The relation between total dust mass and central face-on opacity

If

$$\tau(r,z) = \begin{cases} A_0 \left[\frac{r}{r_{in}} (1-\chi) + \chi \right] e^{-\frac{r_{in}}{r_d}} e^{-\frac{z}{z_d}} & r < r_{in} \\ A_0 \, e^{-\frac{r}{r_d}} e^{-\frac{z}{z_d}} & r > r_{in} \end{cases}$$

and

r_t - radial truncation of the dust disk
z_t - vertical -"- -"- -"-
ρ_c - central dust mass density
κ - extinction coefficient

$$\text{mass} = \rho_c \left[\frac{4\pi}{3} \left(1 + \frac{\chi}{2} \right) r_{in}^2 z_d \, e^{-\frac{r_{in}}{r_d}} T_z \right] + \rho_c \cdot 4\pi z_d r_d^2 T_z T_r$$

where

$$T_z = 1 - e^{-\frac{z_t}{z_d}}$$

$$T_r = e^{-\frac{r_{in}}{r_d}} - e^{-\frac{r_t}{r_d}} + \frac{r_{in}}{r_d} e^{-\frac{r_{in}}{r_d}} - \frac{r_t}{r_d} e^{-\frac{r_t}{r_d}}$$

$$M_{oss} = \frac{\tau}{2\cancel{z_d}} \kappa \left[\frac{4\pi}{3} \left(1 + \frac{\chi}{2}\right) r_{in}^2 \cancel{z_d} e^{-\frac{r_{in}}{h_d}} + 4\pi \cancel{z_d} h_d^2 T_r \right] T_z$$

$$moss = \frac{\tau}{2\kappa} \left[\frac{4\pi}{3} \left(1 + \frac{\chi}{2}\right) r_{in}^2 e^{-\frac{r_{in}}{h_d}} + 4\pi h_d^2 T_r \right] T_z$$

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for WD dust

$$\kappa(B) = 8.07 \frac{pc^2}{M_\odot}$$