EXPERIMENT FACILITIES ON BOARD KIBO

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Human Space Systems and Utilization Mission Directorate,
JAXA

LAUNCH SCHEDULE OF EXPERIMENT FACILITIES

JFY 2008 | JFY 2009 | JFY 2010 | JFY2011 | JFY2012 | JFY2013

March, 2008 ELM-PS

June, 2008 JPM

July 2009 EF & ELM-EF

Nov. 2009 HTV#1 launch

HTV#2 launch

HTV#3 launch

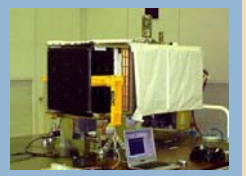
HTV#4 launch

HTV#5 launch

Ryutai **Rack**

Saibo **Rack**

SEDA-AP



MAXI

SMILES

Kobairo Rack

Multi-Purpose Small payload Rack

MCE

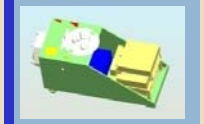
Aquatic Habitat

In the PLC of HTV

Electrostatic Levitation Furnace

On the ULC of HTV

CALET



PAYLOADS ACCOMODATION INSIDE KIBO

SAIBO Rack

On-board

Clean Bench (CB)

Treatment of Life sample, micro scope observation.

Cell Biology Experiment Facility (CBEF)

Cell culture, incubation

High Definition TV System

On-board

HDV camera

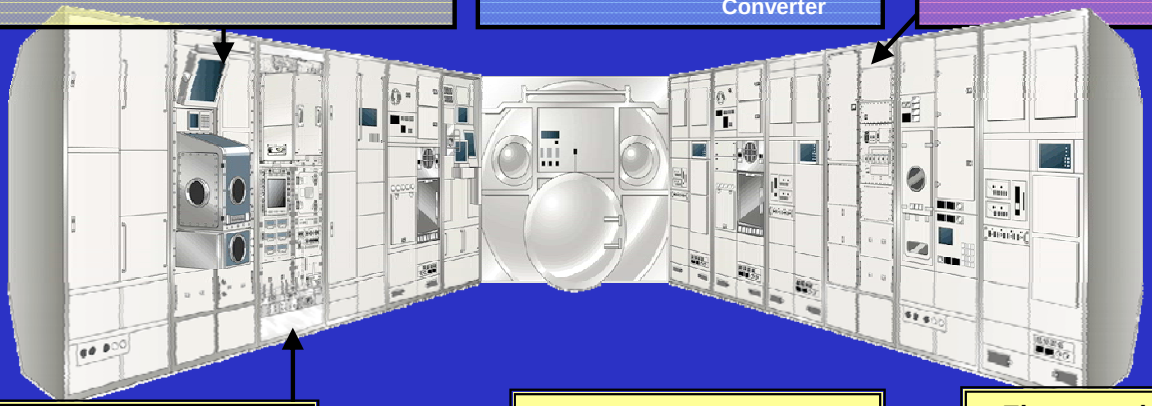
Multi Protocol Converter

KOBAIRO Rack

2011～

Gradient Heating Furnace (GHF)

Material processing



RYUTAI Rack

On-board

Fluid Physics Experiment Facility (FPEF)

Image Processing Unit (IPU)

Solution Crystallization Observation Facility (SCOF)

Protein Crystallization Research Facility (PCRF)

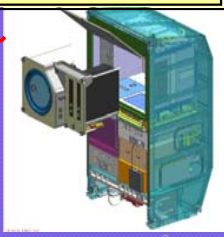
Observation of physical phenomenon under microgravity

