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Research Interests

- Quantitative Ultrasound Backscatter Tissue Characterization
 - Diagnosis and Grading of Non-Alcoholic Fatty Liver Disease
 - Quantitative Characterization of Breast Masses
 - Liver Masses
 - Pre-Term Cervix
- Ultrasound Inverse-Scatter Computed Tomography
- Breast Ultrasound Computer-Aided Diagnosis
- Observer Performance Studies (ROC)
- Quantitative X-Ray Computed Tomography

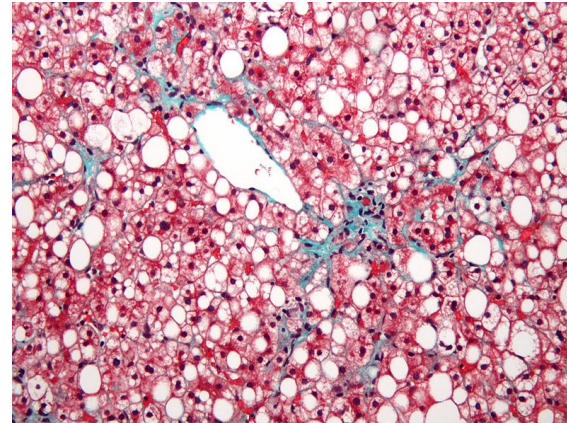
Non-Alcoholic Fatty Liver Disease (NAFLD)

Leading cause of chronic liver disease (USA: 21-50% adults, 17% children)

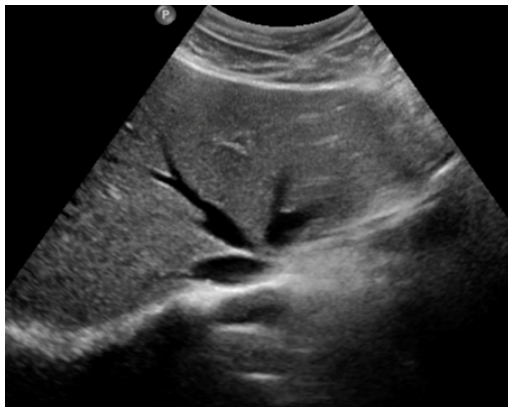
Steatosis -> Steatohepatitis -> Fibrosis -> Cirrhosis -> Carcinoma

Reference Standards:

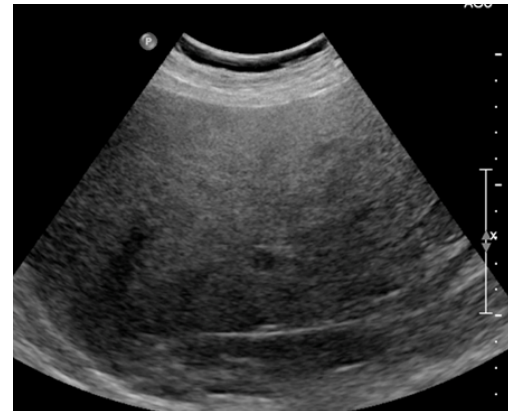
- Biopsy
- MRI-PDFF
- Clinical US



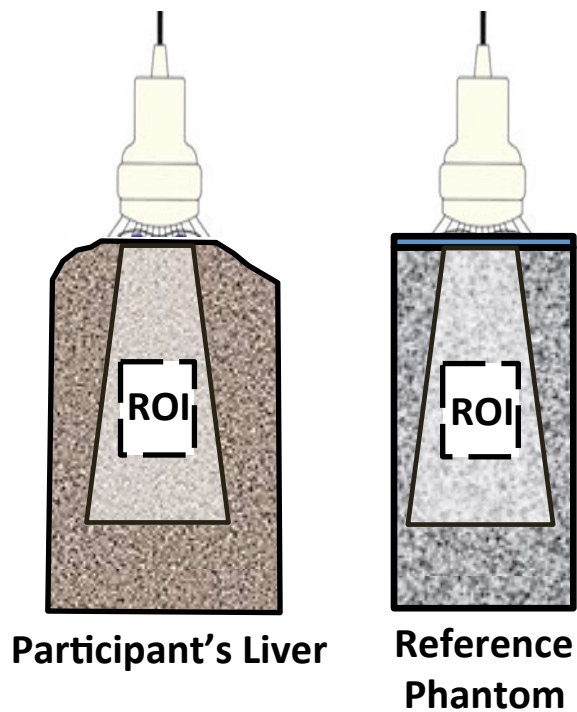
Normal



Severe steatosis



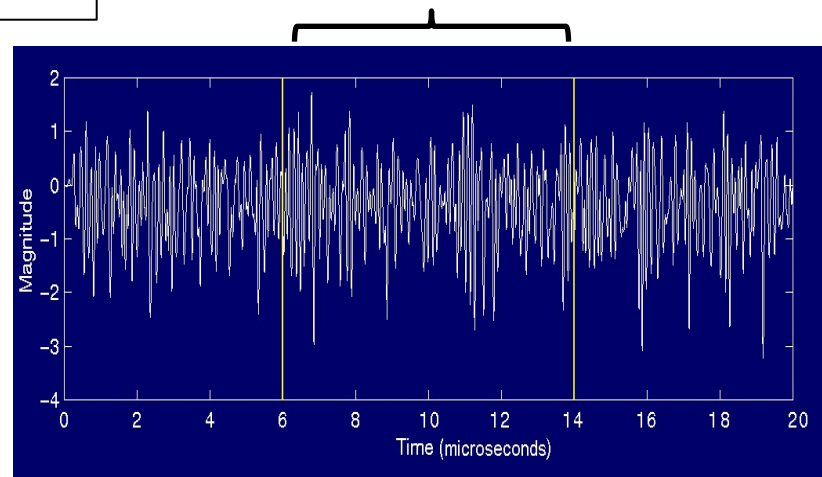
CUS: High reader variability, operator dependent, low sensitivity at early stages



(a.)

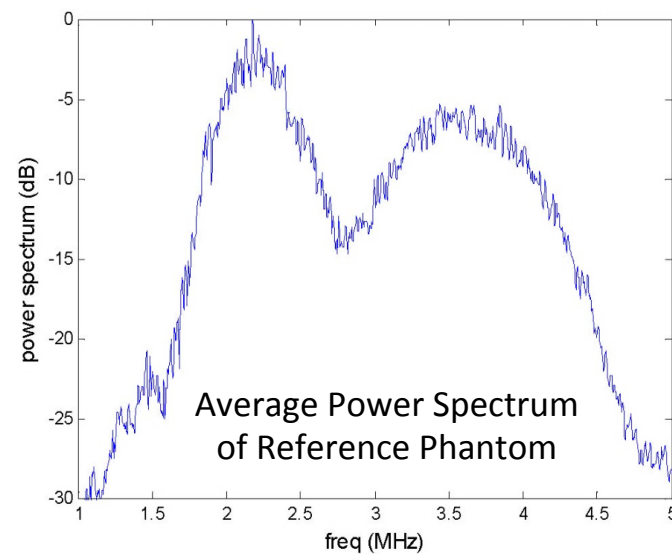
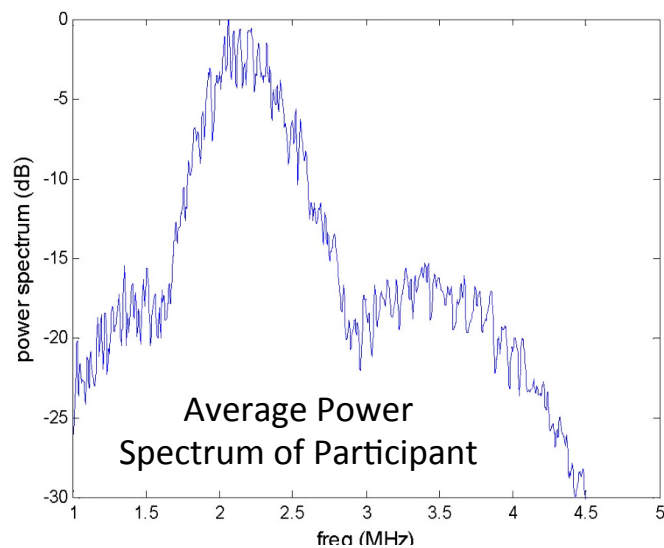
QUS

ROI (window function)



