

Industrial & Systems Engineering  
Seminar Announcement

Alternatives to Regular Resolution III and IV Screening Designs in 16 Runs

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**Abstract:** The resolution III and IV regular  $2^{k-p}$  fractional factorial designs in 16 runs for 6 – 14 factors are in standard use. They are economical and the resolution IV designs in 6, 7, and 8 factors provide clear estimates of main effects when three-factor and higher-order interactions are negligible. However, because the two-factor interactions are completely confounded, experimenters are frequently required to augment the original fraction with new runs to resolve ambiguities in interpretation. The resolution III case for 9 – 14 factors completely confound main effects and two-factor interactions. We identify nonregular orthogonal fractions in 16 runs for these situations that have no complete confounding of two-factor interactions. These designs allow for the unambiguous estimation of models containing both main effects and a few two-factor interactions and potentially avoid the need for additional experimentation. We present the rationale behind the selection of these designs from the nonisomorphic 16-run fractions and discuss some of their properties. We illustrate how to use these designs with two examples; one from the literature, and another from Professor Montgomery's experience with winemaking.

**Bio:** *Douglas C. Montgomery*, Ph.D., is Regent's Professor of Industrial Engineering and ASU Foundation Professor of Engineering at Arizona State University. Previously he was the John M. Fluke Distinguished Professor of Engineering, Director of Industrial Engineering and Professor of Mechanical Engineering at the University of Washington in Seattle and Professor of Industrial and Systems Engineering at the Georgia Institute of Technology. He holds BSIE, MS and Ph.D. degrees from Virginia Tech. Dr. Montgomery's industrial experience includes engineering assignments with Union Carbide Corporation and Eli Lilly and Company. He also has extensive consulting experience.

Dr. Montgomery's professional interests focus on industrial statistics, including design of experiments, quality and reliability engineering, applications of linear models, and time series analysis and forecasting. The Office of Naval Research, the National Science Foundation, the United States Army, the Department of Defense, and private industry have sponsored his research. He has supervised 68 doctoral dissertations and over 40 MS theses and MS Statistics Projects.

Dr. Montgomery is an author of twelve books and over 270 archival journal papers. He is currently one of the Chief Editors of Quality and Reliability Engineering International and is a former Editor of the Journal of Quality Technology. He is a Fellow of the American Statistical Association, an Honorary Member of the American Society for Quality, a Fellow of the Royal Statistical Society, a Fellow of the Institute of Industrial Engineers, an Elected Member of the International Statistical Institute and an Academician of the International Academy for Quality. His recognition awards include the Shewhart Medal, the Distinguished Service Medal, the William G. Hunter Award, the Brumbaugh Award, the Lloyd S. Nelson Award, and the Shewell Award (twice) from ASQ, the Deming Lecture Award from ASA, the George Box Medal from ENBIS (European Network for Business and Industrial Statistics), the Greenfield Medal from the Royal Statistical Society and the Ellis R. Ott Award. He has also received several outstanding teaching awards, including the Arizona State University Engineering College Graduate Teaching Excellence Award in 1994. He was named an ASU Outstanding Doctoral Mentor in 2004.

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