



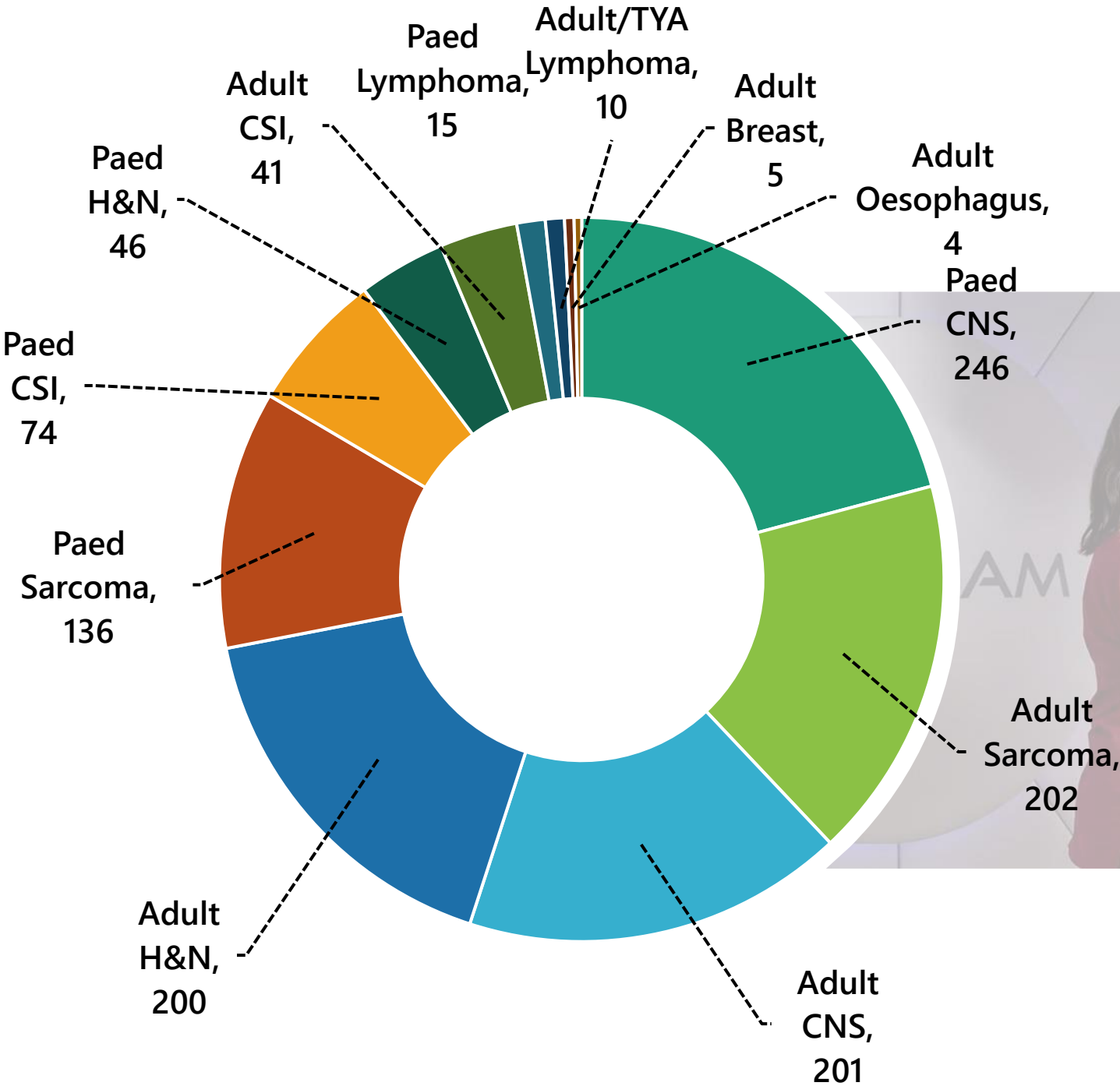
Proton treatment and experimental research at The Christie

