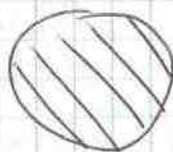


Rotated grids & wires are now horizontal

Angle	V	H	file #
50.0	-17	-177	032666
60.0	-57	-143	032667
70.0	-56	-118	032668
80.0	-103	-51	032669
90.0	-176	-19	032670
100.0	-160	-6	032671
110.0	-142	-52	032672
120.0	-79	-112	032673
130.0	-38	-120	032674
50.0	-18	-168	032675



← grid wire look like this when viewed from MB location

50	-99	-81	032676
60	-24	-133	032677
70	-46	-172	032678
80	-36	-167	032679
90	-82	-161	032680
100	-150	-69	032681
110	-191	-32	032682
120	-196	-31	032683
130	-147	-54	032684
50	-134	-117	032685

121  
Note: The leveling for previous was a bit odd. Sometimes it brought up a new window, sometimes it just came back w/ black lettering immediately.

Maybe levelling was just not necessary.

---

All gain low, calibrator in, plastic disk in entrance aperture

Put cold load in place, in front of plastic disk

V: ~ -25

H: ~ -20

Remove nylon absorber from in front of box 4

V: ~ -20

H: ~ -200

> ~ factor of 10 attenuation (90% absorption)

7/18/06

Hand signals - low gain  
 - nylon  $\rightarrow$  10x attenuation  
 - 20  $\rightarrow$  20 on display

$\rightarrow$  yellow hand signal (old)

$\rightarrow$  Level hardware  
 $\rightarrow$  Grab leveling frame  
 - Reset display -100  $\rightarrow$  100

$\rightarrow$  hand signal : 20-40

- No nylon  
 - low gain  
 - -1000  $\rightarrow$  1000

$\rightarrow$  hand signal : 200-400

- Nylon  
 - high gain  
 - -1000  $\rightarrow$  1000

$\rightarrow$  hand signal : 200-400

Signal w/o nylon should be  $\sim$  3000

- No nylon  
 - high gain  
 - 100  $\rightarrow$  100 range

location

close side of box 4  
 far side of box 4  
 box 1

pickup

30 on left side  
~~negligible~~ " "  
 red  $\rightarrow$   $\rightarrow$  30

Also, signal getting in through hole on SHARC-II cylinder

What did we learn?

1) Coupling to ~~the~~ Giles hand is 1% of what it is for Giles' hand in front of beam. (in front of box 4)



(could be a bit less)

There ~~could be~~<sup>are</sup> some memory issues also. If you put hand in beam and take it away signal does not always revert to normal value.

Note: Reminder... this experiment was completed w/ cal IN

### grid angle test

↓ grid in wires are vertical but rotated  $11.3^\circ$  CCW as viewed from M3

Integration time = 90  
cal in all-gain ~~low~~ low

- 1) move hwp
- 2) remove basket
- 3) level hardware
- 4) replace basket
- 5) take data

Angle	V	H	file #
50.0	-248	-21	033000
72.5	-113	-138	033001
95	-11	-207	033002
117.5	-150	-105	033003



	$V_{null}$	test
80	(V) -39	(H) -211
85	-22	-228
90	-14	-238
95	-15	-240
100	-21	-232
105	-37	-217

(levelled at 90)

7/19

SHARP data in:

home / transfer / sharcc / data - 2006jul

HWP test files: 032645 - 032685  
033000 - 033003

copy to dir: Engineering / july - tests

↳ home / kilaukea / sharp / bin / sharcslice

to run sharcslice:

sharcslice . / data / sharcs2 - 0 .ft slice          .ft  
↳ cont 1 100

Looked at 1st<sup>grid</sup> test: 032645 - 55

<u>File #</u>	<u>V</u>	<u>H x 10<sup>3</sup></u>	<u>Angle</u>
32645	30	220	50.0
32646	-27	160	60.0

Agrees w/ data!

---

7/19

Blank-sky polarimetry  
(before DSOS fully up & running)

Ang. min. vector points towards  
SHARP for positive hwp rot.

7/20

Procedure for final cal:

① cal  $\omega$  / in -

$z_a$   $\omega$  30

all-gain low  
move hwp to whatever angle is  $V_{min}$   
level

single  
grab leveling frame

Angle	V	H
80	-47	-190
85	-33	-206
90	-27	-214
95	-28	-216
100	-34	-209
105	-46	-196

reading from  
bolometer  
level array



for some  
reason  
bolometer  
array did  
not work

repeating	V	H
80	-73	-181
85	-57	-197
90	-50	-202
95	-49	-199
100	-56	-189
105	-	-

this time  
bolometer  
array  
works



(lesson: plastic disk must be cold)



TO DO for next  
time:

① more bolts to connect  
boxes — see notes on prev.  
page.

② (a) 10" straight tweezers  
(for X-grid removal)

(b) 3/16" 8" long allen  
wrench w/ hand grip  
(for some)

③ covers for box 1 → need  
little inserts to stick in  
80/20 and need bolts. Get  
sizes from Thang and confirm  
that

④ get drugs of hup module, spare  
set screws and learn how to  
disassemble.

