VLBA TEST MEMO NO. 36

CURRENT STATUS OF PHASE CAL PHASE STABILITY

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Aug.4, 1992

This memo describes results of the recent pcal phase stability tests done at PT, LA, KP and FD on 1992JUL25 using 13/4 cm band observations. PT used new VLBA type pcal generator which is driven by 500 MHz signal from the LO receiver in the vertex room. Therefore PT pcal phases should get effected only to the extent of the frequency of the IF as the first LO and pcal reference are derived out of the same 500 MHz in the VR.

Following plots are enclosed for each of the stations:

Plot 1- PCAL phase for one 4cm channel and one 13 cm channel,
Plot 2- cablecal (length of 500 MHz cable using 500 MHz round trip phase),
Plot 3- Temperature measurements in the station building-
- (a) ambient (not available for PT
- (b) C- rack
- (c) DAR
- (d) Electronics room
- (e) tape recorder temp. monitor (at PT and may be some other station located in duct below floor in computer room)
- (d) computer room air

Plot 4- Antenna temperature data
- (a) VR down
- (b) FC down
- (c) VR up
- (d) FC up
- (e) Ped room air

DISCUSSION OF THE RESULTS-

Pie Town:

Pcal phase variations are
about 15 deg peak to peak at rf = 8150 MHz, IF = 550 MHz
about 10 deg peak to peak at rf = 2160 MHz, IF = 740 MHz

I donot see a direct correlation between pcal phases and any of the temperature measurements or cablecal. Also the phase variations at 4 and 13 cm bands donot seem completely correleted. This seems to indicate that there is no single dominating factor responsible for these variations. However there seems to be some correlation between the pcal phases and the FC up temperature as well as cablecal. It is hard to seperate the effects of these two on the pcal phases since ambient temperature effets both cablecal and FC temperatures.
The phase differences between the 8550 MHz and 8150 MHz channels (see plot 5 for PT) follow the cablecal variations. The variation of the ariations difference phases can be accounted more or less by changes of 500 MHz cable length (and assuming that IF cable behaves similar to the 500 MHz cable). But the shape of the FC up temperature plot is similar to that of the cablecal, and therefore it is hard to seperate effects from these two on the group delay variations. We need to change the VR temp and see if that effects pcal phases and group delays.
Also to see the effect of temperature changes of pcal module and cable carrying 500 MHz from B-rack to the Pcal module we need to change temperature of each of these seperately and find its effect on the pcal phases. This is needed to see whether we need to better temperature control the feed cone temperature and/or insulate the cable.

LOs Alamos:

Whatever were causing funny variations of pcal phases in May 1992 (very large variations of 13 cm pcal phases not correlated with 4 cm variations, jumps etc.) have disappeared. Pcal phase variations (about 200 deg at 4cm and 60 deg at 13 cm) donot seem to be completely correlated with either cablecal or ambient variations (which seem correlated). Pcal phase plot seems more like feed cone Up temperature plot. The effect may be a combination of the ambient and FC temperatures. Cycling of the C-rack and the building temperatures are not obivious in these data. This may be responsible for not seeing any pcal phase cycling (as seen in earlier runs) during this run!

Kitt Peak:

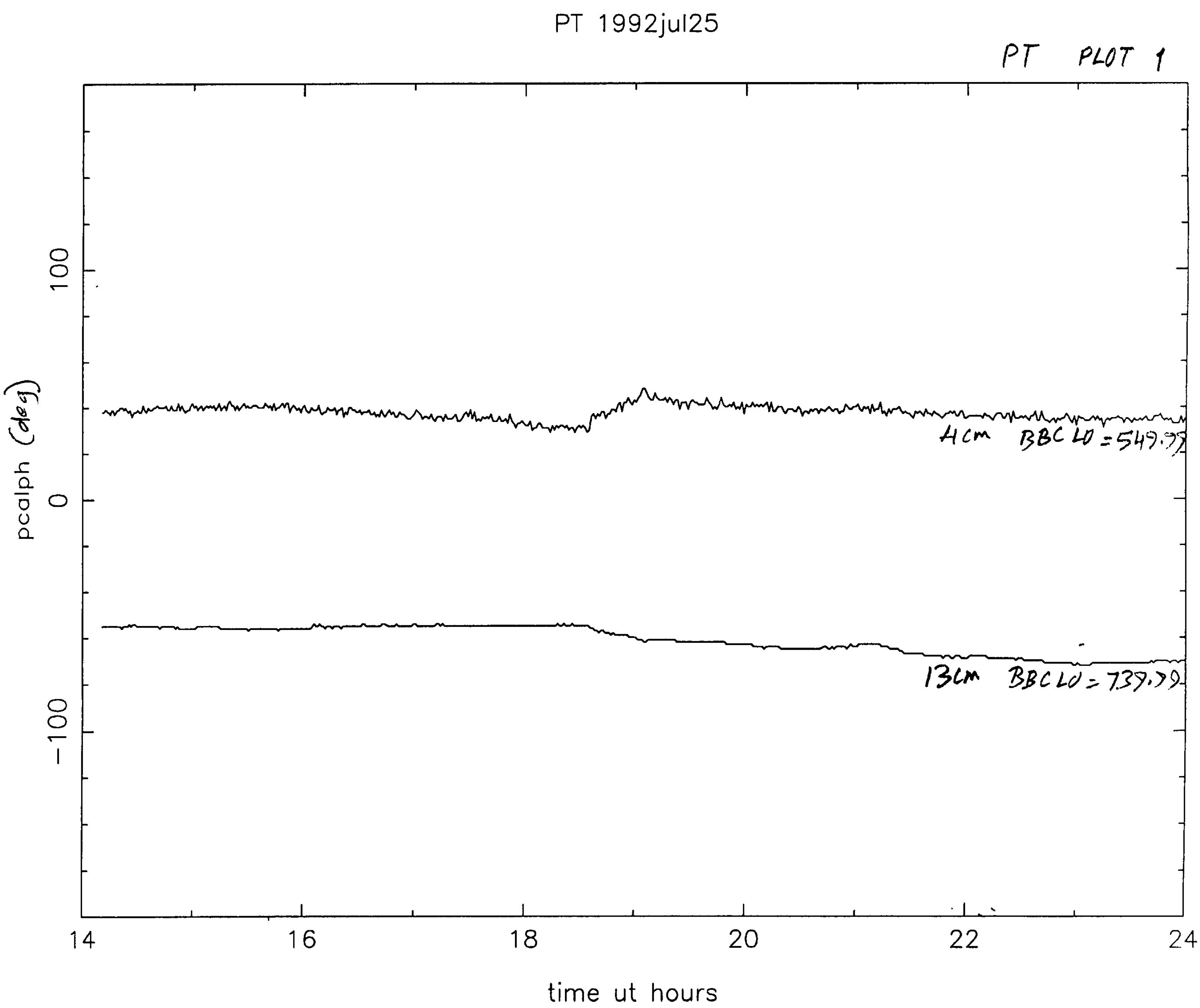
There is a small temperature cycling of C-rack (about 1 deg C) and <~5 deg of phase cycling at 4 cm. Both tape recorder temp monitor and control room air temp monitor show ~6-7 deg C temperature cycling. Donot understand why control room temperature is varying by 5-6 deg when the electronics room temperature is stable to <1/2 deg.
Also it seems the pcal phases are effected by both the ambient and the feed cone temperature variations.

Fort Davis:

Looking at the temperature plots and comparing with other stations it appears that there is some mix-up in the locations of some of the temperature sensors. Pcal phase variations are small (<~20 deg) and my guess is that these are effected by both ambient and feed cone temperatures. The cablecal variations seem to be dominated by the ambient temperature variations.

