

# Video Quality in digital TV

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**Set-top-box manufacturers** when advertising their products, often refer to the excellent video quality ensured by the nature of digital TV. However, when we zap channels we can see great difference in quality between channels. Is it only imperfection of our senses? Unfortunately not! Actually, there is a great difference between channels. Why? One of the most important factors is the video resolution used by service providers.

## Video resolution

DVB standard for digital TV allows the providers to use a number of resolutions. The maximum resolution when digitizing PAL signal is 720x576 pixels. However, the service provider may decide to use lower resolution see table 1. Table 2 provides the resolutions for NTSC.

PAL/SECAM
720 x 576
704 x 576
544 x 576
480 x 576
352 x 576
352 x 288

Table 1. Signal resolution for PAL/SECAM.

NTSC
720 x 480
704 x 480
640 x 480
544 x 480
480 x 480
352 x 480
352 x 240

Table 2. Signal resolution for NTSC

As you can see, the difference can be really big! Probably the inquisitive reader will have a few questions here. Let's try to answer the most typical ones.

Why we have the two so close resolutions: 720 and 704 pixels per line? It is due to legacy reasons. In analog TV, the transmitted image was slightly greater than the picture shown on the TV-set screen. Also now, our TV-set can only show 704 pixels. The additional 8 pixels at every end, help our satellite receiver produce slightly better signal at the very edges of the screen. However it can rather be measured than observed.

704 x 576 is close to the 4:3 aspect ratio of a traditional TV-set but what about other

resolutions? Figure 1 explains how the signal resolution influences the shape and size of a pixel.

For the 704 x 576 resolution, the pixel is almost exactly a square. For 372 x 576, it is a rectangle that is twice as wide as it is high. For 352 x 288 it is again close to a square but of course it is 2 times wider and 2 times higher than that of the highest resolution. How this influences the quality of picture, you may see this in figure 2. It shows the same picture in the highest and reduced resolution.

An interesting fact is that the number of lines and the number of pixels in a line is always a multiple of 16. That's because digital TV is based on 16 x 16 block structure.

And what does happen in the real world? Which resolutions do the providers use? The quick check of one of the Hotbird transponders (11,727 MHz, V) revealed that all of them use different resolutions! See table 3.

Channel	Video resolution
Zagros TV	720 x 576
TRSP	352 x 288
La Locale	480 x 576
ATN Bangla	544 x 576
Telefortune	480 x 576
N-Test	352 x 576

Table 3. Video resolution for different channels on the same transponder.

## Aspect ratio

And what happens if the SDTV signal is transmitted in a widescreen mode? Aspect ratio is no longer 4:3 but 16:9. Do we get extra pixels at each side of the screen? Unfortunately not. The pixels are stretched. Although we can see additional details at both sides of the screen, the actor's face that took 40 pixels, now takes only 30 pixels in horizontal axis.

So, can we say that widescreen mode is better than the regular 4:3 mode? Rather not.

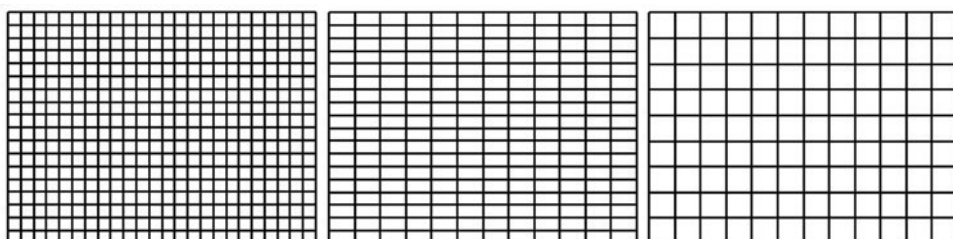


Fig. 1. A comparison of the pixel size and shape for the images: 704 x 576, 352 x 576 and 352 x 288



Fig. 2. The same picture when its resolution is decreased from 720x576 to 352x288.

The actual resolution is what really counts, not the aspect ratio.

Another, perhaps more important thing that you should keep in mind is that when there is a mismatch between the aspect ration of the incoming signal and your TV-set, the picture quality will suffer. Figure 4 shows what you can get in such situation - depending on the setting in your receiver menu.

