

VASTA

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VASTA

Cryogenic Wiring and Electronics

About VASTA

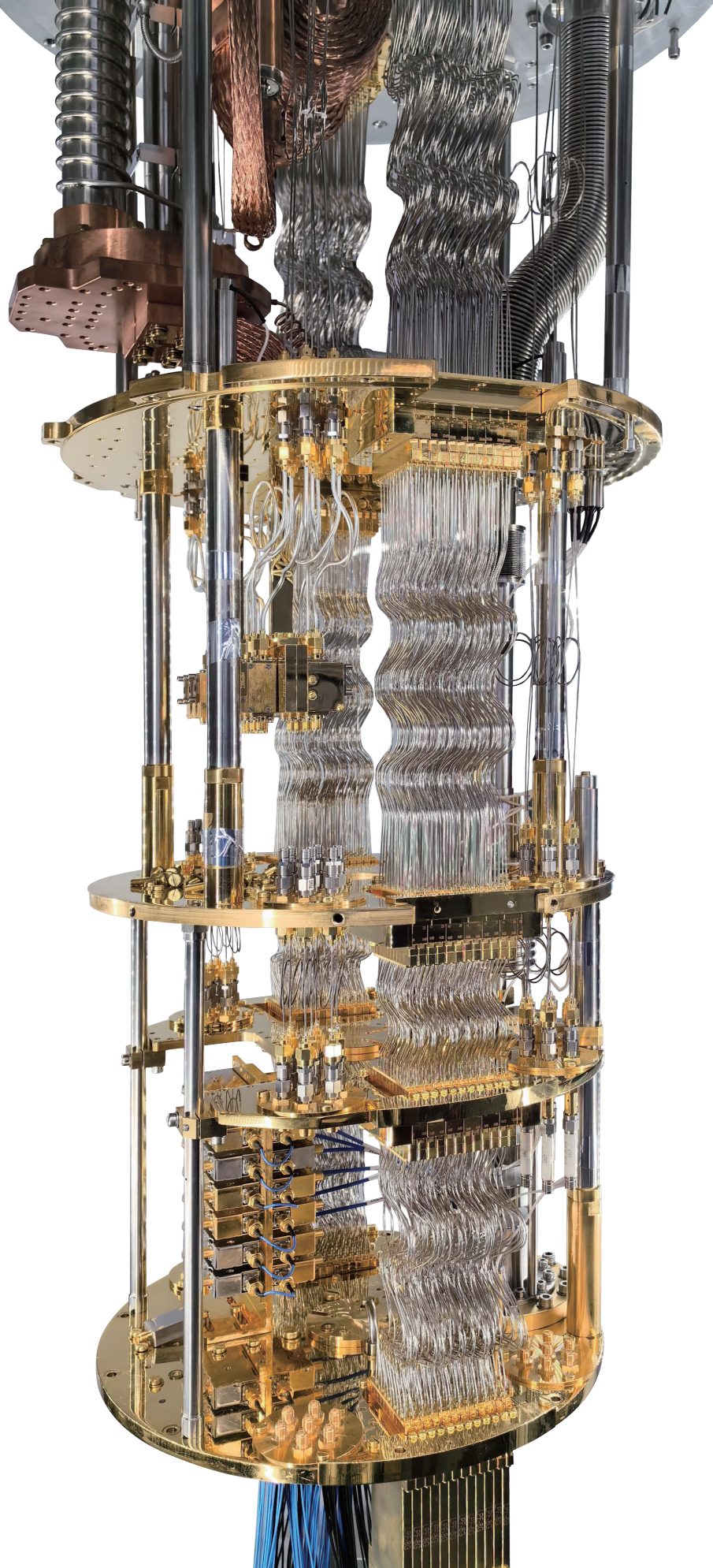
VASTA PTE. LTD. provides instruments and components for scientific research and industrial R&D.

We provide cryogenic RF cabling, components, and cryogenic electronics with SMA and high-density interfaces compatible with all mainstream dilution fridge systems.

We provide fast delivery, cutting-edge technology, and responsive service to customers worldwide.

Key Offering

- 1) High Density Cabling
- 2) SMA Cabling
- 3) Cryogenic electronics
- 4) Bespoke RF components
- 5) DC wiring and filtering



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High-density Cabling

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High-density Cabling

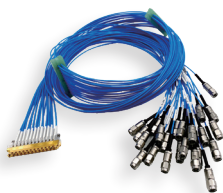
Our high-density (HD) cabling design offers enlarged wiring capacity while maintaining its RF performance (i.e. insertion loss, return loss, consistency, and cross talk) as well as heat load to the cryostat at optimized state.

The HD cabling with SMPS 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 μ W heat load on the MXC plate with 240 high-density SCN cables installed.
- 3) Modular design enabling easy individual integration, flexible configuration, and future on-site upgrades.
- 4) Guaranteed zero-failure rate on the final factory test.

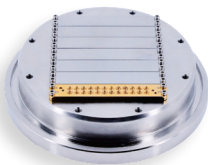
Modular Phase and Amplitude Stable Cables (HD)



Low-pass Filter Module (HD)



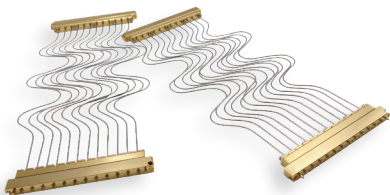
Hermetic Multi-channel Feedthroughs (HD)



Attenuator Module (HD)



Modular Coaxial Cables (HD)



Modular Non-magnetic Flexible Coaxial Cables (HD)



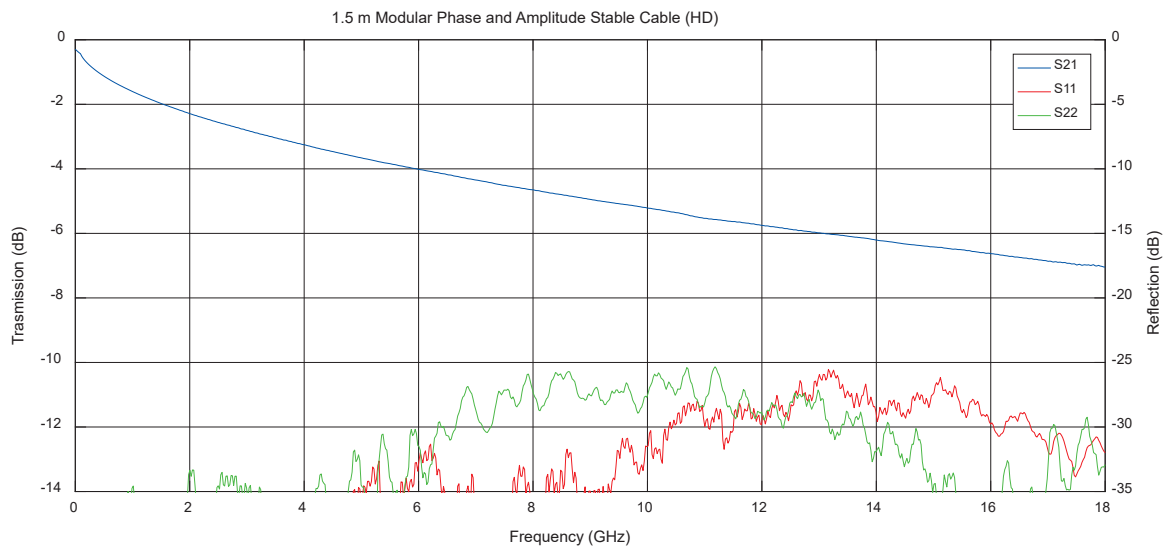
Modular Phase and Amplitude Stable Cables (HD)



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.

