tions. Ce dernier, fondé au Caire le 20 Août 1798 par Bonaparte, fut la première institution scientifique du pays. Malheureusement, en 1801, l' Institut d' Égypte disparaissait en tant qu' institution scientifique; mais les savants qui en firent partie poursuivirent leur tâche et publièrent les résultats de leurs études dans l' ouvrage magistral constitué par la «Description de l' Égypte», paru en 1809, et traitant de toutes les branches des connaissances humaines. Revenons à 1859, date de la refondation de l' Institut Égyptien qui vit le jour à Alexandrie et fut transféré au Caire en 1880. Dès lors une collaboration scientifique internationale s' établit au grand profit de la science, du progrès et de l' humanité. L' Institut Égyptien reprenait en 1918 sa nomination primitive et redevenait l' Institut d' Égypte. L' apport à la science de l' Institut d' Égypte a constitué une contribution des plus utiles au pays.

La lecture de Bulletins et Mémoires depuis 1859 montre comment ont évolué les sciences naturelles et humaines en Égypte et comment, grâce au travail consciencieux des membres de l' Institut d' Égypte, s' est édifié un véritable monument de Science, par des travaux féconds en découvertes particulièrement notables.

Il m' est extrêmement agréable de vous avoir présenté cet aperçu sommaire sur l' Institut d' Égypte et ses membres qui, depuis un siècle, à travers de tant de péripéties et d' adversités supportées avec une noble endurance, ont pu maintenir allumé le flambeau des sciences qui succède à l' éclatante splendeur de l' Égypte ancienne.

ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΗ ΜΕΛΩΝ

ΡΑΔΙΟΜΕΤΕΩΡΟΛΟΓΙΑ. — **Preliminary remarks on the propagation conditions between Martina-Franca and Corfu*** *by* ***M. A. Anastassiades, L. N. Carapiperis, N. K. Kariambas, P. G. Paraskevopoulos*****. Ἀνεκοινώθη ὑπὸ τοῦ κ. Ἰωάνν. Ξανθάκη***.

SUMMARY

As the signals from the Italian Television station Martina-Franca received at Corfu were found to be strong for a considerable percentage of

* This study was sponsored by a research grant from NATO's Scientific Committee.

** Μ. Α. ΑΝΑΣΤΑΣΙΑΔΗΣ, Λ. Ν. ΚΑΡΑΠΙΠΕΡΗΣ, Ν. Κ. ΚΑΡΥΑΜΠΑΣ, Π. Γ. ΠΑΡΑΣΚΕΥΟΠΟΥΛΟΣ, Παρατηρήσεις ἐπὶ τῶν συνθηκῶν τῆς διαδόσεως τῶν ἠλεκτρομαγνητικῶν κυμάτων μεταξὺ Martina - Franca καὶ Κερκύρας.

*** Ἀνεκοινώθη κατὰ τὴν συνεδρίαν τῆς 7ης Φεβρουαρίου 1963.

time, in spite of the intervening distance, which renders the path beyond-the-horizon, the present investigation has been undertaken for the purpose of studying the propagation conditions across the Adriatic sea.

I. INTRODUCTION

In the present study the propagation conditions are examined over the Adriatic Sea, between the Italian TV station Martina-Franca and Corfu, a distance of 240 km.

The technical data of the Martina-Franca television transmitter are as follows(1):

1. Frequency band: 174-181 Mc/s (channel D). (Video carrier frequency: 175.25 Mc/s).

2. Effective transmitted power towards 117° azimuthal direction:

Video signal 220 kw.

Sound signal 55 kw.

3. Horizontal polarization.

4. Antenna height above sea level: 597 m. (Altitude: 486 m. Tower: 111 m).

5. Station latitude: 40° 7′ N.

longitude: 17° 2′ E.

As to the data concerning the receiving and recording device at Corfu, these are the following:

1. A. common TV receiver has been used. The DC potential taken from the AVC circuits, was amplified to drive the recording gear.

2. Antenna gain: 12 db.

3. Receiver bandwidth: suitable for the reception of the TV signal.

4. Altitude: 560 m.

5. The calibration of the writing system deflections was made by comparison of the received signal to the known output of a signal generator and was being checked very frequently to avoid errors comming from the receiver inherent instability.

