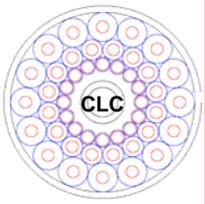


Bunch-by-bunch luminosity studies

Roberto Rossin - Aimin Xiao

Joint Luminosity Meeting 05/27/05



Idea



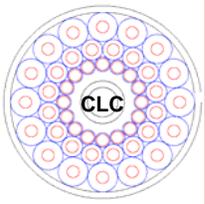
- CDF measures luminosity per every bunch with the CLC
- AD calculate the luminosity per every bunch at IPs by measuring beam parameters and using the formula:

$$L = \frac{6 \cdot 10^{-5} f_{bc} N_p N_a \beta_r \gamma_r}{4\pi\beta^* 0.5 \cdot \sqrt{(\varepsilon_p + \varepsilon_a)_h \cdot (\varepsilon_p + \varepsilon_a)_v}} \cdot H(\sigma_1 / \beta^*)$$

The spread in luminosity among bunches is large (~ 2).

By comparing CDF and AD measurements we can investigate now $\mu=7 \leftrightarrow L = 2E32 \text{ cm}^{-2} \text{ s}^{-1}$ ($L \cdot \sigma = f_{bc} \cdot \mu$)

Values measured at the beginning of the stores: Remove halo or HEP1



BB initial luminosities



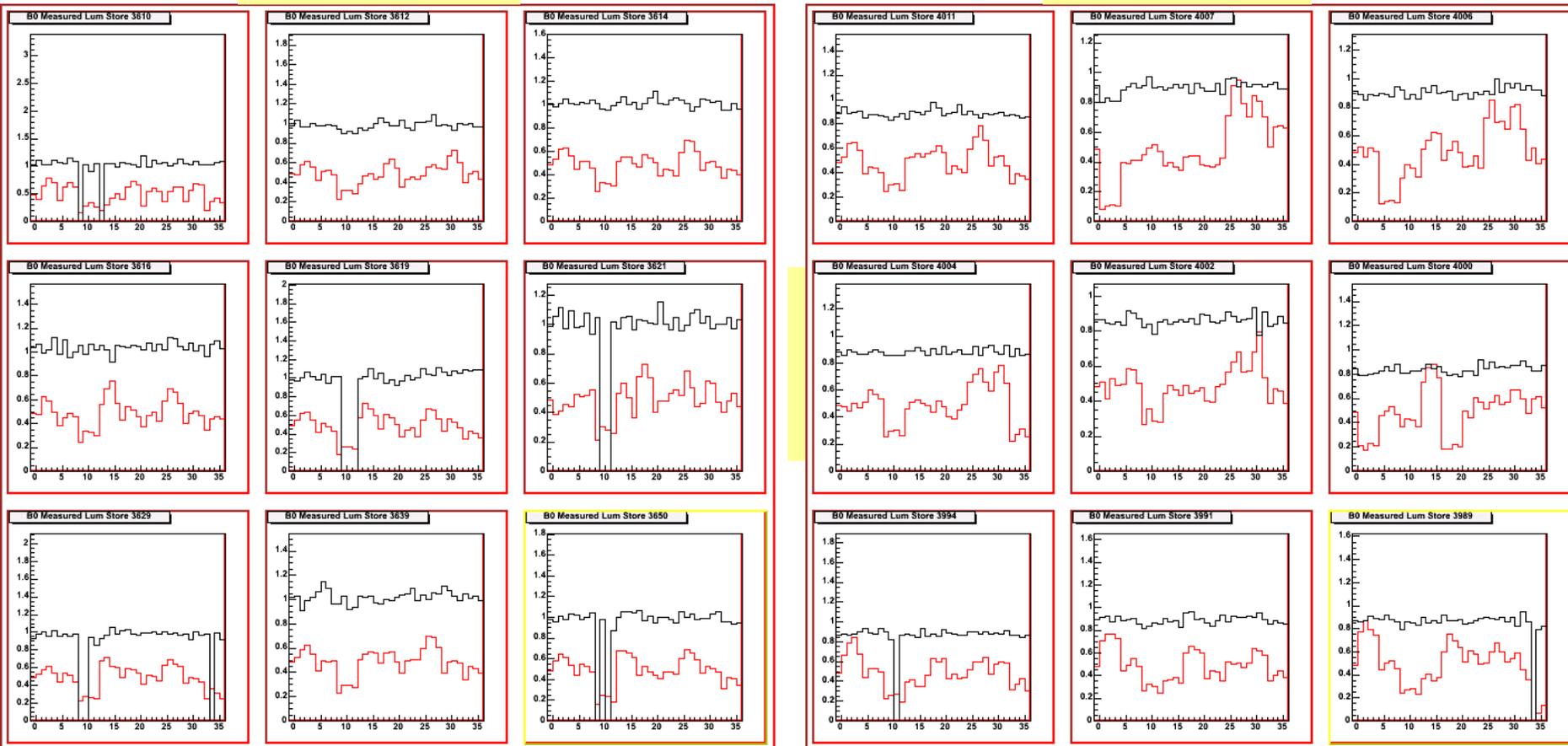
Ratio AD/BO luminosities per bunch

