IEPE Vibration Sensor Interface for PLC Analog Input Reference Design TIDA-01471

Summary

1. ADC output changes with increasing frequency

The digital output values are first increasing and then decreasing with increasing frequency. A signal generator is used to produce a sweep from e.g. 100 Hz to 8 kHz with constant amplitude to demonstrate this behavior. The output is 10-20 times bigger on lower frequencies (1 Hz to 1 kHz) than on higher frequencies like 8 kHz.

2. Full scale output of the ADC is not achievable

We tested all possible settings and are not able to get the ADC to full scale output. The maximum digital value is around +-1.000.000 (with J7 and J9 set) and should be 8.388.607 to -8388608 according to the ADS127L01 data sheet. Setting J9 and J7 causes a bad output at the differential amplifier/ ADC input, but a higher output range on ADC. Without J9 set the output gets a positive offset and has a much smaller magnitude.

Board Setup:

| Pin	setup
J3	set to use J2 instead of shift register
J5	attenuation set to 1:2
J7	set
J9	not set
J4	not set
J8	not set
J2	gain set to 4 OSR set to 31.5 kSPS

1. ADC output changes with increasing frequency

The digital output values are first increasing and then decreasing with increasing frequency. A signal generator is used to produce a sweep from e.g. 100 Hz to 8 kHz with constant amplitude to demonstrate this behavior. The following picture shows the sweep signal measured on ADC input:
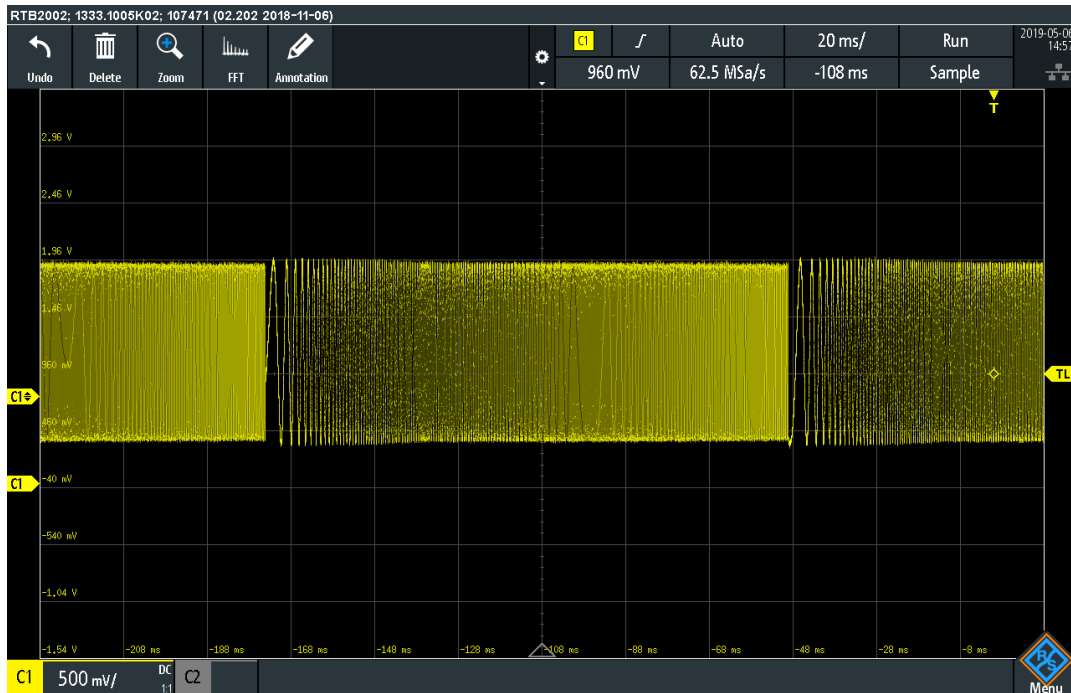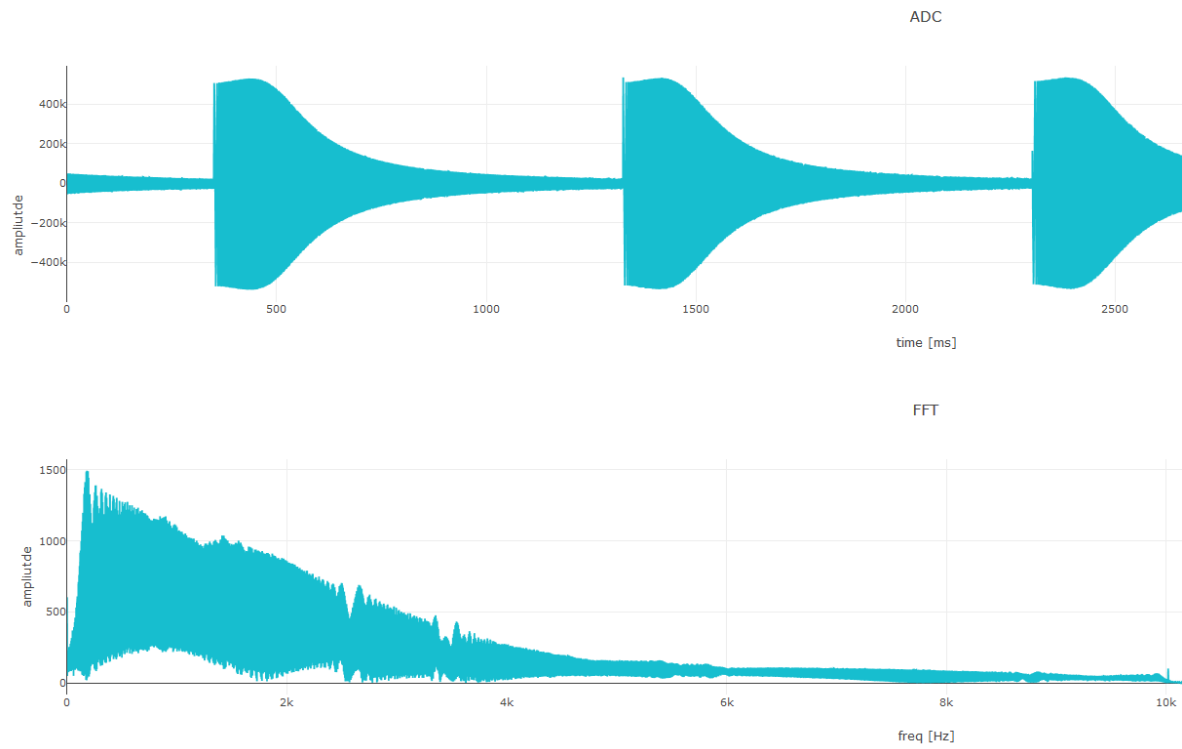

Picture 1: ADC input signal (100Hz-8kHz sweep)

