

CALCULATING THE SIZE OF A FILM

We are going to calculate how much space (in GB) will we need to store a digital video, given its features. Firstly, read this solved example, and then try to solve the problem below.

Solved example:

We have a **video** with a resolution of 720 x 576 (like a DVD), and a color depth of 24 bits per pixel (this is, we need 24 bits to represent each pixel). The video has been recorded at 25 FPS.

Regarding the **audio**, it has a frequency of 48 KHz (48000 samples per second), with a depth of 16 bits per sample, and 5 audio channels (audio 5.1)

The film lasts **2 hours**. ¿How many GB will it have?

The first thing that we need to do, is to calculate the bitrate of video and audio separately:

Video bitrate:

- Resolution $720 \times 576 = 414.720$ pixels
- 414.720 pixels per image x 24 bits / pixel = $9.953.280$ bits/image
- $9.953.280$ bits/image x 25 images/second (FPS) = $248.832.000$ bps (bits per second)
- $248.832.000$ bps / 1024 = 243.000 kbps

Audio bitrate:

- 48.000 samples/second x 16 bits / sample = 768.000 bps (bits per second)
- 768.000 bps x 5 channels = $3.840.000$ bps / 1024 = 3.750 kbps

Total bitrate:

- Video bitrate + Audio bitrate = $243.000 + 3.750 =$ 246.750 kbps

File size:

- 2 hours = 7200 seconds. We multiply the total bitrate by the total seconds:
 $246.750 \times 7.200 = 1.776.600.000$ kb / 8 = 222075000 KB / 1024 = MB / 1024 = **211 GB**

Repeat the steps above with this film:

- **Video:**
 - Resolution 1920x1080 (Full HD)
 - Color depth 24 bits/pixel
 - 24 FPS
- **Audio:**
 - 44100 samples/segundo (44,1 KHz)
 - Depth 16 bits/sample
 - 2 channels
- Film duration: 1 hour 30 minutes