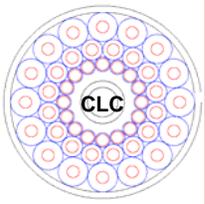
\propto BO luminosities per bunch

First bin is the average over all the bunches

Before shutdown

After shutdown



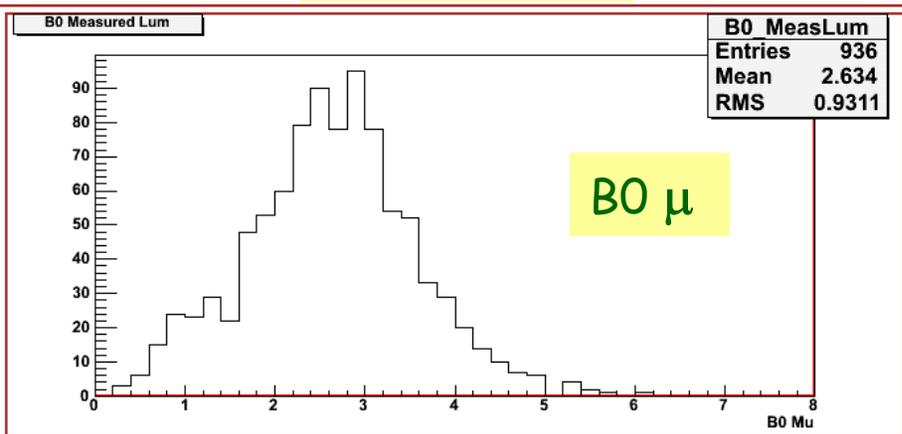


BB initial luminosities

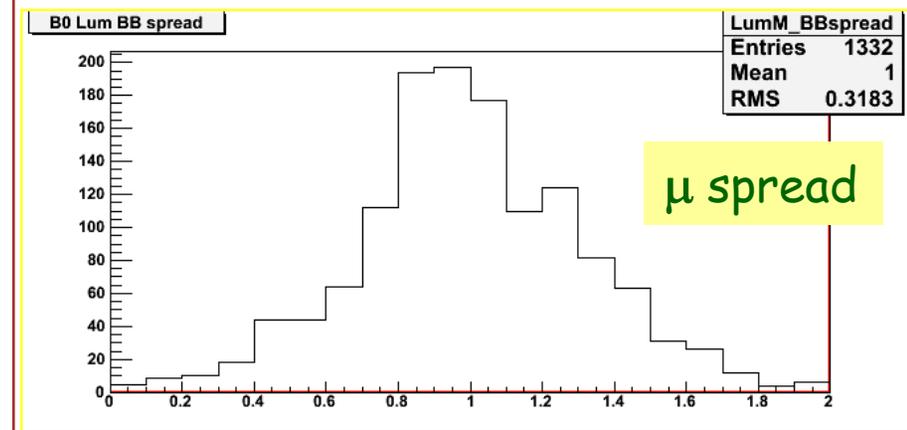
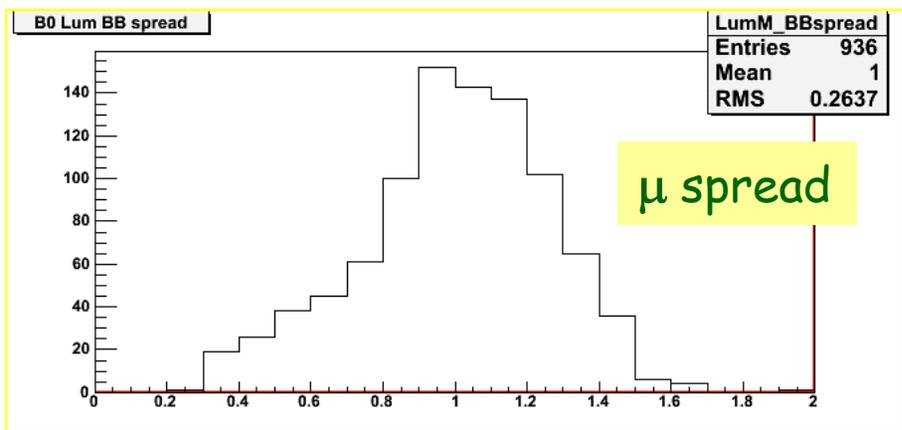
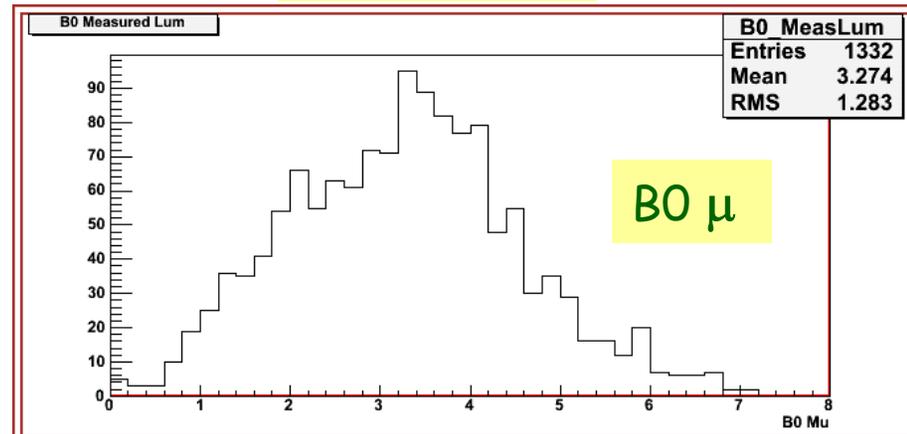


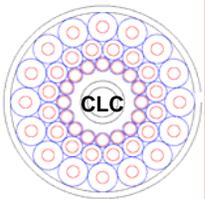
μ on each bunch and spread around the average store luminosity

