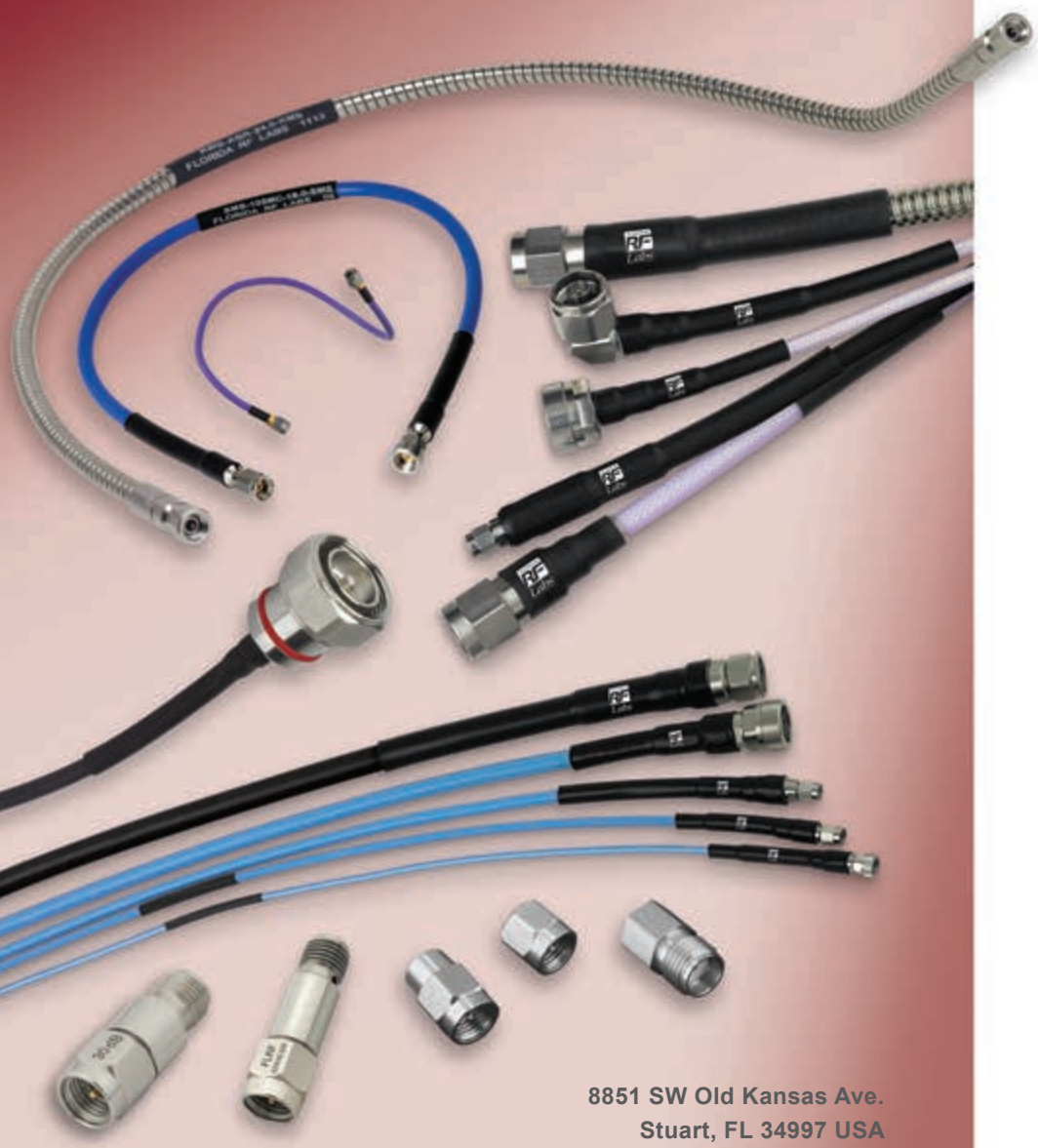
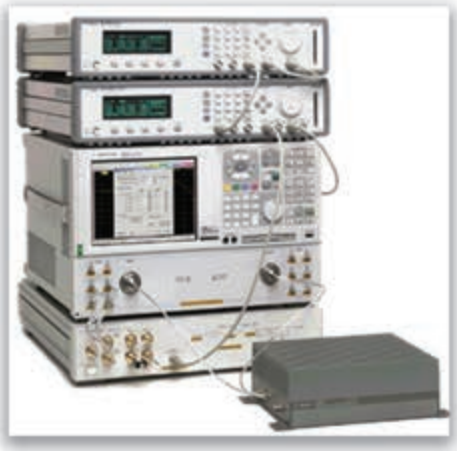
Test Cable Assemblies

