IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Science, Instruments and Technologies (3B)

Author: Mrs. Mariam AlShamsi
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates, mariam.alshamsi@mbrsc.ae

Mrs. Fatma Lootah
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates, fatma.lootah@mbrsc.ae
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
Dr. Michael Wolff
Space Science Institute, United States, mjwolff@spacescience.org
Mr. Greg Holsclaw
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, Greg.Holsclaw@lasp.colorado.edu
Mrs. Eman AlTunaiji
MBRSC, United Arab Emirates, Eman.AlTunaiji@mbrsc.ae
Dr. Andrew Jones
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, andrew.jones@lasp.colorado.edu
Dr. Justin Deighan
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, Justin.Deighan@lasp.colorado.edu
Dr. Michael Smith
NASA Goddard Space Flight Center Greenbelt MD 20771, United States, michael.d.smith@nasa.gov
Mr. Christopher Jeppesen
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, Chris.Jeppesen@lasp.colorado.edu
Dr. Michael Chaffin
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, Michael.Chaffin@Colorado.EDU
Dr. Philip Christensen
Arizona State University, United States, phil.christensen@asu.edu
Dr. Mikki Osterloo
Space Science Institute, United States, mosterloo@SpaceScience.org
Mr. Kush Tyagi
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United Arab Emirates, Kush.Tyagi@lasp.colorado.edu
Mr. Ralph Shuping
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, rshuping@SpaceScience.org
Dr. Robert Lillis
Space Sciences Laboratory, University of California, CA, USA, United States, rlillis@ssl.berkeley.edu

Mr. Charles Fisher
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, charles.fisher@lasp.colorado.edu
Ms. Hessa Al Matroushi
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates, Hessa.AlMatroushi@mbrsc.ae
Mr. Mohammed Khoory
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates, Mohammed.Abdulla@mbrsc.ae
Dr. Mathew Fillingim
Space Sciences Laboratory, University of California, CA, USA, United States, matt@ssl.berkeley.edu
Mr. David Summers
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, david.summers@lasp.colorado.edu
Mr. Ahmed AlShehhi
United Arab Emirates, ahmed.alshehhi@mbrsc.ae
Mr. Justin Knavel
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, justin.knavel@lasp.colorado.edu
Dr. Scott England
Virginia Tech, United States, englands@vt.edu
Mrs. Ginger Drake
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, Ginger.Drake@lasp.colorado.edu
Mr. SUHAIL AlMheiri
Mohammed Bin Rashid Space Centre (MBRSC), United Arab Emirates, suhail.aldhafri@mbrsc.ae
Mrs. Heather Reed
Laboratory for Atmospheric and Space Physics (LASP) at University of Colorado, United States, Heather.Reed@lasp.colorado.edu

KEYNOTE: EMIRATES MARS MISSION: SCIENCE INSTRUMENT 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 The Emirates Mars Mission (EMM) launched in July 2020 and 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), Emirates Mars Infrared Spectrometer (EMIRS), and the Emirates Mars Ultraviolet Spectrometer (EMUS). EXI and EMIRS will investigate the lower atmospheric constituents of dust, ice clouds, water vapor, and ozone as well as the three-dimensional global thermal structure of both the lower atmosphere and the surface. EMUS will observe the upper atmosphere, enabling important links between the lower atmospheric dynamics and the thermosphere and exosphere. The EMIRS instrument is a collaboration between MBRSC and ASU. It collects spectral data from 6–40+ m 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 Deuterated Lanthanum Alanine doped TriGlycine Sulphate (DLaTGS) pyroelectric detectors and a scan

mirror that enables it to make high-precision infrared radiance measurements over a Martian hemisphere in 30 minutes at a spatial resolution of 100–300 km/pixel. The EXI instrument is a collaboration between MBRSC and LASP. It is a multi-band, camera capable of taking 12 megapixel images with a spatial resolution of better than 8 km and well-calibrated radiometric performance. EXI uses a selector wheel mechanism consisting of 6 discrete bandpass filters to sample the optical spectral region: 3 UV bands and 3 visible (RGB) bands. Atmospheric characterization will involve the retrieval of the ice optical depth using the 300–340 nm band and the column abundance of ozone with a band covering 245–275 nm. The EMUS instrument is a collaboration between MBRSC and LASP. It is a far-ultraviolet imaging spectrometer that measures emissions in the spectral range 100–170 nm. Using a combination of one-dimensional imaging and spacecraft motion, EMUS will build up two-dimensional far-ultraviolet images of the Martian disk and near-space environment at several important wavelengths: the Lyman beta atomic hydrogen emission (102.6 nm), the Lyman alpha atomic hydrogen emission (121.6 nm), two atomic oxygen emissions (130.4 nm and 135.6 nm), and the carbon monoxide fourth positive group band emission (140-170 nm). This presentation will include an overview of the Instruments' characteristics and scientific importance for the Emirates Mars Mission. In addition to observational strategies and instrument status.