TITLE: 46 mm __ Isogrid Outer Vacuum Shell For SDC Solenoid

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INTRODUTION: This design note contains a study of an isogrid outer vacuum shell for the SDC solenoid with an overall thickness of 46 mm. In the "P.S." study[1], the isogrid geometry was calculated with a 56 mm over all thickness and a collapse pressure Pcr=30 (psi). The E* and t*, equivalent monocoque modulus and thickness, were also calculated; they allow one to directly use the stability equations for shells made of solid plate. In this study a 46 mm isogrid patten having the same t* and E* will be chosen. Therefore, this patten will automatically satisfy the stability equation. The method shows very good agreement with the results provided by "P.S." for an overall thickness of 56 mm. The effective thickness tw is calculated using an equation in the "Iso-grid Design Handbook" [2].

COMPUTATIONAL METHOD: From "Iso-grid Handbook", E* and t* are given

$$t^* = t \cdot \frac{\beta}{(1+\alpha+u)} \qquad (1)$$

$$E^* = E \cdot \frac{(1+\alpha+u)^2}{\beta} \qquad (2)$$

Multiplying Eq.1 to Eq.2, it gives

$$E^* \cdot t^* = t \cdot E \cdot (1+\alpha+u) \qquad (3)$$

or

$$1+\alpha+u=\frac{t^*\cdot E^*}{E\cdot t} \qquad (4)$$

and α can be obtained as

$$\alpha=\frac{E^*\cdot t^*}{E\cdot t}-u-1 \qquad (5)$$

Substituting u=wc/th, Mw=S/w, and Mc=S/c into Eq.5, it gives

$$\alpha=\frac{E^*t^*}{E\cdot t}-\frac{M_w^2\cdot M_c\cdot S^2}{th}-1 \qquad (6)$$

in which the E* , t* , S , Mw, and Mc are given. Equation 6 can be solved with many different t and h combinations. The width of web b can be calculated as

$$b=\frac{t\cdot h\cdot\alpha}{d}=\frac{t\cdot h\cdot\alpha}{s-t-c} \qquad (7)$$

and effective weight thickness tw is now

$$tw=t(1+3u+3\alpha) \qquad (8)$$

RESULT: By first assuming S=56 mm, a computer program was written to solve Eqs.6,7, and 8 for all possible solutions which satisfy Pcr=30 (psi). It was found from the computer output (Appendix A) that there is a solution which is exactly same as that provided by "P.S". We then assumed b=0.15", w=1.0" and S=1.81" (46 mm), the program is modified slightly and the effective thickness tw was found to be about 13.5 mm /0.6317 inches(Appendix B).

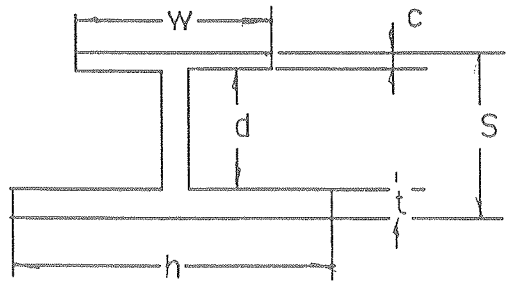

Fig.1 Isogrid Geometry

REFERENCES:

1.L.W.Swenson,"Buckling and stress Analysis of the SDC (Isogrid) Vacuum Shell", SDC, DN-156, Aug. 30, 1991