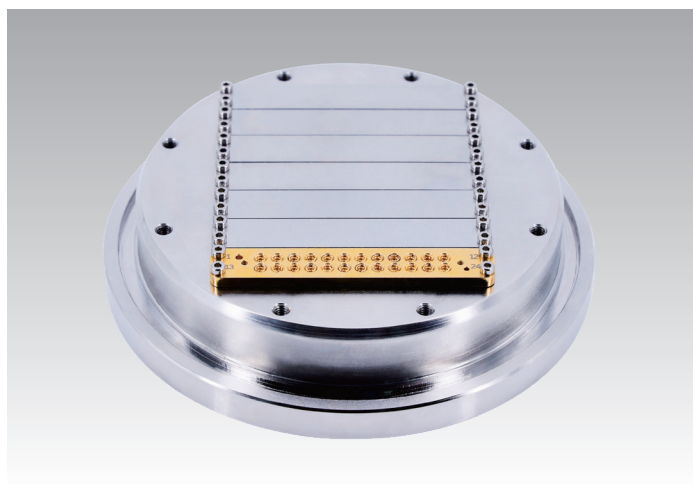
Features & Benefits

- 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	

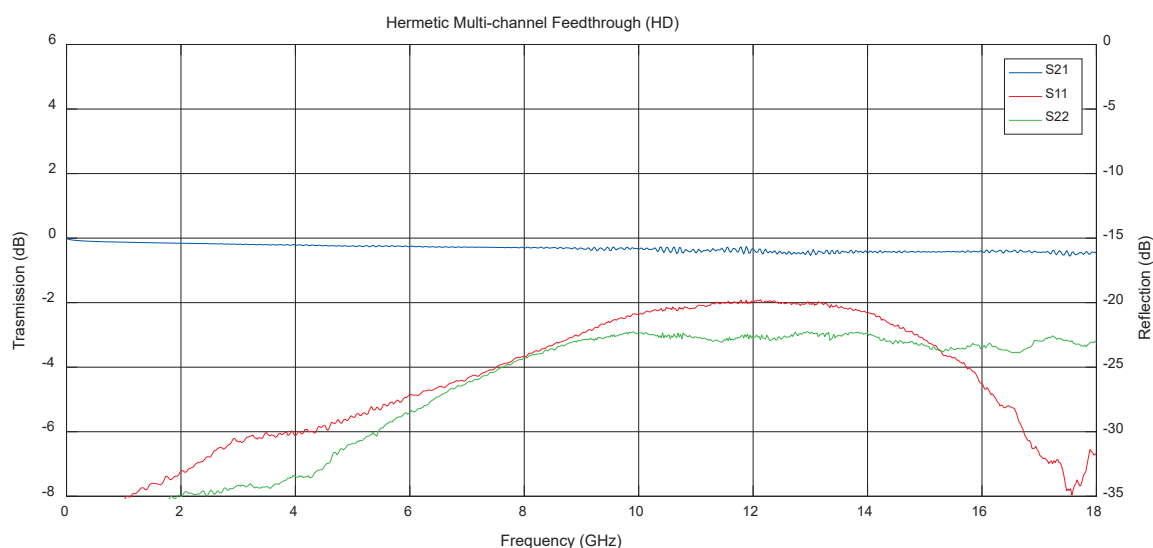
Hermetic Multi-channel Feedthroughs (HD)



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

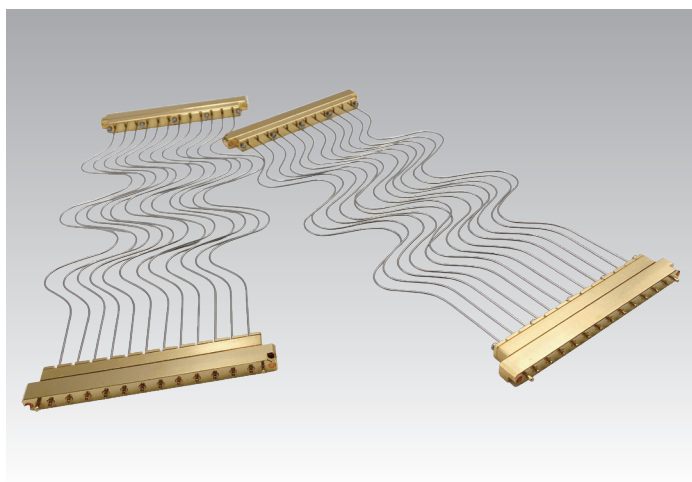
- Glass-to-metal sealing technology
- O-ring sealed modular design
- Easy installation and servicing
- In-house leak check



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	<1×10 ⁻⁹ mbar·L/s
	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 (HD)

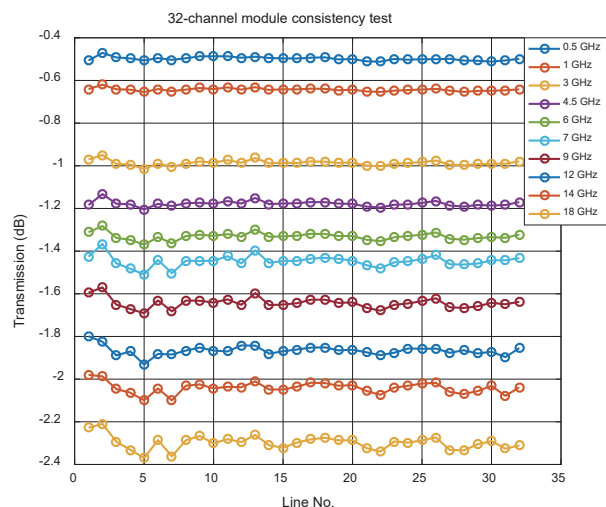
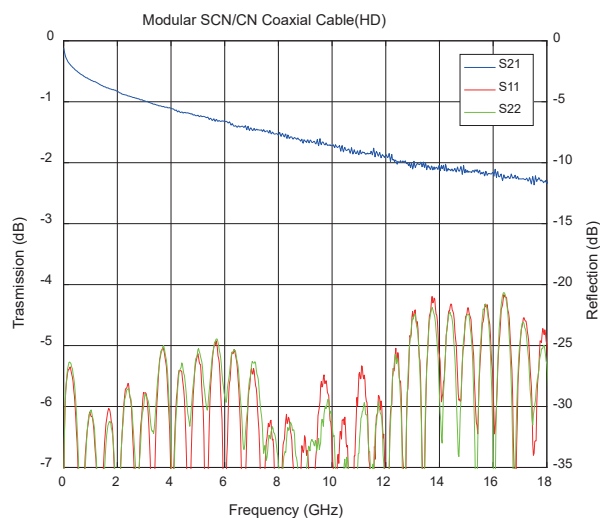


The silver-plated CuNi center conductor provides excellent transmission while keeping the heat load manageable with the thin cable dimensions (diameter=0.034" or 0.86 mm), leading the SCN/ CN cable one of the best choices for cryogenic RF applications.

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-f to SMPS-f	
	Modular capacity	10/12/16 per module	

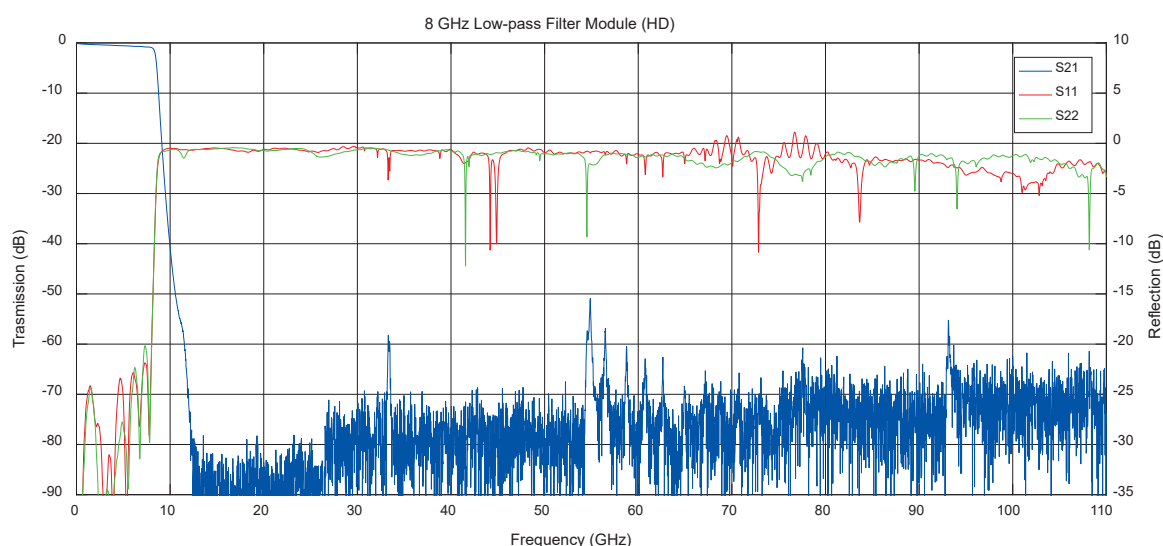
Low-pass Filter Module (HD)



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.

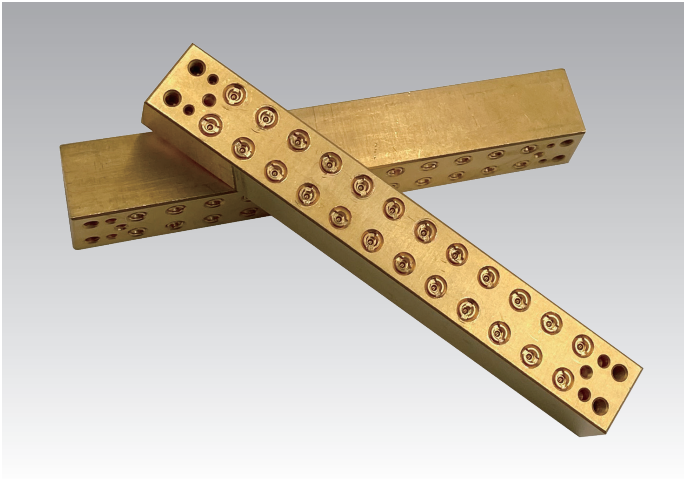
Features & Benefits

- 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-3G	VS-HDLPF-8G	VS-HDLPF-15G
RF property	Frequency range	DC-1 GHz	DC-3 GHz	DC-8 GHz	DC-15 GHz
	Pass band insertion loss	≤ 2 dB@DC-1 GHz	≤ 1 dB@DC-3 GHz	≤ 1.5 dB@DC-8 GHz	≤ 1.5 dB@DC-15 GHz
	Pass band return loss	≥ 13 dB@DC-1 GHz	≥ 15 dB@DC-3 GHz	≥ 13 dB@DC-8 GHz	≥ 13 dB@DC-15 GHz
	Impedance	50 Ω			
	Rejection	≥ 40 dB@2-53 GHz	≥ 40 dB@7-53 GHz	≥ 40 dB@11-53 GHz	≥ 40 dB@18~53 GHz
	Nearest channel crosstalk	< -75 dB			
Physical property	Working temp.	10 mK to room temp.			
	Connector type	SMPS-male to SMPS-male			
	Modular capacity	10/12/16 per module			

