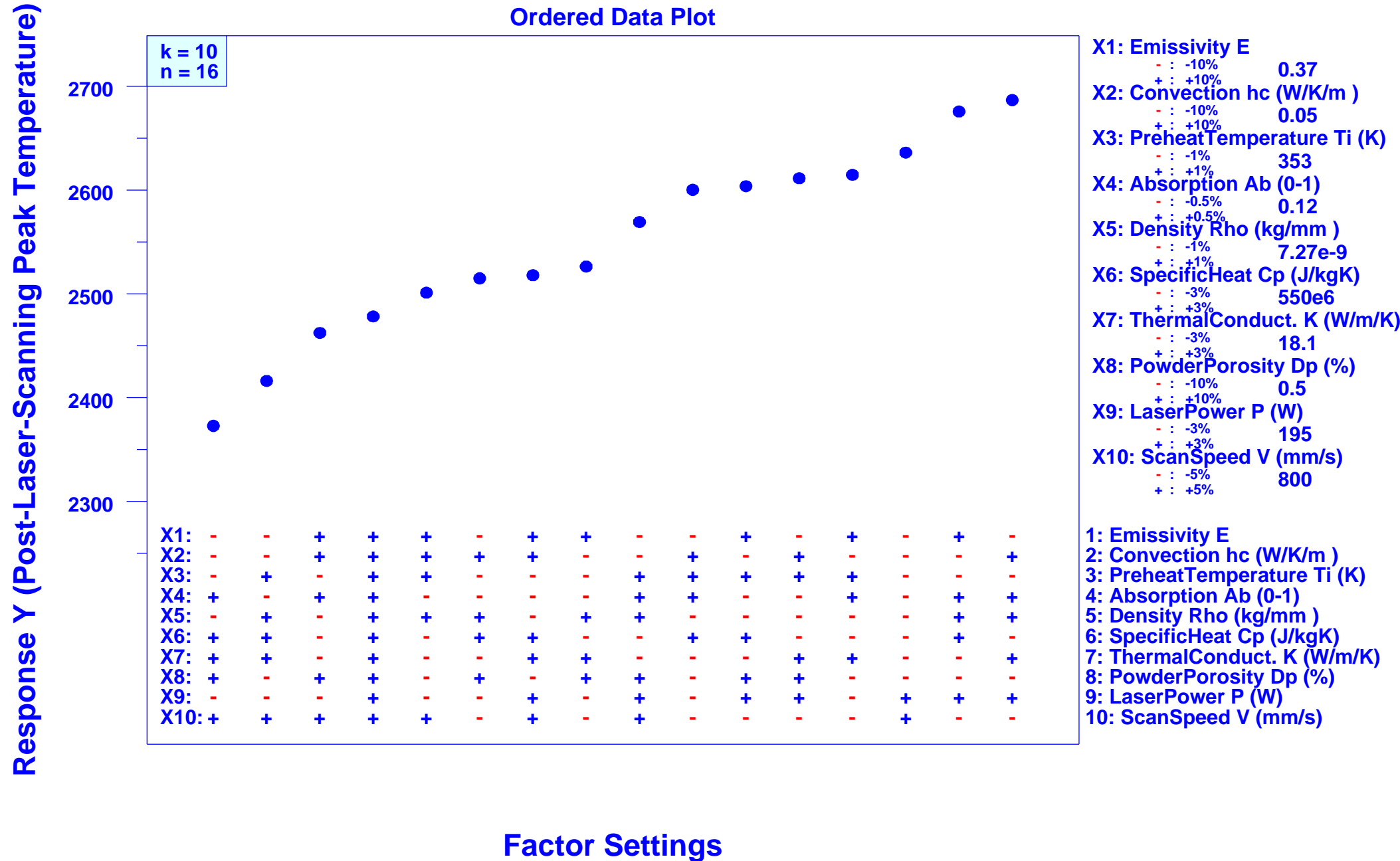
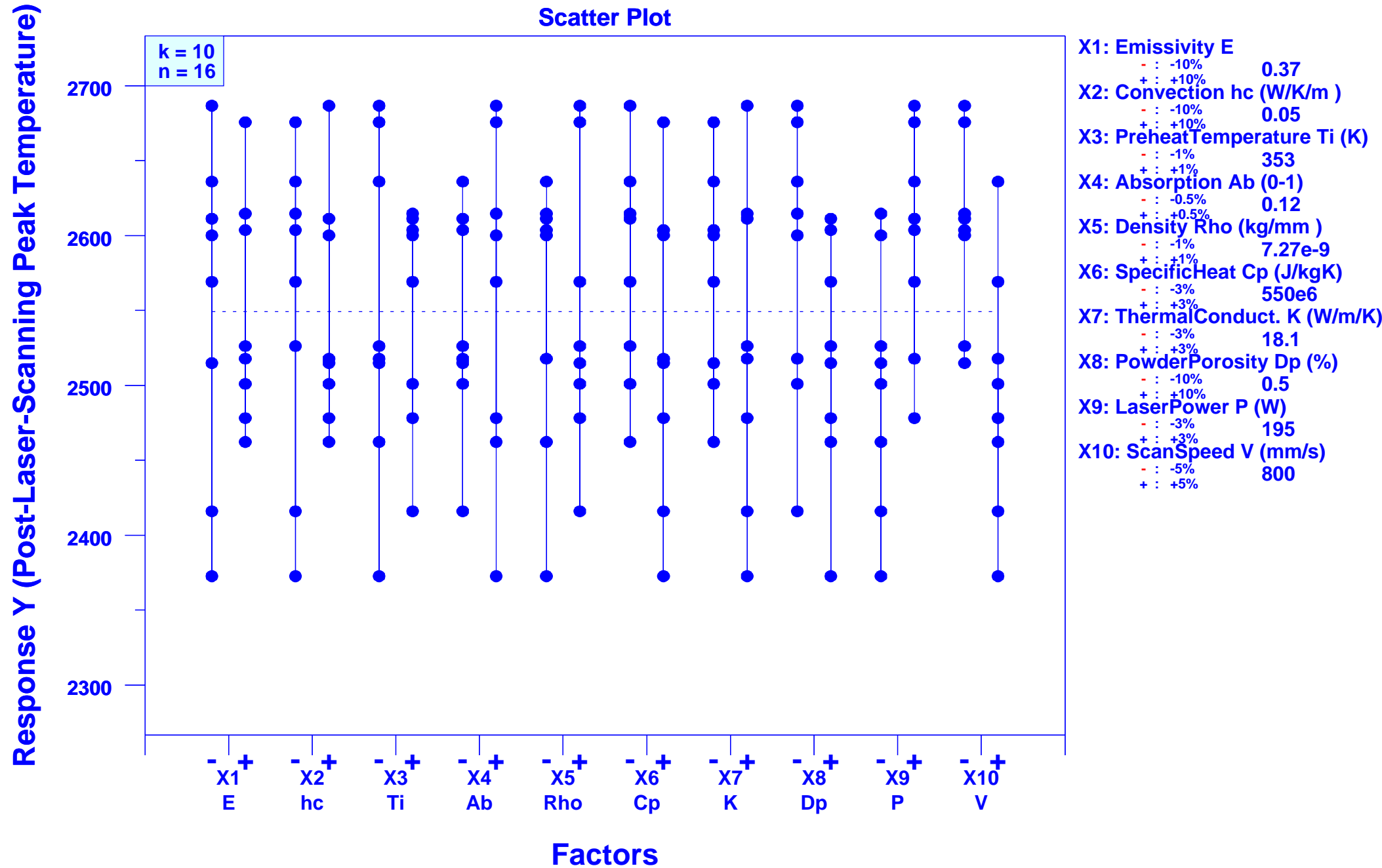
