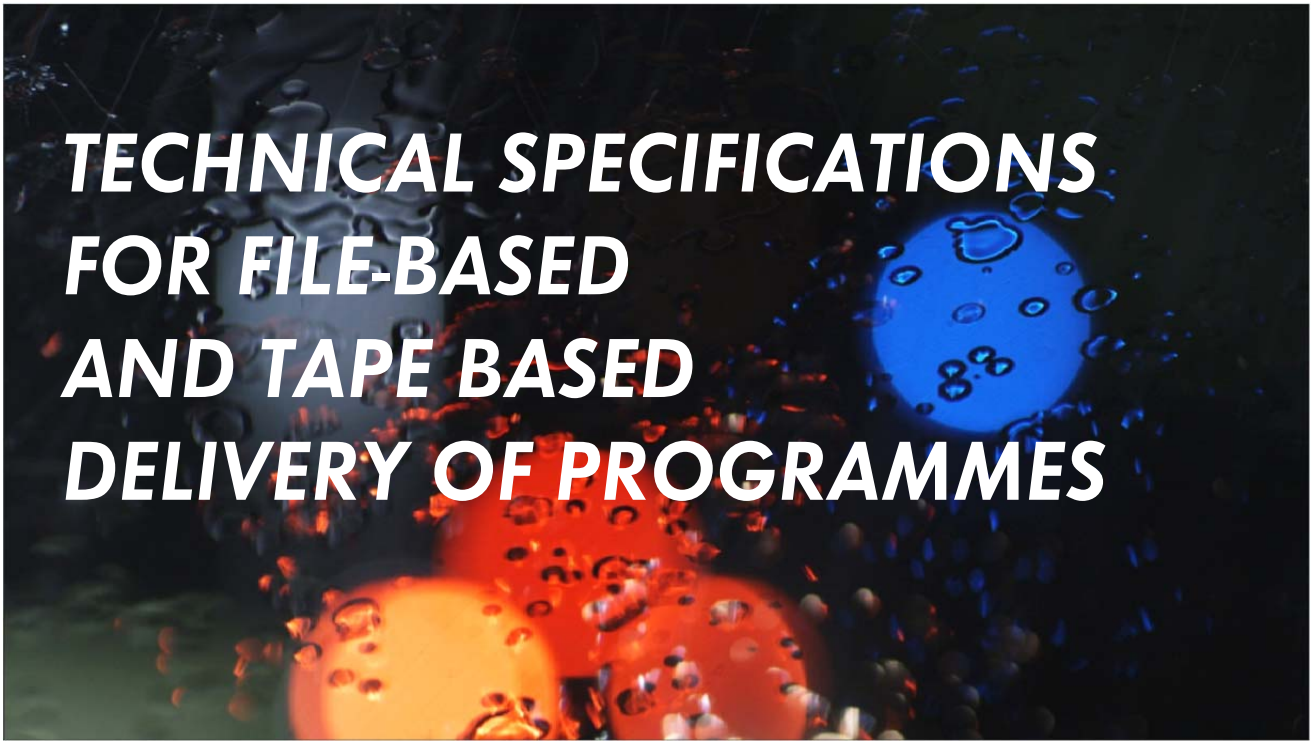
DirectionTechnique Edition

Version 6.0 December 2013



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Revision history

Version	Date	Release history
1.0	11/2005	Initial version
2.0	07/2006	p.5 § 1.1: modified the “line 23" note p.12 subtitles: naming convention for files and various add-ons. p.15 subtitles: "deliverable" item expected.
2.1	11/2006	Not published
2.2	11/2006	p.9-10 *DialNorm* replaced with *Dialog Level* p.10-11 modification to the Dolby-E Metadata summary table and additional notes p.11 added Dolby-E positioning spec. p. 21 alignment of audio versions
2.21	08/2007	p.2 *blank page* notice addition
3.0	04/2008	Major revision for channels of the CANAL+ group: • File name modification • Removal of signal specs and connection with the French broadcasters RFB document hosted on CST / HDFORUM web sites. • Revision / simplification of deliverable item organisation
3.1	04/2008	Concatenation of both SD and HD deliverable versions
3.2	05/2008	Summary table of deliverable items
4.0	04/2010	- Update to track new common French broadcasters RFB 2.x release. - Dolby E audio tracks only allowed on HDCAM-SR tapes (i.e. not allowed on HDCAM)
5.0 5.1	06/2011	Added specifications : • Audio Description • R128 (loudness) • Video 3D Added details for delivery of subtitles Merged File-based and Tape-based delivery specifications
5.2	09/2011	Added specifications for non linear services (VOD / SVOD)
5.21	11/2011	Added specifications for VOD / SVOD : “VT” Burned-in subtitles
5.3	03/2013	Minor updates : added HD 1,33:1, delivery list for tapes, “VT” Removed specific file formats for nonlinear services
6.0	12/2013	Aligned to French document release 6.0 Added details on file names rules. Added details on XML description file Added details on leader and end of file Added “dialog level” mention for DolbyE audio

This document, and the different international standards mentioned inside are regularly updated. Readers should regularly check that they have the latest version.

