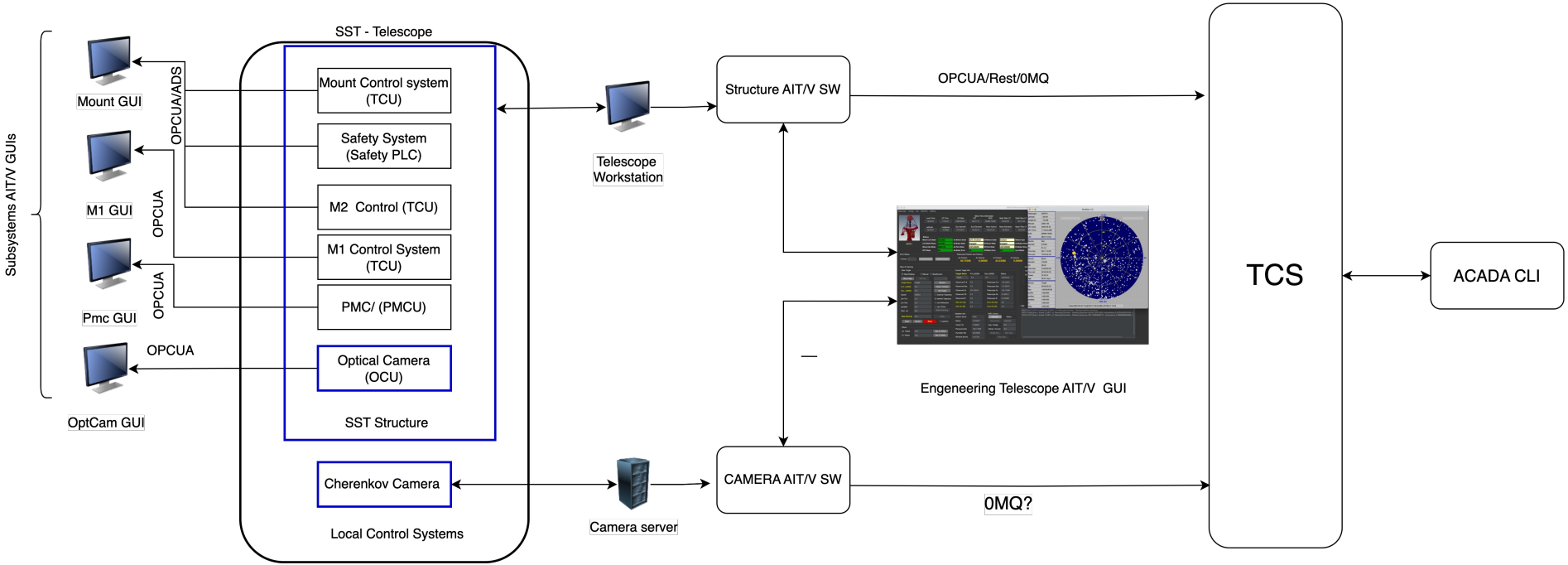
cherenkov telescope array

sst

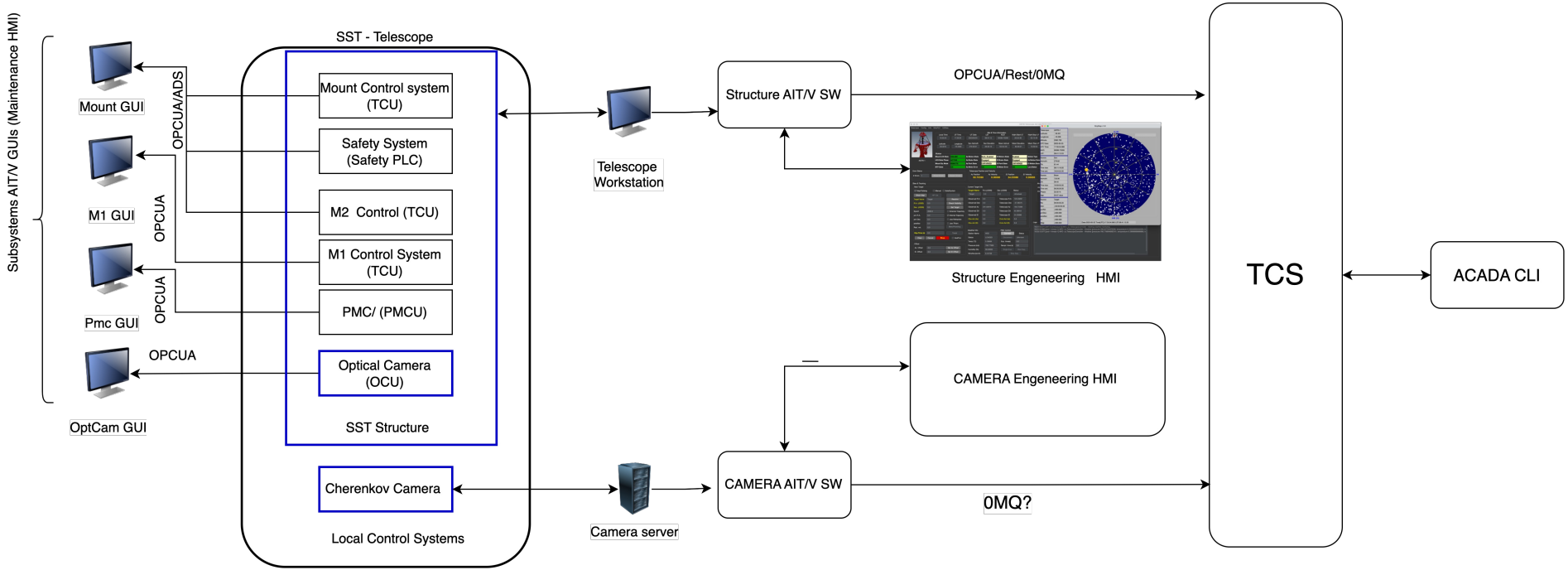
Structure Acceptance Tests and Support Sw.

