

STAR's Plans for Remainder of Run 18

Run 18 request

Assuming 15 cryo-weeks (including 2 weeks for CeC tests)

Beam Energy (GeV/nucleon)	$\sqrt{s_{NN}}$ (GeV)	Run Time	Species	Number Events	Priority	Sequence
100	200	3.5 weeks	Ru+Ru	1.2B MB	1	1
100	200	3.5 weeks	Zr+Zr	1.2B MB	1	2
13.5	27	3 weeks	Au+Au	1B MB	2	3
3.85	3.0 (FXT)	2 days	Au+Au	100M MB	3	4

Ru⁹⁶, Zr⁹⁶ - Expectation that Ru generates higher B-field while keeping everything else “constant”

Study effect on CME measurements

Inform on low p_T di-lepton excess

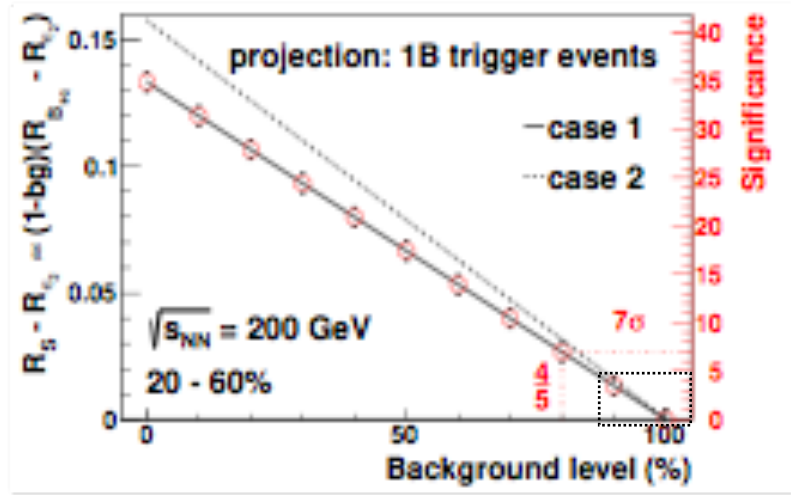
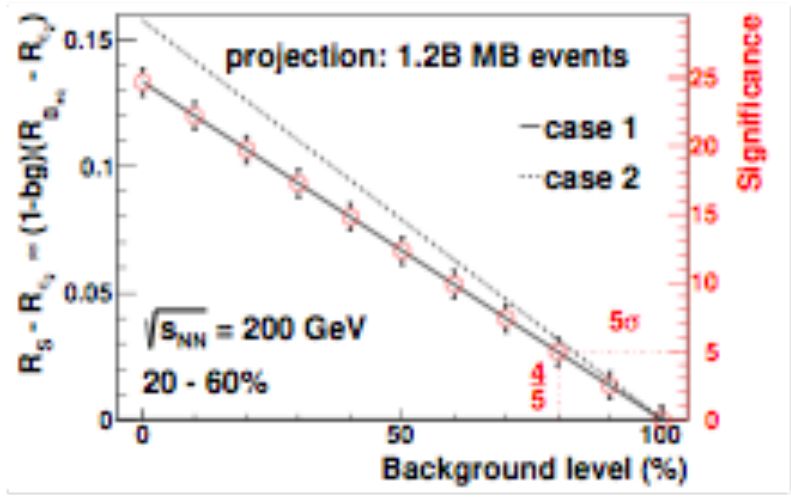
Au+Au 27 GeV - High statistics (anti)Lambda global polarization measurements. EPD presence important

First intermediate mass measurement from di-leptons

Au+Au 3.0 GeV (or 3.2) - Good statistics fluctuation measurements between the recent HADES and our ~~7.7 GeV. Competition with BM@N~~ (NICA) scheduled for 2019

