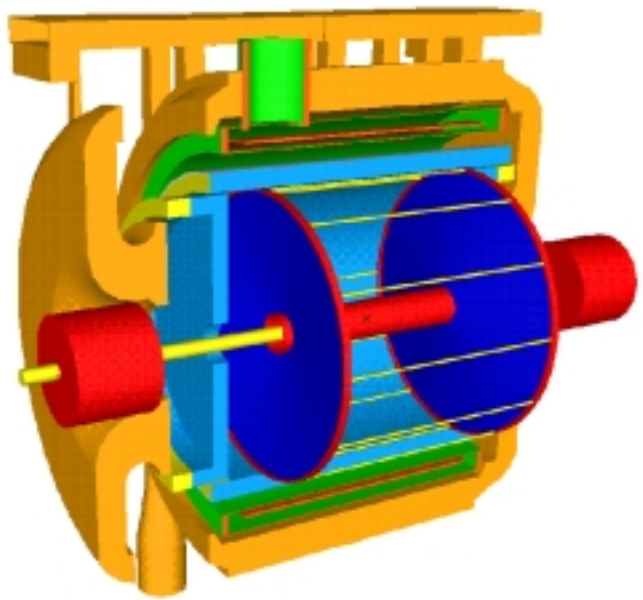
Status of the KLOE experiment

M. Moulson, for the KLOE collaboration

LNF Scientific Committee

23 May 2002



Data taking in 2001 and 2002

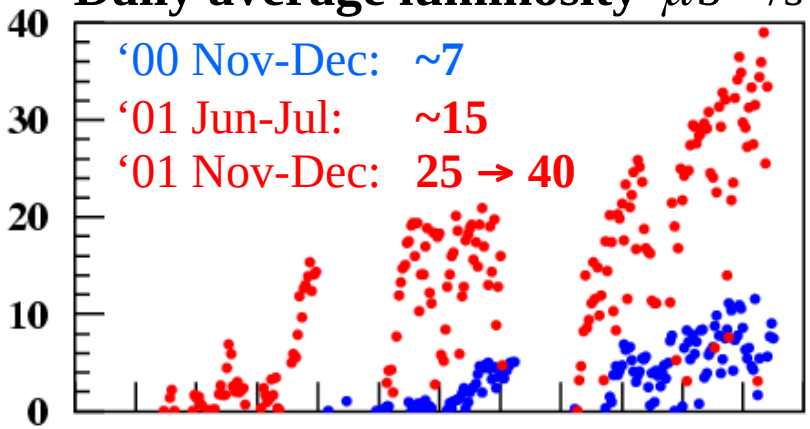
Hardware and startup status

Data processing

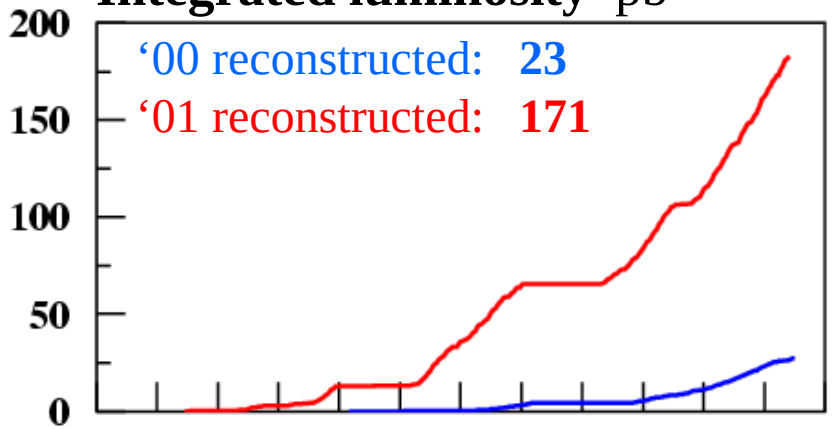
MC and DST production

Data taking in 2001

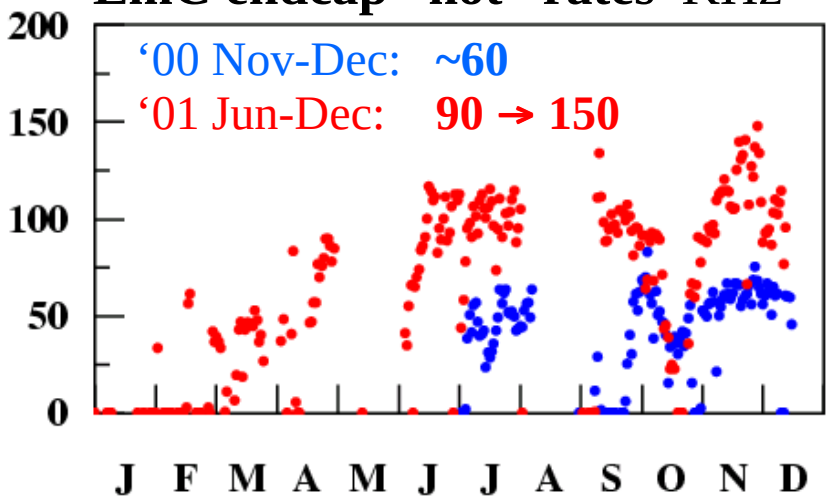
Daily average luminosity $\mu b^{-1}/s$



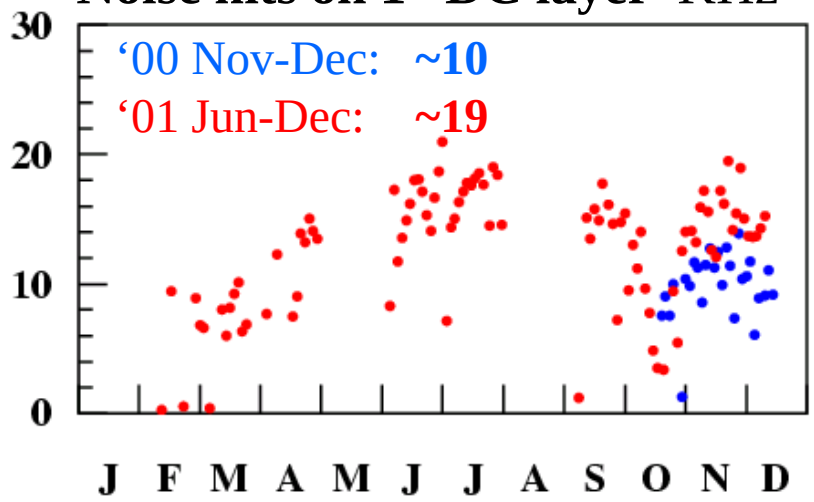
Integrated luminosity pb^{-1}



EmC endcap "hot" rates KHz

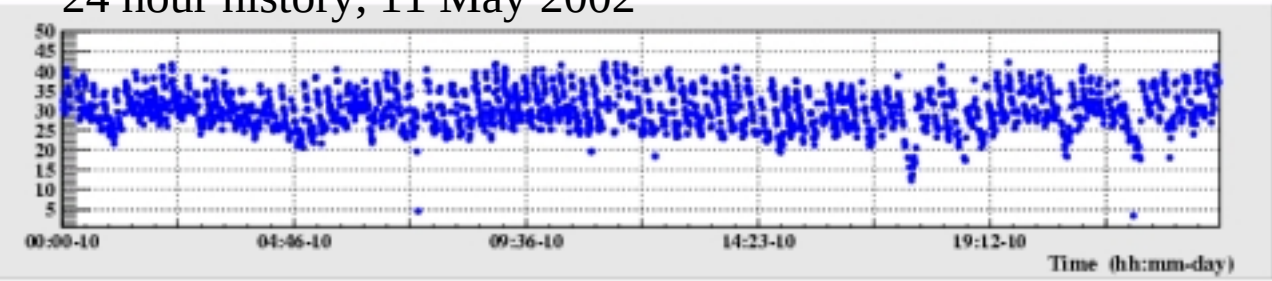


Noise hits on 1st DC layer KHz

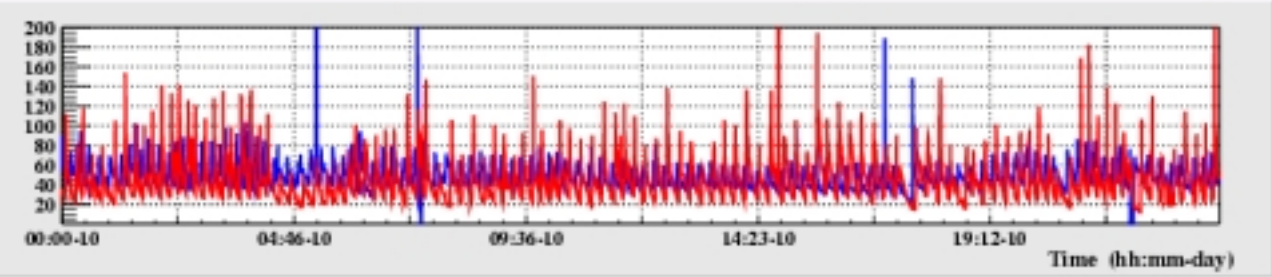


