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Elvis Dominguez-Ontiveros

Sr. R&D Scientist Nuclear Technologies Division / SNS

Virtual Workshop on Optical Sensors for Energy Applications

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• Ryan Schultz .œ åÁ æ ^ Á c@!• ÁÉÉÉÉ

• Robert Sangrey

• Allie Morris



# The Spallation Neutron Source • A 1.1 GeV, 1.8 MW, 1.4 s<sup>-1</sup> megawatt class accelerator-based pulsed neutron source

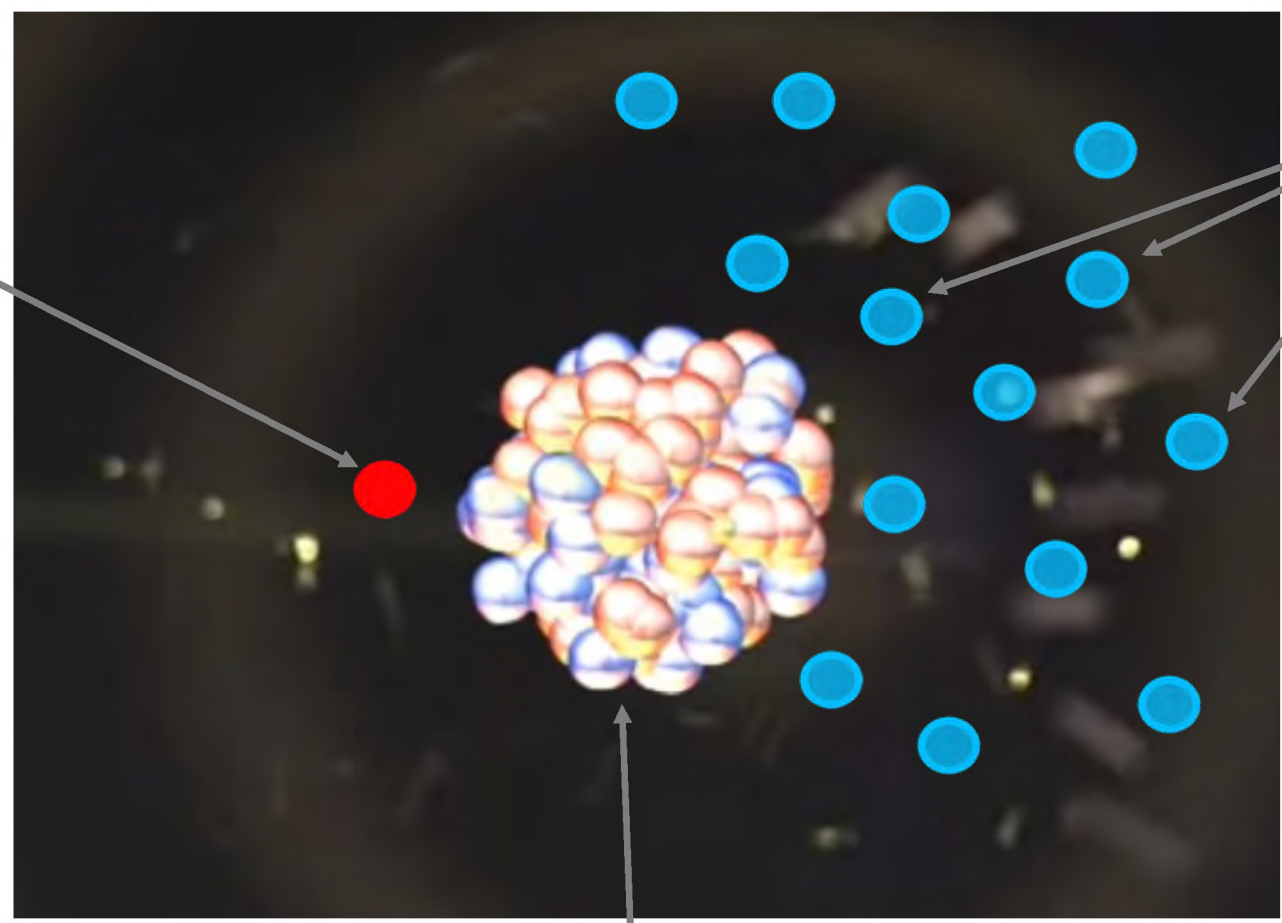


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Neutrons are produced via high-energy spallation reactions induced by injecting 1 GeV protons into liquid mercury at a frequency of 1.4 s<sup>-1</sup>.

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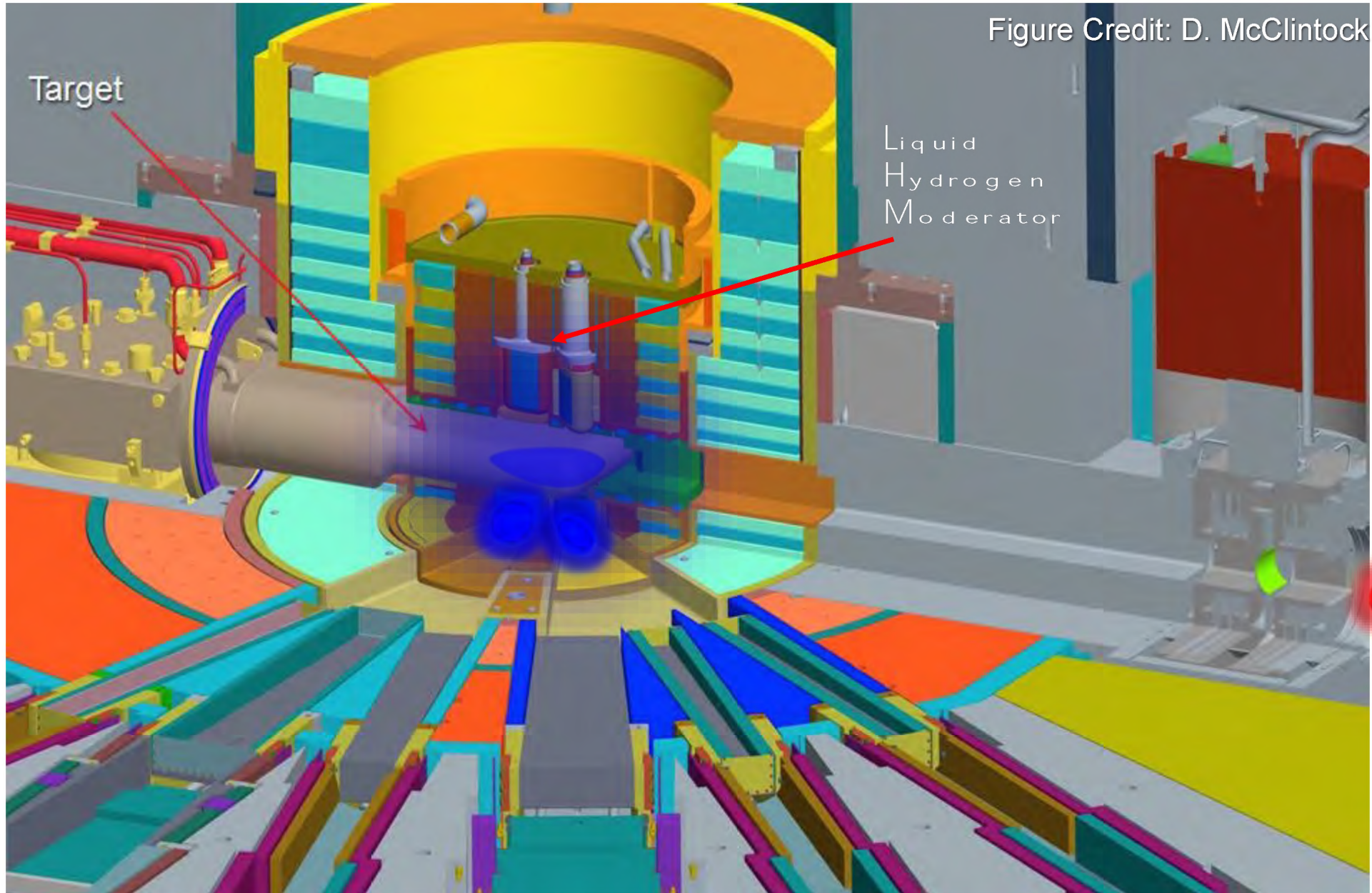