Attenuator Module (HD)

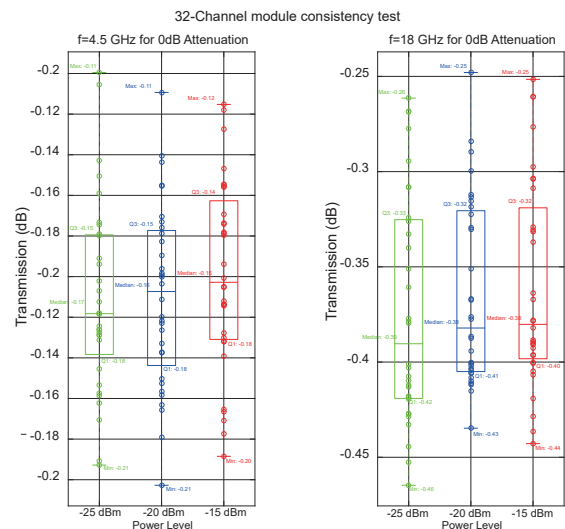
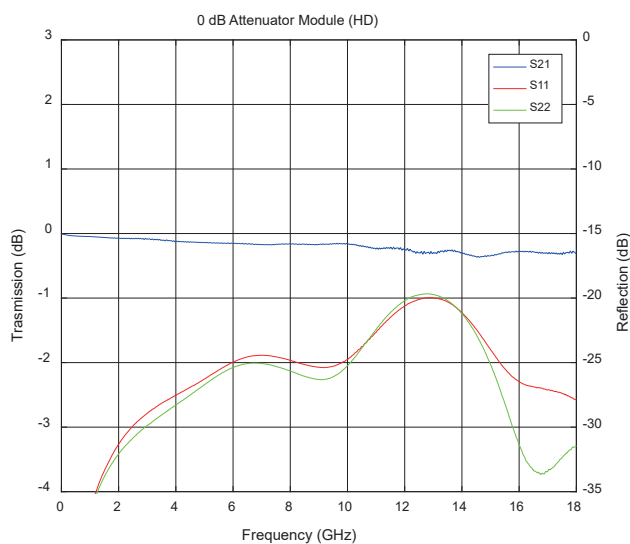


The cryogenic attenuator reduces the level of noise and interference transmitted to the lower temperature stages and enhances thermalization of the coax cabling to each temperature stage. Constant attenuation is achieved across the whole frequency range.

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

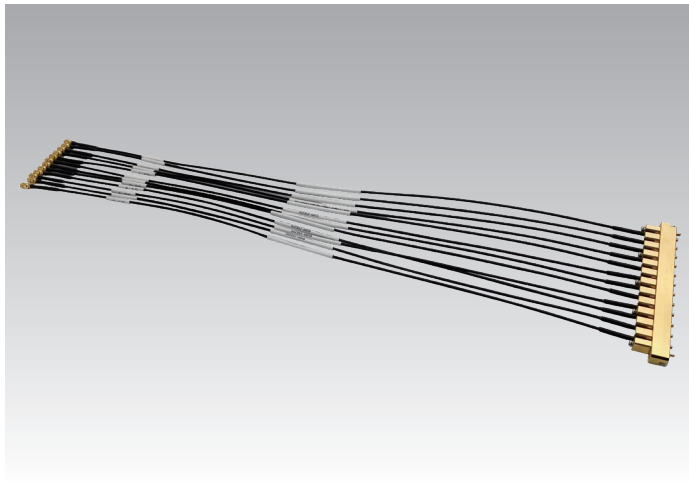


Specifications

VS-HDATNR

RF property	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
	Attenuation drift	within ± 0.5 dB @ 8 GHz
Physical property	Nearest channel crosstalk	< -75 dB
	Working temp.	10 mK to room temp.
	Connector type	SMPS-male to SMPS-male
	Modular capacity	20/24/32 per module

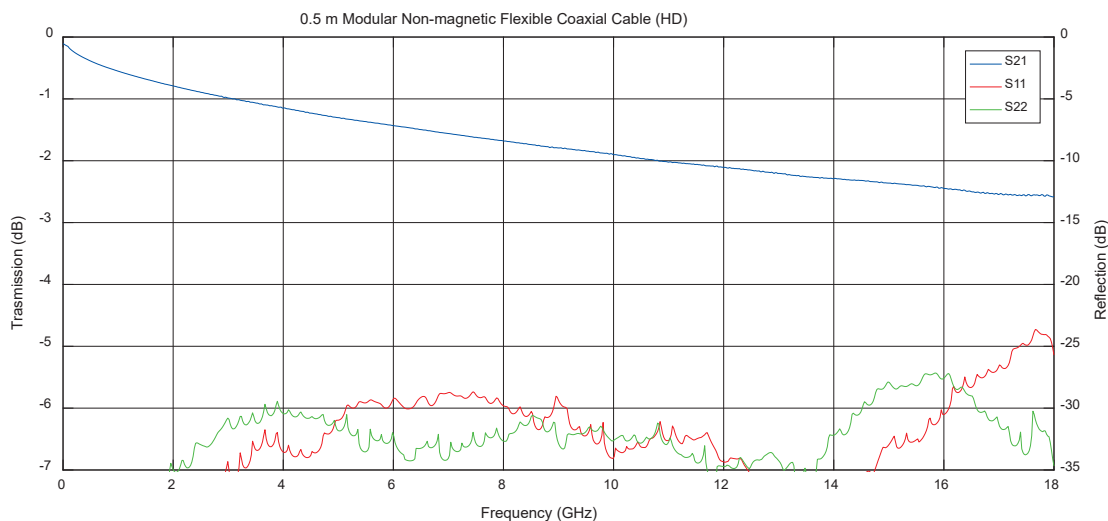
Modular Non-magnetic Flexible Coaxial Cables (HD)



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-female Sample end: SMA-male	
	Modular capacity	10/12/16 per module	

SMA Cabling

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

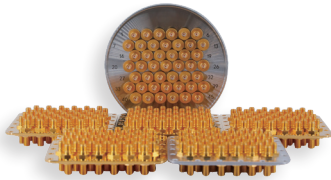
Phase and Amplitude Stable Cable (SMA)



Attenuator (SMA)



Feedthrough Plate Set (SMA)



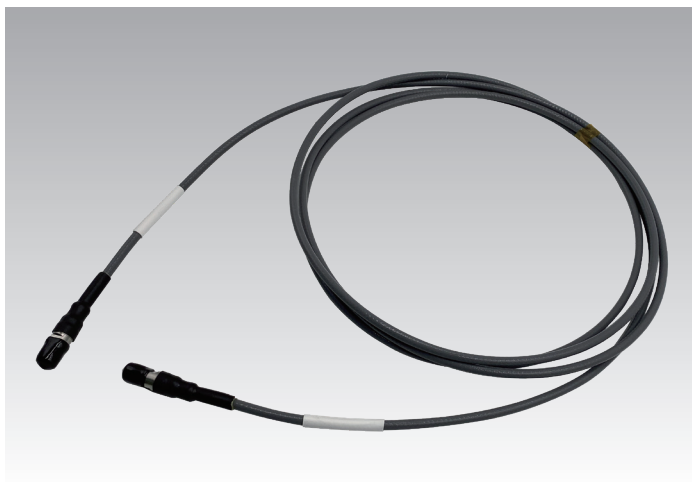
Non-magnetic Flexible Coaxial Cable (SMA)



Coaxial Cable (SMA)



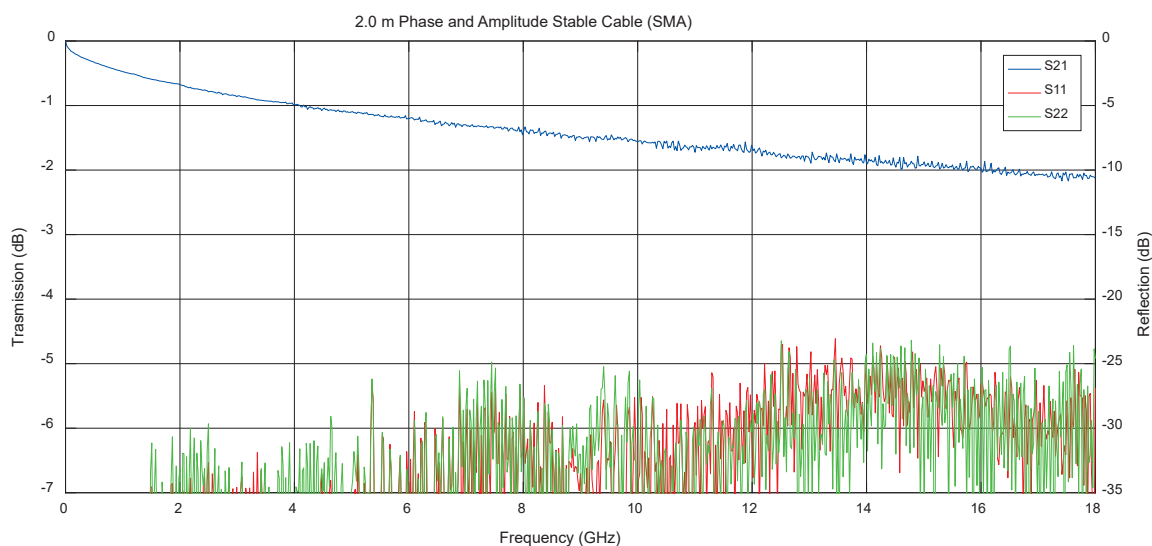
Phase and Amplitude Stable Cable (SMA)



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.

