RHIC p-Carbon Polarimeters

Status Update

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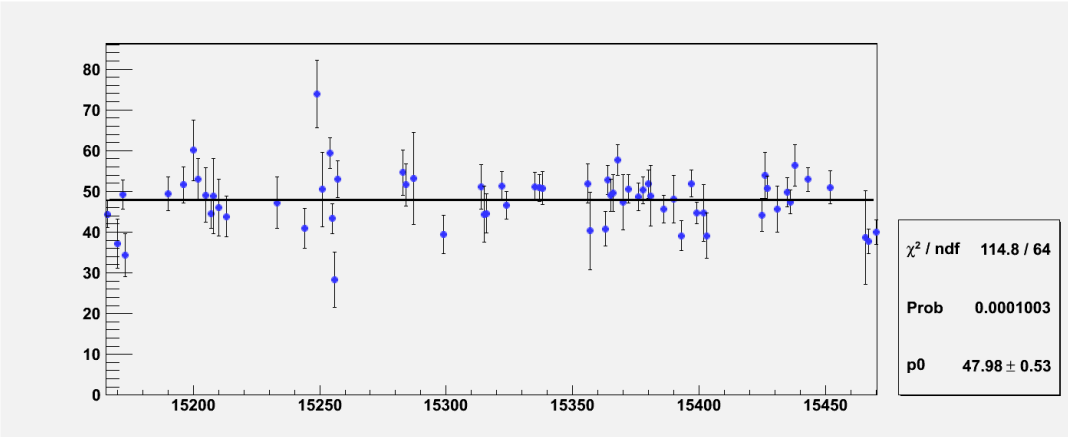
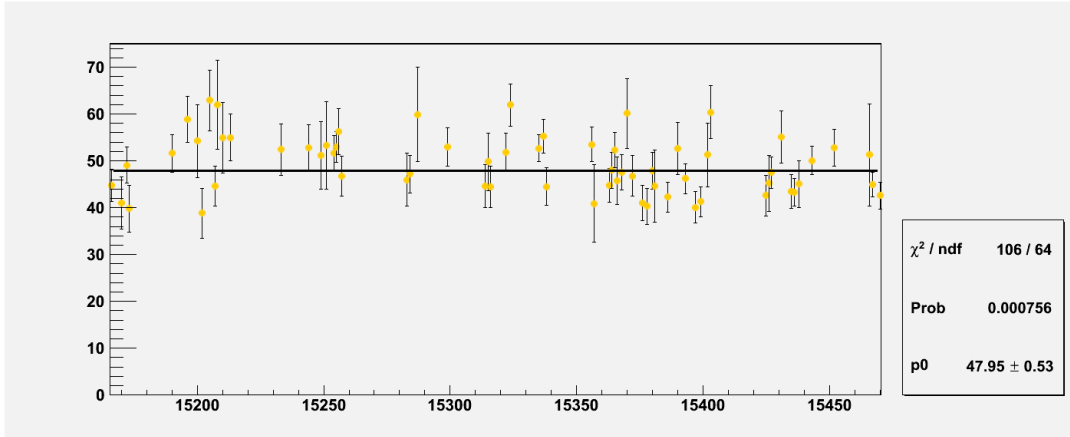
p-Carbon Normalization to H-jet at 250 GeV

Beam Energy 250 GeV

Blue-1 Upstream	Yellow-2 Upstream
1.068	1.072
Blue-2 Downstream	**Yellow-1 Downstream**
0.971	1.106





