Purpose: This study showed to what extent ASIR improves CT-image and to what extent it degrades it.

Methods: In our study we used GE HD750 CT-scanner, Siemens Sensation CT-scanner, Catphan, PTW-pin-ion-chamber, CTDI-phantom. We measured the CT-dose using the PTW-pin-ion-chamber and CTDI-phantom. Image-quality and noise were evaluated using catphan and GE water phantom.

Results: Image noise reduce as higher levels of ASIR are applied. A phantom scan showed that 50%ASIR with 50% lower-dose (10.8mGy) achieved the same image noise of standard FBP image with full dose 21.7mGy (noise~5). To confirm that the two same-noise images retain same image-quality, two scans were compared; one with full dose 260mAs(21.7mGy) and the other one with 50% lower dose 130mAs(10.8mGy). The results showed that ASIR failed to retain the same quality. For high contrast resolution, 50%ASIR reduced the resolution of patterns = 7lp/cm, however it improved the detectability of patterns = 6lp/cm. ASIR has degraded the CNR of the low-contrast-objects of = 5HU (CNR of 1.4 at 260mAs STND to CNR of 1.08 at 130mAs ASIR), however it improved the CNR of the low-contrast-objects of = 10HU (CNR of 2.35 at 260mAs STND to CNR of 2.63 at 130mAs ASIR). ASIR degraded the edges and killed some of the small objects. This shows that ASIR has a critical point of improve/degrade. Also, ASIR can improve images for the same dose, but with high levels of ASIR (e.g. 100%ASIR), cause disappear of small low contrast objects (e.g. 2mm).

Conclusions: People think that ASIR only improves image and reduces patient dose. Our study showed that ASIR has some drawbacks. There is a threshold before which ASIR is positive and after which ASIR is negative. Recently only GE provide ASIR in the market but our study showed that other CTs such as Siemens can do similar performance like ASIR.