Matthew Lowe | Matthew.Lowe11@nhs.net

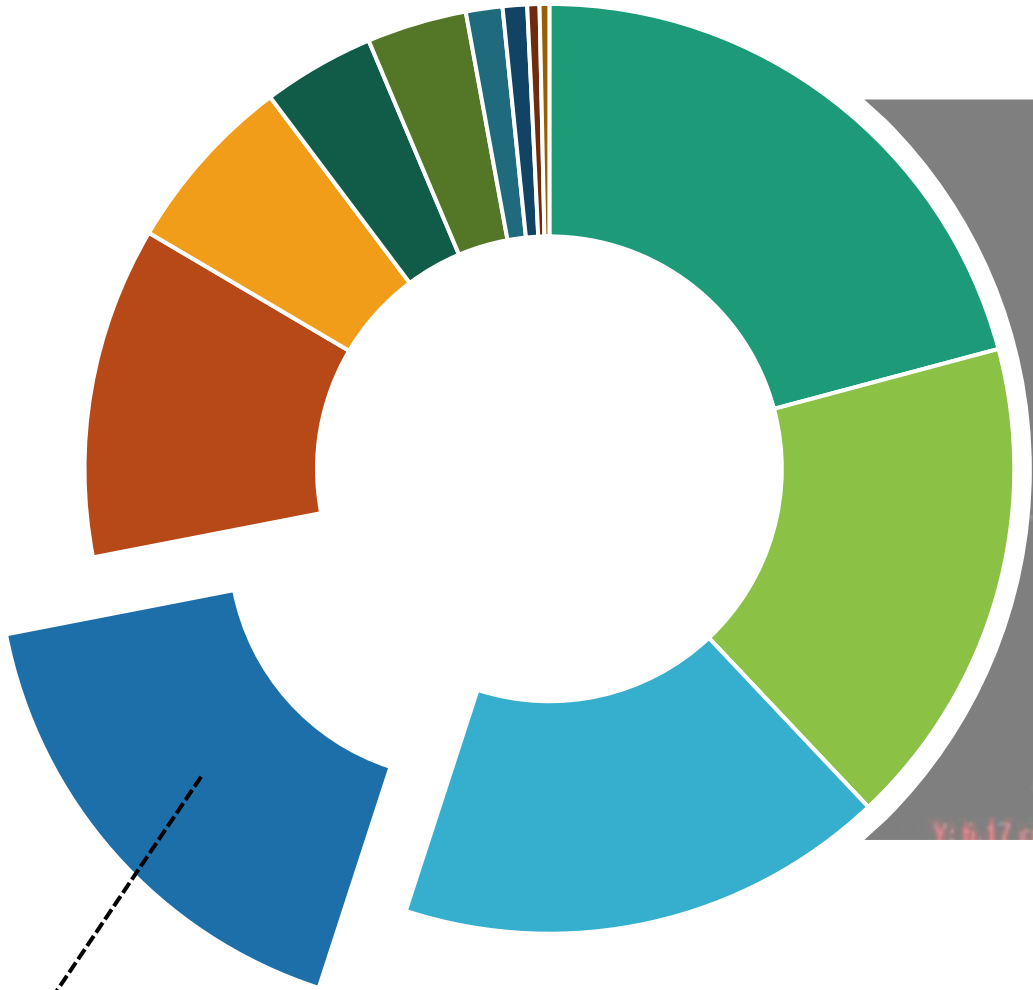




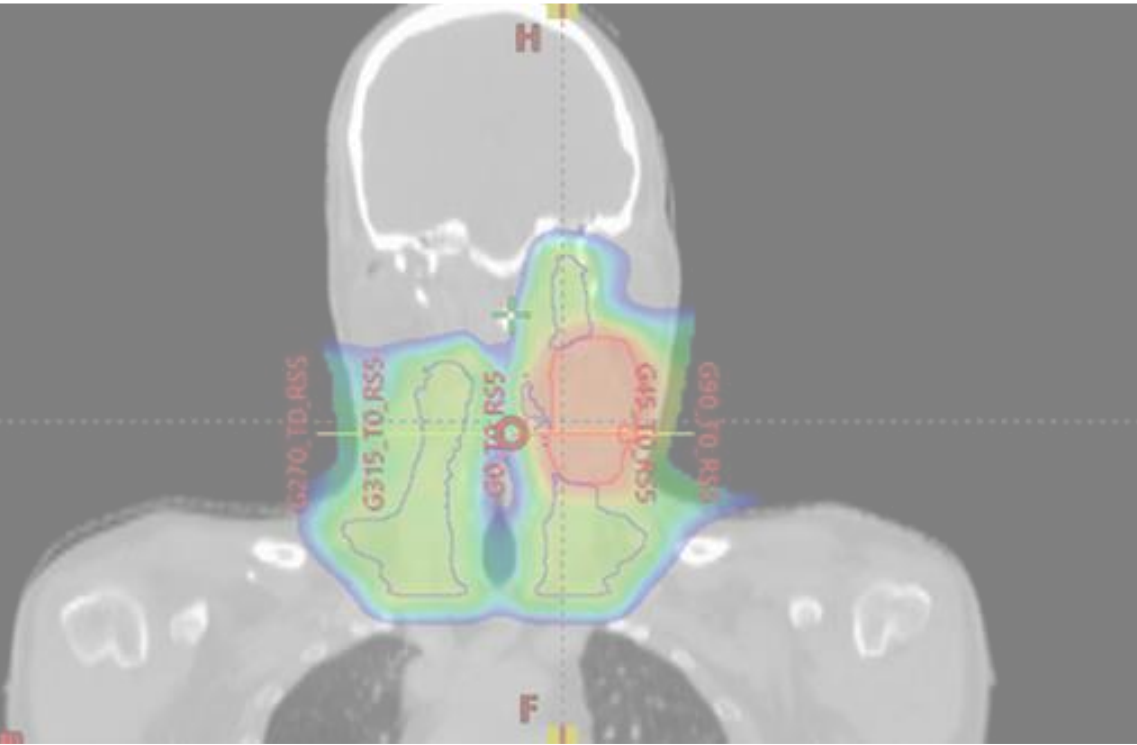
Patient mix to date



Head and Neck



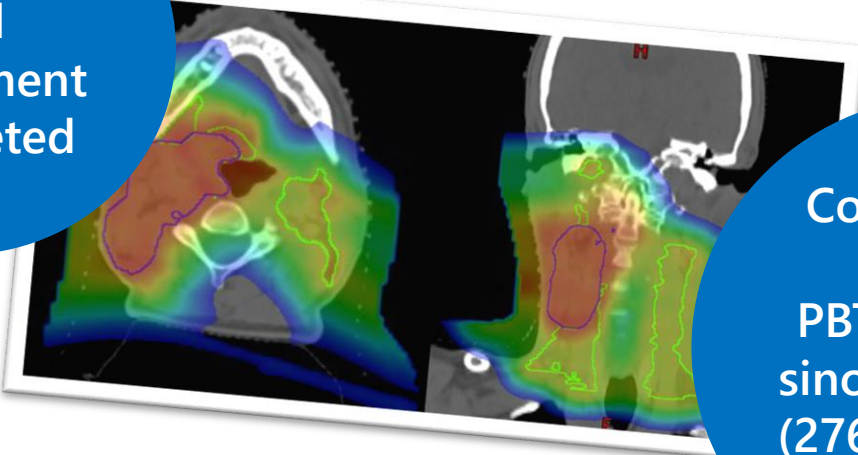
Adult
H&N,
200



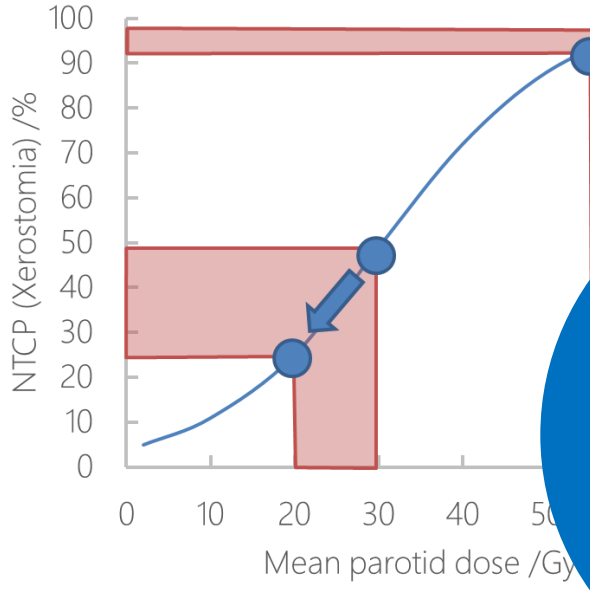
Generating evidence



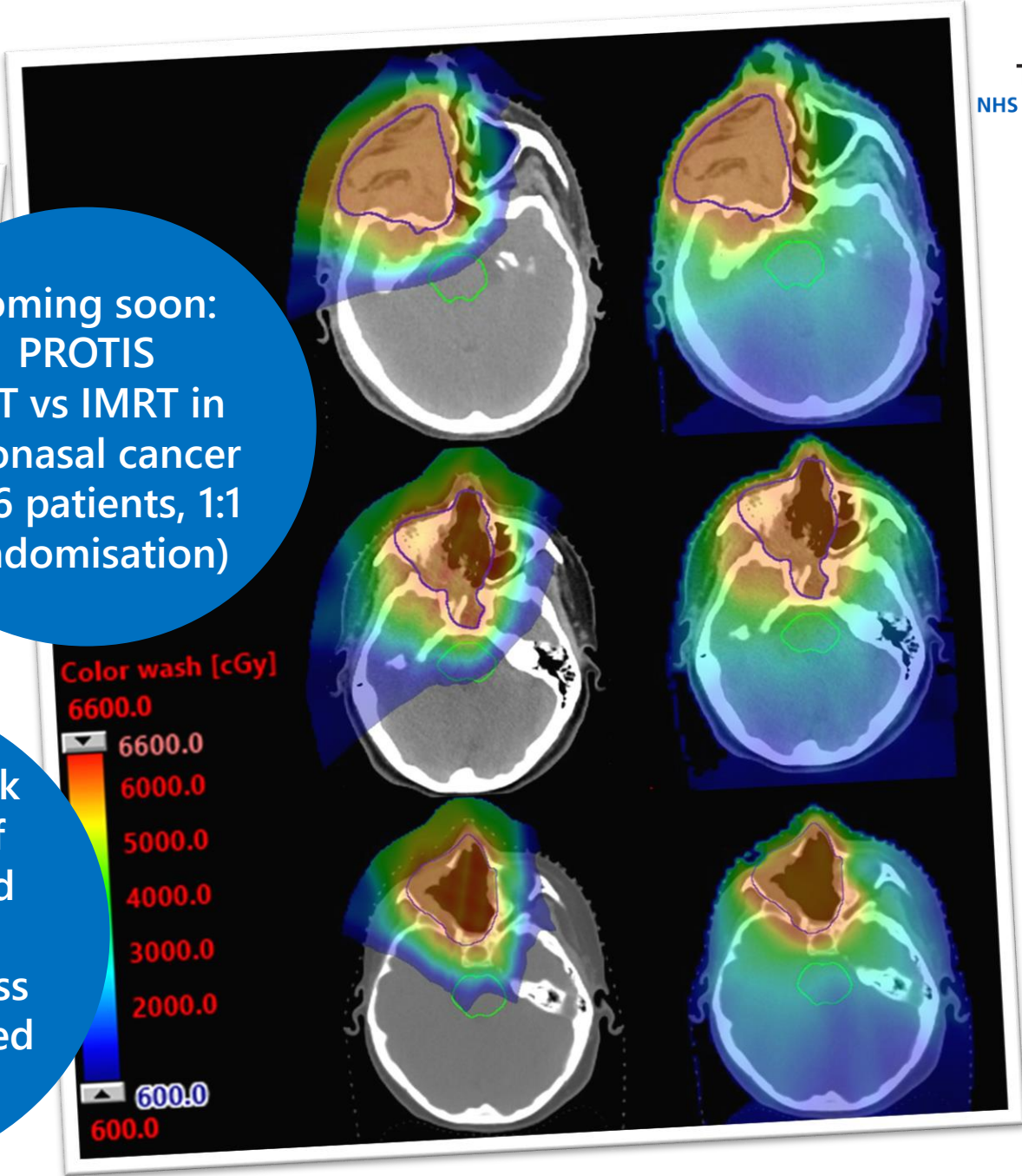
TORPEdO
Trial
recruitment
completed

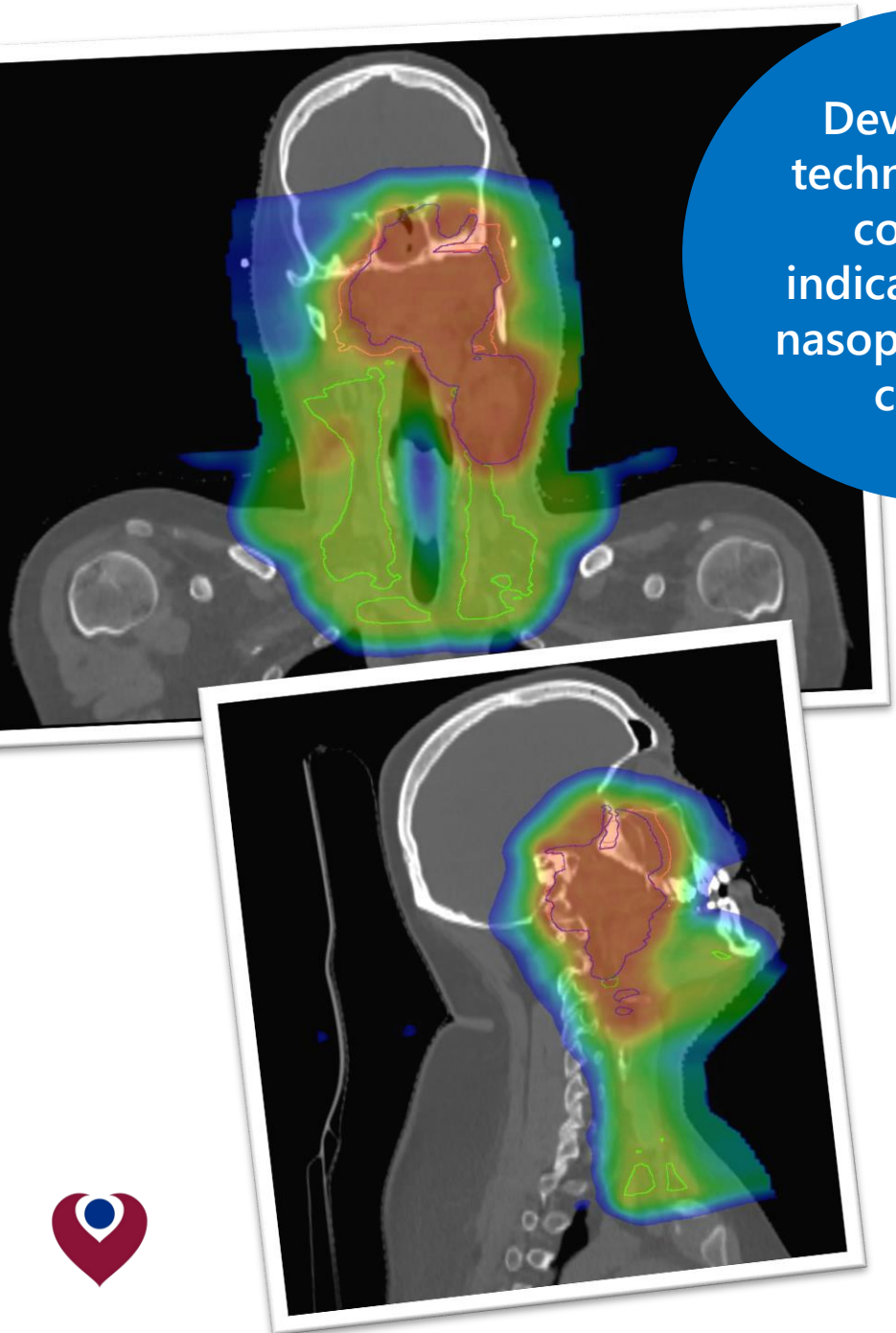


Coming soon:
PROTIS
PBT vs IMRT in
sinonasal cancer
(276 patients, 1:1
randomisation)



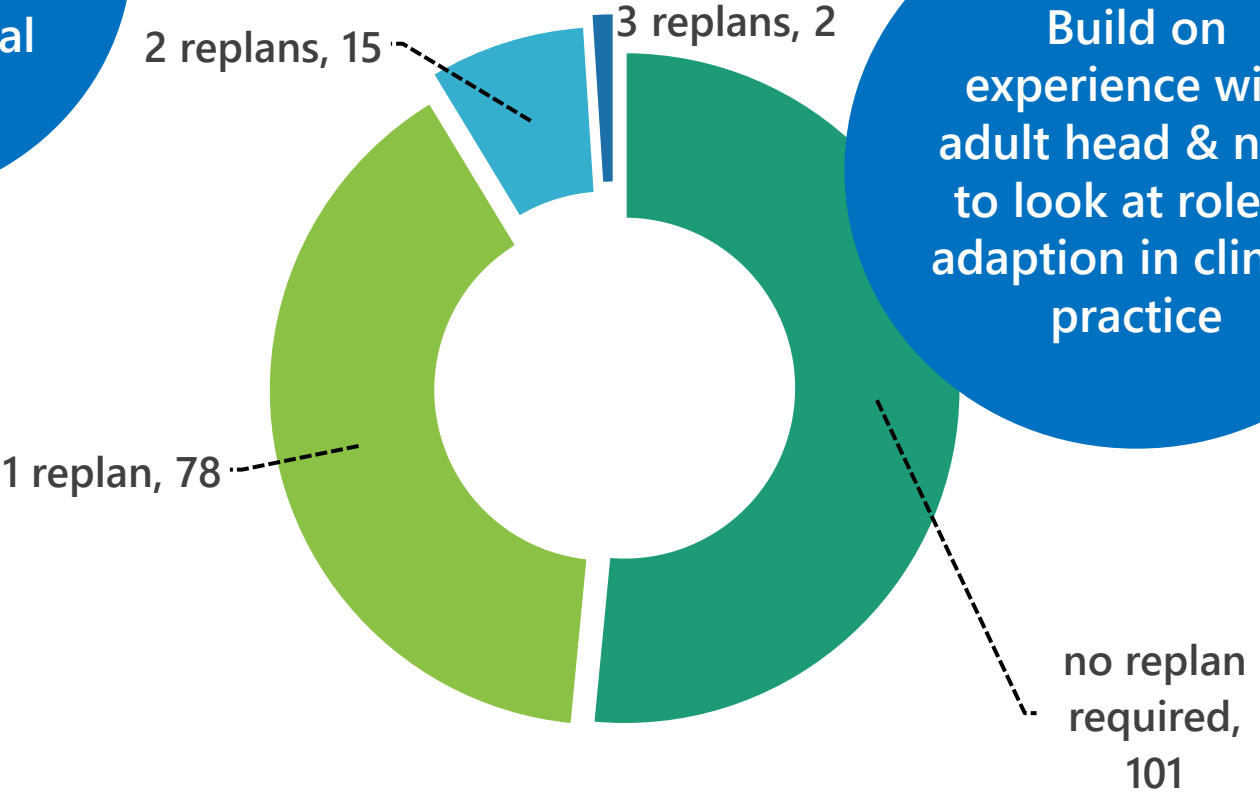
Continue to work
on validation of
NTCP model and
comparative
planning to assess
benefit in enriched
subgroup



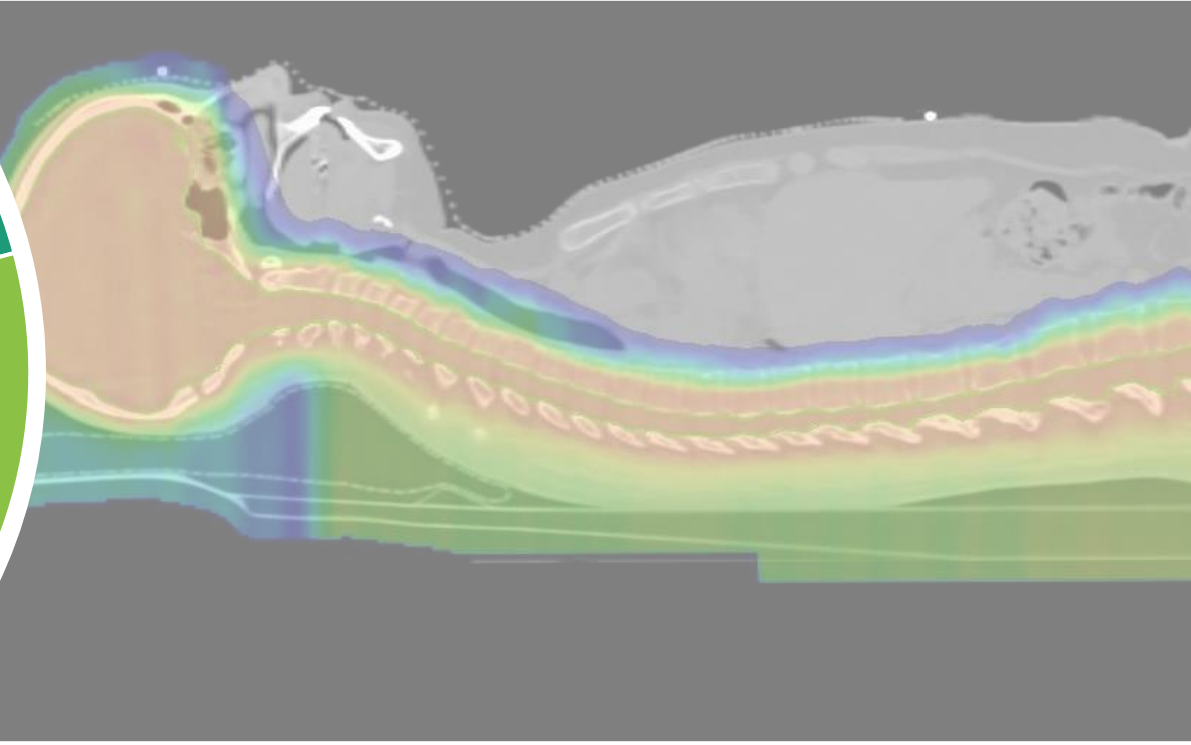
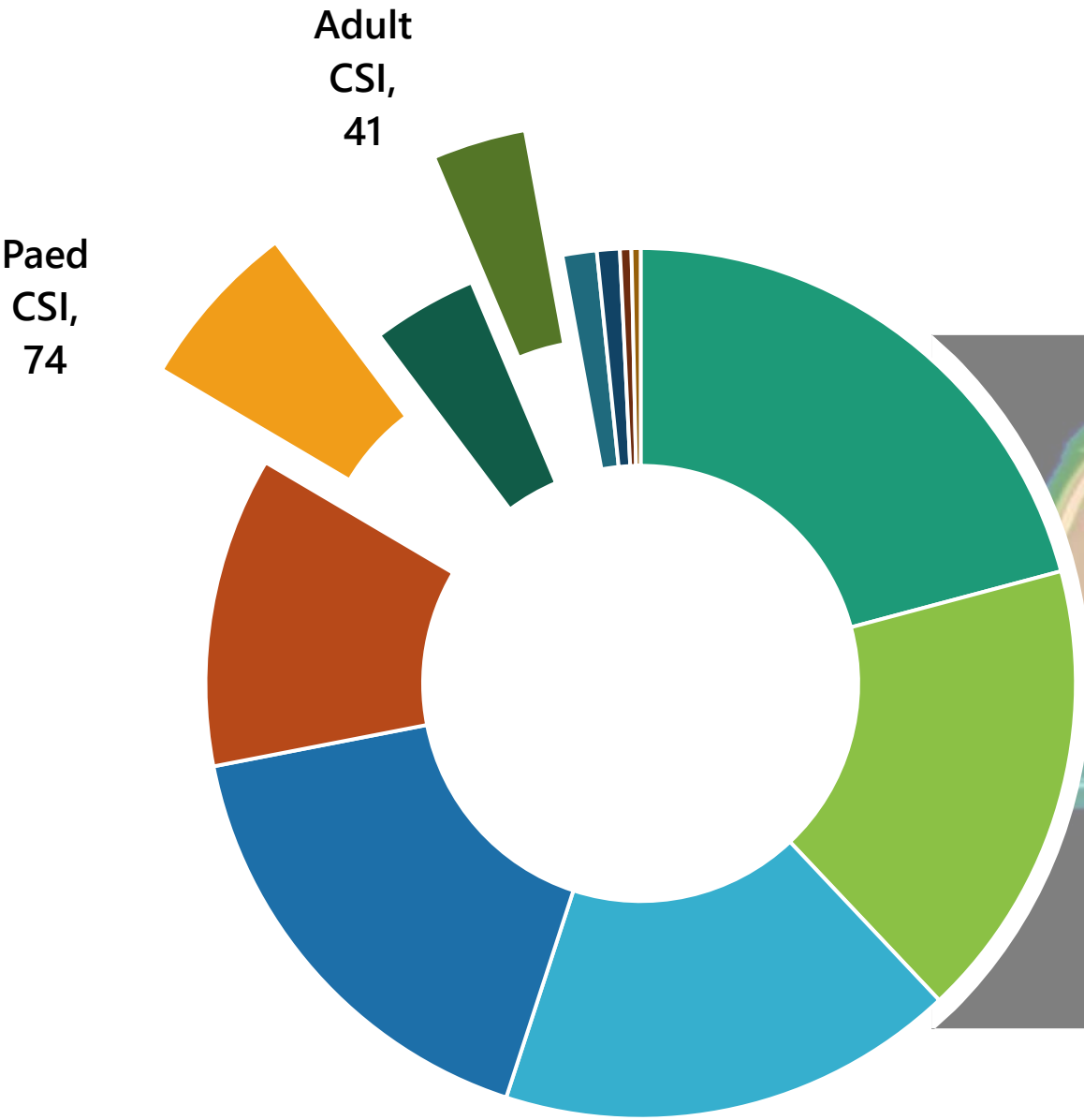


