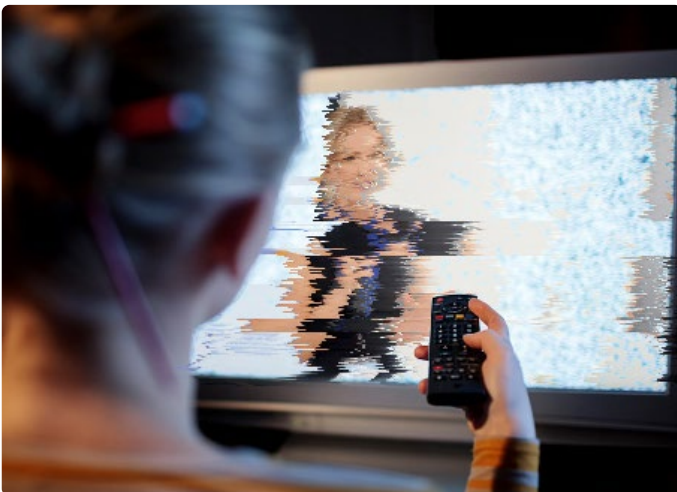




How to Detect Interference That May Be Causing Unexpected Communication Failures

Wireless Communication Is Essential to Our Daily Lives: Interference May Interrupt That Communication

In today's society, services using terrestrial and satellite broadcasting, mobile phones, and other wireless communications have become an integral part of our lives. However, the quality of these communications may degrade due to changes in the receiving environment, such as external interference (unwanted radio waves) or shielding by nearby obstacles. For example, in terrestrial broadcasting, the propagation of radio waves may be blocked by high-rise buildings or mountains. In addition, reception may be affected by the effect of multipath. Furthermore, satellite broadcasting may exhibit signal attenuation during bad weather conditions, such as heavy rain or snow, resulting in interruptions to video and audio. Strong radio waves emitted by wireless communication devices and electronic equipment being used in the vicinity can also interfere with the reception of broadcast radio waves, causing communication problems.



Overview

- ♦ **Enterprises:** Wireless communications infrastructure maintenance company
- ♦ **Key Challenges:** Investigation of unwanted emissions affecting communications
- ♦ **Solution:** Real-time spectrum analyzer capable of detecting intermittent and instantaneous radio signals
- ♦ **Results:** Captures interference that occurs intermittently or instantaneously rather than constantly, acquires causal waveform data, and uses directional antennas to identify the source

Causes of Communication Failures and Issues to be Resolved

Several types of interference, commonly referred to as noise, can cause communication problems, emanating from a wide variety of sources. In homes and offices, these include LED lighting, wireless LANs, *Bluetooth*® devices, EV chargers, and solar power conditioners. Meanwhile, in factories and infrastructure installations, inverter equipment for motor control, mobile base stations, high-voltage transmission lines, and substation equipment are the main sources of interference.

Interference can be wideband, affecting a wide frequency range, or narrowband, affecting a specific frequency band. There is also continuous interference emitted by power system equipment and momentary interference generated by switching operations. Spectrum analyzers are commonly used to detect interference. However, narrowband radio waves that change intermittently and instantaneously can be difficult to detect with a conventional swept-type spectrum analyzer (SA). This requires the introduction of more advanced measurement equipment and analysis methods.

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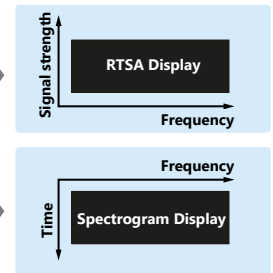
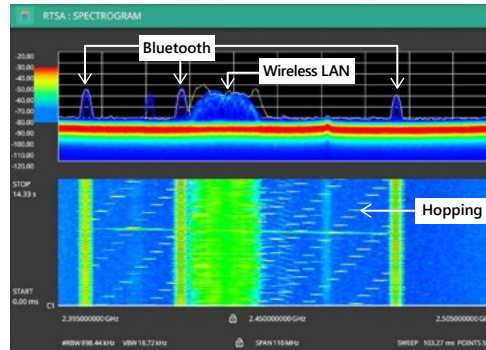
Solutions for Solving These Challenges

