BABAR Overview & Ramp-Down Planning

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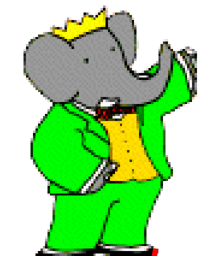
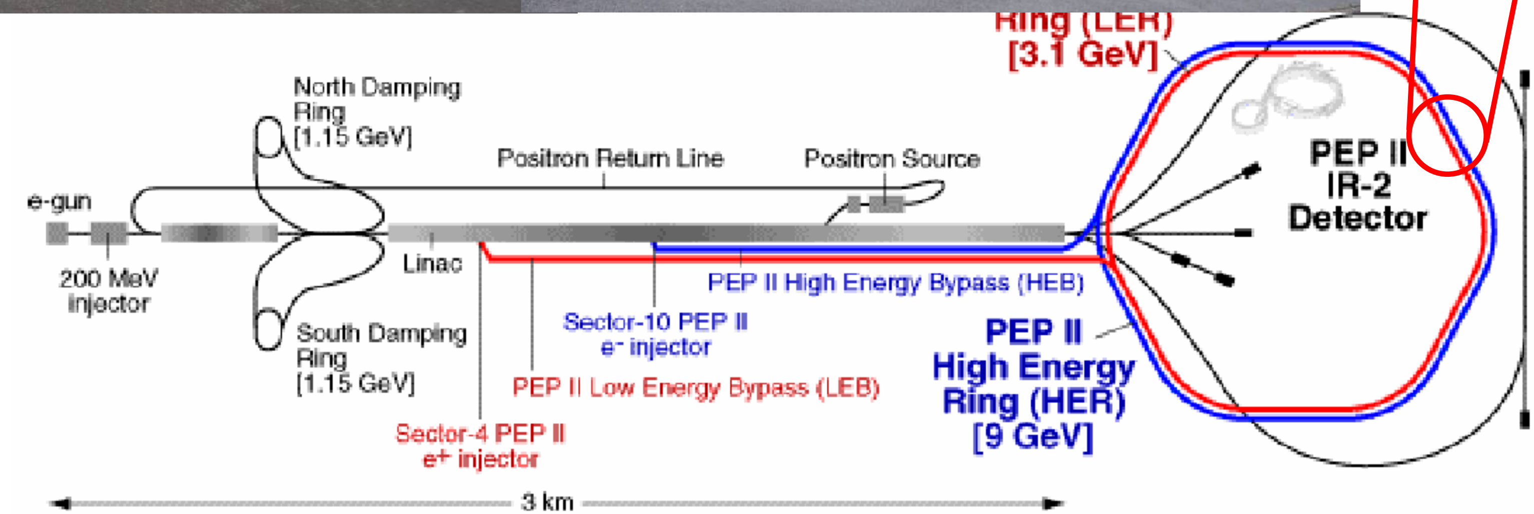
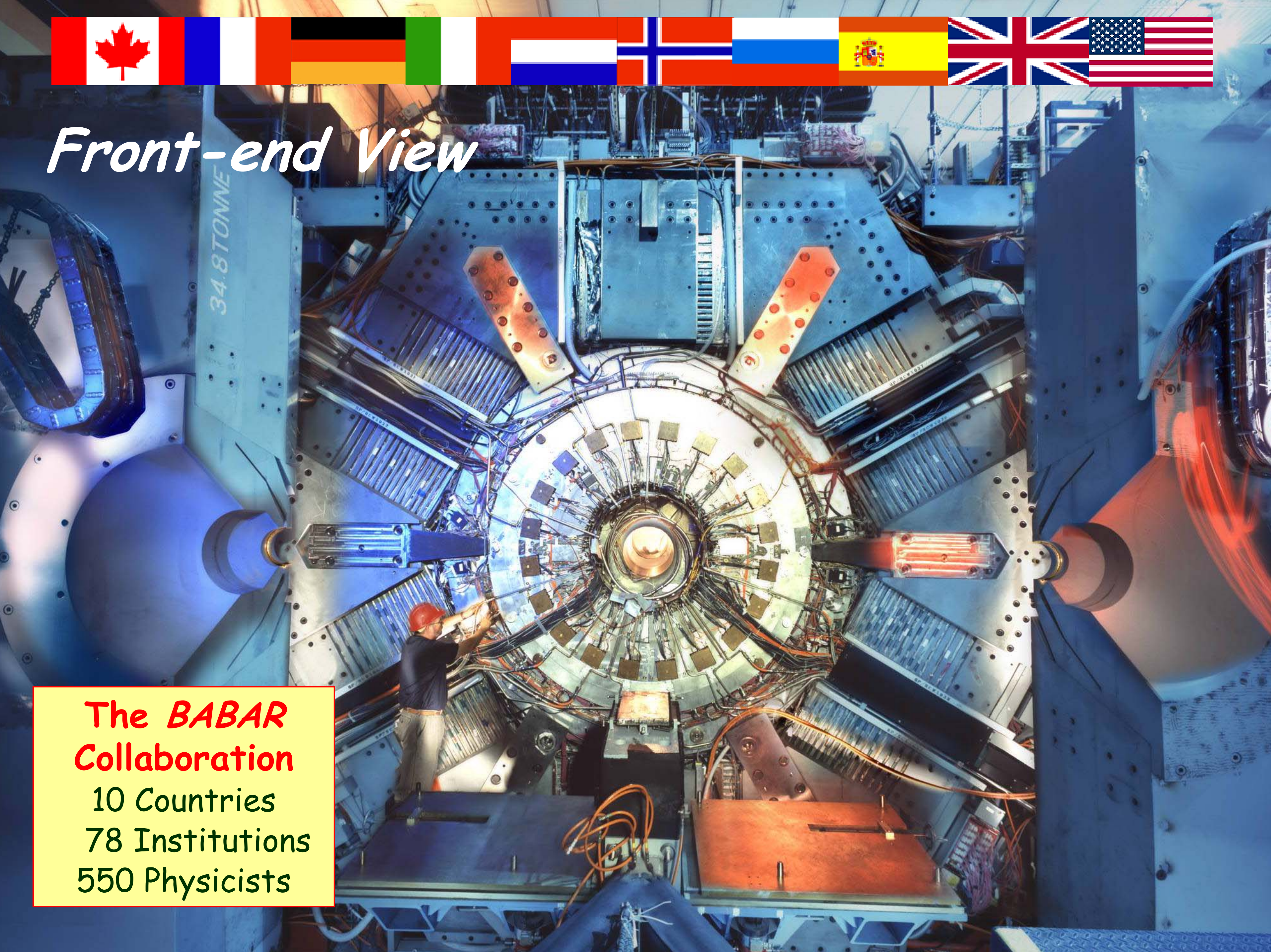
Stanford
Linear
Accelerator
Center

