Padova SN re-searches

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+
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- SN Ia as Cosmological Distance Indicators

- SNe as Cosmic Stellar Population Tracers

- Understanding SN diversity (evolution)

- Link GRBs and SNe

Asiago 40/50 cm Schmidt telescope
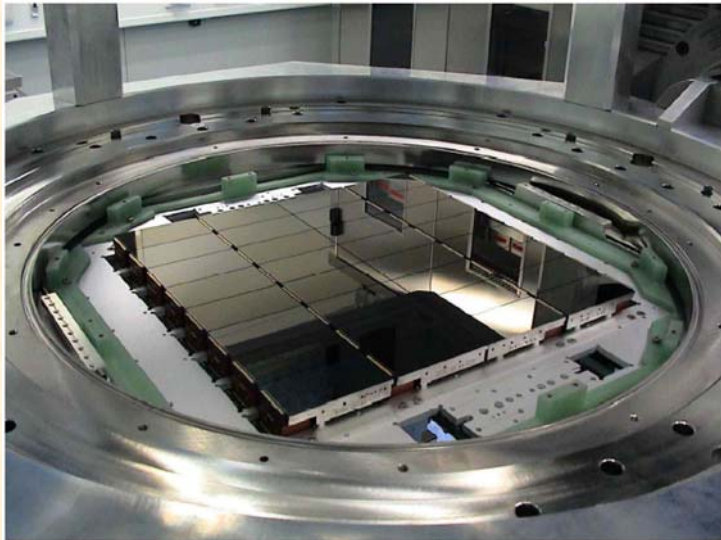## (1958 - 1992)

1 SN / 410 films or plates

1 SN / 12 nights exposure time

M31

6 deg

VST: VLT Survey Telescope

- built by the Capodimonte Astronomical Observatory

- 2.6 m primary mirror

- 1.46 deg FoV ($\varnothing$), 80% EE in 0.4″

OmegaCAM

- built by a Dutch, German & Italian consortium + ESO

- 16k×16k CCD mosaic

- 1 deg FoV (   ), 0.21″/pixel scale

Location

- located at Cerro Paranal

- dome built by ESO

- operation carried out by ESO

Scientific use of VST
ESO instrument

VST time share

ESO   **60 %**   { • **Public Survey** (~80%)
              • Service to the community

VST   **20 %**   INAF Capodimonte Observatory (Naples)

OmegaCAM **20 %**   distributed among Dutch, German
              and Italian communities

25% of VST time is for the Italian community

SUpernova Diversity And Rate Evolution

approved OmegaCAM+VST proposal for guaranteed time

Aim: Detection and monitoring of ~200 SNe

3 yr monitoring of 1sq deg field, limiting magnitude 25

frequency	filter	exposure	purpose
every 2nd night	r	30 min	detection light curve
once a week	g, i	30 min	classification extinction

Constraints: R.A. , > ±5 days from full moon, seeing < 1.4"

80 r + 30 g, i exposures/yr → 80 h/yr

Follow-up:

1. spectroscopy at selected epochs for SN classification

→ ~ 8 VLT nights year

2. u, z (IR) for galaxy photometric redshifts

→ 3-4 VST nights

By-product: Deep images (seeing < 1arcsec)
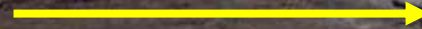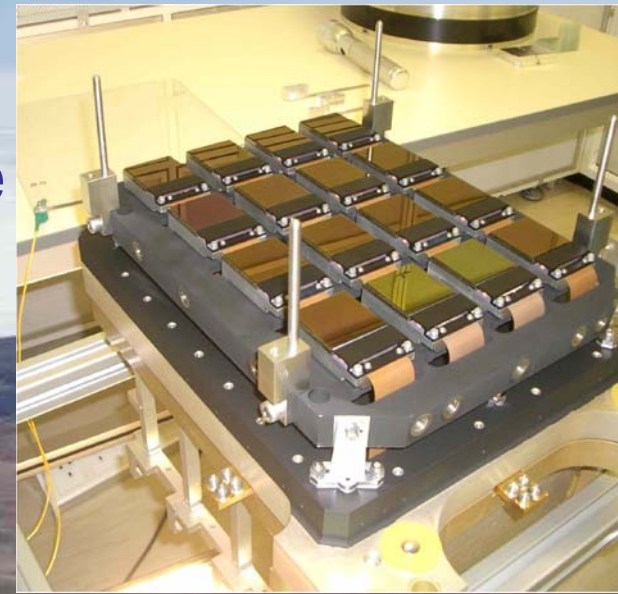
r 60h ; g, i 22h

