



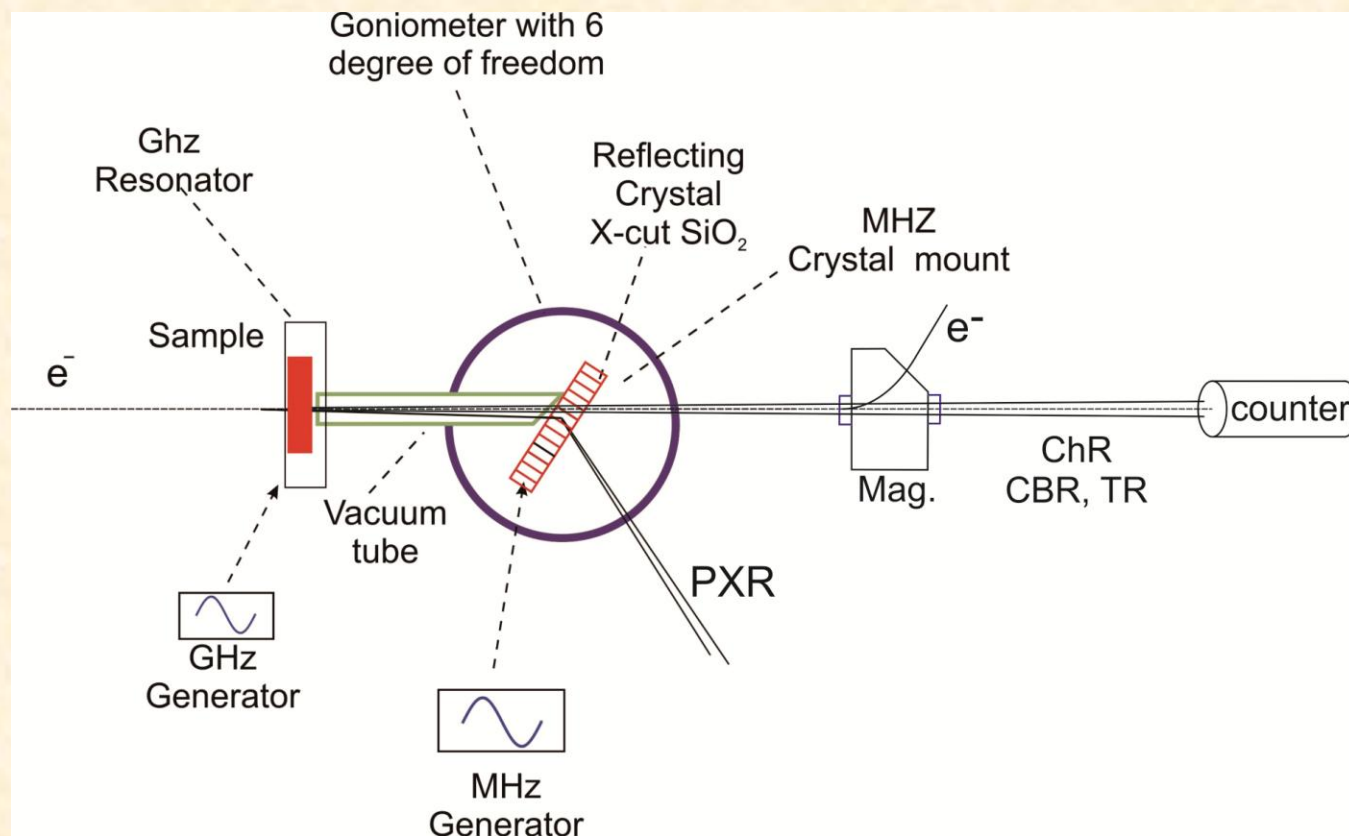
# **INFLUENCE OF EXTERNAL HYPERSONIC FIELDS ON THE CHANNELING RADIATION OF 20 MEV ELECTRONS IN QUARTZ SINGLE CRYSTAL**

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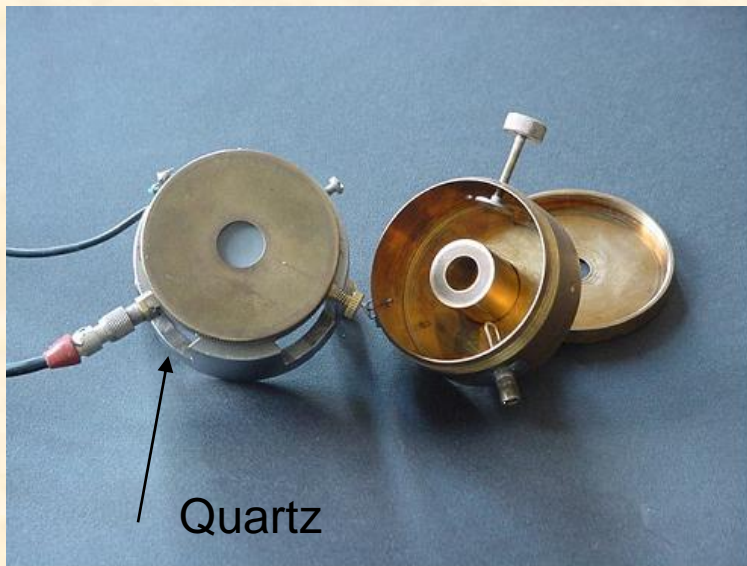
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*Experimental investigations of the channeling radiation (ChR) were conducted on the 20 MeV electron beam of the LEA-50 linear electron accelerator of the Yerevan Physics Institute.*

