

2015/12/14

B-mode from space

Systematic error analysis

for LiteBIRD

LiteBIRD error budget

Statistical

Foreground

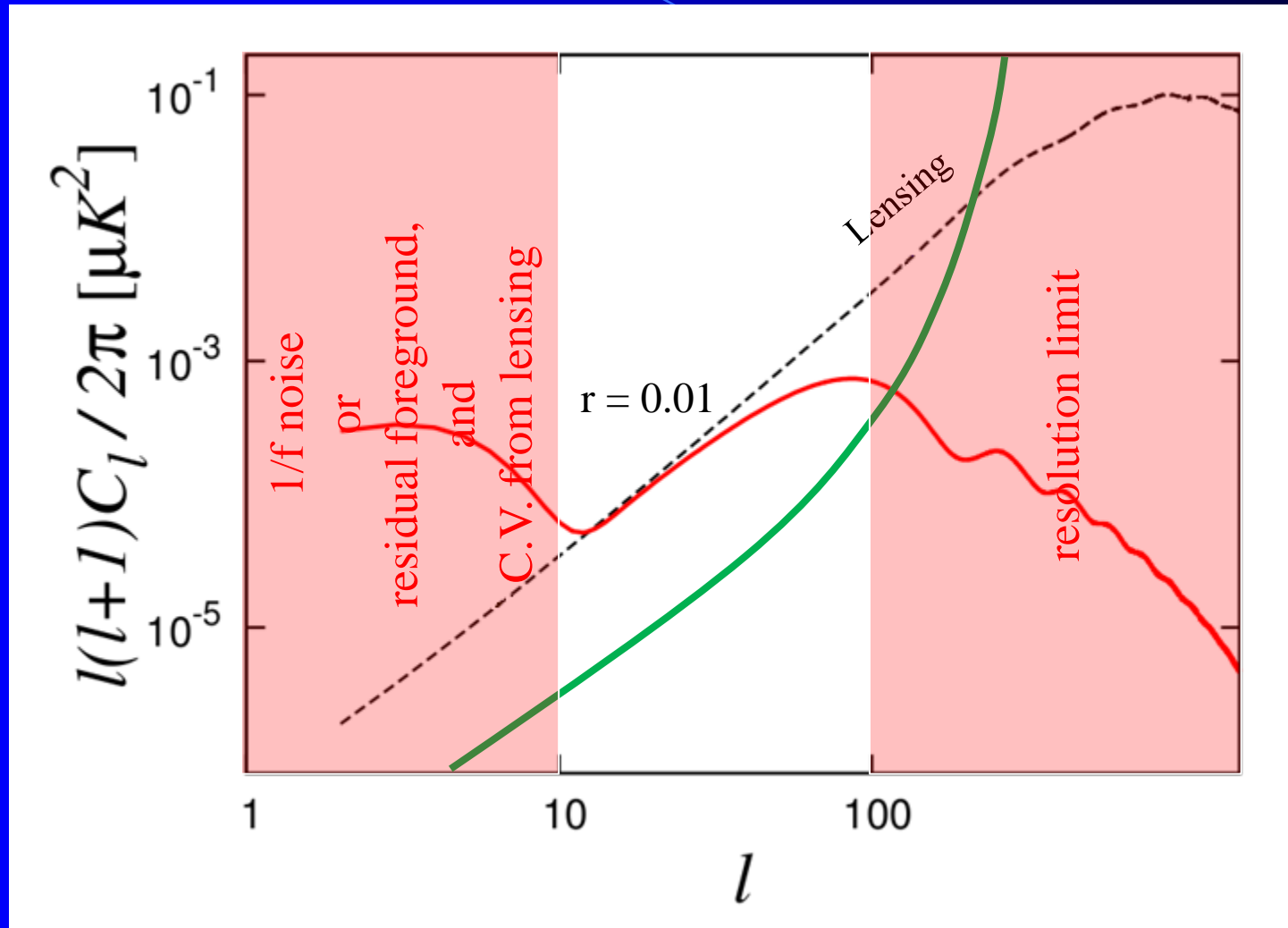
Lensing

Systematic

A diagram showing four error budget components in colored rounded rectangles: Statistical (red), Foreground (purple), Lensing (teal), and Systematic (green). A central blue circle with two curved arrows indicates a covariance between the Statistical and Foreground components, labeled with the equation $\delta r < 0.001$. A thin blue line connects the title to the Foreground box, and a blue arrow points from the Foreground box towards the bottom right.

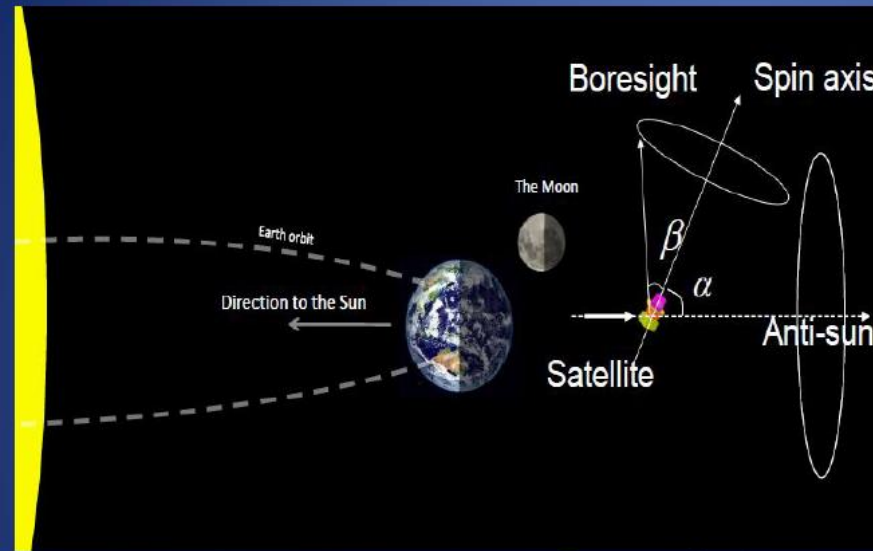
$$\delta r < 0.001$$

By rule of thumb



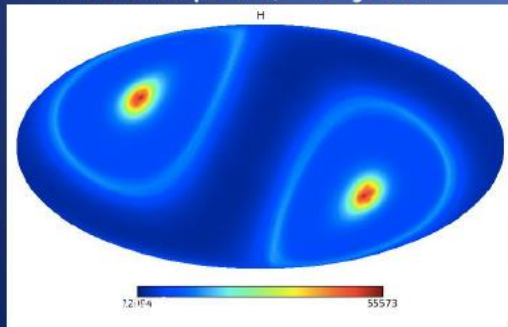
Scan

All sky survey @ sun-earth L2

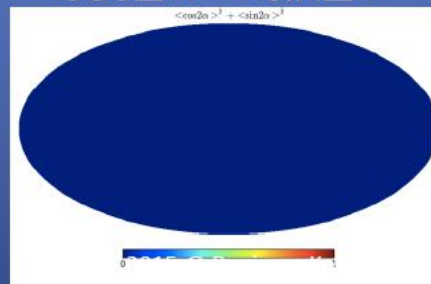


- avoid sun, decrease cross-link
 - $\alpha = 65$ degs.
 - $\beta = 30$ degs.
- Precession : 90 min.
- Spin rate : 10 min.
- Data rate : 160 kbps
- Telemetry : X-band