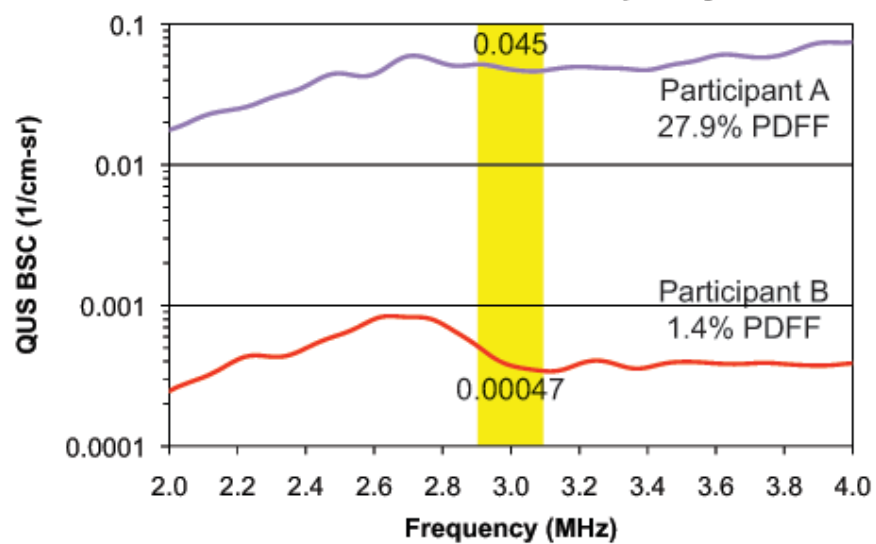
Raw RF signal from transducer

(b.)

