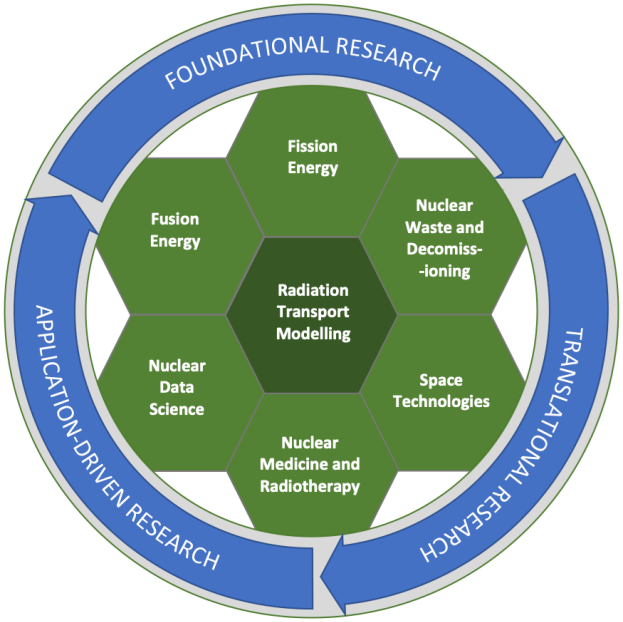
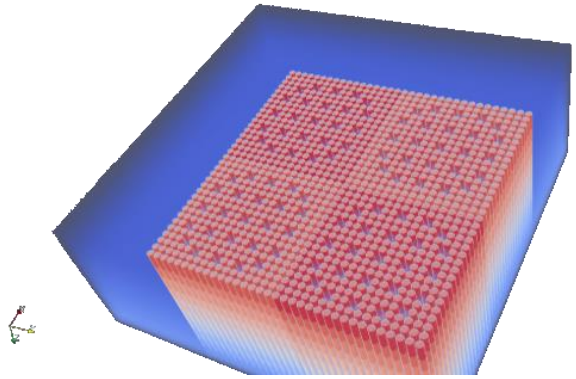
MaThRad

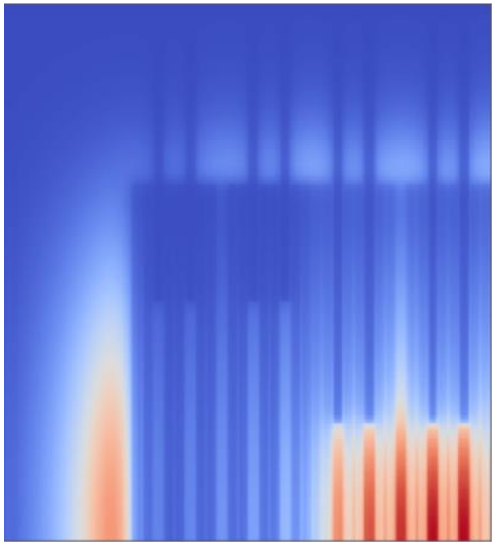
- Mathematical Theory of Radiation Transport: Nuclear Technology Frontiers
- £7M, 5-year EPSRC Program Grant
- Translate mathematical advances in probability theory and inverse problems to MC radiation transport
- Reactor analysis, criticality, shielding, medical and space applications
- 26 partners from industry and academia
- 30 postdoc-years, up to 10 PhDs
- Internships and hosting visitors
- Industry workshops and symposia
- UCLH proton treatment team + beam time



Vision

- **Fundamentally disruptive approach** – breaks existing siloes integrates interdisciplinary research
- **Foundational:** Developing mathematics of spatial branching processes, interacting particle system MC, inverse problems
- **Translational:** algorithms, tested against real-world physical, engineering and clinical demands, showcased on dedicated research software (SCONE)
- **Application-driven:** Industry workshops, case studies, internships to remain relevant & build future capacity





Work Packages

- WP 1: Mathematical representations of BTE solutions
- WP 2: Correlation and path decomposition in spatial branching
- WP 3: Interacting Particles (IPS) in multiplying media
- WP 4: Monte Carlo for fixed source problems
- WP 5: Radiation transport for medical applications
- WP 6: Reactor modelling with higher complexity
- WP 7: Sensitivity and uncertainty in medical and reactor physics
- WP 8: Monte Carlo algorithms for future computing architectures
- WP 9: Case studies and industrial engagement

Outcomes

- A step change in radiation transport modelling through an interdisciplinary dialogue
- A new generation of researchers – PDRAs & 10 pledged PhDs
- Creating a radiation transport community, fluently cross-fertilizing ideas
- Research software with operational capacity beyond any other of its kind
- Enabling new technologies and practices within industry and healthcare
- Impact → Industry-relevant case studies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