Training Course Description

Course: **HDTV, MPEG-4 and DVB-T2 coding**
Course code: **ESS108**
Duration: **3 day**

Format: Classroom explanation and demonstration.

Supporting materials:

Each delegate completing the course will receive the following:

- A full set of course notes
- Certificate of attendance

Overview:

The course provides delegates with a practical understanding of the technologies, vocabulary, techniques of HD, MPEG-4 DVB-T2 television systems, explaining broadcast the infrastructure, the creation of MPEG Elementary and Transport Streams, MPEG-4 video processing and DVB-T2 modulation.

Who should attend:

Technical staff working in an MPEG video environment who need an understanding of the specific technologies and issues associated with implementing and working with MPEG-2 and MPEG-4 coding systems.

Prerequisites:

No specific television or broadcast knowledge is required, but a general familiarity with technical concepts is assumed. A PC video projector should be available for presentation and to show demonstration sequences.

Key benefits:

At the end of the course delegates will be able to:

- Understand DVB-T2 systems and architectures
- Describe DVB hardware architectures
- Describe the MPEG-4 video compression processes
- Understand the effects of bit rate reduction on picture quality
- Understand the issues involved in manipulating and transmitting MPEG signals
- Describe the MPEG-2 Transport processes
- Understand the relation between MPEG-2 Transport structure and DVB-T2 structure
- Describe the DVB-T2 structure and modulation

Course Content:

Broadcast Television and Audio systems
- Video sampling structures, 4:4:4, 4:2:2, 4:2:0
- SDTV, HDTV (high definition TV) and aspect ratios
- WideScreen WSS (Wide Screen Signalling) AFD (Active Format Descriptor)
- HDSDI, 3GSDI
- Progressive scan and interlace, Segmented Format
- frame rates

MPEG-4 Video Compression
- MPEG-4 part 10 AVC and H264
- Use of MPEG-4 levels and profiles
- Enhancements in MPEG-4 coding techniques
- Intra and Inter slice coding, I, P and B slices
- MPEG structure, GOPs (Groups of Pictures) Slices, Macroblocks and Blocks
- Intra frame estimation
- Motion estimation
- Sub pixel motion estimation
- Integer transform coding
- Prediction Slices
- Use of arbitrary reference frames
- Hierarchical GOP
- Switch slices
- Exp Golomb coding
- Discrete Cosine Transform
- Entropy coding
- Zig Zag Scan
- Lossy and Lossless compression
- MPEG-4 decoding, use of de-blocking filters
- Performance comparison with MPEG-2

MPEG Audio Compression
- MPEG audio coding, layers and modes
- Sample frequencies and bit rates

MPEG-2 System and Transport Layer
- The PES, Packetised Elementary Stream
- The Transport Stream
- PID (Packet ID)
- PAT (Program Association Table)
- PMT (Program Map Table)
- Time synchronisation and time stamping
- PCR (Program Clock Reference)
- PTS (Program Time Stamp) and DTS (Decode Time Stamp)
- Buffer delays
- Lip Sync issues

DVB
- DVB SI and tables structure, NIT, TDT, TOT, EIT, BAT etc.
- Actual and Other tables

MPEG in Practice
- System Multiplexing
- Concatenating Compression
- Transrating and Transcoding
- Picture assessment quantisation and compression artefacts

- MPEG test signals
- Statistical Multiplexing

DVB-T2 SYSTEM
- PLPs (Physical Layer Pipes) and Data Structure
- FEC (Forward Error Correction)
- QAM (Quadrature Amplitude modulation)
- Pilot Tone Insertion
- IFFT (Inverse Fast Fourier Transform)
- PAPR (Peak to average Power Reduction) Guard Interval and P1 signalling
- DAC (Digital to Analogue Converter)
- TFS (Time Frequency Slicing)

DVB-T2 STRUCTURING - DATA INPUTS TO SUPER FRAMES
- PLPs (Physical Layer Pipes)
- Input Stream Types
  TS (Transport Stream)
  GFPS (Generic Fixed-length Packetised Stream)
  GSE (Generic Encapsulated Stream)
  GCS (Generic Continuous Stream)
- BBFrame (BaseBand Frame) Creation
- Single PLP BBFrame
- Multiple PLP BBFrame
  Input Sync
  Delay
  NULL Deletion
  Scheduler
  Frame Delay
  Scrambling
- FEFs (Future Expansion Frames)
- FECFrame (Forward Error Correction Frame) Creation
- Bitstream to QAM Constellation formation
- FECFrames
- FEC Blocks
- TI (Time Interleaving) Blocks
- Interleaving Frames
- T2 Frame
- Super Frame Data Structuring
- T2 Gateway and Modulator strucure
- T2-MI (T2 Modulator Interface) frames

DVB-T2 ERROR CORRECTION SCHEME
- Outer BCH code
- Inner LDPC
- BCH and LDPC options
- Multipass error correction

DVB-T2 OFDM (ORTHOGONAL FREQUENCY DIVISION MULTIPLEX) SCHEME
- Guard intervals
- Modulation Schemes
- QPSK, 16 QAM, 64 QAM, 256 QAM
- Constellation Rotation
- Pilot Tones
- PAPR (Peak to Average Power Ratio) Reduction
- ACE (Active Constellation Extension)
- TR (Tone Reservation)

- IFFT (Inverse Fast Fourier Transform)

DVB-T2 INTERLEAVING
- Bit Interleaver
- Time Interleaver
- Frequency Interleaver

DVB-T2 SIGNALLING
- P1 Symbol
- S1 Signal
- S2 Signal
- P2 symbol, L1 pre-signal and L1 post-signal
- P2 symbol
- L1 pre-signalling
- L1 post-signalling