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1 These data have been obtained from the list of TV stations, E.B.U Technical Center, Brussels. According to information obtained through correspondence the effective transmitted power (in actual operation) is 7 db less than that of paragraph 2 above. Nevertheless this difference does not affect the conclusions of the present paper, but rather renders them stronger.

Fig. 1 shows the path profile, for $\frac{4}{3}$ effective earth radius, between transmitting and receiving stations, with an indication of the effective scattering volume. Also, the map of fig. 2 includes the geographical positions of the stations and the propagation routing.

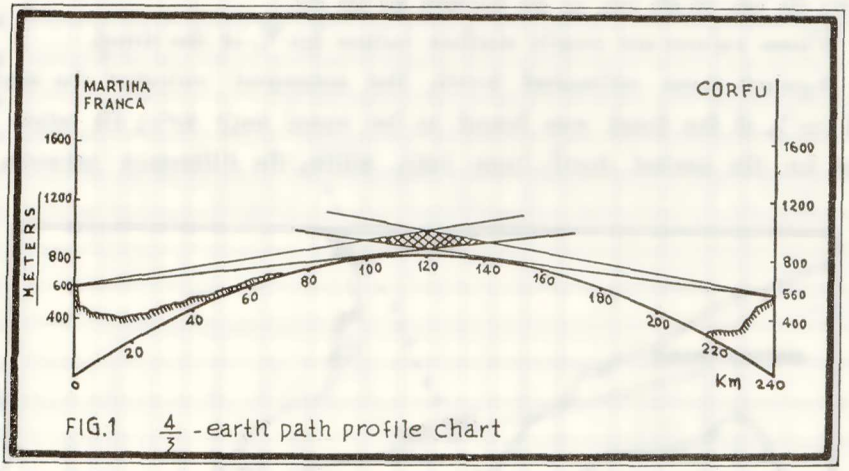

FIG.1 $\frac{4}{3}$ -earth path profile chart

The basic material for the study of the propagation conditions over the above mentioned link was a series of field strength records taken at the receiving site of Corfu in the period April-June 1961.

From these records the hourly median value (both absolute and relative to free space) of the received field was estimated, for each day. Then a statistical distribution curve was derived for the period of April to June, represented in fig 3, as well as a variation curve was drawn, based on hourly median values (fig. 4).

On the other hand a classification was made of the forms of fading into three distinct types (fig. 5) and the daily variation of the frequencies of appearance was derived (average percent values for the three months (April-May-June) period as in fig. 6).

2. PROPAGATION LOSS.

In accordance with the technical data of the TV transmitter at Martina-Franca and the geometry of the path, we computed, on the one hand the free space received level, which was found to be -32 dbm, and on the

other hand the transhorizon losses. From these, the diffraction losses (1) for $\frac{4}{3}$ - effective earth radius were found to be 37.5 db below free space and for $\frac{2}{3}$ - effective earth radius 90 db, while losses due to turbulent scattering, as derived from different sources of experimental data, were found to be 39.5 db (2), 36 db (3), 32 db (4) and 40 db (5).

These values are yearly median values (50 % of the time).

Against these estimated levels, the measured value of the median level (50 % of the time) was found to be equal only to 13 db below free space, for the period April-June 1961, while the difference between the

