Remote Implementation Example

for RWC5020A FW V1.172 or later and RWC5020B

LoRa End Device Radiated RF Performance EU V1.1

RedwoodComm





Initialization

CONFIGURATION - GENERAL

CONFIGURATION - PROTOCOL

CONFIGURATION - RF

Activation

TX Measurements

POWER MEASUREMENT – [Part 1] 3D Pattern for MaxEIRP

Method 1

Method 2

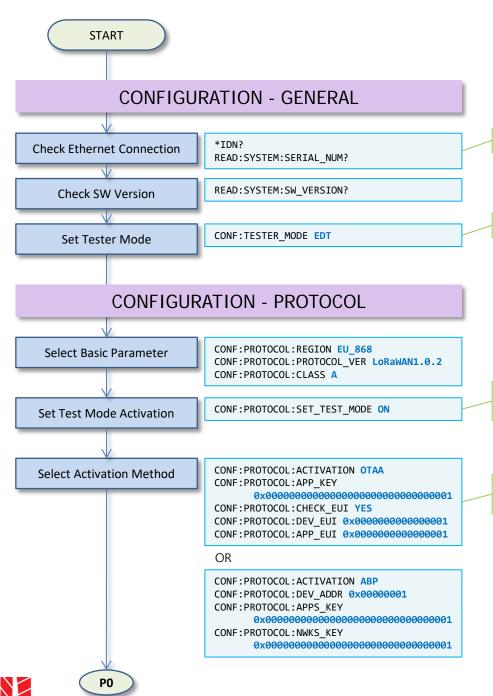
POWER MEASUREMENT – [Part 2] Meas. at Best Position for Non MaxEIRP

RX Measurements

RX SENSITIVITY MEASUREMENT - RX1 Window

RX SENSITIVITY MEASUREMENT - RX2 Window





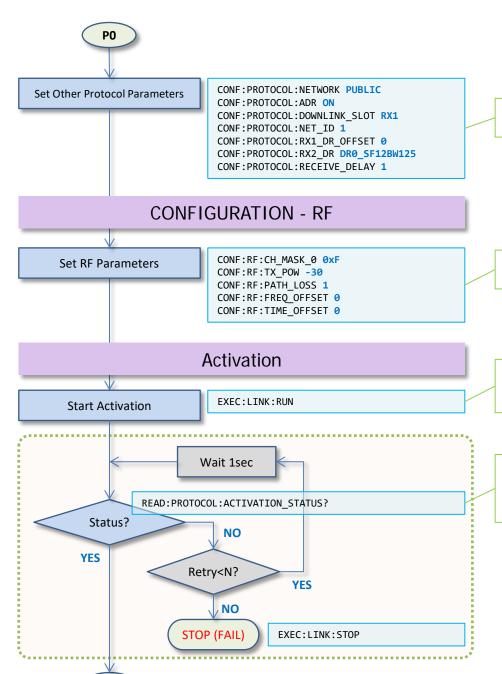
Please be sure that the Ethernet setup with IP configuration has been completed prior to starting this example. You may refer to the User Manual or Application Note of RWC5020A for further information.

Check the connection to the tester via Ethernet.

Set the operating mode for testing an end-device, EDT.

If this is ON, the tester will issue *Activate Test Mode* command immediately after receiving the first uplink message from DUT.

Select the activation method to be used; OTAA or ABP. Depending on it, other relevant parameters must be configured as listed.

