

# Task 17. 5 description

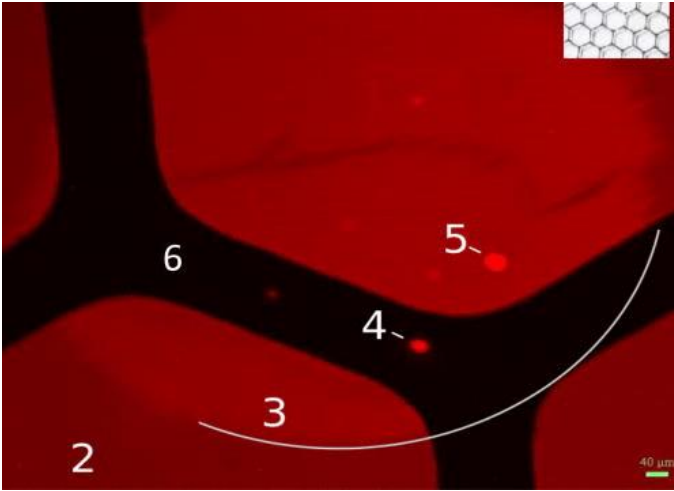
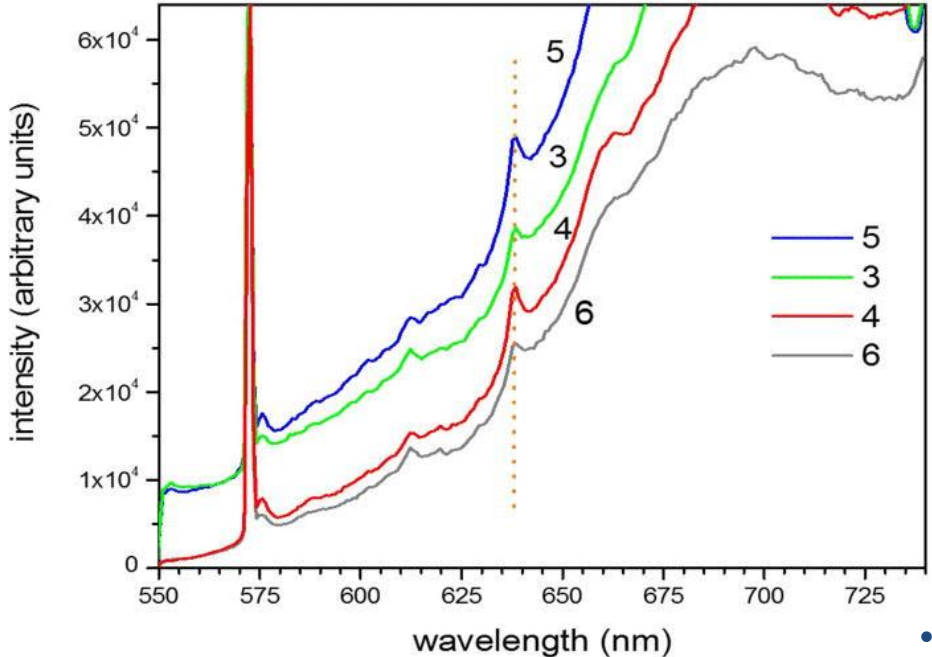
*Task 5: Broader accelerator and societal applications*  
*(M. Tomut – GSI)*

This task will follow broader applications of new developed materials for high-power accelerators, space, society (energy, medicine, computing)

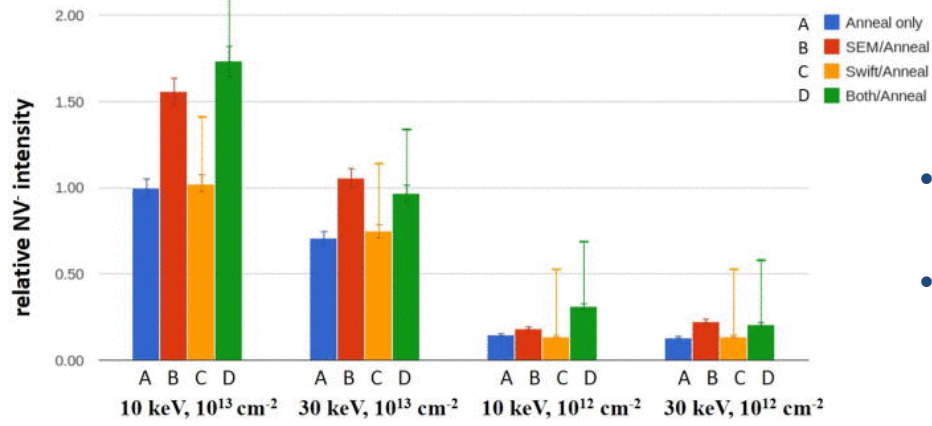
- Irradiation induced defect centers in diamond for luminescent screens, medical imaging and quantum computing.
- Application of novel materials for high power targets, beam catchers, beam windows.
- Applications for advanced engineering solutions, efficient energy solutions, space.
- Applications for thermal management.

