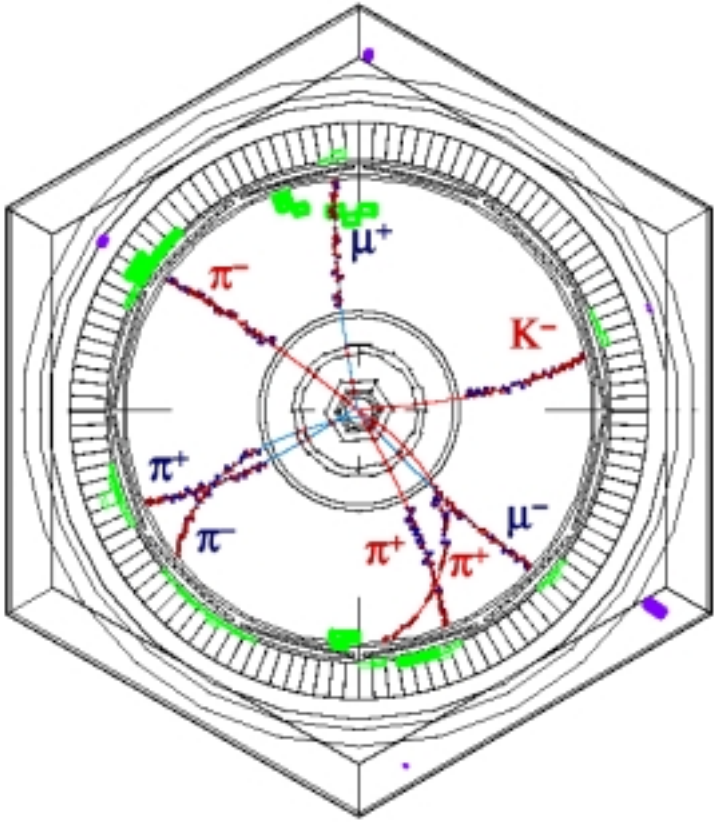
SLAC: New BaBar Results



By Jonathan Dorfan

Director, SLAC

HEPAP Meeting

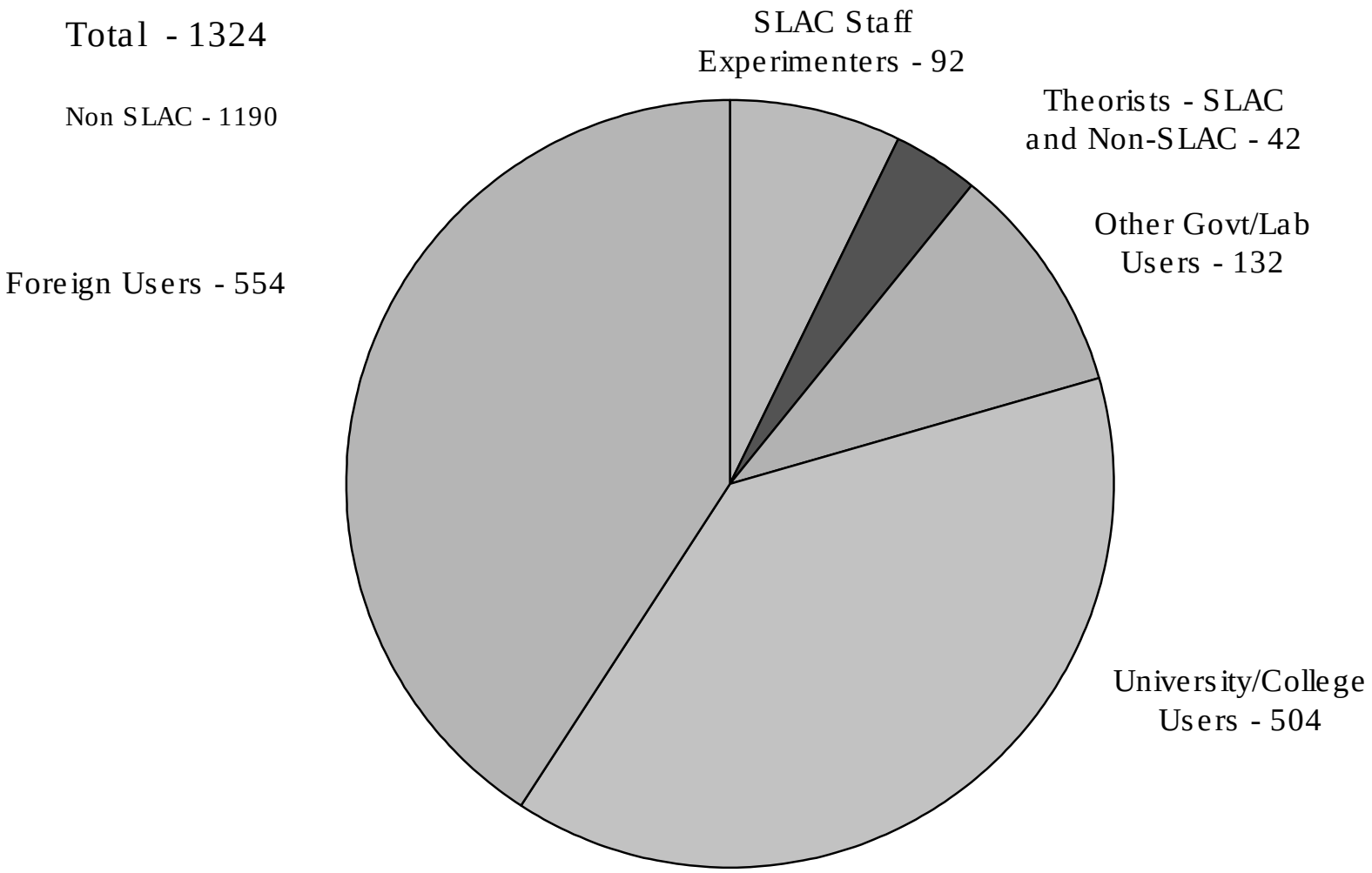
March 26, 2001

SLAC HEP Program

- **Main elements of the SLAC Program**
  - ***B* Factory**
  - **End Station A fixed Target Program**
    - E158 - Möller Scattering, will run in 2001, 2002
    - Three newly approved experiments using polarized photon beam will take the program to ~2006
  - **Final analysis of SLD**
  - **Non Accelerator Physics**
    - USA X-ray Timing Experiment – in analysis
    - GLAST
    - Quark Search, Massive Charged Particle Search
    - EX0 – R&D study for expt. to measure ν_e mass
  - **Theory**
  - **Accelerator R&D**
    - Next Linear Collider (NLC)
    - Diverse, user-based program of advanced accelerator R&D experiments and theory
  - **Test Beams**

SLAC HEP Experimenters / Users

December 2000



End Station A
Fixed Target Program

- ***B*** **Factory Program is complemented by Fixed Target program in End Station A**
  - **Unique capability at SLAC is high electron polarization and high electron energy**
  - **Next experiment is Möller Scattering, scheduled to run in FY2001 and FY2002**
- **Accepted EPAC recommendation to build proposed $\gtrsim$ 40 GeV, polarized photon beam. Like the polarized electron beam, this facility will be unique in the World**

  Again, following EPAC recommendations, we have approved 3 proposals for this facility
  - **Anticipate running one each in years 2003-2005**

B Factory

- **Exciting, broad physics program with excellent discovery potential**
  - **Accelerator and machine have performed well**
- **Machine has reached design performance**
  - **There is plenty of headroom for achieving higher peak luminosity**
- **Have begun the upgrade process. Goals are:**