Developing techniques for complex indications like nasopharyngeal cancer

Build on experience with adult head & neck to look at role of adaption in clinical practice



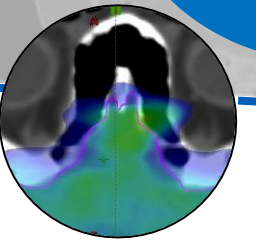
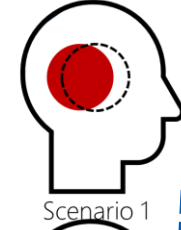
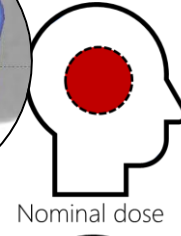
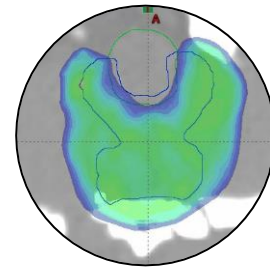
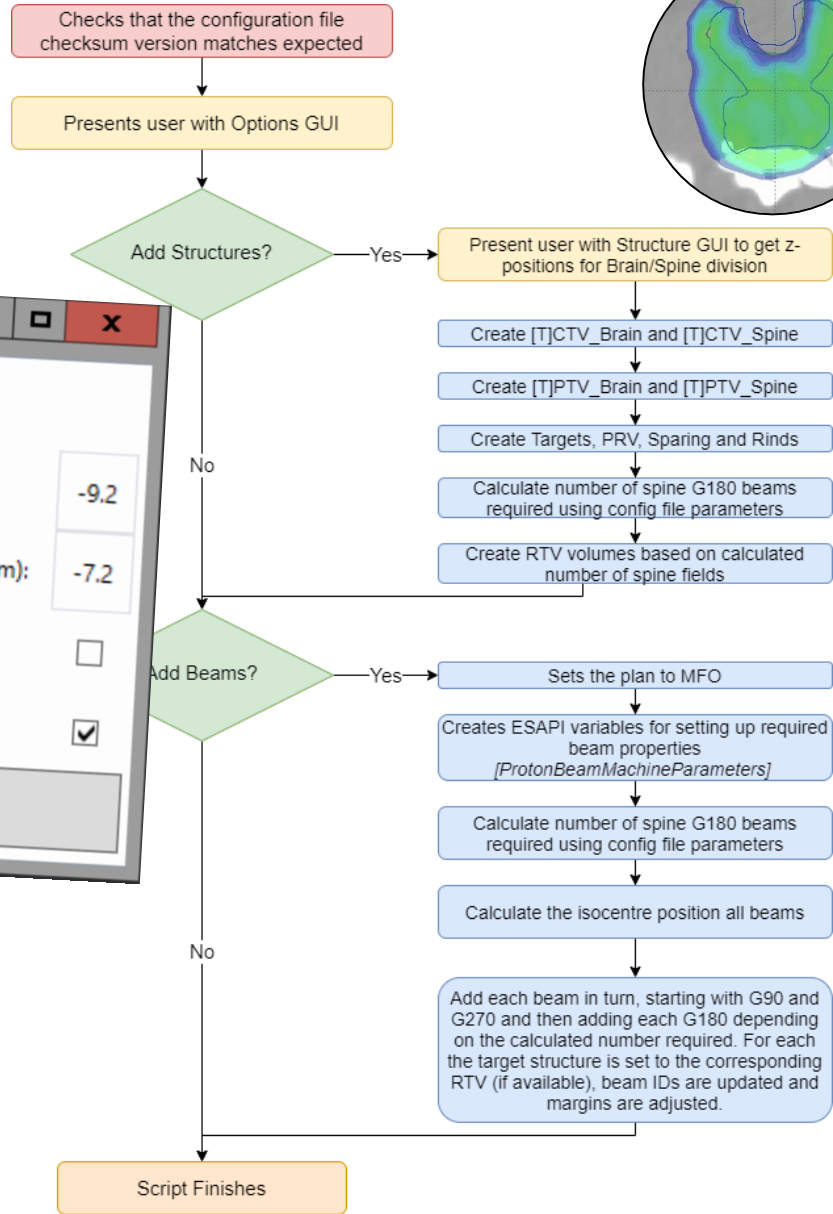
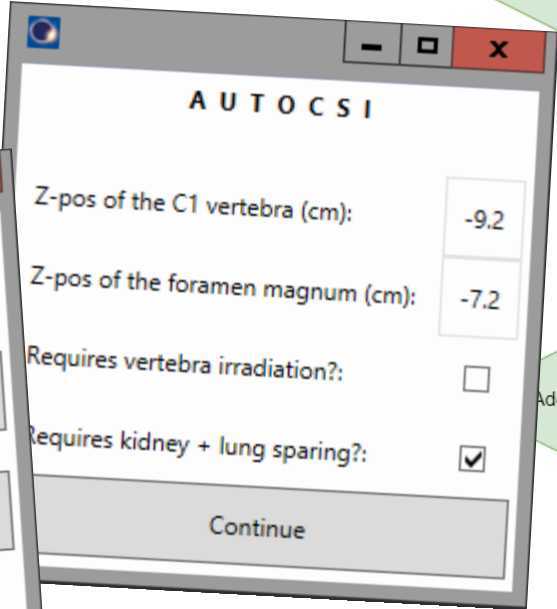
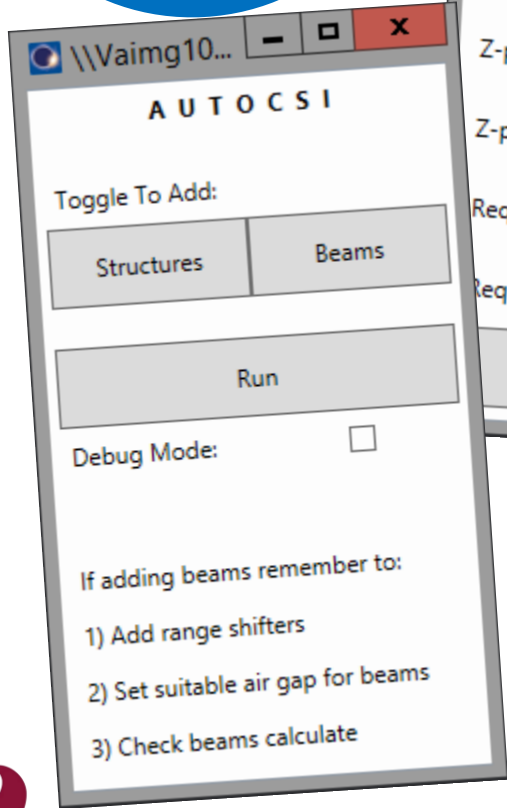
Craniospinal irradiation



