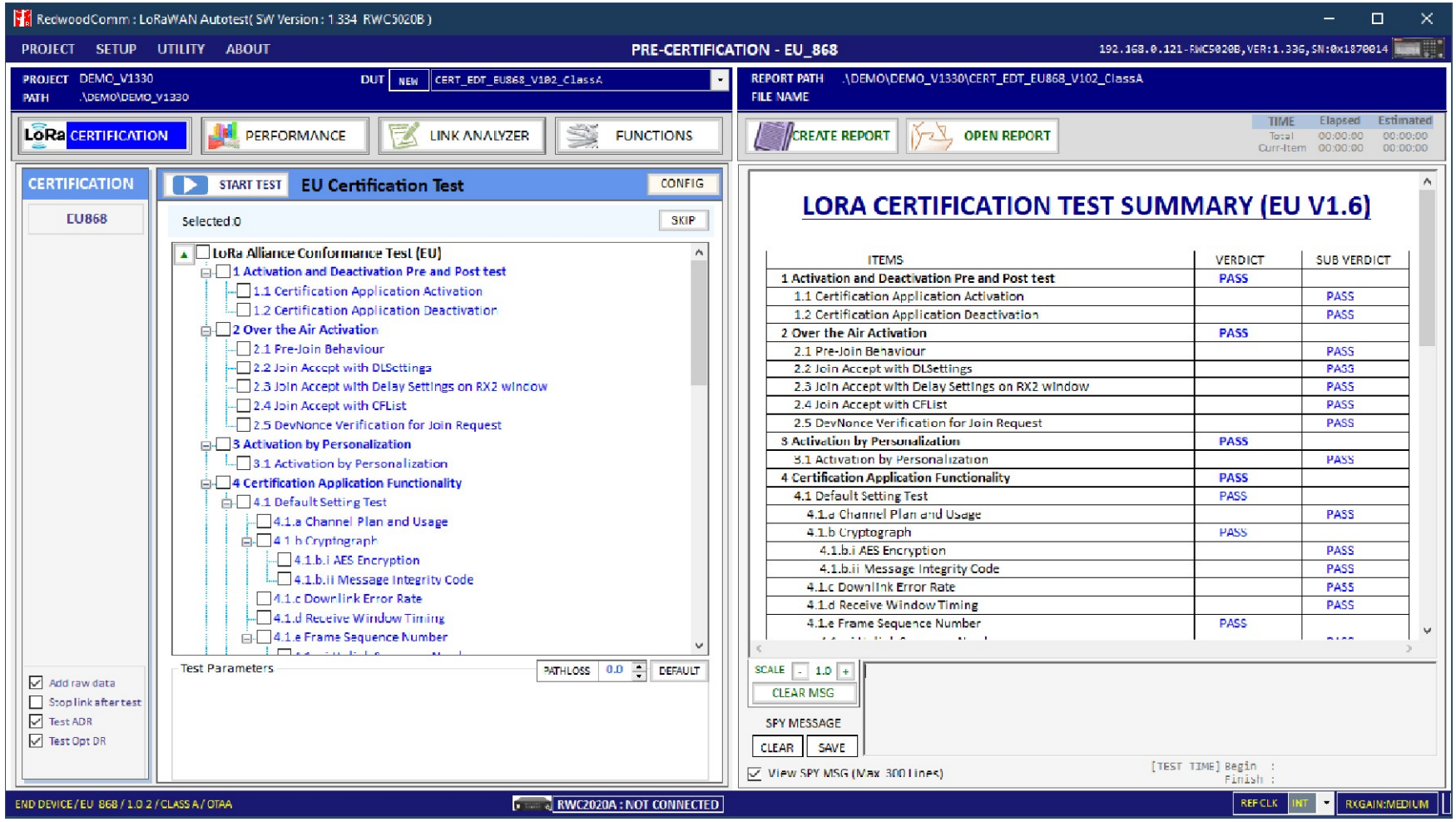
Order Code	Part Name
O5021P-01	LoRaWAN Region EU868
O5021P-03	LoRaWAN Region US915
O5021P-04	LoRaWAN Region AS923
O5021P-05	LoRaWAN Region KR920
O5021P-06	LoRaWAN Region IN865
O5021P-09	LoRaWAN Region AU915
O5021P-11	LoRaWAN Region RU864
O5021P-12	LoRaWAN Region EU433
O5021P-99	SW/FW Maintenance

** The default PC software is provided with purchasing of C5021P-00.*

Contents

Pre-Cert Test for LoRaWAN® V1.0.2

PC Application Software

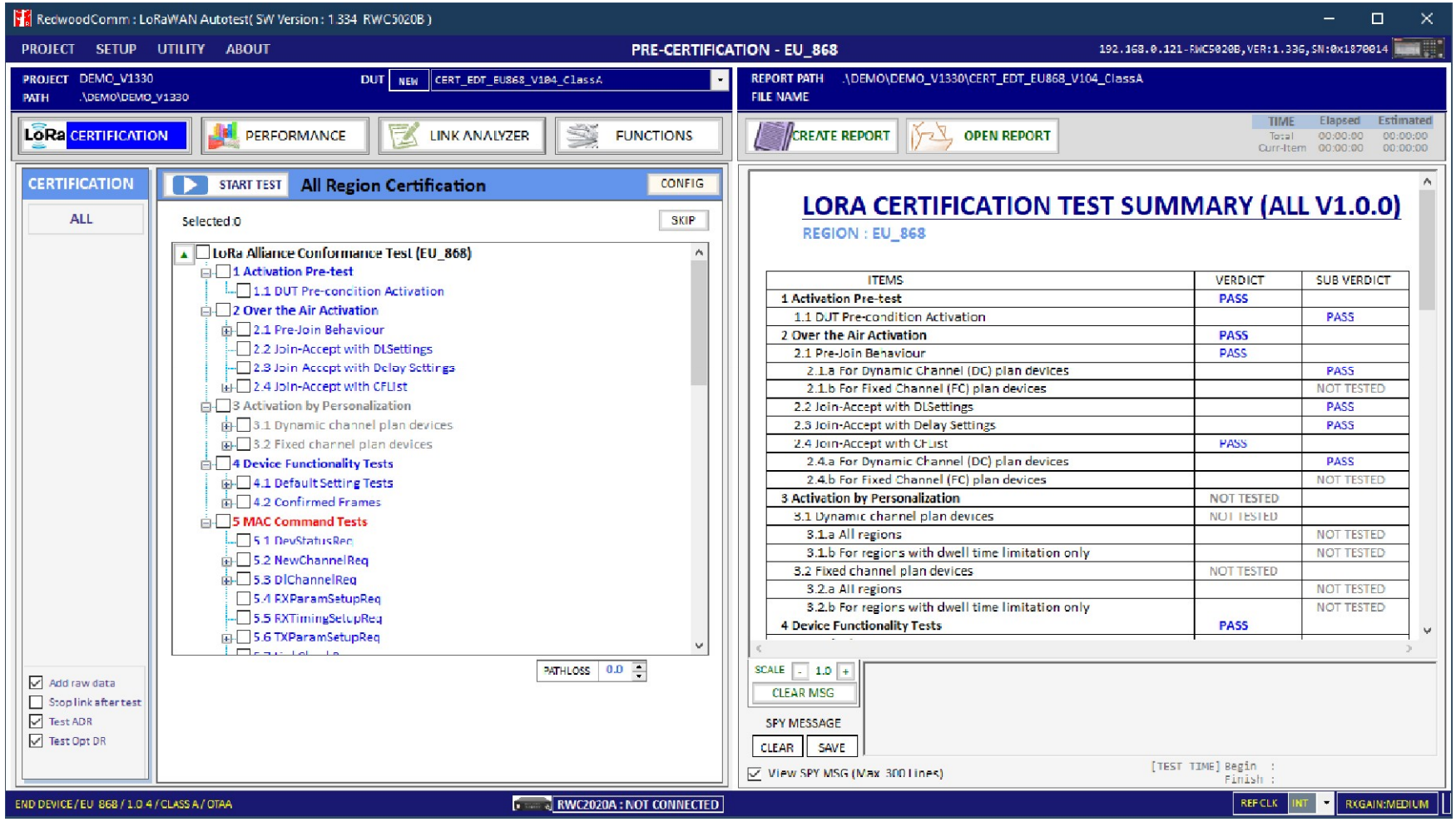


* ***LoRaWAN V1.0.2***:
  EU863-870, US/CA902-928, AS923, KR920-923, and IN865-867

* *Test summary and report generation*
* *Estimated and elapsed time information*

Pre-Cert Test for LoRaWAN® V1.0.4

PC Application Software

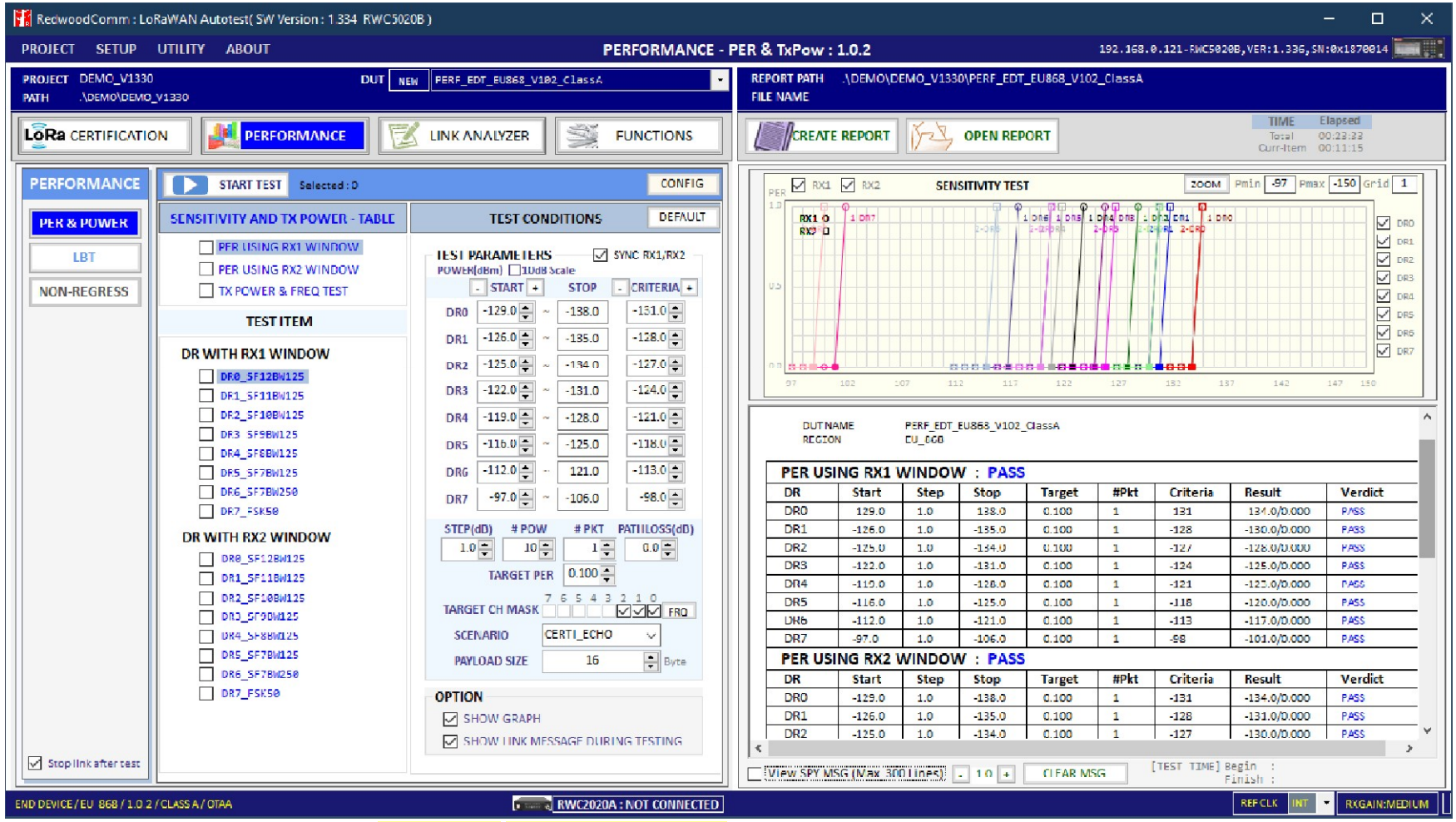


* ***LoRaWAN V1.0.4***:
  EU863-870, US/CA902-928, AS923-1/2/3/4, KR920-923, IN865-867, AU915-928, RU864-870, and EU433
  Class B/C Certification

* *Test summary and report generation*
* *Estimated and elapsed time information*

RF Performance Test (EDT Class A)

