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FZP Design Considering Spherical Wave Incidence

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Abstract : Fresnel Zone Plates (FZPs) are widely used in many areas, such as optics, microwaves or acoustics. On the design of FZPs, plane wave incidence is typically considered, but that is not usually the case in ultrasounds, especially in applications where a piston emitter is placed at a certain distance from the lens. In these cases, having control of the focal distance is very important, and with the usual Fresnel equation a focal displacement from the theoretical distance is observed due to the plane wave supposition. In this work, a comparison between FZP with plane wave incidence design and FZP with point source design in the case of piston emitter is presented. Influence of the main parameters of the piston in the final focalization profile has been studied. Numerical models and experimental results are shown, and they prove that when spherical wave incidence is considered for the piston case, it is possible to have a fine control of the focal distance in comparison with the classical design method.

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