

VLBA Antenna Memo 100  
**Tiger Team, Mechanical Maintenance**  
**Kitt Peak, AZ**  
**October 10 – October 18, 2017**

Michael Romero  
November, 2017

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## 1.0 INTRODUCTION

The major maintenance visit was performed at the Kitt Peak site from October 10-18 2017. The mechanical maintenance team consisted of Dominic Zamora, Anthony Foss, Alvin Alvarado and Michael Romero. Site Techs Ray Mcfarlin, Duane Clark and Ed Soto assisted throughout. The following document details the mechanical maintenance/inspections performed during the visit.

## 2.0 APEX AND SUB REFLECTOR

The FRM was inspected thoroughly. The flex shaft was replaced during the inspection. The INA bearing pull test was performed with readings of 15 lbs CCW and 17 lbs CW. In addition to the inspection, the FRM was balanced by placing sub reflector at both long and short axis and releasing the brake. A total of three weights were removed from the top of the barrel. Ray performed positioning tests which did not fault, as was previously seen. The sub reflector mounting, cabling, and drainage was also inspected. Overall, apex and subreflector are in good shape, including paint.



## 3.0 QUAD LEGS AND DISH INSPECTION.

The quad legs and hardware were inspected along with checking the quad leg flange bolts. Rust inspection and “hammer test” were performed to ensure the mechanical integrity of the quad legs remained. As would be expected in a dry environment, the rust was minimal and concentrated around the bottom drain holes. Flange bolts were checked for tightness. The guy wires and turn buckles were also inspected. Guy wires were still taught with minimal corrosion on turn buckles.



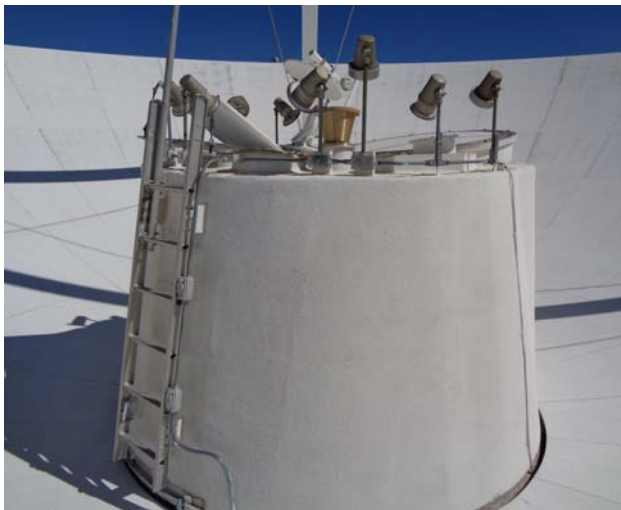
The dish surface was inspected and found to be free of major dents or holes. The paint is starting to fade in areas, as shown in pictures. Panel bolts were spot checked for tightness, all fasteners checked were still acceptable.





#### 4.0 FEED CONE INSPECTION

The dichroic panel was replaced because it was cracked in the corner. The feed cone hardware and windows were inspected and all looked in good condition. The ellipsoid paint is starting to peel as indicated in the images below. The feed cone insulation had a few cracks that were addressed with silicone. Ray McFarlin indicated that they plan on recoating the surface in the near future. The heater hardware and overall condition of the “dog house” was good.





## **5.0 ELEVATION PLATFORM AND BEARING INSPECTION**

The elevation bearing grease was inspected for metal for both bearings. Both sides had very clean grease. The grease pans were cleaned and both bearings were re-greased. Both axles and surrounding structure was inspected for cracks or wear. Elevation was ran back and forth, no popping or grinding noises from the bearings.



Both elevation platforms and catwalk were inspected. Overall in good condition. There are a few areas that can be touched up with paint, but structurally sound. Catwalk and pins, and all stairways on elevation platform appeared in good condition, other than could use paint as well. Jib-arm and joist looked in good condition, cable did not show excessive wear or frayed strands.



The bull gear, pinon gear, counterweights, and hardware were inspected on the elevation platform. Both bull and pinon looked good and were adequately lubed. Both elevation gear boxes were inspected and found to be in decent shape. There were no visible leaks and gearbox oil samples from both gearboxes did not show any signs of metal. Both gearboxes are scheduled to have oil changed in February. The gearbox to motor couplings were replaced for both gearboxes. Additionally, both lube pump couplings, and two leaking flow gauges were replaced. When running, no popping or grinding could be heard from either gearbox or bull gear.



The duration of the maintenance visit the antenna structure was checked over for cracked welds, rusted members and overall condition. Bolts were spot checked for tightness with no loose bolts found. Backup structure could use some touch up paint, but overall good condition. Welds and structure near elevation bearing showed no signs of cracking or fatigue. VTX room and external

“tanks” all looked in good condition. One section of the stair case on lower structure was badly rusted so we repaired it as shown below (before left, after right).



