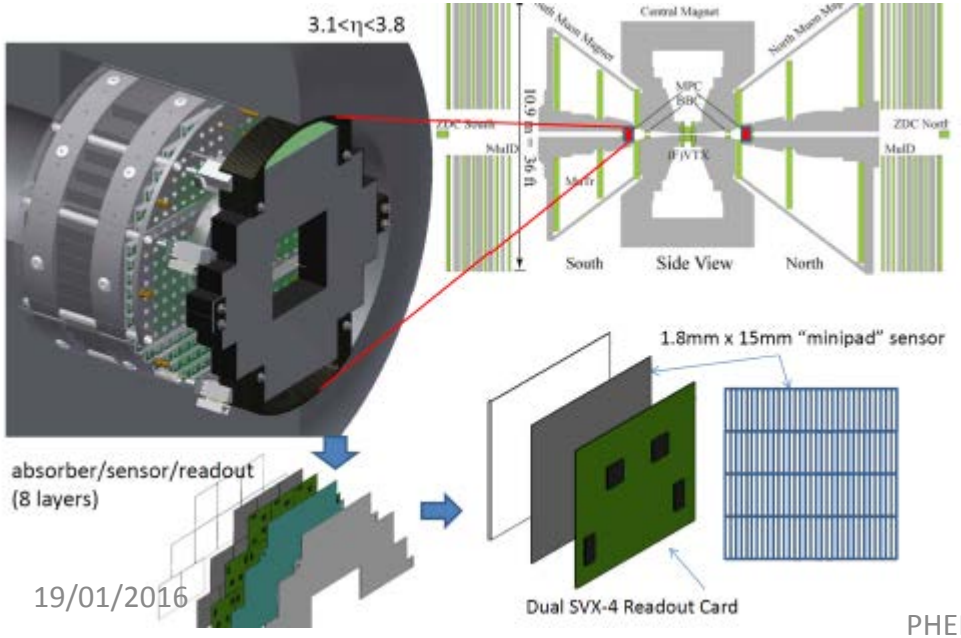
PHENIX Status
Rhic machine-experiment meeting
01/19/2016

