THE EDUCATION UNIVERSITY OF HONG KONG

FACULTY OF LIBERAL ARTS AND SOCIAL SCIENCES

Research Output Prize

for the Dean's Research Fund 2021/22

Brief Introduction of Awardee's

Research Output/Publication and Future Research Development

Awardee (Dept):	Dr Chan Man Ho, Associate Professor (SES)
Publication/Research Output Title/project:	Constraining primordial black hole fraction at the galactic centre using radio observational data

A. *Briefly introduce your research output/publication for which you have received the prize.*

Some theoretical models propose that primordial black holes would be formed in the early universe. These primordial black holes can probably contribute a certain amount of dark matter. In our study, we have applied the synchrotron radiation framework used in the dark matter annihilation studies to constrain the primordial black hole fraction. We follow the idea proposed by Stephen Hawking that black holes would emit Hawking Radiations. High-energy electrons and positrons would be emitted by black holes during the evaporation process.

Our study is the first one to use radio data to get stringent constraints of primordial black holes, which can fill one of the important gaps of using multi-wavelength approach to constrain primordial black hole fraction. Besides, we have applied the state-of-the-art computing programme 'BlackHawk code' to calculate the secondary emission of Hawking radiation. Therefore, our study provides a more comprehensive analysis, which can give a rigorous and robust constraint for primordial black holes. We have also considered the data of our inner Galactic Centre, which have not been rigorously examined before.

We have shown that the amount of primordial black holes only constitutes a very minor component of dark matter at the Galactic Centre for a large parameter space. This result is consistent with previous results using gamma-ray, X-ray and cosmic-ray data.

B. *How you used/will use your prize and perhaps its usefulness to your research development?*

I will use it to enhance my research on dark matter astrophysics. A research staff will be hired to help analyse astrophysical data.

C. *Expected research outcomes/outputs/impacts arising from this prize.*

I expect that the results done by the hired research staff can be published in academic journals.