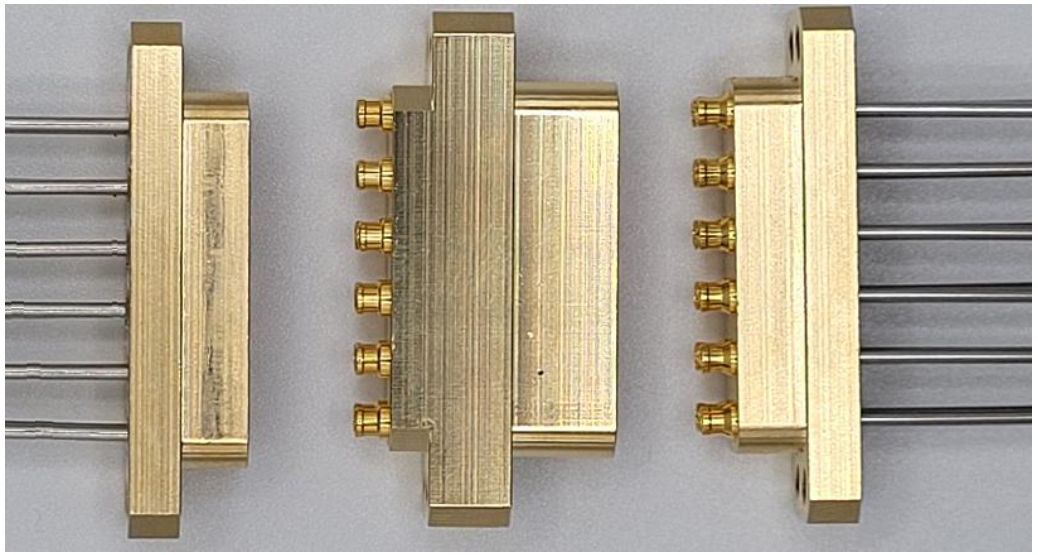
CryoCoax
An Intelliconnect Brand

Q-CON

High Density Connector



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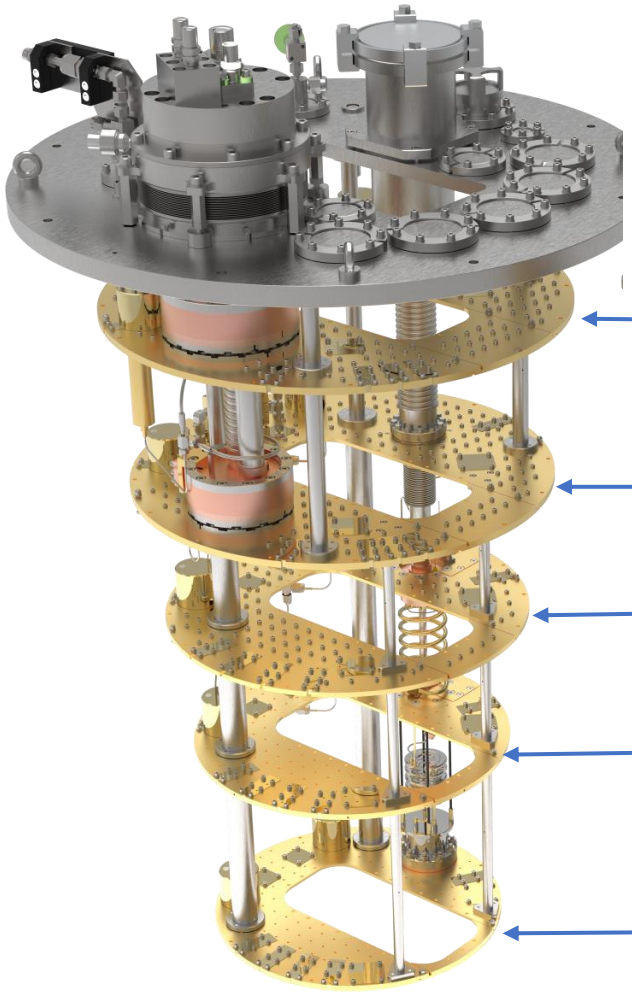
Schematic of a typical Cryogen-free ULT Fridge with components for microwave measurements



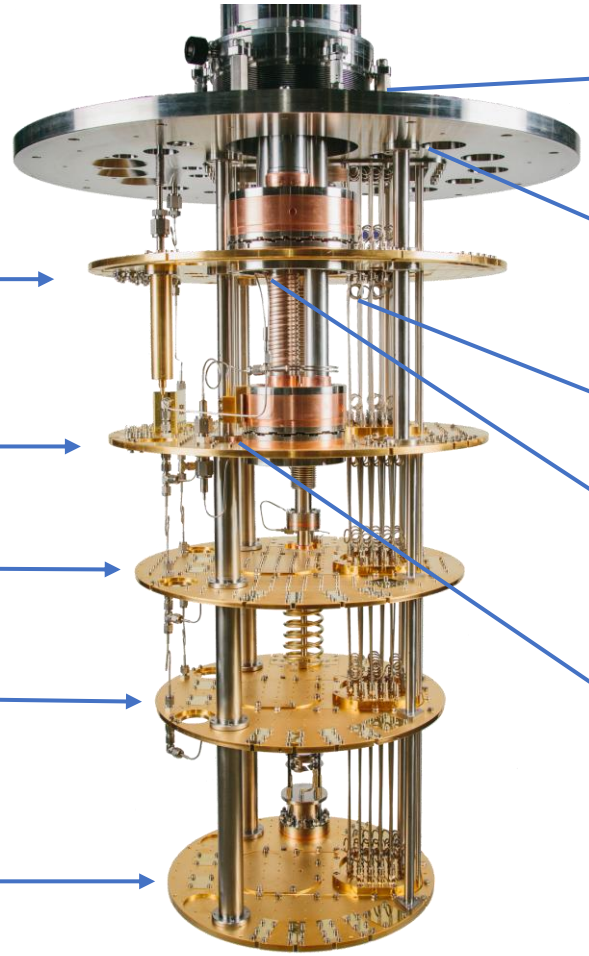
~ 60 K

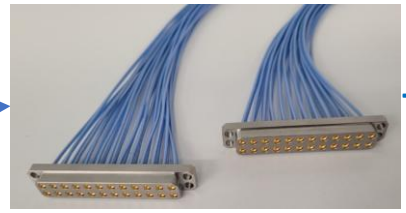
~ 4 K

~ 0.7 K

~100 mK

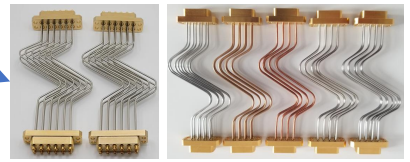
< 10 mK





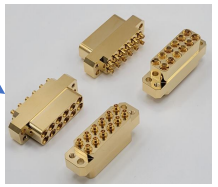
Room Temperature Cables

Hermetic Plate



Low Temperature Cables

Thermalized Feedthrough Connectors



Coaxial Attenuators

The Fridge image courtesy of Oxford Instruments

OXFORD INSTRUMENTS

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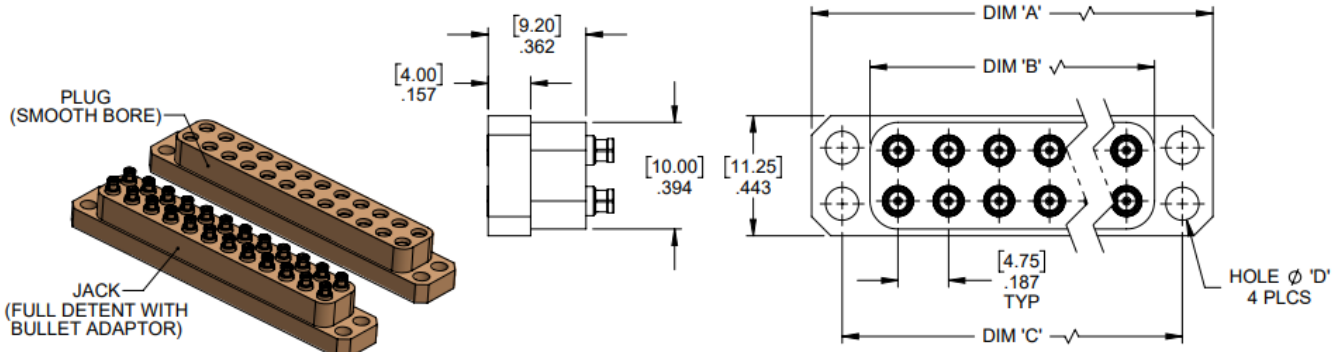
Q-CON Connectors

