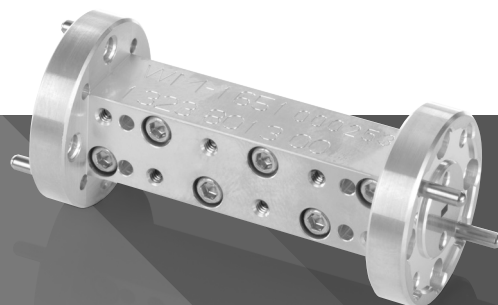


# R&S® FE110-Zxx ACCESSORIES

## Specifications

Specifications  
Version 02.00



**ROHDE & SCHWARZ**

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# Definitions

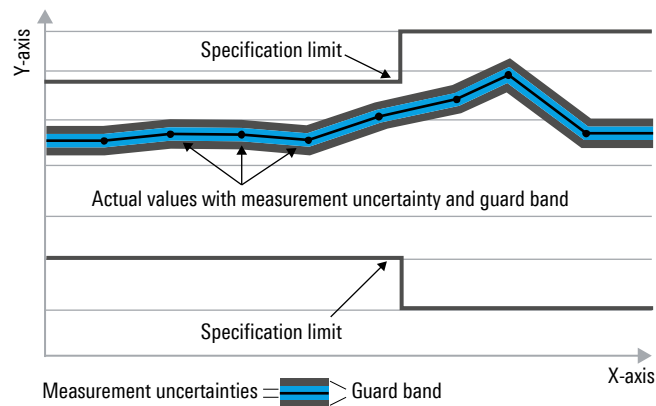
## General

Product data applies under the following conditions:

- Three hours of storage at ambient temperature followed by 30 minutes of warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

## Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as  $<$ ,  $\leq$ ,  $>$ ,  $\geq$ ,  $\pm$  or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



## Non-traceable specifications with limits (n. trc.)

Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

## Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value, e.g. dimensions or resolution of a setting parameter. Compliance is ensured by design.

## Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with  $<$ ,  $>$  or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

## Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter, e.g. nominal impedance. In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

## Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

## Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

In line with the 3GPP standard, chip rates are specified in million chips per second (Mcps), whereas bit rates and symbol rates are specified in billion bit per second (Gbps), million bit per second (Mbps), thousand bit per second (kbps), million symbols per second (Msps) or thousand symbols per second (ksps), and sample rates are specified in million samples per second (Msample/s). Gbps, Mcps, Mbps, Msps, kbps, ksps and Msample/s are not SI units.

# Specifications

## Bandpass filters

The bandpass filters are available for the frequency bands:

- 75 GHz to 90 GHz (R&S®FE110-Z01)
- 80 GHz to 95 GHz (R&S®FE110-Z02)
- 85 GHz to 105 GHz (R&S®FE110-Z03)
- 94 GHz to 110 GHz (R&S®FE110-Z04)
- 70 GHz to 86 GHz (R&S®FE110-Z10)
- 76 GHz to 92 GHz (R&S®FE110-Z11)
- 82 GHz to 98 GHz (R&S®FE110-Z12)
- 88 GHz to 104 GHz (R&S®FE110-Z13)
- 100 GHz to 115 GHz (R&S®FE110-Z14)

The filter includes an internal memory that contains identification information and calibration data. Rohde & Schwarz frontend units readout the stored data and will use them to correct for insertion loss, thus the level at the user interface is calibrated, even for wideband modulation.

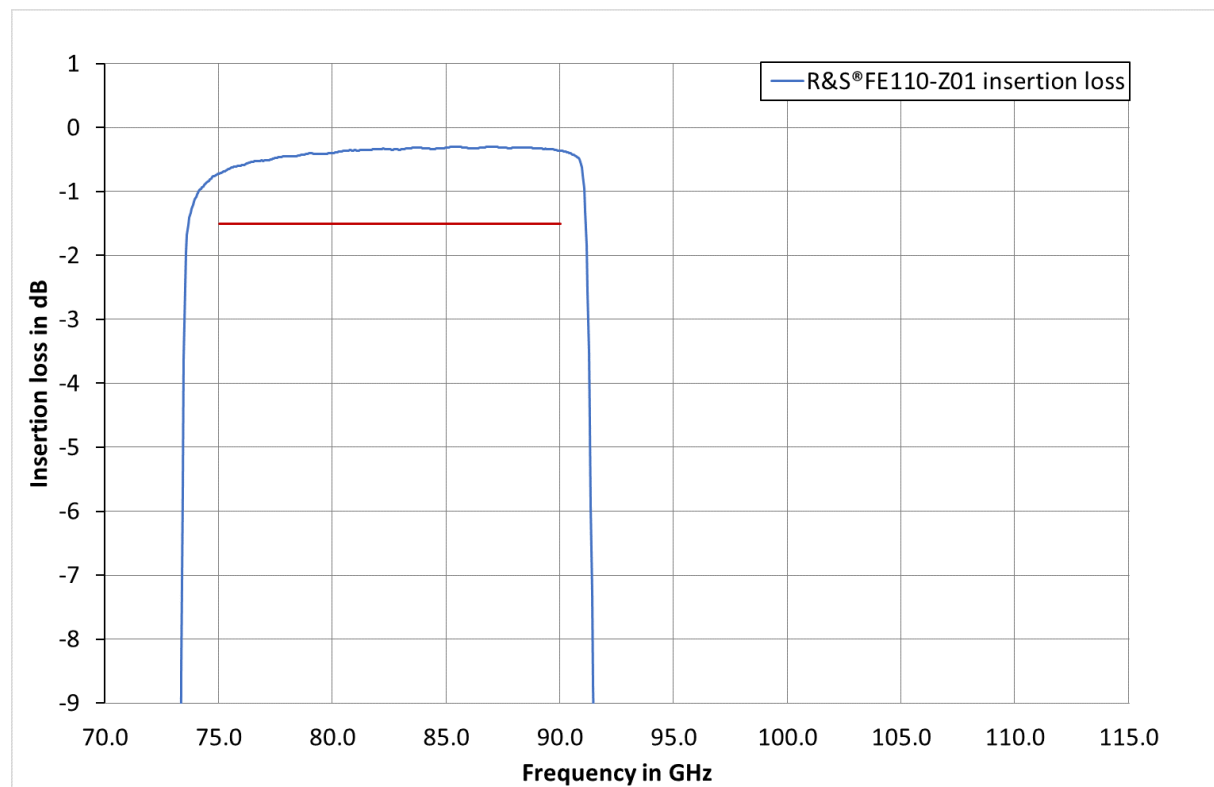
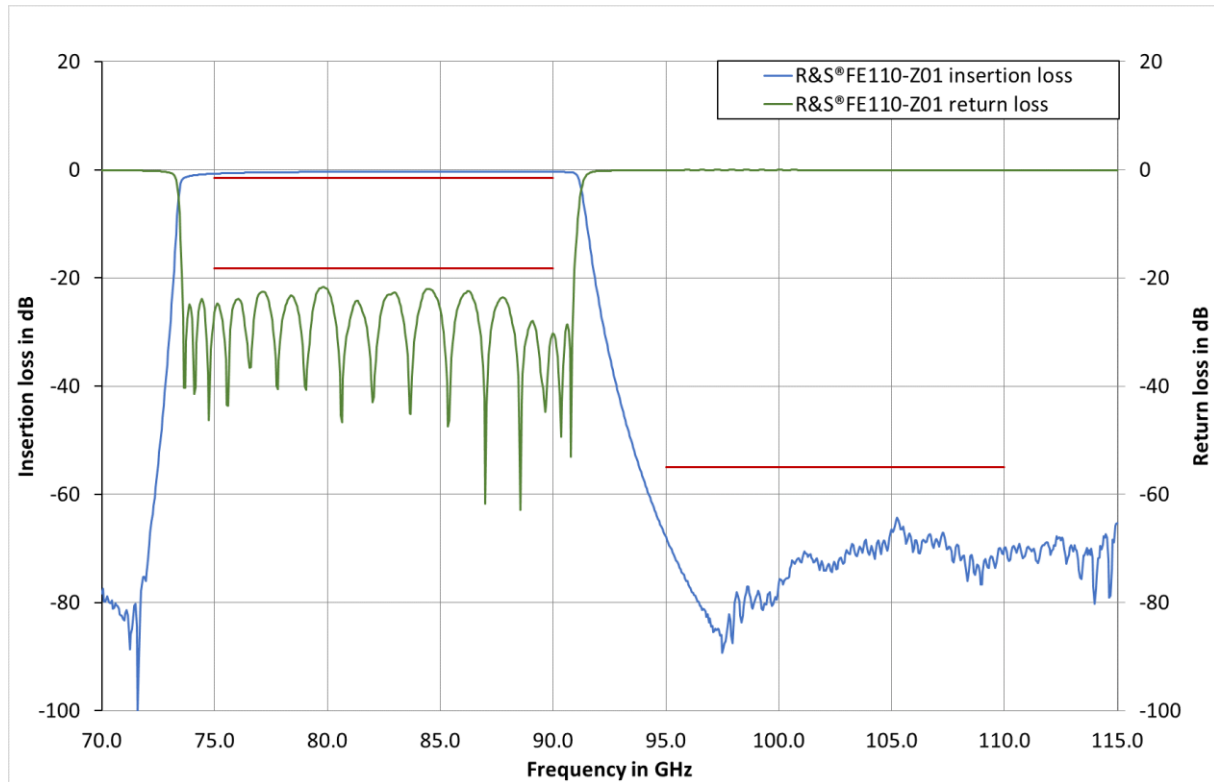
## Electrical specifications

Frequency range		
R&S®FE110-Z01		75 GHz to 90 GHz
R&S®FE110-Z02		80 GHz to 95 GHz
R&S®FE110-Z03		85 GHz to 105 GHz
R&S®FE110-Z04		94 GHz to 110 GHz
R&S®FE110-Z10		70 GHz to 86 GHz
R&S®FE110-Z11		76 GHz to 92 GHz
R&S®FE110-Z12		82 GHz to 98 GHz
R&S®FE110-Z13		88 GHz to 104 GHz
R&S®FE110-Z14		100 GHz to 115 GHz
Insertion loss		
R&S®FE110-Z01	75 GHz ≤ f ≤ 90 GHz	< 1.6 dB, < 0.75 dB (meas.)
R&S®FE110-Z02	80 GHz ≤ f ≤ 95 GHz	< 1.6 dB, < 0.8 dB (meas.)
R&S®FE110-Z03	85 GHz ≤ f ≤ 105 GHz	< 1.6 dB, < 0.8 dB (meas.)
R&S®FE110-Z04	94 GHz ≤ f ≤ 110 GHz	< 1.8 dB, < 1 dB (meas.)
R&S®FE110-Z10	70 GHz ≤ f ≤ 86 GHz	< 1.7 dB, < 1.1 dB (meas.)
R&S®FE110-Z11	76 GHz ≤ f ≤ 92 GHz	< 1.2 dB, < 0.6 dB (meas.)
R&S®FE110-Z12	82 GHz ≤ f ≤ 98 GHz	< 1.6 dB, < 0.8 dB (meas.)
R&S®FE110-Z13	88 GHz ≤ f ≤ 104 GHz	< 1.6 dB, < 0.85 dB (meas.)
R&S®FE110-Z14	100 GHz ≤ f ≤ 115 GHz	< 1.9 dB, < 1.1 dB (meas.)
Return loss		
R&S®FE110-Z01	75 GHz ≤ f ≤ 90 GHz	> 17 dB, > 22 dB (meas.)
R&S®FE110-Z02	80 GHz ≤ f ≤ 95 GHz	> 17 dB, > 22 dB (meas.)
R&S®FE110-Z03	85 GHz ≤ f ≤ 105 GHz	> 15 dB, > 20 dB (meas.)
R&S®FE110-Z04	94 GHz ≤ f ≤ 110 GHz	> 17 dB, > 21 dB (meas.)
R&S®FE110-Z10	70 GHz ≤ f ≤ 86 GHz	> 13 dB, > 17 dB (meas.)
R&S®FE110-Z11	76 GHz ≤ f ≤ 92 GHz	> 15 dB, > 20 dB (meas.)
R&S®FE110-Z12	82 GHz ≤ f ≤ 98 GHz	> 17 dB, > 22 dB (meas.)
R&S®FE110-Z13	88 GHz ≤ f ≤ 104 GHz	> 18 dB, > 22 dB (meas.)
R&S®FE110-Z14	100 GHz ≤ f ≤ 115 GHz	> 18 dB, > 24 dB (meas.)

