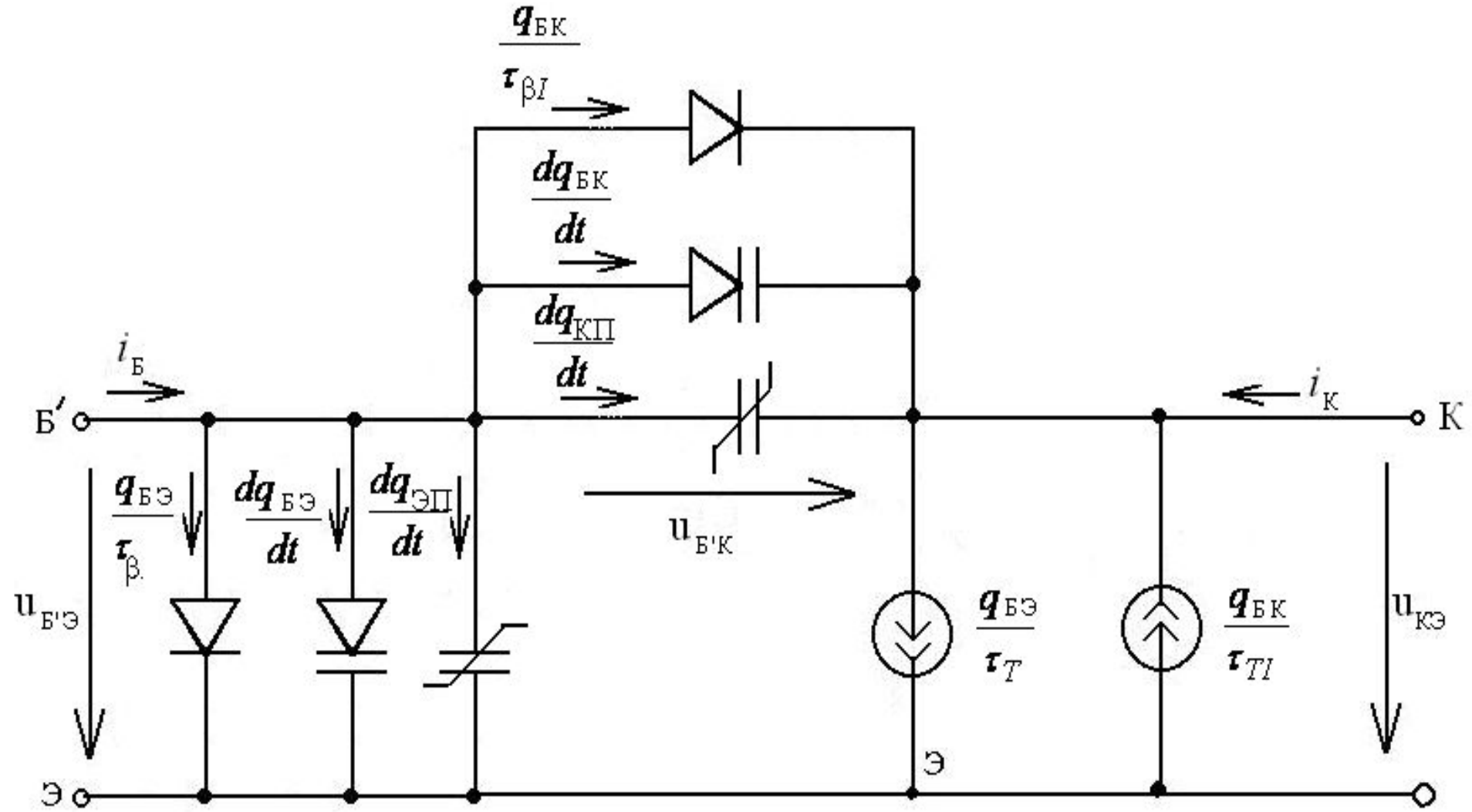
К Лекции 15

3.6. Зарядовые модели БТ



Уравнения зарядовой модели БТ

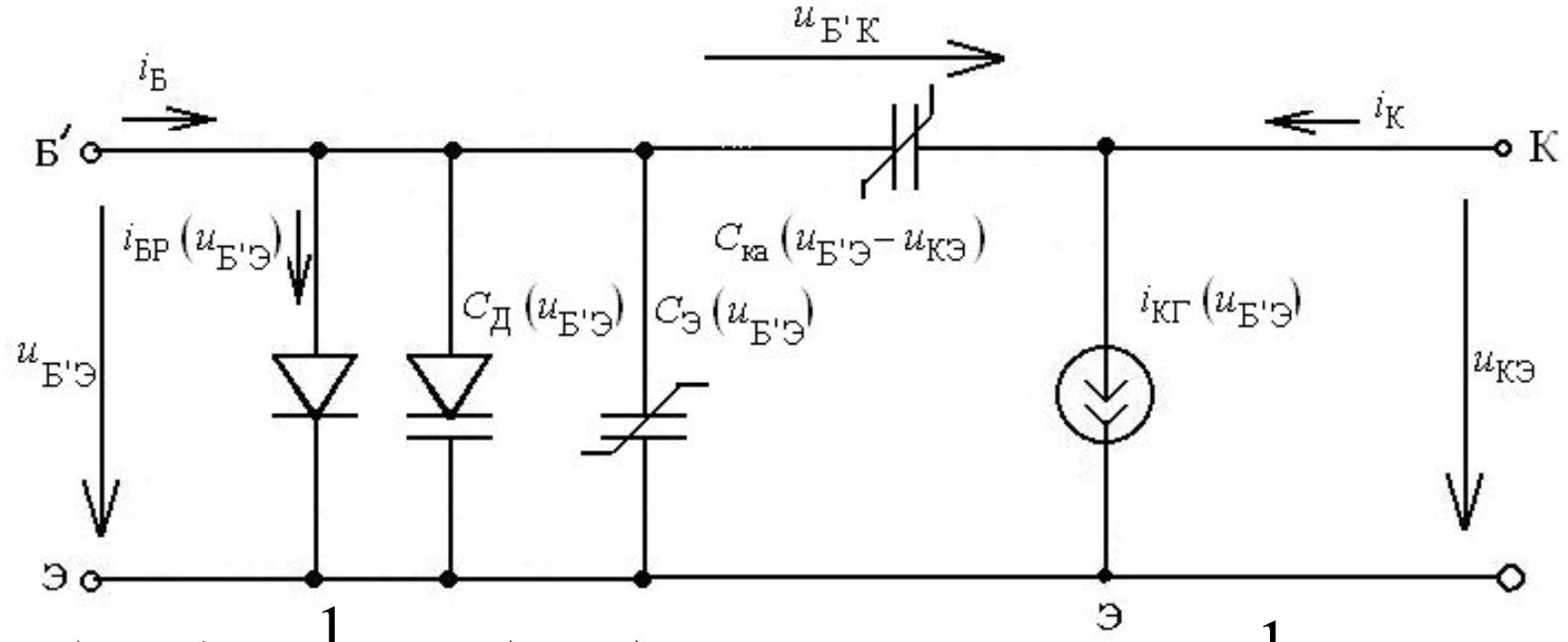
$$i_{\text{Б}} = \frac{1}{\tau_{\beta}} q_{\text{БЭ}} + \frac{\mathrm{d}q_{\text{БЭ}}}{\mathrm{d}t} + \frac{\mathrm{d}q_{\text{ЭП}}}{\mathrm{d}t} + \frac{1}{\tau_{\beta I}} q_{\text{БК}} + \frac{\mathrm{d}q_{\text{БК}}}{\mathrm{d}t} + \frac{\mathrm{d}q_{\text{КП}}}{\mathrm{d}t}$$

$$i_{\text{К}} = \frac{1}{\tau_{T}} q_{\text{БЭ}} - \left(\frac{1}{\tau_{TI}} + \frac{1}{\tau_{\beta I}} \right) q_{\text{БК}} - \frac{\mathrm{d}q_{\text{БК}}}{\mathrm{d}t} - \frac{\mathrm{d}q_{\text{КП}}}{\mathrm{d}t}$$

$$q_{\text{БЭ}}\left(U_{\text{Б'Э}}\right) = q_{\text{БЭS}} \left(e^{\frac{U_{\text{Б'Э}}}{\varphi_T}} - 1 \right) \qquad q_{\text{БК}}\left(U_{\text{Б'К}}\right) = q_{\text{БКS}} \left(e^{\frac{U_{\text{Б'К}}}{\varphi_T}} - 1 \right)$$

$$q_{\text{ЭП}}\left(U_{\text{Б'Э}}\right) = -q_{\text{ЭП}}(0) \left(1 - \frac{U_{\text{Б'Э}}}{V_{\text{Э0}}} \right)^{\gamma_{\text{Э}}} \qquad q_{\text{КП}}\left(U_{\text{Б'К}}\right) = -q_{\text{КП}}(0) \left(1 - \frac{U_{\text{Б'К}}}{V_{\text{К0}}} \right)^{\gamma_{\text{К}}}$$

