

Systematics on CLC luminosity measurement due to SPP calibrations and beam position

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Luminosity with zero counting method

$$L = \frac{f_{BC} \cdot \mu}{\sigma}$$

$$P_0(\mu, \varepsilon_0, \varepsilon_E, \varepsilon_W) = e^{-(1-\varepsilon_0)\mu} \left[e^{\varepsilon_E \mu} + e^{\varepsilon_W \mu} - 1 \right]$$

ε_0 = probability of NO hits on both modules

ε_E = probability of hits only on East module

ε_W = probability of hits only on West module

$$L \propto \mu$$

$$\mu = 1.8 \leftrightarrow L \sim 5 \cdot 10^{31}$$

$$\mu = 3.5 \leftrightarrow L \sim 10^{32}$$

$$\mu = 7.1 \leftrightarrow L \sim 2 \cdot 10^{32}$$

Evaluation of systematics

Given a “baseline” set of $(\varepsilon_0, \varepsilon_E, \varepsilon_W)$

and a new set of $(\varepsilon'_0, \varepsilon'_E, \varepsilon'_W)$ both evaluated from MC

Solving

$$P_0(\mu, \varepsilon_0, \varepsilon_E, \varepsilon_W) = P_0(\mu', \varepsilon'_0, \varepsilon'_E, \varepsilon'_W)$$

for μ' we get the sys on L

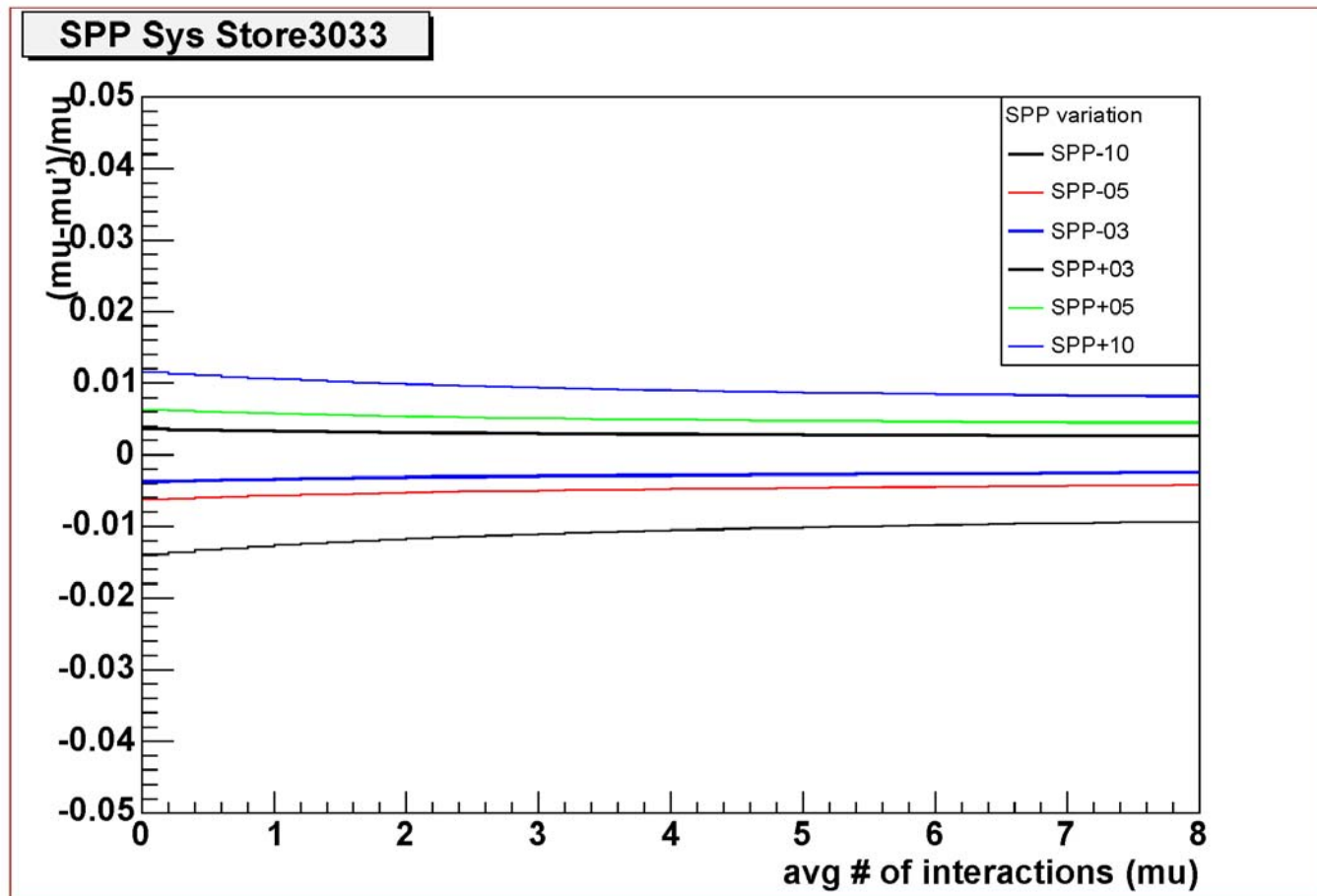
$$\frac{\mu - \mu'}{\mu} = \frac{L - L'}{L}$$

