DTAPI

|Multi-PLP Extensions

REFERENCE

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Struct DtBigTsSplitPars

Structure for specifying the parameters for the "Big-TS splitting" operation, which is defined for DVB-C2 and DVB-T2. This operation splits one "big" Transport Stream into multiple SPTSes (Single Program Transport Streams), one for each data PLP in the group. Each SPTS will contain one service and adapted PSI/SI. The Transport Stream for the common PLP gets the common SI.

The parameters in this structure are used for the creation and modification of PAT, SDT and EIT tables for a single PLP. Furthermore it specifies the PIDs to be included in the Transport Stream. This structure is used in class `DtPlpInPars`.

```
struct DtBigTsSplitPars
{
  bool   m_Enabled;           // Enable "Big-TS splitting"
  bool   m_IsCommonPlp;       // Common PLP (yes/no)
  bool   m_SplitSdtIn;        // SDT is already split (yes/no)
  std::vector<int>  m_Pids;   // Series of PIDs to include
  // Parameters below are not used in case m_IsCommonPlp == true
  int   m_OnwId;              // Original Network ID of the Big TS
  int   m_TsId;               // Transport Stream ID of the Big TS
  int   m_ServiceId;          // ID of the service to include in PLP
  int   m_PmtPid;             // PID of the PMT table of selected service
  int   m_NewTsId;            // Transport Stream ID of the TS in the PLP
  // Parameters below are not used in case m_SplitSdtIn == true
  int   m_SdtLoopDataLength;        // SDT loop data length
  unsigned char  m_SdtLoopData[168];  // The SDT-actual loop data
};
```

Members

m_Enabled

If true, "Big-TS splitting" is enabled, otherwise it is disabled and the remaining parameters are not used. Big-TS splitting is supported for DVB-C2 and DVB-T2.

m_IsCommonPlp

If true, the type of the associated PLP is a common PLP, otherwise the type is a data PLP.

m_SplitSdtIn

If true, the "Big TS" is "MPLP-prepared" and already contains separated SDT subtables for each PLP.

m_Pids

Series of PID values that specify the elementary streams to be included in Transport Stream for the associated PLP (e.g. for the data PLP: service components, ECM and PCR PIDs and for the common PLP: CAT, NIT, TOT, TDT-table PIDs).

The following parameters are not used if parameters are related to a common PLP (*m_IsCommonPlp* equals *true*).

m_OnwId, m_TsId, m_ServiceId

Identifies a service from the "Big TS" to include in the Transport Stream for the PLP.

m_PmtPid

> The PID of the PMT-table of the selected service, needed for the creation of a new PAT-table.

m_NewTsId

> Specifies the Transport Stream ID of the newly created TS in the PLP.

The following parameters are not used if the "Big TS" already contains separated SDT subtables for each PLP (*m_SplitSdtIn* equals *true*); otherwise, a new SDT-actual table is created for the selected service with the aid of the parameters below.

m_SdtLoopDataLength

> Length of the new SDT-loop data for the selected service. The valid range is 0, 5 … 168.

m_SdtLoopData

> Specifies the new SDT-actual loop data for the selected service. The SDT-loop data starts with the service_id field and includes the SDT-loop descriptors. The maximum length of the SDT-loop data is 168 bytes.

Struct DtComplexFloat

Structure describing a complex floating-point number.

```
Struct DtComplexFloat
{
  int   m_Re;                    // Real part
  int   m_Im;                    // Imaginary part
};
```

Members

m_Re
    The real part of the complex floating-point number.

m_Im
    The imaginary part of the complex floating-point number.

Struct DtPlpInpPars

Structure for specifying the input stream for a PLP. This structure is used in class **DtDvbC2Pars**, **DtDvbT2ComponentPars** and in class **DtIsdbTmmPars**, in an array of structs. The index in the array corresponds to the index of the related PLP (or TS in case of ISDB-Tmm).

```
struct DtPlpInpPars
{
   int  m_FifoIdx;                      // Index of input FIFO
   InDataType  m_DataType;              // Input data type
   DtBigTsSplitPars  m_BigTsSplit;      // Big-TS splitting parameters
};
```

Members

m_FifoIdx

> The index of the FIFO used by the associated PLP. PLPs in the same group that have "Big-TS" splitting enabled can share the same input FIFO.
> The index will be used in several methods that operate on a specific FIFO (e.g. **DtMplpOutpChannel::WriteMplp()**).
> The default value of *m_FifoIdx* is equal to the index in the array of **DtPlpInpPars** structs. For writing data to the nth PLP (which is specified at index n in the array of **DtPlpInpPars**) you have to use FIFO index n.
> The valid range of *m_FifoIdx* is 0 … 255.

m_DataType

> Specifies the type of the input data.

Value	Meaning
TS188	188-byte TS packets
TS204	204-byte TS packets

m_BigTsSplit

> Specifies (for this PLP) the parameters for the "Big-TS" splitting operation.

Struct DtTestPointOutPars

Test-point data generation is specified by the Verification and Validation (V&V) group for DVB-C2 and DVB-T2 as a means for the verification and validation of the DVB specifications. Structure **DtTestPointOutPars** enables or disables test-point data generation, and – if enabled – specifies the associated handler.

This structure is used in class **DtDvbC2Pars** and in class **DtDvbT2ComponentPars**.

```
struct DtTestPointOutPars
{
  bool  m_Enabled;                    // Enable test points (yes/no)
  void*  m_pTpWriteDataOpaque;        // Opaque pointer
  DtTpWriteDataFunc*  m_pTpWriteDataFunc; // Test-point data handler
};
```

Members

m_Enabled

   If true, the generation of test point data is enabled. Whenever test point data is available, the callback function is called and the test point data is passed to the callback function. Note that test point data generation cannot be performed in real time.

m_pTpWriteDataOpaque

   Opaque pointer that is passed to the callback function.

m_pTpWriteDataFunc

   Pointer to the callback function of type **DtTpWriteDataFunc** that handles the generated test point data.

Struct DtVirtualOutData

Structure describing the type of output data generated by a virtual output.

```
struct DtVirtualOutData
{
 OutDataType  m_DataType;              // Output data type
 union {
   struct {                           // 16-bit int I/Q samples
     const unsigned char**  m_pBuffer; // Array of buffers
     int  m_NumBuffers;               // #Buffers
     int  m_NumBytes;                 // #Bytes in each buffer
   } IqSamplesInt16;
   struct {                           // 32-bit float I/Q samples
     const unsigned char**  m_pBuffer; // Array of buffers
     int  m_NumBuffers;               // #Buffers
     int  m_NumBytes;                 // #Bytes in each buffer
   } IqSamplesFloat32;
   struct {                           // 188byte T2MI TS packets
     const unsigned char*  m_pBuffer; // Pointer to TS packet(s)
     int  m_NumBytes;                 // #Bytes
     __int64  m_T2MiFrameNr;          // T2MI frame counter
   } T2MiTs188;
 } u;
};
```

Members

m_DataType
> Type of output data.

Value	Meaning
IQ_INT16	Pairs of signed 16-bit integers in I, Q order, little Endian
IQ_FLOAT32	Pairs of 32-bit floats in I, Q order
T2MI_TS188	T2-MI packets encapsulated into DVB/MPEG Transport Stream packets

u.IqSamplesInt16
> Structure used in case *m_DataType* equals **IQ_INT16**.

u.IqSamplesInt16.m_pBuffer
> Pointer to an array of *m_NumBuffers* pointers to buffers of length *m_NumBytes*.
> The buffers contain pairs of signed 16-bit integers in I, Q order, little Endian.

u.IqSamplesInt16.m_NumBuffers
> The number of buffers. There is one output buffer for each output channel (e.g. 2 buffers in case of MISO).

u.IqSamplesInt16.m_NumBytes
> The number of bytes in each buffer.

u.IqSamplesFloat32
> Structure used in case *m_DataType* equals **IQ_Float32**.

u.IqSamplesFloat32.m_pBuffer

Pointer to an array of *m_NumBuffers* pointers to buffers of *m_NumBytes* length.
The buffers contain pairs of 32-bit floats in I, Q order.

u.IqSamplesFloat32.m_NumBuffers

The number of buffers. There is one output buffer for each output channel (e.g. 2 buffers in case of MISO).

u.IqSamplesFloat32.m_NumBytes

The number of bytes in each buffer.

u.T2MiTs188

Structure used in case *m_DataType* equals **T2MI_TS188**.

u.T2MiTs188.m_pBuffer

Pointer to a buffer with 188-byte Transport Packets encapsulating T2-MI packets.

u.T2MiTs188.m_NumBytes

The number of bytes in the buffer.

u.T2MiTs188.m_T2MiFrameNr

DVB-T2 superframe counter. The counter is incremented each time the buffer contains a packet that contributes to a new DVB-T2 superframe. This parameter enables cutting of the output data stream at DVB-T2 superframe boundaries.

Struct DtVirtualOutPars

Structure for specifying the output data type in case the output data is generated for a virtual output.

```
struct DtVirtualOutPars
{
    bool  m_Enabled;                              // Parameters enabled
    DtVirtualOutData::OutDataType  m_DataType;    // Output data type
    double  m_Gain;                               // RMS of the I/Q samples
};
```

Members

m_Enabled

If true, the parameters in **DtVirutalOutPars** overrule the default values; otherwise, default output data type and gain will be used.

m_DataType

Specifies the type of output data for the virtual output.

Value	Meaning
IQ_INT16	Pairs of signed 16-bit integers in I, Q order, little Endian
IQ_FLOAT32	Pairs of 32-bit floats in I, Q order
T2MI_TS188	T2-MI packets encapsulated into DVB/MPEG Transport Stream packets

m_Gain

If the output data type is either **IQ_INT16** or **IQ_FLOAT32**, this field specifies the Root Mean Square (RMS) of the complex samples. This value should be set as large as possible to have the largest SNR, but small enough to avoid saturation. When a DekTec card is used for play-out of the I/Q samples, the value 5000 is an appropriate value.

Struct DtDvbC2DSlicePars

Structure describing DVB-C2 parameters for one data slice. This structure is used in class **DtDvbC2Pars**, in an array of **DTAPI_DVBC2_NUM_DSLICE_MAX** structs for the data slices.

```
struct DtDvbC2DSlicePars
{
  int   m_Id;                // Data slice ID
  int   m_TunePosition;      // Tune position
  int   m_OffsetLeft;        // Data slice left offset (start position)
  int   m_OffsetRight;       // Data slice right offset (end position)
  int   m_TiDepth;           // Time interleaving depth
  int   m_Type;              // Data slice type
  int   m_FecHdrType;        // FEC header type
  bool  m_ConstConfig;       // Constant data slice configuration(yes/no)
  bool  m_LeftNotch;         // Left notch present (yes/no)
  std::<vector<DtDvbC2PlpPar> m_Plps; // PLPs
};
```

Members

m_Id

  Unique identification of the data slice within a C2-System. The valid range is 0 … 255.

m_TunePosition

  Tune position of the associated data slice relative to the start frequency of the C2-System, in multiples of pilot carrier spacing.
  The valid range is 0 … 8191 if the guard interval is 1/128.
  The valid range is 0 … 16383 if the guard interval is 1/64.

m_OffsetLeft

  Start position of the associated data slice by means of the distance to the left from the tuning position, in multiples of the pilot carrier spacing.
  The valid range is -128 … 127 if the guard interval is 1/128.
  The valid range is -256 … 255 if the guard interval is 1/64.

m_OffsetRight

  End position of the associated data slice by means of the distance to the right from the tuning position, in multiples of the pilot carrier spacing.
  The valid range is -128 … 127 if the guard interval is 1/128.
  The valid range is -256 … 255 if the guard interval is 1/64.
  If *m_OffsetLeft* equals *m_OffsetRight,* the data slice is empty and no input streams are created for the PLPs of the data slice.

m_TiDepth

Time interleaving depth within the associated data slice.

Value	Meaning
`DTAPI_DVBC2_TIDEPTH_NONE`	No time interleaving
`DTAPI_DVBC2_TIDEPTH_4`	4 OFDM symbols
`DTAPI_DVBC2_TIDEPTH_8`	8 OFDM symbols
`DTAPI_DVBC2_TIDEPTH_16`	16 OFDM symbols

m_Type

Data slice type.

