Dark Energy Survey
Aluminum Nitride CCD Backing Hybrid
Specifications Document V2.1

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Introduction:

The Dark Energy Survey Collaboration is proposing to build a large mosaic CCD camera as a new instrument for the 4m Blanco telescope at Cerro Tololo Inter-American Observatory in Chile. The mosaic camera will consist of 62 optical CCD sensors and other devices for guiding the telescope and for keeping precise focus. The fundamental readout unit consists of a CCD sensor and the electrical and mechanical support necessary for mounting the sensor in the camera vessel and for reading out the sensor.

The aluminum nitride CCD backing hybrid functions to provide a mechanical backing to each CCD sensor for mounting and making thermal contact, to route CCD signals from the sensor to a small connector, to support surface mount electronics including a temperature sensor, and to provide good electrical characteristics in order to minimize readout noise and issues such as crosstalk.

Operating environment:

The AlN Backing Hybrid will be placed inside the camera vessel on the focal plane which will generally be under vacuum (~10^-5 – 10^-6 Torr) at a temperature of approximately –100 degC. Before operation, the hybrid will be exposed to atmospheric pressures. The board will also be expected to be exposed to temperatures in the range from –150C to 50 C.

Mechanical specifications:

The AlN Backing Hybrid is to be roughly the same size as the CCD sensor except that it will be narrower so that the edge wirebond pads on the CCD sensors can be used to wirebond from the sensor the AlN backing hybrid. The thickness of the hybrid will be 1 mm to provide mechanical stiffness and to maintain flatness. All metalization will be on the top surface. Metalization will be gold with appropriate back metal suitable for soldering and/or wirebonding. Solder pads will be located near the center of the hybrid for a high-density connector and for surface mount components. A non-outgassing solder dam such as silicon nitride will protect the gold traces.

Electrical specifications:

The AlN Backing Hybrid consists of gold traces that connect edge wirebond pads to central solder pads for a connector. In addition, various surface mount components will be soldered upon the surface of the AlN board.

Testing specifications:

The AlN Backing Hybrid is to be electrically tested for continuity between the bond pads and the termination of the trace from the bond pads. Adjacent traces are to be tested to make sure there is no electrical short. In addition, each board will be visually inspected for incomplete traces or for extra metallization.

Aluminum Backing Hybrid Specifications:

Length: 2.430 +/- 0.002 in
Width: 1.180 +/- 0.002 in
Thickness: 0.040 +/- 0.001 in
Flatness of bottom surface: +/- 0.001 in (unpolished)
Typical metalization: 500A W Ti under 2000A Ni under 125 +/-25 micro-inch gold
Minimum trace width/spacing: 4mil width on 4 mil spacing
Typical solder dam material: Silicon Nitride, 1-2 micron thick
Trace pattern: per Fermilab submitted Gerber files.
Mechanical dimensions per Fermilab Autocad file 436002