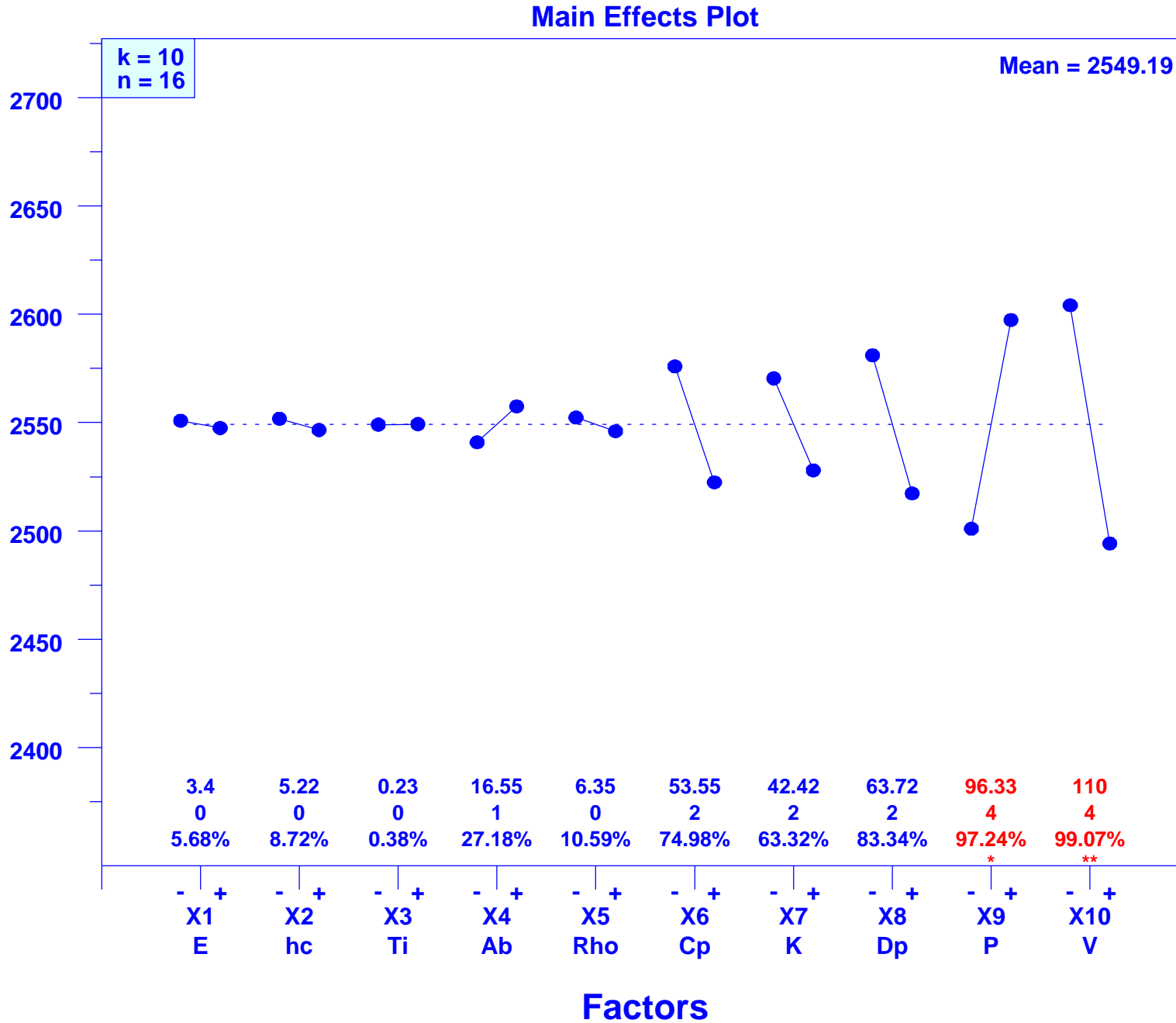


