

## Cable Selection Guide by Frequency Sorted by Attenuation (per 100 feet)

Page	Cable	2.5 GHz	5 GHz	12.4 GHz	18 GHz	30 GHz	35 GHz	40 GHz	45 GHz	60 GHz
40	LMR® 1200	2.3								
40	LMR® 900	3.0								
40	LMR® 600	4.4								
40	LMR® 500	5.5								
40	LMR® 400	6.8								
12	Lab-Flex® 290	7.0	10.1	16.4	20.0					
13	Lab-Flex® 335	8.6	12.4	20.5	25.0					
12	Lab-Flex® 290 AW	7.0	10.1	16.4	20.0					
21	RG401 (.250 S/R)	11.9	18.6	34.7	45.5					
40	LMR® 240	12.9								
11	Lab-Flex® 200	13.8	19.9	32.2	39.5	52.3				
40	LMR® 200	16.9								
20	RG402 (.141 S/R)	18.8	28.3	50.1	64.0	90.7	101.1			
35	K-Jumper	19.5	30.0	53.0	65.0	98.0	108.0			
27	BJ141	19.5	30.0	53.0	66.0					
39	T-Flex® 402	19.5	29.9	52.0	66.0					
40	LMR® 195	19.0								
10	Lab-Flex® 160	19.2	27.5	44.3	57.3	76.4	77.5	90.0		
9	Lab-Flex® 135	22.4	31.5	51.9	64.0	86.0	94.2	102.0	110.9	
33	SF-142	21.2	31.9	54.2	68.5					
33	RG142	21.4	32.0	54.7						
33	RG223	24.3	33.5	57.2						
33	RG400	28.3	36.0	61.1						
33	142D	21.8	43.6	80.1	104.0					
19	RG405 (.086 S/R)	31.5	46.2	81.0	98.0	134.6	148.5	161.8	177.7	211.4
26	BJ085	33.0	48.4	81.7	102.0					
39	T-Flex® 405	34.5	50.5	85.0	106.0					
36	Mini-Flex 105	34.5	50.5	85.0	106.0					
40	LMR® 100	39.8								
32	115 (SF-316)	42.4	61.6	101.7	128.3					
32	RD316	42.4	62.2	101.8						
32	RG316	42.5								
32	316D	44.0	72.0							
18	.047 S/R	53.7	77.7	127.8	157.6	211.6	231.7	250.8	269.1	320.4
25	BJ047	69.4	91.0	142.0	180.0					
32	RG178	71.3								

To select a cable first determine the maximum frequency the cable assembly needs to operate at. Cables under that frequency are listed by lowest attenuation first. Refer to catalog page for detailed information.

Flexible	Lab-Flex®	Semi-Rigid	Formable
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LMR® is a registered trademark of Times Microwave Systems

**Features**

- Up to 46 GHz
- 40% Lower Loss than Solid Dielectrics
- Superior Shielding Effectiveness
- Direct Solder Sleeve to Outer Braids
- Available with Protective Coverings of:  
Armor  
Weatherized  
Armor/Weatherized  
Extended Boots
- Stainless Steel Connectors
- Phased Matched Sets Available  
(Standard Tolerance is  $\pm$  One Degree per GHz; See Page 51)
- Silver Plated Copper Conductors

**Applications**

- Test Cables
- Low Loss Jumpers
- High Frequency Interconnects
- Satcom
- Instrumentation
- Antennas
- Telecommunication



*Lab-Flex® cables are manufactured in accordance with Florida RF Labs® specifications. The high velocity low loss tape-wrapped dielectric provide up to 40% lower loss than conventional cables. Custom braids provide superior mechanical strength and shielding greater than 90dB.*

**Quick Chart**

<b>Lab-Flex® Cable</b>	<b>Diameter (Inches)</b>	<b>Maximum Frequency</b>
Lab-Flex® 135	0.135	46 GHz
Lab-Flex® 160	0.160	40 GHz
Lab-Flex® 200	0.200	30 GHz
Lab-Flex® 290	0.290	18 GHz
Lab-Flex® 335	0.335	18 GHz

*The smaller the cable diameter the higher the frequency; the smaller the cable diameter the higher the loss.*