- The scale factors are w.r.t. theoretical predictions from Run 4

p-Carbon Normalization to H-jet at 24 GeV

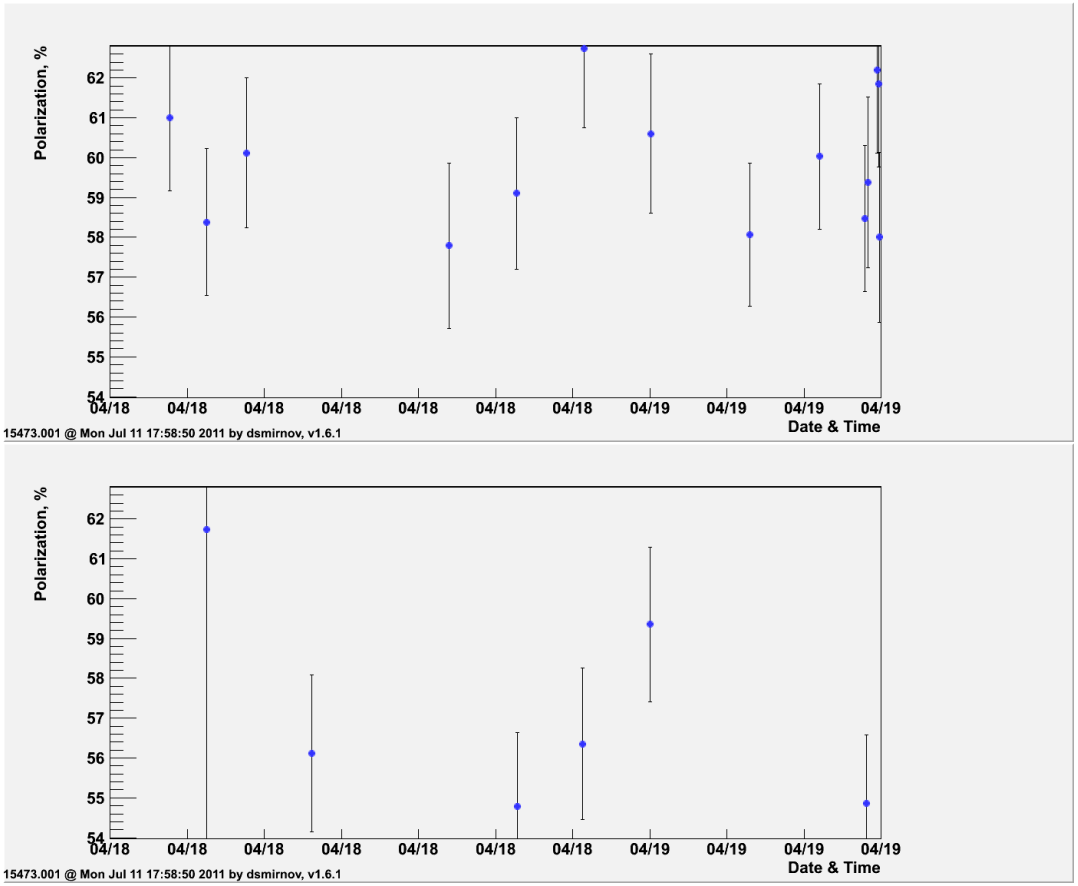
- Three fills at the end of Run 11: 15473, 15474, and 15475
  - Only blue beam in last fill
- H-jet polarization:

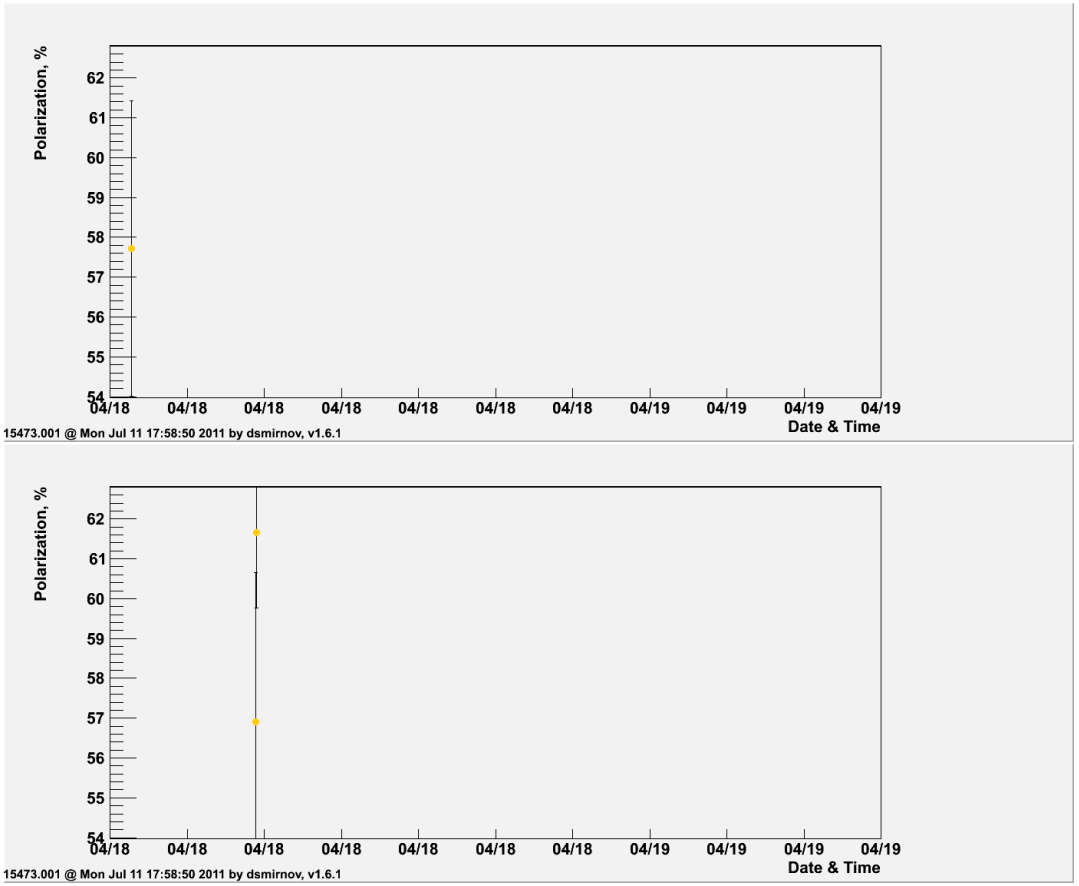
Yellow: $\mathbf{70 \pm 4\%}$**, Blue:** $\mathbf{60 \pm 4\%}$

