

section8_Ex.3&9

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3. What is meant by CTE or charge transfer efficiency? If a 2048 x 2048 CCD is quoted as having a CTE of "five nines", what fraction of the original charge in the last pixel will remain when it reaches the output?

- **CTE indicates**

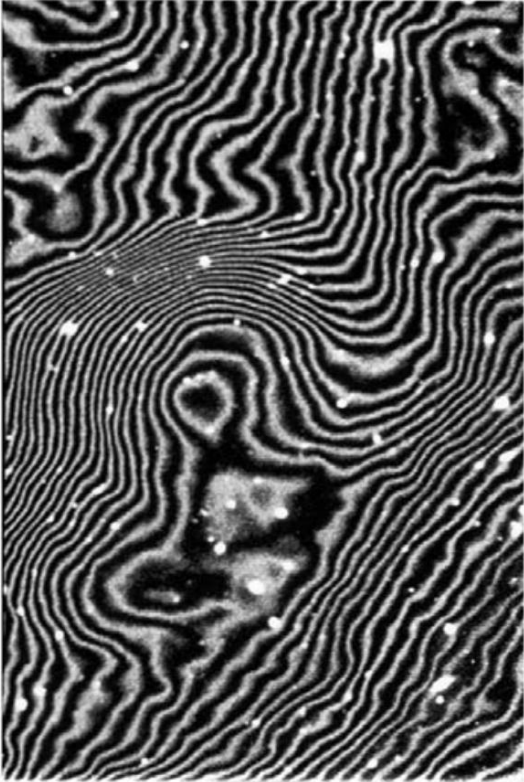
- After one transfer, what fraction of charge remains.

- **Having CTE of "five nines" means**

- After one transfer, 99.999% of the original charges will have made it successfully.
- The remaining charge in the last pixel originating from the first pixel can be calculated, considering 2048 steps of a charge transfer,
$$(0.99999)^{2048} = 0.979728190519641$$

9. What causes “fringing” in CCD systems? Why is it worse at longer wavelength?

Fringe pattern



Removal of fringing

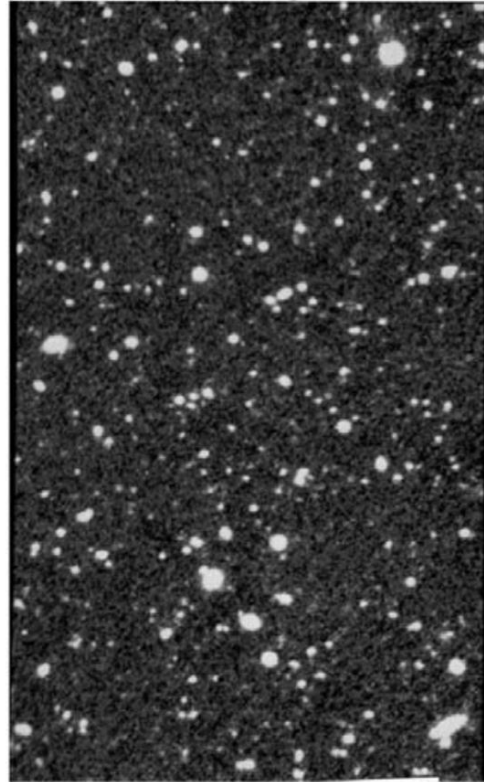


Figure 9.9.

- Fringing is mainly caused by OH emissions of night sky.
 - In the case of thinned backside-illuminated CCD, particularly, the entering light reflects many times internal to the substrate.
- Why is it worse at longer wavelength?
 - The longer the wavelength is, the longer the absorption is.
 - That leads multiple reflections with less attenuation.