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Elvis Dominguez-Ontiveros

Sr. R&D Sce Au luclear Technologies Division (SNS

Virtual Workshop on Optical Sensors for Energy Applications Tas & CAR TO THE Sensors for Energy Applications

UÜÞŠÆ managed by WEÓattelle, LLC for the WÙÆÖepartment of Energy



#### O`dã^

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- Ù[ č ¦ &^ ÁÖ^ç^|[ ] { ^} oź; åÁÔ} \* ã ^^ ¦ã \* ÁÕ ¦[ č] (SNS)
- <u>Ÿ`} Šã́</u> • Ö¦^, Y/ą̃å^¦

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- Þ/a&\ Úæ}}^ ∥
- Ryan Schultz
- Robert Sangrey
- Allie Morris •

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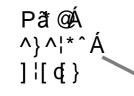


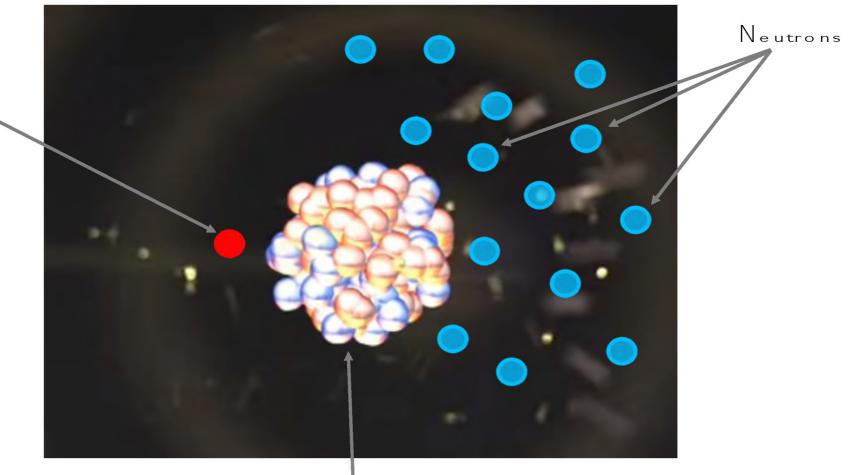
## The Spallation Neutron Source ABC megawatt class accelerator based pulsed n C[A] source



CAK RIDGE

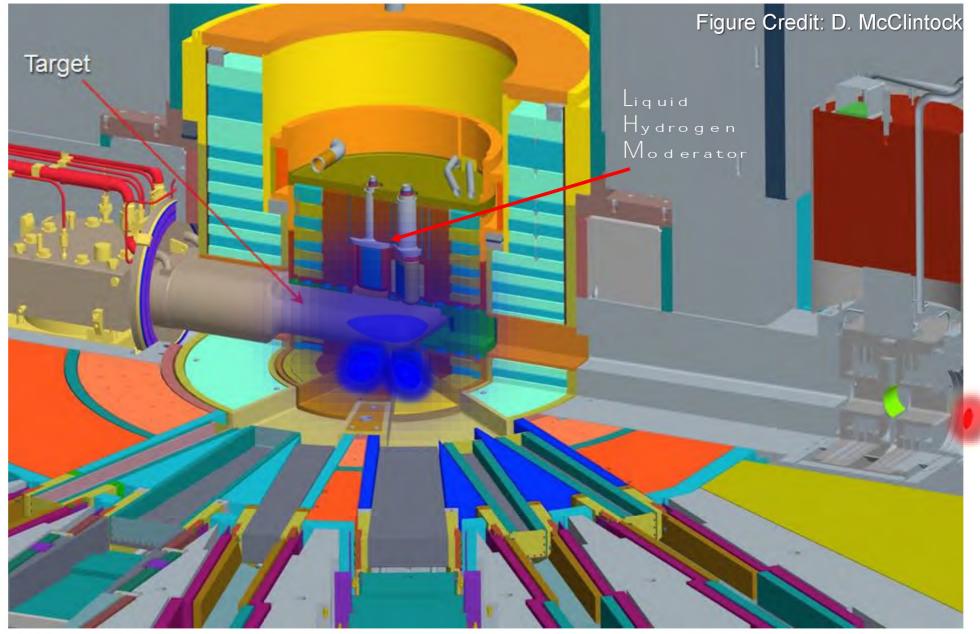
Neutrons are produced via high-energy spallation reactions induced by injecting I (Je FÉÍÁTY / protons into liquid mercury at a frequency o ÂÉA z Th^ÂÛ],æ¢|ææã[}ÂÚ¦[[8^••







