

Automated Evaluation of Uniformity and MTF for Dental CBCT Systems

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KING'S HEALTH PARTNERS

- Image quality in Dental CBCT
- Uniformity of non-uniform images?
- Circular-edge MTF
- Pitfalls & summary

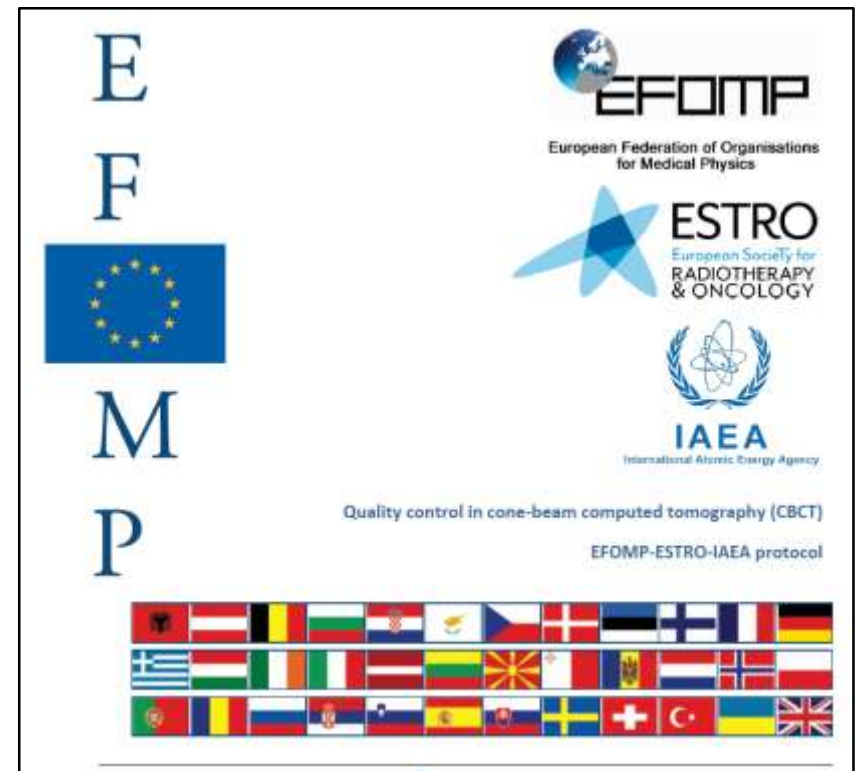
- Two CBCT systems at King's Dental School
 - OP300 Instrumentarium
 - KaVo OP 3D Vision V17
- Review/update QC program
- Tube/generator/KAP – fairly straightforward
- Image Quality – more thought required