## 6.0 AZIMUTH WHEEL AND BEARING INSPECTION/REPLACEMENT

The idler and drive wheel bearing grease was inspected (except drive 2 being replaced). The idler grease was clean with no large particles or excessive metal flake. The bearing spanner nuts and lock rings were all still in place. The bearing grease from drive #1 did have some small metal flake but not an excessive amount. All wheel bearings were re-greased after inspection.



Drive wheel #2 was replaced during the maintenance visit. Once stubborn bolts were torched off, the old wheel was removed with ease but the new wheel was very difficult to install. Once installed, it was apparent the axle length was too long. After measurements and discussion with mechanic, it was determined the axle length was left too long. Additionally, the short coupling intended for Pie Town was installed instead of standard coupling. Images below show the position of wheel with axle butted up to gearbox output shaft.



It was decided the extra length would be cut using cut off wheels. For all future wheel assembly builds, engineering shall inspect dimensions and the axles should be cut off at the coupling.



Once cut, the wheel installation was much smoother. The wheel was aligned using standard procedure. The following table details the AZ wheel #2 alignment

<b>Azimuth Drive Wheel #2</b>		
<b>Measured</b>	<b>Spec</b>	<b>Drive #2</b>
Horizontal	<.023°	.018°
Vertical	93.440 +/- .010	93.440
Radius	300.00"	299.67"
Axle Run Out	<.005	.002 max

Both azimuth gear boxes were inspected and found to be in decent shape. There were no visible leaks and gearbox oil samples from both gearboxes did not show any signs of metal. As with the elevation gearboxes, both gearboxes are scheduled to have oil changed in February. The gearbox to motor couplings were replaced for both gearboxes. Additionally, both lube pump couplings, and one leaking flow gauge (drive #1) were also replaced. When running, no popping or grinding could be heard from either gearbox.

## 7.0 PINTLE BEARING INSPECTION

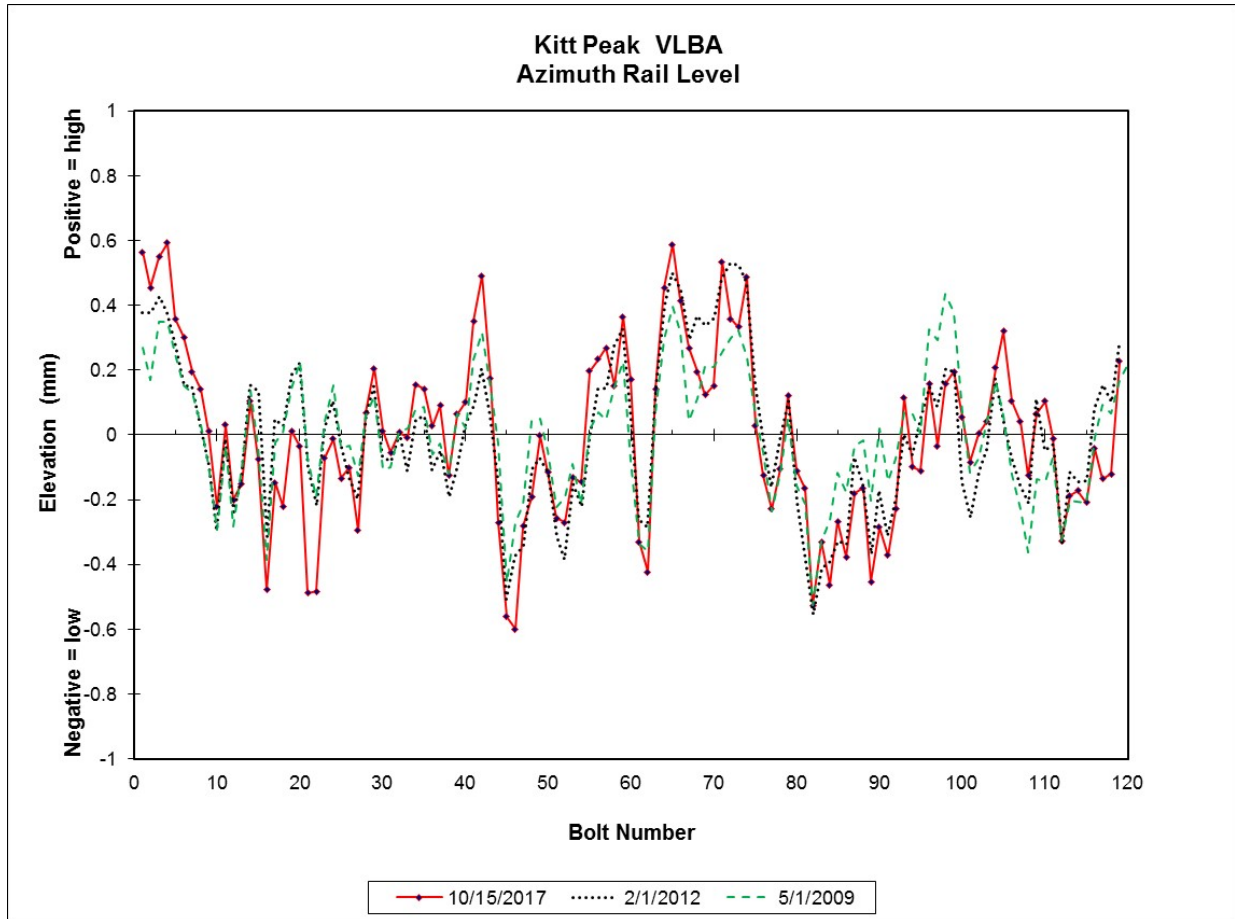
The pintle bearing grease trap was cleaned and grease inspected. Grease was in good shape, no large metal particles or excessive metal flake. Pintle bearing was re-greased after inspection. Cable wrap and cables were inspected along with cable wrap support structure. All looked to be in good operating condition. Plastic cable protectors were all in place. Bolts were spot checked, found no loose fasteners. The snake pit window was in decent condition and not replaced.