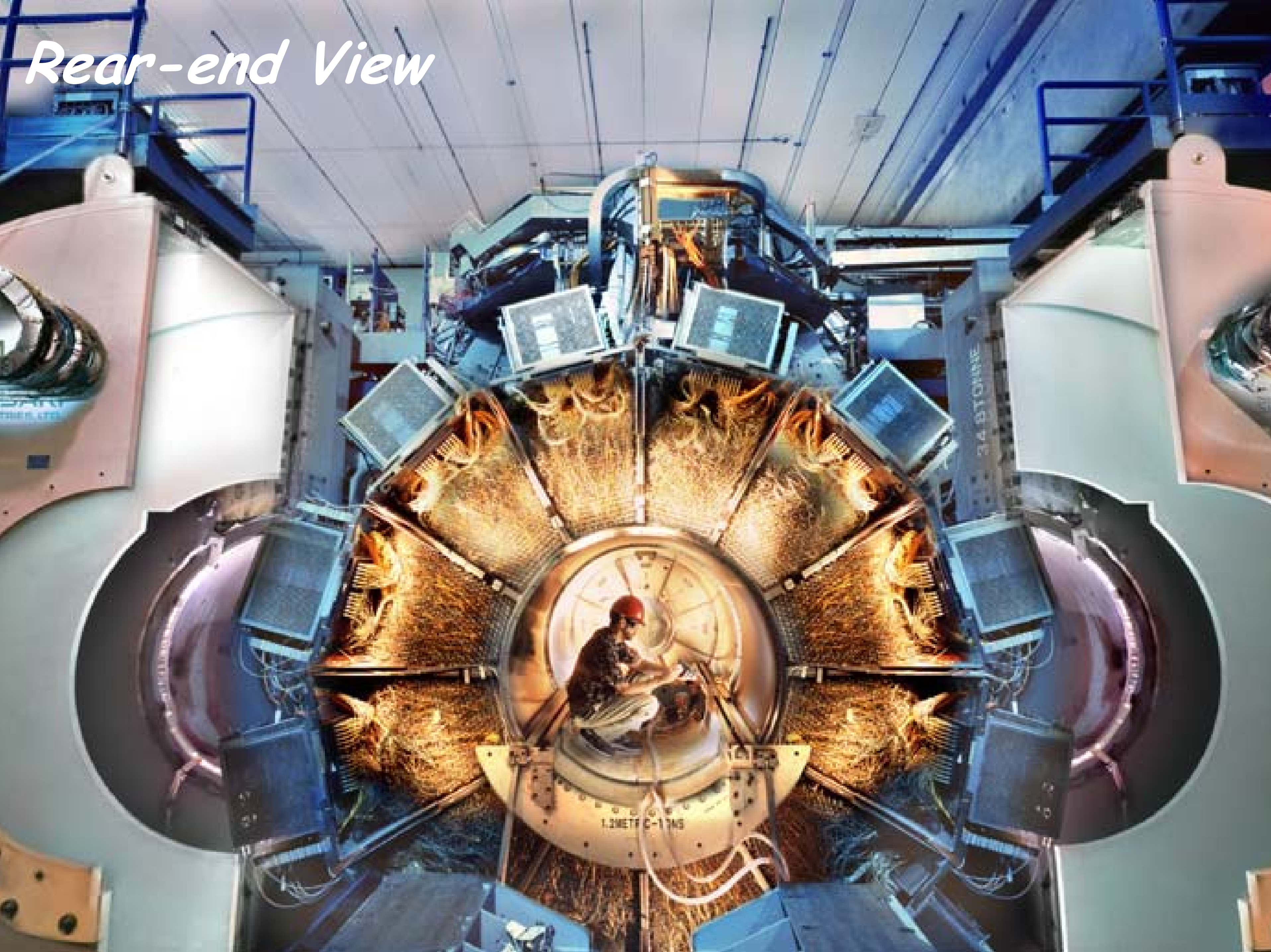
BABAR at IR-2



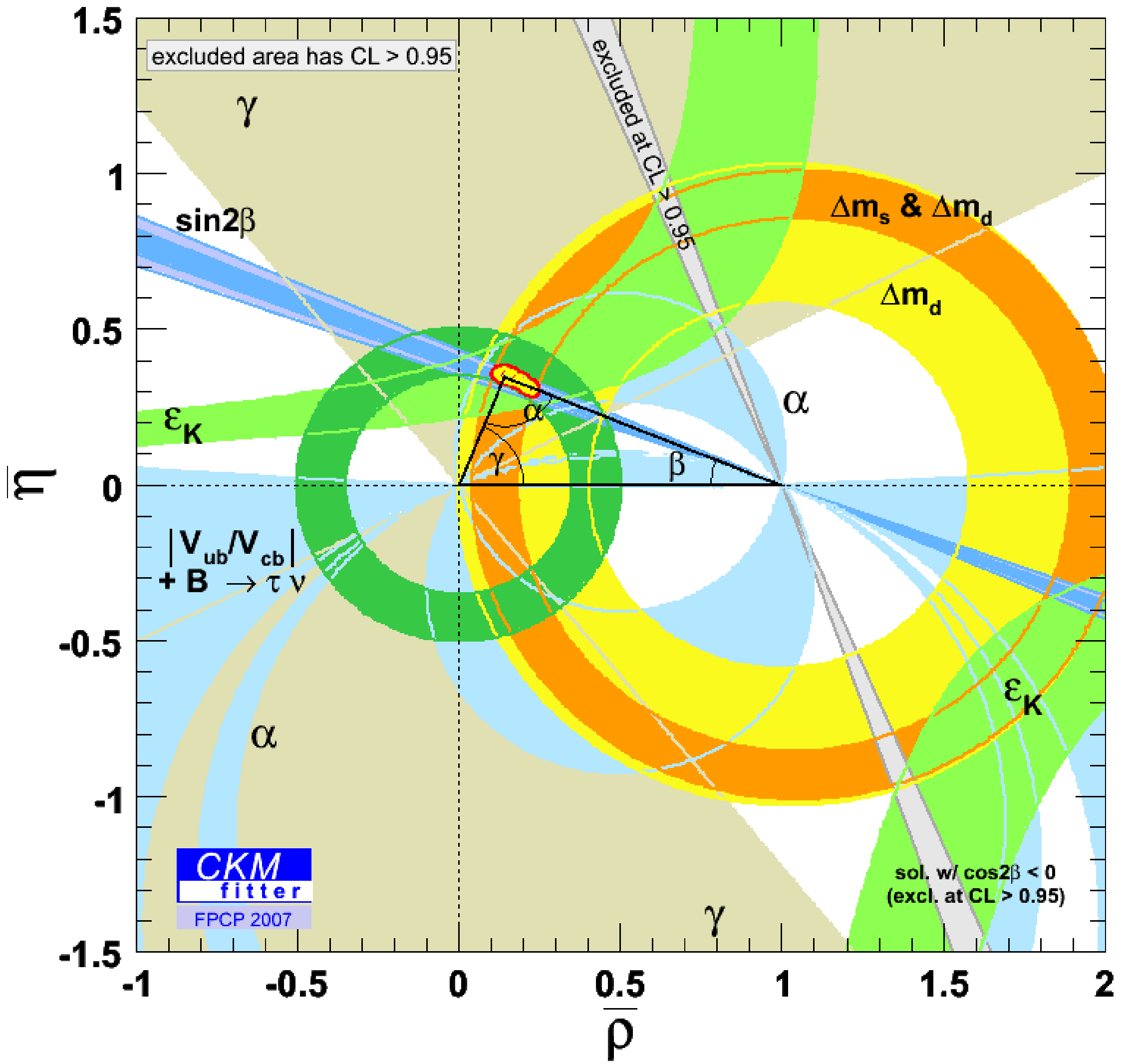

Ring (LER)
[3.1 GeV]
North Damping
Ring
[1.15 GeV]
Positron Return Line
Positron Source
e-gun
200 MeV
injector
Linac
South Damping
Ring
[1.15 GeV]
PEP II High Energy Bypass (HEB)
Sector-10 PEP II
e⁻ injector
PEP II Low Energy Bypass (LEB)
Sector-4 PEP II
e+ injector
PEP II
IR-2
Detector
PEP II
High Energy
Ring (HER)
[9 GeV]
3 km


Front-end View
34.8TONNE
The BABAR Collaboration
10 Countries
78 Institutions
550 Physicists

