Rolling search at CFHT for 2002 A

Pierre Astier

13 September 2001

---

1 Observational setup

We propose to use CFHT to find and measure supernovae in a rolling search mode. The design is as follows:

- We observe the same fields 5 times per dark run, 4 dark runs in a row.
- the observing dates are defined to be -6 -3 0 3 6 .w.r.t new moon at each dark run.
- We observe 1800s in I (3 images), and 600s in R at each epoch (1 image).
- We propose to observe 3 fields, i.e. 1 square degree. The total integration time is then 40 hours.

The dates are defined w.r.t the first new moon taken as 0.

We will trigger and measure the light curves using the same data, up to a redshift of 0.8-0.9. Above this redshift, we scan still trigger, but the measurement becomes really poor.

We simulated the light curves, coupling an instrument simulator, a SN simulator, and a Mauna Kea weather simulator. the latter provides the usable fraction of the night, the seeing, and the extinction. If only a fraction of the night is usable, we randomly perform or do not perform the observation. If performed, it is parametrized according to the observing conditions. The instrument simulator reproduces the performances of the 12k.

Once a light curve is generated, we fit it to the template for this redshift and band, with 3 free parameters: date of max, amplitude and stretch factor.

We then define the following set of cuts:

- **Quality cuts for the light curve**:
  - · the fitted time of maximum should allow the observation of [-10,+15] days restframe.
  - · we should measure at least 8 points.
- **The trigger cuts**:

· we want at least 3 points before max which pass $S/N > 3$
· we want the probablity that those early detections are fluctuations to be less than 10^{-10}, which corresponds roughly to 7.5 σ

2 A few plots

We show the expected average distributions of redshift, number of points and peak brightness resolution in fig 1. The number of events passing the 2 sets of cuts is 20.

