

**VASTA**

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**VASTA**

Cryogenic Wiring and Electronics

# PREFACE

Hello,

Thank you for taking a moment with our brochure. If you're wondering what we do at Vasta, we invite you to read on. If you're curious about what we offer, simply turn the page to explore our products!

At Vasta, our goal is to provide accessible infrastructure for low-temperature experiments at every level. We focus on solutions that are:

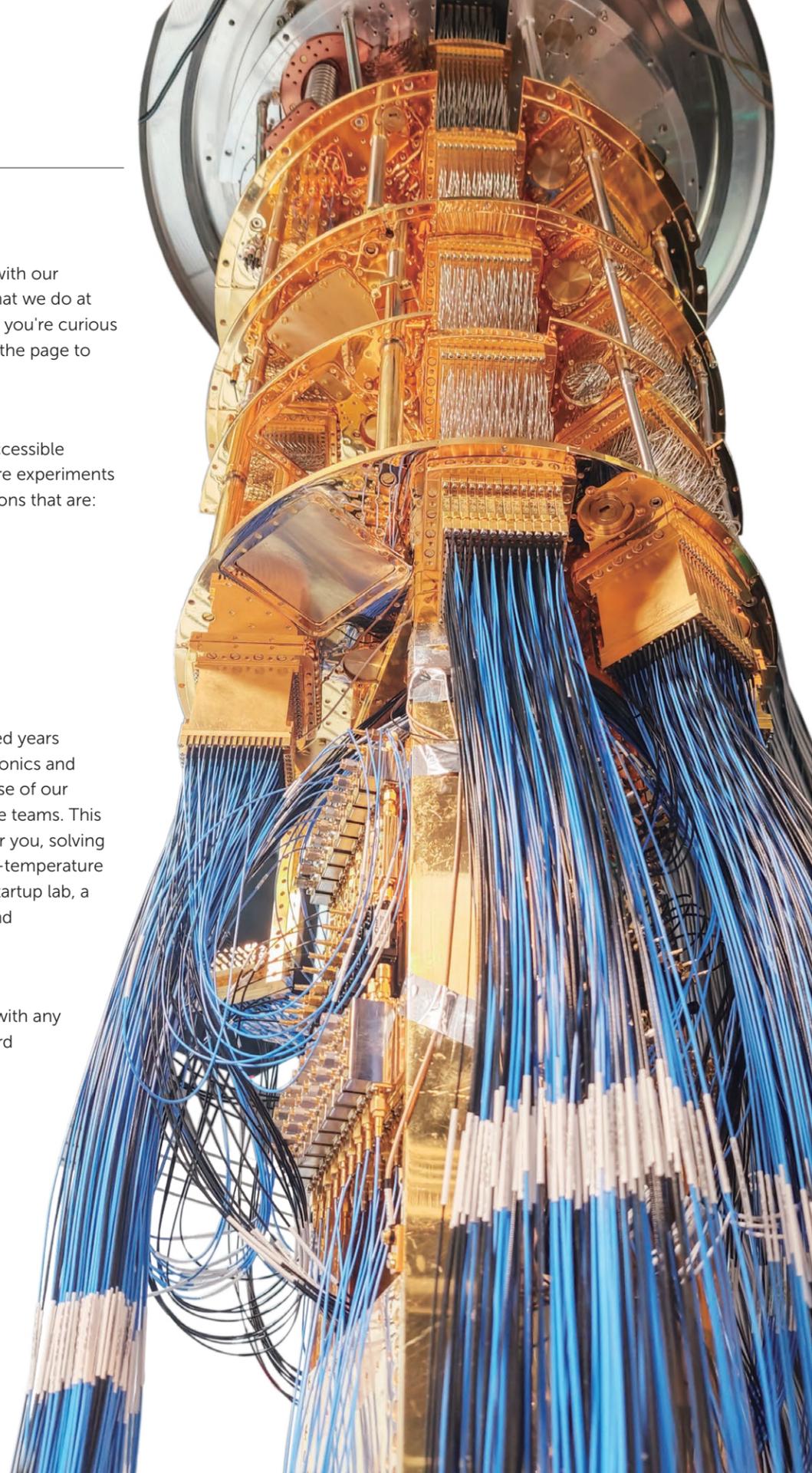
- Proven in their suitability
- Built with familiar interfaces
- Fundamentally cost-effective
- Designed to scale sufficiently
- Ready for prompt delivery

We combine globally accumulated years of experience in cryogenic electronics and wiring with the dedicated expertise of our engineering and customer service teams. This allows us to do excellent work for you, solving technical problems faced by low-temperature experimentalists - whether in a startup lab, a university, or a large-scale test and manufacturing facility.

You're welcome to approach us with any questions, whether about standard components or custom inquiries.

We're here to help.

Yours,  
Vasta team



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# New Product Offering

Vasta continuously expands its product portfolio in direct response to customer needs. While the following items are not yet part of our standard solution family, they are available upon request. Each product has been successfully delivered and implemented in research laboratory environments.

## 40 GHz coaxial lines

This measurement line, designed for connectivity from a room-temperature flange to the mixing chamber plate of a dilution refrigerator, is based on the K2.92mm connector. The system includes a hermetic feedthrough plate, semi-rigid coaxial cables, low-temperature feedthrough plates, and attenuators. Components near the mixing chamber plate are constructed with non-magnetic materials.

## Optical fiber Integration

A complete solution for integrating optical fibers into cryogenic systems. The offering includes all necessary components: vacuum feedthroughs, fiber, thermalization stages, and breakouts.

## Radiation shields

Custom-fabricated radiation shields for dilution refrigerators, available in aluminum or gold-plated copper.

## Quick test insert (dipstick)

A comprehensive assembly for rapid sample testing at helium temperatures. Standard configurations include RF and DC wiring, attenuators, and filters. Inserts are customized to meet specific experimental requirements.

## SMPM high-density wiring modules

The modules can be made compatible with the high-density wiring from other vendors.



# High-density Modular Wiring

Our high-density modular cabling design offers enlarged wiring capacity while maintaining its RF performance (i.e. insertion loss, return loss, consistency, and cross talk) as well as heat load to the cryostat at optimized state.

The HD cabling with SMPM connectors provides up to 256 channels per ISO100 side-loading port and 120 channels per K63 port. HD cabling interfaces for other line-of-sight port is available upon discussion.

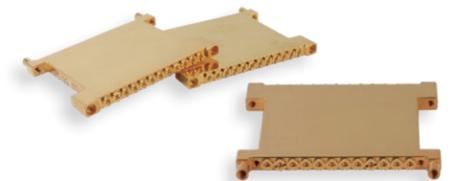
## Featured Performances

- 1) VSWR better than 1.15 across the 0-8 GHz range for the entire line from RT to mK.
- 2) Less than 2 nW per line heat load on the MXC plate, even with 1,000+ high-density SCN cables installed and a base temperature below 11 mK.
- 3) Modular design enabling easy individual integration, flexible configuration, and future on-site upgrades.
- 4) SMPM connector-based components are available upon discussion.
- 5) Lowest cross talk (-75 dB nearest channel).

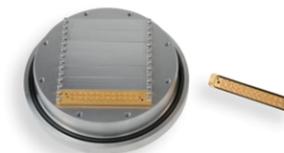
## Modular Phase and Amplitude Stable Cables



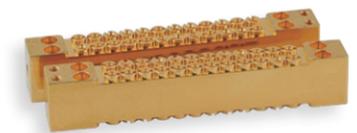
## Low-pass Filter Module Infrared Filter Module



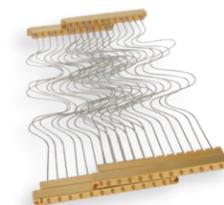
## Hermetic Multi-channel Feedthrough Module



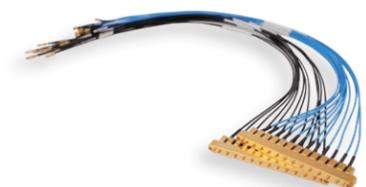
## Attenuator Module



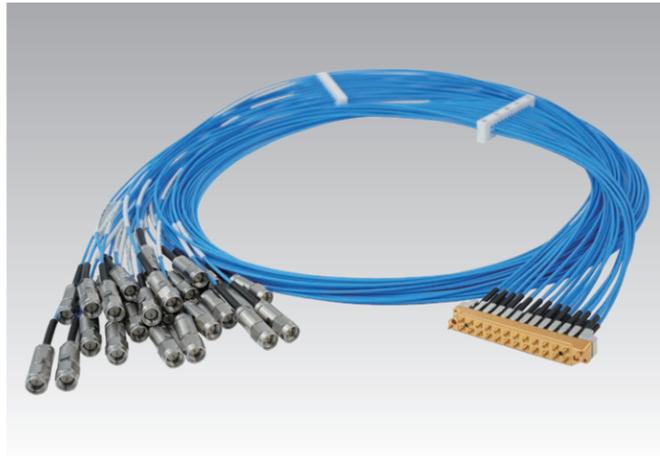
## Modular Coaxial Cables



## Modular Non-magnetic Flexible Coaxial Cables



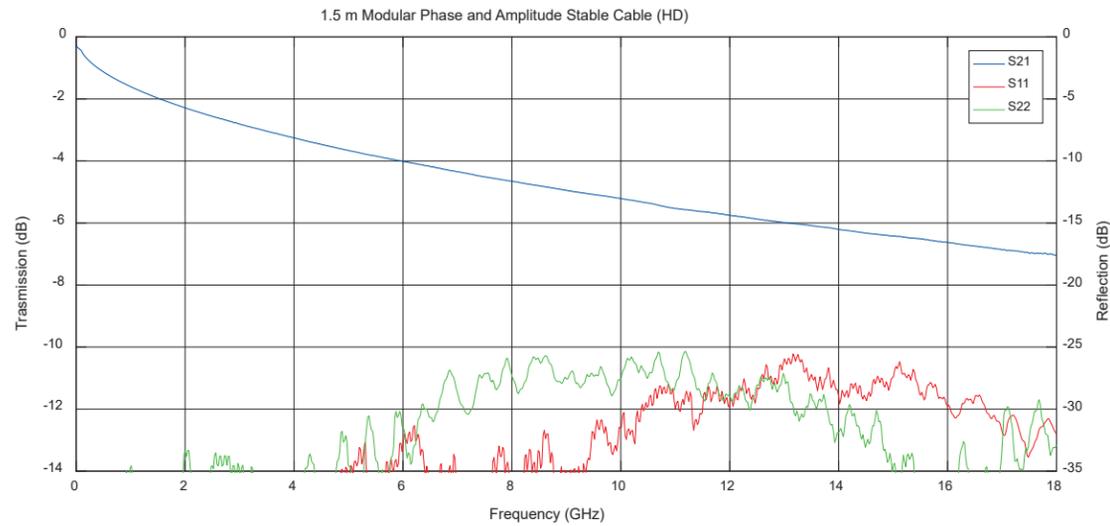
## Modular Phase and Amplitude Stable Cables



This low-loss flexible phase and amplitude stable coaxial cable module offers well balance between the signal stability and system compactness. Less than 300 ppm variation between 15°C to 30°C is guaranteed while less than 200 ppm variation is well expected.

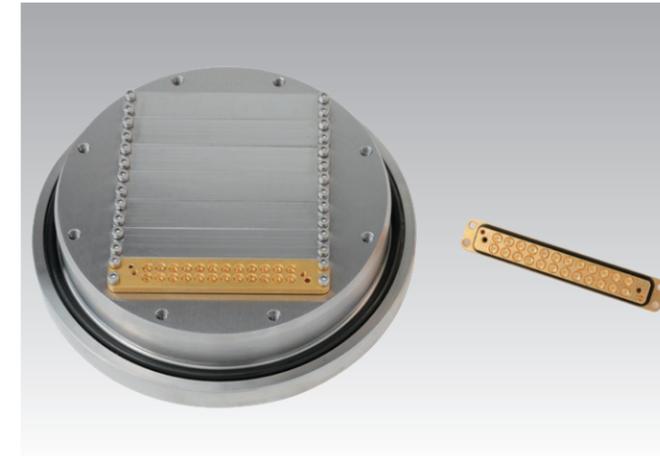
### Features & Benefits

- Improved stability for both amplitude and phase signal
- Well expected <200 ppm phase variation
- Customizable cable length and connector type
- Modular design for easy assembly



Specifications		VS-HDPASC
RF property	Frequency range	DC-18 GHz
	Insertion loss	≤1.2 dB/m@1 GHz    ≤1.7 dB/m@4 GHz
		≤2.4 dB/m@6 GHz    ≤3.3 dB/m@8 GHz
	Return loss	≥19 dB
	Impedance	50 Ω
	Phase stability	<300 ppm (15-30°C)
Amplitude stability	<0.1 dB (15-30°C, 1.6 m, 8 GHz)	
Physical property	Nearest channel crosstalk	<-75 dB
	Working temp.	15-30 °C
	Jacket diameter	1.5 mm
	Conductor diameter	0.047"
	Connector type	SMPS-female to SMA-male
	Modular capacity	20/24/32 per module

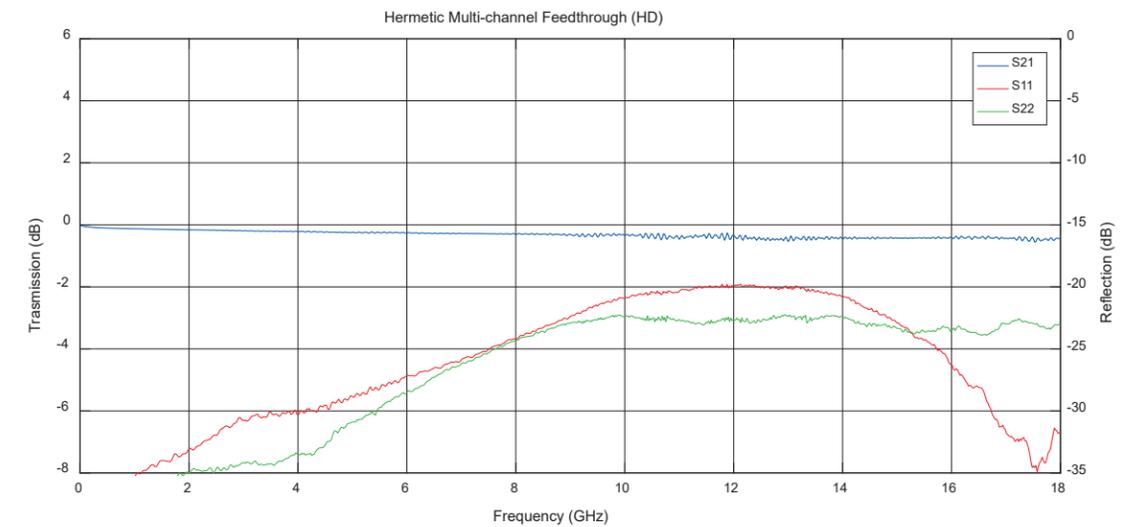
## Hermetic Multi-channel Feedthrough Module



Each individual SMPS connector is hermetically sealed with the glass-to-metal sealing technology which will keep the connector leak tight over years with long term stability and reliability.

