Fachhochschule Nordwestschweiz
Hochschule für Technik

Front-End Signal Processing for Red Pitaya Spectrum Analyzer

Bachelor Thesis

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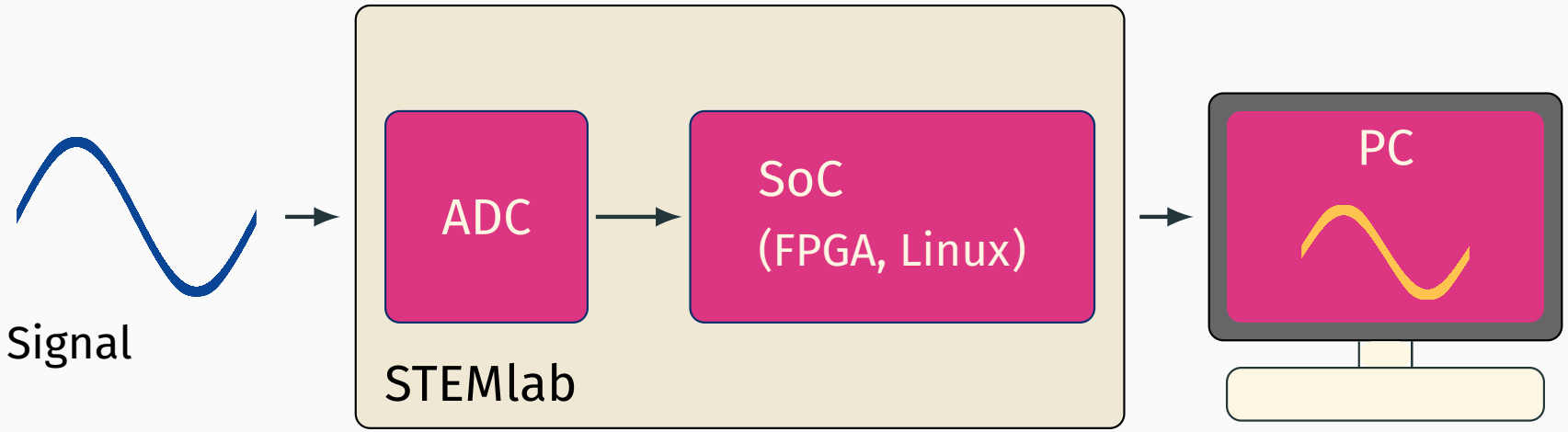
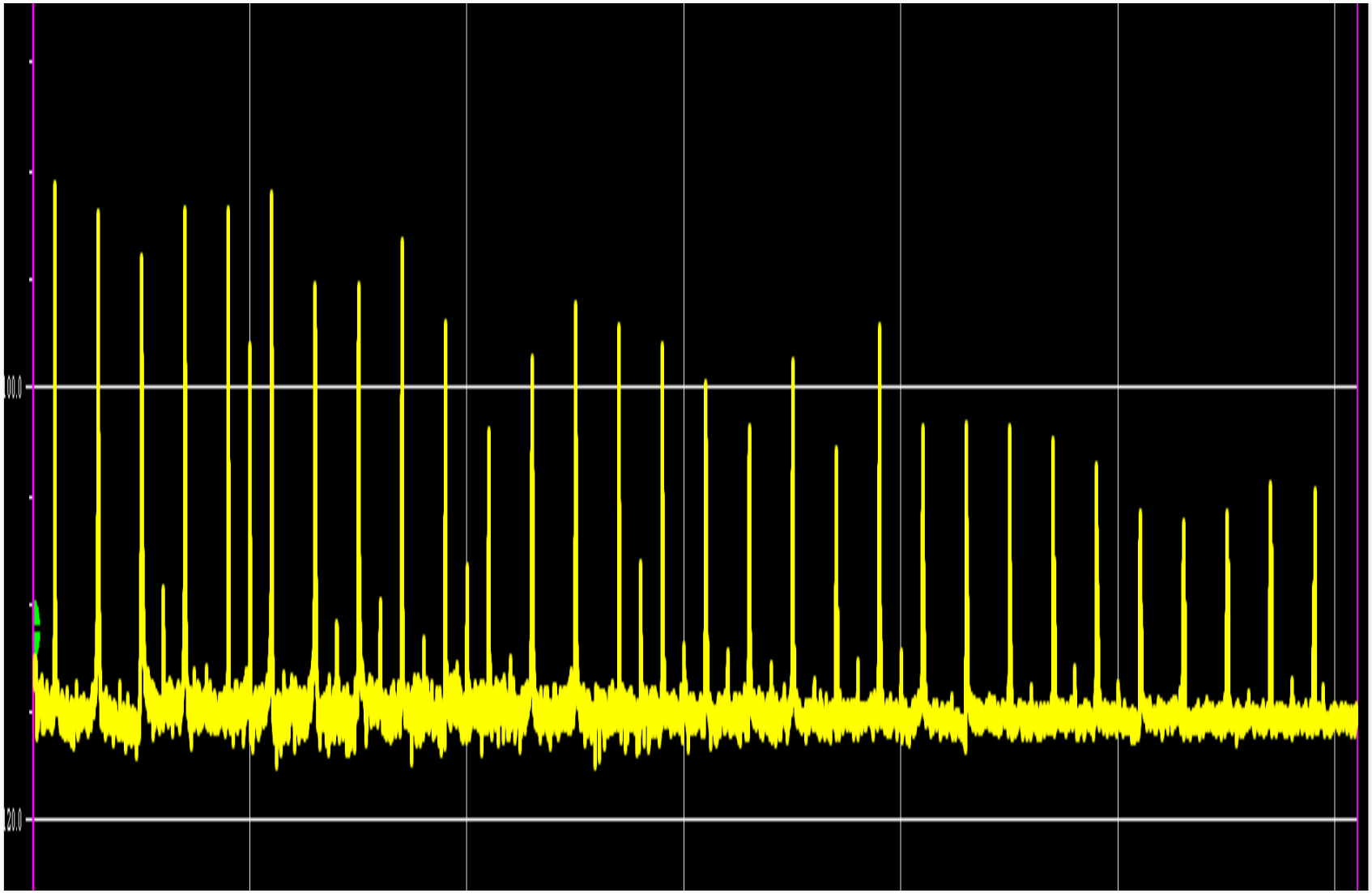
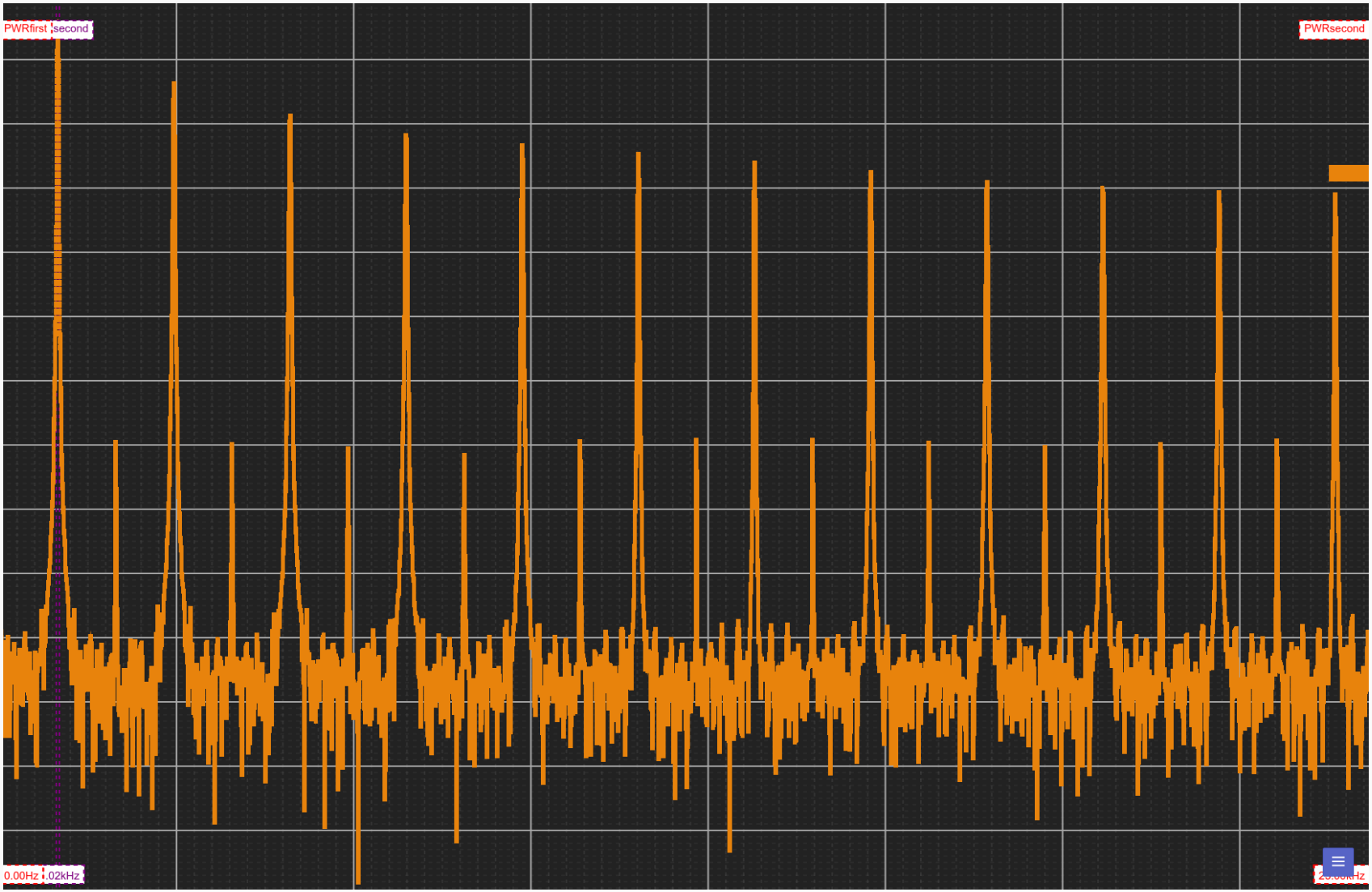
System Overview



