Overview and Status of BRAHMS

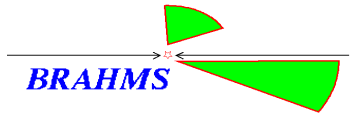
Krakow,
June 4-7, 2003

F. Videbœk

Physics Department

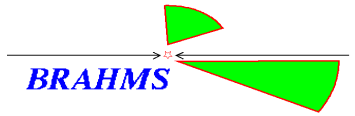
Brookhaven National Laboratory

Presentation Content



- RUN-3 d-Au and pp
  - Machine performance
  - Brahms measurements, accomplishments and issues.
- Analysis and publications
  - Publications and nearly completed analysis
- Near and Longer term plans
  - RBUP (end August)
  - Future document (End June)
- Preparations for run-4
  - Repairs, Upgrades
- Other Collaboration issues
  - Collaboration, Manpower
  - Talks & publications.
  - Communication

RHIC status – Beam Schedule



The actual schedule was not so different from the plans in December,

- Dec 3- Blue (d) Cold; “2 week” setup
- Dec 9 -yellow cold.
- Dec 23 - first collisions at store, “3 week setup”
- Jan 12 - d Au physics starts “(9 days late)
- Mar 24 - end d-Au (3 days extension – no blue Au background studies)
- Mar 24 -pp setup “5 week setup”
- Apr 10 - pp and detector commissioning
- Apr 28 - pp physics run (late by
- May 19 “48 hour pp2pp physics run”
- May 23 – kill the small guys.
- May 30 – end RHIC RUN-3 (Phenix got 350 nb-1 for pp)

RHIC issues during running.

- **RHIC Run Plan.**
  - Lack of Federal Budget and continuing resolution until Feb followed by budget uncertainties due to war on Iraq . Actual funding for pp run was essentially not known until the last minute
  - CA-D took a conservative approach to the run with a setup time 2 weeks + 3 weeks to reach minimal goal.
  - This was not met for either species even though Physics running was declared with only minor delay compare to plan.
  - It took many weeks to figure out the d-Au backgrounds, limiting apertures I.e the reason for going to beta(*)=3
  - Last ~ 3 weeks of dAu delivered ~ ½]

RHIC Machine/Detector Planning Meeting

19 Mar 2003
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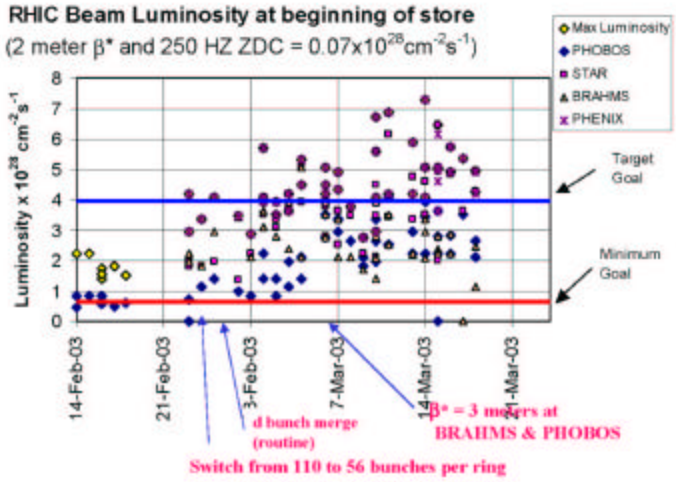
Numerous machine problems in d-Au run.

Large backgrounds (beta* 2->3)

Beam-beam interactions (110->56 bunches)

Tune issues due to asymmetric beams.

