

## MICROWAVE COMPONENTS

*R404/R41X*

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Terminations

**INTRODUCTION**

Synergy coaxial terminations offer excellent reliability and repeatability from DC to 67 GHz. The offer includes low, medium, high power terminations, and a platinum range for instrumentation applications which provide the lowest VSWR.

**MAIN FEATURES OF SYNERGY TERMINATIONS**

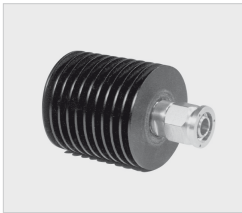
- Power range from 0.5 W to 1000 W
- Frequency from DC up to 67 GHz
- 50 Ω and 75 Ω Impedance
- High repeatability
- Compatible with all standard connector interfaces
- Connector interface according to applicable MIL, DIN, NF and CEI
- Dedicated platinum range for Test & Measurement providing lowest VSWR

**LOW POWER TERMINATIONS**



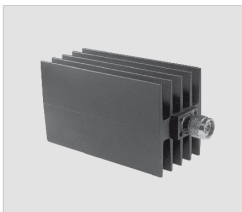
<b>POWER</b>	0.5 to 3 Watts
<b>CONNECTORS</b>	BMA, BNC, QMA, QN, N, SMA, SMA2.9, SMB, SMP, SSMA, TNC, 1.0/2.3
<b>FREQUENCY RANGE</b>	DC to 67 GHz

**MEDIUM POWER TERMINATIONS**



<b>POWER</b>	6 to 30 Watts
<b>CONNECTORS</b>	4.3-10, 7-16, BNC, N, SMA, TNC
<b>FREQUENCY RANGE</b>	DC to 18 GHz

**HIGH POWER TERMINATIONS**



<b>POWER</b>	50 to 1000 Watts
<b>CONNECTORS</b>	4.3-10, 7-16, N, SMA, TNC
<b>FREQUENCY RANGE</b>	DC to 6 GHz

**PLATINUM TERMINATIONS**

Synergy's low power terminations offer is dedicated for Test & Measurement and provides the lowest VSWR.



<b>POWER</b>	1 Watt
<b>CONNECTORS</b>	SMA2.9, SMA3.5, SMA, N, BNC, TNC
<b>FREQUENCY RANGE</b>	DC to 40 GHz



Terminations

**LOW POWER TERMINATIONS, UP TO 3 WATTS**

**1.0/2.3 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
2.5	1.15	23.1	1	100	50 ± 5%	Male	ST404 144 000

**1.85 mm - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
67	1.65	12.2	0.5	100	50 ± 5%	Male	ST404 2V0 000
67	1.70	11.7	0.5	100	50 ± 5%	Female	ST404 2V5 000

**2.4 mm - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
50	1.30	17.7	0.5	100	50 ± 5%	Male	ST404 2N0 000
50	1.30	17.7	0.5	100	50 ± 5%	Female	ST404 2N5 000

**4.3/10 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.25	19.1	2	500	50 ± 5%	Male Screw	ST404 1D1 000
6	1.25	19.1	2	500	50 ± 5%	Male Screw	ST404 1D1 121 <sup>[2]</sup>
6	1.25	19.1	2	500	50 ± 5%	Male Push-Pull	ST404 1D2 000
6	1.25	19.1	2	500	50 ± 5%	Male Push-Pull	ST404 1D2 121 <sup>[2]</sup>
6	1.25	19.1	2	500	50 ± 5%	Female	ST404 1D5 000

**7/16 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.15	23.1	2	500	50 ± 5%	Male	ST404 170 111
4	1.15	23.1	2	500	50 ± 5%	Female	ST404 175 111

**BMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
18	1.2	20.8	1	100	50 ± 5%	Male	ST404 270 000
18	1.3	17.7	1	100	50 ± 5%	Female	ST404 275 000

**BNC - 50 AND 75 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
1	1.2	20.8	1	500	50 ± 1%	Male	ST404 441 000 <sup>[3]</sup>
1	1.2	20.8	1	500	50 ± 1%	Male	ST404 441 120 <sup>[1] [3]</sup>
1	1.2	20.8	1	500	50 ± 1%	Male	ST404 441 121 <sup>[2] [3]</sup>
4	1.2	20.8	1	100	50 ± 2%	Male	ST404 111 000
4	1.2	20.8	1	100	50 ± 2%	Male	ST404 111 120 <sup>[1]</sup>
4	1.2	20.8	1	100	50 ± 2%	Female	ST404 112 000
8	1.25	19.1	1	1,000	50 ± 5%	Male	ST404 110 000
8	1.25	19.1	1	1,000	50 ± 5%	Male	ST404 110 120 <sup>[1]</sup>
1	1.15	23.1	1	500	75 ± 5%	Male	ST404 012 000
1	1.15	23.1	1	500	75 ± 5%	Male	ST404 012 120
1	1.15	23.1	1	500	75 ± 5%	Female	ST404 014 000
1	1.15	23.1	1	500	75 ± 0.1%	Male	ST404 412 000 <sup>[3]</sup>
1	1.15	23.1	1	500	75 ± 1%	Male	ST404 442 000 <sup>[3]</sup>
1	1.15	23.1	1	500	75 ± 1%	Male	ST404 442 120 <sup>[1] [3]</sup>

Notes

1. Bead Chain
2. Cord
3. Resistive Pad



Terminations

**N - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
1.5	1.1	26.4	1	500	75 ± 2%	Male	ST404 055 000
1.5	1.1	26.4	1	500	75 ± 2%	Female	ST404 056 000 <sup>[1]</sup>
4	1.2	20.8	1	500	50 ± 2%	Male	ST404 131 000
4	1.2	20.8	1	500	50 ± 2%	Male	ST404 131 120 <sup>[1]</sup>
4	1.2	20.8	1	500	50 ± 2%	Female	ST404 132 000
4	1.2	20.8	1	500	50 ± 2%	Female	ST404 132 120 <sup>[1]</sup>
12.4	1.15	23.1	1	500	50 ± 2%	Male	ST404 240 000
12.4	1.15	23.1	1	500	50 ± 2%	Male	ST404 240 120 <sup>[1]</sup>
12.4	1.15	23.1	1	500	50 ± 2%	Male	ST404 240 121 <sup>[2]</sup>
12.4	1.15	23.1	1	500	50 ± 2%	Female	ST404 245 000
18	1.2	20.8	2	100	50 ± 2%	Male	ST404 340 000
18	1.2	20.8	2	100	50 ± 2%	Male	ST404 340 120 <sup>[1]</sup>
18	1.2	20.8	2	100	50 ± 2%	Female	ST404 355 000

**NEX10 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.15	23.1	1	100	50 ± 5%	Male	ST404 1E1 000
4	1.15	23.1	1	100	50 ± 5%	Male	ST404 1E1 121 <sup>[2]</sup>
4	1.15	23.1	1	100	50 ± 5%	Male	ST404 1E2 000
6	1.15	23.1	2	100	50 ± 5%	Male	ST404 2E1 000
6	1.15	23.1	2	100	50 ± 5%	Male	ST404 2E2 000
6	1.15	23.1	2	100	50 ± 5%	Female	ST404 2E5 000

**QMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.1	26.4	2	200	50 ± 5%	Male	ST404 114 111
4	1.2	20.8	1	100	50 ± 5%	Male	ST404 114 000
4	1.2	20.8	1	100	50 ± 5%	Male	ST404 114 120 <sup>[1]</sup>

