

# Noise investigation on Tama-sized sapphire sample, sitting on aluminum blocks

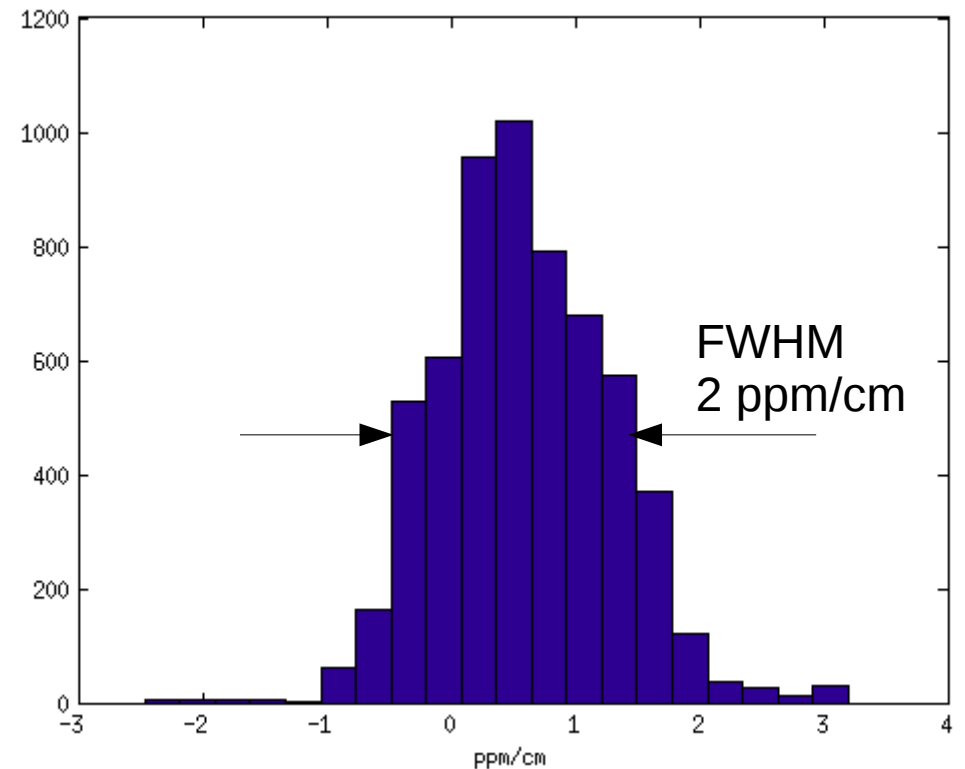
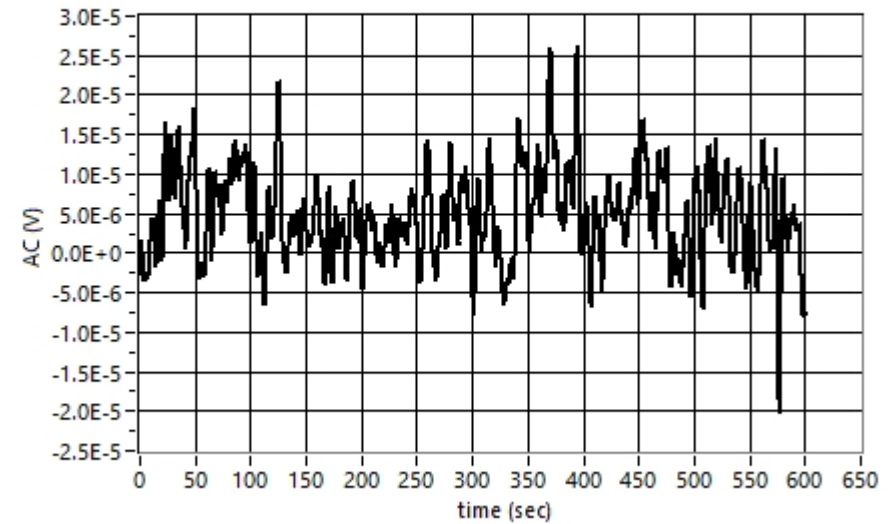
2016年4月26日

Tuesday, April 26, 2016

apr26\_1.txt

**First of all, I check the noise level WITHOUT the sample**

- Probe ON
- DC = -5.9V
- Pump OFF
- NO sample
- Sampling time: 100ms
- Filtering:
  - Median: 30 samples
  - Average: 30 samples
  - Phase expected -115
- Time 600s

