VHF/UHF Automatic Filters
For R&S®M3SR
software defined radios

R&S®FT213A VHF/UHF Automatic Filter
R&S®FD213A UHF Automatic Filter
R&S®FD213A2 UHF Automatic Filter
R&S®FU214A VHF Automatic Filter

SOVERON
True independence is a choice

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VHF/UHF
Automatic Filters
At a glance

The R&S®FU214A and R&S®FD213A filters are single-cavity high-precision automatic filters. The filters are an essential part of any radio site where the reciprocal influence of neighboring radio systems must be restricted. The filters allow simultaneous operation of multiple radio systems in very tight spaces. As a result, sustainable, higher quality radio links can be achieved.

A wide variety of radio installations can be the source of unwanted RF interference. Common sources include broadcasting, microwave link and radar applications because they often operate with high transmit power. The filters protect the operator's radio system from such interferences.

The filters cover the VHF band from 100 MHz to 162 MHz and the UHF band from 225 MHz to 400 MHz.

The filters also suppress own radio out-of-band RF signals and minimize interference with other sensitive communications systems such as navigation or radiomonitoring systems.

The filters work in both the transmit and receive directions.

The selective filters are very rugged, making them suitable for use on board ships and semi-mobile facilities as well as in civil and military ground installations.

The selected filter frequency can be read directly on the filter.

R&S®FD213A2 UHF automatic filter

Key facts
- Excellent mechanical precision
- Short tuning time
- Compact 19" 3 HU design
- Embedded distress channel bypass
- Very low insertion loss

Benefits

Receiver benefits
- Suppression of out-of-band intermodulation products by additionally attenuating all signals and their harmonics which are outside the receiving range and – due to nonlinearities and mixing – could cause intermodulation products to fall within the useful VHF or UHF band and interfere with reception
- Suppression of crossmodulation products by attenuating strong interfering signals which could transfer their modulation to the wanted signal
- Increase of image frequency rejection
- Prevention of desensitization (reciprocal mixing) by attenuating strong interfering signals that could otherwise transfer the noise sidebands of the local receiver oscillator (mixed onto the interfering signal) to the useful band, thus reducing sensitivity

Transmitter benefits
- Attenuation of broadband transmitter noise caused by the frequency synthesizer or power amplifiers
- Suppression of spurious emissions caused by the radio power amplifier
- Suppression of harmonics mainly generated in the output stages
- Attenuation of transmitter (backward) third order or higher intermodulation products, mainly caused by simultaneously operating radio systems with co-sited transmitters

R&S®FD213A UHF single-coupler configuration

R&S®HK014E
VHF/UHF coaxial dipole

R&S®FD213A

R&S®M3SR Series4400

Design and functions

The R&S®FD213A and R&S®FU214A filters use capacitively tuned coaxial resonators. Tuning is performed by an air variable capacitor on top of the resonator. A high precision stepper motor/gear arrangement is used to move the shaft of this capacitor's rotor section to its appropriate frequency-dependent angle position.

A robust mechanical design and the use of temperature-stable materials and low-loss surfaces guarantee the specifications throughout the entire temperature range and under 100% duty-cycle high-power operation.

Connected radios provide the operating DC voltage as well as necessary frequency and control information.

The R&S®FD213A2 filter includes two independently controllable R&S®FD213A filters in one housing. Such a configuration needs less space and simplifies system integration.

The R&S®FT213A is a combination of a VHF R&S®FU214A and a UHF R&S®FD213A filter arranged in one single housing.

The filter tuning time is very low and in the range of less than four seconds. This is possible due to a precise mechanical filter tuning mechanism.

The filter design provides a very low insertion loss. This is achieved with a well-matched RF filter design based on technical Rohde&Schwarz experience.

Distress channels at 121.5 MHz and at 243 MHz will be bypassed. The internal bypass is an active implementation. During transmit operation, the bypass is disabled.

Overview of frequency range/filter types

Filter type	R&S®FD213A	R&S®FD213A2	R&S®FT213A	R&S®FU214A
100 MHz to 162 MHz (VHF)			●	●
225 MHz to 400 MHz (UHF)	●	●	●	

Overview of bypassed distress frequencies/filter types

Filter type	R&S®FD213A	R&S®FD213A2	R&S®FT213A	R&S®FU214A
121.5 MHz (VHF)			●	●
243 MHz (UHF)	●	●	●	

Filter selectivity

The figure on the left shows the typical R&S®FU214A filter selectivity versus the relative frequency in %. When the operator's transmit frequency has a 5% frequency spacing, the stopband attenuation of the VHF filter is about 35 dB.

Thanks to this selectivity, radiocommunications equipment can be installed at airports, shore radio stations and other locations without sustained limitations in radio performance. The filters even facilitate adding more radio circuits for future radio site expansion.