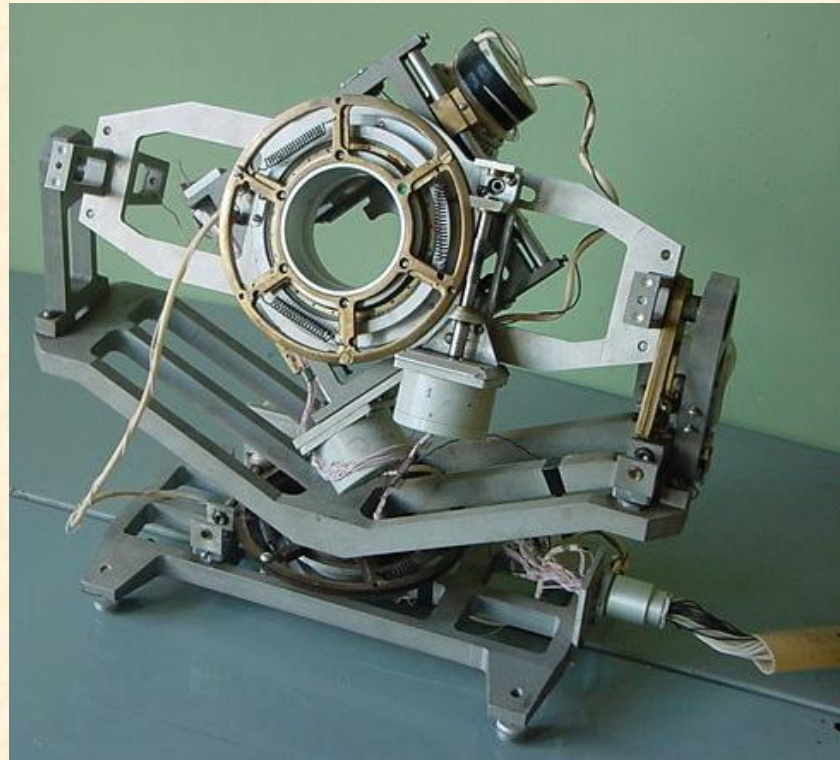
*The experimental setup based on new developed electron beam track was designed to detect channeling radiation in the forward direction.*



*New remote controlled high precision goniometric device with 5 degrees of freedom, new high accuracy hypersonic generator with 100 W power output, and new hypersonic resonators where put signed quartz crystal for generator hyper frequency acoustic wave were developed.*