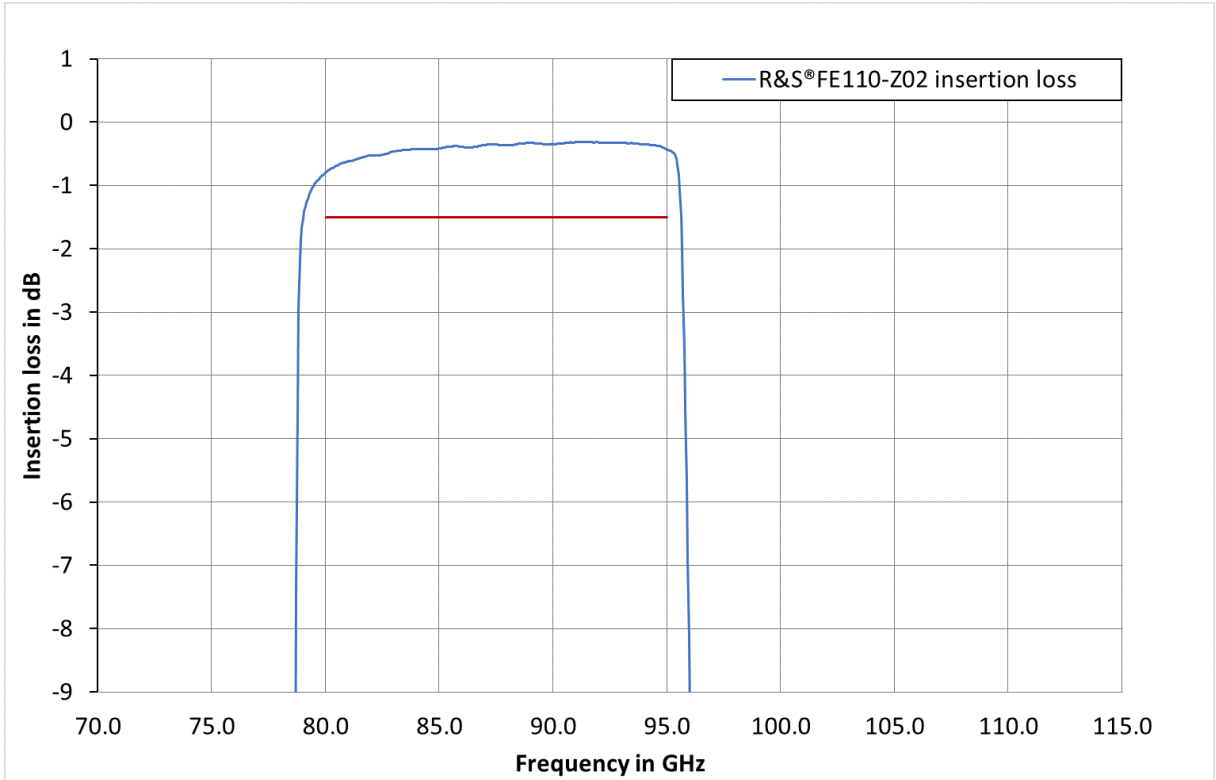
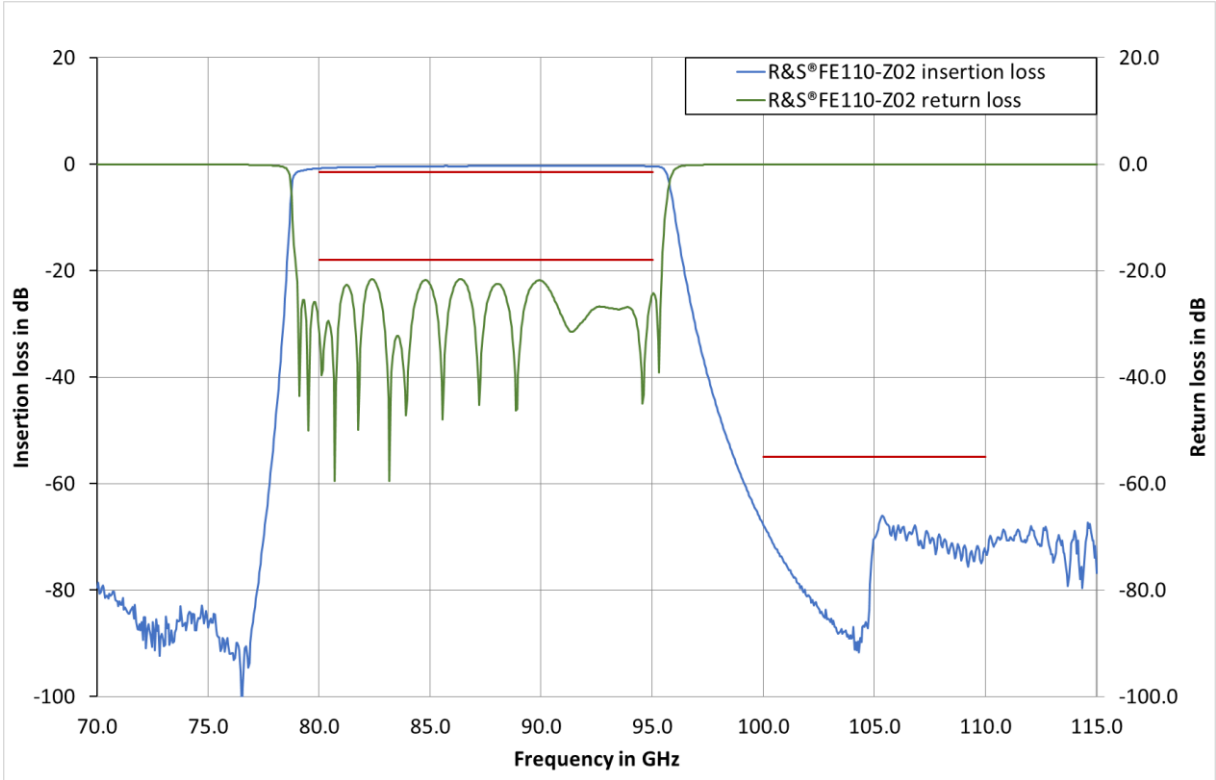
<b>Stopband attenuation</b>		
R&S®FE110-Z01	$f \leq 70 \text{ GHz}$ , $95 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 77 dB (meas.), > 54 dB, > 64 dB (meas.)
R&S®FE110-Z02	$f = 75 \text{ GHz}$ , $100 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 59 dB, > 78 dB (meas.), > 54 dB, > 66 dB (meas.)
R&S®FE110-Z03	$75 \text{ GHz} \leq f \leq 80 \text{ GHz}$ , $109 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 59 dB, > 75 dB (meas.), > 44 dB, > 53 dB (meas.)
R&S®FE110-Z04	$75 \text{ GHz} \leq f \leq 89 \text{ GHz}$ , $f > 115 \text{ GHz}$	> 59 dB, > 75 dB (meas.), > 70 dB (meas.)
R&S®FE110-Z10	$f \leq 65 \text{ GHz}$ , $91 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 54 dB (meas.), > 44 dB, > 56 dB (meas.)
R&S®FE110-Z11	$f \leq 71 \text{ GHz}$ , $97 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 77 dB (meas.), > 52 dB, > 63 dB (meas.)
R&S®FE110-Z12	$75 \text{ GHz} \leq f \leq 77 \text{ GHz}$ , $103 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 59 dB, > 83 dB (meas.), > 51 dB, > 66 dB (meas.)
R&S®FE110-Z13	$75 \text{ GHz} \leq f \leq 83 \text{ GHz}$ , $109 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 59 dB, > 84 dB (meas.), > 59 dB, > 72 dB (meas.)
R&S®FE110-Z14	$75 \text{ GHz} \leq f \leq 95 \text{ GHz}$ , 117 GHz	> 59 dB, > 77 dB (meas.), > 43 dB (meas.)
<b>Passband ripple</b>		
R&S®FE110-Z01	$75 \text{ GHz} \leq f \leq 90 \text{ GHz}$	< 0.04 dB (meas.)
R&S®FE110-Z02	$80 \text{ GHz} \leq f \leq 95 \text{ GHz}$	< 0.02 dB (meas.)
R&S®FE110-Z03	$85 \text{ GHz} \leq f \leq 105 \text{ GHz}$	< 0.02 dB (meas.)
R&S®FE110-Z04	$94 \text{ GHz} \leq f \leq 110 \text{ GHz}$	< 0.05 dB (meas.)
R&S®FE110-Z10	$70 \text{ GHz} \leq f \leq 86 \text{ GHz}$	< 0.05 dB (meas.)
R&S®FE110-Z11	$76 \text{ GHz} \leq f \leq 92 \text{ GHz}$	< 0.04 dB (meas.)
R&S®FE110-Z12	$82 \text{ GHz} \leq f \leq 98 \text{ GHz}$	< 0.04 dB (meas.)
R&S®FE110-Z13	$88 \text{ GHz} \leq f \leq 104 \text{ GHz}$	< 0.03 dB (meas.)
R&S®FE110-Z14	$100 \text{ GHz} \leq f \leq 115 \text{ GHz}$	< 0.04 dB (meas.)

