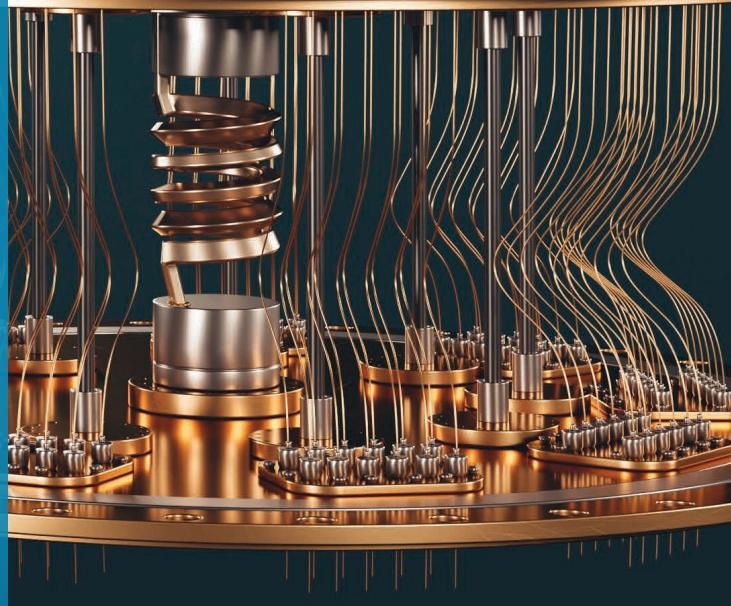




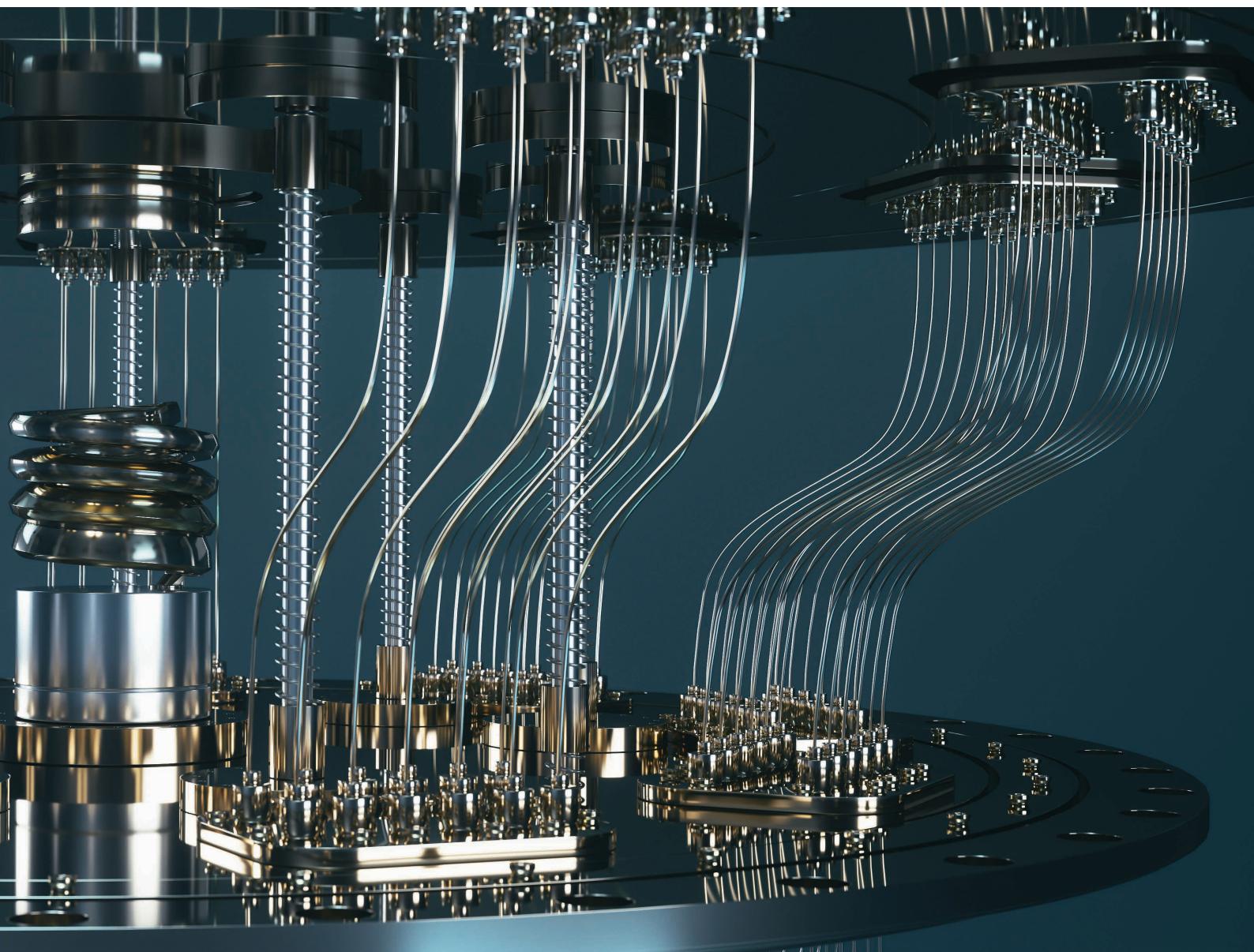
QUANTUM TECHNOLOGIES

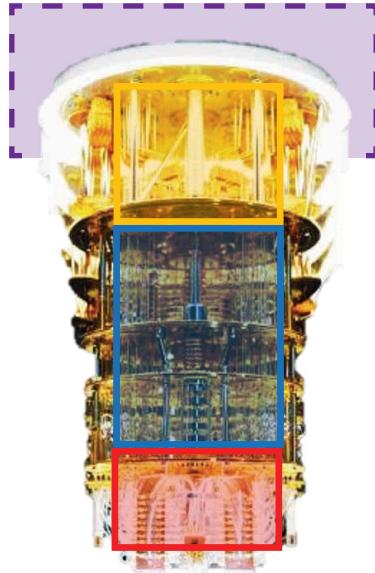


SIMPLIFICATION IS OUR INNOVATION

Radiall ™

Quantum computers are accelerating the transformation of various industries like aeronautic conception and design, health care and life science, financial services and manufacturing efficiency and productivity. To support the growing quantum technologies, Radiall is working with R&D, laboratories, start-ups and others to create new interconnect solutions that are tested in-house and qualified in accredited labs. Radiall's interconnect offering brings together a solution of RF cable assemblies, connectors, attenuators, switches and fiber optics to emerging