and Coaxial Passive Components

DC-65 GHz





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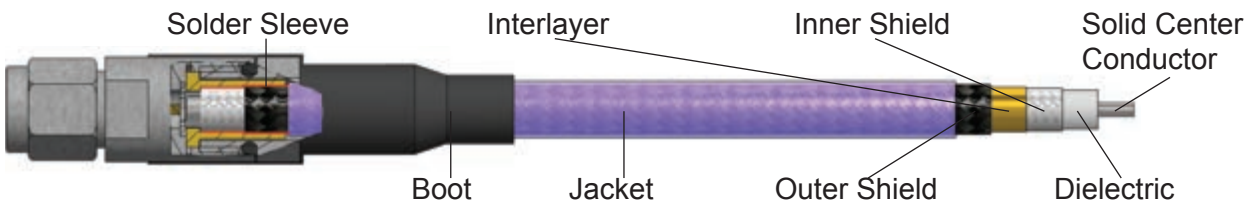
smiths microwave

Premium Test Cable

Lab-Flex® 200

Frequency to 31 GHz



With over 6 million feet of test cables sold, our Lab-Flex® 200 has become the premier cable platform for Florida RF Labs' test assemblies. The most popular versions are presented here.

200A – The **Armor** option provides a flexible, stainless steel conduit over the entire cable from connector to connector. The RF cable inside is then protected from severe damage. The armor is terminated with conductive epoxy directly to the connectors, which provides a continuous ground and adds greater than 40 dB of shielding to the assembly. This option is also available with the extruded PVC covering over the armor - 200AW.

200TV – With **Thermal Vacuum** test cables, the connectors used are typically vented to prevent pressure build up. Only materials that are NASA outgassing approved are used for these assemblies. TV assemblies are pre-conditioned for dielectric stability in order to provide the best electrical performance across an extreme temperature range. Add a "V" after the connector code SMSV for vented connectors.

200UV – This special cable design offers the very highest return loss, **(Ultra Low VSWR)**, across the DC-26 GHz frequency band. The cable is built around our standard Lab-Flex® core, but contains a proprietary shield construction that cancels unwanted noise. These assemblies are available with the following options: Weatherized, extended boots and armor. Maximum VSWR: 1.20:1 to 18 GHz, 1.25:1 to 26.5 GHz.

200W – An extruded PVC covering over the standard FEP Lab-Flex® 200 jacket offers excellent protection **(Weatherized)** from the elements as well as protection from damage due to rough handling. The .34 inch diameter covering gives the cable a comfortable, flexible feel and when coupled with the extended boots makes a very durable test cable assembly.

200LP – This is a **Low Passive Intermodulation (PIM)** cable assembly that utilizes non-ferrous materials in the cable and connector designs in order to minimize the effects of PIM distortion. The connector/cable designs utilize mechanical contact attachment to further minimize PIM effect. Our PIM performance is specified at -155 dBc nominally with a typical performance of -160 dBc. These assemblies come standard with a weatherized jacket and extended boots.

200E – This popular option addresses the most common failure of RF cable assemblies: intermittence at the connector to cable termination area. Our special **Extended booting** system is made using different layers of shrink tubing that provide both stability and a smooth radius when the cable is positioned 90 degrees to the connector mating, while also preventing cable kinking. Add an E after the connector code SMSE for extended booting.

Frequency	dB/100 ft. LF 200	dB/100 ft. LF 200UV	Phase Over Flexure	Power Watts LF 200	Power Watts LF 200UV
1 GHz	8.6	8.6	0.4 Degrees	740	649
10 GHz	28.7	32.7	3.7 Degrees	208	182
18 GHz	38.3	43.7	6.7 Degrees	156	136
26 GHz	47.6	54.3	10.0 Degrees	132	115
31 GHz	53.3	N/A	13.0 Degrees	116	N/A

Available Interfaces for Lab-Flex® 200:

SMA, 2.9mm, Type N, TNC & 7mm

Low PIM: SMA, Type N & 7/16DIN

DC to 31 GHz Standard (may be limited by connector choice)

DC to 26.5 GHz Low PIM and 200UV (may be limited by connector choice)

Premium Test Cable

Lab-Flex® 160 & 125

Frequency to 40 GHz and 50 GHz

160 – Lab-Flex® 160, with performance to **40 GHz**, offers a very cost effective test cable with 2.92mm and 2.4mm connector interfaces. This cable also offers our **lowest insertion loss** possible at 40 GHz. There is also a wide range of protected coverings available from the most popular extended boot to fully armored and weatherized assemblies. Sharing the same construction as the Lab-Flex® 200, the Lab-Flex® 160 can also be provided for ThermalVac applications (160 TV).

