



Dolby® Vision Streams Within the MPEG-2 Transport Stream Format

Version 1.2

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Issue 1

Table of Contents

List of Tables	vii
Introduction.....	1
1.1 Terms, Definitions, and Abbreviated Terms	1
1.1.1 Terms and Definitions	1
1.1.2 Abbreviated Terms	2
1.2 Resources	2
1.3 Contacting Dolby	3
Dolby Vision VES Format.....	5
Signaling of Dolby Vision Stream	6
3.1 PMT Signaling.....	7
3.1.1 Primary Dolby Vision PID Carrying an SDR or HDR Compliant BL substream	8
3.1.2 Primary Dolby Vision PID Carrying a Non-SDR and Non-HDR Compliant BL substream	8
3.1.3 Secondary Dolby Vision PID Carrying the EL and/or RPU substream 8	8
3.2 Stream ID	10
3.3 DOVI Video Stream Descriptor	11
PES Constraint.....	13
4.1 RPU AU Re-ordering.....	13
4.1.1 Single PID Implementation	13
4.1.2 Dual PID Implementation	13

4.2 PES Align.....	14
4.3 PTS.....	14
Timing Requirements	15
5.1 Initial PTS Alignment.....	15
5.2 Maximum Decode Delay	15
Carriage of Dolby Vision Stream	16
6.1 Carriage of combo Dolby Vision stream in a single Dolby Vision PID	16
6.2 Carriage of BL substream on the primary PID of Dual Dolby Vision PID ..	16
6.3 Carriage of EL stream on the secondary PID of Dual Dolby Vision PID ..	16
Dolby Vision Stream Configuration	17
7.1 Single Dolby Vision PID	17
7.1.1SDR or HDR Compliant BL Dolby Vision Stream	17
7.1.2Non-SDR and Non-HDR Compliant BL Dolby Vision Stream	18
7.2 Dual Dolby Vision PID.....	18
7.2.1Primary Dolby Vision PID.....	18
7.2.2Secondary Dolby Vision PID.....	19

List of Tables

Table 1-1	Abbreviated Terms.....	2
Table 3-1	DOVI Registration Descriptor.....	7
Table 3-2	DOVI Video Stream Descriptor Syntax	11

Introduction

This document defines the syntax and semantics needed to enable the transport of one or more Dolby Vision streams in an MPEG-2 Transport Stream multiplex per ISO/IEC 13818-1.

1.1 Terms, Definitions, and Abbreviated Terms

1.1.1 Terms and Definitions

1.1.1.1 SDR signal

An ITU-R BT.1886 signal with peak luminance equal to 100cd/m².

1.1.1.2 HDR signal

An ITU-R BT.2100 signal with peak luminance equal to 1000cd/m².

1.1.1.3 SDR or HDR Compliant Base Layer Dolby Vision track

A Dolby Vision track with the Base Layer, Enhancement Layer, and RPU combined into a single VES. The Base Layer signal in the combined VES carried in the track has a non-zero value for the BL signal compatibility ID, is compliant with ISO/IEC 14496-10, 14496-15, and ISO/IEC 23008-2 and is decodable by an AVC or HEVC compliant decoder to output a SDR or HDR signal compliant with a particular set of standards as defined in the Dolby Vision Profiles and Levels doc.

1.1.1.4 Non-SDR and Non-HDR Compliant Base Layer Dolby Vision track

A Dolby Vision track with the Base Layer, Enhancement Layer, and RPU combined into a single VES. The Base Layer in the combined VES carried in the track has a zero value for the BL signal compatibility ID, is compliant with ISO/IEC 14496-10, 14496-15, and ISO/IEC 23008-2 and is decodable by an AVC or HEVC compliant decoder to output a non-SDR and non-HDR signal that is not compliant with any standard.

1.1.2 Abbreviated Terms

The following table describes the terminology and abbreviations used throughout this document.

