

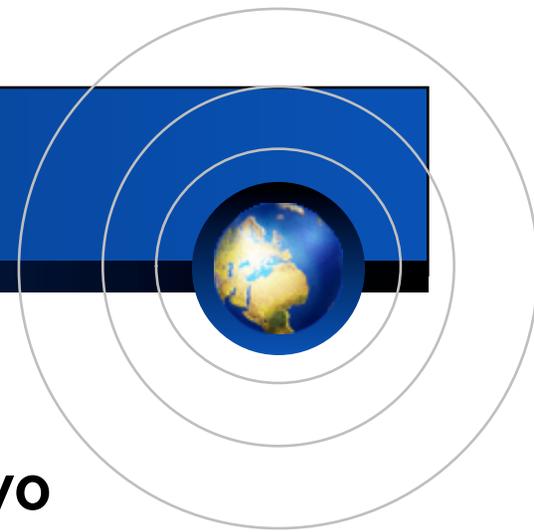
HDTV Extend from “Space-shuttle” to the “Kaguya”

2010.11.15

Joshi University of Art and Design

Hideichi Tamegaya

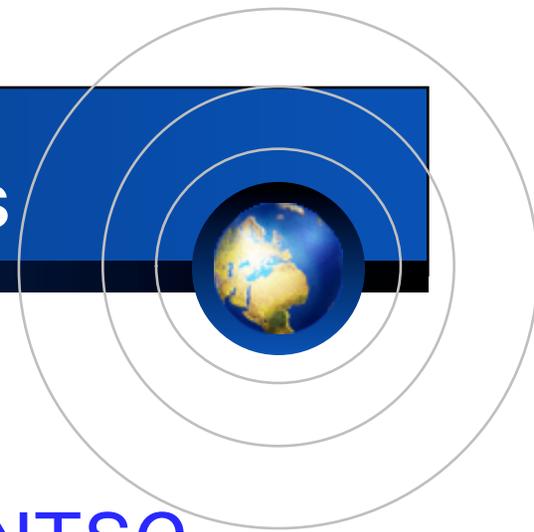
Hideichi Tamegaya



- Professor, Graduate school ,
- Joshibi University of Art and Design, Tokyo

- April 1960, Joined Japan Broadcasting Corporation (NHK)
- March 1966, Graduate from Department of Telecommunication Engineering, Tokyo Denki University
- June 1991, Media International Corporation (MICO)
- June 1995, Executive Engineer, NHK
- June 1996, Executive Consultant, NHK
- April 2001, Professor, Department of Media Art, Joshibi University of Art and Design (2002–2004 NHK Science and Technology Laboratory : Guest Researcher)

HDTV technology developments



Open the door to space

HDTV has 6 times resolution than NTSC

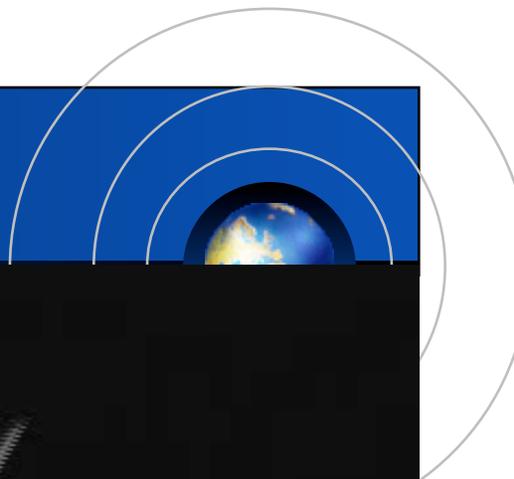
- New technologies create new contents field for TV programming
- The project started HDTV shooting of the space shuttle **(STS-32)** launch in cooperation with NASA in 1990
- HDTV application includes not only for TV programs, but also for scientific image analysis, etc.

