DARK ENERGY
SURVEY

PreCam 1.5 Exposure Times

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DES-Calib/PreCam Telecon

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The Equation

$$S/N = N_* / sqrt(N_* + N_{sky})$$

where

N_* and N_{sky} are in # of detected electrons.

(Readnoise and dark current are ignored.)

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Original Estimates (2009)

Baseline PreCam Survey Point-Source Magnitude Limits (optimized to achieve S/N=50 at DES saturation + 1.5mag)

Band	Exposure time [seconds]	PreCam saturation limit	PreCam mag limit S/N=50	Number of usable stars per sq deg (SGP)
g	36	12.8	17.8	186
r	51	13.2	17.8	265
i	65	13.4	17.7	344
z	162	14.1	17.5	317
Y	73	11.6	14.3	150

Measured Depth of PreCam Data: S/N vs. Magnitude

(10-arcsec-diameter Aperture Magnitudes)

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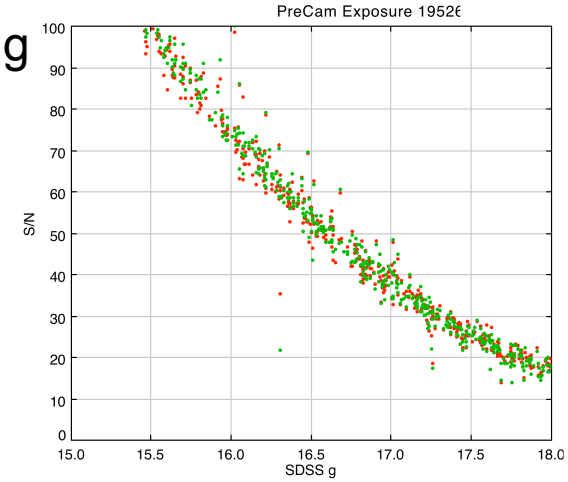
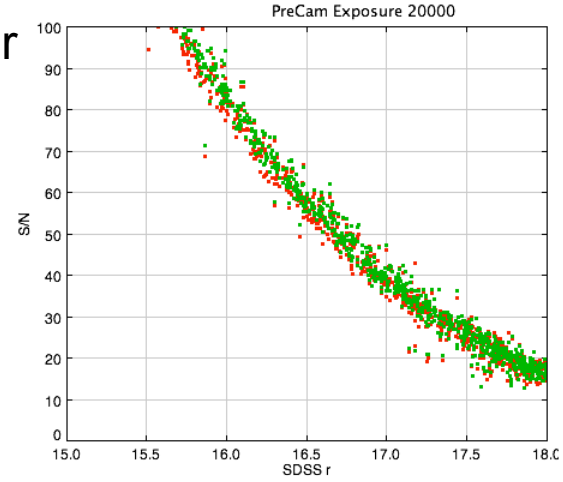
g



r



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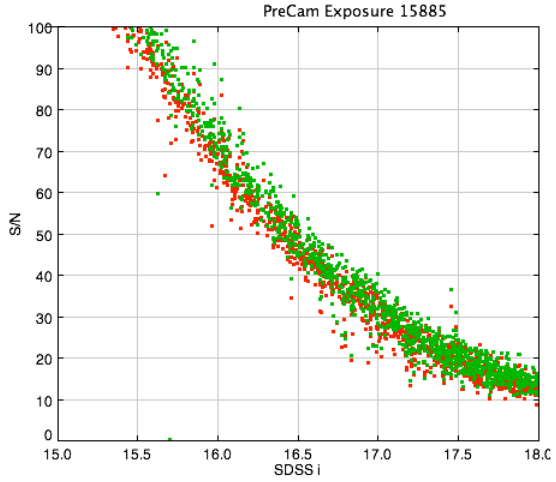

