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# A SURVEY OF INNER ZONE PROTONS

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Abstract

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This report presents detailed data from a survey of trapped protons made by Relay I. Six energy channels from 1.1 to 63 MeV are analyzed to determine the stationary distribution of trapped protons as of January 1, 1963. This data is presented as the observed flux of locally mirroring particles plotted as a function of /B/ on each shell of force, and in the form of contour maps in B, L space. Although interpretation is reserved for a companion paper, it is believed that this data will be useful reference material for scientists investigating the trapped radiation.

Author

## I. Introduction

The State University of Iowa - University of California detectors aboard Relay I have been used before to make selected studies of the trapped radiation in the interior of the magnetosphere. A broad survey of radiation intensities, including electrons of energy greater than 0.45 MeV and protons from 1.1 to 63 MeV, emphasizing spatial dependence, radiation damage effects on satellite solar cells, and geomagnetic storm-time effects, was distributed in a NASA report [McIlwain, Fillius, Valerio, and Davé, 1964]. McIlwain exhibited the effects of the major magnetic storm of September, 1963 on the protons counted by a 34 MeV threshold omnidirectional scintillation detector [McIlwain, 1964]. Fillius and McIlwain used the array of eight energy selective proton channels to demonstrate the spatial dependence of the energy spectrum and to indicate the intensities encountered [Fillius and McIlwain, 1964].

The present report is a detailed presentation of data from a survey of protons in six energy ranges from 1.1 to 63 MeV. This report is a supplement to a more interpretive paper to be published by Fillius [Fillius, 1965]. Because it was desired to make the complete set of data available, and because its bulk was too great to be included in the companion paper, the collection is presented in this separate report. It is believed that this data will be found useful by other experimenters for detailed comparison with their work, for theoreticians who want more than a superficial knowledge of experimental results, and, in general, by anyone who wishes to refer to the trapped proton intensities within the inner zone.

## II. Instrumentation

This report deals with two of the four SUI/UCSD instruments on Relay I. Using pulse height discrimination, these detectors generate six energy bands of data on the trapped proton fluxes. Table I summarizes their characteristics. Previous reports have described the design and calibration of these instruments quite thoroughly [Fillius, 1963; Fillius and McIlwain, 1964; McIlwain et al, 1964]. These references can be consulted for a more detailed review of the instrumentation.

The output of the detector is digital, with digital telemetry and data handling. The discriminators and scalers are linear for the counting rates experienced by these detectors and a redundant readout in the telemetry frame guards against transmission errors. The linear amplifiers have a temperature coefficient which causes the discrimination levels to change by as much as 20% in the operating temperature range of -5 to +30° C. The data presented here has been compensated for this change by calculating, for the observed spectrum, the counting rate that would have been observed at the calibration temperature. Furthermore, radiation damage caused the gain of detector B to drop to 50% of its initial value in the period from April 10 to May 10, 1963. This data has been recovered by a similar correction. A complete description of this correction is given by Fillius [1965]. The temperature correction to the B detector data rarely amounts to as much as 40% and is generally less than 20%. That to the C detector data is rarely more than 30% and generally less than 15%. The radiation damage correction to detector B increases from zero to as much as a factor of ten at the highest. These changes have proved themselves valid by reducing the scatter in the points, and, furthermore, the data recovered by the damage correction has made it possible to perform operations on the computer which, without it, had to be done by hand. It may be noted that previously published data [McIlwain, et al, 1964; Fillius and McIlwain, 1964] does not include the temperature correction to detector C or the additional detector B data gained by the damage correction.

III. Data Reduction

The complex data analysis program used for this survey was developed by McIlwain [McIlwain, 1963] for Explorer XV data. The method will be reviewed here as it has been applied to Relay I.

The raw satellite data consists of counting rates for the several detectors versus time. The position of the satellite as a function of time is provided by NASA and added to the data. Position is calculated in magnetic coordinates, or B, L space. [McIlwain, 1961]. From this is obtained the counting rates versus B and L. Next a computer program interpolates the data to selected magnetic shells [L = 2.0, 2.05, 2.1, etc.] wherever the orbit crosses them and data are usable. The interpolated data are grouped according to L value and sorted in order of B. With adequate data, one can then plot the counting rates as a function of B for any selected L. Usually there is a strong B dependence.

As each crossing of a magnetic shell occurs at a different time, the time dependence has so far been left out. For proton data it is typically quite small. When the time dependence is steady and not a function of B, one can fit the flux on a line of force with the function,

$$\ln_e \Phi = \ln_e \left(1/G\right) + A_1 + A_2 \; t + A_3 \left(\frac{B}{B_o}\right) + A_4 \left(\frac{B}{B_o}\right)^2 + \ldots + A_N \left(\frac{B}{B_o}\right)^{N-2} \quad (1)$$

where

$B_o = \frac{.3116}{L^3}$ is the value of the magnetic field at the equator for that L,

$3 \leq N \leq 8$ is selected by the computer or by the programmer for the best fit.

G is the geometric factor in $cm^2$ - ster for the detector.

t is numbered in days and fractions of a day, beginning with 1 on January 1, 1963.

One sees that the given function can produce a strong B dependence and a weak t dependence as required. Good fits are obtained with this function without cross terms or higher powers in time.

Satisfactory coefficients $A_1$, - - -, $A_N$ have been obtained on a grid of L values for each of the six data channels of this survey. These coefficients are listed in Tables 2 through 7, along with the limits of B (in gauss) over which the fit is satisfactory and the number of data points on the line of force. The last column gives 100 times the rms difference between the logarithm of the data and the logarithm of the fit. In the approximation of a good fit this is just the rms error in per cent. This measure of quality ranges from 5 to 75 %, and is typically between 10 and 25%.

During a stable or slowly changing epoch a counting rate at time t can be projected to a reference time $t_{ref}$ by multiplying by $\exp\left(A_2 (t - t_{ref})\right)$. The result is the intensity that would presumably have been measured at the reference time. The figures accompanying this paper represent such presumed intensities, projected to January 1, 1963. Data in the three ranges of detector B were taken during the interval from December 14, 1962 to May 10, 1963; in the three ranges of detector C, from December 14, 1962 to September 22, 1963.

Figures 1 through 21 exhibit log $\Phi$ vs log B measured in the six energy ranges of detectors B and C. The next three figures, Figures 22 - 24, show the sum of the detector C channels, or the flux of protons from 18.2 to 63 MeV. The points represent the individual measurement projected to day 1, and the line is the analytical fit according to equation (1).

All of the information from an individual channel can be displayed by a map of intensity contours. F gures 25 through 31 are contour maps in B, L space for the seven energy ranges named above. Although the former plots are more accurate, contour maps are convenient and make a pleasing summary of a set of data.

## IV. Summary

Over 6000 data points have been presented which show the fluxes of trapped protons in the inner radiation zone. Discussion of the data will be made in a separate paper [Fillius, 1965]. It is hoped that distribution of this data will supplement other experimental work, and will stimulate theoretical studies of the origin, transport, and loss of these particles.

Acknowledgment

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# Table I

## Summary of Detector Characteristics

### Detector B

Sensor: Silicon surface-barrier diode with depletion depth of 25 $mg/cm^2$.

Geometric factor: .0136 $cm^2$-ster (directional).

Shielding: 8.5 $gm/cm^2$ brass in sides and back. 1.115 $mg/cm^2$ (air equivalent) nickel light shield over look cone.

Electronic discrimination levels:

| | | | |
|---|---|---|---|
| $B\alpha$ | = | 0.87 | MeV |
| $B\beta$ | = | 1.41 | MeV |
| $B\gamma$ | = | 2.11 | MeV |
| $B^{\delta}$ | = | 3.84 | MeV |

Proton energy ranges:

Range one: 1.1 to 1.6 MeV and
7.1 to 14 MeV

Range two: 1.6 to 2.25 MeV and
4.75 to 7.1 MeV

Range three: 2.25 to 4.7 MeV

### Detector C

Sensors: Two silicon Li-drift diodes with active depths of 107 and 132 $mg/cm^2$, operated in coincidence.

Geometric factor: 0.22 $cm^2$ ster (directional).

Table I (Continued)

Electronic discrimination levels:

| | | | |
|---|---|---|---|
| C1α | = | 0.75 | MeV |
| C1β | = | 1.71 | MeV |
| C1γ | = | 2.84 | MeV |
| C2α | = | 1.14 | MeV |
| C2β | = | 2.04 | MeV |
| C2γ | = | 3.53 | MeV |

Proton Energy Ranges:

| | |
|---|---|
| Range one: | 18.2 to 25 MeV |
| Range two: | 25 to 35 MeV |
| Range three: | 35 to 63 MeV |

Directionality

These detectors are mounted perpendicular to the satellite spin axis and are gated by a magnetometer to record data only when they point within $\pm$ 10 degrees of the plane perpendicular to the local magnetic field vector. Thus they measure $j_{\perp}$, the flux of locally mirroring particles.

TABLE 2 1.1 TO 14 MEV PROTONS

| L | BMN | BMX | A(1) | A(2) | A(3) | A(4) | A(5) | A(6) | A(7) | A(8) | N | RMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | .10 | .20 | 11.6582800 | -0 | -4.0635220 | .2950260 | -0 | -0 | -0 | -0 | 7 | 5.4 |
| 1.6 | .08 | .23 | 35.8079400 | -0 | -74.7808600 | 82.4972800 | -46.5561300 | 12.9346100 | -1.4074120 | -0 | 16 | 10.7 |
| 1.7 | .07 | .23 | 19.1000500 | .0009004 | -20.4352700 | 16.1119200 | -7.3456670 | 1.7426390 | -.1673900 | -0 | 16 | 8.1 |
| 1.8 | .06 | .23 | 15.5548900 | .0002643 | -8.2263050 | 2.5557890 | -.3006881 | -0 | -0 | -0 | 18 | 9.6 |
| 1.9 | .05 | .22 | 15.0070500 | -.0015174 | -6.5427110 | 1.6956190 | -.1647541 | -0 | -0 | -0 | 27 | 7.7 |
| 2.0 | .04 | .21 | 14.4767000 | -.0015160 | -5.2990570 | 1.1730630 | -.0980400 | -0 | -0 | -0 | 38 | 7.3 |
| 2.1 | .03 | .21 | 16.1838800 | -.0020190 | -8.2367300 | 3.3151030 | -.7793776 | .0963539 | -.0048545 | -0 | 42 | 5.9 |
| 2.2 | .03 | .21 | 16.5321300 | -.0020329 | -8.2829380 | 3.1400140 | -.6544800 | .0684164 | -.0028211 | -0 | 48 | 5.8 |
| 2.3 | .03 | .28 | 16.0865100 | -.0020970 | -7.0064430 | 2.2676300 | -.3982481 | .0349287 | -.0012073 | -0 | 51 | 8.4 |
| 2.4 | .03 | .28 | 15.5399100 | -.0026470 | -5.9621920 | 1.7436280 | -.2721119 | .0209292 | -.0006304 | -0 | 54 | 10.2 |
| 2.5 | .03 | .29 | 15.2792100 | -.0028744 | -5.3004260 | 1.4271100 | -.2039458 | .0142715 | -.0003880 | -0 | 60 | 10.3 |
| 2.6 | .03 | .20 | 13.8347300 | -.0018612 | -3.4891630 | .6776554 | -.0629868 | .0021517 | -0 | -0 | 61 | 11.2 |
| 2.7 | .04 | .22 | 15.0687900 | -.0009437 | -4.5599780 | 1.0647950 | -.1281342 | .0074639 | -.0001679 | -0 | 66 | 11.2 |
| 2.8 | .04 | .21 | 17.2443100 | -.0003762 | -5.8026860 | 1.3078970 | -.1463451 | .0078552 | -.0001624 | -0 | 57 | 21.7 |
| 2.9 | .04 | .24 | 13.2640700 | .0005477 | -2.7341500 | .4720224 | -.0416744 | .0017696 | -.0000291 | -0 | 53 | 9.8 |
| 3.0 | .04 | .24 | 12.9305900 | .0002248 | -2.4331510 | .3965054 | -.0333284 | .0013597 | -.0000216 | -0 | 43 | 9.3 |
| 3.1 | .04 | .25 | 9.1532710 | -.0003249 | -.4624939 | .0238457 | -.0005213 | -0 | -0 | -0 | 37 | 8.5 |
| 3.2 | .04 | .24 | 8.2265660 | -0 | -.2203311 | .0034380 | -0 | -0 | -0 | -0 | 36 | 11.3 |
| 3.3 | .04 | .24 | 7.3978680 | -0 | -.1038430 | .0002531 | -0 | -0 | -0 | -0 | 27 | 34.7 |
| 3.4 | .05 | .24 | 6.8390540 | -0 | -.0752574 | -0 | -0 | -0 | -0 | -0 | 20 | 30.3 |
| 3.5 | .05 | .30 | 6.4095180 | -0 | -.0781935 | -0 | -0 | -0 | -0 | -0 | 23 | 27.6 |
| 3.6 | .05 | .26 | 5.8561310 | -0 | -.0680025 | -.0001437 | -0 | -0 | -0 | -0 | 20 | 45.3 |
| 3.7 | .05 | .26 | 5.2430680 | -0 | -.0313821 | -.0006436 | -0 | -0 | -0 | -0 | 18 | 58.9 |
| 3.8 | .05 | .12 | 4.5995740 | -0 | -.0182007 | -0 | -0 | -0 | -0 | -0 | 20 | 62.7 |
| 3.9 | .05 | .11 | 4.0471550 | -0 | -.0011601 | -0 | -0 | -0 | -0 | -0 | 19 | 67.3 |
| 4.0 | .05 | .09 | 3.7010570 | -0 | -.0033989 | -0 | -0 | -0 | -0 | -0 | 18 | 71.1 |
| 4.1 | .05 | .08 | 4.2664950 | -0 | -.0904359 | -0 | -0 | -0 | -0 | -0 | 17 | 68.4 |
| 4.2 | .05 | .29 | 3.2889300 | -0 | -.0350940 | .0001093 | -0 | -0 | -0 | -0 | 19 | 64.9 |

TABLE 3 1.6 TO 7.1 MEV PROTONS

| L | BMN | BMX | A(1) | A(2) | A(3) | A(4) | A(5) | A(6) | A(7) | A(8) | N | RMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | .10 | .22 | 10.5428500 | -0 | -3.0688050 | -0 | -0 | -0 | -0 | -0 | 9 | 23.4 |
| 1.6 | .08 | .23 | 36.9233700 | .0043508 | -77.1469700 | 83.1371200 | -45.6908500 | 12.3814800 | -1.3196480 | -0 | 15 | 10.5 |
| 1.7 | .07 | .23 | 11.2449600 | -0 | .2078288 | -4.3942450 | 2.1227820 | -.3041325 | -0 | -0 | 16 | 15.9 |
| 1.8 | .06 | .23 | 15.5863500 | .0028247 | -8.4748080 | 2.6676580 | -.3164716 | -0 | -0 | -0 | 18 | 13.6 |
| 1.9 | .05 | .22 | 14.8767800 | -.0006612 | -6.8101790 | 1.8398700 | -.1845511 | -0 | -0 | -0 | 27 | 11.0 |
| 2.0 | .04 | .21 | 14.0408500 | -.0002171 | -5.2701650 | 1.1776130 | -.0989961 | -0 | -0 | -0 | 38 | 9.8 |
| 2.1 | .03 | .21 | 13.6473500 | -.0007179 | -4.4566230 | .8679136 | -.0631783 | -0 | -0 | -0 | 42 | 7.8 |
| 2.2 | .03 | .21 | 15.5517500 | -.0013353 | -7.5997450 | 2.7675590 | -.5655090 | .0598016 | -.0025714 | -0 | 48 | 6.4 |
| 2.3 | .03 | .28 | 14.9710700 | -.0015203 | -6.3993520 | 1.9712950 | -.3292901 | .0276083 | -.0009222 | -0 | 51 | 9.4 |
| 2.4 | .03 | .28 | 14.5559900 | -.0017712 | -5.7150850 | 1.6101930 | -.2406252 | .0177668 | -.0005178 | -0 | 51 | 10.2 |
| 2.5 | .03 | .29 | 14.2622200 | -.0019230 | -5.0511310 | 1.2387340 | -.1568914 | .0097437 | -.0002412 | -0 | 56 | 8.9 |
| 2.6 | .03 | .20 | 13.1594800 | -.0007147 | -3.7880840 | .7224352 | -.0632694 | .0020100 | -0 | -0 | 51 | 12.0 |
| 2.7 | .04 | .21 | 12.5648000 | -.0000511 | -3.1374940 | .5172966 | -.0384145 | .0010133 | -0 | -0 | 53 | 11.6 |
| 2.8 | .04 | .21 | 17.2031800 | .0007859 | -6.8108610 | 1.6047440 | -.1879814 | .0106522 | -.0002340 | -0 | 45 | 12.5 |
| 2.9 | .04 | .22 | 12.4913200 | .0019125 | -2.8392740 | .4131045 | -.0260275 | .0005714 | -0 | -0 | 36 | 15.2 |
| 3.0 | .04 | .22 | 12.6997200 | .0014857 | -2.7936560 | .3852723 | -.0228945 | .0004739 | -0 | -0 | 28 | 16.1 |
| 3.1 | .04 | .25 | 6.5738880 | -0 | -.1585077 | -0 | -0 | -0 | -0 | -0 | 22 | 20.5 |
| 3.2 | .04 | .24 | 6.2511540 | -0 | -.1325682 | -0 | -0 | -0 | -0 | -0 | 23 | 22.4 |
| 3.3 | .05 | .24 | 5.7716520 | -0 | -.1041656 | -0 | -0 | -0 | -0 | -0 | 19 | 24.9 |
| 3.4 | .05 | .24 | 4.9016750 | -0 | -.0454015 | -.0011382 | -0 | -0 | -0 | -0 | 16 | 26.8 |
| 3.5 | .05 | .25 | 4.4574680 | -0 | -.0537307 | -0 | -0 | -0 | -0 | -0 | 20 | 46.5 |
| 3.6 | .05 | .25 | 4.1721680 | -0 | -.0659510 | -0 | -0 | -0 | -0 | -0 | 14 | 62.8 |
| 3.7 | .05 | .12 | 4.0672430 | -0 | -.0653543 | -0 | -0 | -0 | -0 | -0 | 14 | 61.6 |
| 3.8 | .05 | .12 | 2.9197630 | -0 | -.0074525 | -0 | -0 | -0 | -0 | -0 | 18 | 63.6 |
| 3.9 | .05 | .11 | 2.4382730 | -0 | .0000488 | -0 | -0 | -0 | -0 | -0 | 18 | 71.4 |
| 4.0 | .05 | .28 | 2.0446340 | -0 | -.0181530 | -0 | -0 | -0 | -0 | -0 | 18 | 69.6 |
| 4.1 | .05 | .28 | 1.8722030 | -0 | -.0215710 | -0 | -0 | -0 | -0 | -0 | 14 | 69.1 |
| 4.2 | .05 | .29 | 1.3180370 | -0 | -.0132529 | -0 | -0 | -0 | -0 | -0 | 12 | 70.0 |