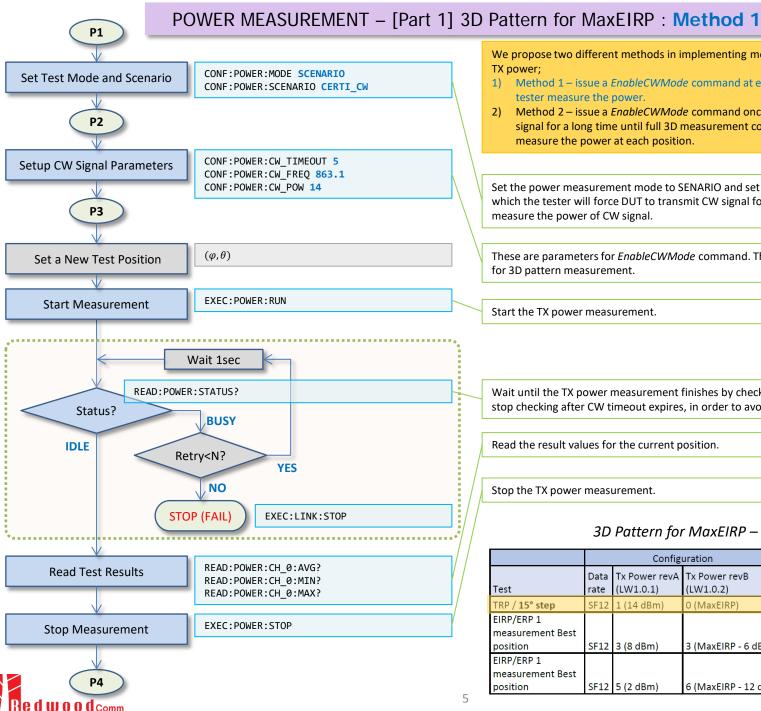


Set other protocol parameters as default. Any parameter can be changed according to Users' test purpose.

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Let the tester start running in the mode of a Gateway and a network server, and waiting for an uplink message from DUT. Uplink messages are expected in different ways according to the selection of activation method.

Read the status of activation procedure by polling a command. Most likely at this point, DUT needs to be initiated to send its first message; *JoinRequest* command for OTAA or usual uplink message for ABP. Users need to set up a timeout value for waiting the first message from DUT, in order to avoid falling into an infinite loop.



We propose two different methods in implementing measurement of 3D pattern of

- 1) Method 1 issue a *EnableCWMode* command at each position of DUT and the tester measure the power.
- 2) Method 2 issue a *EnableCWMode* command once to force DUT to send CW signal for a long time until full 3D measurement completes and the tester will measure the power at each position.

Set the power measurement mode to SENARIO and set SENARIO to CERTI CW, in which the tester will force DUT to transmit CW signal for specified timeout and measure the power of CW signal.

These are parameters for EnableCWMode command. The power must be MaxEIRP for 3D pattern measurement.

Start the TX power measurement.

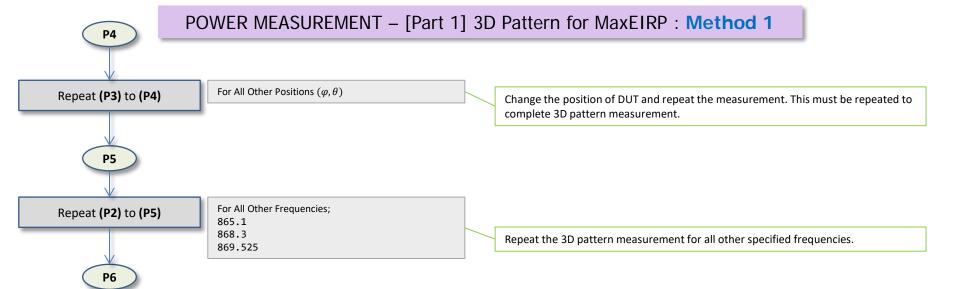
Wait until the TX power measurement finishes by checking its status. Users need to stop checking after CW timeout expires, in order to avoid falling into an infinite loop.

Read the result values for the current position.

Stop the TX power measurement.

