

Nadding to the negative beam first

02 UT  
01 Feb 2001 IRTF MR, TG, CG.

2 Tau 1000

ATAU.1000  
.1001

Good Set  
Good Set

Moon

moon. 1002  
.1003

Aborting - garbage

Humidity = 14%

Reset Grating 50.843 nuclear why needed slit 100, Filter

287.8

- moon. 1004 C<sub>2</sub>H<sub>6</sub> Garbage
- \* moon. 1005 (C<sub>2</sub>H<sub>6</sub> setting) Airmass 1.014 Good!
- \* moon. 1006 (C<sub>2</sub>H<sub>6</sub> setting) Grating 58.744, slit 100, filter 284.75
- \* moon. 1007 (C<sub>2</sub>H<sub>6</sub> setting) Grating 64.580, slit 80, filter 195.00
- \* moon. 1008

Jupiter

jup. 1009 Junk!  
jup. 1010 Junk! Red Leak at 1233 ζ. 7.

CVF

C<sub>2</sub>H<sub>6</sub>

jup. 1011 Junk!  
jup. 1012 Junk! Lost

jup. 1013 tilt of slit is off - need to work on this  
jup. 1014 CVF not optimized - big effect Humidity = 25%

\* jup. 1015 Good set Airmass 1.126  
\* jup. 1016 In 1<sup>st</sup> scan, sky is bad. Offset numbers in the

\* jup. 1017 Go back to Io. We need to move 5.6E + 0.4S to get back

Display are not consistent with our input / arrived @ 23.4, 3.5 at end of 2<sup>nd</sup> scan on Io. Pointing was off.

\* jup. 1018 Go back to Io. We need to move 3.4E + 0.2S to get back

on Io. Pointing was off by ~ 1/2 last. We'll change Jovian drift rate. / arrived @ 23.7, 3.5

\* jup. 1019 " " " " 1.4W " " "

" "

\* jup. 1020 Go back to Io. Bang on! We're 3 hrs west and need to point

in 0.0040E to correct drift rates TR. RATES: 15.0360W  
0.0004S

C<sub>2</sub>H<sub>6</sub>

jup. 1021 Set Grating 50.872 / @ 115 more 1 arcsec East

jup. 1022 Start scan Go to Io. Need to go 1.5S + 0.7W to Good sky at the beginning

Start binary on planet and move off planet at end - good skys at end get back on Io Airmass: 1.62 Humidity = 25%

C<sub>2</sub>H<sub>6</sub>

jup. 1023 Too many sky frames compared to expected. More to Io.

jup. 1024 E-balls moved slightly between 1<sup>st</sup> + 2<sup>nd</sup> scan. More to Io.

Need to move 6.5 W to recenter on Io  
" " " 3.0 W to center on Io



01 Feb 2001 cont.

M<sub>g</sub>I Hi-lo mode 815 cm<sup>-1</sup>

Sirius = α Cma guide star at 110E & 60N

α Cma. 1025 Airmass 1.395 some signal in pair 7.

pair 11 good

α Cma. 1026 pair 5 is when it got good pair 15 good + 16

α Cma. 1027 really good at pair ~~8~~

α Cma. 1028 really good all the way through

α Cma. 1029 great signal

Beta gem

β gem. 1030 pair six is good good: 9 on

β gem. 1031 good

β gem. 1032 really good

α Lyn

α Lyn. 1033 really good

α Lyn. 1034 "

α Lyn. 1035 "

α Lyn. 1036 "

30% humidity

τ = 0.096

α Lyn. 1037 "

α Hya

α Hya. 1038 got good around <sup>pair</sup> 15 S/N ≈ 75

α Hya. 1039 guiding around pair 12 sky noise around pair 15



01 Feb 2001 cont

R Leo. 1040 pair 5 got strong (peaked up) ☺

mu UMA

muma. 1041 good

muma. 1042 Cosmic ray pair 22

.1043 spikes pair 2

.1044 another cosmic ray type hit pair 22

Del Vir

dvir. 1045 pair six got good S/N ≈ 70

dvir. 1046 all kinds of lines!