Systematics from SPP

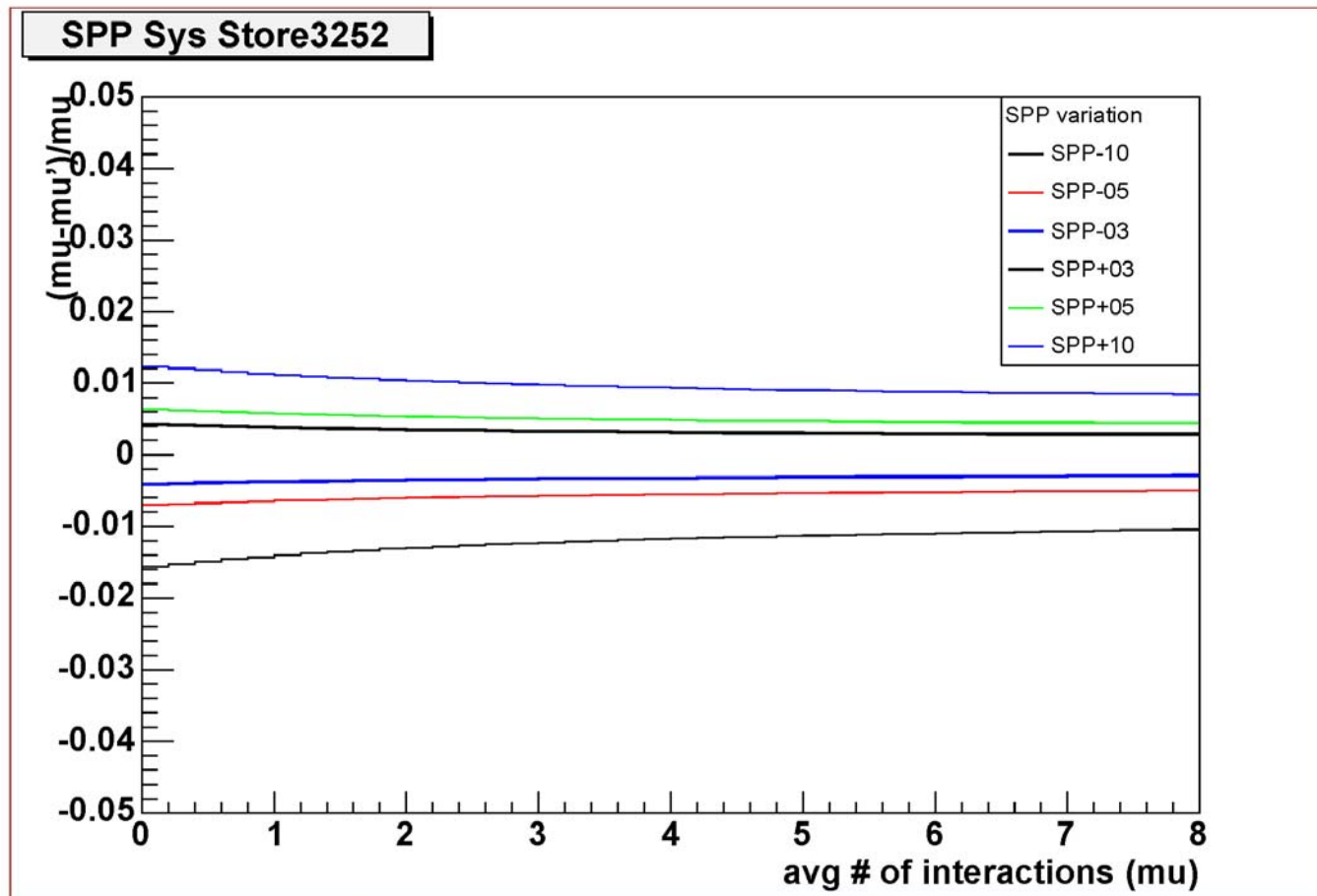
Given a SPP calibration, we change ALL the SPP values by $\pm 3\%$ ($\pm 5\%$, $\pm 10\%$) and plot VS μ

