

Preliminary results of SI3 and ICCH-CR-39 experiments obtained by PADC track etch detectors

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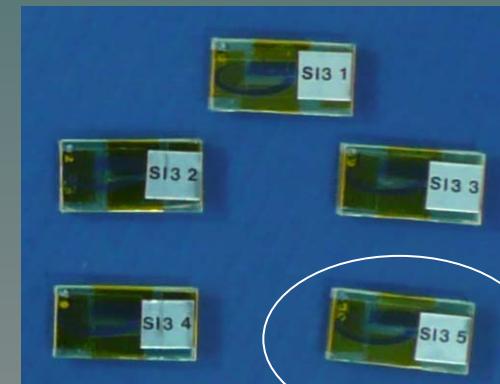
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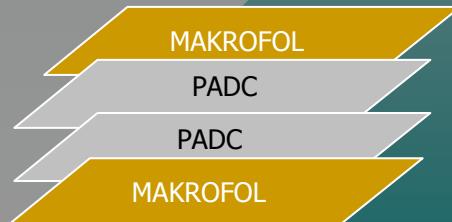
INTRODUCTION - Position of the AERI detectors 1.(SI3)

| Stack #I | Stack #II | Stack #III | Stack #IV | Stack #V | |
|-------------------------------|---------------------------|----------------------------------|-------------------------------|----------------------|--|
| NPI Top + Page No1 | NIRS Top + SI3-T-001 | ATI Top + SI3-T-005 | OSU Top + SI3-OSU-4-1 | IBMP SI3-T-015 | |
| INP Top + SI3 IFJ 1 | JAXA Top + JAXA-301 | DLR Top + DLR I | NASA-JSC Top + SI3-JSC-4-1 | Armenia SI3-T-016 | |
| SCK-CEN Top + SI3-T-008 | SI3 BL 2 | SI3 BL 3 | SI3 BL 4 | SI3 BL 5 | |
| SI3 BL 1 | SI3-T-011 | SI3-T-012 | SI3-T-013 | SI3-T-014 | |
| SCK-CEN Bottom + SI3-T-009 | SI3-B-001 | SI3-B-002 | SI3-B-003 | SI3-B-004 | |
| INP Bottom + SI3 IFJ 2 | SI3 1 | SI3 2 | SI3 3 | SI3 4 | |
| NPI Bottom + Page No2 | TD-1 No1 | TD-1 No2 | TD-1 No4 | TD-1 No3 | |
| | Page No4 | Page No5 | DLR IV | DLR V | |
| JAXA Bottom + JAXA-302 | DLR Bottom + DLR II | NASA-JSC Bottom + SI3-JSC-4-2 | Armenia SI3-T-017 | | |
| NIRS Bottom + SI3-T-002 | ATI Bottom + SI3-T-006 | OSU Bottom + SI3-OSU-4-2 | IBMP SI3-T-018 | | |