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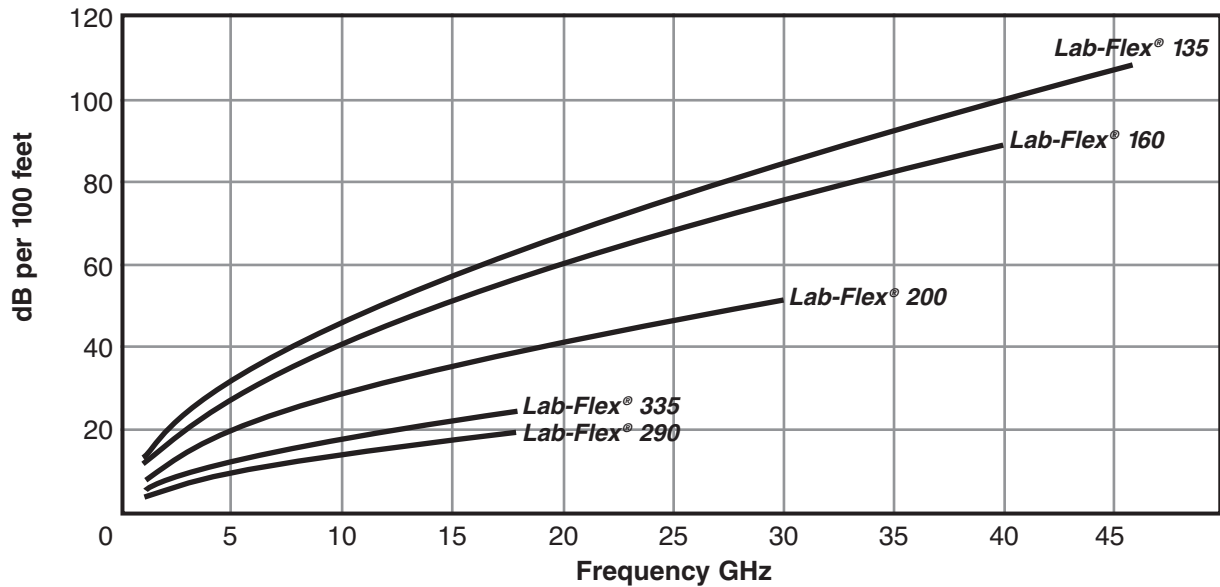
**Lab-Flex® Electrical Specifications**

	<b>Lab-Flex® 135</b>	<b>Lab-Flex® 160</b>	<b>Lab-Flex® 200</b>	<b>Lab-Flex® 290</b>	<b>Lab-Flex® 335</b>
Frequency Max (GHz)	46	40	30	18	18
Velocity of Propagation	82%	76%	80%	84%	80%
Shielding Effectiveness 1 GHz (dB/ft)	>90	>90	>90	>90	>90
Capacitance (pF/ft)	25	27	25	24	25
Delay (ns/ft), (ns/meter)	1.24, 4.07	1.34, 4.40	1.27, 4.17	1.21, 3.97	1.27, 4.17

**Lab-Flex® Construction Specifications**

	<b>Lab-Flex® 135</b>	<b>Lab-Flex® 160</b>	<b>Lab-Flex® 200</b>	<b>Lab-Flex® 290</b>	<b>Lab-Flex® 335</b>
Inner Conductor Solid Silver Plated Copper	Solid 0.032	Solid 0.035	Solid 0.051	Solid 0.089	Solid 0.088
Dielectric Taped Micro-Porous PTFE	0.087	0.105	0.145	0.235	0.251
First Outer Shield (inches) Flat Silver Plated Copper Braid	0.094	0.117	0.152	0.249	0.258
Second Outer Shield (inches) Metalized Film Tape Interlayer	N/A	0.124	0.158	N/A	0.264
Third Outer Shield (inches) Round Silver Plated Braid	0.112	0.142	0.168	0.267	0.284
Jacket (inches) Extruded FEP Color Mauve	0.135	0.160	0.195	0.292	0.335
Weight (lbs/100ft) (Kg/100m)	1.9 (1.6)	4 (3.5)	5.6 (4.7)	7.5 (6.3)	8.5 (7.1)
Temp. Range (°C)	-65 to 200	-65 to 200	-65 to 200	-65 to 200	-65 to 200
Minimum Bend Radius Inches (mm)	0.75 in. (19.1 mm)	0.9 in. (22.9 mm)	1 in. (25.4 mm)	1.6 in. (40.6 mm)	2 in. (50.8 mm)

