L 18365-65 EWT(m)/EPR/T/EWP(t)/EWP(b) Ps-4 IJP(c)/ASD(a)-5/AS(mp)-2/
FAEM(c)/AFWL/ESD(t)/ESD(gs) JD
ACCESSION NR: AP4044149 S/0126/64/018/002/0215/0219

AUTHOR: Kralina, A. A.; Merezhko, N. F.

B

TITLE: Changes in the dimensions and disorientation of mosaic blocks along the direction of the crystallization of aluminum crystals grown from a melt

27

SOURCE: Fizika metallov i metallovedeniye, v. 18, no. 2, 1964, 215-219

TOPIC TAGS: disorientation, mosaic block, crystallization, aluminum bicrystal, single crystal, crystal growth, Laye method

16

ABSTRACT: The changes in the perfect Al bicrystals grown from the melt were observed. 99.95% pure Al specimens were used. The bicrystals were grown by way of oriented crystallization in aluminum oxide boats in a 10^{-5} Hg vacuum. The orientation of adjacent crystals was determined by the Laye method and the dimensions of the mosaic blocks computed on the basis of primary and secondary extinctions. The comparison between experimental and calculated values of integral intensity made the computation of the mean dimensions of mosaic blocks in

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any of the crystal bands possible with the help of the following equation:

$$P = P^0 \cdot \mu/\varepsilon \cdot \frac{1-\exp(-4/3\varepsilon \cdot L)}{1-\exp[1-4/3[\mu+u(\varepsilon-\mu)]\cdot L]} \times$$
$$\times \left\{1-\exp\left[-2(\mu+u(\varepsilon-\mu))\cdot\frac{t}{\sin\theta}\right]\right\},$$

where P^0 is the integral intensity of the reflection of X-rays produced by an ideally mosaic crystal; μ-linear absorption coefficient; ε-effective absorption coefficient of X-rays including dimensions conditioned by the effect of primary extinction; u-coefficient comprising the action of secondary extinction; L-mean dimensions of a mosaic block; t-crystal thickness; θ-Bragg angle. The disorientation angle $\Delta\theta$ was determined from the Laye line broadening. The authors suggest that the period changes in the dimensions and the angle of disorientation which coincide with the periodicity of the visually observed changes in the arrangement of surface layers, are caused by the inhomogeneous distribution of the admixture giving rise to imperfections during the formation of the solid phase. Furthermore, the crystallographic orientation of the boundary in the bicrystal and the zonal refinement

may greatly affect the general pattern of changes of the micromosaic during crystal growth in the inhomogeneous environment of the segregation of the admixture. These three influencing factors should be taken into account in all future studies. Orig. art. has: 3 figures

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of the Physics of Metals, AN SSSR)

SUBMITTED: 02Nov63 ENCL: 00

SUB CODE: MM, SS NO REF SOV: 009 OTHER: 005

MEREZHKO, V. G.

MITIN, A. V., inzhener; MEREZHKO, V.G., inzhener; RIDEL', E.I., kandidat tekhnicheskikh nauk, redaktor; KHITROV, P.A., tekhnicheskiy redaktor

[Manual for machinists operating railroad freight-lifting cranes] Rukovodstvo mashinistu gruzopod"emnogo krana na zheleznodorozhnom khodu. Izd. 2-e, dop. Moskva, Gos.transp. zhel-dor. izd-vo, 1955. 234 p. (MLRA 9:3)

(Cranes, derricks, etc.)

MEREZHKO, V.G.

Development of locomotive shed arrangements for diesel and electric traction equipment. Zhel.dor.transp. 37 no.10:8-12 O '55. (MLRA 9:1)

1.Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
(Railroads--Stations)

BYLEYEV, G.S.; KRYUGER, P.K.; KAZAKOV, V.N.; VIL'KEVICH, B.I.; MEREZHKO, V.G., inzhener, redaktor; SAZONOV, A.G., inzhener, redaktor; BOBROVA, Ye.N., tekhnicheskiy redaktor

[Management and operation of diesel locomotives] Teplovoznoe khoziaistvo. Moskva, Gos. transp. zhel-dor. izd-vo, 1956. 311 p. (MLRA 9:12)
(Diesel locomotives)

MEREZHKO, V.G.

Modern equipment for electric and diesel locomotives. Zhel.dor. transp. 37 no.6:19-24 Je '56. (MLRA 9:8)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey sooveshchaniya.
(Electric locomotives) (Diesel locomotives)

MEREZHKO, V.G., inzhener; MESHALINA, N.N., inzhener.

Reequipping locomotive sheds to service and repair diesel locomotives. Elek. i tepl. tiaga no.6:21-23 Je '57. (MLRA 10:8)
(Locomotives--Maintenance and repair)

MEREZHKO, V.G.

Moscow railroad terminal will convert to diesel traction. Elek. i tepl. tiaga 2 no.8:1-3 Ag '58. (MIRA 11:9)

1.Zamestitel' nachl'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
(Moscow Province--Diesel locomotives)

MEREZHKO, V.G.

Important factors in the development of locomotive maintenance.
Zhel.dor.transp. 40 no.10:31-34 O '58. (MIRA 11:12)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
(Locomotives--Maintenance and repair)

MEREZHKO, Vasiliy Grigor'yevich, inzh.; CHEREPASHENETS, R.G., inzh., red.; KHITROV, P.A., tekhn.red.

[Expansion of the network of locomotive roundhouses] Razvitie lokomotivnykh depo. Moskva, Gos.transp.zhel-dor.izd-vo, 1959. 169 p. (MIRA 13:1)

(Railroads--Repair shops)

MEREZHKO, V.G.

Complex mechanization and automatic control of operations in locomotive repair shops. Elek.i tepl.tiaga 3 no.10:1-4 O '59. (MIRA 13:2)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva.
(Locomotives--Maintenance and repair)
(Automatic control)

MERFZHKO, V.G.

Organizing locomotive operation and maintenance for new type of traction. Zhel.dor.transp. 42 no.2:9-13 F '60. (MIRA 13:5)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
(Locomotives)

LYUTTSAU, Aleksey Grigor'yevich; MER, N.I.; MERRO, Ye.M.; RYBIN, N.G.; ROZENVASSER, M.A.; SOLOV'YEV, S.N.; FILIMONOV, V.P.; SHAROYKO, V.V.; MEREZHKO, V.G., retsenzent; USENKO, L.A., tekhn. red.

[On the road of great initiative] Po puti velikogo pochina. Moskva, Transzheldorizdat, 1961. 75 p. (MIRA 15:2)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya (for Merezhko).
(Railroads—Employees—Labor productivity)

MEREZHKO, V.G.

Improve the conditions and quality of the current maintenance and repair of locomotives. Elekt.i tepl. tiaga 5 no.10:7-8 O '61. (MIRA 14:10)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
(Locomotives—Maintenance and repair)

MEREZHKO, V.G., inzh.

Servicing of locomotives operating on long hauls. Zhel.dor.transp. 43 no.3:23-28 Mr '61. (MIRA 14:3)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva Ministerstva putey soobshcheniya.
(Locomotives—Maintenance and repair)

KMETIK, Petr Iosifovich; MEREZHKO, Vasiliy Grigor'yevich; USTINOV, Nikolay Petrovich; Prinimal uchastiye SHCHERBACHEVICH, G.S., inzh.; UGLINSKIY, A.Ya., inzh., retsenzent; BONDARENKO, M.D., inzh., retsenzent; TEREKHOV, V.M., inzh., retsenzent; KONOVALOV, S.Ye., inzh., retsenzent; SOKALIN, V.V., inzh., red.; KHITROV, P.A., tekhn. red.

[Organization of the operation, maintenance and repair of diesel locomotives]Organizatsiia teplovoznogo khoziaistva. Moskva, Transzheldorizdat, 1962. 197 p. (MIRA 15:9)
(Diesel locomotives--Maintenance and repair)

MEREZHKO, V.G.; YELISEYEV, P.M., inzh., retsenzent; TROFIMOV, S.L., inzh., red.; SOBAKIN, V.V., inzh., red. [deceased]

[Mechanization of the repair of locomotives in a depot] Mekhanizatsiia remonta lokomotivov v depo. Moskva, Izd-vo "Transport," 1964. 198 p. (MIRA 17:5)

MEREZHKO, V.G.

Cooperation and specialization in locomotive roundhouses.
Zhel. dor. transp. 47 no.6:45-49 Je '65. (MIRA 18:6)

1. Zamestitel' nachal'nika Glavnogo upravleniya lokomotivnogo khozyaystva.

LAPTEV, N.G.; VYSOKOSOV, A.N.; MEREZHKOVA, I.A.

4-Carbamoylanilide of acetoacetic acid in connection with the synthesis of migration-stable monoazo pigments. Zhur.VKHO 7 no.1:110-111 '62. (MIRA 15:3)

1. Nauchno-issledovatel'skiy institut organicheskikh poluproduktov i krasiteley.
(Acetoacetic acid) (Azo compounds) (Dyes and dyeing)

MERGABOV, Grayr Artem'yevich; TIGANOV, G.A., red.

[Methods of constructing and straightening the broken axis of crankshafts in marine internal combustion engines by measured slits] Metody postroeniia i vypriamleniia izlomannykh osei kolenchatykh valov sudovykh dvigatelei vnutrennego sgoraniia po zamerennym raskepam. Moskva, Transport, 1964. 73 p. (MIRA 17:7)

MERGABYAN, Andranik Ambartsumovich, prof.; ZAGRABYAN, S.G., spets. red.; KOLESNIKOVA, N.I., red. izd-va; CHANCHAPANYAN, E., tekhn. red.

[Depersonalization] Depersonalizatsiia. Erevan, Armianskoe gos. izd-vo, 1962. 354 p. (MIRA 15:12)
(PSYCHOLOGY, PATHOLOGICAL)

MERGACHEVA, L. I.

"The Hyaluronidase Content in the Chorion and Placenta During the Pregnancy and Birth in Humans." Cand Med Sci, First Leningrad Medical Inst, Leningrad, 1954. (RZhBiolKhim, No 1, Jan 55)

Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (12)
SO: Sum. No. 556, 24 Jun 55

HRUBISKO, M.; MERGANCOVA, O.