technology to solve application challenges like densification, thermalisation to some tens of milliKelvin, networking and integration, miniaturization and non-magnetism.





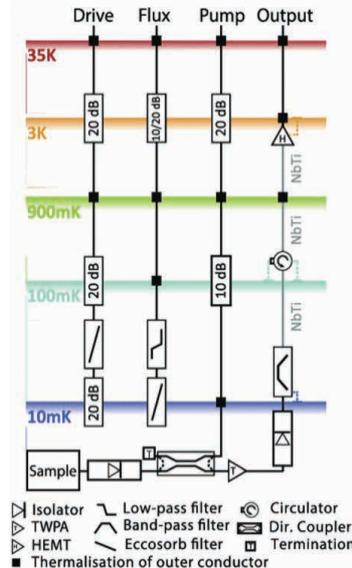
Dilution Refrigerator (DR)

Room Temperature Long Semi-rigid

> 4°K: Good Thermal Isolation

1°K - 4°K: Superior Thermal Isolation

< 1°K: Highly Conductive



Radiall semi-rigid cables assemblies use proprietary/specific technologies to withstand the lower temperatures up to tens of millikelvin. These technologies have been proven in laboratory and in field. With cables in .047" (and .033" - .013" under development), we have SMA, SMPM and multiport coax connector solutions. Stage interface could use Radiall attenuators (0-30 dB on request):