And the output of the ADC:
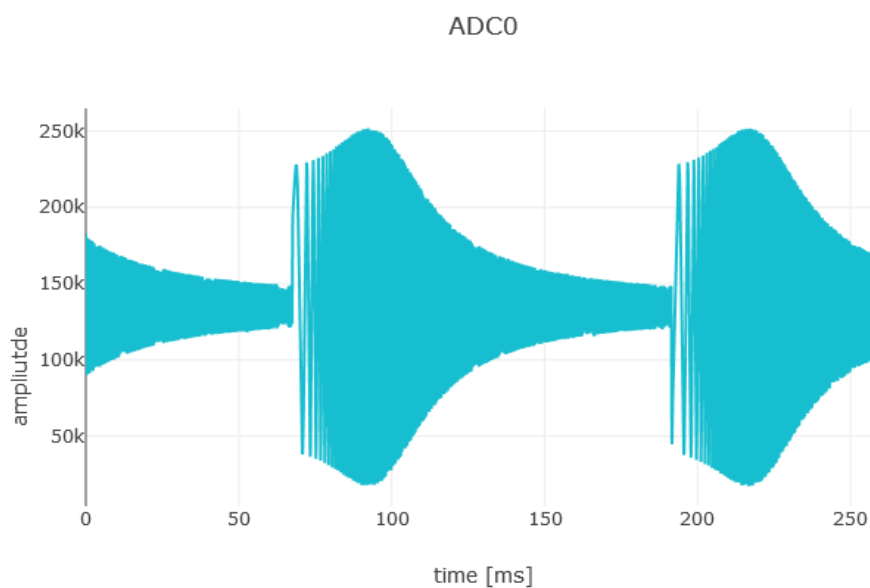

Picture 2: ADC output (100Hz-8kHz sweep)

The FFT also shows the decreasing amplitude (with sweep from 10Hz to 20 kHz).

