Anodenverlustleistung V 1.1 *S . Loos* 2015

B − Betrieb leitende Halbwelle eines sinus:

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

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

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

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

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

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

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

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

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

für B − Betrieb mittlere Verlustleistung voller Sinus:

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

Signal Stromausschlag I_{mp} *der größten Verlustleistung*:

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

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

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

worst case Analyse I_{mp} *state*:

$$Pavmp = \frac{2U_0}{R\Pi}(\frac{U_0}{\Pi} - \frac{R}{4}\frac{2U_0}{R\Pi}) = \frac{U_0^2}{R\Pi^2} = \frac{U_0 I_{max}}{\Pi^2}$$