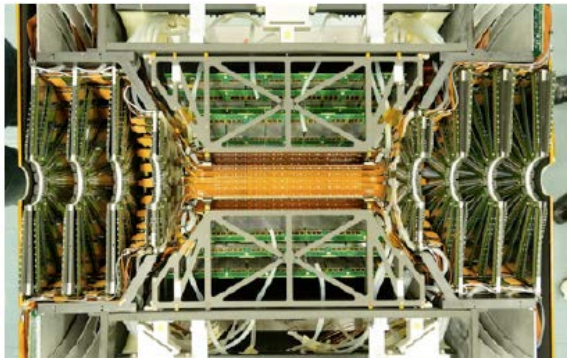
Denis Jouan

PHENIX Run Coordinator

Context

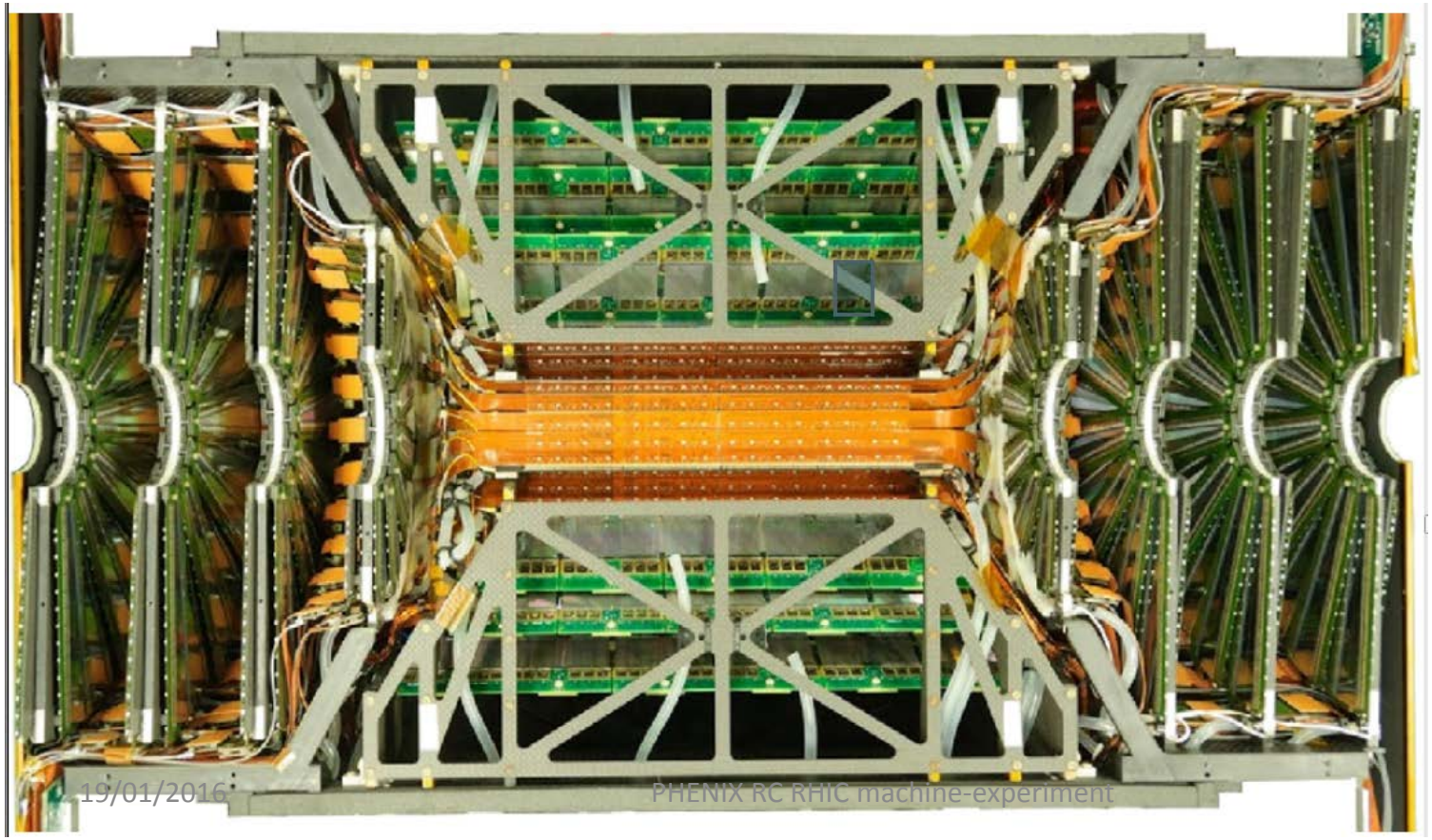
- Last PHENIX run
- Detector: with FVTX, VTX and MPC+MPC-EX
- AuAu 200: Increasing the dataset, HF-> double the data, complete HF measurement
- dAu energy scan : onset of QGP in small systems



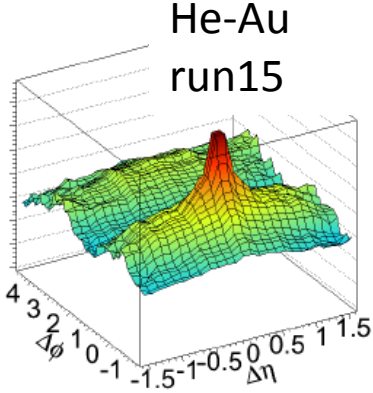


A very important requirement for collisions : |z|<10cm

- high intensity, **Stable**
- In the **|Z|<10cm** vertex



The extended coverage from this detector, brings new performances in d-Au: for instance the event plane



Au-Au 200 GeV

- **Au+Au @ 200 GeV for 10 weeks**

BUP: 1.8 /nb (12 Billion minimum bias events) recorded within |z| < 10 cm (added to the 2.3 /nb recorded in the longer and very successful Run-14)

- An increase of statistics, in particular if the z-vertex distribution is sharper.

Ideally : higher average luminosity (+25%) **flat during the store**, **in Zv<10cm**

