

Spare encoder

A/R coated hwp

2 PM4's

resistors with spare military connectors and ~~map~~ grid protection hardware

spare hwp ~~gear~~ gear ~~and~~ ^{assembly} mount

instruction booklets - no indexer (3), PM4 (1), Amp det (2), encoder (1)

indexer ~~cable~~ power cable and cable to motor (2 parts)

encoder cable, pm4 power cable, 2 serial cables

Amp trimmer

spare foam

Spare encoder

absorber

mirror chips

inspection goggles

2 unbreathed hws

grid holder parts

laser level

X-grid nuts + bolts

paddle

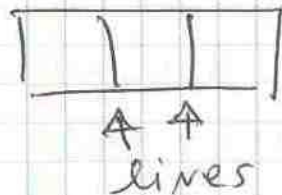
upgrades for Fall '06 or beyond

- spare hwp plate and parts since gears, bearings, and bushings can wear. This is expensive but could be good. [actually bearings would be inexpensive]
- get instructions on how to access encoder set screw - may need special tool
- get spares for things like encoder set screw, motor set screw
- get drawings for hwp module and make sure you have autocad saved. I'm not sure that I do. (well I have "SHARP 6/10/05" in my desk drawer)
- see also p. 95 of this NB and p. 35 of second SHARP project notebook.
- spares for [✓] all connectors used in SHARP
- calibration and ease of installation
- improve method for attaching Box ϕ

- Improve way to mount gnd - need two threaded rods sticking out and I just put nuts on. Use loctite on the threaded rods 103

- where would hwp fall? could just catch it in a garbage bag?

- DISPLAY:



last file written: XXX

tests deferred to future runs

tests for "missed rays"

July 8, 2006

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Hua-bai, Giles, Hiroko, Ed at summit
we have 3 days to prepare

Rough plan:

today (Sat)

unpack
align SHARC-II
cherry-picker tests

Sun

Fanny = data acq. and
analysis work.
new method of
4 hwp pos'n
per cycle

Fanny + Giles = test hwp
+ set it up

Giles, Hua-bai = install
SHARP, align SHARP

Mon

Mike & Larry: Mike's software
& new quicklook

Hua-bai: matlab software

Giles + Darren: shake tests

Larry's code?

Troy's code?

7/8/06: noon

we removed Zspec + Zeus stuff
(Ed did this) and unpacked and
inspected all SHARP boxes (there
are 5).

doing a fill and then will start
cycle while we eat lunch.

note: SHARC-II electronics rack has
been moved to a location which
will make it difficult to install
SHARP.

questions :

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CDD : inside of dome ok for
shake tests? or cold
load?

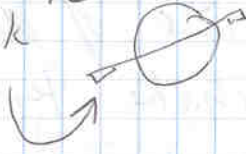
CDD : point sources for beam
studies + focusing.
Jupiter's moons or other?

CDD & H-B : i.p. ? plan ?

7/8/06

Cherry picker

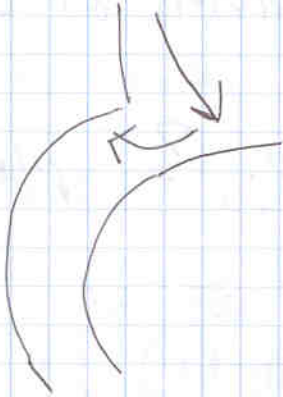
- ① ~~ZA=40~~ ZA=40
- ② wheels lock



unlock

~~pull out and swing~~

- ③ pull out and swing



- ④ position just to side of center, as far in as possible



- ⑤ plug in - (phone just inside door)
intercom 22

- ⑥ open outside panel and push unlabeled

- ⑦ black reset button
move telescope to ZA = 87

- ⑧ push red emergency stop right next to cherry picker

~~Ed is going to find long phone cord so we can move control-room intercom to Right Nasmyth~~

(9) Ed is going to find long phone cord so we can move control-room intercom to Right Nasmyth

(10) phone on cherry picker was dead so we stole one from galley [where the phone cord plugs in]

sharc2pixel.dat ← where gains used by IRC are stored

7/9/06

Proper wiring for indexer motor control is

- white - A
- red - A
- black - B
- green - B

Disregard all previous

~~EDAS~~ EDAS 1 (Bought for Larry) acting up as usual switched to megans. Old settings for it were

IP 10.128.0.86

Gatins 10.128.0.1

Subnet 255, 255, 255, 0

PNS 128, 196, 208, 2

EDAS 1 on CSO network. Problem solved by allowing DHCP to set network settings and then entering them statically. Settings are

IP: 128.171.86.195

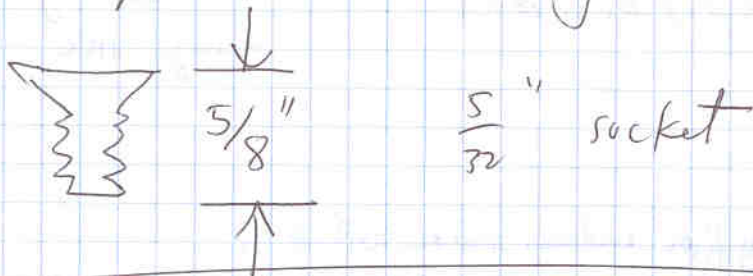
Subnet Mask: ~~128~~ 255.255.255.0

Gateway: 128.171.86.2

The IP address that the IRC has for the the polarimeter computer ~~is~~ had to be changed.

Screw hole in upper left corner of plate (looking from X-gal) is cross-threaded. Short screw gets 3 threads ~~it~~ should retap at end of run

Screws for connecting boxes:



need two more socket-head ones ↗
plus three spares

July 9, '06

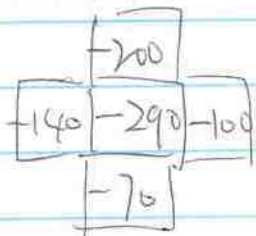
Measuring SMARC-II alignment
all-gain lo

Edit → Preferences → Color Table → [...]
set to -1000, +1000

Found peak w/ strength -300 mV
@ pixel [5, 15]

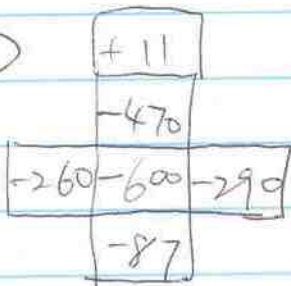
[.362] : Detector Temp.

