2016 NCAR ARISTO Campaign MTHP Preliminary Report
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The Jet Propulsion Laboratory (JPL) participated in the ARISTO 2016 campaign logging a total of **21 ½ operational flight hours on the aircraft without major hardware issues over the six research flights**. The instrument was mounted on a C-130 aperture plate allowing for a number of installation locations on either side of the aircraft. The design and fabrication of the mount was performed by the NCAR staff, and completed rapidly (~3 months). Figure 1 shows part of the drawings generated and the final installation location on the aircraft. In the final installation location the instrument was angled 12° off the C-130 centerline.

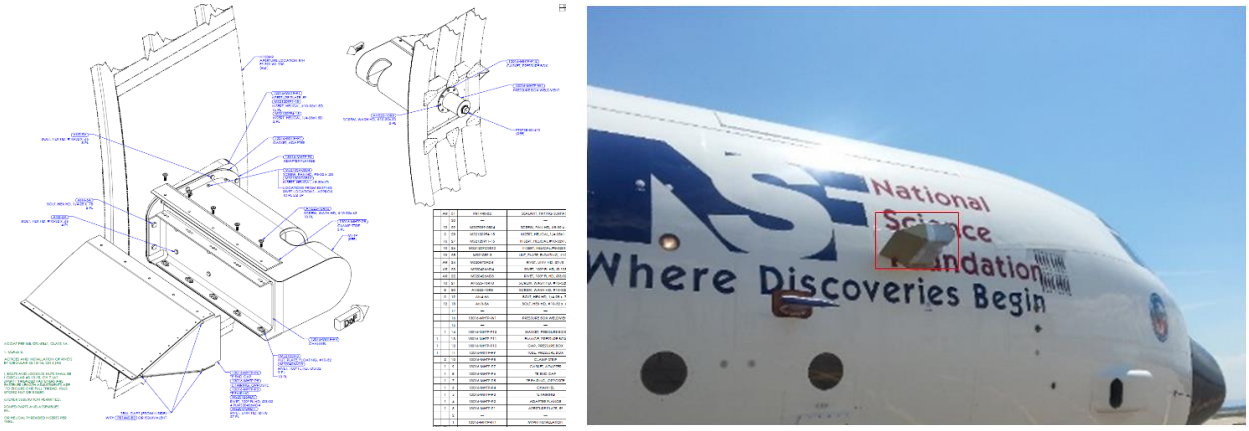

Figure 1. (Left) MTHP mount design drawings (Right) MTHP mounted on the NCAR C-130

During the flights, no instrument operator flew onboard the aircraft. The MTHP was monitored remotely via a combination of NCAR utilities – Xchat and Aeros. A subset of instrument data was delivered in real-time to the MTHP scientist monitoring the instrument remotely, either at the Research Aviation Facility (RAF) or at JPL. This allows for the instrument to be operated anywhere a reliable internet connection is available, with the real-time link. The instrument operated nominally during the flights, and resets were only performed to re-enable the real-time communications link, which was tested for the first time during ARISTO 2016. By the last research flight, a patch was applied to the software, and the MTHP operated uninterrupted for the duration, almost 12 hours.

Data analysis is currently on-going. While the instrument is operating nominally, there appears to be added noise interference on the 60 GHz channels. This is typical of new instruments with installation on new aircraft. We can mitigate some of this noise in post processing, but in the future hardware mitigation can be attempted – including added shielding, line noise suppression, etc. Figure 2 shows a sample of the larger noise levels on the 60 GHz channels from the RF02. This is evident from the 'thickness' of the spread in the blue line (58.36 GHz) compared to the red line (178.84 GHz).