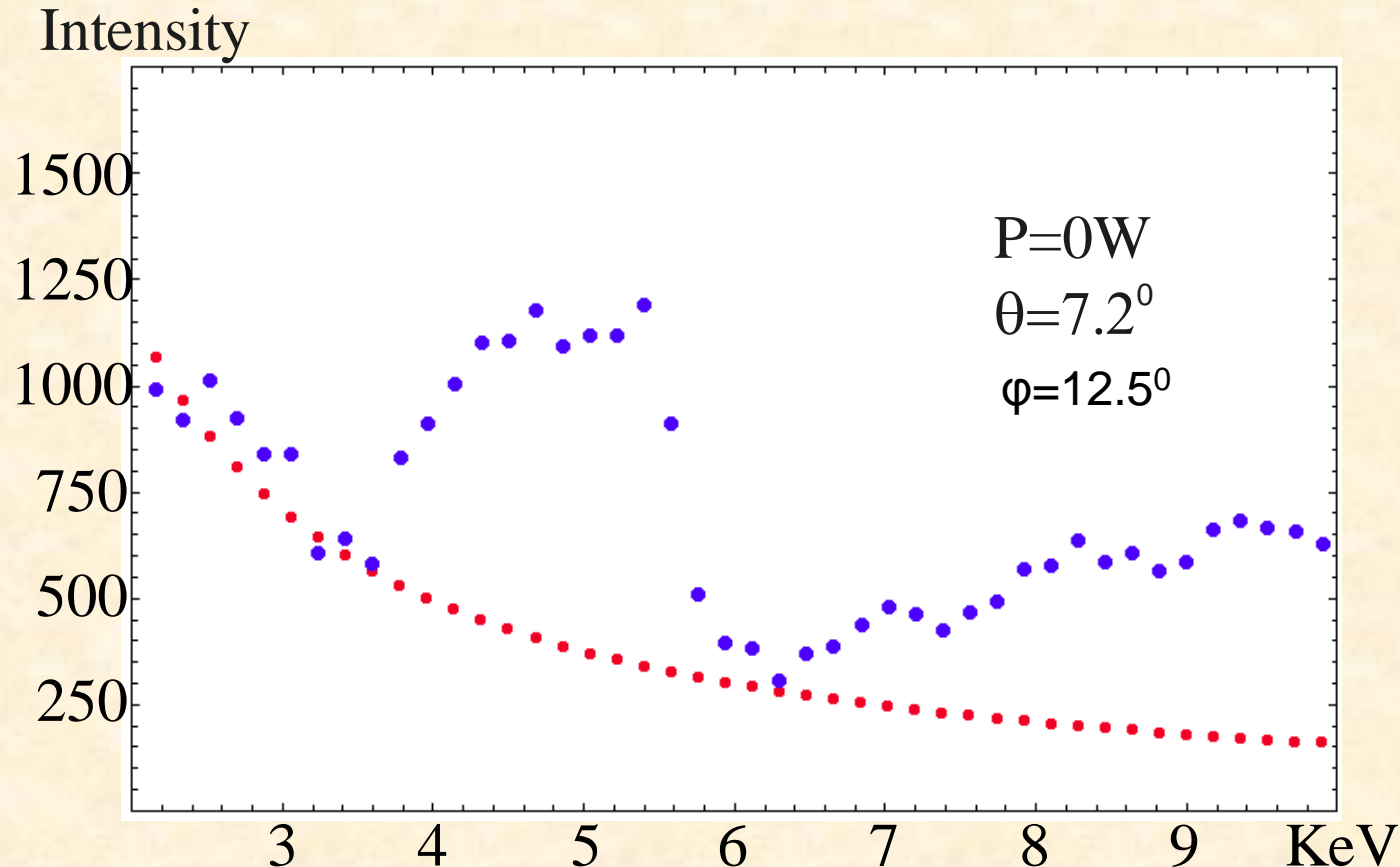


GHz  
*hypersonic resonators*



*goniometer with 5 degrees of freedom*

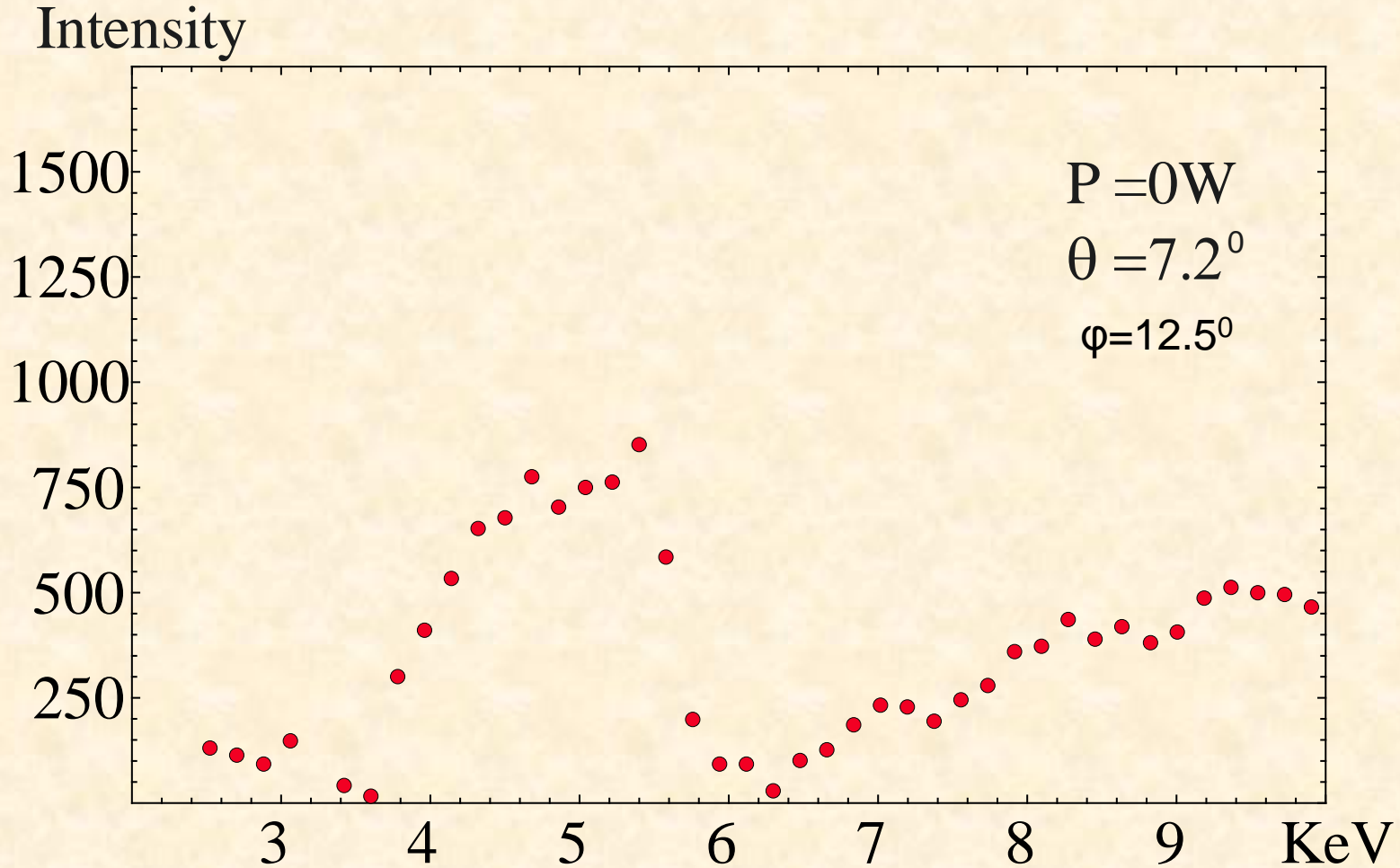
***Channeling radiation spectrum of 20 MeV electrons from the quartz single crystal with the spectrum of bremsstrahlung calculated with the aid of Betty Heitler.***