TABLE 4 2.25 TO 4.7 MEV PROTONS

| L | BMN | BMX | A(1) | A(2) | A(3) | A(4) | A(5) | A(6) | A(7) | A(8) | N | RMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.5 | .10 | .22 | 9.9040480 | -0 | -2.9120660 | -0 | -0 | -0 | -0 | -0 | 9 | 26.7 |
| 1.6 | .08 | .23 | 16.3282900 | -0 | -13.4555100 | 6.0788420 | -1.0368100 | -0 | -0 | -0 | 15 | 20.4 |
| 1.7 | .07 | .23 | 20.1631000 | -0 | -17.3207700 | 7.0108750 | -.9822686 | -0 | -0 | -0 | 16 | 24.9 |
| 1.8 | .06 | .23 | 17.1763800 | -0 | -11.1843800 | 3.7758890 | -.4514030 | -0 | -0 | -0 | 18 | 19.0 |
| 1.9 | .05 | .22 | 14.3962000 | -0 | -6.7516690 | 1.8369300 | -.1852364 | -0 | -0 | -0 | 27 | 11.6 |
| 2.0 | .04 | .21 | 13.2287000 | .0015741 | -4.9719260 | 1.0776170 | -.0885237 | -0 | -0 | -0 | 39 | 12.0 |
| 2.1 | .03 | .21 | 12.8552900 | .0006450 | -4.2776070 | .8220975 | -.0591745 | -0 | -0 | -0 | 42 | 9.3 |
| 2.2 | .03 | .21 | 13.6164700 | -.0000473 | -5.4710230 | 1.4304060 | -.1773227 | .0080251 | -0 | -0 | 48 | 9.6 |
| 2.3 | .03 | .22 | 15.7077400 | -.0004589 | -9.4184020 | 4.0788830 | -1.0053530 | .1362941 | -.0093610 | .0002493 | 50 | 10.5 |
| 2.4 | .03 | .21 | 15.9658100 | -.0006573 | -9.5613430 | 3.9275710 | -.8972405 | .1123597 | -.0071764 | .0001805 | 50 | 10.8 |
| 2.5 | .03 | .29 | 11.9034000 | -.0005543 | -3.6149810 | .6696126 | -.0544286 | .0014846 | -0 | -0 | 56 | 11.8 |
| 2.6 | .03 | .20 | 11.6427800 | .0007706 | -3.5955800 | .6841598 | -.0593454 | .0018542 | -0 | -0 | 51 | 15.3 |
| 2.7 | .04 | .21 | 11.3036700 | .0014346 | -3.2491810 | .5620647 | -.0441086 | .0012429 | -0 | -0 | 54 | 13.8 |
| 2.8 | .04 | .21 | 8.8939410 | -0 | -1.4651980 | .1452113 | -.0051605 | -0 | -0 | -0 | 46 | 25.8 |
| 2.9 | .04 | .22 | 7.7306670 | -0 | -.9844201 | .0808824 | -.0024764 | -0 | -0 | -0 | 36 | 26.9 |
| 3.0 | .04 | .22 | 8.0688600 | -0 | -1.1556010 | .0964732 | -.0027787 | -0 | -0 | -0 | 29 | 24.9 |
| 3.1 | .04 | .13 | 5.4278520 | -0 | -.2344463 | -0 | -0 | -0 | -0 | -0 | 19 | 24.7 |
| 3.2 | .04 | .24 | 4.5441580 | -0 | -.1318399 | -0 | -0 | -0 | -0 | -0 | 23 | 28.5 |
| 3.3 | .05 | .24 | 3.8189720 | -0 | -.0986965 | -0 | -0 | -0 | -0 | -0 | 19 | 29.8 |
| 3.4 | .05 | .24 | 3.2226480 | -0 | -.0871034 | -0 | -0 | -0 | -0 | -0 | 16 | 41.3 |
| 3.5 | .05 | .25 | 2.6164030 | -0 | -.0802174 | -0 | -0 | -0 | -0 | -0 | 19 | 57.1 |
| 3.6 | .05 | .25 | 2.2118950 | -0 | -.0628416 | -0 | -0 | -0 | -0 | -0 | 16 | 71.6 |
| 3.7 | .05 | .12 | 1.7286760 | -0 | -.0337218 | -0 | -0 | -0 | -0 | -0 | 14 | 56.9 |
| 3.8 | .05 | .12 | 1.4321420 | -0 | -.0262435 | -0 | -0 | -0 | -0 | -0 | 18 | 60.8 |
| 3.9 | .05 | .11 | 1.1667130 | -0 | -.0151207 | -0 | -0 | -0 | -0 | -0 | 18 | 77.3 |

TABLE 5 18.2 TO 25 MEV PROTONS

| L | BMN | BMX | A(1) | A(2) | A(3) | A(4) | A(5) | A(6) | A(7) | A(8) | N | RMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.3 | .14 | .20 | 15.8884100 | -.0006014 | -9.4411690 | -0 | -0 | -0 | -0 | -0 | 11 | 14.2 |
| 1.4 | .13 | .22 | 44.2170500 | -.0030533 | -71.2245200 | 45.3188500 | -10.2203000 | -0 | -0 | -0 | 24 | 15.1 |
| 1.5 | .09 | .23 | 23.7005000 | -.0023621 | -26.9895900 | 14.0833400 | -2.7327540 | -0 | -0 | -0 | 30 | 15.8 |
| 1.6 | .08 | .24 | 44.1594200 | -.0011770 | -92.2339700 | 93.8274500 | -49.0659400 | 12.7873500 | -1.3201970 | -0 | 38 | 10.8 |
| 1.7 | .06 | .24 | 15.8696300 | -.0011602 | -11.4196300 | 4.1710400 | -.5664800 | -0 | -0 | -0 | 45 | 12.7 |
| 1.8 | .05 | .23 | 20.8353800 | -.0004001 | -26.4460800 | 19.3024700 | -7.4511230 | 1.4399310 | -.1101860 | -0 | 48 | 12.6 |
| 1.9 | .05 | .24 | 11.6251500 | -.0002598 | -6.1116010 | 1.6709340 | -.1654887 | -0 | -0 | -0 | 66 | 14.0 |
| 2.0 | .04 | .25 | 10.4375800 | -.0005865 | -4.7492870 | 1.1634430 | -.1028861 | -0 | -0 | -0 | 90 | 12.6 |
| 2.1 | .03 | .26 | 10.4258000 | -.0002375 | -5.2636250 | 1.5181310 | -.1949160 | .0084708 | -0 | -0 | 106 | 15.7 |
| 2.2 | .03 | .28 | 9.5170660 | -.0006003 | -4.3134470 | 1.1324020 | -.1330999 | .0053629 | -0 | -0 | 146 | 13.8 |
| 2.3 | .03 | .28 | 8.1546280 | .0001225 | -3.1700220 | .7229578 | -.0760918 | .0027924 | -0 | -0 | 162 | 19.7 |
| 2.4 | .03 | .28 | 7.0326820 | -.0008836 | -2.3805630 | .4752252 | -.0431096 | .0013383 | -0 | -0 | 164 | 21.5 |
| 2.5 | .03 | .29 | 4.9575040 | -.0016423 | -.9619683 | .1029726 | -.0043162 | -0 | -0 | -0 | 173 | 26.1 |
| 2.6 | .03 | .30 | 2.8452590 | -.0003892 | -.2125737 | -0 | -0 | -0 | -0 | -0 | 167 | 33.4 |
| 2.7 | .03 | .28 | 1.9540890 | -.0007630 | -.1414619 | -0 | -0 | -0 | -0 | -0 | 167 | 44.3 |
| 2.8 | .03 | .28 | .9755268 | -.0007618 | -.0688191 | -0 | -0 | -0 | -0 | -0 | 110 | 54.5 |
| 2.9 | .03 | .21 | -.1850345 | .0004638 | -.0106418 | -0 | -0 | -0 | -0 | -0 | 65 | 45.9 |
| 3.0 | .04 | .21 | -.6825705 | .0009982 | -.0134183 | -0 | -0 | -0 | -0 | -0 | 25 | 39.5 |

TABLE 6 25 TO 35 MEV PROTONS

| L | BMN | BMX | A(1) | A(2) | A(3) | A(4) | A(5) | A(6) | A(7) | A(8) | N | RMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.6 | .08 | .24 | 8.0221080 | -.0006074 | 5.0248340 | -9.1147680 | 4.0774380 | -.6042224 | -0 | -0 | 37 | 9.9 |
| 1.7 | .06 | .24 | 13.9620900 | .0002514 | -10.1130800 | 3.6773820 | -.4977730 | -0 | -0 | -0 | 45 | 14.0 |
| 1.8 | .05 | .23 | 11.7686400 | .0008132 | -7.3270580 | 2.2763270 | -.2583201 | -0 | -0 | -0 | 44 | 14.6 |
| 1.9 | .05 | .24 | 9.9469850 | .0012174 | -5.3242060 | 1.4353770 | -.1395492 | -0 | -0 | -0 | 59 | 14.8 |
| 2.0 | .04 | .25 | 9.9003000 | .0010664 | -5.6410830 | 1.7855080 | -.2542363 | .0122408 | -0 | -0 | 80 | 15.2 |
| 2.1 | .03 | .26 | 11.3467400 | .0014431 | -8.4634710 | 3.5479840 | -.7647769 | .0813939 | -.0034437 | -0 | 91 | 13.7 |
| 2.2 | .03 | .23 | 8.9186590 | .0007538 | -4.4106810 | 1.1896720 | -.1462802 | .0063613 | -0 | -0 | 127 | 17.4 |
| 2.3 | .03 | .27 | 7.9511350 | .0005376 | -3.4872920 | .8198835 | -.0855337 | .0030315 | -0 | -0 | 139 | 20.7 |
| 2.4 | .03 | .20 | 6.4831420 | .0009097 | -2.5772740 | .5526946 | -.0530208 | .0017349 | -0 | -0 | 141 | 24.3 |
| 2.5 | .03 | .29 | 4.3003440 | .0010197 | -1.0253120 | .1136218 | -.0047648 | -0 | -0 | -0 | 151 | 31.4 |
| 2.6 | .03 | .20 | 3.1117840 | -.0005469 | -.4732603 | .0168934 | -0 | -0 | -0 | -0 | 147 | 37.4 |
| 2.7 | .03 | .26 | 1.2797600 | .0016163 | -.1736106 | -0 | -0 | -0 | -0 | -0 | 137 | 49.4 |
| 2.8 | .03 | .10 | .0829587 | .0008991 | -.0641442 | -0 | -0 | -0 | -0 | -0 | 80 | 59.0 |
| 2.9 | .03 | .17 | -.2250829 | .0013297 | -.1030687 | -0 | -0 | -0 | -0 | -0 | 26 | 51.2 |

TABLE 7 35 TO 63 MEV PROTONS

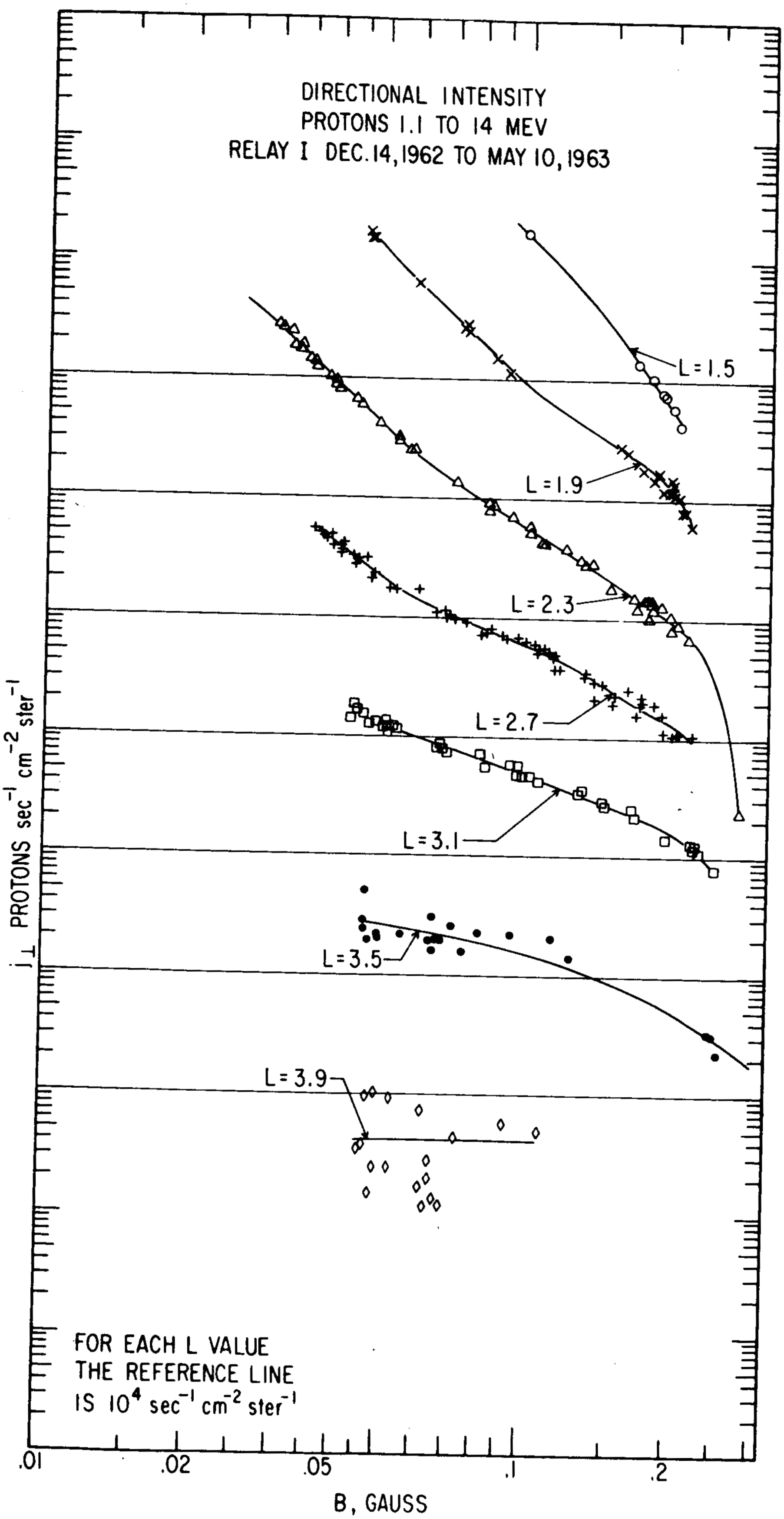
| L | BMN | BMX | A(1) | A(2) | A(3) | A(4) | A(5) | A(6) | A(7) | A(8) | N | RMS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.8 | .05 | .23 | 10.3396500 | -.0003308 | -6.8858710 | 2.3154030 | -.2758983 | -0 | -0 | -0 | 44 | 23.4 |
| 1.9 | .05 | .24 | 8.4352300 | .0001479 | -4.9150510 | 1.4710840 | -.1547764 | -0 | -0 | -0 | 59 | 20.1 |
| 2.0 | .04 | .25 | 8.0709220 | .0007800 | -4.4680360 | 1.1772180 | -.1060265 | -0 | -0 | -0 | 79 | 19.9 |
| 2.1 | .03 | .26 | 8.0241180 | -.0001189 | -3.9468710 | .8797388 | -.0670586 | -0 | -0 | -0 | 89 | 26.6 |
| 2.2 | .03 | .27 | 7.5207700 | .0001800 | -3.4239520 | .6692296 | -.0437430 | -0 | -0 | -0 | 126 | 25.8 |
| 2.3 | .03 | .27 | 6.3867810 | .0006308 | -2.5871340 | .4401495 | -.0249583 | -0 | -0 | -0 | 137 | 33.2 |
| 2.4 | .03 | .27 | 5.3389960 | -.0005407 | -1.8318750 | .2588822 | -.0123537 | -0 | -0 | -0 | 134 | 33.4 |
| 2.5 | .03 | .28 | 4.1338650 | -.0011154 | -1.2806070 | .1571931 | -.0064725 | -0 | -0 | -0 | 144 | 44.5 |
| 2.6 | .03 | .28 | 1.3903660 | -.0003072 | -.1407362 | -0 | -0 | -0 | -0 | -0 | 123 | 61.1 |
| 2.7 | .03 | .22 | .4588950 | .0002999 | -.0693819 | -0 | -0 | -0 | -0 | -0 | 82 | 61.7 |
| 2.8 | .03 | .07 | -.3357471 | .0001383 | .0259355 | -0 | -0 | -0 | -0 | -0 | 38 | 59.9 |
| 2.9 | .04 | .17 | -1.0660410 | .0047092 | -.0012526 | -0 | -0 | -0 | -0 | -0 | 11 | 49.0 |

# FIGURE CAPTIONS

| Figure Nos. | |
|---|---|
| 1 - 4 | Protons 1.1 to 14 MeV. The flux of mirroring particles vs B for 28 lines of force from $L = 1.5$ to $L = 4.2$, on January 1, 1963. |
| 5 - 8 | Protons 1.6 to 7.1 MeV. The flux of mirroring particles vs B for 28 lines of force from $L = 1.5$ to $L = 4.2$, on January 1, 1963. |
| 9 - 12 | Protons 2.25 to 4.7 MeV. The flux of mirroring particles vs B for 25 lines of force from $L = 1.5$ to $L = 3.9$, on January 1, 1963. |
| 13 - 15 | Protons 18.2 to 25 MeV. The flux of mirroring particles vs B for 18 lines of force from $L = 1.3$ to $L = 3.0$, on January 1, 1963. |
| 16 - 18 | Protons 25 to 35 MeV. The flux of mirroring particles vs B for 14 lines of force from $L = 1.6$ to $L = 2.9$, on January 1, 1963. |

FIGURE CAPTIONS
(Continued)

| Figure Nos. | |
|---|---|
| 19 - 21 | Protons 35 to 63 MeV. The flux of mirroring particles vs B for 12 lines of force from $L = 1.8$ to $L = 2.9$, on January 1, 1963. |
| 22 - 24 | Protons 18.2 to 63 MeV. The flux of mirroring particles vs B for 12 lines of force from $L = 1.8$ to $L = 2.9$, on January 1, 1963. |
| 25 - 31 | Contour maps in B, L space for the flux of trapped protons. |



DIRECTIONAL INTENSITY
PROTONS 1.1 TO 14 MEV
RELAY I DEC.14,1962 TO MAY 10,1963
L = 1.5
L = 1.9
L = 2.3
L = 2.7
L = 3.1
L = 3.5
L = 3.9
FOR EACH L VALUE
THE REFERENCE LINE
IS 10^4 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS


Figure 1

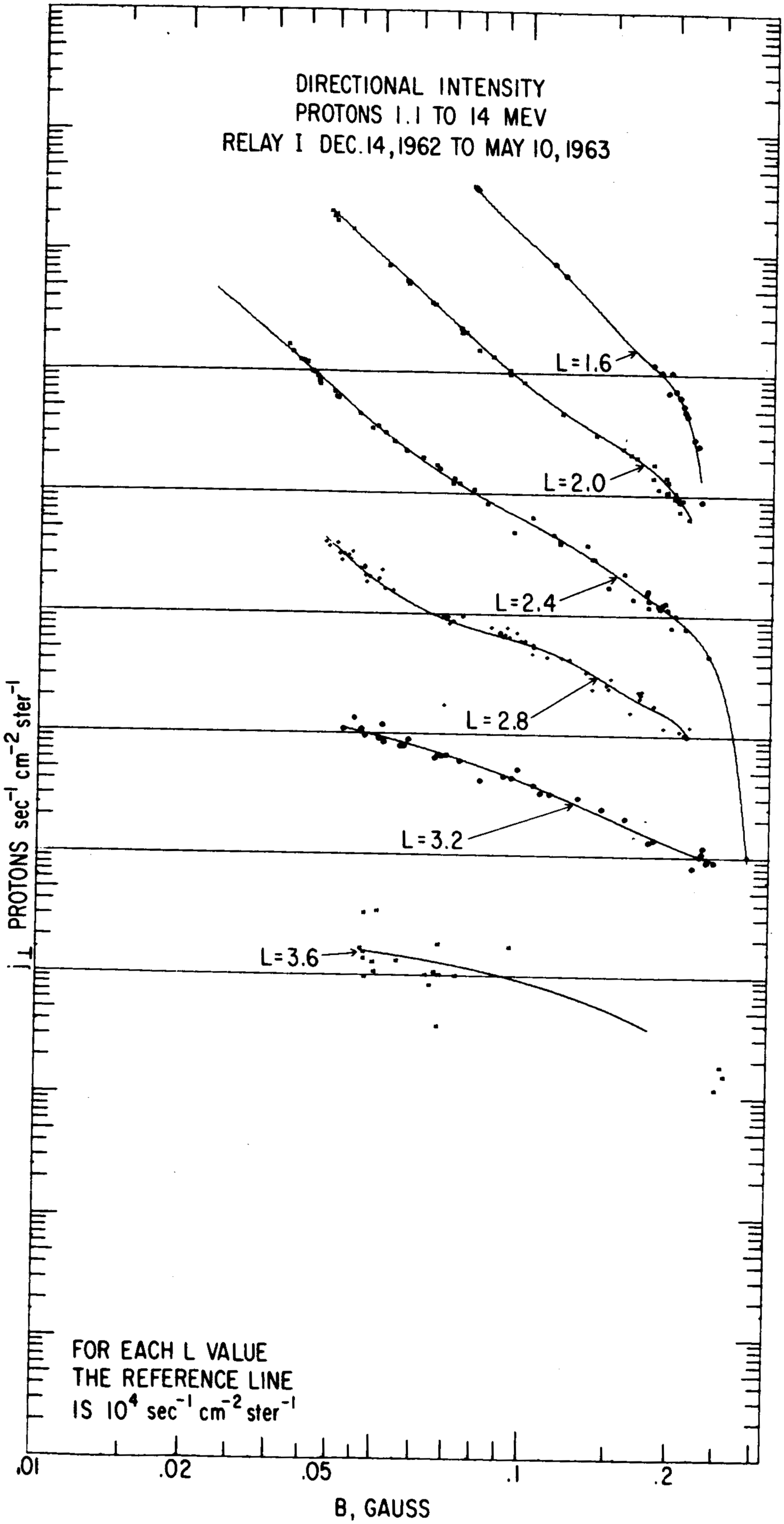

DIRECTIONAL INTENSITY
PROTONS 1.1 TO 14 MEV
RELAY I DEC.14,1962 TO MAY 10,1963
L=1.6
L=2.0
L=2.4
L=2.8
L=3.2
L=3.6
j⊥ PROTONS sec⁻¹ cm⁻² ster⁻¹
FOR EACH L VALUE
THE REFERENCE LINE
IS 10⁴ sec⁻¹ cm⁻² ster⁻¹
.01
.02
.05
.1
.2
B, GAUSS

