Synthetic Aperture Imaging(SA imaging)提高了图像分辨率和对比度，但是帧频低，SNR信噪比低，对杂乱clutter的压缩取决于传输次数。针对帧频低的问题，提出了Sparse SA imaging，可以提高帧频。Diverging wave transmission可以提高SNR。（每个element都发射SW）

Plane Wave Imaging可以做到ultrafast，但是图像分辨率和对比度下降了。据此提出了Coherent Plane Wave Compounding(CPWC)，既能提高分辨率和对比度，也能ultrafast(>1 khz)。但是缺点是：杂乱clutter没办法得到有效的压缩，而且axial ghost artifact和side lobe artifact的存在导致对比度下降。

变迹apodization的方法可以用在CPWC上来减少两种artifact，但是会损耗分辨率。

第一次提出了结合SA和PW的成像方法【Adaptive compounding of synthetic aperture and compounded plane-wave imaging for fast ultrasonography】，可以只用标准传输次数的一半来达到比PW高的分辨率，比SA高的SNR。但是这种方法既不是ultrafast，也不能解决artifact的问题（即对比度问题）。

本文提出的方法也是结合PW和SA，同时提高帧频，降低artifact。3次transmission(ultrafast)，其中一次全孔径PW，两个边缘element发射的SW。PW和SW结合来降低axial artifact，CCF(Cross Coherence Factor)降低side artifact。

演讲稿

Instead of transmitting focused beams, which scan the whole region of interest line-per-line, ultrafast imaging is obtained by transmitting plane (or unfocused) waves which scan in a single transmit event over the whole region of interest.

this huge increase in frame rate was initially achieved through a compromise in image quality。suﬀer from a low quality in terms of resolution and contrast

the processing of such ultrafast imaging sequences has always been slower than the acquisition rate

Today, the computational power produced by graphical processing unit (GPU)-based platforms and high-speed buses (e.g., PCI Xpress [4 GB/s]) is typically capable of transferring and computing the beamforming of 100 frames from 100 successive wide field-of-view RF data transmissions at 10 kHz. （？？？10khz???）

The potential use of compounded plane-wave transmissions instead of line-per-line acquisitions for optimal real-time B-mode imaging could occur around year 2017