

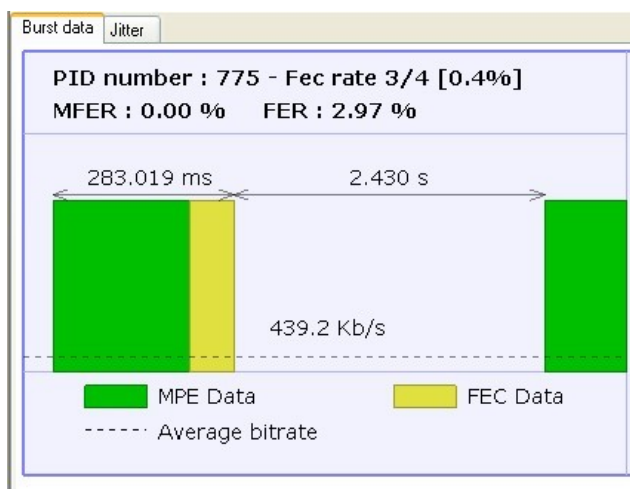
DVB-H monitoring – Ratios that matter

The DVB-H standard for mobile TV broadcasting is based on the principle of time slicing to achieve consequent power saving of the receiver's battery. This highly specific transmission characteristic requires a combination of digital TV proven ratios with both new and specific monitoring measures to render the quality of restitution « on the field ».

Mobile TV faces a strong constraint based on the capabilities of the receiver's battery. TV programs in mobility are highly power consuming and the limitations of handsets could have hindered mobile TV adoption. DVB-H standard was created to overcome these limitations. By slicing the transport stream into data « bursts » of alternate programs, the handset, which is tuned to the service the user is watching, can switch off between two bursts of the same program (ie while bursts of other services are received), thus achieving battery power saving. Bursts are composed of both MPE data and FEC data. MPE data corresponds to the useful data of the transport stream, whereas FEC data is redundant data to allow for correction of potential corrupted MPE data received. A DVB-H service is made up of IP datagrams, as opposed to MPEG2 Transport Streams packets which are common to many other DVB transmission standards.

Taking all these specific characteristics into consideration, it is obvious that DVB-H networks cannot only be monitored as other traditional digital TV networks. New ratios are required to account for specific time slicing aspects.

Frame Error Rate (FER) is the ratio of transmitted bursts containing errors during a specified period. A burst is marked erroneous if any TS-packet within the burst is erroneous.



MPE-FEC Frame Error Rate (MFER) is the ratio of uncorrectable MPE-FEC frames received during a specified period. An uncorrectable MPE-FEC frame is a frame in which there are more errors in the MPE section than the number of errors that FEC is actually capable of correcting.

Both ratios have become referential indicators of the quality of restitution for each transmitted service and the « degradation point » has been unanimously set to 5% for both

ratios. Note that an MFER of 5% means that each 5 minutes there is 15 seconds without any video (based on a time slicing of 3 seconds).

It is also important to note that a 5% FER may result in an actually better quality of experience than with a 5% MFER: It is actually possible with FER that only a few TS-packets within the frame are erroneous, whereas with MFER an uncorrectable frame is more probably highly corrupted.

Of course, all standard DTV well-proven ratios can also be reused as such for DVB-H. Yet, when considering « in-field » measurement to exhibit a reflection of end-users' quality of reception, some ratios are more useful than others.

Modulation Error Ratio (MER) represents the deviation between measured and theoretical constellation points. It is an indicator of noise, interferences or distortions on the signal, and an acclaimed ratio to characterize a modulation equipment. However, for DVB-H field measures, it may be more relevant to rely on Carrier to Noise ratio (C/N) and Bit Error Rate (BER).

C/N is the ratio of RF or IF signal power to noise power: The more noise in the transmission, the lower the C/N. Inversely, the higher the C/N, the « clearer » the signal.

BER is the ratio of the number of bits incorrectly received to the total number of bits sent during a specified period. A Quasi Error Free (QEF) value of BER has been standardized at $2.10e-4$ before the Reed-Solomon decoder.

C/N and BER combined together are the most important elements to assess the quality of digital transmission. Combining MFER and FER with C/N and BER achieves the most accurate diagnosis on quality of service in a DVB-H network.

Given the highly differentiating formatting of DVB-H signals, it is now widely admitted that DVB-H specific parameters like MFER and FER are best-suited

to account for quality of restitution of DVB-H signals. As a reference, the DVB-H Validation Task Force has based all DVB-H performance field trials on C/N, MFER and FER ratios.