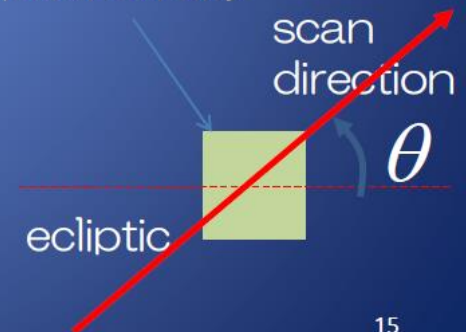
Hit map w/ 1 year



Cross-link
 $= \langle \cos 2\theta \rangle^2 + \langle \sin 2\theta \rangle^2$



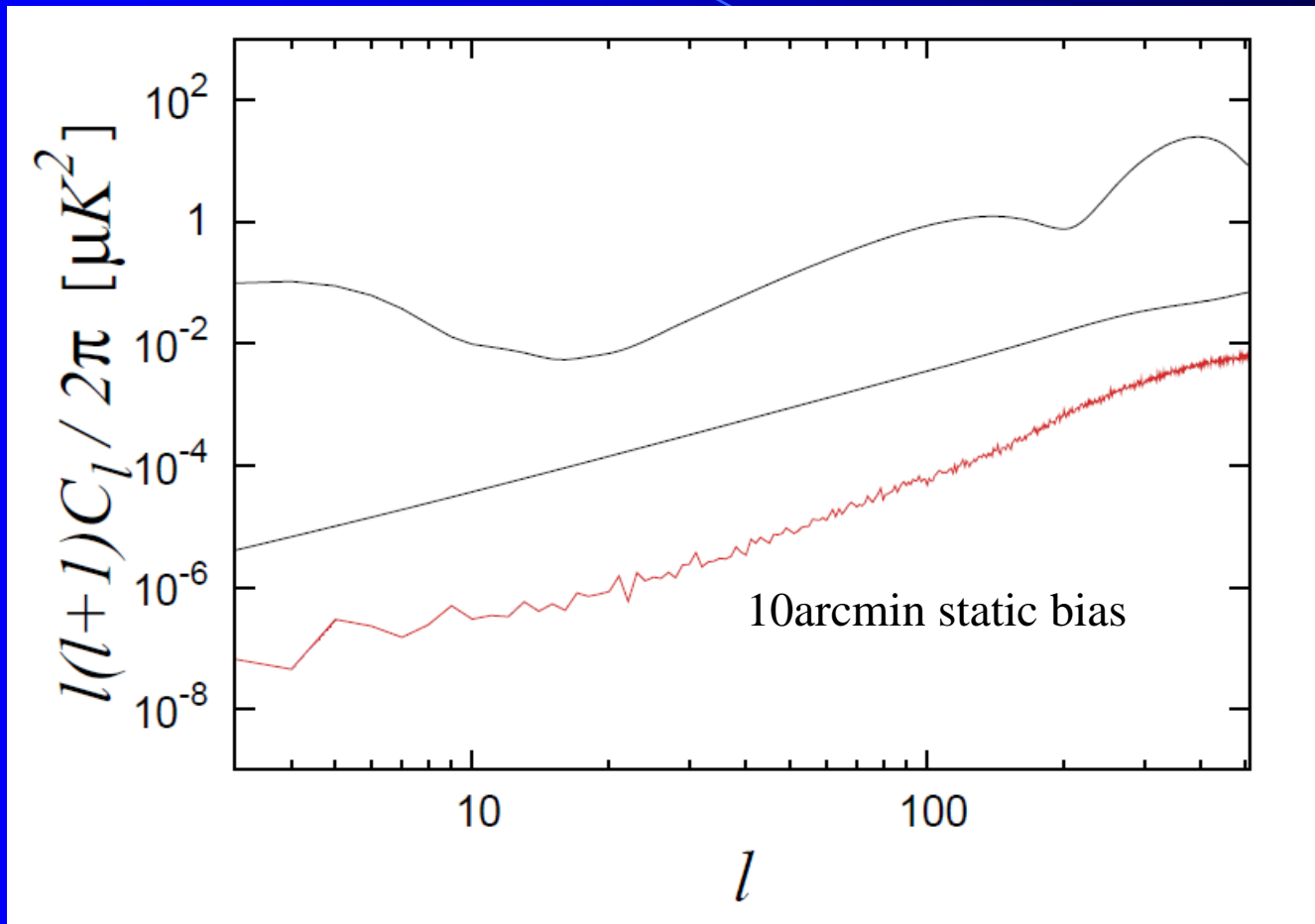
a pixel on sky



15