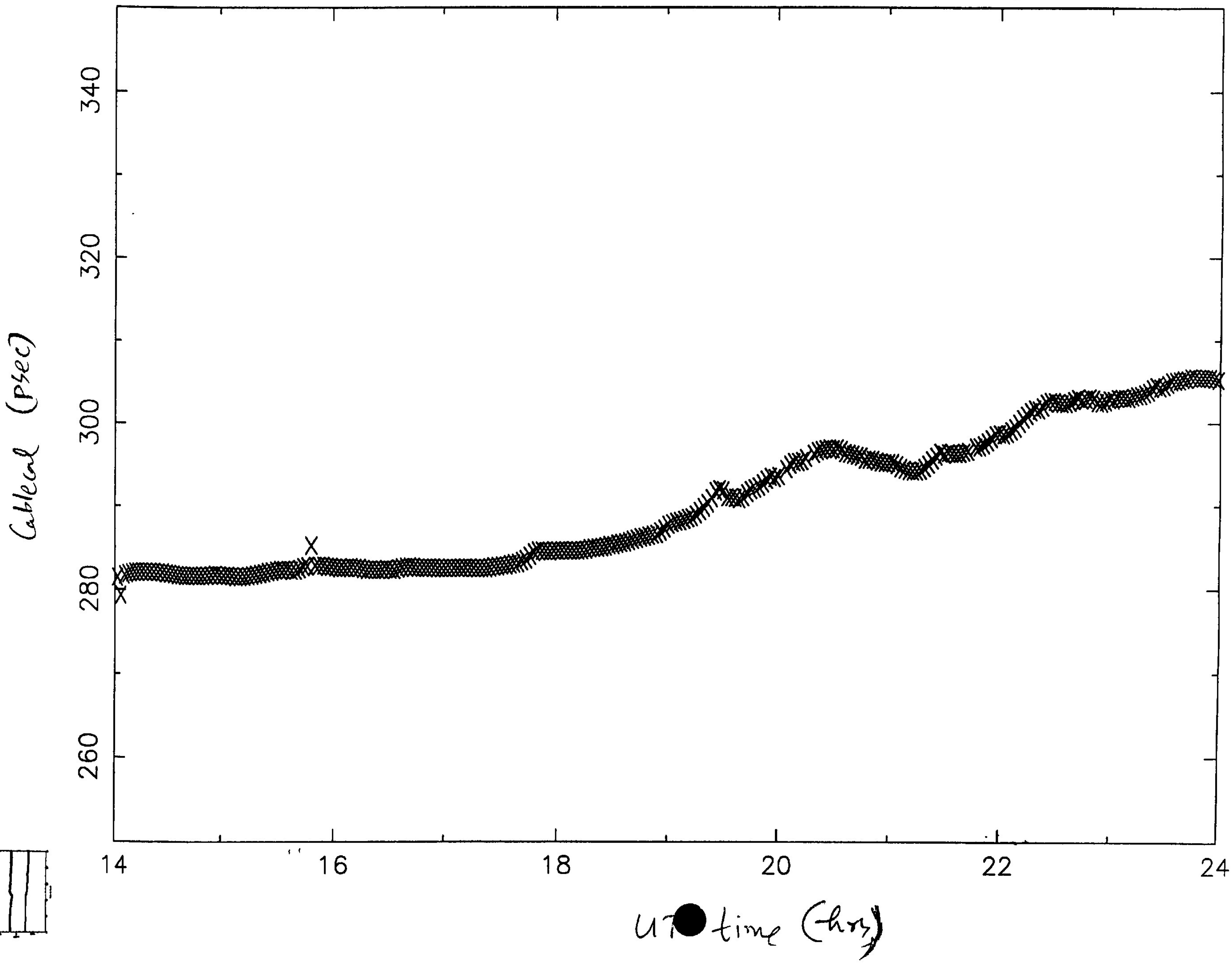
CONCLUSIONS-

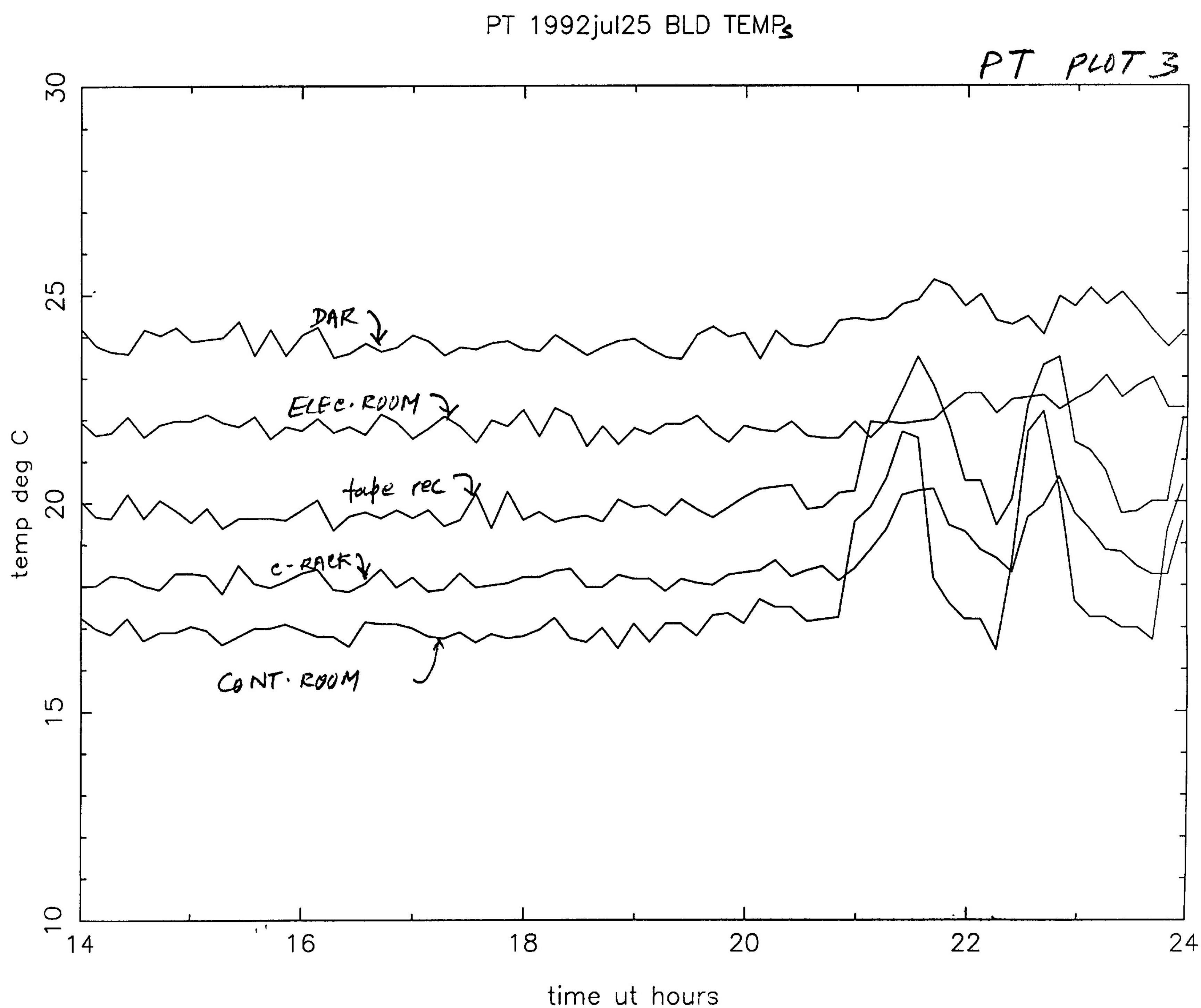
On first look it appears that the pcal system at PT (with new pcal generator) is working reasonablly well though we need to evaluate it in more detail. LA, KP and FD systems do not have obivious major problem, though their pcal phase stability is not good (specially KP). However these are not our final systems, and they are sufficiently different from our planned system, I suggest that we devote most of our efforts trying to understand PT system.


PT 1992jul25
PT PLOT 1
pcalph (deg)
100
0
−100
14
16
18
20
22
24
time ut hours
4cm BBC LO = 549.99
13cm BBC LO = 739.99

