

Subset of output from FQ 2010 deployment:

\$#FQ.ENS CRC\_OK

1564 Sat Mar 14 16:39:29 2009 4.3 17.4 40 251 0xFF 36 44 166 464 688 912 988 1286 1592  
-328 -332 -325 -323 0 40 1 65 967 380 0 0 1 1548

E0 6 **0.61** 0.03 **0.45** 0.08 **32.40** 4.10

E1 120 0.59 0.51 37.50 0.63 0.50 36.70 0.55 0.53 35.70 0.60 0.38 34.50 0.68 0.53 33.60 0.62  
0.38 32.20 ...

E2 296 -186 -33 4 -6 -29 -34 -30 0 3 4 20 26 11 ...

E3 222 **-204 -108 -88** -79 -73 -7 -32 -46 5 -33 ...

E4 222 **-226 -6 88** -107 20 7 -56 21 -5 -58 27 ...

Vinst =

**-204**

**-108**

**-88**

r = 0.0106

p = 0.0079

h = 0.5655

Rrp =

0.9999 0.0000 0.0079

0.0000 1.0000 -0.0106

-0.0079 0.0106 0.9999

Rheading =

0.8443 -0.5358 0

0.5358 0.8443 0

0 0 1.0000

Vearth =

**-115.4504**

**-200.0760**

**-87.5399**

This is the code to generate the Rrp and Rheading matrices:

$A_{11} = 1 - \sin(r)^2 ./ (\sin(r)^2 + \sin(p)^2) .* (1 - \sqrt{1 - \sin(r)^2 - \sin(p)^2});$

$A_{22} = 1 - \sin(p)^2 ./ (\sin(r)^2 + \sin(p)^2) .* (1 - \sqrt{1 - \sin(r)^2 - \sin(p)^2});$

$A_{33} = \sqrt{1 - \sin(r)^2 - \sin(p)^2};$

$A_{12} = \sin(r) * \sin(p) ./ (\sin(r)^2 + \sin(p)^2) .* (1 - \sqrt{1 - \sin(r)^2 - \sin(p)^2});$

$A_{13} = \sin(p);$

$A_{23} = -\sin(r);$

$Rrp(1,1,1:\text{length}(A_{11})) = A_{11};$

$Rrp(1,2,1:\text{length}(A_{11})) = A_{12};$

$Rrp(1,3,1:\text{length}(A_{11})) = A_{13};$

$Rrp(2,1,1:\text{length}(A_{11})) = A_{12};$

$Rrp(2,2,1:\text{length}(A_{11})) = A_{22};$

```
Rrp(2,3,1:length(A11)) = A23;  
Rrp(3,1,1:length(A11)) = -A13;  
Rrp(3,2,1:length(A11)) = -A23;  
Rrp(3,3,1:length(A11)) = A33;
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```
Rheading(1,1,1:length(A11)) = cos(h);  
Rheading(1,2,1:length(A11)) = -sin(h);  
Rheading(1,3,1:length(A11)) = 0;  
Rheading(2,1,1:length(A11)) = sin(h);  
Rheading(2,2,1:length(A11)) = cos(h);  
Rheading(2,3,1:length(A11)) = 0;  
Rheading(3,1,1:length(A11)) = 0;  
Rheading(3,2,1:length(A11)) = 0;  
Rheading(3,3,1:length(A11)) = 1;
```

And then —

```
Srph = Rheading * Rrp;
```

```
Vearth = Srph * Vinst;
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