

Digital Conversion of INTELSAT OUTV Service

Discontinuing use of analog will ease congestion in trans-continental satellite transmissions.

David Wheeler

Director, Marketing

Media Networks

Scientific-Atlanta, Inc.

Preamble

With the surging demand for trans-continental satellite communications, INTELSAT has prepared plans to convert its global occasional use television (OUTV) service from analog to digital. This will simplify frequency coordination in the increasingly congested trans-continental orbital slots and permit a move to 2 degree spacing. Extra capacity from the use of MPEG-2/DVB digital compression will make additional circuits available for broadcasters, and digital's more neighbourly interference characteristics will allow the deployment of additional satellites to cope with the enormous demand for Internet backbone traffic.

Background

For many years INTELSAT has set aside a transponder connected to its C-band global beam for OUTV services. The 41 MHz transponder supports two half-transponder analog (FM) TV services and allows broadcasters to send TV programs from country to country between INTELSAT gateway earth stations and teleports. The use of standardised analog modulation parameters for these services simplifies inter-operation between earth stations in different countries.

Digital Standards

To facilitate inter-operation in the digital era, the Inter-union Satellite Operations Group (ISOG) has recently defined standard parameters for digital transmissions, based on the MPEG-2/DVB international standards. Two ISOG standard modes have been defined – one for standard quality distribution service (using 4:2:0 coding in 9 MHz bandwidth) and one for high quality contribution service (using 4:2:2 coding in 18 MHz bandwidth). The parameters are set out in Table 1.

Table 1 - ISOG Standard Mode Parameters

Parameter	Distribution Value	Contribution Value
Transport data rate (excl. RS)	8.448 Mb/s	21.503 Mb/s
Convolutional FEC code	3/4	7/8
Reed Solomon code	204/188	204/188
Symbol rate	6.113 Mbaud	13.333 Mbaud
Video data rate	7.5 Mb/s	20.0 Mb/s
Video resolution	704 ppl	720 ppl
Audio data rate	256 kb/s	256 kb/s
Audio format	stereo	stereo
Audio sample rate	48 ksps	48 ksps
Occupied bandwidth	8.3 MHz	18.0 MHz

Inter-operability Testing

Since MPEG-2/DVB compression equipment became available in 1996 ISOG has regularly conducted inter-operability testing between manufacturers, with major tests of 4:2:0 interoperability in Feb-Mar 1997 and Feb-Mar 1999. Another round was recently concluded in Washington DC, involving ten manufacturers, and for the first time testing interoperability in 4:2:2 mode for contribution applications. The greater complexity of digital compression makes the additional testing necessary if inter-operation for OUTV in digital is to be as successful as it was in analog.

Transponder Plan

Whilst it has not been finalised, it is expected that INTELSAT will make nominal 9 MHz bandwidth slices available for digital operation in the global beam OUTV transponder. The selection of 9 MHz affords compatibility with the majority of satellite transponders in orbit, as it divides evenly into 27, 36, 54 and 72 MHz.

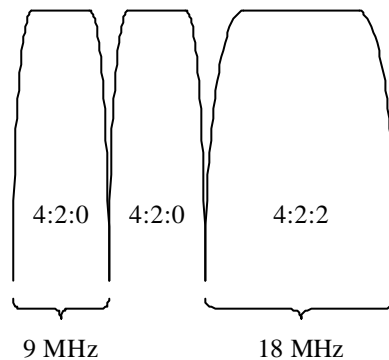


Figure 1 - Typical Frequency Plan

Figure 1 illustrates how two 9 MHz contribution carriers and one 18 MHz distribution carrier would occupy the transponder. Other possibilities are four 9 MHz or two 18 MHz slots. Service providers will need to be able to access any one of four possible frequency slots for 9 MHz carriers, and two or perhaps even three for 18 MHz carriers.

Conversion Timetable

This conversion process will take place over the next two or three years. Letters have already been sent out by INTELSAT to inform operators of the approximately 300 access earth stations in the Indian Ocean Region (IOR). Conversion of services on the IOR satellites is planned to be complete by mid 2000, with OUTV access only permissible in digital from that time. Services on the Atlanta Ocean Region (AOR) satellites are expected to be converted during 2001 and the Pacific Ocean Region (POR) by the end of 2002.

Scientific-Atlanta releases its Originator Encoder

Scientific-Atlanta has developed a product ideally suited for digital transmission of OUTV services – the PowerVu Plus™ Originator™ Encoder (Model D9150). This

product, launched at IBC'99 in Amsterdam, provides a flexible solution for teleport and earth station operators. It is expected to become the operator's favorite due to its unsurpassed performance, flexibility and ease of use.

Video and audio inputs can be analog or digital, and four video formats are supported, including NTSC and PAL, to enable inter-continental transmissions between countries using different standards. Audio may be compressed using Dolby digital or MPEG audio formats, and video coding can be 4:2:0 for distribution or 4:2:2 for contribution applications. A conditional access option is also available, if desired.

Operation is possible from the front panel of the encoder or via RS-232 serial remote control, and the Originator encoder automatically updates modulation parameter settings in the companion model D9380A QPSK modulator. Sixteen operator-defined presets can be programmed to simplify operation. One of the presettable parameters is modulator output frequency, so an operator can preset the Originator encoder to enable easy access to the various frequency slots used in ISOG mode operation of the OUTV service. ISOG standard mode parameters are pre-programmed into the encoder to further simplify operation. Non-redundant or fully 1:1 redundant configurations are available.



Figure 2 - Originator Encoder

Conclusion

As INTELSAT migrates the OUTV service to digital, service providers around the world will be looking for best-of-breed digital compression systems to enable them to continue to provide this service for their broadcast customers. They will primarily select those products which offer the greatest flexibility, to ensure that they will always be able to meet the unforeseen needs of their customers. Ease of operation, transmission quality and reliability will also be key selection criteria. There will also be a preference for products from trusted suppliers using the latest technology – to protect the investment, and provide expansion capabilities for the future.

television broadcasting and satellite communications, Wheeler joined the Media Networks business unit of Scientific-Atlanta, Inc in Atlanta, Georgia (USA) in October, 1998. He had previously been based in Scientific-Atlanta's Asia regional headquarters since 1994, and joined the company in 1988 as Engineering Manager of the company's Australian subsidiary.

Prior to joining Scientific-Atlanta, Wheeler worked for four years as an earth station engineer at AUSSAT, and for eight years he served at the Seven Network in Australia as a Broadcast Engineer. During that time he was directly involved in many satellite television milestone events including the world's first true DBS service established in Australia and the first use of analog multiplexing of television signals on INTELSAT.