### Measured insertion loss and return loss over frequency

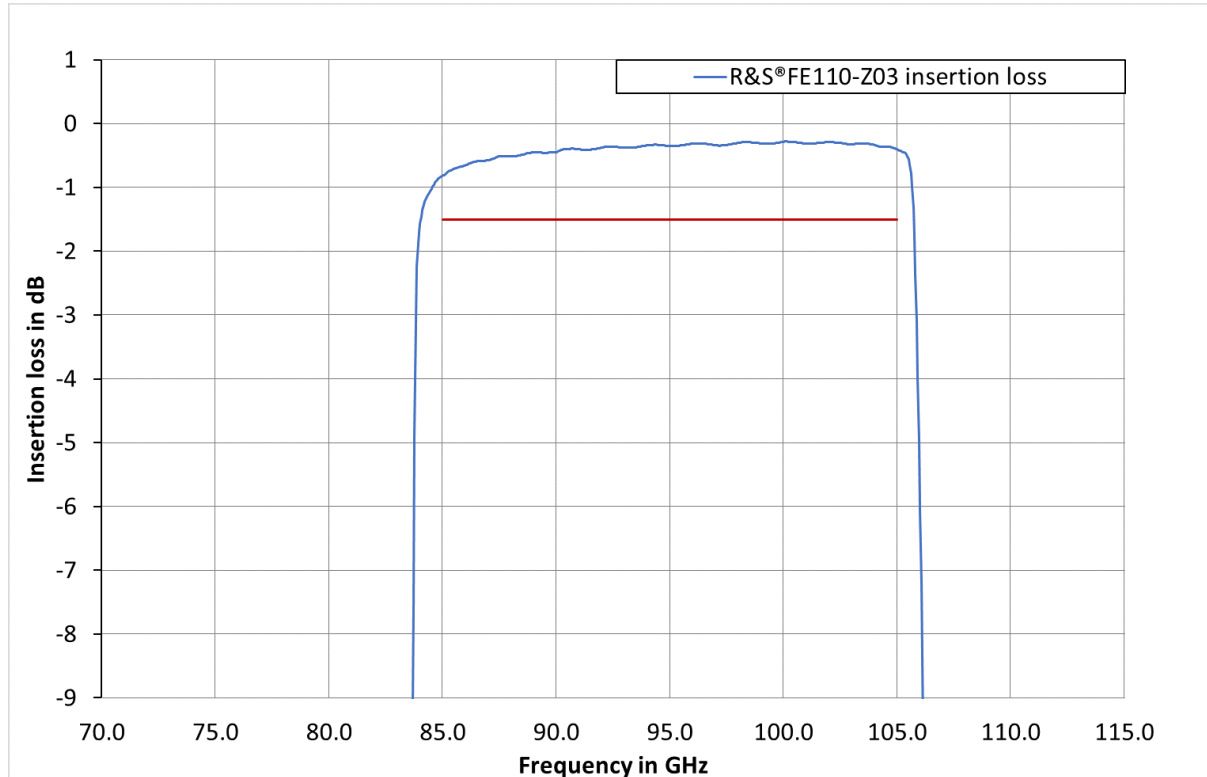
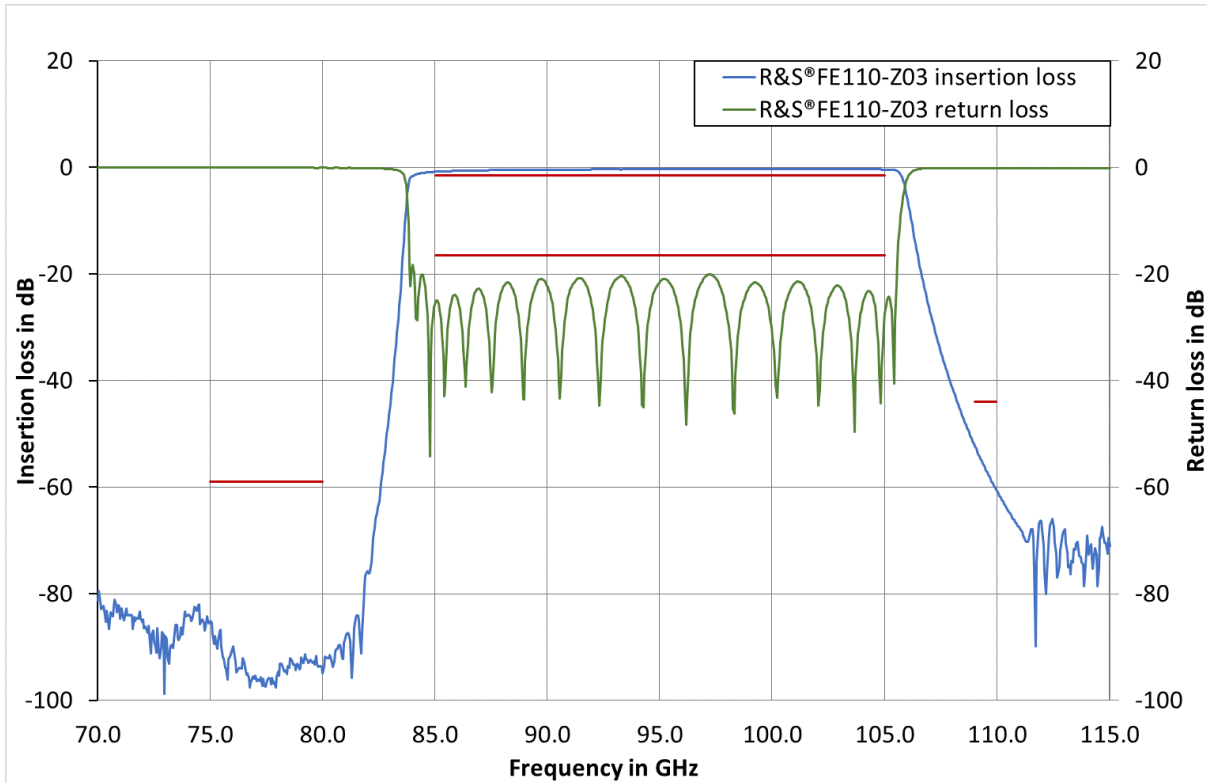
R&S®FE110-Z01



R&S®FE110-Z02

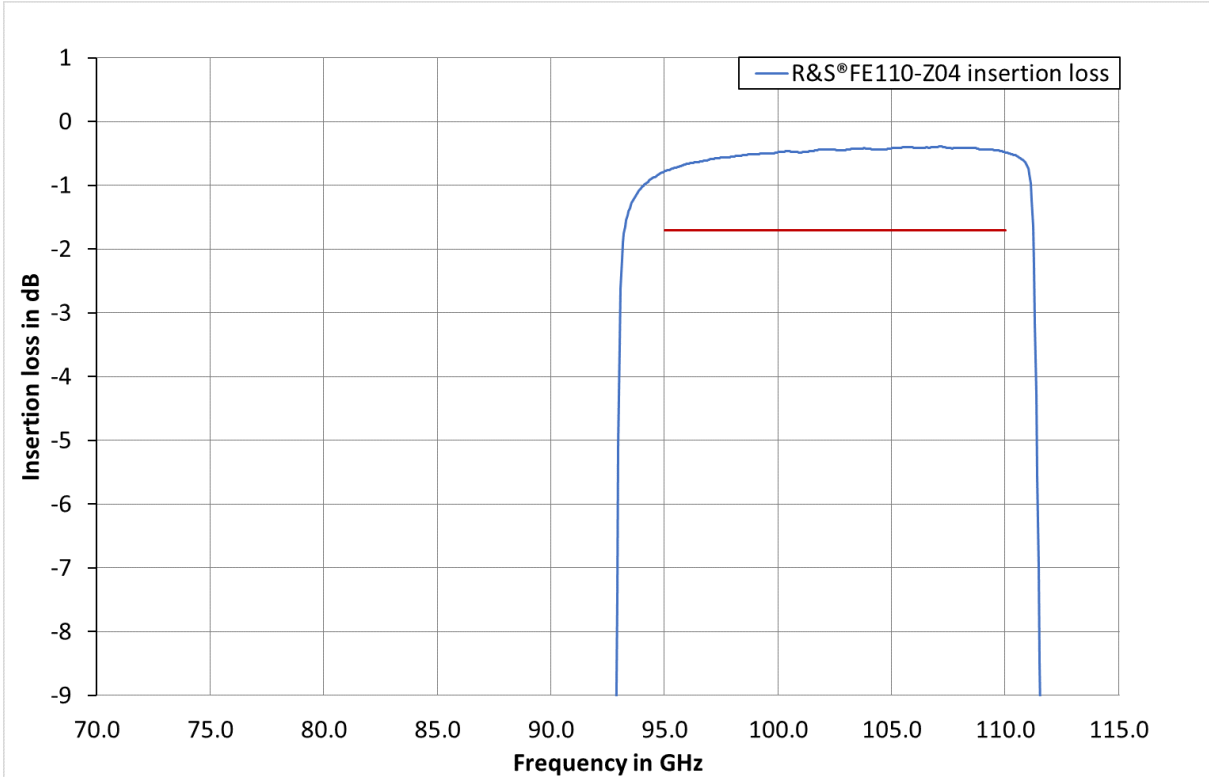
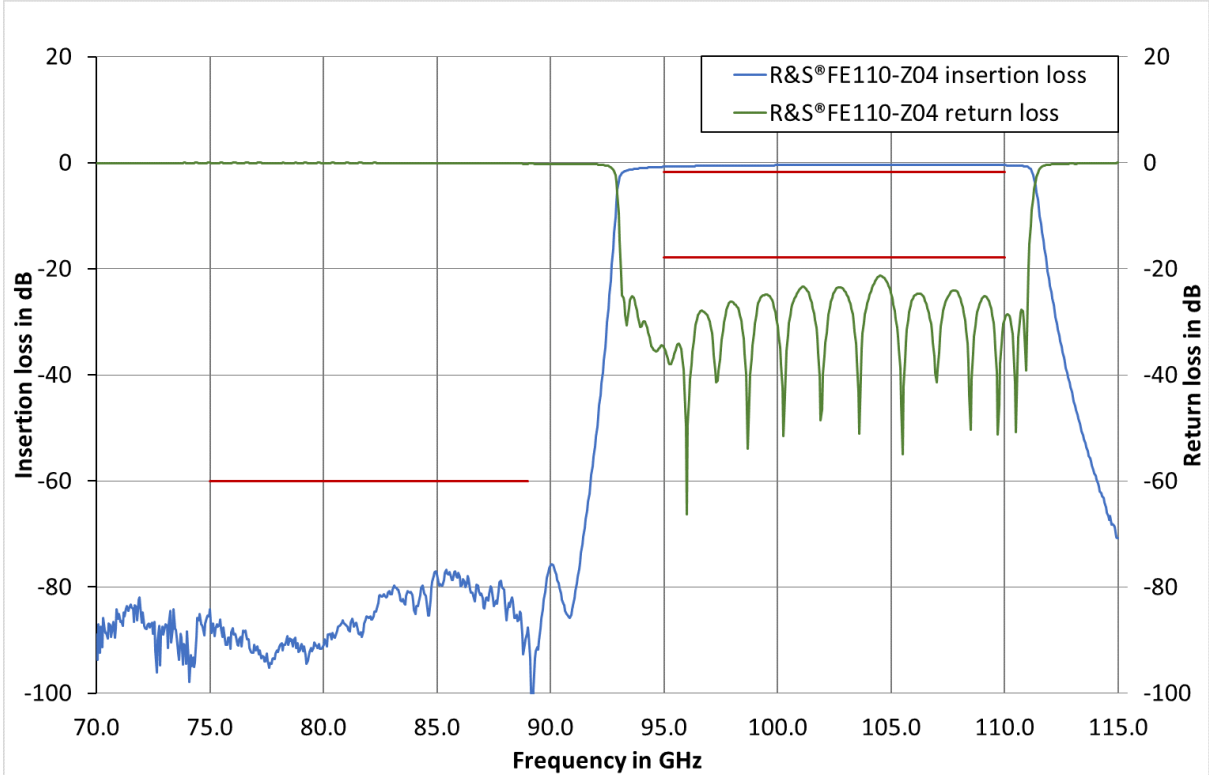