**QN - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.2	20.8	1	100	50 ± 5%	Male	ST404 116 000

**SMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.2	20.8	1	100	50 ± 5%	Male	ST404 101 000
4	1.2	20.8	1	100		Male	ST404 101 019
4	1.2	20.8	1	100		Male	ST404 101 120 <sup>[1]</sup>
4	1.25	19.1	1	100		Female	ST404 102 000
8	1.15	23.1	3	250		Male	ST404 600 000
18	1.2	20.8	1	100		Male	ST404 N05 000
18	1.2	20.8	1	100		Male	ST404 N05 120 <sup>[1]</sup>
18	1.2	20.8	1	100		Male	ST404 N05 121 <sup>[2]</sup>
18	1.2	20.8	1	100		Female	ST404 N06 000
18	1.25	19.1	2	100		Male	ST404 210 161
18	1.2	20.8	2	100	50 ± 5%	Male	ST404 N01 000
18	1.2	20.8	2	100		Male	ST404 N01 120 <sup>[1]</sup>
18	1.2	20.8	2	100		Male	ST404 N01 121 <sup>[2]</sup>
18	1.2	20.8	2	100		Female	ST404 N02 000
18	1.34	16.8	3	250		Male	ST404 605 000
26.5	1.3	17.7	1	100		Male	ST404 N07 000
26.5	1.3	17.7	1	100		Female	ST404 N08 000
26.5	1.3	17.7	2	100		Male	ST404 N03 000
26.5	1.3	17.7	2	100	Female	ST404 N04 000	

Notes

1. Bead Chain
2. Cord



Terminations

**SMA2.9 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
40	1.35	16.5	1	100	50 ± 5%	Male	ST404 280 000
40	1.35	16.5	1	100	50 ± 5%	Female	ST404 285 000

**SMB - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.2	20.8	1	100	50 ± 5%	Male	ST404 104 000
4	1.2	20.8	1	100	50 ± 5%	Female	ST404 105 000
8	1.25	19.1	0.5	100	50 ± 5%	Female	ST404 155 000 <sup>[2]</sup>
8	1.25	19.1	0.5	100	50 ± 5%	Female	ST404 165 000

**SMC - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
8	1.25	19.1	0.5	100	50 ± 5%	Female	ST404 160 000

**SMP - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
18	1.2	17.7	1	100	50 ± 5%	Male	ST404 N61 000
18	1.2	17.7	1	100	50 ± 5%	Female	ST404 N62 000
40	1.7	11.7	0.5	100	50 ± 5%	Male	ST404 260 000
40	1.7	11.7	0.5	100	50 ± 5%	Female	ST404 262 000

**SMPM - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
18	1.2	20.8	1	100	50 ± 5%	Male	ST404 NM1 000
18	1.2	20.8	1	100	50 ± 5%	Female	ST404 NM2 000
18	1.2	20.8	1	100	50 ± 5%	Male	ST404 NM3 000

**SSMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
18	1.35	16.5	0.5	100	50 ± 5%	Male	ST404 380 000

**TNC - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.2	20.8	1	100	50 ± 2%	Male	ST404 121 000
4	1.2	20.8	1	100	50 ± 5%	Male	ST404 121 120 <sup>[1]</sup>
4	1.2	20.8	1	100	50 ± 5%	Female	ST404 122 000
12.4	1.25	19.1	1	500	50 ± 5%	Male	ST404 225 000
12.4	1.25	19.1	1	500	50 ± 5%	Male	ST404 225 120 <sup>[1]</sup>
18	1.2	20.8	2	100	50 ± 5%	Male	ST404 370 000
18	1.2	20.8	2	100	50 ± 5%	Male	ST404 370 120 <sup>[1]</sup>
18	1.2	20.8	2	100	50 ± 5%	Female	ST404 375 000

Notes

1. Bead Chain
2. Cord



Terminations

**MEDIUM POWER TERMINATIONS, UP TO 30 WATTS**

**4.3/10 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.3	17.7	30	2,000	50 ± 5%	Male Screw	ST404 758 000
6	1.3	17.7	30	2,000	50 ± 5%	Female	ST404 759 000

**7/16 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.4	17.7	30	2,000	50 ± 5%	Male	ST404 756 000
6	1.4	17.7	30	2,000	50 ± 5%	Female	ST404 757 000
4	1.2	20.8	6	1,500	50 ± 5%	Male	ST404 514 000
4	1.2	20.8	12	1,500	50 ± 5%	Male	ST404 564 000

**BNC - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
2	1.1	26.4	6	1,500	50 ± 5%	Male	ST404 505 000
2	1.1	26.4	12	1,500	50 ± 5%	Male	ST404 555 000
8	1.25	19.1	6	1,500	50 ± 5%	Male	ST404 510 000
8	1.25	19.1	12	1,500	50 ± 5%	Male	ST404 560 000

**N - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
2	1.1	26.4	6	1,500	50 ± 5%	Male	R404 507 000
2	1.1	26.4	12	1,500	50 ± 5%	Male	ST404 557 000
6	1.4	17.7	30	2,000	50 ± 5%	Male	ST404 750 000
6	1.4	17.7	30	2,000	50 ± 5%	Female	ST404 751 000
8	1.25	19.1	6	4,000	50 ± 5%	Male	ST404 512 000
12.4	1.3	17.7	6	1,500	50 ± 5%	Male	ST404 517 000
12.4	1.3	17.7	12	1,500	50 ± 5%	Male	ST404 567 000
12.4	1.25	19.1	20	300	50 ± 5%	Male	ST404 587 000
12.4	1.25	19.1	20	300	50 ± 5%	Female	ST404 587 500
18	1.3	17.7	6	300	50 ± 5%	Male	ST404 522 000
18	1.3	17.7	6	300	50 ± 5%	Female	ST404 522 500
18	1.3	17.7	12	300	50 ± 5%	Male	ST404 572 000
18	1.3	17.7	12	300	50 ± 5%	Female	ST404 572 500
18	1.35	16.5	20	300	50 ± 5%	Male	ST404 588 000
18	1.35	16.5	20	300	50 ± 5%	Female	ST404 588 500

**SMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
12.4	1.3	17.7	6	1,500	50 ± 5%	Male	ST404 518 000
18	1.3	17.7	6	300	50 ± 5%	Male	ST404 523 000
18	1.3	17.7	6	300	50 ± 5%	Female	ST404 523 500
12.4	1.3	17.7	12	1,500	50 ± 5%	Male	ST404 568 000
18	1.3	17.7	12	300	50 ± 5%	Male	ST404 573 000
18	1.3	17.7	12	300	50 ± 5%	Female	ST404 573 500
12.4	1.25	19.1	20	300	50 ± 5%	Male	ST404 584 000
12.4	1.25	19.1	20	300	50 ± 5%	Female	ST404 584 500
18	1.35	16.5	20	300	50 ± 5%	Male	ST404 589 000
18	1.35	16.5	20	300	50 ± 5%	Female	ST404 589 500
6	1.4	15.6	30	2,000	50 ± 5%	Male	ST404 754 000
6	1.4	15.6	30	2,000	50 ± 5%	Female	ST404 755 000



Terminations

TNC - 50 OHMS

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
2	1.1	26.4	6	1,500	50 ± 5%	Male	ST404 506 000
2	1.1	26.4	12	1,500	50 ± 5%	Male	ST404 556 000
6	1.4	17.7	30	2,000	50 ± 5%	Male	ST404 752 000
6	1.4	17.7	30	2,000	50 ± 5%	Female	ST404 753 000
12.4	1.3	17.7	6	1,500	50 ± 5%	Male	ST404 516 000
12.4	1.3	17.7	12	1,500	50 ± 5%	Male	ST404 566 000
12.4	1.25	19.1	20	300	50 ± 5%	Male	ST404 585 000
12.4	1.25	19.1	20	300	50 ± 5%	Female	ST404 585 500
18	1.3	17.7	12	300	50 ± 5%	Male	ST404 571 000
18	1.35	16.5	20	300	50 ± 5%	Male	ST404 586 000
18	1.35	16.5	20	300	50 ± 5%	Male	ST404 586 500

