StabilityPlus™ Microwave/RF Cable Assemblies

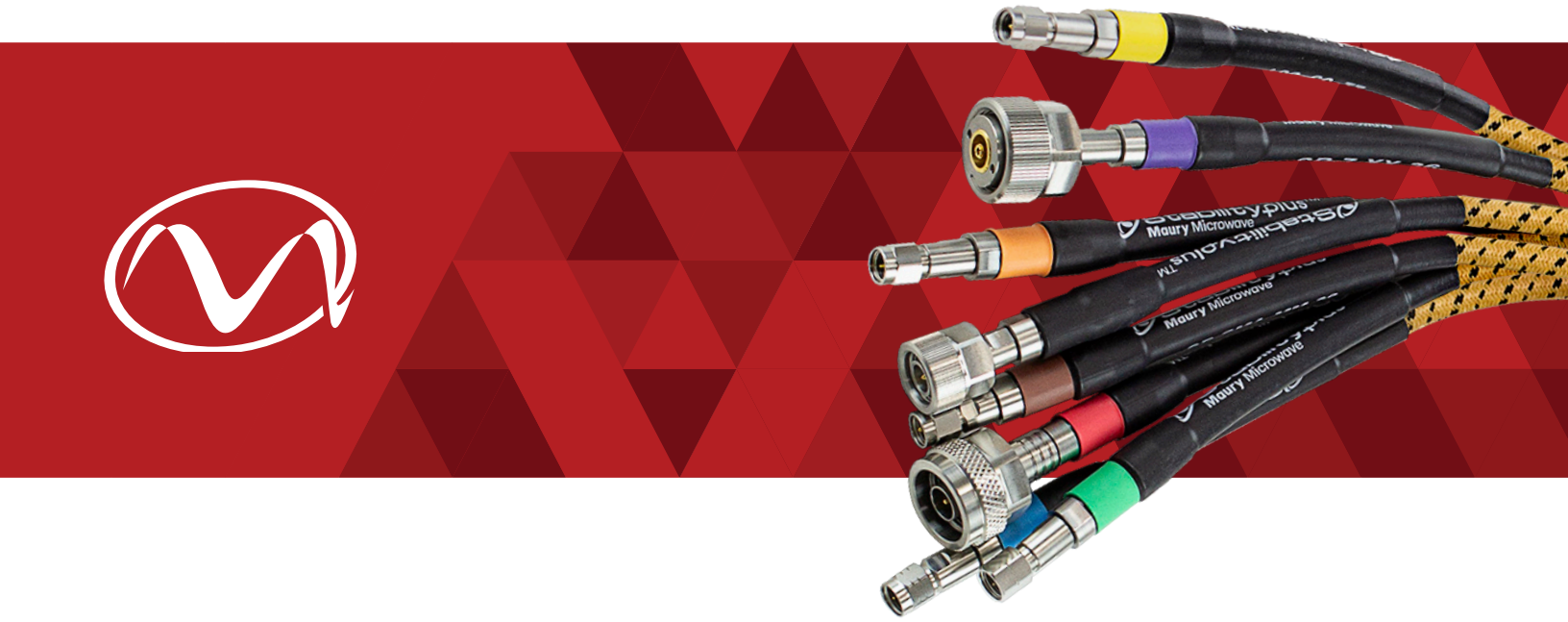
DATA SHEET / 2Z-009

THE INDUSTRY'S BEST PHASE STABLE CABLE ASSEMBLY JUST GOT BETTER!

StabilityPlus™ Maury Microwave

MODELS:

SP-185 // 1.85mm color-coded StabilityPlus™ cables
SP-24 // 2.4mm color-coded StabilityPlus™ cables
SP-292 // 2.92mm color-coded StabilityPlus™ cables
SP-35 // 3.5mm color-coded StabilityPlus™ cables
SP-SMA // SMA color-coded StabilityPlus™ cables
SP-N // Type N color-coded StabilityPlus™ cables
SP-7 // 7mm color-coded StabilityPlus™ cables
SP-TNCA // TNC-A StabilityPlus™ cables



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StabilityPlus™ Microwave/RF Cable Assemblies

SERIES SP-185 , SP-24, SP-292, SP-35, SP-SMA, SP-N, SP-7, AND SP-TNCA

Features and Benefits

- Industry's best phase phase stability with flexure
- Amplitude stable with flexure
- Increased flexibility
- Reliable and repeatable measurements
- Longer flex life

Typical Applications

- Vector network analyzers (VNAs)
- RF and microwave instruments
- Bench-top testing
- RF production testing
- ATE systems

Description

Maury Microwave's StabilityPlus™ series sets the standard for high-performance ruggedized cable assemblies. Designed specifically for phase-stable and amplitude-stable applications, StabilityPlus™ offers excellent measurement repeatability even after cable flexure. StabilityPlus'™ light weight, superior flexibility and small form factor make it ideal for daily use with VNA's, test instruments, bench-top testing and ATE systems.

StabilityPlus™ cable assemblies are now part of the ColorConnect™ family! Following the proposed IEEE high-frequency connector/adapter color convention, StabilityPlus™ cable assemblies are the first commercially available assemblies to offer clear indications of compatibility and intermatability. ColorConnect™ makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible interconnects.