## 8.0 AZIMUTH RAIL INSPECTION

All the splice plate bolts were checked for tightness. Splice plate located at bolt #1 was relatively loose and was tightened. All splice plates were in decent shape. The rail grout looked to be in very good shape compared to other sites. The rail elevation was measured using the recently re-calibrated Wild N3 level.

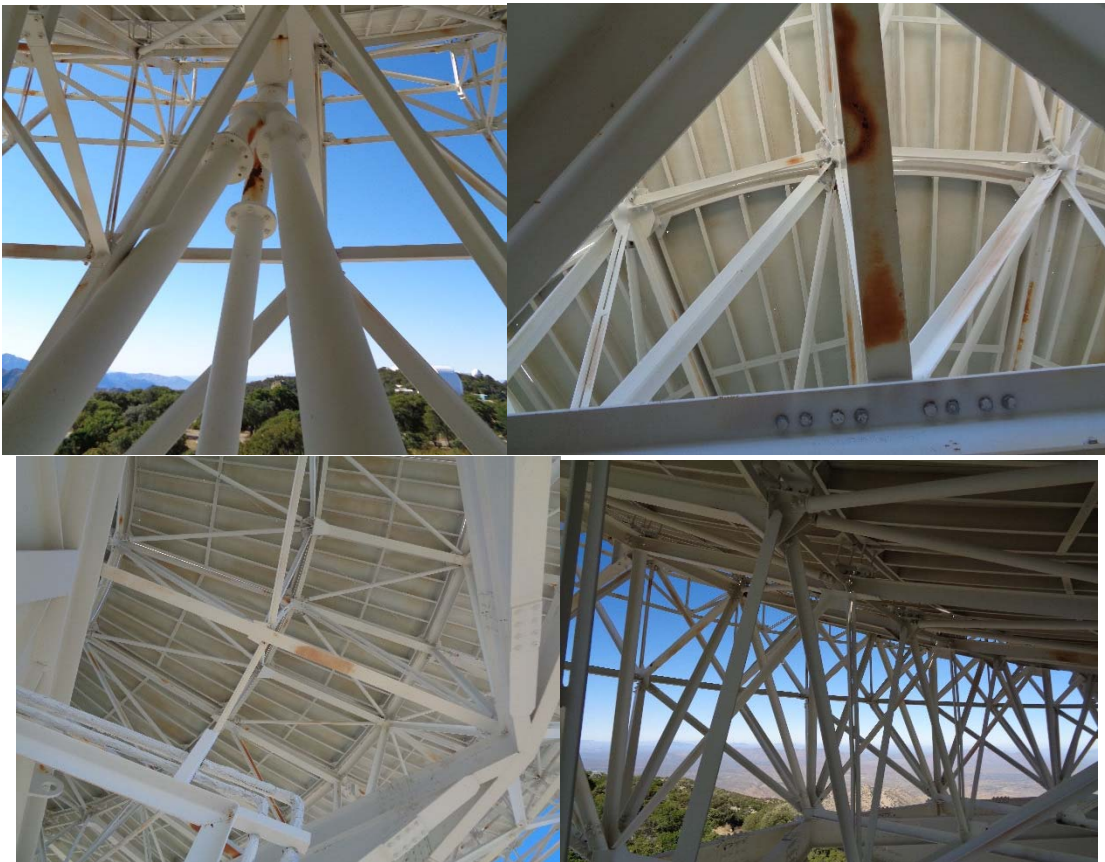


## 9.0 ANTENNA PAINT/INSULATION

Two section of insulation covering was missing from the support structure. Aluminum flashing was installed to replace the damaged panels.



The antenna paint is in decent shape. There are some areas that need paint touch up as there is rust beginning to show through the paint.



## **10.0 CONCLUSION**

Overall maintenance visit went well. More care and oversight will be involved for the next wheel assemblies to prevent another mistake like the long axle. The team overcame the obstacle and finished the visit with no real issues. It would also be a good idea for the antenna mechanics and supervision to become better familiarized with maintenance container, as the mechanic primarily responsible for organization is no longer involved. Too much time was spent looking for items.