Neutrons

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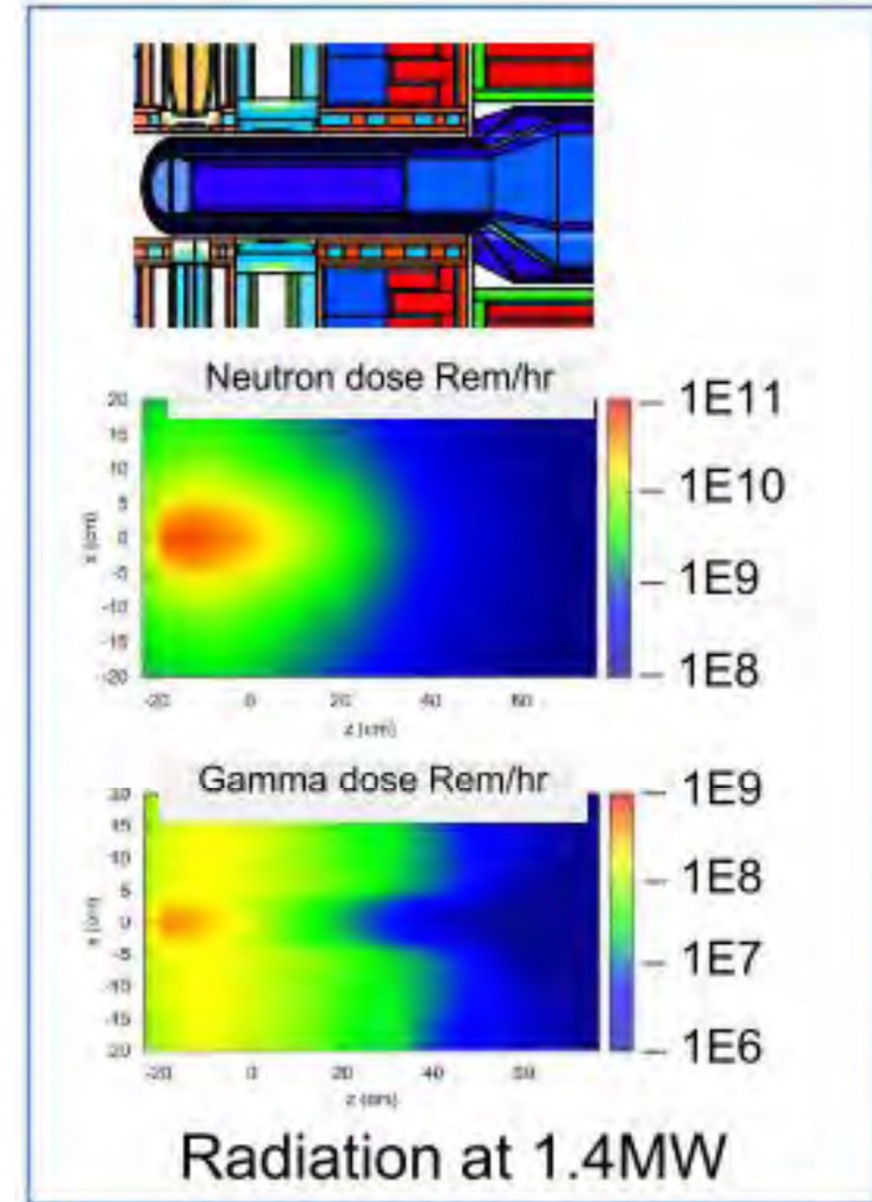
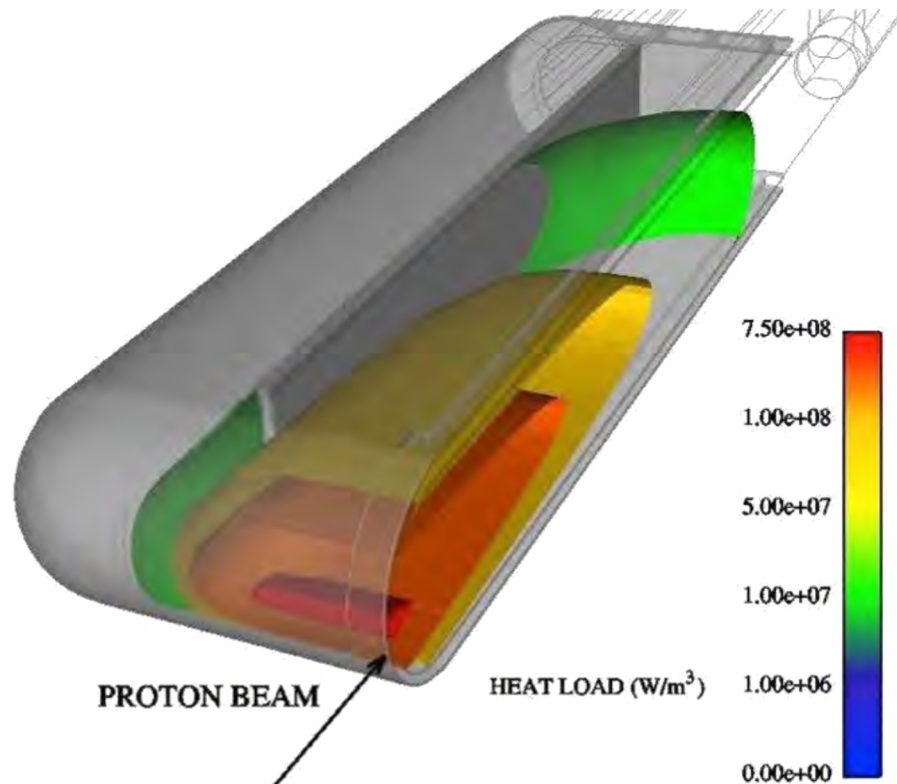


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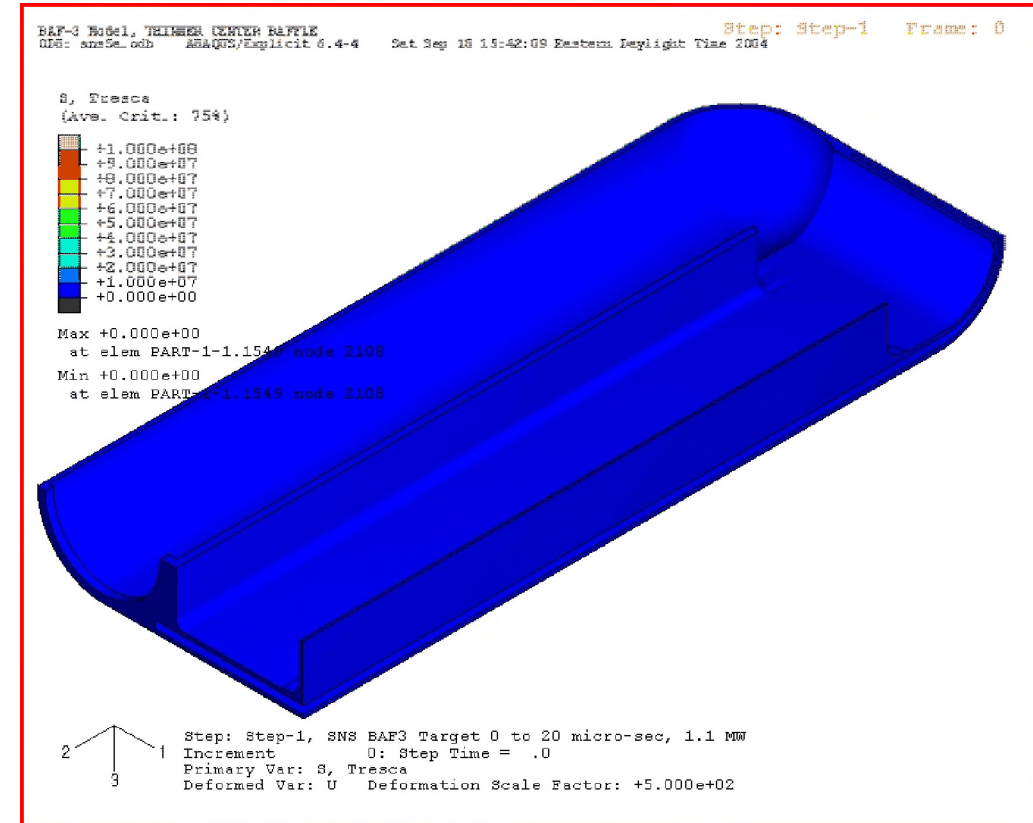
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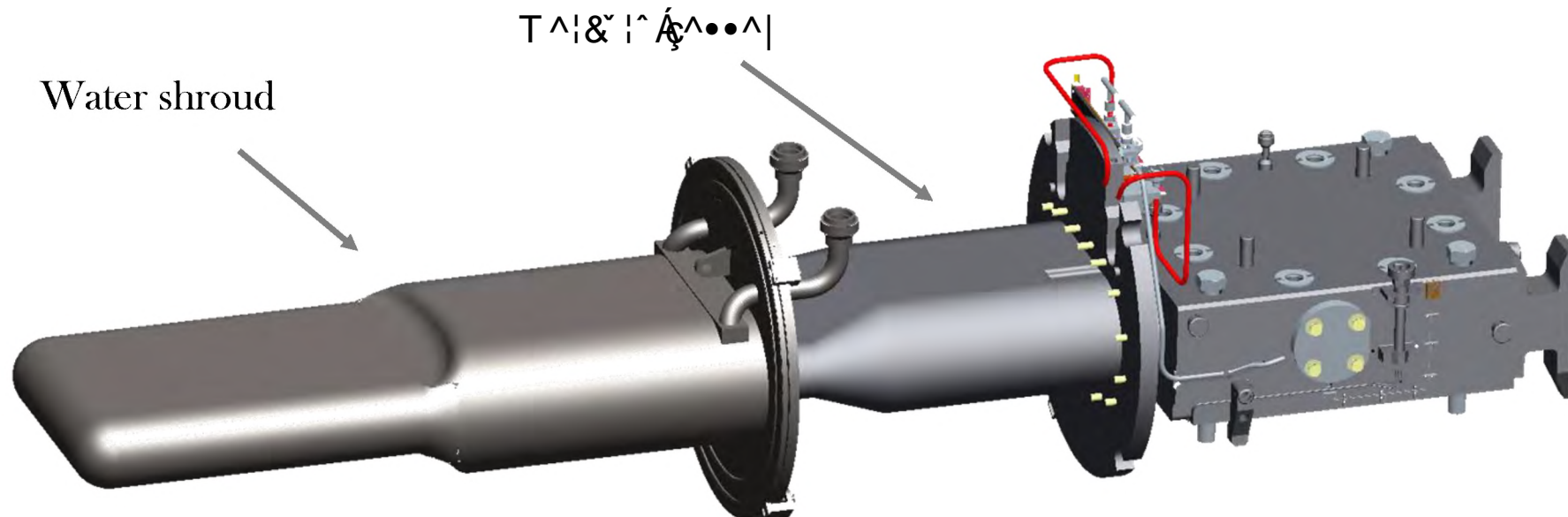
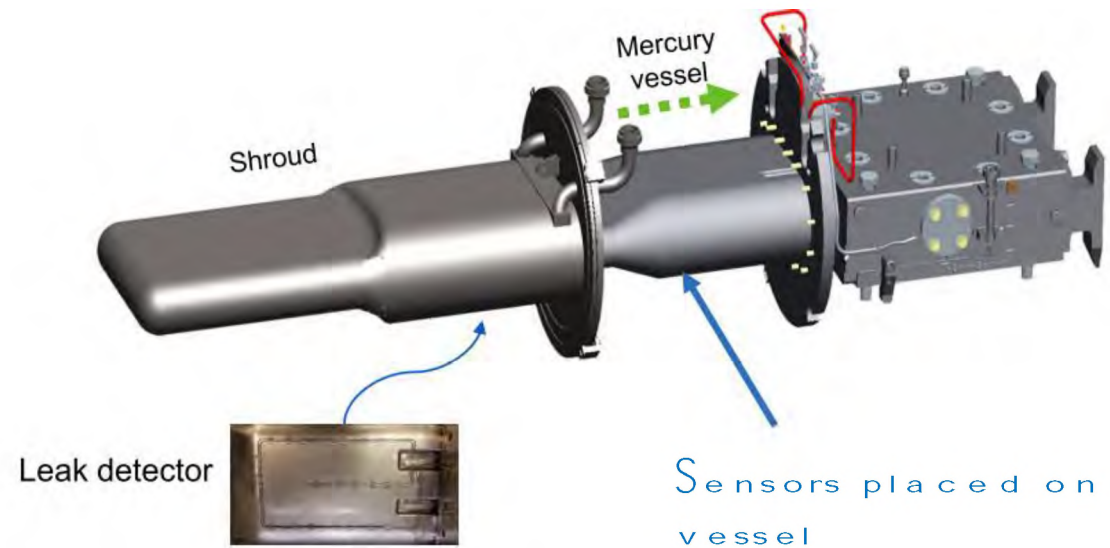
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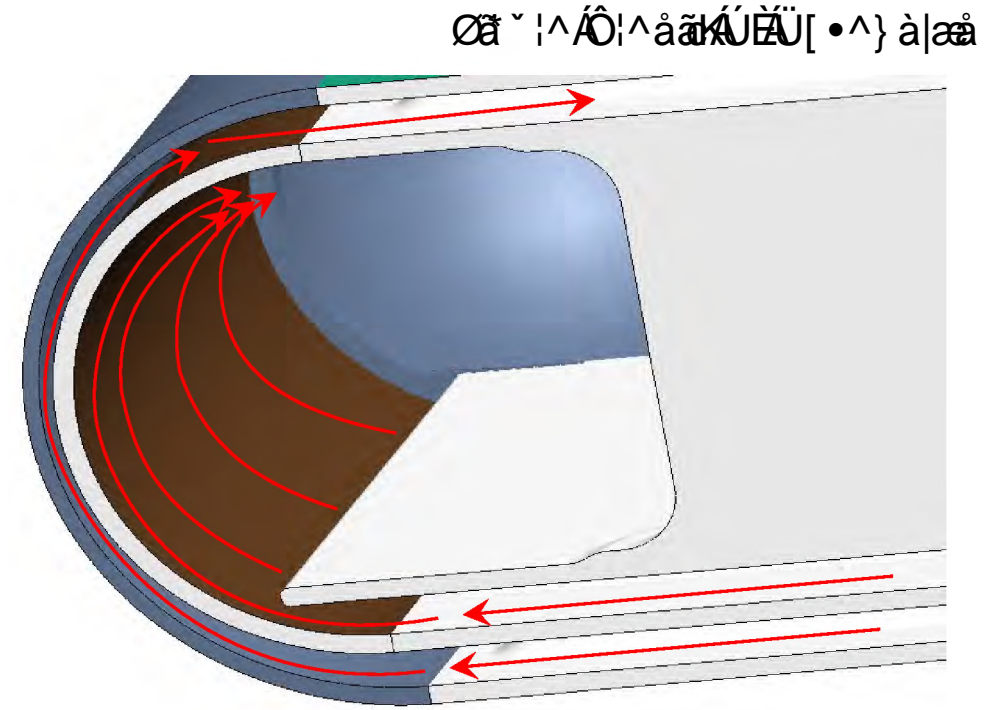
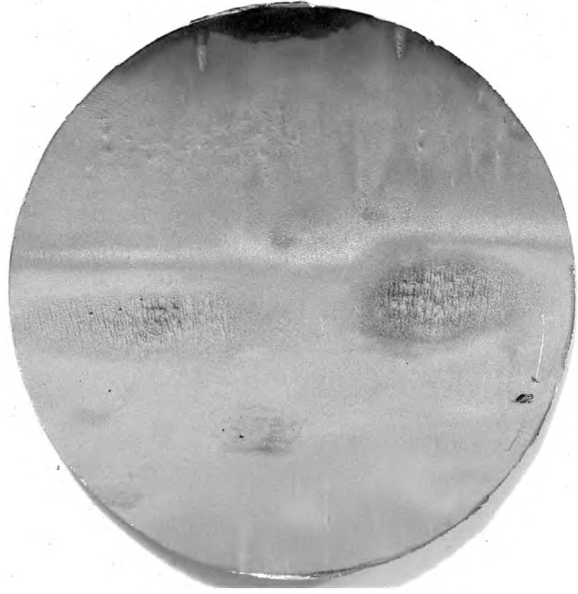


