

**STATUS of USA
RIKEN-COLUMBIA-BNL**

Norman H. Christ

**Columbia University
RBC & QCDOC Collaborations**

Izu — September 23, 2004

OUTLINE

- Overview of QCDOC architecture.
- QCDOC Project status.
- Preliminary plans for RBC running.

COLLABORATION

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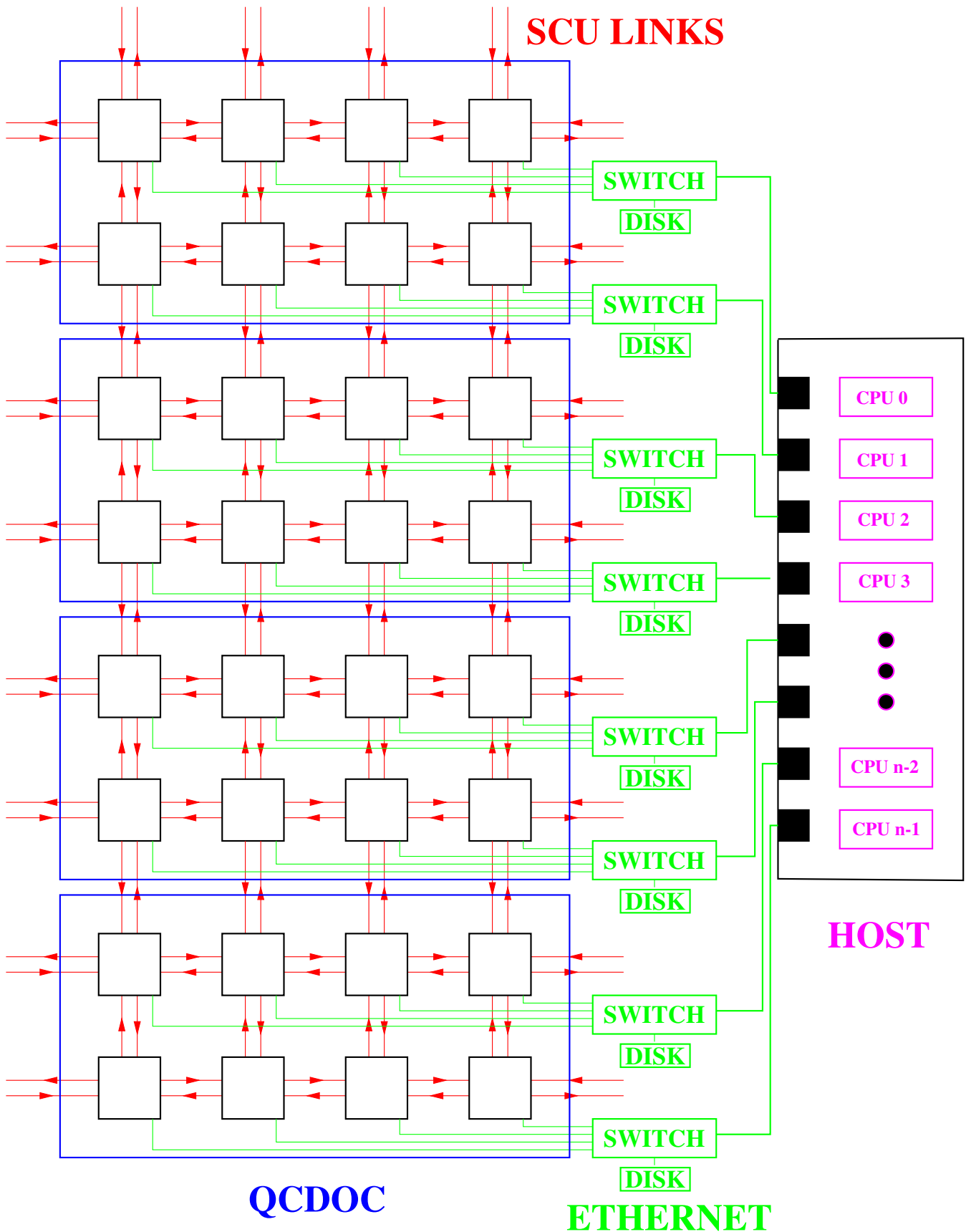
RBRC (RIKEN): Shigemi Ohta (KEK)
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IBM: Dong Chen
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Design groups:
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Rochester, MN; Raleigh, NC

