National Bureau of Standards
Library, N.W. Bldg
FEB 1 1965

Central Radio Propagation Laboratory

TK 6570

B7U47

A11102 155021

IONOSPHERIC PREDICTIONS

for
April
1965

IMPORTANT
NOTICE

SEE
INTRODUCTION PAGE

TB 11-499-25/TO 31-3-28

U.S. DEPARTMENT of COMMERCE
National Bureau of Standards
Number 25/Issued January 1965

U.S. DEPARTMENT OF COMMERCE

Luther H. Hodges, Secretary

NATIONAL BUREAU OF STANDARDS

A. V. Astin, Director

Central Radio Propagation Laboratory

Ionospheric Predictions

for April 1965

Number 25

Issued

January 1965

[Formerly "Basic Radio Propagation Predictions," CRPL Series D.]

The CRPL Ionospheric Predictions are issued monthly as an aid in determining the best sky-wave frequencies over any transmission path, at any time of day, for average conditions for the month. Issued three months in advance, each issue provides tables

of numerical coefficients that define the functions describing the predicted worldwide distribution of foF2 and M(3000)F2 and maps for each even hour of universal time of MUF(Zero)F2 and MUF(4000)F2.

NOTE: Department of Defense personnel see back cover.

Use of funds for printing this publication approved by the Director of the Bureau of the Budget (June 19, 1961).

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Price 25 cents.

Annual subscription (12 issues) \$2.50 (75 cents additional for foreign mailing).

National Bureau of Standards

The functions of the National Bureau of Standards are set forth in an Act of Congress, March 3, 1901, as amended. These include the development and maintenance of the national standards of measurement and the provision of means and methods for making measurements consistent with these standards; the determination of physical constants and properties of materials; the development of methods and instruments for testing materials, devices, and structures; advisory services to government agencies on scientific and tech-

nical problems; invention and development of devices to serve special needs of the Government; and the development of standard practices, codes, and specifications. The work includes basic and applied research, development, engineering, instrumentation, testing, evaluation, calibration services, and various consultation and information services. The Bureau also serves as the Federal technical research center in a number of specialized fields.

Central Radio Propagation Laboratory

The Central Radio Propagation Laboratory at Boulder, Colorado, is the central agency of the Federal Government for the collection, analysis, and dissemination of information on propagation of radio waves at all frequencies along the surface of the earth, in the atmosphere, and in space, and performs scientific studies looking toward new techniques for the efficient use and conservation of the radio spectrum. To carry out this responsibility, the CRPL—

1. Acts as the central agency for the conduct of basic research on the nature of radio waves, the pertinent properties of the media through which radio waves are transmitted, the interaction of radio waves with those media, and on the nature of radio noise and interference effects. This includes compilation of reports by other foreign and domestic agencies conducting research in this field and furnishing advice to government and nongovernment groups conducting propagation research.

2. Performs studies of specific radio propagation mechanisms and performs scientific studies looking

toward the development of techniques for efficient use and conservation of the radiofrequency spectrum as part of its regular program or as requested by other government agencies. In an advisory capacity, coordinates studies in this area undertaken by other government agencies.

3. Furnishes advisory and consultative service on radio wave propagation, on radiofrequency utilization, and on radio systems problems to other organizations within the United States, public and private.

4. Prepares and issues predictions of radio wave propagation and noise conditions and warnings of disturbances in these conditions.

5. Acts as a central repository for data, reports, and information in the field of radio wave propagation.

6. Performs scientific liaison and exchanges data and information with other countries to advance knowledge of radio wave propagation and interference phenomena and spectrum conservation techniques, including that liaison required by international responsibilities and agreements.

NOTICE

Beginning with the December issue, No. 24 of this series, polar plots of the prediction maps will be included for every even hour universal time. These are plotted on the same scale as the former polar plots, but extend only to 40° latitude. The contours of the rectangular world maps are now cut off at 80° latitude. Occasional slight discrepancies between the contours of the rectangular maps and those of the polar maps are due to the different computer programs used to derive the two sets of contours from the table of numerical coefficients. These discrepancies are well within the accuracy of the predictions.