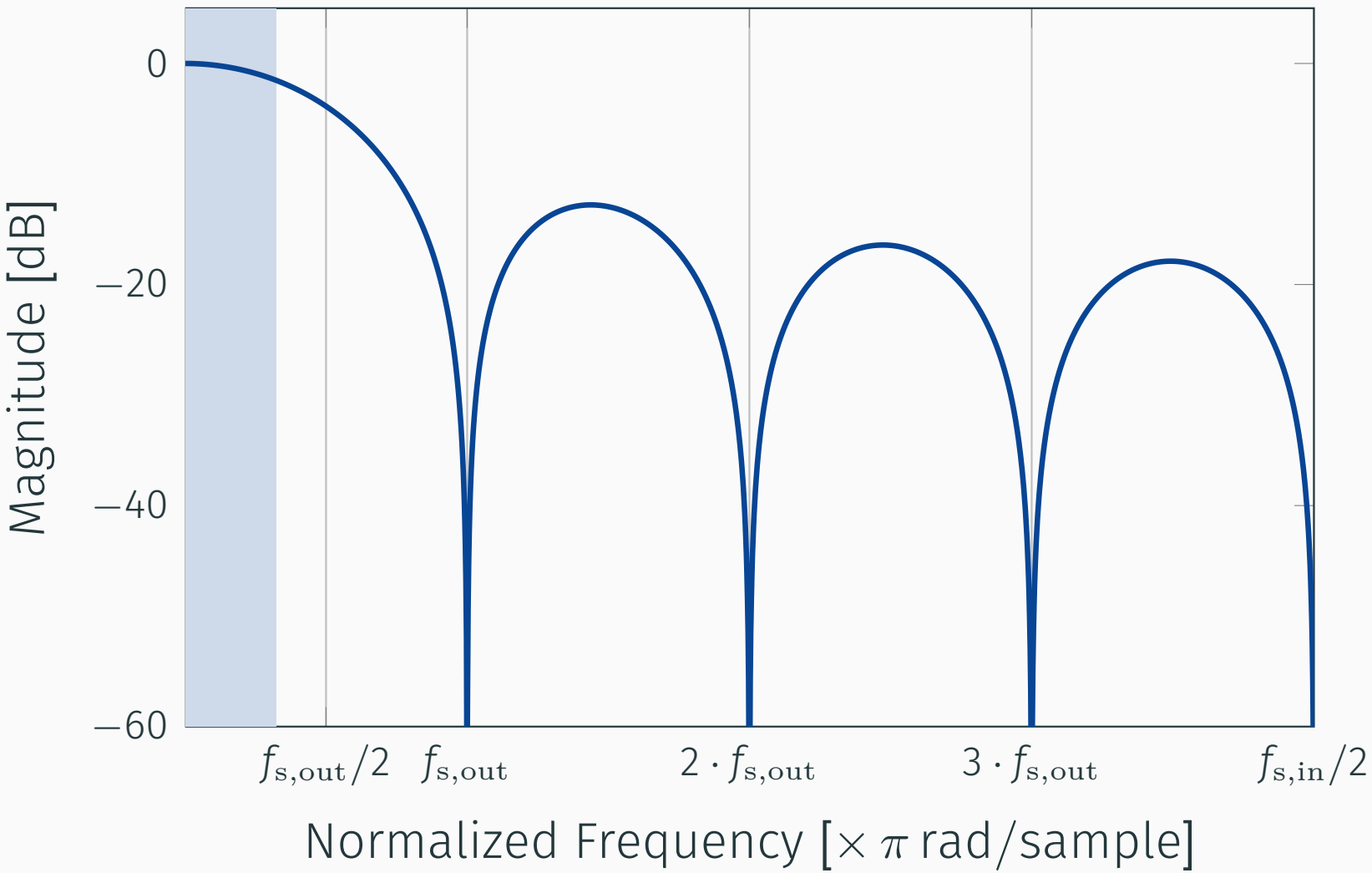
Stopband Attenuation: Stock Configuration



Stopband Attenuation: Our Result



Folding Back: Moving Averager, R=8



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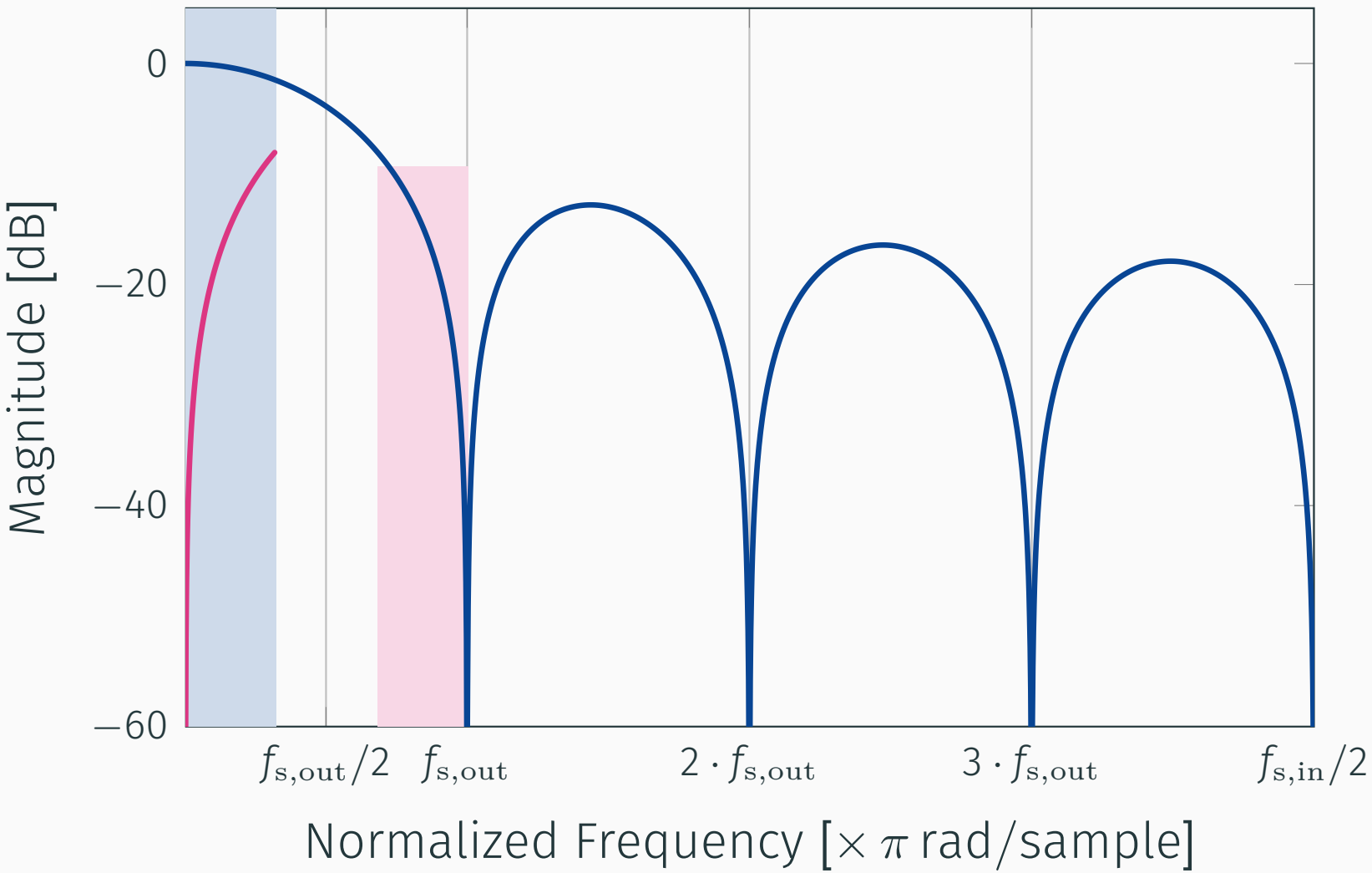

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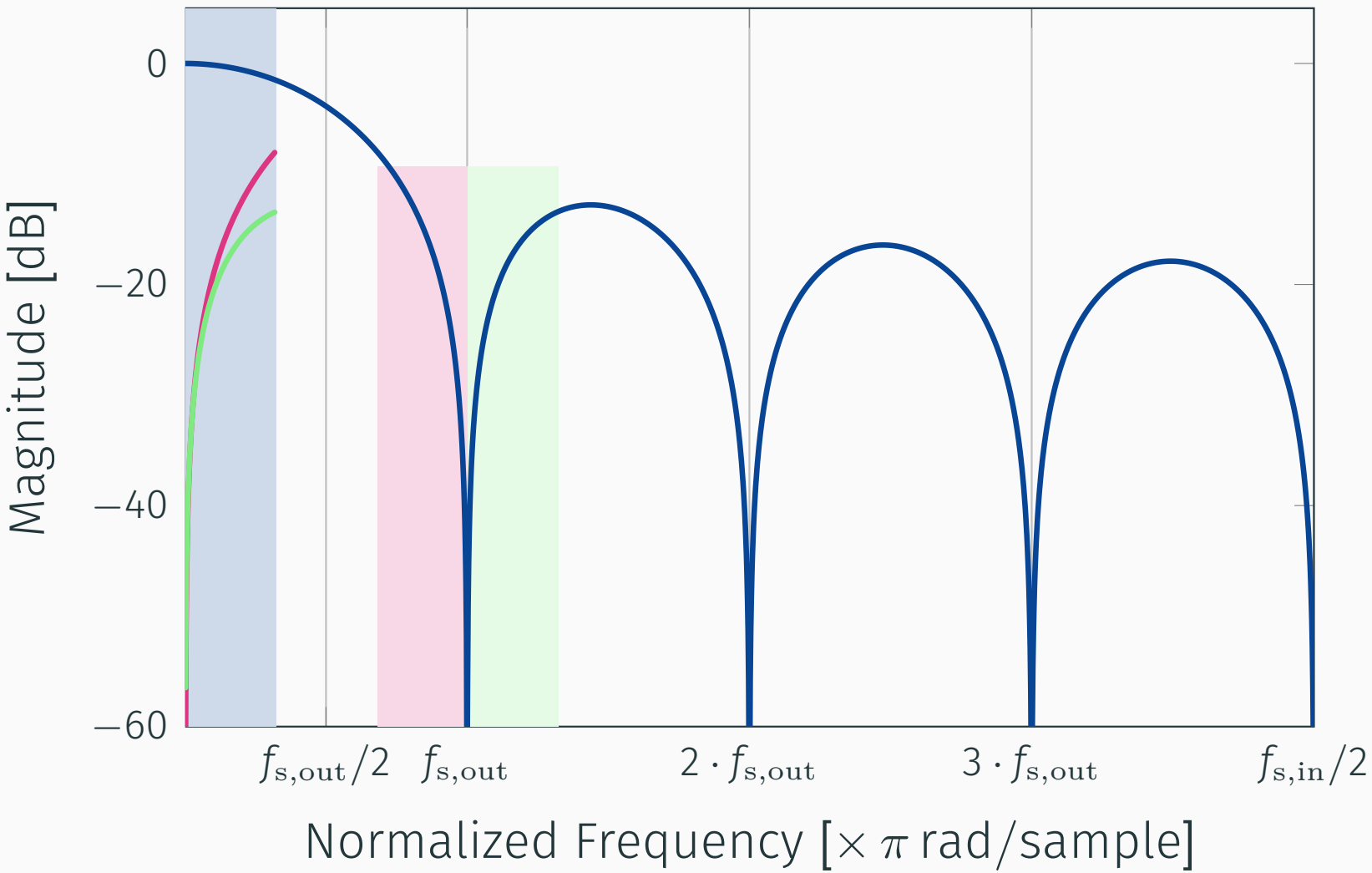

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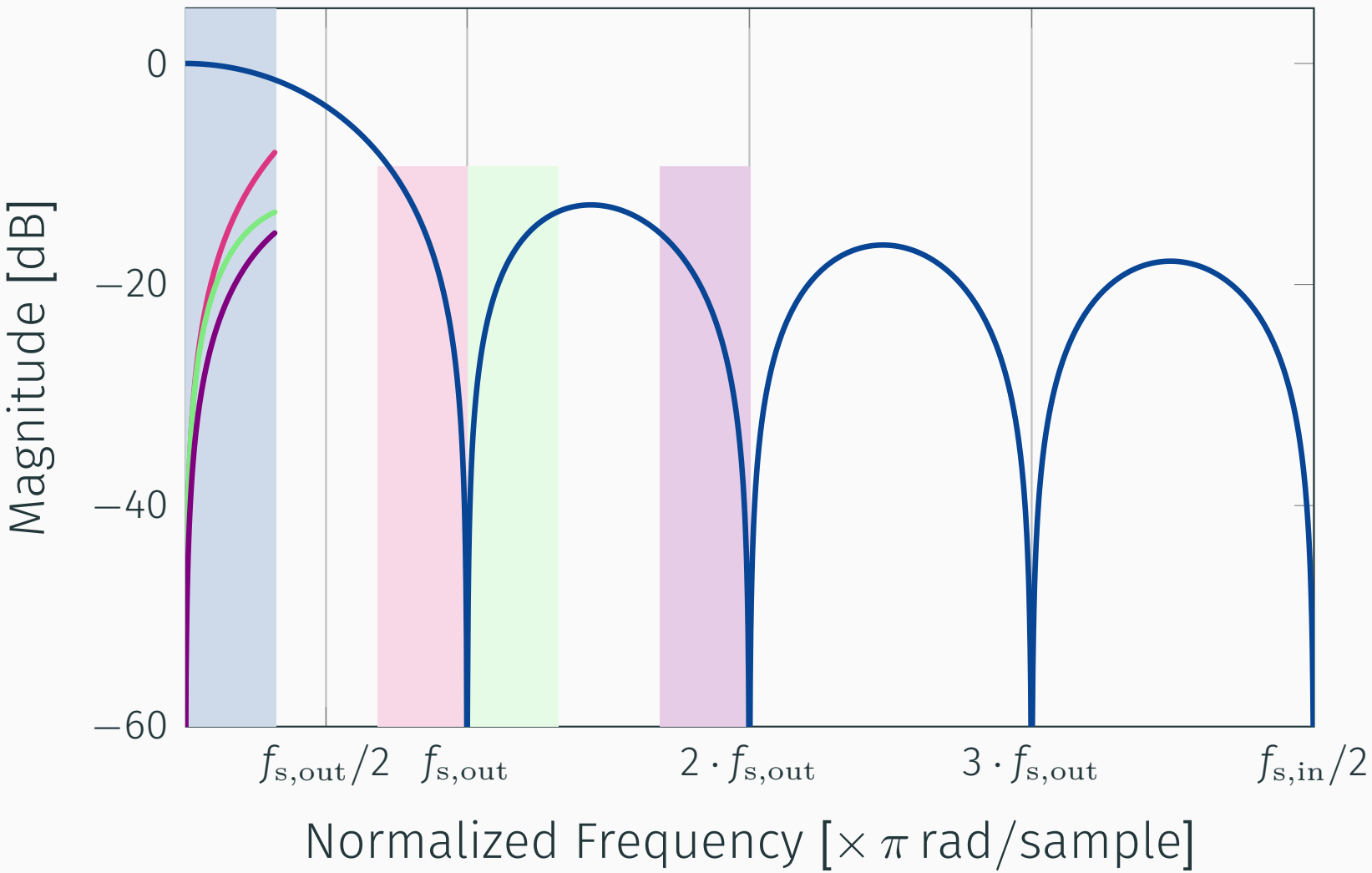

