

SMA Operations



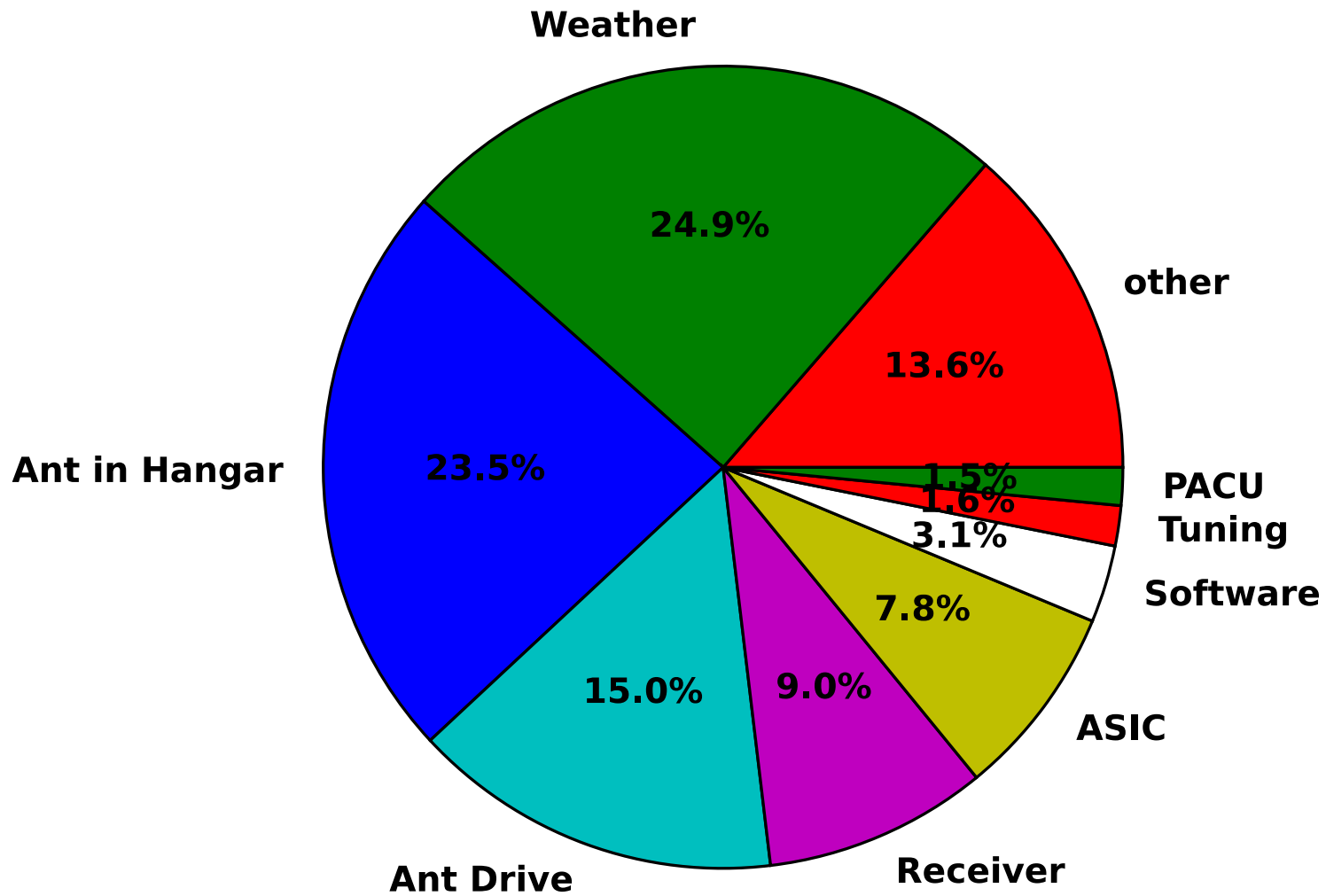
Time Lost Over the Last 3 Years

43849 Antenna-Hours lost (35.1%)

Ignoring Weather 26.4%

% of lost	Reason	% of lost	Reason
24.86	Bad Weather	1.25	Summit Power Failure
23.46	Antenna in the Hangar	0.71	Receiver Hardware
14.98	Antenna Drive Problem	0.70	Antenna Not Calibrated
8.79	Unclassified	0.37	Operator Error
8.32	Warm dewar	0.30	Server Computer Dead
5.92	ASIC Partially Broken	0.26	Script Error
3.11	Software Bugs	0.16	Optical Telescope Failures
1.89	ASIC Completely Broken	0.06	Dead Weather Station
1.62	Tuning Problem	0.05	6 GHz BDA Reference Lost
1.53	PACU Failure	0.04	BDA Power Loss
1.51	Getting SWARM Running	0.04	TMT Construction or Protests

Time lost over the last 3 years



Routine Receiver Maintenance

- Cryostats should be serviced every 20,000 hours (about every 2 years).
- Servicing must be done in hangar, takes 2 weeks, if nothing but receiver cryogenics needs servicing.
- Three antennas are over 20,000 hours right now. Antenna 2 has 35,000 hours. Current average 14,800 hours.
- Four antennas should be serviced per year. That alone would bring our average track down to 7.8 antennas.
- The receivers are getting older and will not last indefinitely, within the last 3 years 2 cold heads have become unreparable.