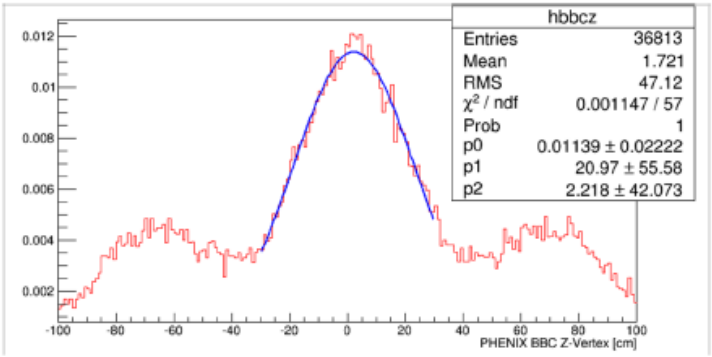
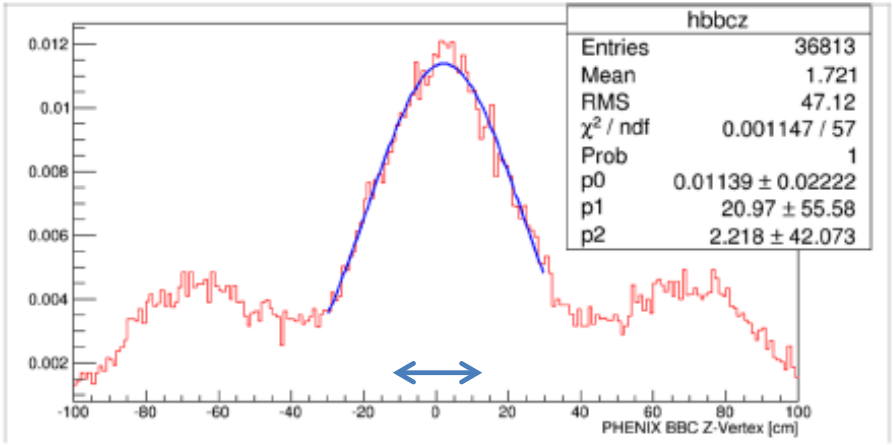


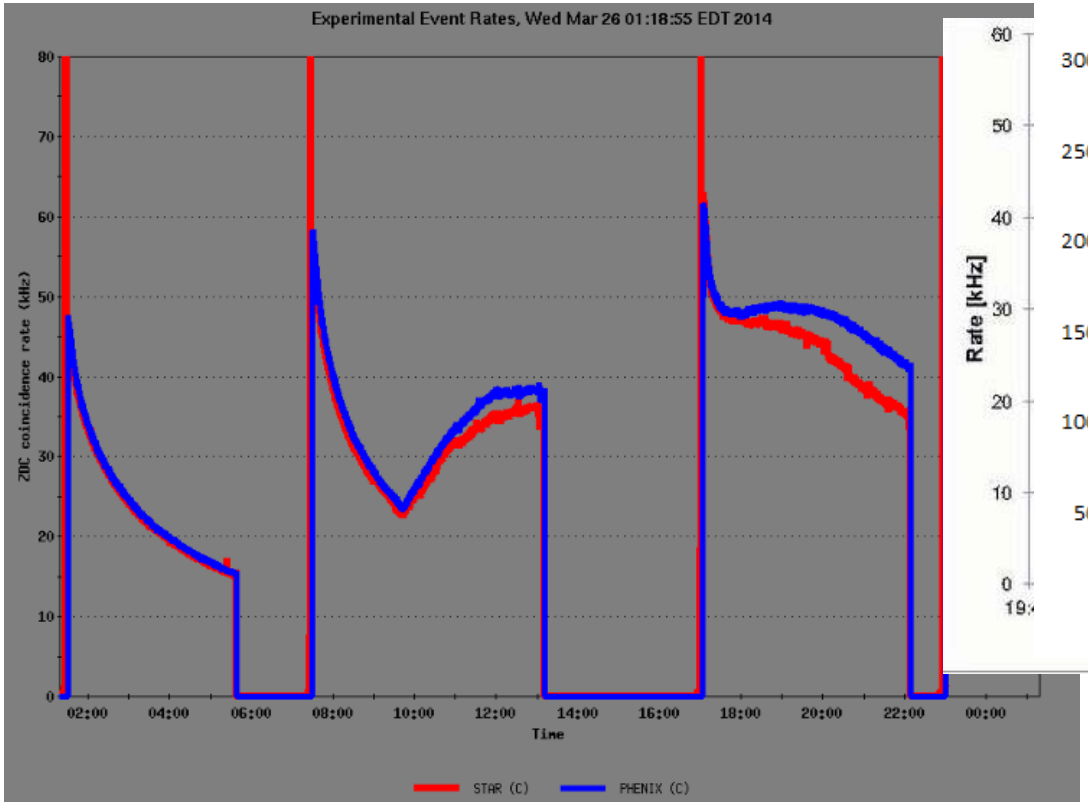
Figure 3.3: Run-14 Au+Au z-vertex distribution.