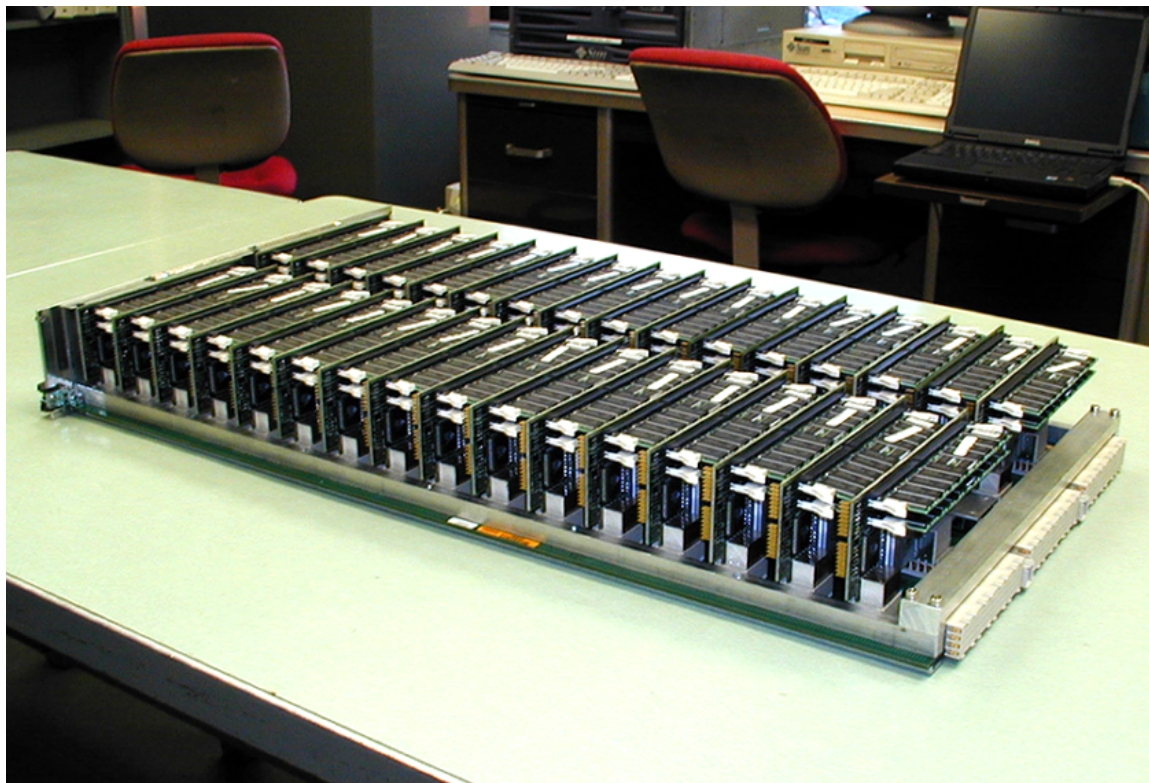
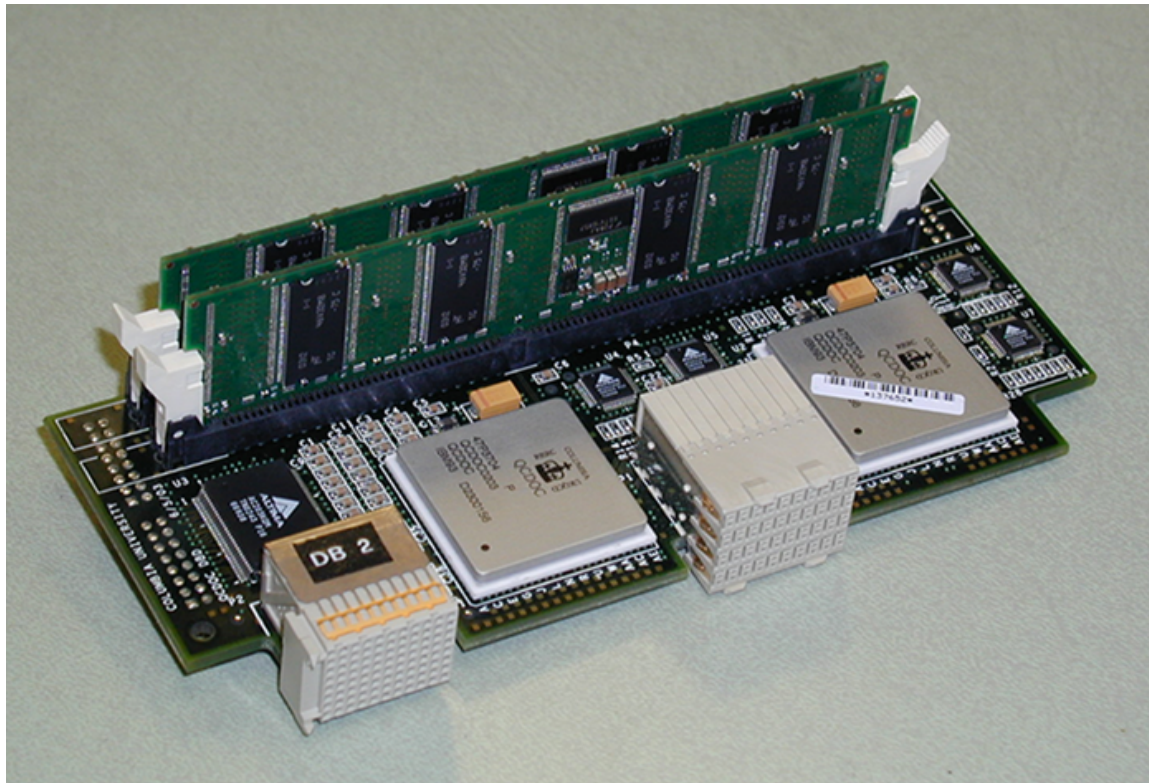
Review of QCDOC Architecture