These polar maps are being published on a trial basis for six months. They will be discontinued after six months unless there is a positive indication of their usefulness from a substantial proportion of users of these predictions. Therefore, if you wish these to continue, it is necessary to send us your comments in writing as soon as possible.

Introduction

The "Central Radio Propagation Laboratory Ionospheric Predictions" is the successor to the former "Basic Radio Propagation Predictions," CRPL Series D. To make effective use of these predictions, National Bureau of Standards Handbook 90, "Handbook for CRPL Ionospheric Predictions Based on Numerical Methods of Mapping," should be obtained from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402, price 40 cents. This Handbook includes required additional data, nomographs and graphical aids, as well as methods for use of the predictions. The Handbook supersedes the obsolete NBS Circular 465.

The basic prediction appears in tables 1 and 2, presenting predicted coefficients for foF2 and M(3000)F2 defining the numerical map functions describing the predicted worldwide variation of these characteristics. With additional auxiliary information, these coefficients may be used as input data for electronic computer programs solving specific high-frequency propagation problems. Basic equations, their interpretation, and methods of using numerical maps are described in papers by W. B. Jones and R. M. Gallet, "The Representation of Diurnal and Geographic Variations of Ionospheric Data by Numerical Methods," Vol. 66D, No. 4, July-Aug. 1962, pages 419-438, and "Methods for Applying Numerical Maps of Ionospheric Characteristics," Vol. 66D, No. 6, Nov.-Dec. 1962, pages 649-662, both in the Journal of Research of the National Bureau of Standards, Section D. Radio Propagation. The predicted numerical map coefficients of tables 1 and 2 may be purchased in the form of a tested set of punched cards. Write to Prediction Services Section, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colo., to arrange for purchase of a set of punched cards, and for information and assistance in the application of computer methods and numerical prediction maps to specific propagation problems.

The graphical prediction maps, derived from the basic prediction, are provided for those unable to make use of an electronic computer. Figures 1 to 12 present world maps of MUF (Zero) F2 and MUF(4000)F2 for each even hour of universal time. Figures 13 to 24 present the same predictions for even hours 00 through 22 universal time for the North and South Polar areas. Handbook 90 describes methods for including regular E-F1 propagation. Figure A is a graph of predicted and observed Zürich sunspot numbers which shows the recent trend of solar activity. Table A lists observed and predicted Zürich smoothed relative sunspot numbers and includes the sunspot number used for the current prediction.

Members of U.S. Army, Navy, or Air Force desiring the Handbook and the Ionospheric Predictions should send requests to the proper service address; for Navy: The Director, Naval Communications, Department of the Navy, Washington, D.C., 20350; for Air Force: Directorate of Command Control and Communications, Headquarters, United States Air Force, Washington, D.C., 20330. Attention: AFOCCAA. Army personnel should refer to the Handbook as TM 11-499 and to monthly predictions as TB 11-499-(), predictions for the month of April 1965 being distributed in January 1965 and designated TB 11-499-(25), and should requisition these through normal publication channels.

Information concerning the theory of radio wave propagation and such important problems as absorption, field intensity, lowest useful high frequencies, etc., is given in National Bureau of Standards Circular 462, "Ionospheric Radio Propagation." A revised work is in preparation which will be announced in the Ionospheric Prediction series when available. Additional information about radio noise may be found in C.C.I.R. Report Number 322, "Revision of Atmospheric Noise Data," International Telecommunication Union, Geneva, 1964.

Reports to this Laboratory of experience with these predictions would be appreciated. Correspondence should be addressed to the Prediction Services Section, Central Radio Propagation Laboratory, National Bureau of Standards, Boulder, Colorado.

NOTE: The MUF(ZERO)F2 values of figures 1A through 12A were derived by adding one-half the gyrofrequency to the foF2 calculated by use of the predicted coefficients in table 1. The error introduced by this approximation is generally not important compared to other uncertainties in the predictions, and is significant only when the foF2 is near or below the gyrofrequency. If more precise values of predicted fxF2 are desired, the theoretical relationships should be applied to the foF2 values calculated by the coefficients in table 1.