Additive Manufacturing FEA Onetrack Peak Temperature Sensitivity Analysis





Additive Manufacturing FEA Onetrack Peak Temperature Sensitivity Analysis



X1: Emissivity E		
-	:	-10%
+	:	+10%
		0.37
X2: Convection hc (W/K/m)		
-	:	-10%
+	:	+10%
		0.05
X3: Preheat Temperature Ti (K)		
-	:	-1%
+	:	+1%
		353
X4: Absorption Ab (0-1)		
-	:	-0.5%
+	:	+0.5%
		0.12
X5: Density Rho (kg/mm)		
-	:	-1%
+	:	+1%
		7.27e-9
X6: SpecificHeat Cp (J/kgK)		
-	:	-3%
+	:	+3%
		550e6
X7: ThermalConduct. K (W/m/K)		
-	:	-3%
+	:	+3%
		18.1
X8: PowderPorosity Dp (%)		
-	:	-10%
+	:	+10%
		0.5
X9: LaserPower P (W)		
-	:	-3%
+	:	+3%
		195
X10: ScanSpeed V (mm/s)		
-	:	-5%
+	:	+5%
		800

Effect
Rel.Eff. (%)
Fcdf (%)

3.4
0
5.68%

5.22
0
8.72%

0.23
0
0.38%

16.55
1
27.18%

6.35
0
10.59%

53.55
2
74.98%

42.42
2
63.32%

63.72
2
83.34%

96.33
4
97.24%

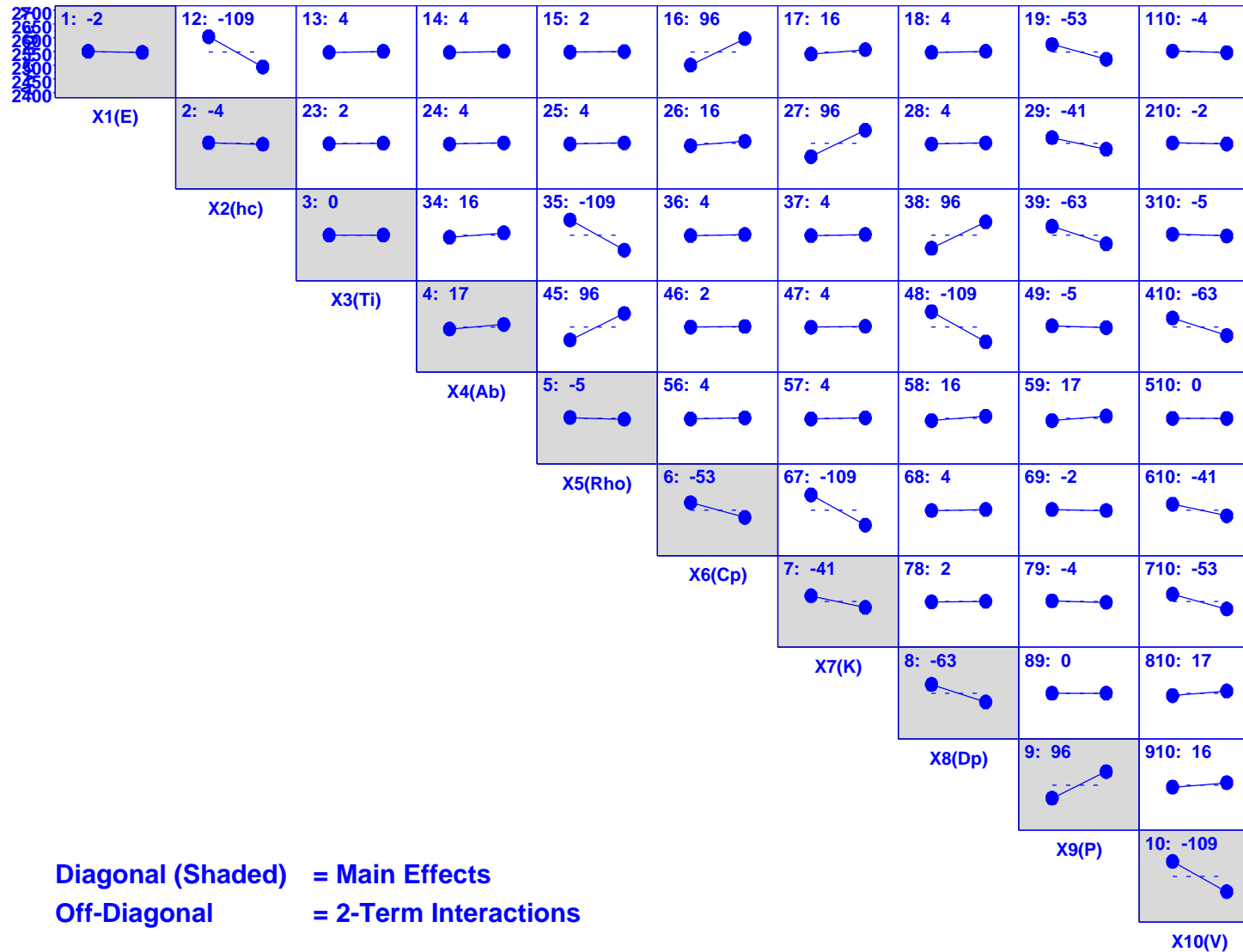
110
4
99.07%

*

**

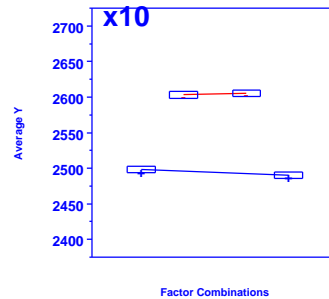
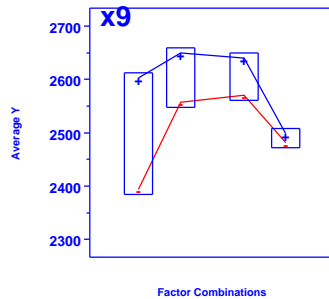
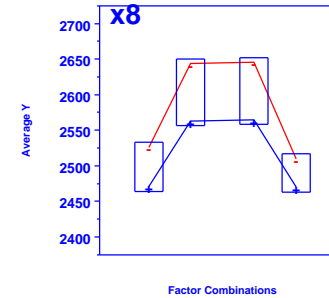
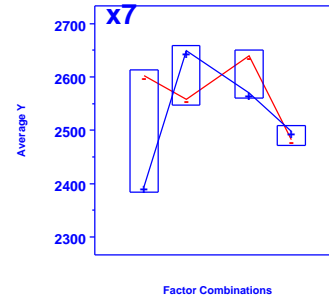
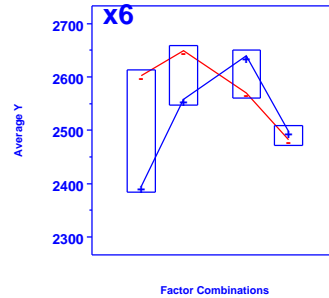
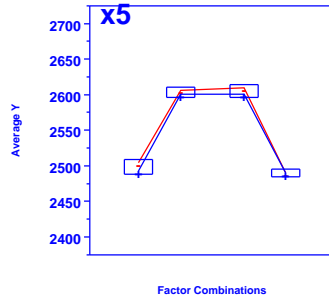
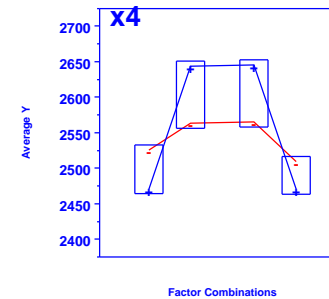
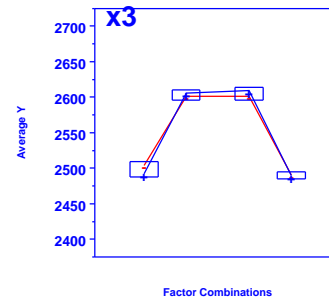
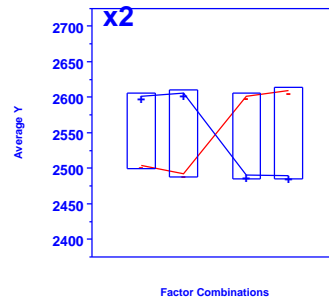
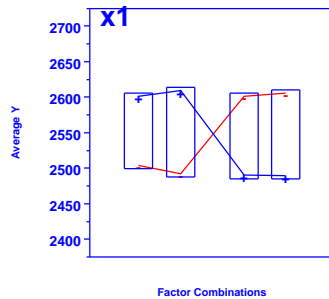
Additive Manufacturing FEA Onetrack Peak Temperature Sensitivity Analysis

Interaction Effects Matrix



- X1: Emissivity E**
 - : -10% 0.37
 + : +10%
- X2: Convection hc (W/K/m)**
 - : -10% 0.05
 + : +10%
- X3: Preheat Temperature Ti (K)**
 - : -1% 353
 + : +1%
- X4: Absorption Ab (0-1)**
 - : -0.5% 0.12
 + : +0.5%
- X5: Density Rho (kg/mm)**
 - : -1% 7.27e-9
 + : +1%
- X6: SpecificHeat Cp (J/kgK)**
 - : -3% 550e6
 + : +3%
- X7: ThermalConduct. K (W/m/K)**
 - : -3% 18.1
 + : +3%
- X8: PowderPorosity Dp (%)**
 - : -10% 0.5
 + : +10%
- X9: LaserPower P (W)**
 - : -3% 195
 + : +3%
- X10: ScanSpeed V (mm/s)**
 - : -5% 800
 + : +5%

Block Plot



X1: Emissivity E

- : -10% 0.37

+ : +10%

X2: Convection h_c (W/K/m)

- : -10% 0.05

+ : +10%

X3: Preheat Temperature T_i (K)

- : -1% 353

+ : +1%

X4: Absorption A_b (0-1)

- : -0.5% 0.12

+ : +0.5%

X5: Density ρ (kg/mm)

- : -1% 7.27e-9

+ : +1%

X6: SpecificHeat C_p (J/kgK)

- : -3% 550e6

+ : +3%

X7: ThermalConduct. K (W/m/K)

- : -3% 18.1

+ : +3%

X8: PowderPorosity D_p (%)

- : -10% 0.5

+ : +10%

X9: LaserPower P (W)

