

Agilent 855xxA Series CalPods and 85523A CalPod Controller

85530A 20 GHz CalPod (Standard)

85531A 20 GHz CalPod (Temperature Characterized)

85540A 40 GHz CalPod (Standard)

85541A 40 GHz CalPod (Temperature Characterized)

85523A CalPod Controller

Use this manual with the following document:

PNA Series Network Analyzer Online Help System

Performance Characteristics

Edition, May 27, 2011

85523-90003



Agilent Technologies

Notices

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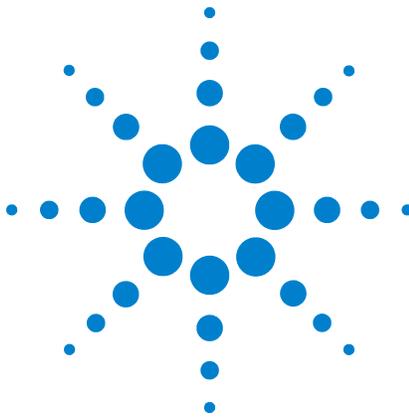
The following safety notes are used throughout this document. Familiarize yourself with each of these notes and its meaning before performing any of the procedures in this document.

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.



Performance Characteristics

Statement of Compliance

This product has been designed and tested in accordance with the standards listed on the Manufacturer's Declaration of Conformity, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

Definitions

Typical describes additional product performance information that is not covered by the product warranty. It is performance that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.

Supplemental Characteristics describes Typical, but non-warranted performance parameters, denoted as "Typical", "Nominal" or "Approximate."

Agilent 85530A 20 GHz CalPod (Standard)

Agilent 85531A 20 GHz CalPod (Temperature Characterized)

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Agilent 85540A 40 GHz CalPod (Standard)

Agilent 85541A 40 GHz CalPod (Temperature Characterized)

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Supplemental Characteristics for All CalPod Models

- [Table 5](#), "Supplemental Characteristics: for All Models of Agilent 855xxA Series CalPods," on page 15



Table 1 Typical: 85530A 20 GHz CalPod (Standard)

Frequency	100 MHz to 20 GHz		
Insertion Loss			
100 MHz to 20 GHz	4.0 dB maximum		
Return Loss (RF2, Output)			
100 MHz to 5 GHz	12.0 dB minimum		
5 GHz to 20 GHz	8.5 dB minimum		
Corrected Performance*			
Repeatability	Amplitude (S21 & S12)	Phase (S21 & S12)	Directivity (S11 & S22)
100 MHz to 750 MHz	±0.10 dB	±1.5°	−32 dB
750 MHz to 18 GHz	±0.05 dB	±1.5°	−38 dB
18 GHz to 20 GHz	±0.20 dB	±2.0°	−32 dB

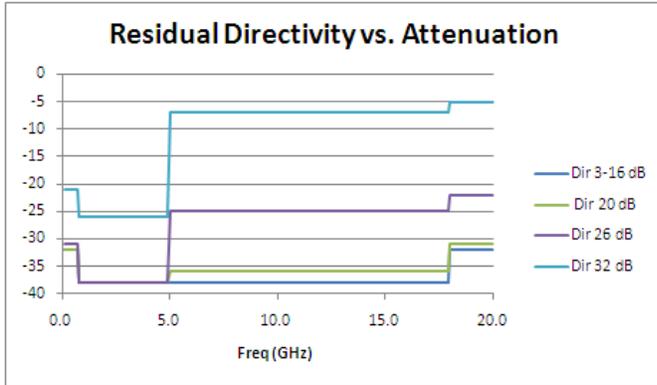
* Measured at 25°C for 3 dB loss between the Test Port and CalPod with 1 kHz IF BW, −5 dBm power level, and 8 averages.

