



## Typical Characteristics for DGM-18G40G-292FF-DS

PMI MODEL NUMBER DGM-18G40G-292FF-DS IS A QUAD PHASE & AMPLITUDE MATCHED mmW (MILLIMETER WAVE) DIPLEXER-GAIN MODULE, DESIGNED TO OPERATE OVER THE 18GHz TO 40GHz FREQUENCY RANGE WITH A SWITCHED OUTPUT. THE BAND SELECT FUNCTION NOT ONLY SWITCHES BANDS, BUT ALSO ALLOWS THE AMPLIFIED BANDS NOT IN USE TO BE TURNED OFF TO REDUCE POWER CONSUMPTION. THIS MODEL IS ALSO DESIGNED TO HAVE BETTER THAN 60 dB HARMONIC SUPPRESSION.



October 16, 2014  
Designed by: PMI Engineering Team  
Electronics Designed By: Paul Kuhn  
Drafted by: Justin Shupe  
Reported by: Paul Kuhn



## Typical Characteristics for DGM-18G40G-292FF-DS

### Summary Test Data

TEST. ITEM NO	PARAMETERS	SPECIFIED VALUE	TEST RESULTS	QA QC
1	Frequency Range:	18.0 to 40.0 GHz	<b>18.0 to 40.0 GHz</b>	
2	Gain:	+3 dB Min. +7 dB Max.	<b>2.5 to 6.5 dB</b> (See Plots) Pages 8-13	
3	Amplitude Ripple:	±1.0 dB Over Every 500 MHz Band Starting @ 18 GHz Excluding the Crossover	<b>±0.68 dB CH1</b> <b>±0.59 dB CH2</b> <b>±0.60 dB CH3</b> <b>±0.51 dB CH4</b> (Worst Case)	
4	Input P1dB:	-20 dBm Min.	<b>-5 dBm</b> (Worst Case)	
5	Input IP3:	-10 dBm, +5 dBm Desired.	<b>+3.5 dBm</b> (Worst Case 40 Ghz) (See Plots) Pages 19-20	
6	Channel to Channel Isolation:	50 dB Typ.	<b>49.9 dB</b> (See Plots) Pages 14-16	
7	Noise Figure:	15 dB Typ.	<b>10 dB</b> (See Plots) Pages 17-18	
8	Phase Matching:	40 Deg. RMS, Channels 2, 3, 4 to REF. Channel 1, Over Operating Temp.	<b>30 Deg. RMS</b> (Worst Case) (See Plot) Pages 21	
9	Phase Tracking:	0.25 Deg/C° Port to Port Typ.	<b>0.22 Deg/C°</b> (See Plots) Pages 22-33	
10	mmW/uW Limiter:	30 dBm, CW or Pulsed, 2-40 GHz Without Damage All Inputs	<b>30 dBm</b>	
11	Limiter 1 dB Recovery Time:	250 ns	<b>146 ns</b> (See Plot) Page 34	



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12	Spurious Products:	-73 dBm	<b>-74 dBm Measured at Spectrum Analyzer Noise floor (See Plots) Pages 35-37</b>
13	Diplexer K Band 1 dB Passband:	18 GHz Min., 25 GHz Max.	<b>18 – 25 GHz</b>
14	Diplexer Ka Band 1 db Passband:	28 GHz Min., 40 GHz Max.	<b>28 – 40 GHz</b>
15	Crossover Band:	25 GHz Min., 28 GHz Max.	<b>25 – 28 GHz</b>
16	Crossover Excess Attenuation:	5 dB	<b>5 dB (Worst Case)</b>
17	Stopband Attenuation:	60 dB	<b>61 dB (Worst Case)</b>
18	K Band Stopbands:	900 MHz-15 GHz, 32 GHz-46 GHz	<b>900 MHz-15 GHz, 32 GHz-46 GHz</b>
19	Ka Band Stopband	900 MHz-22 GHz	<b>900 MHz-22 GHz</b>
20	Comm Band Attenuation:	60 dB	<b>&gt;60 dB</b>
21	Comm Band:	900 MHz-2.5 GHz	<b>900 MHz-2.5 GHz</b>
22	Comm Interference Immunity1:	36 dBm CW, 900 MHz – 2.5 GHz, Without Limiter or Amplifier Saturation.	<b>36 dBm Based On filter Rejection</b>
23	Comm Intereference Immunity2:	53 dBm Pulsed RF, 900 MHz – 2.5 GHz, Without Limiter or Amplifier Saturation.	<b>53 dBm Based On filter Rejection</b>
24	VSWR In Passbands:	2:1 Typ.	<b>(See Plots) Pages 10–13</b>
25	Harmonics for -20 dBm:	-80 dBm 15-40 GHz	<b>-84 dBm (See Plots) Page 38</b>
26	Band Switching Time, Required:	10 ms	<b>400 ns</b>

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27	Band Switching Time, Goal:	1 us	<b>0.4 us</b> (See Plots) Page 39
28	Power Divider Input Power:	20 dBm Max.	<b>20 dBm</b>
29	Power Divider Insertion Loss:	15 dB, $\pm 3$ dB	<b>15 dB, <math>\pm 2</math> dB</b> (See Plots) Pages 40-41
30	Power Divider Phase Ripple:	$\pm 5$ Deg RMS	<b><math>\pm 4</math> Deg RMS</b> (See Plots) Pages 40-41
31	Band Select Protection Circuitry:	$\pm 15$ V	<b><math>\pm 15</math> V</b>
32	Power Supply Protection Circuitry On Both $\pm 6.0$ VDC Supplies:	$\pm 15$ V	<b><math>\pm 15</math> V</b>
33	Power Supply Voltage:	$\pm 6.0$ VDC	<b>+6.0 V @ 0.571 Amps</b> <b>-6.0 V @ 0.132 Amps</b>
34	Power Consumption Required:	5W Goal	<b>4.2 W</b>



# Typical Characteristics for DGM-18G40G-292FF-DS

## DESCRIPTION

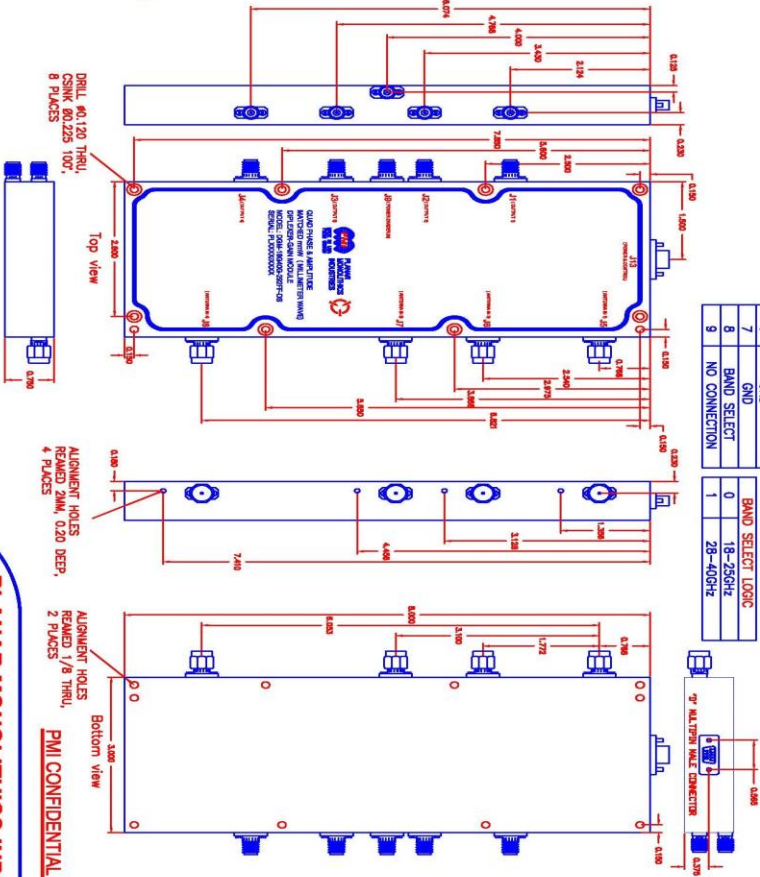
PMI MODEL NUMBER DGM-18G40G-292FF-DS IS A QUAD PHASE & AMPLITUDE MATCHED MMW (MILLIMETER WAVE) DIPLEXER-GAIN MODULE. DESIGNED TO OPERATE OVER THE 18GHz TO 40GHz FREQUENCY RANGE WITH A SWITCHED OUTPUT. THE BAND SELECT FUNCTION NOT ONLY SWITCHES BANDS, BUT ALSO ALLOWS THE AMPLIFIED BANDS NOT IN USE TO BE TURNED OFF TO REDUCE POWER CONSUMPTION. THIS MODEL IS DESIGNED TO HAVE BETTER THAN 80 dB HARMONIC SUPPRESSION.

## SPECIFICATIONS

- FREQUENCY RANGE: 18 to 40 GHz
- GAIN: 3 dB MIN., 7 dB MAX.
- AMPLITUDE RIPPLE: ±1.0 dB OVER EVERY 500 MHz BAND SWEEPING 915GHz EXCLUDING THE CROSSOVER
- INPUT P1dB: -20 dBm MAX.
- CHANNEL TO CHANNEL ISOLATION: -10dBm, +5dBm DESIRED
- CHANNEL ISOLATION: 50 dB TYP.
- NOISE FLOOR: 40 dBZ, RMS, CHANNELS 2,3,4 TO REF. CHANNEL 1, OVER OPERATING TEMP.
- PHASE MATCHING: 0.25 DEGREE POINT TO POINT TYP. MAXIMUM OVER ALL BANDS, 2-40 GHz
- PHASE TRACKING: 0.25 DEGREE POINT TO POINT TYP. MAXIMUM OVER ALL BANDS, 2-40 GHz
- LINEAR 1dB RECOVERY TIME: 250 ns
- SPURIOUS PRODUCTS: -72dBm
- DIRECTIONALITY: 18 GHz MIN., 25GHz MAX.
- DRIVER K BAND 1dB PRESSAND: 28 GHz MIN., 40GHz MAX.
- CROSSOVER BAND: 25GHz MIN., 28GHz MAX.
- CROSSOVER EXCESS ATTENUATION: 5 dB TYP.
- STOPBAND ATTENUATION: 60dB-150Hz, 320Hz-460Hz
- K BAND STOPBANDS: 600MHz-220Hz
- K BAND ATTENUATION: 60dB
- COMB BAND: 60dB
- COMB INTERFERENCE IMMUNITY: 30dBm CW 600 MHz - 2.5 GHz, WITHOUT FILTERS OR AMPLIFIER SATURATION
- COMB INTERFERENCE IMMUNITY: 55dBm PULSED RF, 200 MHz - 2.5 GHz, WITHOUT FILTERS OR AMPLIFIER SATURATION
- VSWR IN PASSBANDS: 2.5 : 1 TYP.
- HARMONICS FOR TIME REQUIRED: -20dBm 15-40GHz
- BAND SWITCHING TIME REQUIRED: 1 ns MAX, 0.5ns TYP
- POWER DIVERGER INPUT POWER: 15 dB, 3.5dB
- POWER DIVERGER INSERTION LOSS: 15 dB, 0.5dB
- POWER DIVERGER PHASE MATCHING: ±10 V
- POWER SUPPLY PROTECTION CIRCUITRY: 410 V ON BOTH, ±4.0 VDC SUPPLIES
- POWER CONSUMPTION REQUIRED: 480 WDC
- CONNECTORS: 2.82mm FEMALE (MIL-9850) & PIN MICRO-D SHIPPED WITH MATING CONNECTOR
- CONTROL CONNECTOR: 3.0" X 8.0" X 0.75" GRAY EPOXY POLYIMIDE COATING LAW MIL-C-22720, TYPE I, OVER EPOXY POLYIMIDE PRIMER LAW MIL-F-22517, TYPE I, CLASS 1 OR 3.
- FINISH: 2.82mm FEMALE

## ENVIRONMENTAL RATINGS

- TEMPERATURE: -55°C TO +45°C (REG. OPERATING)
  - -40°C TO +100°C (EXTREMED)
  - THERMAL SHOCK: 5°C/MIN OVER OPERATING TEMP., 5 CYCLES
  - HUMIDITY: MIL-STD-202G, METHOD 103B COND. B
  - VIBRATION: MIL-STD-202G, METHOD 212A, MODIFIED COND. A
  - ACCCELERATION: 50g, MIL-STD-202G, METHOD 212A, MODIFIED COND. A
  - VIBRATION: 5g, 5 TO 500 Hz, 20 MIN. PER AXIS AS SPECIFIED (RMS/SHOCK)
  - VIBRATION: MIL-STD-202G, METHOD 204A, MODIFIED COND. B
  - VIBRATION: 5.25g RMS, 0.04" @ 72Hz, 15 MIN. PER AXIS AS SPECIFIED IN DRAWING
  - MIL-STD-202G, METHOD 214A, COND. A
  - JOLT RESISTANCE: 1 nT, 0-1 Hz, KEYSHOCK 10 cm FROM BANDS
  - ALTITUDE: MIL-STD-461F, NET10
  - MAGNETIC SUSCEPTIBILITY: MIL-STD-461F, CEM10, MIL-STD-461F, CEM12
  - CONDUCTED RADIATION: MIL-STD-461F, CS101, MIL-STD-461F, CS106
  - CONDUCTED RADIATION: MIL-STD-461F, CS101, MIL-STD-461F, CS106
  - RADIATION: MIL-STD-461F, NET2, FROD WIND INTERNAL, CS 9, 100 MHz - 10 GHz
  - MIL-STD-1898C, PINS ONLY, HARD CLAS 1, DIRECT CONTACT, NON-OPERATING
- NOTE: THE ABOVE SPECIFICATIONS ARE SUBJECT TO CHANGE OR REVISION



ZONE	REL.	DESCRIPTION	DATE	APPROVED
A1		ORIGINAL RELEASE	10/14/14	

CONNECTION	FUNCTION
1	GN2
2	+6
3	GN2
4	-6
5	GN2
6	GN2
7	GN2
8	BAND SELECT
9	NO CONNECTION

BAND SELECT LOGIC	REL.	DESCRIPTION
0	18-25GHz	
1	28-40GHz	

ALL DIMENSIONS ARE IN INCHES  
TOLERANCES:  
XXX .0010  
XXX .0005

**PLANAR MONOLITHICS INDUSTRIES, INC.**

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ISO 9001 CERTIFIED

APPROVALS

DATE

DESIGNED

SKETCH

DATE

10/14/14

SIZE

A

SCALE

N.S.

PRODUCT FEATURE

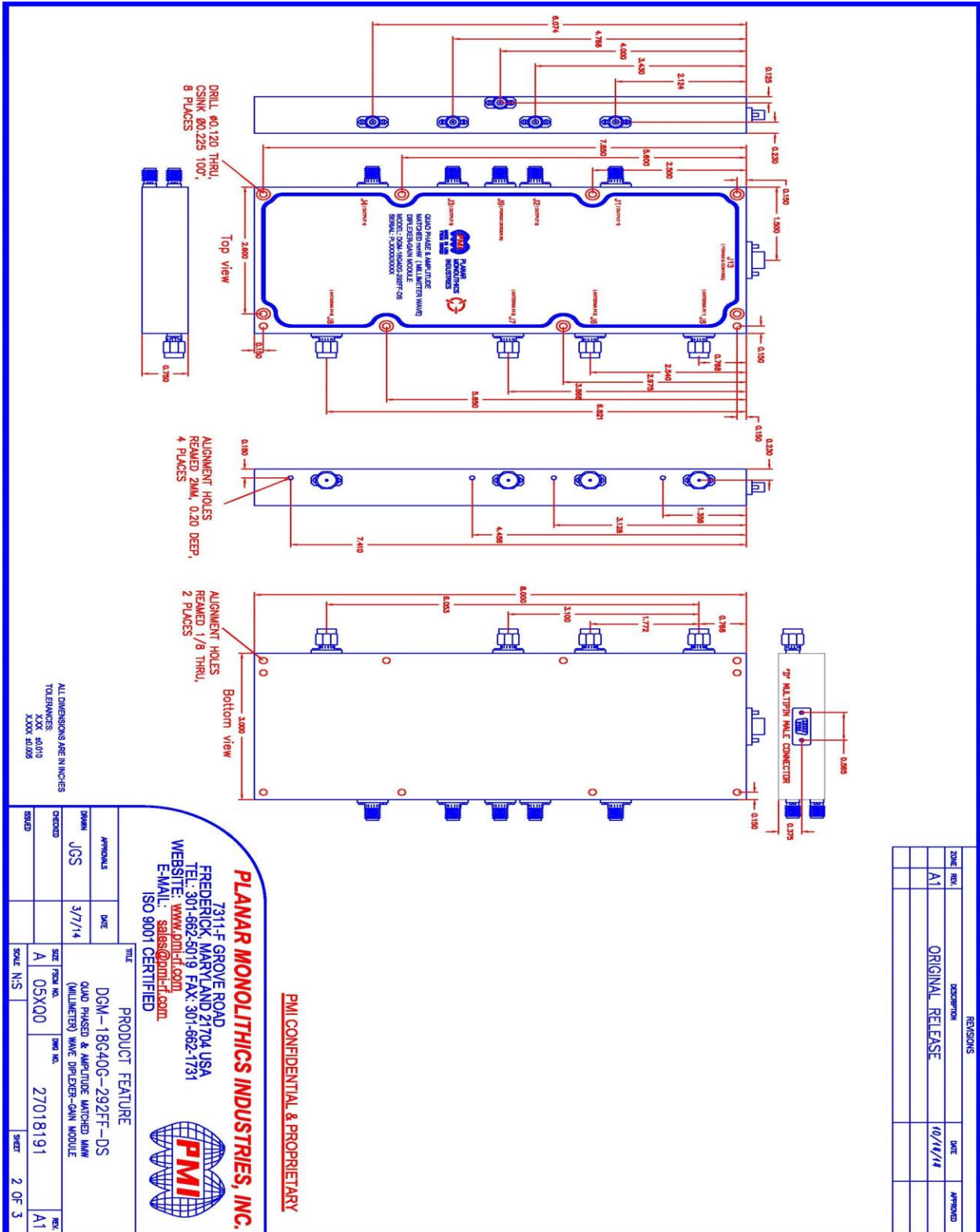
DGM-18G40G-292FF-DS  
QUAD PHASE & AMPLITUDE MATCHED MMW  
(MILLIMETER) WAVE DIPLEXER-GAIN MODULE

