New Year Beast Data
and
Concerns for Baking

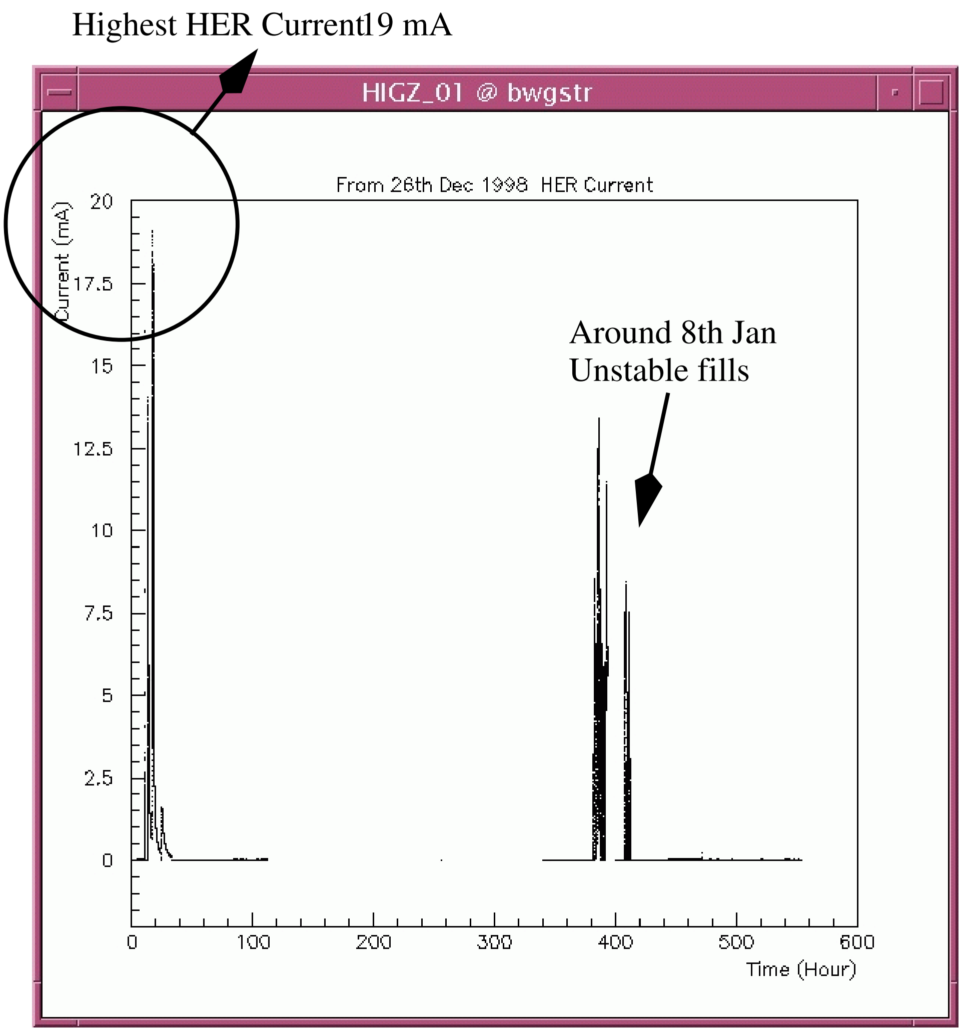
Saroj Sahu, 18th Jan 1999

BEAST Data in the New Year

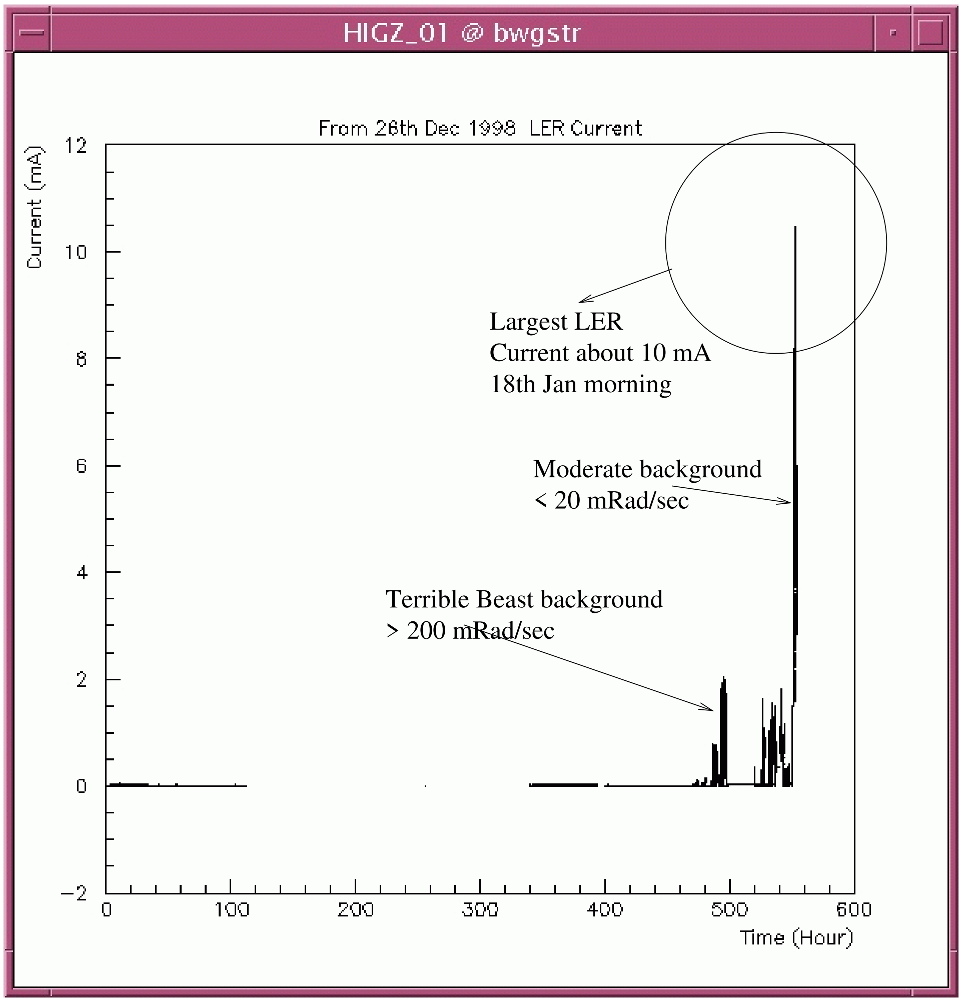
Beast Group
Sahu/1/18/99
Belle Weekly Meeting

1. Some HER unstable runs
2. LER Start-up
3. Total Doses
4. Amp-Hour .... How far are we from reasonable baking ??

This is a write-up of the talk I gave this morning at the Belle weekly meeting. I show histories of beam current since X-mas, and raise some concerns about the beam pipe baking. The concerns were raised during my discussion with Dan Marlow. His wise advices are greatly appreciated. This is the first page.



The HER current went pretty high at the end of last year, upto about 20 mA, but in the new year, after the shutdown, they cannot reproduce it. There were some fills, but they were very unstable, with erratic background at Beast. They will investigate the reason in a few days.