On the problem of the so-called safety test before blood transfusion. Rozhl. chir. 42 no.5:345-347 My '63.

1. Fakultna transfuzna stanica a subkatedra hematologie a transfuzie krvi SUDL v Bratislave, veduci doc. dr. M. Hrubisko, CSc.

(BLOOD TRANSFUSION) (ABO FACTORS)
(HEMOLYSIS) (BLOOD GROUP INCOMPATIBILITY)

MERGELOV, Georgiy Sergeyevich; YASTREBTSEV, V., red.; SHATROVA, T., red. izd-va; LEBEDEV, A., tekhn. red.

[Planning and financing administrative expenditures]Planirovanie raskhodov na upravlenie. Moskva, Gosfinizdat, 1962. 58 p. (MIRA 15:9)

(Local finance)

MERGELOV, V. M.

Tobacco Manufacture and Trade

From the backward to progressive. Tabak 13 no. 1, 1952.

Monthly List of Russian Accessions, Library of Congress, June 1952. Unclassified.

MERGELOVA A

MERGELOVA, A.

Disseminating progressive practices. Grazhd. av. 14 no.8:24-25 Ag '47. (MLRA 10:9)
(Aeronautics, Commercial)

MERGELOVA, A

84-8-16/36

AUTHOR: Mergelova, A.

TITLE: Propagation of Advanced Experience (Propaganda peredovogo opyta)

PERIODICAL: Grazhdanskaya Aviatsiya, 1957, Nr 8, pp. 24-25 (USSR)

ABSTRACT: The article is a review of materials published in the professional paper "Nashi Kryl'ya" of the Georgian Territorial Administration of the GVF. Specifically, the article shows how the paper promotes the dissemination of advanced experience within this administration. In an article published in "Nashi Kryl'ya", the senior engineer of one of the operational units, Davydov, evaluated experience of flying without flight mechanics. According to Davydov, yearly savings in two operational units will amount to 440,000 rubles, not accounting for income from carrying 80 kg additional cargo. But he also points out that changing over to flights without mechanics on board is a serious test for all services and requires a prolonged preparation of all crews. On one of the so-called "technical pages", A. Rybin, a team head of the Tbilisi Airline Maintenance Workshops, describes a new process of exchange

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Propagation of Advanced Experience (Cont.)

of engines initiated by aviation technician Zharov. Senior radio technician of the Tbilisi airport V. Labuchenko proposed certain changes in receiver circuitry to eliminate microphonics. Milyukov, an engineer, published an article about innovators of the Armenian Aviation Group, concerning mechanization and automatization of maintenance procedures. Aviation technician Karapetyan, for instance, designed a crane for the Yak-12 plane which is already in operation. Adibekyan, an engineer, by means of a simple contrivance considerably cut the tanking time of lubricants. Head of Communications Department Zaks published an article about a device for the duplication of telephone calls by a visual signal introduced in a unit under Bocharev. Another technical page was dedicated to a new method of exchanging passenger seat cables, and to a proposal made by aviation technician Laushin concerning the mounting of the Pitot tube support. The timely information eliminates much duplicate work on problems already solved. The paper

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Propagation of Advanced Experience (Cont.)

publishes from time to time also reports on achievements of operational units as a whole. Thus, an article by Avetisyan, an engineer of the Yerevan airport, told about the "unit method" of maintenance operations introduced in one of the units. The exchange of engines here takes only 12-14 work hours, while the 200-hour regulation maintenance is accomplished in one day. A worker of another unit, Klimov, told about the uses of an hour-to-hour maintenance graph, after whose introduction the idling time of planes in maintenance was cut nearly half. Frequently reports are published on units which attain foremost places in socialist competition. A winner, plane commander Markov, explained that his success is due to a comprehensive computation of all economic indicators after every flight: the fulfillment of the plan in ton/kilometers, the productivity of the aircraft per hour of flight, regularity of flight (keeping on schedule), and the fuel saved. These data were discussed with the crew members. Such a method keeps the crew up to date as to the stage of

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Propagation of Advanced Experience (Cont.)

fulfillment of their obligations. Valuyev, a pilot of agricultural aviation in Transcaucasia, writes that on the average, 76.7 hectares were covered per day (5 flight hours) using the shuttle flying pattern. A special column is dedicated to the "Exchange of Advanced Experience". Materials of this column are extensively used by propagandists. Much attention is paid to activities of the command, party and trade union organizations. In an article by Rechkov, for example, the method of dissemination of advanced experience used by the local committee was described. The activity on the unit level in this field was considered inadequate. Therefore, a report on a conference dedicated to accomplishments of Simonyan, the radio technician in charge of the transmitters of a radio center of one of the units, was published. The report drew general attention to the factors hampering the activity of innovators and the dissemination of their accomplishments. Advanced experience of other Territorial Administrations also finds its way into columns of "Nashi Kryl'ya".

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S/022/59/012/05/006/009

AUTHORS: Garbyan, G.M., Mergelyan, O.S.

TITLE: Cherenkov and Transition Radiation of a Charged Current-supporting Thread

PERIODICAL: Izvestiya Akademii nauk Armyanskoy SSR. Seriya fiziko-matematicheskikh nauk, 1959, Vol. 12, No. 5, pp. 91-97

TEXT: The authors generalize the former results of A.I. Morozov (Ref. 9) on the radiation of a charged current-supporting thread in a homogeneous medium to the case where the thread from the medium with the constants ε_1, μ_1 changes over into a medium with ε_2, μ_2. By partition of the solutions the authors calculate the transition- and Cherenkov radiation with the method from (Ref. 3).
There are 9 Soviet references.

ASSOCIATION: Yerevanskiy gosudarstvennyy universitet (Yerevan State University)

SUBMITTED: February 6, 1959

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9,3100 (1031, 1144, 1331)

S/022/60/013/002/005/007
C 111/ C 333

AUTHORS: Garibyan, G. M., Mergelyan, O. S.

TITLE: The Radiation of a Charge Which Moves in Parallel With the Boundary of two Media

PERIODICAL: Izvestiya Akademii nauk Armyanskoy SSR. Seriya fiziko-matematicheskikh nauk, 1960, Vol.13, No.2, pp.123-130

TEXT: The method proposed by Garibyan (Ref.5,6) is used for determining the radiation of a charge flying in parallel with the boundary of two media.

At first the authors consider general radiation fields as solutions of the Maxwell equations according to (Ref.5,7,8). By integration then the components of the electric and magnetic fields are obtained at first in the second medium. The formulas of Pafomov (Ref.3) are obtained for the energy flow. From the formulas it appears: a.) The first medium is not a Cherenkov medium, the second is a Cherenkov medium. Then for the Poynting vector there holds a formula which describes the Cherenkov radiation which is generated by the particle in the second medium (effect of Ginzburg and Frank (Ref.8)). b.) Both media are Cherenkov media. It exists a Cherenkov radiation which originated in the first medium and entered into the

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The Radiation of a Charge Which Moves in Parallel With the Boundary of two Media

second medium. Furthermore it exists a radiation which originated in the second medium. Both flows move under Cherenkov angles which are characteristic for the second medium.

Then the authors determine the components of the fields and of the energy flow for the first medium. If the second medium is an ideal conductor ($\epsilon_2 = \infty$), then from the formula for the energy flow it follows that there are frequencies, the intensity of which is quadrupled compared with the intensity in the homogeneous medium. Simultaneously there exist frequencies, to which the intensity 0 corresponds because of interference.
There are 8 references: 6 Soviet and 2 American.
ASSOCIATION: Fizicheskiy institut AN Armyanskoy SSR (Physical Institute, AS Armyanskaya SSR) Institut matematiki i mekhaniki AN Armyanskoy SSR (Institute of Mathematics and Mechanics, AS Armyanskaya SSR)

SUBMITTED: January 5, 1960

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S/022/60/013/003/004/006
D217/D301

9.3100 (1140, 1159, 1532)

AUTHOR: Mergelyan, O.S.

TITLE: The radiation of a charged thread, carrying current, for movements parallel to the interface of two media

PERIODICAL: Izvestiya akademii nauk Armyanskoy SSR, seriya fiziko-matematicheskikh nauk, v. 13, no. 3, 1960, 107-116

TEXT: In this paper the author derives rigorously expressions for the electric and magnetic fields, due to both the charge and the current on a thread, in two transparent media with different dielectric constants and magnetic permeabilities. He examines the Cherenkov effect, produced by the motion of the thread, the nature of the radiation in the medium which does not carry the thread, and interference effects in the radiation in the medium containing the thread. The problem has been partially considered by A.I. Morozov (Ref. 1: Vzaimodeystviye mezhdy dvizhushcheysya zaryazhennoy

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The radiation of a ...

str~u~yey i magnitodielektrikom (Interaction of a Moving Charged Jet and a Magneto Dielectric), "Vestnik MGU", 1, 72, 1957), and by A.G. Sitenko and V.S. Tkalich (Ref. 2: Ob effekte Cherenkova pri dvizhenii zaryada parallel'no granitse razdela dvukh sred (On the Cherenkov Effect during the Movement of a Charge Parallel to the Interface of Two Media), "ZHTF", 29, 1074, 1959). The field in the medium containing the thread (medium 1) is given by the sum of the solutions of the homogeneous and inhomogeneous Maxwell equations, while that in the other medium (medium 2) is the solution of the homogeneous equations only. From considerations of orthogonality and the boundary conditions at the interface, the Fourier components of the radiation fields are obtained

$$E_{1z}^{t}(\vec{\kappa}) = \frac{i\rho_0}{\pi} \frac{\frac{\varepsilon_2}{\varepsilon_1}\frac{\omega^2}{v^2}\xi_1^2 - k_z\alpha_2}{\left(\kappa^2 - \frac{\omega^2}{c^2}\chi_1\right)\left(\varepsilon_2\alpha_1 - \varepsilon_1\alpha_2\right)} e^{i(k_z \cdot \cdot)t}, \qquad (7a)$$

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The radiation of a ...

$$E^{\prime\prime\rho}_{2z}(\vec{x}) = \frac{ip_0}{\pi} \frac{\frac{\omega^2}{v^2}\xi_1^2 - k_z\alpha_1}{\left(\varkappa^2 - \frac{\omega^2}{c^2}\chi_1\right)\left(\varepsilon_2\alpha_1 - \varepsilon_1\alpha_2\right)} e^{i(k_z - \alpha_1)l}, \tag{7a}$$

$$E^{\prime\prime\rho}_{1,2x}(\vec{x}) = -\frac{v}{\omega}\alpha_{1,2}E^{\prime\prime\rho}_{1,2z}(\vec{x});$$

$$H^{\prime\prime J}_{1z}(\vec{x}) = \frac{ij_0}{\pi c} \frac{\frac{\omega}{v}(\mu_1\alpha_2 - \mu_2 k_z)}{\left(\varkappa^2 - \frac{\omega^2}{c^2}\chi_1\right)(\mu_2\alpha_1 - \mu_1\alpha_2)} e^{i(k_z - \alpha_1)l}, \tag{7b}$$

$$H^{\prime\prime J}_{2z}(\vec{x}) = \frac{ij_0}{\pi c} \frac{\mu_1\frac{\omega}{v}(\alpha_1 - k_z)}{(\mu_2\alpha_1 - \mu_1\alpha_2)\left(\varkappa^2 - \frac{\omega^2}{c^2}\chi_1\right)} e^{i(k_z - \alpha_2)l}, \tag{7b}$$

$$H^{\prime\prime J}_{1,2x}(\vec{x}) = -\frac{v}{\omega}\alpha_{1,2}H^{\prime\prime J}_{1,2z}(\vec{x}).$$

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The radiation of a ...

