



Contribution ID: 185

Type: **Wedge Participant**

Autonomous Mobile Directionally and Spectrally Sensitive Neutron Detectors

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IAEA managed access inspections are limited in time and inspector hours, and by the needs (1) to avoid exposure of sensitive information, (2) to minimize impacts on facility operations, and (3) to conserve inspectorate resources. We are developing autonomous, mobile, directionally sensitive neutron sensors ("inspector bots") to support inspectors in detecting undeclared enriched UF₆ through (alpha, n) reactions. Applications of interest for IAEA safeguards include support for Limited Frequency Unannounced Access inspections at large gas-centrifuge enrichment plants and use as Unattended Monitoring Systems at UF₆ feed stations. Based on previous work of ours that demonstrated significant directional sensitivity of rows of moderated neutron counters, we are constructing a simple, robust one-foot diameter, two-foot high cylinder of polyethylene moderator, containing three one-inch diameter, 50 cm long, boron-coated-straw neutron counters located 120 degrees apart, half-way between the center-line and the surface of the cylinder. This detector system will be mounted on a robotic transport mechanism to form a prototype inspector bot. MCNP studies show that this system provides high sensitivity and remarkable directionality: 0.37 cps per ng of bare Cf-252 at 2 m and 6:1 signal ratio between a counter directly facing the neutron source and each of the two counters at the back. The bot's search algorithm will adjust its heading to maximize the signal in its most active counter and to balance the signals in the two less active counters, thus facilitating smart mapping of neutron fields. A swarm of cooperative inspector bots could efficiently detect undeclared withdrawal stations in very large centrifuge halls. Strategically located individual bots could rapidly detect undeclared enriched UF₆ in feed stations.

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Which "Key Question" does your Abstract address?

TEC5.1

Which alternative "Key Question" does your Abstract address? (if any)

TEC5.4

Topics

TEC5

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