Multi-Purpose Small payload Rack

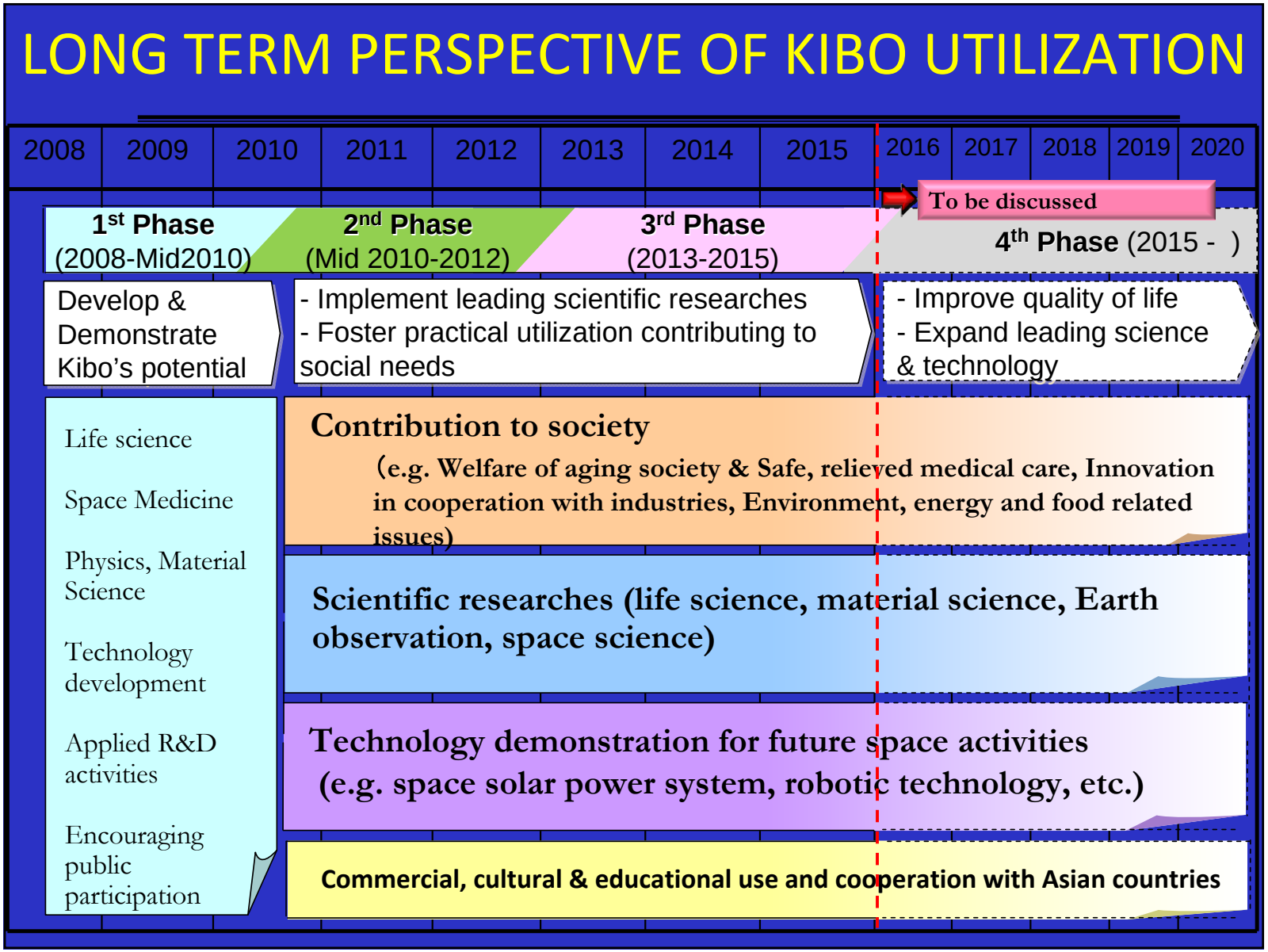
2011～

Electrostatic Levitation Furnace Rack

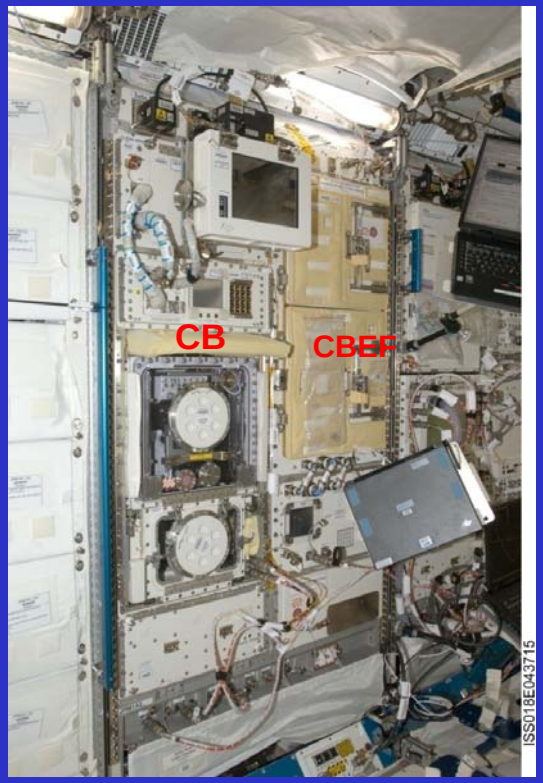
2013(TBD)～



LONG TERM PERSPECTIVE OF KIBO UTILIZATION

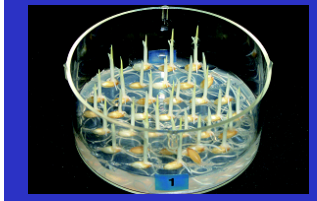


LIFE SCIENCE EXPERIMENTS IN SAIBO RACK

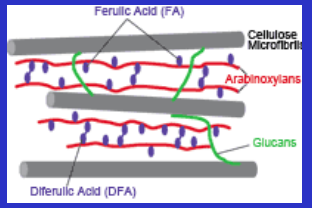


Rotating table had exchanged as functional trouble shooting

C.elegans Experiment in Space
CERIES in-flight experiment successfully completed
Post-flight analysis will be performed for examining effectiveness of RNA interference (RNAi) and changes and differences in gene and protein activities

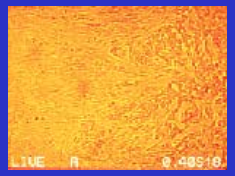


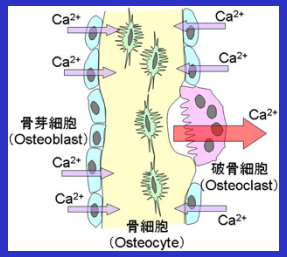
Cell wall structure of rice shoots under microgravity conditions in space.
Regulation by Gravity of Ferulate Formation in Cell Walls of Rice Seedlings