**Attenuation vs Frequency**



**Maximum Insertion Loss and Power Handling**

Frequency GHz	Lab-Flex® 135		Lab-Flex® 160		Lab-Flex® 200		Lab-Flex® 335		Lab-Flex® 290		
	Loss dB/100ft	Power* Watts	Loss dB/100ft	Power* Watts	Loss dB/100ft	Power* Watts	Loss dB/100ft	Power* Watts	Loss dB/100ft	Power* Watts	
1.0	13.5	396	12.6	532	8.6	740	5.3	1620	4.3	1940	
2.0	19.6	271	17.9	367	12.3	507	7.6	1100	6.1	1320	
4.0	27.9	186	25.5	286	17.7	358	10.9	780	8.8	940	
6.0	34.8	155	31.5	198	21.9	279	13.6	630	10.9	750	
8.0	40.7	128	36.6	169	25.5	220	15.9	530	12.7	630	
10.0	46.0	111	41.2	159	28.7	208	18.0	470	14.4	570	
12.0	50.9	99	45.6	134	31.7	194	19.9	420	15.9	500	
14.0	55.5	90	49.8	121	34.4	178	21.7	390	17.3	460	
16.0	59.9	81	53.6	112	37.0	166	23.4	360	18.7	430	
18.0	64.0	72	57.3	106	39.5	156	25.0	330	20.0	400	18 GHz
20.0	68.0	67	62.0	101	41.8	147					
22.0	71.8	65	65.0	95	44.1	140					
24.0	75.5	63	67.0	90	46.2	134					
26.0	79.1	60	71.5	86	48.3	132					
28.0	82.6	57	73.5	82	50.4	122					
30.0	86.0	54	76.4	79	52.3	119					30 GHz
32.0	89.3	51	79.0	77							
34.0	92.6	48	82.0	75							
36.0	95.8	45	84.5	72							
38.0	98.9	42	87.0	69							
40.0	102.0	40	90.0	64							40 GHz
42.0	105.0	38									
44.0	108.0	35									
46.0	110.9	33									46 GHz

\*CW Power in watts at sea level and 23°C

**Armorized Overall Length**



Stainless Steel Armor  
Jacket overall length



Cable Jacket



**Stainless Steel Armor** - add "A" after  cable  product code

A flexible stainless steel armor is installed over the jacket of the cable from connector to connector. This prevents damage to the cable from being stepped on or run over by light equipment and prevents cable kinking throughout the assembly.

**Weight and Size by Cable Type - Armorized**

Cable	lbs/100ft	Outside Diameter of Armor
Lab-Flex® 135/160	8.0/10.0	0.31 in. (7.87 mm)
Lab-Flex® 200	10.0	0.33 in. (8.38 mm)
Lab-Flex® 290/335	15.5/19.0	0.50 in. (12.7 mm)

**Weatherized Overall Length**



Polyolefin (W) or Neoprene (N)  
Jacket overall length



Cable Jacket



Exposed cable left bare for illustration purposes only.

**Weatherized** - add "W" for Polyolefin after  cable  product code.  
add "N" for Neoprene after  cable  product code.

A polyolefin jacket (shrink tubing) is applied over the jacket of the cable from connector to connector to provide additional protection from UV, moisture and other elements encountered in outdoor applications. Neoprene may be substituted at a slightly higher cost.

**Weight and Size by Cable Type - Weatherized**

Cable	lbs/100ft	Outside Diameter of Cable
Lab-Flex® 135/160	3.1/5.2	.18/.21 in. (4.57/5.33 mm)
Lab-Flex® 200	10.0	.25 in. (6.35 mm)
Lab-Flex® 290/335	9.5/10.5	.34/.39 in. (8.64/9.9 mm)

**Armorized & Weatherized Overall Length**

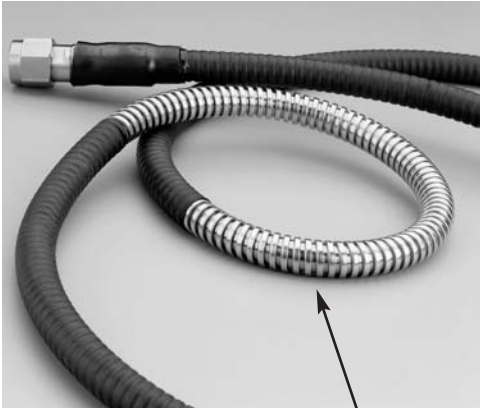


Polyolefin (W) or Neoprene (N)  
Jacket overall length



Stainless Steel Armor  
Jacket overall length

Cable Jacket



Exposed armor left bare for illustration purposes only.