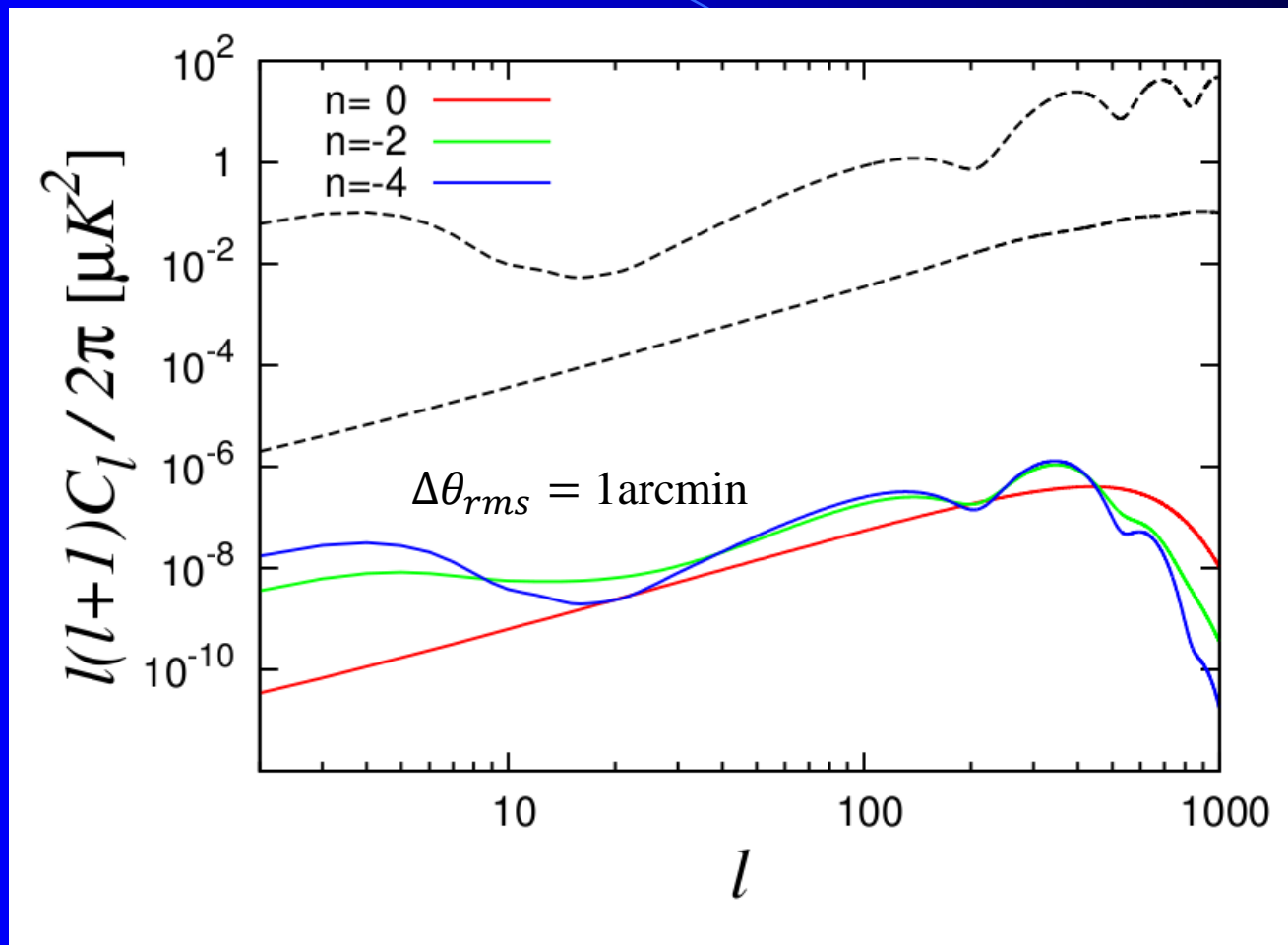
from H.Ishino's slide of COSPA2016

Pointing knowledge



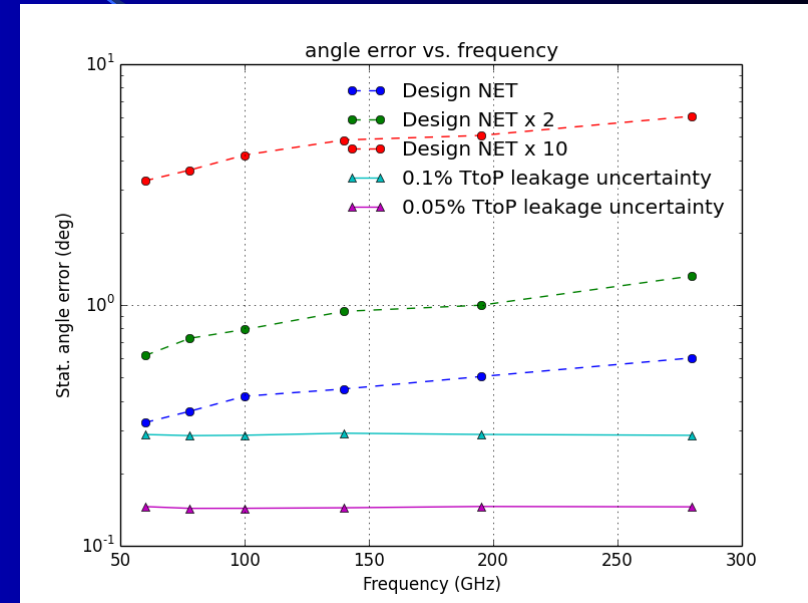
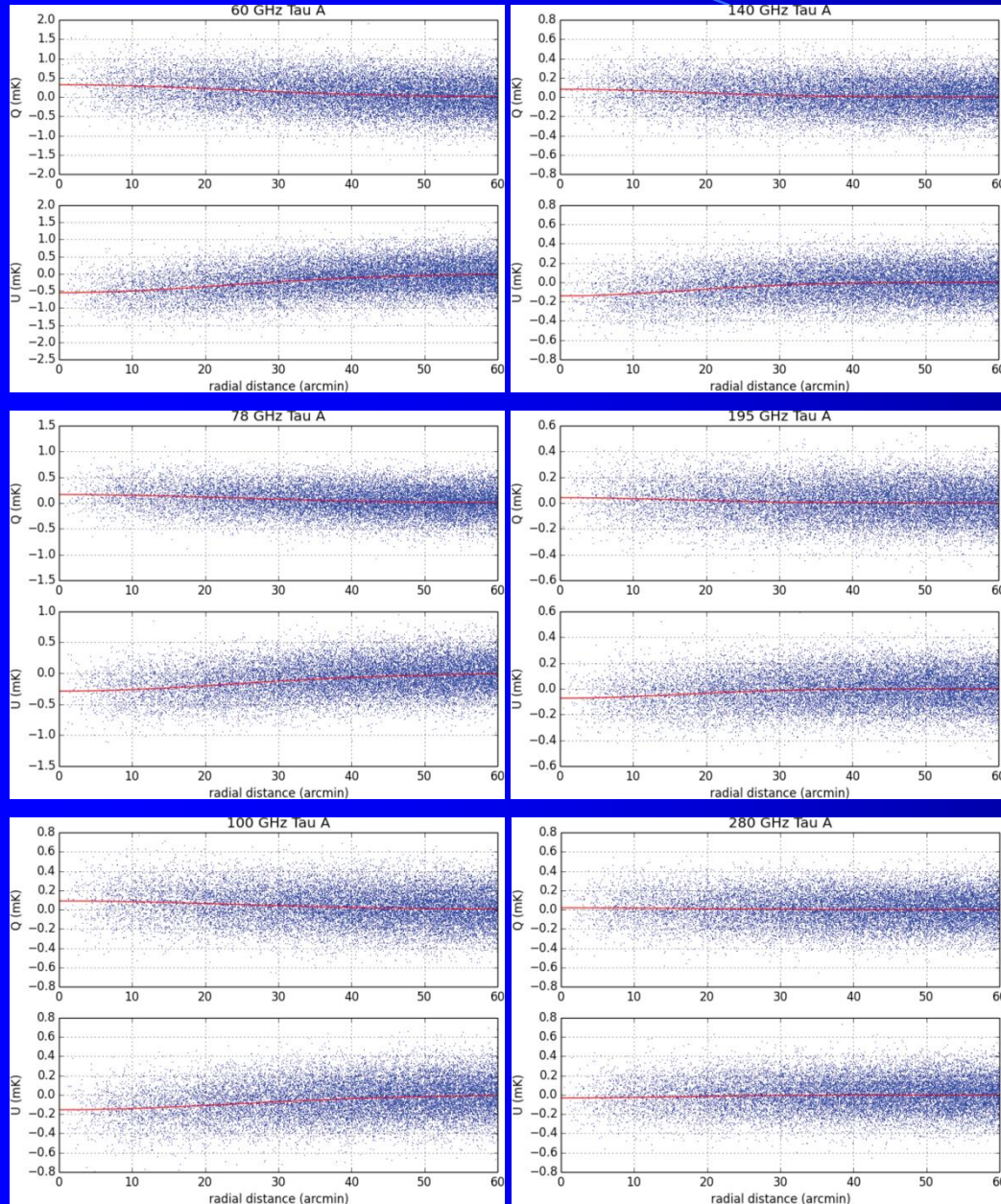
Current status: collecting information of error power spectrum

