OVERVIEW OF CONNECTOR TYPES

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INTRODUCTION

There are hundreds of connectors that can be used in RF applications. Detailed here is a selection of the most common ones, with maximum frequencies from 100 MHz to 110 GHz.

This table summarizes the maximum frequencies, compatibilities, and torque specifications for the connectors.

Connector	Max Frequency	Torque (in-pounds)	Compatibility
Type F	3 GHz	15	
BNC	4 GHz	N/A	
FAKRA	6 GHz	N/A	
7/16 DIN	6 GHz	221	
N	11 GHz	15-20	
SMA	18 GHz	7-10	3.5mm, 2.92mm
3.5mm	26.5 GHz	7-10	SMA, 2.92mm
2.92mm	40 GHz	7-10	SMA, 3.5mm
2.4mm	50 GHz	7-10	1.85mm
1.85mm	67 GHz	7-10	2.4mm
1.0mm	110 GHz	7-10	

F CONNECTORS

- 75Ω connector
- Used extensively in the cable TV industry
- Up to 3GHz

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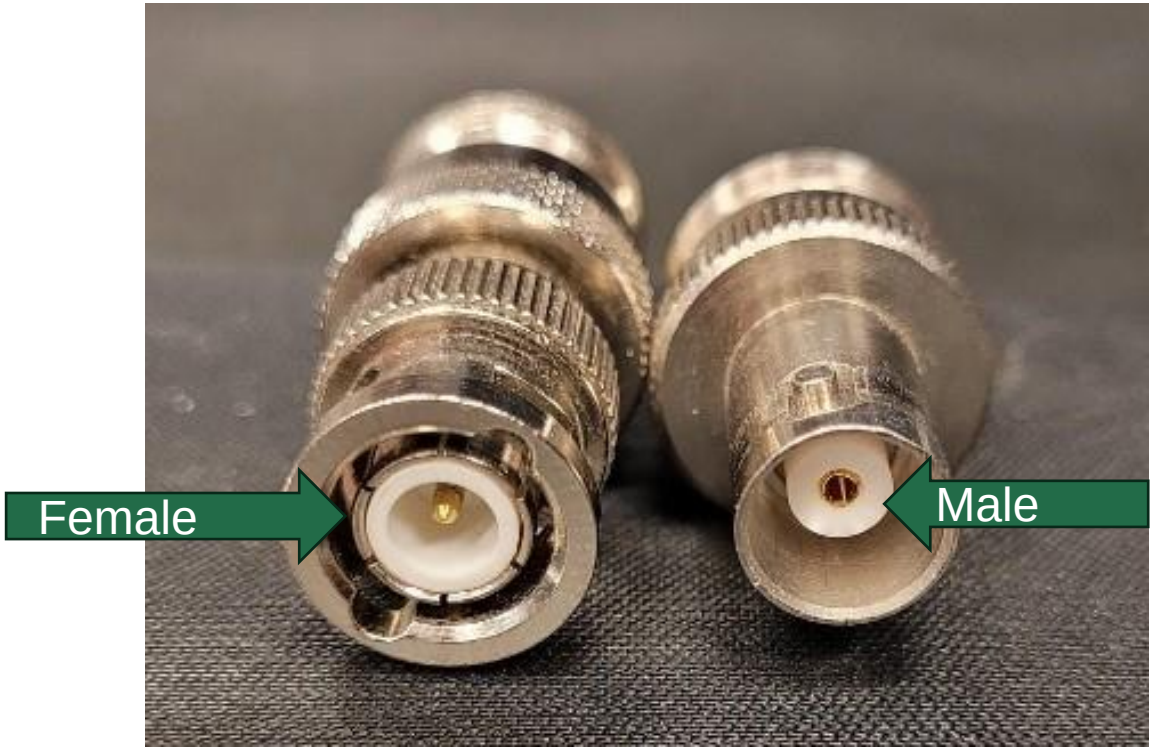
BNC