Stability Specifications

StabilityPlus™ Cable Type	Frequency	Typical Phase Stability with Flexure	Typical Amplitude Stability with Flexure
SP-185	67 GHz	±6°	±0.05 dB
SP-24	50 GHz	±4°	±0.05 dB
SP-292	40 GHz	±2°	±0.02 dB
SP-35	26.5 GHz	±2°	±0.02 dB
SP-SMA	26.5 GHz	±2°	±0.02 dB
SP-N	18 GHz	±2°	±0.02 dB
SP-7	18 GHz	±2°	±0.02 dB
SP-TNCA	18 GHz	±2°	±0.02 dB

Electrical Specifications

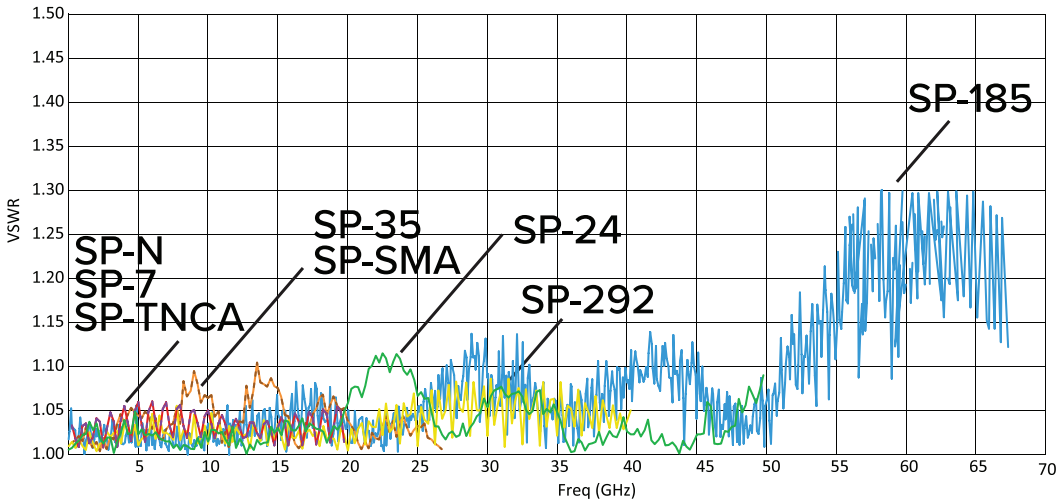
Stability™ Cable Type	SP-185	SP-24	SP-292	SP-35	SP-SMA	SP-N	SP-7	SP-TNCA
Maximum Frequency	67 GHz	50 GHz	40 GHz	26.5 GHz		18 GHz		
Typical Insertion Loss (cable only)	1.70 dB/ft	0.95 dB/ft	0.84 dB/ft	0.68 dB/ft		0.55 dB/ft		
VSWR (typical)	1.20:1	1.15:1	1.10:1					
Typical Phase Stability (degree)	±6°	±4°	±2°					
Max Phase Stability (degree)	±14°	±10.5°	±8.5°	±5.5°		±4.2°		
Typical Amplitude Stability (dB)	±0.05 dB		±0.02 dB					
Max Amplitude Stability (dB)	±0.20 dB	±0.10 dB						
Impedance (nominal)	50 ohm							
Velocity of Propogation	74% (nominal)							
Shielding Effectiveness	>100 dB (DC - 18 GHz)							
Time Delay (nominal)	1.34 ns/ft (4.5 ns/m)							
Phase Stability vs Temp	<4°/m/GHz (–55°+105°C)							

Mechanical Specifications

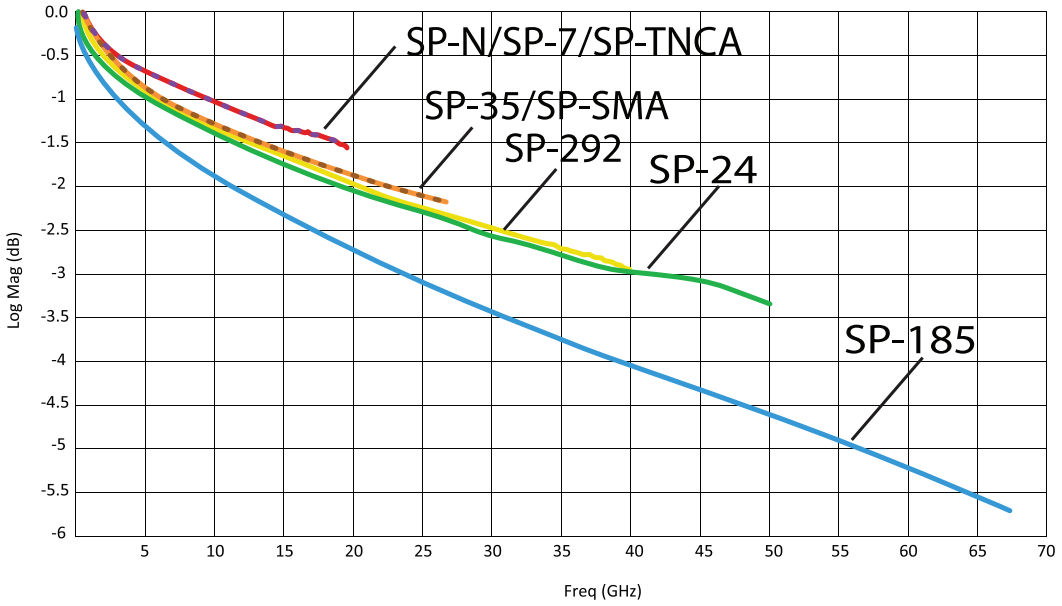
Stability™ Cable Type	SP-185	SP-24	SP-292	SP-35	SP-SMA	SP-N	SP-7	SP-TNCA
Center Conductor Material	Silver Plated Copper							
Connector Outer Diameter (nominal)	0.42 in (10.7mm)	0.49 in (12.5mm)				0.870 (22mm)	0.875 in (22.22mm)	0.64in (16.25mm)
Cable Outer Diameter (nominal)	0.2 in. (5mm)	0.25 in (6.35mm)						
Nominal Weight	0.677 oz/ft (63g/m)	0.97 oz/ft (90g/m)						
Flex Life Cycles (typical)	>15,000							
Connector Mating Cycles	>5,000							
Static. Bend Radius	1.0 in (25.4mm)							
Dynamic. Bend Radius	2 in (50.8mm)							
Crush Resistance	>254 lbf/in (44 kgf/cm)	>305 lbf/in (54 kgf/cm)						
Operating Temperature Range	–67°F to 221°F (–55°C to 105°C)							
ROH/Reach	Yes							