Value	Meaning
`DTAPI_DVBC2_DSLICE_TYPE_1`	Data slice type 1
`DTAPI_DVBC2_DSLICE_TYPE_2`	Data slice type 2

m_FecHdrType

FEC frame header type.

Value	Meaning
`DTAPI_DVBC2_FECHDR_TYPE_ROBUST`	Robust mode
`DTAPI_DVBC2_FECHDR_TYPE_HEM`	High efficiency mode

m_ConstConfig

If true, indicates that the configuration of the associated data slice shall not change; otherwise, the configuration is assumed to be variable.

m_LeftNotch

If true, indicates the presence of a left neighboured notch band.

m_Plps

A vector specifying the DVB-C2 modulation parameters for the physical layer pipes.

Struct DtDvbC2L1UpdateDSlicePars

Structure describing DVB-C2 parameter updates for one data slice. This structure is used in class `DtDvbC2L1UpdatePars`.

```
struct DtDvbC2L1UpdateDSlicePars
{
  bool  m_Enable;            // Enable the data slice (yes/no)
  int   m_OffsetLeft;        // Updated data slice left offset
  int   m_OffsetRight;       // Updated data slice right offset
  std::<vector<DtDvbC2L1UpdatePlpPar> m_Plps; // L1 PLP updates
};
```

Members

m_Enable

If true, the data slice is enabled, otherwise it is disabled and the remaining parameters are not used. Only enabled data slices will occur in the L1 signalling.
Note that only "empty" data slices can be disabled. An empty data slice is either a data slice where *m_OffsetLeft== m_OffsetRight* in the global configuration, or a data slice where all PLPs have *m_NoData==true.*

m_OffsetLeft

Updated start position of the associated data slice by means of the distance to the left from the tuning position, in multiples of the pilot carrier spacing.
The valid range is -128 … 127 if the guard interval is 1/128.
The valid range is -256 … 255 if the guard interval is 1/64.

m_OffsetRight

Updated end position of the associated data slice by means of the distance to the right from the tuning position, in multiples of the pilot carrier spacing.
The valid range is -128 … 127 if the guard interval is 1/128.
The valid range is -256 … 255 if the guard interval is 1/64.

If the data slice is not empty then for type 1 data slices no change is accepted and for type 2 must hold that *m_OffsetLeft< m_OffsetRight*. It is up to the user to ensure that there is sufficient bandwidth and no bitrate overflow.

m_Plps

A vector specifying the DVB-C2 parameters updates for the physical layer pipes. Note that the number of physical layer pipes and the order of physical layer pipes must be the same as in the global configuration.

Struct DtDvbC2L1UpdatePlpPars

Structure describing DVB-C2 parameter updates for one physical layer pipe. This structure is used in class **DtDvbC2L1UpdateDSlicePars**.

```
struct DtDvbC2L1UpdatePlpPars
{
  bool  m_Enable;              // Enable the PLP (yes/no)
};
```

Members

m_Enable

If true, the physical layer pipe is enabled, otherwise it is disabled. Only enabled physical layer pipes will occur in the L1 signalling.

Note that only physical layer pipes where *m_NoData==true* can be disabled.

Struct DtDvbC2L1UpdatePars

Structure describing the updated DVB-C2 L1 signalling part2 parameters. This structure is used in class `DtDvbC2Pars`.

```
struct DtDvbC2L1UpdatePars
{
   int  m_NumFrames;            // Number of C2 frames the update is used
   // L1 data slice updates
   std::vector<DtDvbC2L1UpdateDSlicePars>  m_DSlices;
};
```

Members

m_NumFrames
   Number of C2 frames the updated data slice parameters are used.

m_DSlices
   A vector specifying for each data slice the updated data slice parameters.
   Note that the number of data slices and the order of data slices must be the same as in `DtDvbC2Pars`.

Struct DtDvbC2ModStatus

Structure containing the status of the DVB-C2 modulator. This structure is an output parameter of `DtMplpOutpChannel::GetMplpModStatus`.

```
struct DtDvbC2ModStatus
{
  int   m_MplpModFlags;       // Multi-PLP-modulator flags
  __int64  m_DjbOverflows;   // Number of DJB overflows
  __int64  m_DjbUnderflows;  // Number of DJB underflows
};
```

Members

m_MplpModFlags
Multi-PLP-modulator flags. If the modulator stalls *m_MplpModFlags* is set to a nonzero value.

m_DjbOverflows
Total number De-Jitter Buffer overflows.
If such overflow occurs, the *DtDvbC2PlpPars::m_IssyOutputDelay* parameter must be decreased or *DtDvbC2PlpPars::m_IssyBufs* must be increased.

m_DjbUnderflows
Total number De-Jitter Buffer underflows.
If such underflow occurs, the *DtDvbC2PlpPars::m_IssyOutputDelay* parameter must be increased.

Struct DtDvbC2NotchPars

Structure specifying a DVB-C2 notch band. This structure is used in class `DtDvbC2Pars`, in an array of `DTAPI_DVBC2_NUM_NOTCH_MAX` structs.

```
struct DtDvbC2NotchPars
{
  int  m_Start;                // Notch start
  int  m_Width;                // Notch width
};
```

Members

m_Start

Start position of the notch band relative to the start frequency of the C2-System. The start position is indicated in multiples of pilot carrier spacing.
The valid range is 0 … 8191 if the guard interval is 1/128.
The valid range is 0 … 16383 if the guard interval is 1/64.

m_Width

Width of the notch band indicated in multiples of pilot carrier spacing.
The valid range is 0 … 255 if the guard interval is 1/128.
The valid range is 0 … 511 if the guard interval is 1/64.

Struct DtDvbC2PaprPars

Structure for specifying PAPR reduction parameters. This structure is used in class `DtDvbC2Pars`.

```
struct DtDvbC2PaprPars
{
  bool   m_TrEnabled;          // PAPR TR enabled
  double  m_TrVclip;           // Clipping threshold
  int   m_TrMaxIter;           // Maximum number of iterations
};
```

Members

m_TrEnabled
  If true, PAPR TR is active, otherwise PAPR TR is not active.

m_TrVclip
  PAPR TR clipping threshold. The valid range is 1 … 4.32 (Volt).

m_TrMaxIter
  Maximum number of iterations. Must be greater than or equal to 1.
  Note: PAPR TR processing time is proportional to this parameter.

Struct DtDvbC2ParamInfo

Structure containing the DVB-C2 "derived" parameters: the value of the members follows from the basic DVB-C2 modulation parameters.

This structure is an output parameter of **DtDvbC2Pars::GetParamInfo**.

```
struct DtDvbC2ParamInfo
{
   int  m_L1Part2Length;      // Number of bits of the L1 part2 data
   int  m_NumL1Symbols;       // Total number of symbols per frame
   int  m_NumSymbols;         // Number of L1 symbols
   int  m_PilotSpacing;       // Distance between pilots
   int  m_FftSize;            // FFT size
   int  m_MinCarrierOffset;   // Lowest used carrier offset
   int  m_CenterFrequency;    // Center frequency
};
```

Members

m_L1Part2Length
   Number of bits of the L1 part 2 data (including CRC).

m_NumL1Symbols
   Number of L1 symbols (L_P).

m_NumSymbols
   Total number of symbols per frame ($L_P + L_{data}$).

m_PilotSpacing
   The number of carriers between pilots (D_X).

m_FftSize
   FFT size.

m_MinCarrierOffset
   The lowest used carrier offset.

m_CenterFrequency
   Center frequency, expressed as the distance from 0 Hz in multiples of the carrier spacing.

Struct DtDvbC2PlpPars

Structure specifying the DVB-C2 modulation parameters for one physical layer pipe. This structure is used in class **DtDvbC2DSlicePars**.

```
struct DtDvbC2PlpPars
{
   bool  m_Hem;                // High Efficiency Mode (yes/no)
   bool  m_Npd;                // Null Packet Deletetion (yes/no)
   int  m_Issy;                // ISSY mode
   int  m_IssyBufs;            // ISSY BUFS
   int  m_IssyOutputDelay;     // ISSY output delay in T units
   int  m_TsRate;              // Transport stream rate
   int  m_Ccm;                 // ACM/CCM bit in the BBFrame header 0 or 1
   int  m_Id;                  // PLP ID
   int  m_Type;                // PLP type
   bool  m_Bundled;            // PLP bundled (yes/no)
   int  m_GroupId;             // PLP group ID
   int  m_FecType;             // FEC type
   int  m_CodeRate;            // Code rate
   int  m_Modulation;          // Modulation type
   int  m_HdrCntr;             // Header counter
   std::vector<DtDvbC2XFecFrameHeader>  m_AcmHeaders;   // ACM headers
   bool  m_PsiSiReproc;        // PSI/SI reprocessing is performed (yes/no)
   int  m_TsId;                // Transport stream ID
   int  m_OnwId;               // Original network ID
   bool  m_NoData;             // No input data is provided for this PLP
};
```

Members

m_Hem

 If true, the PLP uses High Efficiency Mode (HEM), otherwise Normal Mode (NM) is used.

m_Npd

 If true, null-packet deletion is active, otherwise it is not active.

m_Issy

 ISSY mode, according to the table below.

Value	Meaning
DTAPI_DVBC2_ISSY_NONE	No ISSY field is used
DTAPI_DVBC2_ISSY_SHORT	2 byte ISSY field is used
DTAPI_DVBC2_ISSY_LONG	3 byte ISSY field is used

m_IssyBufs

 ISSY 'BUFS' value. The valid range is 0 … 2097151

m_IssyOutputDelay

 Delay (in T units) between the incoming data and the output data in the receiver model. This value determines the minimum and maximum dejitter buffer usage and is used to compute the ISSY 'BUFSTAT' field.

m_TsRate

> Transport-Stream rate in bps. If *m_TsRate* is set to '0', no ISSY is used and null-packet deletion is not active then the transport stream rate is computed from the PLP parameters.

m_Ccm

> ACM/CCM-field (Adaptive Coding and Modulation or Constant Coding and Modulation) in the BBFrame header 0 or 1.

m_Id

> Unique identification of the PLP within a C2-System. The valid range is 0 … 255.

m_Bundled

> If true, the associated PLP is bundled with other PLP(s) within the current C2 System. All the bundled PLPs have the same PLP ID. An input stream is created only for the first PLP of the bundle.

m_Type

> PLP type.

Value	Meaning
DTAPI_DVBC2_PLP_TYPE_COMMON	Common PLP
DTAPI_DVBC2_PLP_TYPE_GROUPED	Grouped data PLP
DTAPI_DVBC2_PLP_TYPE_NORMAL	Normal data PLP

m_GroupId

> Identifies the PLP group with which the PLP is associated. The valid range is 0 … 255.

m_FecType

> FEC type used by the PLP.

Value	Meaning
DTAPI_DVBC2_LDPC_16K	16K LDPC
DTAPI_DVBC2_LDPC_64K	64K LDPC

m_CodeRate

> Convolutional coding rate used by the PLP.

Value	Meaning
DTAPI_DVBC2_COD_2_3	2/3
DTAPI_DVBC2_COD_3_4	3/4
DTAPI_DVBC2_COD_4_5	4/5
DTAPI_DVBC2_COD_5_6	5/6
DTAPI_DVBC2_COD_8_9	8/9 (for 16K FEC)
DTAPI_DVBC2_COD_9_10	9/10 (for 64K FEC)

m_Modulation

Modulation used by the PLP.