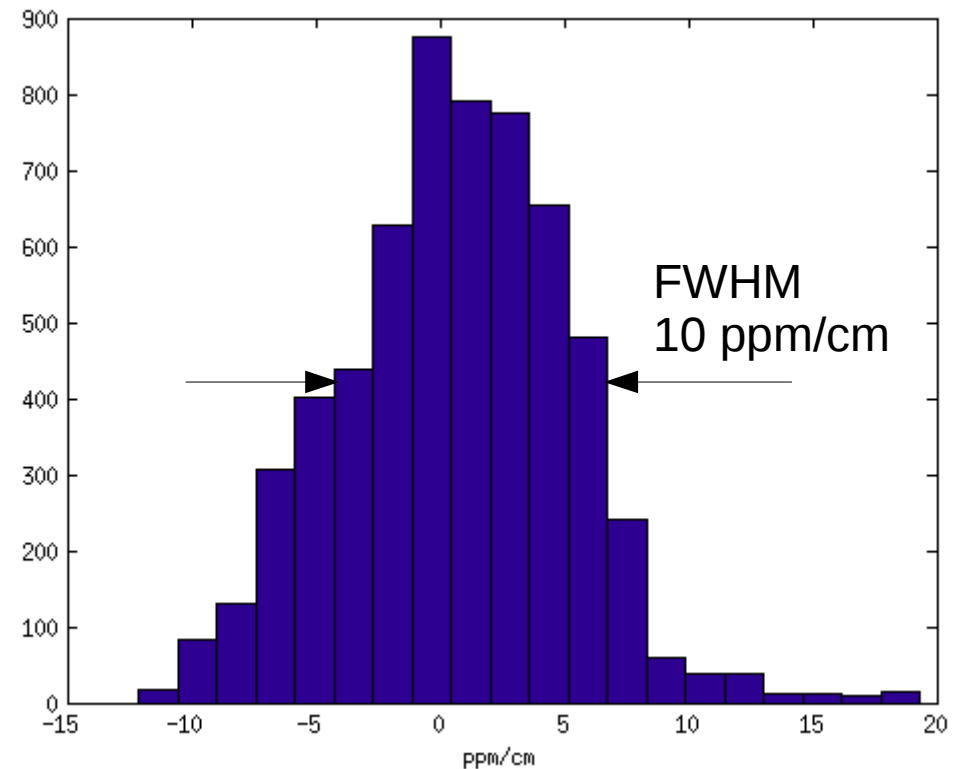
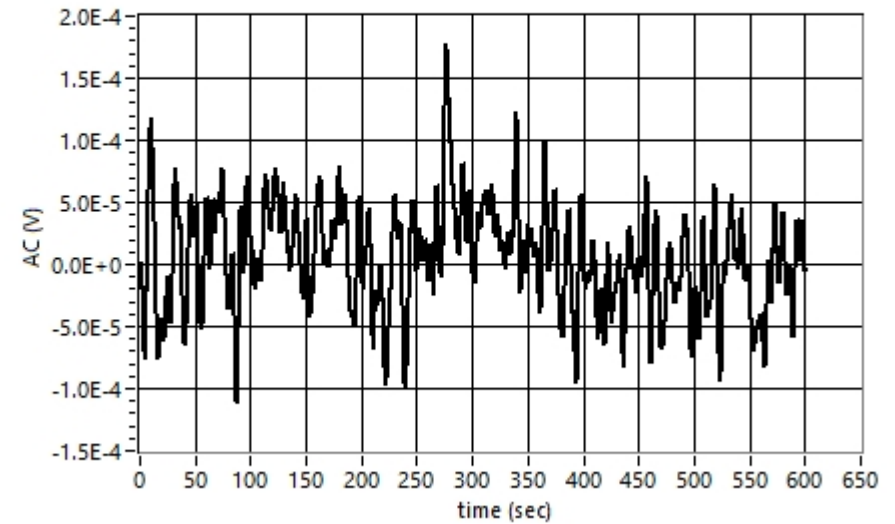


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apr26\_2.txt

## noise level WITH the sample

- Probe ON
- DC = -6.6V
- Pump OFF
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 30 samples
  - Average: 30 samples
  - Phase expected -115
- Time 600s

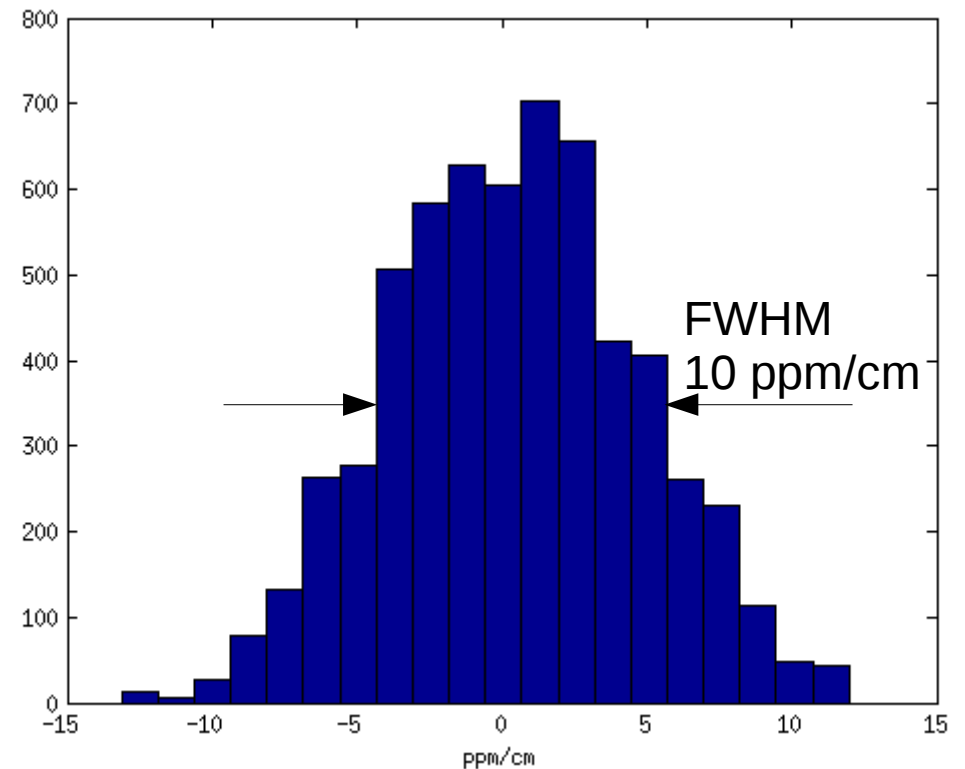
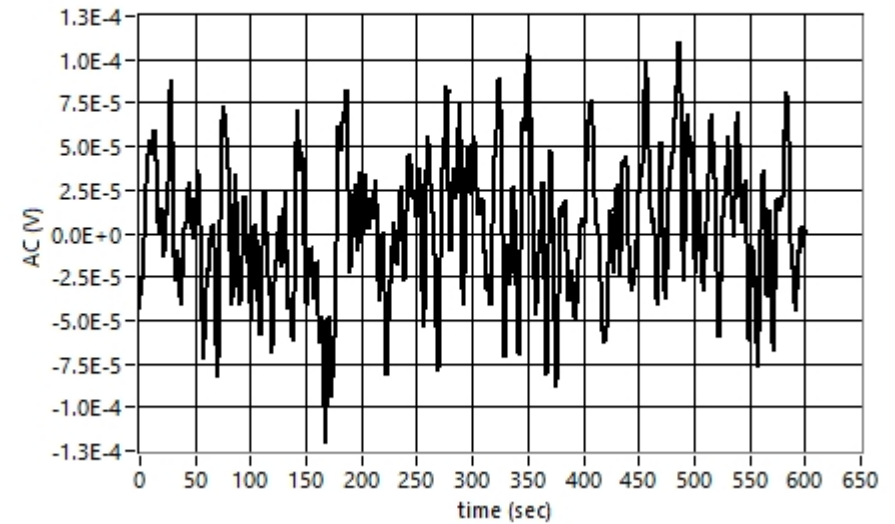


