



## Keen to be Green

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an Overview



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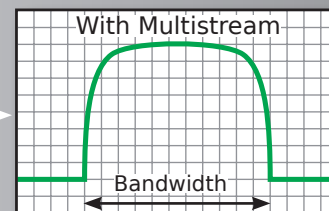
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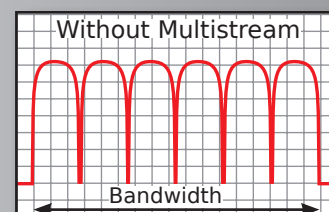
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# The Greening Of Broadcasting

## A Word From DVB

In the nearly 20 years of its existence DVB has been extremely successful. According to Screen Digest more than 600 million digital receivers based on our specifications are in use worldwide. We can proudly say that our technology changed the way people are watching TV. But what does this mean for the environment? How energy efficient is our technology and can we become better by improving technology and production processes? This issue of DVB Scene will provide some answers to these questions.

Owing to the large number of receivers in use, their energy consumption is a critical component in the overall picture. At the start of the transition to digital, STBs needed much more power than their analogue counterparts. Today, chipset technology has become much more energy efficient and is now able to provide a real standby mode. In parallel to STBs, display devices have dramatically improved energy efficiency. The latest LED technology needs only a fraction of the power needed by the previous generation of displays.

We have come a long way on the receiver side, but what has happened at the transmitter side? First of all our second generation standards offer more robustness, which means that the same data rate can be transmitted with less power. This is especially important for terrestrial networks with their high numbers of transmitters. Here DVB-T2 can offer a reduction of power by a factor of four. This is a great reduction in operational costs, especially when considering that in many parts of the world these transmitters are getting their energy from a local generator, as they are not connected to the power grid. DVB-T2 also provides a mechanism for peak to average power reduction that allows the transmitter to operate in a more efficient mode. DVB-T2 is an excellent example of how specifications can result in a more efficient use of our resources.

In the wider scheme of things there is the standardization process itself with its meetings and the travel to and from that consumes natural resources. The switch to phone conferences and online meetings can offer a substantial saving



**Peter Siebert**  
Executive Director

of resources. The DVB promotes the culture of online meetings, which are proving very popular with our Members. The number of online meetings has now surpassed the number of face to face meetings and this trend will continue.

It is obvious that broadcast transmission and reception are using natural resources in the form of energy and raw materials. The industry has gone a long way to improve efficiency but we have not yet reached the end of this road. I am optimistic that all stakeholders including DVB are committed to following this route to a true green broadcasting environment.

## New Standards

- EN 302 755: Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2) (04/02/11)
- TR 102 993: Upper Layer FEC for DVB Systems (10/02/11)
- TS 102 825- (1 - 14): Content Protection and Copy Management (DVB-CPCM); Part 1: CPCM Abbreviations, Definitions and Terms (23/03); Part 2: CPCM Reference Model (23/03); Part 3: CPCM Usage State Information (23/03); Part 4: CPCM Authorized Domain Management scenarios (18/02); Part 5: CPCM Security Toolbox (18/02); Part 6: CPCM Security Test Vectors (21/02); Part 7: CPCM Authorized Domain Management (18/02); Part 8: CPCM Authorized Domain Management scenarios (21/02); Part 9: CPCM System Adaptation Layers (18/02); Part 10: CPCM Acquisition, Consumption and Export Mappings (23/03); Part 11: CPCM Content Management Scenarios (16/03); Part 12: CPCM Implementation Guidelines (11/03); Part 12: CPCM Implementation Guidelines (11/03); Part 13: CPCM Compliance Framework (21/02); Part 14: CPCM Extensions (18/02)
- TS 102 833: File Format Specification for the Storage and Playback of DVB Services (23/03/11)
- EN 302 769: Frame structure channel coding and modulation for a second generation digital transmission system for cable systems (DVB-C2) (21/04/11)
- TS 102 851: Uniform Resource Identifiers (URI) for DVB Systems (28/04/11)
- TS 102 771: Generic Stream Encapsulation (GSE) implementation guideline (03/05/11)
- TR 101 190: Implementation guidelines for DVB terrestrial services; Transmission aspects (04/05/11)
- TS 101 162: Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream (04/05/11)
- TS 101 547: Frame Compatible Plano-stereoscopic 3DTV (16/05/11)
- TS 102 542-1: Guidelines for the implementation of DVB-IPTV Phase 1 specifications; Part 1: Core IPTV Functions (30/05/11)
- TS 102 542-3-2: Guidelines for the implementation of DVB-IPTV Phase 1 specifications; Part 3: Error Recovery; Sub-part 2: Application Layer - Forward Error Correction (AL-FEC) (30/05/11)
- TS 102 542-4: Guidelines for the implementation of DVB-IPTV Phase 1 specifications; Part 4: Remote Management and Firmware Update (30/05/11)
- TS 102 991: Implementation Guidelines for a second generation digital cable transmission system (DVB-C2) (06/06/11)
- TS 102 542-4: Specification for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream (24/06/11)

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# In the Pipe

## Multiple Physical Layers Pipes - an overview

**Azzedine Abchir & Anders Dale, T-Vips**

The second generation standard for terrestrial broadcasting, DVB-T2, was approved by ETSI in September 2009, bringing a considerable number of technical enhancements compared to DVB-T. The primary benefit when implementing the new standard is a bitrate increase of at least 50%, which in turn enables the delivery of more HD services in terrestrial networks. DVB-T2 also offers attractive opportunities for diversified services and new business models. Network operators can use different features from the large DVB-T2 'toolbox', amongst others, Multiple Physical Layer Pipes (Multiple PLPs), to deploy advanced, flexible terrestrial networks. The concept of PLPs is not totally new and has roots in the Hierarchical Modulation specified in DVB-T and in the Multistream feature introduced in DVB-S2.

A Physical Layer Pipe is a virtual container for data broadcasted with the same modulation and protection scheme. A normal DVB-T2 signal carries a single PLP where all the data is transmitted in a homogenous manner as shown in Figure 1. A Multiple PLP signal will include several groups of data modulated differently. This means that a DVB-T2 signal can contain television or radio signals that are modulated and protected differently as shown in Figure 2.

The DVB-T2 specification defines a structural PLP classification with three types of PLPs:

- Common PLP encapsulating data shared by all the PLPs, such as EPG

information and other auxiliary data, carried in a single continuous segment as first PLP within the DVB-T2 frame

- Data PLP Type 1 carrying data, as Transport Streams (TS) or General Stream Encapsulation (GSE) streams, in a single segment ('sub-slice') per DVB-T2 frame
- Data PLP Type 2 carrying TS or GSE spread over several 'sub-slices' per DVB-T2 frame. The number of sub-slices influences the time diversity of the signal and the buffer of the receiving devices, and thus their power consumption

Physical Layer Pipes may also be classified according to their behavior:

- Static PLP operation as the name suggests, maps services to individual PLPs in a static manner. The size and bitrate of a PLP is identical over time (in all DVB-T2 frames)
- Dynamic PLP allows one or a group of PLPs to have a variable bitrate over time. The size of the PLP can be different from one DVB-T2 frame to another

This first approach, implemented in current market solutions, limits the complexity of the system by requiring less processing on the stream adaptation and signal generation processes and simplifies the buffer management in the receivers. The dynamic PLP alternative may offer bitrate savings by allowing a group of PLPs to share the available bitrate of the DVB-T2 signal. A dynamic PLP can be seen as a statistical multiplexing operation on the DVB-T2 physical layer. Adopting this alternative introduces a greater level of

complexity in adaptation, modulation and reception equipment and requires special synchronisation mechanisms between the headend statistical multiplexers and the DVB-T2 Gateways.