2."Isogrid Design Handbook" , General Dynamics, 1973

APPEDIX A S' = 56 mm

```
t(weight)=  0.3972754
Pcr(ge)   =   30.17357
a(N.S)=    6.970000     b(W.w.)=  0.1600000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    50.54665    delta=   16.36364     alpaf=  0.4337597
-----------------------------------------------------------------
t(weight)=  0.4062217
Pcr(ge)   =   30.43419
a(N.S)=    6.970000     b(W.w.)=  0.1700000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    51.08171    delta=   16.36364     alpaf=  0.4608697
-----------------------------------------------------------------
t(weight)=  0.3789968
Pcr(ge)   =   29.62274
a(N.S)=    6.980000     b(W.w.)=  0.1400000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    49.43182    delta=   16.36364     alpaf=  0.3789960
-----------------------------------------------------------------
t(weight)=  0.3879303
Pcr(ge)   =   29.88567
a(N.S)=    6.980000     b(W.w.)=  0.1500000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    49.96987    delta=   16.36364     alpaf=  0.4060671
-----------------------------------------------------------------
t(weight)=  0.3968638
Pcr(ge)   =   30.14728
a(N.S)=    6.980000     b(W.w.)=  0.1600000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    50.50607    delta=   16.36364     alpaf=  0.4331383
-----------------------------------------------------------------
t(weight)=  0.4057973
Pcr(ge)   =   30.40765
a(N.S)=    6.980000     b(W.w.)=  0.1700000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    51.04048    delta=   16.36364     alpaf=  0.4602094
-----------------------------------------------------------------
t(weight)=  0.3786120
Pcr(ge)   =   29.59704
a(N.S)=    6.990001     b(W.w.)=  0.1400000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    49.39264    delta=   16.36364     alpaf=  0.3784537
-----------------------------------------------------------------
t(weight)=  0.3875327
Pcr(ge)   =   29.85971
a(N.S)=    6.990001     b(W.w.)=  0.1500000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    49.93003    delta=   16.36364     alpaf=  0.4054861
-----------------------------------------------------------------
t(weight)=  0.3964534
Pcr(ge)   =   30.12107
a(N.S)=    6.990001     b(W.w.)=  0.1600000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    50.46558    delta=   16.36364     alpaf=  0.4325185
-----------------------------------------------------------------
t(weight)=  0.4053741
Pcr(ge)   =   30.38117
a(N.S)=    6.990001     b(W.w.)=  0.1700000     d=(W.d.)   1.800000
t(s.th)=  0.1100000     w(f.w.)=  0.9999999    c(f.th.)=  0.2900000
beta=    50.99934    delta=   16.36364     alpaf=  0.4595510
-----------------------------------------------------------------
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same as. P.S. DATA

$\beta = 49.9$
$\alpha = 0.4$
$\delta = 16$
$t_w = 0.3$

APPENDIX B

$d = 46$ mm, (1.81").

$b = 0.15$"

$w = 1$"