3D Pattern for MaxEIRP - Method 1

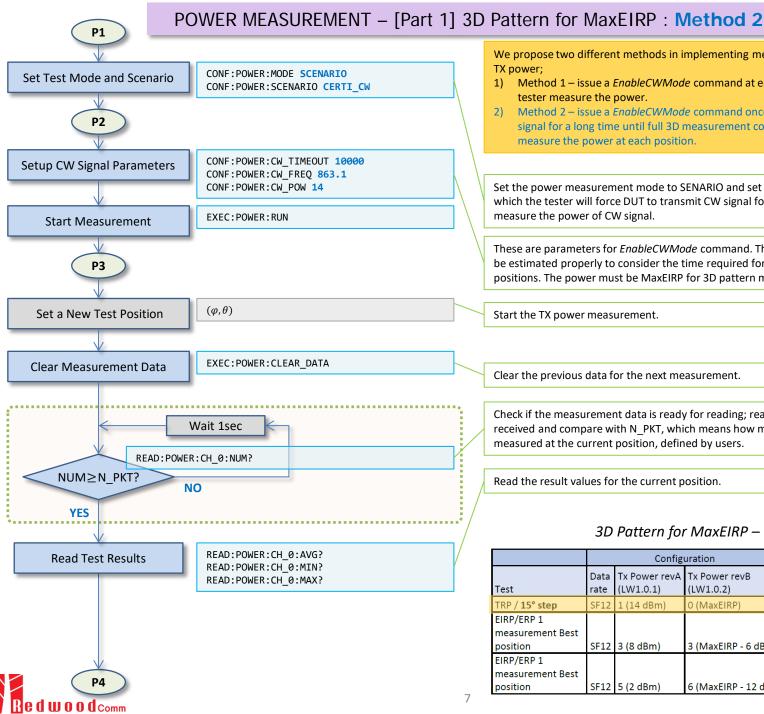
	Configuration			Channels			
Test		Tx Power revA (LW1.0.1)	Tx Power revB (LW1.0.2)	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz
TRP / 15° step	SF12	1 (14 dBm)	0 (MaxEIRP)	Х	X	X	Х
EIRP/ERP 1 measurement Best position	SF12	3 (8 dBm)	3 (MaxEIRP - 6 dB)	X	X	X	-
EIRP/ERP 1 measurement Best position	SF12	5 (2 dBm)	6 (MaxEIRP - 12 dB)	X	x	Х	-



3D Pattern for MaxEIRP – Method 1

	Configuration			Channels				
Test	Data rate	Tx Power revA (LW1.0.1)	Tx Power revB (LW1.0.2)	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz	
TRP / 15° step	SF12	1 (14 dBm)	0 (MaxEIRP)	Х	Х	Х	Х	
EIRP/ERP 1								
measurement Best								
position	SF12	3 (8 dBm)	3 (MaxEIRP - 6 dB)	Х	Х	X	-	
EIRP/ERP 1								
measurement Best								
position	SF12	5 (2 dBm)	6 (MaxEIRP - 12 dB)	Х	Х	X	-	





We propose two different methods in implementing measurement of 3D pattern of

- 1) Method 1 issue a *EnableCWMode* command at each position of DUT and the tester measure the power.
- 2) Method 2 issue a *EnableCWMode* command once to force DUT to send CW signal for a long time until full 3D measurement completes and the tester will measure the power at each position.

Set the power measurement mode to SENARIO and set SENARIO to CERTI CW, in which the tester will force DUT to transmit CW signal for specified timeout and measure the power of CW signal.

These are parameters for EnableCWMode command. The CW TIMEOUT value must be estimated properly to consider the time required for measurement of all test positions. The power must be MaxEIRP for 3D pattern measurement.

Start the TX power measurement.

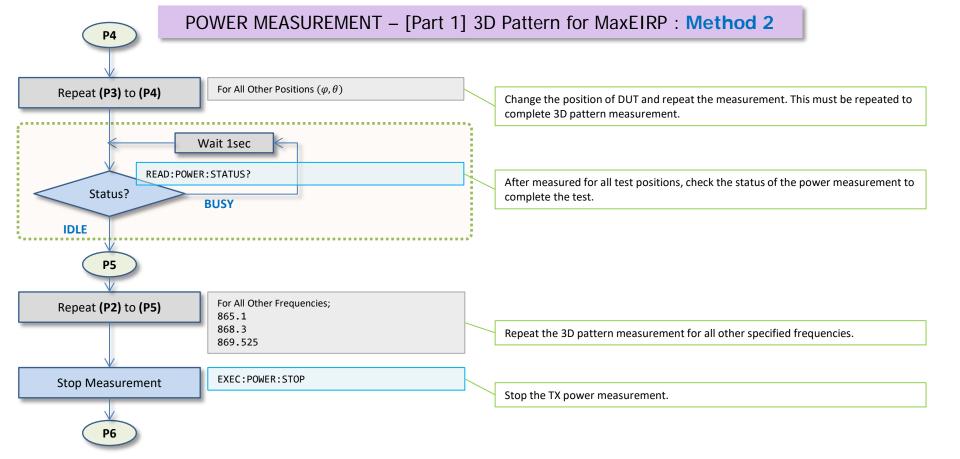
Clear the previous data for the next measurement.

