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METHOD OF ELECTRICAL SCANNING BY AN ANTENNA RADIATION PATTERN (U)  
FEB 81 L N DERYUGIN, A N OSOVITSKIY

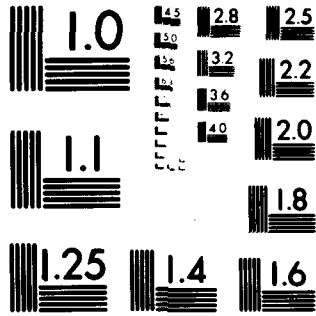
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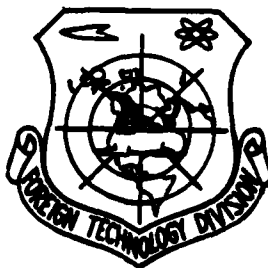


METHOD OF ELECTRICAL SCANNING BY AN ANTENNA  
RADIATION PATTERN

by

L. N. Deryugin, A. N. Osovitskiy and V. Ye. Sotin

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# UNEDITED MACHINE TRANSLATION

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(6) METHOD OF ELECTRICAL SCANNING BY AN ANTENNA RADIATION PATTERN, [15/6]

By: L. N. Deryugin; A. N. Osovitskiy and V. Ye. Sotin

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WP-AFB, OHIO.

U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
Б б	<i>Б б</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З з	<i>З з</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й й	<i>Й й</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch.
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
When written as ë in Russian, transliterate as yě or ě.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh
cos	cos	ch	cosh	arc ch	cosh
tg	tan	th	tanh	arc th	tanh
ctg	cot	cth	coth	arc cth	coth
sec	sec	sch	sech	arc sch	sech
cosec	csc	csch	csch	arc csch	csch

Russian      English

rot      curl  
lg      log

## METHOD OF ELECTRICAL SCANNING BY AN ANTENNA RADIATION PATTERN.

L. N. Deryugin, A. N. Osovitskiy and V. Ye. Sctin.

Invention relates to the region of radio engineering.

Are noted for the methods of electrical scanning the antenna radiation pattern by changing the signal frequency.

A deficiency/lack in the known methods is the inconstancy of the emitted frequency, which is changed depending on the position of ray/beam.

For the purpose of the retention/preservation/maintaining the constancy of the emitted frequency during the scanning by ray/beam using the proposed method the signals of two frequencies are supplied to the opposite inputs of the open nonlinear waveguide, in this case the control of angle of radiation is realized by a simultaneous change in the frequency of the supplied signals with the

retention/preservation/maintaining of the constancy of the sum of their frequencies, emitted directly from the open waveguide.

Scanning by a radiation pattern is realized as follows.

Along the open nonlinear waveguide towards one to another are propagated two intense waves of frequencies  $\omega_1$  and  $\omega_2$ . At each point of the waveguide, which possesses quadratic nonlinearity, except the assigned currents of initial waves, appear the currents of combination frequencies ( $\omega_1 \pm \omega_2$ ). The phase delays/retardings/decelerations of the wave  $\gamma$  of the currents of combination frequencies depend on the geometry of the waveguide of the types of initial waves and can change over wide limits.

During the propagation of wave with the delay/retarding/deceleration  $\gamma$  on the open regular waveguide the radiation/emission of this wave into free space is possible under condition  $|\gamma| < 1$  and it occurs at angle  $\theta$ , calculated off the normal to the axis of the waveguide where  $\sin \theta = \gamma$ .

Utilizing mathematical vehicle it is possible to show that radiation condition can be fulfilled only for the sum frequency, for which is possible the inequality

$$\gamma = \frac{\omega_1 \beta_1 - \omega_2 \beta_2}{\omega_1 + \omega_2} < 1$$

Thus, during the propagation along the open retarding waveguide, which possesses nonlinear properties, two contrary waves with the frequencies  $\omega_1$  and  $\omega_2$  from the waveguide occur the radiation/emission of sum frequency  $\omega_1 + \omega_2$ , moreover with the simultaneous a change in the frequencies  $\omega_1$  and  $\omega_2$  the emitted sum frequency remains constant for any angle of radiation.

Page 2.

Object/subject of invention.

The method of electrical scanning by the antenna radiation pattern by change signal frequencies, that is characterized by the fact that, for purposes of the retention/preservation/maintaining the constancy of the emitted frequency, the signals of two frequencies supply to the opposite inputs, for example, of the open nonlinear waveguide, in this case control of angle of radiation realize by a simultaneous change in the frequency of the supplied signals with the retention/preservation/maintaining of the constancy of the sum of their frequencies, emitted directly from the open waveguide.