  A) $L > 10^{34}$ cm^{-2} sec^{-1} during 2003

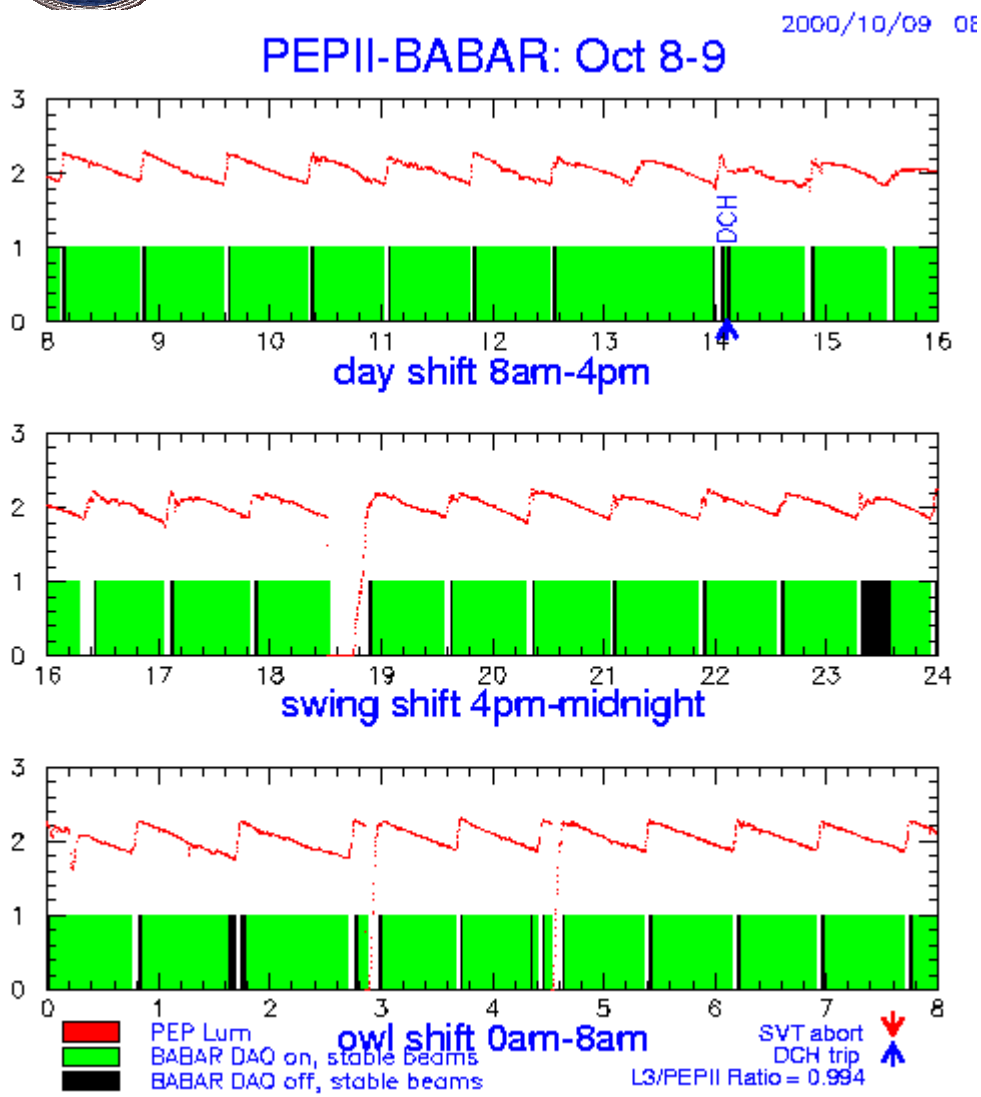
  $\geq$ 500 fb^{-1} by the end of 2005 ($\delta \sin 2\beta \lesssim 0.02$)

  B) $L \sim 3 \times 10^{34}$ cm^{-2} sec^{-1} during 2006
- **Provides at least 10 years of Frontier Science**

