Contribution ID: **22** Type: **not specified**

General solutions of the leakage in integral transforms and applications to the EB-leakage and detection of the cosmological gravitational wave background

Sunday, 8 September 2019 14:30 (30 minutes)

For an orthogonal integral transform with complete dataset, any two components are linearly independent; however, when some data points are missing, there is going to be leakage from one component to another, which is referred to as the "leakage in integral transforms" in this work. A special case of this kind of leakage is the EB-leakage in detection of the cosmological gravitational wave background (CGWB). We first give the general solutions for all integral transforms, prove that they are the best solutions, and then apply them to the case of EB-leakage and detection of the CGWB. In the upcoming decade, \blue{most likely, new cosmic microwave background (CMB) data are from ground/balloon experiments}, so they provide only partial sky coverage. Within this context, the EB-leakage becomes inevitable. We show how to use the general solutions to achieve the minimal error bars of the EB-leakage, and use it to find out the maximum ability to detect the CGWB through CMB. The results show that, \blue{when focusing on the tensor-to-scalar ratio r (at a pivot scale of 0.05 Mpc^{-1})}, 1% sky coverage ($f_{sky} = 1\%$) is enough for a 5σ-detection of $r \geq 10^{-2}$, but is barely enough for $r = 10^{-3}$.
If the target is to detect $r \sim 10^{-4}$ or 10^{-5}, then $f_{sky} \geq 10\%$ or higher is strongly recommended to enable a 5σ-detection and to
reserve some room for other errors.

Primary author: Dr LIU, Hao (NBI)

Presenter: Dr LIU, Hao (NBI)

Session Classification: Science-5