CBCT Image Quality

HPA-RPD-065

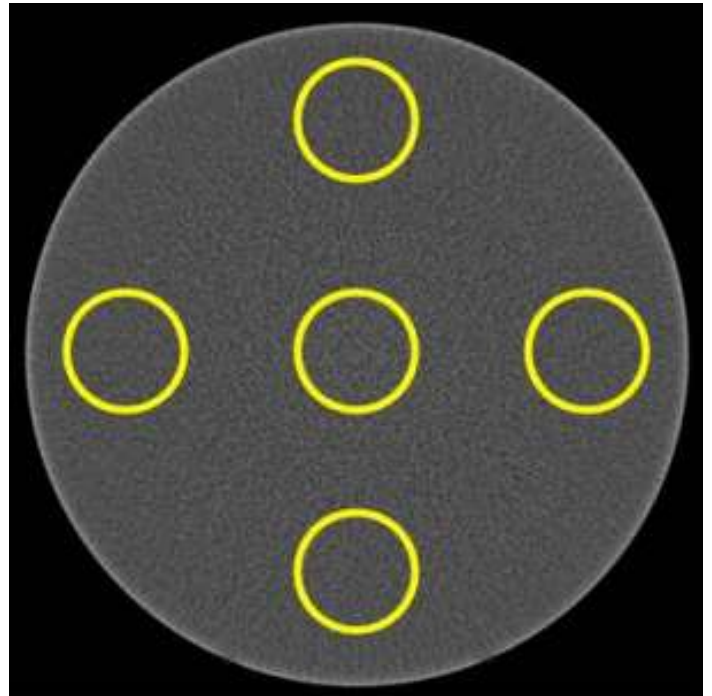
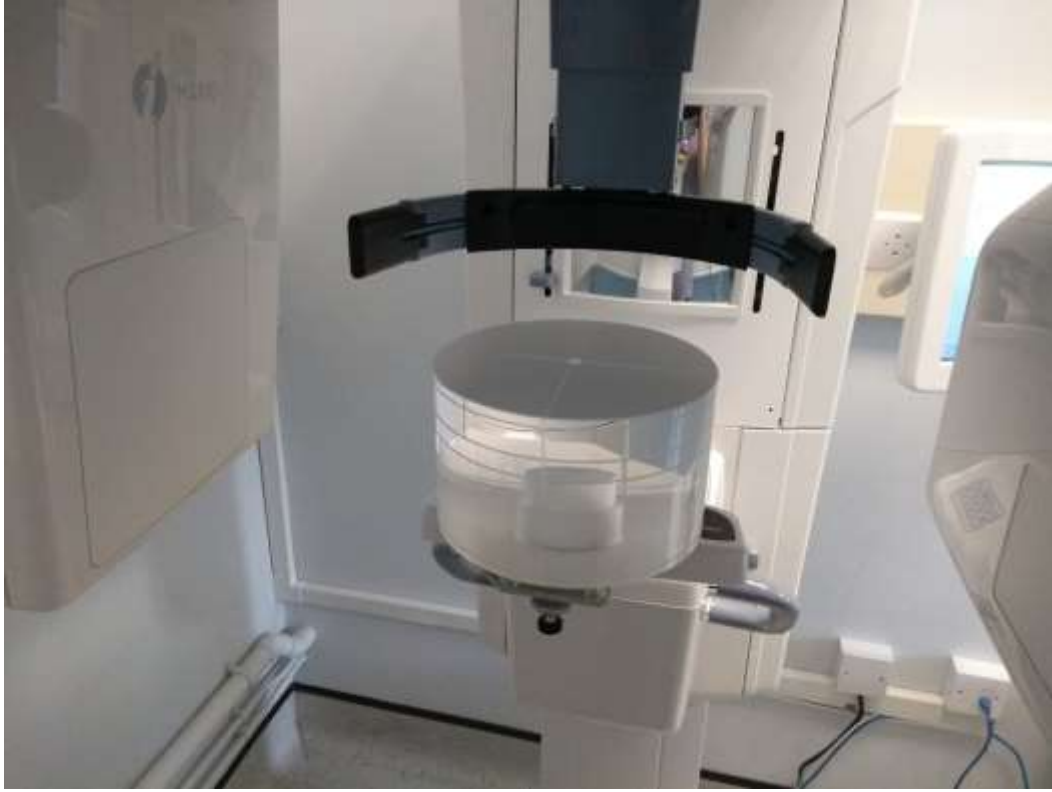
Recommendations for the Design of X-ray Facilities and the Quality Assurance of Dental Cone Beam CT (Computed Tomography) Systems

- CNR
- **Uniformity**
- Geometric Precision
- Image Density Values
- **Spatial Resolution**

