Collimation Counting Rates

1. Collimation (basic definitions):

$$n_{primary} * \eta = n_{tertiary}$$

$n_{primary}$: *impact rate on primary collimator;* η: *collimation inefficiency;* $n_{tertiary}$: *loss rates at aperature limitation*

2. Losses at collimation:

$$n_{col} = n_{prim}(1-\eta) = \sum_{i=1}^{4} N_{primary\ i} * \alpha_i + \sum_{i=1}^{16} N_{secondary\ i} * \beta_i$$

n_{col}: *loss rate at collimators;* $N_{primary}$, $N_{secondary}$: *counting rates at the collimator monitors,* α, β: *monitor sensitivity*

3. Losses at other locations:

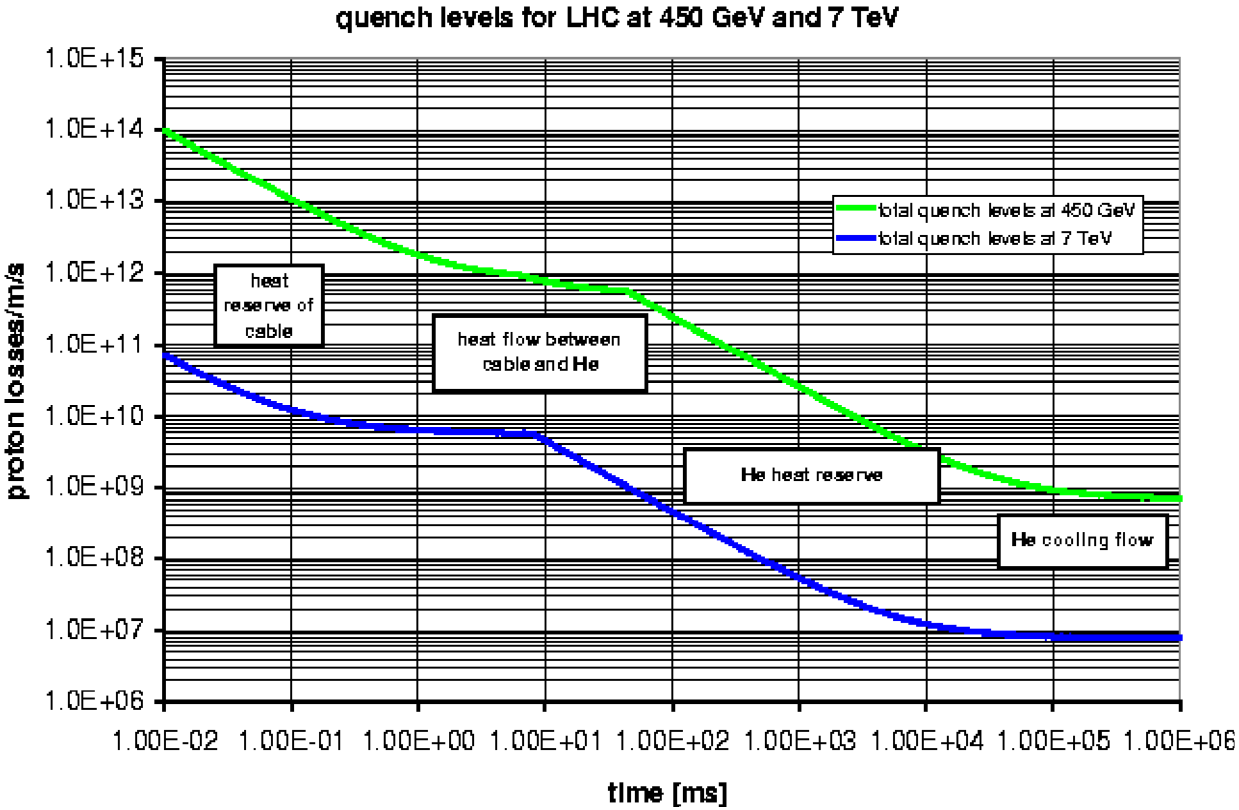
$$n_{tertiary} = n_{col} \frac{\eta}{1+\eta} = \sum_{i=1}^{N} quench\,level_i * \overline{safety}$$

$\overline{safety}$: *ratio of maximal safe losses to quench level; N: number of locations where losses will occur*

4. Aim of collimation: measure losses at collimation to avoid quenches and damages
(aimed predict accuracy of quench levels with an error of 2)