REV. A1

SHEET 1 OF 3



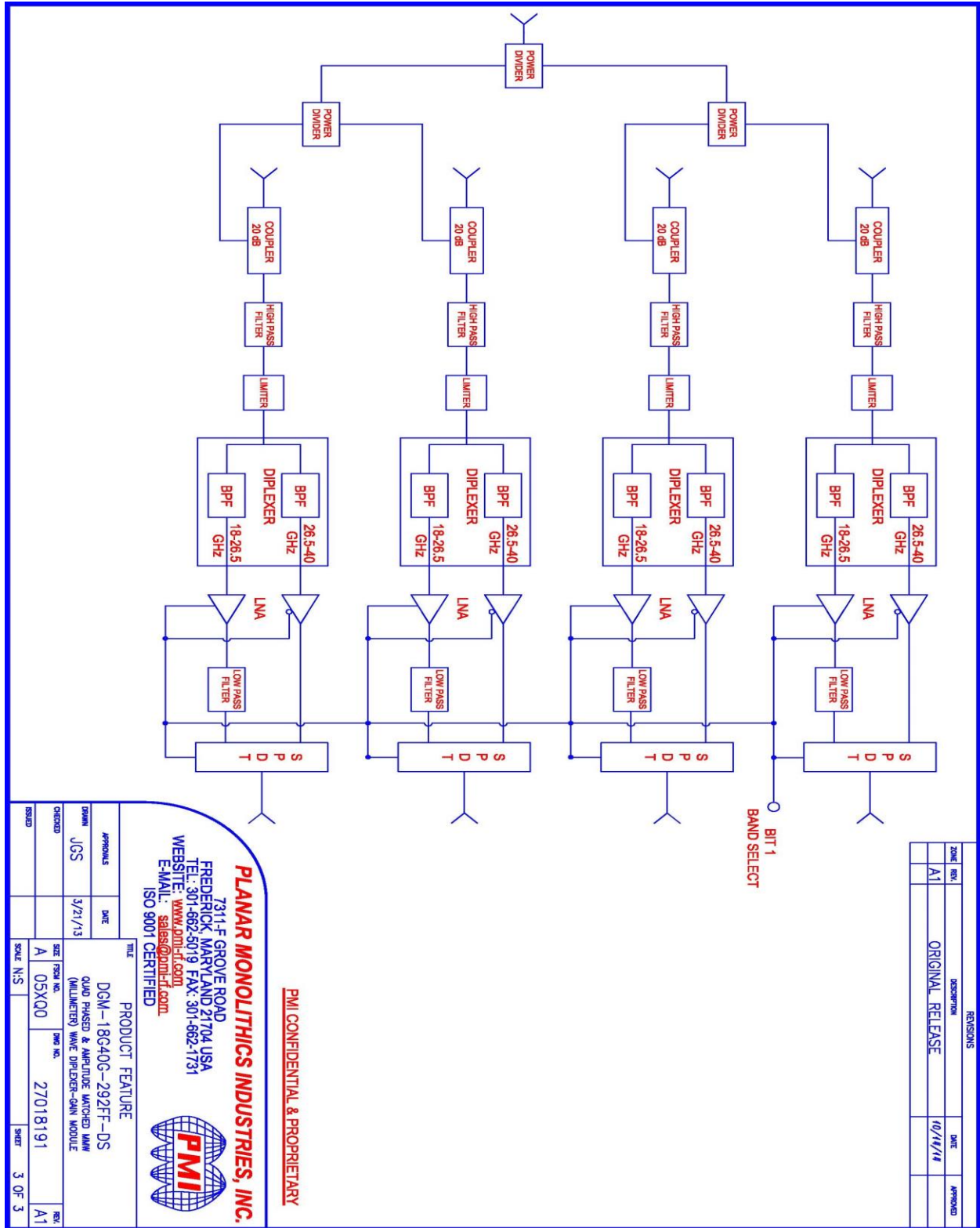
# Typical Characteristics for DGM-18G40G-292FF-DS



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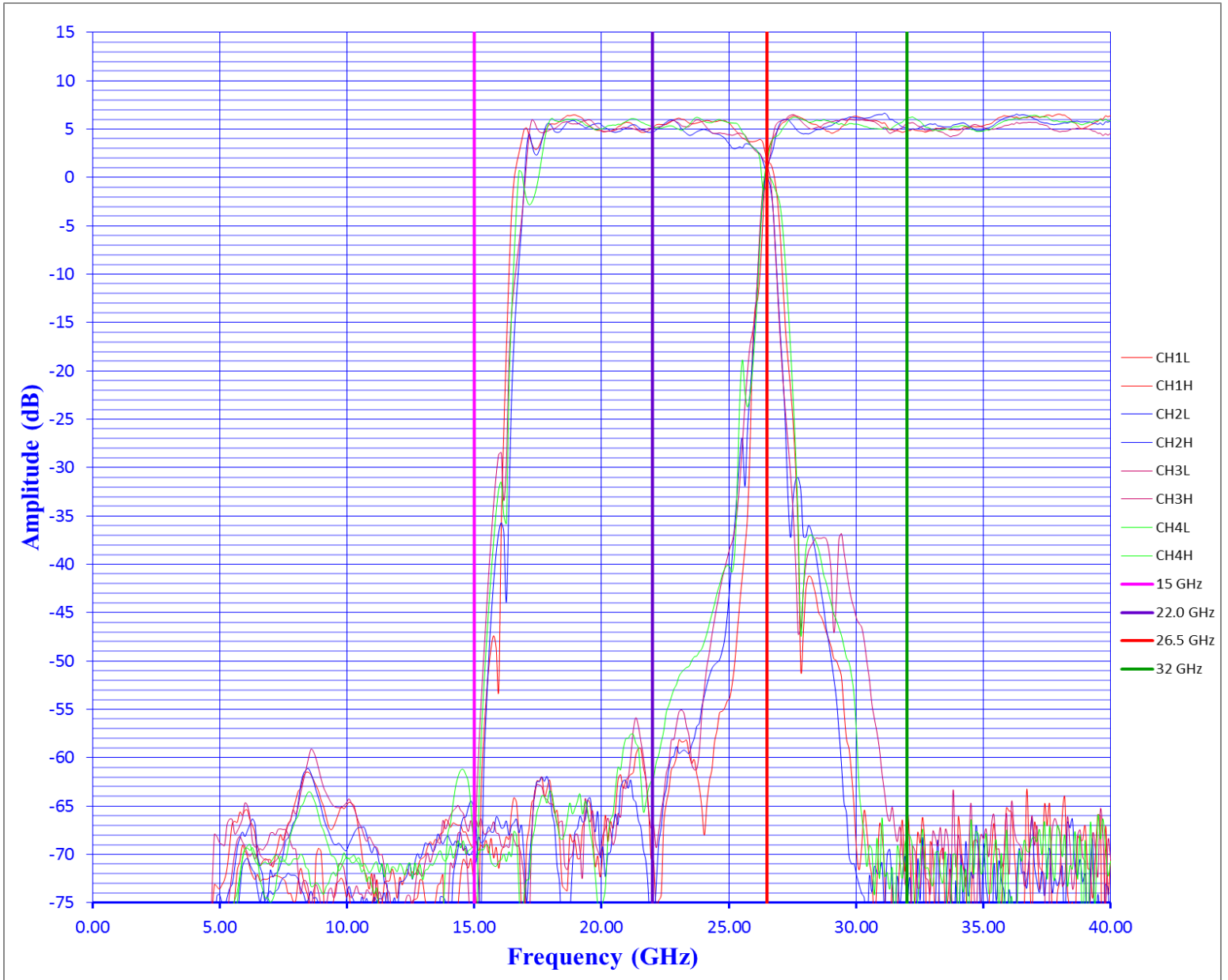


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# Typical Characteristics for DGM-18G40G-292FF-DS

## Channel to Channel Performance



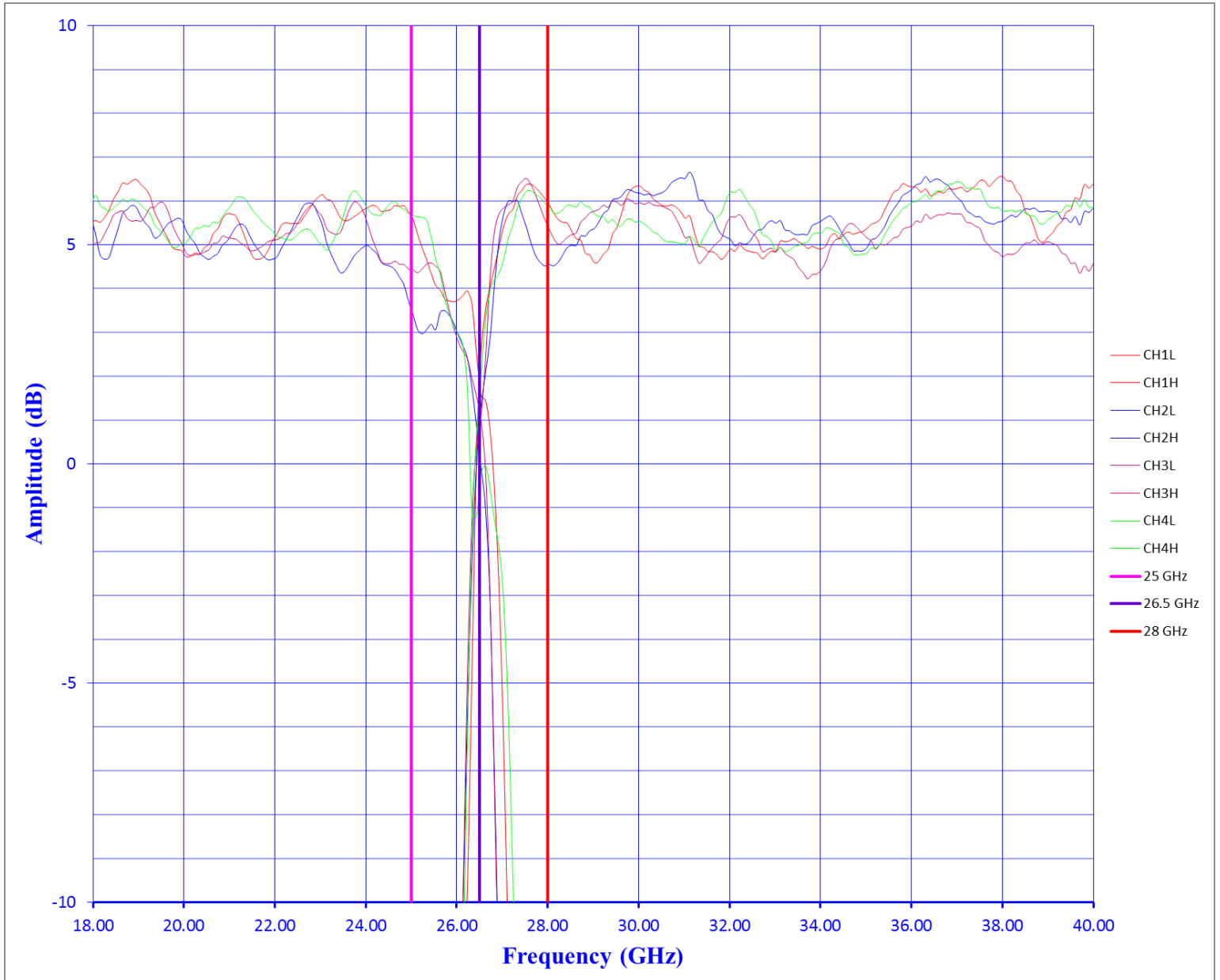
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# Typical Characteristics for DGM-18G40G-292FF-DS

## Gain All Channels



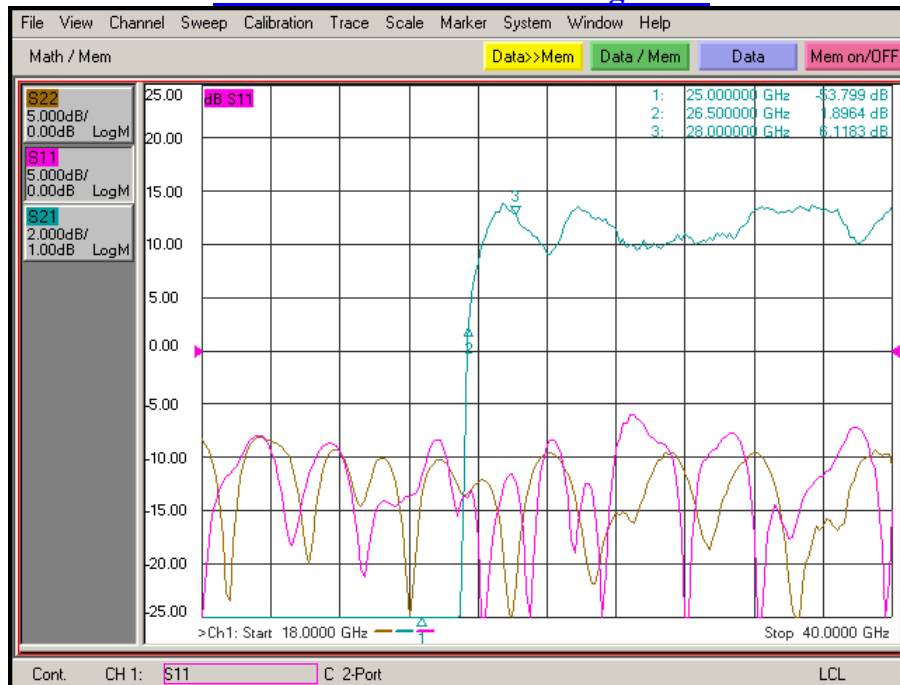


# Typical Characteristics for DGM-18G40G-292FF-DS

## Gain & VSWR Channel 1 Low Side



## Gain & VSWR Channel 1 High Side



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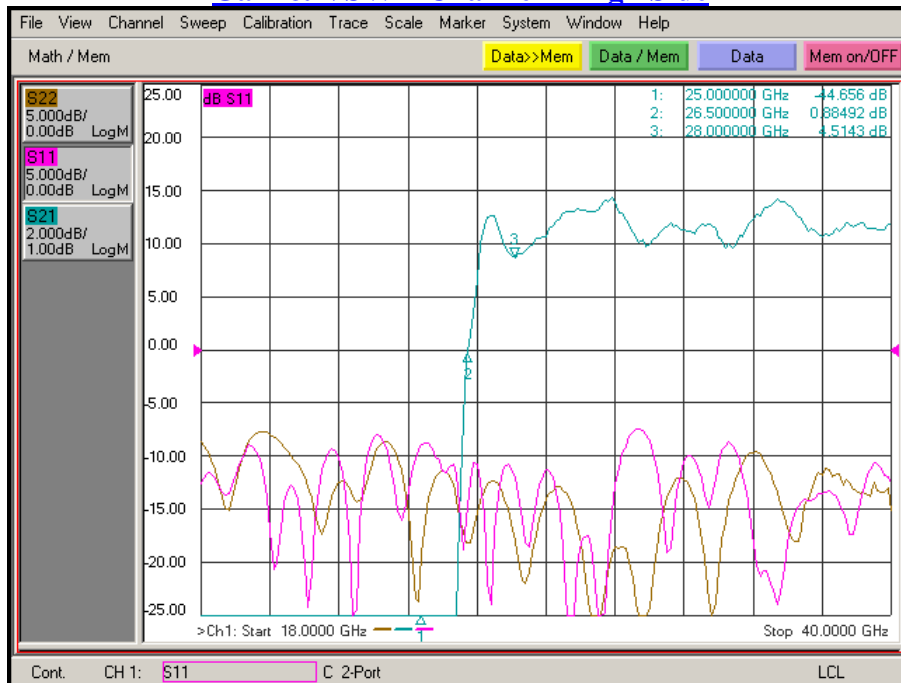


# Typical Characteristics for DGM-18G40G-292FF-DS

## Gain & VSWR Channel 2 Low Side



## Gain & VSWR Channel 2 High Side



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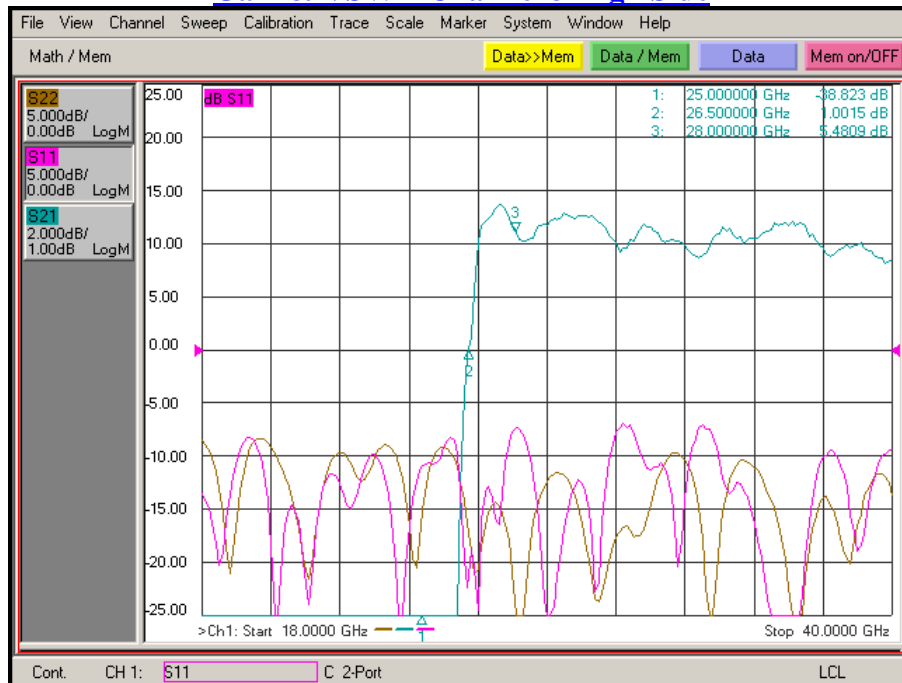


