



Video goes mobile – with DVB-H



**ROHDE & SCHWARZ**

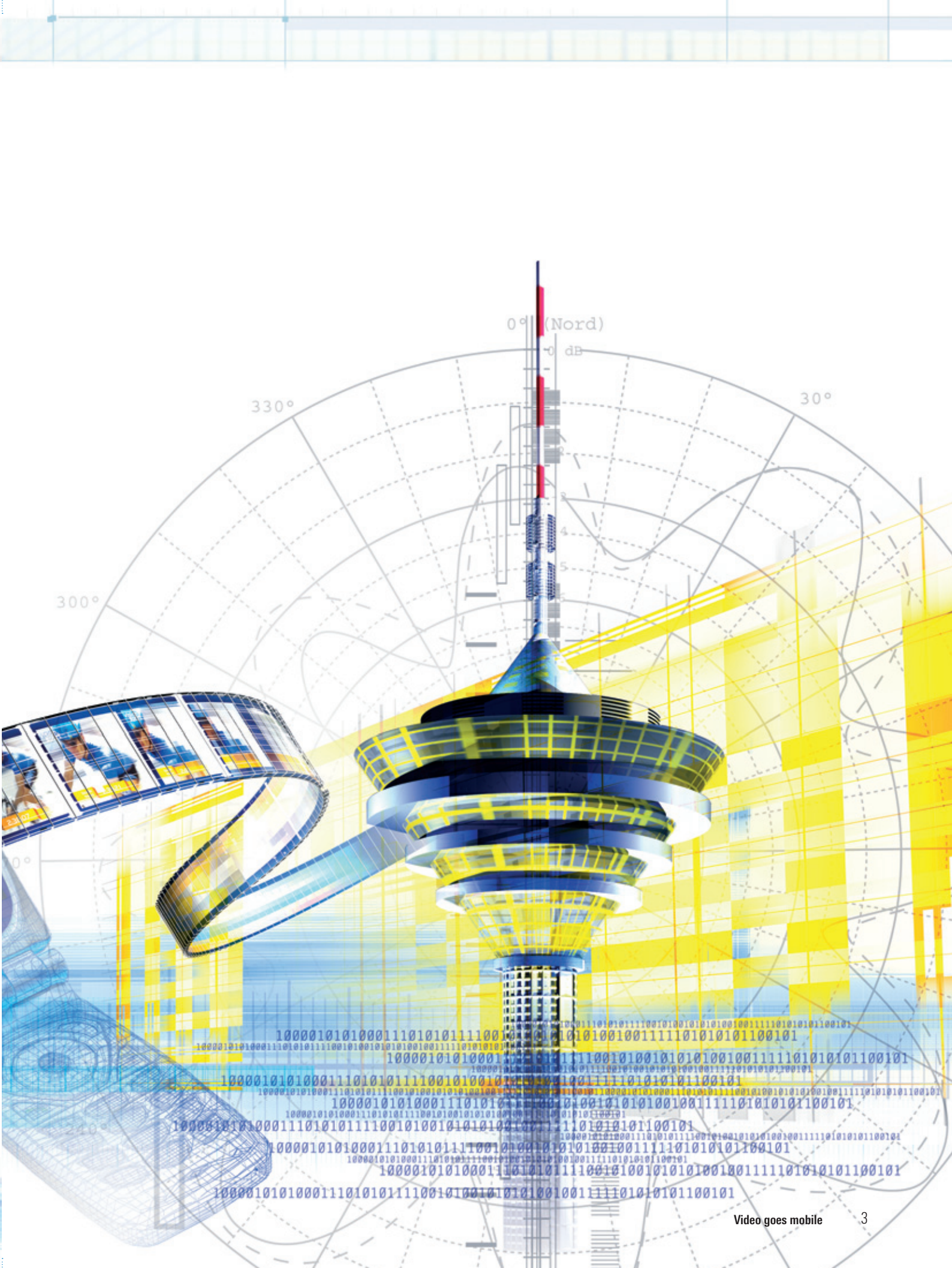
# Mobile radio and television are converging