Polarization angle



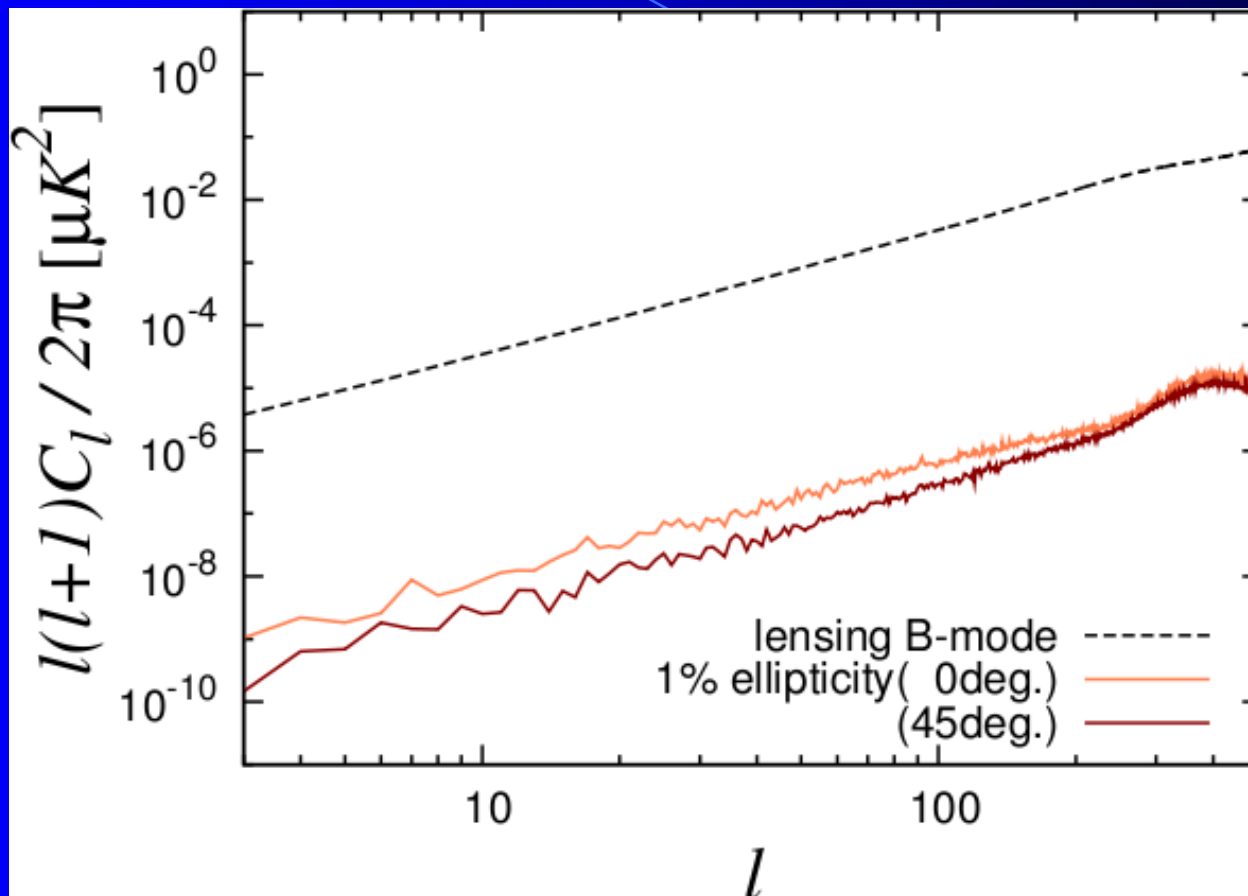
Current status: collecting information of error power spectrum

Some speculation about angle calibration



simulation by H.Nishino

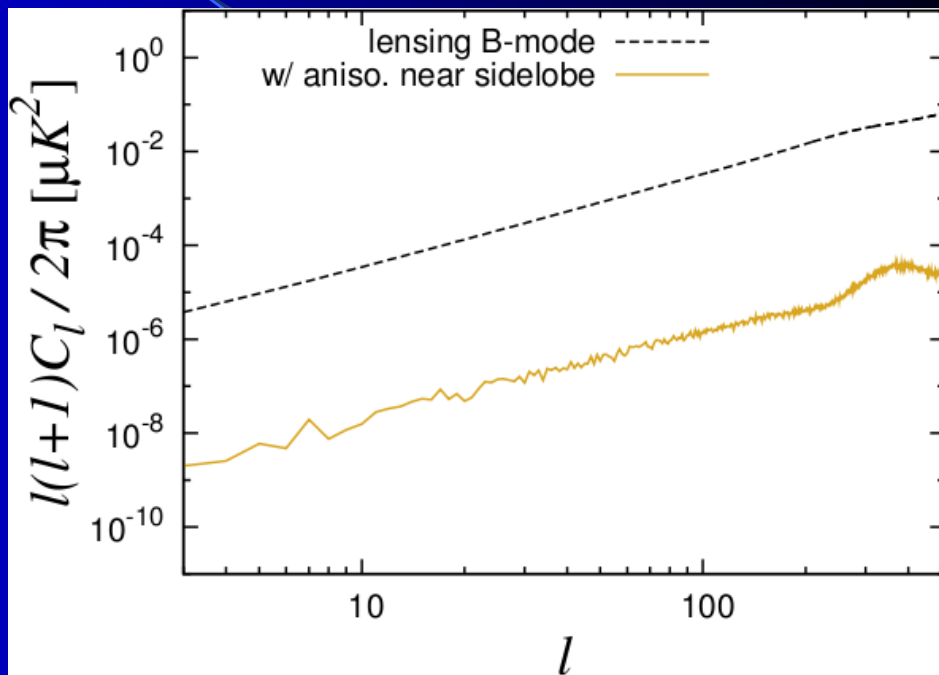
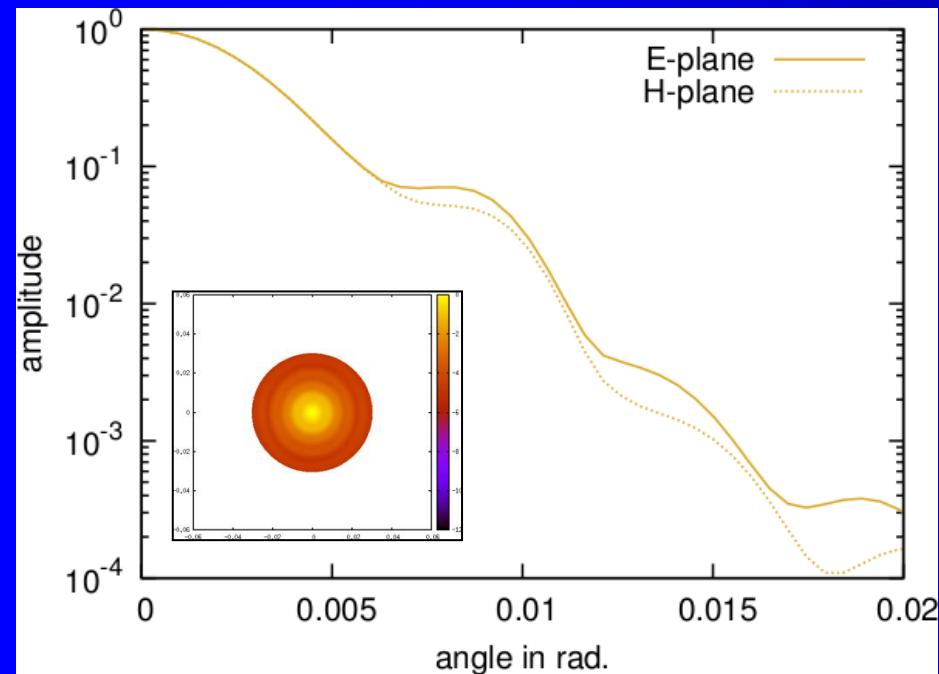
Mainbeam anisotropy