PT 1992 JUL 25

PT PLOT 2

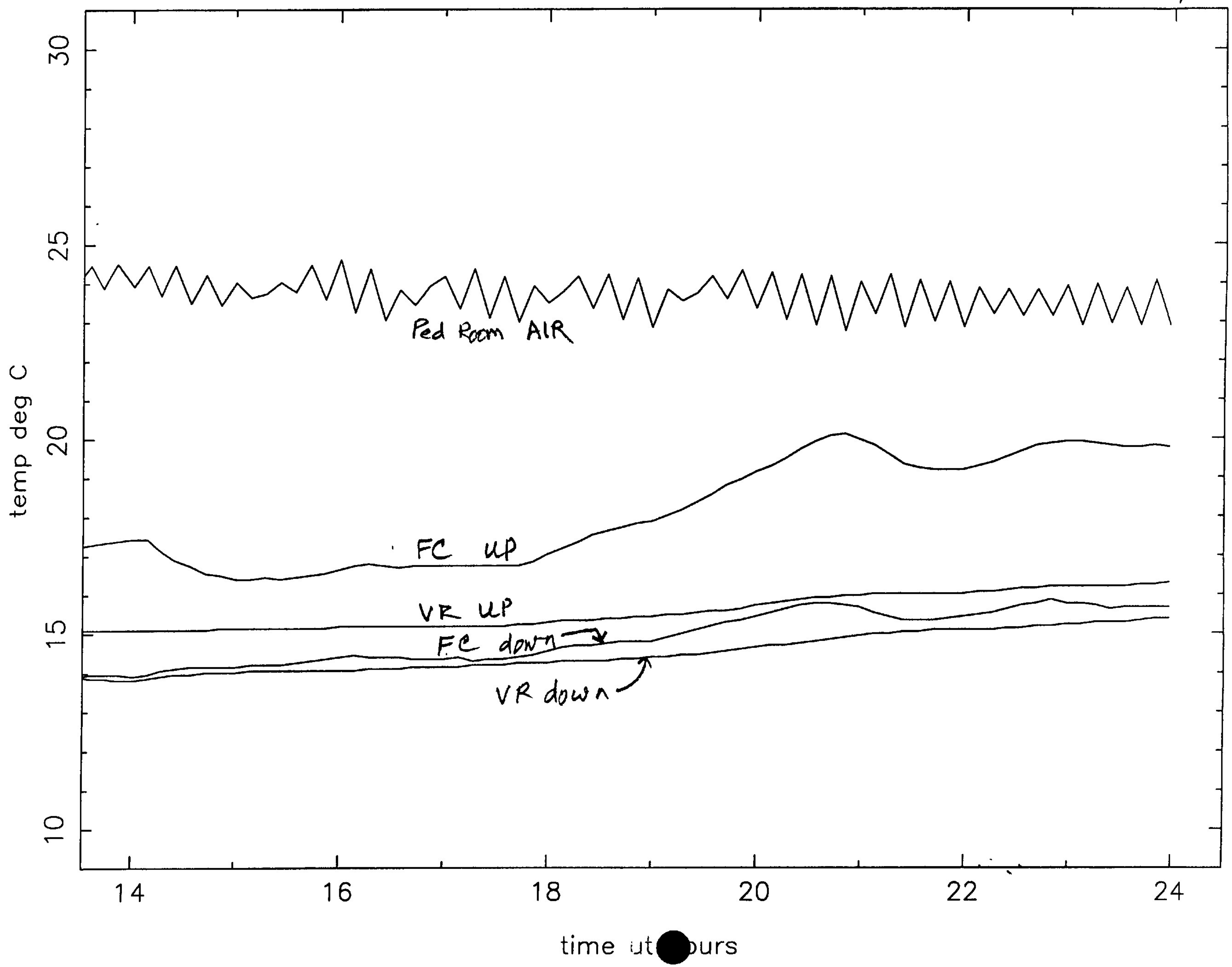




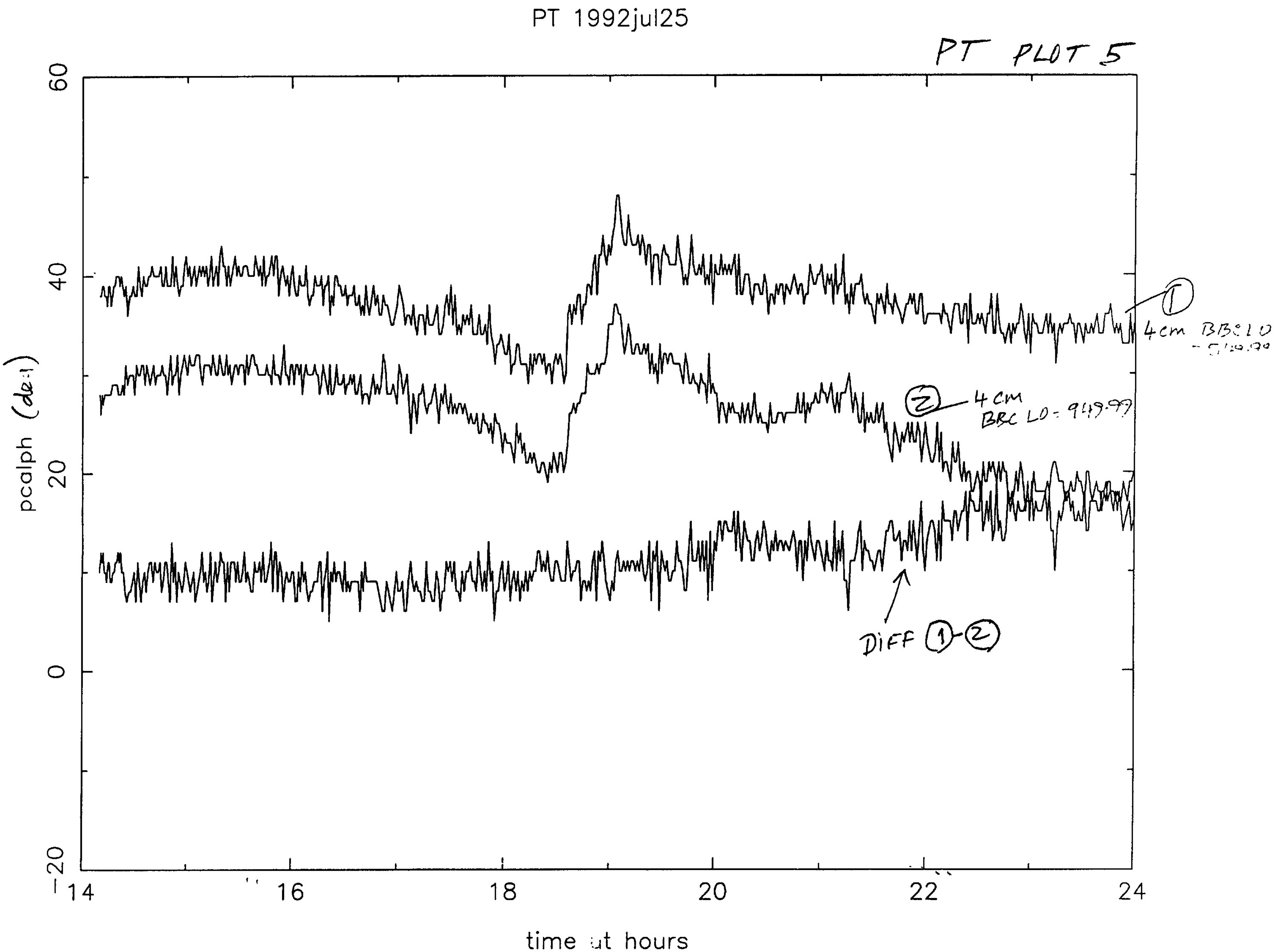
PT 1992jul25 BLD TEMPs
PT PLOT 3
DAR
ELEC. ROOM
tape rec
C-RACK
CONT. ROOM
temp deg C
time ut hours
30
25
20
15
10
14
16
18
20
22
24