Table A

Observed and Predicted Zurich Smoothed Relative
Sunspot Numbers

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1954	6 (14)	6 (12)	4 (11)	3 (10)	4 (10)	4 (9)	5 (8)	7 (8)	8 (8)	8 (10)	10 (10)	12 (11)
1955	14 (12)	16 (14)	20 (14)	23 (13)	29 (16)	35 (18)	40 (22)	46 (27)	55 (30)	64 (31)	73 (35)	81 (42)
1956	89 (48)	98 (53)	109 (60)	119 (68)	127 (77)	137 (89)	146 (95)	150 (105)	151 (119)	156 (135)	160 (147)	164 (150)
1957	170 (150)	172 (150)	174 (150)	181 (150)	186 (150)	188 (150)	191 (150)	194 (150)	197 (150)	200 (150)	201 (150)	200 (150)
1958	199 (150)	201 (150)	201 (150)	197 (150)	191 (150)	187 (150)	185 (150)	185 (150)	184 (150)	182 (150)	181 (150)	180 (150)
1959	179 (150)	177 (150)	174 (150)	169 (150)	165 (146)	161 (143)	156 (141)	151 (142)	146 (141)	141 (139)	137 (137)	132 (137)
1960	129 (136)	125 (135)	122 (133)	120 (130)	117 (125)	114 (120)	109 (118)	102 (115)	98 (110)	93 (108)	88 (105)	84 (100)
1961	80 (100)	75 (90)	69 (90)	64 (90)	60 (85)	56 (85)	53 (80)	52 (75)	52 (70)	51 (70)	50 (65)	49 (60)
1962	45 (60)	42 (50)	40 (48)	39 (45)	39 (42)	38 (37)	37 (34)	35 (31)	33 (29)	31 (28)	30 (27)	30 (34)
1963	29 (31)	30 (28)	30 (26)	29 (25)	29 (25)	28 (25)	28 (23)	27 (21)	27 (20)	26 (18)	23 (18)	21 (17)
1964	19 (17)	17 (17)	15 (17)	12 (17)	(17)	(17)	(17)	(17)	(17.5)	(17.3)	(17.0)	(17.0)
1965	(15.0)(16.0)(16.0)(16.0)*											
1966												

Note: Final numbers are listed through June 1963, the succeeding values being based on provisional data. The predicted numbers are in parentheses.

* Number used for predictions in this issue.

