So far, 950 hours of data have been studied, and all information indicates that the experiment is functioning properly. During the portion of the flight represented by these data, the detector plate was approximately perpendicular to the ecliptic plane and facing in the direction of flight. Thus, it was primarily sensitive to particles in retrograde heliocentric orbits, although impacts from particles in direct heliocentric orbits with low relative collision velocities were a possibility.

During this period, one definite hit was recorded on the more sensitive momentum channel. Some of the data will be re-examined in order to check several possible hits which are classified questionable at the present time.

However, an estimate of the flux can be made by computing the flux necessary for a 0.9 probability of at least one impact for the time of the measurement.

With an area-time product of 1.2×10^5 m^2 sec, a flux of 6×10^{-6} particles/m^2 sec srad is obtained. If an average collision velocity of 55 km/sec for this retrograde flux is assumed, the mass of the minimum detected particle is $1.3 \pm 0.3 \times 10^{-10}$ g.

A few brief remarks can be made concerning the direct measurements from earlier satellites and the preliminary results from the cosmic dust experiment on Mariner II. If an assumption is made that the flux of the dust particles in interplanetary space is omnidirectional, the flux of dust particles measured by satellites near the earth (see *3, 4*) is found to be about 10^4 times greater than the preliminary measurement from the Mariner II experiment.

From a similar experiment on Pioneer I, Dubin reported a measurement of dust particle flux in cislunar space (see *5*). The flux obtained from this measurement is 10^2 times greater than the preliminary Mariner II flux value. These direct measurements are showing a concentration of small dust particles near the earth.

The spacecraft has completed its scheduled 180-degree roll around the sun-probe axis. The detector plate is now primarily sensitive to particles in direct heliocentric orbits. A more effective comparison of the dust-particle flux in interplanetary space with that near the earth will be possible with the analysis of these data.

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Interplanetary Magnetic Fields

Abstract. Preliminary analysis of Mariner II magnetometer data indicates a persistent interplanetary field varying between a least 2 and 10 gamma ($1\gamma = 10^{-5}$ gauss). The interplanetary field appears to lie mainly in the ecliptic plane, although there is a substantial, fluctuating, transverse component. The Mariner II data agree reasonably well with the prior Pioneer V observations. Typically, variations as large as 5 to 10 gamma in the field component radial from the sun are measured. Correlations with the Mariner II plasma measurements have been observed.

The orbit of Mariner II will take the spacecraft from its injection point just outside the earth on 27 August 1962 to the vicinity of Venus on 14 December 1962. The scientific instruments aboard the spacecraft are designed to provide observations in the vicinity of Venus and to measure several properties of the interplanetary environment over the range of heliocentric distances between 1.5×10^8 and 1.1×10^8 km. Among these instruments is a triaxial, fluxgate magnetometer with three orthogonal sensors. Readings of the *X*-,*Y*-, and *Z*-field components are separated by 1.9 seconds, and a complete set of triaxial readings is relayed to earth every 36.96 seconds. The accuracy of each reading is about 1 gamma (10^{-5} gauss). However, the observed field is the super-position of the interplanetary magnetic field and a nearly constant spacecraft magnetic field. Thus, only *changes* in the interplanetary field can be measured unless the spacecraft field can be independently determined. The two components of the spacecraft field perpendicular to the sun-spacecraft direction have been determined as described below, but not the radial component parallel to this direction. The results described herein were obtained in interplanetary space during late August and early September 1962, far enough from the earth to be unaffected by the earth's presence. No magnetic measurements were obtained either inside the geomagnetic field or in the region of the transition to interplanetary space.

Preliminary analysis of data from the earlier portion of the Mariner II flight has verified a number of widely accepted beliefs and confirmed the main features of prior, less complete observations. Probably the most important result is the convincing evidence that interplanetary space is rarely empty or field free. Magnetic fields of at least a few gamma are nearly always present, except perhaps for occasional, transient nulls. The fields usually vary irregularly with characteristic periods ranging from an observable lower limit of 40 seconds to several hours. The magnitude of the field component transverse to the sun-spacecraft direction (see $B\perp$, Fig. 1) agrees reasonably well with the Pioneer V observations (*1*). The magnitude is typically 5 gamma during times of small magnetic activity, rising to values of 20 gamma or more during magnetic storms, and falling to about 2 gamma during very quiet times. Occasionally, all three components of the field show almost no variations for periods of an hour or two. Such intervals appear to be of shorter duration, and to occur less frequently, than was indicated by Pioneer V data obtained in March and April 1960.

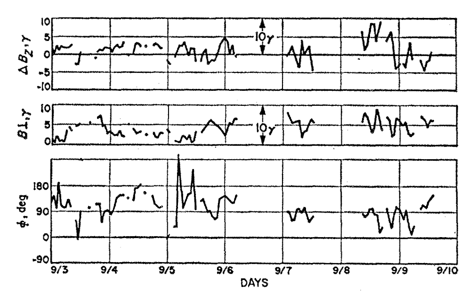

Fig. 1. Magnitude and direction of the interplanetary field. ΔB_Z is the variation in the radial field component. The absolute magnitude of this component is not known at this time because the *Z*-component of the spacecraft magnetic field is unknown. The $+Z$-direction is radially outward from the sun. $B\perp$ is the component of the interplanetary field perpendicular to the *Z*-direction. $B\perp = (b_x^2 + b_y^2)^{\frac{1}{2}}$ where b_x and b_y are derived from the *X*- and *Y*- measurements by subtracting the *X*- and *Y*- spacecraft magnetic field components. The angle $\phi = \tan^{-1} (b_y/b_x)$. During the period shown, the *X*-axis was nearly paralled to the direction of the north ecliptic pole. ϕ is a counter-clockwise angle in a view toward the sun. The values of each variable are hourly averages obtained during the 7 days after the spacecraft was stabilized.