Figure 2

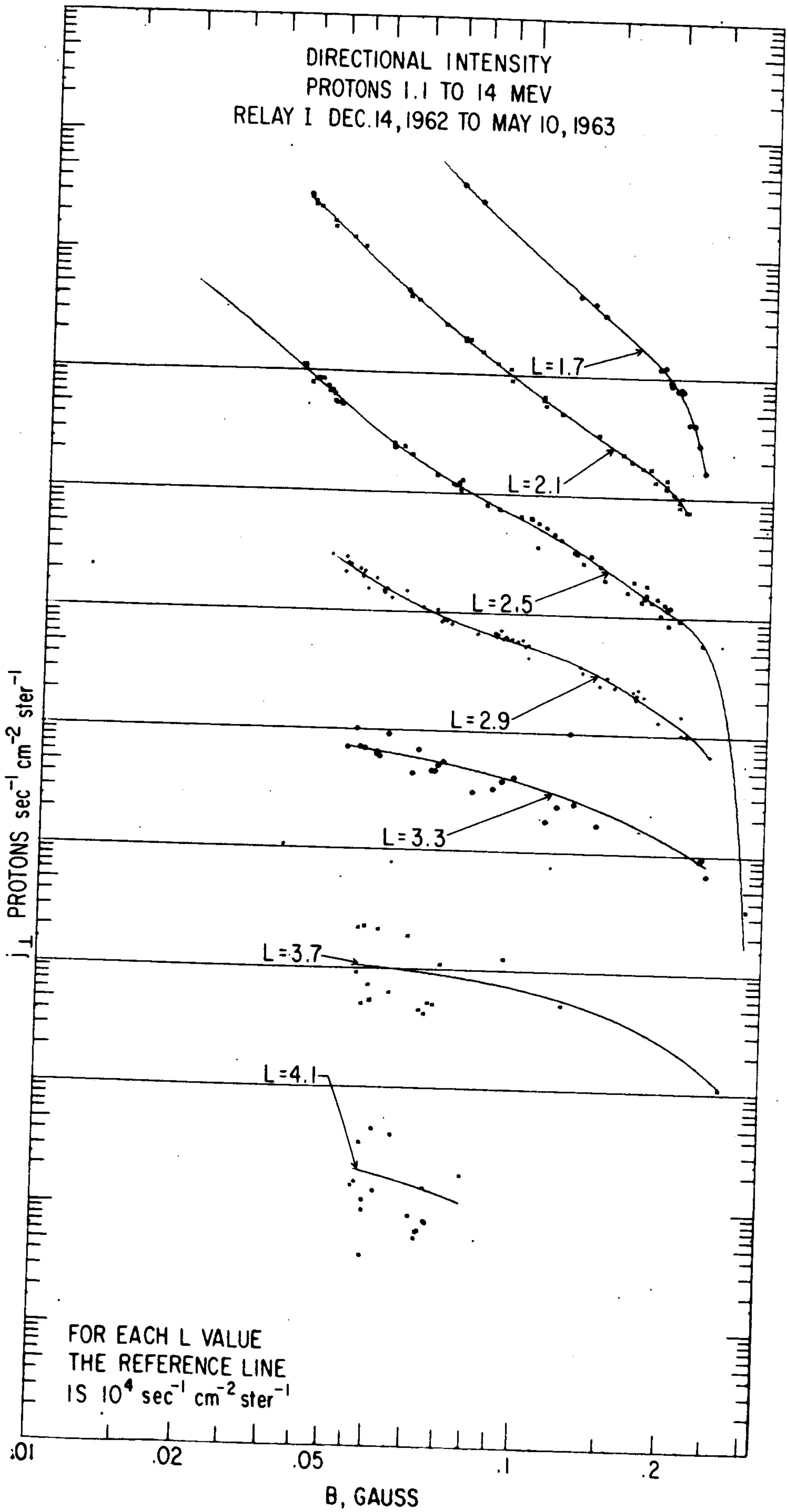
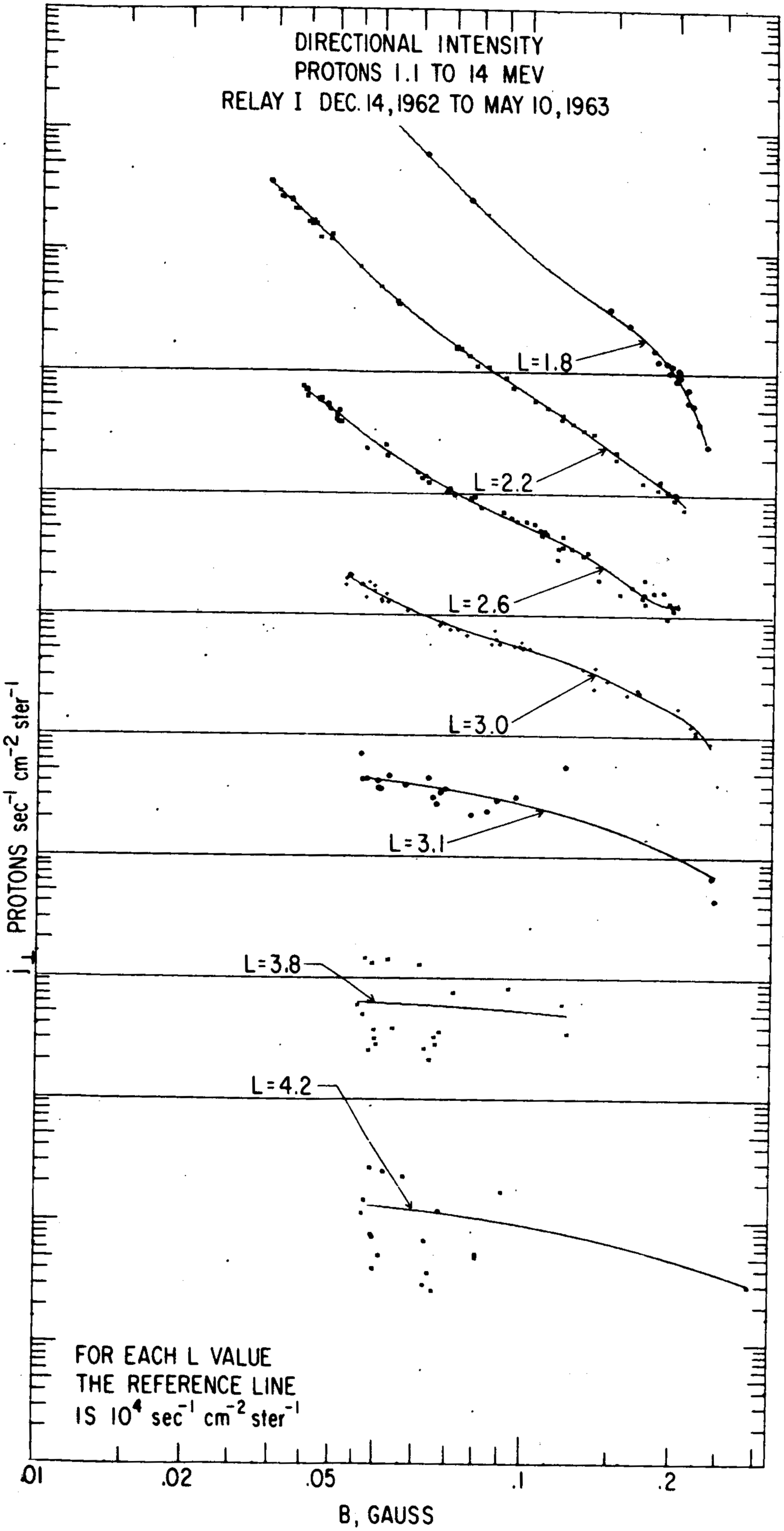

DIRECTIONAL INTENSITY
PROTONS 1.1 TO 14 MEV
RELAY I DEC.14,1962 TO MAY 10,1963
L=1.7
L=2.1
L=2.5
L=2.9
L=3.3
L=3.7
L=4.1
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^4$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

Figure 3



DIRECTIONAL INTENSITY
PROTONS 1.1 TO 14 MEV
RELAY I DEC. 14, 1962 TO MAY 10, 1963
L=1.8
L=2.2
L=2.6
L=3.0
L=3.1
L=3.8
L=4.2
FOR EACH L VALUE
THE REFERENCE LINE
IS 10⁴ sec⁻¹ cm⁻² ster⁻¹
J⊥ PROTONS sec⁻¹ cm⁻² ster⁻¹
.01
.02
.05
.1
.2
B, GAUSS


Figure 4

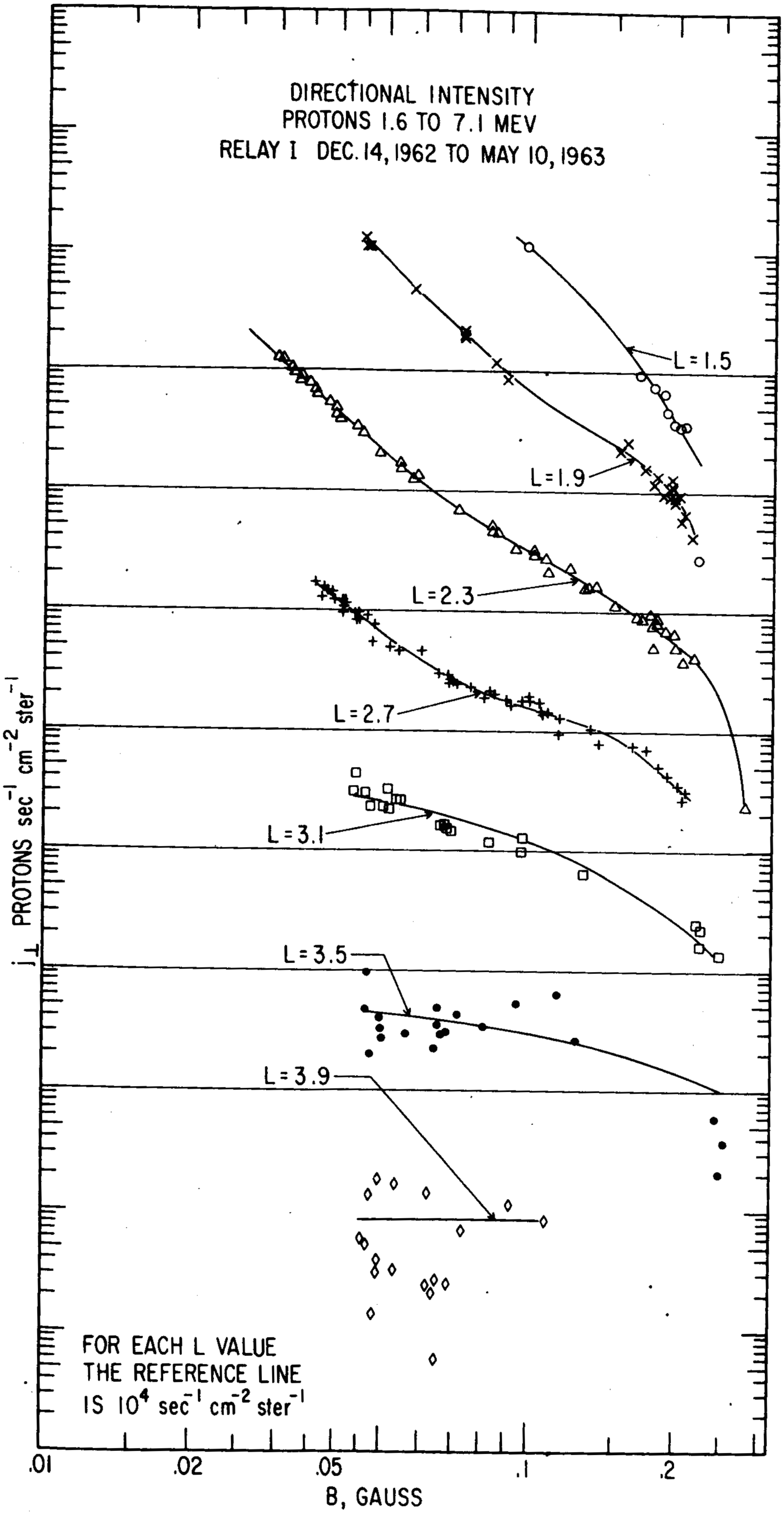

DIRECTIONAL INTENSITY
PROTONS 1.6 TO 7.1 MEV
RELAY I DEC. 14, 1962 TO MAY 10, 1963
L = 1.5
L = 1.9
L = 2.3
L = 2.7
L = 3.1
L = 3.5
L = 3.9
FOR EACH L VALUE
THE REFERENCE LINE
IS 10^4 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS

Figure 5

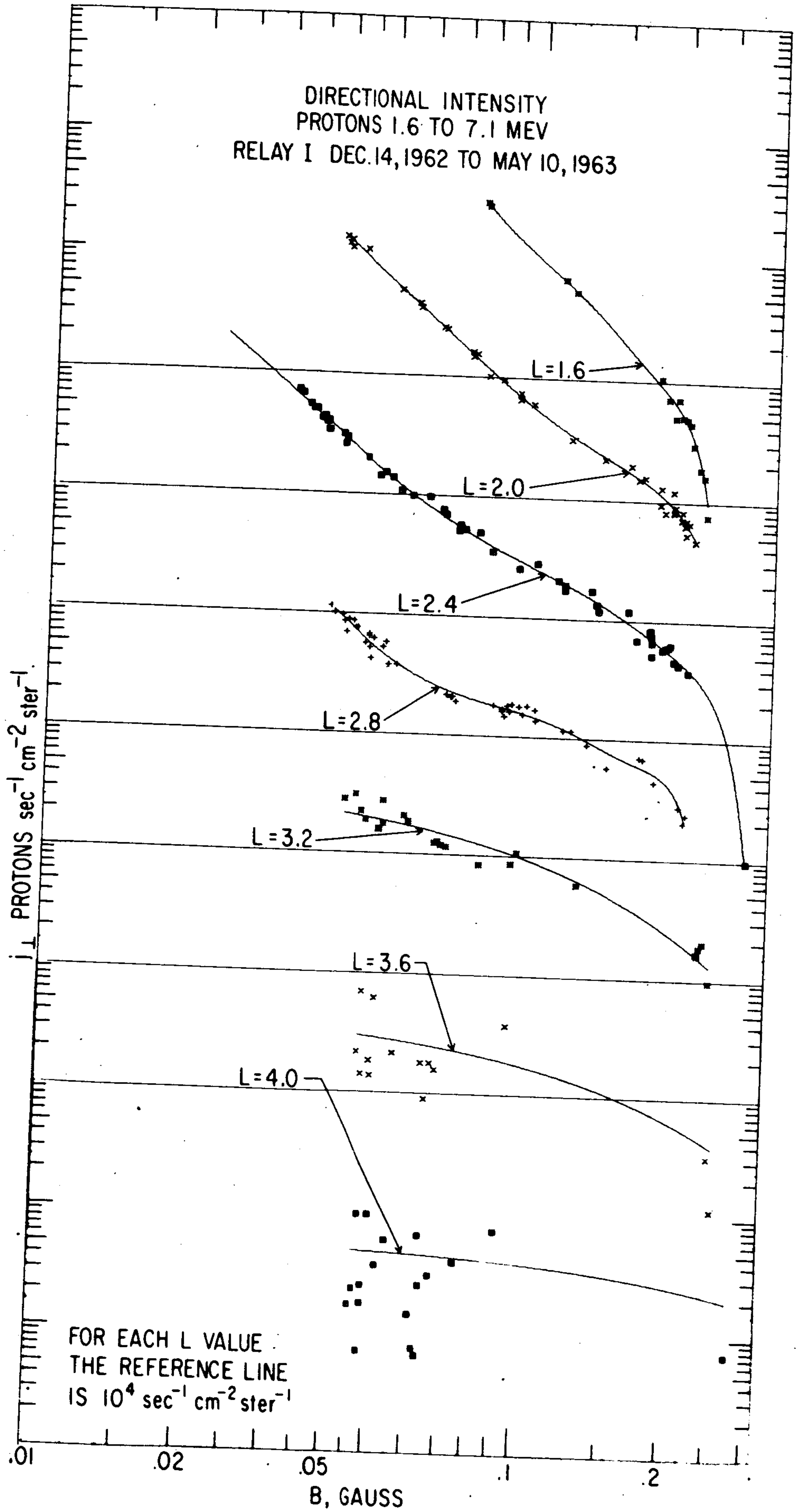
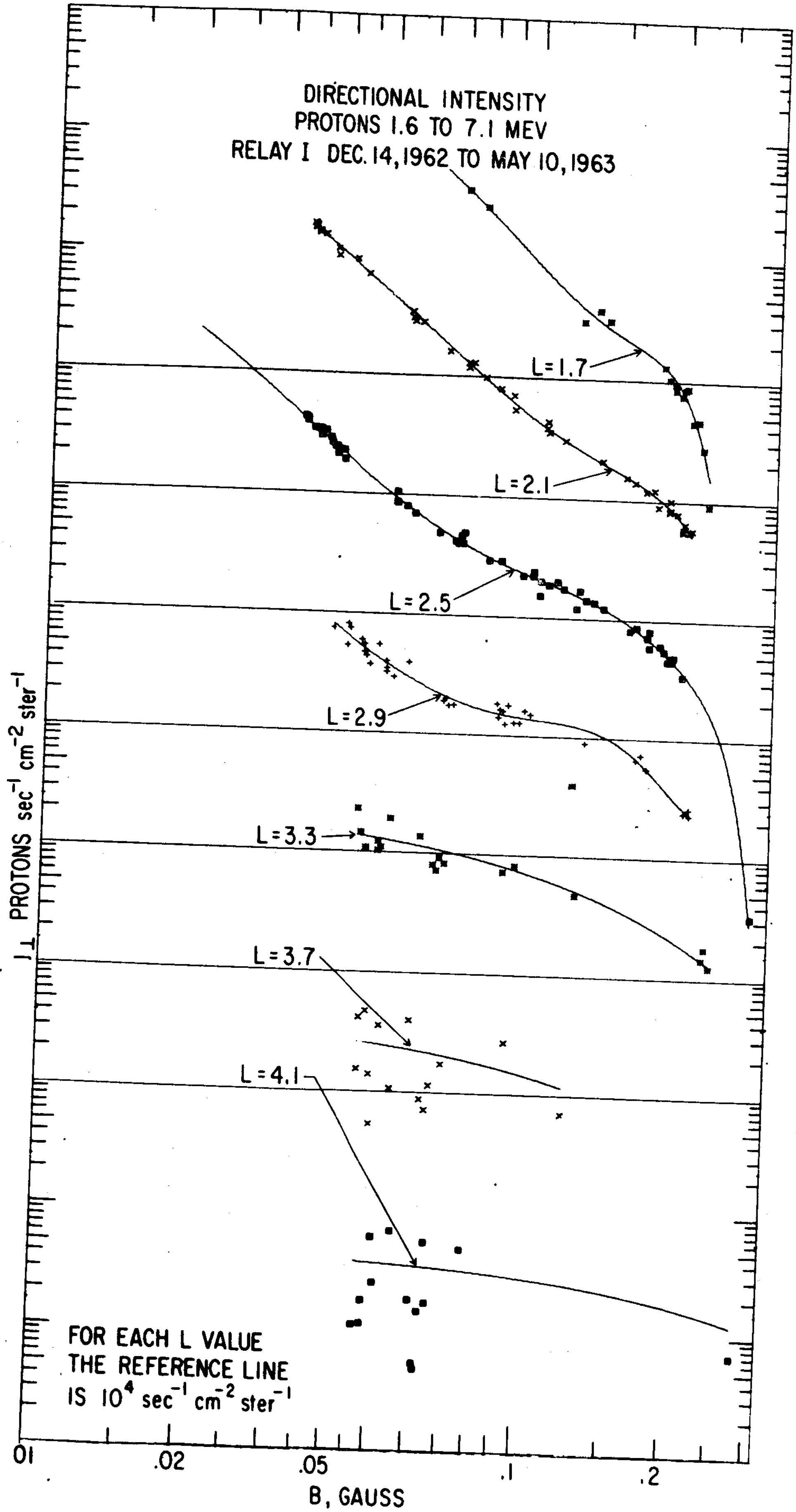