FIG. A. PREDICTED AND OBSERVED SUNSPOT NUMBERS

TABLE 1

TIME VARIATION

Harmonic	TIME VARIATION																		
	K	S	TIME VARIATION																
			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
I																			
0	7.6337207E 00	2.4066219E 00	1.7875039E 00	2.9217171E-01	3.3533292E-01	2.8807244E-01	3.1572497E-01	-6.0496540E-01	-4.4502552E-01	2.9672048E-01	-1.478962E-01								
1	7.2869242E-01	-2.1779065E-01	-2.4862888E 00	2.9217171E-01	-2.8807244E-01	2.8807244E-01	3.1572497E-01	-6.0496540E-01	-4.4502552E-01	2.9672048E-01	-1.478962E-01								
2	-1.0316163E 01	-2.3753131E 00	1.9959498E 01	1.2094207E-01	1.2094207E-01	1.2094207E-01	1.2094207E-01	1.2094207E-01	1.2094207E-01	1.2094207E-01	1.2094207E-01								
3	-6.1475045E 00	-2.5514222E 01	4.7794449E 01	1.3141982E 01	3.9913905E 01	2.9913905E 01	1.5691339E 00	7.0684398E 00	5.5077769E-01	9.3560668E 00	1.1728346E 01								
4	-2.7964425E 01	-2.4327475E 02	1.4452518E 02	-9.8733328E 01	1.4608314E 00	1.4608314E 00	2.5504438E 00	1.3223736E 01	1.3223736E 01	5.908364E 00	-1.476782E 01								
5	-4.1407358E 01	-1.6662197E 02	-2.5707259E 02	-9.6951684E 01	2.4708095E 01	2.4708095E 01	4.0076131E-02	3.1323112E 01	3.1323112E 01	-4.3178090E 01	-6.6622649E 01								
6	-8.4858645E 01	9.5194341E 01	2.5248697E 02	1.2665350E 02	-2.6735740E 01	-2.6735740E 01	1.1139350E 01	4.9069700E 01	4.9069700E 01	-8.4322259E 00	1.412614E 02								
7	-8.4895888E 01	8.3501827E 01	4.5152465E 02	2.2762422E 02	-2.6735740E 01	-2.6735740E 01	1.1139350E 01	4.9069700E 01	4.9069700E 01	-8.4322259E 00	1.412614E 02								
8	-1.8873431E 02	-1.4674614E 02	-6.2227913E 02	-1.4449789E 02	2.9217171E-01	2.9217171E-01	1.7672422E 02	4.3940884E 01	4.3940884E 01	-1.1981286E 01	-5.3872528E 01								
9	-5.445599E 02	-1.4674614E 02	-6.2227913E 02	-1.4449789E 02	2.9217171E-01	2.9217171E-01	1.7672422E 02	4.3940884E 01	4.3940884E 01	-1.1981286E 01	-5.3872528E 01								
10	-1.5900206E 02	1.0925849E 02	1.0925849E 02	7.861329E 01	7.861329E 01	7.861329E 01	-1.5387117E 02	2.533588E 01	2.533588E 01	2.6227586E 01	3.7502716E 01								
11	-5.4065645E 01	-1.3319659E 01	-1.3319659E 01	1.766501E 02	1.766501E 02	1.766501E 02	4.3353390E 01	5.8198273E 00	5.8198273E 00	-1.020216E 01	-1.033269E 01								
12	-4.2064225E-02	3.1212744E-01	1.0252372E-01	1.7992212E-01	-5.7147652E-02	-5.7147652E-02	-5.7147652E-02	1.0884945E-01	1.0884945E-01	1.8533390E-02	6.8049309E-02								
13	-1.2892843E-02	2.8625849E-01	1.252372E-01	-8.220543E-04	-8.220543E-04	-8.220543E-04	-5.7147652E-02	1.0884945E-01	1.0884945E-01	1.8533390E-02	6.8049309E-02								
14	-1.1678283E-01	2.4376886E-01	-1.2241593E-01	9.0159452E-01	-1.5113467E-01	-1.5113467E-01	-1.5113467E-01	1.3302800E-01	1.3302800E-01	6.988072E-02	1.787266E-02								