In order to access all the capabilities of the new DVB-T2 standard, the specification recommends a DVB-T2 Gateway for Baseband adaptation. Such a device encapsulates the incoming Transport

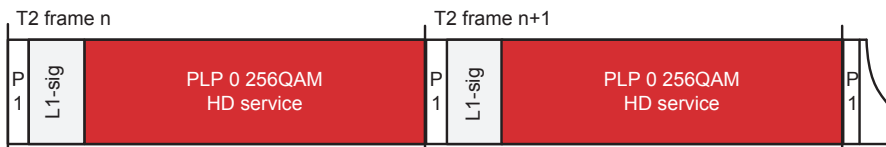
**The equipment manufacturers responded rapidly by offering professional and consumer products supporting this technology.**

Stream packets into Baseband frames. PLP mapping is carried out by allocating Baseband frames to a specific PLP, inserting a pointer indicating the beginning and the end, and signalling the modulation parameters for each PLP. In effect, a DVB-T2 Gateway allows the user to remotely assign a position for the different Transport Streams in the signal, set the properties of the physical layer, and thereby protects the services carried in the DVB-T2 signal in different ways.

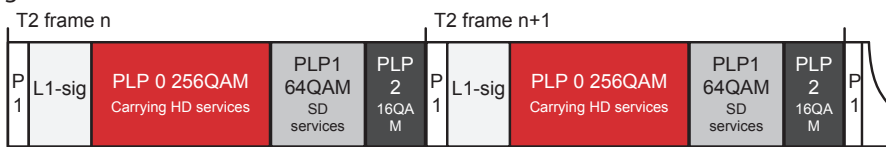
Multiple PLP features enable terrestrial broadcasters to offer more flexible services such as different protection levels, different geographical coverage alternatives, multiple receiver platforms and local content insertion.

Mapping several Transport Streams to various parts of the DVB-T2 signal and protecting these PLPs differently allows the network operators to offer a more flexible pricing structure for their services targeted to match the robustness requirement of the broadcaster. As an example, a broadcaster with greater emphasis on robustness can request the network operator to modulate his services using 64-QAM and a low FEC code rate. The resulting PLP will have increased robustness and a relatively low bitrate. Thanks to DVB-T2, the PLP carrying the services of this broadcaster will have the same carrier to noise ratio and a bitrate gain of up to 50% compared to a similar DVB-T signal - in short, a larger

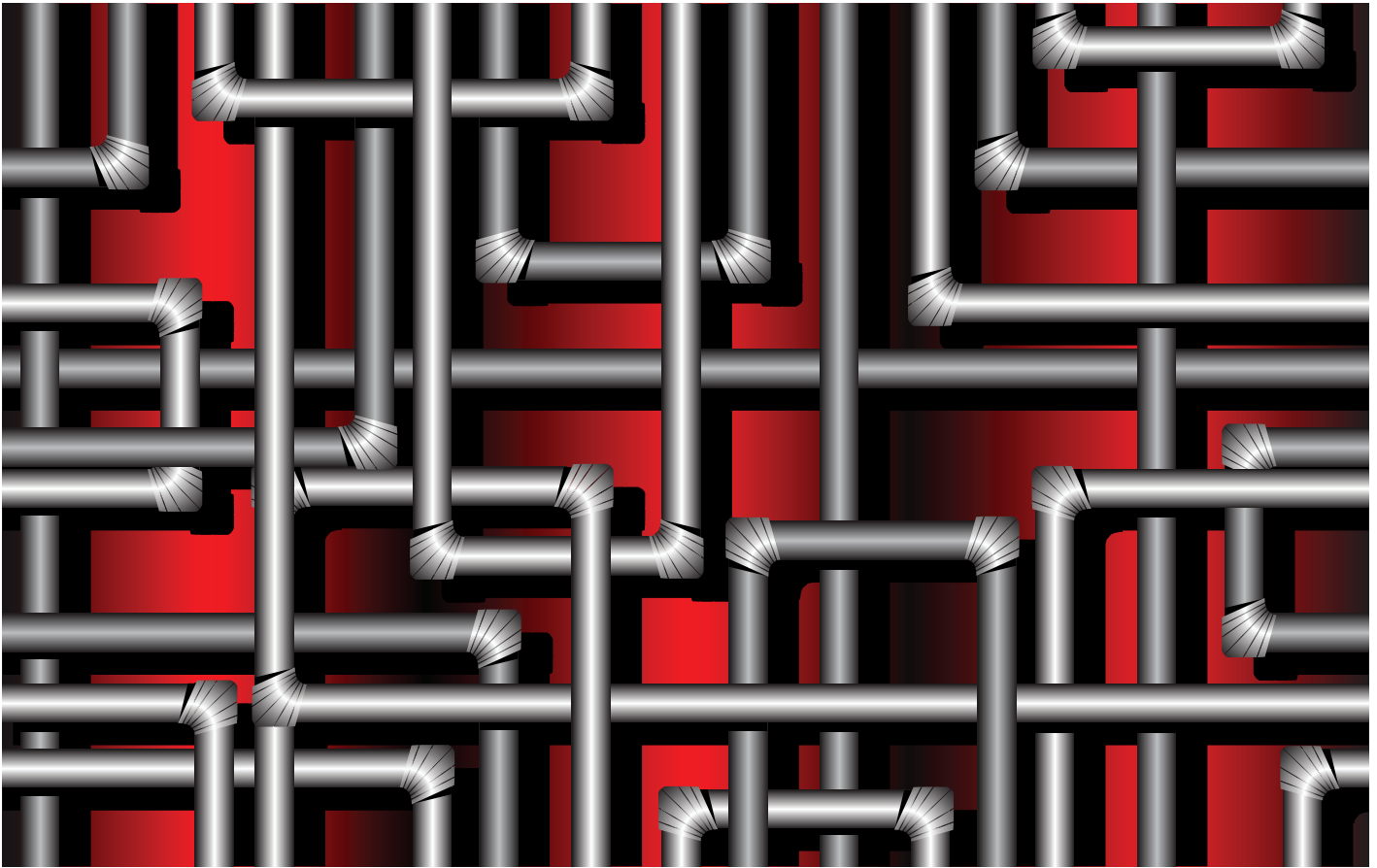
**PLP representation in a DVB-T2 frame**



**Fig. 1**



**Fig. 2**



amount of data can be transmitted with greater robustness.

Multiple PLPs could potentially boost the use of portable and mobile TV by enabling a DVB-T2 signal capable of serving diverse reception platforms. A DVB-T2 signal, as shown in Figure 2, contains a PLP modulated with 256-QAM to allow a high bitrate for HD services. Another PLP modulated with 64-QAM intended for indoor and portable reception might deliver an HD channel and several SD channels. By using a pointer (present in the L1-signalling frame), indicating the start of the corresponding PLP, portable devices only need to decode the P1, L1-signalling and the correct PLP. They don't need to decode the entire DVB-T2 frames and therefore have a longer battery life. DVB is bringing this concept of selective decoding closer through specification work for a new DVB-T2 profile. These efforts recently resulted in a tailor made profile (released with the latest version of the specification) for mobile terrestrial reception (See page 7).