CME Request in STAR's BUR

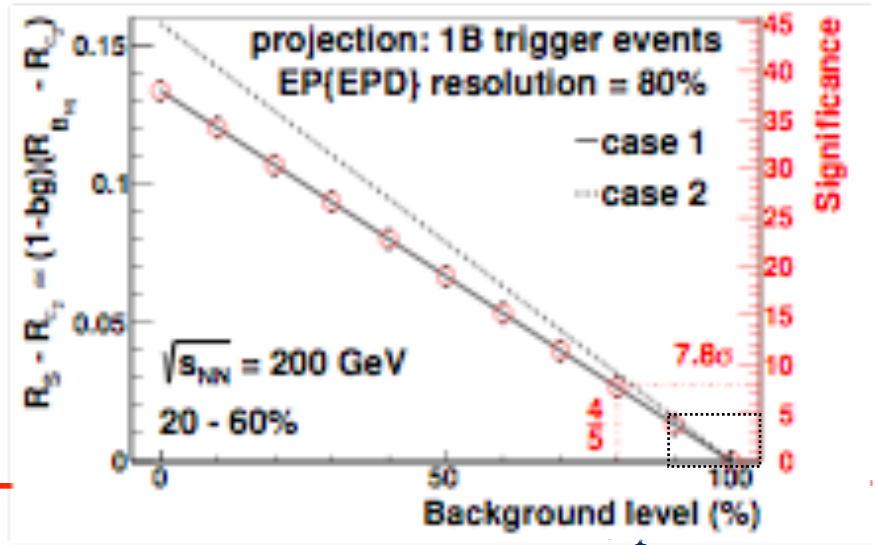
Events are quoted as "Good events" assuming Good = 0.8*Recorded Events



Request was minimum 1.5 B events **BUT** we already noted that significance was greatly improved ($5\sigma \rightarrow 7\sigma$) if we took 1B mid-central triggers, which equates to 2.5-3B recorded minibus events

Inclusion of the EPD $7\sigma \rightarrow 7.8\sigma$

If we collect 2.7B minibias with EPD
We could rule out at 5σ at 85%
background level



Additional Improvements

Another goal of the isobar running is to inform on the origin of the low- p_T dilepton excess as presented

Table 7: The expected dielectron data over cocktail ratios in the mass region $0.4 - 0.76$ GeV/c^2 for $p_T < 0.15$ GeV/c with 1.2 billion minimum-bias isobaric collisions and the projected differences between Zr+Zr and Ru+Ru collisions for the two physics scenarios.

mass range $0.4 < m < 0.76$ GeV/c^2

Physics process	data/cocktail 47 - 75% Ru+Ru	data/cocktail 47 - 75% Zr+Zr	Difference between Ru+Ru and Zr+Zr
Photonuclear	16.1 ± 0.4	14.3 ± 0.4	1.8 ± 0.6 (3.0σ)
Two-photon	17.4 ± 0.4	14.2 ± 0.4	3.2 ± 0.6 (5.3σ)

