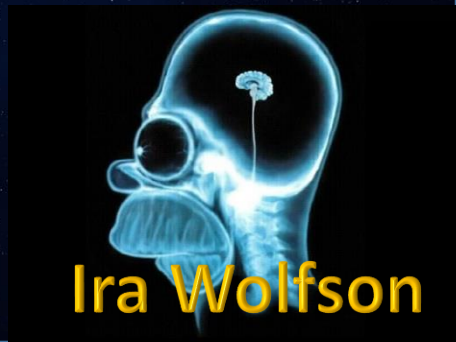
Ahead of the Hunt:

Small field models and GW – leading candidates

Ben-Gurion University of the Negev



Ira Wolfson

Motivation

The hunt for Primordial Gravitational Waves

- Alternatives to large field models.

- Fundamental Physics?

Ben-Dayan, Brustein JCAP 1009, 007 (2010)
Hotchkiss, Mazumdar, Nadathur JCAP 1202, 008 (2012)

Outline

I. Recent Results
   - The model
   - Covering the plane of interest
   - Finding the most probable member
II. Discrepancy between analytics and numerics
III. Summary and outlook

Wolfson, Brustein (2016) arXiv:1607.03740
And ongoing work

I. Recent Results
- The model
- Covering the plane of interest
- Finding the most probable member

II. Discrepancy between analytics and numerics

III. Summary and outlook

Results

5 Degree polynomial model

$$V(\phi) = V_0 \left(1 + \sum_{p=1}^{5} a_p \phi^p\right)$$

$$\Downarrow$$

$$V(\phi) = V_0 \left(1 - \sqrt{\frac{r_0}{8}}\phi + \frac{\eta_0}{2}\phi^2 + \frac{\alpha_0}{3\sqrt{2r_0}}\phi^3 + a_4\phi^4 + a_5\phi^5\right)$$

Ben-Dayan & Brustein JCAP 1009, 007 (2010)

