A Novel MT-style Optical Package

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Outline

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- Design
- Result
- Summary

Introduction

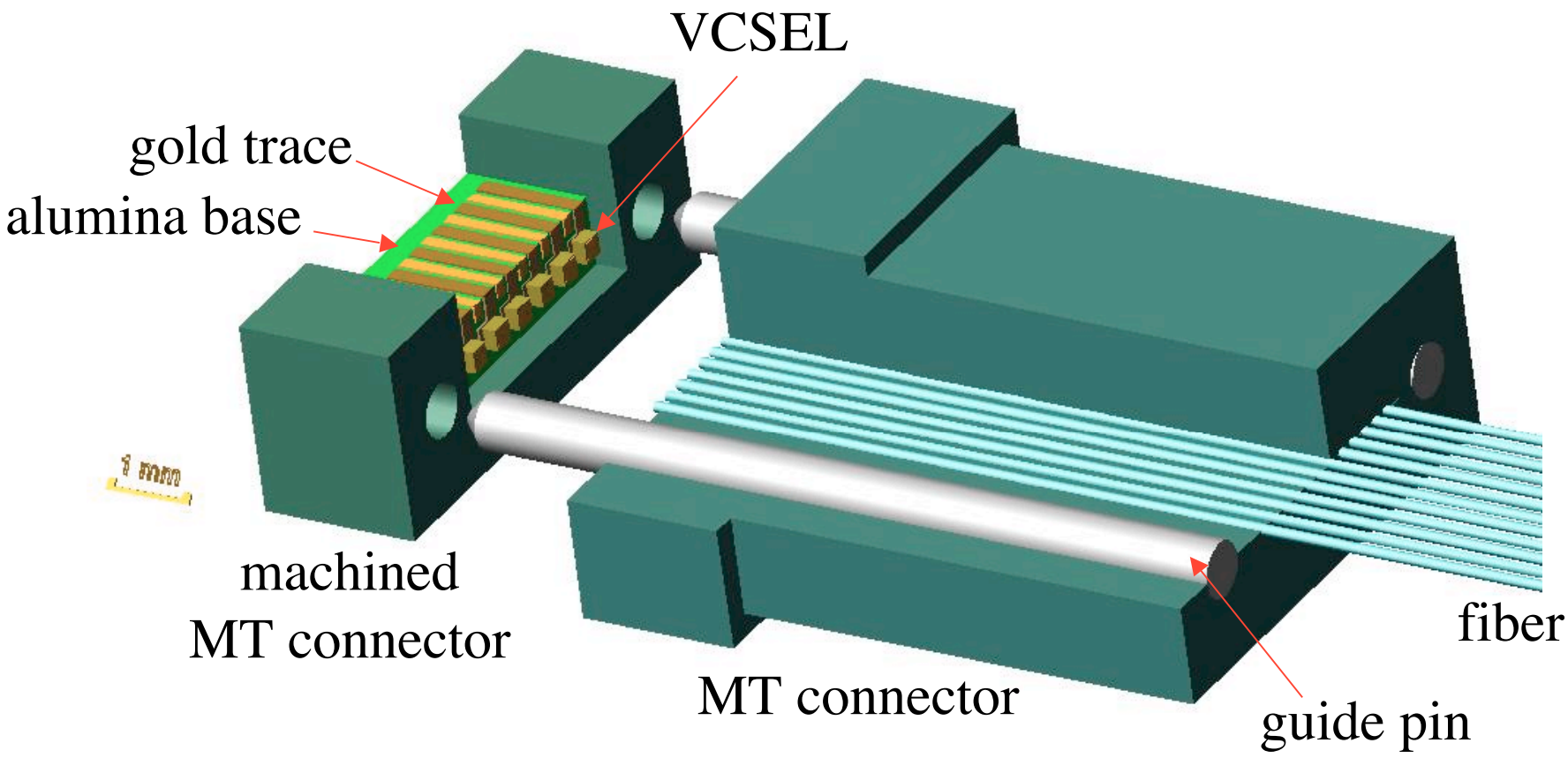
- optical fibers now replacing copper wires in HEP detectors:
  - eliminate electromagnetic interference
  - eliminate ground loops