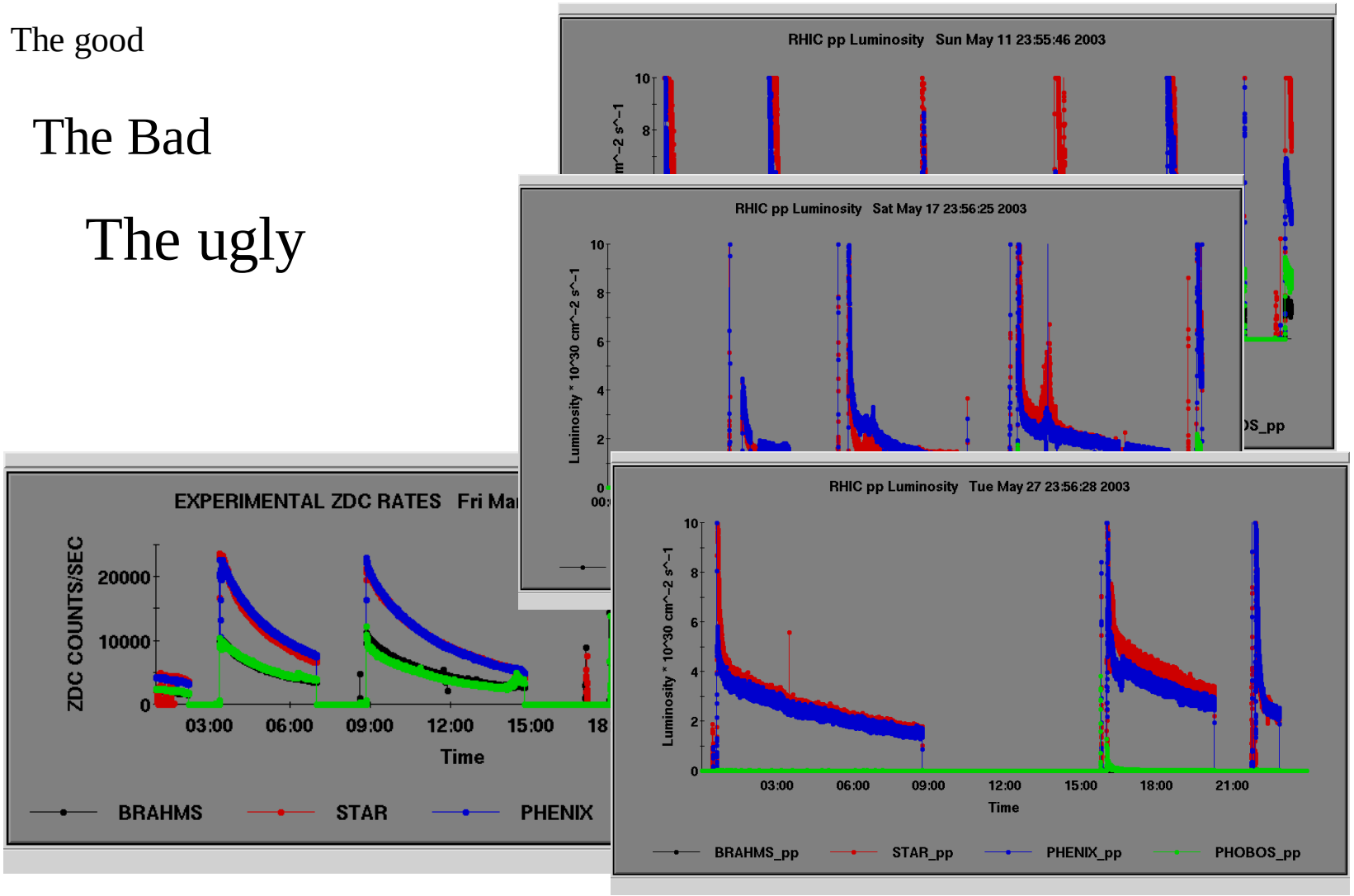


Machine Performance

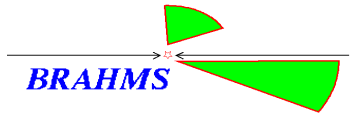
The good

The Bad

The ugly

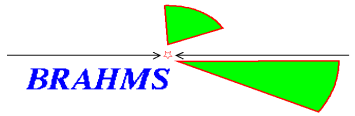


pp Running



- The pp run failed in
  - Intensity below minimal goal
  - Uptime ~35%
  - Polarization ~25-30% in most stores
- A major component in this years pp running was the spin program, and thus good tunes that preserve polarization were clearly more difficult to get. In addition the snake in the yellow ring had problems (could not run at full field).
- The additional week of running that was only funded very late was argued by the virtue of the A_{LL} of measurements in Star an Phenix. There are also indications that it is in fact difficult, but not impossible, to get good tunes where the multiple interactions point causes beam losses (change in lifetime)
- The decision was justified, but the process NOT.
- The 2-IR running mode may be the de facto mode for pp running in the future due to the (perceived?) machine issues associated with this, and BRAHMS pp running may have to be for dedicated physics (e.g. Ann) as I will come back to later.