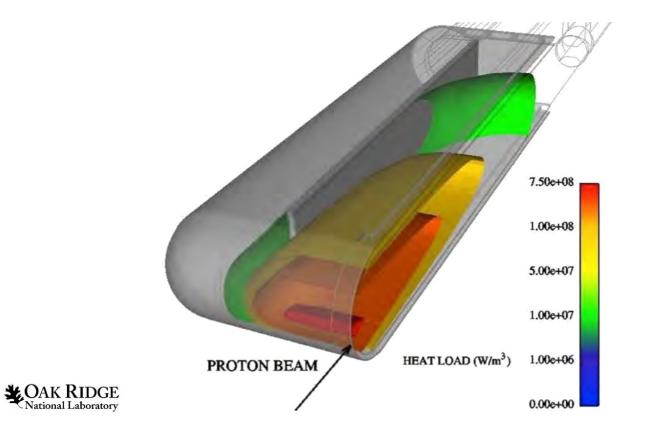


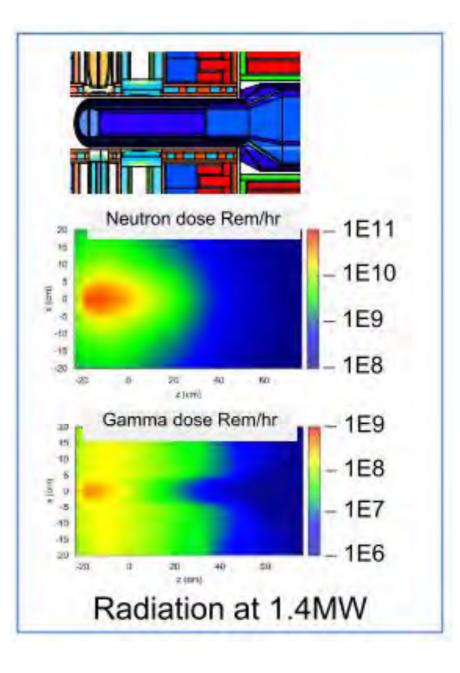


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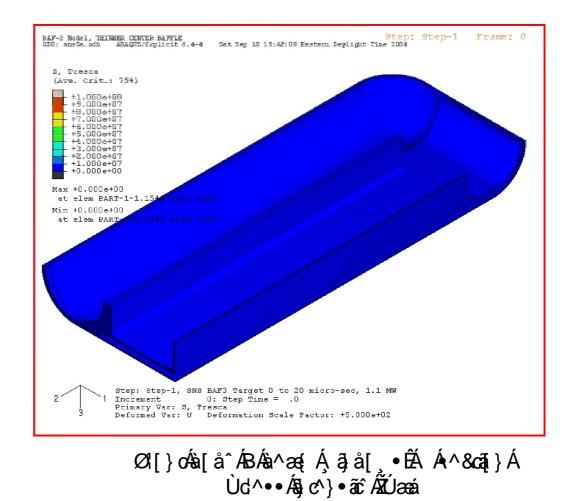
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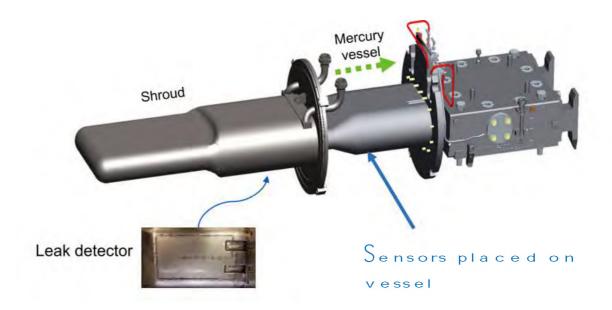
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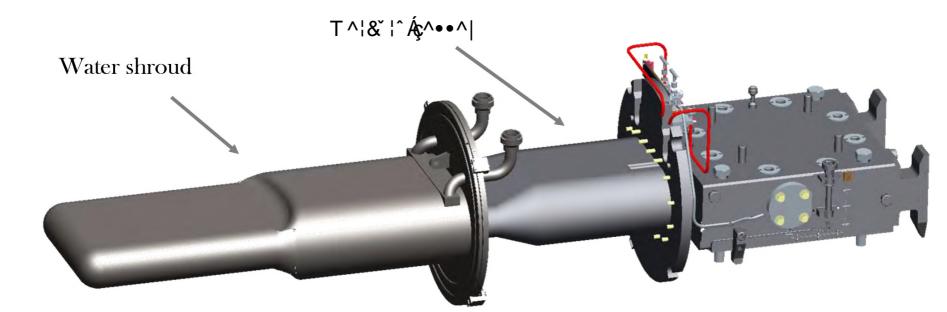