HDTV technology developments



- 1998, HDTV camera installed in the space shuttle
- 2006, HDTV live broadcast from the ISS
- 2007, HDTV System onboard the Lunar Explorer “KAGUYA” (SELENE)

- 2011 & Future Plan
 -
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Study from Space Applications



- HDTV system in Space shuttle and the ISS
 - Clear NASA safety rule
 - EMC, Off-Gas, Vibration etc.
 - HDTV camera performance in micro gravity
 - Training for Astronauts
- HDTV image quality
 - Image sensor CCD damaged by heavy particles
 - Advantage of Moving Image (30 frame/sec)

Live broadcasting from space station

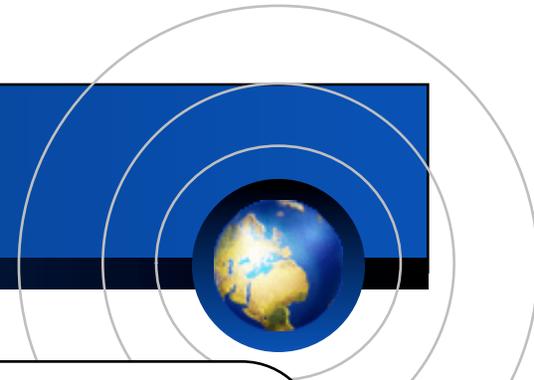


- NASA、JAXA、NHK、DCI (Discovery Channel)
Joint Project
- HDTV Live Broadcast from the International Space Station
- World First HDTV Live Transmission

Nov. 2006



Kaguya (SELENE) Project

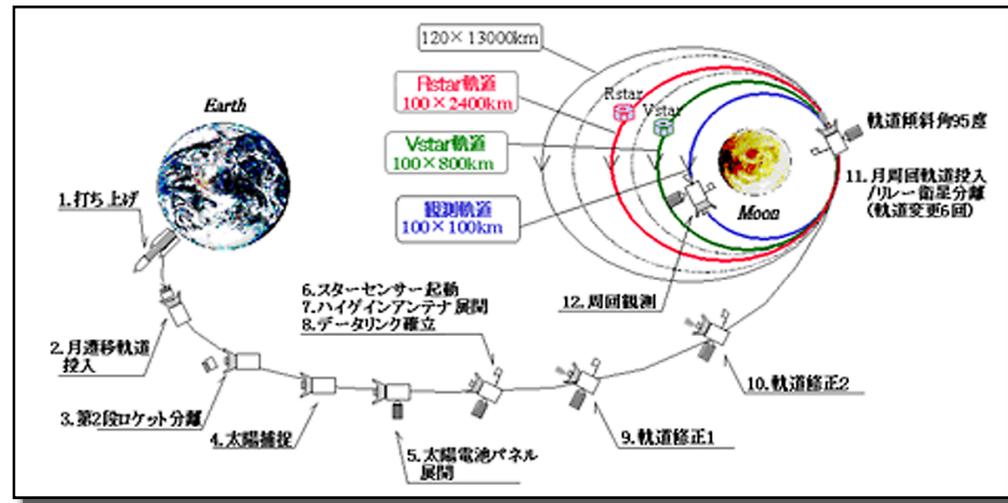
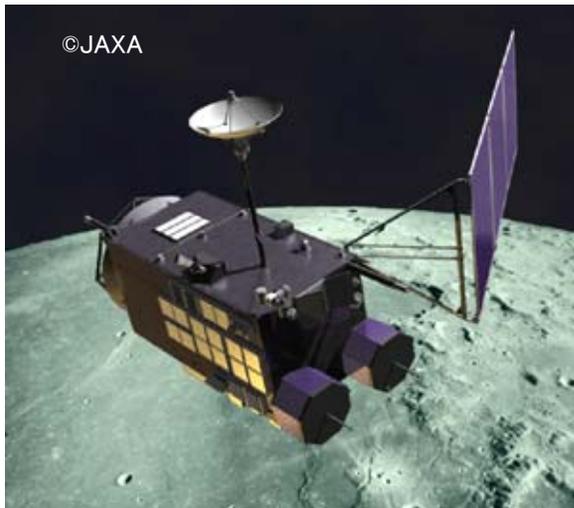


