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Tune measurement with NAFF, ver.2

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- HPF did not improve the tune measurement.
- Beam does not last for many turns, at most ~60 turns. A simple FFT gives the tune resolution of 1/60=0.017.
- NAFF (numerical analysis of fundamental frequency) gives much higher resolution. It was demonstrated in EMMA.

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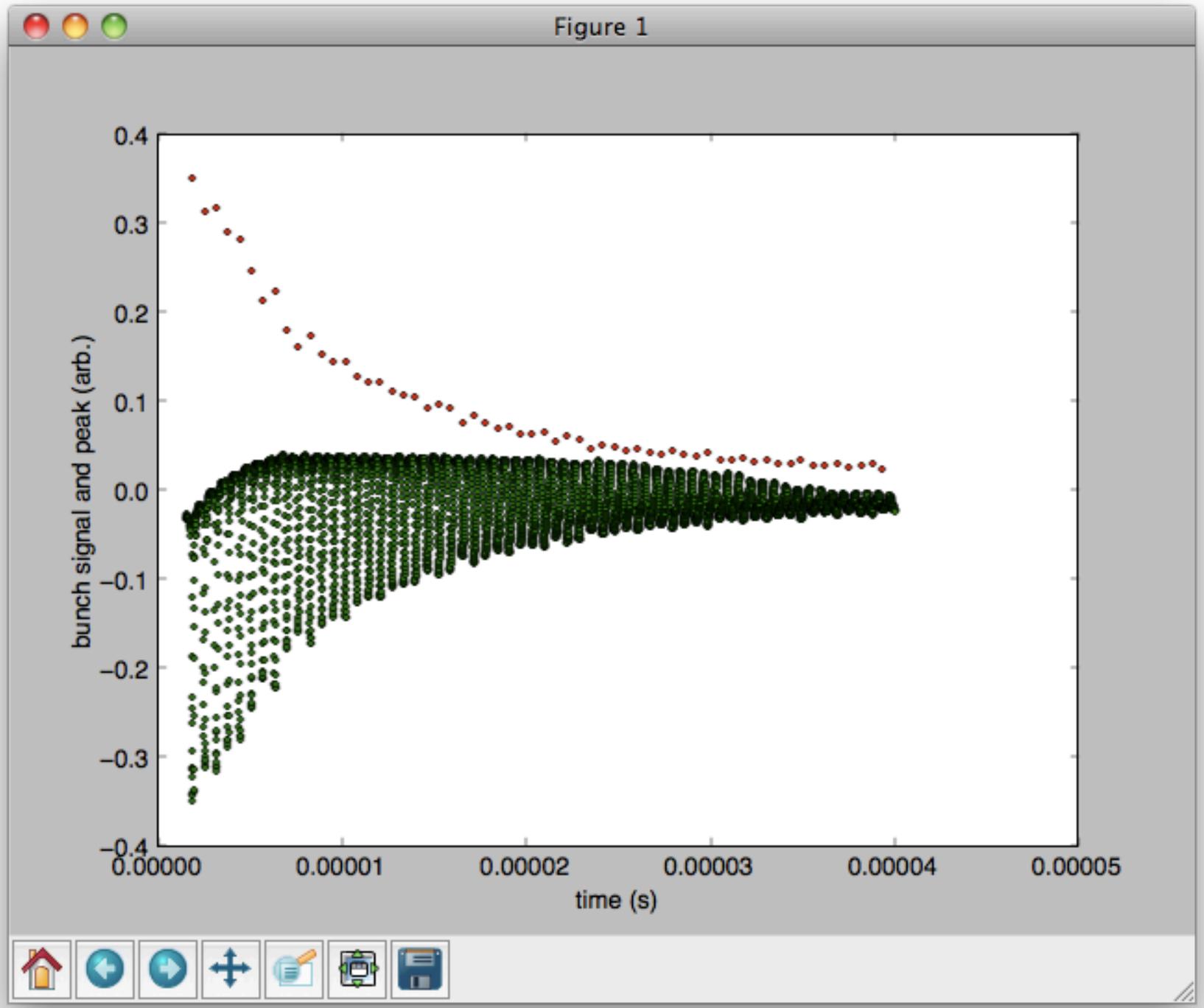
Raw data (black) and peak sampled (red)



