

Title	Improvement of efficiency of T. W. T by velocity convergence
Sub Title	
Author	長井, 義男(Nagai, Yoshio)
Publisher	慶応義塾大学藤原記念工学部
Publication year	1966
Jtitle	Proceedings of the Fujihara Memorial Faculty of Engineering Keio University (慶応義塾大学藤原記念工学部研究報告). Vol.19, No.76 (1966. ) ,p.254(36)- 254(36)
JaLC DOI	
Abstract	
Notes	Summaries of Doctor and Master Theses Master of Engineering, 1966
Genre	Departmental Bulletin Paper
URL	<a href="https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO50001004-00190076-0036">https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO50001004-00190076-0036</a>

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# Improvement of Efficiency of T. W. T by Velocity Convergence

Yoshio NAGAI\*

The purpose of this thesis is to improve the efficiency of Traveling Wave Tube. The method is to get rid of the energies which are consumed in the form of heat at the collector. For this purpose I must make the velocities of electrons go to zero at the collector. But as the electrons after used have random velocities, even if I give a definite retarding electric field, I can not make the velocities of all electrons go to zero.

So previously I must converge various velocities upon one velocity. It is called the velocity convergence. I have used a traveling electric field for the velocity convergence, because there is the output of Traveling Wave Tube. Then I assume that the velocity modulation of electron beam after used is expressed by  $v = v_0 + v_1 \sin \varphi$  and density modulation by  $\rho = \rho_0 + \rho_1 \sin \xi$ . And let each phase relation, depth of velocity modulation  $v_1/v_0$ , depth of density modulation  $\rho_1/\rho_0$  and amplitude of traveling electric field  $A$  which is adequate to let the electron beam to velocity convergence by traveling electric field  $E = A \sin (T - X + \theta)$ , using analog computer. The conclusion is that the phase of velocity modulation must advance  $\pi/2$  to that of density modulation and the smaller  $v_1/v_0$ , the bigger  $\rho_1/\rho_0$  and the bigger amplitude of traveling electric field are better.

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