HIGH POWER TERMINATIONS, UP TO 1000 WATTS

4.3/10 - 50 OHMS

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	17.7	50	2,000	50 ± 5%	Male	ST404 768 000	300
6	1.4	17.7	50	2,000	50 ± 5%	Female	ST404 769 000	320
6	1.4	17.7	100	2,000	50 ± 5%	Male	ST404 778 000	1,200
6	1.4	17.7	100	2,000	50 ± 5%	Female	ST404 779 000	1,200

7/16 - 50 OHMS

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
1	1.1	26.4	1000	40,000	50 ± 5%	Female	ST404 867 000	15,000
2.5	1.3	17.7	600	40,000	50 ± 5%	Female	ST404 865 000	8,200
6	1.4	17.7	50	2,000	50 ± 5%	Male	ST404 766 000	350
6	1.4	17.7	50	2,000	50 ± 5%	Female	ST404 767 000	340
6	1.4	17.7	100	2,000	50 ± 5%	Male	ST404 776 000	1,260
6	1.4	17.7	100	2,000	50 ± 5%	Female	ST404 777 000	1,250
6	1.4	17.7	150	2,000	50 ± 5%	Male	ST404 786 000	1,960
6	1.4	17.7	150	2,000	50 ± 5%	Female	ST404 787 000	1,950
6	1.4	17.7	200	2,000	50 ± 5%	Male	ST404 786 020	1,960
6	1.4	17.7	200	2,000	50 ± 5%	Female	ST404 787 020	1,950

7/16 - 50 OHMS CONDUCTION COOLING

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	17.7	200	2,000	50 ± 5%	Male	ST404 786 120	200
6	1.4	17.7	200	2,000	50 ± 5%	Female	ST404 787 120	180

N - 50 OHMS

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
2.5	1.3	17.7	400	40,000	50 ± 5%	Female	ST404 863 000	4,050
6	1.4	17.7	50	2,000	50 ± 5%	Male	ST404 760 000	295
6	1.4	17.7	50	2,000	50 ± 5%	Female	ST404 761 000	289
6	1.4	17.7	100	2,000	50 ± 5%	Male	ST404 770 000	1,200
6	1.4	17.7	100	2,000	50 ± 5%	Female	ST404 771 000	1,200
6	1.4	17.7	150	2,000	50 ± 5%	Male	ST404 780 000	1,900
6	1.4	17.7	150	2,000	50 ± 5%	Female	ST404 781 000	1,900
6	1.4	17.7	200	2,000	50 ± 5%	Male	ST404 780 020	2,000
6	1.4	17.7	200	2,000	50 ± 5%	Female	ST404 781 020	1,900
6	1.2	20.8	250	25,000	50 ± 5%	Female	ST404 861 000	3,000



Terminations

**N - 50 OHMS CONDUCTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	17.7	200	2,000	50 ± 5%	Male	ST404 780 120	140
6	1.4	17.7	200	2,000	50 ± 5%	Female	ST404 781 120	140
6	1.4	15.6	150	2,000	50 ± 5%	Male	ST404 780 100	140
6	1.4	15.6	150	2,000	50 ± 5%	Female	ST404 781 100	140

**SMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	17.7	50	2,000	50 ± 5%	Male	ST404 764 000	290
6	1.4	17.7	50	2,000	50 ± 5%	Female	ST404 765 000	290
6	1.4	17.7	100	2,000	50 ± 5%	Male	ST404 774 000	1,200
6	1.4	17.7	100	2,000	50 ± 5%	Female	ST404 775 000	1,200

**SMA - 50 OHMS CONDUCTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	15.6	100	2,000	50 ± 5%	Male	ST404 774 100	130
6	1.4	15.6	100	2,000	50 ± 5%	Female	ST404 775 100	130

**TNC - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	17.7	50	2,000	50 ± 5%	Male	ST404 762 000	290
6	1.4	17.7	50	2,000	50 ± 5%	Female	ST404 763 000	290
6	1.4	17.7	100	2,000	50 ± 5%	Male	ST404 772 000	1,200
6	1.4	17.7	100	2,000	50 ± 5%	Female	ST404 773 000	1,200
6	1.4	17.7	150	2,000	50 ± 5%	Male	ST404 782 000	1,900
6	1.4	17.7	150	2,000	50 ± 5%	Female	ST404 783 000	1,900
6	1.4	17.7	200	2,000	50 ± 5%	Male	ST404 782 020	1,900
6	1.4	17.7	200	2,000	50 ± 5%	Female	ST404 783 020	1,900

**TNC - 50 OHMS CONDUCTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER	WEIGHT (G)
			AVG. (W)	PEAK (W)				
6	1.4	17.7	200	2,000	50 ± 5%	Male	ST404 782 120	130
6	1.4	17.7	200	2,000	50 ± 5%	Female	ST404 783 120	130



Terminations

**PLATINUM TERMINATIONS, UP TO 1 WATT**

Radiall's platinum series of terminations is designed for Test & Measurement applications. This range can be easily integrated in communication matrices, test benches and laboratories where high RF performance and reliability are essential.

**MAIN FEATURES OF RADIALL'S PLATINUM SERIES OF TERMINATIONS**

- 1 W power rating
- Frequency from DC up to 40 GHz
- Lowest VSWR
- 50 Ω Impedance
- Compatible with all standard Test & Measurement interfaces
- Full integration in Radiall Test & Measurement offer: electromechanical switches and TestPro cable assemblies



**SMA2.9 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
40	1.18	21.7	1	50	50 ± 5%	Male	ST404 280 150
40	1.22	20.1	1	50	50 ± 5%	Female	ST404 285 150

**SMA3.5 - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
26.5	1.1	26.4	1	50	50 ± 5%	Male	ST404 211 150
26.5	1.12	24.9	1	50	50 ± 5%	Female	ST404 216 150

**SMA - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
22	1.15	26.4	1	50	50 ± 5%	Male	ST404 210 150
22	1.15	24.9	1	50	50 ± 5%	Female	ST404 215 150

**N - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
18	1.1	26.4	1	50	50 ± 5%	Male	ST404 350 150
18	1.12	24.9	1	50	50 ± 5%	Female	ST404 355 150

**TNC - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
12.4	1.15	23.1	1	50	50 ± 5%	Male	ST404 370 150
12.4	1.15	23.1	1	50	50 ± 5%	Female	ST404 375 150

**BNC - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		IMPEDANCE (Ω)	GENDER	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.12	24.9	1	50	50 ± 5%	Male	ST404 110 150
4	1.12	24.9	1	50	50 ± 5%	Female	ST404 115 150



Attenuators

**INTRODUCTION**

Radiall coaxial fixed attenuators offer excellent reliability and repeatability from DC to 67 GHz. The offer includes low, medium, high power attenuators and a platinum range for instrumentation applications which provide the lowest VSWR.

