Impacts of Satellite Constellations on Astronomy

Ammar E. M. Abdulla

Astronomical Observatories Department

Sharjah Academy for Astronomy, Space Sciences and Technology

University of Sharjah

Linkedin

Email: Amabdulla@sharjah.ac.ae **Phone:** 0097156-9002008

SHARJAH ASTRONOMICAL OBSERVATORY

Recognized by the Minor Planet Center (IAU) as M47 Sharjah Observatory

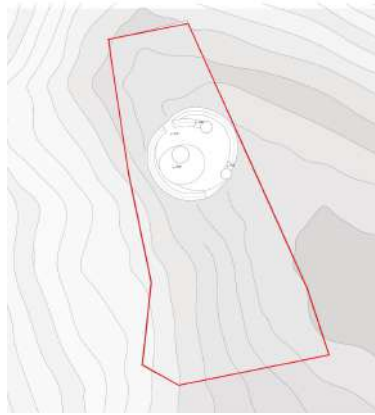
Key Observations:

Deep-Sky Objects (DSO) Astronomy
- Transit Photometry of Exoplanets
- Spectroscopy of Binary and Multiple Stellar Systems

Space Situational Awareness (SSA):
- Near-Earth Asteroids
- Satellite Tracking

Solar System:
- Crescent Moon
- Lunar impacts
- Sun (H-Alpha & white light)
- Comets
- Planets of the Solar System

Astrophotography:
- Nebulae



SATELLITE TRAILS

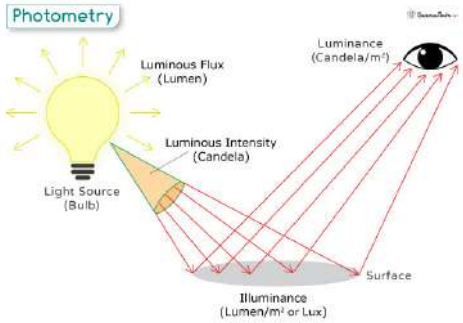
- Long-exposure imaging records fast-moving satellites as bright linear streaks.
- Trails obscure astronomical sources and complicate calibration workflows.
- Highly disruptive to time-domain astronomy and survey automation systems.

SURFACE BRIGHTNESS INCREASE

- Satellite reflections contribute to increased sky background illumination.
- Especially problematic for wide-field and deep-sky surveys requiring long exposures.
- Reduced contrast and signal-to-noise ratios degrade image precision.

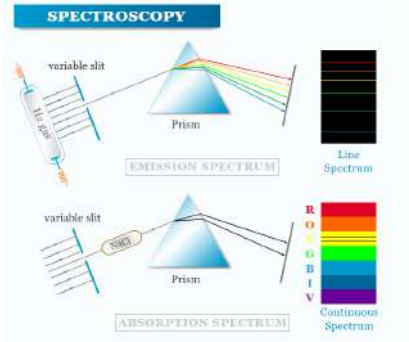
PHOTOMETRY AND SPECTROSCOPY

Photometry

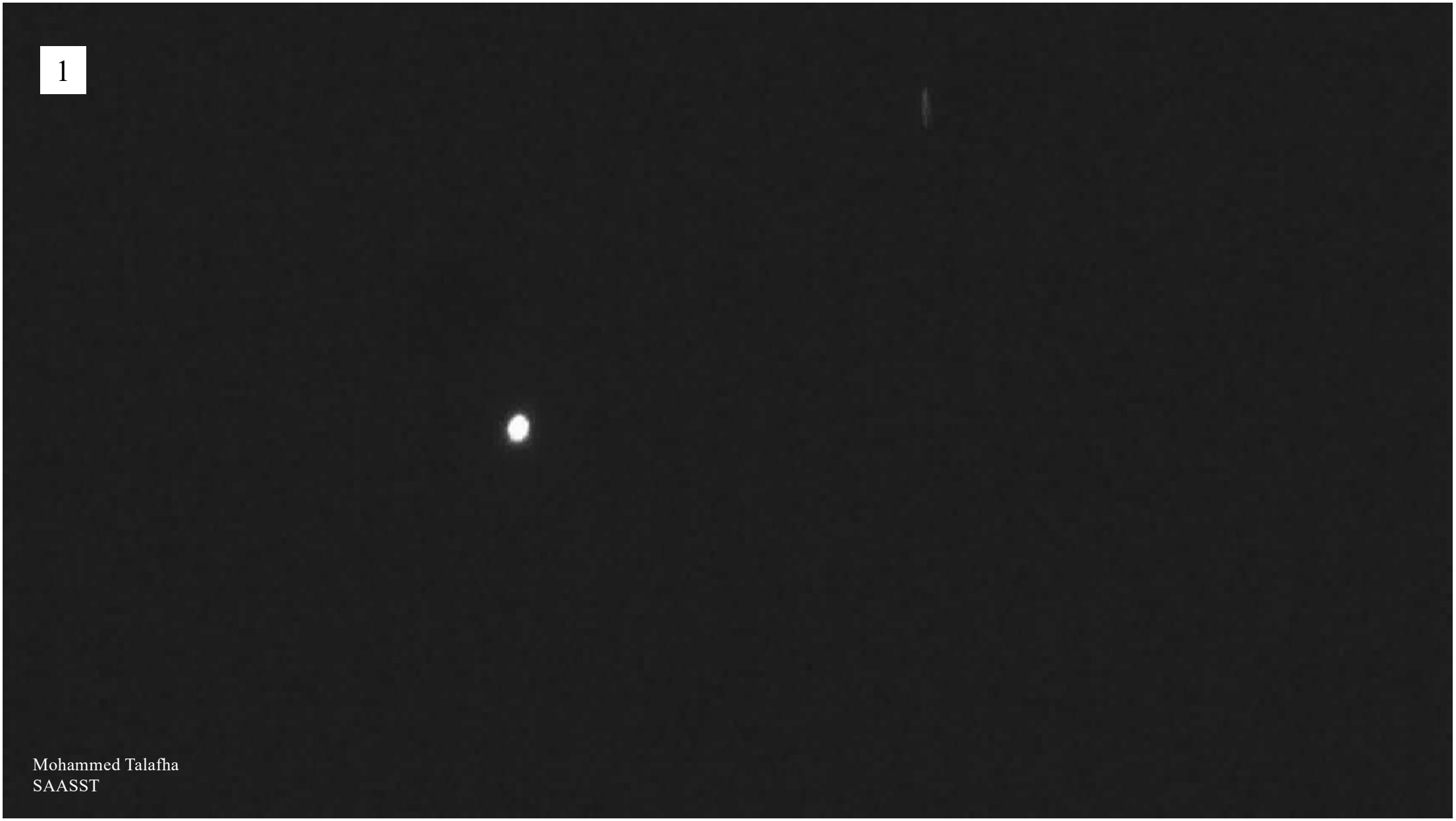


- Satellite-induced brightness contamination alters photometric measurements.
- Can result in artificial variability or incorrect light-curve interpretation