△ outside D disk installed



peak is 5,15
file 031550

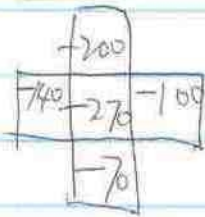
Inside ⊕



peak 6,15

file 031551

Outside ②



peak
file

5 15
0.31552

Detector Temp = 0.362

PS: Distance between 2 plates = 11"

cherry picker $\#try$ =

array range = $-100 \sim 100$.

array shows green, ~~red~~ yellow, red evenly.

position 0, 8 ~~0~~ : mostly green

position 0, 8 : half green / half red.

position 1, 2 : mostly red.

four direction (up, down, left, right)
vary similarly.

July 9. Work on SHARC-II 115
alignment.

discovered SHARC-II height was set wrong - a few spacers missing (nuts)

For the analog output red cable goes to channel 0 (top left when on rail) which is the status flag. The green cable goes to channel 1 which is the angle flag (top right when on rail). Black is ground on both and is plugged into 2nd from top spot on terminal board. Here is plugged into top and is colored wire. Red cable goes to BNC '3' while green goes to '2' -
3 is status 2 is angle

July 10th

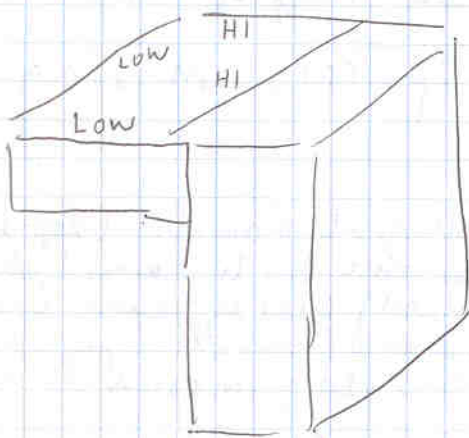
raised SHARC-II ~~to~~ by inserting
spacers.

installed box 3 after putting X-grid
into it.

Time required to change analog output is comparable to h.w.p. motion
so added a 1's delay. Also ~~there~~ a 250 ms delay was added in
situation when both channels needed changed concurrently.

July 10, 2006

Box 1-3 installed. levelling.



looking from
door from
control room

left-right tilt is 0.06°

back-forth tilt is $0.05^\circ - 0.06^\circ$

Used method of flipping level
by 180° and averaging
measurements. Need
inspection mirror and
flashlight.

we did our leveling on top
of box 3.

PS: AF

Compare with p. 17 we are doing ok.

laser spot. on plastic disk



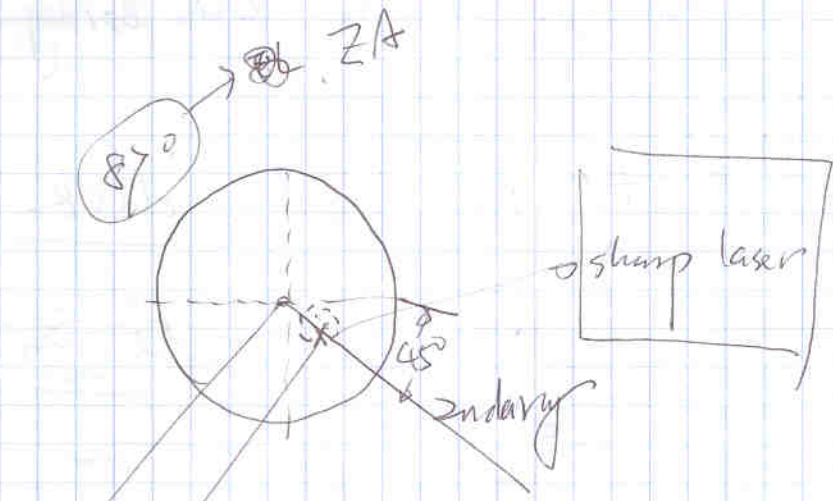
laser spot is left and low
by about 0.25 of a hole
diameter.

method used: judged by eye
while rotating laser in holder.
seems to change slightly when
rotating.

hole is .18" \sim 4.5 mm.

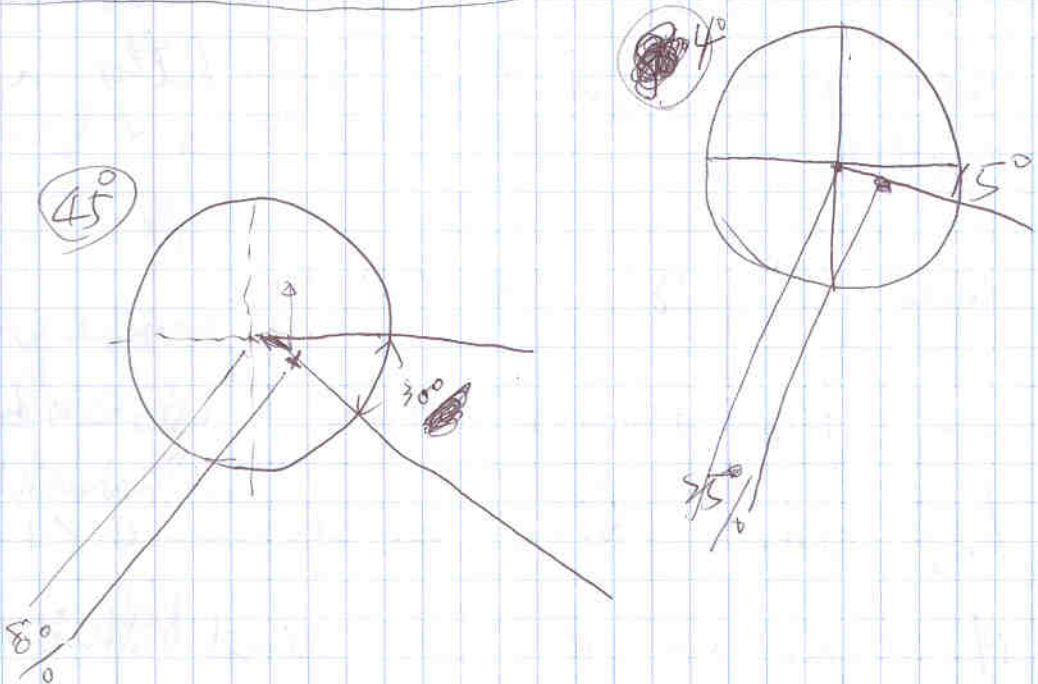
so translational error is about
1.1 mm for each axis