- : -3% 195

+ : +3%

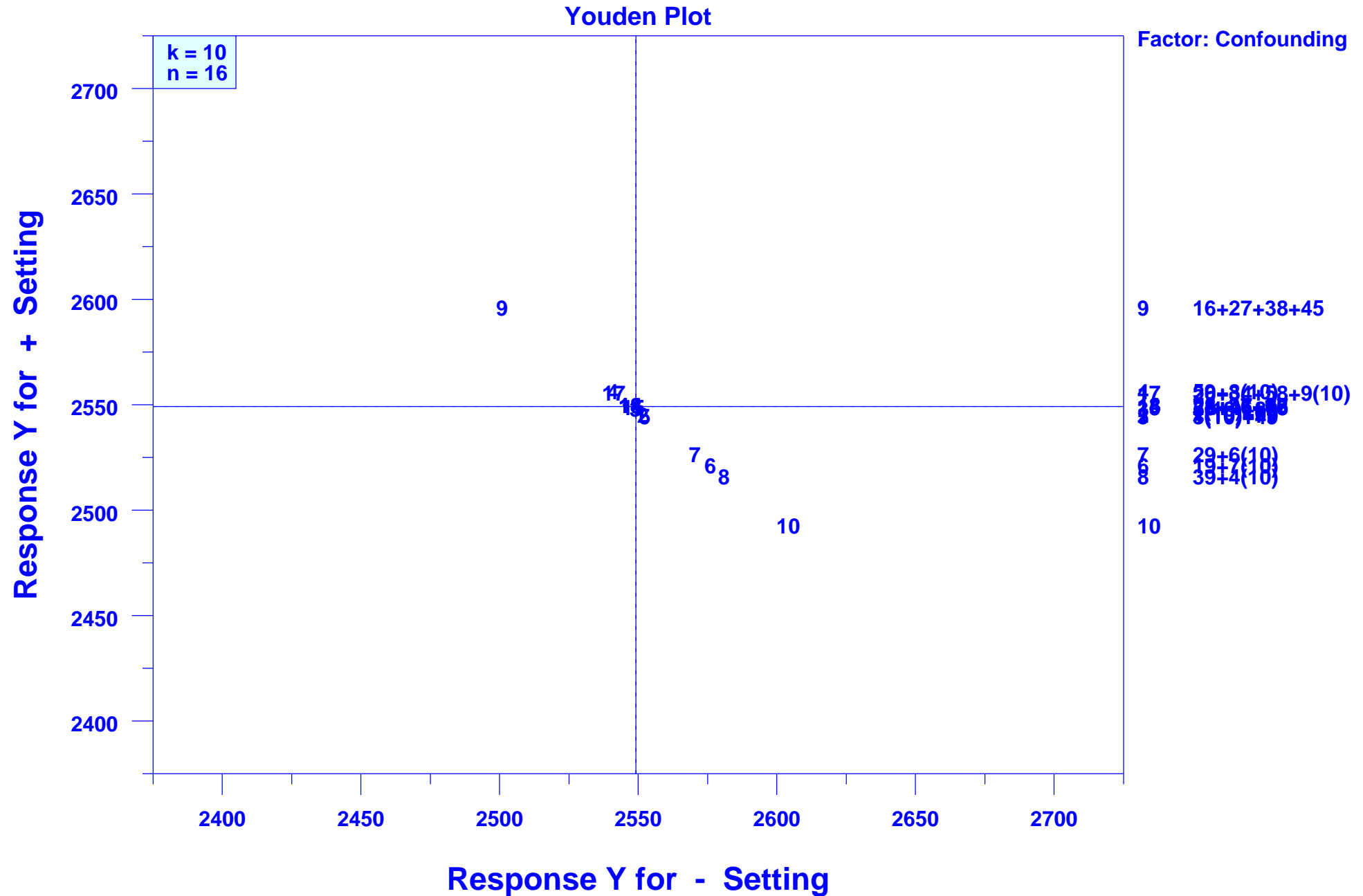
X10: ScanSpeed V (mm/s)