→ r_{AB} ~27 S/N = 10

Open issue: Data delivery policy

starting mid 2008

VISTA

4m infrared survey telescope

1.65 degree diameter field of view.
16 2k x 2k IR science detectors 0.34"pixels.
Y: 23.0 J: 22.5 H: 21.3 K: 20.3
(30min, 5-sigma limit)

The Vista SuperNova Abell clusters Public Survey (SNAPS)
PI Marco Riello

Proposal submitted to VISTA public survey call (75% of time allocation)

Starting point: 1/3 - 2/3 of all core collapse SNe remains undetected
        due to dust obscuration

Proposal aim: Search for extinguished SNe, Measure extinction bias
   of optical SN searches.

Strategy: Imaging of 30-40 Abell Clusters in J and K bands
        1 visit/mo x field per 3 yr
        Expected 2-3 dozen SNe

Rejected for public time (main motivation: modest survey legacy value)
Encouraged to apply for open time call
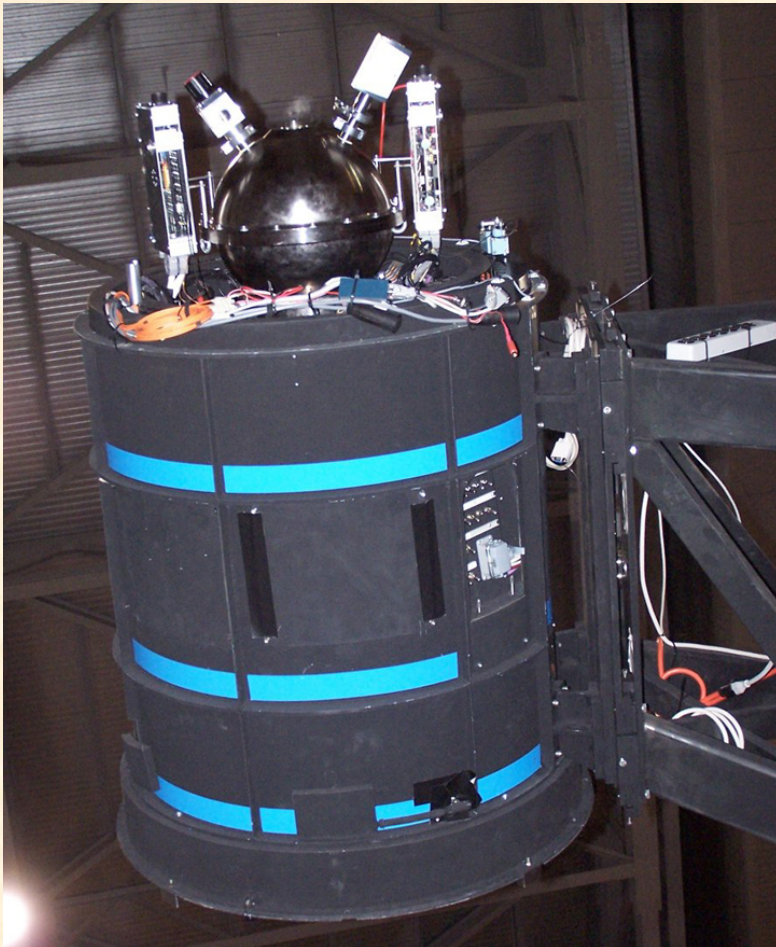
Large Binocular Telescope
2 x 8.4m - Mt. Graham, Arizona

