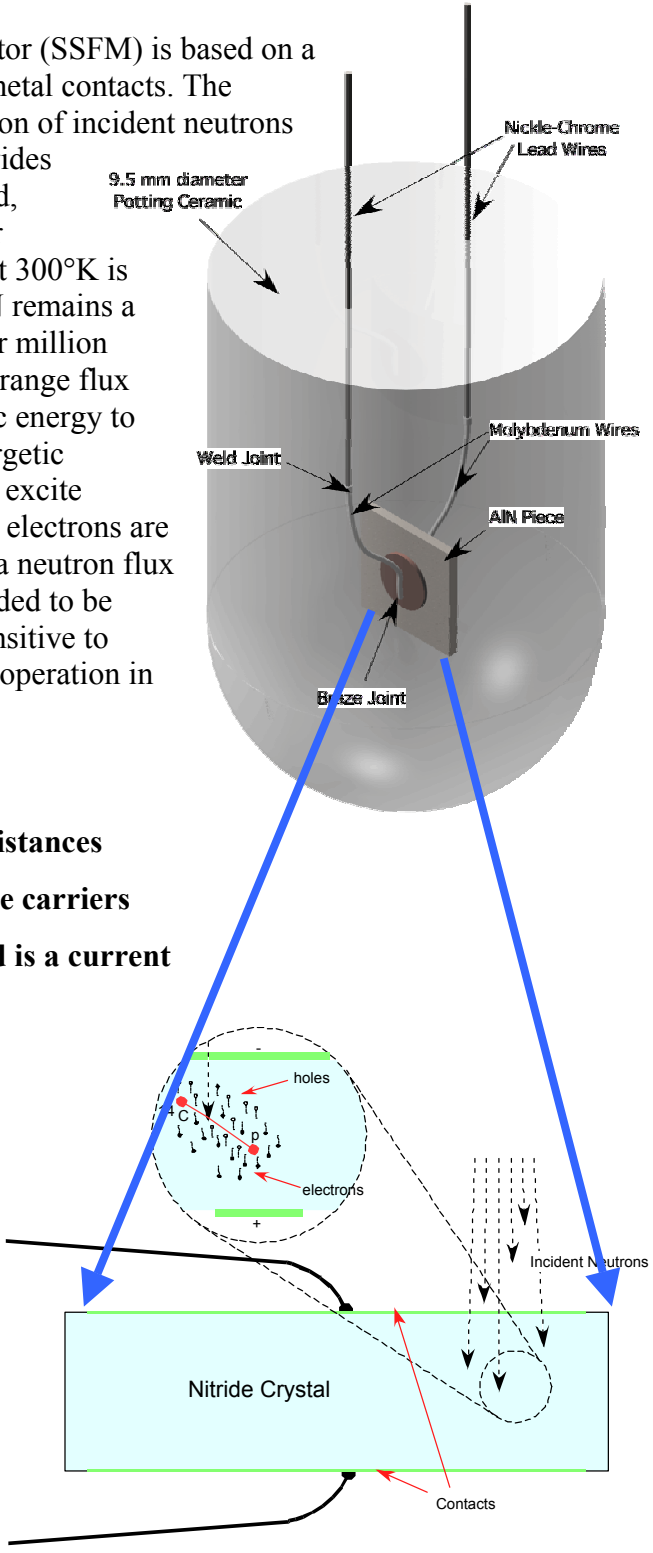
OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY
FACT SHEET

In-core Flux Monitor

Solid-State, In-core Flux Monitor Functions as a Flux Sensitive Resistor

The in-core version of the solid-state flux monitor (SSFM) is based on a polycrystalline AlN compact with evaporated metal contacts. The detector functions by intercepting a small fraction of incident neutrons in the 14N(n,p)14C reaction. The Group III nitrides are very chemically stable, mechanically rugged, have wide band gaps, and high electrical carrier mobilities. The electrical conductivity of AlN at 300°K is typically over 10^{14} Ω-cm. Even at 1300°K, AlN remains a very good insulator with less than a one part per million temperature-induced error expected in a power range flux measurement. The reaction imparts a net kinetic energy to the energetic daughters of 627 keV. As the energetic daughters slow down in the nitride matrix, they excite electrons into the conduction band. The excited electrons are free to move under an applied bias resulting in a neutron flux induced electrical current. The detector is intended to be operated in current mode, and it will also be sensitive to gamma rays. Thus the SSFM will be limited to operation in reactor power range fluxes.



Features

- **Wide band-gap crystal have very high resistances**
- **Radiation interaction produces free charge carriers**
- **Motion of free carriers under applied field is a current**
- **Magnitude of current is measure of flux**

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