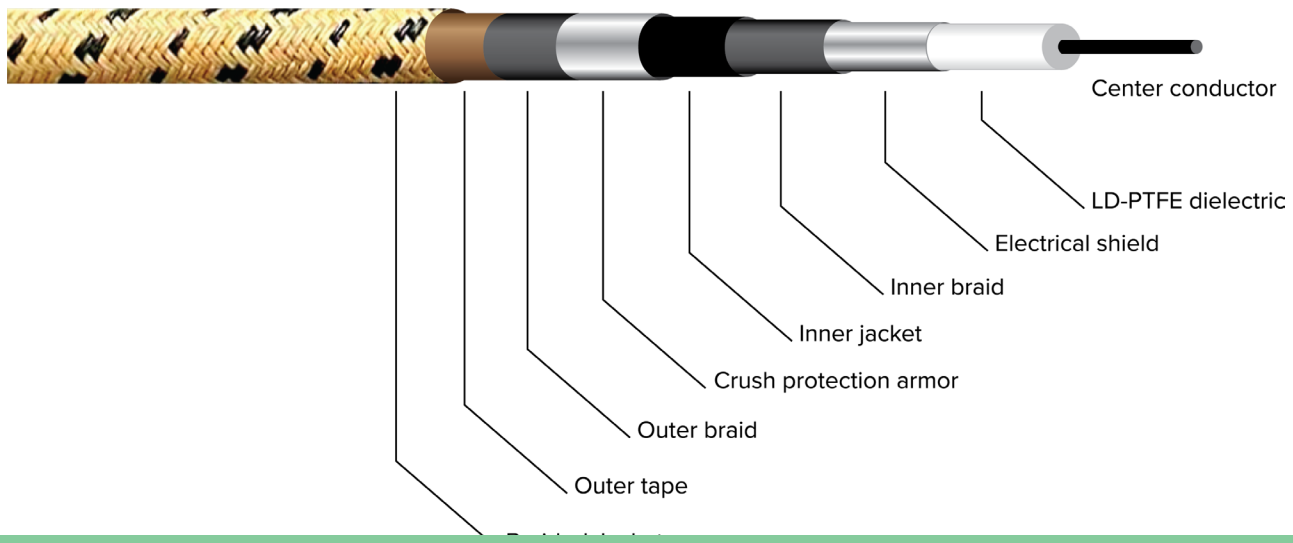
Maury StabilityPlus™ Cable Assembly Typical Performance

Maury StabilityPlus™ 36" Cable Assembly Typical VSWR



Maury StabilityPlus™ 36" Cable Assembly Typical Insertion Loss





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Max Insertion Loss/Attenuation

(1:1 VSWR, 25 C, Sea Level, Cable Only)

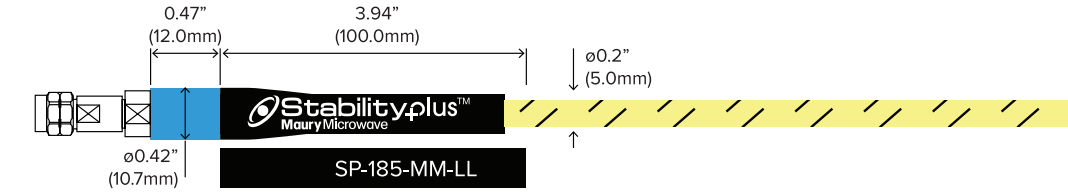
Freq (GHz)	SP-185 (dB/100 ft)	SP-24 (dB/100 ft)	SP-292 (dB/100 ft)	SP-35/SP-SMA (dB/100 ft)	SP-N/SP-7/SP-TNCA (dB/100 ft)
1	19.20	13.3	13.3	13.3	13.3
2	27.37	19.00	19.00	19.00	19.00
4	39.14	27.00	27.00	27.00	27.00
6	48.35	33.20	33.20	33.20	33.20
8	56.23	38.40	38.40	38.40	38.40
12	69.70	47.40	47.40	47.40	47.40
18	86.57	58.50	58.50	58.50	58.50
26.5	106.77	71.60	71.60	71.60	—
40	133.94	88.90	88.90	—	—
50	151.70	100.10	—	—	—
67	179.00	—	—	—	—

