A Row–Column-Addressed 2D Probe with an Integrated Compound Diverging Lens - DTU Orbit (02/11/2019)

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Planar 2D row–column-addressed (RCA) arrays can be an attractive alternative to fully-populated arrays due to their significantly lower channel count. However, these arrays can only look straight forward, which limits their utility. One way to increase their field of view is by applying a diverging lens. However, when common lens materials are used for a single-layer diverging lens, they exhibit deficiencies in performance or form factor. A compound lens solution was integrated into a fully functioning probe to achieve a 30° field-of-view (FOV) while retaining clinically-acceptable patient contact characteristics. The compound lens was fabricated of a Bi$_2$O$_3$ loaded RTV and an urethane, Hapflex 541.

Two similar developed probes were compared one with lens and one without. A curvilinear FOV of 28.5° was obtained, which was slightly lower than the designed and was caused by small deformation of the lens during assembly. The output pressure was lowered a factor 6 and the center frequency decreased from 8.5 MHz to 4.9 MHz due to the lens. This was caused by the lens thickness, resulting in an increased attenuation of the transmitted signal. The difference between the two dB compressed frequency responses was observed to follow a linear tendency with a fitted slope of $-4 \text{ dB/MHz}$, which was in agreement with the estimated attenuation of the lens.

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