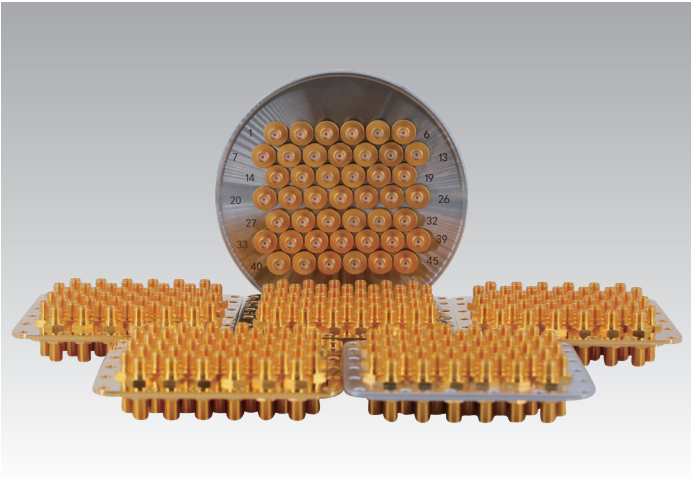
Features & Benefits

- 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

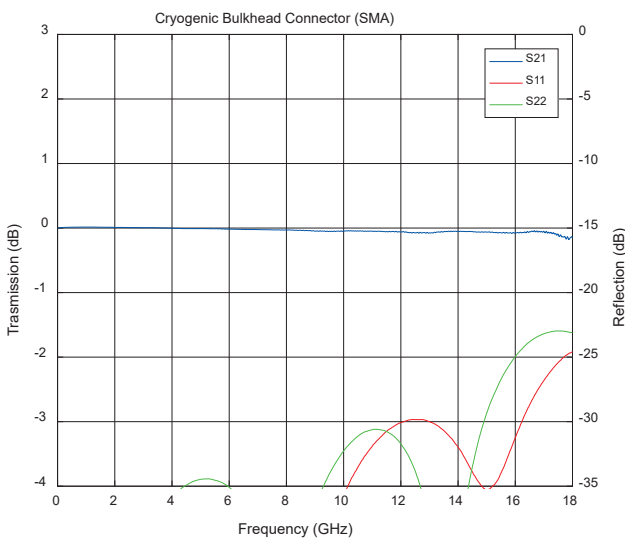
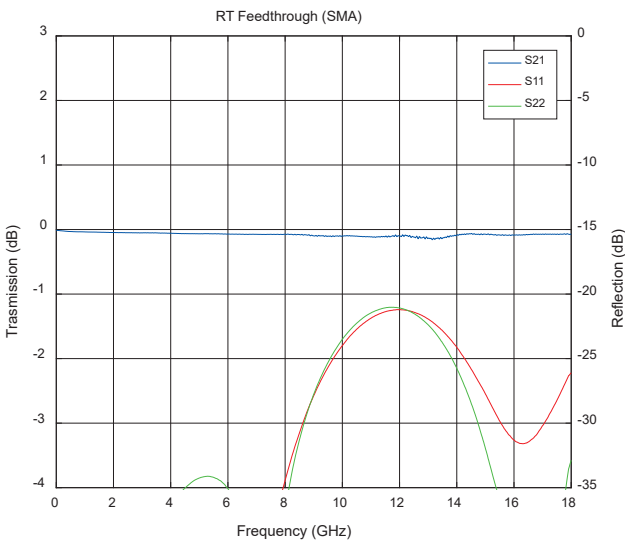
Feedthrough Plate Set (SMA)



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.

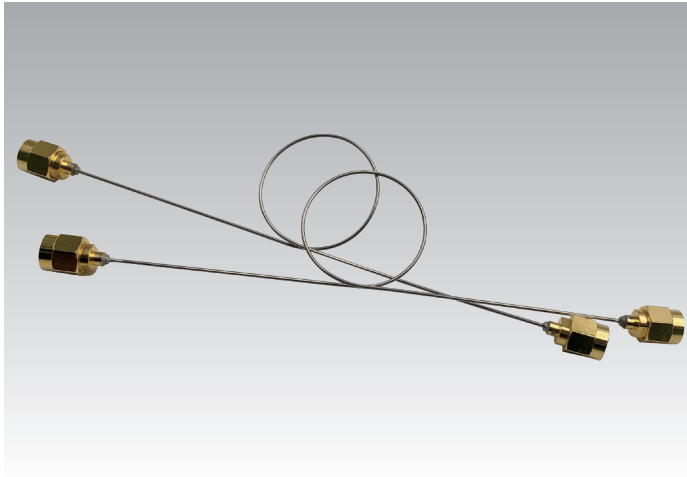
Features & Benefits

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



Specifications		VS-FT
RF property	Frequency range	DC-18 GHz
	Return loss	≥17 dB
	Impedance	50 Ω
Physical property	Leak rate	<1×10 ⁻⁹ mbar·L/s
	Connector type	SMA-female to SMA-female
	Plate materials	Stainless steel / Aluminum / Non-magnetic gold-plated OFHC
Channel options	ISO100	55
	ISO100-SL	45/32
	K63	20/10
	KF40	7/4

Coaxial Cable (SMA)

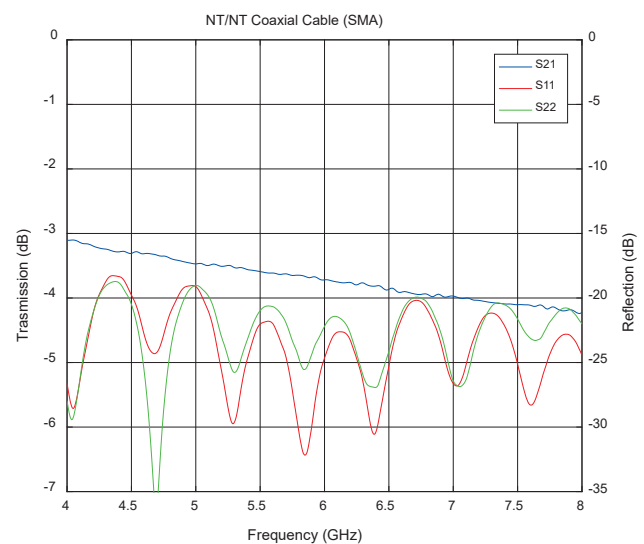
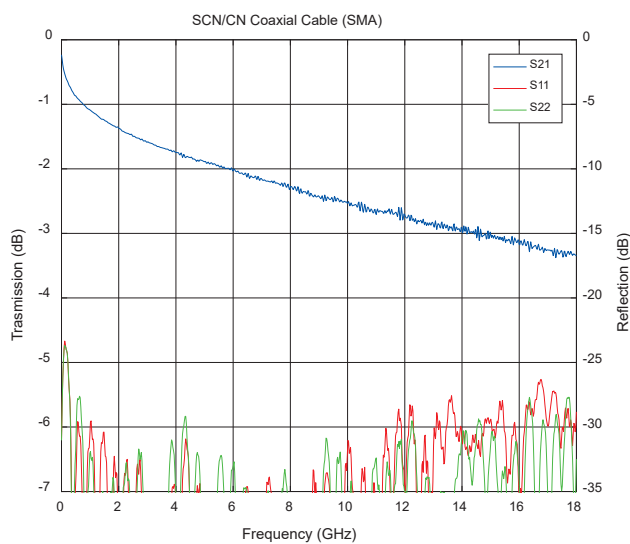


The silver-plated CuNi center conductor provides excellent transmission while keeping the heat load manageable with the thin cable dimensions (diameter= 0.034" or 0.86 mm), leading the SCN/CN cable one of the best choices for cryogenic RF applications.

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
Cable property	Center conductor	Silver-plated CuNi	NbTi	Al
	Dielectric	PTFE	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	≥18 dB	≥17 dB	≥17 dB
	Impedance	50 Ω		
Physical property	Working temp.	10 mK to room temp.	Below 4K plate	Below CP
	Connector type	SMA-male to SMA-male		

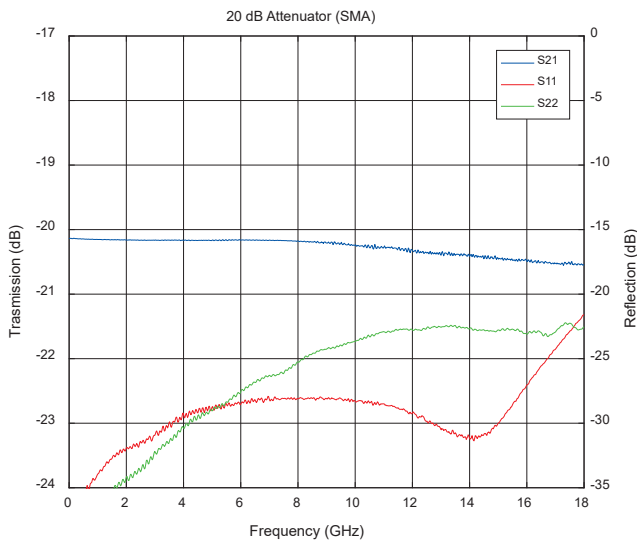
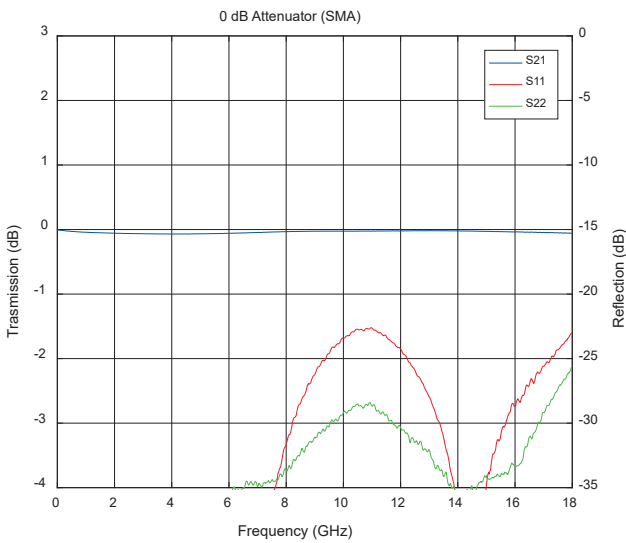
Attenuator (SMA)



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.

