

## Wideband Amplifier MITEQ AMF5S-040080-12-13P

Matthias, DD1US, December 2<sup>nd</sup> 2018

I am presently building a frequency doubler to extend my measurement setup to higher frequencies. I am using a frequency doubler from Hittite which need quite some drive power thus I decided to buy a MITEQ AMF5S-040080-12-13P amplifier.

There is little data in the internet but the part number suggested a frequency range from 4-8 GHz, a noise figure of 1.2dB and a 1dB compression point of 13dBm. As it is a 5-stage amplifier the gain should be quite high.

All this fits my purpose of a frequency doubler with an input frequency range of 3-8 GHz as from my experience the frequency range of the Miteq amplifiers is typically wider than specified.

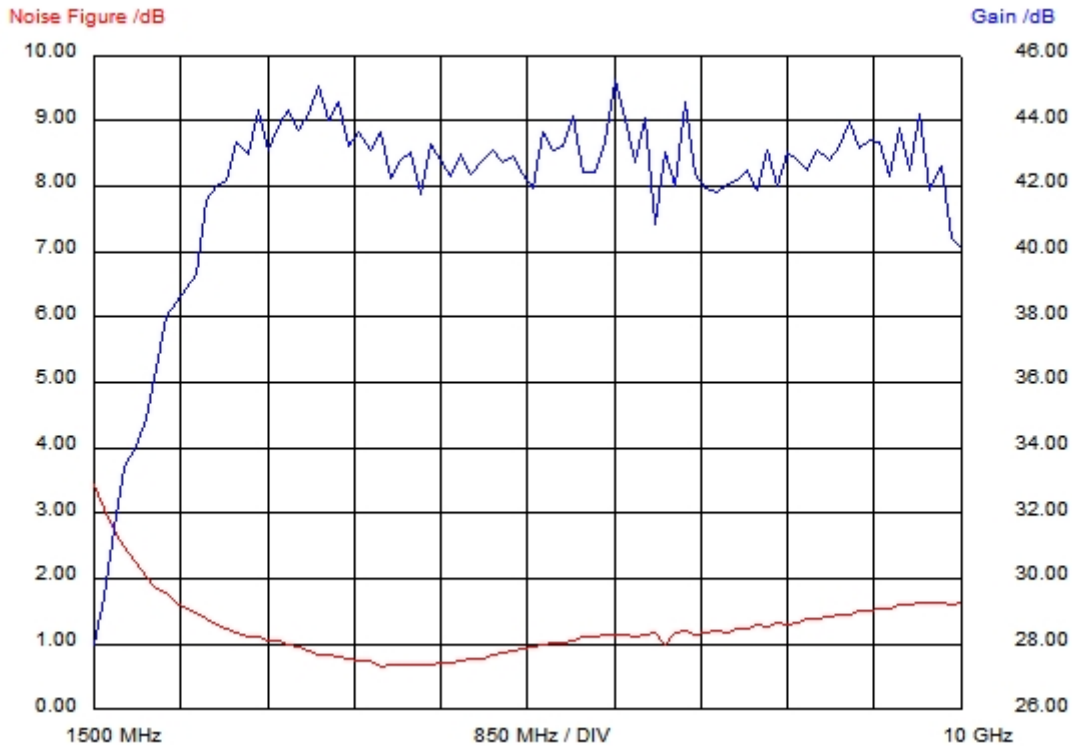
Here are some pictures of the amplifier I bought:



I am not planning to mounted the amplifier on a dedicated heatsink but will rather mount on an aluminum plate where all the components of the doubler are placed. This should provide an adequate low thermal resistance to keep the amplifier cool enough. The amplifier is specified to operate at 15V DC and I measured a current

consumption of 120mA. My measurements showed very little degradation of gain and maximum output power when operating the amplifier at 12V.

First, I measured the gain and the noise figure between 1.5 GHz and 10 GHz using a supply voltage of 15V.



