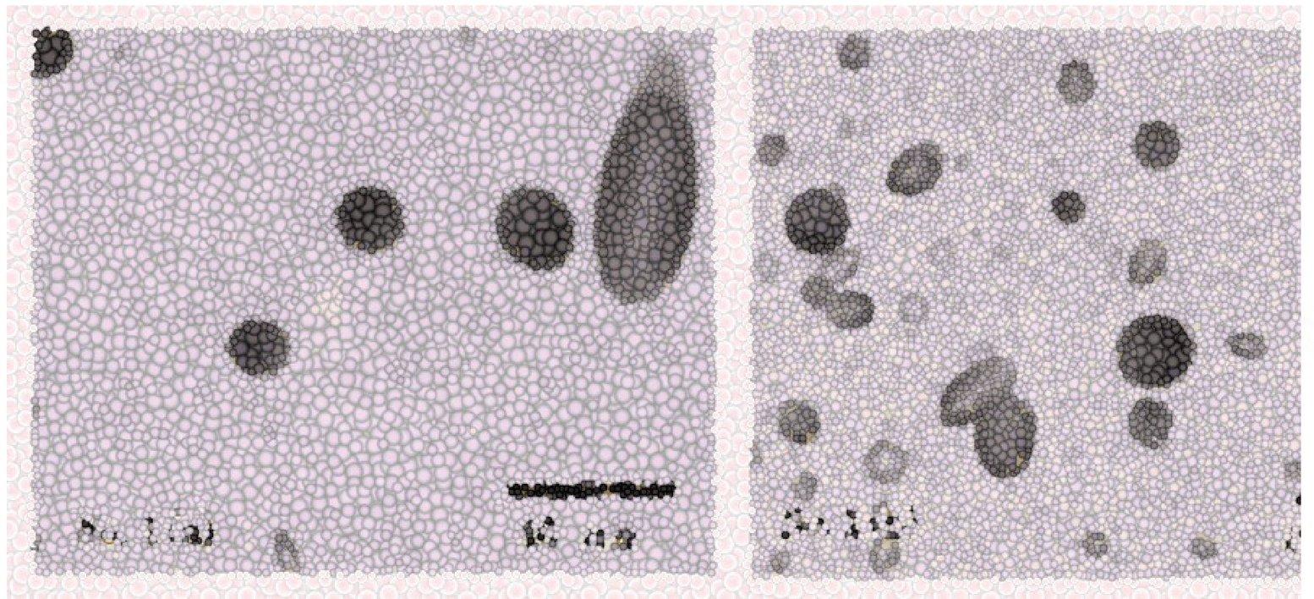
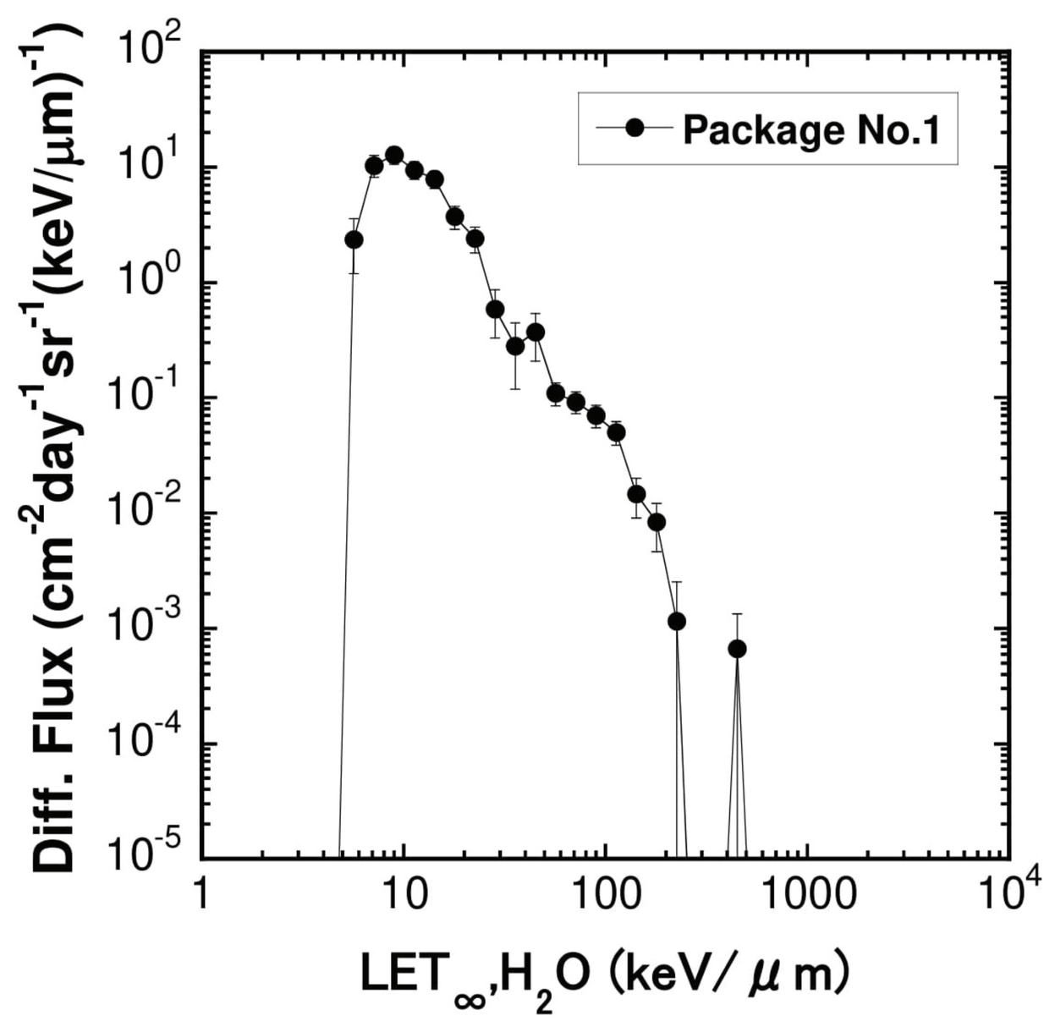
METHOD AND DATA ACQUISITION DATABASE OF BIO-PADDLE IN THE KIBO ISS MODULE FOR LONG TERM SPACE FLIGHT DURING THE SOLAR MINIMUM