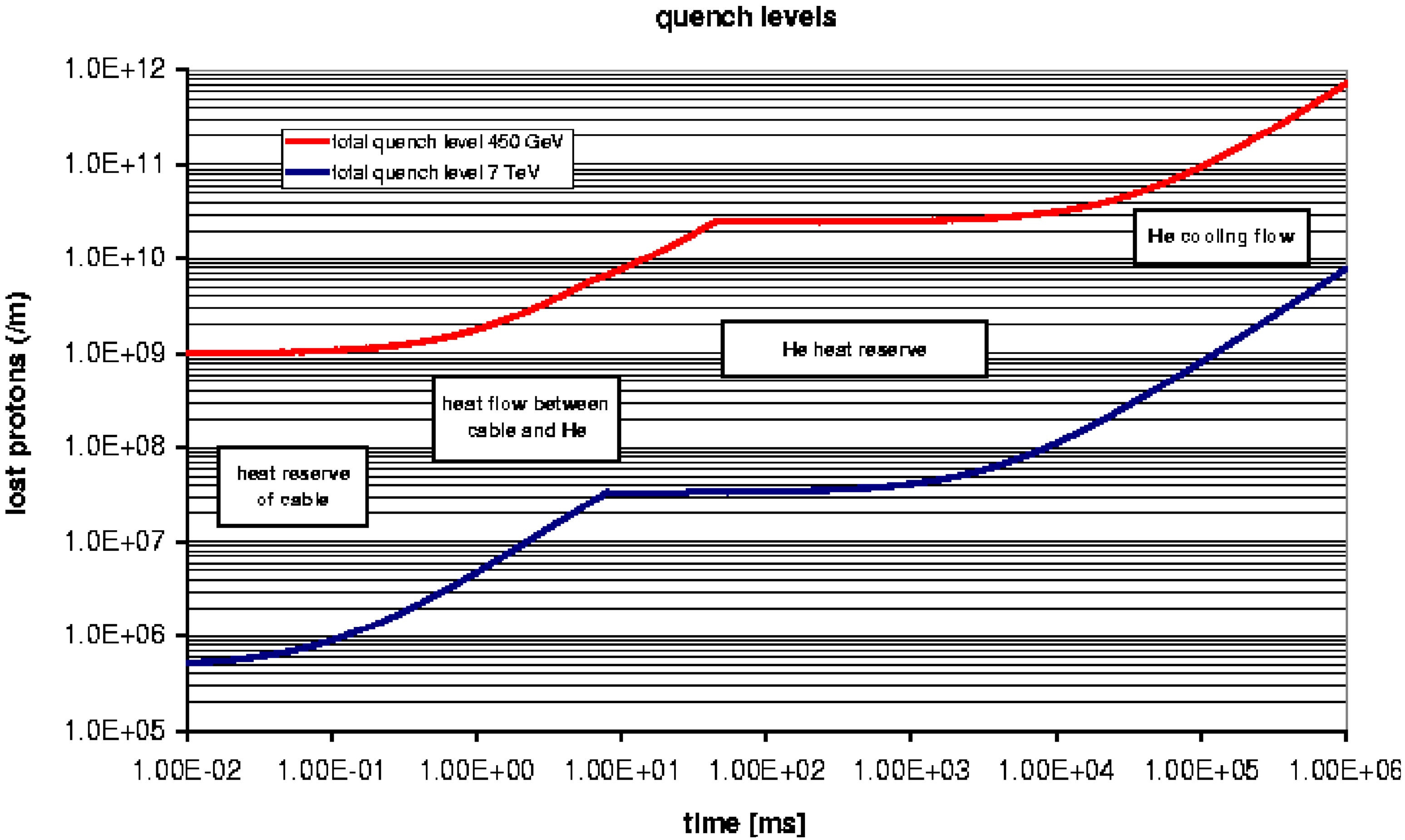
Quench Level Rates

1. MB bending magnet quench level rates Lit.: B. Jeanneret, LHC Project Report 44
2. Rates depend strongly on duration of losses
3. non linear rate change between injection and top energy