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# Jet Flow Target Cross Section

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# Sensor Installation

- Different compositions over the years

Fluorine-terminated polyimide  
Fujikura

- Installation

using Stycast 1260 epoxy cured with heat

Installation of sensors



Laying out the sensors



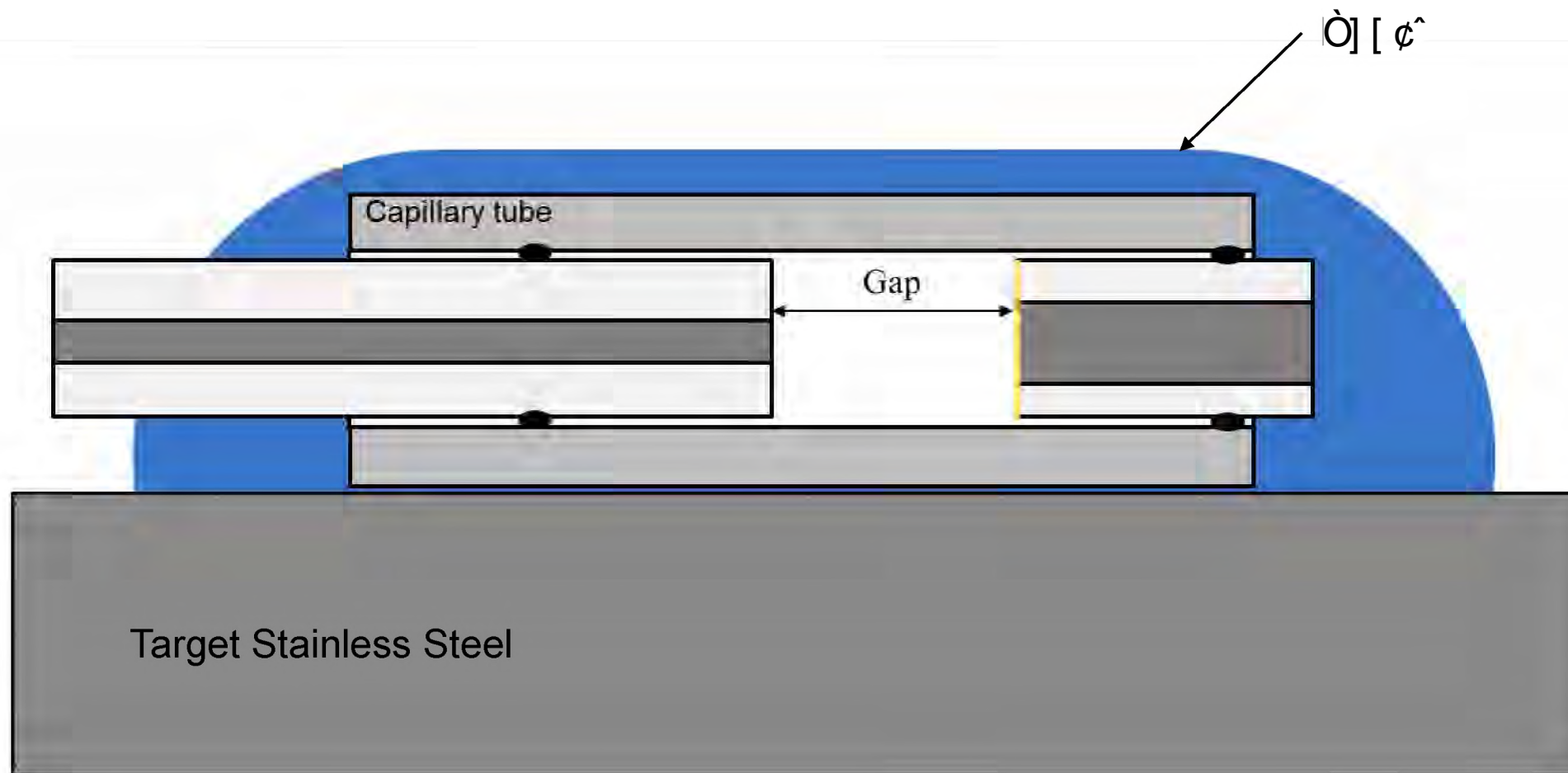