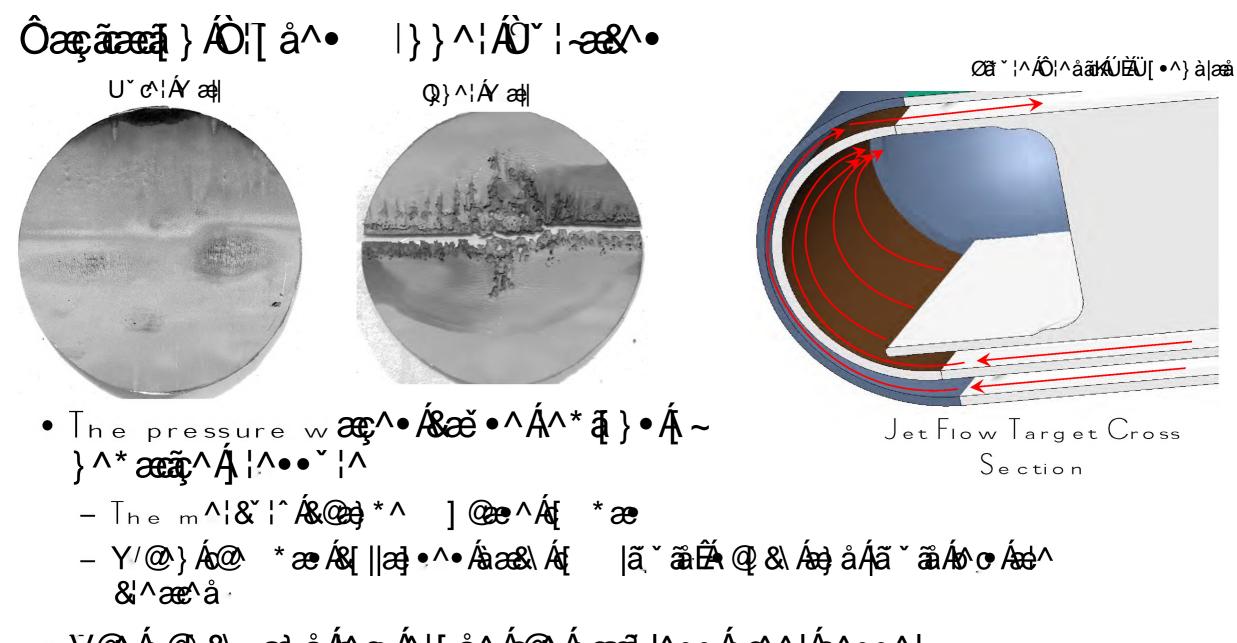
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compositions t **^• C^å** over the years

- Fluorine-å[]^åÁą\*| e mode-Fujikura ÜÜÜT ØÓ
- Installation
  - "ÁT [ſ] Ga \* sensors on ÙÙÁç^●●^| using Styca● GÂC Í €ØVÁA oxy cured with & 2000 € OÁFF

