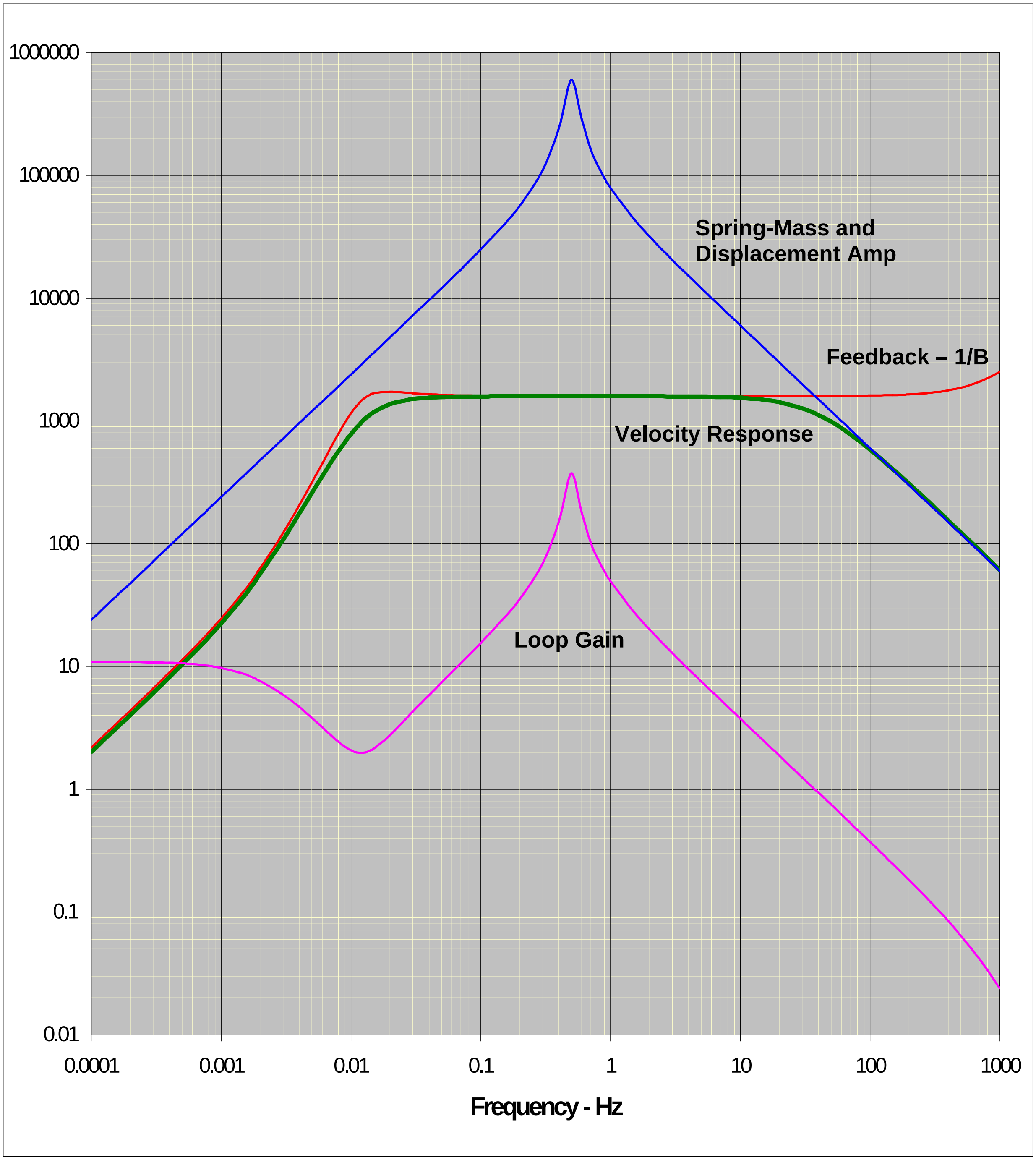
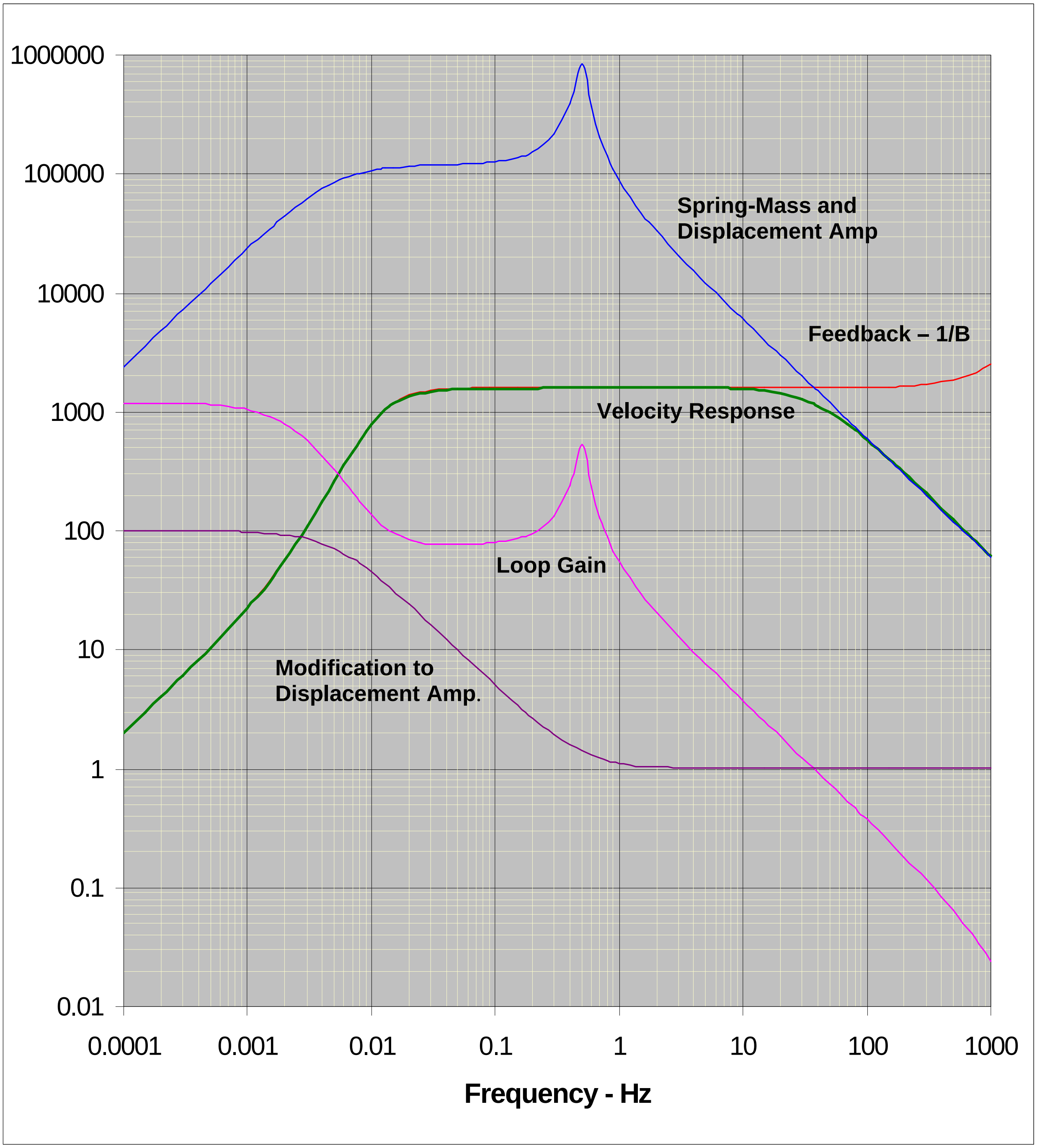