- Bayonet Neill-Concelmann
- Up to 4GHz
- Can operate to about 11GHz, but there will be significant radiation from the open slots on the side
- Not great repeatability due to loose mechanical tolerances
- Available in 50 and 75Ω



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FAKRA

- Generally used in automotive applications
- Up to 6GHz

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7/16 DIN

- Most often used in land mobile radio applications
- Higher voltage breakdown than N connector (2,700 vs 500 VRMS) – highly suitable for high RF power connections
- Up to 7.5 GHz
- Torque specification: 221 in-pounds for field use, 20 in-pounds for lab testing

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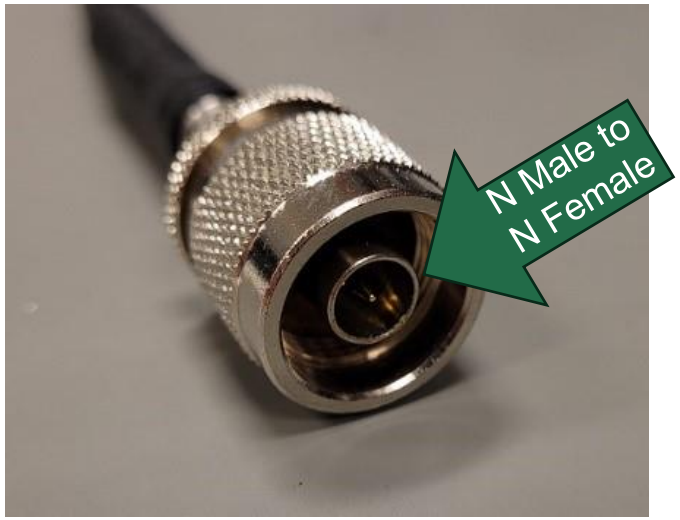
N TYPE CONNECTOR

- Up to 11GHz
  - With certain manufacturing enhancements: up to 18 GHz
- Comes with knurling for hand tightening and a hex configuration for wrench tightening
- Torque specification: 15-20 inch-pounds



- F70
- FN50-4
- FN50-8
- M70
- MN50-4
- MN50-72

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SMA CONNECTORS

- Mode-free up to 18GHz
- PTFE dielectric clearly visible (differentiates from higher performance 3.5mm)
- Torque specification: 7-10 in-pounds for stainless steel shell and 3-5 in-pounds for brass

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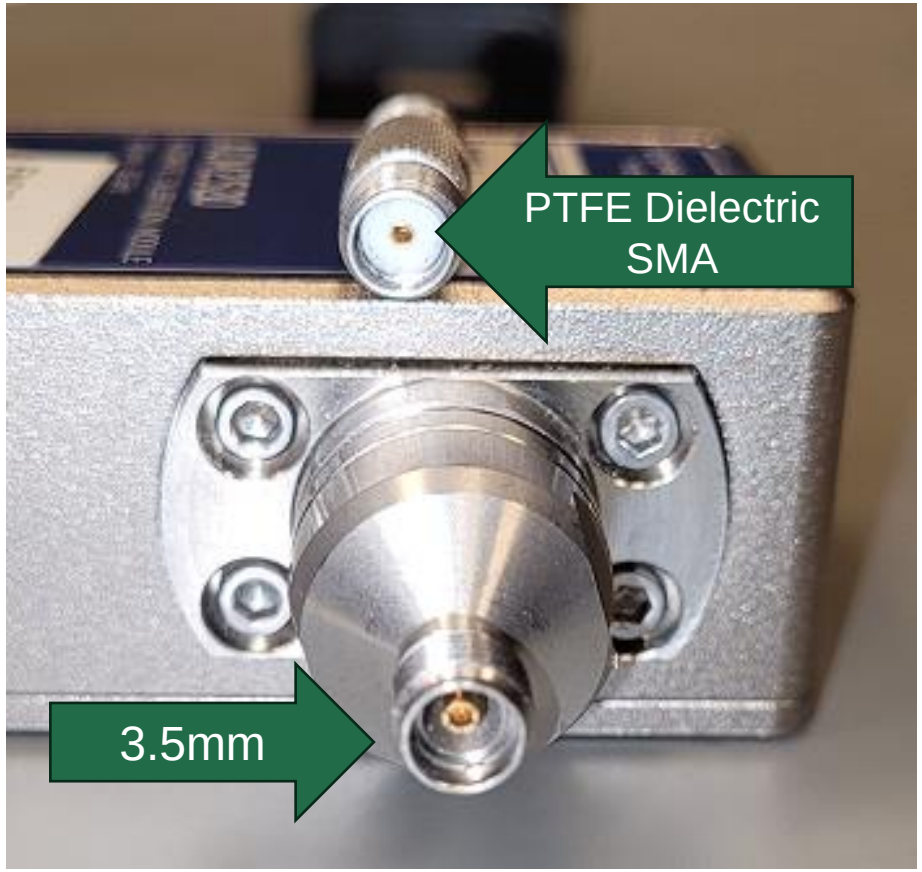
3.5MM CONNECTOR