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#### Laying out the sensors



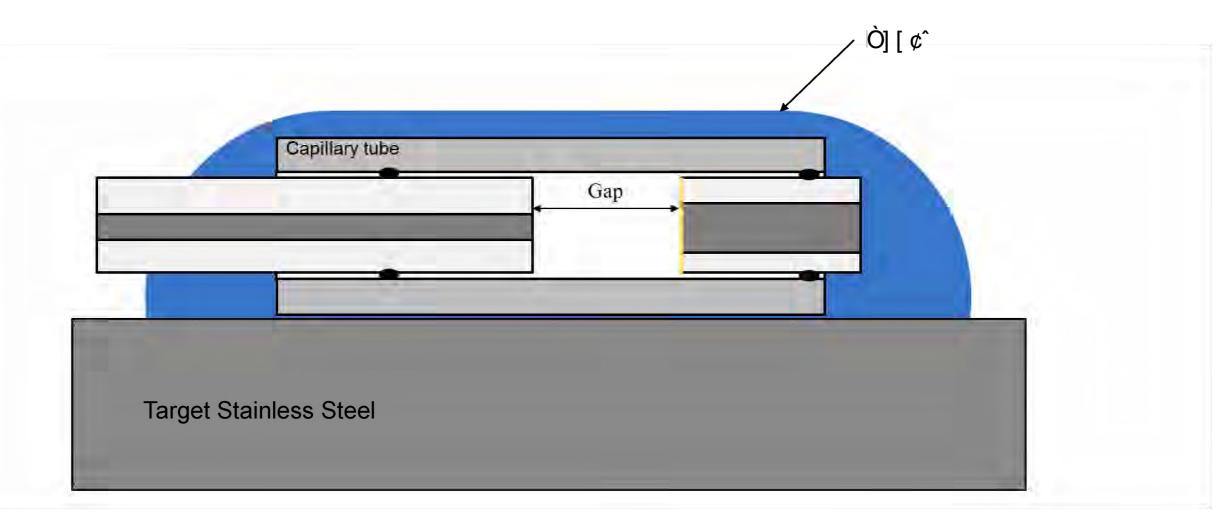
Installed sensors



Curing of epoxy glue

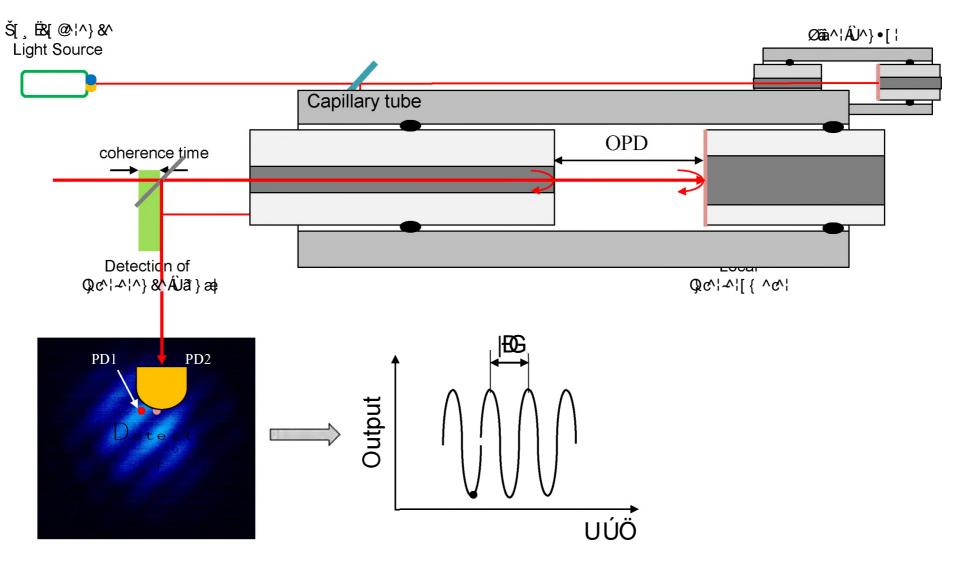


#### Fiber Optic Strain Gauges





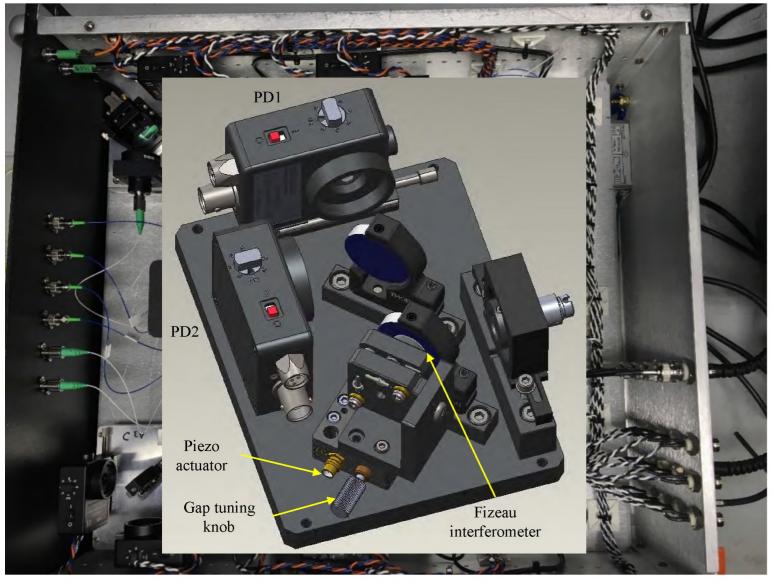
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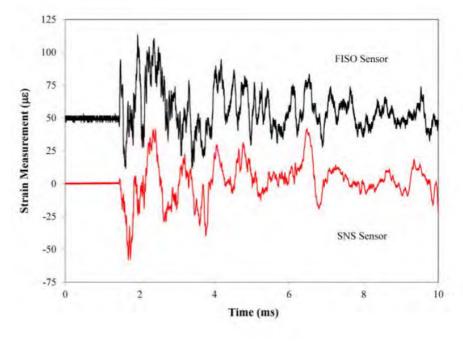


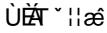


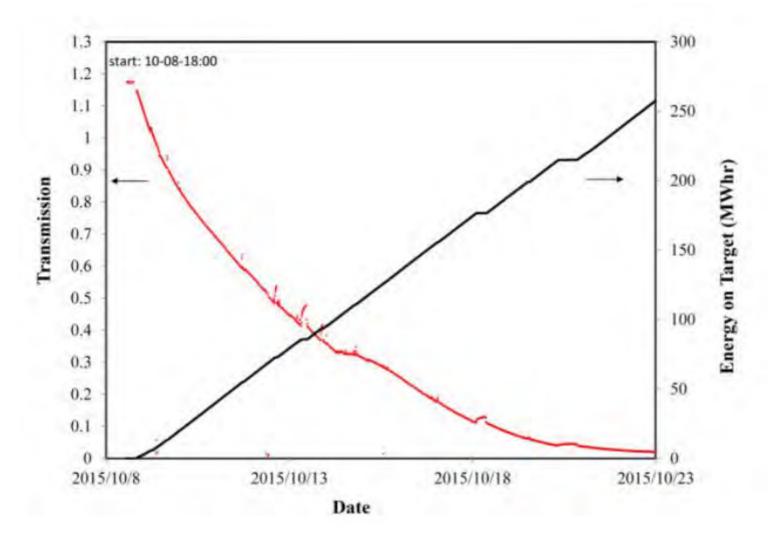
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ΓÍ