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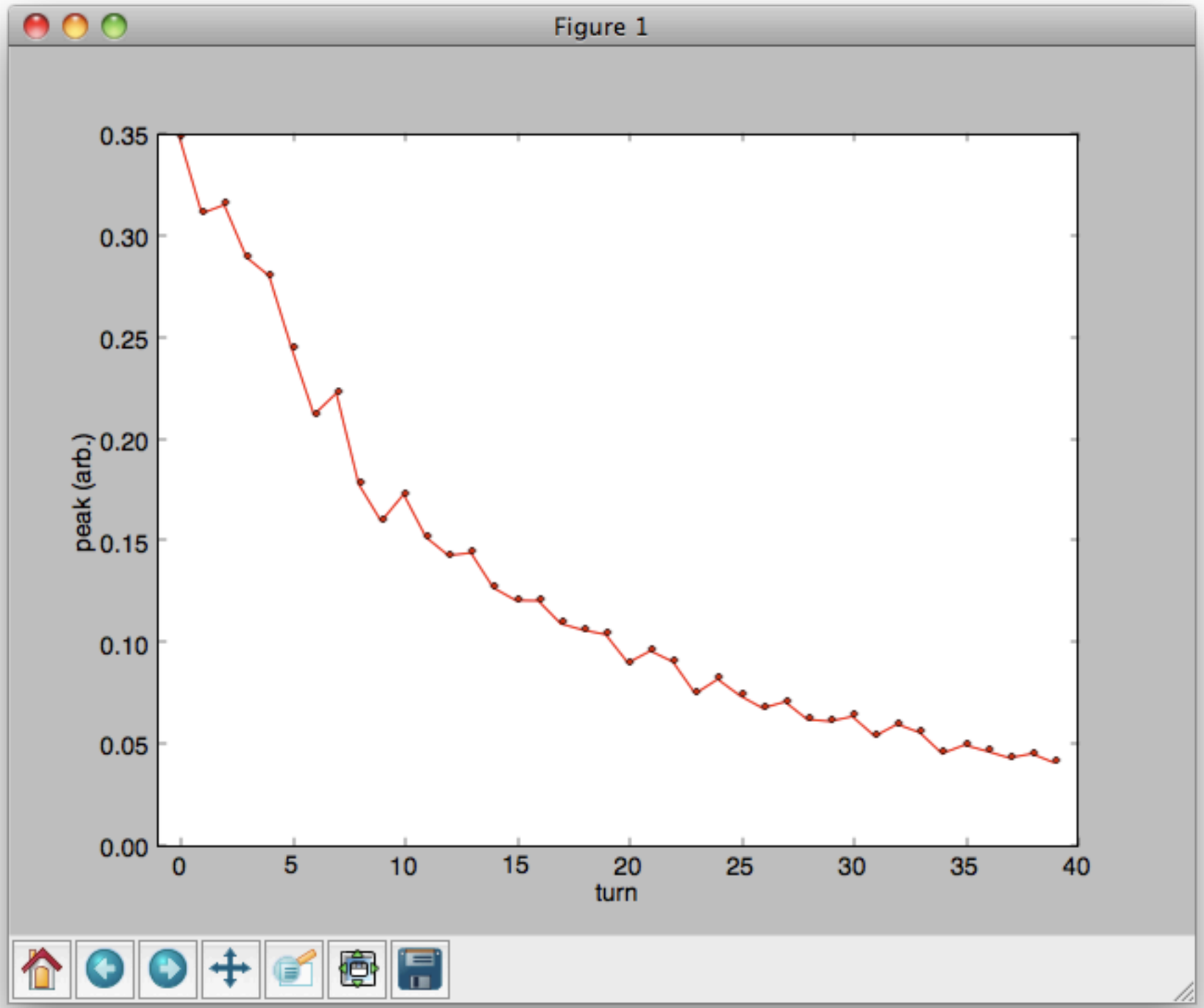
40 peak data from turn 0 to 39