Top
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Bottom

- Travelling background detectors
- Thickness of stacks: 3 mm



Position of the AERI detectors 1.(SI3)- in Russian Service Module

| Wall #1 SI 1 | Wall #2 SI 2 | Wall #3 SI 3 | Wall #4 SI 4 | Wall #5 SI 5 | Wall #6 SI 6 | |
|--------------------------|--------------------------|--------------------------|--------------------------|----------------------------|----------------------------|--|
| SI3-W-T-001 | SI3-W-T-002 | SI3-W-T-003 | SI3-W-T-004 | SI3-W-T-005 | SI3-W-T-006 | |
| SI3-W-B-001 | SI3-W-B-002 | SI3-W-B-003 | SI3-W-B-004 | SI3-W-B-005 | SI3-W-B-006 | |
| SI3-OSU-1-1 | SI3-OSU-1-2 | SI3-OSU-2-2 | SI3-OSU-2-1 | SI3-OSU-3-2 | SI3-OSU-3-1 | |
| SI3-JSC-1-1 | SI3-JSC-1-2 | SI3-JSC-2-2 | SI3-JSC-2-1 | SI3-JSC-3-1 | SI3-JSC-3-2 | |
| Box 2 1 | Box 2 2 | Box 2 3 | Box 2 4 | Box 2 5 | Box 2 6 | |
| Page No3 K46 | Page No4 K47 | Page No3 K51 | Page No4 K52 | Page No3 K56 | Page No4 K57 | |
| Tastrak No3 T129 | Tastrak No4 T130 | Tastrak No3 T134 | Tastrak No4 T135 | Tastrak No3 T139 | Tastrak No4 T140 | |
| TD-1 No3 Z48 | TD-1 No4 Z49 | TD-1 No3 Z53 | TD-1 No4 Z54 | TD-1 No3 Z58 | TD-1 No4 Z59 | |
| WALL-JAXA- 303 | WALL-JAXA- 304 | WALL-JAXA- 308 | WALL-JAXA- 309 | WALL-JAXA- 313 | WALL-JAXA- 314 | |
| DLR BIII | DLR BII | DLR BIII | DLR BII | DLR BIII | DLR BIV | |
| Spc-ICC SPD Big IFJ 1 | Spc-ICC SPD Big IFJ 2 | Spc-ICC IFJ 1 SPD Med | Spc-ICC IFJ 2 SPD Med | Spc-ICC SPD IFJ 1 small | Spc-ICC SPD IFJ 2 small | |

Wall
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↓
Inside

- Wall detectors
- Thickness of AERI stacks: 1.4 mm



14th May 2008 – 24th October 2008

Position of the AERI detectors 2. (ICCH-CR-39) – in PIRS Docking Module

Main stack
(1):

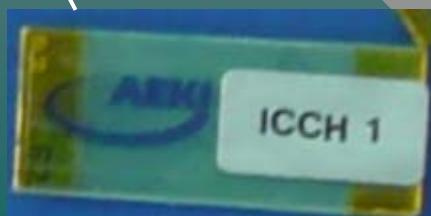
| |
|--------------------------|
| IC3-T001 |
| IC3-B001 |
| TTS-1 |
| OSU-5-1 |
| JSC-5-1 |
| ICCH1, ICCH2 ICCH3 ICCH4 |
| Page No1 K33 |
| Tastrak No1 116T |
| TD-1 No1 Z35 |
| ATP No1 A116 |
| CR39ICCHI-JAXA-301 |
| DLR ICC I |
| Spc-ICC IFJ1 |

Wall detectors:

| Wall #1 IC 1 | Wall #2 IC 2 | Wall #3 IC 3 | Wall #4 IC 4 | Wall #5 IC 5 | Wall #6 IC 6 | |
|-----------------|-------------------|-----------------|-------------------|-----------------|---------------------|--|
| IC3-W-T-001 | Page No1 K44 | IC3-W-T-003 | Page No1 K49 | IC3-W-T-005 | Page No1 K54 | |
| IC3-W-B-001 | Tastrak No1 T127 | IC3-W-B-003 | Tastrak No1 T132 | IC3-W-B-005 | Tastrak No1 T137 | |
| CRSI-OSU-1-2 | TD-1 No1 Z46 | CRSI-OSU-2-2 | TD-1 No1 Z51 | CRSI-OSU-3-2 | TD-1 No1 Z56 | |
| CRSI-JSC-1-2 | WALL-JAXA-301 | CRSI-JSC-2-2 | WALL-JAXA-306 | CRSI-JSC-3-2 | WALL-JAXA-311 | |
| Box 1 1 | DLR BV | Box 1 3 | DLR BV | Box 1 5 | DLR BI | |
| | SI3 SPD Big IFJ 1 | | SI3 SPD Med IFJ 1 | | SI3 SPD IFJ 1 small | |

