

Space Sector in the UAE

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Member: Emirates Mars Mission Science Mission Team, Muhammad Bin Rashid Space Centre

Member: Project Development Team, National Space Science & Technology Centre, UAE University

PI: Transient Radio Astronomy Project (TRAP), UAE University

External Collaboration: NASA Goddard Space Flight Centre; University of Colorado; Johns Hopkins University; University of New Mexico – USA | CSIRO; ICRAR; MWA; Square Kilometer Array (SKA) – Australia

My journey so far...

Chalmers, Sweden

ASTRON, The Netherlands

Curtin University, Australia

SHAO, China

NYU, USA/UAE

NASA JPL | CDSSC, USA/Australia

Harvard-Smithsonian CfA, USA

University of Johannesburg, South Africa

NASA GSFC, USA

UAEU/UAESA/MBRSC



The United Arab Emirates (UAE)







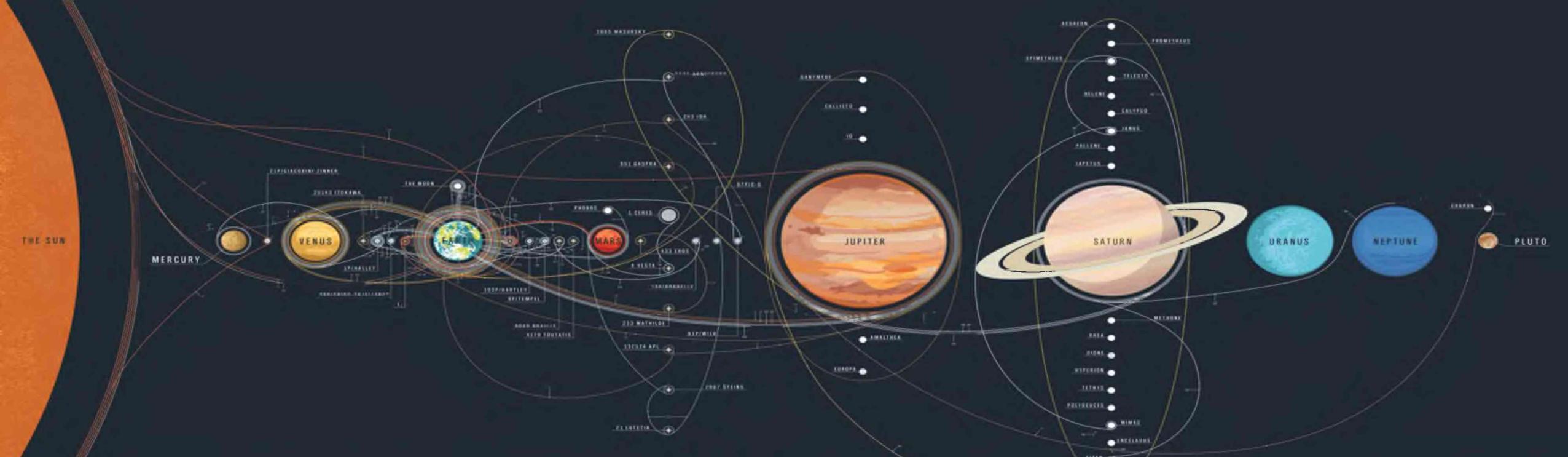
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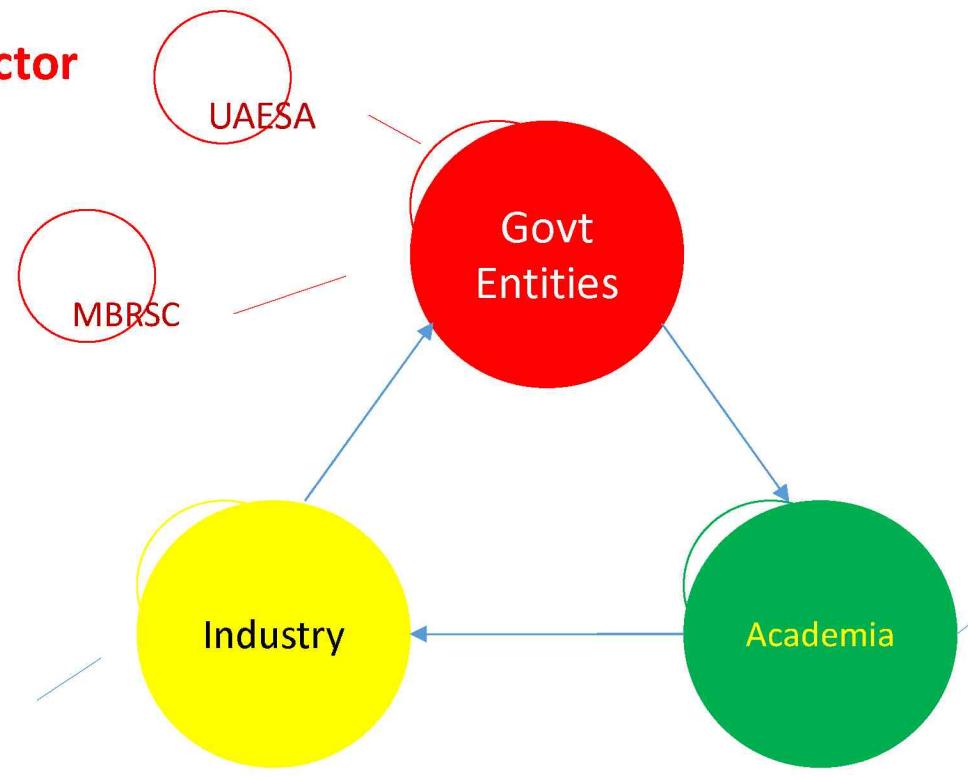
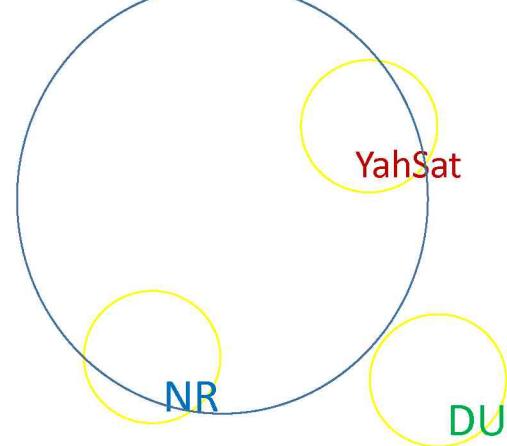
THE CHART OF COSMIC EXPLORATION



