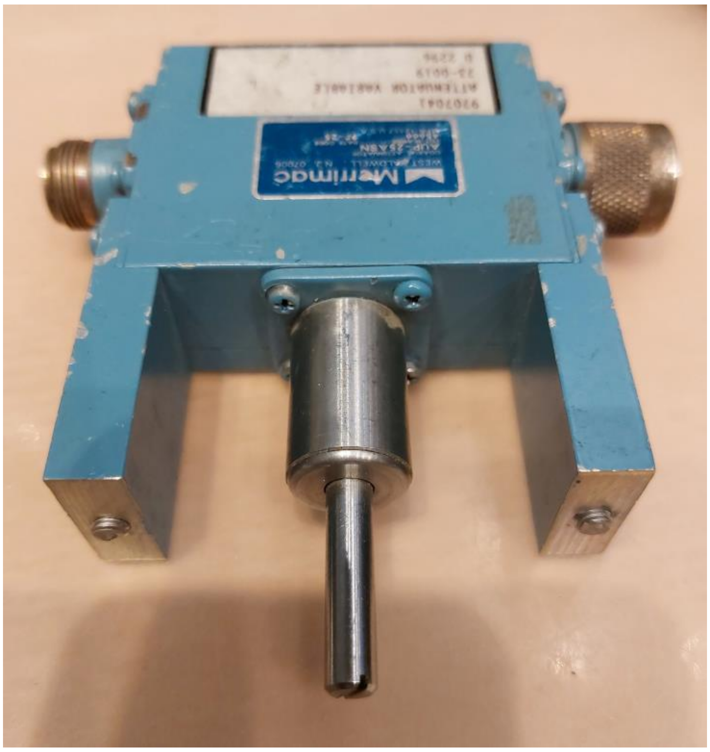
Characterization of variable attenuator Merrimac AUP-25ASN

Matthias, DD1US, May 8th 2026, rev 1.0

Continuous variable attenuators are very helpful when levelling for instance the drive power for an amplifier. Some time ago I acquired a Merrimac AUP-25ASN variable attenuator. It is a coaxial design with N-plug and N-jack at its input / output ports. The internal design is symmetrical and the attenuation is varied by mechanically moving a U-shaped lossy material closer or further away to a transmission line.

Here are two pictures of the device:

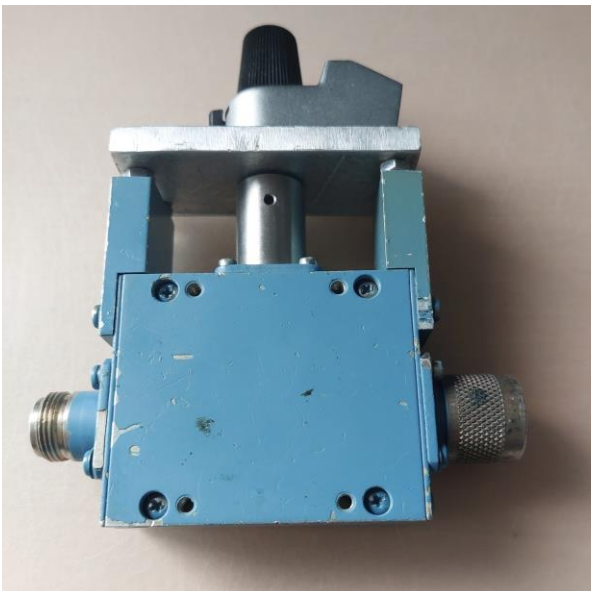


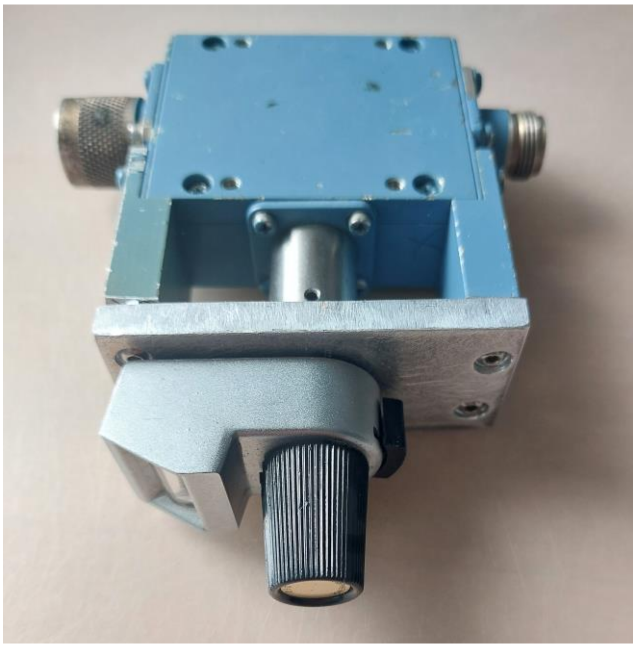
To increase the variable attenuation one turns the metal axis and this moves the attenuation material inside the attenuator laterally closer to the transmission line. The design is such that the characteristic impendance of the transmission line is changing very little while changing the attenuation.

