

## Measurement of Bluetooth low energy signal with real-time spectrum analyzer

With the real-time mode of the signal analyzer MSA500 series, the intermittent signal and frequency hopping signal of Bluetooth Low Energy (BLE) can be acquired.

### [ \*Application\* ]

Bluetooth Low Energy (BLE), which is added with Bluetooth 4.0 or later, has been adopted for many small wireless devices with the recent spread of IoT (Internet of Things) technology. BLE has the specifications specialized for IoT by drastically reducing power consumption and simplifying device connection from conventional communication methods of Bluetooth 3.0 or earlier. So, it is desirable to use a real-time spectrum analyzer to accurately acquire the radio wave of the BLE signal in communication that connects and disconnects the device frequently and repeatedly as in the sensor network field.

Our handheld signal analyzer (real-time spectrum analyzer) MSA500 series has the spectrogram analysis and powerful trigger function. With these functions, it is possible to accurately acquire the intermittent signals of the advertising channels (CH37 to 39) and the frequency hopping signals of the data channels (CH 0 to 36) used for BLE device detection. Also, with the time domain analysis, the modulation signal of BLE can be analyzed with time axis waveform.

### [ \*Solution\* ]

**Measurement environment**

Handheld signal analyzer MSA538 (REAL TIME Spectrum Analyzer)

Shield box MY3710

The hand-in type shield box allows you to operate terminals or sensors directly with bare hands.

Measure the frequency hopping signal before and after connecting BLE device using channel power trigger and pre-trigger functions.

REAL TIME CF [ Hz ] 2426.0000M SPAN 20MHz

REF -35dBm ATT 1dB SCL 10dB/

TRIG POWER CH5

ANALYSIS SPECTRUM

MEAS Holding

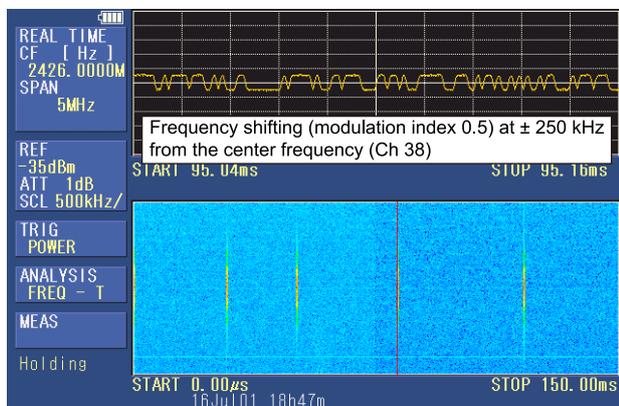
START 0.00μs STOP 450.00ms

16Jul01 19h40m

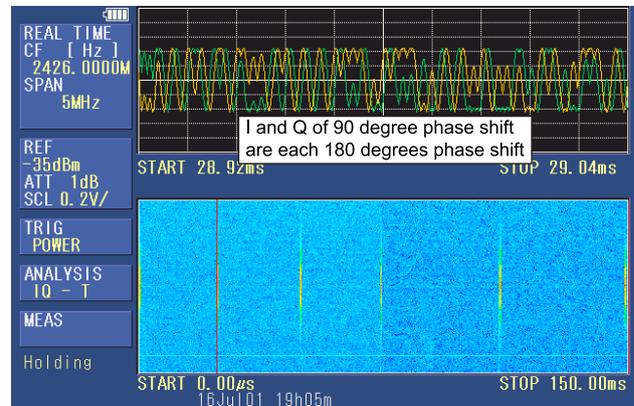
MAIN screen (top) [SPECTRUM] SUB screen (bottom) [SPECTROGRAM]

### Time domain analysis

By displaying Frequency vs. time (left fig.) and IQ vs. time (right fig.), it's possible to observe the frequency deviation and the baseband signal of GFSK which is the modulation method of BLE.



MAIN screen (top) [FREQ-T] SUB screen (bottom) [SPECTROGRAM]



MAIN screen (top) [IQ-T] SUB screen (bottom) [SPECTROGRAM]

### [ \*System constitution\* ]

- Handheld signal analyzer MSA538
- Lithium-ion Battery MB400
- Portable antenna M304 2.4GHz band
- Shield box MY3710



Handheld signal analyzer MSA538  
Measurement Frequency : 20kHz to 3.3GHz  
Maximum span : 20kHz  
\*For 5 GHz band measurement, MSA 558 is also available.  
Measurement Frequency : 20kHz to 8.5GHz