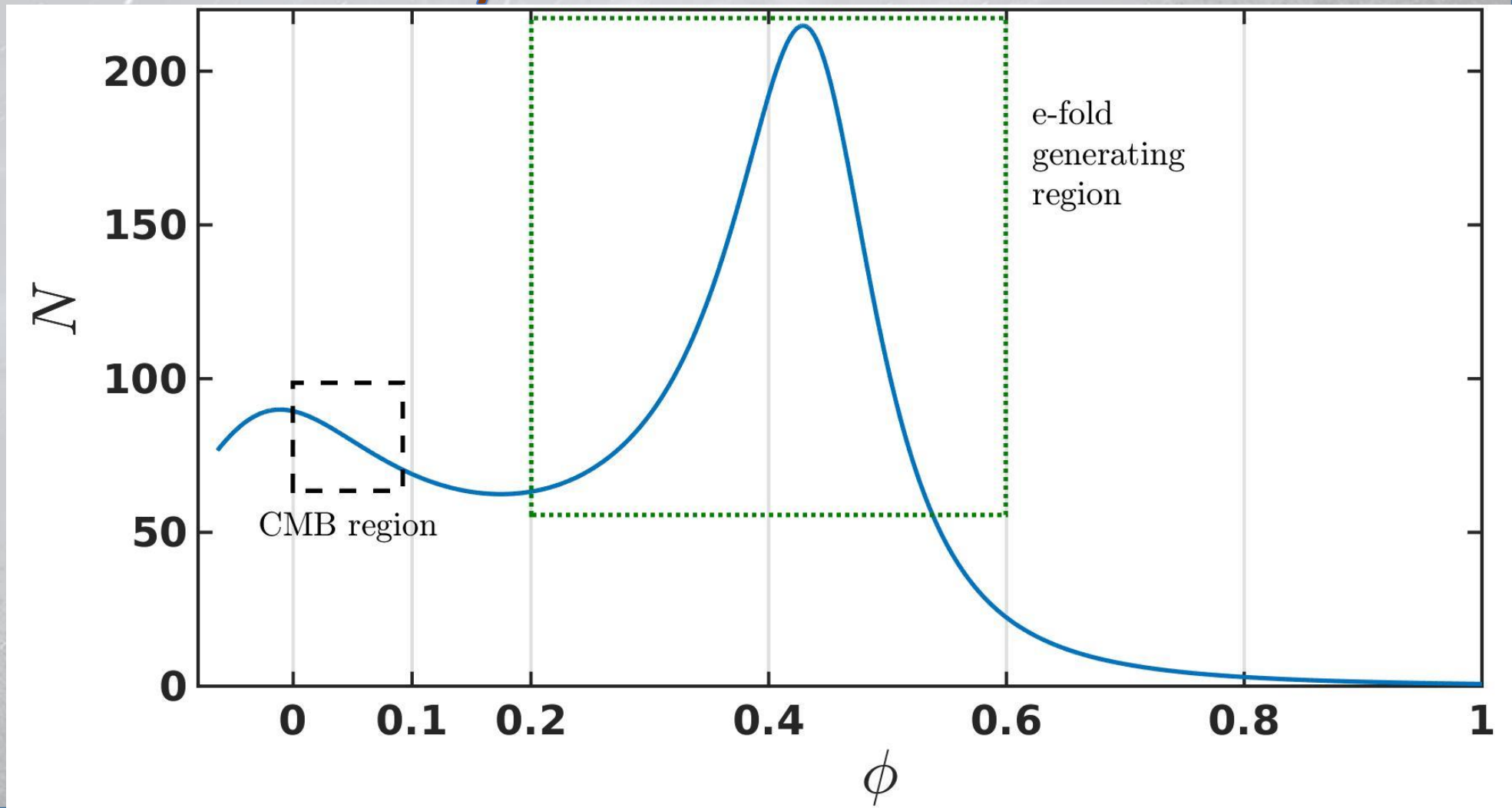
Results

Why look at these models?