## HDTV and flat panel TV-sets

Fortunately we have much less problems with High Definition TV. Both signal and TV-

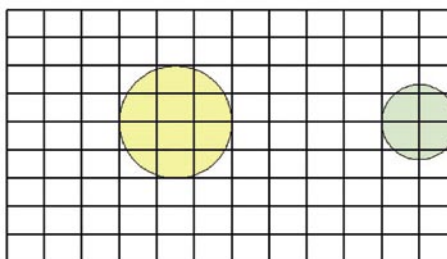
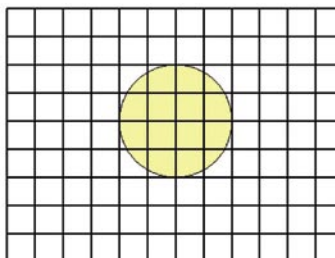


Fig. 3. A comparison of the 4:3 and 16:9 formats for the same resolution SDTV signal.

sets have the 16:9 aspect ratio and there are only 2 resolutions in use: 1280 x 720p and 1920 x 1080i. Pixels are square. Although the authors of the H.264/AVC standard made it very versatile (e.g. they permitted many different aspect ratios), in the digital satellite TV, we should not encounter too many other variations than those mentioned above.

If now, you go to the shop to find a suitable TV-set for yourself, you will probably be confused again. The resolution of the currently available TV-sets (especially those cheaper ones) is quite often different from the values mentioned above. The popular values are: 1366 x 768 and 1024 x 768. Where are they from? They are taken from the PC monitors specifications. See table 4.

#### PC Monitor Resolutions

640 x 400 VGA
640 x 480 VGA
854 x 480 SVGA
800 x 600 SVGA
1024 x 768 XGA
1280 x 768 XGA
1280 x 1024 SXGA
1600 x 1200 UXGA

Table 4. Standardized resolutions for PC monitors.

WXGA (1366 x 768) is a derivation from XGA. It means that when we receive the HDTV signal, our TV-set must convert it to the so-called native resolution of the screen. It means that the quality of video will be reduced. But will this be really perceivable? It depends on the TV-set size and the distance you will be watching it. Because of the imperfection of our eyesight, for a 32" display, we must come to the screen closer than 1.3 meter to see all details of the 1920 x 1080 pixel picture. In other words, it makes sense to produce the full resolution TV-sets only if they are big enough. For example, the above mentioned distance increases to ca. 2 meters for 50" screen. It makes sense to watch the TV from 2-meter distance (but rather not from 1.3 m).

So, if you want to buy a really big flat panel screen, search for the full HD resolution. If your living room is not that big and a smaller TV-set will do, 1366 x 768 or even 1024 x 768 will be a good enough choice. When making the decision, think of other aspects influencing the video quality like contrast, brightness, reflections of light (the weak point of plasma devices!). Just avoid the cheapest models that have resolution of 852 x 480.

## Conclusions

Among the SDTV broadcasts we can easily find a signal of really poor resolution and thus poor video quality. It can be as bad as the VHS tape. So, this is not always true that digital TV ensures better quality than analog one. However this is always true when we talk about HDTV. Only such signals, when seen on proper TV-set, secure high quality.

The resolution is not the only factor that influences the quality of video. As you already know, the mismatch of the aspect ratio between signal and TV-set will also reduce it. But there are also other factors. We will write about them in the next issue of TELE-satellite.

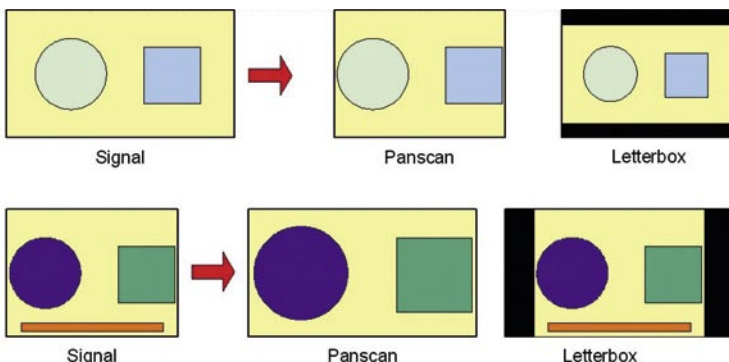


Fig. 4. Converting the picture when there is a mismatch between its aspect ratio and the aspect ratio of a TV-set.

# Program variety ...



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