### Features & Benefits

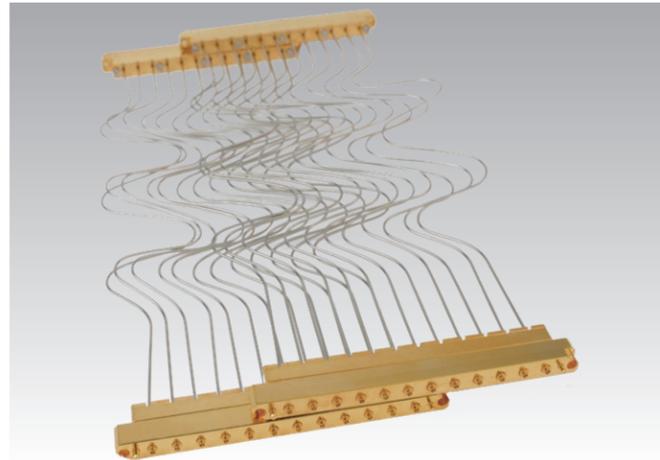
- Glass-to-metal sealing technology
- O-ring sealed modular design
- Easy installation and servicing
- In-house leak check



Specifications		VS-HDFT
RF property	Frequency range	DC-18 GHz
	Insertion loss	Insertion loss < 0.5 dB@18 GHz
	Return loss	≥18 dB
	Impedance	50 Ω
	Nearest channel crosstalk	<-75 dB
	Physical property	Leak rate
Connector type		SMPS-male to SMPS-male
Modular capacity		120*/24/64 per module

\* K63 port requires 120 channels in a single module due to space limitation

# Modular Coaxial Cables

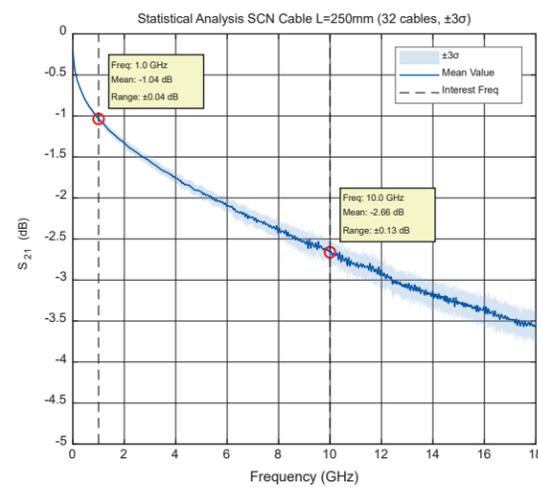
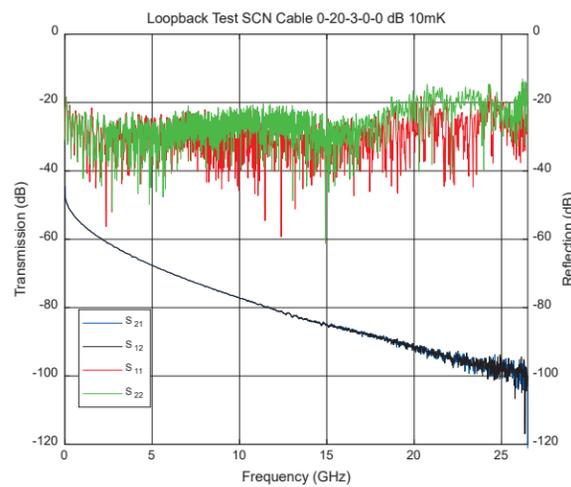


The silver-plated CuNi center conductor provides excellent transmission while keeping the heat load manageable with the thin cable dimensions (diameter=0.034" or 0.86 mm), leading the SCN/ CN cable one of the best choices for cryogenic RF applications.

The NbTi (NT/NT) cable is superconducting below 4K, providing almost zero heat load below 4K with minimized signal degradation. Copper plating of inner and outer conductor prior soldering for better reliability.

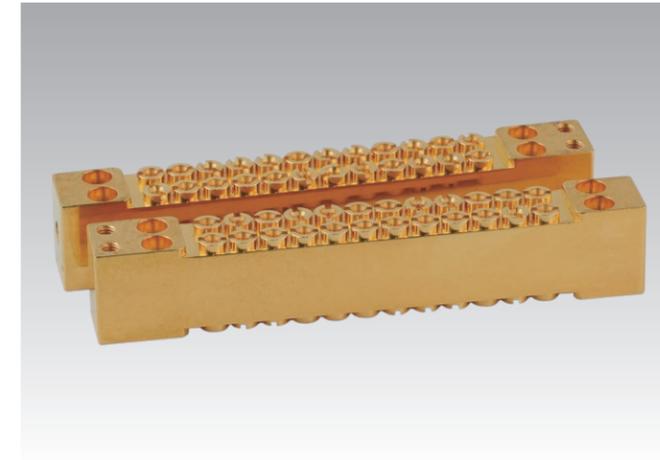
### Features & Benefits

- Modular design for high-capacity demand
- Minimized heat load
- Customizable cable materials
- Customizable cable configuration



Specifications	VS-HDCX-SCN	VS-HDCX-NT	
Cable property	Center conductor	Silver-plated CuNi	NbTi
	Dielectric	PTFE	PTFE
	Outer conductor	CuNi	NbTi
	Diameter	0.86 mm (0.034")	0.86 mm (0.034")
RF property	Frequency range	DC-18 GHz	DC-18 GHz
	Insertion loss	≤11 dB/m@300 K, 10 GHz	<1.0 dB/m@4 K, 10 GHz
	Return loss		≥17 dB
	Impedance		50 Ω
	Nearest channel crosstalk		<-75 dB
Physical property	Connector type	SMPS-female to SMPS-female	
	Modular capacity	10/12/16 per module	

# Attenuator Module

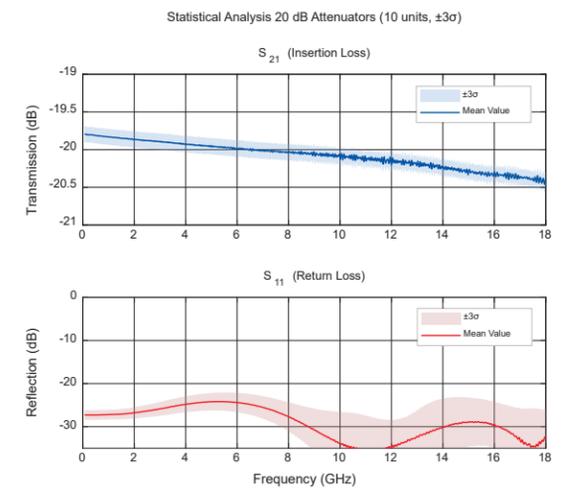
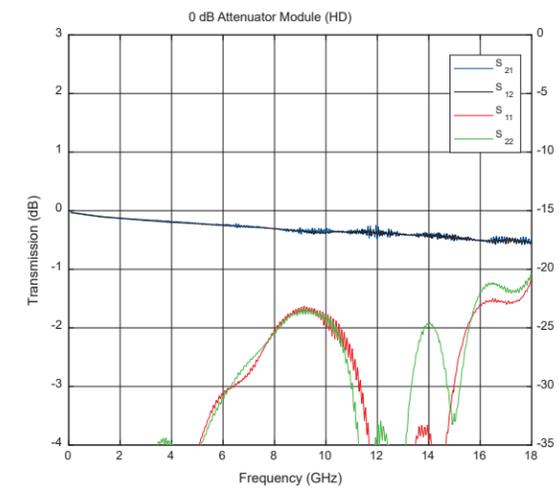


The cryogenic attenuator reduces the level of noise and interference transmitted to the lower temperature stages and enhances thermalization of the coax cabling to each temperature stage. Constant attenuation is achieved across the whole frequency range.

The attenuator also serves as bulkhead connector as in conventional SMA layout.

### Features & Benefits

- Low attenuation variation between 0-18 GHz
- Customizable attenuation per line of channels
- Modular design for easy assembly
- Consistent performance below -15 dBm



Specifications	VS-HDATNR
Frequency range	DC-18 GHz
Return loss	≥17 dB
Impedance	50 Ω
Attenuation	0 dB, 3 dB, 6 dB, 10 dB, 20 dB, 30 dB, 40 dB
Attenuation drift	within +/-0.5 dB @ 8 GHz
Nearest channel crosstalk	<-75 dB
Working temp.	10 mK to room temp.
Connector type	SMPS (SMPM)-male to SMPS (SMPM)-male
Modular capacity	20/24/32 per module

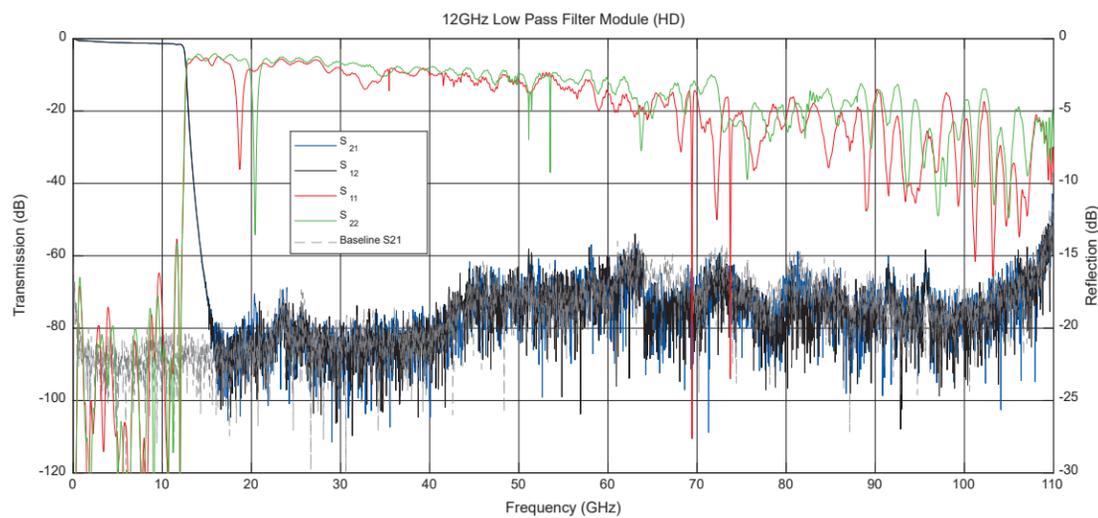
## Low-pass Filter Module



The cryogenic low-pass filter reduces or eliminates high-frequency noise and interference in the electrical signals transmitted. It helps to ensure that the sensitive samples are preserved and manipulated accurately, without being affected by unwanted thermal fluctuations or electromagnetic radiation.