- : -5% 800

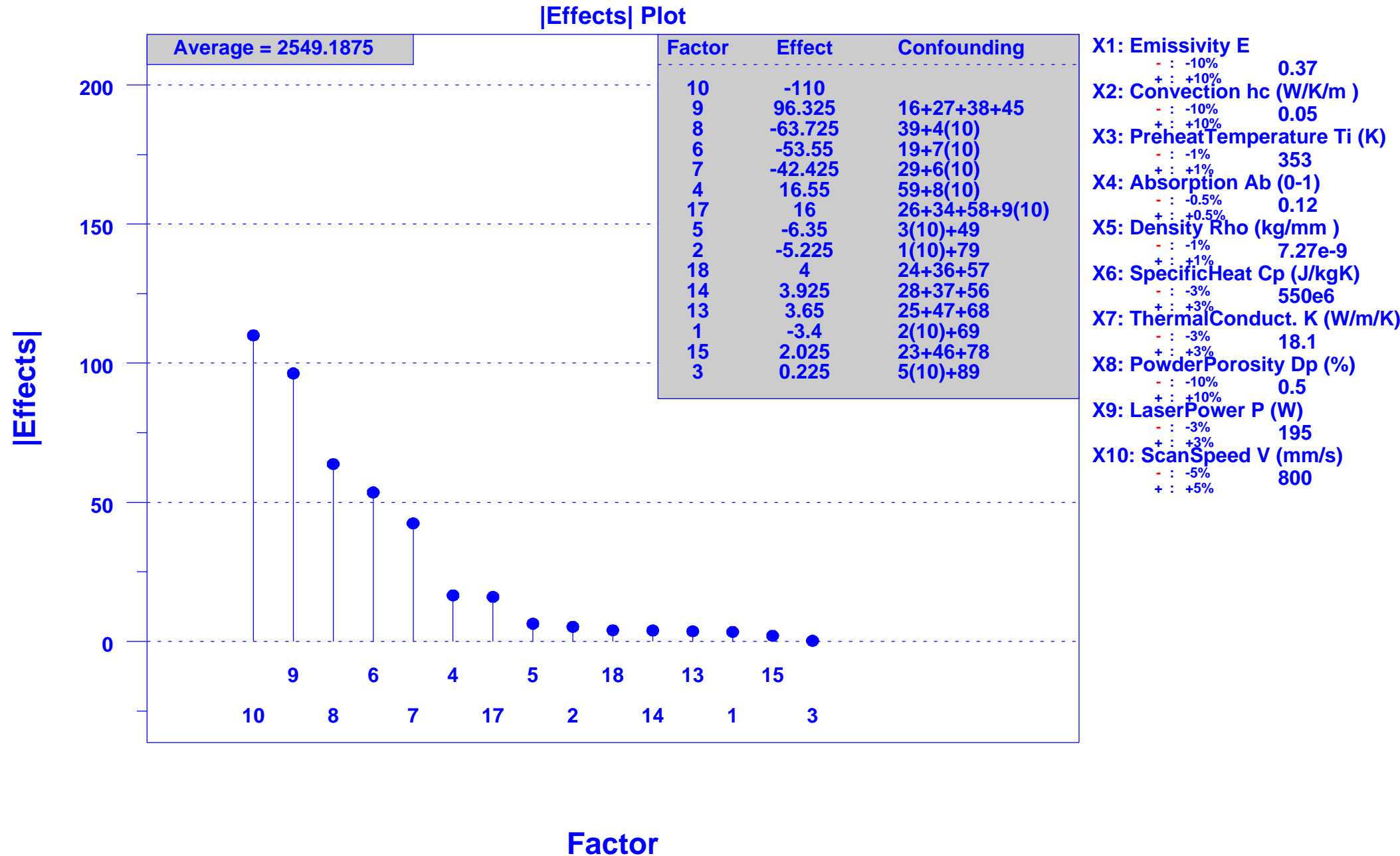
+ : +5%

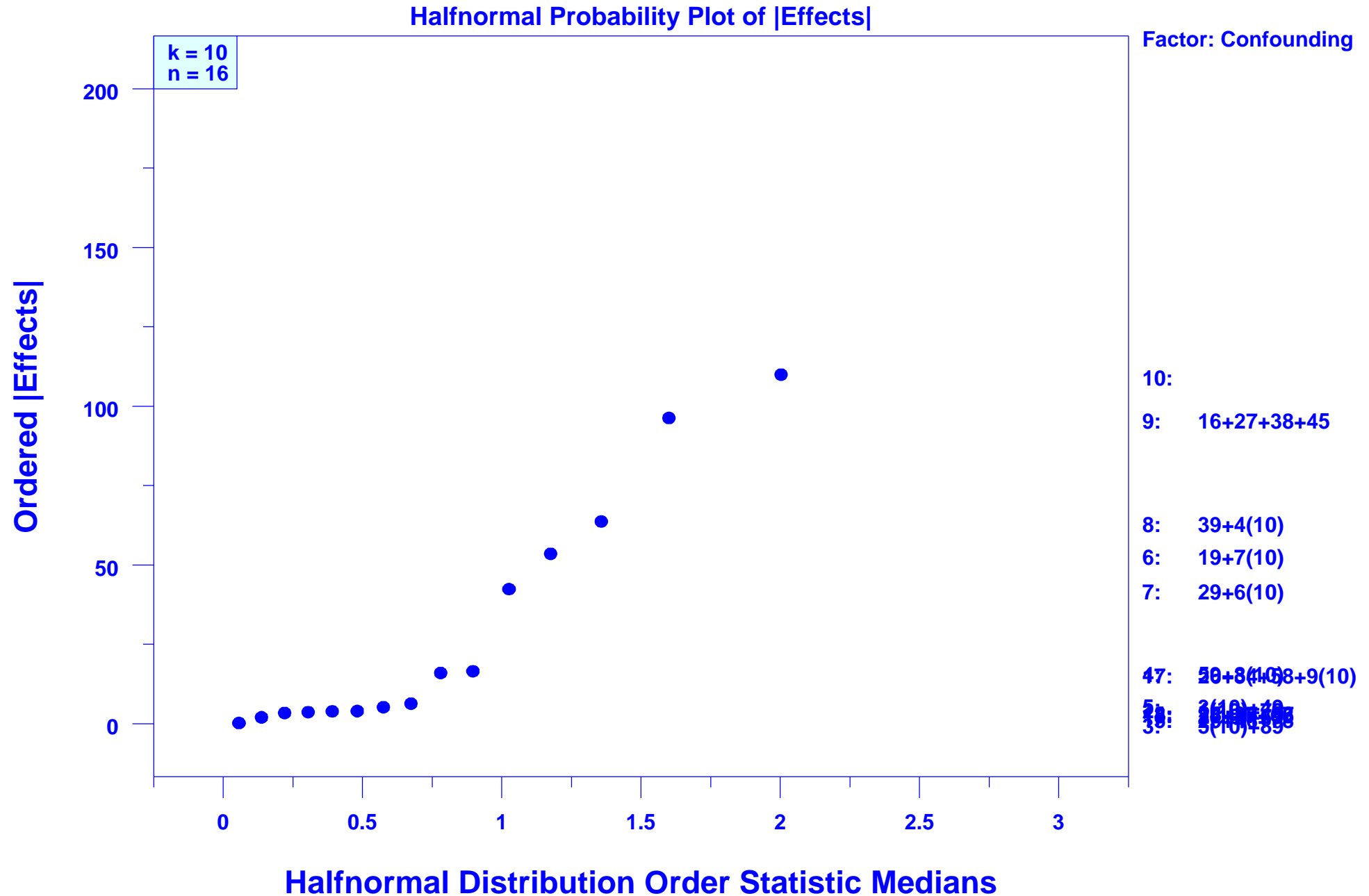
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