12/12/05

crossed-grid returned.

Crude measurements on gap

small gap – 5 wires
large gap – 6.75 wires

The improvement is from a 4-wire difference (see a few pages back) to a less than 2-wire difference.

It could be even better as those measurements were taken very quickly.

But there is another problem which is that grid quality seems to have deteriorated.

The large grid has big ~~patches~~ patches where wires are clumped in the middle of the grid though they are separated at the ends.

(The C-shaped grids (at least one of them) also does.)

Except for where the patch of dirt was. I did not see this before. All the problems with spacing & clumping were at the ends.

The worst patch has about 6 clumps of 4 wires each.

Well, the PCB grids had 80% efficiency at 100μm, so this patch should have ~80% @ 350μm as its 4X worse.

~~Such patches~~

So this is a 20% ~~loss over~~ loss and such patches cover 20% of the grid so this is a net loss of 4% of our signal to noise.

~~It's~~ w

And its unlikely to have a big effect on ~~the~~ beams just as secondary blockage does not have a big effect

This on patch covers 4x6 = 24 wires ≅ 1mm ~ $\frac{1}{40}$ of the grid area. Its not that different than a secondary.

I think its something we should worry about but not a huge problem

Well we went from 10-20% clumped in groups of 2-3 to a situation where about 10% of the area seems to be quite badly clumped → worse than 2's & 3's → probably 10% of area is ~~clumpeds~~ clumped in 4's & 5's and some cases worse.

this 10% will have low efficiency [70% ?] [50% ?] [80%].

Say 65%. This means overall we lose 3.5% of the transmission. The affected area might be 20%

So this could be a 10% loss of throughput.

That would not be enough of a reason to send it back.

Only one of the C-shaped grids is affected.

I know this happened SINCE I mailed the grid out because the way I measured the gap size was to count wire-spacings and its hard to find a patch near the grid center where this method works.

---

contaminant → cleaned it off with degreaser.

fine artists brush gently stroke the wires.

solvent →

Talking w/ Richard & Trevor

(A) he used a solvent to get a contaminant off of ~~the~~ one of the C-shaped grids. this was just a little piece of junk.

(B) he didnt notice the problem

(C) they both said a fine artist brush will fix (or might fix) the problem

work in shop Dec. '05

adjustability of grids + combiner

✓ missing mirror holder

hwp - protect X-grid if it falls out

✓ sides for box 4 ? 3 ? [defer 3]

way to anchor box 4 to SHARC-2 ?

✓ calibration-grid-holder improvements.

absorber in box 3, 4 ?

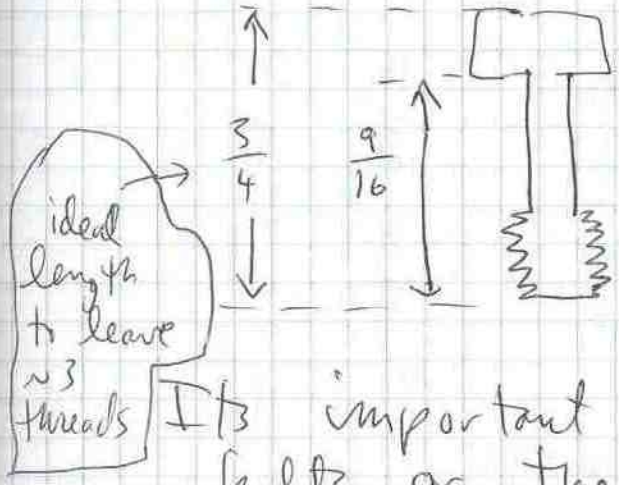
idea for adjusting grids

8 washers in each ~~size~~ size:

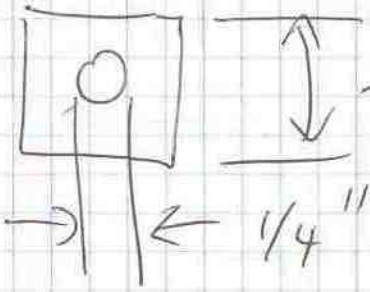
5, 10, 20, 30 mils

Can be round or square

also, shave down bolts



It's important to shave down the bolts or the whole thing will be impossible to fit [it will bind]



12/2/05 cables of HWP

red – white 6 Ω.
green – blk 6 Ω

called Sony April 2008

A	A	white	white
B	$\overline{A}$	green	red
C	B	blk.	black
D	$\overline{B}$	red	

↑ military connector ↖ indexer ↖ on cable from indexer to connector

Ran HWP successfully in lab at NU

is height of brass retainer above black plate

It was noisy. Anti-backlash too lose? bad wiring? speed wrong?