#### Upgraded Fiber-Optic Sensor Syst {

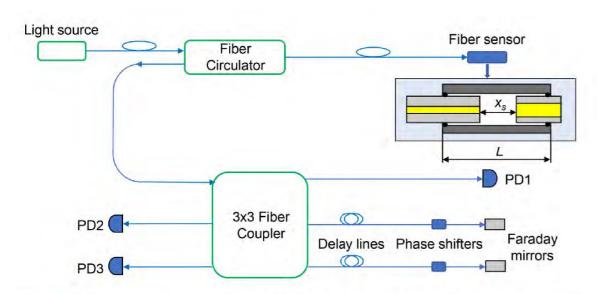


Fig. 1. Schematic of the fiber-optic sensor head and interrogator setup. PD: photodetector. Each sensor had a 2.5-m-long lead fiber with a polyimide coating, and the outer diameter of the coating was 250  $\mu$ m. Inset box shows the sensing FP interferometer. *x<sub>s</sub>*: sensor gap, *L*: sensor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

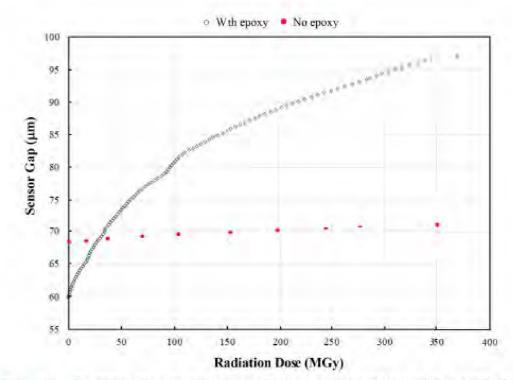


Fig. 16. Measured sensor gap variation as a function of the radiation dose on the sensor head. The increased gap growth is due to the radiation-induced volume expansion of the epoxy.

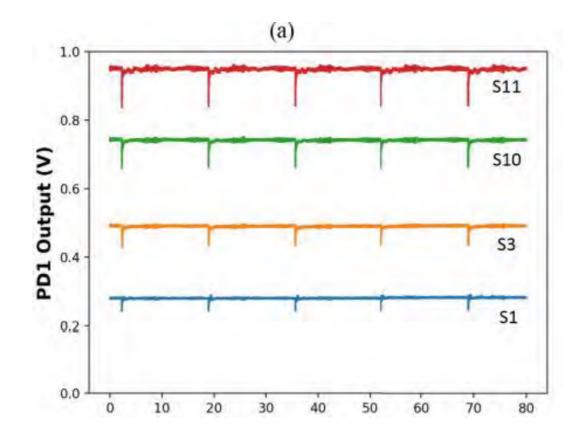


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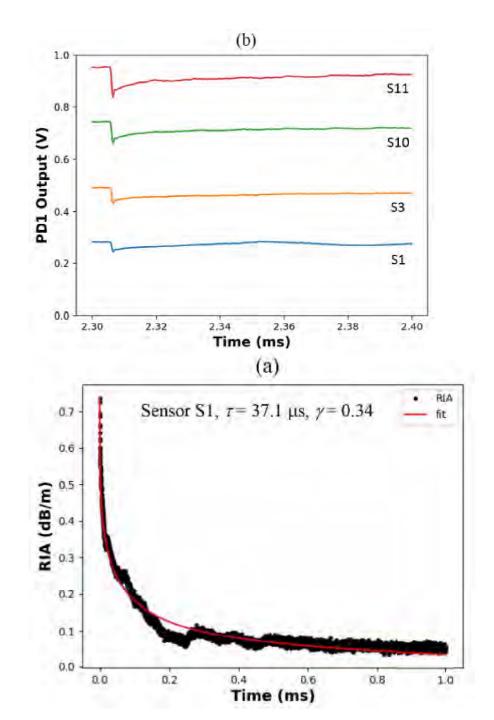
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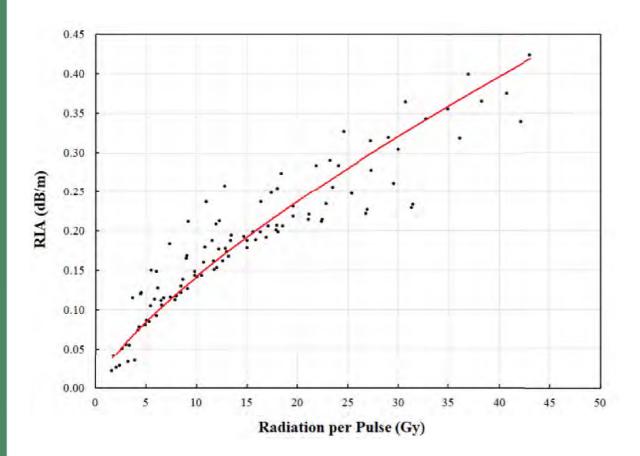


