1057-35-183 **Justin Holmer**, **Rodrigo Platte** and **Svetlana Roudenko*** (svetlana@math.asu.edu), School of Math & Stat, Arizona State University, Tempe, AZ 85287-1804. *Behavior of solutions to the focusing 3D cubic nonlinear Schroedinger equation.*

We consider the 3d NLS equation $iu_t + \Delta u + |u|^2 u = 0$. We are interested in finding criteria on the initial data u_0 that predict the asymptotic behavior of $u(t)$: whether $u(t)$ blows-up in finite time, exists globally in time but behaves like a linear solution for large times (scatters), or exists globally in time but does not scatter. This question has been resolved (for H^1 data) in series of papers by Duyckaerts-Holmer-Roudenko when $M[u]E[u] \leq M[Q]E[Q]$, where $M[u]$ and $E[u]$ denote the mass and energy of u, and Q denotes the ground state solution to $-Q + \Delta Q + |Q|^2 Q = 0$. We now study the complementary case $M[u]E[u] > M[Q]E[Q]$. First, we review Lushnikov's result giving a sufficient condition for blow-up. Then, using a sharp interpolation-type inequality in his argument we obtain a new blow-up condition that in some cases improves upon Lushnikov's condition. This approach also allows for an adaptation to radial infinite-variance initial data. We also prove that there exist Gaussian data u_0 with negative quadratic phase such that $\|u_0\|_{\dot{H}^{1/2}} < \|Q\|_{\dot{H}^{1/2}}$ but $u(t)$ blows-up. Lastly, we examine Gaussian type data and give the theoretical predictions for scattering or blow-up provided as well as the results of numerical simulation. (Received January 21, 2010)