125 – Lab-Flex® 125 with 2.4mm connectors offers excellent performance up to **50 GHz**. Its small, .125 inch diameter makes it a great choice for flexible, low loss test assemblies and the best option for **high density, high frequency** test setups. An assembly as short as 6 inches is possible and a wide range of protective coverings are available. These assemblies can also be offered with the same options as the Lab-Flex® 160 above.

Frequency	dB/100 ft. LF 125	dB/100 ft. LF 160	Phase Over Flexure	Power Watts LF 125	Power Watts LF 160
1 GHz	16.7	12.6	0.4 Degrees	460	540
10 GHz	57.0	39.5	3.7 Degrees	140	170
18 GHz	79.0	51.6	6.7 Degrees	105	133
26 GHz	100.0	63.5	10.0 Degrees	88	103
40 GHz	126.0	81.6	14.0 Degrees	70	88
50 GHz	144.0	N/A	17.0 Degrees	65	N/A

Available Interfaces for Lab-Flex® 160:

SMA, 3.5mm, 2.9mm, 2.4mm, Type N

Available Interfaces for Lab-Flex® 125:

SMA, 2.9mm, 2.4mm, Type N

DC to 40 GHz Lab-Flex® 160 (may be limited by connector choice)
DC to 50 GHz Lab-Flex® 125 (may be limited by connector choice)

Highly Flexible, Premium Test Cable

Lab-Flex® 235SP, 180SP & 115S

Frequency to 26 GHz, 40 GHz and 65 GHz

235SP – This cable is a **stranded** center conductor, **polyurethane jacket** version of our popular Lab-Flex® 200. When used with our super SMA connectors, the 235SP assemblies have outstanding return loss up to **26 GHz**. The advantage of the 235SP is its flexibility and durability when used in test applications requiring constant movement.

180SP – Lab-Flex® 180SP offers outstanding performance in applications up to **40 GHz**. With a **stranded** center conductor and **polyurethane jacket,** it provides a very flexible and durable test cable, accommodating interfaces from 2.92mm to Type N.

115S – Our 115S is a low-loss, **stranded** center conductor, high performance cable which, when coupled with our custom 1.85mm connectors, makes an excellent **65 GHz** assembly. The special design of the 115S along with its small diameter offers superb flexibility when used in test applications requiring high flexure rates.

Frequency	dB/100 ft. LF 115S	dB/100 ft. LF 180SP	dB/100 ft. LF 235SP	Phase Over Flexure (degrees)		
				LF 115S	LF 180SP	LF 235SP
1 GHz	27.3	17.8	11.5	0.4	0.4	0.4
10 GHz	100.0	58.8	36.5	2.0	2.0	2.0
18 GHz	136.0	81.6	56.1	4.0	4.0	4.0
26 GHz	167.0	100.6	67.2	6.0	6.0	6.0
40 GHz	213.0	129.4	N/A	10.0	10.0	N/A
65 GHz	290.0	N/A	N/A	14.0	N/A	N/A

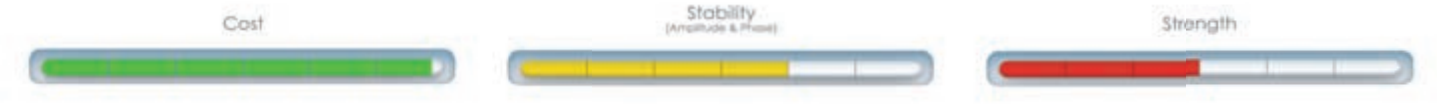
Available Interfaces for Lab-Flex® 235SP: SMA, 2.9mm, Type N & TNC
Available Interfaces for Lab-Flex® 180SP: SMA, 2.9mm, 2.4mm, Type N
Available Interfaces for Lab-Flex® 115S: SMA, 2.9mm, 2.4mm, 1.85mm

DC to 26 GHz Lab-Flex® 235SP (may be limited by connector choice)
DC to 40 GHz Lab-Flex® 180SP (may be limited by connector choice)
DC to 65 GHz Lab-Flex® 115S (may be limited by connector choice)

Premium Test Port Cable

ASR

Frequency to 50 GHz



ASR – These high-performance **VNA test port cable assemblies** are an excellent value for precision test applications. Since they are **semi-flexible**, they provide a test set up which will maintain its configuration for a very repeatable test platform. ASR is available with precision Type N (NMS, NFS), 2.92mm (KMS, KFS), & 2.4mm (MMS, MFS) interfaces and can also be supplied with the NMD style connector for a direct, rugged connection to the VNA test port adapter.