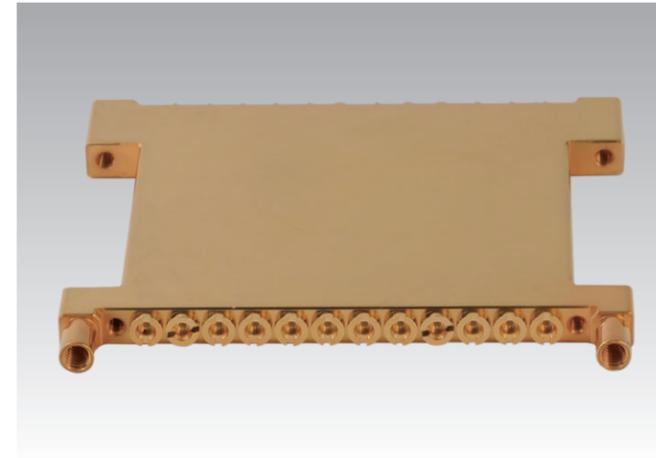
### Features & Benefits

- Better than -50 dB suppression up to 110 GHz
- Compatible with HD cabling module
- Multi-stage cascade configuration available
- Modular design for easy assembly



Specifications	VS-HDLPF-1G	VS-HDLPF-5G	VS-HDLPF-8G	VS-HDLPF-12G	VS-HDLPF-15G
Frequency range	DC-1 GHz	DC-5 GHz	DC-8 GHz	DC-12 GHz	DC-15 GHz
Pass band insertion loss	≤2 dB @DC-1 GHz	≤1.5 dB @DC-5 GHz	≤1.5 dB @DC-7.5 GHz	≤1.5 dB @DC-11.5 GHz	≤1.5 dB @DC-15 GHz
Pass band return loss	≥13 dB @DC-1 GHz	≥13 dB at DC-5 GHz	≥13 dB @DC-7.5 GHz	≥13 dB @DC-11.5 GHz	≥13 dB @DC-15 GHz
Impedance	50 Ω				
Rejection	≥40 dB @2-53 GHz	≥40 dB @8-53 GHz	≥40 dB @10-53 GHz	≥40 dB @14-53 GHz	≥40 dB @18~53 GHz
Working temp.	10 mK to RT				
Connector type	SMPS (SMPM)-male to SMPS (SMPM)-female				
Modular capacity	10/12/16 per module depending on connector				

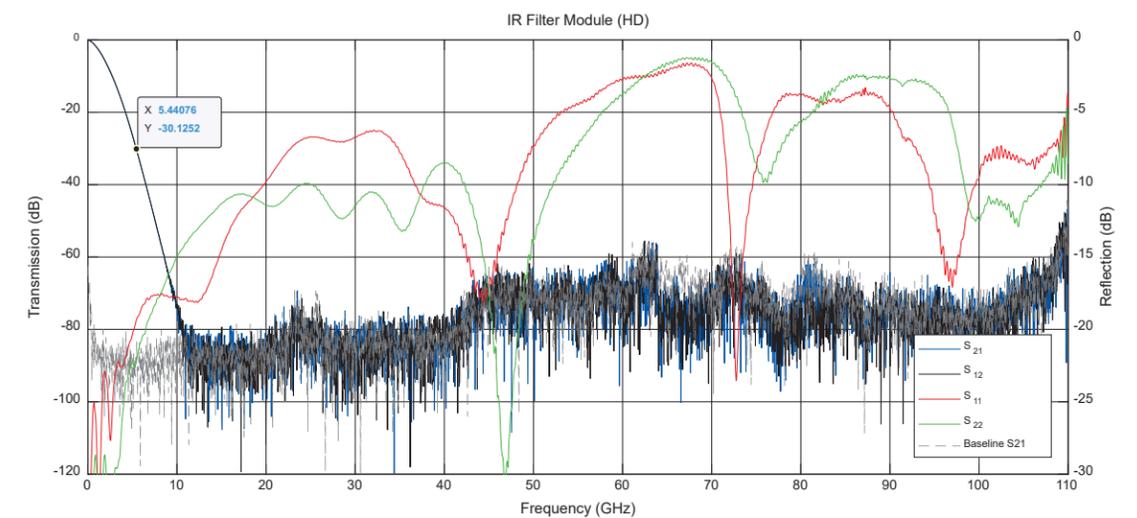
## Infrared Filter Module



Infrared filters are used to protect sensitive qubits from high-energy thermal radiation (photons) that can cause heating, decoherence, and unwanted quasiparticle generation in superconducting qubit structures. They act as absorbers, preventing infrared radiation from traveling down coaxial lines.

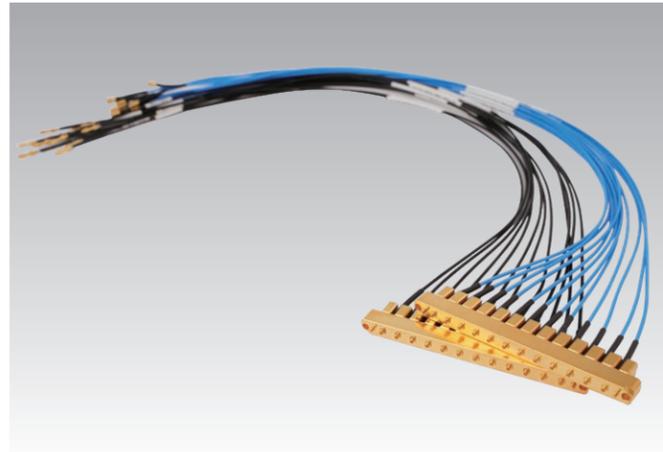
### Features & Benefits

- Effective suppression of thermal radiation
- Multi-stage cascade configuration with low pass filters available
- Modular design for easy assembly
- Customized solution



Specifications	VS-HDIR-2-10	VS-HDIR-40-6	VS-HDIR-30-5.5
RT insertion loss	≤2 dB@DC-10 GHz	40±2.5 dB@6 GHz	≤3 dB@DC~1 GHz
LT insertion loss reduction	~45%@10 GHz	~12%@6 GHz	~25%@5.5 GHz
Return loss	≥20 dB@DC-10 GHz	≥12 dB@DC-4 GHz	≥15 dB@DC-8 GHz
Impedance	50 Ω		
Working temp.	10 mK to RT		
Connector type	SMPS (SMPM)-male to SMPS (SMPM)-female		
Modular capacity	10/12 per module		

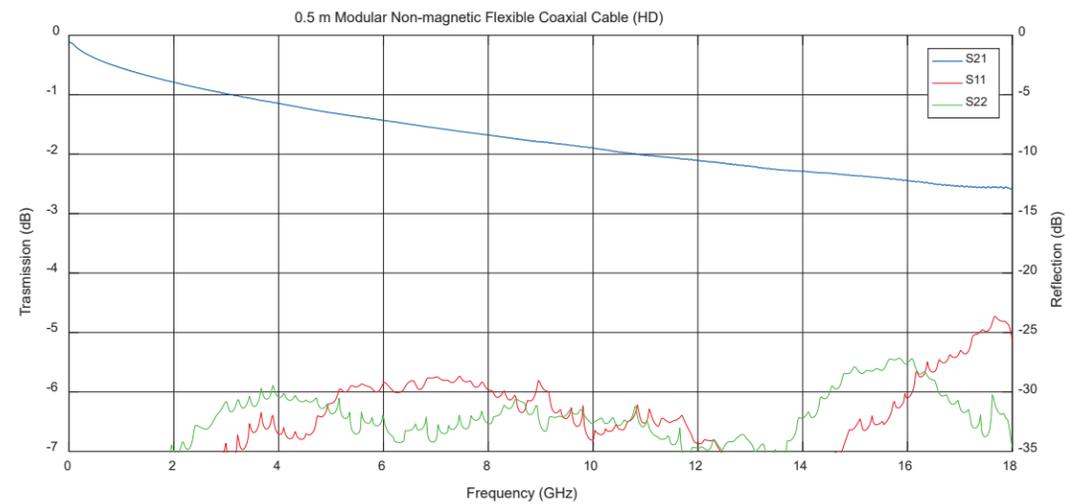
## Modular Non-magnetic Flexible Coaxial Cables



The non-magnetic flexible cable module connects the sample box to the RF components that extend from the mixing chamber at the lowest temperature. The cable module is composed of non-magnetic materials for both the conductor and the coating, preventing any signal interference to the delicate samples. The cable module is flexible and durable, and can handle a high density of wires near the sample.

### Features & Benefits

- Non-magnetic technique and materials
- Flexible cable for easy routing
- Minimized insertion loss and reflection
- Customizable length and connector type at the sample end
- Modular design for easy assembly



Specifications		VS-HDNMC	
RF property	Frequency range	DC-18 GHz	
	Insertion loss	1.16 dB/m@1 GHz	2.46 dB/m@4 GHz
		3.09 dB/m@6 GHz	3.64 dB/m@8 GHz
	Return loss	≥19 dB	
	Impedance	50 Ω	
Physical property	Nearest channel crosstalk	<-75 dB	
	Jacket diameter	1.42 mm	
	Conductor diameter	0.047"	
	Connector type	HD end: SMPS (SMPM)-female Sample end: SMA-male	
	Modular capacity	10/12/16 per module	

## SMA Cabling and Electronics

Our SMA cabling products transmit RF signals to and from the samples while keeping the electromagnetic noise and thermal noise from the environment.

### Phase and Amplitude Stable Cable



### Feedthrough Plate Set



### Coaxial Cable



### Attenuator



### Low-pass Filter



### Infrared Filter



### Non-magnetic Flexible Coaxial Cable



Cryogenic Isolator / Circulator



Traveling Wave Parametric Amplifier (TWPA)



Cryogenic Low Noise Amplifier



Diplexer



Bias-Tee



Microwave Signal Matrix Switch



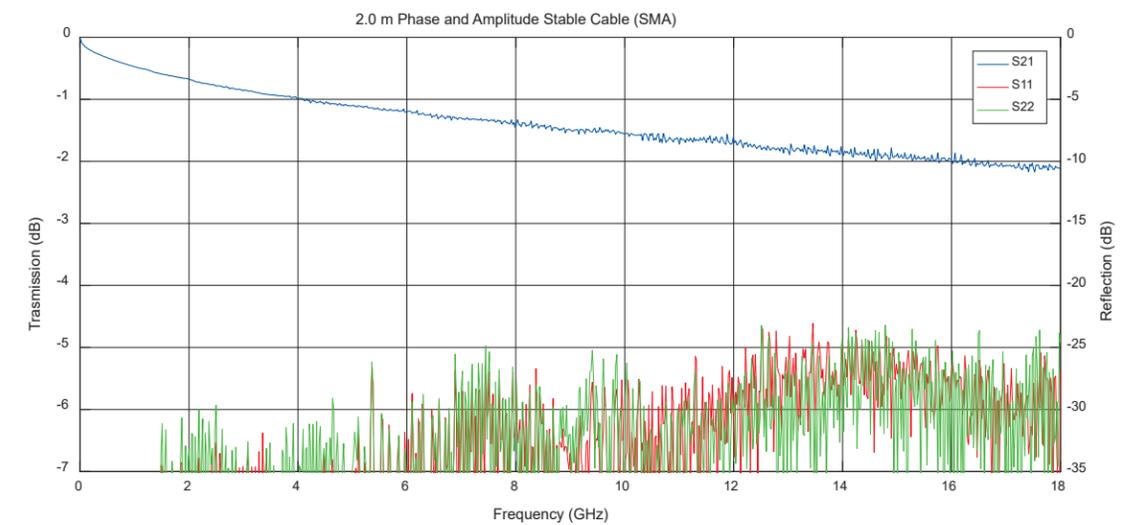
## Phase and Amplitude Stable Cable



This low-loss flexible phase and amplitude stable coaxial cable offers excellent phase and amplitude stability against mechanical and temperature fluctuations. Less than 300 ppm variation between 15°C to 30°C is guaranteed while less than 100 ppm variation is well expected.

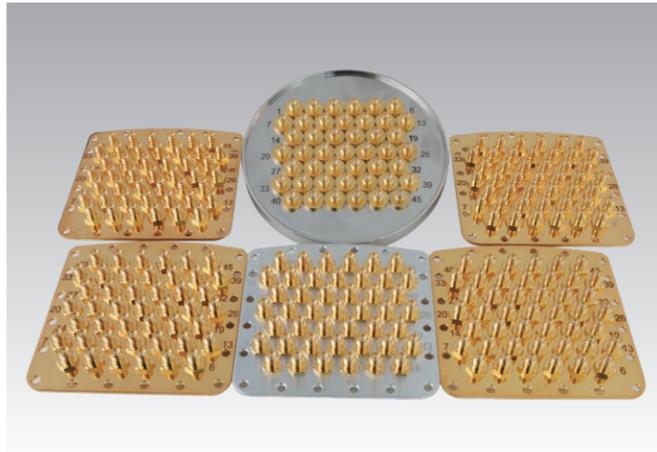
### Features & Benefits

- Improved stability for both amplitude and phase signal
- Well expected <100 ppm phase variation
- Customizable cable length and connector type



Specifications		VS-PASC
RF property	Frequency range	DC-18 GHz
	Insertion loss	<1.1 dB/m@18 GHz
	Return loss	≥19 dB
	Impedance	50 Ω
	Phase Stability	<300 ppm (15-30°C, 2.8 m, 0-20 GHz)
	Amplitude stability	<0.1 dB (15-30°C, 2.0 m, 8 GHz)
Physical property	Working temp.	10-30°C
	Jacket diameter	5.2 mm
	Connector type	SMA-male to SMA-male

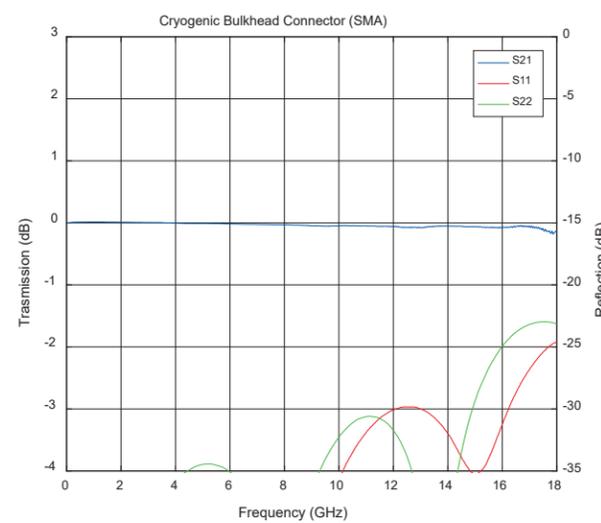
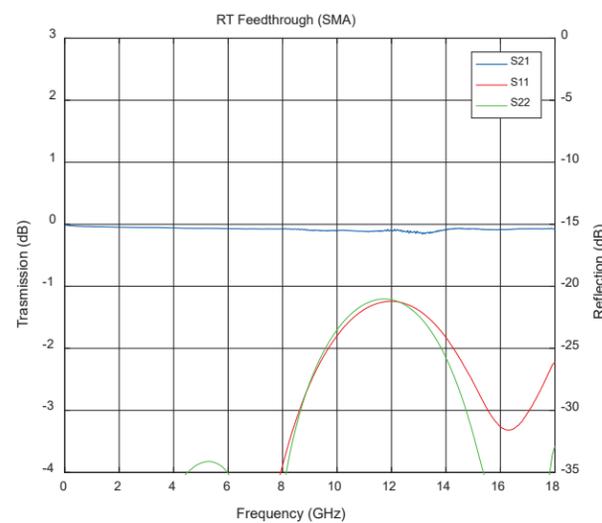
## Feedthrough Plate Set



The SMA vacuum feedthrough plate and bulkhead thermal conduction plates (50K, 4K, Still, CP, MXC) with bulkhead connectors stabilize and thermalize the coaxial cables. Each SMA connector is hermetically sealed on the room temperature flange. Plate materials are selected to seamlessly match with fridge plates for stable thermalization during thermal cycles.

