D. Bursztyn, D.M. Steinberg
Comparison of designs for computer experiments
***Journal of Statistical Planning and Inference*.**

Rotation designs: Orthogonal first-order designs with higher order projectivity
Journal of Applied Stochastic Models in Business and Industry
18 (2002), 197-206.

Our JSPI paper (currently in press) and our JASMBI paper assume there are k factors that can be varied independently in the unit hypercube $[-1,1]^k$. The analysis in the paper uses orthonormal polynomials defined with respect to a uniform measure on the hypercube. The polynomials are derived by requiring orthogonality to all lower-degree terms and then by requiring that the integral of the square of the polynomial, on $[-1,1]^k$, equals 1. Note that the final requirement results in polynomials whose coefficients are functions of k, the number of factors. The polynomials used in the paper are listed here.

Constant Term:

$$\frac{1}{2^{k/2}}$$

Linear Terms in Each Factor:

$$\left(\frac{3}{2^k}\right)^{1/2} X_i$$

Pure Quadratic Terms in Each Factor:

$$\left(\frac{45/4}{2^k}\right)^{1/2} (X_i^2 - 1/3)$$

Two-factor Linear by Linear Interactions

$$\left(\frac{9}{2^k}\right)^{1/2} X_i X_j$$

Pure Cubic Terms in Each Factor

$$\left(\frac{175/4}{2^k}\right)^{1/2} (X_i^3 - \frac{3}{5} X_i)$$

Pure Quartic Terms in Each Factor

$$\left(\frac{11025/64}{2^k}\right)^{1/2} (X_i^4 - \frac{6}{7}(X_i^2 - 1/3) - 1/5)$$