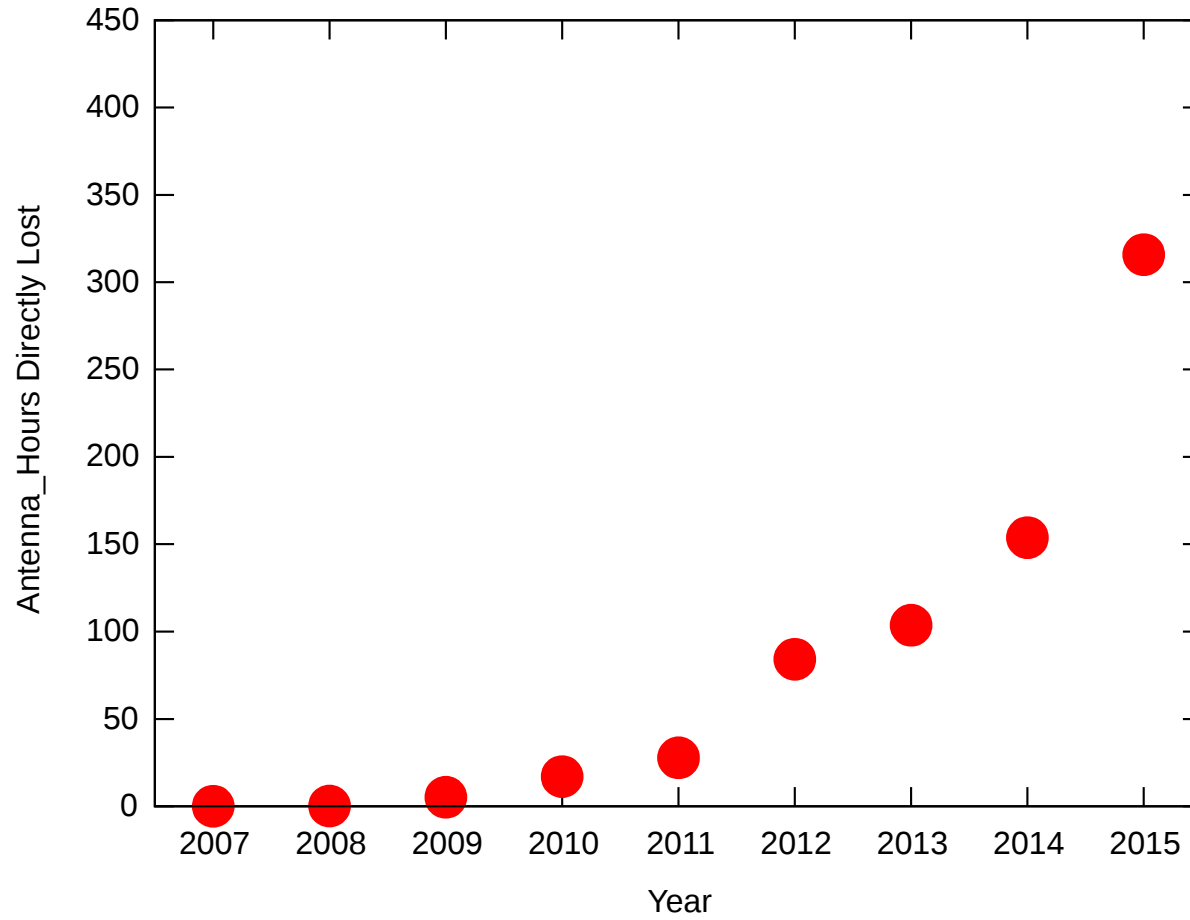
Antenna Drive Problems

- Seven of the antennas (all except antenna 2) have needed elevation drive servicing during the last three years
- A fault was discovered in the alignment procedure. Alignments should be more accurate from now on.
- Ram Rao has been doing alignment with theodolite.
- Seven of the antennas (all except antenna 2) now are lubricated by grease rather than oil, which should prevent lubricant leakage into motor cavities, etc.
- Currently all eight antennas are operational.

