Hi Jose,

Thanks for your reply, I have read it with a lot of interest. However, I did some experiments that still raise some new questions.

I decided to do my experiments on the ADS8881EVM-PDK this time. First, this this rules out the possibility that I made mistakes in the design, production and assembly of my test setup. Second, this makes it possible for you to reproduce my results on the exact same platform I'm using. This does make my setup slightly different compared to the setup I was using to get the results in my previous post. Two things change:

1. Instead of the ADS8885, an ADS8881 is used. In my final design I want to use the much cheaper ADS8885, which has (as far as I can tell from the datasheet) the same performance as the ADS8881 but has a maximum sampling rate of 400 kSPS. I therefore decided to run the ADS8881 at 400 kSPS using the setting in ADCPro. My first question is:

   Question 1: Can I indeed expect identical performance from a ADS8881 and a ADS8885 ADC both running at 400 kSPS?

2. The OPA320 is replaced by a THS4521 opamp as shown in figure 1:

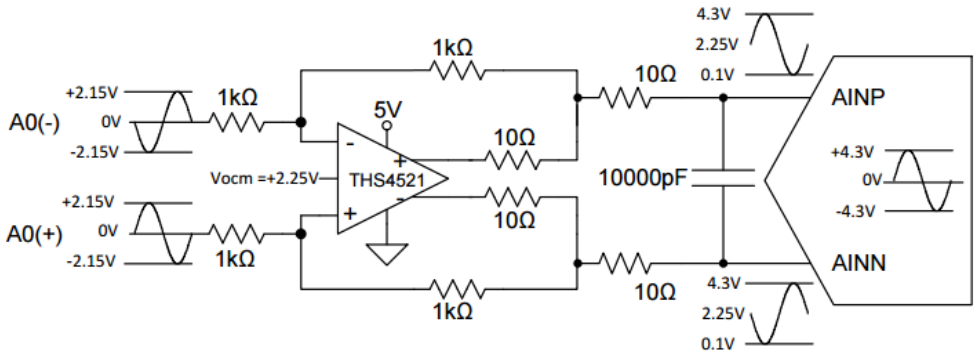
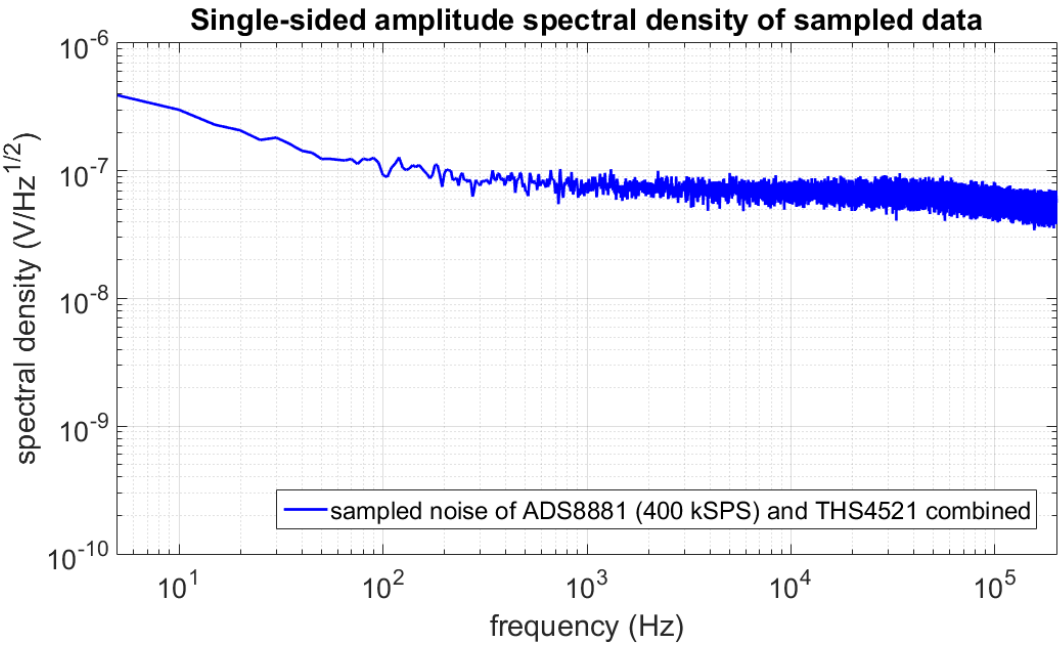
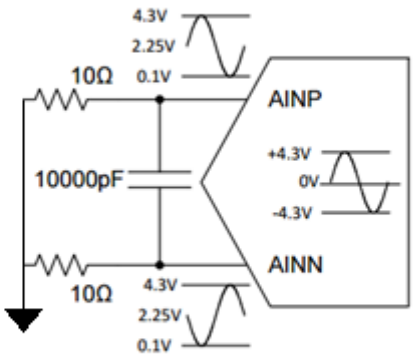