Check if the measurement data is ready for reading; read the number of packets received and compare with N PKT, which means how many times the power will be measured at the current position, defined by users.

Read the result values for the current position.

3D Pattern for MaxEIRP – Method 2

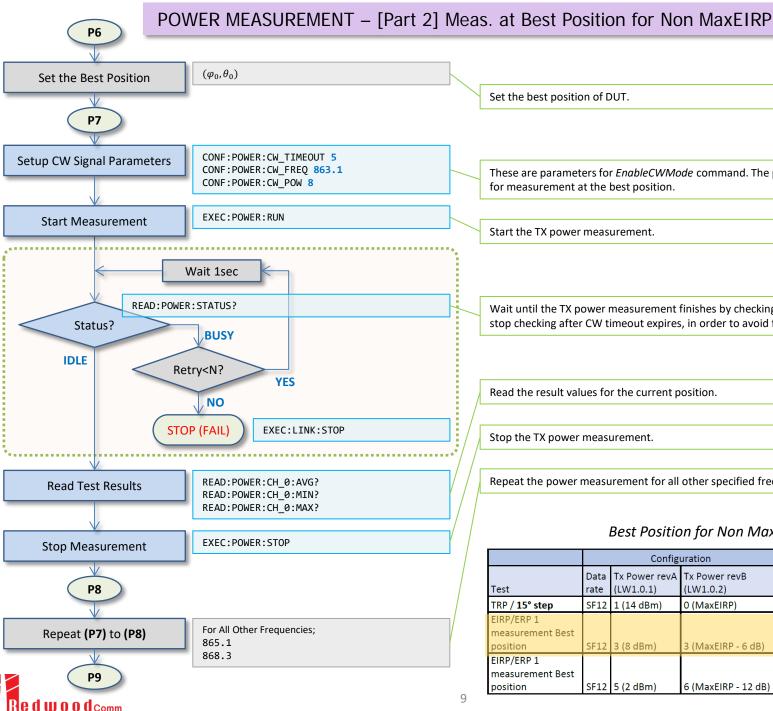
	Configuration			Channels			
Test		Tx Power revA (LW1.0.1)	Tx Power revB (LW1.0.2)	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz
TRP / 15° step	SF12	1 (14 dBm)	0 (MaxEIRP)	Х	X	Х	х
EIRP/ERP 1 measurement Best position	SF12	3 (8 dBm)	3 (MaxEIRP - 6 dB)	X	х	х	-
EIRP/ERP 1 measurement Best position	SF12	5 (2 dBm)	6 (MaxEIRP - 12 dB)	х	х	х	-



3D Pattern for MaxEIRP – Method 2

	Configuration			Channels			
Test	Data rate	Tx Power revA (LW1.0.1)	Tx Power revB (LW1.0.2)	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz
TRP / 15° step	SF12	1 (14 dBm)	0 (MaxEIRP)	х	Х	Х	Х
EIRP/ERP 1							
measurement Best							
position	SF12	3 (8 dBm)	3 (MaxEIRP - 6 dB)	Х	X	X	-
EIRP/ERP 1							
measurement Best							
position	SF12	5 (2 dBm)	6 (MaxEIRP - 12 dB)	X	X	X	-





Set the best position of DUT.

These are parameters for EnableCWMode command. The power must be MaxEIRP-6 for measurement at the best position.

Start the TX power measurement.

Wait until the TX power measurement finishes by checking its status. Users need to stop checking after CW timeout expires, in order to avoid falling into an infinite loop.