Another application for Multiple PLPs is diversified coverage. It is possible to define a PLP with restricted coverage range, aimed at covering large cities and suburban areas and carrying a large service package (HD and SD). Another PLP can have a wider coverage range and reach rural areas and deliver smaller set of services using a lower bitrate.

Many countries have regional customizations of their networks where regional content is inserted into the

transmitter feed. In contrast to DVB-T, where the insertion is done at the Baseband level, DVB-T2 can perform the insertion at the physical layer. Multiple PLPs can be used to achieve this purpose by encapsulating the national stream in a PLP and inserting the local or regional content into another. This operation can be done at all transmission sites and the population in the region receives the DVB-T2 signal containing both streams. This simple approach has however some significant drawbacks. The two streams must have a constant bitrate and every bitrate variation leads to packet losses or loss of bandwidth. The OPEX need grows with the complexity of the system and in addition the redundancy requirement increases. It makes sense to perform the local insertion at the Baseband level to increase the scalability of the system and optimize bandwidth utilization.

Network operators may also use Multiple PLPs for maintenance and test purposes. Receivers in the field may be updated by transmitting software upgrades and maintenance data on a robust PLP with a very low bitrate.

During network design and test phases, Multiple PLPs have proved to be a very useful tool. Engineers can test many combinations of modulation and code rate at the same time, without having to reconfigure the system for every test.

With Multiple PLPs, DVB made the concept of Hierarchical Modulation simpler, more accessible and affordable



**Anders Dale and Azzedine Abchir** are software engineers working at T-VIPS. They are focused on developing solutions for terrestrial television and in particular for DVB-T2. Their field of expertise covers Baseband adaptation, monitoring, redundancy and distribution. They are involved in numerous projects and commercial deployments around the world.

than ever. The equipment manufacturers responded rapidly by offering professional and consumer products supporting this technology. The Multiple PLP toolbox helps network operators diversify their service offerings and solutions; which in turn helps broadcasters to master their challenges - it makes terrestrial broadcasting more competitive and ultimately results in more satisfied viewers.

# Health Checks

## New Section on T2-MI for DVB Measurement Guidelines

Jürgen Lauterjung, Rohde & Schwarz

After more than ten years, the update of the Measurement Guidelines (TR 101 290) for the second generation DVB systems has started with parameter definitions for the Modulator Interface (MI) of the DVB-T2 system. The interface T2-MI is defined as the output of the T2 Gateway and the input of the T2 modulator, and therefore, simultaneously, the input and output of a distribution network that provides the T2 signals to the terrestrial network.

The signals passing through this interface are based on T2-MI packets into which the DVB-T2 baseband (BB) frames are encapsulated as payload. The T2-MI packets are encapsulated into MPEG-2 Transport Stream packets that allow transport over existing infrastructure.

The new section on T2-MI parameters includes ten test definitions based on the DVB-T2-MI standard (Bluebook A136).

- `2MI_packet_type_error_1` is set if mandatory `packet_types` for each T2 frame (1016, 2016, and if indicated L1-future 1116) are not present.
- `T2MI_packet_type_error_2` is based on information from L1 signalling and is set if the signalled number of BB frames (`packet_type 0016`) is not consistent with the L1 signalling.
- `T2MI_packet_count_error` indicates missing or repeated T2-MI packets
- `T2MI_CRC_error` signals bit errors in T2-MI packets.
- `T2MI_payload_error` is set if the `plp_id` of a BB frames is missing in L1 signalling.

- `T2MI_plp_num_blocks_error` checks for the consistency between the received BB frame packets and the L1 signalling information.
- `T2MI_transmission_order_error` is set if the order of `packet_types` of the T2-MI packets specified in the DVB T2-MI standard is violated.
- `T2MI_DVB-T2_Stamp_error` gives a rough indication if the timestamps in a superframe are not consistent.
- `T2MI_DVB-T2_Stamp_discontinuity` is set if the value of the timestamp in the next superframe is not increased.
- `T2MI_T2_frame_length_error` shows if the frame length signalled in L1 is longer than 250 ms.

Annex B of the DVB-T2-MI standard defines the Modulator Information Packet (MIP) which is used to synchronize SFNs or send settings to individual modulators. The new section of the Measurement Guidelines defines four MIP related parameters.

- `T2MI_MIP_Stamp_error` shows a mismatch between a T2-MI MIP timestamp and a DVB-T2 timestamp
- `T2MI_MIP_individual_addressing_error` shows inconsistencies between the information in the `individual_addressing_byte` and the `individual_addressing_data` field.
- `T2MI_MIP_continuity_error` signals a T2 superframe without the expected T2 MIP.

- `T2MI_MIP_CRC_error` is set if bit errors occur in a T2 MIP.

There are two more parameters that address aspects of the consistency between signalled information and the content or properties of the data stream.

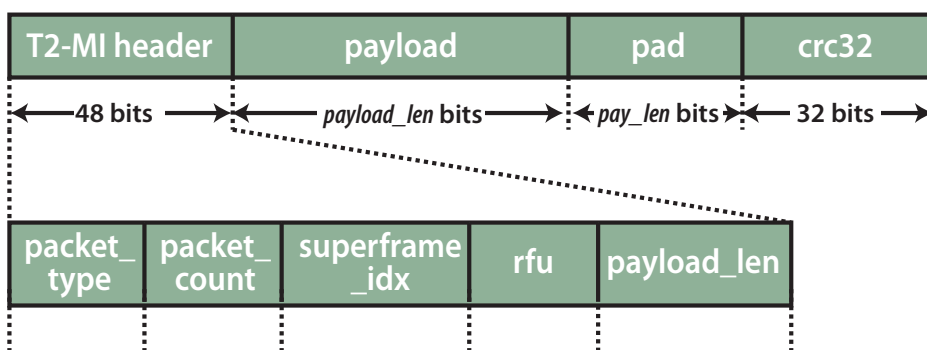
- `T2MI_bandwidth_consistency_error` shows deviations of the signalled bitrate from the actual bitrate of the stream in the T2-MI packets.
- `T2MI_DVB-T2_Stamp_leap_second_error` makes sure that the leap seconds in the DVB time system are signalled correctly.

The new section of the Measurement Guidelines also contains parameter definitions relevant to the transport of T2-MI packets over MPEG-2 TS and over IP. The former are a subset of the Transport Stream related parameters in Clause 5 of TR 101 290 and may only be applicable if certain tables are used. The latter set includes a number of informative parameters derived from the IP header information and the AL-FEC evaluation (if present), as well as several integrity parameters which focus on lost and corrected frames and other QoS parameters such as Media Delivery Index - Media Loss Rate (MDI-MLR) and Delay Factor (MDI-DF).

As in the past, this new section of the Measurement Guidelines does not aim at conformance or compliance tests. This is well beyond the scope of the Measurement Guidelines document. The objective is the provisioning of useful parameter definitions for health checks. This strategy has worked well and is also applied here.

The current version of the new section of the Measurement Guidelines was approved by the DVB Technical Module in June 2011. It was then endorsed by the Commercial Module and the Steering Board and was published as DVB Bluebook A14-1. Further sections are planned that will address the second generation DVB systems, starting with DVB-T2 and followed by DVB-C2.

### T2-MI packet format



# DVB-T2 Lite

## BBC Tests New Profile for Mobile Applications

### Justin Mitchell, Lead Engineer, BBC R&D

In July 2011, BBC R&D began a technical trial of DVB-T2 Lite for mobile reception in London, the same day the specification was approved by the DVB steering board. We would like to invite you to the DVB stand at IBC 2011 (1.D81) to learn more about the trial and to see a live over-the-air demonstration of both the transmitter and the receiver.