PEP-II Records

	Achieved	Design
Peak luminosity (x 10^{33} cm^2 s)	3.3	3.00
Peak luminosity with BaBar	3.2	3.00
Integrated lumi. per shift (pb^{-1})	66	45
Integrated lumi. per day (pb^{-1})	184	135
Integrated lumi. per week (pb^{-1})	1030	785
Integrated lumi. per month (fb^{-1})	3.8	3.3
Peak HER e- current (mA)	920	750
Peak LER e+ current (mA)	2140	2140

Daily Operations PEPII Performance Plot



Red line is PEPII luminosity. nearly continuous

Green Bar; BaBar logging data

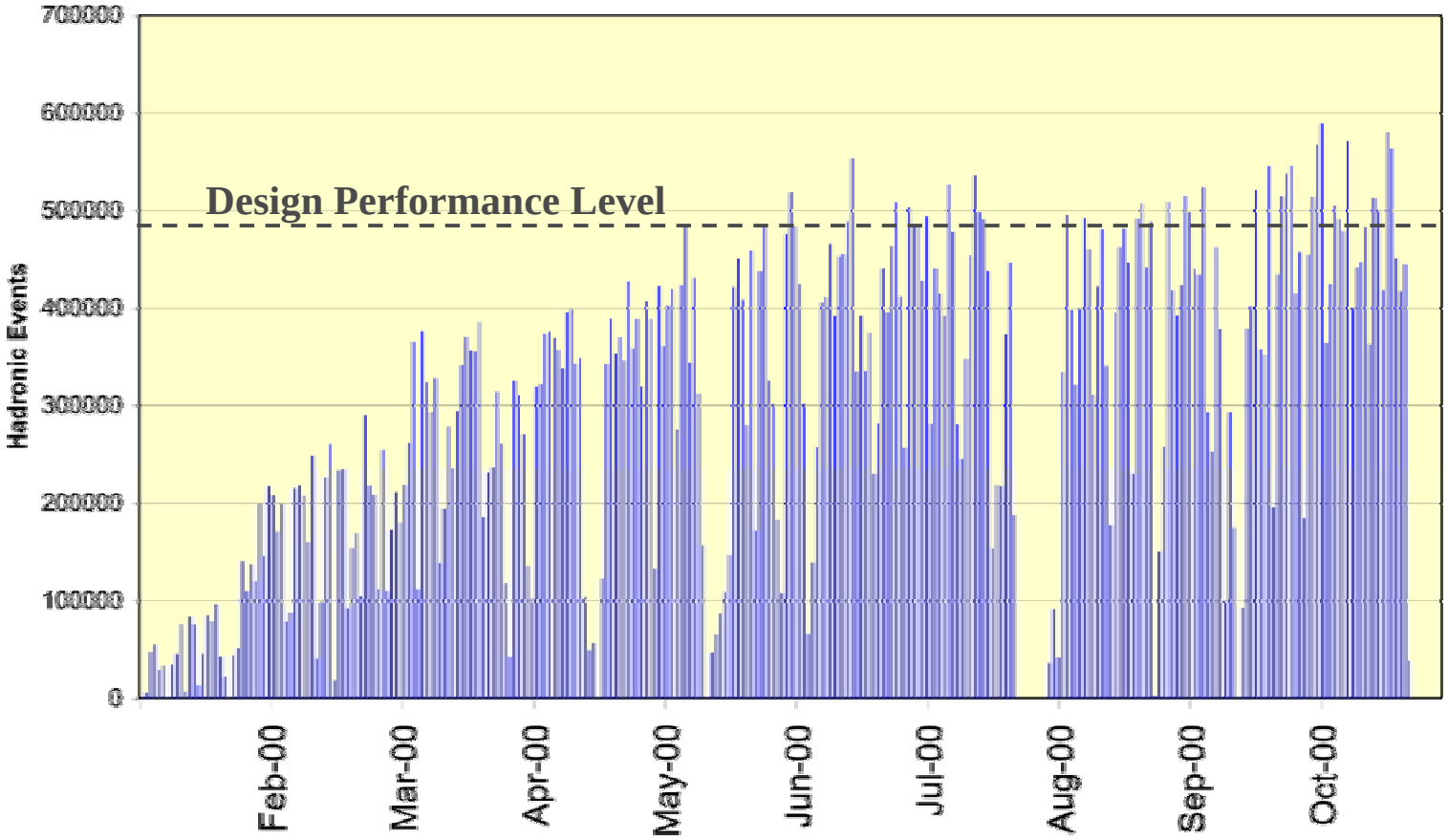
Black Bar; BaBar not logging data while PEP beams available