# Typical Characteristics for DGM-18G40G-292FF-DS

## Gain & VSWR Channel 3 Low Side



## Gain & VSWR Channel 3 High Side



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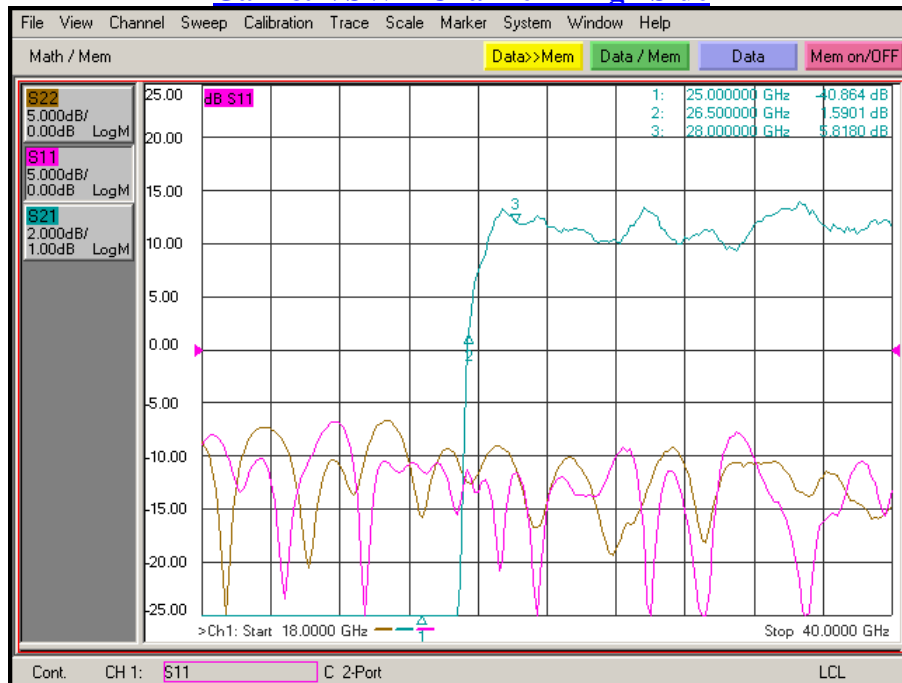


# Typical Characteristics for DGM-18G40G-292FF-DS

## Gain & VSWR Channel 4 Low Side



## Gain & VSWR Channel 4 High Side



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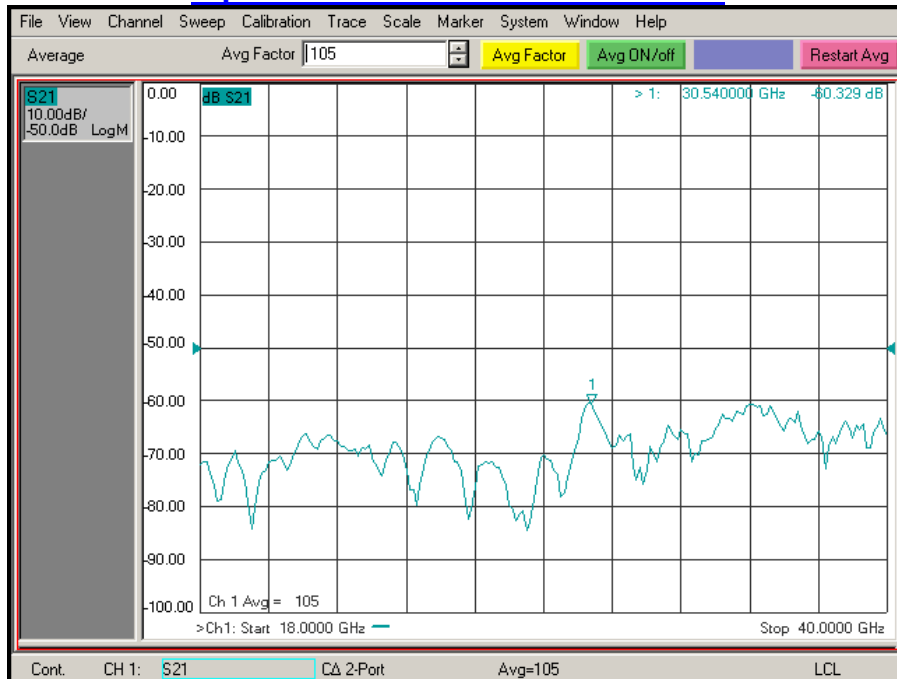


# Typical Characteristics for DGM-18G40G-292FF-DS

## Input Channel 1 to Channel 2 Isolation



## Input Channel 2 to Channel 3 Isolation



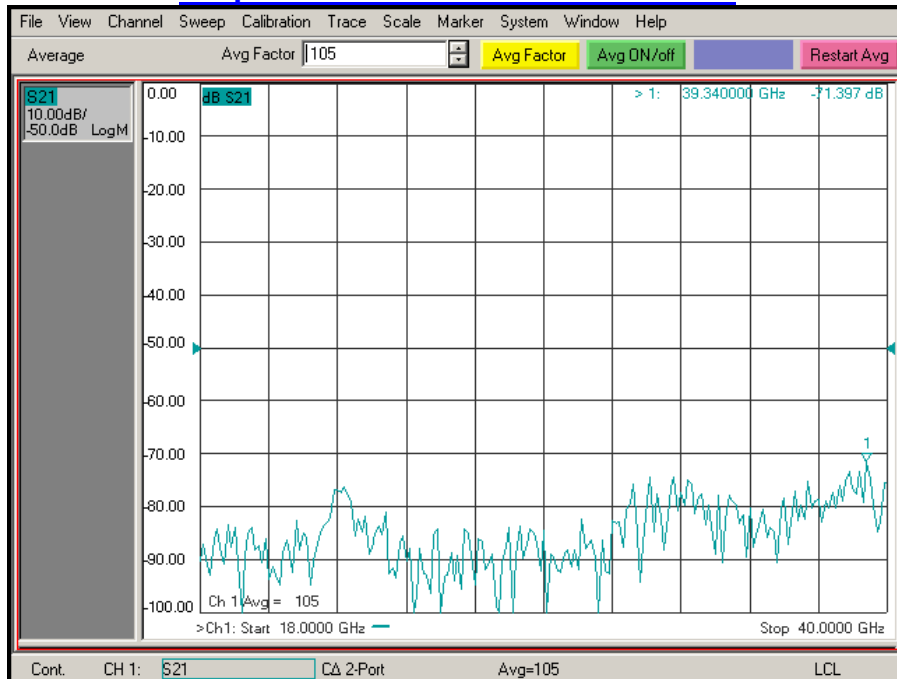


# Typical Characteristics for DGM-18G40G-292FF-DS

## Input Channel 3 to Channel 4 Isolation



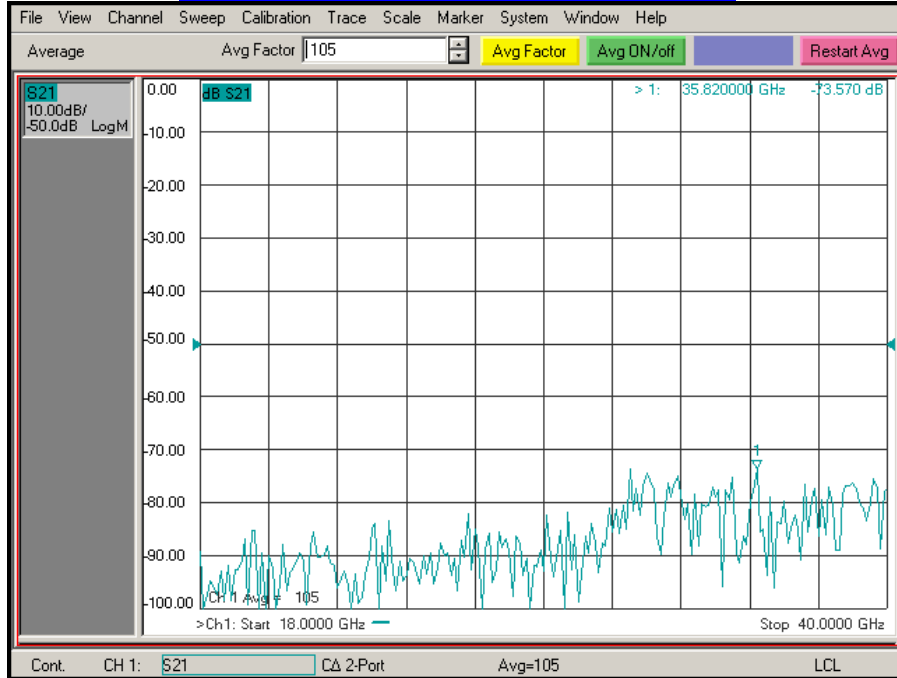
## Output Channel 1 to Channel 2 Isolation



