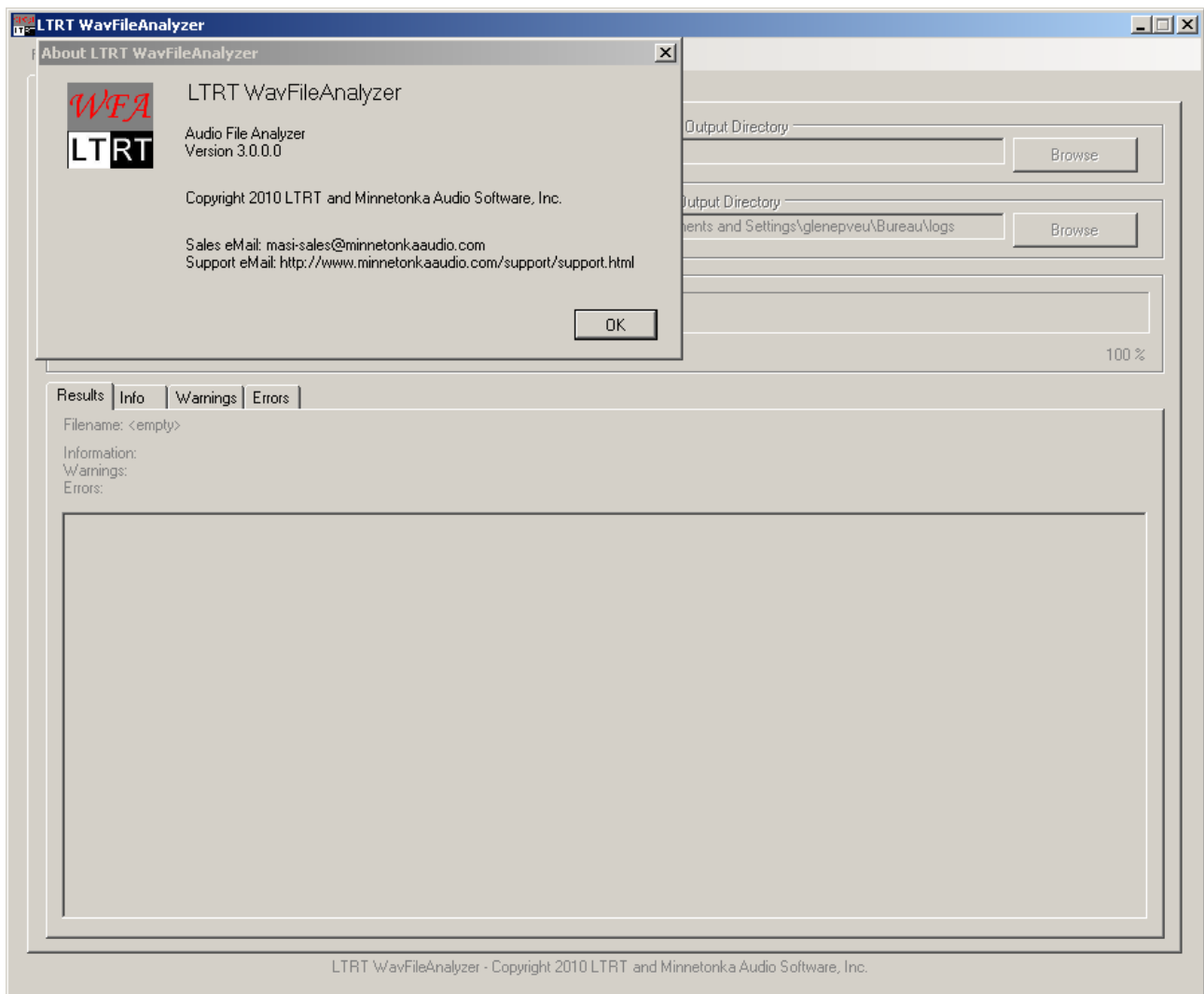


WavFileAnalyzer understandings



Version 1.0

Summary

1 Introduction.....	3
2 WAV/BWF files.....	4
2.1 Headers in WAV/BWF files.....	4
2.2 WAV/BWF file size	6
2.3 WAV/BWF quantification.....	7
2.4 WAV/BWF sample rate.....	8
2.5 WAV/BWF audio channels.....	9
2.6 WAV/BWF mandatory and optional headers.....	10
3 WAV/BWF file and DolbyE streams.....	11
3.1 DolbyE streams wrapping.....	11
3.2 DolbyE synchronisation.....	11
4 Conclusion.....	15
5 Lexical.....	16
6 Logs samples.....	17
6.1 BWF with RF64.....	17
6.2 BWF with faulty and correction on RF64.....	18
6.2.1 BWF with faulty RF64.....	18
6.2.2 BWF with correction on RF64.....	19
6.3 BWF with dbmd chunk.....	19
6.4 BWF containing DolbyE.....	22
6.4.1 BWF containing corrupted DolbyE.....	22
6.4.2 BWF containing corrected DolbyE.....	22

1 Introduction

What are the issues that occur with audio software and WAV/BFM files? This document brings several answers to your everyday issues with audio software and WAV/BWF files.