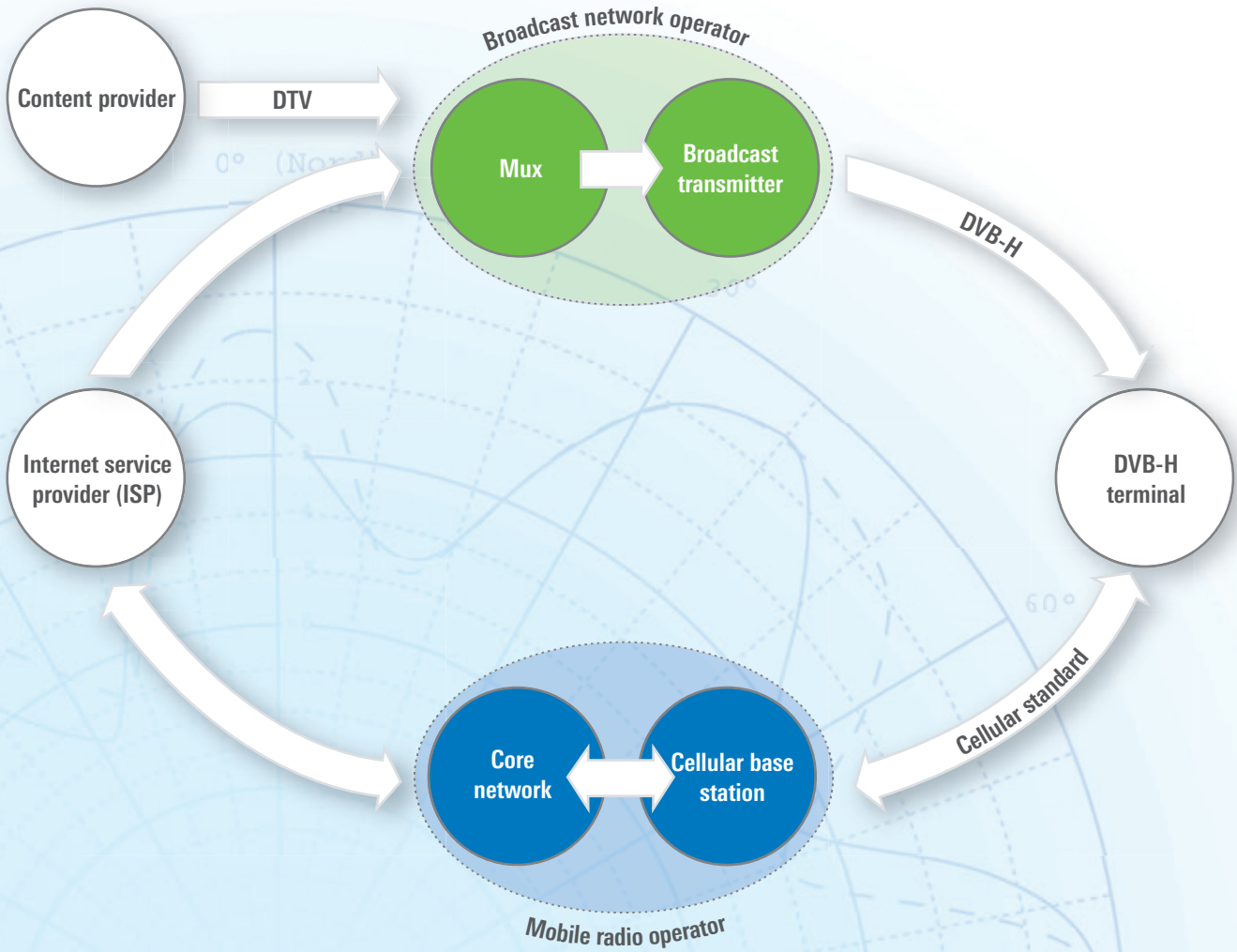
Digitization is making it all possible. After maintaining separate lives and development tracks over the decades, certain services and technologies are now finding themselves face to face at the bit and byte level. This convergence is the driving force behind many new products, markets and business models. One prime example is the convergence of mobile radio and television. Here, the catch phrase is "DVB-H". These two worlds coexisted before with practically no contact, but DVB-H is bringing

them together in terms of culture and technology. This can be a trying process, but Rohde&Schwarz is a great resource as we have been at home in both worlds since their early days. We have expert knowledge of the technologies, we speak their respective languages, and we know what is needed and expected in both "camps". Of course, we offer a wide range of technical solutions that will be useful for implementing new products and services in the future.