I. Recent Results
- The model
- Covering the plane of interest
- Finding the most probable member

II. Discrepancy between analytics and numerics

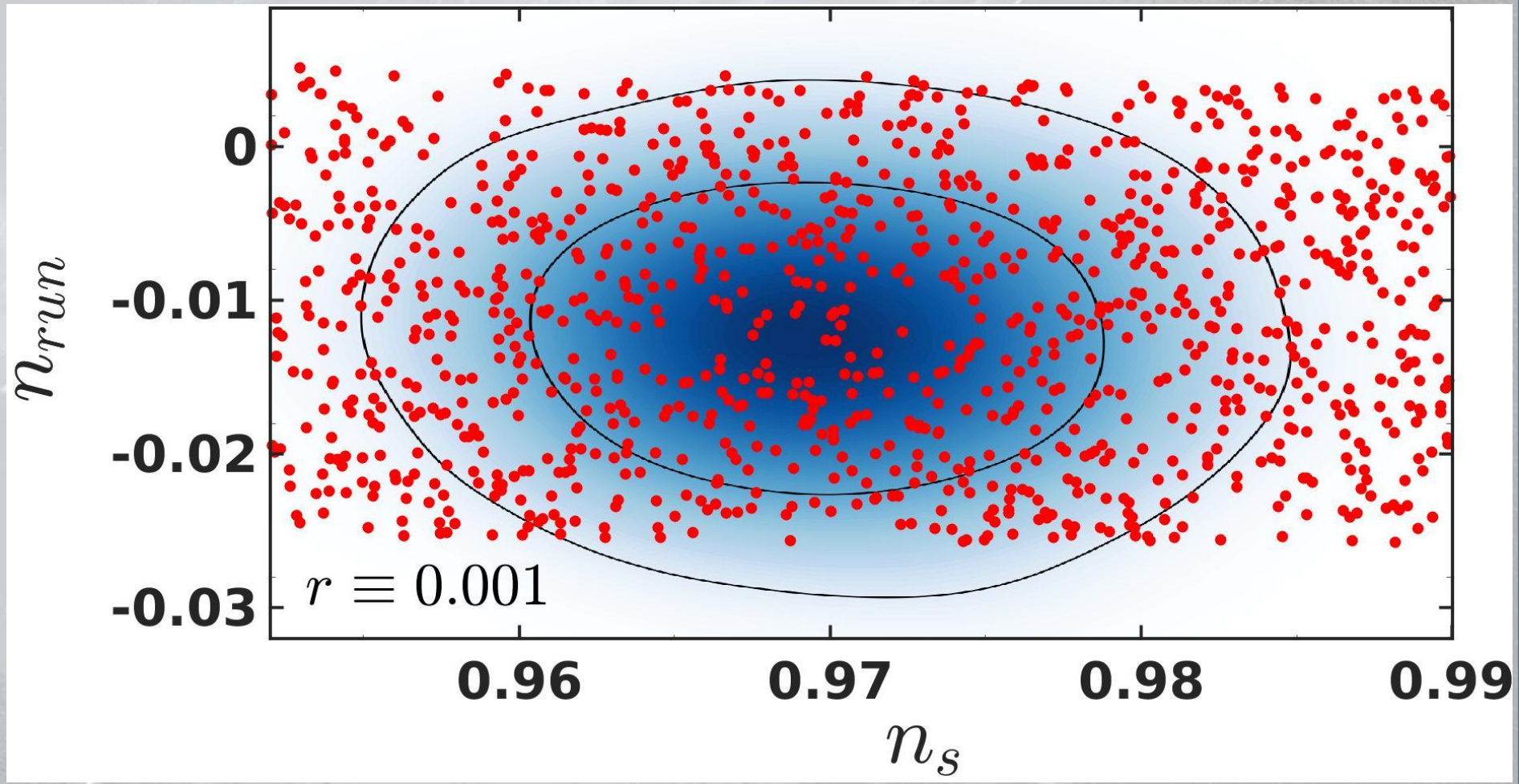
III. Summary and outlook



I. Recent Results
   - The model
   - Covering the plane of interest
   - Finding the most probable member
II. Discrepancy between analytics and numerics
III. Summary and outlook