Prospects for data taking in 2002

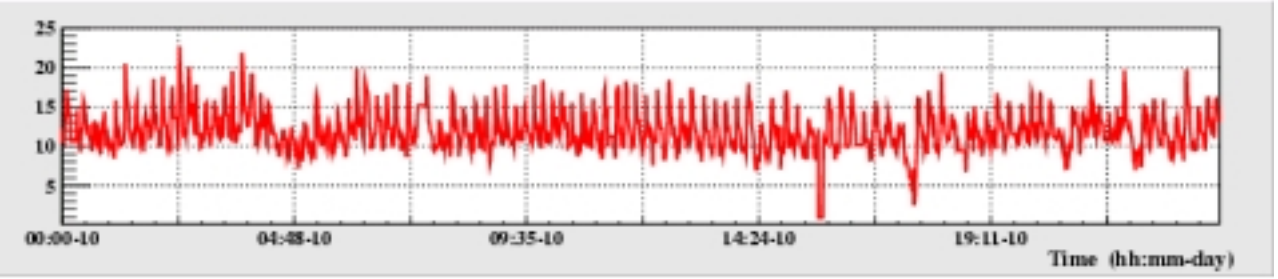
24 hour history, 11 May 2002



Average Luminosity
3.1×10^{31} cm^{-2}s^{-1}
About same as in Nov 2001



EmC endcap "hot" rates
44 KHz avg
2-3 times less than Nov 2001

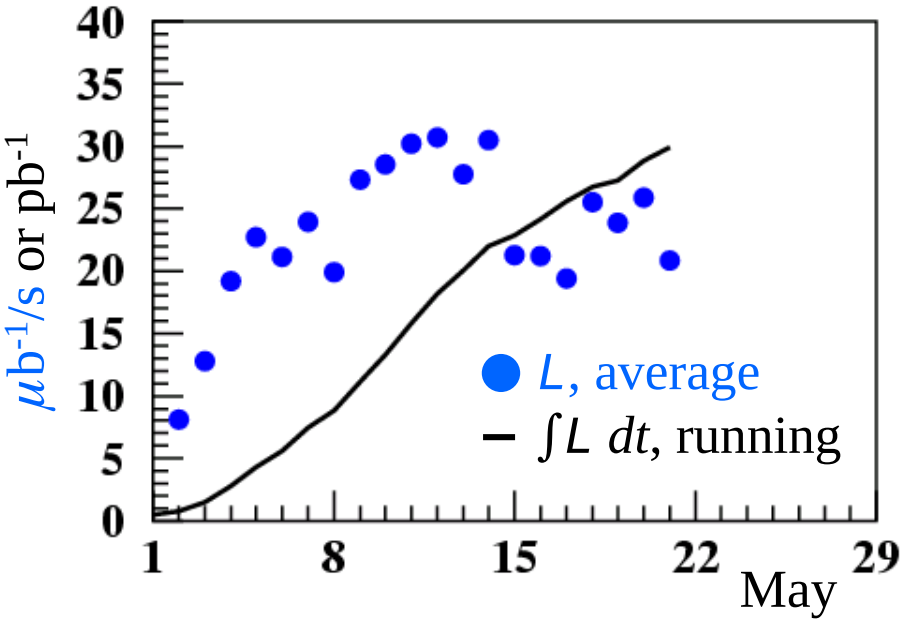


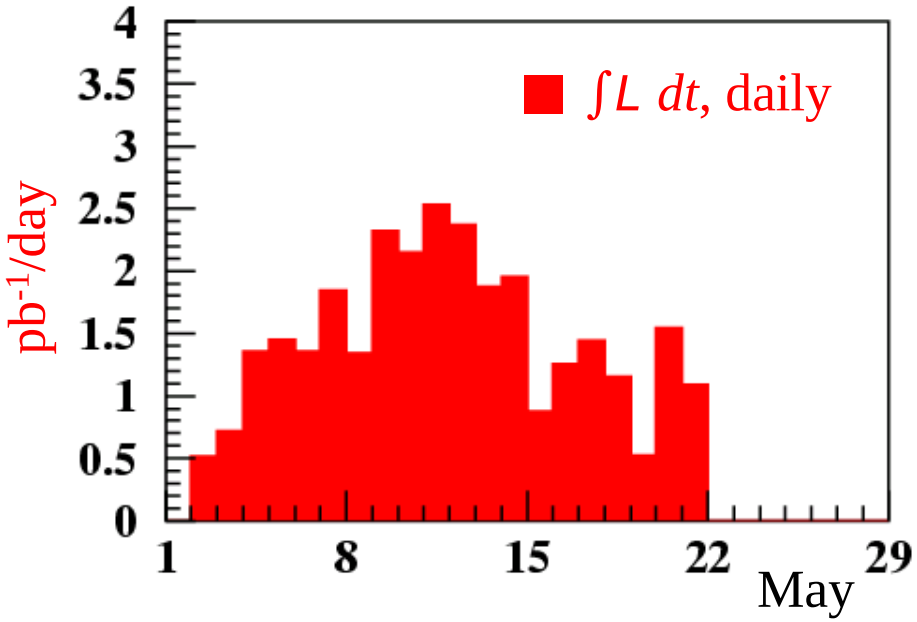
Noise hits on 1st DC layer
8.5 KHz avg, hottest sector
About 2 times less than 2001

KLOE plans based on educated estimate by DAΦNE group:

Extrapolating from experience obtained so far this year, an increase of up to a factor of 4 in $L\times\tau$ should be possible during the next couple of months

Startup of 2002 KLOE data-taking