*Weatherized Armor* - add "AW" for Armor with Polyolefin after cable product code.  
add "AN" for Armor with Neoprene after cable product code.

*A polyolefin jacket (shrink tubing) is applied over the entire length of the stainless steel armor, to prevent dirt, water and other elements from penetrating into the armor. Neoprene may be substituted at a slightly higher cost.*

**Weight and Size by Cable Type - Armorized & Weatherized**

Cable	lbs/100ft	Outside Diameter of Armor
Lab-Flex® 135/160	9.1/11.2	0.36 in. (9.14 mm)
Lab-Flex® 200	11.5	0.38 in. (9.65 mm)
Lab-Flex® 290/335	17.5/18.0	0.55 in. (13.97)

Beside offering a wide range of protective covering Florida RF Labs® offers two methods of strain relief. The extended boots are available for all flexible cable assemblies. The armored end option, which takes advantage of the solder sleeve cable-to-connector termination method, is available on the Lab-Flex® series only.



### **The Solder Sleeve Advantage**

One advantage of using Lab-Flex® cables is the cable to connector termination utilizing solder sleeves. Common methods of cable terminations such as crimping or clamping the outer cable braids to the connector body does not capture all of the braid, which leads to intermittent electrical performance and low connector pull performance. With the Lab-Flex® solder sleeve, both the inner and outer braid are directly soldered 360 degrees around the sleeve. This solder sleeve provides the best braid to connector termination assuring superior electrical performance and the highest connector pull performance.

### **Strain Relief**

Protects the cable from kinking at the cable-to-connector termination.

Regardless of attachment method, the cable can be damaged when a load in excess of 10 pounds (4.5kg) is applied perpendicular to the connector. All flexible cable assemblies from Florida RF Labs® come with dual wall shrink tubing boots that provide limited strain relief. In most applications this standard boot is adequate, however, if the application requires large movements, such as a test cable, additional strain relief might be required. Two methods of strain relief are described below.



### **The Extended Boot Advantage, Option E**

This method uses layers of different lengths of shrink tubing. This will distribute the force applied to the cable-to-connector termination over a 3-5 inch (7-13cm) length of cable, depending on the cable diameter. This method of additional strain relief is available on all flexible cables assemblies made by Florida RF Labs®.

See the previous pages for detailed information on Armor & Weather Protective Coatings.



MMS-135A-24.0-MMS  
MMS-135-24.0-MMS

Lab-Flex® 135 cable offers about 40% reduction in loss and all the advantages of a flexible cable, when compared with RG405 semi-rigid cable. With 2.4 mm connectors Lab-Flex® 135 provides a cost effective, low loss flexible cable for frequencies up to 46 GHz.

### Connector Types

Connector	Code	Max Frequency
2.4 mm plug (male) straight	MMS	54 GHz
2.4 mm jack (female) straight	MFS	54 GHz
2.9 mm plug (male) straight	KMS	40 GHz
2.9 mm jack (female) straight	KFS	40 GHz
SMA plug (male) straight	SMS	18 GHz
SMA plug (male) right angle	SMR	14 GHz

### Features/Benefits

- Mode Free Operation to 46 GHz
- 80% Velocity Low Loss Dielectric
- Superior Shielding Effectiveness
- Available with Protective Coverings of:
  - Armor
  - Weatherized
  - Armor/Weatherized
- Stainless Steel Connectors
- Phase Matched Sets Available  
(Standard tolerance is  $\pm$  One degree per GHz)

