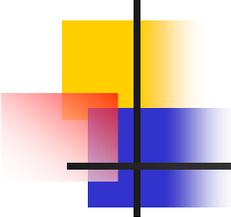


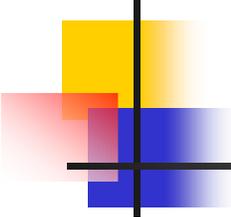
Excess Rotations prior to and following a helical CT run

Catherine Chapman-Jones
Medical Physics Radiographer
Kent and Canterbury Hospital



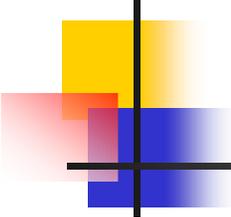
Background

- During commissioning work on a Toshiba Aquilion multislice CT we noticed discrepancies between axial and helical dosimetry.
- Understanding this action with a pencil CT chamber was initially difficult to interpret
- Direct measurement of the excess radiation on film was essential.



Initial Findings

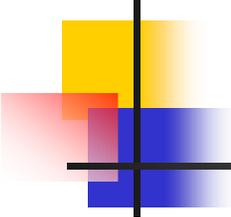
- The Toshiba scanner appeared to perform two complete rotations before and after the planned volume or “range” as given on the operators console.
- This was verified by Toshiba.



Example – standard abdomen

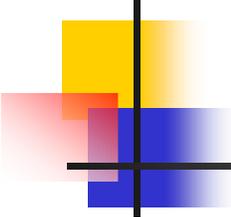
- Range 280.5mm
- Total scan time 10.5s
- Rotation time 0.5s
- Couch speed 16.5mm/rotation

- The number of rotations calculated from the range/speed
 $= 280.5 / 16.5 = 17$
- The rotations calculated by the number of individual times divided by the total time = $10.5 / 0.5 = 21$



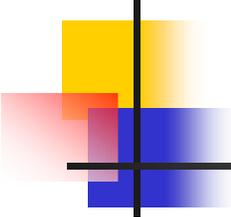
Example – standard abdomen

- Irradiated volume = $21 \times 16.5 = 346.5\text{mm}$
- Excess irradiation = $346.5 - 280.5 = 66\text{mm}$
- The axial length taken up by a single rotation is
= effective slice width x pitch/multislice setting
= $12 \times (5.5/4)$
= 16.5mm
- The extra axial length irradiated = $16.5 \times 4 = 66\text{mm}$
- An excess 3.3cm of tissue is irradiated at each end of the volume



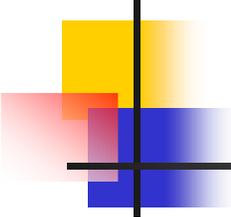
Excess irradiation

- The actual excess dose will depend on the specific parameters set.
- However, our findings show that this increases the dose by approximately 20%
- e.g. $66/280.5 \times 100 = 23.5\%$
- A standard head scan with a range of 209 and an actual scanned length of 253mm has an excess dose of $44/209 \times 100 = 21\%$



Clinical Implications

- More 'standard' scans are performed with volume scanning
- There will therefore be irradiation of organs outside the planned volume e.g. the lens of the eye prior to a standard head run, or the extension into the abdomen after a chest scan.
- This is made worse by the increased effective slice width provided by multislice scanners.



Future work

- Other scanners showed a variety of pre-and post-volume rotation.
- We need to understand exactly what is being described by the start and end of a scan to ensure proper effective dose estimations and patient protection.
- We need to ensure that the users are aware of these problems and how to manage them.