**MAIN ATTENUATOR FEATURES**

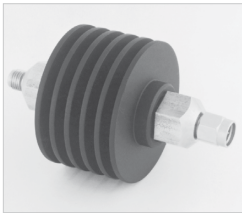
- Power range from 0.5 W to 150 W
- Frequency from DC up to 67 GHz
- Attenuation values from 0 up to 60 dB
- High repeatability
- 50 Ω Impedance
- Compatible with all standard connector interfaces: BNC, QN, N, 7/16, SMA, TNC, SMA2.9
- Dedicated platinum range for Test & Measurement providing lowest VSWR

**LOW POWER ATTENUATORS**



<b>POWER</b>	1 to 2 Watts
<b>CONNECTORS</b>	1.85 mm, 2.4 mm, 7-16, BNC, N, QMA, QN, SMA, SMA 2.9, SMA3.5, SMB, SMC, TNC
<b>FREQUENCY RANGE</b>	DC to 67 GHz
<b>ATTENUATION RANGE</b>	0 to 60 dB

**MEDIUM POWER ATTENUATORS**



<b>POWER</b>	10 to 30 Watts
<b>CONNECTORS</b>	4.3-10, 7-16, BNC, N, NEX10, SMA, TNC
<b>FREQUENCY RANGE</b>	DC to 18 GHz
<b>ATTENUATION RANGE</b>	3 to 30 dB

**HIGH POWER ATTENUATORS**



<b>POWER</b>	30 to 150 Watts
<b>CONNECTORS</b>	N, SMA, TNC, 7/16
<b>FREQUENCY RANGE</b>	DC to 6 GHz
<b>ATTENUATION RANGE</b>	3 to 30 dB

**PLATINUM ATTENUATORS**

Radiall's low power attenuator offer is dedicated for Test & Measurement and provides the lowest VSWR.



<b>POWER</b>	2 Watts
<b>CONNECTORS</b>	SMA2.9, SMA3.5, SMA, N, BNC, TNC
<b>FREQUENCY RANGE</b>	DC to 40 GHz
<b>ATTENUATION RANGE</b>	0 to 30 dB



Attenuators

**LOW POWER ATTENUATORS, UP TO 2 WATTS**

**7/16 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.3	17.7	1	100	xx	± 0.5 <sup>[1]</sup>	ST412 8xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**BNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
2	1.2	20.8	2	100	xx	± 0.35 <sup>[2]</sup>	ST412 4xx 000
Available Attenuation Value: xx = 00 to 20 step 1, 30, 40 and 50 dB							
3	1.3	17.7	1	100	xx	± 0.5 <sup>[3]</sup>	ST412 4xx 124
Available Attenuation Value: xx = 00 to 20 step 1 dB							
8	1.25	19.1	2	100	xx	± 0.5 <sup>[4]</sup>	ST414 4xx 000
Available Attenuation Value: xx = 00 to 15 step 1, 20, 25, 30, 40 - 50 and 60 dB							

**N - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
2	1.15	23.1	2	100	xx	± 0.35 <sup>[3]</sup>	ST412 7xx 000
Available Attenuation Value: xx = 00 to 15 step 1, 20, 30, 40 and 50 dB							
6	1.4	15.6	1	100	xx	± 0.5 <sup>[3]</sup>	ST412 700 124
Available Attenuation Value: xx = 00 to 20 dB step 1							
12.4	1.4	15.6	2	100	xx	± 0.7 <sup>[5]</sup>	ST414 7xx 000
Available Attenuation Value: xx = 00 to 15 step 1, 20, 25, 30, 40 - 50 and 60 dB							
18	1.35	16.5	2	100	xx	± 0.4 <sup>[6]</sup>	ST414 7xx 161
Available Attenuation Value: xx = 00 to 20 dB step 1							

**QMA - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.3	17.7	1	100	xx	± 0.5 <sup>[3]</sup>	ST411 7xx 124
Available Attenuation Value: xx = 00 to 20 dB step 1							

**QN - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.3	17.7	1	100	xx	± 0.5 <sup>[3]</sup>	ST412 3xx 124
Available Attenuation Value: xx = 00 to 20 dB step 1							

**SMA - 50 OHMS, MALE TO FEMALE, .75 IN.**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.4	15.6	1	100	xx	± 0.5 <sup>[3]</sup>	ST411 8xx 124
Available Attenuation Value: xx = 00 to 20 dB step 1							
12.4	1.3	17.7	2	100	xx	± 0.5 <sup>[7]</sup>	ST411 8xx 119
Available Attenuation Value: xx = 00 to 20 step 1 and 30 dB							
18	1.35	16.5	2	100	xx	± 0.7 <sup>[8]</sup>	ST411 8xx 121
Available Attenuation Value: xx = 00 to 20 step 1 and 30 dB							

Notes

1. ± 1 for xx = 20
2. Up to xx = 14
3. Up to xx = 15
4. Up to xx = 25
5. Up to xx = 20
6. Up to xx = 6
7. Up to xx = 10
8. Up to xx = 7



Attenuators

**SMA - 50 OHMS, MALE TO FEMALE, .86 IN.**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.15	23.1	2	100	xx	± 0.3 <sup>[1]</sup>	ST413 8xx 115
Available Attenuation Value: xx = 00 to 20 step 1, 30, 40 - 50 and 60 dB							
18	1.35	16.5	2	100	xx	± 0.3 <sup>[1]</sup>	ST413 8xx 000
Available Attenuation Value: xx = 00 to 20 step 1, 25, 30, 35, 40, 45 - 50, 55 and 60 dB							
26.5	1.5	14.0	2	100	xx	± 0.5 <sup>[1]</sup>	ST413 8xx 121
Available Attenuation Value: xx = 00 to 20 step 1, 25 and 30 dB							

**SMA2.9 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
40	1.6	12.7	2	100	xx	± 0.8	ST413 3xx 000
Available Attenuation Value: xx = 00 to 10 step 1 and 20 dB							

**1.85 mm - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
67	1.75	11.3	1	50	xx	± 1 <sup>[4]</sup>	ST413 Vxx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**2.4 mm - 50 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
53	1.75	11.3	1	50	xx	± 1 <sup>[5]</sup>	ST413 Nxx 000
Available Attenuation Value: xx = xx = 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 12, 15, 20 and 30 dB							

**SMB - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
8	1.3	17.7	2	100	xx	± 0.5	ST410 2xx 121
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**SMC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
8	1.3	17.7	2	100	xx	± 0.5	ST410 1xx 121
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**TNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
2	1.15	23.1	2	100	xx	± 0.35 <sup>[2]</sup>	ST412 5xx 000
Available Attenuation Value: xx = 00 to 15 step 1, 20, 30, 40 and 50 dB							
3	1.3	17.7	1	100	xx	± 0.5 <sup>[2]</sup>	ST412 5xx 124
Available Attenuation Value: xx = 00 to 20 dB step 1							
12.4	1.3	17.7	2	100	xx	± 0.7 <sup>[3]</sup>	ST414 5xx 000
Available Attenuation Value: xx = 00 to 15 step 1, 20, 25, 30, 40 - 50 and 60 dB							
18	1.35	16.5	2	100	xx	± 0.4 <sup>[1]</sup>	ST414 5xx 161
Available Attenuation Value: xx = 00 to 20 dB step 1							