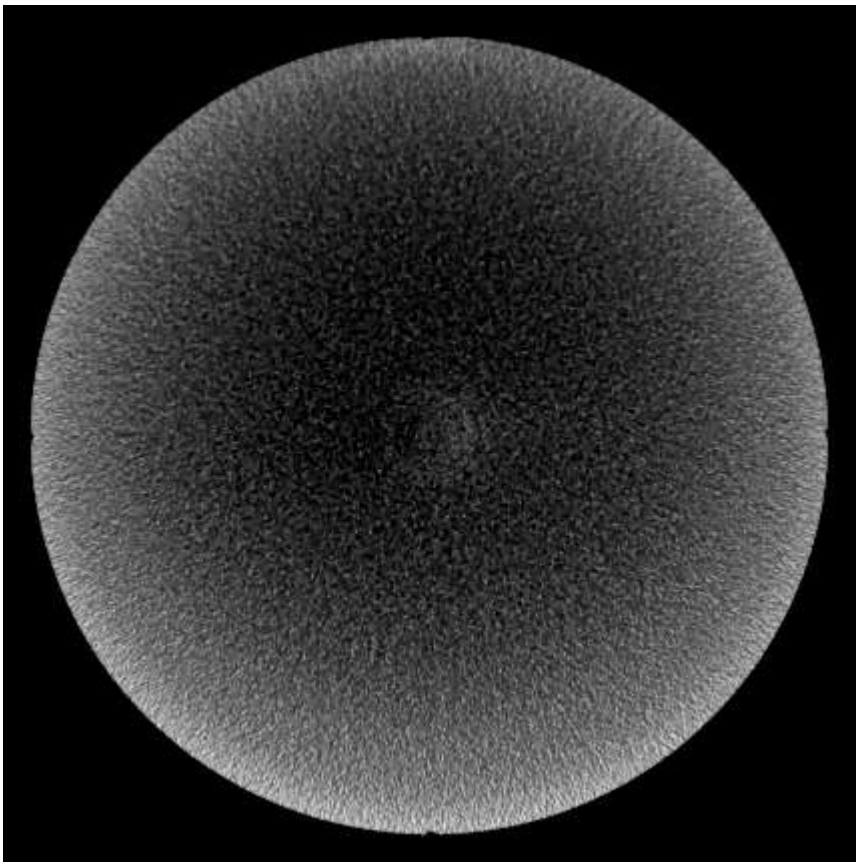
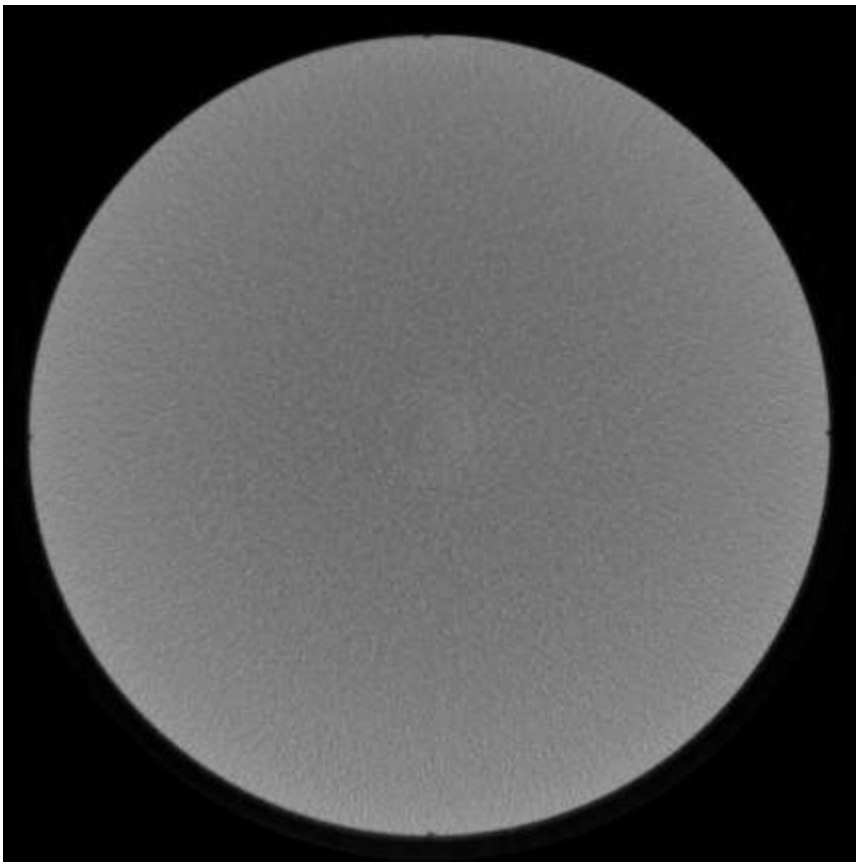