MATERIAL PROPERTIES:
BODY: COPPER PER CW004A
INTERFACE: BERYLLIUM COPPER PER ASTM B196 OR EQUIVALENT

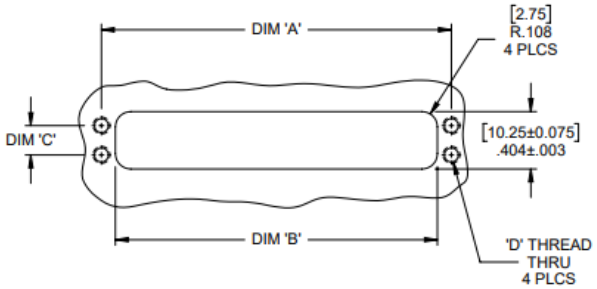
PLATING PROPERTIES:
BODY/INTERFACE: .000040 MIN. GOLD PER MIL-G-45204 OVER
.000050 MIN. COPPER PER MIL-C-14550

CONNECTOR MEETS: MIL-STD-348 FIG. 328-2
CONNECTOR MEETS: RoHS 3 2015/863/EU STANDARDS
CONNECTOR DURABILITY: 100 CYCLES MIN.
CABLE: .047" CRYOGENIC SEMI RIGID CABLES
IMPEDANCE: 50 OHMS NOMINAL
FREQUENCY RANGE: DC-40 GHz

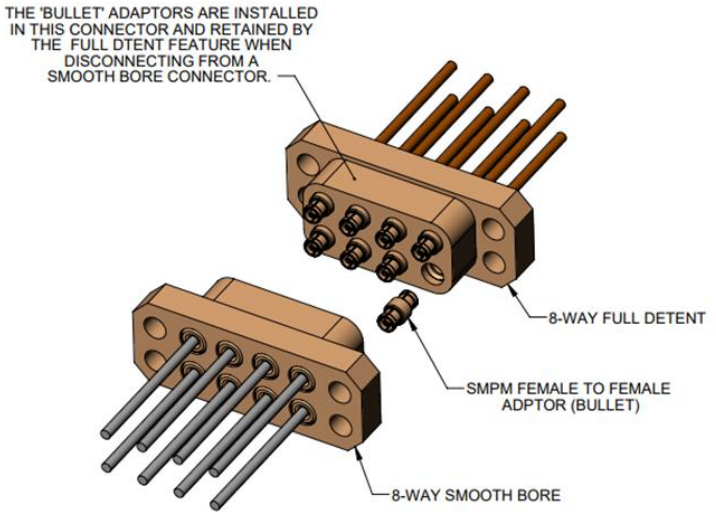


VERSION	CONFIGURATION	DIM 'A' ±.003	DIM 'B' ±.002	DIM 'C' ±.002	HOLE ∅ 'D'
8-WAY	2x4	1.181 (30.00)	.768 (19.50)	.955 (24.25)	.114 (2.90)
10-WAY	2x5	1.368 (34.75)	.955 (24.25)	1.142 (29.00)	.114 (2.90)
12-WAY	2x6	1.555 (39.50)	1.142 (29.00)	1.329 (33.75)	.114 (2.90)
16-WAY	2x8	1.929 (49.00)	1.516 (38.50)	1.703 (43.25)	.114 (2.90)
24-WAY	2x12	2.697 (68.50)	2.264 (57.50)	2.470 (62.74)	.122 (3.10)

MOUNTING HOLE DIMENSIONS



VERSION	DIM 'A' ±.002"	DIM 'B' ±.003	DIM 'C' ±.002	'D' THREAD
8-WAY	.955 (24.25)	.778 (19.75)	.187 (4.75)	M2.5x0.45
10-WAY	1.142 (29.00)	.965 (24.50)	.187 (4.75)	M2.5x0.45
12-WAY	1.329 (33.75)	1.152 (29.25)	.187 (4.75)	M2.5x0.45
16-WAY	1.516 (38.50)	1.338 (34.00)	.187 (4.75)	M2.5x0.45
24-WAY	2.470 (62.75)	2.27 (57.75)	.207 (5.25)	M3x0.5



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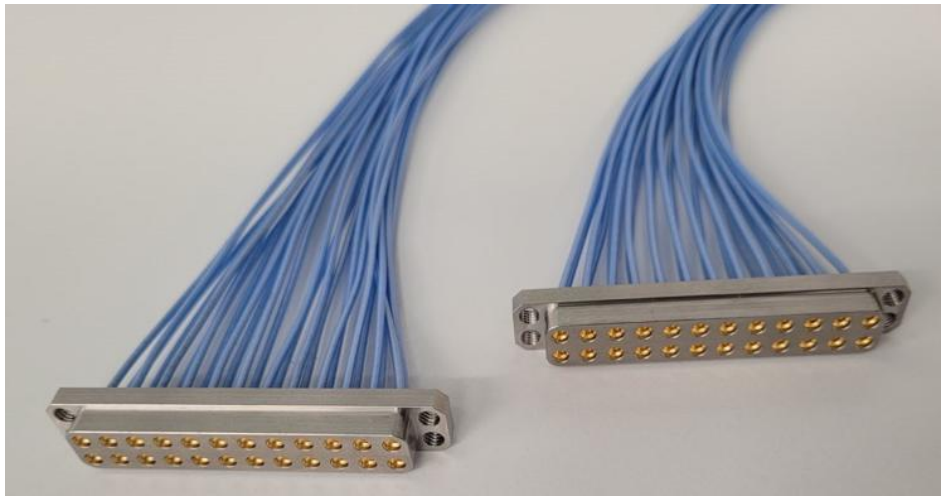
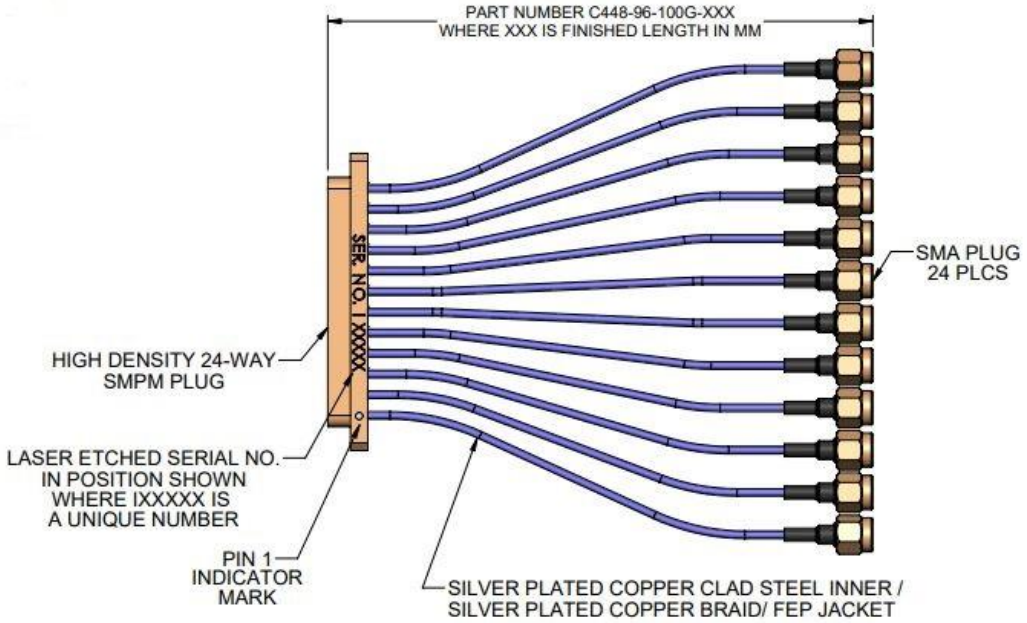
RT Instrumentation Cables



These cables allow connections at room temperature between the instrumentation and the top plate of the fridge. These are flexible .047” with an FEP outer jacket using silver plated copper conductors. They’re usually configured to have a Q-CON HD connector one end and SMA connectors at the other end but can be customised with other choices of connector if desired.