Spectroscopy



- Satellite reflections cause spectral line pollution.
- Risk of misidentifying chemical elements or measuring inaccurate redshifts.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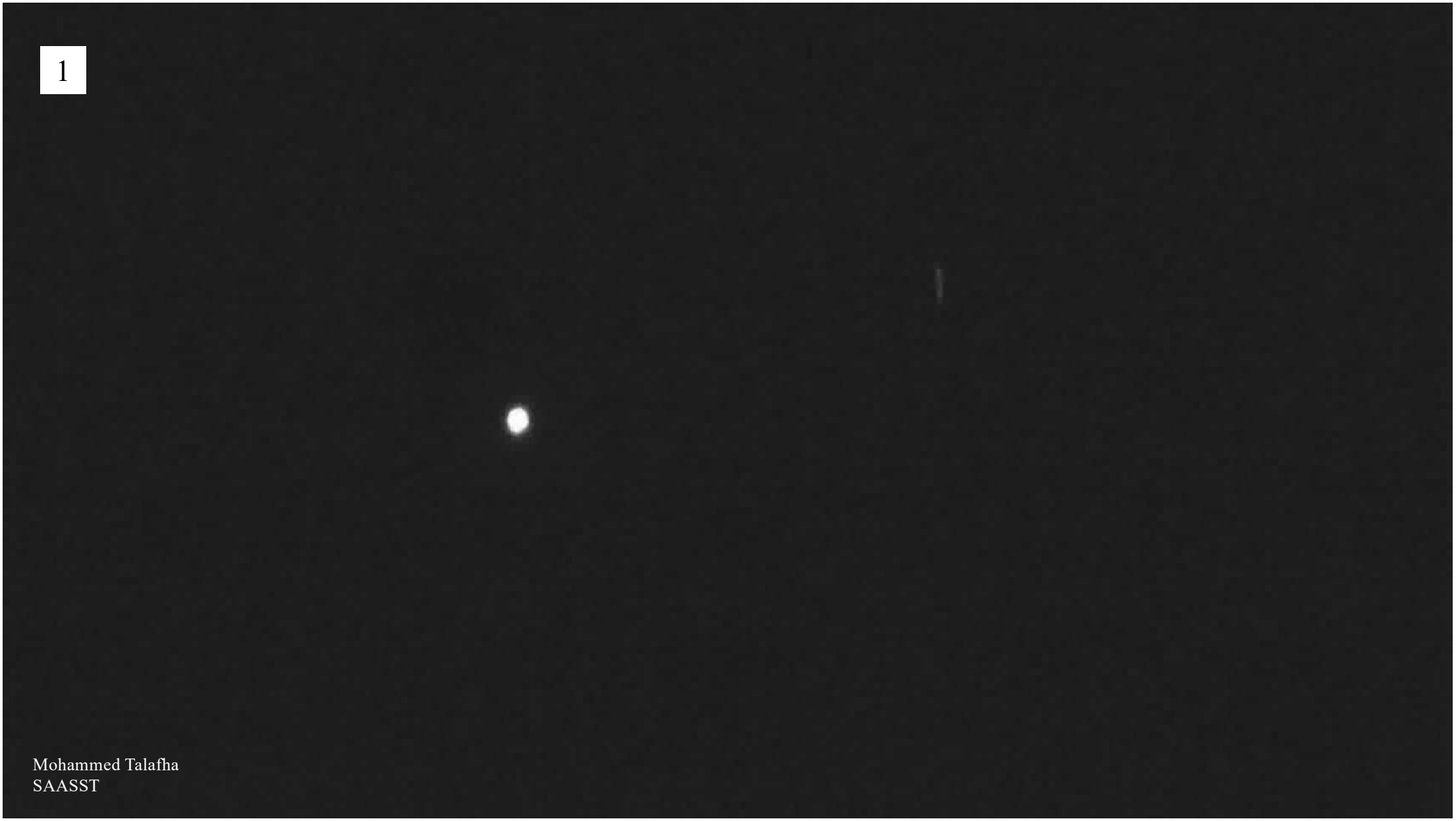