This document describes the key technical elements needed for creating HD or SD MXF files or videotapes for RFB acceptance (RFB - Ready for Broadcast) of programmes sent to different channels of the CANAL+group.

A. SIGNALS STANDARDS AND SPECIFICATONS.

1. Common specifications.

The standards and specifications of the different signal formats used for making *CANAL+* programmes are now described in a document commonly ratified by French broadcasting partners of the HD Forum, FICAM and CST under the titles:

RT 017 - TV - Rec Tech PAD DiffuseursVx.y.pdf

➔ *At the time of writing this document, V3.0 was the latest available release.*

These documents, otherwise known as ***Broadcasters RFB Technical Recommendations,*** as well as accompanying files that are relevant to it, are available on-line on three different websites:

- CST : (http://www.cst.fr/index.php?article=56)
- HD Forum : (http://www.hdforum.fr/publications)

2. Complements for the CANAL+ group

2.1 HD video

o The formats indicated in green in the table below have been accepted by *CANAL+*, in relation to image formats described in the ***Broadcasters RFB Technical Recommendations***, but resizing or cropping of the original picture will **not** be accepted (**)

Image format	*Starting line*	*Ending line*	*Number of lines*
1.33	21	560	540
1.66	21	560	540
1.77	21	560	540
1.85	32**	550**	519**
2.35	87**	495**	408**

Accepted
Accepted only after prior approval of CANAL+
Refused

2.2 SD video

- The formats indicated in red in the table below will not be accepted for *CANAL+* channels, in relation to image formats described in the ***Broadcasters RFB Technical Recommendations***.

- 1.33:1 (4/3) format will no longer be accepted other than in particular situations, with prior agreement from **CANAL+**.

- Use of line 23 is authorised provided that it is complete (not a half line).

	4/3 video			16/9 video		
Image format	*Starting line*	*Ending line*	*Number of lines*	*Starting line*	*Ending line*	*Number of lines*
1.33	23	310	288	-	-	-
1.55	44	290	246	-	-	-
1.66	52	281	230	23	310	288
1.77	59	274	216	23	310	288
1.85	64	270	207	29**	304**	276**
2.35	86	247	162	59**	274**	216**

(**): **CANAL+** will not accept any resizing or cropping of the picture content.

Accepted
Accepted only after prior approval of **CANAL+**
Refused

B. FILE BASED DELIVERABLES

1. General rules

Whatever its duration and segments number, a file-based delivery of program is composed of:

- One single MXF Op1a file containing the video essence and the related audio essences.
- Possibly one or several .STL files containing the associated subtitles.
- One XML file containing editorial and technical metadata about program.

Programs shall be delivered without leader and with 1 second black/silence added at the end.
(that means the duration of the file is the duration of the program + 1second).

First frame or first useful sound (SOM) shall start at **10:00:00:00**
In case of a multiple segmented program, all segments will be joined together, with no gap between segments.

Important: CANAL+ will test the compatibility of files with each provider before allowing the delivery of programs in that form. (contact : qualif_ingest@canal-plus.com).

1.1 Rules for naming files

Each program broadcasted on CANAL+ has a unique house ID named « Affaire Programme ».
This unique identifier, supplied by your usual contact at CANAL+, is constituted of distinct fields separated by the _ (underscore) character:

- Affaire : « affair » number (generally 6 to 7 digits)
- Programme : « program » number (1 to 4 digits)
- Version Type : VM (multilingual) / VF (French) / RE …

The name of the files will take its root from those “Affaire Programme” fields ;

- MXF and XML file name shall be identical. It will include “Affaire Programme” and the following fields (separated with _ underscore char)
  - Format : HD / 16 / 43 (HD / SD-16/9 / SD 4/3)
  - Program title (truncated to 20 characters)
  - Supplier’s name (truncated to 10 characters)
  - Delivery sequence number on 2 digits.
    (01 for the first delivery, then 1 increment for each new delivery of same program).

- STL subtitles files : will include “Affaire Programme” and the following fields
  - F for French subtitles, S for hearing impaired subtitles
  - Delivery sequence number on 2 digits (01 for the first delivery).

Example: **« Affaire Programme »** = **1234567_1234_VM**

MXF file	1234567_1234_VM_HD_Title_Supplier_01.MXF
XML metadata file	1234567_1234_VM_HD_Title_Supplier_01.XML
French .STL subtitles	1234567_1234_VM_F_01.STL
Hearing impaired STL subtitles	1234567_1234_VM_S_01.STL

1.2 XML program file description

An XML file containing some descriptive and editorial metadata shall be supplied with each MXF file delivery.