Available in 8-Way, 10-Way, 12-Way, 16-Way & 24-Way

Attenuation dB/m	
0.5GHz	0.92dB
1.0GHz	1.28dB
5.0GHz	2.95dB
10GHz	4.26dB
18GHz	5.90dB



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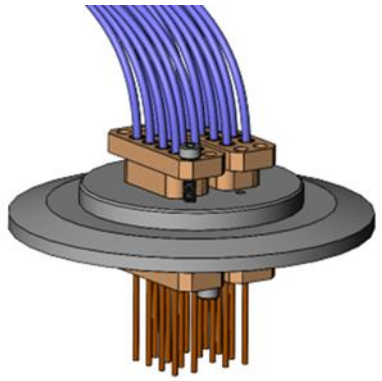
Hermetic Feedthrough Connectors

Hermetic feedthroughs provide vacuum tight coaxial connections between Room Temperature to the upper cooling stage of the fridge. These can be incorporated into standard KF or ISO flanges or they can be custom designed plates with multiple Q-CON HD connections.
Each coaxial line is fitted with a glass-to-metal seal and is tested to ensure Hermeticity of $1 \times 10^{(-8)}$ CC He/Sec at 1 Atm.

SMPM male interfaces are provided on both sides of the plate. Each SMPM interface is fitted with a replaceable female to female 'bullet' adaptor.
Our Q-CON cable assemblies simply connect either side of the vacuum plate.

STANDARD FLANGES	TYPICAL NUMBER OF LINES (Q-CON)	CONFIGURATION (Q-CON)	COMPARISON USING SMA'S
KF40	8	1x 8-WAY	4
OINS 40 LOS	12	1x 12-WAY	6
KF50	24	3x 8-WAY 2x 12-WAY	6
OINS 50 LOS	24	3x 8-WAY 2x 12-WAY	8
KF63	36	3x 12-WAY	8
OINS 65 LOS	36	3x 12-WAY	8
ISO100	120	5x 24-WAY	37



IntelliConnect
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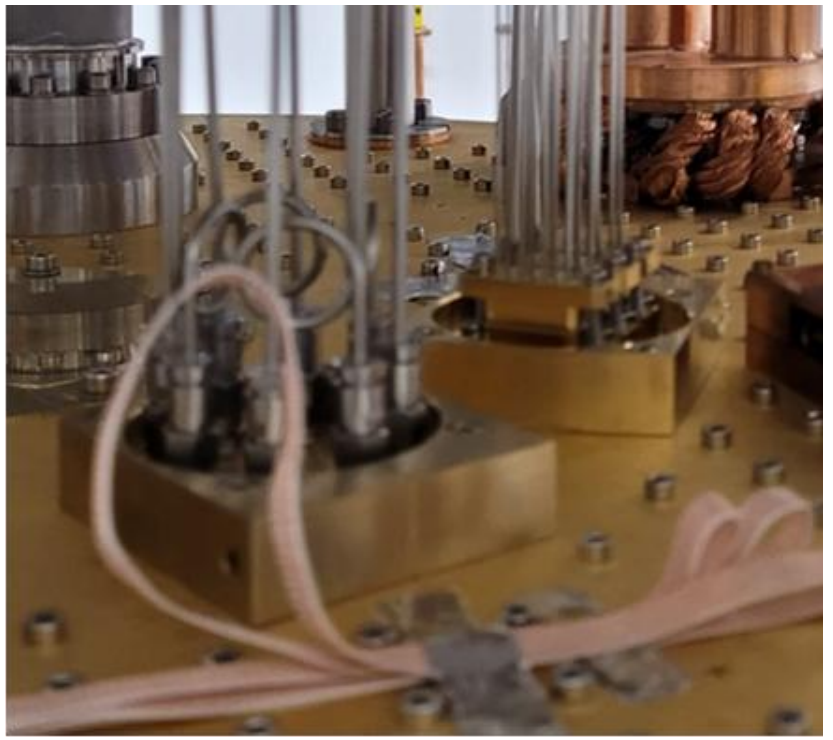
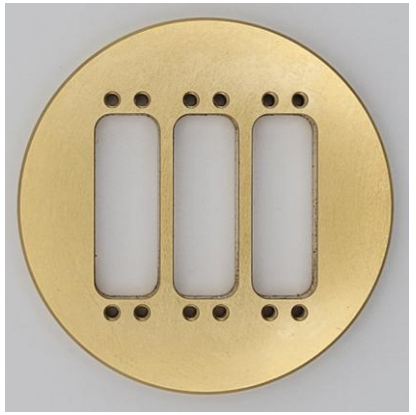


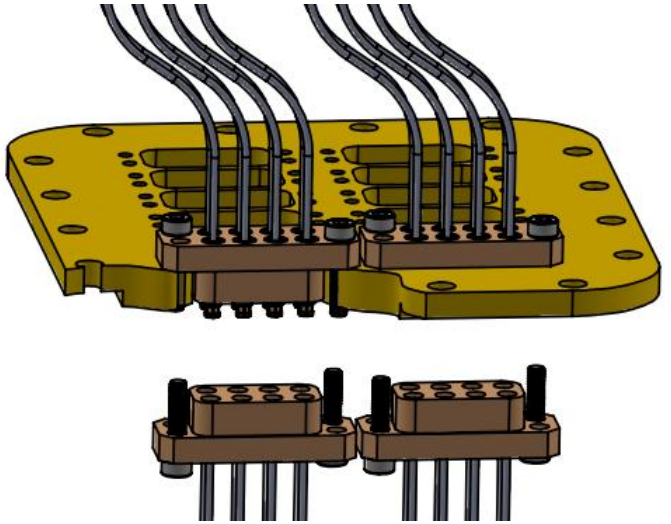
Connector Mounting & Thermalising



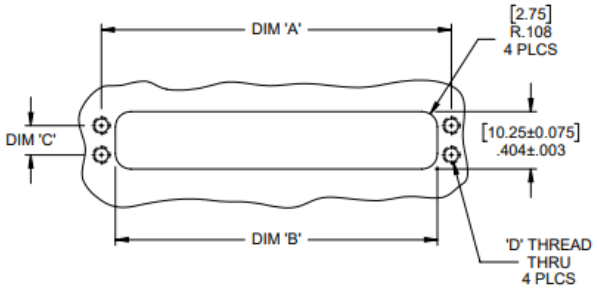
Feedthrough plates provide a means of mounting and thermalising Q-CON connectors and/or Attenuators between cooling stages of a fridge. Each connector/attenuator is held securely using two fixing screws, contact with the plate is via a small flange on the connector/attenuator which ensures the interface is light tight.

These plates are usually custom made to suit the application.

The Q-CON connectors can accommodate plate thicknesses from 5mm to 10mm.