- IBM-fabricated, single-chip node.
[50 million transistors, 1-2 Watt, 1.3cm×1.3cm die]
- PowerPC 32-bit processor
 - 1 Gflops, 64-bit IEEE FPU.
 - Memory management.
 - GNU and XLC compilers.
- 4 Mbyte on-chip memory and up to 2.0 Gbyte/node on DIMM card.
- 6-dim communications network:
 - Efficient for small packet sizes, $\approx 200\text{ns}$ latency.
 - Global sum/broadcast functionality.
 - Minimal processor overhead.
 - Lower dimensional machine partitions.
- 100 Mbit/sec, Fast Ethernet
 - JTAG/Ethernet boot hardware.
 - Host-node OS communication.
 - Disk I/O.
 - RISCWatch debugger.
- ≈ 5 Watt, 15 in³ per node.

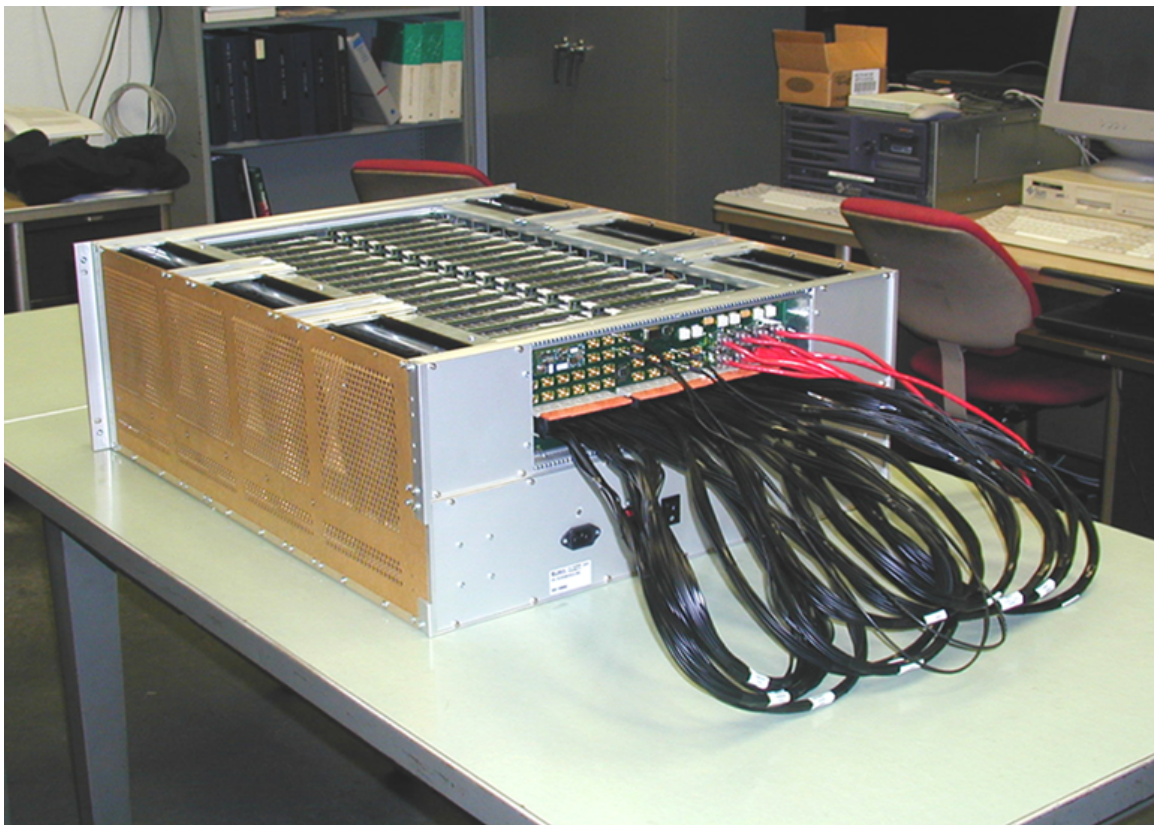
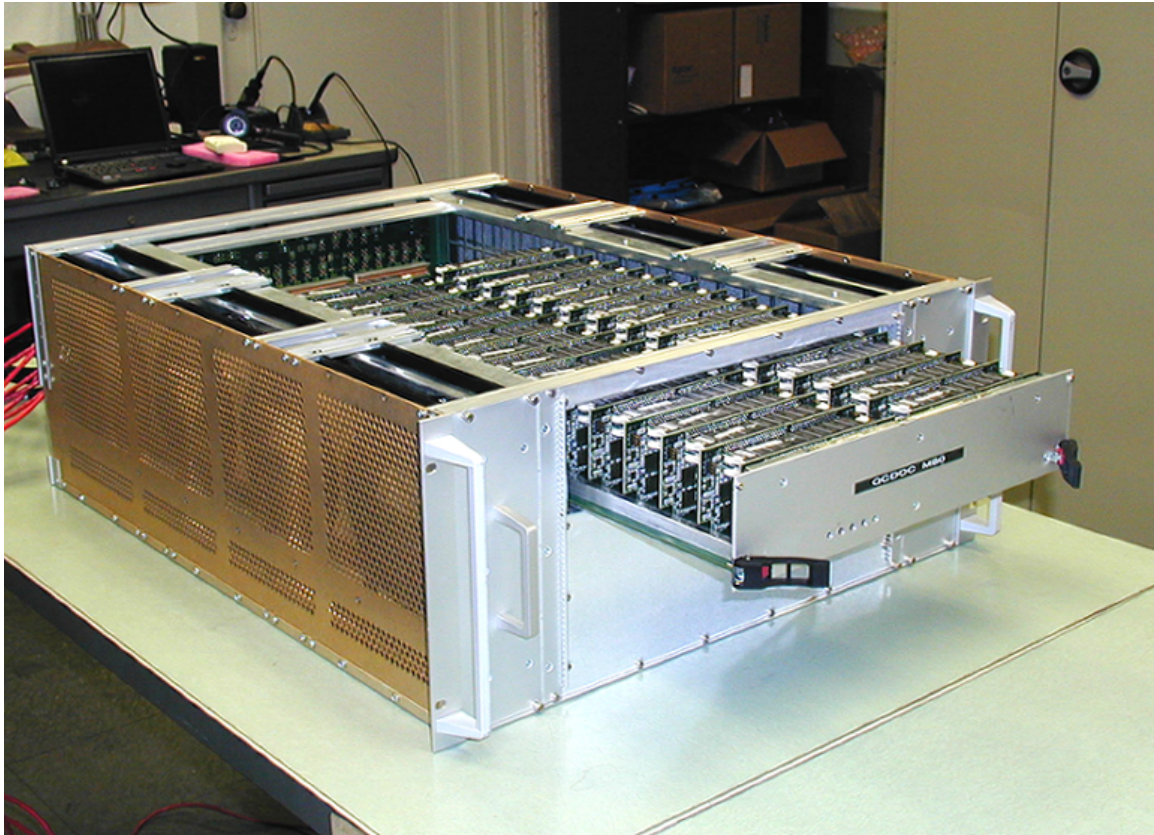
MACHINE OVERVIEW