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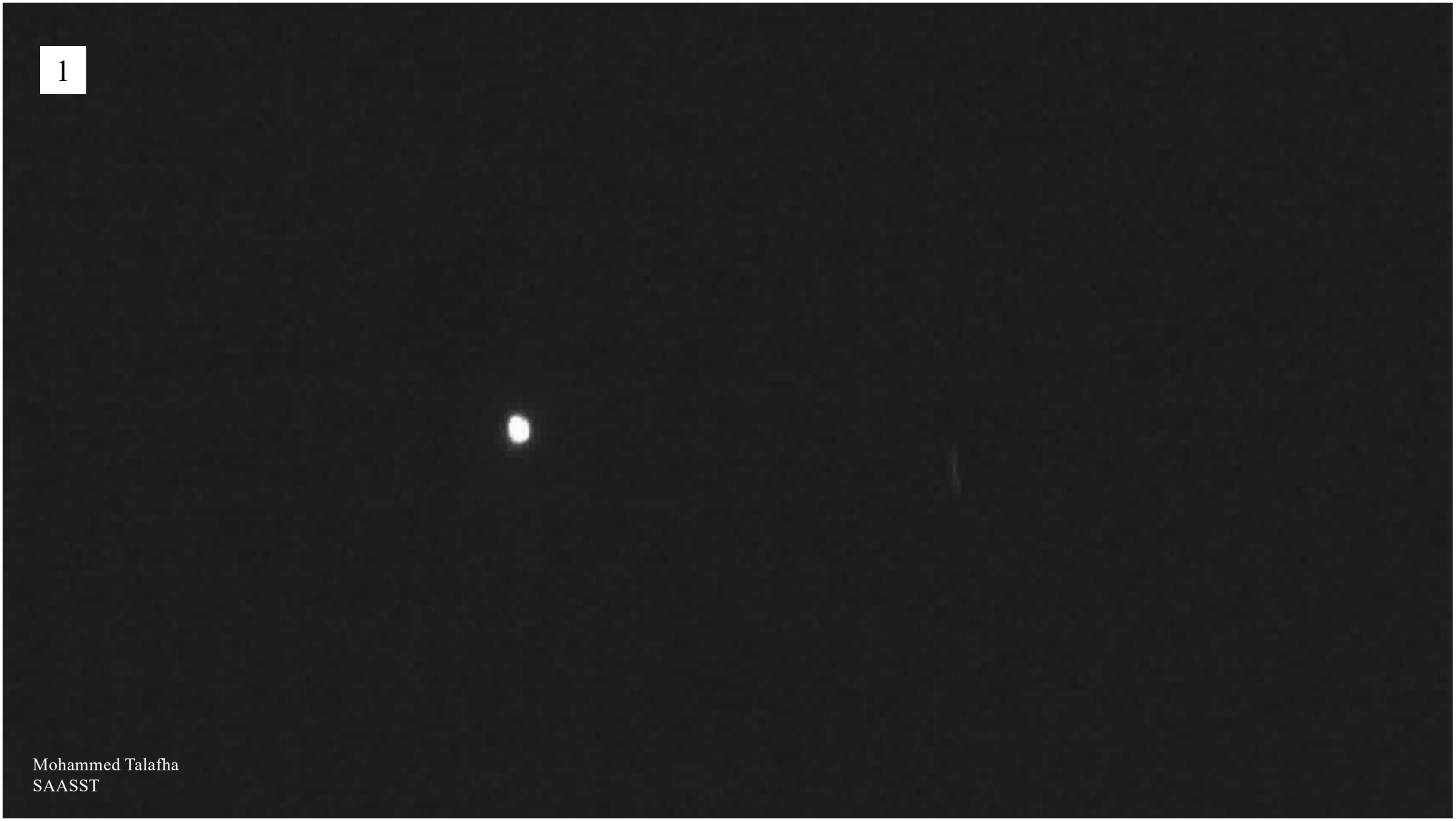
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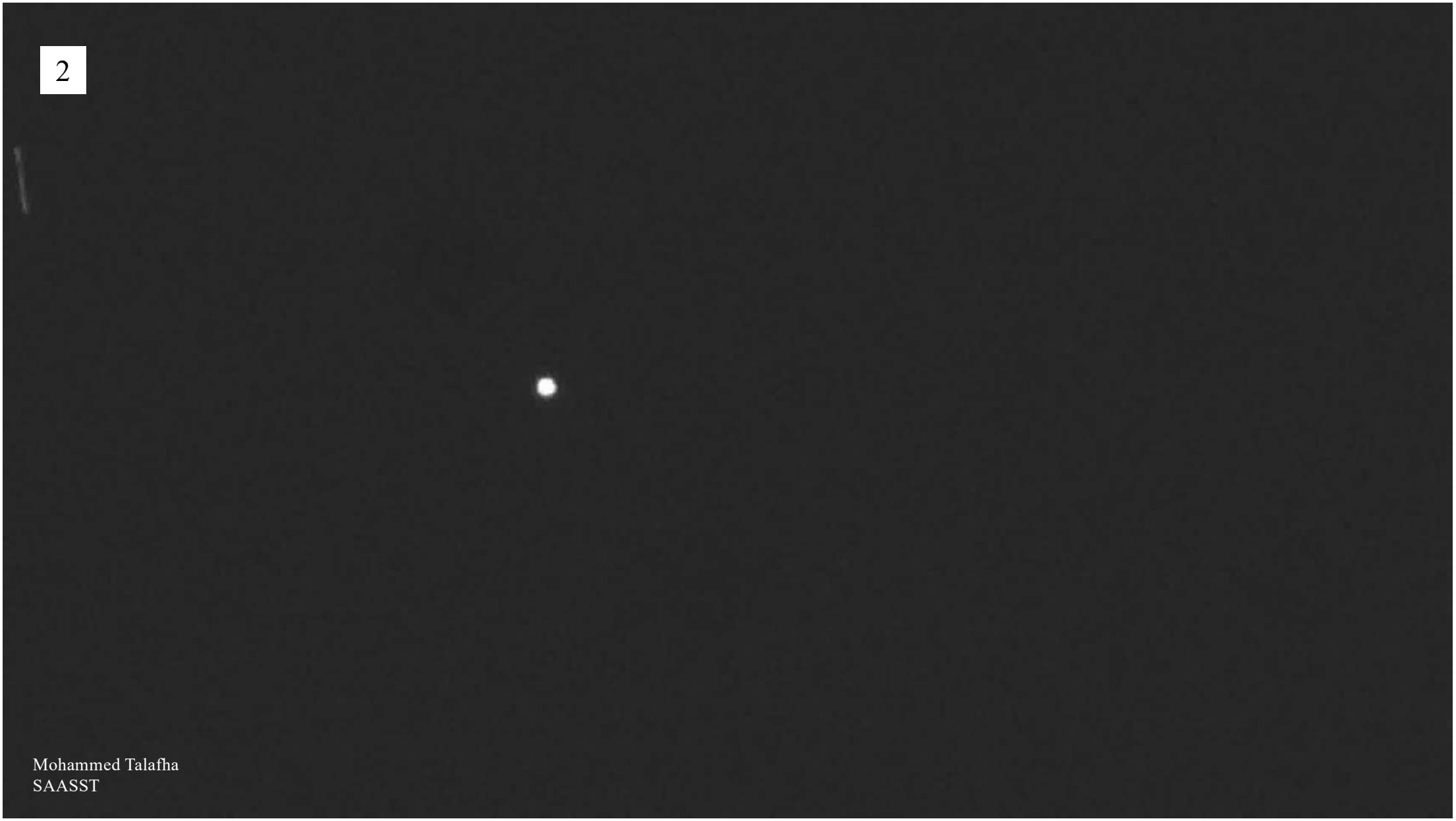