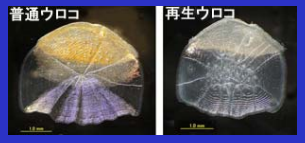


Cbl-Mediated Protein Ubiquitination Down regulates the Response of Skeletal Muscle Cells to Growth Factors in Space (Myo Lab)

Biological effects of space radiation and microgravity on mammalian cells (Neuro Rad)

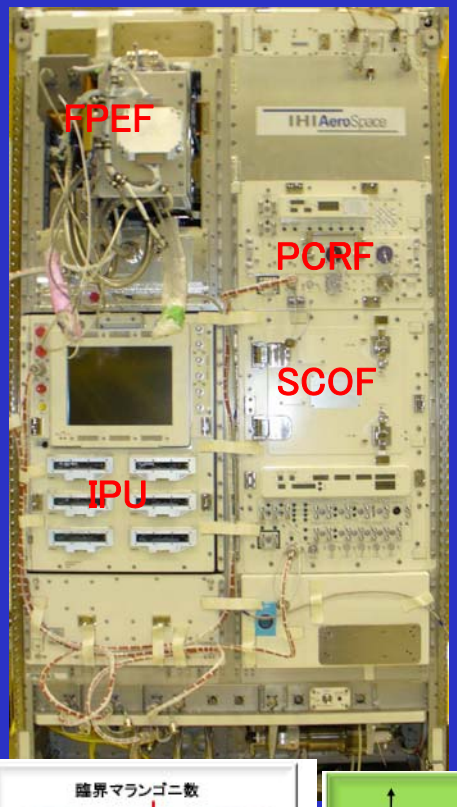






Regulation of bone metabolism in space: Analysis by an in vitro assay system using goldfish scale as a model of bone

MICROGRAVITY EXPERIMENTS IN RYUTAI RACK

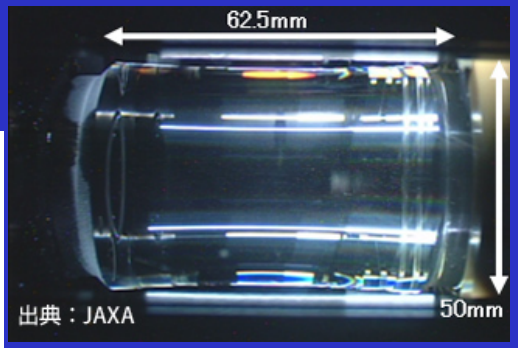


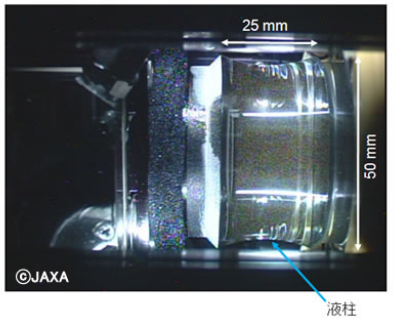
- Marangoni Experiment series have been conducting in the FPEF.
- FACET and Ice Crystal experiments have been done in the SCOF.
- High Quality Protein Crystal Growth is conducted in the PCRF.
- Image Processing Unit (IPU) supports most of the experiments.