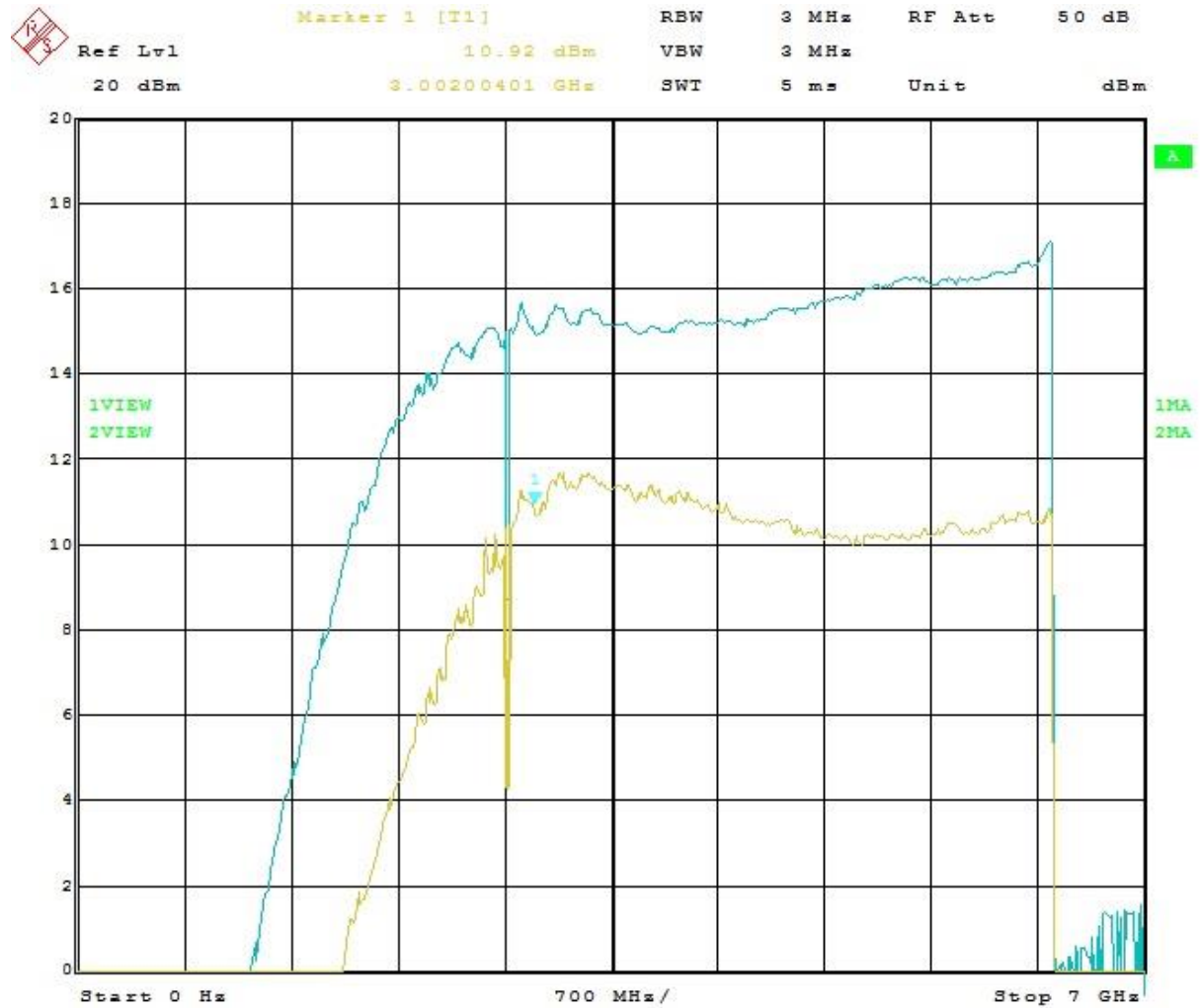
The gain is about 42...44dB in the frequency range 3..9.5 GHz. The noise figure between 3...8 GHz is between 0.7 and 1.3dB.

Here is a table of the measurement values from 1.5 GHz to 10 GHz (@Vs=15V).