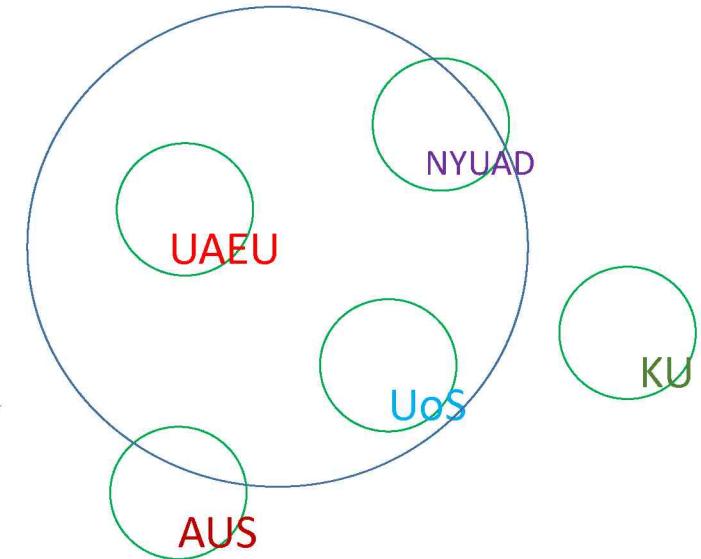
Global Radio Observatories Map



Emergence of UAE Space Sector



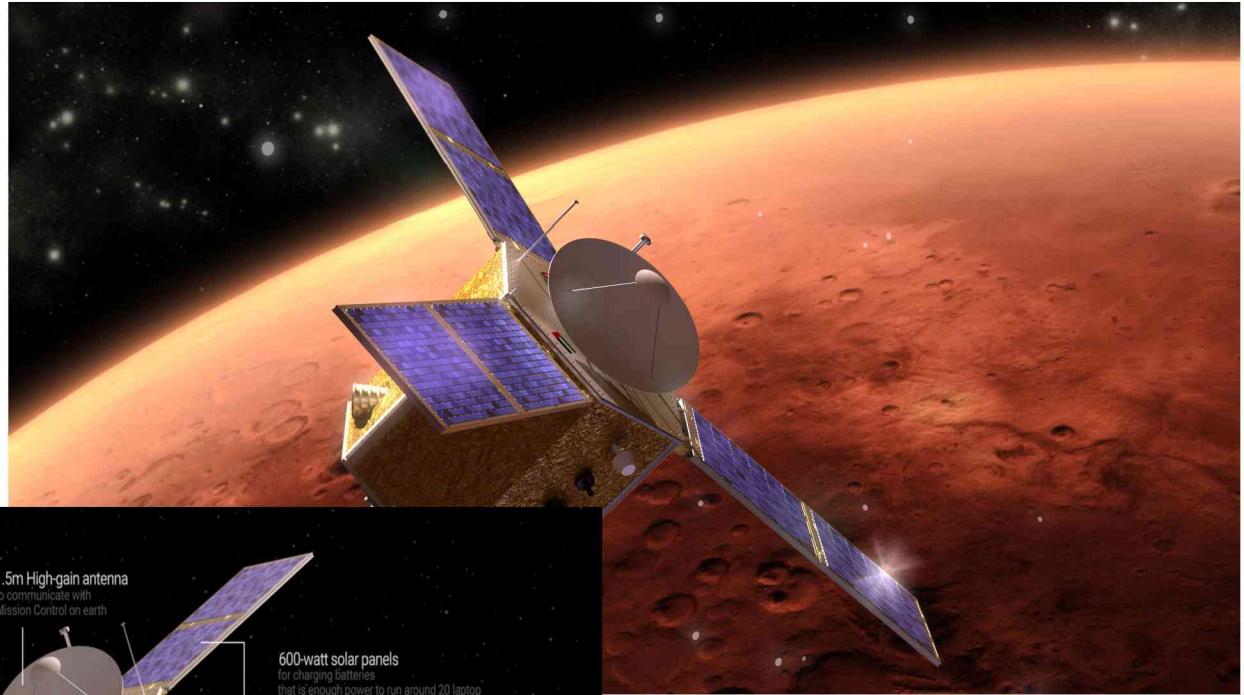
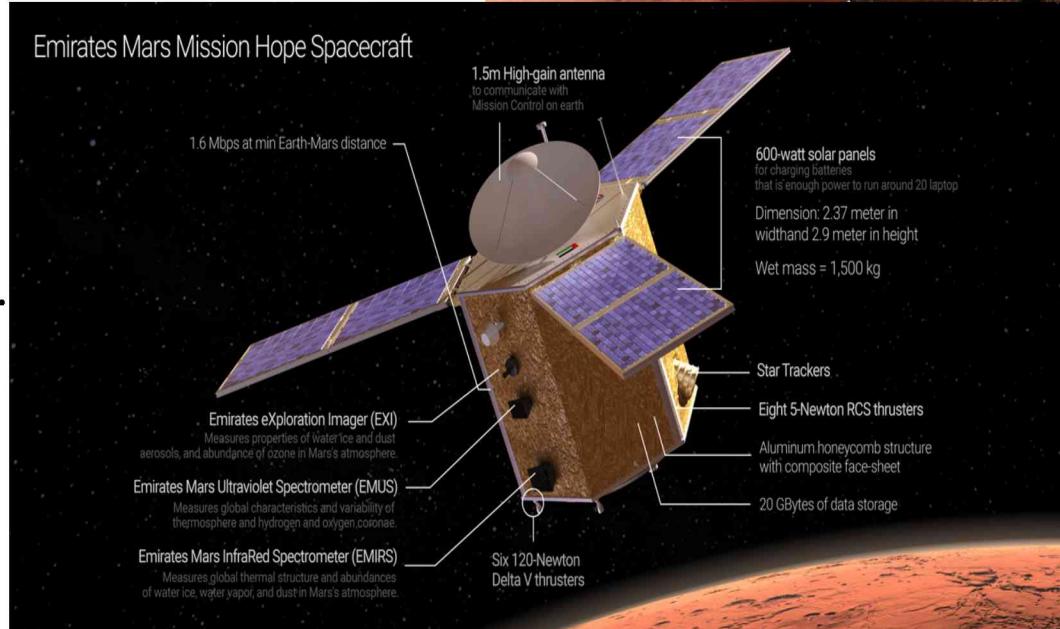
Need for a Space Ecosystem