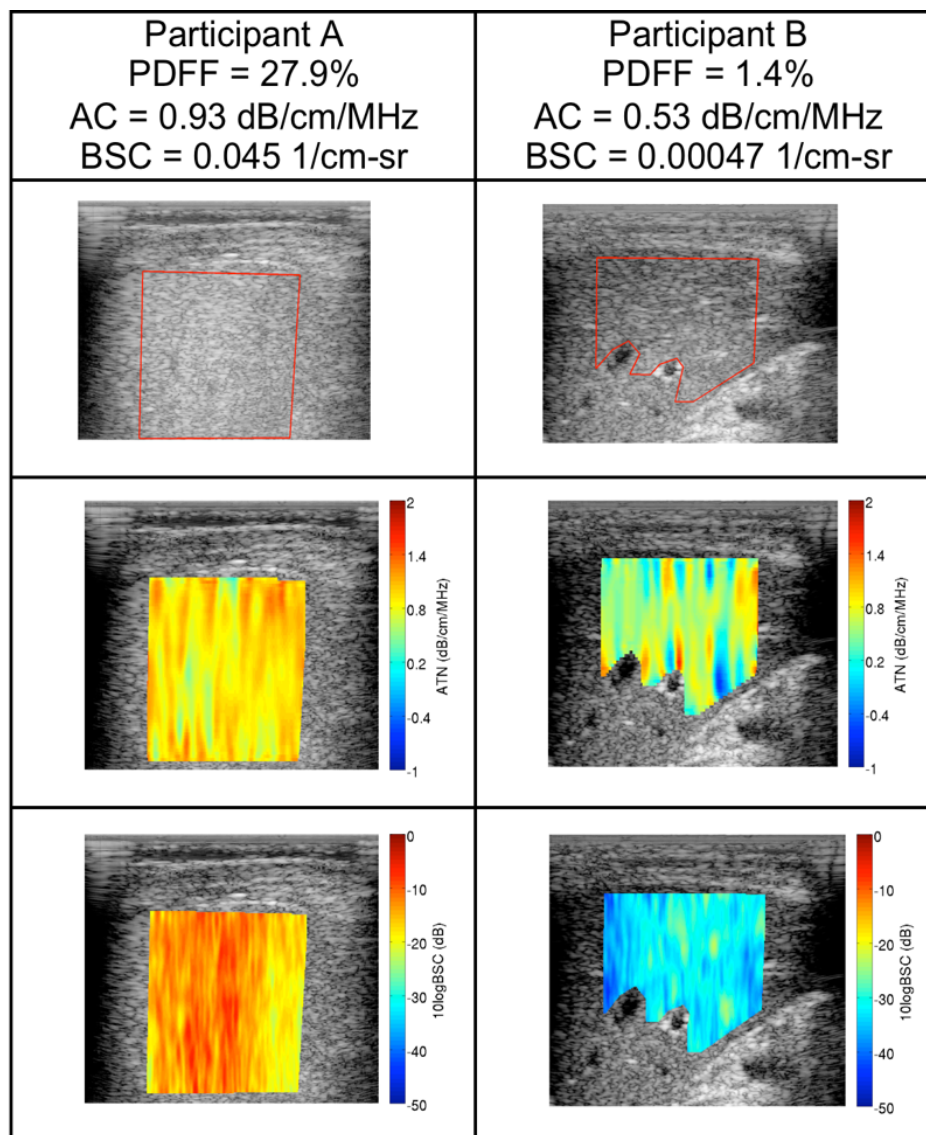
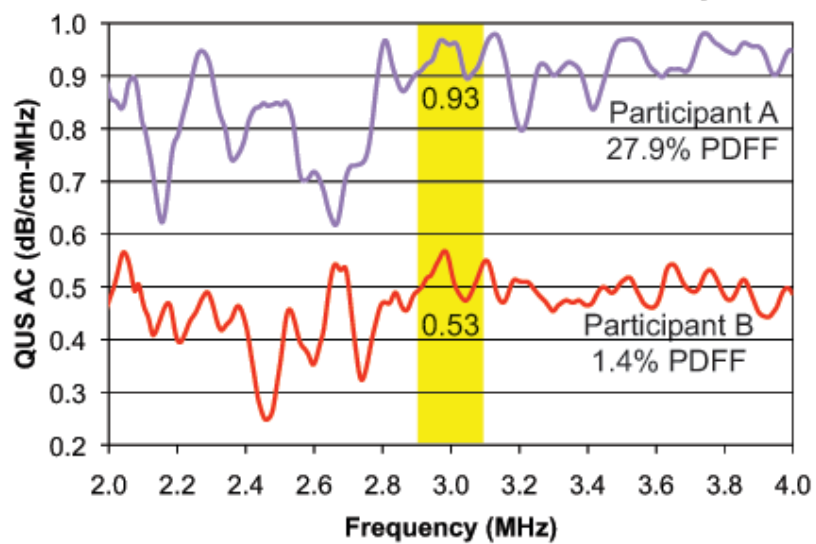