Frequency	Gain	Nf	Temp
1500 MHz	27.95 dB	3.44 dB	350.4 K
1600 MHz	29.47 dB	3.08 dB	298.8 K
1700 MHz	31.50 dB	2.74 dB	255.2 K
1800 MHz	33.43 dB	2.49 dB	224.7 K
1900 MHz	34.03 dB	2.25 dB	196.3 K
2000 MHz	34.90 dB	2.03 dB	173.1 K
2100 MHz	36.44 dB	1.85 dB	154.3 K
2200 MHz	38.00 dB	1.77 dB	145.8 K
2300 MHz	38.45 dB	1.62 dB	131 K
2400 MHz	38.89 dB	1.54 dB	123.7 K
2500 MHz	39.32 dB	1.48 dB	117.7 K
2600 MHz	41.59 dB	1.39 dB	109.1 K
2700 MHz	41.98 dB	1.30 dB	101.1 K
2800 MHz	42.16 dB	1.22 dB	94.1 K
2900 MHz	43.35 dB	1.16 dB	88.8 K
3000 MHz	42.96 dB	1.12 dB	85 K
3100 MHz	44.35 dB	1.09 dB	82.9 K
3200 MHz	43.12 dB	1.06 dB	80.2 K
3300 MHz	43.81 dB	1.04 dB	78.7 K
3400 MHz	44.31 dB	0.98 dB	73.2 K
3500 MHz	43.73 dB	0.94 dB	70.4 K
3600 MHz	44.19 dB	0.89 dB	65.9 K
3700 MHz	45.05 dB	0.84 dB	61.8 K
3800 MHz	44.03 dB	0.83 dB	61.3 K
3900 MHz	44.57 dB	0.80 dB	58.6 K