### Features & Benefits

- Multiple channel options available
- Optimized thermalization at cold plates
- Customizable channel quantity
- In-house leak-check



Specifications	VS-FT
Frequency range	DC-18 GHz
RF property	Return loss $\geq 17$ dB
	Impedance 50 $\Omega$
Physical property	Leak rate $< 1 \times 10^{-9}$ mbar-L/s
	Connector type SMA-female to SMA-female
	Plate materials Stainless steel / Aluminum / Non-magnetic gold-plated OFHC
	ISO100 55
	ISO100-SL 45/38/32
Channel options	K63 20/10
	KF40 8/7/4

## Coaxial Cable

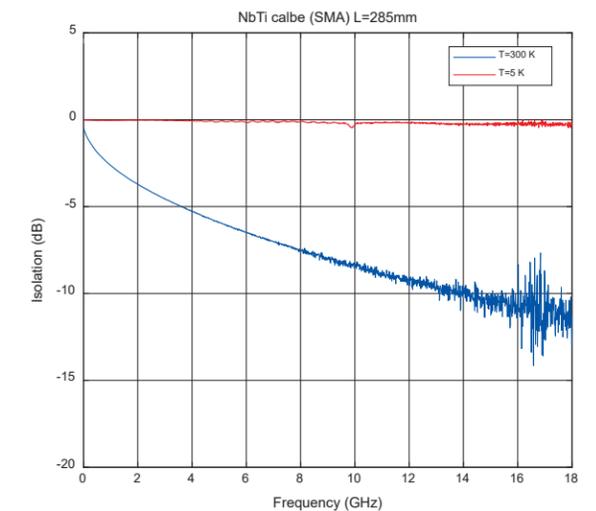
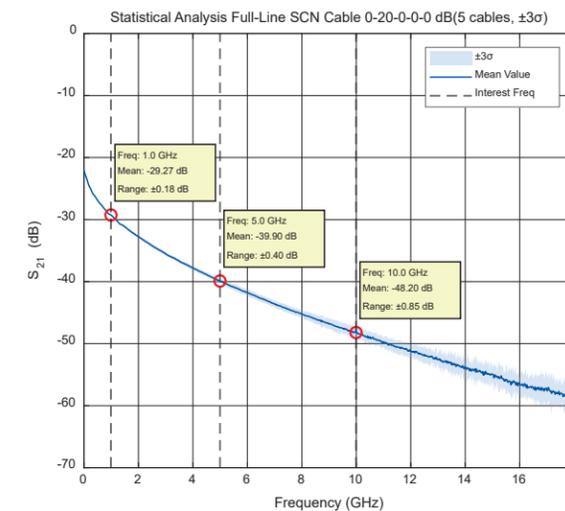


The silver-plated CuNi center conductor provides excellent transmission while keeping the heat load manageable with the thin cable dimensions (diameter=0.034" or 0.86 mm), leading the SCN/CN cable one of the best choices for cryogenic RF applications.

The NbTi (NT/NT) cable is superconducting below 4K, providing almost zero heat load below 4K with minimized signal degradation. Out of the 1000+ NbTi cables we have delivered, the mechanical failure rate is below 0.3%.

### Features & Benefits

- Minimized heat load
- Customizable cable length and materials



Specifications	VS-CX-SCN	VS-CX-NT	VS-CX-AI	
Center conductor	Silver-plated CuNi	NbTi	Al	
Cable property	Dielectric	PTFE	PTFE	
	Outer conductor	CuNi	NbTi	Al
	Diameter	0.86 mm(0.034")	0.86 mm(0.034")	2.19 mm(0.086")
RF property	Frequency range	DC-18 GHz	DC-18 GHz	DC-18 GHz
	Insertion loss	$< 11$ dB/m@300 K, 10 GHz	$< 1.0$ dB/m@4 K, 8 GHz	$< 3.0$ dB/m@300 K, 8 GHz
	Return loss	$\geq 18$ dB	$\geq 17$ dB	$\geq 17$ dB
	Impedance	50 $\Omega$		
Physical property	Working temp.	10 mK to room temp.	Below 4K plate	Below CP
	Connector type	SMA-male to SMA-male		

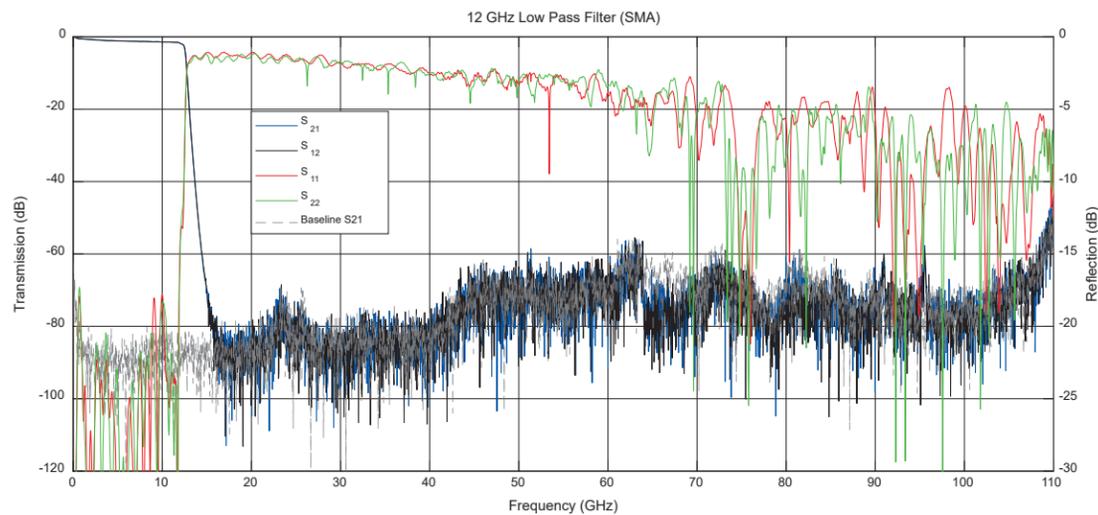
# Low-pass Filter



The cryogenic low-pass filter reduces or eliminates high-frequency noise and interference in the electrical signals transmitted. It helps to ensure that the sensitive samples are preserved and manipulated accurately, without being affected by unwanted thermal fluctuations or electromagnetic radiation.

### Features & Benefits

- Better than -50 dB suppression up to 110 GHz
- Non-magnetic



Specifications	VS-LPF-1G	VS-LPF-5G	VS-LPF-8G	VS-LPF-12G	VS-LPF-15G
Frequency range	DC-1 GHz	DC-5 GHz	DC-8 GHz	DC-12 GHz	DC-15 GHz
Pass band insertion loss	≤2 dB @DC-1 GHz	≤1.5 dB @DC-5 GHz	≤1.5 dB @DC-7.5 GHz	≤1.5 dB @DC-11.5 GHz	≤1.5 dB @DC-15 GHz
Pass band return loss	≥13 dB @DC-1 GHz	≥13 dB at DC-5 GHz	≥13 dB @DC-7.5 GHz	≥13 dB @DC-11.5 GHz	≥13 dB @DC-15 GHz
Impedance	50 Ω				
Rejection	≥40 dB @2-53 GHz	≥40 dB @8-53 GHz	≥40 dB @10-53 GHz	≥40 dB @14-53 GHz	≥40 dB @18~53 GHz
Physical property	Working temp. 10 mK to RT				
Connector type	SMA-male to SMA-female				

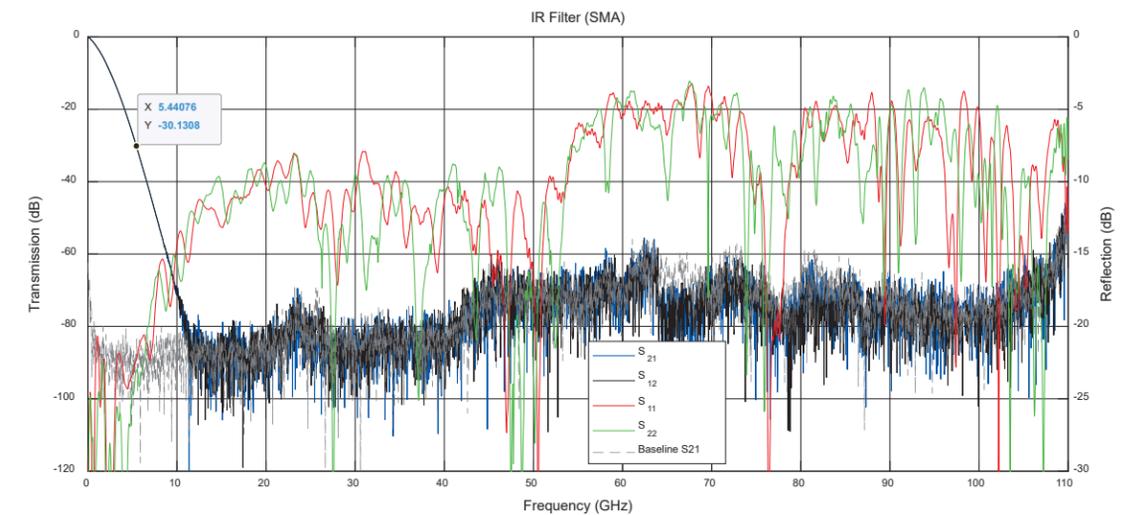
# Infrared Filter



Infrared filters are used to protect sensitive qubits from high-energy thermal radiation (photons) that can cause heating, decoherence, and unwanted quasiparticle generation in superconducting qubit structures. They act as absorbers, preventing infrared radiation from traveling down coaxial lines.

### Features & Benefits

- Effective suppression of thermal radiation
- Customized solutions



Specifications	VS-IR-3-10	VS-IR-40-6	VS-IR-30-5.5
RT insertion loss	≤3 dB@DC~10 GHz	40±2.5 dB@6 GHz ≥45 dB@8-53 GHz	≤3 dB@DC~1 GHz 30 dB±2 dB@5.5 GHz ≥45 dB@8-53 GHz
RF property	LT insertion loss reduction ~45%@10 GHz	~12%@6 GHz	~25%@5.5 GHz
Return loss	≥20 dB@DC-10 GHz	≥12 dB@DC-4 GHz ≥15 dB@4-8 GHz	≥15 dB@DC-8 GHz
Impedance	50 Ω		
Working temp.	10 mK to RT		
Connector type	SMA-male to SMA-female		
Modular capacity	10/12 per module		

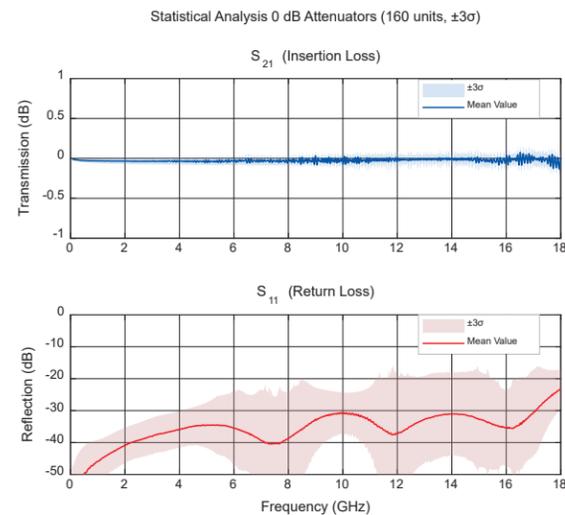
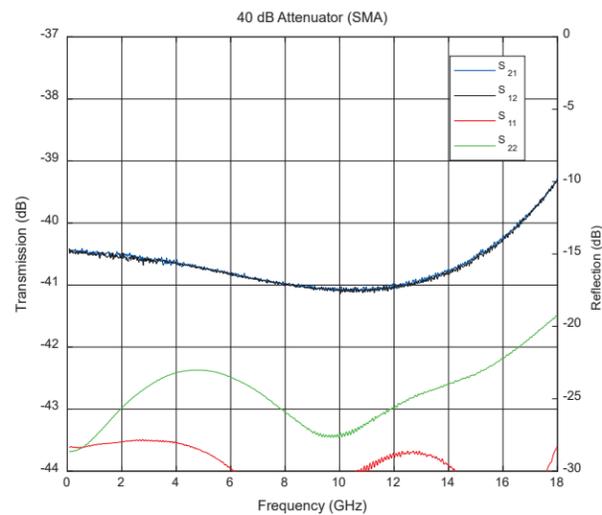
# Attenuator



The cryogenic attenuator reduces the level of noise and interference transmitted to the lower temperature stages and enhances thermalization of the coax cabling to each temperature stage. Constant attenuation (+/-0.5 dB) is achieved across the whole frequency range.