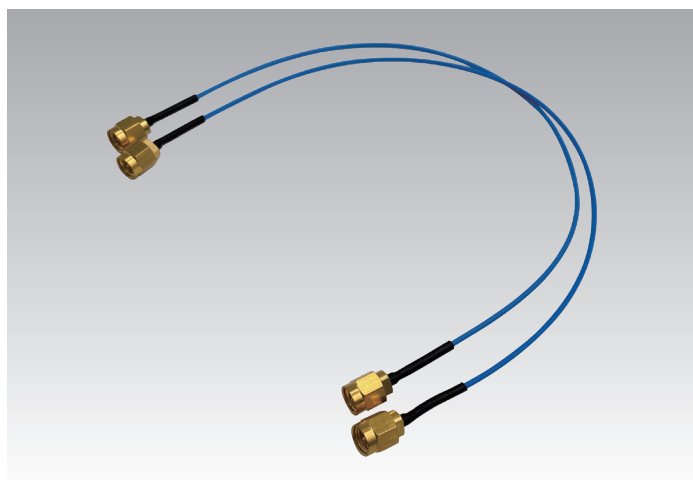
Features & Benefits

- 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
	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

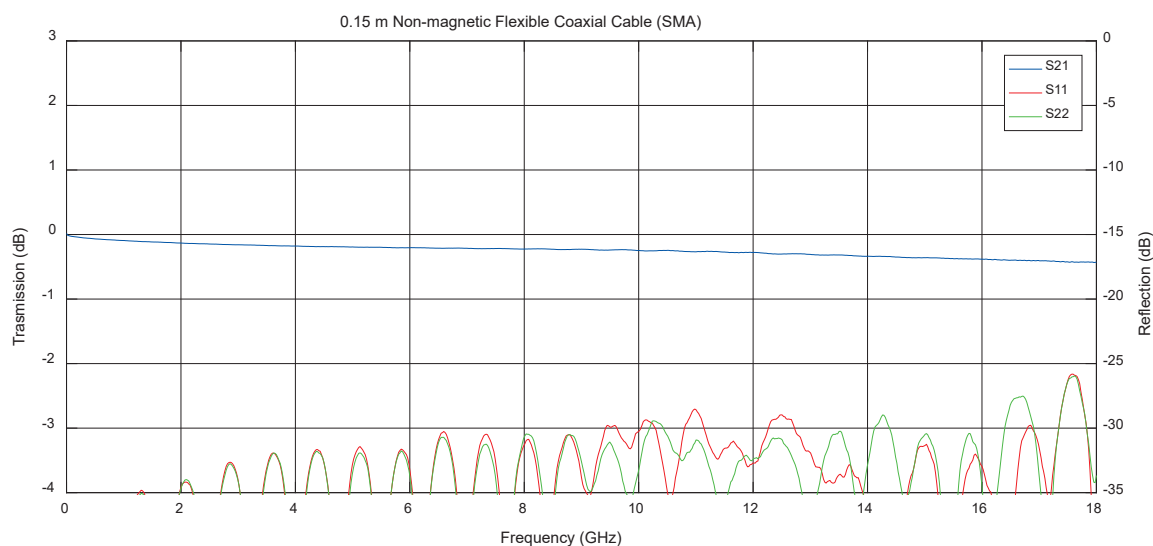
Non-magnetic Flexible Coaxial Cable (SMA)



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

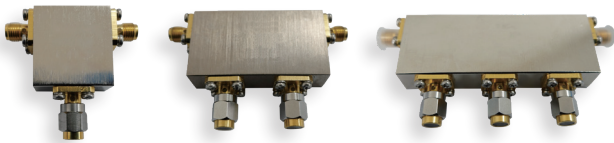


Specifications		VS-NMC	
RF property	Frequency range	DC-18 GHz	
	Insertion loss	0.70 dB/m@1 GHz	1.31 dB/m@3 GHz
		1.72 dB/m@5 GHz	2.49 dB/m@10 GHz
	Return loss	≥ 18 dB	
	Impedance	50 Ω	
Physical property	Jacket diameter	2.5 mm	
	Conductor diameter	0.086"	
	Connector type	SMA-male to SMA-male	

Cryogenic Electronics

The cryogenic electronic components minimize the noise and interference from the environment, and enable integration and multiplexing structure of the signal delivery system.

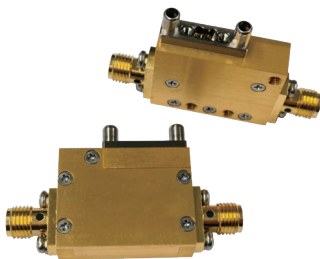
Cryogenic Isolator / Circulator



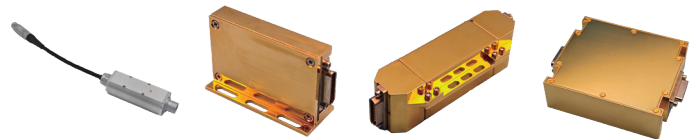
Microwave Signal Matrix Switch



Cryogenic Low Noise Amplifier



Filtering for DC



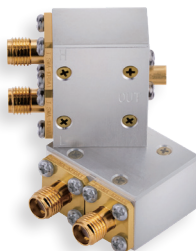
Traveling Wave Parametric Amplifier (TWPA)