Value	Meaning
`DTAPI_DVBC2_QAM16`	16-QAM
`DTAPI_DVBC2_QAM64`	64-QAM
`DTAPI_DVBC2_QAM256`	256-QAM
`DTAPI_DVBC2_QAM1024`	1024-QAM
`DTAPI_DVBC2_QAM4096`	4096-QAM
`DTAPI_DVBC2_QAM16384`	16384-QAM
`DTAPI_DVBC2_QAM65536`	65536-QAM

m_HdrCtr

Header counter field, number of FECFrames following the FECFrame header: 0=1 FECFrame; 1=2 FECFrames.

m_AcmHeaders

A vector that holds the XFEC Frame modulation parameters for Adaptive Coding and Modulation (ACM) testing. If the number of ACM headers is greater than zero, then the successive XFEC frames of this PLP use the modulation and coding parameters from the m_AcmHeaders vector. After the last value is used, it loops again to the start of the vector. In this case the *m_FecType, m_Modulation, m_CodeRate* and *m_HdrCntr* parameters from the **DtDvbC2PlpPars** structure are ignored.

m_PsiSiReproc

If true, indicates that PSI/SI has been reprocessed.

m_TsId, m_OnwId

If *m_PsiSiReproc* is set to 'false', these members specify the Transport Stream ID and Original Network ID of the TS in the PLP. A receiver will use these fields if it can't rely on the PSI/SI.

m_NoData

If true, no input data is provided for this PLP. It is implicitly true for all PLPs in a data slice where *m_OffsetLeft == m_OffsetRight*.

Struct DtDvbC2XFecFrameHeader

Structure describing the coding and modulation parameters for a series of XFEC frames for Adaptive Coding and Modulation (ACM) tests. This structure is used in class **DtDvbC2PlpPars**.

```
struct DtDvbC2XFecFrameHeader
{
  int  m_FecType;            // PLP FEC type
  int  m_Modulation;         // PLP modulation
  int  m_CodeRate;           // PLP code rate
  int  m_HdrCntr;            // Header counter
  int  m_XFecFrameCount;     // Number XFEC frames using these parameters
};
```

Members

m_FecType
    PLP FEC type. See **DtDvbC2PlpPars** for a list of applicable values.

m_Modulation
    PLP modulation. See **DtDvbC2PlpPars** for a list of applicable values.

m_CodeRate
    PLP code rate. See **DtDvbC2PlpPars** for a list of applicable values.

m_HdrCntr
    PLP header counter. See **DtDvbC2PlpPars** for a list of applicable values.

m_XFecFrameCount
    Number of XFEC frames using the parameters. The valid range is 1 … 256.

Struct DtDvbT2AuxPars

Structure for specifying AUX stream parameters, which can be inserted for test purposes. This structure is used in class `DtDvbT2ComponentPars`.

```
struct DtDvbT2AuxPars
{
    int    m_NumDummyStreams;   // Number of dummy AUX streams
};
```

Members

m_NumDummyStreams

Number of dummy AUX streams added for test purposes.
If TX signature through AUX streams is enabled, the valid range is 0 ...14; otherwise, the valid range is 0 …15.

Struct DtDvbT2MiPars

Structure for enabling T2-MI generation, and for specifying its parameters. This structure is used in class **DtDvbT2Pars**.

```
Struct DtDvbT2MiPars
{
  bool   m_Enabled;           // Enable T2-MI output
  int    m_Pid;               // (First) T2-MI data PID
  int    m_StreamId;          // Stream-id for the (first) T2-MI stream
  int    m_Pid2;              // Second T2-MI data PID
  int    m_StreamId2;         // Stream-id for the second T2-MI stream
  int    m_PcrPid;            // T2-MI PCR PID
  int    m_PmtPid;            // T2-MI PMT PID
  int    m_TsRate;            // T2-MI Transport-Stream rate
  int    m_TimeStamping;      // T2-MI timestamping
  __int64  m_SecSince2000;    // First T2-MI output timestamp value
  int    m_Subseconds;        // Number of subseconds
  int    m_T2miUtco;          // Offset in seconds between UTC and Y2000
  bool   m_EncodeFef;         // Encode FEF (yes/no)
};
```

Members

m_Enabled

If true, T2-MI generation is enabled. An MPEG-2 Transport Stream is generated containing Transport Packets that encapsulate the T2-MI packets.

m_Pid

PID carrying the T2-MI packet data. The valid range is 0 … 8190.

m_StreamId

Stream-id for the generated T2-MI stream. The valid range is 0 … 7.

m_Pid2

A second PID carrying the T2-MI packet data, used in case of multi-profile stream generation. The valid range is 0 … 8190.

m_StreamId2

Stream-id for the second generated T2-MI stream, used in case of multi-profile stream generation. The valid range is 0 … 7.

m_PcrPid

PID carrying PCR values. If *m_PcrPid* equals -1, no PCRs are inserted in the Transport Stream; otherwise a PCR is inserted on the indicated PID once per 40ms. The valid range is -1 … 8190.

m_PmtPid

PID carrying the PMT-table. If *m_PmtPid* equals -1, no PAT and no PMT-table are inserted in the Transport Stream; otherwise, PAT and PMT are inserted on PID 0 once per 100ms. The valid range is -1 … 8190.

m_TsRate

T2-MI Transport-Stream rate in bits per second.

m_TimeStamping

Type of DVB-T2 timestamps to insert.

Value	Meaning
`DTAPI_DVBT2MI_TIMESTAMP_NULL`	Null timestamp
`DTAPI_DVBT2MI_TIMESTAMP_REL`	Relative timestamps. Use *m_Subseconds*.
`DTAPI_DVBT2MI_TIMESTAMP_ABS`	Absolute timestamps. Use *m_SecSince2000*, *m_Subseconds* and *m_T2MiUtco*.

m_SecSince2000

Number of seconds since 2000-01-01 00:00:00 UTC. This value is inserted in the first DVB-T2 timestamp that is generated. Subsequent timestamps are computed.
This field is used if *m_TimeStamping* equals `DTAPI_DVBT2MI_TIMESTAMP_ABS`.

m_Subseconds

Number of subsecond units (T_{sub}) elapsed since the time expressed in the seconds field. This value is inserted in the first generated DVB-T2 timestamp. Subsequent timestamps are computed.
This field is used if *m_TimeStamping* is either `DTAPI_DVBT2MI_TIMESTAMP_REL` or `TAPI_DVBT2MI_TIMESTAMP_ABS`.
The T2 system bandwidth defines the units of the subseconds as shown in the table below.

Bandwidth	Subseconds units, T_{sub}
`1.7 MHz`	$1/131\ \mu s$
`5 MHz`	$1/40\ \mu s$
`6 MHz`	$1/48\ \mu s$
`7 MHz`	$1/56\ \mu s$
`8 MHz`	$1/64\ \mu s$
`10 MHz`	$1/80\ \mu s$

m_T2MiUtco

Offset in seconds between UTC and *m_SecSince2000*. As of February 2009 the value shall be 2 and shall change as a result of each new leap second. This field is used if *m_TimeStamping* equals `DTAPI_DVBT2MI_TIMESTAMP_ABS`.

m_EncodeFef

If true, generates a FEF part composite packet with the required subpart. Otherwise, only generates a FEF part NULL packet when FEF is enabled.

Struct DtDvbT2ModStatus

Structure containing the status of the DVB-T2 modulator. This structure is an output parameter of `DtMplpOutpChannel::GetMplpModStatus`.

```
struct DtDvbT2ModStatus
{
  int   m_MplpModFlags;              // Multi-PLP-modulator flags
  __int64  m_PlpNumBlocksOverflows;  // Number of PLP block overflows
  __int64  m_BitrateOverflows;       // Number of bitrate overflows
  __int64  m_TtoErrorCount;          // Number of invalid TTOs
  // T2MI specific
  __int64  m_T2MiOutputRateOverflows; // Number of T2MI rate overflows
  int   m_T2MiOutputRate;            // Current effective T2MI rate
};
```

Members

m_MplpModFlags

Multi-PLP-modulator flags. If the modulator stalls *m_MplpModFlags* is set to a nonzero value.

m_PlpNumBlocksOverflows

Total number of FEC frames for which the requested number of PLP blocks is greater than *DtDvbT2PlpPars::m_NumBlocks*. An overflow results in an invalid stream.

m_BitrateOverflows

Total number FEC frames for which too many bits were allocated. An overflow results in an invalid stream.

m_TtoErrorCount

Number of times the generated TTO value was invalid. Typically this occurs if *DtDvbT2PlpPars::m_IssyTDesign* is too small.

m_T2MiOutputRateOverflows

Number of T2-MI bitrate overflows. The *DtDvbT2MiPars::m_TsRate* must be increased for reliable operation.

m_T2MiOutputRate

Current T2-MI rate excluding null packets in bps.

Struct DtDvbT2PaprPars

Structure for specifying the PAPR reduction parameters. This structure is used in class `DtDvbT2ComponentPars`.

```
struct DtDvbT2PaprPars
{
  bool   m_AceEnabled;        // PAPR ACE enabled
  double m_AceVclip;          // ACE clipping threshold
  double m_AceGain;           // ACE gain
  double m_AceLimit;          // ACE limit
  int    m_AceInterpFactor;   // ACE interplation factor
  int    m_AcePlpIndex;       // PLP used for PAPR ACE
  bool   m_TrEnabled;         // PAPR TR enabled
  bool   m_TrP2Only           // PAPR TR is only applied on the P2 symbol
  double m_TrVclip;           // TR clipping threshold
  int    m_TrMaxIter;         // TR maximum number of iterations
  int    m_L1ExtLength;       // L1 extension field length
  bool   m_L1AceEnabled;      // L1 ACE enabled
  double m_L1AceCMax;         // L1 ACE max constellation extension value
  bool   m_L1Scrambling;      // L1 Post Scrambling (for V1.3.1 only)
  // Parameters only applicable for DVB-T2 V1.2.1
  int    m_NumBiasBalCells;   // Number cells added to reduce P2 PAPR
  int    m_BiasBalancing;     // L1 bias compensation
};
```

Members

m_AceEnabled
If true, PAPR ACE is active, otherwise PAPR ACE is not active.

m_AceVclip
PAPR ACE clipping threshold. The valid range is 1 … 4.32 (Volt).

m_AceGain
PAPR ACE gain. The valid range is 0 … 31 (steps of 1).

m_AceLimit
PAPR ACE limit. The valid range is 0.7 … 1.4 (steps of 0.1).

m_AceInterpFactor
PAPR ACE interpolation factor. The valid range is 1 … 4.
Note: PAPR ACE processing time is proportional to this parameter.

m_AcePlpIndex
PLP used for the PAPR ACE.

m_TrEnabled
If true, PAPR TR is active, otherwise PAPR TR is not active.

m_TrP2Only
If true, PAPR TR is only applied on the P2 symbol, otherwise PAPR TR is applied on all symbols.

m_TrVclip
PAPR TR clipping threshold. The valid range is 1 … 4.32 (Volt).

m_TrMaxIter

Maximum number of iterations. Must be greater than or equal to 1.
Note: PAPR TR processing time is proportional to this parameter.

m_L1ExtLength

L1 extension field length. The valid rang is 0 … 65535.

m_L1AceEnabled

If true, L1 ACE is active, otherwise L1 ACE is not active. Only applicable when DVB-T2 V1.3.1 is selected.

m_L1AceCMax

Maximum value added to extend the QAM constellation values of L1.

m_L1Scrambling

If true, L1-Post scrambling is active.

m_NumBiasBalCells

Number of dummy cells added to reduce the P2 PAPR.
The valid range is 0 … *DtDvbT2ParamInfo::m_BiasBalCellsMax.*

m_BiasBalancing

L1 bias balancing.

Value	Meaning
DTAPI_DVBT2_BIAS_BAL_OFF	No L1 bias compensation
DTAPI_DVBT2_BIAS_BAL_ON	Modify the L1 reserved fields and L1 extension field padding to compensate the L1 bias

Struct DtDvbT2ParamInfo

Structure containing the DVB-T2 "derived" parameters: the value of the members follows from the basic DVB-T2 modulation parameters.