CANAL+ will supply a sample of such expected XML file, and a Microsoft Excel sheet with prepared cells to be filled.
This Excel file also includes macros to create the XML file to be delivered.

	A	B	C	D	L
1					
2		Template XML - ACQUISITION FICHIER - Vx.yy	Fabriquer le XML		
3		CANAL +			
4					
5		**Général**		**Type**	**Obligatoire**
6		Nom du MXF	*123456_1234_VM_HD_Titre_Labo_01*	Général	OUI
10					
11		**Description Fichier**			
14		Diffuseur	*CANAL+*	Description	OUI
15		Fournisseur du fichier	*Labo*	Description	OUI
17		Numéro d'Affaire	*123456*	Description	OUI
18		Numéro de Programme	*1234*	Description	OUI
19		Type de programme (Version audio)	*VM*	Description	OUI
20		Titre Programme Local	*Titre*	Description	OUI
21		Titre Episode Local		Description	NON
22		Titre Programme Original		Description	NON
23		Titre Episode Original		Description	NON
24		RevisionID	*1*	Description	OUI
31					
32		**Informations techniques**			
33		TC in Fichier (amorce)	*10:00:00:00*	Infos Techniques	OUI
34		TC in Programme	*10:00:00:00*	Infos Techniques	OUI
35		TC out Programme	*10:59:59:24*	Infos Techniques	OUI

Excel macros also generate expected MXF file name depending of the data filled in the XL sheet.

For a multi-part program, IN&OUT TimeCode of each segment must be supplied into XML file.

45		**Description de la segmentation**			
46		Nombre de parties	*2*	Segment	OUI
47					
48		**Description de la partie 1**			
49		Numéro de partie	*1*	Segment1	OUI
50		TC in (Programme ou message)	*10:00:00:00*	Segment1	OUI
51		TC out (Programme ou message)	*10:20:12:15*	Segment1	OUI
52					
53		**Description de la partie 2**			
54		Numéro de partie	*2*	Segment2	OUI
55		TC in (Programme ou message)	*10:20:12:16*	Segment2	OUI
56		TC out (Programme ou message)	*10:41:23:04*	Segment2	OUI

3. HD Files

• File format (MXF Op1a wrapper)

The file shall conform to the following standards:

- SMPTE ST 377-1-2009 (or later revisions) (*Material eXchange Format*).
- SMPTE ST 378 (*operationnal pattern 1a*)
- SMPTE ST 379 (*MXF Generic container*)
- SMPTE ST 381 (Mapping MPEG Streams into the MXF Generic Container)
- SMPTE ST 382 (*Mapping AES3 and Broadcast Wave Audio into the MXF Generic Container*)

The MXF specific implementation described in the SMPTE **RDD9** document shall be applied.

• TimeCode

The different TimeCode information that may be embedded into an MXF file shall be coherent with each other and shall be found :

- in the « Material Package » of MXF file (mandatory).
- in the « Source Package » of MXF file (mandatory).
- *Optional: in the « system item » of each GC.*
- *Optional: in the « time code 1 » of MPEG2 header (SMPTE 328M).*

NB: The first frame of the MPEG Long GOP file may not the first useful frame of the program.
In this case, the « pre-load » and « roll out » mechanisms, as described in the ST 377-1-2009 SMPTE standard will be used.

• Video.

The video signal compliant with *"Broadcasters RFB Technical Recommendations"* will be encoded with the following characteristics:

- Video resolution HxV : 1920x1080i
- Field frequency : 50Hz (25i)
- Coding : MPEG2 Long GOP “XDCAM HD” 422P@HL 50Mb/s
- Fixed GOP of 12 IBBP (N=12, M=3)
- « Closed GOP » preferably.

• Audio.

Each audio version must be in compliance with *"Broadcasters RFB Technical Recommendations"*

The **loudness** of each version (stereo and 5.1) shall conform with the EBU R128 recommendation, including the downmix of the 5.1 version if any…

The MXF file shall always have 4 or 8 audio tracks;
Each audio track shall contain a single mono AES3 channel (24 bits 48 Khz).
→ In other words, each HD MXF file shall have 2 or 4 audio pairs.
Unused tracks shall contain silence.

- ***Program with 5.1 (Dolby-E) audio content.***

  - In a Dolby-E signal, the « Program 2 » (optional channels A and B or tracks 7 and 8 of this Dolby-E) shall carry a stereo content. When not carrying audio description, the corresponding stereo version must be incorporated in 2.0 format.