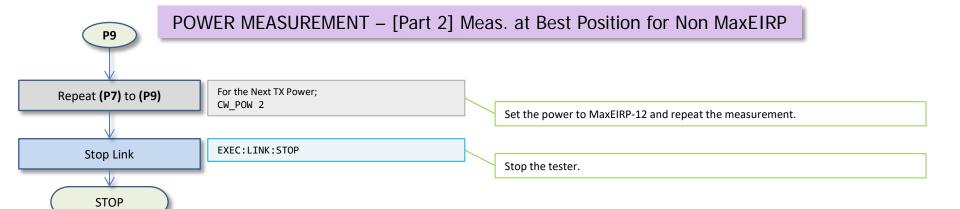
Read the result values for the current position.

Stop the TX power measurement.

Repeat the power measurement for all other specified frequencies.

Best Position for Non MaxEIRP

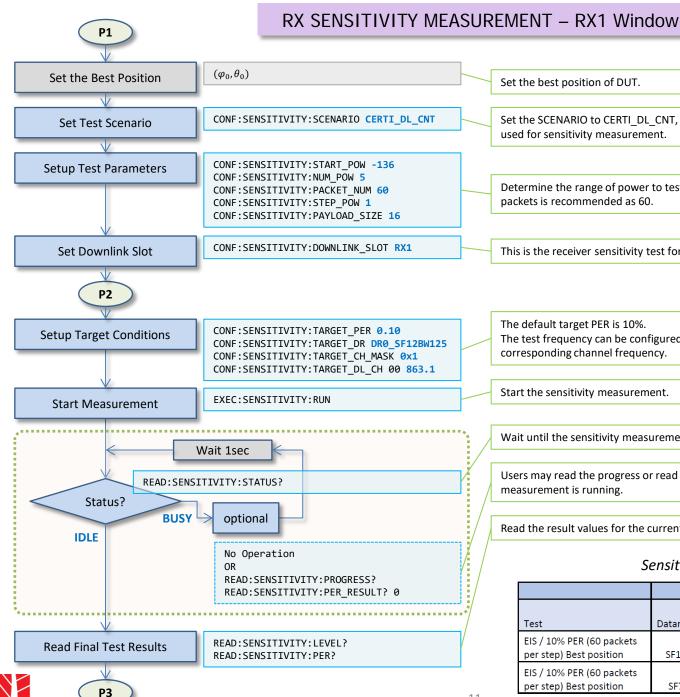
	Configuration			Channels				
Test	Data rate	Tx Power revA (LW1.0.1)	Tx Power revB (LW1.0.2)	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz	
TRP / 15° step	SF12	1 (14 dBm)	0 (MaxEIRP)	X	X	X	х	
EIRP/ERP 1 measurement Best position	SF12	3 (8 dBm)	3 (MaxEIRP - 6 dB)	X	х	Х	-	
EIRP/ERP 1 measurement Best position	SF12	5 (2 dBm)	6 (MaxEIRP - 12 dB)	х	х	х	-	



Best Position for Non MaxEIRP

		Configuration			Channels			
Test	Data rate	Tx Power revA (LW1.0.1)	Tx Power revB (LW1.0.2)	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz	
TRP / 15° step	SF12	1 (14 dBm)	0 (MaxEIRP)	Х	X	X	Х	
EIRP/ERP 1 measurement Best								
position	SF12	3 (8 dBm)	3 (MaxEIRP - 6 dB)	Х	X	X	-	
EIRP/ERP 1 measurement Best position	SF12	5 (2 dBm)	6 (MaxEIRP - 12 dB)	X	X	X	_	





Set the best position of DUT.

Set the SCENARIO to CERTI DL CNT, in which downlink counter packets will be used for sensitivity measurement.

Determine the range of power to test the receiver sensitivity. The number of packets is recommended as 60.

This is the receiver sensitivity test for RX1 window.

The default target PER is 10%.

The test frequency can be configured by using the target channel mask and the corresponding channel frequency.

Start the sensitivity measurement.

Wait until the sensitivity measurement finishes by checking its status.

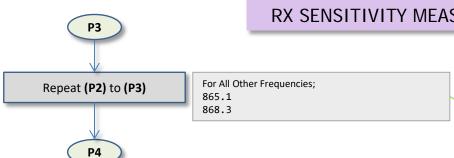
Users may read the progress or read the PER result with power index while the measurement is running.