Packing Inventory (to NU)

- 5 hups - 1 350  $\mu$ m AR coated
  - 1 450  $\mu$ m AR coated
  - 2 450  $\mu$ m
  - 1 350  $\mu$ m
- } one of each sent to Martin
- HWP mount
  - ~~2~~ <sup>pink</sup> bag of small parts
  - Megan's EDAs
  - Larry's EDAs
  - Manuals
  - Foam (3 pieces)
  - Motor cable
  - Cables 6 and re
  - ~~PM4~~
  - SHARP laser (3 pieces)
  - Crimp tool
  - Saddle
  - HWP Module bolts
  - spare gear assembly
  - Absorber

Leave at C50Wooden box

- HWP module Heater power supplier (2)
- spare motor ✓
- Huabai's stuff ~~III~~ III ✓✓✓
- Aluminium foil ~~III~~ ✓
- spare indexers ~~III~~ ✓
- Indexer
- Shim
- spare bolts (4 bags) ✓
- Calibration grid holder
- box 4 restraints
- Resistors ✓
- junk
- nylon sheets ✓
- calibration grids
- level ✓
- spare PM4 ✓

SHARP grex box #1

---

- box 1

---

Sharp big grey box

---

Box 2

- ⇒ Cold Load mirrors
  - Cross grid replacement plate ✓
  - ⇒ spare encoder ✓
  - spare 15 cm x 15 cm mirror ✓
  - ~~HW P~~ used in august ✓
  - uncoated unused HWP (550) ✓
  - transportation for cold load grids and large mirror ✓
  - transportation case for cross grid ✓
  - Box 4 side panels ✓
  - magnifying viewer ✓
  - box for X-grid washers + screws (empty) ✓
- 

Sharp grex box # 2

← box 4 (w/ bolts  
to connect all  
boxes to each other)



SHARP black box

box 3 (incl. cross-grid but  
w/o ~~hwp~~ hwp module and  
w/o ~~bolts~~ bolts for hwp module)

END July '06 Run

11-2-06 EDAS, indexer setup

power cables - green - ground  
white - neutral  
black - line

Wiring for cable (indexer  $\rightarrow$  motor) See pg 109:

white - A  
red -  $\bar{A}$   
black - B  
green -  $\bar{B}$

8-prong female military connector goes to other  
motor cable (8-prong M military - crimped  
plastic end)

red crimped attaches to motor - black on connector  
matches w/ "missing wire" on motor

Indexer to EDAS (serial) port 1 on EDAS

Encoder to  PM4/Power supply

Encoder  $\rightarrow$  17 F "flower" military connector  
 $\rightarrow$  line up matches & screw on



banana plugs → to power supply, set to (just under)  
+10V (red → +, black → -)

green connector → to PM4, pins 7-12 "screw side"  
up

PM4 → EDAS (serial)

serial end → port 2 on EDAS  
green connector → PM4, ABC, screws down

PM4 power cable → 123 screws up

MAKE SURE SERIAL CABLE IS  
ABOVE POWER CABLE BEFORE  
TURNING ON!

Green/black, Red/black cables  
→ to Data Acq System (see pg 115)

red/black → channel 0 (hwp status) BNC3  
top left on rail

green/black → channel 1 (angle flag) BNC2  
top right

Heater cables → find BNC cable, hook to  
large power supply  
(stay below ~~30V~~) run at  
30V → 15-20V?

Note: EDAS startup code needs to be changed.  
move 'hwp.exe' from storage card  
to startup

black = ground

# Packing List → ship to CSO

163

- HWP's (1 350, 1 450 AR coated, 1 450 non-coated)
- HWP mount
- pink bag of small parts
- Megra's EDAS
- manuals
- foam (3 pieces)
- Motor cable
- Cables galore
- PM4
- SHARD laser (3 pieces)
- crimp tool
- paddle
- HWP module bolts
- spare gear assembly
- Absorber (bag + 15x15)

## Nov. 10

Hiroko, Mogam, John, Giles arrive at Summit.

located box shipped from NU and EDAS left by Darren

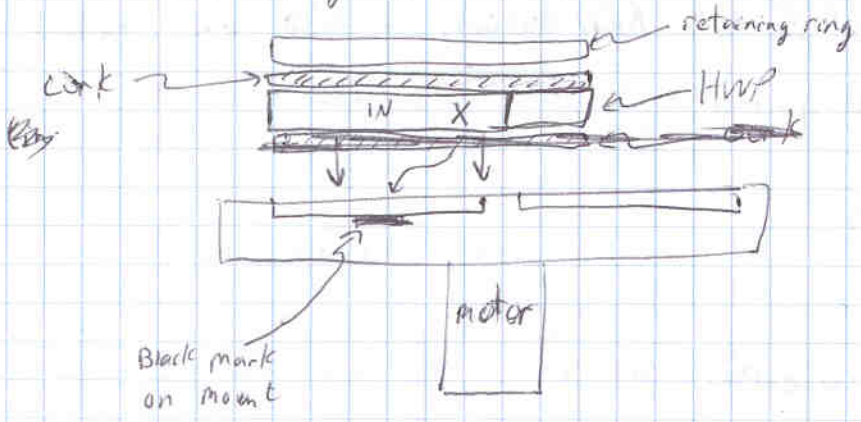
### HWP, indexer test

- Set up according to 19's 161, 162
- plug in PM4 → 23A & 23B → 120V AC power
- turn on +10V power → read encoder angle
- move hwp manually → 280's & 285's
- plug in indexer, Paddle