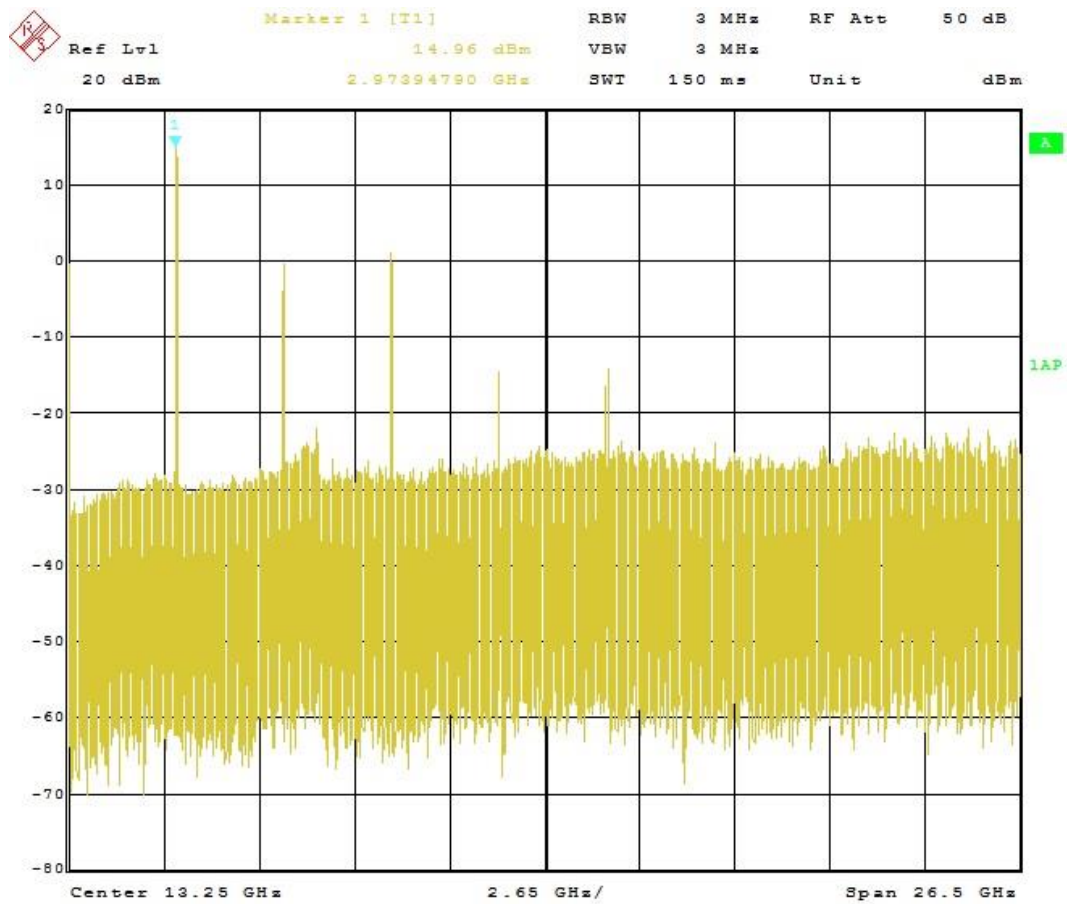
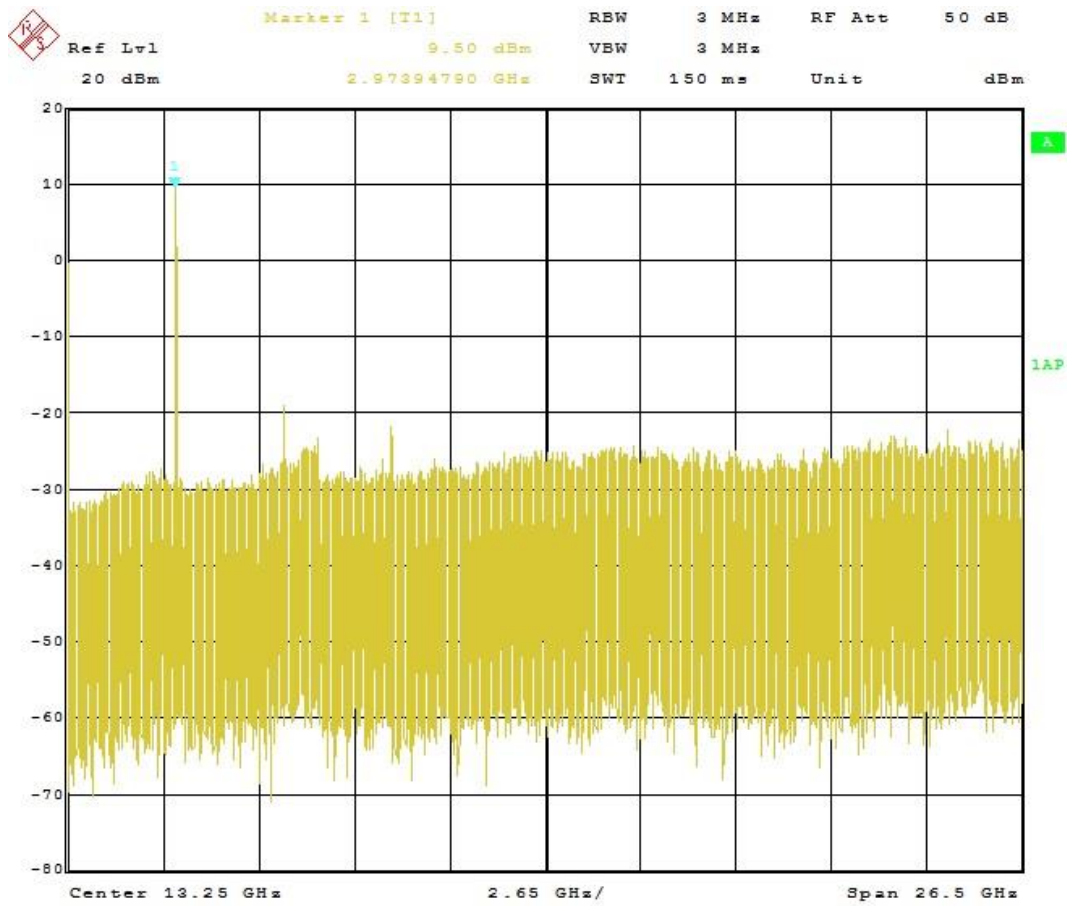
Frequency	Gain	Nf	Temp
4000 MHz	43.25 dB	0.77 dB	56.1 K
4100 MHz	43.68 dB	0.74 dB	54.3 K
4200 MHz	43.08 dB	0.73 dB	52.9 K
4300 MHz	43.65 dB	0.65 dB	47.1 K
4400 MHz	42.25 dB	0.67 dB	48.5 K
4500 MHz	42.80 dB	0.68 dB	49.3 K
4600 MHz	43.03 dB	0.70 dB	50.5 K
4700 MHz	41.74 dB	0.68 dB	48.8 K
4800 MHz	43.30 dB	0.68 dB	49.1 K
4900 MHz	42.80 dB	0.70 dB	51.1 K
5000 MHz	42.32 dB	0.70 dB	50.8 K
5100 MHz	42.95 dB	0.75 dB	54.4 K
5200 MHz	42.35 dB	0.76 dB	55.8 K
5300 MHz	42.77 dB	0.79 dB	57.5 K
5400 MHz	43.13 dB	0.85 dB	62.5 K
5500 MHz	42.72 dB	0.86 dB	63.9 K
5600 MHz	42.90 dB	0.88 dB	65.4 K
5700 MHz	42.34 dB	0.93 dB	69.3 K
5800 MHz	41.95 dB	0.96 dB	71.9 K
5900 MHz	43.66 dB	0.99 dB	73.9 K
6000 MHz	43.12 dB	1.02 dB	76.7 K
6100 MHz	43.26 dB	1.02 dB	76.9 K
6200 MHz	44.16 dB	1.06 dB	79.9 K
6300 MHz	42.41 dB	1.11 dB	84.9 K
6400 MHz	42.42 dB	1.10 dB	83.9 K
6500 MHz	43.35 dB	1.13 dB	86 K
6600 MHz	45.24 dB	1.14 dB	87 K
6700 MHz	44.09 dB	1.14 dB	87.3 K
6800 MHz	42.75 dB	1.12 dB	85.7 K
6900 MHz	44.07 dB	1.15 dB	88.3 K
7000 MHz	40.86 dB	1.16 dB	88.4 K
7100 MHz	43.05 dB	1.00 dB	75.2 K
7200 MHz	42.01 dB	1.16 dB	88.6 K
7300 MHz	44.59 dB	1.19 dB	91 K
7400 MHz	42.38 dB	1.15 dB	88.3 K
7500 MHz	41.94 dB	1.18 dB	90.5 K
7600 MHz	41.84 dB	1.19 dB	91.2 K
7700 MHz	42.09 dB	1.18 dB	90.7 K
7800 MHz	42.22 dB	1.23 dB	95 K
7900 MHz	42.48 dB	1.24 dB	95.5 K
8000 MHz	41.88 dB	1.29 dB	100.4 K
8100 MHz	43.12 dB	1.27 dB	98.7 K
8200 MHz	42.01 dB	1.31 dB	102.4 K
8300 MHz	43.01 dB	1.30 dB	101.2 K
8400 MHz	42.79 dB	1.32 dB	103.3 K
