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METHOD FOR DEFINING POSITION OF MAGNETIC FIELD LINES

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Alan W. DeSilva and John M. Wilcox

January 12, 1960

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## METHOD FOR DEFINING POSITION OF MAGNETIC FIELD LINES

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In the course of some experiments on Alfvén wave propagation<sup>1</sup> it was necessary to be sure that our hydromagnetic wave guide (a copper cylinder 34 in. long and 6 in. in diameter) was accurately aligned with a uniform axial magnetic field. For this purpose a simple method was used to produce a well-defined line discharge which followed along particular magnetic field lines. The copper cylinder appeared to be filled with glowing rubber bands which were stretched along the field lines.

One end of the cylinder was closed with a copper plate, and the other end was closed with a Pyrex glass plate which was pierced with 8 wires that stuck out for about 1 in. on each side of the plate. The wires, which were welded in place by a glassblower, were 1/16 in. in diameter and were mounted on a 4-in. diam. circle 45 deg apart. The cylinder was evacuated and then filled with hydrogen to a pressure of 150 microns. In a uniform axial magnetic field of several kilogauss, 1200 volts negative was applied to the 8 wires. Less than a milliampere of current flowed, and the magnetic lines were illuminated as described above. With the aid of a small telescope and fiduciary lines scribed on the copper plate, it was possible to check the alignment of the copper cylinder with the magnetic field to within less than 1/32 in.

We changed the strength of the magnetic field in various parts of the cylinder and observed that the line discharge would follow the magnetic lines around a rather sharp curvature. This would indicate that the method would be valuable for use with the various complex magnetic-field geometries that have been proposed for controlled thermonuclear heating.

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<sup>1</sup>Wilcox, Boley, and DeSilva, "Experimental Study of Alfvén Wave Properties", to be published in *Physics of Fluids*. See also Allen, Baker, Pyle and Wilcox, *Phys. Rev. Letters* 2, 383 (1959).