Table 1-1 Abbreviated Terms

Term	Definition
AU	Access Unit.
AVC	Advanced Video Coding.
BL	Base Layer.
DOVI	Dolby Vision.
EL	Enhancement Layer.
ES	Elementary Stream.
HEVC	High efficient Video Coding.
HDR	High Dynamic Range
NAL	Network Abstraction Layer.
PES	Packetized elementary stream
PID	Packet Identifier
PMT	Program Map Table.
PTS	Presentation Time Stamp.
RPU	Reference Processing Unit
SDR	Standard Dynamic Range.
VES	Video Elementary Stream.

1.2 Resources

The following resources supplement the information in this manual:

- ISO/IEC 13818-1:2015, *Information technology — Generic coding of moving pictures and associated audio information: Systems*, reference latest available from www.iso.org
- ISO/IEC 14496-15:2014, *Information technology — Coding of audio-visual objects, Part 15:Carriage of NAL unit structured video in the ISO Base Media File Format*; reference latest available from www.iso.org
- ISO/IEC 14496-10: 2014, *Information technology — Coding of audio-visual objects, part 10:Advanced Video Coding*, reference latest available from www.iso.org

- ISO/IEC 23008-2: 2013, *Information technology — High efficiency coding and media delivery in heterogeneous environments, part 2:High Efficiency Video Coding*, reference latest available from www.iso.org
- *Dolby Vision Decoder Specification*, available from [Dolby Laboratories, Inc](http://DolbyLaboratories.com)
- *Dolby Vision VES Multiplexing Specification*, reference latest available from [Dolby Laboratories, Inc](http://DolbyLaboratories.com)
- *Signaling Dolby® Vision Profiles and Levels*, reference latest available from [Dolby Laboratories, Inc](http://DolbyLaboratories.com)

1.3 Contacting Dolby

For technical questions about the system development materials, contact dolbyonlinekits@dolby.com.

If you have questions or comments about this document, contact documentation@dolby.com.

Dolby Vision VES Format

A Dolby Vision stream consists of BL, EL, and RPU substreams or BL and RPU substreams. These substreams must be multiplexed into Dolby Vision VES before being fed into an MPEG-2 Transport Stream multiplexer. For information on how the Dolby Vision VES should be multiplexed, refer to *Dolby Vision VES Multiplexing Specification*, see [Resources](#).

Signaling of Dolby Vision Stream

A Dolby Vision stream can be transported in an MPEG-2 Transport Stream multiplex using a single or dual PID method.

For a single PID transmission, the BL, EL and RPU substreams or BL and RPU substreams are combined into a single ES for transmission on a single Dolby Vision PID.

For a dual PID transmission, the BL substream is transmitted on a primary Dolby Vision PID while the EL and RPU substreams are combined into an additional ES for transmission on a secondary Dolby Vision PID.

This section specifies the syntax and semantic for signaling a Dolby Vision stream using `stream_type`, `stream_id`, DOVI Video Stream Descriptor, and the MPEG-2 Registration Descriptor.

3.1 PMT Signaling

The method to uniquely identify a Dolby Vision stream in the MPEG-2 Transport Stream multiplex is the responsibility of those defining how to construct the MPEG-2 Transport Stream multiplex. This specification only addresses the generic way of signaling Dolby Vision using the MPEG-2 Registration Descriptor.

When an MPEG-2 Registration Descriptor is used to provide the unique identification for the Dolby Vision stream, the `format_identifier` shall be set to 0x444F5649 (“DOVI”), as shown in **Table 3-1**; which contains the descriptor structure for context and convenience of the reader.

Table 3-1 DOVI Registration Descriptor

Syntax	No. of Bits	Mnemonic	Value
<code>registration_descriptor() {</code>			
<code>descriptor_tag</code>	8	Uimbsf	0x05
<code>descriptor_length</code>	8	Uimbsf	0x04
<code>format_identifier</code>	32	Uimbsf	0x444F5649
<code>}</code>			

The following sections specify how the `stream_type` parameter shall be set and which elementary stream descriptor shall be inserted in the PMT for each of the PID carrying Dolby Vision stream.