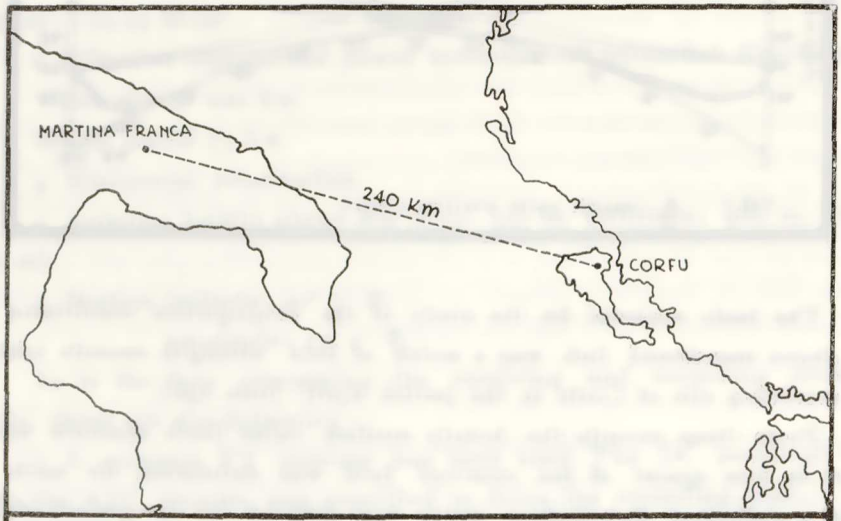

FIG. 2. MAP OF MARTINA FRANCA – CORFU TV PATH

1. K. BULLINGTON, «Radio Propagation Fundamentals», B.S.T. Journal, May 1957, p. 606.

2. TELEFUNKEN, «Entwurf für Überhorizontverbindungen, AW/Rf 1935», Nov. 1961, Blatt 1.

3. SIEMENS, «Plannung und Berechnung von Richtunkverbindungen», 8. Ausgabe, Dez. 1960.

4. COLLINS, «Tropospheric Scatter, Principles and Applications», Dec. 1959, pp. 3 - 3 and 3 - 5.

5. M. TELFORD, «Tropospheric Scatter System Evaluation», Journal Brit. I R E., Sept. 1958, p. 512 (according to Bullington's work in conjunction with ref. 5) above).

90% and 10% values was 32 db, as derived from fig. 3 which in turn was based on the records of the above period.

By comparison of the measured values with those theoretically computed and if we consider that the electrical data given in paragraph 1.,

