FEB 2023

2023 UN COPUOS 59TH SCIENTIFIC AND TECHNICAL SUBCOMMITTEE

SPACE SITUATIONAL AWARENESS
ACTIVITIES And Updates IN KOREA

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Ministry of Science and ICT

Korea Astronomy and Space Science Institute

NSSAO 우주환경감시기관

KASI Korea Astronomy and Space Science Institute NSSAO 우주환경감시기관

NATIONAL SPACE SITUATIONAL AWARENESS ORGANIZATION

Safety and Protection from Space Hazards

01 

Astronomical Calculation Division & NEO Research Team

1983.01.08
Korea 1ST Satellite reentry response team (COSMOS 1402)

1986.03.02
Satellite Orbit Determination & Tracking R&D

2000.06.14
NEO research team as a national Research laboratory

02 

Space Object Montioring Group

2008.07.10
NEO research group was formed

2008.12.01
KASI initiated 1ST space object monitoring research group for SLR development

03 

SSA project for OWL-Net

2011.06.01
KASI organized the first dedicated SSA project center in Korea for OWL-Net development

2014.06.20
SSA project center was renamed Center for SSA directly under the vice president of KASI

04 

1ST national basic plan for space hazards NSSAO designation

2015.01.14
KASI was inaugurated by government as a national SSA designated organiztion

2019.~2023.
KASI / NSSAO develop and operate national space object observation infrastructure and conducts R&D

Secure national safety and space assets from space hazards

- Rapid response on space hazards
- Development of SSA sensors and analysis capability
- Operation and support of the national SSA structure

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NSSAO

SYSTEM

Building a quick response system against disasters resulting from space hazards

TECHNOLOGY

Developing technologies and constructing facilities for monitoring space hazards

INFRASTRUCTURE

Creating an environment for expanding capability of the response system (International cooperation, R/D, etc)

SSA KEY TECHNOLOGY

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DETECTION

Activities to detect incoming satellites and space debris, projectiles, space objects within the observed range of the monitoring facilities

CATALOGING

Activities to manage the database of collected data such as name, identification number, orbit elements, mission, etc.

SSA KEY TECHNOLOGY

TRACKING

Activities to track the object within the initial orbit of ‘detection’

IDENTIFICATION

Activities to identify the mission and nationality of the detected object with the precise orbit elements through ‘detection’ and ‘tracking’

SPACE SITUATIONAL AWARENESS ACTIVITIES IN KOREA

SSA SENSORS

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TRACKING

〈20cm
Precise Orbit Determination

TRACKING

〈20m
Orbit Determination

DETECTION

〈200m
Initiall Orbit
Determination

OPTICS

LASER

SIGNALS

RADAR

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Integrated Analysis Center

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OWL-NET (Optical Wide-field patroL Network)

Space Objects Tracking and Monitoring Network

5 Global Optical Space Surveillance Network composed of five robotic observatories

- Track and Monitor LEO satellites and space debris and GEO belt
- Observe for asteroids and comets

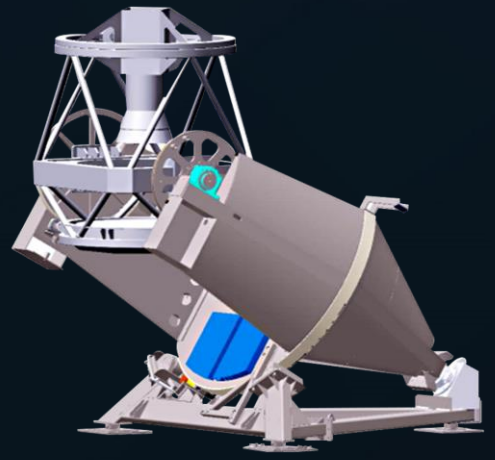
NEAR EARTH OBJECT OBSERVATION

01 **KMTNet**
(Korea Microlensing Telescope Network) :

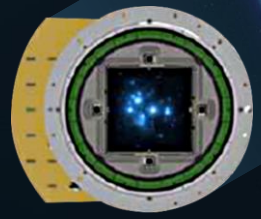
1.6m wide-field optical telescope located in Chile, South Africa and Australia in the southern hemisphere, 24hour observation IAWN Asteroid observation campaign participation

