Emile and Emile Reply: In the preceding Comment [1], G. Verma, J. Nair, and K. P. Singh raise three issues regarding our Letter [2]. They used a modified setup to try to reproduce our results. They claimed (i) that they didn't see any deformation of the air-water interface (AWI), (ii) they concluded that their experiment supports the calculations performed in [3], and (iii) they proposed an explanation to interpret the dimple on the AWI, reported in [2]. This Reply aims to respond to these three points.

First, they argued that their modified setup eliminated many artifacts of our experimental apparatus. Unfortunately, they introduced new artifacts or systematic errors. (i) Since the pump beam is focalized, leading to an angular spread, part of the beam may be partly reflected. (ii) They sent a pump laser from below the AWI using a flat window. However, they did not mention the angle between this window and the surface of the water; we will call it α in the following. Let us take $\alpha = 45°$ which is a likely value. For an angle $\theta = 49°$, as in Fig. 1 in [1], the angle of incidence of the laser is 4° and, according to Snell's laws, the angle of refraction in the water is 3°. Then, the real angle of incidence on the AWI equals 48° and doesn't correspond to $\theta = 49°$. The beam is under partial reflection conditions. As they varied the angle of incidence from 47.3° to 48.7° [1], the incident beam is in partial reflection conditions where there is no Goos-Hänchen effect. This could explain the fact that they did not see anything although they used a laser with a 100 mW power.

Second, they claimed that their experiment supports the *standard theory* of [3]. In this development, the author used the hydrodynamic stress tensor within the framework of fluid mechanics to estimate the volumic force on the AWI. Implicitly, he considered a fluid particle (also called a reference element of volume) whose dimensions are big compared with the characteristic distances, mainly the mean free pass of the molecules. Whereas for a liquid, this mean free pass is of the order of a few nanometers, it is of the order of few micrometers for air. Then a fluid particle in air should be of the order of $10^3\ \mu m^3$ [4]. However, the penetration depth of the evanescent wave is less than a micron. The action of the laser beam on the fluid particle in air can't be considered as a volumic force. The standard theory of [3] which is correct for a liquid-liquid interface does not hold in the case of an AWI as already stated in [5].

Last, they proposed an explanation based on a supposed artifact of our experimental apparatus [2]: mainly, the tube we used to inject the laser in the water would induce a curvature of the AWI. Such curvature effects are observable up to a few capillary lengths λ_C. For the case of water $\lambda_C = 2.73$ mm. In our experimental setup, the distance between the injecting tube and the zone of total internal reflection is higher then 20 mm, which corresponds to more than $7\lambda_C$. There should be no curvature effects [4]. Besides we have changed the water height in the tank, thus modifying d, and we clearly noticed that the deformation of the AWI remained the same. Finally, their explanation could not account for the polarization deformation of the AWI we observed. We thus think that their explanation is not the correct one.

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[1] G. Verma, J. Nair, and K. P. Singh, preceding Comment, Phys. Rev. Lett. **110**, 079401 (2013).
[2] O. Emile and J. Emile, Phys. Rev. Lett. **106**, 183904 (2011).
[3] E. Brasselet, Phys. Rev. Lett. **108**, 269401 (2012).
[4] G. K. Batchelor, *An Introduction to Fluid Mechanics* (Cambridge University Press, Cambridge, England, 1967).
[5] O. Emile and J. Emile, Phys. Rev. Lett. **108**, 269402 (2012).

