



SMA OPERATIONS

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SMA OPERATIONS

GENERAL COMMENTS

- **We have transitioned from an Engineering to a Science driven operation.**
- **SMA operations are working well even with the sudden loss of senior staff (Schinckel, Peck)**
- **SAO/ASIAA interactions are much improved.**
- **We have 4 professional antenna operators presently and have selected a 5th operator and processing an employment offer.**
- **Hawaii relations are excellent. They have approved the new Phase Monitor and we resolved a road access problem to everyone's satisfaction.**
- **Our remote surveillance has been upgraded allowing unattended operations to extend into the morning and weekends.**



OBSERVING MODEL

- **Scheduling system determines the science track based on array configuration, project rating, weather, antennas status etc.**
- **Currently 6 nights Science observing and 1 engineering testing night per week.**
- **“Priming” –Tests the array to ensure that is is ready for observing.**
- **Priming checks: Observing frequency, Correlator mode, Pointing, Delays and Fringes.**
- **Priming is done from both the Summit and Hilo Office at HP. A technical staff member is available during Priming to ensure proper instrument operation.**



Observing Model

- **First shift (1700-0200):**
 - **Hawaii Staff**
 - **1 Observer**
 - **Visiting Astronomer or second Observer**
- **Second Shift (0200-0900):**
 - **Remote**
 - **Two Observers**
 - **Operating from Cambridge or Taiwan**
- **Summit Technical Staff**
 - **Assumes control of the Array upon completion of Observing.**



ARRAY RE-CONFIGURATIONS

JULY'06-JULY'07

- **Science drives Array re-configurations**
- **Most re-configurations require 3 to 4 antennas to be moved.**
- **Timing of moves is usually adjusted to correspond to poor weather.**

Re-Configurations

JUL 06 Moved to Compact

SEP 06 Moved to Extended

OCT 06 Moved to Very Extended

DEC 06 Moved to Compact

JAN 07 Moved to Sub-Compact

FEB 07 Moved to Compact

APR 07 Moved to Sub-Compact

MAY 07 Moved to Very Extended

JUN 07 Moved to Compact

JUL 07 Moved to Extended



OBSERVING EFFICIENCY

- **POTENTIAL CAUSES FOR LOST TIME**
 - **Weather:** Snow, Ice, Fog, High Winds, Unstable Phase etc.
 - **Instrumentation:** Hardware, Servo systems, Receivers etc.
 - **Software:** Correlator, pointing, observing script etc.
 - **Observer errors**
 - **Array configuration changes:** 2-3 days per re-configuration



OBSERVING EFFICIENCY

- **Total nights available (2007A, Apr 23 - Aug 23): 123**
- **Total lost time:**

(weather)	19**
(receivers)	3
(correlator)	1
(polarization)	2
- **Engineering nights: 25**
(Testing, & re-configurations)
- **Observing nights for science: (123-24) 99**
- **Total number of successful tracks: 75 (+5 filler)**
- **Successful science efficiency: (75/99) 76%**
(successful science on nights allocated for science)
- **Overall operational efficiency (123-25/123): 80%**
(successful operation with no bad weather or equipment failure)

**** 4=fog, 4=high humidity, 11=bad phase**



SMA ANTENNA ATTRIBUTES

ATTRIBUTE	ANTENNA 1	ANTENNA 2	ANTENNA 3	ANTENNA 4
RECEIVER SET	200,300&600	200,300&600	200,300&600	200,300,400&600
CO 2-1	69K	71K	66K	100K
Trec CO 3-2	85K	89K	67K	119K / 171K
CO 6-5	349K	290K	352K	386K
DISH FIGURE	12 μ	13 μ	16 μ	17 μ
BLIND POINTING OFFSETS (" RMS)				
OPTICAL(AZ,EL)	2.5,2.6	1.5,1.9	1.5,2.2	2.1,2.9
RADIO(AZ,EL)	3.3,2.8	3.6,2.4	3.1,2.2	2.7,3.8
SETTLING TIME				
WIND 20M/SEC	< 1 SECOND	< 1 SECOND	< 1 SECOND	< 1 SECOND
AZ.=4 ⁰ /S, EL= 2 ⁰ /S				
TRACKING ERROR	<0.5 arc-sec's	<0.5 arc-sec's	<0.5 arc-sec's	<0.5 arc-sec's
BEAM CO-ALIGNMENT	< 8 arc sec @ 690 GHz	< 4 arc sec @ 690 GHz	< 6 arc sec @ 690 GHz	< 4 arc sec @ 690 GHz
T CONTROL (C ⁰)				
CABIN	0.5 N, 2.2 D	0.5 N, 1.0 D	0.4 N, 0.7 D	0.4N, 0.8 D
IF/LO BOX	1.1 N, 3.0 D	0.7 N, 1.7 D	1.0 N, 2.4 D	0.7 N, 2.1 D
GUIDE CAMERA	OPTEL 2, FOCUS, PC104	OPTEL 1 PC104	OPTEL 2, FOCUS, PC104	OPTEL 1 PC104