PT 1992jul25 VR TEMPs

PT PLOT 4

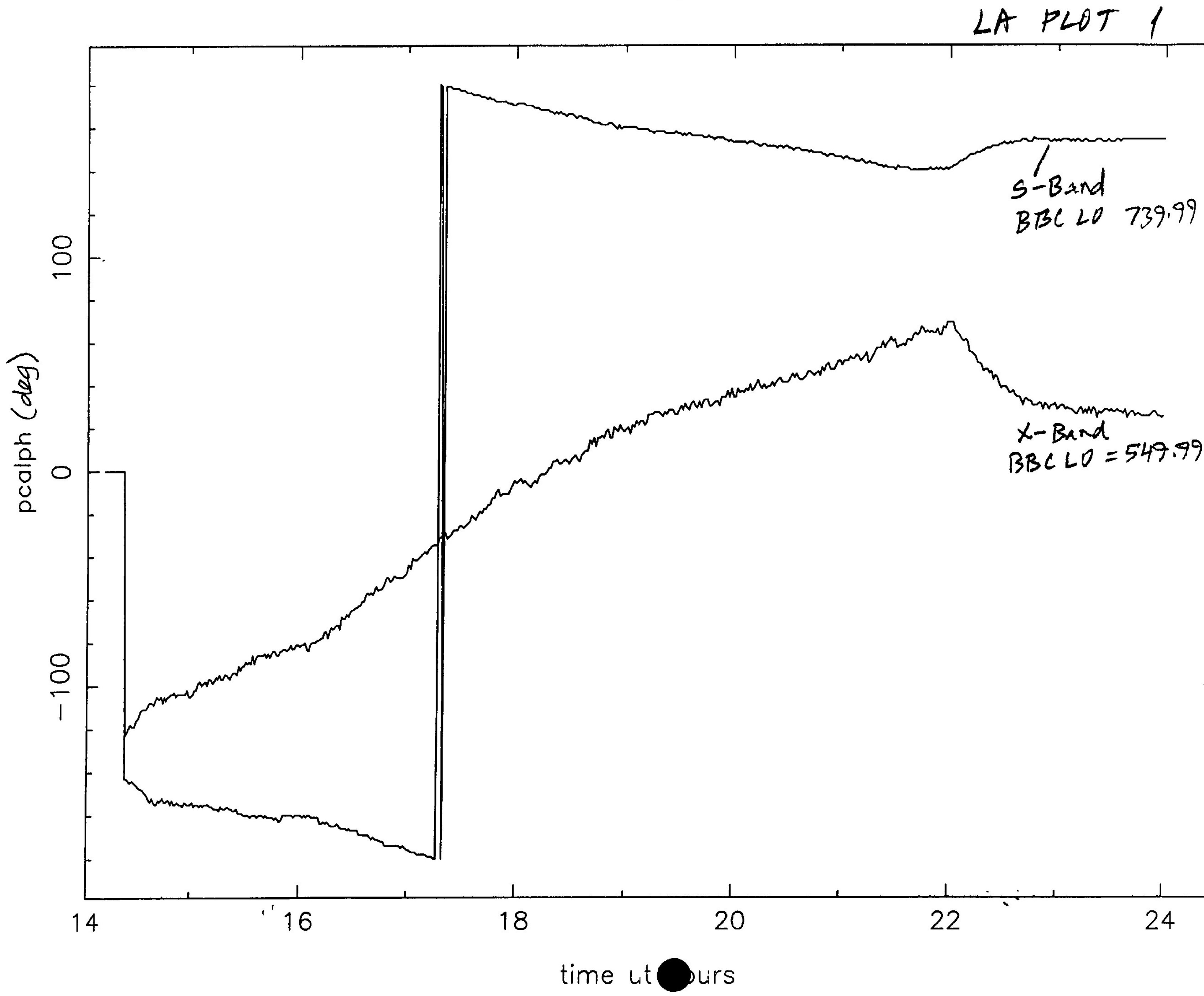


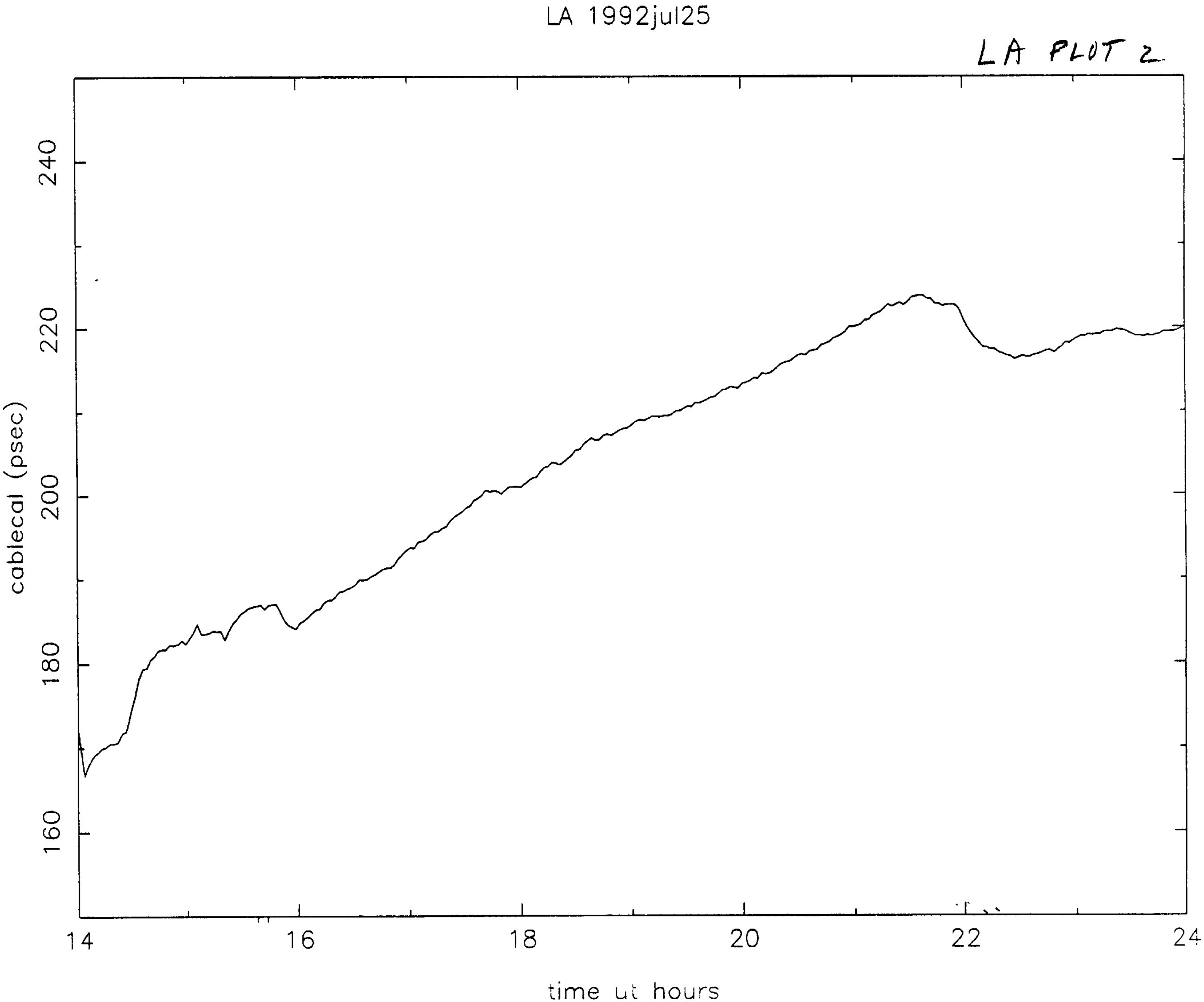
PT PLOT 5



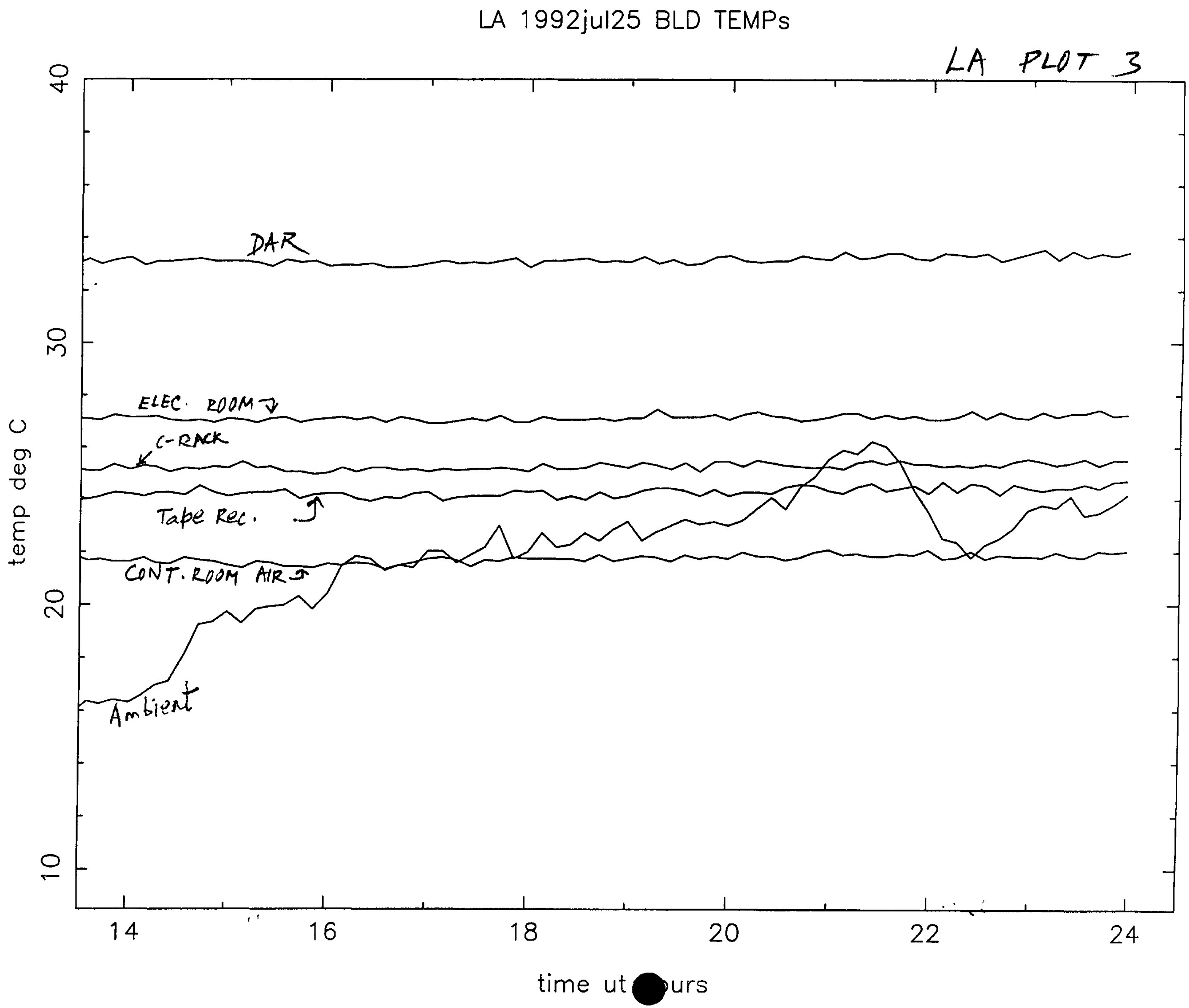
PT 1992jul25
60
40
20
0
-20
pcalph (deg)
14
16
18
20
22
24
time ut hours
①
4cm BBC LO
②
4 cm
BBC LO = 949.99
DIFF ①-②