Table 2 Typical: 85531A 20 GHz CalPod (Temperature Characterized)

Frequency	100 MHz to 20 GHz		
Insertion Loss			
100 MHz to 20 GHz	3.5 dB maximum		
Return Loss (RF2, Output)			
100 MHz to 5 GHz	12 dB minimum		
5 GHz to 20 GHz	9 dB minimum		
Corrected Performance*			
Repeatability	Amplitude	Phase	Directivity
	(S21 & S12)	(S21 & S12)	(S11 & S22)
100 MHz to 750 MHz	±0.10 dB	±1.5°	−32 dB
750 MHz to 18 GHz	±0.05 dB	±1.5°	−38 dB
18 GHz to 20 GHz	±0.20 dB	±2.0°	−32 dB

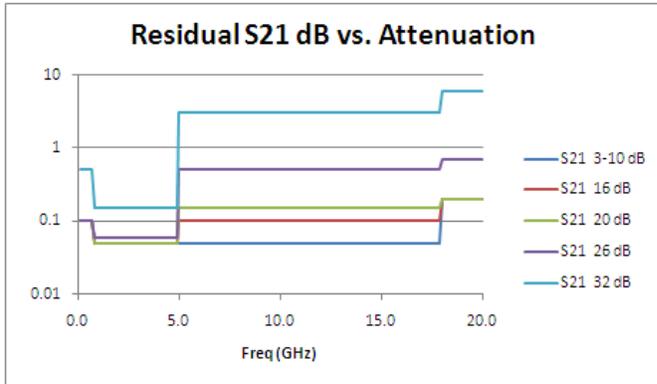
* Measured at 25°C for 3 dB loss between the Test Port and CalPod with 1 kHz IF BW, −5 dBm power level, and 8 averages.

Figure 1 Typical: Degradation¹ of Residual Directivity vs. Attenuation for Agilent 85530A 20 GHz CalPod/Agilent 85531A 20 GHz CalPod



Freq	Dir 3-16 dB	Dir 16 dB	Dir 20 dB	Dir 26 dB	Dir 32 dB
0.1	-32	-32	-32	-31	-21
0.7	-32	-32	-32	-31	-21
0.8	-38	-38	-38	-38	-26
4.9	-38	-38	-38	-38	-26
5.0	-38	-38	-36	-25	-7
17.9	-38	-38	-36	-25	-7
18.0	-32	-32	-31	-22	-5
20.0	-32	-32	-31	-22	-5

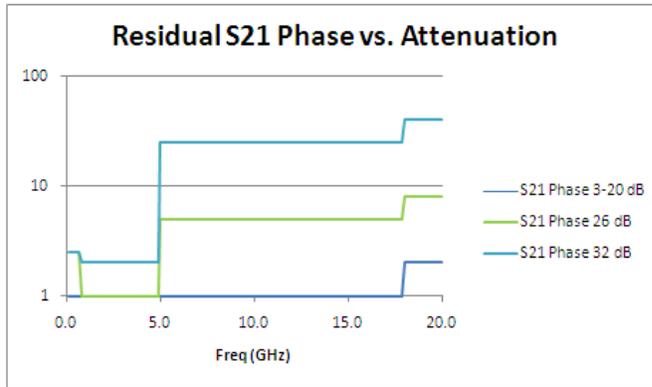
Figure 2 Typical: Degradation¹ of Residual S21 dB vs. Attenuation for Agilent 85530A 20 GHz CalPod/Agilent 85531A 20 GHz CalPod



Freq	S21 3-10 dB	S21 16 dB	S21 20 dB	S21 26 dB	S21 32 dB
0.1	0.1	0.1	0.1	0.1	0.5
0.7	0.1	0.1	0.1	0.1	0.5
0.8	0.05	0.05	0.05	0.06	0.15
4.9	0.05	0.05	0.05	0.06	0.15
5.0	0.05	0.1	0.15	0.5	3
17.9	0.05	0.1	0.15	0.5	3
18.0	0.2	0.2	0.2	0.7	6
20.0	0.2	0.2	0.2	0.7	6

¹ Degradation is in addition to the typical performance shown.