G. Tosti 20/02/2024

SST: SST SW AIT/V Architecture version 1



SST: SST SW AIT/V Architecture version 2



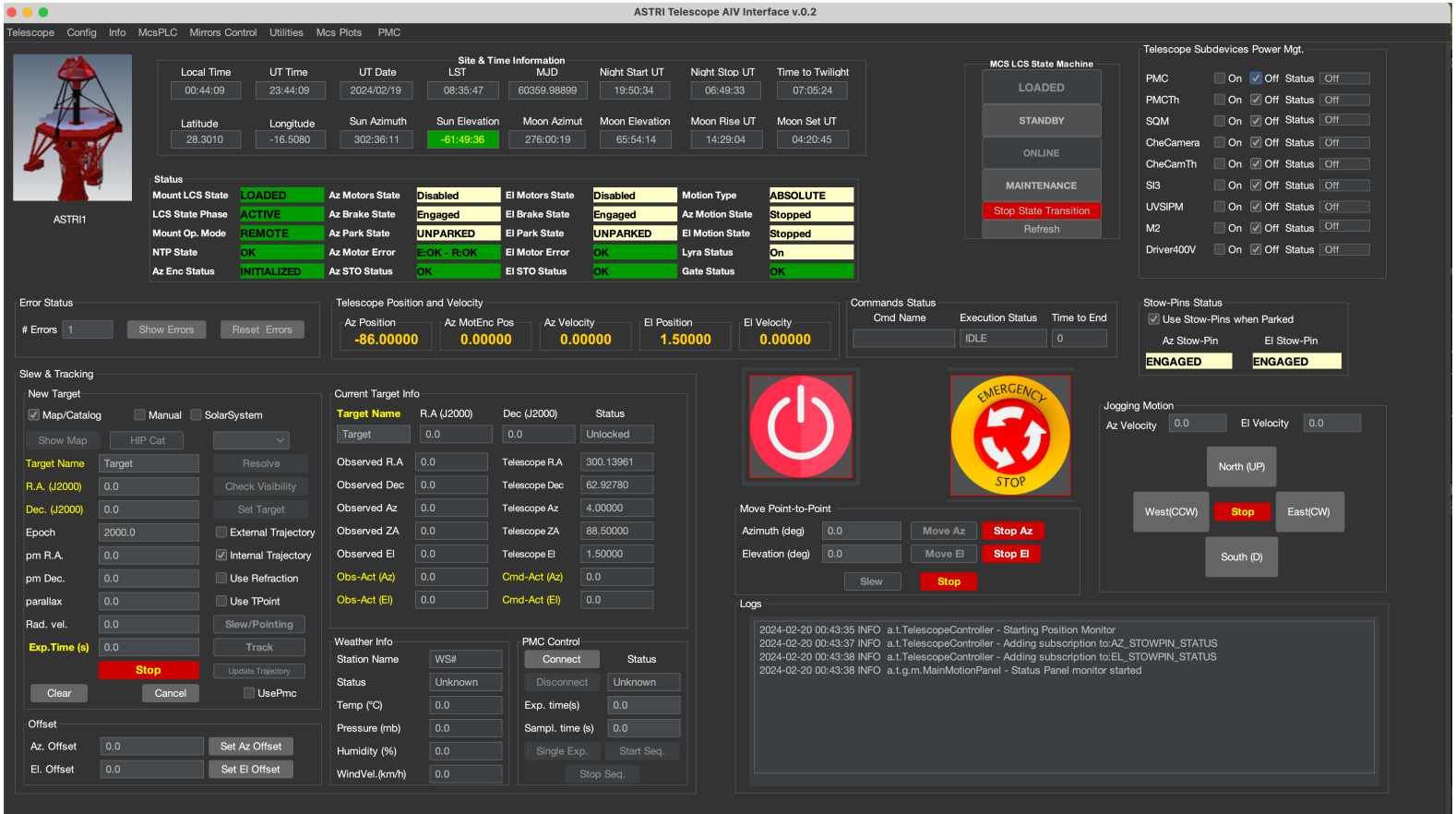
Some Structure Technical UCs

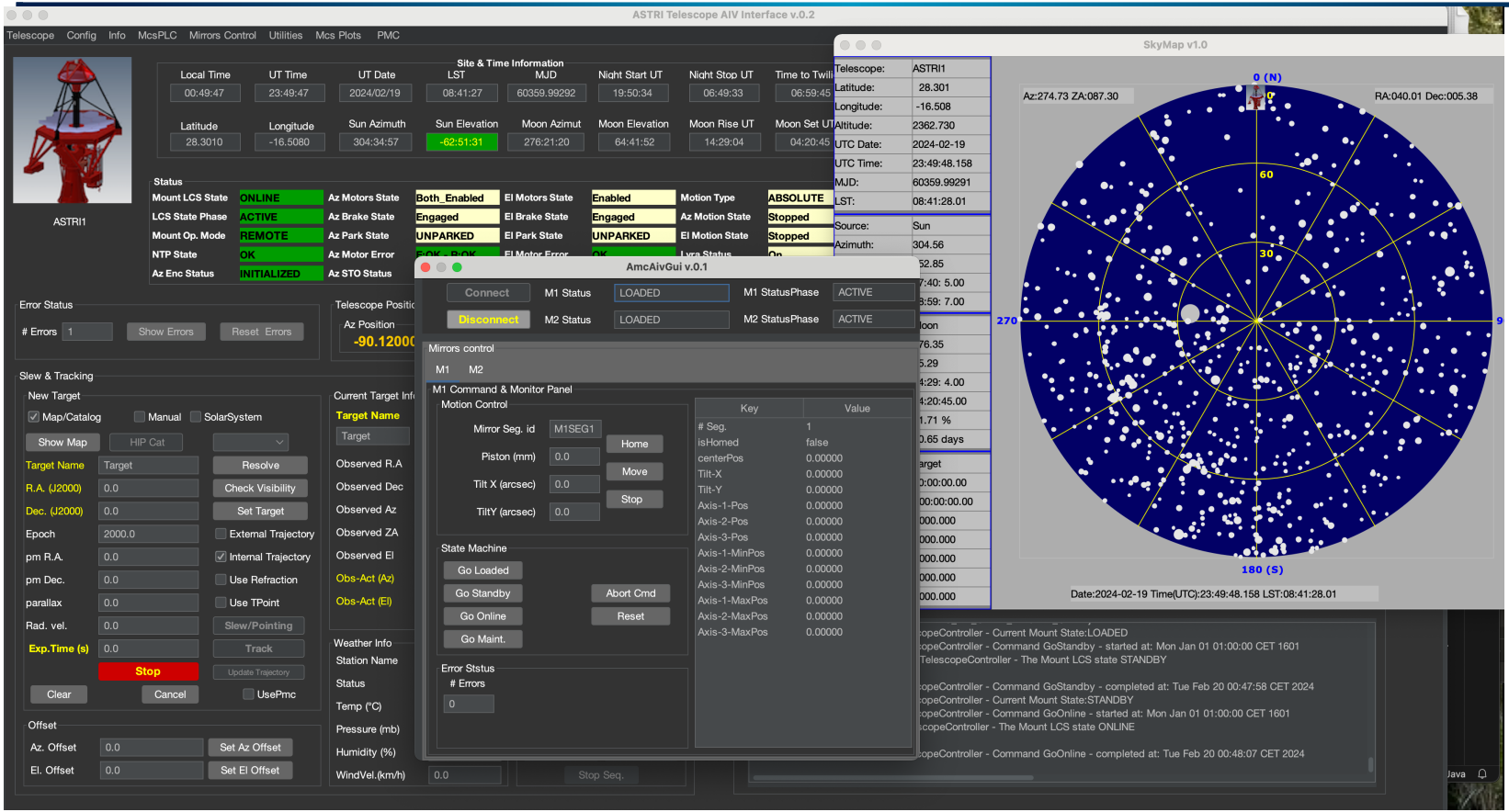
CODE	DESCRIPTION	ACCESS MODE	PROTOCOL
UC-SST-TECH-1	Telescope Structure Pointing Model includes: selection of the reference pointing grid, collection of the offsets based on the astrometry of images obtained with the Pointing monitoring Camera and the cherencov	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-2	Telescope Control Unit configuartion changes. This is done by expert users using the Beckhoff Twincat enviroment running the main Program managing all the Hw and Sw componentes of the Mount Local Control System. A deep knowlege of the HW and SW componets is required. This UC is executed in maintenance mode.	Remote	Connection to the Telescope PC-PLC via Remote Desktop/AnyDesk/TeamViewer
