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Simulating The Prompt Electromagnetic Pulse In 3D Using Vector Spherical Harmonics[1] ALEX FRIEDMAN, BRUCE I. COHEN, CHESTER D. ENG, WILLIAM A. FARMER, DAVID P. GROTE, HANS W. KRUGER, DAVID J. LARSON, Lawrence Livermore Natl Lab — We describe a new, efficient code for simulating the prompt electromagnetic pulse. In SHEMP ("Spherical Harmonic EMP"), we extend to 3-D the methods pioneered in C. Longmire's CHAP code [1]. The geomagnetic field and air density are consistent with CHAP's assumed spherical symmetry only for narrow domains of influence about the line of sight, limiting validity to very early times. Also, we seek to model inherently 3-D situations. In CHAP and our own CHAP-lite [2], the independent coordinates are r (the distance from the source) and τ = t-r/c; the pulse varies slowly with r at fixed τ, so a coarse radial grid suffices. We add non-spherically-symmetric physics via a vector spherical harmonic decomposition. For each (l,m) harmonic, the radial equation is similar to that in CHAP and CHAP-lite. We present our methodology [3] and results on model problems. [1] C. L. Longmire, IEEE Trans. Electromag. Compatibility 20 no. 1, 3 (1978). [2] W. A. Farmer, et al., IEEE Trans. Nucl. Sci. 63, 1259 (2016). [3] A. Friedman, et al., submitted to J. Rad. Effects Research and Engr.; also report LLNL-JRNL-732043 (2017).

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