On board maintenance by astronaut Soichi NOGUCHI to repair sealing of experiment cartridge.

流れが強くなり、臨界マランゴニ数を超えると振動流へと遷移する。

過去のロケット実験では液柱サイズ依存性が見られたが、流体力学では説明できなかった。





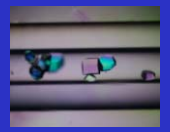
INDUSTRIAL APPLICATIONS

PCG

Obtain high quality protein crystals under microgravity in order to bring more precise protein 3D structures, which are useful for new drug/chemical design.

On the ground

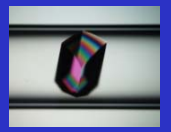

1.20Å


1.20Å

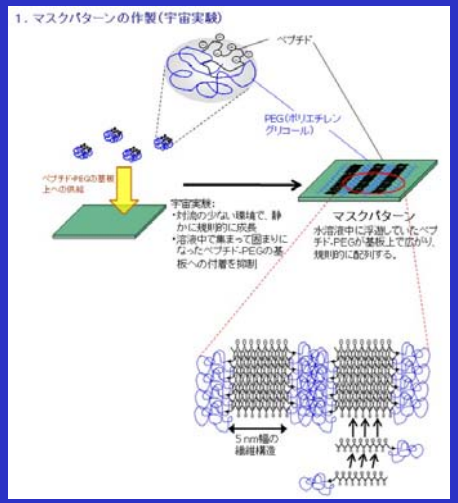

~4Å

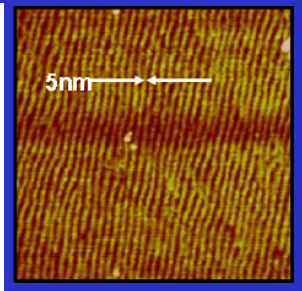
In space


0.89Å


0.9Å

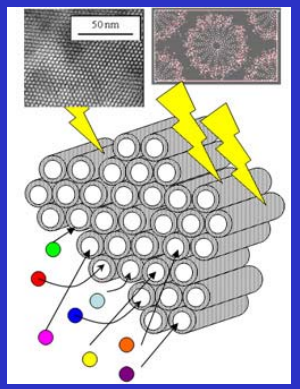

2.0Å





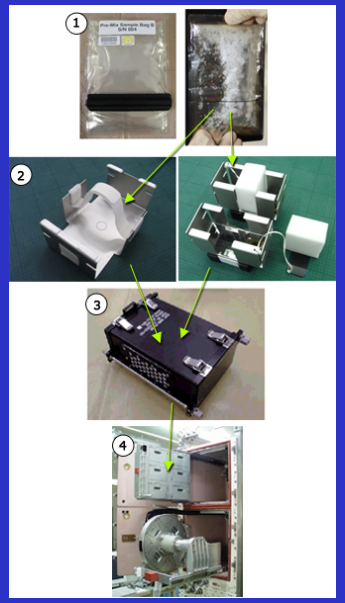
Nanotemplate

Produce two dimensional nano level mask pattern, which is expected to be used as a template for IC development.



Nanoskelton

Analyze new porous structure in space for designing photocatalystic materials on the ground.

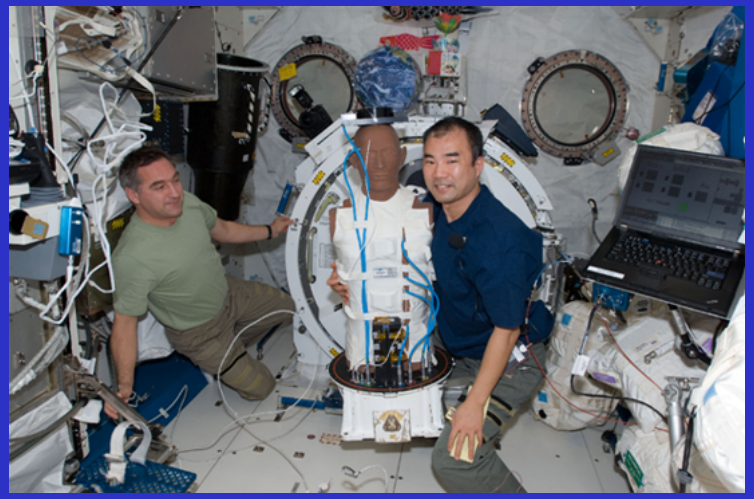


HUMAN RESEARCHES

Holter Electric Cardiogram to monitor crew Biorhythm in the ISS.