DIRECTIONAL INTENSITY
PROTONS 1.6 TO 7.1 MEV
RELAY I DEC.14, 1962 TO MAY 10, 1963
L=1.6
L=2.0
L=2.4
L=2.8
L=3.2
L=3.6
L=4.0
FOR EACH L VALUE THE REFERENCE LINE IS 10^4 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS

Figure 6



DIRECTIONAL INTENSITY
PROTONS 1.6 TO 7.1 MEV
RELAY I DEC. 14, 1962 TO MAY 10, 1963
L = 1.7
L = 2.1
L = 2.5
L = 2.9
L = 3.3
L = 3.7
L = 4.1
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^4$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$J_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
01
.02
.05
.1
.2
B, GAUSS


Figure 7

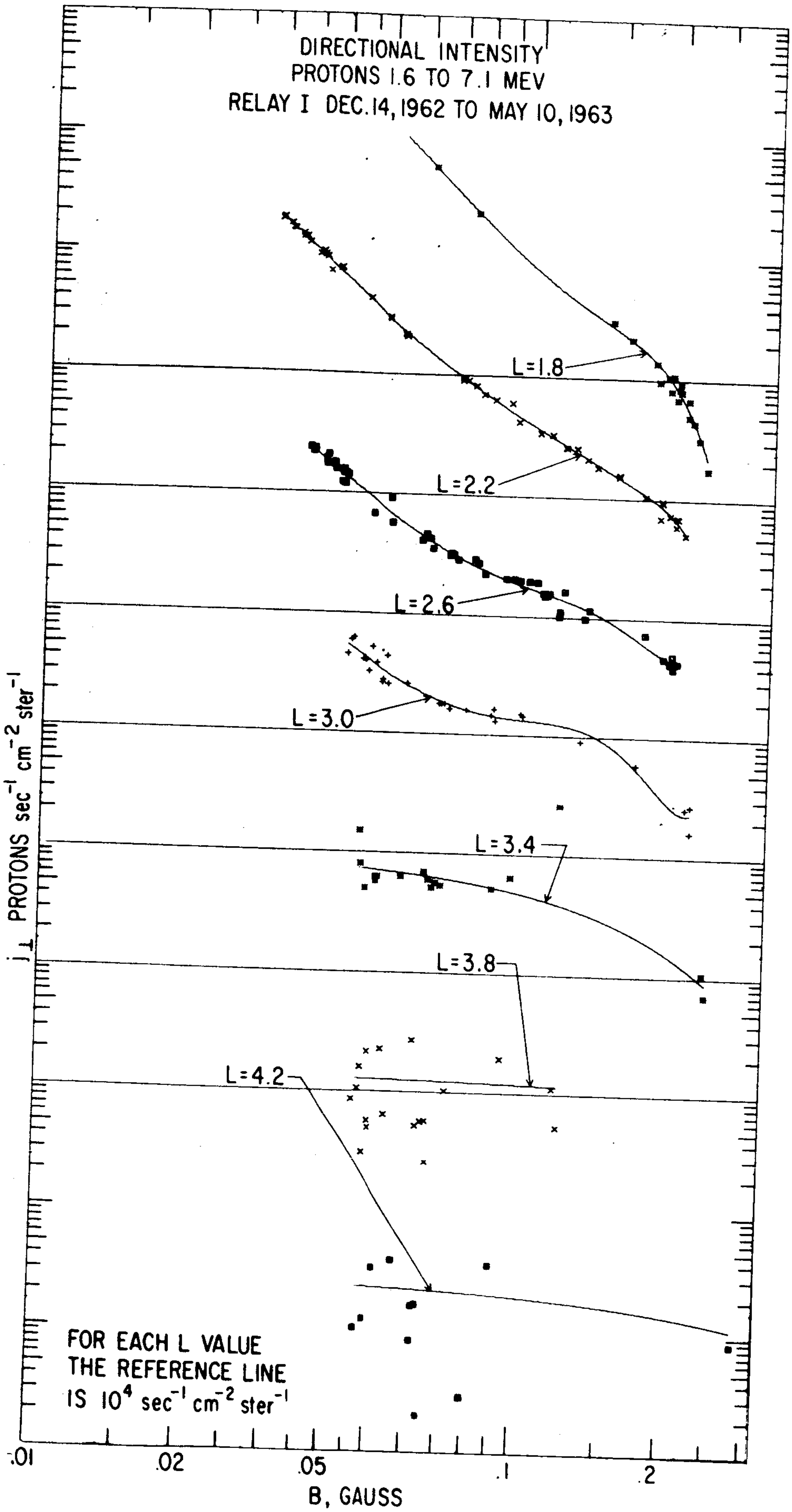

DIRECTIONAL INTENSITY
PROTONS 1.6 TO 7.1 MEV
RELAY I DEC.14, 1962 TO MAY 10, 1963
L=1.8
L=2.2
L=2.6
L=3.0
L=3.4
L=3.8
L=4.2
FOR EACH L VALUE
THE REFERENCE LINE
IS 10^4 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS

Figure 8

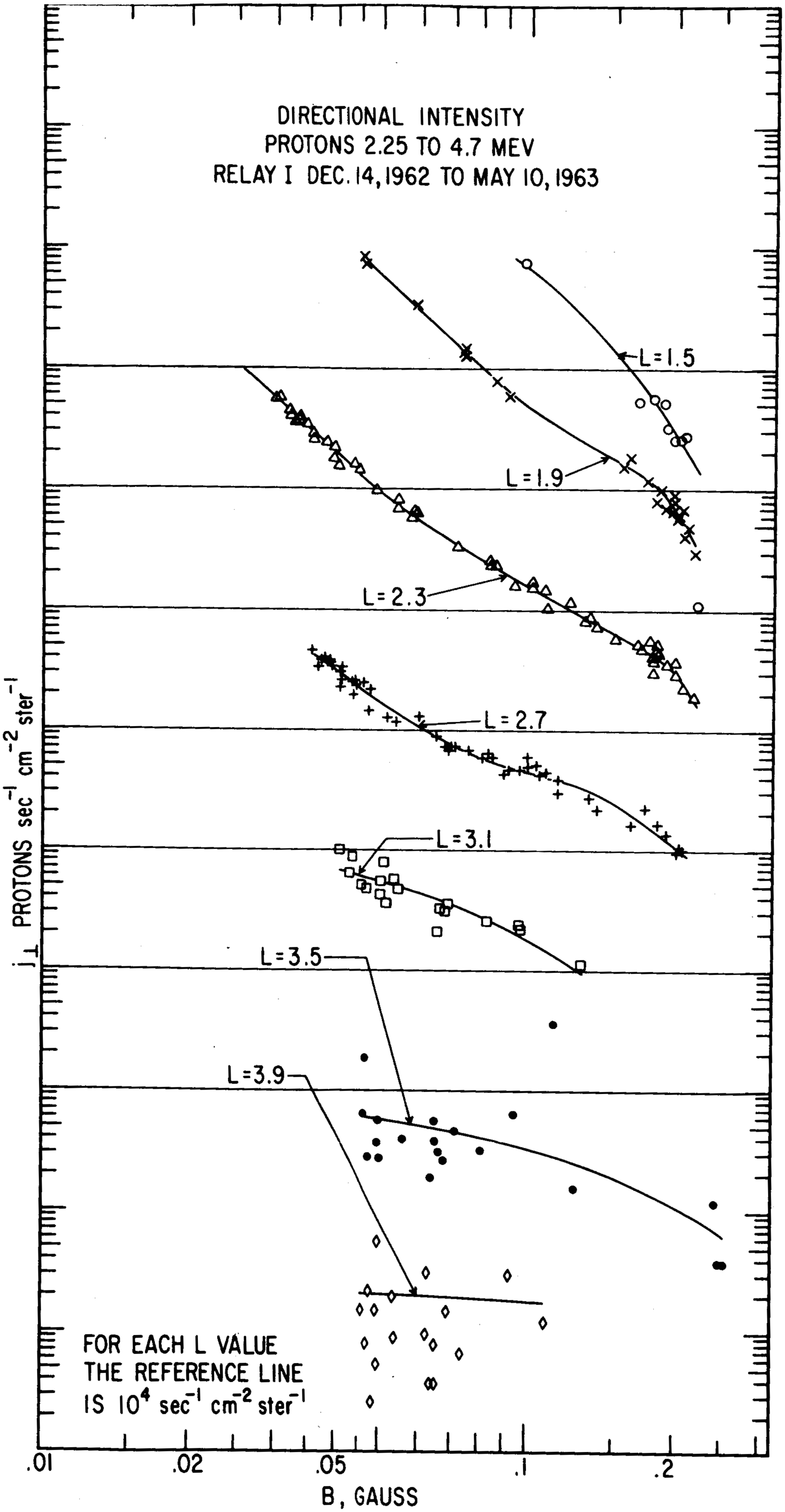

DIRECTIONAL INTENSITY
PROTONS 2.25 TO 4.7 MEV
RELAY I DEC. 14, 1962 TO MAY 10, 1963
L = 1.5
L = 1.9
L = 2.3
L = 2.7
L = 3.1
L = 3.5
L = 3.9
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^4$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

Figure 9

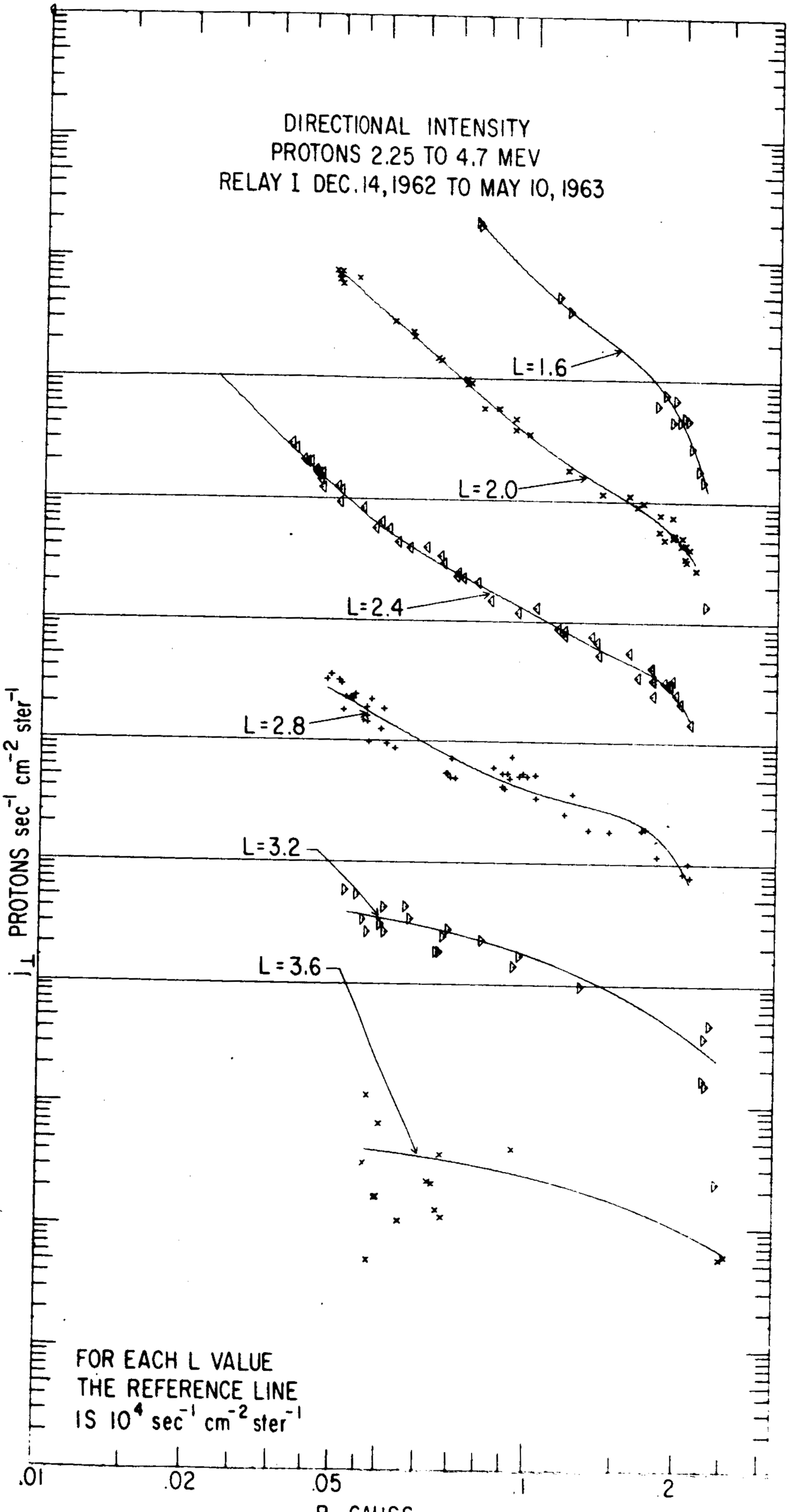

DIRECTIONAL INTENSITY
PROTONS 2.25 TO 4.7 MEV
RELAY I DEC. 14, 1962 TO MAY 10, 1963
L=1.6
L=2.0
L=2.4
L=2.8
L=3.2
L=3.6
FOR EACH L VALUE
THE REFERENCE LINE
IS 10^4 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS

Figure 10

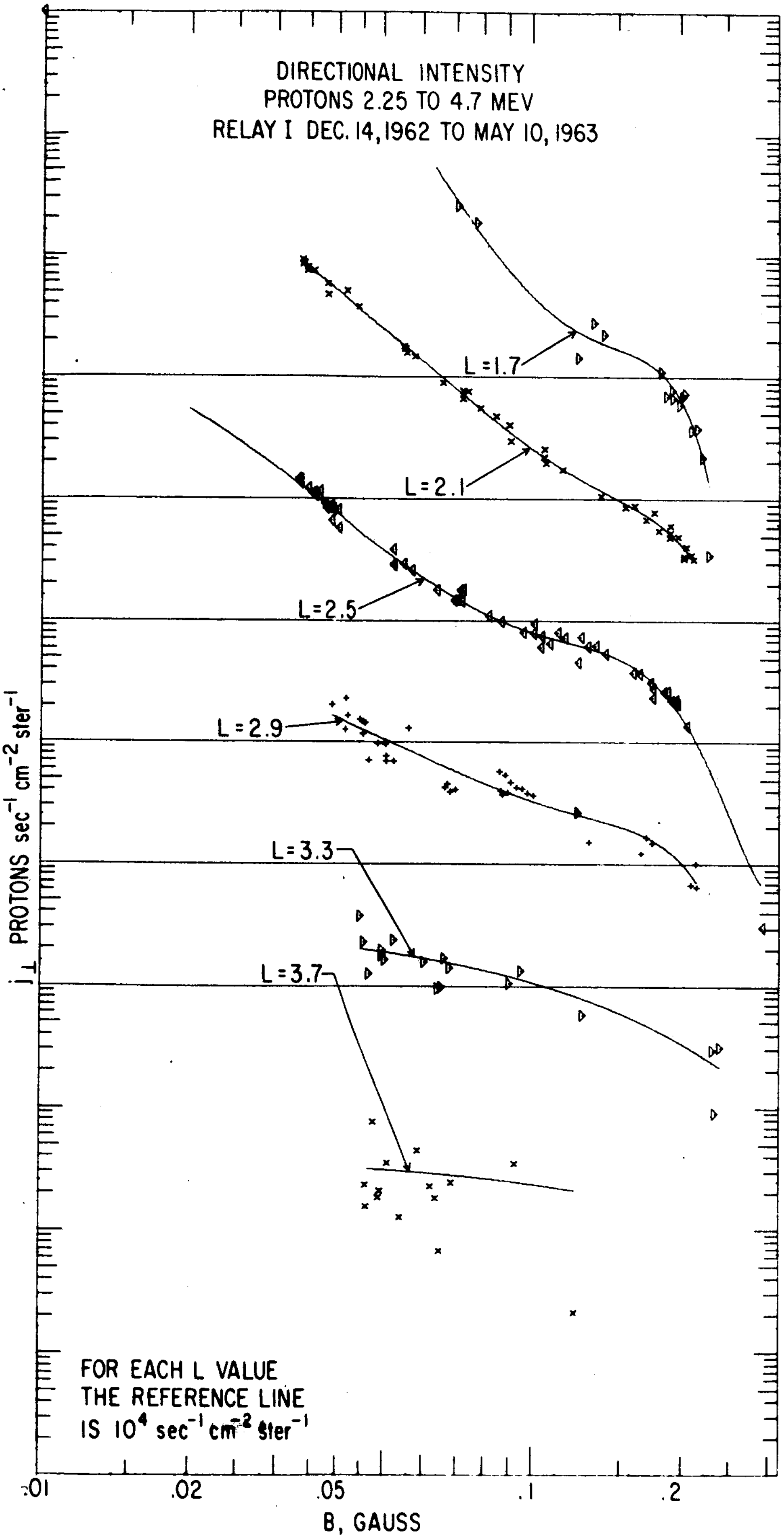

DIRECTIONAL INTENSITY
PROTONS 2.25 TO 4.7 MEV
RELAY I DEC. 14, 1962 TO MAY 10, 1963
L = 1.7
L = 2.1
L = 2.5
L = 2.9
L = 3.3
L = 3.7
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^4$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