2 WAV/BWF files

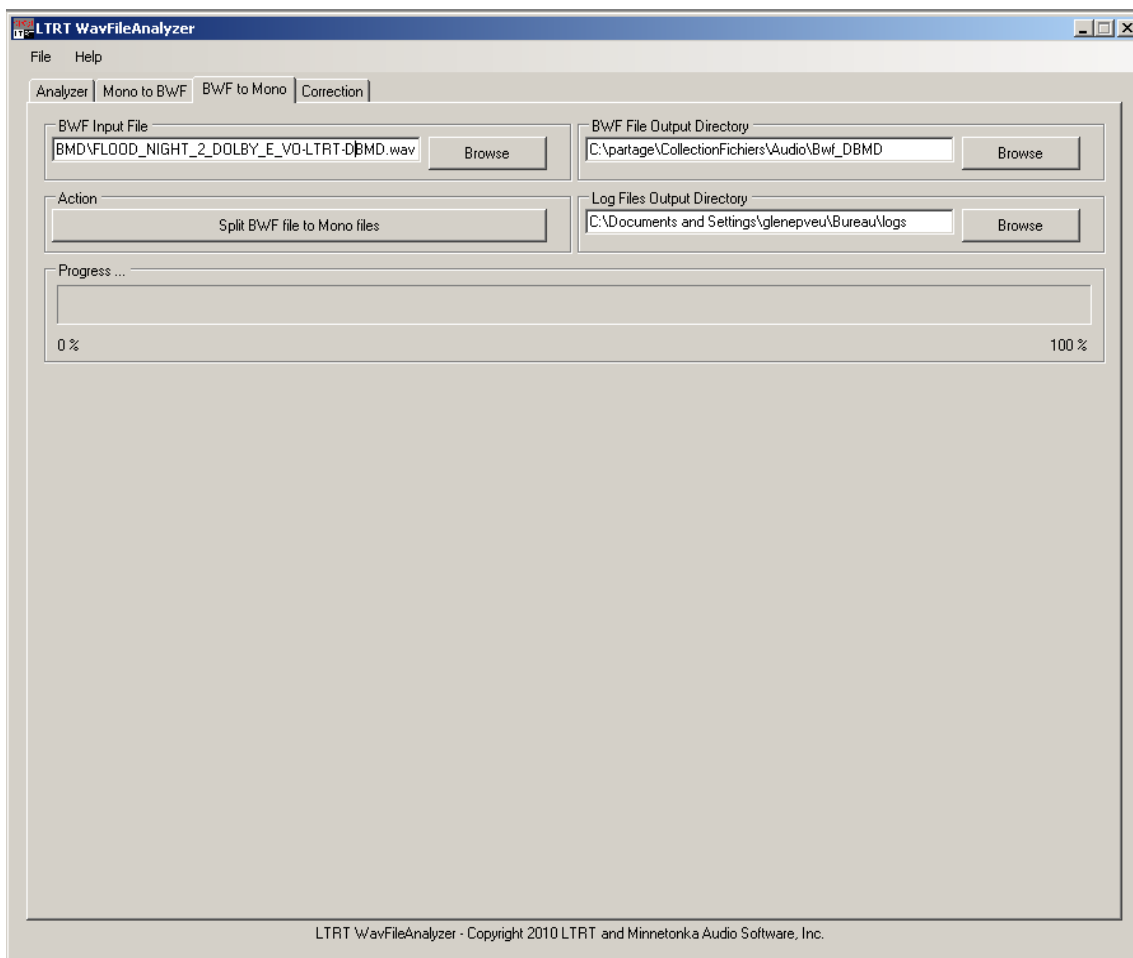
2.1 Headers in WAV/BWF files

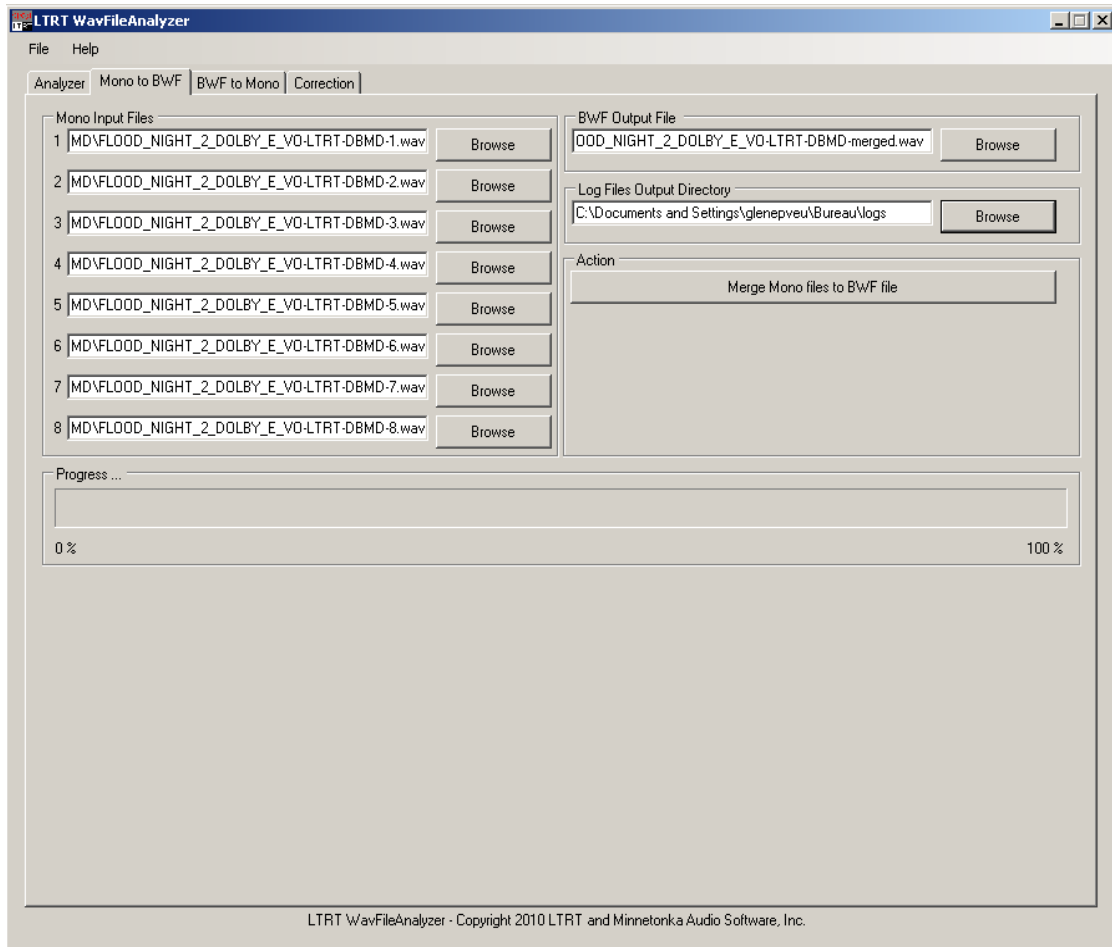
“ Why can't I open this file with my audio software? When opening an WAV/BWF file, my audio software crashes. What should I check? “

Wav and Bwf files contains numerous of header describing numerous of parameters. Those parameters can be corrupted during a transmission or during a disk access (read/write). So the first thing to check is the header names and size.