Automation and efficiency



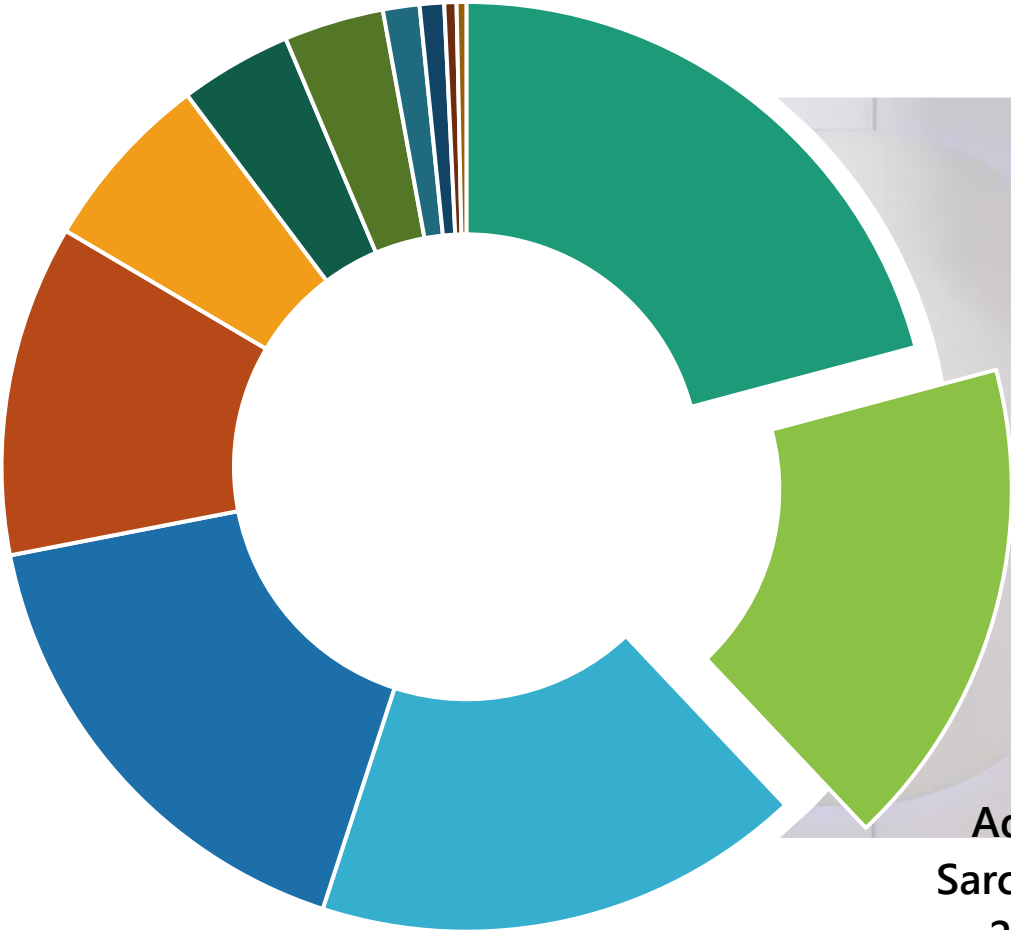
Automation
in whole CNS
planning



Tools to
improve
efficiency
uncertainty
evaluation



Adult sarcoma



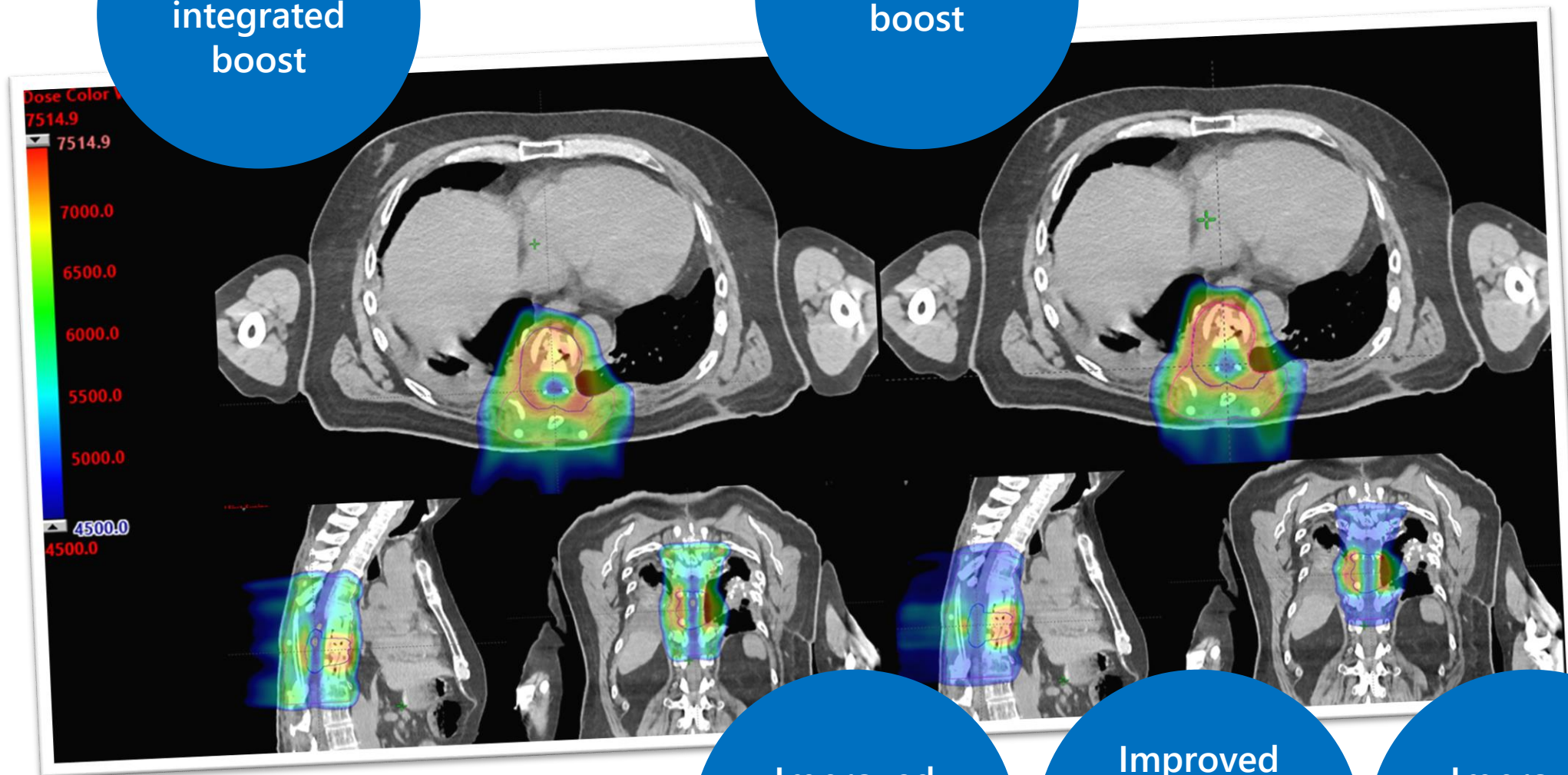
Adult Sarcoma, 202

Improving treatments and workflow



Simultaneous
integrated
boost

Sequential
boost



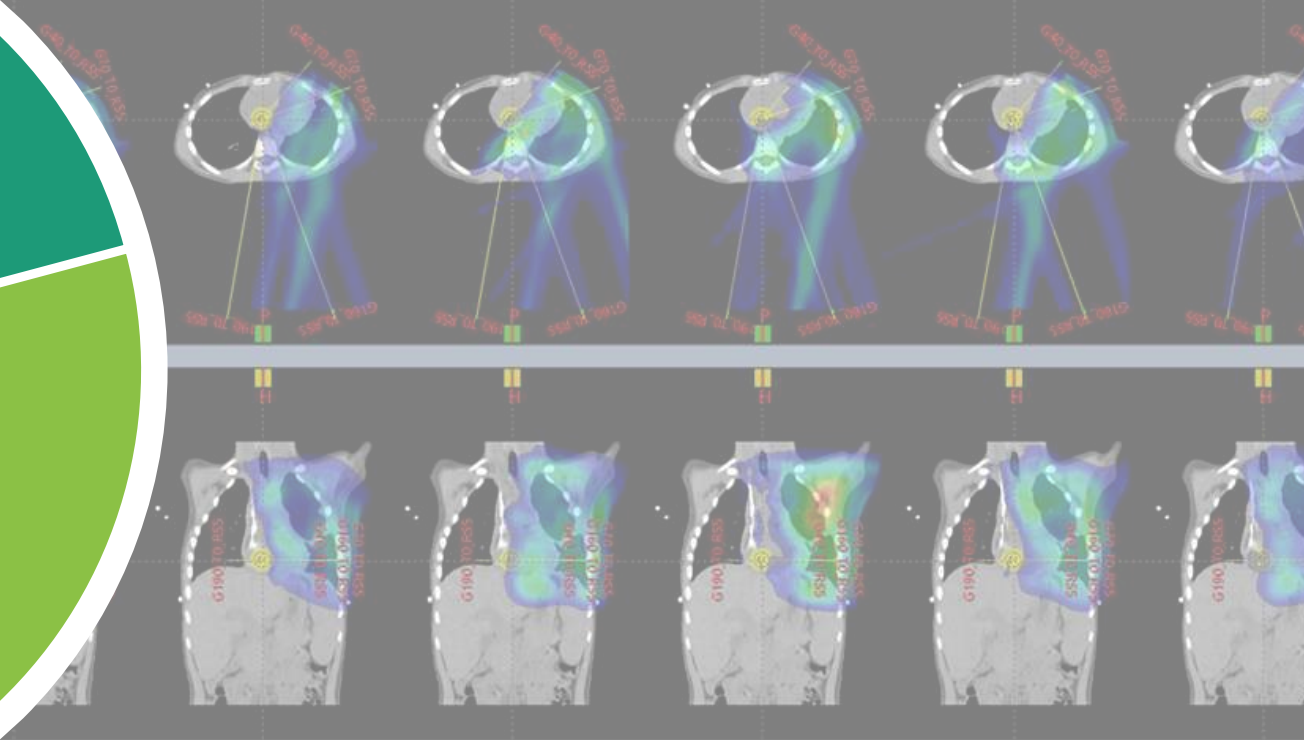
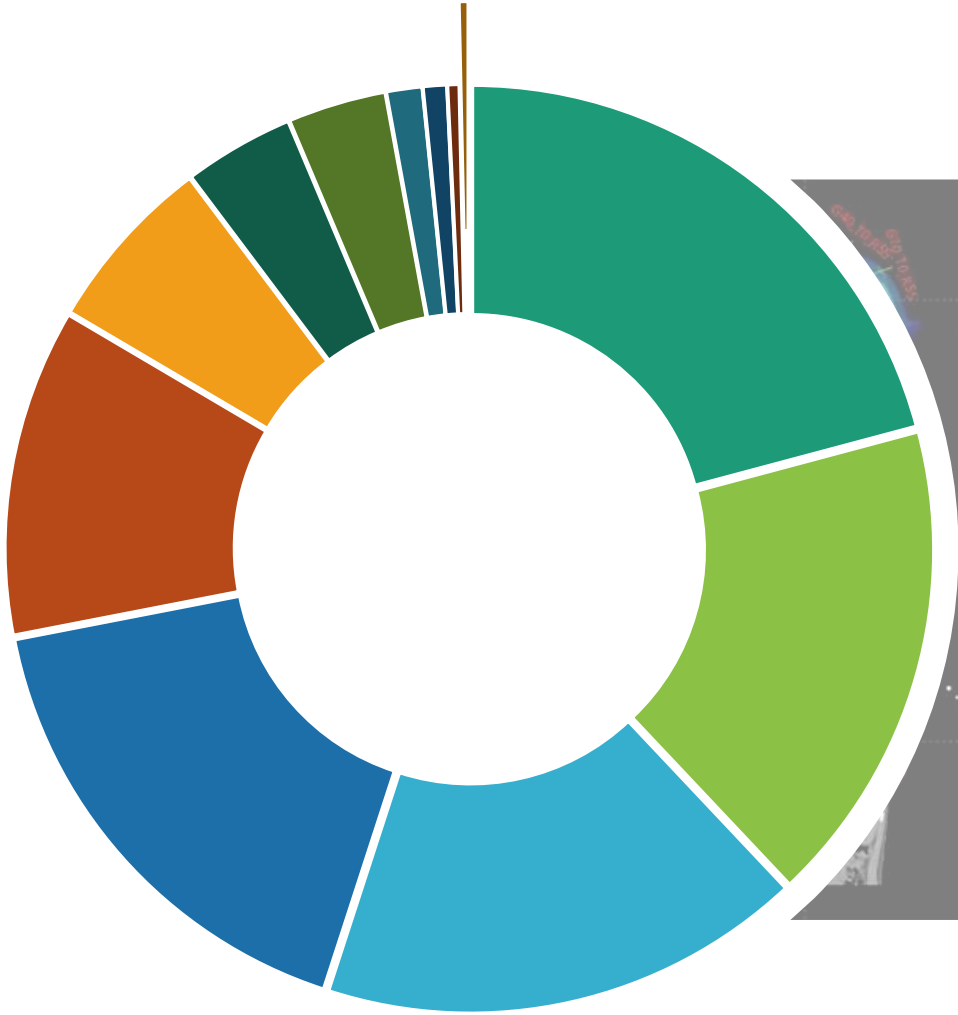
Improved
CTV High
coverage