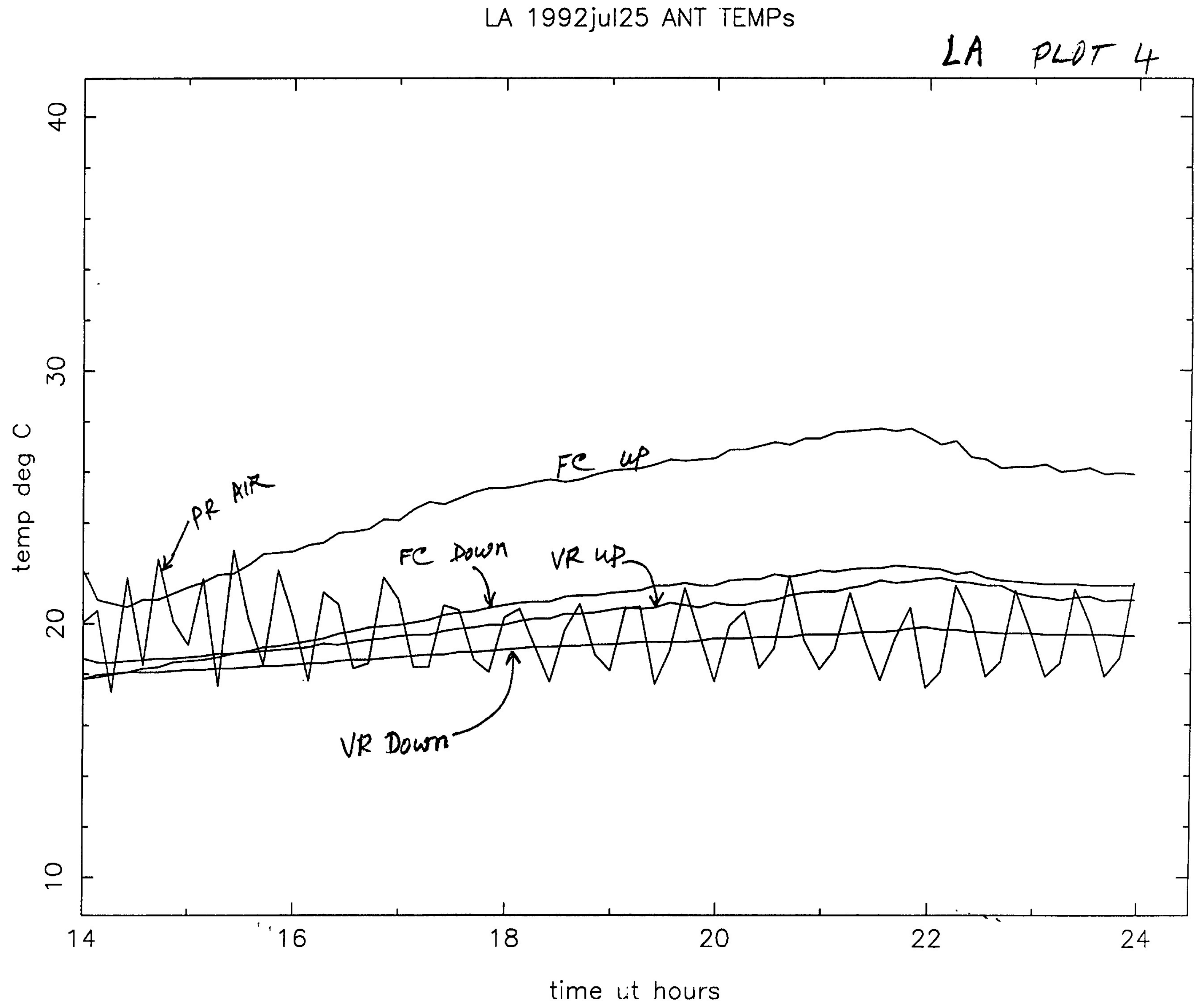
LA 1992jul25



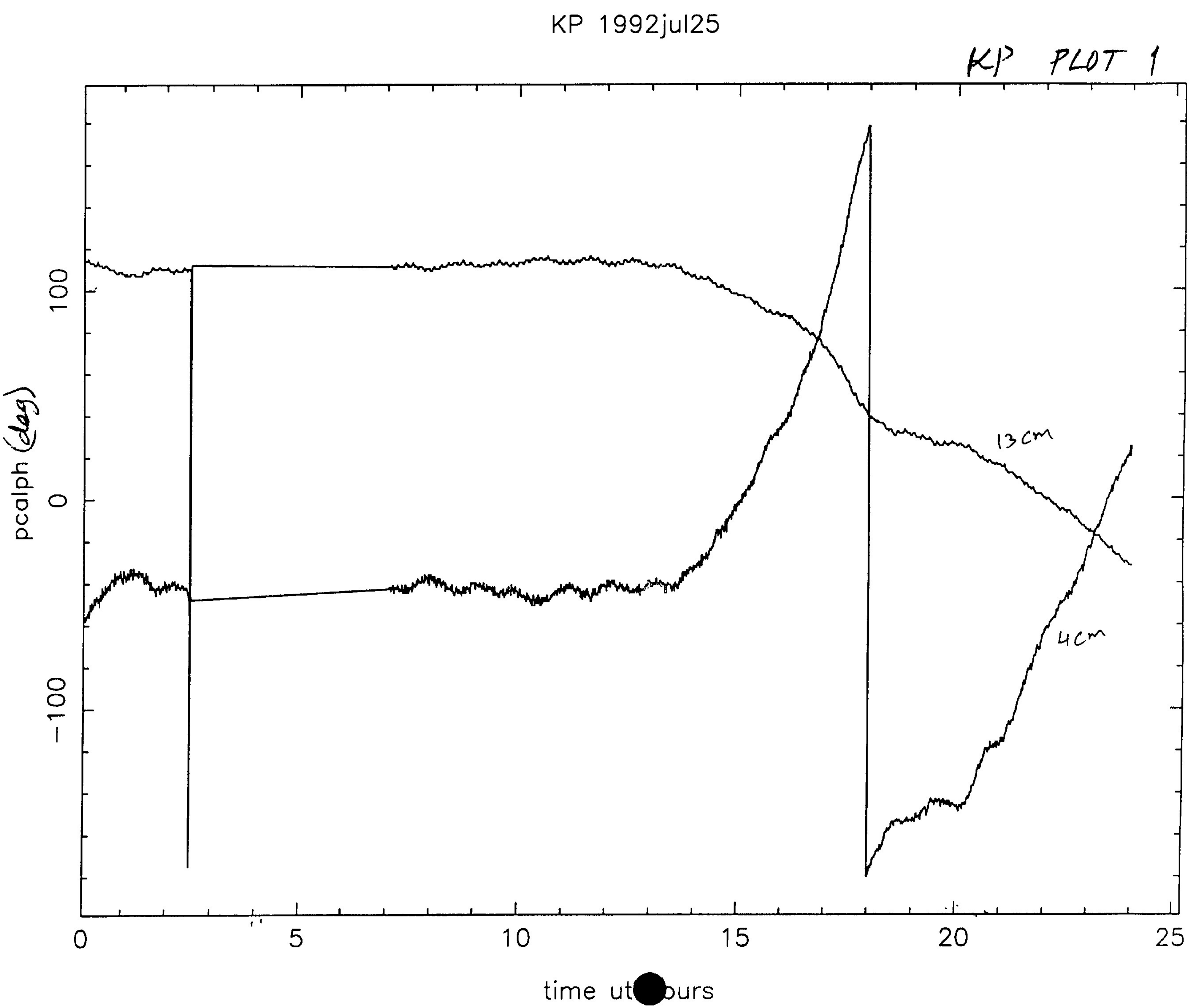


LA 1992jul25
LA PLOT 2
cablecal (psec)
160
180
200
220
240
14
16
18
20
22
24
time ut hours


LA 1992jul25 BLD TEMPs
LA PLOT 3
DAR
ELEC. ROOM
C-RACK
Tape Rec.
CONT. ROOM AIR
Ambient
temp deg C
40
30
20
10
14
16
18
20
22
24
time ut