(c.)

Backscatter Coefficient vs Frequency



Attenuation Coefficient vs Frequency



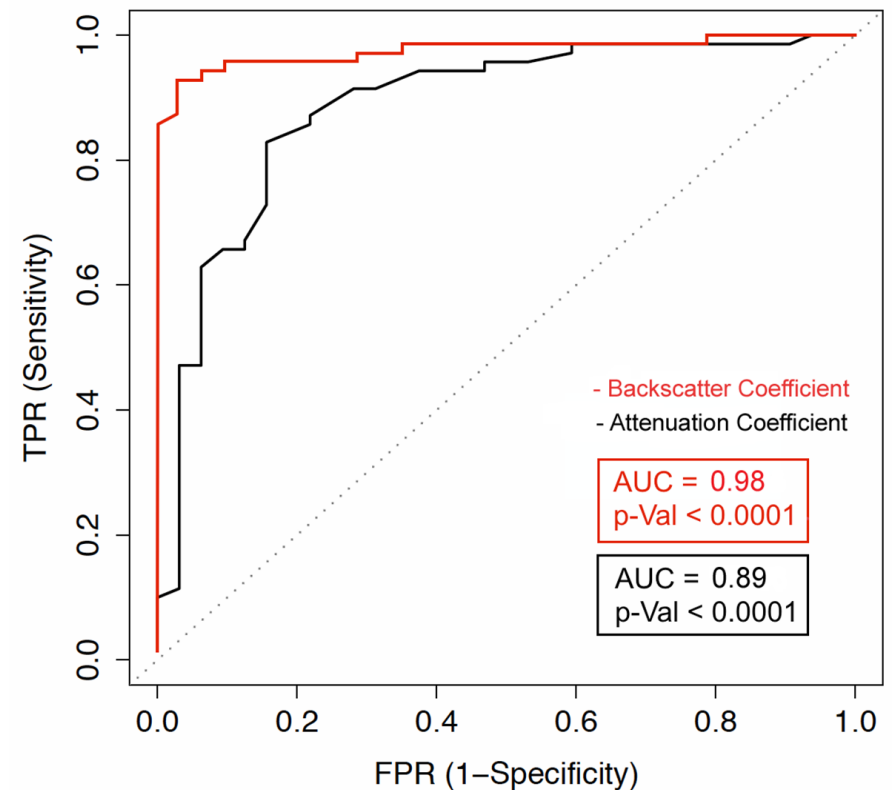
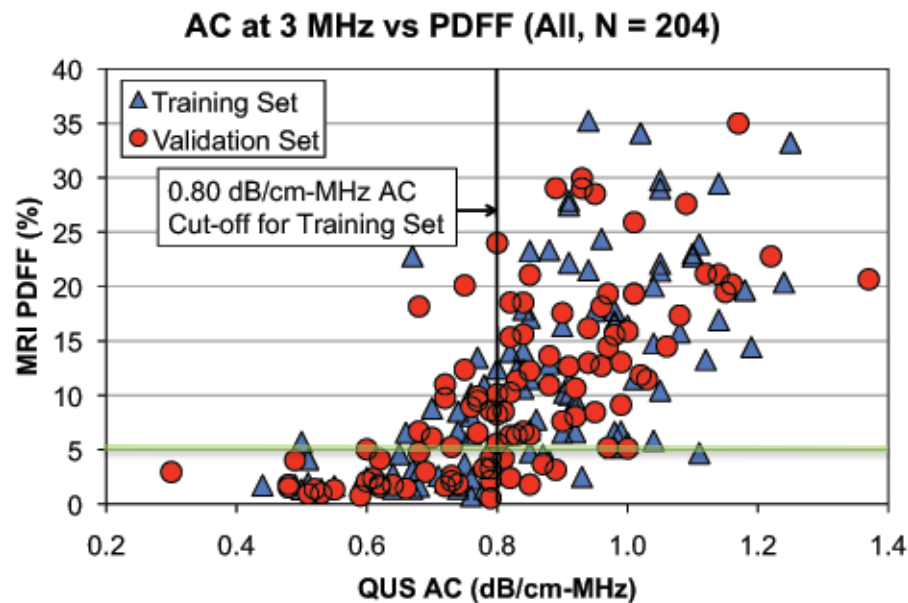
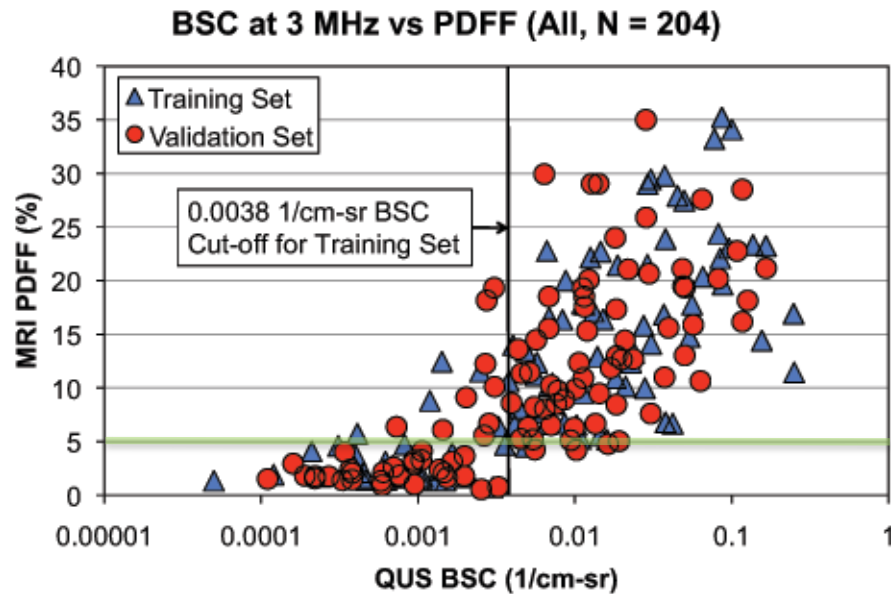
Compare QUS to MRI PDFF