Uniformity

Uniformity

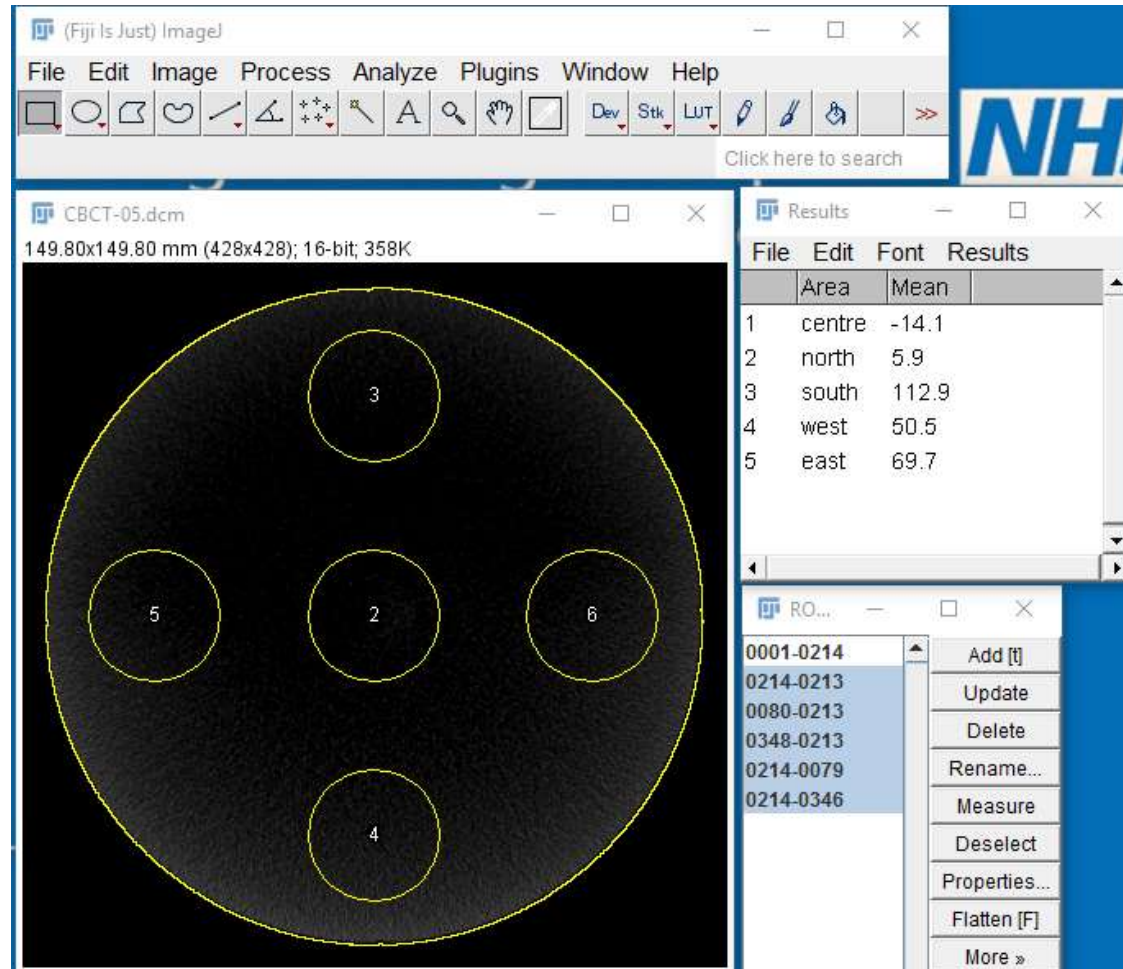


Uniformity



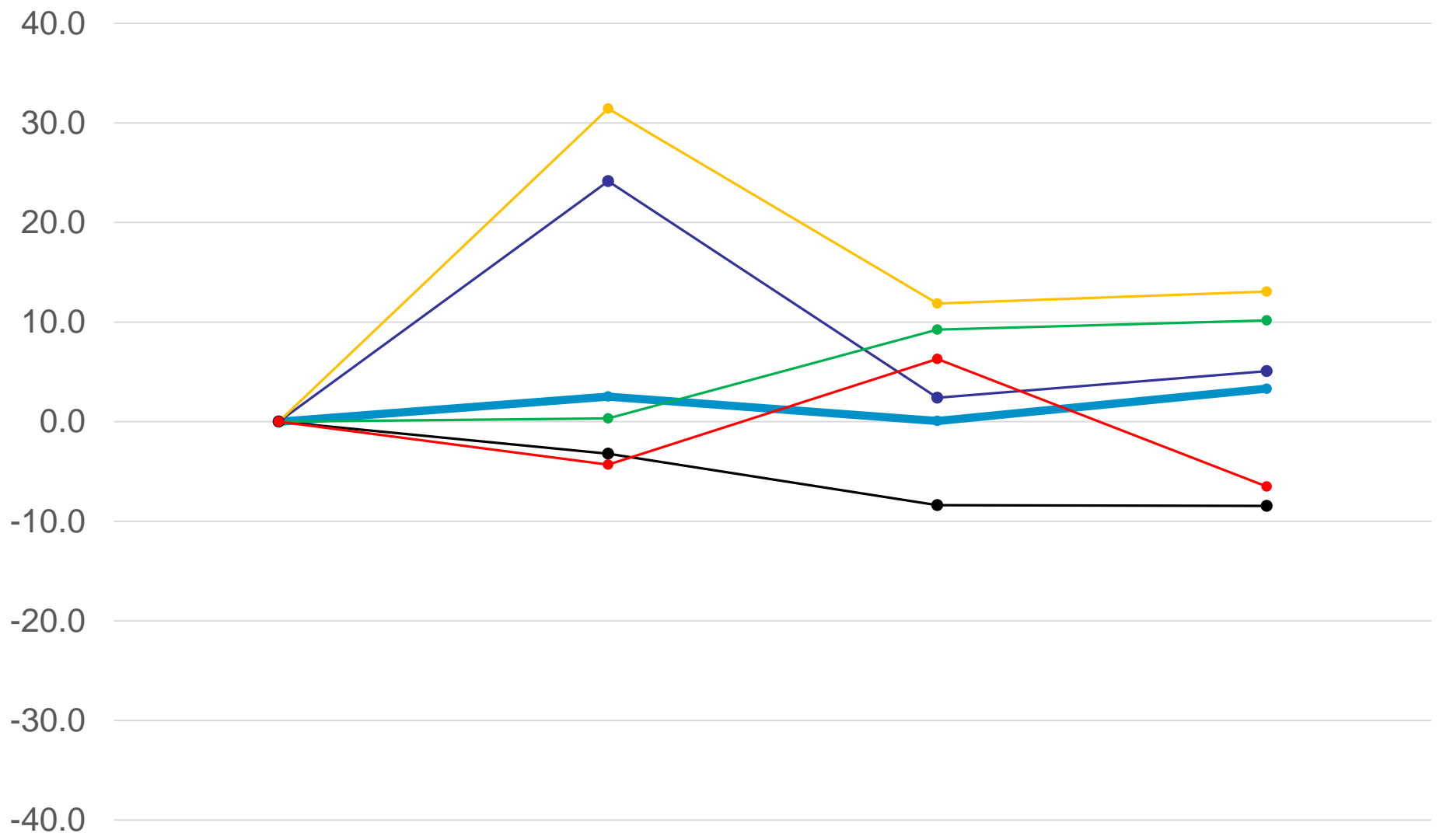
Uniformity

- ImageJ plugin written in Jython
- Automatic phantom-detection and ROI placement



Uniformity

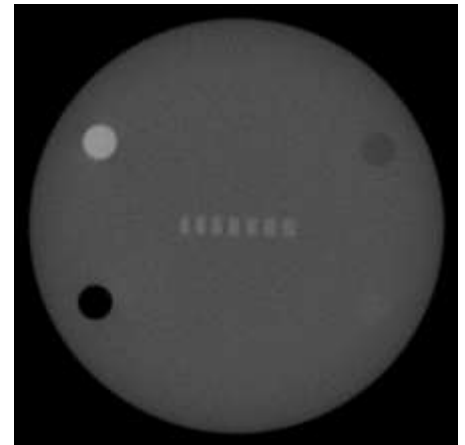