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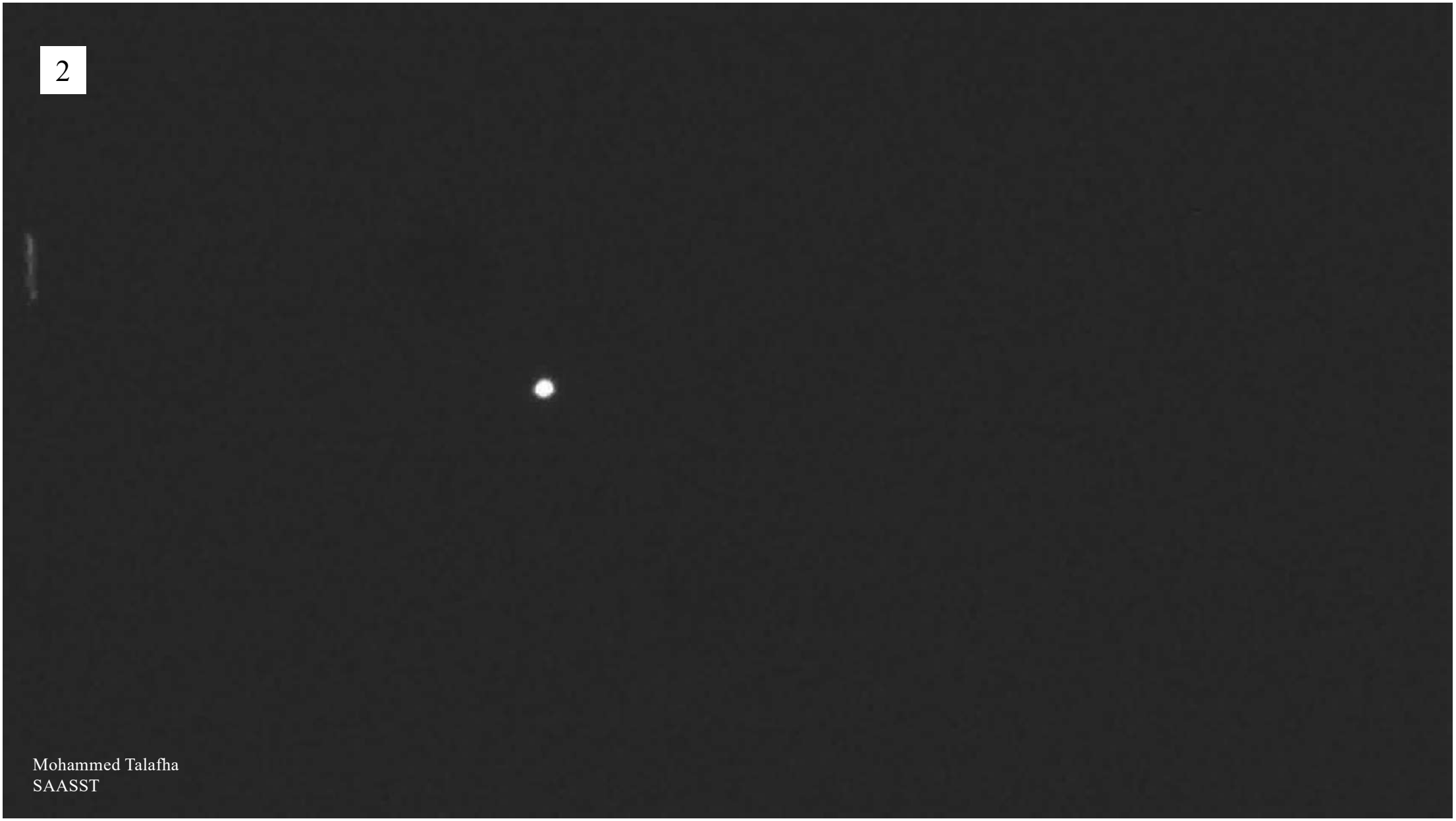
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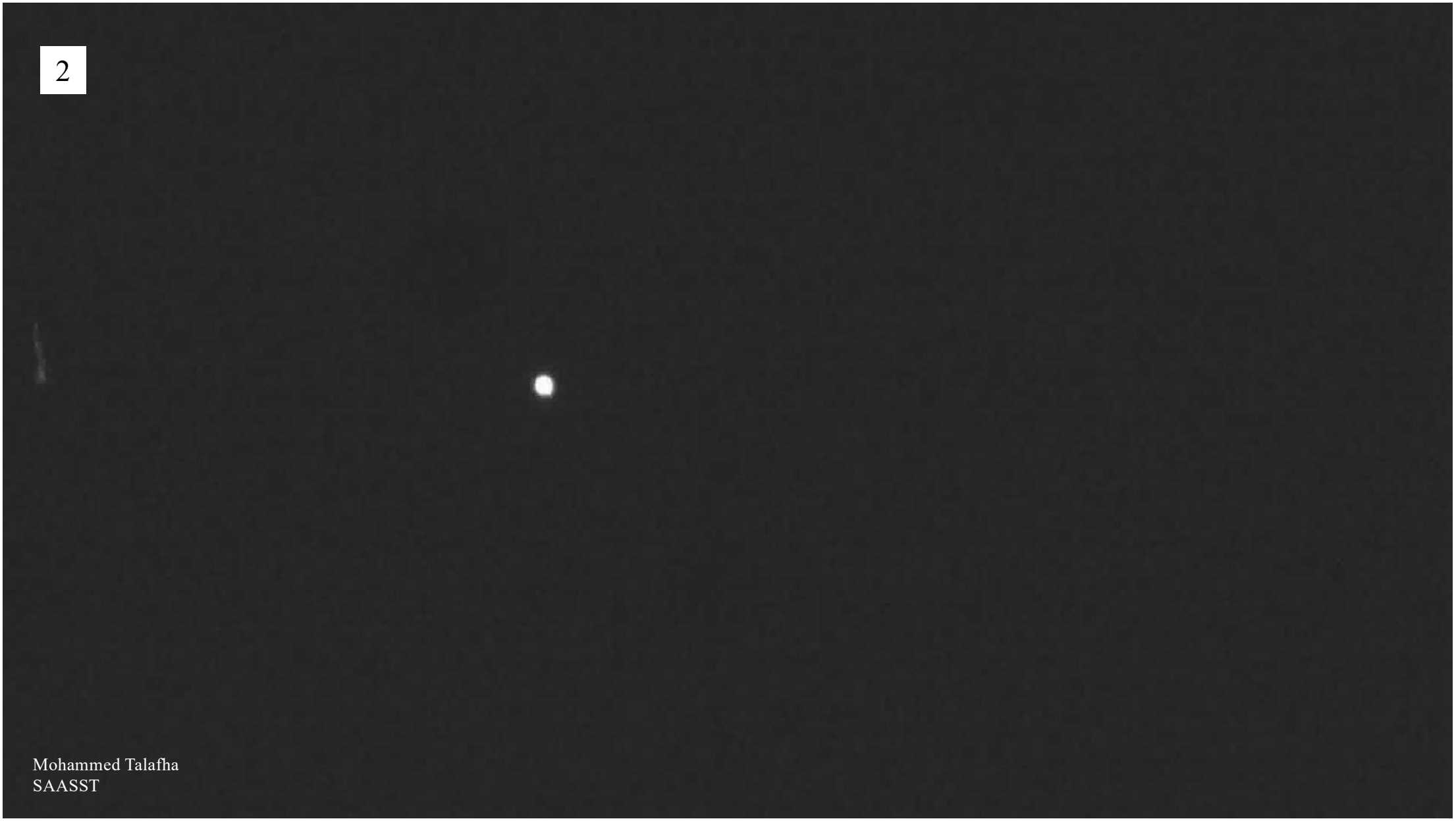
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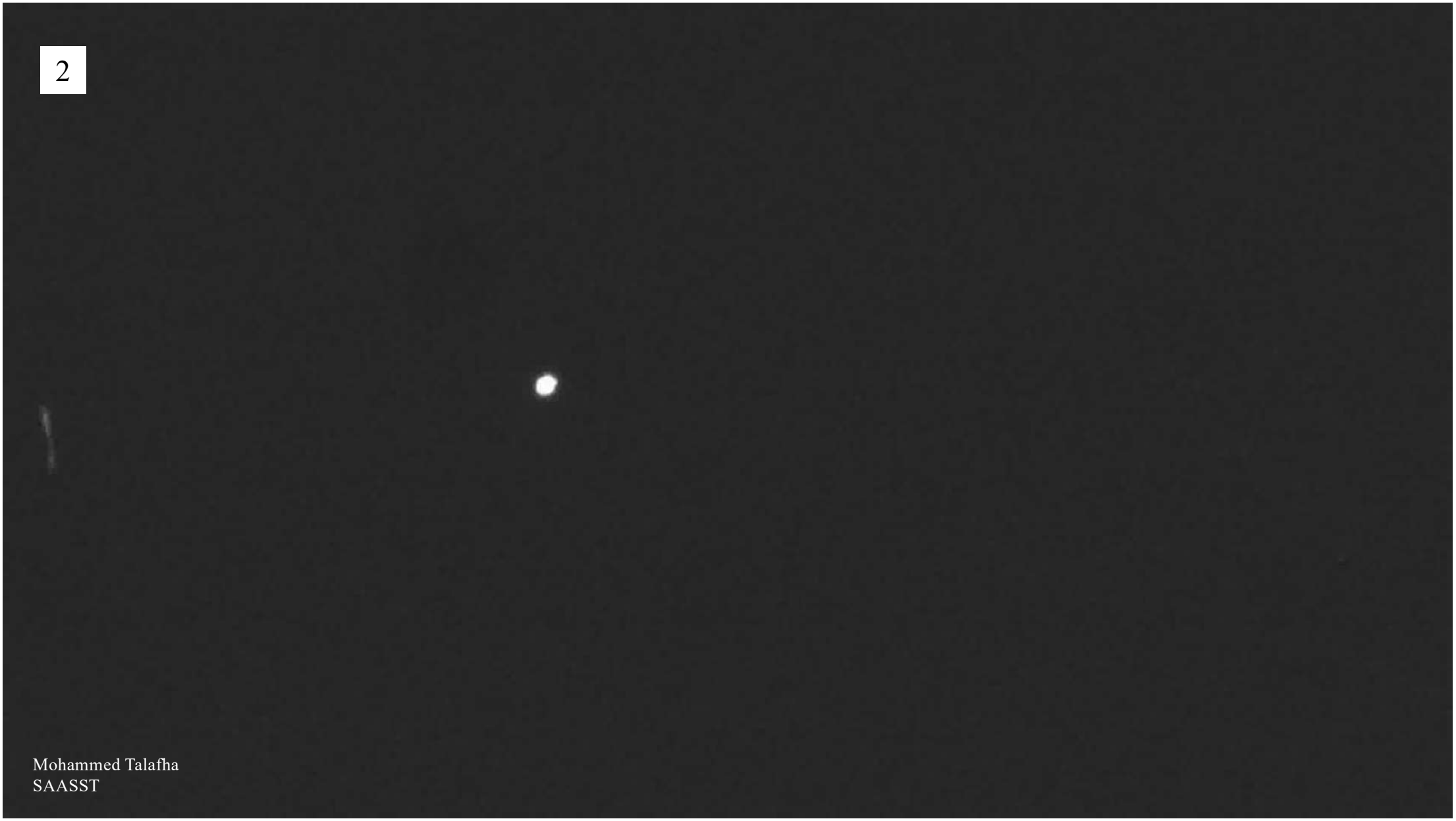