η Boo

eboo. 1047 pair 10 - with some decent earlier  
pair 26 - very weird

eboo. 1048 big spike pair 25. sky noise pair 28

eboo. 1049 lost some signal ~ pair 20 on.

α Boo

aboo. 1050 pair six were on + integrating

aboo. 1051 new setting 828 cm<sup>-1</sup> great from

This is what it's all about!

playing with focus - pair 22 S/N ≈ 5  
done focusing at pair 28

313.907

had it to pair 10 lost till 20 off + on for next 10 lost 10

optimally overkill

the start! had feature labeled Mg I (not correct label)



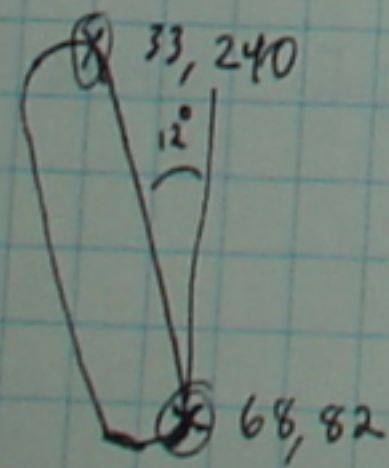
01 Feb 2001 cont.

Mars

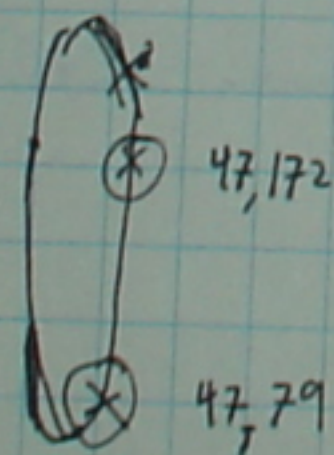
- Mars.1052 828 Hi-Lo mode Way way overkill end it after 6 pairs
- Mars.1053 815 Hi-Lo Junk!
- .1054 815 again
- Mars.1055 C<sub>2</sub>H<sub>2</sub>R(G) ~~end~~ end (its all sky) Junk!!
- Mars.1056 11 not completely on planet
- .1057 Still not on
- .1058 pair 10 good
- .1059 ethane C<sub>2</sub>H<sub>6</sub> pair 5 is good ended at pair 12
- .1060 CH<sub>4</sub> or H<sub>2</sub>O<sub>2</sub>
- .1061 Fish <sup>in</sup> N Hemisphere for H<sub>2</sub>O<sub>2</sub> pair 5 found lines & lines?

Testing

Image of "N" band filter w/ long slit only



N band Filter



250 μm slit

Δx = 35

Δy = 156



03 Feb 2001 IRTF MR, TG, GG

α Tau

atau. 2001 Guiding stopped early Junk  
atau. 2002 Nodding off the slit Found pair 5

Io then offset to center of Jupiter

Jupiter

CH<sub>4</sub>

jup. 2003 North pole of Jupiter: test of position / Took a while to get on Jupiter, size seems reasonable  
jup. 2004 North pole of Jupiter - first limb only: Establish drift rates  
jup. 2005 Another of the same Go to Io, 1.6E ← Need to Move to  
jup. 2006 2<sup>nd</sup> scan, Image 30 → there may be ~~some~~ some grating  
jup. 2007 Came on to Jupiter a little later than before, perhaps 13  
jup. 2008 Hit pixels around 98 & 124  
jup. 2009 Came on at 14, Cosmic Ray ~ 18, 19 / Go to Io.  
jup. 2010 Sky is bright  
jup. 2011 Another... Go to Io. Move 0.55 to center

C<sub>2</sub>H<sub>6</sub>

jup. 2012  
jup. 2013 Second scan has a kink in the DC near frame 73

C<sub>2</sub>H<sub>2</sub>

jup. 2014 Good data!  
jup. 2015 " " ! Go to Io Move 0.3W; 0.75 to center on Io

Grating 50.88

Center RA <sup>RA</sup> 3.57 28 DEC <sup>DEC</sup> 19 46 21 ← for a centered Io

bounce instead of 11. Shift in echelle at 4<sup>th</sup> scan. / Go to Io. ~~More~~ Centered! / Humidity = 20%

