Realistic Nuclear Density Distributions

The Θ-function in the expression for the two-photon luminosity implies that the nuclei have sharp edges.

$$L_{\gamma\gamma} = L_{AA} \iint n(\omega_1,b_1)\, n(\omega_2,b_2)\, \Theta(|b_1-b_2|-2R)\, d^2b_1\, d^2b_2$$

This ignores edge effects. A more realistic approach it to define

$$L_{\gamma\gamma} = L_{AA} \iint n(\omega_1,b_1)\, n(\omega_2,b_2)\, (1-P_{int}(|b_1-b_2|)\, d^2b_1\, d^2b_2$$

Where $P_{int}(b)$ is the hadronic interaction probability for a Nucleus-Nucleus Collision at impact parameter b. This can be calculated from (Glauber Model):

$$P(b) = 1 - EXP(- \sigma_{nn} \iint T_A(r)\, T_B(b-r)\, d^2r)$$

Where $T_A(r)$ is the thickness function.

Using a Woods-Saxon density distribution for $T_A(r)$ gives a 5-15% reduction in luminosity, depending on energy.