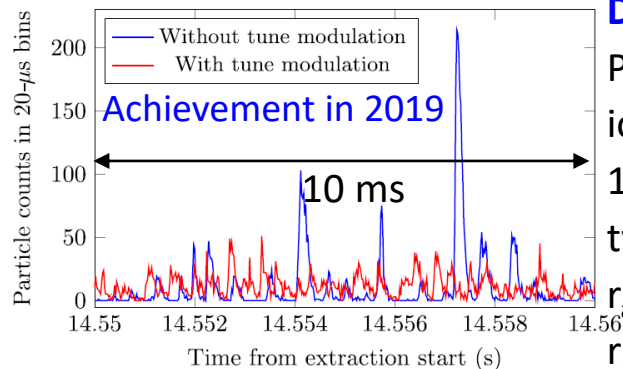


Goal for slow extraction (typ. 5 s, 500 MeV/u):

Improvement of 'micro-spill' up to Poisson limit:



Detection:

Primary
ion counting by
1mm plastic scint.
typ. $\Delta t_{\text{read}} = 10 \mu\text{s}$
 $r_{\text{aver}} = 2 \cdot 10^6 \text{ s}^{-1}$
 $r_{\text{max}} = 2 \cdot 10^7 \text{ s}^{-1}$

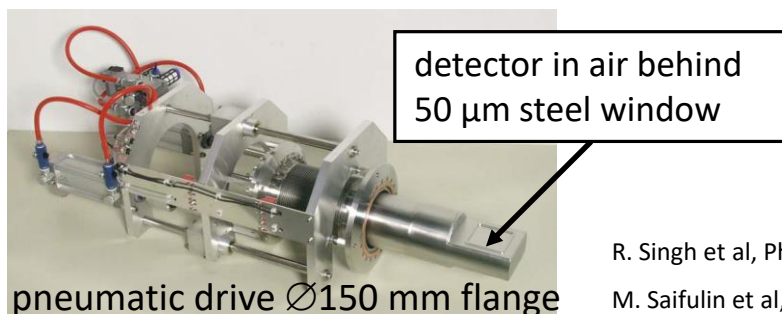
Display: Counts analyzed \Rightarrow acc. physics quantity
for **online** accelerator optimization

Latest achievements:

Rate-dependent Poisson limit almost reached

\Rightarrow **increase of count-rate required to**

$r_{\text{aver}} = 10^7 \dots 10^8 \text{ s}^{-1}$, $r_{\text{max}} = 10^8 \dots 10^9 \text{ s}^{-1}$



R. Singh et al, Phys. Rev. Applied 13, 044076 (2020)

M. Saifulin et al, Conf. IBIC 2020

Detector requirements:

Size: At least $4 \times 4 \text{ cm}^2$

beam size $\approx 1 \text{ cm}$, but movement $\approx 2 \text{ cm}$

Count rate: At least $r_{\text{max}} = 10^8 \text{ s}^{-1}$

good pulse-height resol. for robust trigger

Rad-hardness: At least $10^{12} \text{ cm}^{-2} \text{ U@300 MeV/u}$
 $\approx 5 \text{ MGy}$ i.e. 100x plastic scintillator

Dynamic range: At least C to U @ $E_{\text{kin}} \geq 300 \text{ MeV/u}$

Channels: In principle only one

but segmentation to increase count rate

Signal processing: Simple for reliable operation

Installation: Movable in beam line

What is the best suited detector?

scDiamond, LGAD, scintillator.....

R&D required for optimal detector and electronics

Example:

Inorganic scintillator