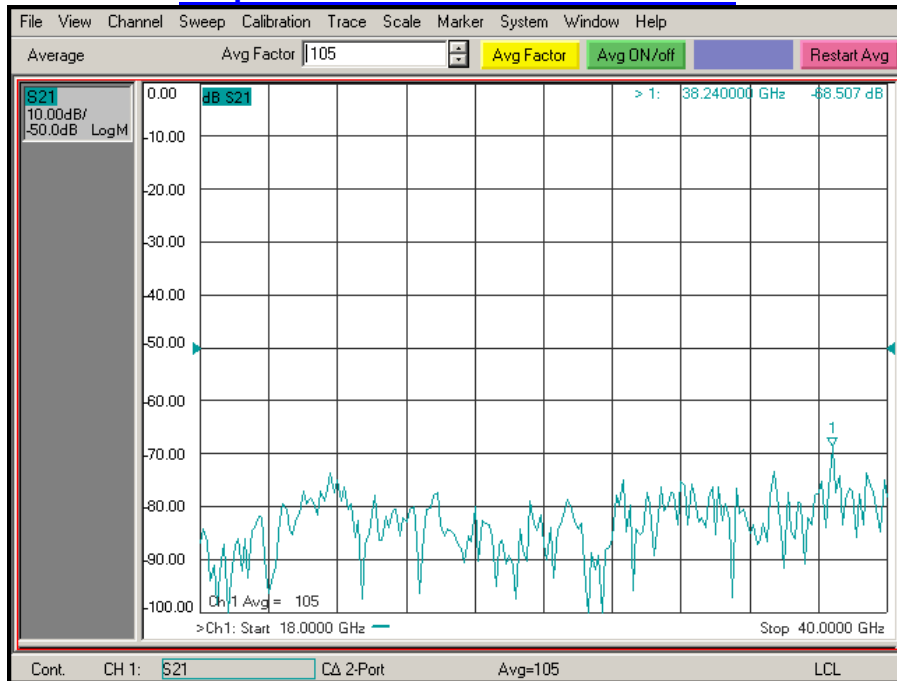


# Typical Characteristics for DGM-18G40G-292FF-DS

## Output Channel 2 to Channel 3 Isolation



## Output Channel 3 to Channel 4 Isolation

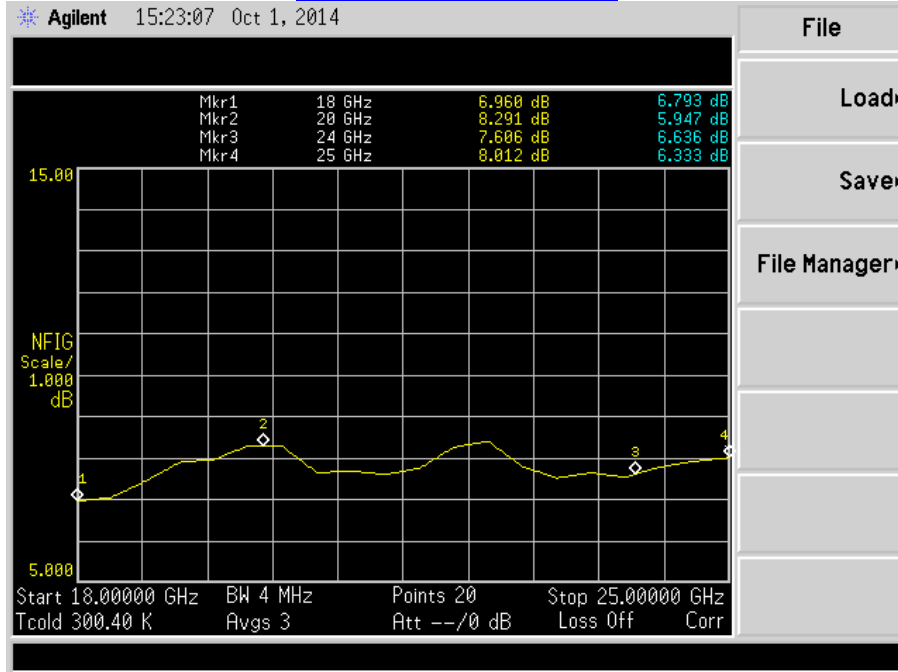




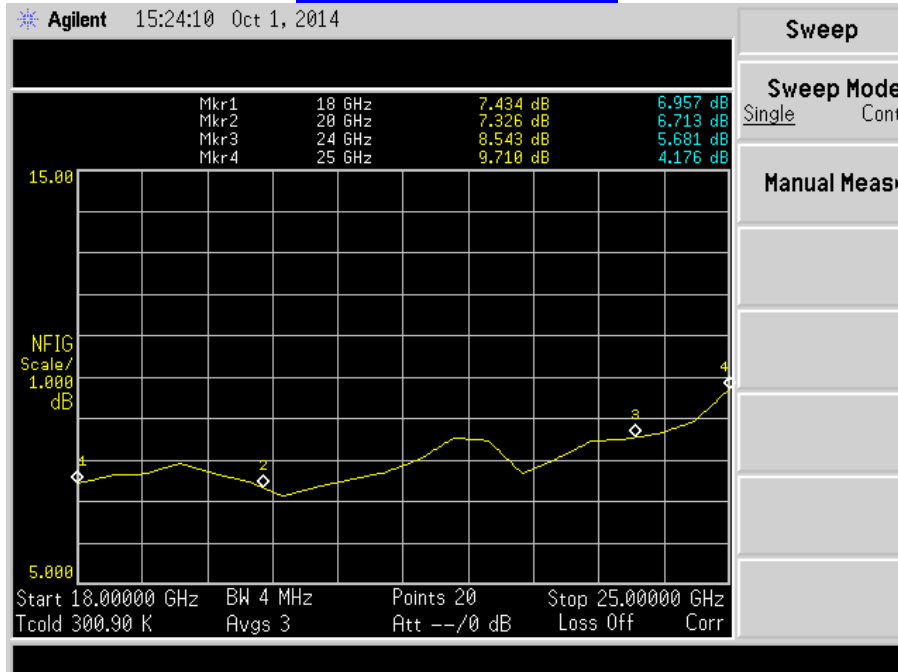


# Typical Characteristics for DGM-18G40G-292FF-DS

## Noise Figure Channel 1



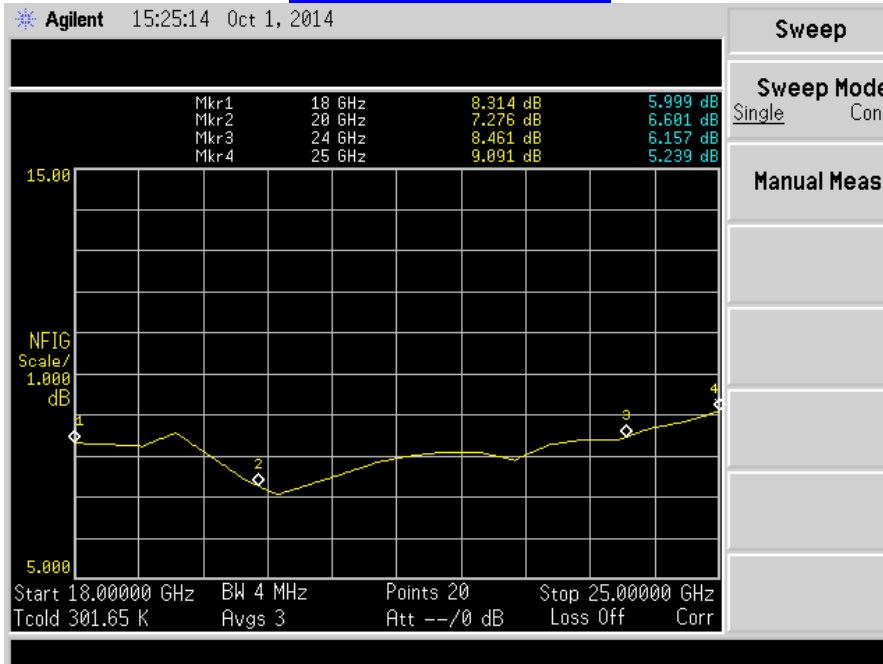
## Noise Figure Channel 2



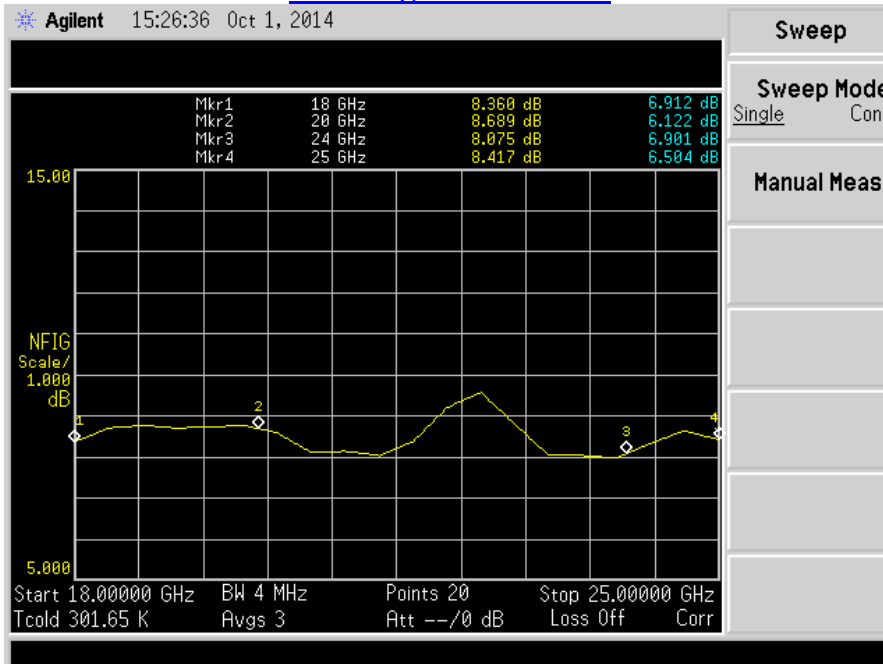


# Typical Characteristics for DGM-18G40G-292FF-DS

## Noise Figure Channel 3



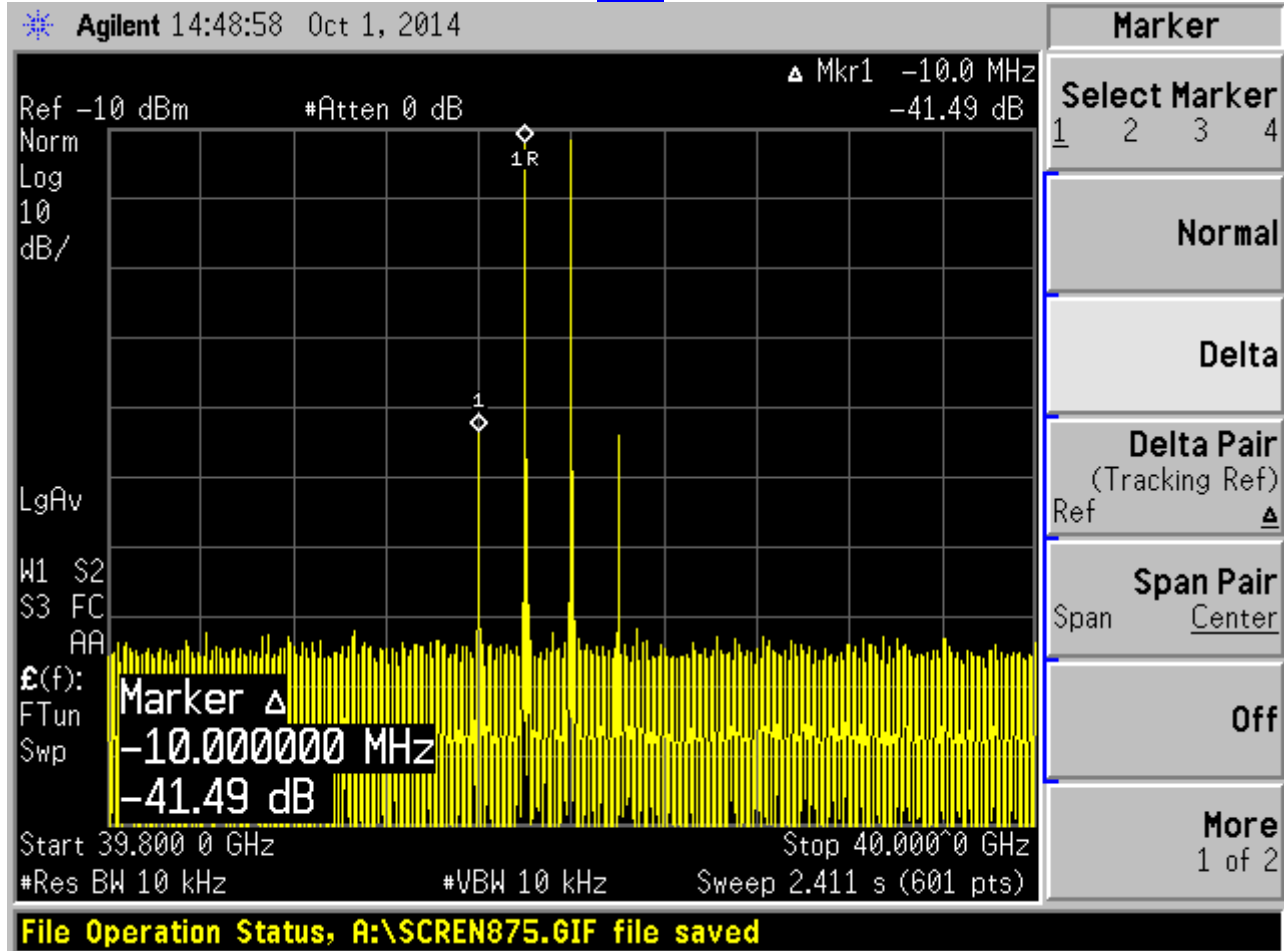
## Noise Figure Channel 4





# Typical Characteristics for DGM-18G40G-292FF-DS

## Third-Order Intercept at 40 GHz, -20dBm Input Delta

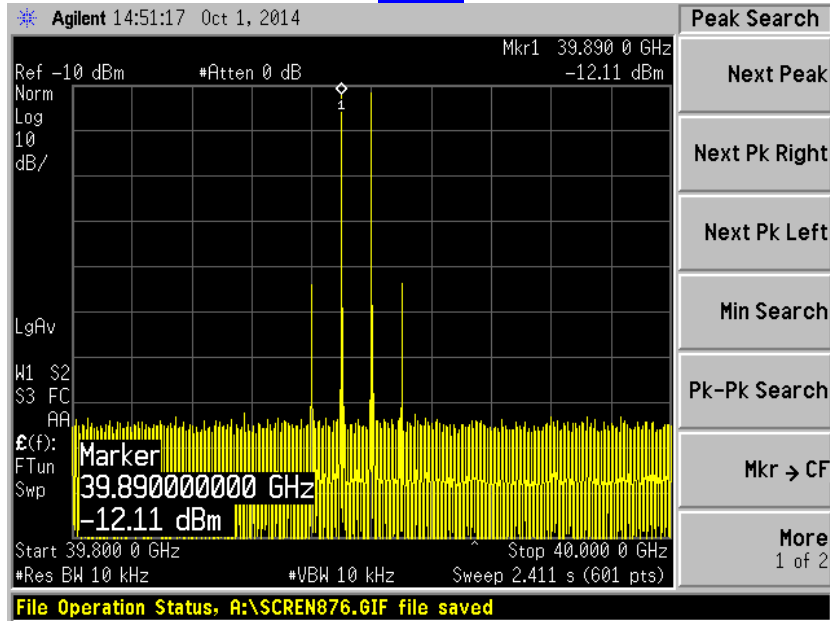




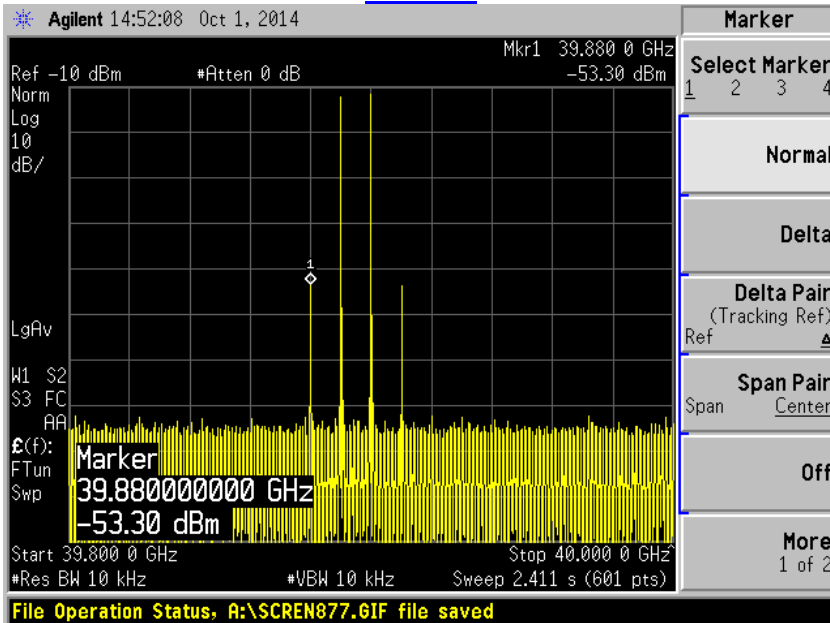
# Typical Characteristics for DGM-18G40G-292FF-DS

## Third-Order Intercept at 40 GHz, -20dBm Input

### Tone 1



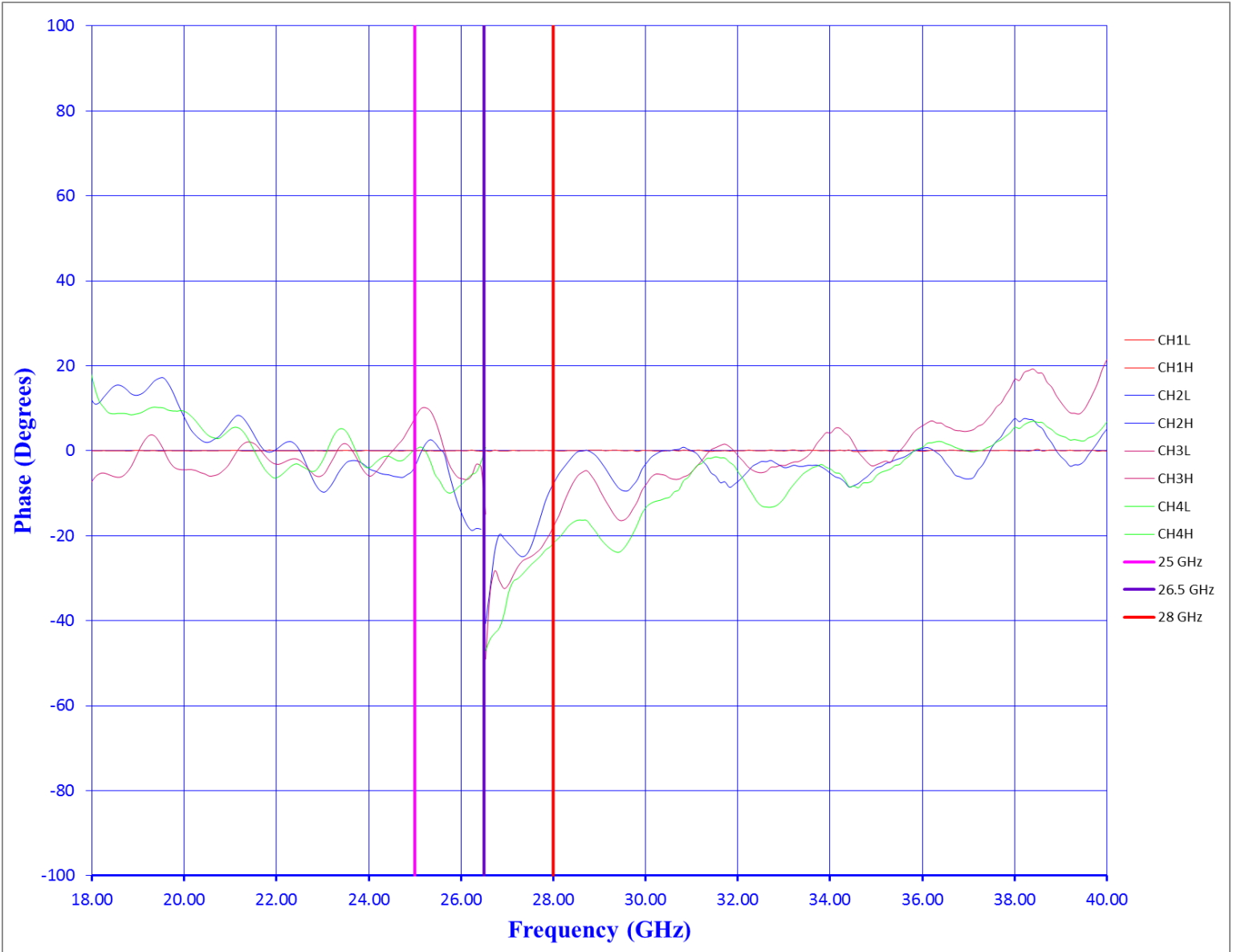
### Low side





# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Matching Port to Port Relative to Channel 1



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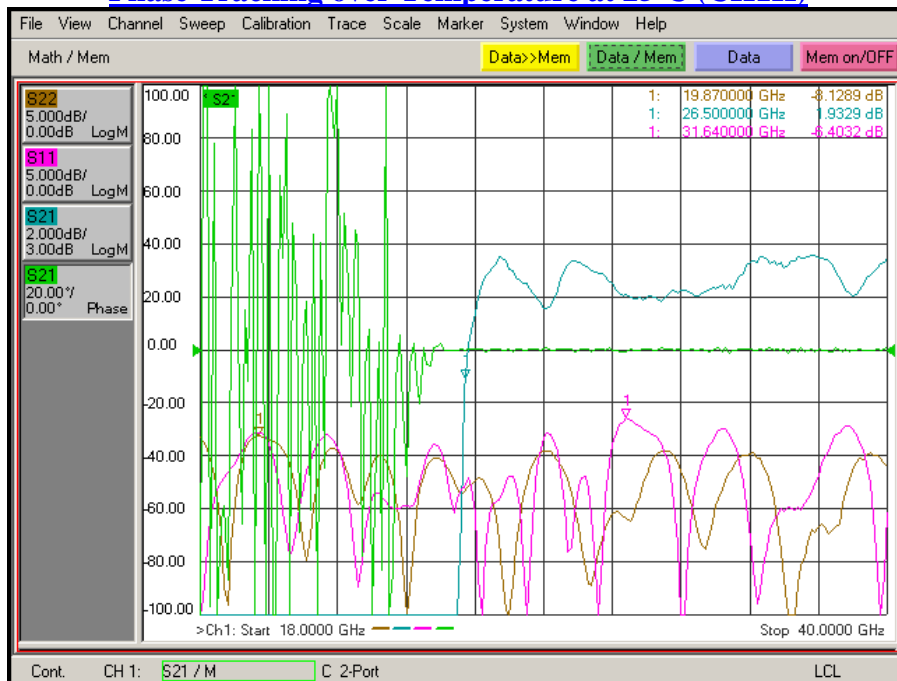


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 25°C (CH1L)



## Phase Tracking over Temperature at 25°C (CH1H)



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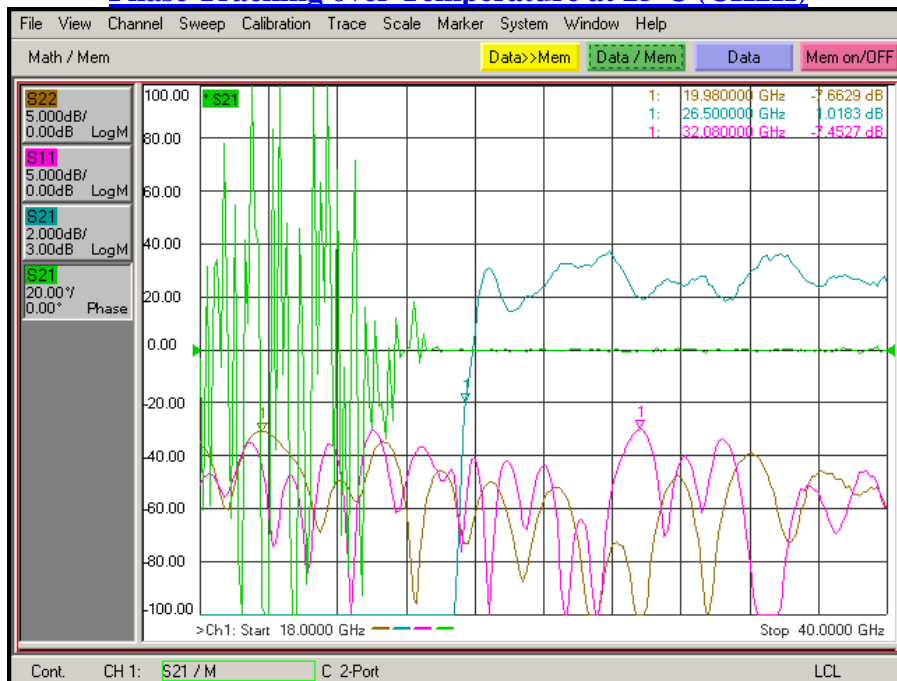


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 25°C (CH2L)



## Phase Tracking over Temperature at 25°C (CH2H)



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Email: [sales@pmi-rf.com](mailto:sales@pmi-rf.com)

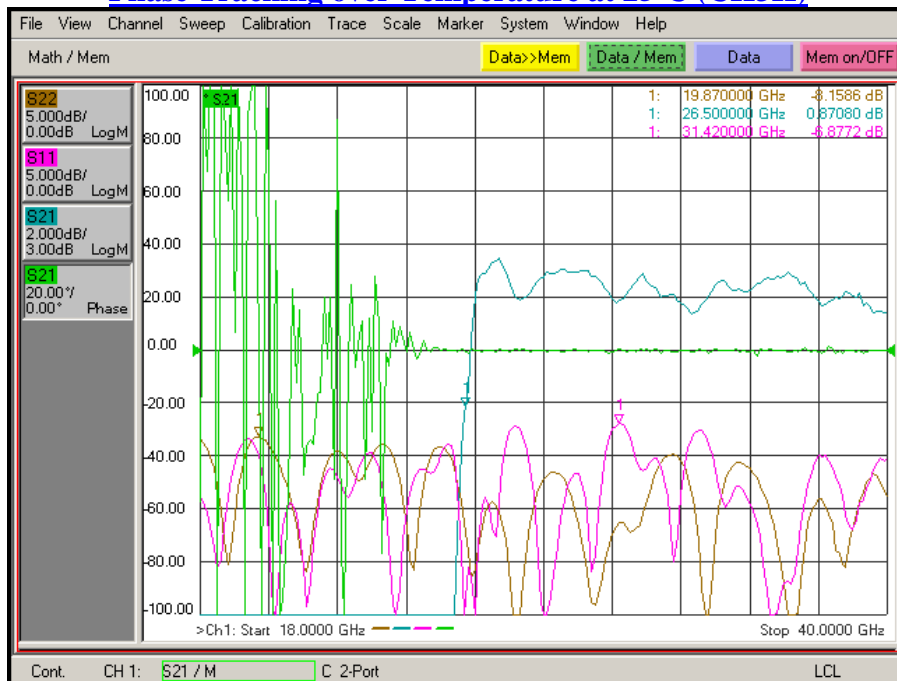


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 25°C (CH3L)



