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Synchrotron CT dosimetry at the IMBL for low wiggler magnetic field strength and spatial modulation with bow tie filters

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Synchrotron CT dose reduction was investigated for the IMBL wiggler source operated at lower magnetic field strength and for beam modulation with spatial filters placed upstream from the sample. Beam quality at 25-30 keV for 1.4-3.0 T was assessed using transmission measurements with copper to quantify the influence of third harmonic radiation. The low energy operational limit is 24-28 keV for 0.1-1% transmission by added filters, 2 mm path length through silicon and 25 m of air. The upper limit is near 80 keV for wiggler field 1.4 T, approximately 100 keV for 2.0 T and extend beyond 100 keV for 3.0-4.2 T. The harmonic radiation contribution is reduced for lower field strengths. Measured dose rates suggest the influence of harmonics is insignificant above approximately 26 keV at 1.4 T and above 33 keV at 2.0 T. Relative to 3 T operation, the mean dose rate in air is reduced to approximately 12% at 2 T and 4% at 1.4 T. Spatial filters were constructed from blocks of perspex with circular voids of diameter matching the CT dosimetry test objects. A calibrated ion chamber integrated absorbed dose to the phantom during 360° rotation. CT dose indices (CTDI) were measured at 25-100 keV for 3.0T only, at the centre and periphery for 35-160 mm diameter perspex phantoms. Beam shaping filters offer protection to the sample by reducing the peripheral and volumetric CTDI by about 10% for small objects and 20-30% for the larger samples.

Presenter Gender

Man

Do you wish to take part in the Student Poster Slam

Condition of submission

Yes

Students Only - Are you interested in AINSE student funding

Level of Expertise

Experienced Researcher

Pronouns

Which facility did you use for your research

Australian Synchrotron

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