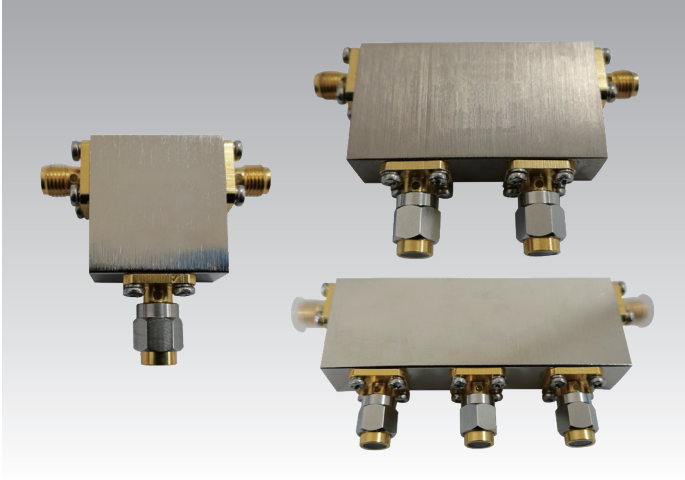
DC wiring



Diplexer



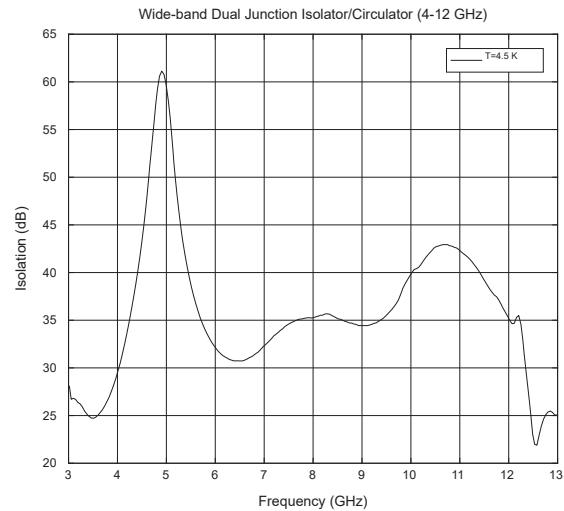
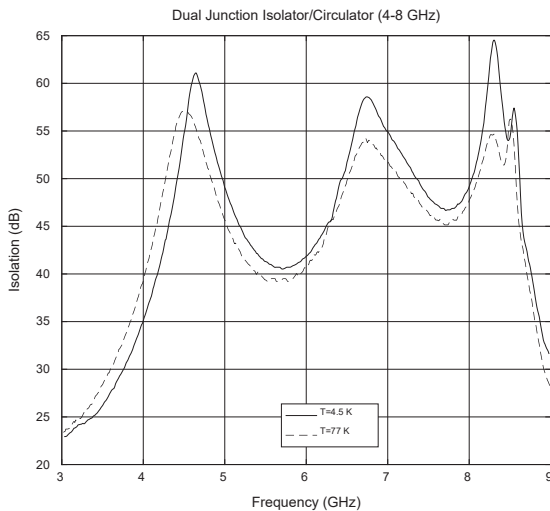
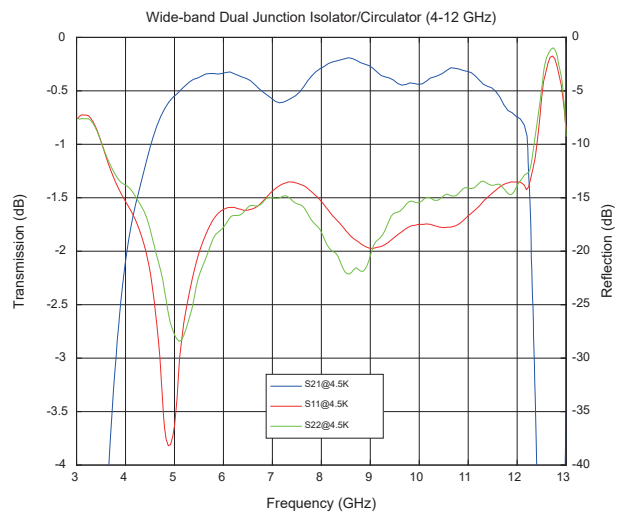
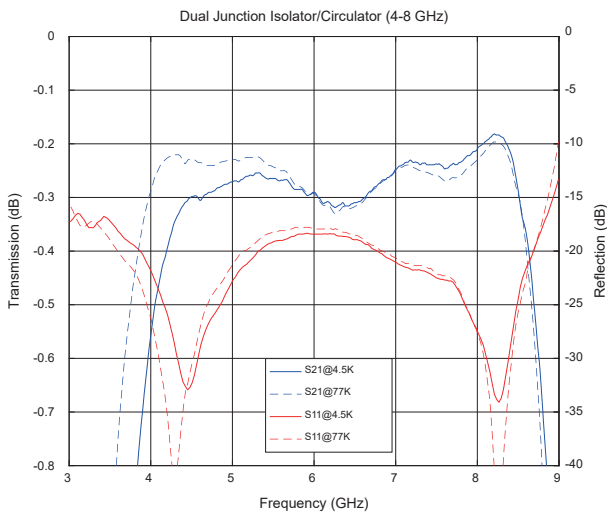
Cryogenic Isolator / Circulator



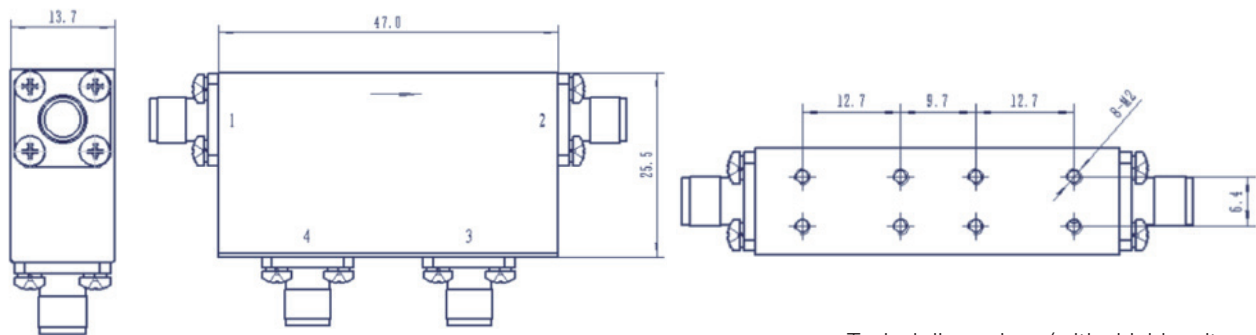
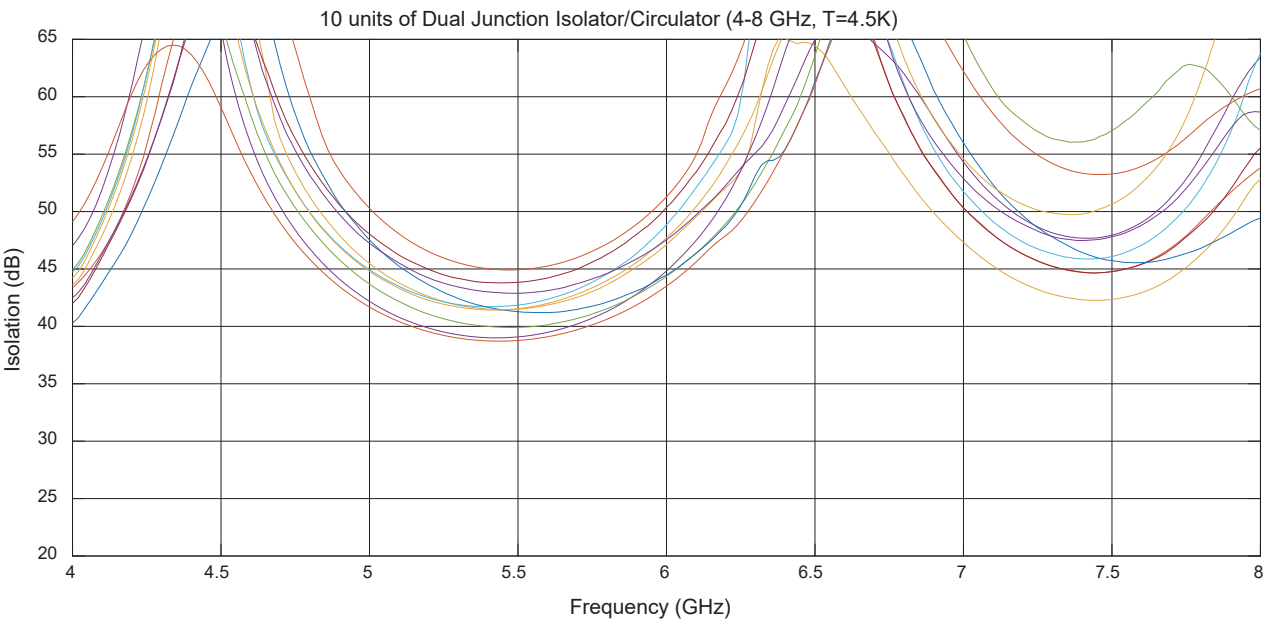
The cryogenic isolator/circulator works between 10 mK and room temperature. It prevents noise from the environment leaking to the delicate samples at cryogenic temperature. The cryogenic isolator/circulator features with low insertion loss and high isolation.

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

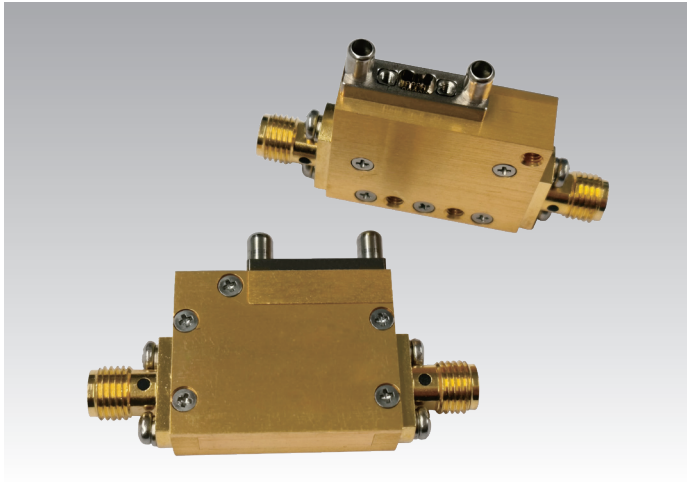


Typical dimensions (with shield, unit mm)

Specifications		VS-IC-S(W)*	VS-IC-D(W)	VS-IC-T(W)
RF property	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(18) dB	40(35) dB	60(53) dB
	Impedance	50 Ω		
Physical property	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 ()

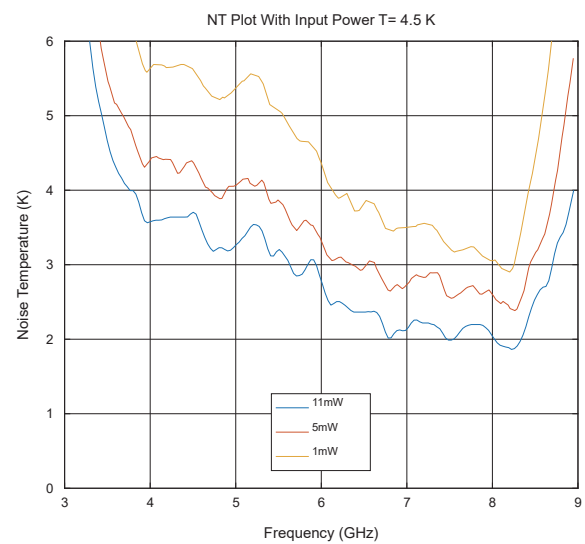
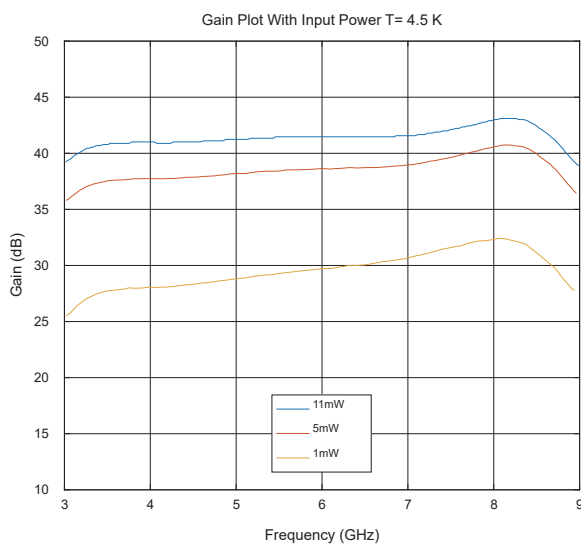
Cryogenic Low Noise Amplifier