This is an OVERESTIMATION of systematics

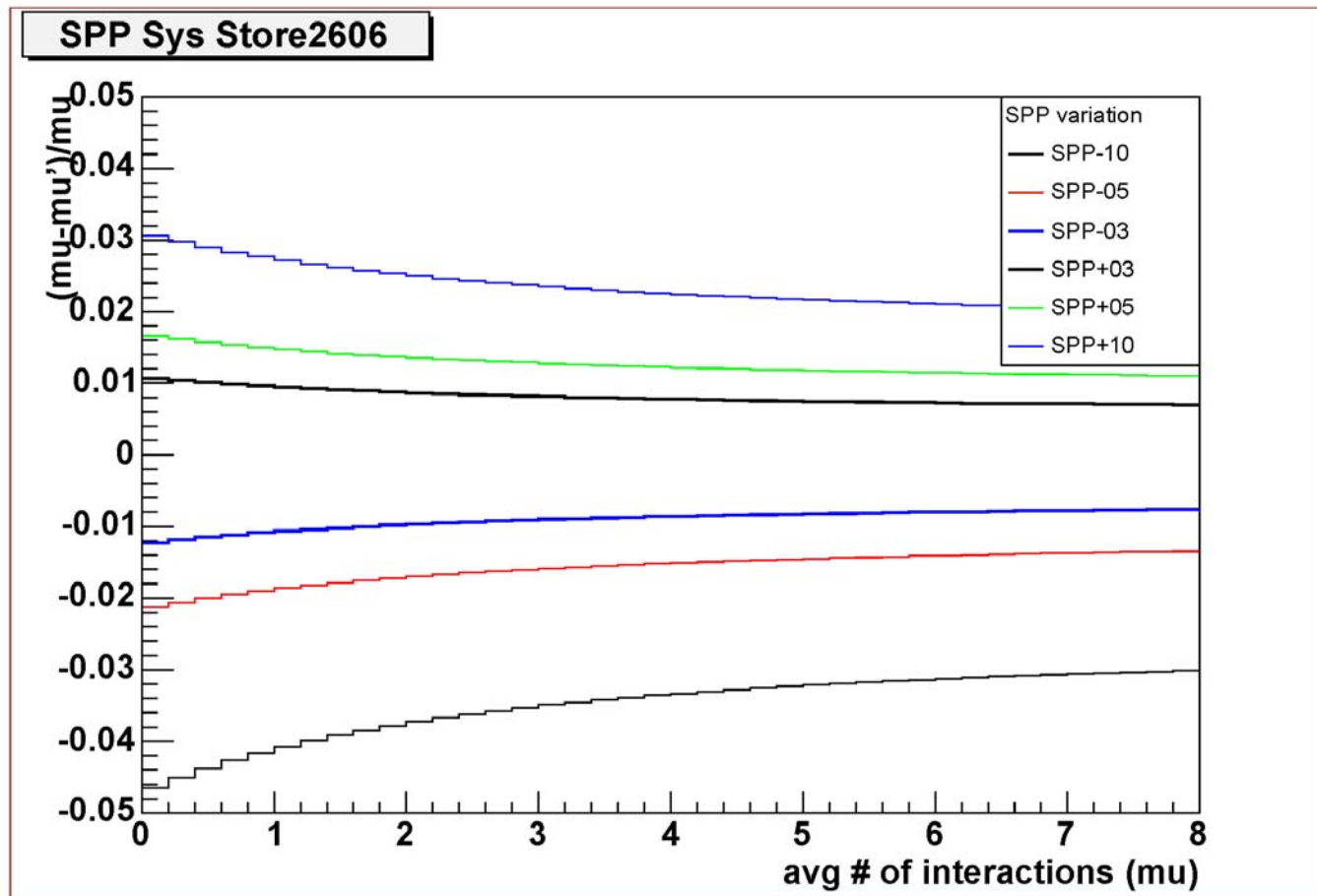
Systematics from SPP