Read the result values for the current position.

Sensitivity for RX1 Window

		Channels					
Test	Datarate	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz		
EIS / 10% PER (60 packets per step) Best position	SF12	Rx1	Rx1	Rx1	Rx2		
EIS / 10% PER (60 packets per step) Best position	SF7	-	-	-	Rx2		

RX SENSITIVITY MEASUREMENT – RX1 Window



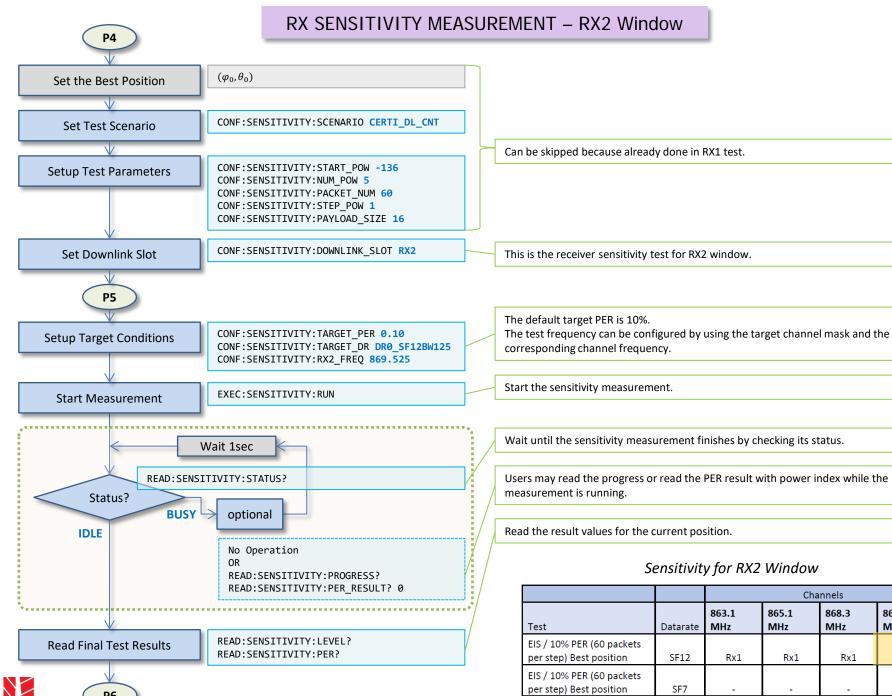
Repeat the sensitivity measurement for all other specified frequencies.

The sensitivity measurement automatically ends after the sensitivity level is found at which the PER exceeds the target PER or all the power values in the range are tested.

Sensitivity for RX1 Window

		Channels						
Test	Datarate	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz			
EIS / 10% PER (60 packets per step) Best position	SF12	Rx1	Rx1	Rx1	Rx2			
EIS / 10% PER (60 packets per step) Best position	SF7	-	<u>-</u>	- -	Rx2			



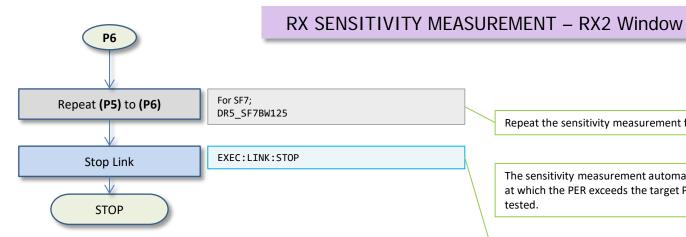


869.525

Rx2

Rx2

MHz



Repeat the sensitivity measurement for all other specified frequencies.

The sensitivity measurement automatically ends after the sensitivity level is found at which the PER exceeds the target PER or all the power values in the range are tested.

Stop the tester.

Sensitivity for RX2 Window

		Channels						
Test	Datarate	863.1 MHz	865.1 MHz	868.3 MHz	869.525 MHz			
EIS / 10% PER (60 packets per step) Best position	SF12	Rx1	Rx1	Rx1	Rx2			
EIS / 10% PER (60 packets per step) Best position	SF7	-	-	-	Rx2			