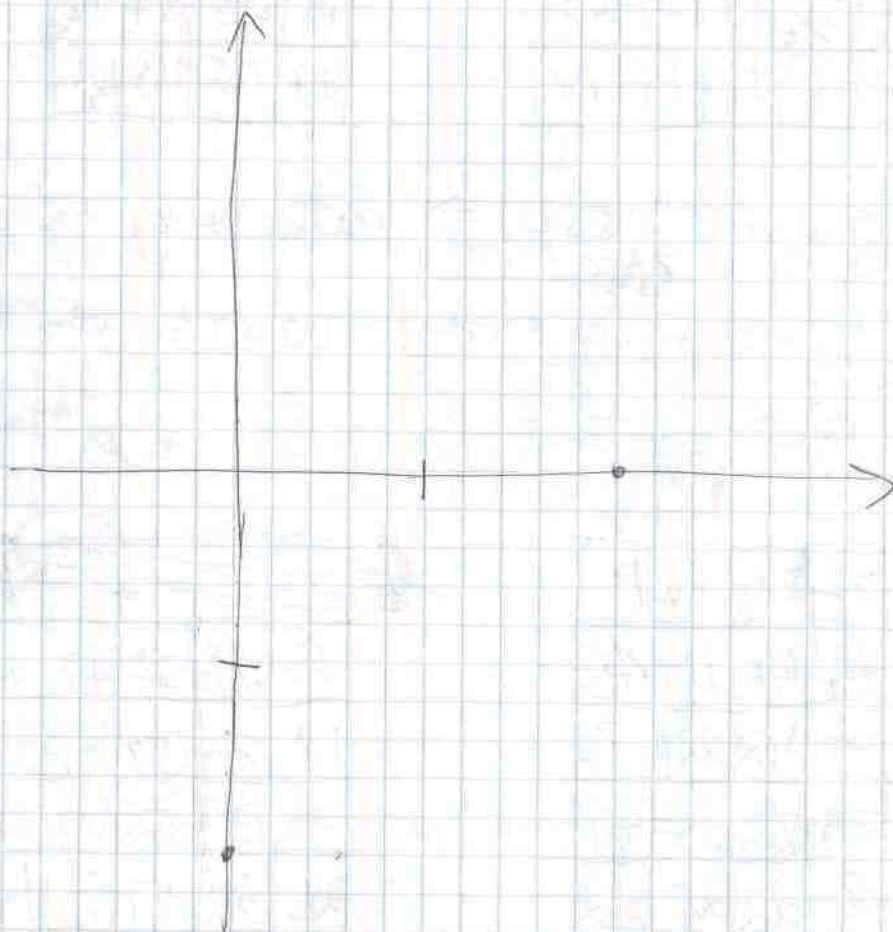
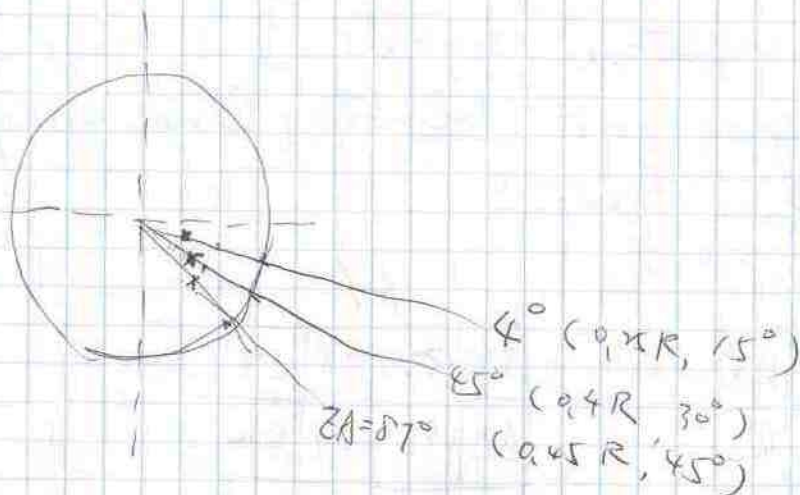
it seems we did at least this well
in August, but notes are not detailed



→ 45% of secondary radius.

which can't be explained by the non-parallelism of the laser





31583 is data + bg reference

V

~ centered LR
almost 1 pixel high

H

~ centered up/down
~ 0.6 pixel right

Hva-bai adjusted flat mirrors (#2h, v)
to get ± 0.25 pixel alignment
for exit aperture:

V

41	67	60	40
54	162	187	70
49	164	192	84
31	53	72	51

H

26	48	74	50
34	135	250	90
52	174	232	77
37	64	55	29

data file: 31584

estimate

V perfect

H

$\frac{1}{4}$ pix right

next entrance aperture

V

25	41	61	56	45
57	130	270	160	41
61	154	263	150	46
34	47	59	38	26

h

38	35	33	26
78	107	77	38
127	266	230	94
62	135	137	82
(21	2	45	40)

