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Plasmonic focusing and collimating of light beyond the conventional diffraction limit[1] KUAN-REN CHEN, National Cheng Kung University — Diffraction sets the smallest achievable product of the line width and the divergence angle of a propagating light. While we still obey the fundamental wave concept, herein we demonstrate that by utilizing a new setup of a metallic subwavelength aperture as the plasmonic lens to preserve, generate and squeeze the sub-limit wave functions an incident light can be focused in the intermediate zone to a single-line width with its value smaller than the conventional diffraction limit of half the wavelength. The fields focused by the plasma effects on the structured lens with the focusing aperture beyond (FAB) the limit are verified to be radiative as of concern and in contrast to the evanescent near-field. With a different structure and plasmonic mechanism, our FDTD simulation has yielded super-collimated light beams with almost zero divergence angles in 2-D free space, as verified by our experimental NSOM measurement. Additionally, we have built an exposure machine; the widths of the exposed patterns at different distances remain almost same and thus verify the super-collimation. The light focusing and collimating processes of the FAB lens, besides being of academic interest, is expected to open up a wide range of application possibilities.

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