MOUNTING HOLE DIMENSIONS



VERSION	DIM 'A' ±.002"	DIM 'B' ±.003	DIM 'C' ±.002	'D' THREAD
8-WAY	.955 (24.25)	.778 (19.75)	.187 (4.75)	M2.5x0.45
10-WAY	1.142 (29.00)	.965 (24.50)	.187 (4.75)	M2.5x0.45
12-WAY	1.329 (33.75)	1.152 (29.25)	.187 (4.75)	M2.5x0.45
16-WAY	1.516 (38.50)	1.338 (34.00)	.187 (4.75)	M2.5x0.45
24-WAY	2.470 (62.75)	2.27 (57.75)	.207 (5.25)	M3x0.5

Attenuators

MATERIAL PROPERTIES:
BODY: COPPER PER CW004A
INTERFACE: BERYLLIUM COPPER PER ASTM B196 OR EQUIVALENT
CONTACTS: BERYLLIUM COPPER PER ASTM B196 OR EQUIVALENT

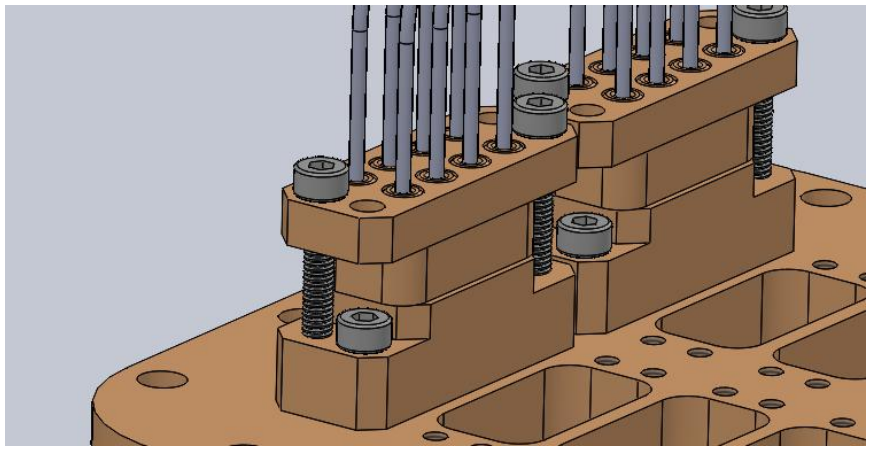
PLATING PROPERTIES:
MAIN BODY: .000040 MIN. GOLD PER MIL-G-45204 OVER
.000050 MIN. COPPER PER MIL-C-14550
INTERFACE: .000040 MIN. GOLD PER MIL-G-45204 OVER
.000050 MIN. COPPER PER MIL-C-14550
CONTACTS: .000040 MIN. GOLD PER MIL-G-45204 OVER
.000050 MIN. COPPER PER MIL-C-14550

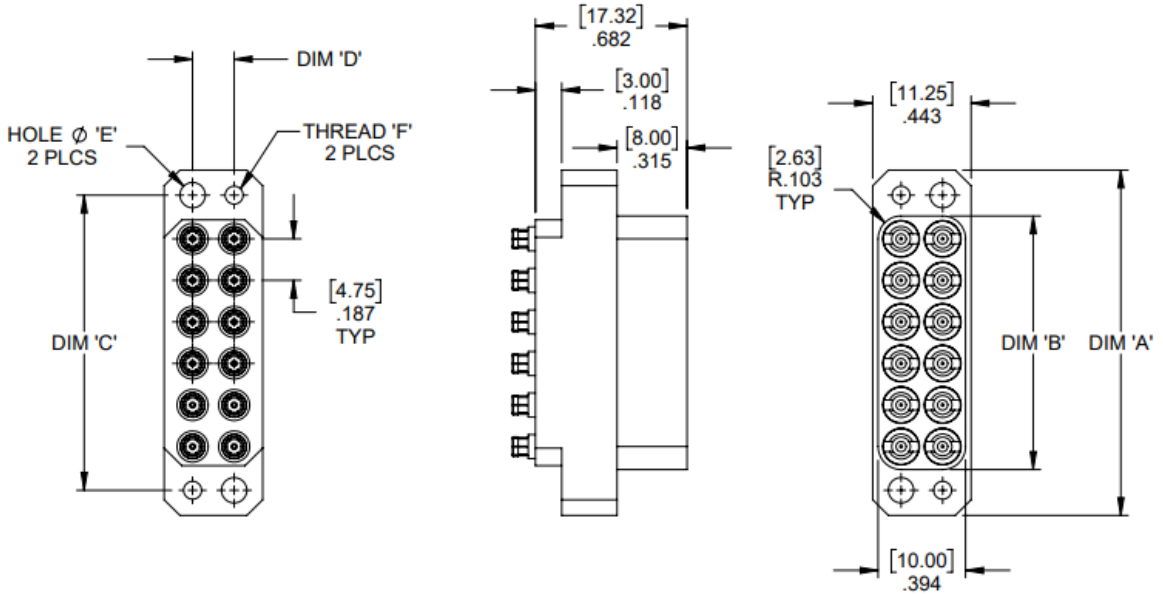
CONNECTOR DURABILITY: 100 CYCLES MIN.
IMPEDANCE: 50 OHMS NOMINAL
FREQUENCY RANGE: DC-18 GHz
VSWR: 1.3:1 MAX.
POWER: 1 WATT AVG. @ 25<MOD-DEG>C
OPERATING TEMPERATURE: 4K - 398K
ATTENUATION ACCURACY 0, 3, 6, 10, 20dB: <MOD-PM>0.75dB

VALUES AVAILABLE 0dB, 3dB, 6dB, 10dB & 20dB.
SUBSTITUTE XX IN PART NUMBER FOR dB VALUE

Attenuators

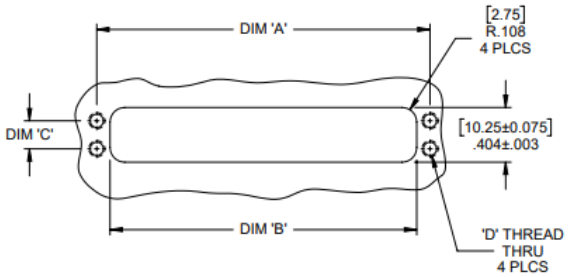
Q-CON attenuator blocks are offered in the same configurations as the connectors and are constructed from high purity copper for good thermalisation. These are arranged as plug to jack interfaces and require the same mounting hole dimensions as the Q-CON connectors.
Available in attenuation values of 0dB, 3dB, 6dB, 10dB & 20dB





VERSION	CONFIGURATION	DIM 'A' ±.002	DIM 'B' ± .002	DIM 'C' ±.002	DIM 'D'	HOLE ∅ 'E'	THREAD 'F'
8-WAY	2x4	1.181 (30.00)	.768 (19.50)	.955 (24.25)	.187 (4.75)	.114	M2.5x0.45
10-WAY	2x5	1.368 (34.75)	.955 (24.25)	1.142 (29.00)	.187 (4.75)	.114	M2.5
12-WAY	2x6	1.555 (39.50)	1.142 (29.00)	1.329 (33.75)	.187 (4.75)	.114	M2.5
16-WAY	2x8	1.742 (44.25)	1.328 (33.75)	1.516 (38.50)	.187 (4.75)	.114	M2.5
24-WAY	2x12	2.697 (68.50)	2.263 (57.50)	2.470 (62.75)	.207 (5.25)	.122	M3

MOUNTING HOLE DIMENSIONS



VERSION	DIM 'A' ±.002"	DIM 'B' ±.003	DIM 'C' ±.002	'D' THREAD
8-WAY	.955 (24.25)	.778 (19.75)	.187 (4.75)	M2.5x0.45
10-WAY	1.142 (29.00)	.965 (24.50)	.187 (4.75)	M2.5x0.45
12-WAY	1.329 (33.75)	1.152 (29.25)	.187 (4.75)	M2.5x0.45
16-WAY	1.516 (38.50)	1.338 (34.00)	.187 (4.75)	M2.5x0.45
24-WAY	2.470 (62.75)	2.27 (57.75)	.207 (5.25)	M3x0.5

