

Mobile television with the new ATSC Mobile DTV standard

The ATSC Mobile DTV standard, in whose development Rohde & Schwarz plays a significant role, provides classic TV providers with new business models for mobile TV services. TV station operators can already benefit from a complete solution consisting of encoders, a multiplexer, a transmitter, and the associated T&M equipment, needed to enter into the mobile television market.

The next stage of development for the ATSC standard

The new ATSC Mobile DTV standard, which is based on the terrestrial ATSC A/53 TV standard (see box on page 62 for a history of its development), now also includes mobile TV receiver services utilizing a portion of the ATSC 8VSB data stream (19.39 Mbit/s). The standard ensures that neither the high-definition (HD) nor the various standard-definition (SD)

TV services are compromised. An ATSC Mobile DTV transmission system includes an ATSC service multiplex that carries the conventional digital TV programs as well as a mobile DTV service multiplex for mobile services (FIGs 1 and 2). The mobile DTV services offer, for example, pulsed transmission for data that can switch mobile receivers into energy-saving mode between transmissions (time slicing).

The data structure of the new standard

In the ATSC Mobile DTV standard, all transmitted data is packed into a fixed structure, i.e. the mobile/handheld (M/H) slots. An M/H slot is the smallest logical unit in the ATSC Mobile DTV data stream (FIG 3). This synchronous, deterministic process, combined with a supplemental error protection of the data used for mobile reception, ensures that the data stream is processed in the receiving instrument in a simple and secure manner.

The M/H slots carry the data for mobile reception as well as the ATSC programs for stationary reception. Unused M/H slots can be completely filled with ATSC program data for stationary reception. Backward compatibility with existing ATSC receivers must always be maintained to prevent errors when displaying ATSC programs. For high-definition channels in particular, packet shifting is linked with the dimensioning of the current ATSC receivers' input buffers and the buffer model being used.

In the ATSC Mobile DTV standard, the data intended for mobile reception is transported via RTP/UDP/IP protocols. These protocols permit flexible mobile service structures, increase flexibility in feeding data to the headend, and support the modular development of software for user equipment. The coding method used for the video data in mobile programs is MPEG-4 Part 10 (H.264) in the baseline profile. The resolution is 416 x 240 pixels, while the maximum data rate is 768 kbit/s. Audio data is transmitted in the MPEG-4 Part 3 (HE-AACv2) format.

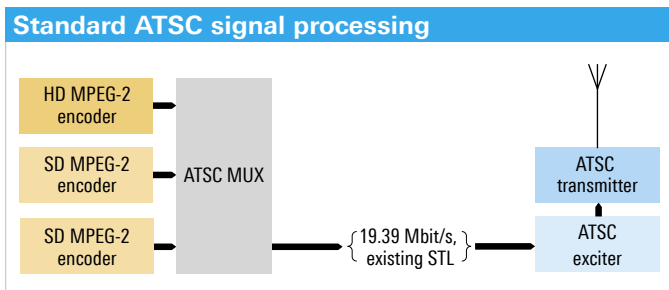


FIG 1 Typical ATSC transmission system for single transmitters as used in the USA so far. One HD program and two SD programs are combined using a multiplexer; data rate 19.39 Mbit/s, ATSC transmitter. STL: studio transmitter link.

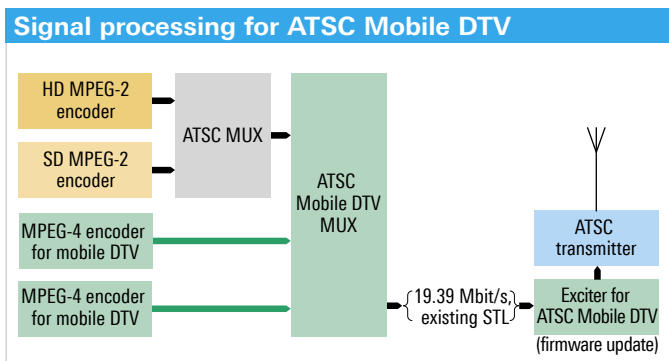


FIG 2 Typical ATSC transmission system for single transmitters with integrated mobile DTV services (green: the required new components / firmware updates).

The data for mobile reception is particularly well protected by means of complex error protection methods such as interleaving, Reed-Solomon, and turbo coding. Additional training sequences for channel estimation are also added to the ATSC Mobile DTV signals. Signaling takes place in three separate layers (FIG 4).