PC Application Software

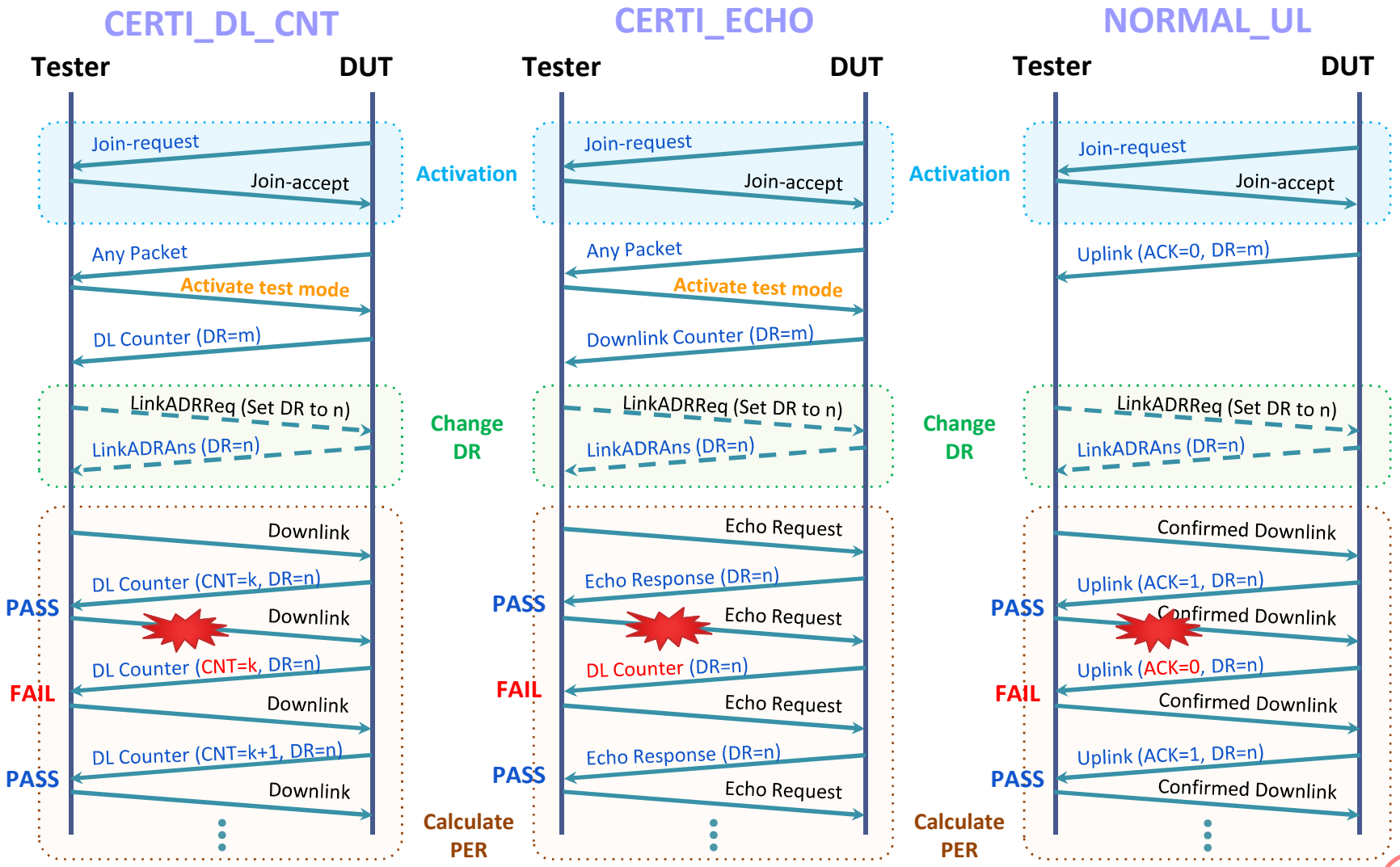


* *PER measurement for **downlink – RX1/RX2 for Class A***
  *Scenario: **CERTI_ECHO, CERTI_DL_CNT, NORMAL_UL***
* *TX power and CW frequency measurement*

* *Test summary and report generation*
* *Estimated and elapsed time information*

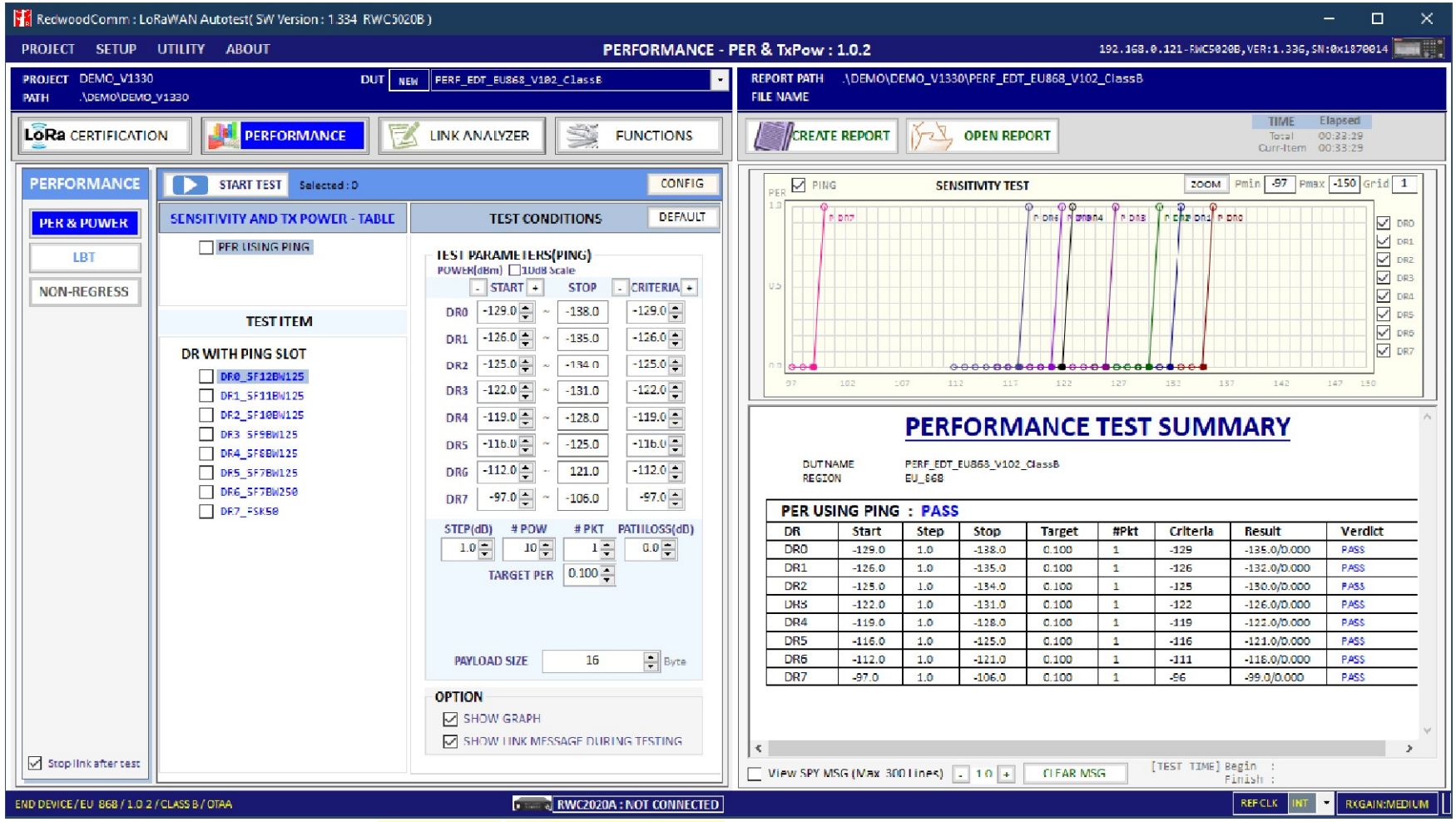
Sensitivity Test Scenario (Class A)

PC Application Software



RF Performance Test (EDT Class B)

PC Application Software



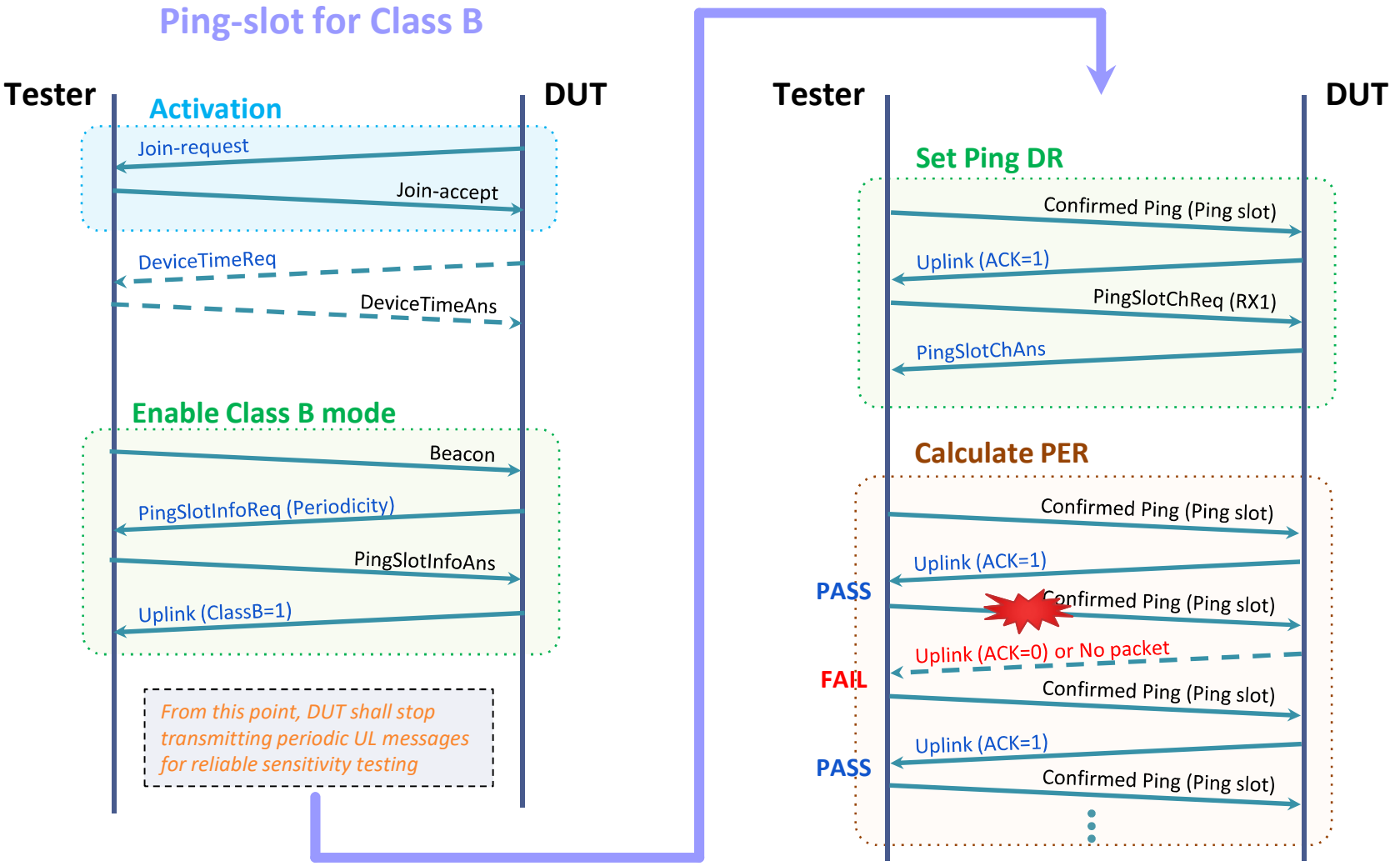
* PER measurement for ***downlink – Ping-slot for Class B***

