Excitation efficiency in film vs pillar

In order to theoretically study the excitation efficiency in the SU-8 film and SU-8 submicropillar, a focusing spot is generated using a Gaussian source at 532 nm to excite the coupled quantum emitter (FDTD, Lumerical). The focusing spot is scanned through the film thickness or along the polymeric submicropillar. We compared the laser intensity distribution in both cases at different positions including the bottom, the middle and the top of the corresponding structure. As it can be seen, the submicropillar affects the excitation intensity, as compared to that in the polymeric film. The light distribution changes as a function of the
focusing position, but the intensity at the quantum dot position is almost equivalent (with low loss). Below is an analysis of three particulars cases:

- Focusing at the bottom of submicropillar [figure S1(f)]: the intensity of the focusing spot is almost the same as in the film case (normalized in figure S1(i)). The light is coupled into the pillar as a waveguide thanks to a proper submicropillar radius.

- Focusing at the middle of submicropillar [figure S1(e)]: the shape of focusing spot is changed. There is a power loss due to the diffraction. The normalized power in the vertical profile [figure S1(h)] shows that at the QD position, the excitation efficiency is about 0.92 as compared to the one in the film case.

- Focusing at the top of submicropillar [figure S1(d)]: as the QD position raises higher, the power of the focusing spot suffers higher losses due to the stronger diffraction. The excitation efficiency in this case is 0.85 compared to the one in the film case.

In conclusion, since the normalized intensity ratio is smaller than 1 (ranging in 0.85 - 1), i.e. the submicropillar does not enhance but slightly reduces the excitation efficiency.
Figure S1. Calculated Poynting vector distribution of the excitation focusing spot in SU-8 film (a,b,c) and submicropillar (d,e,f) at different positions. The film thickness and pillar height are 1500 nm. The excitation power in the submicropillar as the vertical cross-section profile is normalized to the corresponding one in the film case. The representative quantum dot indicates the coupled position and the corresponding excitation efficiency in SU-8 submicropillar structure compared to the SU-8 film.