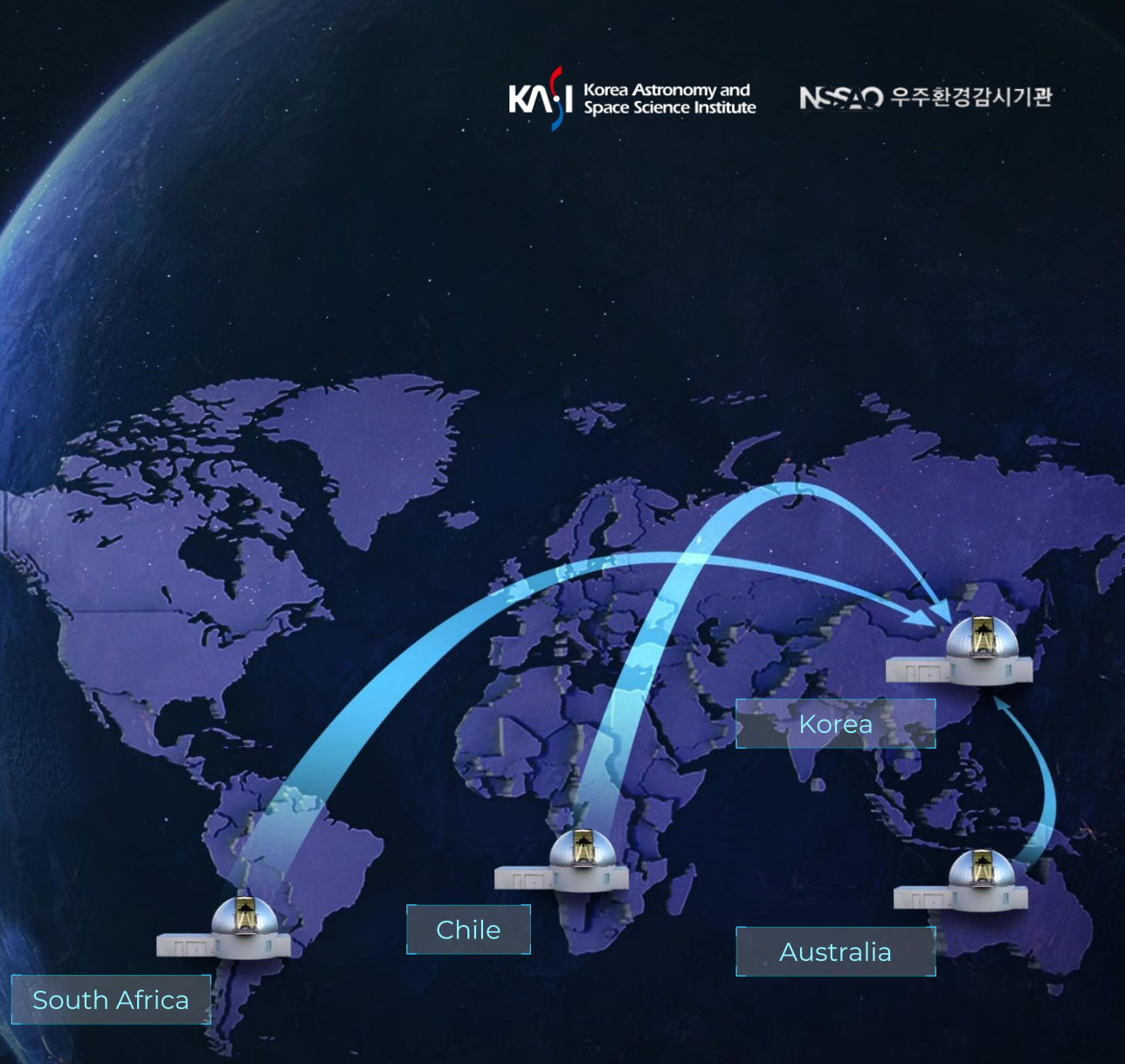
02 **Near Space Optical Survey-Alpha** (NSOS-α) (2027~)

The first dedicated observation facility for NEO survey in the southern hemisphere using a 1.5-meter class telescope



NSOS-α





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ALL-SKY SPACE OBJECT MONITORING SYSTEM

Fly eye type multiple camera observation system
for large artificial space object monitoring

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KOREA METEOR MONITORING AND OBSERVATION NETWORK (K-M²ONET)

Observation of meteors falling down over the Korean peninsular
Detection of fireballs and generation of information for the estimation of their falling trajectories and impact areas

By 2022, 16 monitoring stations are going to be installed over the southern part of the Korean peninsula.