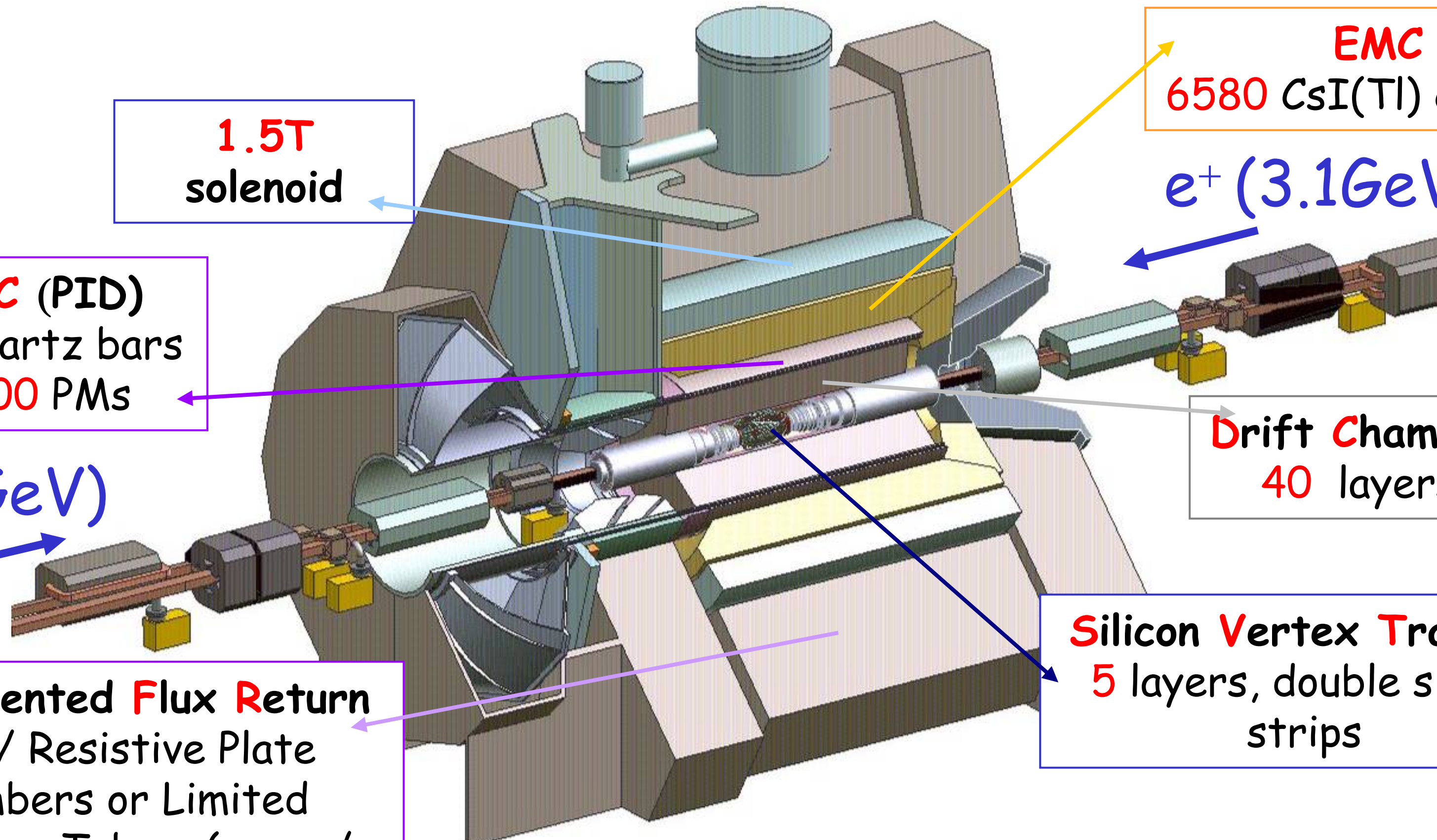
Rear-end View



Spectacular physics program

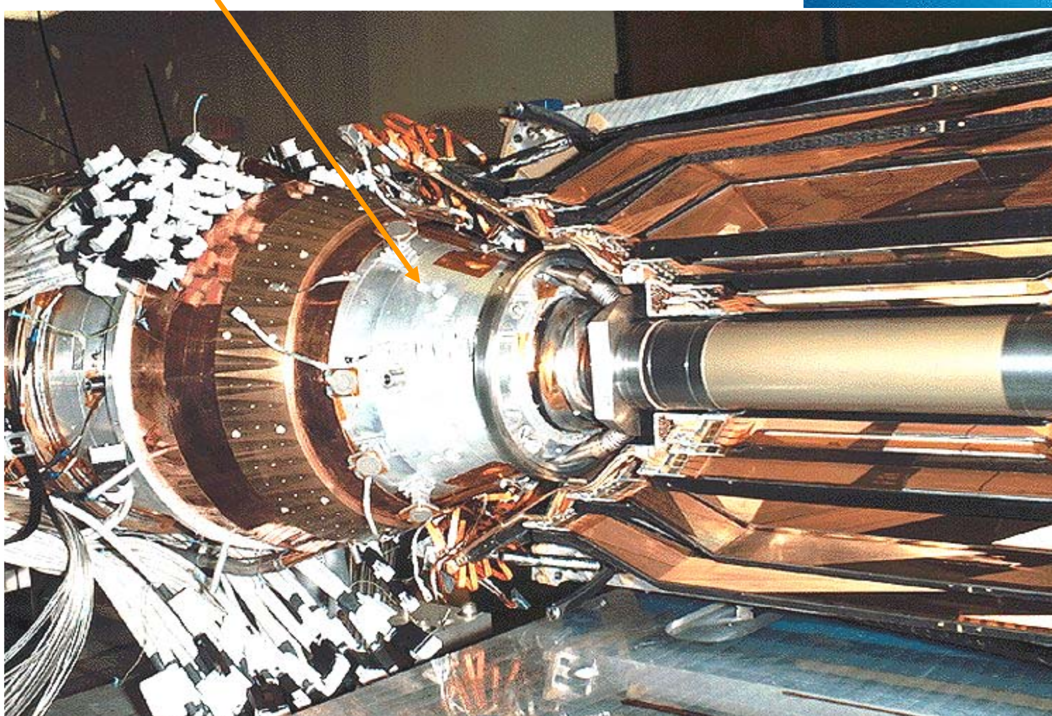


BABAR detector systems



BABAR Silicon Vertex Tracker (SVT)

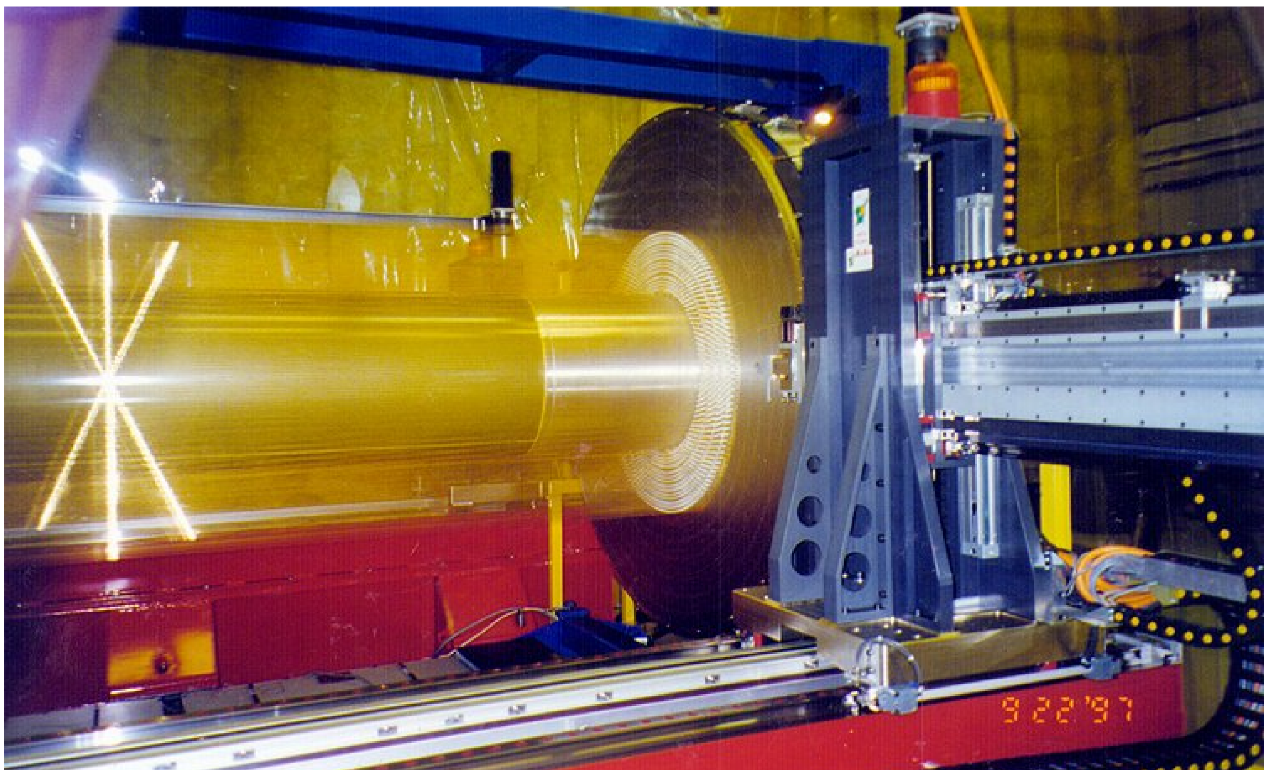
- 5 layers of double-sided silicon microstrip detectors
- Mounted on space frame supported off B1 magnets