Here, the superscripts ρ and j indicate that the field is due to charge or current respectively, and ρ_0 and j_0 are the linear charge and current densities. $\varepsilon_{1,2}$ are the dielectric constants, and $\mu_{1,2}$ the magnetic permeabilities of the respective media. The interface is the plane z = 1, and the coordinates of the thread are z = 0, X = vt. Also, $x_{1,2} = \varepsilon_{1,2}\,\mu_{1,2}$, $\vec{x} = \vec{X}(k_x, k_z)$, $\omega = k_x v$, $\alpha^2_{1,2} = \frac{\omega^2}{v^2}\xi^2_{1,2}$, $\xi^2_{1,2} = \beta^2 X_{1,2} - 1$ [Abstractor's note: β^2 not defined]. With these Fourier components, the frequency distribution of the electric and magnetic fields in the second medium is obtained by performing the integrations in the solutions of the homogeneous equations. The Poynting vector in the medium is then determined for two different cases:

(i) $\xi^2_2 > 0, \xi^2_1 < 0$, and (ii) $\xi^2_1 > 0, \xi^2_2 > 0$,

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The radiation of a ...

the condition $\xi^2 > 0$ being the Cherenkov condition. From the results, it is seen that radiation is only generated in the second medium, when the first does not satisfy the Cherenkov condition. When both media satisfy the condition, the radiation in the second medium represents radiation generated in the first medium and refracted at the interface and, from the law of refraction, it follows that for $\xi_1^2 > 0, \xi_2^2 < 0$, the radiation generated in the first medium is totally internally reflected at the interface and there is no radiation in the second medium. Having established the relationships for the radiation fields in the first medium, the author considers the effect of interference due to the component reflected at the interface. He establishes the frequencies giving maximum and minimum intensities for the cases (i) $\xi_1^2 > 0, \xi_2^2 > 0$ (a) $\varepsilon_1\xi_2 > \varepsilon_2\xi_1$ ($\mu_2\xi_1 > \mu_1\xi_2$). The maxima are given by Eq. (16)

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$$2\frac{\omega}{v}\xi_1 l = 2n\pi, \qquad (16)$$

and the minima by Eq. (17) $2\frac{\omega}{v}\xi_1 l = (2n+1)\pi$, (17)
(b) $\varepsilon_1\xi_2 < \varepsilon_2\xi_1$ $(\mu_2\xi_1 < \mu_1\xi_2)$. The maxima are given by Eq. (17) and the minima by Eq. (16). (ii) $\xi_1^2 > 0$, $\xi_2^2 < 0$. (a) $\varepsilon_2^2\xi_1^2 > \varepsilon_1^2(1-\beta^2 X_2^2)$;
As in case (i) (b) (b) $\varepsilon_2^2\xi_1^2 < \varepsilon_1^2(1-\beta^2 X_2^2)$; As in case (i) (a).

The author thanks G.M. Garibyan for his advice and discussions on the problem. There are 3 Soviet-bloc references.

ASSOCIATION: Institut matematiki i mekhaniki AN Armyanskoy SSR (Institute of Mathematics and Mechanics AS Armenian SSR).

SUBMITTED: January 11, 1960

MERGELYAN, O.S.

Radiation from a charged current-carrying thread in a moving medium. Dokl. AN Arm. SSR 32 no.4:205-212 '61. (MIRA 14:8)

1. Fizicheskiy institut Akademii nauk Armyanskoy SSR. Predstavleno chlenom-korrespondentom AN Armyanskoy SSR N.M. Kocharyanom.
(Radiation) (Electric currents) (Vector analysis)

44923

S/022/62/015/006/004/006
D218/D308

9.3700

AUTHOR: Mergelyan, O.S.

TITLE: Reflection and refraction of electromagnetic waves at the boundary between an isotropic and an optically active medium

PERIODICAL: Akademiya nauk Armyanskoy SSR. Izvestiya, v. 15, no. 6, 1962, 75 - 82

TEXT: The constitutive relations for the optically active medium are

$$\vec{D}(\vec{k}) = \varepsilon \vec{E}(\vec{k}) + \frac{i\gamma}{k}\left[\vec{k}\,\vec{E}(\vec{k})\right]$$

$$\vec{B}(\vec{k}) = \mu \vec{H}(\vec{k}), \qquad (2)$$

where γ is the gyration constant representing the optical activity of the medium. The dispersion relation is

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$$k^{\pm 2} = \frac{\omega^2}{c^2} n^{\pm 2} = \frac{\omega^2}{c^2} \mu (\varepsilon \pm \gamma) \qquad (3)$$

where the sign of γ corresponds to the superscript of K. A study of the field equations, together with the above constitutive relations indicate that two elliptically polarized waves can propagate in the optically active medium. General expressions are then obtained for the phase relationships and the Fresnel formulas for the field amplitudes are derived for a wave travelling in either direction across the separation boundary. It is shown that when the wave enters the active medium from the non-active medium, the radiation reflected at the surface will in general be elliptically polarized. If the incident wave is polarized in the plane of incidence, then both the reflected and the refracted waves will be elliptically polarized. In the opposite case, i.e. when the radiation enters the non-active medium, the reflected wave consists of two components travelling with different velocities and at different angles. The refracted wave is elliptically polarized. A general feature of the reflection of

electromagnetic waves in the case of incidence from an active medium on to an isotropic medium, is that as the angle of incidence approaches 90° , the amplitude of the ordinary reflected wave tends to zero, whilst the amplitude of the extraordinary wave increases. With normal incidence the reflected wave is exclusively the extraordinary wave.

ASSOCIATION: TsNI, Physico-tekhnicheskaya Laboratoriya, AN Armyanskoy SSR; Fizicheskiy Institut AN SSSR im. Lebedeva (TsNI, Physicotechnical Laboratory, AS Armenian SSR, Physics Institute of the AS USSR im. Lebedev)

SUBMITTED: May 26, 1962

24 3102

S/252/62/034/002/001/002
I023/I223

AUTHOR Mergelyan, O. S.

TITLE: Reflection and refraction of electromagnetic waves in a moving medium

PERIODICAL. Akademiya nauk Armyanskoy SSR. Doklady, v. 34, no. 2, 1962, 65-70

TEXT: The reflection and refraction of electromagnetic waves at the boundary of a stationary and a moving medium with a tangential velocity discontinuity is investigated. Phase relations and equations for the field amplitudes for the general case are obtained. The solutions are obtained by solving Maxwell's equations with the proper dispersion relations. Two special cases are investigated in detail: plane of incidence parallel and perpendicular to the velocity of the moving medium. The general formulas obtained can be applied to the diagnostics of a moving plasma. Parameters of the moving medium can be found by obtaining the rotation of the plane of polarization, the angle of total reflection, and the angle for which there is no reflection.

ASSOCIATION: Fizicheskiy institut Akademii nauk Armyanskoy SSR (Institute of Physics, Academy of Sciences, Armyanskaya SSR)

PRESENTED: December 9, 1961, by N. M. Kocharyan, Corespondent-Member, AS Armyanskaya SSR

Card 1/1

S/051/63/014/003/009/019
E032/E514

AUTHORS: Bolotovskiy B.M. and Mergelyan O.S.

TITLE: Theory of the Vavilov-Cherenkov radiation in an isotropic, optically active medium

PERIODICAL: Optika i spektroskopiya, v.14, no.3, 1963, 383-387

TEXT: The Vavilov-Cherenkov radiation emitted by a charged particle moving in a straight line with a constant velocity $\underline{v}$ in an isotropic, optically active medium, e.g. sugar solution, is discussed. It is assumed that the constitutive equations for the Fourier components of the electromagnetic field in the medium are given by

$$\left.\begin{aligned} \underline{D}_{\underline{k}} &= \epsilon \underline{E}_{\underline{k}} + \frac{i\gamma}{k}\left[\underline{k}\underline{E}_{\underline{k}}\right], \\ \underline{B}_{\underline{k}} &= \mu \underline{H}_{\underline{k}}. \end{aligned}\right\} \qquad (4)$$

where γ is a parameter representing the rotation of the plane of polarization and k is the wave number. It is shown that the radiated field may be looked upon as a superposition of plane waves which are circularly polarized in such a way that waves

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corresponding to the refractive index n_1 have a right-handed polarization, while those corresponding to the refractive index n_2 have a left-handed polarization, where

$$n_1^2 = \mu(\varepsilon + \gamma), \quad n_2^2 = \mu(\varepsilon - \gamma) \tag{7}$$

As in other media, the necessary condition for the emission of these waves is that their phase velocity should be lower than the velocity of the particle. A general formula is obtained for the rate of loss of energy by the emission of the Vavilov-Cherenkov radiation. The rate of loss of energy by the emission of a longitudinal field is found to be independent of γ and the same as in a nonactive medium. The losses occur at frequencies at which the permittivity becomes equal to zero.