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apr26\_3.txt

## Turned OFF the fan of the air recirculation

- Probe ON
- DC = -6.6V
- Pump OFF
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 30 samples
  - Average: 30 samples
  - Phase expected -115
- Time 600s

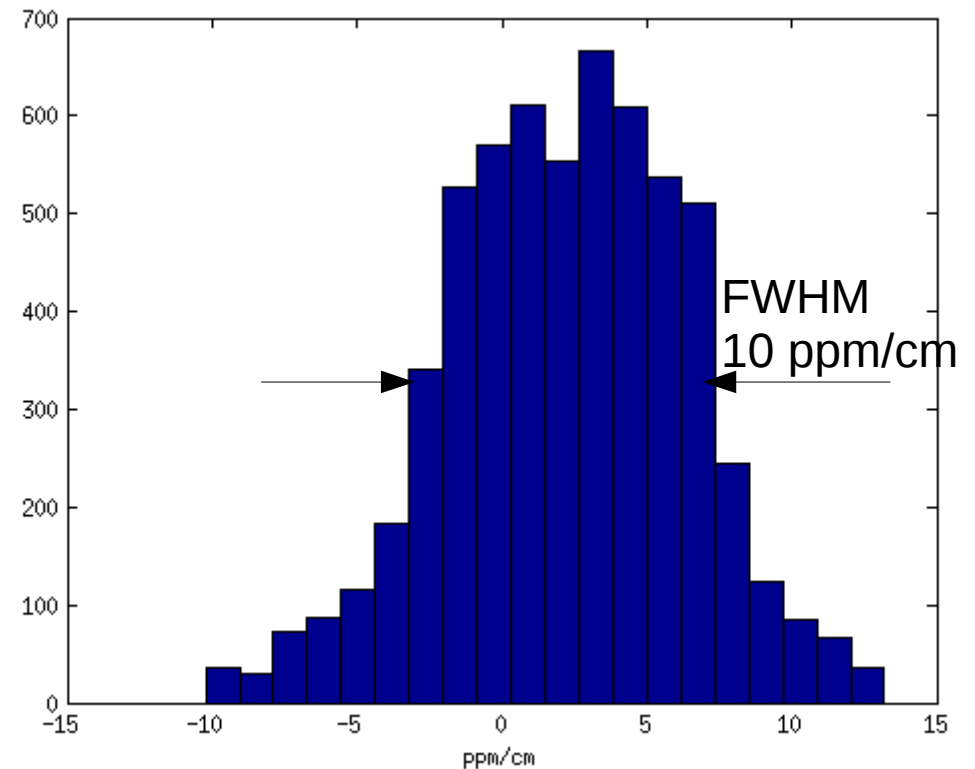
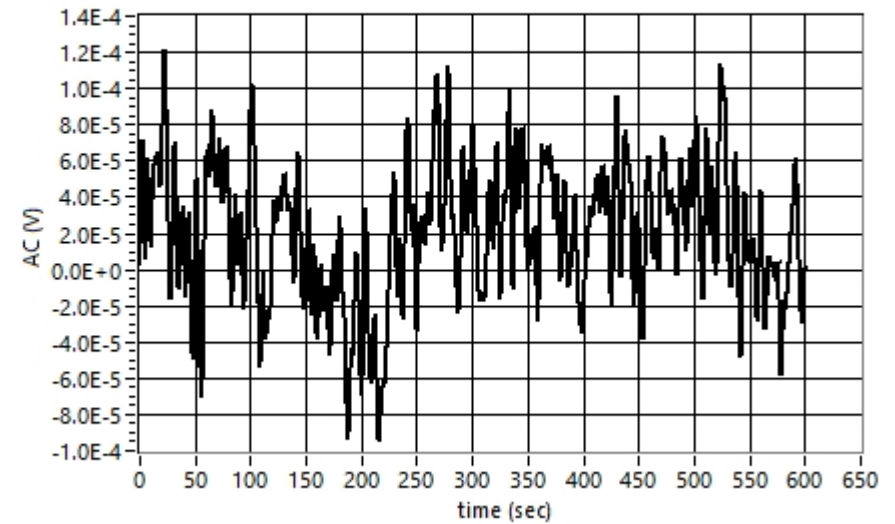


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apr26\_4.txt

**Covered the box with the green plastic panel to filter external light**

- Probe ON
- DC = -6.6V
- Pump OFF
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 30 samples
  - Average: 30 samples
  - Phase expected -115
- Time 600s