**Notes**

1. Up to xx = 6
2. Up to xx = 15
3. Up to xx = 14
4. ± 1.5 for xx = 20
5. ± 1.5 for xx = 12, 15, 20 and 30 dB



Attenuators

**MEDIUM POWER ATTENUATORS, UP TO 30 WATTS**

**7/16 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.35	16.5	25	5,000	xx	± 0.6 <sup>[1]</sup>	ST420 3xx 110
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**4.3/10 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.15	23.1	15	250	xx	± 0.3 <sup>[1]</sup>	ST415 6xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**BNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.3	17.7	15 <sup>[2]</sup>	250	xx	± 0.5	ST415 4xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**N - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.35	16.5	25	5,000	xx	± 0.6 <sup>[3]</sup>	ST417 3xx 110
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
-	-	-	30	2,000	xx	± 0.75 <sup>[3]</sup>	ST422 0xx 010
4	1.35	16.5	30 <sup>[4]</sup>	5,000	xx	± 0.6 <sup>[3]</sup>	ST417 3xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
8	1.25	19.1	15 <sup>[2]</sup>	250	xx	± 0.3	ST415 7xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
18	1.4	15.6	15 <sup>[2]</sup>	300	xx	± 0.5	ST416 0xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**NEX10 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
6	1.15	23.1	15	250	xx	± 0.3 <sup>[1]</sup>	ST415 8xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**SMA - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.35	16.5	25	5,000	xx	± 0.6 <sup>[3]</sup>	ST417 5xx 110
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
4	1.35	16.5	30 <sup>[4]</sup>	5,000	xx	± 0.6 <sup>[3]</sup>	ST417 5xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
8	1.25	19.1	15 <sup>[2]</sup>	250	xx	± 0.3	ST415 3xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
18	1.4	15.6	15 <sup>[2]</sup>	300	xx	± 0.5	ST416 1xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**Notes**

1. ± 0.6 for xx = 20
2. 12 for xx= 06 , 10 for xx = 10 and 20
3. Up to xx = 10
4. Conduction cooling type



Attenuators

**TNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
4	1.35	16.5	25	5,000	xx	± 0.6 <sup>[1]</sup>	ST417 6xx 110
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
6	1.25	19.1	30	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 0xx 010
4	1.35	16.5	30 <sup>[3]</sup>	5,000	xx	± 0.6 <sup>[1]</sup>	ST417 6xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
8	1.25	19.1	15 <sup>[2]</sup>	250	xx	± 0.3 <sup>[1]</sup>	ST415 5xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
18	1.4	15.6	15 <sup>[2]</sup>	300	xx	± 0.5	ST416 8xx 000
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**HIGH POWER ATTENUATORS, UP TO 100 WATTS**

**7/16 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST420 0xx 110
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
3	1.3	17.7	100	5,000	xx	± 1 <sup>[1]</sup>	ST420 7xx 110
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**N - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 0xx 110
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 7xx 118
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**N - 50 OHMS, MALE TO FEMALE, CONDUCTION AND CONVECTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	40 / 50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 0xx 120
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 7xx 128
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**N - 50 OHMS, MALE TO FEMALE, CONDUCTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 0xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 7xx 138
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**SMA - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 1xx 110
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 8xx 118
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
6	1.25	19.1	30	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 0xx 010
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
6	1.25	19.1	50	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 2xx 020
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
6	1.25	19.1	100	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 2xx 030
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							

Notes

1. Up to xx = 10

2. 12 for xx = 06, 10 for xx = 10 and 20

3. Conduction cooling type



Attenuators

**SMA - 50 OHMS, MALE TO FEMALE, CONDUCTION AND CONVECTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 1xx 120
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 8xx 128
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**SMA - 50 OHMS, MALE TO FEMALE, CONDUCTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 1xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 8xx 138
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**TNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 2xx 110
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 9xx 118
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
6	1.25	19.1	30	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 1xx 010
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
6	1.25	19.1	50	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 1xx 020
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
6	1.25	19.1	100	2,000	xx	± 0.75 <sup>[1]</sup>	ST422 2xx 030
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
6	1.25	19.1	150	2,000	xx	± 1 <sup>[1]</sup>	ST422 1xx 040
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							

**TNC - 50 OHMS, MALE TO FEMALE, CONDUCTION AND CONVECTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	40 / 50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 2xx 120
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	80 / 100	5,000	xx	± 1	ST417 9xx 128
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							

**TNC - 50 OHMS, MALE TO FEMALE, CONDUCTION COOLING**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)		NOM. ATTENUATION (DB)	MAX DEV.	PART NUMBER
			AVG. (W)	PEAK (W)			
3	1.35	16.5	50	5,000	xx	± 0.7 <sup>[1]</sup>	ST417 2xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							
2	1.25	19.1	100	5,000	xx	± 1	ST417 9xx 138
Available Attenuation Value: xx = 03, 06, 10 and 20 dB							
4	1.35	15.5	30	5,000	xx	± 0.6	ST417 6xx 130
Available Attenuation Value: xx = 03, 06, 10, 20 and 30 dB							

Notes

1. Up to xx = 10



Attenuators

**PLATINUM ATTENUATORS, UP TO 2 WATTS**

Radiall's platinum series of attenuators are designed for Test & Measurement applications. This range can be easily integrated in communication matrices, test benches and laboratories where high RF performance and reliability are essential.

**MAIN FEATURES OF RADIALL'S PLATINUM SERIES OF ATTENUATORS**

- 2 W power rating
- Frequency from DC up to 40 GHz
- 50 Ω Impedance
- Attenuation value from 0 to 30 dB
- Lowest VSWR for test applications
- Compatible with all standard Test & Measurement interfaces
- Connector interface according to applicable MIL, DIN, NF and CEI
- Full integration in Radiall Test & Measurement offer: electromechanical switches and TestPro cable assemblies



**SMA2.9 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)	IMPEDANCE (Ω)	NOM. ATTENUATION	MAX DEV.	PART NUMBER
40	1.45	14.71907141	2	50	xx	± 0.5 dB	ST413 3xx 150
Available Attenuation Value: xx = 03, 06, 10, 20, 30 dB							

**SMA3.5 - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)	IMPEDANCE (Ω)	NOM. ATTENUATION	MAX DEV.	PART NUMBER
26.5	1.35	16.53999636	2	50	xx	± 0.4 dB	ST413 2xx 150
Available Attenuation Value: xx = 03, 06, 10, 20, 30 dB							

**SMA - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)	IMPEDANCE (Ω)	NOM. ATTENUATION	MAX DEV.	PART NUMBER
18	1.3	17.69213163	2	50	xx	± 0.4 dB	ST413 8xx 150
Available Attenuation Value: xx = 03, 06, 10, 20, 30 dB							

**N - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)	IMPEDANCE (Ω)	NOM. ATTENUATION	MAX DEV.	PART NUMBER
18	1.12	24.9430923	2	50	xx	± 0.4 dB	ST414 7xx 150
Available Attenuation Value: xx = 03, 06, 10, 20, 30 dB							

**TNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)	IMPEDANCE (Ω)	NOM. ATTENUATION	MAX DEV.	PART NUMBER
12.4	1.1	26.44438589	2	50	xx	± 0.4 dB	ST414 5xx 150
Available Attenuation Value: xx = 03, 06, 10, 20, 30 dB							

**BNC - 50 OHMS, MALE TO FEMALE**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER RATING (W)	IMPEDANCE (Ω)	NOM. ATTENUATION	MAX DEV.	PART NUMBER
4	1.1	26.44438589	2	50	xx	± 0.4 dB	ST414 4xx 150
Available Attenuation Value: xx = 03, 06, 10, 20, 30 dB							



## INTRODUCTION

### COAXIAL COUPLERS

3 dB hybrid couplers and directional couplers are passive devices used in the microwave field. A directional coupler is a reciprocal four port device. When a signal is applied to its input port, it provides two amplitude ports, coupling is the ratio in dB of the incident power fed into the input port of the main line of the directional coupler to the coupled port of the secondary line when all ports are terminated on matched load. A 3 dB hybrid coupler is a special class of directional couplers in which signals at the two outputs are equal to split RF signal in two equal parts or to combine two RF signals on one port.