Figure 3 Typical: Degradation¹ of Residual S21 Phase vs. Attenuation for Agilent 85530A 20 GHz CalPod/Agilent 85531A 20 GHz CalPod



Freq	S21 Phase 3-20 dB	S21 Phase 16 dB	S21 Phase 20 dB	S21 Phase 26 dB	S21 Phase 32 dB
0.1	1	1	1	2.5	2.5
0.7	1	1	1	2.5	2.5
0.8	1	1	1	1	2
4.9	1	1	1	1	2
5.0	1	1	1	5	25
17.9	1	1	1	5	25
18.0	2	2	2	8	40
20.0	2	2	2	8	40

¹ Degradation is in addition to the typical performance shown.

Table 3 Typical: 85540A 40 GHz CalPod (Standard)

Frequency	500 MHz to 40 GHz		
Insertion Loss			
500 MHz to 750 MHz	4.5 dB maximum		
750 MHz to 20 GHz	3.8 dB maximum		
20 GHz to 27.5 GHz	5.5 dB maximum		
27.5 GHz to 33 GHz	6.0 dB maximum		
33 GHz to 40 GHz	7.3 dB maximum		
Return Loss (RF2, Output)			
500 MHz to 750 MHz	8.0 dB minimum		
750 MHz to 26.5 GHz	11.0 dB minimum		
26.5 GHz to 33 GHz	8.5 dB minimum		
33 GHz to 40 GHz	6.5 dB minimum		
Corrected Performance*			
Repeatability	Amplitude (S21 & S12)	Phase (S21 & S12)	Directivity (S11 & S22)
500 MHz to 750 MHz	±0.10 dB	±1.5°	−32 dB
750 MHz to 18 GHz	±0.05 dB	±1.5°	−38 dB
18 GHz to 23 GHz	±0.20 dB	±2.0°	−32 dB
23 GHz to 33 GHz	±0.10 dB	±1.5°	−34 dB
33 GHz to 40 GHz	±0.20 dB	±2.0°	−32 dB

* Measured at 25°C for 3 dB loss between the Test Port and CalPod with 1 kHz IF BW, −5 dBm power level, and 8 averages.

Table 4 Typical: 85541A 40 GHz CalPod (Temperature Characterized)

Frequency	500 MHz to 40 GHz		
Insertion Loss			
500 MHz to 750 MHz	4.5 dB maximum		
750 MHz to 1 GHz	3.8 dB maximum		
1 GHz to 20 GHz	3.5 dB maximum		
20 GHz to 33 GHz	5.5 dB maximum		
33 GHz to 40 GHz	7.0 dB maximum		
Return Loss (RF2, Output)			
500 MHz to 750 MHz	8 dB minimum		
750 MHz to 20 GHz	12 dB minimum		
20 GHz to 33 GHz	10 dB minimum		
33 GHz to 40 GHz	7 dB minimum		
Corrected Performance*			
Repeatability	Amplitude (S21 & S12)	Phase (S21 & S12)	Directivity (S11 & S22)
500 MHz to 750 MHz	±0.10 dB	±1.5°	-32 dB
750 MHz to 18 GHz	±0.05 dB	±1.5°	-38 dB
18 GHz to 23 GHz	±0.20 dB	±2.0°	-32 dB
23 GHz to 33 GHz	±0.10 dB	±1.5°	-34 dB
33 GHz to 40 GHz	±0.20 dB	±2.0°	-32 dB

* Measured at 25°C for 3 dB loss between the Test Port and CalPod with 1 kHz IF BW, -5 dBm power level, and 8 averages.

Figure 4 Typical: Recorrection with 3 dB Loss for Agilent 85540A 40 GHz CalPod/Agilent 85541A 40 GHz CalPod

