63rd ANNUAL CONFERENCE OF THE SA INSTITUTE OF PHYSICS



Contribution ID: 77

Type: Oral Presentation

Fast algorithm for the computation of the CMB polarization <i>TE</i> power spectrum using non-circular beam

Wednesday, 27 June 2018 12:00 (20 minutes)

A precise measurement of the Cosmic Microwave Background (CMB) anisotropy has been one of the foremost concerns in modern cosmology as it provides a valuable information on the cosmology of the Universe. The estimation of the CMB power spectrum is complicated by different systematics. For the polarization experiments, the signals are rather fainter in comparison with the CMB total intensity, which may lead to an important bias in the estimation of the angular power spectrum. One of the most important source of bias in CMB polarization experiment is the beam asymmetry. We present a semi-analytical framework using the pseudo-<i>C_l</i> estimator to compute the power spectrum <i>TE</i> of the temperature anisotropy and the <i>E</i>-component of the polarization radiation field using non-circular beams. We assume that the beam is non-rotating. We adopt a model of beams obtained from a perturbative expansion of the beam around a circular (axisymmetric) beam in harmonic space. We compute the resulting bias matrix which relates the true power spectrum with the observed one by using an efficient algorithm for rapid computation. We show that for a multipole up to <i>l_{max}</i>=500, the bias matrix can be computed in less than one second with a single CPU processor at 2.53 GHz. We find that the systematic effect induced by the beam asymmetry in the temperature and polarization power spectrum at the peak of the bias matrix for the <i>WMAP</i> and <i>Planck</i> experiments can be as large as a few 10 to 20%.

Please confirm that you
have carefully read the
abstract submission instructions
under the menu item
"Call for Abstracts"
<b/(Yes / No)

Yes

Consideration for
student awards
Choose one option
from those below.
N/A
Hons
MSc
PhD

N/A

Supervisor details
If not a student, type N/A.
Student abstract submision
requires supervisor permission:
please give their name,
institution and email address.

N/A

Primary authors: Dr RAMAMONJISOA, Fidy Andriamanankasina (University of the Free State); Prof. MITRA,

Sanjit (Inter-University Centre for Astronomy and Astrophysics); Prof. RAY, Subharthi (University of KwaZulu-Natal); Prof. SOURADEEP, Tarun (Inter-University Centre for Astronomy and Astrophysics)

Presenter: Dr RAMAMONJISOA, Fidy Andriamanankasina (University of the Free State)

Session Classification: Astrophysics

Track Classification: Track D1 - Astrophysics