## Phase Tracking over Temperature at 25°C (CH3H)



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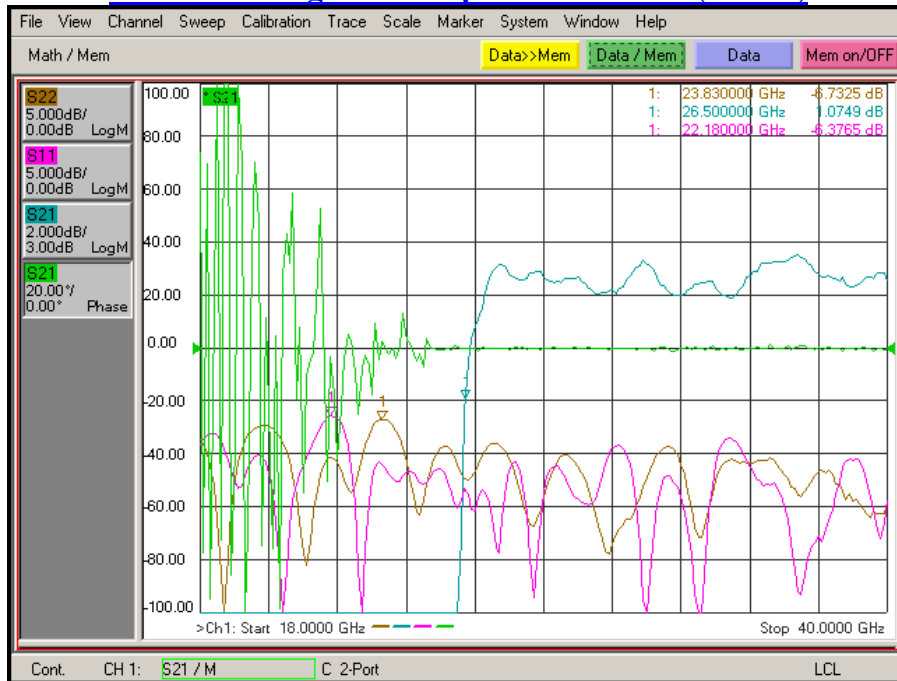


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 25°C (CH4L)



## Phase Tracking over Temperature at 25°C (CH4H)



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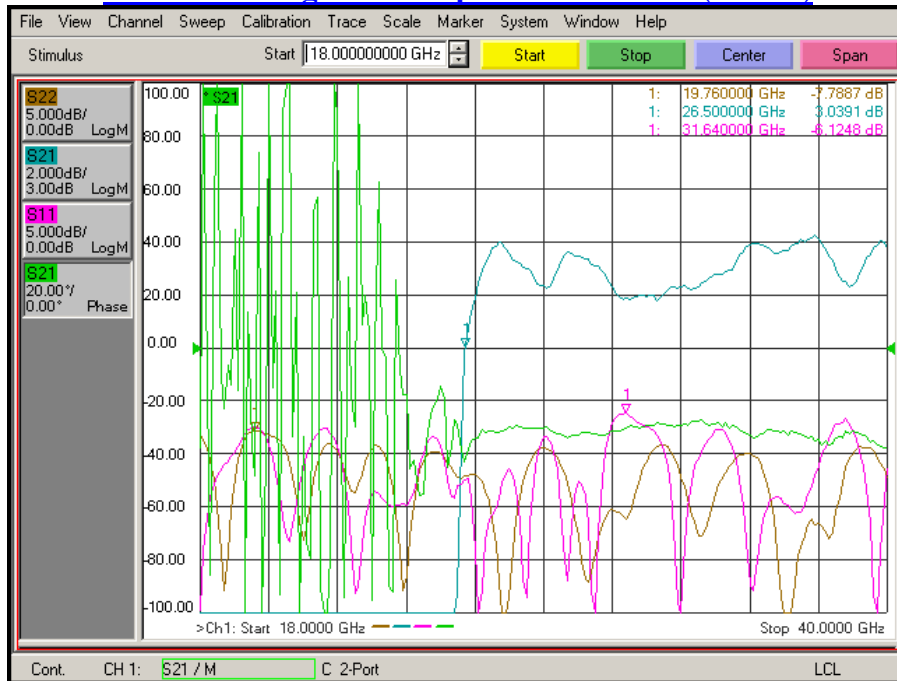


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at -20°C (CH1L)



## Phase Tracking over Temperature at -20°C (CH1H)

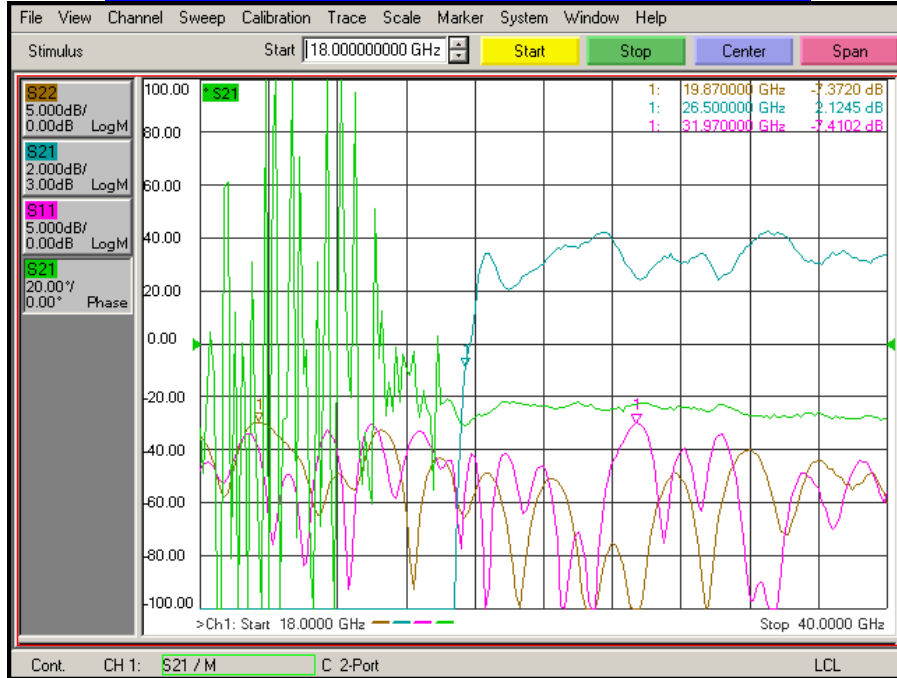


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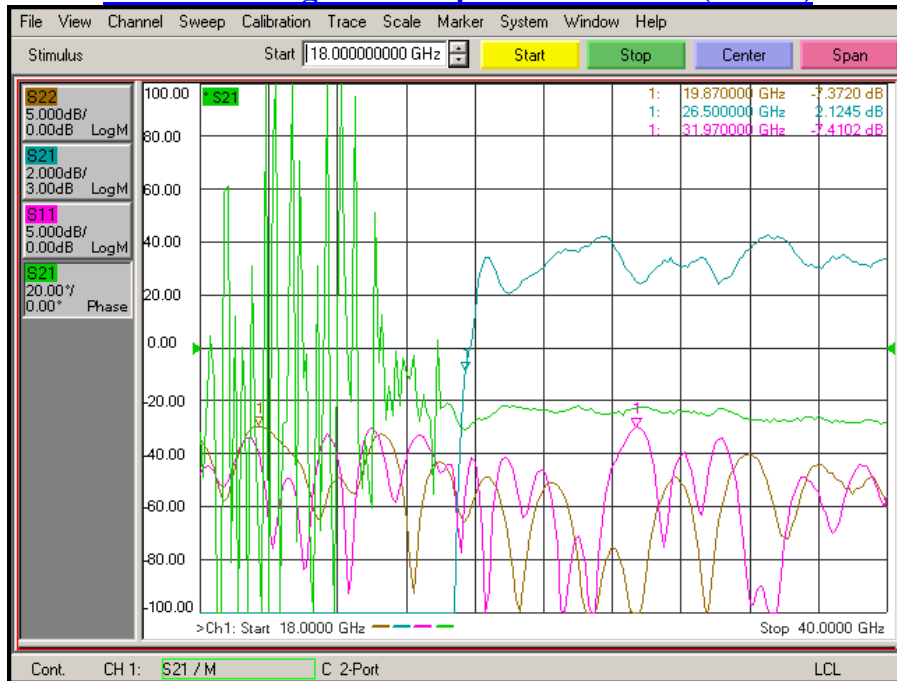


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at -20°C (CH2L)



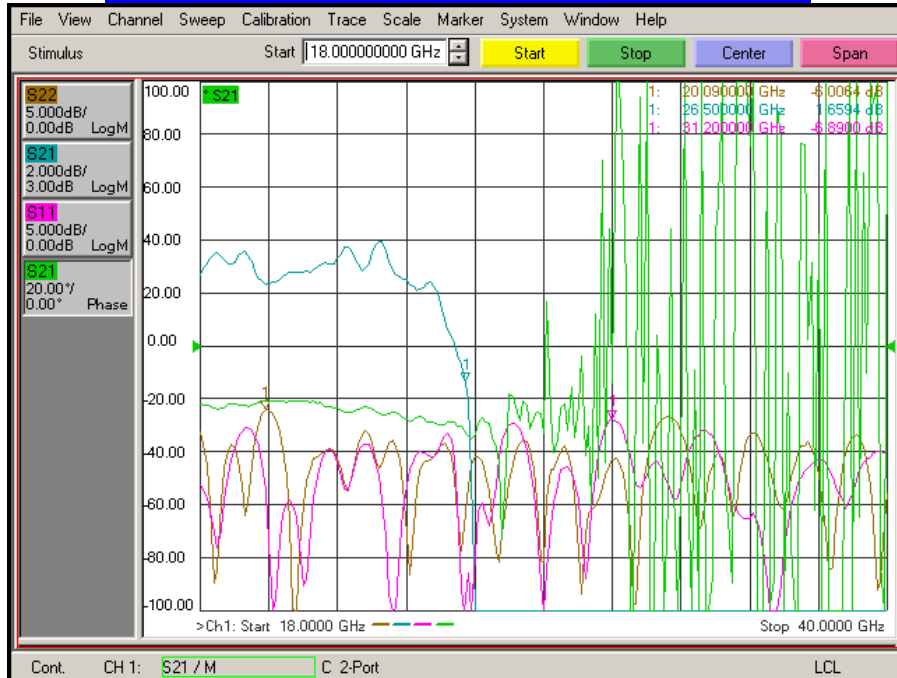
## Phase Tracking over Temperature at -20°C (CH2H)



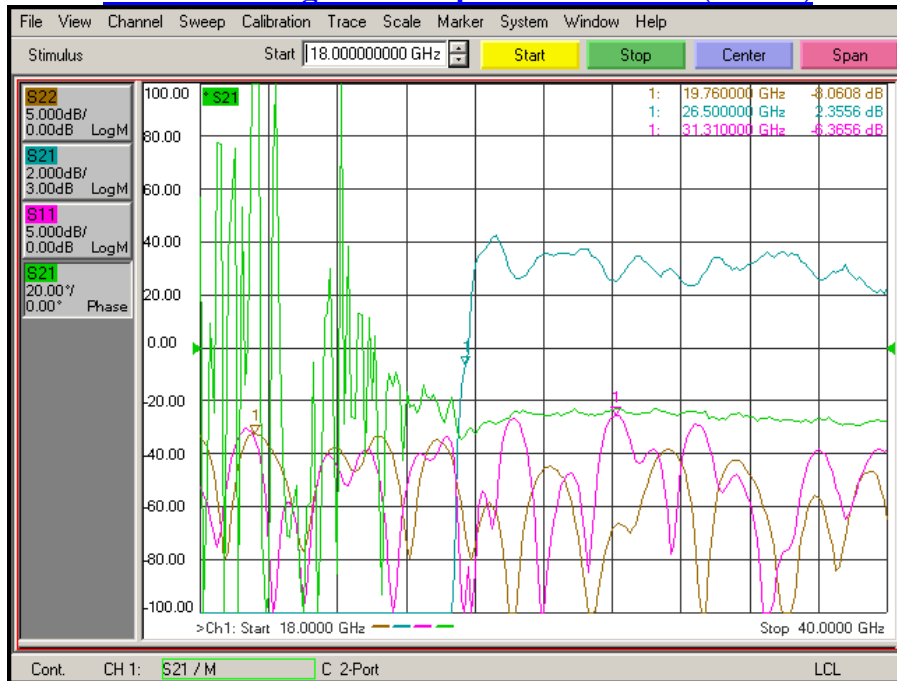


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at -20°C (CH3L)



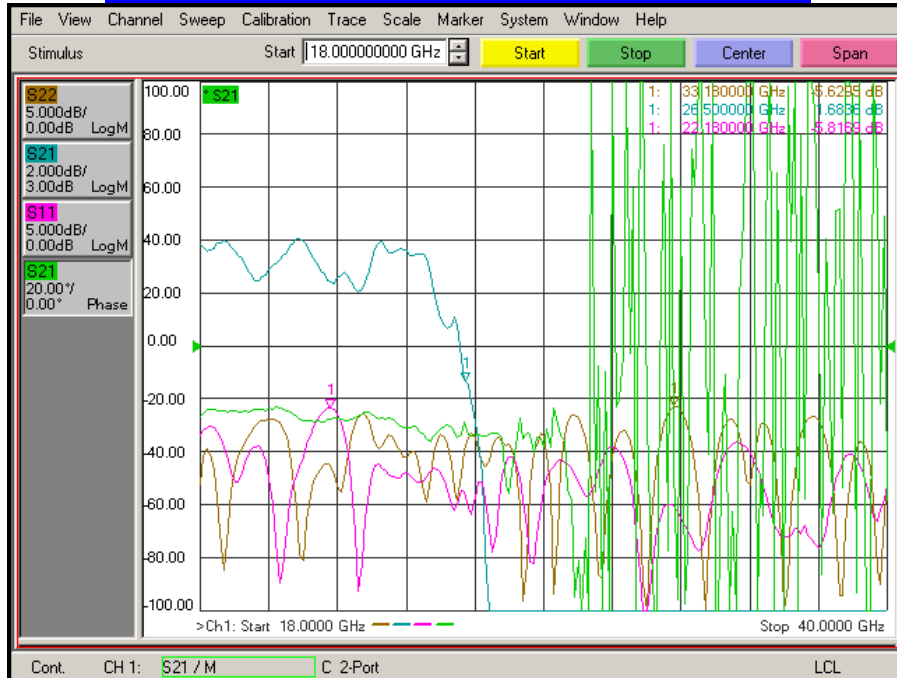
## Phase Tracking over Temperature at -20°C (CH3H)



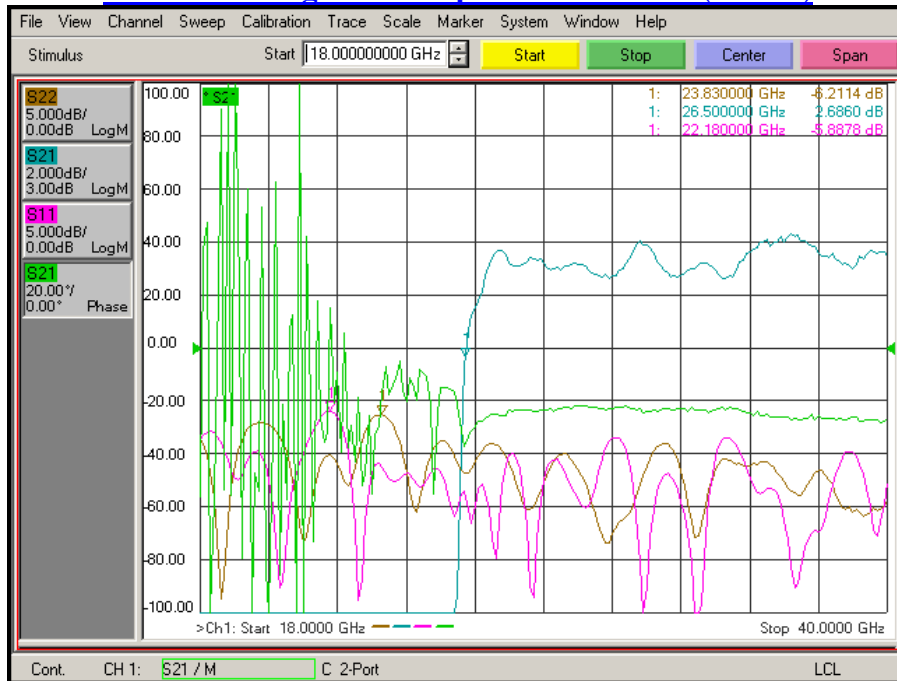


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at -20°C (CH4L)