ADC

FFT

Picture 3: Sweep and FFT

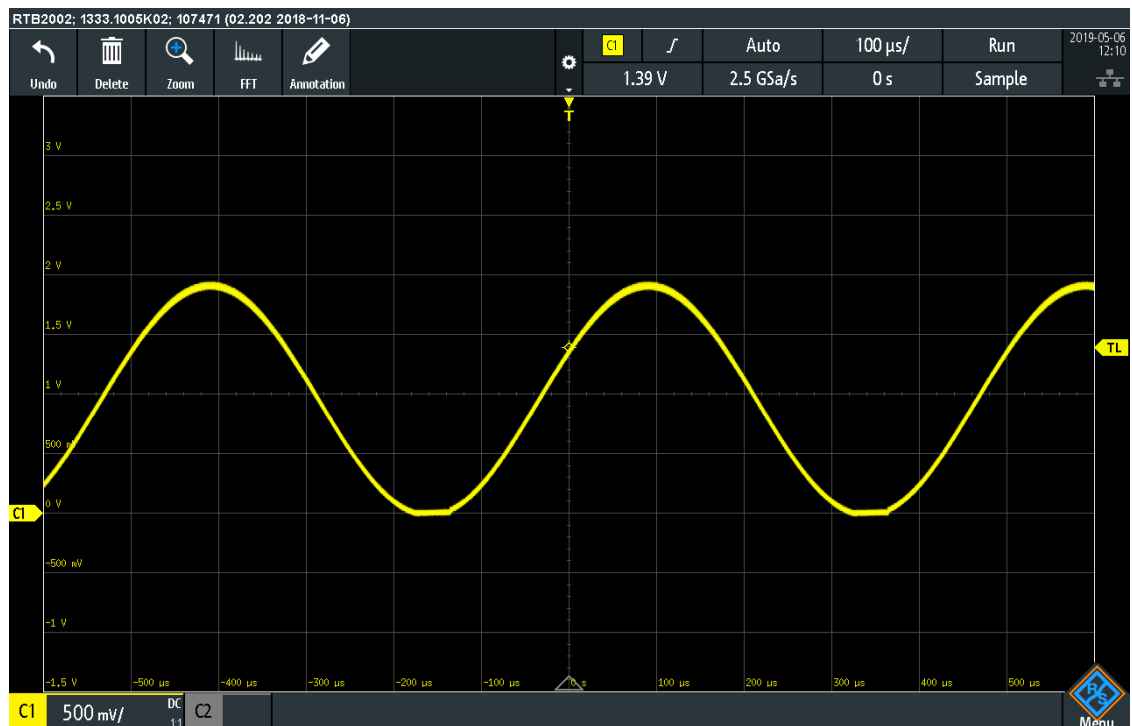## 2. No full scale and influence of J9

Another point is the setting of J9. Here we used a sine wave with 2KHz. The following pictures are