In the loop, with the assumed parameters, it is seen that the loop gain in the 0.01 Hz region gets as low as 2. Because of this, the system response in that region is affected by the spring-mass-amplifier characteristic. To compensate for the additional rounding off of the response function, the feedback path function, 1/B is slightly underdamped.



By increasing the Displacement Amp gain in the frequency region 0.005 – 0.5 Hz, the loop gain is maintained at a healthy level at all low frequencies. Now the low-end system velocity response closely tracks the feedback, and is truly independent of the spring-mass. To restore the original velocity response damping factor, I increased the damping in 1/B, by lowering R_p from 581 to 369 k.

I think this is what Weiland and Steim do in their 360 sec. Very Long Period instrument. I haven't looked at the 1986 article, but something like this would be essential for getting really long periods, and it should be desirable even in the 90sec. instrument.

The modified transfer function for the displacement amp that I tried in the model, plotted above, was $10 (s + \pi) / (s + \pi/100)$ This gives a gain of 1000 at very low frequencies, falling back to the original 10 at 0.5 Hz

I don't think this would add significant additional noise, because the gain could be added at a point where the signal is already at a pretty decent level. It might possibly even improve the noise/drift situation, depending on the source, though I doubt it. It *would* make it easier to analyze noise sources, as most of the good rules of thumb are accurate only where the loop gain is high.

Loop stability is not affected as the changes are all at frequencies well below 37 Hz.