- Not reusable for other applications, except specialized components

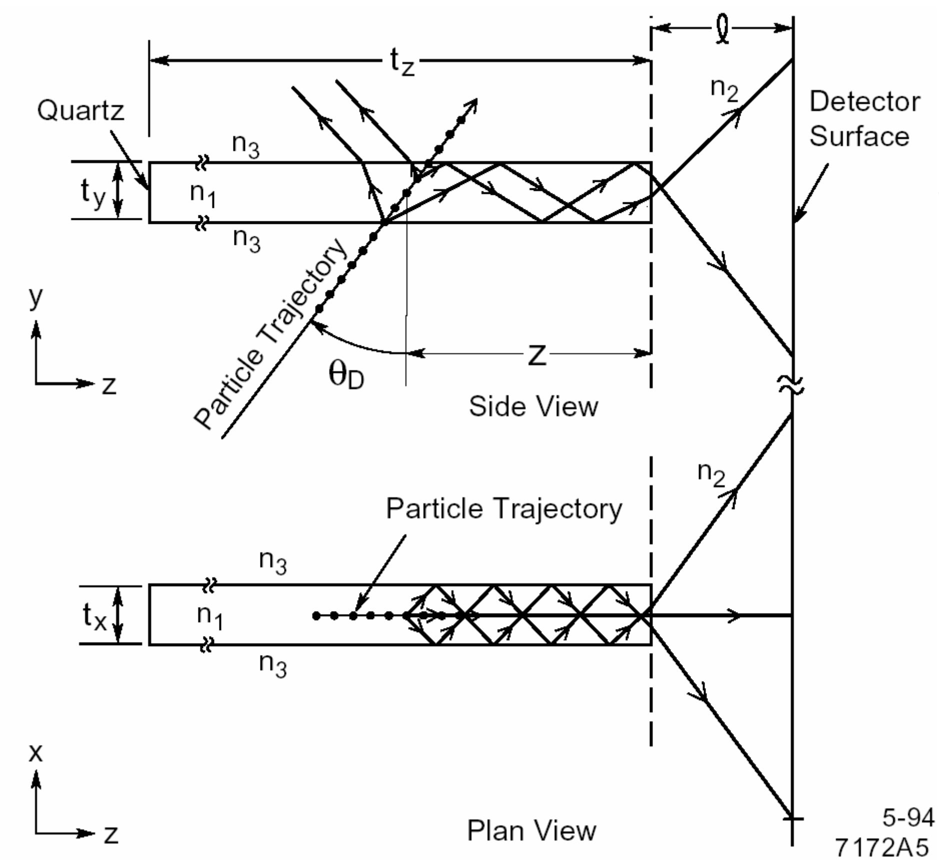
BABAR Drift Chamber (DCH)

- 7104 cells, 30k wires arranged into 40 layer wire chamber, Beryllium inner wall, CF outer, custom readout on rear endplate
- Operating gas is 80:20 He:Isobutane, but is readily replaced with inert alternatives
- Not reusable for other applications, except specialized components

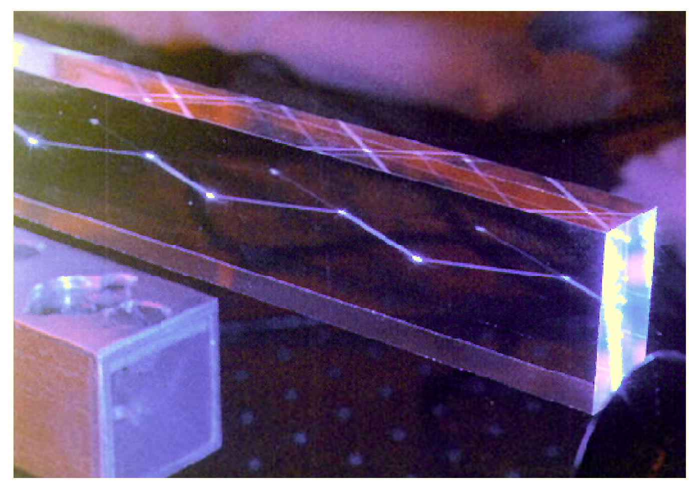


BABAR DIRC

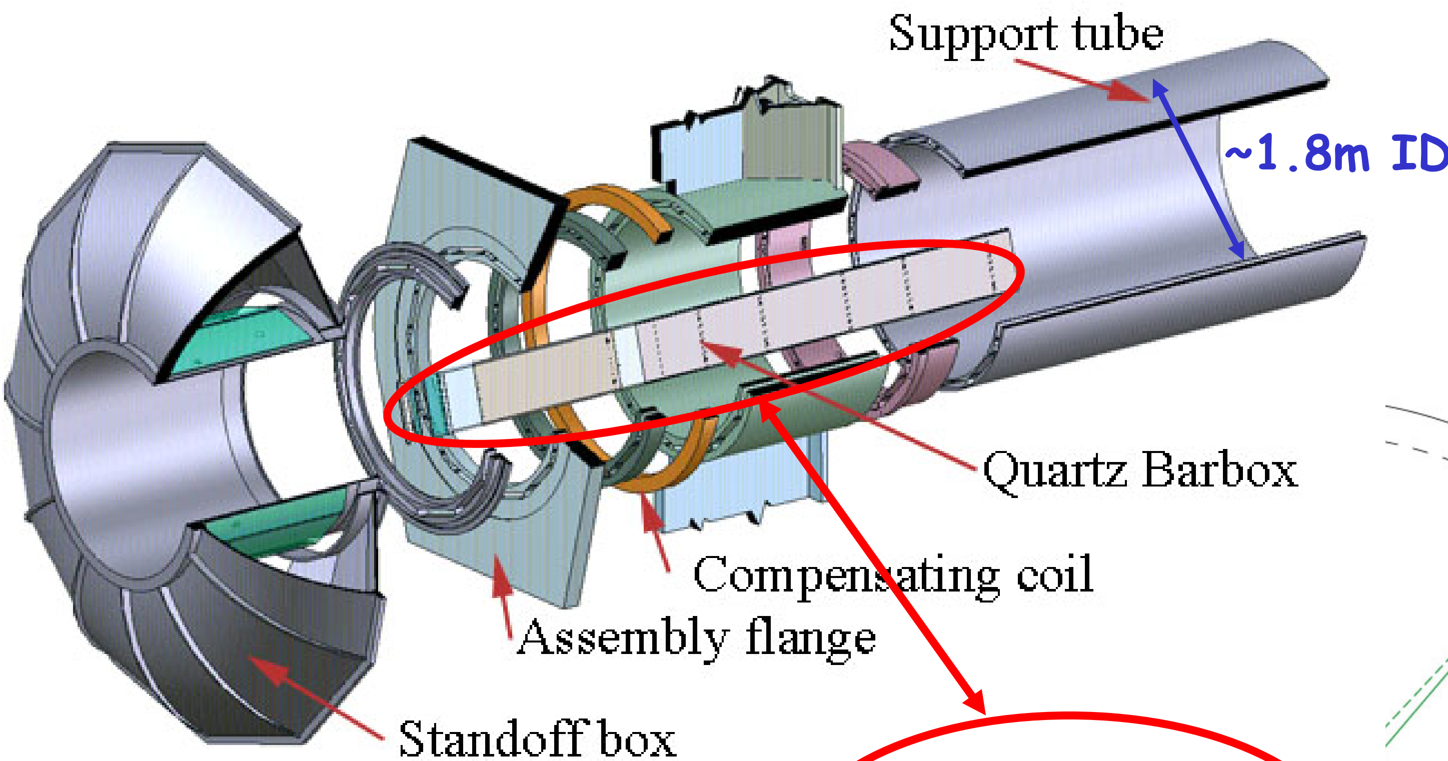
DIRC = Detection of Internally Reflected Cherenkov Light

