

Confirming a tentative detection of ultra-rare cosmologically distance OH absorption

Abstract

The molecular hydroxyl radical (OH) gas is widely distributed in galaxies and is expected to trace the total molecular H_2 gas as well as measure the variations of the fundamental constants at cosmological distances. However, despite the frequent detections of OH in our Galaxy, such detections at cosmological distances are very rare with only six known at $z > 0.05$. PKS 2300-18 is a radio source against which the OH 1665 and 1667 MHz absorption lines were detected. However, the detection significance is low due to the poor sensitivity. In this proposal we will use the MeerKAT telescope to observe this target to confirm or refute the OH detection. Moreover, the large L-band bandwidth covers the frequencies of redshifted OH 1612 and 1721 MHz and HI 21-cm lines, which allow us to detect them. If all OH 18-cm lines and HI 21-cm line are detected, we can not only test the correlation between OH 18-cm absorption depth and V-K color (Curran 2021) but also be able to measure the variations on the fundamental constants at a look back time of 1.6 Gyr through comparing these transitions. In total, we request 2.9 hours including overheads.