MagAO-X support agreement
DRAFT

1. Instrument Description

MagAO-X is an entirely new adaptive optics system and coronagraphic imager, which will use the f/11 static secondary mirror on the Clay telescope. MagAO-X consists of an optical table and an electronics rack. The instrument is a 1.3 m by 2 m, two-level, optical table, supported on legs with air damping and active height and level control. The electronics rack is 2m tall (42 U), 3.6 m deep, and 0.7 m wide, and sits next to the instrument when on the telescope.

MagAO-X is a P.I. instrument, and will be shipped back to Steward Observatory at the conclusion of each telescope run.

2. Configuration

>*Specify the intended port**

MagAO-X will be installed on the Clay Nasmyth-East (NASE) platform.

>*Specify the secondary mirror and ADC**

MagAO-X is designed to use the F/11 secondary mirror. No external ADC is required.

>*Provisions for guiding: Does the instrument require one of the observatory guiders and, if so, specify which model:**

The MIKE guider will be used.

>*Specify instrument size and weight:**

Optical Table:
W x L x H: 1.3 m x 2 m x 2 m
Weight: 2500 lbs [approx, will be updated when shipped]

>*List size and location of instrument racks, compressors, and other equipment:**

Electronics Rack:
Location: on platform next to instrument optical table
W x L x H: 0.7 m x 1.3 m x 2m tall
Weight: 1000 lbs [approx, will be updated when shipped]
Description: A 42 U 19 inch equipment, enclosed and insulated for heat control, liquid cooled.

Auxiliary Components Rack:
Location: on platform near instrument
W x H x D: 0.7m x 0.7m x 1 m
Description: a small rack on wheels. Contains a small HEPA blower for instrument dust control and the table air system controller. ~100 lbs.

*>*Description and location of the control console. Is this dedicated equipment or shared with other instruments?**

The control console consists of a dedicated linux workstation with four monitors. We intend to locate this in the control room at one of the tables facing away from the telescope operator (just as is done for the VisAO operator station). The four monitors are mounted on a table-top stand.

*>*Discuss telescope and rotator balance considerations:**

N/A. The instrument does not attach to the elevation axis or rotator in any way.

*>*Specify special baffle requirements:**

None.

*>*Cable description and layout. State if the cables are permanently installed and if they are shared with other
instruments. Is a cable wrap required?**

No permanent cables required. No cable wrap required.

We plan to use the existing network fibers from platform to equipment room, and the existing MagAO switchgear.

3. Service requirements
*>*Requirements for power, compressed air, and coolant:*

-- UPS power, 3x NEMA 5-15P plugs, 120V 60 Hz, (instrument draws 10 amps total, 6 amps max on one plug).

-- 1 set of glycol connections [instrument cooling]

-- Air at 90 lbs pressure providing 3 SCFM

-- 1 Bottle of dry N2 for DM operations

-- Use of 2 pairs of existing network fibers to Equipment Room (E.R.) (we will use MagAO switchgear in E.R.)

-- 1x dedicated Cat-5 connection from E.R. to control room (existing VisAO port)

>*Air ducting for heat extraction*

None.

>*Requirements for cryogens*

None.

4. Routine Support

>*Description of the routine servicing & periodic maintenance that will be performed by the Observatory Staff both when the instrument is on and off the telescope:*

None. All servicing will be performed by MagAO-X team.

>*Technical personnel required for operation and an estimated amount of time they will regularly devote to the instrument:*

None. Instrument will be operated by MagAO-X team.

>*Consumable supplies required for operations with estimated quantities:*

None

>*Power, air, and coolant requirements:*

See above for Nasmyth platform requirements.

Cleanroom Operations [all runs]:

-- Cleanroom operating at Class 10,000 or better
(please verify filters have been changed if needed, etc)
-- Compressed air supply (90 lbs, 3 scfm) for table flotation and DM operations
-- 1 bottle of dry N2 for DM operations
-- Continuous use of chiller for liquid coolant supply [do we need to discuss with Rob Simcoe?]
(up to 2 weeks at a time)
-- UPS power, 3x NEMA 5-15P plugs, 120V 60 Hz, (instrument draws 10 amps total, 6 amps max on one plug)

*>*Description of the procedures required for instrument changes. These include pump down and cool down procedures, cabling, power up, filter and mask preparation, preparation of the data system, and actual start-up procedures. Actual handling procedures are described in a later section.**

All instrument preparation will be performed by MagAO-X team.

*>*Requirements for status reports from the support staff to the instrument group. Here the instrument groups would specify what feed back they expect from LCO on the operation and performance of the instrument.**

The MagAO-X team will document any problems and solutions that have been employed in the daily report forms and the observatory trouble reporting and issue tracking software (JIRA).

*>*Instrument mailing list and the names of its members:**

All emails are @email.arizona.edu
Jared Males jrmales@
Laird Close lclose@
Victor Gasho vgasho@
Alex Hedglen ahedglen@
Joseph Long josephlong@
Jennifer Lumbres jlumbres@
Lauren Schatz jlumbres@
Alex Rodack atrodack@
Kyle Van Gorkom kvangorkom@

5. Troubleshooting and Repair
*>*List the subsystems that are serviceable by the observatory staff and describe those repair procedures that may be attempted by the local staff for each subsystem**

Local staff should not attempt to repair or service MagAO-X.

>*List the critical subsystems and repair procedures that specifically may not be attempted by the local staff.*

Local staff should not attempt to repair or service MagAO-X.