Expected and achieved Luminosities



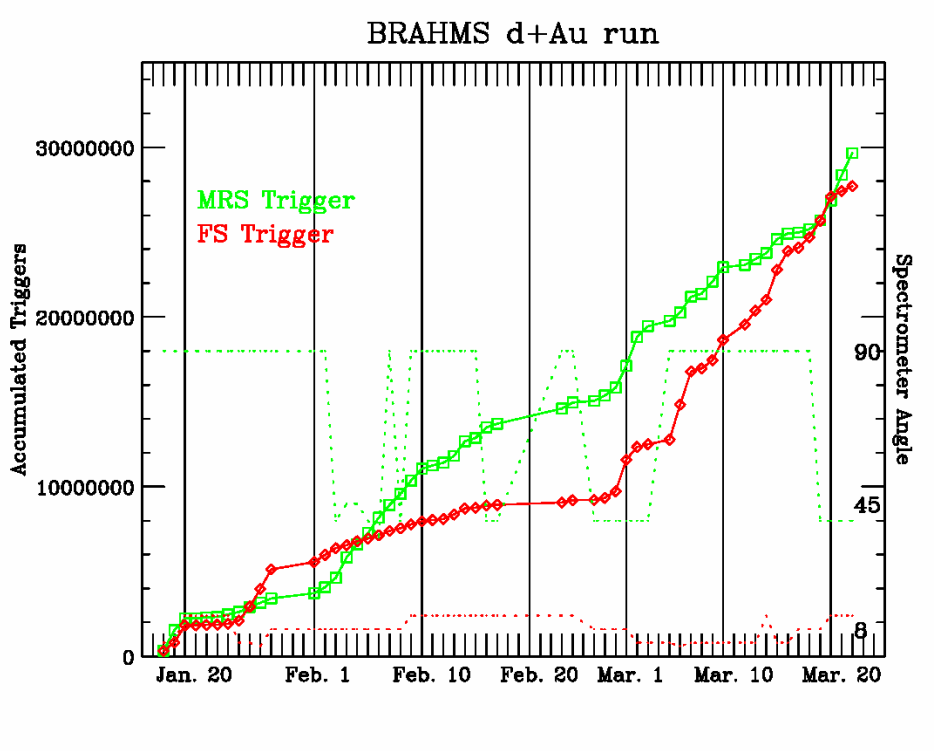
Our request for d-Au was for 20 **$(nb)^{-1}$**.

Actually close to delivered, but the misc. changes in INEL setup did reduced the amount of data taken, as well as less within useful vertex.

We could have used an extra week in d-Au.

Mode	bunches	Ions per bunch	L(ave)/wk	Integral	Delivered
p p*	56	70 x (10**9)	**0.3 $(pb)^{-1}$**	**1$(pb)^{-1}$**	**.1$(pb)^{-1}$**
d Au	**56**	**20(d)0.7(au)**	**0.7 $(nb)^{-1}$** **4.0 $(nb)^{-1}$**	**8 $(nb)^{-1}$** **40 $(nb)^{-1}$**	**15 $(nb)^{-1}$**