Wall
↑
↓
Inside

Thickness of AERI
stacks: 3 mm



Thickness of AERI stacks:
1.4 mm

ETCHING METHOD

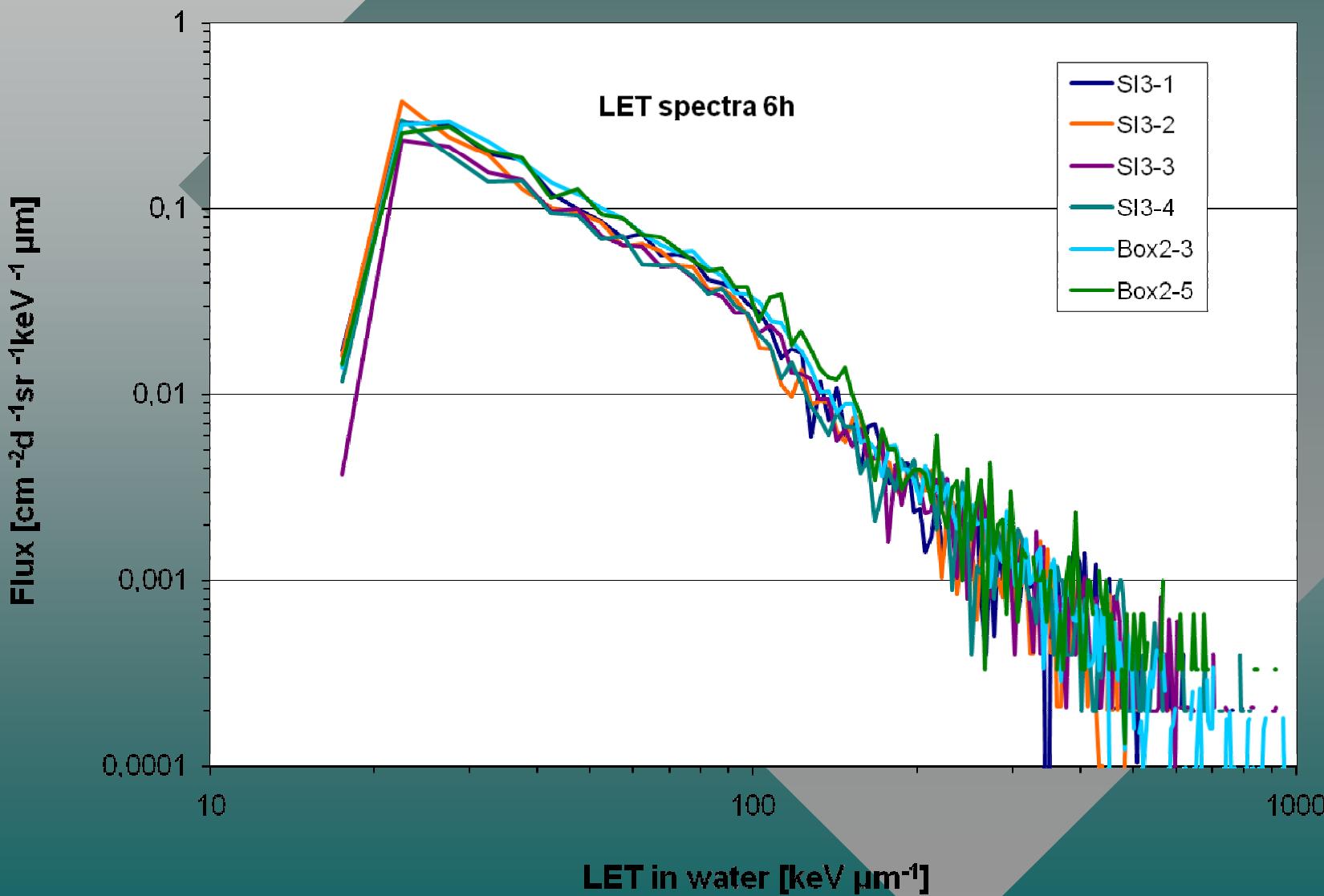
- In 6 N NaOH, 70 °C
- Detector material: polyallyl-diglycol-carbonate (PADC, Tastrak)
- Thickness of detectors: 1 mm
- 6h: to measure the short range and high LET particles, 8 µm removal
- +9h=15h: to measure lower LET particles, 20.1 µm removal