- Air dielectric connector
- Mode-free operation up to 26GHz
- Mechanically compatible with 2.92mm
- Torque specification: 7-10 in-pounds

- F3.5T
- F35
- M3.5T
- M35
-P35F35M.2
- PHDM.434542.002



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2.92MM CONNECTOR

- Air dielectric connector
- Operates up to 40GHz
- Mechanically compatible with 3.5mm
- Torque specification: 7-10 in-pounds

- 29DM
- C001
- PCB29

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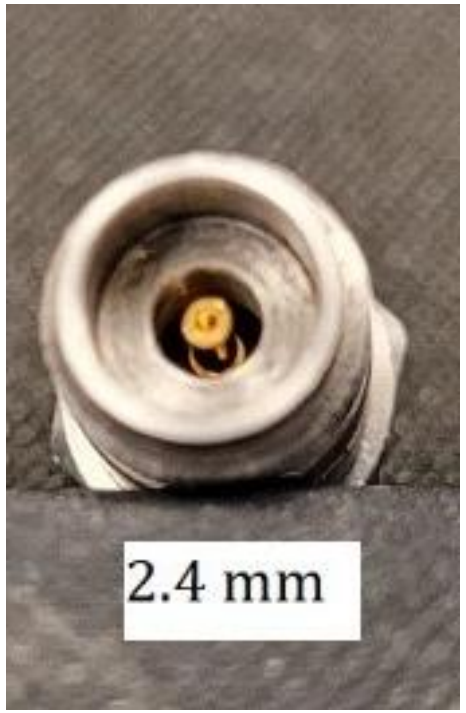
2.4MM CONNECTOR

- Up to 50 GHz
- Mechanically compatible with 1.85mm (NOT 2.92 or 3.5!)
- Torque specification: 7-10 in-pounds



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1.85MM CONNECTOR

- Up to 67 GHz
- Mechanically compatible with 2.4mm
- Torque specification: 7-10 in-pounds

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1MM CONNECTOR

- Highest frequency coaxial connector available
- Up to 110 GHz
- Very fragile and expensive
- Torque specification: 7-10 in-pounds

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TORQUE WRENCHES

- Two sizes and two torques
- Cable connectors are 19mm
- Some NMD and some adapters are 20mm
- Higher torque for stainless DUT connector
- Lower for Gold

TW-N N-Type Torque Wrench

The TW-N is a N-Type, proof coupling torque wrench used to properly install or disassemble a wide range of coaxial connectors.