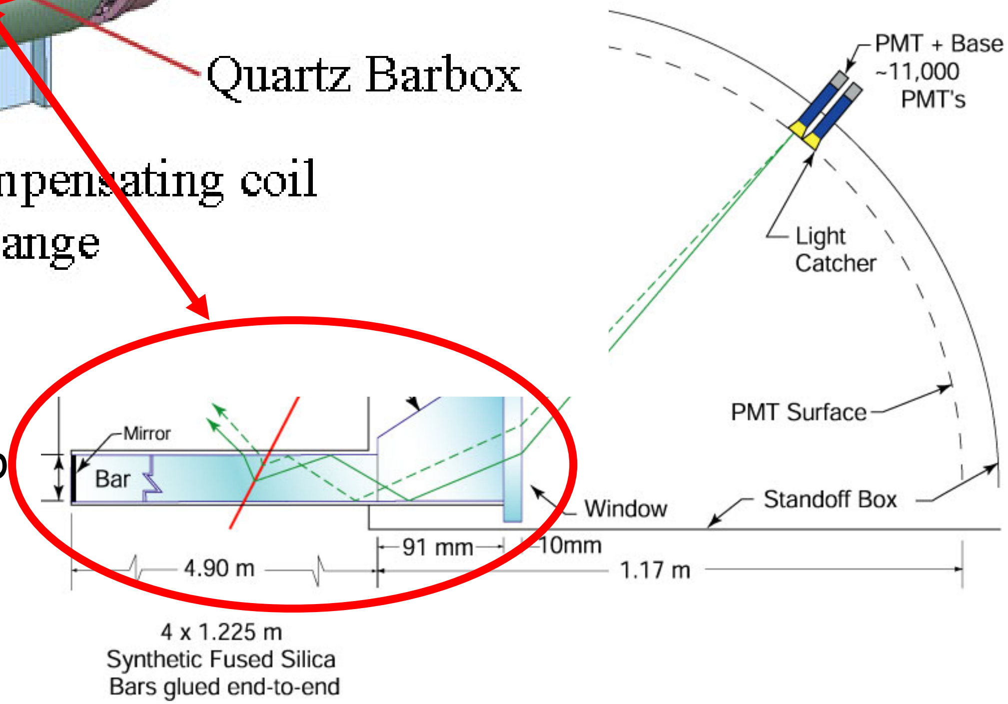


- UV Cherenkov light generated in quartz with $1/\beta$ opening angle
- Light transmitted length of bar by internal reflection, preserving angle information with optically precise surfaces
- Rings projected in water-filled standoff box (best match to quartz index), where photons are detected with an array of 11K PMTs



Elements of DIRC System

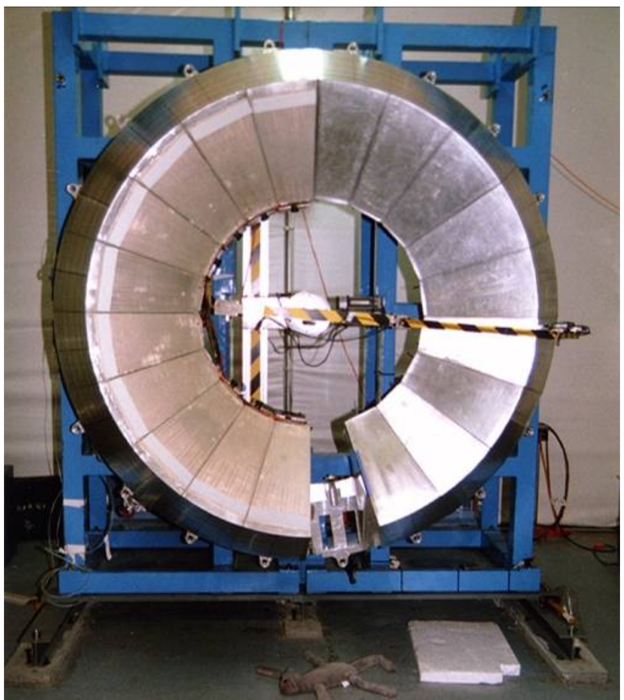




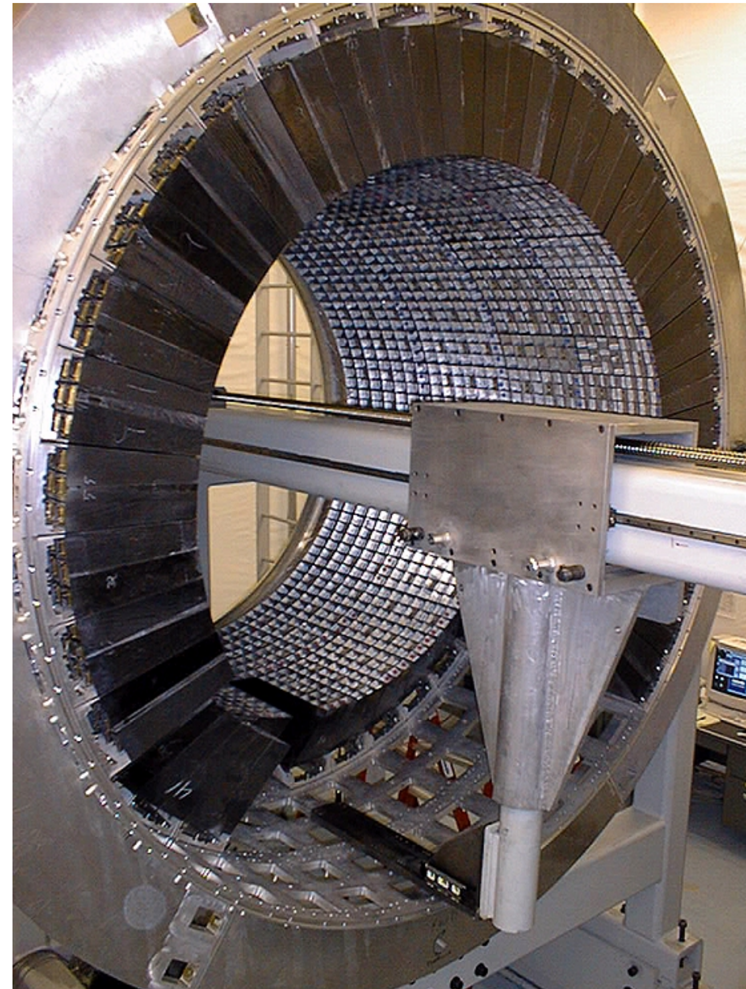
- Phototubes near lifetime, mechanical systems particular to *BABAR* implementation
- Quartz bars, protected in bar boxes, are a unique asset of long-term value

BABAR Electromagnetic Calorimeter (EMC)

- 6580 CsI(Tl) crystals with photodiode readout, arranged in barrel and forward endcap
- Crystals are an asset with long-term value in many applications



Forward endcap nearly assembled



Assembly of modular barrel units

BABAR magnetic system

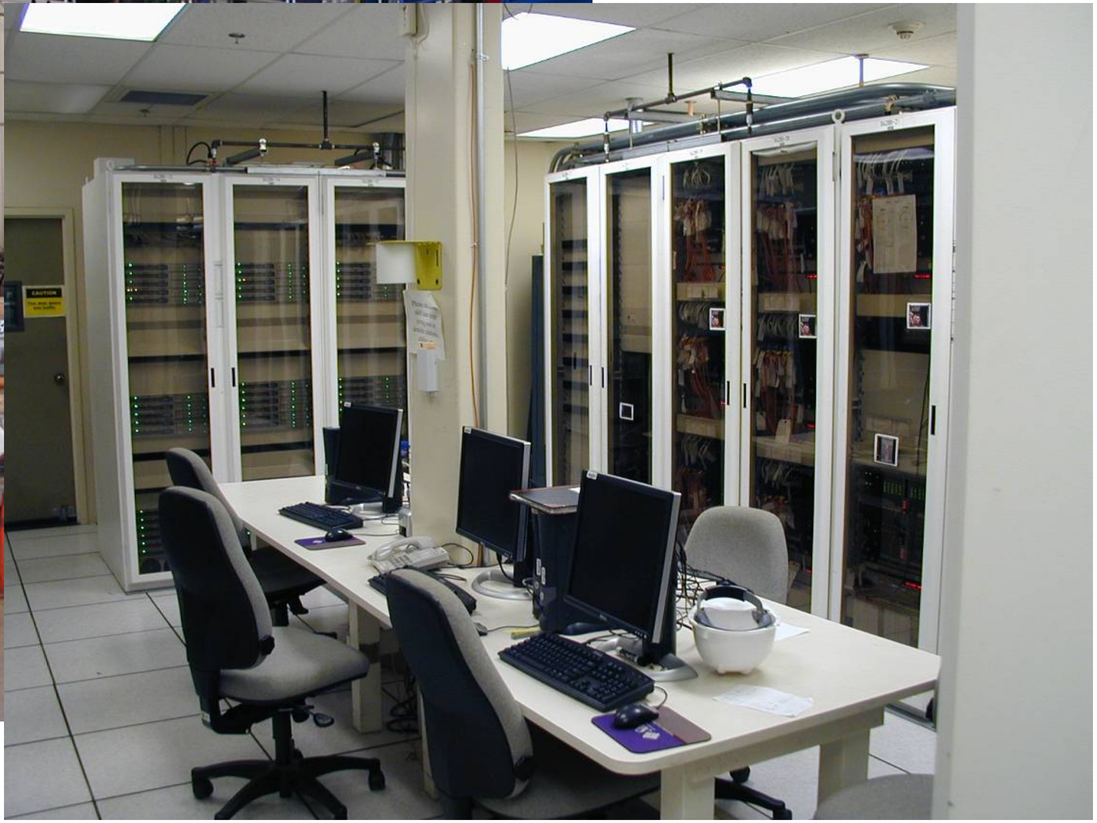
- 1.5 Tesla superconducting coil, flux return, cryogenic systems and controls
- Coil is an asset with long-term value in many applications; less clear for steel and cryogenic systems