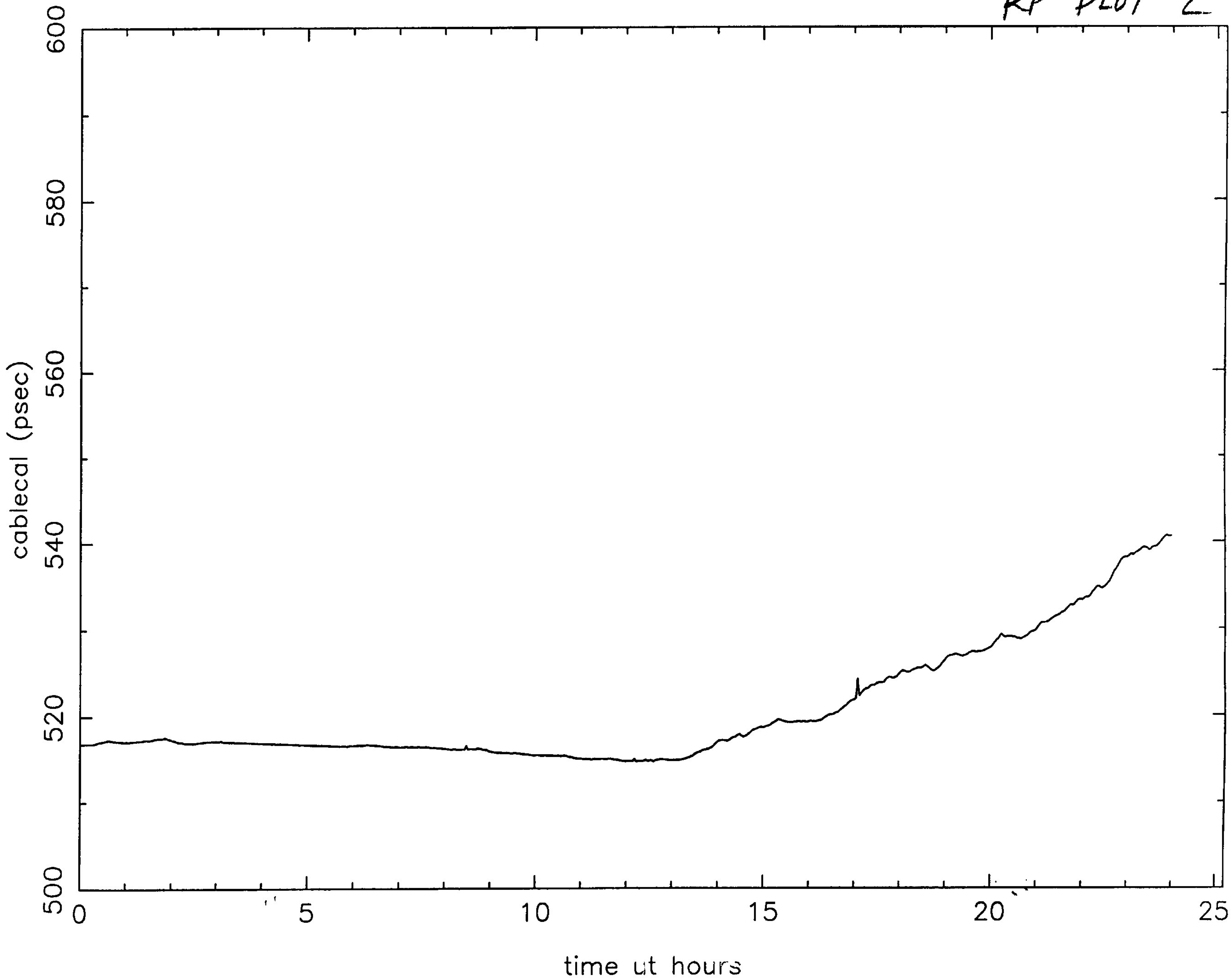


LA 1992jul25 ANT TEMPs
LA PLOT 4
temp deg C
time ut hours
10
20
30
40
14
16
18
20
22
24
PR AIR
FC UP
FC Down
VR UP
VR Down


KP 1992jul25
KP PLOT 1
pcalph (deg)
100
0
−100
0
5
10
15
20
25
time ut ours
13cm
4cm