### Applications

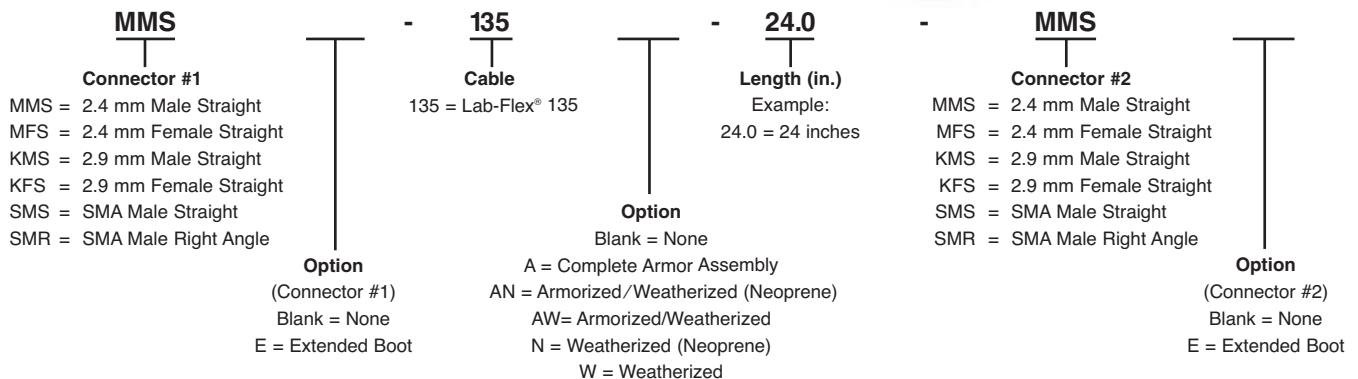
- Test Cables
- Test Head Cables
- Switch Interconnects

### Quick Spec.

Frequency GHz	Power Watts	Loss dB/100ft
1	396	13.5
10	111	46.0
18	72	64.0
26	60	79.1
40	40	102.0
46	33	110.9

Bend Radius: 0.6 inches (15.2mm)

### Part Numbering Code for Lab-Flex® 135





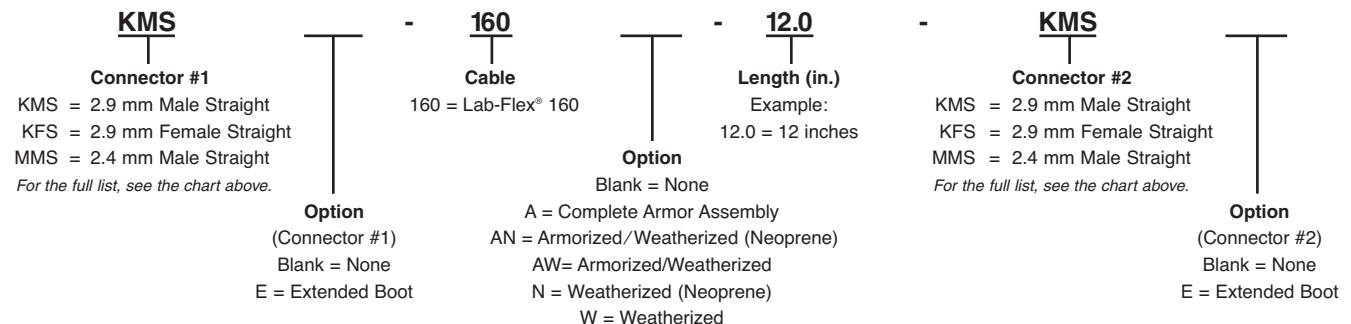
KMS-160A-24.0-KMS  
KMS-160-24.0-KMS

Lab-Flex® 160 cable offers a very cost effective means of meeting high frequency cable assembly requirements. A wide range of high frequency stainless steel connectors are available for use. A 76% velocity dielectric provides low loss without sacrificing dielectric strength.

### Connector Types

Connector	Code	Max Frequency
2.9 mm plug (male) straight	KMS	40 GHz
2.9 mm plug (male) right angle	KMR	40 GHz
2.9 mm jack (female) straight	KFS	40 GHz
2.9 mm bulkhead (female) straight	KFBS	40 GHz
2.4 mm plug (male) straight	MMS	40 GHz
2.4 mm plug (male) right angle	MMR	40 GHz
2.4 mm jack (female) straight	MFS	40 GHz
3.5 mm plug (male) straight	3MS	35 GHz
3.5 mm jack (female) straight	3FS	35 GHz
SMA plug (male) straight	SMS	18 GHz
Type N plug (male) straight	NMS	18 GHz

### Part Numbering Code for Lab-Flex® 160



### Features/Benefits

- Mode Free Operation to 40 GHz
- 76% Velocity Low Loss Dielectric
- Superior Shielding Effectiveness
- Available with Protective Coverings of:
  - Armor
  - Weatherized
  - Armor/Weatherized
- Stainless Steel Connectors
- Phase Matched Sets Available  
(Standard tolerance is  $\pm$  One degree per GHz)

