



AI Conrad &lt;aconrad@lbto.org&gt;

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**Re: TCS commands to interact with SOUL (resend: adding AoOps)**

8 messages

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**AI Conrad** <aconrad@lbto.org>

Fri, Jan 20, 2023 at 11:31 AM

To: "Ricci, Davide" &lt;davide.ricci@inaf.it&gt;

Cc: Jennifer Power &lt;jpower@lbto.org&gt;, Matthieu Bec &lt;mbec@lbto.org&gt;, Maria Bergomi &lt;maria.bergomi@inaf.it&gt;, Alfio Puglisi &lt;alfio.puglisi@inaf.it&gt;, Brandon Mechtley &lt;bmechtley@lbto.org&gt;, Glenn Eychaner &lt;geychaner@lbto.org&gt;, Guido Brusa &lt;gbrusa@lbto.org&gt;, "Laudisio, Fulvio" &lt;fulvio.laudisio@inaf.it&gt;, Luca Marafatto &lt;luca.marafatto@inaf.it&gt;, Paul Grenz &lt;pgrenz@lbto.org&gt;, Jacopo Farinato &lt;jacopo.farinato@inaf.it&gt;, Xianyu Zhang &lt;xzhang@lbto.org&gt;, John Hill &lt;jhill@lbto.org&gt;, Alessandro Lorenzetto &lt;alessandro.lorenzetto@inaf.it&gt;, AO Operations &lt;aoops@lbto.org&gt;

Hi Maria, Davide, All -

We have been discussing this internally today at the AO software meeting. (Please others that attended that meeting correct any of what follows if you spot inaccuracies).

It's come to light that the offsetZ command has not yet been implemented. The existing command is just a placeholder. There are also some questions about how such a command could be implemented in such a way that offloads to the hexapod occur sufficiently often to avoid excess piston on the AdSec. And there are some other open questions. In short, providing the capability you are asking for (offsets in XYZ in closed loop) would require a small project on the LBT side. So that we can best assess the magnitude and priority of this project, can you please provide a short document stating the requirements and priority.

Thanks very much,

AI

On Fri, Jan 20, 2023 at 12:30 PM AI Conrad &lt;aconrad@lbto.org&gt; wrote:

Hi Maria, Davide, All -

We have been discussing this internally today at the AO software meeting. (Please others that attended that meeting correct any of what follows if you spot inaccuracies).

It's come to light that the offsetZ command has not yet been implemented. The existing command is just a placeholder. There are also some questions about how such a command could be implemented in such a way that offloads to the hexapod occur sufficiently often to avoid excess piston on the AdSec. And there are some other open questions. In short, providing the capability you are asking for (offsets in XYZ in closed loop) would require a small project on the LBT side. So that we can best assess the magnitude and priority of this project, can you please provide a short document stating the requirements and priority.

Thanks very much,

AI

On Thu, Jan 19, 2023 at 9:51 AM Ricci, Davide &lt;davide.ricci@inaf.it&gt; wrote:

Hello Jennifer,

the idea is to move SOUL in XY so that the adaptive secondary compensates for the position, resulting in the shift of the PSF on our scientific camera, so that we can place it as close as possible to its rotation center.

Cheers,  
Davide

Il giorno gio 19 gen 2023 alle ore 17:44 Jennifer Power <[jpower@lbto.org](mailto:jpower@lbto.org)> ha scritto:

Hi Davide,

I think for X Y offsets, the preferred method would be to use telescope offsets rather than bayside offsets. These do pause and resume the AO loop. Can you explain why you are opting for bayside offsets?

Jenny

On Thu, Jan 19, 2023, 9:36 AM Ricci, Davide <[davide.ricci@inaf.it](mailto:davide.ricci@inaf.it)> wrote:

Hello Alfio,

would you be online next days for a call concerning the SOUL XY movement via TCS\_IIF →AOS commands?

Ciao,

Davide

Il giorno gio 19 gen 2023 alle ore 15:44 Matthieu Bec <[mbec@lbto.org](mailto:mbec@lbto.org)> ha scritto:

Hello Maria,

Request received. We will discuss it tomorrow during our AO/SW meeting.

Thanks,  
Matthieu

> On Jan 19, 2023, at 4:40 AM, Maria Bergomi <[maria.bergomi@inaf.it](mailto:maria.bergomi@inaf.it)> wrote:

>

> Hi Matthieu and all,

> I am getting back to this email to try to summarize current status:

> - we are working to gather all the missing information to implement a procedure to be able to offset SOUL in X-Y to the position requested by SHARK-NIR in an automatic way. When we will be ready, we could ask for a few hours of day-time with AO support (ARGOS-SOUL) to test it, if you agree (hopefully before SHARK-NIR Com-2 run, which is starting on March 6th).

> - we would like to officially put in an official request for the OffsetZ to be implemented at LBTO SW level. I report here what Davide stated to explain you why we need this:

> Our NCPA evaluation procedure using the Phase Diversity technique foresees in-focus (62mm) and defocused (59mm) images.

> Currently, we must pause the template script, ask the AO operator to give the offset, and resume.

> Bringing this to automatic would be a pretty good improvement. Moreover, the control of OffsetZ would also allow the possibility to include a "through-focus by SOUL" template to SHARK-NIR.

>

> We can discuss by email if more details are needed or directly at the videocon on Jan 26th.

>

> Thanks a lot in advance!

> Maria

>

>

> Il 10/01/2023 23:17, Ricci, Davide ha scritto:

>> Hello Alfio and Xianyu,

>>

>> thank you for this useful information.

>>

>> Curiously, I spotted the bug you mentioned just yesterday! In fact, during one of the offset tests, the log error said:

>>

>> OffsetXY{FLAO}[2177] - [Exception] 'Status' object has no attribute 'status'

>>

>> Now the meaning of this error is clear to me :-)

>>

>> I'll try to recover the information about the LUCI and LBTI procedure to perform automatic OffsetXY, so that we could raw-center the PSF without asking the AO operator to manually do it.

>>

>> I take advantage from this mail thread to clarify the need of OffsetZ:

>> Our NCPA evaluation procedure using the Phase Diversity technique foresees in-focus (62mm) and defocused (59mm) images.