## Phase Tracking over Temperature at -20°C (CH4H)

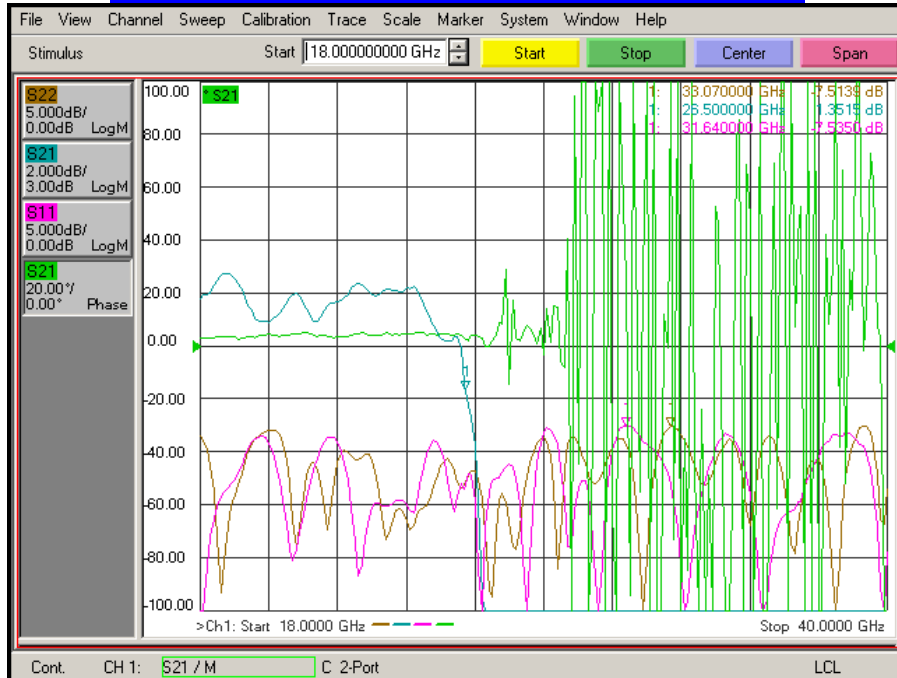


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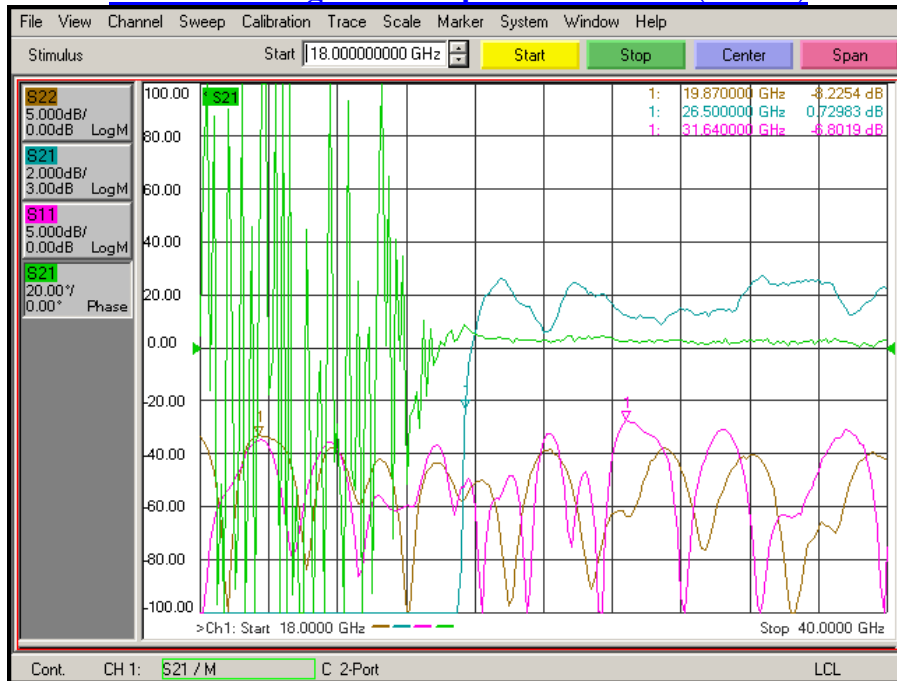


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 65°C (CH1L)



## Phase Tracking over Temperature at 65°C (CH1H)

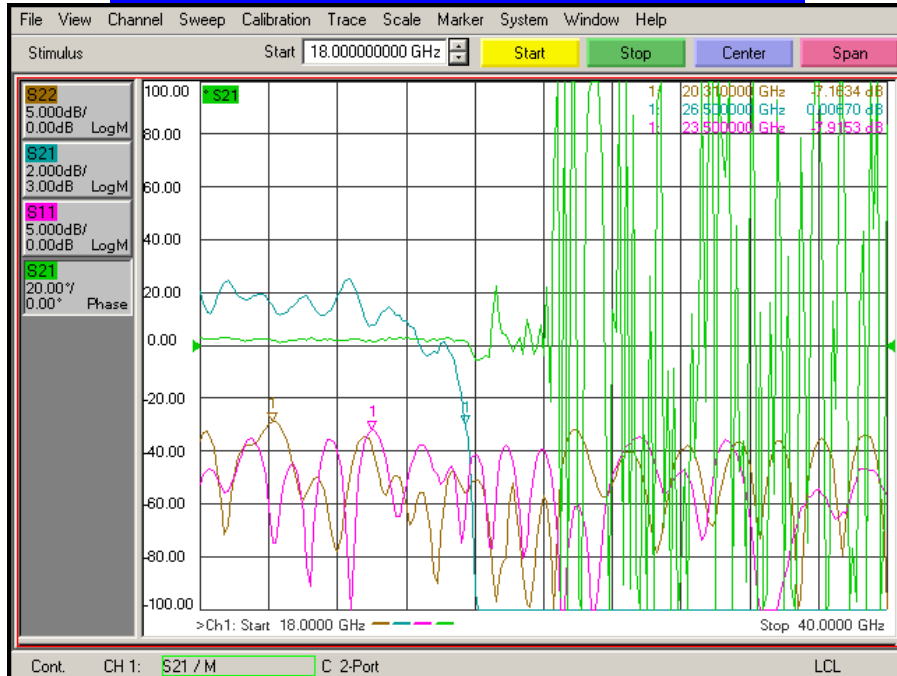


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Email: [sales@pmi-rf.com](mailto:sales@pmi-rf.com)

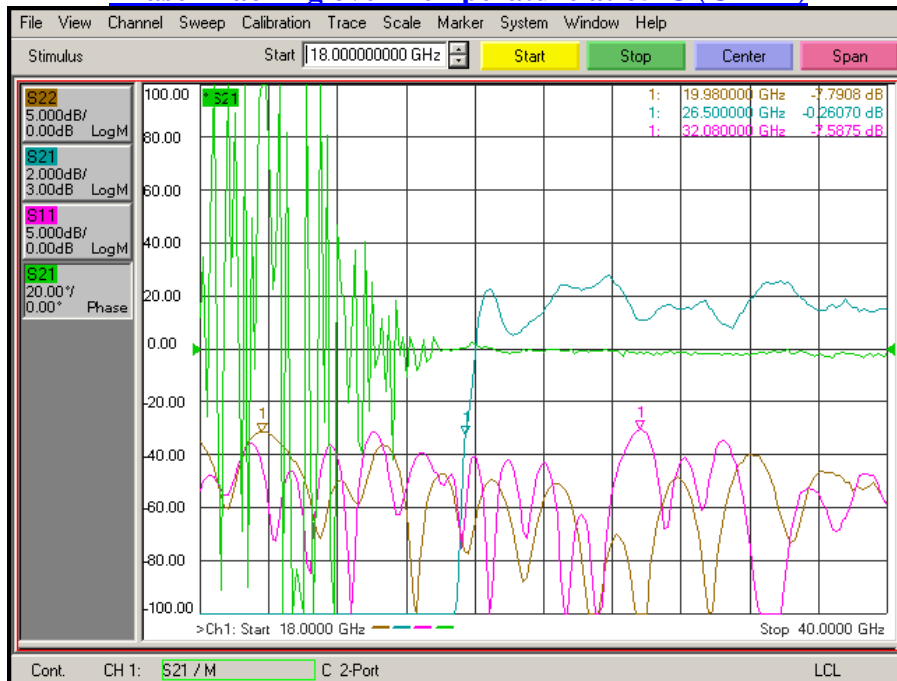


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 65°C (CH2L)



## Phase Tracking over Temperature at 65°C (CH2H)



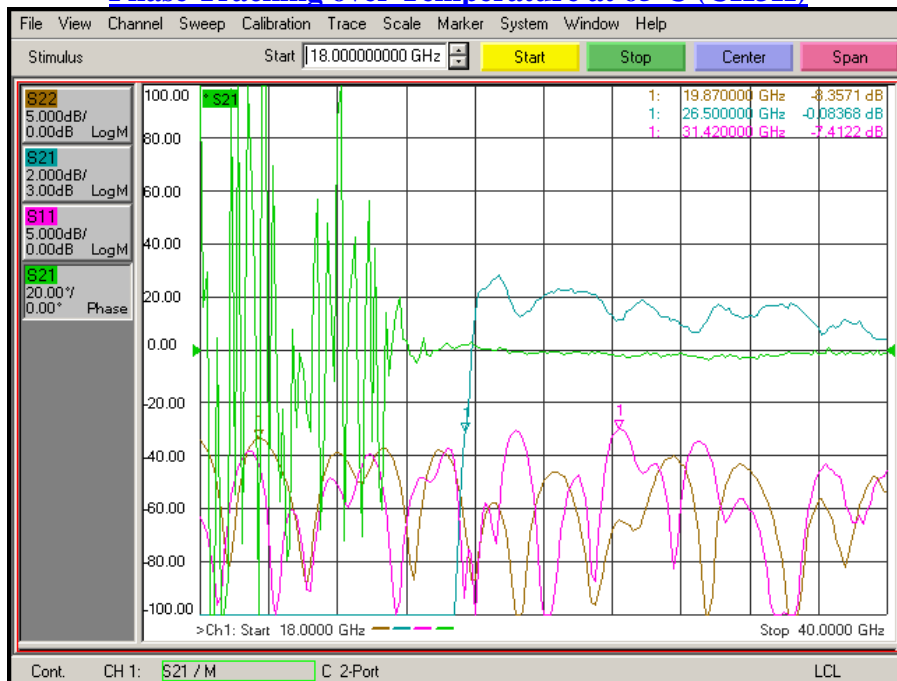


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 65°C (CH3L)



## Phase Tracking over Temperature at 65°C (CH3H)



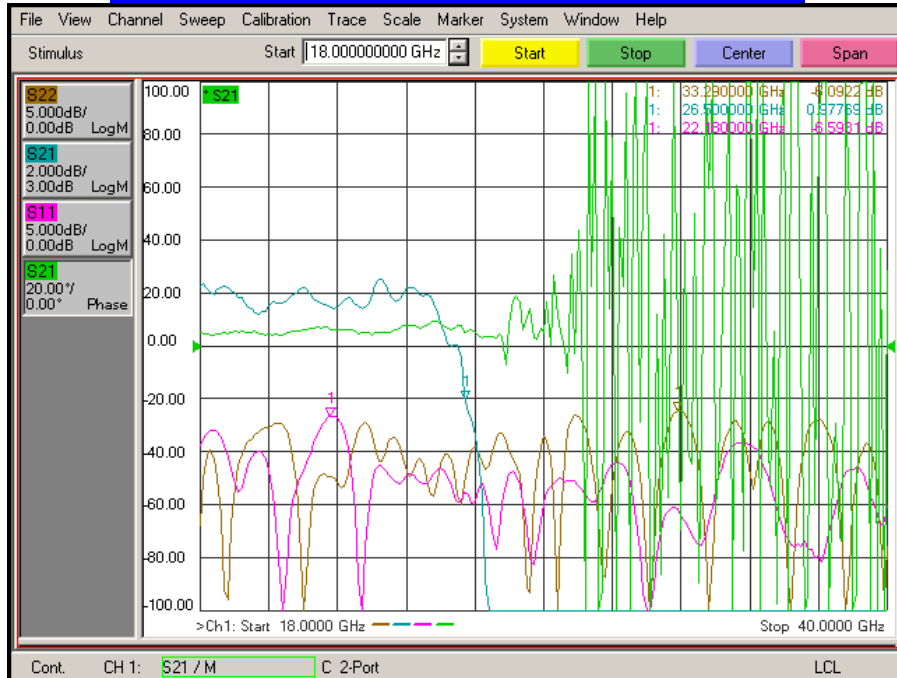
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Email: [sales@pmi-rf.com](mailto:sales@pmi-rf.com)



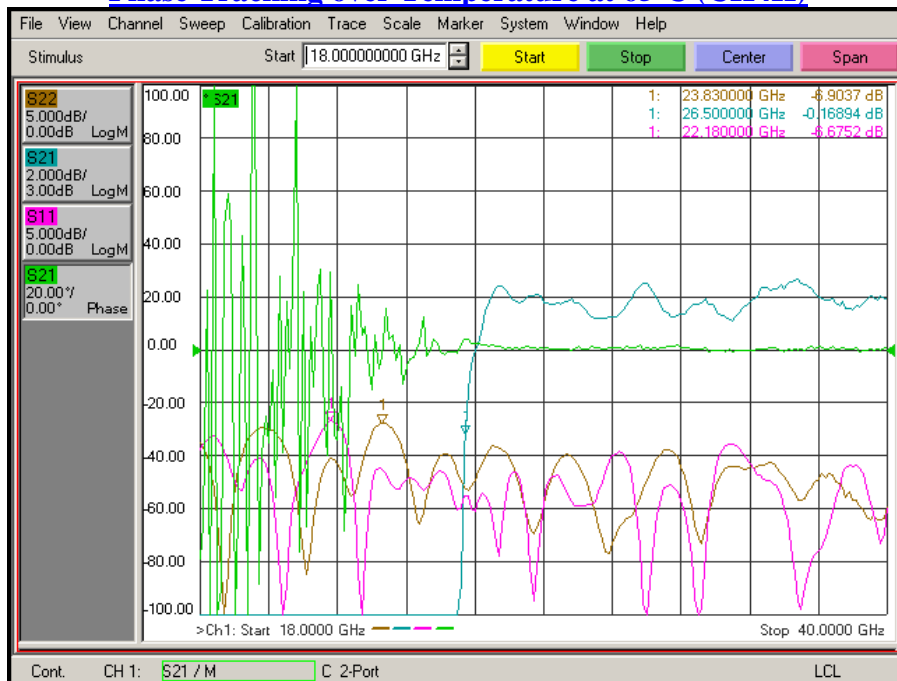


# Typical Characteristics for DGM-18G40G-292FF-DS

## Phase Tracking over Temperature at 65°C (CH4L)



## Phase Tracking over Temperature at 65°C (CH4H)

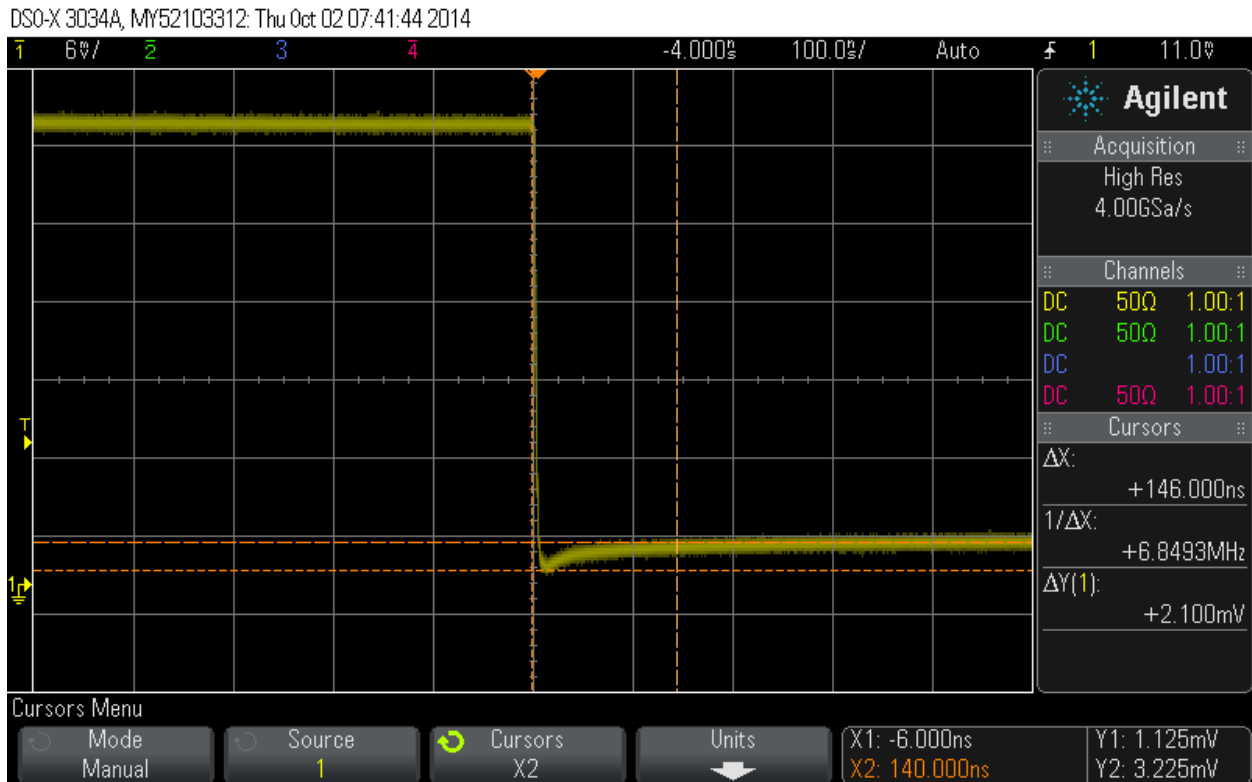


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# Typical Characteristics for DGM-18G40G-292FF-DS

