

Accelerator/Reactor Coupling Global Activities

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Summary

- MUSE 1, 2 and 3 (completed)
- MUSE 4, in progress
- TRADE 1B, in progress
- TRADE 2 and 3, planned

Completed Coupling Tests

MUSE 1 and 2

- Cf-252 source
- Neutron source strength $1e8$ n/s
- Core Fuel: MOX (UO₂PuO₂, Pu around 25% enrichment)
- Core power (500 watts from intrinsic source)
- Test completed in 1995 and 1996 (few weeks each)
- Experiment provided first measurement of the source importance
- Demonstrated the ability to measure the source importance

MUSE 3

- DT commercial tube (SODERN GENIE26)
- Neutron source strength $1e8$ n/s
- Core Fuel: Same as in MUSE 1, 2
- Core power (500 watts from intrinsic source)
- Tests completed in February thru April, 1998
- Experiment demonstrated the difficulties of measuring reactivity by PNS (in absolute sense)

* See George Imel for details

In Progress Coupling Tests

MUSE 4

- DT and DD generator built by CNRS Grenoble (Deuterium accelerator coupled to D or T target)
- Source Strength, DD approximately $1e08$ n/s, DT approximately $1e10$ n/s
- Same core fuel as MUSE 1, 2, 3
- Core power from zero to a few kw. (Core is slightly air cooled)
- November 27, 2001 was first coupling of generator to core. Experiments ended July 31, 2004 (although analysis will continue through first part of 2005)
- Extensive multinational effort to demonstrate methods of reactivity monitoring (variations of PNS, Feynman and Rossi alpha, and noise techniques).
- Recommendations will be made to the XADS community based on these experiments.
- Follow-up qualifications will be done in TRADE

In Progress TRADE Tests

TRADE 1B

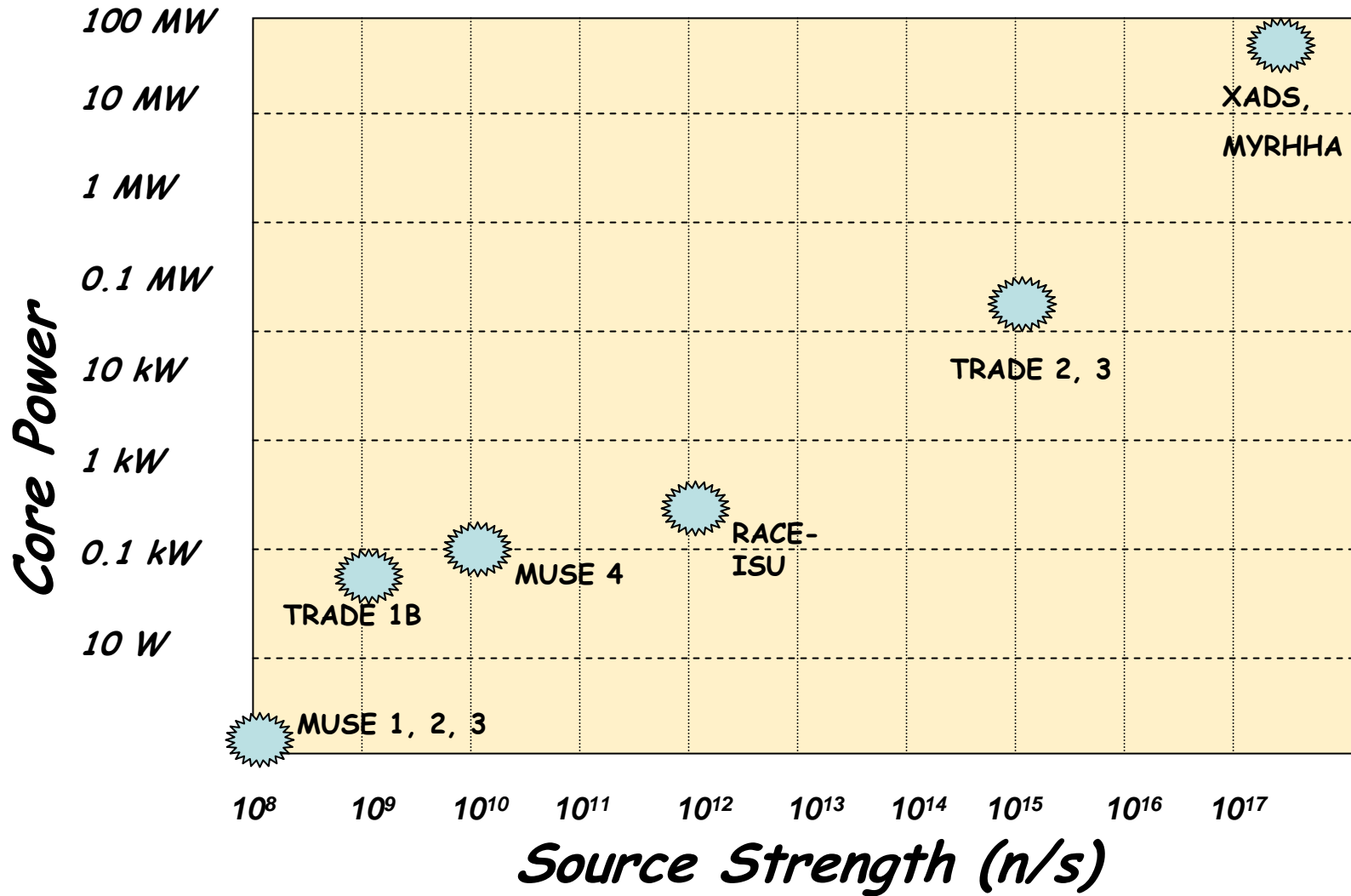
- DD and DT neutron source
- DT around $1e09$ n/s
- TRIGA fuel (20 % enriched U235, 8 w/o Uranium, UZrH matrix)
- Core power from zero to a few hundred watts
- Experiment Commenced July 15, 2004 and will continue thru the summer of 2005
- Experiment will provide qualification of MUSE reactivity measurement methods
- Experiment will demonstrate the independence of reactor spectrum (TRADE is a thermal spectrum, while MUSE is fast)

Planned TRADE Tests

TRADE II and III

- Neutron Source: 140 MeV protons from cyclotron at 300 micro-amps impinging on a Water-cooled Tantalum Target. (30-40 kW target power)
- Source strength of $1e15$ n/s
- TRIGA fuel with central elements removed for the tantalum target.
- Up to 200 kW core power.
- Expected to commence in 2007 or 2008
- Will provide operational testing of beam current, reactivity, and source importance interactions at a power level where feedback is important.
- Demonstration of controlling an ADS power level w/o control rods, etc.
- Will provide final reactivity monitoring techniques to XADS and/or MYRRHA

Coupling Experiment Comparison



Summary

- MUSE experiments at zero power are providing basis for reactivity monitoring and control.
- TRADE experiments to provide demonstration of control and operation at sufficient power level to measure feedback effects.
- XADS or MYRRHA will provide a 100 MW demonstration.
- RACE can bridge the gap between MUSE and TRADE