Figure 11

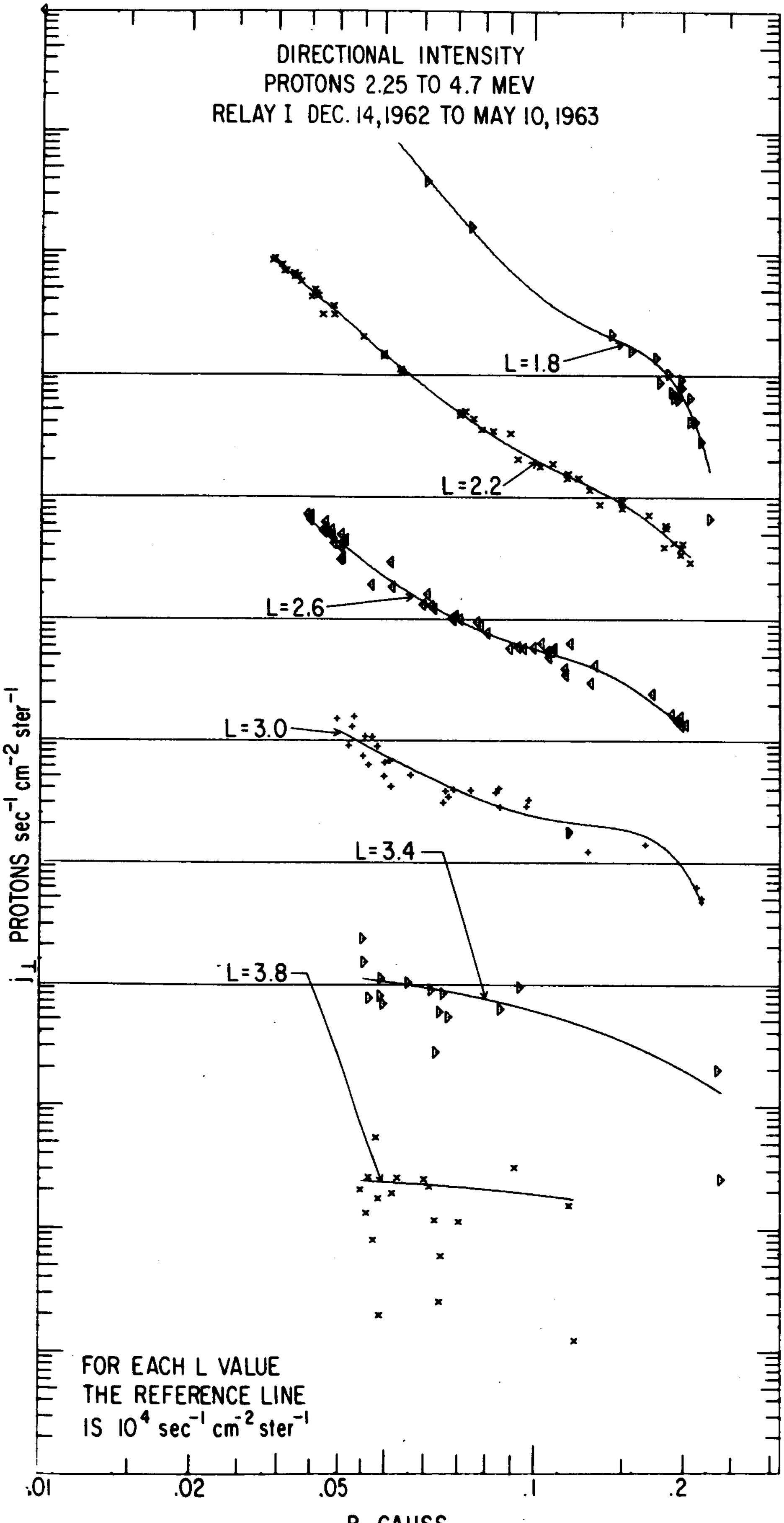

DIRECTIONAL INTENSITY
PROTONS 2.25 TO 4.7 MEV
RELAY I DEC. 14,1962 TO MAY 10,1963
L=1.8
L=2.2
L=2.6
L=3.0
L=3.4
L=3.8
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^4$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

Figure 12

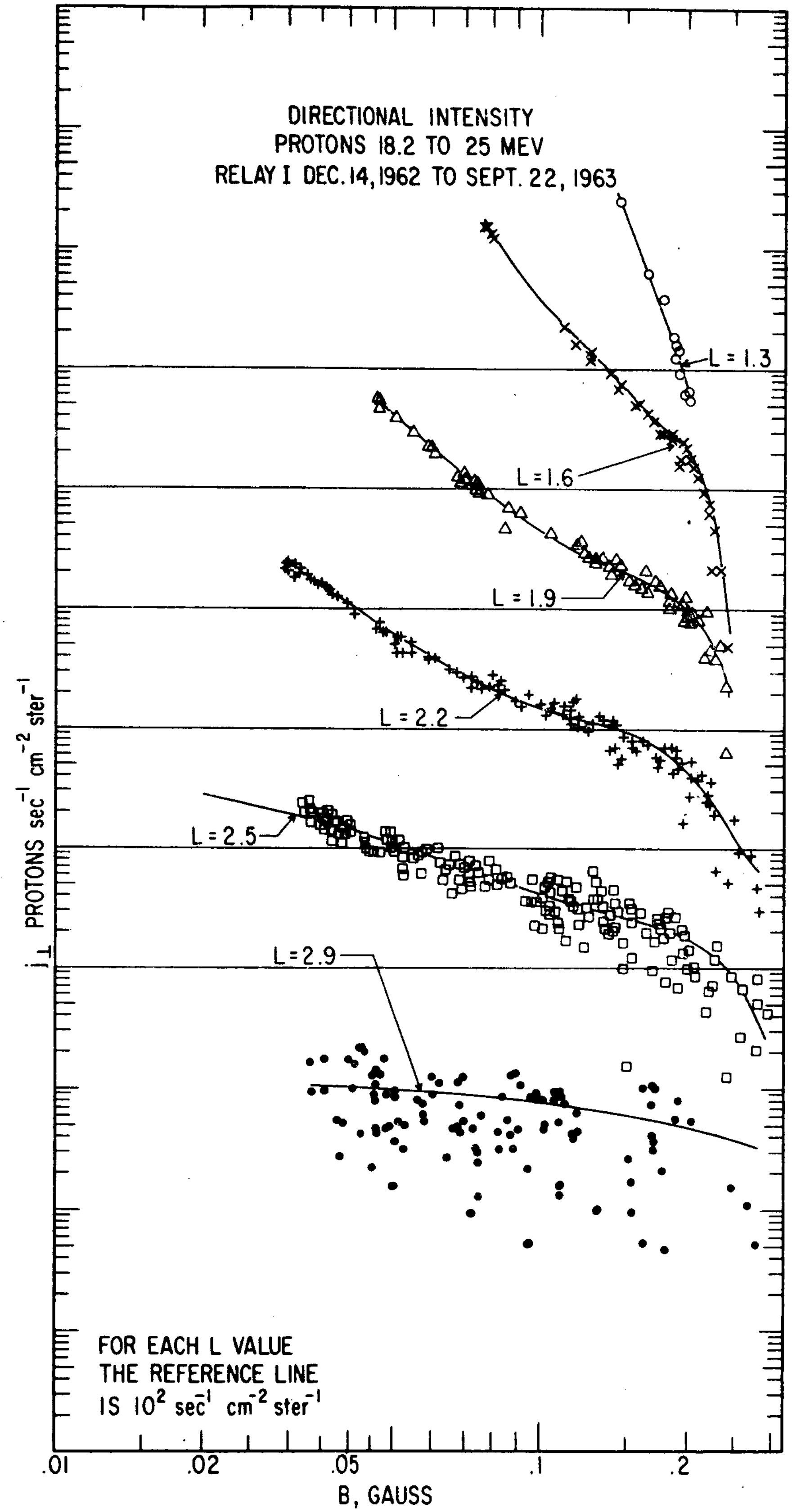

DIRECTIONAL INTENSITY
PROTONS 18.2 TO 25 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.3
L = 1.6
L = 1.9
L = 2.2
L = 2.5
L = 2.9
FOR EACH L VALUE
THE REFERENCE LINE
IS 10^2 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS

Figure 13

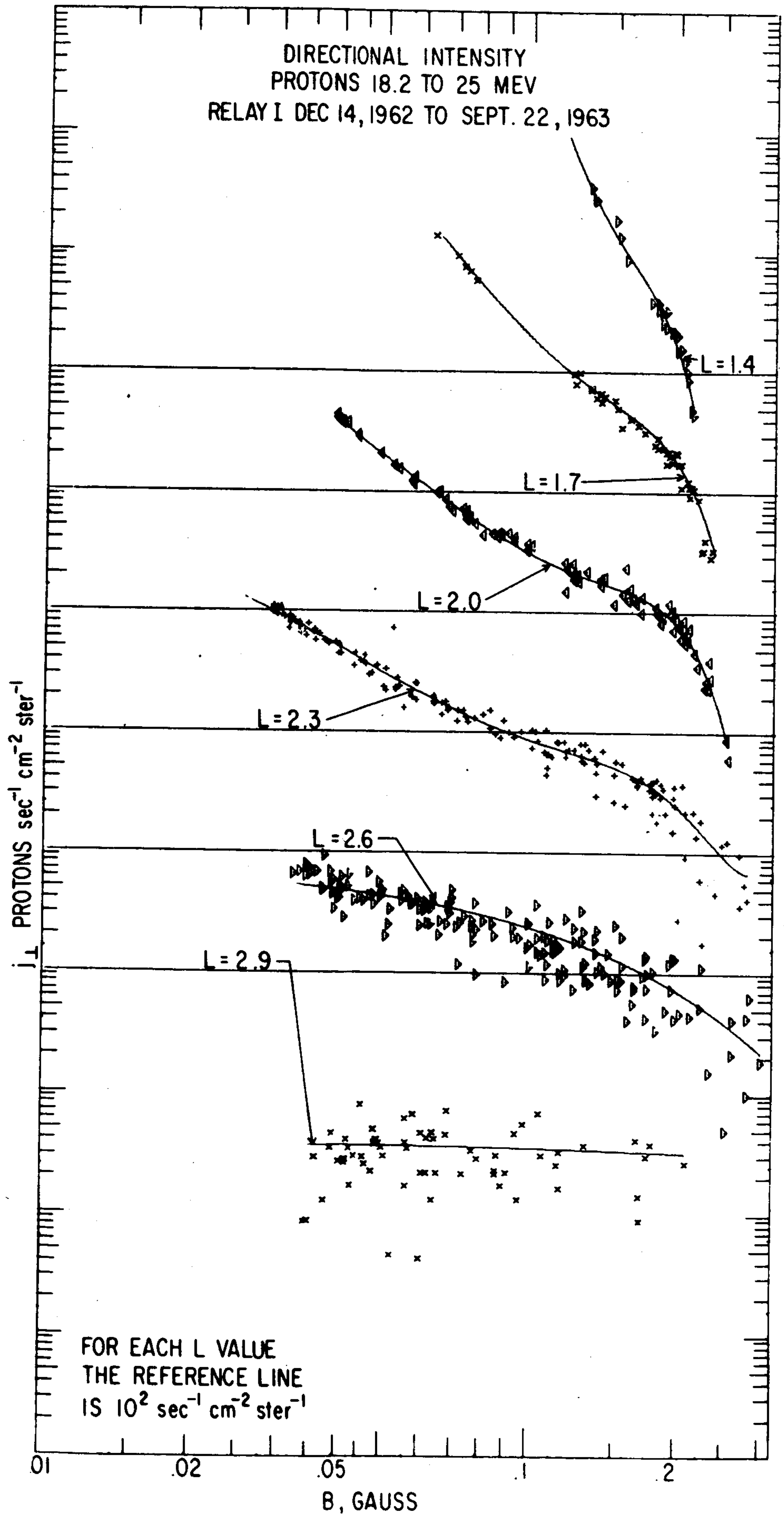
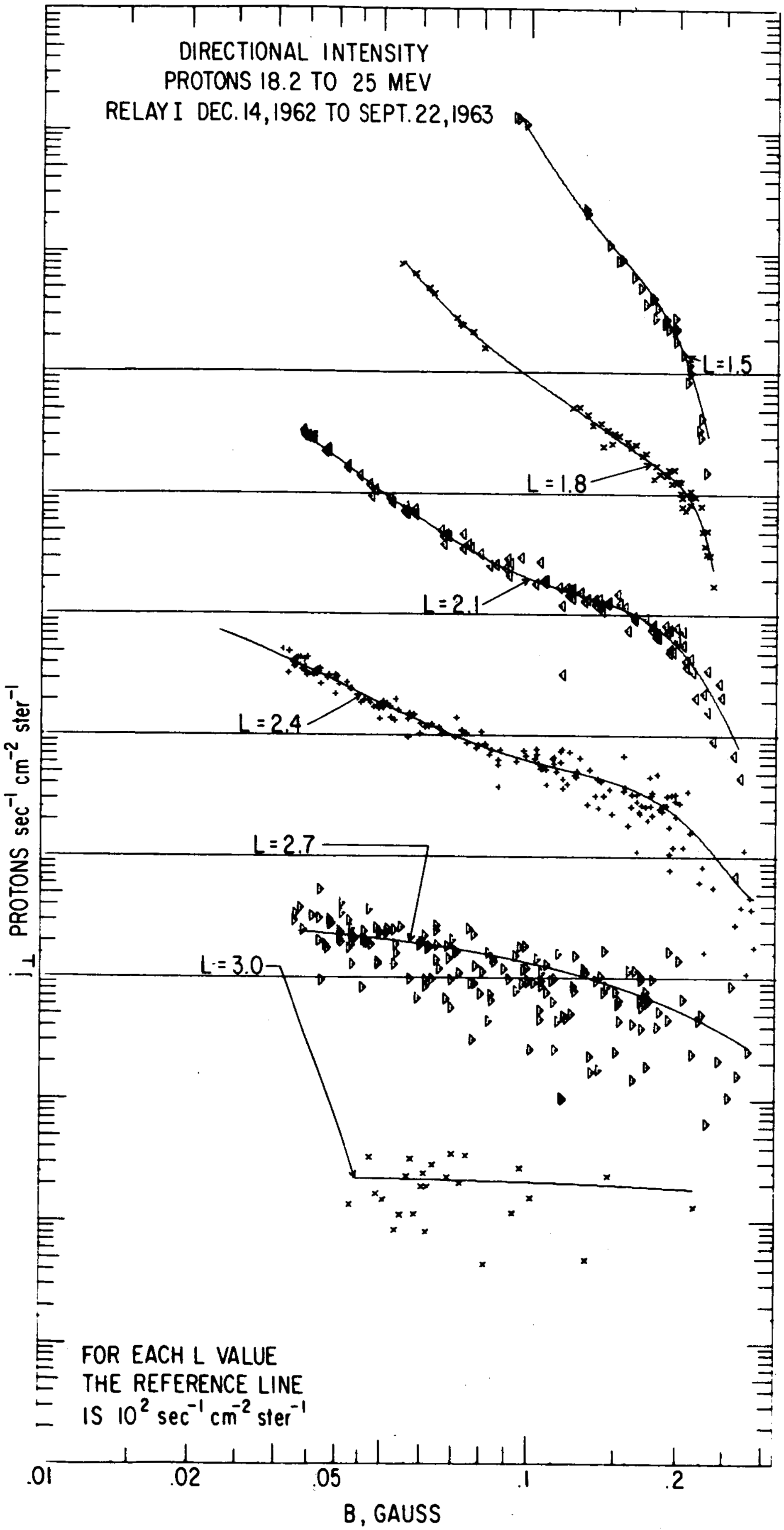
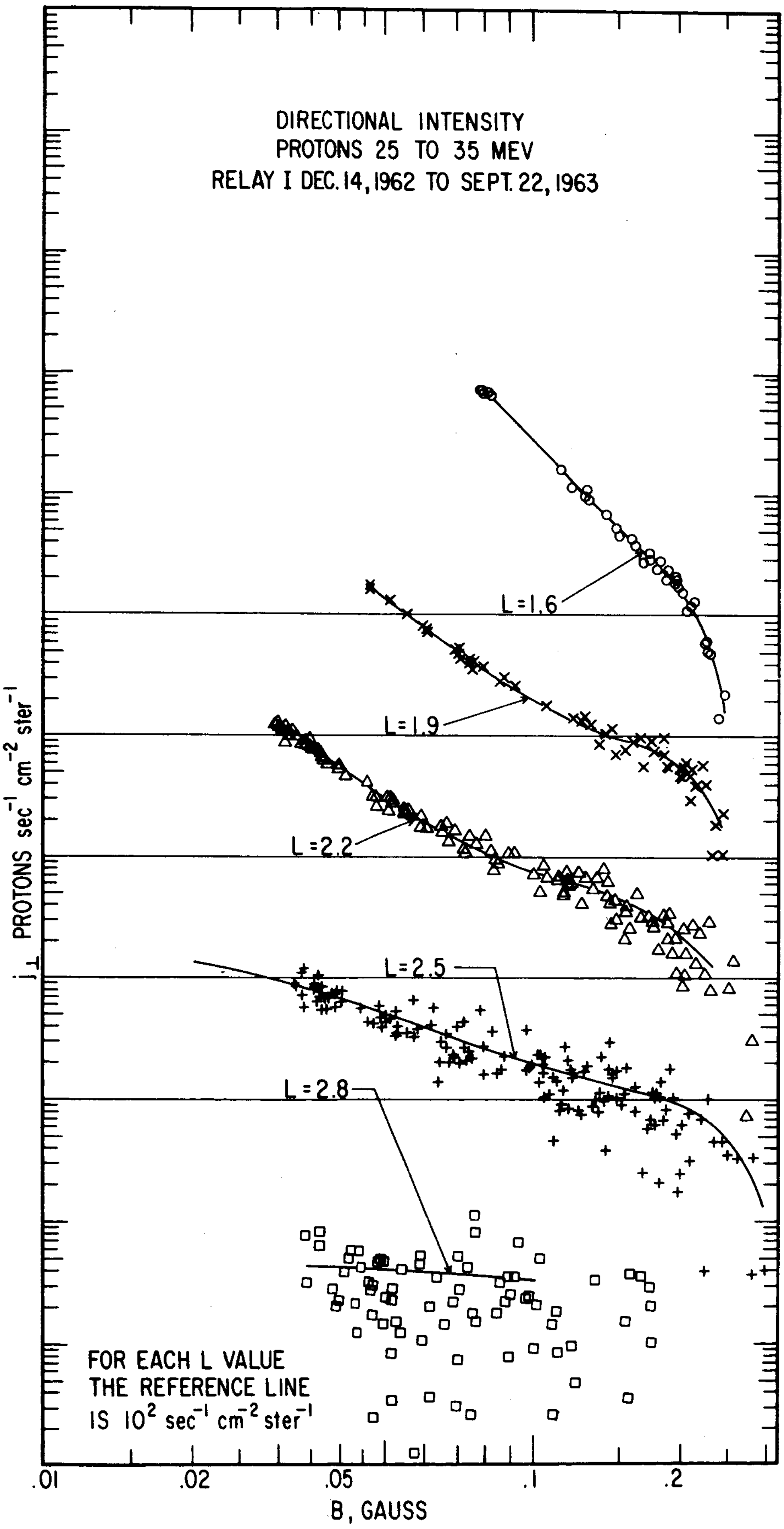

DIRECTIONAL INTENSITY
PROTONS 18.2 TO 25 MEV
RELAY I DEC 14, 1962 TO SEPT. 22, 1963
L = 1.4
L = 1.7
L = 2.0
L = 2.3
L = 2.6
L = 2.9
j⊥ PROTONS sec⁻¹ cm⁻² ster⁻¹
FOR EACH L VALUE
THE REFERENCE LINE
IS 10² sec⁻¹ cm⁻² ster⁻¹
.01
.02
.05
.1
.2
B, GAUSS

Figure 14



DIRECTIONAL INTENSITY
PROTONS 18.2 TO 25 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.5
L = 1.8
L = 2.1
L = 2.4
L = 2.7
L = 3.0
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS


Figure 15



DIRECTIONAL INTENSITY
PROTONS 25 TO 35 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.6
L = 1.9
L = 2.2
L = 2.5
L = 2.8
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS


Figure 16

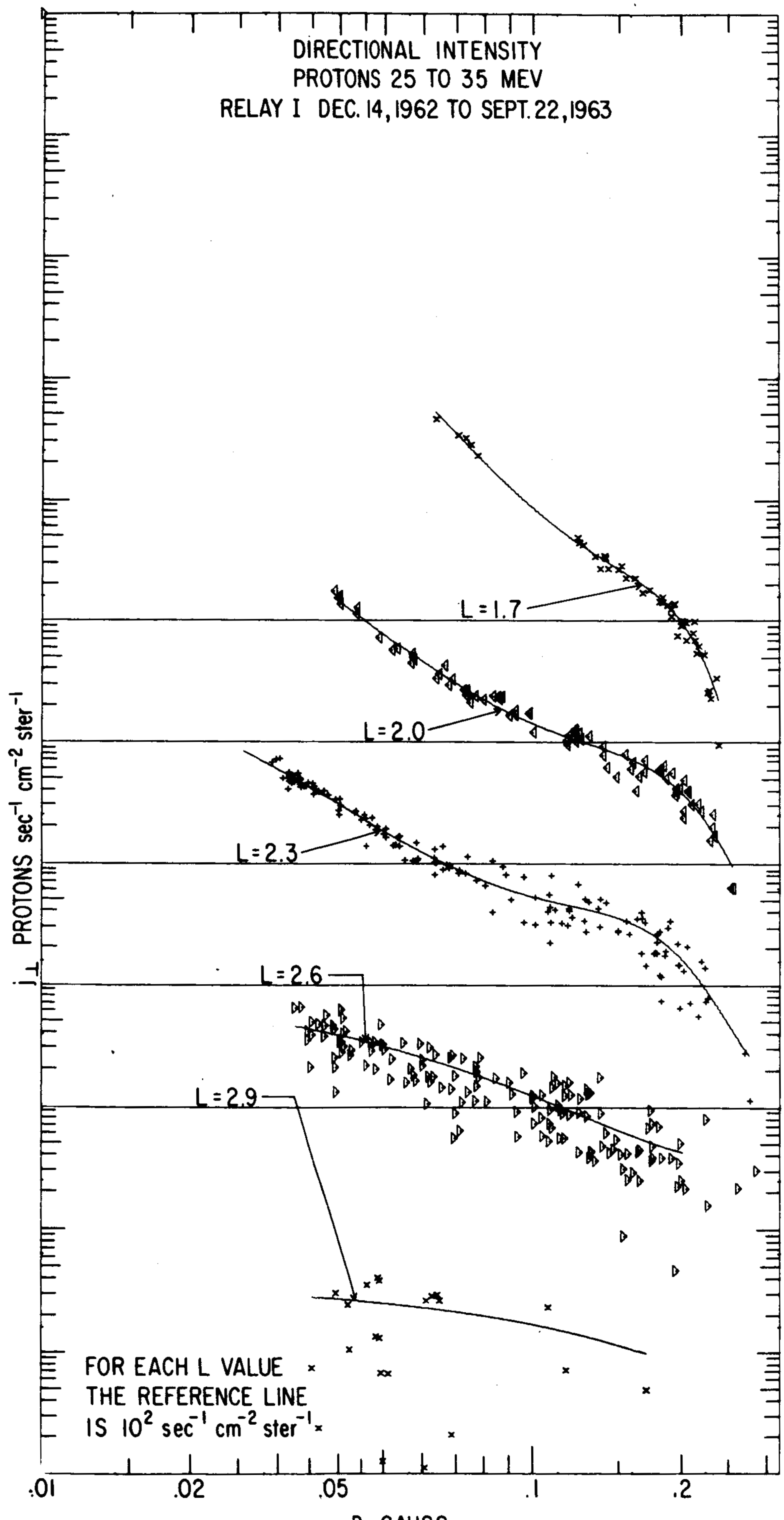

DIRECTIONAL INTENSITY
PROTONS 25 TO 35 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.7
L = 2.0
L = 2.3
L = 2.6
L = 2.9
FOR EACH L VALUE
THE REFERENCE LINE
IS 10^2 sec^-1 cm^-2 ster^-1
j⊥ PROTONS sec^-1 cm^-2 ster^-1
.01
.02
.05
.1
.2
B, GAUSS

Figure 17

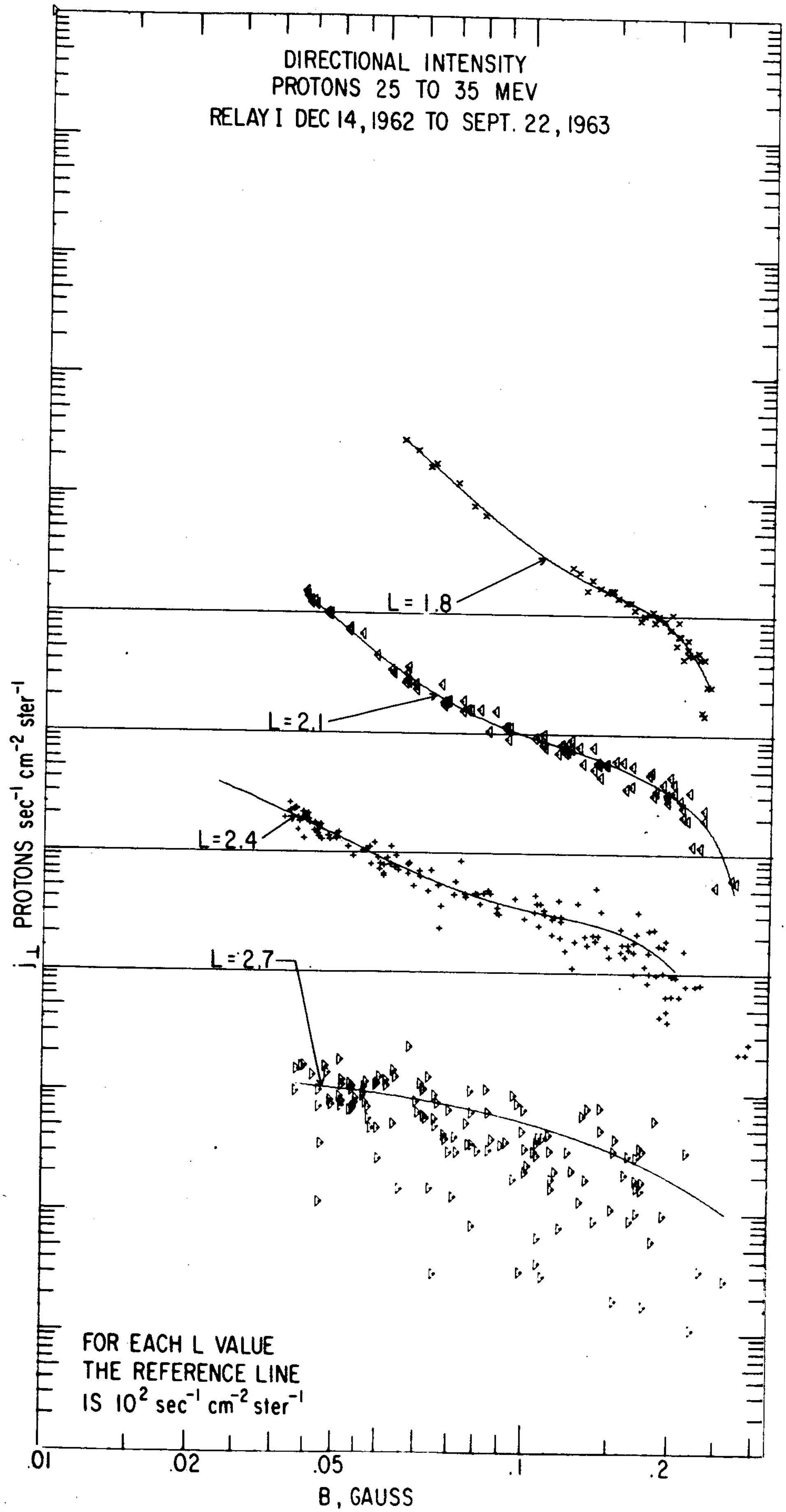
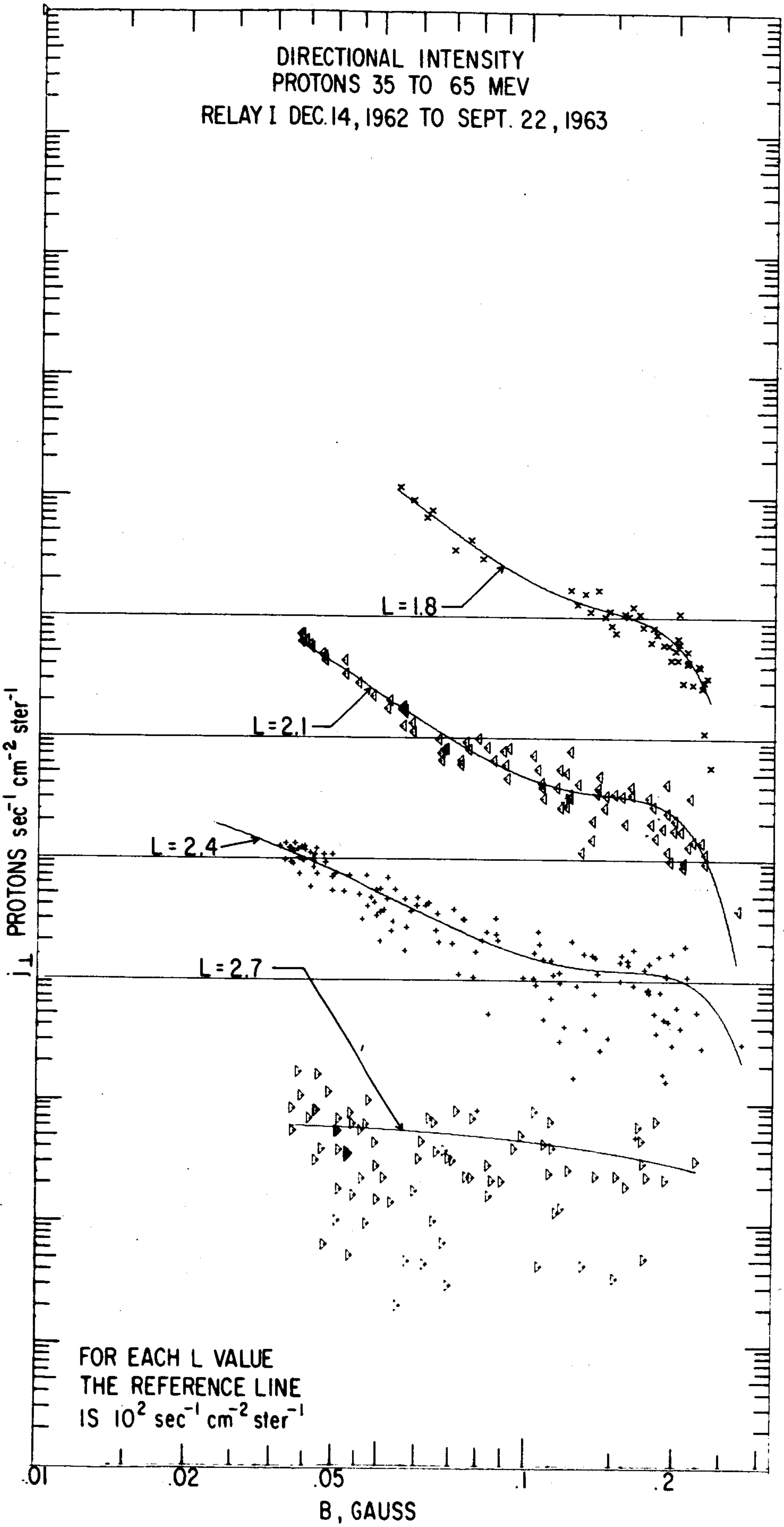
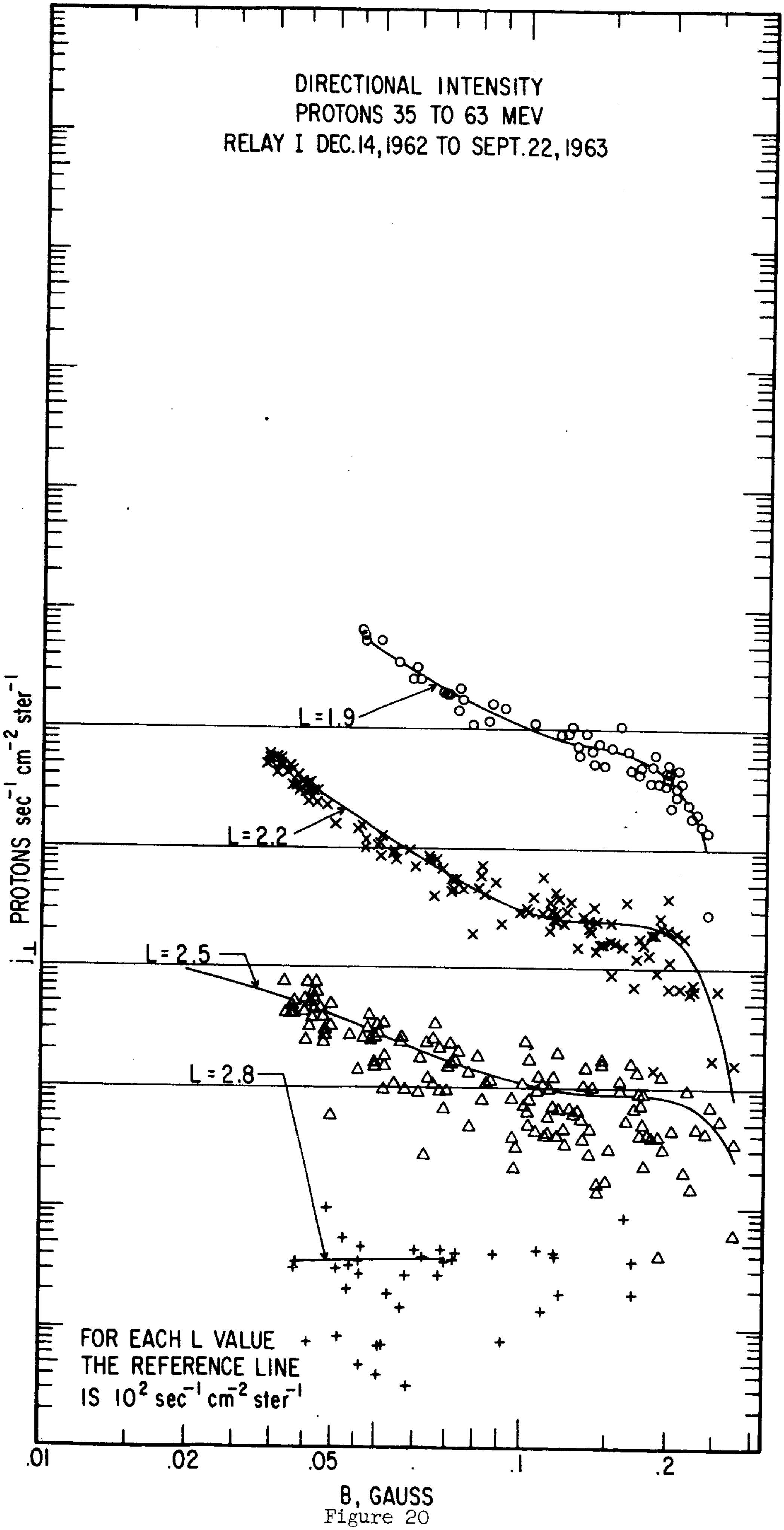

DIRECTIONAL INTENSITY
PROTONS 25 TO 35 MEV
RELAY I DEC 14, 1962 TO SEPT. 22, 1963
L = 1.8
L = 2.1
L = 2.4
L = 2.7
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

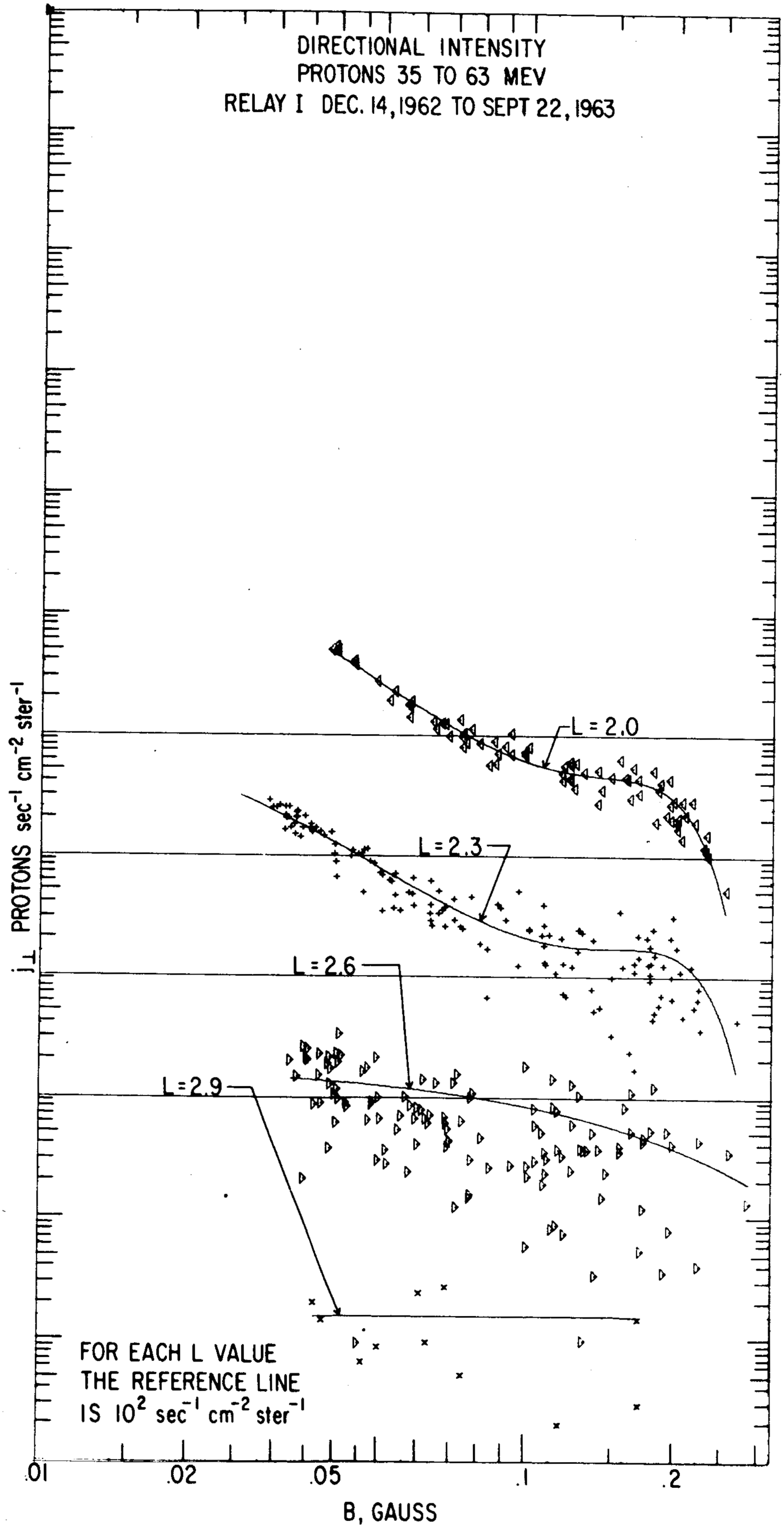
Figure 18



DIRECTIONAL INTENSITY
PROTONS 35 TO 65 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.8
L = 2.1
L = 2.4
L = 2.7
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

