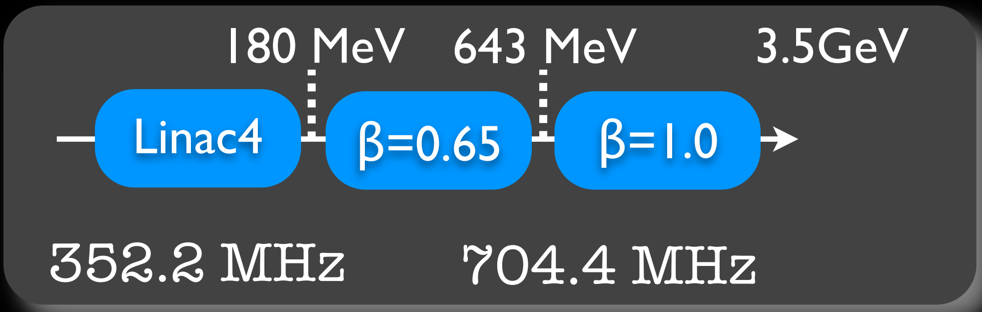
The optimum choice of the geometric beta

F. Gerigk, M. Eshraqi, M. Schuh

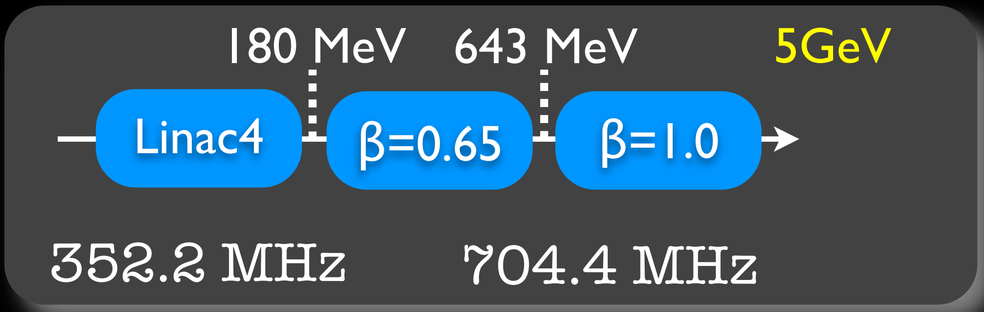
1st SPL collaboration meeting, 11-12 December 2008, CERN

nominal SPL layout

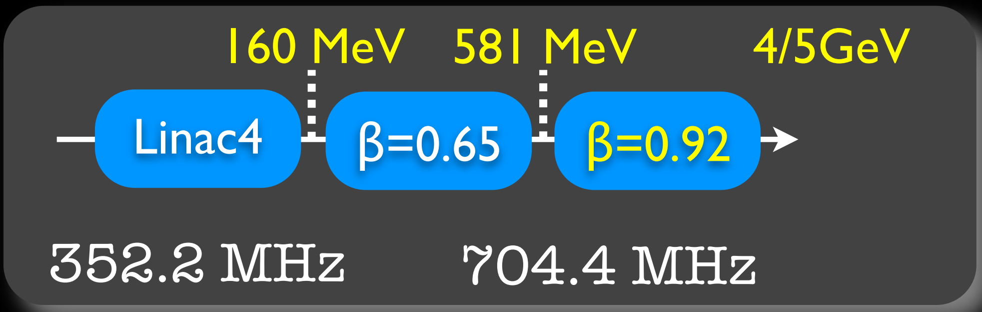
SPL 2006:



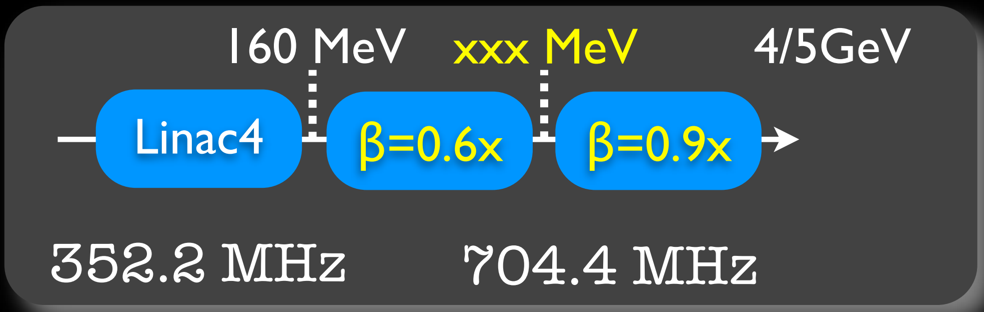
SPL 2007:



SPL 2008:



SPL 2009:

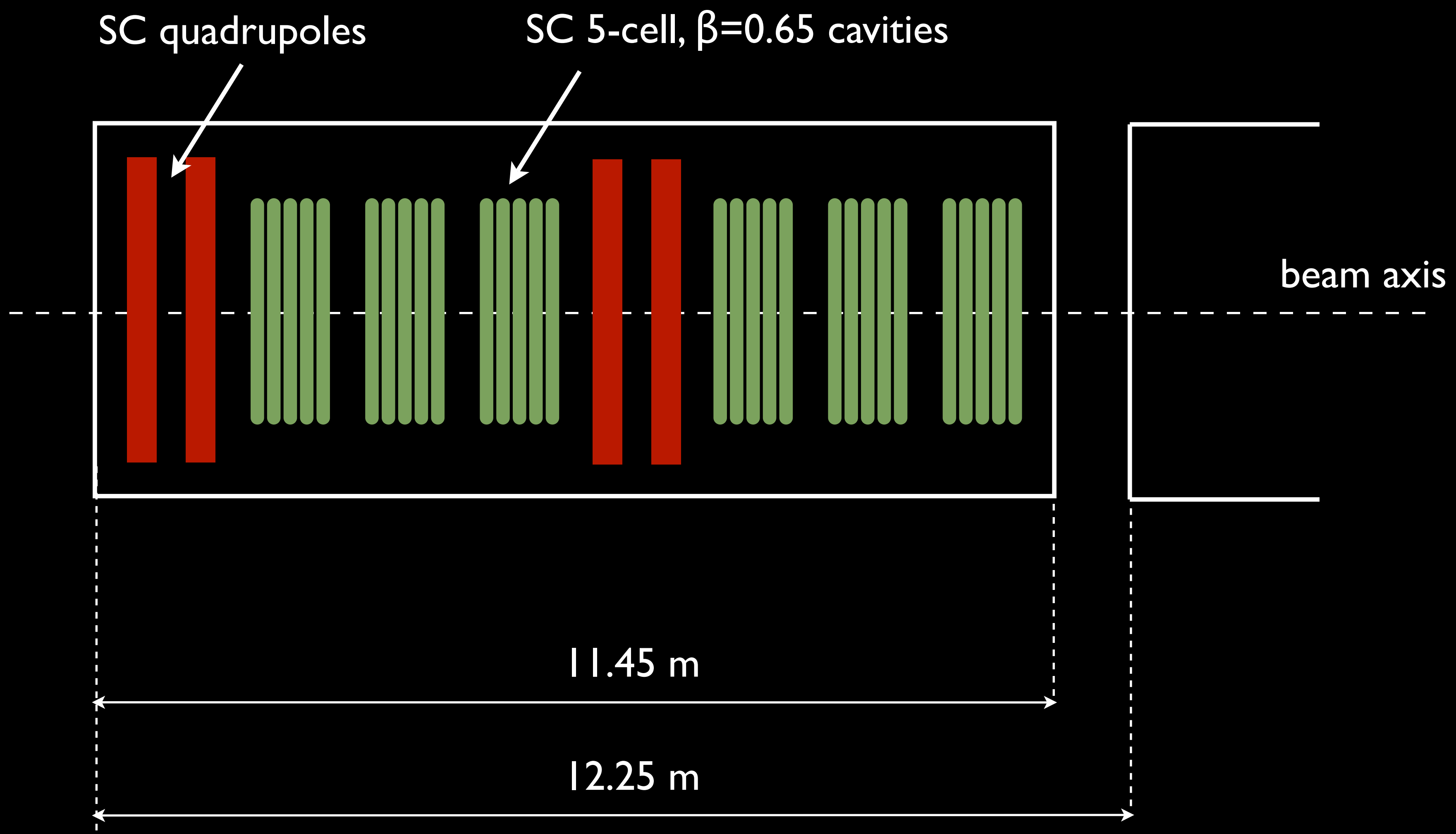


- ....2017 ?

