

Biases in CNC analysis

Most important update : Now strictly using white noise.

Notation

q —> SNR

Ideal —> Refers to noise variance being known i.e. $\langle \sigma^2 \rangle$

AK —> (**A**ll **K**nown) Size & location is assumed perfectly known

SK —> (**S**ize **K**nown) Size of the cluster is assumed perfectly known

LK —> (**L**ocation **K**nown) Location of the cluster is assumed perfectly known

NK —> (**N**o **K**nown)

Semi-ideal —> Noise realization known

Real —> Totally blind matched filtering analysis

Real iterative —> Real + estimated signal subtraction

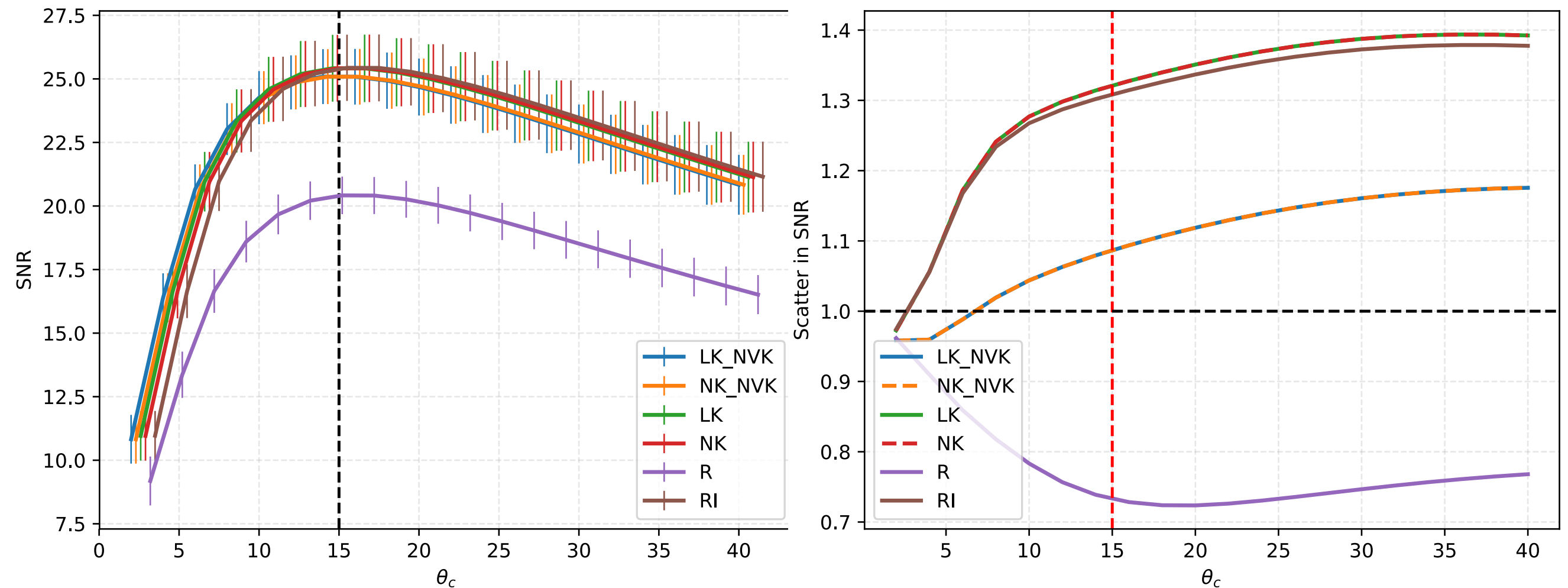
d.o.f —> 0 for AK, 1 for LK, 2 for SK, and 3 in all other cases

Some details to bear in mind:

- In most likelihood analyses, the noise covariance needs to be measured from data.
- In MF analysis, the case is no different. Note that the noise covariance depends on measurement noise as well as subtle foreground details, which in principle may only be measured once you have the data.