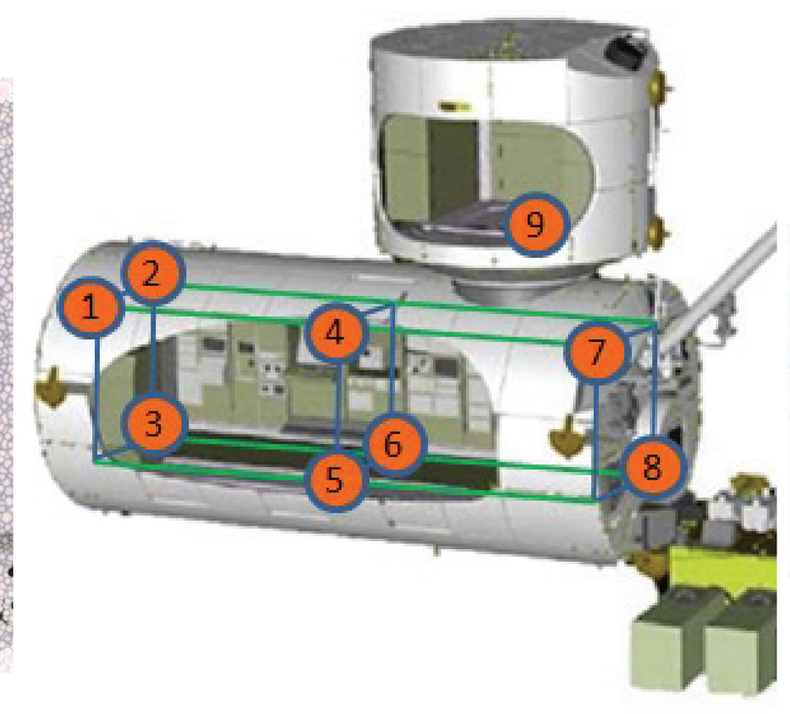
RESULTS

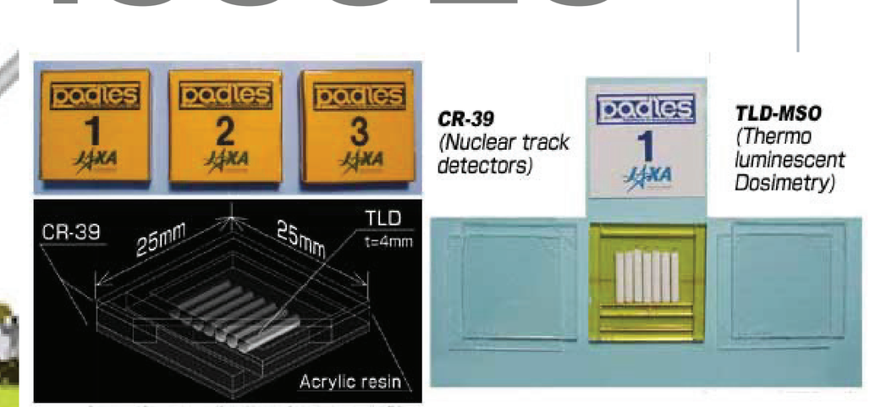




Package Serial No.	1
Total Absorbed Dose [mGy in water]	113.1±6.9
Total Dose Equivalent [mSv]*	213.2±12.5
Absorbed Dose Rate [mGy/day]	0.45±0.03
Dose Equivalent Rate [mSv/day]*	0.86±0.05
Absorbed Dose(10keV/μm) [mGy]*	102.1±7
Absorbed Dose(>10keV/μm) [mGy]	11.1±0.89
Dose Equivalent (>10keV/μm) [mSv]*	111.1±10.4
Mean QF	1.88±0.16