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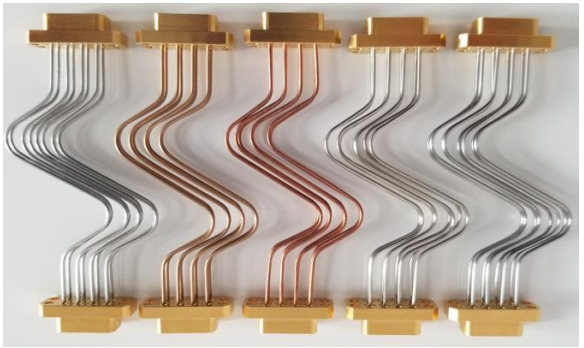
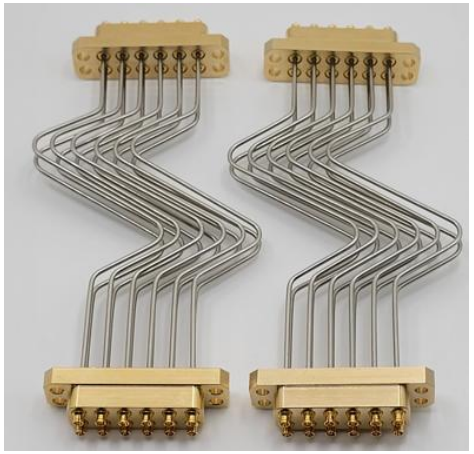
Semi-Rigid Cable Assemblies

Cable assemblies are available in all the popular cable materials, CuNi, St-St, BeCu, NbTi, Cu. These are constructed using .047" (1.19mm) semi-rigid coax with solderless connections to our Q-CON HD connectors. The cables can be ordered as custom lengths pre-formed with shapes that enable a degree of compliance for thermal expansion/contraction as well as installation.
They can also be configured with male or female connections.





- SMPM Male interfaces
- 8, 10, 12, 16 & 24-Way versions
- 4.75mm pitch
- Copper bodies
- Non-Magnetic

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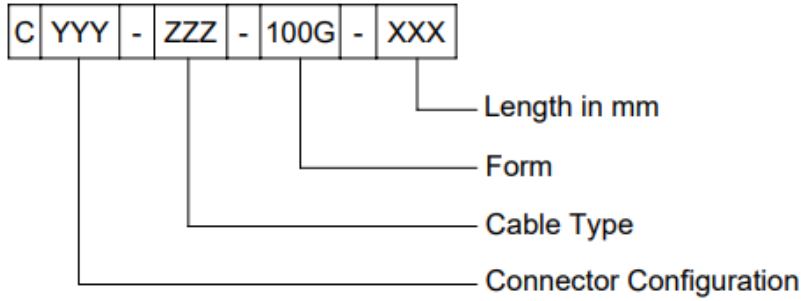
Cable Assemblies



Standard cable assemblies can be configured using the following tables

Cable Assemblies with 8-Way Connectors

Connector End A	Connector End B	Code YYY
Q-CON-8 JACK	Q-CON-8 JACK	407
Q-CON-8 PLUG	Q-CON-8 PLUG	426
Q-CON-8 PLUG	Q-CON-8 JACK	427
Q-CON-8 PLUG	SMA PLUG	428
Q-CON-8 PLUG	SMA JACK	429
Q-CON-8 PLUG	SMP PLUG	430
Q-CON-8 PLUG	SMP JACK	431
Q-CON-8 JACK	SMA PLUG	432
Q-CON-8 JACK	SMA JACK	433
Q-CON-8 JACK	SMP PLUG	434
Q-CON-8 JACK	SMP JACK	435

Cable Assemblies with 10-Way Connectors

Connector End A	Connector End B	Code YYY
Q-CON-10 JACK	Q-CON-10 JACK	
Q-CON-10 PLUG	Q-CON-10 PLUG	416
Q-CON-10 PLUG	Q-CON-10 JACK	417
Q-CON-10 PLUG	SMA PLUG	418
Q-CON-10 PLUG	SMA JACK	419
Q-CON-10 PLUG	SMP PLUG	420
Q-CON-10 PLUG	SMP JACK	421
Q-CON-10 JACK	SMA PLUG	422
Q-CON-10 JACK	SMA JACK	423
Q-CON-10 JACK	SMP PLUG	424
Q-CON-10 JACK	SMP JACK	425

Cable Assemblies with 12-Way Connectors

Connector End A	Connector End B	Code YYY
Q-CON-12 JACK	Q-CON-12 JACK	396
Q-CON-12 PLUG	Q-CON-12 PLUG	397
Q-CON-12 PLUG	Q-CON-12 JACK	398
Q-CON-12 PLUG	SMA PLUG	399
Q-CON-12 PLUG	SMA JACK	400
Q-CON-12 PLUG	SMP PLUG	401
Q-CON-12 PLUG	SMP JACK	402
Q-CON-12 JACK	SMA PLUG	403
Q-CON-12 JACK	SMA JACK	404
Q-CON-12 JACK	SMP PLUG	405
Q-CON-12 JACK	SMP JACK	406

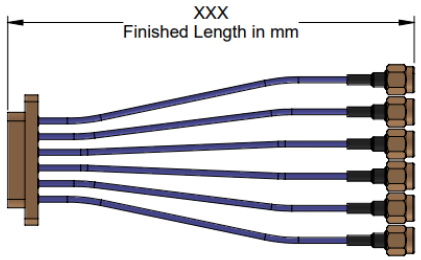
Cable Assemblies with 16-Way Connectors

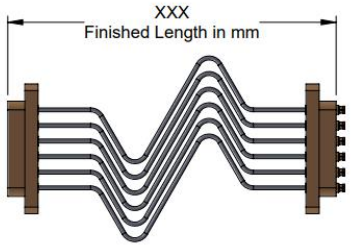
Connector End A	Connector End B	Code YYY
Q-CON-16 JACK	Q-CON-16 JACK	
Q-CON-16 PLUG	Q-CON-16 PLUG	436
Q-CON-16 PLUG	Q-CON-16 JACK	437
Q-CON-16 PLUG	SMA PLUG	438
Q-CON-16 PLUG	SMA JACK	439
Q-CON-16 PLUG	SMP PLUG	440
Q-CON-16 PLUG	SMP JACK	441
Q-CON-16 JACK	SMA PLUG	442
Q-CON-16 JACK	SMA JACK	443
Q-CON-16 JACK	SMP PLUG	444
Q-CON-16 JACK	SMP JACK	445

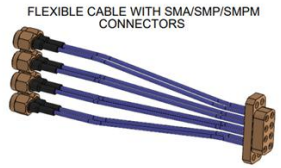
Cable Assemblies with 24-Way Connectors

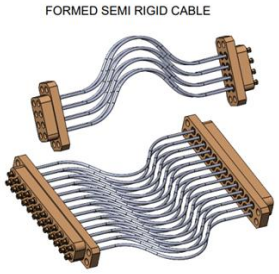
Connector End A	Connector End B	Code YYY
Q-CON-24 JACK	Q-CON-24 JACK	
Q-CON-24 PLUG	Q-CON-24 PLUG	446
Q-CON-24 PLUG	Q-CON-24 JACK	447
Q-CON-24 PLUG	SMA PLUG	448
Q-CON-24 PLUG	SMA JACK	449
Q-CON-24 PLUG	SMP PLUG	450
Q-CON-24 PLUG	SMP JACK	451
Q-CON-24 JACK	SMA PLUG	452
Q-CON-24 JACK	SMA JACK	453
Q-CON-24 JACK	SMP PLUG	454
Q-CON-24 JACK	SMP JACK	455

Cable Type ZZZ	Cable Description	Ref
127	BeCu Inner / BeCu Outer	BCB034
106	Silver Plated BeCu Inner / BeCu Outer	BCB006
123	304 SS Inner / 304 SS Outer	BCB019
118	Silver Plated 304 SS Inner / 304 SS Outer	BCB028
114	Cupronickel Inner / Cupronickel Outer	BCB021
104	Silver Plated Cupronickel Inner / Cupronickel Outer	BCB025
92	NbTi Inner / NbTi Outer	BCB007
128	Silver Plated Copper Inner / Copper Outer	BCB039
129	Silver Plated Copper Inner / Tin Soaked Copper Braid	-