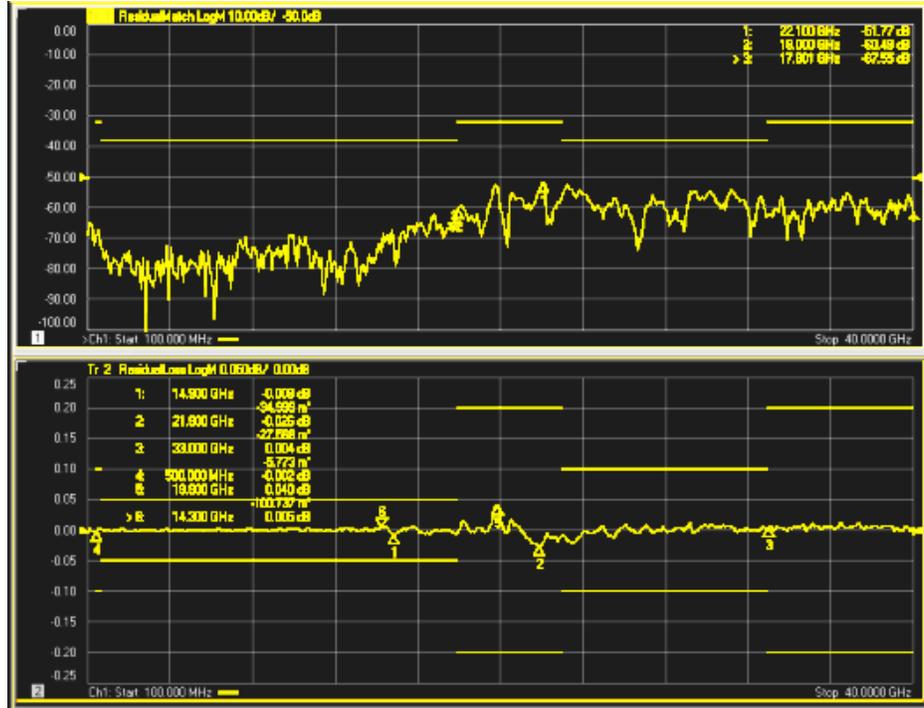


Figure 5 Typical: Recorrection with 16 dB Loss for Agilent 85540A 40 GHz CalPod/Agilent 85541A 40 GHz CalPod

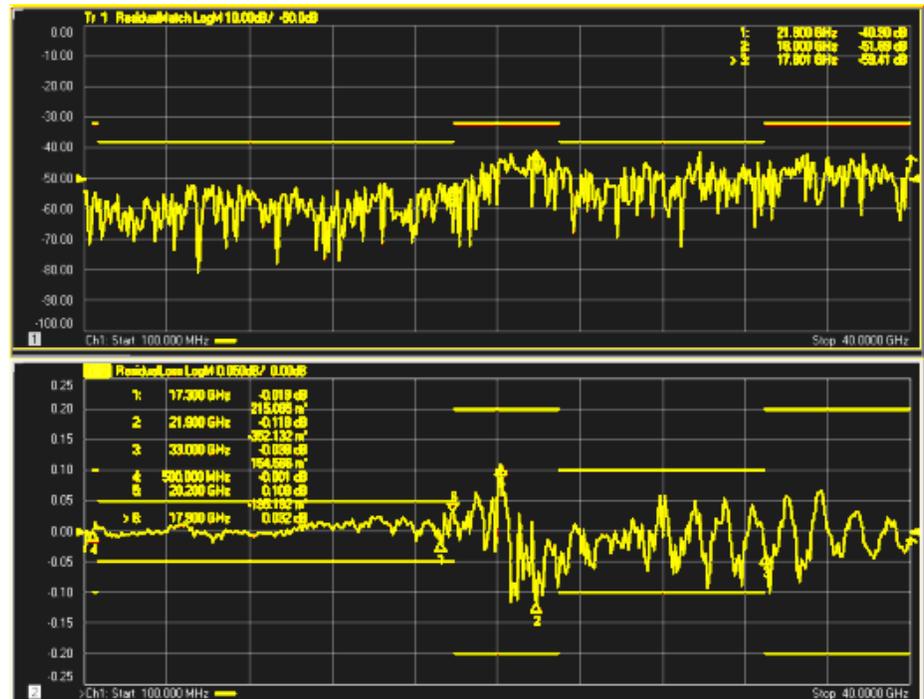
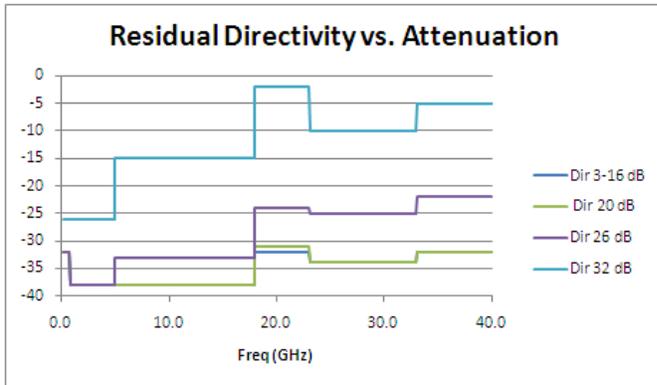
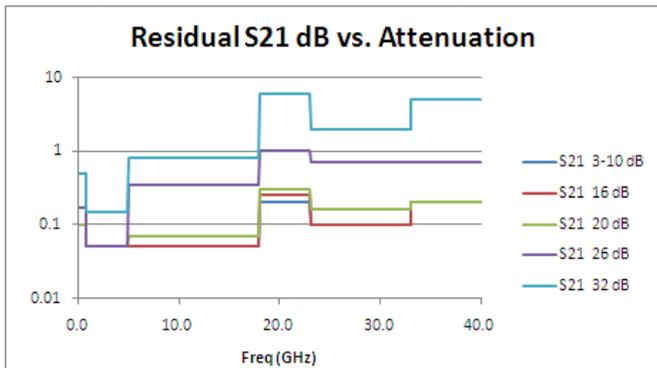