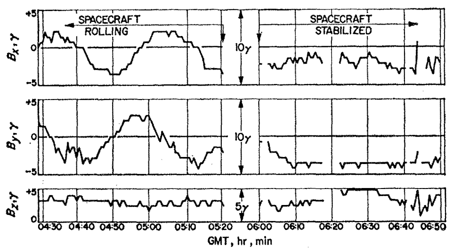

Fig. 2. Interplanetary magnetic field measurements before and after the stabilization of the spacecraft 3 September 1962. The data preceding the gaps in the curves were obtained while the spacecraft was rolling about the Z-axis. The ambient field was relatively undisturbed. B_Z was nearly constant, while B_X and B_Y showed sinusoidal variations produced mainly by the rolling motion. The curves that follow the break in the data were obtained after the spacecraft was stabilized. B_Z was virtually unchanged. B_X and B_Y were also nearly constant after the spacecraft stopped rolling. Note that B_X and B_Y are approximately equal on both sides of the break; the spacecraft orientation corresponding to the data taken just before the break was within 10 degrees of the stabilized orientation.

Preliminary analysis of the Mariner II magnetometer data has also produced some new information. These results, including correlations with the plasma data, do not agree in an obvious way with any simple model of the interplanetary medium (*2*). Averaged over almost any period of several hours, the transverse component of the interplanetary field appears to lie more nearly in, rather than normal to, the plane of the ecliptic (the plane of the earth's orbit). However, there is a substantial, fluctuating component perpendicular to the ecliptic plane. Further investigation should establish whether or not its average, over periods of days, is zero. During the first ten days of the flight, the transverse component was usually directed toward the east, opposite to the direction of planetary motion (see ϕ, Fig. 1). Our earlier speculation (*1*) that in very quiet periods the transverse component might be mainly perpendicular to the ecliptic plane is inconsistent with the Mariner II data for this period. During this same period the range of variations in the radial-field component, ΔB_Z (Fig. 1), was typically 5 to 10 gamma.

When the plasma density and velocity increase during magnetic-storm intervals, the interplanetary field becomes larger and more irregular. Many of the changes in the field components correlate in detail with simultaneous changes in the plasma flux. Often, however, the plasma and field variations cannot be readily correlated. A consistent pattern has not yet been identified that can be ascribed to simple structures or to waves. No correlations have been noted that correspond to the plasma-field correlations observed by Explorer X (*3*) near the earth in which regions of intense plasma flux and intense magnetic flux alternated.

The orientation of the spacecraft, and therefore of the magnetometer, is controlled so that the Z-axis points toward the sun. The orientations of the other two orthogonal axes, X and Y, depend upon the mode of operation of the spacecraft. From 29 August to 3 September the spacecraft was allowed to roll about the Z-axis, so that the X- and Y-magnetometer sensors, although remaining perpendicular to the spacecraft-sun direction, also rotated about the Z-axis. On 3 September the orientation of the X- and Y-axes was stabilized with the Y-axis lying in a plane defined by the sun, earth, and spacecraft.

The magnetometer measurements obtained immediately preceding, and immediately following, the stabilization of the spacecraft about its roll axis are shown in Fig. 2. Since the scientific instruments were inoperative during stabilization, there is a gap in the measurements. The variation in the X- and Y-components during the period preceding the stabilization is attributable principally to the rolling of the spacecraft. The contribution from the transverse interplanetary field, when averaged over many complete revolutions, is zero. The average field values represent the X- and Y-spacecraft field components. Fortunately, the interplanetary field was relatively undisturbed during this period.

The center-to-peak amplitude of the variations in the X- and Y-components is a measure of the transverse component of the interplanetary field. During the period shown in Fig. 2, the component was approximately 3 gamma. The spacecraft made almost one complete revolution (approximately 350°) about the Z-axis between the end of the rolling period and stabilization. Thus, components measured just before, and just after, stabilization are approximately equal. Since the orientation of the Z-axis was not affected by stabilization, and since conditions were magnetically quiet, the measurements of B_Z show very little change (*4*).

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Lysergic Acid Diethylamide: Its Effects on a Male Asiatic Elephant

Because of his remarkable intelligence, his extended life span, his capacity for highly organized group relationships, and his extraordinary psychobiology in general, the elephant is an animal of great interest to the zoologist and the comparative psychologist. It has only been in recent years that the physiology of the elephant has received the attention of scientists (*1*). There is now a growing interest in this animal on the part of psychiatrists (*2*).

One of the strangest things about elephants is the phenomenon of going "on musth." This syndrome, a form of madness which occurs almost exclusively in the males, begins with early adulthood (when the elephant is between 12 and 20 years old) and continues to occur once or twice a year until after the involutional period (around age 45 to 50). As he enters a period of musth, the bull elephant begins to show signs of restlessness and irritability, his eyes water, and the slit-like bilateral temporal gland (located midway between the eye and ear) starts to excrete a brown, sticky fluid. Within 48 to 72 hours there is a violent change in the animal's behavior. Normally cooperative and tamable, the elephant now runs berserk for a period