A novel phantom to evaluate longitudinal and angular automatic tube current modulation (ATCM) in CT

CT Users Group Meeting, 15th December 2015

Deborah Merzan, Patrik Nowik, Robert Bujila

Department of Medical Physics, Section for X-ray Physics

deborah.merzan@karolinska.se, +46 (0)72 582 34 82

KAROLINSKA
University Hospital

Agenda

ATCM Theory
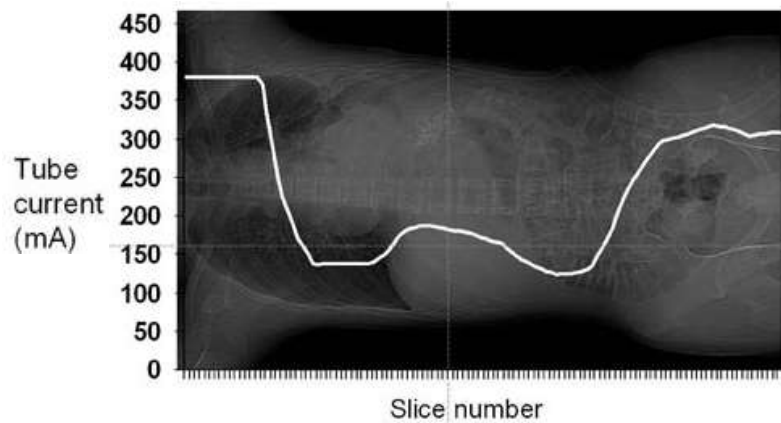
Phantom design & Image analysis