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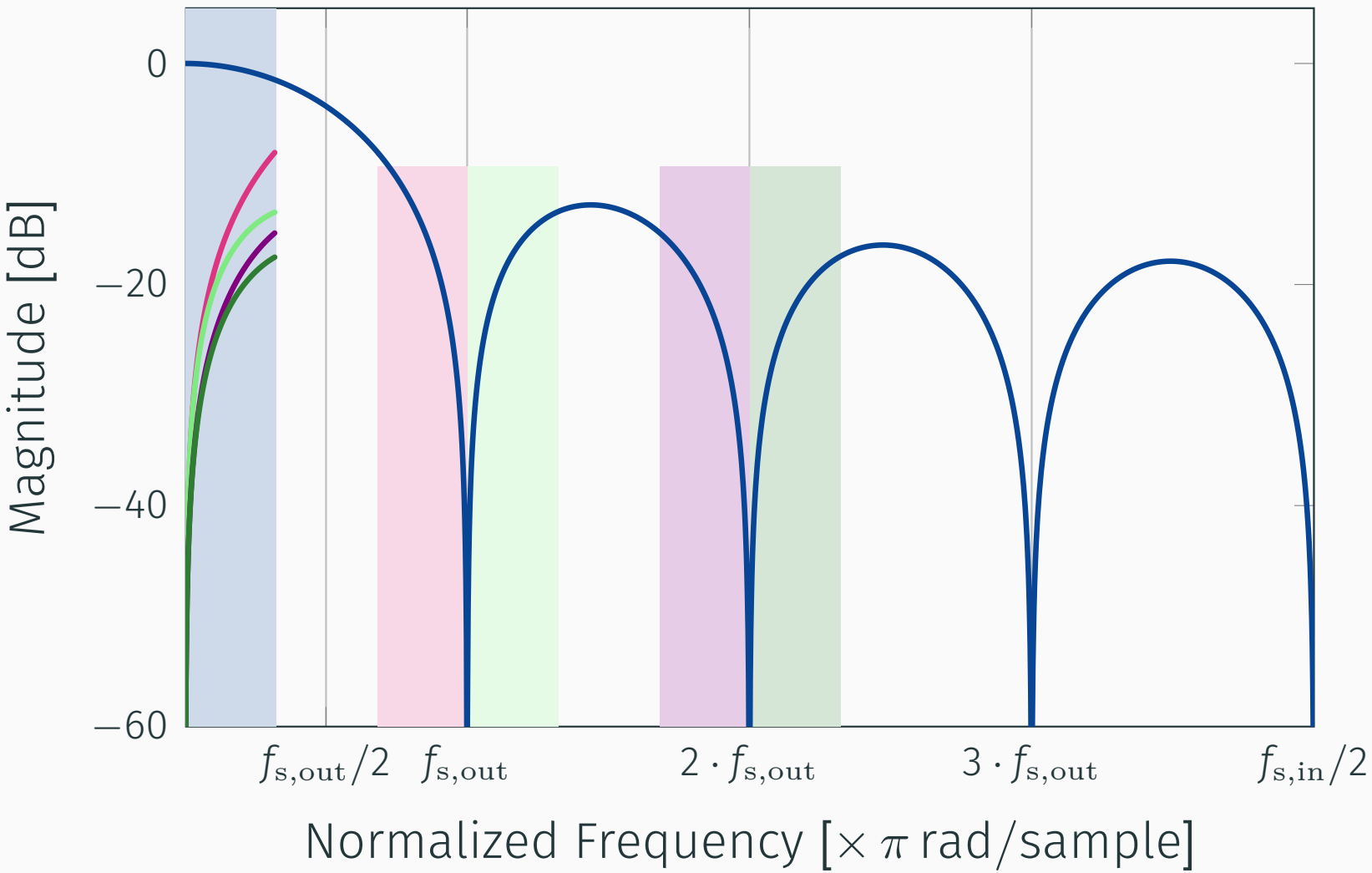

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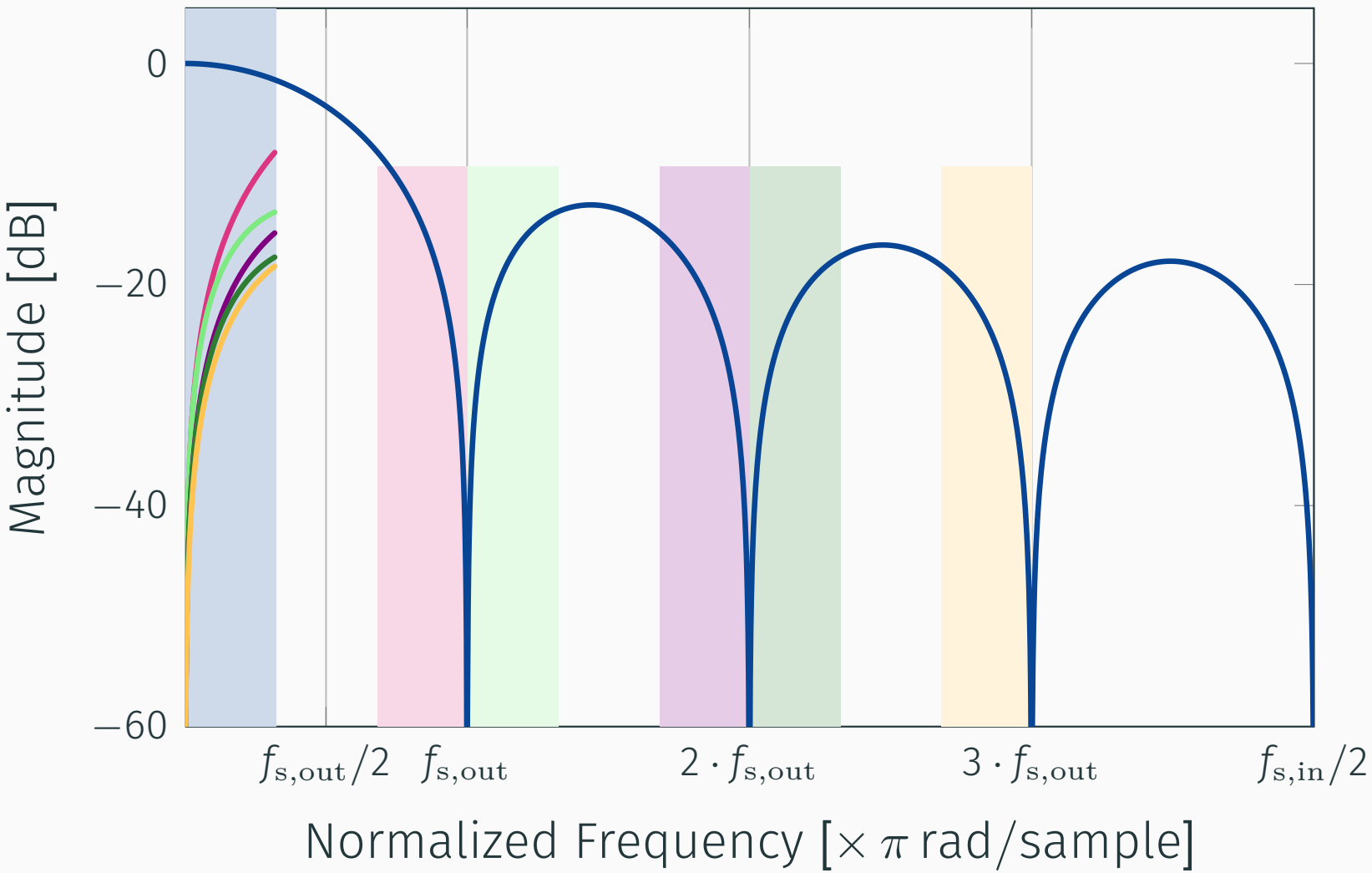

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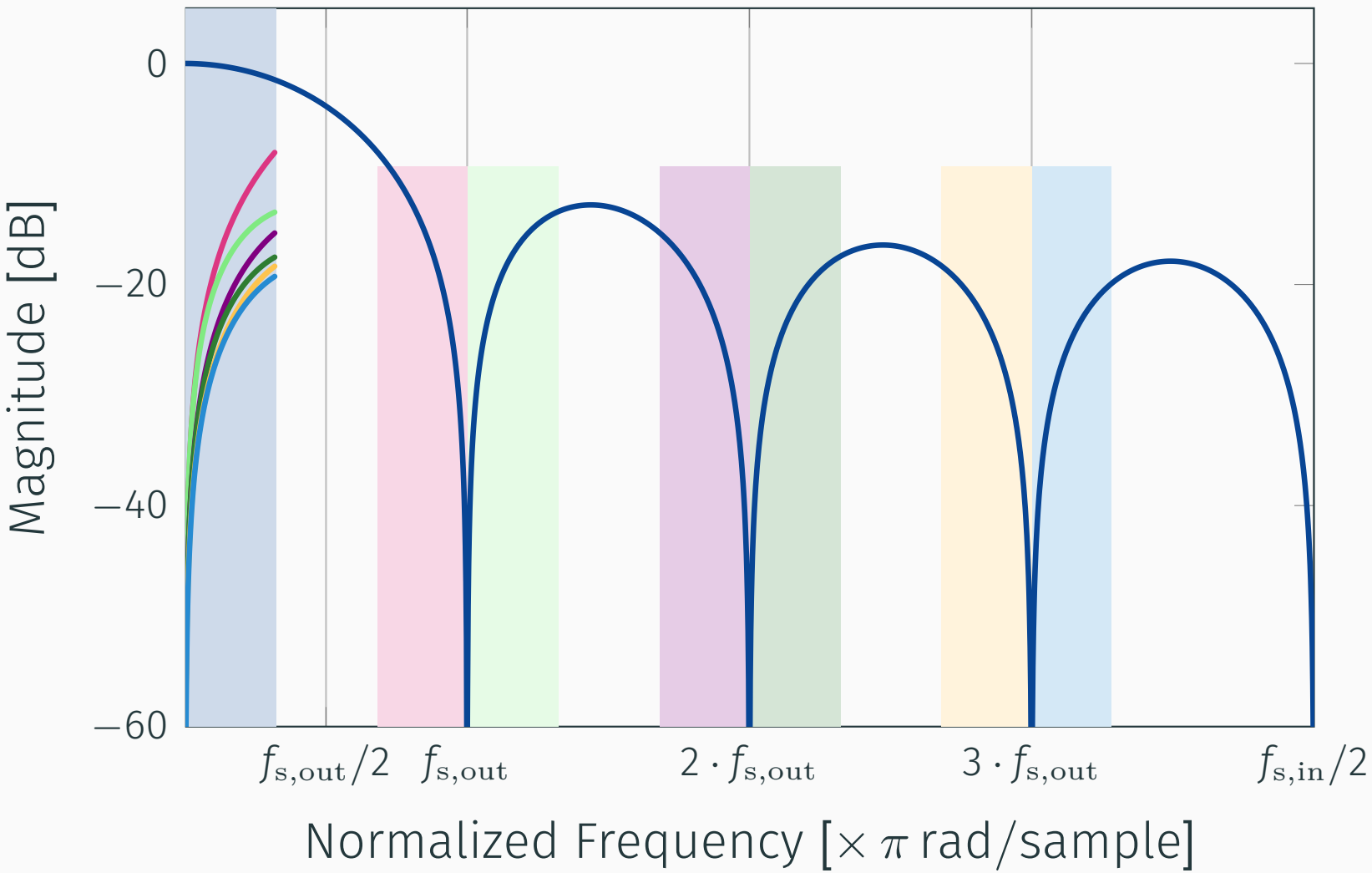