KLOE calibrated on 26 April and began taking data 3 May

- DAΦNE delivering ~2 pb^{-1}/day
- 30 pb^{-1} to date under much cleaner conditions than in 2001
- Present acquisition rate: 1.5 KHz (vs. 1.8 KHz in 2001)

Calorimeter status

Detector status	4-5 PMT bases, 1 TDC board, 1 SDS board fixed during shutdown No dead channels HV distribution boards continue to fail at rate of 1 channel/week

Calibration status

Residual-slewing correction implemented

Cluster times and *z*-positions corrected for dependence on energy and attenuation in fibers

0.8% correction in time scale

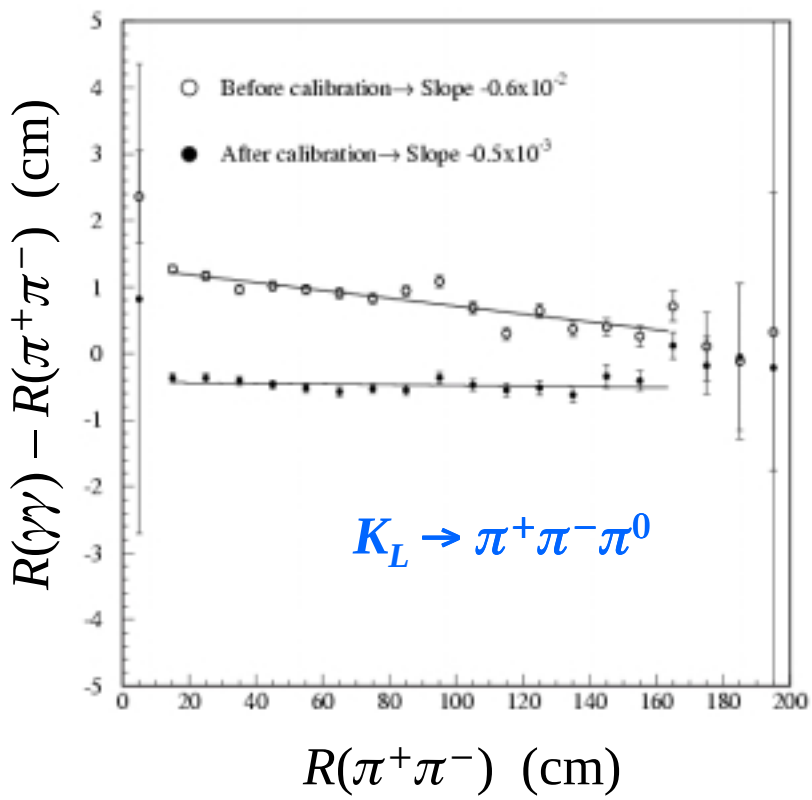
Partially from effects of above dependences on global t_0 determination