Saving to file

31585

0.6 pix R

0.24 pix L

0.75 pix. Low

deviation from parallelism

V
0.6 pix

H
0.5 pix
and
0.75 pix

~0.85 pix

2 mm

$2\frac{1}{2}$ mm

distance between plates 11" = 28 cm

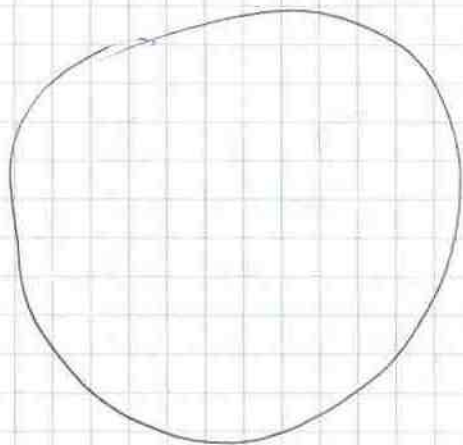
angular error of beams travelling towards secondary

$$V \rightarrow .4^\circ$$

side to side

$$H \rightarrow .55^\circ$$

mostly up/down
some side to side



f/12 beam

means sec'y

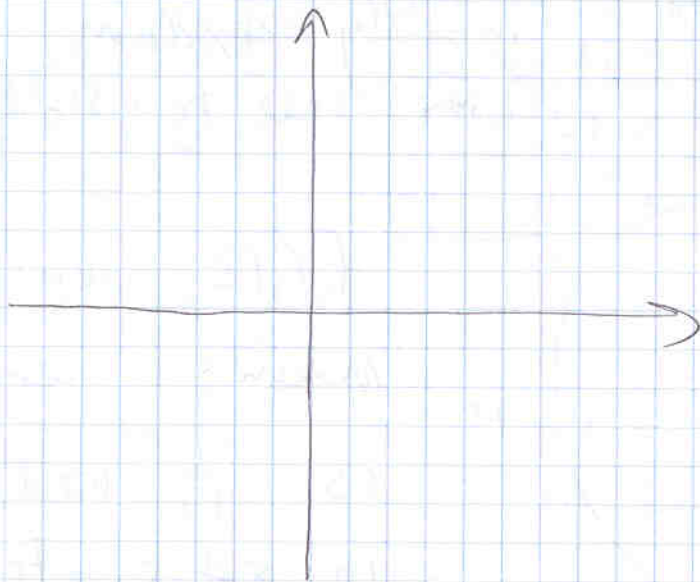
is $\frac{1}{12}$ radian

in ~~set~~ subtended

angle = 5°

We are centered $\sim (15\%)R(V) \sim (20\%)R(H)$
off the center

253
 $Z \uparrow$ That's like turning your
laser CCW. But due to
mirror it will twist CW on sec'y





In-disk:

$$(-1, -1)$$

$$(0, -1)$$

out disk

$$\left(+\frac{1}{4}, 0\right)$$

$$\left(-\frac{1}{4}, 0\right)$$

67 103 63 34
 102 153 186 54
 63 169 135 61
 29 44 54 36

-0.5 0

0 0.15

04, t
 2h

49 42 44 27
 91 221 155 47
 70 182 143 55
 23 46 50 33

29 90 116 53
 53 98 252 86
 51 118 128 43
 27 33 28 17

~~04, t~~
 2h

20 46 91 60
 40 174 297 127
 51 169 217 79
 30 52 47 19

57 64 41 30
 99 143 138 48
 101 236 200 76
 63 50 86 53

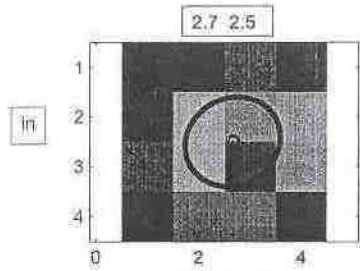
+0.5 0

-0.25 0

07/11 sharp alignment

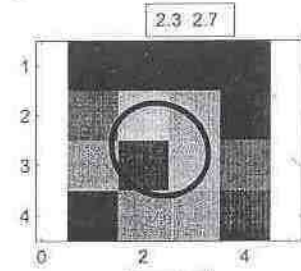
Center = (2.5, 2.5)

2.5 2.5

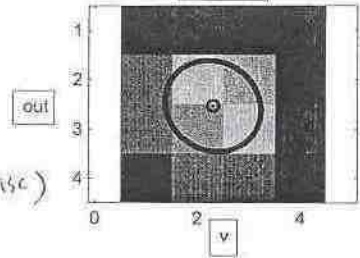


P2

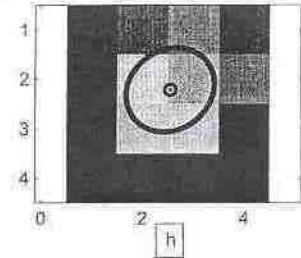
2.4 2.5



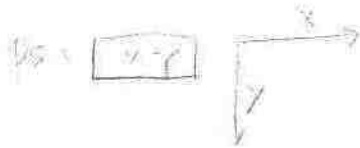
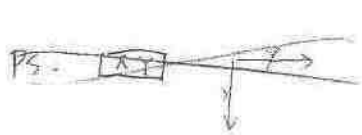
2.3 2.5



2.5 2.2



disc)



Final 0711

48 26 50 36
72 142 1864
62 105 108 85
346 271 54

V

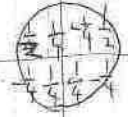
H

(031741)

In

21	31	56	45
36	134	233	108
55	209	277	103
35	70	72	29

38	41	27	18
77	155	143	34
108	264	207	69
45	100	106	55



Out

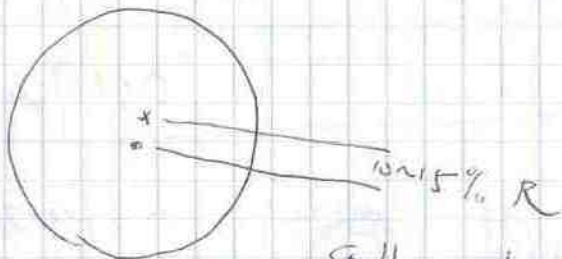
35	44	25	17
72	174	114	29
74	228	157	47
28	66	63	41

7	53	71	29
35	180	224	67
40	138	144	35
19	29	20	9

(031740)