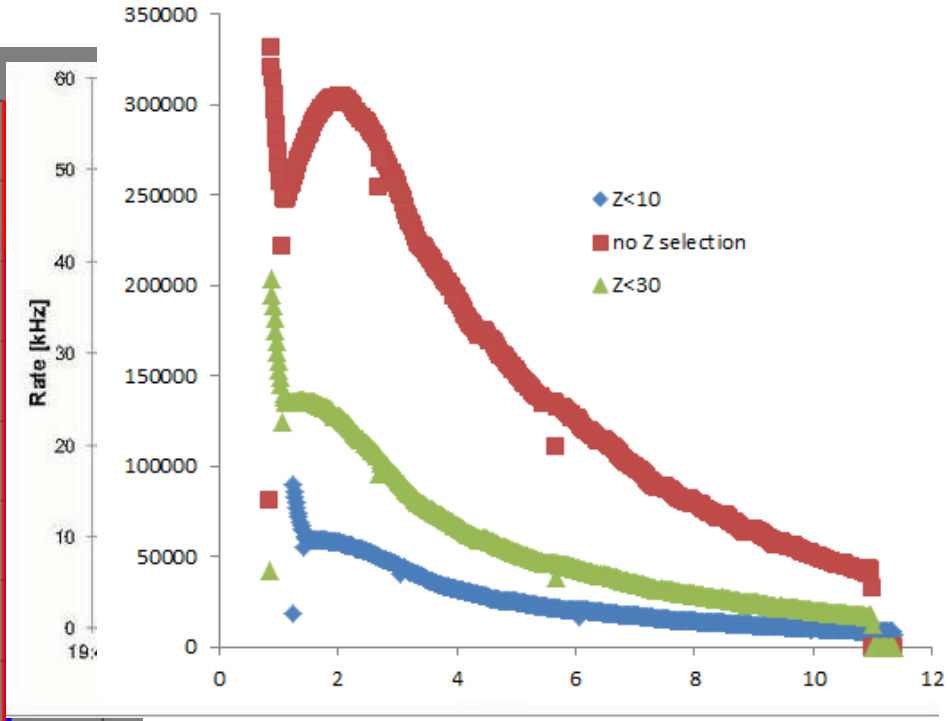
- With the ultimate PHENIX set up, bringing additionnal information for tracking in **HF studies: double the data, complete HF measurement**

Why flat & for Z<10cm ?

- High luminosity but
- in **Z<10cm** , and **stable**







A beautiful improvement of the luminosity

But Higher total luminosity does not imply higher integrated luminosity for z<10cm

D-Au BES: some extracts from the PAC June 2015:

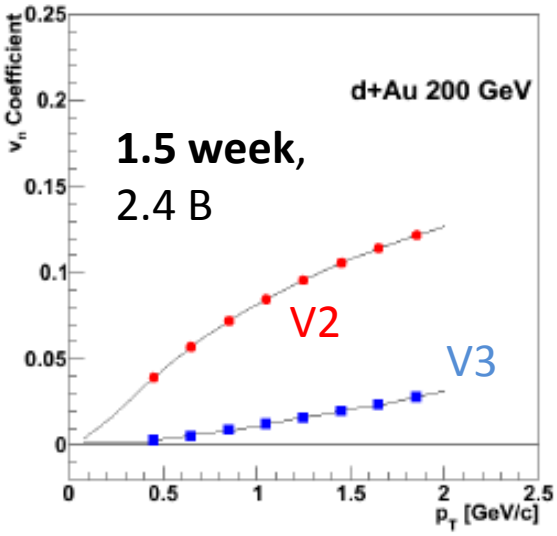
In "2.2 Discussion of run 16 priorities:"

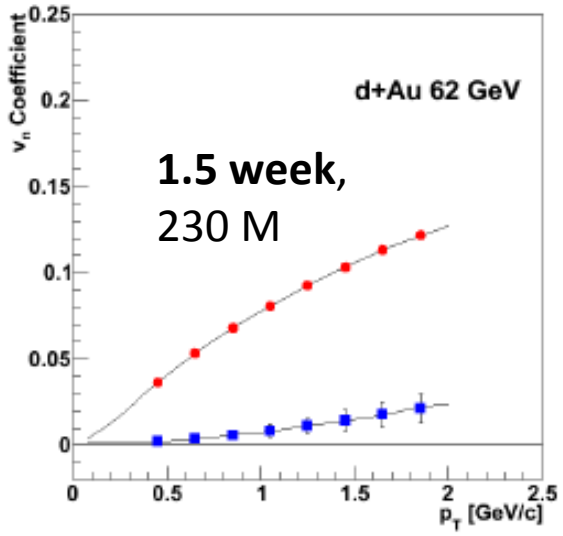
"2.2.2 Five to seven weeks of running to perform a small system beam energy scan: »