### Applications

- Test Cables
- Test Head Cables
- Switch Interconnects
- Fiber Optic Systems
- Radio Systems
- Test Equipment Interconnects

### Quick Spec.

Frequency GHz	Power Watts	Loss dB/100ft
1	530	12.6
10	150	41.2
18	130	56.3
26	110	68.6
40	60	98.8

Bend Radius: 0.9 inches (22.9mm)

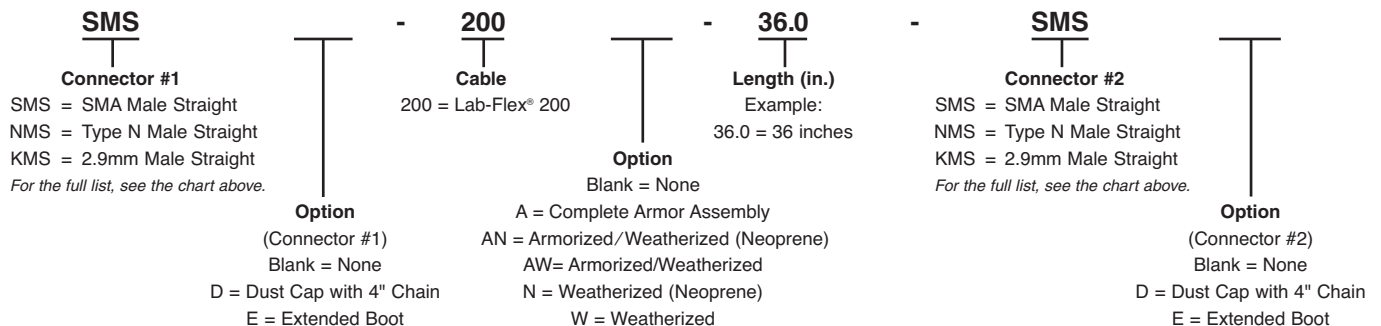


Lab-Flex® 200 is ideal for low loss replacement of solid dielectric .195 diameter cable. With an 80% velocity tape-wrapped dielectric, Lab-Flex® 200 cable has 40% lower loss than solid dielectrics of the same size.

### Connector Types

Connector	Code	Max Frequency
2.9 mm plug (male) straight	KMS	30 GHz
2.9 mm plug (male) right angle	KMR	30 GHz
SMA plug (male) straight	SMS	18 GHz
SMA jack (female) straight	SFS	18 GHz
SMA bulkhead (female) straight	SFBS	18 GHz
SMA plug (male) right angle	SMR	18 GHz
Type N plug (male) straight	NMS	18 GHz
Type N jack (female) straight	NFS	18 GHz
Type N bulkhead (female) straight	NFBS	18 GHz
Type N plug (male) right angle	NMR	18 GHz
TNC plug (male) straight	TMS	18 GHz
TNC jack (female) straight	TFS	18 GHz
TNC bulkhead (female) straight	TFBS	18 GHz
TNC plug (male) right angle	TMR	18 GHz
7mm straight	A7	18 GHz

### Part Numbering Code for Lab-Flex® 200



### Features/Benefits

- Mode Free Operation to 30 GHz
- 80% Velocity Low Loss Dielectric
- Superior Shielding Effectiveness
- Available with Protective Coverings of:
  - Armor
  - Weatherized
  - Armor/Weatherized
- Stainless Steel Connectors
- Phase Matched Sets Available  
(Standard tolerance is ± One degree per GHz)

### Applications

- Test Cables
- Test Head Cables
- Switch Interconnects
- System Upgrades

### Quick Spec.

Frequency GHz	Power Watts	Loss dB/100ft
1	740	8.6
10	208	28.7
18	156	39.5
26	132	48.3
30	119	52.3

Bend Radius: 1.0 inches (25.4mm)