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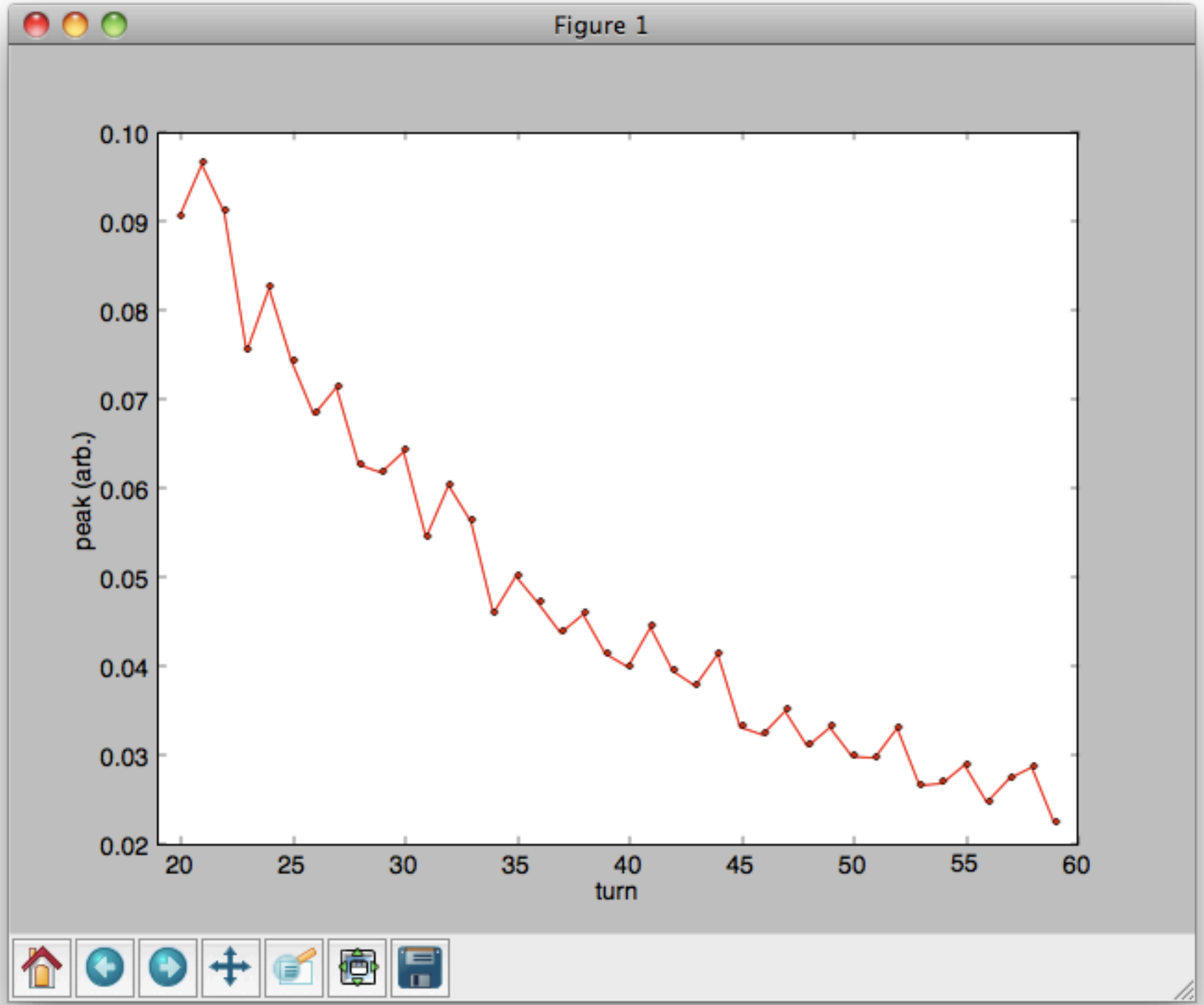
40 peak data from turn 20 to 59