- Room temperature long semi-rigid, precise bending shape
- 4°K: Cable with good thermal isolation, CuproNickel CuN semi-rigid cables
- 1°K: Cable with superior thermal isolation, superconducting semi-rigid cables in Niobium Titanium (NbTi)
- 10°mK: Highly conductive, close to qubit, lower temperature, amagnetic, hand formable cable assembly in Copper Silver (CuPro)

Source: Krinner, S., Storz, S., Kurpiers, P., Magnard, P., Heinsoo, J., Keller, R., Luetolf, J., Eichler, C. and Wallraff, A., 2019. Engineering cryogenic setups for 100-qubit scale superconducting circuit systems. *EPJ Quantum Technology*, 6(1), p.2.

RF CABLES, CONNECTORS & ASSEMBLY SOLUTIONS

Radiall's RF cables, connectors and assemblies are able to satisfy quantum technologies' specific requirements, including:

- Densification: Miniature connectors, multi coaxial harness (bundle), small diameter semi-rigid cables, multi-pin coax connectors
- Thermalization: Through panel, thermal conductivity insulator
- Solution: A-magnetism, seamless/solderless connectors, HF and material expertise, (cryo)switches and (cryo)attenuators

With testing during the R&D stage, Radiall determined that SMA, 2.92, SMP and SMPM connectors remain stable at low temperatures. VSWR, insertion loss and mechanical properties remain stable down to 10 mK.

To meet market demands, Radiall is continuously developing more modular, miniaturization and cryogenic evaluation on cryogenic representative environments.



SMPM-LOCK



SMPW



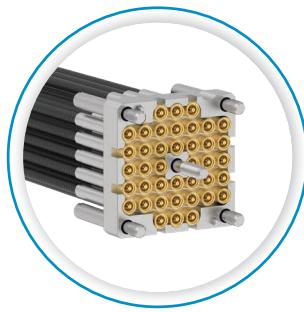
IMP (LP-SR-HD)



ATTENUATOR



SEMIRIGID 3D BENDING



F2C-40



SMA



2.92



SMP

RF CABLE ASSEMBLIES

Our range of coaxial connector solutions are suitable for cryogenic applications such as quantum computing.

PART NUMBER	DESCRIPTION
R294C2312002	2 SMA Straight Plugs Semi-Rigid .085" Tinned Copper 500 mm
R294C2312005	2 SMA Straight Plugs Semi-Rigid .085" Tinned Copper 2000 mm
R294C2312008	2 SMA Straight Plugs Semi Rigid .034" Niobium-Titanium Inner/Outer conductor 100 mm
R294C2312009	2 SMA Straight Plugs Semi Rigid .034" Niobium-Titanium Inner/Outer conductor 200 mm
R294C2312010	2 SMA Straight Plugs Semi Rigid .034" Niobium-Titanium Inner/Outer conductor 450 mm
R294C2312012	2 SMA Straight Plugs Semi Rigid .034" Niobium-Titanium Inner/Outer conductor 200 mm
R294C2312015	2 SMA Straight Plugs Semi Rigid .034" Silver Plated CuproNickel Inner/Outer conductor 200 mm
R294C2312017	2 SMA Straight Plugs Semi Rigid .034" Silver Plated CuproNickel Inner/Outer conductor 100 mm
R294C2312018	2 SMA Straight Plugs Semi Rigid .034" Silver Plated CuproNickel Inner/Outer conductor 200 mm
R294C2312019	2 SMA Straight Plugs Semi Rigid .034" Silver Plated CuproNickel Inner/Outer conductor 450 mm
R294C2312020	2 SMA-COM Straight Plugs Hand-Formable Cable Unjacketed .085" 250 mm
R294C2312021	2 SMA-COM Straight Plugs Hand-Formable Cable Unjacketed .085" 500 mm
R294C2312022	2 SMA-COM Straight Plugs Hand-Formable Cable Unjacketed .085" 1000 mm

Notes

There are more cable assemblies available as well as custom cable assemblies.