“SPL specifications..”, SPL collaboration meeting ‘09, F. Gerigk et al

low-beta cryo-module

doublet focusing, 2 periods per cryo-module



“SPL specifications..”, SPL collaboration meeting ‘09, F. Gerigk et al

high-beta cryo-module

doublet focusing, 1 period per cryo-module

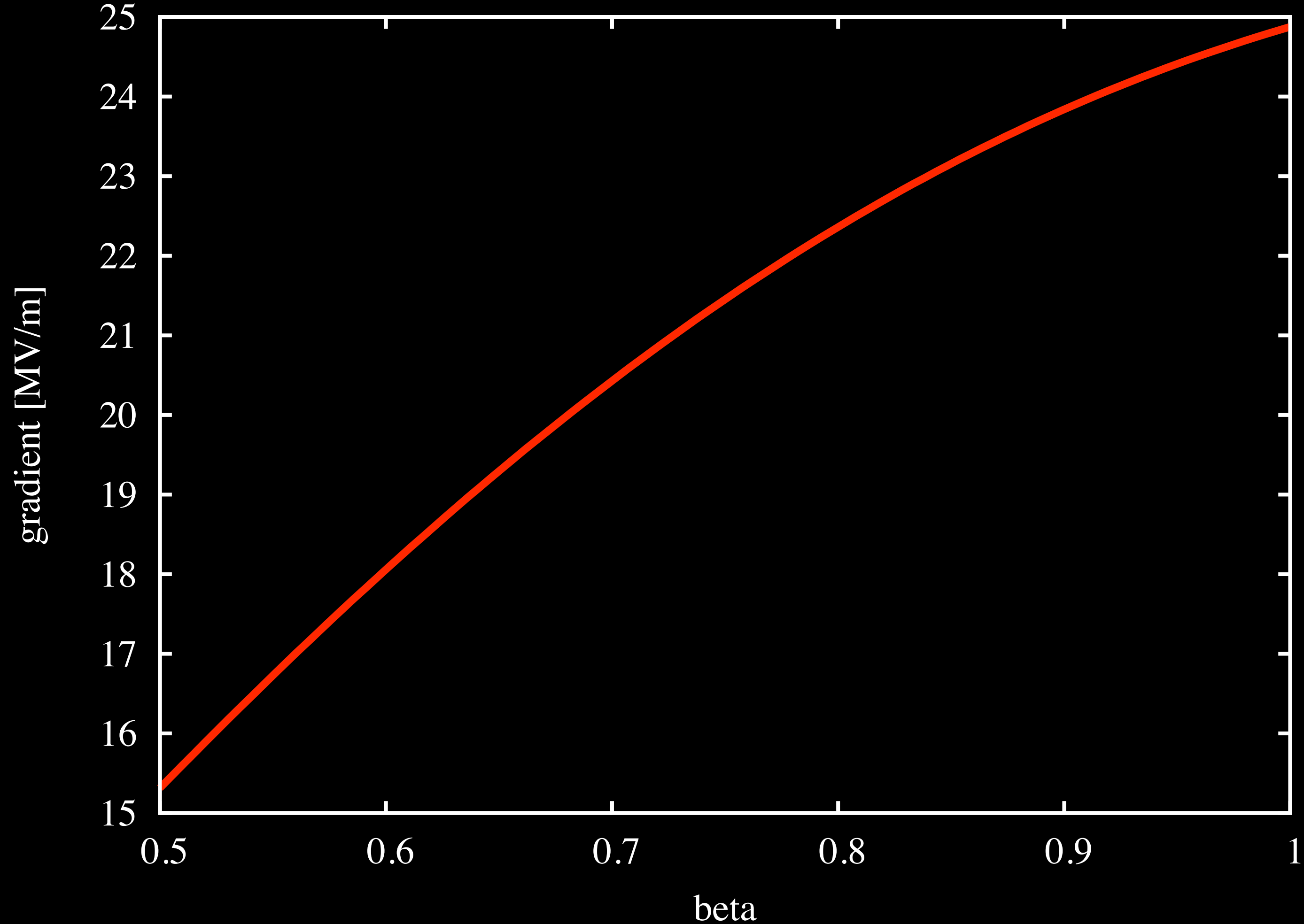
“SPL specifications..”, SPL collaboration meeting ‘09, F. Gerigk et al

gradient versus beta

We assume 25 MV/m @ β=1!

for β<1 the gradients are scaled according to:

$$E_p/E_a \approx 1.84/\beta + 1.17\beta - 1$$



"SPL specifications..", SPL collaboration meeting '09, F. Gerigk et al

comparison of cavity betas

using a constant synchronous phase of -15 deg, and LEP-type end-cell fields: 9% shorter high energy section (7% of total linac length) for b=0.92

SPL type	1.0	0.92
input energy [MeV]	160	160
output energy [MeV]	5011	5059
cavity beta	1.0	0.92
trans. energies [MeV]	646	646
gradients [MV/m]	24.9	24.1
average gradient [MV/m]	11.6	12.8
cavities p. family	200	192
length [m]	**377**	**345**

