Assembly Length Definition

The outlines below show typical cable assembly configurations and reference points to determine overall length.

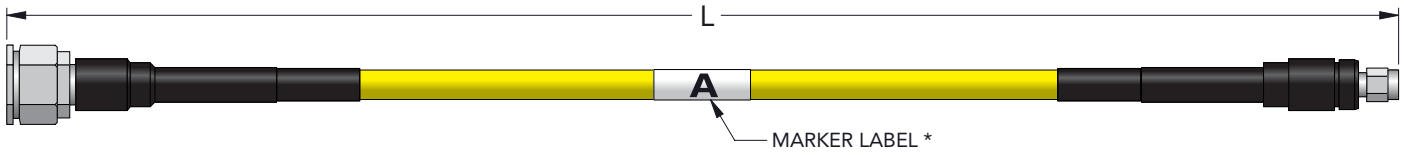


Fig. 1 – NPS-XXXX-XXX-SPS

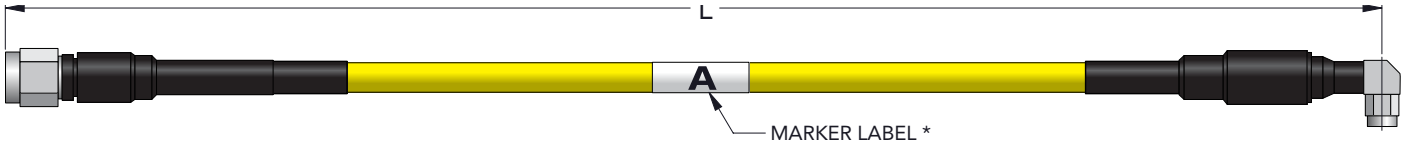


Fig. 2 – TPS-XXXX-XXX-SPRC

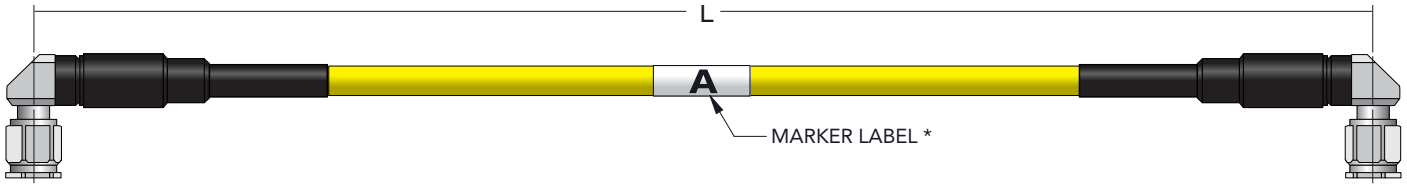


Fig. 3 – TPR-XXXX-XXX-TPR

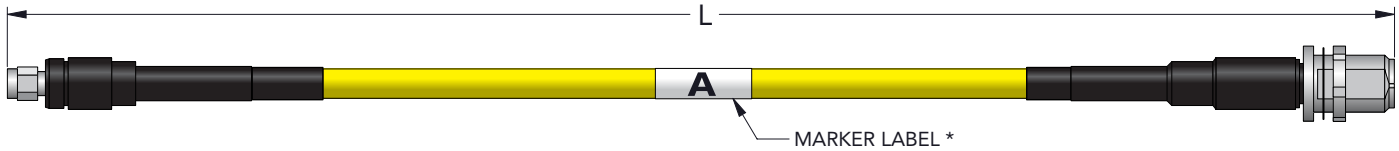


Fig. 4 – SPS-XXXX-XXX-NJB

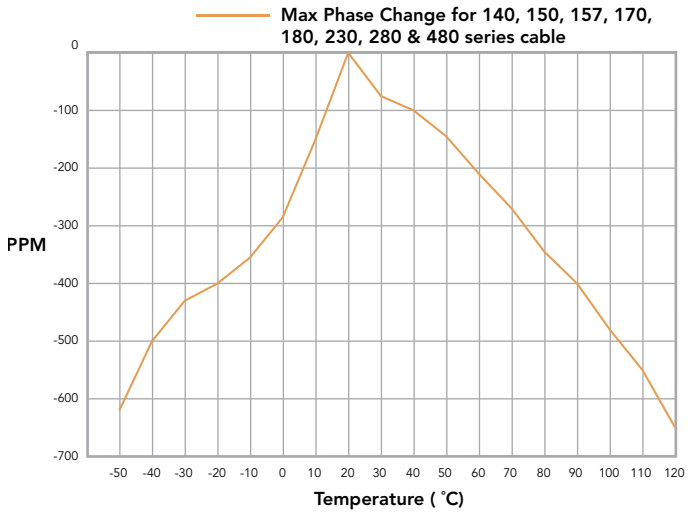
* A center marker label is fitted to all assemblies over 6" in length; two markers located close to the cable ends are fitted for asemblies greater than 10ft./120"/3m.