SMA ANTENNA ATTRIBUTES

ATTRIBUTE	ANTENNA 5	ANTENNA 6	ANTENNA 7	ANTENNA 8
RECEIVER SET	200,300,400&600	200,300,400&600	200,300,400&600	200,300 & 600
CO 2-1	67K	61K	79K	85K
Trec CO 3-2	78K / 120K	69K / 117K	102K / 150K	134K
CO 6-5	333K	396K	455K	NA
DISH ACCURACY	14 μ	17 μ	12 μ	11 μ
TRACKING ERROR	<0.5 arc-sec's	<0.5 arc-sec's	<0.5 arc-sec's	<0.5 arc-sec's
BLIND POINTING OFFSETS (" RMS)				
OPTICAL(AZ,EL)	1.7,2.8	1.4,1.6	2.0,2.5	2.1,1.9
RADIO(AZ,EL)	3.1,2.4	2.7,3.3	3.1,4.8	2.8,1.8
SETTLING TIME WIND 20M/SEC AZ.=4 ⁰ /S, EL= 2 ⁰ /S	< 1 SECOND	< 1 SECOND	< 1 SECOND	< 1 SECOND
BEAM CO-ALIGNMENT	< 3 arc sec @ 690 GHz	< 14 arc sec @ 690 GHz	< 14 arc sec @ 690 GHz	< 5 arc sec @ 690 GHz
T CONTROL (C ⁰) CABIN IF/LO BOX	0.5 N, 1.1 D 1.0 N, 1.4 D	*IF/LO INSULATED 0.4 N, 1.2 D 1.0 N, 1.1 D	*A/C NOT OPER. 3.5 N, 2.2 D 4.5 N, 5.8 D	0.45 N, 1.7 D 1.0 N, 2.6 D
GUIDE SCOPE	OPTEL 2, FOCUS, PC104	OPTEL 1 PC104	OPTEL 1	OPTEL 1



ANTENNA MAINTENANCE ISSUES

- **Preventative maintenance:**

Instrument CCC's

Receiver Checks

Chill Water Systems

Elevation Lead Screws

Azimuth Motors

Dish & BUS inspections

PACU / Correlator

Pad Inspections

Fiber (Single and Multimode) Measurements

Transporter / Forklift



06-07 ANTENNA PROJECTS

- **Antenna 7 & 8 Roof repairs**
- **Antenna 7 & 8 Air handler installation**
- **Antenna 6, 7 & 8 Azimuth encoder upgrade**
- **Antenna 1-8 Elevation Hard stops**

