BioPhysicsX presentation

Key messages of the presentation

* improving clinical outcomes at heart
* Beyond protons – a step change in radiotherapy science Radiobiology research at cellular level - currently uncharted territory
* Innovation happens at disciplinary interfaces
* Interdisciplinary – common end goals
* Already started
* Collaborative with international partners

BioPhysicsX: the future of convergent science

Slide 1

Beyond protons – The science/opportunities behind why do it

* Theory says carbon ions should be better than protons
  + higher LET, shielding more effective with higher concentration deposited energy
  + different type of cell damage
* But little experimental evidence
* BioPhysicsX allows exploration of this
  + Flexibility speed and ions
  + In vitro and in vivo experiments possible

Slide 2

Why BioPhysicsX

* Interdisciplinary approach gives focus on end goals
* Continual development of skills, expertise and IP in design, construction, operation and research
* Stimulating environment attracts world class researchers and industry across the contributory disciplines
* Embedded in entrepreneurial setting and working with relevant teams to promote spin-outs

Slide 3

What is BioPhysicsX

* Physical co-location at White City
* Truly multidisciplinary – equality of disciplines creating new field
* Builds on existing expert partnerships
* In line with Imperial strategy, strengths national and international partnerships e.g. with CNRS
* Network already in place
* Links with industry, e.g. LEO cancer care already established – working with Tracy Underwood UKRI Fellow

Slide 4

Novel research

(why can’t we carry on as we are ….)

Different aspects driven by jointly developed science programme to create science pull rather than push

* Trusted experts and leaders to develop team - remove silos
* Ground breaking research across many disciplines
* Co-location
* Application driven – focus on real-life technical/clinical problems for practicable and affordable solutions
* Industry partners and entrepreneurs
* Skills training in new emerging discipline

Photos

* End station consultation meeting 19 June
* ?

Slide 5

BioPhysicsX and LhARA

* Laser-hybrid Accelerator for Radiobiological Applications (LhARA) is at the heart
* The accelerator facility will deliver ion species at ultra-high dose rate in different spatial- temporal and spectral fractionation schemes
* 2-year funding for preliminary study is underway

Graphic shows lay out – including in vitro (2) and in vivo end stations

BioPhysicsX current research

* Physics – energy efficient accelerator with fixed field alternating gradient
* Laser – system large of flux in nano-second pulses with interactive feedback to reposition the beam
* Physics (?) – Gabor lens a capture device that removes the limitations on the instantaneous dose rate
* Clinical treatment (?) – ion acoustic dose profile measurement
* Computing – simulation systems and techniques, machine learning
* Radiobiology – study of relative biological effectiveness of different ions and effectiveness of different beam systems

Slide 6

The existing collaboration is already working and there’s on-going research that is relevant to this and the disciplines they stem from

Ion acoustic dose profile measurement is WP5 of LhARA (and currently funded) led by Jeff Bamber (ICR)