SUBMITTED: May 18, 1962

MERGELYAN, O.S.

Radiation from a charged particle flying parallel to the interface of an isotropic and an optically active medium. Izv. AN Arm. SSR. Ser. fiz.-mat. nauk 16 no.1:111-117 '63. (MIRA 16:3)

1. TSentral'naya nauchno-issledovatel'skaya fiziko-tekhnicheskaya laboratoriya AN Armyanskoy SSR.
(Cherenkov radiation) (Electron optics)

MERGELYAN, O.S.

Transient radiation from a particle allowing for a magnetic charge. Dokl. AN Arm. SSR 36 no.1:17-21 '63. (MIRA 17:1)

1. TSentral'naya fiziko-tekhnicheskaya laboratoriya AN Armyanskoy SSR. Predstavleno akademikom AN Armyanskoy SSR N.M.Kocharyanom.

ACCESSION NR: AP4026808 S/0022/64/017/001/0105/0112

AUTHORS: Gazazyan, E. D.; Mergelyan, O. S.

TITLE: A study of Vavilov-Cherenkov radiation from a linear charge and finite dimension beams in an optically active medium

SOURCE: AN ArmSSR. Izv. Seriya fiziko-matematicheskikh nauk, v. 17, no. 1, 1964, 105-112

TOPIC TAGS: optically active medium, Vavilov-Cherenkov radiation, finite dimension beam, field equation, charge density, Fourier component, radiation spectra

ABSTRACT: The Vavilov-Cherenkov radiation from a linear charge and finite dimension beams have been studied analytically in an optically active isotropic medium. The field equations describing the radiation phenomena are given by

$$\operatorname{rot} H = \frac{1}{c}\frac{\partial D}{\partial t} + \frac{4\pi}{c}\frac{qv}{2a}\delta(x)\delta(z - vt)\sigma(y),$$

$$\operatorname{rot} \vec{E} = -\frac{1}{c}\frac{\partial \vec{B}}{\partial t},$$

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ACCESSION NR: AP4026808

$$\operatorname{div}\vec{B}=0,$$

$$\operatorname{div}\vec{D}=4\pi\frac{q}{2a}\delta(x)\,\delta(z-vt)\,\sigma(y).$$

where the charge density is described by

$$\rho=\frac{q}{2a}\delta(x)\,\delta(z-vt)\,\sigma(y),$$

Using the Fourier components of the field equations, expressions are obtained for energy loss and the field energy, and a relationship is established between charge dimension and radiation spectra. For a → 0, the results are shown to lead to those derived by B. M. Bolotovskiy and O. S. Mergelyan (Teoriya izlucheniya Vavilova-Cherenkova v izotropnoy opticheski aktivnoy srede. Optika i spektroskopiya, 14, 3,1963). The case of an infinite line charge is also considered in the optically active medium where the current density is represented by

$$\vec{i}=\rho\vec{v}=\frac{q}{8abd}\sigma(x)\,\sigma(y)\,\sigma(z-vt),$$

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ACCESSION NR: AP4026808

where

$$\sigma(x)=\begin{cases}1 & |x|<b\\ 0 & |x|>b,\end{cases}$$

$$\sigma(y)=\begin{cases}1 & |y|<a\\ 0 & |y|>a,\end{cases}$$

$$\sigma(z-vt)=\begin{cases}1 & |z-vt|<d\\ 0 & |z-vt|>d.\end{cases}$$

Orig. art. has: 23 equations.

ASSOCIATION: none

SUBMITTED: 20May63 DATE ACQ: 16Apr64 ENCL: 00

SUB CODE: PH NO REF SOV: 004 OTHER: 000

Card 3/3

L 21 [illegible]/EPA(s)-2/EWG(k)/EPA(sp)-2/EPA(w)-2/EEC(t)/T/EEC(b)-2/EWA(m)-2
Pi-6/Ps-4/Pab-24/Pt-10/Pi-4/Pi-4 IJP(c)/ASD(a)-5/RAEM(c)/SSD/AFETR/AFWL/AFMD(c)/
ACCESSION NR: AP4044087 RAEM(a)/ESD(gs)/ S/0022/64/017/004/0097/0101
ESD(t)/RAEM(t) GG/AT

AUTHORS: Gazazyan, E. D.; Mergelyan, O. S.

TITLE: Radiation of pointlike and extended charges moving near the separation boundary of a gyrotropic dielectric

SOURCE: AN ArmSSR. Izvestiya. Seriya fiziko-matematicheskikh nauk, v. 17, no. 4, 1964, 97-101

TOPIC TAGS: gyrotropic dielectric, Maxwell equation, polarization, Cerenkov radiation, surface property

ABSTRACT: The dielectric in question is situated in an external magnetic field, and the problem is solved in the approximation wherein the gyration parameter g is small, of the order of 10^{-3}--10^{-6} in realistically feasible magnetic fields. This means that g does not influence greatly the amplitudes of the fields and the radiation intensity, but rotates appreciably the plane of polarization of the

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radiation, so that the results can be useful for the generation of radiation with specified polarization. Solution of the Maxwell material equations yields a dispersion relation for the gyrotropic dielectric and an equation for the far field. These equations show that the radiation in the gyrotropic medium has circular polarization. The distance over which the plane of polarization makes a complete revolution and the Cerenkov angle are evaluated, along with the energy lost by the particle per unit path. Solutions are given for a point charge, for a linear charge of finite length and constant charge density, and for a charge moving along the axis of an empty channel in a dielectric medium. It is shown that in the latter case the radiation of a particle moving along the axis of an empty channel does not differ from the radiation in a solid dielectric placed in a magnetic field. "The authors are grateful to B. M. Bolotovskiy and M. L. Ter-Mikayelyan for interest in the work and for valuable remarks." Orig. art. has: 15 formulas.

L 214[illegible]
ACCESSION NR: AP4044087

ASSOCIATION: Fizicheskiy institut GKAE (Physics Institute, GKAE); TsNI fiziko-tekhnicheskaya laboratoriya AN Armyanskoy SSR (Central Scientific Research Physicotechnical Laboratory, AN ArmSSR)

SUBMITTED: 30Dec63 ENCL: 00

SUB CODE: EM, NP NR REF SOV: 005 OTHER: 000

Card 3/3

AYVAZYAN, Yu.M.; MERGELYAN, O.S.

Use of optical methods in determining the parameters of optically active media. Izv. AN Arm. SSR. Ser. fiz.-nauk 17 no.4:125-126 '64.
(MIRA 17:11)

1. TSentral'naya nauchno-issledovatel'skaya fiziko-tekhnicheskaya laboratoriya AN Armyanskoy SSR.

L 16549-65 EWT(1)/EED-2 ESD(dp)
ACCESSION NR: AP4049202 S/0022/64/017/005/0087/0091

AUTHORS: Gazazyan, E. D.; Mergelyan, O. S.

B

TITLE: Study of linear sources flying along the boundary of a gyrotropic ferrite

SOURCE: AN ArmSSR. Izvestiya. Seriya fiziko-matematicheskikh nauk, v. 17, no. 5, 1964, 87-91

TOPIC TAGS: linear charge, linear current, charge motion, ferrite, gyrotropy

ABSTRACT: The authors consider the radiation from linear charges and currents traveling in vacuum parallel to the boundary of a gyrotropic ferrite. Simple gyrotropy is assumed, such as can be produced by superposition of an external magnetic field parallel to the motion of the charge. The problem is solved for arbitrary gyration constant, and the simplifications arising in the particular

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L 16549-65
ACCESSION NR: AP4049202

cases when the gyration constant is much larger or much smaller than the magnetic permeability are stated. Orig. art. has: 14 formulas.

ASSOCIATION: Fizicheskiy institut GKAE (Physics Institute, GKAE); TsNI Fiziko-tekhnicheskaya laboratoriya AN ArmSSR (Central Scientific Research Physicotechnical Laboratory AN ArmSSR)

SUBMITTED: 31Mar64 ENCL: 00

SUB CODE: EM NR REF SOV: 003 OTHER: 000

Card 2/2

ACCESSION NR: AP4042930 S/0057/64/034/008/1432/1435

AUTHOR: Gazazyan, E.D.; Mergelyan, O.S.

TITLE: The Vavilov-Cerenkov effect in a magnetized ferrite

SOURCE: Zhurnal tekhnicheskoy fiziki, v.34, no.8, 1964, 1432-1435

TOPIC TAGS: Cerenkov radiation, Cerenkov effect, ferrite

ABSTRACT: The authors develop the theory of the Cerenkov radiation from a charged particle moving parallel to the magnetic field in a magnetized ferrite. The calculation is performed in terms of the Fourier components of the fields and current in much the same way as for an isotropic medium. The only complication arises from the fact that here the relation between the magnetic field, H, and the induction, B, is $B = \mu H + iHxg$ (exponential time dependence has been introduced), where g is proportional to the magnetic field and depends on the frequency. This complication is minimized and the problem rendered tractable by assuming that g is small and that $(g/\mu)^2$ may be neglected compared with unity. It is found that near the radiating particle the radiation field may be represented by two elliptically polarized waves of nearly the same intensity propagating at angles $\theta_\pm$ given by $\tan^2\theta_\pm = \tan^2\theta_0 +$

ACCESSION NR: AP4042930

+ $(g/\mu)\sec\theta_o$, where θ_o is the propagation angle for Cerenkov radiation in the unmagnetized medium. Far from the radiating charge, however, the field represents a circularly polarized wave of intensity equal to that of Cerenkov radiation from the particle in the unmagnetized medium and an elliptically polarized wave, the intensity of which is smaller by a factor of the order of $(g/\mu)^2$. "The authors are grateful to M.L.Ter-Mikayelyan for pleasant discussions." Orig.art.has: 21 formulas.

ASSOCIATION: none

SUBMITTED: 30Oct63 ENCL: 00

SUB CODE: EM, NP NR REF SOV: 006 OTHER: 000

2/2

GAZAZYAN, E.D.; MERGELYAN, O.S.

Emission of linear currents in optically active and gyrotropic media. Dokl. AN Arm. SSR 37 no.4:185-189 '63. (MIRA 17:8)

1. Predstavleno chlenom-korrespondentom AN ArmSSR N.M. Kocharyanom.

GAZAZYAN, E.D.; MERGELYAN, O.S.