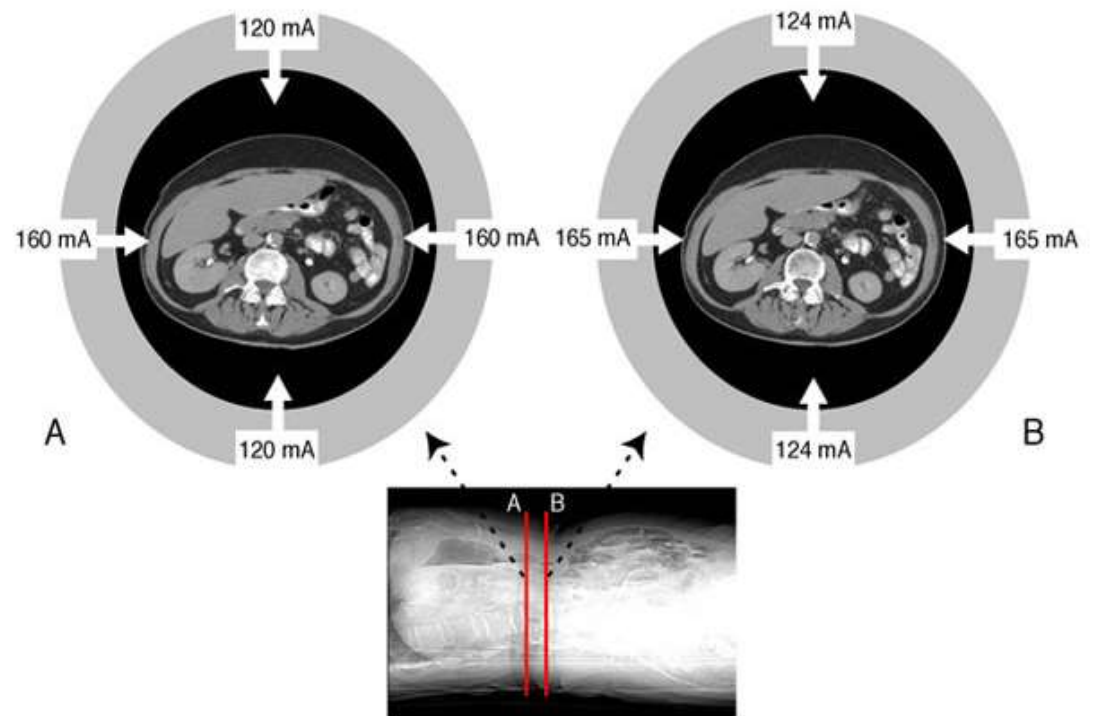Results – effect of miscentering on ATCM

Conclusion

Future Work

ATCM Theory

Longitudinal ATCM

Angular ATCM

Images from: *Minimizing CT Radiation Dose*. J. Miller m.fl., Radiology Roundss, 2008, Volume 6, Issue 2.
CT and Rtadiation: What Radilogists Should Know. C. Coursey, Applied Radiology, 2008, 37(3):22-29.
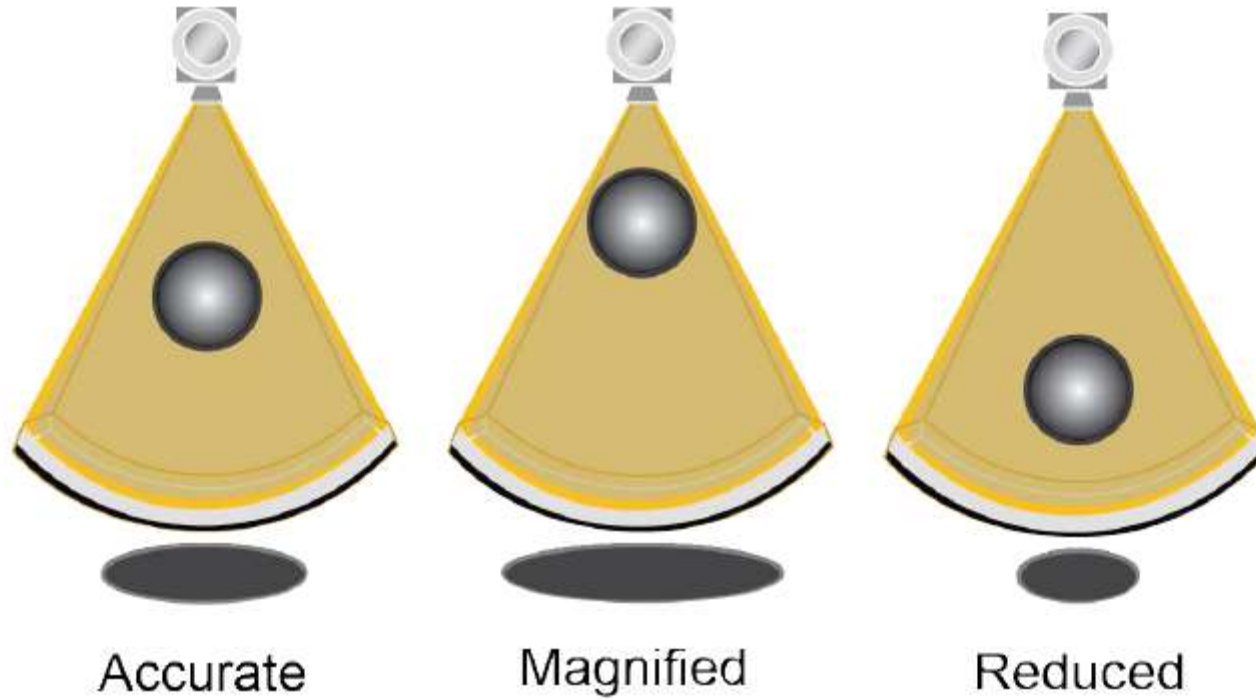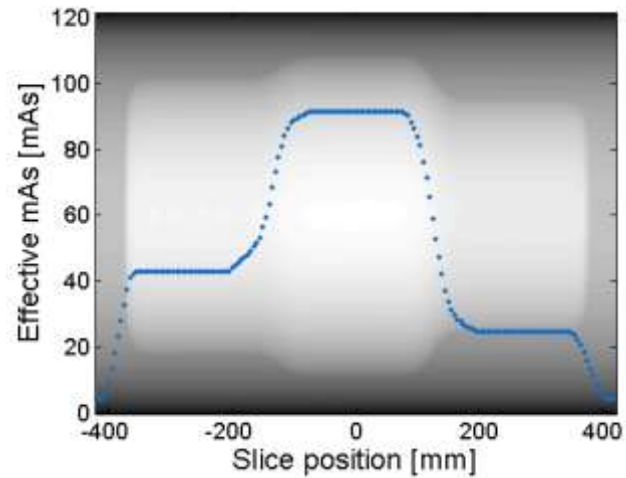
ATCM Theory