Systematics from SPP

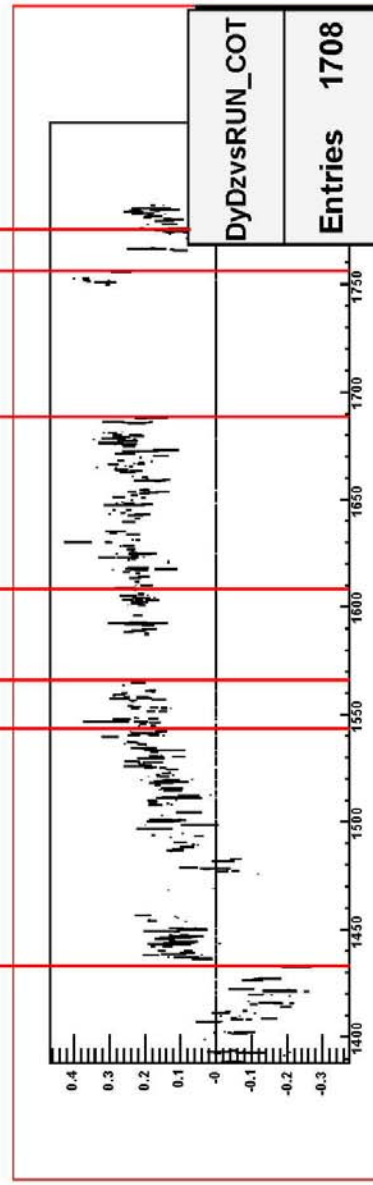
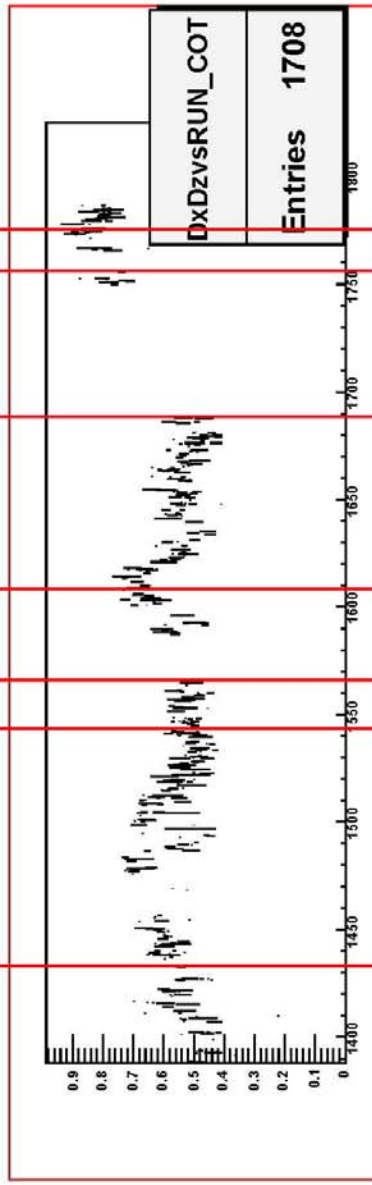