This structure is an output parameter of `DtDvbT2Pars::GetParamInfo` and `DtDvbT2Pars::OptimisePlpNumBlocks`.

```
struct DtDvbT2ParamInfo{
  int  m_TotalCellsPerFrame;    // Total number of cells per frame
  int  m_L1CellsPerFrame;       // #L1 cells per frame
  int  m_AuxCellsPerFrame;      // #Aux stream cells per frame
  int  m_BiasBalCellsPerFrame;  // #Bias balancing cells per frame
  int  m_BiasBalCellsMax;       // Max #bias balancing cells
  int  m_DummyCellsPerFrame;    // #Dummy cells per frame
  int  m_SamplesPerFrame;       // #Samples per frame
};
```

Members

m_TotalCellsPerFrame
   Total number of cells per frame.

m_L1CellsPerFrame
   Total number of cells per frame used for L1 signalling.

m_AuxCellsPerFrame
   Total number of auxiliary stream cells per frame.

m_BiasBalCellsPerFrame
   Total number of L1 bias balancing cells per frame.

m_BiasBalCellsMax
   Maximum number of L1 bias balancing cells per P2.

m_DummyCellsPerFrame
   Total number of cells lost per frame; dummy cells overhead = *m_DummyCellsPerFrame / m_TotalCellsPerFrame*. It is only computed for the first frame.

m_SamplesPerFrame
   Total number of samples per frame.

Struct DtDvbT2PlpPars

Structure specifying the DVB-T2 modulation parameters for one PLP (Physical Layer Pipe). This structure is used in class **DtDvbT2ComponentPars**, in an array of **DTAPI_DVBT2_NUM_PLP_MAX** structs for the physical layer pipes.

```
struct DtDvbT2PlpPars
{
  bool  m_Hem;              // High Efficiency Mode (yes/no)
  bool  m_Npd;              // Null Packet Deletion (yes/no)
  int   m_Issy;            // ISSY mode
  int   m_IssyBufs;        // ISSY BUFS
  int   m_IssyTDesign;     // ISSY T_design value
  int   m_CompensatingDelay; // Additional delay in samples
  int   m_TsRate;          // Transport Stream rate
  int   m_Id;              // PLP ID
  int   m_GroupId;         // PLP group ID
  int   m_Type;            // PLP type
  int   m_CodeRate;        // Code rate
  int   m_Modulation;      // Modulation type
  bool  m_Rotation;        // Constellation rotation (yes/no)
  int   m_FecType;         // FEC type
  int   m_FrameInterval;   // T2-frame interval
  int   m_FirstFrameIdx;   // First frame index
  int   m_TimeIlLength;    // Time interleaving length
  int   m_TimeIlType;      // Timer interleaving type
  bool  m_InBandAFlag;     // In-band A signalling information (yes/no)
  bool  m_InBandBFlag;     // In-band B signalling information (yes/no)
  bool  m_NumBlocks;       // Maximum number of FEC blocks per IL frame

  int   m_NumOtherPlpInBand; // Number of other PLPs in the in-band sign
  int   m_OtherPlpInBand[DTAPI_DVBT2_NUM_PLP_MAX-1];
                           // Array of IDs of the other in band PLPs

  // Parmeters below are only meaningful for type 1 PLPs in TFS system.
  bool  m_FfFlag;          // FF flag
  int   m_FirstRfIdx;      // First TFS RF channel where PLP occurs
};
```

Members

m_Hem
   If true, the PLP uses High Efficiency Mode (HEM); otherwise, Normal Mode (NM) is used.

m_Npd
   If true, null-packet deletion is active.

m_Issy
   ISSY mode.

Value	Meaning
DTAPI_DVBT2_ISSY_NONE	No ISSY field is used
DTAPI_DVBT2_ISSY_SHORT	2-byte ISSY field is used
DTAPI_DVBT2_ISSY_LONG	3-byte ISSY field is used

m_IssyBufs
   ISSY 'BUFS' value. The valid range is 0 … 2097151

m_IssyTDesign

T_design value for TTO generation. Set to '0' to have the modulator choose the value. T_design is defined as the delay (in samples) between the start of the first T2 frame in which the PLP is mapped and the first output bit of the Transport Stream.

m_CompensatingDelay

Additional delay (in samples) before the TS data is sent. Set to '-1' to have the modulator choose the value.

m_TsRate

Tranport stream rate in bps. If *m_TsRate* is set to '0' and no null-packet deletion is active then the transport stream rate is computed from the PLP parameters.

m_Id

Unique identification of the PLP within a T2 system. The valid range is 0 … 255.

m_GroupId

Identifies the PLP group with which the PLP is associated. The valid range is 0 … 255.

m_Type

PLP type.

Value	Meaning
DTAPI_DVBT2_PLP_TYPE_COMM	Common PLP
DTAPI_DVBT2_PLP_TYPE_1	Data PLP type1
DTAPI_DVBT2_PLP_TYPE_2	Data PLP type2

m_CodeRate

Convolutional coding rate used by the PLP.

Value	Meaning
DTAPI_DVBT2_COD_1_2	1/2
DTAPI_DVBT2_COD_3_5	3/5
DTAPI_DVBT2_COD_2_3	2/3
DTAPI_DVBT2_COD_3_4	3/4
DTAPI_DVBT2_COD_4_5	4/5 (not for T2-Lite)
DTAPI_DVBT2_COD_5_6	5/6 (not for T2-Lite)
DTAPI_DVBT2_COD_1_3	1/3 (only for T2-Lite)
DTAPI_DVBT2_COD_2_5	2/5 (only for T2-Lite)

m_Modulation

Modulation used by the PLP.

Value	Meaning
DTAPI_DVBT2_BPSK	BPSK
DTAPI_DVBT2_QPSK	QPSK
DTAPI_DVBT2_QAM16	16-QAM
DTAPI_DVBT2_QAM64	64-QAM
DTAPI_DVBT2_QAM256	256-QAM

m_Rotation

If true, constellation rotation is used.

m_FecType

FEC type used by the PLP.

Value	Meaning
DTAPI_DVBT2_LDPC_16K	16K LDPC
DTAPI_DVBT2_LDPC_64K	64K LDPC

m_FrameInterval

The T2-frame interval within the super-frame for this PLP. The valid range is 1 ... 255.

m_FirstFrameIdx

The index of the first frame of the super-frame in which this PLP occurs. The valid range is 0 ... *m_FrameInterval*-1.

m_TimeIlLength

Time interleaving length. The valid range is 0 … 255.
If *m_TimeIlType* is set to '0' (**DTAPI_DVBT2_IL_ONETOONE**), this parameter specifies the number of TI-blocks per interleaving frame.
If *m_TimeIlType* is set to '1' (**DTAPI_DVBT2_IL_MULTI**), this parameter specifies the number of T2 frames to which each interleaving frame is mapped.

m_TimeIlType

Type of interleaving used by the PLP.

Value	Meaning
DTAPI_DVBT2_IL_ONETOONE	One interleaving frame corresponds to one T2 frame
DTAPI_DVBT2_IL_MULTI	One interleaving frame is carried in multiple T2 frames

m_InBandAFlag

If true, the in-band A flag is set and in-band A signalling information is inserted in this PLP.

m_InBandBFlag

If true, the in-band B flag is set and in-band B signalling information is inserted in this PLP.

m_NumBlocks

The maximum number of FEC blocks contained in one interleaving frame for this PLP. The valid range is 0 ... 2047.

m_NumOtherPlpInBand

Specifies the number of other PLPs in the in-band signalling. The valid range is
0 … **DTAPI_DVBT2_NUM_PLP_MAX-1**.

m_OtherPlpInBand

Array specifying the IDs of the other PLPs in the in-band signalling.

m_FfFlag

If true, the PLP occurs on the same RF channel in each T2-frame; otherwise, inter-frame TFS is
applied. This parameter is only meaningful for a type 1 PLP in a TFS system.

m_FirstRfIdx

The RF channel where this PLP occurs on in the first frame of a super-frame in a TFS system. If,
m_FfFlag is set to 'true' the field indicates the RF channel the PLP occurs on in every T2-
frame. This parameter is only meaningful for a type 1 PLP in TFS system.

Struct DtDvbT2RbmEvent

Structure containing the Receiver Buffer Model (RBM) event data. If RBM-validation is enabled then on an RBM-event the `DtDvbT2RbmEvent` parameters are sampled and passed to the RBM-event handler.

```
struct DtDvbT2RbmEvent
{
  int   m_DataPlpId;                    // Data PLP ID
  int   m_DataPlpIndex;                 // Data PLP index
  double  m_Time;                       // Time in T units
  int   m_IsCommonPlp;                  // Common PLP
  DtDvbT2RbmEvent  m_EventType;         // RBM event type
  union {
    struct {
        // DTAPI DVBT2 RBM EVENT PLOT parameters
        int  m_TdiWriteIndex;           // TDI write index
        int  m_TdiReadIndex;            // TDI read index
        int  m_TdiReadAvailable;        // Available cells in TDI buffer
        int  m_DjbSize;                 // Dejitter buffer size in bits
    } Plot;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_BUFS_TOO_SMALL parameters
        int  m_Bufs;                    // BUFS value
    } BufsTooSmall;
    struct {
        // DTAPI DVBT2 RBM EVENT TTO IN THE PAST parameters
        int  m_Tto;                     // TTO value
    } TtoInThePast;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_DJB_OVERFLOW parameters
        int  m_DjbSize;                 // Dejitter buffer size in bits
        int  m_DjbMaxSize;
    } DjbOverflow;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_CRC8_ERROR_HEADER parameters
        int  m_Val;                     // CRC8 value
    } Crc8ErrorHeader;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_DFL_TOO_LARGE parameters
        int  m_SyncD;                   // SYNCD
        int  m_Dfl;                     // DFL
    } SyncDTooLarge;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_INVALID_SYNCD parameters
        int  m_SyncD;                   // SYNCD
        int  m_Left;                    // #bytes left
    } InvalidSyncD;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_TDI_OVERFLOW parameters
        int  m_TdiWriteIndex;           // TDI write index
        int  m_TdiReadIndex;            // TDI read index
    } TdiOverflow;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_INVALID_PLP_START parameters
        int  m_PlpId1;                  // IDs of overlapping PLPs
```

```
        int   m PlpId2;
    } InvalidPlpStart;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_ISCR_ERROR parameters
        int   m_Delta;                   // Delta time in T units
    } IscrError;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_BUFS_NOT_CONSTANT parameters
        int   m_CufBufs;                 // Current and new BUFS values
        int   m_NewBufs;
    } BufsNotConstant;
    struct {
        // DTAPI_DVBT2_RBM_EVENT_PLP_NUM_BLOCKS_TOO_SMALL parameters
        int   m_PlpNumBlocks;            // Number of blocks
    } PlpNumBlocksTooSmall;
    } u;
};
```

Members

m_DataPlpId
>   Data PLP ID identifying the stream.

m_DataPlpIndex
>   Data PLP index.

m_Time
>   Time in T units.

m_IsCommonPlp
>   Indicates whether the event refers to a common PLP.
>   Possible values:
>   -1 : Event doesn't refer to a specific PLP
>   0 : Data PLP
>   1 : Common PLP

m_EventType
>   Type of Receiver Buffer Model event

Value	Meaning
`DTAPI_DVBT2_RBM_EVENT_PLOT`	Plot event
`DTAPI_DVBT2_RBM_EVENT_DJB_UNDERFLOW`	De-jitter buffer underflow
`DTAPI_DVBT2_RBM_EVENT_BUFS_TOO_SMALL`	BUFS gives too small dejitter buffer
`DTAPI_DVBT2_RBM_EVENT_TTO_IN_THE_PAST`	TTO gives time in the past
`DTAPI_DVBT2_RBM_EVENT_DJB_OVERFLOW`	De-jitter buffer overflow
`DTAPI_DVBT2_RBM_EVENT_CRC8_ERROR_HEADER`	CRC8 error in BBFrame
`DTAPI_DVBT2_RBM_EVENT_DFL_TOO_LARGE`	DFL too large in BBFrame
`DTAPI_DVBT2_RBM_EVENT_SYNCD_TOO_LARGE`	SYNCD too large in BBFrame
`DTAPI_DVBT2_RBM_EVENT_INVALID_UPL`	Invalid UPL in BBFrame