140-170) rough spots  
330-350)



# Installing HWP



- the X on the HWP lines up w/ Black Mark
- insert cork under retaining ring before tightening screws

145 deep  
 150 - plate thickness  
 12  
 E

50 deep (cover)  
 thickness 40, 30  
 cork

Serial cable, indexer → edge, is BROKEN on male side. Need to resolder connector

- 1 - red
- 2 - green
- 3 - black
- 5 - blue

Level Box 4  
 off by 0.1° along long axis  
 " " 0.05° " short axis

0.192 = 450 AIR HWP

.129 + 0835

$$\begin{array}{r} .1290 \\ - .0835 \\ \hline .2125 \end{array}$$

11/11/2016

165

407 420

430 427

390 360

370 340

Zimmer disk

hwp problems Nov. '06

On Fri, hwp moves were typically 20% short. 100 steps should be  $90^\circ$ , but it was anywhere from  $60^\circ$  to  $90^\circ$ .  
did not have heat.  
motion feels OK

On Sat, it seemed worse, but sometimes OK and sometimes really bad. heat seemed possibly to help, but it seems like heat messes up encoder - it flickers between  $45^\circ$  and  $90^\circ$ .



## SPARO initialization

K 10 10

I 100

V 150

H I

Y  $\emptyset$  8

D  $\emptyset$

Check in dexer parameters w/ paddle (X)

Y = 0 8

NA =

E = 50

I = 100 (3200/32)

K = 10/10

V = 150 (4800/32) (RL=0)

H = VR

~~ER~~

HWP marking: black mark up  $\rightarrow 75^\circ$

Problems w/ PM4 - kept jumping to 239419  
Finally, angle started jumping between values, each separated by a factor of 2

- $\rightarrow$  Cables plugged PM4 into a new power supply
- $\rightarrow$  Power supply labeled '325 downs' may be faulty

Try ~~moving~~ moving hwp w/ client/server program  
- move between 30 & 75  
 $\rightarrow$  moves off by  $\sim 2^\circ$   
- apply heat ( $2 \times 12V$ )

- increase heat to  $2 \times 15V$   
 $\rightarrow$  hwp moves to within  $1^\circ$ , with at most 2 iterations

To Do: Create a box for hwp/EDAS control

- = small 10V power supply
- $\rightarrow$  indexer
- PM4
- EDAS

### properties

- power switch (front)
- power switch LED (front)
- 3-prong outlet (120-V) back
- PM4 display (front)  $\rightarrow$  bracket
- 9-pin D connector for paddle (front)
- switch between paddle, EDAS (front)
- 'power strip' (interior)  $\rightarrow$  delay chain
- 2 BNC's to EDAS AO (back)
- 2 Military connectors (back) encoder  $\rightarrow$  PM4 6 pin  
indexer  $\rightarrow$  motor 4 pin
- Fuse on AC power line

H array alignment

1-2
3-4

- pixel 1 = ~~118~~ 009
- 2 = 118
- 3 = 121
- 4 = 131

- Bad pixel?

- units of mV

V array

- pixel 1 = 113
- pixel 2 = 126
- 3 = 122
- 4 = 112

aperture disk on far side of Nasmyth tube  
from SHARC2

aperture disk near side

H-array

- pixel 1 = 104
- 2 = 114
- 3 = 119
- 4 = 104

V-array

- pixel 1 = 108
- 2 = 101
- 3 = 100
- 4 = 100

aperture disk far side

H-array

- |               |
|---------------|
| pixel 1 = 213 |
| 2 = 211       |
| 3 = 180       |
| 4 = 206       |

V:

- 1 = 206
- 2 = 229
- 3 = 211
- 4 = 194

aperture near side

H:

- |         |
|---------|
| 1 = 169 |
| 2 = 169 |
| 3 = 179 |
| 4 = 149 |

V:

- |         |
|---------|
| 1 = 150 |
| 2 = 132 |
| 3 = 147 |
| 4 = 142 |

aperture far side

V:

- |         |
|---------|
| 1 = 211 |
| 2 = 220 |
| 3 = 219 |
| 4 = 192 |

final alignment



JV - repairing motor cable connector

R = pin B  
 G = D  
 B = C  
 W = A

encoder

clock - clock = pins 8-9 = 119.5  $\Omega$   
 data - data = pins 14-17 = 120.5  $\Omega$   
 $V_p - U_N$  = pins 7-10 = 1 M $\Omega$

