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# Inverse scattering in modern ultrasound imaging

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Progress in solid state electronics and sensor manufacturing has led to the rapid development of ultrasound arrays over the last decade resulting in prototypes with thousands of transreceivers. Ultrasound scanners that use this technology are widely used in medical imaging and are based on beamforming techniques. In a similar fashion to an optical lens, the array forms an aperture which can focus and steer an ultrasound beam in space as it is done by microscopes and telescopes. The beamforming process can be seen as an inverse scattering problem whereby the scattering measurements are used to reconstruct the structure of the object being probed. To achieve this, a model that describes the interaction of the probing wave with the object is required. Beamforming assumes that scattering events occurring at different locations within the object are independent of each other, thus neglecting multiple scattering. Here, it is argue that accounting for more accurate wave-matter interaction models in the inverse scattering problem leads to greater image quality than that obtained with conventional beamforming. Experimental images with unprecedented resolution beyond the classical diffraction limit are presented along with tomographic reconstructions of a complex 3-D breast phantom that show striking similarities with X-ray CT.