3.1.1 Primary Dolby Vision PID Carrying an SDR or HDR Compliant BL substream

3.1.1.1 Stream Type

The value of `stream_type` shall be set according to the codec type. It shall be set to either 0x1B for AVC-compatible BL or 0x24 for HEVC-compatible BL.

3.1.1.2 Descriptors

Appropriate AVC or HEVC Video Descriptor shall be inserted.

For a single PID transmission in which the BL, EL and RPU substreams or BL and RPU substreams are combined into a single ES, the `DOVI Video Stream Descriptor` shall be inserted, see `DOVI Video Stream Descriptor`.

3.1.2 Primary Dolby Vision PID Carrying a Non-SDR and Non-HDR Compliant BL substream

3.1.2.1 Stream Type

The value of `stream_type` shall be set to 0x06 (indicating PES packets containing private data).

3.1.2.2 Descriptors

The `DOVI Registration Descriptor` shall be inserted.

Appropriate AVC or HEVC Video Descriptor shall be inserted.

For a single PID transmission in which the BL, EL and RPU substreams or BL and RPU substreams are combined into a single ES, the `DOVI Video Stream Descriptor` shall be inserted, see `DOVI Video Stream Descriptor`.

3.1.3 Secondary Dolby Vision PID Carrying the EL and RPU substream

Note that certain profiles defined in *Signaling Dolby® Vision Profiles and Levels* do not include an EL.

3.1.3.1 Stream Type

The value of `stream_type` shall be set to 0x06 (indicating PES packets containing private data).

3.1.3.2 Descriptors

The DOVI Registration Descriptor shall be inserted.

Appropriate AVC or HEVC Video Descriptor shall be inserted.

The DOVI Video Stream Descriptor shall be inserted, see DOVI Video Stream Descriptor.

3.2 Stream ID

For primary Dolby Vision PID, the value of `stream_id` in the PES header shall be set to `0xEX` where X is the video stream number.

For secondary Dolby Vision PID carrying the EL and RPU substreams, the value of `stream_id` in the PES header shall be set to `0xEX` where X is the video stream number.

3.3 DOVI Video Stream Descriptor

The `DOVI_video_stream_descriptor` shall be constructed per **Table 3-2** with the field semantics as defined below. It shall be used for configuration of the Dolby Vision decoder.

Table 3-2 DOVI Video Stream Descriptor Syntax

Syntax	No. of Bits	Mnemonic
<code>DOVI_video_stream_descriptor() {</code>		
<code>descriptor_tag</code>	8	uimsbf
<code>descriptor_length</code>	8	uimsbf
<code>dv_version_major</code>	8	uimsbf
<code>dv_version_minor</code>	8	uimsbf
<code>dv_profile</code>	7	bslbf
<code>dv_level</code>	6	bslbf
<code>rpu_present_flag</code>	1	bslbf
<code>el_presnet_flag</code>	1	bslbf
<code>bl_present_flag</code>	1	bslbf
If (<code>!bl_present_flag</code>) {		
<code>dependency_pid</code>	13	bslbf
<code>reserved</code>	3	bslbf
}		
<code>dv_bl_signal_compatibility_id</code>	4	bslbf
<code>reserved</code>	4	bslbf
}		

`descriptor_tag` – the value for the DOVI descriptor tag shall be set to 0xB0.

`descriptor_length` – this is an 8-bit field specifying the number of bytes of the descriptor immediately following `descriptor_length` field.

`dv_version_major` - specifies the major version number of the Dolby Vision specification that the stream complies with. A stream compliant with this specification shall have the value 1.

`dv_version_minor` - specifies the minor version number of the Dolby Vision specification that the stream complies with. A stream compliant with this specification shall have the value 0.

`dv_profile` – specifies the Dolby Vision profile. Valid values are Profile IDs as defined in Table 1 column 1 of *Signaling Dolby Vision Profiles and Levels*.