mass range $3 < m < 3.2$ GeV/c^2

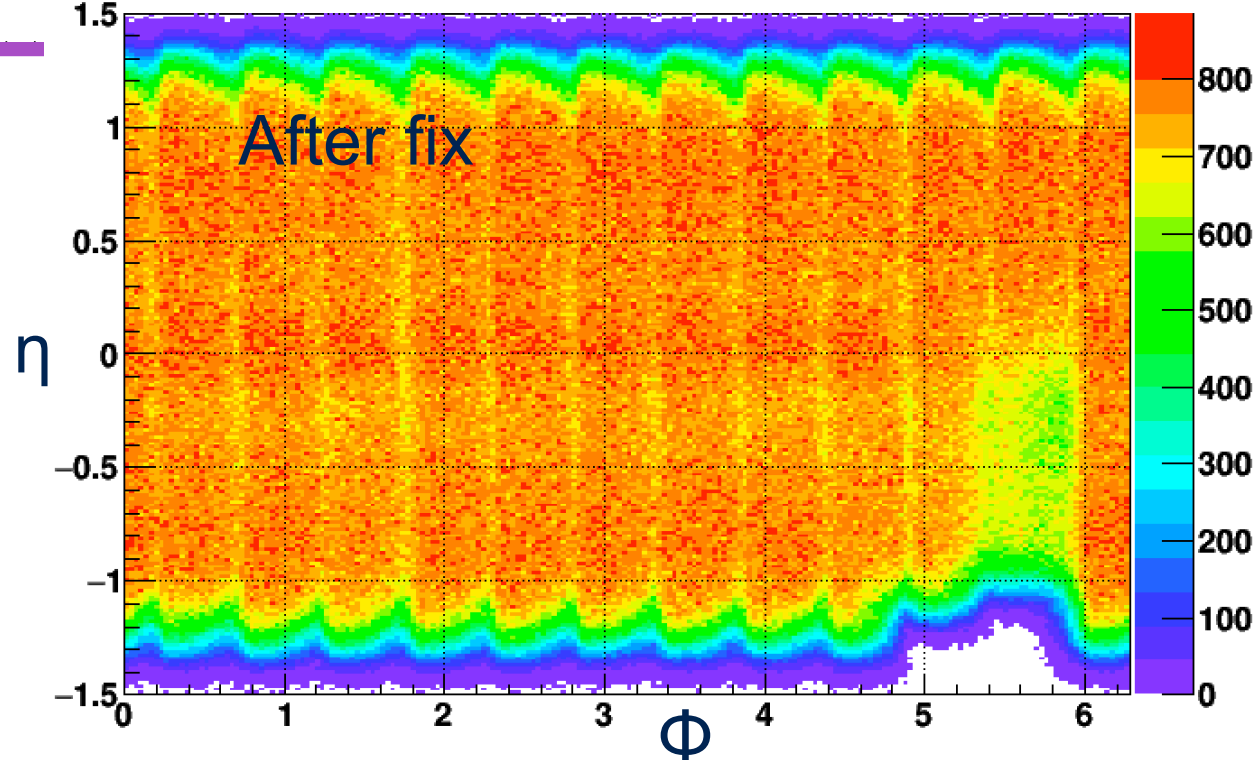
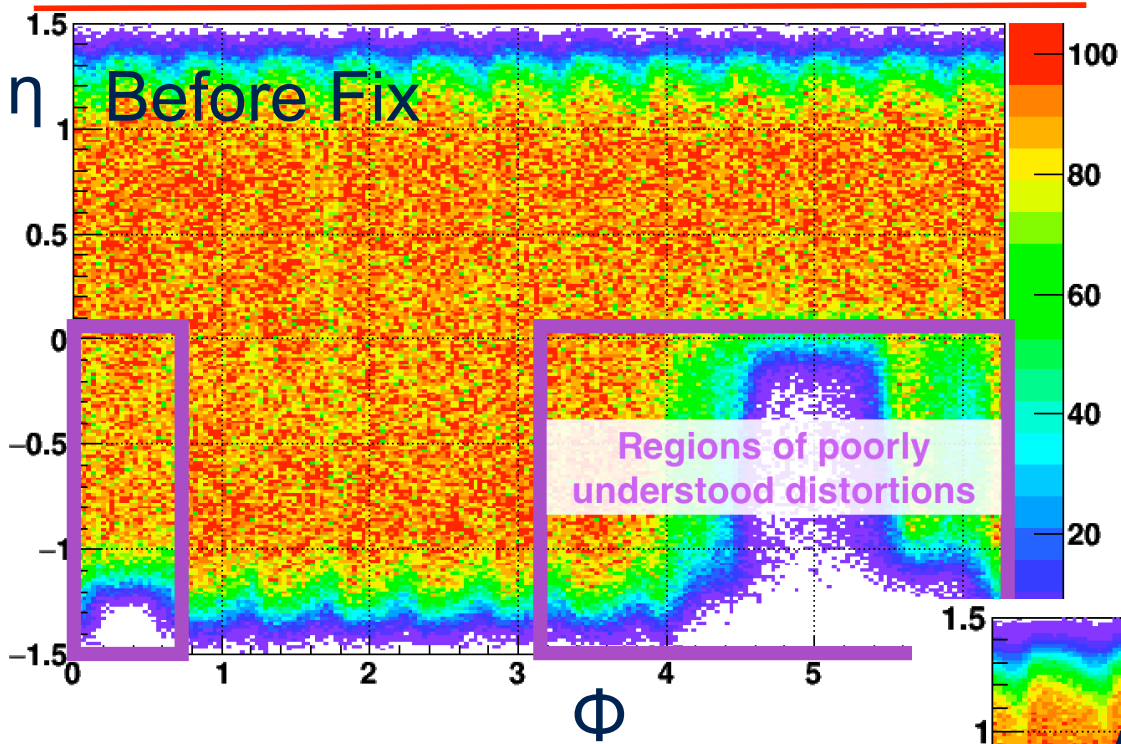
Physics process	data/cocktail 47 - 75% Ru+Ru	data/cocktail 47 - 75% Zr+Zr	Difference between Ru+Ru and Zr+Zr
Photonuclear	20.0 ± 1.7	17.5 ± 1.7	2.5 ± 2.4 (1.0σ)
Two-photon	17.3 ± 1.7	21.8 ± 1.7	4.5 ± 2.4 (1.9σ)

