Function to describe photopeak shape ($\sigma_m = K_0\sigma_s$):

$$f(x) = \begin{cases} 0 < x - x_0 < +\infty : & \exp\Big[-\dfrac{(x-x_0)^2}{2\sigma^2}\Big] \\ -K_1\sigma_m < x - x_0 \le 0 : & C + (1-C)\cdot\exp\Big[-\dfrac{(x-x_0)^2}{2\sigma_m^2}\Big] \\ -\infty < x - x_0 \le -K_1\sigma_m : & C + (1-C)\cdot\exp\Big[K_1\Big(\dfrac{x-x_0}{\sigma_m} + \dfrac{K_1}{2}\Big)\Big] \end{cases} \tag{1}$$

Convolution with gaussian ($x - x_0 \to x$):

$$S(x) = \int dy \begin{cases} [0 \div +\infty] : & \exp\Big[-\dfrac{y^2}{2\sigma^2}\Big]\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] + \\ [-K_1\sigma_m \div 0] : & +\Big(C + (1-C)\cdot\exp\Big[-\dfrac{y^2}{2\sigma_m^2}\Big]\Big)\cdot\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] + \\ [-\infty \div -K_1\sigma_m] : & +\Big(C + (1-C)\cdot\exp\Big[K_1\Big(\dfrac{y}{\sigma_m} + \dfrac{K_1}{2}\Big)\Big]\Big)\cdot\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] \end{cases} \tag{2}$$

The same, with $D \equiv 1 - C$:

$$S(x) = \int dy \begin{cases} [0 \div +\infty] : & \exp\Big[-\dfrac{y^2}{2\sigma^2}\Big]\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] + \\ [-\infty \div 0] : & +C\cdot\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] + \\ [-K_1\sigma_m \div 0] : & +D\cdot\exp\Big[-\dfrac{y^2}{2\sigma_m^2}\Big]\cdot\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] + \\ [-\infty \div -K_1\sigma_m] : & +D\cdot\exp\Big[K_1\Big(\dfrac{y}{\sigma_m} + \dfrac{K_1}{2}\Big)\Big]\cdot\exp\Big[-\dfrac{(x-y)^2}{2\sigma_s^2}\Big] \end{cases} \tag{3}$$

Rewrite 1:

$$S(x) = \exp\Big(-\frac{x^2}{2\sigma_s^2}\Big)\int dy \begin{cases} [0 \div +\infty] : & \exp\Big[-\dfrac{y^2}{2\sigma^2}\Big]\exp\Big[\dfrac{2xy - y^2}{2\sigma_s^2}\Big] + \\ [-\infty \div 0] : & +C\cdot\exp\Big[\dfrac{2xy - y^2}{2\sigma_s^2}\Big] + \\ [-K_1\sigma_m \div 0] : & +D\cdot\exp\Big[-\dfrac{y^2}{2\sigma_m^2}\Big]\cdot\exp\Big[\dfrac{2xy - y^2}{2\sigma_s^2}\Big] + \\ [-\infty \div -K_1\sigma_m] : & +D\cdot\exp\Big[K_1\Big(\dfrac{y}{\sigma_m} + \dfrac{K_1}{2}\Big)\Big]\cdot\exp\Big[\dfrac{2xy - y^2}{2\sigma_s^2}\Big] \end{cases} \tag{4}$$

Rewrite 2 ($q \equiv 1/2\sigma^2$, $q_s \equiv 1/2\sigma_s^2$, $q_m \equiv 1/2\sigma_m^2$):

$$S(x) = \exp\Big(-q_s x^2\Big)\int dy \begin{cases} [0 \div +\infty] : & \exp\Big(-y^2(q + q_s) + 2yxq_s\Big) + \\ [-\infty \div 0] : & +C\cdot\exp\Big(-y^2 q_s + 2yxq_s\Big) + \\ [-K_1\sigma_m \div 0] : & +D\cdot\exp\Big(-y^2(q_m + q_s) + 2yxq_s\Big) + \\ [-\infty \div -K_1\sigma_m] : & +D\cdot\exp\Big(-y^2 q_s + y(2xq_s + K_1\sqrt{2q_m})\Big)\exp\Big(K_1^2/2\Big) \end{cases} \tag{5}$$

