

HASPIDE



9th Meeting 2023-06-14

<https://https://agenda.infn.it/event/36644/>

L. Servoli



HASPIDE STATUS



1) HASPIDE PostDoc position partially covered:

- WP2: (TO) Lorenzo Piccolo (started 2022)
- WP4: (FI) Deborah Chila (started 2023)
- WP1: (PG) Luca Tosti (started 2023)
- WP1: (LE) Almost closed (start in july)
- WP5: (Urbino) : selection to be restarted
- WP2: (LNS) : selection to be restarted



Projects linked to HASPIDE (1)



→ **Submitted proposal for ASI call for innovative detectors and measurement strategies.**

Mauro Menichelli is the PI of the proposal.

It is a two-stage call:

Money asked: 25 k€ for the first step, to be used to work on full proposal definition (6 months).

Only 4 projects will be selected for the second stage.

Requests passing to the second stage will have 275 k€ more for preparing a demonstrator (2 years).



Projects linked to HASPIDE (2)



- A PRIN proposal has been submitted (INFN, UNIFI).
Title: DEFLADOS (Detectors for photon FLASH therapy Dosimetry).
PI L. Servoli, deputy PI C. Talamonti
Project aims to use 3D diamond and a-Si:H devices as possible dosimeters for photon beams in FLASH mode.
Requested ~ 300 k€ .
a-Si:H devices from HASPIDE project, some of the prototypes available to be used.



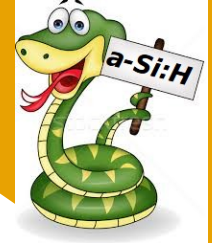
Other projects linked to HASPIDE



- 5) *I did a presentation of the HASPIDE project at a INFN-E meeting in Rome 21-03-2023. It's a project dealing with energy applications, including nuclear sites monitoring.*
- 6) *Searching for possible participation to PNRR calls.*



Publications policy:



Open Access issue:

Realistically we could ask money to CNS5 to publish Open Access papers. *Let's say 2-3 per year.*

We have to discuss our internal policy to decide when to request such type of publication access.

First approach would be to have at least one paper for each WP during the project lifetime. They should be significant or basic papers.



Publications policy:



Open Access issue:

Realistically we could ask money to CNS5 to publish Open Access papers.

*INFN has a deal with **Journal of Instrumentation** such that, under certain requirements, the publication will be Open Access without fee.*



Publications submitted: WP4



- 1) Paper on precision measurements at Australian Synchrotron for sensor characterization.**

Hydrogenated Amorphous Silicon High Flux X-ray Detectors for Synchrotron Beam Monitoring Applications. Accepted for publication: Physics in Medicine and Biology

PMB-114633 - DOI: 10.1088/1361-6560/acdb43

It will be open access thanks to UOW funding.



Publications submitted: WP1



5) Neutron irradiation of Hydrogenated Amorphous Silicon p-i-n diodes and charge selective contacts detectors.

Accepted for publishing: Nuclear Instruments and Methods A: Volume 1052 July 2023

Article number 168308

doi: 10.1016/j.nima.2023.168308



Publications submitted: WP5



- 3) Paper on proposal for measurement instrument for Space Weather applications. "A Hydrogenated amorphous silicon detector for Space Weather Applications. Submitted to **Astrophysics and Space Science** First iteration: major rewriting. We are working on that.

Also arXiv: <http://arxiv.org/abs/2302.00339>

Candidate to be open access, money to be asked to CSN5.



Conferences and Workshops:



- 1) WP4: Poster at ESTRO Conference in Vienna → C. Talamonti
- 2) WP3: Poster at E-MRS Conference (Strasbourg) → D. Passeri
- 3) WP5: Talk at workshop SPACEMON ESA/ESTEC Noordwijk
→ C. Grimani (CSN5)
- 4) WP1: Talk at IWASI 2023 (Monopoli) → M. Menichelli (CSN5)
- 5) WP4: Talk at ASAPP conference (Perugia) → L. Servoli (CSN5)
- 6) WP4: Talk at ASAPP conference (Perugia) → C. Grimani (CSN5)
- 7) WP1: Talk at IWORID conference (Oslo) → F. Peverini

Conferences and Workshops:



8) **HASPIDE: Talk at X-ray precision measurement workshop (LNF)**

→ **K. Kanxheri**

9) **WP1: Poster at FISMAT 2023 (Milano) → F. Peverini**

10) **WP1: Talk at 109° SIF Conference (Salerno) → B. Gianfelici**

11) **WP4(?): invited talk at 20th International Conference on Solid State Dosimetry → M. Petasecca**

12) **HASPIDE: HASPIDE: a project for the development of hydrogenated amorphous silicon radiation sensors on a flexible substrate**

13) **Proton irradiation of Hydrogenated Amorphous Silicon p-i-n diodes**



HASPIDE STATUS: Milestones (1)



WP2: MiniASIC development:

- produce a news chip for current mode readout.
- implement a readout system to functionally test it
- test the ASIC chip attached to a sensor.