New procedure for calibration of global t_0

T_{RF} fixed to nominal value

Reconstruction waits for run calibrations

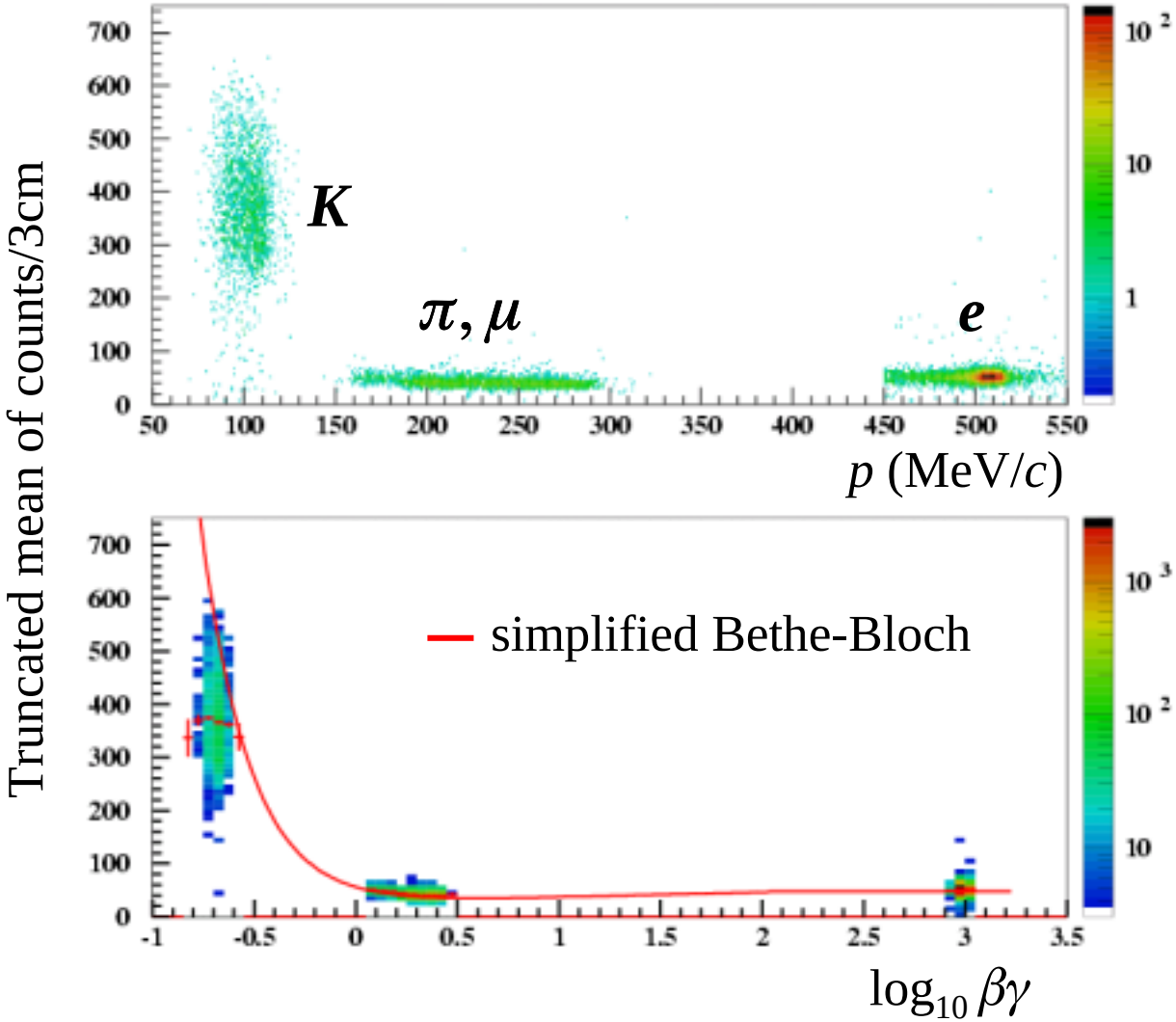
Run size now ~100 nb^{-1}



Drift chamber status

Detector status	Dead cells currently ~0.5% of total
Background conditions	Integrating charge on layer 1 at 0.4 mC/cm/wire/month (5-20 May) Compare to 1.2 mC/cm/wire/month (Nov 2001)
ADC's	All ADC's installed and read out (1050 channels) Pedestal calculation and zero suppression implemented In progress: • Refinements to calculation of track length in cells • Gain calibrations • Incorporation of particle ID algorithm using *dE*/*dx* in reconstruction program

First results using ADC's



***K*, *π*, and *μ* from**
***K* → *ππ*⁰, *K*→ *μν* decays**

***e* from Bhabha events**

Very preliminary!