The number of optional headers may result in a non supported wav by your audio software.

When using WFA converter BWF to Monos or Monos to BWF, it is possible to output a WAV/BWF file containing only mandatory headers with header size correction.





Although, this correction has been done, the audio software may not open the WAV/BWF file properly because of unsupported parameters.

2.2 WAV/BWF file size

“ What can't I concatenate correctly two segments of audio within 1 file? Is my file size too big? ”

WAV file size is defined in the RIFF header in a 32bits field. This means that the maximum size that can be declared is 2^{32} Bytes = 4 GB.

To avoid this limitation, the RF64 and ds64 headers replace the RIFF header to define the file size over 2x 32bits fields. The new limitation is then 2^{64} = 18 446 744 TB which is sufficient for the moment.

2.3 WAV/BWF quantification

“My audio software raises an error such 16 bits file, 24 bits file, 32 bits file not supported”

The quantification of WAV/BWF file is defined in the fmt header.

8 bits quantification means that 1x Byte are allocated per audio sample value (256 values possible).

16 bits quantification means that 2x Bytes are allocated per audio sample value (65536 values possible).

24 bits quantification means that 3x Bytes are allocated per audio sample value (16777216 values possible).

32 bits quantification means that 4x Bytes are allocated per audio sample value (4294967296 values possible).

2.4 WAV/BWF sample rate

“ My audio software does not support the frequency. “

The sample rate parameter in the fmt header defines the frequency that the audio software should read each sample value.

The common values for sample rate are: 8 000 Hz, 11 025 Hz, 22 050 Hz, 32 000 Hz, 44 100 Hz, 48 000 Hz.

In broadcast domain, 48 kHz is the frame rate typically used.

2.5 WAV/BWF audio channels

“ How many audio channels can I save in one WAV/BWF file?”

One of the parameters of the fmt header set the number of audio channels contained in the file. We can find between 1 and 8 channels going from regular mono to 5.1 + 2 = 8 channels passing by stereo file.

2.6 WAV/BWF mandatory and optional headers

“ What are the headers analysed in further details by WFA ?”

Mandatory headers:

RIFF: defines the file size <4GB.

RF64: defines the file size >4GB.

ds64: defines the file size >4GB.

fmt: defines quantification, sample rate and number of channels.

data: contains the sample values of all the audio channels.

Optional headers:

bext: Broadcast data with timecode.

smpl: Manufacturer information.

dbmd: A specific Dolby header determines all the Dolby E and Dolby D metadata that can be set for further encoding processes.

LIST: list of data.

3 WAV/BWF file and DolbyE streams

3.1 DolbyE streams wrapping

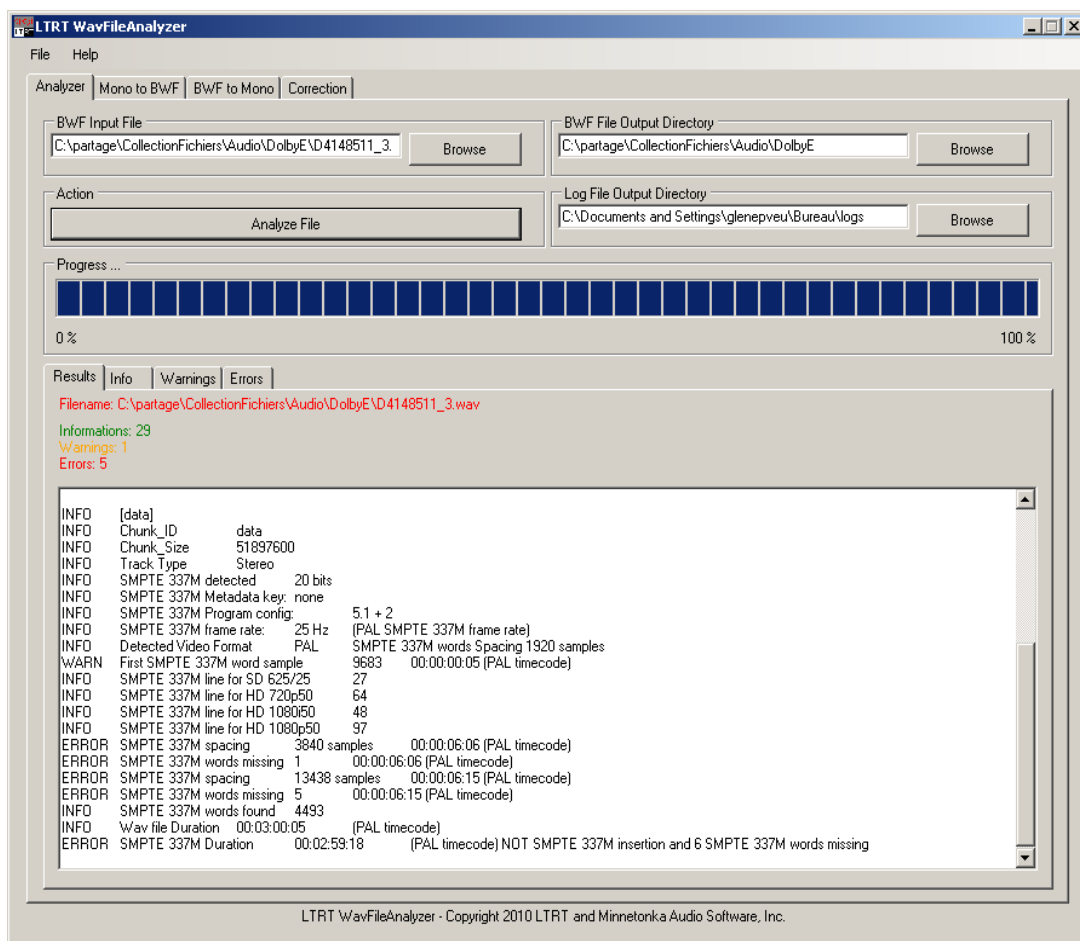
“ How can I record a DolbyE stream in a WAV/BWF file ?”