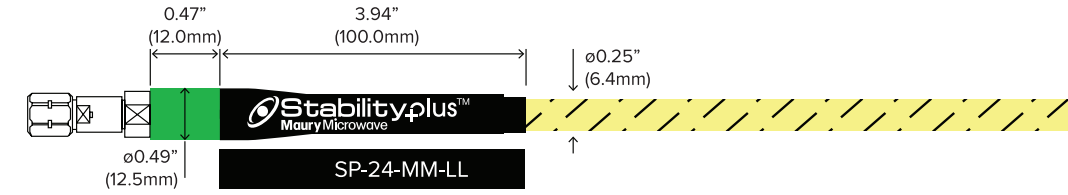
Average Power Handling

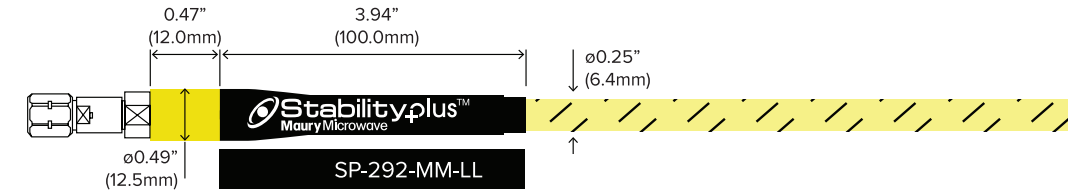
(1:1 VSWR, 25 C, Sea Level, Cable Only)

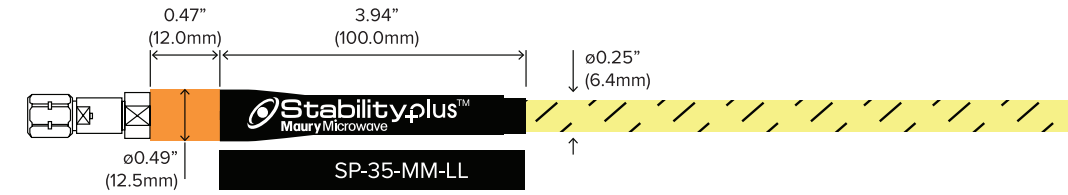
Freq (GHz)	SP-185 Watts (Max)	SP-24 Watts (Max)	SP-292 Watts (Max)	SP-35/SP-SMA Watts (Max)	SP-N/SP-7/SP-TNCA Watts (Max)
1	271	409	409	409	409
2	190	288	288	288	288
4	133	202	202	202	202
6	106	165	165	165	165
8	93	142	142	142	142
12	75	115	115	115	115
18	60	93	93	93	93
26.5	49	76	76	76	—
40	39	61	61	—	—
50	34	55	—	—	—
67	29	—	—	—	—

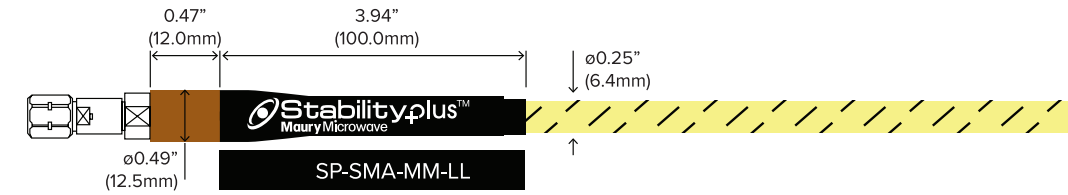
StabilityPlus™ Dimensions

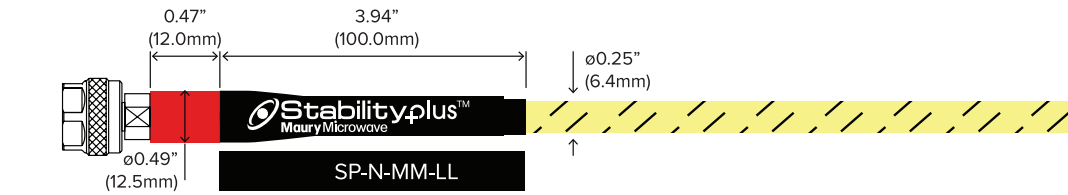


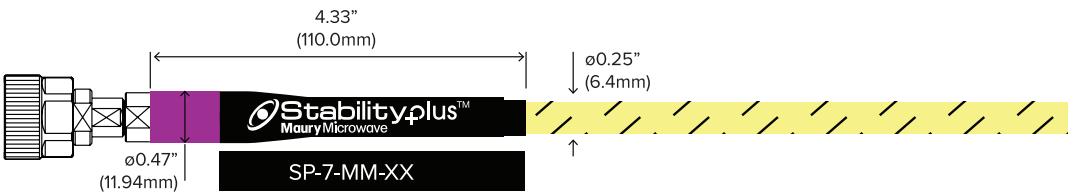


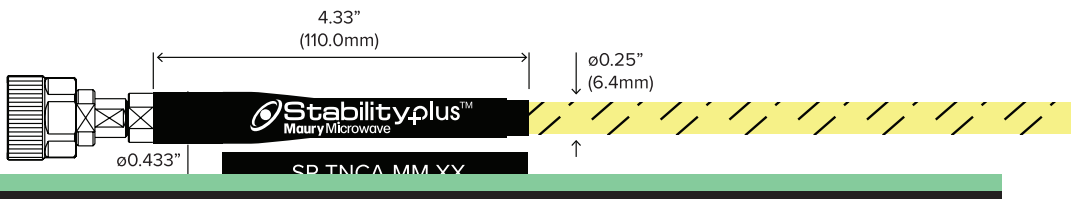












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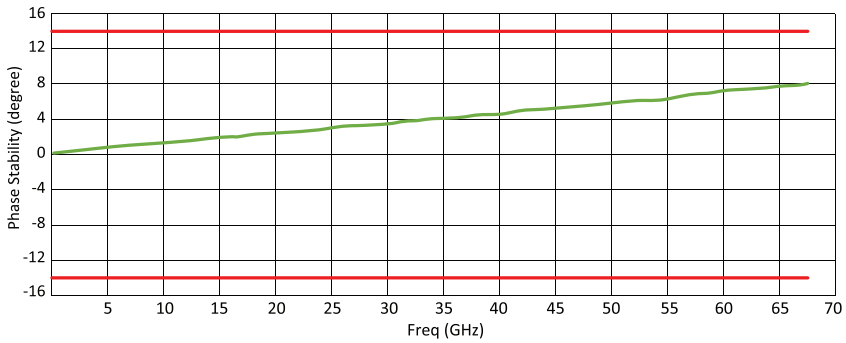
Phase Stability