`dv_level` – specifies the Dolby Vision level. Valid values are Level IDs as defined in Table 3 of *Signaling Dolby Vision Profiles and Levels*.

`rpu_present_flag` – if 1 indicates that this PID carries the RPU substream.

`el_present_flag` – if 1 indicates that this PID carries the EL substream.

`bl_present_flag` – if 1 indicates that this PID carries the BL substream.

`dependency_pid` – specifies the primary Dolby Vision PID that carries the BL substream for a Dolby Vision stream transmission using dual PID.

`dv_bl_signal_compatibility_id` – specifies a particular form of a base-layer sub-stream that can be decoded to a signal compliant with a particular set of standards. ~~if any.~~ Note that certain `dv_bl_signal_compatibility_id`'s, as defined in *Signaling Dolby® Vision Profiles and Levels*, may provide an indication that the decoded base-layer sub-stream is not compliant with any standards, and is of a form containing certain elements proprietary to Dolby Vision.

PES Constraint

This section specifies the format and constraints for PES carrying Dolby Vision stream.

4.1 RPU AU Re-ordering

4.1.1 Single PID Implementation

For a Dolby Vision stream transmission using single PID, the RPU AUs shall be re-ordered according to the BL AUs decoding order and multiplexed with the BL and EL substreams or BL substream only according to the *Dolby Vision VES Multiplexing Specification* into a combo Dolby Vision stream consisting of BL, EL and RPU substreams or BL and RPU substreams. This combo Dolby Vision stream shall be used as input for the ES feeding the single Dolby Vision PID on the Transport Stream multiplex.

4.1.2 Dual PID Implementation

For a Dolby Vision stream transmission using dual PID, the primary Dolby Vision PID shall carry the BL substream while the secondary Dolby Vision PID shall carry the EL substream plus the RPU substream.

The BL substream shall be used directly as input for the ES feeding the primary Dolby Vision PID on the Transport Stream multiplex.

The RPU AUs shall be re-ordered according to the EL AUs decoding order and multiplexed with the EL substream according to the *Dolby Vision VES Multiplexing Specification* into a combo Dolby Vision EL stream consisting of EL and RPU substreams. This combo Dolby Vision EL stream shall be used as input for the ES feeding the secondary Dolby Vision PID on the Transport Stream multiplex.

4.2 PES Align

The AU shall be aligned with the PES with each PES carrying only 1 AU.

4.3 PTS

A PTS value shall be present in every PES header.

Timing Requirements

This section specifies the timing requirement for the primary and secondary Dolby Vision PID in a dual Dolby Vision PID multiplex configuration.

5.1 Initial PTS Alignment

The PTS value for the first AU of the ES carried on the primary and the secondary Dolby Vision PID shall be identical in a dual Dolby Vision PID multiplex configuration.

5.2 Maximum Decode Delay

The maximum decode delay value which limits the difference between the AU DTS and PCR for the ES carried on the primary and secondary Dolby Vision PID shall be identical in a dual Dolby Vision PID multiplex configuration.

Carriage of Dolby Vision Stream

This section specifies how the Dolby Vision stream shall be carried in the MPEG-2 Transport Stream multiplex.

6.1 Carriage of combo Dolby Vision stream in a single Dolby Vision PID

Combo Dolby Vision stream containing the BL, EL and RPU substreams or BL and RPU substreams shall be carried as a regular AVC/HEVC stream using the T-STD model.

6.2 Carriage of BL substream on the primary PID of Dual Dolby Vision PID

Dolby Vision BL substream shall be carried as a regular AVC/HEVC stream using the T-STD model.

6.3 Carriage of EL stream on the secondary PID of Dual Dolby Vision PID

Dolby Vision EL stream containing the EL and RPU substreams shall be carried as a regular AVC/HEVC stream using the T-STD model.