HWP setup in lab (paddle control)

Grid Tests - JV, HL

- 101 - aperture @ rear side of Nasmyth tube from SHARC II
- 001 - grid mounted on front of Box 4
- 001 - wires vertical

Signal in lower left corner of Varray = 

1	2
3	4

encoder HWP angle	V-signal	H-signal
30.4	-61	-70
51.2	-103	-6.6
74.8	-47	-87
96.9	-3.8	-122
80.2	-30	-112
<del>99.7</del>	-4	-141
<u>90.6</u>	-3	-155

Pol. est File set

sharc2-033996.fits 30°  
 3997 30°  
 3998 40°  
 ↓  
 4005 110°  
 4006 30°  
 4007 80°

Nov. 14, J.E.V.

171

File	HWP	int (sec)	Comments
shard 2 = 034068	30.6	90	cold load, no grid aperture on rear side of Nasmyth w/rt SHARC
↓			
4010			

- place wire grid on front of Box 4
- wires vertical
- 0.012 inch shim under bottom side of grid.
- nope - still need hardware level

File	HWP	int	Comments
034011	30.7°	60 sec	vert. grid
↓			
020	120°		10° steps of HWP
21	30°		
22	80°		

- Re-Still cold load w/ LN<sub>2</sub>
- rotate grid so wires diagonal
- leave shim in place

↗ looking away from SHARC

034023	31.1°	60 sec	grid diagonal
↓			
027	70°	Bad file <del>was</del> forgot cold load	
028	70°		
↓			
033	120°	10° HWP steps	
034	30°		
035	80°		

11-15-2006 John + Hiroko

- calibration taped to aperture placed in for  
side of Nasmyth tube (further from SHARC 2)

Files 034036-045

HWP = 30°-120° in ten 10° steps  
- no attempt to determine alignment of  
calibration grid

- attempt to put grid wires vertical by eye  
- pretty good

Files 034046-55

HWP = 30°-120°, 10° steps Vert Grid

- attempt to put grid horizontal by eye  
- not as good as Vert. but not bad

Files 034058-67

HWP = 30°-120°, 10° steps Horiz grid  
about files 056 + 057 - HWP error

- Test of EDAS Analog Output

HWP inclination	Readout
32deg	270 mV
38.9deg	325 mV
44.9deg	416 mV
59.7deg	498 mV
69.8deg	583 mV
21.5deg	181 mV
11.3deg	97.1 mV
0.8deg	9.3 mV
350.8deg	2.9 V
359.7deg	2.99 V
0.1deg	43 mV

← not connected to SHARC

0.4deg 0.9 mV

Connected to SHARC II

10.2deg 84 mV

↔ (87 mV when disconnected)

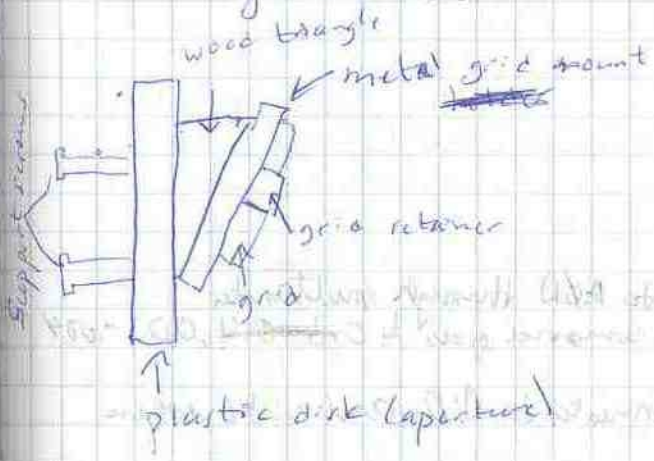


Ground to EDAS R1 — 6.2 MΩ  
 " " R2 — 9.9 MΩ ← connected to STARC  
 system  
 Both sides open — not connected to STARC  
 BNC shield to STARC input is not grounded  
 to STARC dewar

Repeat Horizontal Grid Test

HWP = 10° - 130°  
 Files 034068-80

Constructed angled grid holder for future  
 grid tests



FILE 10000

grid holder assembly. Grid of CHAD may align with grid 1.0, 2.0  
 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, 21.0, 22.0, 23.0, 24.0, 25.0, 26.0, 27.0, 28.0, 29.0, 30.0, 31.0, 32.0, 33.0, 34.0, 35.0, 36.0, 37.0, 38.0, 39.0, 40.0, 41.0, 42.0, 43.0, 44.0, 45.0, 46.0, 47.0, 48.0, 49.0, 50.0, 51.0, 52.0, 53.0, 54.0, 55.0, 56.0, 57.0, 58.0, 59.0, 60.0, 61.0, 62.0, 63.0, 64.0, 65.0, 66.0, 67.0, 68.0, 69.0, 70.0, 71.0, 72.0, 73.0, 74.0, 75.0, 76.0, 77.0, 78.0, 79.0, 80.0, 81.0, 82.0, 83.0, 84.0, 85.0, 86.0, 87.0, 88.0, 89.0, 90.0, 91.0, 92.0, 93.0, 94.0, 95.0, 96.0, 97.0, 98.0, 99.0, 100.0