UC-SST-TECH-3	Telescope Structure TCU Local control software restart. This procedure is activate as extreme attempts to recover unpredictable crash of the PLC Local control software	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-4	Telescope Structure TCU PC shutdown. This procedure is activate before to switch off the Telescope Power.	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-5	Telescope Axes control loop tuning. This is done by expert users using the Beckhoff Twincat enviroment running the main Program managing all the Hw and Sw componentes of the Mount Local Control System. A deep knowlege of the HW and SW componets is required. This UC is executed in maintenance mode.	Remote	Connection to the Telescope PC-PLC via Remote Desktop/AnyDesk/TeamViewer

Some Structure Technical UCs

CODE	DESCRIPTION	ACCESS MODE	PROTOCOL
UC-SST-TECH-6	System Tests. Includes (partial list): Azimuth and Elevation axes speed and acceleration limits test Azimuth and Elevation Motion Modes (Absolute, Jog) test Azimuth and Elevation Parking procedure test Azimuth and Elevation State changes test Azimuth and Elevation Stow-Pin insertion/extraction test Azimuth and Elevation I/O states test Azimuth and Elevation Accelerometers acquisition test M2 positioning test Power consumption Test Internal device Power on/off test Interlocks chain test Motion limit switches Test Encoder only Tracking error test Encoder only Pointing error test	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-7	M1 actuator system test. These are executed after the M1 Actuator and control box are mounted on the telescope and before to proced to the M1 alignement.	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-8	Optical Camera system Test.M1 actuator system test. These are executed after the Optica Camera is mounted on the telescope and before to proced to the M1 alignement.	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-9	M1 Alignement procedure. This is activated after detection of a degratection of the optical performance of the telescope and after dismounting of the cherenckov camera and mounting of the Optical camera and M1 Actuator system.	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI
UC-SST-TECH-10	Pointing Monitor camera system test.	Remote	HMI - Telescope: OPCUA Remote user can run on any PC to run the HMI