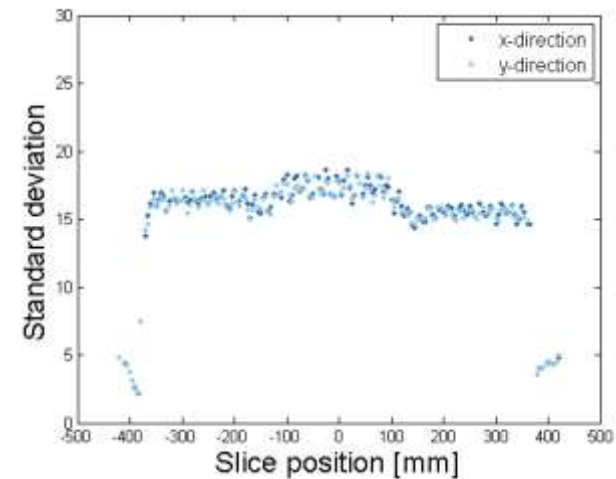Accurate   Magnified   Reduced
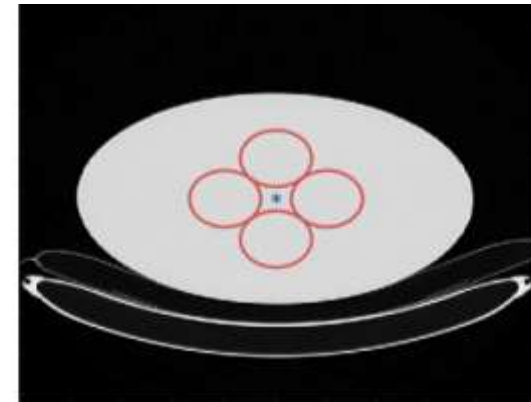
Phantom design