* Test summary and report generation

* Estimated and elapsed time information

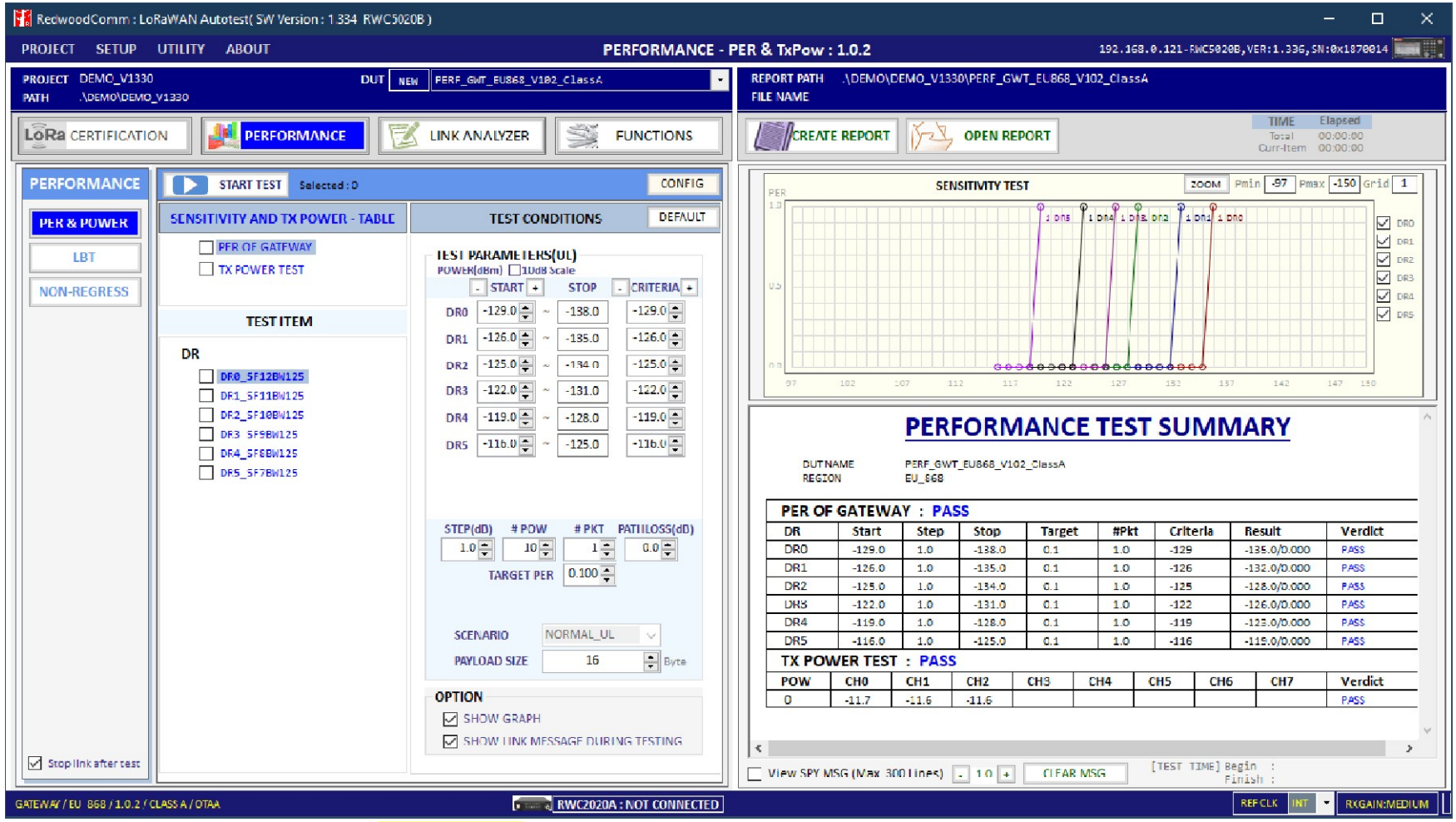
Sensitivity Test Scenario (Class B)

PC Application Software



RF Performance Test (GWT)

PC Application Software

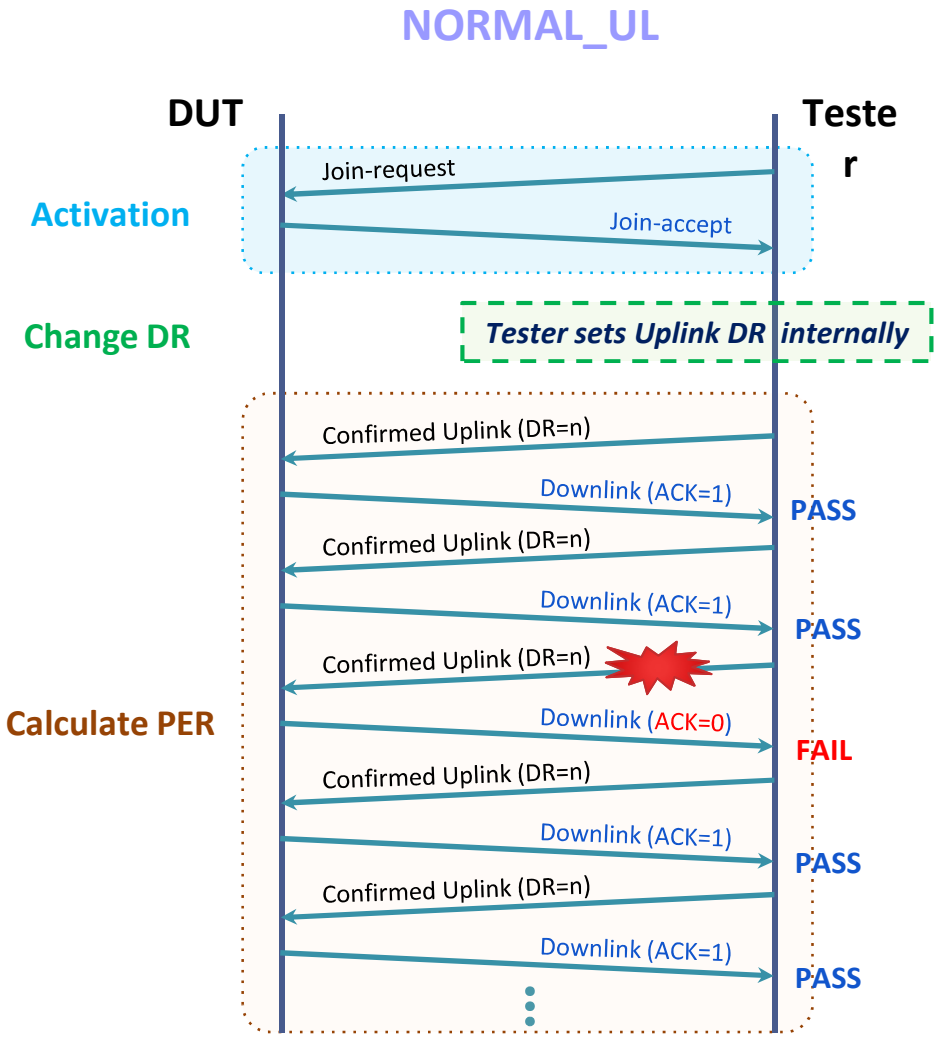


** PER measurement for **uplink (GWT)***

** Test summary and report generation*
** Estimated and elapsed time information*

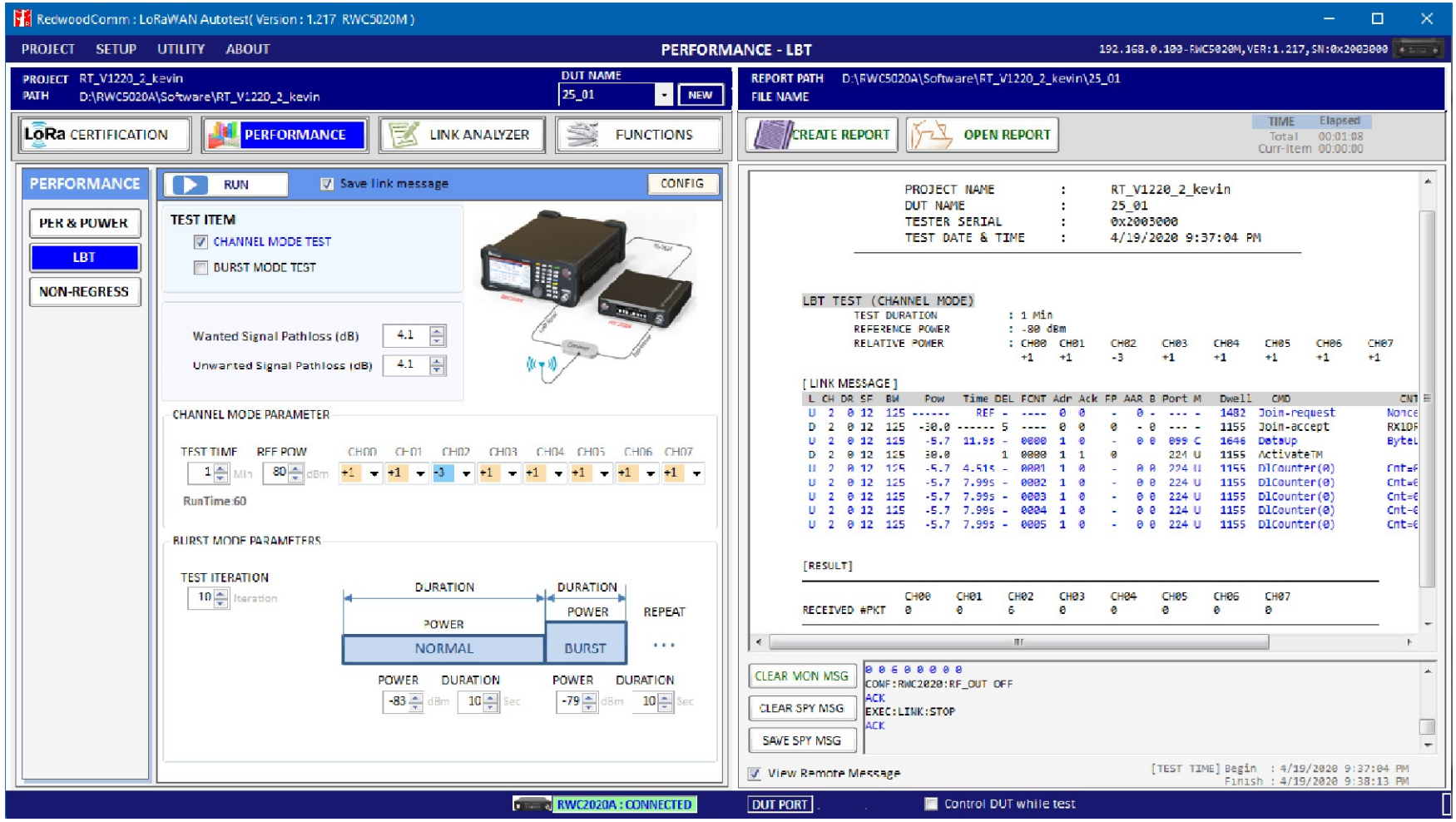
Sensitivity Test Scenario (GWT)

PC Application Software



LBT Test (EDT, GWT)

PC Application Software

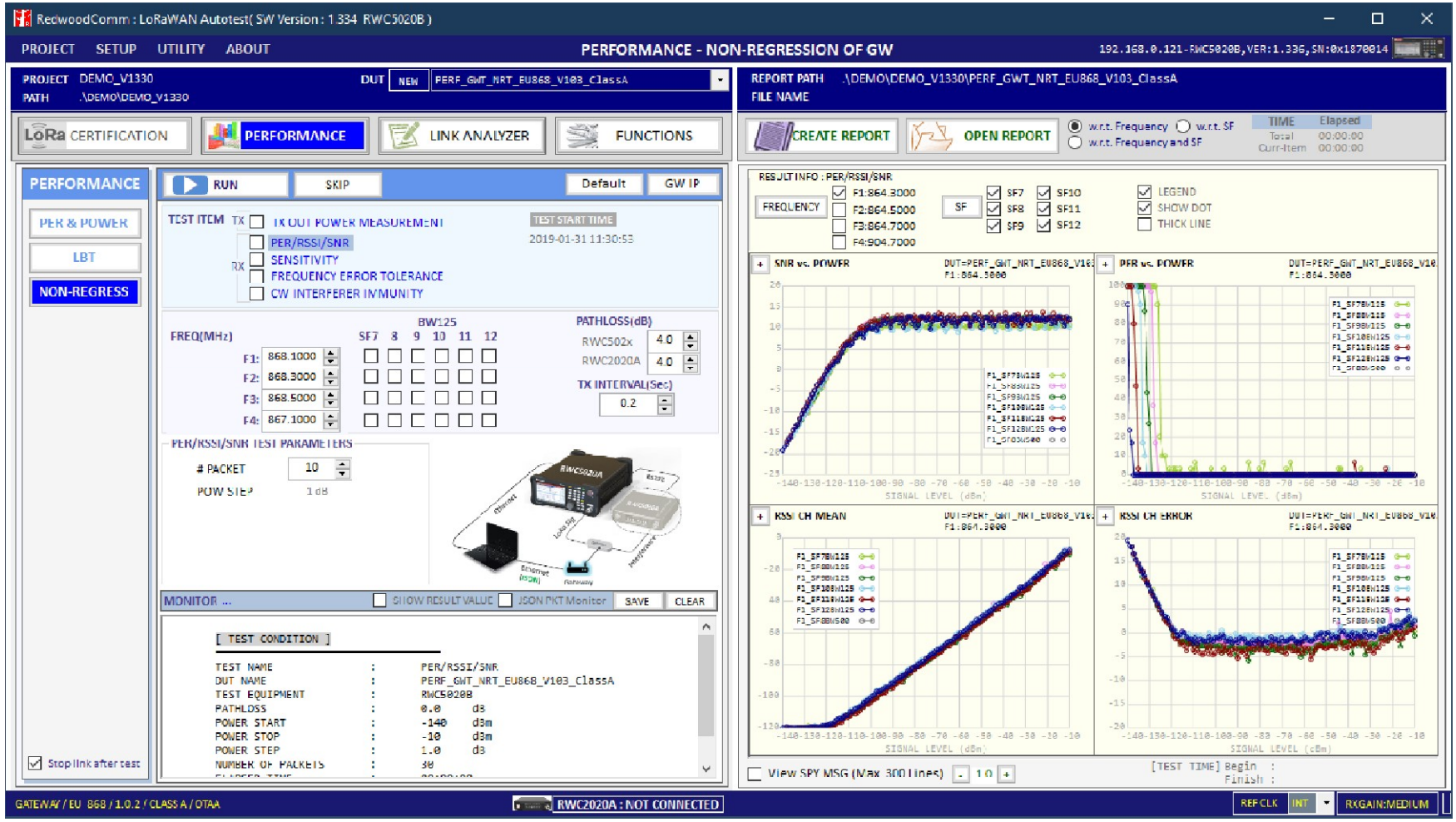


* *Integration with RWC2020A*
* *Channel mode test*
* *Burst mode test*

* *Test summary and report generation*
* *Elapsed time information*

GW Non-regression Test (Semtech)