Current status: practical beam simulation
& calibration planning

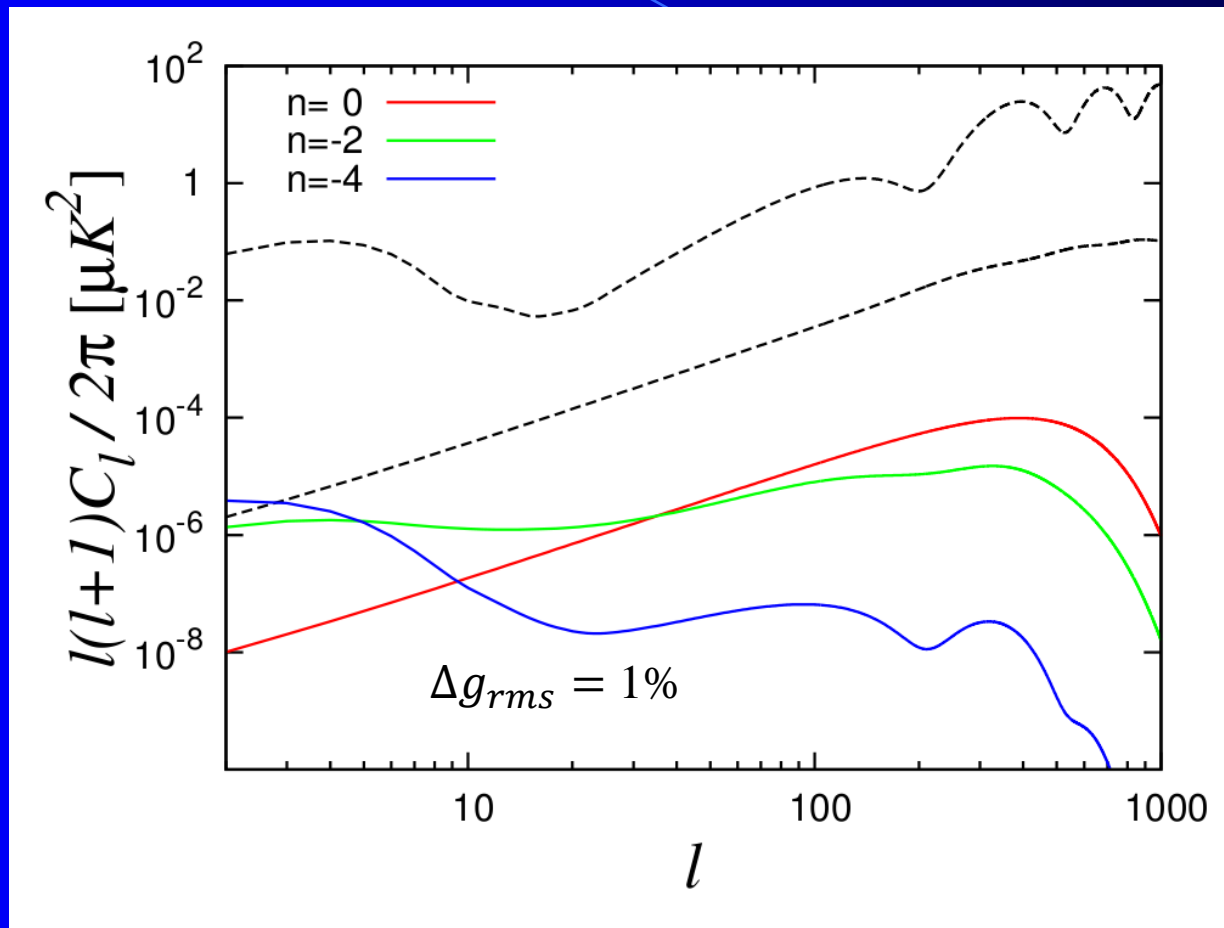
Near sidelobe anisotropy

A beam model simulated by NAOJ



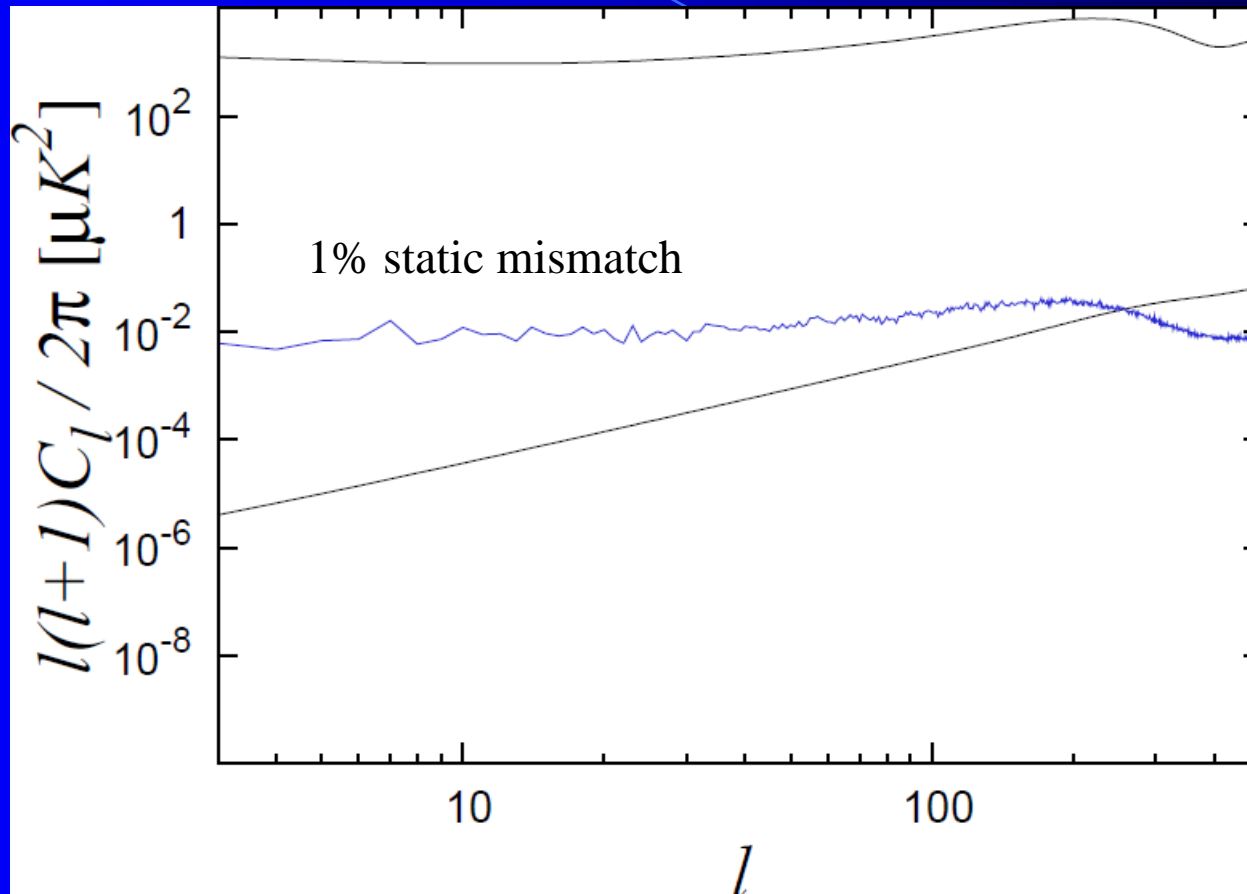
Current status: calibration planning
& inclusion of far sidelobe effects