Excise and medicine which are useful for bone loss protection. (NASA/JAXA)

Microbe sampling kits for Astronauts



Phantom torso “MATROSHIKA”

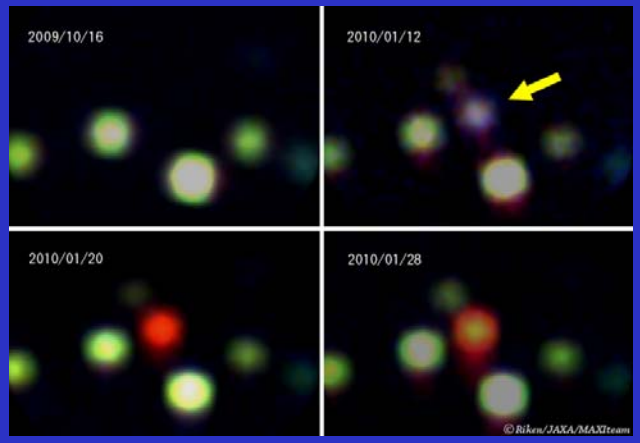
KIBO EXTERNAL PAYLOADS (1/3)

Monitor of All-sky X-ray Image (MAXI)

MAXI public data web site.

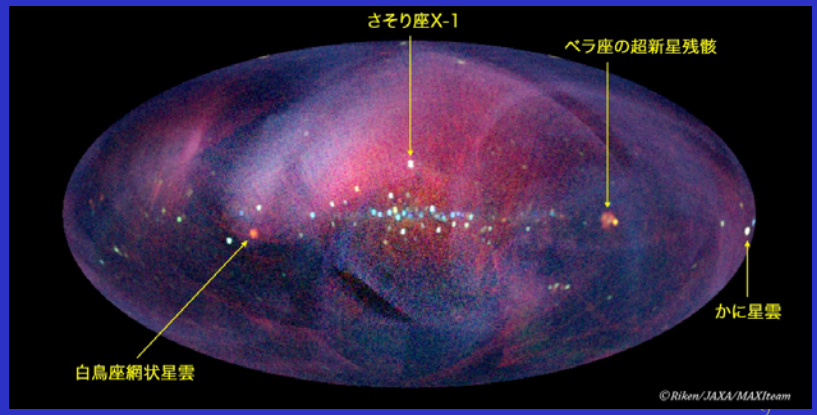
http://maxi.riken.jp/top/

MAXI on the JEM EF



New star in the Sagittarius

Gas Slit Camera Data

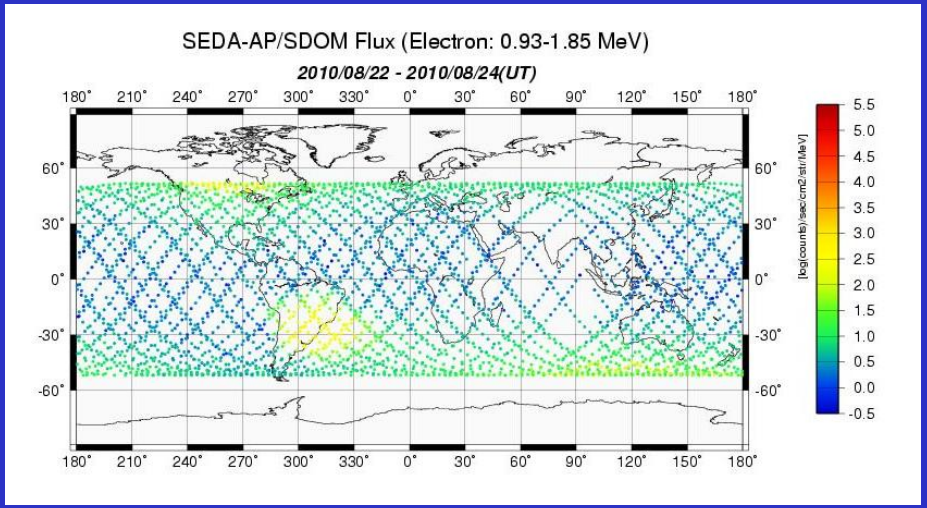


X ray CCD Camera Data

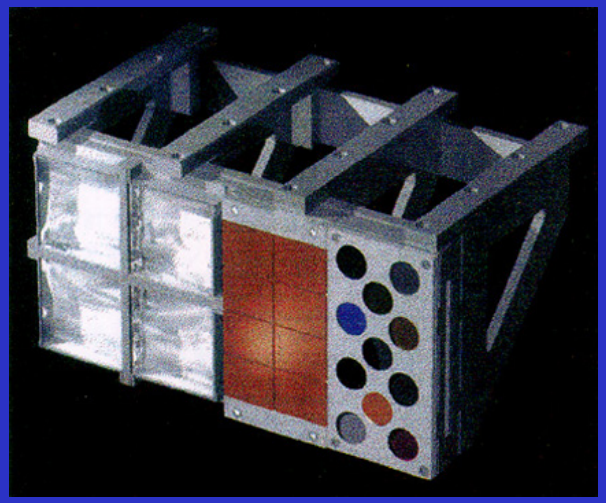
KIBO EXTERNAL PAYLOADS (2/ 3)