Improved
conformality
&
homogeneity

Improved
uncertainty
evaluation



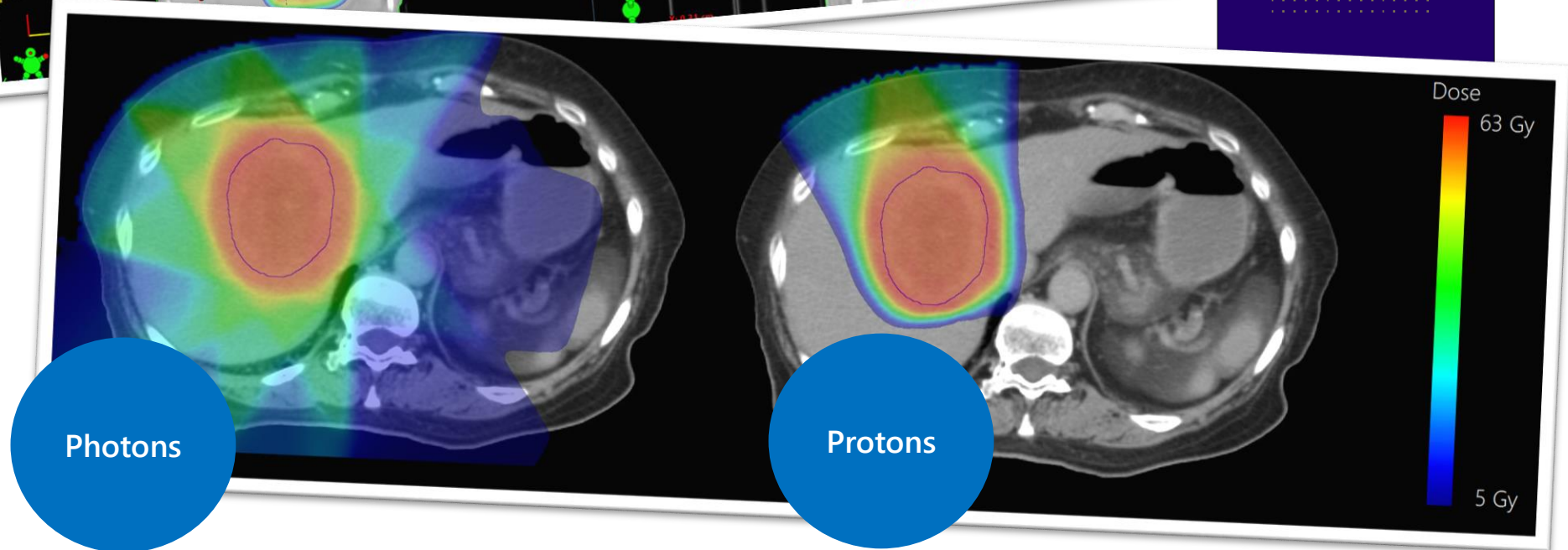
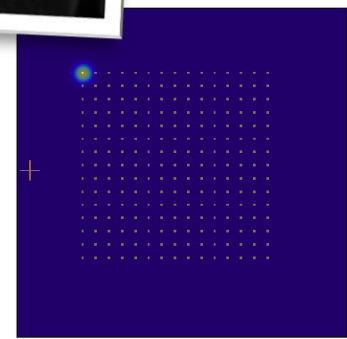
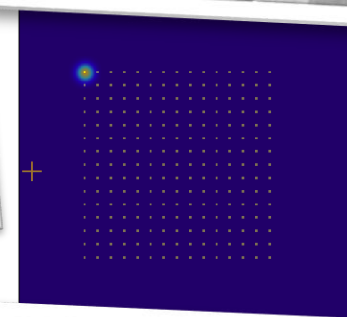
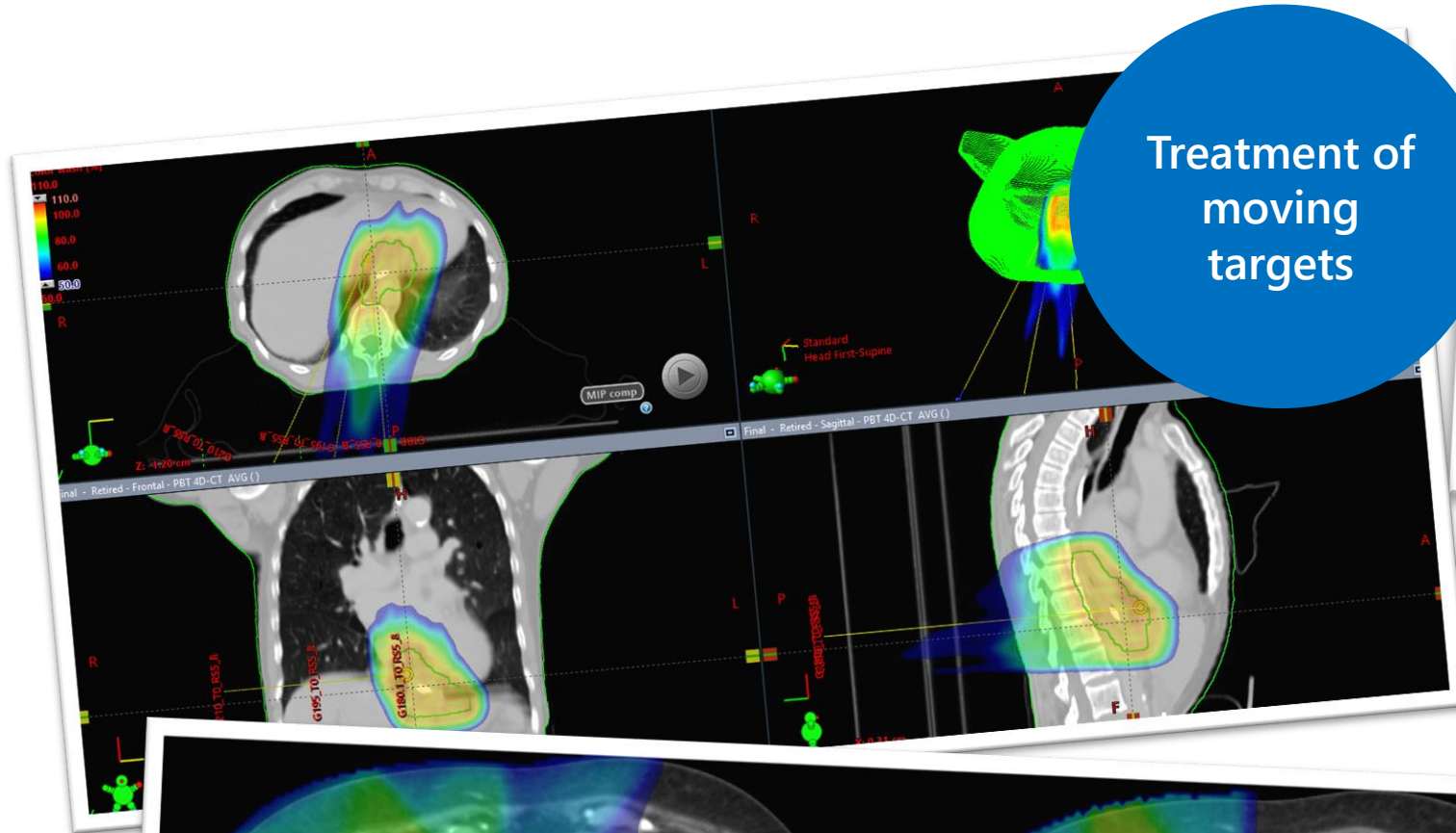
Moving targets



Expanding indications



Treatment of moving targets

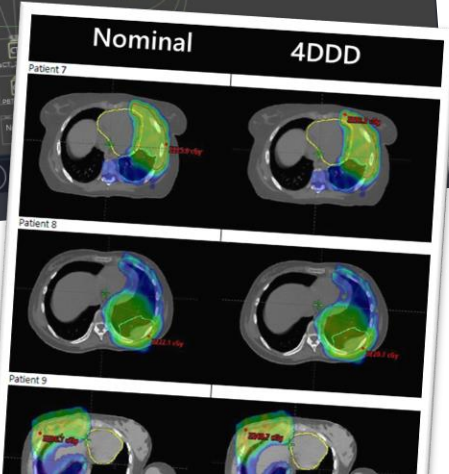
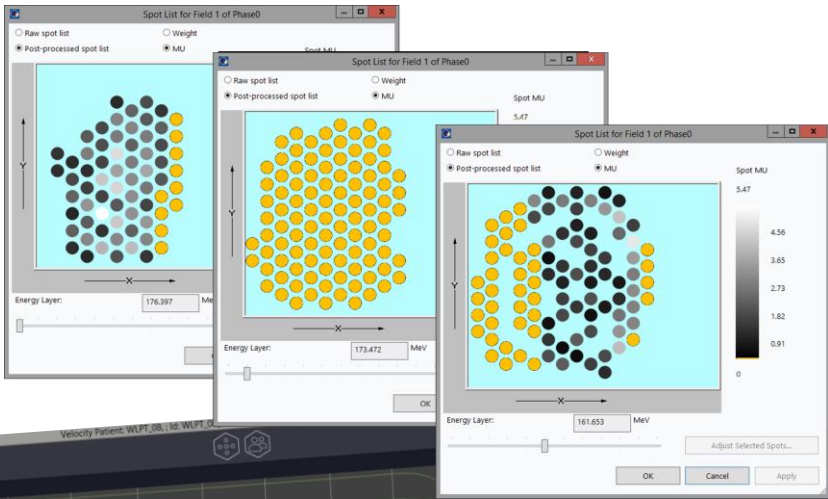


Photons

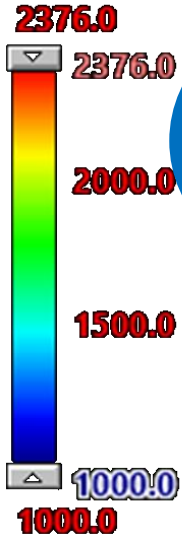
Protons



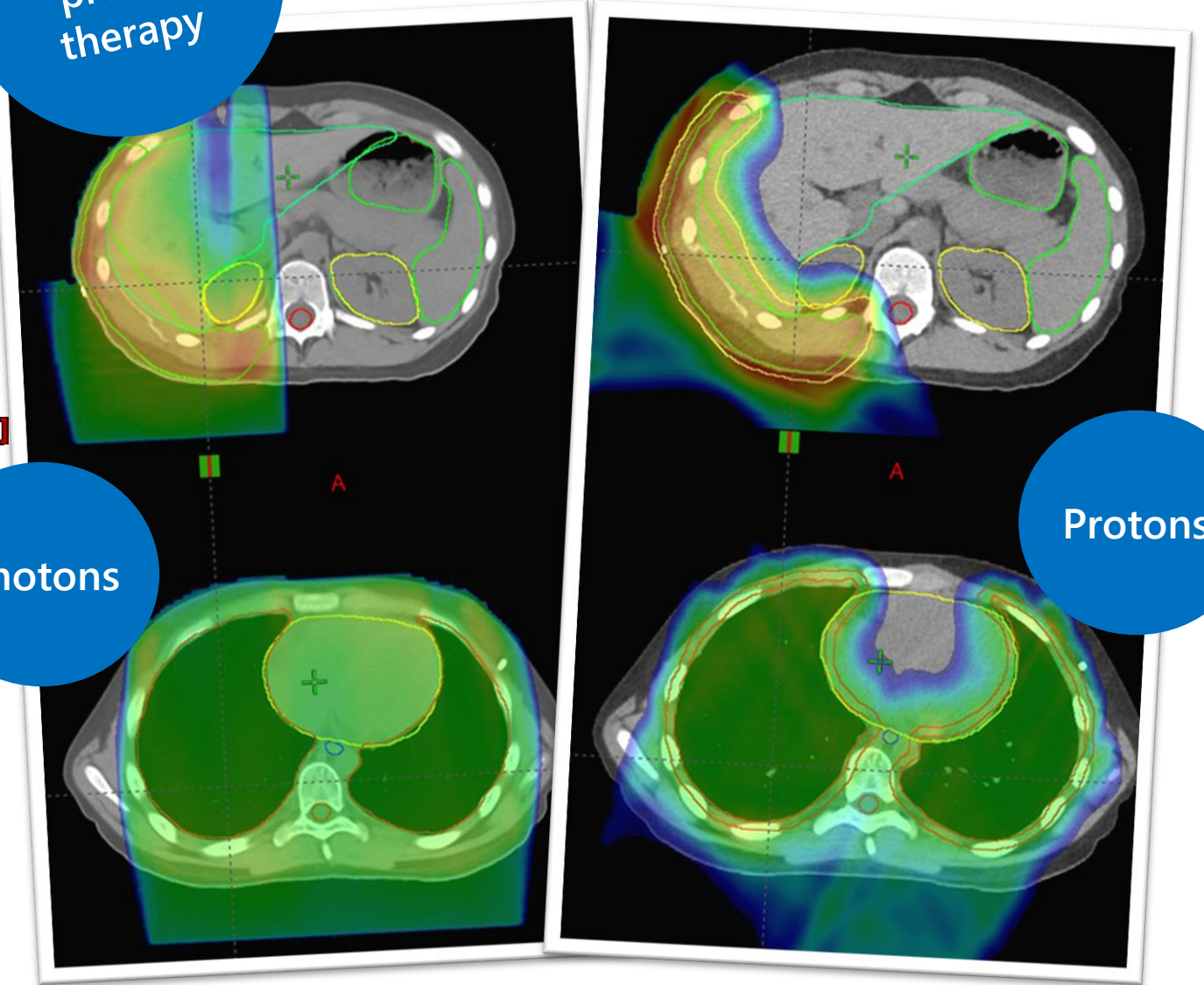
Whole lung
proton
therapy



Color wash [cGy]



Photons



Protons



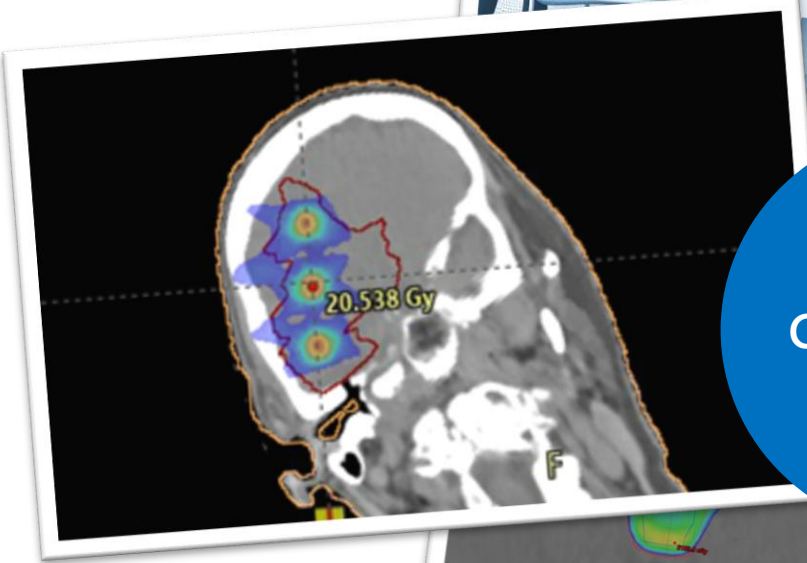
Clinical outcomes & learning from experience



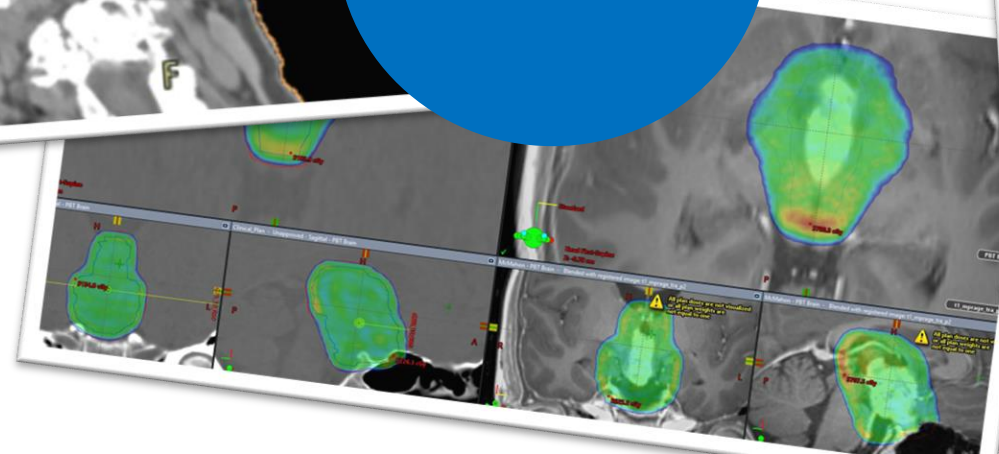
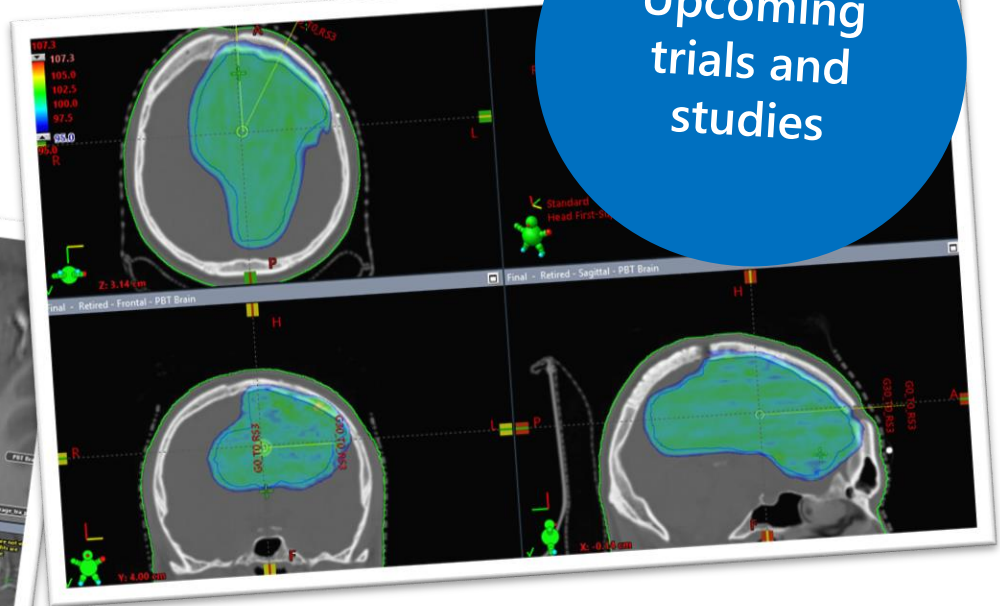
Efficiency in QC & patient specific verifications