Figure 1. Differential Input Example

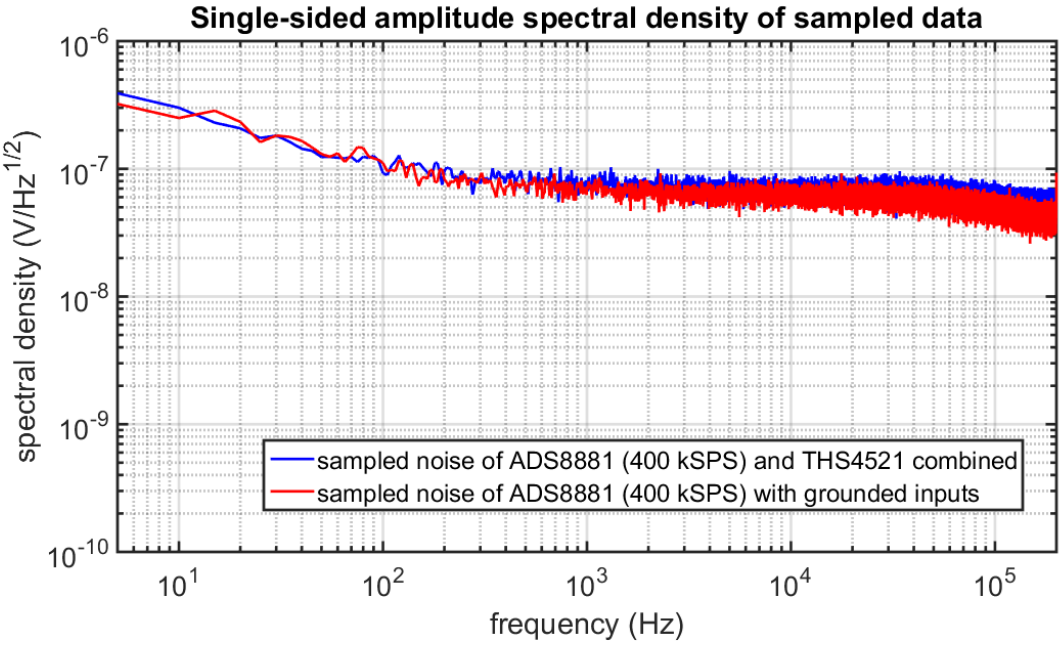
In my first measurement, I connect A0(-) to A0(+) to measure the noise of my setup. I used ADCpro (which btw is not very easy to get working under Windows 10 but I managed to) to take about a million samples at a speed of 400 kSPS with a SCLK of 80 MHz (default). The spectrum of the sampled data is shown in the next figure:



Although the 1/f noise is slightly less than in my 'own' test setup, the 1/f noise is clearly visible. According to your analysis, this noise originates from the pre-amplifier. To test this, I disconnected the preamplifier and connected the input of the ADC to ground as described in slau514.pdf and shown in the next figure:

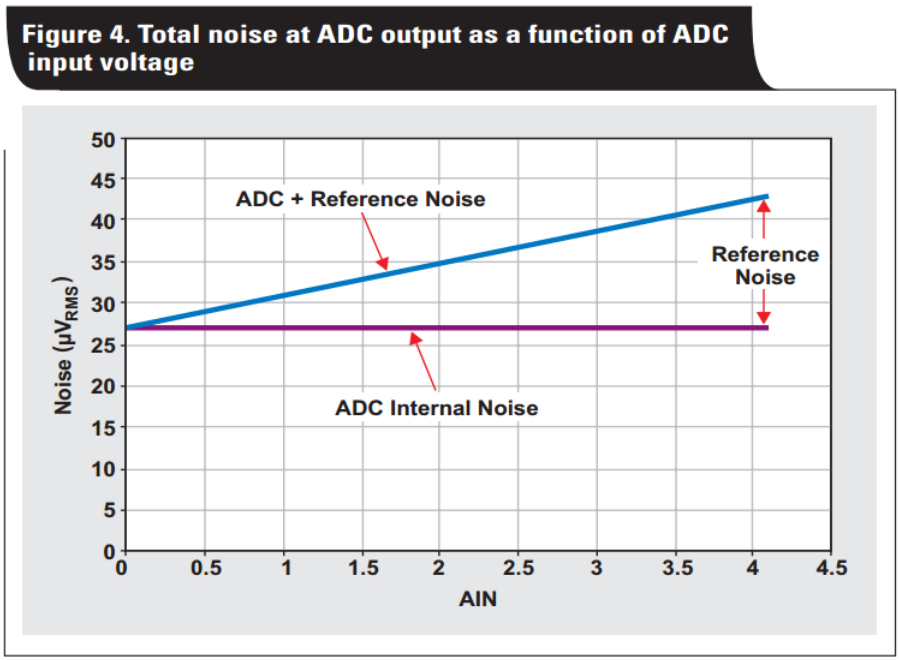


After this, I measured the noise again and plotted it in the same figure as the previous test (with Opamp connected to the ADC). The result is shown in the next figure



Although the overall noise is slightly lower than before, this measurement clearly shows that the 1/f noise does **not** originate from the THS4521.

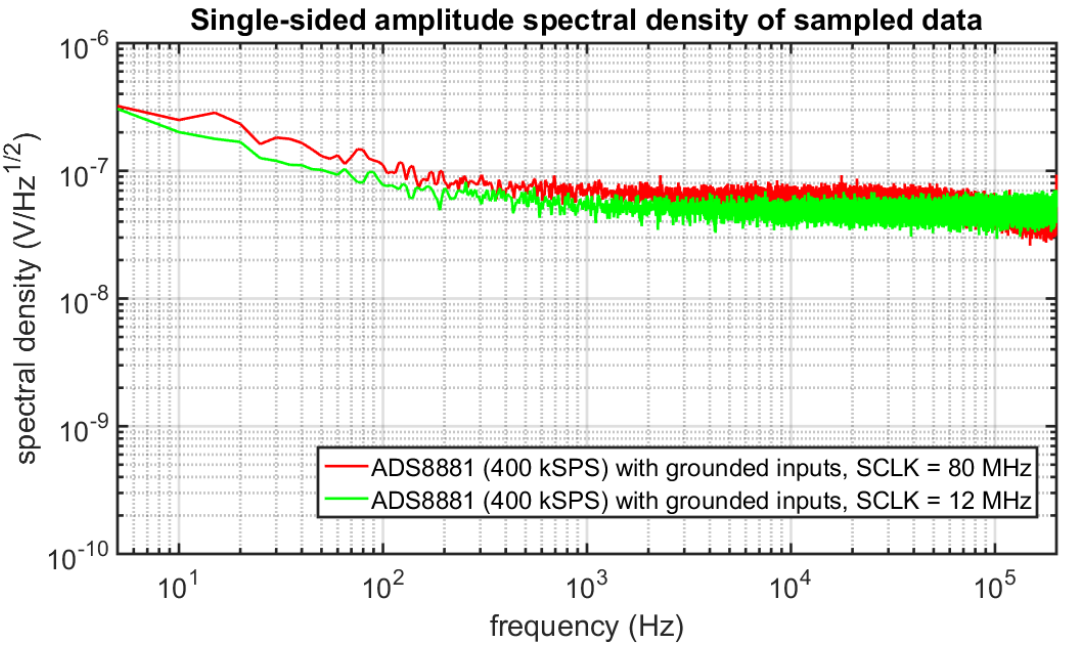
I thought about the reference being the 1/f noise source, but in the application note slyt339.pdf I found the following figure:



According to this figure, reference noise scales linearly with the input voltage, and since we measure a shorted grounded differential input, the reference noise in my measurement should be zero.

Question 2: Can you confirm that, when measuring with a shorted input, the reference noise is indeed zero?

In the next measurement I did, I lowered the serial clock speed used to clock out the ADC in ADCPro from 80 MHz to 12 MHz. The results are shown in the next figure:



As shown in this figure, lowering the SCLK to 12 MHz clearly improves both 1/f and broadband noise performance. This surprises me, because during a conversion, the serial clock is not active. And therefore I raise my next question:

Question 3: How can the effect of the serial clock speed on the noise performance of the ADC be explained?

Although lowering the SCLK speed brings improvement, this is unfortunately not enough to achieve my requirements. It is tempting to lower the SCLK even more, but then I have not enough time to clock out my data between two conversions anymore when sampling at 400 kSPS.

To summarize my reply, I believe that my original question still stands:

Question 4: Where does the 1/f noise originate from when measuring with the ADS8881 with grounded inputs and how do I get rid of it?

Can you please help me solve this? Thank you very much in advance.

Best regards,

Nick Robertson