Space Environment Data Acquisition equipment-Attached Payload (SEDA-AP)

Data is available on the SEES web page. http://sees.tksc.jaxa.jp/



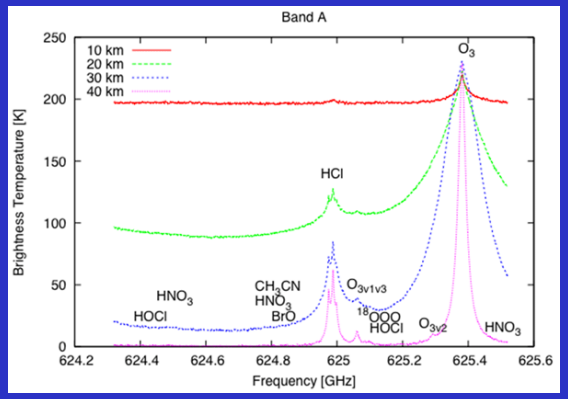
Electron Distribution

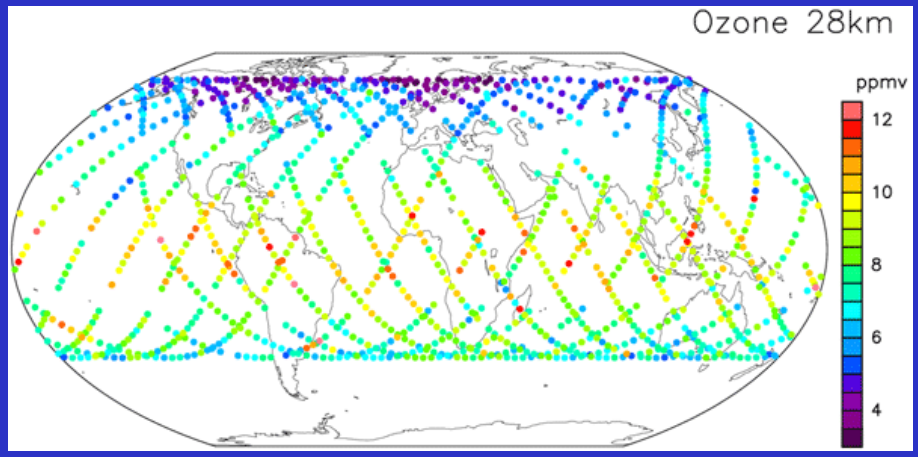


MPAC&SEED: Micro-Particles Capturer and Space Environment Exposure Device have been retreaved for analysis.

KIBO EXTERNAL PAYLOADS (3/ 3)

Superconducting Sub millimeter-wave Limb-Emission Sounder (SMILES) Observation is finished.





Ozone Distribution

EDUCATION AND ARTS

Moon Score

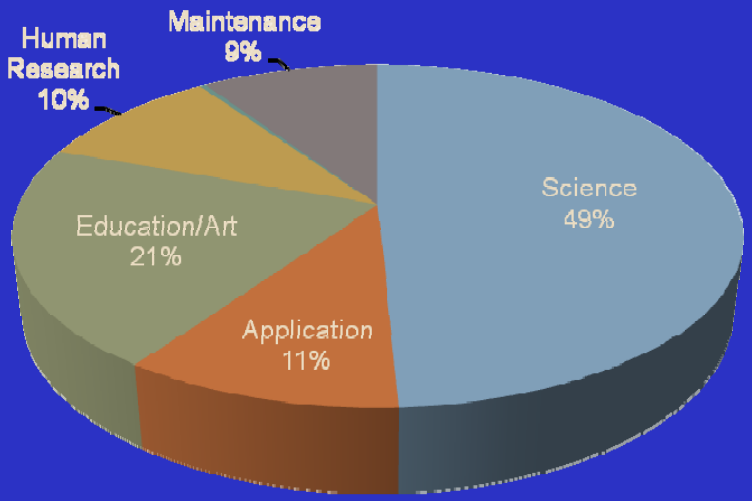
Space gardening

Space Dance “Hiten”

