



DARK ENERGY
SURVEY

1.2.2 – CCD Packaging

Greg Derylo

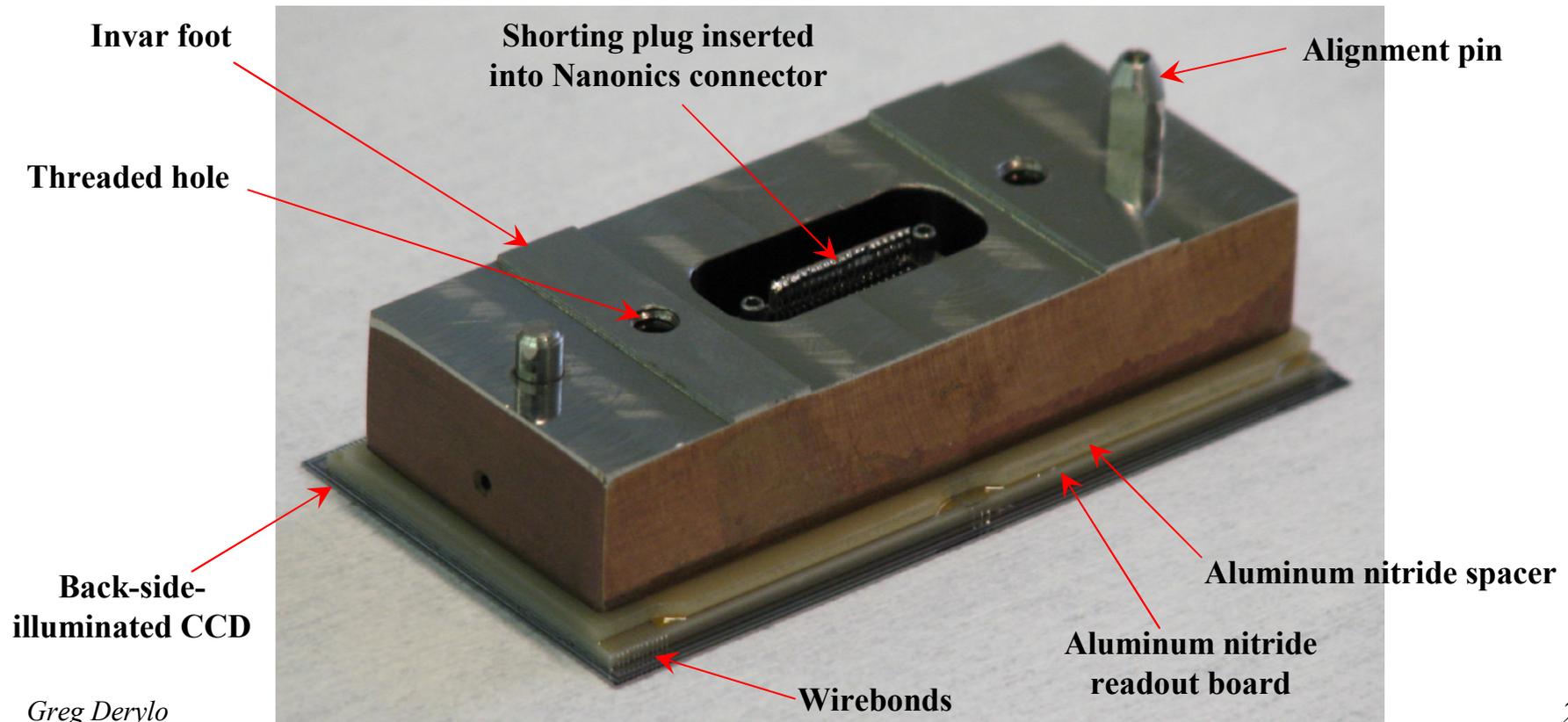
- Version 1 Packaging Progress & Plans
- Version 2 Packaging Plans
- Guide & Focus Modules



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1.2.2 – CCD Packaging V1 Progress & Plans

- Initial V1 module version based on previous work done with these devices at LBNL & Lick Observatory / UCSC



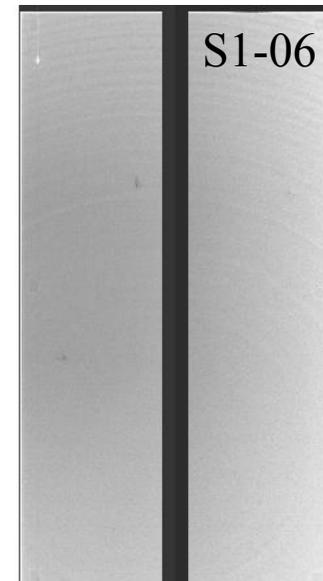
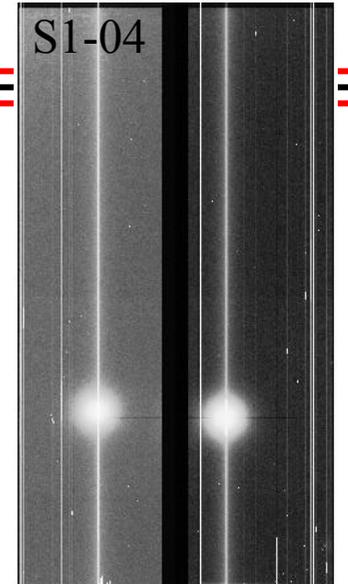
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1.2.2 – CCD Packaging V1 Progress & Plans