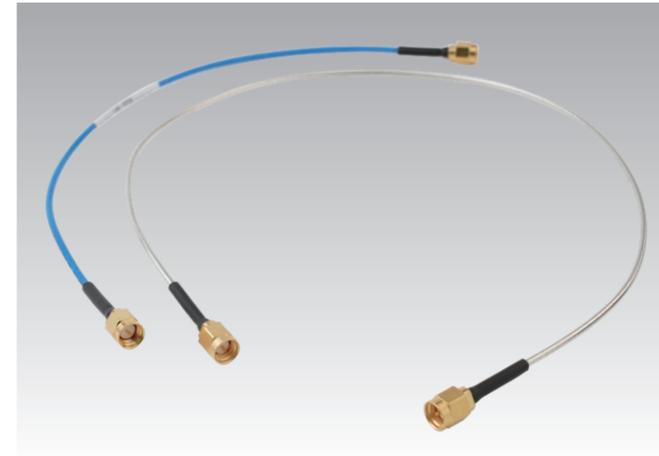
### Features & Benefits

- Low attenuation variation between 0-18 GHz
- Optimized stabilization over a wide temperature range with the brass packaging
- Consistent performance below -15 dBm



Specifications		VS-ATNR
RF property	Frequency range	DC-18 GHz
	Return loss	≥18 dB
	Impedance	50 Ω
	Attenuation	0 dB, 3 dB, 6 dB, 10 dB, 20 dB, 30 dB, 40 dB
	Attenuation drift	within +/-0.5 dB @8 GHz
Physical property	Working temp.	10 mK to room temp.
	Connector type	SMA-female to SMA-male
	Body material	Brass

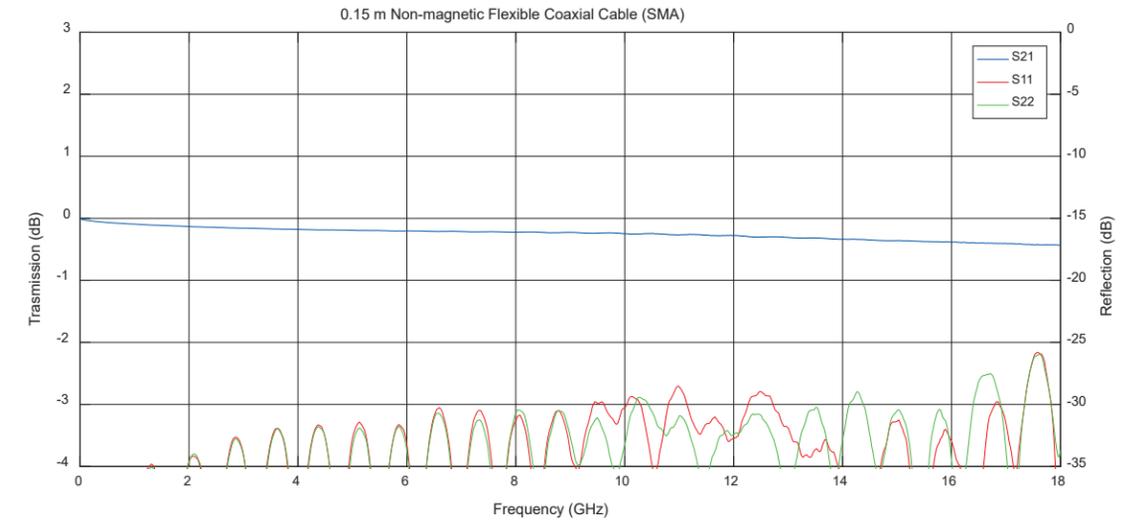
# Non-magnetic Flexible Coaxial Cable



The non-magnetic flexible cable connects the sample box to the RF components that extend from the mixing chamber at the lowest temperature. The flexible and durable cable is composed of non-magnetic materials for both the conductor and the coating, preventing any signal interference to the delicate samples.

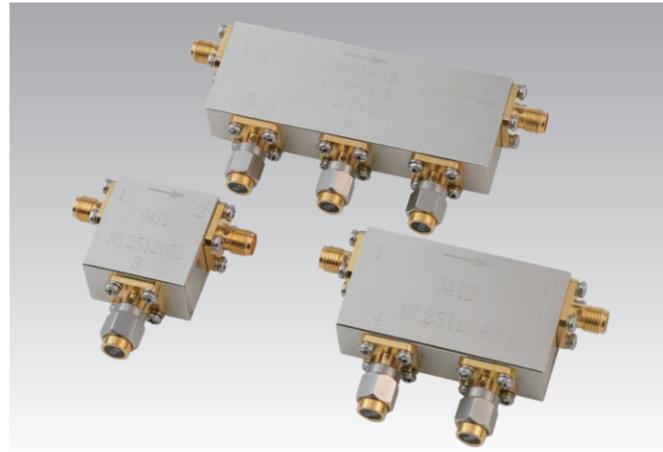
### Features & Benefits

- Non-magnetic technique and materials
- Flexible cable for easy routing
- Minimized insertion loss and reflection
- Customizable cable length, diameter and connector



Specifications		VS-NMC
RF property	Frequency range	DC-18 GHz
	Insertion loss	0.70 dB/m@1 GHz 1.31 dB/m@3 GHz 1.72 dB/m@5 GHz 2.49 dB/m@10 GHz
	Return loss	≥18 dB
	Impedance	50 Ω
	Physical property	Jacket diameter
Conductor diameter		0.086"
Connector type		SMA-male to SMA-male

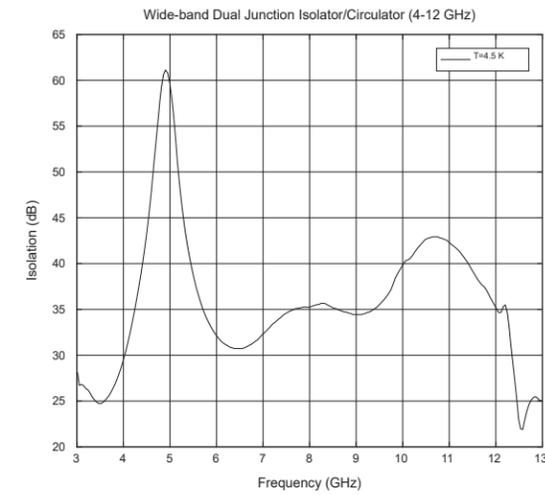
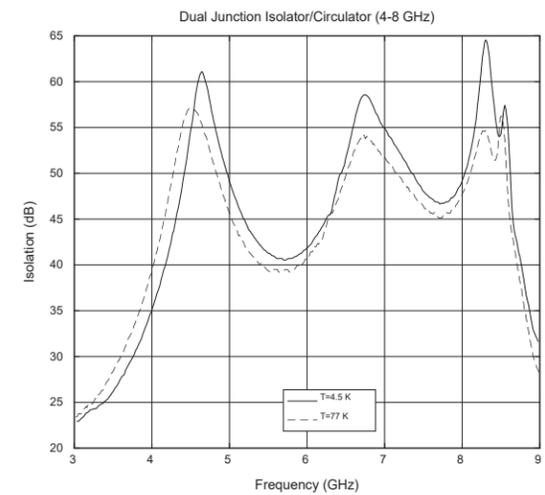
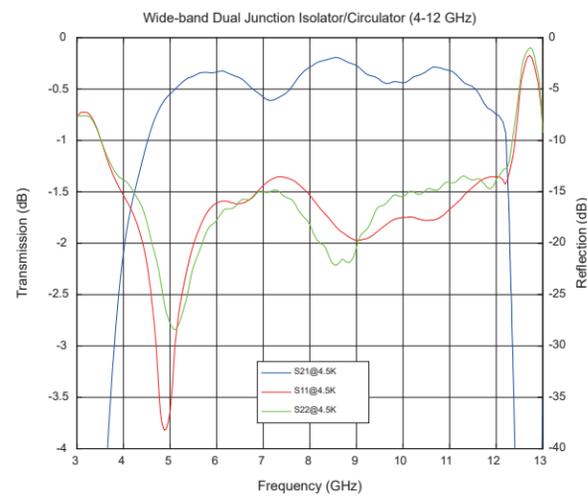
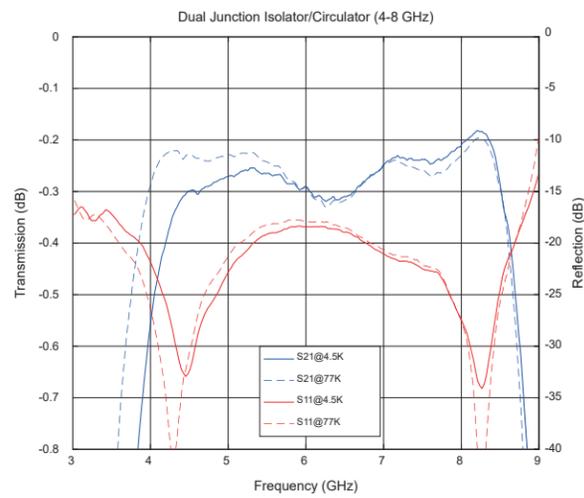
# Cryogenic Isolator / Circulator



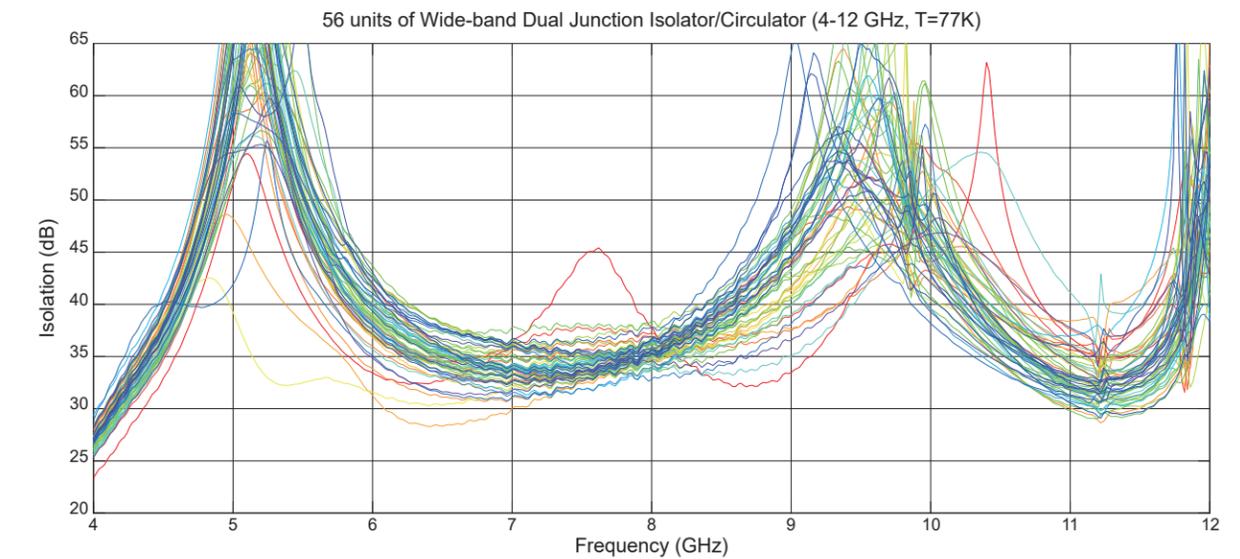
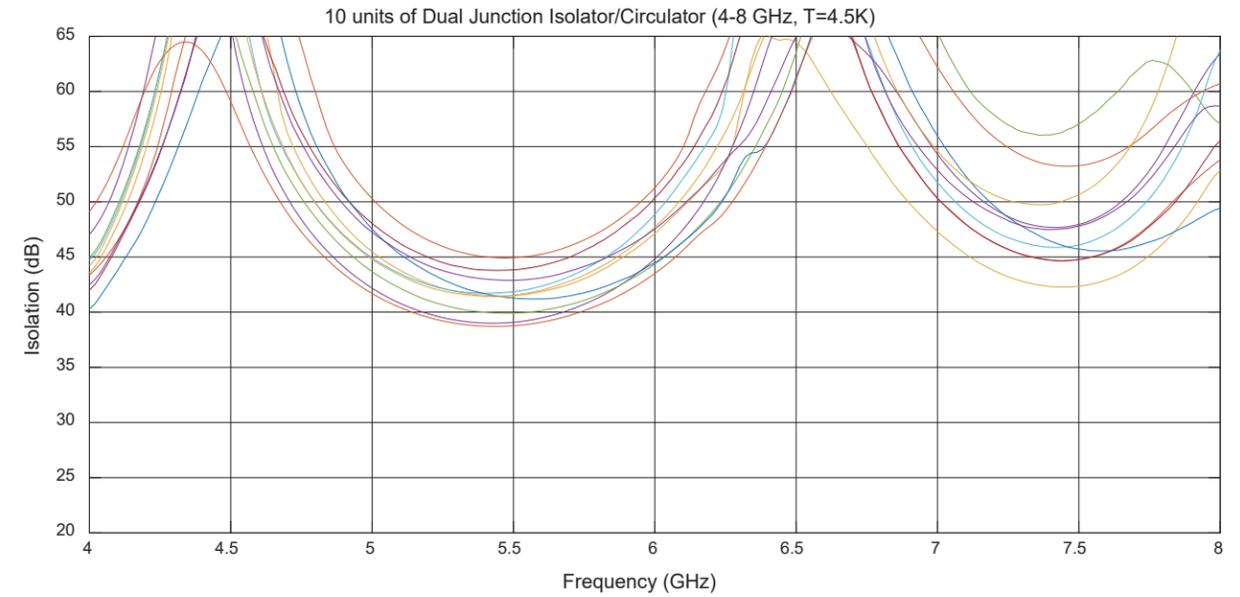
The cryogenic isolator/circulator works between 10 mK and room temperature. It prevents noise from the environment leaking to the delicate samples at cryogenic temperature. The cryogenic isolator/circulator features with low insertion loss and high isolation.

