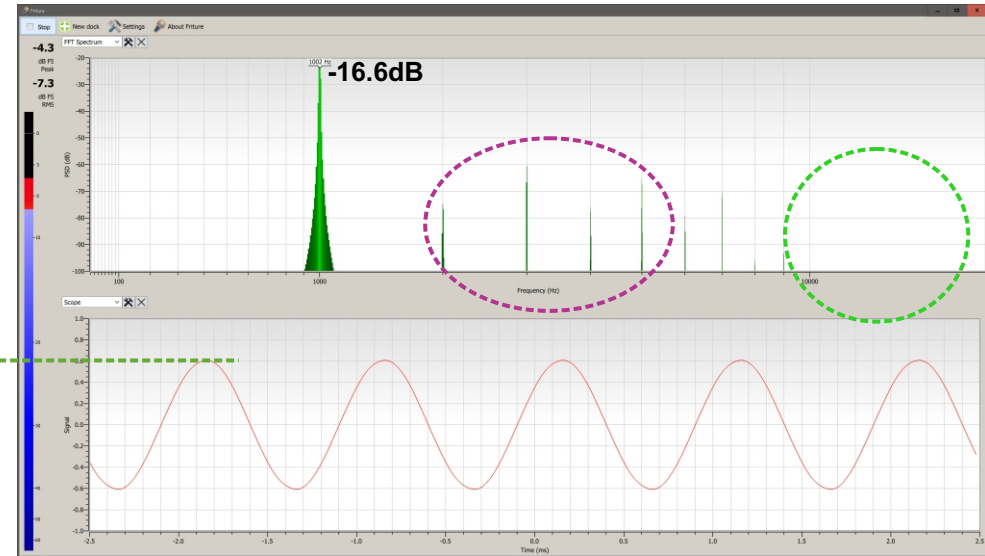
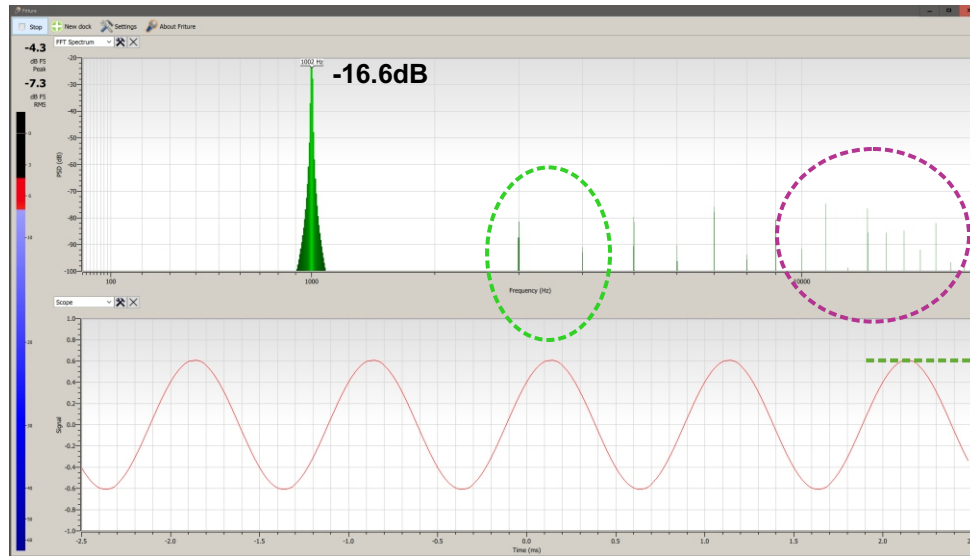