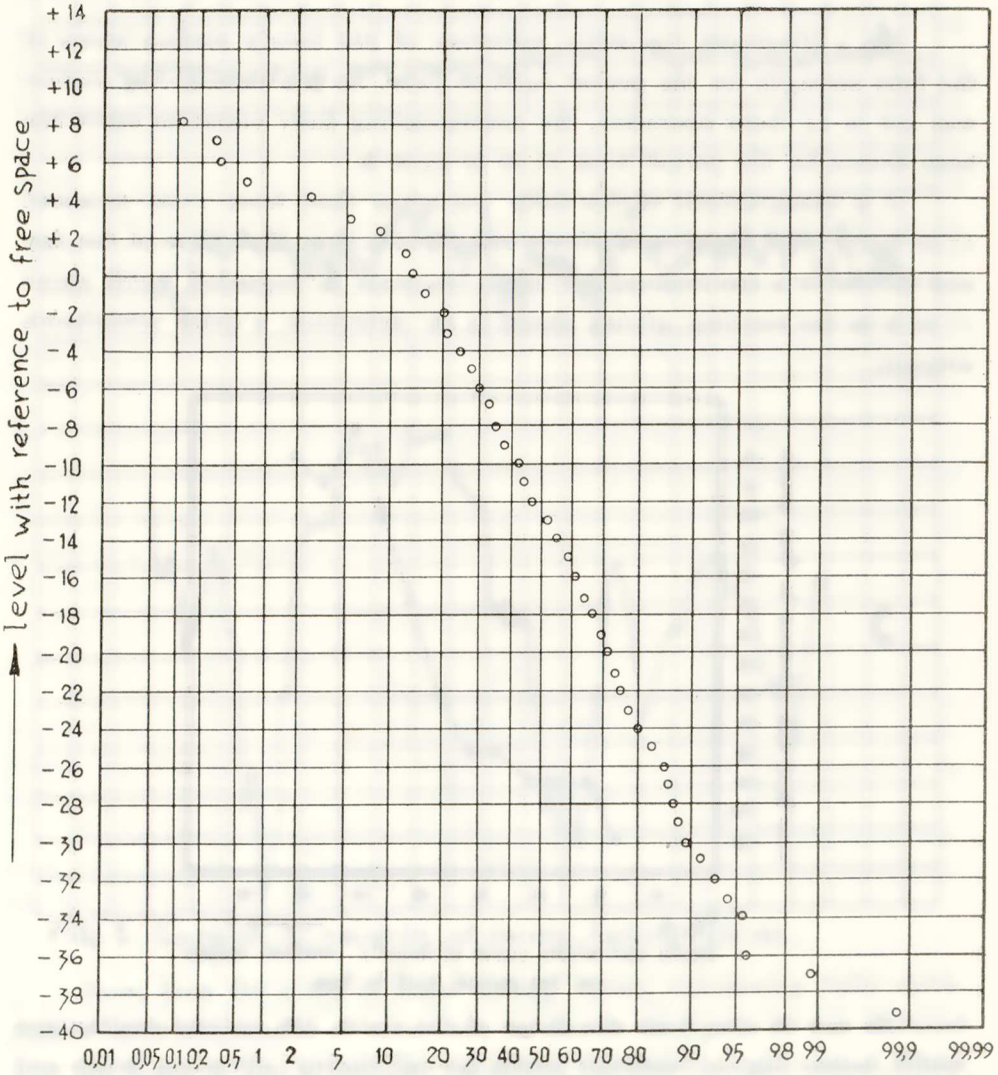

FIG. 3 Statistical distribution curve of hourly median values for the period April to June

regarding the TV transmitter, as well as the receiver calibration procedure, do not introduce appreciable errors, we arrive at the conclusion that

probably neither diffraction nor turbulent scattering prevail, but some other mechanism, perhaps partial reflection on inversion layers or ducting (evaporation or free) to explain such rather strong received fields.

3. DAILY VARIATIONS

Fig. 4 illustrates the daily variation of the hourly median levels of the field strength for the period April to June. As the transmitting station was not in 24 - hour operation, the corresponding daily variation curve has been drawn for the period from 11.00 to 23.00 h.

It is characteristic of this daily variation that from 11.00 to about 17.00 h the level remains relatively low, while from that time of the day and thereafter a continuous and steep increase is regarded untill about 11.00 h in the evening, giving about 12 db difference, a quite remarkable amount.

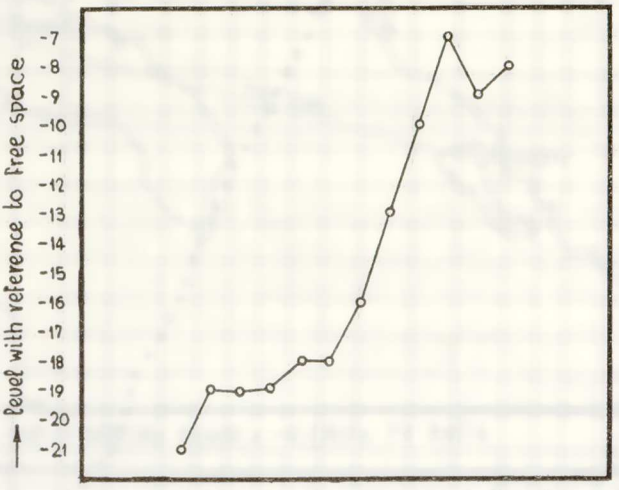

Fig. 4
Daily variation curve of hourly median values for the period April to June

As can be seen from the shape of the curve, the various mechanisms which favour higher reception levels, prevail during afternoon hours and especially in the evening.

Moreover, in accordance with a previous study of the authors (6),

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6. M. Anastassiades, L. Carapiperis, N. Kariambas, P. Paraskevopoulos: Prediction of the field strength fading forms by means of weather situations.

the fading forms were classified into three types A,B,C, samples of which are illustrated in fig. 5