DolbyE stream encodes from 4 to 8 audio channels over 2 channels thanks to 16 or 20 bits words.

DolbyE 16 bits stream can be recorded in 16, 24, 32 bits WAV/BWF files whereas DolbyE 20 bis stream can only be supported in 24 and 32 bits WAV/BWF.

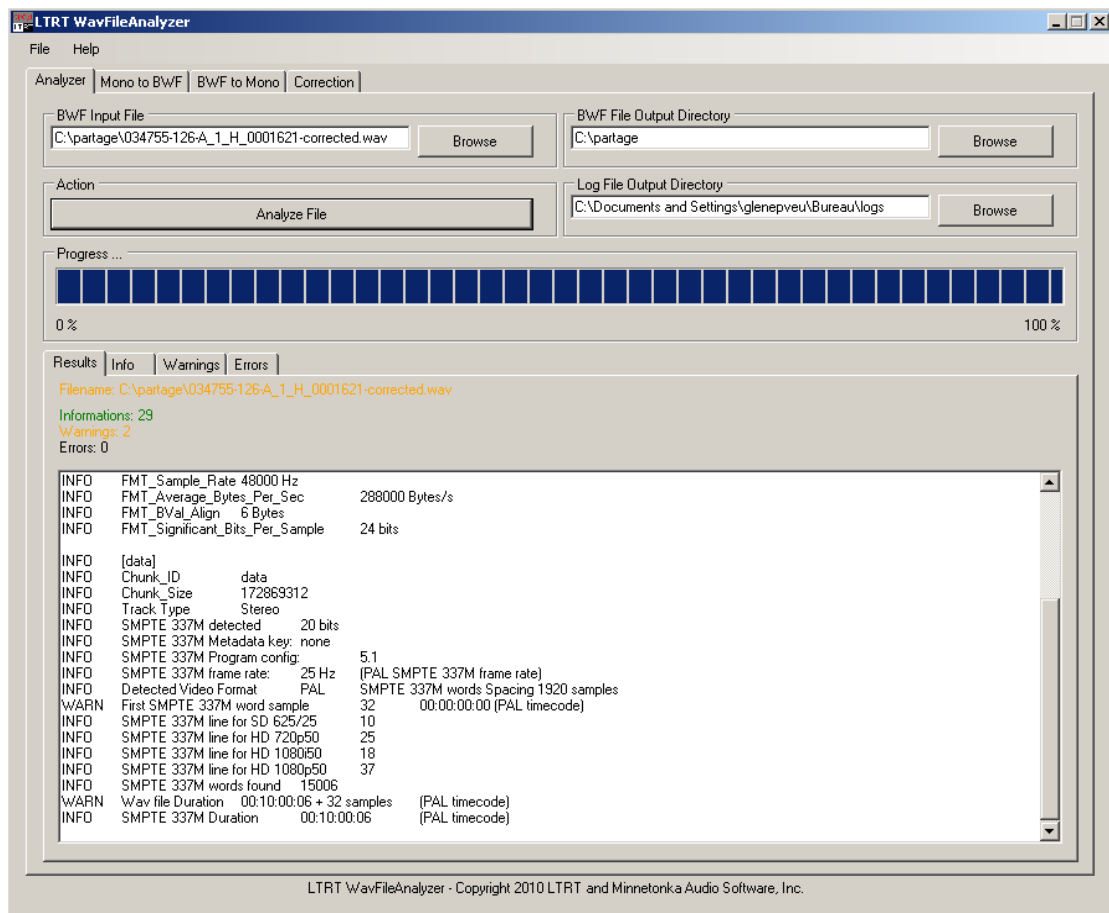
3.2 DolbyE synchronisation

Moreover, DolbyE word shall be aligned with the video which means that the first DolbyE word shall appear at a certain sample and the following ones should be accurately spaced.