>> Currently, we must pause the template script, ask the AO operator to give the offset, and resume.

>> Bringing this to automatic would be a pretty good improvement. Moreover, the control of OffsetZ would also allow the possibility to include a "through-focus by SOUL" template to SHARK-NIR.

>> Cheers,

>> Davide

>>

>>

>>

>>

>>

>> Il giorno mar 10 gen 2023 alle ore 15:04 Xianyu Zhang <xzhang@lbto.org> ha scritto:

>> Ciao Alfio, ciao all,

>>

>> Thanks for mentioning the exception. I had noticed it but did not pay much attention, since I focused on the fixed movement.

>>

>> I looked at the code, I found a bug in the code:

>> line 1389 in aoarbitrator.py, i.e., "if wfsres.status != AODefs.Status.OK:", since the wfsres is AODefs.Status; it should be changed to "if wfsres != AODefs.Status.OK:".

>>

>> I do not know if we never did the OffsetXY during close loop in the past. BTW, the mentioned bug does not apply to the OffsetXY during open loop. Thank you.

>>

>> Cheers,

>> Xianyu

>>

>> On Tue, Jan 10, 2023 at 6:09 AM Alfio Puglisi <alfio.puglisi@inaf.it> wrote:

>> Hi all,

>> from what I see, SHARK is using a different IIF command to execute offsets wrt. LUCI or LBTI: with these instruments, an offset in closed loop always results in a pause+offset+resume sequence, coordinated by TCS, while the SHARK command is forwarded directly to the AO system. There, the offset size in closed loop is limited to 0.3 mm, in order to avoid large tilts on the secondary. The AO code is then supposed to iterate this movement until the whole offset is executed, but there is a bug that is throwing an exception and the movement stops there:

>>

```
>> python_70710 |INF| 643|2023-01-07 08:16:02.650736| MAIN > Request: OffsetXY((2.0, 0.0))
```

```
>> python_70710 |INF| 644|2023-01-07 08:16:03.653156| MAIN > Moving by 0.3 0.0, remaining offset 1.7 0.0
```

```
>> python_70710 |DEB| 645|2023-01-07 08:16:05.463316| MAIN > Status after command: AOArbitrator.LoopClosed
```

```
>> python_70710 |ERR| 646|2023-01-07 08:16:05.463351| MAIN > [Exception] 'Status' object has no attribute 'status'
```

>>

>> I'd recommend the sequence that LUCI and LBTI already use, since it is well tested and also faster, since the offset is executed in open loop and there is no size limitation. But I do not know the specific IIF command that they are using.

>>

>> Regarding OffsetZ, as Xianyu says unfortunately it is not really implemented on the AO side (it was never used). Instead, other instruments use the WFS setup file to set a fixed focus position. I see that SHARK already has a setup file setting the focus position at 62.0 mm.

>>

>> Alfio

>>

>>

>>

>>

>>

>> On Tue, Jan 10, 2023 at 4:20 AM Xianyu Zhang <xzhang@lbto.org> wrote:

>> Hello Davide,

>> Please see my reply below,

>> On 1/9/23 7:39 PM, Ricci, Davide wrote:

>>> Hi All,

>>>

>>> thank you for all the information provided.

>>>

>>> 1) OK, then I'll try to test again and I'll check the position with

>> OK, please let us know how it goes.

>>>

>>> In [91]: os.getDdParameters(["L\_AORefX"])

>>> Out[91]: (0L, ['GetParameter result status: OK', '-2.169956642808472e-01'])

>>>

>>> In [92]: os.getDdParameters(["L\_AORefY"])

>>> Out[92]: (0L, ['GetParameter result status: OK', '-3.035632846688625e-01'])

>>>

>>> 2) Ok, for this reason I have no access to this Dd keyword?

>> yes, you do not have access to the AORefZ, since there is no AORefZ in the TCS DD. If it is needed, we can add it easily, but we need to rebuilt the TCS to use this variable name.

>>>

>>> In [93]: os.getDdParameters(["L\_AORefZ"])

>>> Out[93]: (1L, ['GetParameter result status: Error', 'Not found: L\_AORefZ'])

>>>

>>> Then I have no way to send Pause, OffsetZ, and Resume commands, the same way I do with OffsetXY?

>> yes, you cannot use offsetZ with current SW.

>> To implement the OffsetZ command is not hard, but it is not easy to make the stage move optically correctly, since the focal plane is not flat.

>>

>> Alfio and others, please feel free to add more info and/or make correction.

>> Cheers,

>> Xianyu

>>>

>>> Cheers,

>>> Davide

>>>

>>>

>>>

>>> Il giorno lun 9 gen 2023 alle ore 18:05 Xianyu Zhang <xzhang@lbto.org> ha scritto:

>>> Hello Jenni, hello Davide,

>>> Thanks for the time stamp.

>>> 1) for offsetXY, you cannot move more than a limit number, which is SplitOffsetXY defined in /home/aoeng/live/aoroot/conf/adsec/current/processConf/AOARB.conf (currently is 0.3). If above the limit, you move the limit number.

>>> 2) for offsetZ, it is not implemented on the AO SW side.

>>> Please let me know if you have more questions.

>>> Cheers,

>>> Xianyu

>>> On 1/9/23 6:00 PM, Xianyu Zhang wrote:

>>>> Hello Jenni, hello Davide,

>>>> Thanks for the time stamp.

>>>> 1) for offsetXY, you cannot move more than a limit number, which is SplitOffsetXY defined in /home/aoeng/live/aoroot/conf/adsec/current/processConf/AOARB.conf (currently is 0.3). If above the limit, you move the limit number.