Here is some data provided by Merrimac:

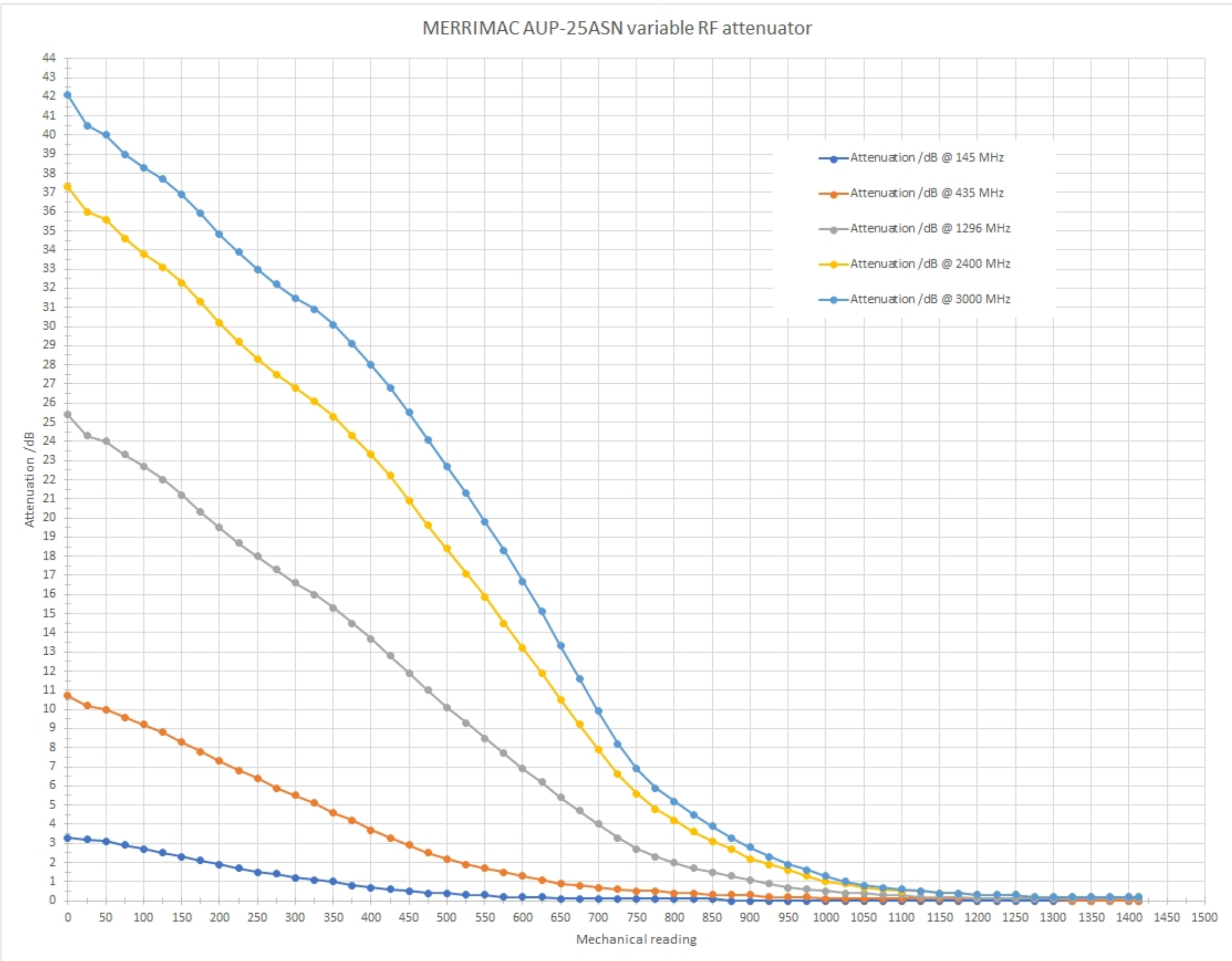
Characteristic impedance:	50 Ohm
Minimum Operating Frequency:	1 GHz
Maximum Operating Frequency:	10 GHz
Maximum Attenuation (1-2 GHz).	15 dB nom.
Maximum Attenuation (2-10 GHz):	30.0 dB nom.
Minimum Attenuation / Insertion Loss:	0.5 dB
Maximum input Power (CW):	36 dBm / 4 W
Maximum VSWR:	1:1.5
Minimum Operating Temperature:	-55 °C
Maximum Operating Temperature:	+85 °C

I added a counting dial in order to be able to measure attenuation as a function of the position of the axis.





