The picture quality of digital TV signals is subject to quite different effects and influences than that of analog TV signals. Whereas noise effects in analog TV signals manifest themselves directly as ‘snow’ in the picture, they initially only produce an increase in the channel bit error rate in digital television. Due to the error protection included in the signal, however, most of the bit errors can be repaired up to a certain limit and are thus not noticeable in the picture or the sound. If the transmission path for digital television is too noisy, the transmission breaks down abruptly (‘brick wall’ effect, also called ‘fall off the cliff’). Neither does linear or nonlinear distortion have any direct effect on the picture and sound quality in digital television but in the extreme case it, too, leads to a total transmission breakdown. Digital TV does not require VITS (vertical insertion test signal) lines for detecting linear and nonlinear distortion or black-level lines for measuring noise, neither are they provided there and would not produce any test results concerning the transmission link if they were. Nevertheless, the picture quality can still be good, bad or indifferent but it now needs to be classified differently and detected by different means. There are mainly two sources which can disturb the video transmission and which can cause interference effects of quite a different type:

- the MPEG-2 encoder or sometimes also the multiplexer, and
- the transmission link from the modulator to the receiver.

The MPEG-2 encoder has a direct effect on the picture quality due to the more or less severe compression imposed by it. The transmission link introduces interference effects resulting in channel bit errors which manifest themselves as large-area blocking effects, as frozen picture areas or frames or as a total loss of transmission. If the compression of the MPEG-2 encoder is too great, it causes blocks of unsharp picture areas. All these effects are simply called blocking. This section explains how the effects caused by the MPEG-2 video coding are produced and analyzed.

All video compression algorithms work in blocks, i.e. the image is in most cases initially divided into blocks of 8 x 8 pixels. Each of these
blocks is individually compressed to a greater or lesser extent, independently of the other blocks. In the case of MPEG-2, the image is additionally divided into 16 x 16 pixels called macroblocks which form the basis for the interframe coding. If the compression is excessive, the block boundaries become visible and blocking occurs. There are discontinuities between blocks in the luminance and chrominance signals and these are perceptible. With a predetermined compression, the amount of blocking in an image also depends on the picture material, among other things. Some source images can be compressed without problems and almost without errors at a low data rate whereas other material produces strong blocking effects when compressed. Simple moving picture sources for moving-picture compression are, for example, scenes with little movement and little detail. Animated cartoons, but also classical celluloid films, can be compressed without loss of quality with relatively few problems. The reason for this is, among other things, that there is no movement between the first and second fields. In addition, the image structures are relatively coarse in animated cartoons. The most critical sources are sports programs, and this, in turn, depends on the type of sport. By their nature, Formula I programs will be more difficult to compress without interference than programs involving the thinker’s sport of chess. In addition, however, the actual picture quality depends on the MPEG-2 encoder and the algorithms used there. In recent years, the picture quality has clearly improved in this department. Fig. 12.1. shows an example of blocking.

Apart from the blocking, the excessively compressed image also shows the DCT structures, i.e. patterned interference suddenly occurs in the picture.

The decisive factor is that it is always the MPEG-2 encoder which is responsible for such interference effects. Although it is difficult to measure good or bad picture quality caused by compression processes, it can be done. Of course, picture quality will never be 100% measurement - there is always some subjectivity involved. Even so-called objective video quality analyzers are calibrated by test persons using subjective tests. At least, this applies to analyzers which do not use a reference signal for quality assessment, but in practice, there is no reference signal with which the compressed video signal could be compared. The requirement that it should be possible to use reference signals is unrealistic, at least with regard to transmission testing.

The basis for all video quality analyzers throughout the world - and there are not many - is the ITU-R BT.500 standard. This standard describes methods for subjective video quality analysis where a group of test persons analyses video sequences for their picture quality.