```
t(weight)=  0.6333026
Pcr(ge)  =   30.66272
a(N.S)=   3.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.470000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    83.67063    delta=   16.33333     alpaf=  0.9430330
-----------------------------------------------------------------
t(weight)=  0.6368111
Pcr(ge)  =   30.77030
a(N.S)=   3.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.420000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    83.98666    delta=   15.77778     alpaf=  0.8408834
-----------------------------------------------------------------
t(weight)=  0.6398186
Pcr(ge)  =   30.70535
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.370000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    83.97122    delta=   15.22222     alpaf=  0.7533267
-----------------------------------------------------------------
t(weight)=  0.6031640
Pcr(ge)  =   29.52354
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.370000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    80.56477    delta=   15.22222     alpaf=  0.7031049
-----------------------------------------------------------------
t(weight)=  0.6424249
Pcr(ge)  =   30.52169
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.320000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    83.72459    delta=   14.66667     alpaf=  0.6774442
-----------------------------------------------------------------
t(weight)=  0.6447056
Pcr(ge)  =   30.25592
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.270000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    83.31472    delta=   14.11111     alpaf=  0.6110469
-----------------------------------------------------------------
t(weight)=  0.6815128
Pcr(ge)  =   30.94230
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.220000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    85.80991    delta=   13.55555     alpaf=  0.5869900
-----------------------------------------------------------------
t(weight)=  0.6467179
Pcr(ge)  =   29.93366
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.220000
t(s.th)=  9.0000004E-02 w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    82.78930    delta=   13.55555     alpaf=  0.5524611
-----------------------------------------------------------------
t(weight)=  0.5924942
Pcr(ge)  =   29.81145
a(N.S)=   3.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.510000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    65.94084    delta=   15.10000     alpaf=  0.8718245
-----------------------------------------------------------------
t(weight)=  0.5999112
Pcr(ge)  =   30.36293
a(N.S)=   3.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.460000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    66.95916    delta=   14.60000     alpaf=  0.7781133
-----------------------------------------------------------------
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t(weight)=  0.6062686
Pcr(ge)  =   30.63581
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.410000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    67.53773    delta=   14.10000     alpaf=  0.6977895
-----------------------------------------------------------------
t(weight)=  0.6117783
Pcr(ge)  =   30.71298
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.360000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    67.80485    delta=   13.60000     alpaf=  0.6281755
-----------------------------------------------------------------
t(weight)=  0.5797922
Pcr(ge)  =   29.60787
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.360000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    65.28770    delta=   13.60000     alpaf=  0.5889146
-----------------------------------------------------------------
t(weight)=  0.6165994
Pcr(ge)  =   30.65037
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.310000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    67.84645    delta=   13.10000     alpaf=  0.5672633
-----------------------------------------------------------------
t(weight)=  0.5862112
Pcr(ge)  =   29.62718
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.310000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    65.49482    delta=   13.10000     alpaf=  0.5338949
-----------------------------------------------------------------
t(weight)=  0.6208532
Pcr(ge)  =   30.48693
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.260000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    67.72223    delta=   12.60000     alpaf=  0.5135172
-----------------------------------------------------------------
t(weight)=  0.5919169
Pcr(ge)  =   29.53786
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.260000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    65.52084    delta=   12.60000     alpaf=  0.4849885
-----------------------------------------------------------------
t(weight)=  0.6246344
Pcr(ge)  =   30.25058
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.210000
t(s.th)=  0.1000000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    67.47507    delta=   12.10000     alpaf=  0.4657429
-----------------------------------------------------------------
t(weight)=  0.6007621
Pcr(ge)  =   30.79243
a(N.S)=   3.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.500000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    56.33997    delta=   13.63636     alpaf=  0.7873189
-----------------------------------------------------------------
t(weight)=  0.5727186
Pcr(ge)  =   30.06262
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.450000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    54.80740    delta=   13.18182     alpaf=  0.6523499
-----------------------------------------------------------------
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```
t(weight)=  0.5811317
Pcr(ge)  =   30.47355
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.400000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    55.50067    delta=   12.72727     alpaf=  0.5878648
-----------------------------------------------------------------
t(weight)=  0.5884931
Pcr(ge)  =   30.67173
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.350000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    55.91125    delta=   12.27273     alpaf=  0.5314403
-----------------------------------------------------------------
t(weight)=  0.5603464
Pcr(ge)  =   29.63067
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.350000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    53.99726    delta=   12.27273     alpaf=  0.5001791
-----------------------------------------------------------------
t(weight)=  0.5949885
Pcr(ge)  =   30.71391
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.300000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    56.11198    delta=   11.81818     alpaf=  0.4816539
-----------------------------------------------------------------
t(weight)=  0.5680447
Pcr(ge)  =   29.74233