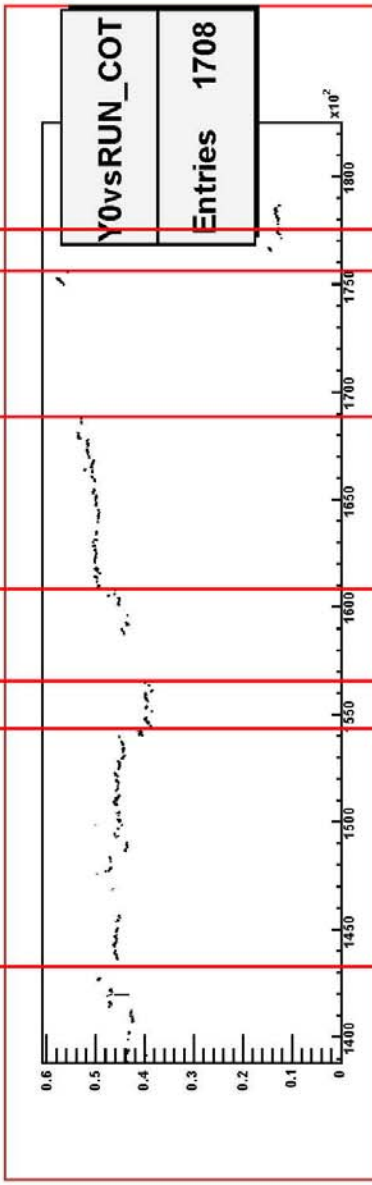
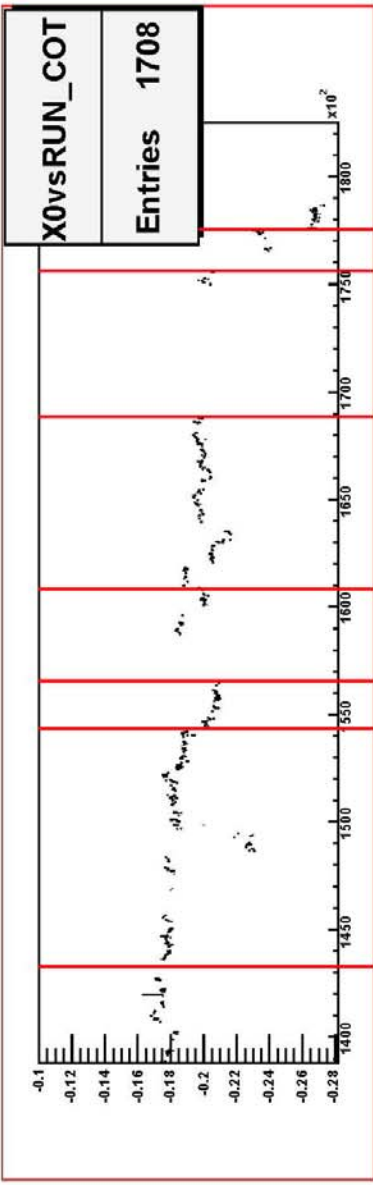