Meaningful results will require comprehensive work on calibrations

System is up and running and functioning nicely

DAQ and trigger status: T3 filter

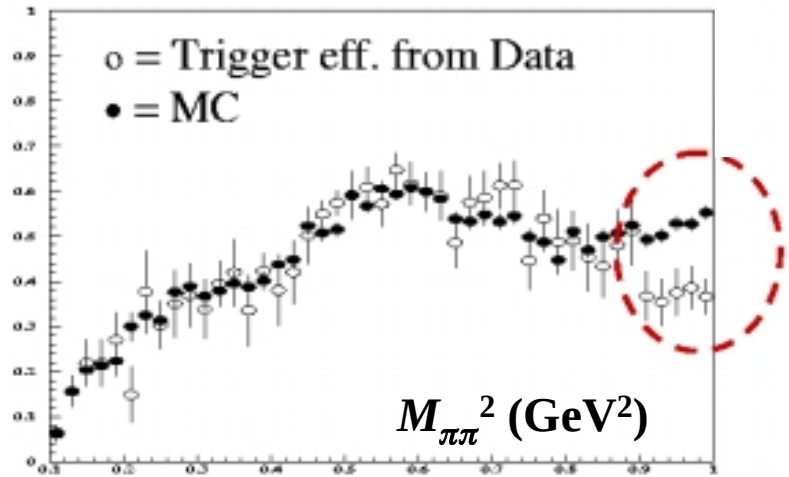
Cosmic veto in EmC trigger eliminates:

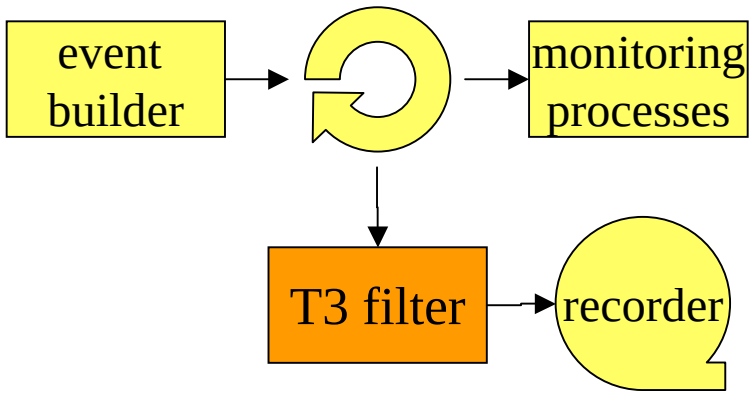
- **75% of cosmic-ray events**
  2600 Hz → 700 Hz, residual mostly slips through cracks in plane-5 coverage
- **Large number of $\pi^+\pi^-\gamma$ events** with high $M_{\pi\pi}$
- **88% of $\mu^+\mu^-$ events on barrel**

T3 filter installed before recorder to review and enforce cosmic-veto decision

- Fast clustering
  Veto enforced if δt_{12} = cosmic ray TOF
- Fast tracking on coarse lattice of DC wires
  Veto enforced if no activity near IR
- Runs on online farm
  Can handle 1.9 KHz cosmic-veto rate