We have a name for the chip: **CLEOPATRA**.
Chip submitted for production → some technical interactions are going on to close the submission.

Milestone 29-09-2023: First miniASIC characterization



HASPIDE STATUS: Milestones (2)



WP1: Device production (PECVD):

- received 2nd batch deposited on kapton from EPFL: both p-i-n and CSC devices;
- characterization started;

Milestone 30-10-2023: Complete qualification of CSC devices on flexible plastic substrate (PECVD), both single or matrices.



HASPIDE STATUS: Milestones (3)



WP1: Sensor characterization:

- *study the devices behaviour both in dark condition and in presence of ionizing radiation stimula.*
- *give feedback to simulation WP to validate the a-Si:H model.*
- *interact with application WPs to optimize design and tests for their specific needs.*

Milestone 14-11-2023: completion of studies on resistance to radiation damage for both p-i-n and CSC devices.



HASPIDE STATUS: Milestones (4)



WP1: *Device production: Pulsed Laser Deposition and reactive sputtering.*

- *Investigation of a different deposition techniques to produce HASPIDE devices.*
- *Realization of a-Si:H films to be fully characterized both with microscopic and electrical techniques.*

Milestone 30-10-2023: *Evaluation of PLD and reactive sputtering techniques to produce devices for HASPIDE applications.*



HASPIDE STATUS: Milestones (5)



WP4: *Clinical applications*

→ *demonstrate that a-Si:H sensor could be used for clinical dosimetry with results compared with reference dosimetry.*

Milestone 31-12-2023: Validation of prototypes performance, with respect to reference dosimetry, when exposed to both photon or electron clinical beams



HASPIDE STATUS: Milestones (6)



WP5: Space Weather application

→ *Demonstrate the feasibility of a-Si:H devices for measurements in space for Space Weather application*

Milestone 14-12-2023: Simulation of prototype instrument, with a-Si:H sensitive volume, for Space Weather applications.

Missing PostDoc.....



HASPIDE STATUS: Milestones (7)



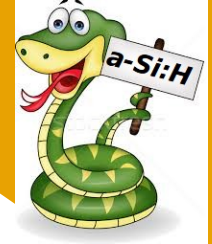
WP6: Neutron detection with a-Si:H devices

→ Demonstrate that a-Si:H devices, if sputtered with ^{10}B , could detect a neutron flux.

Milestone 31-12-2023: ^{10}B thin films deposition on flexible substrate and on a-Si:H sensors and their characterization.



HASPIDE STATUS



We have been financed by INFN CSN5:

2022: 240 k€ / 515 k€ requested (3 AdR included)

2023: 257.5 k€ / 358 k€ requested

(3 AdR included anticipated to 2022)

Total = 497.5 k€

Need to prepare requests for next year.!!!!

According to proposal next year we foresee: 238 k€



HASPIDE STATUS



Manpower situation looks reasonable:

41 researchers + 5 PostDoc starting 2023 = 46 (44)

~ 11 FTE + 3.0 (PostDoc) = 14 FTE

FTE/person = 0.32

6) If possible we have to try to attract young people for their Master thesis or PhD programs.



HASPIDE STATUS: WP1



Sensor characterization: Points to be addressed:

→ **sensitivity:**

- depends on contact type? How?
- depends on surface, volume, thickness, shape?
- depends on bias? And how S/N depends on bias?

→ **stability:**

- how much time to stabilize from biasing?
- priming will make better the device behaviour?



HASPIDE STATUS: WP4



1) *Clinical applications: Means*

- *Phantom development for clinical validation*
- *access to clinical beams (approved at Careggi)*
- *access to clinical beams (approved at Trento)*
- *access to clinical beams (requested at UOW)*
- *access to clinical beams (approved at Berne)*

- *1 year PostDoc position at FI*



HASPIDE STATUS: WP4



2) *Non-Clinical applications: Goals*

- *Verify the a-Si:H sensors could be used for beam monitoring in case of non-clinical beams.*
- *Study the threshold to operate an a-Si:H sensor in current mode for low radiation flux.*
- *Evaluate possibility to use pulse mode readout.*



HASPIDE STATUS: WP4



2) *Non-Clinical applications: Means*

- *Test at Trento protontherapy center to measure low flux proton beams at various energy (synergic with WP1 and WP5).*
- *Test at ELIBEAM facilities.*
- *Test at ion beam facilities.*