Figure 6 Typical: Degradation¹ of Residual Directivity vs. Attenuation for Agilent 85540A 40 GHz CalPod/Agilent 85541A 40 GHz CalPod



Freq	Dir 3-16 dB	Dir 16 dB	Dir 20 dB	Dir 26 dB	Dir 32 dB
0.1	-32	-32	-32	-32	-26
0.7	-32	-32	-32	-32	-26
0.8	-38	-38	-38	-38	-26
4.9	-38	-38	-38	-38	-26
5.0	-38	-38	-38	-33	-15
17.9	-38	-38	-38	-33	-15
18.0	-32	-32	-31	-24	-2
23.0	-32	-32	-31	-24	-2
23.1	-34	-34	-34	-25	-10
33.0	-34	-34	-34	-25	-10
33.1	-32	-32	-32	-22	-5
40.0	-32	-32	-32	-22	-5

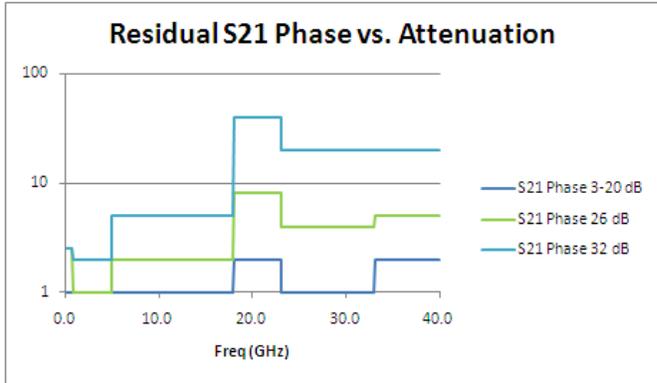
Figure 7 Typical: Degradation¹ of Residual S21 dB vs. Attenuation for Agilent 85540A 40 GHz CalPod/Agilent 85541A 40 GHz CalPod



Freq	S21 3-10 dB	S21 16 dB	S21 20 dB	S21 26 dB	S21 32 dB
0.1	0.1	0.1	0.1	0.17	0.5
0.7	0.1	0.1	0.1	0.17	0.5
0.8	0.05	0.05	0.05	0.05	0.15
4.9	0.05	0.05	0.05	0.05	0.15
5.0	0.05	0.05	0.07	0.35	0.8
17.9	0.05	0.05	0.07	0.35	0.8
18.0	0.2	0.25	0.3	1	6
23.0	0.2	0.25	0.3	1	6
23.1	0.1	0.1	0.16	0.7	2
33.0	0.1	0.1	0.16	0.7	2
33.1	0.2	0.2	0.2	0.7	5
40.0	0.2	0.2	0.2	0.7	5

¹ Degradation is in addition to the typical performance shown.