- Publicity at the national level that also contributes to science gifted education
- Plan to join the international meteor observation network

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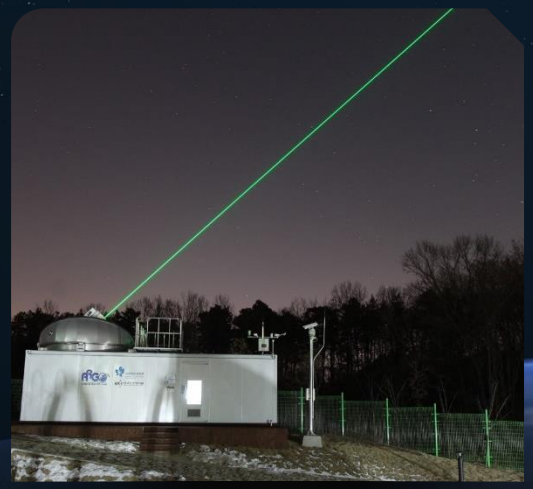
SLR (SATELLITE LASER RANGING SYSTEM)

Precise orbit determination through laser ranging measurement
Contribution to international SLR societies and ILRS network participation



36,000km

25,000km

2014~

2018~

Sejong

Geochang

Sejong SLR station

250km ~ 25,000km
ranging LEO & MEO

Geochang station

300km~36,000km
ranging including GEO

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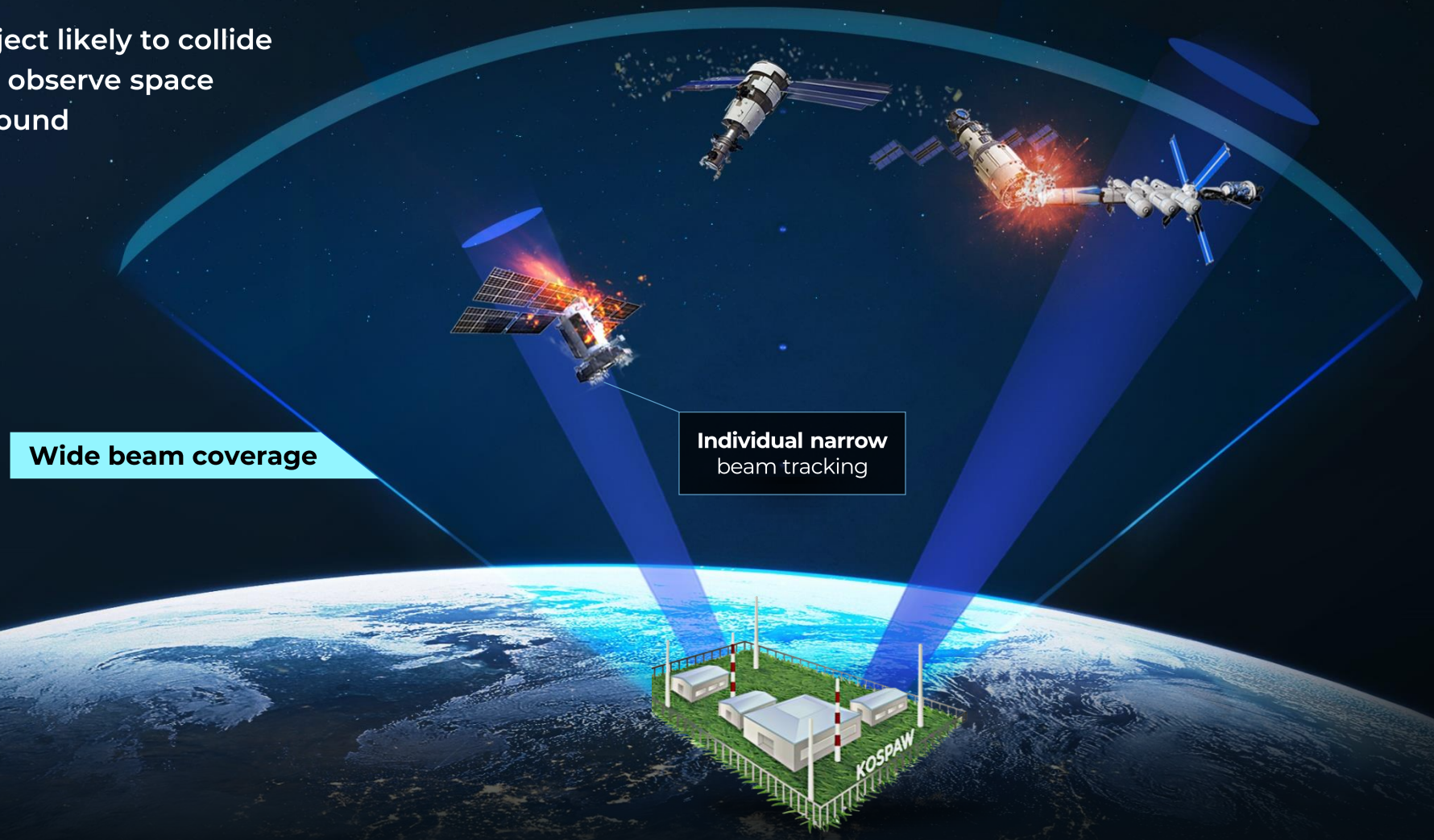
KOREA SPACE SURVEILLANCE ACTIVE PHASED ARRAY RADAR WINDOW (KOSPAW)