Dolby Vision Stream Configuration

This section gives the required configuration for signaling the various configurations of Dolby Vision stream transmission in a generic MPEG-2 Transport Stream multiplex.

7.1 Single Dolby Vision PID

The BL, EL and RPU substreams or BL and RPU substreams shall be combined into a combo Dolby Vision stream.

7.1.1 SDR or HDR Compliant BL Dolby Vision Stream

The value of `stream_type` in the PMT shall be set to 0x1B for AVC-compatible BL and 0x24 for HEVC-compatible BL respectively.

Appropriate AVC or HEVC Video Descriptor shall be inserted in the PMT.

The DOVI Video Stream Descriptor shall be inserted in the PMT with

- The `rpu_present_flag` set to 1.
- The `el_present_flag` set according to the profile. Note that certain profiles defined in *Signaling Dolby® Vision Profiles and Levels* do not include an EL.
- The `bl_present_flag` set to 1.
- The `dv_profile` shall be set according to the encoded Dolby Vision profile.
- The `dv_level` field shall be set according to the encoded Dolby Vision level.
- The `dv_bl_signal_compatibility_id` shall be set to a non-zero value according to the encoded BL signal compatibility ID.

The value of `stream_id` in the PES header shall be set 0xEX where X is the video stream number.

7.1.2 Non-SDR and Non-HDR Compliant BL Dolby Vision Stream

The value of `stream_type` in the PMT shall be set to 0x06.

A DOVI Registration Descriptor shall be inserted in the PMT.

Appropriate AVC or HEVC Video Descriptor shall be inserted in the PMT.

The DOVI Video Stream Descriptor shall be inserted in the PMT with

- The `rpu_present_flag` set to 1.
- The `el_present_flag` set to 0.
- The `bl_present_flag` set to 1.
- The `dv_profile` shall be set according to the encoded Dolby Vision profile.
- The `dv_level` field shall be set according to the encoded Dolby Vision level.
- The `dv_bl_signal_compatibility_id` shall be set to 0x0.

The value of `stream_id` in the PES header shall be set 0xEX where X is the video stream number.

7.2 Dual Dolby Vision PID

The BL substream shall be transmitted alone by itself in the primary Dolby Vision PID. The EL and RPU substreams shall be combined into a combo Dolby Vision EL stream to be transmitted on the secondary Dolby Vision PID.

7.2.1 Primary Dolby Vision PID

The primary Dolby Vision PID carries the BL substream.

7.2.1.1 SDR or HDR Compliant BL Dolby Vision Stream

If an HDR compliant BL DoVi stream, the primary Dolby Vision PID shall be signaled as a HEVC video stream. If an SDR compliant BL DoVi stream, the primary Dolby Vision PID may be signaled as either an AVC or HEVC video stream.

7.2.1.2 Non-SDR and Non-HDR Compliant BL Dolby Vision Stream

Earlier versions of this document specified an approach to signaling these types of streams. This was useful for Profiles 1 and 3. As those profiles have been deprecated, the details for that signaling have been removed.

7.2.2 Secondary Dolby Vision PID

The secondary Dolby Vision PID carries the EL and RPU substreams.

The value of `stream_type` in the PMT shall be set to 0x06.

A DOVI Registration Descriptor shall be inserted in the PMT.

Appropriate AVC or HEVC Video Descriptor shall be inserted in the PMT.

The DOVI Video Stream Descriptor shall be inserted in the PMT with

- The `rpu_present_flag` set to 1.
- The `el_present_flag` set to 1.
- The `bl_present_flag` set to 0.
- The `dependency_pid` set to the primary Dolby Vision PID carrying the BL substream.
- The `dv_profile` shall be set according to the encoded Dolby Vision profile.
- The `dv_level` field shall be set according to the encoded Dolby Vision level.
- The `dv_bl_signal_compatibility_id` shall be set according to the encoded BL signal compatibility ID.

The value of `stream_id` in the PES header shall be set 0xEX where X is the video stream number.