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.300000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    54.31026    delta=   11.81818     alpaf=  0.4548954
-----------------------------------------------------------------
t(weight)=  0.6007622
Pcr(ge)  =   30.64044
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.250000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    56.15442    delta=   11.36364     alpaf=  0.4373994
-----------------------------------------------------------------
t(weight)=  0.5749326
Pcr(ge)  =   29.73289
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.250000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    54.45652    delta=   11.36364     alpaf=  0.4143783
-----------------------------------------------------------------
t(weight)=  0.6059281
Pcr(ge)  =   30.48071
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.200000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    56.07625    delta=   10.90909     alpaf=  0.3978032
-----------------------------------------------------------------
t(weight)=  0.5811317
Pcr(ge)  =   29.63177
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.200000
t(s.th)=  0.1100000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    54.47384    delta=   10.90909     alpaf=  0.3779131
-----------------------------------------------------------------
t(weight)=  0.5714124
Pcr(ge)  =   30.22789
a(N.S)=   3.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.490000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    46.58258    delta=   12.41667     alpaf=  0.6617516
-----------------------------------------------------------------
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t(weight)=  0.5812340
Pcr(ge)  =   30.98376
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.440000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    47.54625    delta=   12.00000     alpaf=  0.5938634
-----------------------------------------------------------------
t(weight)=  0.5504850
Pcr(ge)  =   29.75217
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.440000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    45.69284    delta=   12.00000     alpaf=  0.5542725
-----------------------------------------------------------------
t(weight)=  0.5603869
Pcr(ge)  =   30.28009
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.390000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    46.42400    delta=   11.58333     alpaf=  0.5015878
-----------------------------------------------------------------
t(weight)=  0.5691238
Pcr(ge)  =   30.58269
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.340000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    46.90221    delta=   11.16667     alpaf=  0.4551012
-----------------------------------------------------------------
t(weight)=  0.5441725
Pcr(ge)  =   29.59665
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.340000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    45.41195    delta=   11.16667     alpaf=  0.4298178
-----------------------------------------------------------------
t(weight)=  0.5768900
Pcr(ge)  =   30.71672
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.290000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    47.18917    delta=   10.75000     alpaf=  0.4137799
-----------------------------------------------------------------
t(weight)=  0.5528431
Pcr(ge)  =   29.79009
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.290000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    45.77709    delta=   10.75000     alpaf=  0.3920020
-----------------------------------------------------------------
t(weight)=  0.5838386
Pcr(ge)  =   30.72319
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.240000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    47.32924    delta=   10.33333     alpaf=  0.3768081
-----------------------------------------------------------------
t(weight)=  0.5606467
Pcr(ge)  =   29.85235
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.240000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    45.99074    delta=   10.33333     alpaf=  0.3579677
-----------------------------------------------------------------
t(weight)=  0.5900924
Pcr(ge)  =   30.63246
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.190000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    47.35522    delta=   9.916666     alpaf=  0.3435335
-----------------------------------------------------------------
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t(weight)=  0.5677071
Pcr(ge)  =   29.81343
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.190000
t(s.th)=  0.1200000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    46.08544    delta=   9.916666     alpaf=  0.3271748
-----------------------------------------------------------------
t(weight)=  0.5682217
Pcr(ge)  =   29.79031
a(N.S)=   3.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.530000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    39.57727    delta=   11.76923     alpaf=  0.6795169
-----------------------------------------------------------------
t(weight)=  0.5476840
Pcr(ge)  =   29.69203
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.480000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    39.16103    delta=   11.38461     alpaf=  0.5634089
-----------------------------------------------------------------
t(weight)=  0.5590993
Pcr(ge)  =   30.57316
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.430000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    40.11924    delta=   11.00000     alpaf=  0.5080832
-----------------------------------------------------------------
t(weight)=  0.5432591
Pcr(ge)  =   30.05583
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.380000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    39.40803    delta=   10.61539     alpaf=  0.4326336
-----------------------------------------------------------------
t(weight)=  0.5530178
Pcr(ge)  =   30.44938
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.330000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    39.91161    delta=   10.23077     alpaf=  0.3937941
-----------------------------------------------------------------
t(weight)=  0.5307536
Pcr(ge)  =   29.51180
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.330000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    38.72795    delta=   10.23077     alpaf=  0.3730680
-----------------------------------------------------------------
t(weight)=  0.5617492
Pcr(ge)  =   30.66459
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.280000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    40.24248    delta=   9.846154     alpaf=  0.3590429
-----------------------------------------------------------------
t(weight)=  0.5401617
Pcr(ge)  =   29.77807
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.280000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    39.11445    delta=   9.846154     alpaf=  0.3410908