R&S®FE110-Z03

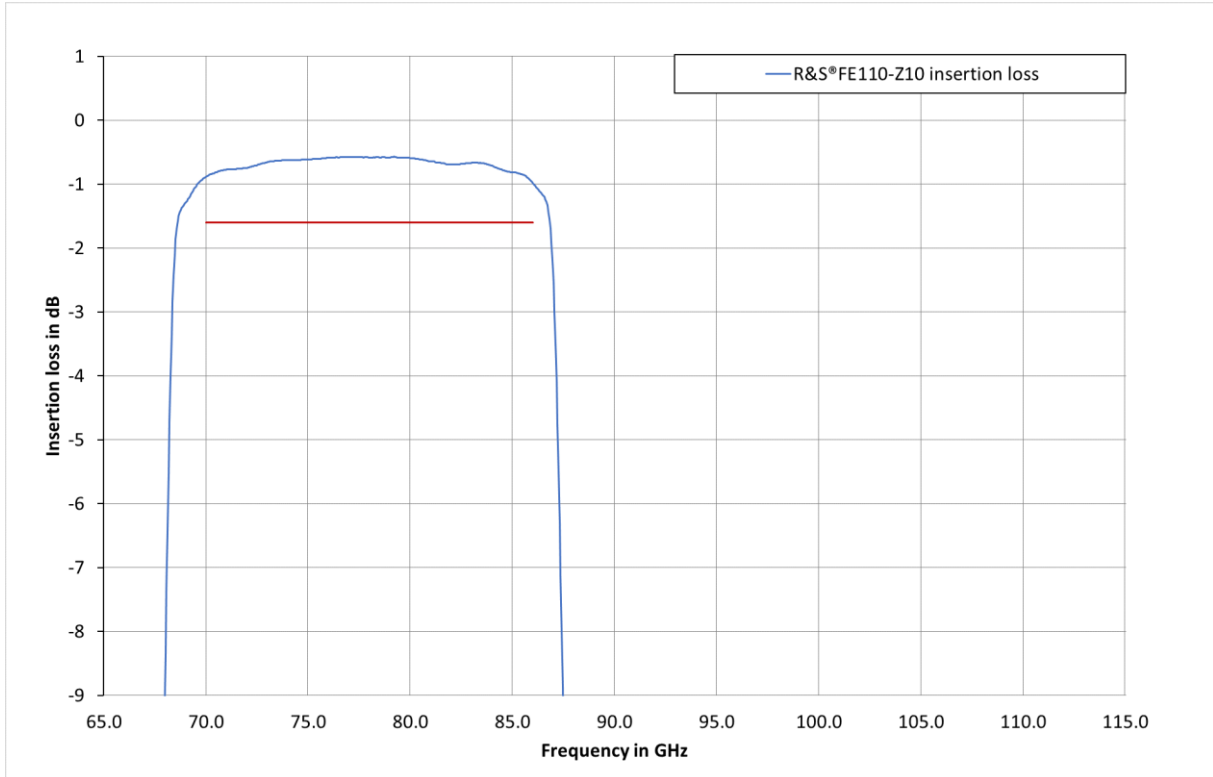
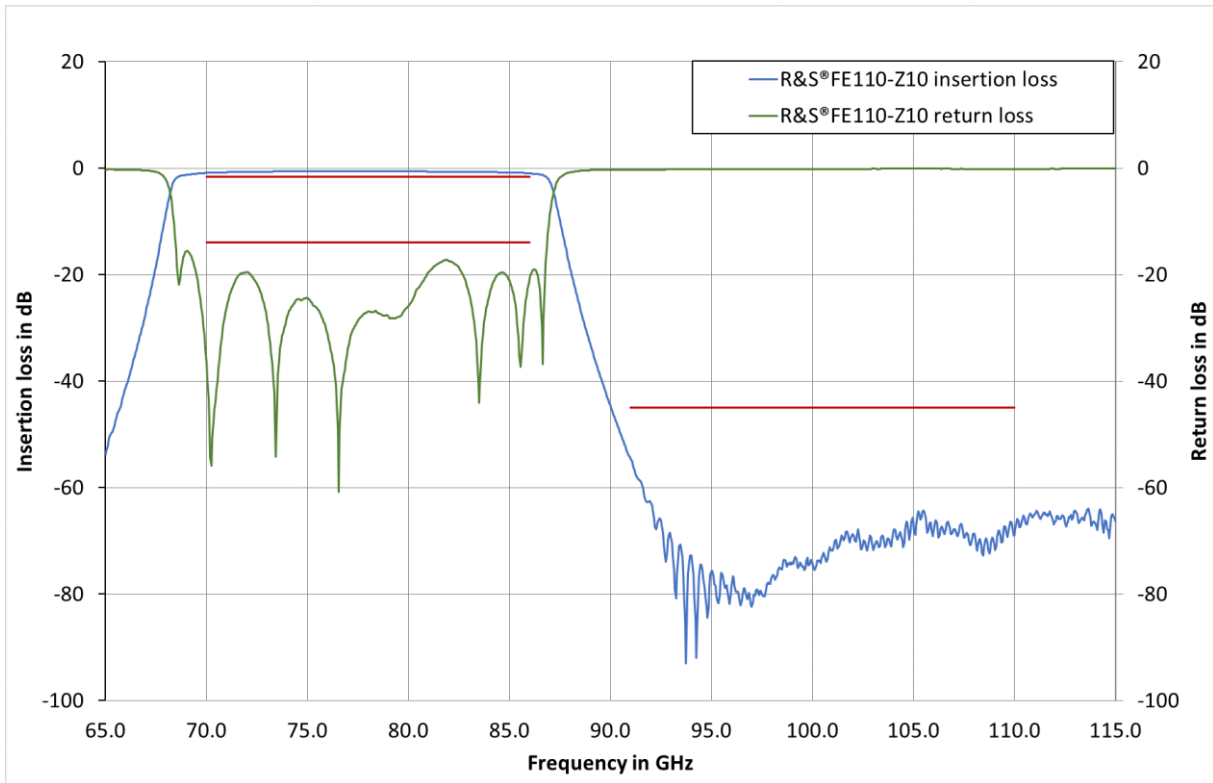




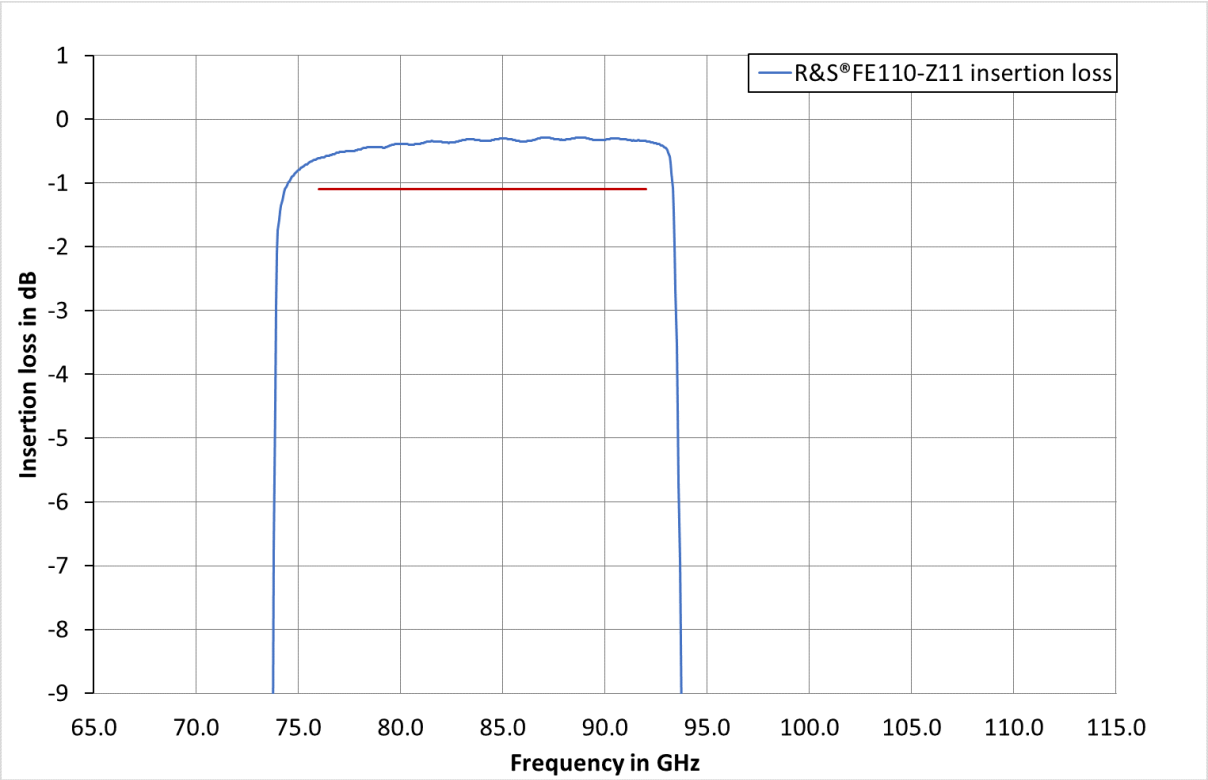
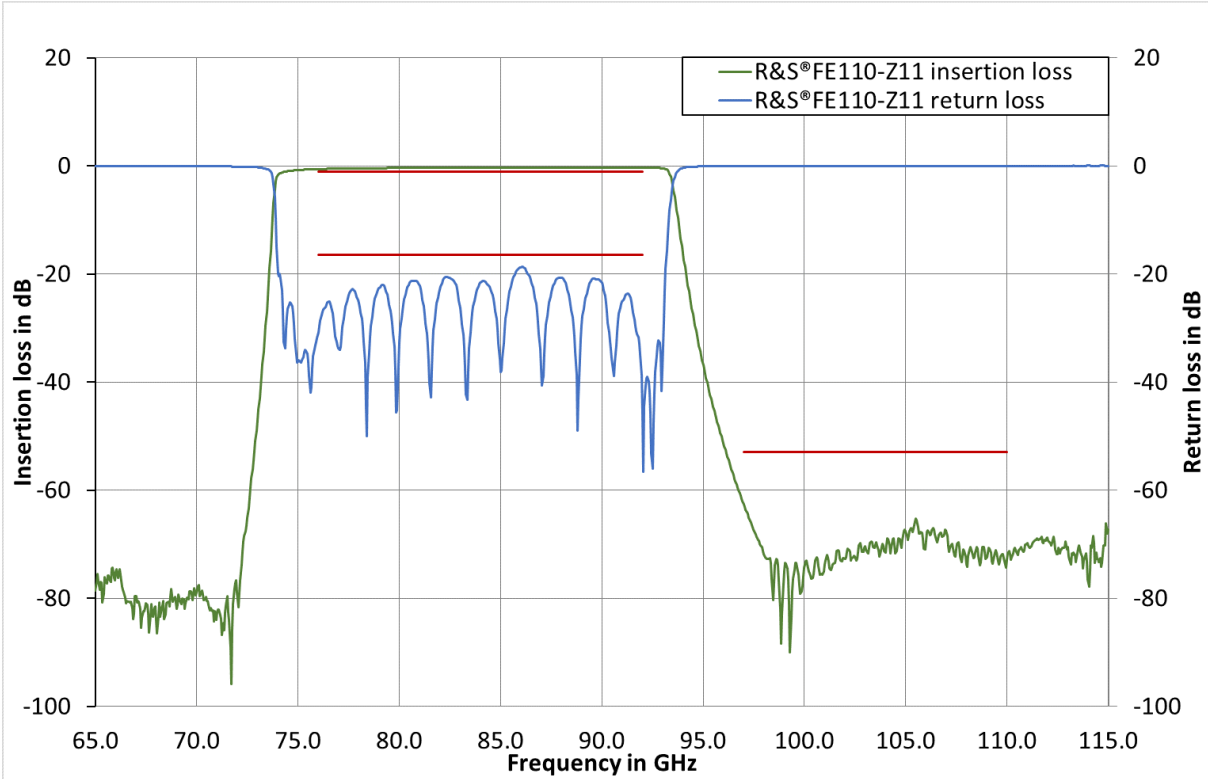
R&S®FE110-Z04