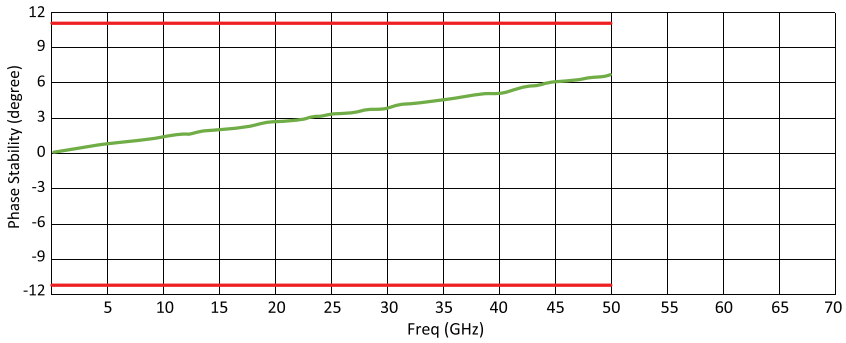
The maximum value for phase and amplitude stability was established using the following method. The cable was terminated with a short. With the cable in a straight position the VNA was normalized. The cable was coiled 360° around a mandrel 4 inches in diameter counter-clockwise and held in position for one sweep. The maximum deviation over the frequency range was recorded. The cable was then coiled 360° around the mandrel clockwise and held in position for one sweep and the maximum deviation was recorded. The cable was then returned to its original position for one sweep and the maximum deviation was recorded.

The plots on the right show the recorded worst-case phase variation.

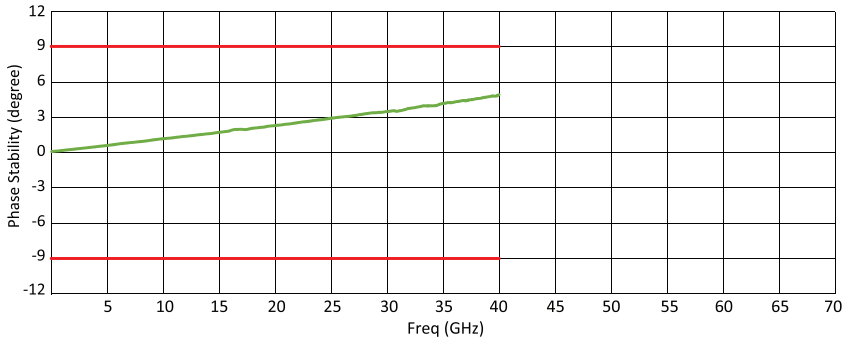
Exemplary data for SP-185-MM-36



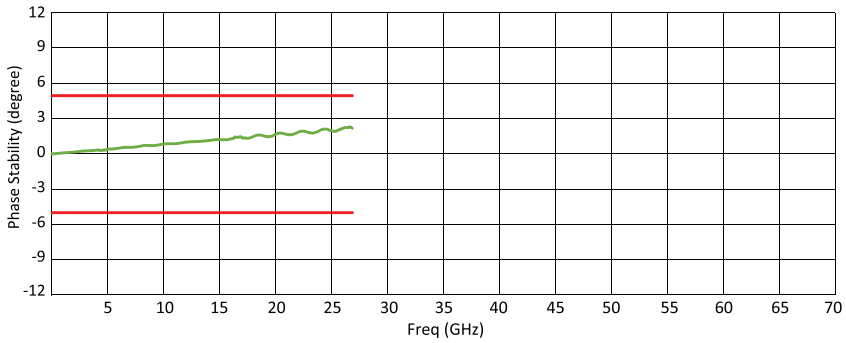
Exemplary data for SP-24-MM-36



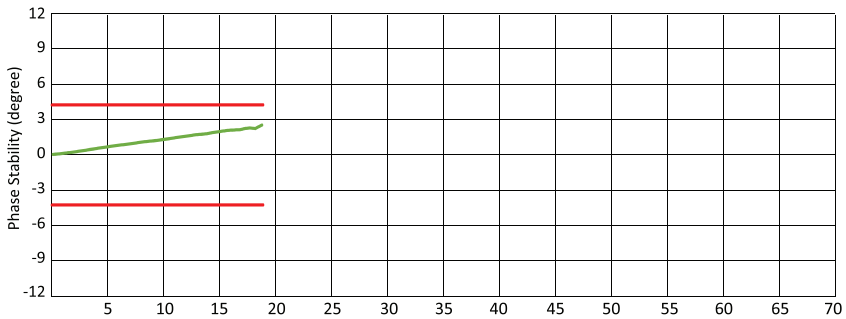
Exemplary data for SP-292-MM-36



Exemplary data for SP-35-MM-36/ SP-SMA-MM-36



Exemplary data for SP-N-MM-36/ SP-7-MM-36/ SP-TNCA-MM-36



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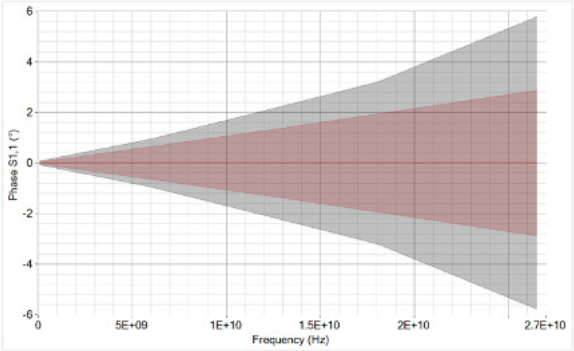
S-parameter measurements with uncertainty

A cable's *phase stability with flexure* specification is a metric used to communicate the impact of cable movement on a DUT measurement. It implies that lower specifications lessen the impact on the measurement (i.e. a cable with a 2° phase stability with flexure specification will have a lesser impact on a measurement than a cable with a 5° phase stability). However, the methods used to determine this specification may not be consistent across manufacturers, and likely do not represent the actual cable movement range of a user.