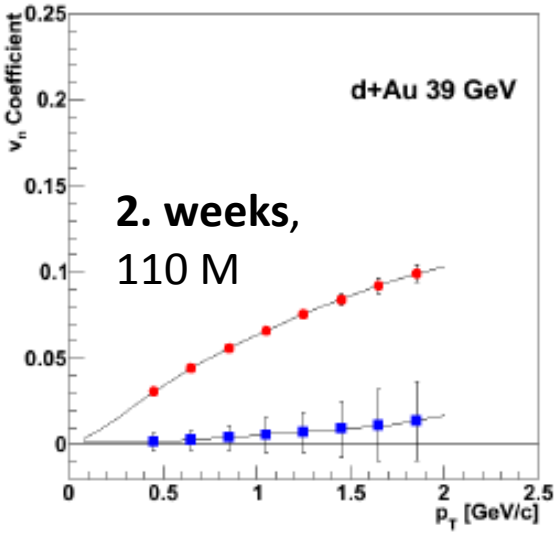
- ….« These measurements capitalize on the **unique and impressive versatility of the RHIC accelerator in providing a variety of collisions systems and energies."**
- … "**One of the hottest topics** in heavy ion physics in the past few years is the observed similarity between the behavior of many observables for p+p, p+A, d+A, 3He+A, and A+A, which poses the fundamental question of how small a system can exhibit thermalized QCD behavior. What is the smallest possible droplet of QGP, and how does the answer to this question depend on the collision energy and event multiplicity, which is to say on the temperature of the QGP in question? Addressing this newly opened, and challenging, question promises to deepen our understanding of, for example, which requirements have to be fulfilled for hydrodynamics to be applicable. »

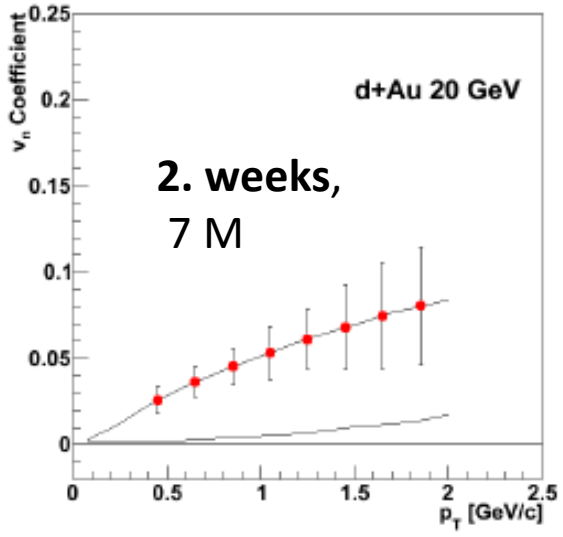
The PHENIX planned measurements in d-Au BES

- **excitation function of two-particle correlations** measured over a long range in pseudorapidity
- **excitation function of v2** measured using event plane in FVTX
- **first RHIC beam energy scanning measurement of v3 in small systems** using event plane in FVTX





