# Response to Last MAC Recommendations

V.Ptitsyn
C-AD, BNL

# Design priorities

- **Recommendation:** the highest priority goal should be the design of an electron – hadron collider with variable center of mass energy of (50-100) GeV, with 5-10GeV electrons, (125-250) GeV protons and a large range of ion with (60-125) GeV/nucleon.

  **The design should aim for a luminosity of at least**

  **$L = 10^{33}\ cm^{-2}\ s^{-1}$ for e-p collisions and**

  **$L = 10^{31}\ cm^{-2}\ s^{-1}$ for e-ion collisions.**

  Electron and proton beams should be spin polarized with a degree of 70%.

- **Response:** The design work continues to follow these guidelines, although, as confirmed by recent studies, reaching e-p luminosity $L=10^{33}cm^{-2}s^{-1}$ in ring-ring option is problematic.

# Electron cooling

- **Recommendations: Electron-cooling R&D should be pursued with high priority in the context of e-RHIC.** In addition the e-cooling dynamics in e-RHIC together with IBS and beam-beam effects should be studied within integrated simulation codes using the e-RHIC design beam parameters for heavy ions and protons.

- **Response:** The progress on e-cooling R&D will be reported in following talks.

  For eRHIC it was shown that effective transverse cooling of lower energy protons can relax considerably requirements on electron current for polarized electron source in linac-ring option.

# Proton Intensity Upgrade

- **Recommendations:** The collider-accelerator department should put a large effort in overcoming the intensity related vacuum problems including **the continuation of the e-cloud studies, the NEG coating of warm sections and improved dynamic vacuum conditions in the cold sections.** All other potential intensity limitations in RHIC have to be studied carefully.

- **Response:**
  - Following year-to-year continuous upgrade of RHIC vacuum system, the total beam intensity of ion (proton) beam have been continuously increasing.
  - During beam studies at Run-5 the Blue total beam intensity more than 3e13 protons was achieved at the injection energy which is comparable with the total beam intensity planned for eRHIC.
  - Further improvements of the vacuum conditions, including the vacuum in cold sections, expected in the coming run.

# Luminosity comparisons

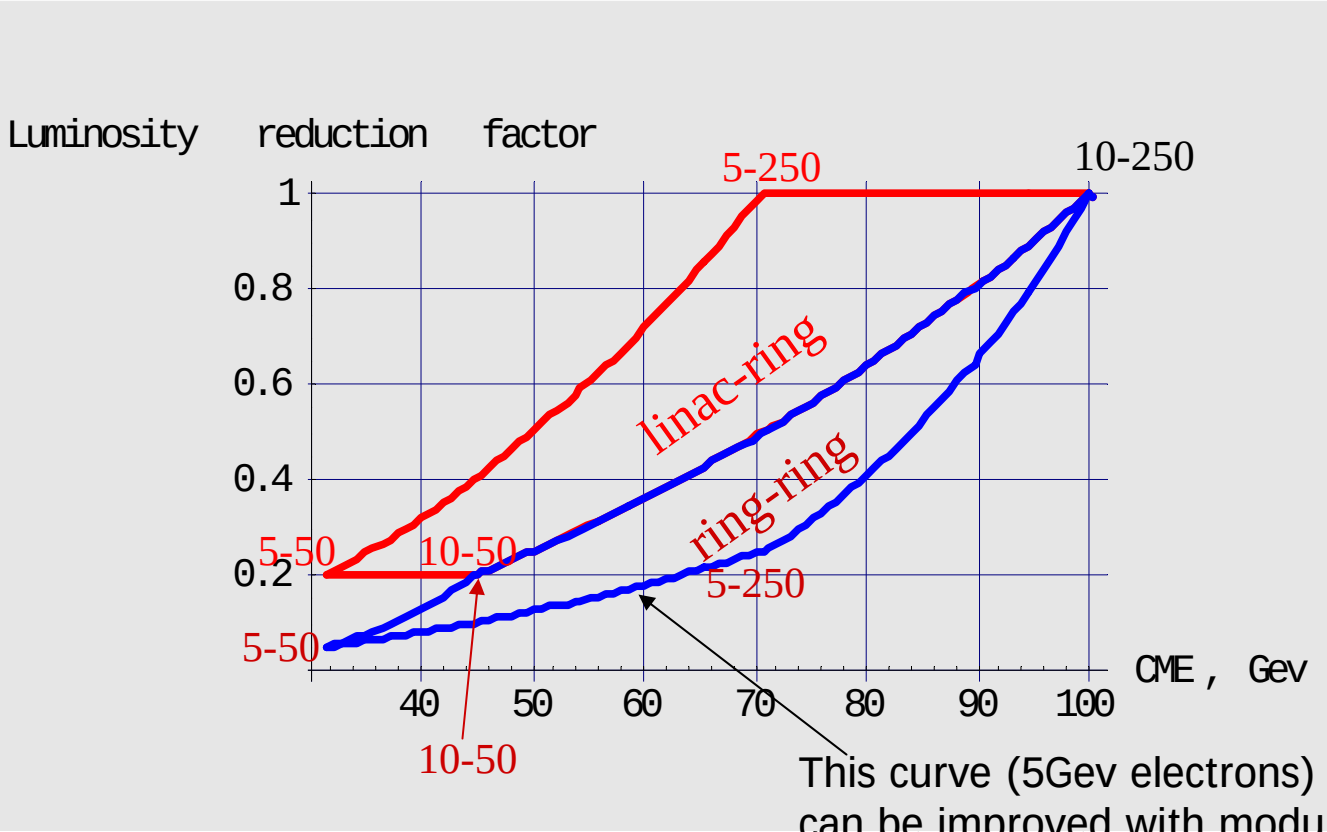
- **Recommendations: a consistent set of luminosity parameters should be worked out** for all IR configurations and for both LINAC-RING and RI NG-RING options.