Quench Levels

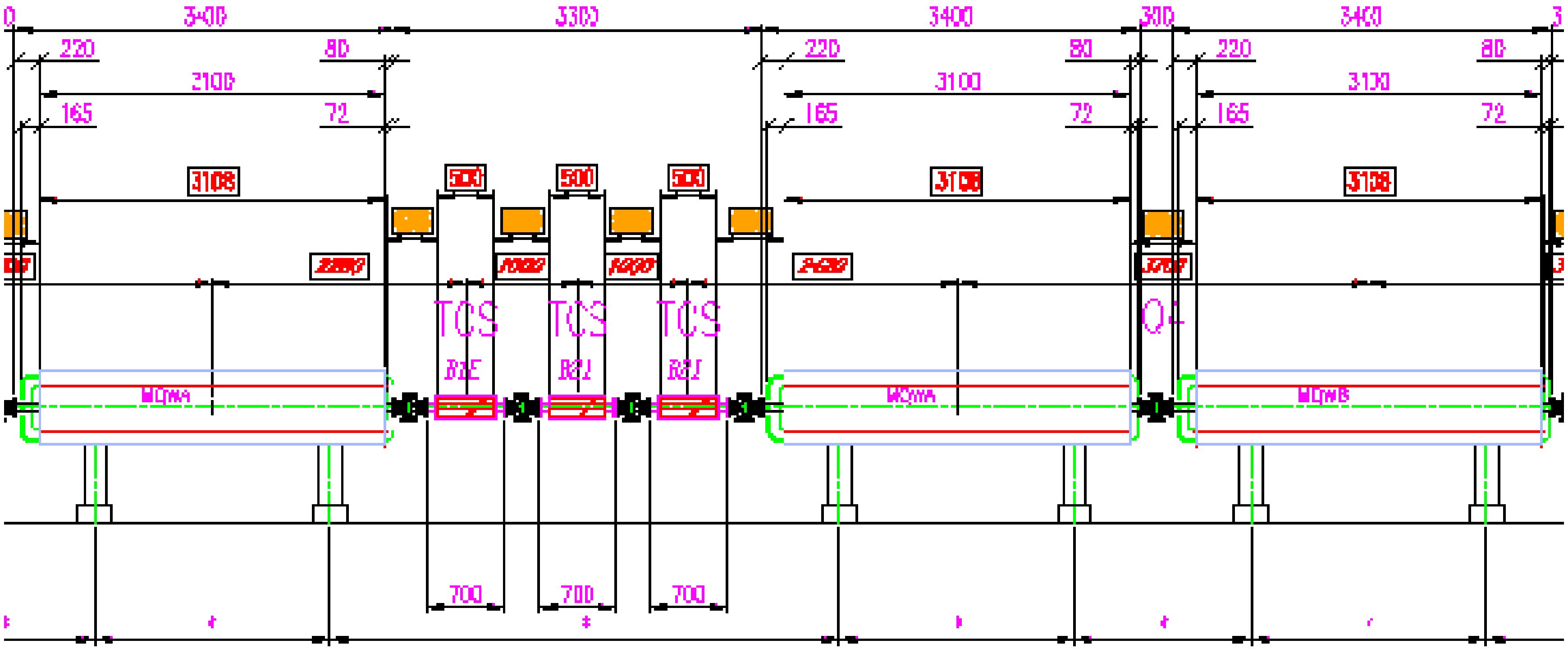
same plot as on previous transparency but in units of protons/meter