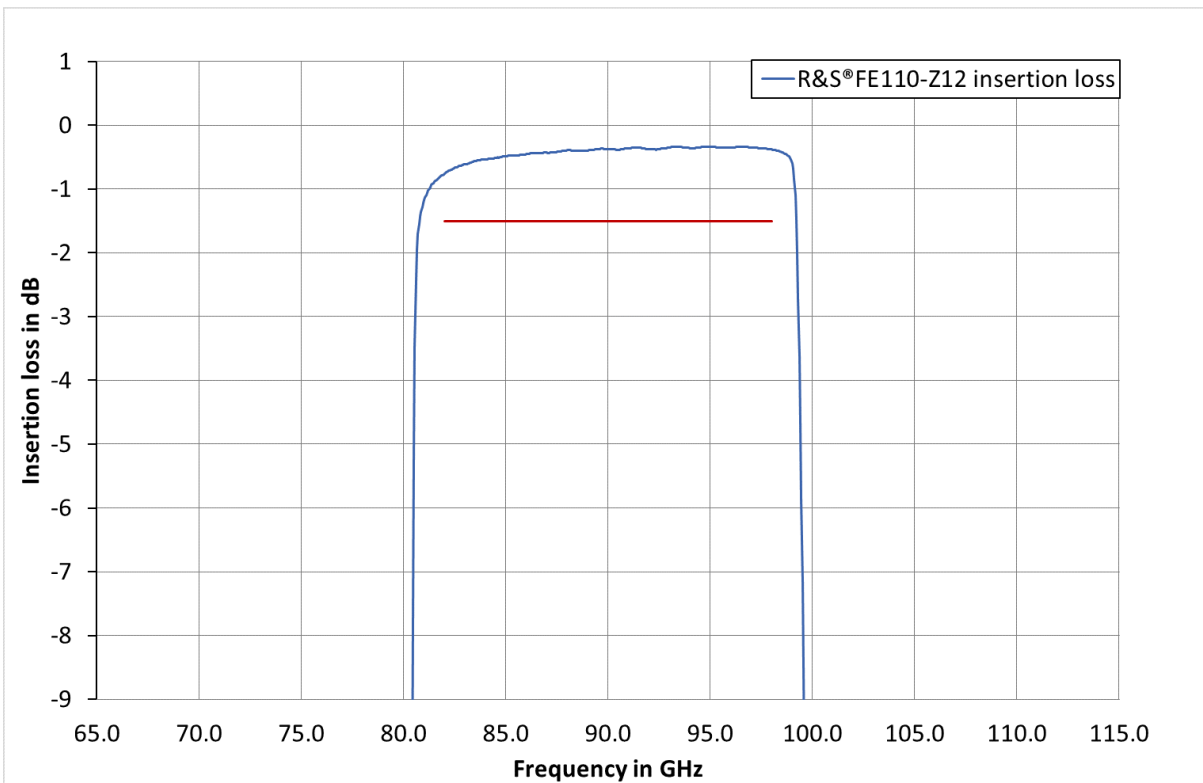
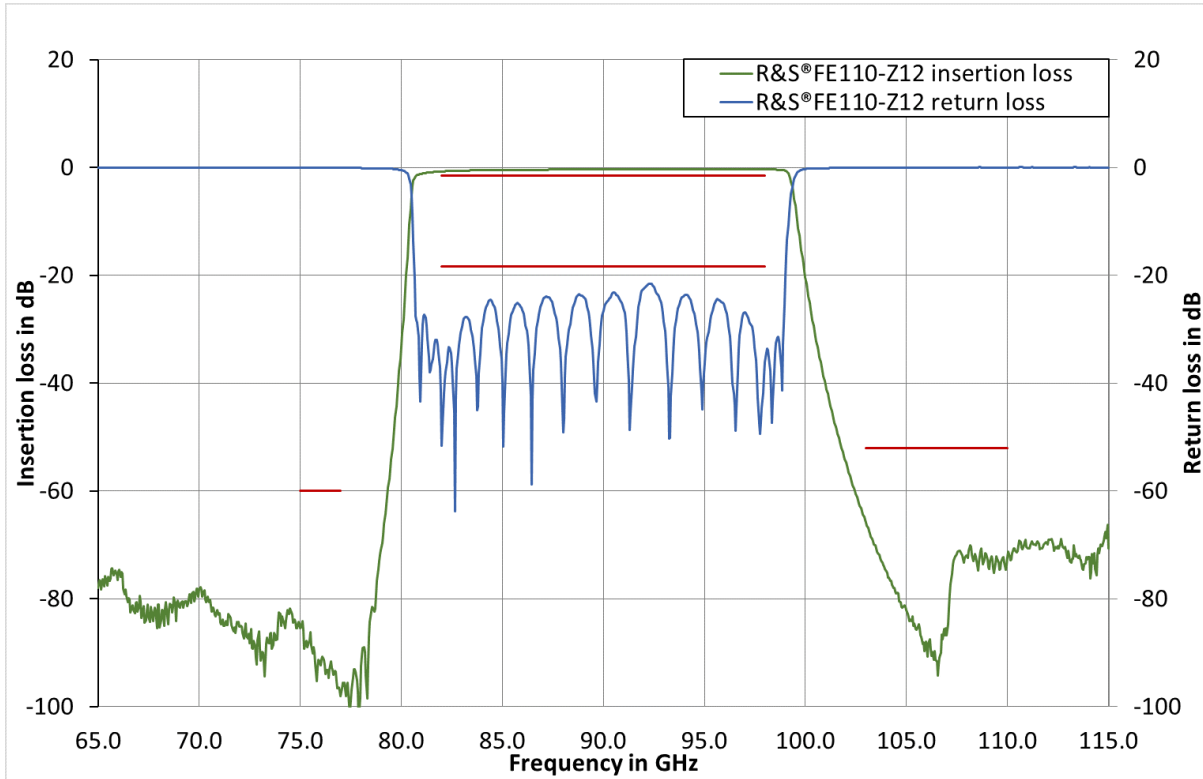
R&S®FE110-Z10



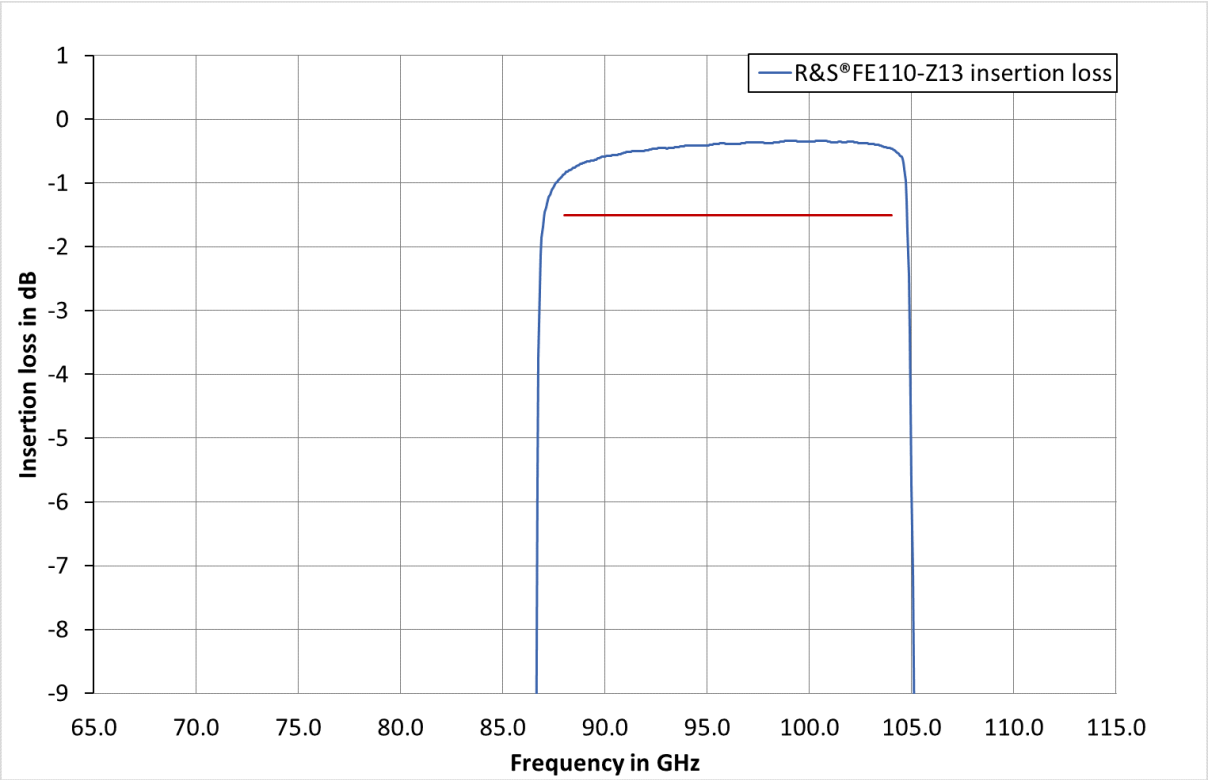
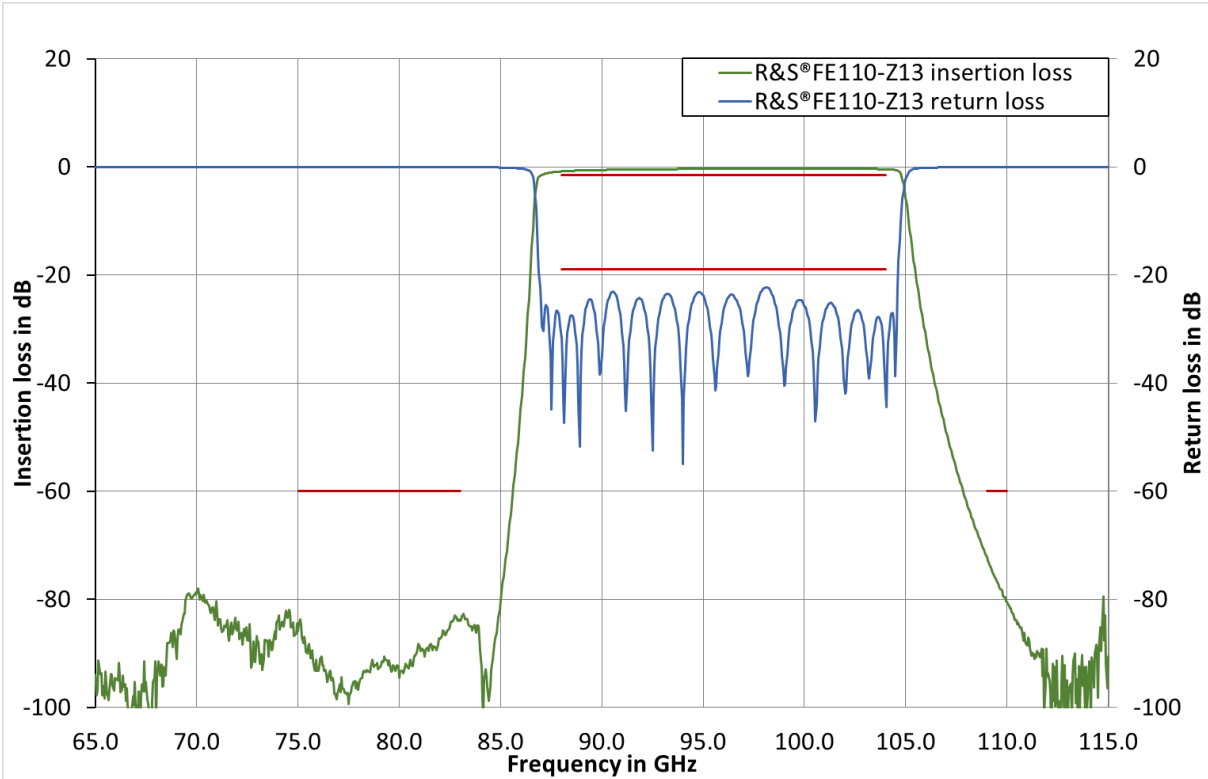
R&S®FE110-Z11