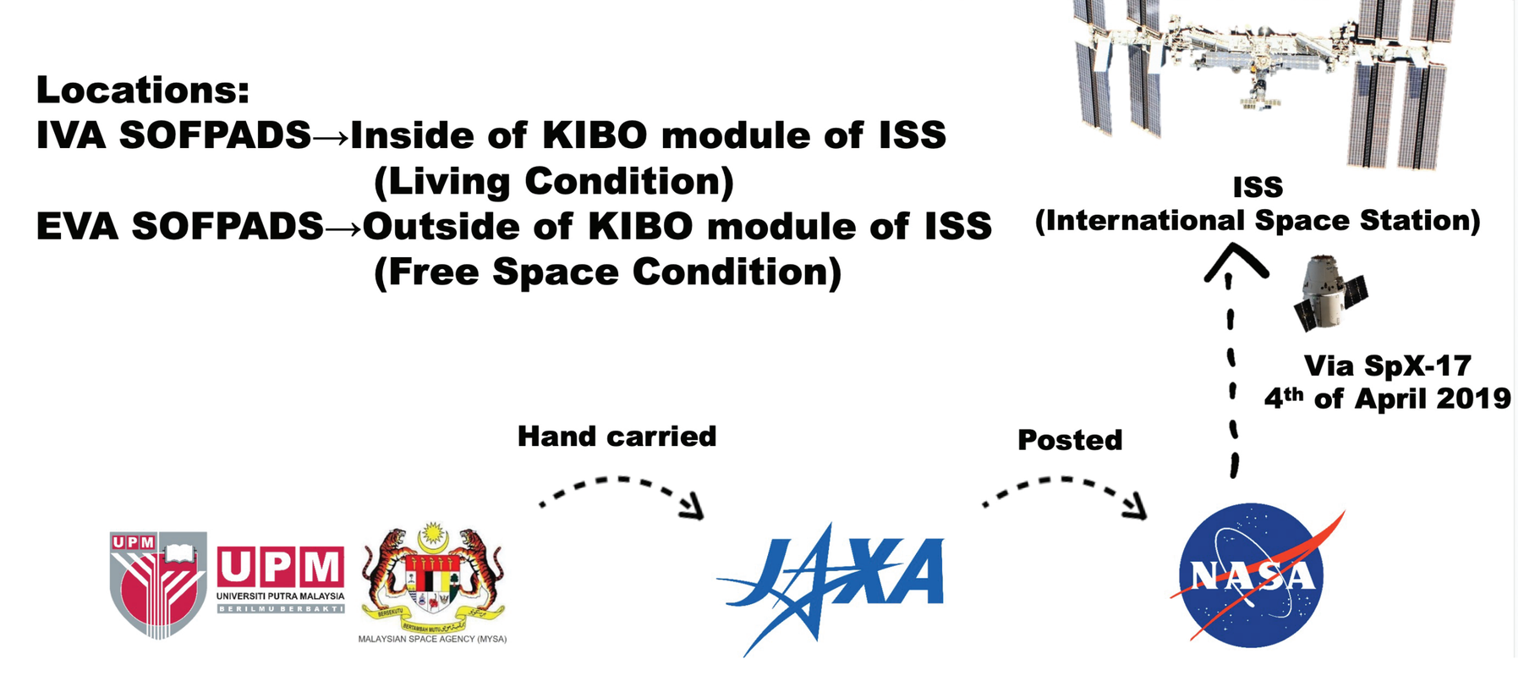
ISSUES





METHOD

LAUNCHING OF SOFPADS



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Preparation	Package assembly	September 5th, 2018
	Delivery to JAXA from AESr	October 30th, 2018
	Launch	May 4th, 2019
Recovery	Recovery from ISS	January 8th, 2020
	Return to AES from JAXA	January 17th, 2020
	Readout of TLD elements	January 27th, 2020
	Chemical etching of CR-39 PNTDs	February 6th – 7th, 2020
	Analysis of CR-39 PNTDs	February 14th – 19th, 2020
	Dose calculation	March 2nd, 2020

BRIEF TECHNOLOGY

The transportation of the BIOPADDLE through different processes, stages and compliances tests and appropriate localisation in the ISS. The results marked the importance of dosimetry data during the intravehicular activity (IVA) among the International Space Station (ISS) crews of the KIBO module of the Japanese ISS segment .

PROBLEM STATEMENT & CURRENT ISSUES

- The current development of automatic radiation monitoring system on the International space under the computer's control will make the monitoring process become efficient, simple and flexible to ensure the safety of the ISS crews at low as reasonably achievable (ALARA). Bodily impact on the radiation sensitive tissue on long haul flight remains as a major challenge for the operating crews.
- The accumulated radiation dose that traverses the ISS hull is uncertain given the ageing of the hull materials and presence of heavy ion radiation from unknown source. These could jeopardise the human tissue whereby radiation injury in chronic exposure which could lead to non-communicable disease i.e stroke, coronary artery disease and tumouregenesis.
- Therefore, a sampling of the radiation dose as a biodosimetry data is required to map the accumulated radiation dose during long flight at low earth orbit
- The database acquired is unique and potentially be utilised as a simulation study and to remodel the ISS crew radiation protection programme.