INVESTIGATIONS AND CALCULATIONS

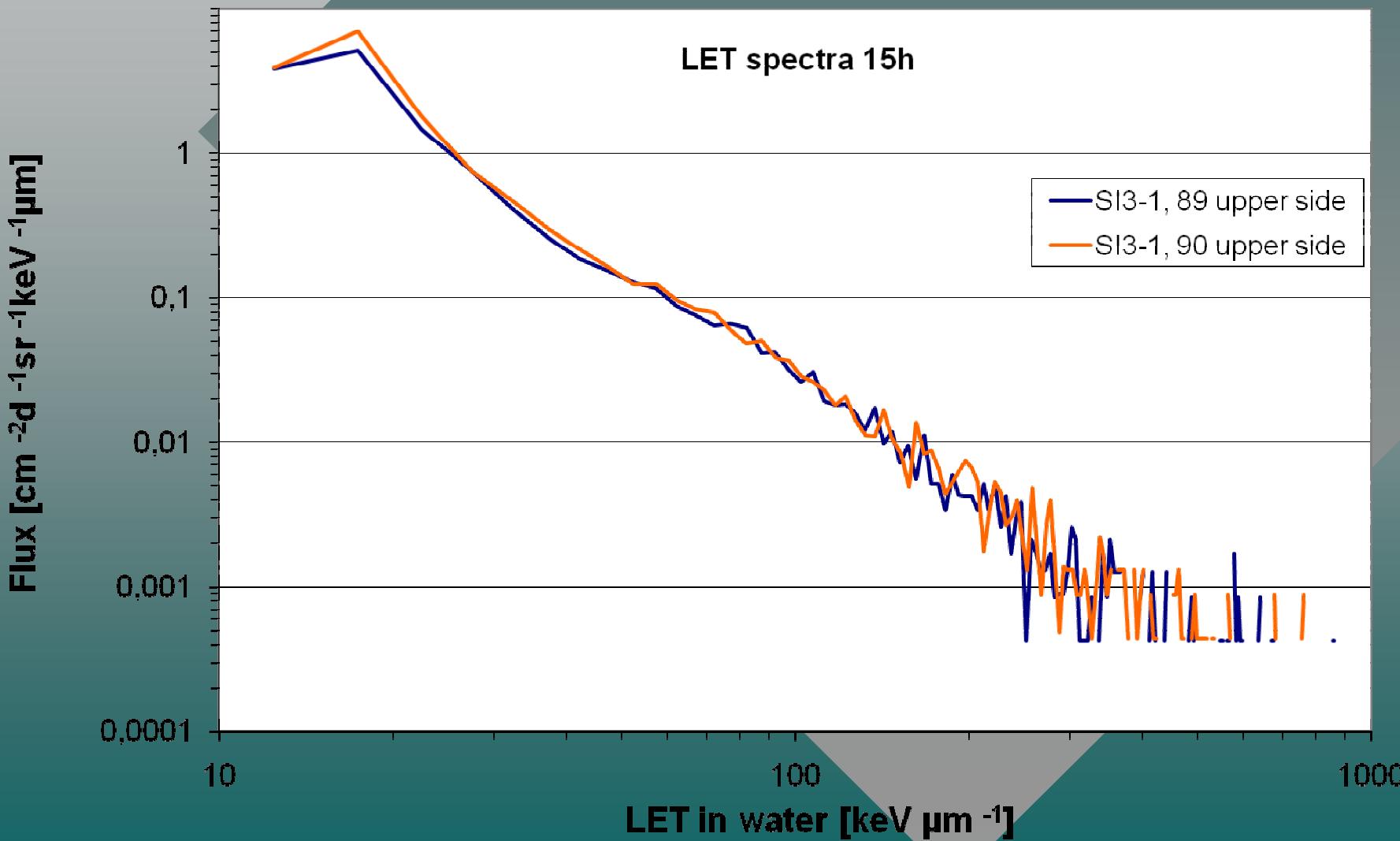
- Semi-automatic measurements using the VIRGINIA image analyzer and optical microscope → geometrical and optical parameters → V
- Calibration curves (6h, 15h) – converting the track etch rate ratio (V) obtained from the track parameters into LET
- Using standard calculation method → $\Phi(L)$, D, H, $Q=H/D$
- Manual measurements → HZE