PC Application Software

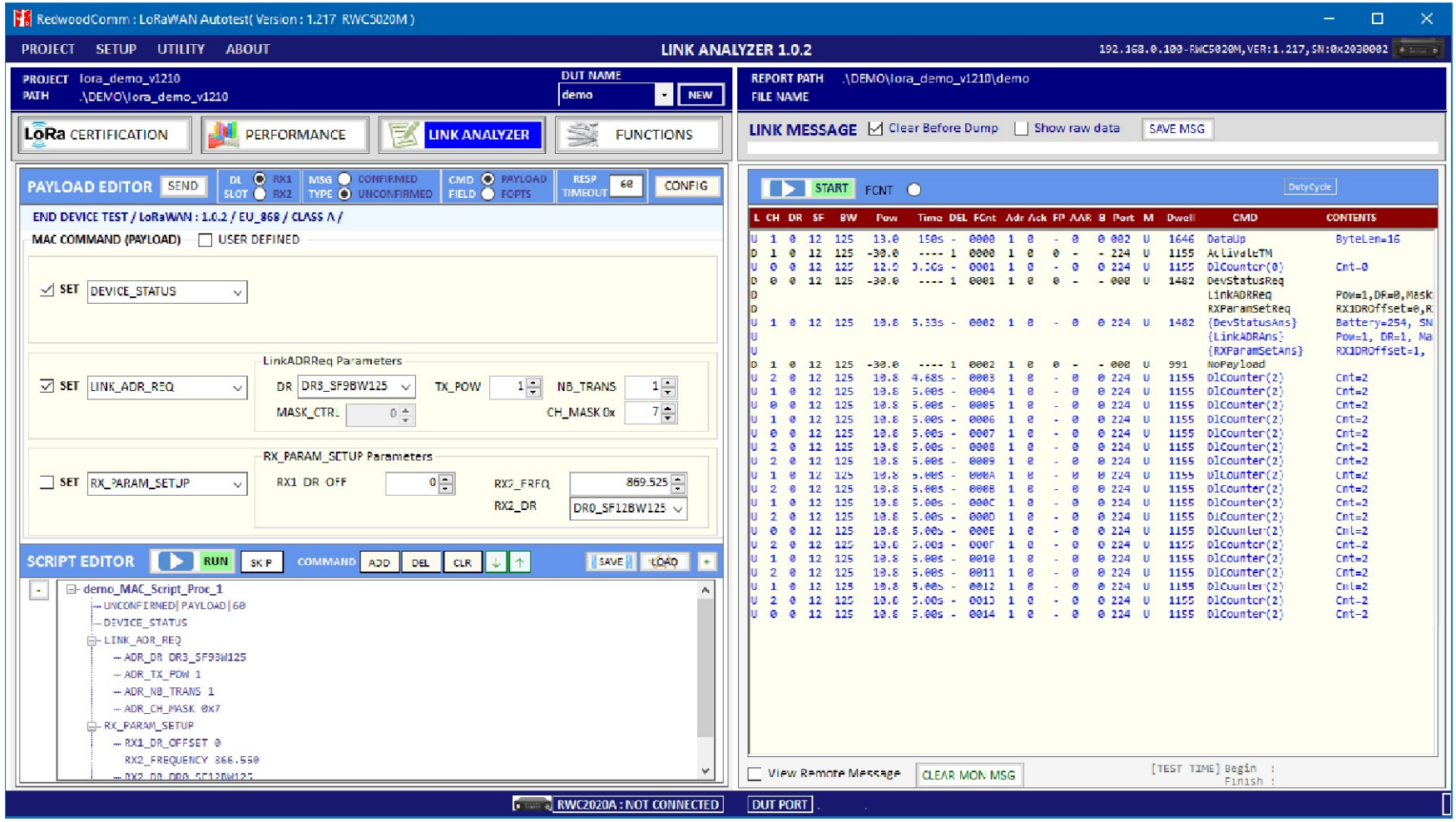


* *Recommended by Semtech*
* *Evaluation of a gateway hardware performances*
* *JSON interface to control a gateway*

* *Test summary and report generation*
* *Elapsed time information*

Link Analyzer & Script Editor

PC Application Software

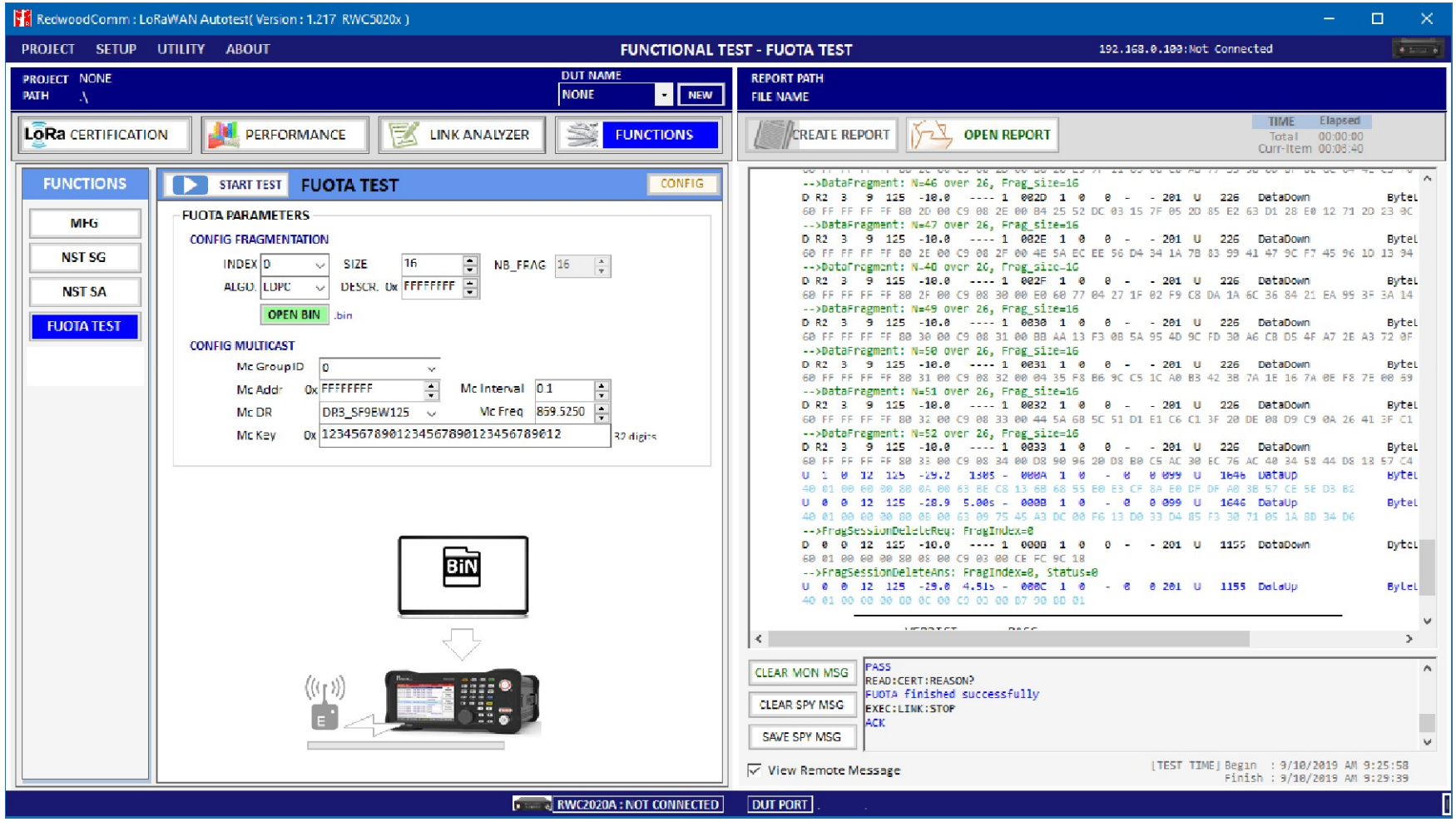


* *Link creation and analysis*
* *MAC command and user data transmission*
* *Multiple MAC commands*
* *Script editor for user scenarios*

* *Recording link messages*
* *Raw data available in hexadecimal format*

FUOTA Test

PC Application Software

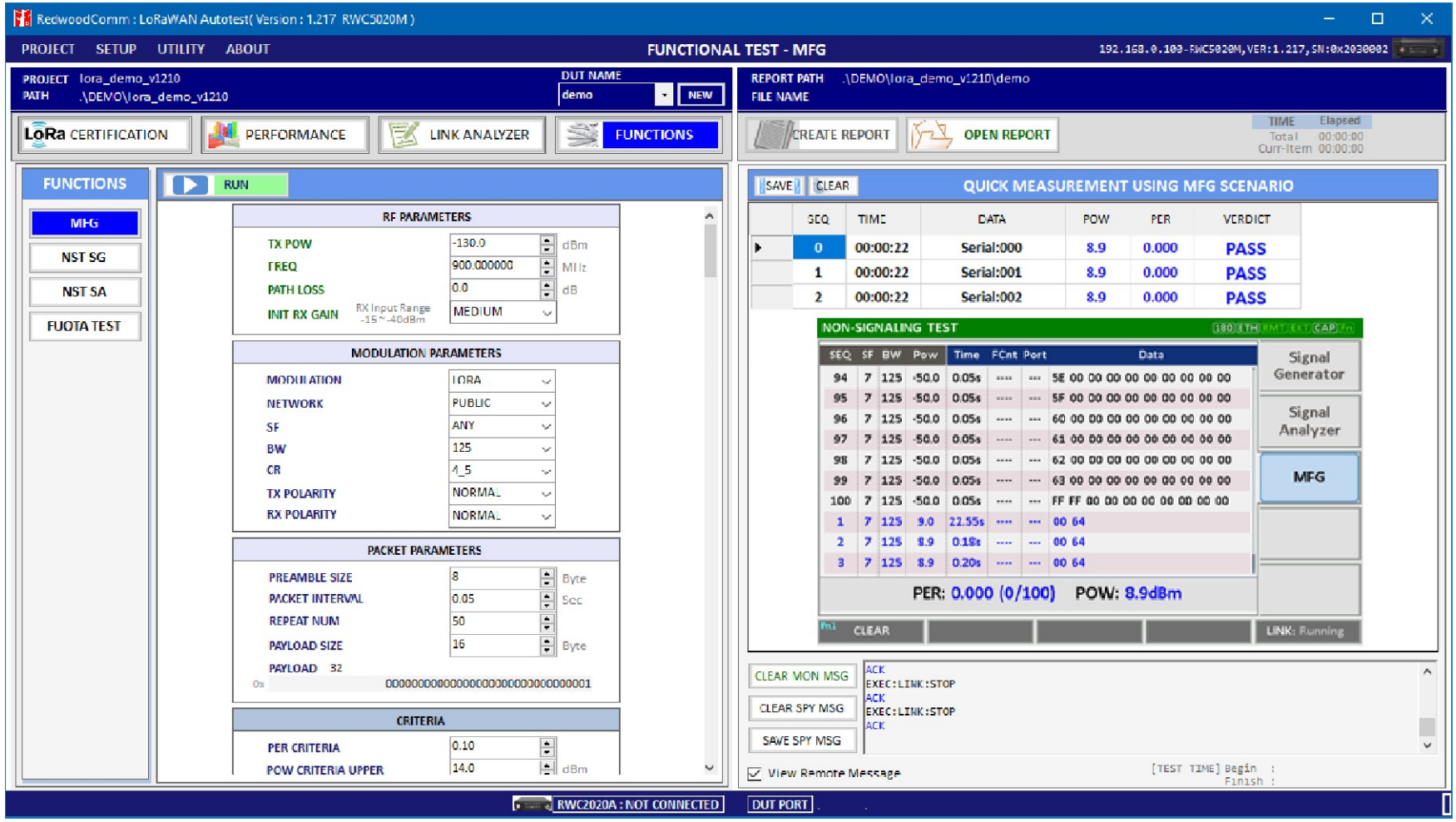


* *Clock synchronization*
* *Multicast / Unicast*
* *Fragmentation and data transport*
* *User binary file*

* *Test summary and report generation*
* *Elapsed time information*

NST / MFG Test

PC Application Software



* *One of production test examples*
* *RX test – PER measurement*
* *TX test – Power measurement*

* *Test summary and report generation*
* *Elapsed time information*

Contents

RWC7100A

RF Shielding Enclosure

- Very High Shielding Effectiveness (dB)

- Applications
  - LTE, NB-IoT devices (700MHz, 2-6GHz)
  - LoRa, Sigfox devices (400MHz, 900MHz, 2.4GHz)
  - WiFi devices (2.4GHz, 5.8-6.2GHz)
  - BT/BLE devices (2.4GHz)
  - GNSS devices (1.2-1.6GHz)