ASR			
Description	**Model Number**	**Description**	**Model Number**
KMS-ASR-XX.X-KMS	ASR-1010-XX	NFS-ASR-XX.X-NFS	ASR-6060-XX
KMS-ASR-XX.X-KFS	ASR-1020-XX	NMD-KFS-ASR-XX.X-KMS	ASR-2010-XX
KFS-ASR-XX.X-KFS	ASR-2020-XX	NMD-KFS-ASR-XX.X-KFS	ASR-0220-XX
KMS-ASR-XX.X-MMS	ASR-1030-XX	NMD-KFS-ASR-XX.X-MMS	ASR-0230-XX
KMS-ASR-XX.X-MFS	ASR-1040-XX	NMD-KFS-ASR-XX.X-MFS	ASR-0240-XX
MMS-ASR-XX.X-MMS	ASR-3030-XX	NMD-MFS-ASR-XX.X-KMS	ASR-0410-XX
MMS-ASR-XX.X-MFS	ASR-3040-XX	NMD-MFS-ASR-XX.X-KFS	ASR-0420-XX
MFS-ASR-XX.X-MFS	ASR-4040-XX	NMD-MFS-ASR-XX.X-MMS	ASR-0430-XX
NMS-ASR-XX.X-NMS	ASR-5050-XX	NMD-MFS-ASR-XX.X-MFS	ASR-0440-XX
NMS-ASR-XX.X-NFS	ASR-5060-XX		

XX = Length in inches
Standard Lengths 12, 24, 36

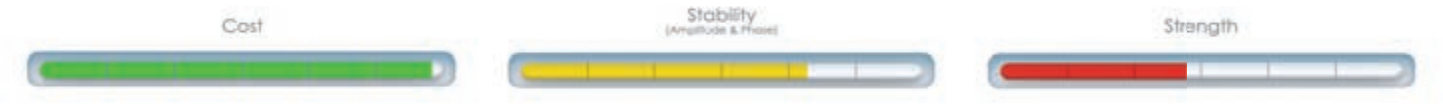
Frequency	dB/100 ft. ASR	Phase Over Flexure	Power Watts ASR
1 GHz	16.7	0.4 Degrees	450
18 GHz	71.0	4 Degrees	130
26 GHz	86.9	6 Degrees	95
40 GHz	110.5	8 Degrees	60
50 GHz	125.4	10 Degrees	30

Available Interfaces for ASR:
2.9mm, 2.4mm, Type N, NMD (direct to test port adapter)
DC to 50 GHz ASR (may be limited by connector choice)

Highly Flexible, Premium Test Port Cable

ASR-F

Frequency to 50 GHz



ASR-F – This phase-stable assembly is a **flexible version of our original ASR** high-performance design. ASR-F comes standard with an abrasion resistant jacket covering the very flexible monocoil armor. These durable test port assemblies provide precision test measurements up to 50 GHz. Like ASR, ASR-F is also available with Type N (NMS, NFS), 2.92mm (KMS, KFS), & 2.4mm (MMS, MFS) interfaces and can also be supplied with the NMD style connector for a direct, rugged connection to the VNA test port adapter.

ASR-F			
Description	**Model Number**	**Description**	**Model Number**
KMS-ASR-F-XX.X-KMS	ASR-F-1010-XX	NFS-ASR-F-XX.X-NFS	ASR-F-6060-XX
KMS-ASR-F-XX.X-KFS	ASR-F-1020-XX	NMD-KFS-ASR-F-XX.X-KMS	ASR-F-2010-XX
KFS-ASR-F-XX.X-KFS	ASR-F-2020-XX	NMD-KFS-ASR-F-XX.X-KFS	ASR-F-0220-XX
KMS-ASR-F-XX.X-MMS	ASR-F-1030-XX	NMD-KFS-ASR-F-XX.X-MMS	ASR-F-0230-XX
KMS-ASR-F-XX.X-MFS	ASR-F-1040-XX	NMD-KFS-ASR-F-XX.X-MFS	ASR-F-0240-XX
MMS-ASR-F-XX.X-MMS	ASR-F-3030-XX	NMD-MFS-ASR-F-XX.X-KMS	ASR-F-0410-XX
MMS-ASR-F-XX.X-MFS	ASR-F-3040-XX	NMD-MFS-ASR-F-XX.X-KFS	ASR-F-0420-XX
MFS-ASR-F-XX.X-MFS	ASR-F-4040-XX	NMD-MFS-ASR-F-XX.X-MMS	ASR-F-0430-XX
NMS-ASR-F-XX.X-NMS	ASR-F-5050-XX	NMD-MFS-ASR-F-XX.X-MFS	ASR-F-0440-XX
NMS-ASR-F-XX.X-NFS	ASR-F-5060-XX	SMS-ASR-F-XX.X-SMS	ASR-F-7070-XX

