PASS Requirements for Real-time FOS GIMP Mitigation

For each 30 minute or shorter period of FOS data collection at a particular S/C orientation (target), starting at time T0, compute a 3rd order polynomial fit to the GIMP offsets in X and Y as a function of time from T0, as follows:

For each (~~90~~ 15 s) GIMP correction interval during the FOS data collection period, compute the amount of GIMP offset required in X and Y:

1. Determine time, T, of mid-point of the interval.

2. Compute geomagnetic field B(V1,V2,V3) (in gauss) in S/C coordinates from the S/C orientation and orbital location at T.

3. Compute geomagnetic field components along Digicon axes, B(X,Y,Z), by successive cartesian coordinate rotation (see diagram below for orientation of detectors wrt S/C coordinates):

   a. rotate about V1 axis by -135 degrees,

   $$B0\_x = \cos(-135)B\_v2 + \sin(-135)B\_v3$$
   $$B0\_y = -\sin(-135)B\_v2 + \cos(-135)B\_v3$$
   $$B0\_z = B\_v1$$

   b. rotate about V2-V3 bisector by -23 degrees,

   $$B1\_x = B0\_x$$
   $$B1\_y = \cos(-23)B0\_y + \sin(-23)B0\_z$$
   $$B1\_z = -\sin(-23)B0\_y + \cos(-23)B0\_z$$

   c. rotate about detector Y axis by +/- 8 degrees (-8 for the Blue detector, +8 for the Amber),

   $$B\_x = \cos(+/-8)B1\_x + \sin(+/-8)B1\_z$$
   $$B\_y = B1\_y$$
   $$(B\_z = -\sin(+/-8)B1\_x + \cos(+/-8)B1\_z;$$ this calc. not required)

   d. reverse sense of x (and z) component,

   $$B\_x = - B\_x$$
   $$(B\_z = - B\_z$$; this calc. not required)

4. Compute effective geomagnetic field, B_eff(X,Y), correcting for ExB electron-optical drift, by rotating about the detector Z axis by 17.6 degrees.

   $$B\_eff\_x = \cos(17.6)B\_x + \sin(17.6)B\_y$$
   $$B\_eff\_y = -\sin(17.6)B\_x + \cos(17.6)B\_y$$

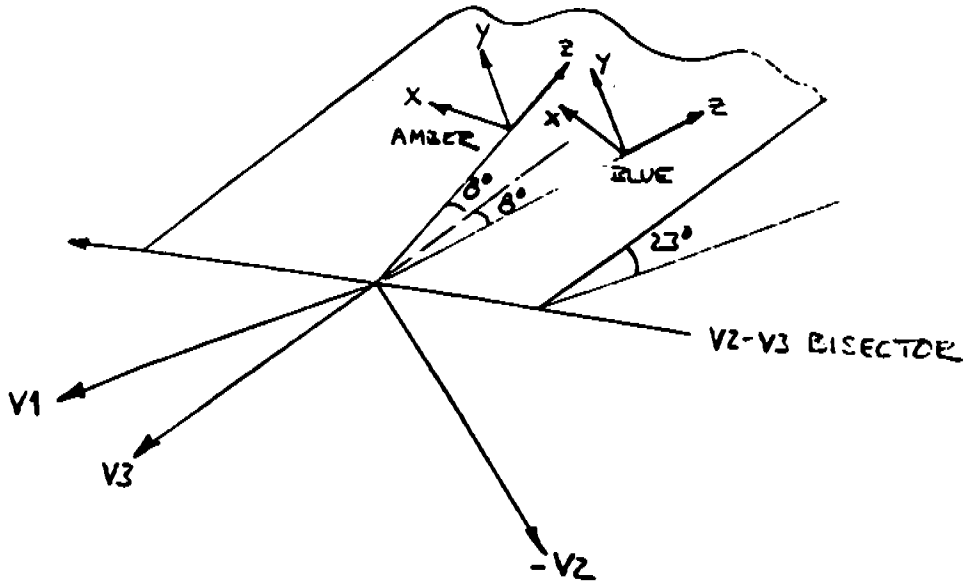
5. Compute GIMP offsets (DX,DY) in X and Y by scaling B_eff(X,Y) with scale factors that are included in the SMS. These scale factors are dependent on detector and data acquisition mode. Units are detector deflection units per gauss, and values range from approximately -200. to +200.

B. Determine the coefficients to be uploaded for GIMP correction, in both X and Y:

1. Using standard least-squares fitting technique, compute a 3rd-order polynomial fit (coefficients C) to dT=T-T0 (in units of ~~90~~ 15 s) vs DX and DY.

2. Scale polynomial coefficients C by constants to accomodate integer math of the NSSC-I (CS). Scaling constants are fixed and hardcoded in flight S/W

3. Place T0 and 4 scaled coefficients CS in table for upload to NSSC-1



FOS Detector Coordinates with respect to Spacecraft Coordinates

The X-Z plane of both detectors is coplanar with a surface defined by rotating the plane including the V1 axis and the V2-V3 bisector -23 degrees about the latter.