Зарядовая модель БТ в АО



$$i_{БР}(u_{Б'Э}) = \frac{1}{\tau_\beta} q_{БЭ}(u_{Б'Э})$$

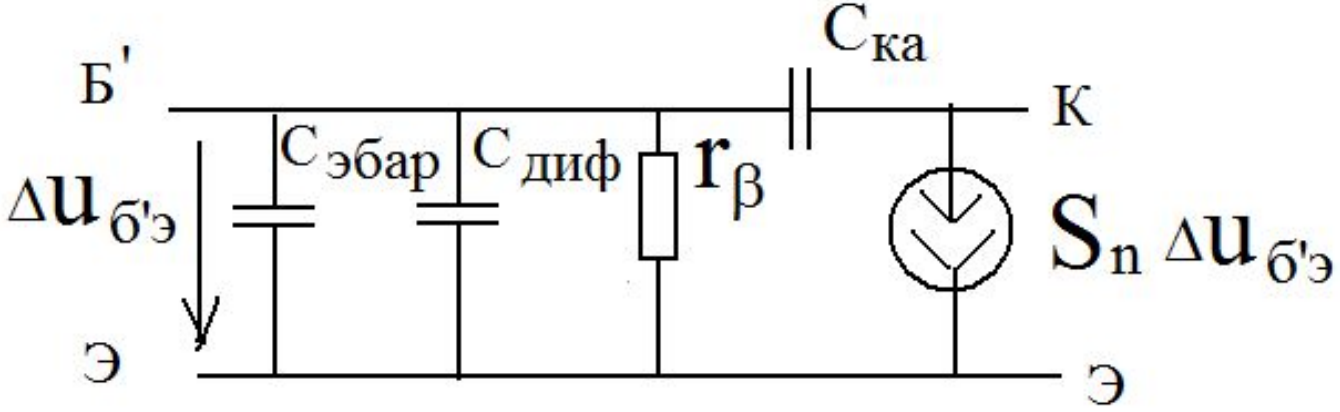
$$i_{КГ}(u_{Б'Э}) = \frac{1}{\tau_T} q_{БЭ}(u_{Б'Э})$$

$$C_Д(u_{Б'Э}) = \frac{\mathrm{d}q_{БЭ}}{\mathrm{d}u_{Б'Э}} = \frac{q_{БЭ}(u_{Б'Э}) + q_{БЭS}}{\varphi_T}$$

$$C_Э(u_{Б'Э}) = \frac{\mathrm{d}q_{БП}}{\mathrm{d}u_{Б'Э}} = \frac{\gamma_Э \cdot q_{ЭП}(0)}{\varphi_{КЭ}} \left(1 - \frac{u_{Б'Э}}{\varphi_{КЭ}}\right)^{\gamma_Э - 1}$$

$$C_{ка}(u_{Б'Э} - u_{КЭ}) = \frac{\mathrm{d}q_{КП}}{\mathrm{d}u_{Б'К}} = \frac{\gamma_К \cdot q_{КП}(0)}{\varphi_{КК}} \left(1 - \frac{u_{Б'Э} - u_{КЭ}}{\varphi_{КК}}\right)^{\gamma_К - 1}$$