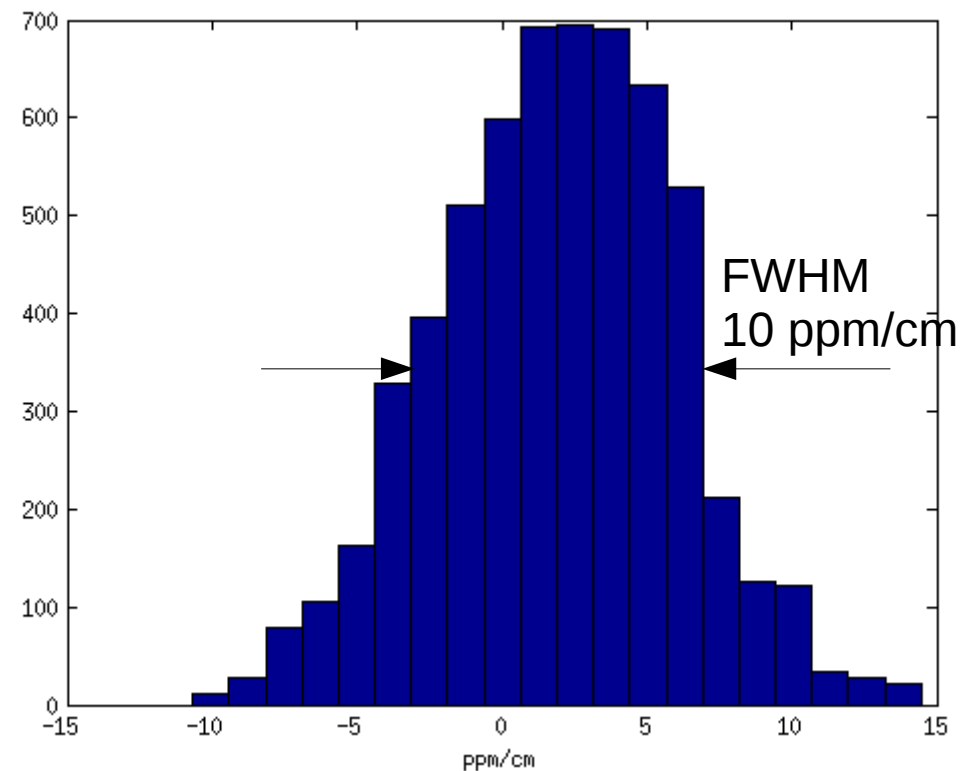
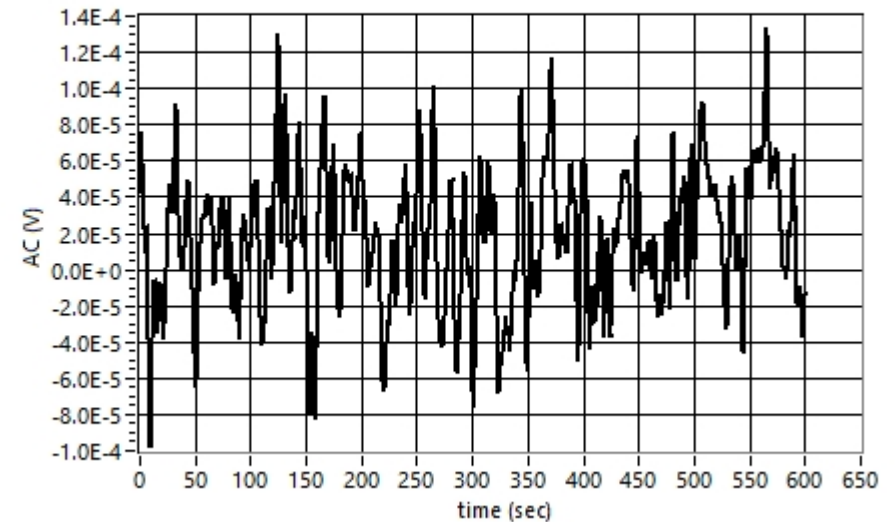


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apr26\_5.txt

## Switch OFF the lights (neon)

- Probe ON
- DC = -6.6V
- Pump OFF
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 30 samples
  - Average: 30 samples
  - Phase expected -115
- Time 600s

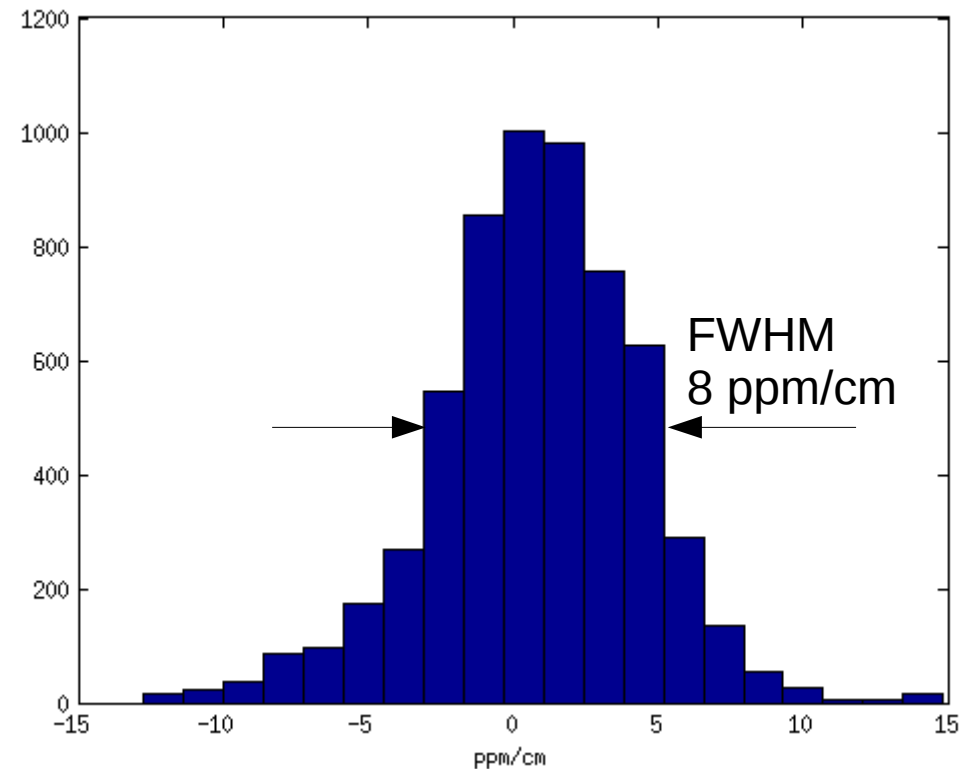
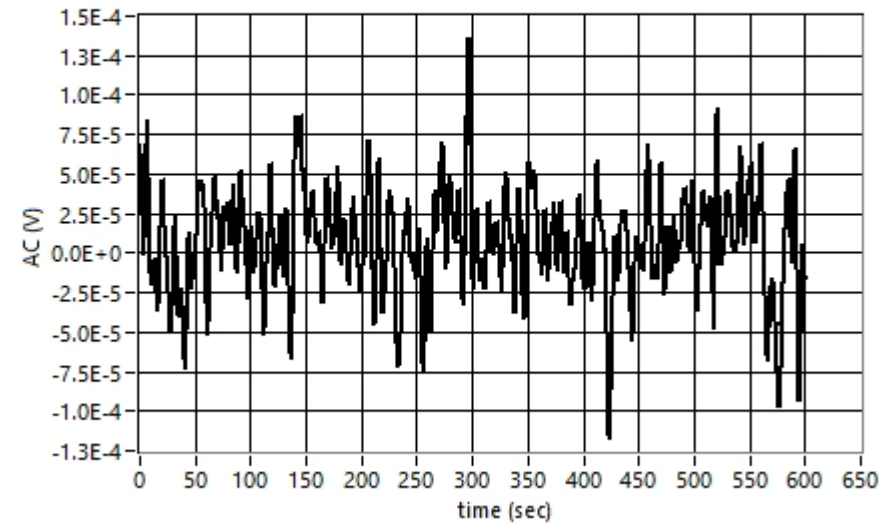


