

Optimization of weak signal measurement by spectrum analyzer

By optimizing the spectrum analyzer, the weak signal can be captured.

[*Application*]

All spectrum analyzers are always affected by noise generated internally. The item specifying the influence of this noise is called an average noise level. This is an important factor for weak signal measurement and means that it will be impossible to measure a signal below the average noise level. Therefore, how to effectively suppress this average noise level is an important point.

Also, if the signal can not be captured even if the setting of the spectrum analyzer is optimized, the measurement can be performed by amplifying the signal.

□The factors to be optimized will be roughly divided into the following three points.

- (1) Reducing the resolution bandwidth (RBW)
- (2) Reducing the input attenuator value
- (3) Using a low noise amplifier

(1) Reducing the resolution bandwidth (RBW)

The resolution bandwidth (hereinafter RBW) is determined by the RBW filter. As the noise generated internally also passes through this filter, narrowing the band of the filter reduces the noise energy and as a result, the average noise level becomes lower.

The RBW and the average noise level are in a logarithmic relationship, and if the RBW becomes 1/10, the average noise level decreases by about 10dB.

However, as a disadvantage, narrowing the RBW causes the response of the RBW filter to be delayed, so that the sweep time becomes longer.

(2) Reducing the input attenuator value

The input attenuator does not actually affect the average noise level. Because the internal noise is generated in the subsequent stage of the input attenuator. However, if the input attenuator value is increased, the input signal level becomes lower and the S/N ratio will become worse. As the S/N ratio worsens, the average noise level also goes up.

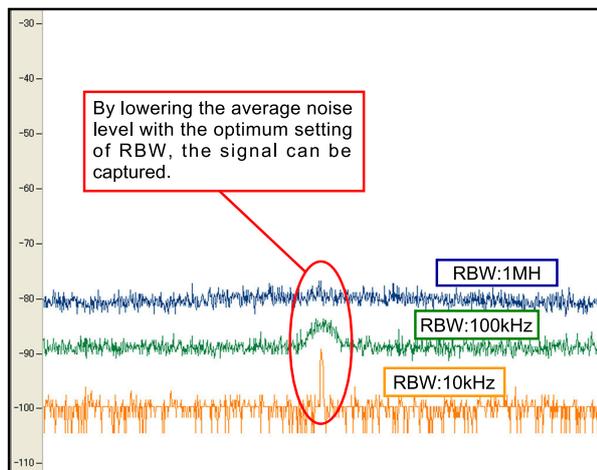
(3) Using a low noise amplifier

If the signal level is still low even after taking measures (1) and (2) above, the measurement can be performed by amplifying the input signal using a low noise amplifier.

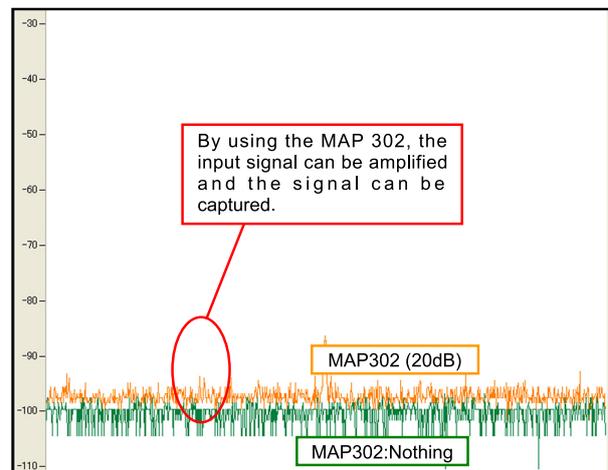
By amplifying the input signal, the S / N ratio of the spectrum analyzer improves as a result. Therefore, it is possible to amplify only the signal without affecting the average noise level.

[*Solution*]

(1) Narrow the resolution bandwidth (RBW) of MSA538.



(3) Use a low noise amplifier MAP302.



(2) Input attenuator value of MSA538 is decreased.

The input attenuator value of the MSA 500 series is automatically set according to the setting value of the reference level (REFER). The input attenuator value is the smallest at the REFE level of -15 to -20dBm.

[*System constitution*]

- Handheld signal analyzer MSA538
- Low Noise Amplifier 302
- PC Software 500
- Others (Cable, Adapter, etc.)