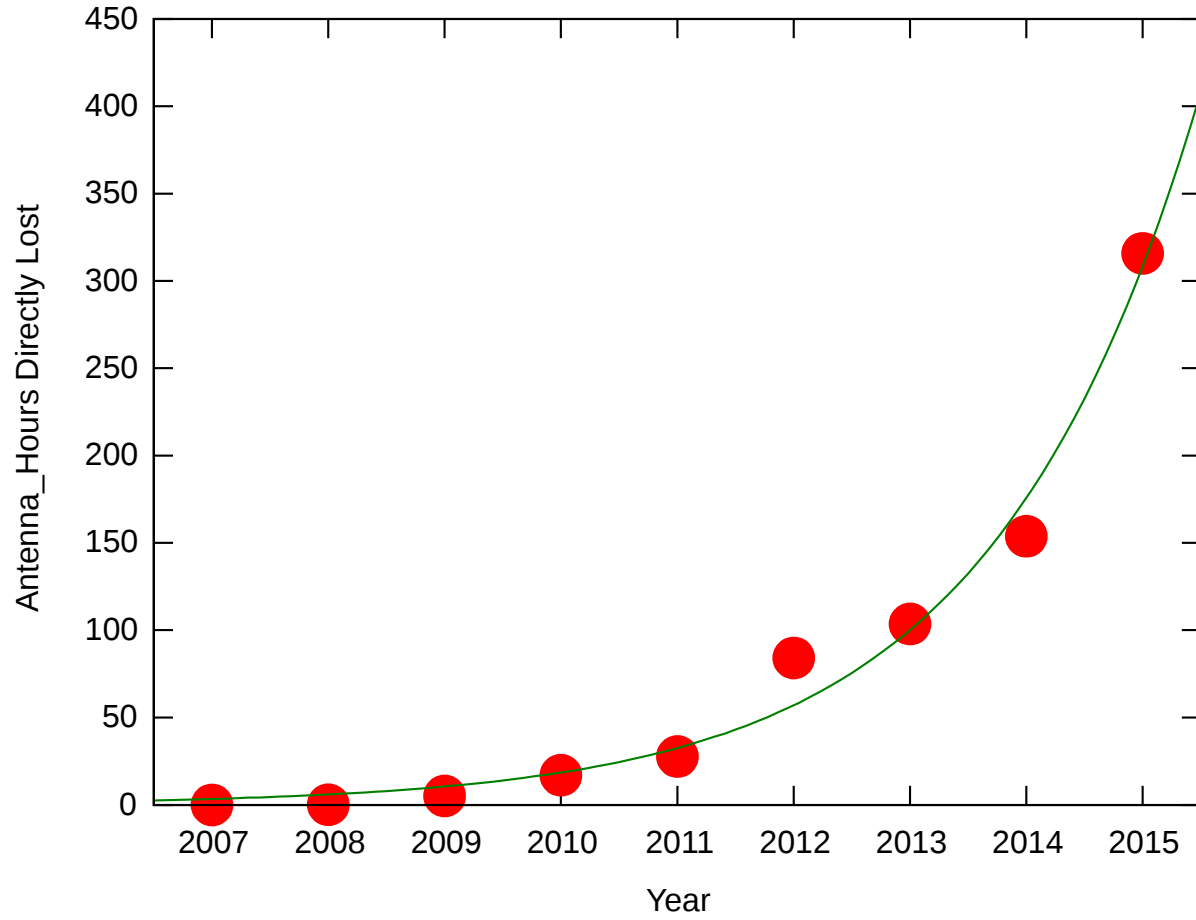
Power Failures by Year

Year	Number of Power Failures	Time Directly Lost
2007 (May→Dec)	0	0.00 Antenna Hours
2008	1	0.07
2009	5	5.07
2010	3	17.0
2011	3	27.7
2012	13	84.2
2013	14	103.6
2014	25	153.8
2015	23 (projected)	315.8 (projected)

Time lost due to summit power failures



Time lost due to summit power failures



- So little time was lost to Power Failures pre-2007 that we did not bother to log them.
- Time loss logged to Power Failures does not include dewar warmups.
- Dewars usually cool back down automatically after a power failure, but 15-20% of the time they do not.
- 2015 is on track to lose ~1600 Antenna Hours due to dewar warmups – the most ever.
- Extrapolating implies we'll lose power forever in 2014.

Ice Storm January 2015

- A prolonged power failure occurred during an ice storm on January 4, 2015.
- The summit was abandoned.
- The temperature in the Control Building fell below freezing.
- Pipes broke, an estimated 100 – 200 gallons of water leaked.
- Equipment in the Correlator Room and Receiver Lab had water damage, GPS antenna was damaged.
- Observing resumed January 10.
- Pipes have been insulated now.

ASIC Correlator Problems

- We inherited the JIVE correlator boards, so we have plenty of spares correlator boards.
- We have no functional spare C2DCs right now.
- One of the correlator crates has been down due to a power supply failure for more than 2 weeks, reducing ASIC to 5/6 BW.
- We have no functional spare power supplies, two are out for repairs. They are nearly 20 years old, with a rated service life of 10 years.
- We often see chunks with bad amplitude closure and other problems, probably due to C2DC or correlator board problems.

PACU Problems

- The PACU (Correlator Room air conditioner) has become increasingly unreliable.
