

An inexpensive way to generate stimulus signals for EMC measurements on TV sets

International standards specify strict limits for electromagnetic interference and electromagnetic immunity to ensure that electronic devices do not mutually disturb each other. During EMC measurements on consumer electronics equipment, defined stimulus signals must be applied to the equipment interfaces. Cost-effective signal generators from Rohde & Schwarz with new options can be used to supply the necessary standard-compliant stimulus signals.

Signals for all types of interfaces

Immunity and emission measurements on broadcast receivers and similar consumer electronics equipment determine conducted disturbance and disturbance caused by electric and magnetic fields.

The permissible disturbance limits are defined in a set of standards issued by the International Special Committee on Radio Interference (Comité international spécial des perturbations radioélectriques – CISPR). The standards CISPR 20 / EN 55020 and CISPR 13 / EN 55013 cover electromagnetic immunity and radio disturbance, respectively.

Electromagnetic immunity measurements determine whether the video and audio quality of a device under test (DUT) remains unimpaired when the device is exposed to disturbance signals. Emission measurements determine a DUT's

potential susceptibility to disturbance. In both types of tests, signal generators are used to feed defined test signals to the equipment's antenna input and analog or digital audio/video interfaces. These signals include a colorbar with a small moving element (known as a moving colorbar test pattern) combined with a sinusoidal tone in the audio channels. Different countries employ different aspect ratios and frame rates, resolutions and types of compression. The R&S®DVSG digital video signal generator and the R&S®SFE100 test transmitter (FIG 1) from Rohde & Schwarz are cost-efficient signal sources capable of delivering standard-compliant stimulus signals.

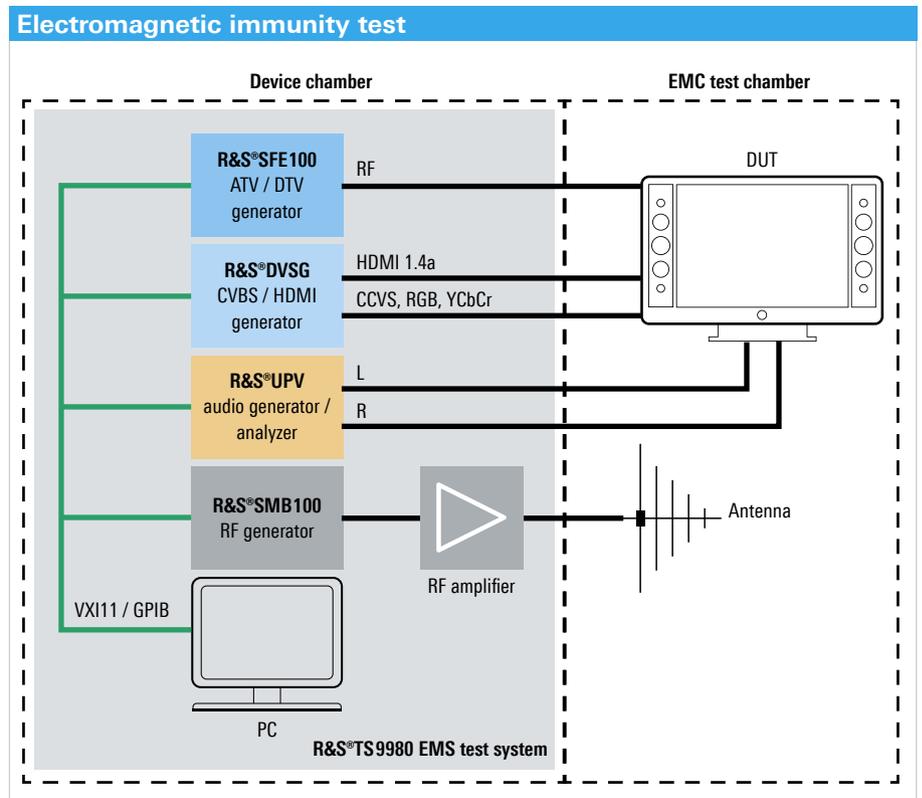
Reference signals – now also via HDMI

When equipped with the R&S®DVSG-K10 AV signal generator option, the R&S®DVSG outputs uncompressed signals which meet the requirements for a precision reference signal source,



FIG 1 EMC measurements on TV sets with the R&S®DVSG digital video signal generator and the R&S®SFE100 test transmitter.

FIG 2 Block diagram showing electromagnetic immunity testing with radiated fields and the R&S®TS9980 EMS test system.



Standard	Resolution	Frame rate	Video content	Audio
MPEG-2	576i, 1080i	25 Hz	moving colorbar 4:3, moving colorbar 16:9	1 kHz / -6 dBFS, silence
ATSC	480i, 1080i	29.97 Hz	moving colorbar 4:3, moving colorbar 16:9	1 kHz / -6 dBFS, silence
H.264	576i, 1080i	25 Hz	moving colorbar 4:3, moving colorbar 16:9	1 kHz / -6 dBFS, silence

FIG 3 Test signals in the R&S®SFU-K228 transport stream library.

for example. The video signal generator delivers a moving colorbar test pattern via a digital high-definition multimedia interface (HDMI) as well as via analog component and composite outputs in all common resolutions, color spaces and bit depths. The generator supports all primary 2D and 3D formats in line with HDMI 1.4a as well as all common formats in compliance with Consumer Electronics Association (CEA) standards via the analog interfaces. In addition, the option's audio generator function makes it possible to add sinusoidal tones of any kind at user-defined levels on up to eight channels.

RF signals for tuner inputs

Full-scale EMC certification of a TV receiver always involves tuner input testing as well. Today's TV sets normally include multiple tuners – for reception via antenna, cable and satellite.

To supply these tuner inputs with standard-compliant test signals during EMC testing, users need a multistandard TV test transmitter. EMC test labs are usually equipped with TV test transmitters, but older equipment of this kind often cannot be upgraded to support DVB-S2. However, the ability to test DVB-S2 becomes increasingly important because HDTV and 3D TV are gaining ground. Model .12 of the R&S®SFE100 test transmitter is ideal for this type of application. The new R&S®SFU-K228 transport stream library makes this model a highly versatile and cost-efficient signal source for EMC testing on TV sets. It includes test signals in common HDTV and SDTV formats, each with MPEG-2/H.262 or AVC/H.264 video compression (FIG 3). All transport streams contain the moving colorbar test pattern and provide two services with the same video but different audio content: Service 1 transmits a 1 kHz sinusoidal tone with a level of -6 dBFS, whereas service 2 transmits audio without tone (silence). As EMC tests always require a screen-filling video representation, the library includes test patterns with aspect ratios of 4:3 and 16:9.

The R&S®DVSG digital video signal generator and the R&S®SFE100 test transmitter are both equipped with a VXI11 remote control interface for easy integration into automatic test systems. Both devices are now supported by the R&S®T80-K1 system software for EMC measurements on broadcast receivers and can therefore be used in the R&S®TS9980 EMS test system (FIG 2).

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