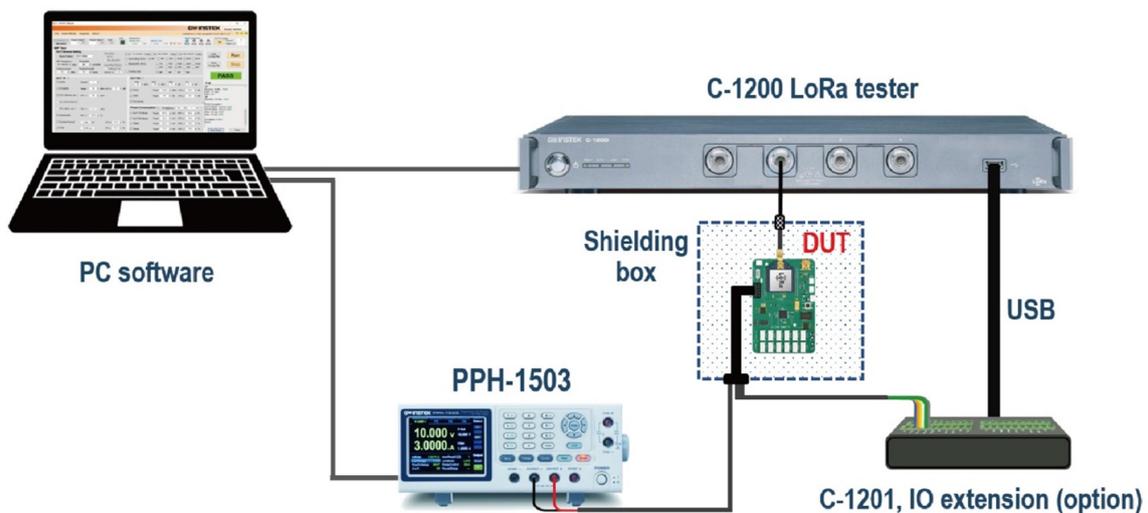


Easy and complete LoRa Test Solution

LoRa is a long-range, low-power, low-bitrate, wireless communication protocol and operates in unlicensed ISM bands. LoRa belongs to LPWAN (Low Power Wide Area Network) IoT applications and it is fast-growing in a variety of fields, for example, smart cities, smart factories, smart agriculture, and smart medicine.

By comparing with other wireless protocols, the complexity of LoRa is simpler than that of others. Even so, any LoRa module or product still need to do the test procedure in different stages to make sure that the RF performance and communications quality meet the requirements.



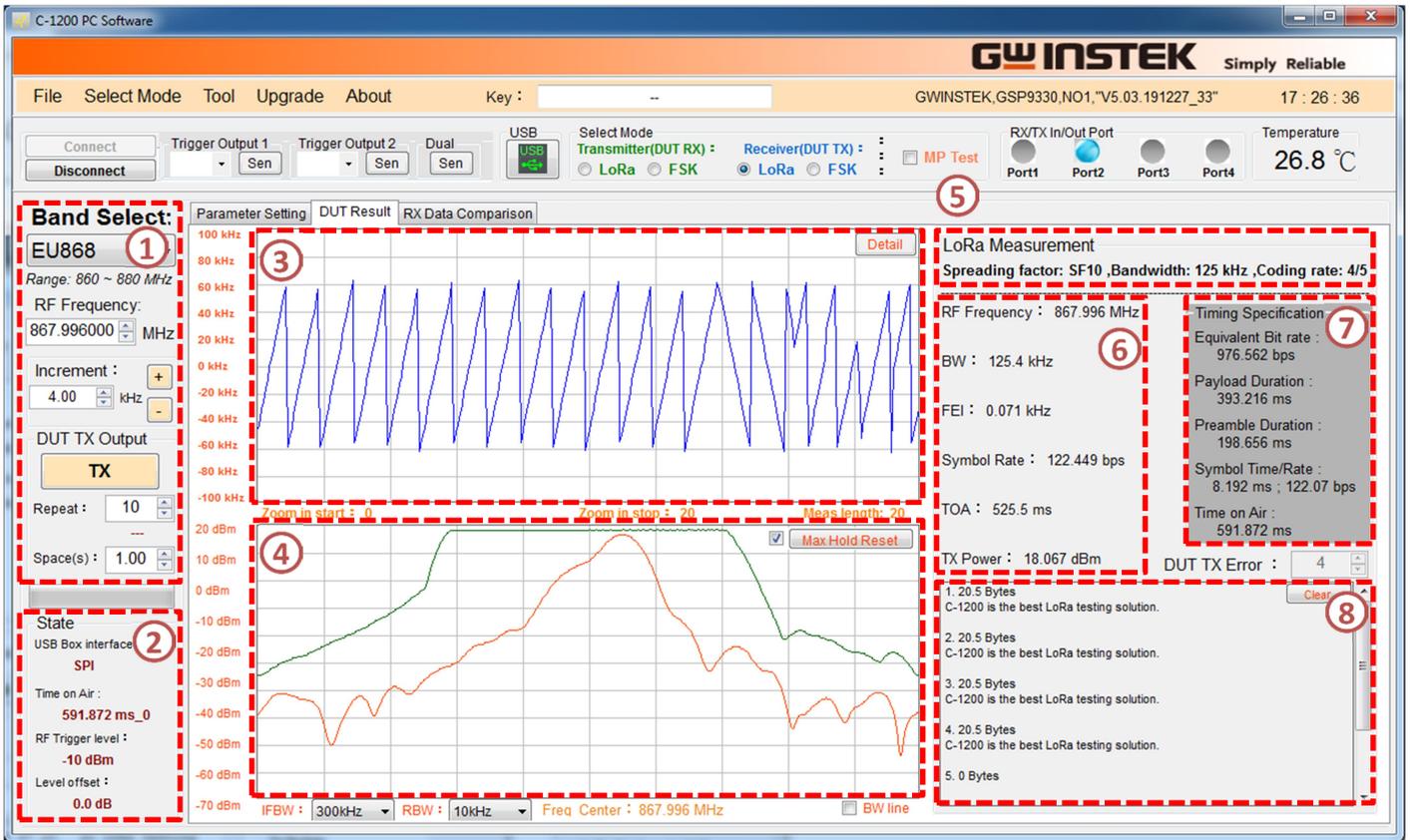
C-1200 is a LoRa-dedicated test solution and it provides complete LoRa testing ability and simple operation interface. It mainly comprises three parts, as the above diagram.