Instrumented Flux Return

Iron assembly with RPCs at BABAR

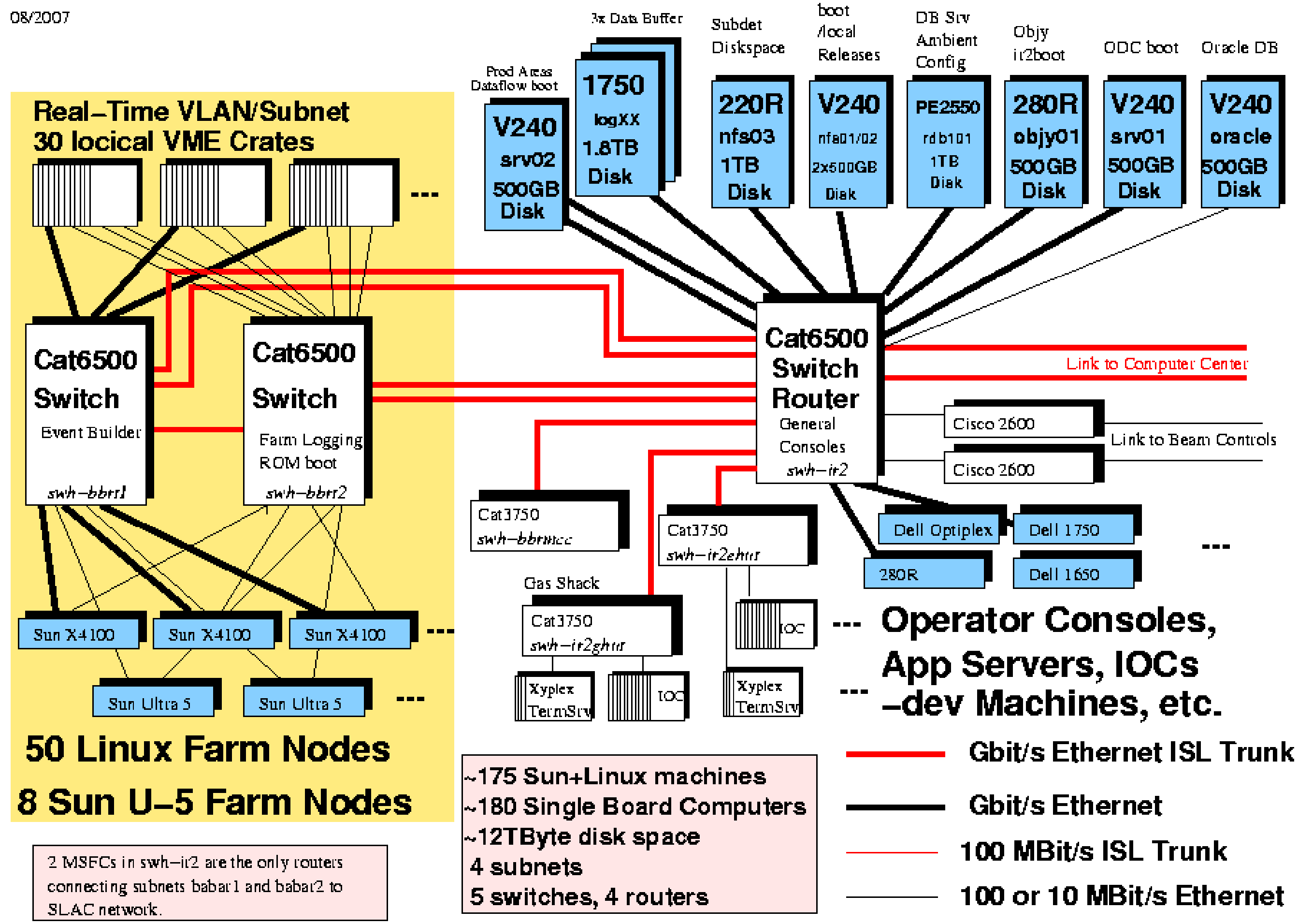
- Forward and rear endcaps instrumented with bakelite RPCs, most recent from 2002
- Barrel instrumented with limited-streamer tubes, installed in 2004, 2006
- LSTs may be reusable for some applications, although utility is probably time limited

Many additional BABAR support facilities



BABAR
Electronics Hut

Simplification of BABAR online system



BaBar Data Acquisition and Controls Networks

Have examined options for simplified & maintainable monitoring system

Transition planning assumptions

- ***FY09-FY10: Transition to minimal maintenance state***
  - *B* Factory will immediately transition to minimal-maintenance state following end of operations
- ***FY10-FY14: Minimal maintenance state***
  - Kept in minimal-maintenance state to prevent deterioration of equipment
  - Envision possibility for strategic re-use of components
    - For example, potential interest in equipment as contribution to an off-shore Super *B* Factory, discussed by INFN and OS, OS-OHEP in a preliminary way at high level
- ***About FY15: Dismantle and dispose***
  - Equipment scheduled for removal, and storage or disposal
  - Costs to be borne by DOE
    - Scenarios for disposal depend on whether existing moratorium on recycling metals from accelerator housing remains in effect or not

Minimal maintenance state

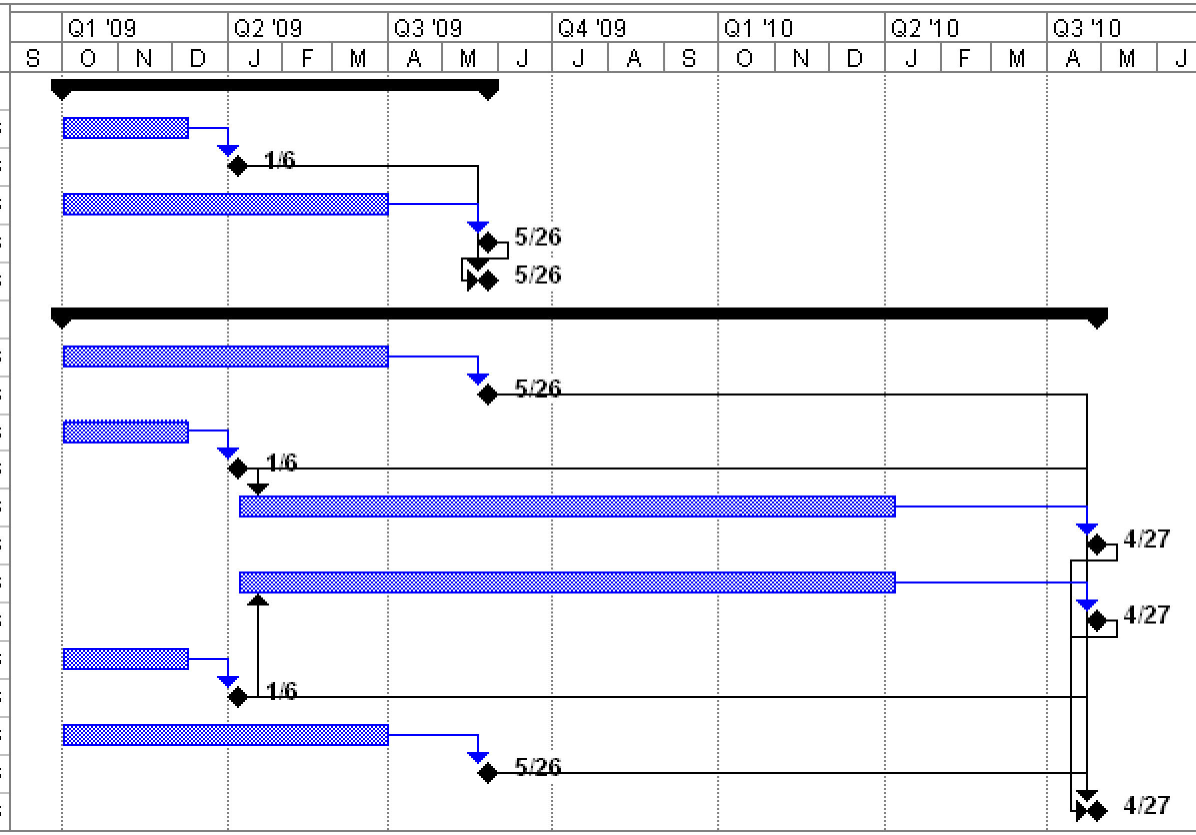
- ***BABAR***
  - Cooling systems drained and dried, DRC SOB empty, magnet warm but under vacuum, flammable gas replaced by nitrogen in DCH
    - Exception is flourinert system for EMC, required to maintain temperature control
  - Stand-alone version of monitoring system for long-term maintenance
  - Will not be able to return detector to an operational state for calibration or other purpose without substantial effort
    - Alternative of maintaining data taking capability judged to be too expensive versus possible justification
  - Estimate ~$300k/year in manpower and M&S, shared by *BABAR* IFC members until end of 2010