DVB-T2 Lite is a new profile in Version 1.3.1 of the DVB-T2 specification. It was designed so that only minimal changes were needed from an existing DVB-T2 modulator and demodulator to be able to support the Lite profile. The Lite profile is essentially a subset of the full DVB-T2 specification, which requires fewer hardware resources in the receiver than a fully-featured DVB-T2 receiver.

In the existing DVB-T2 specification, the signal can, optionally, already contain arbitrary periods of time which can be used to transmit something other than DVB-T2. This feature was put into the specification to allow for future improvements in modulation technology to be incorporated into the system. These periods of time are called Future Extension Frames (FEFs).

However, in the DVB-T2 Lite profile, both the main part and the FEF contain valid DVB-T2 signals but with different levels of robustness, allowing both services to mobiles and fixed receivers to be transmitted as part of the same transmission on the same frequency. The system also permits the transmission of a DVB-T2 Lite service without a second DVB-T2 service being present.

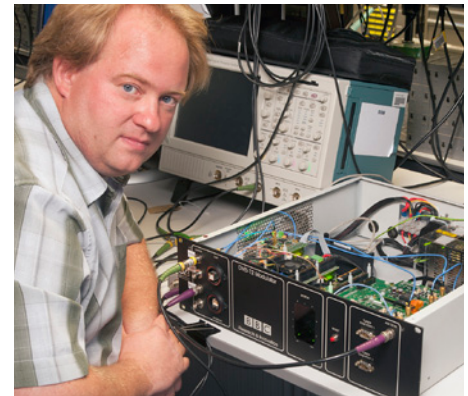
The DVB-T2 Lite profile allows most of the flexibility of the DVB-T2 specification, but limits the FFT size to exclude 1K and 32K, prohibits the use of rotated constellations in 256-QAM, allows only short FEC frames ( $N_{ldpc} = 16200$ ), adds two new even more robust code rates (1/3 and 2/5), limits the size of the time interleaver memory to approximately half that of standard DVB-T2, reduces the number of permitted mode combinations,

prohibits the use of PP8 and provides the capability of scrambling the L1 post preamble signalling bits.

As part of the digital switchover programme, the UK has already rolled out a nationwide DVB-T2 multiplex which provides several HD terrestrial channels.

For this trial we have combined an HD multiplex intended for reception on fixed receivers with a more robust mobile service which could be television, radio or data or any combination of these. In the UK, we currently use the mode 32K 1/128 256-QAM 2/3 which gives a bitrate of 40.21 Mbit/sec in an 8 MHz multiplex. In the DVB-T2 Lite trial, we have kept the same mode for the HD part of the multiplex but have added a FEF containing the mobile service. The HD part of the multiplex consists of a DVB-T2 frame which is 216.9 ms in duration followed by a FEF of 44.6 ms. This FEF contains the DVB-T2 Lite service. This reduces the bitrate of the HD service from 40.21 Mbit/sec to 33.36 Mbit/sec.

The mobile part of the service is transmitted in a more robust mode. We have chosen 8K 1/32 QPSK 1/2 with  $L_{DATA} = 46$ . This gives a bitrate of 1.02 Mbit/sec for the mobile service. The HD



Justin Mitchell

part of the service is contained within a FEF of the mobile service. This means that the HD service and mobile service are both FEFs of each other.

The modulator uses two Xilinx FPGAs on Synopsys HAPS cards together with some circuits designed by BBC R&D to provide the transmitted DVB-T2 Lite signal at UHF. The demodulator uses three Xilinx FPGAs on Synopsys cards to receive the DVB-T2 Lite signals.

In summary, we are delighted to have been able to demonstrate the successful transmission and mobile reception of DVB-T2 Lite in London in July. Don't miss the demonstration at IBC so we can tell you more about the trial.



L-R: BBC's Andrew Murphy, Justin Mitchell and Martin Thorpe

# Green Transmitters

## Energy saving and life cycle cost reduction for modern digital V/UHF TV transmitters

**Jerome David,**  
Strategic Marketing Manager, Thomson Broadcast



**Jerome David**, holds a Masters Degree from ENSERG. He specializes in OFDM and SFN deployment and on DVB, MediaFLO and ATSC-MH standardization.

Over the last 10 years, CAPEX has driven network investments. This led to networks with poor efficiency. Today, as environmental requirements (carbon footprint) are becoming more important and energy prices rise, OPEX is now a key factor in the broadcaster's investment policy.

Peak average energy costs continue to rise and networks continue to become denser. Transmission power consumption is playing an increasingly important role in network operation. In countries where energy is rare and expensive, poor power consumption can delay the digital TV rollout or in some cases even prevent the introduction of new services. Based on ongoing advanced research programs showing very favorable technology advances and new transmitter techniques, this decade promises a huge opportunity for modern digital TV transmitters to save energy and dramatically lower life cycle costs.

### Evolution in high power V/UHF transistor

Latest LDMOS transistors have been designed for high Peak to Average Power Ratio (PAPR) signals like Orthogonal Frequency Division Multiplexing (OFDM) terrestrial waveforms. Output power has been increased by five in VHF from 55Wrms to 250Wrms and by four in UHF from 35Wrms to 120Wrms. Thermal resistance has been reduced by a factor of four enabling better power and transistor VSWR (Voltage Standing Wave Ratio) reliability has been improved (10:1 to 65:1). Overall efficiency has been improved by 35 percent in VHF and by 40 percent in UHF.

### Improvements in digital pre-distortion

Since the introduction of Digital Adaptive Pre-correction (DAP) in 1998, real time algorithms have improved transmitter performance, enabling them to operate at their maximum quality without the need for maintenance.

### Applicable PAPR techniques

DVB-T2 has introduced for the first time in the OFDM standard, advanced clipping functions called PAPR techniques, consisting of reducing signal Peak to RMS ratio in

the OFDM signal. These techniques called Active Constellation Extension (ACE) and Tone Reserved (TR) have been introduced in DVB-T2. The ACE technique consists of extending outer constellation points on the clipped signal while tone reservation method modulates iteratively a few reserved carriers (1 percent) to reduce PAPR. Up to a 10 percent efficiency improvement is obtained for fixed transmission with tone reservation. Higher gains for mobile transmission and lower constellation orders are achieved using ACE (typically about 1.5 dB net gain for a QPSK signal).

### TV transmitter efficiency status today

Class AB with pre-correction remains the state-of-the-art modulation choice for digital V/UHF TV transmitters today. While feed-forward represents an alternative with an overall efficiency of 10 to 15 percent, digital pre-distortion remains the most efficient solution showing figures between 20 and 25 percent.

### High efficiency modulation techniques

Various new techniques are and will be available as better power devices are introduced. The first of them is the Doherty technique. The principle of the technique is to adapt the load in function of the output power. The load is optimized in order to produce the maximum power of the amplifiers with the maximum efficiency. This load adaptation is made

dynamically by using two different amplifiers. Doherty amplifiers are in use for telecom bands but such amplifiers are narrowband (+/-30 to 40 MHz) and do not really fit the wideband operation required by TV broadcasting (170 to 240 MHz in VHF and 470 to 860 MHz in UHF).