Transient radiation in gyrotropic ferrite. Dokl. AN Arm. SSR 38 no.3:143-147 '64. (MIRA 17:6)

1. TSentral'naya fiziko-tekhnicheskaya laboratoriya AN Armyanskoy SSR. Predstavleno chlenom-korrespondentom AN Armyanskoy SSR G.M. Garibyanom.

L 63123-65 EWT(1)/EED-2

ACCESSION NR: AP5020375

UR/0141/65/008/003/0629/0631
621.372.853.2/3

28
26
E

AUTHOR: Gazazyan, E. D.; Mergelyan, O. S.

TITLE: Cerenkov radiation of charged particles in a circular waveguide filled with a gyrotropic ferrite

21

SOURCE: IVUZ. Radiofizika, v. 8, no. 3, 1965, 629-631

TOPIC TAGS: Cerenkov radiation, circular waveguide, gyrotropic medium waveguide, ferrite

ABSTRACT: The authors examine the Cerenkov effect in a circular waveguide filled with a medium with a known magnetic permeability with magnetic gyrotropism. This may be a ferrite in a constant magnetic field. First the field of a point charge in a gyrotropic ferrite is computed. Then the charged particle is moved along the axis of a circular waveguide and expressions for the reflections from the waveguide walls are found. These produce a deceleration force on the particle with resulting energy losses. The spectrum of the radiation is determined. Under certain conditions the results coincide with those which have been found for the isotropic case.

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L 63123-65

ACCESSION NR: AP5020375

2

"The authors thank G. M. Garibyan for interest in the work and discussion." Orig. art. has: 8 formulas.

ASSOCIATION: Tsentral'naya nauchno-issledovatel'skaya fiziko-tekhnicheskaya laboratoriya AN Arm. SSR (Central Scientific Research Physicotechnical Laboratory, AN Arm. SSR)

SUBMITTED: 21Jul64 ENCL: 00 SUB CODE: EC, NP

NO REF SOV: 004 OTHER: 000

Card 2/2

L 21185-65 EWT(l)/T/EEC(b)-2 IJP(c)/AFWL/SSD/ASD(a)-5/AFMD(c)/RAEM(c)/RAEM(a)
ACCESSION NR: AP5003017 S/0051/65/018/001/0003/0009

AUTHOR: Bolotovskiy, B. M.; Mergelyan, O. S.

TITLE: Radiation produced by a charge crossing the interface between an isotropic and optically-active medium

SOURCE: Optika i spektroskopiya, v. 18, no. 1, 1965, 3-9

TOPIC TAGS: transition radiation, Cerenkov radiation, radiating charge

ABSTRACT: From an analysis of the dispersion equation for the transition radiation of a point charge crossing the interface between an isotropic and optically-active media it is shown that two waves, with oppositely directed circular polarizations, can propagate in the optically active medium. The polarization of this radiation is studied, and also its angular and frequency distribution. Expressions are obtained for the fields and energy fluxes of the transition radiation in the forward and backward directions. Conditions under which Cerenkov radiation appears in the isotropic medium are obtained, and the polarization of the resultant Cerenkov radiation is investigated. Orig. art. has: 31 formulas.

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L 21185-65
ACCESSION NR: AP5003017

ASSOCIATION: None

SUBMITTED: 03Nov63 ENCL: 00 SUB CODE: OP, NP

NR REF SOV: 005 OTHER: 000

Card 2/2

L 64470-65 EWT(1)/EWA(h)
ACCESSION NR: AP5012632 UR/0051/65/018/005/0913/0915
537.24:535.23.001.1

AUTHORS: Gazazyan, E. D.; Mergelyan, O. S.

TITLE: Vavilov-Cerenkov effect in a waveguide field with an isotropic optically active medium

SOURCE: Optika i spektroskopiya, v. 18, no. 5, 1965, 913-915

TOPIC TAGS: Cerenkov effect, waveguide, electron radiation, circular polarization, optic activity

ABSTRACT: The authors calculate the radial and longitudinal field components, the field reflected from the walls of the waveguide, and the energy loss per unit path of a particle moving with constant velocity in a cylindrical waveguide filled with an isotropic optically active medium on the axis of the waveguide. The energy loss is expressed in the form of a sum of the intensities of the right and

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L 64470-65

ACCESSION NR: AP5012632

left circularly polarized radiations. The length within which the polarization vector makes a complete revolution is calculated. It is shown that the spectrum of the Cerenkov radiation from such a particle is discrete. 'The authors thank G. M. Garibian for interest in the work and valuable discussions.' Orig. art. has: 7 formulas.

ASSOCIATION: None

SUBMITTED: 27Jun64 ENCL: 00 SUB CODE: OP, EM

NR REF SOV: 003 OTHER: 000

Card 2/2

L 26968-65

ACCESSION NR: AP5003254 S/0057/65/035/001/0158/0159

AUTHOR: Gazazyan, E.D./ Mergelyan, O.S.

TITLE: Radiation from a point charge in a waveguide in the presence of an external magnetic field

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.1, 1965, 158-159

TOPIC TAGS: radiation, radiated power, Cerenkov radiation, waveguide, longitudinal magnetic field

ABSTRACT: The authors calculate the radiation from a point charge moving uniformly along the axis of a circular waveguide filled with dielectric material and located in a longitudinal magnetic field. The equations for the electric field of the moving charge are quoted from the textbook literature and the calculation reduces to fitting the boundary conditions on the waveguide surface. The energy radiated per unit path length is calculated. The spectrum of the radiation is discrete and the same for both right- and left-hand circularly polarized components, but the intensities of these components and the conditions for their radiation are different. The authors are grateful to G.M.Garibyan for interesting discussions

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L 26968-65

ACCESSION NR: AP5003254

and valuable advice." Orig.art.has: 7 formulas.

ASSOCIATION: none

SUBMITTED: 09Jul64 ENCL: 00 SUB CODE: EM

NR REF SOV: 006 OTHER: 000

Card 2/2

L 10946-65 EED-2/EWT(1)

ACCESSION NR: AP5007304

S/0057/65/035/003/0539/0541

25
B

AUTHOR: Gazazyan, E.D.; Mergelyan, O.S.

TITLE: Interaction of charged particles with a gyrotropic ferrite

SOURCE: Zhurnal tekhnicheskoy fiziki, v.35, no.3, 1965, 539-541

TOPIC TAGS: Cerenkov radiation, charged particle, ferrite, gyromagnetic susceptibility

ABSTRACT: The authors calculate the Cerenkov radiation of a charged particle moving parallel to the external magnetic field in a magnetized ferrite. The medium is described by the following relation between the electric and magnetic fields E, H and the displacement and induction, D, B:

$$\mathbf{D} = \varepsilon \mathbf{E},$$

$$\mathbf{B} = \mu \mathbf{H} + i[\mathbf{gH}],$$

where ε, μ are constant scalars and g is a constant vector. The dispersion equation for electromagnetic waves is derived and discussed briefly. An expression for the

Card 1/2

L 40946-65

ACCESSION NR: AP5007394

field of a charged particle moving with constant velocity parallel to g is obtained in the form of an integral over frequency of a rather involved function, and the energy loss per unit path length is calculated. Two waves can be radiated, which are elliptically polarized in opposite senses. When g is small, only a single circularly polarized wave is present at great distances. This case has been previously discussed by the authors (ZhTF 34,1432,1964). When g = 0, the formula for the energy loss reduces to that given by I.Ye.Tamm and I.I.Frank (DAN SSSR 14,107,1937). Orig.art.has: 13 formulas.

ASSOCIATION: none

SUBMITTED: 09Jun64 ENCL: 00 SUB CODE: EM,OP

NR REF SOV: 007 OTHER: 000

Card 2/2 mb

GAZAZYAN, F.I.; MARKARYAN, [illegible]

Two-dimensional problem of radiation in a waveguide with a gyrotropic ferrite. Izv. AN Arm. SSR (Fizika) [illegible]

1. Fizicheskiy institut Gosudarstvennogo komiteta po ispol'zovaniyu atomnoy energii SSSR i Tsentral'naya nauchno-issledovatel'skaya fiziko-tekhnicheskaya laboratoriya AN ArmSSR. [illegible]

Mergelyan, S. N.

Mergelyan, S. N. On best approximation in adjacent regions. Doklady Akad. Nauk SSSR (N.S.) 62, 981-983 (1948). (Russian)

In this and in the following two papers, some theorems and observations on best approximation by polynomials are stated without proof. Let D_1, D_2 be simply-connected regions the boundaries of which are the complete boundaries of the corresponding complementary regions, and set $D=D_1+D_2$. Let $f_i(z)$, $i=1, 2$, be regular in D_i and continuous in $\bar{D}_i$, and set $\rho(n)=\max|f_i(z)-P_n(z)|$ $(z\in\bar{D}_i, i=1, 2)$ for all polynomials P_n of degree n. Suppose D_1, D_2 have only one point ($z=0$) in common, and that $f_1(0)=f_2(0)$, and set $f(z)=f_i(z)$ for $z\in\bar{D}_i$. Let $d(R)$ be the distance from $z=0$ to the level line L_R $(R>1)$ of the complement to $\bar{D}$.

(I) If D_1, D_2 are convex, and $\omega(\delta)$ is the modulus of continuity of $f^{(s)}(z)$ on $\bar{D}$, then

$$\rho(n)<c\{d(1+n^{-1}\log n)\}^s\omega\{d(1+n^{-1}\log n)\},$$

c=constant. Suppose the boundaries of D_1, D_2 have near $z=0$ the respective equations $y=\varphi(x)=\varphi(-x)$ and $y=-\varphi(x)$ (for $|x|<a$), where $\varphi(x)$ is monotonic decreasing to zero with $|x|$. If D_1, D_2 meet at an angle: $\varphi(x)\sim q|x|$, $q>0$, then from (I): (1) $\rho(n)<c(n^{-1}\log n)^{1+Q}\omega\{(n^{-1}\log n)^Q\}$, c=constant, $Q=1-2\pi^{-1}\tan^{-1}q$; and if D_1, D_2 have contact of algebraic order, i.e., $c_1x^m<\varphi(x)<c_2x^m$ $(m>1)$, then (2) $\rho(n)<c(\log n)^{-m(m-1)}\omega\{(\log n)^{-1/(m-1)}\}$. (This estimate cannot be improved, and (1) is close to being sharp.)