Megan figured this out:

brown line

blue neutral

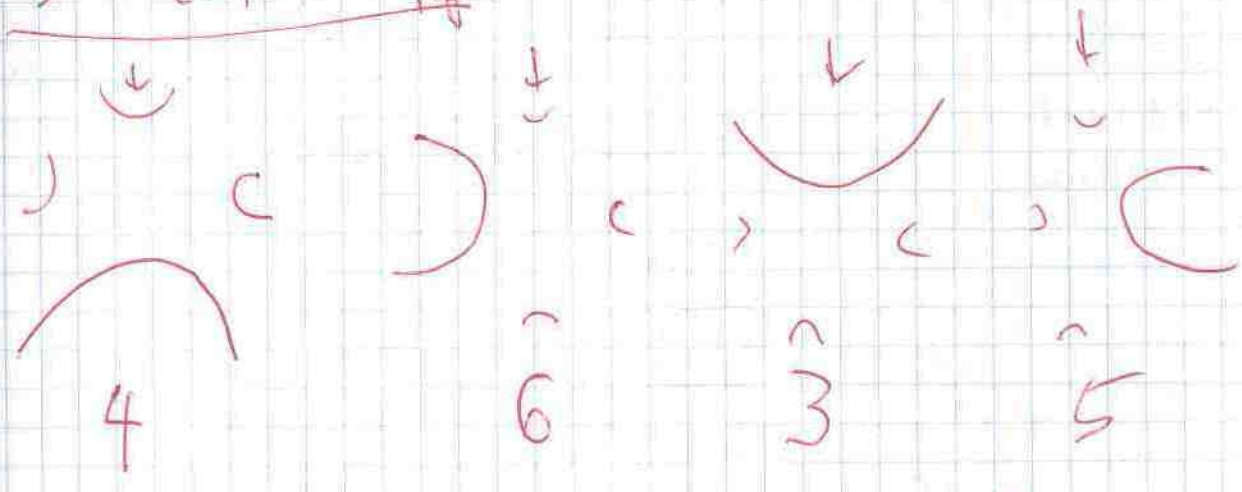
green/yellow case gnd.

X-grid testing

gap size

measure top + bottom gap because center-gap is too hard to measure because there are no wires that are nicely separated.

blue dot on top



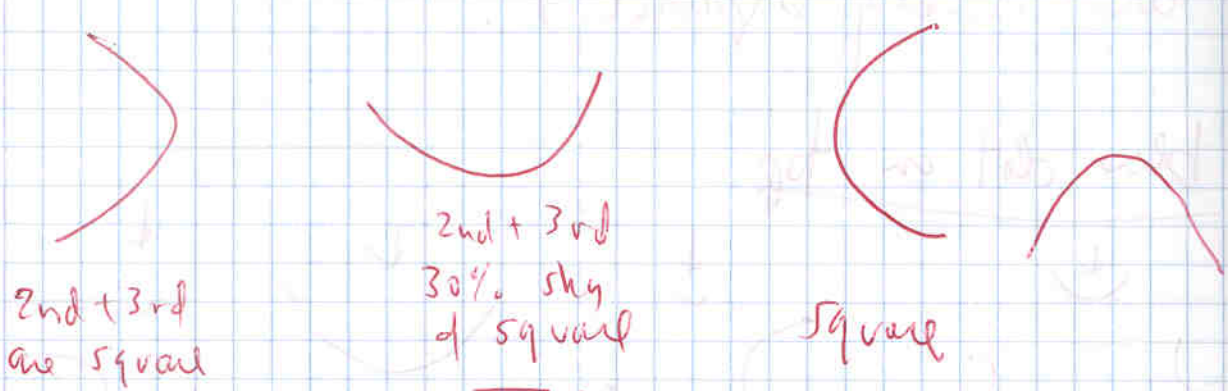
blue dot on bottom

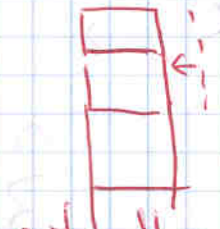
5	6	6	5
~~4~~	~~6~~	~~4~~	~~4~~
4.5	6	4.5	5

4.5 and 5.5 makes a difference of 30 μm.

Estimated step size is 20 μm.

This is good news.





actually 15%

The difference is 15% of 2 × 4

~ 1.2 wires

25 μm different

Gap is wider when ~~the cut~~ the big cutout is sideways

Gap is is some sense as before.

Brushing actually does some good. I closed a twelve-wire gap (the worst gap) but could not close a series of 4-wire gaps (4 in a row). But when wires are clumped in 2's & 3's I don't think I did any good

Jan. 5

- Jerry, Hua-bai, Michael, Martin begin work at CSO
  - dewar got rotated
  - serial "translator" got damaged
  - crossed-grid ~~and~~ and all mirrors for Box 3 & 4 were hand carried by Hua-bai
  - boxes 3 & 4 were sent FedEx
  - new hwp (w/ A/R coat) has arrived.