$e^+e^- \rightarrow \pi^+\pi^-\gamma$

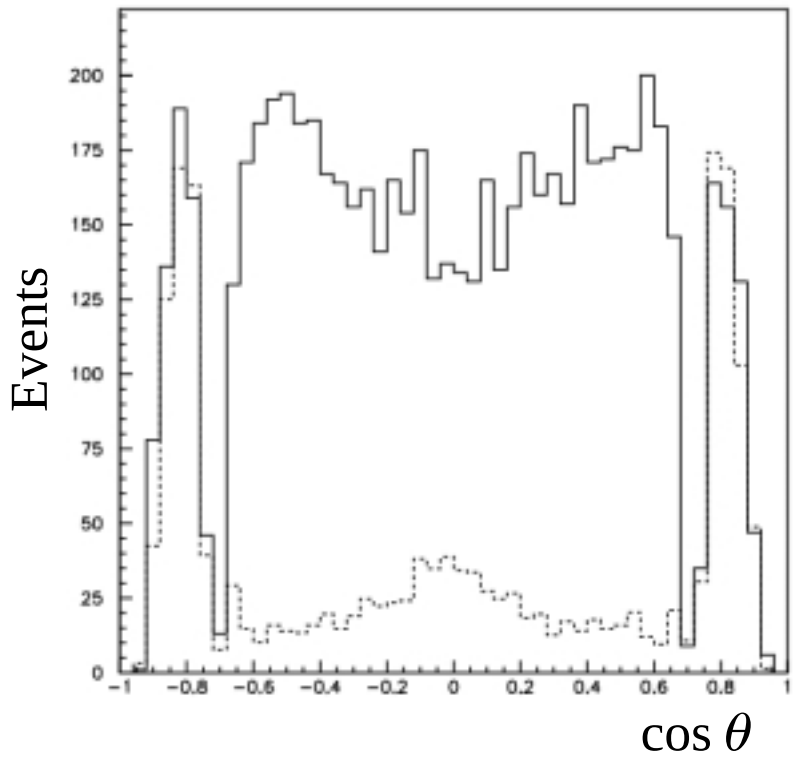




T3 filter performance

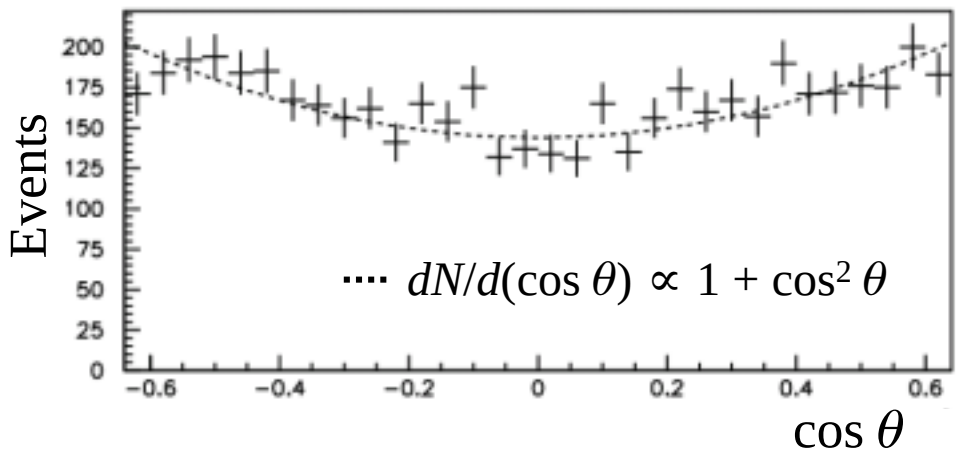
Results of tests on 5.5 pb^{-1} of 2001 data taken with T3 filter enabled:

$e^+e^- \to \mu^+\mu^-$



$\pi^+\pi^-\gamma$, small θ_γ:	104 ± 5%
$\pi^+\pi^-\gamma$, large θ_γ:	95 ± 10%
$\mu^+\mu^-$, barrel:	94 ± 12%

$e^+e^- \to \mu^+\mu^-$, barrel



No longer need scaled-down veto sample

Cosmic-ray contribution to recorded event rate: 1100 Hz → 700 Hz

Offline computing resources

IBM 7026-B80
4-way 375 MHz

MC & DST PRODUCTION
32 Sun CPU's

Sun Enterprise 450
4-way 400 MHz

RECONSTRUCTION
84 IBM CPU's

Tape/disk servers

ANALYSIS
8 Sun + 8 IBM CPU's

Local online disks: 1.4 TB
Data acquisition
Calibration work

afs cell: 2.0 TB
User areas
Analysis/working groups

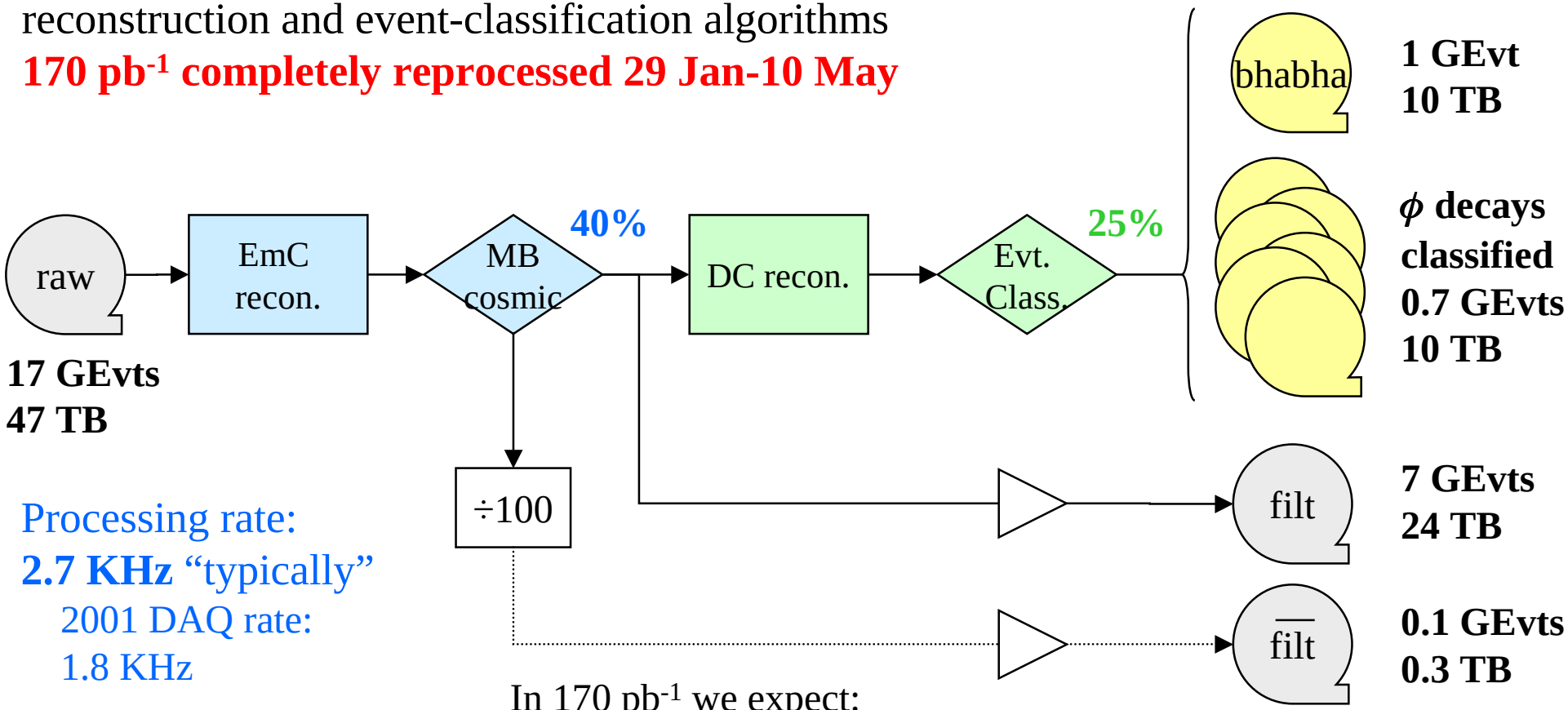
Managed disk space: 3.0 TB
1.2 TB: Input/output staging
Reconstruction
MC/DST production
1.4 TB: Cache for data on tape
DST's maintained on disk

