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Author: Mr. Khalid Badri
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates, khalid.badri@mbrsc.ae

Dr. Christopher Edwards
Northern Arizona University, United States, christopher.edwards@nau.edu
Mrs. Eman AlTunaiji
MBRSC, United Arab Emirates, eman.altunaiji@mbrsc.ae
Dr. Philip Christensen
Arizona State University, United States, phil.christensen@asu.edu
Dr. Michael Smith
NASA, United States, michael.d.smith@nasa.gov

EMIRATES MARS MISSION: EMIRATES MARS INFRARED SPECTROMETER (EMIRS) OVERVIEW

Abstract

The Emirates Mars Mission (EMM) launched in July 2020 and has successfully entered Mars Orbit on 9th of February 2021 to explore the diurnal and seasonal dynamics of the Martian atmosphere on a global scale. The Observatory has three scientific instruments on board; the Emirates Exploration Imager (EXI) and Emirates Mars Infrared Spectrometer (EMIRS), will investigate the lower atmospheric constituents: dust, ice clouds, water vapor, ozone, and the three-dimensional global thermal structure of both the lower atmosphere and the surface. The Emirates Mars Ultraviolet Spectrometer (EMUS) will observe the upper atmosphere, enabling important links between the lower atmospheric dynamics and the thermosphere and exosphere of the planet to be explored. This presentation will include an overview of the EMIRS Instrument characteristics and its scientific importance for the Emirates Mars Mission. The EMIRS instrument is an interferometric thermal infrared spectrometer developed by Arizona State University (ASU) and the Mohammed Bin Rashid Space Centre (MBRSC). It builds on a long heritage of thermal infrared spectrometers designed, built, and managed by ASU's Mars Space Flight Facility. Comparing EMIRS to its heritage line, it has enabled a relatively small (50x30x30cm), modest mass (17kg) and relatively low power requirements (21W) without sacrificing measurement performance and reliability. EMIRS instrument collects spectral data from 6- 40+ μm at 5 and 10 cm-1 spectral sampling, which is enabled by a Chemical Vapor-Deposited (CVD) diamond beam splitter and digital interferometer control electronics. This instrument utilizes DLaTGS detectors and a scan mirror that enables it to make high-precision infrared radiance measurements over a Martian hemisphere in 30 minutes. The EMIRS instrument performance, spectral coverage, and spatial sampling are optimized to capture the integrated, lower and middle atmospheric dynamics, collecting 60 observations per week (20 images per orbit) at a resolution of 100-300 km/pixel.