Jan. 6

- problems w/ computer network need Troy & ~~Jeff~~ Hiro help.

new hwp .149" thick

hwp holder .141 ± .002" deep

pwinder .017" * should be .008"

maybe its irregular edges of A/R coat or maybe meas. error.

depth of holder .086" ± .003"

.086 - .017 = .070"

.086 - .008 = .078"

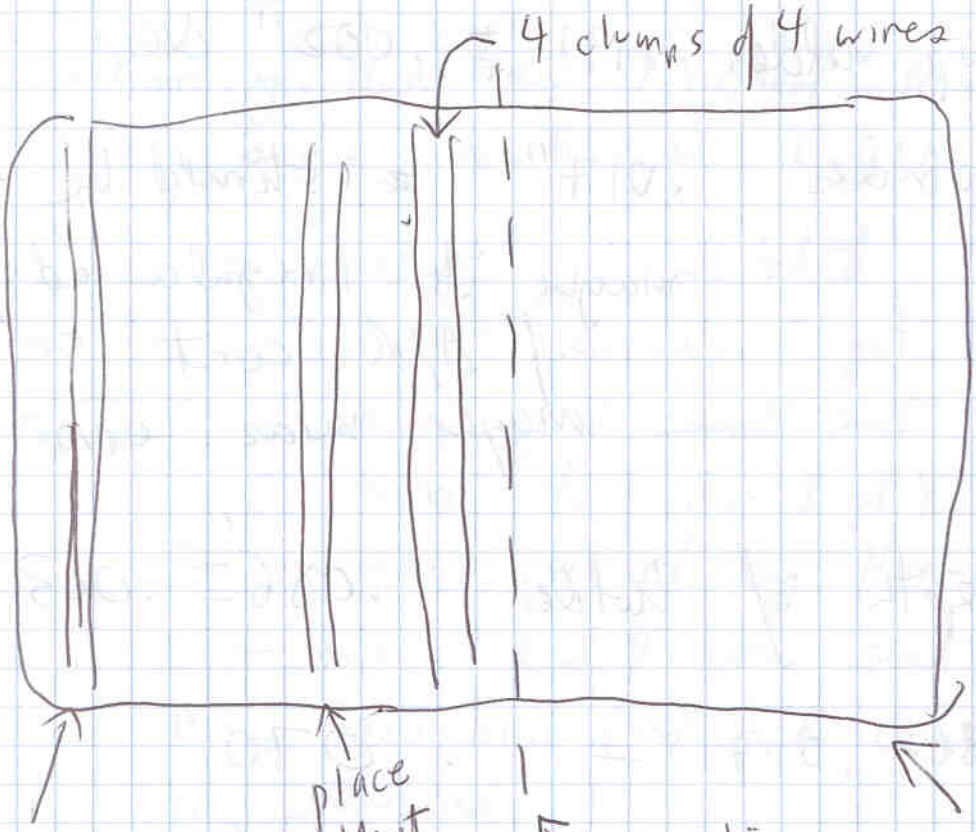
want .078" cork it will compress a little

cork thickness 38, 60, 32 mils

38 + 38 = 76 OK

actually thickness of 38 varies from ~40 to ~50.

looking at grid under M-scope

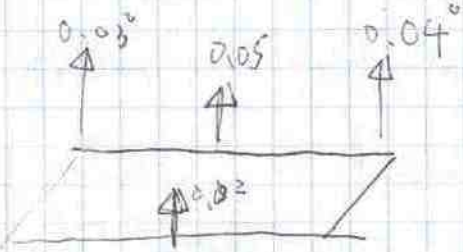


Conclusion:

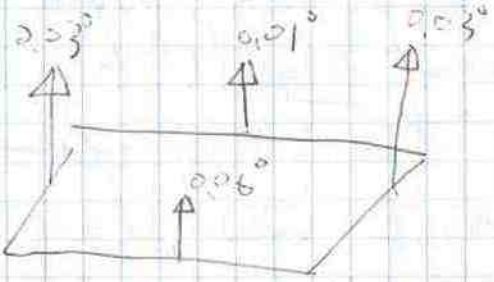
~~looked~~ looking under mag. light shows some 2 spots are the worst spots.

1/6

leveling :



box I & II
befor locking down



box I & II
after locking down

1/6 adjusting MY & MS for SHARC-II.

~~We could~~
→ we never did this before rotating, only after.

→ 

→ Hua-bai & Hinks could not get it centered. (Having relay cage mounted makes it harder)

So we had to remove 2 of the plastic disks on M4.

M4 was used to center near disk. (we are near limit of how far we can raise even w/o Nylon disks

For disk was high (!) we adjusted M5 to lower it. Then ~~far disk~~ near disk was low (1 pix) we adjusted M4 to raise it. Then far-disk ~~was~~ was high (1 pix.). Its clear this is not converging.