  - The **loudness** of each program and the *downmix* version of the 5.1 program shall be in compliance with the R128 recommendation of the EBU.

  - Dolby-E « **DialogLevel** » metadata of each program shall be filled with the value measured by « Dialog intelligence » algorithm from Dolby.

  - Each « edit unit » in the MXF file contains one frame and associated audio in sync (MXF « frame wrapped »);
    The position of the « DolbyE Header » (« guard band ») shall comply with the current recommendations.

  - For quick identification of programs, the value of the Dolby-E *metadata* indicating the name of each of those programs (*Program Name*) shall be filled as follows :

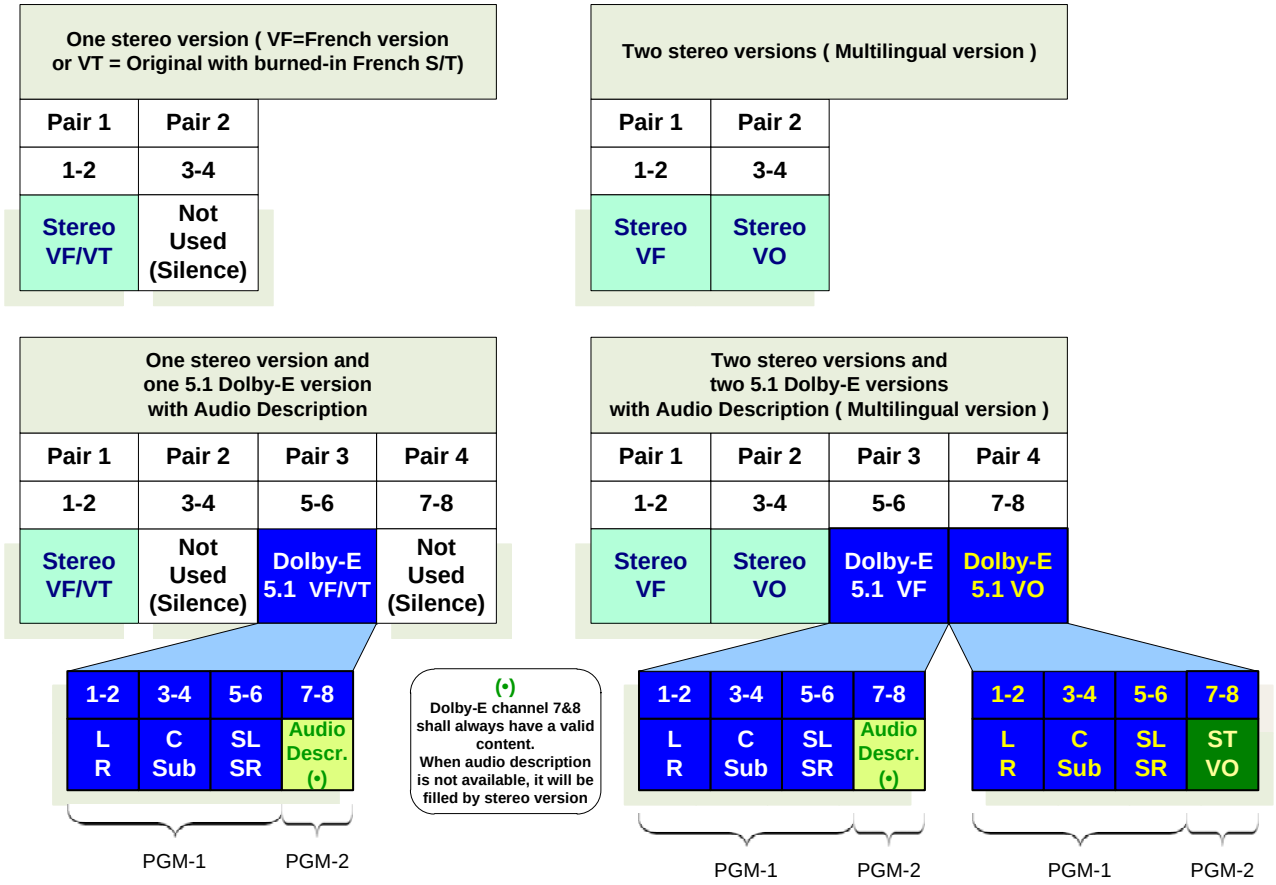
Type of program	*Program Name*
French multi channel version coded in 5.1 or Original multi channel version coded in 5.1	**VF_51**_*title of movie or* **VT_51**_*title of movie*
French stereo version coded in 2.0 or Original stereo version coded in 2.0	**VF_20**_ *title of movie or* **VT_20**_ *title of movie*
Original multi channel version coded in 5.1	**VO_51**_ *title of movie*
Original stereo version coded in 2.0	**VO_20**_ *title of movie*
Audio Description stereo version coded in 2.0	**AD_20**_ *title of movie*

  -

- ***Audio-Description.***

The audio-described version supplied in the form of a stereo mixdown, currently used for a *Broadcast Mix* transmission, shall be encoded in 2.0 and delivered on optional channels 7 and 8 of the French Dolby-E version (PGM-2).

