

RF Connectors

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HFIR



RF Connectors Choices

- Cables, attenuators, and connectors have caused more LLRF system down-time than any other element at the Spallation Neutron Source.
- RF connectors are normally not high on the list as an exciting design element but will greatly effect system performance.
- Front panel space, rather than how good the connector specifications are, dictates what connectors we use.
- There are not many high-density RF connector choices available.



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Standard Type Connectors

- **BNC (Bayonet Neil-Concelman)**
- **C Connector (Concelman)**
- **F Connector**
- **HN Connector (High-voltage version of the N connector)**
- **LC Connector (type of large screw connector)**
- **N Connector (Neil)**
- **Spinner Connector (7-16 inch Spinner connector)**
- **TNC Connector (Threaded Neil-Concelman)**
- **UHF Connector (also known as an “M-Type” connector)**



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Miniature Type Connectors

- **Miniature BNC connectors**
- **Miniature UHF connectors**
- **DIN 47223 connectors**
- **U.FL connectors**



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Sub-miniature Type Connectors

- **MMCX connector (smaller version of the MCX)**
- **MCX connector**
- **FME connector**
- **SMA connector**
- **SMB connector**
- **SMC connector**
- **SMP connector**



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Connector Frequency Range Chart

HF Band	VHF Band	UHF Band	L Band	S Band	C Band	X Band	Ku Band	K Band	Ka Band	V to W Bands
3-30 MHz	30-300 MHz	.3 to 1 GHz	1 to 2 GHz	2 to 4 GHz	4 to 8 GHz	8 to 12.4 GHz	12.4 to 18 GHz	18 to 26 GHz	26 to 40 GHz	40 to 100 GHz
	BNC TWINAX									
	TWINAX									
	FME									
		UHF								
			1.6 / 5.6							
			F							
			LC							
			BNC (75-OHM)							
				10-32						
				Mini-UHF						
					BNC (50-OHM)					
					HN					
					RP-BNC					
					RP-TNC					
					SMB (50-OHM)					
					SMB (75-OHM)					
					MCX (50-OHM)					
					MCX (75-OHM)					
					MMCX					
					7/16 DIN					
						GR874				
						GR900				
						1.0 / 2.3				
						SMC (50-OHM)				
						SMC (75-OHM)				
						C				
						SC				
						N (50-OHM)				
						RP-N				
						TNC				
						SSMB				
							7mm (APC-7)			
							RP-SMA			
							SMA			
								3.5mm (APC-3.5)		
								2.9mm		
								SMP		
								SSMA		
								2.4mm		
									1.85mm	



TestParts
www.TestParts.com
RF Microwave Parts & Electronic Test Equipment

For Reference Only - Information Not Verified

Amateur (Ham) Radio Bands	
160m	1.80 to 2.00 MHz
80m	3.50 to 4.00 MHz
60m	5.30 to 5.40 MHz
40m	7.00 to 7.30 MHz
30m	10.10 to 10.15 MHz
20m	14.00 to 14.35 MHz
15m	21.00 to 21.45 MHz
12m	24.89 to 24.99 MHz
10m	28.0 to 29.70 MHz
6m	50.00 to 54.00 MHz
2m	144 to 148 MHz
70cm	430 to 440 MHz
23cm	1240 to 1300 MHz



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Blind-Mate High-Density Connectors

- Limited offerings available
- Must transition from small cable (.085, .141, LMR, etc) to lower loss, more durable cable for system runs
- Many are difficult to terminate properly
- Expensive
- Difficult to procure and no second source available



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Applied Engineering Products

- **SMP blind-mate interconnect system.**
- **Ultra-miniature**
- **Center-to-center spacing as low as 4.8mm**
- **Use with .086" and .047" semi-rigid cable.**



Aeroflex/Weinschel

- **Planar Blind-mate connector that interfaces with standard SMA connectors.**
- **Usable to 40.0 GHz**
- **Does not terminate directly to a cable type.**
- **Size is still an issue for number of connections that will fit available space.**



Phoenix Company of Chicago

- 41612 DIN-style connector
- Available with a D-shell housing with up to 8 connections
- Flexible & semi-rigid cables
- Usable to 32 GHz
- Difficult to properly terminate
- Long lead-times



SNS LLRF System

- At SNS, we used the PKZ 26 series coax contacts with their 8-pin D-subminiature connector housing.
- This provided for good connector density and ease in mating of all necessary RF cables with only two screws to attach.
- The connector design is useful up to 32 GHz and maintains a constant impedance from initial mating to full seating.
- Issues with proper termination of ground braid can cause a 0.5dB shift in attenuation.
- Difficult to properly provide stress relief of cables.

Some RF Connector Suppliers

- Aeroflex/Weinschel - <http://www.weinschel.com>
- Amphenol RF - <http://www.amphenolrf.com>
- Gore & Associates - <http://www.gore.com>
- Kings Electronics - <http://www.kingselectronics.com>
- Phoenix Co. of Chicago - <http://www.phoenixofchicago.com>
- Radiall – <http://www.radiall.com>
- RF Connectors - <http://www.rfcoaxconnectors.com>
- SV Microwave - <http://www.svmicrowave.com>



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