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

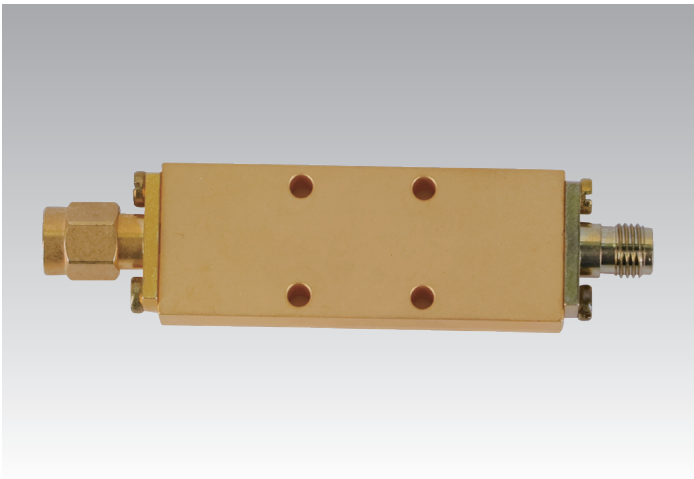
- >40 dB gain over 4-8 GHz
- Low noise temperature
- Adaptive working condition



Specifications		VS-LNA
RF property	Frequency range	4-8 GHz
	Gain	> 40 dB
	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

Traveling Wave Parametric Amplifier (TWPA)

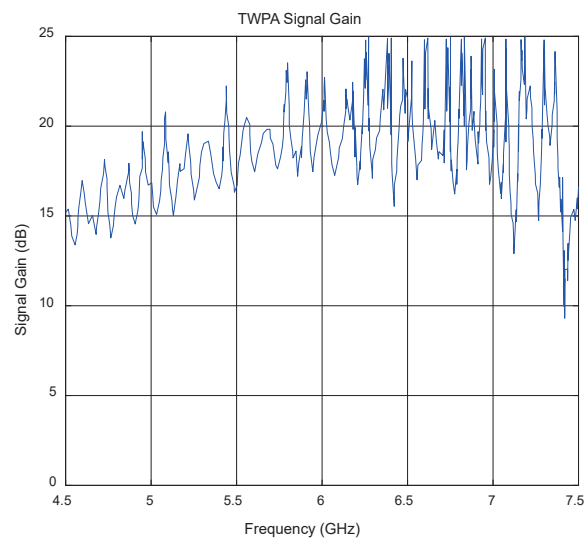
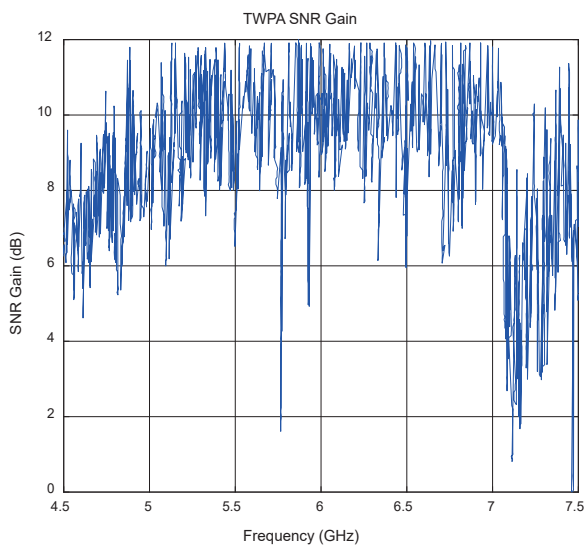


The traveling wave parametric amplifier works at the base temperature of a dilution fridge. It amplifies signals of specific microwave frequency bands at ultra-low temperature environments, and improves the signal-to-noise ratio of the signals in the signal chain.

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

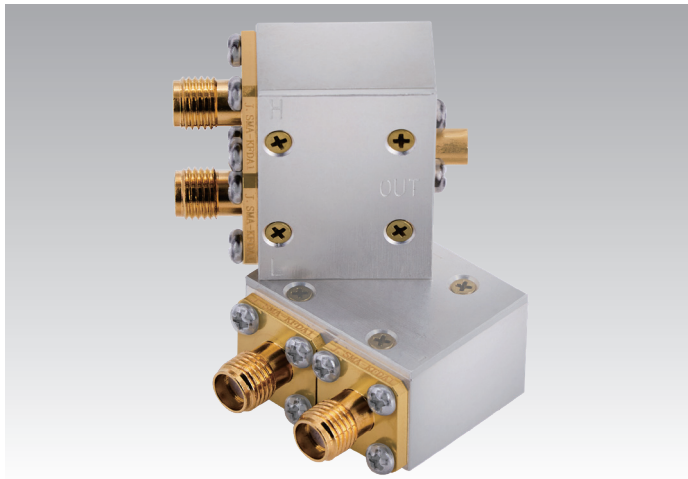
Features & Benefits

- 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)	68×18.5×9 mm

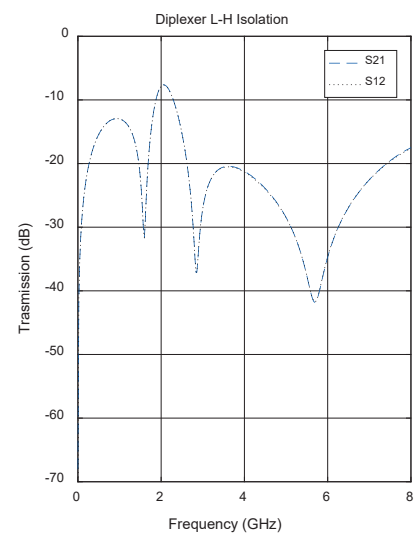
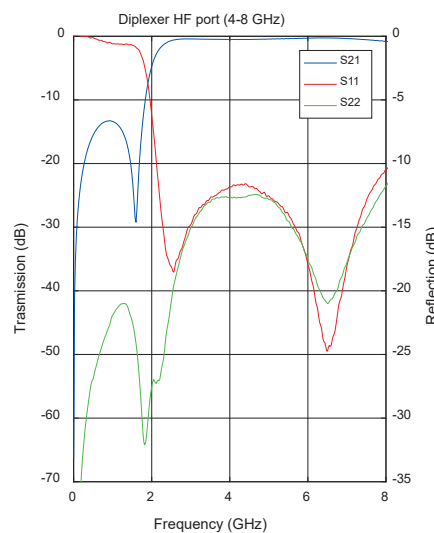
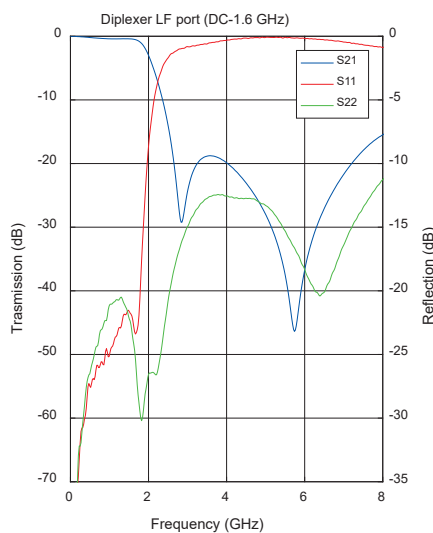
Diplexer



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 dB
	Return loss	-10 dB
	Impedance	50 Ω
Physical property	Isolation	> 12 dB
	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

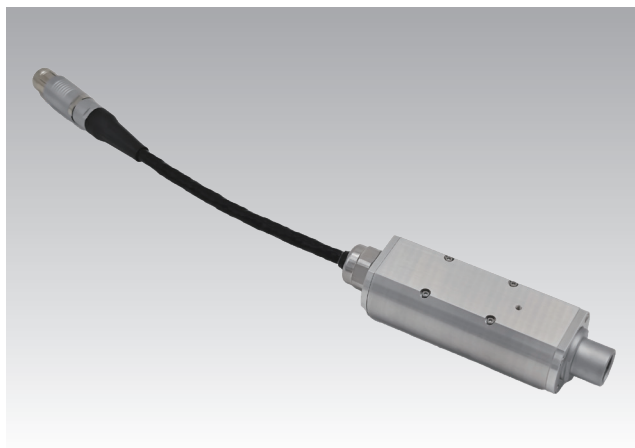


Cryogenic matrix switch (VS-MSCRYO)