Box 4 laser test a/ear
Darren adjusted M3



Stable with EL

primary direction of motion for h/w has any room vector proximity to SHARP

7/13

✓

H

In 7 142 392 220
132 1065 1881 662
229 1295 1671 395
4 228 180 93

163 153 46 142
560 1203 452 67
589 1597 1021 140
45 249 224 30

2.7 2.4

2.2 2.5

mean = 2.5 2.5

out 356 465 282 120
579 1443 1029 284
587 1580 1244 318
181 420 421 220

199 233 2.4 292
484 1852 1664 424
468 1210 933 210
159 243 149 45

2.3 2.5

2.4 2.2

7/12

rotation test tile : 031928X

031929X

031930X

031931

031931 :

Vcenter:

2.1, 3.2

6.6, 6.8

3.5, 4.3

2.9, 4.8

9.2, 9.1

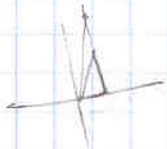
Hcenter : 9.4, 2.6

6.8, 6.6

3.2, 9.4

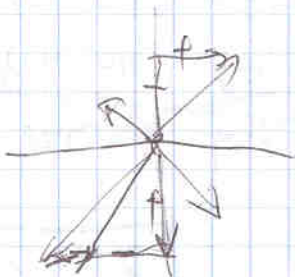
3.8, 4.4

9.5, 8.7



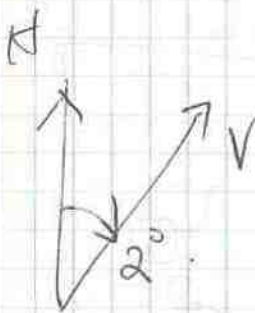
2.5, -3.6

2.6, -4.0



(-0.1, 0.4)

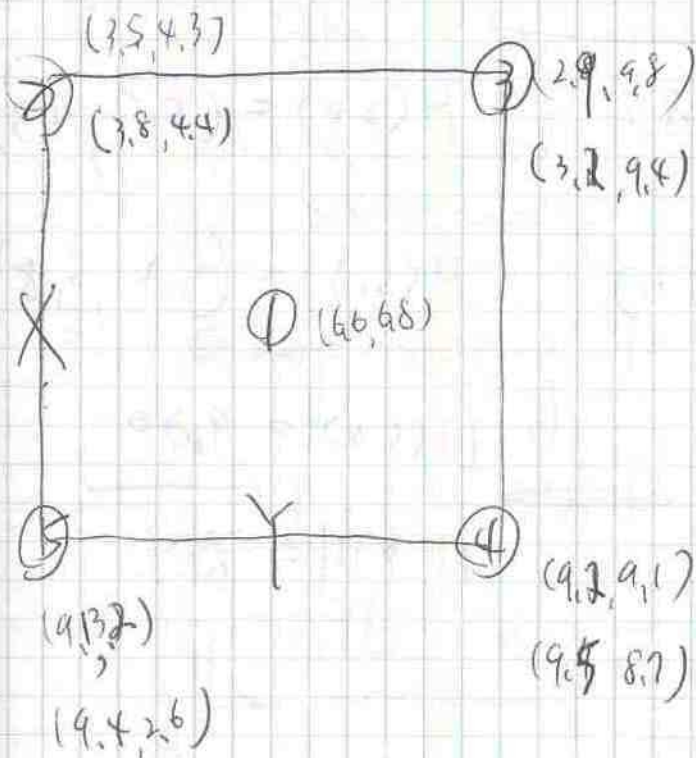
03/931 =



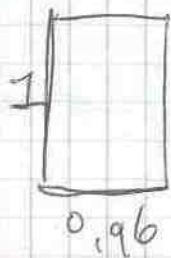
worst case = 0,2 paxel

~~03/930~~

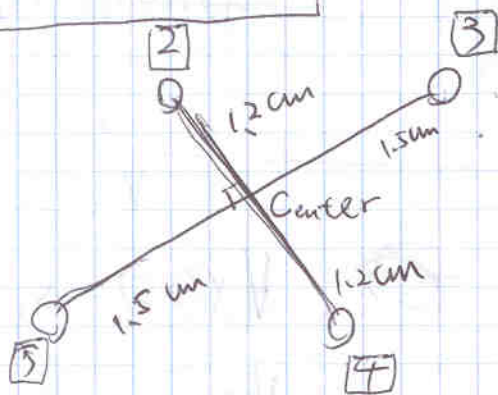
~~03/930~~



V	H
$V_X(25) = 5,6$	5,6 5,6
$V_X(24) = 5,7$	5,9
$V_X(35) = 6,2$	6,2
$V_X(34) = 6,3$	6,3
$V_Y(23) = 5,5$	5,0
$V_Y(24) = 4,8$	4,3
$V_Y(53) = 6,6$	6,8
$V_Y(54) = 5,9$	5,9



out size holes



$$\frac{1.5}{1.2} = 1.25$$

$$V(24) = (5.7, 4.8)$$

$$H(24) = (5.7, 4.3)$$

$$V(53) = (6.2, 6.6)$$

$$H(53) = (6.2, 6.8)$$

$$|V(53)| = 9.06$$

$$|H(53)| = 9.20$$

$$|V(24)| = 7.45$$

$$|H(24)| = 7.14$$

||

||

1.22

1.29

Conclusion of 7/12 "Rotation of Image" test.

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1. The difference of H and V is $\sim 2^\circ \pm 1.4^\circ$

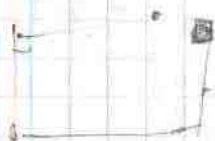
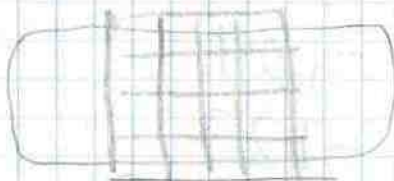
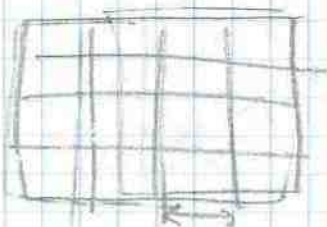


2. 2° makes the misalignment of boundary @ pixels
 ~ 0.2 pixel.

3. Image stretching of $V \neq H$ are

$l=1$ in ~~direction~~ ↓ directions

$l=0.96$ in → direction.