***The sample of quartz single crystal was taken X-cut for the  $(10\bar{1}1)$  plate and thickness of 1 mm.***

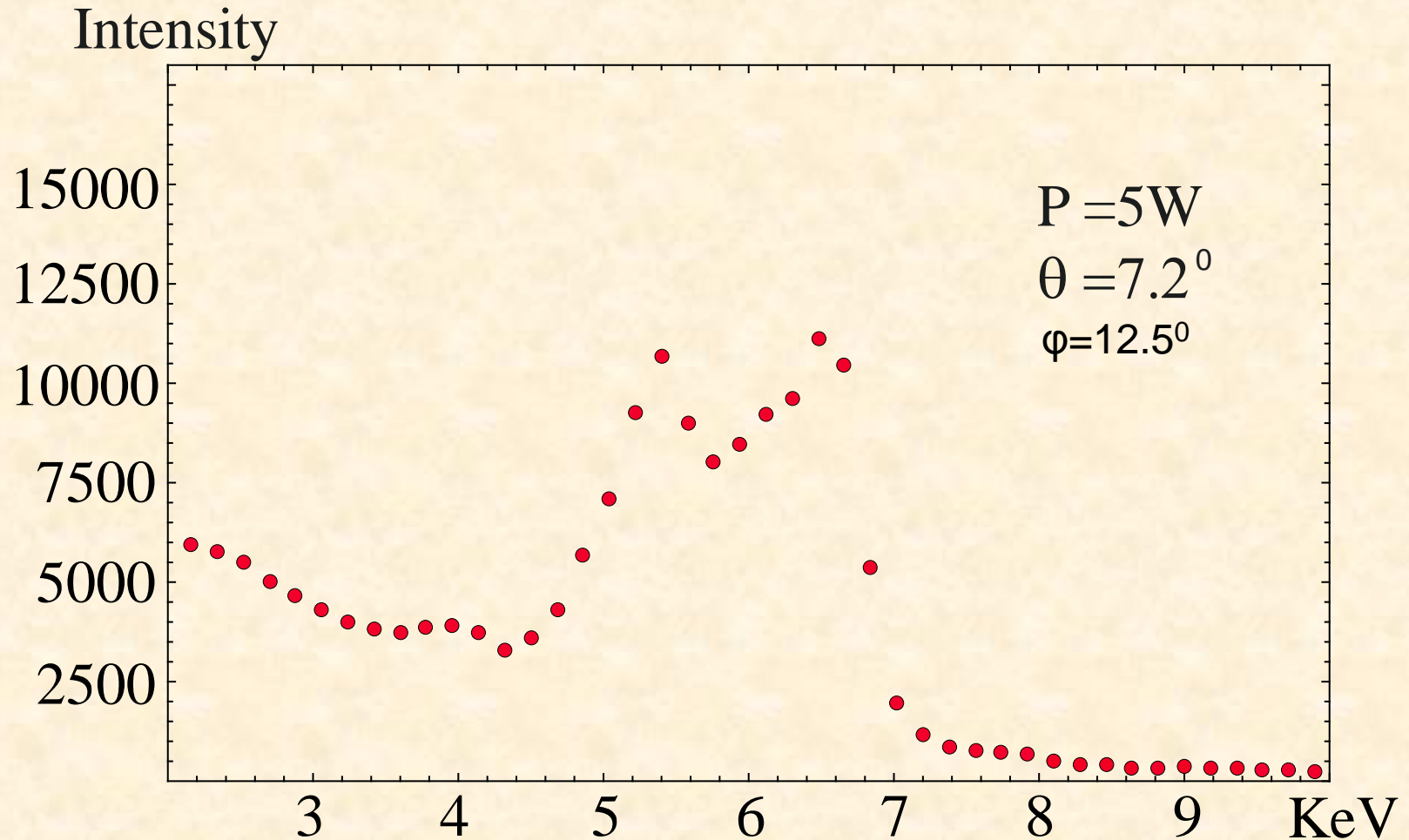


*As it is clear from picture channeled radiation peaks appear in the form of two peaks of the radiation energy 4.5 keV and 5.5 keV.*

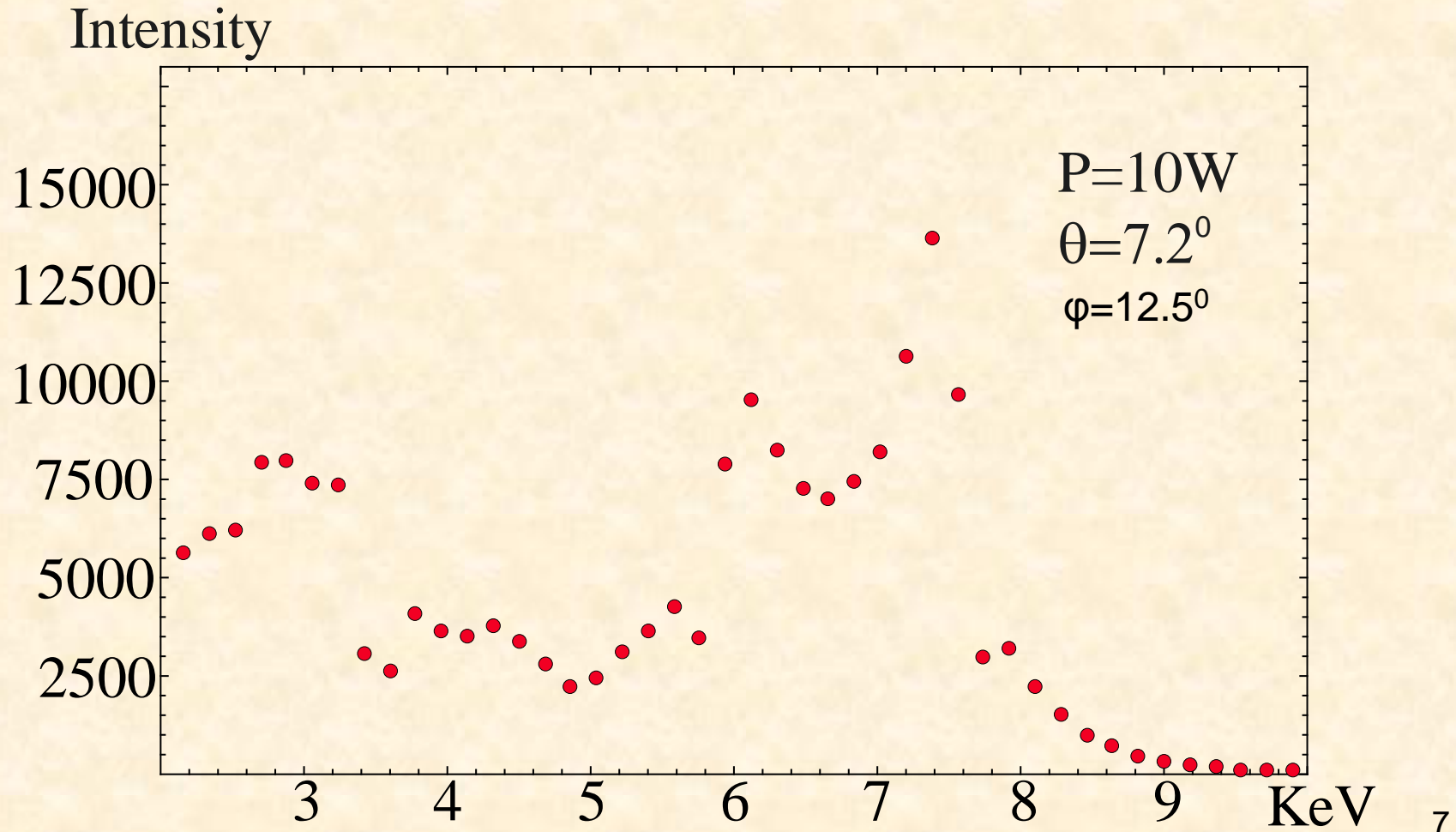


*Planar channeling degree is  $7.2^\circ$  horizontal and  $12.5^\circ$  vertical.*