Let the polynomials $\{P_n(z)\}$ converge uniformly in $\bar{D}_i$ to $f_i(z)$, and set $r_i(n)=\max|f_i(z)-P_n(z)|$ $(z\in\bar{D}_i)$. (II) If D_1, D_2 touch at $z=0$, and if

$$\liminf\{\log r_1(n)r_2(n)\}/\{\log d(1+1/n)\}=A,$$

then for every $\epsilon>0$, the derivative of $f(z)$ of order $[(A-\epsilon)/2]$ is continuous in $\bar{B}_1+\bar{B}_2$ and satisfies there a Lipschitz condition of order $(A-\epsilon)/2$. (B_i is any subregion of D_i with the property that the ratio of the distance of any point of $\bar{B}_i$ from $z=0$ to the distance of that point from the boundary of D_i is uniformly bounded.)

Let the polynomials $\{P_n(z)\}$ converge to $f(z)$ in $\bar{D}$, and set $r(n)=\max|f(z)-P_n(z)|$, $z\in\bar{D}$. (III) If

$$r(n)<e^{-\lambda_n}, \quad \lambda=\lambda_n=e^{s_n}, s_n=\{d(1+1/n)\}^{-1},$$

then from the convergence of $\{P_n\}$ to zero in $\bar{D}_i$ it follows that $\{P_n\}$ likewise converges to zero in $\bar{D}_3$; so that the function $f_i(z)$ to which $\{P_n\}$ converges in $\bar{D}_i$ determines at the same time the function to which $\{P_n\}$ converges in $\bar{D}_2$, which is the "quasianalytic" continuation of $f_i(z)$ into D_2.

I. M. Sheffer (State College, Pa.).

Source: Mathematical Reviews, Vol 10 No. 4

Mergelyan, S.N.

Mergelyan, S. N. On best approximation on closed sets. [Doklady Akad. Nauk SSSR (N.S.) 62, 163–166 (1948); errata, 63, 220 (1948). (Russian)

In the paper reviewed above, estimates for ρ_n were established for regions with smooth boundary or boundary having a corner point or a "re-entrant" point. Now more general sets are considered. Part I is concerned with a finite region D whose boundary is also the complete boundary of the complement of D. Let $d(t;r)$ be the distance from boundary point t to the image of the circle $|w|=r>1$ under the conformal mapping of $|w|>1$ on the complement of D. (I) Let $\liminf_{n\to\infty}(\log \rho_n)/\log d(t;1+n^{-1})=A$. If $A<\infty$, then for every $\varepsilon>0$, $f(z)\in L(D;A-\varepsilon)$ [see the preceding review for definition of class L]; but if $A=\infty$, then $f(z)$ has an unbounded differential in $\bar{B}_t$ [$\bar{B}_t$ is defined like $\bar{B}$, in the second preceding review, with $\varepsilon=0$ now replaced by $t(\in D)$]. If $A=0$, $f(z)$ may be nondifferentiable and not satisfy any Lipschitz condition of positive order, yet its modulus of continuity $\omega(\delta)$ satisfies in $\bar{B}_t$ the relation (1) $\omega(\delta)<C\cdot\min_{n\geq 1}\{\rho_n+\delta/d(t;1+1/n)\}$; and (1) cannot be improved. (II) Let $A=\infty$, and set $M_n=\max|f^{(n)}(z)|$ $(z\in\bar{B}_t)$. Then for arbitrary positive integers $n_1<n_2<\cdots$, and arbitrary μ $(0<\mu<1)$,

(2) $M_n<C^n\cdot n!\{\sum_{k=1}^{n}\rho_{n_k}^{\mu}[d(t;1+[(1-\mu)/n_{k+1}]\log(1/\rho_{n_{k+1}}))]^{-n}\}$,

where C depends on d and on $\{\rho_n\}$. In particular, if $\rho_n<q^n$ $(q<1)$, then $M_n<C^n\cdot n!$, and $f(z)$ is analytic at t. (III) Let $\varphi(n)>0$ be any function for which $\lim_{n\to\infty}k^n\varphi(n)=\infty$ for every $k>1$, and let D be a finite region identical with the set of interior points of its closure. There exists a function $f(z)$, regular in D, continuous in $\bar{D}$, such that $\rho_n(D;f)<\varphi(n)$, but the boundary of D is a cut for $f(z)$.

Part 2 deals with the behavior of $\rho_n=\rho_n(E;f)$, where E is a closed nowhere dense set not separating the plane, and $f(z)$ is an arbitrary continuous function on E. (IV) Let $M(r)>0$ be any function increasing to ∞ for $r\to\infty$ fast enough so that $M(r)/r^N\to\infty$ for every N, and let E be an infinite set. There exists a positive function $\varphi(n)$, such that (3) $\rho_n(E;f)<\varphi(n)$ implies that $f(z)$ can be continued from set E to the whole plane, the function obtained by the resulting continuation being an entire function with $\max|F(z)|<M(r)$ $(|z|=r)$.

(V) Whatever be $\varphi(n)>0$, $n=1,2,\cdots$, and $\omega(\delta)>0$ $(\omega(\delta)\to 0$ as $\delta\to 0)$, there exists a perfect set of points $P\subset[0,1]$ and a function $f(x)$ continuous on P, such that $\rho_n(P;f)<\varphi(n)$,

Source: Mathematical Reviews, Vol. 10, No. 1

MERGELYAN, S. N.

"Concerning the Optimum Approximations in the Complex Region," (Doctor's dissertation), Uspekhi Matemat. Nauk, 4, No.5, 1949

Math. Inst. im. Steklov, AS USSR

MERGELYAN, S. N.

Mergelyan, S. N. - "On the integration of analytic functions in the fields of a complex variable", Doklady (Akad. nauk Arm. SSR), Vol. X, No. 3, 1949, p. 101-06, (Resume in Armenian).

So: U-4630, 16 Sept. 53, (Letopis 'Zhurnal 'nykh Statey, No. 23, 1949).

Mergelyan, S.N.

Mergelyan, S. N. On best approximation in a complex domain. Acta Sci. Math. Szeged 12, Leopoldo Fejér et Frederico Riesz LXX annos natis dedicatus, Pars A, 198–212 (1950). (Russian)

The author considers the best approximation $\rho(f, D)$ by polynomials of degree n to an $f(z)$ which is regular in the region D and continuous on the boundary. The following results are established. (1) If the boundary of D is a smooth curve with continuously turning tangent and $f^{(k)}(z)\in\mathrm{Lip}\,\alpha$, $0<\alpha\leqq 1$, in $\bar{D}$, then $\rho_n(f, D)<Cn^{-k-\alpha+\epsilon}$, $\epsilon>0$. (2) If $\omega(\delta)$ is the modulus of continuity of $f(z)$ in $\bar{D}$, then $\rho_n(f, D)<C\omega(n^{-1+\epsilon})$. (3) Let the boundary of D be the curve $z=z(s)$, s arc length, and let $\gamma(\delta)$ be the modulus of continuity of $z'(s)$. If

$$\int_\epsilon^\delta x^{-1}\gamma(x)dx>\{\log\{\log\epsilon\}\}-\{\log\{\log\delta\}\},$$

then "in general" there is a $\varphi(z)$ of $\mathrm{Lip}\,\alpha$ such that $\limsup \rho_n(\varphi, D)n^\alpha(\log n)^{-\gamma}=\infty$. (4) Results similar to (3) for a special form of $\gamma(\delta)$. (5) If $\int_0 x^{-1}\gamma(x)dx$ converges and $\rho_n(f, D)<Cn^{-k-\alpha}$, $0<\alpha<1$, then $f^{(k)}(z)\in\mathrm{Lip}\,\alpha$ in $\bar{D}$. If $\alpha=1$, $f^{(k)}(z)\in\mathrm{Lip}\,1$ if and only if $\sum_{n=0}^{\infty}n^k\rho_n(f, D)<\infty$. (6) A further theorem inferring properties of $f(z)$ from the magnitude of $\rho_n(f, D)$ under hypotheses too complicated to reproduce here. This theorem implies that $\rho_n(f, D)$ may tend to zero arbitrarily slowly and still imply that $f(z)$ is infinitely differentiable at a boundary point if D behaves suitably near that point.

R. P. Boas, Jr. (Evanston, Ill.).

Source: Mathematical Reviews, Vol. 12, No. 3.

1. MERGELYAN, S. N.

2. USSR (600)

4. Convergence

7. General concept of convergence of a sequence of functions. Soob.Inst.mat. i mekh. AN Arm. SSSR, no. 5, 1950.

9. Monthly List of Russian Accessions, Library of Congress, April 1953, Uncl.

MERGELYAN, S. N.

USSR/Mathematics - Integration Sep/Oct 51

"An Integral Connected With Analytical Functions," S. N. Mergelyan, Sec of Math and Mech, Acad Sci Armenian SSR

"Iz Ak Nauk SSSR, Ser Matemat" Vol XV, No 5, pp 395-400

Considers the problem on the integrability, over the area of a circle, of the modulus of an arbitrary function which is analytic and bounded in the circle. Namely, considers the integral of the type $S = \int\int_{|z|<1} |f(z)|\, dS$.

Submitted by Acad M. V. Keldysh, 30 Jan 51.

189T56

MERGELYAN, SM.

Functions

Some problems of a constructive theory of functions. Trudy Mat. inst. No. 37 1951

Monthly List of Russian Accessions, Library of Congress, August, 1952. UNCLASSIFIED

MERGELYAN, S. N.

USSR/Mathematics - Topology, Measure Theory 1 Apr 51

"Concerning M. A. Lavrent'yev's Theorem," S. N. Mergelyan, Sector Math and Mech, Acad Sci Armenian SSR

"Dok Ak Nauk SSSR" Vol LXXVII, No 4, pp 565-568

Derives new and sufficiently simple proof for following theorem: Any function f(z) continuous on nowhere dense bounded continuum K not dividing surface is resolvable in series of polynomials in z which series converge uniformally to f(z) in K. Submitted 1 Feb 51 by Acad M. A. Lavrent'yev.