`DTAPI_DVBT2_RBM_EVENT_INVALID_SYNCD`	Invalid SYNCD in BBFrame
`DTAPI_DVBT2_RBM_EVENT_TDI_OVERFLOW`	TDI overflow
`DTAPI_DVBT2_RBM_EVENT_TOO_MANY_TI_BLOCKS`	Too many TI blocks queued
`DTAPI_DVBT2_RBM_EVENT_INVALID_PLP_START`	PLP-start values gives overlap
`DTAPI_DVBT2_RBM_EVENT_FDI_OVERFLOW`	Frequency/L1 de-interleaver overflow
`DTAPI_DVBT2_RBM_EVENT_NO_TS_RATE`	Not enough ISCR data to estimate TS rate
`DTAPI_DVBT2_RBM_EVENT_ISCR_ERROR`	ISCR error
`DTAPI_DVBT2_RBM_EVENT_BUFS_NOT_CONSTANT`	BUFS not constant
`DTAPI_DVBT2_RBM_EVENT_ISSYI_NOT_CONSTANT`	ISSYI not constant
`DTAPI_DVBT2_RBM_EVENT_HEM_NOT_CONSTANT`	HEM not constant
`DTAPI_DVBT2_RBM_EVENT_PLP_NUM_BLOCKS_TOO_SMALL`	PLP numblocks for this interleaving frame is too small

u.Plot
   Structure used for event type `DTAPI_DVBT2_RBM_EVENT_PLOT`.

u.Plot.m_TdiWriteIndex
   Write index in time de-interleaver buffer.

u.Plot.m_TdiReadIndex
   Read index in time de-interleaver buffer.

u.Plot.m_TdiReadAvailable
   Number of available cells in the time de-interleaver read buffer.

u.Plot.m_DjbSize
   De-jitter buffer size in number of bits.

u.BufsTooSmall
   Structure used for event type `DTAPI_DVBT2_RBM_EVENT_BUFS_TOO_SMALL`.

u.BufsTooSmall.m_Bufs
   BUFS value.

u.TtoInThePast
   Structure used for event type `DTAPI_DVBT2_RBM_EVENT_TTO_IN_THE_PAST`.

u.TtoInThePast.m_Tto
   TTO value from the ISSY-field

u.DjbOverflow
   Structure used for event type `DTAPI_DVBT2_RBM_EVENT_DJB_OVERFLOW`.

u.DjbOverflow.m_DjbSize
   De-jitter buffer size in bits.

u.DjbOverflow.m_DjbMaxSize
   Maximum de-jitter buffer size in bits.

u.Crc8ErrorHeader
   Structure used for event type `DTAPI_DVBT2_RBM_EVENT_CRC8_ERROR_HEADER`.

u.Crc8ErrorHeader.m_Val
   CRC-8 value from the baseband header.

u.SyncDTooLarge
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_DFL_TOO_LARGE**.

u.SyncDTooLarge.m_SyncD
   SYNCD value from the baseband header.

u.SyncDTooLarge.m_Dfl
   DFL value from the baseband header.

u.InvalidSyncD
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_INVALID_SYNCD**.

u.InvalidSyncD.m_SyncD
   SYNCD value from the baseband header.

u.InvalidSyncD.m_Left
   Number of bits remaining from the last baseband frame.

u.TdiOverflow
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_TDI_OVERFLOW**.

u.TdiOverflow.m_TdiWriteIndex
   Write index in time de-interleaver buffer.

u.TdiOverflow.m_TdiReadIndex
   Read index in time de-interleaver buffer.

u.InvalidPlpStart
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_TDI_OVERFLOW**.

u.InvalidPlpStart.m_Plp1, u.InvalidPlpStart.m_Plp2
   IDs of the overlapping PLPs.

u.IscrError
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_ISCR_ERROR**.

u.IscrError.m_Delta
   Delta time in T-units.

u.BufsNotConstant
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_TDI_OVERFLOW**.

u.BufsNotConstant.m_CurBufs, u.BufsNotConstant.m_NewBufs
   Current and new BUFS values

u.PlpNumBlocksTooSmall
   Structure used for event type **DTAPI_DVBT2_RBM_EVENT_PLP_NUM_BLOCKS_TOO_SMALL**.

u.PlpNumBlocksTooSmall.m_PlpNumBlocks
   NUM_BLOCKS value for this PLP.

Struct DtDvbT2RbmValidation

Structure for enabling Receiver Buffer Model (RBM) validation, and specifying its parameters. This structure is used in class **DtDvbT2ComponentPars**.

```
Struct DtDvbT2RbmValidation
{
   bool  m_Enabled;           // Enable RBM validation
   bool  m_PlotEnabled;       // Enable RBM plotting events
   int  m_PlotPeriod;         // Plot period in T-units
   void*  m_pCallbackOpaque;  // Opaque pointer for the callback function
   void  (*m_pCallbackFunc)( void*, const DtDvbT2RbmEvent*);
                              // Pointer to the callback function
};
```

Members

m_Enabled

> If true, Receiver Buffer Model (RBM) validation is enabled. When a RBM-violation occurs, the callback function *(*m_pCallbackFunc)* is called and an RBM-event is passed.
> Note that RBM-validation consumes a substantial amount of CPU cycles and therefore cannot always be performed in real time.

m_PlotEnabled

> If true, Receiver Buffer Model (RBM) plotting is enabled. Periodically, the callback function will be called passing a **DTAPI_DVBT2_RBM_EVENT_PLOT** event.

m_PlotPeriod

> Plot period time in T-units.

m_pCallbackOpaque

> Opaque pointer that is passed to the callback function.

m_pCallbackFunc

> Pointer to the callback function that handles the RBM-events.

Struct DtDvbT2TxSigPars

Structure for enabling and specifying the DVB-T2 transmitter signature. This structure is used in class `DtDvbT2ComponentPars`.

```
Struct DtDvbT2TxSigPars
{
   bool  m_TxSigAuxEnabled;     // Enable TX signature through AUX streams
   int  m_TxSigAuxId;           // Transmitter ID
   int  m_TxSigAuxP;            // P-value
   int  m_TxSigAuxQ;            // Q-value
   int  m_TxSigAuxR;            // R-value

   bool  m_TxSigFefEnabled;     // Enable TX signature through FEF
   int  m_TxSigFefId1;          // Transmitter ID for 1st period
   int  m_TxSigFefId2;          // Transmitter ID for 2nd period
};
```

Members

m_TxSigAuxEnabled
If true, transmitter signature transmission through AUX streams is enabled.

m_TxSigAuxId
Transmitter ID. The valid range is 0 … 3071.

m_TxSigAuxP
The total number of possible transmitter IDs (M) is derived from *m_TxSigAuxP* (P).
M = 3 * (P+1). The valid range for *m_TxSigAuxP* is 0 … 1023.

m_TxSigAuxQ
The number of cells used per transmitter (N) is derived from *m_TxSigAuxQ* (Q).
N = 2^Q. The valid range for *m_TxSigAuxQ* is 0 … 15.

m_TxSigAuxR
The number of T2-frames used per transmitter signature (L) is derived from *m_TxSigAuxR* (R).
L = R+1. The valid range for *m_TxSigAuxR* is 0 … 255.

m_TxSigFefEnabled
If true, transmitter signature transmission through FEF is enabled. To use this, FEF generation must be enabled and the FEF length must be greater than or equal to `DTAPI_TXSIG_FEF_LEN_MIN`.

m_TxSigFefId1
Transmitter ID for the first signature period. The valid range is 0 … 7.

m_TxSigFefId2
Transmitter ID for the second signature period. The valid range is 0 … 7.

Class DtDvbC2Pars

Class specifying parameters for DVB-C2 modulation.

```
class DtDvbC2Pars
{
  int   m_Bandwidth;          // Bandwidth (channel raster)
  int   m_NetworkId;          // Network ID
  int   m_C2SystemId;         // C2-System ID
  int   m_StartFrequency;     // Start frequency
  int   m_C2Bandwidth;        // Bandwidth of the generated signal
  int   m_GuardInterval;      // Guard interval
  bool  m_ReservedTone;       // Reserved tones present (yes/no)
  int   m_L1TiMode;           // L1 time interleaving mode
  // Data-slice parameters
  int   m_NumDSlices;         // Number of data slices
  DtDvbC2DSlicePars  m_DSlices[DTAPI_DVBC2_NUM_DSLICE_MAX];
  // Notches
  int   m_NumNotches;         // Number of notches
  DtDvbC2NotchPars  m_Notches[DTAPI_DVBC2_NUM_NOTCH_MAX];
  // Parameters specifying the source for each PLP
  int   m_NumPlpInputs;       // Number of PLP input streams
  DtPlpInpPars  m_PlpInputs[DTAPI_DVBC2_NUM_PLP_MAX];
  // Miscellaneous: PAPR, Virtual output, Test-point output
  DtDvbC2PaprPars  m_PaprPars;
  DtVirtualOutPars  m_VirtOutput;
  DtTestPointOutPars  m_TpOutput;
  // Parameters specifying the generated carriers of one C2-system
  int   m_OutpFreqOffset;     // Output frequency offset
  int   m_OutpBandwidth;      // Output bandwidth (0 means default)
  // L1 updates
  std::vector<DtDvbC2L1UpdatePars>  m_L1Updates;
};
```

Public members

m_Bandwidth
> Channel raster of the network.

Value	Meaning
DTAPI_DVBC2_6MHZ	6 MHz
DTAPI_DVBC2_8MHZ	8 MHz

m_NetworkId
> Network ID. Unique identification of the DVB-C2 network. The valid range is 0 … 0xFFFF.

m_C2SystemId
> C2-System ID. Unique identification of a C2-System. The valid range is 0 … 0xFFFF.

m_StartFrequency

Start frequency of the C2-System by means of the distance from 0Hz in multiples of the carrier spacing. The valid range is 0 … 0xFFFFFF and multiples of D_X. ($D_X=24$ for guard interval 1/128 and $D_X=12$ for guard interval 1/64).

m_C2Bandwidth

Bandwidth of the generated signal in multiples of pilot carrier spacing. The valid range is 0 … 65535.

m_GuardInterval

The guard interval between OFDM symbols.

Value	Meaning
DTAPI_DVBC2_GI_1_128	1/128
DTAPI_DVBC2_GI_1_64	1/64

m_ReservedTone

If true, indicates one or more reserved tones (carriers) are used. When carriers are reserved (e.g PAPR TR is enabled) it shall be set to true.

m_L1TiMode

L1 time interleaving mode.

Value	Meaning
DTAPI_DVBC2_L1TIMODE_NONE	No time interleaving
DTAPI_DVBC2_L1TIMODE_BEST	Best fit
DTAPI_DVBC2_L1TIMODE_4	4 OFDM symbols
DTAPI_DVBC2_L1TIMODE_8	8 OFDM symbols

m_NumDSlices

Specifies the number of data slices in the C2-System. The valid range is 1 … **DTAPI_DVBC2_NUM_DSLICE_MAX**.

m_DSlices

Array specifying the DVB-C2 parameters for the data slices.

m_NumNotches

Specifies the number of notch bands in the C2-System. The valid range is 0 … **DTAPI_DVBC2_NUM_NOTCH_MAX**.

m_Notches

Array specifying the notch bands in the C2-System.

m_NumPlpInputs

Specifies the number of PLP inputs in the C2-System. The valid range is 1 … **DTAPI_DVBC2_NUM_PLP_MAX**.

m_PlpInputs

Array specifying the PLP input streams. The index in the array is related to the index of a PLP in the C2 System (i.e. the first **DtPlpInpPars** in the array is related to the first PLP in the C2 System, which is the first PLP in the first data slice).

Note that PLPs in empty data slices are not taken into account and in case of bundled PLPs only the first PLP occurrence is taken into account.

m_PaprPars

Specifies the PAPR reduction parameters.

m_VirtOutput

In case of a virtual output *m_VirtOutput* specifies the virtual output data parameters.

m_TpOutput

In case of a virtual output *m_VirtOutput* specifies the virtual output data parameters.

m_OutpFreqOffset

Output frequency offset from *m_StartFrequency* (in carriers) of the generated spectrum. Must be a multiple of the carrier spacing (D_X=24 for guard interval 1/128 and D_X=12 for guard interval 1/64). *m_OutpFreqOffset* in combination with *m_OutpBandwidth* can be used to output a part of carriers of one C2-system.

m_OutpBandwidth

Output bandwidth (in carriers). 0 selects the default output bandwidth. Must be a multiple of the carrier spacing (D_X=24 for guard interval 1/128 and D_X=12 for guard interval 1/64).

m_L1Updates

A series of L1 signalling part2 parameters updates. The first update is applied immediately. After the last update is applied, it loops to the first one .

