MATROSHKA – Overview of 2004 - 2005

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ESA Project

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International Contribution:
15 Institutes
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MATROSHKA

MATROSHKA (MTR) Facility is designed to determine the radiation exposure of an astronaut / cosmonaut during an extravehicular activity (EVA).

Radiation exposure is measured in a Phantom simulating an Human Upper Torso shielded with a Carbon Fibre structure simulating the EVA suit.

Active and Passive Radiation Detectors are distributed over the whole body to determine skin and organ doses.
MATROSHKA

MATROSHKA is the first long duration phantom experiment positioned outside a Space Station.

Results shall give the dose distribution inside a Human Phantom for a better correlation between skin and organ dose and for better risk assessment in future long duration space flight.
MATROSHKA simulates an astronaut during an Extra Vehicular Activity. A human phantom is exposed in a pressurized container which meets the mean shielding thickness of a space suit (0.5 – 1 g/cm²).
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Phantom Torso + Poncho + Container + MLI
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DOSTEL

TEPC

SSD

- Eye
- Lung
- Stomach
- Kidney
- Intestine
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Radiation detectors inside the MATROSHKA facility
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- EVA: 26. February 2004
- Active instruments: April 2004
- Exposure Time: 1 ½ years
- Back inside ISS: 18. August 2005
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MTR EVA: 26. February 2004
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MTR Activation of active instruments: April 2004
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MTR Recovery EVA: 18. August 2005
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Science and Housekeeping Data
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Temperature Sensor #1 (Slice 2)
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Temperature Sensor #2 (Slice 16)

Temperature (°C)

04.04 06.04 08.04 10.04 12.04 02.05 04.05 06.05 08.05
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Temperature Sensor #3 (Slice 26)
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DOSTEL / April 04

- GCR – Dose: 296 µGy/day
- Qualityfactor: 3.1 ± 0.3

- SAA – Dose: 256 µGy/day
- Qualityfactor: 1.5 ± 0.4

- Dose: 552 µGy/day
- Dose equivalent: 1.36 mSv/day

JSC / April 04

- GCR – Dose: 277 µGy/day
- Qualityfactor: 3.7

- SAA – Dose: 219 µGy/day
- Qualityfactor: 1.4
Outside ISS measurements (April 2004)

- DOSTEL: ~ 1.3 mSv/day
  ~ 550 µGy/day

- EV-CPDS: ~ 400 µGy/day

Inside ISS measurements (April 2004)

- NASA TEPC: ~ 450 – 550 µSv/day
- TLD´s: ~ 150 – 250 µGy/day
- IV-CPDS: ~ 220 – 270 µGy/day
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- Radiation exposure during an EVA: ~ 1.3 mSv/day
- Radiation exposure inside the ISS: ~ 0.4 mSv/day

Countrate of the active radiation detector „DOSTEL“ over a period of 16 days
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OUTLOOK 2005 - 2006
MATROSHKA I

- MATROSHKA Recovery EVA on the 18. August 2005
- MATROSHKA passive detectors to be returned with Soyuz in October 2005
- Passive detectors distributed to investigators ~ November 2005
Preparation for MATROSHKA II already started

Passive detector packages to be uploaded with Progress in December 2005

Passive detector packages to be ready by the end of October 2005
Thanks very much for your attention !!