Blue only (last fill): $\mathbf{54 \pm 3\%}$

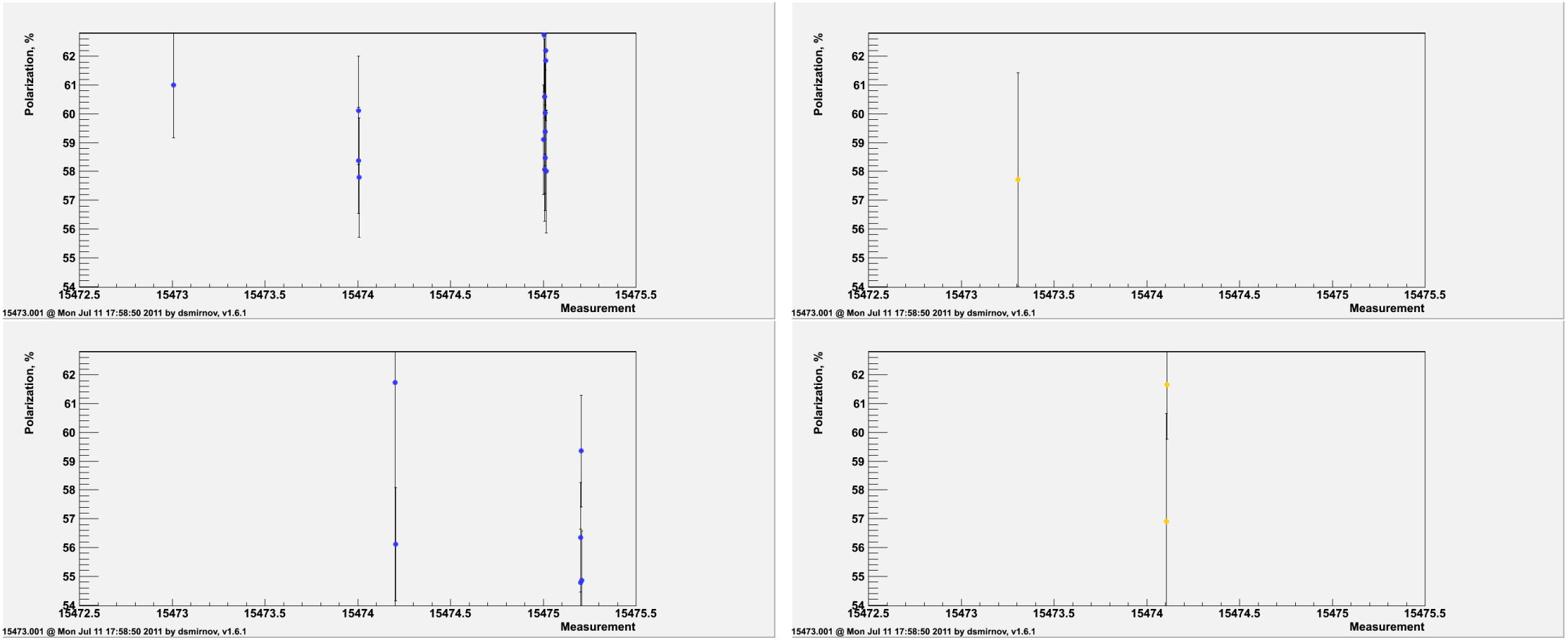
- p-Carbon: Only four measurements in Yellow, six with Blue Downstream