>>>> 2) for offsetXY, it is not implemented on the AO SW side.

```

>>>> Please let me know if you have more questions.
>>>> Cheers,
>>>> Xianyu
>>>> On 1/9/23 3:43 PM, Jennifer Power wrote:
>>>>> Hi Xianyu,
>>>>>
>>>>> From my log:
>>>>> 9:27 Sending X Y Z offsets
>>>>> There is some weirdness with X and Y offsets. They appear in the AOS Commands GUI as sent,
but regardless of size int eh AOS Commands:
>>>>> 1000mm moved 0.301 in Y and 1000mm in AOS moved 0.299 in X
>>>>> 22mm moved 0.301 in Y and 11mm in AOS moved 0.299 in X
>>>>> 100mm moved 0.301 in Y and 100mm in AOS moved 0.299 in X
>>>>> From baysidex log:
>>>>> CopleyCtrl_2527 |INF| 91|2023-01-07 09:48:56.250946| MAIN > Stage pos (mm):
66.400, current (A): 0.620
>>>>> CopleyCtrl_2527 |INF| 92|2023-01-07 09:52:21.702513| MAIN > Moving to: 66.698
mm
>>>>> CopleyCtrl_2527 |INF| 93|2023-01-07 09:52:22.091191| MAIN > Stage pos (mm):
66.400, current (A): 0.570
>>>>> CopleyCtrl_2527 |INF| 94|2023-01-07 09:52:22.325543| MAIN > Stage pos (mm):
66.677, current (A): 0.690
>>>>> CopleyCtrl_2527 |INF| 95|2023-01-07 09:52:22.540376| MAIN > Stage pos (mm):
66.689, current (A): 0.680
>>>>> CopleyCtrl_2527 |INF| 96|2023-01-07 09:52:22.735691| MAIN > Stage pos (mm):
66.693, current (A): 0.710
>>>>> CopleyCtrl_2527 |INF| 97|2023-01-07 09:52:22.931036| MAIN > Stage pos (mm):
66.696, current (A): 0.690
>>>>> CopleyCtrl_2527 |INF| 98|2023-01-07 09:54:39.153962| MAIN > Moving to: 66.998
mm
>>>>> CopleyCtrl_2527 |INF| 99|2023-01-07 09:54:39.767269| MAIN > Stage pos (mm):
66.698, current (A): -0.600
>>>>> CopleyCtrl_2527 |INF| 100|2023-01-07 09:54:39.991865| MAIN > Stage pos (mm):
66.970, current (A): 0.770
>>>>> CopleyCtrl_2527 |INF| 101|2023-01-07 09:54:40.196917| MAIN > Stage pos (mm):
66.988, current (A): 0.780
>>>>> CopleyCtrl_2527 |INF| 102|2023-01-07 09:54:40.392243| MAIN > Stage pos (mm):
66.993, current (A): 0.780
>>>>> CopleyCtrl_2527 |INF| 103|2023-01-07 09:54:40.587584| MAIN > Stage pos (mm):
66.996, current (A): 0.780
>>>>>
>>>>>
>>>>>
>>>>> CopleyCtrl_2527 |INF| 218|2023-01-07 10:02:27.483018| MAIN > Stage pos (mm):
66.498, current (A): 0.720
>>>>> CopleyCtrl_2527 |INF| 219|2023-01-07 10:04:51.655181| MAIN > Moving to: 67.297
mm
>>>>> CopleyCtrl_2527 |INF| 220|2023-01-07 10:04:52.063423| MAIN > Stage pos (mm):
66.500, current (A): 0.720
>>>>> CopleyCtrl_2527 |INF| 221|2023-01-07 10:04:52.287990| MAIN > Stage pos (mm):
66.848, current (A): 0.700
>>>>> CopleyCtrl_2527 |INF| 222|2023-01-07 10:04:52.522422| MAIN > Stage pos (mm):
67.267, current (A): 0.800
>>>>> CopleyCtrl_2527 |INF| 223|2023-01-07 10:04:52.737211| MAIN > Stage pos (mm):
67.286, current (A): 0.800
>>>>>
>>>>> From baysidey log:
>>>>> CopleyCtrl_2541 |INF| 114|2023-01-07 09:48:58.204052| MAIN > Stage pos (mm):
20.536, current (A): 1.840
>>>>> CopleyCtrl_2541 |INF| 115|2023-01-07 09:52:23.009147| MAIN > Moving to: 20.842

```

```

mm
>>>> CopleyCtrl_2541 |INF| 116|2023-01-07 09:52:24.024784| MAIN > Stage pos (mm):
20.834, current (A): 1.940
>>>> CopleyCtrl_2541 |INF| 117|2023-01-07 10:04:53.256742| MAIN > Moving to: 21.145
mm
>>>> CopleyCtrl_2541 |INF| 118|2023-01-07 10:04:53.430595| MAIN > Stage pos (mm):
20.843, current (A): 1.030
>>>> CopleyCtrl_2541 |INF| 119|2023-01-07 10:04:53.664962| MAIN > Stage pos (mm):
20.843, current (A): 1.780
>>>> CopleyCtrl_2541 |INF| 120|2023-01-07 10:04:53.899339| MAIN > Stage pos (mm):
21.117, current (A): 1.850
>>>> CopleyCtrl_2541 |INF| 121|2023-01-07 10:04:54.104396| MAIN > Stage pos (mm):
21.134, current (A): 1.850
>>>> CopleyCtrl_2541 |INF| 122|2023-01-07 10:04:54.301876| MAIN > Stage pos (mm):
21.140, current (A): 1.870
>>>> CopleyCtrl_2541 |INF| 123|2023-01-07 10:04:54.495036| MAIN > Stage pos (mm):
21.142, current (A): 1.880
>>>> CopleyCtrl_2541 |INF| 124|2023-01-07 10:05:52.532270| MAIN > Moving to: 21.446
mm
>>>> CopleyCtrl_2541 |INF| 125|2023-01-07 10:05:53.831109| MAIN > Stage pos (mm):
21.442, current (A): 1.850
>>>> CopleyCtrl_2541 |INF| 126|2023-01-07 10:07:30.845083| MAIN > Moving to: 21.747
mm
>>>> CopleyCtrl_2541 |INF| 127|2023-01-07 10:07:31.290310| MAIN > Stage pos (mm):
21.446, current (A): 0.400
>>>> CopleyCtrl_2541 |INF| 128|2023-01-07 10:07:31.516824| MAIN > Stage pos (mm):
21.686, current (A): 1.940
>>>> CopleyCtrl_2541 |INF| 129|2023-01-07 10:07:31.751236| MAIN > Stage pos (mm):
21.727, current (A): 1.900
>>>> CopleyCtrl_2541 |INF| 130|2023-01-07 10:07:31.956329| MAIN > Stage pos (mm):
21.739, current (A): 1.900
>>>> CopleyCtrl_2541 |INF| 131|2023-01-07 10:07:32.151611| MAIN > Stage pos (mm):
21.753, current (A): 1.820
>>>> CopleyCtrl_2541 |INF| 132|2023-01-07 10:09:27.954608| MAIN > Moving to: 22.048
mm
>>>> CopleyCtrl_2541 |INF| 133|2023-01-07 10:09:28.304165| MAIN > Stage pos (mm):
21.747, current (A): 1.150
>>>> CopleyCtrl_2541 |INF| 134|2023-01-07 10:09:28.538539| MAIN > Stage pos (mm):
21.935, current (A): 1.900
>>>> In Z - Commands will fail to send unless loop is paused. Z Offset will appear to update with
requested offset, but WFS log shows no received offset and no offset appears to be attempted as seen on
the HWGUI.
>>>>
>>>>
>>>> On Mon, Jan 9, 2023 at 11:59 AM Xianyu Zhang <xzhang@lbt.org> wrote:
>>>> Hello Davide,
>>>> I checked the log files on tcs and lbt-sxwfs, but did not find any commands related to offsetXYZ
between 4:00 and 5:00UT of January 6th 2023.
>>>> Is it possible you gave the wrong time and date?
>>>> Cheers,
>>>> Xianyu
>>>> On 1/8/23 7:30 PM, Xianyu Zhang wrote:
>>>>> Hello Davide,
>>>>>
>>>>> OK, thanks for the info, I will try to have a look tomorrow.
>>>>>
>>>>> Cheers,
>>>>> Xianyu
>>>>> On 1/8/23 7:27 PM, Ricci, Davide wrote:
>>>>>> Hello Xianyu,

