Simulation Results for the SPS Collimator Test

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Simulation Parameters

A simulation of the measurement of the LHC collimator impedance in the SPS was envisaged. The following global parameters had been used:

Symbol	Value	Quantity
p	270.0 GeV/c	operation momentum
N_b	$1.1 \cdot 10^{11}$ p/b	bunch intensity
n_b	288 bunches	number of bunches
	$71 * 5, 50, 71 * 5, 50, 71 * 5, 50, 71 * 5, 50, 3000$	bucket layout
Q_y	26.13	vertical tune
$< \beta >$	42.097 m	average vert. beta
σ	$71428.6, 1.4e6, 1.4e6, 1.4e6, 1.4e6, 1.4e6\ (\Omega m)^{-1}$	conductivities
b_y	$0.00125, 0.01765, 0.02465, 0.01915, 0.065, 0.0415$ m	beam pipe dimensions
l_{rel}	$0.000145, 0.326065, 0.347797, 0.228199, 0.048918, 0.048875$	relative lengths

Simulation Results 1/2

Two resistive wall impedance models were tested, the classical resistive wall and the one with inductive bypass (L.Vos thick wall).

Classic Resistive Wall:

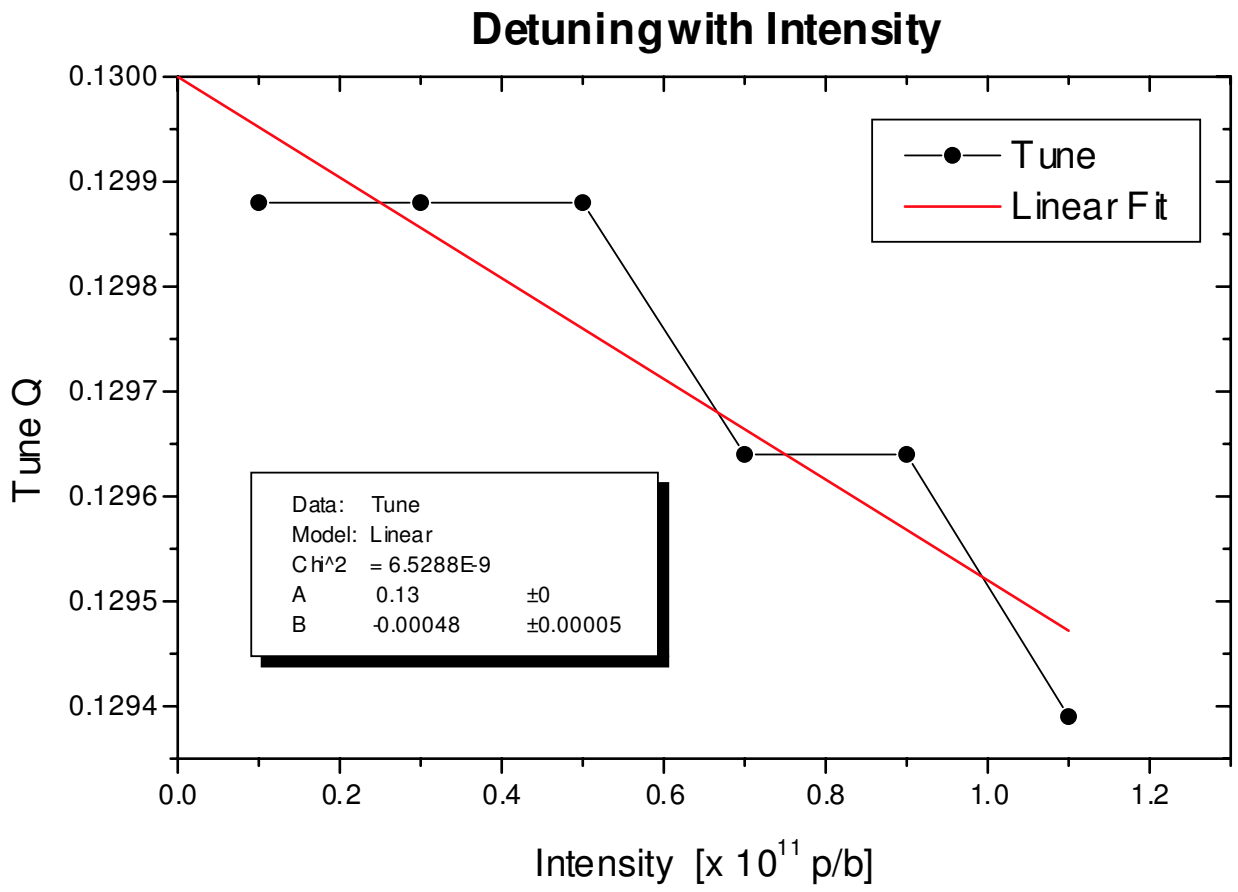
Conditions	Growth Rate	Tune ($Q_0 = 0.13$)	Tuneshift
Collimator N/A	$1/\tau = 410$ Turns	$Q = 0.12988$	$\Delta Q = 0.00097$
Collimator @ 2 mm	$1/\tau = 116$ Turns	$Q = 0.12891$	

Resistive Wall with inductive bypass:

Conditions	Growth Rate	Tune ($Q_0 = 0.13$)	Tuneshift
Collimator N/A	$1/\tau = 467$ Turns	$Q = 0.12988$	$\Delta Q = 0.00049$
Collimator @ 2 mm	$1/\tau = 438$ Turns	$Q = 0.12939$	

Simulation Results 2/2

By varying the intensity from $0.1 - 1.1 \cdot 10^{11}$ p/b the tune slope was established. Mind the steps due to the resolution of the FFT.



Conclusions

- If the inductive bypass effect is NOT present, tuneshift and growth rate measurements should clearly indicate it.
- If the inductive bypass model is valid, growth rate measurements with varying collimator gap would be the appropriate tool of verification.
- Also the tuneshift variation with collimator gap variation should show a visible difference for the two impedance models.