- 3 sections, 15 cm each

- Smooth transitions of 10 cm

- Major axes of 25, 30 and 35 cm

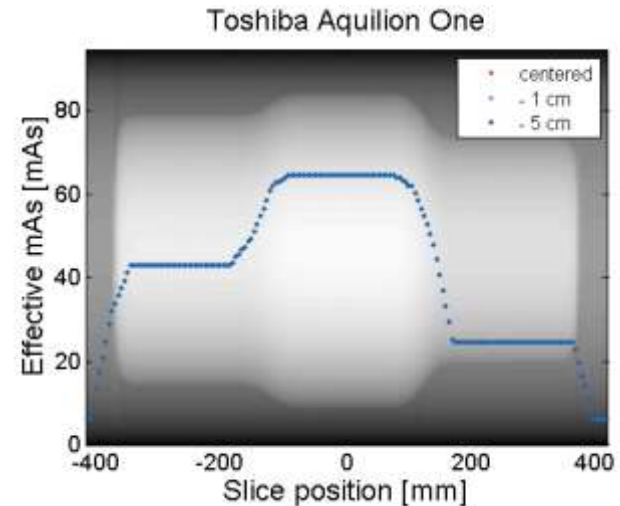- Aspect ratio 3:2

- Solid PMMA

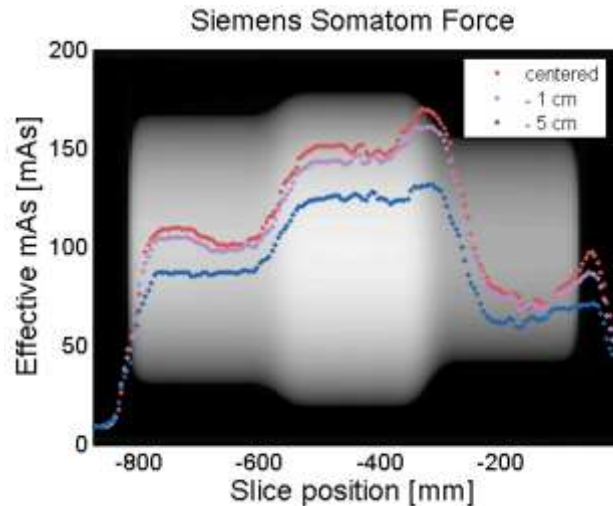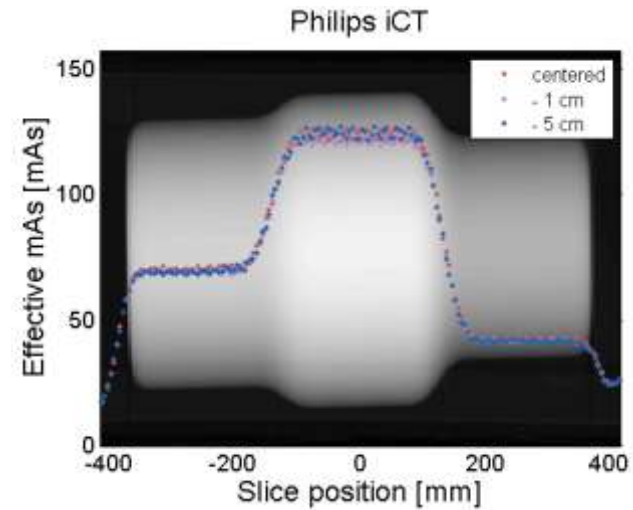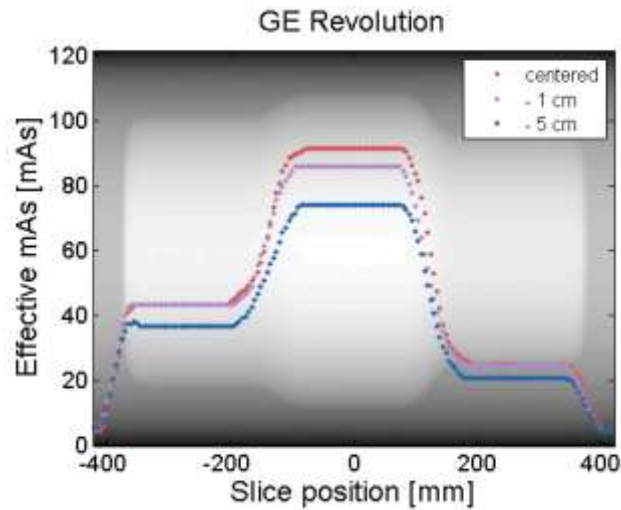- 38 kg

Image analysis

Data extracted from DICOM
header for each slice.