## Limiter 1 dB Recovery Time from 20dBm to 0dBm at 18 GHz

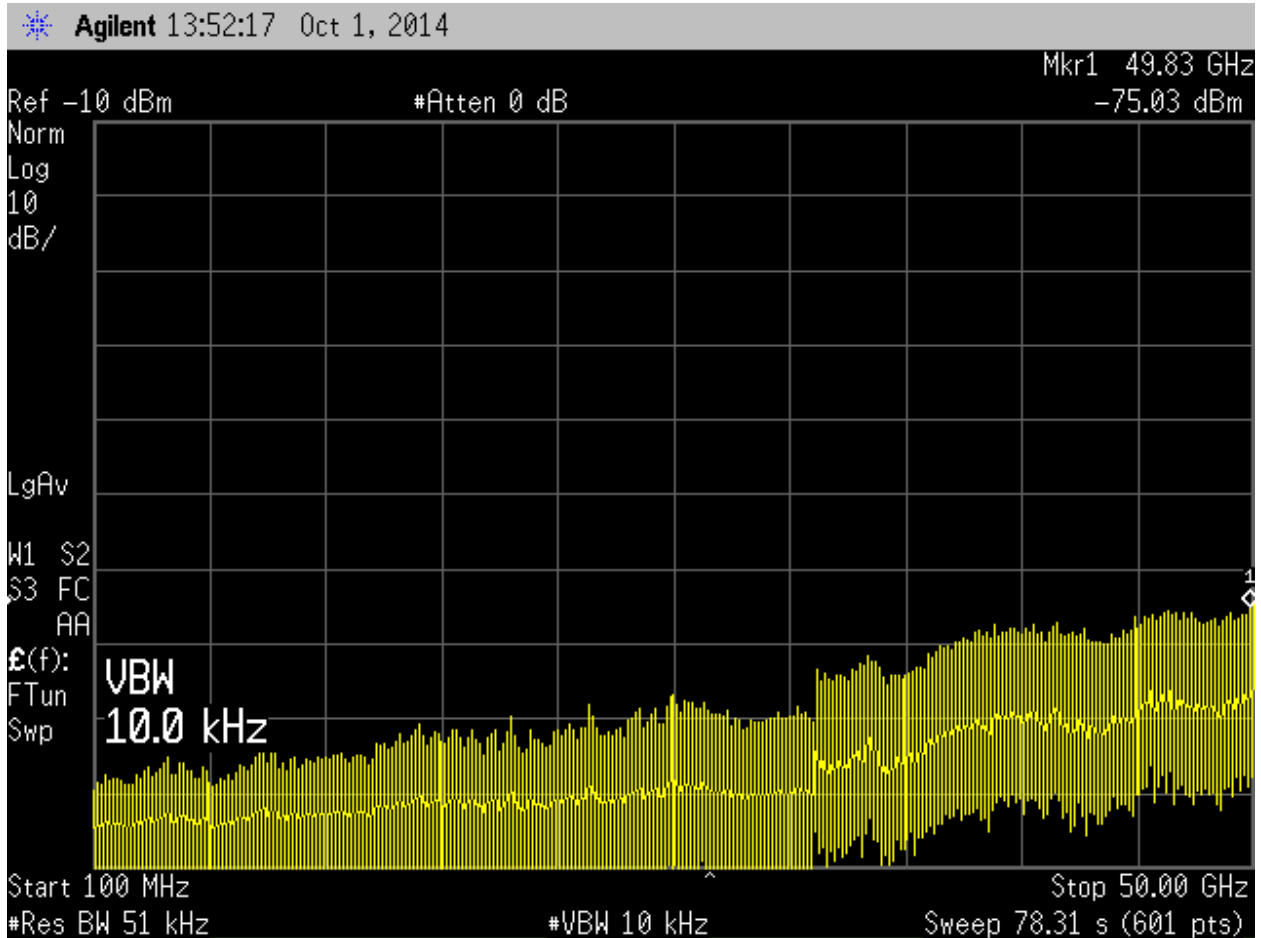




# Typical Characteristics for DGM-18G40G-292FF-DS

## Spurious Products

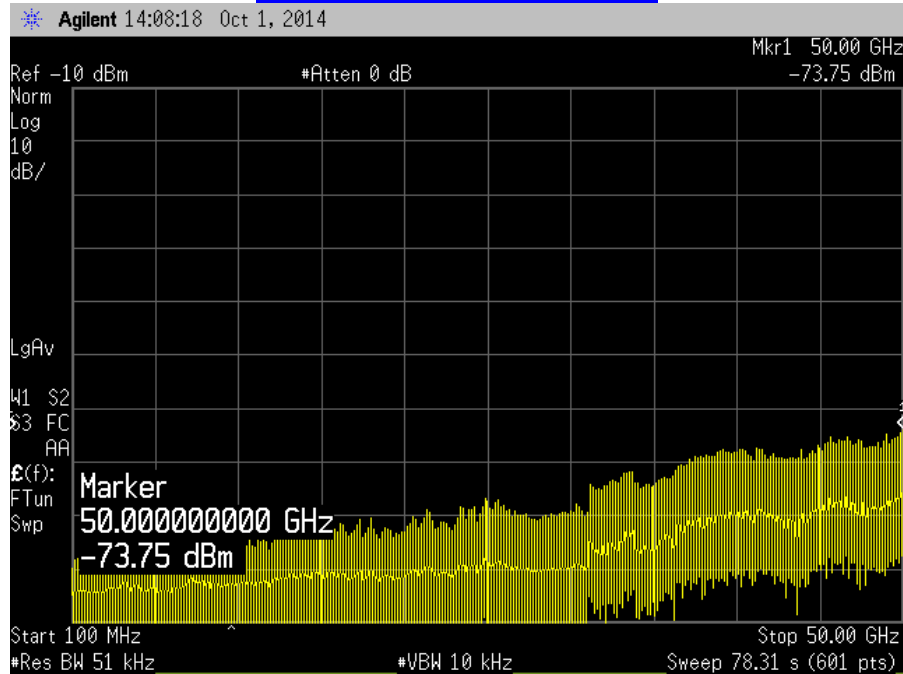
### Spectrum Analyzer Noise Floor at 10 KHz Video Bandwidth and 51 KHz Resolution Bandwidth



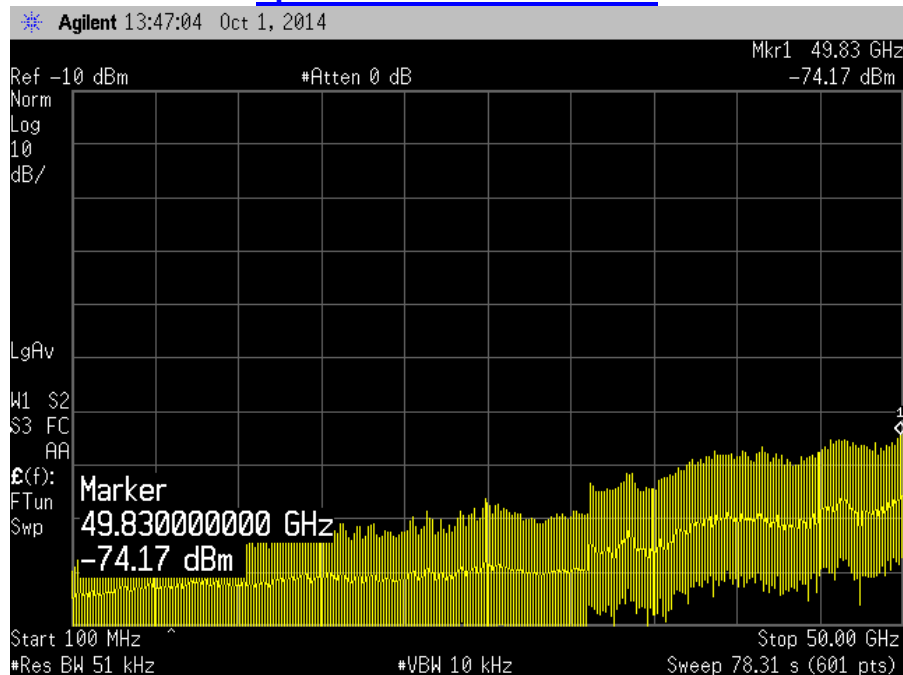


# Typical Characteristics for DGM-18G40G-292FF-DS

## Spurious Products Channel 1



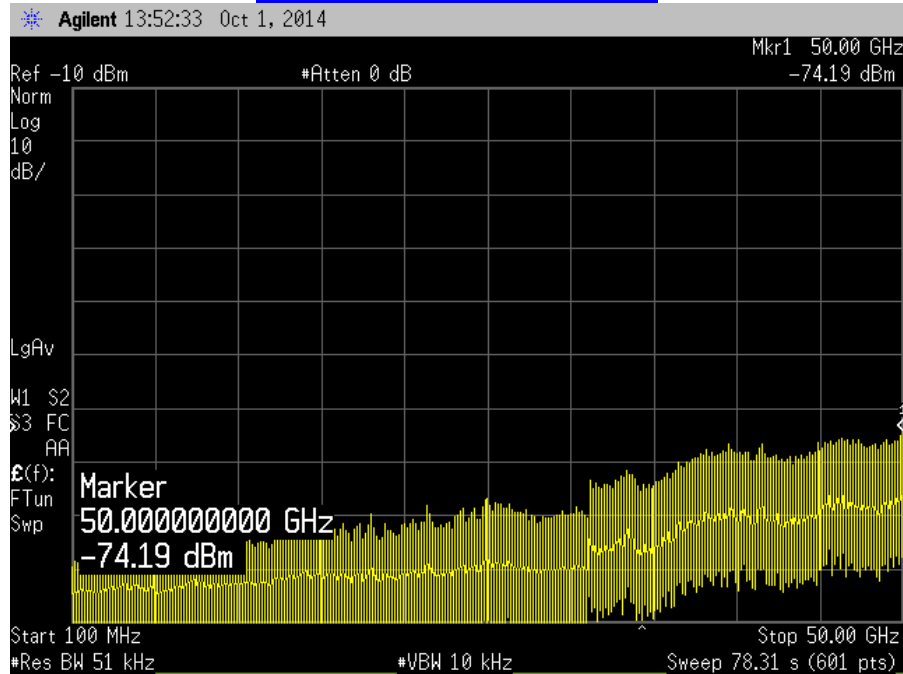
## Spurious Products Channel 2



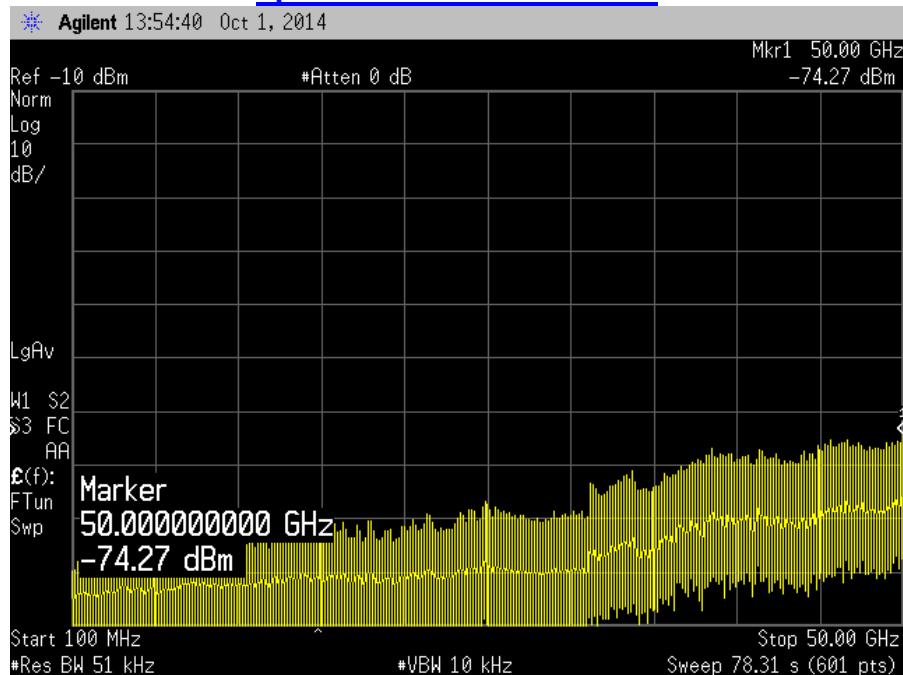


# Typical Characteristics for DGM-18G40G-292FF-DS

## Spurious Products Channel 3



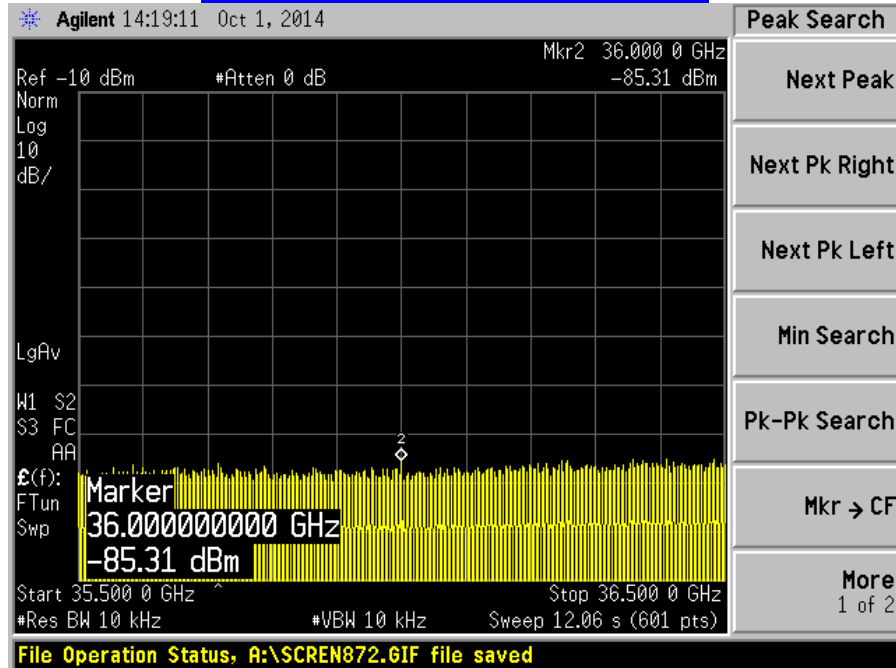
## Spurious Products Channel 4



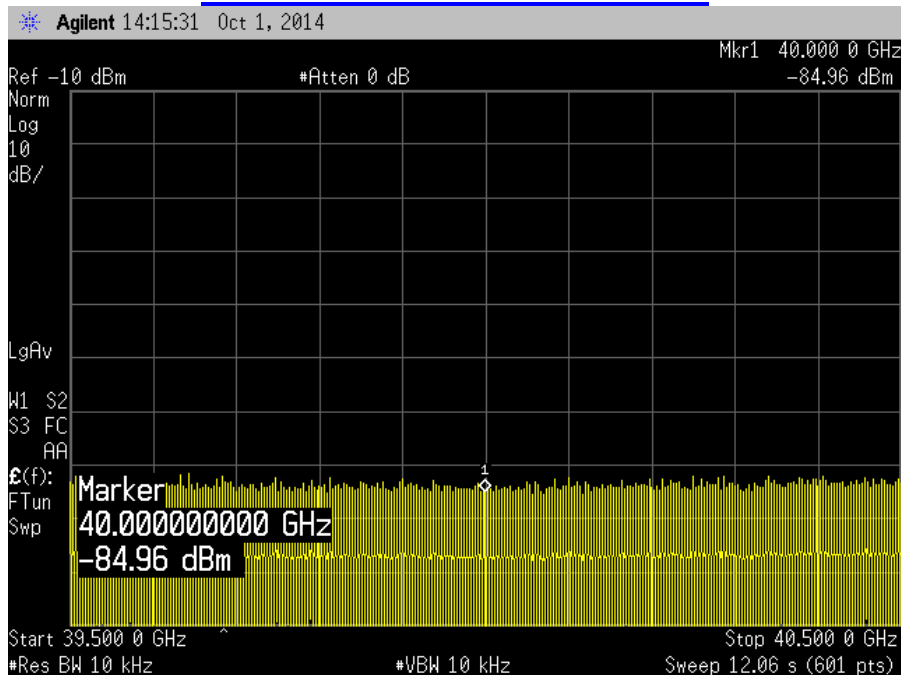


# Typical Characteristics for DGM-18G40G-292FF-DS

## 18 GHz at -20dBm Second Harmonic



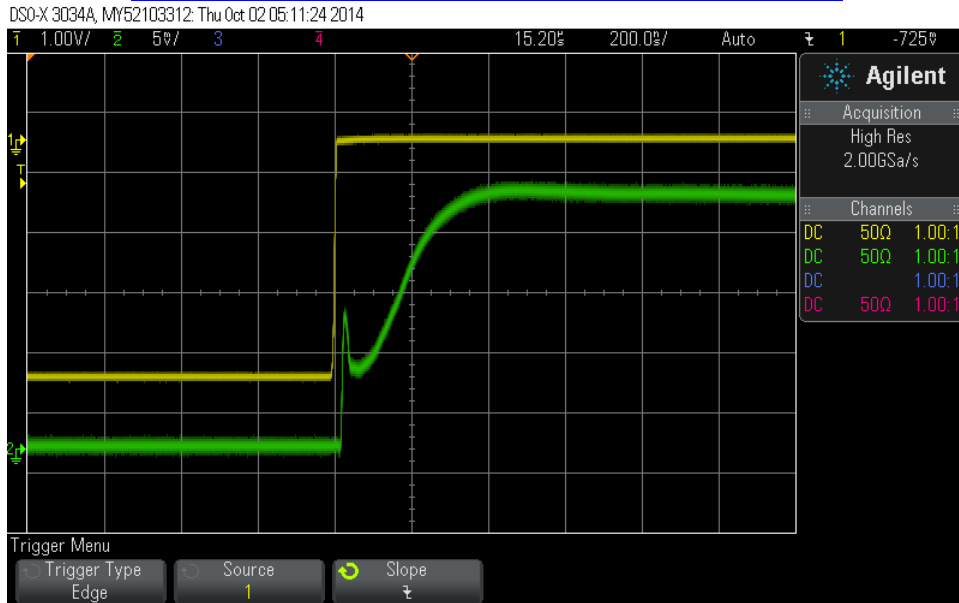
## 20 GHz at -20dBm Second Harmonic





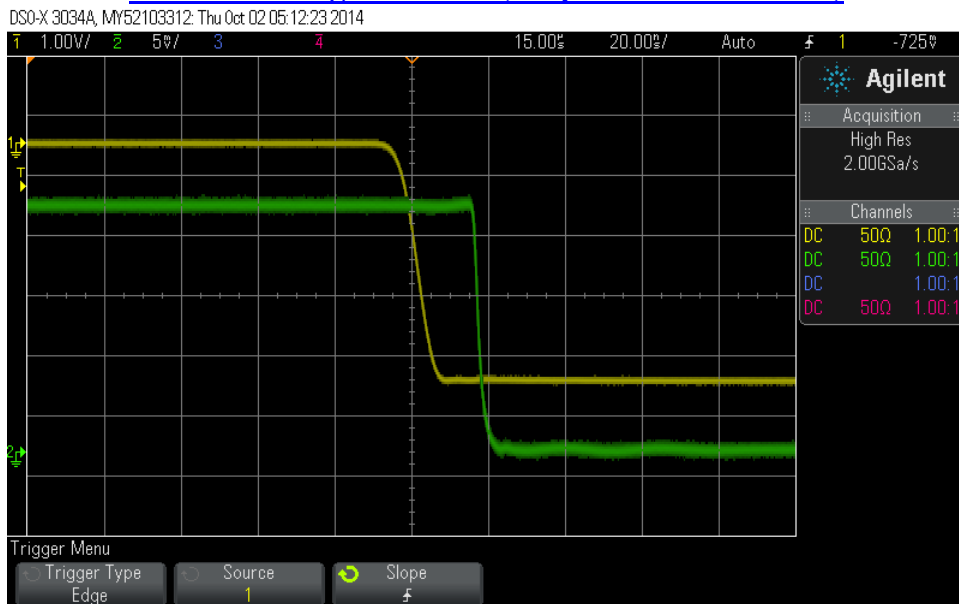
# Typical Characteristics for DGM-18G40G-292FF-DS