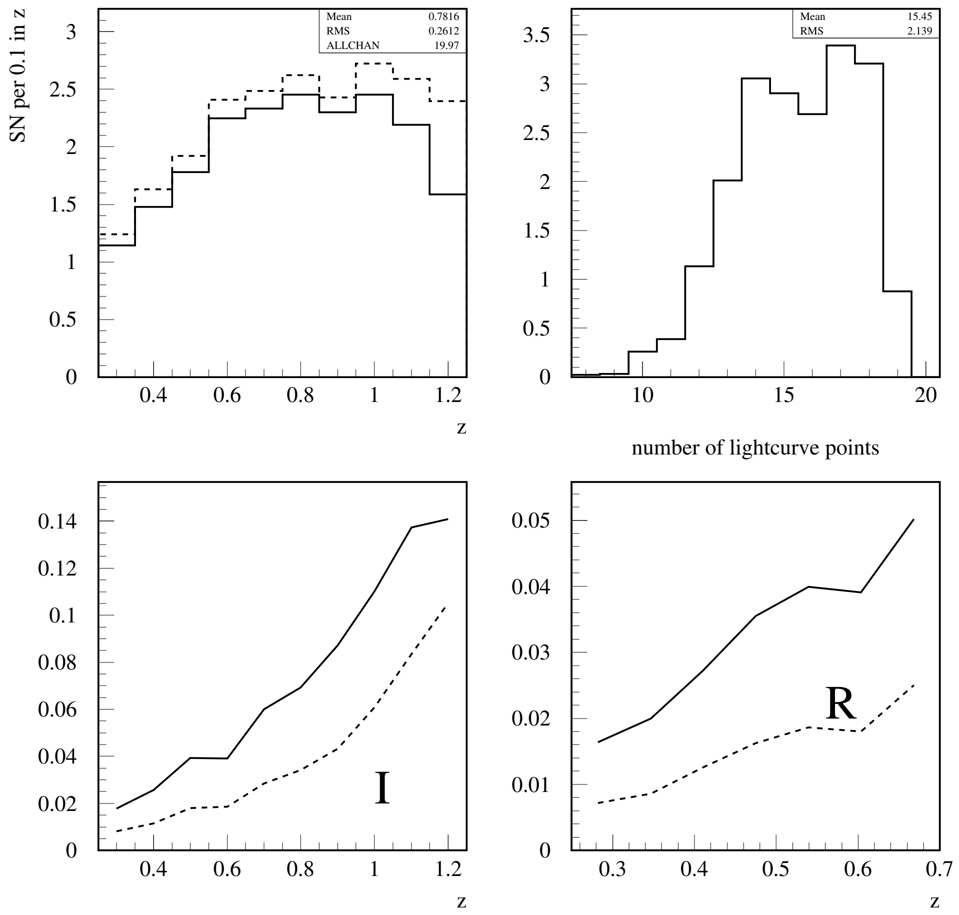

Fig. 1. *Redshift distribution (2 set of cuts, or only quality cuts). Number of light curve points (all cuts). Bottom plots show the r.m.s resolution of fitted peak brightness. Dashed line is raw estimation, full line is stretch corrected. The dispersions are evaluated as the scatter of Monte-Carlo realizations. One bin is one week*

The distribution of peaking times are given in figure 2. There, we consider the case of CFHT used only as a trigger, and used also for photometry. We further separate into $z < 0.9$ and $z > 0.9$.

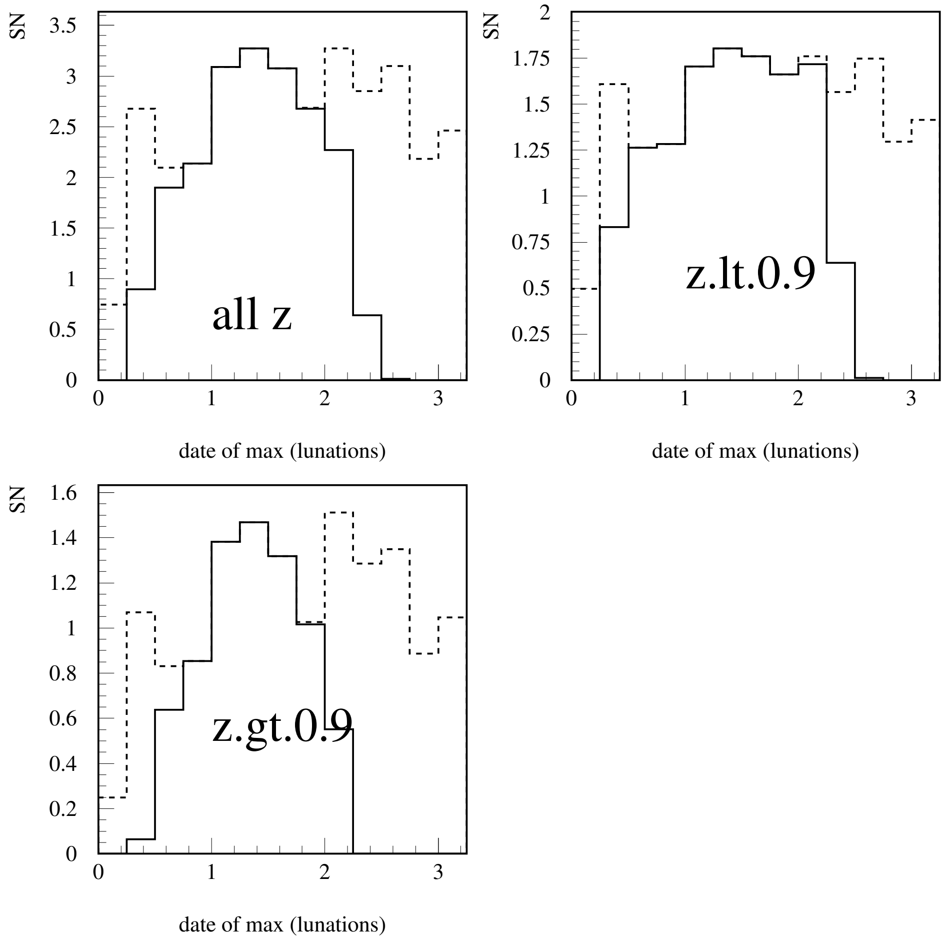

Fig. 2. *Peaking times (in lunations units, first new moon is 0). Full lines are for all cuts, dashed lines for trigger cuts only.*