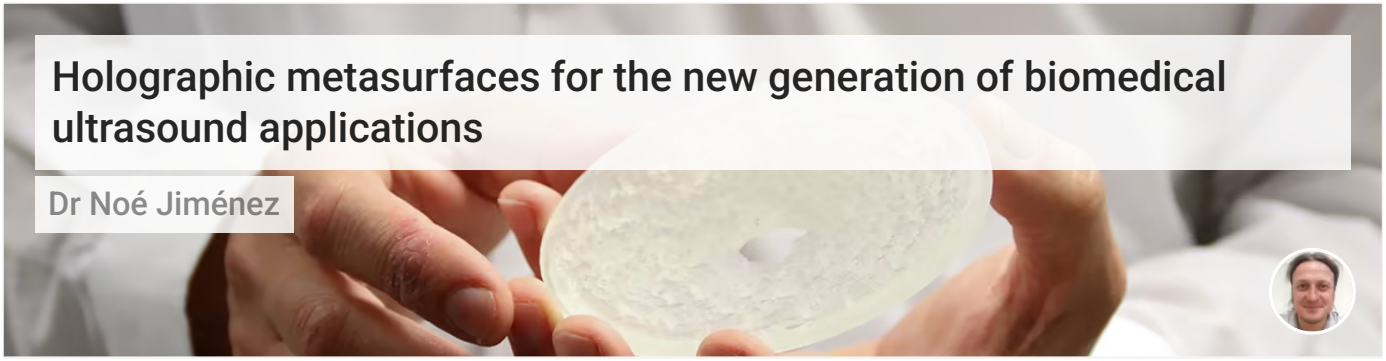
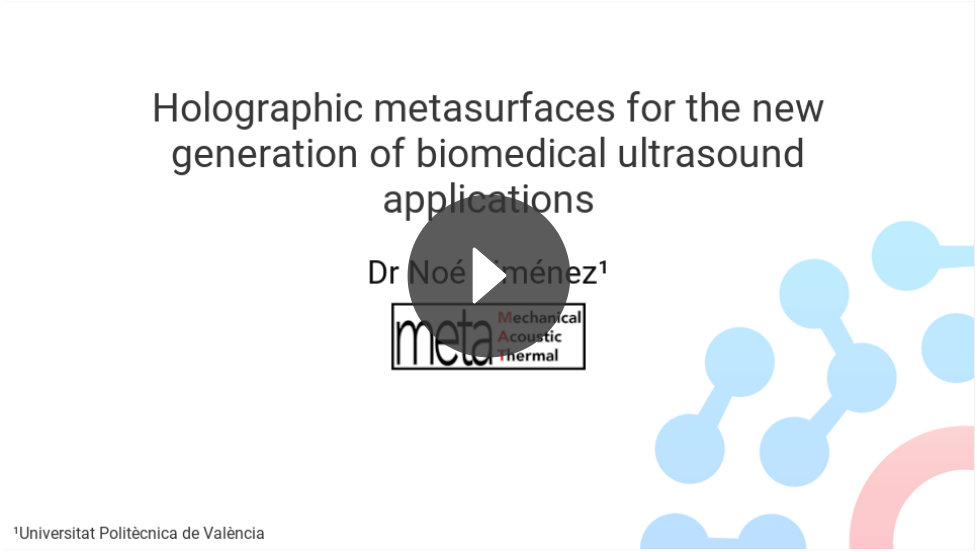


# Holographic metasurfaces for the new generation of biomedical ultrasound applications

Dr Noé Jiménez

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## Associated publication

S. Jiménez-Gambín et al. (2019) Holograms to Focus Arbitrary Ultrasonic Fields through the Skull. *Physical Review Applied*, 12(1)

View on publisher site

**Holographic metasurfaces for the new generation of biomedical ultrasound applications**

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Optical holograms can modulate light wavefronts to generate visible images. In the same way, acoustic images can also be synthesized by holograms, shaping the areas where mechanical waves present a high amplitude, and areas where the media is at rest. In this work, we present the recent advances of acoustic holograms and structured media to engineer the acoustic wavefront to focus ultrasound beams for biomedical applications. We show how we can engineer ultrasonic wavefronts by using acoustic metasurfaces. This results in complex holographic lenses, or acoustic holograms, that can shape therapeutical acoustic images for the non-invasive treatment of neurological disorders, to produce cavitation patterns for localized drug delivery, and uniform thermal patterns of arbitrary shape for targeted hyperthermia. In this way, acoustic holograms emerge as a disruptive and low-cost approach for biomedical ultrasound applications in neurology, including blood-brain barrier opening for localized drug-delivery or neuromodulation using low-cost systems. In addition, increasing the temperature using low-cost and MRI-compatible holographic transducers might be of great interest for many biomedical applications, such as ultrasound hyperthermia, physiotherapy, or high intensity focused ultrasound, where the control of specific thermal patterns is needed.

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### Cite as

N. Jiménez (2022, December 13), *Holographic metasurfaces for the new generation of biomedical ultrasound applications*

DOI 10.52843/meta-mat.h6yyqy

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