JAXA (Japan Aerospace Exploration Agency) Project

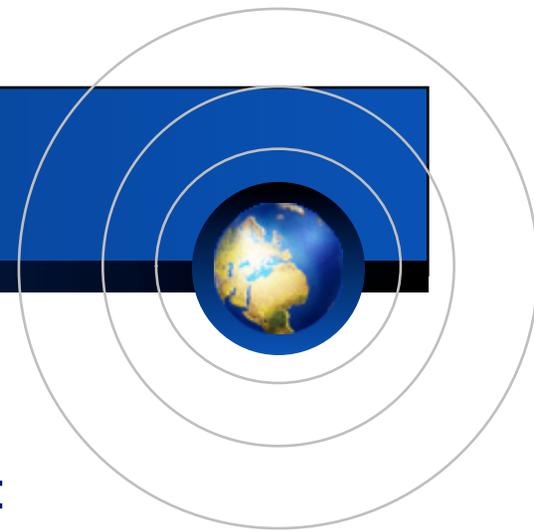
SELENE : SELEnological and ENgineering Explorer

The Japanese lunar explorer , launched on September 14, 2007

14 observation instruments with a polar orbit 100km above the
Moon. End of life 11. June, 2009



Objective & Roles



■ < Objective >

Capturing High Definition movies and still images:

Earth Rise / Earth Set

Famous lunar geographical features and lunar farside

■ < Roles >

1.Through broadcasting:

Reconsider the environmental change on the Earth

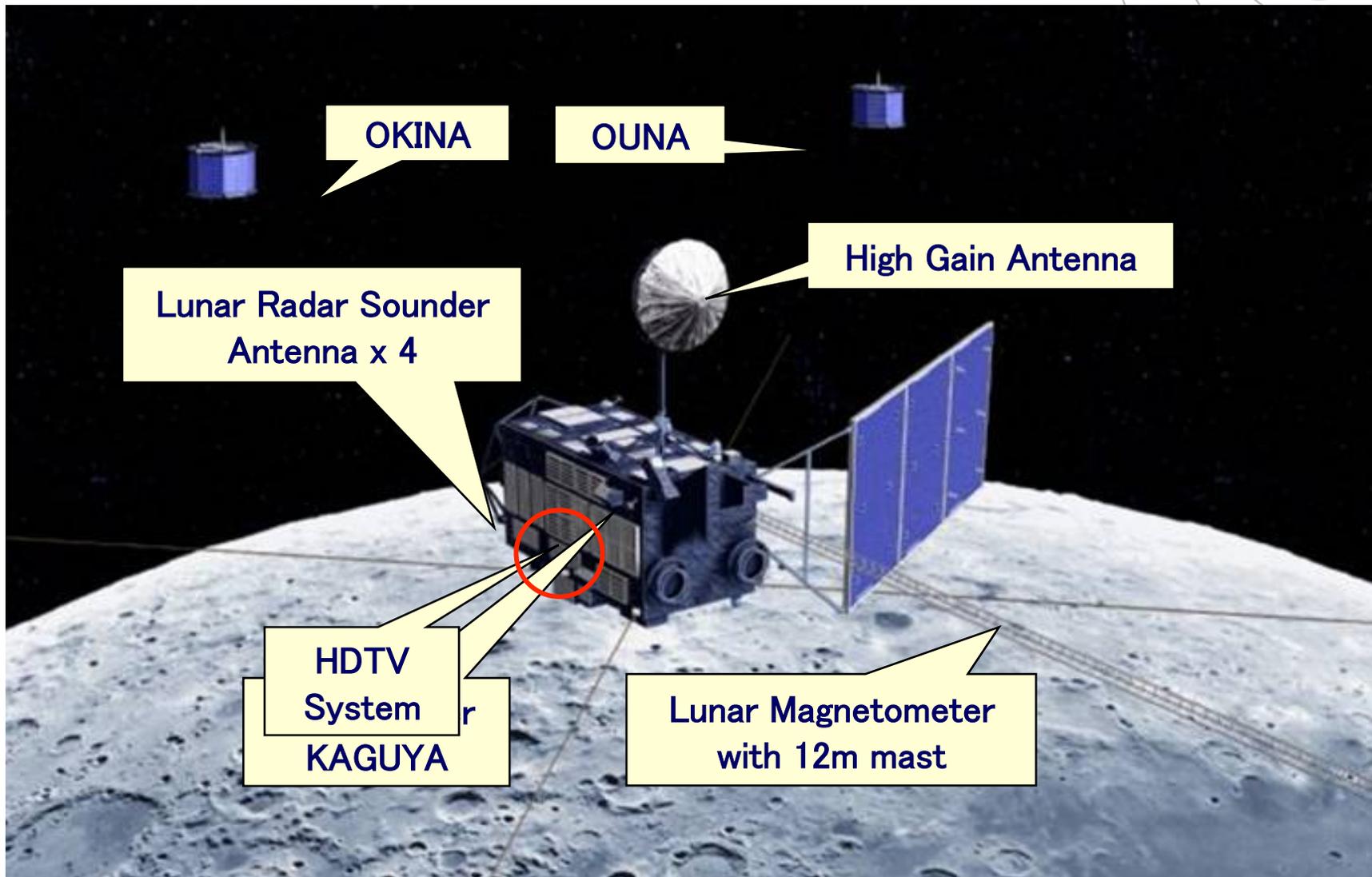
2.For public relations:

Increase the public understanding of space

3.Verification of consumer technology performance in space

Environment for HDTV technology in space

Characteristics of Kaguya (SELENE)



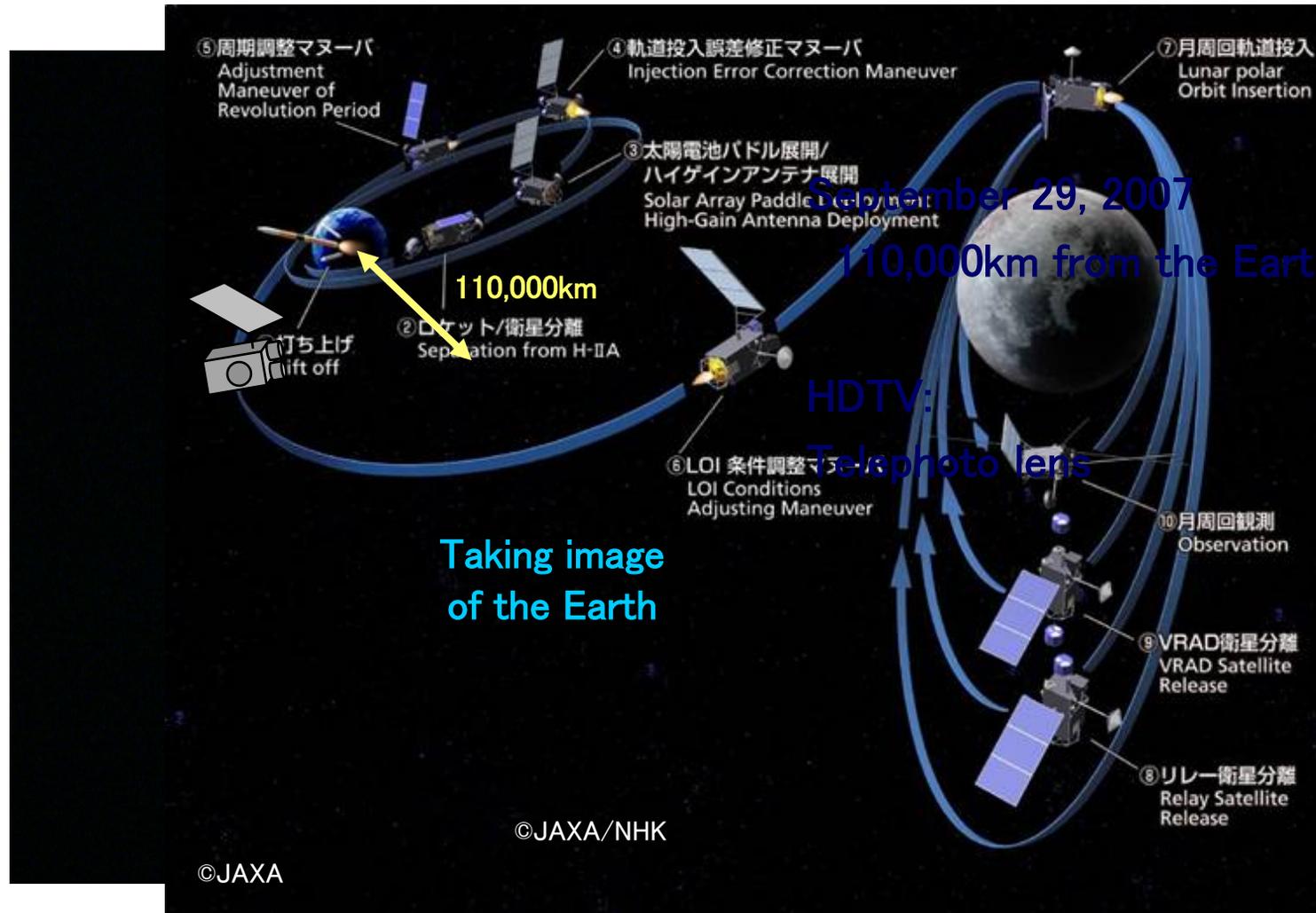
Problems in space



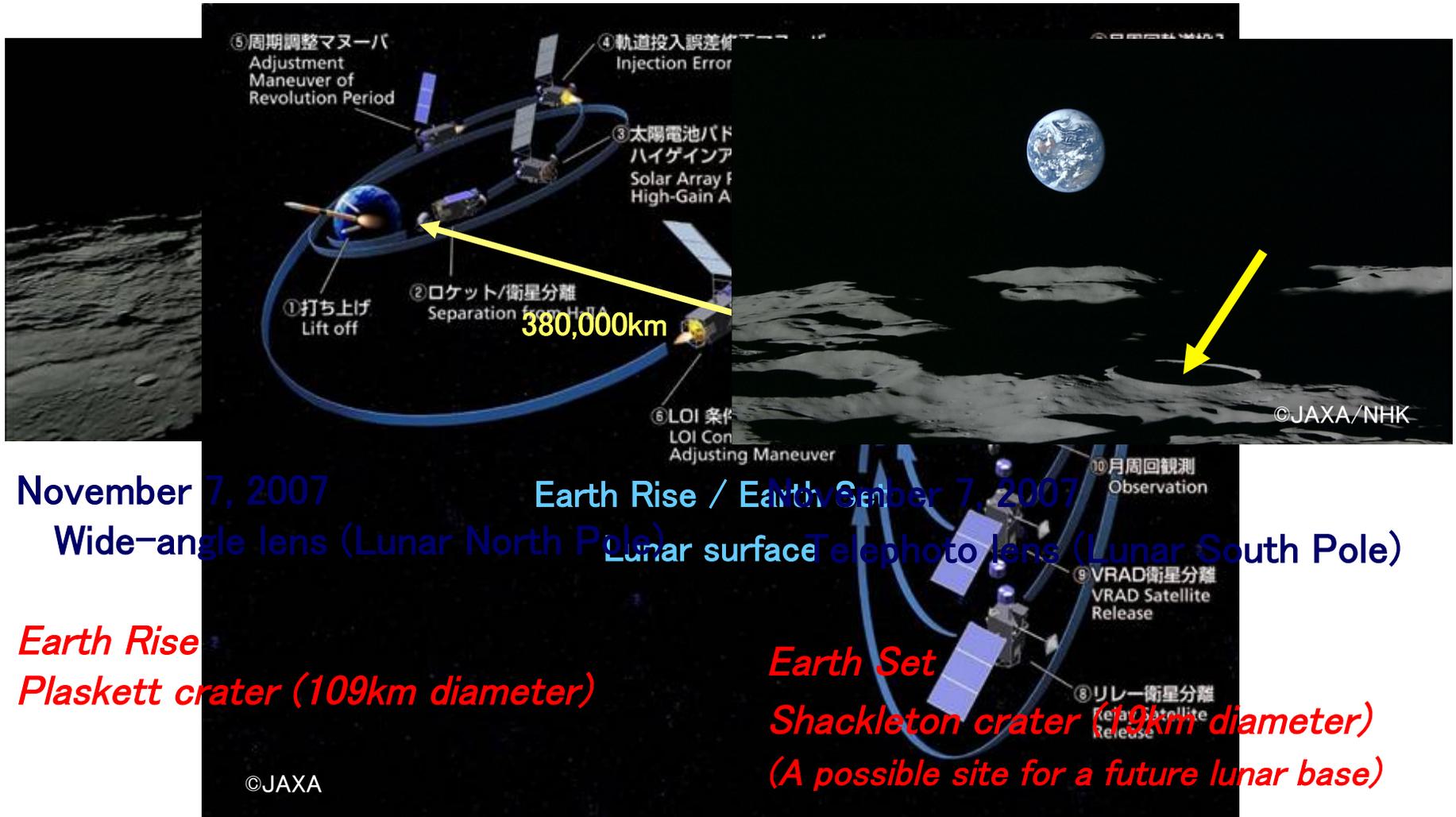
Difficulties in using highly integrated HDTV hardware in space

