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Birefringent selector of laser generation wave length

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***Abstract**: selector has a stack of plane-parallel plates of single axis crystal, placed by Brewster's angle relative to an optical axis of the device. Crystal optical axis of the plates are oriented relative to normals to their surfaces by the same angle β, defined from relation , where n - mean refraction factor of the crystalline material. The selector provides wide-range readjustment of the laser at fluctuation of angle φ in a very narrow band from 45 degrees. EFFECT: maximum selectivity at readjustment of the whole working range of the laser.*
1 cl, 3 dwg

Description

The invention relates to the field of quantum electronics and is designed for tuning the wavelength of the lasing line lasers with a broad line of uniformly accelerated gain.

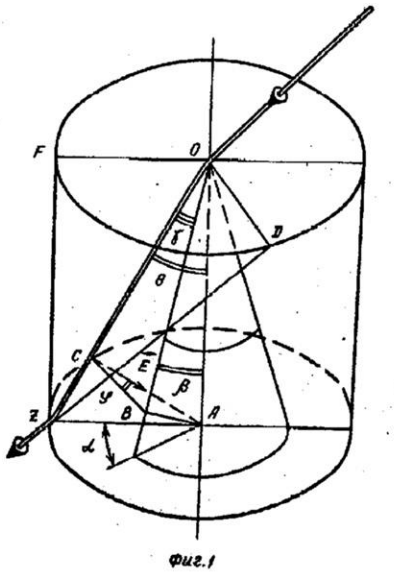
The purpose of the invention - providing maximum selectivity birefringent selector in the restructuring of the entire operating range.

FIG. 1 shows the geometry of the birefringent plate; FIG. 2 - spectral transmission function selector - the prototype and the proposed selectors in the center of the operating range; FIG. 3 - spectral transmission curves selector prototype (curve 1) and of the selector (Curve 2) at the boundaries of the operating range.

Selector contains a stack of plane-parallel plates of uniaxial crystal set at the Brewster angle to the optical axis of the selector with the possibility of a synchronous rotation around the normal to their surfaces. When this crystal optical axis of the plates are oriented with respect to these normals at the same angle β, which is determined from the relationship

$$\beta = \text{Arcsin}\,[1/(2n^2+1)^{1/2}], \quad (1)$$

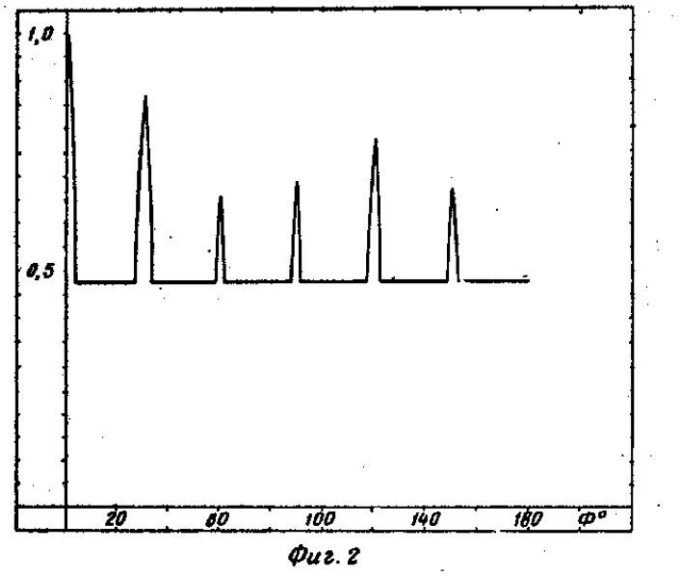
where n - an average refractive index of the used crystal material n = (nl + no) / 2 wherein nl, no - the principal refractive indices.



Фиг.1

Proposed selector operates as follows.

The most acute have transmission peaks in the case where the optical axis of the projection onto the plane ABC, normal to the propagation direction OZ, makes with the plane of incidence OFZA, which contains the vector of polarization of the laser radiation, the angle ϕ, equal to 45^0. FIG. 2 shows the spectral transmission function selector, composed of three plates with the thickness ratio of 1: 2: 9 in a situation where the angle $\phi = 45^0$. The horizontal axis represents the phase difference F, vertical - transmission values of the selector. The transmission function is shown for half the field of free dispersion, the second half is a mirror image of the first.

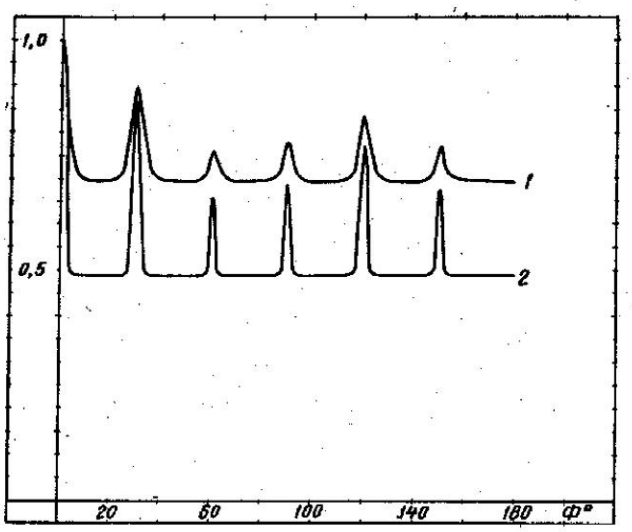


Фиг. 2

Side transmission peaks (Fig. 2) whose amplitude is less than 1, - is a consequence of incomplete isolation units selector partial polarizers. In redesigning the selector by the rotation of the plate, ie. E. The angle α between the projection of the optical axis on the wafer surface and the plane of incidence OFZA, also changes the angle ϕ, leading to a peak broadening bandwidth selector and, even more desirable to increase by amplitude peaks. FIG. 3 (curve 1) shows the transmission function selector at a deviation angle ϕ 15^0 from its optimum value of $\phi = 45^0$. The growth of the amplitude peaks by generating leads to the capture of one of them while trying to readjust to the border of the operating range of the dye or laser crystal, which limits the operating range selector. This is especially true in high-power lasers.

The basis of this selector is put this choice in the orientation of the optical axis of the plate, which would provide wide-range restructuring of the laser when the angle ϕ in a very narrow range in the vicinity of 45^0.

By rotating the plate about axis OA (Fig. 1) an optical axis OB describes some conical surface with an angle β between the axis and the generatrix of the cone. If you choose the angle β such that the cone touched the plane ODZ, making an angle of 45^0 to the plane of incidence OFZA, then, if the center of the operating range corresponds to the point of contact, the rotation of the plate on either side of the point of contact is a big change of the angle γ with almost constant angle ϕ.



Фиг. 3

Claims (1)

1: Birefringent Selector lasing wavelength of the laser, containing a stack of plane-parallel plates of uniaxial crystal set at the Brewster angle to the optical axis of the selector with the possibility of a synchronous rotation around the normal to the surfaces, and the crystal optical axis of the plates are oriented with respect to these normals at the same angle β, wherein in that, in order to maintain maximum selectivity when rebuilding the entire working range, the angle β between the normal and the optical axis of the plates is determined from the relationship $\beta = \text{Arcsin}\,[1/(2n^2+1)^{1/2}]$, where n - an average refractive index of the used crystal material $n = (nl + n0) / 2$, where nl, n0 - the principal refractive indices.