Add-on Modules

RF Shielding Enclosure

- IO Modules
  - USB 3.0 Fiber Interface Module
  - USB 3.0 to 2.0 HUB Module
  - N to SMA Module
  - SMA to SMA Module
  - DB9 Module

- Antenna Modules
  - Wide-band Right-hand Circular Polarized (RHCP) Antenna Set
  - Wide-band Left-hand Circular Polarized (LHCP) Antenna Set

Contents

Manufacturing Solution 1

Production Test Solution

Separate TX/RX Test with SG/SA (NST)

DUT
End-device or Gateway

SF, BW, length, …
Frequency,
Low TX Power

Number of packets

0. Configure the test packet

1. Repeat sending packets

3. Stop

Signal Generator

*0. Enter **RX** Test Mode*

2. Count # of RX packets

4. Calculate PER

Any form of LoRa test packets can be generated with various flexible protocol parameters

SF, BW, …
Frequency

0. Configure the receiver

2. Measure TX Power & CW Frequency

Signal Analyzer

*0. Enter **TX** Test Mode*

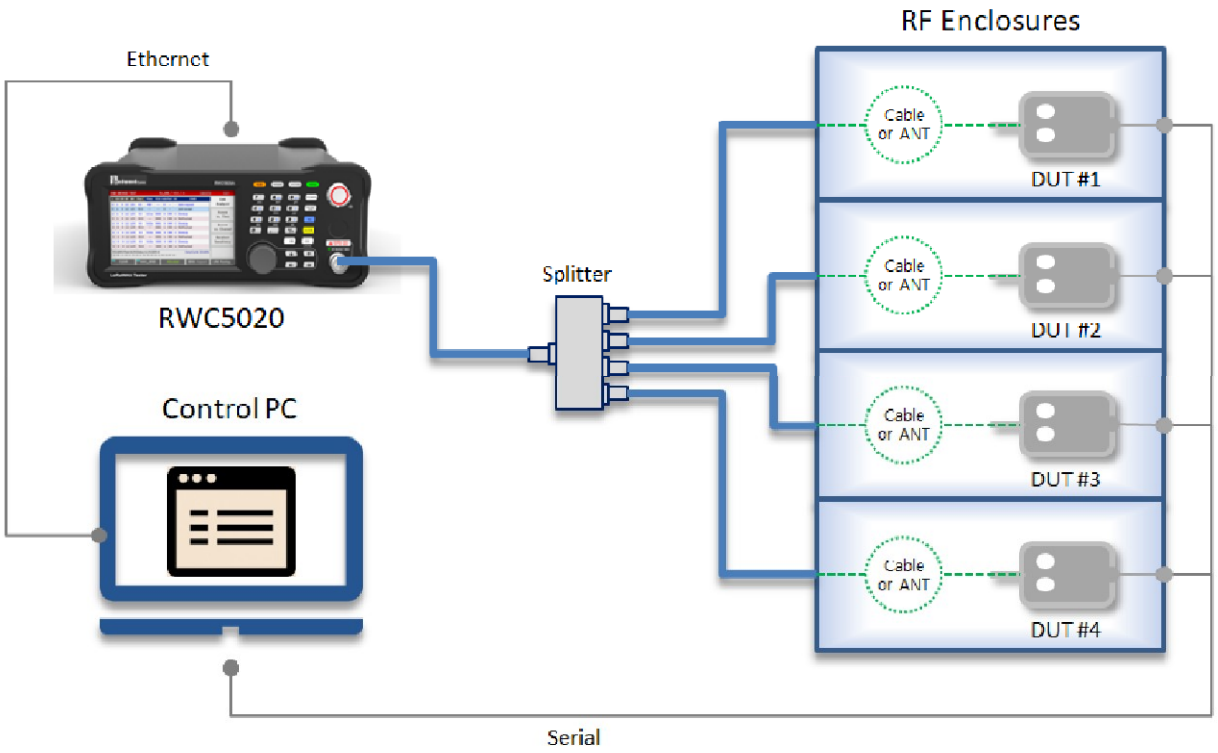
1. Repeat sending packets

3. Stop

Test Example of Multiple DUTs

Production Test Solution

Using NST SG/SA



[RX TEST]

- *The test packets sent by the tester as specified are transferred to each DUT by a splitter at the same time.*
- *Each DUT counts the number of packets it receives, which is read by the user application software.*

[TX TEST]

- *A DUT is forced to transmit CW signal.*
- *The tester measures the power and the frequency* of the CW signal.*
- *A DUT is forced to send the LoRa test packets.*
- *The tester measures the power of the test packets.*
- *The rest of DUTs are tested in turns.*

- *The tester shall be controlled by the user application software via Ethernet.*
- *This software may also control the DUTs if necessary.*

- *The DUTs should be put into RF enclosure(s) to minimize the effect of interferences.*
- *Any available or efficient method can be adopted for RF connection; either radiated or conducted.*

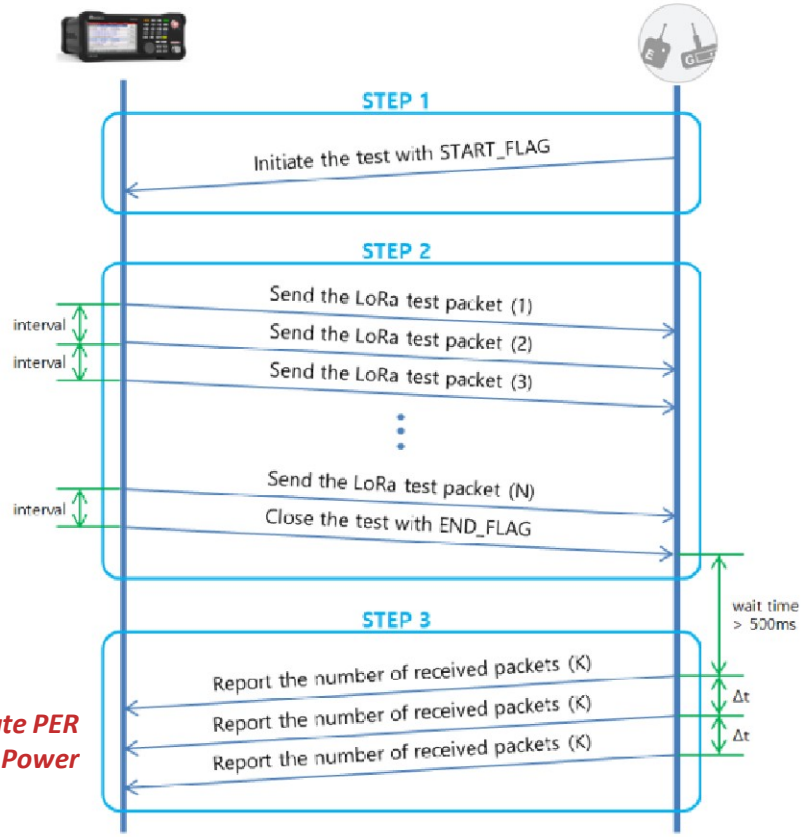
* *Frequency measurement is available only in* ***RWC5020B/M.***

Manufacturing Solution 2

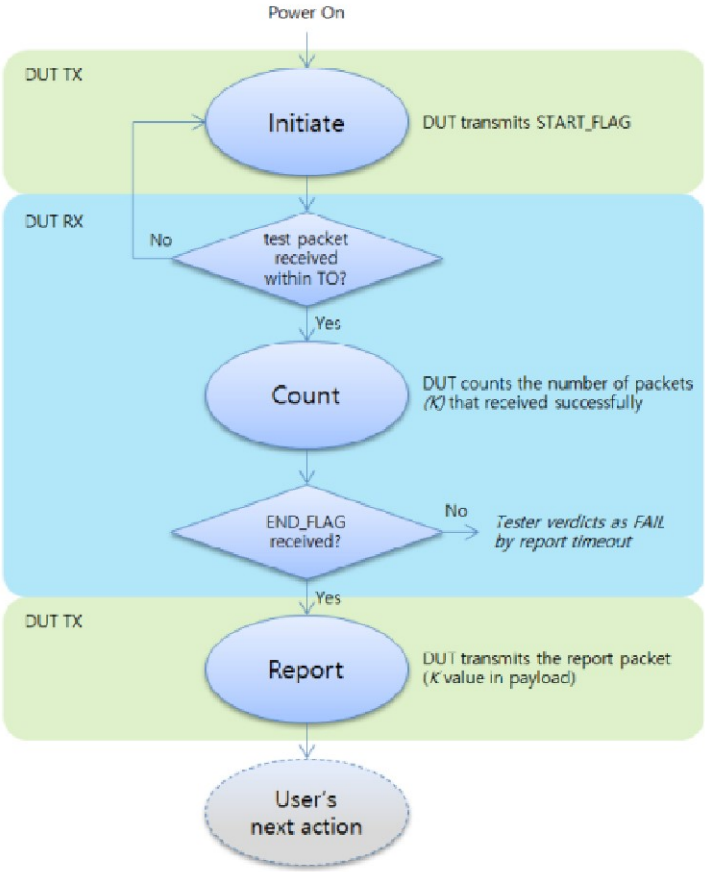
Production Test Solution

Simultaneous TX/RX Test with MFG

Applicable to all LoRa products (end-devices & gateways)



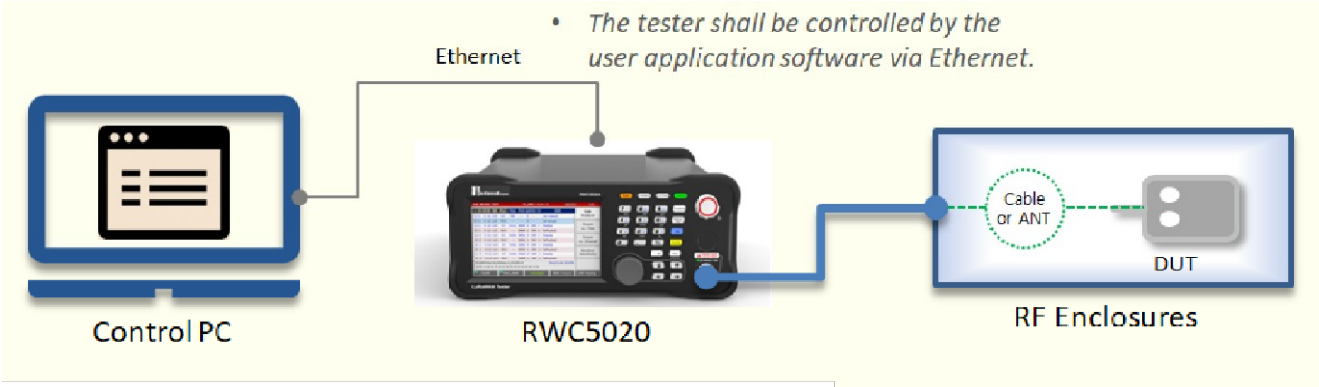
Calculate PER
Measure TX Power



Test Example of a Single DUT

Production Test Solution

Using MFG Function



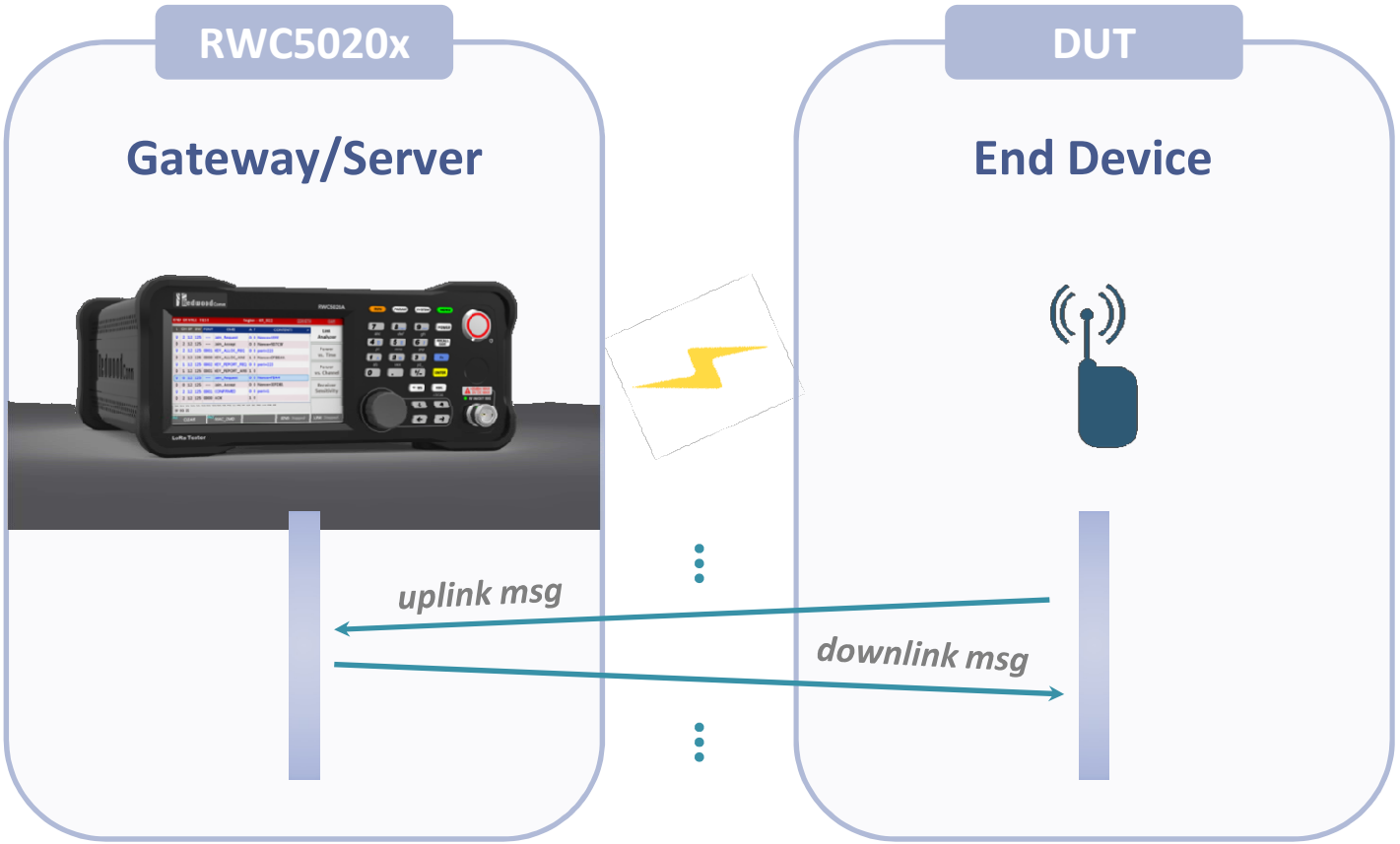
- *The tester shall be controlled by the user application software via Ethernet.*