Results

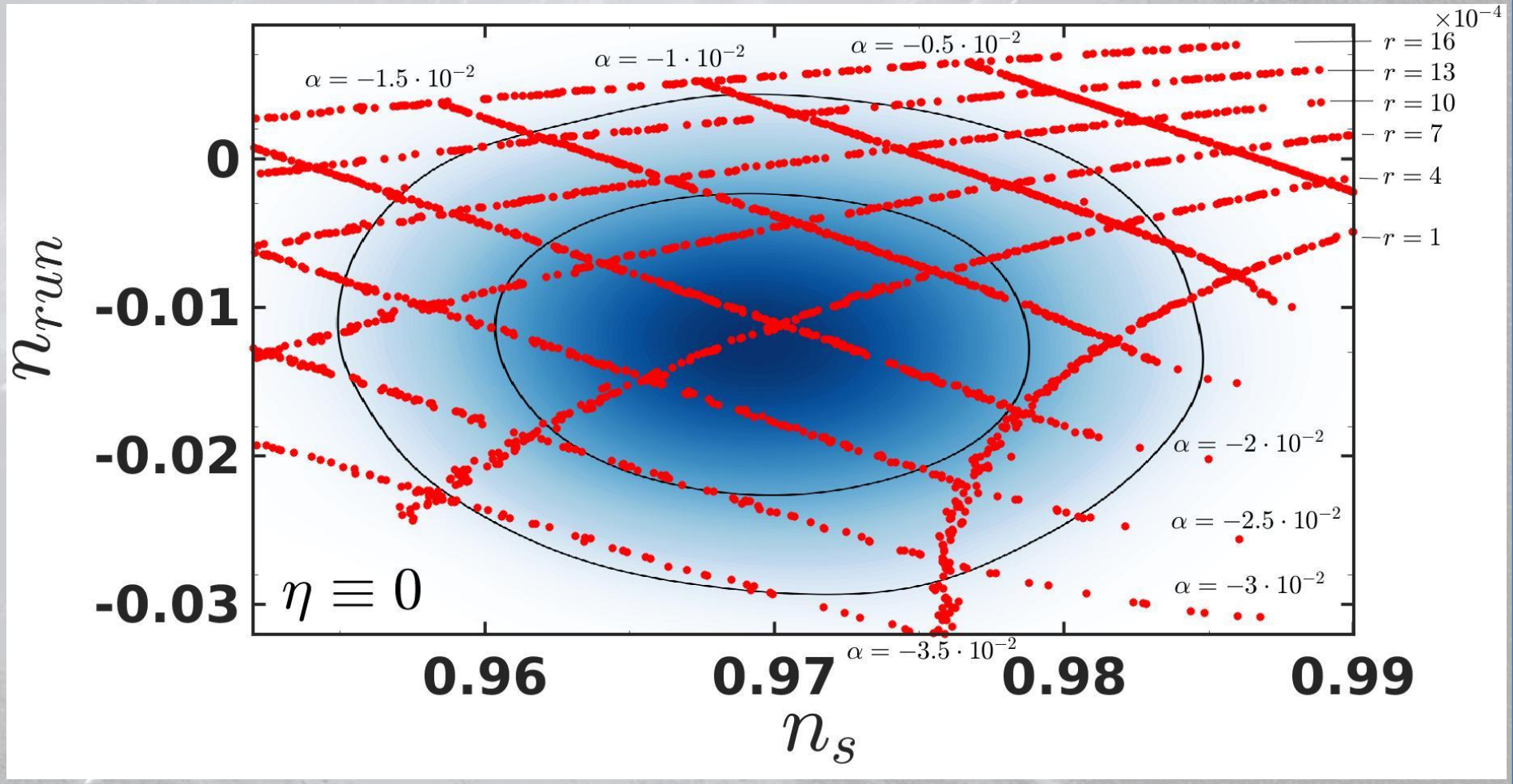
5 Degree polynomial model



I. Recent Results
   - The model
   - Covering the plane of interest
   - Finding the most probable member
II. Discrepancy between analytics and numerics