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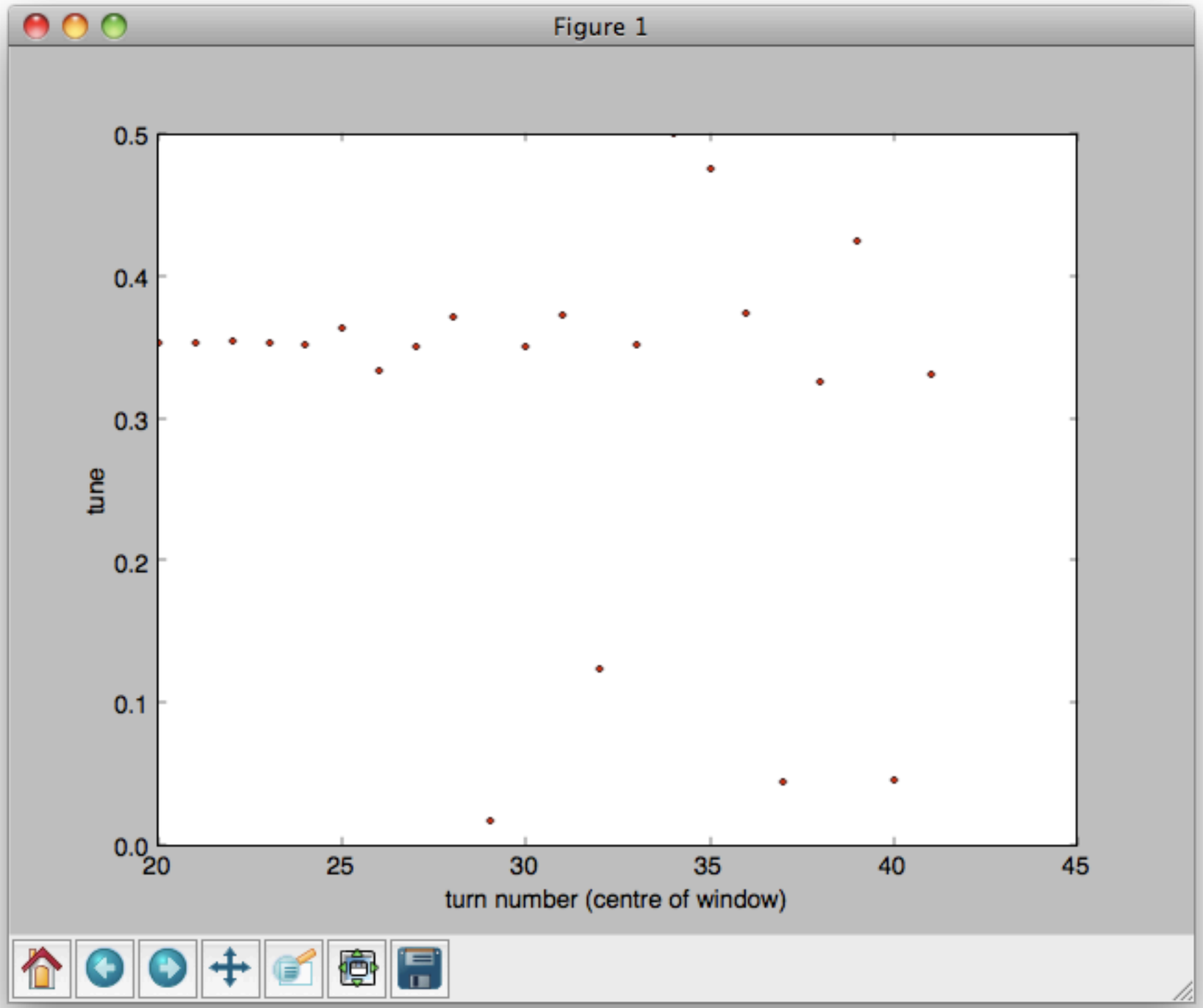
Tune vs turn (or each moving window when width is 40 turns)



