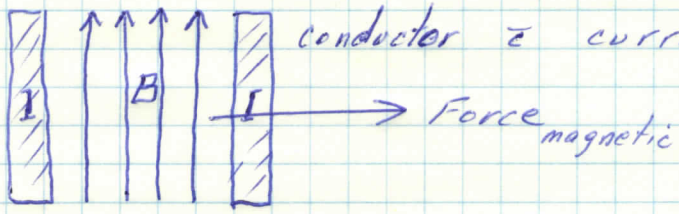
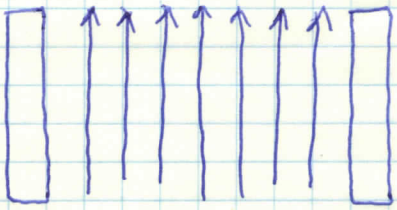
P-1 5 Oct Michels - Solar Wind

E & M

Plasma — Charge conserved
Neutral
Diamagnetic
Freeze in flux

Magnetic field pressure





tends to move conductor

There is press. ~~assoc~~ & energy density assoc. ⊂ field

$$Press_{mag} = \frac{B^2}{2\mu_0} \qquad \mu_0 = \text{energy density}$$

$$\oint B\,dl = \int \mu_0 J\,ds$$

$$BL = \mu_0 i$$

∴ there is ↑ in pressure on ionized gas in field

Energy of particle in magnetic field remains constant

∵ follows from $F = eV \times B$

$$F \cdot V = e\underline{V} \cdot \underline{V} \times B$$

$$= e\underline{V} \times \underline{V} B$$

$$\| \| \|$$

$$0$$

Gradient drift - ~~~

P-2 5 Oct Michels Solar Wind –

Curvature drift –

Adiabatic Invariance: describes general motion of particles in field – slow changes in fields

$I_{invariant} = \oint P\,dx$ (momentum)

Invariants

① Moment

$$\mu \equiv iA = \frac{e_{charge}}{T_{period}} = \frac{1}{2}\frac{mv_\perp^2}{B} = \frac{W_\perp}{B}$$

Find radius & velocity –

Balance forces – centrifugal

$$F = evB = \frac{mv^2}{a} \qquad a_{radius} = \frac{mv}{eB}$$

$$T = \frac{2\pi a}{Velocity}$$

Flux enclosed = constant

$$= \oint B\,ds = \pi B a^2$$

$$= (2\pi m)\frac{1/2\, mv^2}{B}$$

② Longitudinal

$$I = LV$$

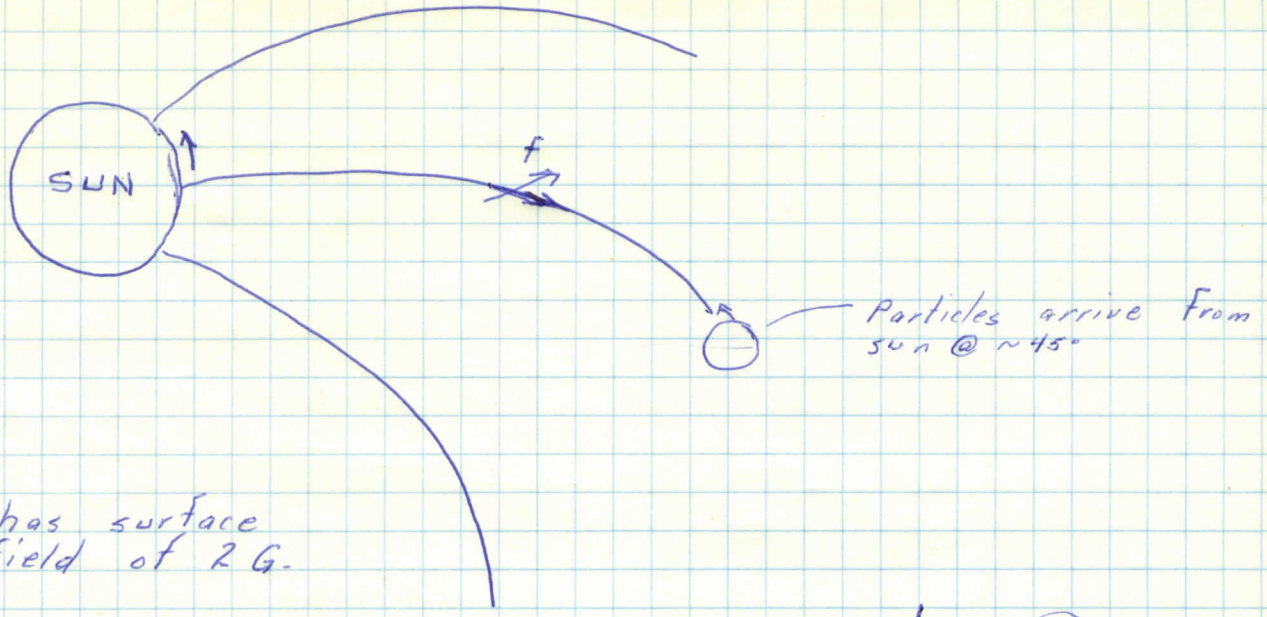
③ Flux

Earth's Mag. Field $\sim .5$ Gauss $= 5 \times 10^4 \gamma$ $\quad \gamma = 10^{-5}$ G $= 10^{-9}$ Weber/m²

50000 $\gamma \pm 100\gamma$ is typical of earth

Magnetic variations on earth were correlated ~ sunspots.

P-3 5 Oct Michels Solar Wind



Sun has surface magi field of 2 G.