"SPL specifications..", SPL collaboration meeting '09, F. Gerigk et al

comparison of cavity betas II

using a phase ramp for b=0.65 and a different end-cell model results in a negligible difference

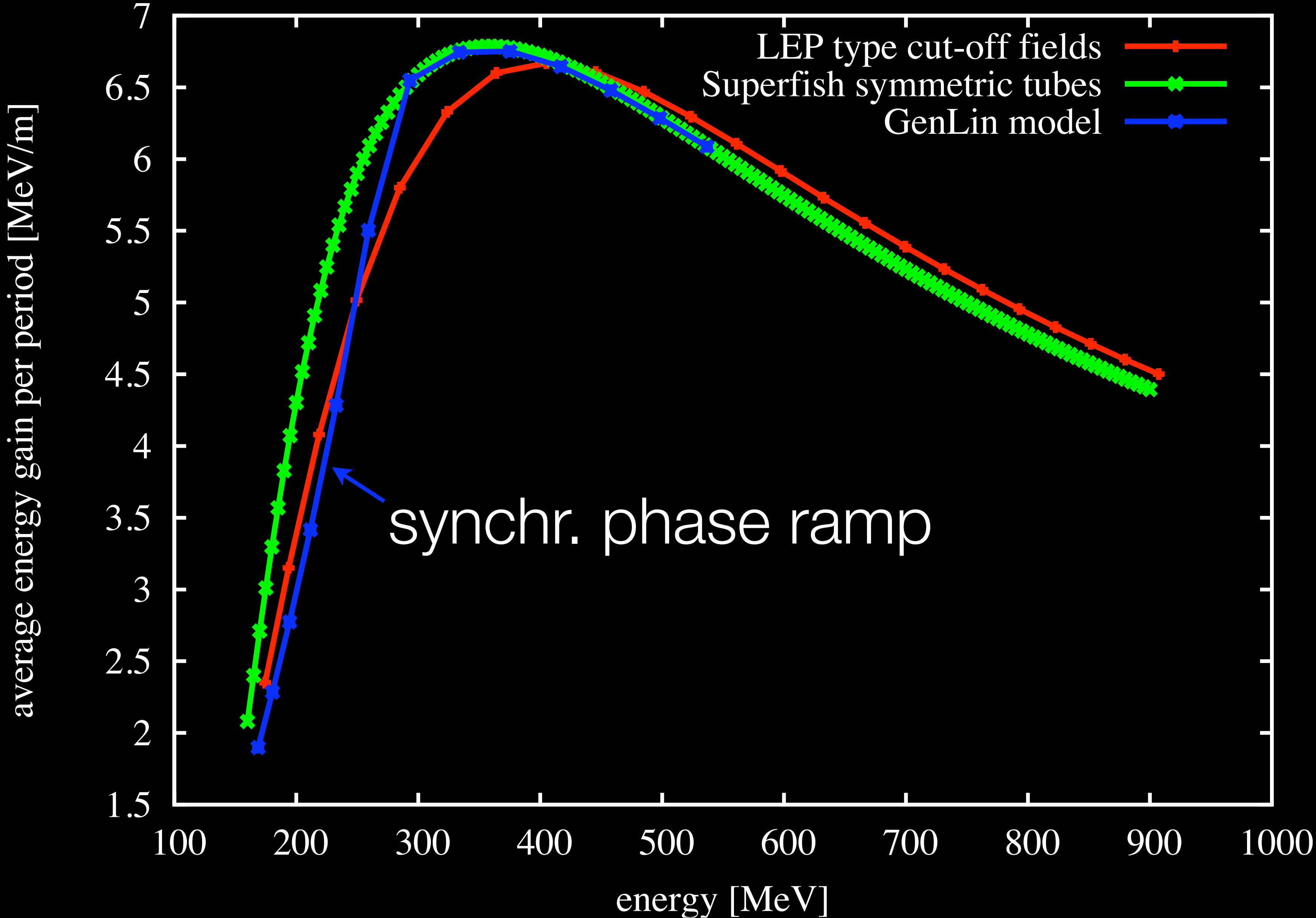
preliminary

SPL type	original	original-5GeV	b=0.65/0.92	b=0.67/0.93
input energy [MeV]	180	160	160	160
output energy [MeV]	3560	5138	5139	5003
cavity beta	0.65/1.0	0.65/1.0	0.65/0.92	0.67/0.93
trans. energies [MeV]	643	646	574	659
gradients [MV/m]	19/25	19/25	19.3/24.1	19.8/24.2
average gradient [MV/m]	5.4/11.4	4.9/11.9	4.8/12.2	4.0/13.56
cavities p. family	42/136	48/200	42/208	60/176
cavities in total	**178**	**248**	**250**	**233**
length [m]	**362**	**477**	**462**	**444**

at β=0.68 we can no longer inject at 160 MeV, so 0.67 seems too risky -> stay with β=0.65

