

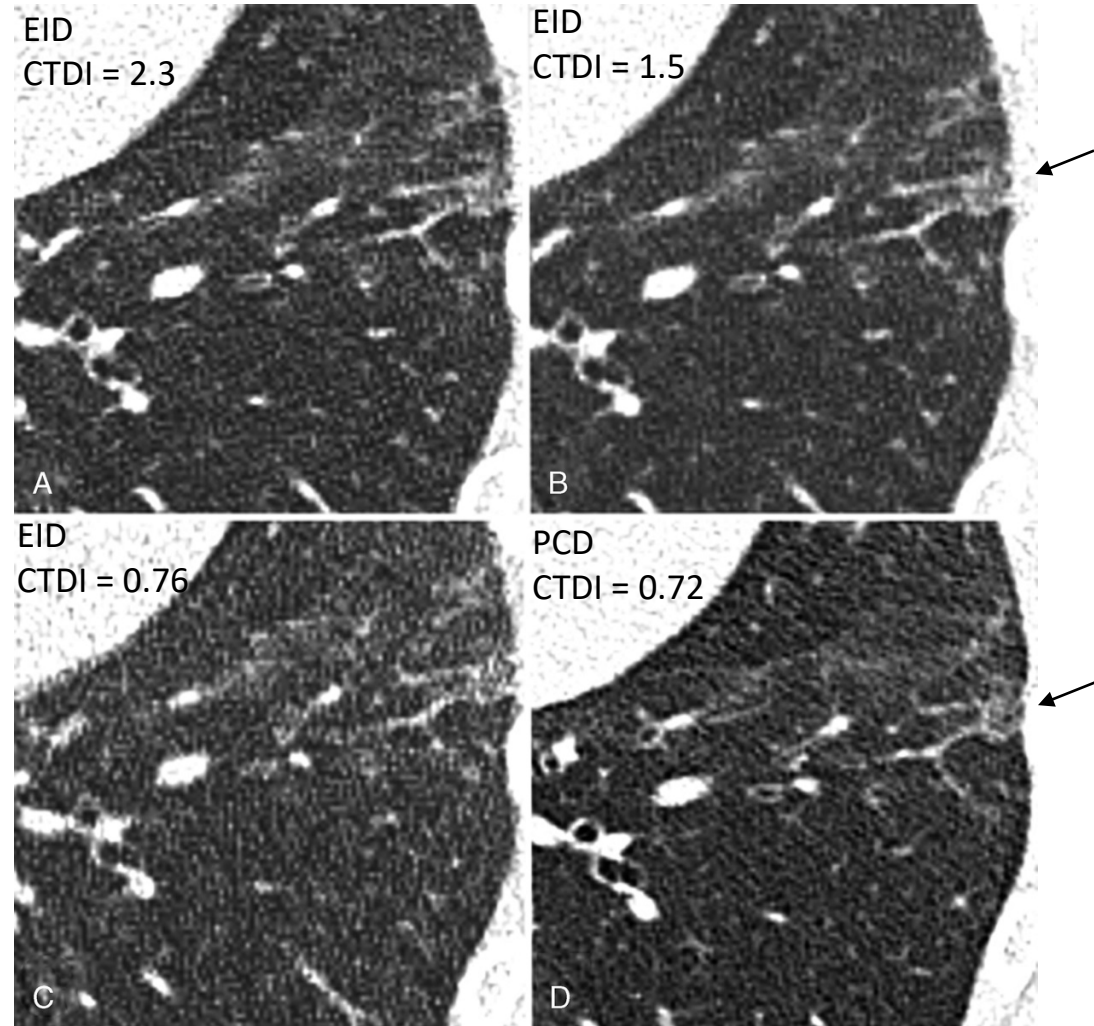
Photon Counting and Quantitative Imaging

Engineering Advance	Capability	Benefit(s)	Potential Impact(s) on Quantification	Potential Challenge(s)
Detector-based spectral resolution	Remove Electrical Noise Floor	<ul style="list-style-type: none"> Improved signal to noise ratio (SNR) 	<ul style="list-style-type: none"> More accurate parenchymal density Improved contrast for texture assessment Reduced CT Dose 	<ul style="list-style-type: none"> Empirical histogram thresholds may change Statistically based texture features may change Calibrating new threshold for “low dose” CT
	X-ray energy binning	<ul style="list-style-type: none"> Reduced beam-hardening Improved low energy detection 		
Continuous semiconductor detectors with direct detection	Smaller detector size (and w/o separation layers)	<ul style="list-style-type: none"> Improved acquired spatial resolution 	<ul style="list-style-type: none"> Improved Accuracy for Airway Wall & Lumen Measures 	<ul style="list-style-type: none"> New choice of kernel to access resolution. <ul style="list-style-type: none"> Source of vendor variability
2 X-ray Sources*	2 X Acquisition Speed*	<ul style="list-style-type: none"> Decreased motion blurring 	<ul style="list-style-type: none"> Better resolution in Left Lung Reduced breath-hold 	<ul style="list-style-type: none"> Increased pitch and need for protocol harmonization

*Not strictly a feature of photon counting CT but complements performance

Energy Integrating Detector (EID) CT vs. Photon Counting Detector (PCD) CT

- Early interstitial lung disease (ILD) in Scleroderma patients at University Hospital Zurich
- Dose reduction from CTDI_{vol} of 2.3 to 0.72
- Visualization of subtle reticulation (arrows)



Spatial Resolution Improvement

- Increased Matrix Size from 512 to 1024
- PCD improvement for high resolution mode
 - 13.58 mean CTClvol
 - Benefit of higher resolution reconstruction kernel (Q65).