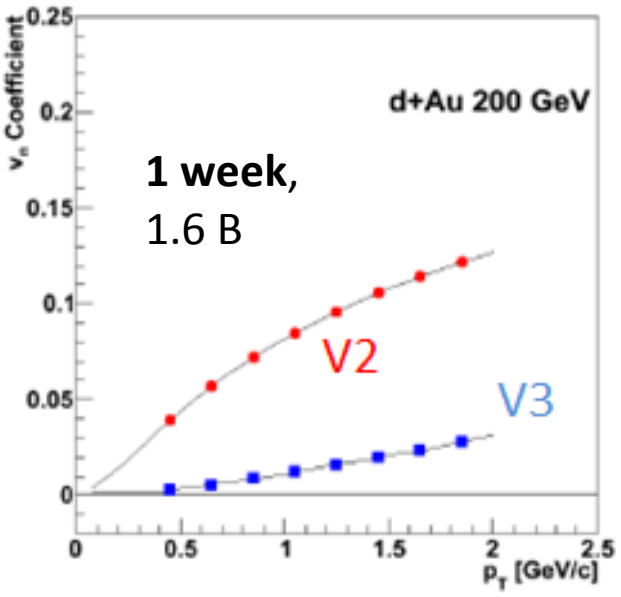


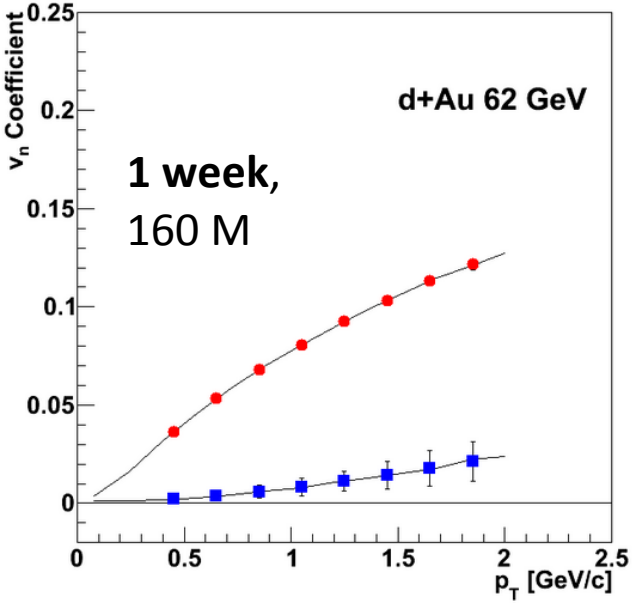


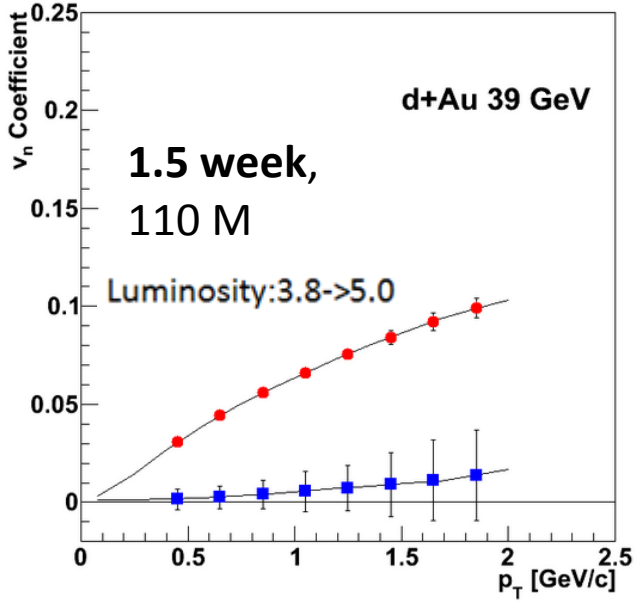
BUP : V2, (V3), 7 weeks

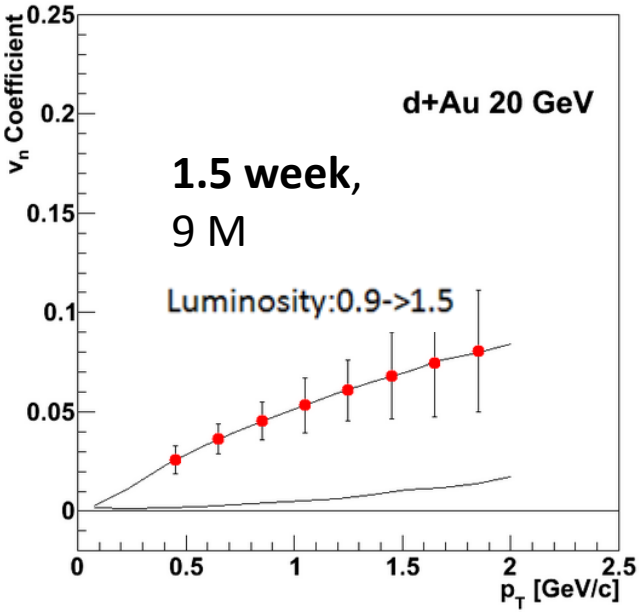
(Numbers are numbers of events in the 5% most central collisions, within |Z|<10cm)

Figure 3.17: Shown are projected uncertainties for measurements of v_2 and v_3 coefficients in 0-5% central d+Au collisions at 200, 62, 39, and 20 GeV energies in the top left, top right, lower left, and lower right panels respectively. For the much smaller data sample at the lowest energy of 20 GeV, we do not quote projected uncertainties for v_3 since it is not clear is the event-plane method determination will be robust.









***Reduction* to**
5 weeks
of data taking

Thanks to
the increase of
luminosity
foreseen at the lowest
energies,
the decrease of
beamtime is
compensated

Exploring the evolution
around 39 GeV and
from 200 to 20 GeV:
possible thanks to
the 4 energies

d-Au : 5 weeks, 4 energies

- **“Five to seven weeks** of running to perform a small system beam energy scan (PAC) »

Our optimized choice for **5 weeks**:

- 20 GeV 1.5 week 9M (BUP: 7M)
- 39 GeV 1.5 week 110M (110M)
- 62 GeV 1. week 160M (230M)
- 200 GeV 1. week 1.6 B (2.4B)

