9/13/90

FOS Geomagnetically-induced Image Motion Problem
(or, Why the Red Digicon is GIMPy, and What to do about it)

I. Discovery & Initial Analysis

- OV2189 image maps show distortion in X and Y
  X center approximately correlated with half orbital period
  Strong correlation with X component of geomagnetic B field

- Lab testing shows magnetic shields of same batch far below spec's
  Blue digicon shield expected to be good - 2189 (Blue) on day 266

- Amplitude approximately 50 microns (1 diode = 1 resolution width)
  or .4 arcseconds

- Maximum rate of drift approximately .1 diode/min, .04 arcsec/min

II. Further Testing

- OV 2188 should provide considerably better picture (22 Sept)

- Special (new) test may be required
  Greater temporal resolution, varied spacecraft pointing
  Second order effects: hysteresis?
  field distortion?
  E x B drift?
  First examine 2188 results

III. Science Impact

- Spectrophotometry impaired
  - Y drift causes loss of signal
    - Exacerbated by relatively distortion characteristic of F12 and FGW non repeatability
  - Use 4.3 aperture (with loss of approx 50% spectral resolution)

- Spectropolarimetry impossible
  - Even small temporal variations in signal induce large pol error
    - Variations cannot be modelled/corrected (FGW non-repeatability)

- Target Acquisition less efficient
  - Binary Search may not be usable (can fail with drifting image)
  - Firmware less susceptible to drift but overhead nearly 2x B/S
  - Peak-up (very inefficient) required for small aperture TA
    - TALED's not useful unless offset from drift modelled/corrected

IV. Solutions

- Immediate: read out often (approx. 1 min) and shift before coadding
  - Regains most of spectral resolution (with some overhead cost)
  - Cannot correct for flux variation
  - Does not address TA issues

need magnetic engineering data for calibration fix!

ground software change

- Final: dither X and Y deflections during acquisition
  - Dead time, initial set-up overheads?
  - Architecture; where are the calculations best performed?
  - Schedule - fix possible by early Cycle 1?