Installed sensors



Curing of epoxy glue

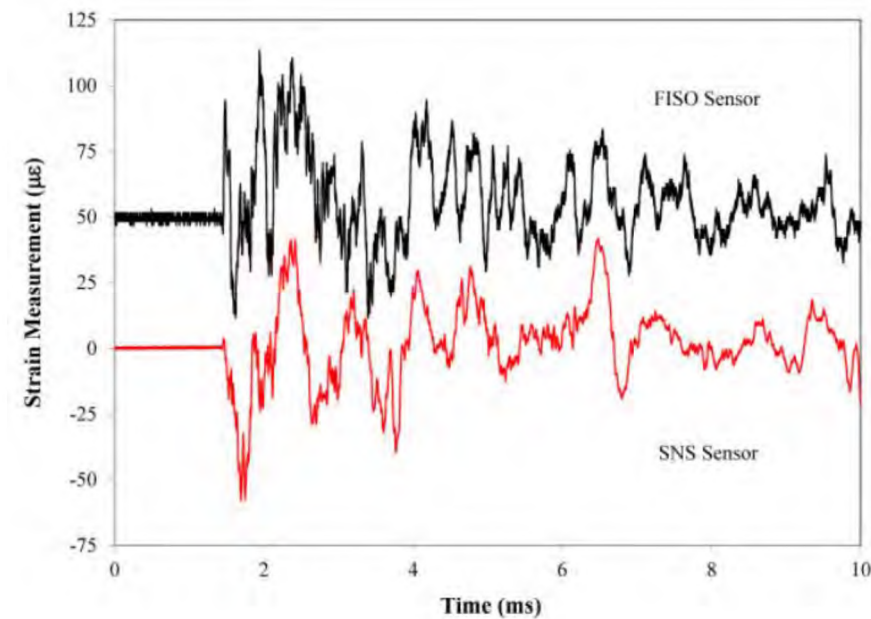
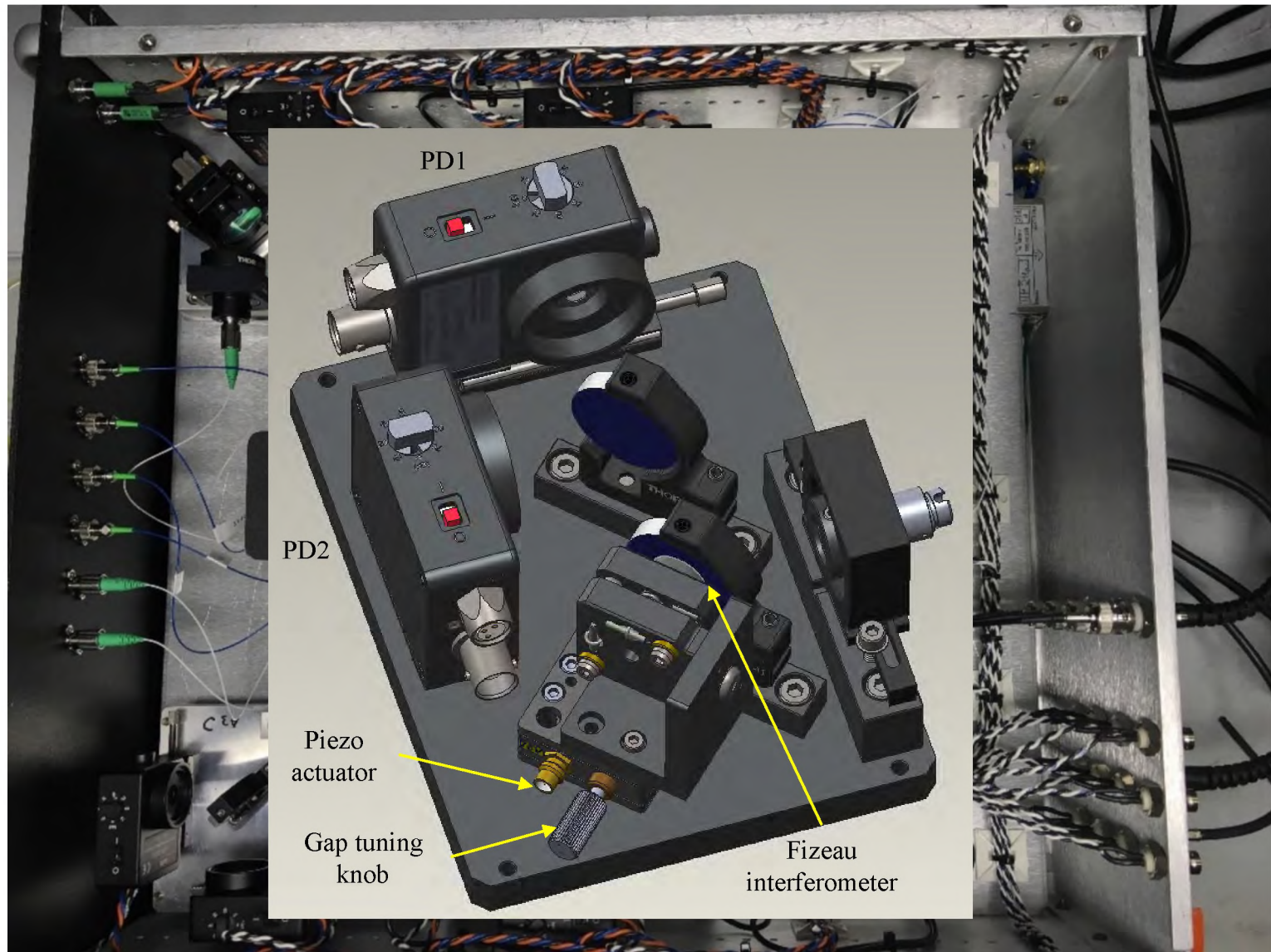


# Fiber Optic Strain Gauges





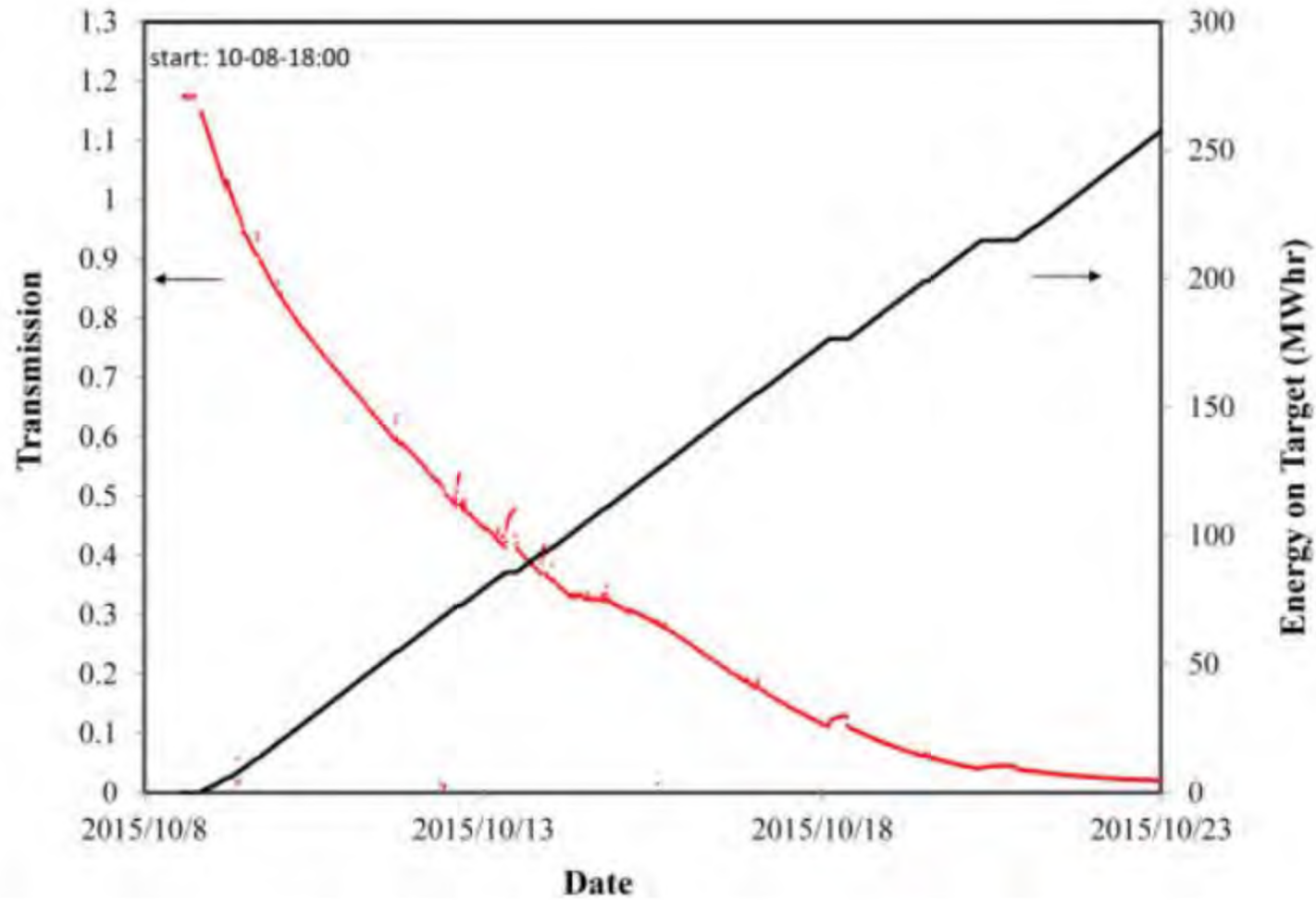
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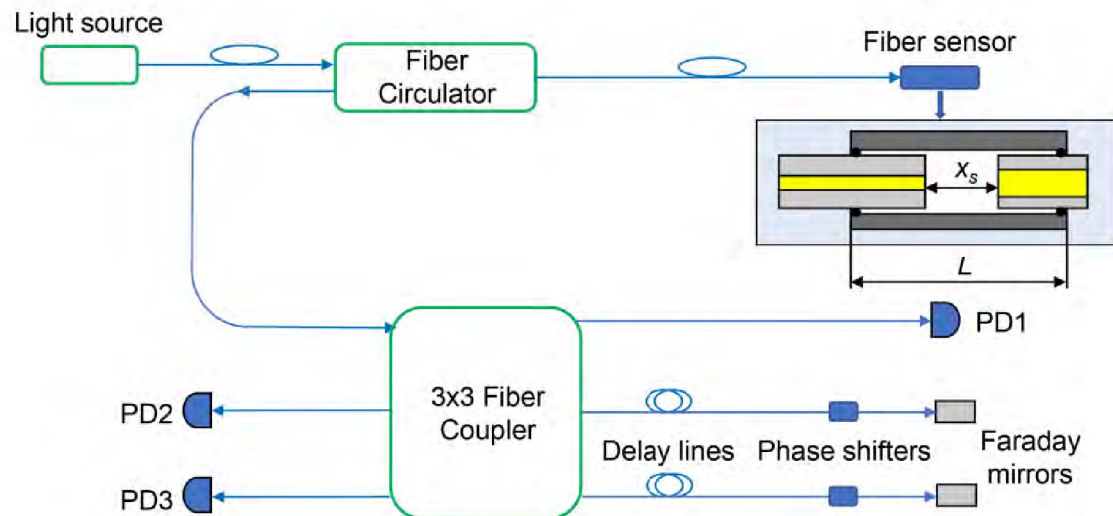


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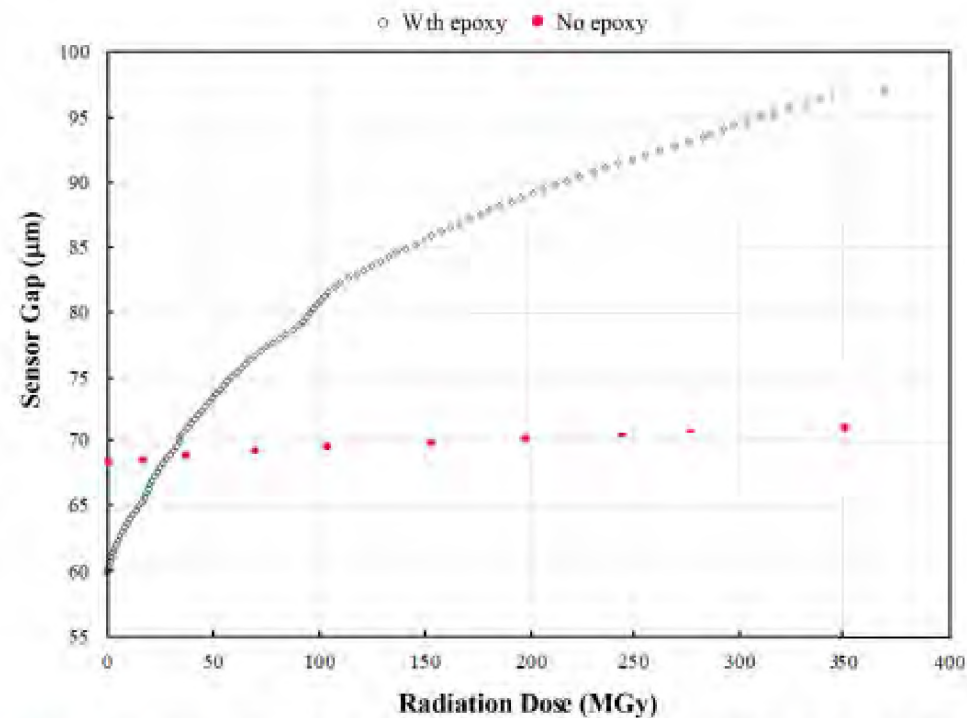