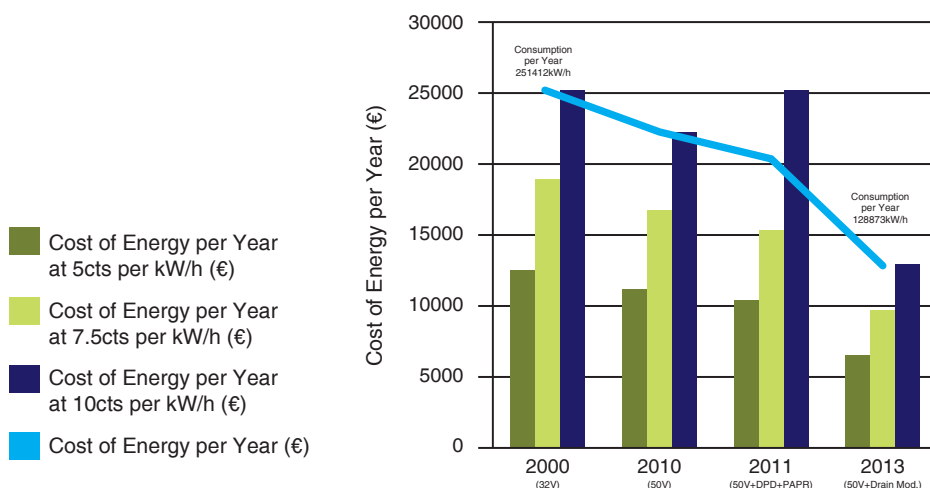
The Drain Modulation principle uses the envelope signal to dynamically control the power supply of the transistor. This avoids the efficiency penalty that arises with AB Class amplifiers at low amplitudes. This technique is wideband and is applicable to TV broadcast.

Ongoing advanced studies are conducted on Switched Mode that enables direct generation of RF signals by high power digital to analog converter devices. The first prototypes of switched mode devices at low power are being studied now but their introduction is not planned in the short term.

### Implementation of new features & impact on choice for the future

Advanced transmitter techniques enable low maintenance while efficiency techniques reduce the energy bill over the transmitter life cycle. Besides helping to reduce the carbon footprint of the transmitter network the annual savings, per 5 kWrms digital DVB transmitter, ranges from 3,500 Euros to 12,000 Euros per year based on current energy costs.

Consumption per Year and Cost of Energy based on 5kWrms UHF Transmitter





# Eco Design

## Reducing power consumption in Integrated Digital TVs

**Martin Cole**, Managing Director, TechniSat Digital UK Ltd.



Martin Cole



Energy consumption in consumer electronics

is a key consideration, governed by evolving regulations. The Energy Related Products directive 2009/125/EC requires manufacturers to consider product design and supply chain aspects covering materials used, manufacturing process, packaging, transport, installation, use, maintenance and disposal. Printed manuals have been replaced by online or on screen guides, European manufacture and the use of lighter materials can reduce the impact of transportation, longer warranties and availability of service components, all address these eco design requirements. European Commission regulation EC 642/2009 for televisions reduces the power requirements over time. The off mode power limit shall not exceed 300mW as from August 2011, and on mode power requirements are reduced as from April 2012. Early plasma IDTVs consumed hundreds of watts, whereas the on mode power limit from next year for a typical 40 inch IDTV must not exceed 168 Watts.

In November, the EU regulation 1062/2010 will enforce energy labelling, where the rating is determined by the energy efficiency when measured and compared to a calculated power rating for a given screen size and functionality. A power allowance is made for multiple tuners and internal hard disk drives needed for recording. To achieve an 'A' rating for a typical 40 inch single tuner IDTV will require the on mode power not to exceed 63 Watts. Meeting all these requirements is now the focus for new IDTV designs.

Manufacturers want to differentiate their IDTVs, offering their customers advanced connectivity, including LAN or WiFi, browsers, better contrast ratio, refresh rate and different screen sizes, but this has to be balanced against the power required. The actual power used will depend on what functions are being used, for example, whether a CI+ CAM or USB drive is inserted or multiple recordings are being made using satellite broadcasts, where external LNB power has to be provided.

There are also standby trade-offs; if the unit has a very low standby, or an off mode, then the user has to wait whilst all the functions of the IDTV are initialized, although 'suspend' techniques can improve this. In standby, the IDTV must still respond to IR commands, timers, HDMI or SCART signalling.

The directive has reduced the standby consumption to a maximum of 0.5 Watts and therefore careful design of the power management is needed. Although Switch Mode Power Supplies are relatively efficient when delivering the required on power, their inefficiency is a large percentage of the standby allowance. Separate microcontrollers and ultra-efficient power supplies are therefore needed just for the standby functionality. Physical off switches or off modes, with user configurable timers, or triggered after a late night recording is made, or the user leaves the room, means the IDTV will then consume significantly less than the mandated off requirement.

Backlight technology for LCD TVs is another key design consideration where CCFL or LED is used. LED backlighting can be edge LED or full dynamic LED

backlighting. With improvements in the translucency of panels and design of the backlighting, less illumination is needed and the number of LEDs used can be reduced to save power. Dynamic control of the LED backlighting, depending on the content of the image displayed, both improves contrast ratio and affects power consumption. Turning the LEDs off behind the black bars when displaying ultra wide screen content, or providing automatic ambient brightness control where the backlight level is adjusted depending on the room lighting level, can save power. The user can be provided with information on the power being consumed when adjusting the display and backlight settings. Power can also be optimized in non-viewing mode for audio or radio use only.

Manufacturers are therefore incurring considerable effort and cost to address these directives and although the energy cost saving to the consumer per year is low, the energy saved when multiplied across millions of IDTVs being sold each year will significantly reduce overall energy demand.

### Energy Saving TechniSat MultyVision HD Series



# Power Savers

## Low Power Set-Top Boxes Fulfill EU Regulations for Standby

**Mario Bollinger,**  
Senior Marketing Engineer, STMicroelectronics

This article explores how the low power mode allows low power consumption in standby conditions by powering down the main DVB chips and its internal clocks.

The European Commission's Regulation No. 1275/2008 and its Directive 2005/32/EC define the rules and schedules for implementations of the standby and off modes electric power consumption of electrical and electronic household and office equipment. Basically, any equipment must not exceed the maximum of 1 Watt in off mode or standby mode and starting from 2012 the power consumption is further reduced to 0.5 Watt. To this end, this equipment shall have an 'off mode' and a 'standby mode'.

One example of an 'always connected' device is a DVB IP STB. This DVB IP STB has a remote control to manage the functions, such as channel selection,

settings for the reception of the transport stream and media function.

A key function on the remote control is the standby with its specific button for On/Off or On/SBY. This button has a central function in the decision chain that places the device into a power saving standby mode. Before explaining the mechanism of the power saving standby mode it needs to be understood which components inside a DVB device consume the most power.

These are:

- DVB tuner and demodulator
- Main MCU or STB chip
- Memory
- Ethernet
- Power supply

The central device of a DVB STB is the SoC with an embedded MPU. This device supports these main features:

- An interface for the DVB tuner to receive the transport stream
- Memory control for the main program and data on a flash memory, and to work the program from RAM memory
- An interface to the IP via Ethernet link
- Drive the external display through HDMI
- Internal clock generation

The main STB chip has several working states, such as reset, normal or idle mode operation, application running mode and low power mode. The following highlights the two modes – normal and lower power. The aforementioned SBY key on the remote control and its IR code manage the transition between these two modes.