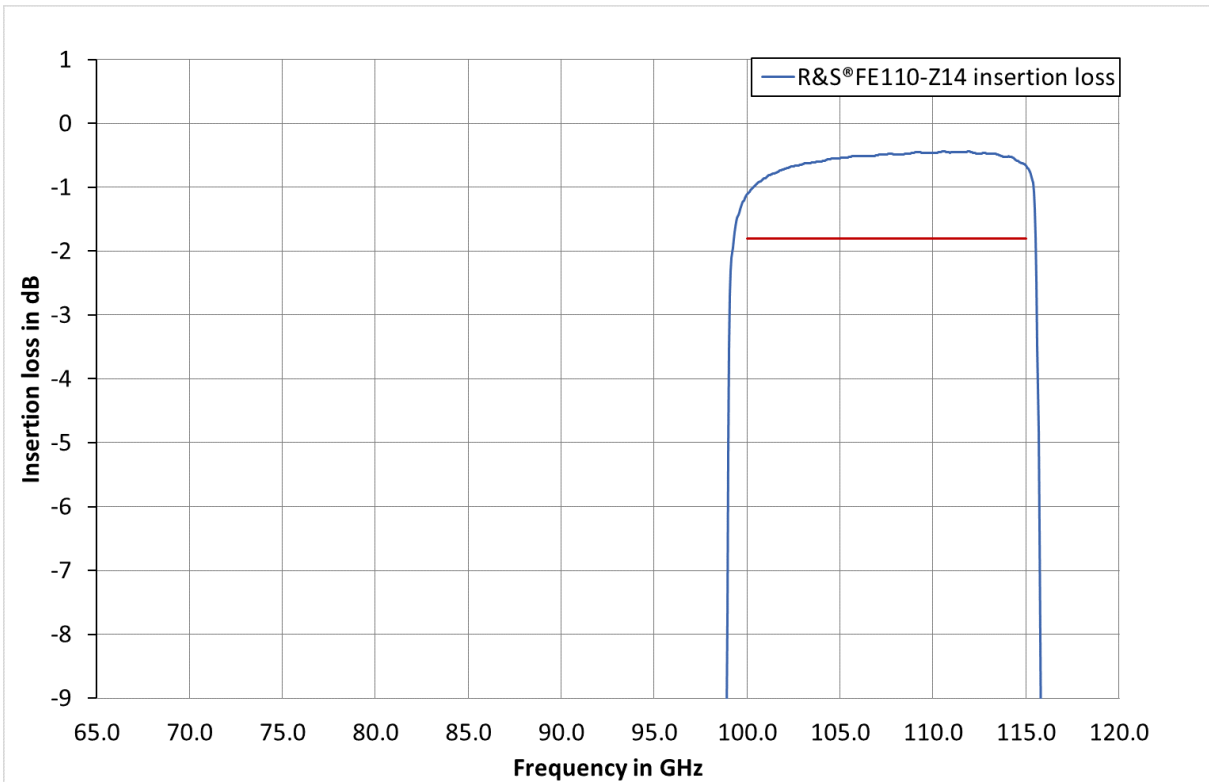
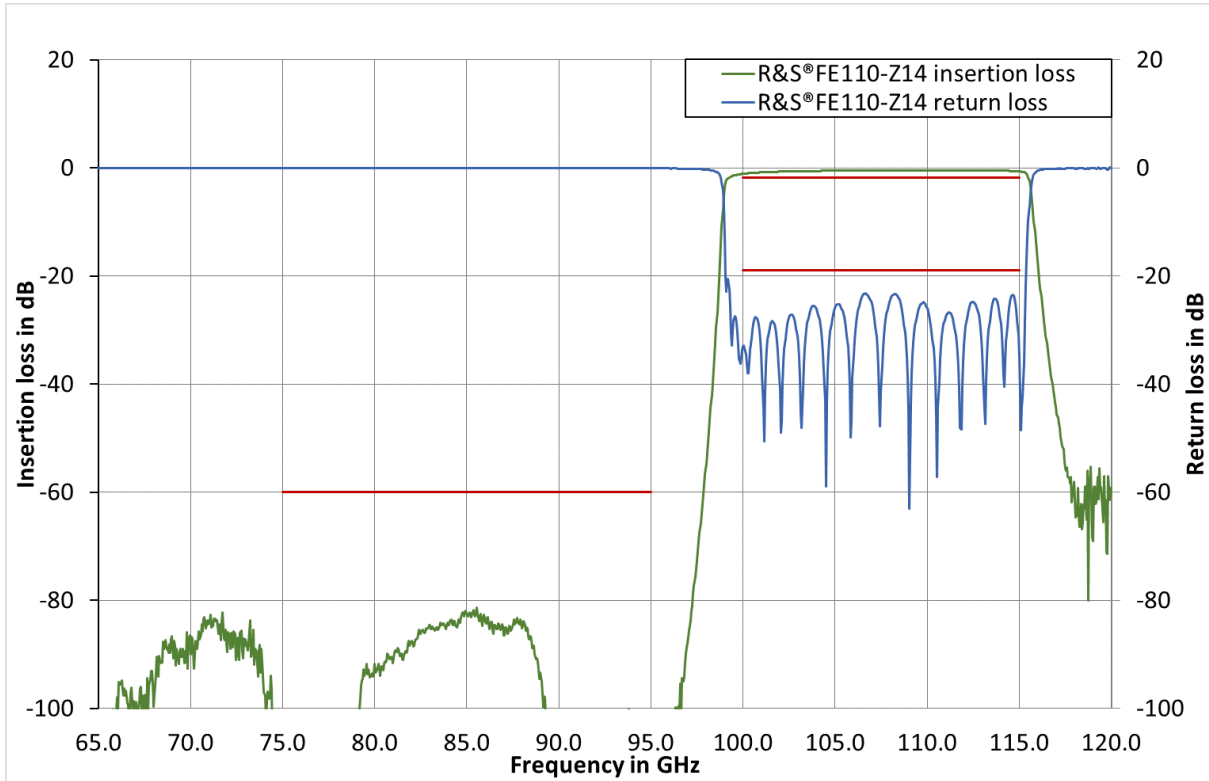
R&S®FE110-Z12