# WAcouSense PDMFilter Compare

#1 STM PDM2PCM

#2 my FIR based filter



calibrate with PDM sine generator  
for same volume out - OK

good:  
smaller 2nd and 3rd harmonics

bad:  
harmonics as noise in higher spectrum

good:  
no high spectrum noise

bad:  
larger 2nd and 3rd harmonics

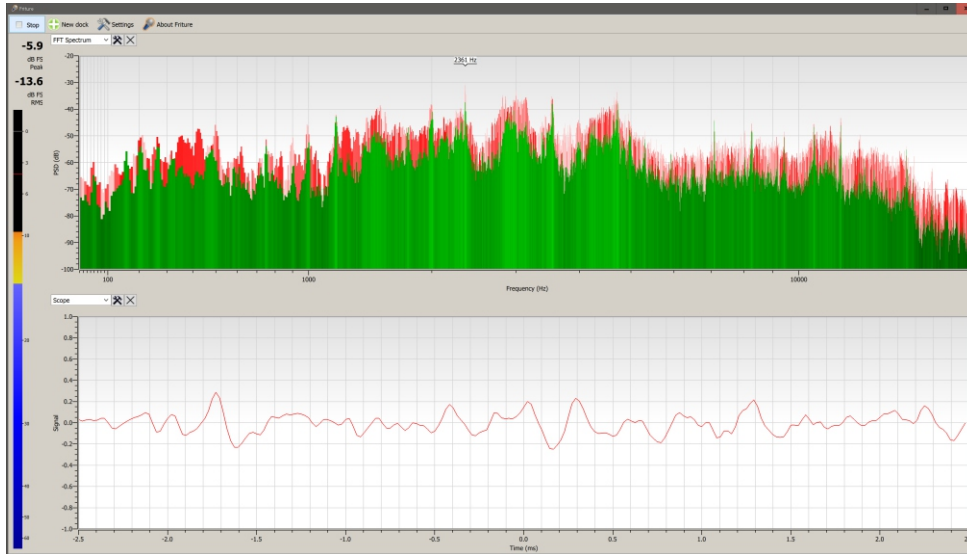
## Implementation:

using the STM PDM2PCM filter  
decimation: 64

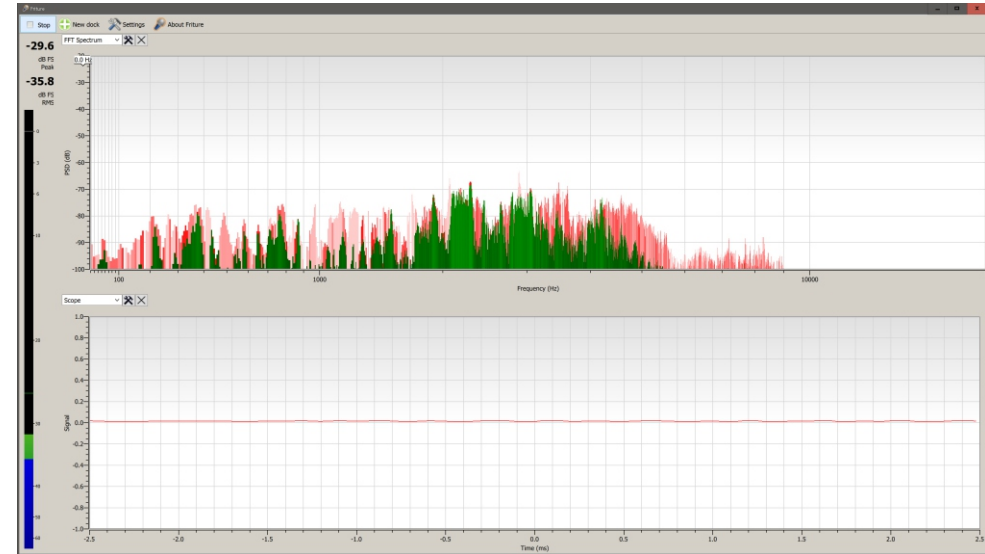
ARM CMSIS DSP filter as `arm_fir_decimate_f32`  
decimation: 64  
taps: 171  
plus  
low pass FIR filter (on 48KHz Fs):  
taps: 9

tjaekel, 2024

## #1 STM PDM2PCM



## #2 my FIR based filter



play real audio (music) on smartphone to PDM MIC - same settings

good:  
it is and sounds louder

*too much high  
frequency noise*

bad:  
volume change on Windows starts to clip early,  
it **sounds really harsh** (due to high frequencies) and  
quite **distorted** (large THD+N!)

bad:  
volume is way lower,  
MIC is not so sensitive anymore

*too much  
attenuation*

good:  
sounds better (**less distortion, less noise**),  
volume change on Windows clips later