Typical DVB-H scenario

**BROADCAST** Selected products

**CELLULAR** Selected products





## Baseband/source



### DTP IP Inserter/Generator R&S® DIP010

- Time slicing, FEC and signaling of data services via IP/MAC notification table supported for generation of DVB-H-compliant data streams
- Insertion of additional data (IP packets) into an MPEG-2 transport stream
- Utilization of dedicated MPEG-2 resources (null packets)
- Realtime data insertion with up to 15 Mbit/s
- Two working modes: MPEG-2 inserter mode and MPEG-2 generator mode
- TS interfaces for input and output: ASI, SPI



### DTV Recorder/Generator R&S® DVRG

- Playing and recording of DVB/DVB-H transport streams (TS)
- Seamless loop TS generation
- Huge TS library including DVB-H streams
- Support of DVB-H multiprotocol encapsulation, time slicing and forward error correction
- Software multiplexer for application-specific DVB/DVB-H TS creation

## Modulator/transmitter



### DVB-T Transmitter Families R&S® NV/NW 7000/F

- Fully compatible with DVB-H (4k and TPS)
- Upgrade for existing transmitters through software
- Output power classes: 10 W to 10 kW
- Solutions for VHF and UHF
- Many common features between the different series (cost savings for spare parts, service, training)
- Easy adaptation to standard modifications
- Sophisticated remote control features: Web server, parallel bus, bit bus
- Various redundancy concepts available (exciter stand-by, passive standby, active standby, N+1 standby)
- Very compact and flexible low-power solutions



### Broadcast Test System R&S® SFU

- Complete DVB-H support: 4k mode, FEC, time slicing, in-depth interleaver, TPS carrier signaling
- DTV multistandard test platform (100 kHz to 3 GHz)
- Large output level range for transmission and channel applications
- Digital noise source (AWGN) for channel simulation
- Up to 40 paths channel simulation (fading)
- Full digital baseband processing
- BER measurement
- ASI, SPI, SMPTE 310M inputs and test signals



### I/Q Modulation Generator R&S® AMIQ

- 100 MHz sample rate
- 16 Msample memory depth
- 14 bit resolution
- Differential I/Q outputs
- Digital I/Q output



### Baseband Fading Simulator R&S® ABFS

- Up to 4 fading channels
- Up to 24 propagation paths
- Noise generator



### Vector Signal Generator R&S® SMU200A

- Up to two complete generators in one unit
- Unrivalled flexibility with four realtime code channels
- Very short frequency setting times
- Electronic attenuator up to 6 GHz
- Intuitive user interface with graphical display of signals

## Radiocommunications and protocol testing



### Universal Radio Communication Tester R&S® CMU 200

- Multiprotocol mobile station test platform supporting all major 2G/3G standards as well as Bluetooth™
- Ready for future expansions such as HSDPA and CDMA2000® 1xEV-DV
- Only currently available solution for acoustic measurements to 3GPP and 3GP2
- Optimized for production and R&D due to high-speed testing, excellent accuracy and extraordinary flexibility



### Universal Protocol Tester R&S® CRTU

- Protocol test system approved by the Global Certification Forum
- Verification of protocol stack implementation
- 2G/3G intersystem handover testing
- Radio resource management verification
- Application and data testing
- Flexible programming interface for user-specific and test scenarios

## RF/baseband analysis

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### TV Test Receiver R&S® EFA

- Display of DVB-H signaling (TPS bits)
- Display of interleaver mode
- 2k and 8k modes supported
- Realtime demodulation, analysis and monitoring
- Several analog and digital TV standards available
- Great variety of measurement functions
- Alarm messages for measurement functions, internal storage
- Transport stream output: ASI and SPI
- MPEG-2 decoder option



### Digital Video Measurement System R&S® DVM400

- Realtime and in-depth analysis of DVB/DVB-H transport streams (TS)
- Monitoring of up to 20 streams in parallel with one system and advanced measurement
- Playing and recording of DVB/DVB-H TS
- DVB/DVB-H data broadcast analysis
- DVB-H data de-encapsulation

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### Vector Signal Analyzer R&S® FSQ

- Up to 3/8/26/40 GHz
- Supports all 2/2.5/3G standards
- High-speed vector signal analyzer
- Multicarrier-capable code domain analyzer
- High-performance spectrum analyzer



### Handheld Spectrum Analyzer R&S® FSH

- Spectrum analysis up to 3/6 GHz
- Perfect tool for base station antenna maintenance and repair
- Available with internal tracking generator, VSWR bridge and channel power measurements with predefined settings for 3GPP-FDD; DTF function
- Four hours of battery operating time

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d test case

## Coverage T&M



- Diverse systems for mobile radio and broadcast coverage measurements

# The best of both worlds

## *DVB-H: two technologies, one market leader*

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If you are just now finding yourself face to face with DVB-H, get ready to deal with two different cultures: broadcasting and mobile radio. Both have their own traditions, technologies, terminology and market structure. In "cross-cultural" situations of this kind, you need a "bilingual" partner who is capable of providing the necessary "translation" services and who offers a complete portfolio of equipment for both sides of the DVB-H equation. Rohde&Schwarz has decades of experience in the fields of mobile radio and broadcasting, and we have developed pioneering and reference solutions in these fields time and time again. Today, we are the international leader in the areas of mobile radio and TV test and measurement as well as digital terrestrial broadcasting.