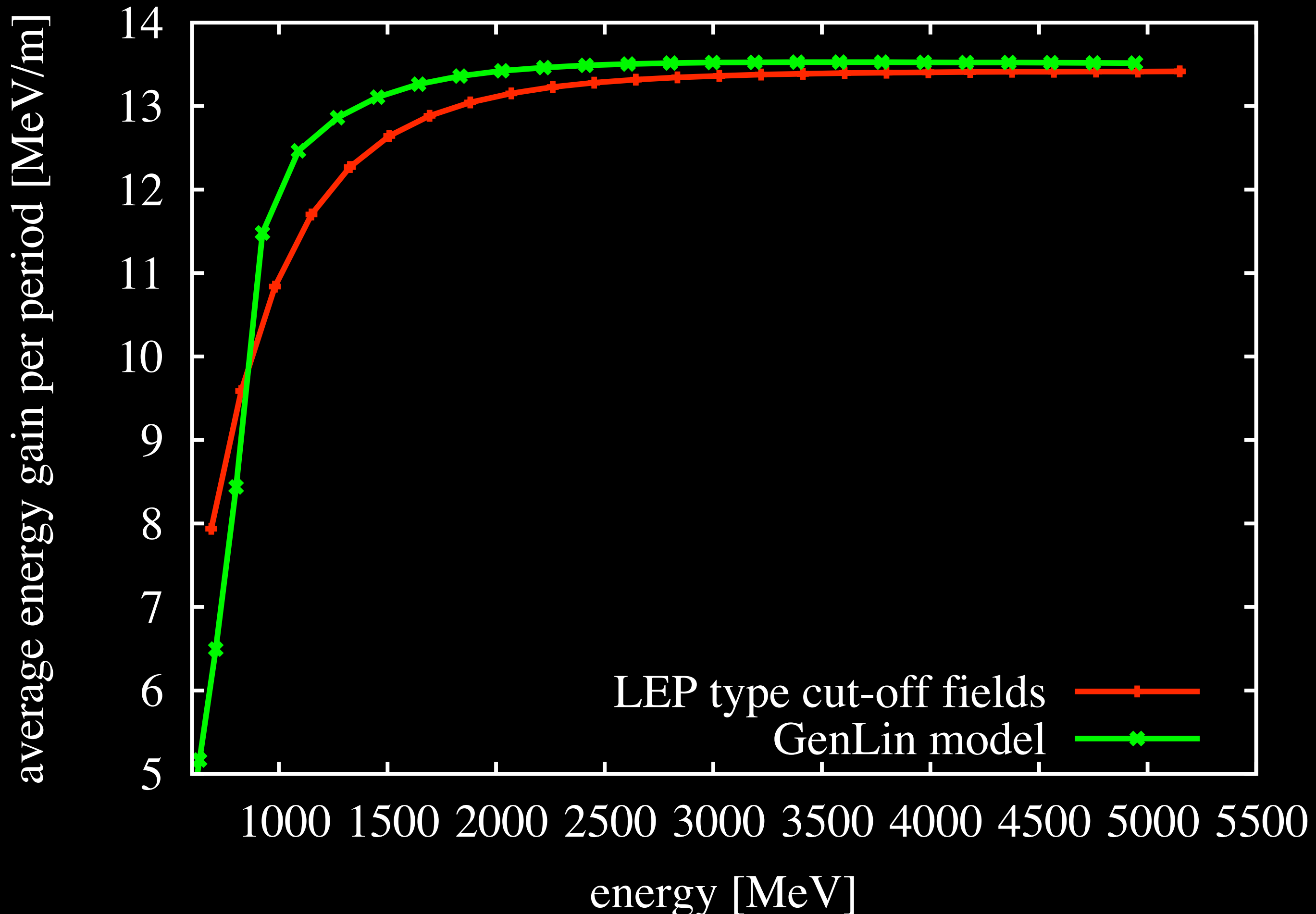
"SPL specifications..", SPL collaboration meeting '09, F. Gerigk et al

comparison of b=0.65 end-cell fields



“SPL specifications..”, SPL collaboration meeting ‘09, F. Gerigk et al

comparison of b=0.92 end-cell fields



not conclusive yet!

but there seems to be a chance that the difference between b=0.92/0.93 and b=1.0 is not too big.

“SPL specifications..”, SPL collaboration meeting ‘09, F. Gerigk et al