Mike Hiroko

Grid Test with angle

2006/11/16

initial angle of HWP 49.97



Junk → 034081 - ~~2990~~

start from 30,

Time 50

Vertical ① 034091 - 100

Start HWP 300

End HWP 1300

||||

② 034101 - 110

HWP angle 100  
Exp



Junk → 110 - 113

Horizontal ① 03114 → 1203



2006/11/19

at 0.1 deg hwp angle from EDAS to A/D through multimeter reads .002, when connection to A/D is removed goes to ~~0.3~~ 0.4, 0.003-.004

at 0.2 deg we have .084 when connected to A/D and .086 when not.

Packing ListsSHARP Grey Box #1

- Box 1 (after Dec)

SHARP Grey Box #2

- Box 4 (w/bolts to connect boxes to each other)

SHARP Black Box

- Box 3 (incl X-grid & hwp module)

SHARP Big Grey Box

- X-grid replacement plate
- spare 15cm x 15cm mirror
- hwp used in August (310µm)
- transportation for cold load grids & large mirror
- transportation case for X-grid
- box 4 side panels
- magnifying viewer
- box for X-grid washers & screws (empty)
- Ice by Mariana Gosnell
- cold load mirrors } (after Dec)
- box 2

SHARP Wooden Box

- Huabai's stuff (5)
- Aluminum box
- shim
- spare bolts (4-6 bags)
- calibration grid holder
- resistors
- junk
- nylon sheets (8)
- calibration grids
- level
- black absorber
- sharp laser (3)
- 15x15 absorber
- foam cork (3)
- hwp module heater power supplies (2)



## SHARP (to NU after Dec) box

- box for 350 $\mu$ m hwp, coated  
(pack hwp in Dec)
- 450 $\mu$ m hwp, coated
- hwp mount (pack in Dec)
- Megan's EDAS
- Larry's EDAS
- manuals
- motor cable
- cables galore
- PM4
- Spare PM4
- indexer
- spare indexer
- crimp tool
- paddle
- hwp module bolts  $\rightarrow$  pack in Dec
- 450 $\mu$ m hwp, uncoated
- spare gear assembly
- pink bag of small parts
- spare encoder
- 350 $\mu$ m hwp, uncoated
- spare motor

Single-file mode #34128. test! (coarse dither)

<u>PM4 hwp angle</u>	<u>Commanded angle</u>	<u>File angle</u> <small>or check later</small>
51	50	
$\rightarrow$ 69.2 *	72.5 $\leftarrow$	-4
93.4	95	
116.8	117.5	

## #34129

$\rightarrow$ 52.03	50 $\leftarrow$ -4
$\rightarrow$ 70.18	72.5 $\leftarrow$ -4
94.1	95
116.8	117.5

\* changed voltage on resistors to +13V from +12V

#34130

177

DM4  
 → 51.9  
 → 69.96  
 95.1  
 116.2

Commanded

50  
 72.5 ← -4  
 95  
 117.5

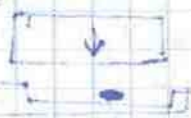
File angle

400000

#34131

DM4  
~~116.2~~ 52.16 ←  
 70.8  
 93.4  
 116.6

50 ← -4  
 72.5  
 95  
 117.5



#34132

(Coarse dither, 60s/hump)

→ 51.9  
 → 69.57  
 93  
 116.8

50  
 72.5 ← -4  
 95  
 117.5

#34133

→ 52.45  
 → 70.36  
 93.6  
 116.5

50 ← -4  
 72.5 ← -4  
 95  
 117.5

note: at end of file, does not go back to starting hump angle

#34134

57.8  
 70.7  
 94  
 116.5

50  
 72.5  
 95  
 117.5

#34135

57.8  
 70.7  
 93.2  
 115.9

50  
 72.5  
 95  
 117.5

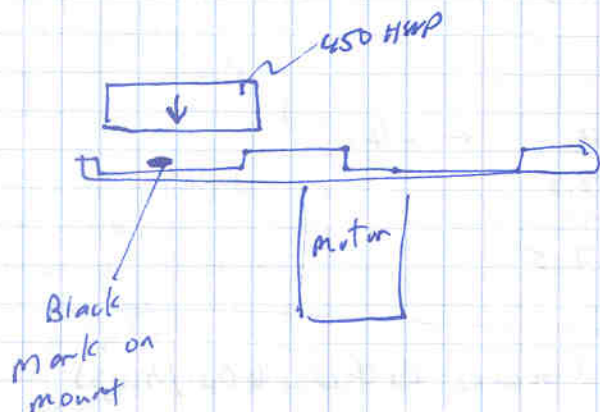
Moral: worst error = 3.5° seems to get better w/ time possible "sticky" spot between

