About One Method of Registration of Multilevel Intensities of Double Mode Optical Beam.

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Many problems of contemporary informatics may be solved by increasing the quantity of information in one act of trasfering, reciving or processing (information density in signal). For that purposes one of the most suitables is optical signal which allows multiparametric modulation (frequency, polarization, intensity, etc.) and can have several levels of parameters. Currently increasing information density up to 8-16 bit/signal is real, which may become an important step in information technologies (i.e. this density is equal to the capabilities of human brain), also in other applications such as small mechanical displacements measuments followed by computer processing of information. This kind of measurments are supposed to be done in ALICE program [1]. In the last case it is possible also to get information about the medium state because as a result of dispersion of optical beam the distribution of intensities of different modes is changed differently [2]. Here the difficulty is in distingushing between the influances of the two modes.

In this connection use of 2×2 matrix of polistors is purposed for detecting double mode optical signal with p-level magnitudes of intensity (method may be generalized for up to $n \times n$ case for m-parametric modulation).

Consider 4 polistors with 2 optical windows on the surface of one of three bases, designed for external control of electroconductivity of the given polistor. First window is "trasparent" for frequency ν_1 and ν_2, and the second - for ν_2 $\nu_2 > \nu_1$ (topology of windows is shown on the pic. 1).

Let us consider the case of homogeneous beam with intersity of mode ν:

$$I^{\nu}_{np} = I_{00}(n_p - 1) \tag{1}$$

where n_p is an integer pointing the level of intensity. Then input information p_{ik} for polistor is given by the relation for the electrical current of control.

$$J^{ik}_c = S^{ik}_1 \left(I^{\nu_1}_{n_1} + I^{\nu_2}_{n_2}\right) + S^{ik}_2 I^{\nu_2}_{n_2}, \tag{2}$$

where S^{ik}_j constants are proportional to surfase S_{ik} of window. Indexes are dependant only on the polistor's structural parameters [3, 4].

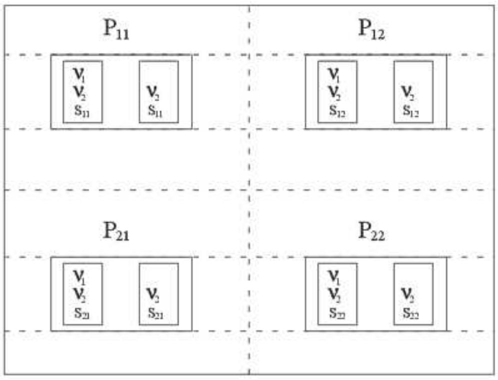
Output currents and voltages on polistors are given by system of electric current equations (indexes i and k are missing).

$$J = J_T(l) - J_c(l)(1 - \delta_{1l}) + \alpha J_c(l)(1 - \delta_{2l}), \qquad l = 1,\ 2,\ \ldots,\ 2p + 1 \tag{3}$$

where l is the number of polistors' $p - n$ junctions, $J_T(l)$ - density of current across the junction when there is no control influence (input infomation), δ_{ql} - Cronecker's symbol.

$$\begin{cases} J_T(e) \text{ for planar polistor is given by following expressions} \\ J_c(l) = \beta_e i_e (1 - e^{V_{e-1}}) + i_e(e^{V_e} - 1) + \beta_{e+1} i_e (1 - e^{-V_{e+1}}) + i_e \delta_e e^{\frac{V_1}{2}} \\ \text{for emitter junction } e \\ J_c(l) = \beta_e i_{e-1}(e^{V_{e-1}} - 1) + i_e(1 - e^{-V_e}) + \beta_{e+1} i_{e+1}(e^{V_{e-1}}) + I_e \\ \text{for collector junction } e \end{cases}$$

Expressions (1)-(3) with given S_{ik} indexes, allow to recover all I^{ν}_{np} magnitudes from input parameters and it is algorithmical base for complicated experimental data computer processing.



Pic. 1.

References

[1] ALICE Experiment, *CERN/LHCC.* 95-71, LHCC/P3, 15 December, 1995.

[2] S. Grigoryan, H. Gulkanyan, H. Karayan, *Using Two Wavelenght Light Beams in the Optical Monitoring Systems.* Preprint of Yerevan Physics Institute, 1571 (7), 2001.

[3] H. Karayan, R. Asatryan, A. Makaryan, *Photoconductividy of bipolar semiconductor structures with respect of surface recombination.* Izv. NAS RA, Physics, v. 34., N5, p. 305.

[4] H. Karayan, *Physical properthies of unhomogeneous semiconductor structures.* PTS, v.19, issu 7, 1985, p. 1367.