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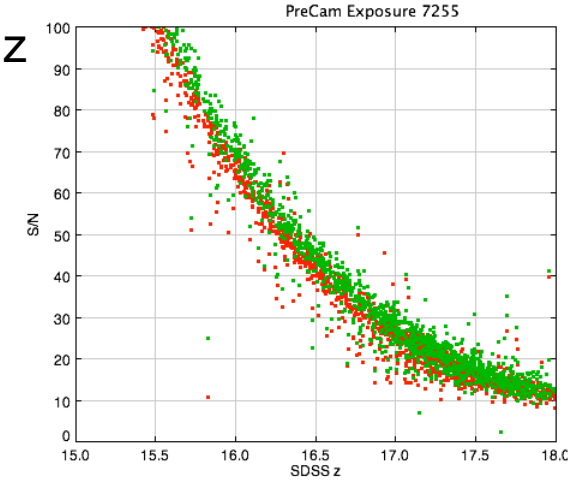

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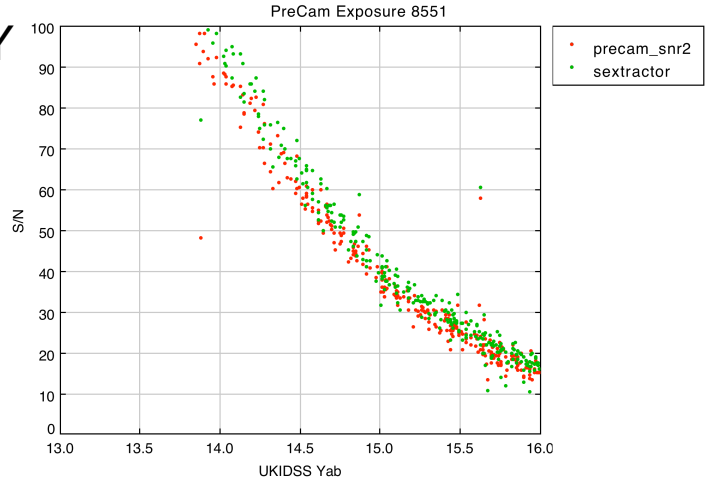

FNAL V3 processing

Measured Depth of PreCam Data: Fits to S/N vs. Magnitude

(10-arcsec-diameter Aperture Magnitudes)

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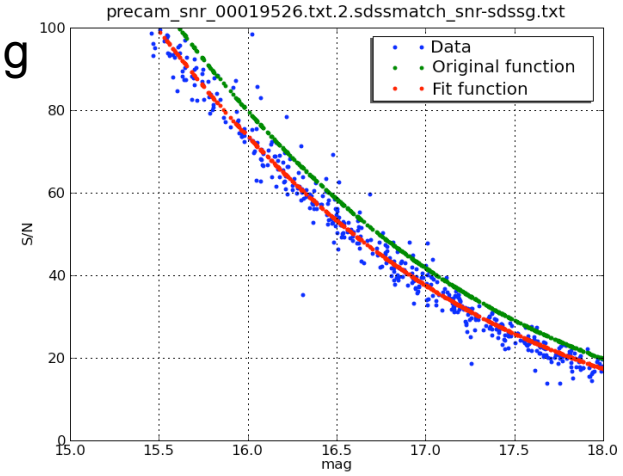
g



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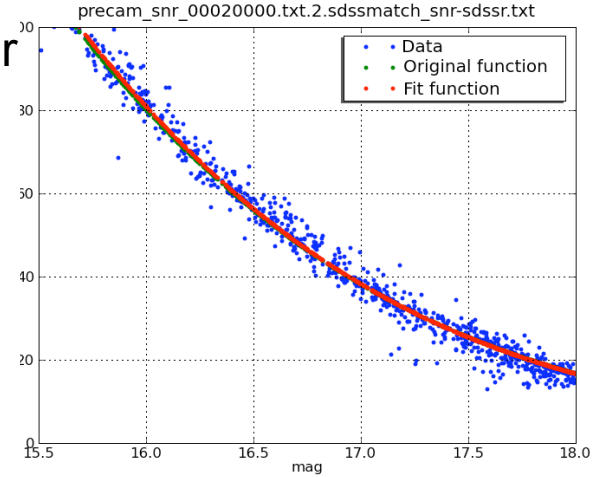