- Arizona Universities (25%),
- Ohio University (12.5%), Research Corporation (12.5%)
- INAF – Italy (25%),
- LBT Beteiligungsgesellschaft – Germany (25%)
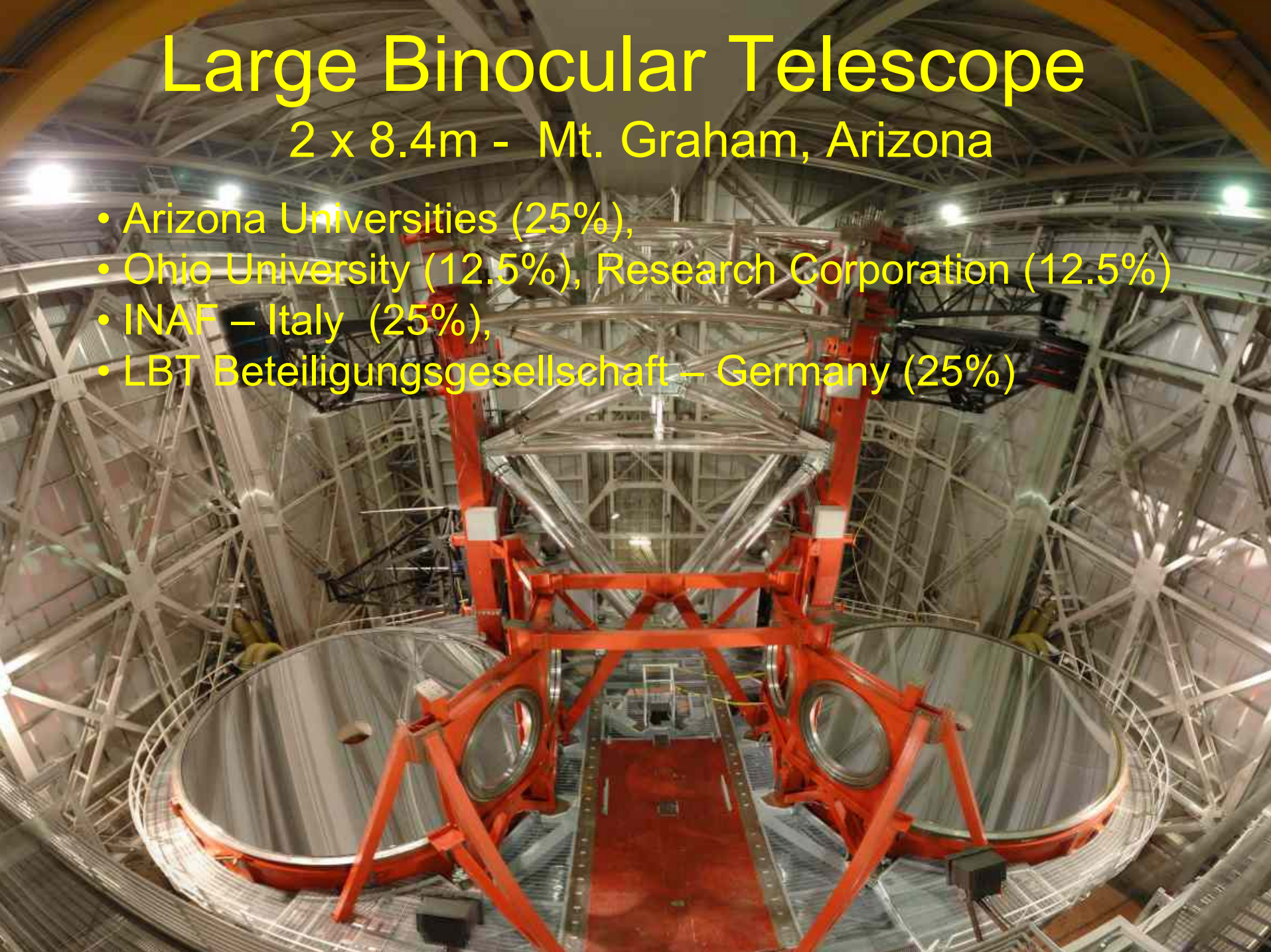
Large Binocular Cameras