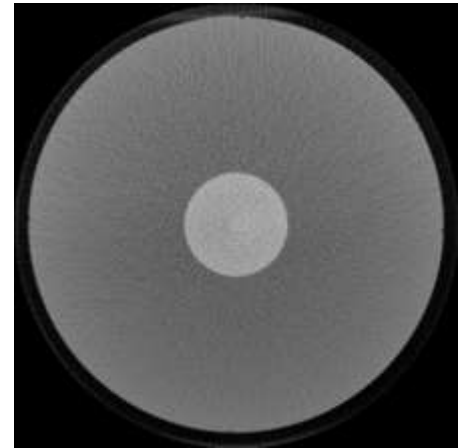
% Change in uniformity score



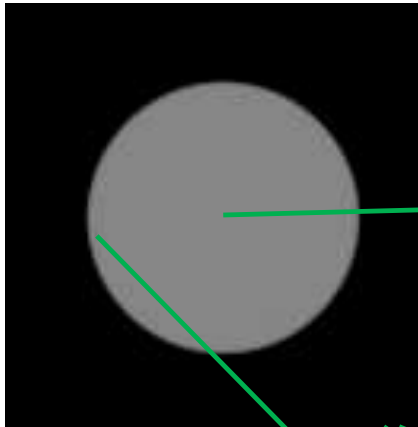
Spatial Resolution

Spatial Resolution

- Manufacturer phantom content is variable
- Consistent test method desired
- Our phantoms both contain cylindrical inserts