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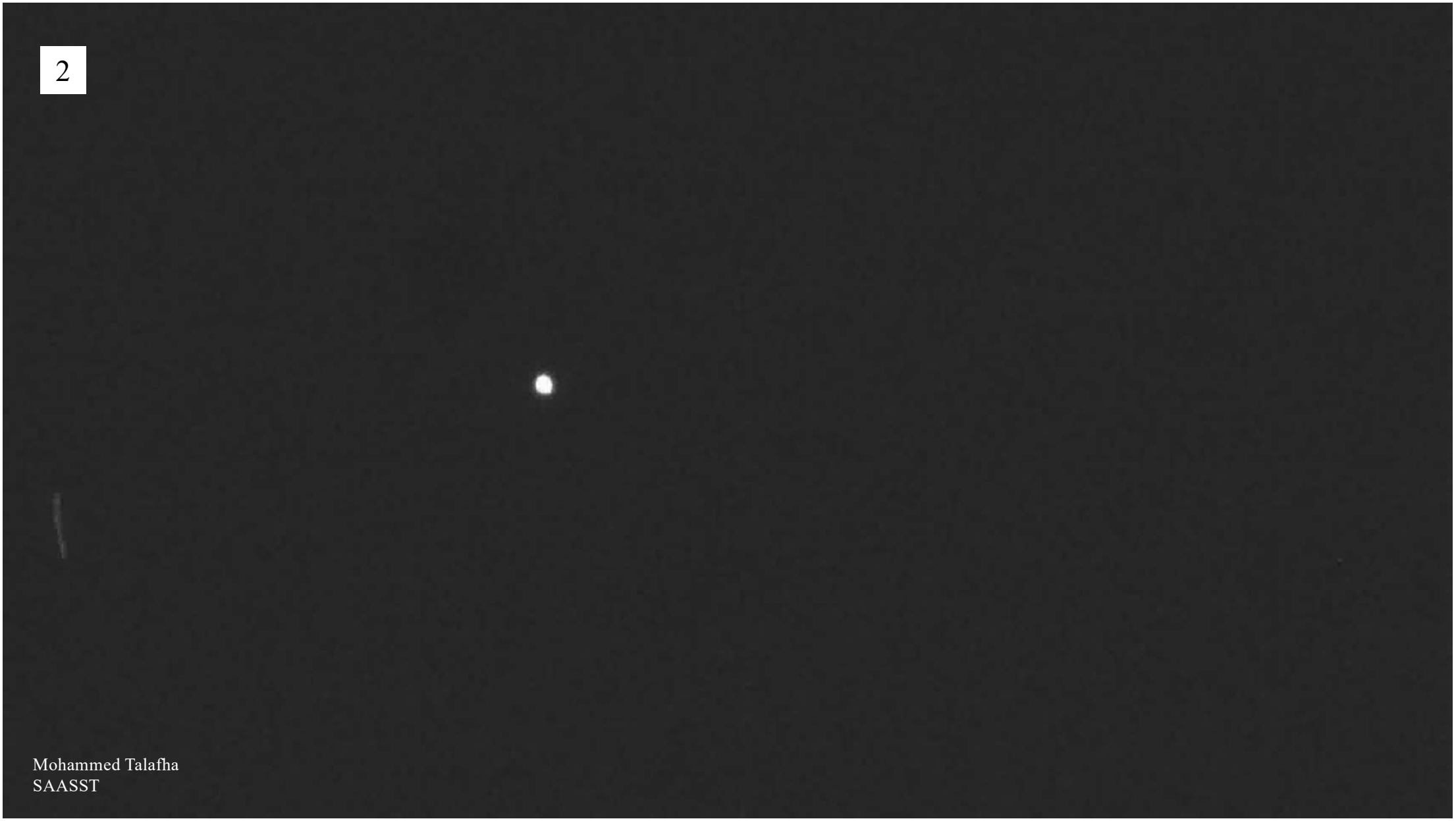
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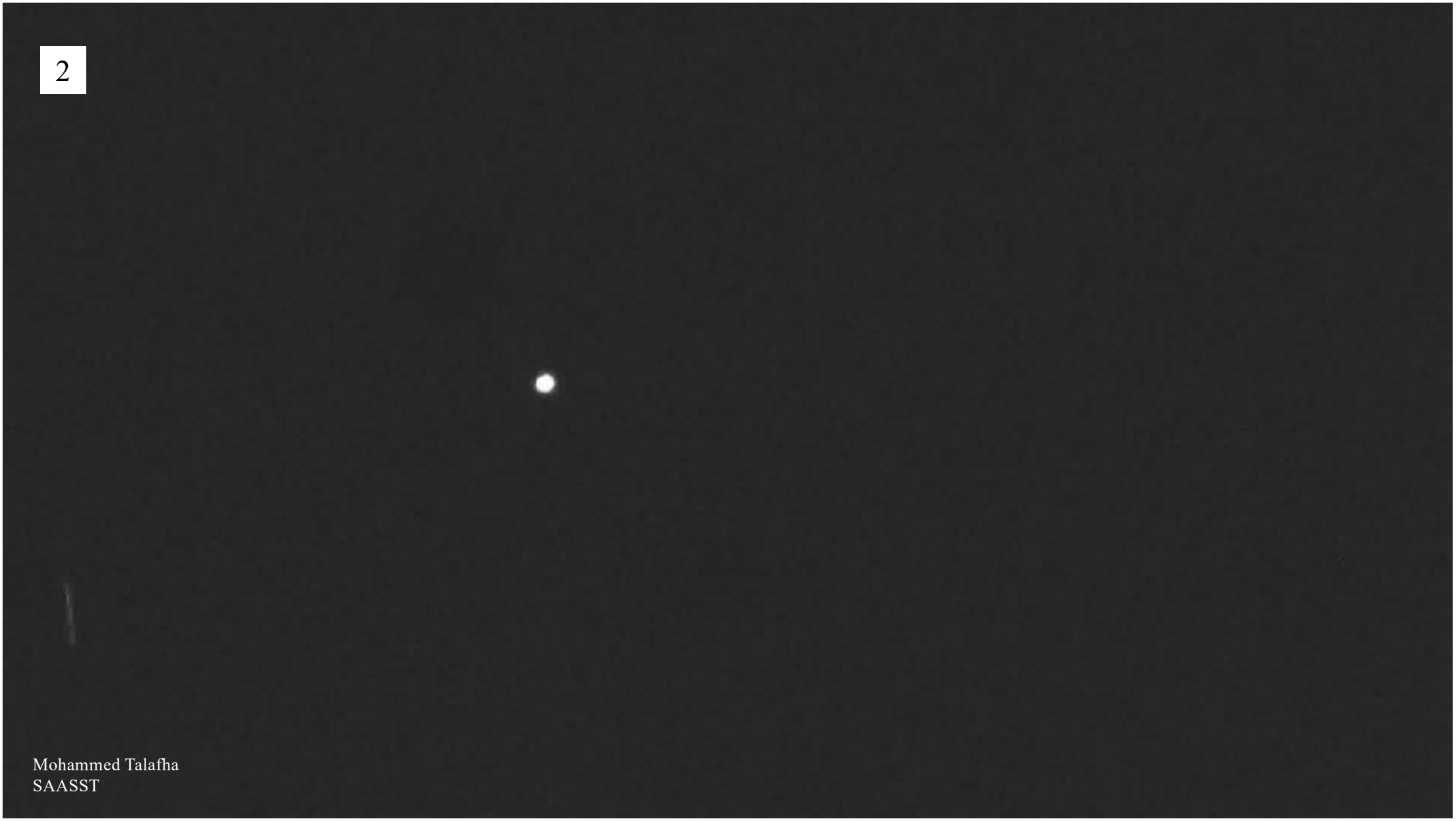