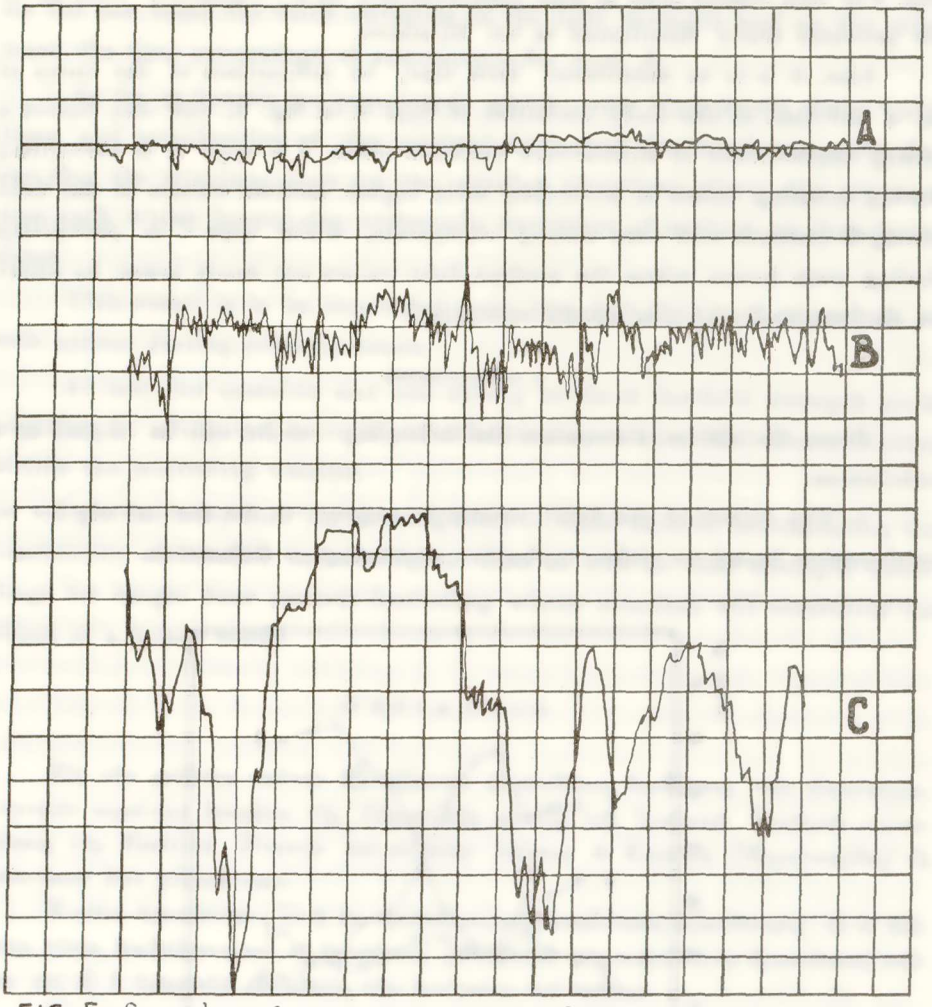

FIG. 5 Samples of records showing fading forms.

Now, from the study of these fading forms, concerning daily variation of their frequencies of occurence, as shown in fig. 6, it was deduced that the types A and C present variations inverse to each other. Thus, while the variation of type A indicates a main minimum between 14.00 and 15.00 and a main maximum between 20.00 and 21.00h, type C behaves in an opposite manner, the absolute amount of variation being about the same for both types.

As far as type B is concerned, this shows neither clear maxima and minima positions along the time axis, nor any appreciable daily fluctuation. For this reason type B was characterized as a «transient» one, as in the previous study, mentioned in ref. (6) above.

Also, it is to be mentioned here that, by conparison of the curve of fig. 4 and that of the daily variation of type A in fig. 6, one can derive a strong resemblence in appearence between them i. e. type A is prevailing during evening hours in according with higher median values of the field strength (smooth and very strong reception), while type C is prevailing during noon hours, when the median field values are much lower, by about 12 db (troubled and less strong reception).

4. CONCLUSIONS

From the above discussion the following results can be stated as a conclusion.

1. The values of the field strength appear to be too strong for an explanation based on either turbulent scattering or diffraction.

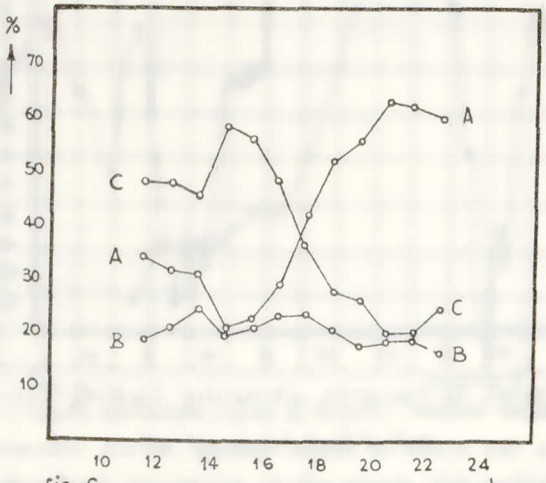

Fig. 6
Average percent values of types A,B,C for the period April to June

2. Both, the hourly median values of the field strength and the time percentages of appearance of types A and C present a great daily variation.