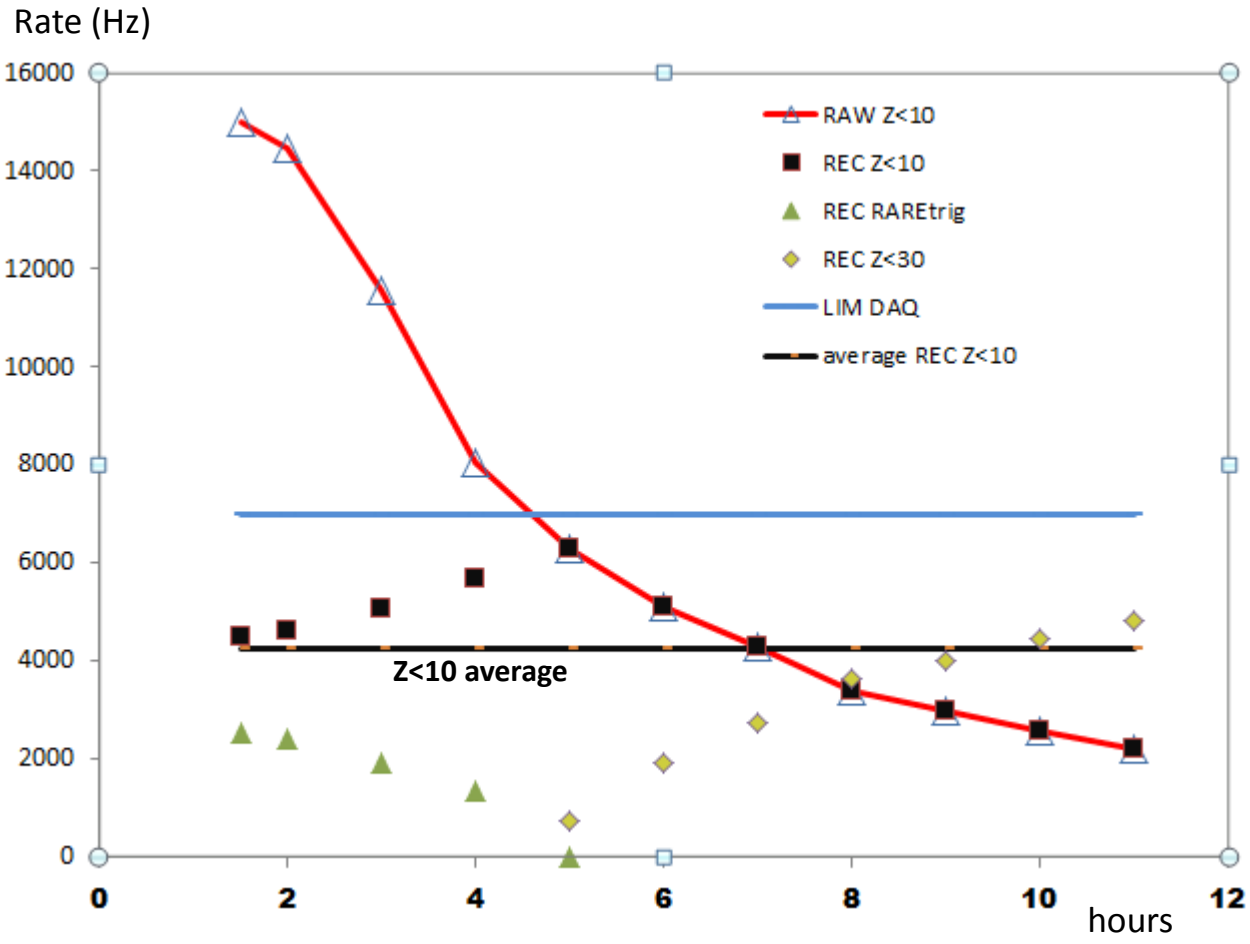
Allowing a complete energy scan in the same detection conditions, and keeping BUP and PAC goals of measuring the excitation function of 2-particle correlations and V2, and possibly - the first BES measurement of V3 in small systems at RHIC.

Store stability: Au Au

Acquisition rate : 6-7 KHz

At beginning of store, part of the bandwidth (1KHz) is devoted to rare triggers

the second part of the store causes a lowering of the average rate of Z<10cm events



An important gain on « effective luminosity » for phenix should be to **keep the Z<10cm rate above 7KHz** in the 2/3 second part of the store

Store stability : d-Au

- d-Au 200 GeV: high rate 1MHz already expected at the start
- Pile up becomes probable
- Here again stable rates would improve