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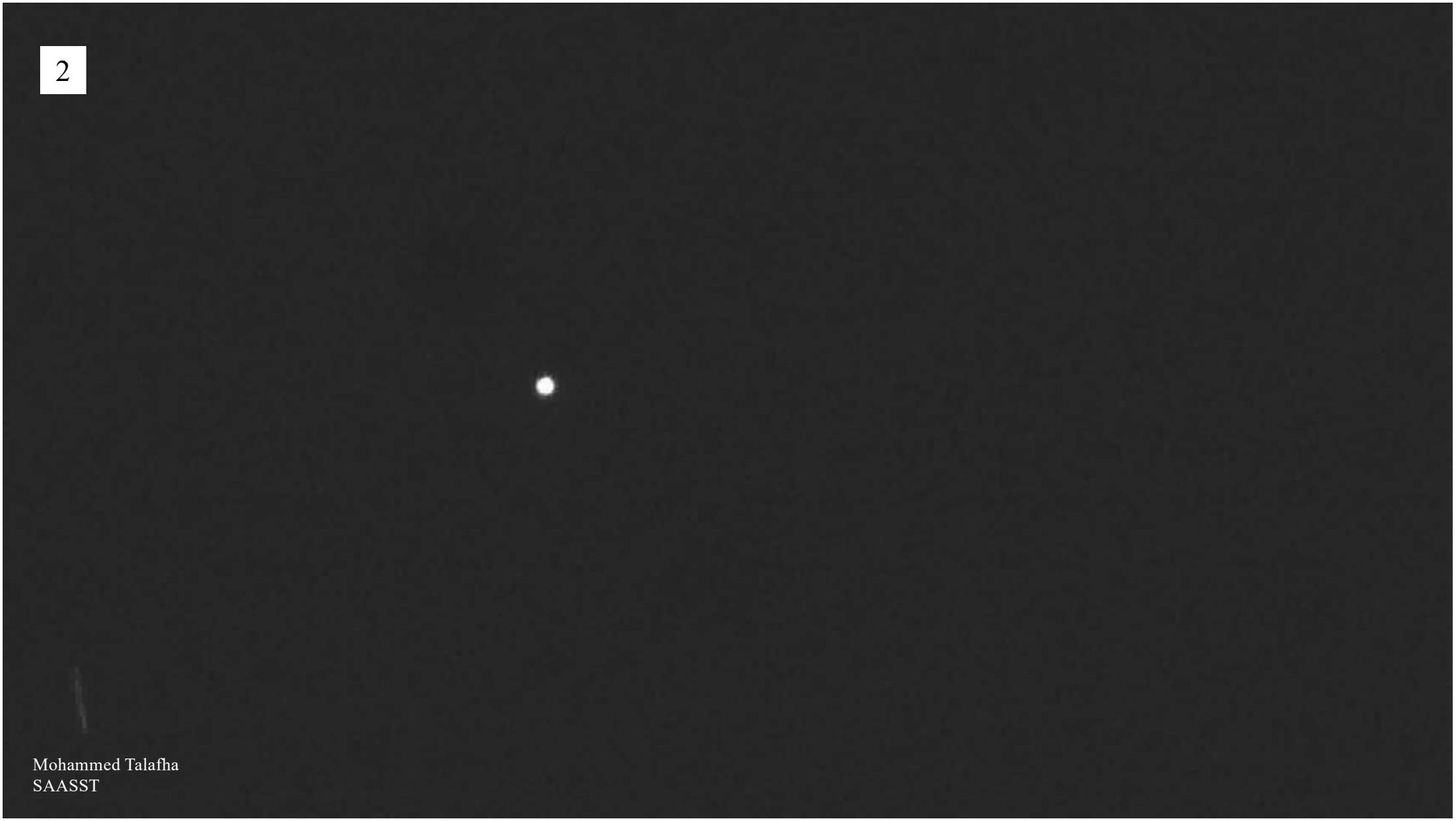
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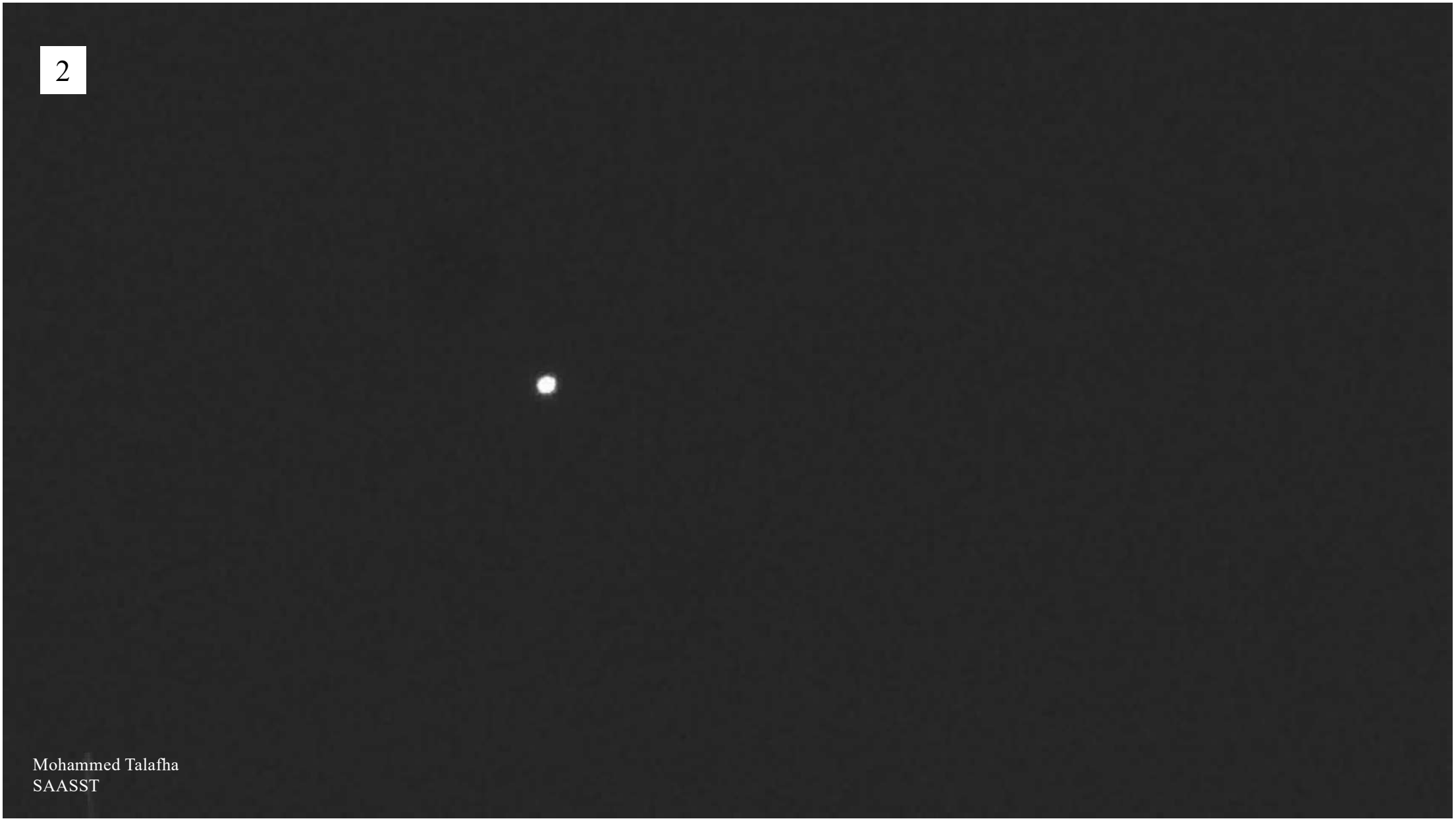
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SAASST