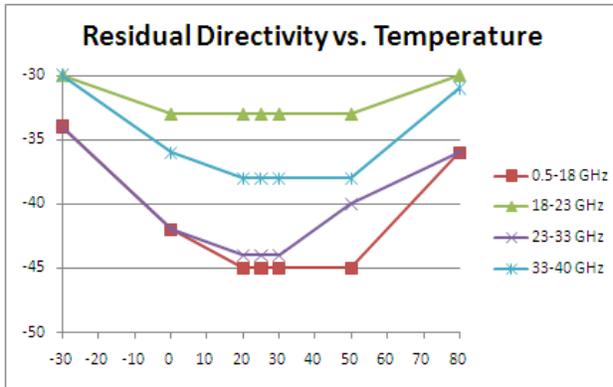
Figure 8 Typical: Degradation¹ of Residual S21 Phase vs. Attenuation for Agilent 85540A 40 GHz CalPod/Agilent 85541A 40 GHz CalPod



Freq	S21 Phase 3-20 dB	S21 Phase 16 dB	S21 Phase 20 dB	S21 Phase 26 dB	S21 Phase 32 dB
0.1	1	1	1	2.5	2.5
0.7	1	1	1	2.5	2.5
0.8	1	1	1	1	2
4.9	1	1	1	1	2
5.0	1	1	1	2	5
17.9	1	1	1	2	5
18.0	2	2	2	8	40
23.0	2	2	2	8	40
23.1	1	1	1	4	20
33.0	1	1	1	4	20
33.1	2	2	2	5	20
40.0	2	2	2	5	20

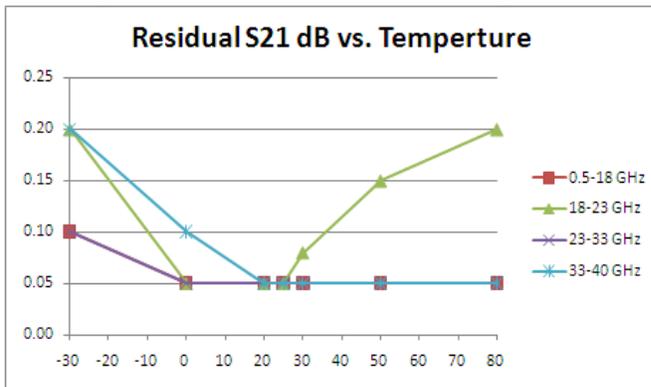
¹ Degradation is in addition to the typical performance shown.

Figure 9 Typical: Degradation¹ of Residual Directivity vs. Temperature for Agilent 85531A 20 GHz CalPod and Agilent 85541A 40 GHz CalPod



Temperature °C	500-750 MHz	0.5-18 GHz	18-23 GHz	23-33 GHz	33-40 GHz
-30	-34	-34	-30	-34	-30
0	-42	-42	-33	-42	-36
20	-45	-45	-33	-44	-38
25	-45	-45	-33	-44	-38
30	-45	-45	-33	-44	-38
50	-45	-45	-33	-40	-38
80	-36	-36	-30	-36	-31

Figure 10 Typical: Degradation¹ of Residual S21 dB vs. Temperature for Agilent 85531A 20 GHz CalPod and Agilent 85541A 40 GHz CalPod



Temperature °C	500-750 MHz	0.5-18 GHz	18-23 GHz	23-33 GHz	33-40 GHz
-30	0.12	0.10	0.20	0.10	0.20
0	0.10	0.05	0.05	0.05	0.10
20	0.05	0.05	0.05	0.05	0.05
25	0.05	0.05	0.05	0.05	0.05
30	0.05	0.05	0.08	0.05	0.05
50	0.10	0.05	0.15	0.05	0.05
80	0.40	0.05	0.20	0.05	0.05

¹ Degradation is in addition to the typical performance shown.