Night of 7/12/06

~~grid angle const~~

grid tests show 12° slip?

encoder?

hwp cork?

HWP cold-load. all-gain low

V

H

50 -137 0

62.5 -95 -18

95 0 ~~117~~ -127

117.5 -87 -69

90 -5 -120

95 -5 -143

100 -15 -132

85 -10 -113

80 -33 -104

105 -29 -127

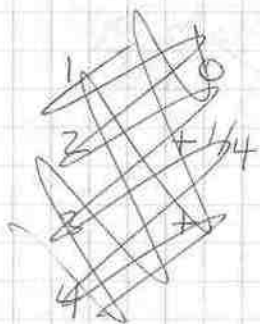
working w/ Mike on his code:

	x	y
1	0	0
2	+ .45 pix	- .09 pix
3	+ .87 pix	- .06 pix
4	+ .91 pix	+ .04 pix

Mars files
~~27954~~
 27951-54

	h	v	r, d (")
27951	-3.0, 0.2	-5.3, -0.7	
27952	-2.1, 0.0	-4.4, -0.8	$\frac{v-h}{}$
3	-3.0, -0.8	-0.8, -0.0	-2.3 -0.9
4	-0.7, -0.4	-2.9, -1.2	-2.3 -0.8
			2.1 0.8
			-2.2 -0.8

1	-4.2	-0.3	0	0
2	-3.3	-0.4	+0.9"	-0.1
3	-1.9	-0.4	+2.3"	-0.1
4	-1.8	-0.8	+2.4"	-0.5



Mike's correlator seems to work
 to ~ 0.3 pixel at least

GN:

What is H-V from Uranus data of 7/12?

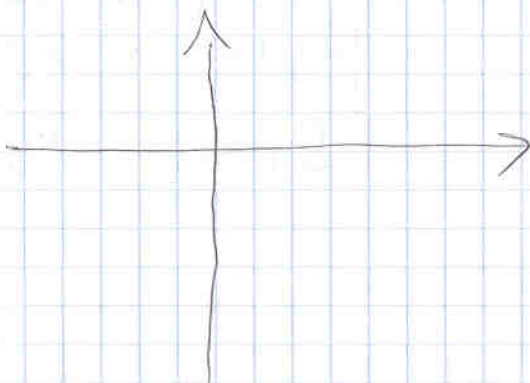
	left (v)	right (h)
31854	5.1", 3.7"	4.1", 3.9"
31855	5.8, 3.3	4.4, 3.6
31862	4.5, 2.2	3.6, 2.6

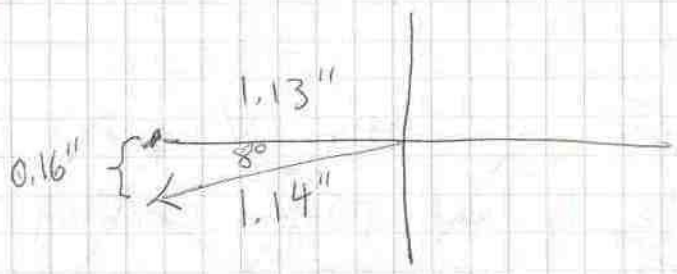
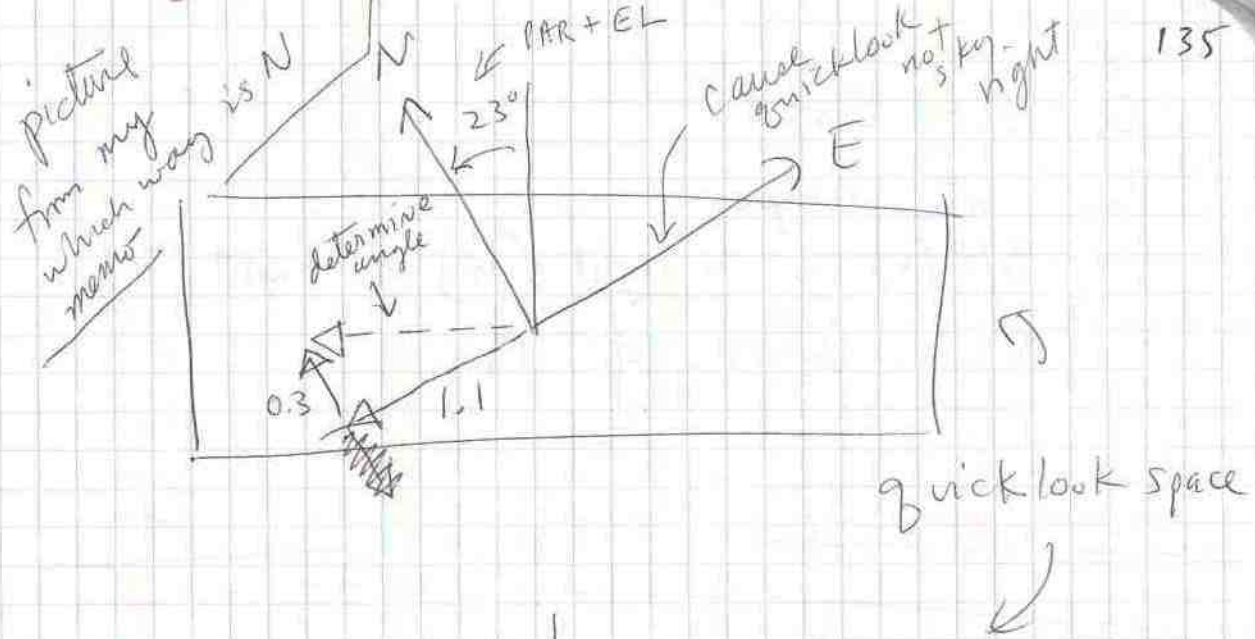
31854	+1.0"	-0.2"	0", 0"
31855	+1.4"	-0.3"	" "
31862	+0.9"	-0.4"	" "
average	+1.1"	-0.3"	

~~WRB~~

on average V is 1.1" towards -RA
and 0.3" towards + δ

EL = 58° PAR = -35 (on average)





1.13

upshot: V is looking $\frac{1}{4}$ pixel towards the left of H in quick-look space

This from Wraner's data of 7/11

Hua-bai had h looking 0.1 pixel to the left and 0.05 pixel high. Discrepancy is 0.35 pixel

Is this correct?