To detect and track space object likely to collide with national space assets To observe space objects likely to fall on the ground

Detection capability:
Test-Bed : RCS 5m @750km
KOSPAW: RCS 1m @1,500km



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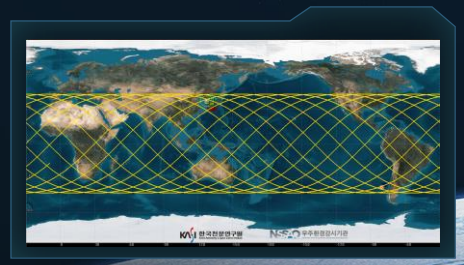
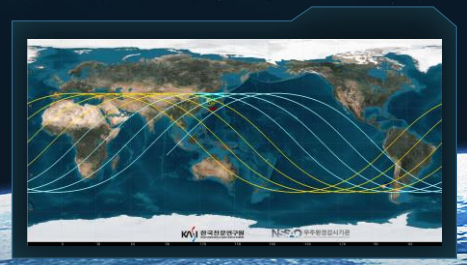
RE - ENTRY PREDICTION

7 day prediction



3 day prediction

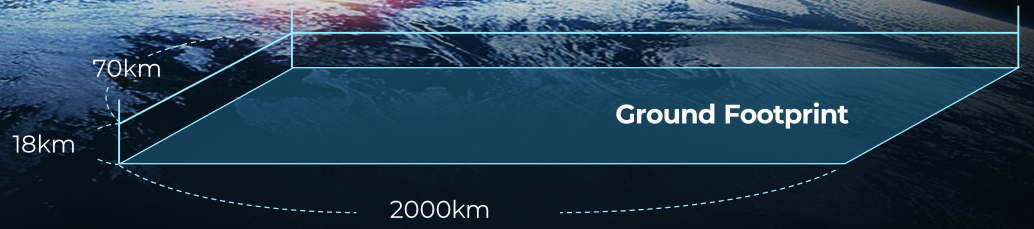


1 day prediction

12 hour prediction

Major breakup

Subsequent breakup



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KASIOPEIA

KASI's Orbit Propagation & Estimation, Integrated Analysis System

KASIOPEIA is a comprehensive space situational awareness total solution for integration all phases from observation data preprocessing to predictive risk assessment

OBSERVATION DATA PROCESSING

- Radar
- Optical
- Passive RF

Orbit Estimation & Prediction

RISK ANALYSIS

- Re-entry Prediction
- Conjunction Analysis

- Radar Observation Preprocessing
- Optical Observation Preprocessing
- Ranging Preprocessing
- Orbit Determination
- Re-entry Prediction
- Conjunction Analysis

