

**Comment to the Reply
by Schumacher and Boswell
About Their Proposed Magnetospheric
Electron Ring Experiment**

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The authors quote several experimental papers on electron beam injection by rocket-borne electron guns into the magnetosphere, and where the spacecraft could be neutralized. In one experiment for example, a large mylar disc was used to collect electrons from the magnetospheric plasma. It is quite obvious, however, that if a large mylar disc can collect electrons for the neutralization of the spacecraft, the much larger surface of the electron ring can do the same even better. If plasma electrons flow to the mylar disc, an equal amount of plasma ions flow to the electron ring, with the plasma electrons neutralizing the rocket gun and the ions neutralizing the electron ring. For the collective electron ring accelerator concept however, a *charged* electron ring is required, and which must have a deep electrostatic potential well. Therefore, the concept proposed by the authors is clearly unfeasible in a plasma environment which can neutralize the gun. Accordingly, all the experiments quoted by Schumacher and Boswell dealt with neutralized or almost neutralized beams. In one experiment for example, it was reported that the gun had a residual potential of

~ 200 Volts. The ring is likely to have about the same potential and which is much too small for an electron ring accelerator.

In case the electron ring is injected into a perfect vacuum, Schumacher and Boswell claim that the gun neutralization problem can there be solved by putting an ion gun at an "appropriate distance" away from the electron gun. I suppose what they mean is to put an ion gun far away from the electron gun and connected with the electron gun by a long wire. In this case however, the ion cloud produced at one end of the wire will lead to a discharge along the conducting wire to the electron cloud produced at the other end of the wire, because the wire in effect shortens the high electric potential in between both clouds, similar to the situation where a high voltage line is connected to the ground by a wire.

Why does it then work in the laboratory? The answer is that there the electron ring is projected into a metallic tube and which can carry a return current. Unlike a plasma, the conducting tube is rigid. The return current along the tube puts positive charges on the inner side of the tube wall at the position of the electron ring. Unlike a plasma, the ions are here bound to the solid wall of the return current conductor as long as the electric field at the wall is less than 10^8 V/cm, the limit for field ion emission. The electric field then goes from the ring in a radial direction to the wall with the magnetic field oriented perpendicular to the ring, thereby satisfying the condition for "magnetic insulation". For the functioning of the electron ring accelerator a rigid return current conductor is necessary, but which in space is absent, except perhaps near the surface of an airless planet of some exotic astrophysical object like a neutron star. It is for this reason that the experiment proposed by Schumacher and Boswell is unfeasible.

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