- 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

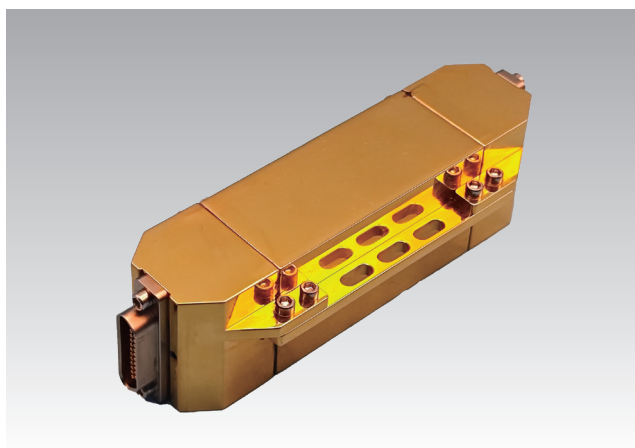
Filtering for DC



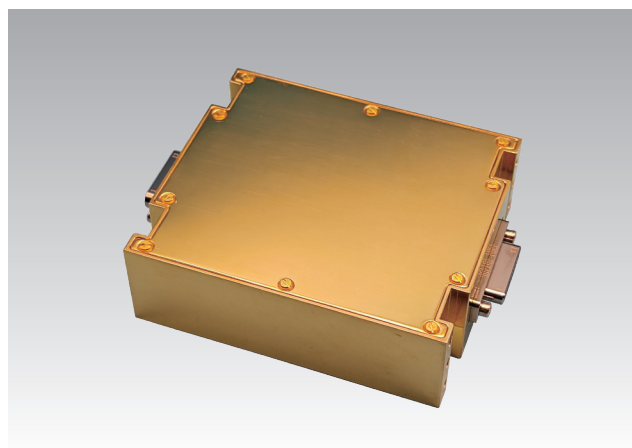
Room-temperature RC Filter
(VS-FLT-RCRT, cut-off freq. 175 kHz)



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



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

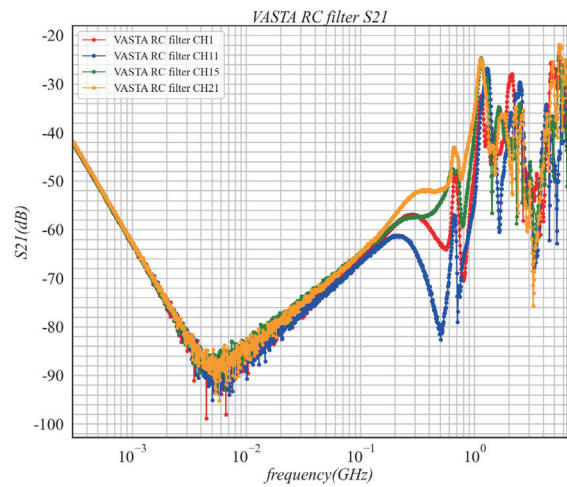
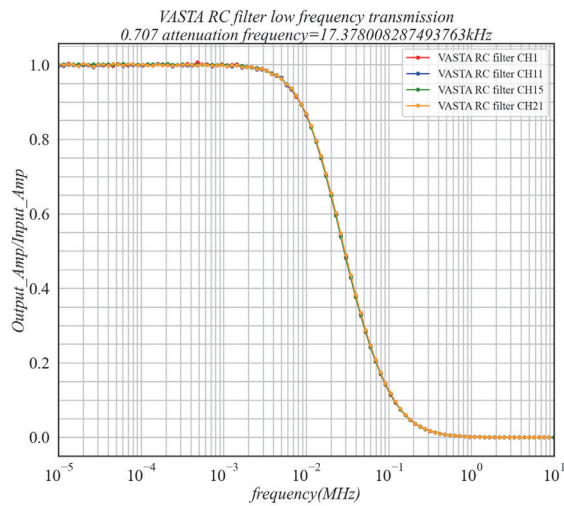


Copper-powder RF Filter
(VS-FLT-RFC, cut-off freq. 700 kHz)

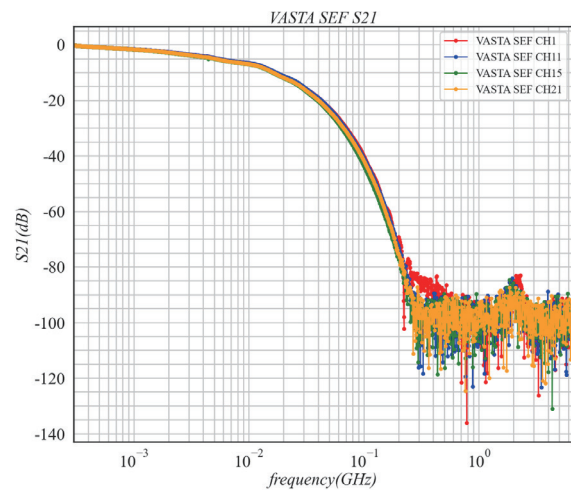
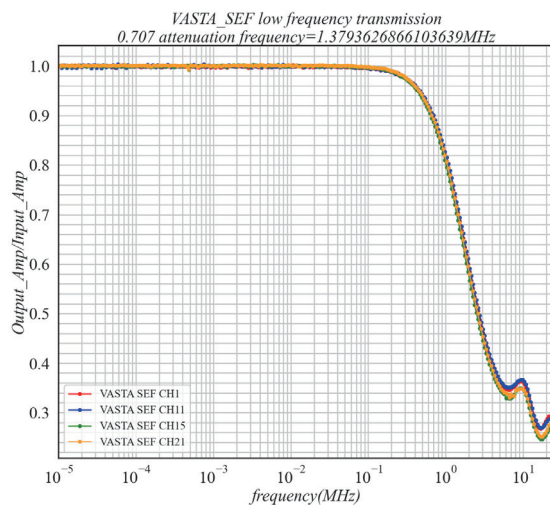
Specifications		VS-FLT-RCRT	VS-FLT-RC	VS-FLT-RFSE	VS-FLT-RFC
Electrical property	Filter type	RC	RC	Silver epoxy	Copper powder
	Channel number	24	24	24 (1)	24 (1)
	Cut-off frequency (input impedance 1 M Ω)	175 kHz	17 kHz	1.3 MHz	700 kHz
	-100 dB point (input impedance 50 Ω)	/	/	300 MHz	1.5 GHz
	Channel 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 G Ω @10 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

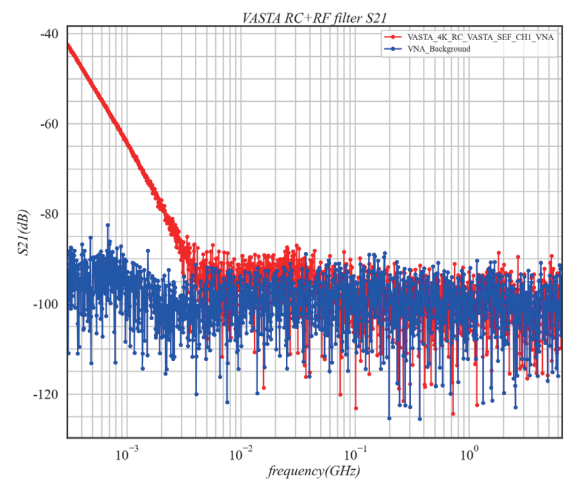
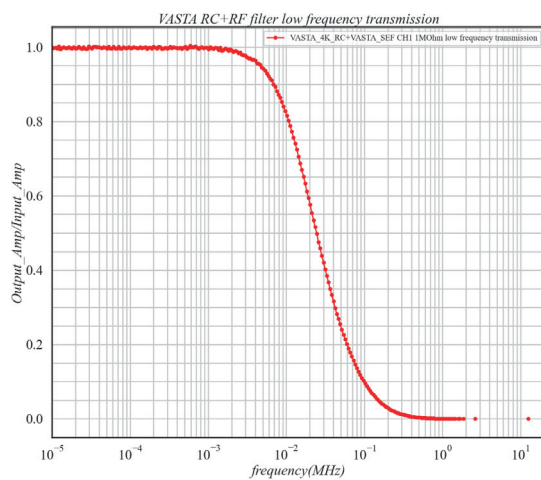
4K RC Filter Performance at Low and High Frequency Range



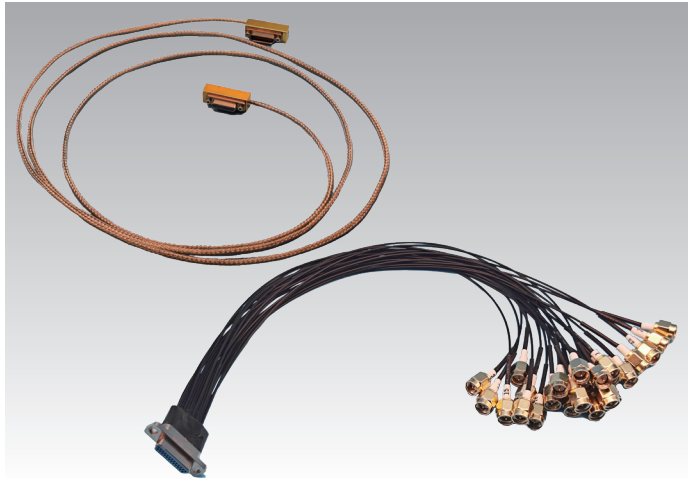
Silver-epoxy RF Filter Performance at Low and High Frequency Range



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



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	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	8.98	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
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Unit: 100 GΩ

Specifications		VS-DC-C	VS-DC-C/PB	VS-DC-PB	VS-DC-PB/NT
Wiring property	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			
Electrical interface	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
Physical property	Vacuum port	KF40, KF25 or KF16			
	Typical application	HEMT	Nano-positioner	Electrical transport measurement	



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