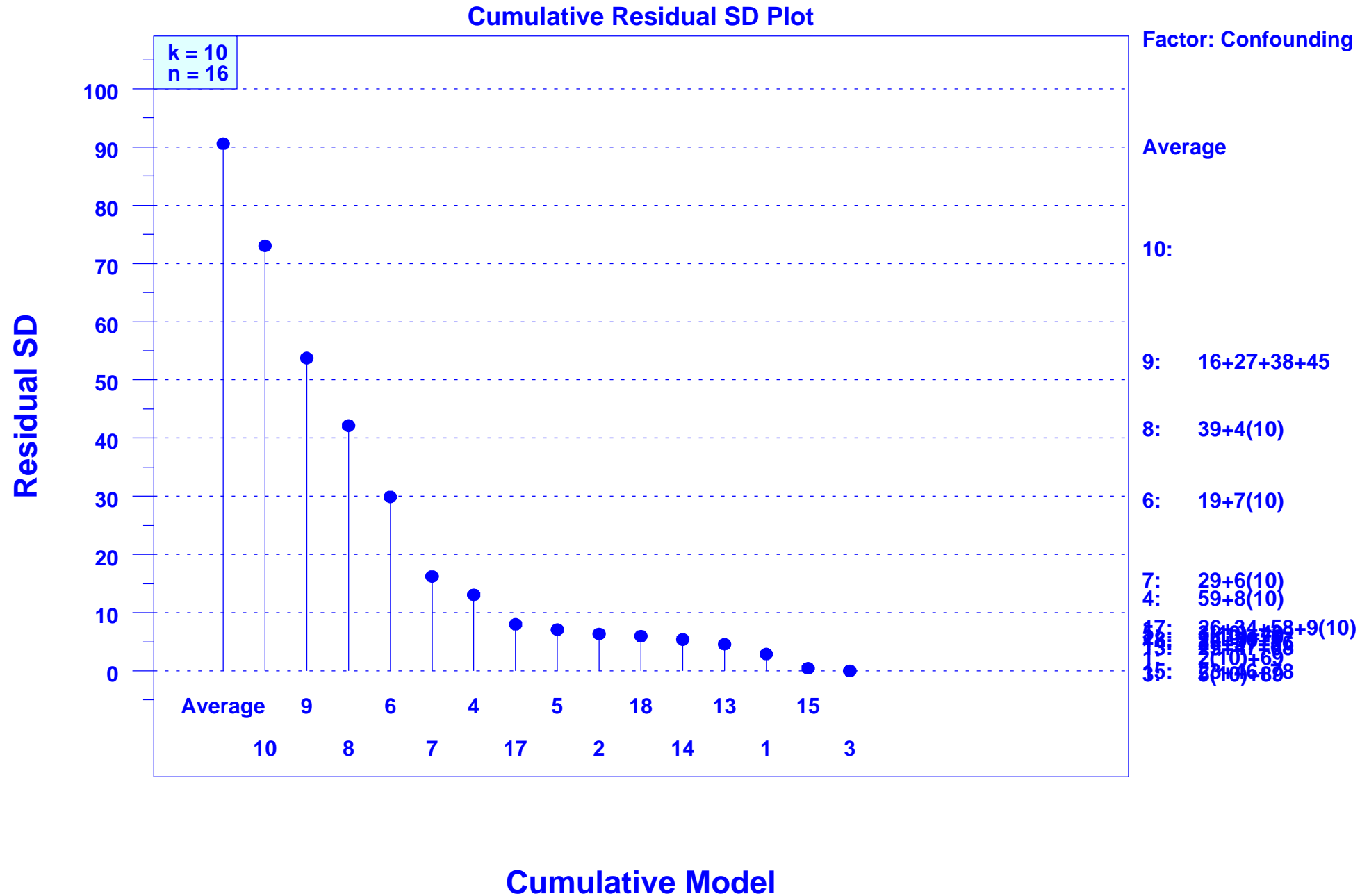
Additive Manufacturing FEA Onetrack Peak Temperature Sensitivity Analysis