- commercial VCSEL/PIN packages too bulky for vertex detectors
  - custom design optical packages
  - convert MT fiber connector into an optical package
  - MT-style optical package allows easy mounting/removal of fiber bundle during testing and detector assembly

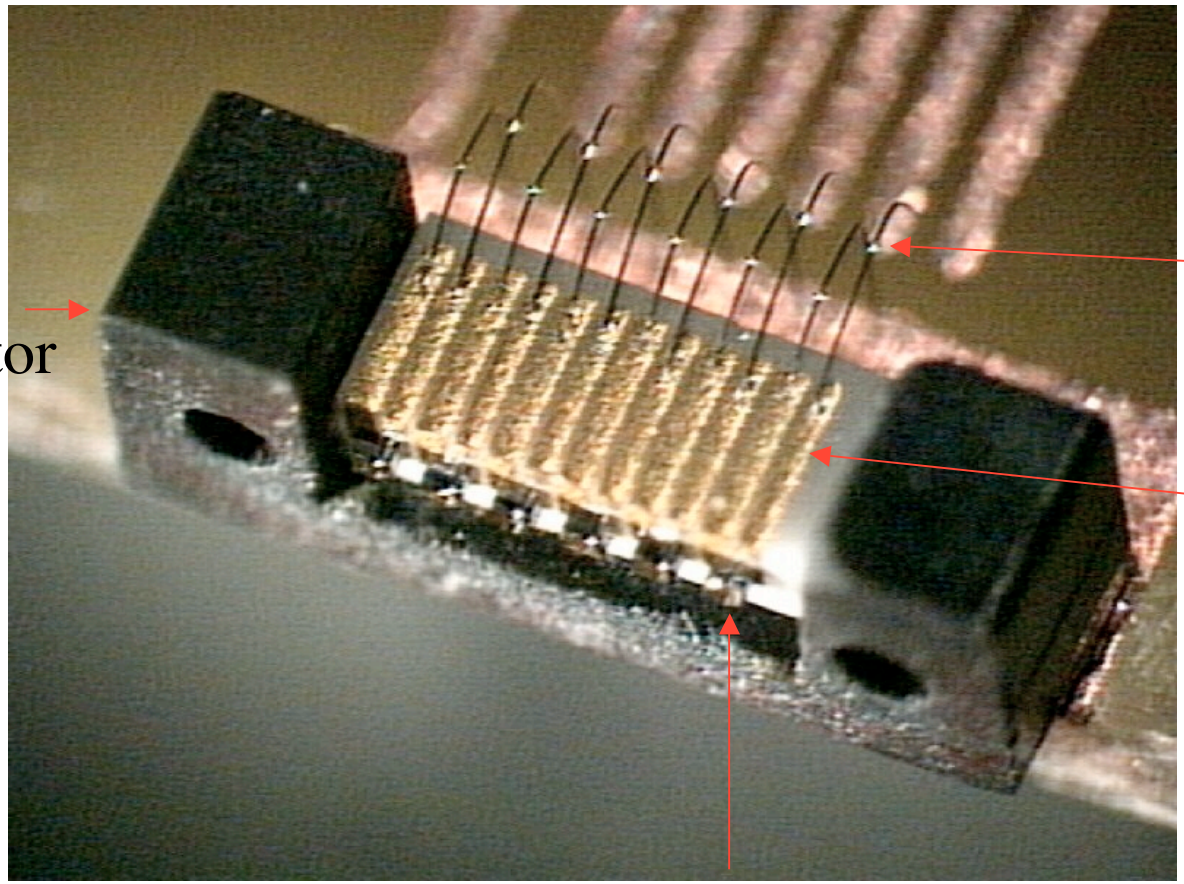
Design

- good coupled optical power requires good VCSEL alignment:
  - 50 □m in z (along fibre)
  - 25 □m in x and y (transverse to fibre)
- alignment for PIN is not stringent
- machine a pocket on MT connector for placement of base:
  - use alumina as base substrate:
    - ground alumina sheet to proper thickness
    - cut alumina sheet into strips
    - deposit 3D gold traces on strips for wire bondings, VCSEL/PIN placements
    - cut alumina strips into bases
      - 3D traces have good connectivity (~ 94%)