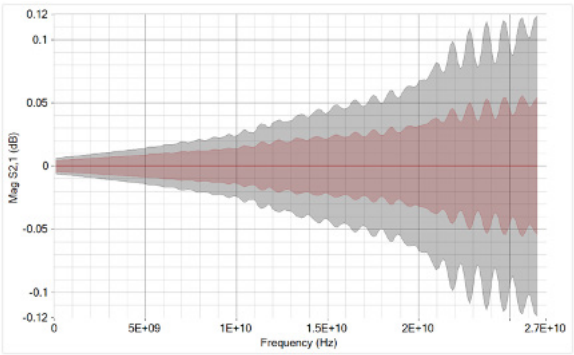
A better metric to understand a cable's impact on a DUT measurement is "uncertainty contribution". The cable's impact on measurement uncertainty can be calculated by moving the cable through a user's actual range of motion and recording the S-parameters across the movement. This technique has been thoroughly documented by the European Association of National Metrology Institutes (EURAMET)* and has been made commercially available in Maury's Insight™** calibration and measurement software platform.

The plots on the right show typical S-parameter measurements with uncertainty boundaries on different types of DUTs. The boundaries shown only consider the cable's direct contribution on measurement uncertainty.

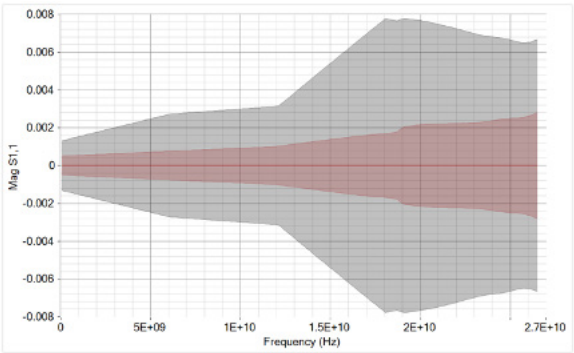
** https://www.maurymw.com/pdf/I-CAL-GUI-012.pdf*
*** https://www.maurymw.com/Precision/Insight_Software.php*



S11_phase measured on a short circuit termination
SP-35-MM-36 shown in red; leading global competitor shown in grey



S21_mag measured on an airline
SP-35-MM-36 shown in red; leading global competitor shown in grey



S11_mag measured on a 50Ω termination
SP-35-MM-36 shown in red; leading global competitor shown in grey

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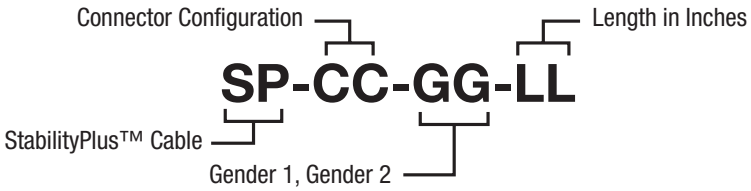
Ordering Instructions for StabilityPlus™ Cable Assemblies

Standard StabilityPlus™ Cable Assemblies



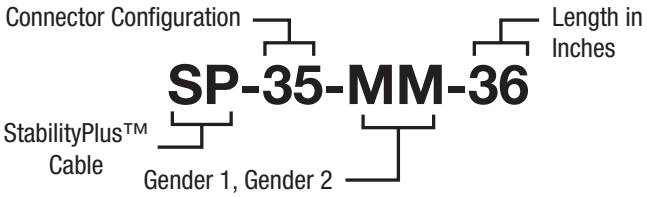
CC	GG	LL (Standard Lengths)
TNCA 7 (7mm) N (Type N)* SMA 35 (3.5mm) 292 (2.92mm) 24 (2.4mm) 185 (1.85mm)	MM (Male To Male) MF (Male to Female) FF (Female To Female) XX (Genderless to Genderless)** MX (Male to Genderless)** FX (Female to Genderless)**	24 36 48 60 78

** Type N available in male only.* *** Available for 7mm only.*

EXAMPLE:

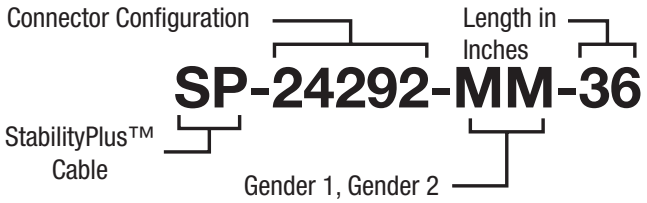
The following is a StabilityPlus™ cable assembly with 3.5mm male connectors on both ends, and 36 inches overall length.

Configuration Sample



EXAMPLE:

The following is a StabilityPlus™ cable assembly with 2.4mm male connector on one end and 2.92mm male connector on the other end, and 36 inches overall length.



