1. Introduction

$$
\begin{aligned}
\nabla^2 T(r) &= -\frac{\alpha}{\sqrt{2\pi r_b^2}} e^{-r^2/2r_b^2} \\
\frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial T(r)}{\partial r}\right) &= -\frac{\alpha}{\sqrt{2\pi r_b^2}} e^{-r^2/2r_b^2} \\
\frac{\partial}{\partial r}\left(r\frac{\partial T(r)}{\partial r}\right) &= -\frac{\alpha r}{\sqrt{2\pi r_b^2}} e^{-r^2/2r_b^2}
\end{aligned}
$$

Integrate both sides and set $a = \alpha/\sqrt{2\pi}$.

$$
\begin{aligned}
r\frac{\partial T(r)}{\partial r} &= a r_b e^{-r^2/2r_b^2} + C \\
\frac{\partial T(r)}{\partial r} &= \frac{a r_b}{r} e^{-r^2/2r_b^2} + \frac{C}{r}
\end{aligned}
$$

Integrate again over a region of $0 < r < r_0$:

$$
\begin{aligned}
T(r')|_r^{r_0} = \Delta T &= \int_r^{r_0} dr' \left(\frac{a r_b}{r'} e^{-r'^2/2r_b^2} + \frac{C}{r'}\right) \\
&= \frac{a r_b}{2}\left[\mathrm{Ei}(-r_0^2/2r_b^2) - \mathrm{Ei}(-r^2/2r_b^2)\right] + C \ln(r_0/r)
\end{aligned}
$$

Or for a uniformly rastered heat load over a circular area radius R

$$
\Delta T = \int_r^{r_0} dr \left(\frac{\alpha \Theta(R-r)}{\pi R^2 r} + \frac{C}{r}\right)
$$

for $r > R$ this is just $T(r) = C\ln(r/r_0)$. For $r < R$

$$
\begin{aligned}
T(r) &= \int_r^{r_0} dr \left(\frac{\alpha \Theta(R-r)}{\pi R^2 r} + \frac{C}{r}\right) \\
&= \frac{\alpha}{\pi R^2} \ln(R/r) + C \ln(r_0/r)
\end{aligned}
$$

Now impose B.C.s $T(r_0) = T_0$.

b

Source	Value	δP/P(%)
Foil Polarization	0.08005	0.57
High Current Extrapolation	–	0.50
Null Asymmetry (Cu Foil)	0.00%	0.22
Beam Bleedthrough	–	0.18
A_{zz}	0.75421	0.16
Dead Time Correction	0.148%	0.15
Other	–	0.13
	Total	**0.85**