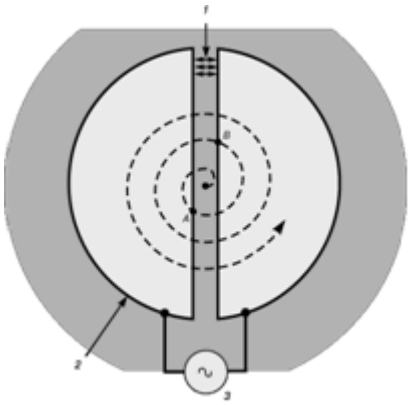
Answer on Question #51230, Physics, Other

With the help of a diagram, explain the working of a synchrocyclotron in your own words.

Answer:



1 – is the interval between two electrodes where charged particles is forced by electric field.

2 – is the two massive hollow electrodes.

3 – is the voltage generator

By doted line here is shown the particles path.

Also should be said that there is a constant magnetic field orthogonal to figure's surface.

Particle move in such a magnetic field by circular trajectory, in case of constant speed.

And it would be some semi spiral motion in case of changeable speed.

So in all space in the hollow of the electrodes particle moves by circular orbit and only in the interval between the electrodes it will forced by electric field that made by voltage generator.

But in case that particle moves by circular path, one time per turn it will pass electrodes interval in the "right direction" and another by "left direction".

If the voltage will no change then particle will be forced positively (relative to it's velocity) one half of turn and also will be forced negatively per another half of turn.

As result particle will be not accelerated.

So, the voltage generator have to change it's polarity two times per particles turn.

In case that particles effective mass depended from it's speed (relativity theory)

the period of the particle rotation will be dependent from it's current speed.

In that case voltage generator frequency have to be dependent by the particle velocity too.

The name *synchrocyclotron* describes this mechanism of the synchronization between the voltage generator frequency and the particle velocity.