$D_0 - \varphi_0$ Beamline Update

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What's Been Going On?

- Last time
  - Looked at run 155919 & 156460
  - Compared $D_0-\varphi_0$ beamline w/VxPrim
  - Varied kinematic quantities to determine optimal values for track quality cuts
- Questions
  - Ray saw ~6 μm variation bet. $D_0-\varphi_0$ and VxPrim beamline in run 145005, but we don't see such a large variation in our more recent runs. What's the difference?
  - What is effect of removing Histogram−Linked (HL) tracks?

Track Quality Cuts

- Define tracks of "good" quality
  - defTracks (no Si Standalone)
  - $p_T > 1.0$ GeV
  - $|d_0| < 1.0$ cm
  - #Si axial hits ≥ 4
  - #COT axial hits ≥ 25
  - #COT stereo hits ≥ 25
  - $f = 0.6$

Di−jet MC: beam at (0,0,0,0)

#events=20,000

Di−jet MC (beam @ (0,0,0,0))

Beamline		x_0 ($\times10^{-6}$cm)	y_0 ($\times10^{-6}$cm)	dx ($\times10^{-6}$rad)	dy ($\times10^{-6}$rad)	σ_{x0} ($\times10^{-6}$)	σ_{y0} ($\times10^{-6}$)	σ_{dx} ($\times10^{-8}$)	σ_{dy} ($\times10^{-8}$)	#trks
$D_0-\varphi_0$ "good" qual.		10.8572	−15.8783	−0.827171	−0.698416	21.0566	21.0329	29.4533	29.4517	3
−no HL		17.5593	−15.2017	−1.121380	−0.641416	21.9927	21.9799	30.8073	30.7903	3
Standard DB $D_0-\varphi_0$		147.979	−364.112	−0.235748	−0.685496	16.3554	17.3012	23.1703	24.4427	6
−no HL (19,600)										
p_T>0.4 (14948)										
p_T>0.5 (13862)										
p_T>0.8 (11578)										
p_T>1.2		1.43670	−21.0210	−0.875302	−0.948984	22.3423	22.3008	31.2365	31.2351	3
p_T>1.5 (7500)										
p_T>2.0		4.90995	−35.2988	−2.02509	−0.229849	31.0248	31.0008	43.3444	43.5553	1
#SiAxHits ≥ 5		9.71473	−19.3513	−0.765865	−0.913213	21.4012	21.3769	29.9770	29.9915	3
#CtAx,St ≥ 30,30		16.1236	−10.6173	−0.406536	−0.944270	21.5761	21.5410	30.1946	30.1545	3
#events = 1000		13.3495	10.4180	1.19124	3.96426	91.4769	91.6763	125.722	128.748	4
−no HL		63.1667	74.2265	−1.18610	3.57671	95.7440	96.1426	131.590	134.316	3

- Surreptitious core dumps prevented completion
  - no info on DB cuts w/o HL or lowering p_T cuts
- Removing HL tracks changes result by 100ths of μm in high stat. case, by 10ths of μm for 1000 ev

Comparison of Runs

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Run	Beamline		x_0 (cm)	y_0 (cm)	dx ($\times 10^{-6}$rad)	dy ($\times 10^{-6}$rad)	σ_{x0} ($\times 10^{-6}$)	σ_{y0} ($\times 10^{-6}$)	σ_{dx} ($\times 10^{-8}$)	σ_{dy} ($\times 10^{-8}$)	#trk
156460	vxprim DB		−0.204898	0.403703	539.340	230.171	26.4841	26.2131	36.6517	36.9961	−−−−
−36379	$D_0-\varphi_0$		−0.205050	0.403773	535.864	231.096	14.8151	14.9590	64.8041	66.9580	4
155919	vxprim DB		−0.205626	0.402345	480.018	236.302	26.4420	25.6174	37.1494	36.6267	−−−−
−33525	$D_0-\varphi_0$		−0.205475	0.402383	479.952	237.785	15.5678	15.4789	69.3981	70.2945	4
145005	vxprim DB		−0.177949	0.457568	606.387	112.949	11.4568	10.9508	48.8998	49.7439	−−−−
−63346	$D_0-\varphi_0$		−0.178118	0.457609	605.148	112.768	13.2344	12.7752	56.3695	57.1962	3
dijet MC	$D_0-\varphi_0$		1.09E−05	−1.59E−05	−0.827171	−0.698416	21.0566	21.0329	93.1396	93.1346	3
−20000	− HL		1.76E−05	−1.52E−05	−1.121380	−0.641416	21.9927	21.9799	97.4211	97.3674	3
dijet MC	$D_0-\varphi_0$ (4)		1.33E−05	1.04E−05	1.191240	3.964260	91.4769	91.6763	397.5676	407.1376	4
−1000	− HL		6.32E−05	7.42E−05	−1.186100	3.576710	95.7440	96.1426	416.1238	424.7458	3

- Recalculated value of VxPrim beamline by averaging over all 7 run sections
  - Had neglected to do so first time around
- Variation of ~2 μm bet. $D_0-\varphi_0$ and VxPrim across the board

Summary

- Variation between VxPrim and the $D_0-\varphi_0$ method is consistent for all runs examined
  - Diff is ~2 μm
- Removing HL tracks results in change on the order of 100^{th}s of a μm
  - On the order of 10^{th}s of a μm for low statistics
- Suggestions for future study?