1:9T55

MERGELYAN, S. N.

USSR/Mathematics - Representation of Functions by Series 21 May 51

"Representation of Functions by Series of Polynomials in Closed Sets," S. N. Mergelyan, Math Sec, Acad Sci Armenian SSR

"Dok Ak Nauk SSSR" Vol LXXVIII, No 3, pp 405-408

Mergelyan solves for arbitrary closed sets and with utmost completeness the problem: Where and to what can polynomials in z coverage uniformly? Cf. Walsh, "Interpolation and Approximation by Rational Functions," 1935; Farrell, "Amer J of Math" 54, 571, 1932. Mergelyan establishes the following theorem: In order that any continuous

186T46

USSR/Mathematics - Representation of Functions by Series (Contd) 21 May 51

function f(z) analytical at int points of E be expanded in series of polynomials in z converging (i.e., series) uniformly in E to f(z), it is necessary and sufficient that closed set E does not divide the plane. Submitted 26 Mar 51 by Acad M. V. Keldysh.

186T46

USSR/Mathematics - Approximation 11 Aug 51
of Complex Functions

"Certain Fundamental Problems of the Theory of Best Approximations of Functions of a Complex Variable," S. N. Mergelyan, Sector of Math, Acad Sci Armenian SSR and Yerevan State U imeni Molotov

"Dok Ak Nauk SSSR" Vol LXXIX, No 5, pp 731-734

Considers a closed connected set E located in the plane of complex variable z and possessing a connected complement, and also functions f(z) defined and continuous in E and analytical at each int point of E. Derives a number of results clarifying the

210T56

USSR/Mathematics - Approximation of Complex Functions (Contd) 11 Aug 51

quant and qual sides of the dependence of rho on the set and functions in the case of an arbitrary continuum, where rho is the lower bound of the absolute difference between f(z) and the approximating polynomical P(z). Submitted by Acad M. V. Keldysh 9 Jun 51.

210T56

MERGELYAN S. N. (Sector of Math)

MERGELYAN, S. N.

USSR/Mathematics - Approximations Mar/Apr 52

"Uniform Approximations of Functions of a Complex Variable," S. N. Mergelyan

"Uspekh Matemat Nauk" Vol VII, No 2 (48), pp 32-122

Discusses uniform approximations by polynominals and rational functions, uniform approximations by entire (integral) functions, and best approximations on arbitrary continua.

214T53

MERGELYAN, S.N.

Mergelyan, S.N.

Mathematical Reviews
May 1954
Analysis

10-4-54 LL

Mergelyan, S. N. On completeness of systems of analytic functions. Uspehi Matem. Nauk (N.S.) 8, no. 4(56), 3–63 (1953). (Russian)

A clear expository article with full proofs on the closure of $\{1, z, z^2, \ldots\}$ in certain spaces of regular functions. L^2-approximation with and without weight functions in bounded and on unbounded sets is discussed. Most of the results have been announced before. New is a theorem of M. Keldyš which concludes the completeness of polynomials in a domain D from the completeness of rational functions with poles outside D under a certain geometrical condition on D. Special attention is given to the closure of polynomials in 'lunes', domains which are homeomorphic to $\{|z|<1, |z-\frac{1}{2}|>\frac{1}{2}\}$. The principal papers summarized are M. M. Džrbašyan, Dissertation, Erevan, 1948; Doklady Akad. Nauk SSSR (N.S.) 62, 581–584 (1948); Doklady 1040; 67, 15–18 (1949); 74, 173–176 (1950) [these Rev. 10, 364; 11, 94, 95; 12, 248]; M. Keldyš, Mat. Sbornik N.S. 5(47), 391–401 (1939); 16(58), 1–20 (1945); these Rev. 6, 64; C. R. (Doklady) Acad. Sci. URSS (N.S.) 4, 171–174 (1936); 30, 778–780 (1941) [these Rev. 3, 114]; A. I. Markuševič, Dissertation, Moscow, 1934; C. R. (Doklady) Acad. Sci. URSS (N.S.) 44, 262–264 (1944) [these Rev. 6, 179]; A. Šaginiyan, ibid. 27, 318–320 (1940); 45, 50–52 (1944); 48, 11–14 (1945); Izvestiya Akad. Nauk SSSR. Ser. Mat. 5, 285–296 (1941); Dissertation, Moscow, 1945; Doklady Akad. Nauk Armyan. SSR 5, 97–100 (1946) and

(over)

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several other papers in this journal which were not available for review [these Rev. 7, 64, 285; 8, 455].

W. H. J. Fuchs (Ithaca, N. Y.).

MERGELYAN, S. N.

USSR/Mathematics - Approximations 21 Aug 53
Speed

"Speed of Approximation of Functions by Polynomials on Arbitrary Continua," S. N. Mergelyan, Sector of Math, Acad Sci Armenian SSR

DAN SSSR, Vol 91, No 6, pp 1271-1274

Evaluates the best approximations by series of polynomials that are close to the exact value and that are correct for arbitrary bounded closed and connected sets E (continua). Presented by Acad M. V. Keldysh 25 Jun 53.

275T80

MERGELYAN, S.N.; TAMADYAN, A.P.

On the absoluteness of a class in non-Jordanic areas. Isz.AN Arm. SSR Ser. FMET nauk 7 no.2:1-17 Mr-Ap '54. (MLRA 8:3)
(Functions, Analytic)

MERGELYAN, S.N.

Mergelyan, S. N. On weighted approximations by polynomials. Dokl. Akad. Nauk SSSR (N.S.) 97, 597–600 (1954); erratum, 101, 196 (1955). (Russian)

Let $h(x)$ be a bounded, non-negative function. Let C_h denote the Banach-space of functions $f(x)$ defined and continuous on the whole real axis and such that $h(x)f(x)\to 0$ as $|x|\to+\infty$ with the norm $\|f\|=\sup|h(x)f(x)|$ $(-\infty<x<\infty)$. The following results are obtained, giving a new solution of the Bernstein approximation problem (for a solution in different terms see the paper reviewed above).

Let $M_h(z)=\sup|P(z)|$ where P runs through all polynomials with $\|P\|\leq 1$ (C_h norm). (1) $S=\{x^n\}$ $(n=0,1,2,\cdots)$ is total in C_h, if and only if $M_{h(x)/(1+|x|)}(\alpha)=\infty$ for some non-real number α. (2) If $M_h(\alpha)=\infty$ for some non-real α, then $M_h(z)=\infty$ for all non-real z. (3) If $M_h(z)<\infty$ for non-real z, then $M_h(z)<\exp(|z|^{1+\epsilon})$ $(|z|>\mathrm{Re}\,(\epsilon))$ and the closure of S in C_h consists of the entire functions satisfying $|f(z)|<M_h(z)\|f\|$. (4) Let E be a nowhere dense closed set dividing the z-plane into n unbounded domains $D_1,\cdots,D_n$. The space $C_h(E)$ is defined in obvious analogy to C_h. If there is an entire function $G(z)$ such that $|G(z)|<1$ $(z\in E)$, $\sup|G(z)|>1$ $(z\in D_k,\ k=1,2,\cdots)$, then the polynomials are total in $C_h(E)$, if, for every $\rho>0$, $m(2|z|)h(z)\to 0$ as $z\to\infty$ in E. Here $m(r)=\sup|G(z)|$ $(|z|=r)$.

(Author)

1 = F/W

Partial sketch of proof. By the subharmonicity of $\log M_k$, $M_k(a)=\infty$ implies $M_k(t)=\infty$ for a continuum T of t passing through a. If $t \in T$ and P is a polynomial with large $P(t)$, then $(P(t)-P(x))/P(t)(x-t)$ approximates $1/(x-t)$. Similarly for $1/(x-t)$. Since $\{1/(x-t), 1/(x-t)\}$ is total in C_k (i.e., $k\equiv 1$), it is total on C_k. This proves the sufficiency part of (1). The proof even shows totality in $C_{(1+|z|)M(z)}=C'$. If $Q(x)$ is an approximation polynomial of $1/(x-b)$ $(b\neq 0)$ in C', then $p(x)=[(x-b)Q-1]/\epsilon$ has bounded C_k-norm and $|p(b)|$ is large. This proves (2) and the necessity of (1). The proof of (4) is similar to that of (1) with G^p (p large) replacing the polynomial P. The proof of (3) is based on an estimate of the form

$$\|1/(x-t\lambda)-q_\lambda(x)\| < b|a+ib|^{-1}+\phi(a,b)/M_k(a+ib)$$

$(1<|\lambda|<2,\ b>0,\ |a+ib|>3$, q_λ a suitable polynomial, ϕ an explicitly computed function of a and b). The necessity of (1) is not proved in the paper. *W. H. J. Fuchs.*

MERGELYAN, S. N.

USSR

Mergelyan, S. N., and Džrbašyan, M. M. On best approximations by rational functions. Dokl. Akad. Nauk SSSR (N.S.) 99, 673–675 (1954). (Russian)

1 - F/W

The authors prove a direct and a converse theorem on approximation on the unit circumference by rational functions with prescribed poles. Let $\{\lambda\}$ be a sequence of complex numbers and let $\epsilon(\lambda_1, \cdots, \lambda_n)$ denote

$$\{1+\sum'(1-|\lambda_k|)\}^{-1}+\{1+\sum''(1-|\lambda_k|^{-1})\}^{-1} \quad (k \leqq n),$$

with $\sum'$ containing those λ_k for which $|\lambda_k| < 1$, and $\sum''$ containing the rest. If $f(z)$ has a pth derivative in Lip α, then (provided no λ has absolute value 1) the best approximation to f by rational functions of degree n with poles $\lambda_1, \cdots, \lambda_n$ is at most a constant multiple of

$$\{\epsilon(\lambda_1, \cdots, \lambda_n)|\log \epsilon(\lambda_1, \cdots, \lambda_n)|\}^{p+\alpha}.$$

If one of the series in the definition of ϵ diverges (when extended over all λ_k), if for every set of n elements of $\{\lambda\}$ the best approximation to f is at most $\{\epsilon(\lambda_1, \cdots, \lambda_n)\}^{p+\alpha}$, and if the arc γ of $|z|=1$ contains no limit point of $\{\lambda\}$, then f has a pth derivative in Lip α on γ.