LET SPECTRA (SI3)- 6h etching time



LET SPECTRA (SI3) - 15h etching time



DOSE VALUES (SI3): results obtained after 6h etching ($\geq 17.5 \text{ keV}/\mu\text{m}$)

| stack | $D \pm 1\sigma$ [mGy] | $H \pm 1\sigma$ [mSv] | $D \text{ rate} \pm 1\sigma$ [$\mu\text{Gy/d}$] | $H \text{ rate} \pm 1\sigma$ [$\mu\text{Sv/d}$] | $Q \pm 1\sigma$ |
|--------|--------------------------|--------------------------|--|--|------------------|
| SI3-1 | 2.05 ± 0.06 | 35.12 ± 0.89 | 12.67 ± 0.38 | 216.8 ± 5.5 | 17.12 ± 0.37 |
| SI3-2 | 1.83 ± 0.13 | 31.09 ± 2.38 | 11.27 ± 0.79 | 191.9 ± 14.7 | 17.02 ± 0.23 |
| SI3-3 | 1.88 ± 0.14 | 32.89 ± 2.22 | 11.60 ± 0.89 | 203.0 ± 13.7 | 17.51 ± 0.35 |
| SI3-4 | 1.84 ± 0.16 | 32.06 ± 3.08 | 11.38 ± 0.99 | 197.9 ± 19.0 | 17.39 ± 0.21 |
| Box2-3 | 2.12 ± 0.20 | 37.51 ± 2.82 | 13.11 ± 1.26 | 231.6 ± 17.4 | 17.74 ± 0.30 |
| Box2-5 | 2.27 ± 0.20 | 40.87 ± 3.29 | 13.99 ± 1.25 | 252.3 ± 20.3 | 18.04 ± 0.16 |

DOSE VALUES (SI3): combined results of 6 and 15h etching ($\geq 10 \text{ keV}/\mu\text{m}$)

| stack | $D \pm 1\sigma$ [mGy] | $H \pm 1\sigma$ [mSv] | $D \text{ rate} \pm 1\sigma$ [$\mu\text{Gy/d}$] | $H \text{ rate} \pm 1\sigma$ [$\mu\text{Sv/d}$] | $Q \pm 1\sigma$ |
|-------|--------------------------|--------------------------|--|--|-----------------|
| SI3-1 | 6.21 ± 0.52 | 61.60 ± 2.36 | 38.32 ± 3.19 | 380.2 ± 14.5 | 9.94 ± 0.45 |

Only the evaluation of the first stack has been completed.