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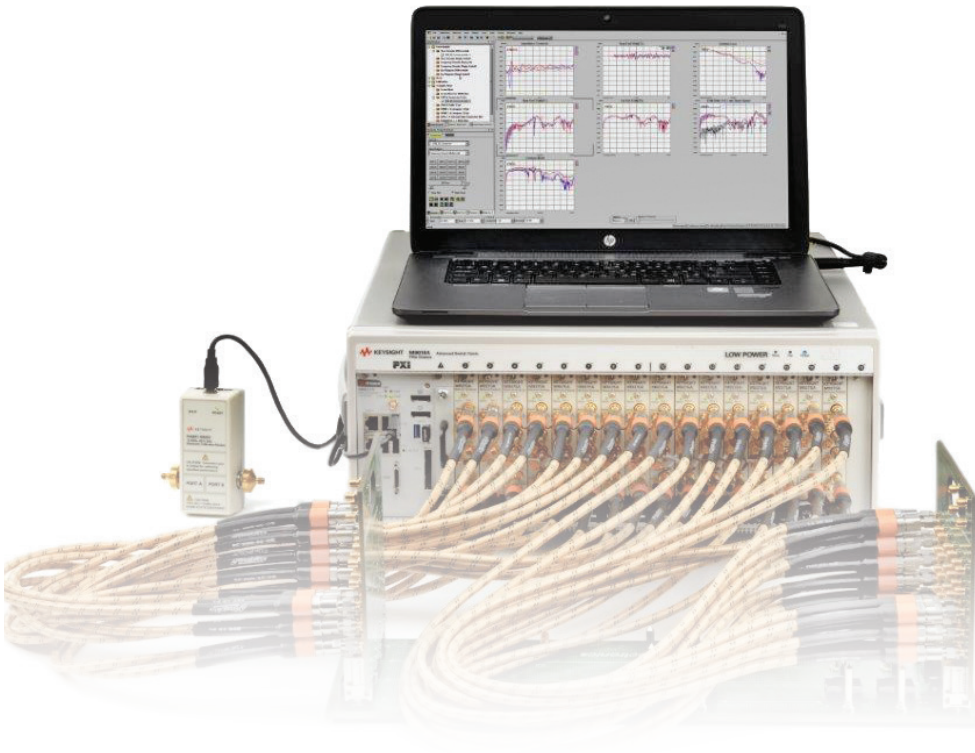
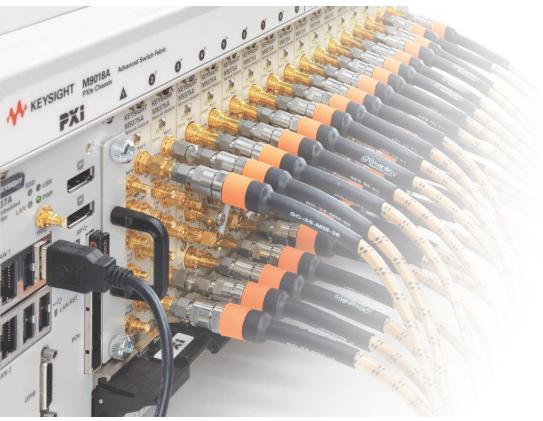
StabilityPlus™ Phase-Matched (PM) Cable Assembly Sets

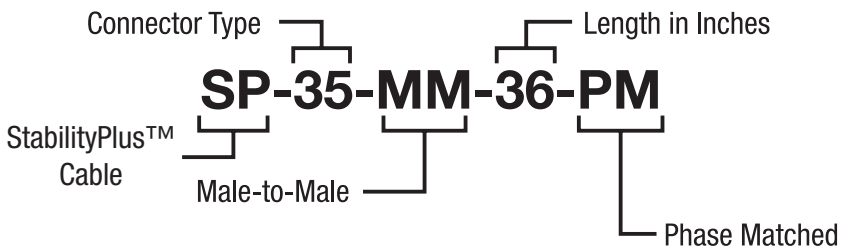
StabilityPlus™ Phase-Matched Cable Assemblies have been designed for applications where strict phase equality between multiple paths are required. StabilityPlus™ PM Cable Assemblies are matched within ±0.5°/GHz and available as sets of two or more assemblies. StabilityPlus™ PM Cable Assemblies are offered in both standard and low-profile formats and maintain the mechanical and electrical characteristics of the original assembly. Phase-matched assemblies are available with 1.85mm, 2.4mm, 2.92mm, 3.5mm and Type-N connectors and in all lengths.





Ordering Instructions for StabilityPlus™ Phase-Matched (PM) Cable Assembly Sets

To specify a StabilityPlus™ Phase-Matched Cable Assembly set, add "PM" at the end of the SP model number, as shown in the example below. "PM" indicates standard configuration Phase-Matched sets.



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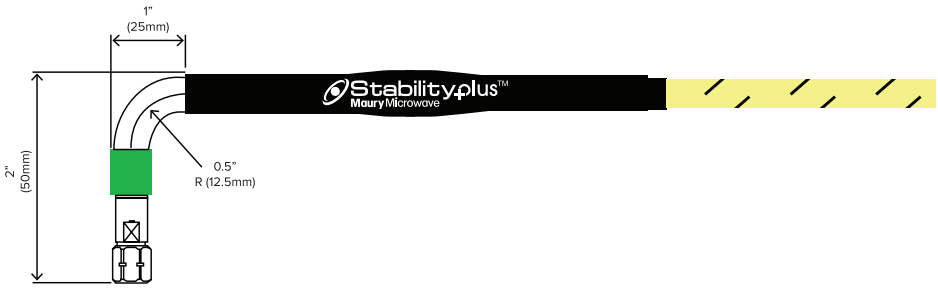
StabilityPlus™ Cable Assemblies — Swept Right-Angle

StabilityPlus™ Cable Assemblies with swept right-angle connectors are designed for applications requiring a fixed and stable bend where traditional cable assemblies may be inconvenient. With a bend radius of 0.5 inches and a cable-to-connector length of 2 inches, right-angle connectors allow StabilityPlus™ Cable Assemblies to retain the electrical and mechanical specifications of the traditional assembly while removing stresses related to hand-formed bends. StabilityPlus™ assemblies with swept right-angle connectors are built on demand and are available with 1.85mm, 2.4mm, 2.92mm, 3.5mm and Type-N connectors.