8500 MHz	42.51 dB	1.37 dB	107.6 K
8600 MHz	43.10 dB	1.38 dB	108.5 K
8700 MHz	42.82 dB	1.43 dB	113 K
8800 MHz	43.25 dB	1.44 dB	114.1 K
8900 MHz	43.96 dB	1.44 dB	113.9 K
9000 MHz	43.16 dB	1.50 dB	119.3 K
9100 MHz	43.38 dB	1.52 dB	121.2 K
9200 MHz	43.33 dB	1.55 dB	124.3 K
9300 MHz	42.31 dB	1.55 dB	124.7 K
9400 MHz	43.76 dB	1.60 dB	128.7 K
9500 MHz	42.48 dB	1.61 dB	129.8 K
9600 MHz	44.18 dB	1.62 dB	131.4 K
9700 MHz	41.86 dB	1.64 dB	132.6 K
9800 MHz	42.62 dB	1.64 dB	133 K
9900 MHz	40.39 dB	1.60 dB	128.9 K
10000 MHz	40.08 dB	1.63 dB	131.9 K

Next I measured the frequency response when applying higher input power. The next diagram shows the output power versus frequency when driving the amplifier with -30dBm (yellow curve) and -20dBm (blue curve).



At an input power of -30dBm the amplifier is still in the linear mode. The amplifier can deliver +16dBm when driving it in saturation. The 1dB compression point is approximately +13dBm as assumed based on the part number.

Here are the spectra of the amplifier when driving it with -30dBm and -20dBm (@ fin=3 GHz)



As to be expected the harmonics are increasing drastically when driving the amplifier in saturation.

Over all I derived the following parameters of the Miteq AMF5S-040080-12-13P amplifier based on my own measurements:

Vs=12...15V  
Is=130mA  
f=3...8Ghz  
Gp=42...44dB  
Nf=0.7...1.3dB  
P1dB ca. +13dBm  
Psat=16dBm

I am always grateful to get feedback and will be happy to answer questions.

Please direct them to the Email address which you will find below.

Best regards

Matthias DD1US

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