- *DUT's firmware needs to be modified to adopt the MFG test method.*
- *It is recommended the DUT is put into RF enclosure(s) to minimize the effect of interferences.*
- *Any available or efficient method can be adopted for RF connection; either radiated or conducted.*

Contents

End Device Test

Stand-alone Operation

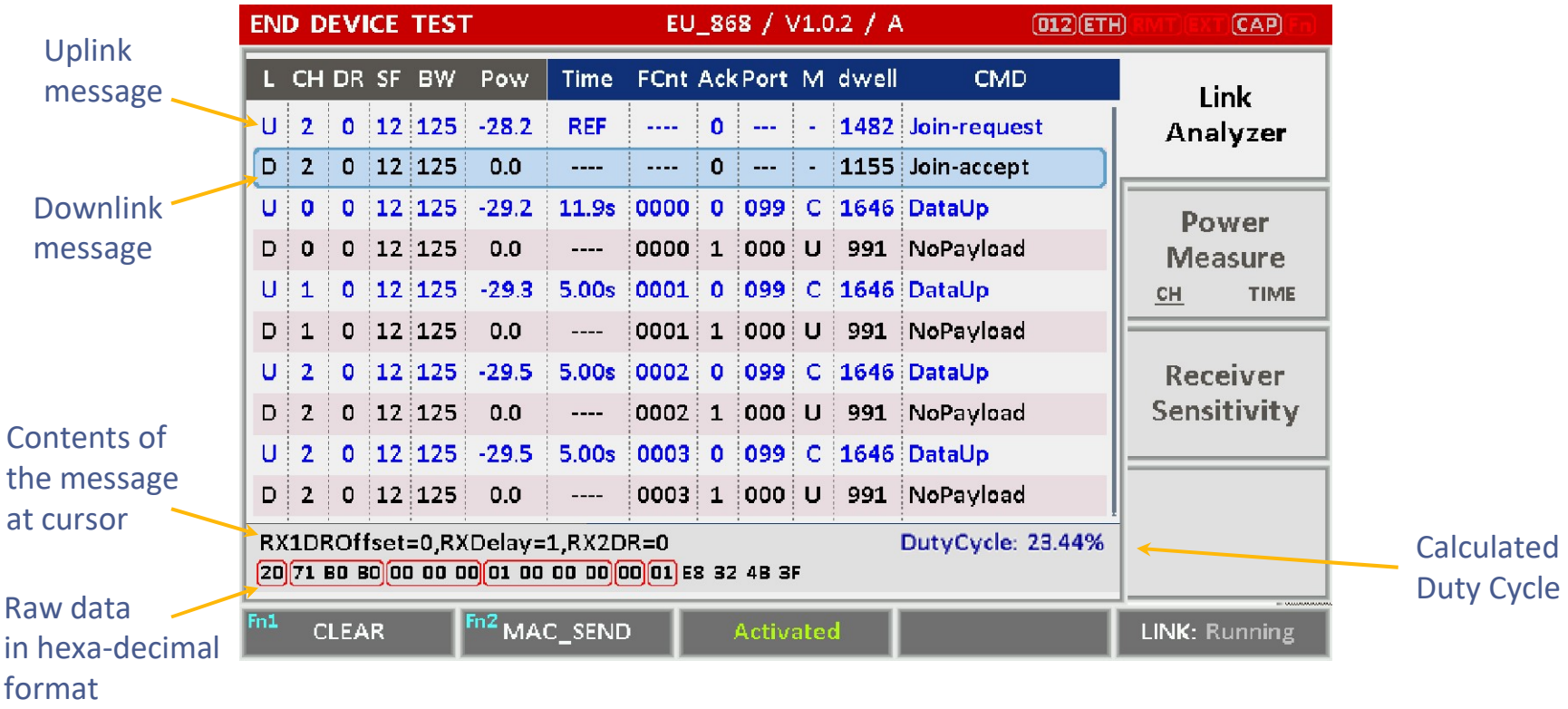


EDT

Link Analyzer

Stand-alone Operation

- Create a LoRaWAN link between a DUT and the tester
- Analyze the MAC and application messages

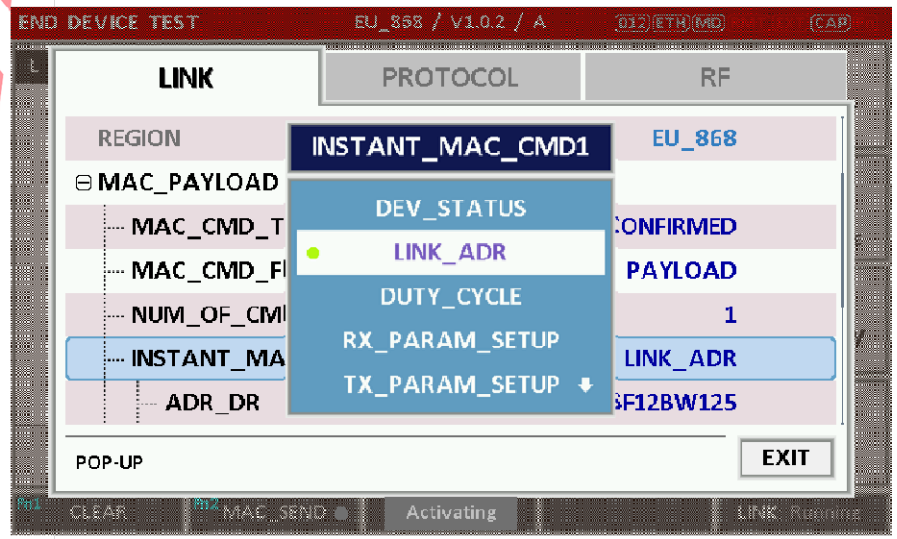


EDT

Link Analyzer

Stand-alone Operation

- Transmission of MAC Command or Application Data
  - To check how a DUT responds to MAC commands
  - Supporting all LoRaWAN MAC commands with user configuration
    - Field selection: frame payload or frame options
    - Message type selection: confirmed or unconfirmed
    - User defined message: editable payload data and port field



EDT

Link Analyzer

Stand-alone Operation

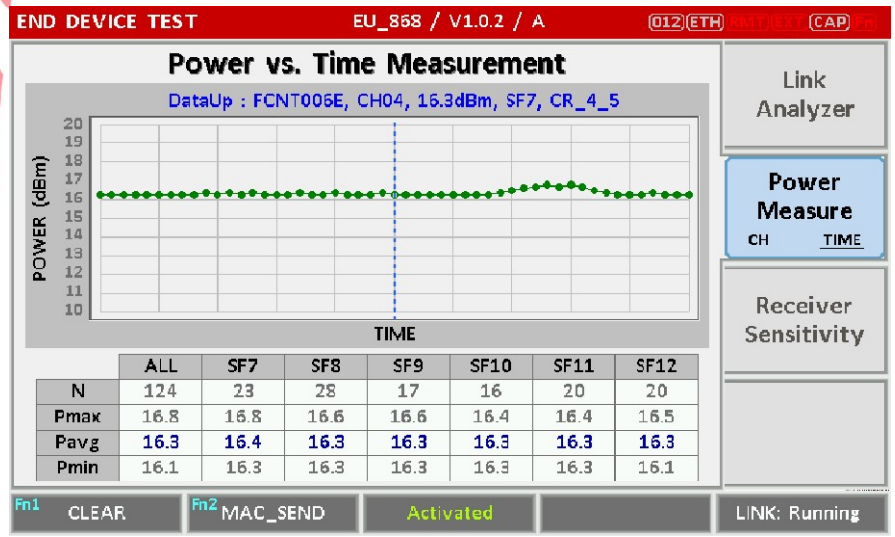
- Transmission of Multiple MAC commands in a single frame
  - To check how a DUT responds to multiple MAC commands
  - Up to 3 MAC commands

EDT

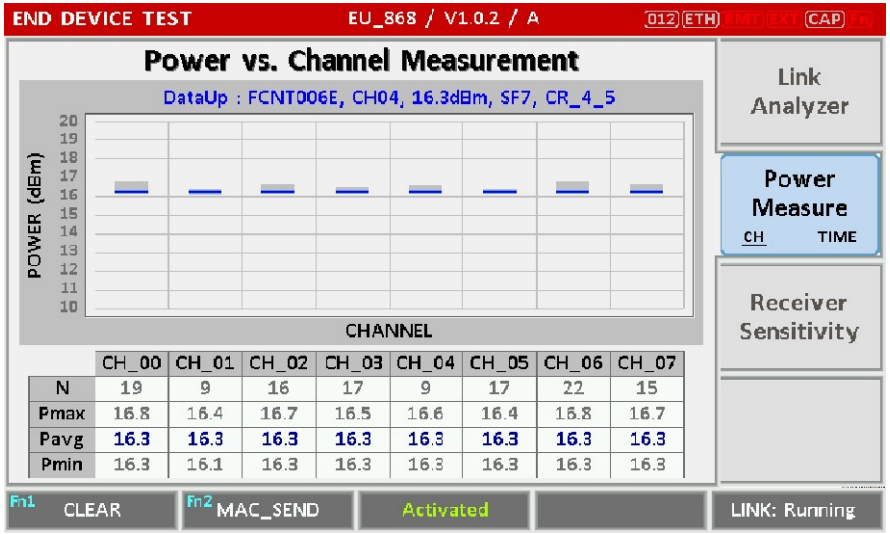
Power Measurement

Stand-alone Operation

- Power vs. Time
  - Continuous monitoring of DUT's TX Power w.r.t. SF
- Power vs. Channel
  - Continuous monitoring of DUT's TX Power w.r.t. Channel
- Calculating the maximum/average/minimum values



	ALL	SF7	SF8	SF9	SF10	SF11	SF12
N	124	23	28	17	16	20	20
Pmax	16.8	16.8	16.6	16.6	16.4	16.4	16.5
Pavg	16.3	16.4	16.3	16.3	16.3	16.3	16.3
Pmin	16.1	16.3	16.3	16.3	16.3	16.3	16.1



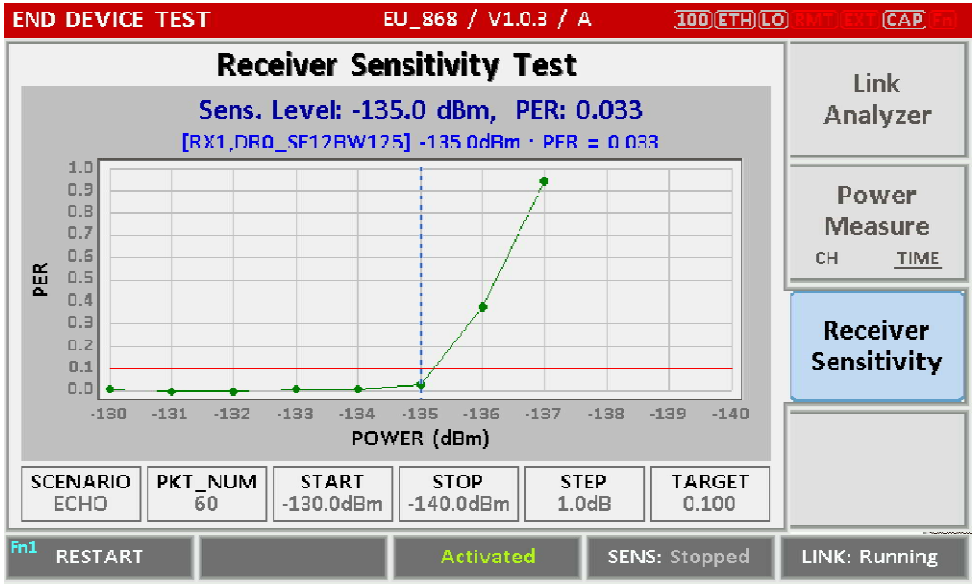
	CH_00	CH_01	CH_02	CH_03	CH_04	CH_05	CH_06	CH_07
N	19	9	16	17	9	17	22	15
Pmax	16.8	16.4	16.7	16.5	16.6	16.4	16.8	16.7
Pavg	16.3	16.3	16.3	16.3	16.3	16.3	16.3	16.3
Pmin	16.3	16.1	16.3	16.3	16.3	16.3	16.3	16.3