PEPII refill time is a few minutes!!

High efficiency data logging and high peak L leads to very high integrated L

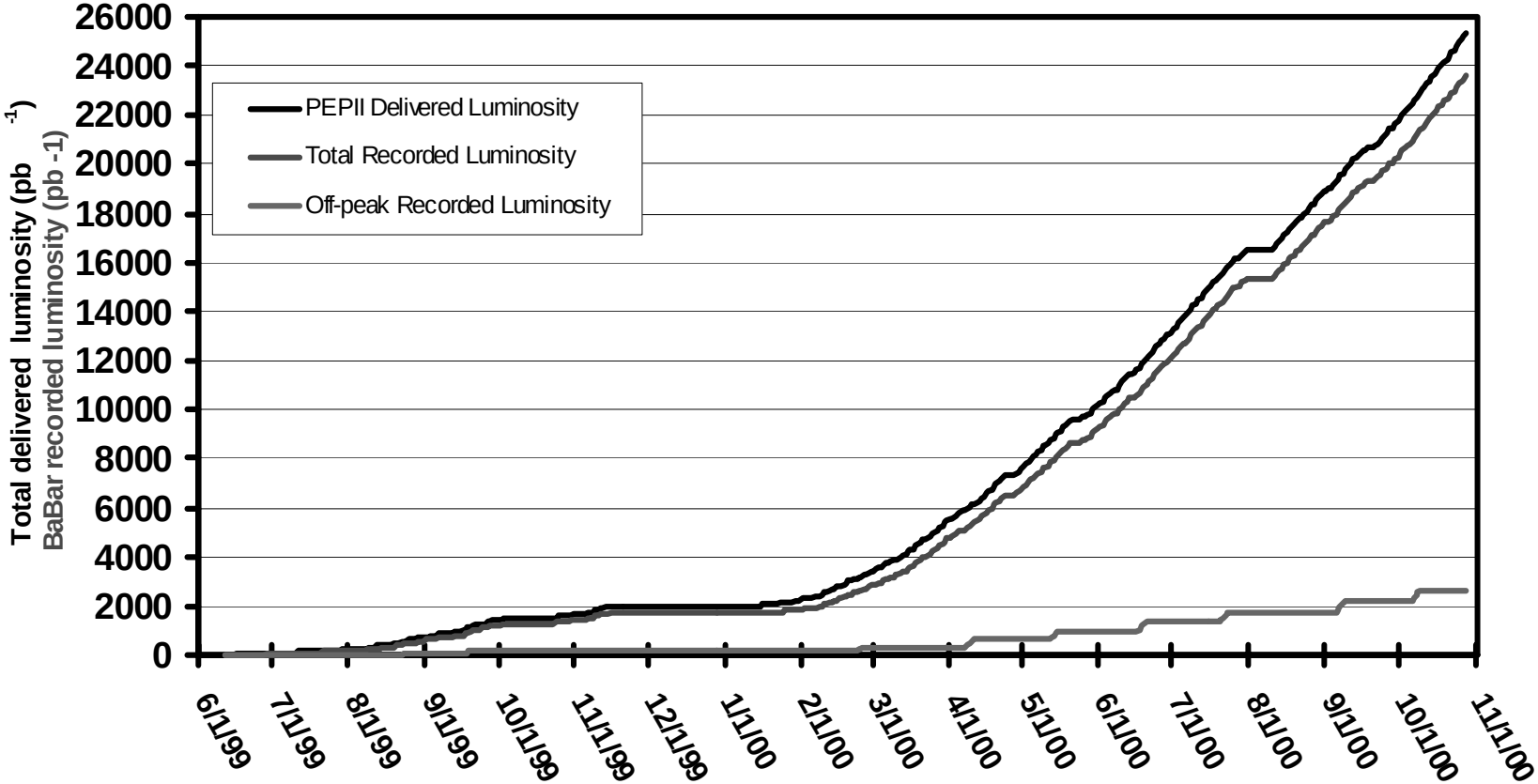
On October 29, 2000, PEP-II exceeded its design peak luminosity of 3 x 10^{33} cm^{-2} sec^{-1}