Remarks

This class is used both for the initialization of the multi-PLP modulator and the traditional single-PLP DVB-C2 modulator. The **DtOutpChannel::SetModControl()** method sets the parameters for the single-PLP DVB-C2 modulator. Thereafter **DtOutpChannel::Write** method is used to write the data to the output channel.

The **DtMplpOutpChannel::SetModControl()** method sets the parameters for the multi-PLP DVB-C2 modulator. The multi-PLP modulator can be used for both single-PLP and multi-PLP parameter sets. The **DtMplpOutpChannel::WriteMplp** method is used to write data to the output channel.

DtDvbC2Pars::CheckValidity

Check DVB-C2 parameters for validity.

```
DTAPI_RESULT DtDvbC2Pars::CheckValidity(void);
```

Parameters

Result

DTAPI_RESULT	Meaning
`DTAPI_OK`	Parameters are valid
`DTAPI_E_BROADBAND_NOTCH`	Broadband notch cannot be inside a data slice
`DTAPI_E_DSLICE_OFFSETS`	Invalid data slice offset
`DTAPI_E_DSLICE_OVERLAP`	Data slices cannot overlap
`DTAPI_E_DSLICE_T1_NDP`	Null-packet deletion not allowed for type1 data slices
`DTAPI_E_DSLICE_T1_TSRATE`	TS-rate/ISSY combination not possible for type1 data slice
`DTAPI_E_DSLICE_TUNE_POS`	Invalid data slice tune position
`DTAPI_E_INVALID_PARS`	Invalid parameter value (generic error)
`DTAPI_E_INVALID_RATE`	PLP TS-rate is too high
`DTAPI_E_INVALID_START_FREQ`	Invalid start frequency
`DTAPI_E_NO_TSRATE`	PLP TS-rate is not specified
`DTAPI_E_NOTCH_OFFSETS`	Invalid notch
`DTAPI_E_L1_PART2_TOO_LONG`	L1 part 2 data is too long
`DTAPI_E_PLP_BUNDLED`	Inconsistent PLP bundled parameters
`DTAPI_E_PLP_ID`	Duplicate PLP IDs

DtDvbC2Pars::GetParamInfo

Get the DVB-C2 "derived" parameters.

```
DTAPI_RESULT DtDvbC2Pars::GetParamInfo(
 [out] DtDvbC2ParamInfo&  ParamInfo   // DVB-C2 derived information
);
```

Parameters

ParamInfo

Output parameter that receives the DVB-C2 "derived" parameters.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Parameters are valid
Other result values	Error in modulation parameters, please refer to **DtDvbC2Pars::CheckValidity**

DtDvbT2ComponentPars

Class describing the modulation parameters for one DVB-T2 component (e.g. base or lite).

```
class DtDvbT2ComponentPars
{
  int   m_T2Version;         // DVB-T2 specification version
  int   m_T2Profile;         // DVB-T2 profile
  bool  m_T2BaseLite;        // T2-Lite is used in a base profile
  int   m_Bandwidth;         // DVB-T2 channel bandwidth
  int   m_FftMode;           // FFT mode (or size)
  int   m_Miso;              // MISO mode
  int   m_GuardInterval;     // Guard interval
  int   m_Papr;              // PAPR reduction mode
  int   m_BwtExt;            // Bandwidth extension
  int   m_PilotPatern;       // Pilot pattern
  int   m_L1Modulation;      // L1 modulation type
  int   m_CellId;            // Cell ID
  int   m_NetworkId;         // Network ID
  int   m_T2SystemId;        // T2 system ID
  bool  m_L1Repetition;      // L1 repetition (yes/no)
  int   m_NumT2Frames;       // Number of T2 frames in a super frame
  int   m_NumDataSyms;       // Number of data OFDM symbols per T2-frame
  int   m_NumSubslices;      // Number of subslices per T2-frame
  int   m_ComponentStartTime; // Offset (T) at which the component starts
  bool  m_FefEnable;         // Insert FEF (yes/no)
  int   m_FefType;           // FEF type
  int   m_FefS1;             // FEF S1 field value
  int   m_FefS2;             // FEF S2 field value
  int   m_FefLength;         // FEF length
  int   m_FefInterval;       // FEF interval
  int   m_FefSignal;         // Type of signal during FEF period
  int   m_NumRfChans;        // Number of RF channels
  int   m_RfChanFreqs[DTAPI_DVBT2_NUM_RF_MAX];
                             // Array of RF channel frequencies
  int   m_StartRfIdx;        // First used RF channel
  int   m_NumPlps;           // Number of PLPs
  DtDvbT2PlpPars  m_Plps[DTAPI_DVBT2_NUM_PLP_MAX];
                             // Array of PLP parameters
  DtPlpInpPars  m_PlpInputs[DTAPI_DVBT2_NUM_PLP_MAX];
                             // Array of PLP input stream
  DtDvbT2AuxPars  m_Aux;     // AUX streams
  DtDvbT2PaprPars  m_PaprPars;// PAPR reduction parameters
  DtDvbT2TxSigPars  m_TxSignature;
                             // Transmitter signature parameters
  DtDvbT2RbmValidation  m_RbmValidation;
                             // Receiver Buffer Model validation
  DtTestPointOutPars  m_TpOutput;
                             // Test point data output parameters
};
```

Public members

m_T2Version

DVB-T2 specification version.

Value	Meaning
DTAPI_DVBT2_VERSION_1_1_1	Version 1.1.1
DTAPI_DVBT2_VERSION_1_2_1	Version 1.2.1
DTAPI_DVBT2_VERSION_1_3_1	Version 1.3.1

m_T2Profile

DVB-T2 profile.

Value	Meaning
DTAPI_DVBT2_PROFILE_BASE	Base profile
DTAPI_DVBT2_PROFILE_LITE	Lite profile (Requires DVB-T2 version 1.3.1)

m_T2BaseLite

If true, T2 lite is used in a base profile component.

m_Bandwidth

The bandwidth of the channel.

Value	Meaning
DTAPI_DVBT2_1_7MHZ	1.7 MHz
DTAPI_DVBT2_5MHZ	5 MHz
DTAPI_DVBT2_6MHZ	6 MHz
DTAPI_DVBT2_7MHZ	7 MHz
DTAPI_DVBT2_8MHZ	8 MHz
DTAPI_DVBT2_10MHZ	10 MHz

m_FftMode

The FFT size used for computing OFDM symbols.

Value	Meaning
DTAPI_DVBT2_FFT_1K	1K FFT
DTAPI_DVBT2_FFT_2K	2K FFT
DTAPI_DVBT2_FFT_4K	4K FFT
DTAPI_DVBT2_FFT_8K	8K FFT
DTAPI_DVBT2_FFT_16K	16K FFT
DTAPI_DVBT2_FFT_32K	32K FFT

m_Miso

MISO mode. This mode can be used to simulate antenna 1 (TX1), antenna 2 (TX2) or the average of antenna 1 and antenna 2 (TX1+TX2) to simulate reception halfway between the antennas.

Value	Meaning
`DTAPI_DVBT2_MISO_OFF`	No MISO
`DTAPI_DVBT2_MISO_TX1`	TX1 only
`DTAPI_DVBT2_MISO_TX2`	TX2 only
`DTAPI_DVBT2_MISO_SUM`	TX1+ TX2 through one output channel
`DTAPI_DVBT2_MISO_BOTH`	Both TX1and TX2 through two output channels

`m_GuardInterval`

The guard interval between OFDM symbols.

Value	Meaning
`DTAPI_DVBT2_GI_1_128`	1/128
`DTAPI_DVBT2_GI_1_32`	1/32
`DTAPI_DVBT2_GI_1_16`	1/16
`DTAPI_DVBT2_GI_19_256`	19/256
`DTAPI_DVBT2_GI_1_8`	1/8
`DTAPI_DVBT2_GI_19_128`	19/128
`DTAPI_DVBT2_GI_1_4`	1/4

`m_Papr`

The peak to average power reduction method. This is used to fill PAPR field in the L1-post signalling block.

Value	Meaning
`DTAPI_DVBT2_PAPR_NONE`	None
`DTAPI_DVBT2_PAPR_ACE`	ACE - Active Constellation Extension
`DTAPI_DVBT2_PAPR_TR`	TR - Power reduction with reserved carriers
`DTAPI_DVBT2_PAPR_ACE_TR`	ACE and TR

`m_BwtExt`

If true, the extended carrier mode is used.

`m_PilotPattern`

The Pilot Pattern used.

Value	Meaning
`DTAPI_DVBT2_PP_1`	PP1
`DTAPI_DVBT2_PP_2`	PP2
`DTAPI_DVBT2_PP_3`	PP3
`DTAPI_DVBT2_PP_4`	PP4
`DTAPI_DVBT2_PP_5`	PP5

`DTAPI_DVBT2_PP_6`	PP6
`DTAPI_DVBT2_PP_7`	PP7
`DTAPI_DVBT2_PP_8`	PP8

m_L1Modulation

The modulation type used for the L1-post signalling block.

Value	Meaning
`DTAPI_DVBT2_BPSK`	BPSK
`DTAPI_DVBT2_QPSK`	QPSK
`DTAPI_DVBT2_QAM16`	16-QAM
`DTAPI_DVBT2_QAM64`	64-QAM

m_CellId

Cell ID. Unique identification of a geographic cell in a DVB-T2 network. The valid range is 0 … 0xFFFF.

m_NetworkId

Network ID. Unique identification of the DVB-T2 network. The valid range is 0 … 0xFFFF.

m_T2SystemId

T2 system ID. Unique identification of the T2 system. The valid range is 0 … 0xFFFF.

m_L1Repetition

If true, L1 signalling is provided for the next frame.

m_NumT2Frames

The number of T2 frames in a super frame. The valid range is 1 … 255.

m_NumDataSyms

The number of data OFDM symbols per T2 frame, excluding P1 and P2.

m_NumSubslices

The number of subslices per T2-frame for type-2 PLPs.

m_ComponentStartTime

Specifies the offset in number of T-units at which the T2 component starts. Note: it should be set to 0 for the first component.

m_FefEnable

If true, FEFs (Future Extension Frames) are inserted.

m_FefType

Specifies the FEF type. The valid range is 0 ... 15.

m_FefS1

The S1-field value in the P1 signalling data. Valid values: 2, 3, 4, 5, 6 and 7.

m_FefS2

The S2-field value in the P1 signalling data. Valid values: 1, 3, 5, 7, 9, 11, 13 and 15.

m_FefLength

The length of a FEF-part in number of T-units (= samples). For the base profile the valid range is 0 … 0x3FFFFF, for the lite profile the valid range is 0 … 0xFFFFFF.

m_FefInterval

The number of T2 frames between two FEF parts. The valid range is 1 … 255 and *m_NumT2Frames* shall be divisible by *m_FefInterval*.

m_FefSignal

The type of signal generated during the FEF period.

Value	Meaning
DTAPI_DVBT2_FEF_ZERO	Zero I/Q samples
DTAPI_DVBT2_FEF_1K_OFDM	1K OFDM symbols with 852 active carriers containing BPSK symbols
DTAPI_DVBT2_FEF_1K_OFDM_384	1K OFDM symbols with 384 active carriers containing BPSK symbols

m_NumRfChans

The number of frequencies in the T2 system. The valid range is 1 … **DTAPI_DVBT2_NUM_RF_MAX**.

m_RfChanFreqs

Array specifying the center frequencies of the RF channels. This is only used to fill the L1-post FREQUENCY fields. The valid range is 1 … 0xFFFFFFFF.

m_NumPlps

Specifies the number of physical layer pipes in the T2 system. The valid range is 1 … **DTAPI_DVBT2_NUM_PLP_MAX**. Must be set to '1' in case not using the Multi-PLP modulator.

m_Plps

Array specifying the DVB-T2 modulation parameters for the PLPs.

m_PlpInputs

Array specifying the PLP input streams. This is only used in case of using the Multi-PLP modulator. Default the FIFO index and PLP index maps 1:1 and "Big-TS splitting" is disabled.

m_Aux

Specifies the AUX stream parameters.
By default, the generation of AUX streams is disabled.

m_PaprPars

Specifies the PAPR reduction parameters.
By default, PAPR reduction is disabled.

m_TxSignature

Specifies the transmission of the DVB-T2 transmitter signature.
By default, the transmission of a transmitter signature is disabled.

m_RbmValidation

Specifies the Receiver Buffer Model validation. This can only be used with the Multi-PLP modulator.
By default, RBM-validation is disabled.

m_TpOutput
   Specifies the generation of test point data.