E. Giallongo, R. Ragazzoni

Two cameras

a) U-V optimized camera: UV coated-thinned CCDs

b) V-I optimized camera: thick CCDs

Field: 24' × 24'
scale: 0.26"/pix
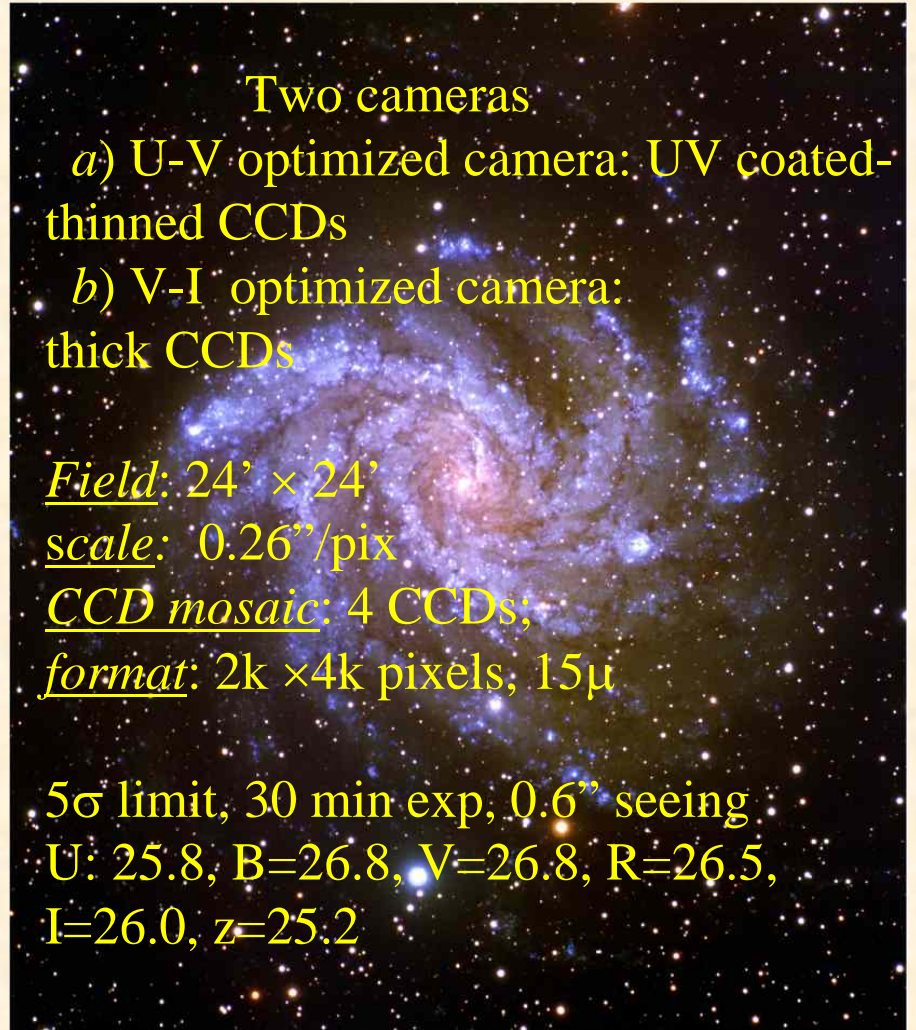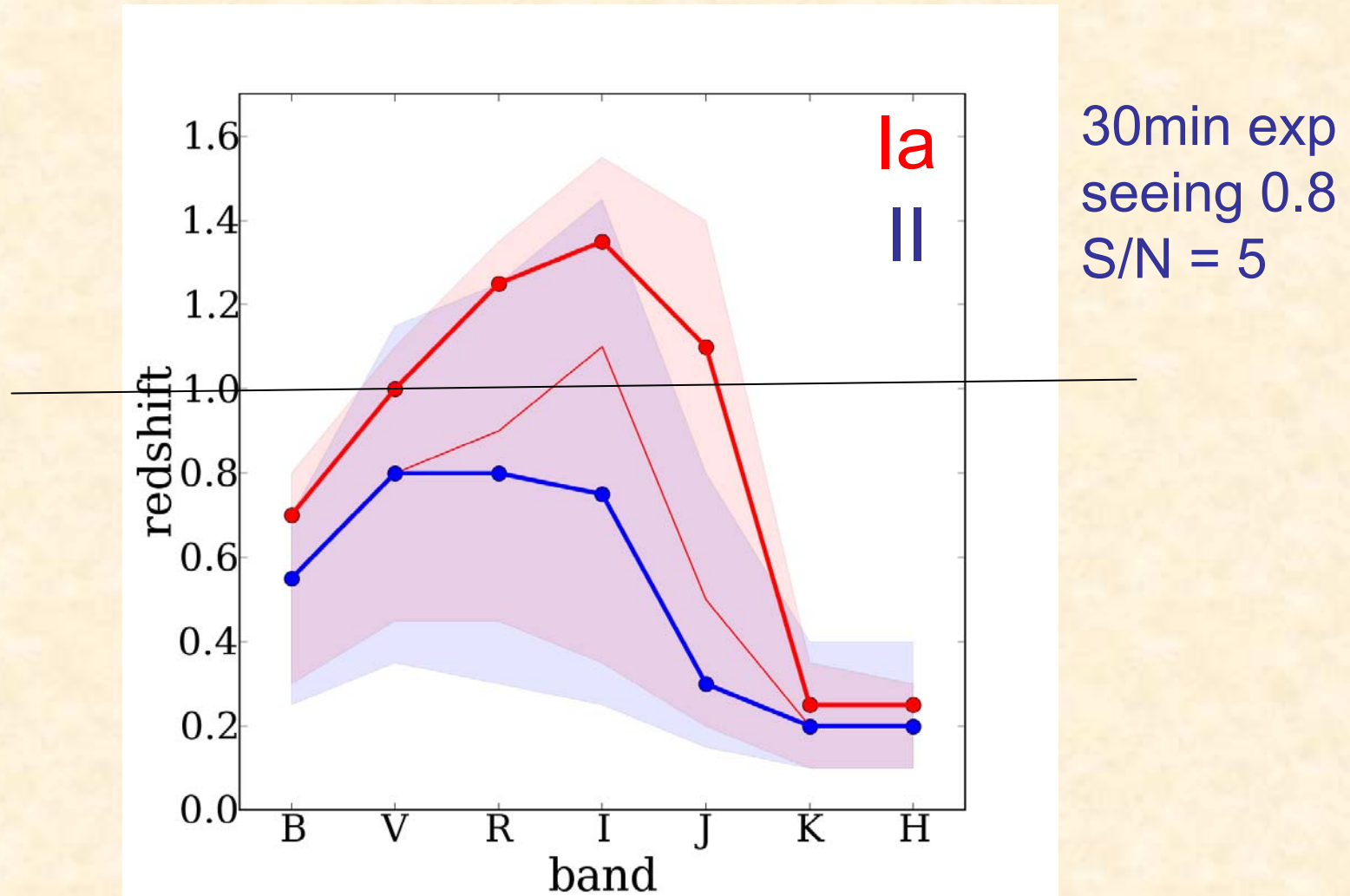*CCD mosaic*: 4 CCDs;
format: 2k ×4k pixels, 15μ