Key Large-Scale Projects:

The Emirates Mars Mission: “Hope”

- Primary vehicle for the diversification of economy.
- Entry into the mainstream space arena.
- Development of support infrastructure:
 - Data Centers.
 - Tools & Applications.
 - Instrument development.
 - Ground Station(s).



Key Large-Scale Projects (2):

- KhalifaSat (0.7m): remote sensing satellite (2018).
- DubaiSat-1 (2.5m), DubaiSat-2 (1m): remote sensing satellites (2009, 2013).
- UAE Astronauts program (First: September 2019).
- Hyperspectral Mission.
- GNSSaS (LEO Augmentation).
- Ground Stations.
- Various small-satellite missions (awarded to universities).
- Mars Science City.
- Mars 2117.
- Massive Public Outreach.



United Arab Emirates University (UAEU), Al Ain - UAE:





UAEU Astronomy & Space Science Profile:

- Started off formally in 2016 with 1 Full-time Astronomy & Space Science Faculty member at the Department of Physics, College of Science (covering all frontiers!).
- 4 new Astronomy / Space Science faculty members have since joined in.
- 2 visiting faculty members coming in Fall 2019.
- 3 PhD, 4 Masters Students, postdoc hiring underway.
- Undergraduate students: a couple of dozen.
- Internal collaborations with faculty members at the Colleges of Engineering, Geography & Urban Planning, Geology, IT etc.

Collaboration & Cooperation:

International:

UNM/NRL, NASA, Max Planck Institute, Johns Hopkins University, CSIRO, Curtin University /ICRAR.
Working and open for more.

Local:

National Space Science & Technology Centre (NSSTC: for a Radio Science Lab), UAE Space Agency, MBR Space Centre, University of Sharjah , Abu Dhabi University, American University of Sharjah.

Establishment of UAEU Space Science & Technology Working Group (SSTWG)
Arab Union for Astronomy & Space Science (Bahrain, Kuwait, Jordan, Oman)

This guy

Dr. Aquib Moin



UAEU Astro & Space Science students



Astronomy and Space Science Education at UAEU:

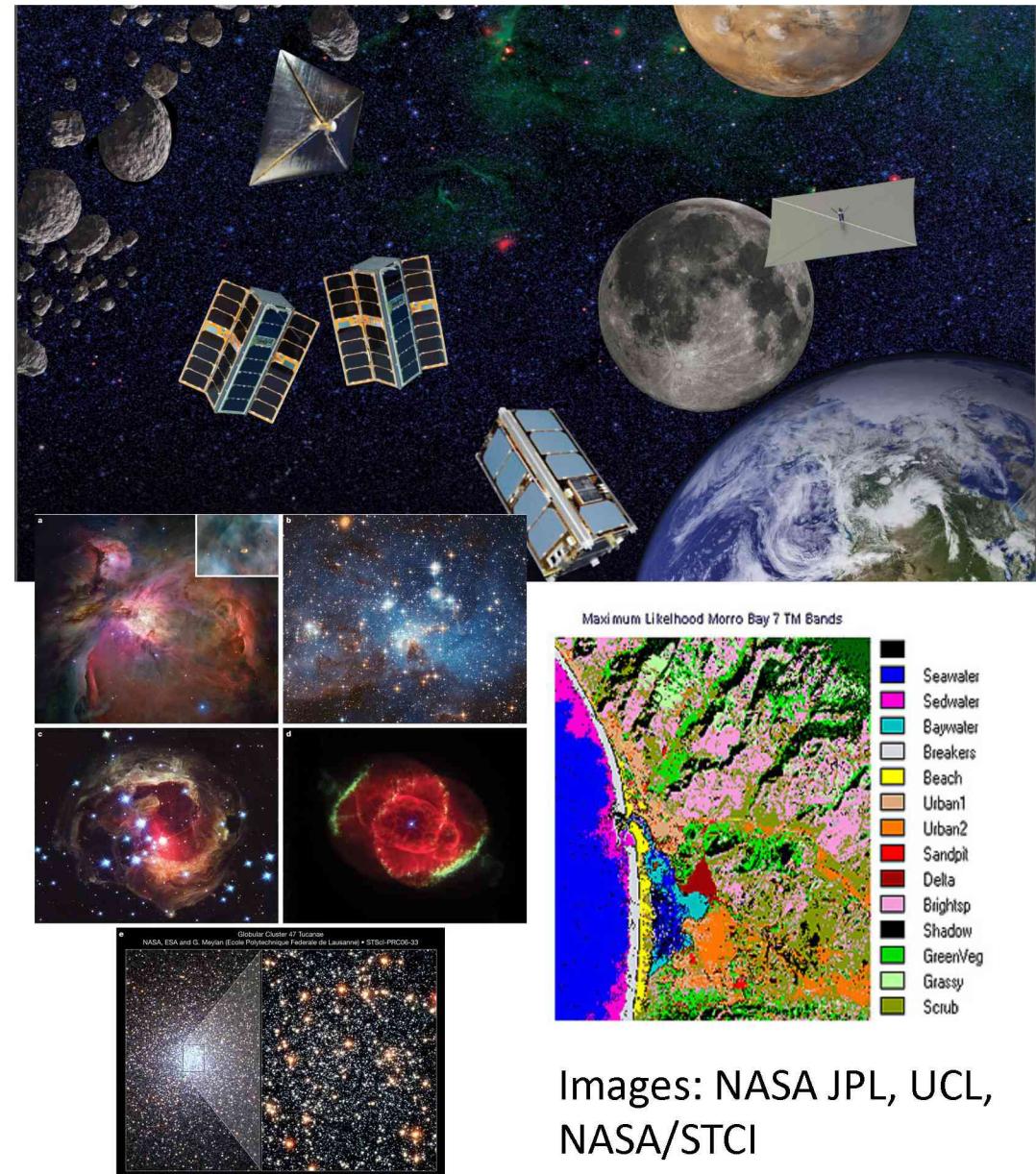
Bachelor of Science in Physics (Space Sciences); Minor in Space Sciences:

1. PHYS 200 - Introduction to Space Sciences
2. PHYS 270 - Celestial Mechanics
3. PHYS 310 - Space Missions
4. PHYS 320 - Spacecraft Instrument Science
5. PHYS 410 - Space Applications I
6. PHYS 420 - Space Applications II