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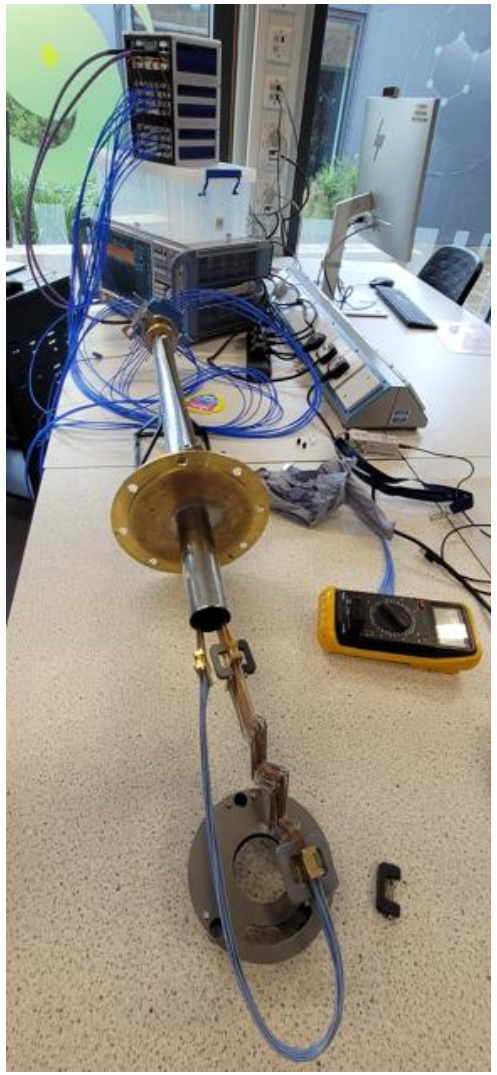
Semi-Rigid Coaxial Cable Assemblies

Working with the Low Temperature Physics team at Lancaster University, we now have the capability to characterize our Q-CON products at temperatures down to 4k. Using an insert fitted with Q-CON connectors we're able to quickly perform and record RF measurements of up to 12 coaxial lines from RT to 4k in as little as 30 minutes.

We've been able to demonstrate that our cables can provide stable, repeatable performance.

The following sets of data show Insertion Loss in the region of 45dB, this includes the chain of the cables from the coax switch boxes through to the bottom of the insert and back again and also includes 3x mated pairs of Q-CON connectors.



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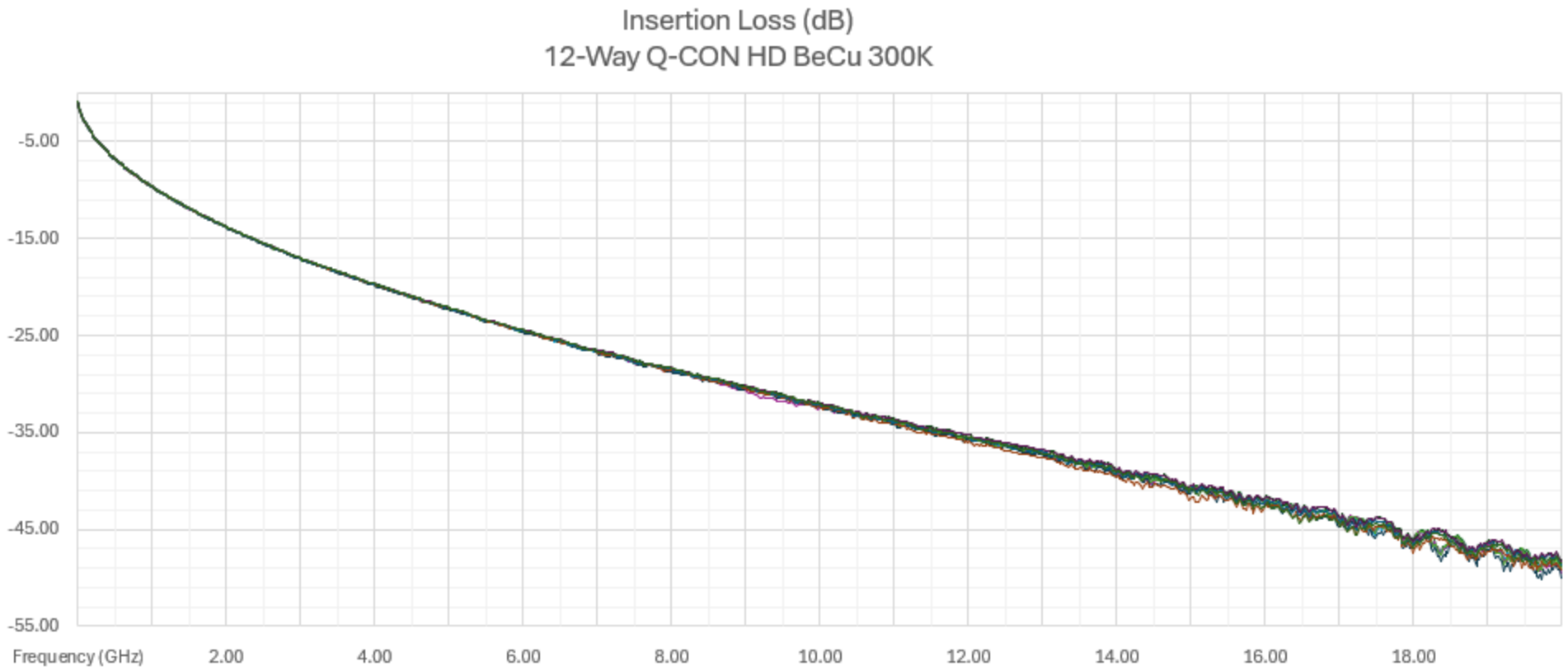
Semi-Rigid Coaxial Cable Assemblies

3x Coax Switches ~ 2.4dB
3x 0.18m .141" semi rigid link cables connecting the switches ~ 0.5dB
2x 2m long .085" flexible cables (Blue) from switches to top of insert ~ 14.3dB
2x 1m long .047" BeCu SMP/Q-CON for insert top to bottom ~20dB
1x 0.4m .047 flexible (blue) Q-CON both ends for connecting sample ~ 2.4dB
1x 0.25m samples Q-CON both ends ~ dB dependent on material being tested