```

>>>>>>  
>>>>>> these tests were performed with closed dome between 4:00 and 5:00UT of January 6th 2023.  
>>>>>>  
>>>>>> Cheers,  
>>>>>> Davide  
>>>>>>  
>>>>>>  
>>>>>>  
>>>>>>  
>>>>>> Il giorno dom 8 gen 2023 alle ore 19:20 Xianyu Zhang <xzhang@lbto.org> ha scritto:  
>>>>>> Hello Matthieu, hello all,  
>>>>>>  
>>>>>> I can be available any time in the morning.  
>>>>>>  
>>>>>> hello Davide,  
>>>>>> 1)the offsetXY should work, could you please give a timestamp when you  
>>>>>> had the issue?  
>>>>>> 2)I do not think the offsetZ is implemented.  
>>>>>>  
>>>>>> Cheers,  
>>>>>> Xianyu  
>>>>>> On 1/8/23 6:24 PM, Matthieu Bec wrote:  
>>>>>>  
>>>>>> > Hello Davide,  
>>>>>> >  
>>>>>> > I'm copying Xianyu and Brandon who may have better insights on the AOS/AO-supervisor  
aspects. But Alfio may know some about it also.  
>>>>>> > Hopefully this is something they can answer and/or decide we arrange to meet.  
>>>>>> >  
>>>>>> > If we need to meet with Italy, my morning schedule is a bit busy Mon/Tue/Wed but can make it  
Thu or Fri anytime from 8 or 9am.  
>>>>>> >  
>>>>>> > Xianyu, Brandon, Alfio - please let us know what you think?  
>>>>>> >  
>>>>>> > Thanks,  
>>>>>> > Matthieu  
>>>>>> >  
>>>>>> >  
>>>>>> >  
>>>>>> >  
>>>>>> >  
>>>>>> >  
>>>>>> >  
>>>>>> >  
>>>>>> >> On Jan 8, 2023, at 6:09 PM, Ricci, Davide <davide.ricci@inaf.it> wrote:  
>>>>>> >>  
>>>>>> >> Hello Matthieu,  
>>>>>> >>  
>>>>>> >> Can we set up a telecon to talk about SOUL interaction via TCS/AOS? We made some tests  
with the kind help of Jennifer and David, and the summary is the following:  
>>>>>> >>  
>>>>>> >> • Offset X and Y:  
>>>>>> >> • We send OffsetXYAO(50.0, 60.0, "left")  
>>>>>> >> • Whatever the range we send, AOS receives that range, but SOUL always moves  
0.301 in Y and 0.299 in X.  
>>>>>> >> • If we ask DD "L\_AOOffsetX" or "L\_AOOffsetY", we obtain the 50 and 60 values.  
>>>>>> >> • Offset Z:  
>>>>>> >> • We send OffsetZAO(50.0, "left")  
>>>>>> >> • We obtain OffsetZ{FLAO}[1847] - Illegal command for state AOArbitrator.LoopClosed  
>>>>>> >> • If we ask DD "L\_AOOffsetZ" , we obtain the 50 value.

>>>>>> >> • AOS has a security system that does not allow one to send commands while in closed loop. We'll have to also control loop pause, send, and resume?

>>>>>> >>

>>>>>> >>

>>>>>> >> Cheers,

>>>>>> >> Davide

>>>>>> >>

>>>>>> >>

>>>>>> >> Il giorno gio 15 dic 2022 alle ore 08:47 Matthieu Bec <[mbec@lbto.org](mailto:mbec@lbto.org)> ha scritto:

>>>>>> >> Hello Fulvio,

>>>>>> >>

>>>>>> >> Good point, the IIF only exposes entries listed in DD.

>>>>>> >> For refmem elements, you need to interface with DDSServer.ice.

>>>>>> >> I'm not sure we offer that to instruments, I think it was designed this way to narrow our "public" interface.

>>>>>> >>

>>>>>> >> Can you explain if you really need it? I think we add it to the translation table.