III. Summary and outlook

Results

5 Degree polynomial model



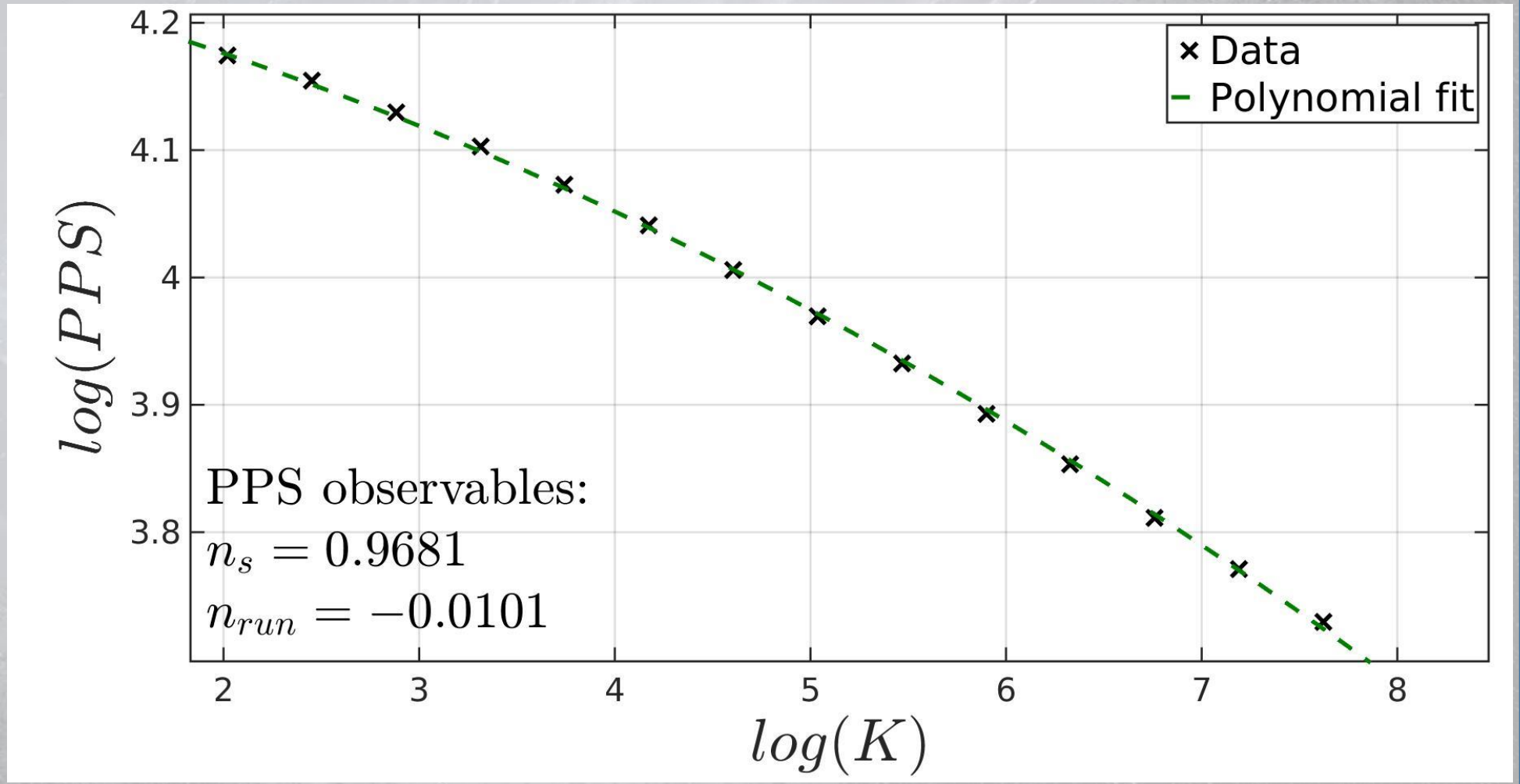
I. Recent Results
- The model
- Covering the plane of interest
- Finding the most probable member