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# Upgraded Fiber-Optic Sensor System

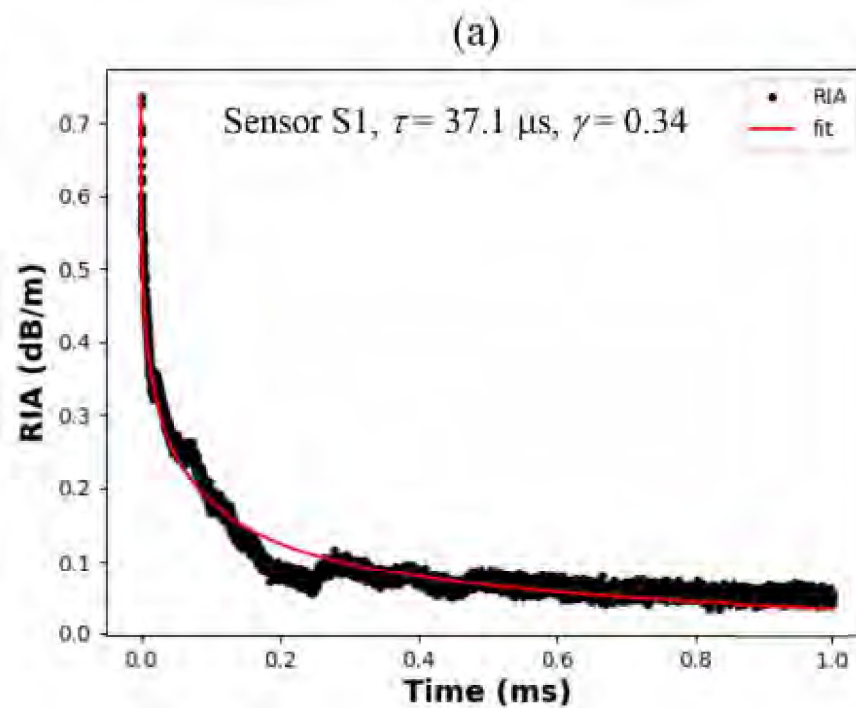
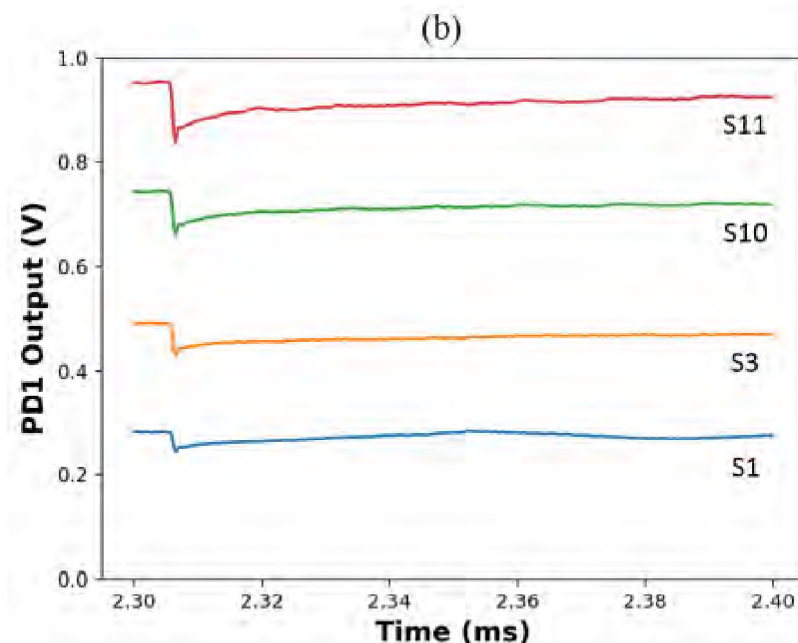
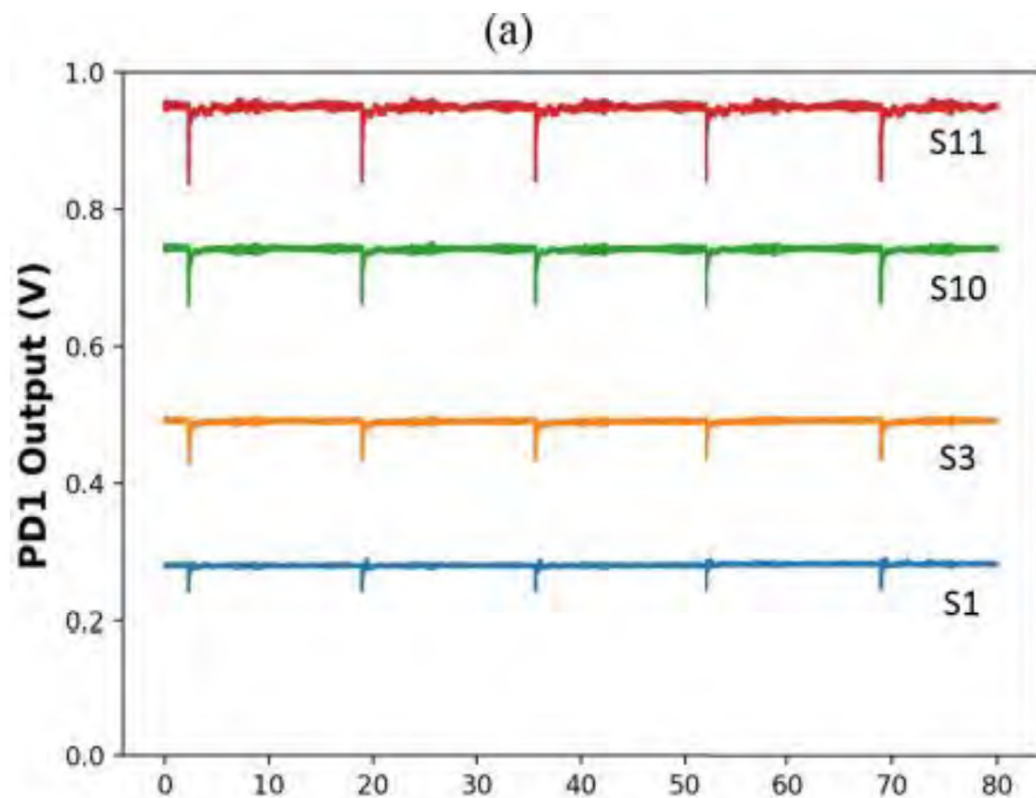


**Fig. 1.** Schematic of the fiber-optic sensor head and interrogator setup. PD: photodetector. Each sensor had a 2.5-m-long lead fiber with a polyimide coating, and the outer diameter of the coating was 250  $\mu\text{m}$ . Inset box shows the sensing FP interferometer.  $x_s$ : sensor gap,  $L$ : sensor length.



**Fig. 16.** Measured sensor gap variation as a function of the radiation dose on the sensor head. The increased gap growth is due to the radiation-induced volume expansion of the epoxy.