-----------------------------------------------------------------
t(weight)=  0.5696075
Pcr(ge)  =   30.74266
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.230000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    40.43885    delta=   9.461538     alpaf=  0.3277670
-----------------------------------------------------------------
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```
t(weight)=  0.5486738
Pcr(ge)  =   29.90499
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.230000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    39.36411    delta=   9.461538     alpaf=  0.3121590
-----------------------------------------------------------------
t(weight)=  0.5767173
Pcr(ge)  =   30.71451
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.180000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    40.52928    delta=   9.076923     alpaf=  0.2994696
-----------------------------------------------------------------
t(weight)=  0.5564120
Pcr(ge)  =   29.92289
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.180000
t(s.th)=  0.1300000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    39.50504    delta=   9.076923     alpaf=  0.2858573
-----------------------------------------------------------------
t(weight)=  0.5764896
Pcr(ge)  =   30.49150
a(N.S)=   3.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.520000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    35.04860    delta=   10.85714     alpaf=  0.6268559
-----------------------------------------------------------------
t(weight)=  0.5561993
Pcr(ge)  =   30.41333
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.470000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    34.71017    delta=   10.50000     alpaf=  0.5196305
-----------------------------------------------------------------
t(weight)=  0.5409816
Pcr(ge)  =   30.16015
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.420000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    34.30660    delta=   10.14286     alpaf=  0.4392115
-----------------------------------------------------------------
t(weight)=  0.5520365
Pcr(ge)  =   30.82302
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.370000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    34.96298    delta=   9.785714     alpaf=  0.3988200
-----------------------------------------------------------------
t(weight)=  0.5291455
Pcr(ge)  =   29.80326
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.370000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    33.87107    delta=   9.785714     alpaf=  0.3766634
-----------------------------------------------------------------
t(weight)=  0.5396597
Pcr(ge)  =   30.27649
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.320000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    34.37630    delta=   9.428571     alpaf=  0.3438157
-----------------------------------------------------------------
t(weight)=  0.5491225
Pcr(ge)  =   30.56385
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.270000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    34.72609    delta=   9.071428     alpaf=  0.3142527
-----------------------------------------------------------------
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t(weight)=  0.5296404
Pcr(ge)  =   29.71387
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.270000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    33.81021    delta=   9.071428     alpaf=  0.2992883
-----------------------------------------------------------------
t(weight)=  0.5576839
Pcr(ge)  =   30.70641
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.220000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    34.95346    delta=   8.714285     alpaf=  0.2875053
-----------------------------------------------------------------
t(weight)=  0.5386984
Pcr(ge)  =   29.89933
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.220000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    34.07689    delta=   8.714285     alpaf=  0.2744369
-----------------------------------------------------------------
t(weight)=  0.5654672
Pcr(ge)  =   30.73525
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.170000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    35.08334    delta=   8.357142     alpaf=  0.2631895
-----------------------------------------------------------------
t(weight)=  0.5469686
Pcr(ge)  =   29.96928
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.170000
t(s.th)=  0.1400000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    34.24455    delta=   8.357142     alpaf=  0.2517465
-----------------------------------------------------------------
t(weight)=  0.5513147
Pcr(ge)  =   29.65883
a(N.S)=   3.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.510000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    29.91234    delta=   10.06667     alpaf=  0.5365074
-----------------------------------------------------------------
t(weight)=  0.5370670
Pcr(ge)  =   29.81626
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.460000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    29.84970    delta=   9.733333     alpaf=  0.4495766
-----------------------------------------------------------------
t(weight)=  0.5496825
Pcr(ge)  =   30.84348
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.410000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    30.68402    delta=   9.400000     alpaf=  0.4070439
-----------------------------------------------------------------
t(weight)=  0.5261717
Pcr(ge)  =   29.74309
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.410000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    29.67098    delta=   9.400000     alpaf=  0.3831001
-----------------------------------------------------------------
t(weight)=  0.5379908
Pcr(ge)  =   30.49047
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.360000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    30.30914    delta=   9.066667     alpaf=  0.3489864
-----------------------------------------------------------------
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t(weight)=  0.5175703
Pcr(ge)  =   29.52589
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.360000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    29.42353    delta=   9.066667     alpaf=  0.3306187
-----------------------------------------------------------------
t(weight)=  0.5485657
Pcr(ge)  =   30.98946
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.310000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    30.76726    delta=   8.733333     alpaf=  0.3184636
-----------------------------------------------------------------
t(weight)=  0.5286375
Pcr(ge)  =   30.06924
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.310000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    29.91720    delta=   8.733333     alpaf=  0.3025404
-----------------------------------------------------------------