3. Types A and C show daily variation complementary to each other.

4. There is a definite correlation between the shapes of curves giving on the one hand the daily variation of the field strength and on the other hand the time percentage of appearance for type A.

As far as factors are concerned, which cause high levels, daily variations and peculiarities of the received field, just discussed, one must find out that the principal ones are the weather situations along the propagation path which favour the systematic formation of surface or free inversions.

This result is to be concluded from the fact that high reception levels appear during evening hours.

At last, the unstable and less strong levels of the field strength could probably be attributed to multiple reflection upon stratified discontinuities within the scattering volume.

It is intended that the investigation of these factors, necessitating the availability of detailed meteorological data as well as field strength recordings for longer time periods (including winter months), will constitute the object of a future study.

ΠΕΡΙΛΗΨΙΣ

Εἰς τὴν μελέτην ταύτην ἐξετάζονται αἱ συνθῆκαι διαδόσεως τῶν ἠλεκτρομαγνητικῶν κυμάτων ὑπεράνω τῆς Ἀδριατικῆς μεταξὺ τοῦ Ἰταλικοῦ Σταθμοῦ τηλεοράσεως τῆς Martina - Franca καὶ σημείου λήψεως ἐν Κερκύρᾳ (Μιχαλακάδες) εἰς ἀπόστασιν 240 χιλιομέτρων.

Κυρίως ἐρευνῶνται: 1) ἡ ἐκ τροποσφαιρικῆς σκεδάσεως ἐξασθένησις· 2) οἱ διάφοροι τύποι διαλείψεων καὶ αἱ ἡμερήσιαι μεταβολαὶ τῆς συχνότητος ἐμφανίσεως τούτων καὶ 3) ἡ ἡμερησία μεταβολὴ τῶν ἐντάσεων τοῦ πεδίου.

Τὰ κύρια συμπεράσματα τῆς ἐν λόγῳ ἐρεύνης εἶναι τὰ κάτωθι:

1) Αἱ τιμαὶ τῆς ἐντάσεως πεδίου ἐμφανίζονται πολὺ ἰσχυραὶ εἰς τρόπον, ὥστε νὰ μὴ δύνανται νὰ ἐξηγηθῶσιν οὔτε διὰ στροβιλώδους σκεδάσεως οὔτε διὰ τοῦ φαινομένου τῆς περιθλάσεως.

2) Τόσον αἱ μέσαι ὡριαῖαι τιμαὶ τῆς ἐντάσεως πεδίου ὅσον καὶ αἱ ἑκατοστιαῖαι ἀναλογίαι ἐμφανίσεως τῶν τύπων A καὶ C παρουσιάζουν μεγάλας ἡμερησίας μεταβολάς.

3) Οἱ τύποι A καὶ C παρουσιάζουν ἡμερησίας πορείας σχεδὸν ἀντιθέτους.

4) Μεταξὺ ἡμερησίας πορείας τῆς ἐντάσεως τοῦ πεδίου καὶ τῆς ἡμερησίας πορείας τῆς συχνότητος ἐμφανίσεως τοῦ τύπου A ὑπάρχει στενὴ σχέσις.

Ὡς πρὸς τοὺς παράγοντας εἰς τοὺς ὁποίους ὀφείλονται αἱ ὑψηλαὶ στάθμαι, αἱ ἡμερήσιαι μεταβολαὶ καὶ αἱ ἰδιομορφίαι τῆς ἐντάσεως πεδίου, οὗτοι δέον νὰ ἀποδοθῶσι κυρίως εἰς τὰς καιρικὰς καταστάσεις.

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Ὁ Ἀκαδημαϊκὸς κ. **Ἰωάνν. Ξανθάκης,** ἀνακοινῶν τὴν ἀνωτέρω μελέτην εἶπε τὰ ἑξῆς.