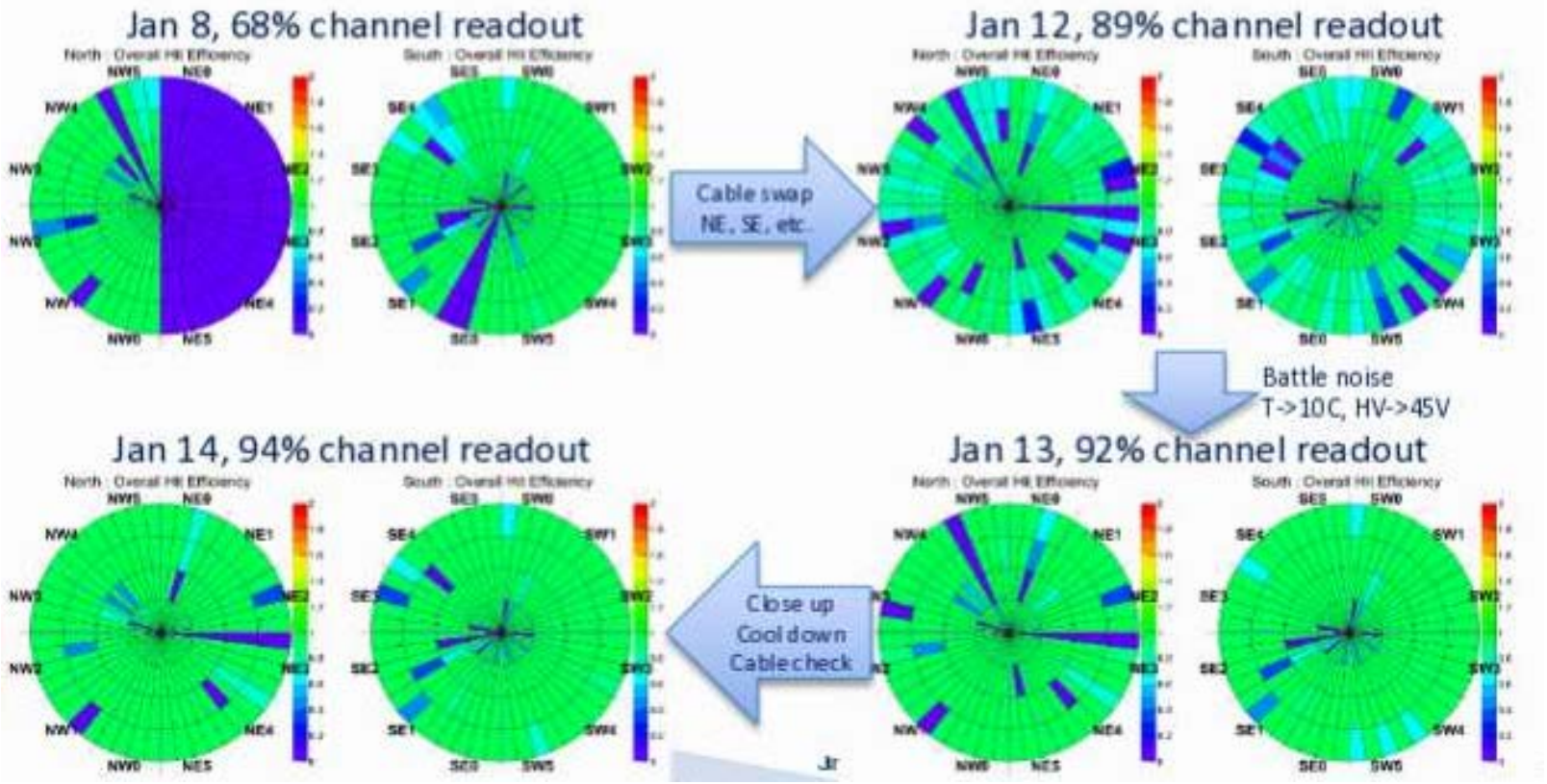
Conclusion:
more stability should be at higher priority than more intensity.

Calendar

- Shield wall closed
- Watch shifts started 12 January
- blue Sheet: 13 january
- flammable gaz started the 14 january
- subsystems initial setting up done or ongoing
- Cosmics about to start
- Replacement UPS 15KV about to be temporary connected
- Cooldown 19 January
- Beam setup, Expect to lose access to IR on Jan. 22
- Full shifts 26 January
- First (physics) collisions in PHENIX expected by Feb

illustration : the FVTX

- Before new year: install, cabled up
- Week Jan 11: checkout, establish communication to detector
- Week Jan 18: closed up, cooled down, further fixes



Tests ongoing

Thanks

These measurements capitalize on the **unique and impressive versatility of the RHIC accelerator in providing a variety of collisions systems and energies. [PAC, June 2015]**