The advantages of ATSC Mobile DTV

- Introduction costs are kept low by preserving the existing infrastructure
- Simple, robust receivers can be deployed because a deterministic transmission method is used to broadcast the data for mobile reception
- Multipath reception is improved by the M/H training sequences included
- Interactive multimedia services are available with an existing back channel
- Data transmission (non-realtime data) and IP broadcasting are possible

FIG 3 The data structure of the ATSC Mobile DTV standard.

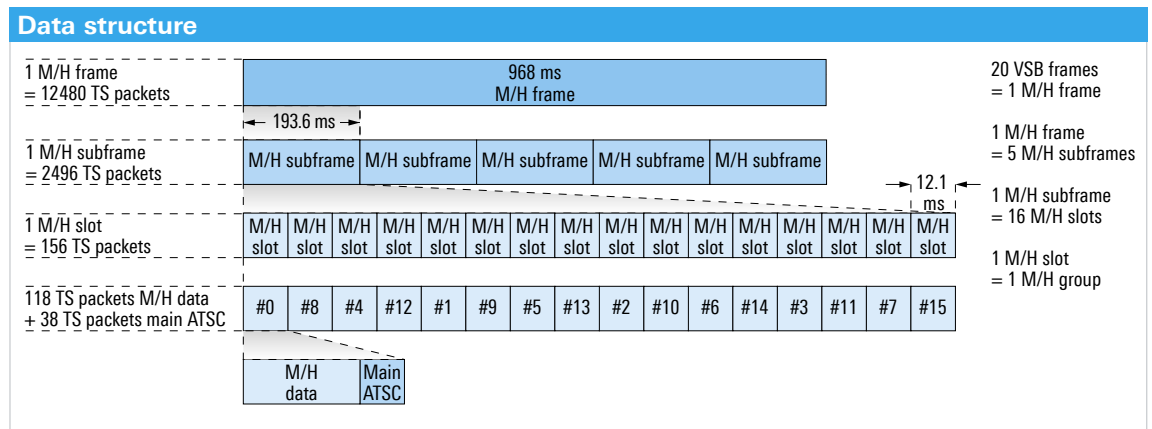


FIG 4 Detailed layer model for the ATSC Mobile DTV standard.