PEP-II Daily Hadronic Events for 2000



PEP-II delivered/*BABAR* recorded luminosity 1999+2000

The 2000 run ended on October 31



PEP-II delivered: 25.3 fb^{-1}
***BABAR* recorded: 23.6 fb^{-1}**

Nov. 2000-Feb. 2001
Shutdown Improvements

- New HER High Power Dump Chamber → More e^-
- New Low Pressure Chamber → Lower backgrounds
- Two new LER collimators in IR2
- LER Arc Solenoids → Reduce e^+ blowup for ECI
- Temperature management of Be chamber bellows
- HER Pulsed Separators → Beams in-out of collision
- Add tunnel shielding wall on forward end
- Installed new LER RF station (e^+ 2A → 3A)
- Started two new RF stations (two year project)
- LER Arc 7 vacuum leaks and new pumps (better τ)
- Current run will go through August 2001. Project $\geq$ 30 fb^{-1} for the run

New HER Dump Chamber
Replaces Chamber with Cracked Flange

New LER Low Pressure Chamber at IP
Lower Backgrounds

The *BABAR* Collaboration

9 Countries
73 Institutions
516 Physicists

USA [36/253]

California Institute of Technology
UC, Irvine
UC, Los Angeles
UC, San Diego
UC, Santa Barbara
UC, Santa Cruz
U of Cincinnati
U of Colorado
Colorado State
Elon College
Florida A&M
U of Iowa
Iowa State U
LBNL
LLNL
U of Louisville
U of Maryland
U of Massachusetts, Amherst
MIT
U of Mississippi
Mount Holyoke College
Northern Kentucky U
U of Notre Dame
ORNL/Y-12
U of Oregon
U of Pennsylvania
Prairie View A&M
Princeton
SLAC
U of South Carolina
Stanford U
U of Tennessee
U of Texas at Dallas
Vanderbilt
U of Wisconsin
Yale

Canada [4/15]

U of British Columbia
McGill U
U de Montréal
U of Victoria

China [1/5]

Inst. of High Energy Physics, Beijing

France [5/51]

LAPP, Annecy
LAL Orsay
LPNHE des Universités Paris 6/7
Ecole Polytechnique
CEA, DAPNIA, CE-Saclay

Germany [3/23]

U Rostock
Ruhr U Bochum
Technische U Dresden

Italy [12/89]

INFN, Bari
INFN, Ferrara
Lab. Nazionali di Frascati dell' INFN
INFN, Genova
INFN, Milano
INFN, Napoli
INFN, Padova
INFN, Pavia
INF, Pisa
INFNN, Roma and U "La Sapienza"
INFN, Torino
INFN, Trieste

Norway [1/2]