Decided to accept good alignment at near disk and one pixel off at far disk

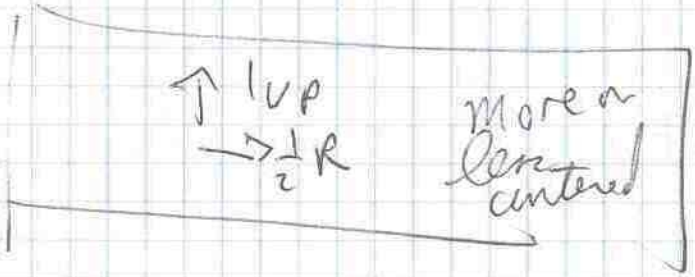
SHARP beams near disk

→ both of 1 pixel
both centered LR

→ both cover 4 pixels, almost no emission visible outside of these

→ intensity equal within 5%

SHARP beams far disk



How to start Larry's program

browser: 128.171.86.71

---

140 & 320 are bad angles. It can't move w/ motor and pretty tough w/ hand

---

new serial cable
20 by compute
19.73 really

20	18.9
42.5	41
~~65~~	
65	63.7
87.5	86.1

ended at 18.5 after 8 cycles
lost $\frac{1}{2}^\circ$ in ~ 1 hour.
I chose the region $20^\circ - 87.5^\circ$ to be free of sticky spots

EDAS Tx light drops out at some locations (out at telescope, on side of wall w/ window). It usually works on the desk opposite the windows so we ran a long serial cable to the EDAS (~~ee~~ encoder not working my way because RS232-488 converter accidentally destroyed)

RS232 is probably 35 feet.

Starting with file 27852, the HWP angles

SET	~~27.78~~ ACTUAL
20.0	19.8
42.5	40.7
65.0	62.5
87.5	84.4

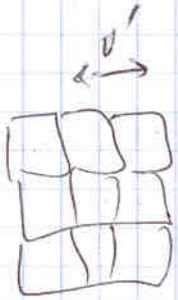
TO DO night of 1/7
SPM - closing

* (1) ~~grid test~~ feel the hup
is it tightening up
or is the problem
with the motor or indexer
(unlikely) or encoder (really
unlikely)

* (2) grid test

(3) more i.p. work

* (4) look at Jupiter



look for that 7% ghost
image 40-60" away

(5) more work on pointing

(6) science: M82

DAY (7) transmission check → take
out box and
~~look~~ look at IRC
and do an integration

(8) fill with Helium + LN_2

(9) start a cycle

~~[illegible]~~

we are losing EDAS once an hour

---

we ~~[illegible]~~ lost ability to move ~~[illegible]~~ lamp w/ paddle even though it does not seem terribly stiff.

---

flux of jupiter in ~~[illegible]~~

quicklook units .226 H } old quicklook
~~[illegible]~~ .191 V

933 ghosts at 5% level

934 ghost at 10% level → 60" off from pk
~~is this~~ what is this ?
it only appears in H

935 ǁ h has 2 pixels at 10% level

v also has ghosts at 10%, level

936
v 1% ghost
h 1% ghost

~~933~~
937
h 15% ghost
v 10% ghost

938
h 3% ghost
v 2% ghost

939
h 5% ghost
v ~~8~~ 10% ghost at edgish

940
h 7% ghost
v ~~5~~ 10% over 4 pixels

941 centered @ .17 h .15 v

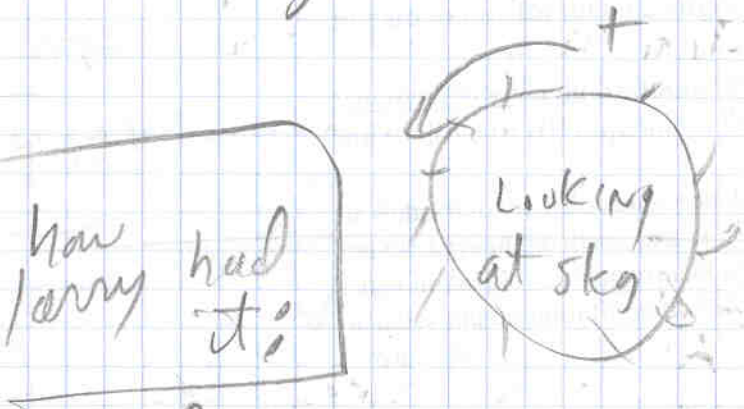
	AZO	ZAO
22	(0 ,	0) ✓
23	(60 ,	0) ✓
24	(60 ,	60) ✓
25	(0 ,	60) ✓
26	(60 ,	-60) ✓
27	(0 ,	-60) ✓
28	(-60 ,	-60) ✓
29	(-60 ,	60) ✓
30	(-60 ,	0) ✓
31	(0 ,	0) ✓

↑

add 10 as the first set was bad

night 1 ~~6~~ 7 1/7/06:

positive travel = pulling gear towards you.