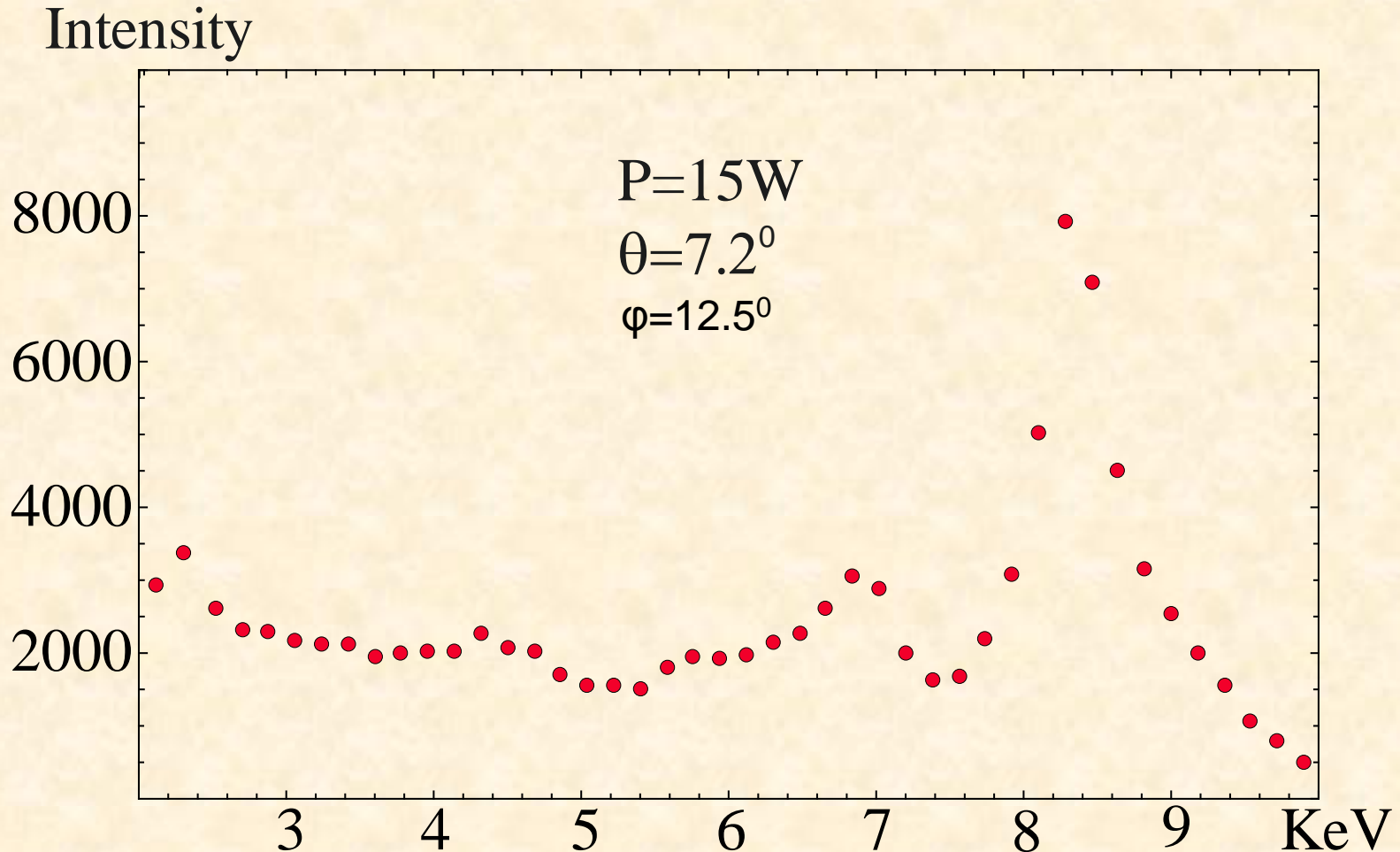
*The influence of hypersonic vibrations were detected.*



*Under the external field causes smart shifts, as well as the intensity and shapes variations of the ChR for duplets 5,8 and 7,5 KeV yields, due to the hypersonic amplitude and frequency changes conducting non-linear effects were obtained.*



*The increase of the hypersonic amplitude lead at first to the decrease, then to increase and finally to saturation of ChR intensity for both lines. This will contribute to the nonlinearity in the acoustic phonon-phonon interactions.*



