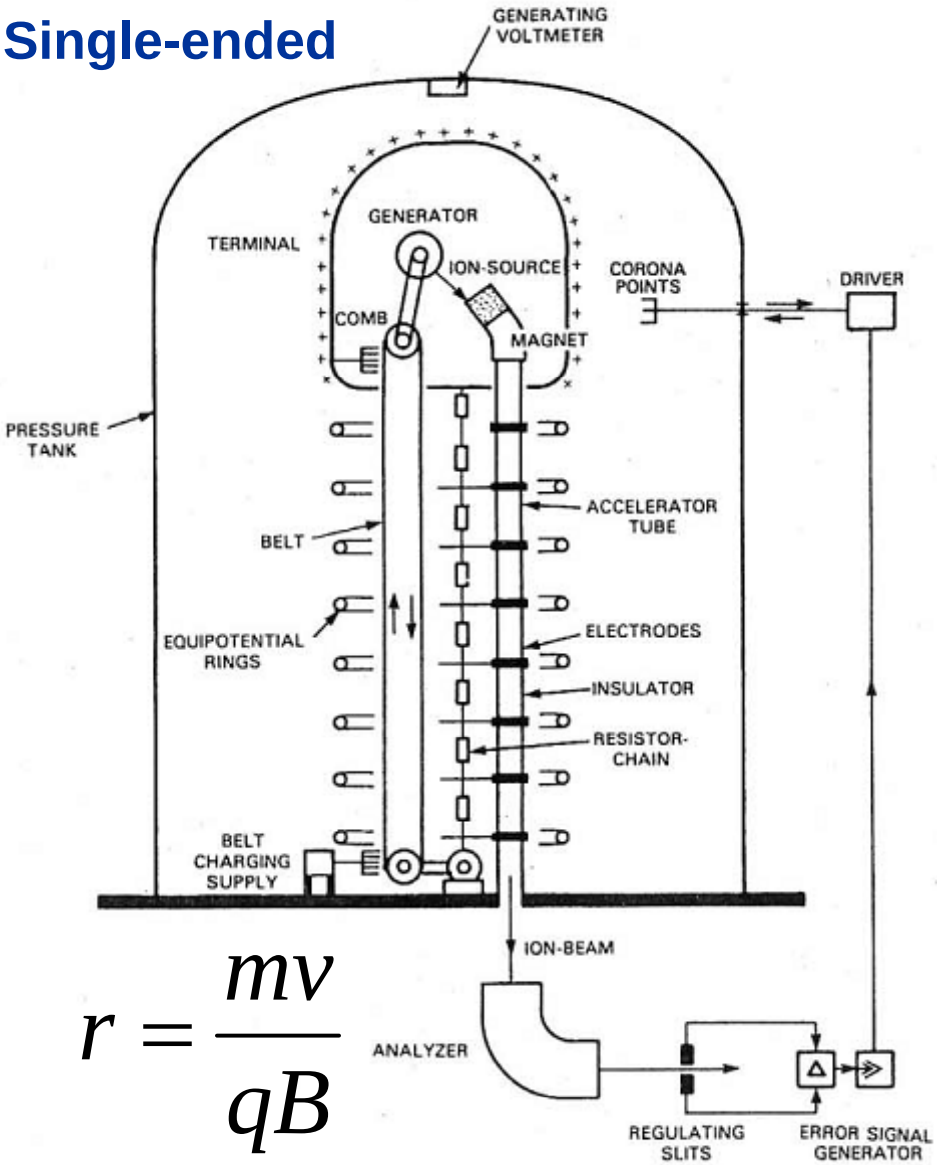
Van de Graaff

Single-ended



$$r = \frac{mv}{qB}$$

$$I_{belt} = I_{beam} + I_{ins} + I_{cor} + I_{res}.$$

1 mA maximum

- V ↑ ► beam bending ↓ ► higher current at one slit ► error signal moves corona points closer to terminal ► I_{cor} ↑ ► V ↓.

Beam Properties

Lorentz's Force

$$\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$$

Change in energy

$$T = qV$$

Charge state

Circular path

$$r = \frac{mv}{qB}, \qquad \vec{v} \perp \vec{B}$$

Beam Properties

- Beam energy. (Terminal voltage, TOF, Wien filter, calibration ➔)
- Energy spread. ➔
- Energy stability.
- Purity. Example ^{3}He ion beam contaminated with DH^+

$^3\mathrm{He}(^3\mathrm{He}, 2p)^4\mathrm{He}$
$^3\mathrm{He}(d, p)^4\mathrm{He}$

$$\frac{\exp(-2\pi\eta)(^3\mathrm{He} + {}^3\mathrm{He})}{\exp(-2\pi\eta)(^3\mathrm{He} + d)} = ?$$

HW 8

at different energies.

- Charge state. Important for interpreting integrated charge measurement.

Beam Properties

$$r = \frac{(2mE)^{1/2}}{qB}\left(1 + \frac{E}{2mc^2}\right)^{1/2}$$

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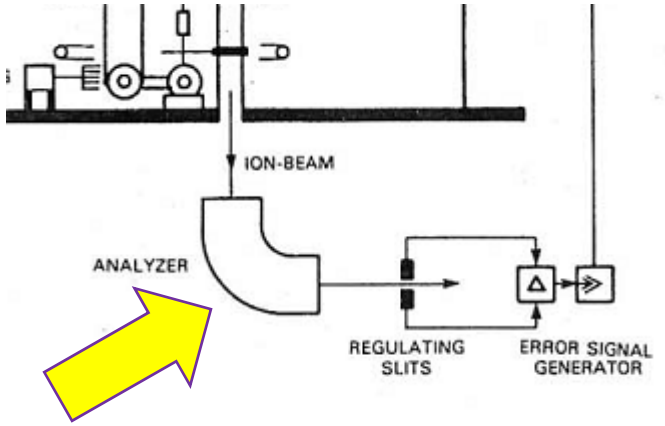
$$r = \frac{1}{qBc}(2mc^2E + E^2)^{1/2}$$



- *B* is measured using Hall or **NMR** probes.
- Fringe effects.
- Magnetic constant

$$K = qB/(2mc^2E + E^2)^{1/2}$$

$$f = A\sqrt{ME\left(1 + \frac{E}{2Mc^2}\right)}$$