50 & 70.3

Nov. 30

JV, HS, RH, MH

- install 450 nm AR coated HWP
- use retaining ring for 350 HWP, but remove one layer of "old" cork



Polarization efficiency test  
2 collection grids || vertical  
file HWP  $\angle$  [SHARC filter = 350 nm, caps!]  
colloid  $\rightarrow$  aperture  $\rightarrow$  grid

file	HWP $\angle$	V =	H =
034294	201 $^{\circ}$	-52	-94
5	209	-30	-64
6	219	-123	-25
7	230	-142	-7
8	240	-139	-6
9	249	-116	-33
300	260	-73	-74
1	270	-33	-103
2	279	-23	-113
3	290	-46	-95
804	200	-62	-92



grid rotated 45° clockwise toward sky

file	HWP	V	H
305	201	-116	-26
306	210	-131	-14
307	219	-122	-21
308	230	-86	-55
309	240	-46	-83
310	250	-17	-112
311	260	-16	-111
312	270	-40	-93
313	279	-112	-24
314	290		
315	201	-115	-24

-55 possible glitches

glitch?  
glitch

3

Dec ~~AM~~ share filter now changed to 450nm

File	HWP	V	H
316	200	-79	-21
317	210	-51	-57
318	220	-19	-98
319	230	+2	-120
320	240	-7	-114
321	250	-29	-85
322	260	-62	-43
323	270	-87	-9
324	280	-94	-1
325	290	-82	-21
326	200	-81	-23

Dec 3 Grid rotated  $45^\circ$  clockwise toward sky

File	HWP L	V	H
327	200	-10	-105
328	210	+1	-121
329	220	-11	-106
330	230	-39	-71
331	240	-70	-30
332	250	-92	-5
333	260	-91	0
334	270	-72	-30
335	280	-39	-69
336	290	-12	-100
337	200	-9	-105

Same as above except  $\frac{1}{4}$ " nylon in front of box 4

338 ~~200~~ no signal

Removed  $\frac{1}{4}$ " nylon. inserted thinnest piece: 0.063"  
Refilled cold load Dewar

- Put nylon immediately after cold load, before grids

38	339	200	-2	-22	* 208 = HWPL
39	340	210	-1	-26	
40	341	220	0	-25	
41	342	230	-8	-17	
42	343	240	-17	-6	
43	344	250	-19	+2	
44	345	260	-21	+1	
45	346	270	-15	-5	
	347	280	-10	-15	
	348	290	-1	-20	
		200	-3	-21	

Removed grid Install aperture with 5 holes

349 200

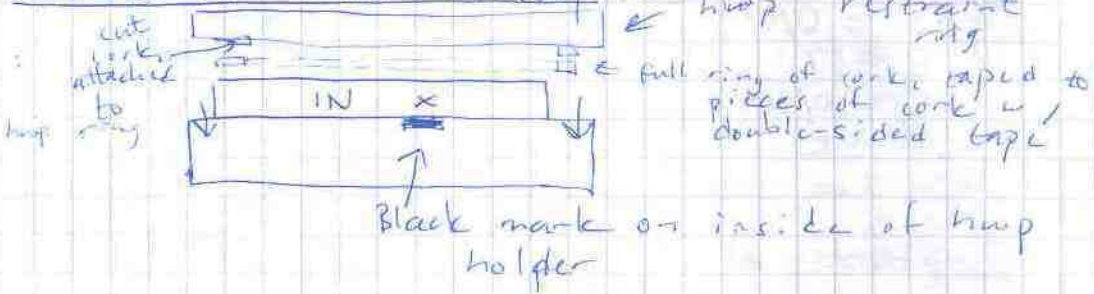
Remove nylon

350  
351

2-8

Start of run - setup

Hwp  
350um



To observe w/ 450um hwp, simply remove full ring of cork (keep piece of cork attached)

Assembling hwp plate to box

- 1) motor away from x grid
- 2) hwp plate on bottom
- 3) slide in so motor side of plate rests against fiberglass (glo) insulation
- 4) attach two short screws to top
- 5) attach one long screw to bottom, where green arrow is

Connect encoder + power supply to encoder

- works smoothly (encoder)
- rough spots: 140-180, 310-20
- makes noise in positive direction
- moves easily in negative direction
- rough spots: 180-150, 10-310

~~positive direction of rotation of hwp corresponds to J pointing toward telescope~~

- positive direction of rotation of hwp corresponds to  $\vec{J}$  pointing toward telescope just as for August '05 run