Real-Time Spectrum Analyzer Capturing Instantaneous Wireless Signals

The Real-Time Spectrum Analyzer (RTSA) digitizes wideband signals in real time and performs instantaneous signal analysis. This allows the RTSA to reliably capture the intermittently and instantaneously changing radio signals that are difficult to detect with conventional sweep-type SA, enabling more accurate measurements.



Field Master MS2080A

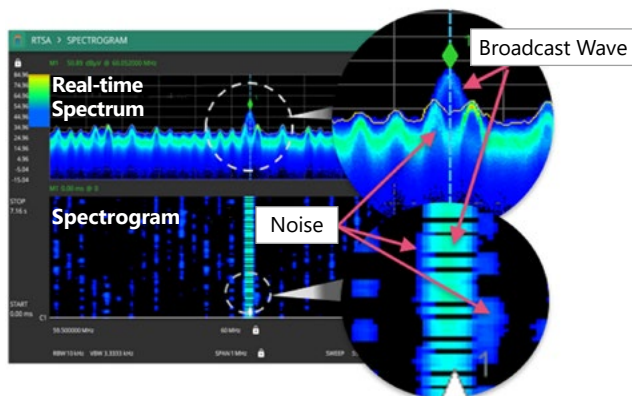


The colors indicate the levels on the left side of the RTSA screen (red is high and blue is low).

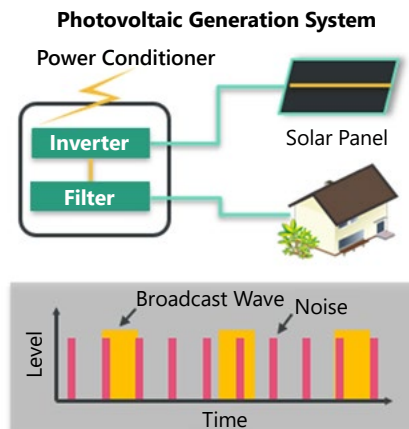
Bluetooth signal and wireless LAN signal measurement screen by RTSA

Search for Interference Waves That Cause Communication Failures and Identify Their Sources

At a particular site, radio broadcasts were being badly affected by interference, which caused frequent communication problems when the radio signals could not be received. Observations of the radio broadcast frequency band with the RTSA showed that the noise level of interference tended to be higher on sunny days and lower on cloudy days. We further verified the noise source, assuming that it originated from the photovoltaic system. As a result, the regular overlapping of noise was able to be observed on the broadcast waveforms through real-time waveforms and spectrograms.

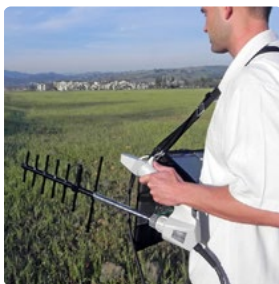


Simultaneously observed broadcast wave and noise interference waveforms



Observation of broadcast wave and noise

Identifying the source of the noise is made possible by combining a directional antenna with a built-in electronic compass and an RTSA with built-in map data. Specifically, by recording measurement data while displaying, on a map, the latitude and longitude of the measurement point where noise is detected by the RTSA and the direction of the interference, the location of the source can be identified with high accuracy.



- Measure the direction of maximum intensity of interference by the RTSA
- Automatic plotting of current point and direction on a map in the measuring instrument
- Identifies areas of interference sources using a three-point measurement method



Our solution combines a real-time spectrum analyzer with a directional antenna to provide an effective means of solving problems with broadcast and wireless communications caused by interference.

For more information, please refer to the details. → [Field Master™ MS2080A Spectrum Monitoring Solution](#)