II. Discrepancy between analytics and numerics

III. Summary and outlook

Results

5 Degree polynomial model



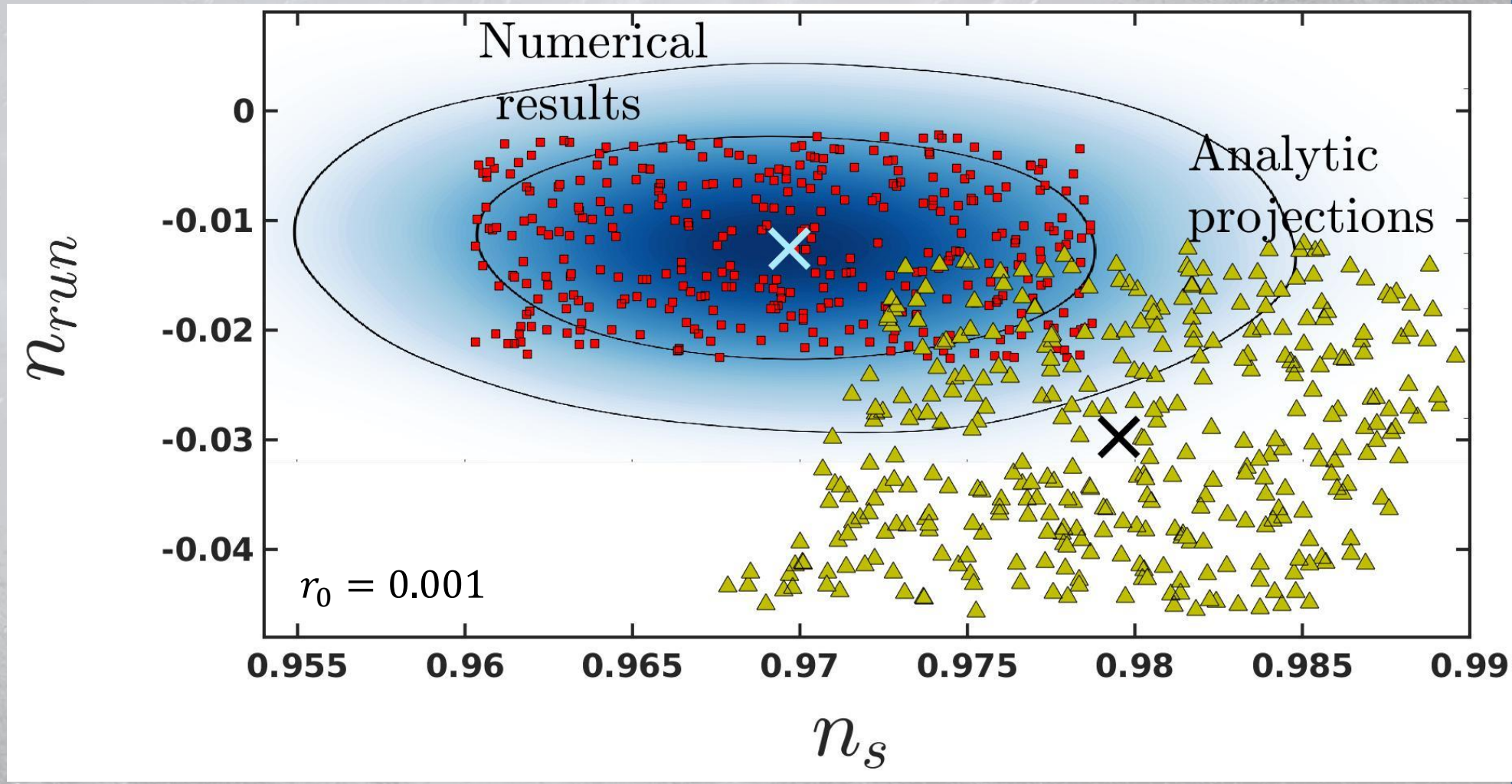
OOPS!... Something's wrong

Discrepancy between analytics & numerics

I. Recent Results
- The model
- Covering the plane of interest
- Finding the most probable member

II. Discrepancy between analytics and numerics

III. Summary and outlook



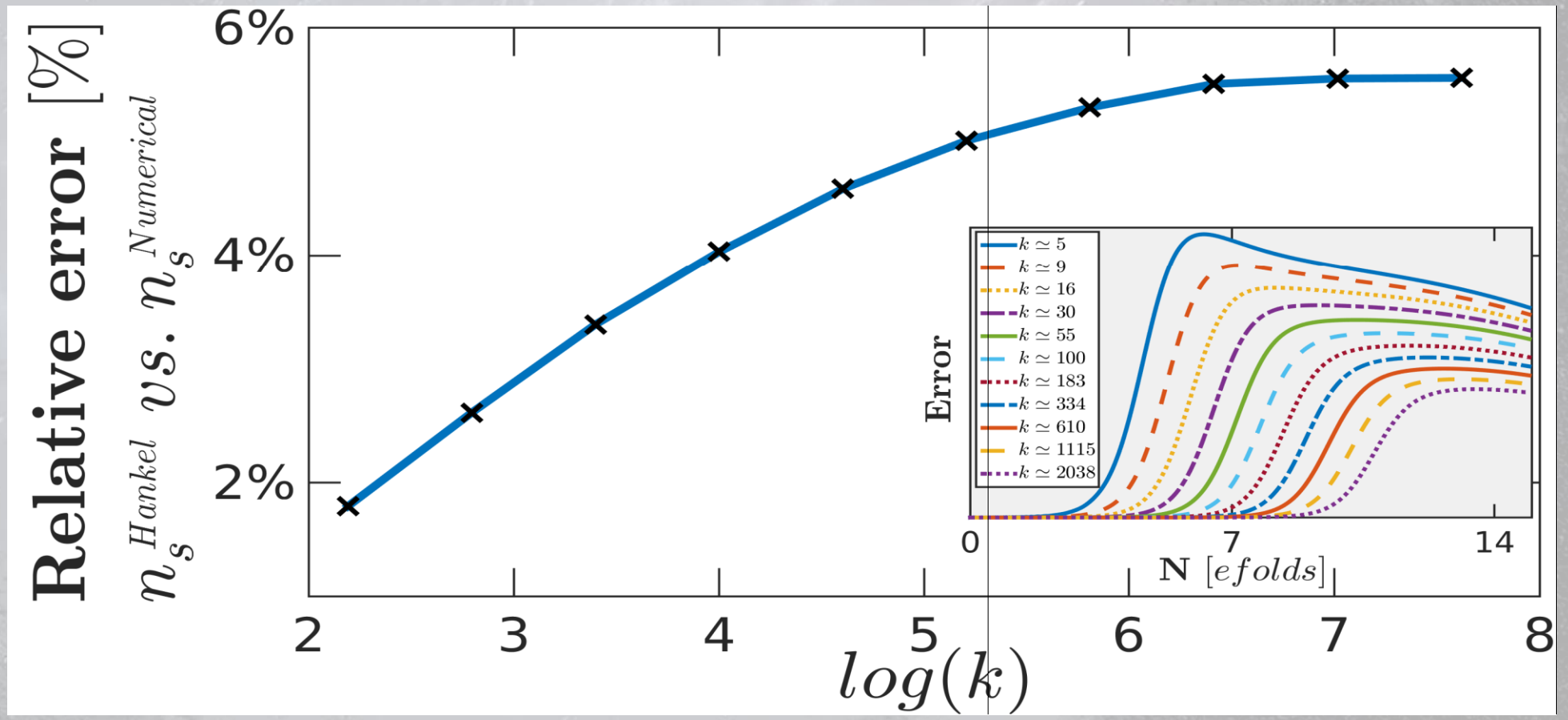
I. Recent Results
- The model
- Covering the plane of interest
- Finding the most probable member