- Packaging work moved from Lab A to Lab C clean room last October
 - Worked to reduce ESD risks (controlled grounding of equipment, tables, chairs, establishing a conductive floor, etc.).
 - SiDet improved the Lab C & D humidity levels.
 - Improvements still being made to minimize ESD-related risks.
- Written procedures generated for module assembly steps.
- Modules produced one-at-a-time at first while fine-tuning process and training new technician. Rate of two per week maintained since Jan 2nd.
- Electrical testing indicates 2 / 5 success rate (two most recent modules). Pictureframe-style package yield ~80% for back-side-illuminated sensors.
- Four more modules in process.



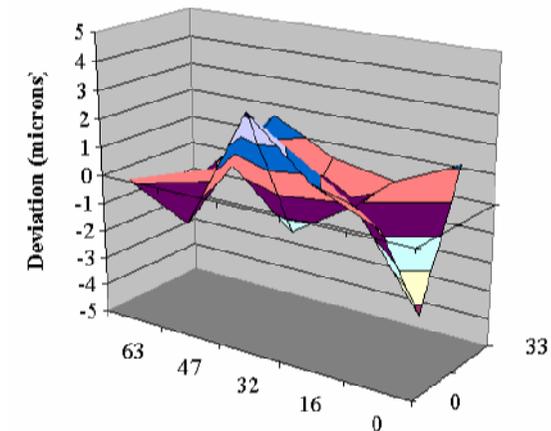


1.2.2 – CCD Packaging V1 Progress & Plans (continued)

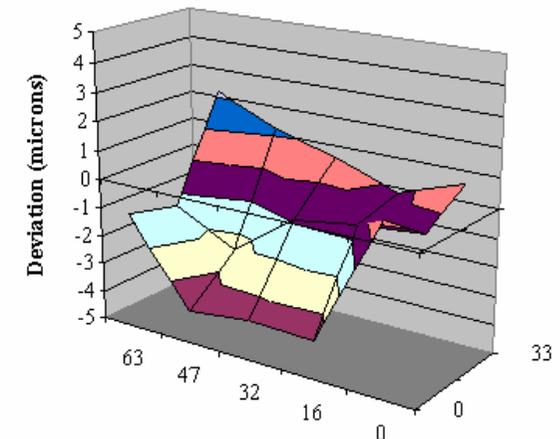
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- Mechanical measurements: thickness measured on some modules. Flatness measurements to be performed.
- V1 module failures:
 - Presumed ESD damage in 3 CCDs at some point between LBNL cold probe testing at the wafer level and module completion.
 - Failure of a connector solder joint during handling (epoxy reinforcement added on newer modules)
 - Failure of sensor wirebond pad (starting to record bonding history in detail to look for patterns)
- Goal is to have 10 working V1 modules for the multi-CCD vessel testing. Total number of modules to be packaged depends on yield.
- Parts in hand / on order to build at least 22 modules. Additional \$ needed for V1 module parts if we need to go beyond this quantity (up to ~\$6k)

Module S1-01 Thickness Deviation from Nom.



Module S0-04 Thickness Deviation from Nom.





1.2.2 – CCD Packaging V2 Plans

- Improvements to be incorporated into the V2 design:
 - Allow more permanent attachment of cable to reduce connector handling.
 - Investigate use of alternate connector type & electrical configurations.
 - Investigate reducing module height to allow wirebonding on completed package rather than partway through assembly. This would reduce CCD handling during assembly and would allow bonds to be repaired on completed modules.
 - Investigate use of AlN ceramic as the foot material for improved performance.
 - Module storage to accommodate permanent cable attachment.
- Design V2 module and assembly fixturing
- Procure V2 module parts to make 10-20 good CCDs (\$40k)
- Procure V2 assembly fixturing (\$30k)
- Procure module storage boxes (\$25k)
- Build and test V2 modules



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1.2.2 – CCD Packaging Guide & Focus Modules

- **Guide & Focus V1 Module Development**
 - Use V2 2k x 4k design results as a starting point for the these designs
 - 2k x 2k sensors packaged in modules with different configurations depending on their duty
 - Guide modules to be coplanar with focal plane
 - Focus / alignment modules to be off-plane for image analysis
- Design modules and assembly fixturing
- Procure module parts to make several of each flavor (\$10k)
- Procure assembly fixtures (\$15k)
- Build and test modules