## *Made for one another: mobile radio and Rohde&Schwarz*

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Not long after its invention, the microprocessor was put to good use in a test instrument from Rohde&Schwarz. Naturally, it was a radio test system. Radio test technology has been one of our main fields from the very start. Of course, mobile radio (analog in its early days) found fertile ground at Rohde&Schwarz. The "Groupe Spécial Mobile" came to us in the 1980s with an order to build a simulator for a revolutionary digital mobile radio system which would set the stage for the most successful technology in the history of radiocommunications: GSM. Many other mobile radio standards have since come into use, and mobile phones can do just about anything nowadays. Throughout this evolution, however, one thing has remained constant: Rohde&Schwarz is still the leading supplier of test equipment for all types of wireless communications. A large share of mobile phones around the globe are developed and manufactured using our equipment. This reflects the confidence that our customers have in us, and it also acts as a driving force to keep us developing innovative products.

## *"3G television" from Rohde&Schwarz – your partner for 3G mobile radio*

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All the way from the heyday of tubes to the analog transistor and finally the age of digital broadcasting, Rohde&Schwarz has been a prominent leader in this field. The first FM transmitter in Europe was developed in a Rohde&Schwarz laboratory. Later, we played a major role in the introduction of the RDS radio data system. Moreover, our TV insertion signal test method became a de facto standard and was copied around the world. Another recent development from Rohde&Schwarz involves nationwide DVB-T transmitter networks. In fact, whenever there is a mention of innovation in the area of broadcasting, the name Rohde&Schwarz tends to follow close behind. If you are seeking to gain market shares in a new field like DVB-H, you are making a wise choice by selecting Rohde&Schwarz.



# From DVB-T to DVB-H

## Making DVB-T mobile and Internet-compatible

DVB-H is an adaptation of the digital terrestrial TV standard DVB-T (which has enjoyed great success worldwide) to the requirements of mobile applications, particularly with battery-powered handheld equipment. The following development objectives were pursued and achieved with DVB-H:

### *Usage of Internet technology*

The DVB-H program content is fed to the playout center in the form of an IP data stream. There, it is transformed into an MPEG-2 transport stream or (in the case of mixed DVB-T/H operation) mixed with the transport stream for "normal" TV programs. IP-based video streaming can be implemented relatively simply and cost-effectively using streaming servers. Modern mobile phones make use of TCP/IP protocol stacks that allow direct processing of IP packets.

### *Low power consumption*

One of the greatest challenges when building battery-powered user equipment is how to extend the amount of time the device can run on a single charge. Of course, video applications tend to be particularly power-hungry. In the case of DVB-H, the solution has been to employ the familiar timeslot technology used in mobile radio standards such as GSM (see figure). Data is transmitted as bursts and not continuously. During the pauses in transmission (while data is being transmitted for other DVB-H users), the mobile phone can turn off parts of its circuitry and save a lot of energy. These pauses are also useful for handling handover procedures.

### *Reliability of transmission*

Although DVB-T was designed with mobile applications in mind, further measures have been taken with DVB-H to ensure reliable reception and good performance even in vehicles moving at high speeds. This includes forward error correction (FEC) and an additional type of modulation (4k mode).

All of these measures are specified in the DVB-H standard, but the details of the implementation are left open. This means that in the simplest case (no time slicing, no FEC, no 4k mode), DVB-H and DVB-T use an identical transmission method. We will have to wait to see which of these configurations turn out to be the most practical and popular.

