

signal will probably not be workable because of the necessary characteristics of an IFB receiver (wearable, omnidirectional antenna, usable beyond range of station).

Issues Pending

Assess the desirability of changing the station reference subcarrier frequency.

Monitor Plane

Introduction

The sub-group's goal was to examine the Top-Down system map and identify monitoring, test, and signal injection points and associated equipment to support DTV station operation and maintenance.

Methodology

The Monitoring Sub-Group reviewed the Top Down system map in order to determine and/or refine the monitoring/test points, to conduct a reality check to determine practicality and usefulness of the points, to determine which points should be used for operational testing and/or maintenance/test, and to determine which points should serve as test signal injection points.

Findings

All signals and possible test points were considered in this examination, including satellite signals, 'baseband' signals, and emission signals. The following is a summary of the various test points and signals, and test conditions as recommended by the sub-group. Through the deliberations we determined that manual and automated operations will continue as today, but in many cases with new test signals, devices and test points as may be needed with new systems. One should refer to the Monitoring Layer Diagram (Attachment G) when reviewing the following findings. The numbers in parenthesis refer to the test point locations noted in diamonds on the Monitoring Layer diagram.

Satellite signal monitoring will largely remain as the current traditional testing and measurement practices. Included will be test points at the output of the LNB (1) fed from the satellite dish using a spectrum analyzer and/or test receiver. Under normal conditions this is not an operational test point nor is a test signal injected here point.

A test point (2) could exist at the output of the satellite receiver (labeled DEMOD in the drawing) with appropriate bit error rate test equipment for the satellite transmission format employed (e.g., MPEG transport stream, other systems which assume little or no knowledge of the payload with the transmission link, DS-3, etc.). This is an operational test point, and test signals may be injected at this test point as appropriate for the device following.

Test point (3) requires a packetized data analyzer as appropriate to the bits stream at that point (e.g., in the case of an MPEG-2 Transport Stream delivered via satellite an MPEG-2 Transport Stream Analyzer would be appropriate, in the case of a DS-3 signal a DS-3 data stream analyzer would be appropriate). Audio/Video time stamp differential analysis may also be measured at this point. This test point is repeated in both the standard definition section (top) and the high definition section (bottom).

Conventional audio & video monitoring equipment appropriate to the signals in use will remain an essential part of the plant. Operational test points are located at (4) throughout the diagram and test signals may be injected at these points.

Conventional monitoring of the BTSC audio signal (L/R, SAP, Pro Channels) will remain an operational test point (5) and test signals may also be injected at this point.

Test equipment appropriate to the type of encoder used to encode the station's conventional NTSC signal for carriage via the STL will be needed at point (6), assuming that some combined carriage is required and that this method is employed. This is not an operational test point but test signals may be injected at this point as required.

Test point (7) is an AC-3 signal and requires an AC-3 decoder or analyzer. This is also not a normal operational test point and is not a test signal injection point.

Test point (8) is the final audio-video monitoring test point for the master control operator and is not a test signal injection point. Decoders and test equipment will be employed as appropriate.

8-VSB analysis is performed at various test points (9) for monitoring spectrum occupancy, eye pattern, EVM (Error Vector Magnitude), RF power, etc. Multiple measurement units may be employed at different locations depending on specific requirements. Device number 206 is an optional BER test set intended to inject a test data signal into the multiplexer which will then be received off-air and measured thus completing an off-air loop. This is an in-circuit and operational test point (10) as well as a constant test signal injection point.

Optical fiber power spectrum is measured at test point (11). This is not an operational test point. A SONET Transport Test Set will be used at test point (12), and this is also not an operational test point nor a test signal injection point.

The HDTV uncompressed video signals and associated audio are monitored at a number of locations including the inputs and outputs of the HD router and just prior to ATSC emission encoding (13). Monitoring equipment will be used as appropriate to the signal format (e.g., 274M, 292M, 305M, and analog or AES audio). ECC within the 292M signals may be monitored at any point throughout the chain to determine the presence of errors, Similarly, ECC can be added to 305M and this monitored at any point throughout the chain. These are operational test points, and also test signal injection points.

SMPTE 310M signals are monitored and measured at point (14) and require monitoring equipment which analyzes the interface as well as the Transport Stream. This is an operational test point, and also a test signal injection point.

An audio distribution format (e.g., Dolby E) decoder/monitor and an AC-3 decoder/simulator will be used to monitor (15) downmix quality and to set dynamic range and dialog level settings to simulate what will be heard at the consumer receiver. The settings will then be conveyed to the AC-3 emission encoder. This is an operational monitoring point in the production environment, but is not a test signal injection point.

Monitoring point (16) is a proposed PSIP monitoring point. Monitoring point (17) is a proposed Conditional Access monitoring point. . Both of these are operational test points but not test signal injection points.

An Inter-Facility Link monitoring point is located at (18) with capabilities suitable for the Link.

Other Findings

Video format converters should display an indication of the original format of the source video and the converted output format for use in operational monitoring. That signal can be in the form of an under-monitor display or visible in an on-screen display (e.g., a special output similar to a VTR monitor output). Consideration should be given to passing on identification of the output video format to other devices in the station.

Issues Pending

The IS or its Specialist Groups may need to address the following issues:

Signal formats at the monitoring/test points must be identified with specific standards.

Further definition is required for the BERT loopback testing (10) on a real-time injection basis with the DTV broadcast bit stream. Other uses should also be examined for this type of signal (e.g., long-term field testing)

Due to the emphasis on the 12-month time horizon for this work, data broadcast functionality and monitoring points have not been addressed. These will include WAN, LAN and server interconnection, etc. The IS should consider this for future assignment.

Monitoring/test points for the Control Plane will need to be identified.

Summary

With future advancement of the art of the digital television infrastructure, monitoring and test techniques will need to be periodically reviewed. Market opportunities identified by manufacturers can be expected to affect techniques and practices for plant monitoring.

Description of Functional Blocks

0 Air Interface

The air interface is the traditional satellite or microwave transmission path as is currently used.

1 Satellite Downlink

The satellite downlink is the traditional satellite receiving system which is designed for the particular application and link requirements.

2 LNB (Low Noise Block Downconverter)

The LNB is the traditional converter unit which converts the satellite frequencies to a lower L band frequency for input into satellite demodulators. Same as 48.