

COPD/asthma technical committee

- Lung Density Reference and Consistency Standards Work Group
- Profile authoring work group

Phantoms for Investigation & Standardization

COPDGene Phantom

–Strengths

- Fairly cheap to produce \$2500 to \$3000 a phantom.
- It has wide acceptance by researchers involved in Quantitative Lung Imaging

–Weakness

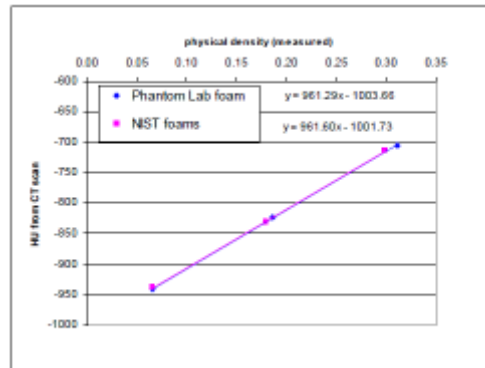
- We have found measureable material differences across phantoms.
- Air CT numbers are not well represented as seen in humans.



COPD Genetic Epidemiology®

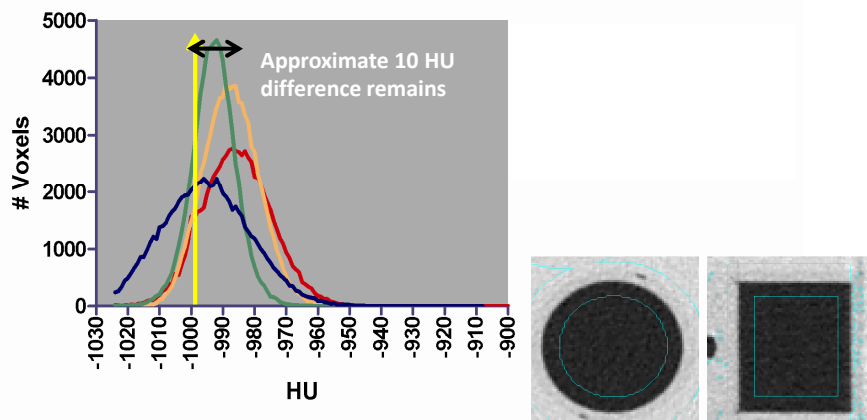
Lung Density Reference and Consistency Standards Work Group

- Establish and validate measures of CT attenuation of foams in the lung-equivalent range



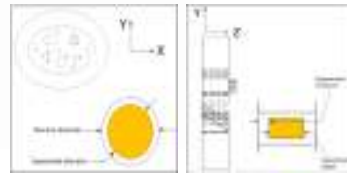
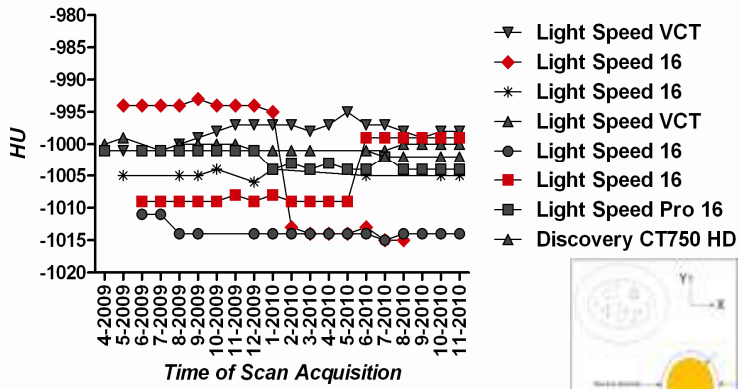
Mod. CATPHAN 500 Results CT Kernel Differences in AIR (HU)