The prerequisites of a low power mode are as follows:

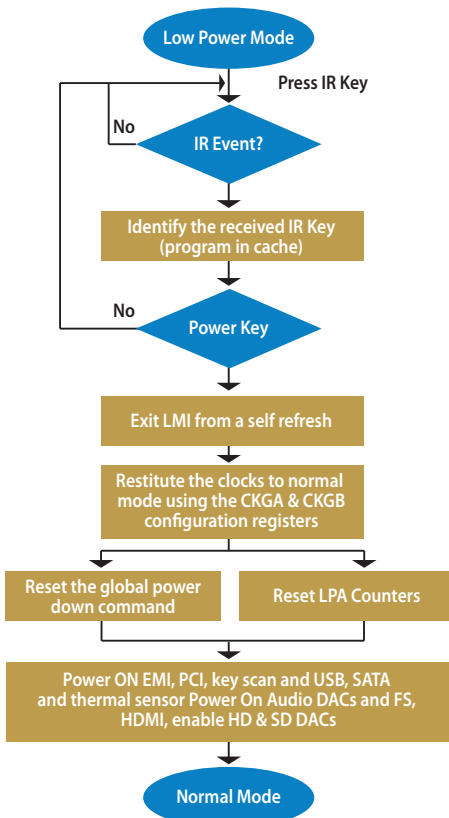
- Remote control IR key to trigger the transition
- Software that is able to convert the IR key into a lower power mode sequence and vice versa to turn the DVB receiver on again
- Specific hardware inside the STB chip to power down clocks and functional blocks of the chip



Mario Bollinger

Power consumption can be reduced by disabling a number of blocks like audio and video DACs, the HDMI interface, the memory interface or external interface, like USB or SATA. A second means of power reduction is to stop internal clocks or reduce clock frequencies to a minimum, in order to further enable execution of program software. The third action for an efficient low power mode is to put the DDR memory into self-refreshing mode. Key software code and parameters are stored in the cache memory of the embedded MPU from the DDR before going into low power mode. The fourth and final action is to halt the embedded CPU by executing the sleep instruction. The power consumption of the main device inside the DVB receiver box is reduced from an average 2.1 Watt, to 0.22 Watt, to achieve the target of Directive 2005/32/EC. Also in this mode, unnecessary clocks should be stopped. Once this is also enabled with the Local Memory Interface, the device consumes just 0.184 Watt.

In order to return to normal operation the program of the embedded CPU needs to be executed from the cache memory of this embedded CPU. The restart time to go from low power mode to normal or idle mode is 0.17 msec. The diagram shows how the software goes from low power mode to idle mode and the related activation of the functional blocks.



# Green Standards

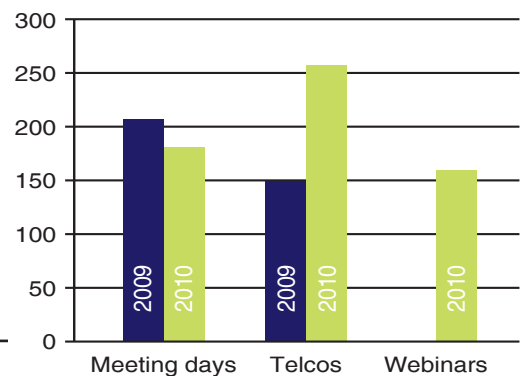
## The Efficiency of Standardization Meetings

**Désirée Gianetti & Peter Siebert, DVB**

DVB standards are free, but this does not mean that they come free of cost. Creating a standard is a major effort and requires heavy investment and commitment from our Members. DVB Members have to send their employees to the meetings which means, amongst other things, travelling costs and time invested. It is therefore in the interest of all participants to make the standardization process as efficient as possible.

The DVB looked into this issue and is now offering various solutions to this challenge. Face to face meetings in standardization will always be necessary. However, they can be complemented

quite significantly by phone and/or video conferencing, as well as web conferences which allow the sharing of documents and working on them collaboratively. Web conferences also allow the use of the internet for voice transmission so that no telephone lines are required. The popularity of online meetings is clearly represented in the graph. Whereas the number of days for meetings in 2010 as compared to 2009 has been slightly reduced, the number of telephone conferences has significantly increased. Also webinars, which are only in existence since 2010, have become extremely popular with our Members.



In times of ever increasing competition, participation in standardization activities like DVB is a competitive advantage. However DVB Members must also use their resources in the most efficient way. The DVB supports the Members in optimizing the participation in DVB meeting by providing the necessary infrastructure via telephone and internet tools. Member companies clearly benefit as employees spend less time out of the office and they do not have to pay travel costs. Also, the environment wins because fewer people travelling means less energy consumption as well as reduced CO2 transmissions.

# Attention Grabber

## DVB-T2 in the Spotlight at BroadcastAsia

**John Bigeni, DVB**

BroadcastAsia is now the Asian region's premier conference and exhibition event for the broadcasting industry. It attracts visitors from not only within the region but also worldwide. DVB-T2 technology was certainly in focus at this year's event with many booths exhibiting a wide range of products for this new exciting technology. DVB was very much in presence with a very attractive and eye catching booth. Again, our own exhibits were on DVB-T2.

We demonstrated Multiple PLP showing 3D and HD multiplexed on one PLP as well as standard definition services on a second pipe, and a mobile service on another with a C/N capability of 3.3db. In addition to this, a separate demonstration was directed to countries using the 6MHz frequency channeling framework. This exhibit demonstrated the transmission of five HD services (using third generation encoders) at 36Mb/s on a 6MHz RF channel. To receive these services we used a Ross DVB-T2 STB, which is available at a very attractive price. This exhibit

was received with great interest by the Philippine delegation who attended BCA 2011.

The promotion for DVB-T2 at BCA was very much highlighted by the regulator's announcement of Singapore's intention for early migration to this new second generation DVB-T2 standard, indicating that they will have in place by this coming September a nationwide trial network. The announcement was made by the Minister for Information, Communications and the Arts, Dr Yacoob Ibrahim, at the opening ceremony. The DVB-T2 network will be used as a test bed for new and innovative content and services, as well as indoor reception.

As an adjunct to the exhibition, DVB also organized a full day conference session dedicated to DVB new systems and standards which focused on DVB-T2. Eleven presentations were delivered, supported by many of our expert DVB Members. This included Enensys, TeamCast, T-Vips, Newtec,



STMicroelectronics, Media Broadcast, Viaccess, Rhode & Schwartz and Ericsson. Presentations were also given by Peter Siebert and John Bigeni of the DVB and the session was chaired by Tay Joo Thong from Mediacomm Associates. The session was very successful in providing information on many aspects of this new technology from program generation, encoding, modulation, transmission through to receiver chipsets, etc. The session was extremely well attended and consistent with the very high interest shown for DVB-T2, not only at this conference but indeed the whole Asian region.

# In My Opinion

## Digital TV in Russia – Getting It Right

**Anna Biteleva**, Deputy Chief Editor of Tele-Sputnik Magazine



**Anna Biteleva** is the Deputy Chief Editor of Tele-Sputnik Magazine. Tele-Sputnik was launched in 1995 as the first Russian SAT-TV and CATV monthly magazine. Nowadays, it covers all issues of digital television such as cable and satellite TV, IPTV, Web TV, terrestrial, mobile TV and home networking. The triple play technologies and data transmission, such as internet via satellite or Ethernet and DOCSIS for CATV operators are also discussed on its pages. Tele-Sputnik's website attracts a significant community of satellite system installers, as well as satellite and cable operators. It is also visited by system integrators and manufactures.