← Qy=0.35

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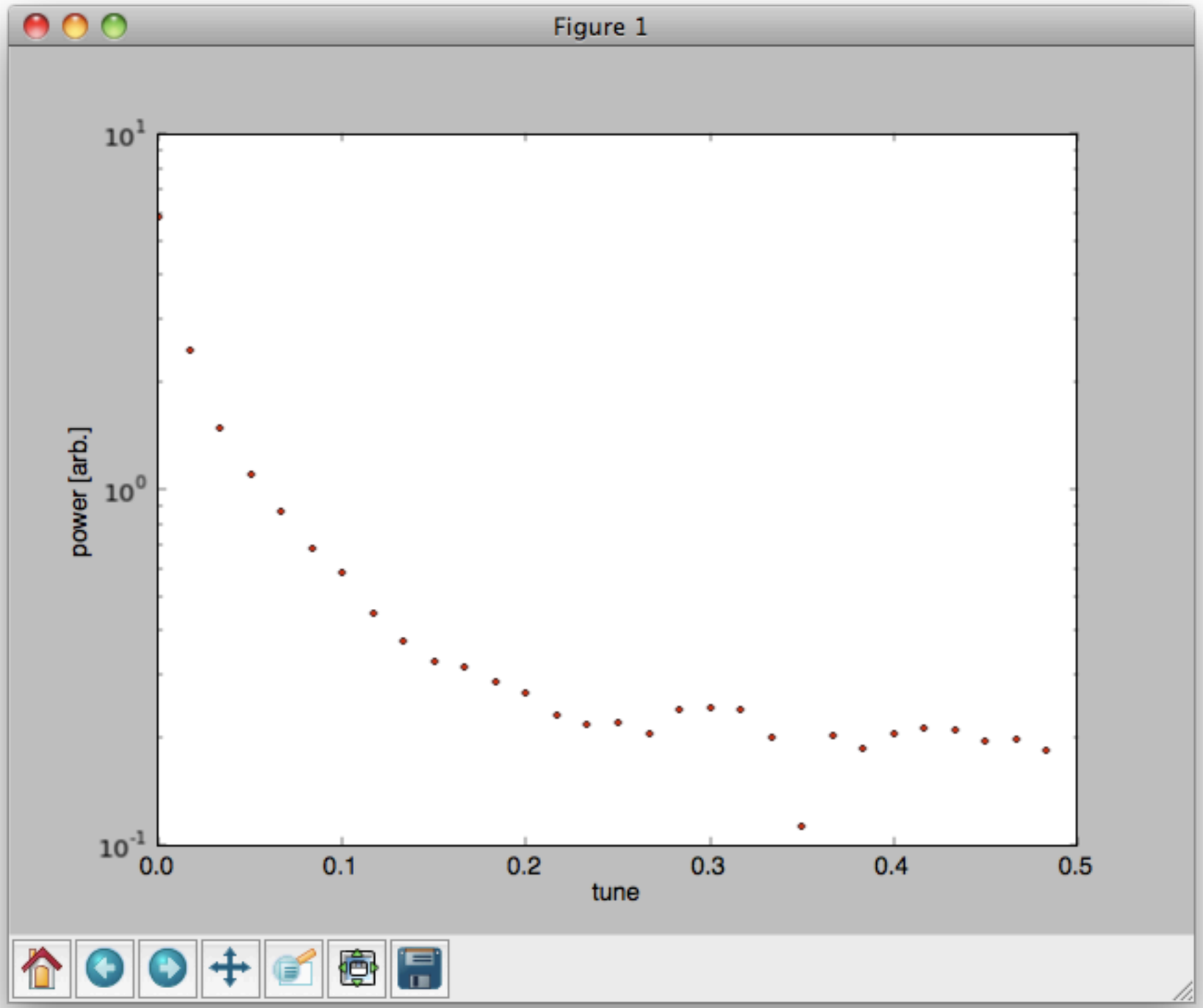
FFT of all the peak data as a comparison



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Dependence of window size (1)

- NAFF claims that tune resolution is proportional to 1/n^4.
- In practice, tune estimate depends on window size.
- Wide window (large sampling n) does not necessarily give more accurate result.
- Nevertheless, next page shows tune at the early turn is around 0.35 - 0.36 in any case.

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Dependence of window size (2)