XX = Length in inches
Standard Lengths 12, 24, 36

Frequency	dB/100 ft. ASR-F	Phase Over Flexure	Power Watts ASR-F
1 GHz	15.6	0.4 Degrees	510
18 GHz	67.1	4 Degrees	150
26 GHz	87.8	5 Degrees	110
40 GHz	112.0	6 Degrees	75
50 GHz	127.3	8 Degrees	40

NMD Connector

2.92mm NMD-KFS

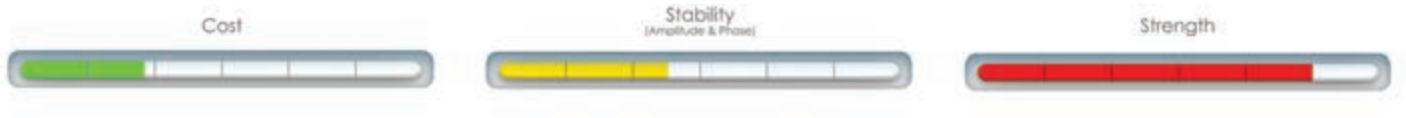
2.4mm NMD-MFS

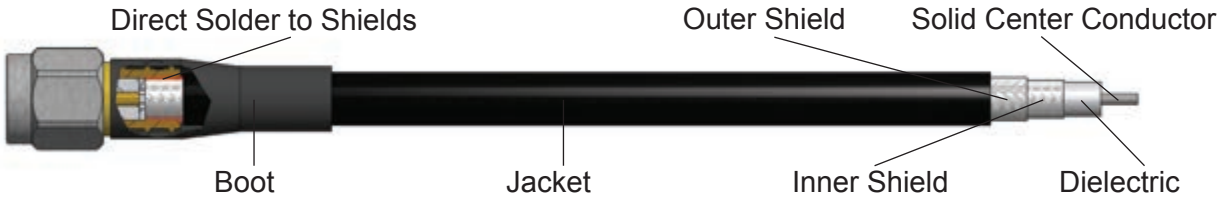
Available Interfaces for ASR-F:
SMA, 2.92mm, 2.4mm, Type N, NMD (direct to test port adapter)
DC to 50 GHz ASR-F (may be limited by connector choice)

Excellent, Durable Test Cable

Titan-Flex™

Frequency to 18 GHz





Titan-Flex™ - The T Series of cables combines a silver plated, copper clad steel center conductor, the crush resistance of a high density dielectric, the strength of over-sized braids, with the reliability of a direct solder termination that produces a durable, “budget sensitive” premier test cable.

T170 - This unique cable design is an excellent alternative for test applications up to **18 GHz**. T170, having a 0.170 inch diameter, accommodates many standard connector interfaces that might typically be used on RG type assemblies. However, the major advantages are **higher shielding, lower insertion loss and superior strength** exhibited by its connector retention. And its **poly jacket** adds the flexibility needed in many test applications.

Frequency	dB/100 ft. T170	Phase Over Flexure	RF Leakage T170
1 GHz	12	0.4 Degrees	-100 dB
10 GHz	46	3.7 Degrees	-95 dB
18 GHz	67	6.7 Degrees	-90 dB

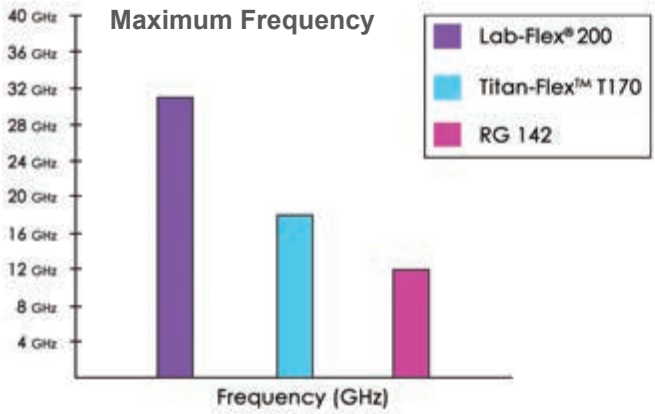
Available Interfaces for T170:

SMA, Type N, TNC, BNC

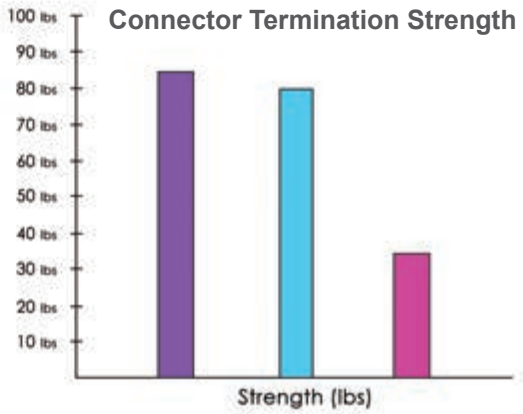
DC to 18 GHz T170 (may be limited by connector choice)