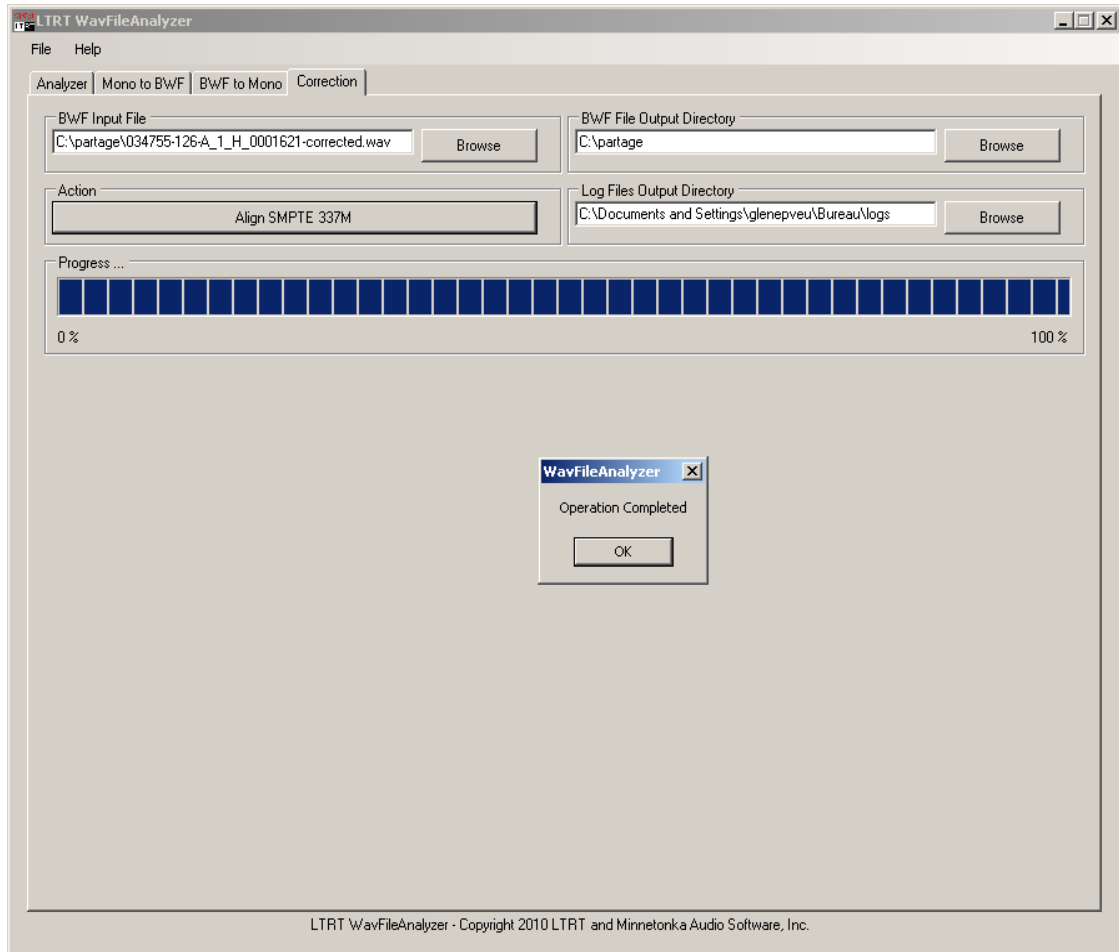


WFA analyses the first DolbyE word position and the space between all the DolbyE words

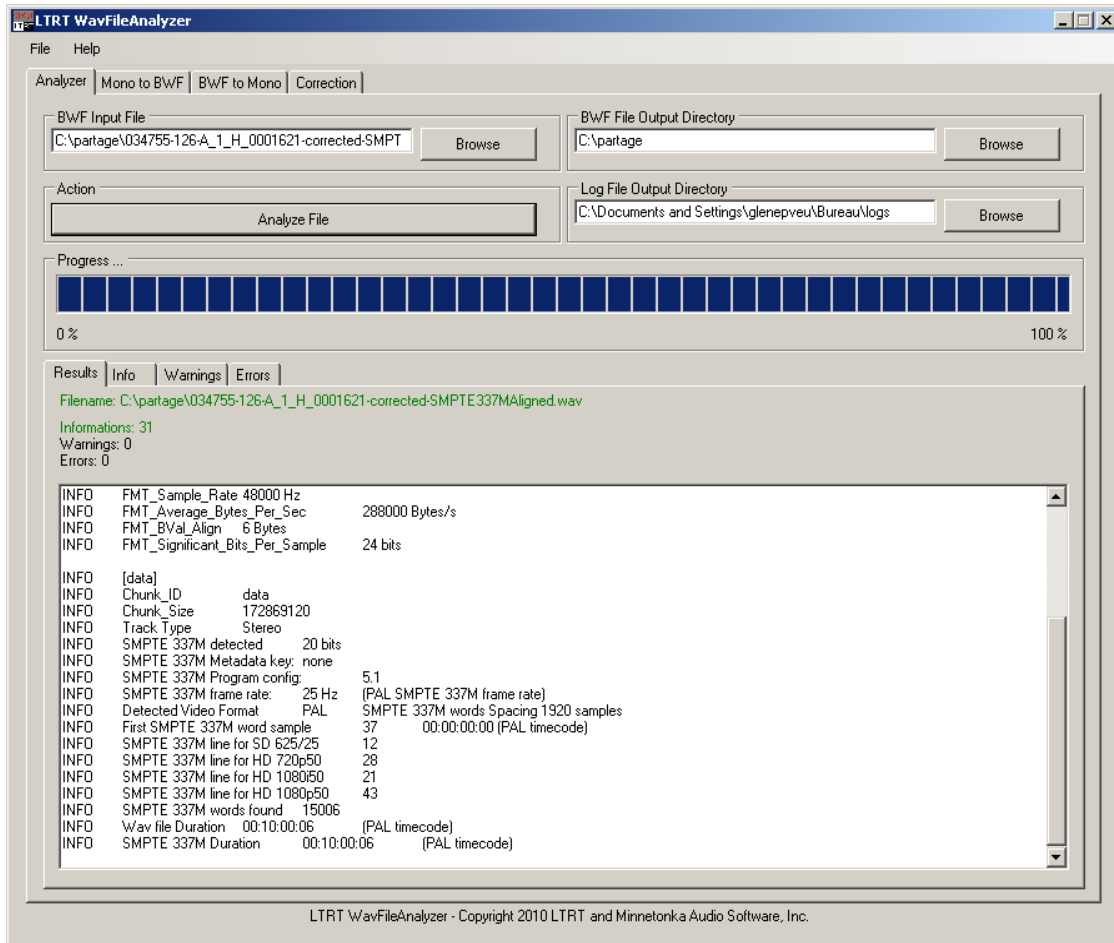
contained in the file to make sure that the DolbyE stream is correctly synchronised with the video.



In case the first DolbyE word is not at the good position, WFA can realign the DolbyE stream.



Once the file is corrected, the DolbyE stream is aligned and the number of audio samples fits exactly the duration of the video.



4 Conclusion

For more information concerning WavFileAnalyzer, please contact Gregoire LENEPVEU, LTRT by email glenepveu@ltrt.fr.

For support please post your request on <http://www.minnetonkaaudio.com/support/support.html>

5 Lexical

audio software: Protools, Pyramix, Nuendo, any audio freeware, ...

WAV file: contains only RIFF (or RF64 and ds64), fmt , data headers. Extension used *.wav

BWF file: contains mandatory RIFF (or RF64 and ds64), fmt , data headers and numerous of optional headers such as BEXT, LIST, ... Extension used *.wav.