- **Response:**

  This work has been completed recently.

  Consistent comparison of ring-ring and linac-ring luminosities has been done for designs with different number of bunches, application of electron cooling and at different center-of-mass energies.

# Luminosity dependence on CME with cooling



# Interaction Region Design

- **Recommendations:**

  More studies on:

  - **performing particle background simulations**
  - **assessment of the heat load and possible temperature gradients** in the IR
  - **complete analysis of synchrotron radiation** including effects of quadrupole magnets, orbit, misalignments.

- **Response:** The work is planned in coming monthes.

# Simulations

- **Recommendations:**
  1. Continue the benchmarking of coherent beam-beam simulation codes with RHIC.
  2. Perform electron beam-beam simulations avoiding coherent beam-beam resonances and synchro-betatron resonances for 360 bunches.

- **Response:**

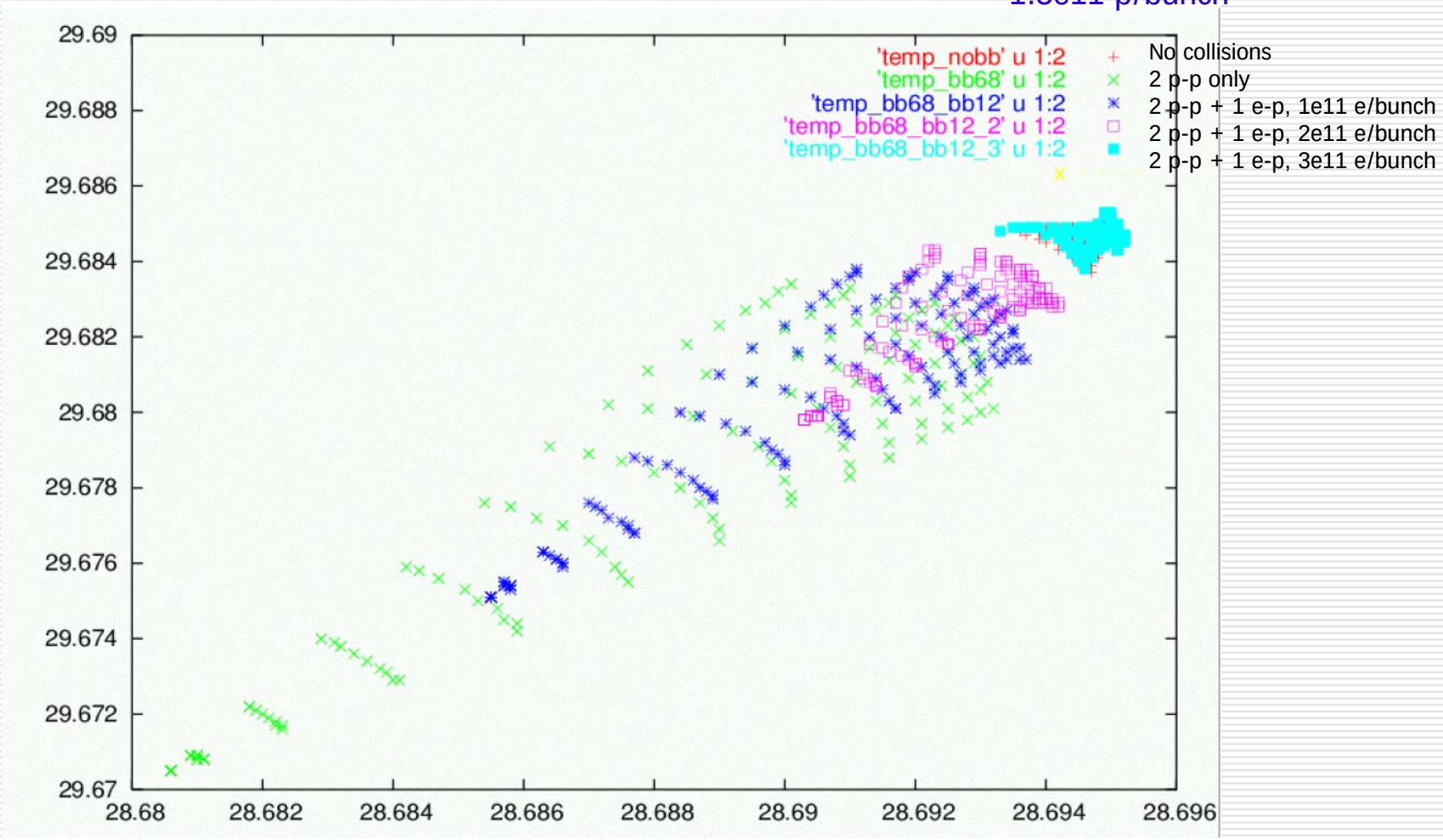
  Beam-beam simulation done for parallel operation mode demonstrated tune footprint compensation from e-p and p-p collision. Proton beam-beam parameter higher than present design value is possible.

  Further simulations are planned, including strong-strong beam-beam simulations.

# Beam-beam simulations (Yun Luo)

## Parallel mode: 2 p-p + 1 e-p collisions

1.5e11 p/bunch



# Ring-Ring Option

- **Recommendation**: Impedance budget for the components of the electron ring has to be examined in detail.

- **Response:** A comprehensive impedance and instability analysis of various devices is underway. (MIT-Bates)