Lab-Flex®, Titan-Flex™ and RG Comparison

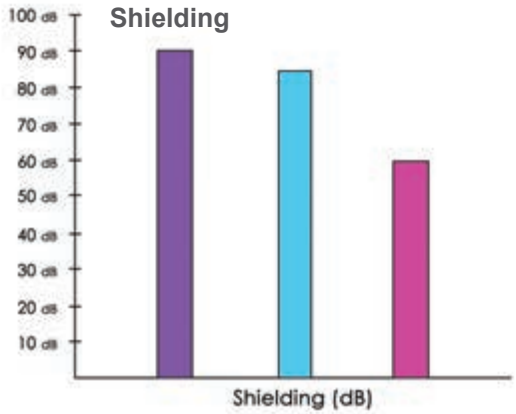
The charts below illustrate a variety of comparisons for 3 cable types that have similar diameters, our popular Lab-Flex® 200, the new Titan-Flex™ 170 and the familiar RG142. As you can see, with a slight increase in cost over RG142, the Titan-Flex™ T170 is quite respectable in many important test cable characteristics such as strength, shielding and stability typically expected from high performance cable assemblies and should be seriously considered for applications up to 18 GHz where loss is less critical. Of course, for optimal performance and the lowest insertion loss, our Lab-Flex® 200 is best.



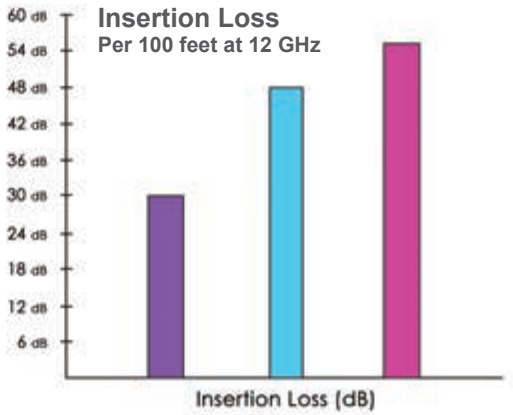
Test applications above 18 GHz will require our LF200.



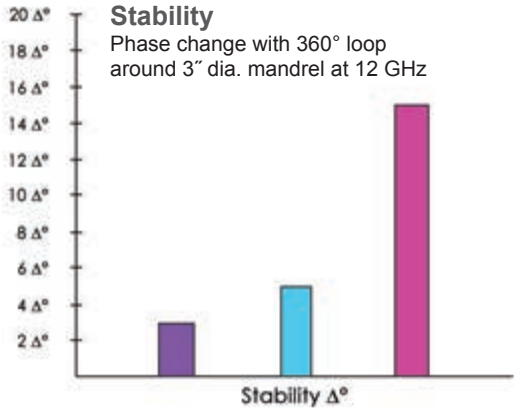
Both LF200 & T170 are far superior in connector retention strength to RG142.



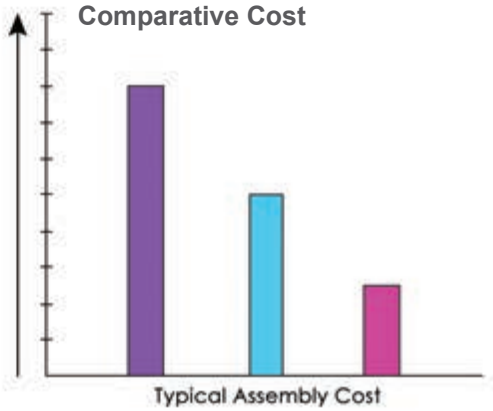
Excellent shielding exhibited by LF200 & T170.



LF200 is by far the lowest in signal transmission losses.



The construction of LF200 & T170 offers a distinct advantage over RG142.



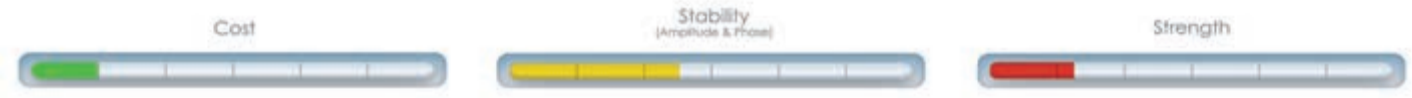
Our T170 offers a superior product, yet has a competitive cost to RG142 assemblies.