Move 1.3W to Center on Io

RA 3 57 28.46 Dec 19 46 21.2 of Io



03 Feb 2001  
Moon

moon. 2016  
moon. 2017 think we were on for flat  
moon. 2018 Ok we think  
moon. 2019

Jupiter CH<sub>4</sub>

jup. 2020 We are 10" east of Jupiter Go back to Io.  
jup. 2021 We are questioning the position on Jupiter. Io looks  
jup. 2022 Are we seeing the hot spot + mistaking it for the limb  
jup. 2023 Go back to Io  
jup. 2024  
jup. 2025  
jup. 2026 Go back to Io  
jup. 2027 Go back to Io  
jup. 2028  
jup. 2029

C<sub>2</sub>H<sub>2</sub>

jup. 2030  
jup. 2031 Go back to Io.

C<sub>2</sub>H<sub>6</sub>

jup. 2032 Just 1 scan.  
jup. 2033  
jup. 2034

1.3W, 0.6S ← need to move to center Io  
- well positioned. Are the offsets correct? → Upon checking they appear to be.

0.6W, 0.6S "

5.6E, 0.0S ← need to move to center Io  
0, 0.3S ← " " " " " "

Need to move the telescope ~ 4" east to center. Humidity = 20%

1.7E, 0.4N ← need to move telescope



03 Feb 2001

Jup H<sub>3</sub><sup>+</sup>

Jup. 2035

Hi-lo

Jup. 2036

guiding

pair 13 stopped guiding

Jup. 2037

good

Jup. 2038

good

Moon

Moon. 2039

Hi-lo H<sub>3</sub><sup>+</sup>

Moon. 2040

Hi-med

C<sub>2</sub> H<sub>2</sub>

something went weird

(~~was~~ maybe only in the quick look)

Moon. 2041

good

C<sub>2</sub> H<sub>2</sub>

Moon. 2042

C<sub>2</sub> H<sub>2</sub>

wired just frame maybe

Moon. 2043

CH<sub>4</sub>

not want was to small

ended early

Moon. 2044

CH<sub>4</sub>

Moon. 2045

CO<sub>2</sub>

for Mars off the moon we think

Moon. 2046

CO<sub>2</sub>

For Mars

Sirius

acma. 2047

913.5 wn

pair 7 is great

acma. 2048

all good!

acma. 2049

LWS angle = 24.315

acma. 2050

pair 16+18 guiding

pair 25 was bad

924 cm<sup>-1</sup>

really good from 29 on

noted what we think of as flexure in the X-dis. parabola

miss  
Labelled H<sub>3</sub><sup>+</sup>  
really Ca H<sub>2</sub>

could be at  
edge of filter



03 Feb 2001

Beta Gem

bgem. 2051

pair 12 quit guiding looks good

bgem. 2052

good

bgem. 2053

very good

bgem. 2054

bgem. 2055

913.5 Wn

bgem. 2056

guiding - pair 12 - pair 15

T = 0.14  
humidity = 28%

bgem. 2057

2hya

ahya. 2058

bit of sky noise (must hand pair 24+25 were low signal

ahya. 2059

have guide star and we're looking

ahya. 2060

924 setting pair 20 bad - 28

ahya. 2061

RLeo

rLeo. 2062

incredible - stopped after

rLeo. 2063

913 setting fun fun fun

~~UMA~~ <sup>U</sup>UMA

muma. 2064

got good ~ pair six

muma. 2065

quick look died halfway through. trusting guide star

guide!) What kind of place is this?

focusing pair 11

really good

pair 6 was bad

pair 15 is stellar!

good now

8 pairs

S/N approaching ∞

Lines everywhere

pair six was kinda crappy



03 Feb 2001

mama.2066 924.5 better pair 8

mama.2067 21 disappeared, found it immediately

mama.2068

Δ Vir

dVir.2069 Tau 0.148 26% humidity cosmic ray hit about 17 reg

dVir.2070 Guiding, Pair 15-20 not very good

dVir.2071 913.5 Wn

dVir.2072

α Boo

α Boo.2073 4 pairs in good

α Boo.2074 924 Wn

over write Mars.2075 scan first one of two bad JUNK  
2nd getting motion didn't locate again