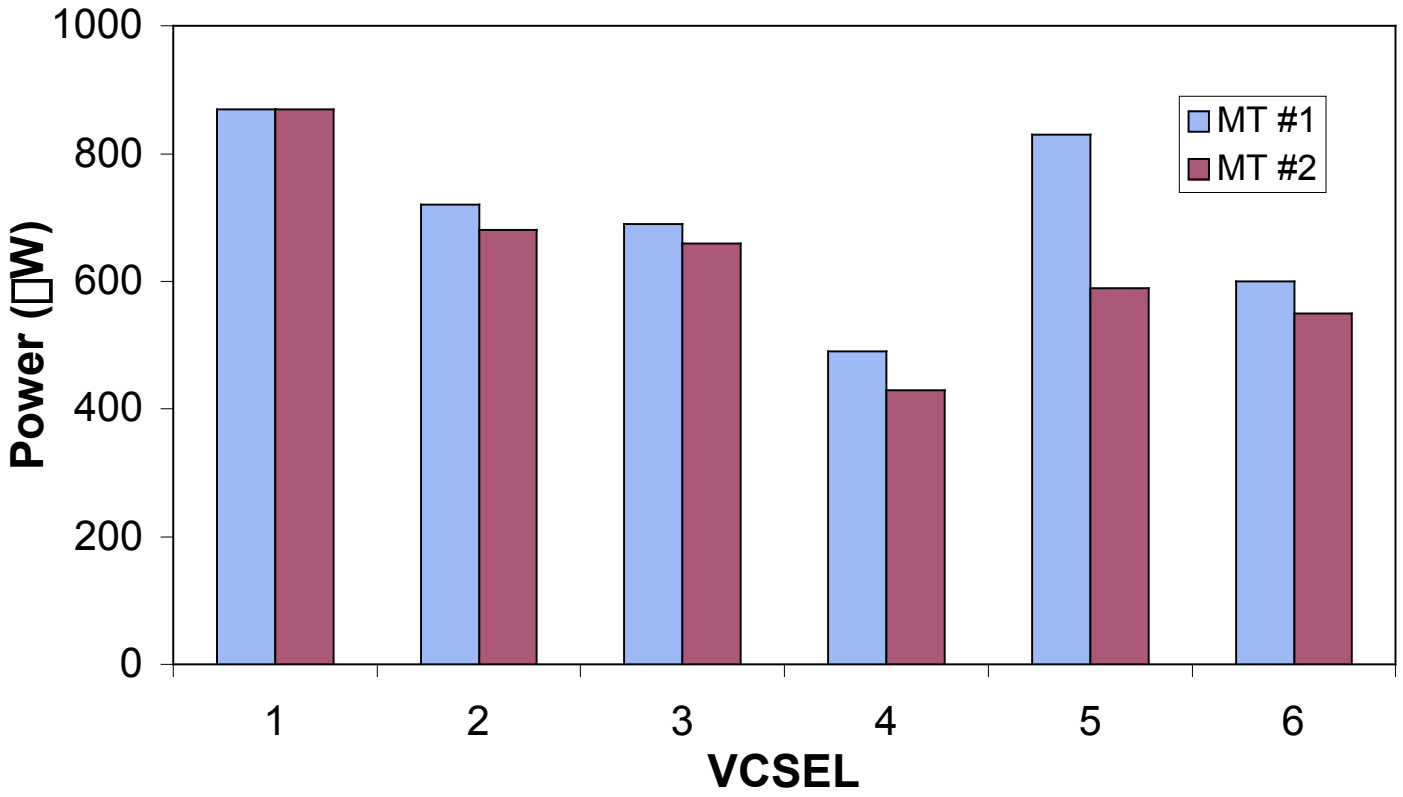
VCSEL Opto-pack Design



VCSEL Opto-pack

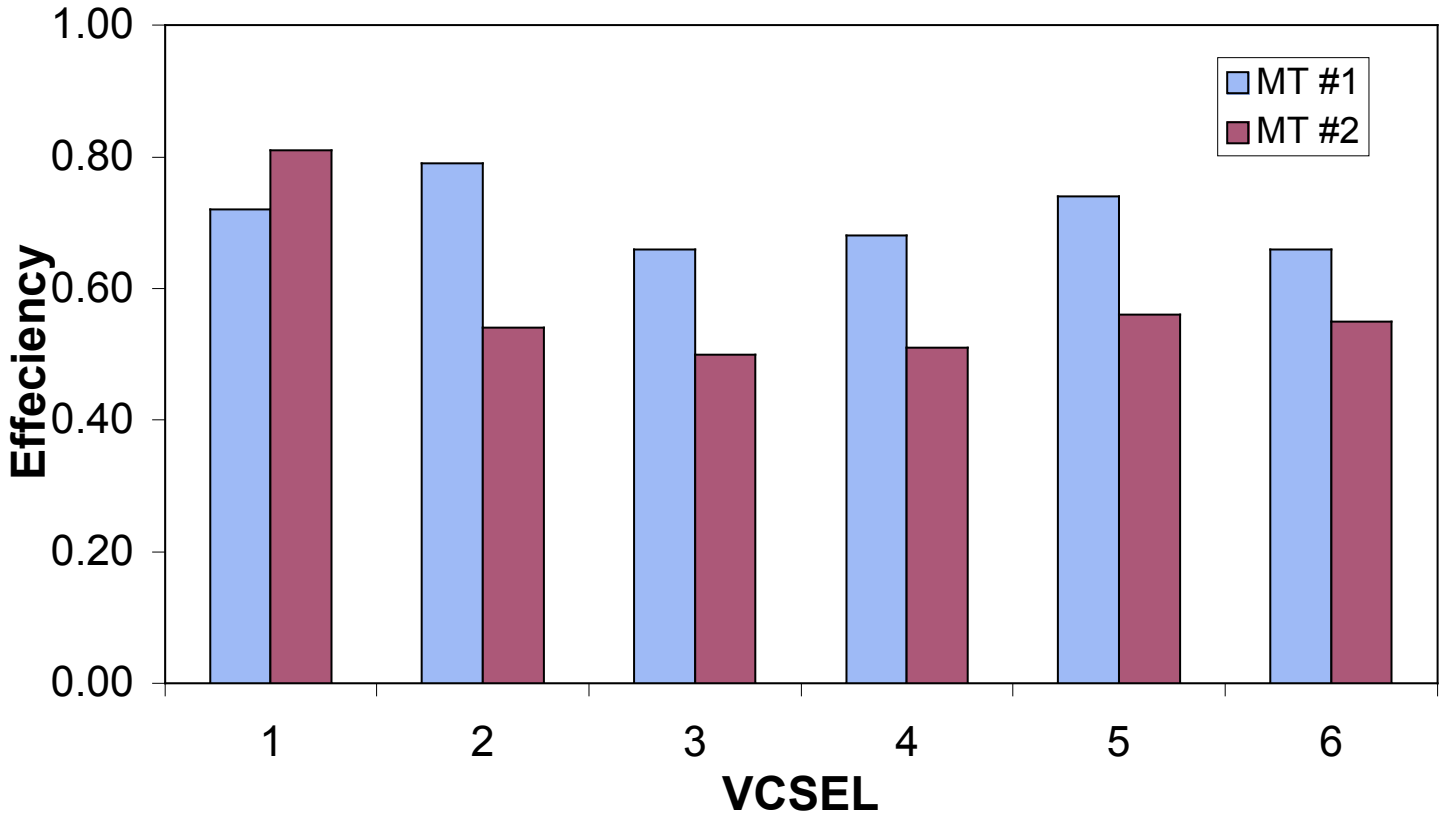


Coupled VCSEL Power @ 10 mA



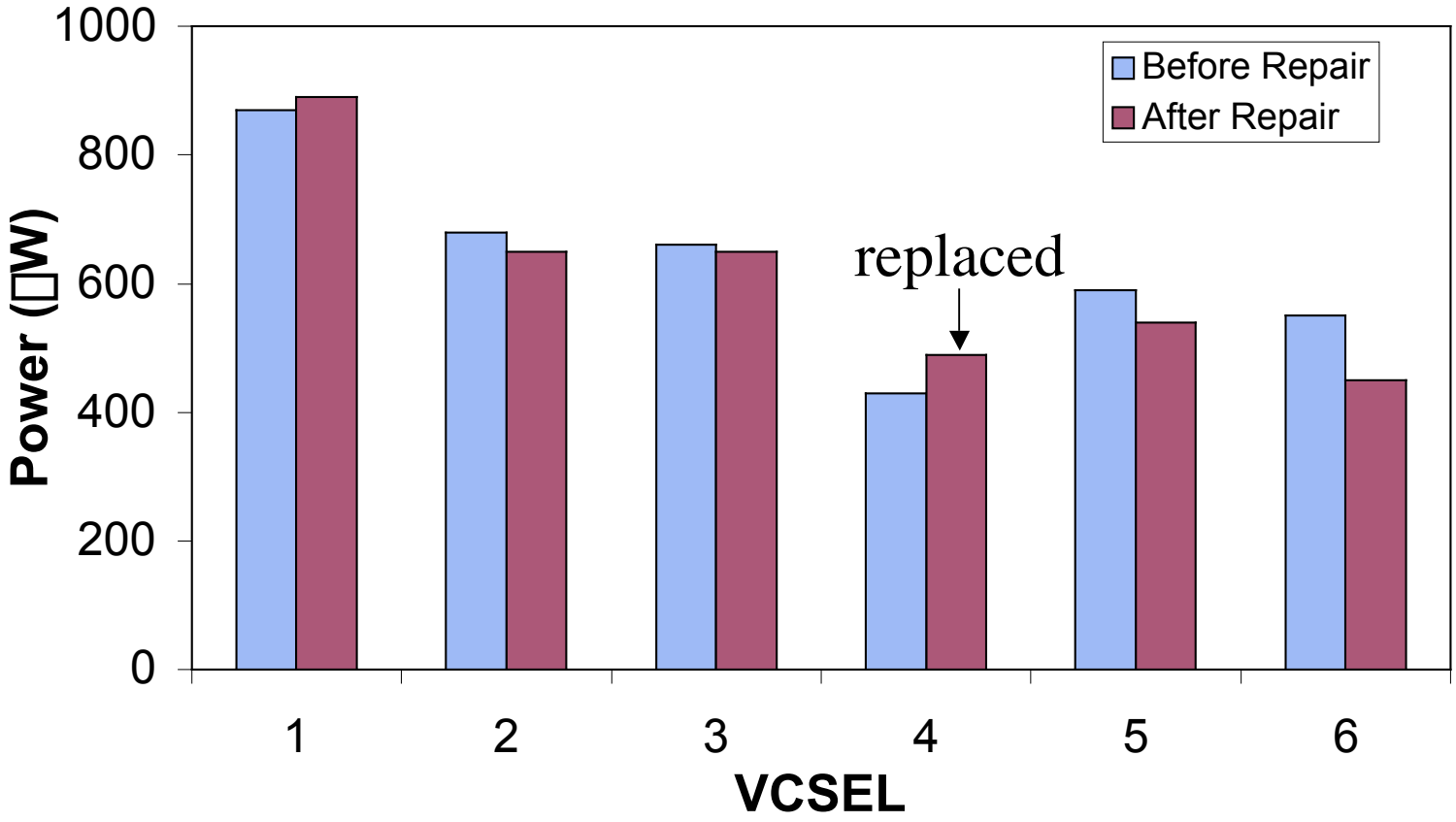
- all VCSELs have good coupled power

VCSEL Power Coupling Efficiency