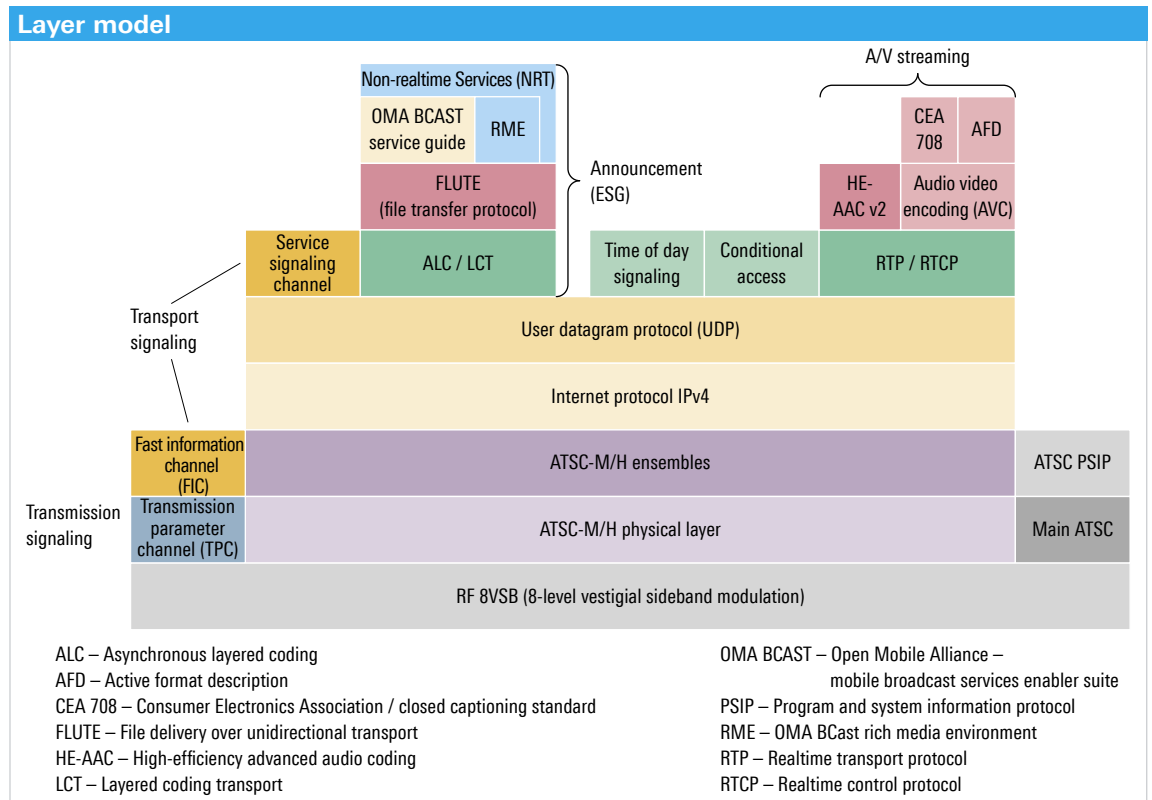




FIG 5 The R&S®SX800 multi-standard exciter is easily converted to the ATSC Mobile DTV standard with a firmware update.

Firmware update for Rohde & Schwarz transmitters

All currently available Rohde & Schwarz Series 800 multistandard exciters (FIG 5), used in transmitters of all power classes, can be converted to ATSC Mobile DTV via firmware update. The standard is already integrated in the new Rohde & Schwarz transmitters – available since April 2009 – and can be activated with a software key. All Series 7000 transmitters can also be updated to the new standard using a retrofit kit – more proof that Rohde & Schwarz transmitters are a secure investment for the future.

compatibility. The existing infrastructure remains usable because the multiplexer is simply integrated into the unmodified system. It adds the data required for mobile reception to an inbound ATSC transport stream. The generated transport stream can be transmitted over ASI or IP (as TSoVerIP). To allow its use in redundant networks, the R&S®AEM100 has four network interfaces for receiving and transmitting data separately. The integrated signaling generator can be used to generate baseband signaling made up of transmission and transport signaling. The multiplexer is completely configured, controlled, and monitored via SNMP or via a web-based graphical user interface.

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Seamless integration: Rohde & Schwarz multiplexers

A multiplexer for the new standard is already available: the R&S®AEM100 from Rohde & Schwarz. Based on a powerful server, it allows network operators to expand their ATSC transmission systems quickly, reliably, and with full

The long road from analog TV to the digital ATSC standard

In 1987, the Federal Communications Commission (FCC) decided to introduce a digital TV standard in the USA. In September 1995, the ATSC A/53 standard was proposed by the Advanced Television Systems Committee, an industry organization concerned with all aspects of television, and of which Rohde & Schwarz is a member. The plan that FCC subsequently presented to Congress provided for the introduction of the standard in the American market over a nine-year period starting in November 1998, with analog service being completely decommissioned in 2007. Approximately 1600 class A stations were impacted. At the same time, the frequency range between 700 MHz and 806 MHz was to be made available for other services, e.g. mobile television. The plan has experienced delays, and the transition is now scheduled to be completed by June 2009.

The available frequencies were auctioned off starting in 2006. As an example, Qualcomm was able to purchase channel 55 (716 MHz to 722 MHz) and use it to set up a nationwide mobile television network based on the MediaFLO™ COFDM standard.

The development of ATSC into ATSC Mobile DTV

ATSC signals cannot be used for mobile reception because their error protection is designed for stationary reception. The increasing demand for mobile reception of television programs and the existence of competing standards such as DVB-H and MediaFLO™ increased the pressure to expand the standard. The most important requirements were the following:

- Complete backward compatibility with ATSC A/53
- Station operators must continue to be able to use existing broadcasting licenses without regulatory obstacles
- The mobile services must work on a single frequency (i.e. without a cellular network)
- Existing receivers must continue to provide classic ATSC reception

Rohde & Schwarz partnered with Samsung at an early stage in order to enhance the ATSC standard. Employees of both companies from Korea, the USA, and Germany worked out a proposal that permitted mobile reception of ATSC and also made it possible to set up efficient single frequency networks (SFN). Of the ten different proposals presented, the ATSC Mobile DTV standard was selected. It will be approved soon.