HEX	Torque	Description
19mm - 3/4"	1.35 Nm - 12 in. lbs	N stainless to N stainless (CMT R60, R140, R180, N612, and N912 is equipped with N male and 19mm HEX. 19mm is also used for APC-7 / 7mm connectors)
19mm - 3/4"	0.9 Nm - 8 in. lbs	N stainless to N nickel/silver plated (DUT) (19mm is also used for APC-7 / 7mm connectors)
20mm - 25/32"	1.35 Nm - 12 in. lbs	N stainless to N stainless
20mm - 25/32"	0.9 Nm - 8 in. lbs	N / NMD stainless to NMD stainless or N nickel/silver plated (DUT)

TORQUE WRENCHES

- This cable for the S5243 requires a 19mm torque wrench for the NMD even though it says nothing about this on the spec sheet
- Recommend the 12 in/lb torque

C5024NMDF24M Test Cable

2 Foot Cable

Electrical Specifications

Frequency Range	DC - 50 GHz
Impedance	50 Ω
Max. Insertion Loss	4.16 dB (at 20°C)
Max. Return Loss	1.43:1

Mechanical Specifications

Connector	50 Ω, 2.4 NMD female and 2.4 mm male
Length	2 ft
Min. Static Bending Radius	25 mm
Min. Dynamic Bending Radius	50 mm
Life (Connectors)	5000 cycles
Crush Resistance	>4,460 N/100m
Temperature Range	-40 to +70°C

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TORQUE WRENCHES

- This N to N cable requires a 19mm torque wrench
- 12 or 8 in/lb torque depending on the DUT connector

C50NMNM Test Cable

2 Foot Cable

Electrical Specifications

Frequency Range	DC - 18 GHz
Impedance	50 Ω
Insertion Loss	
DC - 2.5 GHz	0.4 dB typ., 0.6 dB max
2.5 GHz - 6 GHz	0.7 dB typ., 1.0 dB max
6 GHz - 12 GHz	1.1 dB typ., 1.4 dB max
12 GHz - 18 GHz	1.4 dB typ., 1.8 dB max
Return Loss	
DC - 2.5 GHz	23 dB min, 30 dB typ.
2.5 GHz - 6 GHz	20 dB min, 30 dB typ.
6 GHz - 12 GHz	17 dB min, 27 dB typ.
12 GHz - 18 GHz	17 dB min, 27 dB typ.

5 Foot Cable

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TORQUE WRENCHES

- This N to SMA cable requires a 12 in/lb 19mm torque wrench for the N and a 5 or 8 in/lb SMA wrench depending on the DUT connector

C50SMNM Test Cable

2 Foot Cable

Electrical Specifications

Frequency Range	DC - 18 GHz
Impedance	50 Ω
Insertion Loss	
DC - 2.5 GHz	0.4 dB typ., 0.6 dB max
2.5 GHz - 6 GHz	0.7 dB typ., 0.95 dB max
6 GHz - 12 GHz	1.1 dB typ., 1.4 dB max
12 GHz - 18 GHz	1.4 dB typ., 1.75 dB max
Return Loss	
DC - 2.5 GHz	23 dB min, 30 dB typ.
2.5 GHz - 6 GHz	20 dB min, 30 dB typ.
6 GHz - 12 GHz	17 dB min, 27 dB typ.
12 GHz - 18 GHz	17 dB min, 27 dB typ.

4 Foot Cable

Electrical Specifications

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TORQUE WRENCHES

- This 2.92mm Cable can be torqued to either 5 or 8 in/lbs depending on the DUT connector

C50292MM.2 Test Cable

2 Foot Cable

Electrical Specifications

Frequency Range	DC - 40 GHz
Impedance	50 Ω
Max. Insertion Loss	2.34 dB (at 40 GHz at 20°C)
Max. Return Loss	1.40:1 (-15.57 dB)

Mechanical Specifications

Connector	50 Ω, 2.92 mm male and 2.92 mm male
Length	2 ft
Min. Static Bending Radius	25 mm
Min. Dynamic Bending Radius	50 mm
Life (Connectors)	5000 cycles
Temperature Range	-55 to +125°C

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