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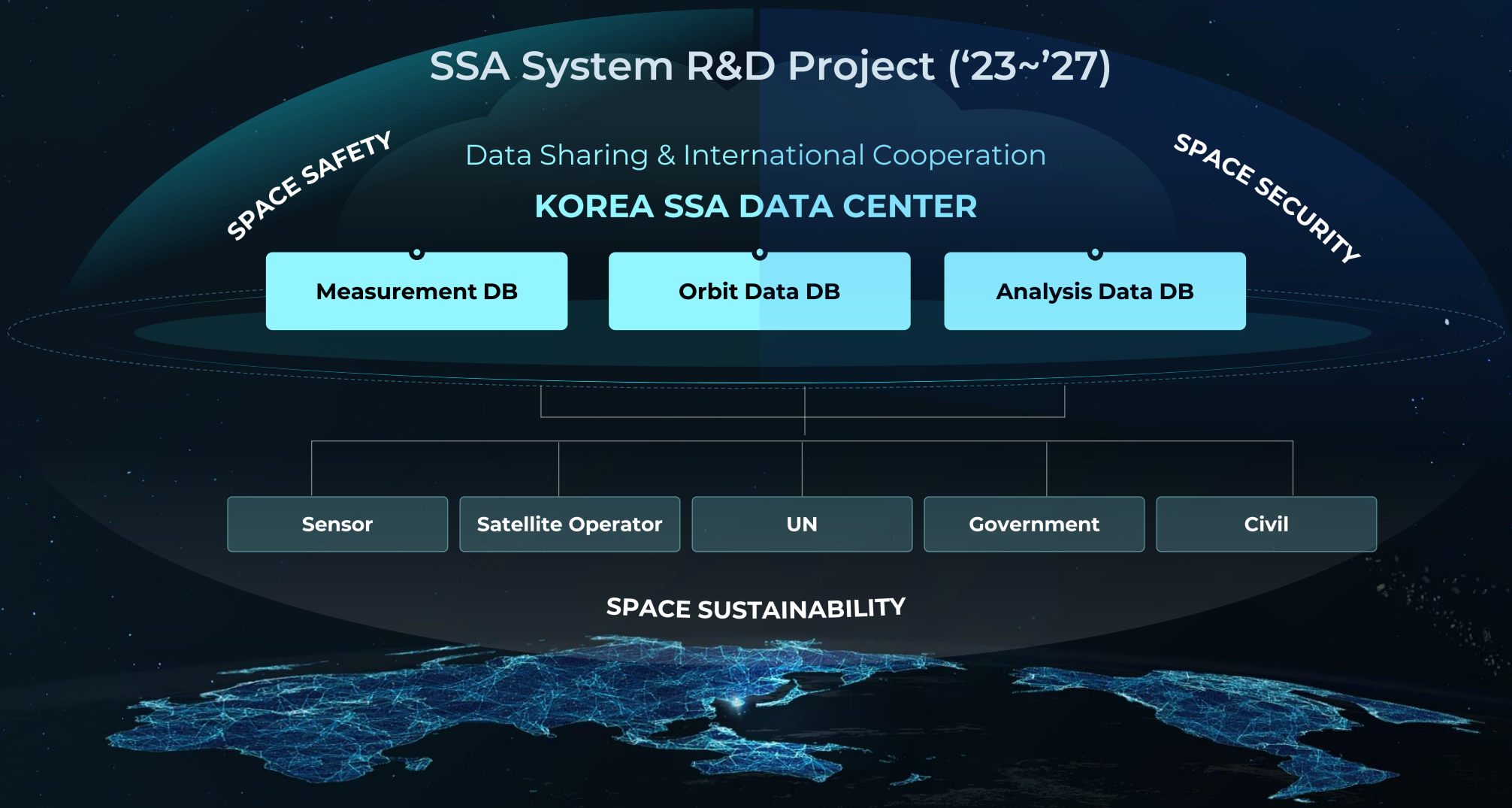
SSA INTEGRATED SYSTEM FOR INTERNATIONAL COOPERATION



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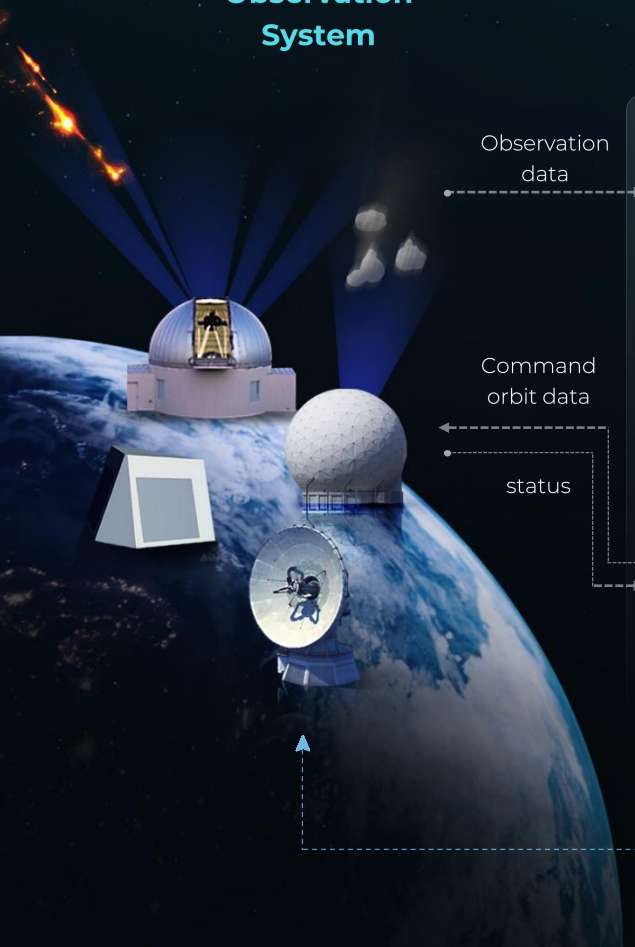
INTEGRATED ANALYSIS SYSTEM FOR DATA MANAGEMENT AND MISSION CONTROL