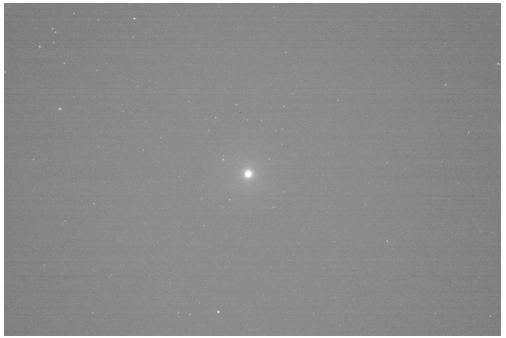
SST: ASTRI Mini Array Structure Engeneering HMI

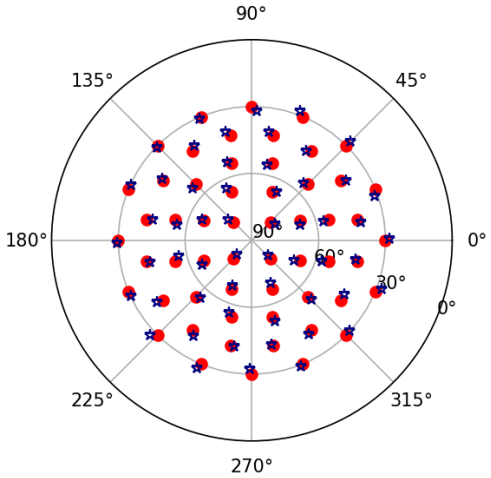



ASTRI Telescope AIV Interface v.0.2
Telescope Config Info McsPLC Mirrors Control Utilities Mcs Plots PMC
ASTRI1
Site & Time Information
Local Time 00:49:47
UT Time 23:49:47
UT Date 2024/02/19
LST 08:41:27
MJD 60359.99292
Night Start UT 19:50:34
Night Stop UT 06:49:33
Time to Twill 06:59:45
Latitude 28.3010
Longitude -16.5080
Sun Azimuth 304:34:57
Sun Elevation -62:51:31
Moon Azimut 276:21:20
Moon Elevation 64:41:52
Moon Rise UT 14:29:04
Moon Set UT 04:20:45
Status
Mount LCS State ONLINE
LCS State Phase ACTIVE
Mount Op. Mode REMOTE
NTP State OK
Az Enc Status INITIALIZED
Az Motors State Both_Enabled
Az Brake State Engaged
Az Park State UNPARKED
Az Motor Error OK
Az STO Status OK
El Motors State Enabled
El Brake State Engaged
El Park State UNPARKED
El Motor Error OK
Motion Type ABSOLUTE
Az Motion State Stopped
El Motion State Stopped
Lyra Status On
Error Status
Errors 1
Show Errors
Reset Errors
Telescope Positi
Az Position
-90.1200
Slew & Tracking
New Target
Map/Catalog
Manual
SolarSystem
Show Map
HIP Cat
Target Name
Target
Resolve
R.A. (J2000) 0.0
Check Visibility
Dec. (J2000) 0.0
Set Target
Epoch 2000.0
External Trajectory
pm R.A. 0.0
Internal Trajectory
pm Dec. 0.0
Use Refraction
parallax 0.0
Use TPoint
Rad. vel. 0.0
Slew/Pointing
Exp.Time (s) 0.0
Track
Stop
Update Trajectory
Clear
Cancel
UsePmc
Offset
Az. Offset 0.0
Set Az Offset
El. Offset 0.0
Set El Offset
Current Target Inf
Target Name
Target
Observed R.A
Observed Dec
Observed Az
Observed ZA
Observed El
Obs-Act (Az)
Obs-Act (El)
Weather Info
Station Name
Status
Temp (°C)
Pressure (mb)
Humidity (%)
WindVel.(km/h) 0.0
Stop Seq.
AmcAivGui v.0.1
Connect
Disconnect
M1 Status LOADED
M2 Status LOADED
M1 StatusPhase ACTIVE
M2 StatusPhase ACTIVE
Mirrors control
M1
M2
M1 Command & Monitor Panel
Motion Control
Mirror Seg. id M1SEG1
Piston (mm) 0.0
Tilt X (arcsec) 0.0
TiltY (arcsec) 0.0
Home
Move
Stop
State Machine
Go Loaded
Go Standby
Go Online
Go Maint.
Abort Cmd
Reset
Error Ststus
Errors
0
Key
Value
Seg. 1
isHomed false
centerPos 0.00000
Tilt-X 0.00000
Tilt-Y 0.00000
Axis-1-Pos 0.00000
Axis-2-Pos 0.00000
Axis-3-Pos 0.00000
Axis-1-MinPos 0.00000
Axis-2-MinPos 0.00000
Axis-3-MinPos 0.00000
Axis-1-MaxPos 0.00000
Axis-2-MaxPos 0.00000
Axis-3-MaxPos 0.00000
SkyMap v1.0
Telescope: ASTRI1
Latitude: 28.301
Longitude: -16.508
Altitude: 2362.730
UTC Date: 2024-02-19
UTC Time: 23:49:48.158
MJD: 60359.99291
LST: 08:41:28.01
Source: Sun
Azimuth: 304.56
Az:274.73 ZA:087.30
RA:040.01 Dec:005.38
0 (N)
60
30
270
180 (S)
Date:2024-02-19 Time(UTC):23:49:48.158 LST:08:41:28.01
TelescopeController - Current Mount State:LOADED
TelescopeController - Command GoStandby - started at: Mon Jan 01 01:00:00 CET 1601
TelescopeController - The Mount LCS state STANDBY
TelescopeController - Command GoStandby - completed at: Tue Feb 20 00:47:58 CET 2024
TelescopeController - Current Mount State:STANDBY
TelescopeController - Command GoOnline - started at: Mon Jan 01 01:00:00 CET 1601
TelescopeController - The Mount LCS state ONLINE
TelescopeController - Command GoOnline - completed at: Tue Feb 20 00:48:07 CET 2024