R. P. Boas, Jr.

Mergelyan, S. N. Several remarks on S. N. Bernštein's approximation problem. Akad. Nauk Armyan. SSR. Dokl. 20 (1955), 113–119. (Russian. Armenian summary)

Let $h(x)$ be a non-negative weight function $(-\infty<x<\infty)$. Put $M_h(z)=\sup|P(z)|$ where P runs through all polynomials satisfying $h(x)|P(x)|\leqq 1$ $(-\infty<x<\infty)$. The author proved recently: If C_h is the Banach space of functions $g(x)$ continuous on the real axis and such that $h(x)g(x)\to 0$ as $|x|\to\infty$ with the norm $\|g\|=\sup_x h(x)|g(x)|$, then the polynomials in x are fundamental in C_h if and only if $M_{h(x)/(1+|x|)}(z)=\infty$ for all non-real z [Dokl. Akad. Nauk SSSR (N.S.) 97 (1954), 597–600; MR 16, 1104]. In this paper the author points out that this does not yet give a very explicit solution to the problem of approximability by weighted polynomials. He underlines this remark by proving the following odd facts: a) If $\mu(x)\geqq 0$, $\lim_{|x|\to\infty}\mu(x)=0$, then there exists an $h(x)$ such that the

Menger-Wyman, S.10.

polynomials are fundamental in $C_{\mu k}$, but not in C_k. b) There is an $h(x)$ such that $\{x^k\}_{k=0}^{\infty}$ is fundamental in C_k, but $\{x^k\}_{k=1}^{\infty}$ is not. c) Changing $h(x)$ at one point may change from fundamentality to the contrary. d) If $\lim_{|x|\to\infty} v(x)|x|^k=0$ $(k=0, 1, \cdots)$, then there exists an $h(x)$ such that $\{x^k\}_{k=0}^{\infty}$ is fundamental in C_h and $\limsup h(x)/v(x)>0$.

All the weight functions used in the constructions vanish except on a discrete set of points.

The paper concludes with some remarks about interpolation series

$$\sum_{n=1}^{\infty} \frac{C_n G(z)}{G'(\lambda_n)(z-\lambda_n)},$$

where the λ_n are real numbers satisfying $|\lambda_{n+1}/\lambda_n| \geqq k>1$ and $G(z)=\prod_{k=1}^{\infty}(1-z/\lambda_k)$. *W. H. J. Fuchs* (Ithaca, N.Y.).

2

2/2

MERGELYAN, S.N.

General metric criterion for the completeness of a system of polynomials. Dokl. AN SSSR 105 no.5:901-904 D '55. (MLRA 9:3)

1. Chlen-korrespondent AN SSSR; 2. Institut matematiki Akademii nauk ArmSSR i Moskovskiy gosuderstvennyy universitet imeni M. V. Lomonosova.

(Polynomials)

MERGELYAN, S. N

Call Nr: AF 1108825

Transactions of the Third All-union Mathematical Congress (Cont.) Moscow, Jun-Jul '56, Trudy '56, V. 1, Sect. Rpts., Izdatl'stvo AN SSSR, Moscow, 1956, 237 pp.

Mel'nik, I. M. (Rostov-na-Donu). Behavior of a Gauchy Type Integral in the Points of Discontinued Density and Exceptional Cases of the Riemann Boundary Problem. 89

Men'shov, D.Ye. (Moscow). On the Limits of a Subsequence of Partial Sums of a Trigonometric Series. 89-90

Mergelyan, S. N. (Moscow). The Problem of the Best Majorant. 90

Mirak'yan, G. M. (Odessa). On Approximating by Means of Expressions Containing Cylindric Functions. 90-91

Mention is made of Voronovskaya, Ye.V. and Bernshteyn, S. N.

There is 1 USSR reference.

Myshkis, A. D. (Minsk). Vigant, Ye.I. (Riga), Lepin, A. Ya. (Minsk). Improper Integrals in n-space. 91-92

Card 28/80

MERGELYAN, S. N.

3 1/8

1-FW

Mergelyan, S. N. Harmonic approximation and approximate solution of the Cauchy problem for the Laplace equation. Uspehi Mat. Nauk (N.S.) 11 (1956), no. 5(71), 3-26. (Russian)

Let σ be a sufficiently smooth homeomorph of a disc embedded in 3-dimensional Euclidean space. The author considers the problem of approximating on σ simultaneously a continuous function f_1 by a harmonic polynomial and a second continuous function f_2 by the normal derivative of this polynomial. An explicit bound for the degree of approximation is found which involves the degree of the approximating polynomial, the modulus of continuity of f_1 and f_2 and a function measuring the deviation of σ from a flat surface. [Theorem 1 of the paper states this bound incorrectly, since it does not give the right answer for a flat disc. The proof seems correct except for the assumption that (14) defines a number α tending to zero with λ.] If σ is replaced by the homeomorph τ of a sphere, then a necessary condition for simultaneous approximability to within ε of f_1 by H, f_2 by $\partial H/\partial n$ is

Mergelyan, S. N.

$$\iint_{\sigma}\left(h_1(Q)\frac{\partial}{\partial n}\frac{1}{r_{PQ}}-\frac{1}{r_{PQ}}h_2(Q)\right)dS=0$$

for P outside σ. For sufficiently smooth σ this condition is also sufficient.

Weighted approximation on σ is also considered and proved possible (within ε), if the weight function tends to zero like $\exp(-|QQ_0|^{-p})$ ($p>2$) near a point $Q_0\in\sigma$. The author also treats several problems of majorisation for harmonic functions. An example is the following result. If $u(P)$ is harmonic in the 3-dimensional unit-sphere and continuous together with its first partial derivatives on the boundary of the sphere, if further for a fixed point A on the boundary and a variable point P

$$|u(P)|+\left|\frac{\partial u}{\partial n}(P)\right|<\exp(-|PA|^{-p}),$$

$p>2$, then $u\equiv 0$.

W. H. J. Fuchs.

MERGELYAN, S. N.

Mergelyan, S. N. Weighted approximations by polynomials. Uspehi Mat. Nauk (N.S.) 11 (1956), no. 5(71), 107–152. (Russian)

A very clear account of weighted approximation by polynomials on the whole real axis and on unbounded, nowhere dense, closed sets in the z-plane. [Mergelyan, Dokl. Akad. Nauk SSR (N.S.) 97 (1954), 597–600; Akad. Nauk Armyan. SSSR Dokl. 20 (1955), 113–119; MR 16, 1104; 17, 148; Děrbaĭyan, Mat. Sb. N.S. 36(78) (1955), 353–440; MR 17, 31; Sogomyan, Akad. Nauk Armyan. SSR. Dokl. 3 (1945), 33–38]. Although most of the results were published before in the papers just cited and the literature quoted in them, this exposition contains some simplifications and additions. As an example: Let $0 \le h(x) \le 1$ $(-\infty < x < \infty)$, define $M(h(x))$ as the class of polynomials $P(x)$ such that $h(x)|P(x)| < 1$ $(-\infty < x < \infty)$. Let $C(h)$ be the space of continuous functions $f(x)$ such that $h(x)f(x) \to 0$, as $|x| \to \infty$, with the norm

$$\|f\| = \sup_{-\infty < x < \infty} h(x)|f(x)|.$$

The polynomials are fundamental (i.e., closed) in $C(h)$ if and only if $\int_{-\infty}^{\infty} \frac{\log h(x)}{1+x^2}\,dx = -\infty$. Here the sup is taken over all $P \in M(h)$ [illegible]

MERGELYAN, S.N.

SUBJECT USSR/MATHEMATICS/Theory of approximations CARD 1/1 PG - 323
AUTHOR MERGELJAN S.N.
TITLE On the approximation problem due to S.N.Bernštejn.
PERIODICAL Doklady Akad. Nauk 107, 25-28 (1956)
reviewed 10/1956

Bernštejn has given the problem (Bull.Math.France 52, 399 (1924)) to find the conditions which must be satisfied by the function $h(x)$ $-\infty<x<+\infty$ in order that an arbitrary continuous function $f(x)$ for which $\lim_{x\to\pm\infty} h(x)f(x) = 0$ with the weight $h(x)$ can be approximated by polynomials

$$h(x)\,|f(x) - P(x)| < \varepsilon \qquad -\infty<x<+\infty .$$

The author solves this problem for an arbitrary function $h(x)$ which can be defined on the real axis as well as on an arbitrary closed, nowhere dense set of the z-plane. The starting point of the investigation is a theorem on necessary and sufficient conditions for the completeness of a system of polynomials with the weight $h(x)$. A new process of regulation for the weight functions is given.

INSTITUTION: Lomonossow University, Moscow.

Mergelyan, S. N. Harmonic approximation and approximate solution of Cauchy's problem for Laplace's equation. Dokl. Akad. Nauk SSSR (N.S.) 107 (1956), 644-647. (Russian)

Let σ be a smooth surface lying in an open sphere G in 3-space, and let $\gamma(\delta)$ be the modulus of smoothness of σ, i.e. the supremum of the magnitude of the angle between the normals to σ at P_1 and P_2 for $|P_1P_2|\leq\delta$. Further, let f_1 and f_2 be continuous real-valued functions on σ, and let $\omega(\delta)$ be their joint modulus of continuity:

$$\omega(\delta)=\max_{i=1,2} \sup |f_i(P_1)-f_i(P_2)| \text{ for } |P_1P_2|\leq\delta.$$

The infimum of the expression

$$\sup_{P\in\sigma} |f_1(P)-H(P)| + \sup_{P\in\sigma} \left| f_2(P)-\frac{\partial H}{\partial n} \right|$$

1) taken over all harmonic polynomials H of degree not exceeding m will be denoted by $E_m(f_1, \sigma)$; 2) taken over all harmonic functions H on G such that $|H|\leq M$ will be denoted by $\mathcal{E}_M(f_1, \sigma)$.

A number of approximation results based on estimates for $E_m(f_1, \sigma)$ and $\mathcal{E}_M(f_2, \sigma)$ are given. The following two theorems are typical. Theorem: For any $\varepsilon>0$ there exist constants C_1 and C_2 such that