

# 220204\_LVV-T2190

February 11, 2022

## 1 MTAOS add aberrations to M1M3+M2+hexapod

This notebook is used for the level 3 integration tests from test plan LVV-P81 (<https://jira.lsstcorp.org/secure/Tests.jspa#/testPlan/LVV-P81>) as part of test cycle LVV-C176 (<https://jira.lsstcorp.org/secure/Tests.jspa#/testCycle/LVV-C176>). The following tests are currently run as part of this notebook:

- LVV-T2190 (<https://jira.lsstcorp.org/secure/Tests.jspa#/testCase/LVV-T2190>)

Execution steps are separated by horizontal lines. Upon completion, save the notebook and its output as a pdf file to be attached to the test execution in JIRA.

Last updated by E. Dennihy 20211020

---

Load all the needed libraries. Get the remotes ready Code in the notebook including section: “Check the summary state of each CSC”.

```
[1]: %load_ext autoreload
      %autoreload 2
```

```
[2]: import rubin_jupyter_utils.lab.notebook as nb
      nb.utils.get_node()
```

```
/tmp/ipykernel_2814/1665379685.py:2: DeprecationWarning: Call to deprecated
function (or staticmethod) get_node. (Please use lsst.rsp.get_node())
      nb.utils.get_node()
```

```
[2]: 'yagan05'
```

```
[3]: import os
      import sys
      import asyncio
      import logging

      import pandas as pd
      import numpy as np

      from matplotlib import pyplot as plt
```

```
from lsst.ts import salobj
from lsst.ts.observatory.control.maintel import MTCS, ComCam
from lsst.ts.observatory.control import RotType
```

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

```
[4]: logging.basicConfig(format="%(name)s:%(message)s", level=logging.DEBUG)
```

```
[5]: log = logging.getLogger("setup")
log.level = logging.DEBUG
```

```
[6]: domain = salobj.Domain()
```

```
[7]: mtcs = MTCS(domain=domain, log=log)
mtcs.set_rem_loglevel(40)
```

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

```
[8]: await mtcs.start_task
```

```
[8]: [None, None, None, None, None, None, None, None, None]
```

---

Ready M1M3: Raise mirror, turn on FB, clear forces

Need to have M1M3 LUT use its inclinometer.

---

Ready M2: Turn on FB, clear forces

Need to have M2 LUT use its inclinometer

---

Get camera hexapod ready: check config; make sure LUT is on, and has valid inputs; make sure hex is at LUT position

---

Get M2 hexapod ready: check config; make sure LUT is on, and has valid inputs; make sure hex is at LUT position

---

Slew to the next target. Choose a target such that the rotator stays within a couple of degrees of its initial position. This is because the CCW is not running (MTmount in simulation mode).

```
[9]: target = await mtcs.find_target(el=60, az=120, mag_limit=8)
      print(target)
```

HD 210782

```
[10]: await mtcs.slew_object(target, rot_type=RotType.PhysicalSky, rot=1.9)
```

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

<IPython.core.display.HTML object>

```

<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>
<IPython.core.display.HTML object>

```

---

add 1um of z7 to the system via OFC

Compare the corrections sent vs forces and position changes applied. This is currently done in a separate notebook.

```
[11]: wavefront_errors = np.zeros(19)
```

```
[12]: wavefront_errors[3] += 1.0 # add1 um to z7
```

```
[13]: await mtcs.rem.mtaos.cmd_addAberration.set_start(wf=wavefront_errors,
↳ timeout=10)
```

```
[13]: <ddsutil.MTAOS_ackcmd_fd03e870 at 0x7f7f14e236a0>
```

This command primes the corrections, the issueCorrection command is needed to actually command them to be sent

```
[14]: await mtcs.rem.mtaos.cmd_issueCorrection.start(timeout=60.)
```

```
[14]: <ddsutil.MTAOS_ackcmd_fd03e870 at 0x7f7f47a3eb80>
```

---

Make plots using telemetry from each component to verify the changes in the DOFs. This step does not currently involve running any commands in this notebook. This step must be verified using a separate notebook.

---

reset the corrections using the resetCorrection command

Compare the corrections sent vs forces and position changes applied (these are all expected to be zero). This is currently done in a separate notebook or on Chronograf.

```
[21]: await mtcs.rem.mtaos.cmd_resetCorrection.start()
```

```
[21]: <ddsutil.MTAOS_ackcmd_fd03e870 at 0x7f7f14edaeb0>
```

```
[22]: await mtcs.rem.mtaos.cmd_issueCorrection.start(timeout=60.)
```

```
[22]: <ddsutil.MTAOS_ackcmd_fd03e870 at 0x7f7f848f6b50>
```

```
<IPython.core.display.HTML object>
```

```
<IPython.core.display.HTML object>
```

```
<IPython.core.display.HTML object>
```

```
<IPython.core.display.HTML object>
```

```
<IPython.core.display.HTML object>
```

---

add 2um of z7 to the system via OFC

Compare the corrections sent vs forces and position changes applied. This is currently done in a separate notebook or on Chronograf.

```
[17]: wavefront_errors[3] = 2.0 # add 2.0 um of z7
```

```
[18]: await mtcs.rem.mtaos.cmd_addAberration.set_start(wf=wavefront_errors,
↳ timeout=10)
```

```
[18]: <ddsutil.MTAOS_ackcmd_fd03e870 at 0x7f7f1d133dc0>
```

```
[19]: await mtcs.rem.mtaos.cmd_issueCorrection.start(timeout=60.)
```

```
[19]: <ddsutil.MTAOS_ackcmd_fd03e870 at 0x7f7f84802400>
```

---

Stop Tracking

```
[20]: await mtcs.stop_tracking()
```

<IPython.core.display.HTML object>

---

Check that the corrections in step 10 are twice of those in step 7. This step does not currently involve running any commands in this notebook. This step must be verified using a separate notebook.

---

Wrap up. Put each component to the following states: mtaos -> standby m1m3 -> lower mirror -> standby m2 -> standby camera hex -> standby m2 hex -> standby

```
[ ]: await mtcs.set_state(salobj.State.STANDBY, components=["mtaos"])
```

```
[ ]: await mtcs.lower_m1m3()
```

```
[ ]: await mtcs.set_state(salobj.State.STANDBY, components=["mtm1m3"])
```

```
[ ]: await mtcs.set_state(salobj.State.STANDBY, components=["mtm2"])
```

```
[ ]: await mtcs.set_state(salobj.State.STANDBY, components=["mthexapod_1"])
```

```
[ ]: await mtcs.set_state(salobj.State.STANDBY, components=["mthexapod_2"])
```

```
[ ]: await mtcs.standby()
```