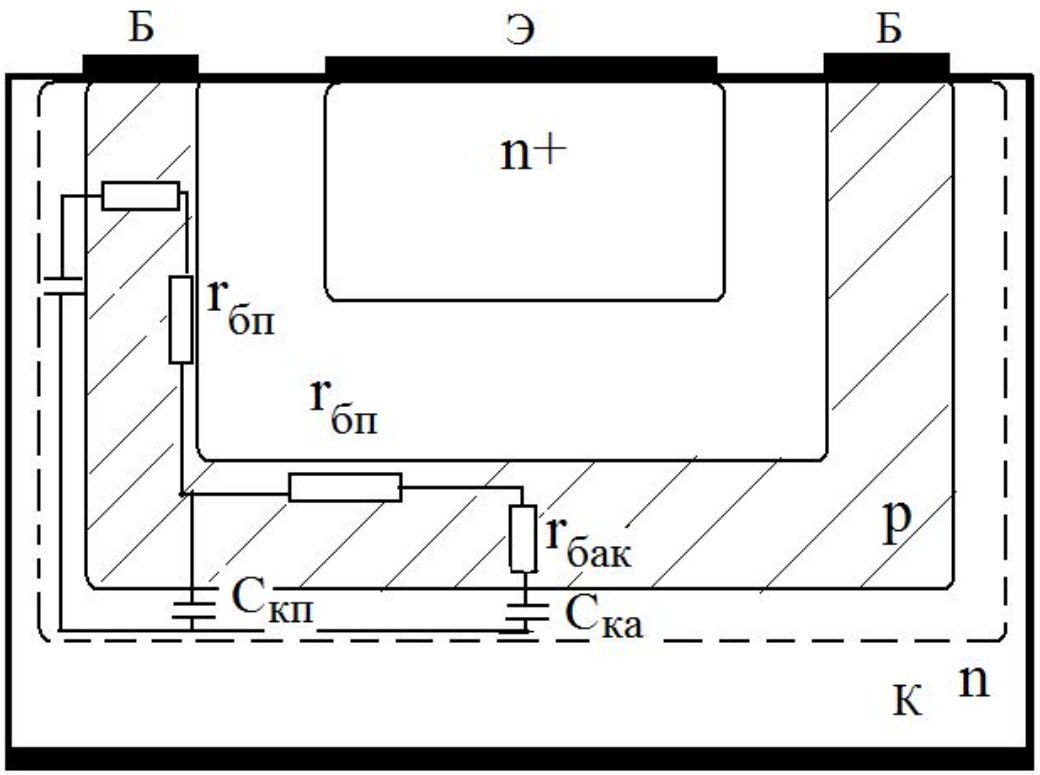
Малосигнальная эквивалентная схема БТ в АО без сопротивления базы

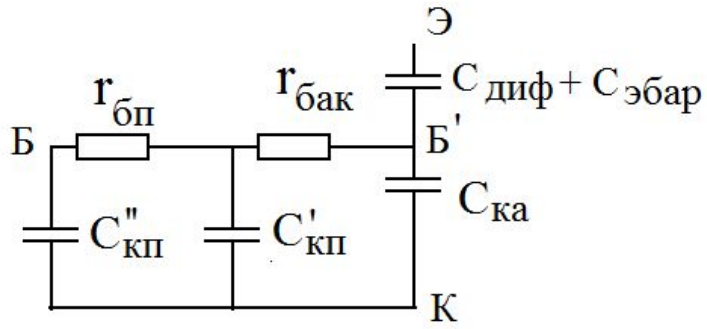


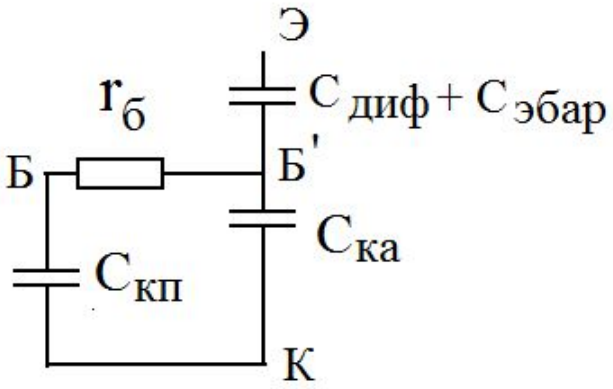
$$S_{\text{п}} = \frac{C_{\text{Д}}\left(U_{\text{Б'Э}}\right)}{\tau_T} \qquad C_{\text{Д}}\left(U_{\text{Б'Э}}\right) = \frac{I_{\text{К}}\left(U_{\text{Б'Э}}\right)\tau_T}{\varphi_T} \qquad S_{\text{п}}\left(U_{\text{Б'Э}}\right) = \frac{I_{\text{К}}\left(U_{\text{Б'Э}}\right)}{\varphi_T}$$

$$r_\beta = \frac{\beta}{S_{\text{п}}} \qquad r_\beta = \frac{\beta\varphi_T}{I_{\text{К}}\left(U_{\text{Б'Э}}\right)} = \frac{\varphi_T}{I_{\text{Б}}\left(U_{\text{Б'Э}}\right)}$$

3.6.3. Влияние поперечных токов и омического сопротивления базы на работу БТ







$C_{кп}$ $C_{эбар}$

$C_{ка}$ $C_{диф}$