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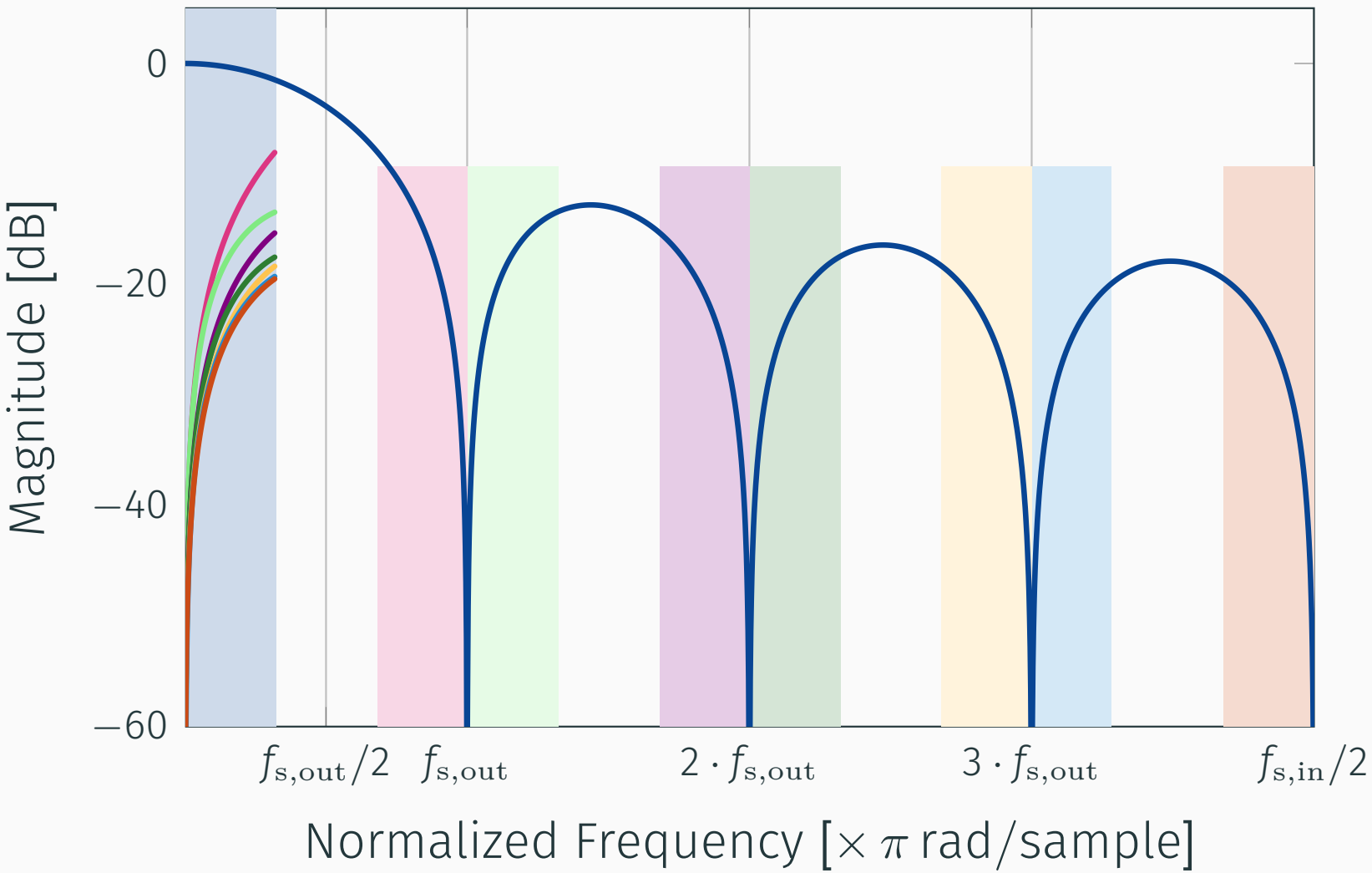

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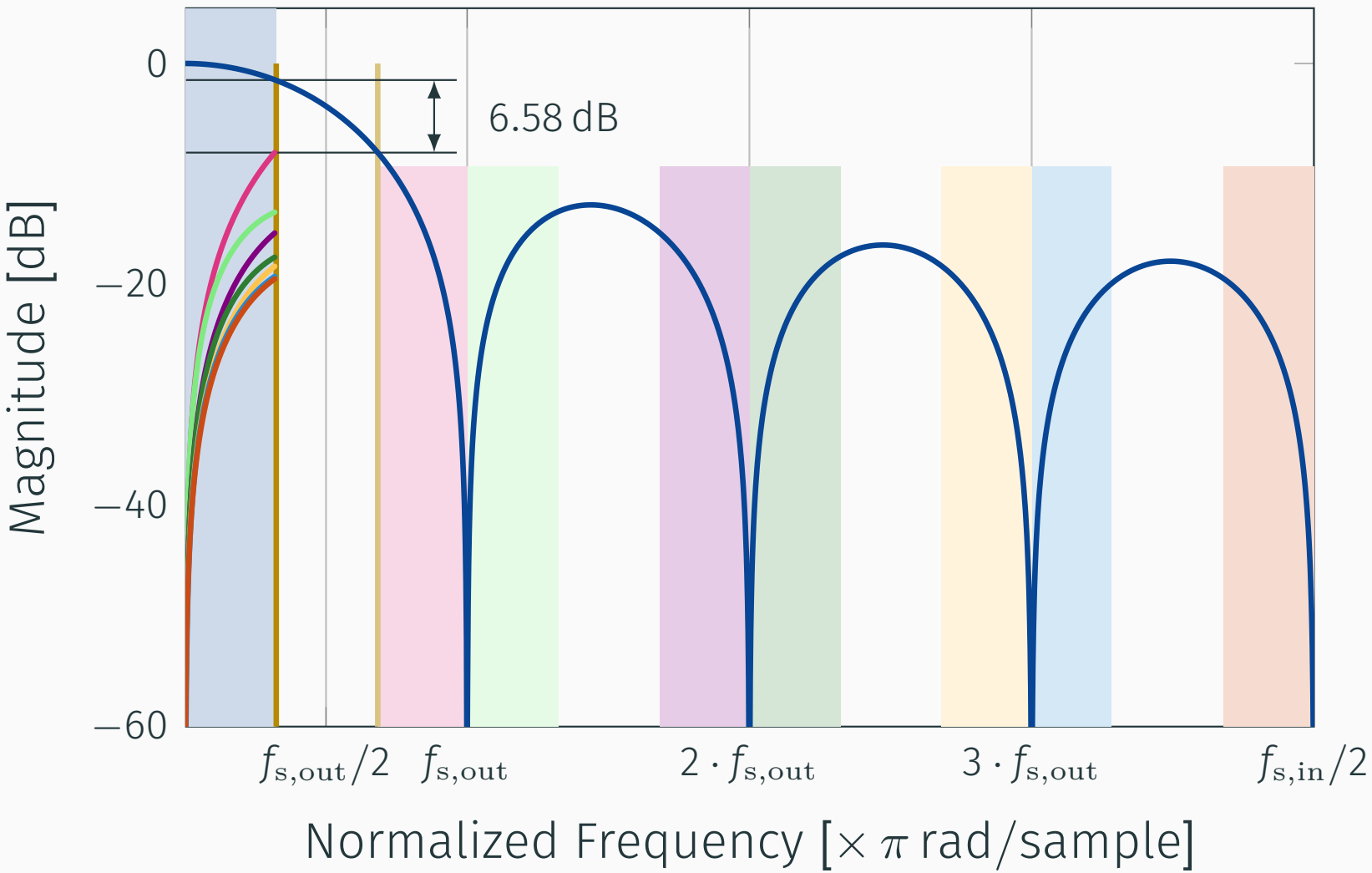
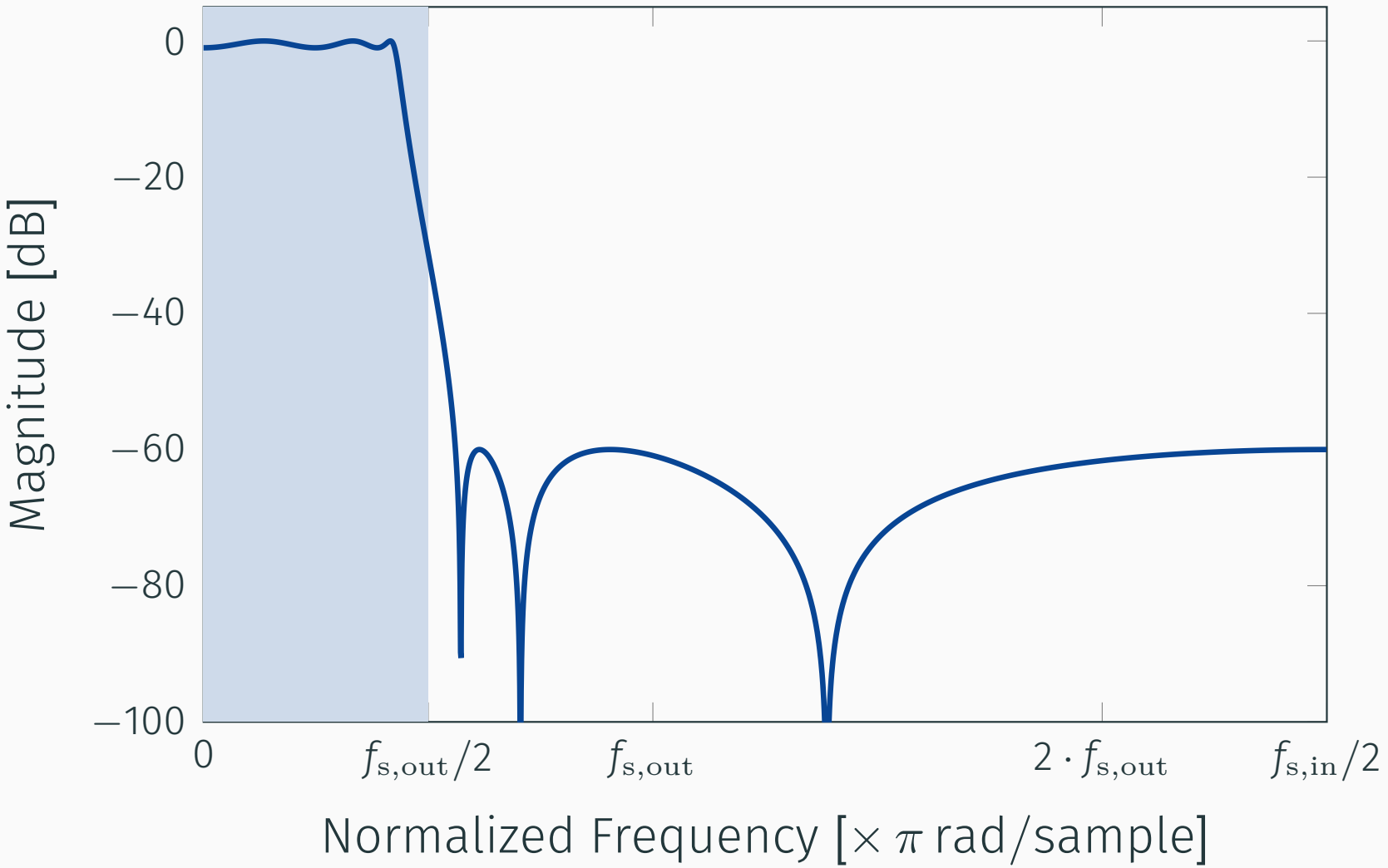
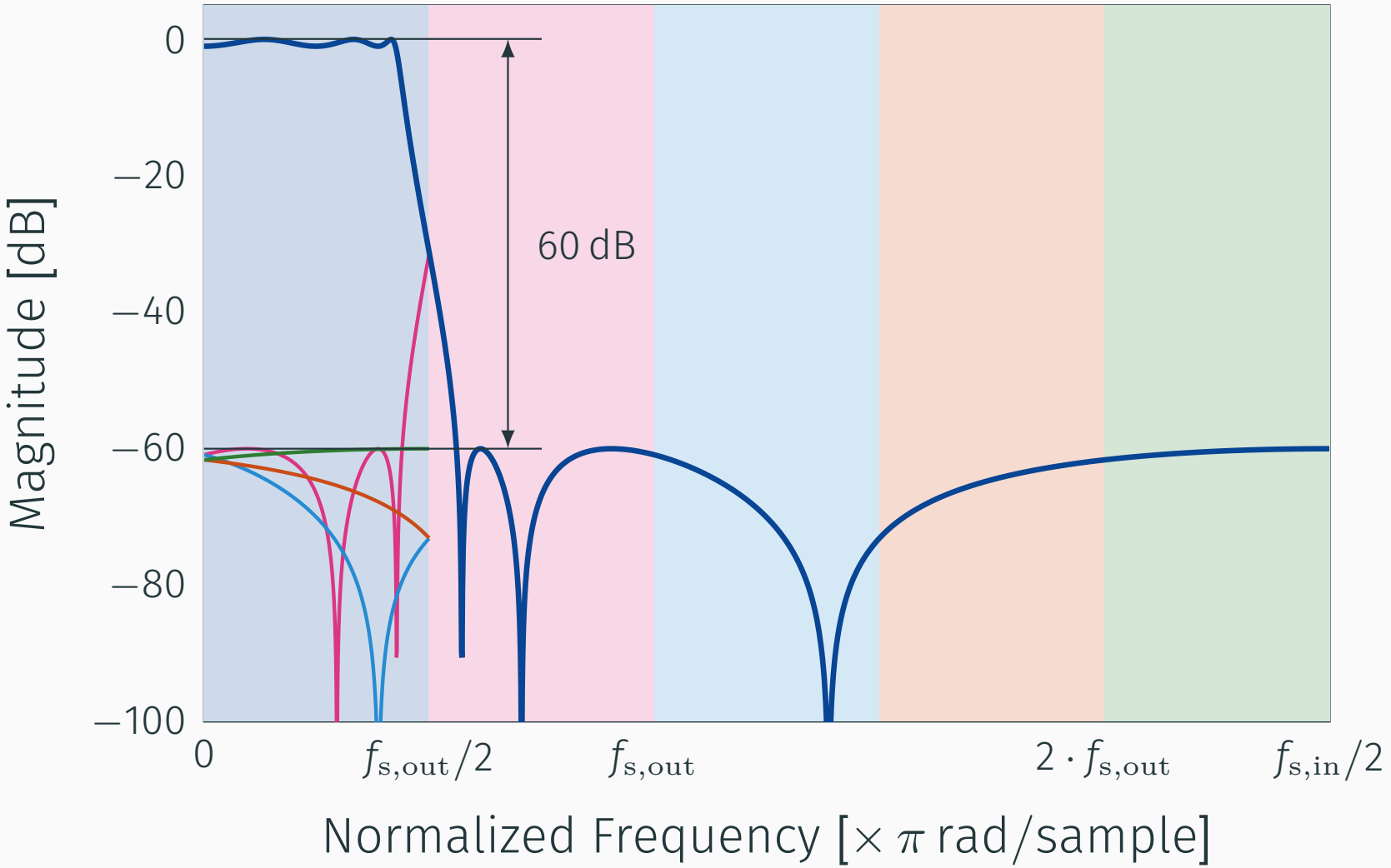