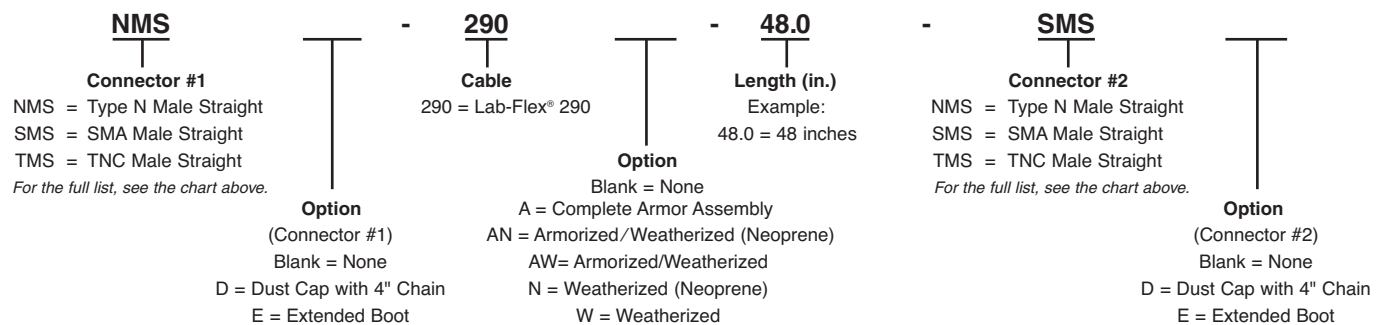


Lab-Flex® 290 offers the lowest loss flexible cable to 18 GHz. This cable is ideal for applications where low loss or high power is a concern. All connectors are made free 18 GHz stainless steel construction.

### Connector Types

Connector	Code	Max Frequency
SMA plug (male)	SMS	18 GHz
SMA jack (female)	SFS	18 GHz
SMA bulkhead (female)	SFBS	18 GHz
SMA plug right angle (male)	SMR	18 GHz
Type N plug (male)	NMS	18 GHz
Type N jack (female)	NFS	18 GHz
Type N bulkhead (female)	NFBS	18 GHz
Type N plug right angle (male)	NMR	18 GHz
TNC plug (male)	TMS	18 GHz
TNC jack (female)	TFS	18 GHz
TNC bulkhead (female)	TFBS	18 GHz
TNC plug right angle (male)	TMR	18 GHz

### Part Numbering Code



### Features/Benefits

- Mode Free Operation to 18 GHz
- 84% Velocity Low Loss Dielectric
- Superior Shielding Effectiveness
- Available with Protective Coverings of:
  - Armor
  - Weatherized
  - Armor/Weatherized
- Stainless Steel Connectors
- Phase Matched Sets Available  
(Standard tolerance is  $\pm$  One degree per GHz)

### Applications

- Long Run Test Cables
- Field Test Setups
- Antenna Systems

### Quick Spec.

Frequency GHz	Power Watts	Loss dB/100ft
1	1940	4.3
10	570	14.4
18	400	20.0

Bend Radius: 1.6 inches (40.6mm)



Lab-Flex® 335 is designed as a low loss replacement for solid dielectric cables such as RG214 & RG393. With an 80% velocity tape-wrapped dielectric, Lab-Flex® 335 cable has 40% lower loss than solid dielectrics of the same size.

**Connector Types**

Connector	Code	Max Frequency
SMA plug (male)	SMS	18 GHz
SMA jack (female)	SFS	18 GHz
SMA bulkhead (female)	SFBS	18 GHz
SMA plug right angle (male)	SMR	18 GHz
Type N plug (male)	NMS	18 GHz
Type N jack (female)	NFS	18 GHz
Type N bulkhead (female)	NFBS	18 GHz
Type N plug right angle (male)	NMR	18 GHz
TNC plug (male)	TMS	18 GHz
TNC jack (female)	TFS	18 GHz
TNC bulkhead (female)	TFBS	18 GHz
TNC plug right angle (male)	TMR	18 GHz

**Features/Benefits**

- Mode Free Operation to 18 GHz
- 80% Velocity Low Loss Dielectric
- Superior Shielding Effectiveness
- Available with Protective Coverings of:
  - Armor
  - Weatherized
  - Armor/Weatherized
- Stainless Steel Connectors
- Phase Matched Sets Available  
(Standard tolerance is ± One degree per GHz)

**Applications**

- Long Run Test Cables
- Field Test Setups
- Antenna Systems

**Quick Spec.**

Frequency GHz	Power Watts	Loss dB/100ft
1	1620	5.3
10	470	18.0
18	330	25.0

Bend Radius: 2.0 inches (50.8mm)

**Part Numbering Code**

