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MegaPhase® 67 GHz Test Cables

VNA Test Port Extension Cables

MegaPhase's industry-leading test cables have been optimized for consistent and repeatable performance through 67 GHz. These phase and amplitude stable test cables feature 1.85mm connectors, including connectors that mate directly with 1.85mm VNA ports.

MegaPhase® 67 GHz test cable products are built-to-order with any combination of 1.85mm connectors, including our *Factory Formed* right angles. Available in lengths from 8 to 72in (20 to 183cm).



Frequency (GHz)	Band	VSWR (x.xx:1)	Attenuation (dB/ft)	Attenuation (dB/m)	Connector Loss (dB/ea)
0.3	VHF	1.02	0.08	0.27	0.02
1.0	UHF	1.05	0.12	0.39	0.02
2.0	L	1.10	0.17	0.57	0.03
4.0	S	1.15	0.26	0.86	0.04
8.0	C	1.20	0.40	1.31	0.07
12.4	X	1.25	0.53	1.74	0.08
18.0	Ku	1.27	0.69	2.26	0.11
20.0	Ku	1.30	0.74	2.44	0.12
26.5	K	1.35	0.91	2.99	0.15
34.0	Ka	1.40	1.05	3.43	0.18
40.0	Ka	1.45	1.24	4.06	0.25
50.0	V	1.50	1.47	4.82	0.32
60.0	V	1.55	1.81	5.94	0.39
67.0	V	1.60	2.05	6.73	0.45

Impedance	50 Ω nominal
Operating Temperature Range	-65°C through +100°C (Increased Range Available)
Phase Stability	$\theta^\circ = F_{\text{GHz}} \div 2.75$
Insertion Loss (Amplitude) Stability	$\text{dB} = 0.01 \times F_{\text{GHz}}$
Phase Matching	Available
Finished Diameter, nominal	TM67 - 0.285in (7.24mm) VN67 - 0.625in (15.88mm)



65 GHz VNA TEST PORT EXTENSION CABLES

Most VNA measurements require the use of extension cables as part of the test set-up. Measurement accuracy can be severely degraded if these cables are not stable over time and flexure. Thus, the choice of measurement cables is as important as the instrument itself. The MegaPhase® VN series are test port extension cables optimized for vector network analyzer equipment, scalar analyzers and probe stations operating at frequencies up to 65 GHz. In addition to their optimized electrical and mechanical performance they are typically priced at a fraction of OEM test cables.

In most precision test applications, cables are constantly moved with repetitive flexures. Traditional coaxial cables use braid/foil outer conductors. Repetitive flexure causes the braid and foil strands to deform, thereby changing the impedance and compromising the phase stability of the cable. In contrast, MegaPhase GrooveTube® VN technology maintains its geometry over the full life of the cable, which permits consistent measurement accuracy from out-of-the-box through 100,000+ flexures. GrooveTube cables feature a corrugated copper outer conductor, manufactured by helically wrapping the copper tape directly over the PTFE dielectric core instead of the traditional braid/foil outer conductor. This results in better accuracy with fewer recalibrations. This improved electrical and mechanical stability over time combined with its lower initial cost results in the *Lowest Cost Per Measurement*.™ The VN test cables

are housed inside of a crush-, torque- and pull-resistant armor that further enhances the cable's useful life.

The electrical and mechanical data for the VN series are shown in **Table 1**. The nominal

TABLE I
VN SERIES DATA

<i>Electrical Data</i>	
Max frequency	67 GHz
Impedance	50 Ω nominal
Velocity of propagation	69 % nominal
Time delay	1.47 Ns/ft (4.82 Ns/m)
Capacitance	29.0 pF/ft (95.1 pF/m)
<i>Mechanical Data</i>	
Jacketed outer diameter	0.625" (15.9 mm)
Outer jacket type	PET braid
Ruggedization	metal braid over metal armor
Minimum bend radius	1.5" (38.1 mm)
Operating temperature	-76° to 347°F (-60° to 175°C)
Weight	0.175 lbs/ft (0.26 kg/m)
Inner conductor	solid Ag-placed Cu
Dielectric	PTFE
Outer conductor	Cu GrooveTube®

MEGAPHASE LLC
Stroudsburg, PA

PRODUCT FEATURE

TABLE II

VN SERIES TYPICAL INSERTION LOSS (dB)

