EDGE OVERHEATING EFFECT

This is a typical non-resonant diffraction phenomenon.

Definition: ***Diffraction results in deviations from the rectilinear wave propagation paths associated with reflection and refraction and include all the wave phenomena inside and outside the object or obstacle.***

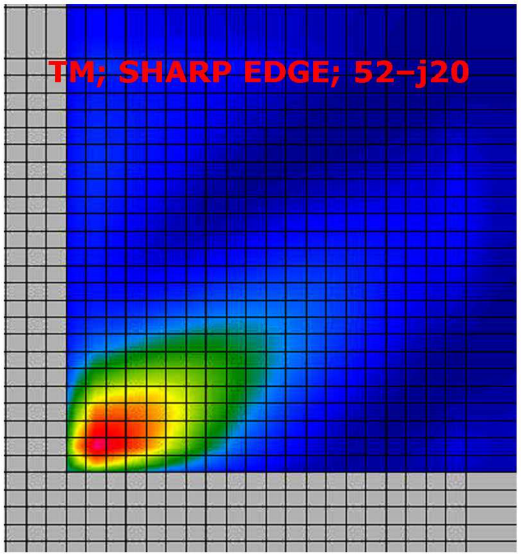
The electrodynamic problem cannot be solved by analytical methods. Using Fermat's principle and an idea by Young (1802) provides the solution, except for a diffraction source amplitude (so-called canonical) constant which can be obtained by modelling or experiments. – One obtains:

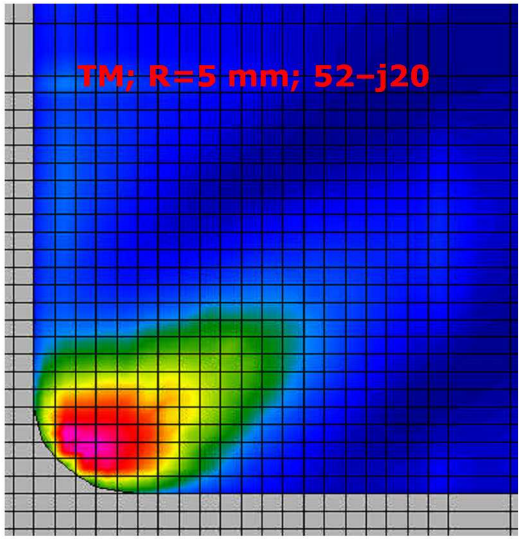
$$\frac{E_{\varrho=0}}{E^i} = \frac{2}{1+\sqrt{\varepsilon}} + \frac{90-\alpha}{180+\arcsin(1/\sqrt{\varepsilon})}$$

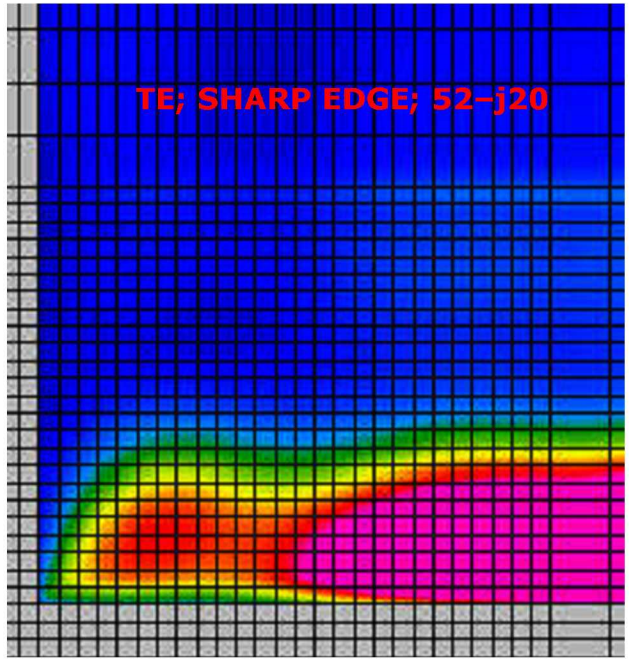
where E are field amplitudes and 2α is the full wedge angle (no wedge $\Rightarrow$ α=90°)

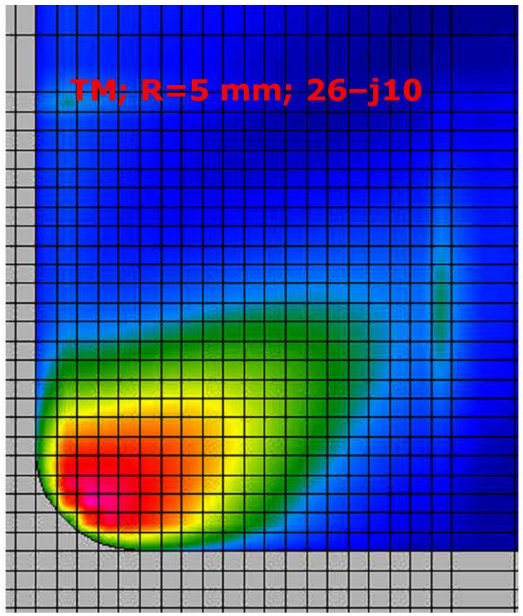
The edge overheating effect is much stronger – in many cases the tip region is heated more than six times stronger than adjacent flat parts – than by the "explanation" often given in the literature (as a simple addition effect of irradiation from two directions).

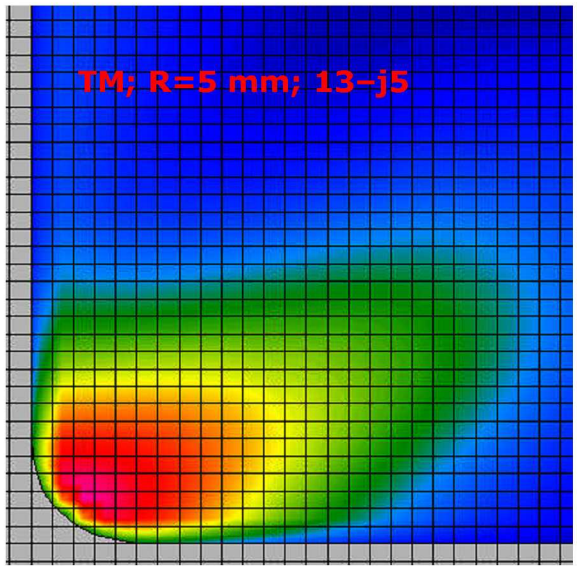
MODELLING OF THE EDGE OVERHEATING EFFECT











Irradiation from “below”

1×1 mm GRIDDING
THROUGHOUT