State of BABAR systems

System	Front-end electronics	Power supplies	Gas	Cooling	Other utilities
SVT	Off	Off	dry air	off, drained	
DCH	Off	Off	dry nitrogen	off	
DRC	Off	Off	dry nitrogen	off, empty	SOB drained, purification system off
EMC	Off	Off	dry nitrogen	fluorinert circulating	water system drained and dried; source system drained
IFR-RPC	Off	Off	dry nitrogen	off, drained	
IFR-LST	Off	Off	dry nitrogen	off, drained	
Trigger	Off	Off	n/a	n/a	
DAQ	Off	Off	n/a	n/a	
Online farm	Off	Off	n/a	n/a	
Safety systems/monitoring/UPS	On	On	n/a	EH cooling on	UPS maintained
Infrastructure	n/a	n/a	n/a	EH cooling on	UPS maintained
Magnet	On	Off	n/a	n/a	vacuum pumps on
IR2 complex	n/a	On	On	On	gas shack limited use

Tasks and timelines: FY09-FY10

ID	Task Name	Duration
1	**BABAR transition to MMS**	**34 wks**
2	Drain & dry all cooling systems	10 wks
3	Cooling systems drained	0 wks
4	Develop standalone slow controls	26 wks
5	Standalone slow controls deployed	0 wks
6	BABAR transition complete	0 wks
7	**PEP-II transition to MMS**	**82 wks**
8	Secure electrical hazards	26 wks
9	Electrical hazards secure	0 wks
10	Secure mechnical hazards	10 wks
11	Mechanical hazards secured	0 wks
12	Drain & dry magnets	52 wks
13	Magnets drained	0 wks
14	Drain & dry vacuum cooling systems	52 wks
15	Vacuum cooling drained	0 wks
16	Vent & secure vacuum system	10 wks
17	Vacuum system secured	0 wks
18	Drain & secure RF systems	26 wks
19	RF systems secured	0 wks
20	PEP-II transition complete	0 wks



BABAR manpower and budgets for transition

PPA physicists and technicians on SLAC budget:
FY09: 7 people @ 30% FTE
FY10: 6 people @ 10% FTE

	FY09		FY10		FY11	
	FTE	Budget [k$]	FTE	Budget [k$]	FTE	Budget [k$]
PPA Labor	2.1	440	0.6	120	0.6	125
Operations Directorate Labor	0.9	150	0.4	90	0.4	90
M&S		100		80		80
Total		690		290		295

Parts of these components in FY09 and FY10 will likely be obtained from the BABAR International Finance Committee

DND: BABAR

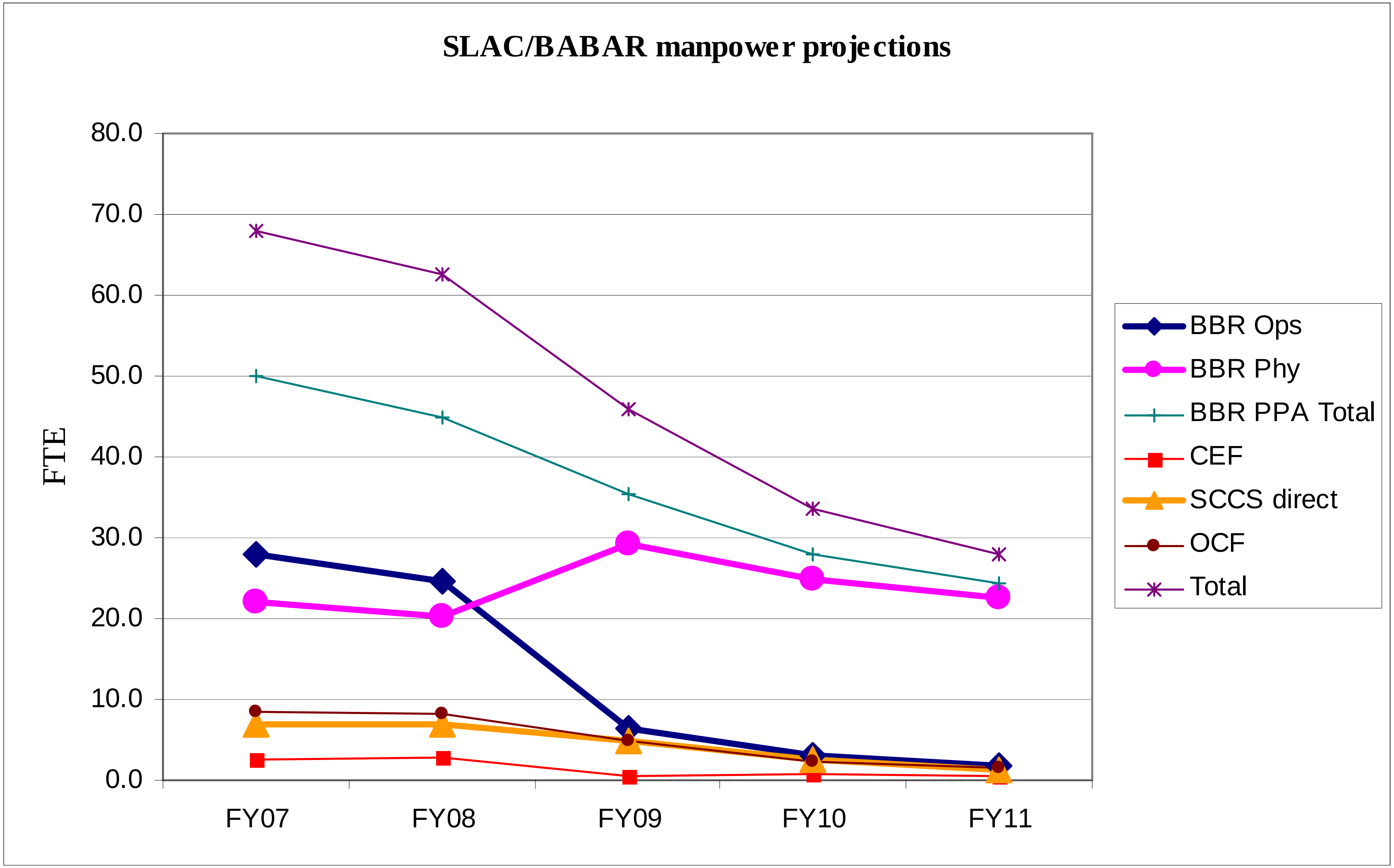
➢ *BABAR* Detector Disassembly

- Rely on the experience of the campaign to upgrade the *BABAR* muon identification system in estimating detector disassembly process, required manpower (labor and engineering) as well as M&S.
  - Process of disassembly will require use of IRs other than IR2 for breakdown of components before disposal/storage
- Subsystem managers involved in identifying components with long term value
  - Include potential preservation of highly valued items:
    - DIRC quartz bars
    - CsI(Tl) crystals (almost 30 tons) with diode readout
    - Superconducting magnet coil