~~Mars.2075 scan 2 North Mars~~  
one more time

Mars.2075 offsets are 4.7E -3.7N

Mars.2076 good sky at end of scan not

Mars.2077

Mars.2078

Mars.2079

960 CO2 setting

Good sky at the end

good at 27 again

pair six good stuff beam last one was junk. bad around pair 22 pair 17 better

got it on pair 25

Really Really is Junk

North 1233

South 1233

South CO2

North CO2



04 Feb 2001

MR, TG, CG

2 Tau

CH<sub>4</sub>

atau. 3001  
atau. 3002  
atau. 3003

Seeing a bit poor, Humidity 43% Found  
Lots of guiding  
Pair 6 is bad  
Get back on at Pair 8.

Jupiter

CH<sub>4</sub>

jup. 3004  
jup. 3005  
jup. 3006  
jup. 3007

Get on at 6 steps as Tommy hypothesized, A little bit of  
Sky variation ~54

Move to Io. Need to offset

jup. 3008

Tommy thinks that we might be 2 steps <sup>too far</sup> off <sub>starting</sub> Jupiter

jup. 3009  
jup. 3010

Now Tommy thinks that we are right on. Background fine but H<sub>2</sub>O lines vary slightly

jup. 3011

Sky noise on 4<sup>th</sup> scan.

jup. 3012

Need to offset

⊙

C<sub>2</sub>H<sub>6</sub>

jup. 3013  
jup. 3014

There's a missing flat (first sky bad due to  
Need to offset

C<sub>2</sub>H<sub>2</sub>

jup. 3015  
jup. 3016

Moved Eckelton focus 1 turn in.

at pair 5, Doing a lot of guiding. Perhaps mostly bad  
this set is good

UT 4:32

jup. 3017

Temperature has been dropping rapidly (1 degree since atau 3001)

~ 1.7E, 1.1N to center on Io. correct drift.

Go to Io. Need to offset 1.3W, 0 to center

Need to offset 1.4W, 1.7S to center on Io

4W 1.2S to center on Io.

memory) (no position file)  
0.4W, 1.8S to center on Io.

Move 1.3E to center on Io



04 Feb 2001

mia

ocet. 3017 896

guiding but high

ocet. 3018 420 913.5

ocet. 3019 924.5

ocet. 3020 815

could of done better

IO. 3021 We can see Io!

Jupiter

CH<sub>4</sub>

- jup. 3022 (atm 23) { 1.6 E, 1.5 N ← need to move to
- jup. 3023
- jup. 3024
- jup. 3025 Go to Io. Move 0.8 N to center on Io
- jup. 3026
- jup. 3027 Go to Io. Centered!
- jup. 3028
- jup. 3029 Go to Io. Move 1.8 E, to center on Io

C<sub>2</sub>H<sub>2</sub>

- jup. 3030
- jup. 3031 Io centered at end of run.

C<sub>2</sub>H<sub>4</sub>

- jup. 3032
- jup. 3033 Go to Io. Need to move 6.1 W, 1.2 S to center on Io

signal to noise  
good around pair 12

not real efficient on n-sum (only 250 S/N per diff)

center on Io

Humidity 40%

$\tau = .041 \approx 1 \text{ mm}$  RH = 12%



04 Feb 2001  
Ia

io.3034 Junk Airman = 1.65! Too short an integration time?  
io.3035 Possible observation ~~at~~ Pair 13  
io.3036 Found on Pair 10  
io.3037 We gave up

moon.

moon.3038 C<sub>2</sub>H<sub>2</sub> R(5)

moon.3039 C<sub>2</sub>H<sub>6</sub> might be non-linear

moon.3040 ~~C<sub>2</sub>H<sub>4</sub>~~

moon.3041 HiLo 896.9 H<sub>2</sub>O setting

moon.3042 913.5

moon.3043 924.5

moon.3044 Mg I 815

α Ori

aori.3045 815 ended but very good

aori.3046 924.5 Xd diagonal is moving

aori.3047 924.5 adjusted Xd screw driver

aori.3048 913.5 setting good

aori.3049 Townes H<sub>2</sub>O good

B gem

bgem.3050 Townes H<sub>2</sub>O ran into shutter - moving shutter stopped

bgem.3051 pair 12 finally got it guiding throughout

Need better springs - at high airmass they aren't holding tight



04 Feb 2001

bgem. 3052 seeing not great and probably on edge of

bgem. 3053 Guiding from pair 20 on.

bgem. 3054 Guiding until pair 10 pair 15 huge cosmic

bgem. 3055 lookin' good.