MF behaviour

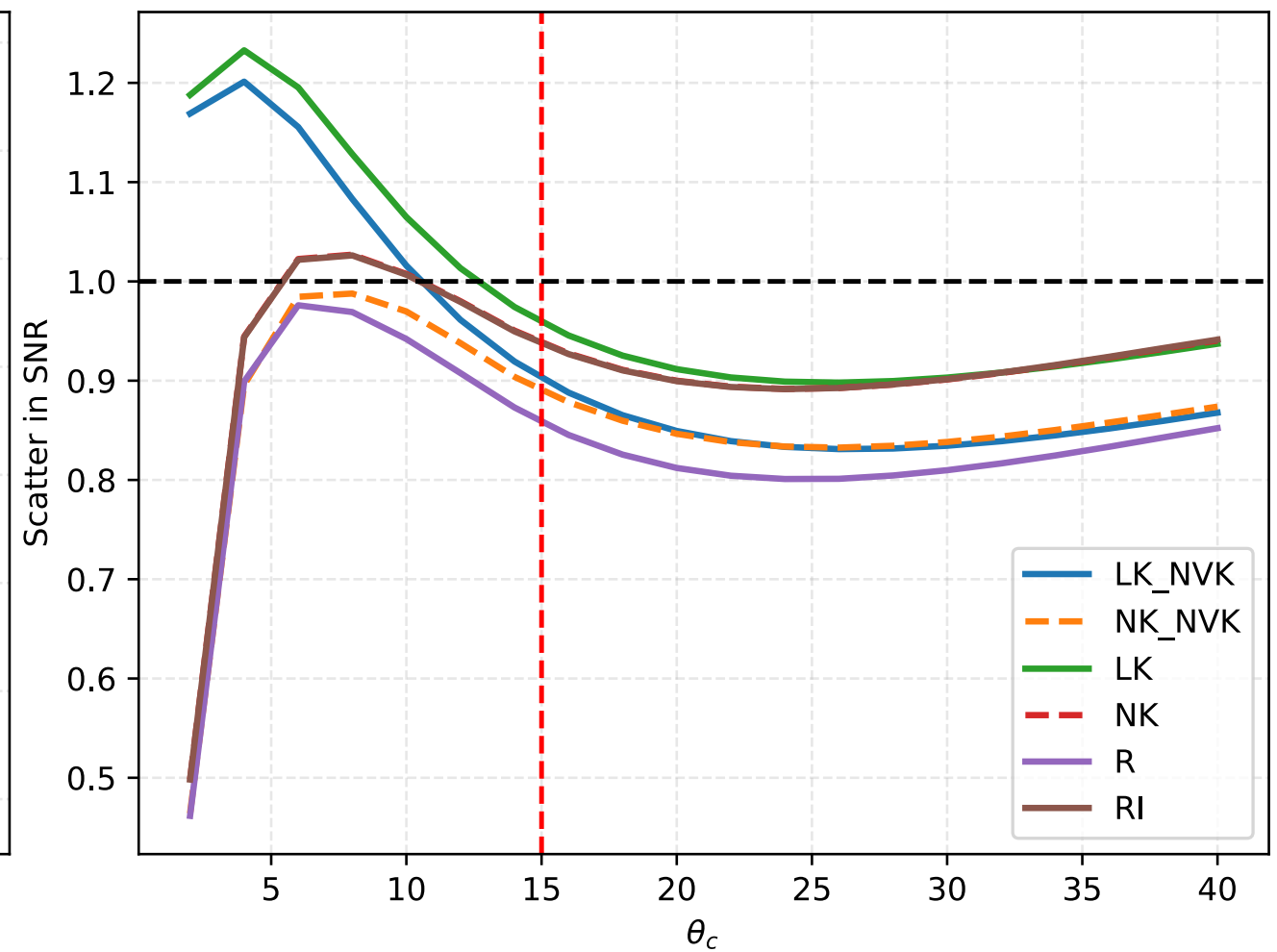
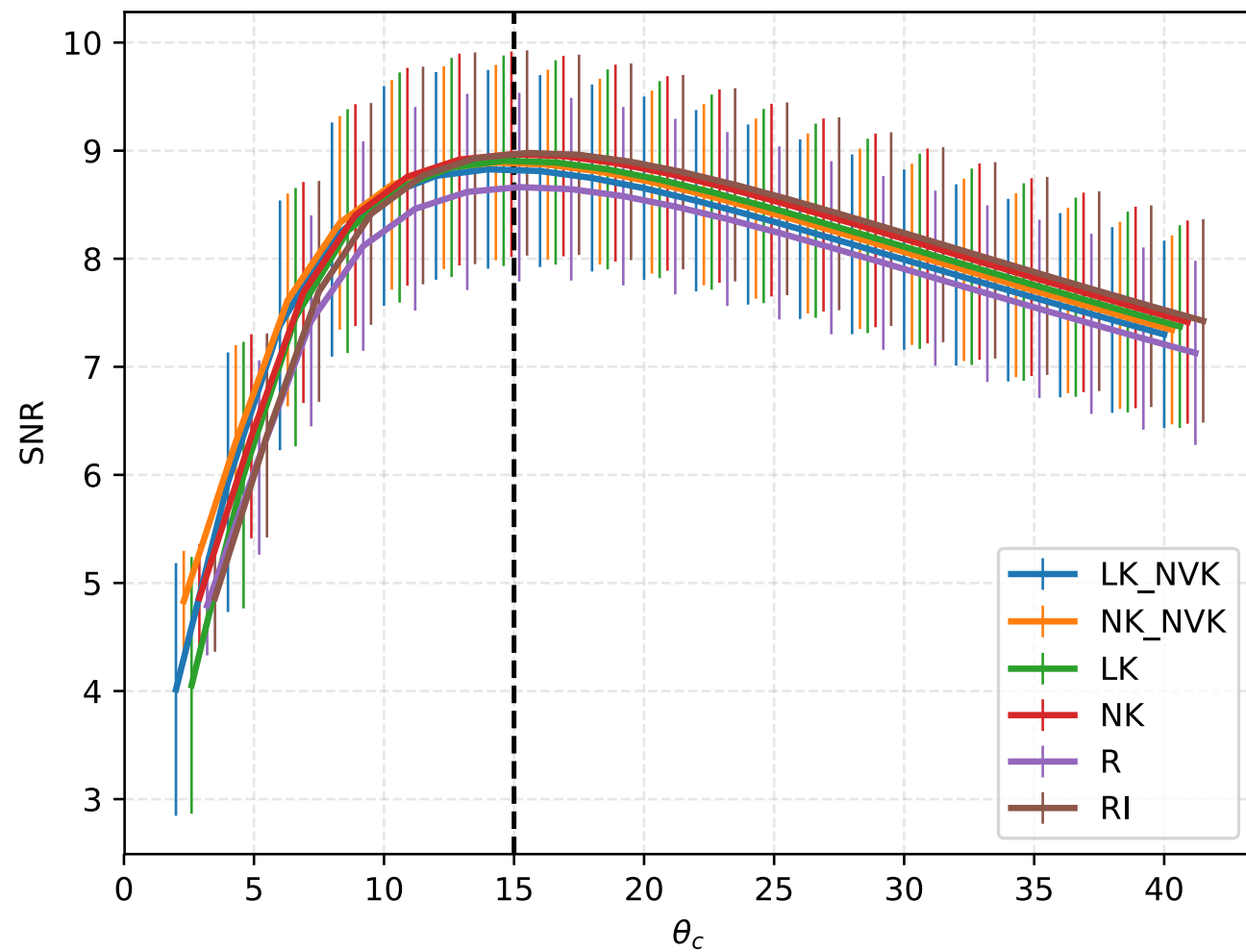
q~25 cluster