Before shutdown



After shutdown

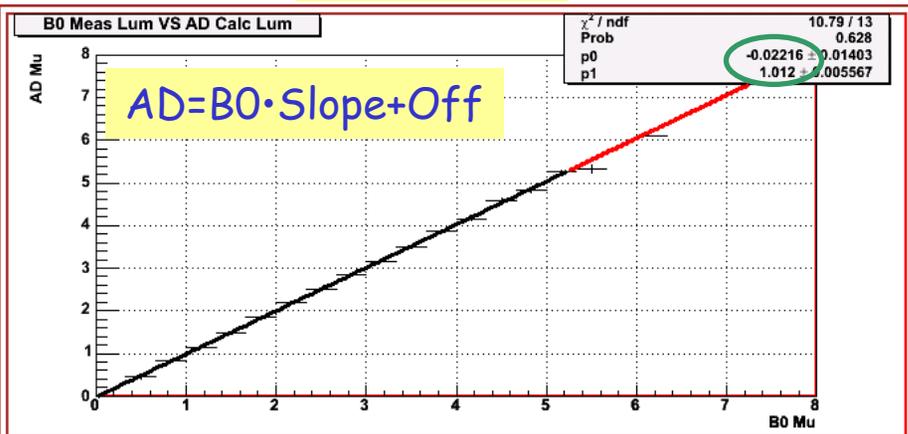




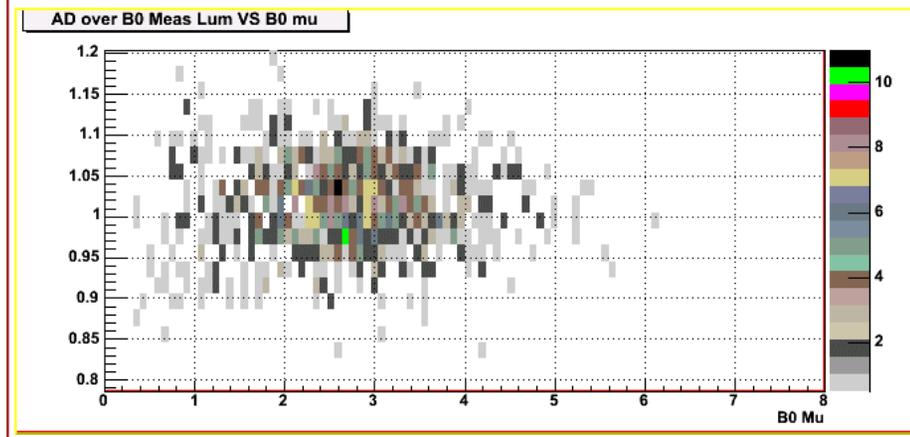
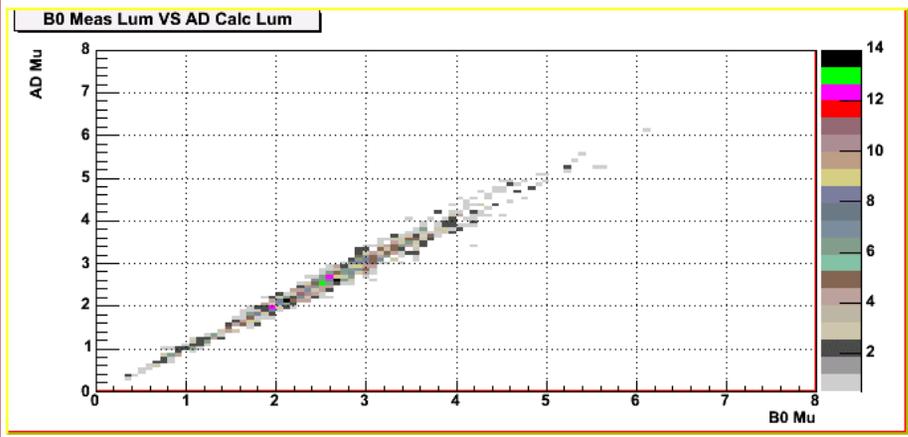
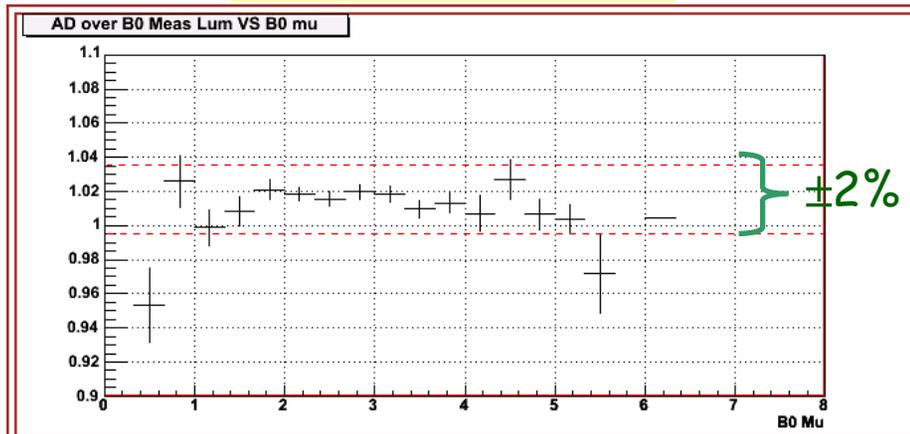
CDF vs AD before shutdown