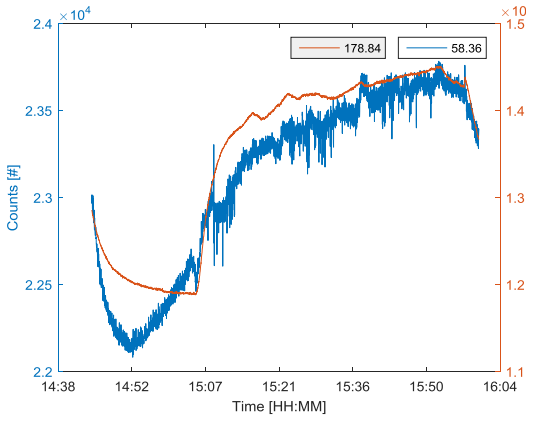

Figure 2. Channel comparisons showing the larger noise levels on the 60 GHz channels

Figure 3 shows the raw data for a single scan for all 183 GHz channels. The blue x's indicate the ambient

load, and the red x's the hot target. The scene data is from 180° (zenith) to 270° (flight level) to 360° (nadir). It can be seen that for the more transparent channel (178.84 GHz) the temperature deflection is significantly larger. From this scan set, there is structure in the water vapor field ahead of the aircraft. Level two product retrievals will follow shortly.

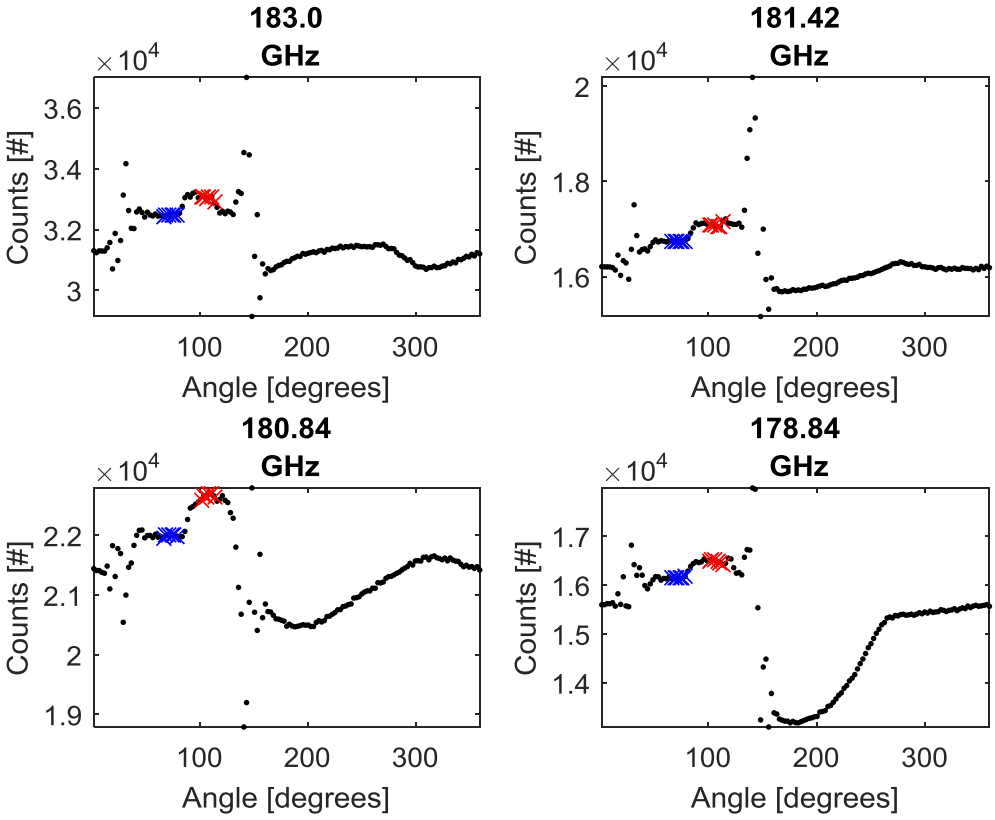

Figure 3. Scan data for the four 183 GHz channel from RF06

A major benefit from ARISTO 2016 will be the integration of the available dropsonde data as a comparison product for the MTHP to verify performance.

Summary

The MTHP is mechanically ready to fly on the NCAR C-130 with the aperture plate mounting successfully tested and verified. Data analysis is ongoing, however external noise is evident in the 60 GHz channels and will be mitigated in the current dataset through software means. For future installations, hardware methods can be applied to minimize the noise. Data post-processing in ongoing, but the raw data is as expected. Level 2 products will be produced by the end of the calendar year 2016 and compared with the data available from the dropsondes. **The MTHP objectives for ARISTO 2016 was to qualify the instrument for flying on the C-130, uncover unforeseen installation issues and determine instrument performance characteristics. All objectives will be accomplished by the end of 2016.**

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