

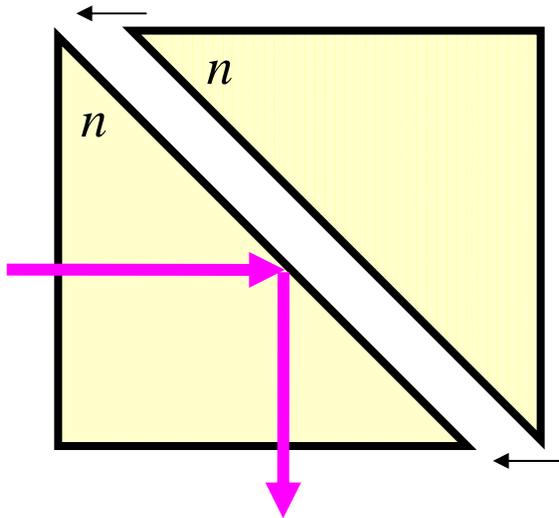
[A few slides from Prof. Dan Mittleman.

www-ece.rice.edu/~daniel/262/pdf/lecture14.pdf]

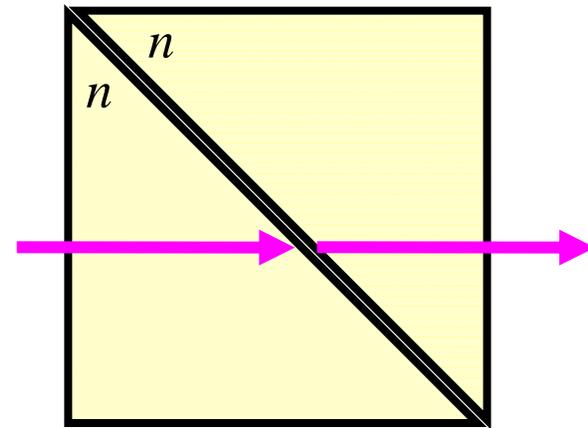
Frustrated Total Internal Reflection (TIR)

By placing another surface in contact with a totally internally reflecting one, total internal reflection can be “frustrated.”