From WolframAlfa:

$$\int_{L_1}^{L_2} \exp(-ax^2 + bx)dx = -\frac{1}{2}\sqrt{\frac{\pi}{a}}\exp\Big(\frac{b^2}{4a}\Big)\Big(\mathrm{erf}\Big(\frac{2aL_1 - b}{2\sqrt{a}}\Big) + \mathrm{erf}\Big(\frac{b - 2aL_2}{2\sqrt{a}}\Big)\Big) \tag{6}$$

$$\int_{0}^{+\infty} \exp(-ax^2 + bx)dx = \frac{1}{2}\sqrt{\frac{\pi}{a}}\exp\Big(\frac{b^2}{4a}\Big)\mathrm{erfc}\Big(\frac{-b}{2\sqrt{a}}\Big) \tag{7}$$

$$\int_{-\infty}^{0} \exp(-ax^2 + bx)dx = \frac{1}{2}\sqrt{\frac{\pi}{a}}\exp\Big(\frac{b^2}{4a}\Big)\mathrm{erfc}\Big(\frac{b}{2\sqrt{a}}\Big) \tag{8}$$

$$\int_{-L_1}^{0} \exp(-ax^2 + bx)dx = \frac{1}{2}\sqrt{\frac{\pi}{a}}\exp\Big(\frac{b^2}{4a}\Big)\Big(\mathrm{erfc}\Big(\frac{b}{2\sqrt{a}}\Big) - \mathrm{erfc}\Big(\frac{2aL_1 + b}{2\sqrt{a}}\Big)\Big) \tag{9}$$

$$\int_{-\infty}^{-L_1} \exp(-ax^2 + bx)dx = \frac{1}{2}\sqrt{\frac{\pi}{a}}\exp\Big(\frac{b^2}{4a}\Big)\mathrm{erfc}\Big(\frac{2aL_1 + b}{2\sqrt{a}}\Big) \tag{10}$$

Hence:

$$S(x) = \frac{\sqrt{\pi}}{2}\exp\Big(-q_s x^2\Big)\times \\ \times\Bigg\{\frac{1}{\sqrt{q+q_s}}\exp\Big(\frac{x^2q_s^2}{(q+q_s)}\Big)\mathrm{erfc}\Big(\frac{-xq_s}{\sqrt{q+q_s}}\Big)+\frac{C}{\sqrt{q_s}}\exp\Big(x^2q_s\Big)\mathrm{erfc}\Big(x\sqrt{q_s}\Big)+ \\ +\frac{D}{\sqrt{q_m+q_s}}\exp\Big(\frac{x^2q_s^2}{q_m+q_s}\Big)\Big(\mathrm{erfc}\Big(\frac{xq_s}{\sqrt{q_m+q_s}}\Big)-\mathrm{erfc}\Big(\frac{(q_m+q_s)K_1\sigma_m+xq_s}{\sqrt{q_m+q_s}}\Big)\Big)+ \\ +\frac{D}{\sqrt{q_s}}\exp\Big(\frac{K_1^2}{2}\Big)\exp\Big(\frac{(2xq_s+K_1\sqrt{2q_m})^2}{4q_s}\Big)\mathrm{erfc}\Big(\frac{2q_sK_1\sigma_m+2xq_s+K_1\sqrt{2q_m}}{2\sqrt{q_s}}\Big)\Bigg\} \tag{11}$$