Absolute gain fluctuation



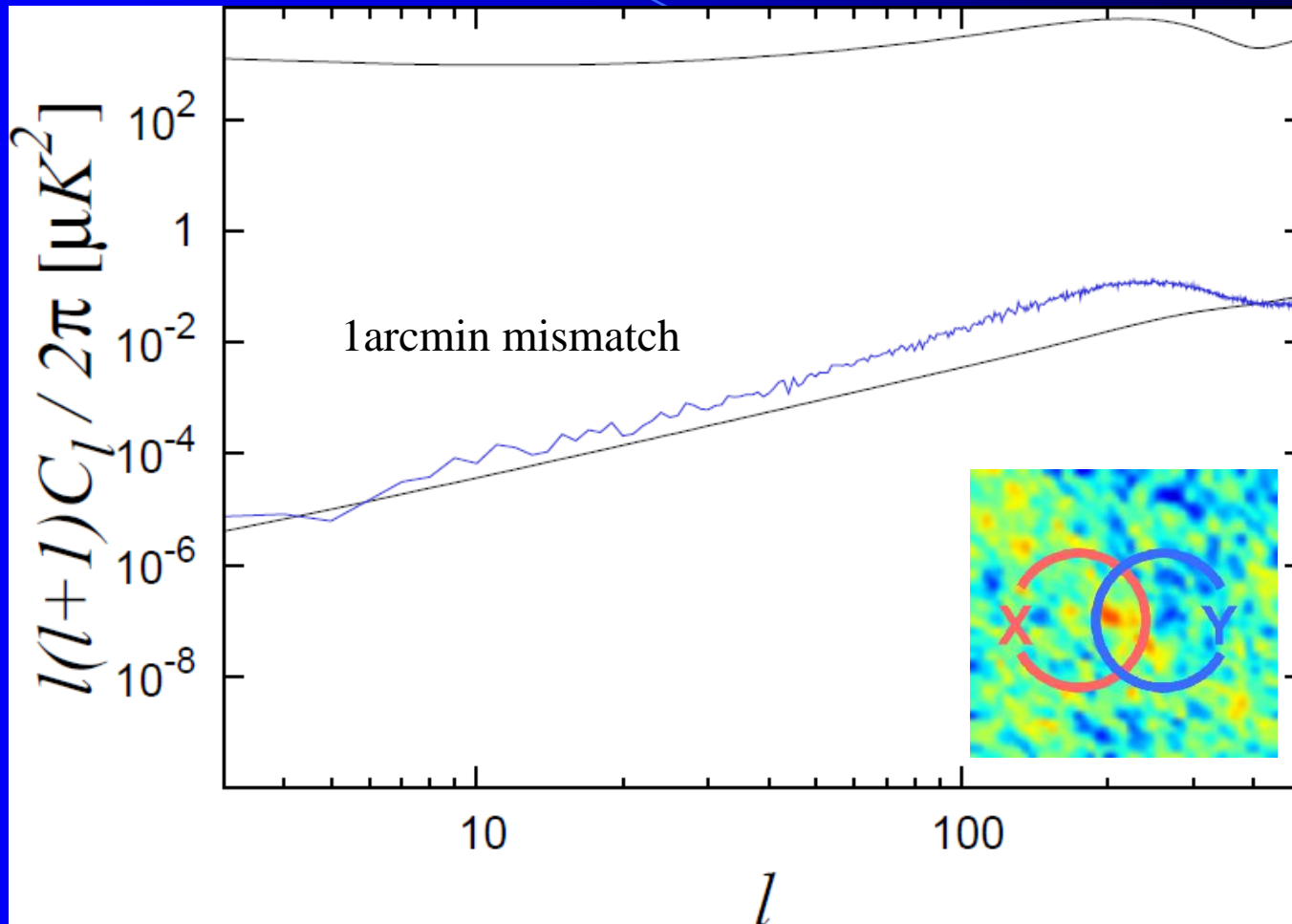
Current status: collecting information of error power spectrum

Gain mismatch



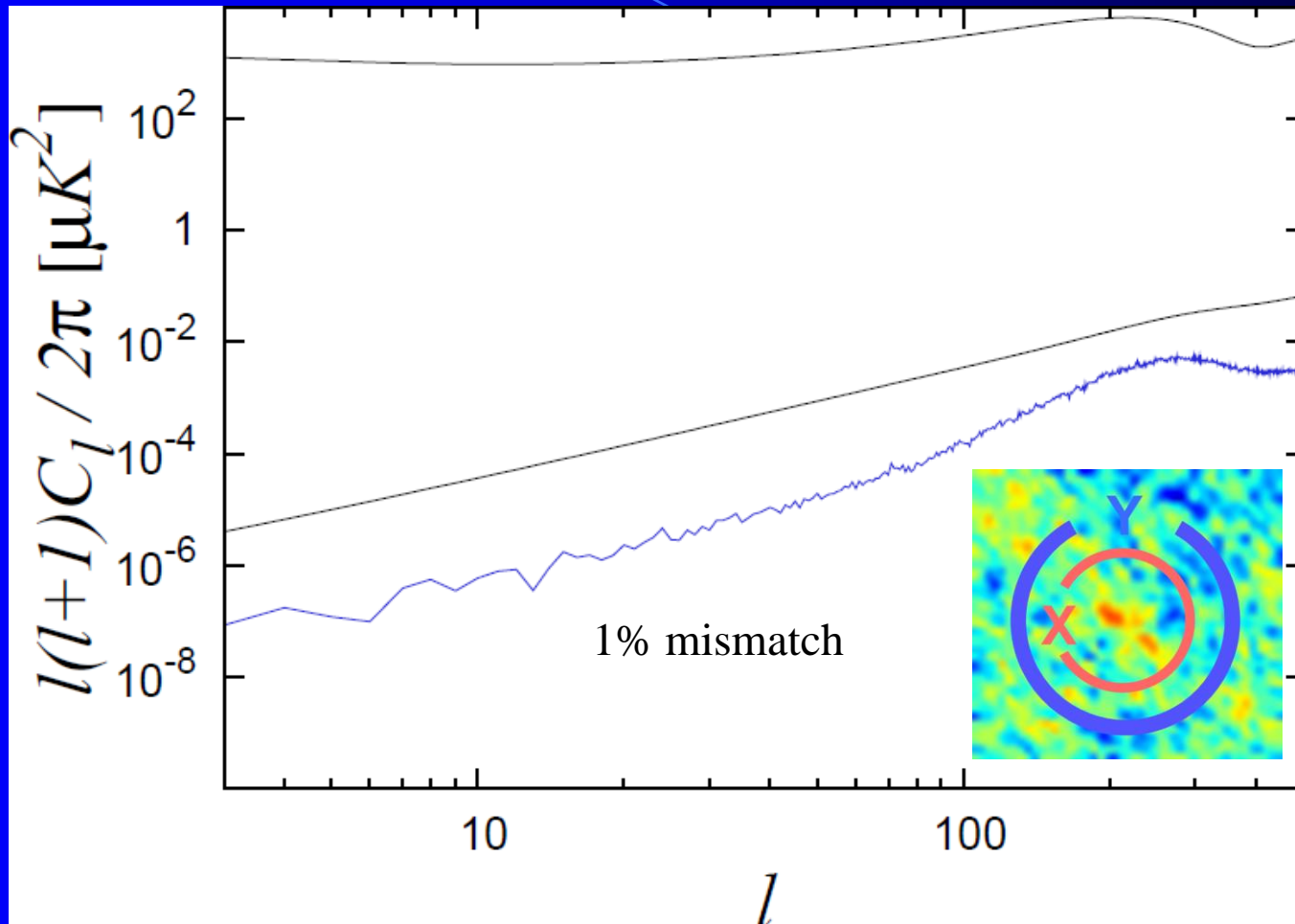
Current status: collecting information of error power spectrum