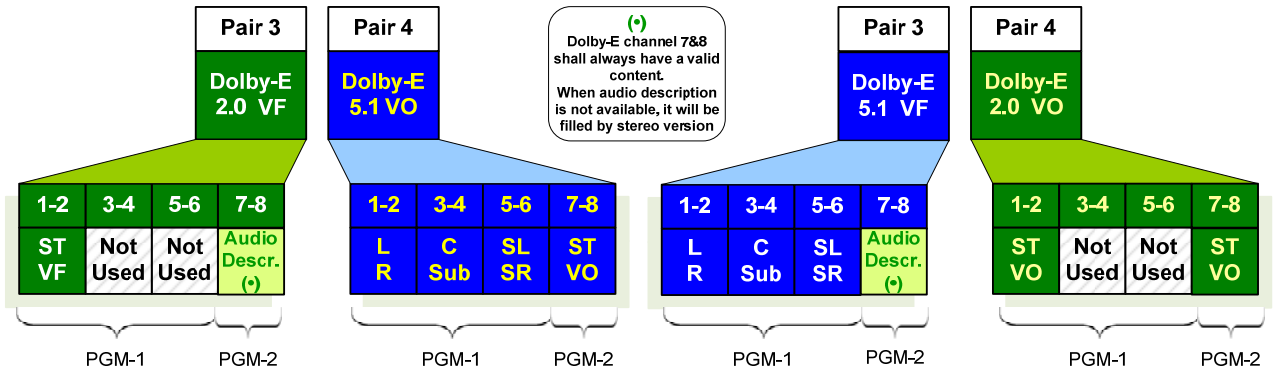
Depending on the available versions, the audio tracks allocation will be as follows:



Particular case: replacing a missing 5.1 version

When the 5.1 audio of a multilingual version (VM) is available only for one of the two versions (VF or VO), the only available version (in stereo format) will be used and encoded in **2.0 Dolby-E** mode as described below:

- In the case of a VF, if there is no audio description, also copy the stereo version on the 7-8 channels of the Dolby-E signal.
- In the case of a VO, also copy the stereo version on the 7-8 channels of the Dolby-E signal.



4. SD Files

• File format (MXF Op1a wrapper)

The file shall conform to the following standards:

- SMPTE ST 377-1-2009 (*Material eXchange Format*)
- SMPTE ST 378 (*operationnal pattern 1a*)
- SMPTE ST 379 (*MXF Generic container*)
- SMPTE ST 382 (*Mapping AES3 and Broadcast Wave Audio into the MXF Generic Container*)
- SMPTE ST 386 (*Mapping Type D-10 Essence Data to the MXF Generic Container*)

• TimeCode

The different TimeCode information that may be embedded into an MXF file shall be coherent with each other and shall be found :

- in the « Material Package » of MXF File (mandatory).
- in the « Source Package » of MXF File (mandatory).
- *if possible : in the VITC (SMPTE ST12-1) of the video essence on the lines 19/21 – 332/334.*
- *optional: in the « system item » of each GC.*
- *optional: in the « time code 1 » of MPEG2 header (SMPTE 328M).*

• Video.

The SD video signal in accordance with *"Broadcasters RFB Technical Recommendations"* shall be encoded with the following characteristics:

- Video resolution HxV: 720x608 (the 32 lines of VBI are encoded).
- MPEG2 “IMX50” D10 encoding profile (intra 422P@ML 50Mb/s).
- The aspect ratio information (16/9 or 4/3) will be properly filled:
  - mandatory : in the « aspect_ratio_information » flag of the « sequence header » of MPEG2 (see ISO-IEC 13818-2).
  - *if possible* : in the « aspect ratio » flag of the « Generic Picture Essence Descriptor » of the MXF file.

• Audio.

Each audio version will conform to *"Broadcasters RFB Technical Recommendations"*

The **loudness** of each version will conform to R128 recommendation of EBU.

The SD MXF file will include 1 audio track carrying 8 mono AES3 channels 24 bits 48Khz.
The « channel count » flag will be filled accordingly to content (8).