showing the input signals at TP10, TP9, with and without J9 set at TP5 and TP6. The other settings are described in the table above.
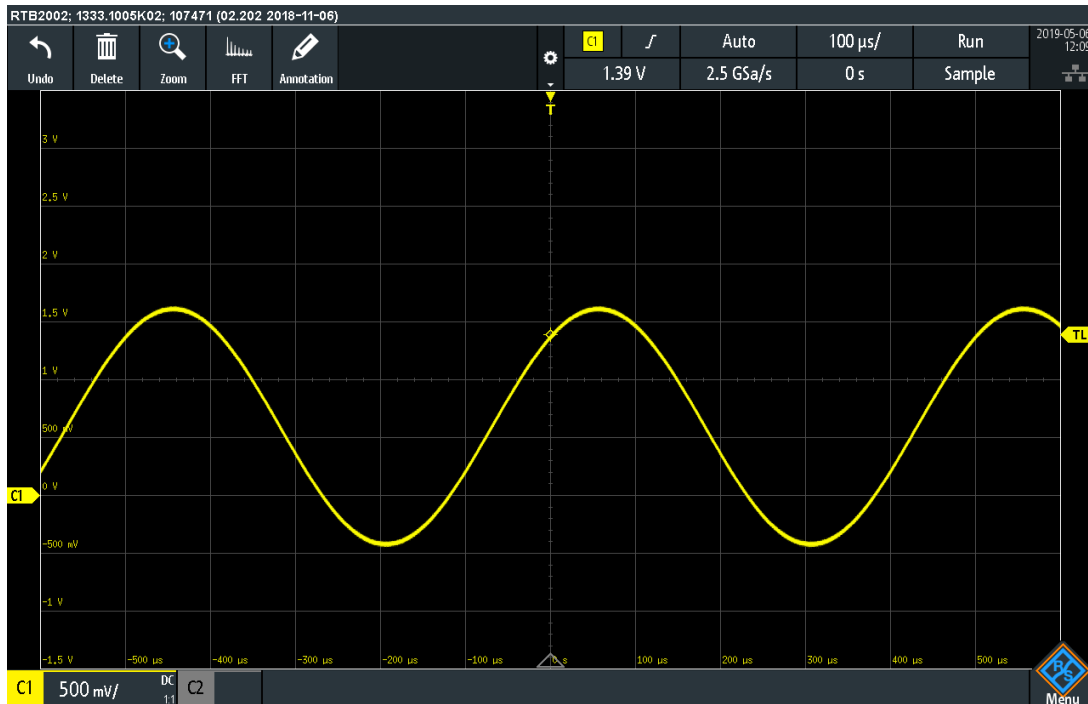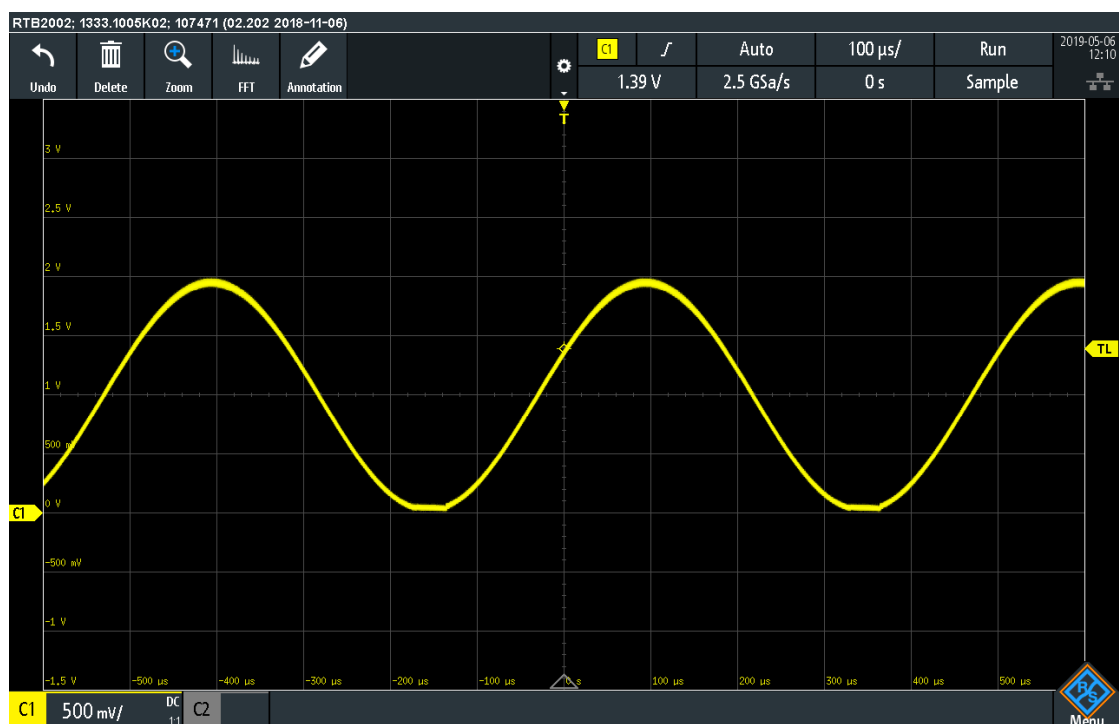