### Features & Benefits

- Consistent isolation across a wide frequency range
- Minimized insertion loss
- Compact design
- Standard inclusion of magnetic field shielding
- Wideband version available (4-12 GHz)
- Cryogenic terminator available as a standalone product



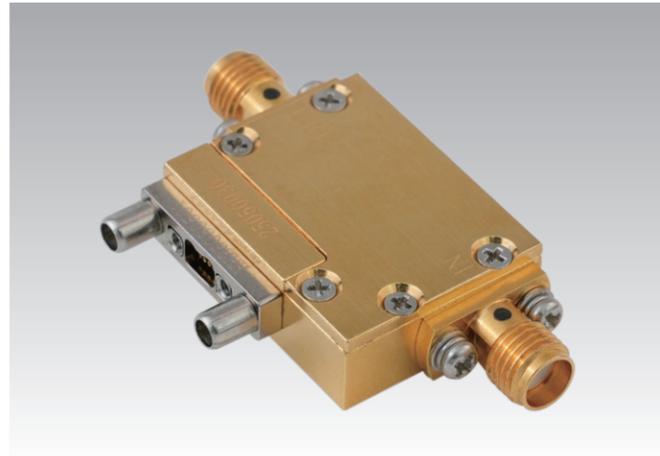
# Cryogenic Isolator / Circulator



Specifications	VS-IC-S(W)*	VS-IC-D(W)	VS-IC-T(W)
Frequency range	4-8(4-12) GHz	4-8(4-12) GHz	4-8(4-12) GHz
Insertion loss	0.2(0.3) dB	0.25(0.5) dB	0.4(0.8) dB
Return loss	20(16) dB	20(16) dB	20(16) dB
Isolation	20(16) dB	40(32) dB	60(48) dB
Impedance	50 Ω		
Junction type	Single	Dual	Triple
Body size (excluding the connectors)	24.2×25.5×13.7(14.7) mm	47×25.5×13.7(14.7) mm	69.9×25.5×13.7(14.7) mm
Working temp.	10 mK to room temp.		
RF connector	SMA-female to SMA-female		

\* 4-12 GHz wide-band version available, specification in the round brackets ( )

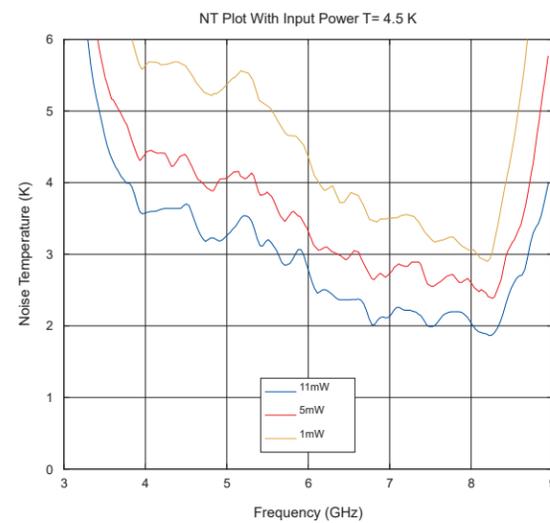
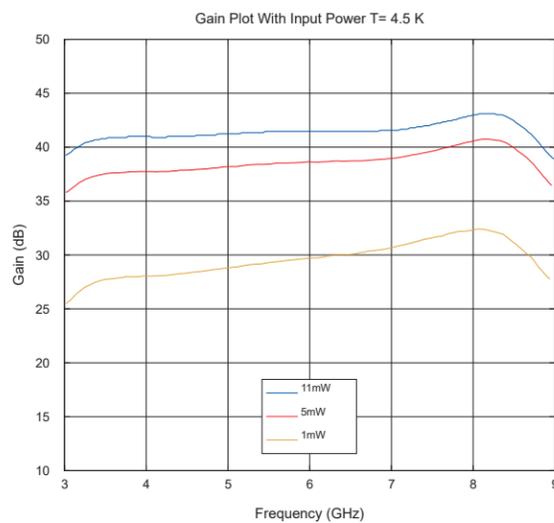
# Cryogenic Low Noise Amplifier



The cryogenic amplifier works at 4K temperature for amplifying weak signals and increasing signal to noise ratio. It Features with ultra-low noise and high bandwidth. The noise temperature is below 3.5K between 4-8 GHz (@11.5 mW).

### Features & Benefits

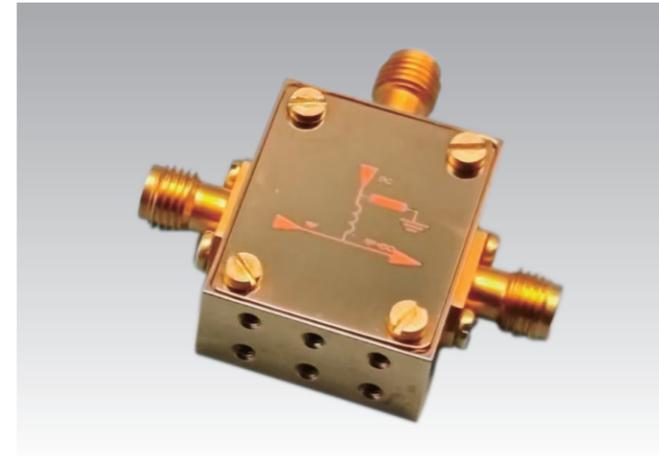
- >40 dB gain over 4-8 GHz
- Low noise temperature
- Adaptive working condition
- Optional RT LNA breakout box mating with its power supplier



Specifications		VS-LNA
	Frequency range	4-8 GHz
	Gain	> 40 dB
RF property	Return loss	10 dB
	Impedance	50 Ω
	Noise Temperature	< 3.5 K
Physical property	DC power (typical)	Vds=0.7 V, Ids=15 mA
	RF connector	SMA-female to SMA-female
	Body size (excluding the connectors)	23.7×19×7.8 mm

\* Power supply and mounting bracket available

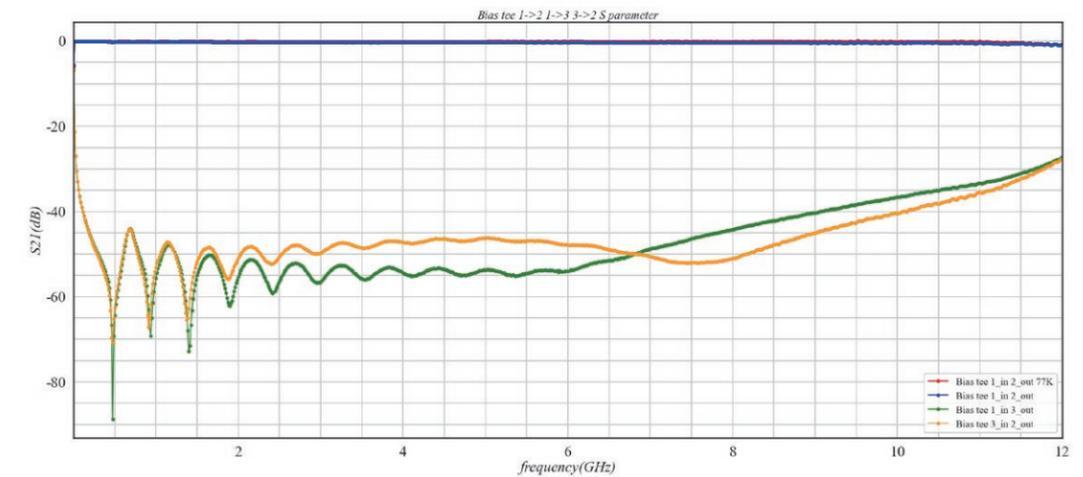
# Bias-Tee



This bias-T is designed to optimize flux control in fluxonium qubits by enabling precise DC flux tuning to locate the qubit's sweet spot. Since the Z-line's coaxial cable and built-in attenuators have limited DC adjustment capability and can generate heat under large bias voltages, the bias-T integrates the same DC source through a low-temperature combiner into the flux line. By using high-frequency-performance inductors for pulse and DC isolation, it effectively reduces pulse distortion while maintaining stable and accurate flux biasing; additionally, a 50-ohm resistor to ground is added at the DC input to ensure better RF impedance matching and further minimize pulse distortion.

### Features & Benefits

- Optional DC blocking capacitor at the RF in port
- Potentially applicable with JPA control, etc.



Specifications		VS-BT
	Range	DC-12 GHz
	Inductance	6.5 μH
RF property	Insertion loss	<0.5 dB
	Isolation DC - RF	>30 dB@0.1-11.5 GHz
	Isolation DC - common	>40 dB@0.2-10 GHz
	Impedance	50 Ω
Physical property	Working temperature	10 mK~300 K
	Connector type	3 x SMA female

# Traveling Wave Parametric Amplifier (TWPA)

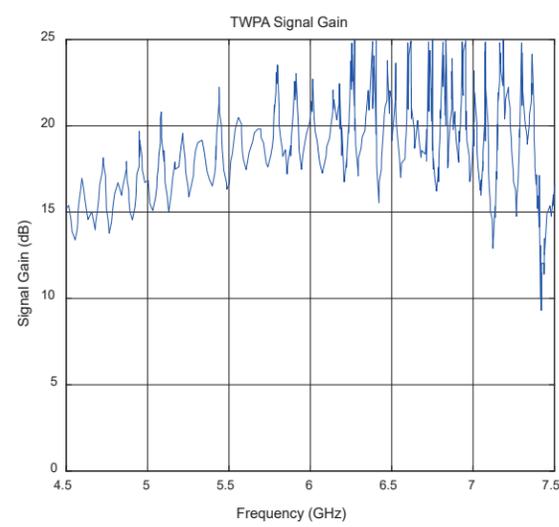
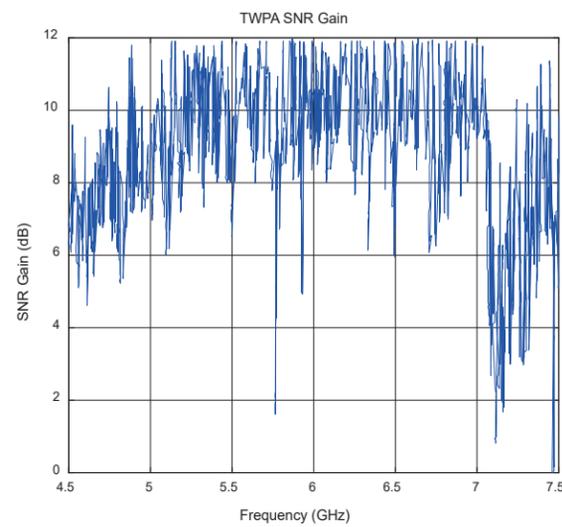


The traveling wave parametric amplifier works at the base temperature of a dilution fridge. It amplifies signals of specific microwave frequency bands at ultra-low temperature environments, and improves the signal-to-noise ratio of the signals in the signal chain.

The signal gain exceeds 15 dB, with an SNR gain of over 6 dB, across a bandwidth ranging from 5.5 to 7 GHz.