Look at images

left (V) is to right (W) of right (H.)

V is West of H

~~Phi_inst - raw is where V peaks
[see plots on web page showing~~

~~Phi_inst - raw = -30 for vertical
wires. (-30 = +60)]~~

~~[see also raw analysis of grid
tests showing V peaks at +60]~~

~~Grid calibration:~~

~~Instrument_offset is where V peaks
Instrument_offset +45 (for vertical wires)~~

~~is where V has a null.~~

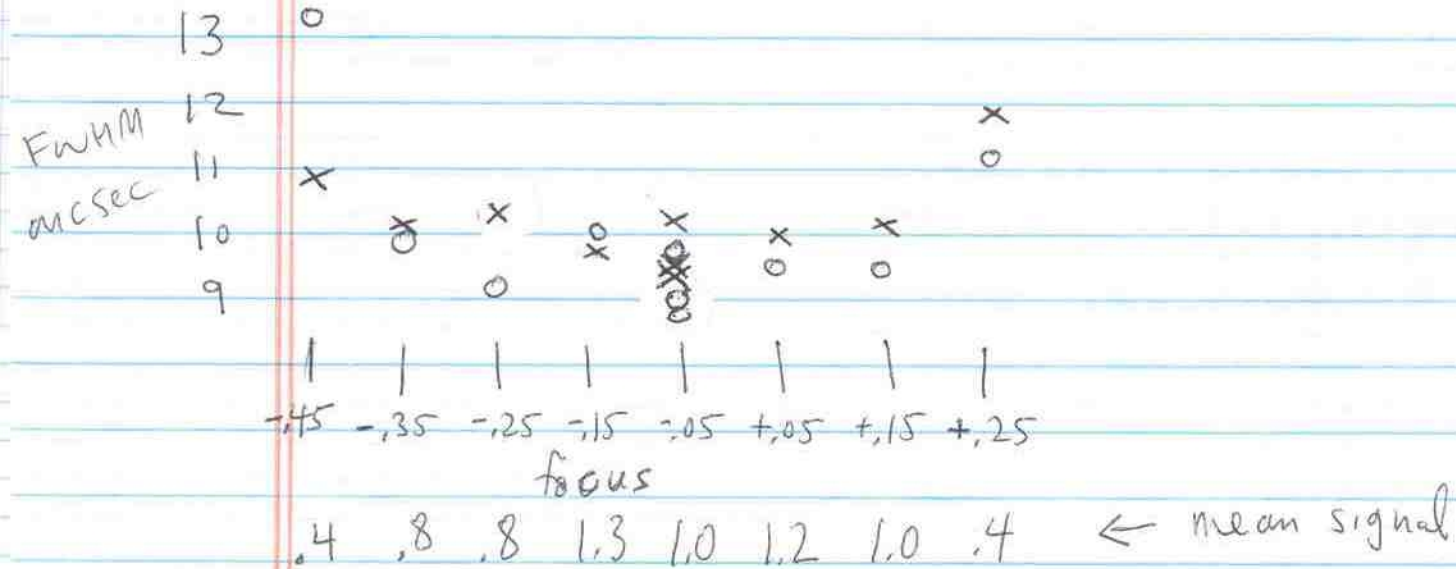
$$\text{HWP} = -\text{Inst off} - 90$$

$$\text{HWP} = -[V_{\text{null}} - 45] - 90$$

$$= -V_{\text{null}}$$

$$L = X \quad R = 0$$

7/11/06



grid calibration - direct way to derive "HWP"

Relationship between V_{null} and hwp flag

<u>Jan</u>	$V_{null} \sim 15$	hwp	~ 30	hwp
<u>July</u>	$V_{null} \sim 92-50$	$hwp \sim 92$		
		hwp		
		really 92		
		is 42 42		

Find the null in V [w/ grid wires vertical]
double it, and that's hwp. But
note you have to subtract the hwp
starting point.

Null changed by 27 (periodicity = 90)
hwp changed by 62 (periodicity = 180)

OR null changed by 63 pretty certain?
hwp changed by 118 uncertain to ± 3

The math just isn't working out. But somehow
($V_{null} - \text{First_angle}$) must be related to "HWP"

Phi-Instr-row

Vnull at zero

then its all +Q

0

Vnull at 22

then its all -U

~~90~~ 135

Vnull at 45

then its all -Q

~~135~~ 90Vnull at $67\frac{1}{2}$

then its all +U

45

$$\text{Phi-Instr} = -1 * \text{Phi-Instr-row} + 60$$

$$90 = -\text{Phi-Instr-row} + \text{I.O.} \quad \text{for vert wires}$$

$$\text{Phi-instr-row} = \text{I.O.} - 90$$

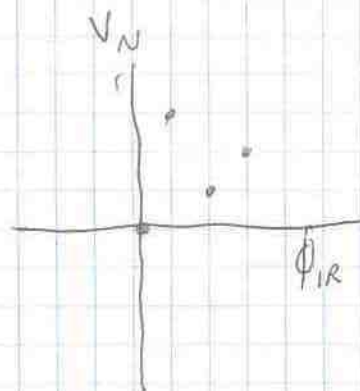
for vert wires

$$\text{Phi-instr-row} = -(HWP + 90) - 90$$

$$\text{Phi-Instr-row} = -HWP$$

$$V_{\text{null}} \mid 2V_N \mid \text{Phi Instr Row} \quad -2V_N$$

0	0	0	0
22	45	90 135	-45
45	90	135 90	-90
$67\frac{1}{2}$	135	45	-135



$$\text{Phi-instr-row} = -2V_N$$

$$-2V_N = -\text{HWP}$$

$$\text{HWP} = 2V_N$$

$$\text{Jan.} \rightarrow V_N = 15 \quad \text{HWP} = 30$$

~~$$\text{July} \rightarrow V_N = 4 \quad \text{HWP} = 8$$~~

~~#98~~

$$\text{July} \rightarrow V_N = 92$$

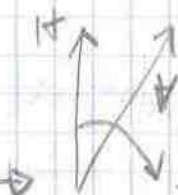
$$= 42$$

$$\text{HWP} = 84$$

But I got 92 for HWP, not 84.