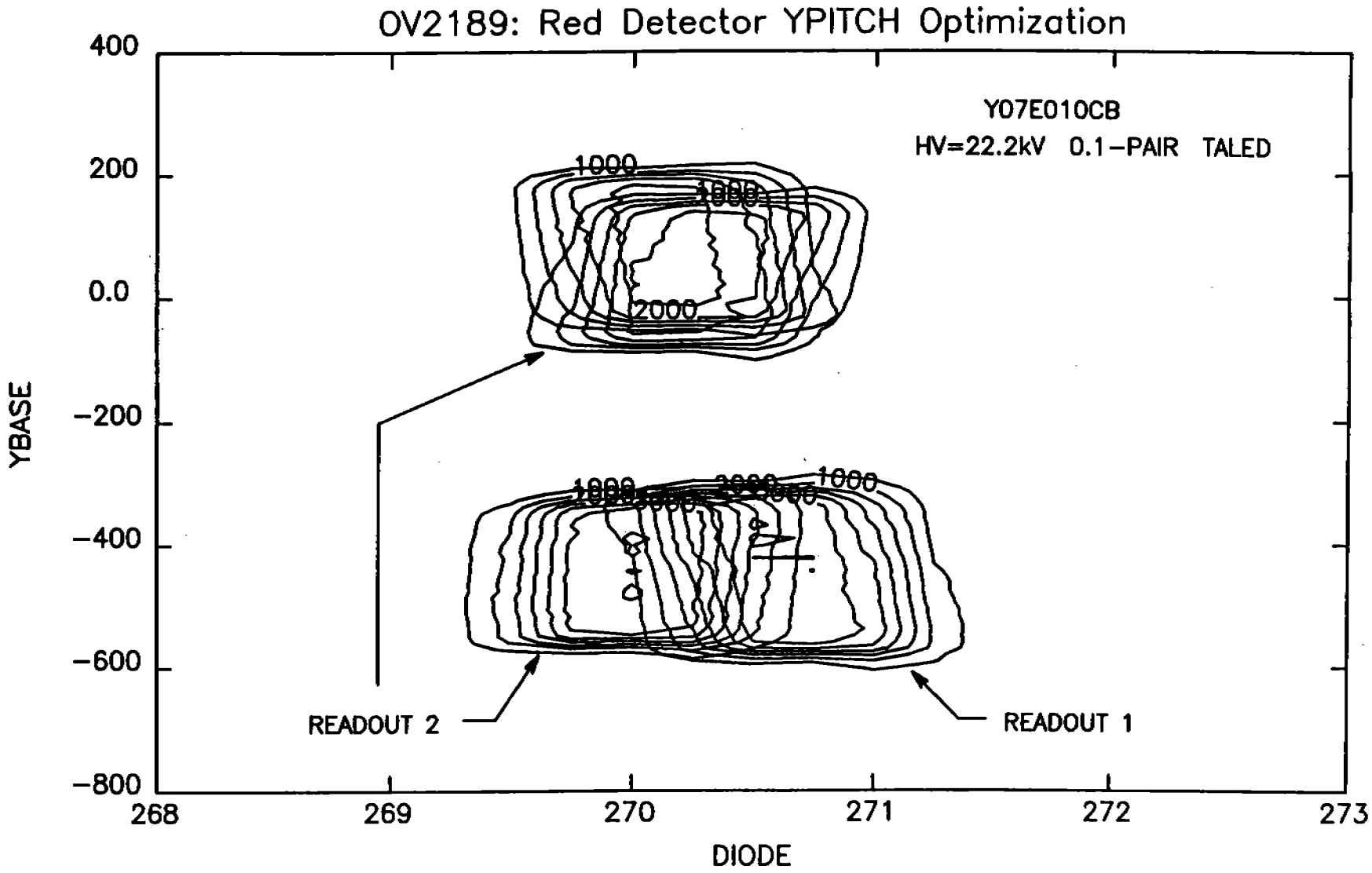

OV2189: Red Detector YPITCH Optimization
Y07E010CB
HV=22.2kV 0.1-PAIR TALED
1000
1000
2000
1000
READOUT 2
READOUT 1
YBASE
DIODE
400
200
0.0
-200
-400
-600
-800
268
269
270
271
272
273