Semi–Rigid Coaxial Cable Assemblies



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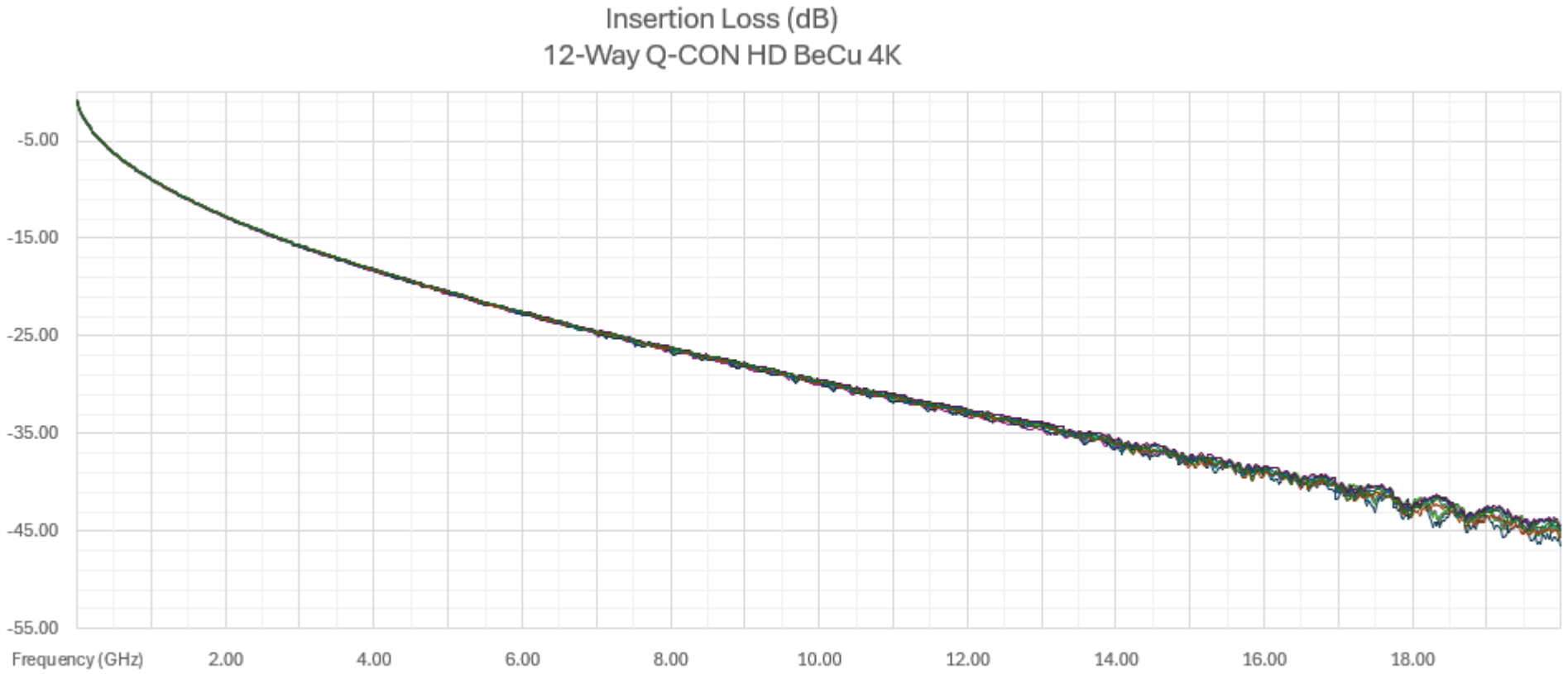
Semi–Rigid Coaxial Cable Assemblies



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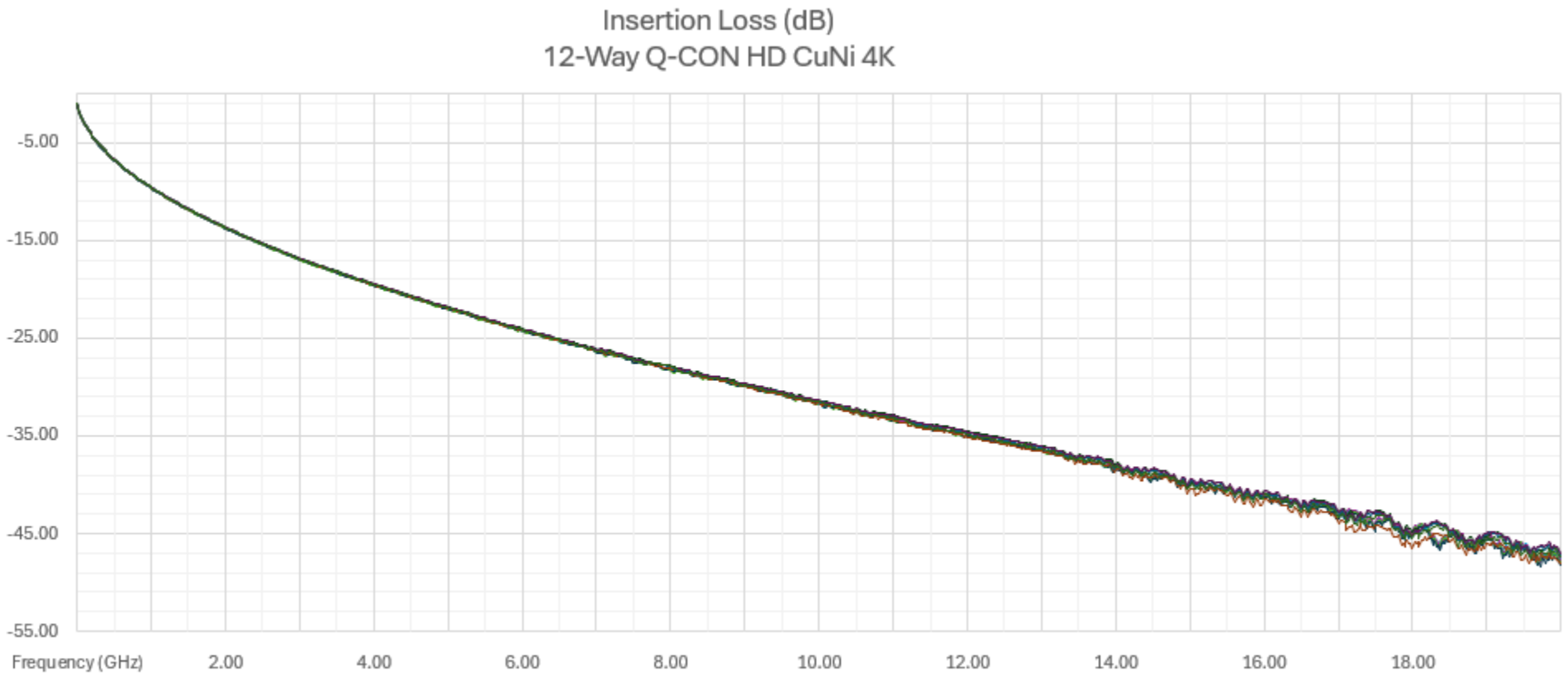

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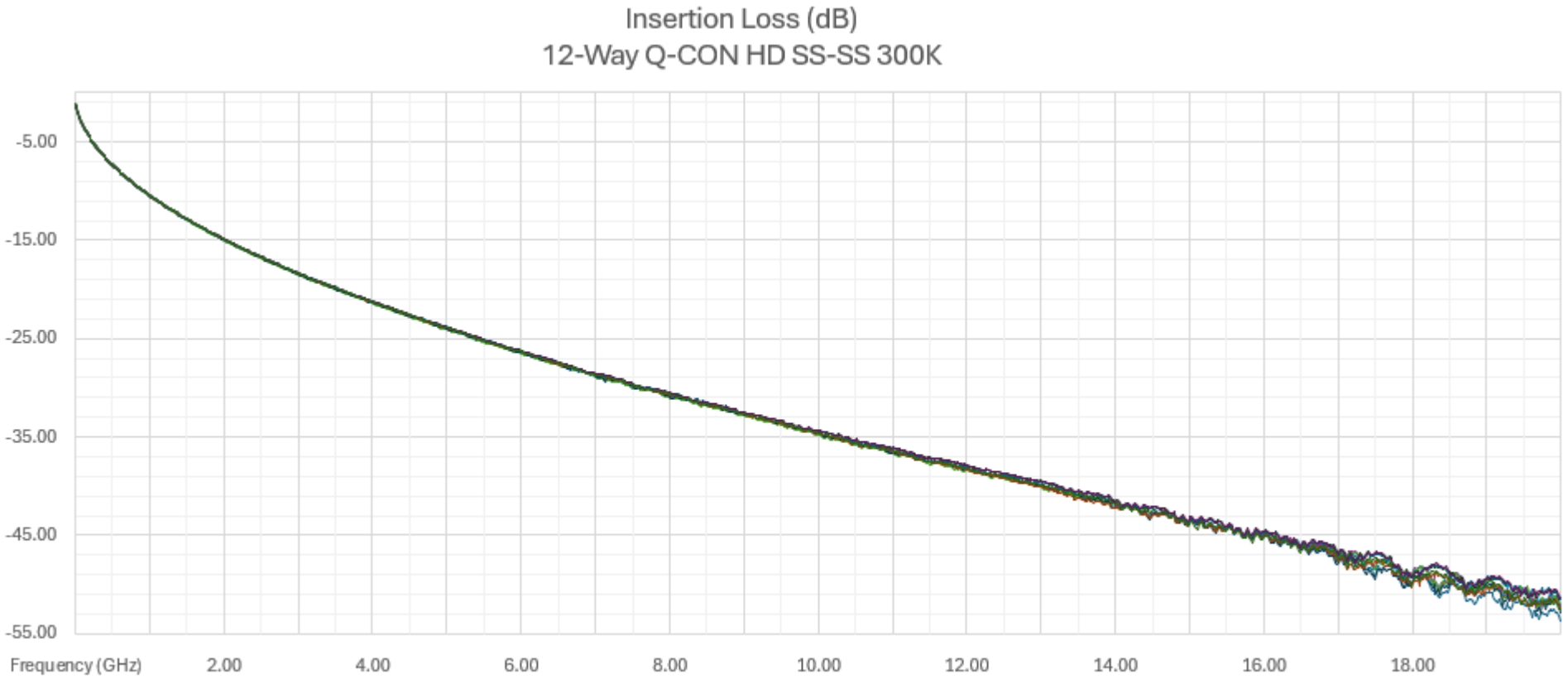