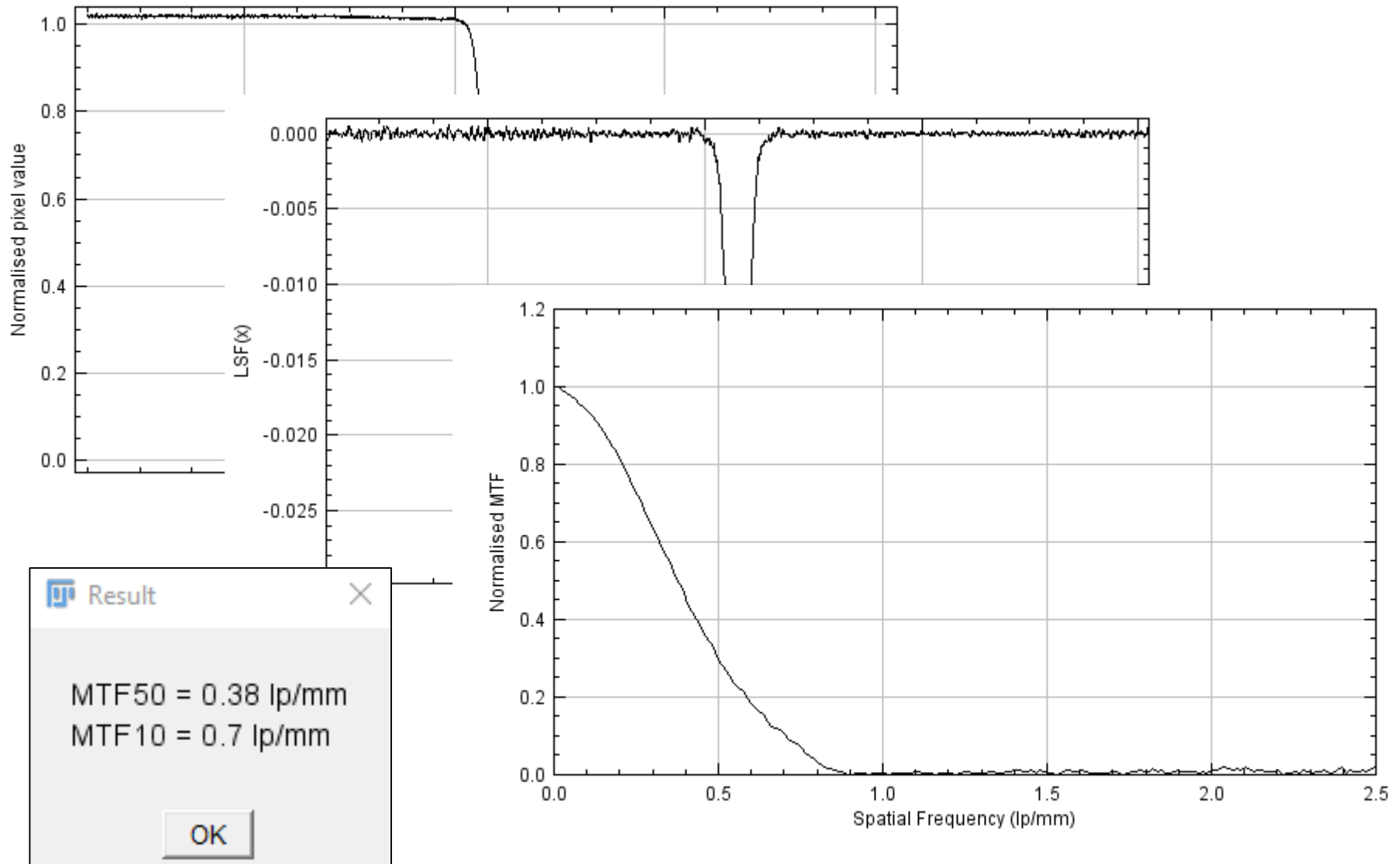
Circular-Edge MTF



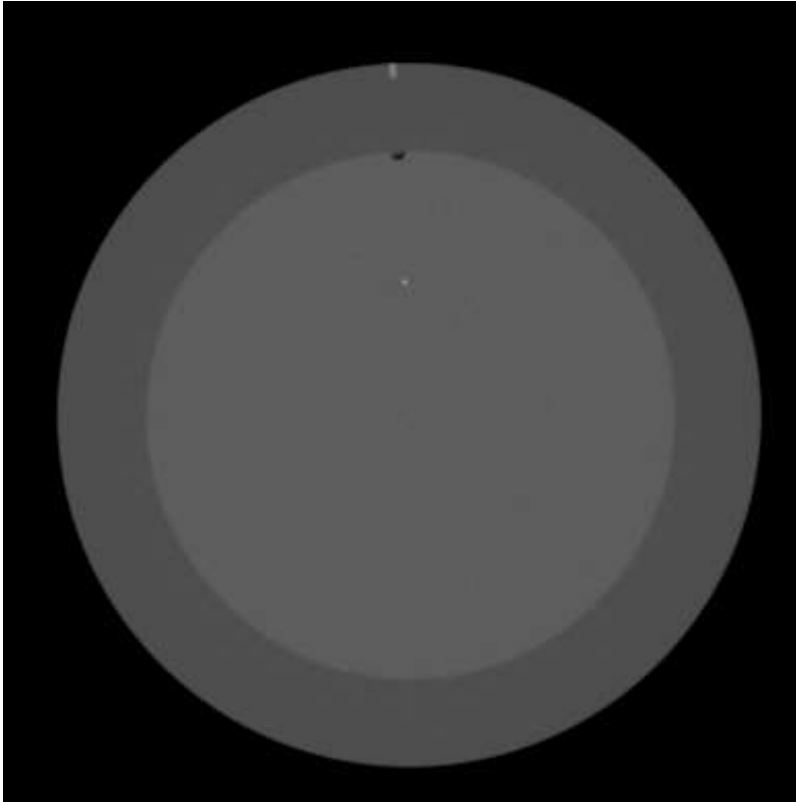
Phantom centre (x_{cen}, y_{cen})