I did measurements of the attenuation of the device as a function of the position of the tuning axis which translates to different positions of the attenuating material relative to the internal transmission line. Some backlash behaviour can be noted when adjusting to a certain position and thus all measurements were done approaching the position from the same side (from higher to lower attenuation i.e. increasing the counter).



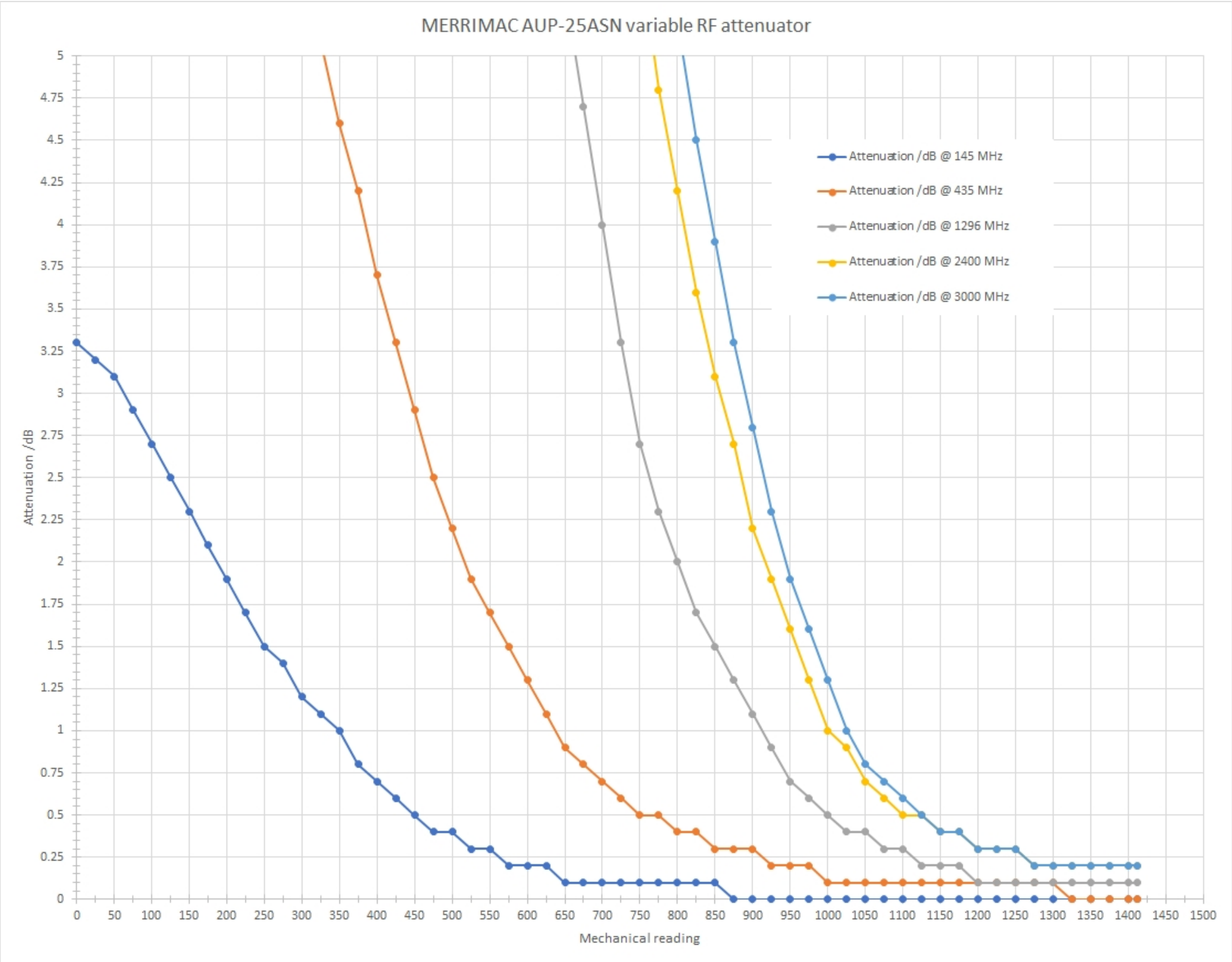
As can be seen the attenuation is highly frequency dependent and not linear to the position of the attenuation material. At low frequencies the change of attenuation is very low. Please note that the device is specified for the frequency range 1-10 GHz and but I also measured it at lower frequencies (in the 2m and 70 cm bands).

The minimum attenuation i.e. insertion loss is quite low. I measured the following values:

Frequency /MHz	Insertion Loss /dB
145	0.004
435	0.042
1296	0.070
2400	0.170
3000	0.150

During the measurements 2 high quality adapters from N to SMA were included which were not calibrated out. Thus the actual insertion loss at higher frequencies is even a bit lower than shown above.

Here is a zoomed out version of the diagram focusing on lower attenuation values.



I always happy receive feedback or answer questions. Please send them to the Email address, which you find below.

Best regards

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