Anodenverlustleistung B – Betrieb leitende Halbwelle eines sinus:

$$Pav = \frac{1}{\Pi}\int_0^{\Pi} U_a(\alpha) I(\alpha) d\alpha$$

$$Pav = \frac{1}{\Pi}\int_0^{\Pi} (U_0 - U_r(\alpha)) I(\alpha) d\alpha$$

$$Pav = \frac{1}{\Pi}\int_0^{\Pi} U_0 I(\alpha) d\alpha - \frac{1}{\Pi}\int_0^{\Pi} U_r(\alpha) I(\alpha) d\alpha$$

$$I(\alpha) = I_m \sin(\alpha)$$

$$U_r(\alpha) = RI(\alpha) = RI_m \sin(\alpha)$$

$$Pav = \frac{U_0 I_m}{\Pi}\int_0^{\Pi} \sin(\alpha) d\alpha - \frac{RI_m^2}{\Pi}\int_0^{\Pi} \sin^2(\alpha) d\alpha$$

$$Pav = \frac{U_0 I_m}{\Pi}[-\cos(\alpha)]_0^{\Pi} - \frac{RI_m^2}{\Pi}[\frac{\alpha}{2} - \sin(\alpha)*\cos(\alpha)]_0^{\Pi}$$

$$Pav = \frac{U_0 I_m}{\Pi} * 2 - \frac{RI_m^2}{\Pi} * \frac{\Pi}{2}$$

$$Pav = \frac{2 U_0 I_m}{\Pi} - \frac{RI_m^2}{2} = 2 I_m (\frac{U_0}{\Pi} - \frac{\Delta U_m}{4})$$

für B – Betrieb mittlere Verlustleistung voller Sinus:

$$Pavm = Pav/2 = \frac{U_0 I_m}{\Pi} - \frac{RI_m^2}{4} = I_m (\frac{U_0}{\Pi} - \frac{\Delta U_m}{4})$$

Signal Stromausschlag I_{mp} der größten Verlustleistung:

$$\frac{dPav}{dI_m} = 0 \Rightarrow \frac{2 U_0}{\Pi} - RI_{mp} = 0$$

$$I_{mp} = \frac{2 U_0}{R \Pi}$$

$$I_{max} = \frac{U_0}{R} \Rightarrow \frac{I_{mp}}{I_{max}} = \frac{2}{\Pi}$$