SST: Pointing Model and tracking verification tools

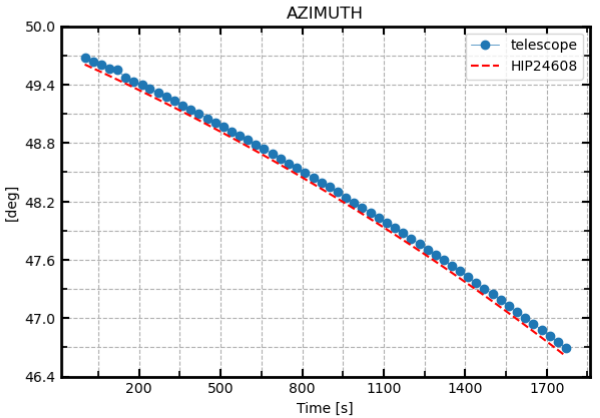
The **Pointing Monitoring Camera** (PMC) is an auxiliary optical camera equipped with the software for real-time astrometry analysis.

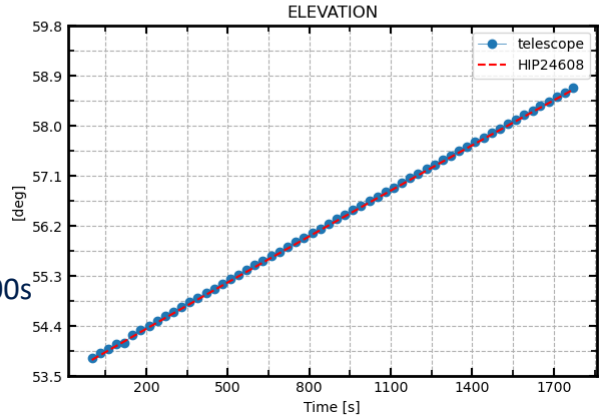




Result: the RMS pointing error projected on sky is 28''.

The **Pointing Model** is a 14-parameter function providing the pointing correction to the telescope for every sky position (Alt, Az).





Tracking:

- the tracking accuracy is ~0.6' over 1800s
- the precision is ~4.6' over 1800s
- the offset is constant (no drift)

SST: ASTRI Mini Array Optical System AIT/V