Accessories for Mobile Applications

Several accessories for the YBT250 help you track interference in mobile equipment

- Directional antenna 824 – 896 MHz
- Directional antenna 896 – 960 MHz
- Directional antenna 1710 – 1880 MHz
- Directional antenna 1850 – 1990 MHz
- Non-directional sniffer antenna
- BNC to Type "N" adapter for sniffer antenna
- General Purpose RF cable (with type "N" connectors)

The non-directional sniffer is a small, flexible, general-purpose antenna. It allows you to detect increased signal strength as you move closer to the source of a signal. The unit is particularly suited to hand-held portable operation and can also be used inside a vehicle.

The handy sniffer antenna covers a wide range of frequencies, but does not have directional characteristics. To determine the direction of RF signals, we use multi-element beam antennas with approximately 30 to 40 degrees beam-width and 10 to 11 dB gain over a dipole. They are less than one meter long, which allows easy pointing by hand.

Special Considerations for Tracking Interference in Mobiles.

Interference in mobile equipment poses some different problems than we find in base station testing. While most of the same techniques used at the BTS can be used in the field, we need to work around some limitations. In a mobile environment, it is not as easy to disable a channel to clear out intended signals, so testing time may be lengthened while waiting for channel traffic. Most interference is relatively localized, so the mobiles will have acceptable call quality everywhere except in the trouble area, where they experience a high rate of dropped calls. That can force us to move around in the call area before we can even pick up the interference.

When trying to locate the source of interference from ground level, it is often difficult to see past local obstructions. To find the true direction of an offending signal, sightings may be needed from several locations due to the many reflections from local obstructions.

Finding Overlap in Your Mobile Network

One of the more difficult problems to resolve is overlapping coverage from your own system. If a BTS is located on high ground, its coverage may unintentionally exceed the engineering plan. If the coverage is so great that it overlaps a cell that has the same control channel (BCCH for GSM), then the mobile can no longer distinguish between the two and is put out of service in the area of overlap.

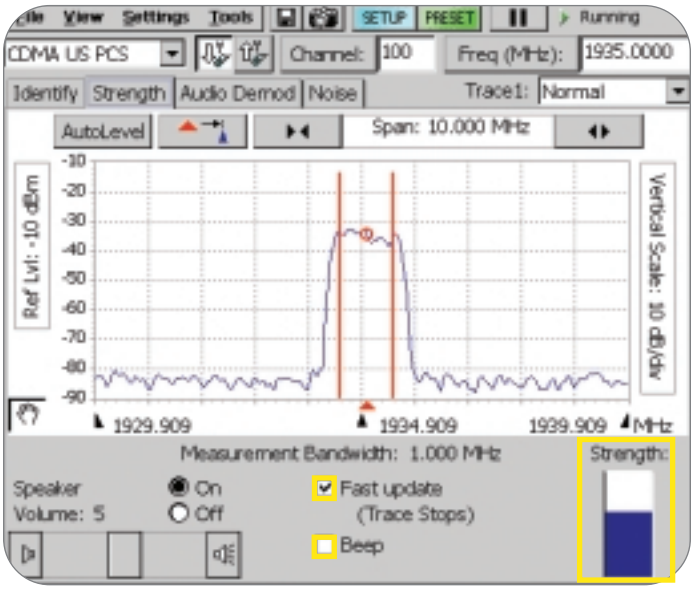
For this problem, set the YBT250 to measure the strength of the control channel. A directional antenna will let you determine the source of each of the overlapping signals. Moving in those directions will confirm which of the base stations is causing the extended overlap.

Tracking Down the Culprit

Once the type of signal has been discovered, as well as the frequency of the offender, the next step is to find the location. This can be done using both directional and non-directional antennas. A magnetic-mount attaches a non-directional antenna to a vehicle, and the direction of the source can be found by moving to locations where the signal is stronger, as shown in Figure 13. A directional-antenna can also be used to determine the bearing to the source of the signal.

Use the Signal Strength Indicator in the YBT250 to monitor the signals. Connect the appropriate directional antenna to the YBT250 (operating on the internal battery) and enter the frequency of the identified interference. Tap the *Strength* button in the Interference window of the YBT250. See Figure 14.

▶ ***Figure 13.*** *Taking the hunt mobile using a magnetically-mounted antenna.*



▶ ***Figure 14.*** *Measuring interference strength.*

Use the *"Span"* to position the interference signal between the two vertical marker lines. If the signal spills out of the marker area, it will not affect the measurement. However, only the interference signal should be inside the lines. If other signals are present the strength may not correctly indicate the direction of the signal you are tracking.

The *"Strength"* indicator bar will show changes visually and a tone (selectable as either beeping or continuous) can be enabled to let you track the signal source without having to watch the display. As you slowly turn, the *"Strength"* indicator should reach the maximum when the antenna is pointing in the most likely direction of the source.

For the best results, check the box next to the *"Fast Update"* label. In this mode, the LCD screen will only occasionally update the spectrum trace, but both the beep and the strength bar will be much more responsive to changes in the signal strength. In normal mode, the update of the spectrum plot takes time away from the signal measurement and slows down the response to changing signal strength.

If the initial search with the directional antenna and the YBT250 points to a visible source, then your search may be done. If not, additional sightings may need to be taken from other locations. Use a compass to identify the heading where the signal is strongest and record the heading lines on a map – they should intersect at the approximate location of the interference source.

Once the culprit is found, you will need either to add filtering to your receiver, or to negotiate the resolution with the operator of the source. The companion Tektronix Application note titled "Fundamentals of Interference In Mobile Networks" includes suggestions for several different types of interference.

▶ ***Figure 15.*** *Using the directional beam antenna and the signal strength measurement.*