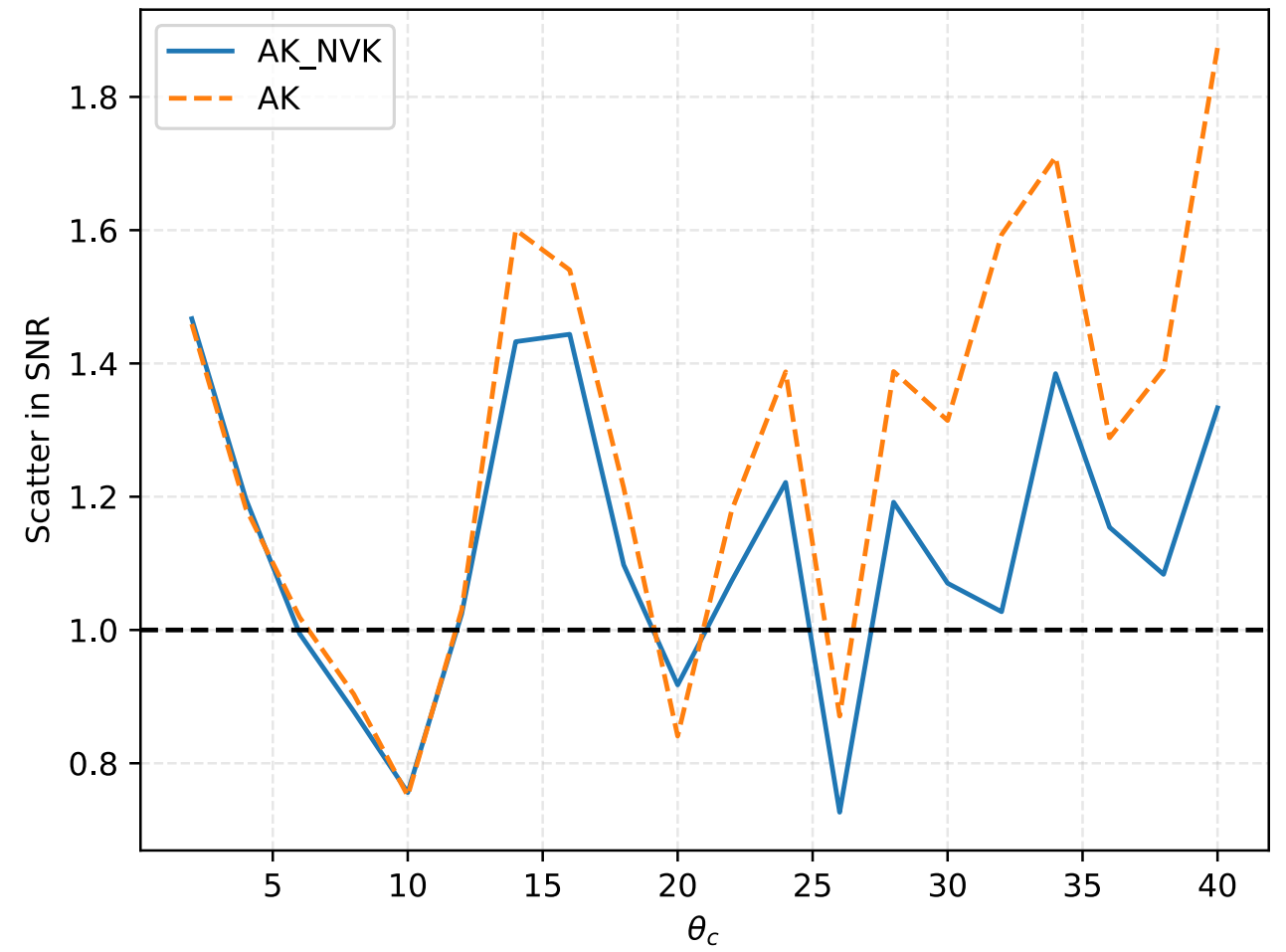
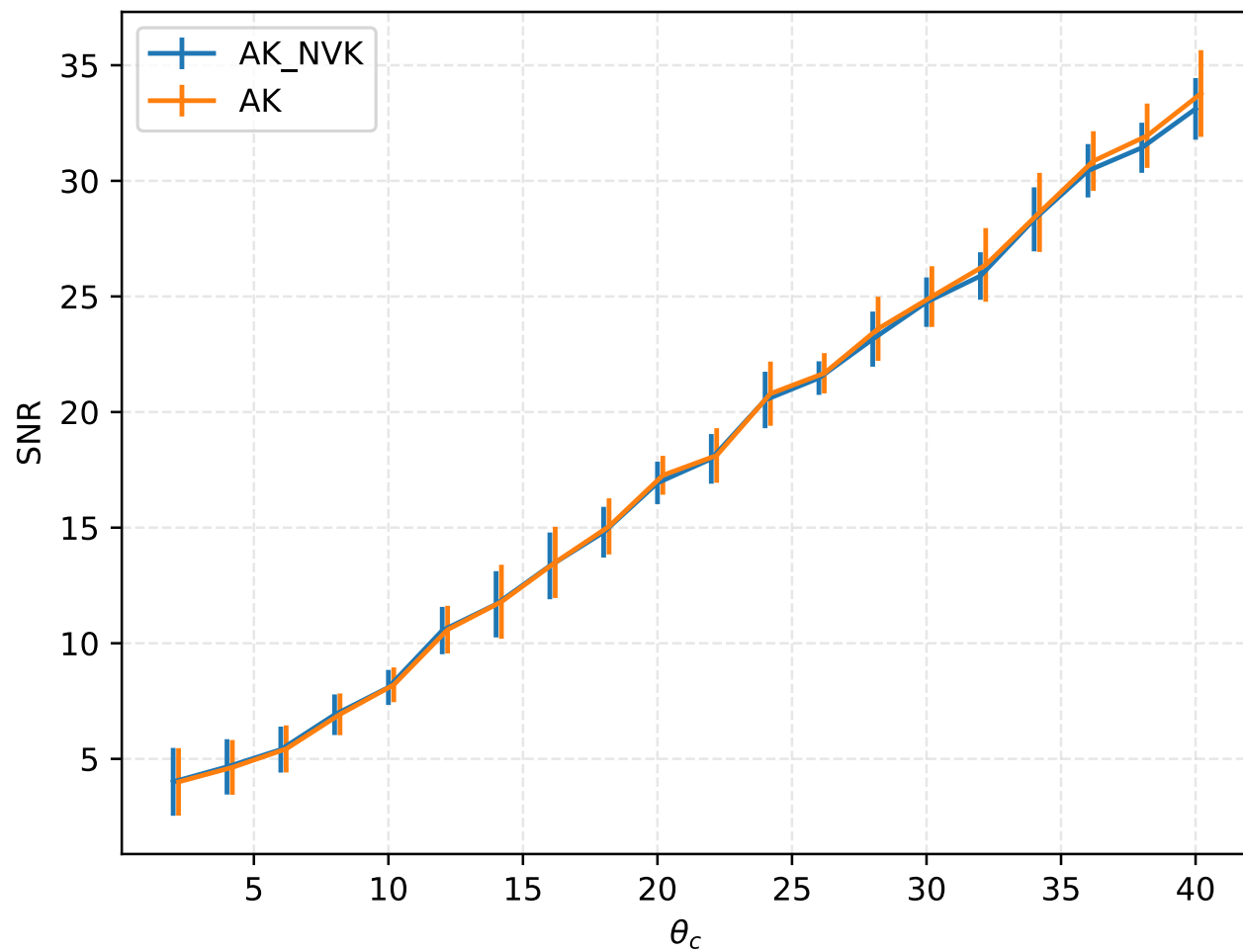
- When optimizing for parameters, the SNR scatter is not consistent with unity!
- High SNR clusters, can significantly bias the true SNR estimates.
- Iterative procedure yields the true SNR (though current demonstration is for a single cluster in the field. In practice there are likely to be multiple clusters in the field.)