15	-6.492164E-01	-2.4022389E 00	9.2845933E 00	-4.9146384E 00	-1.9946529E 01	-1.9946529E 01	-5.7147652E-02	1.0884945E-01	1.0884945E-01	1.8533390E-02	6.8049309E-02								
16	-6.983999E 00	-9.7899592E 00	8.2316132E 00	7.8270830E-01	1.3076232E-01	1.3076232E-01	2.7783625E 00	-3.0960800E 00	-3.0960800E 00	-2.5205939E-01	-1.395614E 00								
17	-1.8552683E 00	-6.5879391E 00	6.6831772E 00	-2.3780602E-01	-2.3780602E-01	-2.3780602E-01	1.19076360E 00	-3.0960800E 00	-3.0960800E 00	-2.5205939E-01	-1.395614E 00								
18	-1.1552733E 01	-6.5234305E 00	3.9309440E 00	6.9163576E-01	-1.0774392E 01	-1.0774392E 01	4.2431511E 00	1.565568E 00	1.565568E 00	-6.8320206E-01	6.562529E 00								
19	7.189510E 01	1.1686667E 01	1.3793240E 02	6.780557E-01	3.1043113E 01	3.1043113E 01	2.8762129E 00	2.2439911E 00	2.2439911E 00	-6.1568903E 00	1.8587596E 01								
20	8.9745017E 01	1.686667E 01	1.686667E 01	1.6595139E 01	5.6165377E 00	5.6165377E 00	-3.0125493E 01	3.5891756E 01	3.5891756E 01	1.4852767E 00	1.4554085E 01								
21	8.9952137E 01	6.7028691E 02	1.0932859E 02	2.0278221E 01	1.7659266E 01	1.7659266E 01	1.5260540E 01	2.7916019E 01	2.7916019E 01	3.0817060E 01	7.9224845E 00								
22	5.4136094E 01	2.4180535E 01	9.0698270E-01	-8.7401040E 00	4.8367449E 01	4.8367449E 01	-1.5020536E 02	2.5763224E 00	2.5763224E 00	-2.5861525E-01	-2.9090413E 01								
23	-4.4816698E 02	-5.2737803E 02	-5.2737803E 02	-1.5774380E 02	-5.0922169E 01	-5.0922169E 01	-1.3574486E 02	-1.4272740E 02	-1.4272740E 02	-8.1358820E 01	-8.120860E 01								
24	-0.925232E 02	-5.2737803E 02	-5.2737803E 02	-1.5774380E 02	-5.0922169E 01	-5.0922169E 01	-1.3574486E 02	-1.4272740E 02	-1.4272740E 02	-8.1358820E 01	-8.120860E 01								
25	-0.925232E 02	-5.2737803E 02	-5.2737803E 02	-1.5774380E 02	-5.0922169E 01	-5.0922169E 01	-1.3574486E 02	-1.4272740E 02	-1.4272740E 02	-8.1358820E 01	-8.120860E 01								
26	-0.925232E 02	-5.2737803E 02	-5.2737803E 02	-1.5774380E 02	-5.0922169E 01	-5.0922169E 01	-1.3574486E 02	-1.4272740E 02	-1.4272740E 02	-8.1358820E 01	-8.120860E 01								
27	-0.925232E 02	-5.2737803E 02	-5.2737803E 02	-1.5774380E 02	-5.0922169E 01	-5.0922169E 01	-1.3574486E 02	-1.4272740E 02	-1.4272740E 02	-8.1358820E 01	-8.120860E 01								
28	1.0171993E 03	9.6503111E 02	1.1909459E 02	6.6440067E 02	3.3054841E 02	3.3054841E 02	-1.1241919E 02	2.1636539E 02	2.1636539E 02	-6.8815690E 01	1.6607459E 01								
29	8.3626584E 02	1.0663334E 02	2.8174478E 02	-2.4570997E 02	1.1978284E 02	1.1978284E 02	-2.8913440E 02	2.7607638E 02	2.7607638E 02	2.1711260E 01	3.5682405E 01								
30	4.9536849E 02	1.6503806E 02	1.1182469E 02	-1.044029E 02	7.0668895E 01	7.0668895E 01	9.1656392E 01	-3.5628805E 01	-3.5628805E 01	1.6183638E 02	3.654395E 01								