6 Logs samples

6.1 BWF with RF64

Report for: C:\partage\CollectionFichiers\Audio\Bwf\FLOOD_NIGHT_2_DOLBY_E_VO-LTRT.wav

```

INFO [RF64]
INFO Chunk_ID RF64
INFO Chunk_Size -1
INFO Chunk_Type WAVE

INFO [ds64]
INFO Chunk_ID ds64
INFO Chunk_Size 28
INFO ds64_chunk_RIFF_size_low 2409678384
INFO ds64_chunk_RIFF_size_high 1
INFO ds64_chunk_data_size_low 2409672704
INFO ds64_chunk_data_size_high 1

INFO [fmt ]
INFO Chunk_ID fmt
INFO Chunk_Size 18
INFO FMT_Compression_Code 0x0001 (PCM)
INFO FMT_Channel_Number 8
INFO FMT_Sample_Rate 48000 Hz
INFO FMT_Average_Bytes_Per_Sec 1152000 Bytes/s
INFO FMT_BVal_Align 24 Bytes
INFO FMT_Significant_Bits_Per_Sample 24 bits
INFO FMT_Extra_Format_Bytes 0 Bytes

INFO [data]
INFO Chunk_ID data
INFO Chunk_Size -1
INFO Wav file Duration 01:37:00:00 (PAL timecode)
INFO Sample value over -3dBFS for Channel 3 -2.80 dBFS 00:02:03:23 + 1543 samples (PAL timecode)
INFO Sample value over -3dBFS for Channel 3 -2.78 dBFS 00:02:03:23 + 1544 samples (PAL timecode)
INFO Sample value over -3dBFS for Channel 3 -2.77 dBFS 00:02:03:23 + 1545 samples (PAL timecode)
INFO Sample value over -3dBFS for Channel 3 -2.97 dBFS 00:02:07:02 + 596 samples (PAL timecode)
WARN More than 800 over -3dBFS peaks
INFO Largest_Sample for Channel 1 -2.70 dBFS
INFO Largest_Sample for Channel 2 -0.87 dBFS
INFO Largest_Sample for Channel 3 -0.00 dBFS
INFO Largest_Sample for Channel 4 -4.50 dBFS
INFO Largest_Sample for Channel 5 -4.31 dBFS
INFO Largest_Sample for Channel 6 -4.45 dBFS
INFO Largest_Sample for Channel 7 -0.00 dBFS
INFO Largest_Sample for Channel 8 -0.00 dBFS

INFO [bext]
INFO Chunk_ID bext
INFO Chunk_Size 858
INFO Description FLOOD_NIGHT_2_DOLBY_E_VO
INFO Originator MEDIADUB
INFO OriginatorReference CHMTIPYRAMIX50000104904241871000
INFO OriginationDate 2009-02-02
INFO OriginationTime 10:49:04
INFO TimeReferenceLow 26279
INFO TimeReferenceHigh 0
INFO Version 0

INFO [iXML]
INFO Chunk_ID iXML
INFO Chunk_Size 4732

```

6.2 BWF with faulty and correction on RF64

6.2.1 BWF with faulty RF64

Report for: C:\partage\CollectionFichiers\Audio\DolbyE\FLOOD_NIGHT_2_DOLBY_E_VO-LTRT-DBMD-smpte337m.wav

```

INFO [RIFF]
INFO Chunk_ID RIFF
INFO Chunk_Size 1676177422
INFO RIFF_Type WAVE
INFO File_Size 1676177430

INFO [ds64]
INFO Chunk_ID ds64
INFO Chunk_Size 28
ERROR ds64_chunk_RIFF_size_low 2409678666 Should be 1676177422
ERROR ds64_chunk_RIFF_size_high 1 Should be 0. DS64 Header not needed
ERROR ds64_chunk_data_size_low 2409672704 Incorrect value
ERROR ds64_chunk_data_size_high 1 Incorrect value

INFO [bext]
INFO Chunk_ID bext
INFO Chunk_Size 858
INFO Description FLOOD_NIGHT_2_DOLBY_E_VO
INFO Originator MEDIADUB
INFO OriginatorReference CHMTIPYRAMIX50000104904241871000
INFO OriginationDate 2009-02-02
INFO OriginationTime 10:49:04
INFO TimeReferenceLow 26279
INFO TimeReferenceHigh 0
INFO Version 0

INFO [fmt ]
INFO Chunk_ID fmt
INFO Chunk_Size 18
INFO FMT_Compression_Code 0x0001 (PCM)
INFO FMT_Channel_Number 2
INFO FMT_Sample_Rate 48000 Hz
INFO FMT_Average_Bytes_Per_Sec 288000 Bytes/s
INFO FMT_BVal_Align 6 Bytes
INFO FMT_Significant_Bits_Per_Sample 24 bits
INFO FMT_Extra_Format_Bytes 0 Bytes

INFO [iXML]
INFO Chunk_ID iXML
INFO Chunk_Size 4732

INFO [data]
INFO Chunk_ID data
INFO Chunk_Size 1676171742
INFO Track Type Stereo
INFO SMPTE 337M detected 20 bits
INFO SMPTE 337M Metadata key: none
INFO SMPTE 337M Program config: 5.1 + 2
INFO SMPTE 337M frame rate: 25 Hz (PAL SMPTE 337M frame rate)
INFO Detected Video Format PAL SMPTE 337M words Spacing 1920 samples
INFO First SMPTE 337M word sample 37 00:00:00:00 (PAL timecode)
INFO SMPTE 337M line for SD 625/25 12
INFO SMPTE 337M line for HD 720p50 28
INFO SMPTE 337M line for HD 1080i50 21
INFO SMPTE 337M line for HD 1080p50 43
INFO SMPTE 337M words found 145501
WARN Wav file Duration 01:37:00:01 + 37 samples (PAL timecode)
INFO SMPTE 337M Duration 01:37:00:01 (PAL timecode)