p-Carbon Normalization to H-jet at 24 GeV

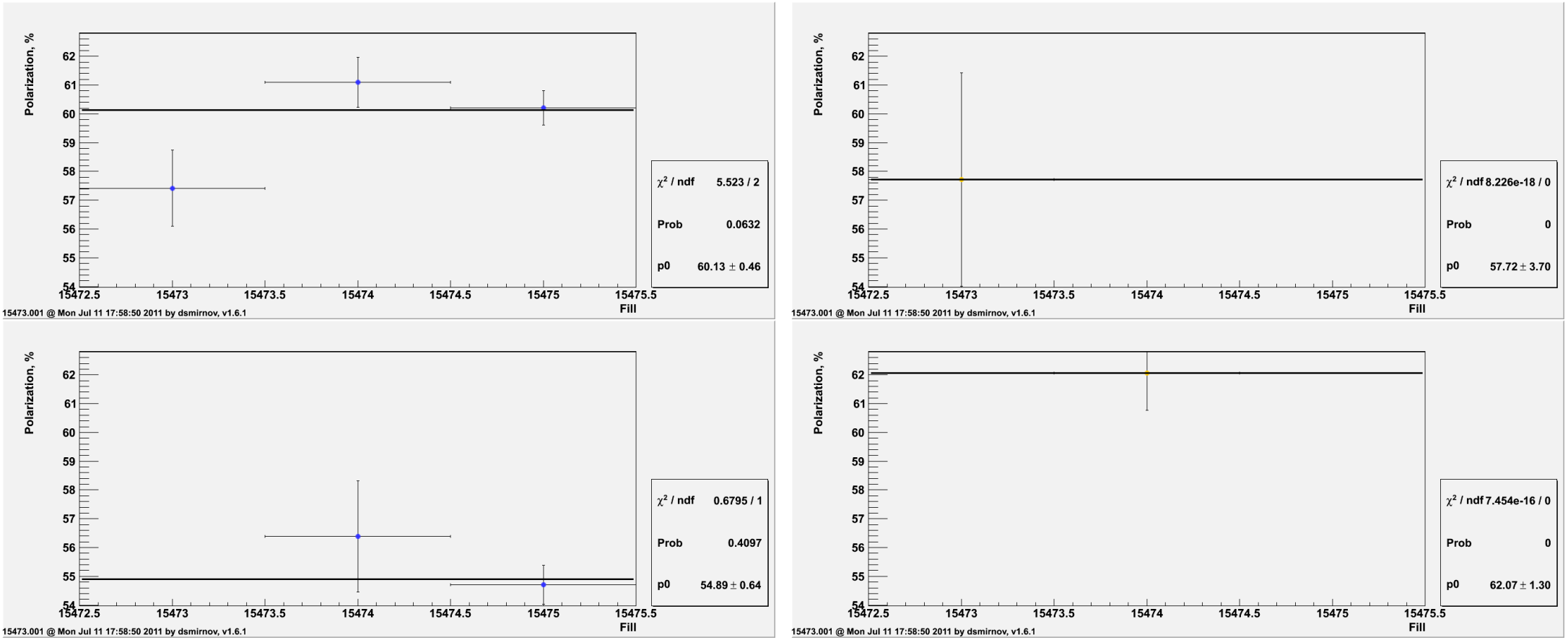




p-Carbon Normalization to H-jet at 24 GeV



p-Carbon Normalization to H-jet at 24 GeV



- Use these numbers to normalize the 24 GeV data set?

Fill Polarization for the Experiments

- Assume gaussian shapes for P and I

$$\langle P \rangle = \frac{\iint P(x,y) I(x,y) dx dy}{\iint I(x,y) dx dy} = \frac{P_{\mathsf{max}}}{\sqrt{(1+R_x)(1+R_y)}}$$

$$\langle P \rangle_{\mathsf{colsn}} = \frac{\iint P(x,y) I_1(x,y) I_2(x,y) dx dy}{\iint I_1(x,y) I_2(x,y) dx dy} = \frac{P_{\mathsf{max}}}{\sqrt{(1+\frac{1}{2}R_x)(1+\frac{1}{2}R_y)}}$$

$$\langle P \rangle_{\mathsf{colsn}} = \frac{\sqrt{(1+R_x)(1+R_y)}}{\sqrt{(1+\frac{1}{2}R_x)(1+\frac{1}{2}R_y)}} \langle P \rangle$$

Fill Polarization for the Experiments

Beam Energy 250 GeV

Blue-1 Upstream		Yellow-2 Upstream	
V profile	H profile	V profile	H profile
0.18 ± 0.01	0.22 ± 0.01	0.21 ± 0.01	0.17 ± 0.04
0.196 ± 0.007		0.194 ± 0.005	
Blue-2 Downstream		**Yellow-1 Downstream**	
V profile	H profile	V profile	H profile
0.19 ± 0.02	0.21 ± 0.01	0.22 ± 0.01	0.19 ± 0.01
0.214 ± 0.007		0.208 ± 0.008	
Blue V profile	Blue H profile	Yellow V profile	Yellow H profile
0.182 ± 0.009	0.215 ± 0.007	0.215 ± 0.007	0.189 ± 0.010

- Run 9: $R = 0.36 \pm 0.04$ (stat.)

p-Carbon Systematics

- **Polarimeter-1 vs polarimeter-2**
  - Blue: 10%
  - Yellow: 4%
  - Can probably reduce by normalizing periods with different targets
- **Profile systematics, i.e. $\langle P \rangle_{\textbf{sweep}}$ vs $\langle P \rangle_{\textbf{profile}}(P_{\textbf{max}})$**
  - Error propagation of R error
  - or direct comparizon of measured quantities
- **Detector asymmetries X90, X45, Y45**
  - Different combinations of the detectors
- **Uncertainties from normalization to H-jet**
  - statistical
  - background
- **Can we use a new approach?**
  - Provide stat and syst uncertanties for each measurement
  - Dynamically calculate total errors for user selected fills

Split time. Yellow-2 Upstream. Run 15202.302

- http://www.phy.bnl.gov/cnipol/rundb/?runid=15202.302