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apr26\_7.txt

**Unscrew the chopper from the optical table and put it on the rubber sheet, without fixing it**

- Probe ON
- DC = -6.6V
- Pump OFF
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 30 samples
  - Average: 30 samples
  - Phase expected -115
- Time 600s



# Results:

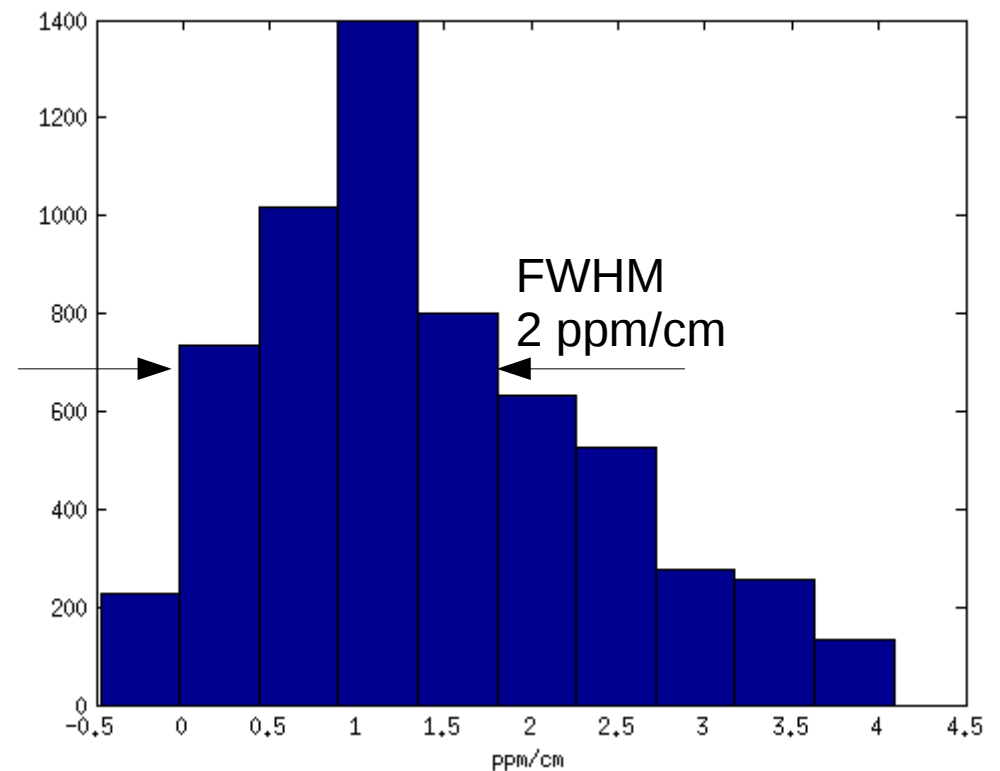
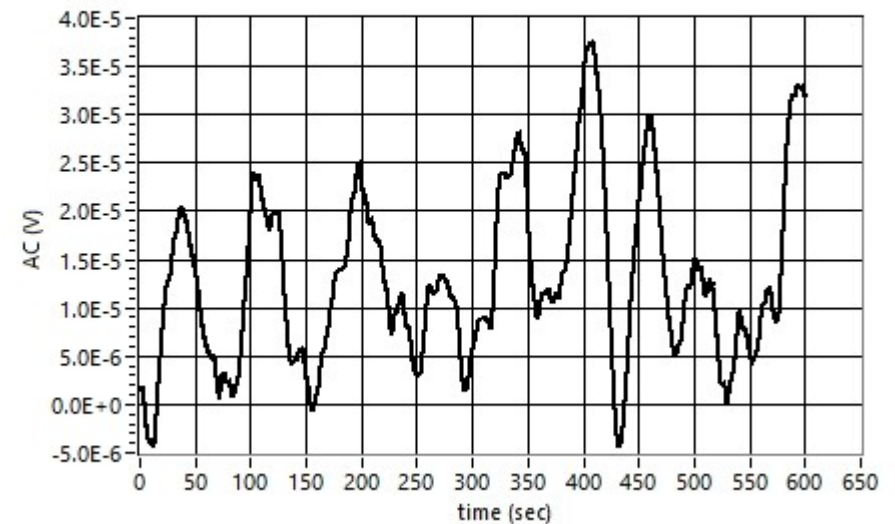
## Without Pump