- The cooling coils now occasionally ice over even in the absence of exterior ice buildup
- We've lost several days of observing time due to PACU failures
- The company which does our periodic PACU maintenance has been unable to fix the problem
- We don't yet know how much cooling we'll need after the ASIC correlator is de-commissioned.

Bandwidth Has Been Increasing

- Original design: 2 GHz IF coverage for 2 receivers.
- Bandwidth Doubler Assemblies added in 2009, increased single receiver IF coverage to 4 GHz.
- SWARM added 2015, increased single receiver IF coverage to 8 GHz.
- Additional SWARM quadrants will increase 2 receiver IF coverage, and eventually replace ASIC correlator.

SWARM (Current)

- The first quadrant of SWARM is running routinely now. It is easier to run than the ASIC correlator.
- SWARM currently runs at 8/11 speed (and bandwidth) but should be at full speed in early 2016.
- SWARM processes 1 receiver now, just needs software work to handle dual Rx and polarization.
- Each SWARM quadrant essentially duplicates the capabilities of the ASIC correlator (for a different portion of the IF).

SWARM (Coming Soon)

- The second quadrant is being brought on line now. (Late update: they got it running yesterday!)
- We will need to start decommissioning the ASIC correlator around the time SWARM quadrant 3 goes in
- We are scheduled to have 4 SWARM quadrants running by the end of 2016. The ASIC should be gone by then.

Remote Observing

- Second shift is always run remotely. Monday – Thursday: Cambridge, Fridays ASIAA.
- Normally two first shifts per week run from Hilo.
- Missing second observers have forced 5-day remote 1st shifts.
- Remote 1st shifts save money, but make us more susceptible to power failures and TMT protests.