DtDvbT2Pars

Class describing parameters for DVB-T2 modulation, it describes the modulation parameters of a DVB-T2 component and optionally the parameters of a second component (e.g. base and a lite profile). The class **DtDvbT2ComponentPars** describes the component parameters.

```
class DtDvbT2Pars : public DtDvbT2ComponentPars
{
   int   m_NumFefComponents;   // Number of DVB-T2 components in FEF part
   DtDvbT2ComponentPars  m_FefComponent[1];
                               // Parameters for a second DVB-T2 component

   DtVirtualOutPars  m_VirtOutput;
                               // Virtual-output parameters
   DtDvbT2MiPars  m_T2Mi;      // T2-MI output parameters
};
```

Inherited Public members

The public members inherited from **DtDvbT2ComponentPars** describe the modulation parameters for the first DVB-T2 component; see description of **class DtDvbT2ComponentPars**.

Public members

m_NumFefComponents

The number of DVB-T2 components transmitted in the FEF part of the first DVB-T2 component. The parameters for these DVB-T2 components are specified in *m_FefComponent*. The valid range is 0 … 1.

m_FefComponent

Array specifying the DVB-T2 modulation parameters for the DVB-T2 components transmitted in the FEF part of the first DVB-T2 component.

m_VirtOutput

When the output channel has been attached to a virtual output, *m_VirtOutput* specifies the virtual output data parameters. This can only be used with the Multi-PLP modulator.
By default, the virtual output parameters are disabled.

m_T2Mi

Specifies the parameters for generation of T2-MI. This can only be used with the Multi-PLP modulator.
By default, the output of T2-MI is disabled.

Remarks

This class is used both for the initialization of the multi-PLP modulator and the traditional single-PLP DVB-T2 modulator. The **DtOutpChannel::SetModControl()** method sets the parameters for the single-PLP DVB-T2 modulator. Thereafter **DtOutpChannel::Write** method is used to write the data to the output channel.

The **DtMplpOutpChannel::SetModControl()** method sets the parameters for the multi-PLP DVB-T2 modulator. The multi-PLP modulator can be used for both single-PLP and multi-PLP parameter sets. The **DtMplpOutpChannel::WriteMplp** method is used to write data to the output channel.

DtDvbT2Pars::CheckValidity

Check DVB-T2 parameters for validity.

```
DTAPI_RESULT DtDvbT2Pars::CheckValidity(void);
```

Parameters

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Parameters are valid
DTAPI_E_BIAS_BAL_CELLS	Invalid number of bias balancing cells
DTAPI_E_BUFS	Invalid BUFS values
DTAPI_E_COMMON_PLP_COUNT	More than one common PLP per group ID
DTAPI_E_COMP_OVERLAP	The fames of two components (lite and base profile) overlap.
DTAPI_E_FEF	Error in FEF parameters
DTAPI_E_FIXED_CELL_PARS	Invalid fixed cell parameters
DTAPI_E_FRAME_INTERVAL	Frame interval must divide number of T2 frames
DTAPI_E_INVALID_BWT_EXT	Invalid bandwidth extension
DTAPI_E_INVALID_FFTMODE	Invalid FFT mode
DTAPI_E_INVALID_GUARD	Invalid guard interval
DTAPI_E_INVALID_NUMDTSYM	Invalid number of data symbols
DTAPI_E_INVALID_NUMT2FRM	Invalid number of T2 frames
DTAPI_E_INVALID_PARS	Invalid parameter value (generic error)
DTAPI_E_INVALID_TIME_IL	Invalid time interleaver length
DTAPI_E_MULTI_COMPS	Invalid mix of parameters in multi component configuration
DTAPI_E_NO_TSRATE	PLP TS-rate is not specified
DTAPI_E_NUM_PLP	Too many PLPs (i.e. L1 data too large)
DTAPI_E_OTHER_PLP_IN_BAND	Invalid PLP ID in m_OtherPlpInBand array
DTAPI_E_PILOT_PATTERN	Pilot pattern not allowed in combination with other parameters
DTAPI_E_PLP_ID	Duplicate PLP IDs
DTAPI_E_PLP_NUM_BLOCKS	Invalid number of PLP blocks (not enough bandwidth)
DTAPI_E_SUBSLICES	Number of subslices and/or TIME_IL_LENGTH does not give an integer number of cells per subslice
DTAPI_E_T2_LITE	Invalid T2 lite profile parameters
DTAPI_E_TI_MEM_OVF	Too many cells in time interleaver

DtDvbT2Pars::GetParamInfo

Get the DVB-T2 "derived" parameters.

```
DTAPI_RESULT DtDvbT2Pars::GetParamInfo(
 [out] DtDvbT2ParamInfo&  ParamInfo   // (First) T2-component information
);
DTAPI_RESULT DtDvbT2Pars::GetParamInfo(
 [out] DtDvbT2ParamInfo&  ParamInfo1, // First T2-component information
 [out] DtDvbT2ParamInfo&  ParamInfo2  // Second T2-component information
);
```

Parameters

ParamInfo, ParamInfo1
> Output parameter that receives the DVB-T2 "derived" parameters of the first component.

ParamInfo2
> Output parameter that receives the DVB-T2 "derived" parameters of the second component.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Parameters are valid
Other result values	Error in modulation parameters, please refer to **DtDvbT2Pars::CheckValidity**

DtDvbT2Pars::OptimisePlpNumBlocks

Compute the optimum value of DVB-T2 parameters to maximise the DVB-T2 channel's bitrate and compute the achieved efficiency.

```
// Overload #1 - Get optimum value for PLP_NUM_BLOCKS
DTAPI_RESULT DtDvbT2Pars::GetParamInfo(
 [out] DtDvbT2ParamInfo&  ParamInfo      // DVB-T2 efficiency information
 [out] Int&  OptPlpNumBlocks             // Optimum number of blocks
);
// Overload #2 - Get optimum value for PLP_NUM_BLOCKS and NUM_DATA_SYMBOLS
DTAPI_RESULT DtDvbT2Pars::GetParamInfo(
 [out] DtDvbT2ParamInfo&  ParamInfo      // DVB-T2 efficiency information
 [out] Int&  OptPlpNumBlocks             // Optimum number of blocks
 [out] Int&  OptNumDataSyms              // Optimum number data symbols
);
```

Parameters

ParamInfo

Output parameter that receives the DVB-T2 "derived" parameters based on the optimum parameter values.

OptPlpNumBlocks

Output parameter that is set to the optimum value for the number of FEC blocks per IL frame for PLP0 to maximise the DVB-T2 channel's bitrate.

OptNumDataSyms

Output parameter that is set to the optimum value for the number of data OFDM symbols per T2 frame to maximise the DVB-T2 channel's bitrate.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Parameters are valid
Other result values	Error in modulation parameters, please refer to **DtDvbT2Pars::CheckValidity**

Remarks

These methods can only be used in case of a single PLP (member variable *m_NumPlps* equals 1).

Class DtIsdbTmmPars

Class specifying parameters for ISDB-Tmm modulation.

```
class DtIsdbTmmPars
{
   int   m_Bandwidth;          // Bandwidth (channel raster)
   int   m_SubChannel;         // Sub-channel of the center segment
   // TS parameters
   int   m_NumTss;             // Number of transport streams
   DtIsdbtPars   m_Tss[DTAPI_ISDBT_NUM_TS_MAX];
   DtPlpInpPars  m_TsInputs[DTAPI_ISDBT_NUM_TS_MAX];
   // Virtual output
   DtVirtualOutPars   m_VirtOutput;
};
```

Public members

m_Bandwidth

Channel raster of the network.

Value	Meaning
DTAPI_ISDBT_BW_6MHZ	6 MHz
DTAPI_ISDBT_BW_7MHZ	7 MHz
DTAPI_ISDBT_BW_8MHZ	8 MHz

m_SubChannel

Sub channel of the center segment of the spectrum, which implicitly specifies the sub-channels of the 1-segment streams in the signal. The valid range is 0 … 41.

m_NumTss

Specifies the number of transport streams in the ISDB-Tmm system. The valid range is 0 … **DTAPI_ISDBT_NUM_TS_MAX**.

m_Tss

An array of **DtIsdbtPars**, specifying the modulation parameters for each transport stream. The index in the array is related to the index of the transport stream in the ISDB-Tmm system. See the description of struct **DtIsdbtPars** in "DTAPI Reference – Core Classes".

m_TsInputs

Array specifying the input transport streams. The index in the array is related to the index of the transport stream in the ISDB-Tmm system.

m_VirtOutput

In case of a virtual output *m_VirtOutput* specifies the virtual output data parameters.

Remarks

This class is only used for the initialization of the multi-PLP modulator. The class **DtIsdbtPars** can be used to initialize the traditional single-PLP modulator.

DtIsdbTmmPars::CheckValidity

Check ISDB-T parameters for validity.

```
DTAPI_RESULT DtIsdbTmmPars::CheckValidity(void);
```

Parameters

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Parameters are valid
DTAPI_E_INVALID_BANDWIDTH	Invalid value for bandwidth or not equal for all streams
DTAPI_E_INVALID_BTYPE	Invalid value for broadcast type
DTAPI_E_INVALID_GUARD	Invalid value for guard-interval length or not equal for all streams
DTAPI_E_INVALID_MODE	Invalid value for transmission mode or not equal for all streams
DTAPI_E_INVALID_NUMSEGM	Number of segments is more than 33 or the number of segments in a streams is not equal to 1, 3 or 13, or number of segments is invalid for the current broadcast type does not match number of segments specified in m_LayerPars
DTAPI_E_INVALID_PARTIAL	'Partial Reception' is selected for a stream but the number of segments in layer A is not 1
DTAPI_E_INVALID_SIZE	'No hierarchical multiplexing' (use TMCC) is selected for a stream where the input type is 188-byte TS packets
DTAPI_E_INVALID_SUBCH	Invalid sub-channel number

DtTpWriteDataFunc

User-supplied callback function used for the processing of test-point data. The data can be written to a file, or processed otherwise.

```
void  DtTpWriteDataFunc(
  [in] void*  pOpaque,         // Opaque pointer
  [in] int  TpIndex,           // Test point
  [in] int  StreamIndex        // Stream index
  [in] const void*  pBuffer,   // Test-point data buffer
  [in] int  Length,            // Number of data items
  [in] int  Format,            // Test point data format
  [in] float  Mult,            // Multiplication factor
  [in] int  IsNewFrame         // New frame (yes/no)
);
```

Parameters

pOpaque
> The opaque pointer that was specified in **DtTestPointOutPars**.

TpIndex
> Specifies the test point.
>
> For DVB-C2 the following test points are defined:

Value	Meaning
DTAPI_DVBC2_TPnn	DVB-C2 test point nn

> Where nn is: 07, 08, 10, 13, 15, 18, 20, 22, 26, 27, 31, 32, 33, 37, 40, 41 and 42.
>
> For DVB-T2 the following test points are defined:

Value	Meaning
DTAPI_DVBT2_TPnn	DVB-T2 test point nn

> Where nn is: 03, 04, 06, 08, 09, 11, 12, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 28, 29, 30, 32, 33, 34, 50, 51 and 53.

StreamIndex
> Identifies the stream. For DVB-C2 bits 0..7 specify the PLP-ID and bits 8..15 specify the data slice I. For DVB-T2 bits 0..7 specify the PLP-index and bit 8 is set when the PLP-type is a common PLP.

pBuffer
> Pointer to a buffer containing the test point data.

Length
> Number of test points data items available in buffer.

Format

The data format of the test-point data items.

Value	Meaning
DTAPI_TP_FORMAT_HEX	Byte data
DTAPI_TP_FORMAT_BIT	Bit data. Eight bits are packaged per byte, most significant bit first
DTAPI_TP_FORMAT_CFLOAT32	Complex 32-bit floating-point data of type **DtComplexFloat**
DTAPI_TP_FORMAT_INT64	64-bit integer data

Mult

Multiplication factor for the complex floating point data.