EDT

RX Sensitivity Test

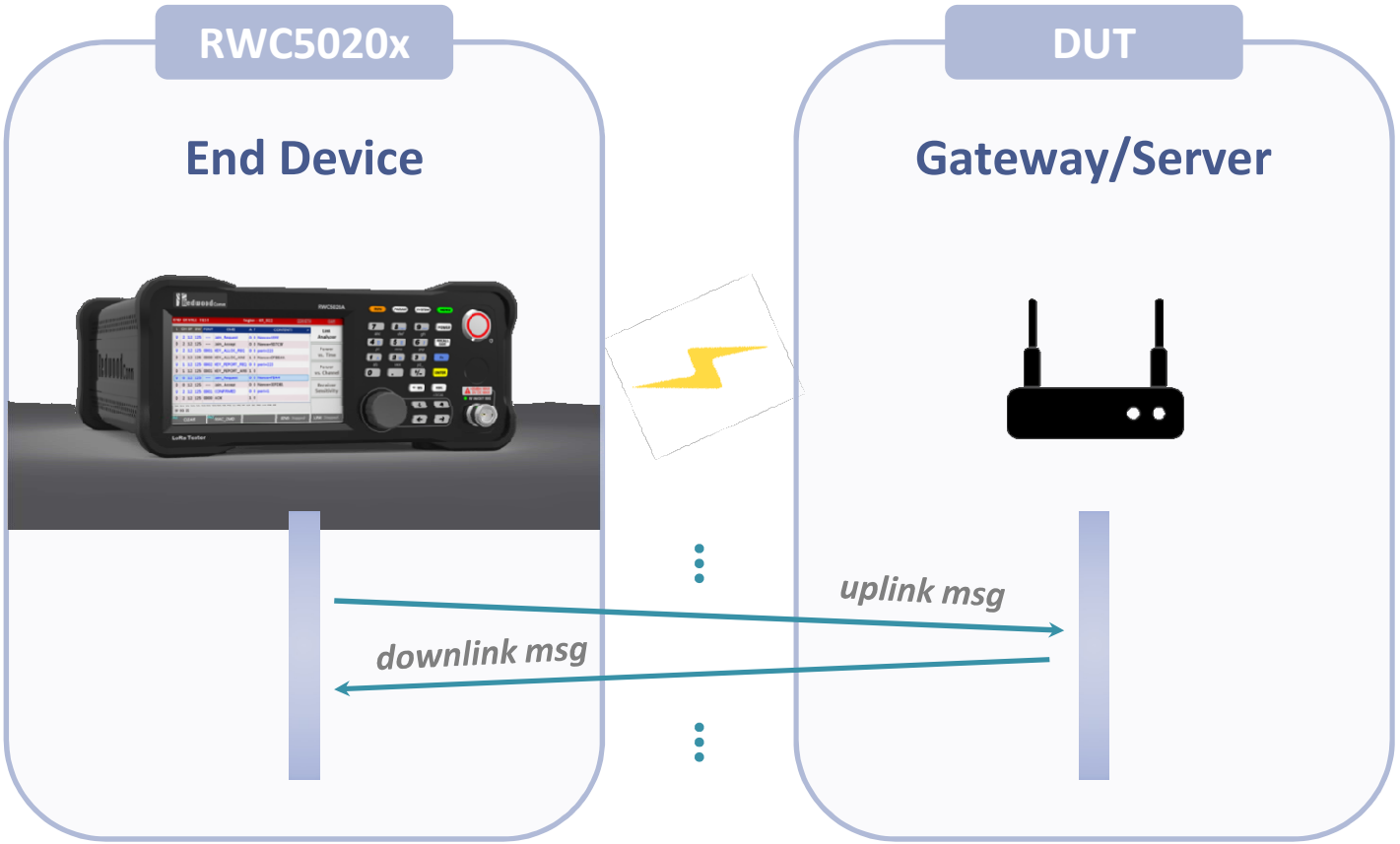
Stand-alone Operation

- Automatic Search of the Minimum Sensitivity Level
  - Determine range and step for the power sweep
  - Select the class of device and the target receive window
    - RX1 and RX2 for Class A, Ping-slot for Class B, RXC for Class C
  - The result value is the minimum power level at which the measured PER does not exceed the limit (TARGET_PER)



Gateway Test

Stand-alone Operation



GWT

Link Analyzer

Stand-alone Operation

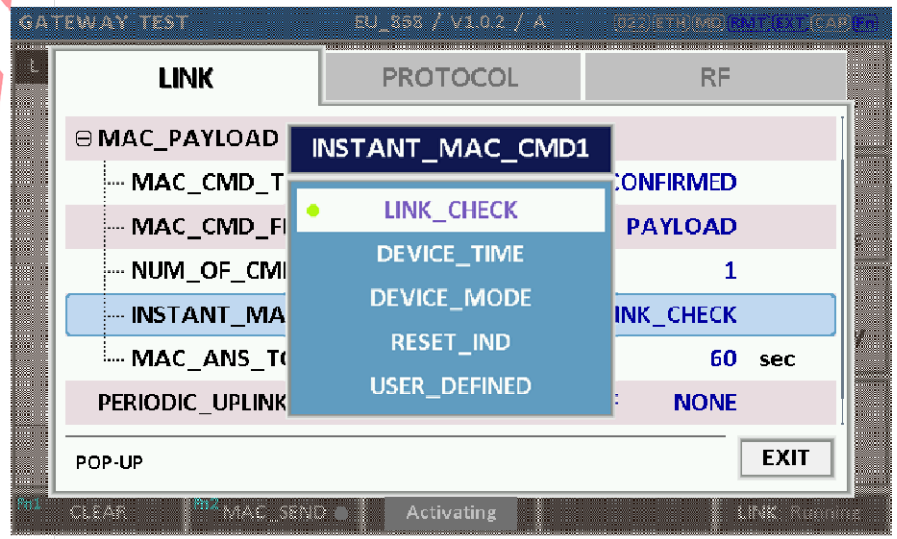
- Create a LoRaWAN link between a DUT and the tester
- Analyze the MAC and application messages

GWT

Link Analyzer

Stand-alone Operation

- Transmission of MAC Command or Application Data
  - To check how a DUT responds to MAC commands
  - Supporting all LoRaWAN MAC commands with user configuration
  - Multiple MAC commands in a single frame (Up to 3 commands)

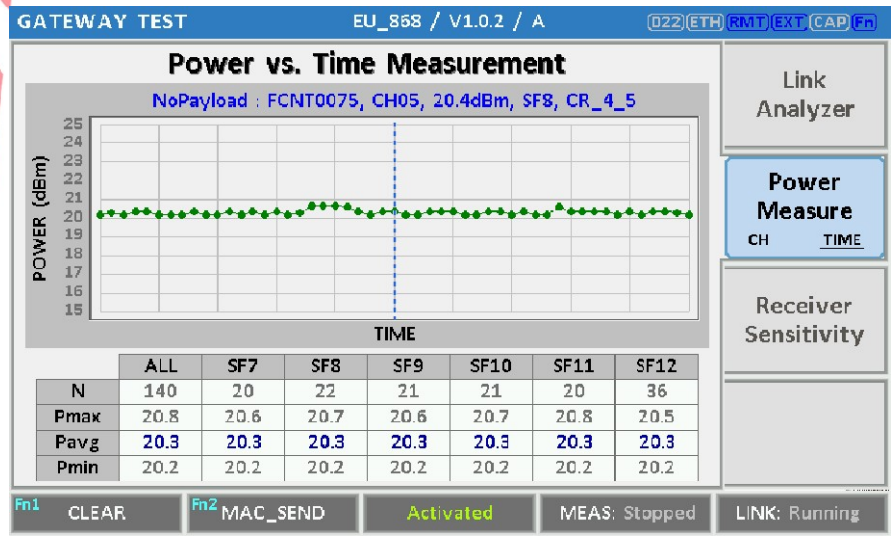


GWT

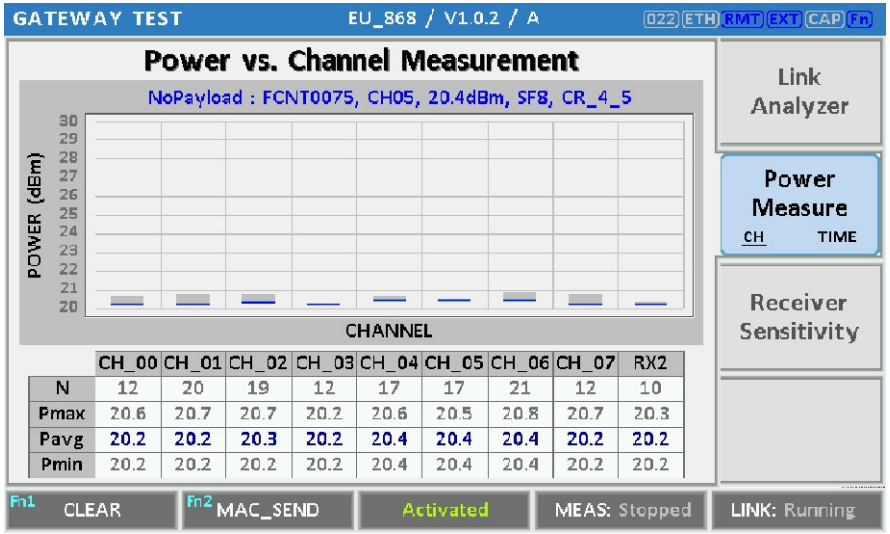
Power Measurement

Stand-alone Operation

- Power vs. Time
  - Continuous monitoring of DUT's TX Power w.r.t. SF
- Power vs. Channel
  - Continuous monitoring of DUT's TX Power w.r.t. Channel
- Calculating the maximum/average/minimum values



	ALL	SF7	SF8	SF9	SF10	SF11	SF12
N	140	20	22	21	21	20	36
Pmax	20.8	20.6	20.7	20.6	20.7	20.8	20.5
Pavg	20.3	20.3	20.3	20.3	20.3	20.3	20.3
Pmin	20.2	20.2	20.2	20.2	20.2	20.2	20.2



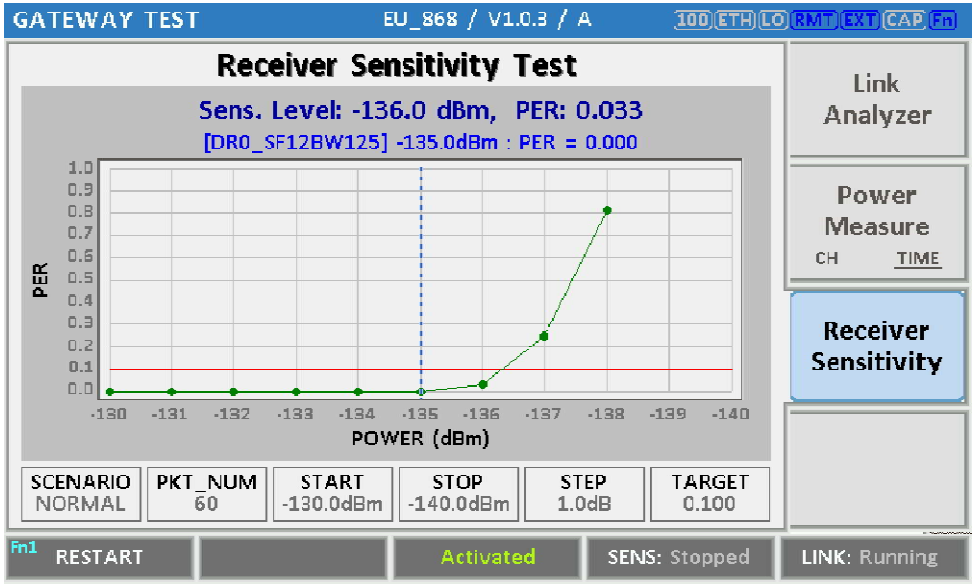
	CH_00	CH_01	CH_02	CH_03	CH_04	CH_05	CH_06	CH_07	RX2
N	12	20	19	12	17	17	21	12	10
Pmax	20.6	20.7	20.7	20.2	20.6	20.5	20.8	20.7	20.3
Pavg	20.2	20.2	20.3	20.2	20.4	20.4	20.4	20.2	20.2
Pmin	20.2	20.2	20.2	20.2	20.4	20.4	20.4	20.2	20.2