31	7.7205120E 01	1.6240595E 01	-6.6228825E 01	-6.3306714E 02	-1.0190151E 02	-1.0190151E 02	-4.3587696E 01	-2.0594649E 02	-2.0594649E 02	-1.5189933E 02	-6.2913178E 01								
32	-1.0197281E 03	-9.2474191E 02	-1.0566144E 03	-6.3758137E 02	-3.3604065E 02	-3.3604065E 02	-2.1791224E 02	-2.8957797E 02	-2.8957797E 02	-2.4704706E 01	-1.4880403E 02								
33	-8.718222E 02	-1.0083649E 03	-2.4952034E 02	2.4461332E 02	-2.4754786E 02	-2.4754786E 02	2.8597797E 02	-2.3976775E 02	-2.3976775E 02	-2.4704706E 01	-1.0681138E 01								
34	-4.2312323E 02	-3.9065444E 02	-1.0842562E 03	-5.6375306E-01	-4.7015317E 01	-4.7015317E 01	-1.6672229E 01	1.3301943E 01	1.3301943E 01	-1.3069991E 02	-1.570189E 01								
35	-1.2051837E 02	7.5075032E 00	3.4655751E 01	-8.1847930E-01	-3.6671699E 01	-3.6671699E 01	1.6672229E 01	1.3301943E 01	1.3301943E 01	-1.3069991E 02	-1.570189E 01								
36	3.7368896E 02	3.2769559E 02	3.5115690E 02	2.3654654E 02	1.4873703E 02	1.4873703E 02	-1.0565340E 02	7.2046719E 01	7.2046719E 01	-3.1596241E 01	4.9749686E 01								
37	2.7429906E 02	3.5843356E 02	8.1872461E 01	-8.5560029E 01	4.8513544E 01	4.8513544E 01	-1.0565340E 02	7.2046719E 01	7.2046719E 01	-3.1596241E 01	4.9749686E 01								
38	1.4431339E 02	1.2319726E 02	3.9307962E 02	7.4420597E 00	1.1999408E 01	1.1999408E 01	2.0610303E 01	4.8653020E 01	4.8653020E 01	4.1653020E 01	2.0550110E-01								
II																			
39	3.6092207E-02	3.8786643E-02	-9.7162532E-02	1.9880302E-02	-4.6371032E-02	-4.6371032E-02	-4.9667058E-02	-4.2711101E-02	-4.2711101E-02	3.3530128E-02	-1.1825735E-03								
40	4.0325045E-01	2.736674E-02	7.0551680E-02	7.0551680E-02	-4.6371032E-02	-4.6371032E-02	-4.9667058E-02	-4.2711101E-02	-4.2711101E-02	3.3530128E-02	-1.1825735E-03								
41	4.0325045E-01	2.736674E-02	7.0551680E-02	7.0551680E-02	-4.6371032E-02	-4.6371032E-02	-4.9667058E-02	-4.2711101E-02	-4.2711101E-02	3.3530128E-02	-1.1825735E-03								
42	1.7978006E-01	-1.3549580E-01	-1.8701323E-02	5.3995395E-01	1.8992171E-01	1.8992171E-01	6.123934E-02	7.3057095E-02	7.3057095E-02	-1.0674705E-01	4.4374809E-03								
43	-4.6489738E-01	-5.353444E-01	3.041693E 00	9.1657606E-01	2.9747161E-01	2.9747161E-01	-8.6729786E-02	7.5291338E-02	7.5291338E-02	-4.8285142E-01	-6.1257310E-03								
44	-5.353444E-01	3.041693E 00	9.1657606E-01	9.1657606E-01	1.5068003E-02	1.5068003E-02	1.5068003E-02	7.5291338E-02	7.5291338E-02	-4.8285142E-01	-6.1257310E-03								
45	-5.490233E-01	1.432828E 00	3.8531205E 00	1.1893529E 00	-1.1283529E-01	-1.1283529E-01	2.2340266E-01	5.1255093E-01	5.1255093E-01	5.9377565E-01	-3.732731E-02								
46	-2.2290748E-01	-3.2686698E-01	8.9360771E-01	-1.4881367E 00	-1.5476147E-01	-1.5476147E-01	-1.6064235E-01	1.6064235E-01	1.6064235E-01	8.5901997E-01	-3.7327								