>>>>>> >>

>>>>>> >> Thanks,

>>>>>> >> Matthieu

>>>>>> >>

>>>>>> >>

>>>>>> >>> On Dec 15, 2022, at 2:47 AM, Laudisio, Fulvio <[fulvio.laudisio@inaf.it](mailto:fulvio.laudisio@inaf.it)> wrote:

>>>>>> >>>

>>>>>> >>> Hello Matthieu,

>>>>>> >>>

>>>>>> >>> How do we read the two elements:

>>>>>> >>> oss.side[0|1].swa.sa\_switch\_deployed[3]

>>>>>> >>> oss.side[0|1].swa.sa\_switch\_retracted[3]

>>>>>> >>>

>>>>>> >>> Thanks,

>>>>>> >>>

>>>>>> >>> Fulvio

>>>>>> >>>

>>>>>> >>> Il giorno mer 14 dic 2022 alle ore 19:39 Matthieu Bec <[mbec@lbto.org](mailto:mbec@lbto.org)> ha scritto:

>>>>>> >>> Hello Davide,

>>>>>> >>>

>>>>>> >>> status of the dome shutter can queried from DD here:

>>>>>> >>>

>>>>>> >>> L\_ShutterOpen

>>>>>> >>> R\_ShutterOpen

>>>>>> >>>

>>>>>> >>> the argos swing arm (id=3) should be here (cc. Paul if I got it wrong):

>>>>>> >>>

>>>>>> >>> oss.side[0|1].swa.sa\_switch\_deployed[3]

>>>>>> >>> oss.side[0|1].swa.sa\_switch\_retracted[3]

>>>>>> >>>

>>>>>> >>> Thanks,

>>>>>> >>> Matthieu

>>>>>> >>>

>>>>>> >>>

>>>>>> >>>

>>>>>> >>>> On Dec 14, 2022, at 2:53 AM, Ricci, Davide <[davide.ricci@inaf.it](mailto:davide.ricci@inaf.it)> wrote:

>>>>>> >>>>

>>>>>> >>>> Hello Matthieu,

>>>>>> >>>>

>>>>>> >>>> thanks for the document.

>>>>>> >>>> I take advantage to ask you where is it possible to get additional information such as:

>>>>>> >>>> - argos swing arm position

>>>>>> >>>> - status of the dome (open/close)



>>>>>> >>>>  
>>>>>> >>>> Cheers,  
>>>>>> >>>> Davide  
>>>>>> >>>>  
>>>>>> >>>>  
>>>>>> >>>>  
>>>>>> >>>> Il giorno mer 7 dic 2022 alle ore 19:21 Matthieu Bec <[mbec@lbto.org](mailto:mbec@lbto.org)> ha scritto:  
>>>>>> >>>> Hello Davide,  
>>>>>> >>>>  
>>>>>> >>>> All the commands we have are exposed thru the IIF.  
>>>>>> >>>> The one you might be looking at "OffsetZAO - This command is used to move the AO  
stage in the Z direction"  
>>>>>> >>>>  
>>>>>> >>>> The ICE / IIF document says there are more details in "L. Fini, A. Puglisi, L. Busoni, "AOS  
The Complete Guide", LBT document CAN 481f341 (July, 2009)"  
>>>>>> >>>>  
>>>>>> >>>> Thanks,  
>>>>>> >>>> Matthieu  
>>>>>> >>>>  
>>>>>> >>>> On Dec 7, 2022, at 9:37 AM, Ricci, Davide <[davide.ricci@inaf.it](mailto:davide.ricci@inaf.it)> wrote:  
>>>>>> >>>>>>  
>>>>>> >>>>>> Dear Matthieu and Glenn,  
>>>>>> >>>>>>  
>>>>>> >>>>>> as my understanding, SOUL is now integrated in the TCS, i.e. it is possible to send to the  
TCS specific commands (via IIF?) to interact with SOUL. Is this correct?  
>>>>>> >>>>>>  
>>>>>> >>>>>> Is SHARK allowed to send to the TCS a command which moves SOUL along the Z axis?  
>>>>>> >>>>>> Is this also implemented in the TCS simulator?  
>>>>>> >>>>>>  
>>>>>> >>>>>> Cheers,  
>>>>>> >>>>>> Davide  
>>>>>> >>>>>>  
>>>>>> >>>>>>  
>>>>>> >>>>>>  
>>>>>>  
>>>>>>  
>>>>>> --  
>>>>>> Jenny Power  
>>>>>>  
>>>>>> Tel: (520) 429-0021  
>>>>>> Skype: "jennifer.power10"  
>>>>>>  
>>>>>> Large Binocular Telescope Observatory  
>>>>>> University of Arizona  
>>>>>> 933 N. Cherry Ave. Room 559  
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**John Hill** <jhill@lbto.org>

Fri, Jan 20, 2023 at 4:20 PM

To: Al Conrad &lt;aconrad@lbto.org&gt;

Cc: "Ricci, Davide" &lt;davide.ricci@inaf.it&gt;, Jennifer Power &lt;jpower@lbto.org&gt;, Matthieu Bec &lt;mbec@lbto.org&gt;, Maria Bergomi &lt;maria.bergomi@inaf.it&gt;, Alfio Puglisi &lt;alfio.puglisi@inaf.it&gt;, Brandon Mechtley &lt;bmechtley@lbto.org&gt;, Glenn Eychaner &lt;geychaner@lbto.org&gt;, Guido Brusa &lt;gbrusa@lbto.org&gt;, "Laudisio, Fulvio" &lt;fulvio.laudisio@inaf.it&gt;, Luca Marafatto &lt;luca.marafatto@inaf.it&gt;, Paul Grenz &lt;pgrenz@lbto.org&gt;, Jacopo Farinato &lt;jacopo.farinato@inaf.it&gt;, Xianyu Zhang &lt;xzhang@lbto.org&gt;, John Hill &lt;jhill@lbto.org&gt;, Alessandro Lorenzetto &lt;alessandro.lorenzetto@inaf.it&gt;, AO Operations &lt;aoops@lbto.org&gt;, jhill@as.arizona.edu

When the AO loop is closed, the excess shape on the thin shell is offloaded to other optics about every 8 seconds. The TTF offload moves Tip,Tilt,Focus to the M2 hexapod. The HO offload moves low order Zernike shapes onto the Primary when AO is on-sky.