MF behaviour

q~5 cluster



MF SNR for AK case



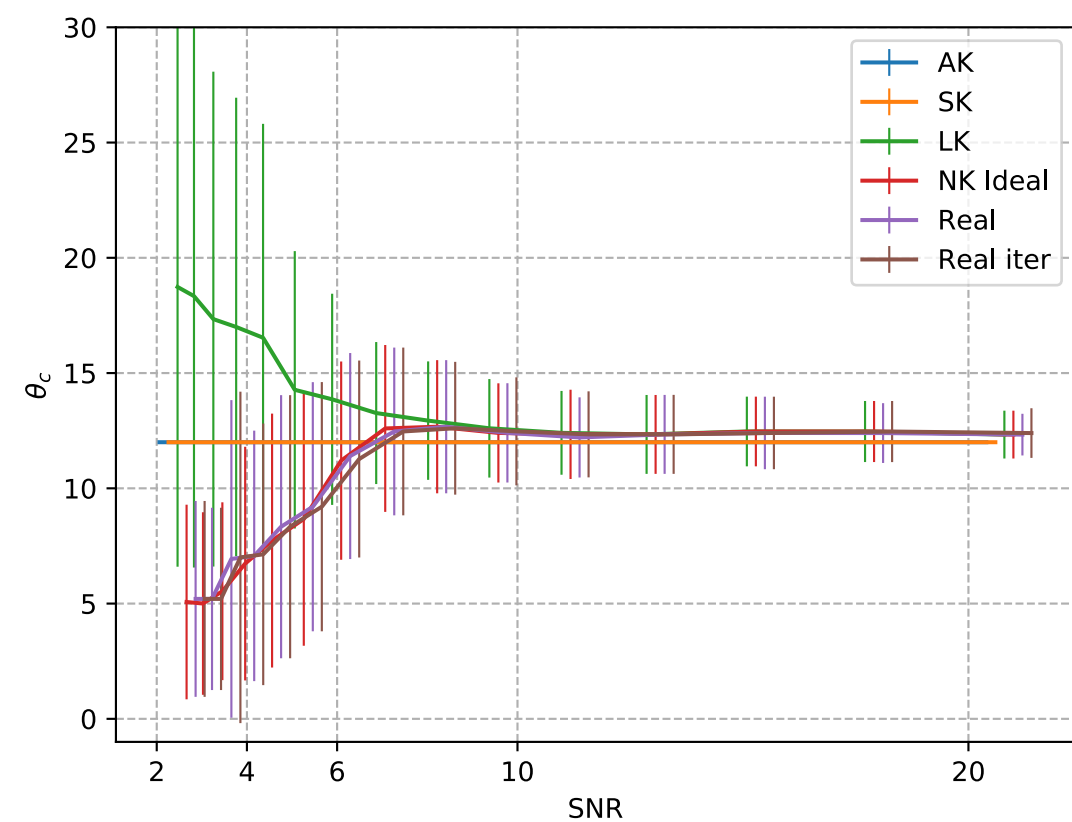
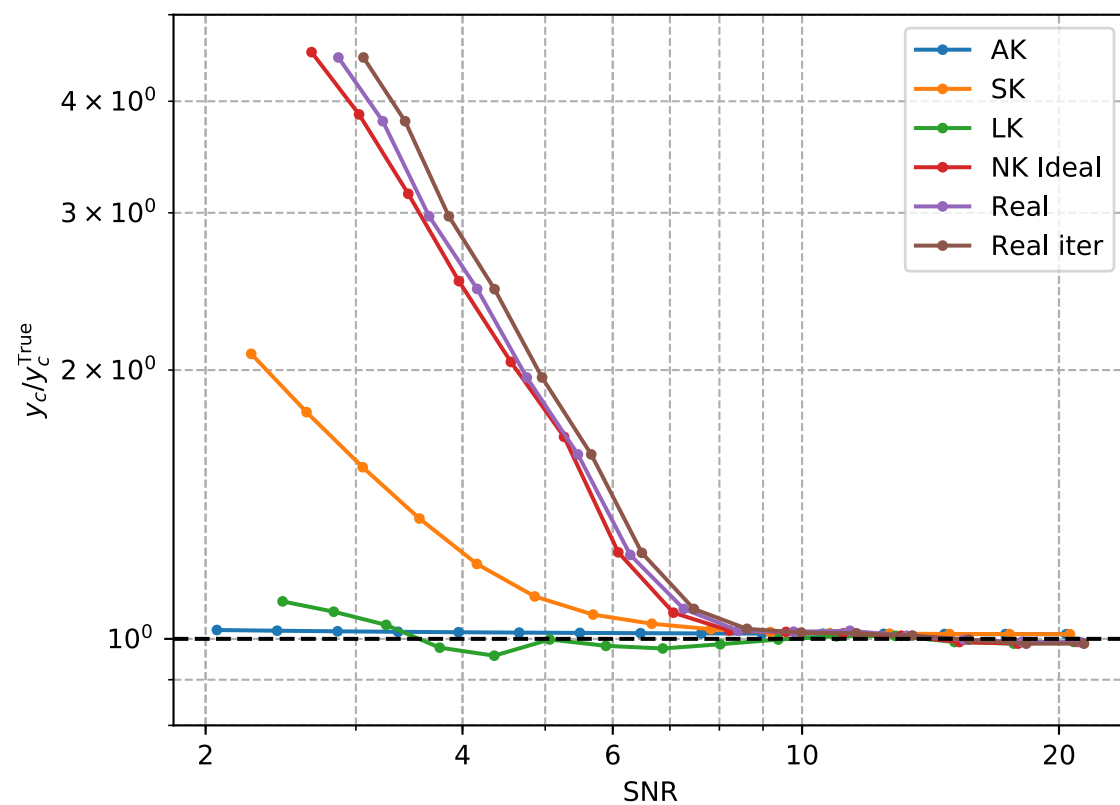