Frequency (GHz)	Band	Part No.	Attenuation (dB/ft)	Attenuation (dB/m)	Connector Loss (dB)	SWR
0.512	UHF	VN4	0.08	0.27	0.02	1.04
0.900	UHF	VN4	0.11	0.36	0.02	1.05
1.000	L	VN4	0.12	0.39	0.02	1.05
1.900	L	VN4	0.17	0.56	0.03	1.10
2.000	S	VN4	0.17	0.57	0.03	1.10
3.000	S	VN4	0.22	0.73	0.04	1.10
4.000	C	VN4	0.26	0.86	0.04	1.15
6.000	C	VN8	0.34	1.10	0.06	1.15
8.000	X	VN8	0.40	1.31	0.07	1.20
10.000	X	VN18	0.46	1.50	0.08	1.25
12.400	X	VN18	0.53	1.74	0.08	1.25
14.000	Ku	VN18	0.58	1.89	0.09	1.30
18.000	Ku	VN18	0.69	2.26	0.11	1.30
20.000	K	VN26	0.74	2.44	0.12	1.30
22.000	K	VN26	0.79	2.61	0.13	1.30
26.500	K	VN26	0.91	2.99	0.15	1.35
28.000	Ka	VN40	0.95	3.11	0.16	1.40
30.000	Ka	VN40	1.00	3.27	0.17	1.40
32.000	Ka	VN40	1.05	3.43	0.18	1.40
38.000	Ka	VN40	1.19	3.90	0.22	1.45
40.000	Ka	VN40	1.24	4.06	0.25	1.45
50.000	V	VN50	1.47	4.82	0.32	1.50
60.000	V	VN65	1.90	6.23	0.37	1.60
65.000	V	VN65	2.00	6.56	0.40	1.65

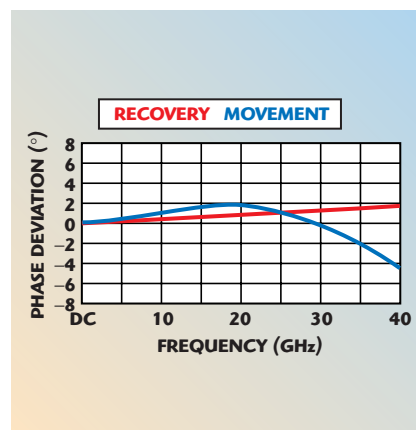
TABLE III

PHASE AND AMPLITUDE STABILITY vs. FLEXURE (360° AROUND A 4" MANDREL)

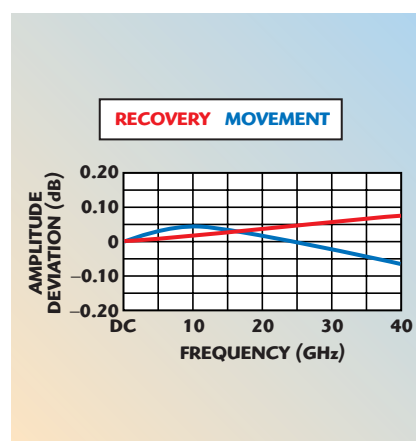
Frequency (GHz)	Phase (°)	Amplitude (dB)
18.0	2.5	0.05
26.5	3.0	0.07
40.0	7.0	0.20
50.0	8.0	0.50
60.0	10.0	0.62
65.0	12.0	0.70

impedance is 50 Ω with a time delay of 1.47 ns/ft. The 0.625" diameter cable has a minimum bend radius of 1.5". The attenuation, connector loss

and VSWR for seven different part numbers are shown in **Table 2** for frequency ranges from 500 MHz to 65 GHz. The phase and amplitude



▲ Fig. 1 Phase deviation during movement and recovery.



▲ Fig. 2 Amplitude change during movement and recovery.

stability versus flexure for a 360° turn around 4" mandrel is shown in **Table 3** for 18 to 65 GHz, while the phase change during movement and recovery from DC to 40 GHz is illustrated in **Figure 1**. **Figure 2** is a similar plot of amplitude change.

Ruggedized port connectors that connect directly to the VNA port are available in 1.85 mm, 2.4 mm, 2.92 mm and 3.5 mm. Other available connector types are N, SMA, TNC and 7 mm, as well as custom designs. All the VN cable assemblies are manufactured to order with a standard two-week lead-time, including odd combinations such as 2.4 mm to Type SC. Because of the modular mechanical design, the VN series cables are repairable. All MegaPhase VN cables are backed by a six-month unconditional warranty.

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