Monitoring DVB-T SFN Networks

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Countries around the world are in the process of switching off their analog video and audio transmission. Among the reasons for this transition are the savings in power using digital transmission as well as the reclamation of bandwidth by the use of single frequency networks (SFN). As a downside to the savings in bandwidth, SFN networks are much more complex in ensuring synchronization and Quality of Service (QoS) for DVB-T transmissions.

Background

With a high MER resolution capability and constellation display, the DVStation DVB-T interface goes above and beyond mere RF measurements to ensure that DVB-T modulators and transmitters are working as expected. Tracking transmitter health is the first step in quality assurance of terrestrial transmission (Figure 1)

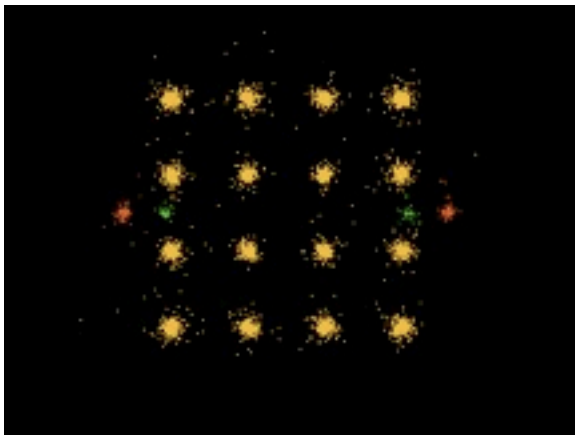

Figure 1: DVB-T constellation visualization

Once in the field, the DVStation can operate in SFN monitoring mode. DTT (Digital Terrestrial Television) has the added complexity of managing synchronization among adjacent towers when transmitting on a single frequency. A drift in synchronization between transmitters can reduce the coverage area. With impulse response masking, the DVStation DVB-T interface can detect potential synchronization drifts before subscribers are affected.

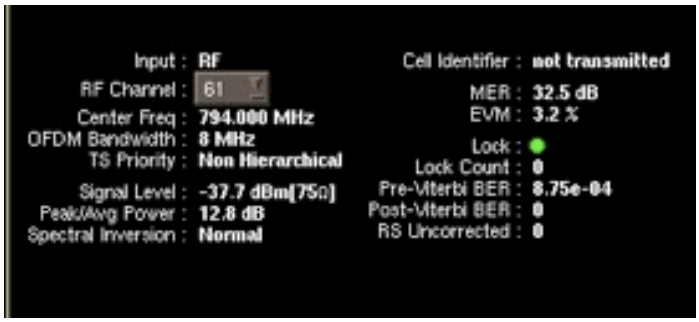

Figure 2: RF parameters monitored

MIP tests

DVB-T SFN networks make use of in-band signaling to ensure synchronous operation of transmitters. The in-band signal used for this purpose is the Mega-frame Initialization Packet (MIP).

The Pixelmetrix DVStation checks and allows the operator to verify that the MIPs have been inserted correctly into each transport. stream. The MIP test suite is in strict conformance to the DVB specification TS 101 191 (Figure 3).

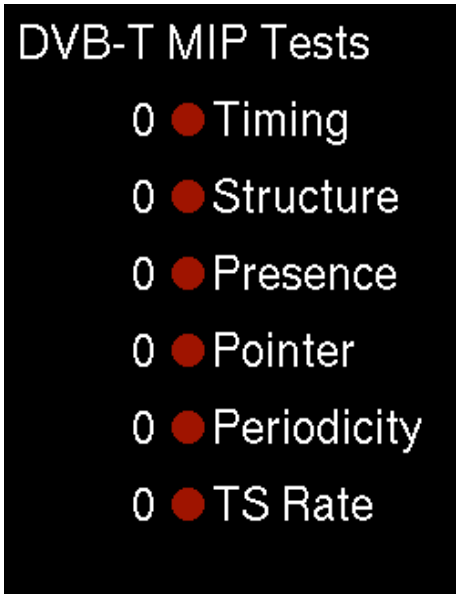

Fig 3: DVB-T MIP tests

As is evident from Figure 1, the DVStation checks the MIP packets for their timing and integrity. If there are any errors detected, then alarm actions may be defined as in Figure 4.