Spiral Top

SUMMARY OF ONBOARD CREW ACTIVITIES

Increment 21&22 (Half year Planning period)
from 2009/10/11/ to 2010/3/18

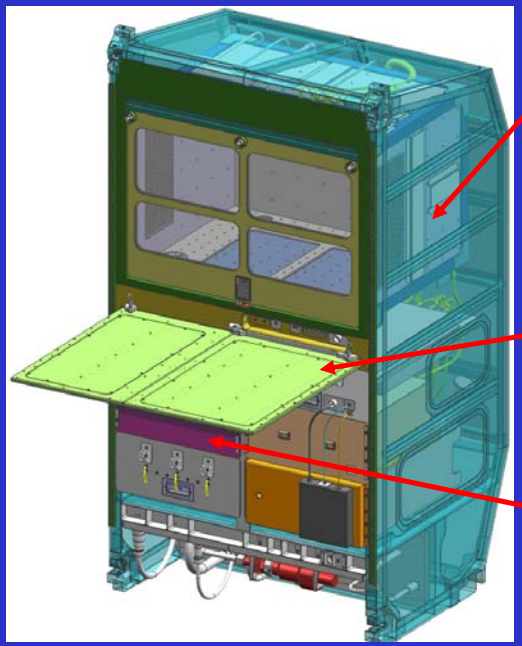


Increment 21/22 Crew activity hour ratio

NEW EXPERIMENT (Launced by HTV#2)

Kobairo Rack (GHF)

- Gradient Heating Furnace (GHF) is a high-temperature electrical furnace with an automated sample exchange mechanism
- Three heater-units can generate high temperature gradient to produce large scale pure crystals



Multi-Purpose Small payload Rack (MPSR)

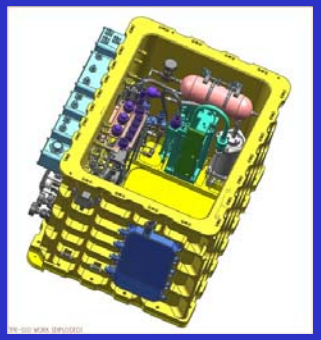
Work Volume
- Supply power: 400[W](28[VDC])
- Volume: 600(H)*900(W)*660(D) mm

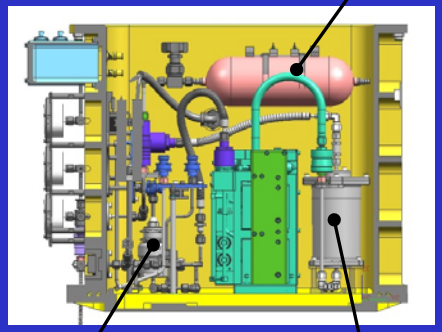
Work Bench
- Supply power for LAPTOP PC
- Area: 900(W)*600(D) mm

Small Experiment Area
- Supply power: 100[W](12[DC])
- Volume: 300(H)*440(W)*516(D) mm