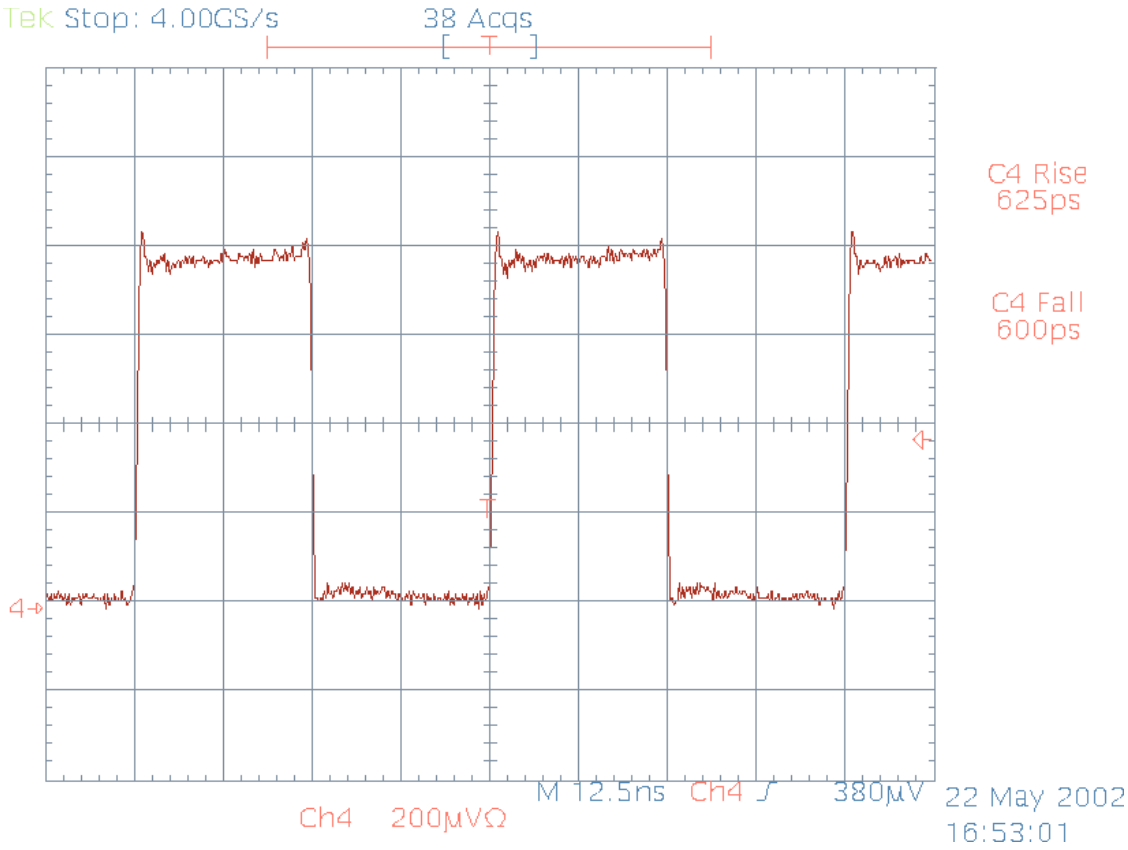
- all VCSELs have good power coupling efficiency

Coupled Power After VCSEL Replacement



- VCSEL can be replaced without damaging adjacent channels

VCSEL Waveform



- VCSEL opto-pack has fast rise and fall times

MT-style Opto-pack Issues/Limitations

- opto-pack limited to 6 channels due to physical limitations:
  - spacing between fibers is 250 μm for 12-fibers MT connector
  - VCSEL is 250 μm wide
- 8 or 12 channel opto-pack can be fabricated using:
  - 8 or 12-channel VCSEL/PIN array
  - fabricated MT connector with wider fiber spacing

Summary on MT-style Opto-pack

- MT-style opto-pack has good coupled power/efficiency
- MT-style opto-pack is repairable
  - ☞ principle of MT-style opto-pack demonstrated