The R&S®FU214A filter, for instance, substantially lowers the antenna spacing required between transmitter and receiver. Without any filtering, two radio systems that are used at the same time, with a frequency distance of about 2%, will have to be much further apart than when using an R&S®FU214A filter. The filter solution allows a more cost efficient system design.
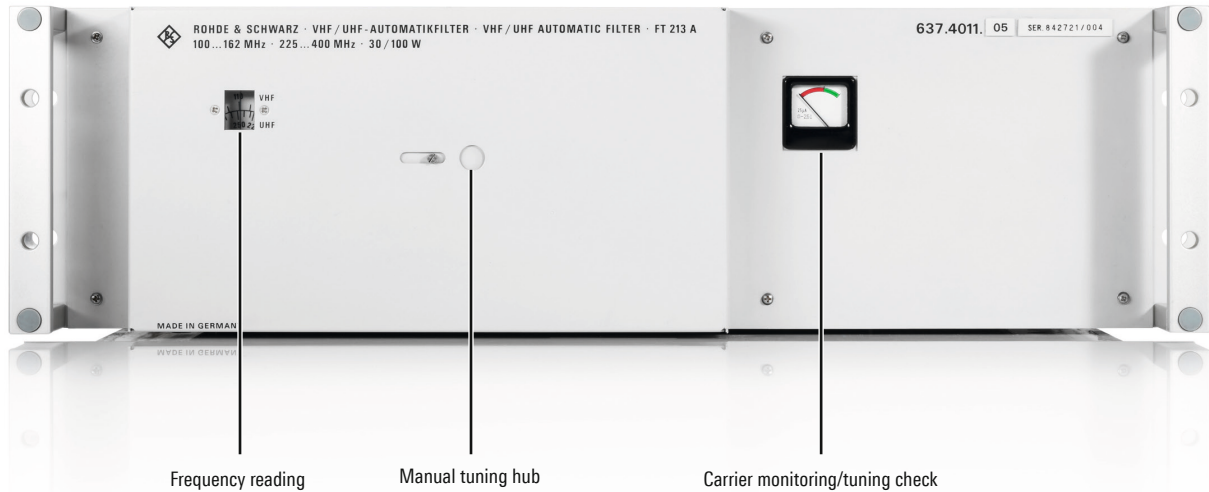
Selectivity characteristics R&S®FU214A