Connect indexer to motor

- motion very sticky

make sure V O P





Parameters (X) for puddle

$I = 0/8$   
 $E = 50$   
 $K = 10/10$   
 $H = VR$

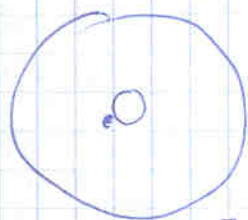
$NA =$   
 $I = 100 (3200/32)$   
 $V = 150 (4800/32)$   
 $(R1 = 0)$

start at 49.39 +25 ( $\rightarrow 22.5^\circ$ )  
 71.59 +25  
 93.9 +25  
 116.15 +25  
 27 -100  
 48.3 +25  
 -2  
 49.8 +25  
 71.7 +25  
 93.9 +25  
 116.3 +25  
 49.6 -75

~~typically~~

typically within  $2^\circ$  of desired values, often off by  $>10^\circ$  (cumulative error)

Laser spot on exit aperture



low by  $\frac{3}{4}$  of a hole diameter radius  
 left by 1.0 of a hole diameter radius

Laser spot on entrance aperture

low by 1.0 of a hole diameter radius  
 left by 1.3 of a hole radius

Aperture diameters are both  $0.175''$

# Alignment

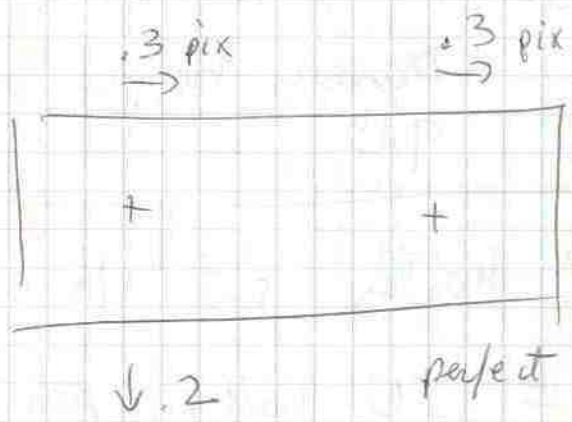
Feb. 9 '07

## SKARC-II

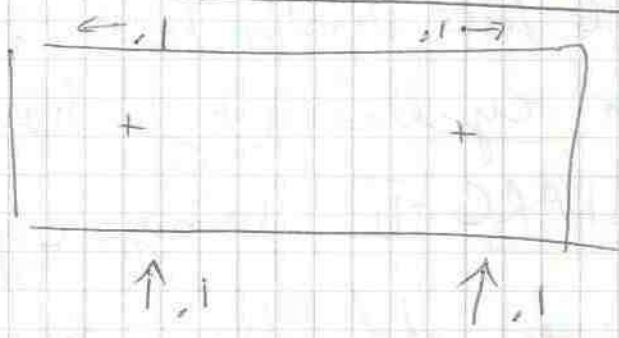
Both beams (near and far disk) off by .2 pixel, I forget which way. But they were off in some sense.

## SHARP

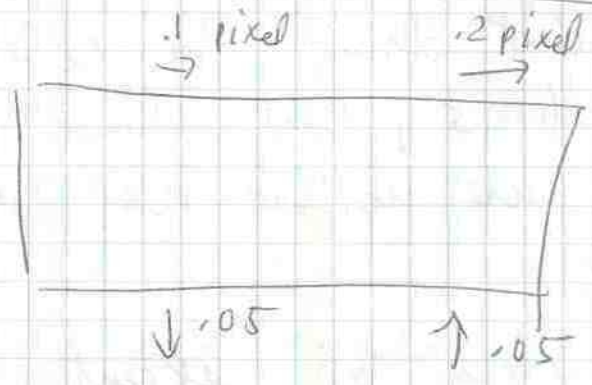
entrance aperture



exit aperture



average



we did not use cherry picker.

---

misc. notes:

→ Megan, Gile, Hiroko, Ed worked  
all day on 8<sup>th</sup>

→ John joined us on 9<sup>th</sup>  
Damen helped out in AM of  
9<sup>th</sup>

---

⇒ HWP heater set to 15V, 0.75A

= 10 Watts per channel  
plate feels slightly below room temp.

ten cycles (by hand since  
SMART-II being cycled)

never off by more than one degree  
we don't think the code is doing any  
iterations, but should ask John to  
be sure nothing new was put in  
Dec.

accuracy .3° except first angle .6°



Grid Test GN MK JV HS

2007/02/09

60 sec integ

start ~~50~~ 50

end 140

Step 225

"SHARP - Single - File"

35965. pits

0

Grid test, wires vertical

- no nylon

filename	hwp L	H	V	H+V	H-V
035906	50	3.9	-167	-163.1	170.9
35967	60	-16	-149	-165	133
35968	70	-92	-105	-197	13
35969	80	-166	-50	-216	-116
35970	90	-217	-12	-229	-204
35971	100	-220	-13	-233	-207
35972	110	-173	45	-218	-128
35973	120	-108	-98	-206	-10
35974	130	-36	-147	-183	111
35975	50	-8	-167	-173	159

Grid Test wires vertical, 1/16" nylon



February 11<sup>th</sup> afternoon. T low!

used cherry picker to align M3

- ① remove box 4
- ② align M3
- ③ replace box 4.