Participants: CERN, GSI, **Brevetti Bizz**, **RHP Technology**

# Local NV-center formation by electronic excitation from swift, heavy ions – yields after thermal annealing



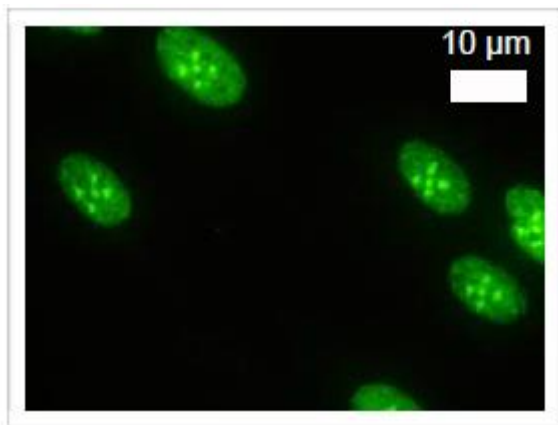
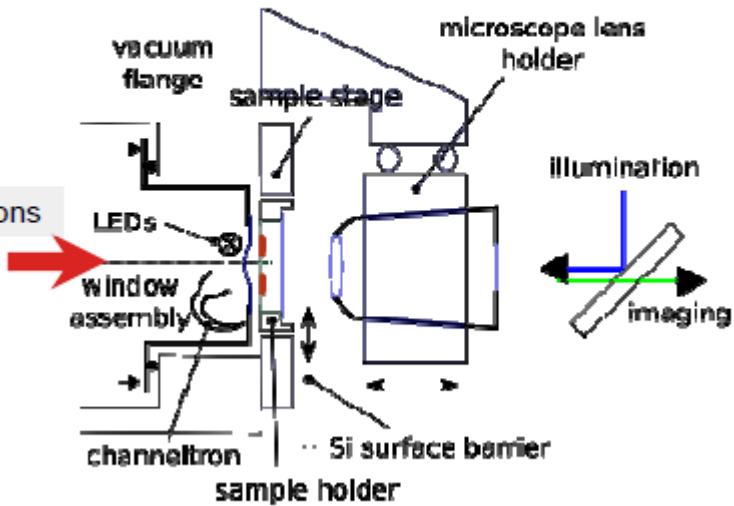
*J. Schwartz, et al., J. Appl. Phys., 2014*



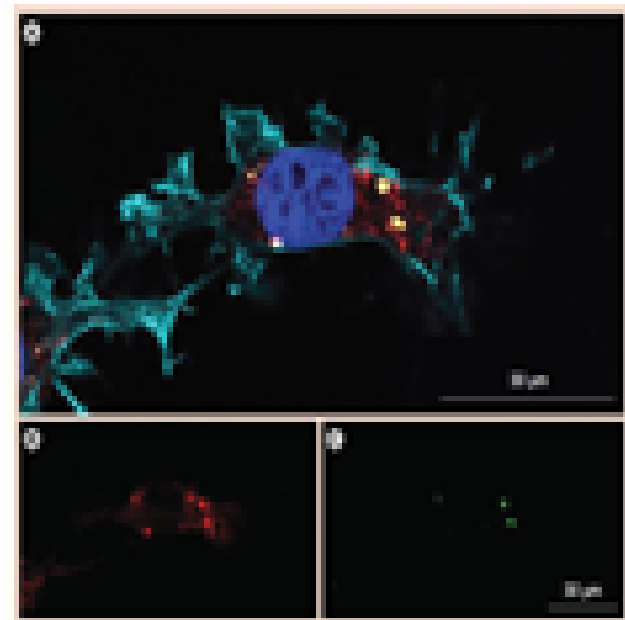
- NV yields higher by factor 1.7x for e-beam and then thermal annealing vs. thermal annealing alone (850 °C, 1 h, in vacuum)
- But no evidence for additive effect of swifts and thermal annealing
- Formation yield is ~0.1 of yield from high fluence e-beam and ~0.02 of yield from thermal annealing
- absolute NV/N ~ 10<sup>-4</sup>–10<sup>-3</sup>

# Biophysics and medical applications

## Radiation effects in cells- Ion beam microprobe



## Functionalized nanodiamond particles for medical imaging



# Milestones

<b>Milestone number<sup>18</sup></b>	<b>Milestone title</b>	<b>WP number<sup>9</sup></b>	<b>Lead beneficiary</b>	<b>Due Date (in months)<sup>17</sup></b>	<b>Means of verification</b>
MS58	Organisation of PowerMat kick-off meeting (Task 17.1)	WP17	1 - CERN	6	Agenda, summary report
MS59	Irradiation campaigns at GSI for radiation hardness studies (Task 17.3)	WP17	23 - POLITO	27	Report to StCom
MS60	Irradiation effects analysis (Task 17.3)	WP17	1 - CERN	36	Report to StCom
MS61	Comparative compendium of materials developed (Task 17.2)	WP17	1 - CERN	40	Report to StCom
MS62	Dissemination of R&D results on novel materials for accelerator and societal applications (Task 17.5)	WP17	12 - GSI	46	Report to StCom

# Deliverables

<b>Deliverable Number<sup>14</sup></b>	<b>Deliverable Title</b>	<b>Lead beneficiary</b>	<b>Type<sup>15</sup></b>	<b>Dissemination level<sup>16</sup></b>	<b>Due Date (in months)<sup>17</sup></b>
D17.1	Material characterization	1 - CERN	Report	Public	12
D17.2	Irradiation effect simulations	1 - CERN	Report	Public	44
D17.3	Irradiation test results	23 - POLITO	Report	Public	46

# Activities



1. *Optimize metal matrix for better response to fast extracted heavy ion beams -ongoing with RHP*
2. *Optimize diamond particle sizes and distribution for different applications – to be started (RHP-GSI)*
3. Optimize color centers in diamond for different applications (luminescence screens, QD's and medical imaging) - using different doping recipe- GSI, collaboration LBNL



# Contributions to task 17.5. session

11:45 - 11:55

*David Grech*

**Development of new diamond based composites for luminescence screens**

11:55 - 12:20

*Pascal Simon et al.*

**First characterization tests and planned experiments on diamonds and diamond based composites for luminescence applications**