```

6.2.2 BWF with correction on RF64

Report for: C:\partage\CollectionFichiers\Audio\DolbyE\FLOOD_NIGHT_2_DOLBY_E_VO-LTRT-DBMD-smpte337m-merged.wav

```

INFO  [RIFF]
INFO  Chunk_ID RIFF
INFO  Chunk_Size      1676171778
INFO  RIFF_Type       WAVE
INFO  File_Size      1676171786

INFO  [fmt ]
INFO  Chunk_ID fmt
INFO  Chunk_Size      16
INFO  FMT_Compression_Code  0x0001 (PCM)
INFO  FMT_Channel_Number    2
INFO  FMT_Sample_Rate      48000 Hz
INFO  FMT_Average_Bytes_Per_Sec  288000 Bytes/s
INFO  FMT_BVal_Align       6 Bytes
INFO  FMT_Significant_Bits_Per_Sample    24 bits

INFO  [data]
INFO  Chunk_ID data
INFO  Chunk_Size      1676171742
INFO  Track Type      Stereo
INFO  SMPTE 337M detected      20 bits
INFO  SMPTE 337M Metadata key: none
INFO  SMPTE 337M Program config: 5.1 + 2
INFO  SMPTE 337M frame rate:   25 Hz   (PAL SMPTE 337M frame rate)
INFO  Detected Video Format     PAL     SMPTE 337M words Spacing 1920 samples
INFO  First SMPTE 337M word sample 37     00:00:00:00 (PAL timecode)
INFO  SMPTE 337M line for SD 625/25 12
INFO  SMPTE 337M line for HD 720p50 28
INFO  SMPTE 337M line for HD 1080i50 21
INFO  SMPTE 337M line for HD 1080p50 43
INFO  SMPTE 337M words found    145501
INFO  Wav file Duration      01:37:00:01 samples (PAL timecode)
INFO  SMPTE 337M Duration    01:37:00:01 (PAL timecode)

```

6.3 BWF with dbmd chunk

Report for: C:\partage\CollectionFichiers\Audio\Bwf_DBMD\DolbyTest2-2-FilmLight-DBMD.wav

```

INFO  [RIFF]
INFO  Chunk_ID RIFF
INFO  Chunk_Size      8781286
INFO  RIFF_Type       WAVE
INFO  File_Size      8781294

INFO  [JUNK]
INFO  Chunk_ID JUNK
INFO  Chunk_Size      28

INFO  [fmt ]
INFO  Chunk_ID fmt
INFO  Chunk_Size      18
INFO  FMT_Compression_Code  0x0001 (PCM)
INFO  FMT_Channel_Number    4
INFO  FMT_Sample_Rate      48000 Hz
INFO  FMT_Average_Bytes_Per_Sec  576000 Bytes/s
INFO  FMT_BVal_Align       12 Bytes
INFO  FMT_Significant_Bits_Per_Sample    24 bits
INFO  FMT_Extra_Format_Bytes    0 Bytes

INFO  [dbmd]
INFO  Chunk_ID dbmd
INFO  Chunk_Size      274
INFO  DBMD version     1.0.0.4

```

INFO [DolbyE]
INFO Program_config: 2 + 2
INFO Frame_rate: 25 Hz (PAL Frame_rate)
INFO Time_code: 00:00:00:00
INFO [DolbyD]
INFO [Program_id0]
INFO Program_name: Prog1 2.0
INFO ac3_LFE: OFF
INFO ac3_bsmod: complete main
INFO ac3_acmod: 2/0 L, R
INFO ac3_data_rate: 192 kbps
INFO ac3_cmixlevel: 0.707 (-3.0 dB)
INFO ac3_surmixlevel: 0.707 (-3.0 dB)
INFO ac3_dsurmod: Dolby Surround encoded
INFO ac3_copyright: protected
INFO ac3_original_bitstream: original bitstream
INFO ac3_dialnorm: -25
INFO ac3_audio_production_info: OFF
INFO ac3_mixlevel: 85
INFO ac3_room_type: Not indicated
INFO ac3_extended_bitstream_info1: OFF
INFO ac3_lorocmixlevel: 0.707 (-3 dB)
INFO ac3_lorosurmixlevel: 0.707 (-3 dB)
INFO ac3_dmixmod: Not indicated
INFO ac3_ltrcmixlevel: 0.707 (-3.0 dB)
INFO ac3_ltrtsurmixlevel: 0.707 (-3 dB)
INFO ac3_extended_bitstream_info2: OFF
INFO ac3_dsurexmod: Not indicated
INFO ac3_dheadphonmod: Not indicated
INFO ac3_adconvtyp: Standard
INFO ac3_hpfn: ON
INFO ac3_bwlpfn: ON
INFO ac3_lfelpfn: OFF
INFO ac3_sur90on: OFF
INFO ac3_suratton: OFF
INFO ac3_rfpemphn: OFF
INFO ac3_compr1: Film, Standard
INFO ac3_dynrng1: Film, Light
INFO Checksum OK
INFO [DolbyD]
INFO [Program_id1]
INFO Program_name: Prog2 2.0
INFO ac3_LFE: OFF
INFO ac3_bsmod: complete main
INFO ac3_acmod: 2/0 L, R
INFO ac3_data_rate: 192 kbps
INFO ac3_cmixlevel: 0.707 (-3.0 dB)
INFO ac3_surmixlevel: 0.707 (-3.0 dB)
INFO ac3_dsurmod: Dolby Surround encoded
INFO ac3_copyright: protected
INFO ac3_original_bitstream: original bitstream
INFO ac3_dialnorm: -25
INFO ac3_audio_production_info: OFF
INFO ac3_mixlevel: 85
INFO ac3_room_type: Not indicated
INFO ac3_extended_bitstream_info1: OFF
INFO ac3_lorocmixlevel: 0.707 (-3 dB)
INFO ac3_lorosurmixlevel: 0.707 (-3 dB)
INFO ac3_dmixmod: Not indicated
INFO ac3_ltrcmixlevel: 0.707 (-3.0 dB)
INFO ac3_ltrtsurmixlevel: 0.707 (-3 dB)
INFO ac3_extended_bitstream_info2: OFF
INFO ac3_dsurexmod: Not indicated
INFO ac3_dheadphonmod: Not indicated
INFO ac3_adconvtyp: Standard
INFO ac3_hpfn: ON
INFO ac3_bwlpfn: ON
INFO ac3_lfelpfn: OFF
INFO ac3_sur90on: OFF
INFO ac3_suratton: OFF
INFO ac3_rfpemphn: OFF
INFO ac3_compr1: Film, Standard
INFO ac3_dynrng1: Film, Light