GWT

RX Sensitivity Test

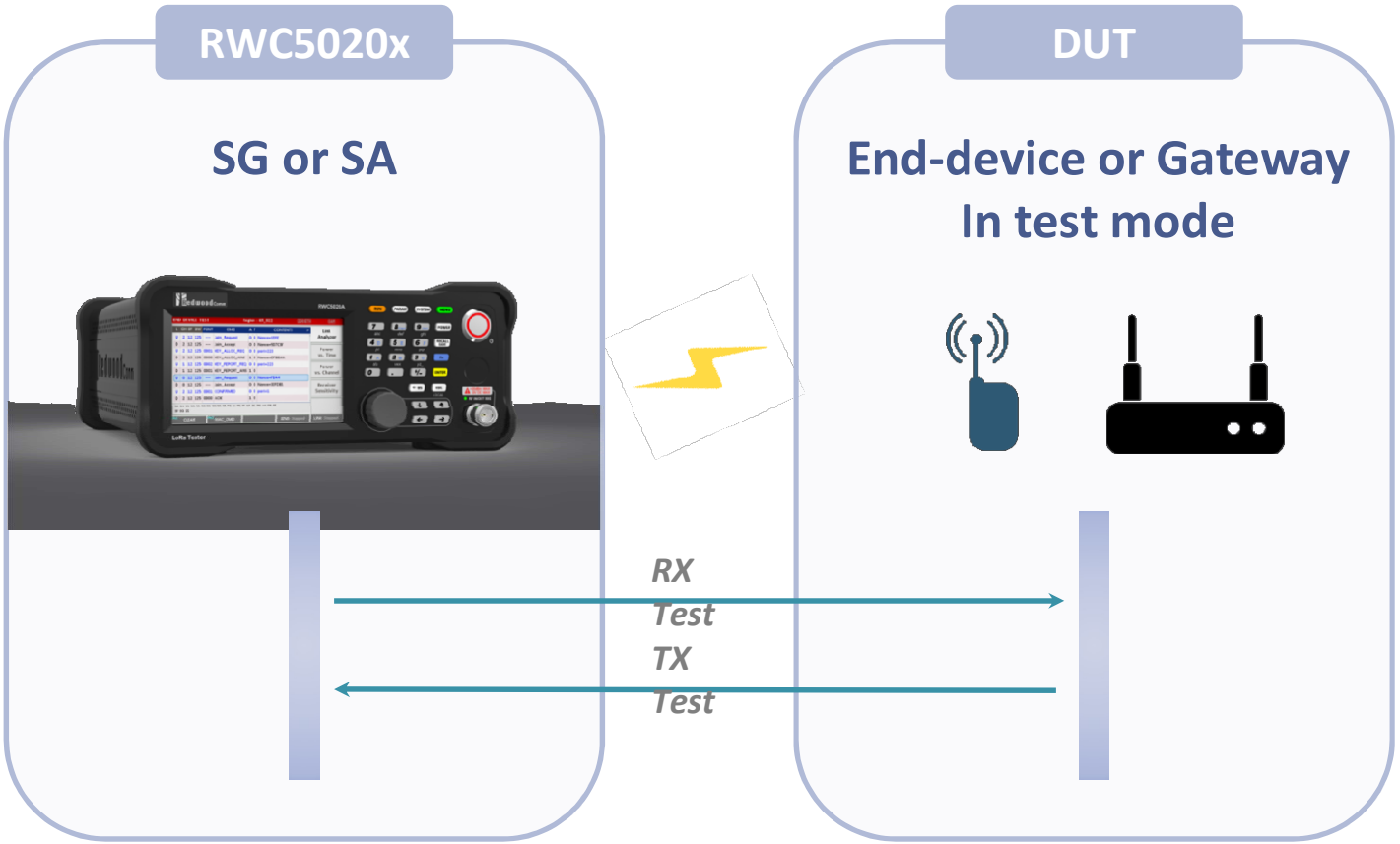
Stand-alone Operation

- Automatic Search of the Minimum Sensitivity Level
  - Determine range and step for the power sweep
  - The result value is the minimum power level at which the measured PER does not exceed the limit (TARGET_PER)



Non-signaling Test

Stand-alone Operation

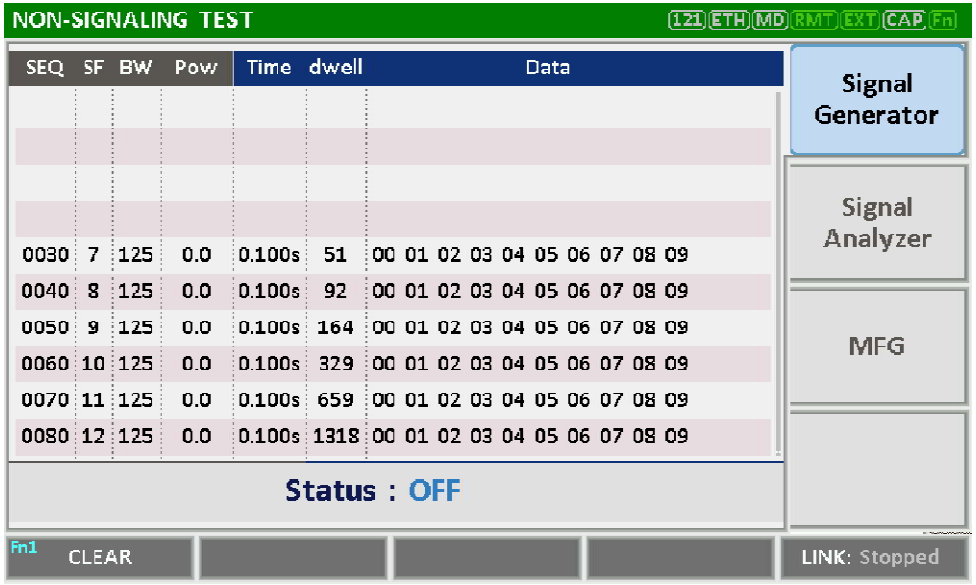


NST

NST TX

Stand-alone Operation

- Signal Generator
  - Modulation - LoRa, FSK, CW
  - LoRa Modulation - Network, Polarity, SF, BW, CR
  - LoRa Packet - Preamble, Payload
  - Repeat number, Packet interval

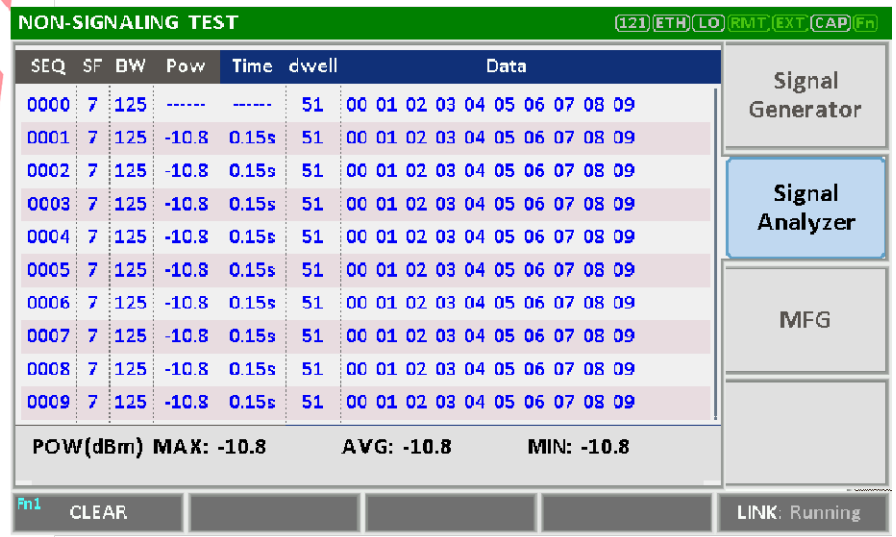


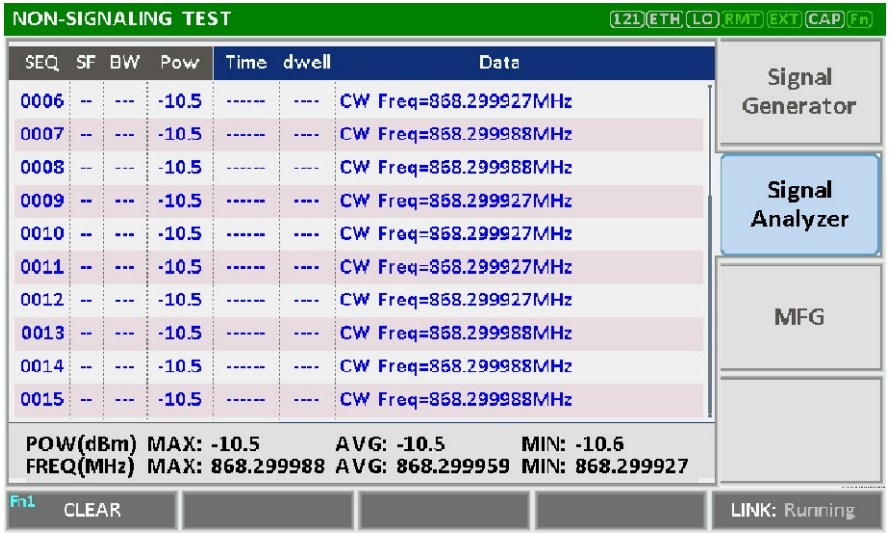
NST

NST RX

Stand-alone Operation

- Signal Analyzer
  - Power Measurement - LoRa / FSK / CW
  - Frequency Measurement - CW



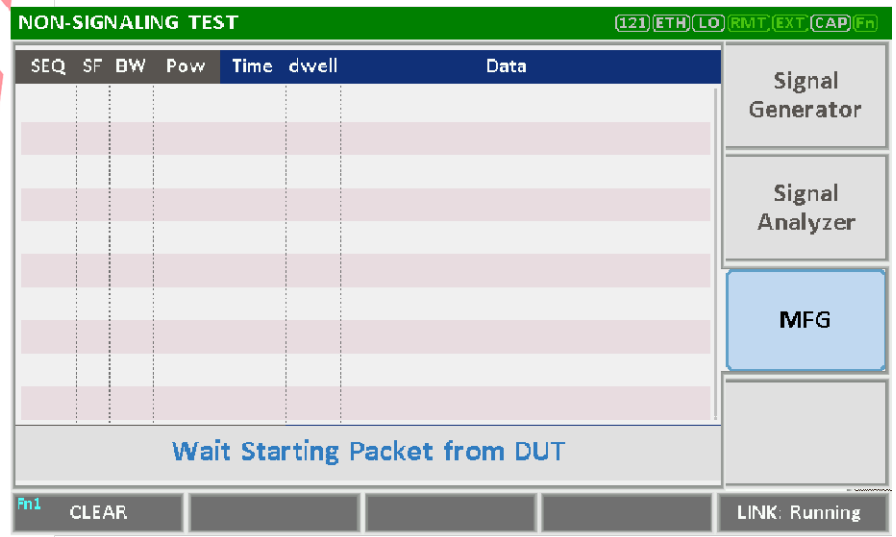


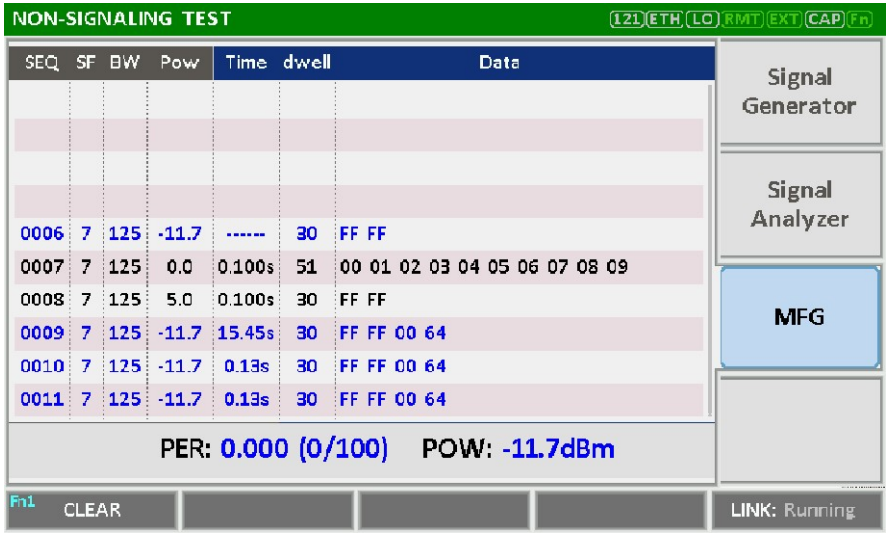
NST

MFG

Stand-alone Operation

- MFG Mode
  - Test scenario defined by RedwoodComm
  - DUT triggers a test transmitting 0xFFFF
  - Simultaneous TX/RX Test
    - RX Sensitivity (PER)
    - TX Power





Feedback

If you have any questions,

contact us at sales@redwoodcomm.com or
visit www.redwoodcomm.com.