Fig 2

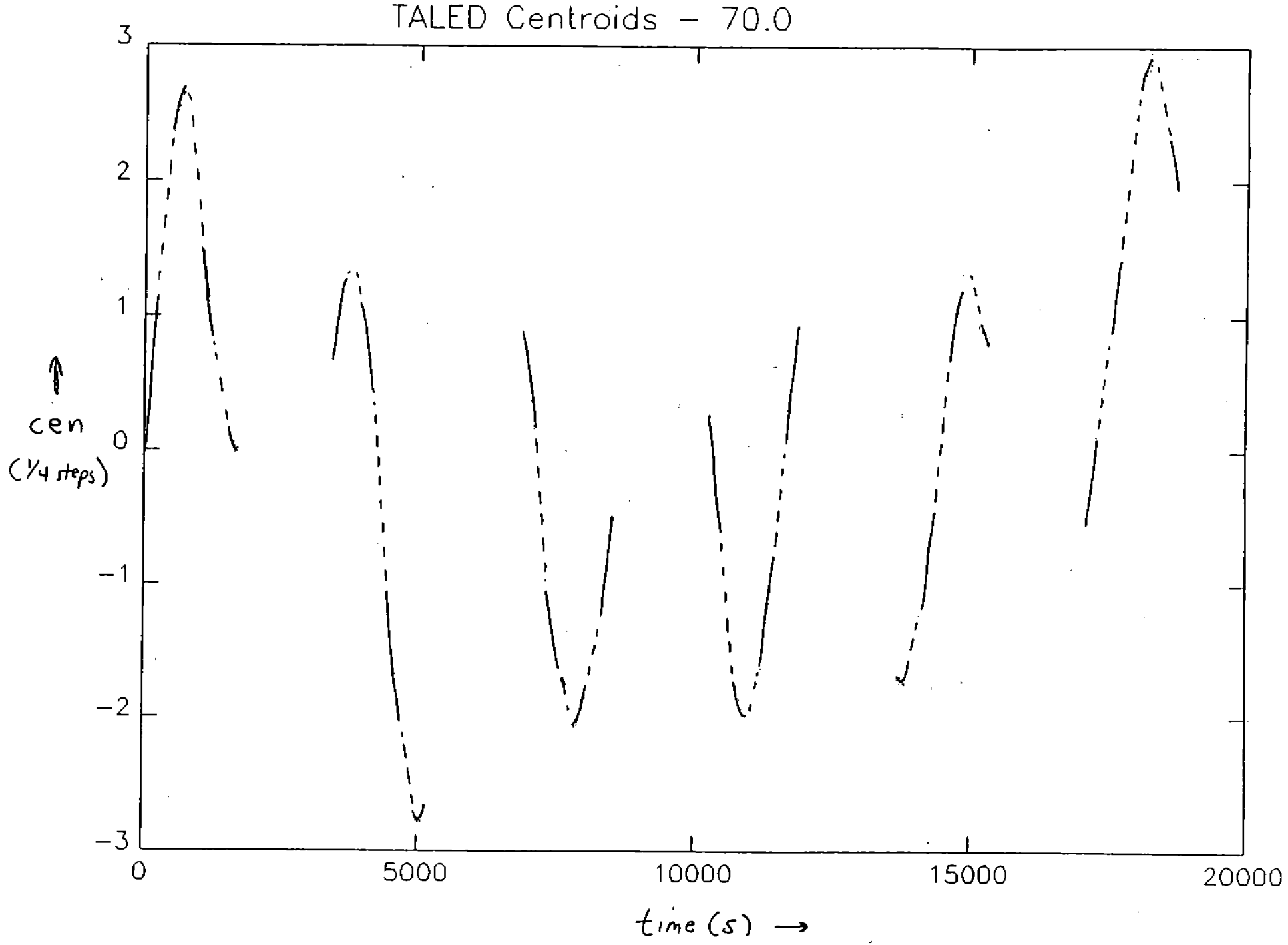

TALED Centroids – 70.0
3
2
1
0
−1
−2
−3
cen
(¼ steps)
0
5000
10000
15000
20000
time (s) →