1. **C-1200, LoRa Tester:** it provides transmitter and receiver modes and supports complete LoRa and FSK modulation settings so that C-1200 is able to satisfy test demands in all phases.
2. **C-1201, IO Extension:** It is a transfer box connecting C-1200 with LoRa DUT that directly controls the DUT through UART/SPI/I2C/GPIO interfaces.
3. **PPH-1503, High Precision DC Power Supply:** It is used as a simulated battery and measures the current consumption simultaneously

The common LoRa test items:

DUT TX	DUT RX	Power Consumption	Ping-Pong Mode
<ul style="list-style-type: none"> ✓ Output Power ✓ FEI, Frequency Error Indicator (Before / After) ✓ Bandwidth ✓ TOA, Time On Air ✓ RAW Data Comparison 	<ul style="list-style-type: none"> ✓ PER / BER ✓ RSSI ✓ SNR 	<ul style="list-style-type: none"> ✓ DUT TX Mode ✓ DUT RX Mode ✓ Standby Mode ✓ Sleep Mode 	<ul style="list-style-type: none"> ✓ Go / No Go

Receiver Mode



1. C-1200 supports Sub-GHz and 2.4 GHz bands which are LoRaWAN format for various regions (EU433, CN490, EU868, US915, AS923). Users can fine adjust the frequency and action of the output signal.
2. This area shows the status of the system which includes the interface of C-1201, the expected TOA, RF trigger level, and Level offset value.
3. This area shows the timing waveform here. It is a very useful tool for debugging. Users can check if the modulation parameters are correct according to the result.
4. This area is a spectrum result and shows the measurements of power and frequency of the signal.
5. This area shows the current modulation parameter.
6. This area shows the test result of the captured signal which includes the RF frequency, Bandwidth, FEI, Symbol rate, TOA, and Power. Users can compare them with the expected specifications in area 7.
7. This area indicates the expected specifications which are calculated by user's settings. It is affected by SF, BW, Coding rate, Preamble length, payload length, and so on.
8. This area displays the content of payload data if the communication is successful. C-1200 supports 3 data formats, Binary, Hexadecimal, and ASCII so users can check them easily.

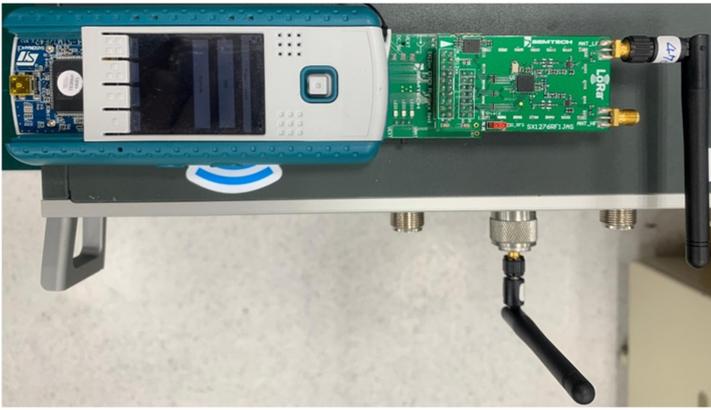
Transmitter Mode

The screenshot displays the C-1200 PC Software interface in Transmitter Mode. The interface is divided into several sections, each highlighted with a red dashed box and a circled number:

- 1. Band Select:** Shows the selected band (CN490) and RF Frequency (470.000000 MHz).
- 2. State:** Shows the USB Box interface (SPI) and Time on Air (526.336 ms).
- 3. DUT Setting:** Includes PA Select (RFO/PA_BOOST), Spreading factor (SF10), Coding rate (4/5), Bandwidth (125 kHz), Preamble (16 symbols), and Payload length (38 bytes).
- 4. DUT Payload Data:** Shows TX Data in Hex format.
- 5. Test Parameters:** Includes Start/Stop dBm (-130/-140), Attenuator (0 dB), Package number (100), and BER target (1.0).
- 6. PER Graph:** A line graph showing the relationship between dBm and PER.
- 7. Sensitivity:** Shows a sensitivity of -136 dBm and a completed time of 4932.327 s.