Effective mAs is plotted over 2D
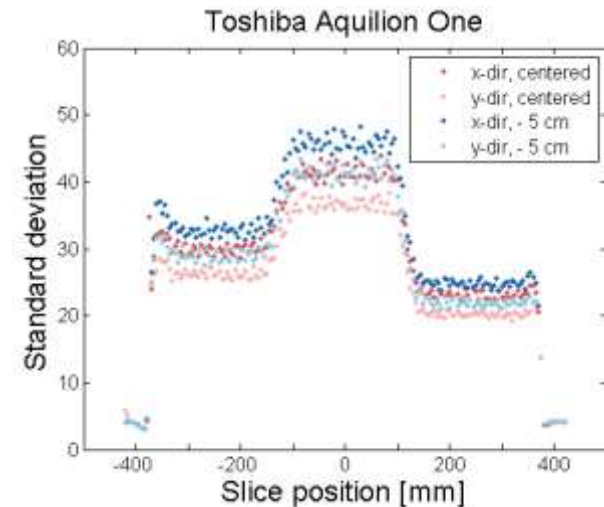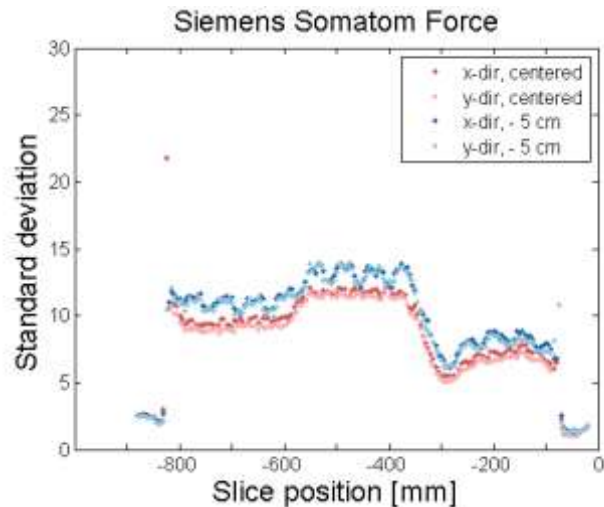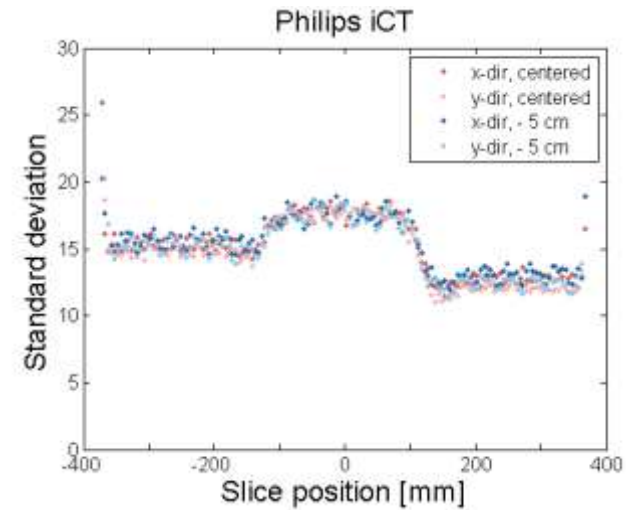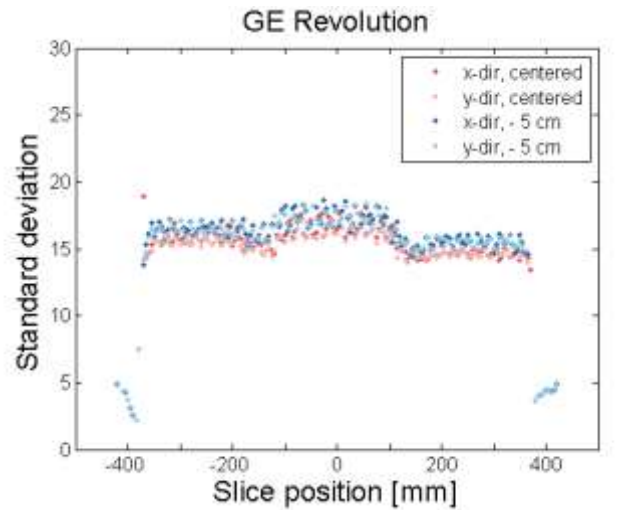projection of volume data.

Standard deviation analyzed
in each slice.

Results – effect of miscentering on tube current

Results – effect of miscentering on image noise

Conclusion

- It is important to understand how different implementations of ATCM work.

- The developed phantom can be used for evaluating how different parameters (e.g. miscentering) affect the outcome of the ATCM.

- Miscentering does not always affect applied tube current, but it affects image noise and dose distribution.

3D rendering by Love Kull, Sunderby sjukhus, Norrbottens läns landsting

Future Work

• Use the phantom to evaluate how other parameters affect the ATCM on CT scanners from different vendors.

- o Settings used for localizer radiograph

- o Scan settings

- o Reconstruction settings

- o Phantom centering

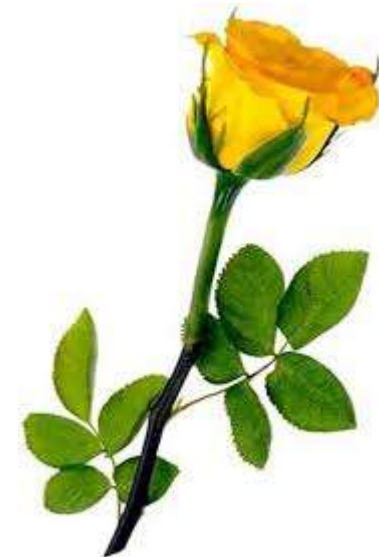3D rendering by Love Kull, Sunderby sjukhus, Norrbottens läns landsting

Acknowledgements

This work is part of the XQuality project at Karolinska University Hospital.

Thank you!

CMIV, Linköping University Hospital

Skåne University Hospital

Thank you!

Questions & Discussion