Interdisciplinary MSc in Space Science

1. PHYS 562 - Astronomy and Astrophysics
2. PHYS 564 – Remote sensing for terrestrial & planetary surfaces
3. PHYS 566 – Atmospheric studies
4. PHYS 568 – Space Physics
5. PHYS 573 – Planetary Sciences
6. PHYS 577 – Spacecraft Systems

College of
Science / Joint
PhD Programs

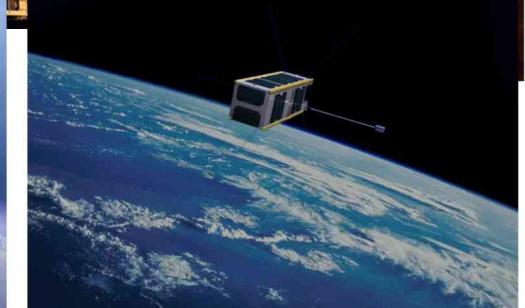
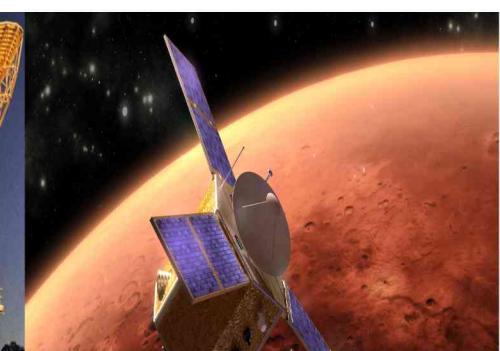
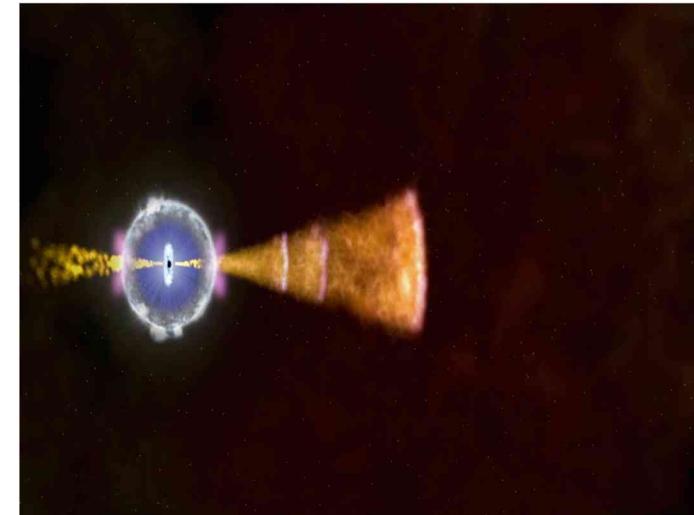
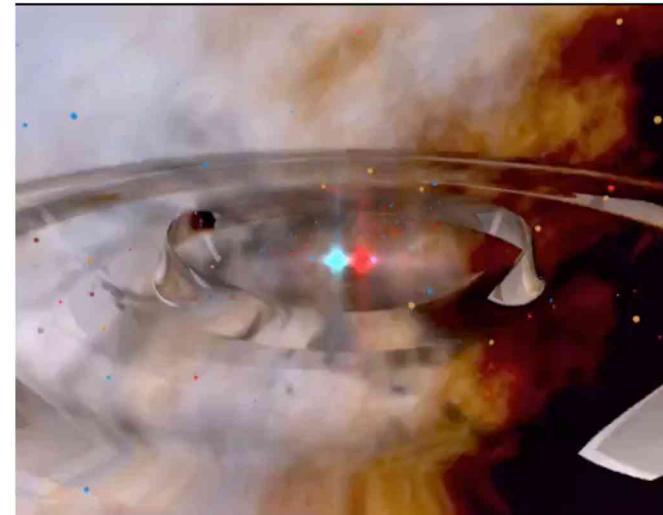




Astronomy & Space Science Research:

- Exploration of possible connections between Binary Black Hole mergers, Gravitational Waves and Gamma-Ray Bursts (**UAEU Grant 1**); [**LIGO, CSIRO, NASA GSFC, Max Planck Institute**].
- Radio and Multi-wavelength Studies of Gamma-Ray Burst progenitors (**ATCA, Fermi, Swift, GROND**).
- Low-frequency array type radio telescope (**UAEU Grant 2/3**) [**with University of New Mexico**].
- ULTRALITE: A CubeSat for pion-decay gamma-ray emission detection and monitoring, triggered by cosmic-rays: Nature, behavior and variability of cosmic rays. Test of novel drag sail mechanism (**UAEU Grant 4**) [**with College of Engineering – UAEU, University of Colorado, Johns Hopkins University, NASA Glenn**].
- **Others:** Low frequency Pulsar studies (**LWA-UNM**); Circinus X-1 (Neutron Star X-ray Binary) studies (**ATCA-ICRAR / Curtin University, CSIRO**), Mars Studies [**UAE Space Agency, MBRSC**]

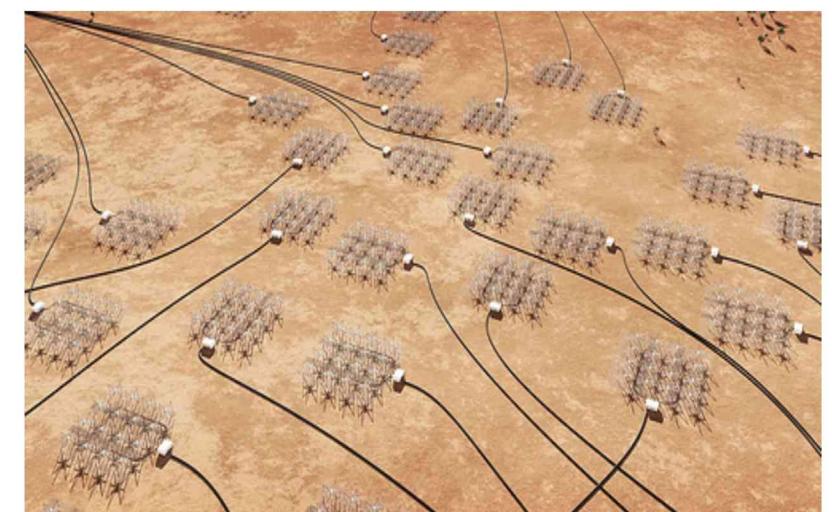
Images: NRAO VLA, ATCA CASS,
EMM MBRSC, NASA Fermi, ESO
Videos: LIGO, NASA GSFC.





“UAEU Radio Astronomy Pathway Project (URAPP)”

- **Low Frequency Radio Astronomy.**
- **Collaborations:**
 - University of New Mexico (UNM) – USA.
 - Curtin University / ICRAR – Australia.
- An LWA-type array.
- An MWA-based EDA.
- Know-how and skill development, capacity building, education and training, collaboration and international connectivity.
- Expansion to a larger initiative.