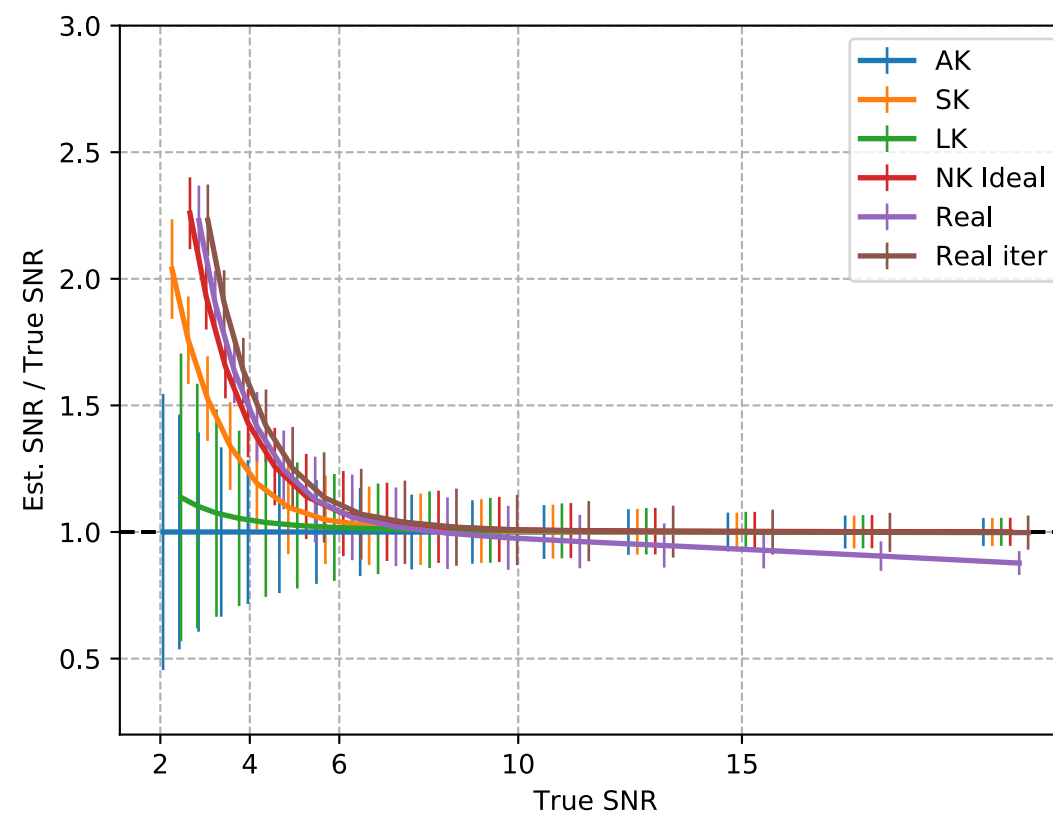
SNR scatter consistent with unity ? - seems so (need more nrlz)