[www.telesputnik.ru](http://www.telesputnik.ru)

Two years ago a state DTT program was initiated in Russia, with the goal of addressing the problem of television reception in remote and rural areas and to boost the Russian TV industry. The plan calls for three multiplexes broadcasting 25 free-to-air TV channels. Further multiplexes are expected on a commercial basis.

Currently only one multiplex is in operation and is under government control. It broadcasts eight channels with their distribution costs partly met by the state. Also, at this stage the only operator that has a license for DTT distribution is the state-owned RTRS Company. It broadcasts to the boundary regions of the far eastern and south western areas of the country, while most other regions have testing zones.

Prior to the start of the government program, six or seven DTT commercial projects were launched in Russia. Some of them are still active but at present their status is unclear, as they are not in the framework of the state program and have lost the financial support of the regional authorities.

The main event this summer in the DTT deployment process was the government committee meeting held in July that had two main issues on the agenda. The first topic was the possible move from DVB-T to DVB-T2, and the second was a decision regarding encrypted services on the free-to-air multiplexes. The committee recognized DVB-T2 as a promising format and recommend arranging DVB-T2 testing zones. RTRS gave further information indicating that

there are plans to switch existing networks to DVB-T2 as well. The decision on encrypted services was not disclosed.

I do hope that the introduction of DVB-T2 will be reasonably timed so as not to harm the existing market. A total and rapid switch to DVB-T2 would require consumers to purchase new equipment. Also, it could lead to the exclusion of Russian transmitter and set-top box manufactures that currently do not have market ready DVB-T2 products. This would be contradictory to the social goals of the program.

As one of the aims of the program is to promote Russian industry in the face of competition from Southeast Asian manufacturers, the inclusion of encrypted services would complicate STB's and distort free competition inside the market as well. Consequently the choice of STBs would shrink and the prices of the receivers would go up and most likely be contradictory to the social goals of the program.

There are also other problems on the horizon. One of the most important is the absence of technical requirements for consumer receivers, and the lack of promotional schemes for the service. RTRS has been tasked with the transition because of its experience in broadcasting; however it is not experienced in all the necessary aspect of the project.

There still are some unclear issues concerning the cooperation of RTRS with the satellite and cable operators. However, I don't think that the deployment of the first multiplex will impact other segments of the digital TV market, particularly

the well-developed DTH segment. There are currently seven satellite platforms in Russia. All together they form a competitive market offering various packages from basic TV to HDTV, and interactive services. At least two platforms, Tricolor TV and Telekarta, successfully serve the main targeted audience of the DTT social program, particularly consumers with poor terrestrial service. It can be expected that DTT might entice their potential subscribers, attracted by the free packages offered, however it will not affect their current subscriber numbers. An early switch to DVB-T2 and the introduction of encrypted services on free-to-air multiplexes would make DTT less attractive for lower-income households which would prefer to stay with the satellite platforms.

Cable TV is well established in Russia, but the number of digital subscribers is small for several reasons. There is a good chance that the introduction of DTT will also lead to digital CATV services.

Some low budget networks hope to take advantage of the situation by providing analog services during the transition period. The early transition to DVB-T2 and the introduction of encrypted services on social multiplexes would be mainly beneficial to these operators.

I hope that these problems will be solved and the introduction of DVB-T2 will be well timed so not to harm the existing ecosystem. Only pay TV operators and some manufactures will benefit from haste, and not the targeted audience.

## Making the right choice



**Myra Moore**, chief analyst, Digital Tech Consulting. DTC is a boutique market research firm that analyzes the worldwide consumer digital TV market and aids countries in transitions to DTT.

For more information, please see: <http://dtcreports.com/dtv.aspx>

Although a growing number of regions within Western Europe have completed transitions from terrestrial analog TV to DVB-T, there are still many countries (especially in Eastern Europe, the Middle East, and parts of Africa) that are only beginning the work of building their DVB-T or DVB-T2 systems.

In fact, approximately 70% of the world's countries have yet to begin commercial digital terrestrial TV services and those countries that are just now beginning their plans have the opportunity to learn from those who went before them. Although transitions have been mostly successful, missteps have occurred and, in many cases, those missteps serve as cautionary tales for broadcasters and government regulators. One, however, is frequently repeated: The exclusion of nontechnical stakeholders (politicians notwithstanding) in the very beginning of planning a DTT system.

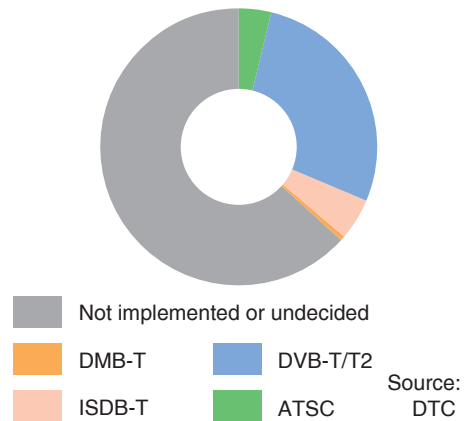
The drive and vision to create a DTT system understandably comes from broadcast engineers. It seems natural that decision making about analog to digital TV transitions is, at the very core, a technical one. After all, it is the engineers who will be responsible for building the system, integrating it with other delivery platforms and maintaining it long after the first DTT transmitters are erected.

Many in the industry instinctively think of an analog to digital transition as a technical problem to be solved, not as a transformation of an old system to a new system that can help improve the communications of an entire population and government. Although it may seem that retailers, government policymakers, and business leaders can parachute into the planning process once the technical specifications, standards selection, and spectrum mapping studies have been completed, these decisions have a profound

impact on all aspects of a transition. To name only a few: the degree of ease in which retailers can source DTT receivers; whether citizens can access their favorite programming in a neighboring country post analog shut off; and how government subsidy programs are designed.

In the end, the ability for all citizens to affordably acquire a receiver is paramount. The adoption of a common transmission technology (i.e., DVB) across a large region helps to accomplish this goal with operational, equipment and human capital efficiencies. Those pan regional efficiencies, in part, have made DVB-T (and T2) the most widely adopted digital terrestrial standard in the world.

### Transmission Standards Selected by Countries Around the World



[ advanced connected device solutions ] [www.ehostar-europe.com/ibc](http://www.ehostar-europe.com/ibc)



### Mercury: Ultra Slim DVR.

At Echostar Europe, we believe in delivering truly inspirational products.

Mercury delivers everything you'd expect from a fully featured, hybrid DVR; brilliant HD pictures, an abundance of recording space and Ethernet connectivity. However, an ultra slim profile of just 12 millimetres means it's a fraction of the size of alternative solutions. With less packaging and low power consumption it's easy on the environment too.

Join us at IBC (stand #1.F76) and supply the very best connected device solutions to your cable, satellite or IP customers.



go beyond the box.

See what we're showing at IBC. Scan with your smartphone using a QR Code Reader app.



# MARKET WATCH

[www.blankom-digital.de](http://www.blankom-digital.de)



Blankom Digital's B-NOVA chassis is a base for an IPTV modular platform and cable TV headend. The chassis enables the operator to set up a very compact headend configuration using various processing and interfacing modules. It scales from one chassis headend in a box to a multiple chassis system for bigger headend systems – the system is designed to grow with your business. It is designed for very high performance, high density and very low power consumption.