RECOMMENDED QUANTITATIVE LUNG KERNELS

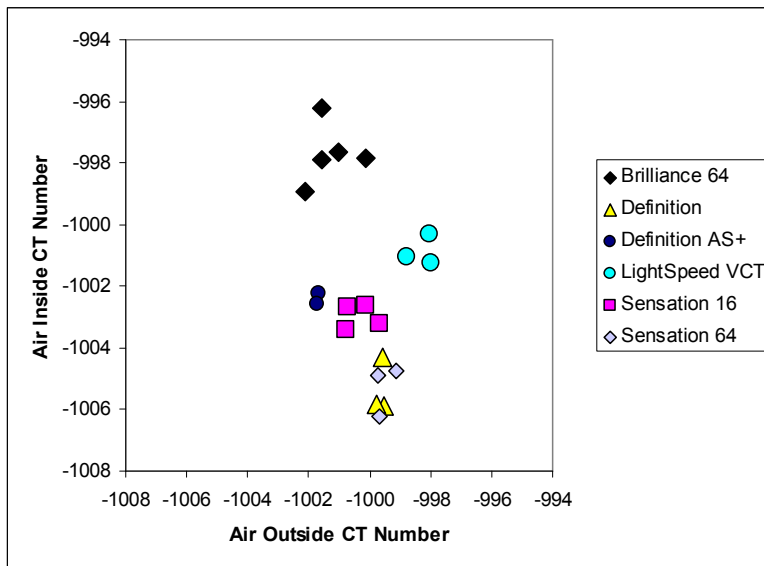


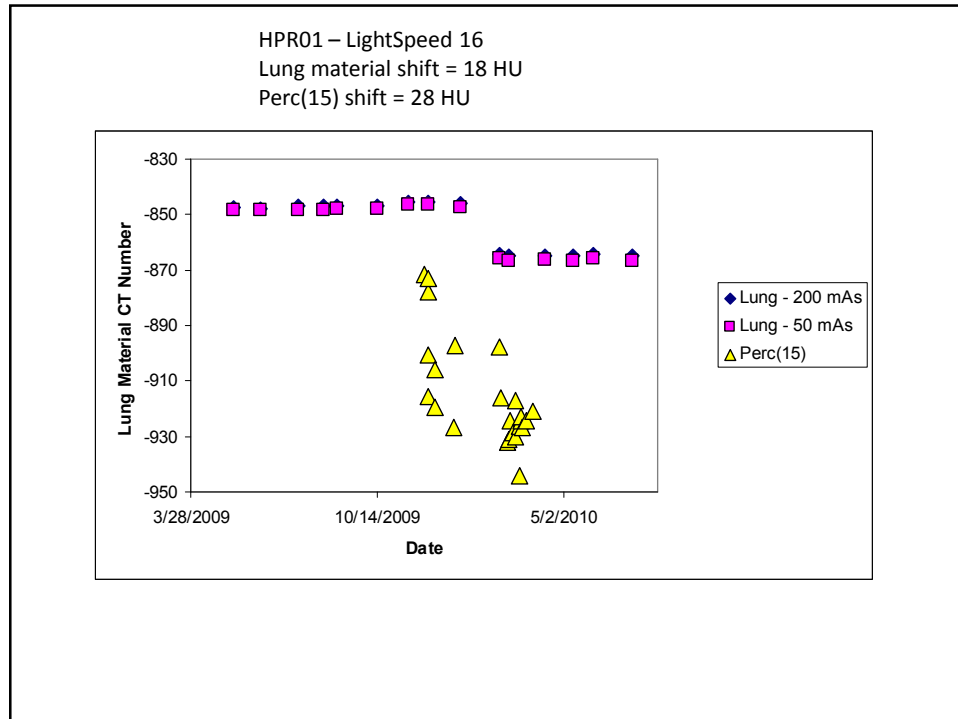
Phantom's Air (HU) Results in a Multi-Center Study

ATTENUATION OF AIR INSIDE OF PHANTOM
200mAs (TLC) Protocol



COPD Gene Phantom – Various Vendor Models
PFJ Validated – More than 3 scans of phantom on specific scanner





COPD/asthma profile

- *Split into lung densitometry profile and airway profile*

COPD/asthma profile: Lung densitometry

This imaging protocol will be able to establish endpoints to serve a clinical trial:

- 1. Severity of emphysema on inspiratory CT.*
- 2. Degree of air trapping in the lungs on expiratory CT.*
- 3. Inspiratory and expiratory lung volumes.*

COPD/asthma profile: Lung densitometry

Claim # 1

Goal of this claim is to achieve adequate calibration and longitudinal stability of CT scanners in order to permit measurement of longitudinal change in phantom CT attenuation of ± 1 HU.

Claim # 2

Using this protocol, we will be able to measure $\pm 2\%$ change in severity of lung emphysema (measured using density mask technique at -950 HU), or 5 HU shift in 15th percentile of lung attenuation.

Compliance Levels for Measurement CT phantom measurements of air or lung equivalent material)

Measurement Result	Performance Levels Achieved under Bull's Eye Conditions
CT attenuation (air inside phantom)	
If Activities are Performed at Target Level	-999 to -1001 HU
Longitudinal stability: CT attenuation (lung equivalent material) Deviation from baseline measurement	
If Activities are Performed at Target Level	± 1 HU

Current activities

- Finalize profile/protocol
- Continued improvement in phantom data
- Publish phantom paper