Ἔχω τὴν τιμὴν νὰ παρουσιάσω εἰς τὴν Ἀκαδημίαν Ἀθηνῶν 1) τὰ πορίσματα τῶν παρατηρήσεων τῶν κ.κ. Μιχαὴλ Ἀναστασιάδου καὶ Λεωνίδου Καραπιπέρη, Καθηγητῶν τοῦ Πανεπιστημίου Ἀθηνῶν, ἐπὶ τῶν συνθηκῶν διαδόσεως τῶν ἠλεκτρομαγνητικῶν κυμάτων μεταξὺ Martina - Franca καὶ Κερκύρας καὶ 2) ἐργασίαν τοῦ κ. Θεοδ. Διαμαντοπούλου, Καθηγητοῦ τῶν ἐφηρμοσμένων μαθηματικῶν εἰς τὸ Πανεπιστήμιον Θεσσαλονίκης ἐπὶ μιᾶς μεθόδου βελτιώσεως τῆς προσεγγιζούσης τιμῆς κεκρυμμένης περιοδικότητος.*

Οἱ κ.κ. Ἀναστασιάδης καὶ Καραπιπέρης μελετῶσι τὰς συνθήκας διαδόσεως τῶν ἠλεκτρομαγνητικῶν κυμάτων ὑπεράνω τῆς Ἀδριατικῆς, μεταξὺ τοῦ Ἰταλικοῦ Σταθμοῦ τηλεοράσεως τῆς Martina - Franca καὶ σημείου λήψεως ἐν Κερκύρᾳ (Μιχαλακάδες) εἰς ἀπόστασιν 240 χιλιομέτρων.

Εἰς τὴν μελέτην ταύτην μετὰ τὴν παροχὴν τῶν ἠλεκτρικῶν καὶ τοπογραφικῶν στοιχείων τῆς ζεύξεως, ἐρευνῶνται 1) ἡ πρόσθετος ἐξασθένησις ἡ ὀφειλομένη εἰς τροποσφαιρικὴν σκέδασιν· 2) οἱ διάφοροι τύποι διαλείψεων καὶ αἱ ἡμερήσιαι μεταβολαὶ τῆς συχνότητος ἐμφανίσεως τούτων καὶ 3) ἡ ἡμερησία μεταβολὴ τῶν ἐντάσεων τοῦ πεδίου.

Τὰ κύρια συμπεράσματα τῆς ἐν λόγῳ ἐρεύνης εἶναι τὰ κάτωθι:

1). Αἱ τιμαὶ τῆς ἐντάσεως πεδίου ἐμφανίζονται πολὺ ἰσχυραὶ εἰς τρόπον, ὥστε νὰ μὴ δύνανται νὰ ἐξηγηθῶσιν οὔτε διὰ στροβιλώδους σκεδάσεως οὔτε διὰ τοῦ φαινομένου τῆς περιθλάσεως.

2). Τόσον αἱ μέσαι ὡριαῖαι τιμαὶ τῆς ἐντάσεως πεδίου ὅσον καὶ αἱ ἑκατοστιαῖαι ἀναλογίαι ἐμφανίσεως τῶν τύπων A καὶ C παρουσιάζουν μεγάλας ἡμερησίας μεταβολάς.

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Ὡς πρὸς τοὺς παράγοντας εἰς τοὺς ὁποίους ὀφείλονται αἱ ἀνωμαλίαι καὶ αἱ διάφοροι μεταβολαὶ τῆς ἐντάσεως πεδίου, οὗτοι δέον νὰ ἀναζητηθῶσιν εἰς τὰς καιρι-

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* *Βλ. τὴν πραγματείαν του εἰς σελ. 75 - 81 τοῦ παρόντος τόμου.*

κὰς καταστάσεις καὶ δευτερευόντως εἰς πολλαπλᾶς ἀνακλάσεις ἐπὶ στρωματοποιημένων ἀσυνεχειῶν ἐντὸς τοῦ ὄγκου σκεδάσεως.