Additional RF Labs Test Cable

Mini-Flex, Pro-Form™ and Standard

Frequency to 12 GHz, 18 GHz and 50 GHz

Excellent Test Cable - Mini-Flex 105 to 50 GHz



Mini-Flex 105 – A very stable, high frequency, cost effective cable for applications requiring great flexibility where slightly higher loss is not an issue. Add to this an **Armor & Weatherized Monocoil** (Mini-Flex 105MC) and you have a test cable with excellent handling and **crush resistant** characteristics. Connector interfaces include SMA, 2.92mm and 2.4mm. The Mini-Flex 105 assembly is an optimal cost conscious alternative to our Lab-Flex 125 while still reaching **50 GHz**.

Frequency	dB/100 ft. 105M	Phase Over Flexure	Pwr. Watts 105M
1 GHz	19.2	0.4 Degrees	130
18 GHz	101.1	6.7 Degrees	30
26 GHz	122.9	10.0 Degrees	21
40 GHz	161.8	16.0 Degrees	13
50 GHz	187.2	20.0 Degrees	11

Excellent, Hand-Formable Test Cable to 18 GHz

Hand-Formable – Florida RF Labs combines the best connector design with the best performing cable along with state of the art assembly to produce the highest level product at a very reasonable price. The Conformable®, or hand-formable, Braided Jacket (BJ) has a tin filled braid with a metal foil underlay for shielding and mechanical integrity. These hand-formable assemblies with stainless steel connectors pro-vide trouble free, 500 plus matings for applications up to **18 GHz**.

Frequency	.047 Dia BJ047 dB/100 ft.	.085 Dia BJ085 dB/100 ft.	.141 Dia BJ141 dB/100 ft.
1 GHz	33.3	19.2	6.8
5 GHz	77.7	46.2	28.3
18 GHz	157.6	102.0	64.0

Standard Test Cable MIL-C-17 / RG Series to 12 GHz

MIL-C-17 / RG Series – Many test applications are lower frequency and do not require the demanding phase stability and shielding construction of higher performance cable assemblies. For these applications up to **12 GHz**, we can supply assemblies manufactured using RG316, RG142 & RG400 per MIL-C-17. Popular connectors available are: SMA, Type N, TNC and BNC. Other MIL-C-17 cables are available upon request.

Frequency	dB/100 ft. RG316	dB/100 ft. RG142	dB/100 ft. RG400
1 GHz	26.8	12.8	14.6
5 GHz	61.7	32.0	36.1
8 GHz	76.7	42.5	47.7
12 GHz	96.6	54.7	61.1

Coaxial Passive Components

Coaxial Terminations - Florida RF Labs has a complete series of SMA, 3.5 mm and 2.9 mm interface compatible coaxial terminations. Some designs are specifically suited for narrow or wide band applications. These terminations have low VSWR, and operate at frequencies from DC to 26.5 GHz. Part number designs beginning with “4” feature solderless construction while the part numbers with the “12” prefix use a soldered construction.

COAXIAL TERMINATIONS					
Part #	Pwr. Rating (Watt)	Max Freq. (GHz)	Max VSWR (1:x)	Length (Inches [mm])	Connector
12-0001	1	18	1.15	0.350 [8.89]	SMA Male
12-0002	0.5	26.5	1.10	0.350 [8.89]	SMA Male
12-0003	1	26.5	1.18	0.350 [8.89]	SMA Male
12-0006	0.5	12.4	1.17	0.525 [13.34]	SMA Male
12-0007	0.5	6	1.10	0.350 [8.89]	SMA Male
12-0008	1	18	1.30	0.350 [8.89]	SMA Male
12-0009	3	18	1.20	0.525 [13.34]	SMA Male
12-0019	2	1	1.30	0.350 [8.89]	SMA Male
12-0101	1	18	1.15	0.525 [13.34]	SMA Female
12-0102	1	26.5	1.10	0.525 [13.34]	SMA Female
12-0103	1	26.5	1.18	0.525 [13.34]	SMA Female
12-3001SF	15	18	1.20	0.250 [6.35]	SMA Female
12-3001SM	15	18	1.20	0.250 [6.35]	SMA Male
12-3002SF	15	18	1.30	0.480 [12.19]	SMA Female
12-3002SM	15	18	1.30	0.480 [12.19]	SMA Male
12-3005SF	50	6	1.35	0.960 [24.38]	SMA Female
12-3007SF	100	3	1.25	0.960 [24.38]	SMA Female
12-3007SM	100	3	1.25	0.960 [24.38]	SMA Male
12-3022SM	25	18	1.25	0.680 [17.27]	SMA Male
4110J	2	18	1.20	0.445 [11.3]	SMA Female
4111P	2	18	1.15	0.500 [12.7]	SMA Male
4111PCD	2	18	1.10	0.500 [12.7]	SMA Male
4112P	1	18	1.25	0.330 [8.38]	SMA Male
4112PLC	1	2.5	1.05	0.330 [8.38]	SMA Male
4113P	1	18	1.15	0.330 [8.38]	SMA Male
4113PCD	1	18	1.10	0.330 [8.38]	SMA Male