- The presence of the sample increase the noise level from 2 ppm/cm to 10 ppm/cm
- Air recirculation fans don't contribute significantly to the noise
- External lights don't contribute significantly to the noise
- The rubber under he chopper reduce the noise level from 10 ppm/cm to 8 ppm/cm



## Increase the filter median and average window

- Probe ON
- DC = -6.6V
- Pump OFF
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 100 samples
  - Average: 300 samples
  - Phase expected -115
- Time 600s



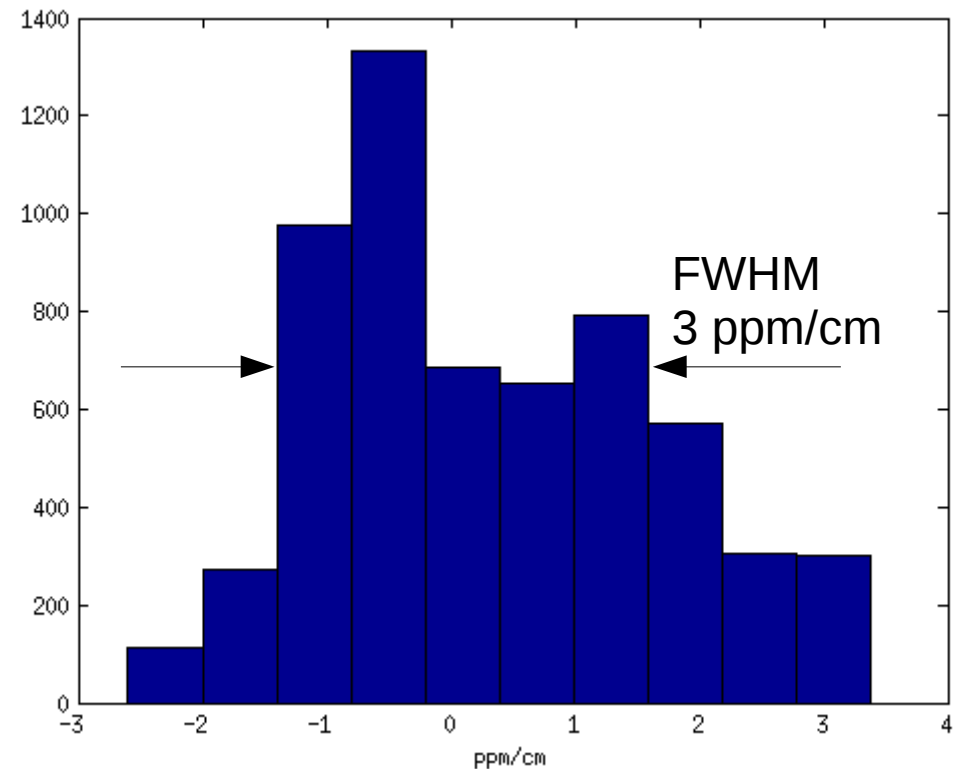
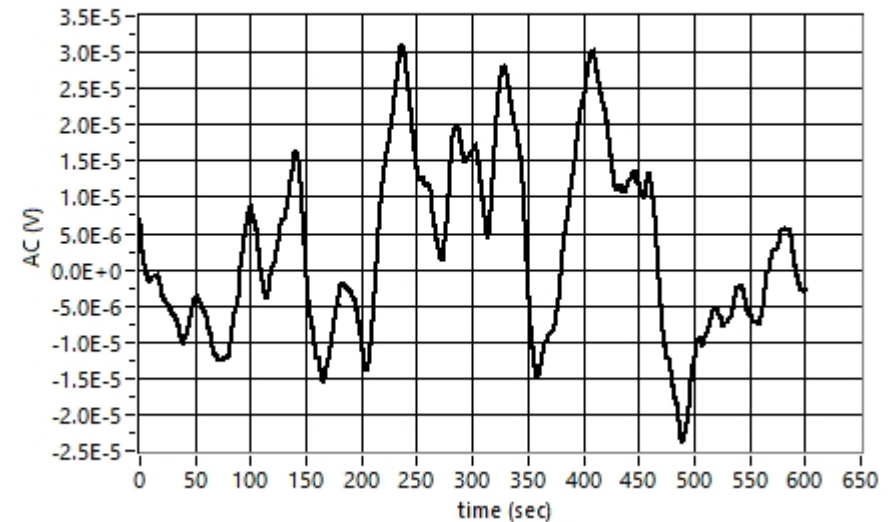
The noise level improved,  
But, for better accuracy,  
larger acquisition time is needed

