# Physical layer tests on DVB-S2/DVB-S2X components

The DVB-S2X extension of DVB-S2 does more than prepare the DVB-S transmission system for the UHD era. It also makes the system attractive for other applications. The R&S®SMW200A vector signal generator now has a new software option to generate signals in line with both standards.

DVB-S2 is the standard currently used by millions of viewers to receive satellite HDTV channels. Even some UHD channels are already being broadcast via DVB-S2. Although UHD compression (H.265) is better than the H.264 standard currently in use, it still generates a larger data volume. Satellites will be pushed to capacity as more and more content providers jump on the UHD bandwagon. Modifying a transponder's channel spacing is no simple task. The frequencies are already occupied, the number of TV channels should not be reduced and backward compatibility with the existing receiver landscape must be guaranteed. This leaves only one option: more efficient use of the spectrum. Adopted in 2014, the new DVB-S2X standard does just this and is already supported by some consumer devices. DVB-S2X prepares the standard for higher data rates and opens a range of options for highly flexible channel use. The standard offers over 100 different modulation and FEC combinations (including constellations up to 256APSK), employs steep-edge filters to reduce channel spacing (the channels will be somewhat wider) and, similar to carrier aggregation in LTE, enables the distribution of transport streams to multiple channels (channel bonding), even across transponders.

DVB-S2 and DVB-S2X are optimized specifically for satellite data transmissions. It therefore makes sense to use the standard to transmit more than video broadcasts. Highly diverse


Fig. 1: The R&S®SMW200A has a new software option to generate signals for physical layer testing on DVB-S2/DVB-S2X components and receivers.

transport streams from a broad range of customers can travel in parallel through a transponder. This allows satellite operators to leverage hosted bandwidth (leased transmission capacity) to optimize their transponder capacity and recoup investments sooner. It is essential for there to be no mutual signal interference. This can and must be ensured by performing RF tests on the components used.

The R&S®SMW200A is the right platform for these tests (Fig. 1). With output frequencies up to 40 GHz, it supports all common satellite communications frequency bands. For wideband applications, the R&S®SMW200A features a fully aligned internal baseband module with a signal bandwidth of up to 2 GHz offering a flat frequency response.

The new R&S®SMW-K116 software option for generating DVB-S2/DVB-S2X signals (Fig. 2) now enables testing of DVB-S2/DVB-S2X components and receivers on the physical layer. The generator's internal realtime coder makes it possible to achieve data rates of up to 600 Msymbol/s. Even 1200 Msymbol/s is feasible if the signal is calculated externally with the R&S®WinIQSIM2 software and loaded into the generator's ARB memory. Although this is far beyond what is required for TV broadcasting, it could be necessary for other types of payloads supporting wideband signals with high data rates.

To test an amplifier for a satellite that supports DVB-S2X, for example, a single channel does not suffice, a sum signal from multiple signals is needed. In TV broadcasting, these signals are usually numerous, adjacent and of equal width. Various bandwidths can arise when used for other purposes. Neither is a major challenge for the R&S®SMW200A, because multicarrier signal generation can be used to combine multiple DVB-S2/DVB-S2X signals (each individually parametrized) into a sum signal with a bandwidth of up to 2 GHz (Fig. 3).

For receiver testing, users can implement their own transport stream (TS) files or use generic continuous (GC)/generic packetized (GP) data. The R&S®SMW200A takes care of the subsequent coding and signal generation in line with the DVB standard. The data initially undergoes data stream adaptation to prepare the packetized or continuous data streams for the subsequent processing steps. The output is scrambled and error protection is applied in the channel coder. The pilot signals are added prior to modulation. All relevant functions and parameters can be varied, activated or deactivated. This flexibility makes it possible to verify individual layers and function blocks within the receiver.

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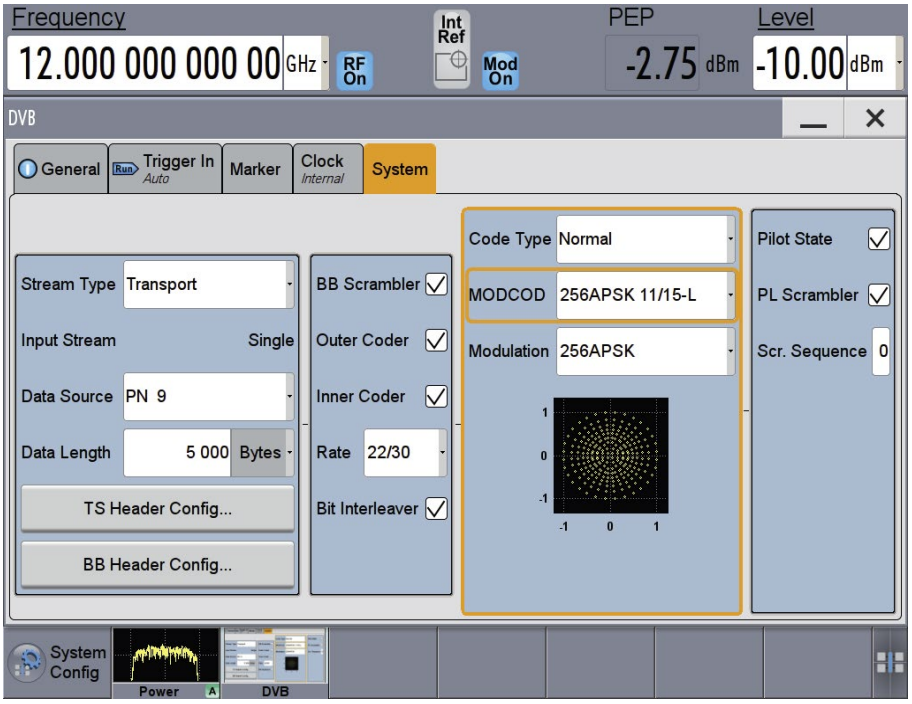


Fig. 2: User interface for DVB-S2X.

Fig. 3: A 2 GHz sum signal for a load test with different payloads in line with DVB-S2.