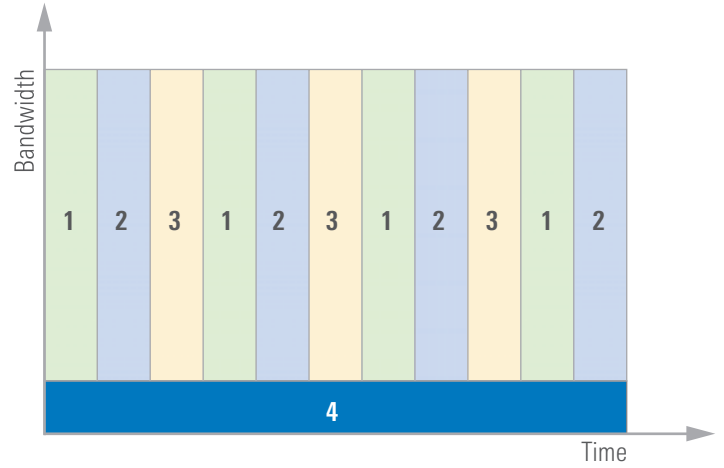
### **Retrofitting DVB-T broadcast equipment is easy**

The embedding of DVB-H program content in the DVB data stream and DVB-H signaling are handled independently of the transmission method. A graphical representation of a playout center for combined DVB-T/H operation shows where DVB-H-specific extensions are required (see figure). Products currently available from Rohde & Schwarz include the Data Inserter R&S® DIP010 (= DVB-H IP Encapsulator) plus relevant upgrades for our transmitters. The availability of these products should speed up expansion of the first DVB-H networks.



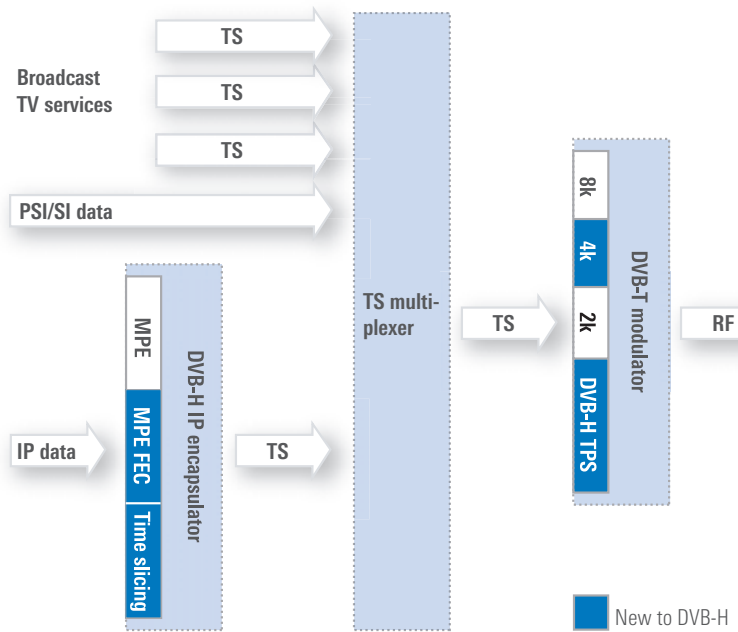
**Timeslot technology**

Timeslot technology makes DVB compatible with mobile radio. Benefits: Multiple services can be transmitted simultaneously, and pauses in reception leave time for handover procedures and temporary shutdowns of the receiver to save power.



**Playout center for mixed service**

From the Internet to a mobile phone via a broadcast path: In a playout center for combined DVB-T/H operation, the IP data stream containing the DVB-H program content is mixed with the MPEG-2 transport stream containing "normal" TV programs. The modulator has to understand typical DVB-H signaling which informs a mobile phone about the technical broadcast parameters (time slicing, FEC modulation).





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[www.rohde-schwarz.com](http://www.rohde-schwarz.com)





Find out more:

**[www.dvb-h.rohde-schwarz.com](http://www.dvb-h.rohde-schwarz.com)**

**Service 1,2,3:** time-sliced

**Service 4:** continuous

#### Specific abbreviations

<b>CRC</b>	<i>Cyclic redundancy check</i> Technique for detecting data transmission errors
<b>DVB-H</b>	<i>Digital video broadcasting for handhelds</i>
<b>FEC</b>	<i>Forward error correction</i> Algorithm to correct transmission errors on the receiving end
<b>IP</b>	<i>Internet protocol:</i> specification of packet format and address scheme
<b>MPE</b>	<i>Multiprotocol encapsulation:</i> methods to encode IP datagram stream onto TS
<b>PSI/SI</b>	<i>Program-specific information</i> Data required by the receiver to demultiplex and decode the various programs in the TS (e.g. NIT, INT)
<b>TS</b>	<i>Transport stream</i>
<b>TPS</b>	<i>Transmission parameter signaling</i> Signaling of parameters related to the transmission scheme (e.g. to channel, coding and modulation)

#### References

- EN 302 304** DVB-H system specification
- EN 300 744 Annex F/G** DVB-T system specification
- EN 301 192** DVB specification for data broadcasting
- Tm2977r3** DVB-H implementation guidelines