[www.echostar-europe.com](http://www.echostar-europe.com)

EchoStar has recently launched a new DVB-S2 digital video recorder that allows consumers to watch the UK's Freesat anywhere inside or outside the home on popular mobile devices. The 'TV anywhere' concept, powered by fully integrated, SlingLoaded technology, enables consumers to use the downloadable SlingPlayer Mobile app to watch live TV, schedule recordings and access their recording library anywhere there is a broadband internet or 3G connection; iPad, iPhone and Android devices are amongst those supported.



[www.neotion.com](http://www.neotion.com)

The Irdeto Cloaked CAM is targeted at mass retail markets where devices are distributed to consumers without operators' smart cards. The device can be prepared for use with multiple operators, each of which uses its own Irdeto CAS. Security updates and new functionalities are downloaded over the air to the device, eliminating costly card swaps. This CAM uses a Neotion secure chipset for control word encryption and as a hardware root of trust for the Cloaked CA Agent.

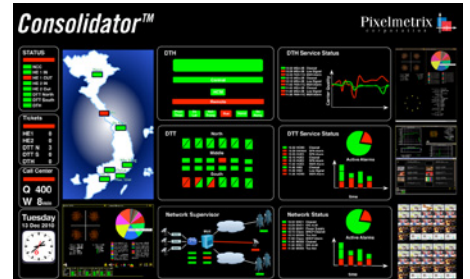


[www.protelevision.com](http://www.protelevision.com)



ProTelevision Technologies has extended their DVB-T2 product range to include also an ISO channel repeater (Gap filler) with echo cancelling. This latest addition to the product portfolio showcases the flexibility of the generic product platform PT2000; the function (modulator or repeater) and the specific terrestrial broadcast format are defined simply by the software loaded.

[www.pixelmetrix.com](http://www.pixelmetrix.com)

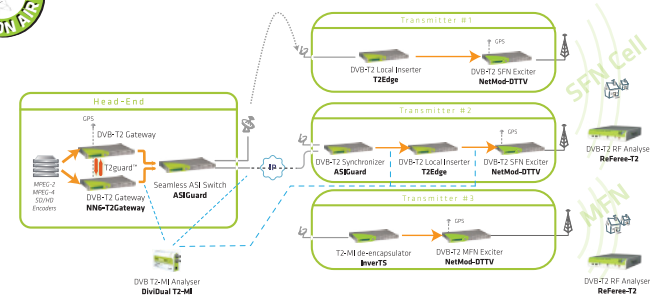


The Pixelmetrix Consolidator provides centralized access and visibility of key network fault and performance information. Scalable to thousands of probes and millions of data points, it tracks all parameters in real time, through a combination of push notifications and information pull mechanisms, enabling faster fault resolution, thus improving Quality of Service. It also gives an aggregated view for display on a video wall. This view combines data collected from different monitoring points within the network.

[www.oceanbluesoftware.com](http://www.oceanbluesoftware.com)

Ocean Blue Software has released a multiprocess version of Sunrise DVB, operating as either the system core or as a plug-in module, supporting multiple presentation engines and other processes running alongside the DVB core. The new version has added the ability to link external graphic environments to Sunrise to generate the UI, such as QT, CSS3 or Adobe Flash.

## Booth 3.B20a **DVB-T2** comprehensive solution



SFN, MISQ, Single and Multiple PLP, T2-MI over ASI and IP support

- DVB-T2 Network adapter
- Local content management
- Advanced redundant architecture
- DVB-T2 Gateway
- T2 Local Inserter
- T2 Modulator

[www.enensys.com](http://www.enensys.com)

[www.technisat.com](http://www.technisat.com)

TechniSat has launched its DigiCorder ISIO, a hybrid HDTV satellite set-top box with IP and browser functionality and embedded HDD. With a twin tuner, Conax and Nagravision CA systems, 2 CI slots with CI+ support, Linux operation system, Opera web browser and HbbTV capability, it offers a lot of value added features. With the newly designed onscreen display, an app bar which may be filled optionally and a linklist for websites, the IP functionality can be used very easily.



[www.teamcast.com](http://www.teamcast.com)

TeamCast has developed a range of products for the DVB-T2 standard. The MT2 OEM modulator is targeted to meet transmitter manufacturers' requirements for high quality DVB-T2 network infrastructures: SFN/MISO, Multiple PLP, in full compliance with DVB-T2 Gateways. The manufacturer claims that it is already deployed on DVB-T2 commercial networks, and is a future proof platform. The RQX DVB-T2 OEM probe for QoS measurement implements RF input level monitoring, RF spectrum display with spectrum shoulder measurements, I/Q constellation outputs, MER, etc.



[www.rohde-schwarz.com](http://www.rohde-schwarz.com)

The R&S DVMS DTV monitoring system from Rohde & Schwarz provides full monitoring of DVB-T2 networks. Two new options make the system a solution that combines all monitoring functions for DVB-T2 networks in a single instrument. Network operators can monitor both the DVB-T2 transmitter and the signal feed via the T2 modulator interface (T2-MI) without any additional equipment. Plus, the instrument supports the monitoring of single frequency networks (SFN) and of the RF spectrum (shoulder measurement).

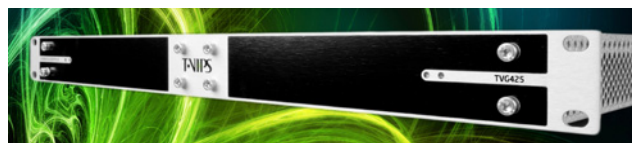


[www.roverinstruments.com](http://www.roverinstruments.com)

The new Atom HD from Rover Instruments supports all TV standards including DVB-T2. It can analyze and measure SAT, TV, CATV, fiber optic and IPTV distribution systems and can show MPEG-2 and MPEG-4, HD & SD pictures. This professional meter is compact, light (2.5 Kg) and easy-to-use with intuitive and fast navigation, thanks to direct key functions and dual displays.



[www.t-vips.com](http://www.t-vips.com)



The TVG425 is the newest member of the T-VIPS Video Gateway suite, designed for real time video contribution and distribution. Key features of the unit include; transmission of up to eight MPEG-2 Transport Streams, output diversity with up to eight copies on ASI, 64 on IP, automatic failover switching between redundant ASI and/or IP inputs, 2 GE interfaces for Transport Streams over IP, FEC (SMPTE 2022-1 compliant) and integrated 1PPS/10MHz input for clock resynchronization for SFN operation.

[www.verimatrix.com](http://www.verimatrix.com)

The Verimatrix ViewRight CI+ for connected TV implements the video content authority system (VCAS) security functions within iDTVs. The CI+ CAM, featuring a hardened implementation of the systems security functionality, is provisioned and authenticated as a client device to a VCAS for DVB hybrid headend. VCAS for DVB hybrid offers a modern smart cardless security architecture



by leveraging the IP connectivity for authentication, signaling and proactive update cycles, and thereby turning iDTVs into DVB-IP hybrid receivers.

[www.work-microwave.de](http://www.work-microwave.de)

WORK Microwave has released its next generation DVB-S/S2 Modulator. The new design includes: multistream technology that allows users to aggregate up to six independent Transport Streams into one DVB-S2 carrier while maintaining the integrity of the original content. Transport Stream over IP in addition to the known ASI interface transport over IP is also available. The user interface has a powerful web interface that supports easier access to all the new features in this product update.



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Booth 3.620a

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- **T2 Signaling:** T2Frame, BBFrame, L1, ...
- **Single & MultiPLP** support
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- **T2-MI** analysis

**ENENSYS ReFree T2**



