Plans for the Precision Cancer Medicine Institute
University of Oxford

STFC & Particle Accelerators and Beams group workshop on particle accelerators for medicine

17th February 2015

Claire Timlin
Physically Targeted
- Robotic Surgery
- Proton Therapy
- HIFU

Physiologically Targeted
- Molecular Imaging

Molecularly Targeted
- Deep Genomic Sequencing
- Biomarker Driven
- Biologically targeted
The New Paradigm

Early Stage Cancer Patient

- Population Health Science
- Molecular Stratification
- Big Data Institute
- Target Discovery Institute
- Structural Genomics Consortium
- Experimental Cancer Medicine Centre
- Precision Cancer Medicine Institute
- Oxford Cancer Imaging Centre

Increased Cures

Courtesy of Gillies McKenna

22/10/2014
• Precise diagnosis needs to be followed by targeted treatment

• PBT can reduce collateral dose for some tumours

• 2 gantry + 1 fixed beam room PBT unit in PCMI

• PBT partner: ProNova solutions
PCMI will...

• Focus on cancers of unmet need – brain, oesophagus, pancreas, lung, bladder

• Position Radiotherapy (and Surgery) central to our plans

• Increase the flow of science into our translational pipeline
Redefining the future of Cancer Treatment

Joe Matteo

President, ProNova Solutions, LLC
Research, Development, and Manufacturing

Disclaimer: The ProNova SC360 has not been cleared by the U.S. Food and Drug Administration (FDA) for commercial distribution in the U.S. and is not available for commercial distribution at this time
Who is ProNova?

ProNova has a strong History of Innovation

Developed and commercialized PET & PET/CT technology

One of the largest suppliers of Cyclotrons in the world
Why ProNova?

To deliver a lower-cost, smaller, lighter, more energy efficient solution for Proton Therapy without sacrificing performance and improving upon existing capabilities, making proton more affordable and more accessible to the cancer community.
ProNova Design Principles - Workflow

Precision, Productivity, Cost

- "Linac like" environment
  - 360° treatment angle, open treatment room
  - 3D imagining, ex-room, no patient movement

- Hypo-Fractionation
  - High current CW beam >300 nA
  - Advanced imaging, continuous tracking
  - Fast scanning IMPT, Range verification

- Recognized Technology Leader
  - Roadmap focus on moving tumors, re-planning, workflow, cost
  - Collaborative research and development
SC360 Treatment Room

Open square room provides improved patient access

Open room provides clear access for lasers, projectors, Optical imaging, & intercom

Projection screens provide easy review of therapy information
SC360 Efficient 1, 2, 3+ Room Solution

- High Current Continuous beam Cyclotron
- Permanent Magnet Constant Energy Beamline
- Dual Energy Selection Systems < 1 sec Room Switching
- 360° Superconducting Gantry
- PBS with Variable Spot Size App’s & Comp’s 0.5 sec Layer Change
- Dual Energy CBCT Integrated with Positioner 5 RPM, Spiral Capable
- Auxiliary Positioner Calibration PET at Isocenter

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Proprietary Superconducting Technology

- Patented SC gantry for PT
- Production design exceeds requirements
- Achromatic bends – PBS energy changes
- Dramatically smaller size, weight, power
- >2X higher field, <0.5X radius
- Cryogen free cooling
Accelerator Design Inputs

• Reduced:
  - Size of device and vault
  - Cost of device and vault
  - Operations and maintenance staff – fully automated
  - Power consumption

• Support Intensity Modulated Proton Therapy (IMPT)
  - Hypofractionated treatments with high dose rate
  - Fast layer painting requiring continuous scanning
  - Volumetric repainting

• Scaleable Design
  - High volume production – 50 cyclotrons per year by 2023
  - Simplified installation, startup, and maintenance
ProNova Solutions at Pellissippi Place

- 55,000 sq ft R&D and Manufacturing facility
- LEED certified energy efficient facility
- Opened January 2015
- Phase I capacity of 10 two-room systems per year
- Phase III capacity of 50 two-room systems per year
Production Layout – Phase 3

Capacity

(50) two room gantry systems per year
(50) super-conducting cyclotrons per year
The Future of Proton Therapy
Oxford / ProNova Collaboration

SOLUTIONS
- Molecular Targeting
- Moving Tumors
- Density Changes
- Tissue Sparing
- In-Room Re-planning

Close the loop with Adaptive Therapy