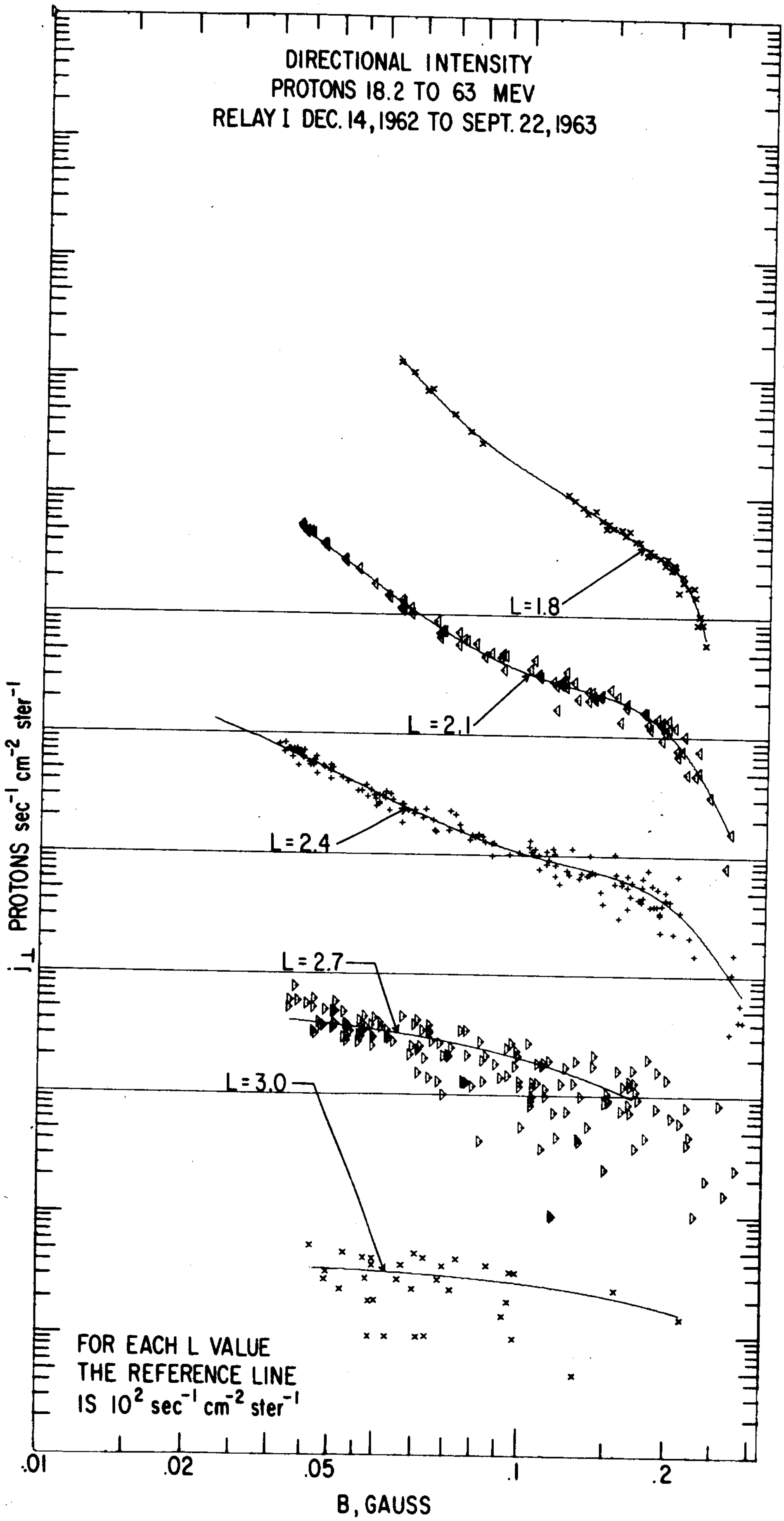

Figure 19


DIRECTIONAL INTENSITY
PROTONS 35 TO 63 MEV
RELAY I DEC.14, 1962 TO SEPT. 22, 1963
L = 1.9
L = 2.2
L = 2.5
L = 2.8
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS
Figure 20



DIRECTIONAL INTENSITY
PROTONS 35 TO 63 MEV
RELAY I DEC. 14, 1962 TO SEPT 22, 1963
L = 2.0
L = 2.3
L = 2.6
L = 2.9
FOR EACH L VALUE
THE REFERENCE LINE
IS 10² sec⁻¹ cm⁻² ster⁻¹
j⊥ PROTONS sec⁻¹ cm⁻² ster⁻¹
.01
.02
.05
.1
.2
B, GAUSS


Figure 21



DIRECTIONAL INTENSITY
PROTONS 18.2 TO 63 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.8
L = 2.1
L = 2.4
L = 2.7
L = 3.0
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ sec$^{-1}$ cm$^{-2}$ ster$^{-1}$
$j_\perp$ PROTONS sec$^{-1}$ cm$^{-2}$ ster$^{-1}$
.01
.02
.05
.1
.2
B, GAUSS


Figure 22

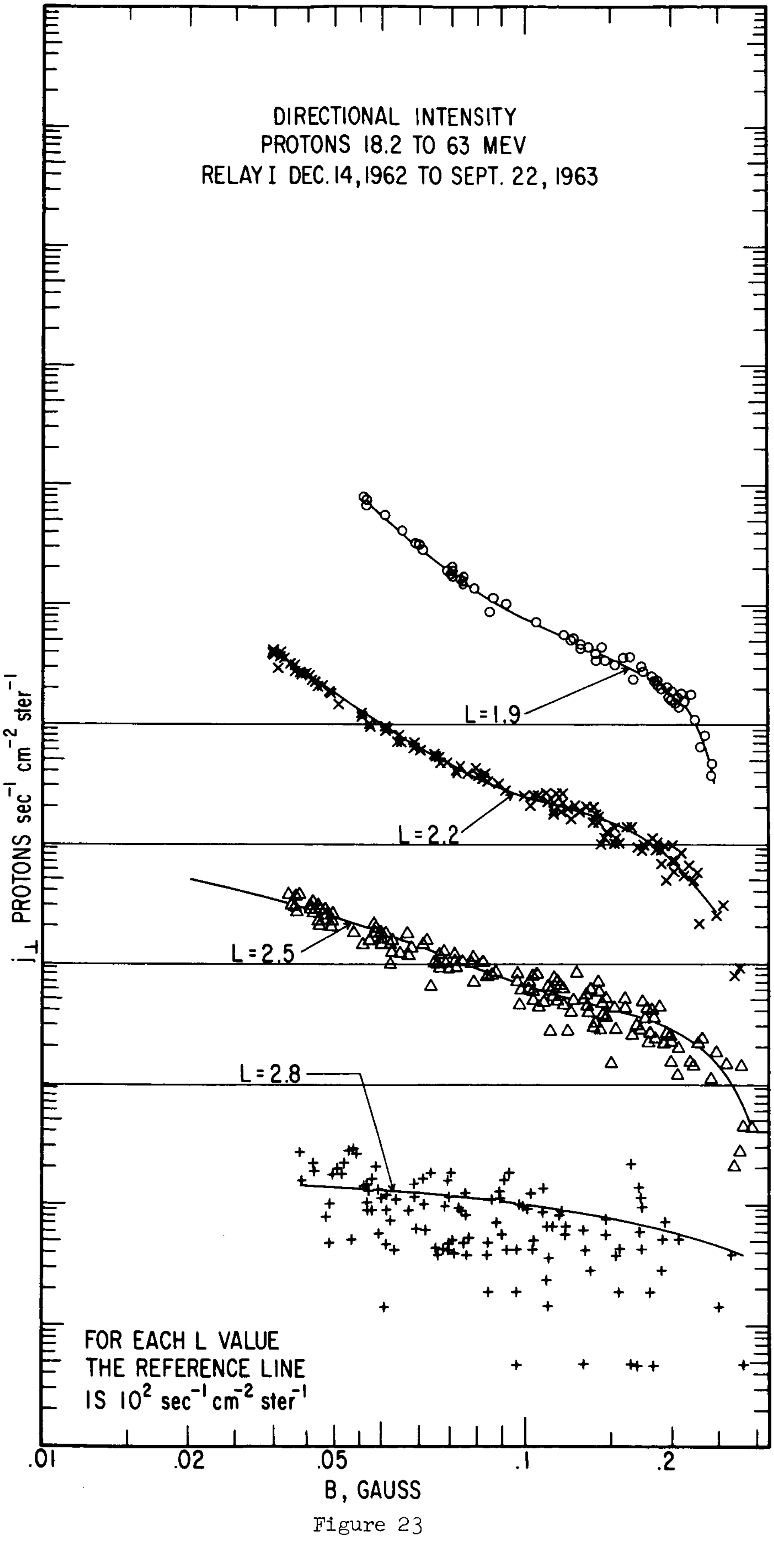

DIRECTIONAL INTENSITY
PROTONS 18.2 TO 63 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
L = 1.9
L = 2.2
L = 2.5
L = 2.8
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

Figure 23

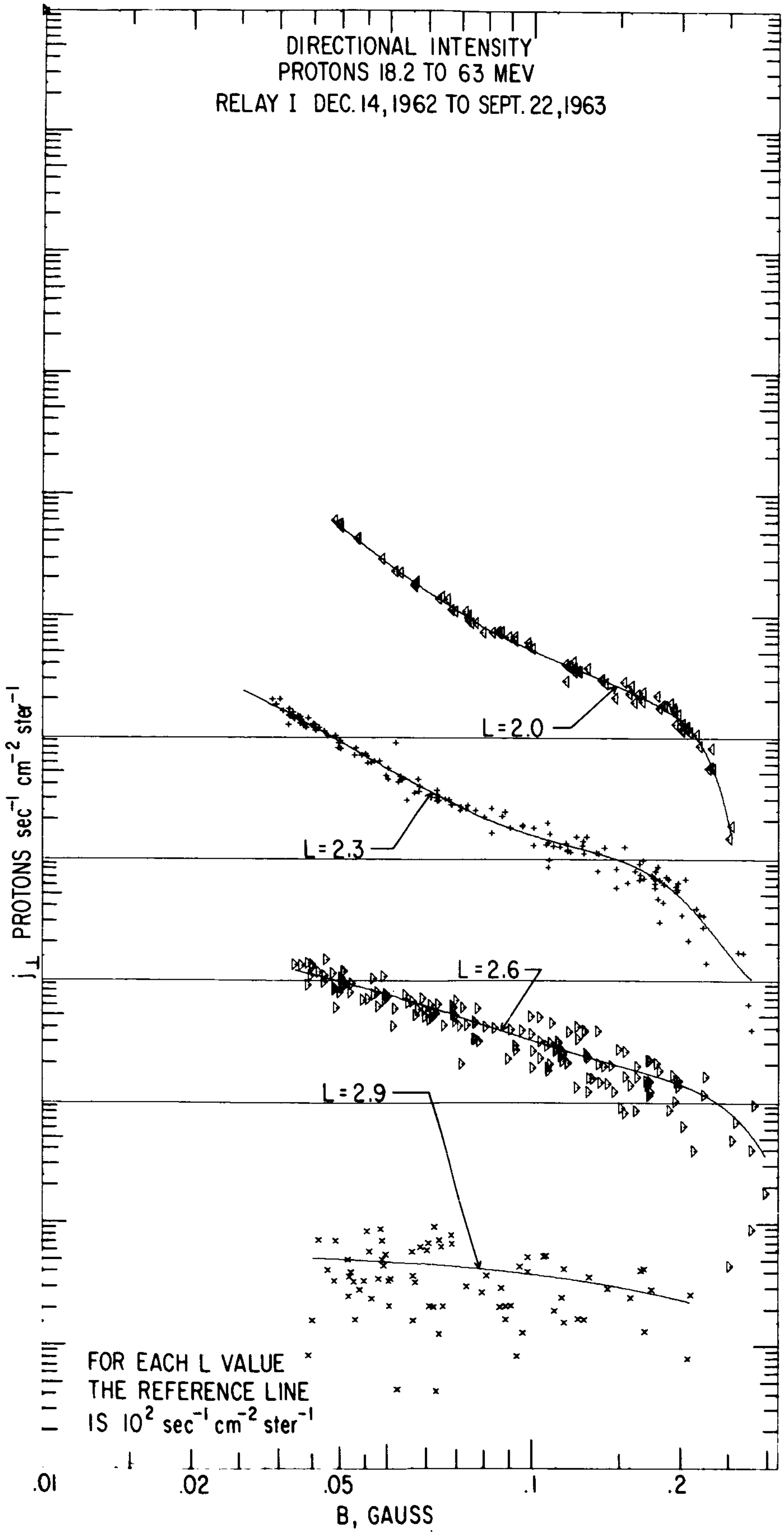

DIRECTIONAL INTENSITY
PROTONS 18.2 TO 63 MEV
RELAY I DEC. 14, 1962 TO SEPT. 22, 1963
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
L = 2.0
L = 2.3
L = 2.6
L = 2.9
FOR EACH L VALUE
THE REFERENCE LINE
IS $10^2$ $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
.01
.02
.05
.1
.2
B, GAUSS

Figure 24

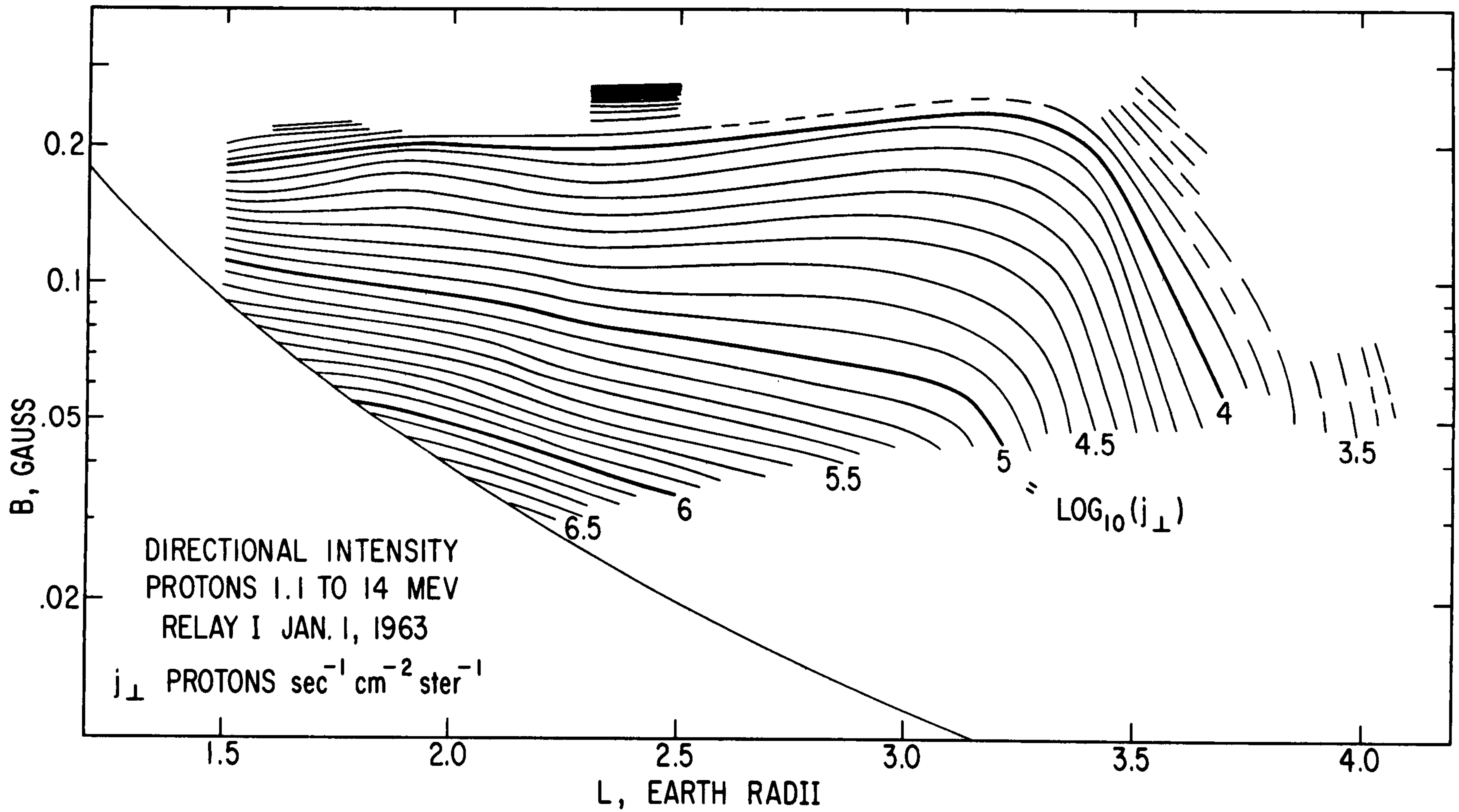

DIRECTIONAL INTENSITY
PROTONS 1.1 TO 14 MEV
RELAY I JAN. 1, 1963
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
$= LOG_{10}(j_\perp)$
6.5
6
5.5
5
4.5
4
3.5
B, GAUSS
0.2
0.1
.05
.02
L, EARTH RADII
1.5
2.0
2.5
3.0
3.5
4.0

Figure 25

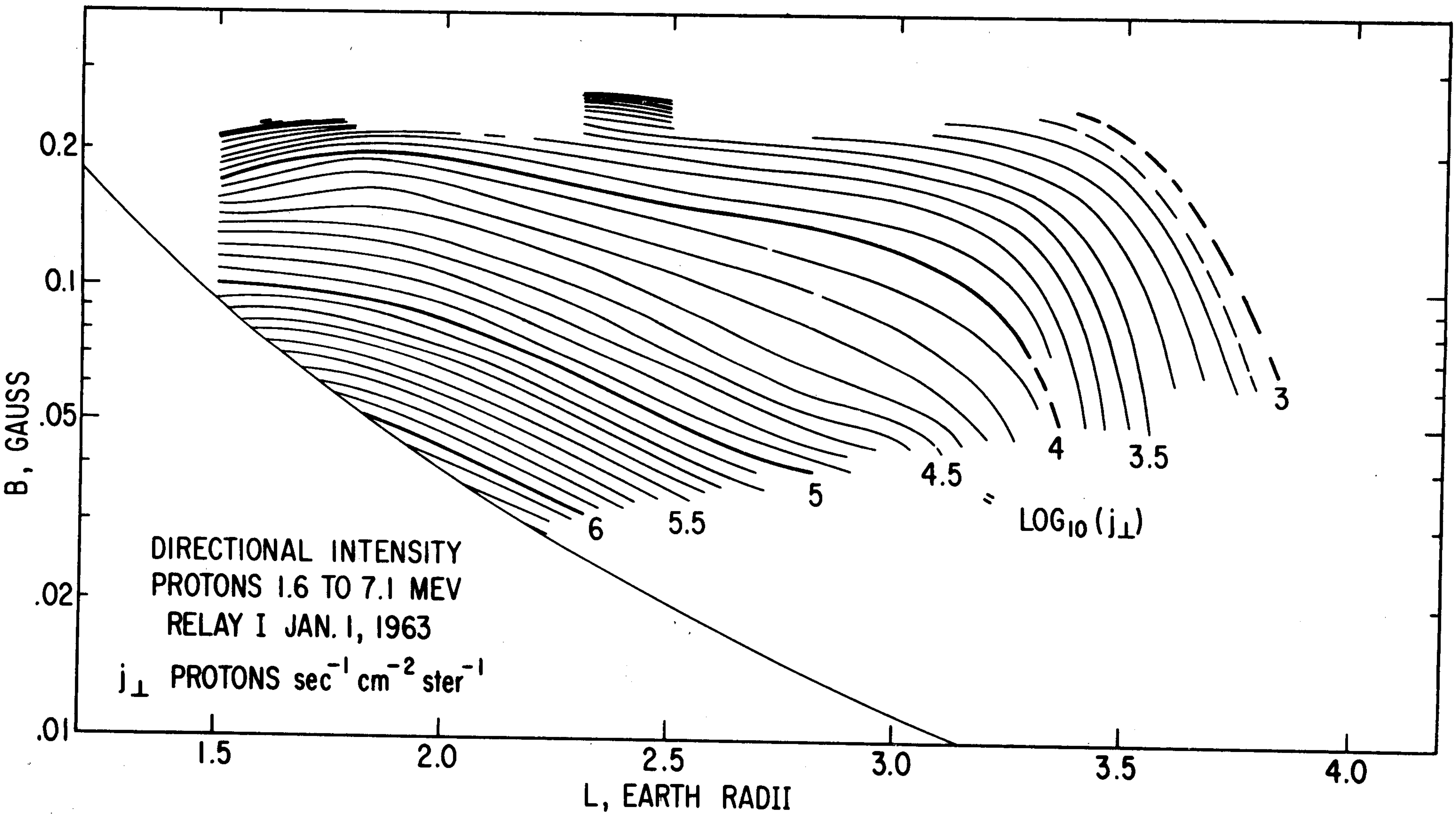
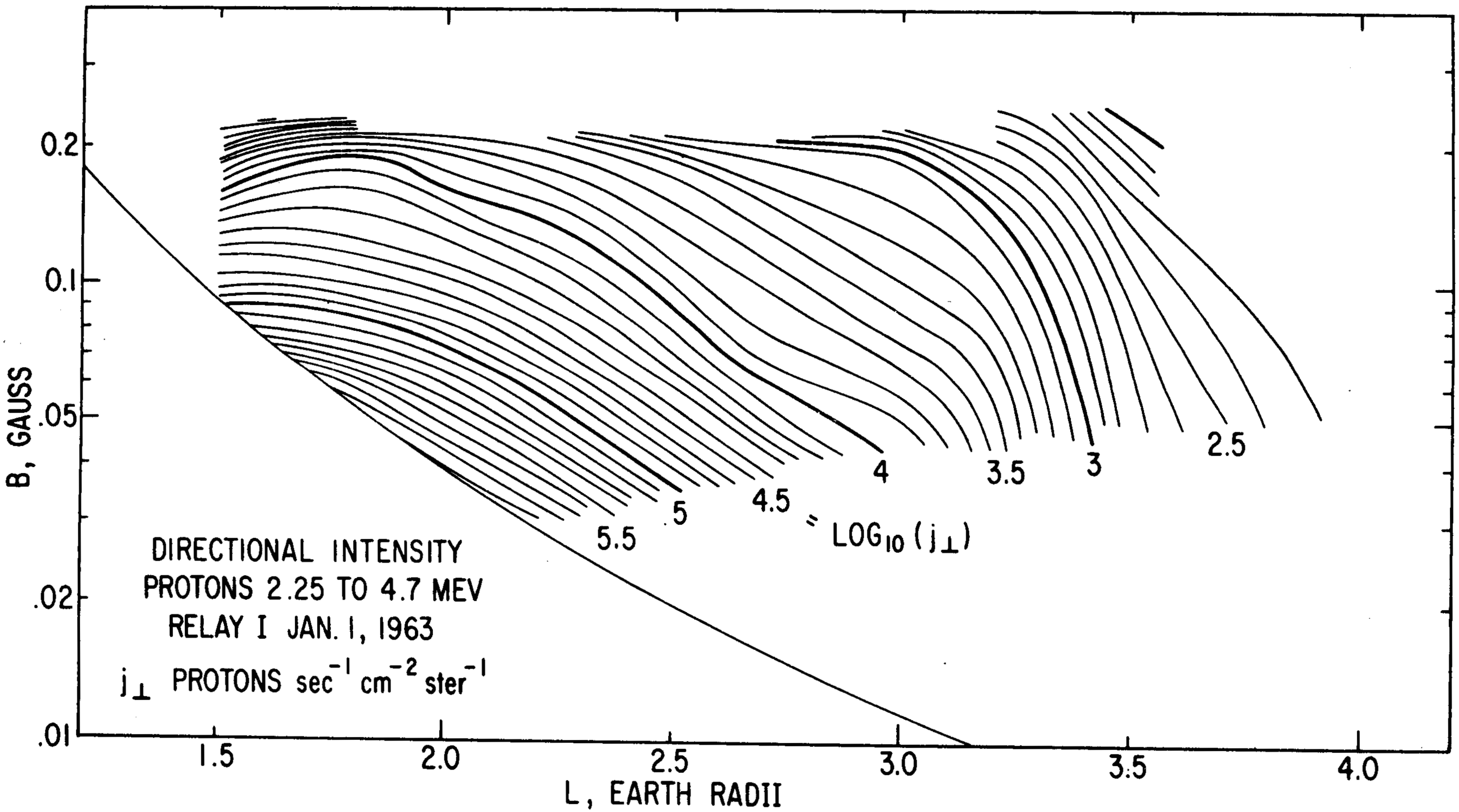