RF ATTENUATORS



In quantum computing, cryogenic microwave attenuators are used in different stages of the thermal dilution refrigerator to reduce the thermal noise in the signal. The RF lines within each layer increases the signal-to-noise ratio (SNR), requiring the attenuator for the thermalized layer to protect the signal level.

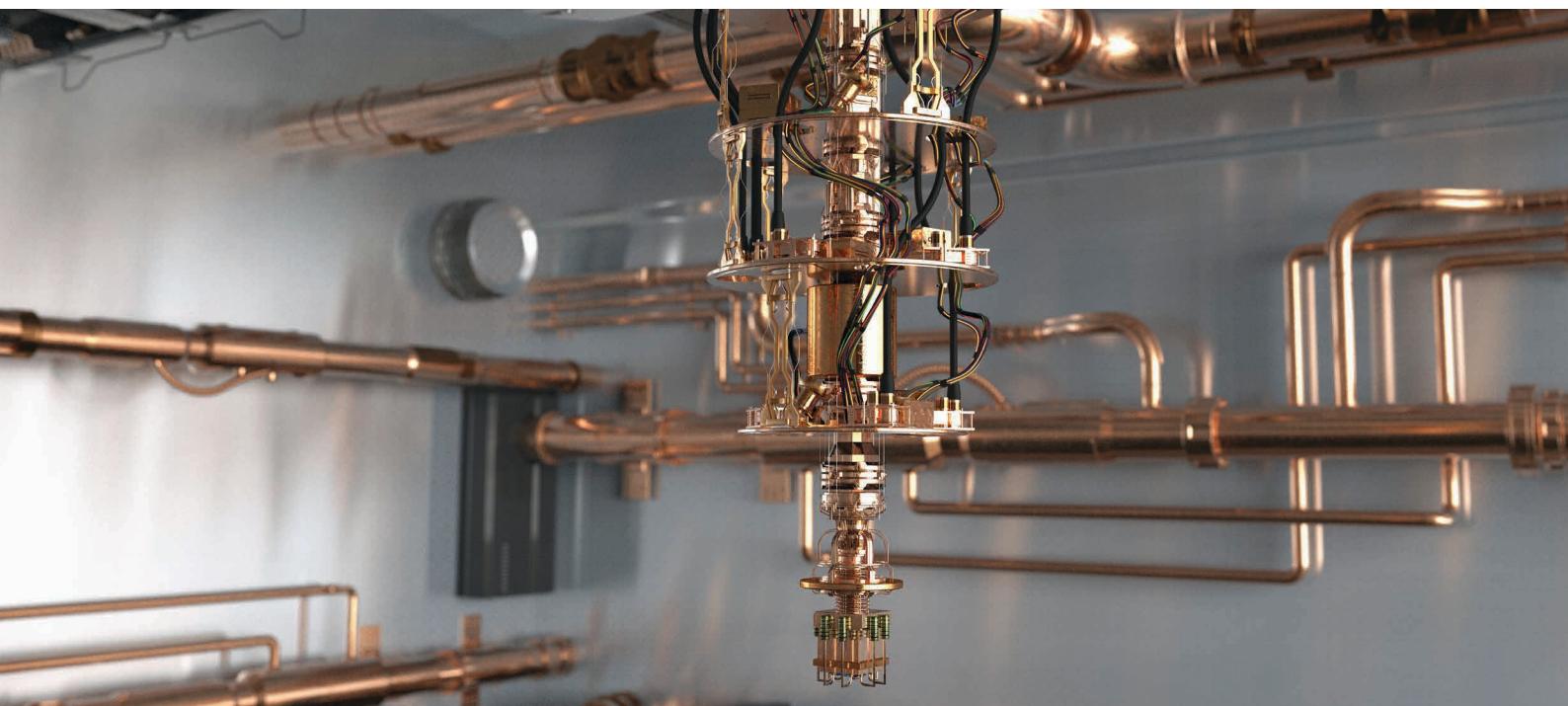
PART NUMBER	DESCRIPTION
R429800000	SMA Attenuator 0 dB 18 GHz 2W
R429820000	SMA Attenuator 20 dB 18 GHz 2W