Depending on the available versions, the audio tracks allocation will be as follows:

One stereo version (VF=French version or VT = Original with burned-in French S/T)			
Pair 1	Pair 2	Pair 3	Pair 4
1-2	3-4	5-6	7-8
Stereo VF/VT	Not Used (Silence)	Not Used (Silence)	Not Used (Silence)

Two stereo versions (Multilingual version)			
Pair 1	Pair 2	Pair 3	Pair 4
1-2	3-4	5-6	7-8
Stereo VF	Stereo VO	Not Used (Silence)	Not Used (Silence)

C. TAPE BASED DELIVERABLES

NB : CANAL+ prefers now to receive MXF files.
Tape delivery is allowed only after prior approval of CANAL+

1. VideoTapes.

- Blank videotapes should be used, in compliance with manufacturer recommendations.
- The tape should include tracking capabilities without any discontinuity over the useful part (line up signals, programme leader, programme, ending).
- The digital recording must not include any portion with the *channel status* indicator going to RED
- The dominant field will always be field 1.

NOTE: for HDCAM-SR and HDCAM formats (in HD), the duration indicated on the tapes correspond to 60Hz formats. The amount of time available in the 50Hz set-up is significantly greater (+20%). Thus, a tape marked as 94 min could actually contain 112 min of programmes. A tape marked as 124 min could actually contain 148 min of programmes, etc.

1.1 Case / Label / Tape recording report

- **Cases**.
  Videotapes will be supplied in their original cases.
- **Labels**.
  Cases and videotapes labels will include the following information:

  - House ID (“Affaire_Programme” number supplied by *CANAL+*)
  - programme title
  - title and/or episode number / list of episodes
  - tape sequence (1/2 , 2/2)
  - programme duration (HH:MM:SS:ff)
  - sound version type: (mono / stereo / 5.1) and language
  - format of the original (File [codec type to indicate], HDCAMSR, D5, D6, etc.)
  - video standard (HD1080/50/I, SD 16/9, SD 4/3)
  - source image format (1,33:1 / 1.66:1 / 1.77:1 1.85:1 / 2.35:1 etc.)
  - A **Dolby-E** label will indicate the coding format and the encoded tracks, for a videotape including version 5.1 multiple audio channels.
  - If the French audio-description version is included, it must be indicated by the appropriate label.

- **Tape recording reports**.
  - Each tape will include a recording report that contains certain information on the label of the case, and completes this with other useful information:
    Name of the lab, description of the source format (HDCAMSR, D5, D6, etc.), sequence of segments on the tape. The report will also contain all information that may prove useful during "RFB" quality check: Any image or sound defects found, temporary problems with audio/video synchronisation (*lipsync*), etc.
  - Video processing (compression, noise reduction, cropping, 60Hz to 50Hz standard conversion etc) used during production or post-production must be indicated.
  - For 5.1 audio programmes delivered in Dolby E format, a *Dolby E Encoding Information Sheet* will be supplied as described in *Broadcasters RFB Technical Recommendations*.

2. HD videotapes: HDCAM-SR format.

- **Video.**

Signals recorded in **1080i/25 (10-bits)** mode must comply with *"Broadcasters RFB Technical Recommendations"* referenced at the start of this document.

- **Audio.**

All audio tracks must comply with *"Broadcasters RFB Technical Recommendations"* referenced at the start of this document.

o ***Stereo tracks.***

- **The first AES pair of an HDCAM-SR videotape must always be used for a stereo PCM version.**
- The **loudness** of each version shall conform to EBU R128 recommendation.

o ***Dolby-E tracks.***

- In a Dolby-E signal, the « Programme 2 » (PGM-2, see drawing here after) shall carry a stereo content, except when audio description is present.
- The **loudness** of each program and the *downmix* version of the 5.1 program shall be in compliance with the R128 recommendation of the EBU.
- For quick identification of programs, the value of the Dolby-E *metadata* indicating the name of each of those programs (*Program Name*) shall be filled as follows :