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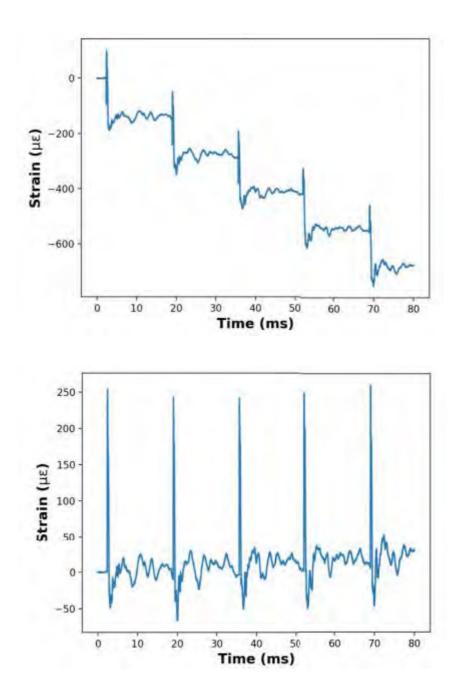
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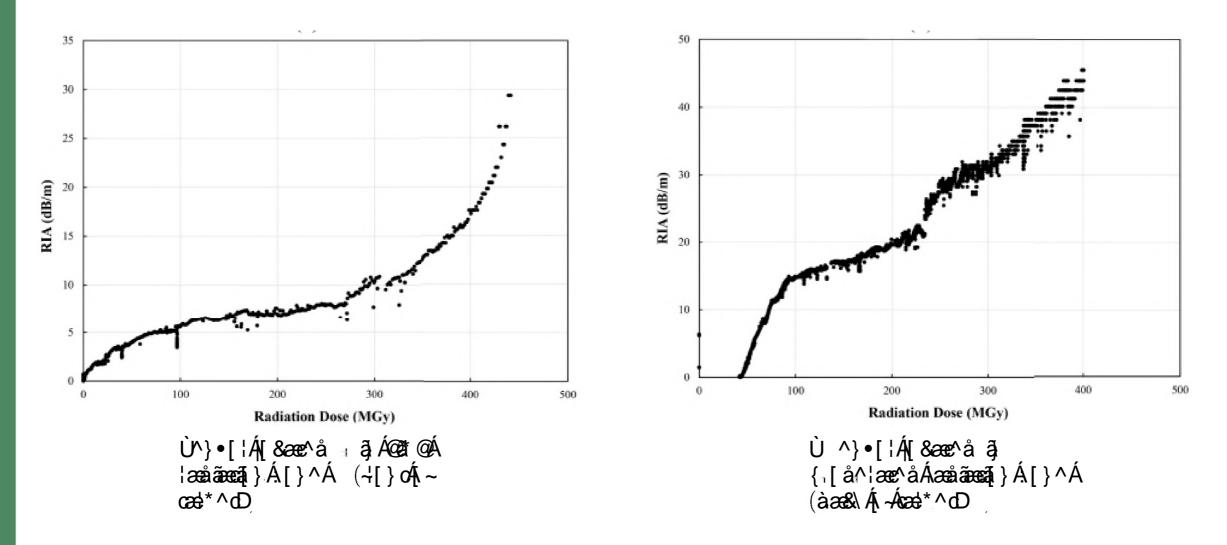


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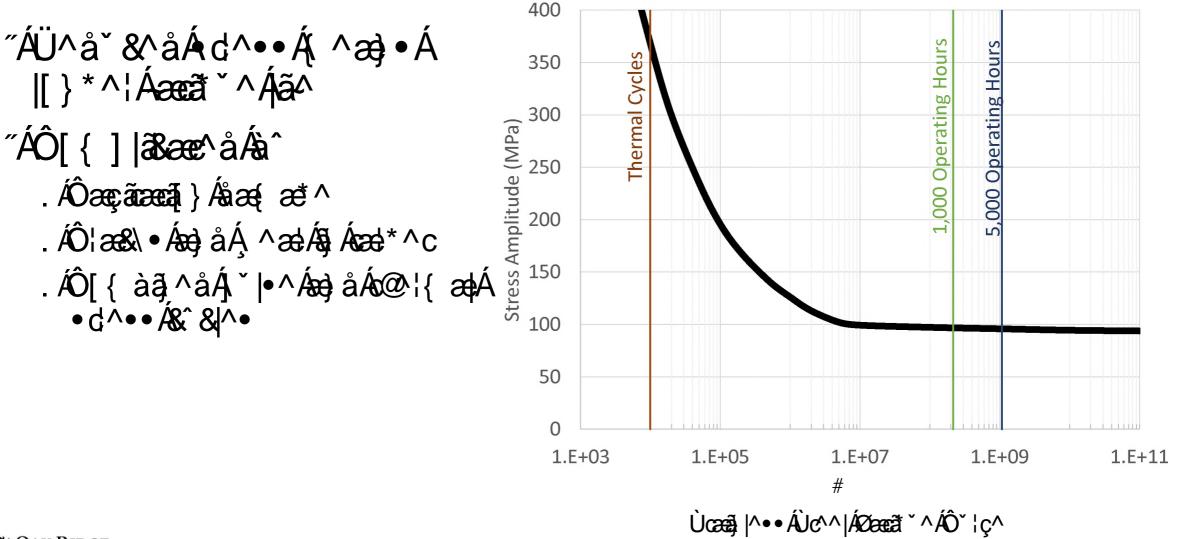