Again:

$$S(x) = \frac{\sqrt{\pi}}{2}\exp\Big(-q_s x^2\Big)\times\Bigg\{\frac{1}{\sqrt{q+q_s}}\exp\Big(\frac{x^2q_s^2}{(q+q_s)}\Big)\mathrm{erfc}\Big(\frac{-xq_s}{\sqrt{q+q_s}}\Big)+\frac{C}{\sqrt{q_s}}\exp\Big(x^2q_s\Big)\mathrm{erfc}\Big(x\sqrt{q_s}\Big)+ \\ +\frac{D}{\sqrt{q_m+q_s}}\exp\Big(\frac{x^2q_s^2}{q_m+q_s}\Big)\Big(\mathrm{erfc}\Big(\frac{xq_s}{\sqrt{q_m+q_s}}\Big)-\mathrm{erfc}\Big(K_1\sigma_m\sqrt{q_m+q_s}+\frac{xq_s}{\sqrt{q_m+q_s}}\Big)\Big)+ \\ +\frac{D}{\sqrt{q_s}}\exp\Big(\frac{K_1^2}{2}(1+\frac{q_m}{q_s})\Big)\exp\Big(x^2q_s\Big)\exp\Big(xK_1\sqrt{2q_m}\Big)\mathrm{erfc}\Big(K_1\sigma_m\sqrt{q_s}+x\sqrt{q_s}+\frac{K_1\sqrt{q_m}}{\sqrt{2q_s}}\Big)\Bigg\} \tag{12}$$

Back from q's to σ's:

$$S(x) = \frac{\sqrt{\pi}}{2}\exp\Big(-\frac{x^2}{2\sigma_s^2}\Big)\times\Bigg\{\sqrt{\frac{2\sigma^2\sigma_s^2}{\sigma^2+\sigma_s^2}}\exp\Big(\frac{x^2\sigma^2}{2\sigma_s^2(\sigma^2+\sigma_s^2)}\Big)\mathrm{erfc}\Big(\frac{-x\sigma}{\sigma_s\sqrt{2(\sigma^2+\sigma_s^2)}}\Big)+ \\ +\sqrt{2}C\sigma_s\exp\Big(\frac{x^2}{2\sigma_s^2}\Big)\mathrm{erfc}\Big(\frac{x}{\sqrt{2}\sigma_s}\Big)+ \\ +D\sqrt{\frac{2\sigma_m^2\sigma_s^2}{\sigma_m^2+\sigma_s^2}}\exp\Big(\frac{x^2\sigma_m^2}{2\sigma_s^2(\sigma_m^2+\sigma_s^2)}\Big)\Big(\mathrm{erfc}\Big(\frac{x\sigma_m}{\sigma_s\sqrt{(\sigma_m^2+\sigma_s^2)}}\Big)-\mathrm{erfc}\Big(\frac{K_1\sqrt{\sigma_m^2+\sigma_s^2}}{\sqrt{2}\sigma_s}+\frac{x\sigma_m}{\sigma_s\sqrt{2(\sigma_m^2+\sigma_s^2)}}\Big)\Big)+ \\ +\sqrt{2}D\sigma_s\exp\Big(\frac{K_1^2}{2}(1+\frac{\sigma_s^2}{\sigma_m^2})\Big)\exp\Big(\frac{x^2}{2\sigma_s^2}\Big)\exp\Big(\frac{xK_1}{\sigma_m}\Big)\mathrm{erfc}\Big(\frac{K_1\sigma_m}{\sqrt{2}\sigma_s}+\frac{x}{\sqrt{2}\sigma_s}+\frac{K_1\sigma_s}{\sqrt{2}\sigma_m}\Big)\Bigg\} \tag{13}$$