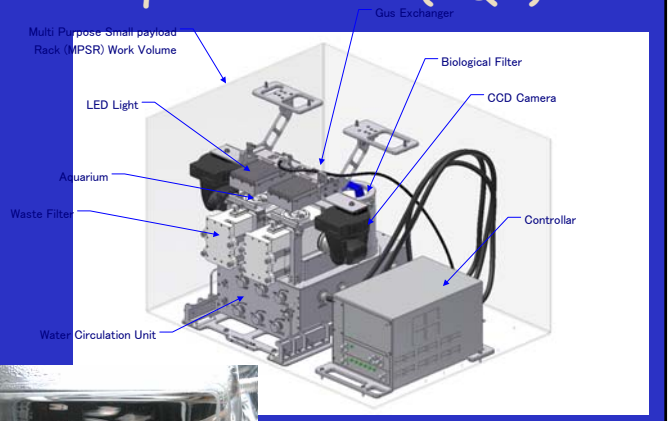
SUBRACK PAYLOADS USING MSPR

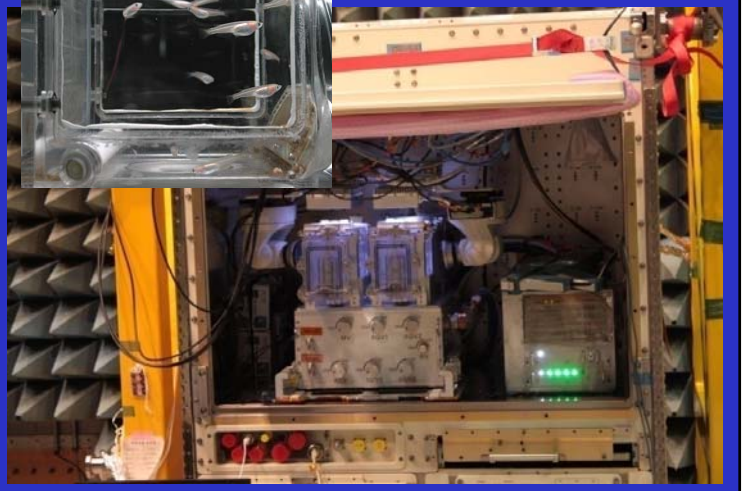
Chamber for Combustion Experiment (CCE)





Aquatic habitat (AQH)



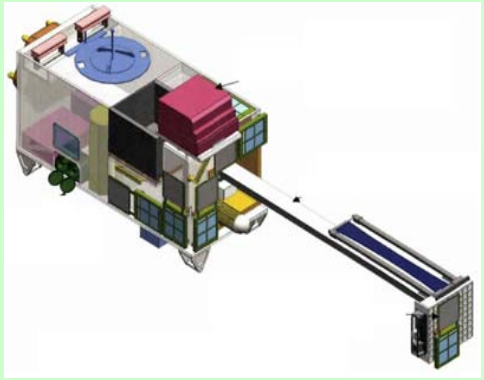


Electrostatic Levitation Furnace (ELF)

ELF levitates metals and ceramic materials by the electro-static force and melt samples without container

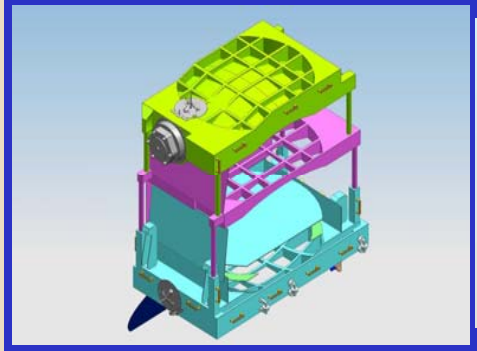
EXTERNAL PAYLOADS UNDER DEVELOPMENT

Port Shared Type Payload



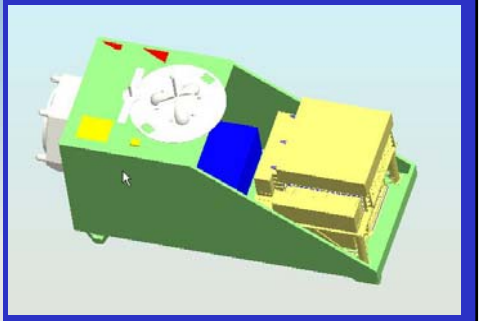
- ◆On-Orbit Demonstration of Space Inflatable Structure (SIMPLE)
- ◆ISS Ionosphere, Mesosphere, upper Atmosphere, and Plasma sphere mapper (ISS-IMAP)
- ◆JEM-GLISM (Global Lightning and Sprite Measurement)
- ◆REXJ: Robot Experiment on JEM

Port-cccupy Type Payloads



Extreme Universe Space Observatory (EUSO)

To determine energy and direction of extreme high energy cosmic ray, and reveal it's generation source (Phase A study)



Calorimetric Electron Telescope (CALET)

To search origin of cosmic ray and dark matter by observing electron and gamma-ray in high energy cosmic ray

COOPERATION ACTIVITIES WITH ASIAN-PACIFIC REGION

- A report issued by Space Activity Commission of Japan June 2009 noted importance of Japanese role as “the gateway to ISS in Asia”, considering that Japan is the only country participating ISS program in Asia.
- JAXA has established a new office, “Kibo Utilization Office for Asia (KUOA)” last summer.
- JAXA promotes ISS/Kibo utilization cooperative activities with Asia-Pacific countries through the Asia-Pacific Regional Space Agency Forum (APRSAF).
- A task force under the Space Environment Utilization Working Group of APRSAF has been working to plan joint Kibo utilization missions with Agean countries.

Parabolic Flight Experiment by Student

16th APRSAF Jan. 26-29, 2010 in Thailand