U of Bergen

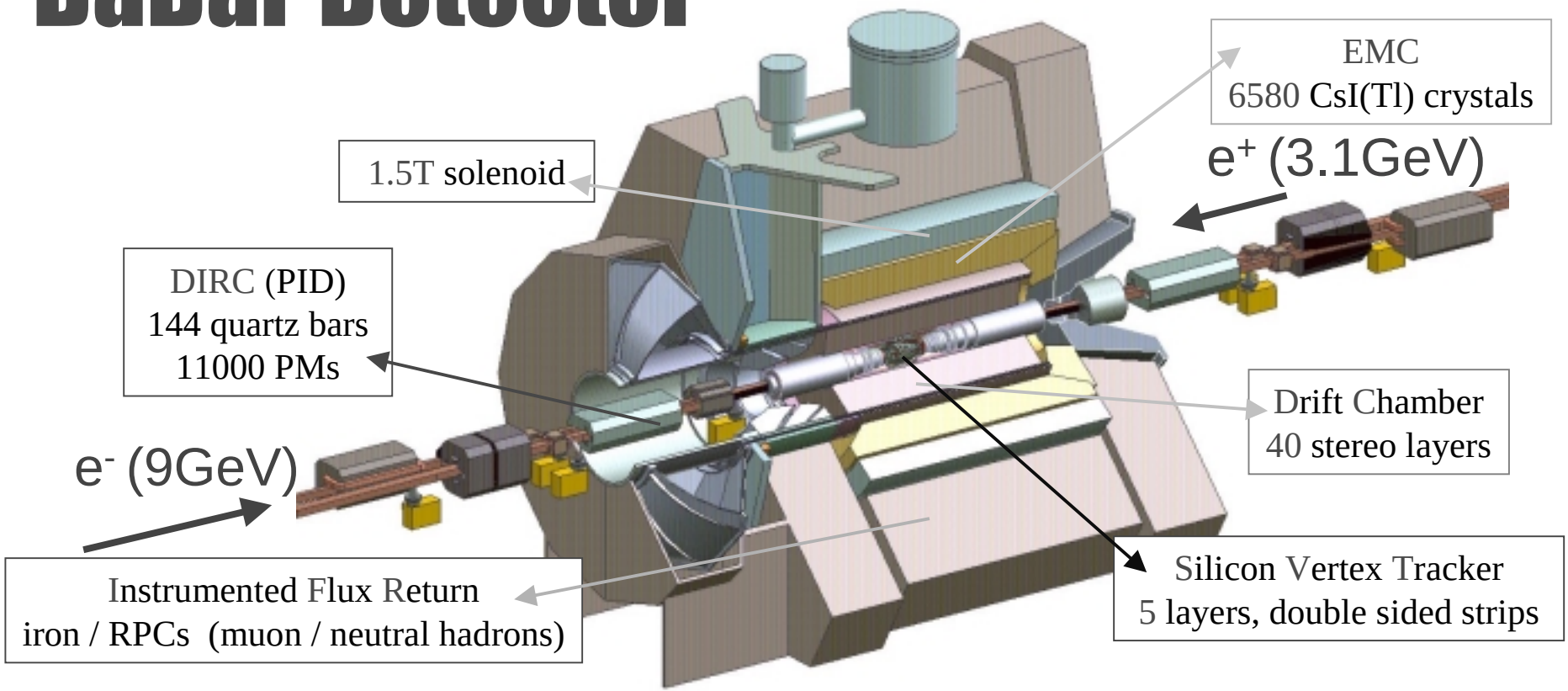
Russia [1/7]

Budker Institute, Novosibirsk

United Kingdom [10/71]

U of Birmingham
U of Bristol
Brunel University
U of Edinburgh
U of Liverpool
Imperial College
Queen Mary & Westfield College
Royal Holloway, University of London
U of Manchester
Rutherford Appleton Laboratory

BaBar Detector



- SVT: B vertex z resolution ~70 microns
- Tracking : $\sigma(p_T)/p_T = 0.13\% \times p_T \oplus 0.45\%$
- DIRC : K-π separation >3.4σ for P<3.5GeV/c
- EMC : $\sigma_E/E = 2.3\% \cdot E^{-1/4} \oplus 1.8\%$