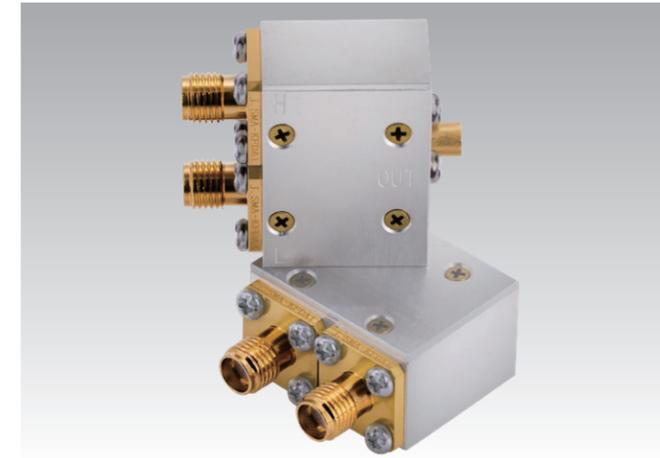
### Features & Benefits

- Wide working band width over 1500 MHz
- Average signal gain 15 dB
- Average SNR gain 6 dB
- Saturation power -105 dBm



Specifications	VS-TWPA	
RF property	Frequency range	5.5-7 GHz
	Insertion loss	<1 dB
	Signal gain	> 15 dB
	SNR gain	> 6 dB
	Saturation power	-105 dBm
Physical property	Working temp.	<20 mK
	RF connector	SMA-male to SMA-female
	Body size (excluding the connectors)	68x18.5x9 mm

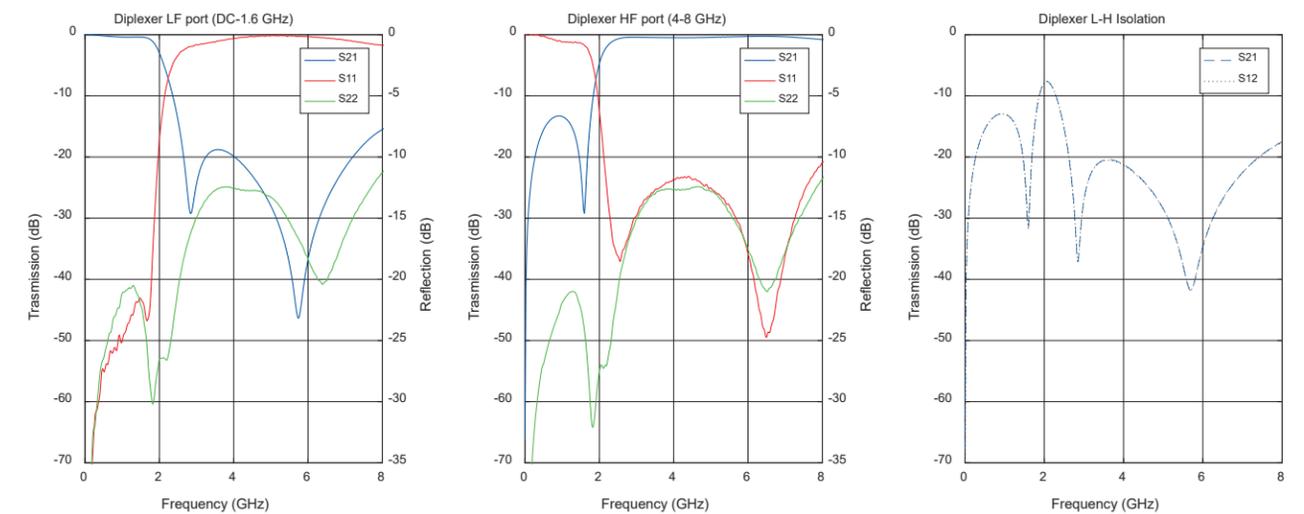
# Diplexer



The diplexer combines the low frequency and high frequency signal lines at room temperature or at cryogenic temperature. It has a band pass filter working at 4-8 GHz and low-pass filter working below 1.6 GHz, filtering the unwanted frequency components. At the same time, the diplexer works as a basic form of multiplexer, reducing the number of cables and simplifying the circuit design.

### Features & Benefits

- Work at both room temperature and cryogenic temperature
- Simplifying circuit design
- Filtering unwanted signals



Specifications	VS-DPX	
RF property	Frequency range @ LF port	DC-1.6 GHz
	Insertion loss @ LF port	≤1 dB
	Frequency range @ HF port	4-8 GHz
	Insertion loss @ HF port	≤1.5 dB
	Return loss	-10 dB
	Impedance	50 Ω
	Isolation	> 12 dB
Physical property	Connector type*	SMA-female (LF/HF) to SMP-male (common)

\* customizable upon request

# Microwave Signal Matrix Switch

The microwave signal matrix switch is an efficient device for signal switching and distribution, offering wide frequency range, low insertion loss, high flatness, and high isolation. It reduces the number of required signal sources or network analyzers, minimizes connector handling, and improves measurement efficiency.



### Room temperature matrix switch (VS-MSRT)

- Two sets of 1-to-10 channel RF switches (customizable channel count)
- Software-controlled switching for ease of use
- Independent channels with >80dB isolation



### Cryogenic matrix switch (VS-MSCRYO)

- 1-to-6 channel RF switches
- Individual channel control to minimize heat generation
- SP6T (Magnetic Latching Switch)
- Software-controlled switching for ease of use

Specifications	VS-MSRT	VS-MSCRYO	
RF property	Frequency range	0-8 GHz	0-20 GHz
	Insertion loss	<2.4 dB	<0.3 dB
	VSWR	<1.5	<1.35 (up to 12 GHz)
	Isolation	>80 dB	>100 dB (up to 12 GHz)
Physical property	Working temp.	room temp.	10 mK
	Connector type	SMA/ BNC	SMA

# DC Measurement

Customizable filters for DC signal conditioning, including our RT filter, cryogenic RC filter, and RF filter. These solutions effectively isolate high-frequency noise and minimize the electron temperature of the sample.

### DC Wiring



### Filtering for DC



### RT Breakout Box



### Adapting cable and board



### Bias-Tee Module with Integrated DC Filter



## DC Wiring



We provide low-noise twisted-pair wiring for DC signal measurement together with customized accessories such as vacuum feedthrough, thermal anchoring, signal splitting adaptors for cryogenic applications.

### Features & Benefits

- PhBr, Cu, NbTi wiring with thermal anchors
- Braided shielding for noise screening
- Up to 5 sets per KF40 port
- Insulation: >100 Gohm@10 V, 300 K
- Voltage rating: 300 V
- In-house electrical and leak check

In-House 24-Way DC Wiring Insulation Cross-Check Table

Micro-D	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Shield
1	9.82	20.41	100.00	5.52	5.64	9.75	100.00	16.12	100.00	12.65	7.33	4.63	1.32	2.62	1.97	14.49	9.06	8.19	9.84	19.33	100.00	14.71	12.28	5.44	
2		5.73	3.41	9.36	5.96	6.30	6.57	8.46	100.00	6.86	10.19	5.99	3.78	8.99	2.57	26.07	12.30	2.62	15.48	32.34	16.34	11.37	100.00	6.05	
3			18.20	7.11	100.00	7.02	11.39	2.63	7.72	12.14	12.02	100.00	5.81	4.96	2.32	100.00	2.22	7.83	19.64	9.52	100.00	9.19	8.46	6.60	
4				4.42	100.00	5.95	5.84	8.33	12.71	6.44	6.52	3.84	5.38	100.00	3.29	100.00	13.12	2.76	1.60	100.00	3.02	10.24	8.98	6.72	
5					5.58	6.96	7.24	7.09	8.00	12.88	12.70	10.89	10.00	12.14	3.79	4.85	7.92	8.88	11.22	10.39	9.41	13.10	7.62	5.62	
6						7.94	9.35	10.84	9.85	10.39	7.77	7.08	6.74	8.26	4.09	10.52	5.63	12.11	9.76	15.91	15.00	34.93	24.69	5.40	
7							7.22	8.22	12.95	8.44	12.92	9.73	13.65	11.41	3.97	12.51	15.12	5.82	13.31	10.66	21.53	11.49	11.99	4.98	
8								7.36	11.31	10.15	7.91	9.71	8.24	8.66	4.24	12.36	7.51	11.40	5.59	10.40	7.54	12.51	10.96	4.25	
9									8.89	10.32	8.60	19.14	9.59	10.85	4.74	18.70	7.07	13.36	10.82	8.13	9.31	16.18	10.11	4.56	
10										7.64	8.22	12.94	9.39	3.20	17.01	7.56	8.67	12.13	8.86	5.89	7.73	14.84	4.52		
11											10.23	8.41	13.73	8.25	3.81	11.50	12.16	10.35	13.52	14.72	9.22	8.02	19.36	4.53	
12												10.49	9.86	11.71	3.79	10.33	9.89	9.78	8.64	7.69	9.15	8.99	7.23	5.02	
14													9.94	19.79	4.29	8.88	11.47	15.37	15.63	14.57	11.93	12.04	11.05	3.95	
15														7.45	4.84	14.17	11.38	11.05	15.65	16.48	11.10	12.94	13.23	4.13	
16															3.44	8.86	12.39	12.95	20.56	18.35	8.11	8.51	10.10	4.25	
17																3.71	4.99	5.16	5.98	5.27	4.74	5.47	4.51	1.61	
18																	13.85	10.16	15.77	14.44	14.15	12.50	10.71	2.71	
19																		9.20	9.42	15.28	10.88	18.22	8.39	2.81	
20																			10.79	9.74	13.29	13.27	12.90	2.93	
21																				12.41	8.91	9.72	13.37	2.99	
22																					8.77	13.19	13.74	2.86	
23																						10.54	10.80	2.77	
24																							10.86	2.85	
25																								2.72	

Unit: 100 GΩ

Specifications	VS-DC-C	VS-DC-C/PB	VS-DC-PB	VS-DC-PB/NT
Connector type	Copper	Copper/PhBr	PhBr	PhBr/NbTi
Wiring type	24-way twisted pair loom			
Wiring gauge	36 AWG	36 AWG/27 AWG	36 AWG	36 AWG
Insulation	100G Ω @10 V, 300 K			
Voltage rating	300 V			
Room temp.	Fischer	Fischer	Fischer	Fischer
4K	Micro-D	Micro-D	Micro-D(or w/o break)	Micro-D
MXC	/	Micro-D	Micro-D	Micro-D
Vacuum port	KF40, KF25 or KF16			
Typical application	HEMT	Nano-positioner	Electrical transport measurement	

## RT Breakout Box



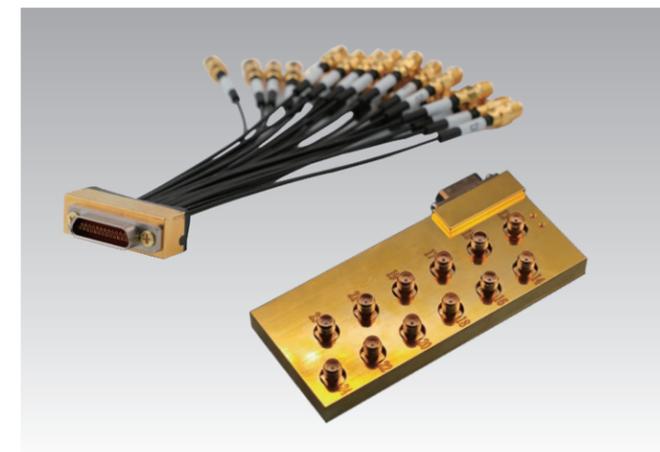
### Features & Benefits

- Silver-plated two-stage signal/ground switches
- Internal box twisted-pair wiring for low noise
- Secure screw-mount grounding post
- Customizable length, channels, and floating options

This compact switching breakout assembly protects and simplifies sample connections between the cryostat and measurement instruments. It combines a sample-protecting switching breakout box with a twisted-pair, universally shielded cable for stable, low-noise signals.

Additional breakout box configurations, including versions for LNA amplifier power supplies, are available upon request.

## Adapting cable and board



### Features & Benefits

- Non-magnetic micro-D connectors with residual field <100 nT after 12 T magnetization
- Multiple configurations available, including adapting cables and adapter boards
- Engineered for low noise and stable operation at cryogenic temperatures

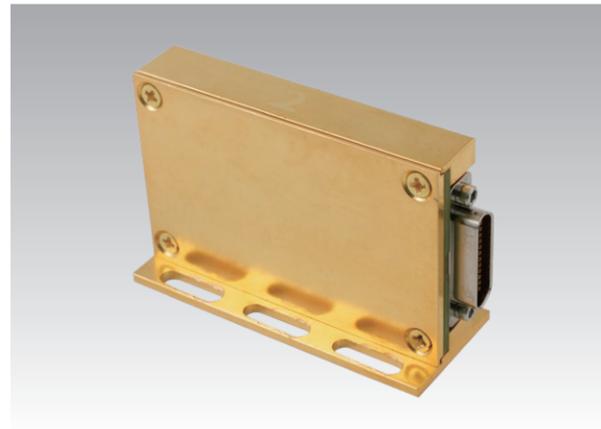
Our cryogenic adapting cable and board are designed for reliable interconnection at low temperatures, whether linking devices directly or bridging between connector standards such as SMA and micro-D. The assemblies feature non-magnetic, shielded constructions with copper or superconducting NbTi conductors to ensure minimal noise, low thermal load, and high stability throughout cool down and operation.