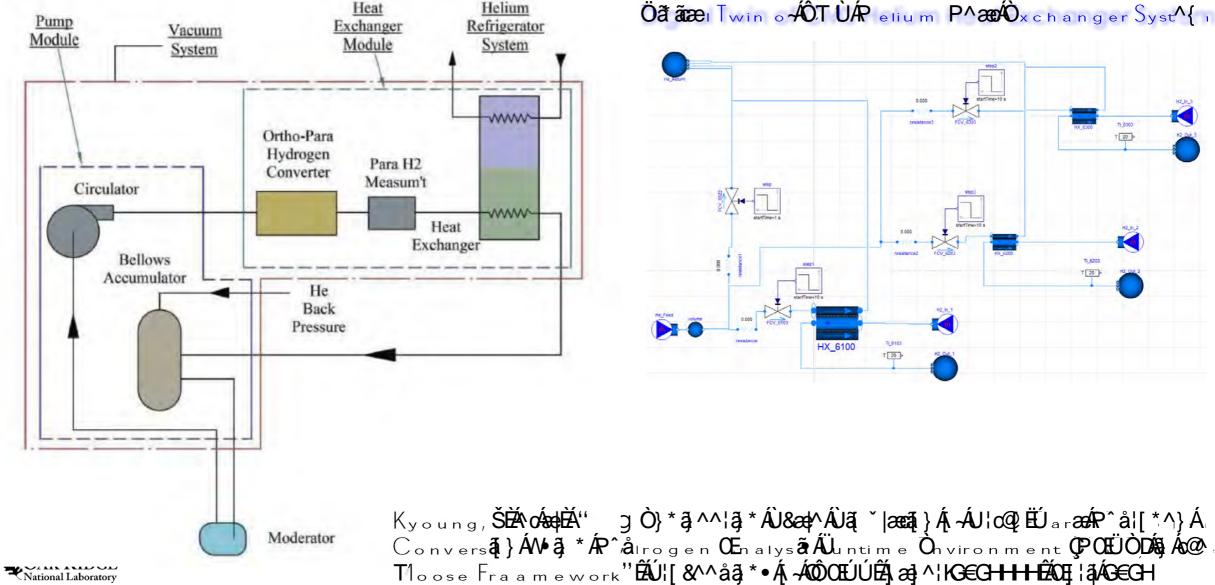
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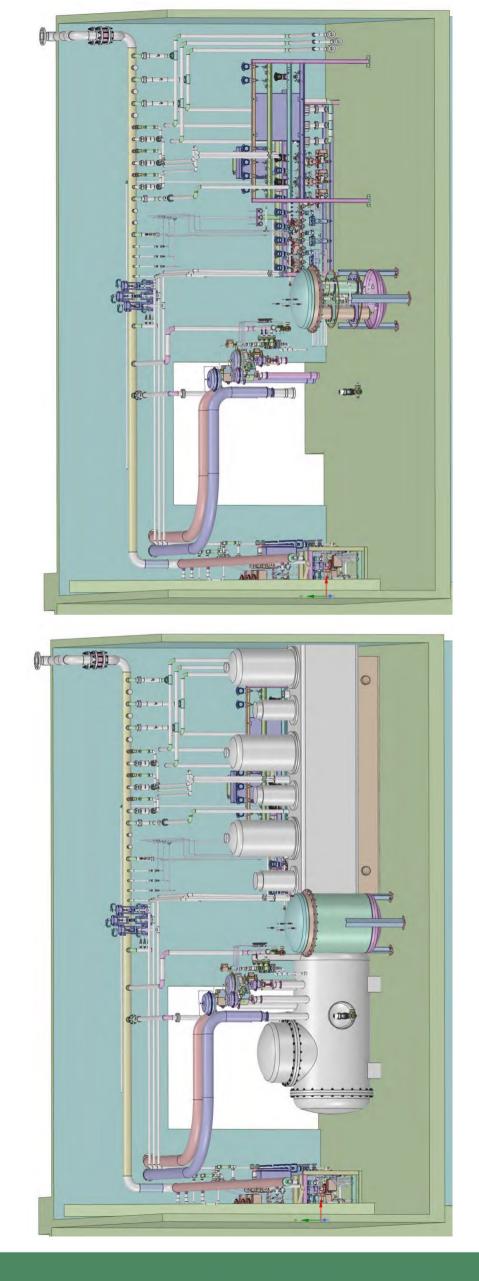
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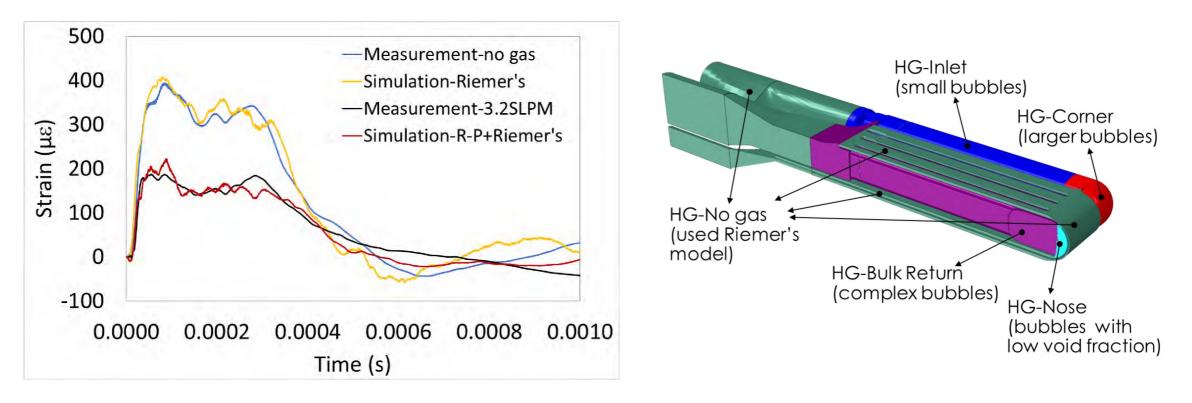
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- Ü[å¦āť^:ÉT ÉÉÚ^āt ÉÚÉÉÓæààð\ÉŐÉÉBEÁR[@;•^}ÉÓÉÉQEÉCEDÉÖ^}æ{ 38•Á;~Áæ}Á§^¦cãæ‡|^Á&[||æ]•ā]\*Á\*æ•Ás`àà|^Ás∧ç^^}Á;[Ájææ‡|^|ÉAātãaÁ;懕ÉR[č]}æ4Á; ÁØ|čãaÁT^&@e) 38•ÉAIÎÉÓEEHĚA å[34F€ÈF€FĨBb{{È€€GĚIIF
- Ó^\;}æååY ÈÄÜā?{^\ÉÉPæţÁRãæ}\*ÉÆaġåÄÖ\^\_\_ÂÒÈY ∄å^\ÉÂUdæãjÁ,\^åã&qãį}Áæ}åÁa^}&@(æ\Ájã@A(^æ`\^{^}ohjÁ@AÛ]æ|æããi}Áp^`d[}ÂÛ[`\&^Á(^\&`\^Åæ\*^oÁjã@q`of\*æA§b%&ãi}ÊÚ@•ã&æAÁ Ü^çã\\_ÁQB&&^|^\æ[\•ÁæjåÅÓ^æ{•ÉX[[ÉGE]É@•ÈXIÊÛ^] c^{{``a^}A@EGG}