Distance to centre	Pixel value
d_1	p_1
d_2	p_2
d_3	p_3
...	...
d_i	p_i

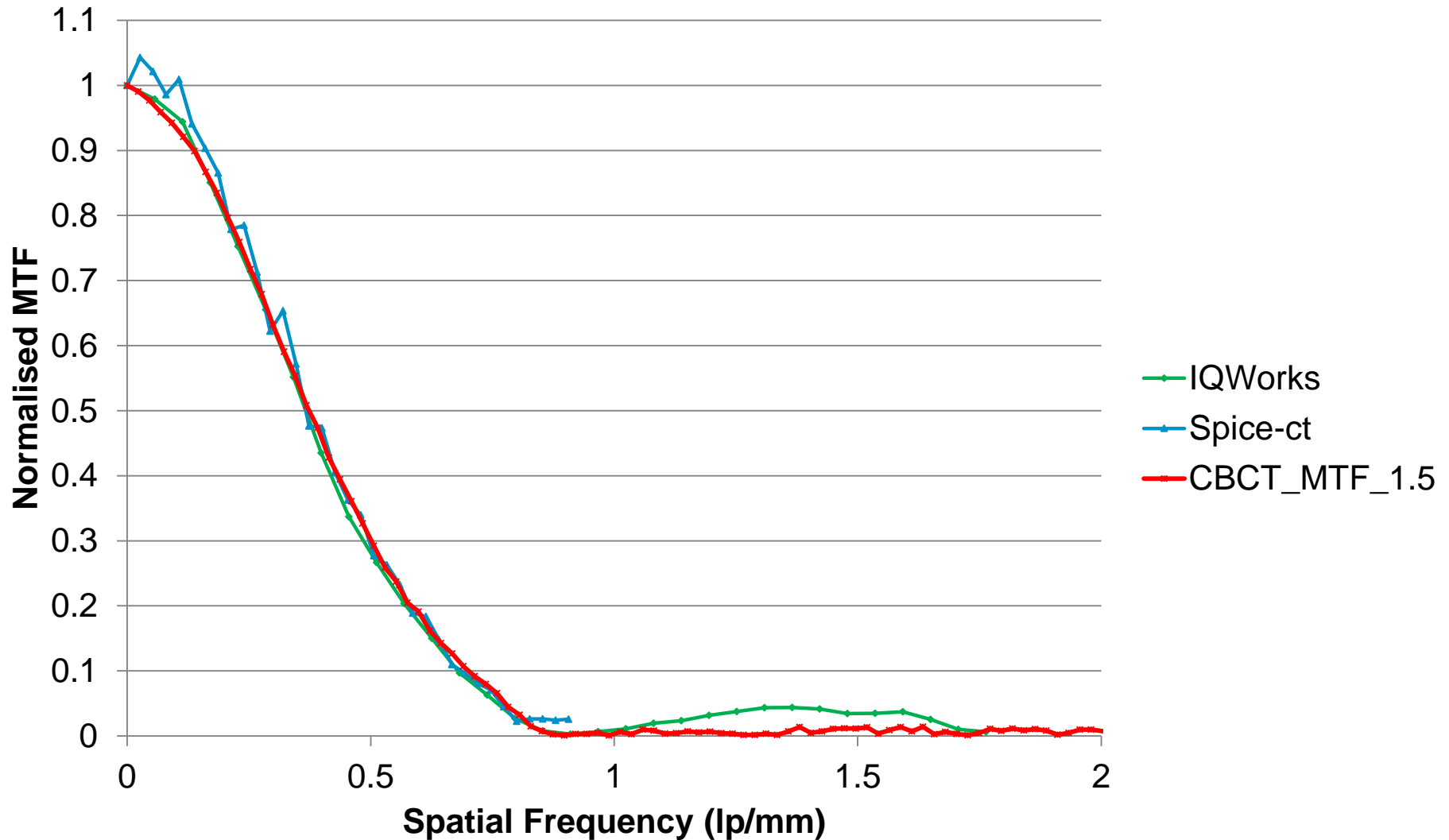
Circular-Edge MTF



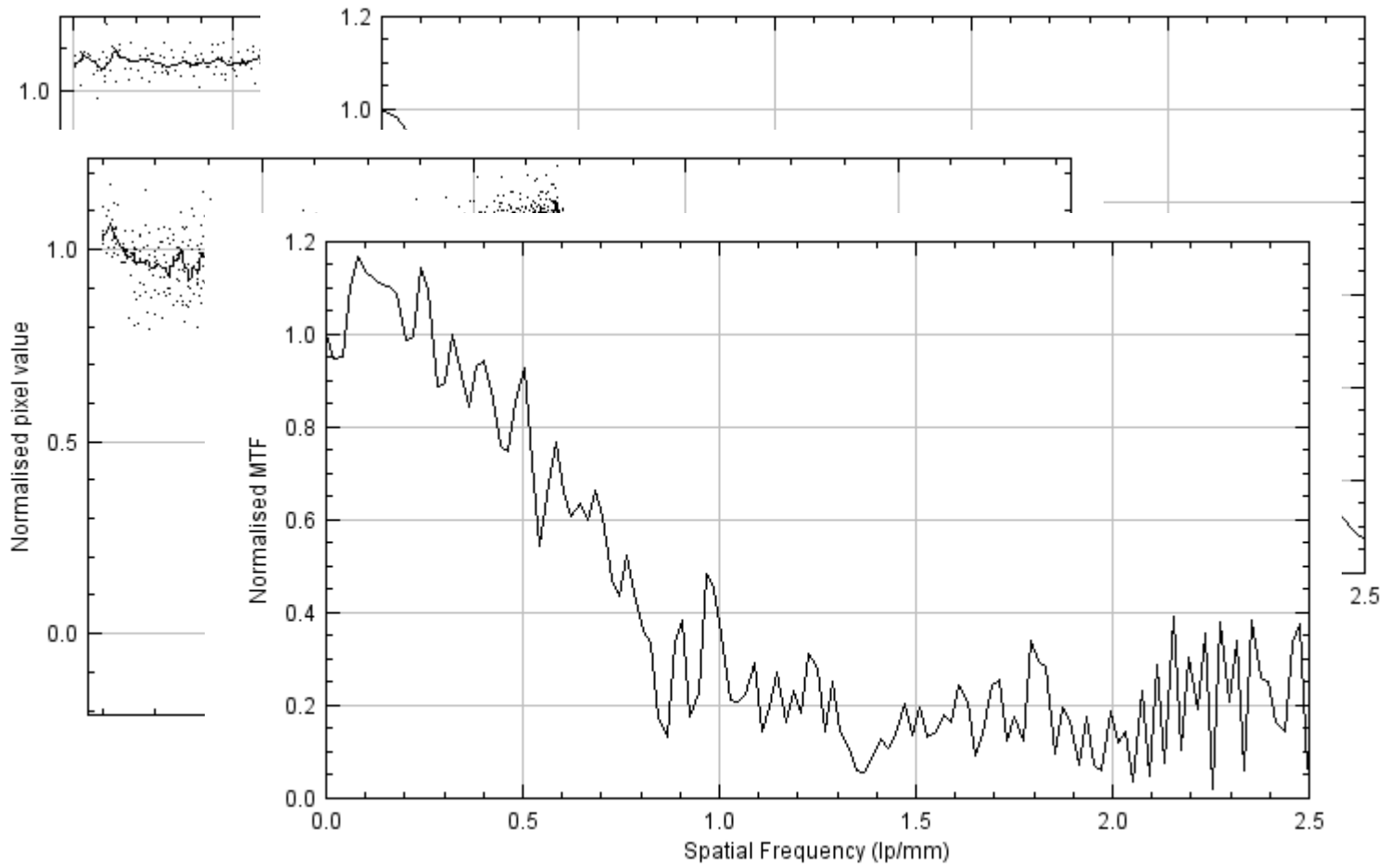
Circular-Edge MTF



Circular-Edge MTF



Circular-Edge MTF



Pitfalls

- Uniformity changes across slices
- MTF phantom centre is critical
- Noisy images \rightarrow Noisy MTF
- Plugin compatibility issues



Summary

- ImageJ plugins were developed to facilitate dental CBCT QC testing
- Automated tests aim to improve reproducibility and test sensitivity
- Time will tell...