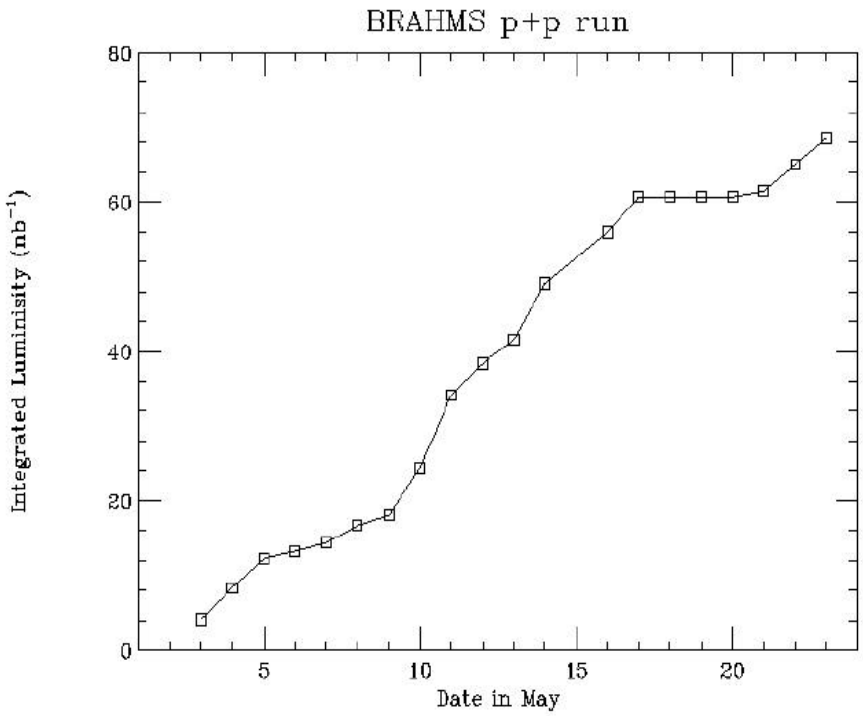
D-Au summary



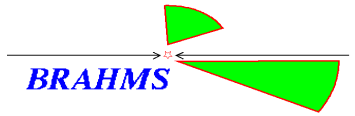
- Low-pt survey: Done
- High-pt at selected rapidities (~0,1,2,3)

  - MRS: 27% of 15 nb^{-1} (9M at 90deg: 2.6nb^{-1}, 10M at 40 deg:1.4 nb^{-1})
  - FS: 20% of 15 nb^{-1} (4M at 4 deg, 1.2M at 12deg)

pp summary

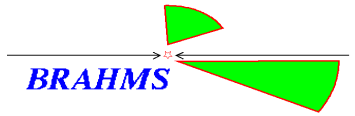


- **69 nb^{-1}** integrated luminosity taken (May 3-23) (RHIC delivered ~ 300 **nb^{-1}**) (Counting inelastic triggers in 5.5 ns timing window)
- y~3 high-pt measurement: up to pt ~ 3 GeV/*c* for ?? ???? ?stat. err.)
- Limited statistics for y~2 high-pt measurement (pt~2.5 GeV/*c* ?? (10% stat. err.)
- + limited stat. at y~0,1
- No meaningful spin (transverse asymmetry) measurement done



Brahms time tables.

- January 24 – Fix multiple crashes in event-builder
- January 24 – Also start of summarized data-run though some earlier may be useable.
- March 3 – Install C4
- March 8 – C4 in running mode
- March 10 – Final re-arrangement of INL setup (discr+adc) optimal vertex resolution.
- March 23 – end of d-Au run.
- April 30 - first pp data
- May 19 – pp2pp run
- May 23 – terminated to optimize additional week for STAR+Phenix $A_{LL.}$

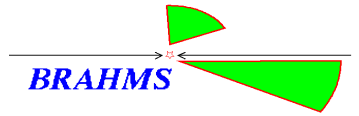


Detector issues.

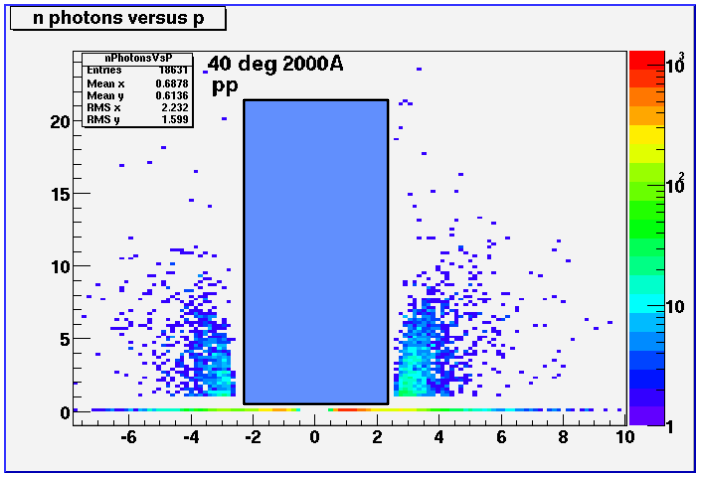
Complete Upgrades, Repairs, new problems