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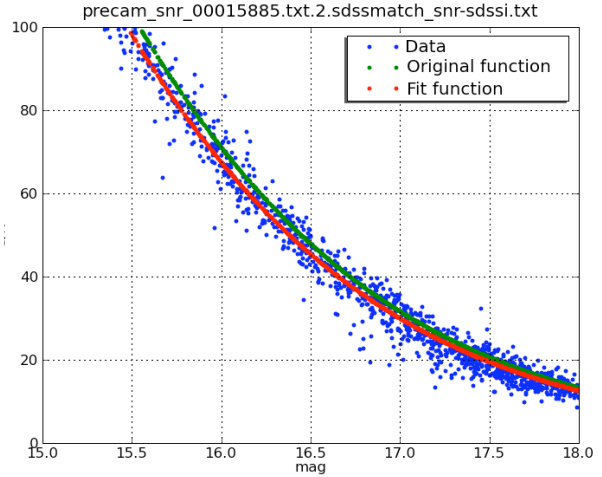

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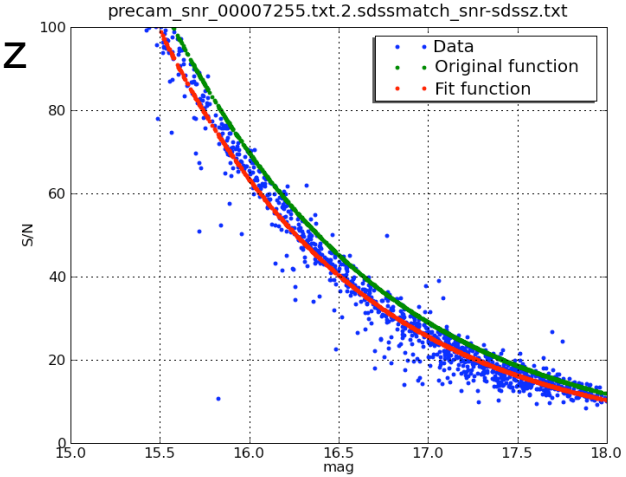

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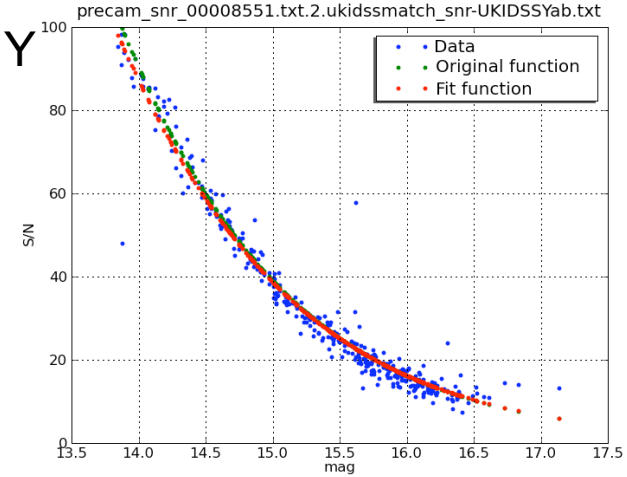

FNAL V3 processing

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Differences from Original PreCam 1 Calculations

1. Used measured sky background counts from PreCam 1 images.

2. Included an $F_{illum} = 0.5$ to account for smaller size of the original Curtis-Schmidt folding flat mirror.

3. Relative to the other filters
   a) z-band appears to have c. 30% more throughput than expected
   b) Y-band appears to have nearly twice (c. 1.8x) as much throughput than expected (almost negating the the effect of the F_{illum} factor.)

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PreCam Exposure Time Estimates: Original Estimates vs. Measured Values

Baseline PreCam Survey Point-Source Magnitude Limits (optimized to achieve S/N=50 at DES saturation + 1.5mag)

Band	Exposure time [seconds]	PreCam mag limit S/N=50 (Predicted)	PreCam mag limit S/N=50 (Measured)
g	36	17.8	16.6
r	51	17.8	16.7
i	65	17.7	16.4
z	162	17.5	16.3
Y	73	14.3	14.7

FNAL V3 processing

Exposure Times for a PreCam 1.5
(still using original CS folding flat)

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First pass – needs double-checking.