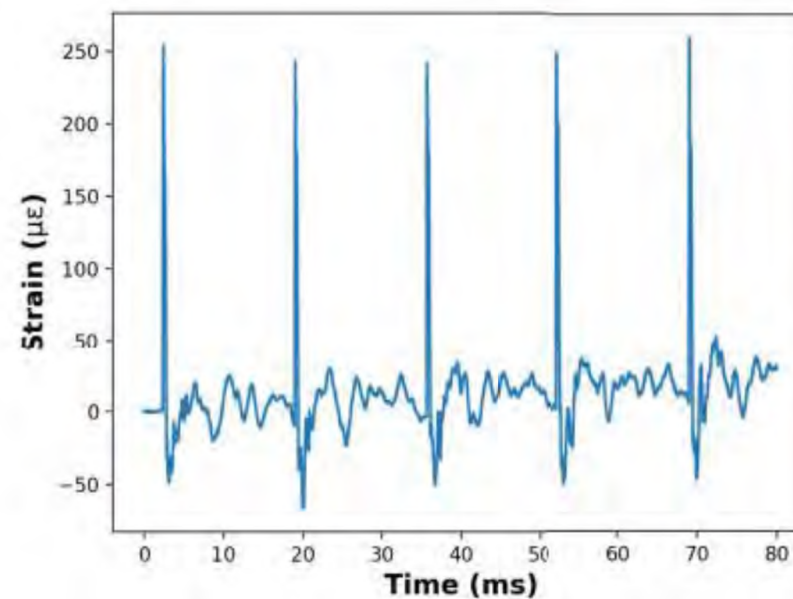
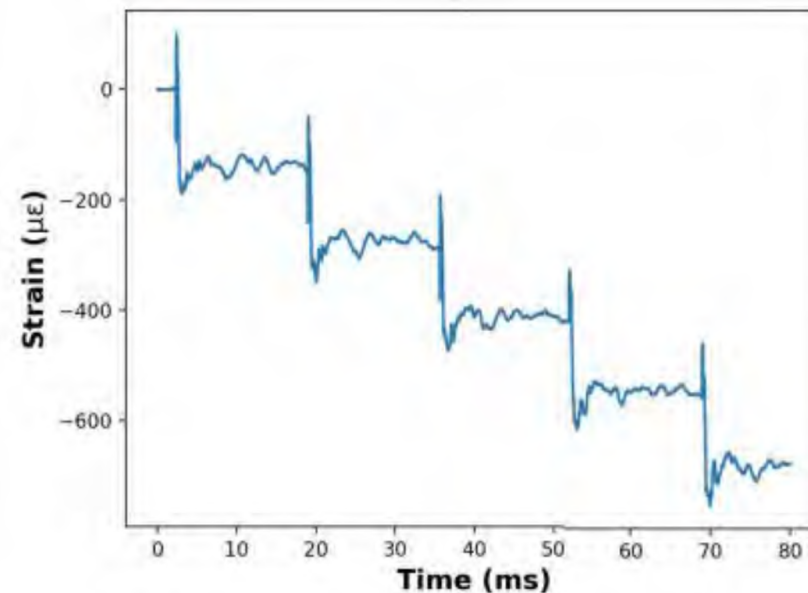
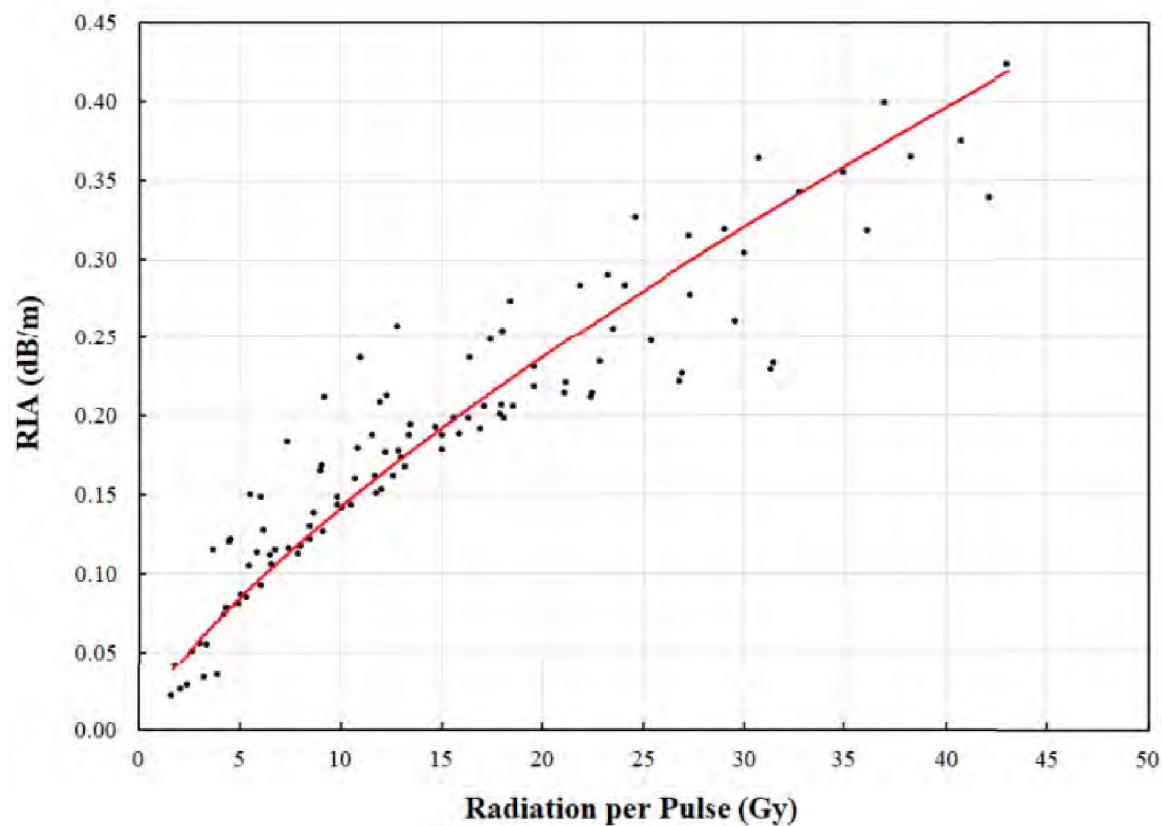
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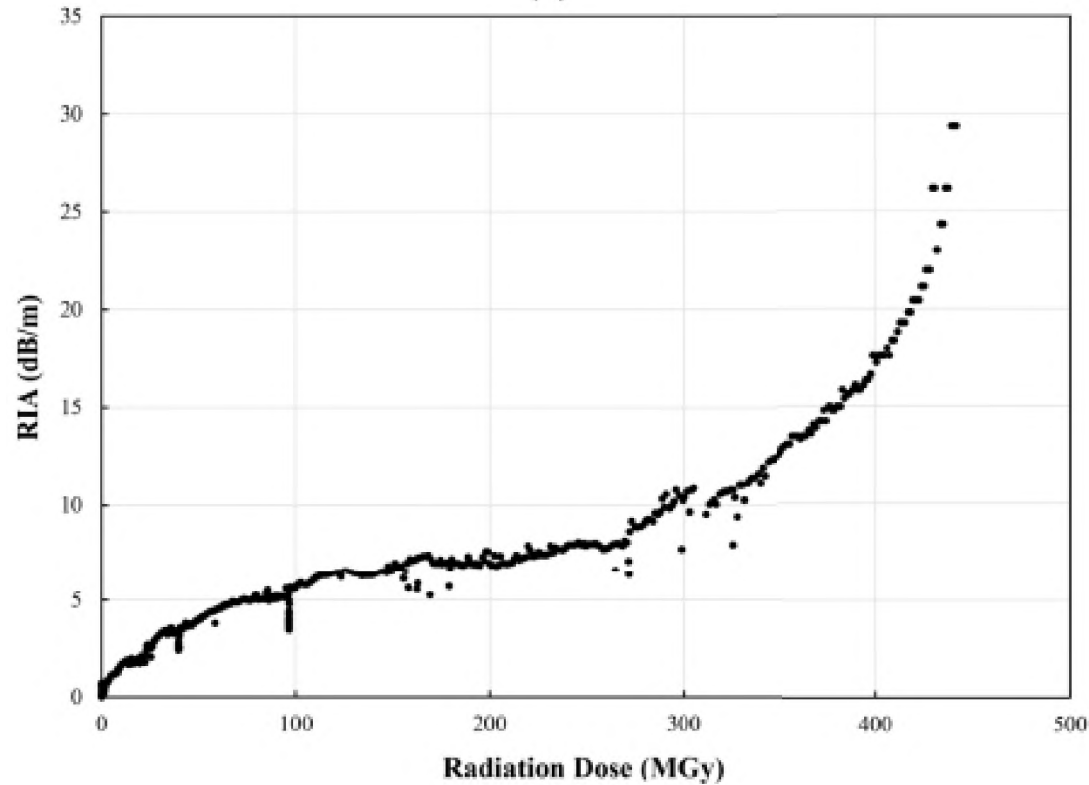


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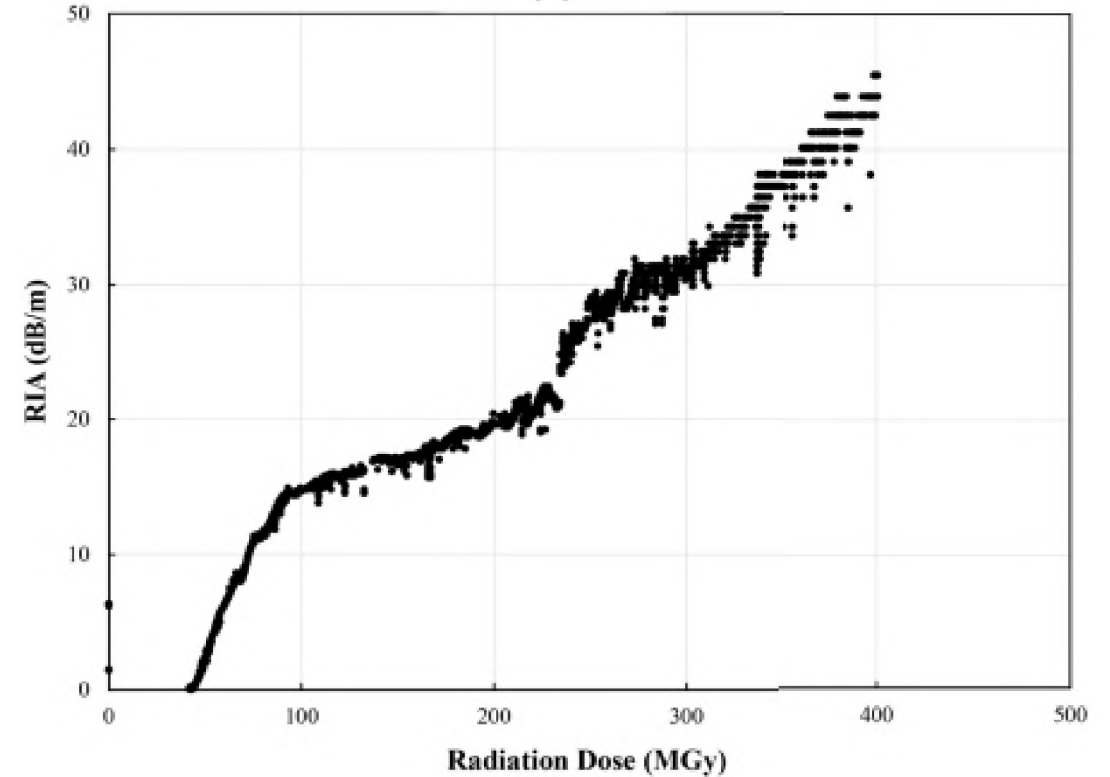