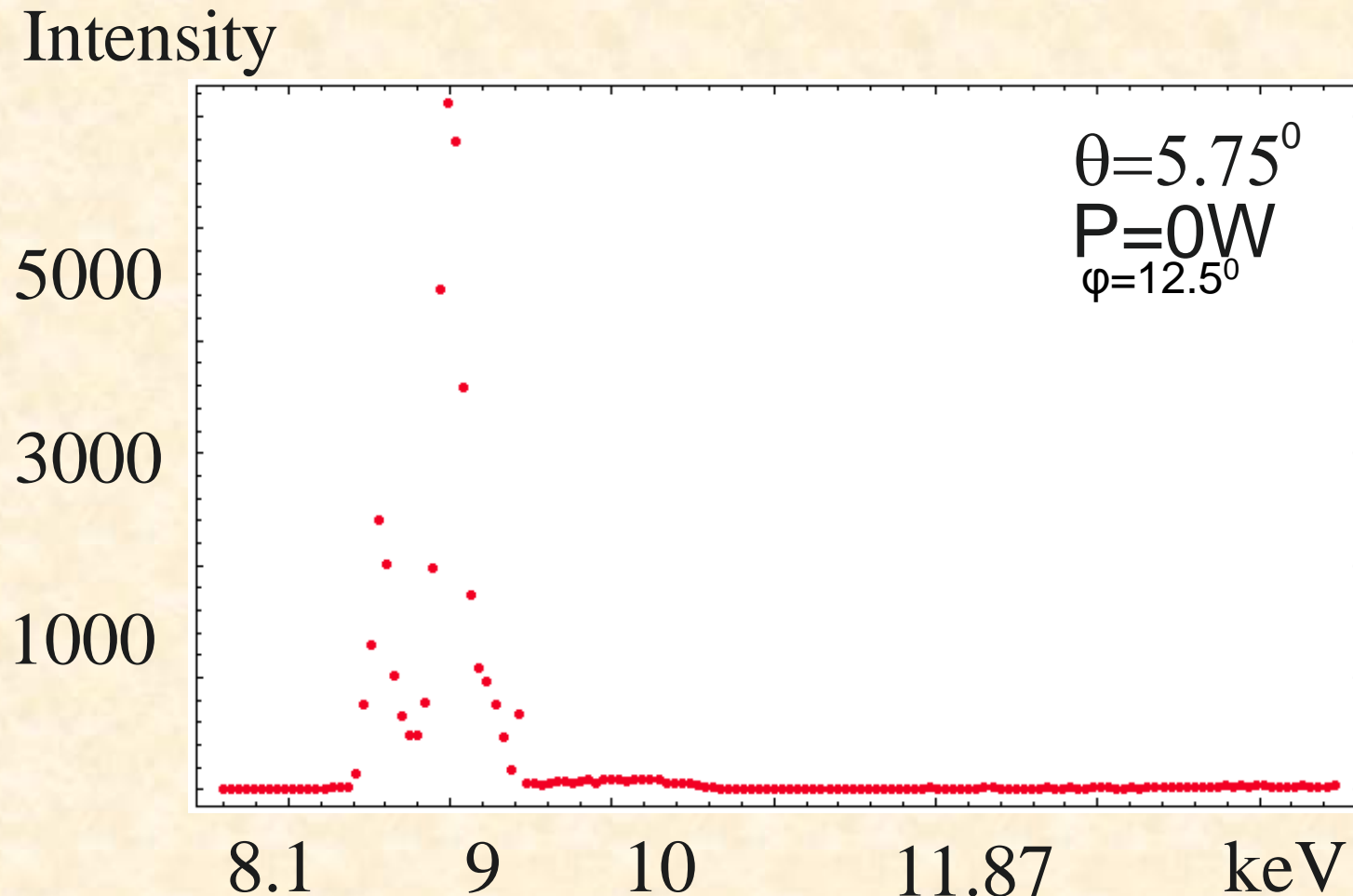


*In this case, with the change of intensity the amplitude simultaneously observed shift of spectral lines in high-energy region. Apparently, this is because the law of conservation of momentum and energy in an elementary act of radiation. To shift the energy of the emitted photon, we have*

$$\Delta(\hbar\omega) = -2n\hbar\omega_s\gamma^2/v_s$$

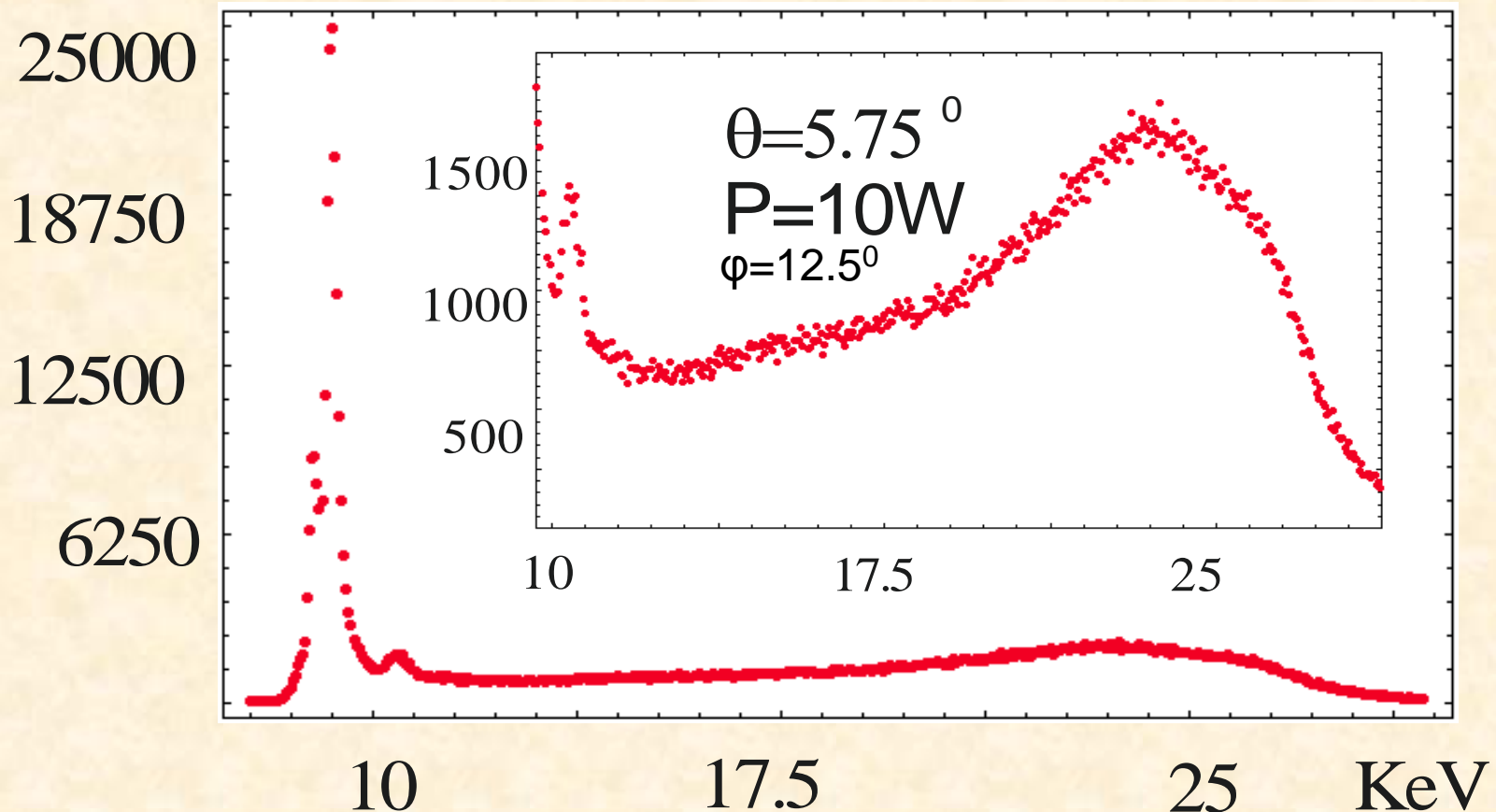
*where  $\omega_s$  and  $v_s$  - the frequency and speed of hypersonic acoustic waves,  $n$  - number of photons involved in the elementary act of radiation,  $\gamma$  - Lorentz-factor of the particle. As can be seen from this expression the shift increases with increasing  $n$ , and it turns out that with the help of acoustic waves can greatly increase the intensity of radiation of channeled relativistic electrons, as well as control other characteristic parameters of the radiation in time and space.*