Coaxial Attenuators - Our line of precision coaxial attenuators are usable for power applications up to 2 watts and frequencies up to 40 GHz. The rugged construction ensures reliability and continuous performance. The standard interface is SMA M/F with other interfaces available upon request. Temperature variable options are also available. The coaxial Thermopad® offers the same benefits as the standard chip temperature variable attenuator with the added benefit of an easy to use coaxial package.

FIXED COAXIAL ATTENUATORS						
Series	Attenuation (dB)	Pwr. Rating (Watt)	Max Freq. (GHz)	Max VSWR (1:x)	Length (Inches [mm])	Connector
42SXX.00F	0 - 30	2	6	1.35	1.020 [25.91]	SMA
42XXF	0 - 30	2	12.4	1.30	0.750 [19.05]	SMA
42WXX.00F	0 - 30	2	18	1.35	1.020 [25.91]	SMA
42UWXX.00F	0 - 12, 15, 20, 30	2	26	1.50	1.020 [25.91]	SMA
42KAXX.00F	0 - 6, 8, 10, 15, 20, 30	2	40	1.40	0.870 [22.10]	2.92mm

TEMPERATURE VARIABLE COAXIAL ATTENUATORS							
Series	Attenuation (dB)	TCA (dB/dB/˚C)	Pwr. Rating (Watt)	Max Freq. (GHz)	Typ VSWR (x:1)	Length (Inches [mm])	Connector
42TVA	1 - 10	-.003 to .009	2	6	1.25	0.750 [19.05]	SMA
42WTVA	2 - 6	-0.003, -0.005, -0.007	0.2	20	1.25	0.870 [22.10]	2.92mm

Page	Cable	Application	Type	Range
2-4	Lab-Flex®	Production or Lab	Flexible	Premium Low-Loss - 50 GHz
5	Lab-Flex® S	Production or Lab	Highly Flexible	Premium Low-Loss - 65 GHz
6	ASR	Lab VNA	Semi-Flexible	Premium Stable - 50 GHz
7	ASR-F	Lab VNA	Highly Flexible	Premium Stable - 50 GHz
8-9	Titan-Flex™	Production or Lab	Flexible	Excellent, Durable - 18 GHz
10	Mini-Flex	Production or Lab	Highly Flexible	Excellent Grade - 50 GHz
10	RF Pro-Form™	Production or Lab	Semi-Flexible	Excellent Grade - 18 GHz
10	MIL-C-17 / RG Series	Production or Lab	Flexible	Fair - 12 GHz
11	Coax Components	Production or Lab	Terminations & Attenuators	DC - 26 GHz

Other high quality cables available from Florida RF Labs:

- Lab-Flex® 100 – Smallest diameter Lab-Flex for use to 50 GHz.
- Lab-Flex® 290 – Lowest insertion loss up to 18 GHz
- Lab-Flex® 335 – Low loss, high power, durable construction up to 18 GHz
- Lab-Flex® 335SP – Lowest loss in an 18 GHz stranded center conductor design
- Lab-Flex® 490S – For high power test applications up to 10 GHz

- .047 Semi-Rigid M17 versions
- .085 Semi-Rigid M17 versions and Low Loss
- .141 Semi-Rigid M17 versions and Low Loss
- Mini-Flex 065 – Flexible alternative to .047" diameter semi-rigid and Conformable
- Mini-Flex 165 – Flexible alternative to .141" diameter semi-rigid and Conformable

For a complete Cable Product listing please visit our website at www.emc-rflabs.com.

Part Numbering Code
(Example)

K M S	E	200		2 4 . 0		K M S	E
CONNECTOR #1 KMS = 2.9mm Male Straight	Option (Connector #1) E = Extended Boot V = Vented	CABLE 200 = Lab-Flex® 200	Option (Additional Jacket Protection) TV = TVAC LP = Low PIM	LENGTH (IN.) Example: 24.0 = 24 inches		CONNECTOR #2 KMS = 2.9mm Male Straight	Option (Connector #2) E = Extended Boot V = Vented

Quick Turn Requirements –

We understand that when you need to evaluate or purchase test cables, you cannot wait months.

- We commit to shipping production volumes of any standard test cable assembly shown in this brochure within three weeks or less (smaller quantities sooner).

smiths microwave

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