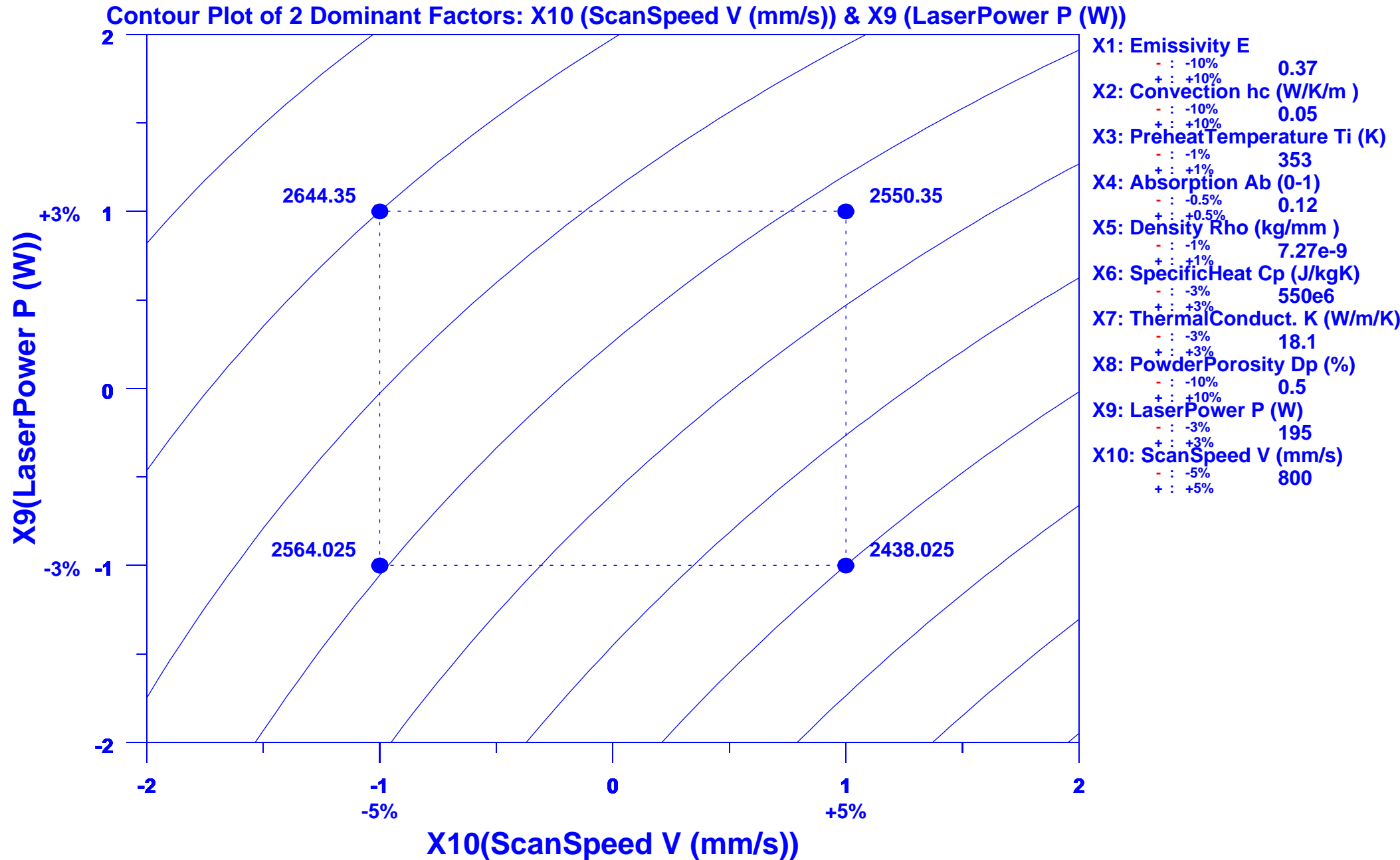
Additive Manufacturing FEA Onetrack Peak Temperature Sensitivity Analysis