1. Radiation ⇒ *Gamma-ray, Proton and Heavy particle*
2. Low transfer rate ⇒ *8Mbps max*
3. Vibration & Shock ⇒ *22G for vibration, 1000G for shock*
4. Temperature ⇒ *From -130 to +170 degrees C*
5. Limited system condition ⇒ *Weight . Power consumption etc.*
6. Avoid interference to other equipment ⇒ *Electro magnetic field etc.*

Capturing images of the Earth



Earth Rise and Earth Set



November 7, 2007

Wide-angle lens (Lunar North Pole)

Earth Rise
Plaskett crater (109km diameter)

Earth Rise / Earth Set

November 7, 2007

Telephoto lens (Lunar South Pole)

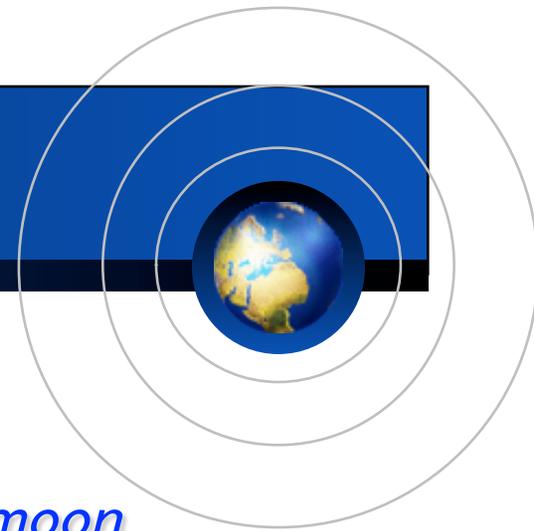
Earth Set
Shackleton crater (19km diameter)
(A possible site for a future lunar base)



The Earthrise and the Moon
2 min.

filmed by KAGUYA HDTV Camera
(Japan's lunar orbiter)

Future and Possibility



- < Future >

NHK team will continue research for the future moon mission.