*Channeling radiation spectrum of 20 MeV electrons from the quartz single crystal when the angle of planar channeling is  $5.75^\circ$  horizontal and  $12.5^\circ$  vertical.*

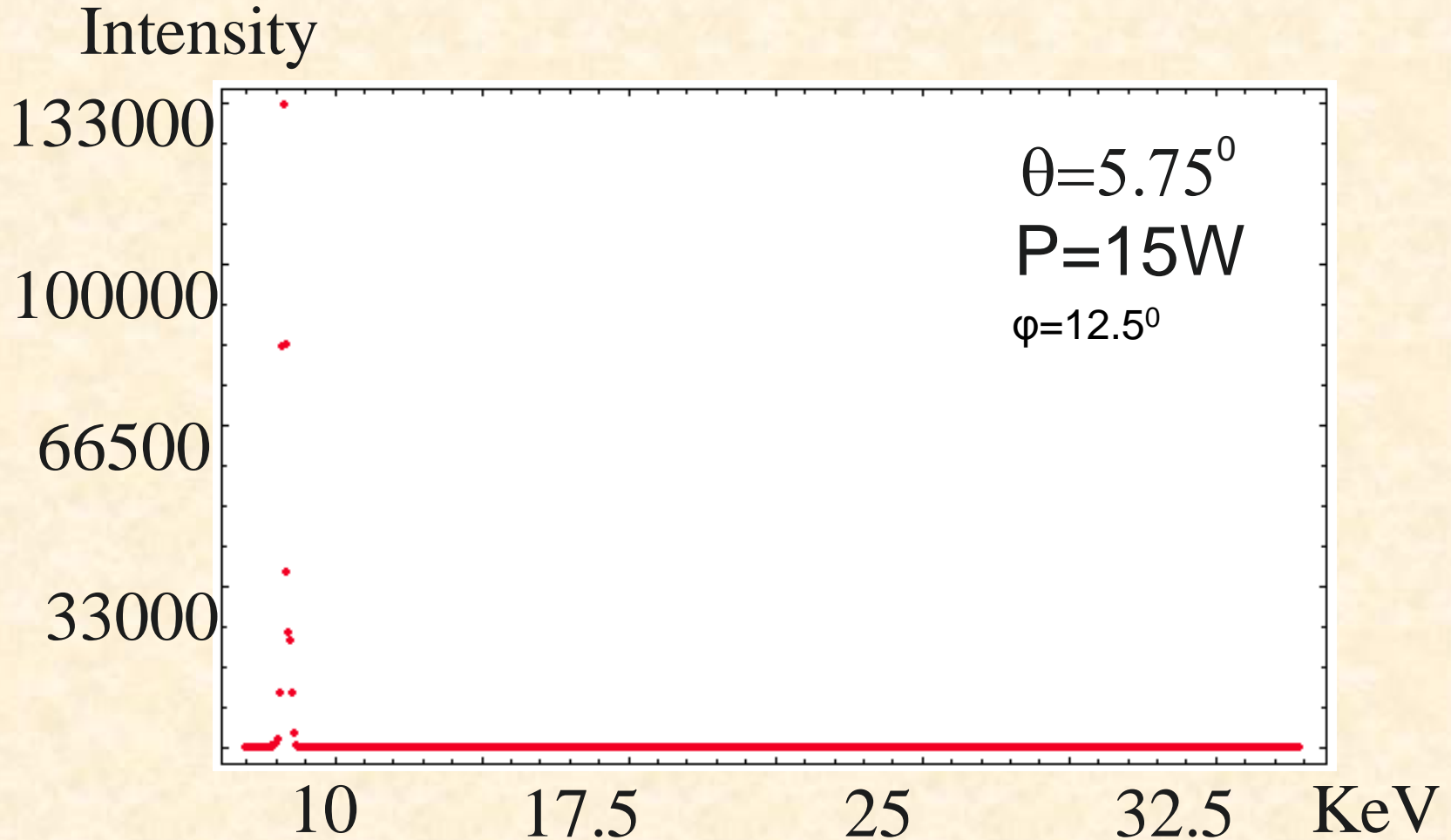


*In the angle of channeling  $5.75^\circ$  ChR increase sharply with increase of the amplitude of the electric field. On the emission spectrum two bands of radiation are also observed .*