Collaboration



Upcoming trials and studies



Proton Treatment and Experimental Research at the Christie

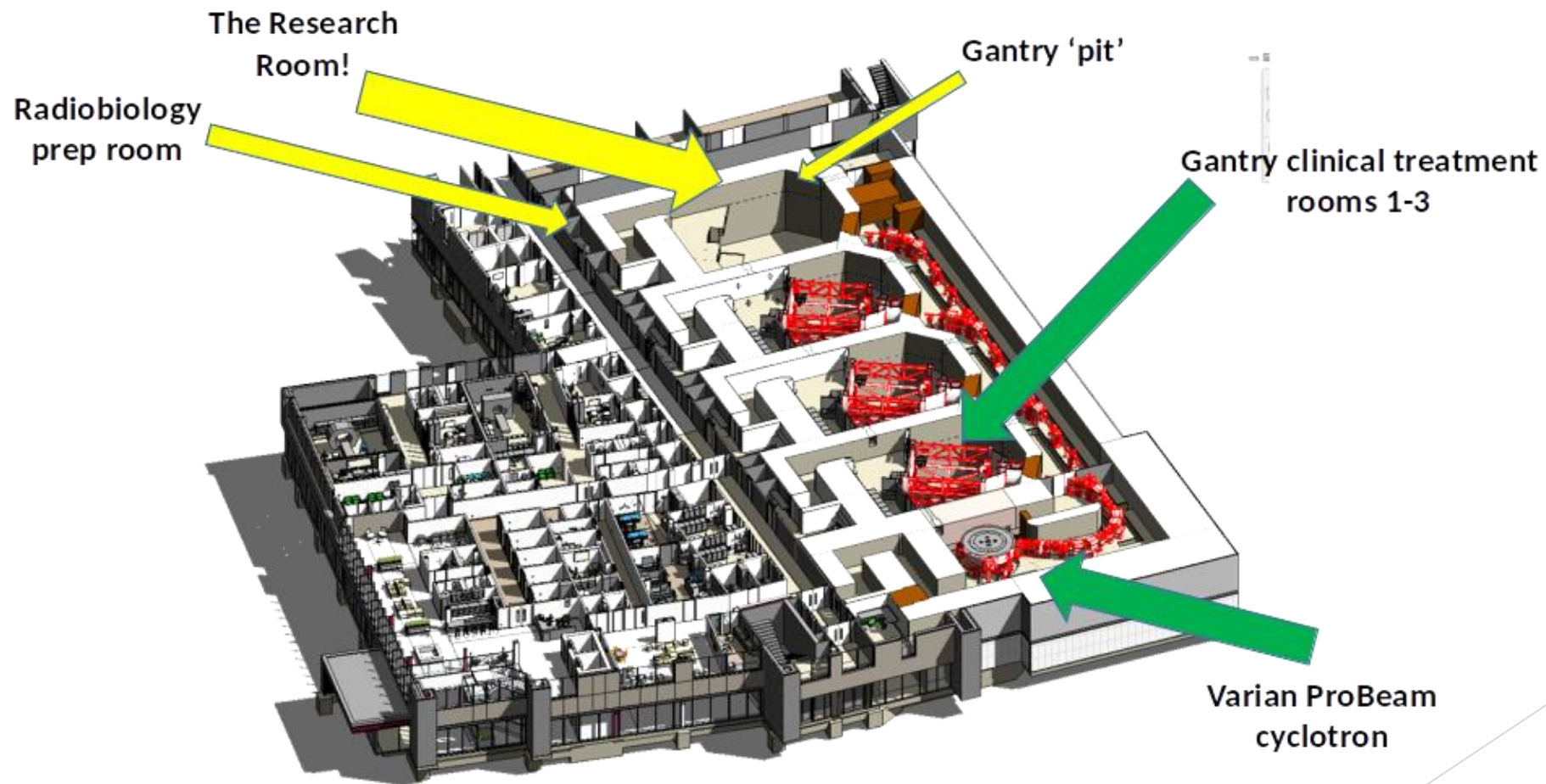
Nicholas Henthorn,
The PRECISE group

The
Precise
Group



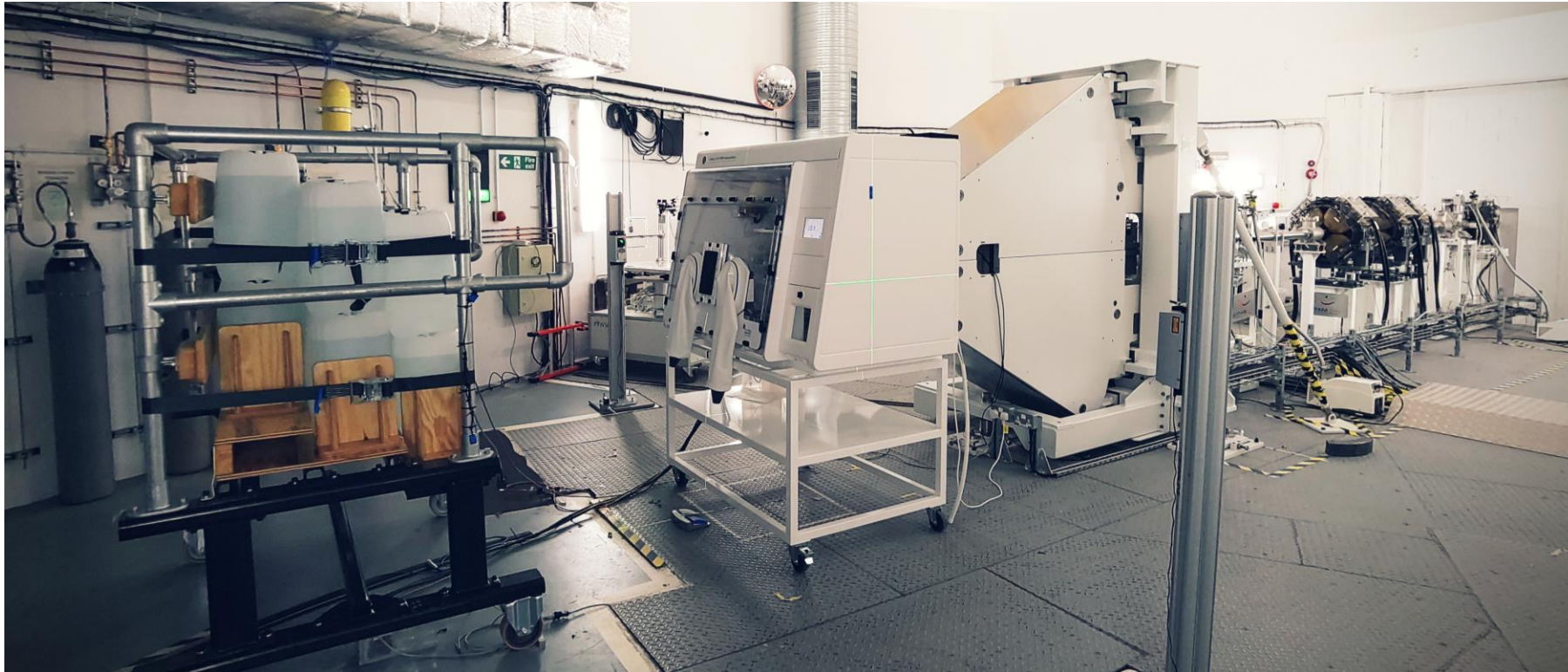
The Research Room

An Infrastructure for Proton Research



The Research Room

An Infrastructure for Proton Research



Prof. Karen Kirkby



Prof. Ranald Mackay



The Research Room

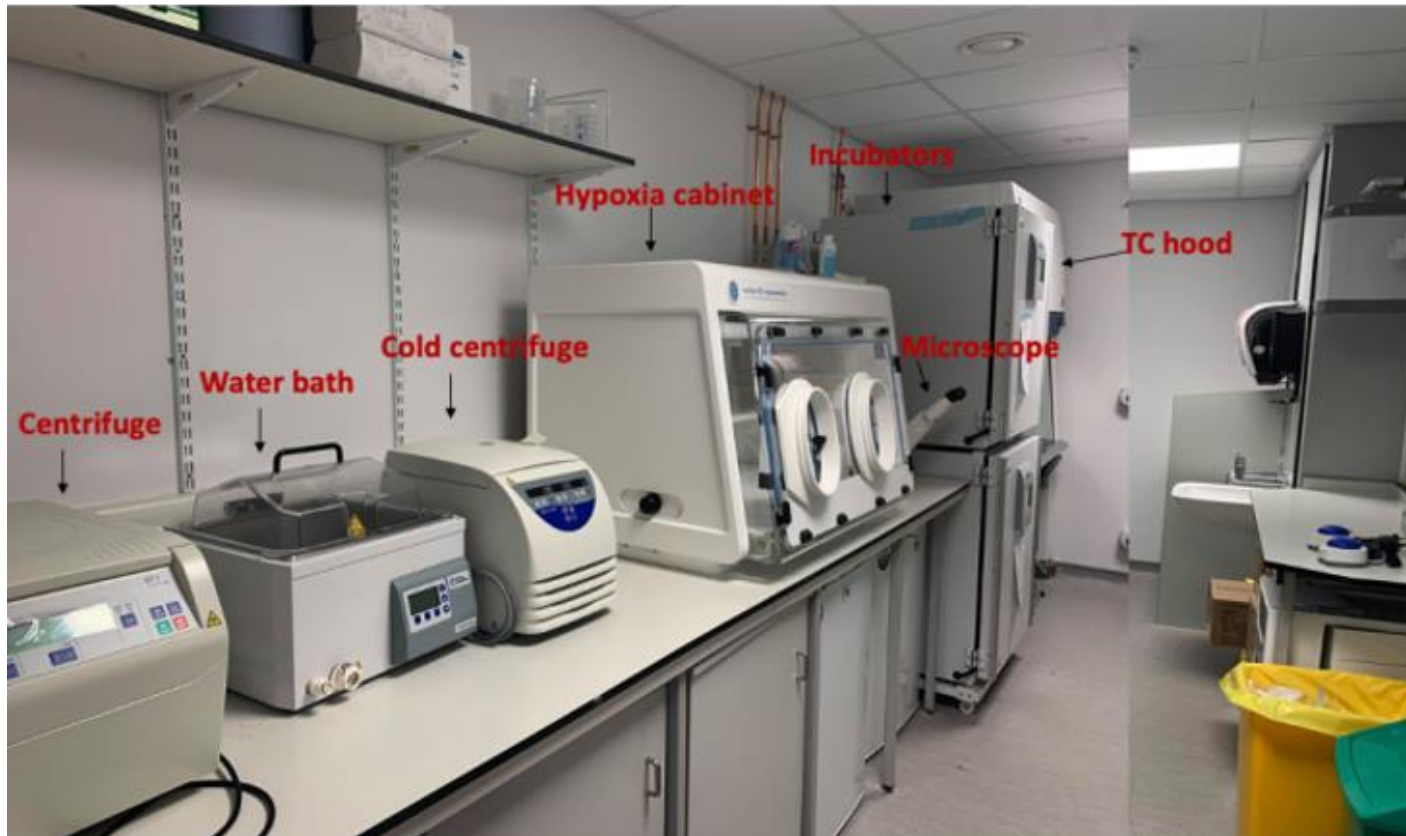
An Infrastructure for Proton Research



Dr. Amy Chadwick



Dr. Elham Santina



Live cell imaging system

EVOS m7000



The Research Room

An Infrastructure for Proton Research



Dr. Nicholas
Henthorn



Dr. Michael
Merchant



Dr. John-William
Warmenhoven



- **O2:** 0.1% - ambient
- **CO2:** 0% - 20%
- **Temp.:** ambient +4°C - 45°C
- **Humidity:** ambient - 100%
- **Scanning Area:** 20x20 cm
- **6-axis robot:** 30s between samples
- **Hotel:** 36 samples (54/night)
- Automated liquid handling for 96-well plates