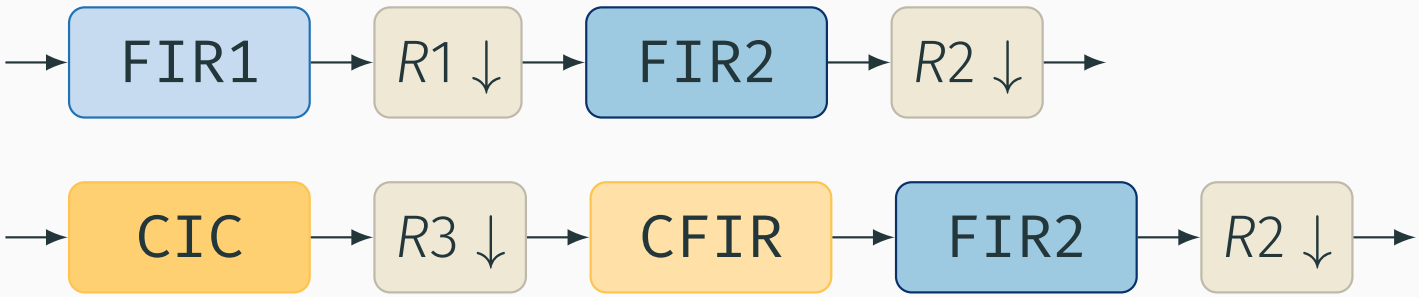
Folding Back: IIR, R=5



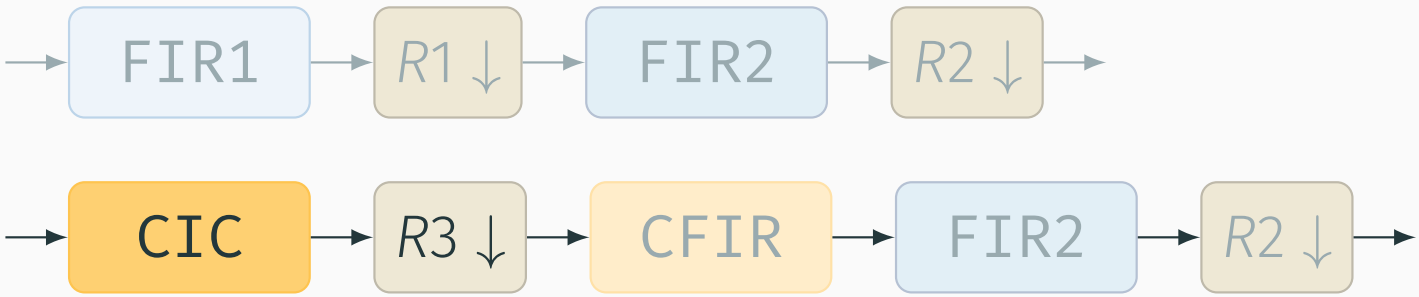
Folding Back: IIR, R=5



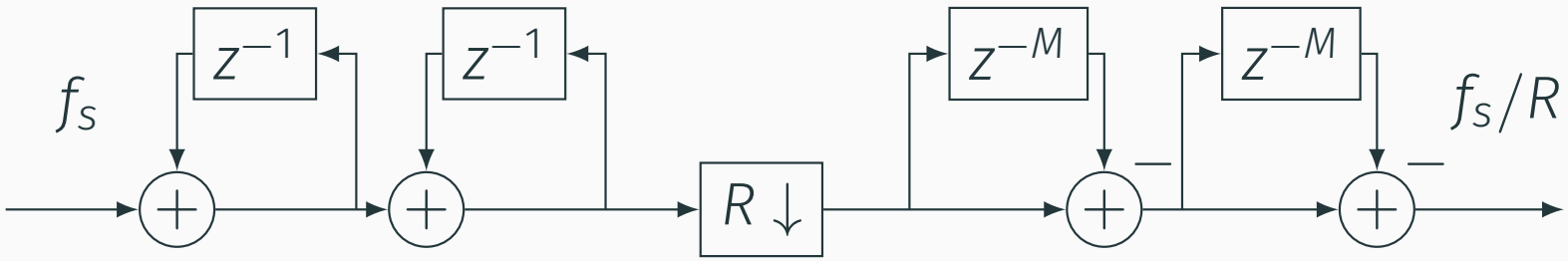
Filtering Concept



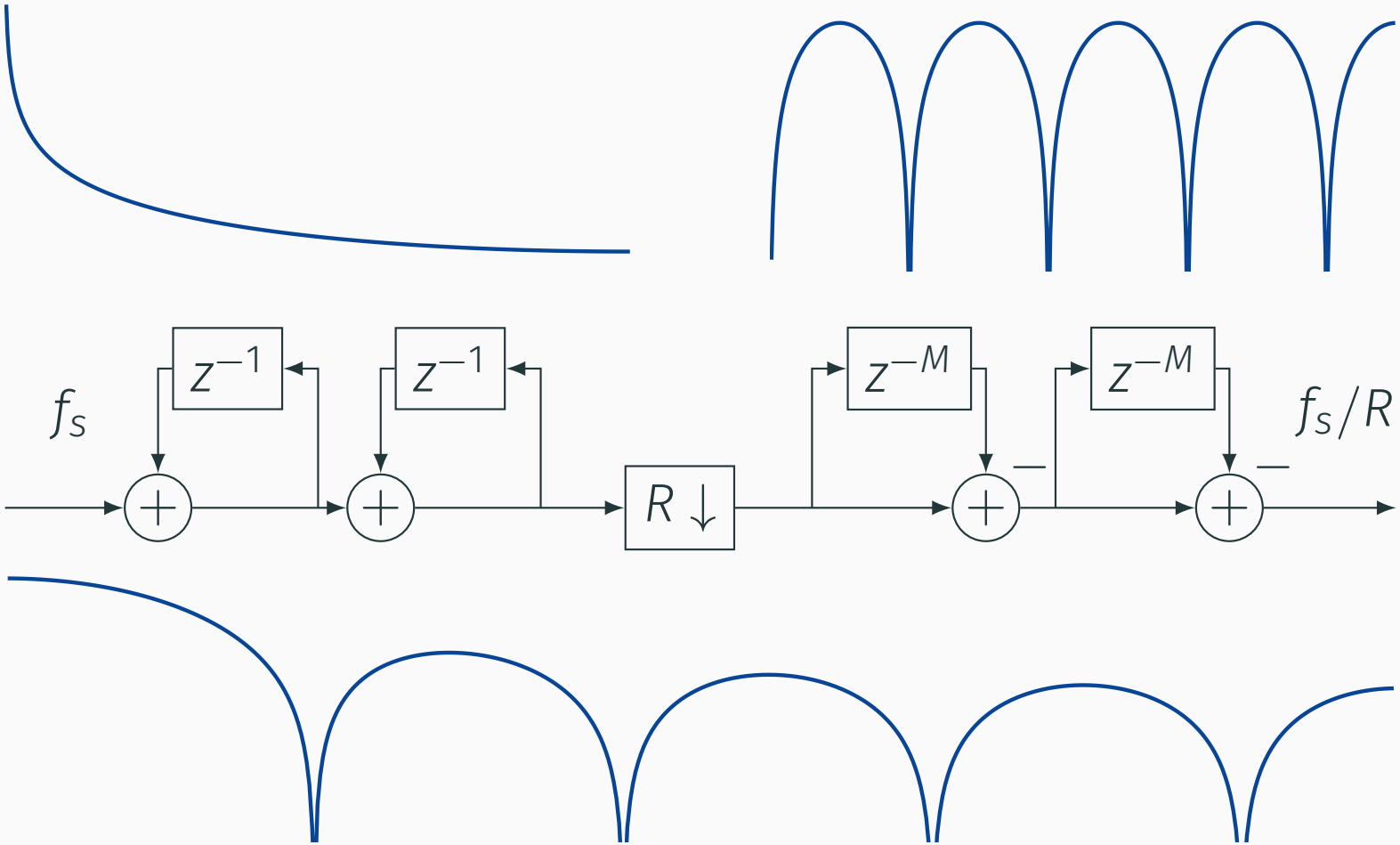
Filtering Concept



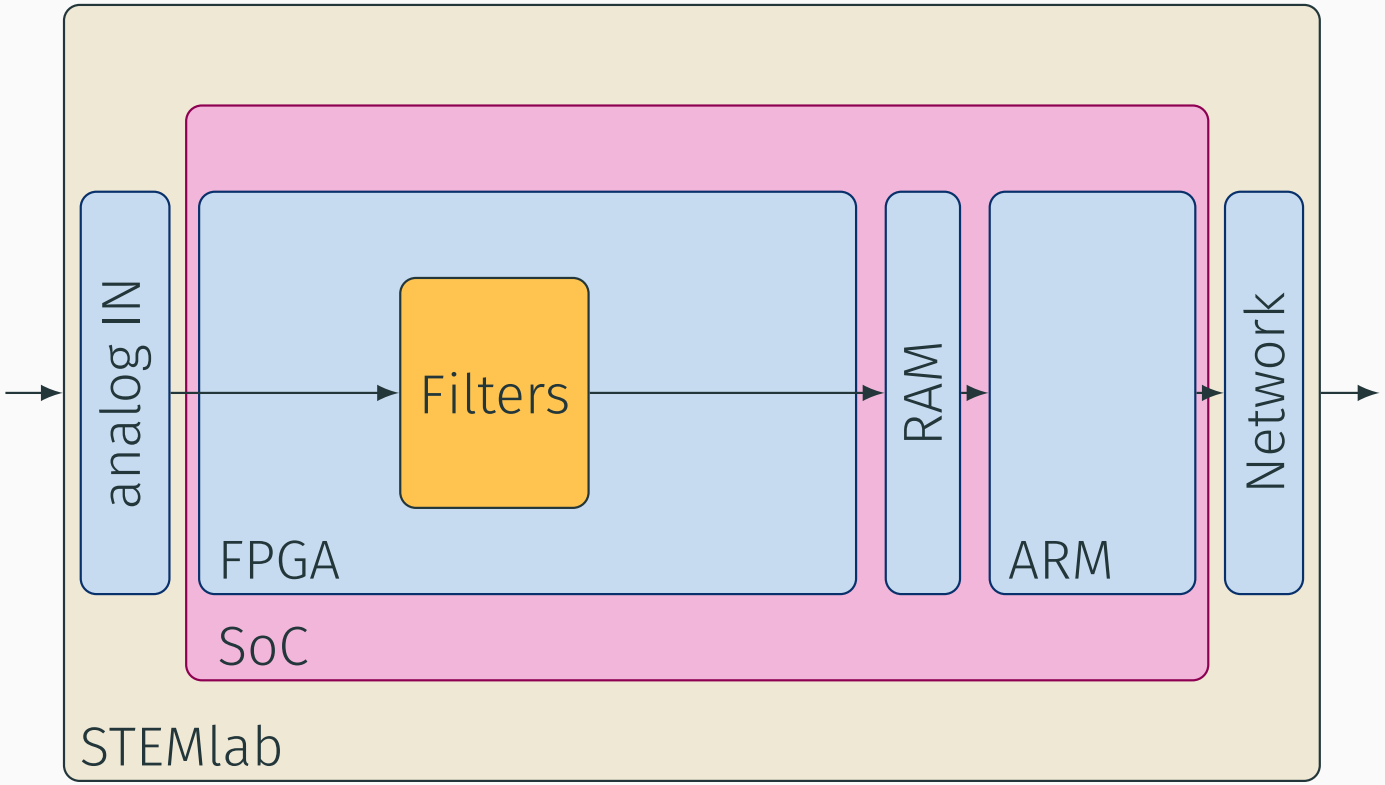
CIC Filter Topology



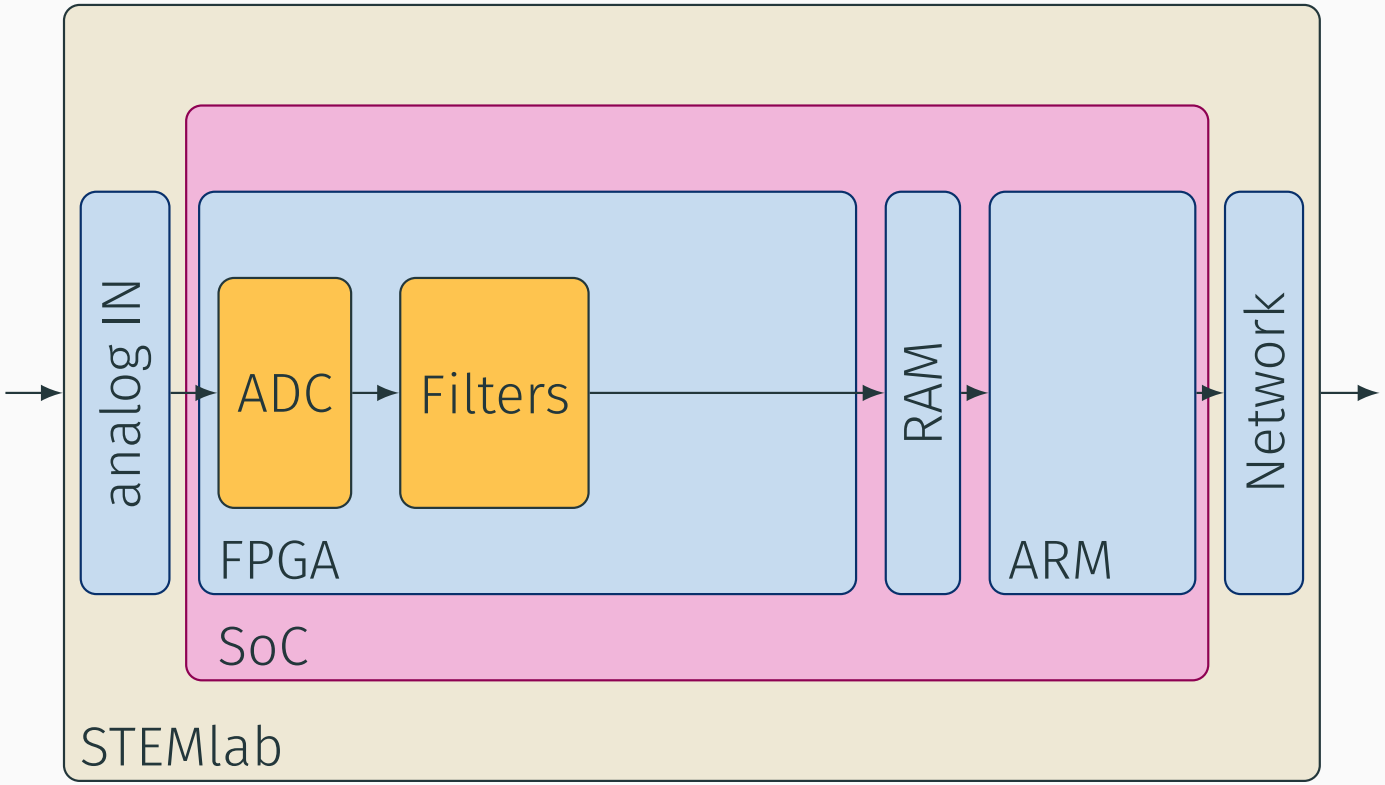
CIC Filter Topology



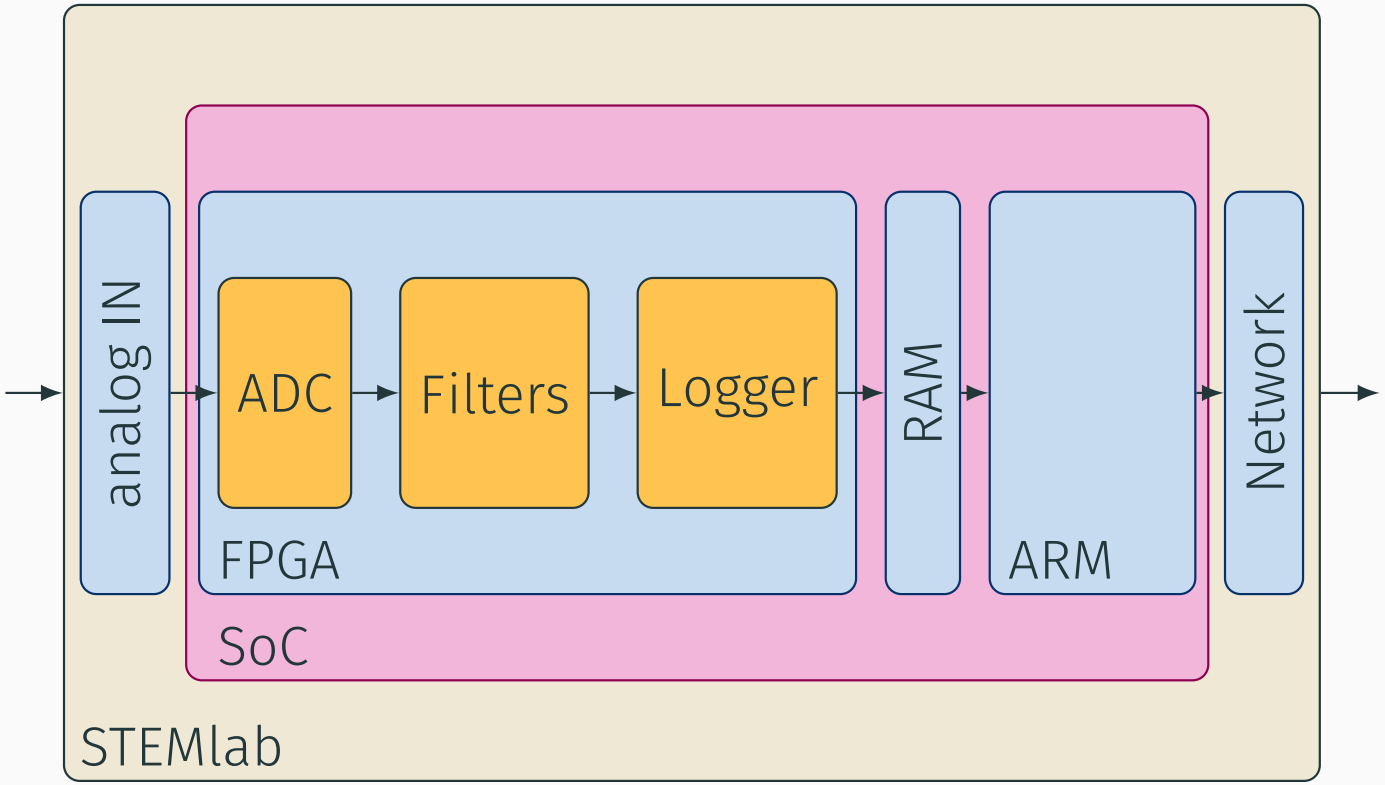