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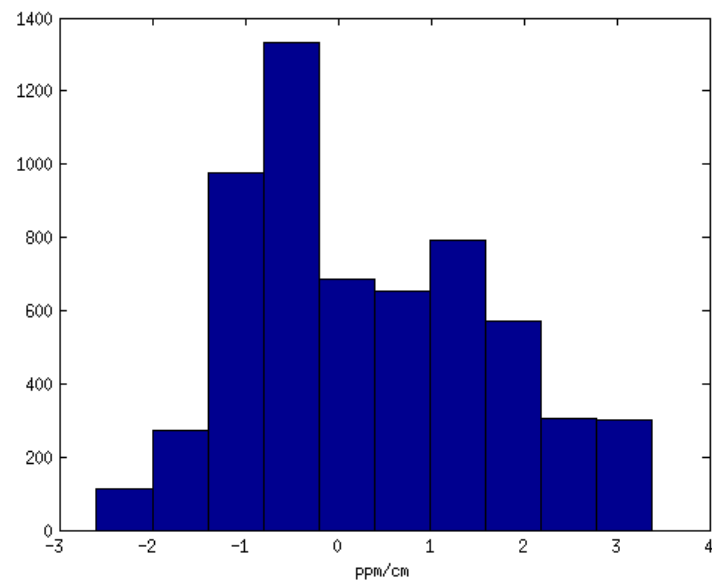
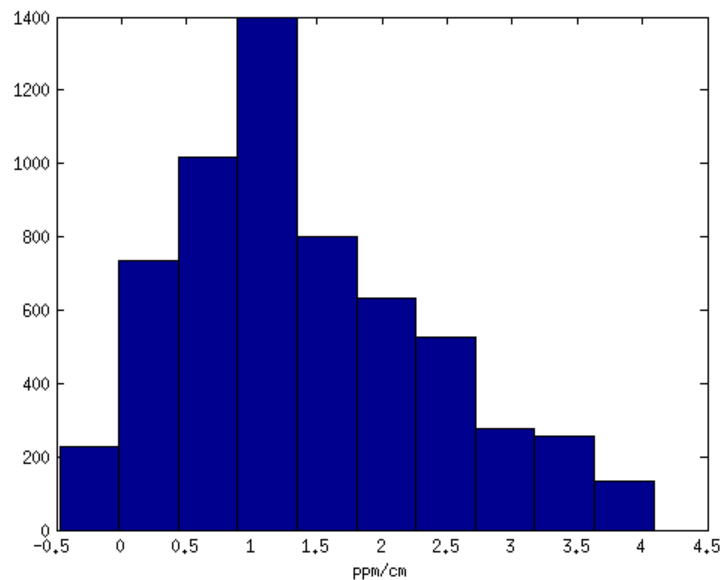
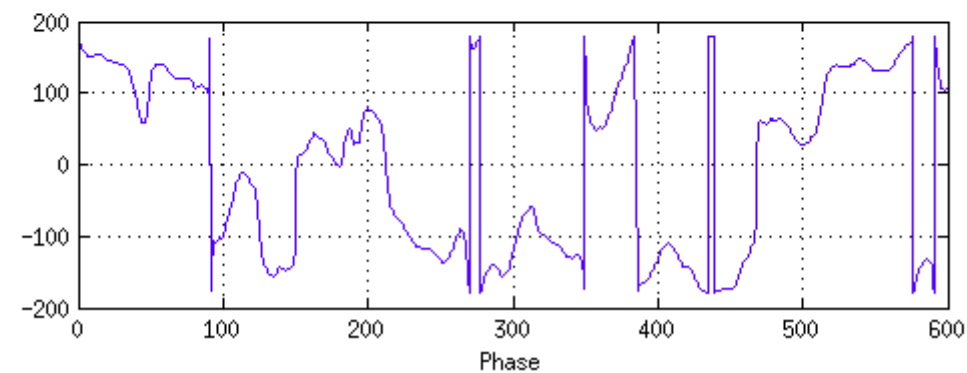
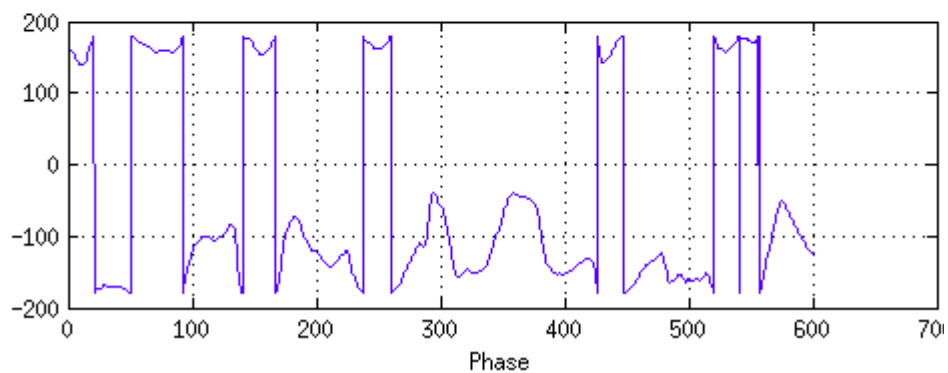
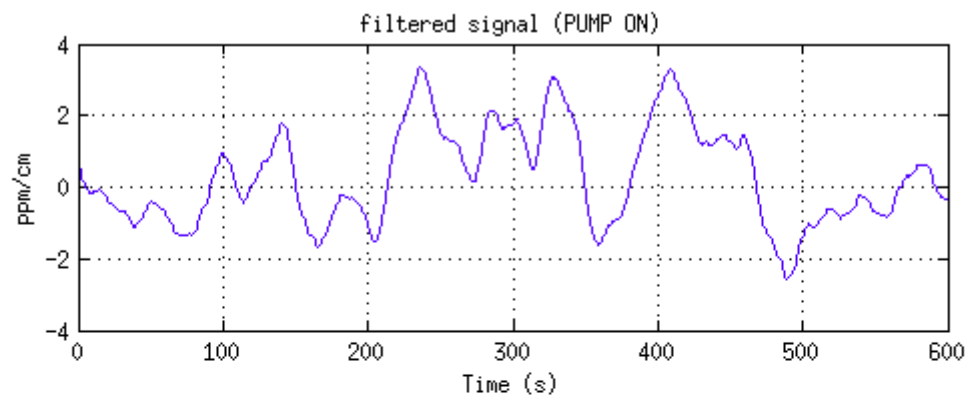
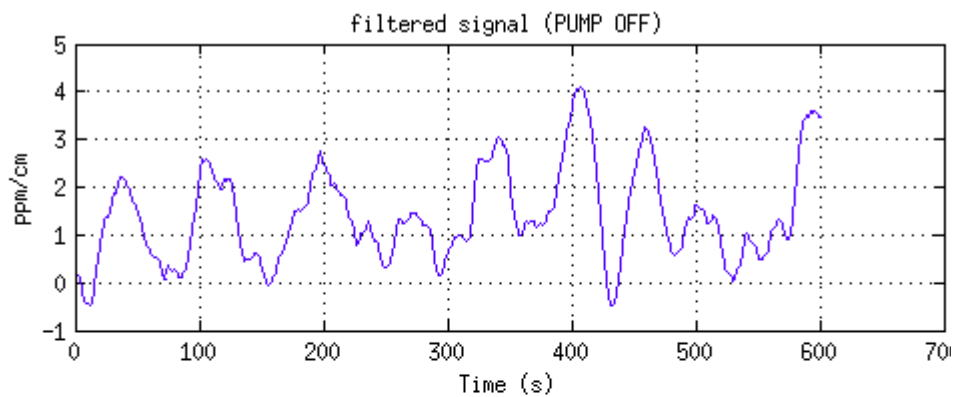
apr26\_9.txt