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SAASST
Emirates Astronomical Society


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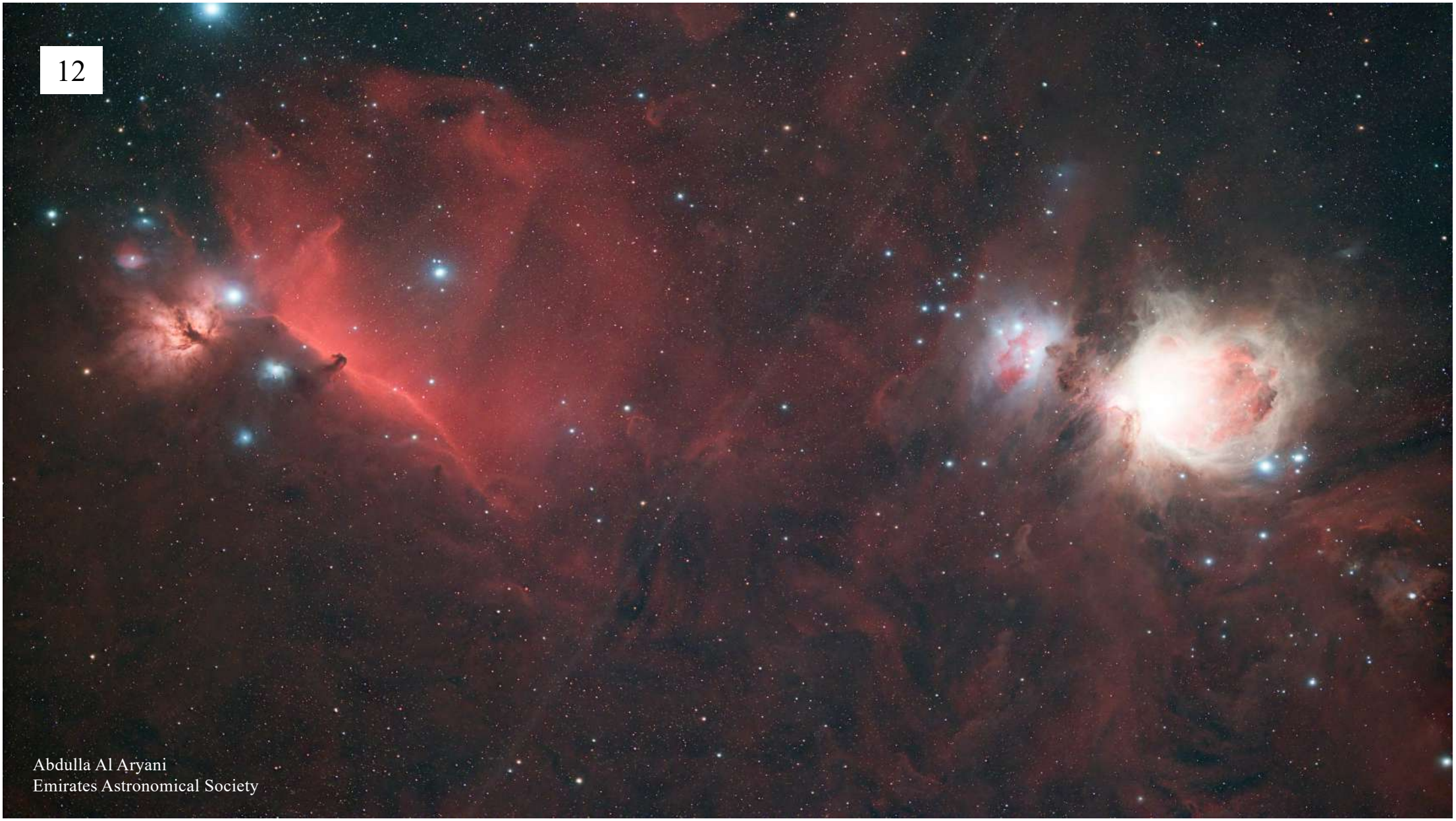
Abdulla Al Aryani
Emirates Astronomical Society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Emirates Astronomical Society