Picture 4: Input at TP10
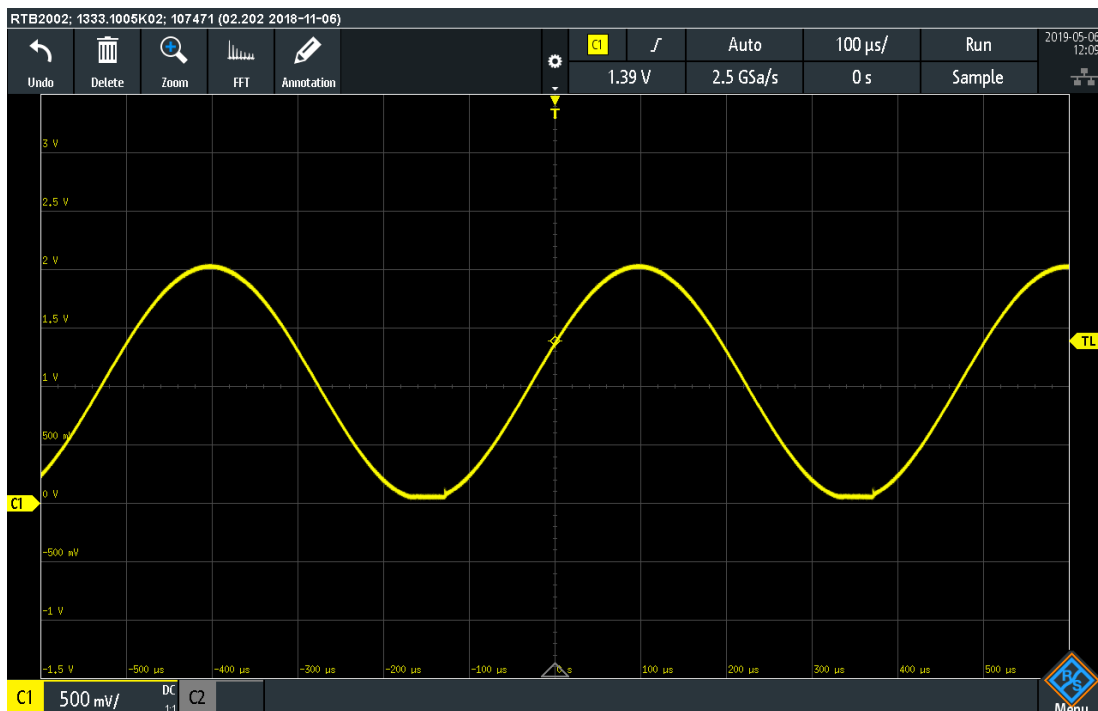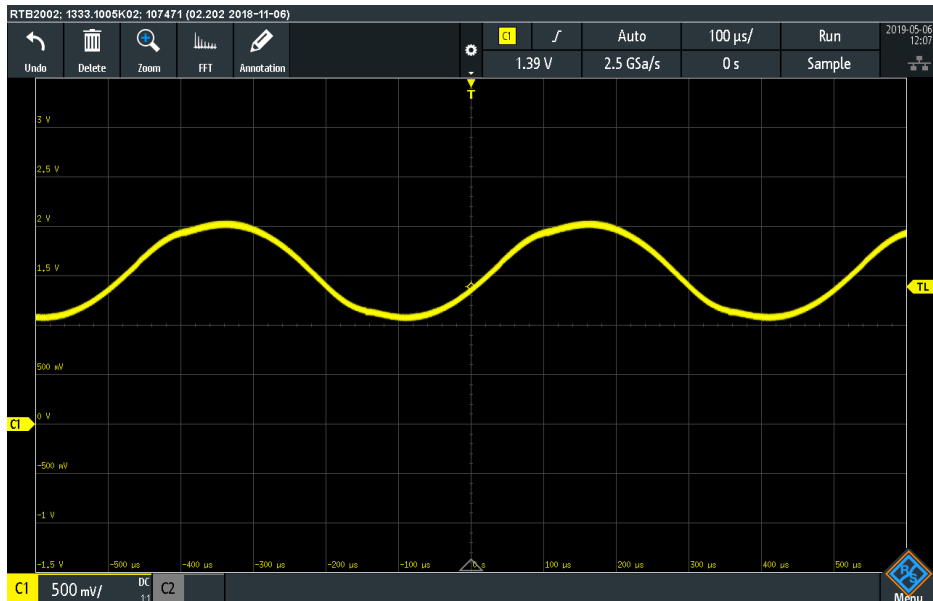