TABLE 2

TIME VARIATION

Harmonic	O		I		2		3		4		5		6	
	K	S	I		2		3		4		5		6	
I	0	0	-1.5231460E-01		-2.4317686E-01		4.4424260E-02		-1.2301798E-01		3.6004010E-02		-2.1454233E-02	
	1	0	-1.4879518E-01		-2.7082177E-01		3.6017381E-01		-2.0391263E-01		4.0594888E-02		4.9272051E-02	
	2	0	1.1819405E-01		2.6446838E-01		-2.7552295E-02		-2.046853E-01		-8.9483926E-01		-2.6395375E-01	
	3	0	5.9268541E-01		1.1045510E-01		-2.0413799E-01		6.4114252E-01		1.7888138E-01		-2.2290508E-01	
	4	0	-6.1096812E-01		4.446582E-01		-1.1230605E-01		2.4693867E-01		3.5687921E-01		9.6522722E-01	
	5	0	-6.7812113E-01		-1.4023953E-01		3.3673499E-01		-7.0328828E-01		3.9118833E-01		4.2257426E-01	
	6	0	3.7615574E-01		6.5668426E-01		2.2605418E-01		-3.3921799E-01		-4.8946851E-01		-1.1969403E-01	
	7	0	2.5315531E-01		8.5126663E-01		-1.6853312E-01		2.5159133E-01		-2.5391786E-01		-2.3634800E-01	
	8	0	-1.7065629E-01		-2.5252611E-01		-1.1614117E-01		1.5466155E-01		2.2110675E-01		5.2577587E-01	
II	9	0	1.2838119E-02		5.3503504E-02		-1.5267096E-02		-1.1595638E-02		-9.9669551E-03		4.1310379E-03	
	10	0	3.4452281E-02		3.0648161E-02		-5.5242755E-02		-3.3930324E-02		-8.0810224E-03		2.7745660E-02	
	11	0	1.2284962E-01		7.6578552E-02		4.9675040E-04		6.9018396E-02		4.7710528E-02		-3.1165009E-02	
	12	0	-4.7870138E-01		-1.0031657E-01		1.3868044E-01		-2.9452247E-02		2.1008550E-01		5.5947816E-02	
	13	0	-5.1456783E-01		-8.3813430E-01		1.4739934E-01		2.1803655E-01		3.6351414E-01		-1.4107611E-01	
	14	0	-6.11368740E-02		4.2252866E-01		1.0766640E-01		2.6126662E-01		8.3911413E-02		-2.1133170E-01	
	15	0	-1.6524952E-02		9.7341975E-01		5.7690334E-02		-5.109597E-01		-4.9579614E-01		2.1165035E-01	
	16	0	3.9237709E-01		2.7234965E-01		-6.6854466E-01		-3.7421150E-01		-1.5873680E-01		-2.8552731E-01	
	17	0	2.2018959E-01		2.6809888E-01		-5.3208208E-01		-9.0331591E-01		-1.9570628E-01		6.7651318E-01	
III	18	0	1.2802082E-01		1.6713267E-01		-4.7429351E-01		-8.6038083E-01		-1.7510564E-01		4.3276328E-01	
	19	0	-2.4937423E-01		-2.3240604E-01		-1.7219793E-01		1.1404226E-02		1.2048124E-01		-4.1939188E-01	
	20	0	-6.8085505E-01		4.7594358E-01		1.0728694E-01		9.7216452E-01		3.0922321E-01		2.8035692E-01	
	21	0	3.1290443E-01		-2.9227531E-01		6.1565076E-01		1.0093850E-01		3.5999833E-01		-9.4900657E-01	
	22	0	-2.4439207E-01		7.1221778E-01		7.2175928E-01		1.6118619E-01		1.4444489E-01		-5.3616498E-01	
	23	0	2.1715074E-01		4.7010752E-01		-6.6129578E-02		1.5517681E-01		-7.4667246E-01		2.8441609E-01	
	24	0	3.6259064E-01		4.9310972E-01		-5.509691E-01		-5.4589406E-01		-1.7669297E-01		-2.5059783E-02	
	25	0	-1.4338610E-01		2.6954123E-01		-2.8877487E-01		-3.5091221E-01		-2.0959117E-01		3.4008301E-01	
	26	0	3.4392223E-02		-4.2516891E-01		-3.5111988E-01		-9.6334599E-01		-4.6219280E-02		3.3918320E-01	
IV	27	0	-1.1252887E-03		-3.9491655E-03		-8.6039367E-03		-1.7396914E-02		1.1299060E-04		6.9894091E-03	
	28	0	-1.9558984E-03		1.5864591E-02		4.6710508E-05		-1.1611752E-02		-3.4087972E-05		2.0601609E-02	
	29	0	-3.2865765E-03		-1.6229821E-01		-1.5506862E-01		5.2204702E-03		1.6698775E-05		6.4227883E-05	
	30	0	-1.0813546E-05		9.1339465E-05		6.3020191E-02		-1.9190370E-02		-3.8826720E-04		-4.0140542E-03	
	31	0	2.5409449E-03		1.0718962E-01		5.0192214E-02		1.3319216E-01		-1.2206854E-03		-5.0292968E-02	
	32	0	7.7260106E-03		-1.3016367E-01		-1.3331092E-01		2.1785975E-01		2.2475044E-03		-1.9011253E-01	
	33	0	3.5083234E-01		3.2222935E-01		-1.0364435E-01		-2.6686814E-02		2.5831028E-02		9.1914771E-02	
	34	0	1.4818435E-02		4.9408619E-03		-2.4734166E-02		3.8300124E-02		8.4771796E-02		9.1914771E-02	
	35	0	2.8503411E-02		-2.8503411E-02		-5.272962E-02		-1.8504993E-01		-1.8504993E-01		8.4771796E-02	
	36	0	-3.2222864E-02		-3.2222864E-02		2.8544968E-01		-3.2768293E-01		-3.2768293E-01		2.3294261E-01	

Harmonic	4		5		6	
	K	S	9		10	
I	0	0	1.2969192E-02		3.4456684E-02	
	1	0	-3.9478352E-02		-9.5432578E-03	
	2	0	-1.0858864E-02		-3.5695337E-02	
II	0	0	2.954764E-02		-8.6661099E-04	
	1	0	6.6672864E-03		-1.7107787E-02	
	2	0	3.3509751E-02		-8.1115075E-03	
III	0	0	-5.1374377E-03		2.1285909E-02	
	1	0	-1.9592001E-02		1.4995504E-02	
	2	0	-1.9592001E-02		2.5647544E-02	

I - Main latitudinal variation. Mixed latitudinal and longitudinal variation; II - First order in longitude, III - Second order in longitude.