John

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**Maria Bergomi** <maria.bergomi@inaf.it>

Sat, Jan 21, 2023 at 1:23 AM

To: John Hill &lt;jhill@lbto.org&gt;, Al Conrad &lt;aconrad@lbto.org&gt;

Cc: "Ricci, Davide" &lt;davide.ricci@inaf.it&gt;, Jennifer Power &lt;jpower@lbto.org&gt;, Matthieu Bec &lt;mbec@lbto.org&gt;, Alfio Puglisi &lt;alfio.puglisi@inaf.it&gt;, Brandon Mechtley &lt;bmechtley@lbto.org&gt;, Glenn Eychaner &lt;geychaner@lbto.org&gt;, Guido Brusa &lt;gbrusa@lbto.org&gt;, "Laudisio, Fulvio" &lt;fulvio.laudisio@inaf.it&gt;, Luca Marafatto &lt;luca.marafatto@inaf.it&gt;, Paul Grenz &lt;pgrenz@lbto.org&gt;, Jacopo Farinato &lt;jacopo.farinato@inaf.it&gt;, Xianyu Zhang &lt;xzhang@lbto.org&gt;, Alessandro Lorenzetto &lt;alessandro.lorenzetto@inaf.it&gt;, AO Operations &lt;aoops@lbto.org&gt;, jhill@as.arizona.edu

Hi Al, John, Jenny and all,

perhaps a discussion at next videocon (Thu 26th) is easier to understand our needs, expanding what written by Davide. I'll just leave here some notes, as maybe what we want should not exactly be called OffsetZ, if that has other implications. In both Z offsets cases, given we deliberately want to introduce defocus on our images, I would not expect the hexapod Z position to move (but maybe I am not considering some aspects).

The AO team during last night run Com-1 and day-time run Pre-Com-3 experienced our needs, so might add details. Essentially, every time we need to take Phase Diversity NCPA data, we need to ask the operator to Pause the loop, move the Z position of SOUL from 62 mm (SHARK-NIR baseline) to 59 mm, we take some images and then we ask again the operator to move back to the 62 mm position.

Other than that, we would need to do a "through-focus", meaning to Pause the loop and then move Z stage to 56 mm, take images, 57 mm, take images, and so on up to 68 mm (numbers could differ from those), in order to identify the best focus position.

Both procedure would have benefits in automatizing the work, on one side to reduce needs of AO operators and on the other side to optimize the timings of the operations.

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Concerning the X-Y adjustments, our goal is to place the PSF on the SHARK-NIR instrument "hot pixel", but at the same time we need the location of the image in LMIRCAM to be in a good location for LMIRCAM use and the SOUL AO correction as accurate as possible, thus, in that case I would believe offsets to the telescopes are included.

In the past 2 runs we have done this operation manually, asking the operator to move the SOUL x-y bayside stages in Paused loop configuration until we were satisfied with the reached position. This could be run automatically and faster using some pre-computed IM matrices to just drive the stages to the target location, with the only constraint to do the adjustments in small steps (not larger than 0.3 mm if I recall well), because of SOUL/telescope needs.

Maybe there are different strategies to obtain the same result and we could discuss them!

Thanks and cheers,

Maria

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**Jacopo Farinato** <jacopo.farinato@inaf.it>

Sat, Jan 21, 2023 at 8:28 AM

Reply-To: jacopo.farinato@inaf.it

To: Al Conrad <aconrad@lbto.org>, "Ricci, Davide" <davide.ricci@inaf.it>

Cc: Jennifer Power <jpower@lbto.org>, Matthieu Bec <mbec@lbto.org>, Maria Bergomi <maria.bergomi@inaf.it>, Alfio Puglisi <alfio.puglisi@inaf.it>, Brandon Mechtley <bmechtley@lbto.org>, Glenn Eychaner <geychaner@lbto.org>, Guido Brusa <gbrusa@lbto.org>, "Laudisio, Fulvio" <fulvio.laudisio@inaf.it>, Luca Marafatto <luca.marafatto@inaf.it>, Paul Grenz <pgrenz@lbto.org>, Xianyu Zhang <xzhang@lbto.org>, John Hill <jhill@lbto.org>, Alessandro Lorenzetto <alessandro.lorenzetto@inaf.it>, AO Operations <aoops@lbto.org>, jacopo.farinato@inaf.it

Ciao Al, I did not quite understand which document we should provide, we are just asking to focus the camera in close loop (that translates in offset in Z to SOUL), since we don't have an internal way to focus, and to give XY offset to SOUL, to position the target as close as possible to the to the SHARK-NIR rotation center. How does it work for the other instruments using AO, such as LMIRCam for example? How do they focus? Are we the only one who are doing focus sweep in Z using the ASM (driven by the SOUL WFS) to optimize it?

Additionally, for the NCPA characterization, we need to apply a defocus using the ASM to acquire defocused images to be used by the Phase Diversity algorithm.

Let me remind you that, between the various requirements to the telescope (specified in the document "SHARK NIR Requirements to the LBT" No. SHARK-INAFP-REQ-001), these are a couple of requirements related to this issue:

**IF-SW-02:** IIF/TCS shall allow SHINS to set an offset shape to the ASM, in closed-loop, specified via a TBD number of Zernike coefficients, for NCPA compensation (see SHARKNIR-TEC-01 AD8). This functionality will be used both **night-time** and **day-time**, depending on stability of NCPA (see SHARKNIR-TEC-01 in AD8), which will be assessed during commissioning. The rate of ASM offsets sent from SHINS is TBD, as well as the list of errors to be propagated from the AOS to SHINS through the IIF.

and, of course, defocus is the simplest offset that we need to apply.

**IF-SW-04:** AOS shall allow SHINS to offset the LBTI-WFS position (using X-Y-Z stages), so to align it to SHARK-NIR optical path. This will be needed during **commissioning**. TBD if the same interface will be used in **day/night-time** to adjust for changes.

and, concerning the TBD, it is now clear that the telescope pointing needs to be refined every time.