Define NAFLD as PDFF $\geq 5\%$

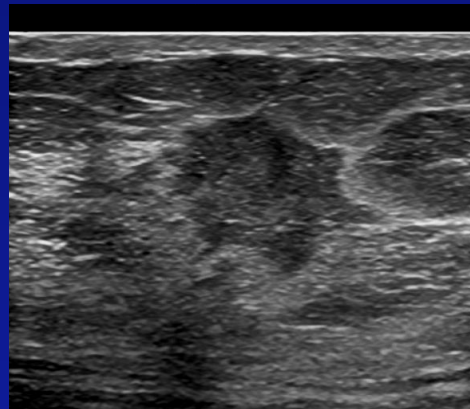
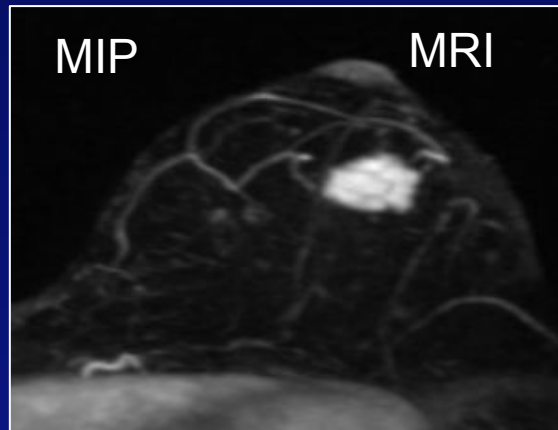
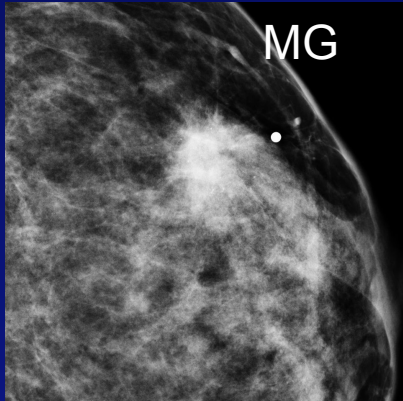
BSC, AC highly correlated

Both accurately diagnose NAFLD

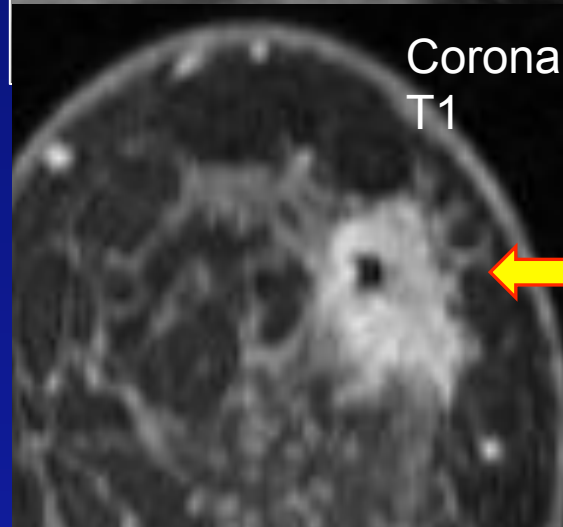
AUC = 0.98 (BC), 0.89 (AC)



Infiltrating Ductal CA



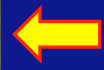
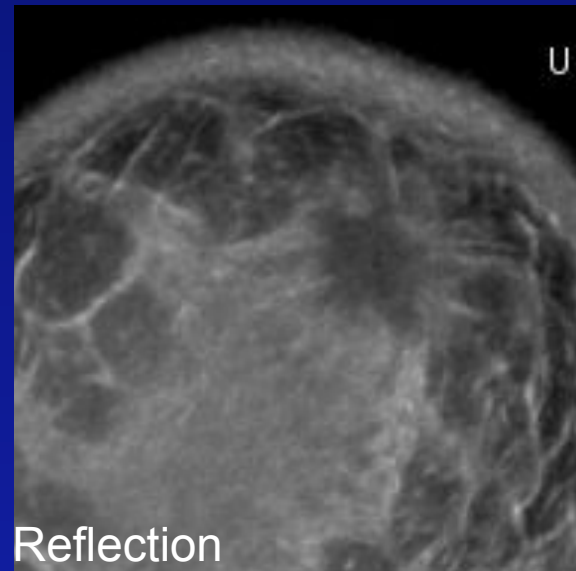
SONOGRAM



Ultrasound CT



Coronal



Reflection