Instrument Design for DESpec

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DESpec began as a notion

Could we modify DECam infrastructure to accommodate a spectroscopic survey?
  • Possible?
  • Inexpensive

Would the enabled spectroscopic survey be scientifically interesting?
  • Meaningfully increase DE parameter precision?
Answers seem to be positive

- Can reconfigure DECam to allow for spectroscopic option
  - Additional optics
  - Fiber positioner/spectrographs
- Use a large fraction of existing DECam infrastructure
  - Corrector optics
  - Structure (cage, etc.)
  - Hexapod
- Cost is not prohibitive
Answers seem to be positive

- DE parameter precision could increase substantially
  - Factors of many
  - Many talks and lots of discussion about what “many” means
- Additional science enabled
  - Talks and discussion of this as well
Many options remain available

- Specific starting point of discussion
  - 500 – 1000nm coverage
  - Resolution of ~3000
  - ~4000 targetable fibers
  - ~3 square-degree field-of-view

- Guidelines, not specifications
  - Other choices are possible
  - Some are more difficult/expensive than others

- Need to transition to science-based decisions about instrumentation
Example: specific red cutoff

- Can use existing corrector to ~1050 nm
  - Can use simultaneously from 500-1050 nm
- Beyond ~940 nm
  - Throughput falls quickly
  - Sky becomes brighter
  - Water absorption
- Note: [OII] 372.7 nm at z=1.5 is at 931.75 nm
- Need to assess the importance of observing at wavelengths longer than ~940 nm
Example: Blue spectra

- DECam optics make good images over any ~200 nm wavelength range from ~350 nm to ~1050 nm
  - In the red the accessible range is larger
  - Blue observations are possible
    - 350-550 nm, for example

- Complications
  - Focus position different
  - Fiber material different
  - ADC more important

- Need to understand utility and added science
Quantitative discussion of added science capability

- Quantitative gain versus added capability is crucial for future instrumentation decisions
  - Ideally want something like “FOM vs red cutoff”
- Allows for examination of instrumentation designs and cost
- As a group we could then discuss “cost versus benefit” trade-offs
Some things are easy to change; others hard (= costly)

- **Resolution**
  - 1000-5000 possible
  - >10000 is difficult

- **Field-of-view**
  - ~3 square degrees possible
  - More is difficult

- **Wavelength range**
  - ~550-1050 nm possible
    - Reduction within this range easy
  - Anything else is difficult

- **Etc.**

- **But nothing is impossible**