There wasn't any LER current last year. This year, at the start-up there were many problems. Although they could make the beam go around the ring, the background was severe at the beginning. Reason could be that the LER quad was at HER setting. The last run at 10 mA was less hot. They could not go beyond it for bureaucratic reasons - in order to go beyond it, the radiation alarm interlock should work and it doesn't, yet.

Maximum Total Dose incurred since Commissioning (LER+HER)

10 kRad

Due to LER

5 kRad

Just a piece of historical fact - from MOSFET measurements we know how much maximum dose we have incurred at Beast.

Right Now, the static pressure < 1 nTorr, but dynamic pressure is 1.4 nTorr/mA

Which means at this rate, it will be 1400 nTorr at 1 Amp !!

One has to bake the beam-pipe with radiation. It takes 1000 Amp-hours to "reasonably" bake it.

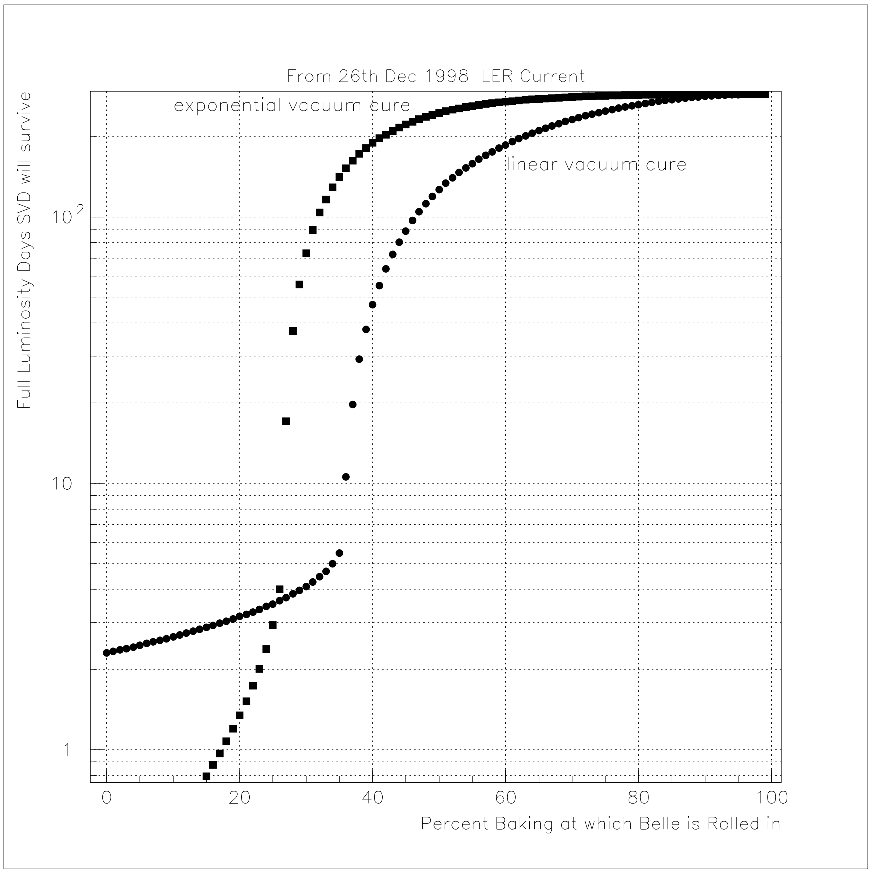
How much do we have until now ?