II. Discrepancy between analytics and numerics

III. Summary and outlook

OOPS!... Something's wrong

Discrepancy between analytics & numerics



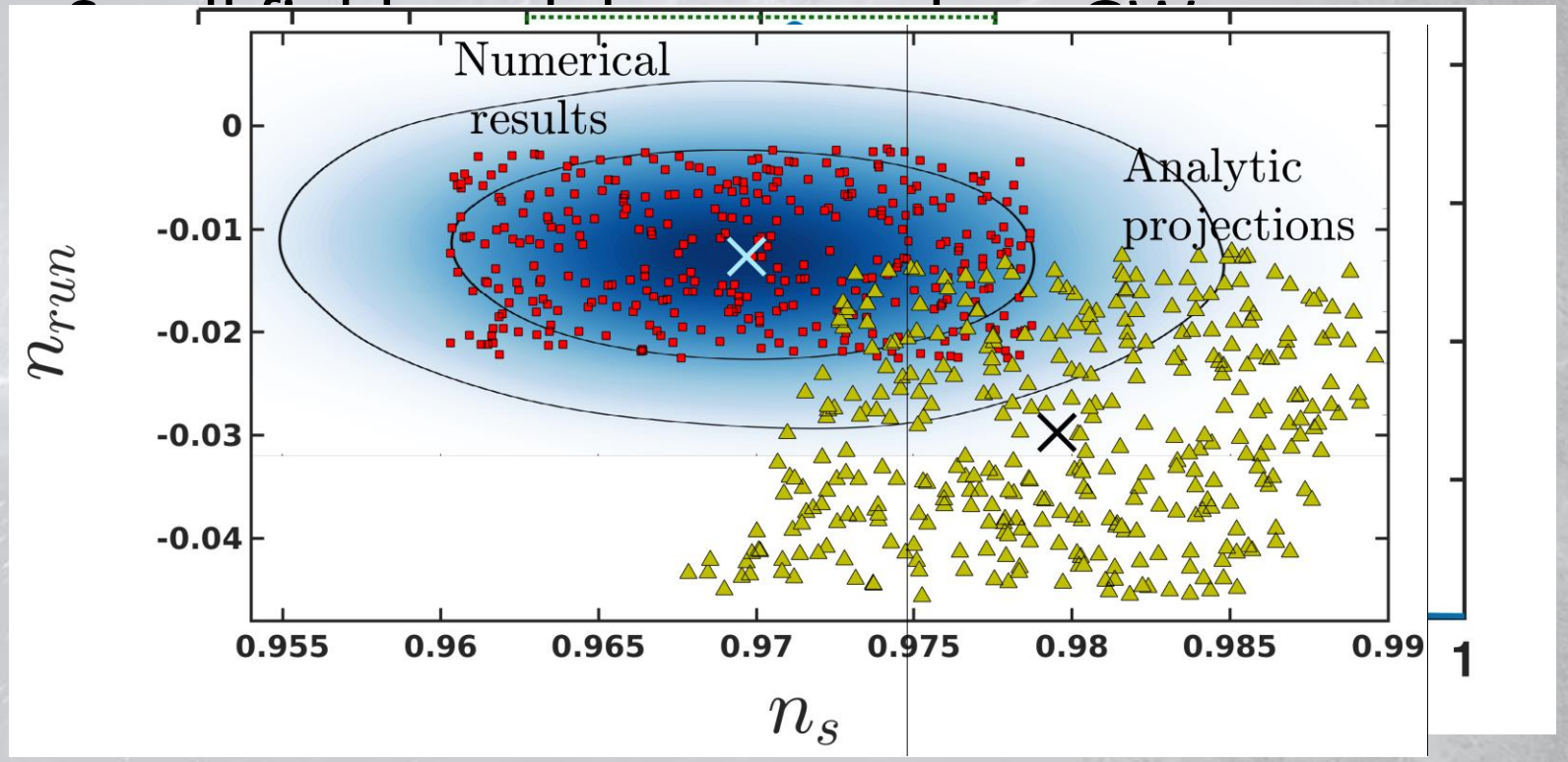
Inflationary perturbations from a potential with a step

Adams et.al. PRD 64, 123514 (2001)

I. Recent Results
   - The model
   - Covering the plane of interest
   - Finding the most probable member
II. Discrepancy between analytics and numerics
III. Summary and outlook

Summary and outlook

Summary



I. Recent Results
   - The model
   - Covering the plane of interest
   - Finding the most probable member

II. Discrepancy between analytics and numerics

III. Summary and outlook

Summary and outlook

where do we go from here?

- Go to higher tensor-to-scalar ratios.
- See what BICEP3 yields, and adjust.
- Find a better analytic expression from first principles?
- Quantify perturbations – give better analytic tools.

Questions?

Thank you!