- Scattered dose to hotel at worst 1.27 mGy/Gy

The Research Room

An Infrastructure for Proton Research



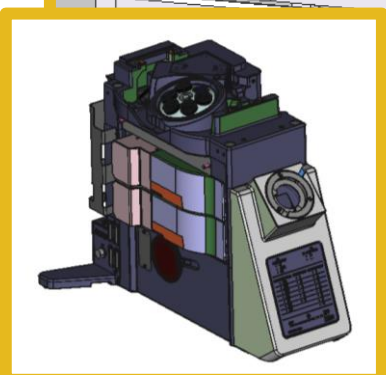
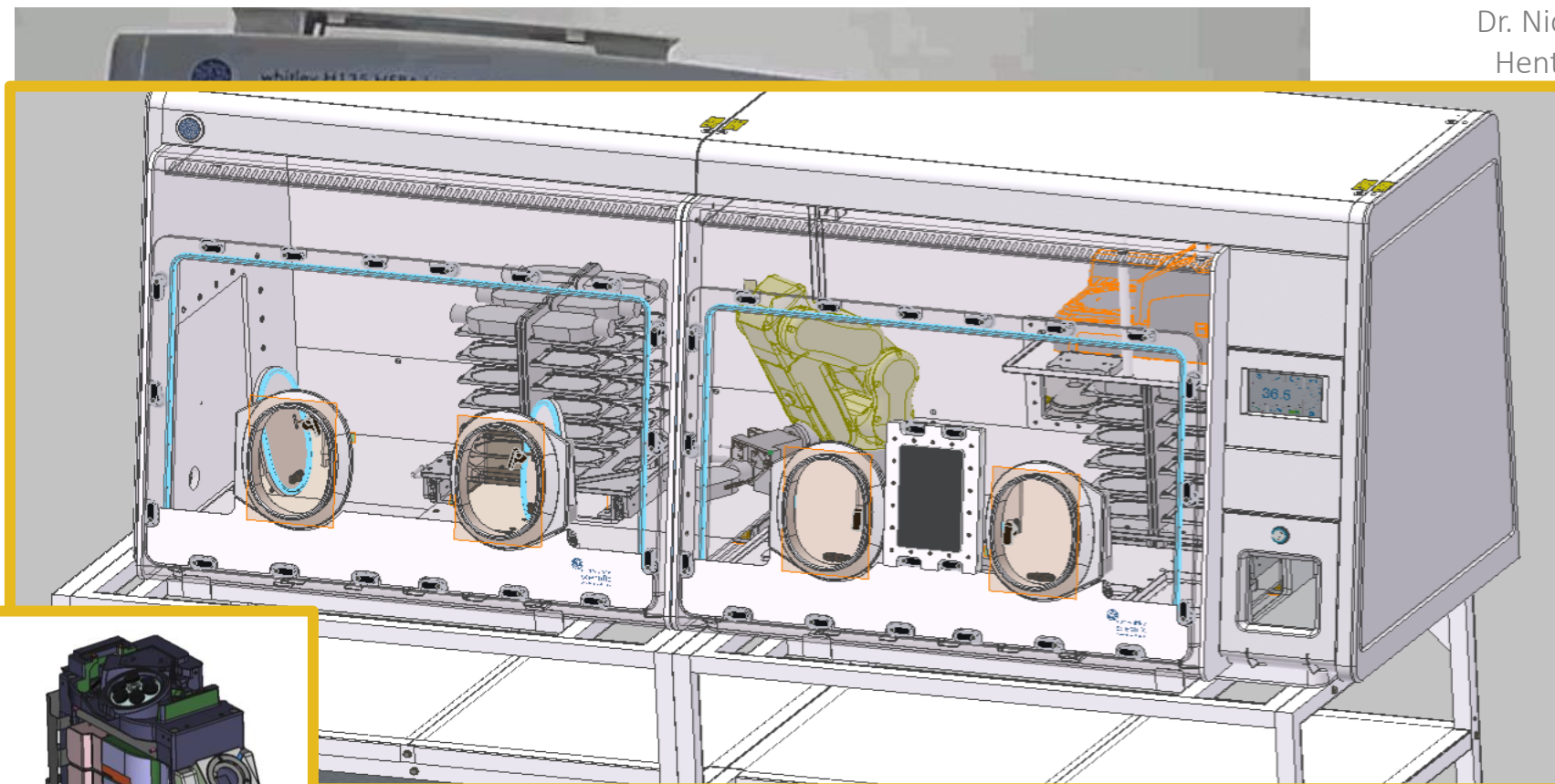
Dr. Nicholas
Henthorn



Dr. Michael
Merchant



Dr. John-William
Warmenhoven



Endstation Extension

- Double the size
- Added capacity
- Online microscopy
- Chiller unit

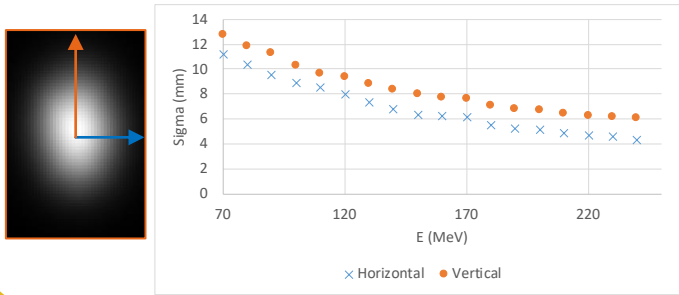
Coming next year

1.27 mGy/Gy

Capabilities

Delivery

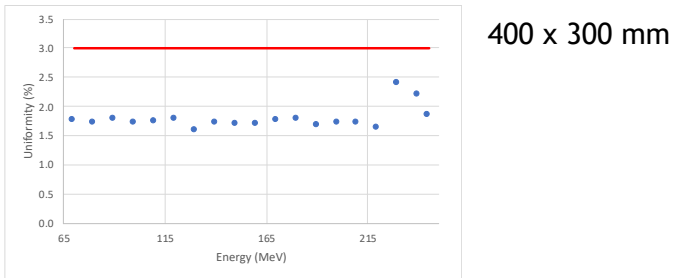
Spot Size



Biology Throughput

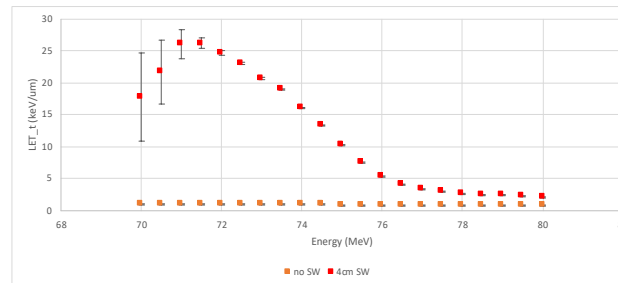
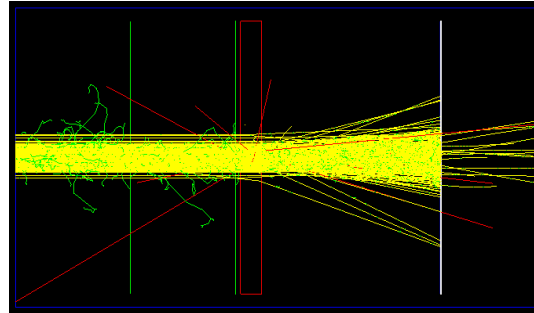
Typically, 36 samples
At most, 56 samples (total 300Gy)

Field Size



Increased LET

Further degrading with solid water



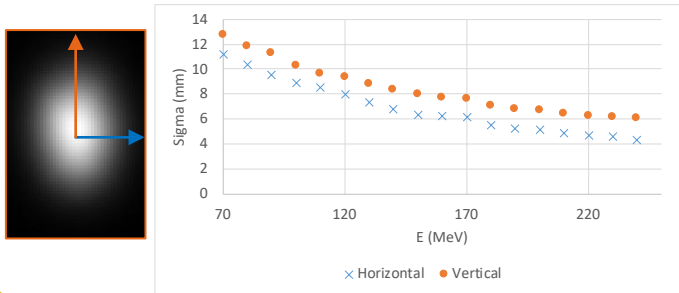
Dosimetry

Conventional Variation: 0.3%
FLASH Variation: 2.9%

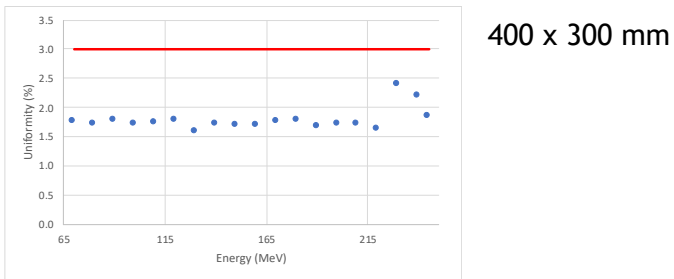
Capabilities

Delivery

Spot Size



Field Size



Dosimetry

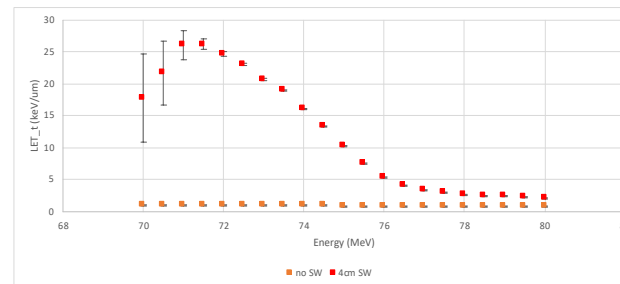
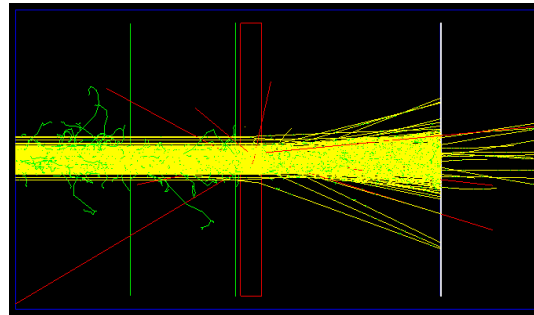
Conventional Variation: 0.3%
FLASH Variation: 2.9%

Biology Throughput

Typically, 36 samples
At most, 56 samples (total 300Gy)

Increased LET

Further degrading with solid water



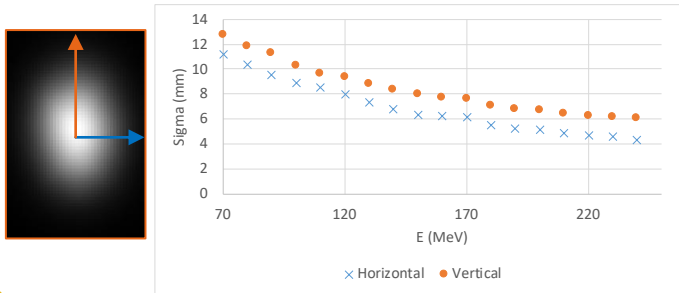
Dose Rate

Single spot dose rate: 139 Gy/s

Capabilities

Delivery

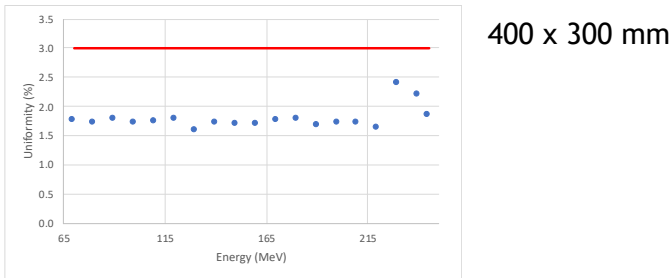
Spot Size



Biology Throughput

Typically, 36 samples
At most, 56 samples (total 300Gy)

Field Size



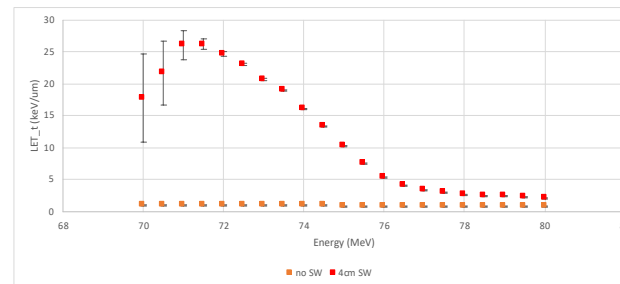
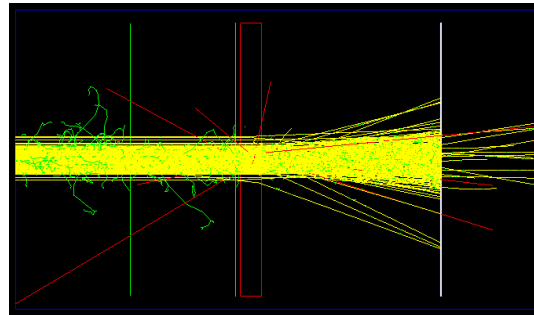
400 x 300 mm