Figure 11 Typical: Degradation¹ of Residual Directivity vs. Temperature for Agilent 85530A 20 GHz CalPod and Agilent 85540A 40 GHz CalPod

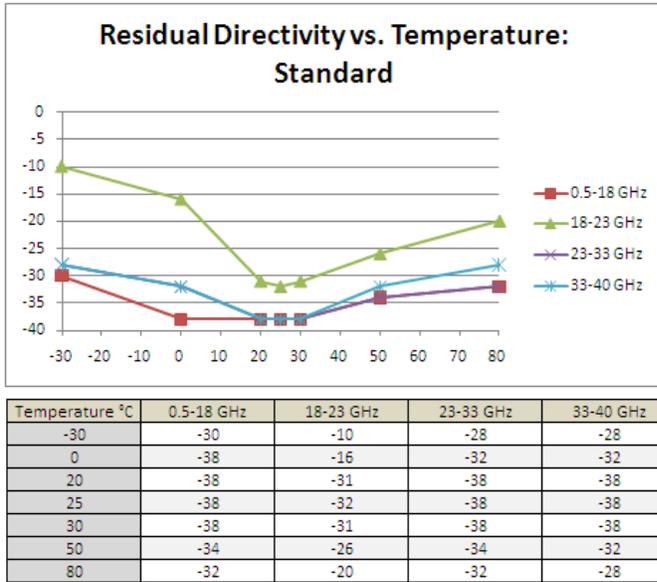
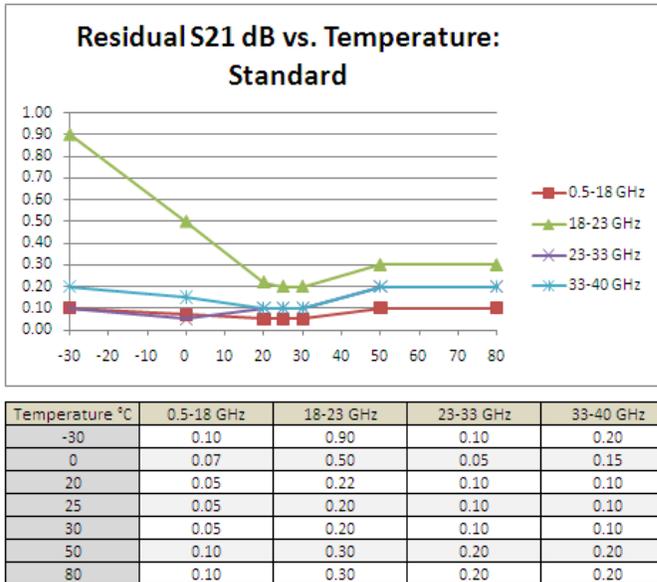


Figure 12 Typical: Degradation¹ of Residual S21 dB vs. Temperature for Agilent 85530A 20 GHz CalPod and Agilent 85540A 40 GHz CalPod



¹ Degradation is in addition to the typical performance shown.

Table 5 Supplemental Characteristics:
for All Models of Agilent 855xxA Series CalPods

Input 1 dB Compression Point (>1 GHz)	26 dBm minimum
Input 3rd Order Intercept Point (>1 GHz)	45 dBm minimum
Input Level for 3rd Order Intercept Point	2 tones @ +15 dBm maximum
Safe RF Input Level (damage limit)	30 dBm minimum
Temperature	
Operating *	–30°C to +80°C
Storage	–40°C to +90°C
Pressure	
Ambient & Thermal	Atmospheric Pressure
Dimensions	
Length x Width x Height, excluding connectors	2.8 in. x 1.2 in. x 0.6 in. (70 mm x 29 mm x 15 mm)
Weight	~100 g
Connectors	
RF2	2.92 mm (m) plug/socket
RF1	2.92 mm (f) plug/socket
CTRL (DC/Control)	9-way mini socket

* Operation outside of 25°C ± 5°C recommended only for the Agilent 85531A 20 GHz CalPod and Agilent 85541A 40 GHz CalPod. Some degradation may occur outside the range of 0 to 50°C. (See [Table 9](#) and [Table 10](#).)

Performance Characteristics

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