System Overview



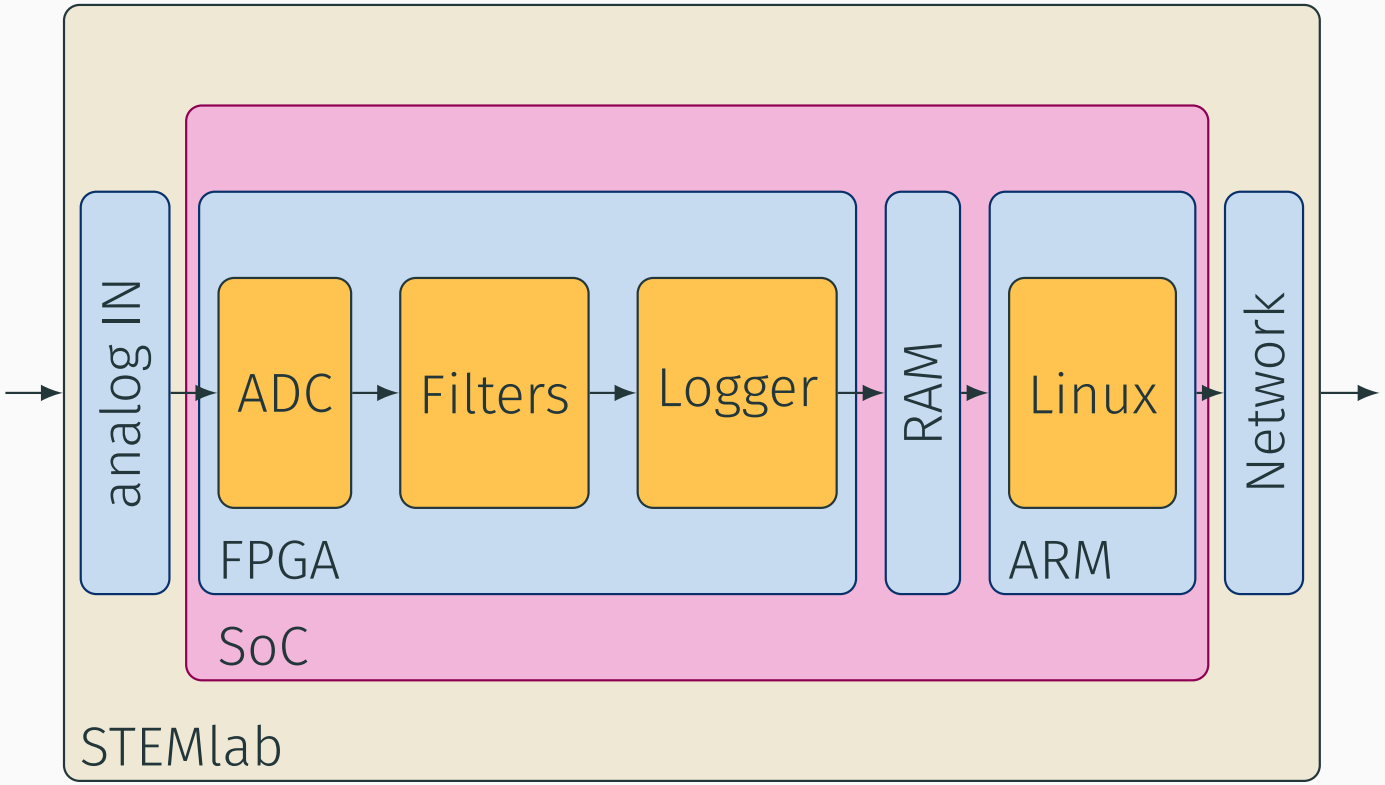
System Overview



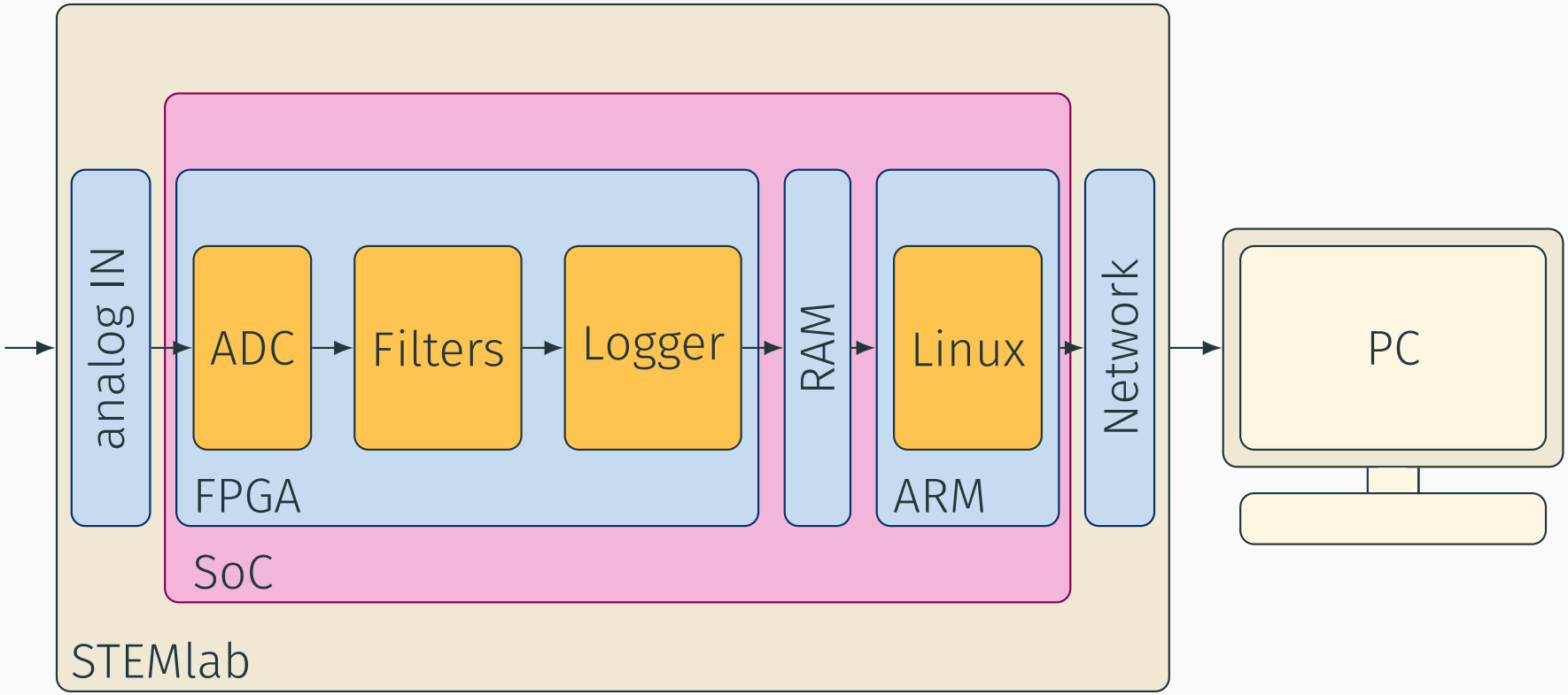
System Overview



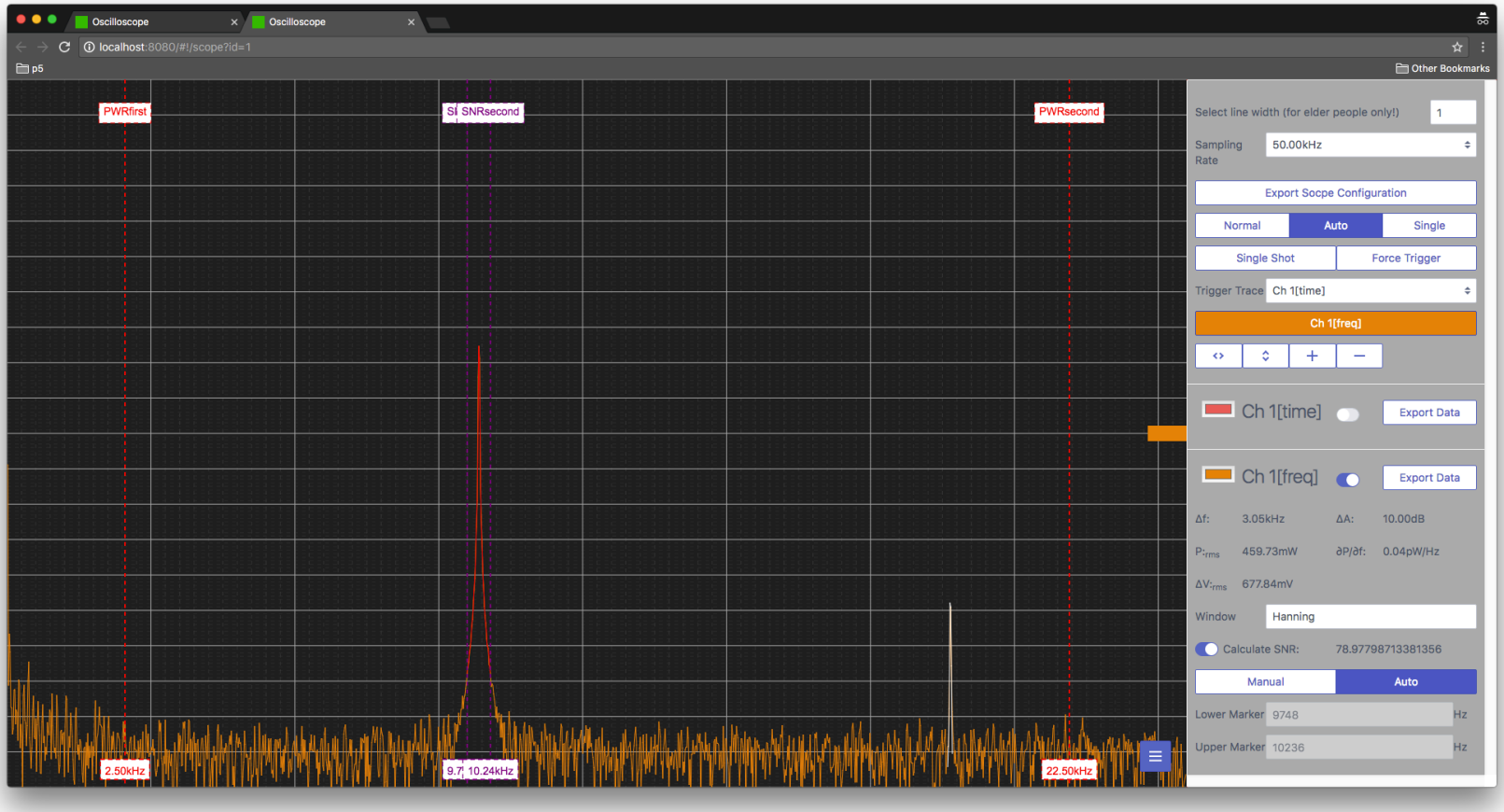
System Overview



System Overview

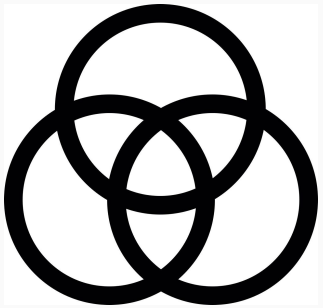


Demo

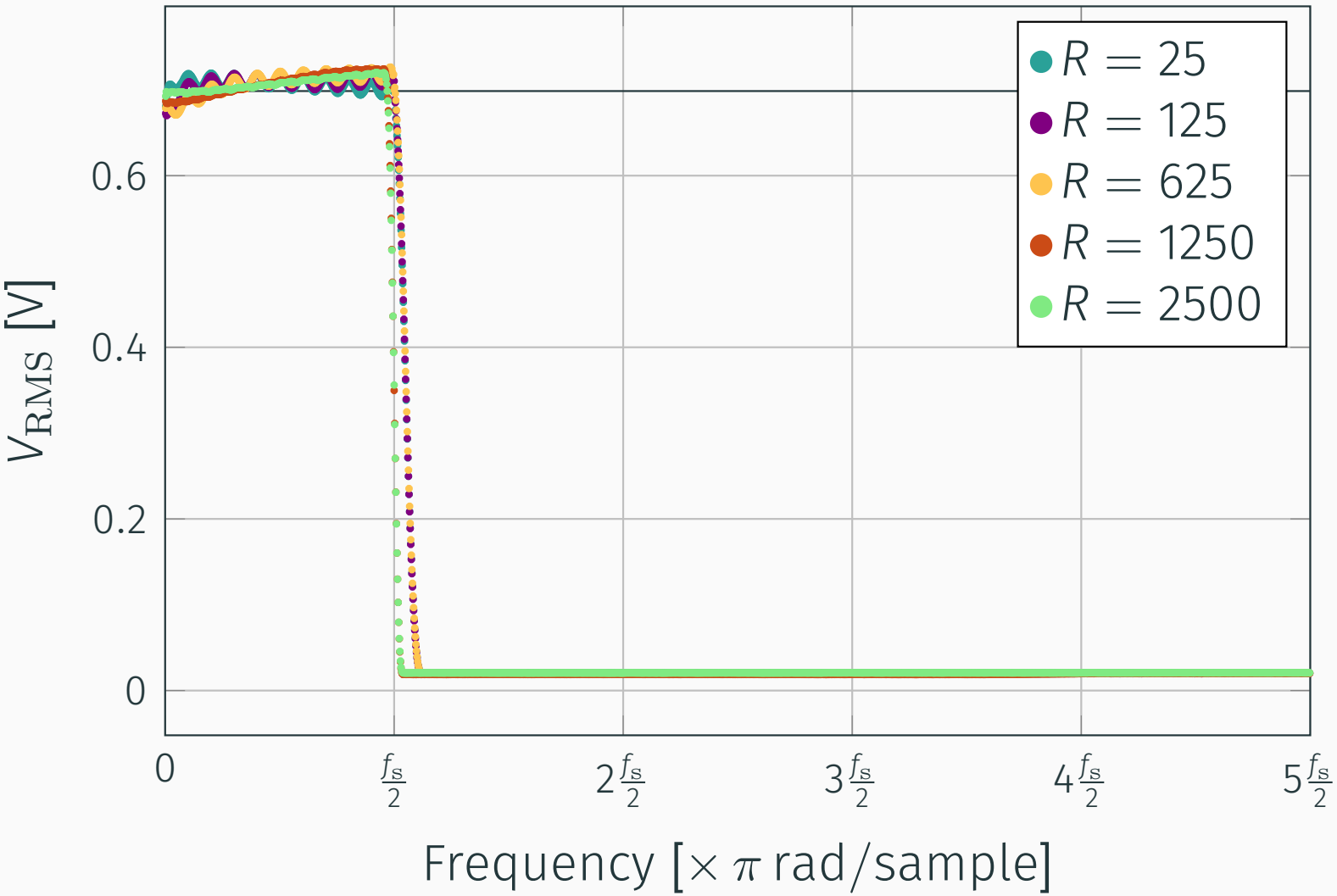

Oscilloscope
Oscilloscope
localhost:8080/#!/scope?id=1
p5
Other Bookmarks
PWRfirst
SNRsecond
PWRsecond
