The University of Texas at San Antonio

UTSA Physics and Astronomy

Qualifying Exam

Michael Velez

Date: **Wednesday, June 22, 2022**

Time: **8:30am/CT**

Advisor: **Dr. Kurt Retherford**

Abstract

Investigating Europa's Atmosphere: Hubble Space Telescope Analysis and Europa-UVS Stellar Occultation Preparations

Europa's tenuous atmosphere remains poorly constrained to this day. What we know is that it is primarily composed of O_2, with a concentration of H_2O near the subsolar point, and surrounded by an extended neutral cloud with an abundance of H_2. One of the main tools used to study this atmosphere has been the Hubble Space Telescope (HST), as it covers many important wavelength ranges that are essential for atmospheric research. The best science for Europa will come when NASA's Europa Clipper mission arrives at the system in the upcoming decade. This study will focus on 3 main objectives working toward further understanding the atmosphere and preparing for the upcoming mission. The first objective will be to establish a stellar occultation quality algorithm to ensure that Europa Clipper's Ultraviolet Spectrograph (UVS) will achieve its optimal science goals. This will be done using a robust stellar UV catalog containing both known and modeled spectra for each star. The second objective will be to analyze Europa's optical aurora. This will be done using HST visible spectrograph images during times when Europa is in Jupiter's shadow. The final objective will be to characterize and constrain H_2 at Europa. This will be done by using a large number of HST UV spectrograph images to compile a spectrum that can be fit with an H_2 emission model.

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