Tape library: 220 TB
5500 40GB slots
12 Magstar drives
14 MB/sec each
Planned upgrade to 60GB/cassette

Reprocessing of 2001 data

2001 data originally reconstructed with 4 different executables due to evolution in reconstruction and event-classification algorithms

170 pb^{-1} completely reprocessed 29 Jan-10 May



Processing rate:

2.7 KHz "typically"

2001 DAQ rate:

1.8 KHz

$\int L\, dt$ processed/day:

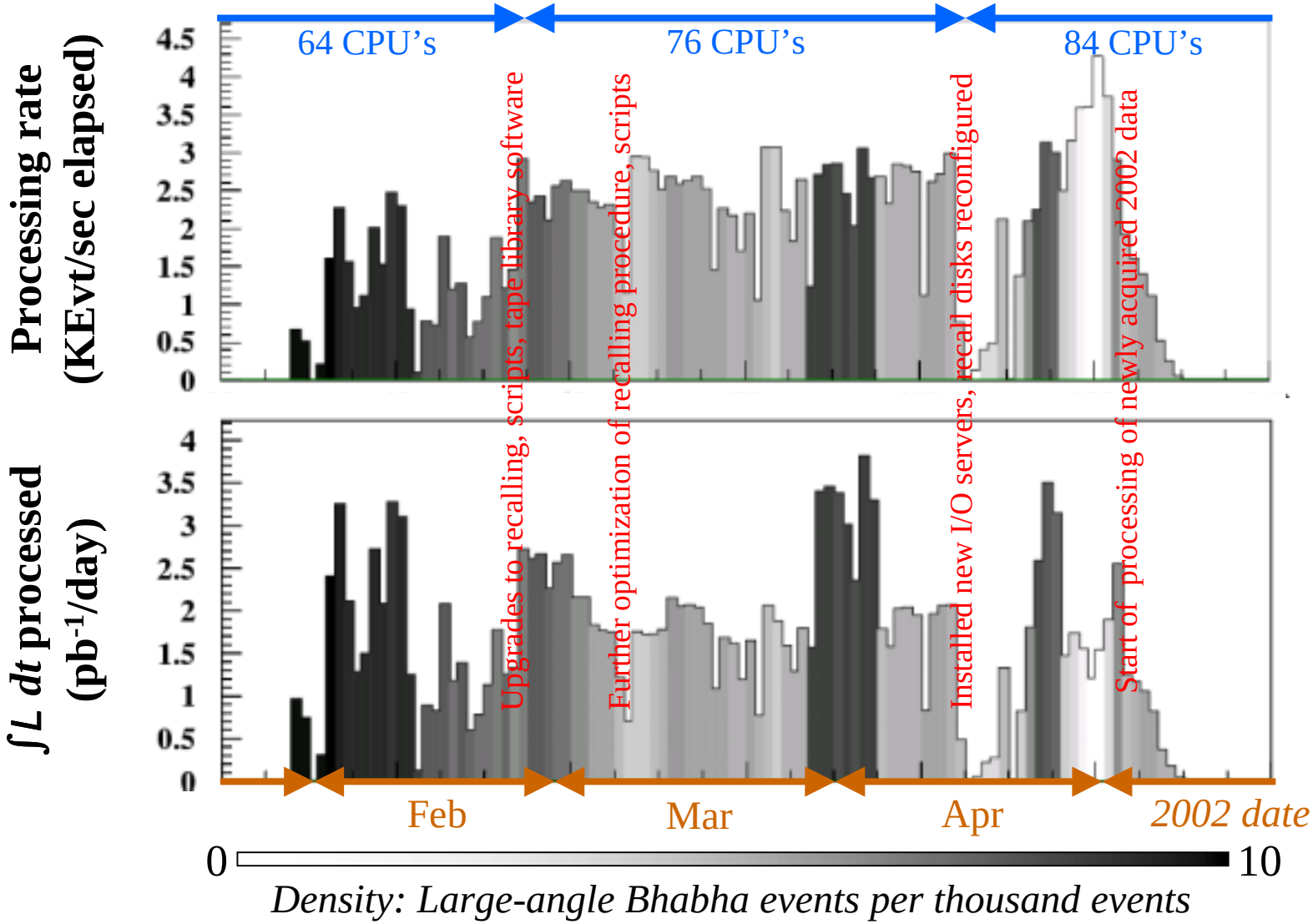
1 to 3.5 pb^{-1}

In 170 pb^{-1} we expect:

0.5 G ϕ events if $\sigma(e^+e^- \to \phi) \approx 3\,\mu$b

1.0 G Bhabha events if $\sigma(e^+e^- \to e^+e^-, \theta > 21°) \approx 6\,\mu$b

2001 reprocessing: daily progress



Data-summary tapes

Data-summary tapes are starting point for KLOE analyses:

- Contain essential bank selection for selected events
- Written in compressed format

Significant variation in size of DST data set due with stream abundances, but **DST event size is always ~3 KB**

