

McDonald Geodetic Observatory

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Abstract This report summarizes the technical parameters of the VLBI system at the McDonald Geodetic Observatory and provides an overview of the activities that occurred in 2021 and 2022.

1 General Information

The McDonald Geodetic Observatory (MGO) is located within the McDonald Observatory (McD), 16 miles north of Fort Davis, Texas at an elevation of 6,260 ft in the valley/basin between Mt. Fowlkes and Mt. Locke. MGO is located at longitude 30°40' N and latitude 104°1' W.

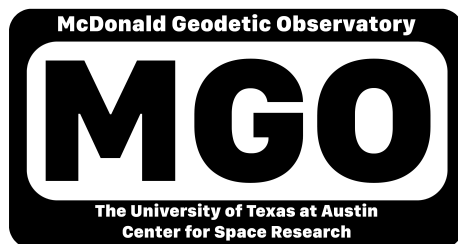


Fig. 1 MGO logo.

The McDonald Geodetic Observatory is a collaborative effort by The University of Texas at Austin's Center for Space Research within the Cockrell School

The University of Texas at Austin / Center for Space Research

MGO Network Station

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of Engineering and McDonald Observatory within the College of Natural Sciences and NASA's Space Geodesy Project.

The McDonald Geodetic Observatory consists of several geodetic elements, such as an SGLSR installation, operational in FY2025, several GNSS stations located in different areas, and a Gravimeter which is operated by associates at UT Jackson School of Geosciences.

2 Activities during the Past Two Years

During the 2021 calendar year, MGO continued operations with VGOS/VT/S2 sessions, although a number of these sessions were observed with a warm front-end due to a faulty cold head and lack of training to replace the cold head.

At the end of COVID-19 we began accepting visitors and contractors for the much needed completion of several tasks, although onsite operations remained the same. We were able to receive onsite training from MIT staff, our cold head was replaced, and MGO staff are now fully trained in cryogenic maintenance. At the beginning of 2021, we also experienced a state-wide power outage for a week, aka the 'February Winter Storm' in Texas, which caused MGO to miss one VGOS session. During 2021, MGO also began S2 Intensives with the Wettzell South station, and so far it has proven to be a good data point and a good resulting baseline. The S2 Intensives also aided Wettzell in becoming a correlation station. MGO also began routine e-transfer procedures for Intensives, utilizing a 1 Gb/s AT&T line.



Fig. 2 MGO/McD site overview.

During the 2022 calendar year, MGO continued operations with both VGOS sessions and Intensives/tests with Wettzell South. The Wettzell Correlation Center had a fast turn-around for the Intensive and test sessions because MGO was able to e-transfer scans overnight utilizing our 1 Gb/s line, and correlation took place the following day. We also calibrated our onsite RF analyzers in order to better understand and troubleshoot our front-end signals with remote assistance from the MIT Haystack staff. MGO was also able to coordinate and install a live feed video camera system that broadcasts VLBI video to the public, utilizing the YouTube live feed feature. MGO also makes our onsite weather information publicly available, utilizing the Ambient Weather hardware and website. The website based on these features can be seen here: <https://www.csr.utexas.edu/mgo/mgo-live-view-of-vlbi-station/>.

The MGO station also experienced a number of problems during 2022. The first major issue was a mechanical break in the primary elevation motor coupler, which was unexpected and was never seen in other installations before occurring onsite. MGO was able to recover with assistance from ISI and with a new coupler being shipped to MGO from Canada. After the coupler was replaced, we were operational but had remaining issues with the manual hand crank operations, which are set to be resolved in March 2023. Other issues or failures we've seen include an AZ encoder failure, timing inconsistencies, antenna controller issues, LMR400 cable replacement, and cryogenic system issues. But through all of these issues and failures, MGO has continually repaired or replaced components onsite in order to continue the operations schedule set forth by IVS.

MGO also began investigation into the possibility of obtaining a 10 Gb/s line that would help to improve and speed up the e-transfer capabilities. This task has taken a lot of effort from onsite staff and the McDonald Observatory department as well as The University of Texas's Office of Telecommunication Services (OTS) department. The project would still be under the same overview of OTS with the same IP address space but would utilize a fiber path controlled and installed by a local telecommunications company which would offer better reliability and local support for this future installation.

Table 1 Sessions completed for 2021 and 2022.

All Sessions	2021	2022
Scans Scheduled	24,431	59,800
Scans Captured	24,265	56,210
Percentage Completed	99.32%	94.00%

3 Current Status

Currently, the MGO VLBI station is fully operational. We recently replaced a failed M700 compressor with a spare compressor from the KPGO site. Our cryogenic compressor is being rebuilt, and a new compressor was ordered by Peraton for future spare capability. The compressor required onsite troubleshooting utilizing Trillium tech support and, once operational, we could begin testing and operations with a cold front-

end. MGO also had to replace the installed fiber lines which feed the back-end equipment due to poor strain relief located at the front-end. This included the signal fiber for H and V polarization, as well as control fibers for our roughing pump and turbo pump.

4 Future Plans

MGO is looking forward to continuing operations with the planned 10 Gb/s line that is still under review. With continual issues/failures, local staff are continually learning and repairing systems onsite with the hope to eventually understand all of the antenna's systems and be prepared to continue operations no matter what other issues/failures occur. In time, we also hope to be able to pass along that knowledge and provide support to future VLBI stations.