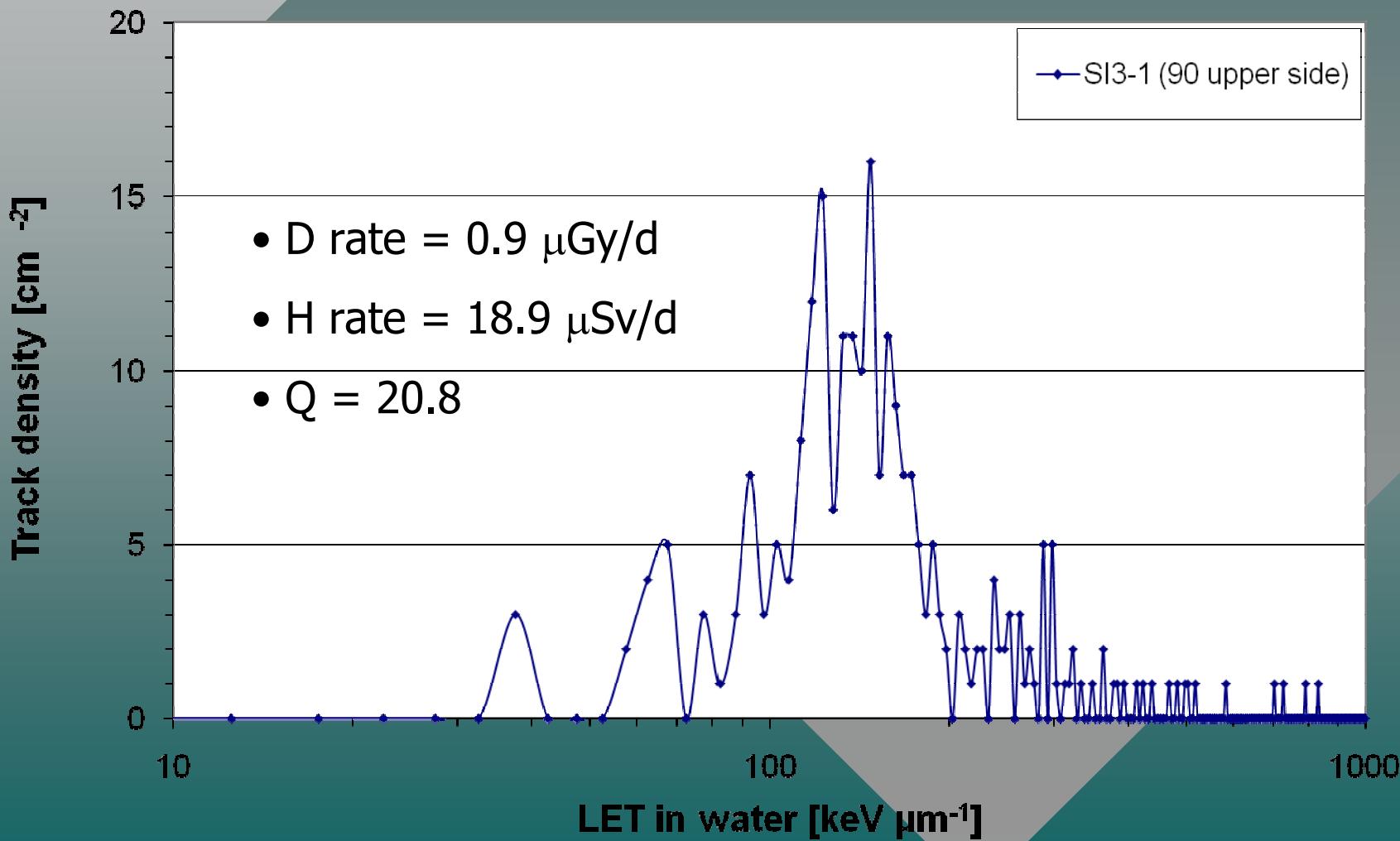
DOSE VALUES (ICCH-CR-39): results obtained after 6h etching (≥ 17.5 keV/ μm)

- Only the evaluation of the first stack has been completed.
- The detectors were placed in PIRS Docking Module.

| stack | $D \pm 1\sigma$ [mGy] | $H \pm 1\sigma$ [mSv] | D rate $\pm 1\sigma$ [$\mu\text{Gy}/\text{d}$] | H rate $\pm 1\sigma$ [$\mu\text{Sv}/\text{d}$] | $Q \pm 1\sigma$ |
|--------|--------------------------|--------------------------|---|---|------------------|
| ICCH-1 | 3.06 ± 0.06 | 53.26 ± 1.08 | 18.88 ± 0.39 | 328.78 ± 6.68 | 17.41 ± 0.30 |

| stack | $D \pm 1\sigma$ [mGy] | $H \pm 1\sigma$ [mSv] | D rate $\pm 1\sigma$ [$\mu\text{Gy}/\text{d}$] | H rate $\pm 1\sigma$ [$\mu\text{Sv}/\text{d}$] | $Q \pm 1\sigma$ |
|-------|--------------------------|--------------------------|---|---|------------------|
| SI3 | 1.90 ± 0.10 | 32.79 ± 1.72 | 11.73 ± 0.64 | 202.4 ± 10.6 | 17.26 ± 0.23 |

Distribution of the manually measured HZE tracks



Acknowledgement

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Thank you for your attention!