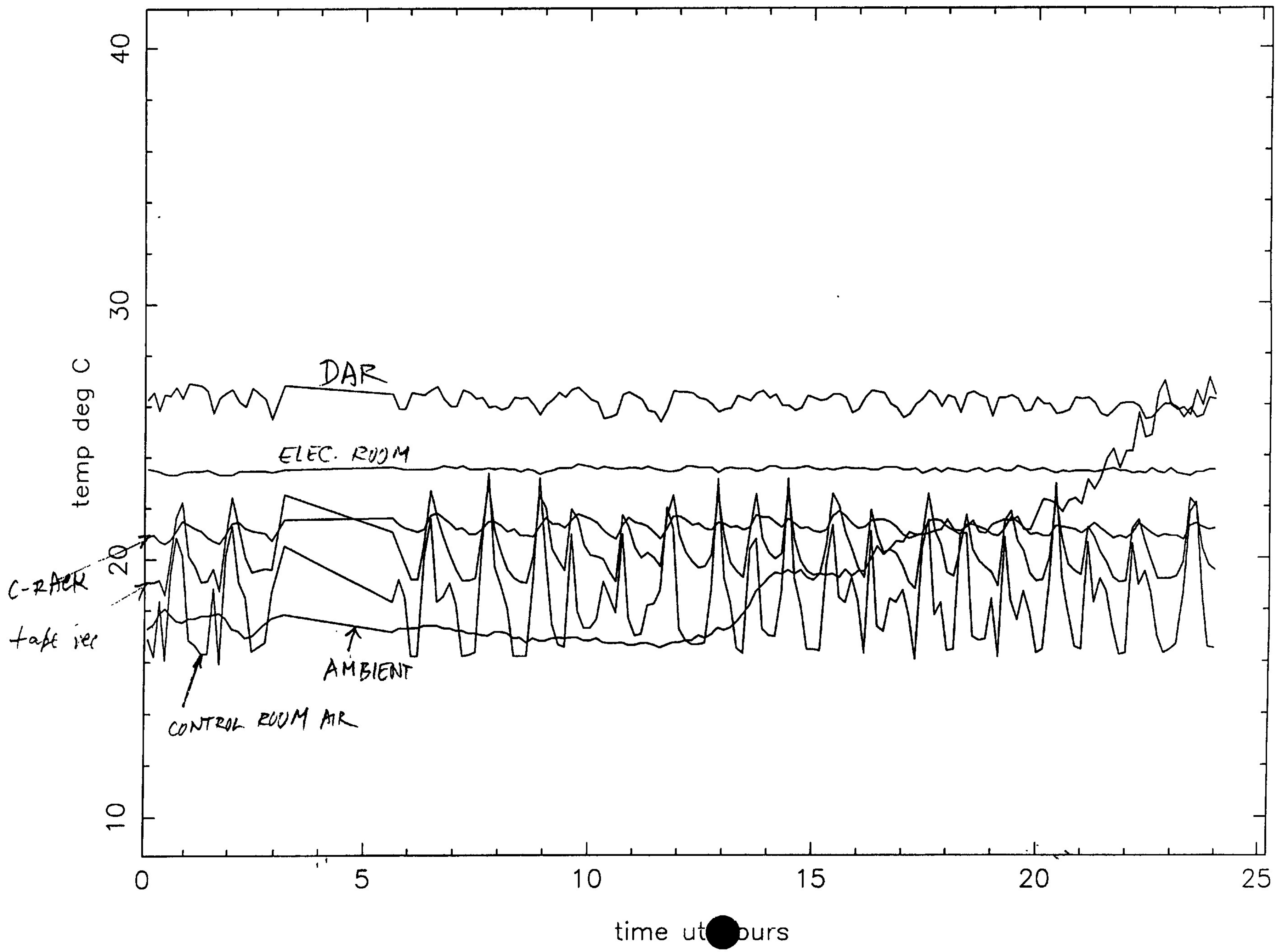
KP 1992jul25

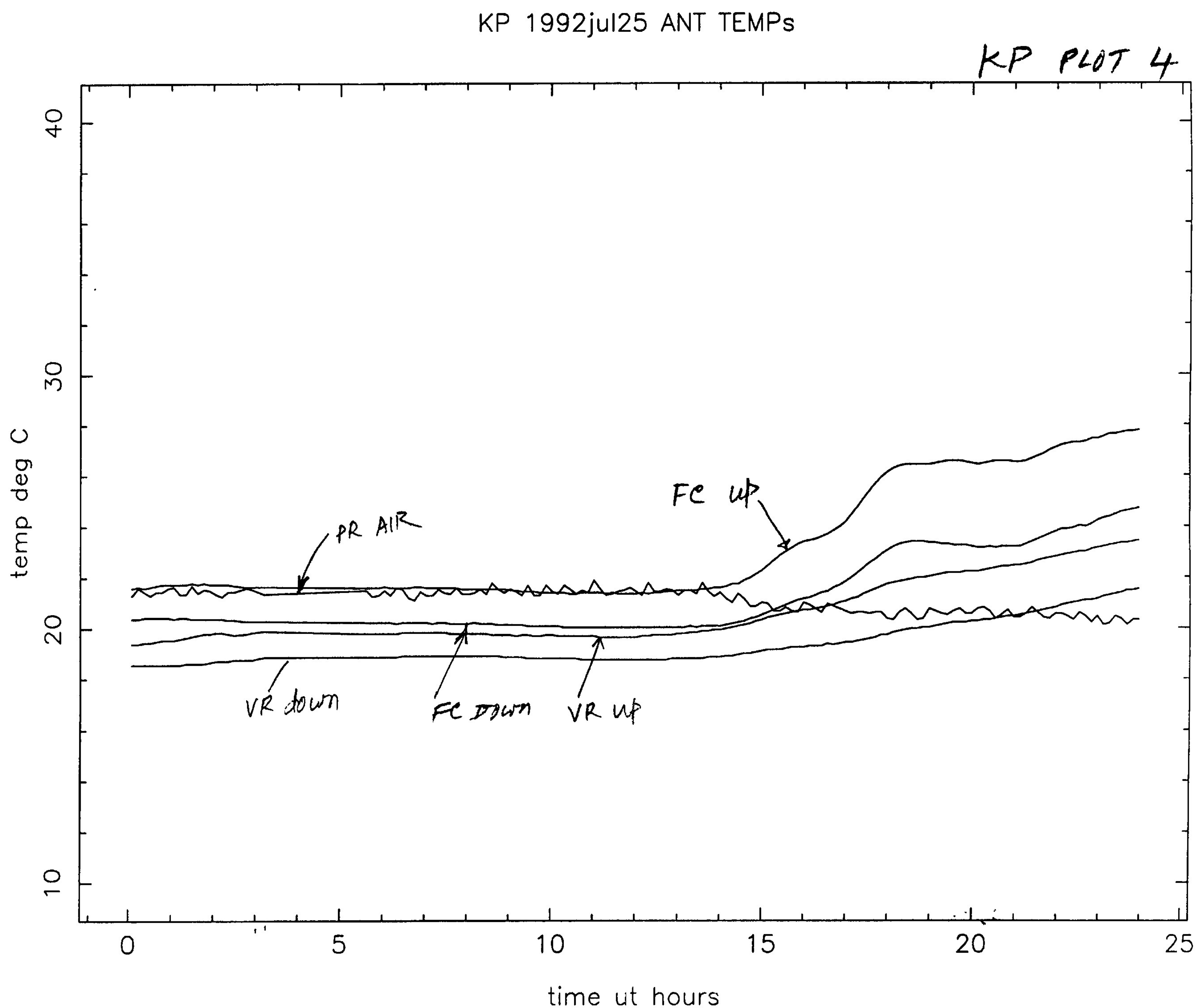
KP PLOT 2



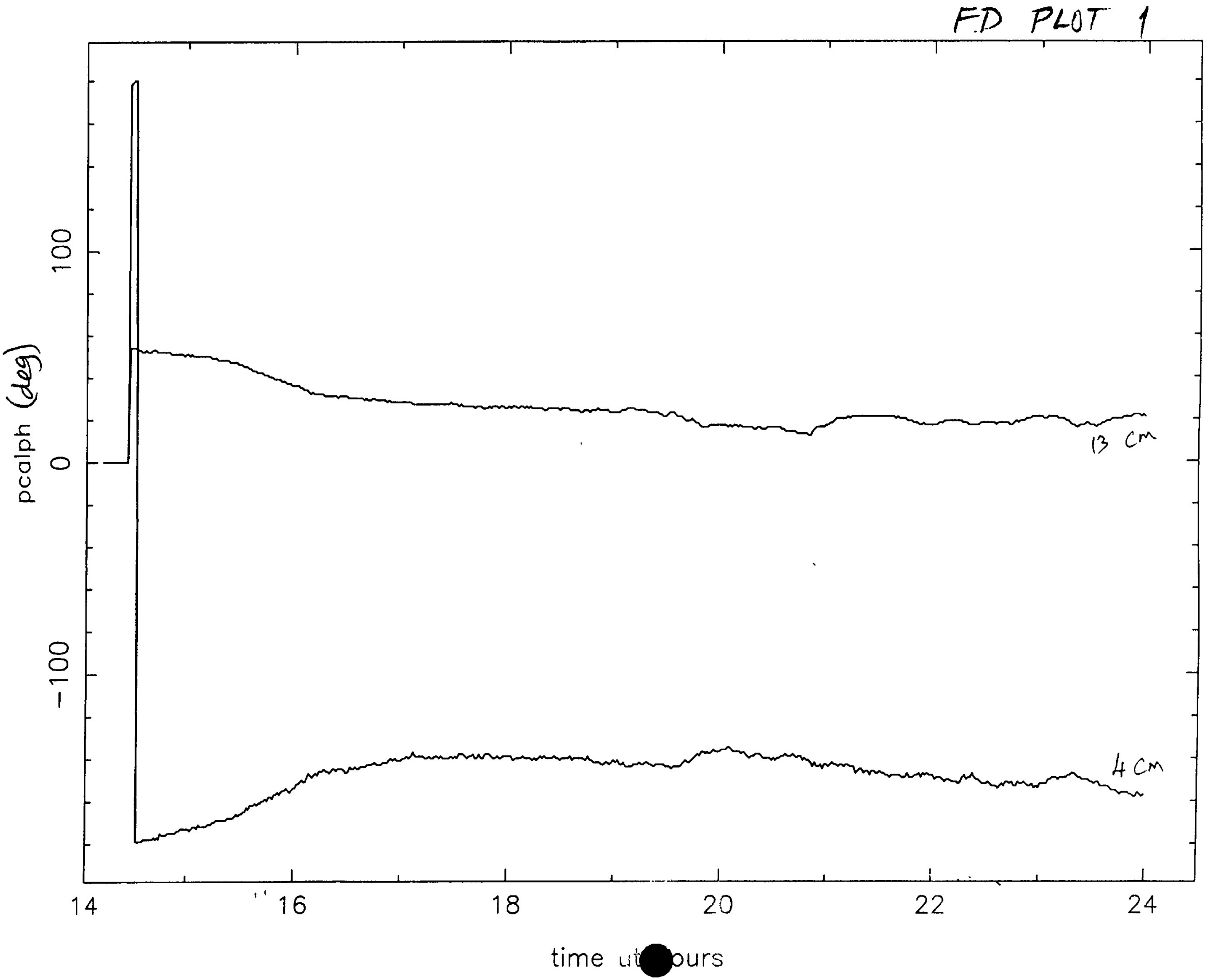
KP 1992jul25 BLD TEMPs

KP PLOT 3



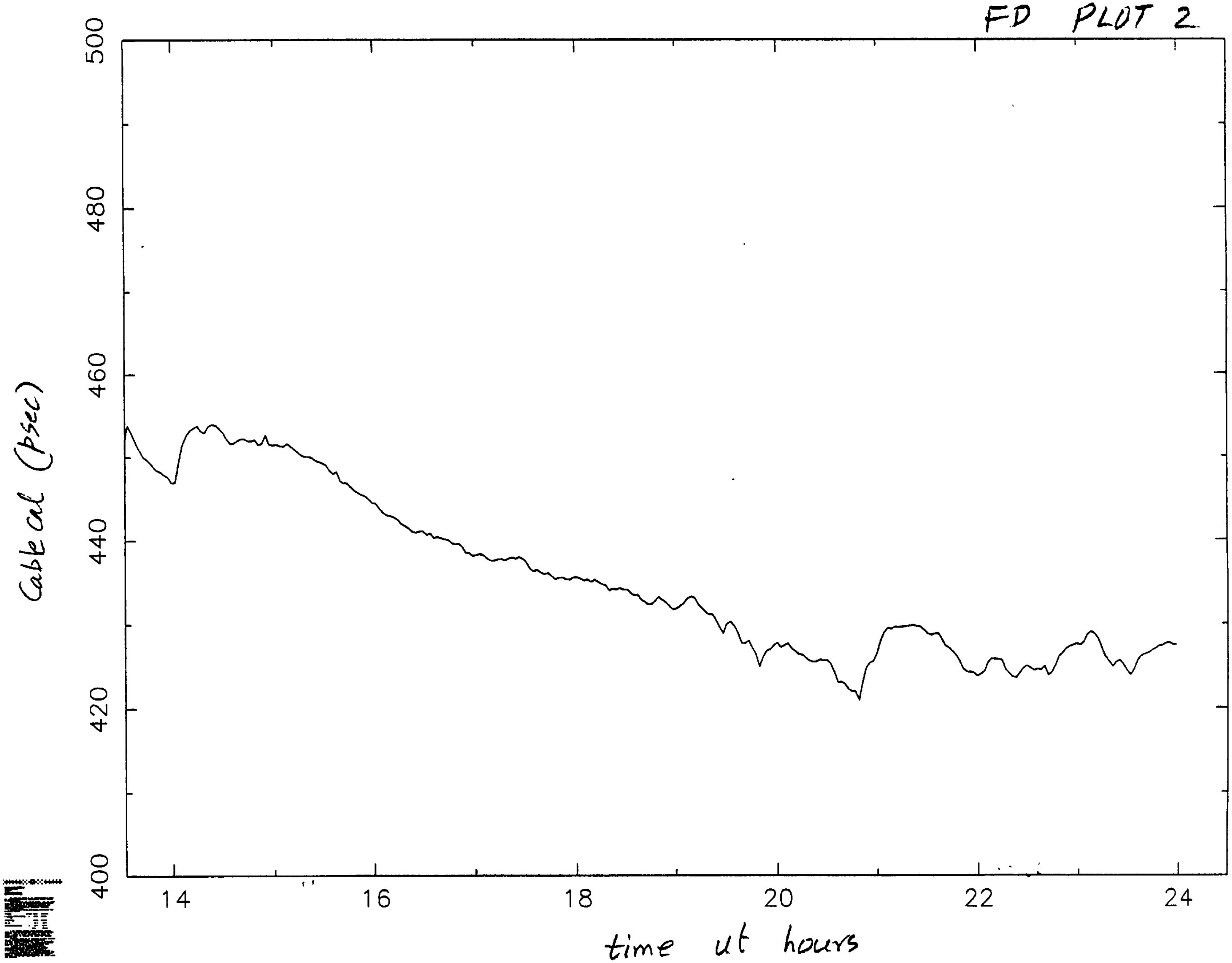

KP 1992jul25 ANT TEMPs
KP PLOT 4
temp deg C
40
30
20
10
0
5
10
15
20
25
time ut hours
PR AIR
FC UP
VR down
FC DOWN
VR UP