Collection

Observation System

Observation data

Command orbit data

status

Management

Integrated Management System (IMS)

Data preprocessing

Observation Data interface

Data Management
(International Cooperation + Catalogue + Observation Data)

Observation Infra Mission control

Mission Planning

Infra Status Display

Preprocessed data

Space objects

Orbit data

Mission Priority

Validation

Integrated Analysis System (IAS)

Data Postprocessing

Space Objects Identification

Space Objects Orbit Determination

Reentry Prediction

Collision Prediction

Risk Assessement

Provision

Users

Government

Satellite Operator

Civil Company

Public

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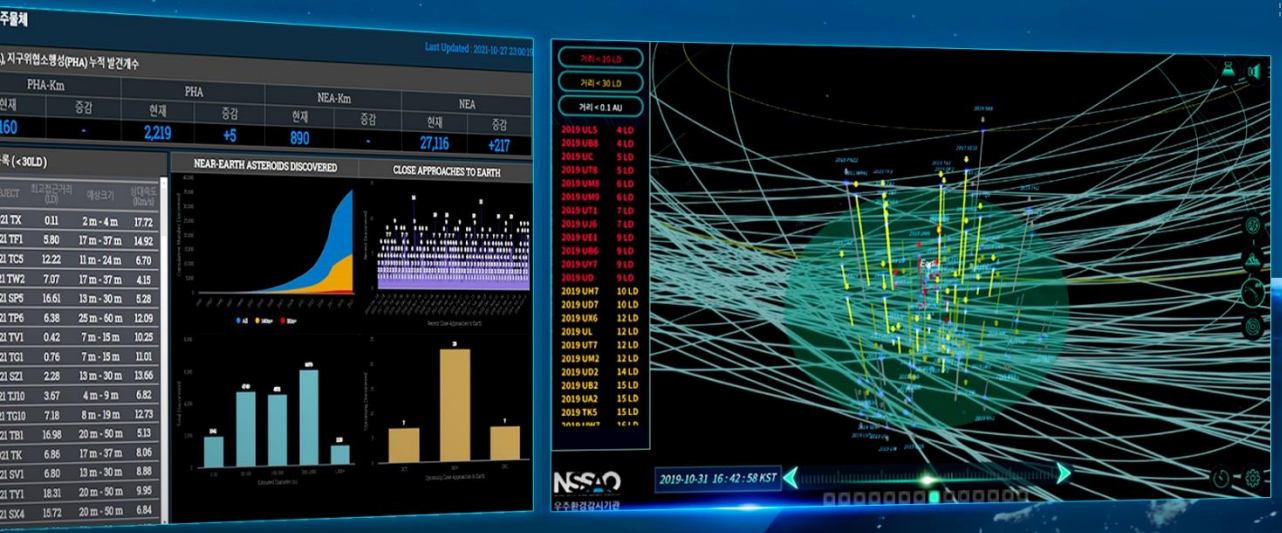
SSA MONITORING SYSTEM

Statistics for Natural Space Objects

NEO Monitoring System



Statistics for Artificial Space Objects

Artificial Space Object Monitoring System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NSSAO 우주환경감시기관
Near Earth Object
Collision Risk
Meteor
Re-entry Risk
Space Debris
Optical telescope
Optical Sensor /Camera
Radar
KOSPAW
Laser
Integrated Analysis System
NSSAO

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THANK YOU

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