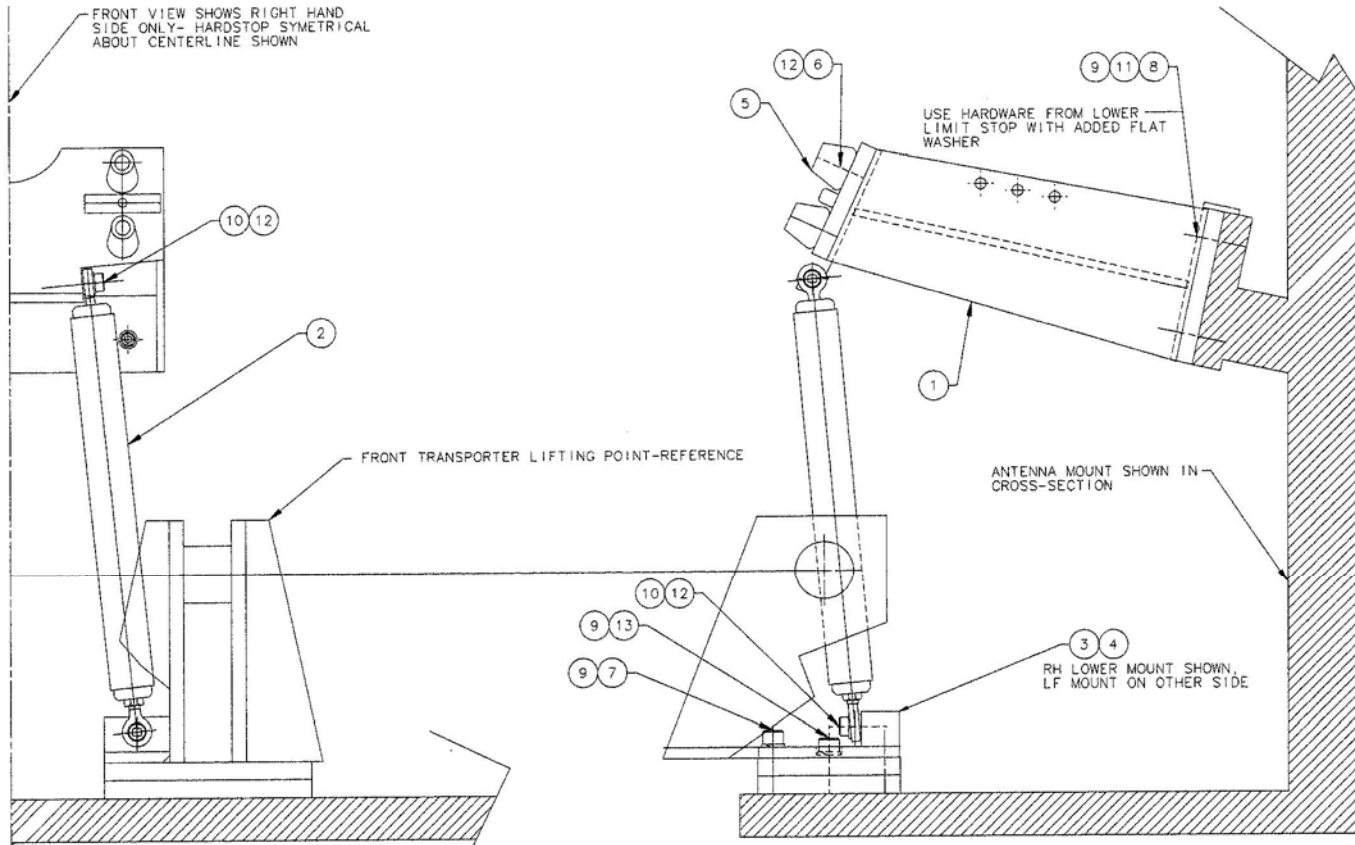


ELEVATION HARD STOP

- **A simple mechanical Elevation limit (Hard Stop) was developed to Allow 6 Antennas to operate within the Inner Ring on Pads 1-6.**
- **It has an Electrical switch that flags that the “Hard Stop” is in place and changes the Electrical Limits to Hard Limit values.**
- **It provides shock absorbers to limit the energy transfer to acceptable levels for both momentum and impact at the Hard limit.**



HARDSTOP DESIGN





SUB COMPACT ARRAY



ABSORBER

SUPPORT
COLUMNS

HARD STOP



SUB COMPACT ARRAY





07-08 Planned Antenna projects

- **Antenna 5, Azimuth encoder upgrade. This completes encoder upgrades.**
- **Antenna's 1, 2 & 3 Cryostat replacements and instrument upgrades. (200,300,400 & 600).**
- **Antenna 8, 400 Receiver installation and alignment.**
- **Antenna 5, Fire system installation and test.**
- **Atmospheric Phase Monitor installation and testing.**



ANTENNA PADS

- **Antenna Pad repairs and sealing has been working extremely well. We see no evidence of chipping, cracking or other damage. We will begin re-coating pads this year.**
- **All Pads have power installed.**
- **All Pads have Fiber connections except Pad 24.**
- **Pads 13 and 17 there has been no progress on their re-location.**



SUMMIT CONTROL BUILDING

- **Emergency generator is operational and tested.**
- **PACU has gone thru several software and hardware changes to improve its temperature stability, monitoring and fire safety systems.**
- **The Control room Oxygen enrichment system has proven to be effective in aiding staff to work at the summit. However it has required a fairly high level of maintenance.**
- **A Second Floor Fire Escapement building addition will be install this coming year. It is presently out for bid with construction firms.**



ANTENNA TRANSPORTER

- **The Transporters hydraulics system was upgraded and tested. This included: Hot oil shuttle, Hydraulics lines (exposed to UV radiation) replacements, Wheel motor replacement (leaking brake seal) and a full routine maintenance was performed.**
- **Testing revealed: Propel system pumps are aging, second wheel motor brake seal leaking, Left rear lift cylinder bushing displaced.**
- **The above problems will be addressed this fall.**



HILO OFFICE BUILDING

- **The Hilo Office building has adequate office space for the SAO/ASIAA staff with sufficient Laboratory space.**
- **We are working with all the MK Observatories and MKSS to improve and move the current High Speed network to the Southern Cross (giga-bit) Network.**
- **We will upgrade SAO Ethernet equipment for the internal (LAN) and External (WAN) connections to support the change to the Southern Cross Network.**
- **We plan to install a Gas Fire Control and Suppression system to protect our Computer equipment room.**



SMA HAWAII STAFFING

	SAO	ASIAA	VISITORS
Admin:	2	2	
Director	1*	1	*INTERIM
Sup. Astr	1	0	
Post Doc's	0	0	
Engineers	5	2	
Technicians	5	2	
Computer Operators	1	1	
Visitors	1	Dick Sramek (NRAO-Sr. Fellow-ALMA 3 Month sabbatical leave).	
Totals:	21	8	
Positions open: Director of Operations, Astronomer			