0.2
0.1
.05
.02
.01
B, GAUSS
1.5
2.0
2.5
3.0
3.5
4.0
L, EARTH RADII
DIRECTIONAL INTENSITY
PROTONS 1.6 TO 7.1 MEV
RELAY I JAN. 1, 1963
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
6
5.5
5
4.5
4
3.5
3
= $LOG_{10}(j_\perp)$

Figure 26



DIRECTIONAL INTENSITY
PROTONS 2.25 TO 4.7 MEV
RELAY I JAN. 1, 1963
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
5.5
5
4.5
4
3.5
3
2.5
= $LOG_{10}(j_\perp)$
B, GAUSS
0.2
0.1
.05
.02
.01
1.5
2.0
2.5
3.0
3.5
4.0
L, EARTH RADII


Figure 27

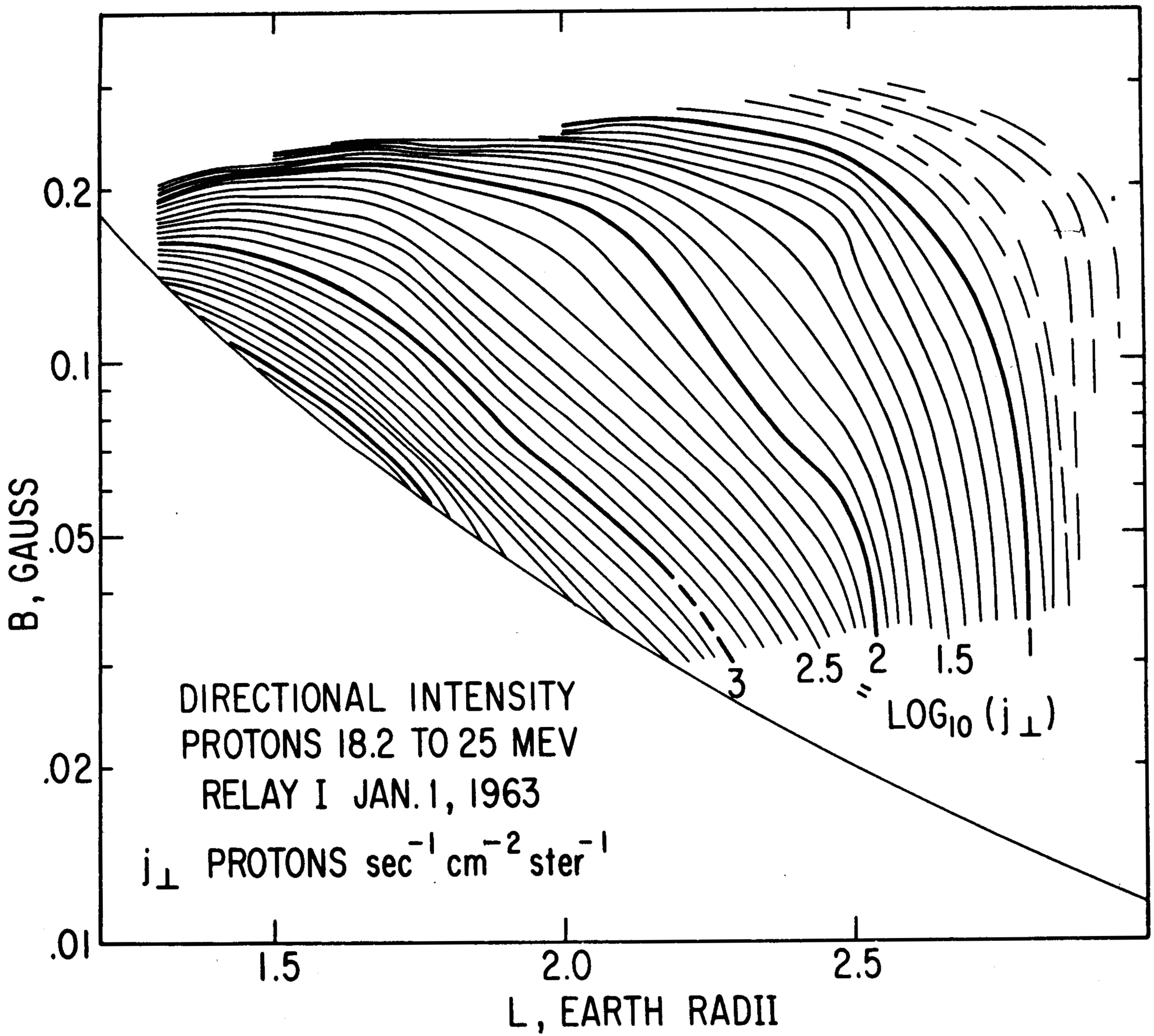
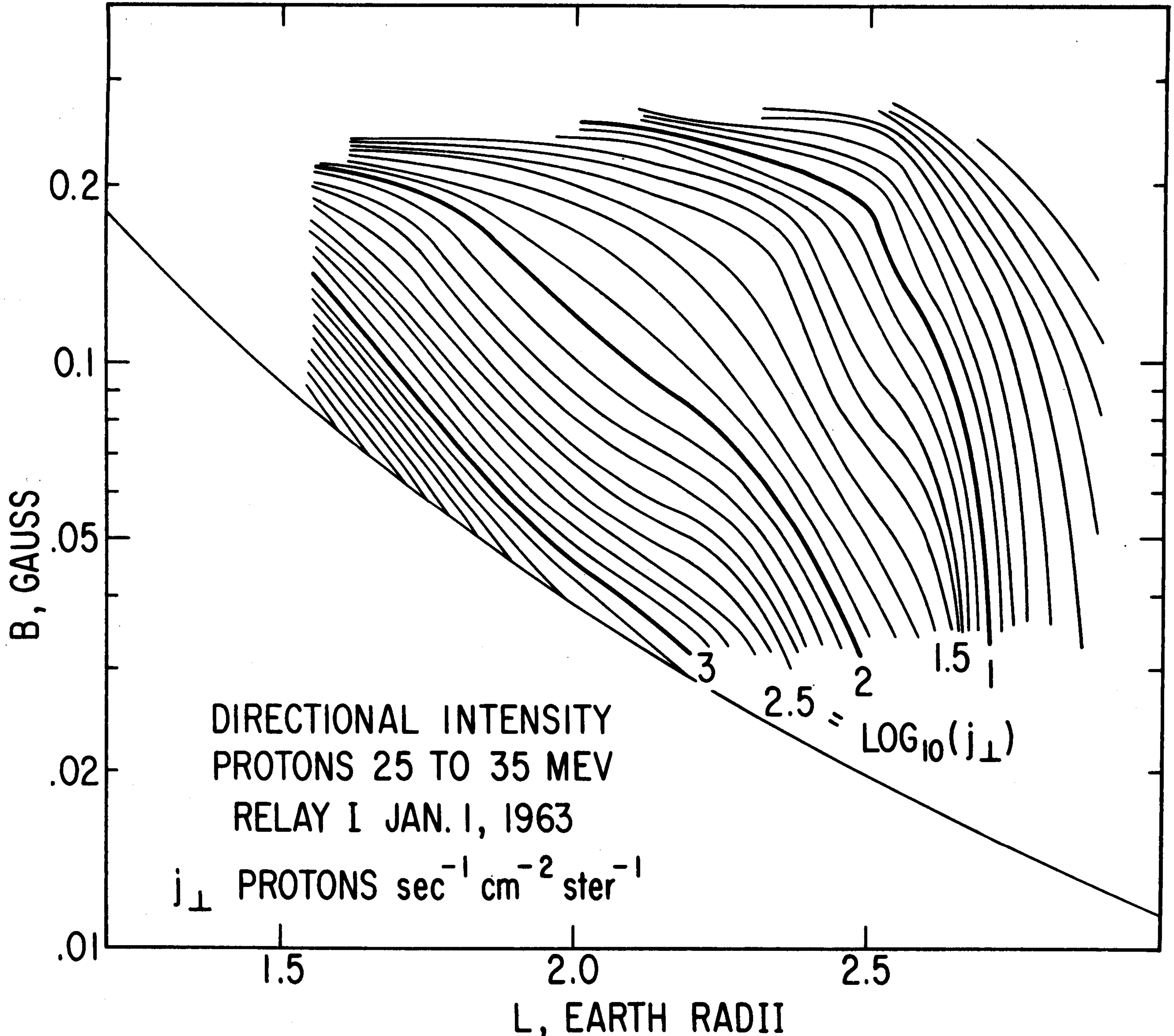

DIRECTIONAL INTENSITY
PROTONS 18.2 TO 25 MEV
RELAY I JAN. 1, 1963
$j_\perp$ PROTONS $sec^{-1} cm^{-2} ster^{-1}$
3
2.5
2
1.5
1
= $LOG_{10}(j_\perp)$
0.2
0.1
.05
.02
.01
B, GAUSS
1.5
2.0
2.5
L, EARTH RADII

Figure 28



DIRECTIONAL INTENSITY
PROTONS 25 TO 35 MEV
RELAY I JAN. 1, 1963
$j_\perp$ PROTONS $sec^{-1}$ $cm^{-2}$ $ster^{-1}$
3
2.5
2
1.5
1
= $LOG_{10}(j_\perp)$
0.2
0.1
.05
.02
.01
B, GAUSS
1.5
2.0
2.5
L, EARTH RADII


Figure 29

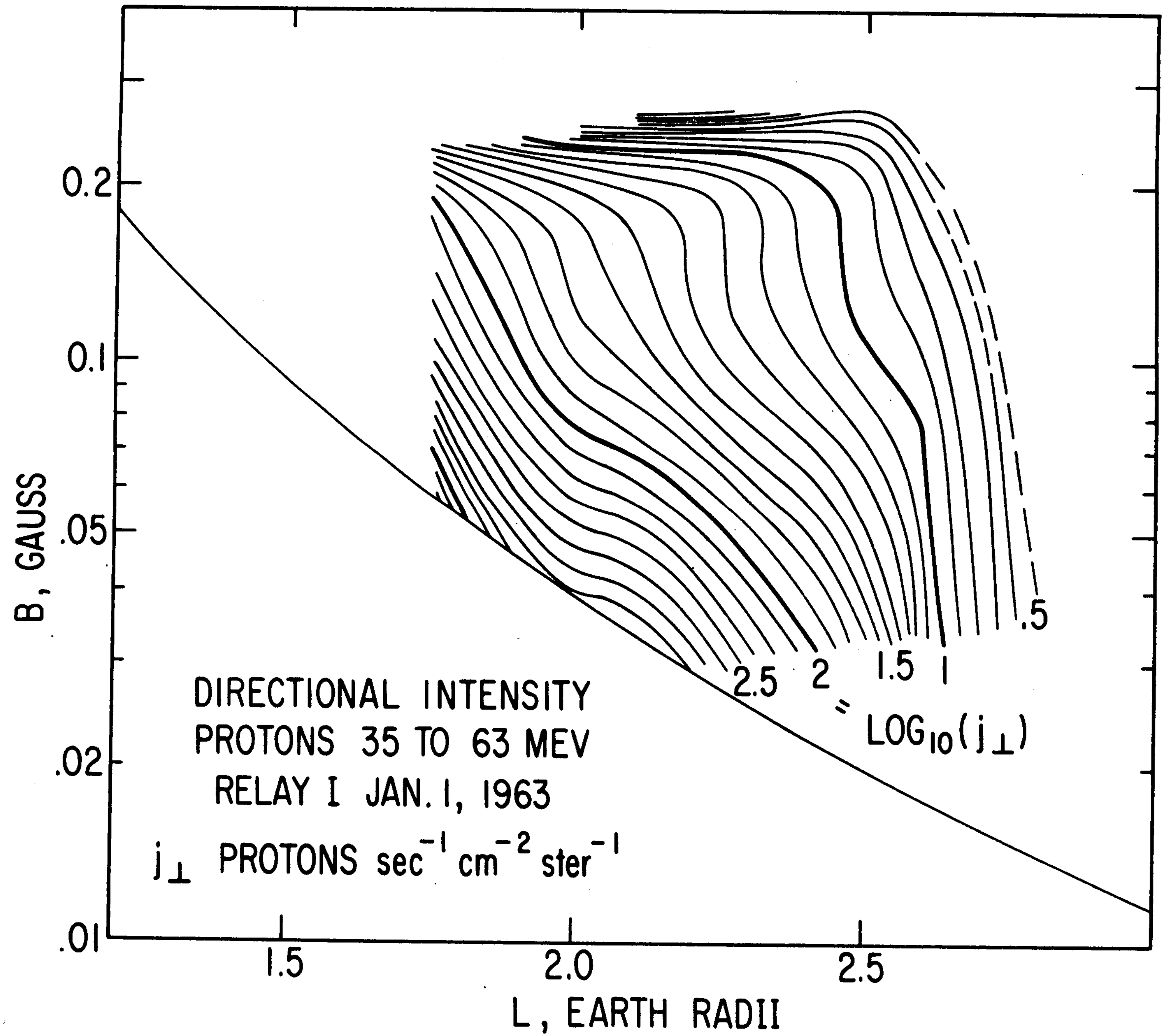
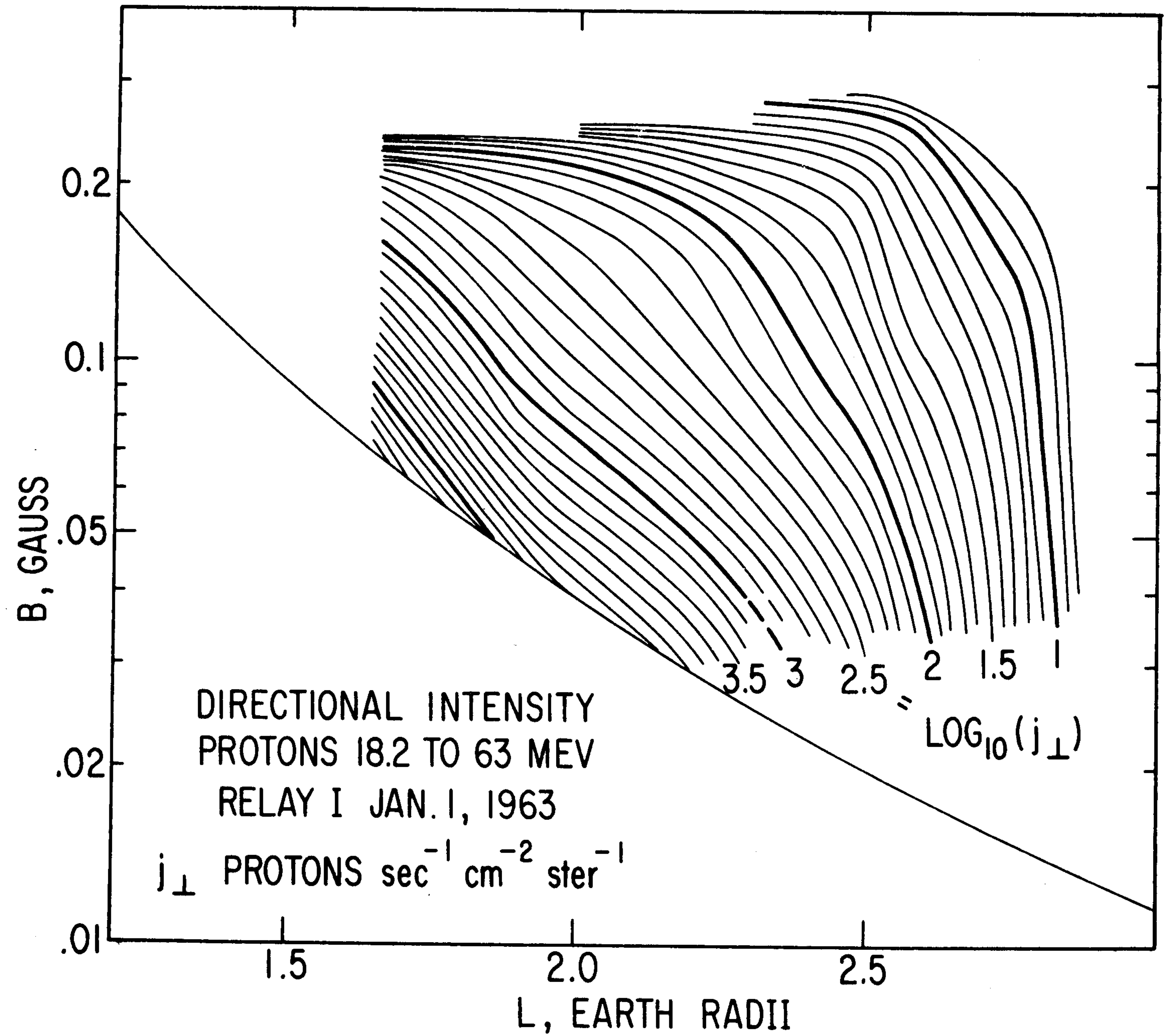

0.2
0.1
.05
.02
.01
B, GAUSS
1.5
2.0
2.5
L, EARTH RADII
DIRECTIONAL INTENSITY
PROTONS 35 TO 63 MEV
RELAY I JAN. 1, 1963
$j_\perp$ PROTONS $sec^{-1} cm^{-2} ster^{-1}$
2.5
2
1.5
1
.5
= $LOG_{10}(j_\perp)$

Figure 30



0.2
0.1
.05
.02
.01
B, GAUSS
1.5
2.0
2.5
L, EARTH RADII
DIRECTIONAL INTENSITY
PROTONS 18.2 TO 63 MEV
RELAY I JAN. 1, 1963
j⊥ PROTONS sec-1 cm-2 ster-1
3.5 3 2.5 2 1.5 1
= LOG10(j⊥)


Figure 31