- **Other recent developments in MIT-Bates include:**
  - Evaluation of possible usage of PEP-II RF system and magnets.
  - An engineering evaluation of the "Trombone" solution for electron beam path length adjustment.
  - The polarized source development.
    A mode locked laser system versus a DC laser followed by a synchronized RF bunching system.

# Linac-Ring

- **Recommendations:** Pursue the following R&D items with highest priority:
  - Prototype ERL
  - Design of the high power CW photo injector for cooling
  - 700 MHZ sc cavity development
- **Response:** Progress on those R&D items is in line with e-cooling development and will be reported in details in following talks.

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- **Recommendation:** Pursue the **R&D on a polarized high average power photo injector** with emphasis on cathode development and high quantum efficiency.
- **Response:**
  - Polarized source development is planned in collaboration between MIT-Bates and BNL.
  - This development can be in line with the development of source technology for ILC.

# Linac-Ring

- The committee pointed out to a list of beam dynamic issues which have to evaluated for linac-ring option.

- **Response:**
  - Simulations of multipass beam break instability are being done in collaboration with JLab.
  - Studies of kink instability are planned for near future.

- **Other important recent developments include:**
  - Further development of electron linac and recirculating passes optics.
  - Evaluation of optimal location of the linac facility on RHIC site.
  - Evaluation of possible use of PEP-II machine magnets in linac lattice.