## Switch ON the PUMP

- Probe ON
- DC = -6.6V
- Pump ON **9.3W**
- Sample present
- Sampling time: 100ms
- Filtering:
  - Median: 100 samples
  - Average: 300 samples
  - Phase expected -115
- Time 600s



10 min is too short acquisition time



**There is not a clear absorption signal**

# Summary

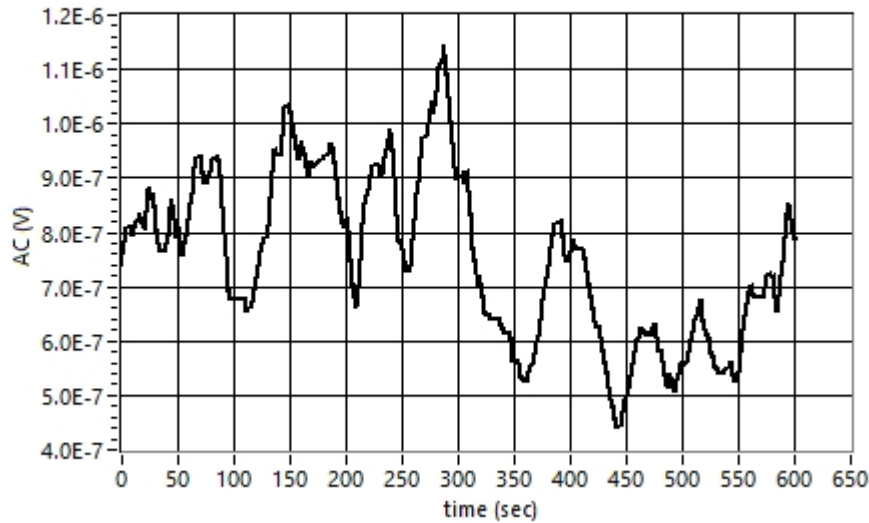
- With long time average filter I should increase the acquisition time.
- I was not able to repeat the measurement I did last week (5.5 ppm/cm)
  - Possible reason: Repositioning accuracy of the sample is not better than some mm

# Additional check: Noise from the photodetector

Probe OFF , Pump OFF

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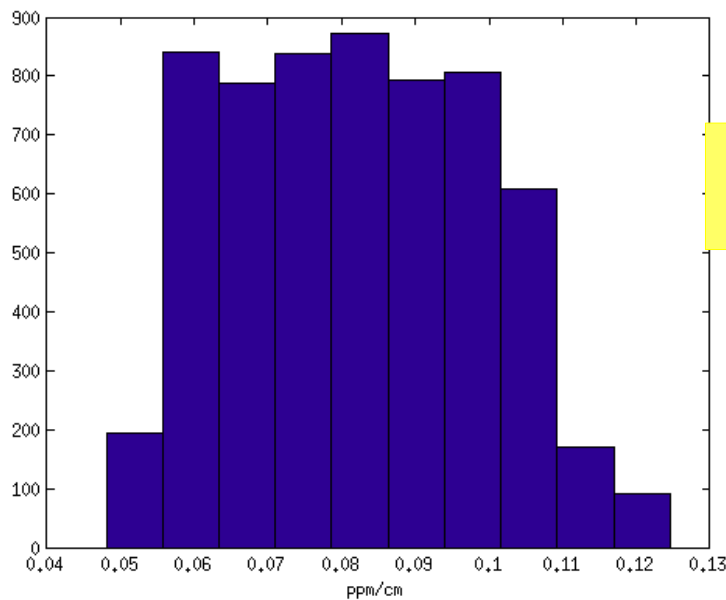
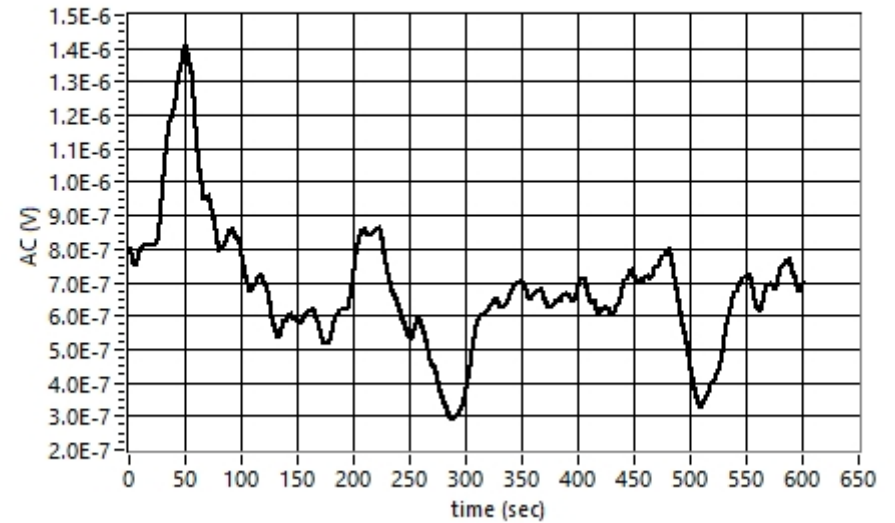
apr26\_11.txt



Probe OFF , Pump ON

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apr26\_12.txt



Noise from detector:  
0.1 ppm/cm