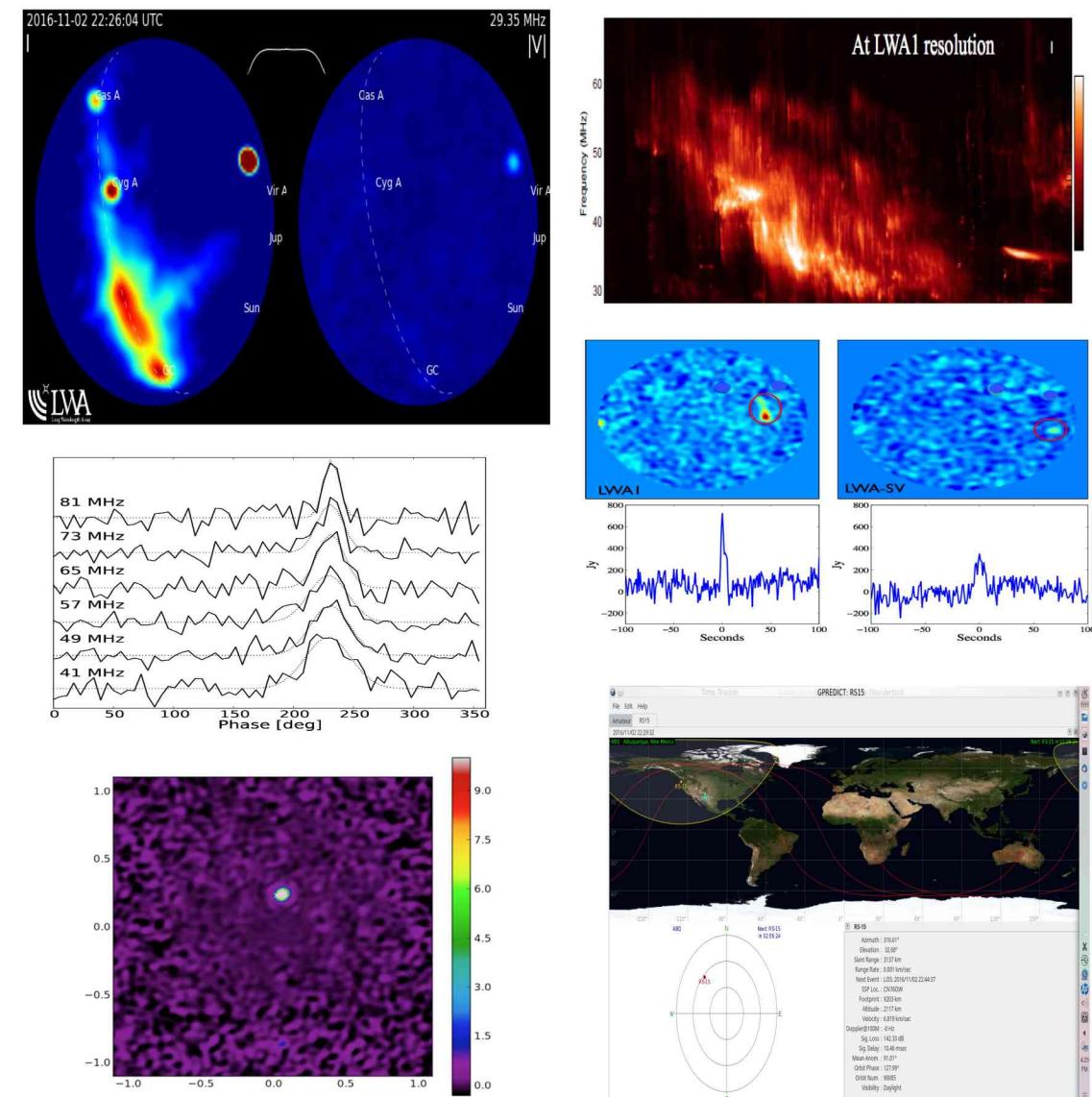
Top: Long-Wavelength Array (LWA1) in New Mexico;
Bottom: Murchison Widefield Array (MWA).



Multi-disciplinary Science with array-type radio facility in the UAE

- Astrophysical Transients: The Dynamic Universe
- Solar Bursts
- Space Physics
 - Meteor Studies
 - Atmospheric and Ionospheric Studies
- Pulsars
- Planets and Exoplanets
- Strategic Space-based Applications
 - Spacecraft tracking
 - Passive radar system/sensor network
 - Space Situational Awareness
- Skill Development:
 - Data Science
 - Antenna & Receiver Systems
 - Imaging & Signal Processing

Images: Science with LWA (UNM)





Initial RA Ground Work at UAEU



Images: UAEU students with an LWA antenna and the HFRS system for site RFI testing.

Thank You

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