How to keep high quality treatments using a compact gantry



R&D Physicist

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The Recipe for Success...



Industrial Plan: 2015 onwards...

A well designed product

- Product Requirements defined by our users
- Incorporating the best of 15 years ProteusPLUS experience
- Rigorous Product Lifecycle Management

A well thought industrial plan

Proactive detailed roadmap for manufacturing, installation and maintenance

A well prepared operation & maintenance plan

Training, certification and documentation associated to predictive maintenance





The Design

ProteusONE: Compact Proton Therapy System

COMPACT Robust Gantry & accelerator design IMPT Most Precise Treatments Easy Workflow

> INTEGRATED Software, Dosimetry & Training

ProteusPLUS

18000 ft² / 1672 m²

3600 ft² / 334 m²

ProteusONE



Gantry Optics Design





Computation made using the PSI Graphic Transport Framework by U. Rohrer, based	on a
CERN-SLAC-FERMILAB version by K.L. Brown et al.	

TABLE 1: KEY PARAMETERS FOR THE PROTEUSONE®	
Energy	70-230 MeV
SCANNING MECHANISM	Pencil beam scanning
GANTRY RADIUS	3.6 meters (30% reduction)
BEAM CURRENT	~20 nA (on degrader)
OPERATION	Pulsed beam
PULSE LENGTH	~ 7 microseconds
REPETITION RATE	1000 Hz
GANTRY ROTATION ANGLE	220 degrees
PATIENT TABLE ROTATION	180 degrees
TREATMENT PATCH	250x200 mm

Integrated into Gantry



It is crowded but everything fits in...



..."Compact" also means new problems to solve



Operation and Maintenance



It's a good product... but it's also reliability and uptime (availability)

Proton Therapy Challenges

- Equipment is spread around the world, but expertise is concentrated
- Access to the equipment is limited by clinical operation. Fix it now!
- Not possible to have every spare part locally
- Differences in the equipment configuration
- Working with suppliers to fix reliability issues
- IBA's Advantages
 - Large installed base of ProteusPlus and long data history to draw from
 - Large R&D and Accelerator Engineering Dept. (300 / 1200 employees)
 - 30 years of experience in commercial accelerators
 - Worldwide spare part network

Why does reliability matter?









Total Unavailability by Event Duration

4% of the failures cause 70% of the downtime.

Our Continuous Improvement Process

2+ hour failure triggers Root Cause Analysis (RCA) process.



Maximising System Availability for ProteusONE









Trained and certified maintenance experts



Remote maintenance ready



Proteus**ONE**

- Latest technology
- Largest proton therapy team
- Operate at the maximum uptime since the first unit



Specific Examples



Improving the maintenance plan

- After approximately 4 years of operation, holes appear in the ionization chamber.
- Last year, we launched a 2-year preventative replacement schedule which does not impact users throughput.





Improving the design

- Stray field around the wide aperture bending magnet exit can affect magnetic materials
- Some structural elements were not designed with this in mind: the holding rods for the retractable snout
- Magnetic forces inhibited snout movement
- Solution: replaced the magnetic rods with non-magnetic inox





Commissioning Update

Shreveport Project Update

ProteusONE – The Willis Knighton Story

Iba

Update since the last Gantry Workshop...

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From Gantry delivery to treatment in less than 1 Year

July 2014 : Acceptance



User Group defined patterns for easy acceptance & QA





First Patient Treatment : September 9th, 2014 (As Planned) 16

Prostate – 2 fields

Full alignment and treatment delivered from Control Room

Beam ON: Under 30 seconds per field



Julien Forthomme – IBA Physics

Dr. Lane R. Rosen

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Today in Willis Knighton

19 patients per day – Ramping up

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15 minutes – 2 field pelvis

98% Uptime since day 1

Nice Project Update

From Rigging To Equipment Start Up



Gantry







Reminder: 11 days for Willis Knighton





Beam Characteristics: Spot Size At Isocenter



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The compact gantry is working well and we are building a roadmap for series production

2009: First sketch of prototype in Louvain-la-Neuve, Belgium2013: First beam at isocentre

2014: First patient treated in Willis Knighton Centre (Shreveport)2015: Move to series production: 7 confirmed projects

2017: Forecast 10 compact gantries per year

Thank you for your attention



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