$\alpha$  Lyn

alyn. 3056 10% humidity  $\tau = .06$  pair 15

alyn. 3057 good given seeing

alyn. 3058 good given seeing

alyn. 3059 as above

$\alpha$  Hya

ahya. 3060 guiding until pair 18

ahya. 3061 looks good

ahya. 3062 good

$\alpha$  Lyn Mg I setting

alyn. 3063 pair 15 good

alyn. 3064 focusing starting at pair 21. much better

alyn. 3065 some guiding until pair 8

alyn. 3066 pair 4 bad.

$\alpha$  Leo H<sub>2</sub>O (Townes)

rleo. 3067 great. ended after 14 pairs

Waveno 0  
mislabeled  
915

(corrected - mjr)

alut. good overall!

~~ray~~ ray

about time.

Z = -4.9 at -3 C



04 Feb 2001

U UMa

$\delta$  UMa  
 muma. 3068 Guiding through pair 15 (some good)  
 muma. 3069 Good  
 muma. 3070 Good

$\delta$  Vir

dvir. 3071 Guiding through pair 15 (most good). Great

$\times$  Boo

aboo. 3072 AH=22%  $\tau = .073$   
Great from the beginning

$\gamma$  Boo

eb00. 3073 xd diagonal mirror moved. H<sub>2</sub>O lines varying

eb00. 3074 guiding + focusing until pair 14. (Some good)

eb00. 3075 H<sub>2</sub>O lines varying throughout.  $\tau = .068$  good

eb00. 3076 guiding and focusing until pair 15 - many good. pair 37-41 bad

eb00. 3077 bad pairs 13, 17, 23

$\delta$  Oph

doph. 3078 AH=12%  
found around pair 10

doph. 3079 some seeing

Guiding and focusing. Many good <sup>mostly last half</sup> (although faint source)  
H<sub>2</sub>O variations pair 30

pairs ~54-58 bad (crossing meridian)



05 Feb 2001

MR, TG, CG

Alpha Tau

atau.4001

pair 4 found it end at 14 pairs

Jup

Jup.4002

obj name (Alpha Tau) wrong came on at frame 8

Jup.4003

obj name still wrong came on at frame 8

Jup.4004

Io 1.1E Humid 17%

Jup.4005

Jup.4006

Io - 1.1W

Jup.4007

Jup.4008

IO - 1W .45 (move telescope to

Jup.4009

frame 240 sky noise with grating 1.3W, 7S

~~Io to check one site~~

Jup.4010

C<sub>2</sub>H<sub>2</sub>

Jup.4011

C<sub>2</sub>H<sub>2</sub>

2.5E 1.2N

correcting

Jup.4012

~~MURMAN~~ C<sub>2</sub>H<sub>6</sub>

Jup.4013

no offset needed for IO

Jup.4014

CH<sub>4</sub>

Jup.4015

1 scan

bang on IO

Jup.4016

CH<sub>4</sub>

Jup.4017

0.35 to IO

all scan data has rates + 3 frames.

wrong positions

~~rates~~

suggestion for Matt  
some obvious signs when integration is over

slight grating shift during 2nd scan.