- PĚA Rão \* ÉŽÖĚ DĚY ∄ å^ \ ÉŽY ĚŠã ÉÅUJ^] ^ zeze ářáč Ási à Á \ &^ \ czáj č Á č å^ Á Á d zaj Á azezá ^ ze ` \^åÁ \ Aze ` \^åÁ \ Á @ ÁS[`] |^ å Á | ´ ãa Ë d` &č \^Áş^••^ |• Á j Á^•] [ } ^ Á [ Á@ ť @Áj c^ } ãc Á \ [ d] } Á ` |• ^• +Ê ( U | [ &^ à Å \* A d zaj Å azezá ^ ze ` \^åÁ \ Aze ` \^åÁ \ Aze ` \^åÁ ` ãa Ë d` &č \^Áş^••^ |• Á j Á^•] [ } ^ Á [ Á@ ť @Áj c^ } ãc Á \ [ d] } Å ` |• ^• +Ê ( U | [ &^ à Å \* A d zaj \* A d zaj \* A d zaj Å azezá ^ ze ` \^åÁ \ Aze ` \^åA [ ` a E d` &č \ Aş^••^ |• Á j Á^•] [ } ^ Á [ Á@ ť @Áj c^ } ãc Á \ [ d] } Å ` |• ^• +Ê ( U | [ &^ à Å ] \* A d zaj \* A d zaj \* A d zaj Å azezá ^ ze ` \^åA [ ` a E d` &č \ A k • ^ |• Á j Å ^ ] ]

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