- DC – HV distributions T3,T4,T5 – worked well
  - Additional HV supplies (no 1471P spares) still no- funding !?
  - DC (T3) developed breakdowns – repaired for pp run.
- Si – some time during pp developed high leakage current for several wafers.
- TPC gas flow/fields.Large non-linear effect on X,Y vs. pad time.
  - All chambers foils replaced by Al.
  - Drift velocities in/out very consistent and matches DVM data (RD)
  - The Hubble effects is still there !! Field/design issue most likely. ==>live with it.
- Calibration fibers
  - Reinstalled + one new set. (MRS).
- Shielding for BFS detectors.
  - Complete shielding installed in IR for BFS
  - Additional shielding installed in tunnel. Qualitative improvement, quantitative ?
  - MRS was operate in pp with shielding at 40 deg
- ZDC tubes replaced – seems ok; missing cross calibration
- Magnets – lots of running at high field, some problems with D1,D2 overheating..
  - Probably lost up to 2 shifts of data due to this.
- FEH air conditioning lost maybe 5-6 shift of data taking due to this

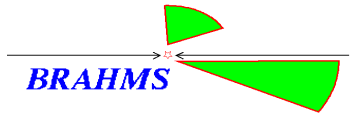
New Detectors components in d-Au and pp running



- High p_t Cherenkov
  - Aimed for run-3 pions 3.0 - 6 GeV/c
  - Installation was later than hoped for (early March)
  - Seems promising (more later)
- Trigger counters for FS and MRS
  - These are a must for dAu and pp running.
  - MRST0 use extensively
- Min Bias and vertex trigger
  - CC counters were installed late for pp run. Looks promising as (vertex) tools in pp and light ions.



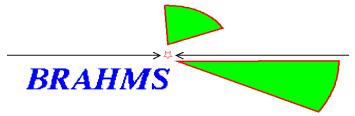
Summary of d–Au / pp run



All runs have been summarized on web page, here I give a brief break down

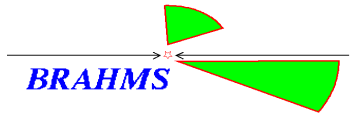
Angle	Field	d-Au	pp
90	250 A/B	350	150 (noB)
90	1050A/B	3,500	500
45	500A/B	400	
40	500 A/B 1050A/B 2000B|A	400 2,000 3,000 (L)	 800 2,700 (L)
35	500 A/B	350	

FS overview



Angle	Field	d-Au	pp
3	¼ AB	300	
	1/2AB	300	
4	1/8AB	300	
	1/4AB	300	40
	1/2AB		40
	1/1AB	*200*	*130*
8	1/15AB	200	250
	1/8AB	200	250
	1/4AB	200	250
12	1/15AB	400	
	1/8AB	2,000	800
	1/4AB	3,000 (L)	2,700
	1/4A	*48*	*9*
	1/2A	*3.2*	*3.7*

Shift activity and efficiency in my perspective

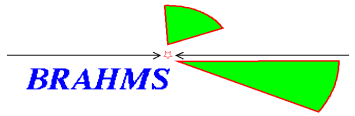


- Shift and data taking
  - Based on recommendation at last meeting the procedures were stream-lined.
  - The e-log (thanks Hiro) has been tremendously successful.
  - Monitor programs have been improved.
  - The update Web instruction (thanks Steve) was found useful to most.
  - There is still to much oral tradition handed over from shift to shift, and information gets lost. It is still fairly in-efficient for people to come in for less than a (single) week due training requirements, an due to learning the knobs at the experiment.
  - Having people stationed for longer period (1-2 month) is tremendously useful for the running of experiment. Having some more experienced people do the same would really help spread out the overall experience (This people could take up the period coordinator responsibilities which was basically carried out by me(keeping track of run-plan), Dana(checking detectors) and JHL (coordination meeting contact)
  - The actual planning of shift was much more quirky than anticipated due to the never ending changes in schedule (accesses, beam-experiments etc)