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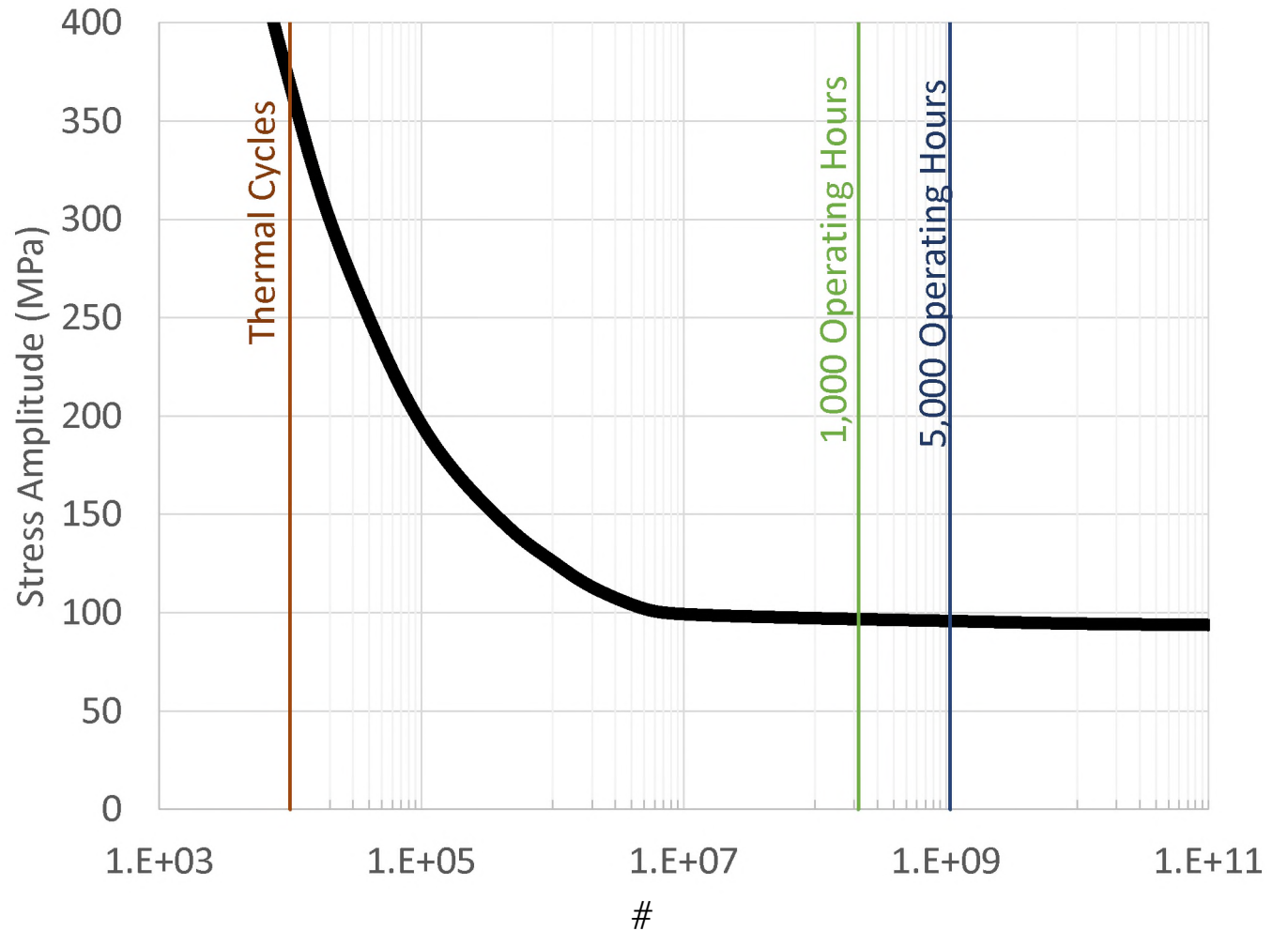
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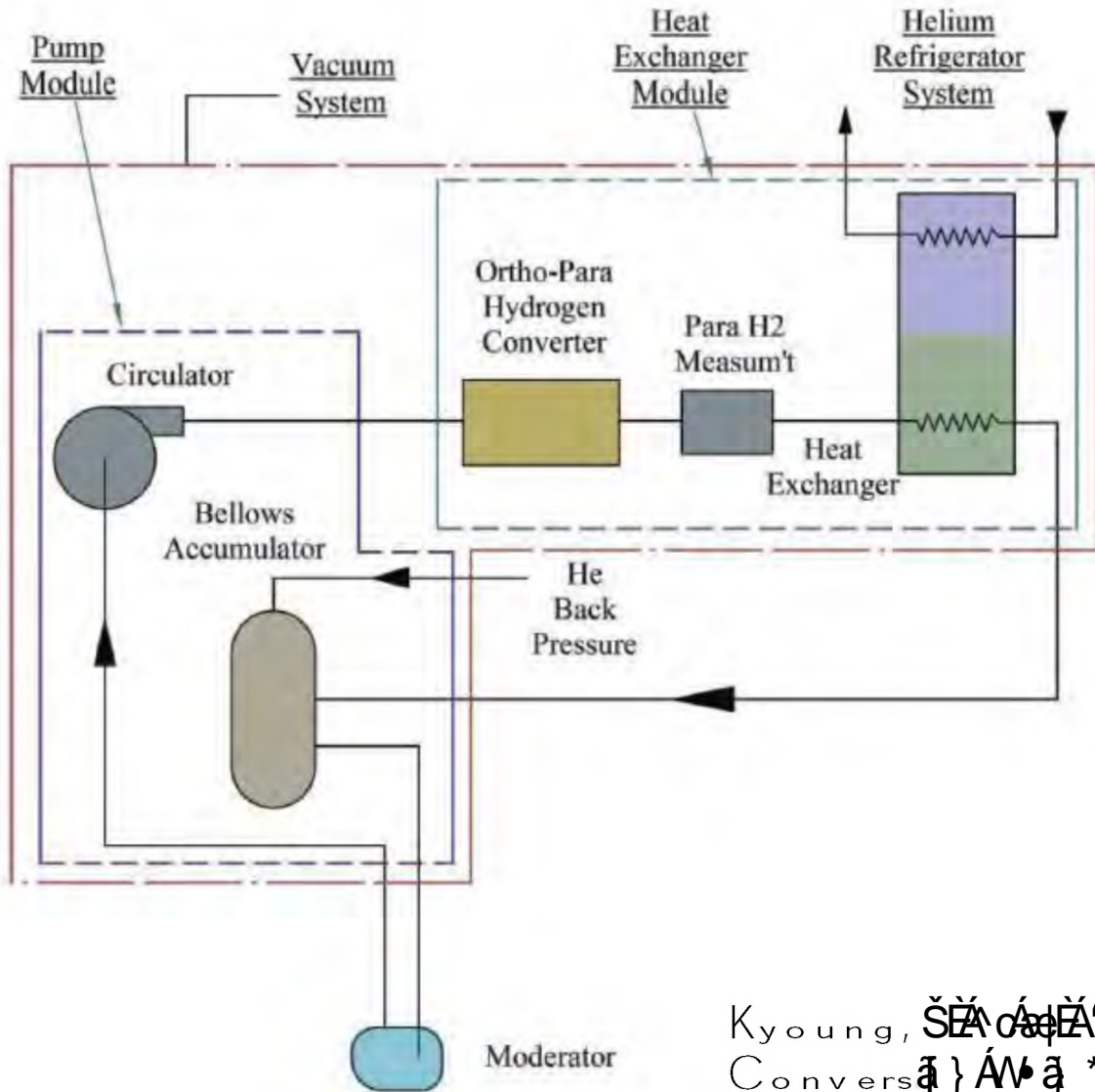
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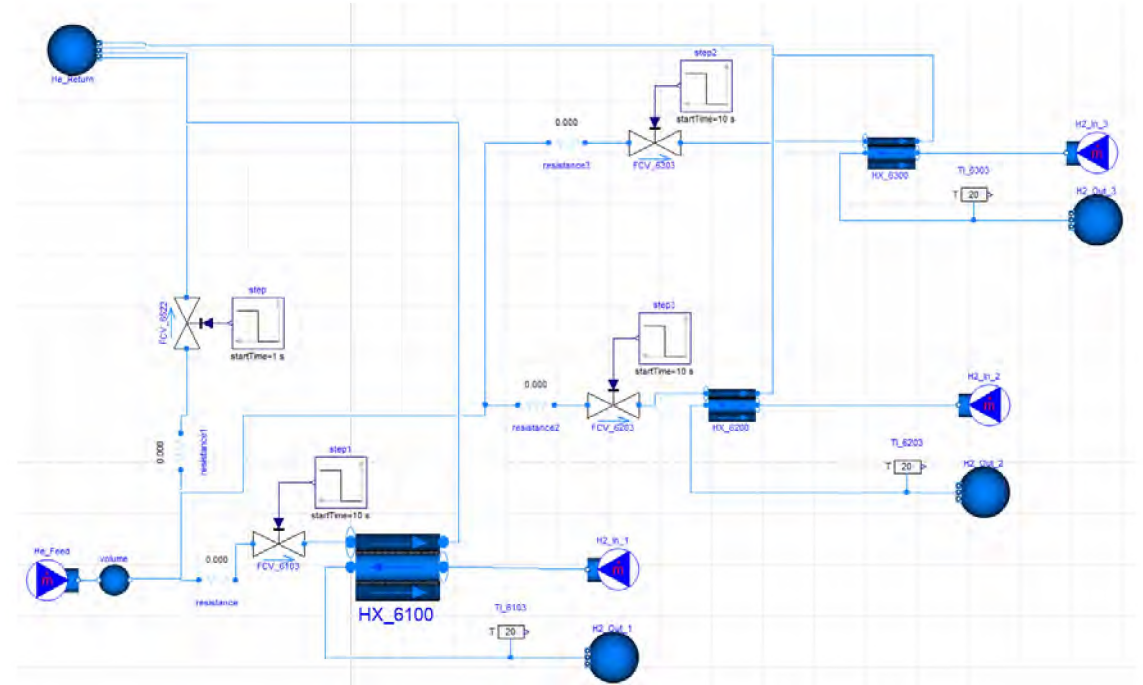
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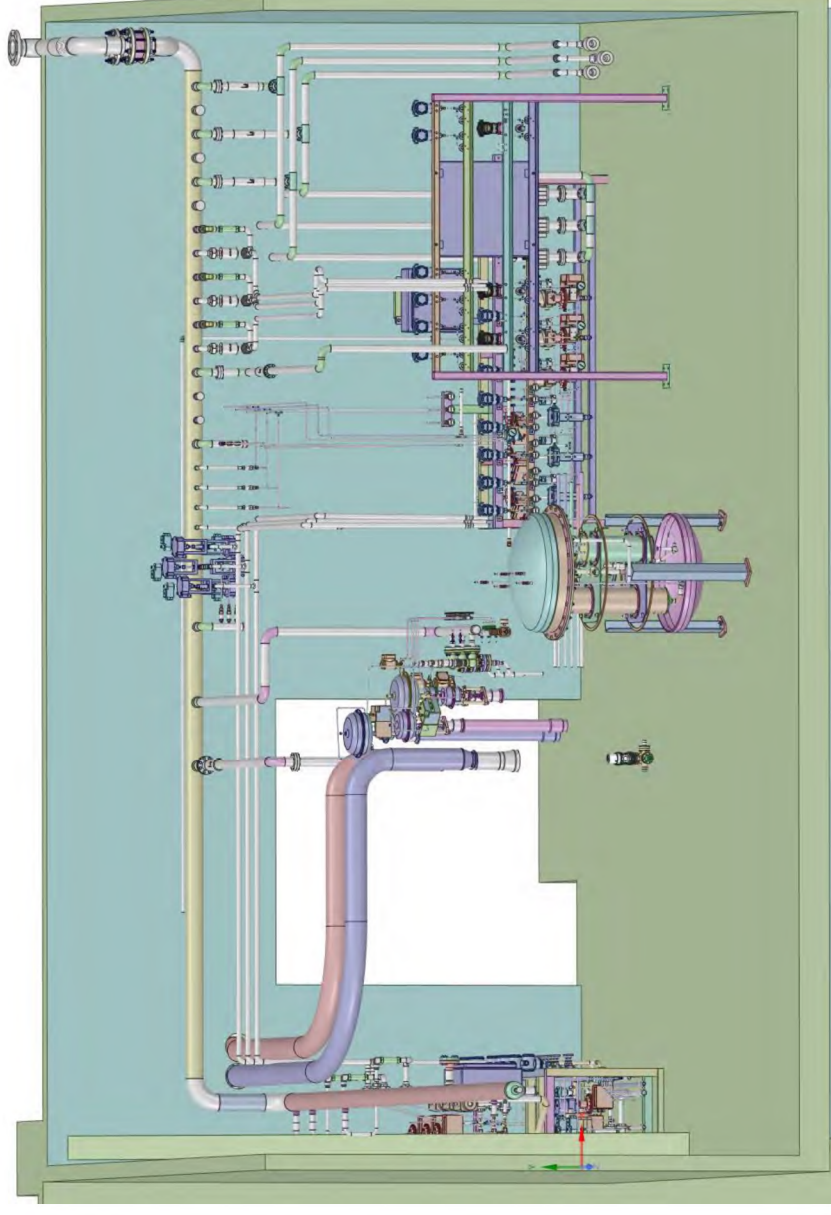
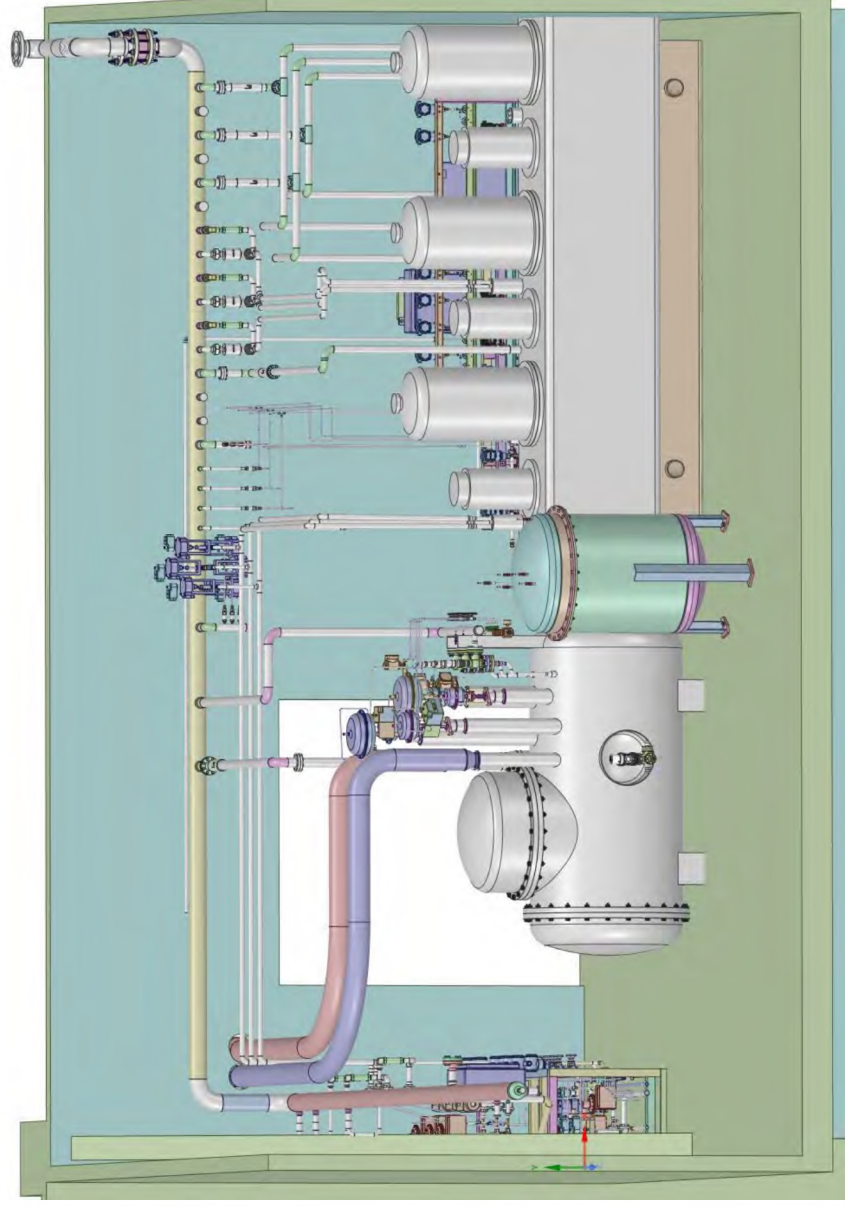