## Band Switching at 18 GHz (Amplifier & Switch On)



Yellow Trace = TTL Input  
Green Trace = RF Signal Measured with a Crystal Detector

## Band Switching at 18 GHz (Amplifier & Switch Off)

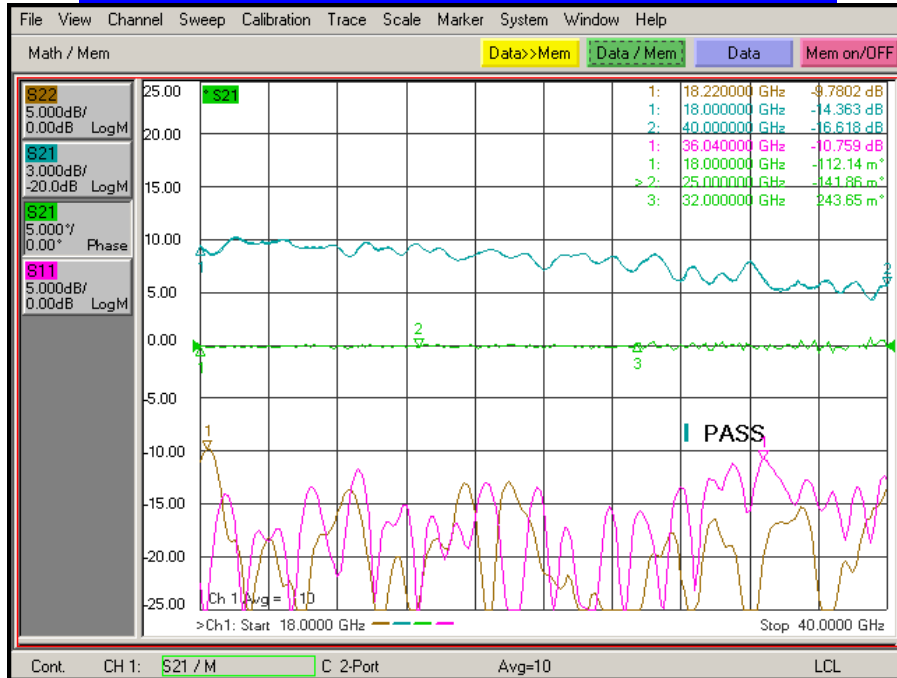


Yellow Trace = TTL Input  
Green Trace = RF Signal Measured with a Crystal Detector

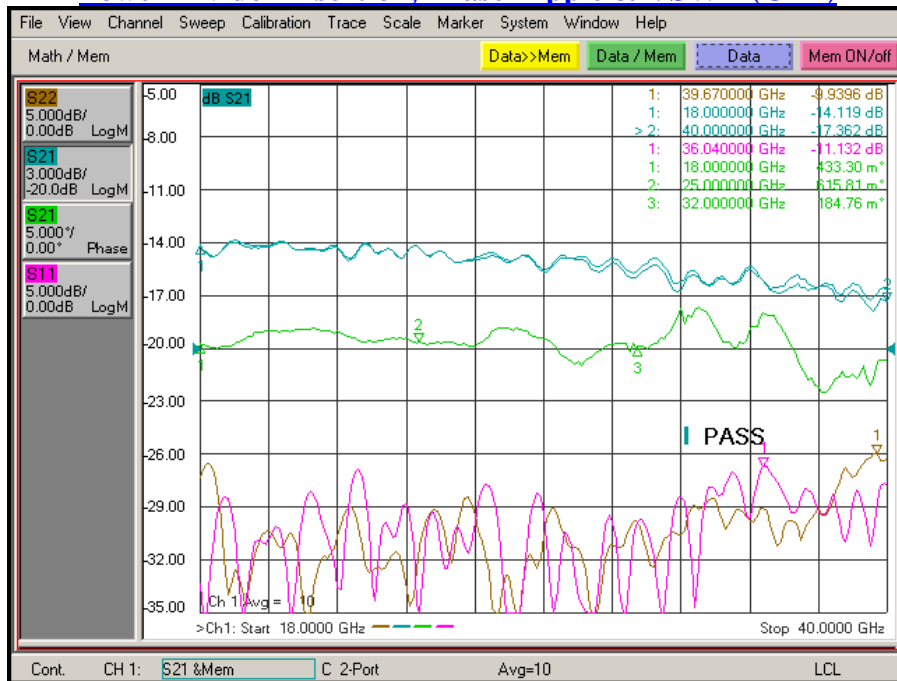


# Typical Characteristics for DGM-18G40G-292FF-DS

## Power Divider Insertion, Phase Ripple & VSWR (CH1)



## Power Divider Insertion, Phase Ripple & VSWR (CH2)



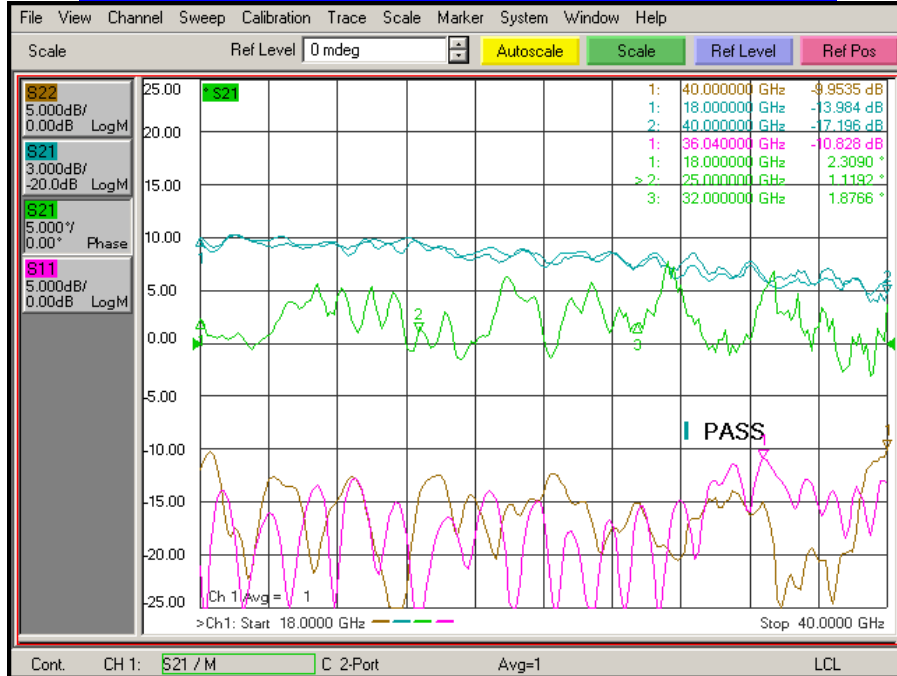
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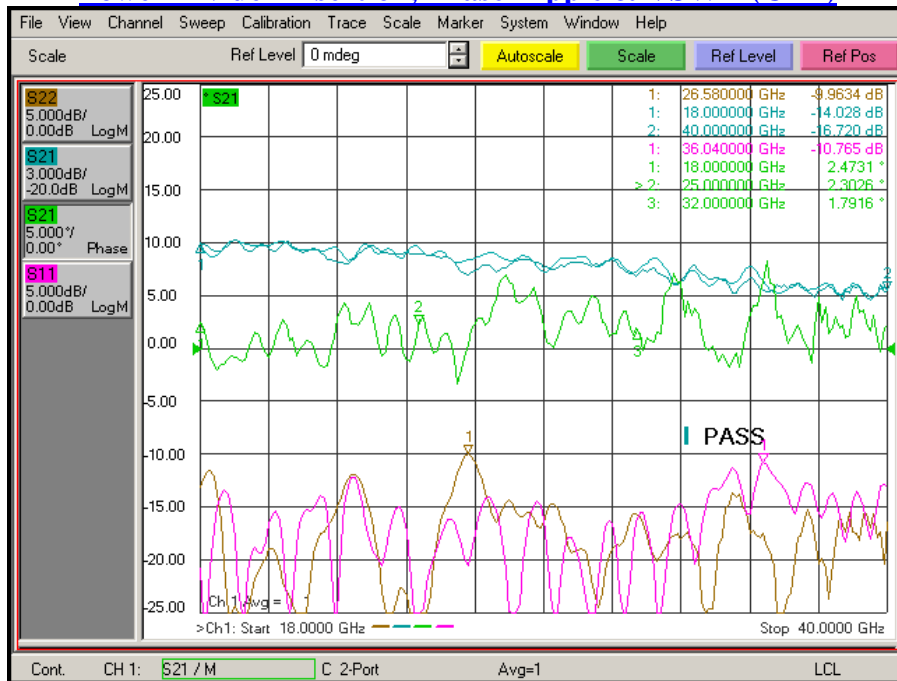


# Typical Characteristics for DGM-18G40G-292FF-DS

## Power Divider Insertion, Phase Ripple & VSWR (CH3)



## Power Divider Insertion, Phase Ripple & VSWR (CH4)

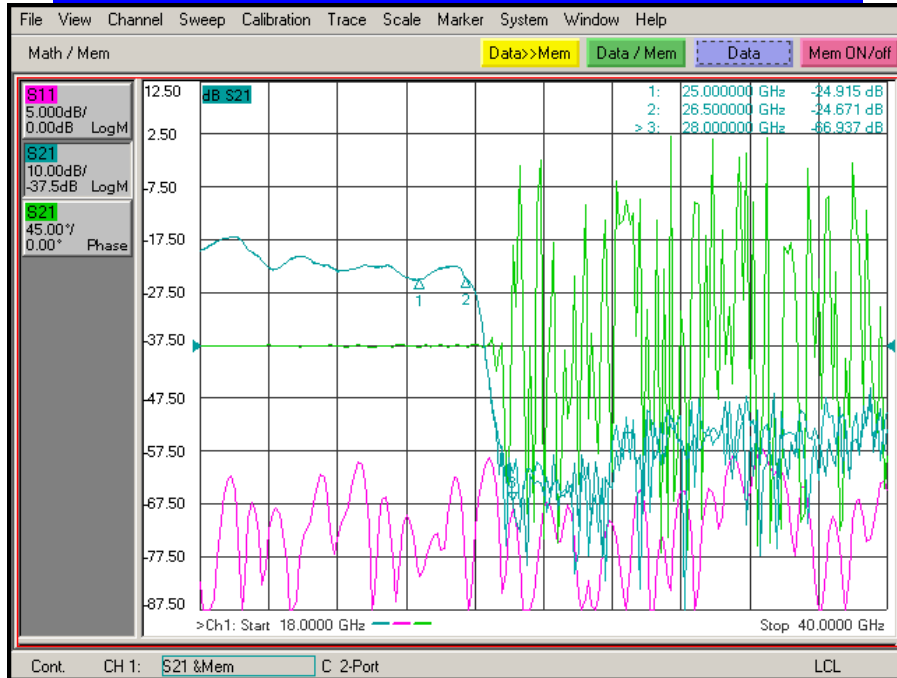


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# Typical Characteristics for DGM-18G40G-292FF-DS

## Power Divider, Coupling Insertion & Phase Ripple (CH1L)



## Power Divider, Coupling Insertion & Phase Ripple (CH1H)



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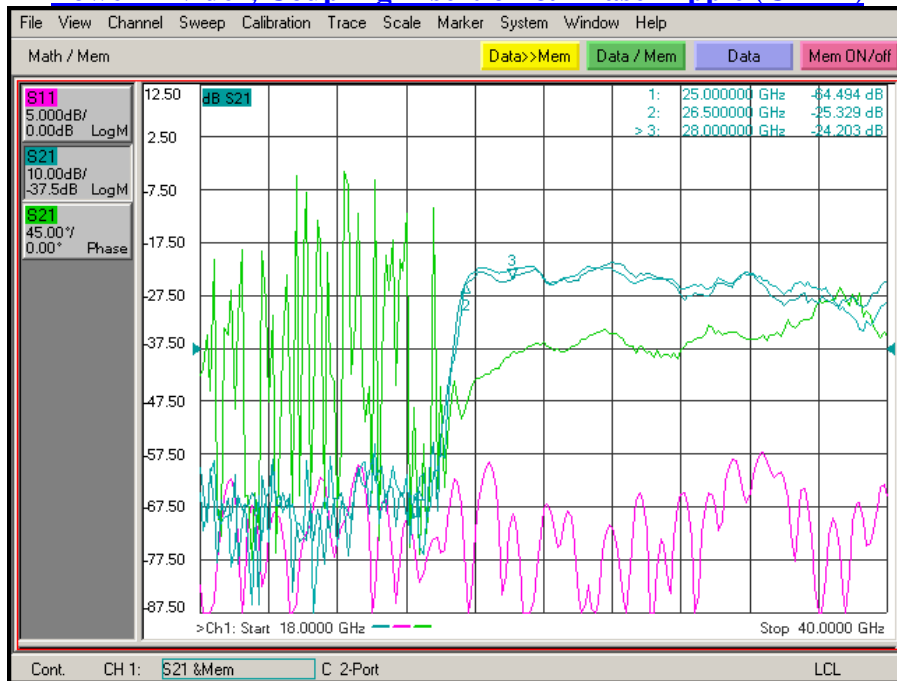


# Typical Characteristics for DGM-18G40G-292FF-DS

## Power Divider, Coupling Insertion & Phase Ripple (CH2L)



## Power Divider, Coupling Insertion & Phase Ripple (CH2H)



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Email: [sales@pmi-rf.com](mailto:sales@pmi-rf.com)

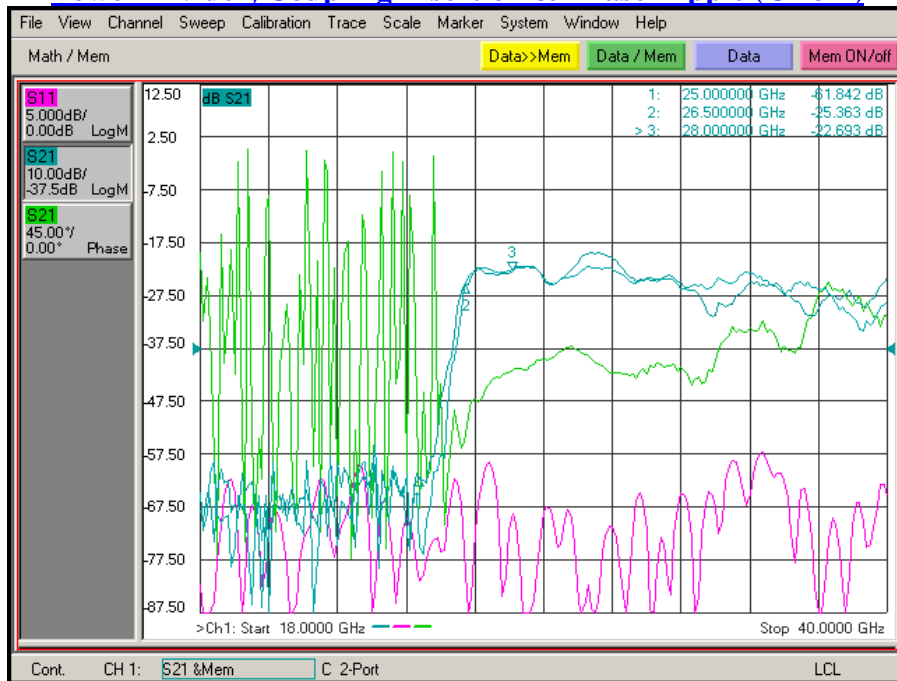


# Typical Characteristics for DGM-18G40G-292FF-DS

## Power Divider, Coupling Insertion & Phase Ripple (CH3L)



## Power Divider, Coupling Insertion & Phase Ripple (CH3H)

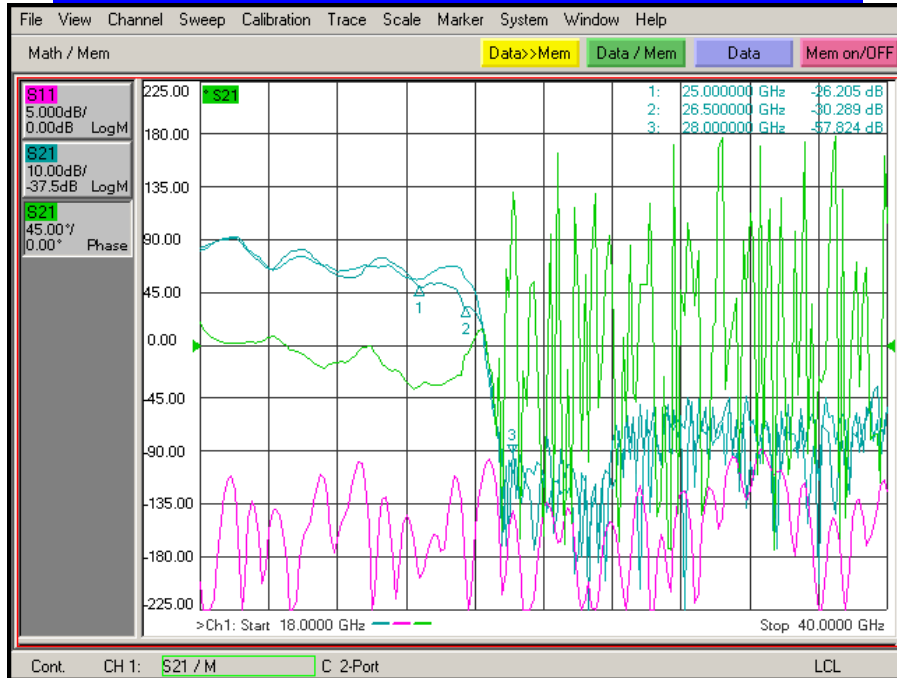


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# Typical Characteristics for DGM-18G40G-292FF-DS

## Power Divider, Coupling Insertion & Phase Ripple (CH4L)



## Power Divider, Coupling Insertion & Phase Ripple (CH4H)



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