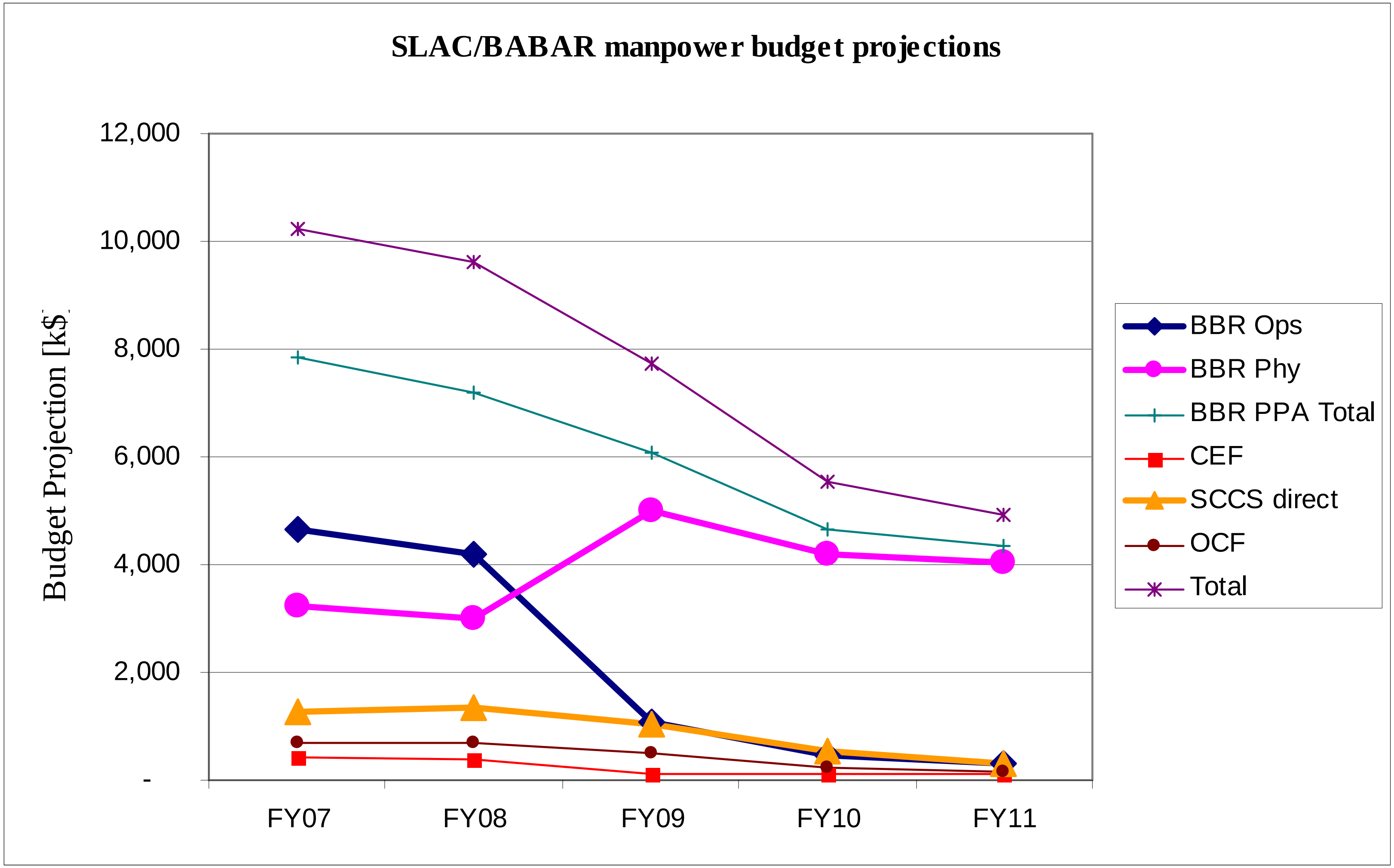
Post-operational computing model

- ***Major long-term post-data taking commitment***
  - *BABAR* has made significant progress in defining this phase, as presented to IFC yesterday
- ***Current assumptions, consistent with existing BABAR plans***
  - FY09-FY11: Intense data analysis period with aim to publish main physics results
    - Final reprocessing of data set Apr-Dec, 2008: some modest implications for resources and personnel as discussed yesterday
  - FY11-FY14: Long-term analysis at reduced level
    - Expect *BABAR* Tier A centers will start to phase out from end of 2010; analysis fully reliant on SLAC by end of 2011
    - Assume some reduction in data replication factor (3?), i.e., not all skims on disk; no reprocessing allowance, etc
- ***Long-term***
  - SLAC will be the archival site for a unique data sample: supported view of *BABAR* IFC

Evolution of BABAR related manpower



Evolution of BABAR related manpower



Full budget projections

Manpower budgets: physicist, operations/ramp down/MMS support, & computing

SLAC/BABAR budget [k$]		FY07	FY08	FY09	FY10	FY11
PPA Directorate	Operations	4600	4200	1100	460	320
	Physics	3200	3000	5000	4200	4000
Operations Directorate	Operations	430	380	110	110	110
	SCCS	1300	1350	1000	530	300
BABAR OCF personnel [50%]	Operations	220	220	80		
	Computing professionals	460	480	415	235	170
Total		**10210**	**9630**	**7705**	**5535**	**4900**

M&S components

SLAC/BABAR budget [k$]	FY07	FY08	FY09	FY10	FY11
Operations	820	830	820	890	810
Computing hardware	3400	3300	580	400	400
BABAR OCF [50%]	710	750	305	225	180
Total	**4930**	**4880**	**1705**	**1515**	**1390**

BABAR ownership and disposal issue

- *Proposed agreement on responsibilities*
  - Equipment ownership formally turned over to SLAC
  - SLAC and DOE takes on responsibility for partial and/or complete dismantling, and storage or disposal
  - Decisions about requests for re-use of equipment will be made on a strategic basis with advice from agencies/collaboration as appropriate
    - SuperB is most likely case for strategic redeployment
  - If there are proceeds from the disposal of the magnet or coil (common fund items) after costs of dismantling, they will be disbursed to the original participating agencies
    - Salvage proceeds from other equipment will be used to offset SLAC costs for DND

Proposed timing of transition

- ***Collaboration proposes to retain responsibility for BABAR until the end of CY2010***
  - Strong desire by a large part of BABAR community to see re-use as part of a SuperB project
  - Future of SuperB should be clear on that time scale; not likely there will be a call to vacate IR-2 before 2010
  - In this scenario, expect IFC members would continue to contribute to BABAR OCF through CY2010
  - Collaboration manages transition to MMS and monitoring of BABAR through CY2010
- ***Issue was discussed at the July 26-27 meeting of the BABAR International Finance Committee***
  - Generally supportive, aim is to reach agreement at February 2008 meeting

Re-use example from SuperB CDR

		Replacement Values [kEuros]	Description
PEP-II		**126330**	
	Magnet and support systems	25380	Dipoles (324), quadrupoles (836), sextupoles (460), correctors (836), IR skew quadrupoles, injection and abort kickers
	Vacuum systems	14200	Lumped pumps (700), controls (2600 m), vacuum chamber (2000 m)
	rf systems	60000	rf stations (12)
	Controls, diagnostics, feedback systems	8750	SR light monitors (2), longitundinal (6) and transverse (6) feedback systems, bunch current monitors (2), bunch length monitors (2), luminosity monitor (1)
	Injections and transport systems	18000	Injection gun, positron target and capture region, 6 GeV linac, 1 GeV damping rings (2), injection transport lines (2), polarization manipulation
BABAR		**46471**	
	DIRC radiators and support structure	6728	Radiator support structure, radiator bars (144) and assemblies (12)
	Barrel EMC crystals and support structure	30120	Barrel CsI crystals (6580), light sensors and readout (13160), support modules, barrel support structure, calibration systems
	Magnet and flux return	9623	Superconducting solenoid, magnet power and protection systems, iron flux return, installation and test equipment

BABAR organization

Conclusions

- ***BABAR ramp-down to MMS***
  - Straightforward extension of operations, managed by collaboration for both detector (~3 months) & online system (~6 months)
  - MMS state requires only a small core group (typically @ 10% FTE) for periodic monitoring
- ***Primary purpose of MMS***
  - Preserve valuable equipment for possible future re-use
  - DIRC bars, EMC CSI crystals and magnet coil are primary large-scale components with long-term shelf life
  - Intention is to re-deploy on a strategic basis for the benefit of the HEP program
  - Costs are minimal compared to dismantle and disposal requirements