THE APPLICATION OF OPERATOR ALGEBRA IN QUANTUM PHENOMENA OCCUR IN ASTROPHYSICS AND COSMOLOGY

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PROJECTS

- NCG model of atom
- DIB from doubly excited He atoms
- Realistic model of black hole corona
NCG MODEL OF ATOM & DIB FROM DOUBLY EXCITED HE ATOMS
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Mathematical model

- Collaborators: Prof. Mairi Sakellariadou, Dr. Paolo Bertozzini, and Dr. Somlak Utudee
- Try to find a student for this task
NCG MODEL OF ATOM & DIB FROM DOUBLY EXCITED HE ATOMS

- Dirac equation: Non-relativistic limit $\rightarrow$ Schrodinger equation

$$-\frac{\partial^2}{\partial R^2} \psi_\nu + \left(\Lambda - \frac{1}{R^2}\right) \psi_\nu = 2E_\nu \psi_\nu$$

- $\psi_\nu = \sum c_{\nu \mu} F_\mu (R) \varphi_\mu (R, \Omega)$

$$-\frac{\partial^2}{\partial R^2} F_\mu - \left(\frac{U_\mu (R) + \frac{1}{4}}{R^2}\right) F_\mu + \sum W_{\mu \alpha} F_\alpha = 2E_\mu F_\mu;\ U_\mu (R) \text{ is eigenvalue of } \varphi_\mu$$
NCG MODEL OF ATOM & DIB FROM DOUBLY EXCITED HE ATOMS

Simulation

• MSc student: Mr. Eakawit Kittiya
• Hyper spherical harmonic
• numerical methods
• Com sim: Python
OTHER ACTIVITIES

Past event

• Collaborate with high energy physicists/astrophysicists
• Dr. Poemwai Chainakun: Spherical corona model (Work in progress)
• Presentation at Theoretical and Computational Physics group, KMUTT
• Invited Prof. Jaewook Ahn to give a talk on quantum computing using Rydberg atoms

Near future event

• Collaborative meeting in SEP: Prof. Mairi Sakellariadou from King’s College London will be visiting NARIT, and Thammasart University.
SUMMARY

- Obtain some part of the model
- Some simulation results
- Discussion with collaborators in SEP
- Working on other projects