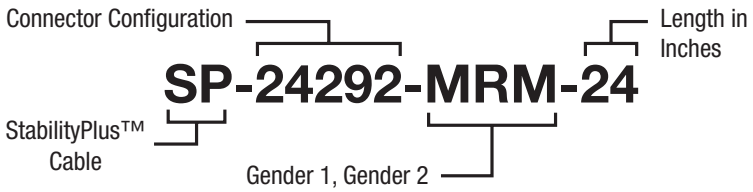


CC	G	LL
TNCA 7 (7mm) N (Type N) SMA 35 (3.5mm) 292 (2.92mm) 24 (2.4mm) 185 (1.85mm)	M (Male) MR (Male swept right-angle) F (Female) FR (Female swept right-angle) XR (Genderless swept right-angle)*	Custom length

** Available for 7mm only.*

Example:

The following is a StabilityPlus™ cable assembly with one 2.92mm male connector and one 2.4mm male swept right-angle connector, and 24 inches overall length.



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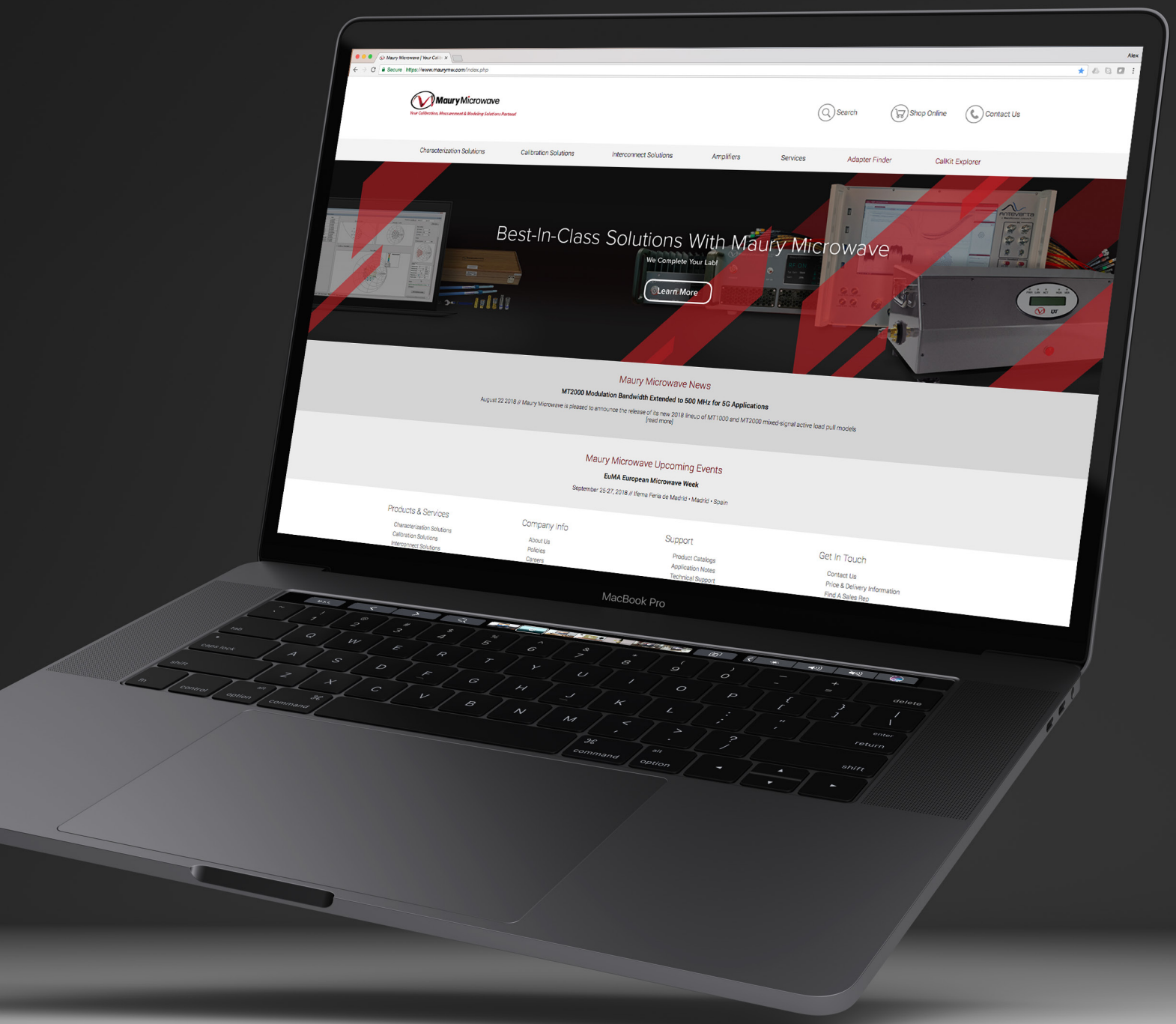

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Maury Microwave

DATA SHEET / 2Z-009 / Rev 2023.12/A
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