back to Io at end ~1E ~5N off

Tau 0.59

Io)

tip

see large variation along slit

rates

not as much variation as above



Jup. 4018

Jup. 4019

Jup. 4020 bangor IO

Jup. 4021

Jup. 4022 frame 160 something weird happened

Jup. 4023 C<sub>2</sub>H<sub>2</sub>

Jup. 4024 IO 2.5E .3N

Jup. 4025 C<sub>2</sub>H<sub>6</sub>

Jup. 4026 2.05 14% humidity

H<sub>3</sub><sup>+</sup> guide star

Jup. 4027 873.439 header said 872.5

Jup. 4028

Jup. 4029

Jup. 4030 770.713 pair 5 were on the limb

Jup. 4031 possible

Jup. 4032 926.602 pair 6 good on limb

Jup. 4033

IO 1.6E .6S

IO 1" W



05 Feb 2001

moon

moon lost & think it was orbiting off moon

moon. 4034 H<sub>3</sub> + 926.62  $\tau = .067$

moon. 4035 H<sub>3</sub> + 970.713

moon. 4036 H<sub>3</sub> + 873.439

~~moon. 4037 C<sub>2</sub>H<sub>6</sub>~~

~~moon. 4038~~

moon. 4037 C<sub>2</sub>H<sub>6</sub>

moon. 4038 C<sub>2</sub>H<sub>2</sub>

moon. 4039 C<sub>2</sub>H<sub>4</sub> store model garbage

moon. 4040 II changed focus to -4.8

moon. 4041 1205.25 garbage

$\tau = .084$

moon. 4042 1209.25

moon. 4043 780.75

moon. 4044 804.242

wierd garbage

moon. 4045 804.242

moon. 4046 817

moon. 4047 831

moon had drifted. caught ~~the~~ limb

R Leo

r Leo. 4048 R(43)

r Leo. 4049 R(37) moved it into center of slit

use for SiO(RI) + Jupiter red leak!!!

overlapping echelle orders



05 Feb 2001

slit is 4" long

r Leo cont.

r Leo .4050 ~~center~~ R(31) 3rd pair on

r Leo .4051 r(21)

r Leo .4052 SiO<sub>2</sub> ~~vs~~ p(16)

<sup>slit 4" long</sup> r Leo .4053 SiO p(16) pair 3 bad

rod along slit to get slit length correctly

r Leo .4054 measure length end

r Leo .4055 go to 2.5" rod

IRC +10 216

I10.4056 rod too small ended early

I10.4057 may have memory in off frame

I10.4058 nodwait 8 2 rods

I10.4059  $\tau = 2.1$

I10.4060

.4061 scan IRC 10 216 <sup>or R21</sup> never got off

.4062 only 1 pair slight order overlap. wasn't there

.4063

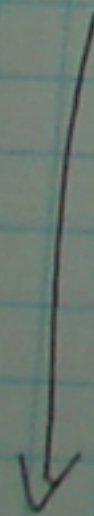
.4064 1.5s nodwait - trash

.4065

.4066

.4067 nod map (R43) xd paraboloid diagonal off a bit  
.4068 stare mode (guiding) no flat

order overlap continues



looks better -

on R LEO



05 Feb 01

CIT 6

- CIT 6 .4069 R43
- .4070 R<sup>37</sup> lost order with H<sub>2</sub>. move echelle & repeat
- .4071
- .4072 R31
- .4073 R21
- .4074 SiO P16 CVF slightly off stopped 2 pairs
- .4075 good
- .4076 CVF slightly off SiO R1

~~w Hyd~~  
~~whya. 4077~~

AX Boo

- RX, 4077 SiO R1 guiding gets good at pair 6. pair 9 bad. Quick look
- .4078 stopped after 11 pairs
- .4079 SiO P16 pairs 9, 10 bad
- .4080 C<sub>2</sub>H<sub>2</sub> R21 guiding up to pair 7
- .4081 R31
- .4082 R37 good
- .4083 R37
- .4084 A43

died halfway through last pairs unknown



05 Feb 2001

W Hya

whye. 4085 R43 guiding entire time

.4086 guiding. star in overlap region most of time. pair 7 bad

.4087 good. star near overlap but clear in difference

.4088 R37 good

.4089 R31 good

.4090 R21 good

.4091 SiO P16 good

.4092 SiO R1 good except for pair 5 + 7

? Boo

eboo. 4093 Mg I (same as R37) found pair 6. Peaking

.4094 focusing + guiding. stopped at pair 12? ?

.4095 found at pair 5 got back 15 only

.4096 found pos at pair 4 bad pairs 7, 17, 24 ended at pair 28

.4097 grating bounce pair 10 - 28 stopped by dust

Too small  
a slit