I also would like to emphasize that we don't have any rush, since the way we are operating the defocus and XY shifts right now is for sure working (AO operator doing that manually), but of course it is not optimal neither (and above all) for the AO operator, which is asked to do such a repetitive operations several times per night, nor for the time to execute it.

Thus, but if I misunderstood something, I really do not see which additional document/information we should provide, other than what I just mentioned.

If instead there is something I did not get properly, we can probably discuss this issue next week in the post-run Videocon.

Thanks a lot and ciao!

Jacopo

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**Da:** Al Conrad [mailto:[aconrad@lbto.org](mailto:aconrad@lbto.org)]

**Inviato:** venerdì 20 gennaio 2023 20:32

**A:** Ricci, Davide

**Cc:** Jennifer Power; Matthieu Bec; Maria Bergomi; Alfio Puglisi; Brandon Mechtley; Glenn Eychaner; Guido Brusa; Laudisio, Fulvio; Luca Marafatto; Paul Grenz; Jacopo Farinato; Xianyu Zhang; John Hill; Alessandro Lorenzetto; AO Operations

**Oggetto:** Re: TCS commands to interact with SOUL (resend: adding AoOps)

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**Al Conrad** <[aconrad@lbto.org](mailto:aconrad@lbto.org)>

Sun, Jan 22, 2023 at 1:17 PM

To: Jacopo Farinato <[jacopo.farinato@inaf.it](mailto:jacopo.farinato@inaf.it)>

Cc: "Ricci, Davide" <[davide.ricci@inaf.it](mailto:davide.ricci@inaf.it)>, Jennifer Power <[jpower@lbto.org](mailto:jpower@lbto.org)>, Matthieu Bec <[mbec@lbto.org](mailto:mbec@lbto.org)>, Maria Bergomi <[maria.bergomi@inaf.it](mailto:maria.bergomi@inaf.it)>, Alfio Puglisi <[alfio.puglisi@inaf.it](mailto:alfio.puglisi@inaf.it)>, Brandon Mechtley <[bmechtley@lbto.org](mailto:bmechtley@lbto.org)>, Glenn Eychaner <[geychaner@lbto.org](mailto:geychaner@lbto.org)>, Guido Brusa <[gbrusa@lbto.org](mailto:gbrusa@lbto.org)>, "Laudisio, Fulvio" <[fulvio.laudisio@inaf.it](mailto:fulvio.laudisio@inaf.it)>, Luca Marafatto <[luca.marafatto@inaf.it](mailto:luca.marafatto@inaf.it)>, Paul Grenz <[pgrenz@lbto.org](mailto:pgrenz@lbto.org)>, Xianyu Zhang <[xzhang@lbto.org](mailto:xzhang@lbto.org)>, John Hill <[jhill@lbto.org](mailto:jhill@lbto.org)>, Alessandro Lorenzetto <[alessandro.lorenzetto@inaf.it](mailto:alessandro.lorenzetto@inaf.it)>, AO Operations <[aoops@lbto.org](mailto:aoops@lbto.org)>, Jacopo Farinato <[jacopo.farinato@inaf.it](mailto:jacopo.farinato@inaf.it)>

Ciao Jacopo, Maria, All -

OK, let's discuss it at the videocon on the 26th and go from there. One quick thing to clarify ahead of the meeting

- From Maria's email: "Essentially, every time we need to take Phase Diversity NCPA data, we need to ask the operator to **Pause the loop**, move the Z position of SOUL from 62 mm (SHARK-NIR baseline) to 59 mm, we take some images and then we ask again the operator to move back to the 62 mm position."
- From Jacopo's email: "we are just asking to focus the camera in **close loop** (that translates in offset in Z to SOUL)"

Possibly this is just semantics, but just to check: Will the loop be paused for the command to change the Z position, or will it stay closed during that operation? I'm not sure it makes a difference on the degree of safety or software effort required, but it might. Others on this distribution may wish to comment.

Also, (and sorry if these are dumb questions), if it is the former case (loop paused)

1. Why not piston the hexapod to go from 62 to 59 and then back to 62?
2. Will the loop be reclosed at the 59 position and then re-paused before going back to 62?

Thanks,

Al

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**Jacopo Farinato** <[jacopo.farinato@inaf.it](mailto:jacopo.farinato@inaf.it)>

Mon, Jan 23, 2023 at 1:00 AM

Reply-To: jacopo.farinato@inaf.it

To: Al Conrad <aconrad@lbto.org>

Cc: "Ricci, Davide" <davide.ricci@inaf.it>, Jennifer Power <jpower@lbto.org>, Matthieu Bec <mbec@lbto.org>, Maria Bergomi <maria.bergomi@inaf.it>, Alfio Puglisi <alfio.puglisi@inaf.it>, Brandon Mechtley <bmechtley@lbto.org>, Glenn Eychaner <geychaner@lbto.org>, Guido Brusa <gbrusa@lbto.org>, "Laudisio, Fulvio" <fulvio.laudisio@inaf.it>, Luca Marafatto <luca.marafatto@inaf.it>, Paul Grenz <pgrenz@lbto.org>, Xianyu Zhang <xzhang@lbto.org>, John Hill <jhill@lbto.org>, Alessandro Lorenzetto <alessandro.lorenzetto@inaf.it>, AO Operations <aoops@lbto.org>, jacopo.farinato@inaf.it

Ciao Al, Maria's sentence is referred to the defocus to be applied while acquiring NCPA using PD, my sentence was referred to sweep in Z to find the right focus on the SCICAM.

Anyhow, for both cases, we need to acquire data in close loop, the fact of keeping the loop closed during the movement or to pause the loop and close it again while having reached the Z position is depending on the AO system capability to keep it closed during the movement, and the AO team knows much more about that than we know, so let's discuss this issue together on the 26.

Nice day to everybody!