Mainbeam mismatch - beam pointing -



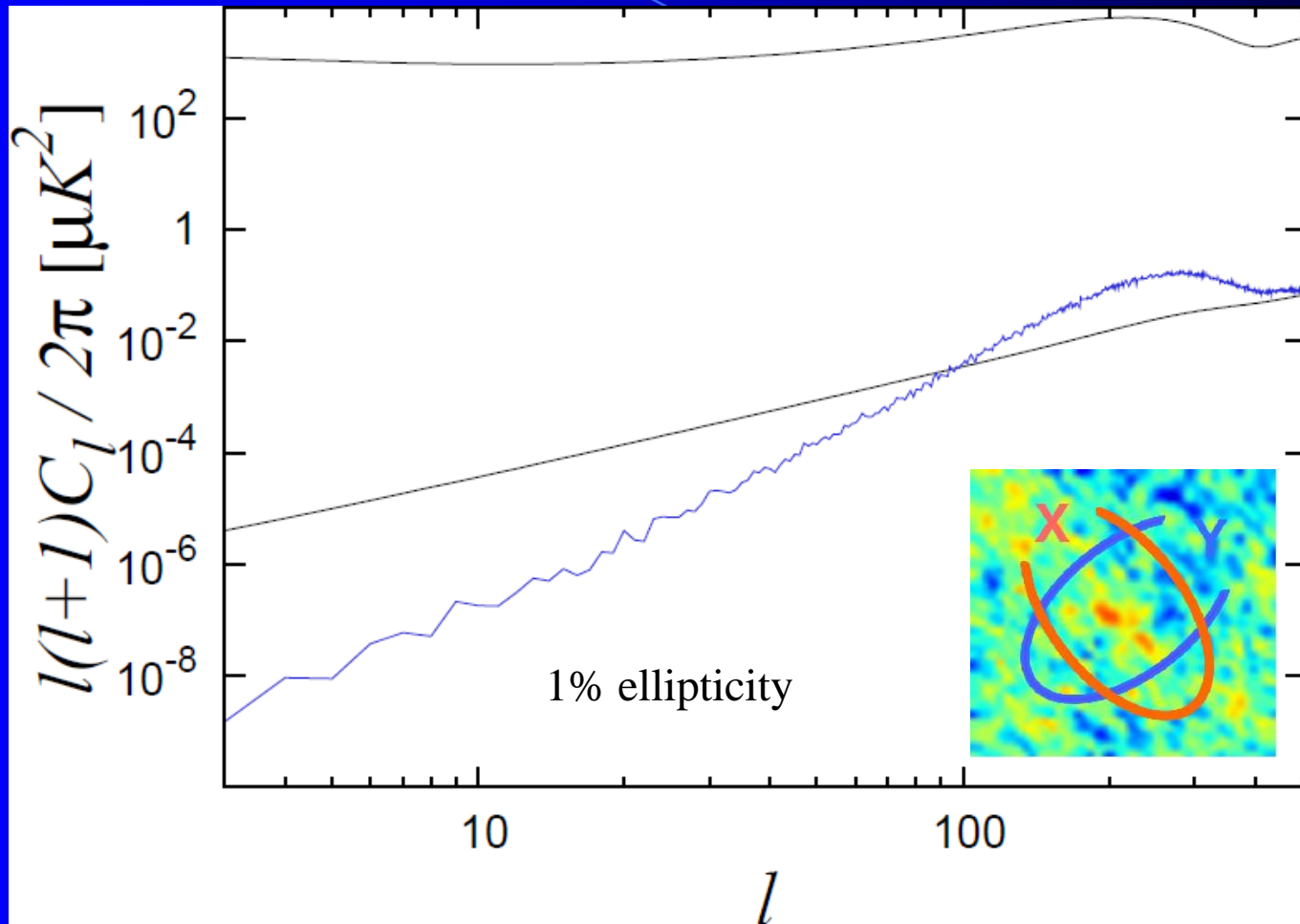
Current status: practical beam simulation
& calibration planning