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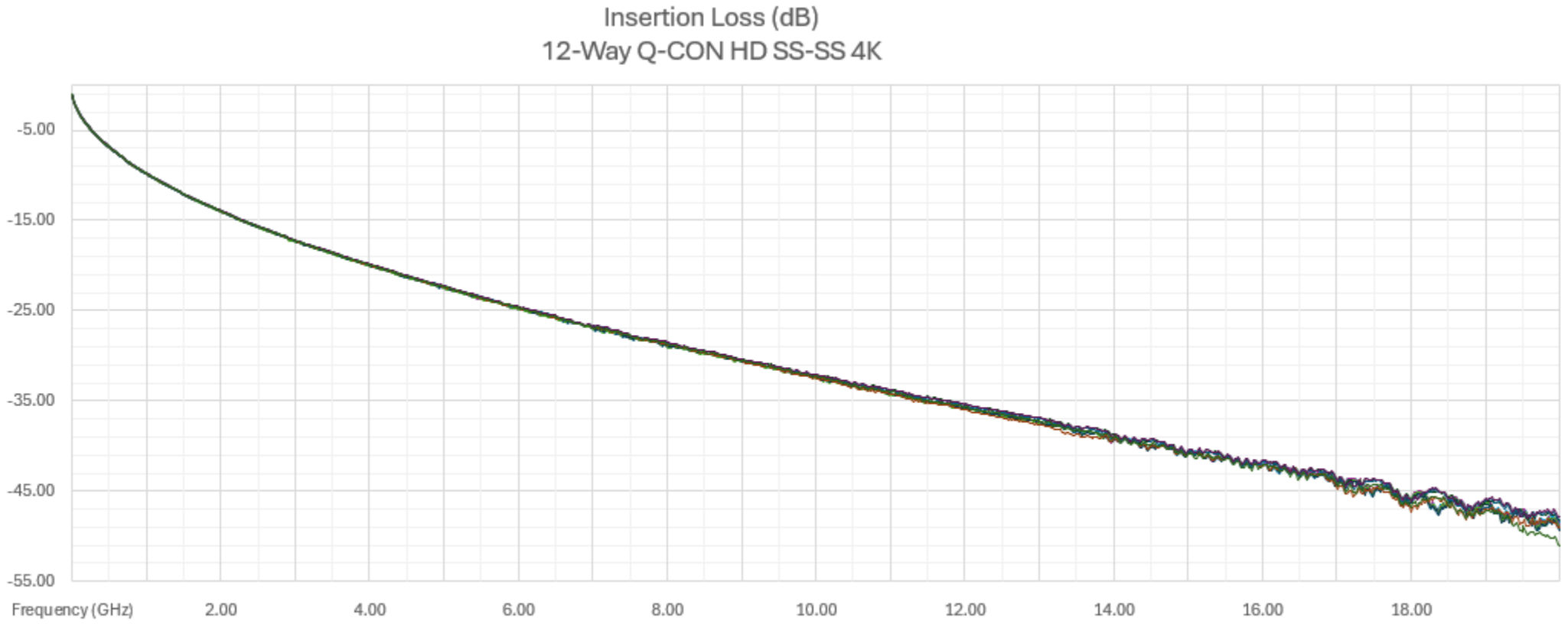

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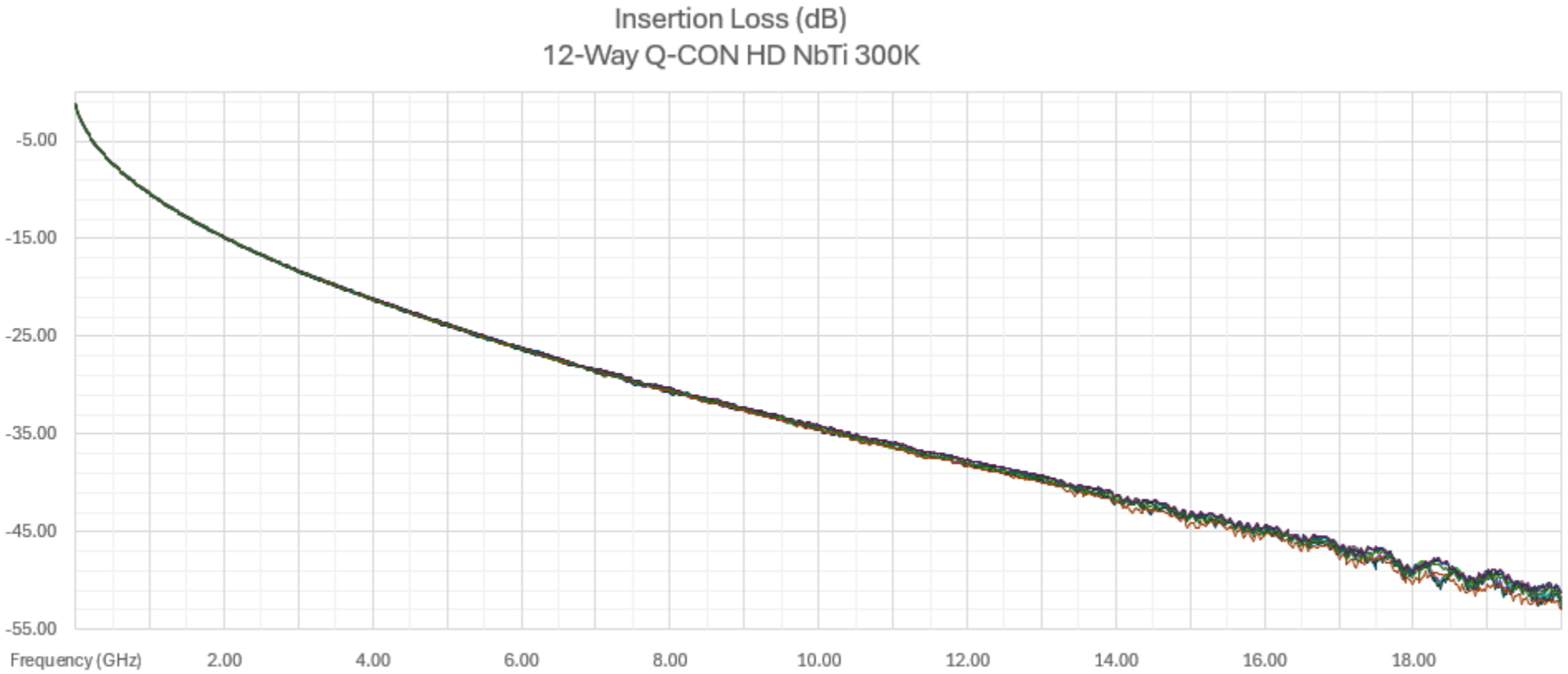

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