Note: we removed grid and nylon

Note - wind was causing <sup>of</sup> sky-noise like 'fluctuations' but not same on two sides of array. So we installed both sides of box 1. This seemed to help. We also put one side (improvised cardboard) on the side of box 3, just as insurance.

---

I noticed that the IRC displays show some left-right asymmetry that might be a function of hwp angle.

Yes, the 117 pos'n has ~~the~~ a full color change in the upper display. The right is yellow, left is green (dk. green)

NOTE: hup failed 3 times on 9<sup>th</sup> but never on 11<sup>th</sup>. Difference may be heat. When you heat above room temp it really works good.

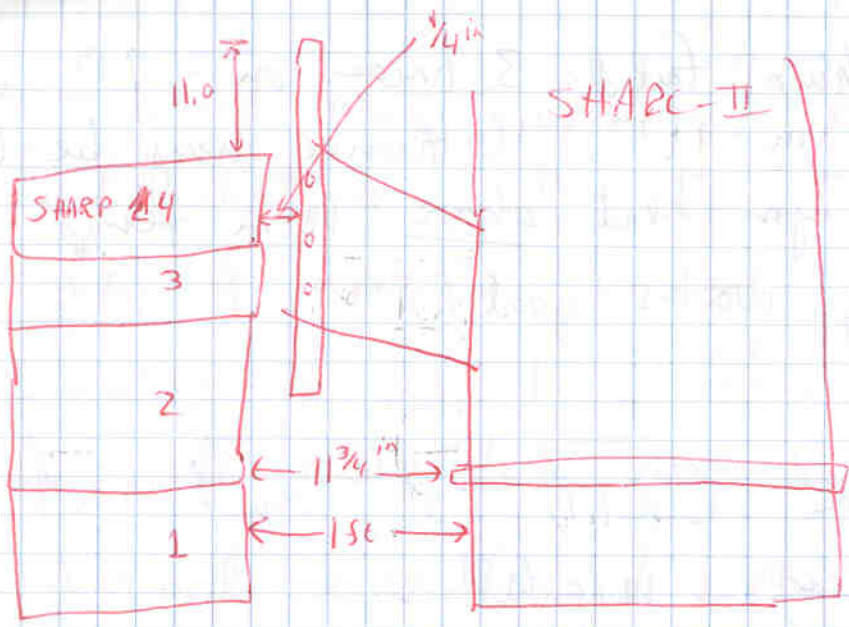
### QUICK GRID test end of Sunday night:

	V	H	
85	-15	-149	V is avg of 4 pixels
90	-10	-164	
95	-10	-155	
100	-12	-156	
80	-30	-131	H is just max signal
105	-5	-134	
110	-30	-125	

Nylon was in beam → I think this hurt us.



to MB  
←



Box 2 width into page = ~~28~~ 26 1/2 in

top of SHARP Box 2 to optical bench = 29 3/4"  
+ 13 1/2"  
+ 2.0

level on top of box 4. It is tipped forward (towards MB) by 0.1°, side to side it is level to ± 0.05°

Mar 31 2007

HL, CD, HS.

### SHARP alignment



SHARP

⊗ for linear

same size → first mirror after X grid



new size →

using sim grid

levelings =

indirection along the <sup>input</sup> beam =  $< 0.09^\circ$

in direction perp to the input beam =  $> 0.06^\circ$

3/31 sharp align

far	1450 1716 1250 1324	1420 1411 1000 1250
near	1580 1070 740 550	1600 1480 920 660

near	1500 950 950 700	1390 1400 1180 962
------	---------------------	-----------------------

far	900 1100 1660 1845	980 830 1490 1621
-----	-----------------------	----------------------

near	1500 1000 860 675	1490 1490 1100 844
------	----------------------	-----------------------

Result :  
 $\leftarrow 0.75 \text{ pixel}$

$\longleftrightarrow \sim 0.1 \text{ pixel}$

$$\frac{2600}{1300} = \frac{8}{13}$$

$$\frac{2400}{600} = \frac{1500}{1500}$$

$$\frac{6}{1300}$$

H

V

$$\frac{4}{1000}$$

$$\frac{5}{1000}$$

$$\frac{4}{13}$$



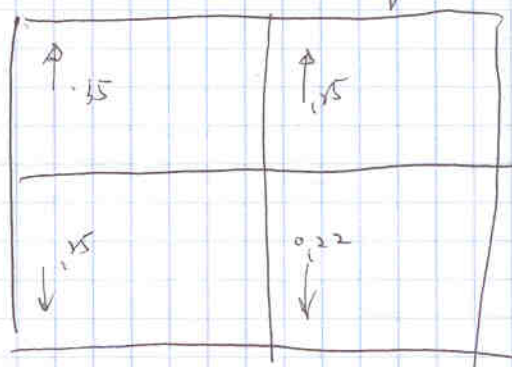
H

V

$$\frac{1650}{16} = \frac{280}{1250}$$

$$295$$

$$\frac{3}{12}$$



$$\frac{76}{2}$$

me