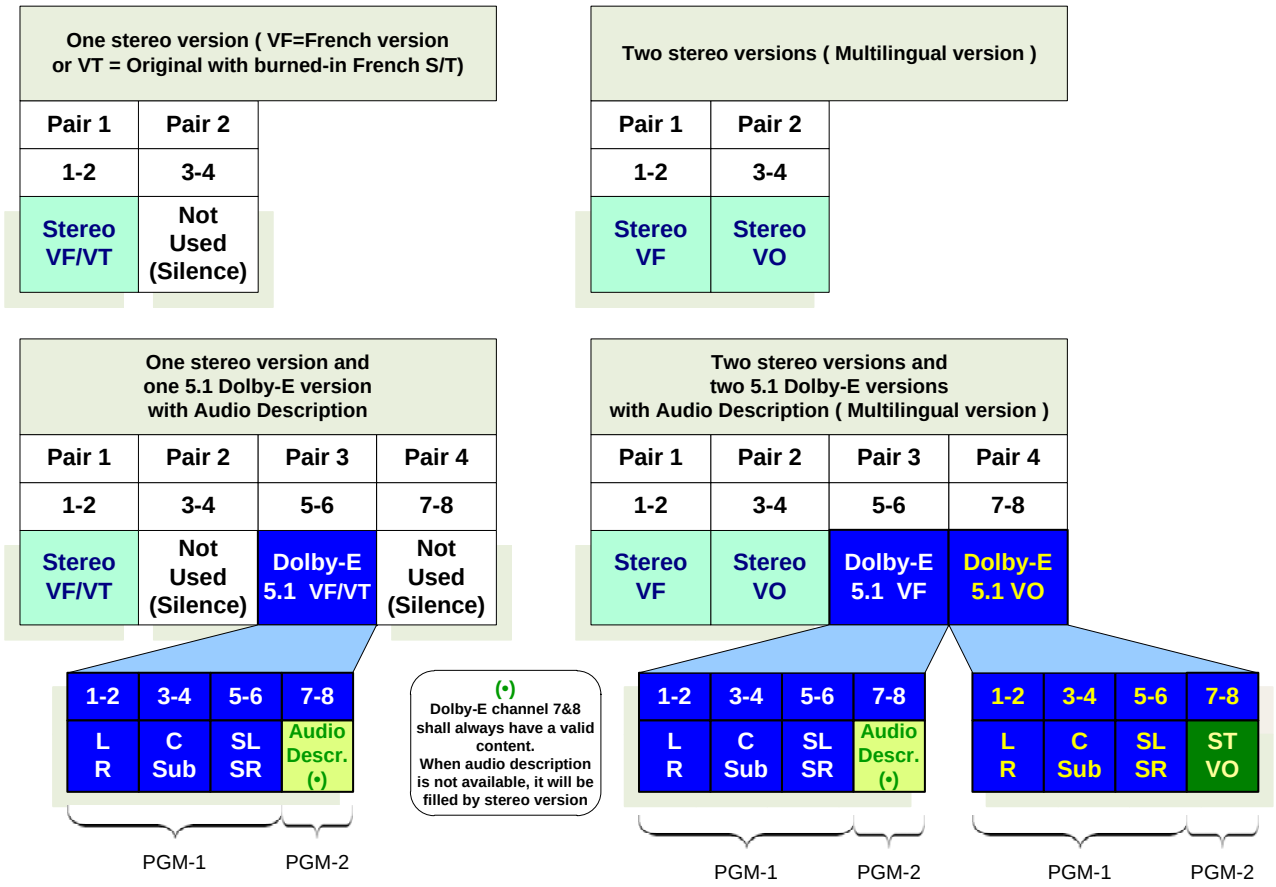
Type of program	*Program Name*
French multi channel version coded in 5.1 or Original multi channel version coded in 5.1	**VF_51**_*title of movie* or **VT_51**_*title of movie*
French stereo version coded in 2.0 or Original stereo version coded in 2.0	**VF_20**_ *title of movie* or **VT_20**_ *title of movie*
Original multi channel version coded in 5.1	**VO_51**_ *title of movie*
Original stereo version coded in 2.0	**VO_20**_ *title of movie*
Audio Description stereo version coded in 2.0	**AD_20**_ *title of movie*

o ***Audio-Description.***

- The audio-described version supplied in the form of a stereo mixdown, currently used for a *Broadcast Mix* transmission, shall be encoded in 2.0 and delivered on optional channels 7 and 8 of the French Dolby-E version (PGM-2).

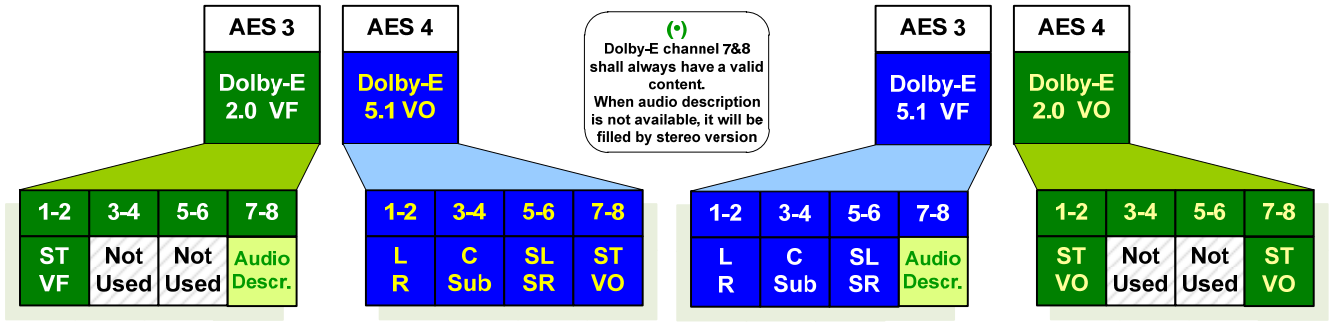
- *Tracks allocation.*

Depending on the versions available, audio track distribution will be carried out as follows:



- *Particular case: replacing a missing 5.1 version.*

When a multilingual version (VM) is available in 5.1 audio format for only one of the two versions (FV or OV), the stereo version of the missing DolbyE element must be encoded in **Dolby-E 2.0** as described below.