7/13 ^{image} rotation test

files = 031964 → $z, 27 \pm 1, 84$
65



→ $z, 11 \pm 0, 62$

Confirmed that angle between H and V is $\sim 2^\circ$
measured in 7/12

alignment of H, V. from Hua-bui's plastic disk measurements

$$7/12 = V_x - H_x = 0,1 \text{ Pixel.}$$

$$V_y - H_y = 0 \text{ Pixel.}$$

$$7/13 = V_x - H_x = 0,2 \text{ Pixel.}$$

$$V_y - H_y = -0,1 \text{ Pixel.}$$

Note = ① difference between 7/12 and 7/13: box 3, 4 reinstalled.

② chief ray position is estimated by the "mean" of the images of inner and outer ~~aperture~~ aperture.

Translation between V, H ~~is~~ ~~the~~

Example by jupiter data taking on 7/13

$$31936 : V_x - H_x = 0.1 \text{ (pixel)}$$

$$V_y - H_y = -0.1$$

$$31947 : V_x - H_x = 0.1$$

$$V_y - H_y = -0.2$$

$$31941 : V_x - H_x = 0$$

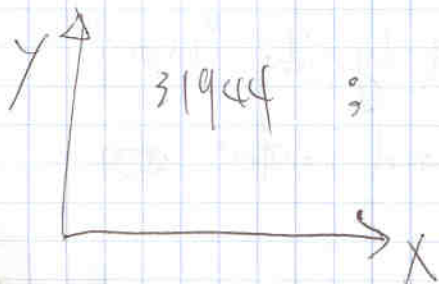
$$V_y - H_y = 0.25$$

$$31939 : V_x - H_x = 0.1$$

$$V_y - H_y = -0.28$$

$$31944 : V_x - H_x = 0$$

$$V_y - H_y = -0.34$$

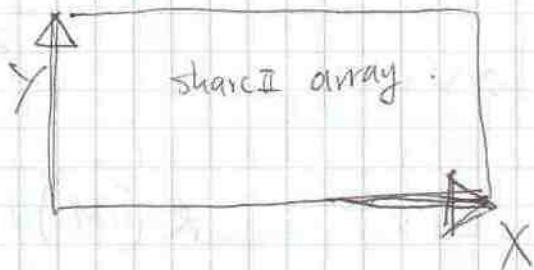


~~8x~~

$$31945 : \quad \odot V_x - H_x = 0.1$$

$$V_y - H_y = -0.1$$

Note: the coordinate is



Answers.

$$31864 \sim 31867 : \quad V_x - H_x = 0$$

$$V_y - H_y = -0.3$$

7/13/06

grid level to $.3^\circ$ on entrance
aperture of el. bearing. wires
vertical

all-gain low

	L(V)	R(H)	
80	80 -55	-158	
85	-30	-198	
90	80 -15	-214	
95	-15	-224	
100	-20	-191	
105	-32	-177	?
80	-60	-170	
105	-51	-182	
80	-60	-170	
105	-45	-186	

80 -57

85 -37

90 -26

95 -22

100 -30

105 -45

~~110~~

93, 94 is min

43 or 44 is null

86-88 is HWP

87

7/16/06

grid test.

grid wires vertical (frame vertical
to $\pm 0.5^\circ$)

hwp	V	H	zero level = -15
60	225	22	
50	-250	-27	
60	-270	-50	
70	-186	-90	
80	-140	-135	
90	-120	-160	
100	-130	-160	
110	-160	-120	
120	-212	-90	
130			

Wow, the V array is weird

I found my problem - I was
levelling on the sky. put cal in

	V	M
80	-52	-226
85	-32	-242
90	-21	-252
95	-19	-254
100	-26	-248
105	-42	-235
80	-57	-230

good!
hwp not
slipping!

remember to set all-gain low
and to have the cal thing in
cal \rightarrow /in_ if dome
 \uparrow underscore is open

~~Analysing some chopped data~~
~~3/13/16~~

7/17/06

grid at plastic disk (entrance aperture)
wires vertical (0.8° error)
Nylon ~~to~~ (1/16") on front of box
all-gain low

edit → properties → colormap → 1000 →
set limits to ±50

	<u>V</u>	<u>H</u>
80	-11	-22
85	-8	-25
90	-6	-27
95	-7	-27
100	-10	-27
105	-13	-25
80	-12	-23

} null

- taped 2 wire grids onto plastic disk for entrance aperture - 1 on each side
- parallel to within -1.1° wires VERTICAL (approximately)
- changing gain to ± 1000
- level hardware before each measurement

practice taking data

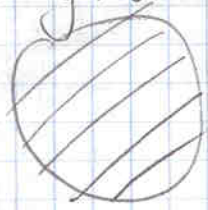
int time \rightarrow 90s

32644 fits

- 1) move hwp
- 2) remove bucket
- 3) level
- 4) replace bucket
- 5) take data (both ways)
- 6) write #s

<u>Angle</u>	<u>V</u>	<u>H</u>	<u>file #</u>
50.0	-219	-18	032645
60.0	-164	30	032646
70.0	-102	-101	032647
80.0	-41	-137	032648
90.0	-34	-203	032649
100.0	-23	-183	032650
110.0	-50	-133	032651
120.0	-140	-88	032652
130.0	-212	-45	032653
50.0	-200	-11	032654
60.0	-177	-55	032655

rotate grid so wires look like this when viewed from M3



<u>Angle</u>	<u>V</u>	<u>H</u>	<u>file #</u>
50	-124	-100	036256
60	-161	-47	036257
70			036258
70	-191	-10	036258
80	-169	-24	036259
90	-121	-64	036260
100	-87	-141	036261
110	-9	# 129	036262
120	-13	-168	036263
130	-39	-118	036264
50	-91	-93	036265
			032665