A white

$\overline{A}$ red

B black

$\overline{B}$ green

Larry has white & red paired up
I had white & green paired up

John is checking connector:
(note there are two black)

John measures

white = A
red = B
blk = C
green = D

} at long connector

---

measuring at short connector
A & B paired up (6Ω)
C & D paired up (6Ω)

A & B are white & green at small
" " white " green connector

C & D are black & red
" ↑ ↑
C D

grid test

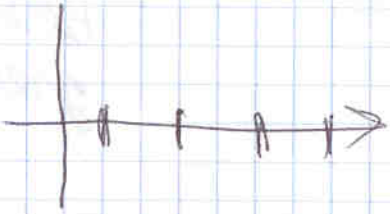
42 46 H 20
43 H 42½
44 H 65
45 H 87½

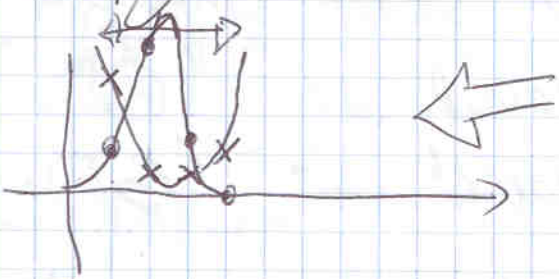
first grid test

H	V
.1 ~~.08~~	.3
.400	.05
.14	.04
.01	.1

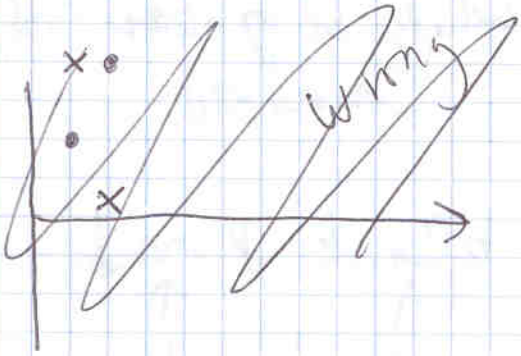
~~yesterday~~ first grid test

first grid test Sunday night





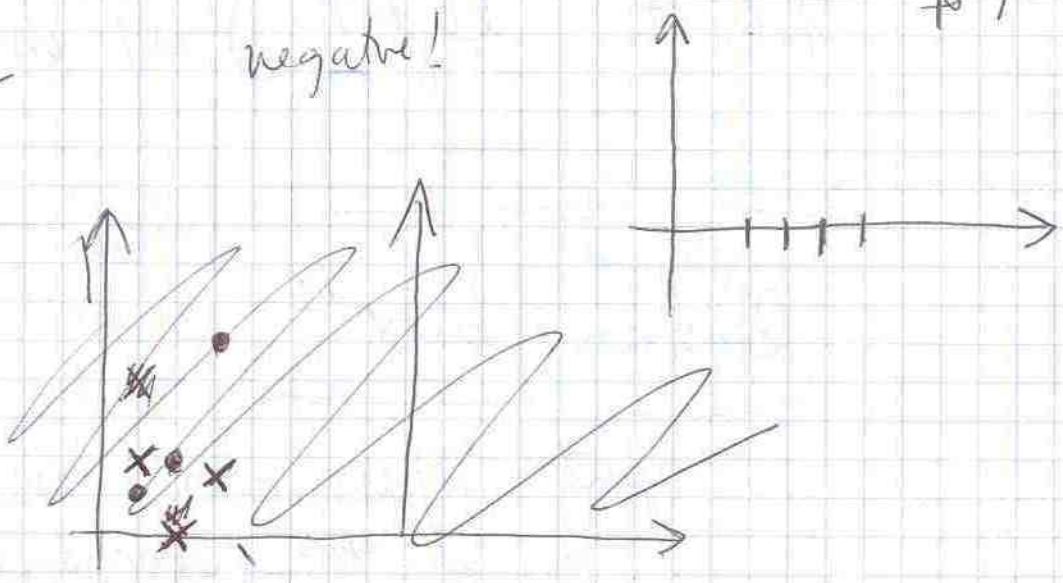
first ever grid test



grid test

	H	V
20	.02	.04
42½	.04	.006
65	.1	.03
87½	negative!	

Hertz model can be Negative



	H(=R)	V(=L)
87½	17	114
65	94	36
42½	141	15
20	40	100

second even grid test

4th night

Mars - no chop -

~~171.1 ri~~

170 right } sharcsolve
167 left } w/ masking

Remove box 4

put Mars over in
one of the subarrays

180,
/

561

re-install box 4

~~177~~ 175

208

~~On 3~~

~~On 3rd night of observations~~

On 3rd night of observations I noticed that pulling hub gear towards you make / # on encoder get bigger.