HER = 0.1 Amp-Hour
LER = 0.03 Amp-Hour

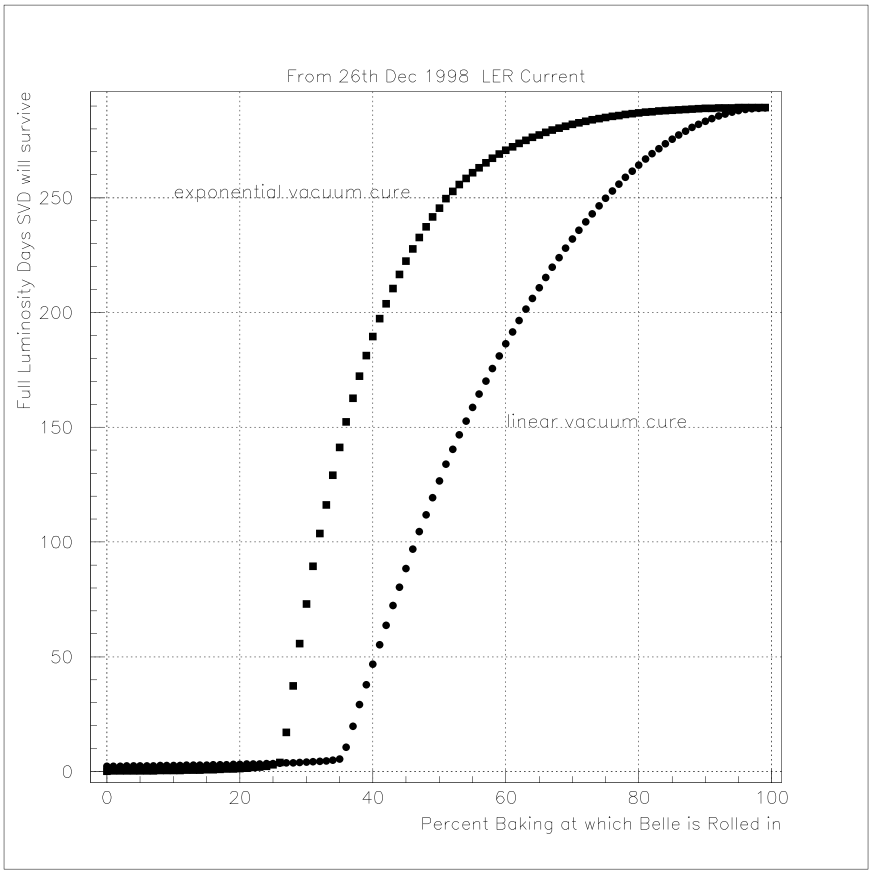
Even if we have 100 mAmp Current everyday, it will take us 10000 hours = 416 days !!

Must do heavy baking before we roll in Belle.

My concerns about rolling in and time scale of baking. How much have we baked ? Minimally. And how much more baking is needed before we can roll in ?



X-axis shows at what fraction of total baking (1000 Amp-hour) Belle is rolled in. When you roll in, there is a certain amount of currency in the SVD pocket you can spend - it is 200 kRad. So, Y-axis tells how many full-luminosity days you can operate the SVD with this pocket-money. A Full-luminosity day is 4 Amp total current with 1 nTorr vacuum operating for 24×3600 seconds. Assumptions are - we get maximum dose of $20\text{kRad}/10^7\text{sec}$ for 1 nTorr and 1 Amp condition. (Simulation expectation, now known to be valid within a few factors.)



Same picture as the previous picture, except that it is in linear scale, for ease of reading.

Catch is that the beam pipe gets scrubbed with current, and we don't know if dynamic pressure (nT/mA) gets better linearly, exponentially, or anything else with $\int I_{beam}.\mathrm{d}t$. So we plot for both, linear and exponential case.

In any case, it seems one has to bake the vacuum by at least 40% before rolling in. Othewise trying to take data doesn't make sense - since, both luminosity and background go up as I^2.

Thoughts....

We should think hard about baking, and decide carefully when we should roll in - in order to optimize SVD life and **first-data** luminosity.