Biases

$\mathbf{q}, y_c, \theta_c$

Averaged noise variance known

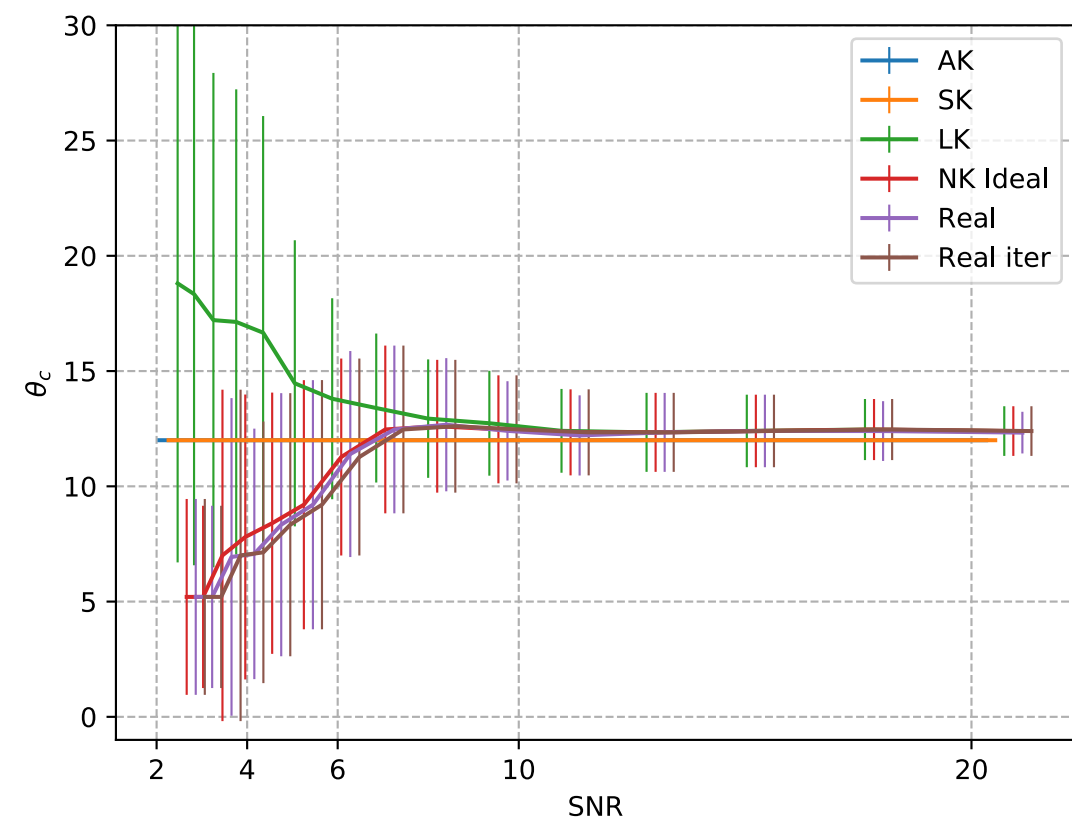
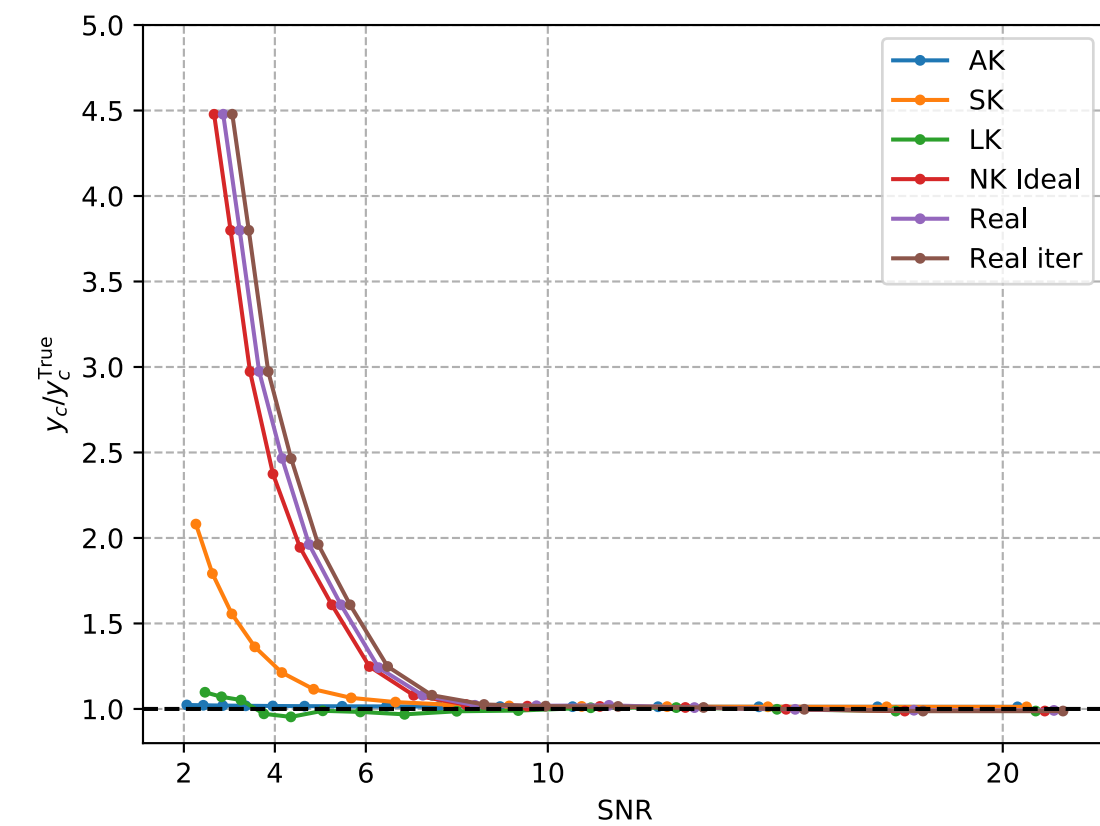
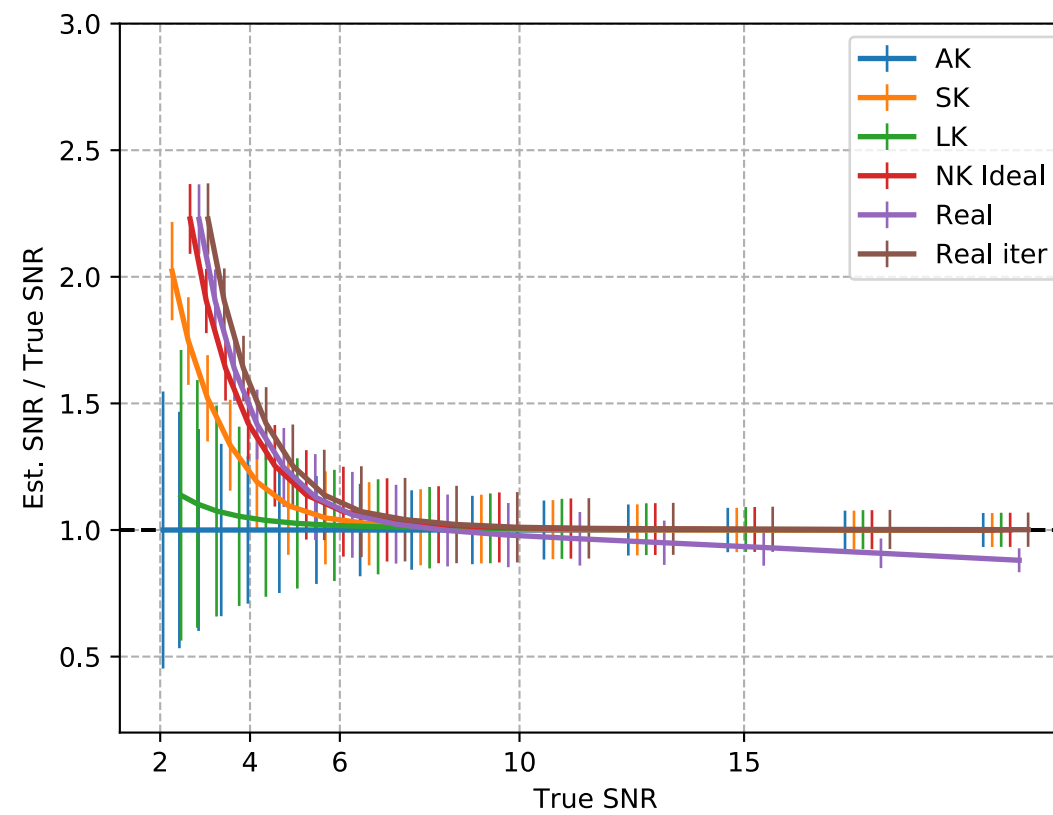
(relevant only to ideal analysis)



$\mathbf{q}, y_c, \theta_c$

Noise realization known

(relevant only to ideal analysis)



Comment:

- LK inconsistency with true SNR now smaller as compared to SK.