(when you are standing to left of SHARP)

3rd grid test

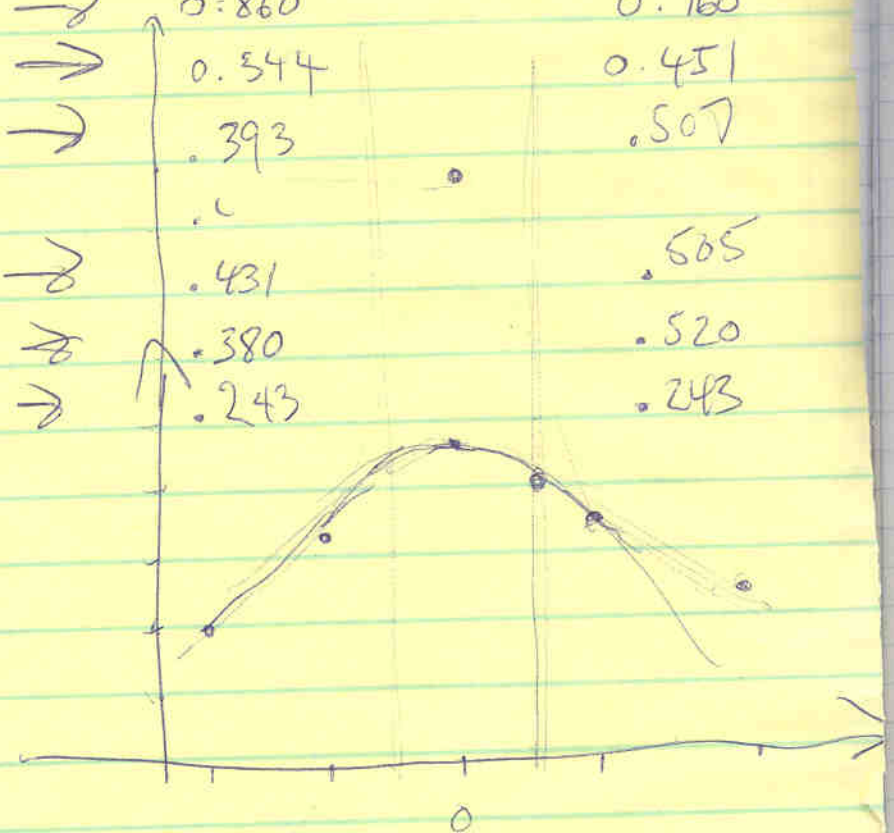
done on night 4

looks similar

did one starting at 20

and one starting at 35

			H	V
28490	0.4	→	0.207	0.245
28491	0.2	→	0.328	0.451
28492	0.0	→	0.860	0.960
28493	-0.2	→	0.544	0.451
~~494~~	~~0.4~~	→	.393	.507
~~[illegible]~~			.	
495	0.0	→	.431	.605
496	-0.1	→	.380	.520
497	-0.4	→	.243	.243



Foc/off = 0.0

focusing on Mars done early in night 5

This document gives the conventions used by SHARP team to keep track of the angle of polarization. The purpose of this document is to establish an agreed terminology for discussing these issues. (For analyzing August 2005 data, we will use the grid tests to establish the correct value of the HWP flag that determines the angle on the sky.)

(1) direction for positive hwp motion

The direction of positive half-wave plate motion is such that the angular velocity vector of the half-wave plate points towards the SHARC-2 instrument. This was recorded by Giles and Hua-bai in the instrument log on August 8, 2005. CONFIRMED JAN '06

(2) Code in sharpsolve/sharpstokes:

```
Q = H(0) - V(0)
-Q = H(45) - V(45)

U = H(22.5) - V(22.5)
-U = H(67.5) - V(67.5)

then flip sign of U
```

(3) Code in sharpsum:

```
ANG = 2 * (PAR + EL - HWP)
```

HWP is a flag that can be added to take into account the arbitrary offset

PAR is the Parallactic Angle

EL is the elevation

```
Q_out = Q_in * cos(ANG) - U_in * sin(ANG)
U_out = U_in * cos(ANG) + Q_in * sin(ANG)
```

(4) Giles' calculation at 14,000 feet:

```
PHI_SKY = - PHI_INSTRUMENT + (PAR + EL)
```

with the following definitions:

PHI_SKY is angle of E-vector on sky, increasing E from N

PHI_INSTRUMENT is angle of E-vector at SHARP input, as viewed by someone looking down the Nasmyth tube from the Nasmyth platform. The angle is zero when the E-vector is vertical and increases as the E-vector is rotated counter-clockwise.

grid tests night 5:

① [wires vertical: Phi_instrument = 90°

② [wires 45° CW: Phi_instrument = 45°

① [EL = 72; P.A. = -80

② [EL = 78; P.A. = -78

① phi_sky = -90 + (-80) + 72
= -98

② phi_sky = -45 + (-78) + 78
= -45

focusing on Mars on night 8

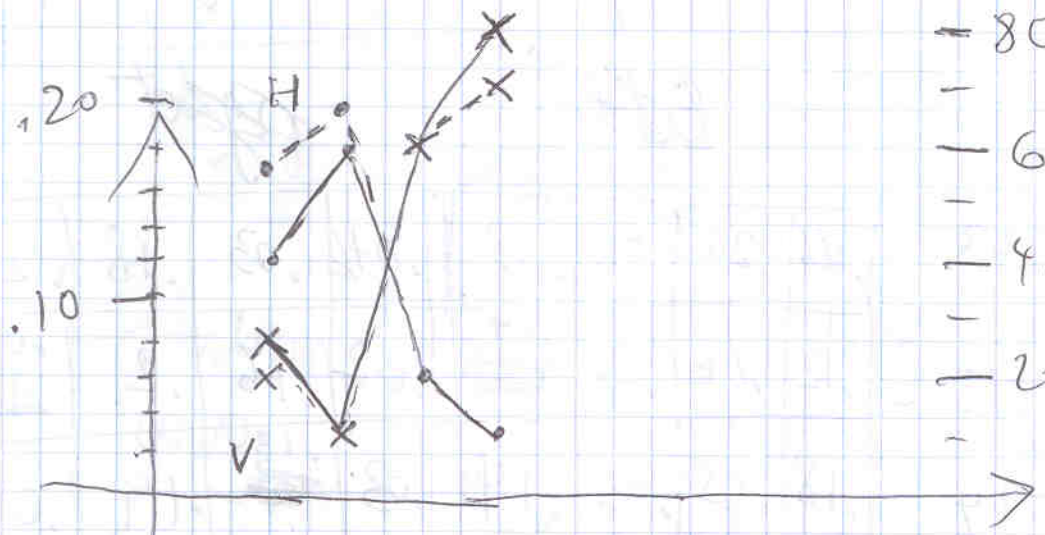
did a careful job

[studying the grid tests using quicksharp

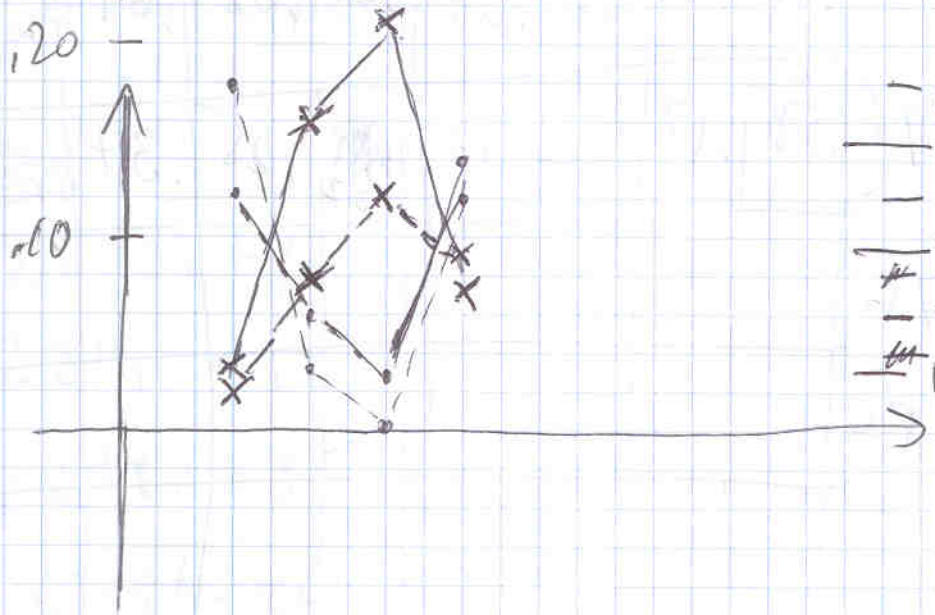
	file #s	date (UT)	wires	start #
J	29170 - 73	Jan. 13	vertical wires	35
~~288~~				
G	28907 - 10	Jan. 12	45° cw	35
H	28911 - 14	"	"	35 (125)
E	28482 - 85	Jan. 11	vert.	35
F	284 86 - 89	"	45° cw	35
C	28473 - 76	Jan. 10	vert	30 (?)
D	28477 - 80	Jan. 10	vert	20

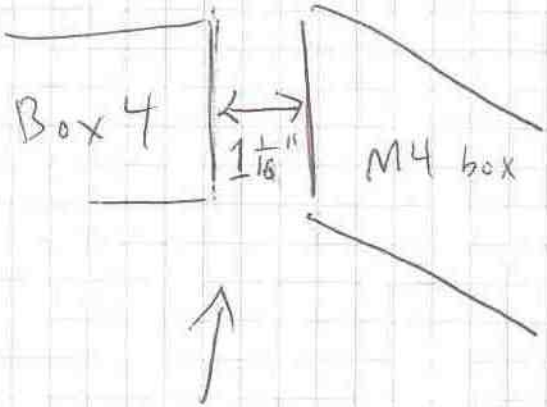
	17 left				V right			
29170-73	.166	.20	.06	.03	.076	.03	.18	.21
28907-10	.12	.06	.03	.14	.02	.16	.21	.07
28911-14	.18	.05	.03	.14	.03	.13	.19	.07
28482-85	.43	.59	.20	.07	.23	.08	.61	.78
28486-89	.58	.13	.02	.37	.07	.25	.37	.29
28473-76								
28477-80								