### ATTENTION:

I hear on both filter and audio pipelines “cracking” sound (discontinuities)  
and artefacts, on right side filter more often

artefacts also on this filter

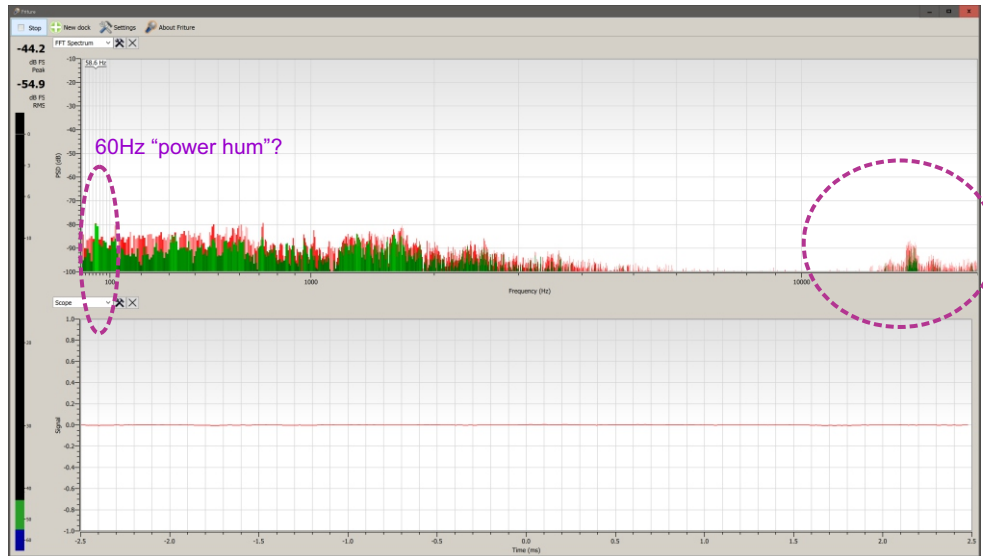
*sometimes  
too slow?*

obvious on this filter:  
decimating FIR: 171 taps  
smoothing FIR2: 9 taps  
plus conversion from/to float32\_t

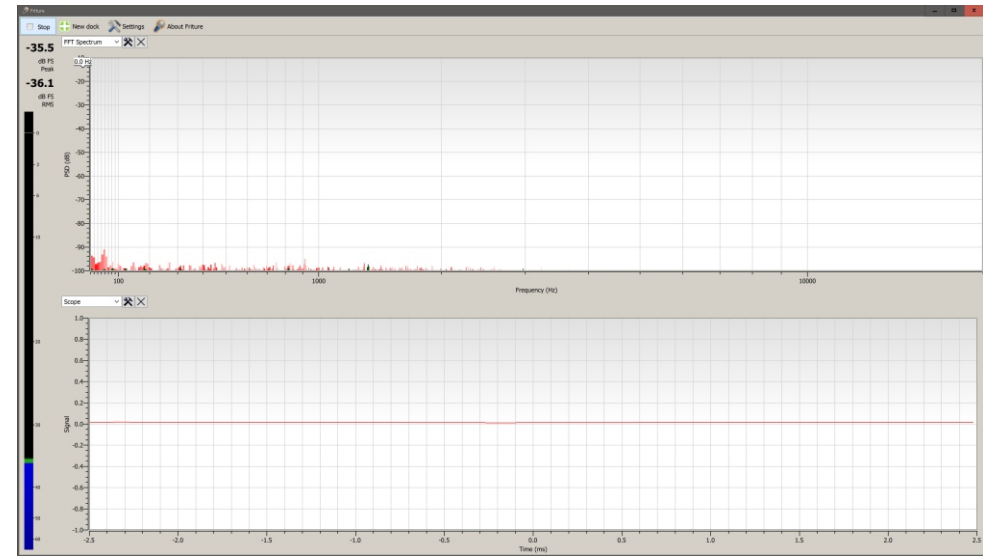
*too slow?*

tjaekel, 2024

## #1 STM PDM2PCM



## #2 my FIR based filter



“quiet” noise floor (ambient noise)

bad:  
MIC picks up large noise, filter adds (left) high frequency noise

tjaekel, 2024