Picture 5: Input at TP9
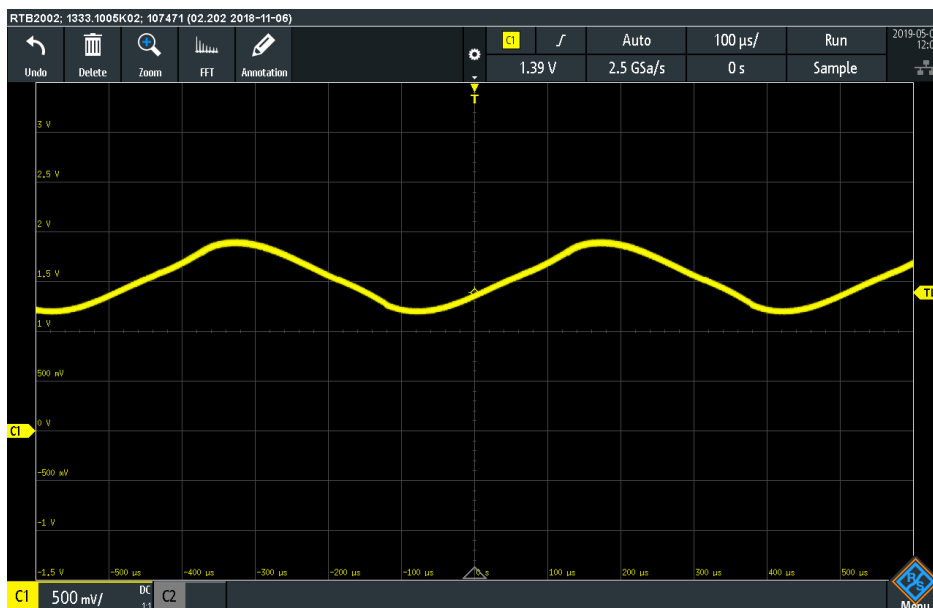
Picture 6: Input at TP5 without J9

Picture 7: Input at TP6 without J9

And if J9 is set the signal on ADC input looks not very nice:

Picture 8: TP5 with J9 set

Picture 9: TP6 with J9 set

Without J9 set the output of the ADC has some positive offset and has a much smaller magnitude.