Αἱ παρατηρήσεις αὗται εἶναι ἐνδιαφέρουσαι, ἰδίᾳ σήμερον μὲ τὴν μελετωμένην ἐγκατάστασιν δικτύου τηλεοράσεως εἰς τὴν χώραν μας καὶ τὴν σύνδεσιν αὐτοῦ μετὰ τοῦ Ἰταλικοῦ δικτύου. Πλὴν ὅμως εἶναι ἀνεπαρκεῖς κατὰ τὴν γνώμην μας διὰ τὴν ἐξαγωγὴν ἀσφαλῶν συμπερασμάτων, διότι ἐκτείνονται εἰς βραχὺ χρονικὸν διάστημα ἀπὸ τοῦ Ἀπριλίου μέχρι τοῦ Ἰουνίου τοῦ 1961. Δεδομένου δέ, ὅτι αἱ παρατηρούμεναι ἀνωμαλίαι καὶ διαφοραὶ τῆς ἐντάσεως τοῦ πεδίου ὀφείλονται, κατὰ τοὺς συγγραφεῖς, εἰς καιρικὰς καταστάσεις, πρέπει αἱ παρατηρήσεις νὰ μὴ περιορισθῶσιν εἰς μίαν μόνον ἐποχὴν τοῦ ἔτους, (τὸ ἔαρ τοῦ 1961) ἀλλὰ νὰ ἐπεκταθῶσι καὶ εἰς τὰς ἄλλας ἐποχάς, διότι δὲν εἶναι ἀπίθανον ἐκτὸς τῶν ἡμερησίων μεταβολῶν εἰς τὴν συχνότητα ἐμφανίσεως καὶ τῶν μεταβολῶν τῶν ἐντάσεων τοῦ πεδίου, νὰ ὑφίστανται καὶ ἐποχιακαὶ μεταβολαί. Δὲν γνωρίζομεν λ.χ., ἂν ἡ ἀντίθετος πορεία τῶν τύπων *A* καὶ *C*, περὶ τῶν ὁποίων οὐδεμία ἐξήγησιν δίδουν οἱ συγγραφεῖς, ἐξακολουθεῖ νὰ ὑφίσταται καὶ διὰ τὰς ἄλλας ἐποχὰς τοῦ ἔτους. Εἶναι συνεπῶς λίαν ἐπιθυμητὴ ἡ ἐπέκτασις τῶν παρατηρήσεων αὐτῶν καὶ εἰς ἄλλας ἐποχὰς τοῦ ἔτους.

Ὁ κ. Διαμαντόπουλος εἰς προηγουμένην ἐργασίαν του ὑπέδειξεν ἕνα τρόπον ἀναζητήσεως κεκρυμμένης περιοδικότητος τῇ βοηθείᾳ ἁπλῶν καὶ σχετικῶς οὐχὶ μακρῶν ὑπολογισμῶν διὰ τῆς ὑπάρξεως εἰς δοθεῖσαν ἀκολουθίαν μιᾶς ἡμιτονοειδοῦς συνιστώσης μεγίστου εὔρους, τῆς ὁποίας τὸ μῆκος τῆς περιόδου εὑρίσκεται κατὰ προσέγγισιν.

Εἰς τὴν παροῦσαν ἐργασίαν του* προτείνει μίαν μέθοδον βελτιώσεως τῆς προσεγγιζούσης ταύτης τιμῆς τοῦ μήκους τῆς κεκρυμμένης περιοδικότητος. Ἡ μέθοδος αὕτη στηρίζεται ἐπὶ τῆς ἐφαρμογῆς καταλλήλου μετασχηματισμοῦ, ἐκφραζομένου ὑπὸ ὡρισμένου ὁλοκληρώματος, περιέχοντος τὴν ζητουμένην περιοδικὴν συνιστῶσαν. Διὰ τοῦ μετασχηματισμοῦ τούτου προκύπτει ἡμιτονοειδὴς κύμανσις τῆς αὐτῆς μὲν περιόδου μετὰ τῆς ζητουμένης, τὸ εὖρος ὅμως τῆς ὁποίας πολλαπλασιάζεται ἐπί τινα συντελεστὴν ἀνεξάρτητον τῆς φάσεως. Περισσότεραι λεπτομέρειαι εἰς τὰ Πρακτικὰ τῆς Ἀκαδημίας.

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* *Βλ. εἰς σελ. 75 - 81 τοῦ παρόντος τόμου.*