Period coordinator

- Responsibilities
  - Coordinate shifts, daily checkout, first contact for problems.
  - At least 2 weeks, best 3-4 weeks
- It would be exceedingly useful if some-one agreed to do this next run period. (arrange teaching,other duties)

Shift Coverage

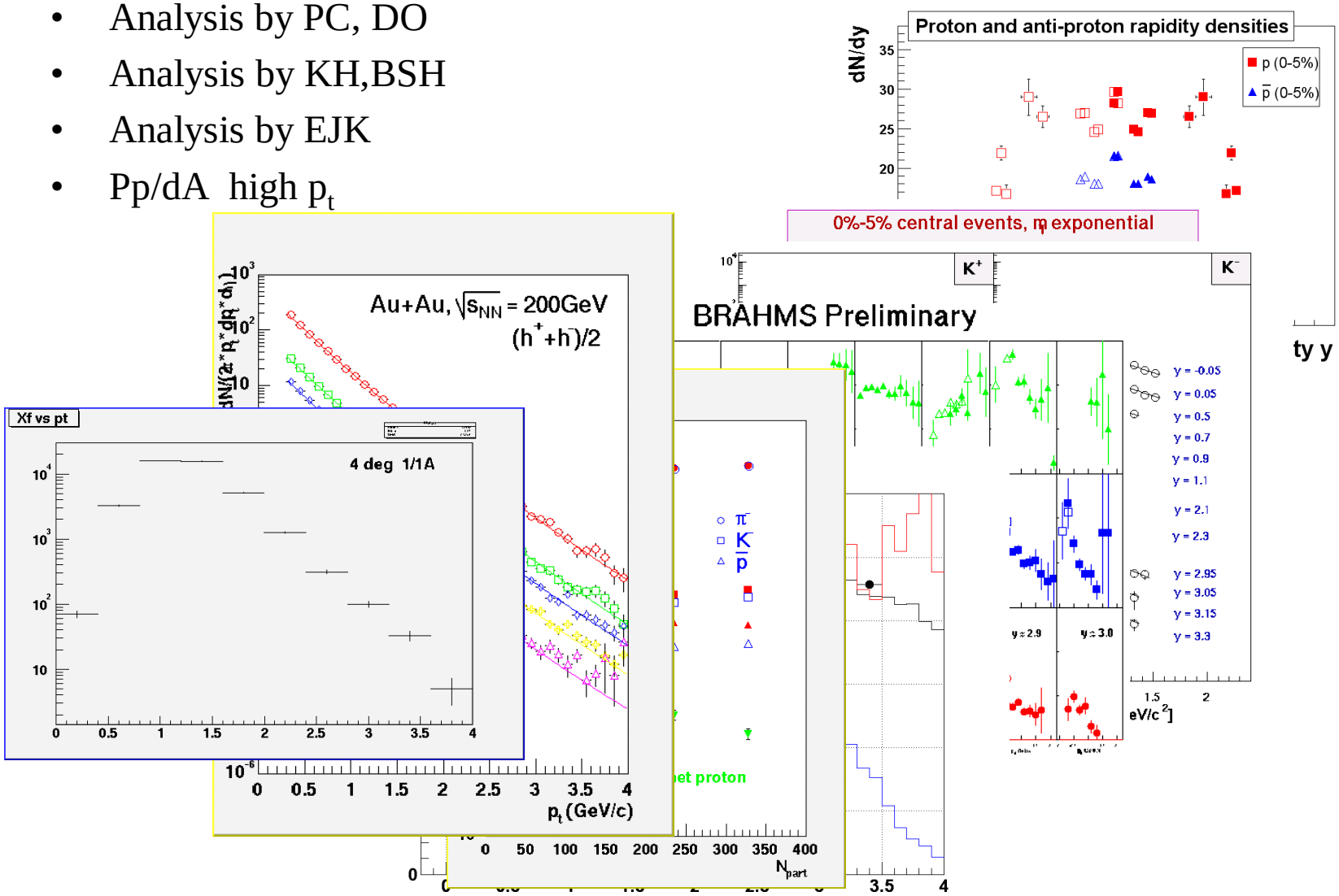


- Pre-run estimate
  - 450 shifts to be covered (Jan 1 – May 15) (1 per shift)
  - Initial commissioning of detectors, triggers. (~20 shifts)

