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A Novel approach to fiber connections for the Dark Energy Spectroscopic Instrument

The Dark Energy Spectroscopic Instrument (DESI), which will be in- stalled on the Mayall telescope at Kitt Peak in 2018, plans to measure the spectra of more than 30 million galaxies and quasars to map the large scale structure of the universe to study Baryon Acoustic Oscillations (BAO). DESI simultaneously collects spectra from 5,000 objects using robotically-actuated fibers which enable the focal plane to be fully reconfigured in less than 3 minutes. The fibers will run 40 meters from the focal plane to the coude´ room where they feed ten 3-arm spectrographs over a wavelength range of 360 - 980 nm. The focal plane assembly will be integrated independently of the spectrograph slits and long fiber cables in order to ease integration flow, and the two subsystems will be connected before final integration on the telescope. In order to retain maximum throughput and minimize the focal ratio degradation (FRD) when connecting the fiber system, we are employing fusion splicing as opposed to mechanical connectorization. We report results from the splicing process, measuring a collimated FRD increase of less than 0.5 degrees for a f/3.9 input beam for the first time in a fiber-fed astronomical instrument.

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