2.50kHz
9.7
10.24kHz
22.50kHz
Select line width (for elder people only!)
1
Sampling Rate
50.00kHz
Export Socpe Configuration
Normal
Auto
Single
Single Shot
Force Trigger
Trigger Trace
Ch 1[time]
Ch 1[freq]
Ch 1[time]
Export Data
Ch 1[freq]
Export Data
Δf:
3.05kHz
ΔA:
10.00dB
P:rms
459.73mW
∂P/∂f:
0.04pW/Hz
ΔV:rms
677.84mV
Window
Hanning
Calculate SNR:
78.97798713381356
Manual
Auto
Lower Marker
9748
Hz
Upper Marker
10236
Hz

Technologies used

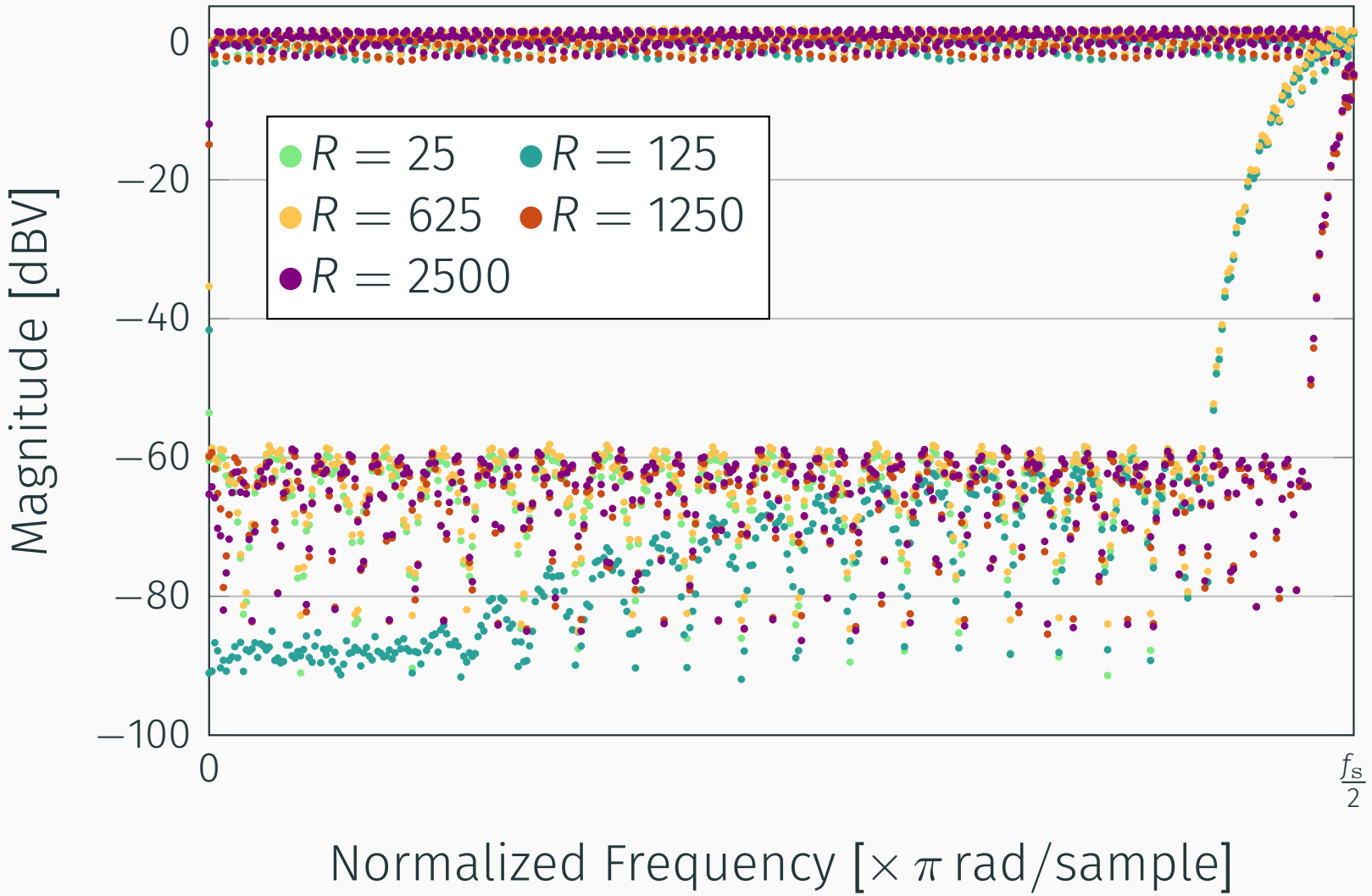
µWebSockets



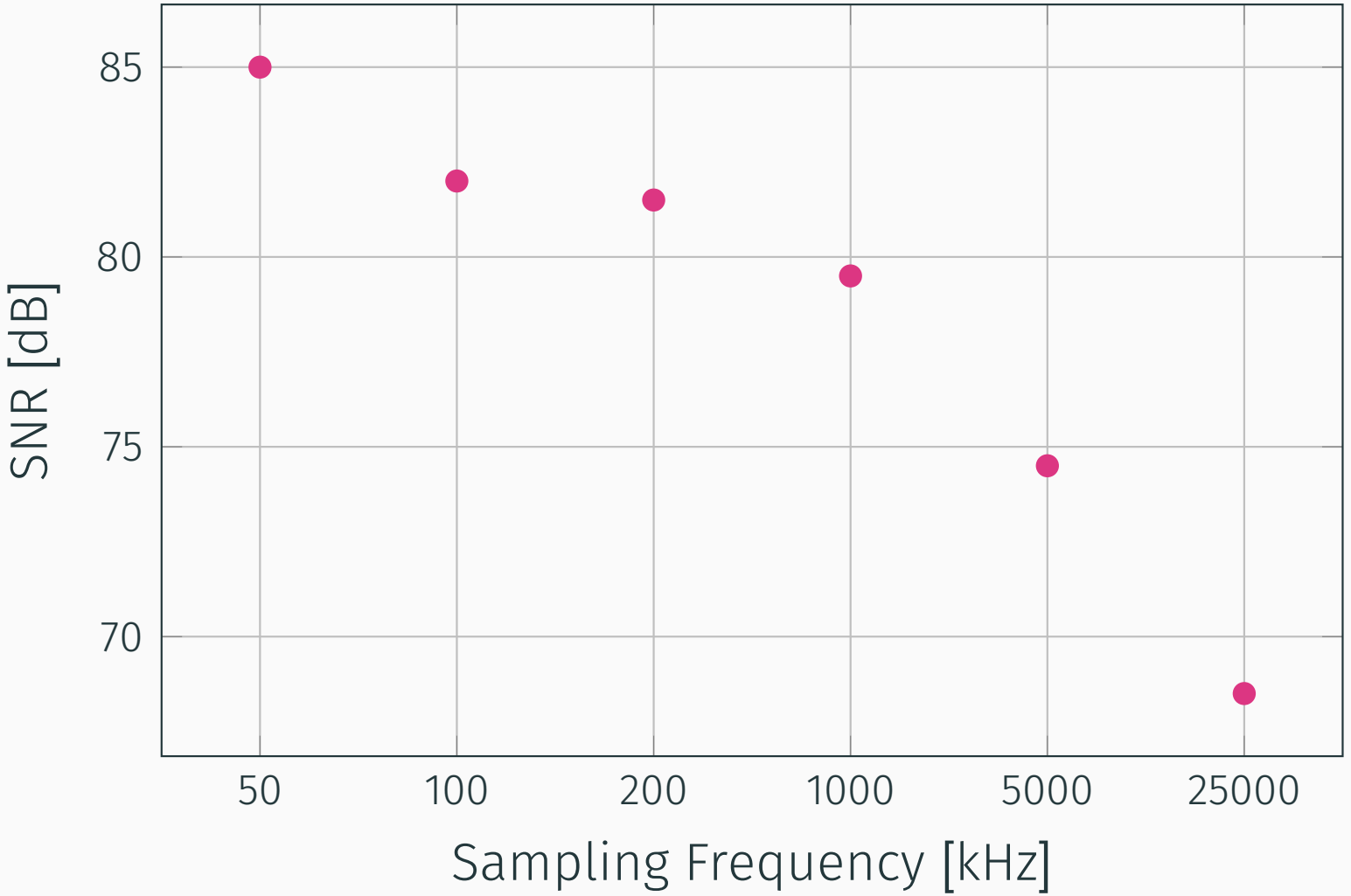
RMS for Different Harmonics



Folding Back (normalized to 0 dB)



SNR


85
80
75
70
SNR [dB]
50
100
200
1000
5000
25000
Sampling Frequency [kHz]

SUCCESS!

SUCCESS!

Future Potential:

- Measurements and Analysis
- Optimize FPGA Resource Usage
- Scope
- Additional Front-Ends

Questions?