5σ limit, 30 min exp, 0.6" seeing
U: 25.8, B=26.8, V=26.8, R=26.5, I=26.0, z=25.2

Redshift limit for SN detection with 8m class telescope

Ia

II

30min exp
seeing 0.8
S/N = 5

SN search efficiency

	r mag lim	FoV □ deg	z limit	SN / exp	fields for 10^2 SN/yr
FORS2@VLT	26.3	0.013	1.0	0.2	50
VIMOS@VLT	25.9	0.06	0.8	0.7	15
Ωcam@VST	**25.3**	**1.0**	**0.5**	**5**	**1**
LBC@LBT	**26.3**	**0.15**	**1.0**	**2**	**5**

Planning a SN search with LBT

.... chat at KITP with Peter Garnavich, Paolo Mazzali, Elena Pian

- Redshift range of interest $0.8 < z < 1.3$

  - Deep exposures with red filter -> ~30 min

- Most candidates will be too faint for spectroscopy

  - Rolling search to include photometric monitoring -> 2-3 x

- Account for weather statistics

  - Usable nights (transparency, seeing < 1.2) -> ~ 50%

- Cameras will be available only part-time (4 other instruments coming on line)

  - Search for optimization with other extragalactic surveys

- Scheduling policy

  - Require collaboration among LBT partners

Planning a SN search with LBT
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- Goal: 100 SN/yr

  - 1 yr monitoring of 5 fields

- "Optimal/*minimal*" time allocation:

  - 1/2 night per week in dark/grey moon (12n/yr)

    (2 x 2h)/mo x 6mo (3n) [30 SNe, poor classification]

- Strategy:

  - Search with red camera. Blue camera parallel observation to get colors (at maximum)

- Synergy

  - Ultra deep images, r>27.5, seeing <1"