Rewrite:

$$S(x) = \sqrt{\frac{\pi}{2}}\sigma_s\times\Bigg\{\frac{\sigma}{\sqrt{\sigma^2+\sigma_s^2}}\exp\Big(-\frac{x^2}{2(\sigma^2+\sigma_s^2)}\Big)\mathrm{erfc}\Big(\frac{-x\sigma}{\sigma_s\sqrt{2(\sigma^2+\sigma_s^2)}}\Big)+C\cdot\mathrm{erfc}\Big(\frac{x}{\sqrt{2}\sigma_s}\Big)+ \\ +D\cdot\frac{\sigma_m}{\sqrt{\sigma_m^2+\sigma_s^2}}\exp\Big(-\frac{x^2}{2(\sigma_m^2+\sigma_s^2)}\Big)\Big(\mathrm{erfc}\Big(\frac{x\sigma_m}{\sigma_s\sqrt{2(\sigma_m^2+\sigma_s^2)}}\Big)-\mathrm{erfc}\Big(\frac{K_1(\sigma_m^2+\sigma_s^2)+x\sigma_m}{\sigma_s\sqrt{2(\sigma_m^2+\sigma_s^2)}}\Big)\Big)+ \\ +D\cdot\exp\Big(\frac{K_1^2}{2}(1+\frac{\sigma_s^2}{\sigma_m^2})+K_1\frac{x}{\sigma_m}\Big)\mathrm{erfc}\Big(\frac{K_1(\sigma_s^2+\sigma_m^2)+x\sigma_m}{\sqrt{2}\sigma_s\sigma_m}\Big)\Bigg\} \tag{14}$$

Rewrite, devide to $2\pi\sigma\sigma_s$, $\sigma_m = K_0\sigma$:

$$S(x) = \frac{1}{2\sqrt{2\pi}}\Bigg\{\frac{1}{\sqrt{\sigma^2+\sigma_s^2}}\exp\Big(\frac{-x^2}{2(\sigma^2+\sigma_s^2)}\Big)\mathrm{erfc}\Big(\frac{-x\sigma}{\sigma_s\sqrt{2(\sigma^2+\sigma_s^2)}}\Big)+\frac{C}{\sigma}\mathrm{erfc}\Big(\frac{x}{\sqrt{2}\sigma_s}\Big)+ \\ +\frac{DK_0}{\sqrt{\sigma_m^2+\sigma_s^2}}\exp\Big(\frac{-x^2}{2(\sigma_m^2+\sigma_s^2)}\Big)\Big(\mathrm{erfc}\Big(\frac{x\sigma_m}{\sigma_s\sqrt{2(\sigma_m^2+\sigma_s^2)}}\Big)-\mathrm{erfc}\Big(\frac{K_1(\sigma_m^2+\sigma_s^2)+x\sigma_m}{\sigma_s\sqrt{2(\sigma_m^2+\sigma_s^2)}}\Big)\Big)+ \\ +\frac{D}{\sigma}\exp\Big(\frac{K_1^2}{2}(1+\frac{\sigma_s^2}{\sigma_m^2})+K_1\frac{x}{\sigma_m}\Big)\mathrm{erfc}\Big(\frac{K_1(\sigma_m^2+\sigma_s^2)+x\sigma_m}{\sqrt{2}\sigma_s\sigma_m}\Big)\Bigg\} \tag{15}$$

Check with $C = 0$, $D = 1$, $\sigma_m = \sigma$, $K_0 = 1$, $K_1 = \xi$:

$$S(x) = \frac{1}{2\sqrt{2\pi}}\Bigg\{\frac{1}{\sqrt{\sigma^2+\sigma_s^2}}\exp\Big(\frac{-x^2}{2(\sigma^2+\sigma_s^2)}\Big)\mathrm{erfc}\Big(-\frac{\xi(\sigma^2+\sigma_s^2)+x\sigma}{\sigma_s\sqrt{2(\sigma^2+\sigma_s^2)}}\Big)+ \\ +\frac{1}{\sigma}\exp\Big(\frac{\xi^2}{2}(1+\frac{\sigma_s^2}{\sigma^2})+\xi\frac{x}{\sigma}\Big)\mathrm{erfc}\Big(\frac{\xi(\sigma_s^2+\sigma^2)+x\sigma}{\sqrt{2}\sigma\sigma_s}\Big)\Bigg\} \tag{16}$$