Dosimetry

Conventional Variation: 0.3%
FLASH Variation: 2.9%

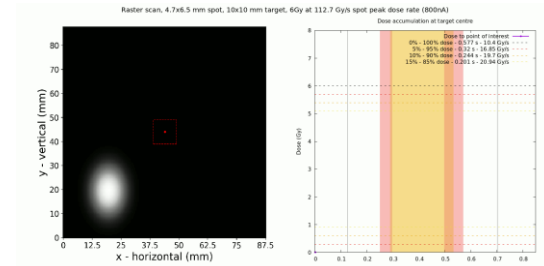
Increased LET

Further degrading with solid water



Dose Rate

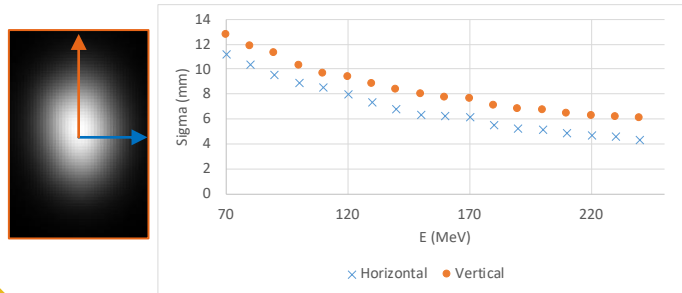
Single spot dose rate: 139 Gy/s



Capabilities

Delivery

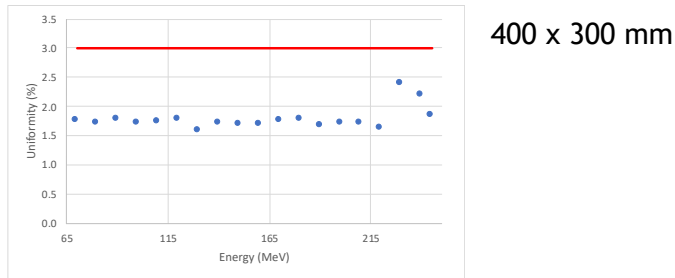
Spot Size



Biology Throughput

Typically, 36 samples
At most, 56 samples (total 300Gy)

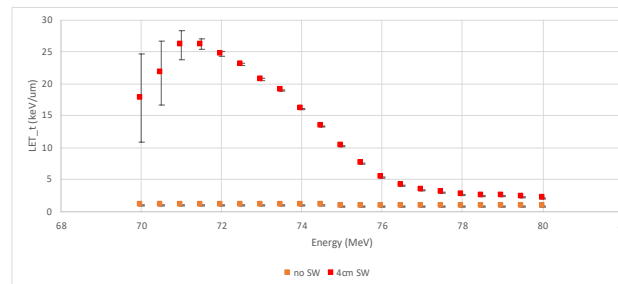
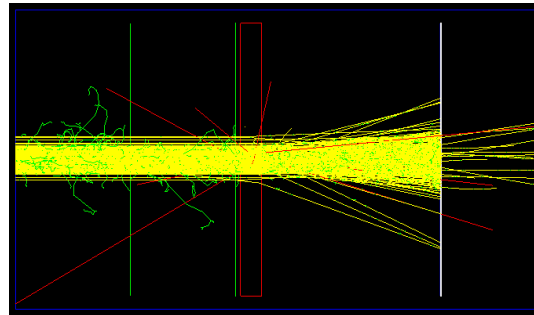
Field Size



400 x 300 mm

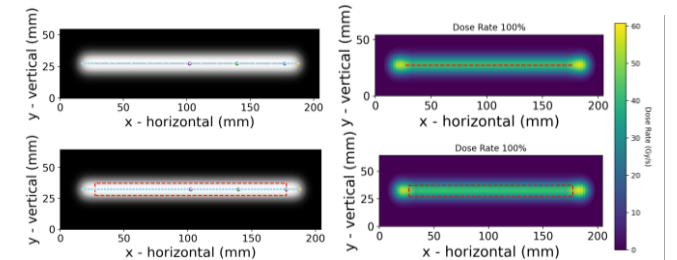
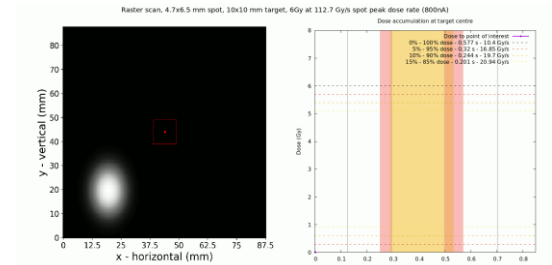
Increased LET

Further degrading with solid water



Dose Rate

Single spot dose rate: 139 Gy/s

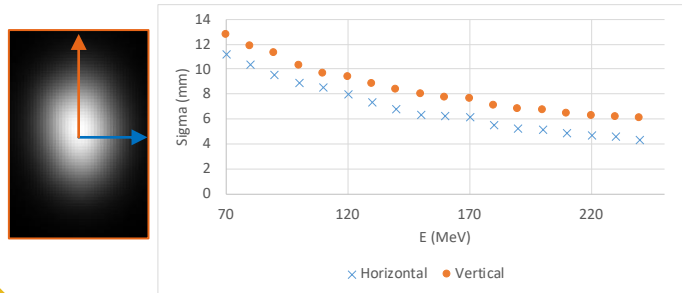


Line scan dose rate: 41 Gy/s

Capabilities

Delivery

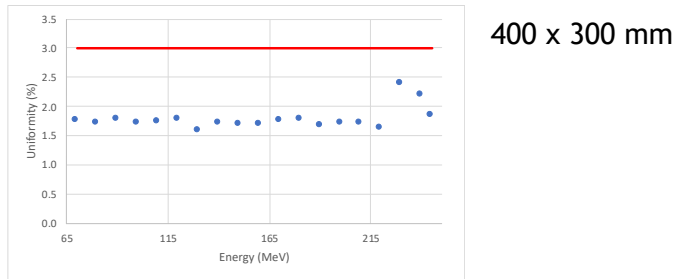
Spot Size



Biology Throughput

Typically, 36 samples
At most, 56 samples (total 300Gy)

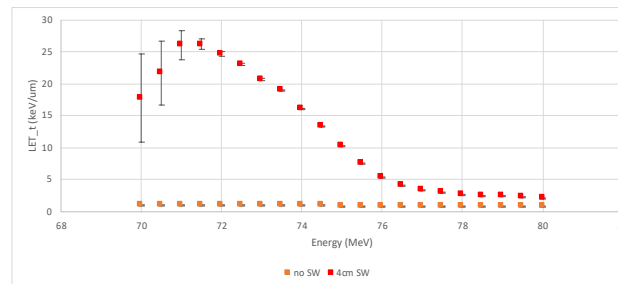
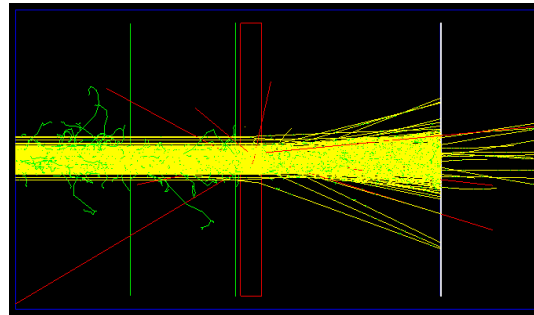
Field Size



400 x 300 mm

Increased LET

Further degrading with solid water

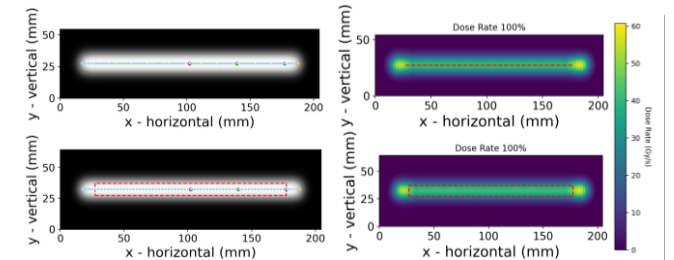
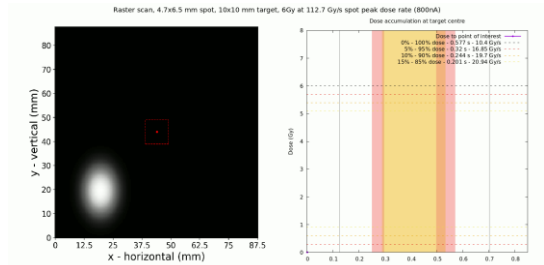


Dosimetry

Conventional Variation: 0.3%
FLASH Variation: 2.9%

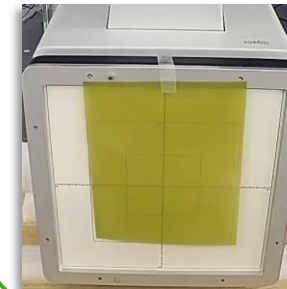
Dose Rate

Single spot dose rate: 139 Gy/s



Line scan dose rate: 41 Gy/s

Conventional

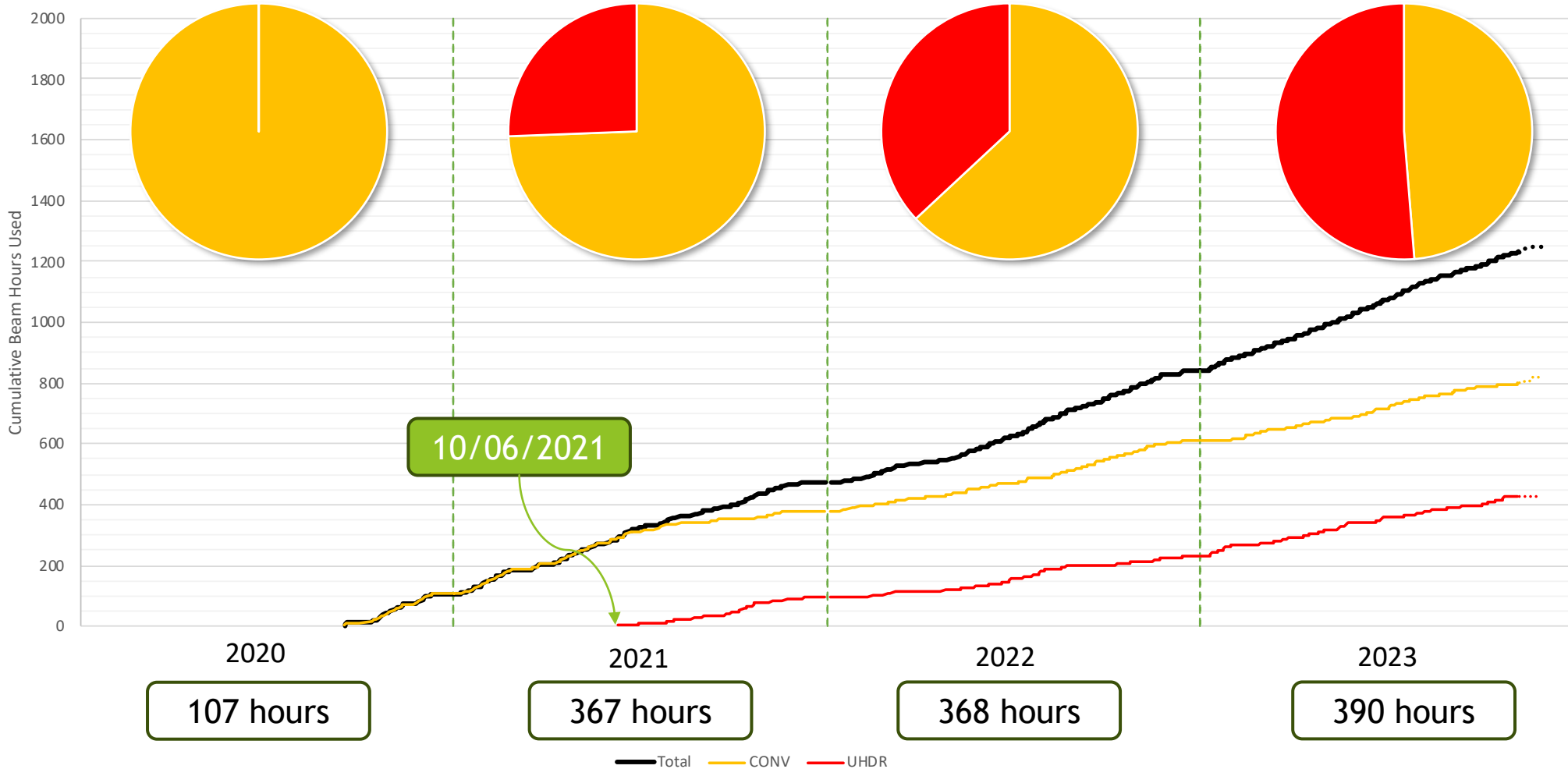


FLASH



Beamtime

Experimental Research Over 4 Years...



11 hours/week
Across 3 days

Maximum
beamtime = 572
hours/year

Outside of clinical
operation
Start time 11pm

Acknowledgments



CANCER
RESEARCH
UK

RADNET
MANCHESTER

The Christie 
NHS Foundation Trust

The PRECISE Group

Karen Kirkby
Ran MacKay
Mike Merchant
Mike Taylor
Helena Kondryn
Ally McGrath

Adam Aitkenhead
Amy Chadwick
Elham Santina
Chris Smith
George Banister
Jennifer Antrobus
Emma Biglin
Nickolay Korabel
Sam Ingram
Sam Manger
Kristina Small
John-William Warmenhoven
Nicholas Henthorn

Charlie Heaven
Danni Love
Hannah Wanstall
Jack Aylward
Sam Burford-Eyre
Abigail Hemming
Josephine Jones
Becky Habgood
Emily Barrett
Joseph Hallett

Additional Thanks to:

Shaun Atherton
Richard Ling
Stephen Fearnhough
Subin Padmanabhan
Syed Mehdi



Science & Technology
Facilities Council

EPSRC **MANCHESTER**
BIOMEDICAL RESEARCH CENTRE



The Christie
Charitable Fund

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