Band	Exposure time [seconds]	PreCam mag limit S/N=50
g	160	17.8
r	300	17.8
i	500	17.7
z	1200	17.5
Y	45	14.3

FNAL V3 processing

Exposure Times for a PreCam 1.5
(still using original CS folding flat)

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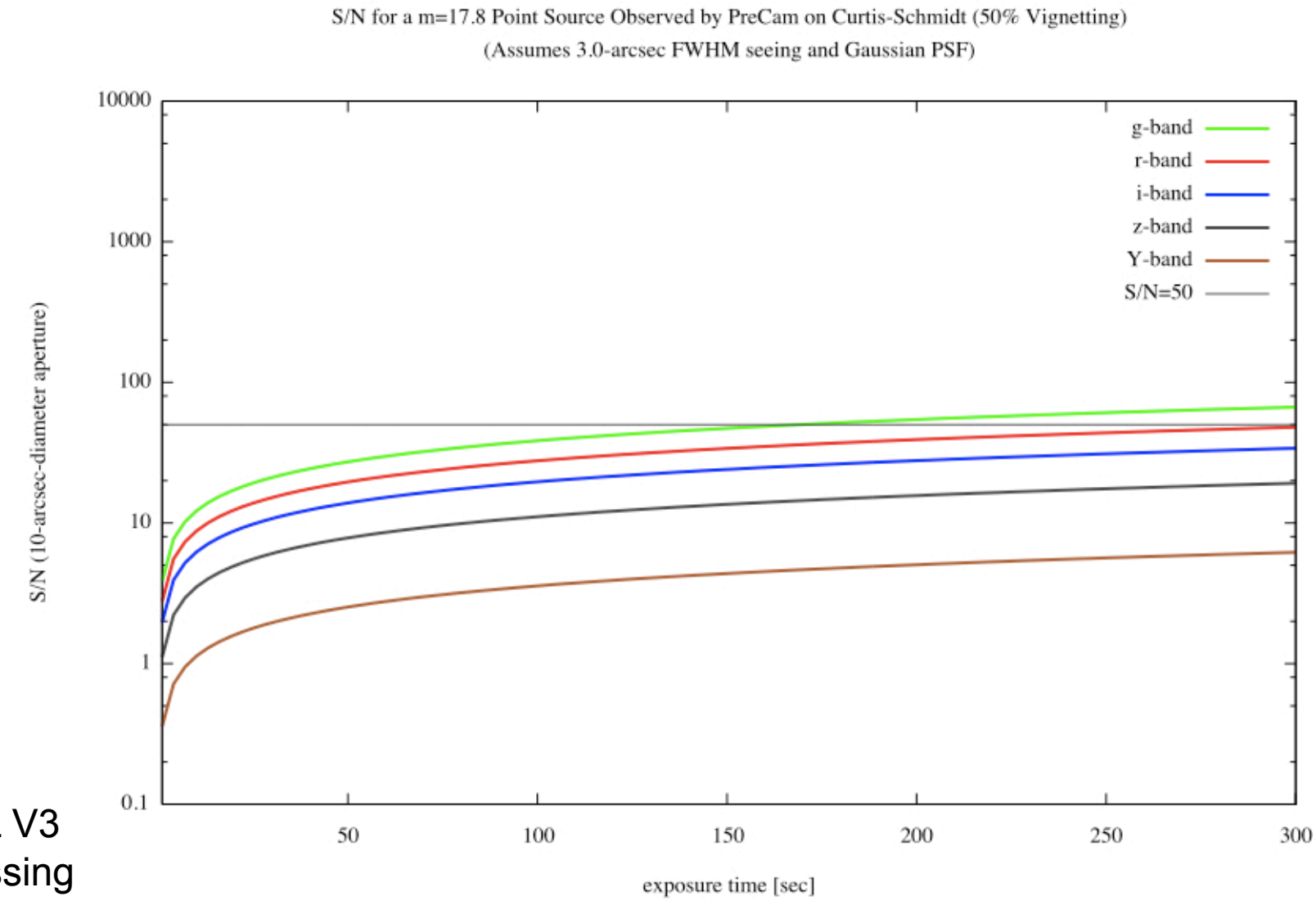

FNAL V3 processing

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Extra Slides