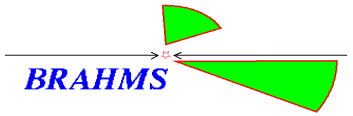
inst	Shift active	d-Au	p-p	total	Shifts/ person
BNL	6	16	28	54	9
TAMU	3	30	14	44	15
JH	1	15			15
NYU	1	5	2	7	7
UKansas	3	21	7	28	9
Krakow	4	30	14	44	11
Bergen Olso	6.5	36 28		36 28	9.8
NBI	6	27	10	37	6
Bucharest	5	35			7
IRES	1	10		10	10
Totals	**36**	**253**	**75**	**328**	

Highlights

- Analysis by PC, DO
- Analysis by KH,BSH
- Analysis by EJK
- Pp/dA high p_t

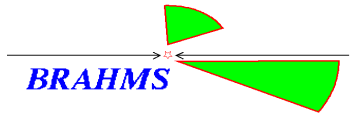


Analysis



- Analysis has been continuing even during the run ; in part also because there are students that have been finishing Ph.D. thesis's.
  - P.Christiansen ‘stopping’ (congratulations)
  - D.Ouerdane ‘Kaon, pions rapidity (final congratulations will have to wait a little)
  - Master Sc.
    - Christian Holm (multiplicity fluctuations)
    - .Sandberg (Transverse expansion)
- Analysis Goals (set forth last – made significant progress)

  See a set of specific analysis goals and papers from run-2.
  - Proton distributions and stopping
  - Produced particles K,? rapidity dependence
  - Centrality dependence (at least at y~0)
  - High p_t analysis y~0,1,2
  - pp particle spectra.
  - Will also hear on Lambda’s..
- A good part of this meeting is devoted to an in-depth discussion of the data, analysis and physics so it can proceed to the paper writing and publication stage.

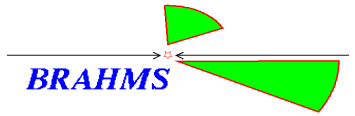


Previous Plans for analysis

- In addition to overall goals of
  - PID, efficiencies, common dst, acceptance code
- Establish sub-groups from different inst that works on specific analysis and communicates at regular intervals on programs.
  - Example: pp analysis in TAMU & Oslo.
- The aim is to mature the analysis, document it in form of analysis notes, proceeding to publication writing.

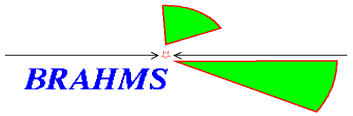
- Well – this has not happened extensively (but we got a few thesis, and some draft analysis notes)
- A coherent effort has to be made towards a common approach.
  - The DST and acceptance is a case in point
  - Another issue is that pp and d-Au requires other ways than central Au-Au. Not all assumptions e.g in how calibrations works, and how PID an even angle calculations is the ame.
- Must spend time on this. A start is the DST discussion later this meeting.

Beam Use proposal



- This will be discussed in more details later. Here I just want to emphasize
  - it should be discussed in view of the next few years running.
  - It has to be strong in terms of physics.
  - The plan should work together with anticipated upgrades.
- The deadline is August 28 for submission, and the PAC meeting at end September.

Future Engagements



BRAHMS baseline program

The basic program (au-Au, Si-Si, pA and pp) at max RHIC energy was anticipated to be completed during the RUN-3 and RUN-4. With the likely 1 specie per year we may need another one run period. Can we handle this within the collaboration?

At least Bergen/Oslo and NBI has commitments to LHC that means ceasing active participation in additional runs/ plans.Commitments may be smaller in Run-5

After about Run-5 the size of Collaboration is too small to run a full scale RHIC program.