- < Possibility >

⇒ Weight reduction of about 1/10 for the Lunar Lander

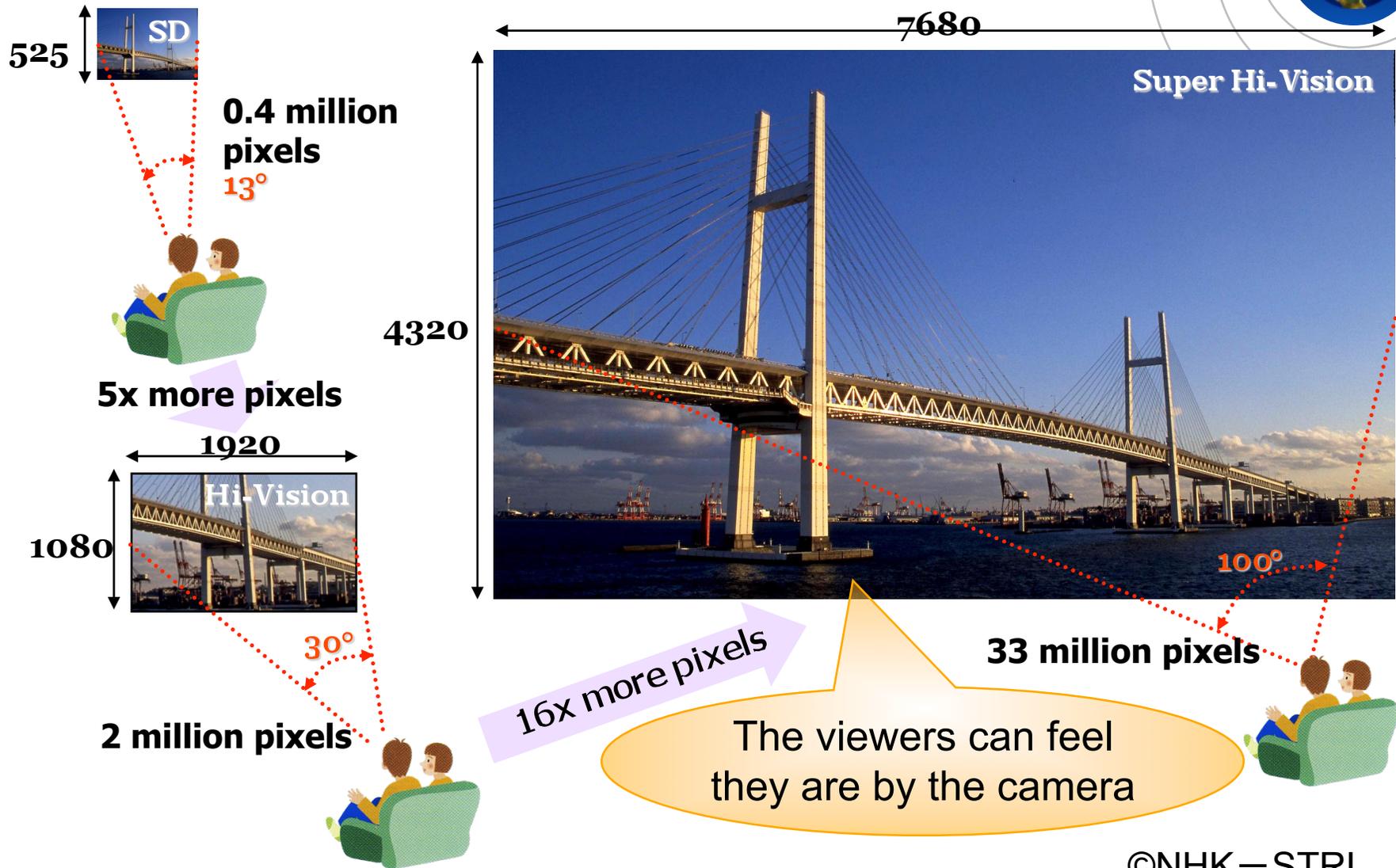
⇒ 4K, 8K ⇒ Monitoring system for global environment research purpose

Conclusion



- *NHK system is the world's first HDTV camera on spacecraft*
- *NHK succeeded in capturing the first High Definition movies and still images in space 380,000km away from the Earth.*
- *And proved that consumer broadcast equipment can be used in a hostile environments such as in space if appropriate modification and operation were applied.*

What is "Super Hi-Vision" ?



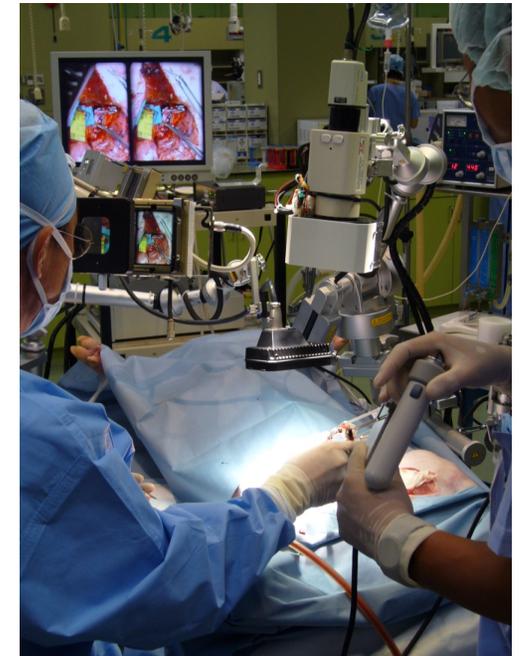
SHV: Super Hi-Vision



Open the **new** door to space

SHV has 16 times resolution than HDTV

- HDTV medical application now on practical stage.
- Application of stereoscopic HDTV video microscope to medical treatment
- More resolution and quality video need for applying future medical application



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Joshibi

Hideichi Tamegaya

**In cooperation with
NASA, JAXA, NHK, NHK-ES**