AbstractID: 10711 Title: Commissioning of Item Part Values (IPVs) in order to improve the efficiency of VMAT delivery on an Elekta Synergy Linac

Purpose:The successful delivery of Volumetric Arc Therapy (VMAT) plans on an Elekta linear accelerator requires the detailed adjustment of a series of Item-Part Values (IPV) within the linac's Desktop software.

VMAT plans (SmartArc, Philips Pinnacle) that force a linear accelerator to or beyond its mechanical limits are evidenced by 'prf drop-outs' (pausing of the delivery to allow movements to reach their desired locations) and 'gantry overshoots' (where the deceleration potential of the gantry is insufficient and an opposing movement is required before delivery can recommence). Delivery inefficiencies occur as a result. Since all movements are interlinked during VMAT delivery a failure of, for example, a leaf to reach its desired location can result in such gantry overshoots and prf failures. A method of IPV commissioning that combines all movements together is desirable.

Method and Materials: The setting of dynamic gains within the Desktop software was performed in the service graphing function by minimising the oscillatory behaviour of the four mechanical movements (leaves, gantry, head and diaphragms) as the linac attempts to reach desired positions during a VMAT delivery.

Results: Whereas the VMAT set-up procedure as provided by Elekta is a good starting point, we have discovered that optimising the delivery of actual VMAT plans designed to approach the linac's mechanical limits provides improvement in the incidence of prf pauses and gantry overshoots. Critically damped behaviour was approached for all movements simultaneously minimising the likelihood of inefficient delivery of aggressive VMAT plans.

Conclusion
The effect on VMAT delivery was sufficient to produce visible improvements in gantry motion compared to the standard linac set-up. Delivery times were reduced to be within ~10 seconds of those predicted by SmartArc.

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