## Filtering for DC

These cryogenic filters are designed to suppress noise and thermal radiation along wiring in dilution refrigerators, helping maintain low electron temperatures for sensitive measurements and device control. The product line includes room-temperature RC filters, 4 K cryogenic RC filters for intermediate stages, cryogenic silver-epoxy RF filters for high-frequency attenuation, and cryogenic copper-powder filters that provide strong broadband suppression up to the GHz range. Together, these options allow you to build multi-stage filtering from room temperature down to the mixing chamber for quantum, nano-electronic, and other ultra-low-noise experiments



**Room-temperature RC Filter**  
(VS-FLT-RCRT, cut-off freq. 175 kHz)



**Cryogenic RC Filter**  
(VS-FLT-RC, cut-off freq. 17 kHz)

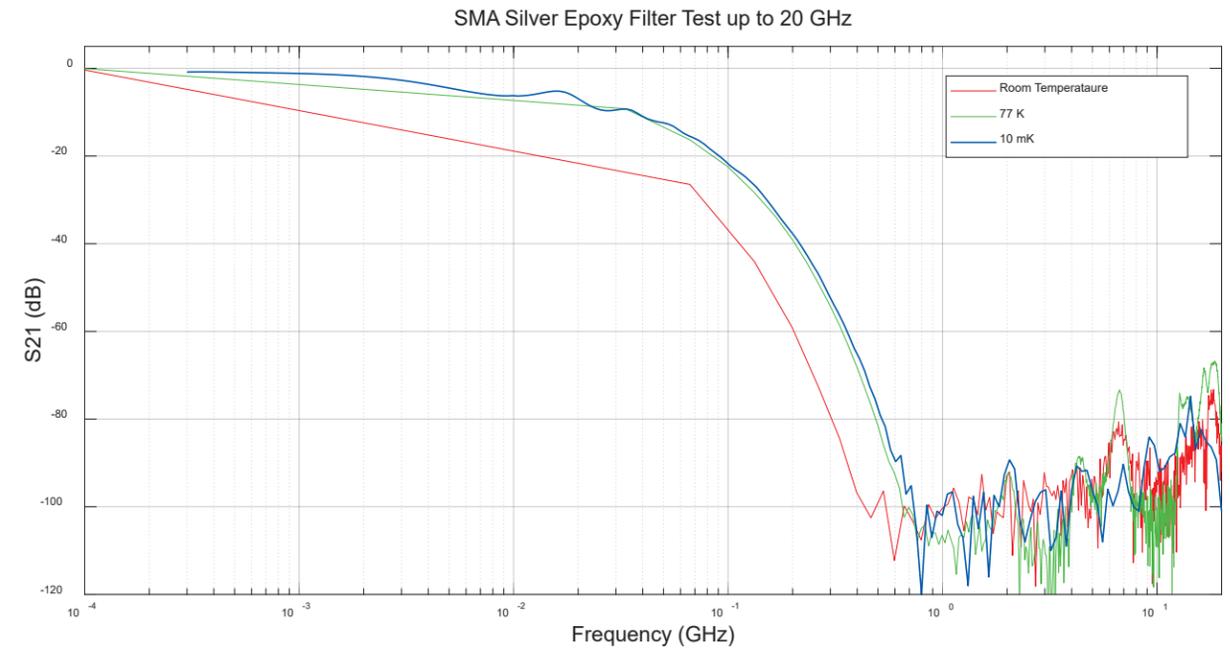


**Silver-epoxy RF filter**  
(VS-FLT-RFSE, cut-off freq. 1300 kHz)



**Copper-powder RF Filter**  
(VS-FLT-RFC, cut-off freq. 700 kHz)

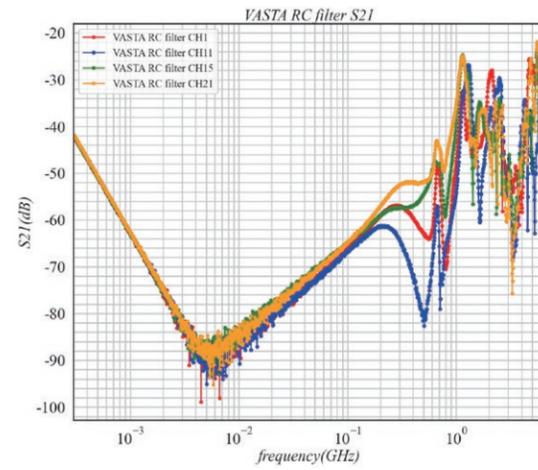
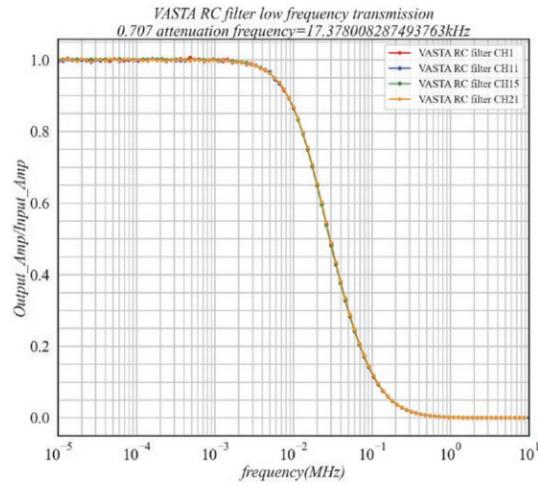
## Filtering for DC



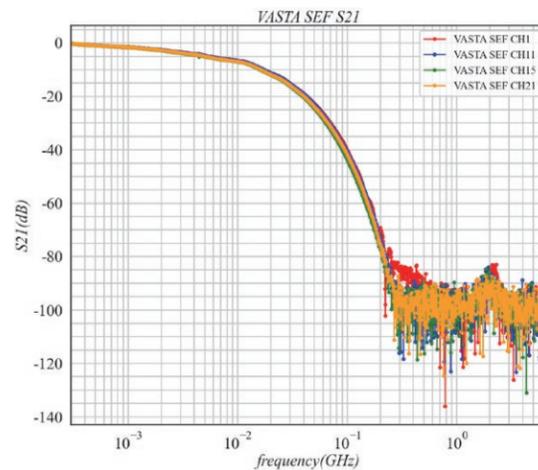
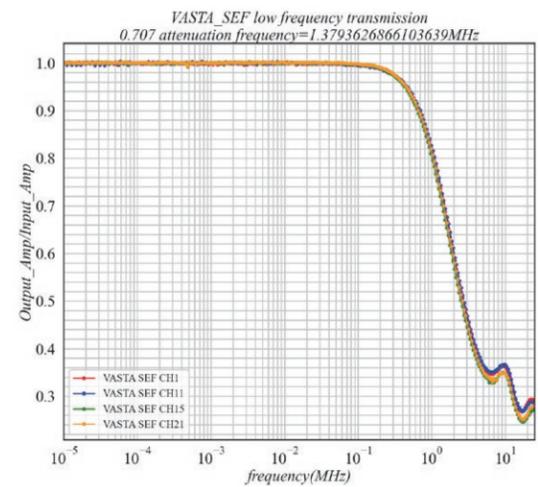
Specifications	VS-FLT-RCRT	VS-FLT-RC	VS-FLT-RFSE	VS-FLT-RFC
Filter type	RC	RC	Silver epoxy	Copper powder
Channel number	24	24	24 (1)	24 (1)
Cut-off frequency (input impedance 1 MΩ)	175 kHz	17 kHz	1.3 MHz	700 kHz
Electrical property				
-100 dB point (input impedance 50 Ω)	/	/	300 MHz	1.5 GHz
Channel resistance	100 Ω	940 Ω	3.4 Ω	5 Ω
Capacitance to GND	6.6 nF	20 nF	2.5 nF	0.25 nF
Insulation	100 GΩ @50 V, 300 K			
Voltage rating	200 V			
Physical property				
Working temp.	300 K	4 K and 10 mK	10 mK and above	10 mK and above
Connector type	Fischer/ LEMO	Micro-D	Micro-D (SMA)	Micro-D (SMA)
Modular capacity	136x42x42 mm	65x41x12.5 mm	95x30x24 mm (90x10x10 mm)	81x69x25.5 mm (90x10x10 mm)

# Filtering for DC

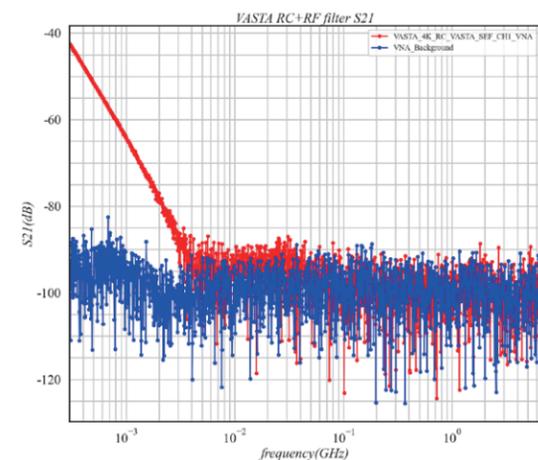
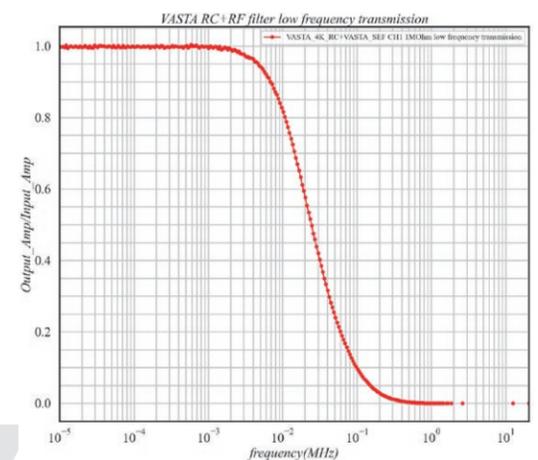
4K RC Filter Performance at Low and High Frequency Range



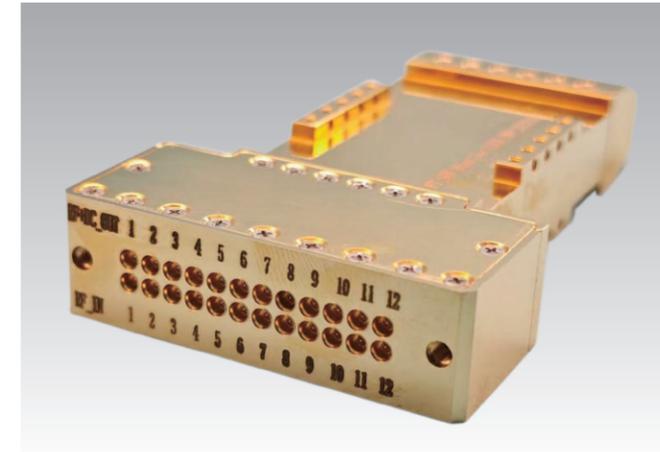
Silver-epoxy RF Filter Performance at Low and High Frequency Range



4K RC Filter + Silver-epoxy RF Filter Cascade Performance at Low and High Frequency Range



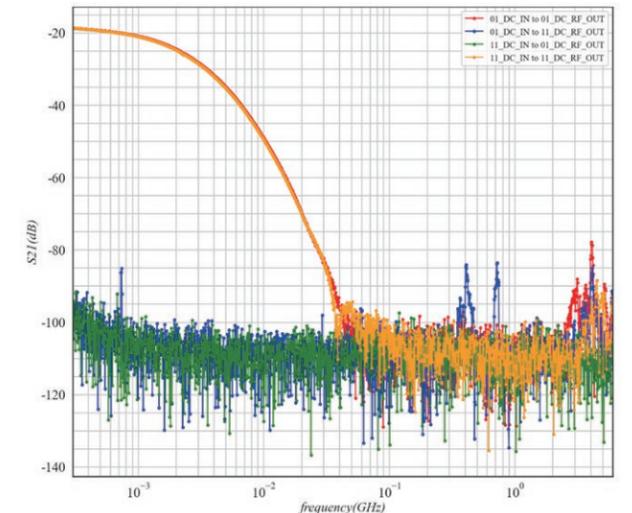
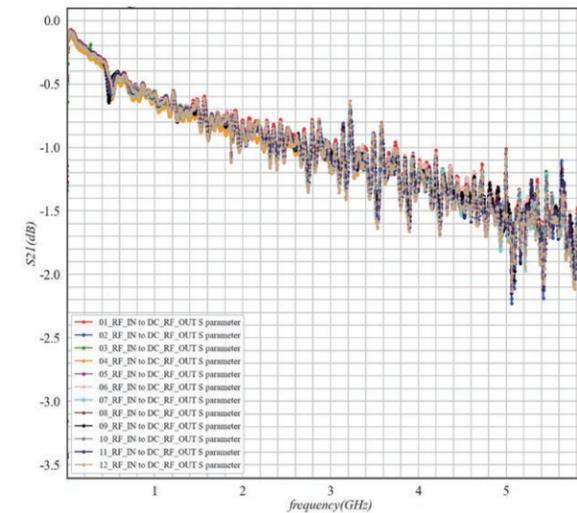
# Bias-Tee Module with Integrated DC Filter



This cryogenic biaste module combines fast Z pulses and DC flux bias on a single flux line for Fluxonium qubits, minimizing heating and pulse distortion in compact multi-qubit setups. The module routes Z pulses via coax while injecting DC bias through a superconducting twisted-pair to minimize heating, both coupled to the same flux line. A cryogenic bias-tee with a broadband inductor isolates pulse and DC paths to suppress distortion and low-frequency noise.

### Features & Benefits

- Integrated control to reduce wiring and components
- Strong DC filtering with -100 dB stopband attenuation
- Compact footprint to ease cryostat space constraints
- Potentially applicable with JPA control, etc.



### Specifications

### VS-DPX

Number of Channels	12
DC filtering	-100 dB @400 MHz
DC Filter conductor material	Copper or superconducting wire
DC passband	-3 dB @1.7 MHz
Insertion loss of RF channels	<2 dB @6 GHz, <3dB @10 GHz
Nearest Channel Isolation	Better than 40 dB @6 GHz
Impedance	50 Ω
Dimensions	12mm x 56mm x 95mm
Connector type	MicroD and SMPM, mating cables available