Directional couplers and power dividers have many applications, including; providing a signal sample for measurement or monitoring, feedback, combining feeds to and from antennas, antenna beam forming.

### SPECIAL DEVICES

#### Feed Through Terminations

These components are used to properly terminate a transmission line while testing with a high impedance measuring system such as an oscilloscope input.

#### Detectors

A detector is a two port device capable of supplying a low frequency signal on its output port (video), of a level proportional of the RF power applied to its input port. This proportionality is achieved by means of non linearity property of the diodes used which at low level supply a detected voltage proportional to the RF voltage.

#### Rotary Joints

These components provide the transition between two coaxial transmission lines rotating with respect to each other while retaining acceptable RF characteristics.

#### DC Blocks

DC blocks are composed of a capacitor inserted to the central conductor of the coaxial line. They block any DC or low frequency current present on the line.

#### Signal Samplers

These devices are used to sample part of an RF signal from a coaxial line. They are not directive, and sample incident and reflected energy.

#### Phase Shifters

These components create a mechanically adjustable phase shift by variation in the physical length of the transmission line.



## COUPLERS

### 3 DB 90° HYBRID COUPLERS

FREQUENCY (GHZ)	AMPLITUDE BALANCE (DB)	PHASE BALANCE	INPUT POWER (W)		MAX INSERTION LOSS (DB) ATTENUATION (DB)	MIN ISOLATION (DB)	VSWR MAX.	CONNECTORS MAIN / COUPLED	PART NUMBER
			AVG. <sup>[1]</sup>	PEAK <sup>[2]</sup>					
0.15 - 0.3	± 0.5	90° ± 0.5°	500	5,000	0.3	30	1.15	N f / N f	ST432 171 000
0.25 - 0.5	± 0.5	90° ± 5°	500	5,000	0.3	30	1.15	N f / N f	ST432 271 000
0.5 - 1	± 0.5	90° ± 5°	300	5,000	0.3	25	1.15	N f / N f	ST432 371 000
1 - 2	± 0.5	90° ± 5°	100	3,000	0.3	25	1.2	SMA f / SMA f	ST432 431 000
1 - 2	± 0.5	90° ± 5°	200	5,000	0.3	25	1.2	N f / N f	ST432 471 000
2 - 4	± 0.5	90° ± 5°	80	3,000	0.3	23	1.2	SMA f / SMA f	ST432 531 000
2 - 4	± 0.5	90° ± 5°	80	3,000	0.3	20	1.2	N f / N f	ST432 571 000
4 - 8	± 0.5	90° ± 5°	50	3,000	0.3	19	1.25	SMA f / SMA f	ST432 631 000
6 - 18	± 0.6	90° ± 6°	30	3,000	0.6	16	1.35	SMA f / SMA f	ST433 611 000
7 - 12.4	± 0.5	90° ± 6°	30	3,000	0.4	18	1.35	SMA f / SMA f	ST433 721 000
7 - 12.4	± 0.5	90° ± 6°	30	3,000	0.4	18	1.35	SMA f / SMA f	ST433 721 700
6 - 18	± 0.6	90° ± 6°	30	3,000	0.75	15	1.5	SMA f / SMA f	ST433 611 700
12.4 - 18	± 0.7	90° ± 6°	30	3,000	0.6	16	1.4	SMA f / SMA f	ST433 831 000
12.4 - 18	± 0.7	90° ± 6°	30	3,000	0.6	16	1.4	SMA f / SMA f	ST433 831 700

### DIRECTIONAL COUPLERS

(ALL DIRECTIONAL COUPLERS ARE LOADED WITH SMA 50 OHMS TERMINATION)

FREQUENCY (GHZ)	AMPLITUDE BALANCE (DB)	PHASE BALANCE	INPUT POWER (W)		MAX INSERTION LOSS <sup>[3]</sup> (DB) ATTENUATION (DB)	DIRECTIVITY (DB)	VSWR MAX. <sup>[4]</sup>	CONNECTORS MAIN / COUPLED	PART NUMBER
			AVG. <sup>[1]</sup>	PEAK <sup>[2]</sup>					
0.15 - 0.3	6 ± 0.3	± 0.8	500	5,000	2	30	1.10 / 1.10	N f / N f	ST432 172 000
0.15 - 0.3	10 ± 0.3	± 0.8	500	5,000	1	30	1.10 / 1.10	N f / N f	ST432 173 000
0.15 - 0.3	20 ± 0.3	± 0.8	500	5,000	0.4	23	1.10 / 1.10	N f / N f	ST432 174 000
0.15 - 0.3	30 ± 0.3	± 0.8	500	5,000	0.4	15	1.10 / 1.10	N f / N f	ST432 175 000
0.25 - 0.5	10 ± 0.3	± 0.8	500	5,000	1	30	1.12 / 1.12	N f / N f	ST432 273 000
0.25 - 0.5	20 ± 0.3	± 0.8	500	5,000	0.4	23	1.12 / 1.12	N f / N f	ST432 274 000
0.25 - 0.5	30 ± 0.3	± 0.8	500	5,000	0.4	15	1.12 / 1.12	N f / N f	ST432 275 000
0.5 - 1	6 ± 0.3	± 0.8	300	5,000	2	25	1.15 / 1.15	N f / N f	ST432 372 000
0.5 - 1	10 ± 0.3	± 0.8	300	5,000	1	27	1.15 / 1.15	N f / N f	ST432 373 000
0.5 - 1	20 ± 0.3	± 0.8	300	5,000	0.4	23	1.15 / 1.15	N f / N f	ST432 374 000
0.5 - 1	30 ± 0.3	± 0.8	300	5,000	0.4	15	1.15 / 1.15	N f / N f	ST432 375 000
1 - 2	6 ± 1.1	± 0.8	100	3,000	1.8	23	1.20 / 1.20	SMA f / SMA f	ST432 432 000
1 - 2	10 ± 0.3	± 0.8	100	3,000	1	23	1.15 / 1.15	SMA f / SMA f	ST432 433 000
1 - 2	30 ± 0.3	± 0.8	100	3,000	0.4	23	1.15 / 1.15	SMA f / SMA f	ST432 434 000
1 - 2	30 ± 0.3	± 0.8	100	3,000	0.4	15	1.15 / 1.15	SMA f / SMA f	ST432 435 000
1 - 2	6 ± 0.3	± 0.6	200	5,000	2.25 <sup>[1]</sup>	23	1.15 / 1.15	N f / N f	ST432 472 000
1 - 2	10 ± 0.3	± 0.8	200	5,000	1	23	1.15 / 1.15	N f / N f	ST432 473 000
1 - 2	20 ± 0.3	± 0.8	200	5,000	0.4	23	1.15 / 1.15	N f / N f	ST432 474 000
1 - 2	30 ± 1.1	± 0.8	200	5,000	0.4	23 (15)	1.15 / 1.15	N f / N f	ST432 475 000
1 - 1.1	30 ± 0.3	± 0.8	200	5,000	0.4	15	1.15 / 1.15	N f / N f	ST432 475 160
1 - 2	25 ± 0.3	± 0.8	200	5,000	0.4	23	1.15 / 1.15	N f / N f	ST432 476 160
2 - 4	10 ± 0.3	± 0.8	80	3,000	1	20	1.15 / 1.15	SMA f / SMA f	ST432 533 000
2 - 4	20 ± 0.3	± 0.8	80	3,000	0.4	20	1.15 / 1.15	SMA f / SMA f	ST432 534 000
2 - 4	20 ± 0.3	± 0.8	100 (80)	3,000	0.4	20	1.15 / 1.15	N f / N f	ST432 574 000
2 - 4	30 ± 1.1	± 0.8	80	3,000	0.4	20	1.15 / 1.15	SMA f / SMA f	ST432 535 000
4 - 8	10 ± 0.3	± 0.8	50	3,000	1	17	1.20 / 1.20	SMA f / SMA f	ST432 633 000
4 - 8	20 ± 0.3	± 0.8	50	3,000	0.4	17	1.20 / 1.20	SMA f / SMA f	ST432 634 000