Systematics from SPP

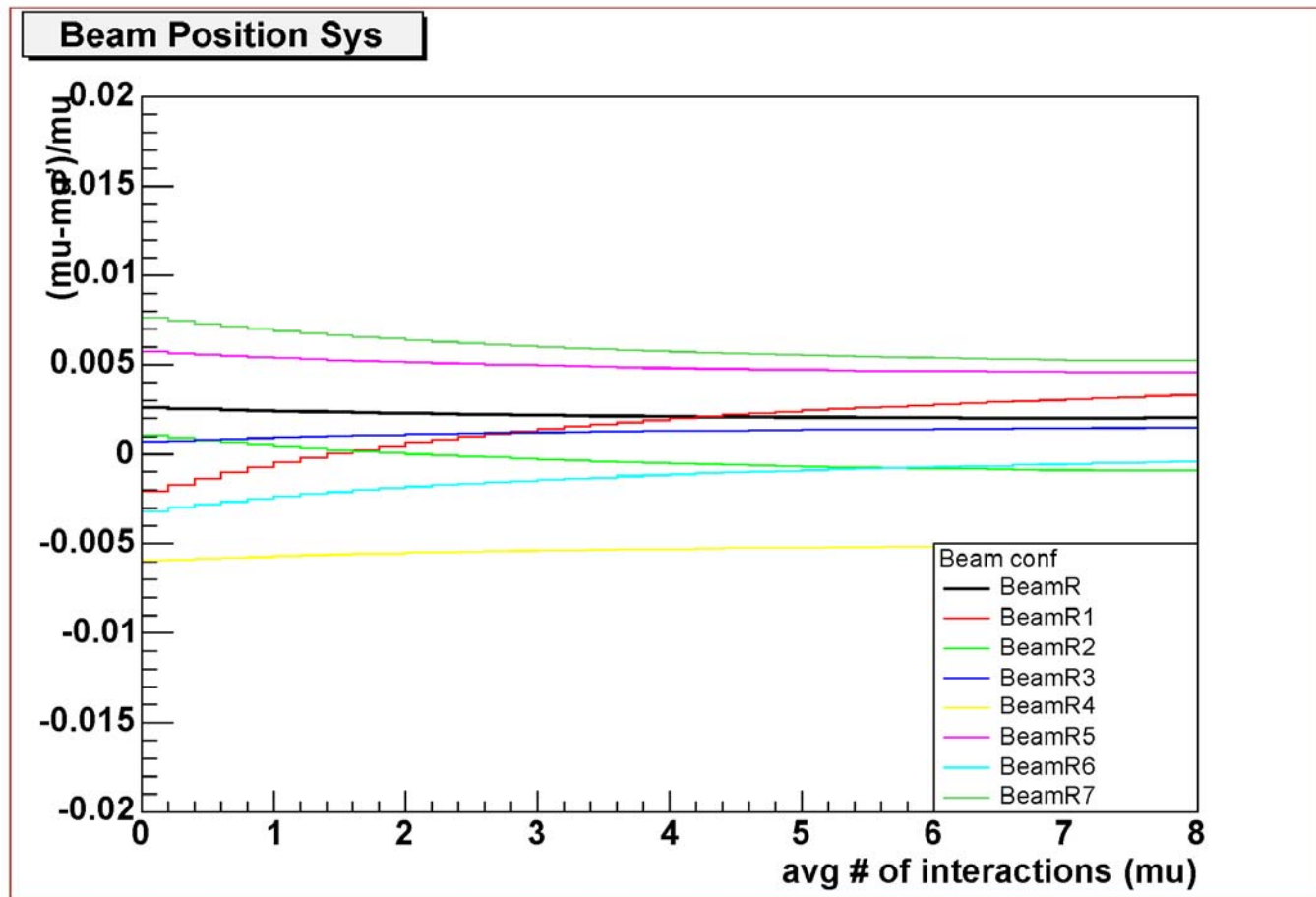


Systematics from Beam Position

Run	Range	X0	Y0	Z0	DxDz	DyDz	SigmaZ	Lum	Lum%
138808	143299	-0.1756	0.4523	3.5	0.5209	-0.1102	26.59	9.24	3.32%
143299	154230	-0.187	0.4491	1.874	0.5605	0.1433	27.3	64.93	23.35%
154230	156487	-0.2056	0.3942	1.314	0.5234	0.2191	27.67	35.37	12.72%
158640	160823	-0.1944	0.4511	1.651	0.6126	0.2141	27.77	19.4	6.98%
160823	168932	-0.1993	0.5068	3.238	0.5464	0.2331	28.92	117.16	42.14%
174990	175648	-0.201	0.5692	3.241	0.7564	0.3279	30.34	2.3	0.83%
175648	177526	-0.2344	0.1304	-1.399	0.8738	0.08624	29.08	13.29	4.78%
177526	182514	-0.2678	0.13	-1.572	0.8115	0.1732	28.77	16.33	5.87%
								278.02	
Baseline									
		X0	Y0	Z0	DxDz	DyDz	SigmaZ		
		-0.16	0.4	0	0	0	30		



Systematics from Beam Position



Conclusions

A conservative evaluation of systematics due to SPP calibration and to the changing of beam parameters:

	Sys
SPP	<1%
Beam Position	<1%

Backup

Systematics from Beam Position