AD vs B0

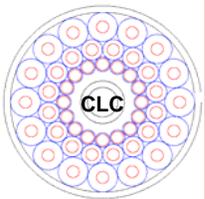


AD-Off/B0 vs B0



μ Offset = -0.022

Slope = 1.012

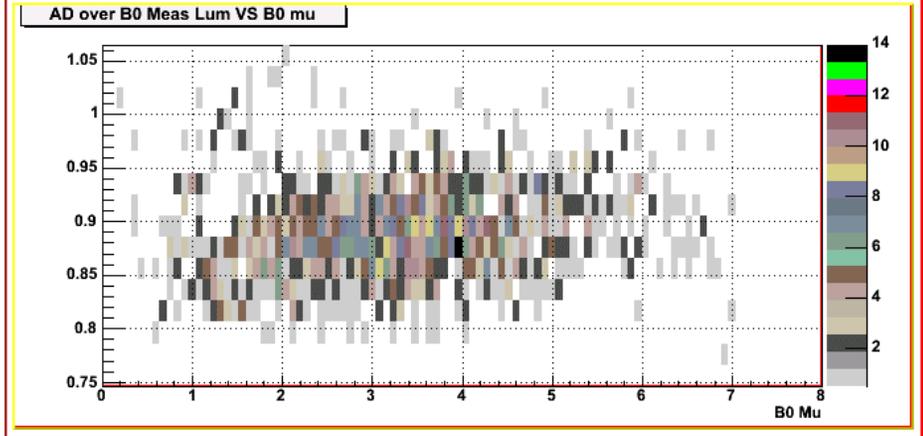
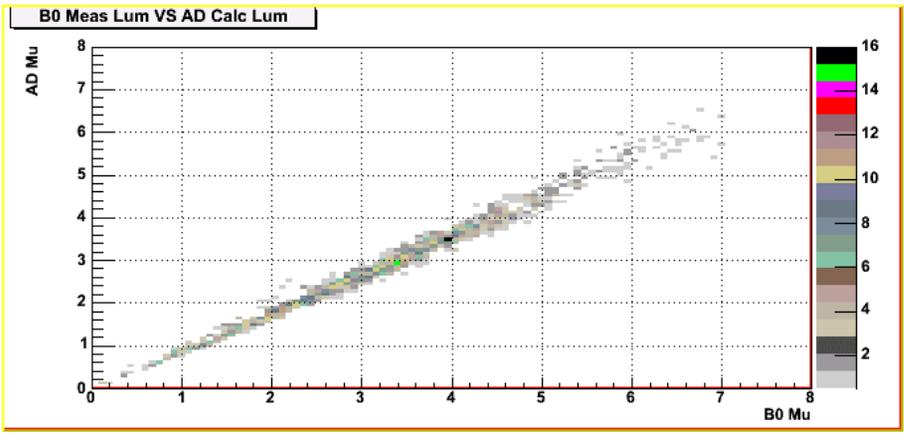
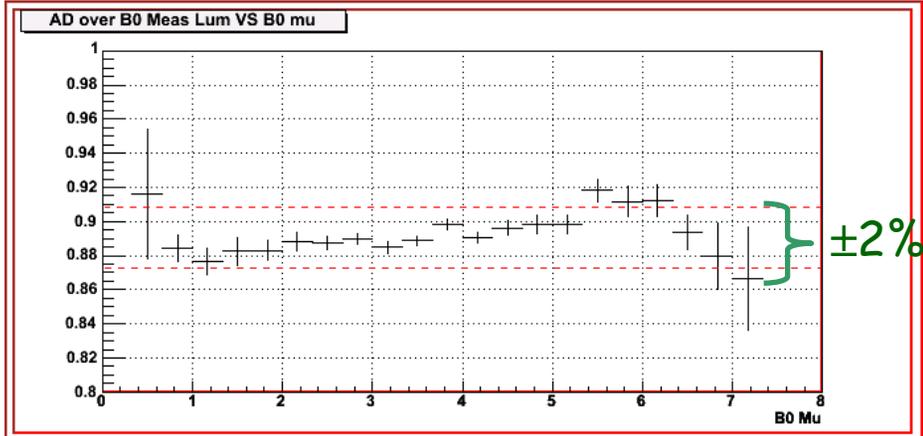
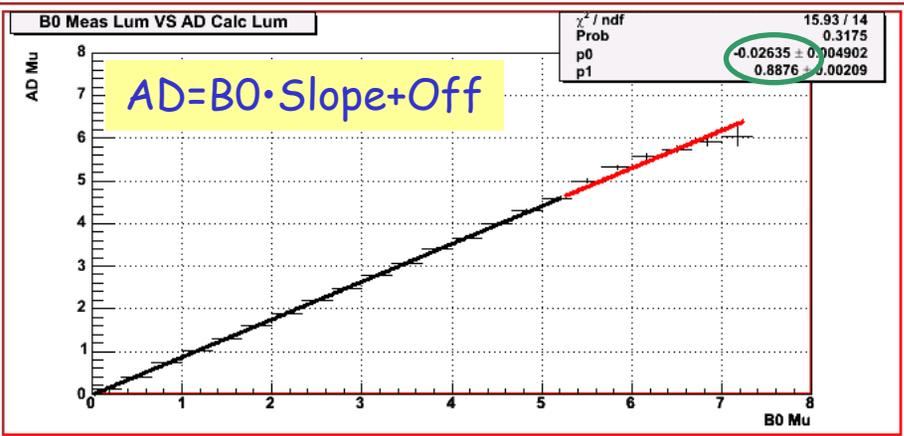