INFO Checksum OK

INFO [data]
INFO Chunk_ID data
INFO Chunk_Size 8777184
WARN Wav file Duration 00:00:15:05 + 1832 samples (PAL timecode)
INFO Sample value over -3dBFS for Channel 3 -1.72 dBFS 00:00:00:20 + 122 samples (PAL timecode)
INFO Sample value over -3dBFS for Channel 3 -0.82 dBFS 00:00:00:20 + 123 samples (PAL timecode)

WARN More than 400 over -3dBFS peaks
INFO Largest_Sample for Channel 1 -4.31 dBFS
INFO Largest_Sample for Channel 2 -4.31 dBFS
INFO Largest_Sample for Channel 3 -0.00 dBFS
INFO Largest_Sample for Channel 4 -0.00 dBFS

INFO [bext]
INFO Chunk_ID bext
INFO Chunk_Size 858
INFO Description Dolby Test 2-2
INFO Originator dbrulhart
INFO OriginatorReference CHMTIPYRAMIX00000101053229371000
INFO OriginationDate 2008-10-03
INFO OriginationTime 10:10:53
INFO TimeReferenceLow 27830
INFO TimeReferenceHigh 0
INFO Version 0

INFO [iXML]
INFO Chunk_ID iXML
INFO Chunk_Size 2872

6.4 BWF containing DolbyE

6.4.1 BWF containing corrupted DolbyE

Report for: C:\partage\CollectionFichiers\Audio\DolbyE\D4148511_3.wav

```

INFO [RIFF]
INFO Chunk_ID RIFF
INFO Chunk_Size 51897636
INFO RIFF_Type WAVE
INFO File_Size 51897644

INFO [fmt ]
INFO Chunk_ID fmt
INFO Chunk_Size 16
INFO FMT_Compression_Code 0x0001 (PCM)
INFO FMT_Channel_Number 2
INFO FMT_Sample_Rate 48000 Hz
INFO FMT_Average_Bytes_Per_Sec 288000 Bytes/s
INFO FMT_BVal_Align 6 Bytes
INFO FMT_Significant_Bits_Per_Sample 24 bits

INFO [data]
INFO Chunk_ID data
INFO Chunk_Size 51897600
INFO Track Type Stereo
INFO SMPTE 337M detected 20 bits
INFO SMPTE 337M Metadata key: none
INFO SMPTE 337M Program config: 5.1 + 2
INFO SMPTE 337M frame rate: 25 Hz (PAL SMPTE 337M frame rate)
INFO Detected Video Format PAL SMPTE 337M words Spacing 1920 samples
WARN First SMPTE 337M word sample 9683 00:00:00:05 (PAL timecode)
INFO SMPTE 337M line for SD 625/25 27
INFO SMPTE 337M line for HD 720p50 64
INFO SMPTE 337M line for HD 1080i50 48
INFO SMPTE 337M line for HD 1080p50 97
ERROR SMPTE 337M spacing 3840 samples 00:00:06:06 (PAL timecode)
ERROR SMPTE 337M words missing 1 00:00:06:06 (PAL timecode)
ERROR SMPTE 337M spacing 13438 samples 00:00:06:15 (PAL timecode)
ERROR SMPTE 337M words missing 5 00:00:06:15 (PAL timecode)
INFO SMPTE 337M words found 4493
INFO Wav file Duration 00:03:00:05 (PAL timecode)
ERROR SMPTE 337M Duration 00:02:59:18 (PAL timecode) NOT SMPTE 337M insertion and 6 SMPTE 337M words missing

```

6.4.2 BWF containing corrected DolbyE

Report for: C:\partage\CollectionFichiers\Audio\DolbyE\DolbyTest5_1-2-FilmLight-SMPTE337MAligned.wav

```

INFO [RIFF]
INFO Chunk_ID RIFF
INFO Chunk_Size 4389158
INFO RIFF_Type WAVE
INFO File_Size 4389166

INFO [fmt ]
INFO Chunk_ID fmt
INFO Chunk_Size 18
INFO FMT_Compression_Code 0x0001 (PCM)
INFO FMT_Channel_Number 2
INFO FMT_Sample_Rate 48000 Hz
INFO FMT_Average_Bytes_Per_Sec 288000 Bytes/s
INFO FMT_BVal_Align 6 Bytes
INFO FMT_Significant_Bits_Per_Sample 24 bits
INFO FMT_Extra_Format_Bytes 0 Bytes

```

```
INFO [data]
INFO Chunk_ID data
INFO Chunk_Size 4389120
INFO Track Type Stereo
INFO SMPTE 337M detected 20 bits
INFO SMPTE 337M Metadata key: none
INFO SMPTE 337M Program config: 5.1 + 2
INFO SMPTE 337M frame rate: 25 Hz (PAL SMPTE 337M frame rate)
INFO Detected Video Format PAL SMPTE 337M words Spacing 1920 samples
INFO First SMPTE 337M word sample 37 00:00:00:00 (PAL timecode)
INFO SMPTE 337M line for SD 625/25 12
INFO SMPTE 337M line for HD 720p50 28
INFO SMPTE 337M line for HD 1080i50 21
INFO SMPTE 337M line for HD 1080p50 43
INFO SMPTE 337M words found 381
INFO Wav file Duration 00:00:15:06 (PAL timecode)
INFO SMPTE 337M Duration 00:00:15:06 (PAL timecode)
```