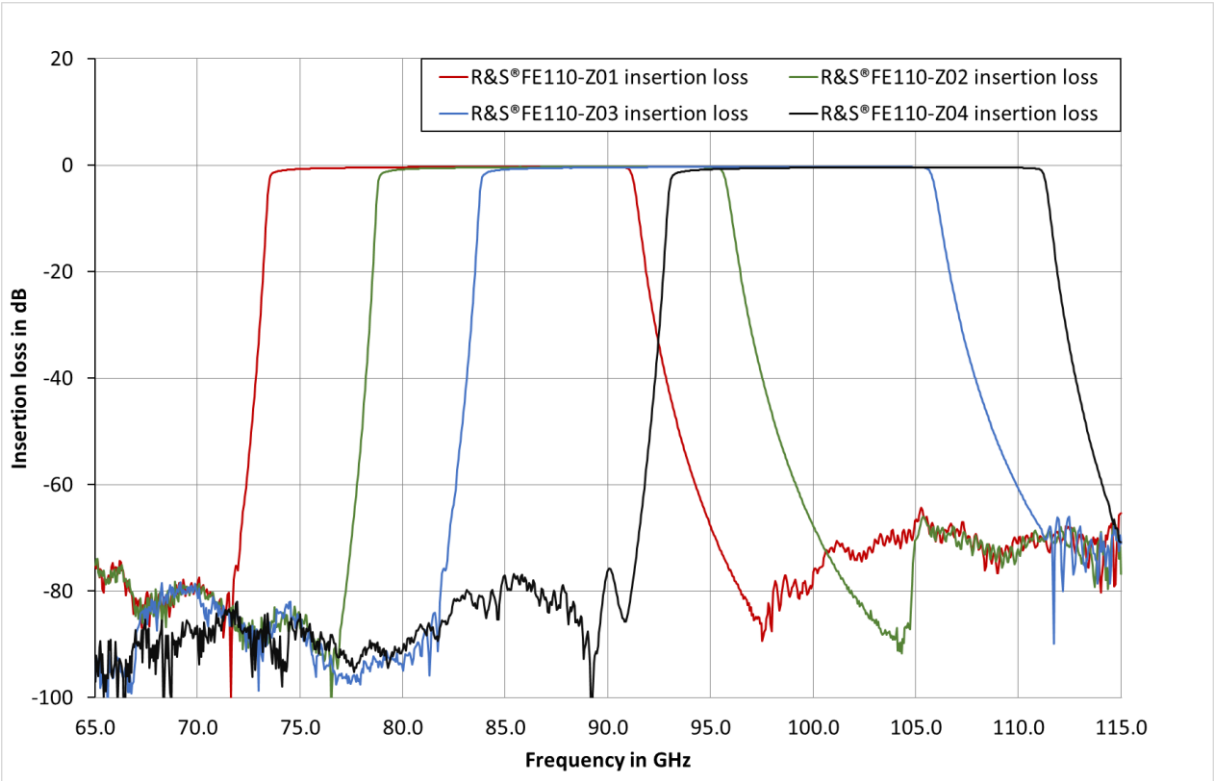
R&S®FE110-Z13



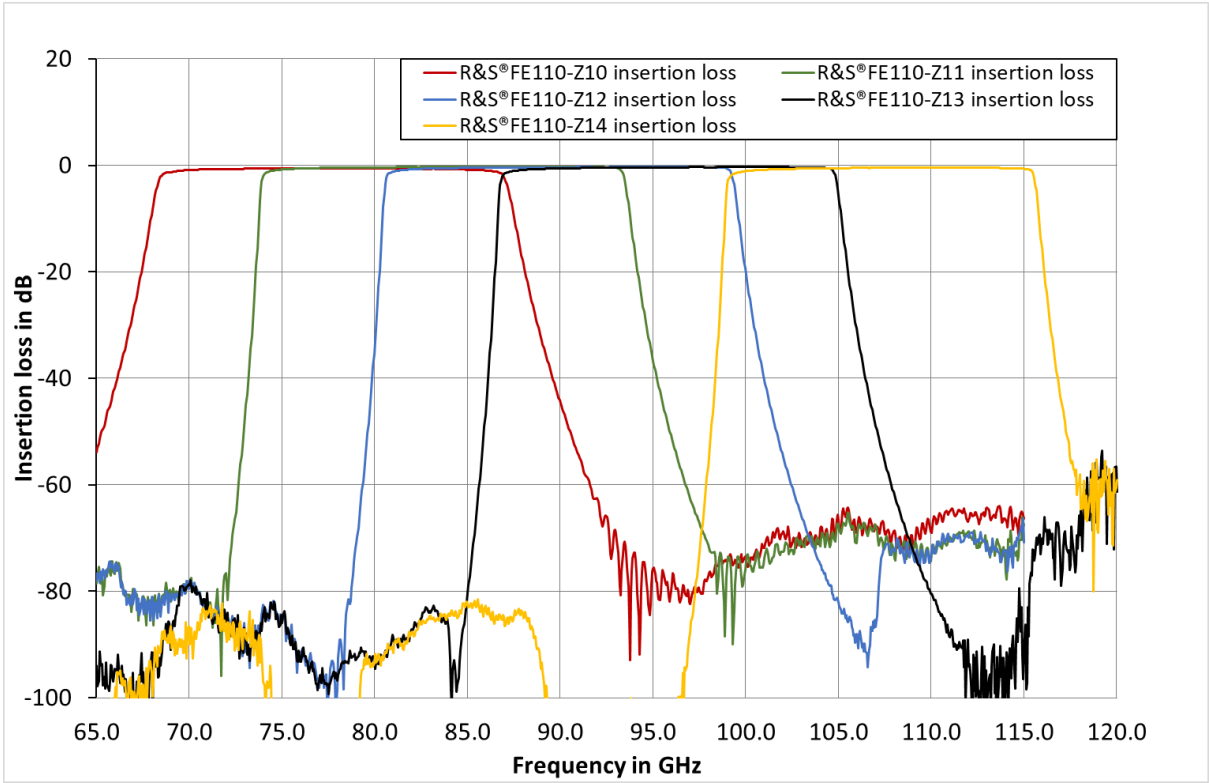
R&S®FE110-Z14



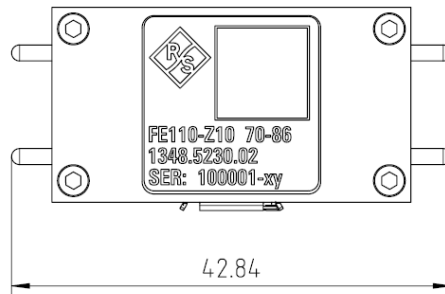
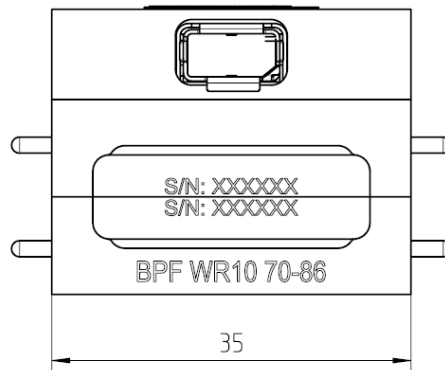
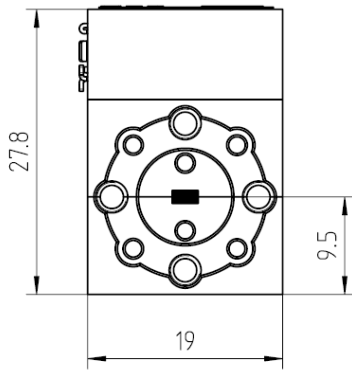
R&S®FE110-Z01, R&S®FE110-Z02, R&S®FE110-Z03 and R&S®FE110-Z04



R&S®FE110-Z10, R&S®FE110-Z11, R&S®FE110-Z12, R&S®FE110-Z13 and R&S®FE110-Z14



Outline drawing of R&S®FE110-Z10





## Inputs and outputs

RF input and output		
Connector		WM2540/WR10
Flange		UG387/U-M

Digital interface accessories		
Connector		ix Industrial® type B

## General data

Temperature		
Temperature range	operating	+5 °C to +40 °C
	storage	-40 °C to +70 °C
Climatic loading		+40 °C at 80 % relative humidity, in line with EN 60068-2-30, without condensation

Altitude		
Maximum operating altitude	above sea level	4600 m (approx. 15100 ft)

Mechanical resistance		
Vibration	sinusoidal	5 Hz to 55 Hz, displacement: 0.3 mm, constant amplitude (1.8 g at 55 Hz), in line with EN 60068-2-6
		55 Hz to 150 Hz, acceleration: 0.5 g constant, in line with EN 60068-2-6
	random	8 Hz to 500 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810G, method 516.6, procedure I

EMC		<ul style="list-style-type: none"> <li>• IEC/EN 61326-1 <sup>1, 2</sup></li> <li>• IEC/EN 61326-2-1</li> <li>• CISPR 11/EN 55011 <sup>1</sup></li> </ul>
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Recommended calibration interval		3 years
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Surface		plated gold
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Dimensions and weight		
Dimensions (nom.)	W x H x D (overall)	19 mm x 28 mm x 35 mm (0.75 in x 1.10 in x 1.38 in)
Net weight (nom.)		72 g (0.16 lb)

<sup>1</sup> Emission limits for class A equipment applied.

<sup>2</sup> Immunity test requirement for industrial environment (EN 61326 table 2).

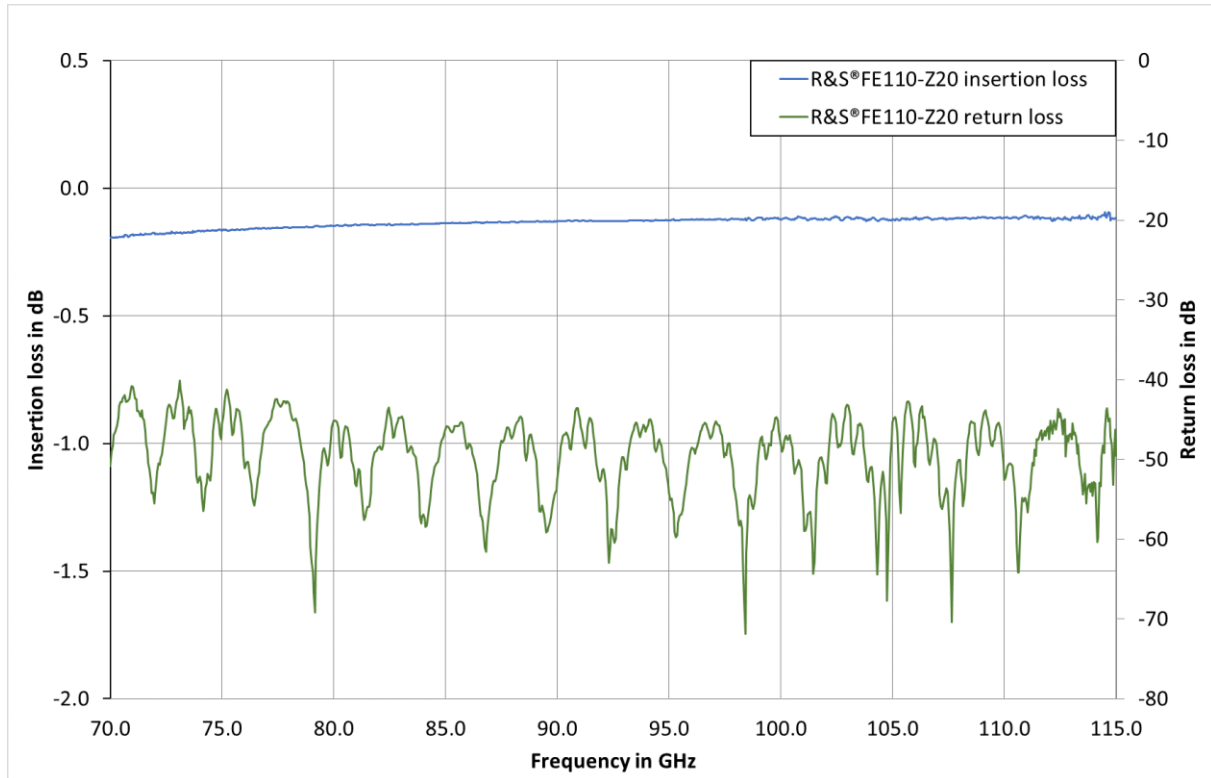
## R&S®FE110-Z20 WR10 waveguide-to-waveguide adapter

The R&S®FE110-Z20 WR10 waveguide-to-waveguide adapter is available for the frequency band from 75 GHz to 110 GHz with a mechanical length of 40 mm.

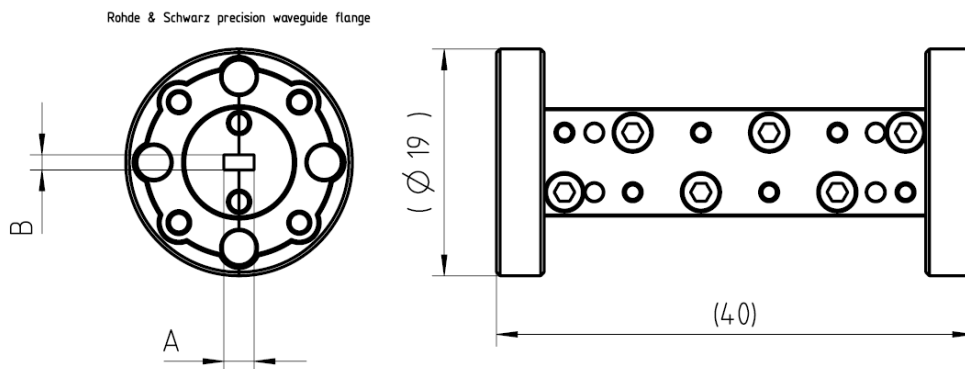
### Electrical specifications

Frequency range		75 GHz to 110 GHz
Insertion loss	$75 \text{ GHz} \leq f \leq 110 \text{ GHz}$	< 0.2 dB (meas.)
Return loss	$75 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 40 dB (meas.)