Proposed Collimator Locations IP7

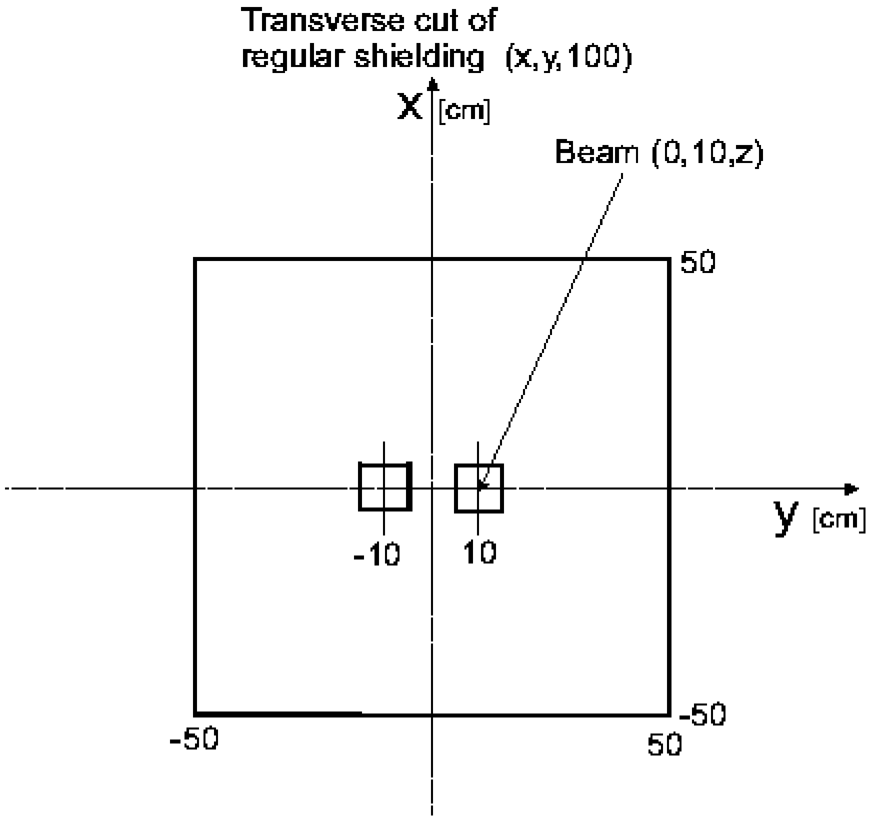
Collimators are about 1m apart and some arrangements are composed

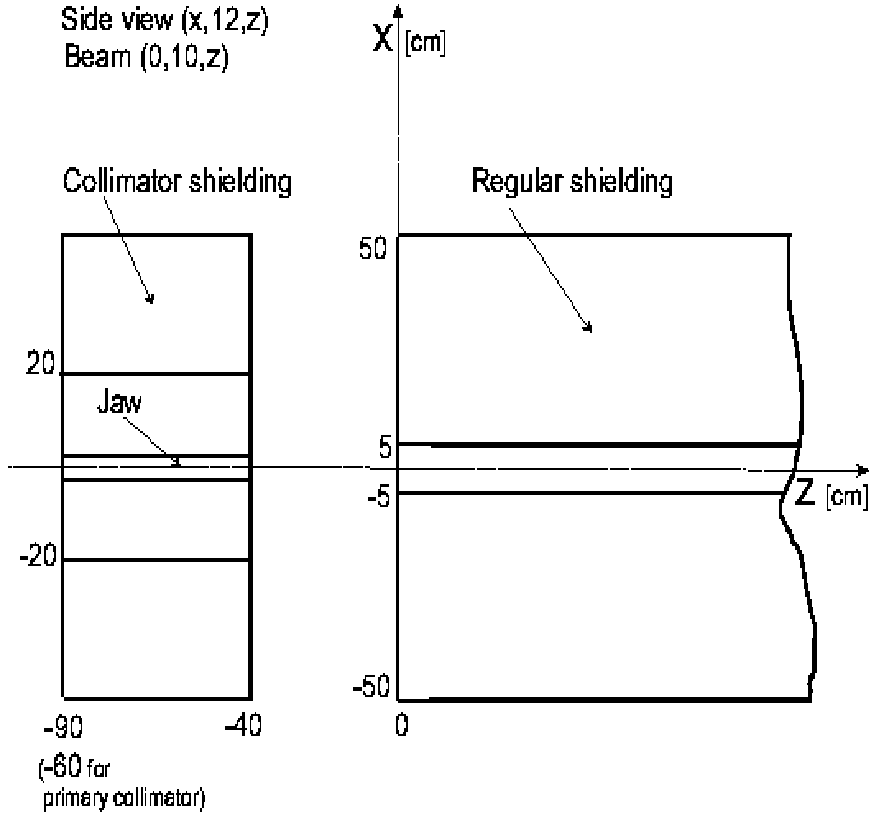
out of beam 1 and beam 2 collimators (distinction between losses of different beams will be not possible).



Shielding at Betatron Collimation

First layout of a IP7 shielding, the beam loss monitors are placed in the gap between collimator shielding and regular shielding





Longitudinal Energy Deposition

1. secondary particle energy deposition along the regular shielding
2. loss monitor location z=0
3. at 100 cm (location of foreseen second collimator in some arrangements) the energy deposition is only reduced by a factor of 10 (10<x<20)

Result: crosstalk between monitors, reduction of collimation adjustment accuracy=>
careful investigations needed