Notation : For each entry the number given by the first eight digits and sign is multiplied by the power of ten defined by the last two digits and sign.

PREDICTED COEFFICIENTS D_{SK} DEFINING THE FUNCTION $\Gamma(\lambda, \theta, t)$ FOR MONTHLY MEDIAN $M(3000)F2$

APRIL 1965

APRIL 1965 UT = 00
LONGITUDE

FIG. 1 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 1 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 02

LONGITUDE

FIG. 2 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 2 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 04

LONGITUDE

FIG. 3 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

LONGITUDE

FIG. 3 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 06

LONGITUDE

FIG. 4 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 4 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 08
LONGITUDE

FIG. 5 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 5 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 10

LONGITUDE

FIG. 6 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

LONGITUDE

FIG. 6 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 12

LONGITUDE

FIG. 7 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 7 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 14

LONGITUDE

FIG. 8 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 8 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 16
LONGITUDE

FIG. 9 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG. 9 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 18

LONGITUDE

FIG.10 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

FIG.10 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT = 20
LONGITUDE

FIG. II A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

FIG. II B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

LONGITUDE

APRIL 1965 UT=00

FIG. 13A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

FIG. 13B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=02

NORTH POLAR AREA

SOUTH POLAR AREA

FIG.14A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG.14B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=04

NORTH POLAR AREA

SOUTH POLAR AREA

FIG.15 A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG.15 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT-06

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 16A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 16B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=08

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 17A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 17B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=10

NORTH POLAR AREA

SOUTH POLAR AREA

FIG 18A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG 18B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=12

FIG. 19A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

FIG. 19B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=14

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 20A PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 20B PREDICTED MEDIAN MUF (4000)F2 (Mc/s)

APRIL 1965 UT=16

FIG. 21A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

FIG. 21 B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=18

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 22A PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 22B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=20

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 23A. PREDICTED MEDIAN MUF(0)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 23B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

APRIL 1965 UT=22

NORTH POLAR AREA

SOUTH POLAR AREA

FIG 24A. PREDICTED MEDIAN MUF(ZERO)F2 (Mc/s)

NORTH POLAR AREA

SOUTH POLAR AREA

FIG. 24B. PREDICTED MEDIAN MUF(4000)F2 (Mc/s)

UNITED STATES
GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS
WASHINGTON, D. C., 20402

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE. \$300
(GPO)

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON, D. C., 20301, 1 January 1965

TB 11-499-25/TO 31-3-28, Central Radio Propagation Laboratory Ionospheric Predictions for April 1965, is published for the use of all concerned.

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff.

OFFICIAL:

J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

CURTIS E. LEMAY,
Chief of Staff, United States Air Force.

OFFICIAL:

R. J. PUGH,
Colonel, United States Air Force,
Director of Administrative Services.

DISTRIBUTION:

Active Army:

USASA (4); USA Elct Comd (1); USA MI Comd (1); USA Test & Eval Comd (1); CC-E (1); US CONARC (3); ARADCOM (2); OS Maj Comd (5); OS Base Comd (2); Log Comd (2); MDW (1); Armies (5); Corps (2); Div (2); USAEPG (2); USA Elct RD Agcy, W (4); Svc Colleges (4); Br Svc Sch (4) except USASCS (20); USAADCEN (4); ARADCOM Rgn (2); WSMR (2); USA Elct RD Agcy A (4); JBUSMC (12); USA Corps (1); USA Mbl Spt Cen (1); USAMC (1); USACDA (1); USA Msl Spt Comd (1); Units org under fol TOE: 11-18 (1); 11-95 (1); 11-500 (Tm AC) (1).

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320-50.