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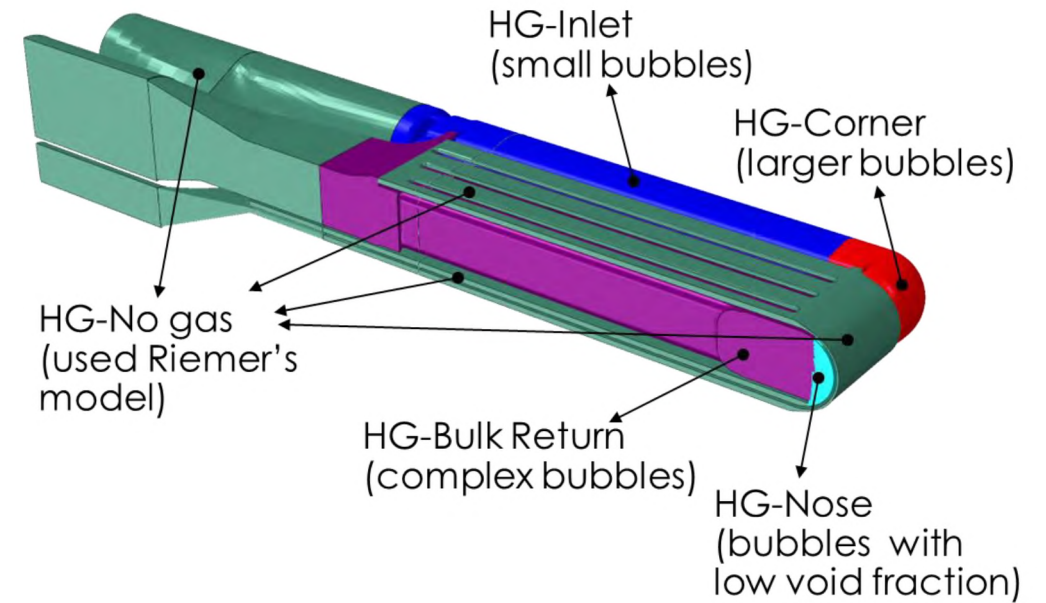
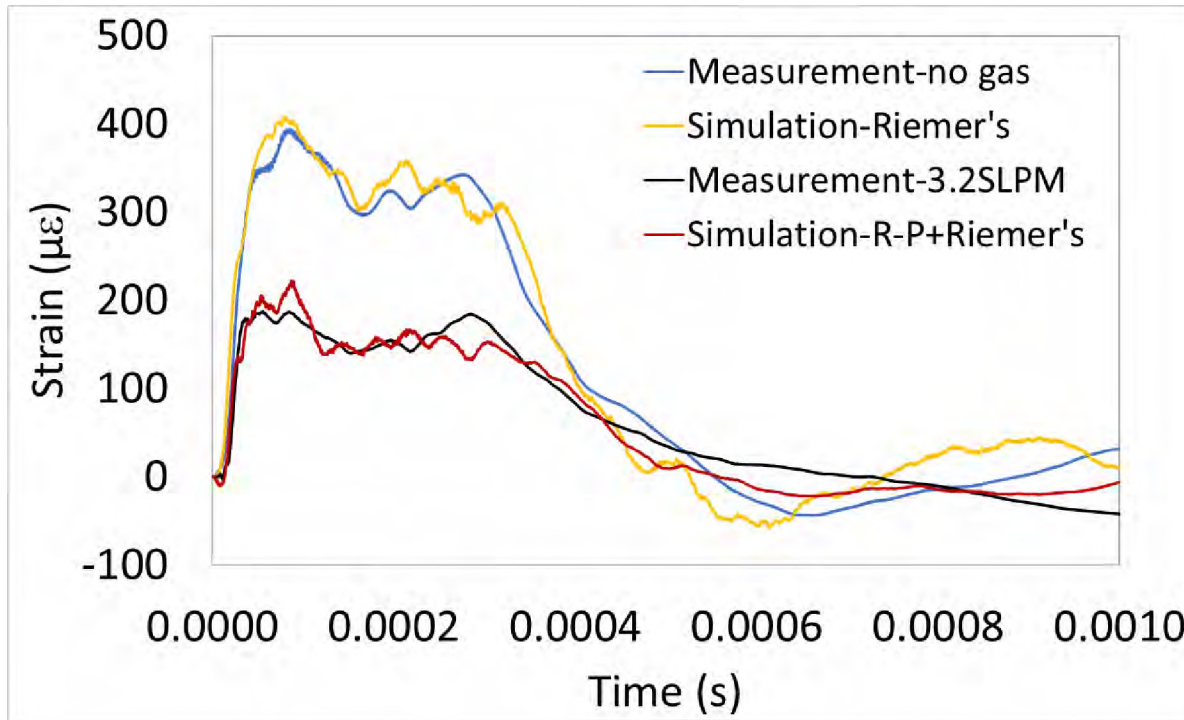
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