National Spherical Torus eXperiment Upgrade

Overview of the Personnel Safety System

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Credited Controls Mitigate Accelerator Specific Hazards

Accelerator Specific Hazard (ASH) (ESH-027)

Any hazard to workers, the environment, or public, whose nature is uniquely defined by the configuration of NSTX-U systems and not fully mitigated by PPPL standard safety management programs (ESHD 5008, etc)

ASH #1: Direct Radiation from Fusion Reactions ASH #2: Cryogenic Oxygen Deficiency

Credited Control (ESH-027)

A system or control, either engineered or administrative in nature, that reduces the risk of an accelerator specific hazard from unacceptable to the acceptable range.

ASH #1: Shielding, Access Control Systems ASH #2: Cryogenic Oxygen Deficiency Alarms

The New Personnel Safety System (PSS)

- The new PSS design
 - Mitigates experimental experimental electrical, magnetic & radiological hazards in the test cell
 - link to hazard analysis
 - Is design to a industrial standard uses fail safe and redundant design elements to achieve a quantified minimum reliability
 - link to performance calc, link to SDD
- The new PSS:
 - Provides operations door interlocks to the test cell + three other locations
 - Provides emergency stop buttons within and at entrances to those four locations
 - Ensure that the the coil and NB power systems are not configured for operations during periods of ACCESS







Use Cases

- You open a door during operations
 - **Design Assumption**: it is not immediately dangerous on the other side of the door
 - The PSS-SIS will direct the Coil and Neutral Beam control systems to shut down (open line switches & vacuum interrupters)
 - If that fails, breakers are opened.
- You press an E-Stop button
 - **Design Assumption**: imminent hazard
 - Breakers will open, alarms will sound
- The PSS-SIS starts alarming (high-pitched screech) while you are in the test cell
 - Could be an E-Stop button hit, the failure of a PLC module, an unsafe condition of the power line ups
 - Will open breakers
 - Evacuate the test cell and let engineering sort it out
- Don't be fearful of hitting the E-STOP if you feel there is an imminent hazard. Then evacuate when the alarm sounds
- If you accidently hit it, thats OK...evacuate with the alarm and tell a machine tech.

Marquees are Controlled by PSS



- If the Marquee says "Access Prohibited", then opening the doors will cause alarms, power systems to interdict
- If "Access Allowed" shows:
 - Techs may still lock the cages or doors for off-hours access limitation
 - You always need to badge in to the test cell; no piggybacking

Configuration Management of PSS-SIS



Don't ever modify/adjust/tamper with any PSS components
If PSS-SIS does not function, likely somebody else who will be harmed
If you see a sign that the PSS has been compromised, tell a machine tech, your supervisor or research contact, a member of the engineering operation team, any member of the research leadership