IsNewFrame

If true, the test point data relates to a new frame.

::DtapiModPars2TsRate

Compute Transport-Stream rate from modulation parameters. There are three new overloads one for DVB-C2, one for DVB-T2 and one for ISDB-Tmm modulation type.

```
// Overload to be used for DVB-C2
DTAPI_RESULT ::DtapiModPars2TsRate(
 [out] int&   TsRate        // Computed Transport-Stream rate
  [in] DtDvbC2Pars  C2Pars,  // DVB-C2 modulation parameters
  [in] int  PlpIdx           // PLP index
);
// Overload to be used for DVB-T2
DTAPI_RESULT ::DtapiModPars2TsRate(
 [out] int&   TsRate        // Computed Transport-Stream rate
  [in] DtDvbT2Pars  T2Pars,  // DVB-T2 modulation parameters
  [in] int  PlpIdx           // PLP index
);
// Overload to be used for ISDB-Tmm
DTAPI_RESULT ::DtapiModPars2TsRate(
 [out] int&   TsRate        // Computed Transport-Stream rate
  [in] DtIsdbTmmPars TmmPars, // ISDB-Tmm modulation parameters
  [in] int  TsIdx            // TS index
);
```

Parameters

TsRate

The Transport-Stream rate in bps computed from the modulation parameters.

C2Pars

DVB-C2 modulation parameters; see description of **class DtDvbC2Pars**.

T2Pars

DVB-T2 modulation parameters; see description of **class DtDvbT2Pars**.

TmmPars

ISDB-Tmm modulation parameters; see description of **class DtIsdbTmmPars**.

PlpIdx

The index of the PLP for which the Transport-Stream rate is computed.

TsIdx

The index of the TS in the ISDB-Tmm system for which the Transport-Stream rate is computed.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	The TS rate has been computed from the modulation parameters successfully
Other result values	Error in modulation parameters, please refer to

	`DtDvbC2Pars::CheckValidity` , `DtDvbT2Pars::CheckValidity` and `DtIsdbTmmPars::CheckValidity`

DtMplpOutpChannel

Class representing a multi-PLP modulator for modulation of DVB-C2, DVB-T2 and ISDB-Tmm signals. Class `DtMplpOutpChannel` is derived from `DtOutpChannel`. For the inherited methods, please refer to the DTAPI documentation.

```
class DtMplpOutpChannel : public DtOutpChannel;
```

DtMplpOutpChannel::AttachVirtual

Attach the output-channel object to a virtual output using the licenses of a particular device. A virtual output lets the user pass the output data to the specified callback function, instead of DTAPI writing the data to a physical output.

```
DTAPI_RESULT DtMplpOutpChannel::AttachVirtual(
  [in] DtDevice*  pDtDevice, // Object representing a DekTec device
  [in] bool (*pFunc)(void*, DtVirtualOutData*),
                           // Pointer to the callback function
  [in] void*  pOpaque      // Opaque pointer for the callback function
);
```

Parameters

pDtDvc
> Pointer to the object that represents a DekTec device. The **DtDevice** object must be attached to the device hardware. The device is used only for reading licenses.

pFunc
> Pointer to the callback function that will handle the generated output data. When the virtual-output calls this function the opaque pointer and a pointer to a **DtVirtualOutData** struct describing the output data are passed. To prevent hanging of the application, the callback function is not allowed to block. In case the callback function has to wait for a certain condition, it can return the Boolean value false. After a few milliseconds the virtual-output will call this function again with the same parameters and will repeat this until the callback function returns the Boolean value true.

pOpaque
> Opaque pointer that is passed to the callback function.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Channel object has been attached successfully
DTAPI_E_ATTACHED	The channel object is already attached a hardware function
DTAPI_E_DEVICE	The **DtDevice** pointer is not valid or the **DtDevice** object is not attached to the device hardware
DTAPI_E_INVALID_ARG	The value of one of the parameters is invalid

Remarks

The intended usage for this method is to allow the user to output the multi-PLP modulator result to file or to a specific device. The licenses are taken from the DekTec device.

DtMplpOutpChannel::GetMplpFifoFree

Get the number of free bytes in the specified multi-PLP modulator FIFO.

```
DTAPI_RESULT DtMplpOutpChannel::GetMplpFifoFree(
  [in] int   FifoIndex        // FIFO index
 [out] int&  FifoFree         // Number of free bytes in the FIFO
);
```

Parameters

FifoIndex
   Specifies the FIFO index.

FifoFree
   Free space in the specified multi-PLP modulator FIFO, in number of bytes.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	FIFO free has been retrieved successfully
DTAPI_E_NOT_ATTACHED	Channel object is not attached

Remarks

If a Data transfer is in progress and/or the transmit-control state is **DTAPI_TXCTRL_HOLD** or **DTAPI_TXCTRL_SEND**, then every call to **GetMplpFifoFree** may return a different value.

DtMplpOutpChannel::GetMplpFifoSize

Get the current size of the multi-PLP modulator FIFO.

```
DTAPI_RESULT DtMplpOutpChannel::GetMplpFifoSize(
 [in] int  FifoIndex          // FIFO index
 [out] int& FifoSize          // Size of Transmit FIFO in bytes
);
```

Parameters

FifoIndex
Specifies the FIFO index.

FifoSize
Size of the multi-PLP modulator FIFO in number of bytes.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	FIFO size has been retrieved successfully
DTAPI_E_NOT_ATTACHED	Channel object is not attached to a hardware function

Remarks

The size of the multi-PLP modulator FIFOs is fixed, it cannot be changed.

DtMplpOutpChannel::GetMplpModStatus

Get the status of the multi-PLP modulator. There are overloads for DVB-C2 and for DVB-T2.

```
DTAPI_RESULT DtMplpOutpChannel::GetMplpModStatus(
 [out] DtDvbC2ModStatus*  pDvbC2ModStat       // Status of DVB-C2
modulator
);
DTAPI_RESULT DtMplpOutpChannel::GetMplpModStatus(
 [out] DtDvbT2ModStatus*  pDvbT2ModStat       // Status of DVB-T2
modulator
);
DTAPI_RESULT DtMplpOutpChannel::GetMplpModStatus(
 [out] DtDvbT2ModStatus*  pDvbT2ModStat1      // Status of DVB-T2
modulator for the first component
 [out] DtDvbT2ModStatus*  pDvbT2ModStat2      // Status of DVB-T2
modulator for the second component
);
```

Parameters

pDvbC2ModStat

DVB-C2 modulator status; see description of **struct DtDvbC2ModStatus**.

pDvbT2ModStat, pDvbT2ModStat1

DVB-T2 modulator status for the first component; see description of **struct DtDvbT2ModStatus**.

pDvbT2ModStat2

DVB-T2 modulator status for the second component; see description of **struct DtDvbT2ModStatus**.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	The status of the MPLP modulator has been retrieved successfully
DTAPI_E_IDLE	Not allowed when in IDLE state
DTAPI_E_NOT_ATTACHED	Channel object is not attached to a hardware function
DTAPI_E_NOT_SUPPORTED	The currently active modulator does not support the request

Remarks

DtMplpOutpChannel::SetMplpChannelModelling

Set channel-modelling parameters. This function may only be called when using the multi-PLP modulator while the transmit-control state is **DTAPI_TXCTRL_IDLE**.

```
DTAPI_RESULT DtMplpOutpChannel::SetMplpChannelModelling(
  [in] bool  CmEnable,           // Enable/disable channel modelling
  [in] DtCmPars&  CmPars         // Channel modelling parameters
  [in] int  ChannelIdx=0         // Output channel index
);
```

Parameters

CmEnable

Enable channel modelling. This parameter provides an easy way to turn off channel modelling entirely for the specified output channel.

CmPars

Channel-modelling parameters. See description of struct **DtCmPars** in "DTAPI Reference – Core Classes".

ChanneIdx

Index of the output channel (e.g. to specify the channel modelling parameters for the individual transmitters in case of MISO).

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Channel-modelling parameters have been applied successfully
DTAPI_E_CM_NUMPATHS	The number of paths specified in **CmPars** exceeds the maximum number of paths
DTAPI_E_NOT_ATTACHED	Channel object is not attached to a hardware function
DTAPI_E_NOT_SUPPORTED	The channel has no license for channel-modelling, or channel modelling is not supported for this type of channel

Remarks

DtMplpOutpChannel::SetModControl

Set modulation-control parameters for modulator channels. There are three overloads defined for the multi-PLP modulator output: one for DVB-C2, one for DVB-T2 and one for ISDB-Tmm.

```
// Overload to be used for DVB-C2
DTAPI_RESULT DtMplpOutpChannel::SetModControl(
  [in] DtDvbC2Pars&  DvbC2Pars    // DVB-C2 modulation parameters
);
// Overload to be used for DVB-T2
DTAPI_RESULT DtMplpOutpChannel::SetModControl(
  [in] DtDvbT2Pars&  DvbT2Pars    // DVB-T2 modulation parameters
);
// Overload to be used for ISDB-Tmm
DTAPI_RESULT DtMplpOutpChannel::SetModControl(
  [in] DtIsdbTmmPars&  IsdbTmmPars// ISDB-Tmm modulation parameters
);
```

Parameters

DvbC2Pars

DVB-C2 modulation parameters; see description of **class DtDvbC2Pars**.

DvbT2Pars

DVB-T2 modulation parameters; see description of **class DtDvbT2Pars**.

IsdbTmmPars

ISDB-Tmm modulation parameters; see description of **class DtIsdbTmmPars**.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	The modulation parameters have been set successfully
DTAPI_E_DEV_DRIVER	Unclassified failure in device driver
DTAPI_E_IDLE	Transmit-control state is not **DTAPI_TXCTRL_IDLE**; The requested modulation parameters can only be set in idle state
DTAPI_E_NOT_ATTACHED	Channel object is not attached to a hardware function
DTAPI_E_NOT_SUPPORTED	The output channel does not support the specified modulation type

Remarks

DtMplpOutpChannel::WriteMplp

Write data to a multi-PLP modulator FIFO.

```
DTAPI_RESULT DtMplpOutpChannel::WriteMplp(
  [in] int  FifoIdx,        // FIFO index
  [in] char*  pBuffer,        // Pointer to data to be written to the FIFO
  [in] int  NumBytesToWrite // Number of bytes to be written
);
```

Parameters

FifoIndex

Specifies the FIFO index.

pBuffer

Pointer to the buffer containing the data to be written to the multi-PLP modulator FIFO. The pointer must be aligned to a 32-bit word boundary.

NumBytesToWrite

Number of bytes to be to be written to the multi-PLP modulator FIFO. The buffer size must be positive and a multiple of four.

Result

DTAPI_RESULT	Meaning
DTAPI_OK	Write operation has been completed successfully
DTAPI_E_INVALID_BUF	The buffer is not aligned to a 32-bit word boundary
DTAPI_E_INVALID_FIFO_IDX	Invalid FIFO index. FIFO index has not been specified in **DtMplpOutpChannel::SetModControl** parameters
DTAPI_E_INVALID_SIZE	The specified transfer size is negative or not a multiple of four
DTAPI_E_IDLE	Cannot write data because transmission-control state is **DTAPI_TXCTRL_IDLE**
DTAPI_E_NOT_ATTACHED	Channel object is not attached to a hardware function

Remarks

The data buffer can be any buffer in user space that is aligned to a 4-byte boundary. The data is only written when the transmit-control state is **DTAPI_TXCTRL_HOLD** or **DTAPI_TXCTRL_SEND** (see **DtOutpChannel::SetTxControl()**), *and* sufficient space is available in the FIFO. **WriteMplp** returns when all data has been transferred to the multi-PLP modulator FIFO.

The data from a multi-PLP modulator FIFO is only transferred to the modulator when all other multi-PLP modulator FIFOs have data to contribute. For this reason the thread executing **WriteMplp** will sleep forever if *NumBytesToWrite* is greater than the number of free bytes in the MPLP FIFO and one of the other MPLP FIFOs is empty.