Mainbeam mismatch - beam width -



Current status: practical beam simulation
& calibration planning

Mainbeam mismatch - beam ellipticity -

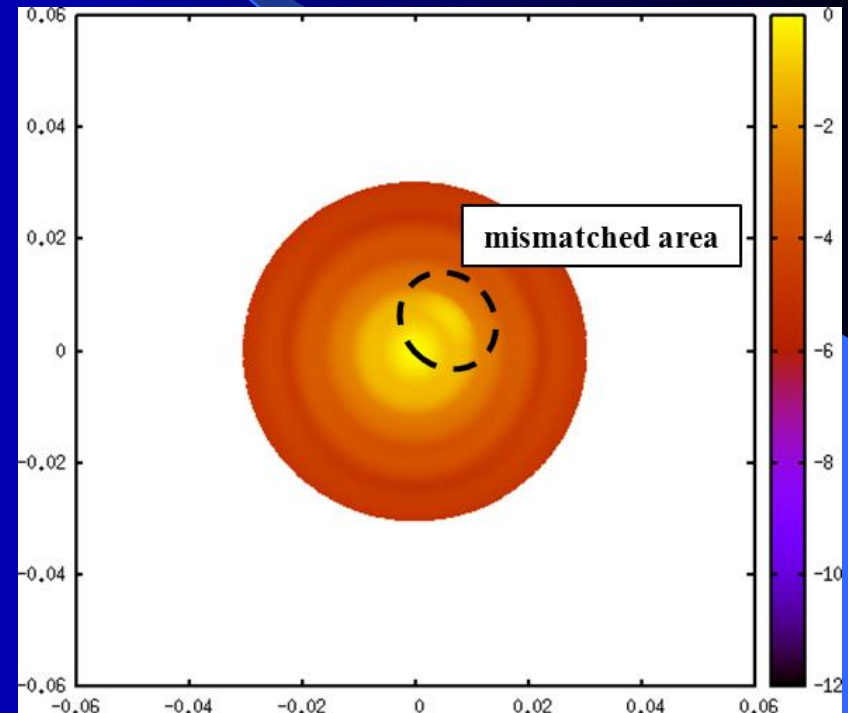
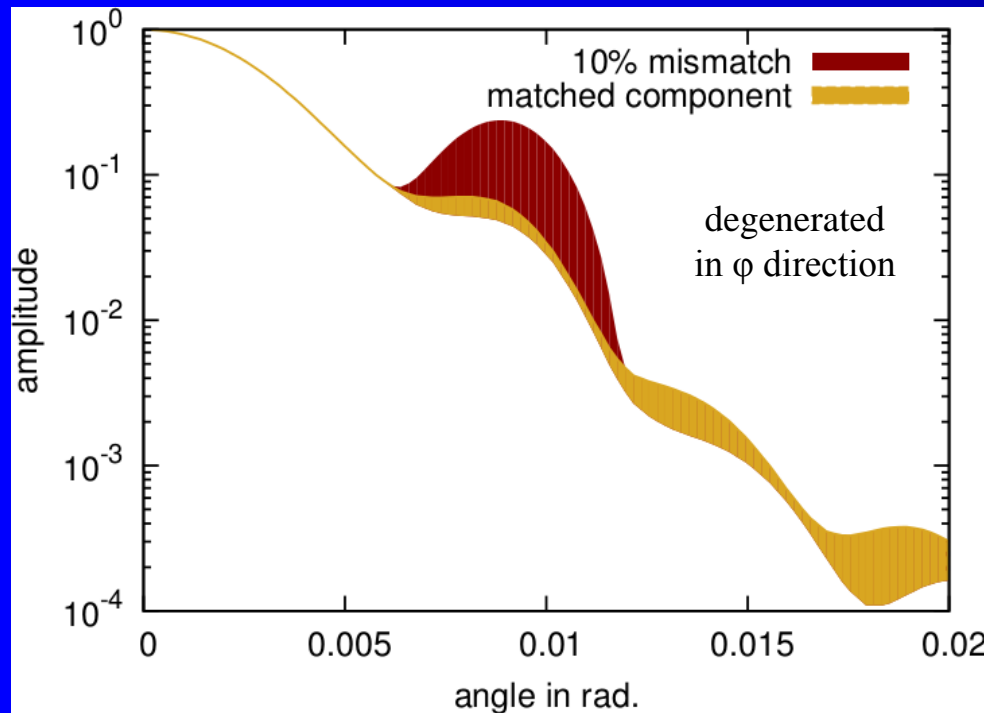


Current status: practical beam simulation
& calibration planning

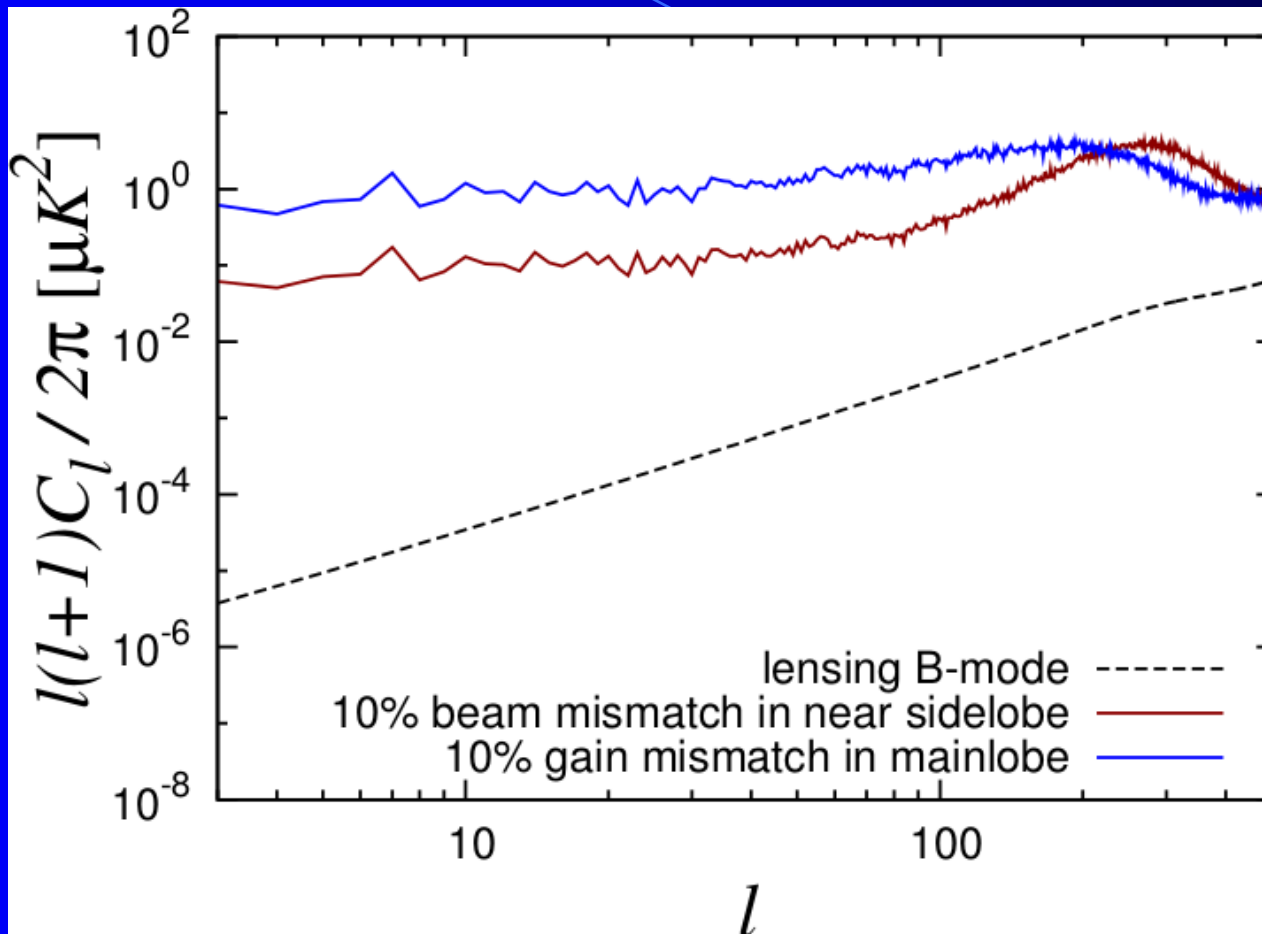
Near sidelobe mismatch

Test case

A mismatch localized in a part of near sidelobe



Near sidelobe mismatch



Current status: practical beam simulation
& calibration planning
& inclusion of far sidelobe effects

Summary

We started simulation analysis of systematic errors,
which include

- pointing offset, angle error, beam anisotropy of mainlobe and near sidelobe, absolute gain fluctuation,

and also include

- mismatch in gain, mismatch in beam mainlobe and near sidelobe.

Still we have so many tasks to complete before the next year's end.