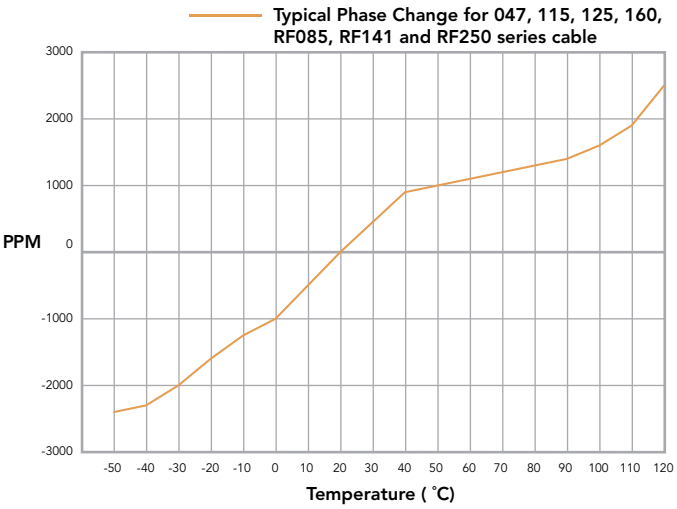
Length in	**Tol In**	**Length metric**	**Tol in metric**
6" to < 12"	+0.50"/-0.00	16 cm to < 30 cm	+1.5 cm/-0.00
12" to <72"	+1.00"/-0.00	30 cm to <180 cm	+3 cm/-0.00
72" < Length	+2.00"/-0.00	180 cm < Length	+6 cm/-0.00

Note: For reflex assemblies with SMA direct solder or shell style connectors, the tolerances are…

2" to < 36"	±0.100"
36" to <72"	±0.250"
72" < Length	±0.500"

Phase Characteristics





Determination of Phase Change Over Temperature

The following example illustrates how to calculate the change in phase (and the tracking error) of cable assemblies over a specific temperature range. In this example, the cable is IW 2801, and the temperature range is -40˚C to +80˚C.

* determined by the charts above

** tracking error of two or more assemblies of the same type

1. Calculate electrical length
2. Calculate change in phase
3. Calculate tracking error

Frequency	=	10 GHz	f
Assembly length	=	72 in	L
Start temp	=	20˚C	T
Dielectric const	=	1.4	e
Change in PPM	=	-500*	PPM
PPM tracking error	=	±100 PPM tracking	
Electrical length	=	TBD	Φ
Change in phase	=	TBD	ΔΦ
Tracking error	=	TBD**	Φ tracking

Phase Change with Flexing

Phase change when flexing will be slightly different depending on the particular cable. Larger cables have more dielectric and greater internal forces, thus phase change will be greater for cables with larger diameters. When wrapped 360˚ around a 4 inch diameter mandrel, the phase change will be:

±0.30˚ • f - for cables 480, 280, 230, 180 and 170

±0.20˚ • f - for cables 157, 150 and 140

$$\Phi = \frac{L \cdot \sqrt{e} \cdot f \cdot 360}{11.808}$$

$$\Phi = \frac{72 \cdot \sqrt{1.4} \cdot 10 \cdot 360}{11.808} = 25,973^{\circ}$$

$$\Delta\Phi = \frac{\Phi \cdot PPM}{1,000,000}$$

$$\Delta\Phi = \frac{25973 \cdot (-500)}{1,000,000} = -12.93^{\circ}$$

$$\Phi_{tracking} = \frac{\Phi \cdot (PPM\ tracking)}{1,000,000}$$

$$\Phi_{tracking} = \frac{25973 \cdot (\pm 100)}{1,000,000} = \pm 2.6^{\circ}$$

Phase Match and Time Delay

For applications where phase or electrical length is a critical performance parameter, IW can provide matched assembly sets, tested to customer specifications, typically up to 40 GHz, with both Low Loss Phase Stable and Re-Flex™ cable types.

Relative phase matching is a common requirement achieved with multiple assembly sets. Typical phase matching tolerances are shown in Table 1 below.

Frequency (GHz)	Phase Match (degrees)
10	± 2
18	± 3.5
26.5	± 5
40	± 8

Tighter tolerances may be achievable; IW engineers review all matching requirements on a case by case basis. In addition, IW also provides time delay matched assemblies with tolerances in the order of 2pS being achievable with both Low Loss and Re-Flex™ cable types, and individual assemblies can also be supplied trimmed to a specific electrical length.

All matched assemblies are tested 100% for insertion loss and VSWR performance parameters in addition to phase.