UAE'S SPACE GOVERNANCE

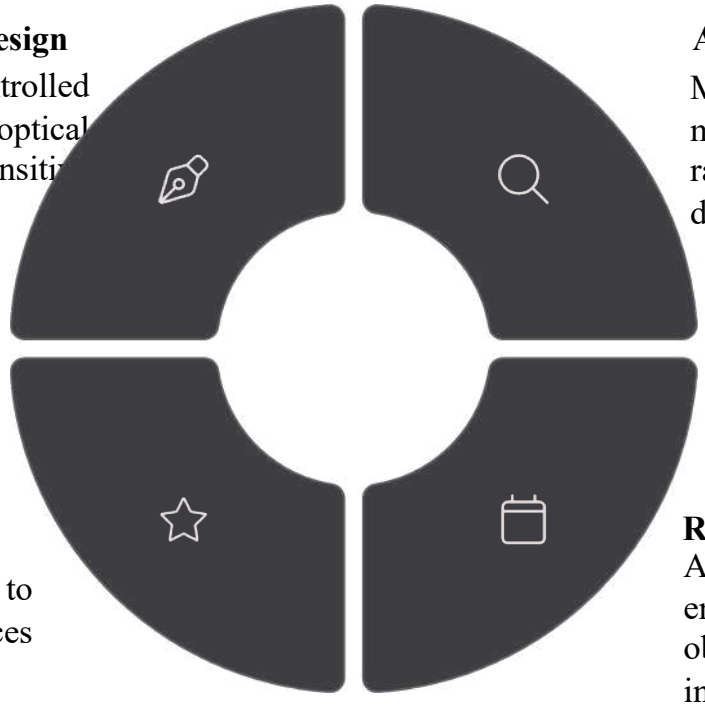
- The **UAE National Space Law (2019)** establishes a regulatory foundation for responsible and sustainable space activities.
- **Telecommunications and Digital Government Regulatory Authority (TDRA)** manages and allocates national radio-frequency spectrum in alignment with **ITU-R recommendations**.
- **Active participation** in UN COPUOS working groups on space debris, long-term sustainability, and space-traffic coordination.
- **Regional leadership** in astronomy and space science, including hosting IAU regional initiatives and advancing technical collaboration programs.
- Development of national astronomical observatories incorporating **light-pollution mitigation** and **dark-sky preservation** strategies.
- **Investment in research and technological capability** supporting sustainable use of the space environment.

Future Vision

The UAE is positioned to lead **regional coordination** on **space sustainability**, **spectrum protection**, and **preservation of astronomical heritage**, strengthened by its recent **chair role at UN COPUOS Space Situational Awareness initiatives**.

MITIGATION STRATEGIES

Satellite Surface & Orientation Design
Low-reflectivity materials and controlled attitude maneuvers to minimize optical brightness and glare during sensiti observation windows.



Advanced Data Processing & AI Filtering
Machine-learning techniques to detect, model, and remove satellite trails and radio interference from astronomical datasets.

End-of-Life Management
Enforced deorbiting requirements to reduce persistent interference sources and orbital congestion.

Real-Time Coordinated Scheduling
Access to accurate orbital predictions enabling observatories to plan observations during satellite-free intervals.

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SHARJAH ACADEMY FOR ASTRONOMY, SPACE SCIENCES AND TECHNOLOGY

Thank you for your attention

Let us work together to protect our skies

Ammar E. M. Abdulla

Linkedin

Email: Amabdulla@sharjah.ac.ae **Phone:** 0097156-9002008