**Notes**

1. At 25 °C
2. At 25 °C (1us - duty cycle 1%)
3. Coupling loss included
4. Main line / coupled line



**FLAT FREQUENCY RESPONSE DIRECTIONAL COUPLERS  
(ALL DIRECTIONAL COUPLERS ARE LOADED WITH SMA 50 OHMS TERMINATION)**

FREQUENCY (GHZ)	COUPLING (DB)	FREQUENCY SENSITIVITY [4] ± (DB)	INPUT POWER (W)		MAX INSERTION LOSS [5] (DB) ATTENUATION (DB)	DIRECTIVITY (DB)	VSWR MAX. [3]	CONNECTORS MAIN / COUPLED	PART NUMBER
			AVG. [1]	PEAK [2]					
0.9 - 2.1	10 ± 0.8	± 0.3	50	3,000	1	22	1.15 / 1.15	SMA f / SMA f	ST433 423 000
0.9 - 2.1	10 ± 0.8	± 0.3	50	3,000	1	22	1.15 / 1.15	SMA m / SMA f	ST433 423 202
0.9 - 2.1	10 ± 0.5	± 0.3	50	3,000	1	22	1.20 / 1.20	N f / N f	ST433 463 000
0.9 - 2.1	20 ± 0.8	± 0.3	50	3,000	0.4	22	1.15 / 1.15	SMA f / SMA f	ST433 424 000
0.9 - 2.1	10 ± 0.5	± 0.3	50	3,000	0.4	22	1.20 / 1.20	N f / N f	ST433 464 000
1.7 - 4.2	10 ± 0.8	± 0.3	50	3,000	1	20	1.20 / 1.20	SMA f / SMA f	ST433 523 000
1.7 - 4.2	10 ± 0.5	± 0.3	50	3,000	1	20	1.25 / 1.25	N f / N f	ST433 563 000
1.7 - 4.2	20 ± 0.8	± 0.3	50	3,000	0.4	20	1.20 / 1.20	SMA f / SMA f	ST433 524 000
1.7 - 4.2	20 ± 0.8	± 0.4	50	3,000	0.4	20	1.25 / 1.25	N f / N f	ST433 564 000
3.7 - 8.3	10 ± 0.5	± 0.3	50	3,000	1	18	1.25 / 1.25	SMA f / SMA f	ST433 623 000
3.7 - 8.3	10 ± 0.5	± 0.3	50	3,000	1	18	1.30 / 1.30	N f / N f	ST433 663 000
3.7 - 8.3	20 ± 0.5	± 0.3	50	3,000	0.4	18	1.25 / 1.25	SMA f / SMA f	ST433 624 000
3.7 - 8.3	20 ± 0.5	± 0.3	50	3,000	0.4	18	1.30 / 1.30	N f / N f	ST433 664 000
2 - 8	10 ± 1	± 0.4	50	3,000	1	20	1.25 / 1.25	SMA f / SMA f	ST433 513 700
2 - 8	20 ± 1	± 0.4	50	3,000	0.4	20	1.25 / 1.25	SMA f / SMA f	ST433 514 700
8.5 - 10	10 ± 0.5	± 0.2	25	1,500	1.5	20	1.35 / 1.35	SMA f / TNC f	ST433 706 000
7 - 12.4	10 ± 0.8	± 0.3	50	3,000	1	16	1.30 / 1.30	SMA f / SMA f	ST433 723 000
7 - 12.4	10 ± 1	± 0.5	50	3,000	1	16	1.30 / 1.30	SMA f / SMA f	ST433 723 700
7 - 12.4	20 ± 0.8	± 0.3	50	3,000	0	16	1.30 / 1.30	SMA f / SMA f	ST433 724 000
7 - 12.4	20 ± 1	± 0.5	50	3,000	0.4	16	1.30 / 1.30	SMA f / SMA f	ST433 724 700
7 - 12.4	30 ± 0.8	± 0.3	50	3,000	0.4	17	1.30 / 1.30	SMA f / SMA f	ST433 725 000
2 - 18	10 ± 1	± 0.6	20	3,000	1.4	12	1.35 / 1.50	SMA f / SMA f	ST433 503 000
6 - 18	6 ± 1	± 0.5	50	3,000	2.2	15	1.40 / 1.40	SMA f / SMA f	ST433 612 700
6 - 18	10 ± 0.5	± 0.5	50	3,000	1	17	1.35 / 1.35	SMA f / SMA f	ST433 613 000
6 - 18	10 ± 1	± 0.5	50	3,000	1.1	16	1.40 / 1.40	SMA f / SMA f	ST433 613 700
6 - 18	20 ± 1	± 0.5	50	3,000	0.6	15	1.40 / 1.40	SMA f / SMA f	ST433 614 700
10 - 15	10 ± 1	± 0.5	50	3,000	1	15	1.35 / 1.35	SMA f / SMA f	ST433 823 000
10 - 15	20 ± 1	± 0.5	50	3,000	0.4	20	1.35 / 1.35	SMA f / SMA f	ST433 824 000
12.4 - 18	6 ± 1	± 0.5	50	3,000	2.2	15	1.40 / 1.40	SMA f / SMA f	ST433 832 000
12.4 - 18	6 ± 1	± 0.5	50	3,000	2.2	15	1.40 / 1.40	SMA f / SMA f	ST433 832 700
12.5 - 18	10 ± 0.8	± 0.3	50	3,000	1	18	1.30 / 1.30	SMA f / SMA f	ST433 833 000
12.4 - 18	10 ± 1	± 0.5	50	3,000	1.1	15	1.35 / 1.35	SMA f / SMA f	ST433 833 700
12.4 - 18	20 ± 1	± 0.5	50	3,000	0.55	15	1.35 / 1.35	SMA f / SMA f	ST433 834 700
12.4 - 18	30 ± 0.1	± 0.5	50	3,000	0.5	15	1.35 / 1.45	SMA f / SMA f	ST433 835 000

**SPECIAL DEVICES**

**FEED THROUGH TERMINATION BNC - 50 AND 75 OHMS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	RETURN LOSS MIN. (DB)	POWER		IMPEDANCE (Ω)	CONNECTORS MAIN / COUPLED	PART NUMBER
			AVG. (W)	PEAK (W)			
1	1.35	16.5	2	1,000	50 ± 5%	m / f Straight	ST405 005 000
1	1.5	16.5	2	1,000	50 ± 5%	m / f Right Angle	ST405 035 000
1	1.35	16.5	2	1,000	75 ± 5%	m / f Straight	ST405 006 000

**WIDE BAND DETECTORS (ALL DETECTORS USE SCHOTTKY ZERO BIAS DIODE - THEY ARE 50 OHMS -12DBM. CW = 200 MW, PEAK POWER 2 W)**