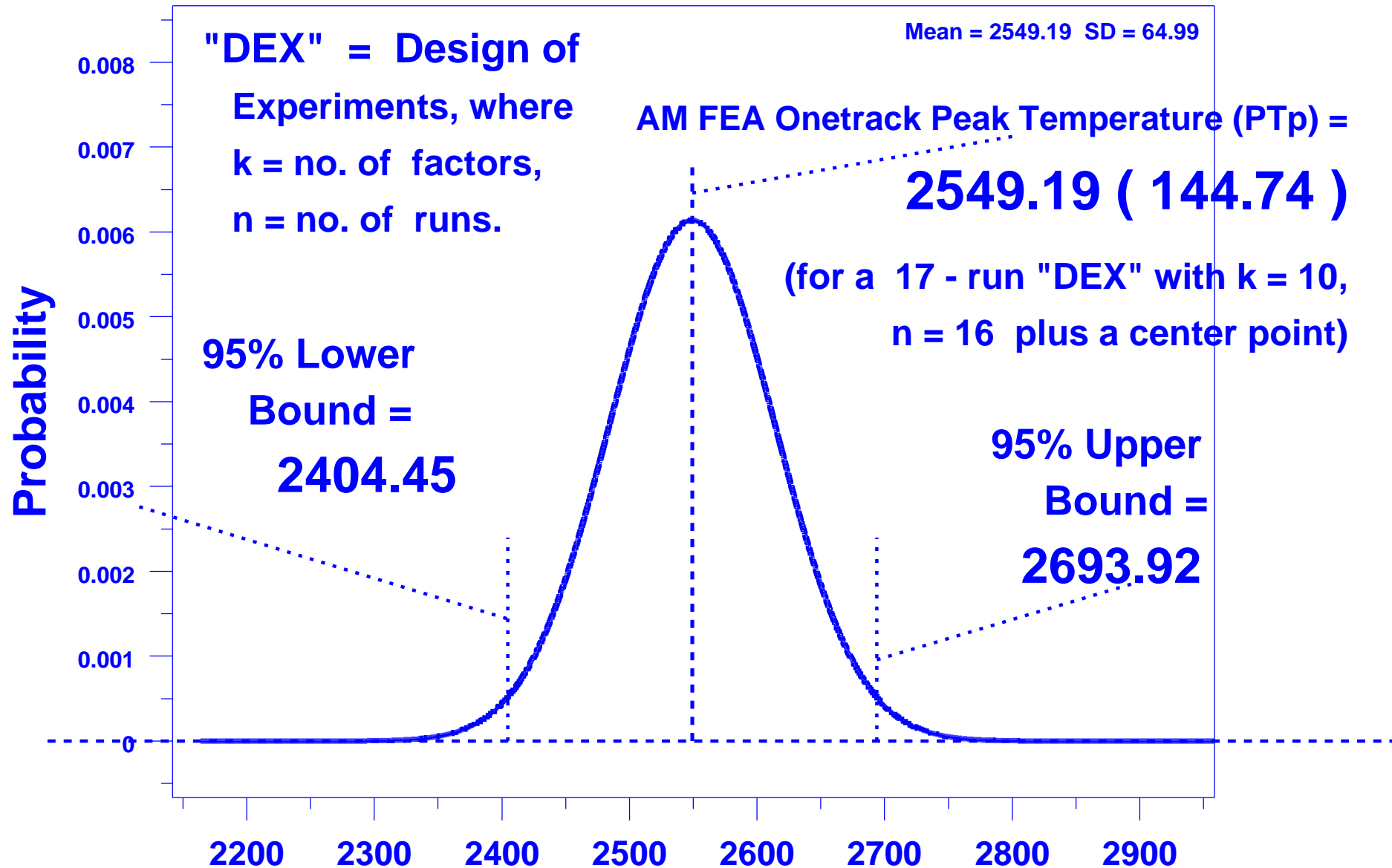


10 Additive Manufacturing FEA Onetrack Peak Temperature Sensitivity Analysis



AM FEA OneTrack Peak Temperature

Materials Sensitivity Analysis, Using Design of Experiments



AM FEA Onetrack Peak Temperature (PTp) (sd = 64.99)

Percent variation of Rh0 (+/- 1.0), k0 (+/- 3.0), E0 (+/- 10.0), A0 (+/- 1.0)

ma_10_16.dp