INVENTIVENESS & NOVELTY

The methods and the database acquired are unique and potentially be utilised as a simulation study to remodel the ISS crew radiation protection programme during solar minimum whereby heavy ion radiation is minimum. Therefore, the exact radiation dose in the ISS could be measured at the optimal level.

TRL 4-Lab validation

USEFULNESS & APPLICATION

- It does not requires a heavy payloads (100g) to obtain the data
- The transportation cost is cheap i.e RM50k for the whole mission
- It has been recognized by the JAXA and NASA space programme for future research tools
- It serves as a baseline dataset for potential future space radiation exploration for the solar minimum phase

IMPACT OF THE PRODUCT

- The method and results obtained from this product are deemed to provide new insight to the ISS space radiation safety programme.
- The new data is set to revise the efficiencey of the radiation sheild of the space station and therefore the crews are well surveillanced on their health status.
- Without the new data, radiation hazard during long space flight may be at risk and crews are at stake of developing non communicable disease i.e stroke, coronary heart disease due to chronic radiation injury.
- All the future experiments in this regards are tangeable to utilise the database informations to design new protocol and guideline of safety radiation standard for space crews living in the space station.

MARKET POTENTIAL

The method and data are ready for research experiment and with collaboration with JAXA research scientist, 1 PhD student is undergoing a simulation research experiment using the sattelite datasets. The method has been recognised and presented at the Asean Space Forum (ASPRAF) for the international space science working group.

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