FREQUENCY (GHZ)	CONNECTORS		PART NUMBER	
	INPUT HF	OUTPUT VIDEO	NEGATIVE	POSITIVE
0.01 - 18	SMA m	SMB m	R451 533 000	ST451 533 500
0.01 - 18	SMA m	SMC m	R451 534 000	ST451 534 500
0.01 - 18	SMA m	SMA f	R451 542 000	ST451 542 500
0.01 - 18	SMA m	Pin	R451 543 000	ST451 543 500
0.01 - 18	SMA m	BNC f	R451 544 000	ST451 544 500
0.01 - 12.4	N m	BNC f	R451 574 000	ST451 574 500
0.01 - 18	N m	BNC f	R451 576 000	ST451 576 500
2.45	N m	BNC f	R451 572 120	-

**Notes**

1. At 25°C

2. At 25°C (1us - duty cycle 1%)

3. Main line / coupled line

4. Frequency sensitivity is included in coupling

5. Coupling loss included



**HIGH SENSIBILITY DETECTORS (ALL DETECTORS USE SCHOTTKY ZERO BIAS DIODE - THEY ARE 50 OHMS -12DBM. CW = 200 MW, PEAK POWER 2 W)**

FREQUENCY (GHZ)	CONNECTORS		PART NUMBER	
	INPUT HF	OUTPUT VIDEO	NEGATIVE	POSITIVE
1 - 18	SMA m	SMB m	ST451 030 000	ST451 030 500
1 - 18	SMA m	SMC m	ST451 031 000	ST451 031 500
1 - 18	SMA m	SMA f	ST451 032 000	ST451 032 500
1 - 18	SMA m	Pin	ST451 033 000	ST451 033 500
1 - 18	SMA m	BNC f	ST451 034 000	ST451 034 500

**DIODE HOLDER DETECTORS**

FREQUENCY (GHZ)	CONNECTORS		PART NUMBER	
	INPUT HF	OUTPUT VIDEO	NEGATIVE	POSITIVE
0.01 - 4	N m	BNC f	ST451 570 000	ST451 570 500
0.01 - 10	N m	BNC f	ST451 075 000	-

**ROTARY JOINTS**

FREQUENCY DC TO (GHZ)	VSWR MAX.	MAX V.S.W.R. VARIATION PER TURN	INSERTION LOSS (DB) MAX.	POWER MAX (W)	PART NUMBER
18	1.5	1.02	0.60	50	ST447 120 000
18	1.5	1.02	0.80	40	ST447 171 000

**DC BLOCKS: INNER CONDUCTOR BLOCK TYPE**

FREQUENCY (GHZ)	CAPACITANCE (PF)	VSWR MAX.	INSERTION LOSS (DB) MAX.	CONNECTORS	MAIN LINE MAX DC VOLTAGE (VOLTS)	PART NUMBER
0.01 - 6	4700	1.40	0.60	SMA m/f	60	ST443 131 000
0.01 - 2	4700	1.15	0.20	SMA m/f	100	ST443 132 000
1 - 12.4	100	1.25	0.50	SMA m/f	250	ST443 134 000
0.01 - 6	4700	1.40	0.60	BNC m/f	60	ST443 141 000
3 - 5	-	1.30	0.20	TNC m/f	250	ST443 150 000
0.01 - 6	4700	1.40	0.60	TNC m/f	60	ST443 151 000
0.01 - 6	4700	1.40	0.60	N m/f	60	ST443 171 000
0.01 - 6	4700	1.40	0.60	QMA m/f	60	ST443 191 000
0.5 - 22	180	1.25	0.50	SMA m/f	100	ST443 137 000
0.1 - 40	180	1.35	0.60	SMA2.9	100	ST443 162 000

**MONITOR TEES**

FREQUENCY (GHZ)	NOMINAL CAPACITY (PF)	VSWR MAX.	INSERTION LOSS (DB) MAX.	MAX AVERAGE POWER (W)	CONNECTORS	PART NUMBER
0.1 - 1.5	4700	1.30	0.25	10	SMA	ST443 530 000
0.9 - 3	10	1.25	0.25	10	SMA	ST443 533 480
1.5 - 6	10	1.20	0.40	40	SMA	ST443 533 000
6 - 12.4	3.5	1.35	0.50	25	SMA	ST443 536 000



Couplers & Special Devices

**SIGNAL SAMPLERS**

FREQUENCY DC TO (GHZ)	COUPLING VARIATION (W)	VSWR MAX.	INSERTION LOSS (DB) MAX.	CONNECTORS MAIN LINE	CONNECTOR COUPLED LINE	PART NUMBER
12	6 / Octave	1.50	0.20	N Male/Female	BNC	ST435 270 000 <sup>[1]</sup>
12	6 / Octave	1.50	0.20	N Male/Female	BNC	ST435 170 000 <sup>[2]</sup>
12	6 / Octave	1.50	0.20	N Male/Female	BNC	ST435 470 000 <sup>[3]</sup>

**PHASE SHIFTERS**

FREQUENCY DC TO (GHZ)	TOTAL PHASE VARIATION	VSWR MAX.	CONNECTORS	PART NUMBER
18	180° (18 GHz)	1.30	SMA Male / Female	ST499 103 000
18	180° (18 GHz)	1.30	SMA Male to S.R. .141 Cable	ST499 101 000
1 - 1.1	-	1.25	N Male / Female	ST499 102 410
18	-	1.05 + 0.014 x F(GHz)	SMA Male / Female	ST499 100 000

*Notes*

1. Loop probe
2. Resistive loop probe
3. Capacitive probe



Cryogenic Microwave Components

**INTRODUCTION**

To support the growing demands of 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 combines a solution for microwave components, RF connectors, cable assemblies, switches and fiber optics with emerging technology to solve application challenges like densification, thermalization to some tens of milliKelvin, networking and integration, miniaturization and non-magnetism.



Radiall's cryogenic components use proprietary/specific technologies to withstand lower temperatures up to tens of milliKelvin. These technologies have been proven in the laboratory and in the field.

**CRYO ATTENUATORS**

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

**INFRARED FILTERS**

The primary objective of these filters is to block infrared radiation (undesired frequency range) between two stages of the cryostat, which is the containment enclosure of a quantum computer. Typically, there are five stages at different temperatures. Starting from the top and descending to the bottom stage, which approaches absolute zero (-273 °C), where the Qubits are located. These filters need to allow the RF signal to pass from one stage to another while preventing the propagation of infrared radiation. This is crucial for the proper functioning and extended lifespan of the Qubits.

**SMA CRYOGENIC ATTENUATORS**

FREQUENCY	VSWR MAX	POWER RATING (W)		NOM. ATTENUATION (dB)	MAX DEV	OPERATING TEMPERATURE (K)	PART NUMBER
		AVG. (W)	PEAK (W)				
18	1.35	2	100	0	0.3	0.01/400	ST429 800 000
18	1.35	2	100	3	0.6	0.01/400	ST429 803 000
18	1.35	2	100	6	0.6	0.01/400	ST429 806 000
18	1.35	2	100	10	0.6	0.01/400	ST429 810 000
18	1.35	2	100	20	0.6	0.01/400	ST429 820 000

**SMA CRYOGENIC INFRARED FILTERS**

FREQUENCY	RETURN LOSS	INSERTION LOSS	OPERATING TEMPERATURE (K)	PART NUMBER
15	0 - 8 GHz: 18 dB min 8 - 15 GHz: 15 dB min	DC - 5 GHz: 0.6 dB max Linear increase after 5 GHz	0.01/350	ST438 538 101
15	0 - 8 GHz: 18 dB min 8 - 15 GHz: 15 dB min	DC - 5 GHz: 2 dB max Linear increase after 5 GHz	0.01/350	ST438 538 100