### Measured insertion loss and return loss over frequency



### Outline drawing



**Inputs and outputs**

<b>RF input and output</b>		
Connector		WM2540/WR10
Flange		UG387/U-M

**General data**

<b>Temperature</b>		
Temperature range	operating	+5 °C to +40 °C
	storage	−40 °C to +70 °C
Climatic loading		+40 °C at 80 % relative humidity, in line with EN 60068-2-30, without condensation

<b>Altitude</b>		
Maximum operating altitude	above sea level	4600 m (approx. 15100 ft)

<b>Mechanical resistance</b>		
Vibration	sinusoidal	5 Hz to 55 Hz, displacement: 0.3 mm, constant amplitude (1.8 g at 55 Hz), in line with EN 60068-2-6
		55 Hz to 150 Hz, acceleration: 0.5 g constant, in line with EN 60068-2-6
	random	8 Hz to 500 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810G, method 516.6, procedure I

<b>Surface</b>		plated gold
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<b>Dimensions and weight</b>		
Dimensions (nom.)	W x H x D (overall)	19 mm x 19 mm x 40 mm (0.75 in x 0.75 in x 1.57 in)
Net weight (nom.)		40 g (0.09 lb)

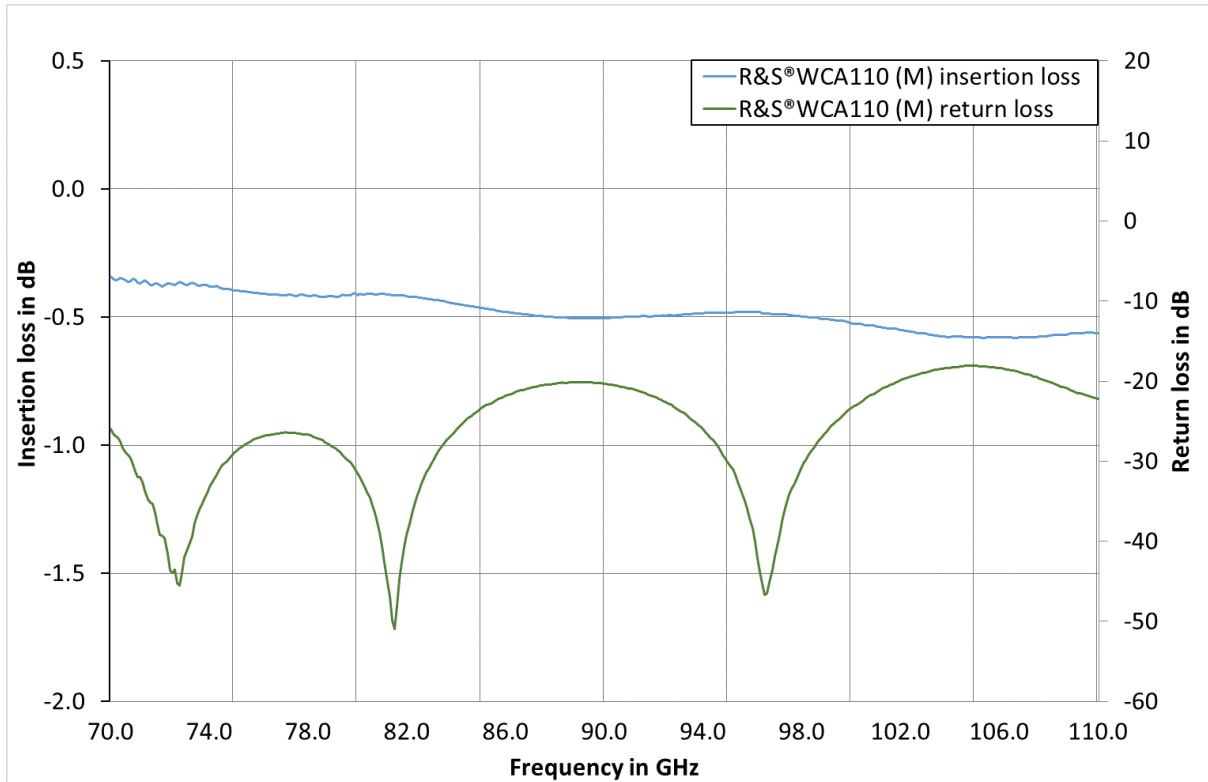
## R&S®WCA110 waveguide coax adapter WR10 to 1 mm

The R&S®WCA110 waveguide coax adapter WR10 to 1 mm is available for the frequency band from 75 GHz to 110 GHz with a 1 mm connector for the input interface in male or female.

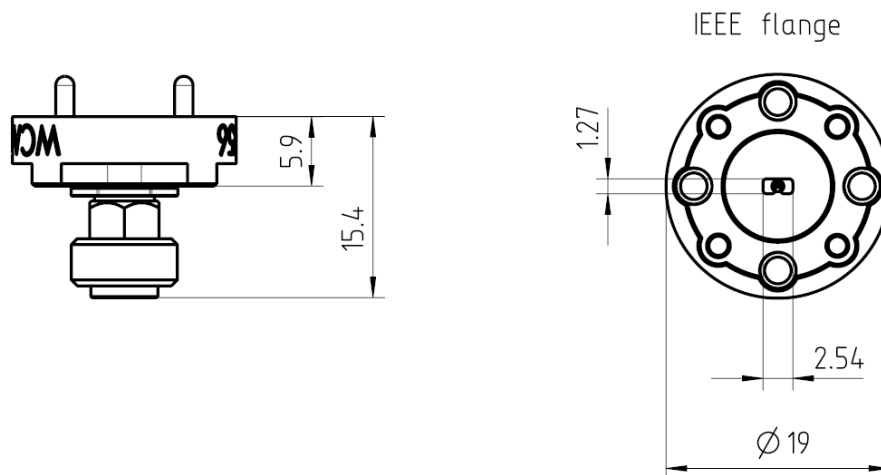
### Electrical specifications

Frequency range		75 GHz to 110 GHz
Insertion loss	$75 \text{ GHz} \leq f \leq 110 \text{ GHz}$	< 0.8 dB, < 0.6 dB (meas.)
Return loss	$75 \text{ GHz} \leq f \leq 110 \text{ GHz}$	> 14 dB, > 18 dB (meas.)

### Measured insertion loss and return loss over frequency



### Outline drawing



**Inputs and outputs**

<b>RF input and output</b>		
Coaxial connector		1 mm
WG connector		WM2540/WR10
Flange		UG387/U-M

**General data**

<b>Temperature</b>		
Temperature range	operating	+5 °C to +40 °C
	storage	−40 °C to +70 °C
Climatic loading		+40 °C at 80 % relative humidity, in line with EN 60068-2-30, without condensation

<b>Altitude</b>		
Maximum operating altitude	above sea level	4600 m (approx. 15100 ft)

<b>Mechanical resistance</b>		
Vibration	sinusoidal	5 Hz to 55 Hz, displacement: 0.3 mm, constant amplitude (1.8 g at 55 Hz), in line with EN 60068-2-6
		55 Hz to 150 Hz, acceleration: 0.5 g constant, in line with EN 60068-2-6
	random	8 Hz to 500 Hz, acceleration 1.2 g (RMS), in line with EN 60068-2-64
Shock		40 g shock spectrum, in line with MIL-STD-810G, method 516.6, procedure I

<b>Surface</b>		
		plated gold

<b>Dimensions and weight</b>		
Dimensions (nom.)	W x H x D (overall)	19 mm x 19 mm x 15.4 mm (0.75 in x 0.75 in x 0.61 in)
Net weight (nom.)		12 g (0.026 lb)

## Ordering information

Designation	Type	Order No.
Waveguide filter, 75 GHz to 90 GHz	R&S®FE110-Z01	1348.5147.02
Waveguide filter, 80 GHz to 95 GHz	R&S®FE110-Z02	1348.5153.02
Waveguide filter, 85 GHz to 105 GHz	R&S®FE110-Z03	1348.5160.02
Waveguide filter, 94 GHz to 110 GHz	R&S®FE110-Z04	1348.5199.02
Waveguide filter, 70 GHz to 86 GHz	R&S®FE110-Z10	1348.5230.02
Waveguide filter, 76 GHz to 92 GHz	R&S®FE110-Z11	1348.5247.02
Waveguide filter, 82 GHz to 98 GHz	R&S®FE110-Z12	1348.5253.02
Waveguide filter, 88 GHz to 104 GHz	R&S®FE110-Z13	1348.5260.02
Waveguide filter, 100 GHz to 115 GHz	R&S®FE110-Z14	1348.5276.02
WR10 waveguide-to-waveguide adapter	R&S®FE110-Z20	1348.5224.02
Waveguide coax adapter WR10 to 1 mm (f)	R&S®WCA110	3626.1067.02
Waveguide coax adapter WR10 to 1 mm (m)	R&S®WCA110	3626.1067.03

## Recommended extra

Designation	Type	Order No.
Torque wrench, for waveguide flanges, 0.58 Nm	R&S®ZCTW	1175.2014.02

## Service options

Warranty		1 year
Service options		
Extended warranty, one year	R&S®WE1	Contact your local Rohde & Schwarz sales office.
Extended warranty, two years	R&S®WE2	
Extended warranty, three years	R&S®WE3	
Extended warranty, four years	R&S®WE4	
Extended warranty with calibration coverage, one year	R&S®CW1	
Extended warranty with calibration coverage, two years	R&S®CW2	
Extended warranty with calibration coverage, three years	R&S®CW3	
Extended warranty with calibration coverage, four years	R&S®CW4	

### Extended warranty with a term of one and two years (WE1 to WE4)

Repairs carried out during the contract term are free of charge<sup>3</sup>. Necessary calibration and adjustments carried out during repairs are also covered.

### Extended warranty with calibration coverage (CW1 to CW4)

Enhance your extended warranty by adding calibration coverage at a package price. This package ensures that your Rohde & Schwarz product is regularly calibrated, inspected and maintained during the term of the contract. It includes all repairs<sup>3</sup> and calibration at the recommended intervals as well as any calibration carried out during repairs or option upgrades.

<sup>3</sup> Excluding defects caused by incorrect operation or handling and force majeure. Wear-and-tear parts are not included.



## Service at Rohde & Schwarz You're in great hands

- ▶ Worldwide
- ▶ Local and personalized
- ▶ Customized and flexible
- ▶ Uncompromising quality
- ▶ Long-term dependability

## Rohde & Schwarz

The Rohde&Schwarz technology group is among the trailblazers when it comes to paving the way for a safer and connected world with its leading solutions in test & measurement, technology systems and networks&cybersecurity. Founded 90 years ago, the group is a reliable partner for industry and government customers around the globe. The independent company is headquartered in Munich, Germany and has an extensive sales and service network with locations in more than 70 countries.

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

## Sustainable product design

- ▶ Environmental compatibility and eco-footprint
- ▶ Energy efficiency and low emissions
- ▶ Longevity and optimized total cost of ownership

Certified Quality Management

**ISO 9001**

Certified Environmental Management

**ISO 14001**

## Rohde & Schwarz training

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

## Rohde & Schwarz customer support

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