Total internal reflection



Frustrated total internal reflection

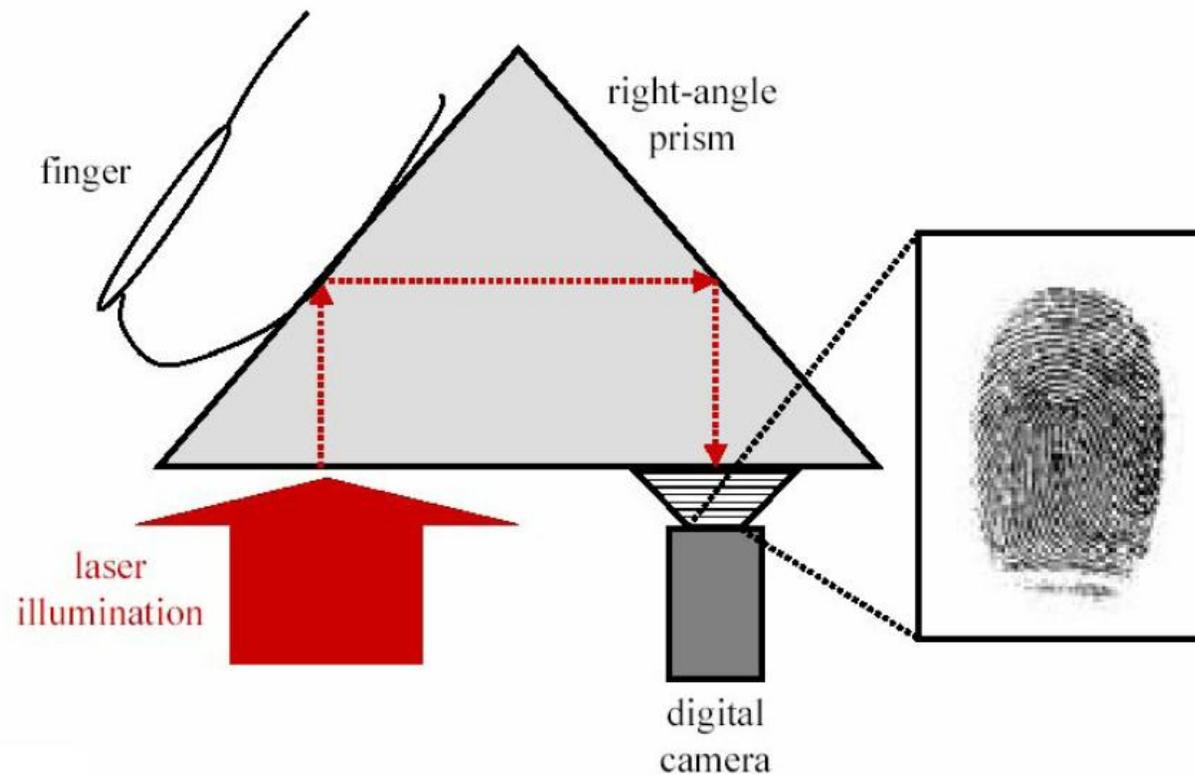


Interesting question: How close do the prisms have to be before TIR is frustrated? Answer: pretty close, but NOT touching!

The quantity β tells us how far the evanescent wave extends beyond the surface of the first prism, which tells us how close the second prism needs to be in order to frustrate the TIR.

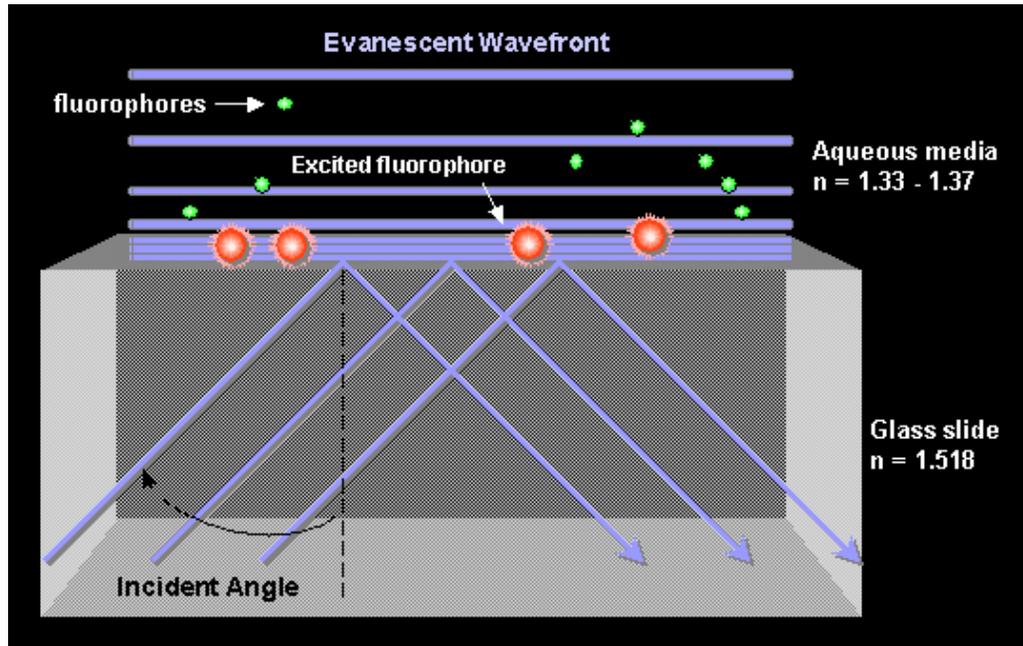
An application of frustrated TIR

Fingerprint sensors



The ridges on a finger act as locations where TIR is frustrated, so no light comes from there. But between the ridges, there is still TIR so light is reflected.

Total internal reflection fluorescence (TIRF) microscopy



Only objects within ~ 100 nm of the interface are illuminated.

TIRF image is sharper



conventional fluorescence microscope image is blurred due to fluorescence from out-of-focus sources \longrightarrow