Jan. 13 vs. Jan. 11 wires vertical



Jan 12 vs. Jan. 11 wires 45° CCW

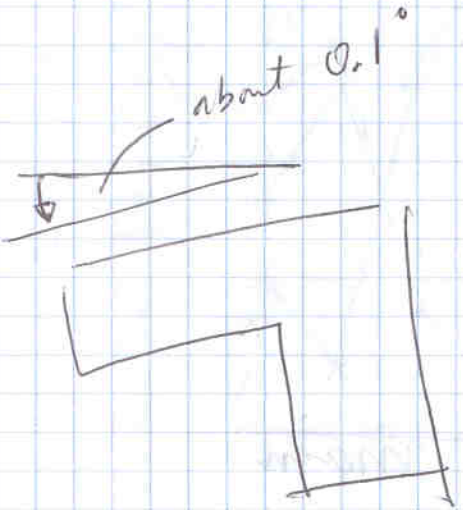




clearance between main structure of box 4 and main structure of M4 box (also see photo)

with this distance, clearance between bottom of box 1 and counter weight is 1" – 1 1/4".

Made marks on bars



→ spot is low by several mm (bottom edge of plastic disk)

low by 2.5 mm

~~top of~~

box 4 (and box 2) are tilted so that end closer to telescope is low. The amount of the tilt is about 0.1°

TO DO FOR NEXT RUN:

- adjustable cold load mirrors
- more screws to hold the boxes together
- install side panel for box #1
  [need to disassemble it!]
  - bring more screws
- screws to attach laser to box-4
  (same size as grid holder screws)
  need to be 3/4" long in thread
  or at least 5/8" would be OK)

Pack list

big grey box

- box 4
- crossed gnd
- 3 mirrors from box 3
- side panels for box 4 (& screws) packed separately

smaller grey boxes (2)

- box 1 (w/ sides and taped)
- ~~box 2~~ (cold load mirror screws installed but not cold load mirrors)

- box 2

- box 2

spare indexer
laser
laser holder (no screws)
laser power supply
hwp used Aug. '05
shim
plexiglass holder for large mirror
holders for auxiliary grids
extra 15 cm x 15 cm mirror
X-grid replacement mirror
Nylon
Alum. foil
paintbrush for X-grid repair

June 7, 2006

AT N.U., Fanny & Giles taking inventory

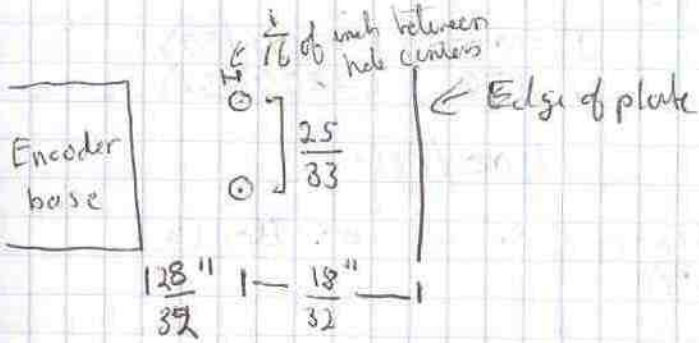
electronics
- encoder cable
- power cable for PM4
- serial PM4 → (brown)
- long serial cable used w/ indexer
- indexer instructions
- one ~~sec~~ indexer over by computer
- 3 indexer manuals
- 1 PM4 manual
- two motor cables
- serial paddle

- three sizes of cork
- big 4" x 4" absorber
- small 1" x 1" tile of absorber
- both cold load mirrors
- level
- extra springy mirror retainers
- 450μm hwp holder w/ gear

2 ~~[illegible]~~ uncoated unopened hwp for 350 μm
gnd holder parts
both SPARO gnds
2 bags of 80/20 stuff
"Adjustable mirror" bolts
misc. other bolts
inspection goggles
box 3 with all parts except X-gnd
box with bolts & washers

Tested HWP module after cooling in box with ice and motoon was completely seized up and almost impossible to turn by hand.

7-15 Schematic for L bracket for motor connector



7-21 Use std 2, 4, 6 ft on motor connector.

A → 4 white
$\overline{A}$ → 6 red
B → 2 black
$\overline{B}$ → 8 green

6/21 203382 andexer UPC # may have been damaged by tesla (some sparking occured)

Packing list

Box 25

2 Power supplies for resistors

cold load x 2

laser bench
laser rail
laser c clam
Laser opt 1
Laser opt 2

} laser alignment

6/28 Indexer settings

Y = 0/8
E = 50
K = 10/10
H = VR

I = 100 (3200/32)
V = 150 (4800/32)

400/rev

Note: Use indexer serial #: 96713 (2 stripes)

Big Black Box 1

Box 3 with hwp module installed.

Big Black

EDAS w/ DIN mounting
spare EDAS
spare motor
indexer
polarizing grids < in box with resistors
spare nuts + bolts (80/20 etc