t(weight)=  0.5386506
Pcr(ge)  =   30.42096
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.260000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    30.27100    delta=   8.400000     alpaf=  0.2771362
-----------------------------------------------------------------
t(weight)=  0.5209847
Pcr(ge)  =   29.60478
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.260000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    29.51690    delta=   8.400000     alpaf=  0.2645392
-----------------------------------------------------------------
t(weight)=  0.5477536
Pcr(ge)  =   30.62173
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.210000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    30.51364    delta=   8.066666     alpaf=  0.2540415
-----------------------------------------------------------------
t(weight)=  0.5304599
Pcr(ge)  =   29.84334
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.210000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    29.78897    delta=   8.066666     alpaf=  0.2429962
-----------------------------------------------------------------
t(weight)=  0.5560650
Pcr(ge)  =   30.70266
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.160000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    30.66695    delta=   7.733333     alpaf=  0.2329551
-----------------------------------------------------------------
t(weight)=  0.5391455
Pcr(ge)  =   29.96099
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.160000
t(s.th)=  0.1500000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    29.97098    delta=   7.733333     alpaf=  0.2232486
-----------------------------------------------------------------
t(weight)=  0.5597157
Pcr(ge)  =   30.23963
a(N.S)=   3.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.500000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    26.92518    delta=   9.374999     alpaf=  0.4996447
-----------------------------------------------------------------
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```
t(weight)=  0.5456814
Pcr(ge)  =   30.41618
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.450000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    26.88537    delta=   9.062499     alpaf=  0.4185912
-----------------------------------------------------------------
t(weight)=  0.5349491
Pcr(ge)  =   30.35420
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.400000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    26.73742    delta=   8.749999     alpaf=  0.3566091
-----------------------------------------------------------------
t(weight)=  0.5264763
Pcr(ge)  =   30.14248
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.350000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    26.52474    delta=   8.437500     alpaf=  0.3076760
-----------------------------------------------------------------
t(weight)=  0.5375983
Pcr(ge)  =   30.71034
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.300000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    26.97396    delta=   8.124999     alpaf=  0.2814665
-----------------------------------------------------------------
t(weight)=  0.5196173
Pcr(ge)  =   29.83283
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.300000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    26.27143    delta=   8.124999     alpaf=  0.2680633
-----------------------------------------------------------------
t(weight)=  0.5300400
Pcr(ge)  =   30.24208
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.250000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    26.62040    delta=   7.812500     alpaf=  0.2460372
-----------------------------------------------------------------
t(weight)=  0.5395563
Pcr(ge)  =   30.49550
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.200000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    26.86843    delta=   7.499999     alpaf=  0.2259263
-----------------------------------------------------------------
t(weight)=  0.5237414
Pcr(ge)  =   29.74426
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.200000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    26.26226    delta=   7.499999     alpaf=  0.2165127
-----------------------------------------------------------------
t(weight)=  0.5482795
Pcr(ge)  =   30.62407
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.150000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    27.03473    delta=   7.187500     alpaf=  0.2074913
-----------------------------------------------------------------
t(weight)=  0.5327483
Pcr(ge)  =   29.90569
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.150000
t(s.th)=  0.1600000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    26.45066    delta=   7.187500     alpaf=  0.1991917
-----------------------------------------------------------------
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```
t(weight)=  0.5681170
Pcr(ge)  =   30.78374
a(N.S)=   3.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.490000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    24.39293    delta=   8.764705     alpaf=  0.4671188
-----------------------------------------------------------------
t(weight)=  0.5542957
Pcr(ge)  =   30.97787
a(N.S)=   3.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.440000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    24.37046    delta=   8.470587     alpaf=  0.3912511
-----------------------------------------------------------------
t(weight)=  0.5302772
Pcr(ge)  =   29.77676
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.440000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    23.52194    delta=   8.470587     alpaf=  0.3667980
-----------------------------------------------------------------
t(weight)=  0.5437264
Pcr(ge)  =   30.92601
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.390000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    24.24697    delta=   8.176470     alpaf=  0.3332348
-----------------------------------------------------------------
t(weight)=  0.5229639
Pcr(ge)  =   29.86972
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.390000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    23.50466    delta=   8.176470     alpaf=  0.3147217
-----------------------------------------------------------------
t(weight)=  0.5353823
Pcr(ge)  =   30.71908
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.340000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    24.06249    delta=   7.882352     alpaf=  0.2874323
-----------------------------------------------------------------
t(weight)=  0.5171132
Pcr(ge)  =   29.78191
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.340000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    23.40544    delta=   7.882352     alpaf=  0.2730607
-----------------------------------------------------------------
t(weight)=  0.5286276
Pcr(ge)  =   30.41033
