NMR evidence of a high field phase transition in $\kappa$-(ET)$_2$Cu(NCS)$_2$ JEFFREY WRIGHT, W.C. CLARK, UCLA, ELIZABETH PRETTNER, Florida St., PHIL KUHNS, ARNEIL REYES, J.S. BROOKS, NHMFL, JOHN SCHLUETER, Argonne National Lab, STUART BROWN, UCLA — The anisotropic electronic properties of the organic superconductor $\kappa$-(BEDT-TTF)$_2$Cu(NCS)$_2$ make it an excellent candidate for inhomogeneous superconductivity (FFLO state) when the magnetic field is applied in-plane, so as to avoid orbital suppression of the superconductivity. Results of various previous measurements have been interpreted as supporting the existence of an FFLO state for fields $B \sim 21-22T$. In this work, $^{13}$C NMR measurements were used to probe the hyperfine fields in the range of $B=14-27T$ and $T=0.5-1.6K$. A sharp peak in the relaxation rate $1/T_1(B)$ at $B \sim 22T$ signals a phase transition associated with a turn-on of spin susceptibility, while evolution the spectrum with field indicate the system remains superconducting at higher fields. Additionally, only small variations of the hyperfine fields are observed for external fields $B=14-20T$, and we discuss this observation in relation to the superconducting order parameter symmetry.