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Experience with random failure in 940nm devices

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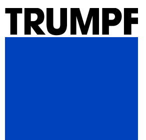


Context of the analysis: Several companies report shipment of >1bln chips to smart phone customers without any field failure

The consumer electronics industry consumes >1bln VCSEL components per year

The vast majority is 940nm and

- Multimode with the same current density as datacom 850nm
- Multiple emitters on a chip, all must function for the applications
- Operate under the same environmental conditions as in datacom (less hours)

Qualifying such devices requires to run repeated batches of

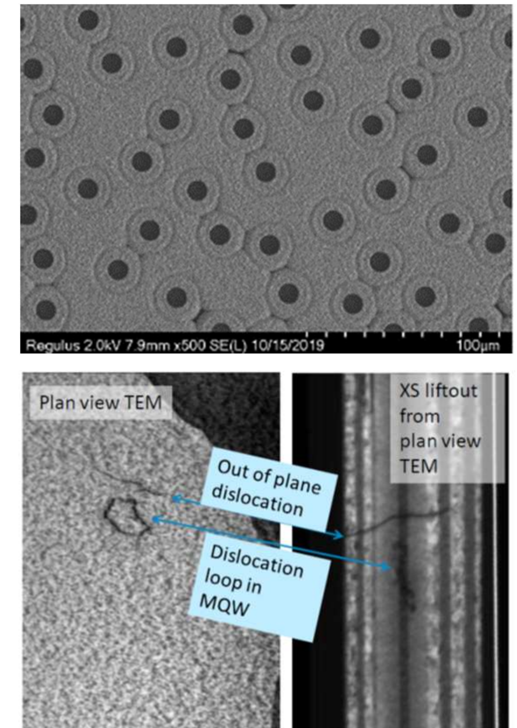
- 10k chips for 1000hrs
- Failures, if any, must be analyzed with extensive failure analysis reports

Historically, failures were all related to substrate defects

- Substrate dislocations may propagate into the active region and damage the laser

Remedy: change to low-defect substrates; no more failures detected

- Etch Point Defects (EPD) 400/cm2 to <100/cm2 (laser-grade). (LED grade <5000/cm2)
- Substrates for 850nm, 940nm, 980nm are identical



2015 analysis

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