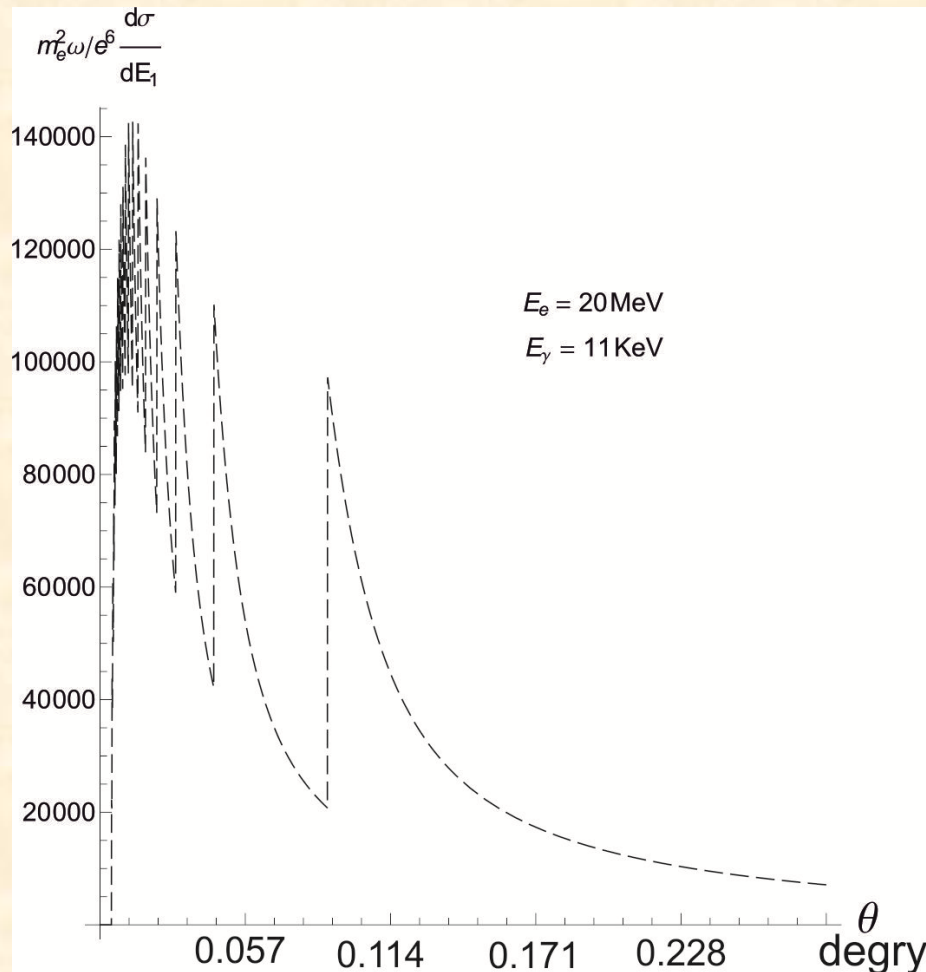
Intensity



*With further increase of the amplitude of electric field, intensity of ChR increase dramatically and saturation did not observed.*

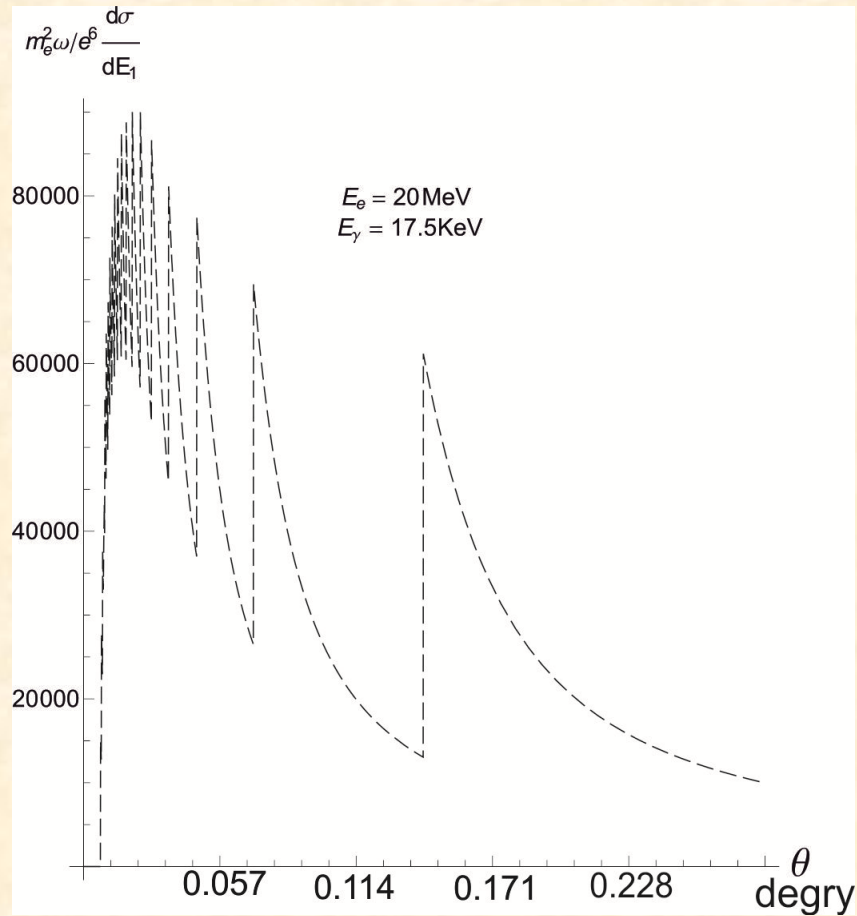


***Theoretical analysis finding the location of that bands in the energy spectrum corresponds to the coherent bremsstrahlung.***



***Theoretical calculations of the scattering cross section of the CBR of the angle of incidence of electrons for 11 KeV photon energy.***





***Theoretical calculations of the scattering cross section of the CBR of the angle of incidence of electrons for 17.5 KeV photon energy.***

# International Conference



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*Dear colleagues,  
Thank you for your attention.*

*We invite you to participate in the conference  
taking part in Meghri (Armenia).*

*The purpose of my visit is also to ask you to  
organize the next meeting in Armenia. I assure  
you that we have all possibilities for a  
successful conference.*

*Sincerely, Professor A.R. Mkrtchyan.*