Jacopo

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**Da:** Al Conrad [mailto:[aconrad@lbto.org](mailto:aconrad@lbto.org)]

**Inviato:** domenica 22 gennaio 2023 22:17

**A:** Jacopo Farinato

**Cc:** Ricci, Davide; Jennifer Power; Matthieu Bec; Maria Bergomi; Alfio Puglisi; Brandon Mechtley; Glenn Eychaner; Guido Brusa; Laudisio, Fulvio; Luca Marafatto; Paul Grenz; Xianyu Zhang; John Hill; Alessandro Lorenzetto; AO Operations

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**Alfio Puglisi** <alfio.puglisi@inaf.it>

Mon, Jan 23, 2023 at 2:22 AM

To: jacopo.farinato@inaf.it

Cc: Al Conrad <aconrad@lbto.org>, "Ricci, Davide" <davide.ricci@inaf.it>, Jennifer Power <jpower@lbto.org>, Matthieu Bec <mbec@lbto.org>, Maria Bergomi <maria.bergomi@inaf.it>, Brandon Mechtley <bmechtley@lbto.org>, Glenn Eychaner <geychaner@lbto.org>, Guido Brusa <gbrusa@lbto.org>, "Laudisio, Fulvio" <fulvio.laudisio@inaf.it>, Luca Marafatto <luca.marafatto@inaf.it>, Paul Grenz <pgrenz@lbto.org>, Xianyu Zhang <xzhang@lbto.org>, John Hill <jhill@lbto.org>, Alessandro Lorenzetto <alessandro.lorenzetto@inaf.it>, AO Operations <aoops@lbto.org>

Hello Al,

I can give a information on a couple of points:

On Sat, Jan 21, 2023 at 8:28 AM Jacopo Farinato <[jacopo.farinato@inaf.it](mailto:jacopo.farinato@inaf.it)> wrote:

How does it work for the other instruments using AO, such as LMIRCam for example? How do they focus? Are we the only one who are doing focus sweep in Z using the ASM (driven by the SOUL WFS) to optimize it?

I can't speak for LBTI, but at the SOUL-LUCI focal station the focus has been optimized with a Z sweep, driven by engineering scripts on the WFS software. That is, instead of the instrument commanding a Z offset, it was the AO system offsetting itself in Z and asking the instrument for an image at each step. The best Z position was then written in a configuration file. We did not use other algorithms, like phase diversity, that require focus offsets, and this is

probably why no one realized that the OffsetZ command was not implemented when sent from the IIF.

On Sat, Jan 21, 2023 at 10:23 AM Maria Bergomi <maria.bergomi@inaf.it> wrote:

The AO team during last night run Com-1 and day-time run Pre-Com-3 experienced our needs, so might add details. Essentially, every time we need to take Phase Diversity NCPA data, we need to ask the operator to Pause the loop, move the Z position of SOUL from 62 mm (SHARK-NIR baseline) to 59 mm, we take some images and then we ask again the operator to move back to the 62 mm position.

In our experience, there is no need of pausing the loop during a focus offset: unlike tip/tilt, we have seen that the AdSec can apply large focus shapes without skipping any frame. This focus is then offloaded to the hexapod over 10-20 seconds, but the actual focus application is done by the AO loop and is basically following the focus stage instantaneously. There is some vibration while the stage is moving, so it's best not to acquire images during the transient, but once the stage has completed the movement the system is ready.

Concerning the X-Y adjustments, our goal is to place the PSF on the SHARK-NIR instrument "hot pixel", but at the same time we need the location of the image in LMIRCAM to be in a good location for LMIRCAM use and the SOUL AO correction as accurate as possible, thus, in that case I would believe offsets to the telescopes are included.

Unless I am missing something, moving the bayside stages in XY will result in the PSF shifting on both LMIRCAM and SHARK-NIR by the same physical amount. The closed-loop offsets you are using now (limited to 0.3 mm) will offload the accumulated tip/tilt to the telescope mount, effectively changing the pointing, therefore using telescope offsets should have the same result but faster, since the offset is done in a single step.

Alfio

---

**Xianyu Zhang** <xzhang@lbto.org>

Mon, Jan 23, 2023 at 1:05 PM

To: jacopo.farinato@inaf.it, Al Conrad <aconrad@lbto.org>, "Ricci, Davide" <davide.ricci@inaf.it>

Cc: Jennifer Power <jpower@lbto.org>, Matthieu Bec <mbec@lbto.org>, Maria Bergomi <maria.bergomi@inaf.it>, Alfio Puglisi <alfio.puglisi@inaf.it>, Brandon Mechtley <bmechtley@lbto.org>, Glenn Eychaner <geychaner@lbto.org>, Guido Brusa <gbrusa@lbto.org>, "Laudisio, Fulvio" <fulvio.laudisio@inaf.it>, Luca Marafatto <luca.marafatto@inaf.it>, Paul Grenz <pgrenz@lbto.org>, John Hill <jhill@lbto.org>, Alessandro Lorenzetto <alessandro.lorenzetto@inaf.it>, AO Operations <aoops@lbto.org>

Ciao Jacobo,

thanks for your reply and refereed documents. The documents you refereed are the ones we were asking for, at least for me. After quickly reading them, I think there was a misunderstanding of the way to get the defocus for phase diversity. According to this email thread before, I got the feeling you wanted to move the stage in Z to get the defocus, which raised a few questions/concerns, so we asked for the documents to clarify the requirements; actually, your requirement is to set a defocus offset on the ASM, I think it is the right way to do it.

I would like to take this chance to ask a few questions, regarding the phase diversity, see below:

- 1) how large is the defocus you need to apply on ASM?
- 2) how fast do you want to swap between the the defocus and nominal shape? since we plan to limit the rates for NCPA.
- 3) what are the ASM and/or AO loop errors you need to handle?

regarding the IF-SW-04 ("through-focus"), I totally agree with Alfio, and add a few comments, see below:

- 1) It takes some efforts to make the "take images, analysis, command stages to move" automatically, including handling the error messages from AO. You may also need to deal with the observation scripts. Since it is required for commissioning, it maybe easier to do the same way as LUCI.
- 2) bayside stages in XY will result in the PSF shifting on both LMIRCAM and SHARK-NIR, so you may do not have

enough range.

3) depends how far you need to move the stage, telescope offsets maybe a better solution.

4) the SW implementation is not complicated, if you just need command to move the bayside stages in X, Y and Z.

Cheers,  
Xianyu

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