The mass fraction X_i of an isotope i is the fraction of all nucleons that are part of i nuclei. Figure (3) above shows the mass fractions of some of the light isotopes as functions of T. At the highest temperatures the isotopes are in **Nuclear Statistical Equilibrium** with each other via the reactions.

$$\begin{array}{rrcl}
11) & n + {}^3He & \leftrightarrow & {}^4He + \gamma \\
8) & p + t & \leftrightarrow & {}^4He + \gamma \\
10) & n + d & \leftrightarrow & t + \gamma \\
7) & p + d & \leftrightarrow & {}^3He + \gamma \\
2) & n + p & \leftrightarrow & d + \gamma
\end{array}$$

(Numbered as they are in the code.) Because of this and the highly non-relativistic status of the nuclei, the nuclei's number densities n approximate a Maxwell-Boltzmann distribution. One can then derive this equation for X_i

$$\begin{aligned}
X_i &= \frac{g_i}{2}(2(1.202)\sqrt{\frac{2}{\pi}})^{A_i-1} A_i^{5/2} (\frac{kT}{m_N})^{3(A_i-1)/2} \\
& \eta^{A_i-1} X_p^{Z_i} X_n^{(A_i-Z_i)} exp(\frac{B}{kT})
\end{aligned}$$

which correspond to the dashed lines in Figure (3). And one can see how the actual mass fractions track this equation. A_i is the atomic weight and Z_i is the atomic number, while $B =$ the difference between the mass of Z_i protons $+(A_i - Z_i)$ neutrons and the nucleus mass. η is the baryon-to-photon ratio.

As with the weak reaction rates, these nuclear reaction rates start out much higher than H, but eventually fall below H. Figure (4) shows when the fractional change in X_i due to a particular reaction falls below H: 6 GK for Reactions (8) and (11), 2 GK for Reactions (7) and (10) and 0.68 GK for Reaction (2). These points correspond to the points in Figure (3) when the X_i graphs bend. At 6 GK, ^{3}He and tritium are no longer plentiful enough to keep up Reactions (8) and (11). So $X_{^4\mathrm{He}}$ falls off its NSE graph and tracks the NSE graphs of ^{3}He and tritium instead. $X_{^3\mathrm{He}}$ and X_t do the same when they become comparable to X_d at 2 GK. And one can see deuterium falling out of NSE at 0.68 GK as well.