Can **RHIC** deliver both Au-Au and Light Ion beam during 04 run in view of the steady commitment to pp running?

Is there enough interest and commitments of people to run a AA/pp program in fy05? I think so based on responses. FY06 will have to be discussed.

Upgrades for Run-4

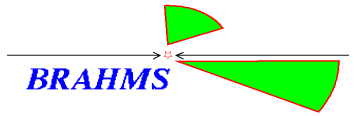
- Flow measurements
- Triggers, trigger system.
- Additional detectors. If the earlier proposed physics addition to Brahms in this run has to be possible a real commitments has to be made.

Discussion on future – possibilities

Informal discussions have started with with groups in Phobos for explore scope ‘small’ experiment that would run after base-line Brahms+Phobos

Focus on specific short term opportunities e.g. in spin physics, or special HI ideas.

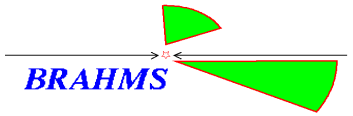
Talks, Publications



- The year since last collaboration meeting has been productive
- Publication in refereed journals
  - 200 GeV Rapidity dependent ratios.
  - RHIC NIM paper in print.
- Proceedings & talks
  - ICHep Amsterdam, Dieter
  - PANIC Osaka. P.Christiansen, H. Ito, J.I. Jordre
  - INTP, Seattle IG.Bearden.
  - 19'th Winter workshop Breckenridge; F.Videbaek, R.Debbe
  - Strange Q.Matter, March NC, J.H.Lee
  - Nordic Nuclear Physics meeting, Olso May 16, I.G.Bearden.
  - CINAP03, May 18 – NYC R.Debbe
  - 8'th Wigner Symposium, May 28, CUNY, F.Videbaek
  - CMS workshop, Delphi – next week – M. Murray

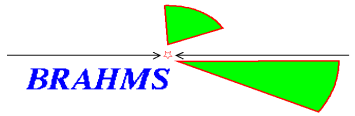
- We should attempt to have talks posted or our web-page.
- I know it is nearly impossible, but It would be useful to have presentation (drafts) posted too. Other exp. have this as a requirement.

Upcoming Conferences.



- **VIII International Conference on Nucleus-Nucleus Collisions**
  Moscow, Russia
  June 17-21, 2003
  - JJGardhoje + (CEJ, C.Ristea,O.Ristea - abstracts)
- **HEP2003 - International Europhysics Conference on High Energy Physics**
  Aachen, Germany
  July 17-23, 2003
  - Parallel session D.Roehrich Convenor
    - Abstract by JIJordre
- **Fifth General Conference of the Balkan Physical Union**
  AUGUST 25-29, 2003
  Vrnjacka Banja, SERBIA and MONTENEGRO,
  - Lovhojden
- **DNP meeting**
  - Tuscon AZ, October 28-Novermber 1
  - Abstract deadline July 1 (including mini-symposium)
- **Quark Matter 2004**
  Oakland, California, USA
  January 11-17, 2004
  - Abstract deadline Sept 1, 2003
- INPC'04
  The Swedish Exhibition and Congress Centre, Göteborg
  June 27 - July 2, 2004

Collaboration Issues



- Communication
  - Local meetings
  - Area meetings
  - Analysis Notes
    - On all of these I think we can do better. It is very important since the collaboration is widely distributed. It takes a while to write a note but it does also help in clarifying what is done.
  - How can be enhance communication. For a while the monthly reports worked, but mainly for reasons of 'overload' I did not request this during the run. Again as said before having an alternate responsible for this would be good.
  - Abstracts, proceedings.
    - The 'reader' primarily responsible for careful reading, seems to work well.
- Brahms and the community
  - Getting talks at meetings.Brahms is still being offered a reasonable number of slots at many meetings. I am not happy with our internal process for speaker selection.
  - Most often it ends with me having to designate people in the last moment.
    - Have a 'speakers bureau' (two persons + fv) that receives, post on web/send to coll, and maintains list of talks given, and make recommendation to Inst.Rep who should speak. For conf like QM we may have a broader discussion with the inst.
  - All abstracts should be posted before submission.
  - Active participation in workshops.