RF SWITCHES

With cryogenic switches, Radiall provides a solution to meet emerging market demands. These switches function at extremely low temperatures (0 Kelvin/-273 °C) and actuate at very low power. They can be easily integrated into equipment and are a perfect solution for a variety of laboratory applications.

PART NUMBER	DESCRIPTION
R583423141	Specific SP6T Ramses SMA 18 GHz Latching 28 Vdc D-SUB Male Connector Bipolar Actuator Command for Cryogenic Application
R571433141	Specific SPDT Ramses SMA 18 GHz Latching 28 Vdc Pins Terminals Bipolar Actuator Command for Cryogenic Application
R5927B2141	Specific SP6T Ramses Sub-Miniature SMA 26.5 GHz Latching 12 Vdc Pins Terminals Bipolar Actuator Command for Cryogenic Application



SIMPLIFICATION is our INNOVATION

We advance the design and engineering process for innovators, groundbreakers and pioneers of technology. We reduce weight, improve durability and streamline installation to provide leading-edge connectors that drive product performance.

AREA OFFICES LOCAL CONTACTS

EUROPE	ADDRESS	PHONE	FAX	EMAIL
FINLAND	Radiall Finland PO Box 202, 90101, Oulu	+358407522412		infofi@radiall.com
FRANCE	Radiall SA 25 Rue Madeleine Vionnet, 93300, Aubervilliers	+33149353535		info@radiall.com
GERMANY	Radiall GmbH Carl-Zeiss-Straße 10, 63322, Rödermark	+49607491070	+496074910710	infode@radiall.com
ITALY	Radiall Elettronica S.R.L. Via Zambelli 19, 20021, Baranzate Milano	+39024885121	+390248843018	infoit@radiall.com
NETHERLANDS	Radiall Nederland BV Hogebrinkweg 15b, 3871, KM Hoevelaken	+31332534009	+31332534512	infonl@radiall.com
SWEDEN	Radiall AB Sollentunavägen 63, 191 40 Sollentuna	+4684443410		infose@radiall.com
UNITED KINGDOM	Radiall Ltd. Profile West, 950 Great West Rd., Brentford, Middlesex TW8 9ES	+441895425000	+441895425010	infouk@radiall.com

ASIA

CHINA	Shanghai Radiall Electronics Co., Ltd. No.688 Hui Fang Road, Shanghai, China, 201806	+862166523788	+862166521177	infosh@radiall.com
HONG KONG	Radiall Electronics (Asia) Ltd. Room A, 16/F., Ford Glory Plaza, 37-39 Wing Hong Street, Cheung Sha Wan, Kowloon, Hong Kong	+85229593833	+85229592636	infohk@radiall.com
INDIA	Radiall India Pvt. Ltd. 25D, Phase 2, Peenya Industrial Area, Bengaluru 560 058	+918028395271	+918028397228	infoin@radiall.com
JAPAN	Nihon Radiall K.K. Sawada Building 8F, Shibuya-ku, Tokyo 150-0011	+81364274455	+81364274456	infojp@radiall.com

AMERICAS

USA & CANADA	Radiall USA, Inc. 8950 South 52nd Street, Ste. 401 Tempe, AZ 85284	+14806829400	+14806829403	infousa@radiall.com
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GLOBAL PRESENCE

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