>*Specify the procedures that must be followed when a problem occurs. This should include who is the responsible [individual] that should be contacted at the home institution, how notification is made, who coordinates the local effort at the observatory.*

Immediate email to the Instrument mailing list. And contact with any MagAO-X team members on site.

>*Specify who authorizes and pays for replacement parts and contracted services.*

University of Arizona, Jared Males.

*>*Specify what constitutes chronic or severe problems that go beyond the ability of the staff to maintain the instrument and/or that place excessive demands on the technical staff such that normal observatory operation is impaired. Under these conditions intervention by the instrument group is expected.**

N/A. This is a P.I. instrument that will be operated and maintained by the instrument team.

6. Support provided by the Instrument Group:
List the individuals at the home institution that are responsible for supporting the instrument:

>*Principal point of contact:*
Jared Males

>*Others: mechanical engineer, software systems, instrument scientist:*
Laird Close
Victor Gasho

Describe the remote help that will be provided:
*>*On-line troubleshooting and consultation:**

N/A. This is a P.I. instrument that will be operated and maintained by the instrument team.

*>*Updating documentation:**

MagAO-X team.

*>*Purchasing parts and arranging repair service in the US**

Jared Males

*>*Specify the period for this support. Normally this would be for the life of the instrument as a Facility Instrument**

Life of the instrument.

*>*Individuals committed to traveling to Chile when necessary**

Jared Males, Laird Close

*>*Time to respond**

Team will be on-site during operations. Response time during storage and shipping periods will be < 12 hrs for email, 2-3 days if needed in person.

7. Handling & storage fixtures

> Description of required handling & storage fixtures and a statement of how they are to be provided**

All storage and handling fixtures will be provided by MagAO-X. These include a WxLxH = 2.4 m x 2.8 m x 2.2 m box containing the instrument, a WxL H = 2 m x 2.2 m x 1 m [TBC] box containing the electronics box, and a WxLxH= 1 m x 2 m x 1 m [TBC] box containing support gear.

A custom lifting bar / load spreader and a handling cart will be used for transportation and rigging of the instrument on the mountain.

> Procedures for moving the instrument to and from the telescope and mounting it on the telescope **

Complete procedure will be provided as a separate document. Here we list the support required from LCO:

Unpacking:
- -- delivery of instrument to cleanroom
- -- forklift & operator
- -- lift gate, removal of rails, operation
- -- crane operation in vestibule during unpacking (intermittently over 1 to 2 days)
- -- 2 crew members to support box disassembly (½ day)

Move To Telescope:
- -- Isuzu flatbed (or equivalent) & driver for instrument
- -- pickup truck for electronics rack, sundries
- -- lift gates (both at C.R. and at summit): set for smoothest operation (as with ASM), rails removed.
- -- 3 crew members for ~1 day
- -- come-alongs for safe handling both on and off the truck while table top is mounted to its cart
- -- straps for securing instrument cart to truck
- -- crane operations in vestibule [table top from legs to cart]
- -- use of elevator to Nasmyth NASE platform

-- use of dome crane to lift from cart to legs
-- (first run) Support to drill alignment holes in platform
-- (first run) Support to drill earthquake restraint holes for electronics rack in platform
-- daytime telescope operations (covers open, tertiary aligned, etc.) for initial alignment assessment
-- (first night) Extra support for tertiary alignment (M3) and initial “mike” guider focusing.

> Description of the off-telescope storage requirements including amount of space, type of environment, and power or cooling**

When MagAO-X is at LCO and unpacked, it will be stored in the cleanroom. See above for requirements for power, cooling, and air while MagAO-X is being operated in cleanroom (for post shipping checkouts, etc.).

When MagAO-X is packed, as it will be when MagAO-X team leaves at conclusion of run, no power or cooling is required.

The only long-term storage needed is approx 4’x8’x4’ for the table legs that stay at LCO and the cart and lifting fixtures. The cart will be disassembled for storage.

> Description of shipping requirements, shipping costs and how arrangements are made. State if this is an on-going expense, e. g. instruments shared with other observatories. If parts of the instrument must be returned to the home institution for periodic upgrade or service, so state.**

MagAO-X will be shipped to LCO from Tucson and back for each telescope run. These costs are covered by the MagAO-X project.

8. Special provisions

> Describe any special provisions, conditions or modifications at the Magellan facility not already covered above and necessary in order to operate the instrument**

Some holes will need to be added to Clay Nasmyth NASE platform for alignment pins and earthquake restraints. No new permanent plates will be added to the NASE floor.

Considerations for unpacking and first run fit-checks:

Possible Fit Check: we would like to perform a fit-check during the November 2019 unpacking period. Ideally this would be a full installation and operational check of the instrument to verify all interfaces. Note that once MagAO-X is on the platform, other engineering tasks (such as moving the telescope or dome) could proceed as MagAO-X does not connect to the rotator or use a cable wrap.

Alternative: We recognize that a full check may be difficult to accommodate due to M2FS being scheduled after the MagAO run. If the full check can not be supported, a short test of placing the legs in the expected location would be useful, and could be performed in approximately one hour.

First Light Installation: if possible, we should plan to install MagAO-X during the day on 01 Dec, which is an LDSS-3 night so NASE is not in use, in order to accommodate any need modifications before the 02 Dec allocated MagAO-X night.

> List any factors associated with the instrument that would interfere with the operation of instruments on other ports or that otherwise constrain normal operations**

None.

> Are there arrangements with other organizations, observatories, or groups that affect the way this instrument will be used and supported at LCO?**

No.