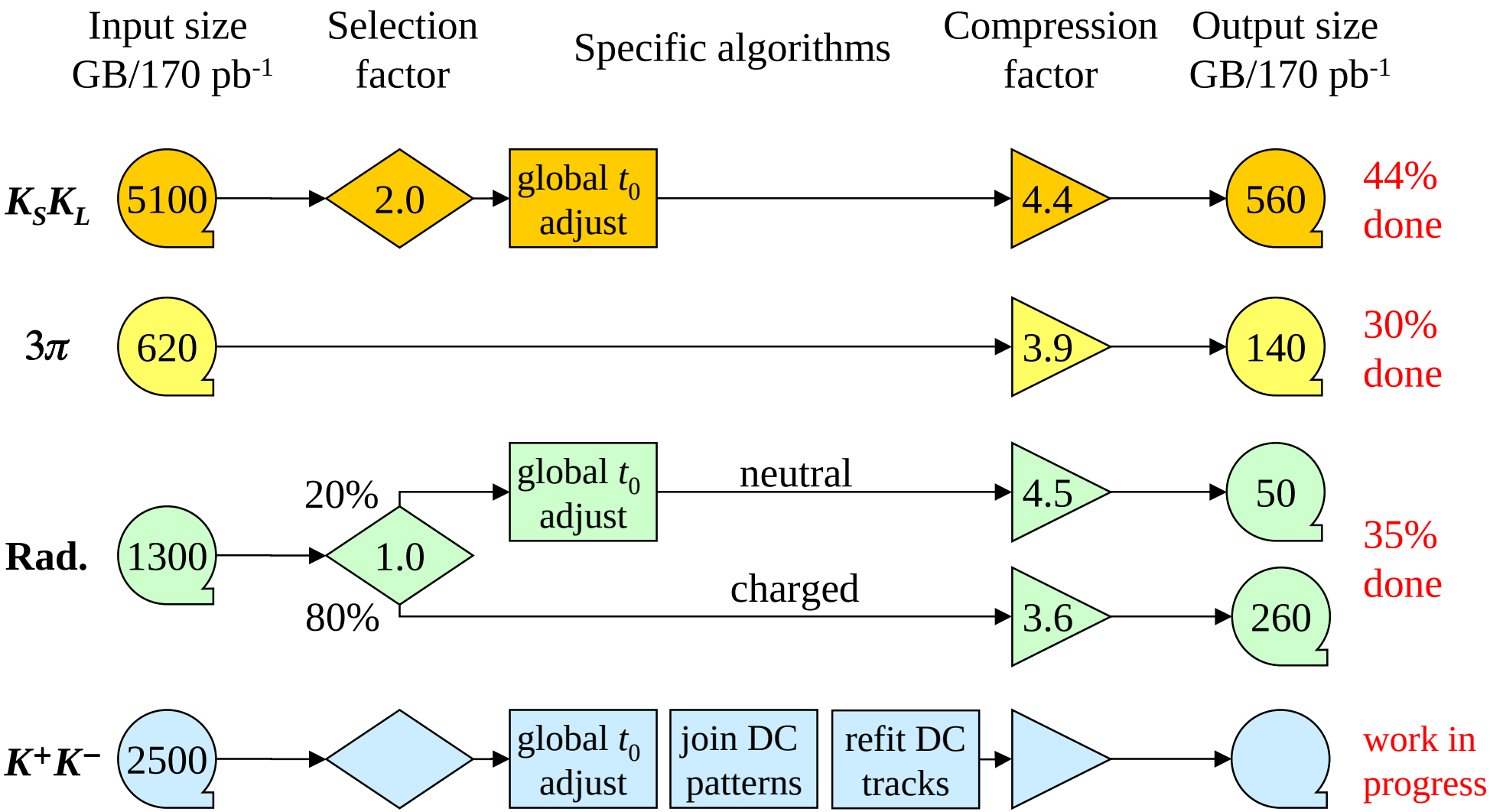
- About same event size as raw data
- Full reconstructed events 10-14 KB

Produced in dedicated jobs for each physics stream

- 16 CPU's of MC/DST farm → **1 pb^{-1}/hour per stream**
- Can follow reconstruction directly (no tape transfer)

"Permanently" reside on disk cache (1.4 TB)

Data-summary tapes



Monte Carlo production

New version of Monte Carlo:

- Improvements to generators for $K \to 3\pi$ and radiative ϕ decays, simulation of QCAL
- Ability to add accidental clusters from machine background

Currently fulfilling requests for analysis of 2001 data:

Event type	Requested (MEvts)	Finished (MEvts)
$K_S \to \pi^+\pi^-$, $K_L \to$ all	48.5	6.8
$\phi \to$ all	12.0	7.6
$K^\pm \to \pi^0\pi^0\pi^\pm$, $K^\mp \to$ all	3.0	1.0
Bhabha, $\theta > 35°$	0.7	0.7
$\phi \to 3\pi$	0.6	0.6
Total	**64.8**	**16.7**

Can generate and reconstruct at 25-50 Hz (2-4 MEvts/day) with 32 MC/DST farm CPU's

Summary and outlook

During the last six months, KLOE has:

- Restarted data taking under promising conditions
- Completed comprehensive reprocessing of 2001 data
- Almost completed DST production for 2001 data
- Reached its Gruppo I milestones
- Readied a dozen papers for publication

During the remainder of the year, KLOE expects to:

- Analyze 170 pb^{-1} of 2001 data
- Collect an additional ~300 pb^{-1} of high-quality data!