- **Subtitles.**

Programs without French audio tracks shall include “burned-in” subtitles (VT).

3. HD Videotapes: HDCAM format.

For Quality reasons, this tape format will not be accepted anymore, except in rare occasions, and only with prior approval from CANAL+

- **Video.**

Signals recorded in **1080i25** mode must comply with *"Broadcasters RFB Technical Recommendations"* referenced at the start of this document.

When dubbing an original in HDCAM tape, SDTI interface should be used if possible, to avoid extra decoding / coding process.

- **Audio.**

All audio tracks must comply with *"Broadcasters RFB Technical Recommendations"* referenced at the start of this document.

o ***Stereo tracks.***

- The first AES pair of an HDCAM videotape must always be used for a stereo PCM version.
- The second AES pair may be used, if required, for an additional original stereo version.
- The **loudness** of each version shall conform to EBU R128 recommendation.

o ***Tracks allocation***

Depending on the available versions, audio track distribution will be carried out as follows:

- **Important Note: It is only with prior *CANAL+* agreement** that the second AES pair may carry the 5.1 Dolby-E encoded audio version.
  (**NB:** this Dolby-E channel shall never be encoded in 2.0 format)

One stereo version	
AES 1	AES 2
1-2	3-4
Stereo VF/VT	Not Used

Two stereo versions (Multilingual version)	
AES 1	AES 2
1-2	3-4
Stereo VF	Stereo VO

One stereo version and one 5.1 Dolby-E version	
AES 1	AES 2
1-2	3-4
Stereo VF/VT	Dolby-E 5.1 VF/VT

NON STANDARD Version

Delivered only with *CANAL+* agreement

1-2	3-4	5-6	7-8
L R	C Sub	SL SR	Audio Descr.

- **Subtitles.**

Programs without French audio tracks shall include “burned-in” subtitles (VT).

4. SD videotapes

Items will be delivered exclusively on DIGITAL BETACAM tapes.
Signals will comply with *"Broadcasters RFB Technical Recommendations"* referenced at the start of this document.

- **Video.**

Video format must comply with general recommendations.

- **Audio.**
  - Audio tracks will only carry stereo versions
  - The **loudness** of each version shall conform to EBU R128 recommendation.
  - Tracks allocation will be as indicated :

One stereo version	
AES 1	AES 2
1-2	3-4
Stereo VF/VT	Not Used

Two stereo versions (Multilingual version)	
AES 1	AES 2
1-2	3-4
Stereo VF	Stereo VO

- **Subtitles.**

Programs without French audio tracks shall include “burned-in” subtitles (VT).

D. SUBTITLES

Programmes in a foreign language are broadcast in the original language with French subtitles. Other programmes in French or in a foreign language can also include subtitles specifically prepared for the hearing-impaired.

These subtitles can be broadcast in “open” (burned-in) mode or in “closed” (teletext) mode.

• Subtitles files

Any programme that must be broadcast with subtitles will be accompanied by one or two subtitle files compliant with EBU N19-2002 technical standard.

o Subtitles will be synchronised in relation to the time code of HD or SD programme delivered to CANAL+.

o The output time code of the last subtitle of the programme will be set at the latest to 1 second before the last useful image of the programme, to avoid this subtitle stays frozen on the next programme.

o In all cases, each subtitle file contains all subtitles for the entire duration of a programme, even for a long duration programme that is splitted over two tapes.

o .STL file names will be compliant to rules decribed in § B 1.1

o General information of the "GSI block" in the .STL file (programme title, episode title, **start of programme**, etc.) will be correctly filled in. Table below gives other details on some mandatory metadata and display attributes :

	Teletext mode	
Version	French	Hearing-impaired
Time code format (DFC)	25 f/s (STL25.01)	
Display standard (DSC)	Level 1 teletext (1)	
Character set table code (CCT)	Latin (00)	
Language (LC)	French (0F)	
Start of programme (TCP)	According to the supplied programme (should be 10:00:00:00)	
Size of characters	Double height - Simple width	
Maximum number of characters per line	37	
Subtitle colour	White	Depends on color codification currently applied.
Position of subtitles	Maximum of 2 lines of text Lower row in position 22 Horizontal alignment: centred	H/V adjusted according to common rules.

• Open (burned-in) subtitles

The properties (size, style) of burned-in subtitles will be chosen in such a way as to have them legible after DownConversion HD >>SD.