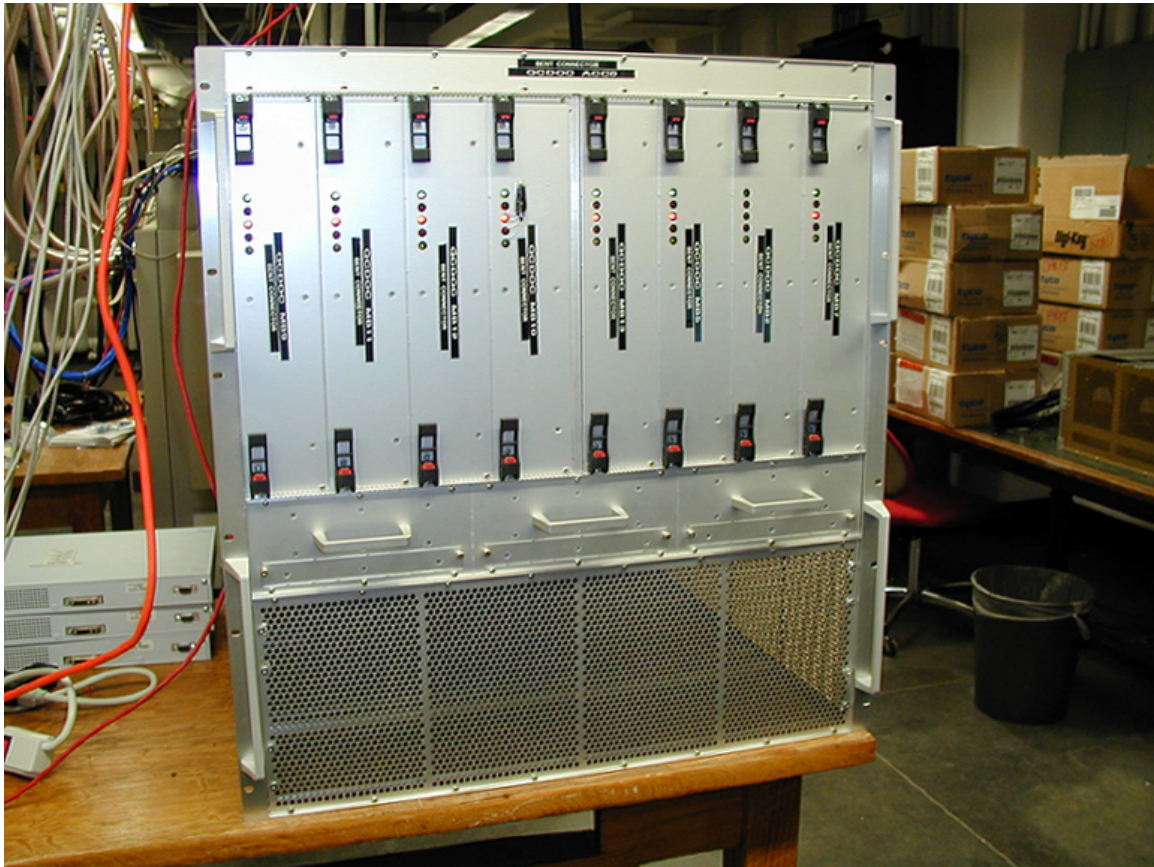
DAUGHTER AND MOTHER BOARDS



Single Motherboard Cabinet



Single 512-Node Machine



4096-node Machine



UKQCD Construction — BNL



SCHEDULE

- Oct. 29, 2004: Ship UKQCD 5 Tflops Machine.
- Dec. 24, 2004: Complete RBRC 5 Tflops Machine.
- Mar. 31, 2004: Complete U.S. DOE 5 Tflops Machine.

RBC Computational Plans

- Extensive $N_f = 2 + 1$ runs.
 - Use Rational HMC for strange quark.
 - Many attempts to adjust gauge action and Dirac operator — none reduced m_{res} substantially.
 - * Adjoint action.
 - * Smeared fermion links.
 - DBW2 gauge action.
 - Test with increased and decreased rectangle coef. to make sure this is helping.
- Possible 10K trajectory gauge ensembles:

Vol	m_{ud}/m_s	Lm_π	$1/a$	Nodes	time
$16^3 \times 32$	1/2	4.46	1.7GeV	2048	14 days
$16^3 \times 32$	1/4	3.16	1.7GeV	2048	3 months
$24^3 \times 64$	1/4	4.73	1.7GeV	12,288	3 months
$24^3 \times 64$	1/4	4.02	2.0GeV	12,288	10 months