1. C-1200 supports Sub-GHz and 2.4 GHz bands which are LoRaWAN format for various regions (EU433, CN490, EU868, US915, AS923). Users can fine adjust the frequency and action of the output signal.
2. This area used to shows the status of the system which includes the interface of C-1201, the expected TOA, RF trigger level, and Level offset value.
3. C-1200 allows users to control the modulation parameters easily so users can implement complex test demands in the development or the engineering phase to guarantee that the performance and function meet the specifications. Users can set the payload as a definite content or random-13e.
4. This is log information used to records the process of the receiving sensitivity test. It includes some important results like RSSI, SNR, BER, and payload data. Users can save the log file as a specific file for back up.
5. It is a graphic result and it will draw a curve depending on the test result. Users can check the performance of the sensitivity easily.
6. This area has some settings which define the test conditions. C-1200 provides two Error types for judgment, one is PER and another is BER. BER is a simplified method to speed up the test time.
7. This area shows the test results, including the real sensitivity specification and the completed time.

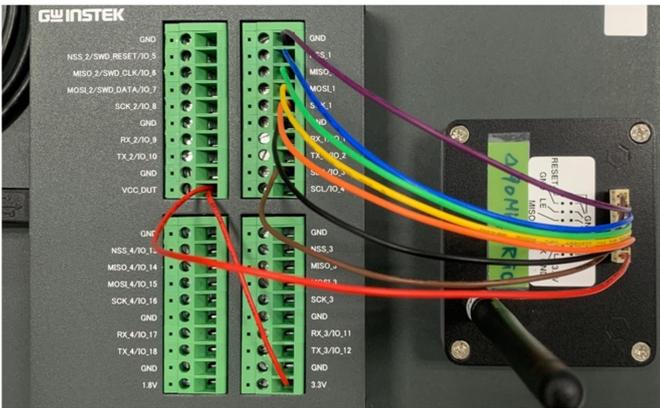
Support various test scenarios



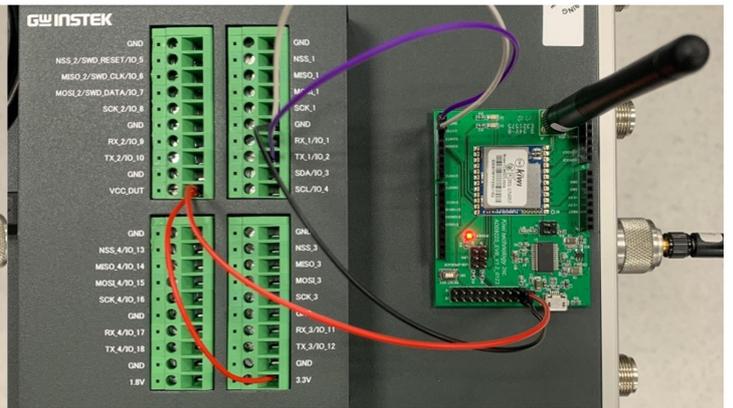
SX1276 test via radiation connection



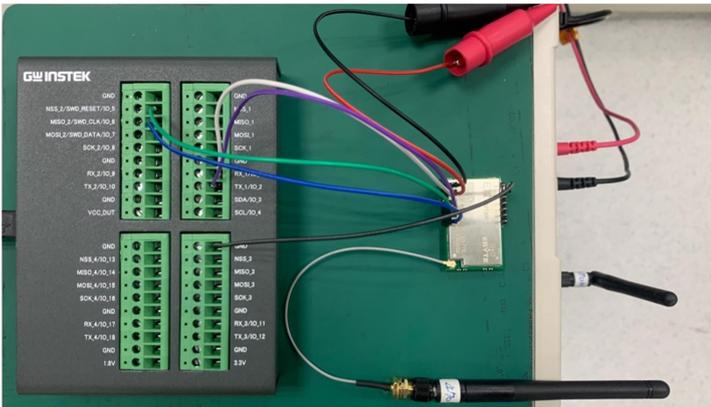
SX126 test via radiation connection



The DUT is controlled by C-1201 directly via SPI



The DUT is controlled by C-1201 directly via UART



The DUT is controlled by C-1201 directly via UART, and PPH-1503 supplies DC power and measures the current consumption simultaneously



C-1200 LoRa test solution can satisfy a variety of test scenarios, regardless of non-signaling type or signaling type. C-1201 provides rich interfaces to meet any DUT control requests when using the non-signaling type. It would be a complete LoRa test configuration to test the RF performance and power consumption at the same time if C-1200 collocates with the PPH-1503. This solution would be suitable for the development and the mass production stages.