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.290000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    23.83935    delta=   7.588234     alpaf=  0.2503541
-----------------------------------------------------------------
t(weight)=  0.5123264
Pcr(ge)  =   29.57224
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.290000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    23.25200    delta=   7.588234     alpaf=  0.2389744
-----------------------------------------------------------------
t(weight)=  0.5390952
Pcr(ge)  =   30.83782
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.240000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    24.15851    delta=   7.294117     alpaf=  0.2297119
-----------------------------------------------------------------
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t(weight)=  0.5230475
Pcr(ge)  =   30.03293
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.240000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    23.59097    delta=   7.294117     alpaf=  0.2197244
-----------------------------------------------------------------
t(weight)=  0.5328754
Pcr(ge)  =   30.33401
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.190000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    23.83818    delta=   6.999999     alpaf=  0.2020785
-----------------------------------------------------------------
t(weight)=  0.5183603
Pcr(ge)  =   29.60865
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.190000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    23.32588    delta=   6.999999     alpaf=  0.1939954
-----------------------------------------------------------------
t(weight)=  0.5419169
Pcr(ge)  =   30.50613
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.140000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    24.01061    delta=   6.705882     alpaf=  0.1858443
-----------------------------------------------------------------
t(weight)=  0.5276124
Pcr(ge)  =   29.81023
a(N.S)=   6.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.140000
t(s.th)=  0.1700000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    23.51551    delta=   6.705882     alpaf=  0.1786964
-----------------------------------------------------------------
t(weight)=  0.5481954
Pcr(ge)  =   29.88836
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.480000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    21.33453    delta=   8.222220     alpaf=  0.4069063
-----------------------------------------------------------------
t(weight)=  0.5389781
Pcr(ge)  =   30.27843
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.430000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    21.44670    delta=   7.944443     alpaf=  0.3440146
-----------------------------------------------------------------
t(weight)=  0.5318092
Pcr(ge)  =   30.38261
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.380000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    21.43857    delta=   7.666665     alpaf=  0.2950988
-----------------------------------------------------------------
t(weight)=  0.5260739
Pcr(ge)  =   30.30087
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.330000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    21.35413    delta=   7.388887     alpaf=  0.2559661
-----------------------------------------------------------------
t(weight)=  0.5376378
Pcr(ge)  =   30.95113
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.280000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    21.75237    delta=   7.111109     alpaf=  0.2346127
-----------------------------------------------------------------
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t(weight)=  0.5213816
Pcr(ge)  =   30.09344
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.280000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    21.21898    delta=   7.111109     alpaf=  0.2239484
-----------------------------------------------------------------
t(weight)=  0.5321438
Pcr(ge)  =   30.57152
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.230000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    21.53004    delta=   6.833332     alpaf=  0.2058439
-----------------------------------------------------------------
t(weight)=  0.5174712
Pcr(ge)  =   29.79873
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.230000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    21.04899    delta=   6.833332     alpaf=  0.1972671
-----------------------------------------------------------------
t(weight)=  0.5420093
Pcr(ge)  =   30.88606
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.180000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    21.75707    delta=   6.555554     alpaf=  0.1892481
-----------------------------------------------------------------
t(weight)=  0.5275289
Pcr(ge)  =   30.14295
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.180000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    21.29151    delta=   6.555554     alpaf=  0.1816782
-----------------------------------------------------------------
t(weight)=  0.5368130
Pcr(ge)  =   30.35493
a(N.S)=   6.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.130000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    21.46555    delta=   6.277776     alpaf=  0.1672884
-----------------------------------------------------------------
t(weight)=  0.5235977
Pcr(ge)  =   29.68075
a(N.S)=   6.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.130000
t(s.th)=  0.1800000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    21.04214    delta=   6.277776     alpaf=  0.1610925
-----------------------------------------------------------------
t(weight)=  0.5567107
Pcr(ge)  =   30.34226
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.470000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    19.54160    delta=   7.736841     alpaf=  0.3828856
-----------------------------------------------------------------
t(weight)=  0.5476790
Pcr(ge)  =   30.74936
a(N.S)=   4.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.420000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    19.65243    delta=   7.473682     alpaf=  0.3236294
-----------------------------------------------------------------
t(weight)=  0.5266390
Pcr(ge)  =   29.61302
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.420000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    19.01923    delta=   7.473682     alpaf=  0.3045924
-----------------------------------------------------------------
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t(weight)=  0.5406544
Pcr(ge)  =   30.86390
a(N.S)=   4.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.370000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    19.65135    delta=   7.210525     alpaf=  0.2775414
-----------------------------------------------------------------
t(weight)=  0.5221989
Pcr(ge)  =   29.85136
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.370000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    19.08988    delta=   7.210525     alpaf=  0.2629339