FD 1992jul25



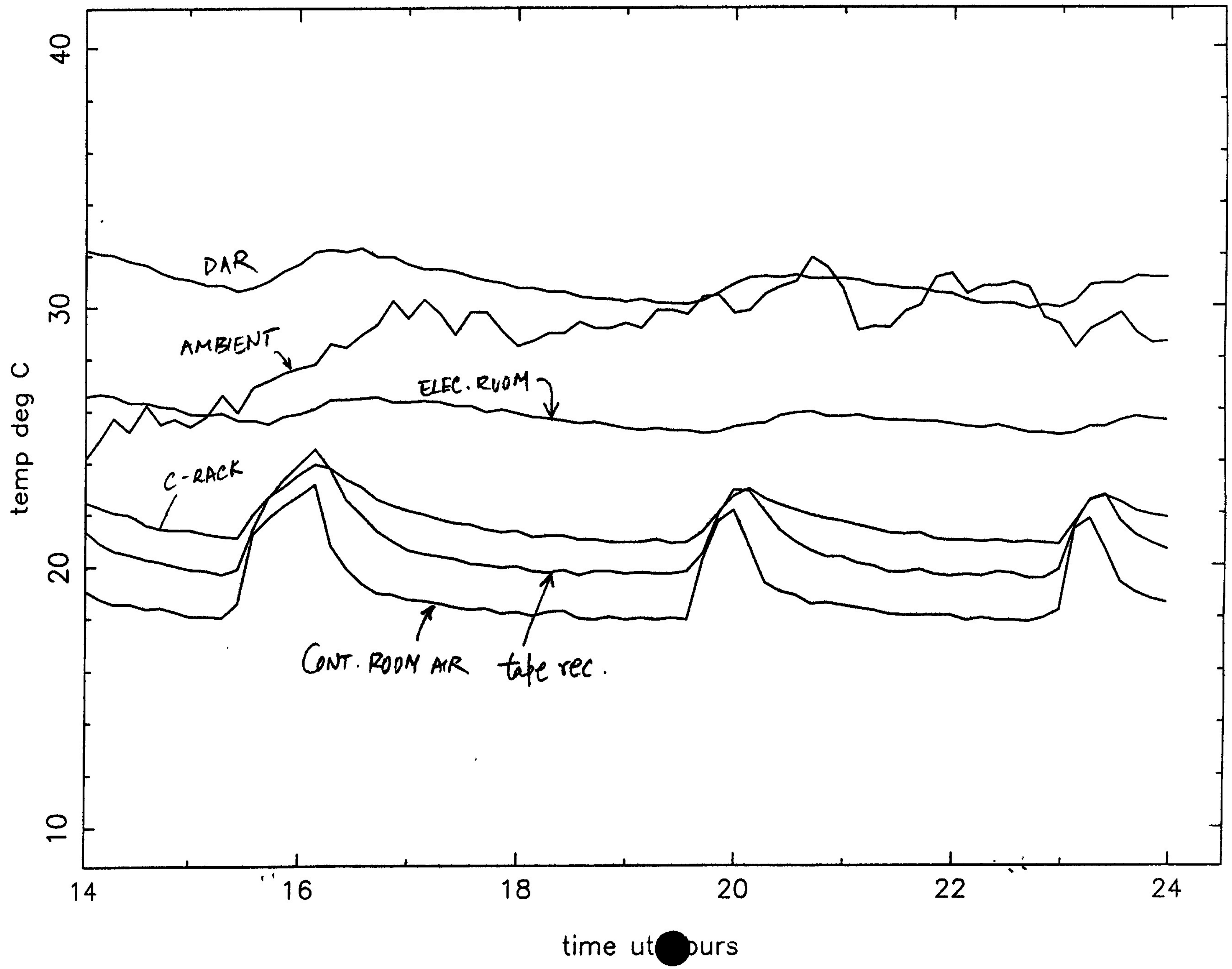
FD 1992jul25

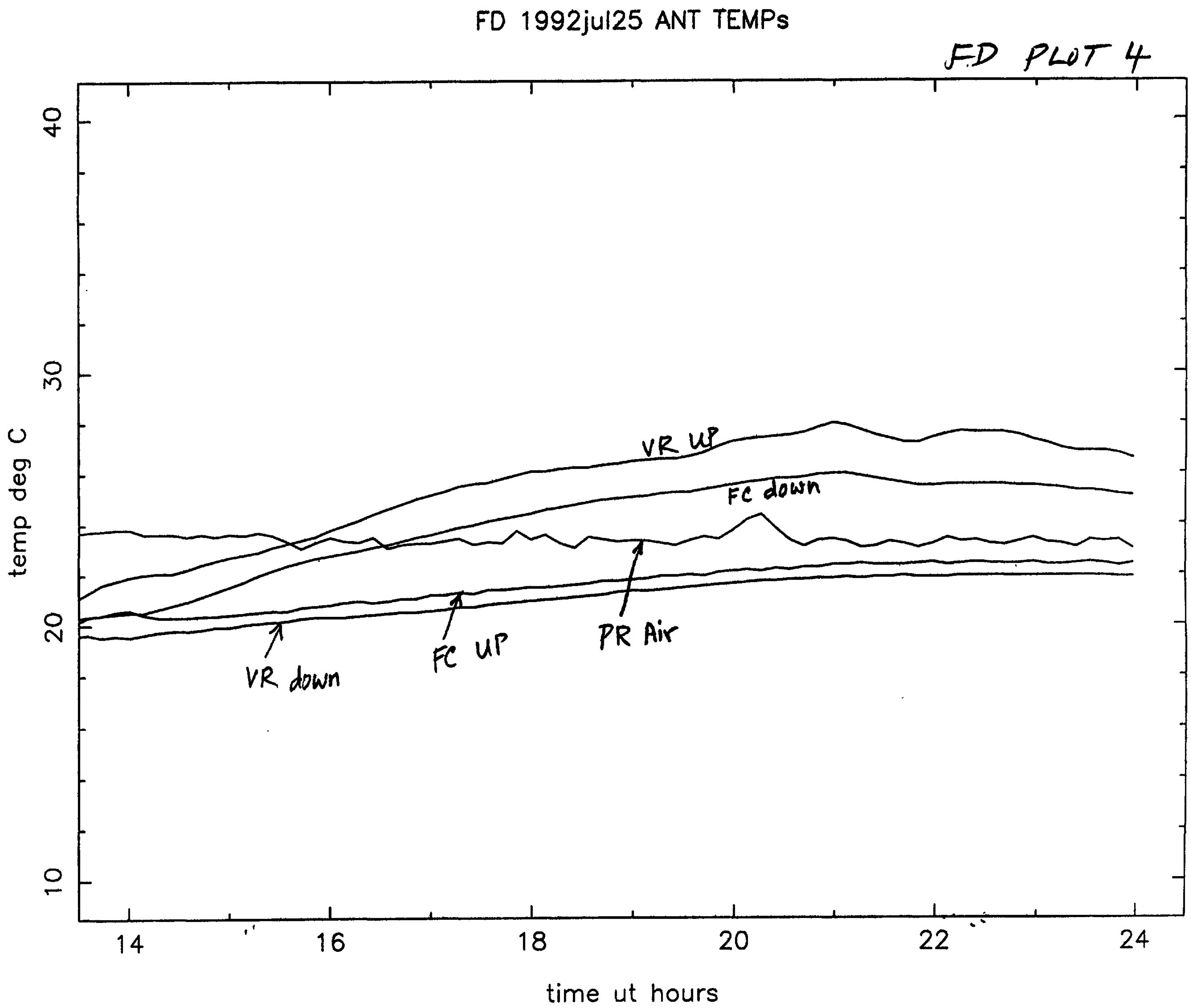
FD PLOT 2



FD 1992jul25 BLD TEMPs

FD PLOT 3




FD 1992jul25 ANT TEMPs
FD PLOT 4
temp deg C
40
30
20
10
14
16
18
20
22
24
time ut hours
VR UP
FC down
PR Air
FC UP
VR down