Typical single cavity

Transmission loss in dB

Relative frequency spacing (Δf/f) in %

Transceiver cosite considerations

Standard cosite considerations

Standard installation without any filter

Distance

Possible installation using R&S®FU214A cavity filter
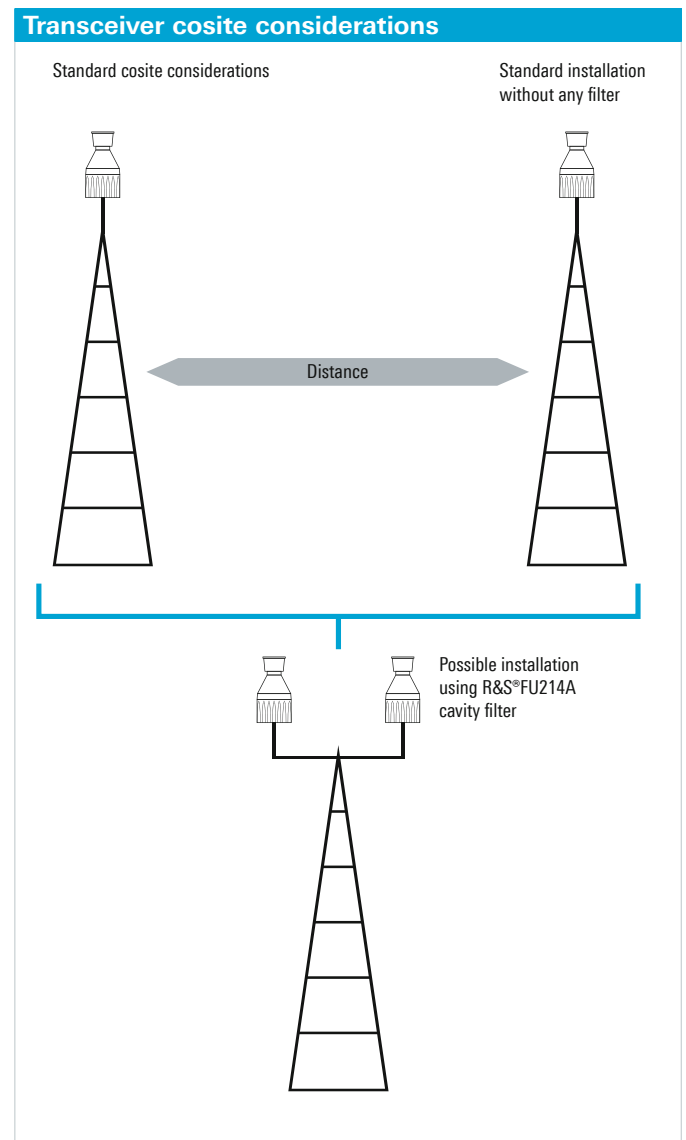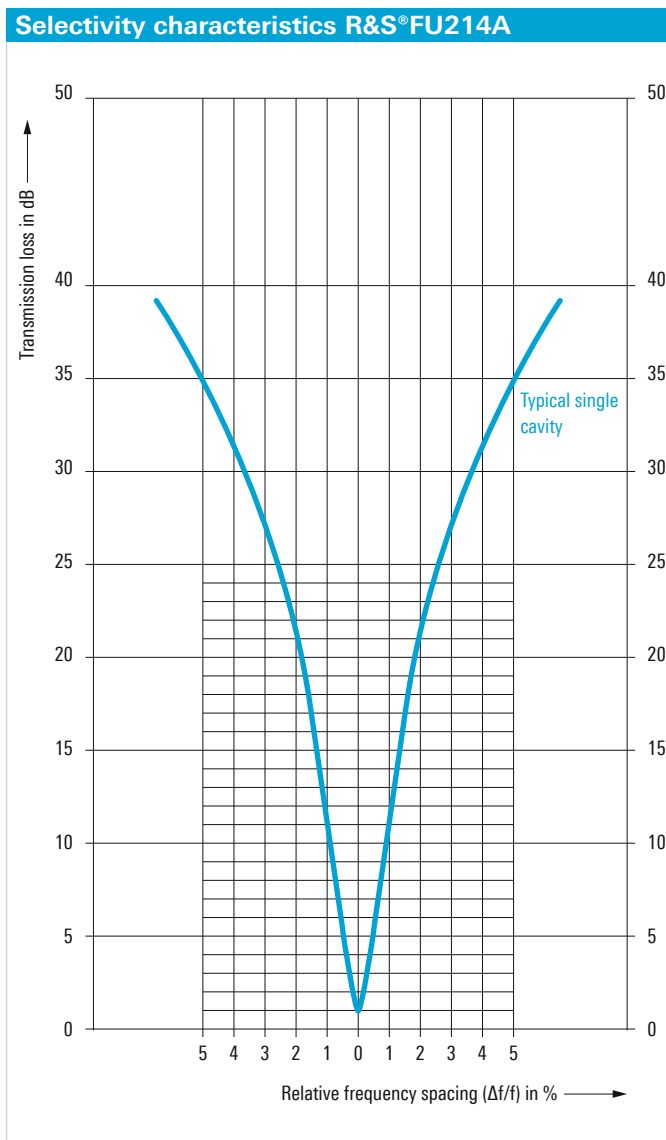
R&S®FT213A
VHF/UHF
automatic filter

R&S®FT213A front view

ROHDE & SCHWARZ · VHF/UHF-AUTOMATIKFILTER · VHF/UHF AUTOMATIC FILTER · FT 213 A
100...162 MHz · 225...400 MHz · 30/100 W

637.4011. 05 SER. 842721/004

MADE IN GERMANY

Frequency reading   Manual tuning hub   Carrier monitoring/tuning check

R&S®FT213A rear view

UHF antenna sockets

UHF BU 2   UHF BU 3

ANTENNE ANTENNA   ANLAGE EQUIPMENT

Filter control

VHF BU 4   ST 1   VHF BU 5

VHF antenna sockets

Product overview

Designation	Type
Automatic filters	
VHF/UHF automatic filter, 100 MHz to 162 MHz/225 MHz to 400 MHz, 50 W AM/100 W FM, 19" plug-in (3 HU)	R&S®FT213A
UHF automatic filter, 225 MHz to 400 MHz, 50 W AM/100 W FM, 19" plug-in (3 HU)	R&S®FD213A
UHF automatic filter [1], 2 × 225 MHz to 400 MHz, 50 W AM/100 W FM, 19" plug-in (3 HU)	R&S®FD213A2
VHF automatic filter, 100 MHz to 162 MHz, 50 W AM/100 W FM, 19" plug-in (3 HU)	R&S®FU214A
Control cables	
Filter control cable, R&S®Fx213A/R&S®Fx214A for R&S®M3SR Series 4400, length: 2 m	R&S®FU214Z2
Filter control cable, R&S®Fx213A/R&S®Fx214A for R&S®M3SR Series 4400, length: 5 m	R&S®FU214Z2

[1] Two filter control cables required.

The radio systems described are hardware- and software-configurable. The system delivered has the configuration as confirmed in the order.

Your local Rohde & Schwarz expert will help you determine the optimum solution for your requirements.
To find your nearest Rohde & Schwarz representative, visit www.sales.rohde-schwarz.com

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