CDF vs AD after shutdown



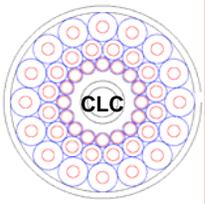
AD vs B0

AD-Off/B0 vs B0



μ Offset = -0.026

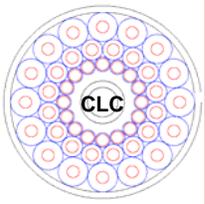
Slope = 0.888



Conclusions and plans



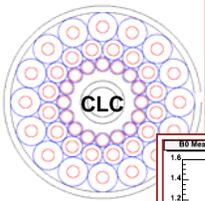
- Very good linearity dependence between CDF and AD luminosity measurements up to $\mu \sim 5 \leftrightarrow L \sim 1.8E32 \text{ cm}^{-2} \text{ s}^{-1}$
- Before shutdown also the absolute measurements agree
- After shutdown AD measurement changed (?) by a factor ~ 0.9 . Nothing changed on CDF measurement.
- Need more data to check very high luminosity regimes. Still, right now the agreement is among few %. Tools are in place.
- Investigate offset BO - AD (?)



Backup: Stores



Before shutdown	3745	3744	3739	3736	3725	3723	3717	3711	3699	3685
	3676	3674	3665	3661	3659	3657	3653	3650	3639	3629
	3621	3619	3616	3614	3612	3610				
After shutdown	4105	4098	4095	4089	4088	4075	4053	4052	4048	4044
	4043	4042	4038	4024	4022	4011	4007	4006	4004	4002
	4000	3994	3991	3989	3987	3986	3980	3969	3968	3962
	3958	3956	3952	3943	3924	3923	3915			



Backup: Other stores lum