Factor 2 more data will makes higher mass range measurement significant

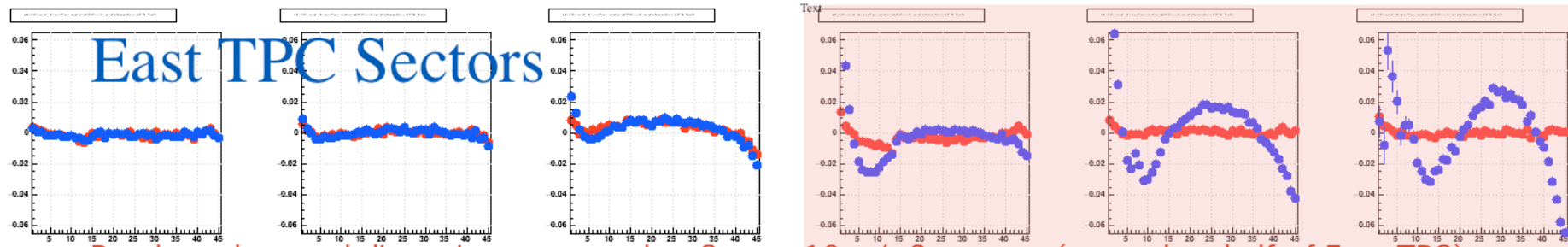
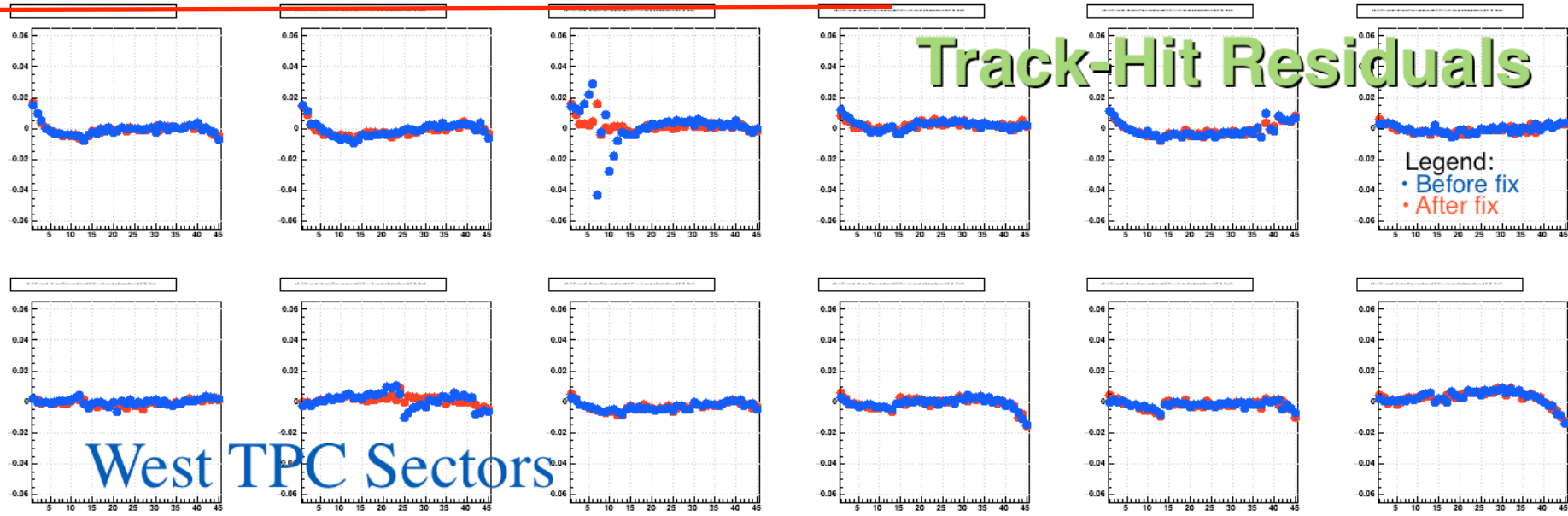
Known Issues to Date:

- 1) TPC sector 19 gating grid - **Effects first 0.5 B events**
- 2) ZDC coincidence causes inefficiency in central collisions
- 3) VPD online vertex cuts (occasionally bit error)
- 4) BBC gain adjustment
- 5) EPD optimization

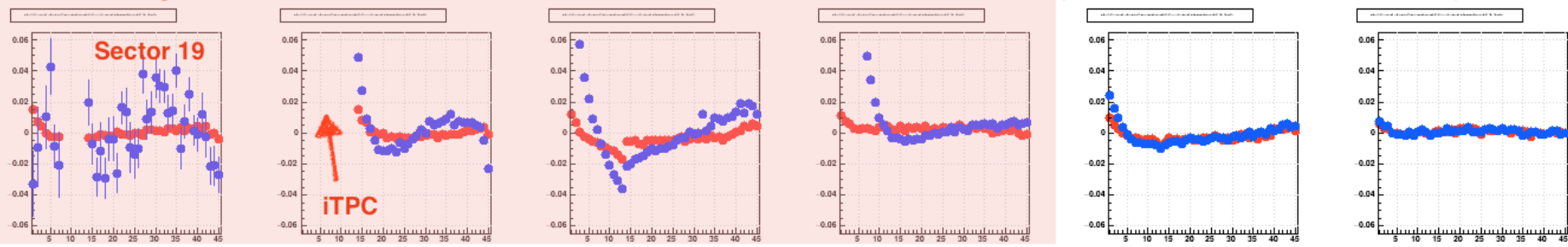
Effects of GG Issue



Track residuals

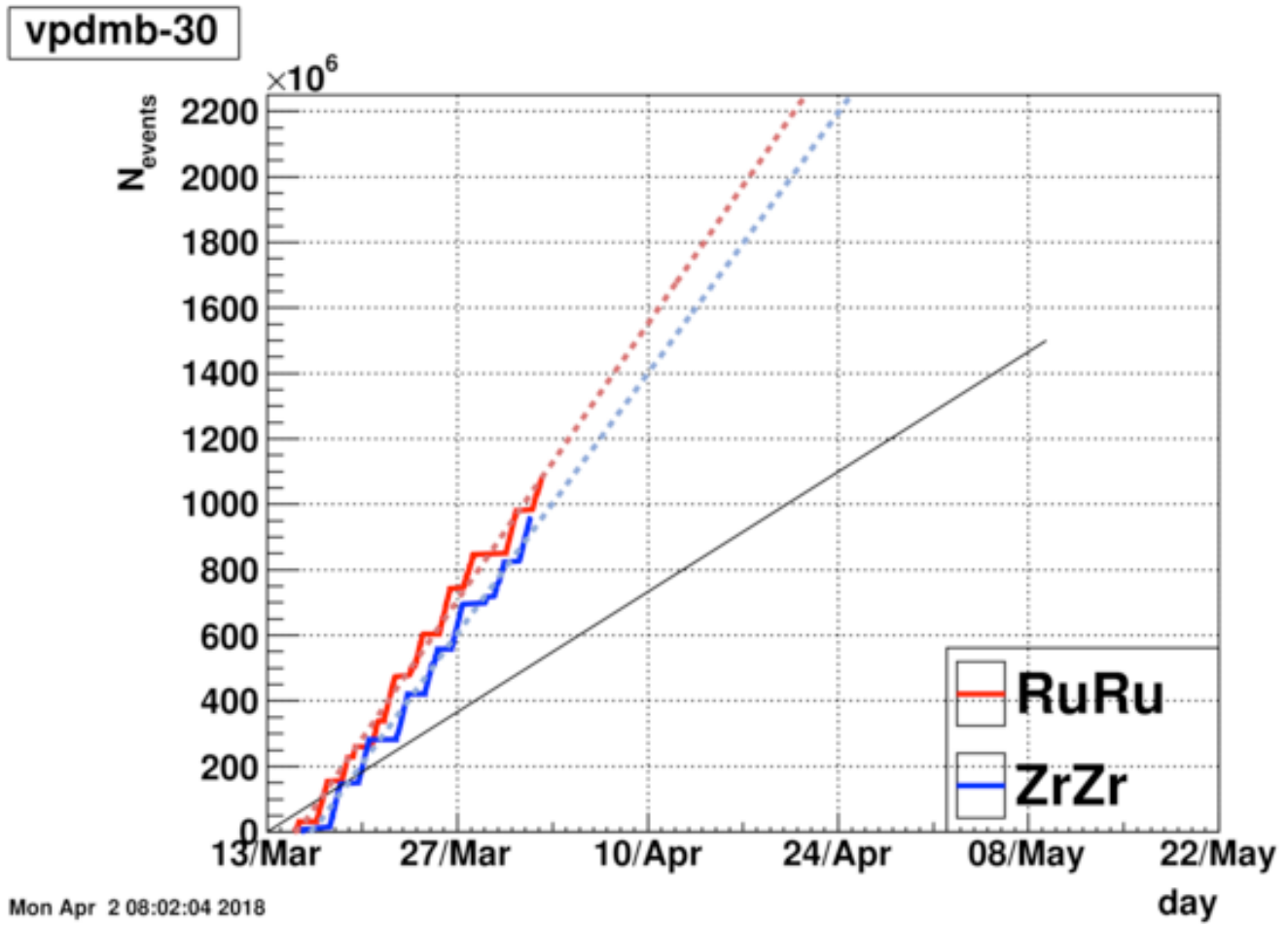


Poorly understood distortions centered at Sector 19 +/- 3 sectors (more than half of East TPC)



NB: Since hits have to be close to correct position for track to be found current residuals are optimistic

Data Collected to Date



Doing better than BUR expectation



As of Mon 8:00am:	Collected		-(GG issue)		85% Good
	Zr 0.95 B	->	0.45 B	->	0.4 B
	Ru 1.1 B	->	0.6 B	->	0.5 B

STAR requested 1.2B good events, possible centrality triggered

Running Proposal

If we can reach 2.5B recorded events and still enable the Au+Au running we should.

The Isobar running is a **one shot discovery** program
need to collect as much high quality data as possible
should not endanger program by assuming correction to large distortions can be corrected offline (N.B. work is already actively underway calibrating and performing QA)

Assuming we continue as is we collect ~0.1B events/day

As of Mon. morning would need 2B more of each species
Requires ~40 more days running which takes us to ~May 9
which is the initial switch over day.

What to do if get 2 more weeks

Still looking at details but very concerned not compatible with iTPC schedule - especially if running 19 weeks or more next year

If we can run preliminary proposal would be:

Isobar until May 9 as originally planned (2.7B each)

Au+Au 27 GeV from May 10 to June 24 (2 B events)

Au+Au FXT at 3GeV from June 25 to June 30 (500M)

- Increase statistics of 27 GeV running enhances sensitivity to effect between Λ and anti- Λ global polarization from 3σ to 4σ + enables sensitivity in higher mass low p_T di-lepton range
- Increased FXT statistics more precision on net-proton fluctuations, especially as not running with iTPC

We feel that it is most cost-effective to double the statistics