-----------------------------------------------------------------
t(weight)=  0.5350347
Pcr(ge)  =   30.78768
a(N.S)=   5.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.320000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    19.57898    delta=   6.947367     alpaf=  0.2406709
-----------------------------------------------------------------
t(weight)=  0.5186045
Pcr(ge)  =   29.87989
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.320000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    19.07664    delta=   6.947367     alpaf=  0.2292104
-----------------------------------------------------------------
t(weight)=  0.5304368
Pcr(ge)  =   30.58216
a(N.S)=   5.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.270000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    19.45905    delta=   6.684209     alpaf=  0.2105042
-----------------------------------------------------------------
t(weight)=  0.5156351
Pcr(ge)  =   29.76344
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.270000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    19.00606    delta=   6.684209     alpaf=  0.2013518
-----------------------------------------------------------------
t(weight)=  0.5266052
Pcr(ge)  =   30.28663
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.220000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    19.30633    delta=   6.421051     alpaf=  0.1853652
-----------------------------------------------------------------
t(weight)=  0.5131410
Pcr(ge)  =   29.54416
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.220000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    18.89502    delta=   6.421051     alpaf=  0.1779506
-----------------------------------------------------------------
t(weight)=  0.5366975
Pcr(ge)  =   30.64375
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.170000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    19.52973    delta=   6.157893     alpaf=  0.1706575
-----------------------------------------------------------------
t(weight)=  0.5233631
Pcr(ge)  =   29.92739
a(N.S)=   6.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.170000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    19.13050    delta=   6.157893     alpaf=  0.1640938
-----------------------------------------------------------------
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t(weight)=  0.5460136
Pcr(ge)  =   30.86546
a(N.S)=   6.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.120000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    19.69007    delta=   5.894735     alpaf=  0.1570812
-----------------------------------------------------------------
t(weight)=  0.5328279
Pcr(ge)  =   30.17577
a(N.S)=   6.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.120000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    19.30315    delta=   5.894735     alpaf=  0.1512634
-----------------------------------------------------------------
t(weight)=  0.5205840
Pcr(ge)  =   29.52270
a(N.S)=   7.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.120000
t(s.th)=  0.1900000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    18.93819    delta=   5.894735     alpaf=  0.1458612
-----------------------------------------------------------------
t(weight)=  0.5770208
Pcr(ge)  =   29.86272
a(N.S)=   3.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.510000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.1000000
beta=    17.69678    delta=   7.549998     alpaf=  0.4359121
-----------------------------------------------------------------
t(weight)=  0.5652260
Pcr(ge)  =   30.76916
a(N.S)=   3.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.460000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.1500000
beta=    17.98016    delta=   7.299998     alpaf=  0.3612669
-----------------------------------------------------------------
t(weight)=  0.5354164
Pcr(ge)  =   30.03513
a(N.S)=   4.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.410000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.2000000
beta=    17.50901    delta=   7.049998     alpaf=  0.2873250
-----------------------------------------------------------------
t(weight)=  0.5311049
Pcr(ge)  =   30.28456
a(N.S)=   4.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.360000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.2500000
beta=    17.57872    delta=   6.799998     alpaf=  0.2479640
-----------------------------------------------------------------
t(weight)=  0.5276147
Pcr(ge)  =   30.31954
a(N.S)=   5.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.310000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.3000000
beta=    17.57024    delta=   6.549999     alpaf=  0.2161003
-----------------------------------------------------------------
t(weight)=  0.5247315
Pcr(ge)  =   30.20606
a(N.S)=   5.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.260000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.3500000
beta=    17.50820    delta=   6.299998     alpaf=  0.1897781
-----------------------------------------------------------------
t(weight)=  0.5357391
Pcr(ge)  =   30.74473
a(N.S)=   6.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.210000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    17.78575    delta=   6.049999     alpaf=  0.1746535
-----------------------------------------------------------------
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t(weight)=  0.5223095
Pcr(ge)  =   29.98709
a(N.S)=   6.250000     b(W.w.)=  0.1500000     d=(W.d.)   1.210000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.4000000
beta=    17.40825    delta=   6.049999     alpaf=  0.1676674
-----------------------------------------------------------------
t(weight)=  0.5325636
Pcr(ge)  =   30.38259
a(N.S)=   6.500000     b(W.w.)=  0.1500000     d=(W.d.)   1.160000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    17.62583    delta=   5.799998     alpaf=  0.1545567
-----------------------------------------------------------------
t(weight)=  0.5202464
Pcr(ge)  =   29.69183
a(N.S)=   6.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.160000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.4500000
beta=    17.28090    delta=   5.799998     alpaf=  0.1488324
-----------------------------------------------------------------
t(weight)=  0.5420581
Pcr(ge)  =   30.64038
a(N.S)=   6.750000     b(W.w.)=  0.1500000     d=(W.d.)   1.110000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    17.78534    delta=   5.549999     alpaf=  0.1424172
-----------------------------------------------------------------
t(weight)=  0.5298417
Pcr(ge)  =   29.97348
a(N.S)=   7.000000     b(W.w.)=  0.1500000     d=(W.d.)   1.110000
t(s.th)=  0.2000000     w(f.w.)=   1.000000    c(f.th.)=  0.5000001
beta=    17.45023    delta=   5.549999     alpaf=  0.1373309
-----------------------------------------------------------------
```