The alarm actions for an error include contact-closure activation, as well as SNMP traps to alert operators as soon as possible..

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Impulse Response Masks

The MIPs are put in the transport stream to allow the transmitters to synchronize to a single clock source, for example, a Global Positioning Satellite (GPS) clock. While MIPs act as a directive to transmitters, they do not guarantee synchronous behavior.

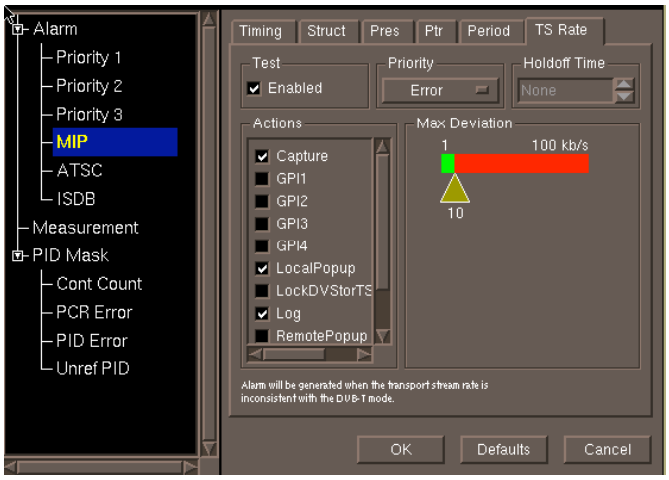

Figure 4: Alarm actions for MIP errors

Working closely with DVB-T operators, Pixelmetrix has pioneered the use of impulse response visualization to closely track transmitters on a temporal axis, and to raise an alarm if the transmitter drifts over time.

An impulse response is the time-domain analysis of the received signal. Sources of signal distortion such as echoes, as well as other SFN transmitters in range can be seen in this Impulse Response visualization.

Each peak in the impulse response visualization can be assigned a mask in the DVStation (Figure 5). Whenever a peak moves horizontally, it may lead to a loss of synchrony. If the same mask moves vertically, there has been a change in the power level of the SFN transmitter.

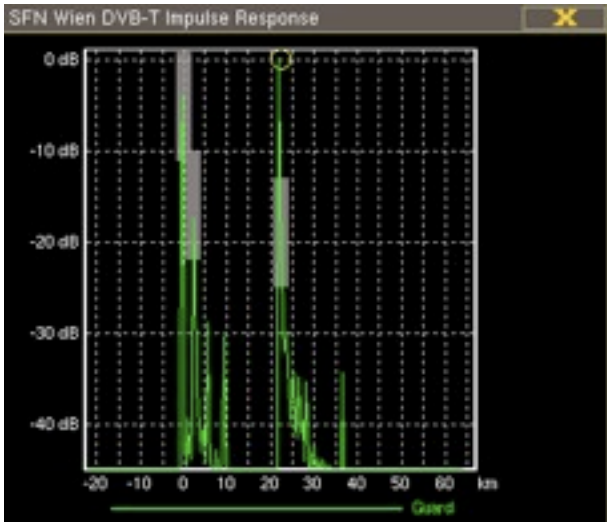

Figure 5: Impulse response masking

The physical environment of the receiver can determine the nature of the reception. The DVStation can visualize reception faults such as 0dB echos as well as allow operators to verify the accuracy of guard intervals assigned at the transmitters.

The impulse response visualization offers operators a clear view of all the visible transmitters as well as echoes from the point of reception. The DVStation can also automatically assign masks to each impulse response peak.

The operator can select the number of peaks to be monitored as well as adjust the tolerance levels in the:

- Attenuation in dB (height of the masks in the vertical axis);
- Delay in km or ms (width of the masks in the horizontal axis).

As a true monitoring system, the innovative Impulse Response Mask feature can automatically generate an alarm on deviations from the baseline Impulse Response. Alarms can be any user-defined event such as SNMP TRAP, GPI closure, an email message or even a text message to your mobile phone!

Available on:

DVB-T interfaces are available in the DVStation-210 and the DVStation-Remote. The DVStation-Mini family also has a DVB-T monitoring and analysis tool.

For More Information

To learn more about the DVStation, request a demo, or learn how Pixelmetrix might help you optimize video network integrity, contact us today!

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