Fig. 3

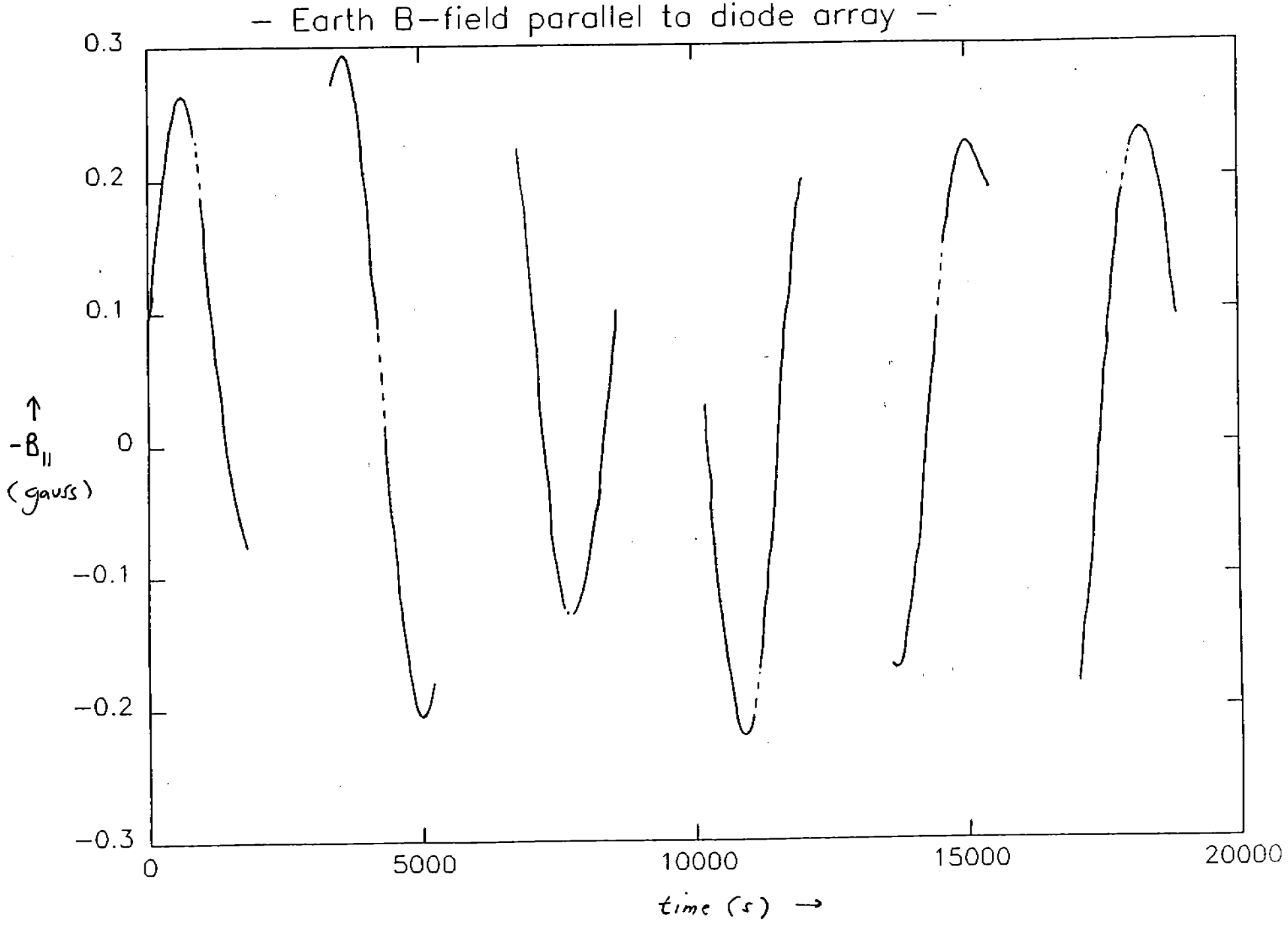
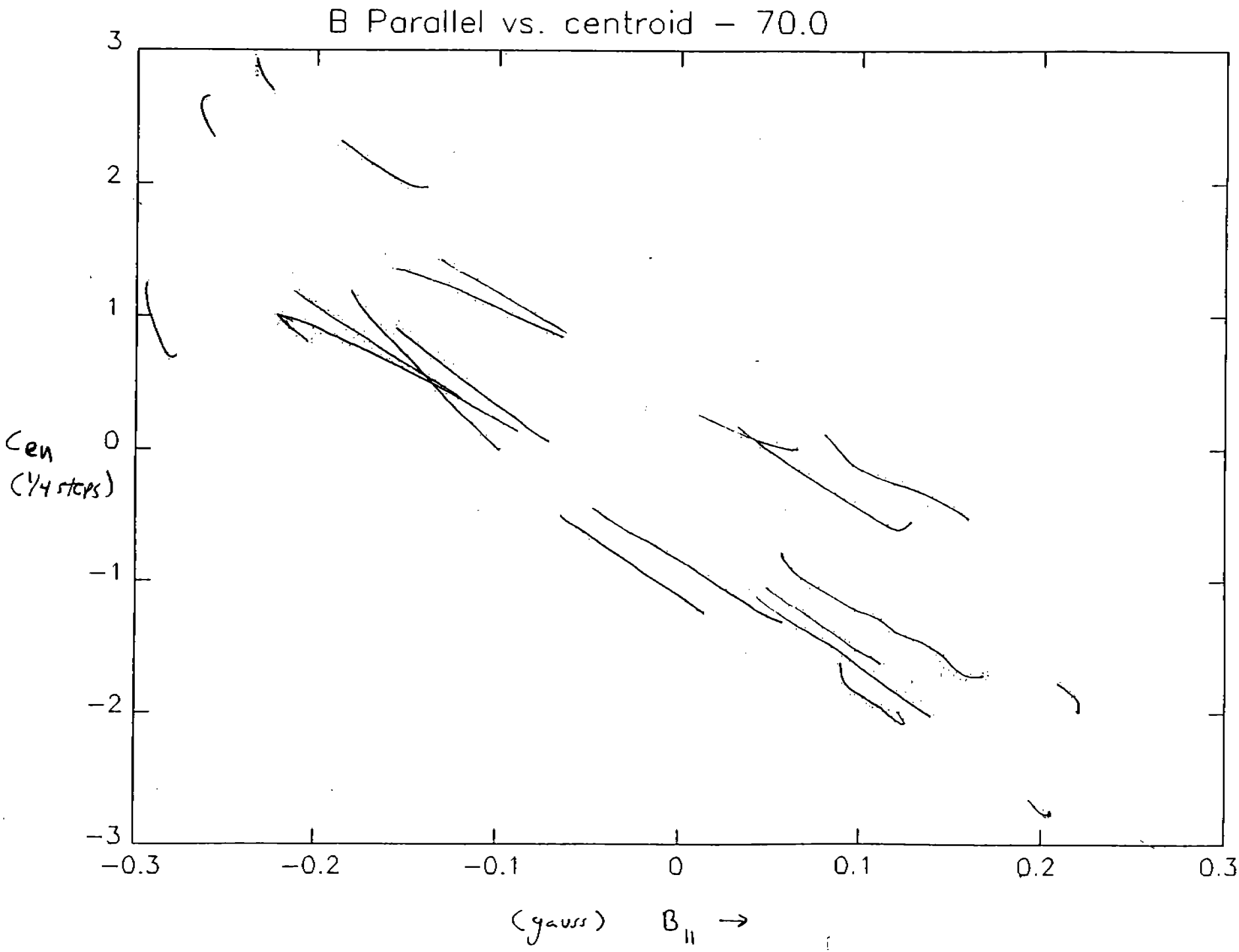

– Earth B–field parallel to diode array –
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
↑
$-B_{\parallel}$
(gauss)
0
5000
10000
15000
20000
time (s) →

Fig. 6


B Parallel vs. centroid – 70.0
3
2
1
0
−1
−2
−3
C_{en}
(¼ steps)
−0.3
−0.2
−0.1
0
0.1
0.2
0.3
(gauss) B_{11} →