

Data Request from **RACE** :

There are 4 major areas in which we would like to obtain more specific data:

1. **General Core Characteristics**
2. **Thermohydraulics**
3. **Thermo-mechanical Issues**
4. **Instrumentation**

Data Request from RACE regarding **General Core Characteristics:**

Objectives: Calibration of our dynamic codes to the current critical TRIGA reactor:

We would like to be able to retrace the critical TRIGA transient behavior as closely as possible with our dynamic codes.

Once we accomplish this (complete retracement capabilities of the critical TRIGA transients) we should be able to predict the dynamic behavior of the sub-critical TRIGA (at various different levels of k_{eff}) using our codes in order to confirm our current understanding of the dynamic behavior of sub-critical systems. The sub-critical TRIGA experimental transient data then of course provides experimental confirmation of our predictive capabilities.

For this purpose we have performed a very extensive test phase early last year (2004) in Casaccia by measuring the time response of the power level, fuel temperature, coolant core inlet and core outlet temperatures at 10 different radial positions to different reactivity insertions at different power levels. Detailed transient data sets for over 50 different reactivity insertion transients have been collected in the Casaccia TRIGA reactor for this purpose over the power range of 50 kW to 900 kW.

We have analyzed this extensive data collection during the last year and are trying to "calibrated" our codes accordingly. We have found some very interesting issues needing further analysis in order to fully understand what is happening in the 300 to 600 kW power range.

We thus would like to get access to the following RACE data:

1. the normal description of the TRIGA core and fuel geometry (number of fuel rods, pin diameter, pin pitch, axial dimensions, etc.)
2. fuel and cladding description, type of fuel and cladding,
3. corresponding material property data such as thermal conductivity, heat capacity, density of the fuel and cladding materials),
4. power level, coolant flow rate (is it all natural circulation or natural circulation enhanced),
5. coolant temperature drop across the core vs power level - if this data should be available,
6. and any transient data that may have been collected during the normal operational modes of the reactor, i.e. power, fuel and coolant (core inlet, core outlet) temperature traces vs time with the corresponding reactivity inserted (control rod position).
7. Also nice would be a detailed control rod calibration curve, i.e. reactivity vs rod position.
8. A detailed burn-up history would be also nice, of course, for our nuclear people to play with their codes predicting the level of criticality and possibly determine corresponding temperature reactivity coefficients. This data has lower priority at this time than the basic data set requested above.

Data Request from RACE regarding **Thermohydraulics**:

Objectives: Margins to Critical Heat flux during normal and transient operations of the RACE target.

To perform the studies from a point of view of thermalhydraulic studies the following ***data are required***:

- Geometry of the whole core configuration
 - o Pool geometry and core position
 - o External cooling configuration and circuit
 - o Singularities geometry and if possible singular pressure drop coefficients
- Geometry of the initial TRIGA core
- Geometry of the foreseen experiment within the TRIGA core.
 - o Place of the target
 - o Modification of the fuel positions inside the core (for example removal of the first fuel ring in the TRADE experiment)
- Target geometry (specially external surface)
- Axial distribution of power on the target surface
- Axial and radial distribution of power within the core
- Limit conditions (pressure, inlet temperature, power) for the core under normal operations
- Cooling mode whether free convection or assisted cooling
- If available in core measurements of flow rate and outlet temperatures
- If observed details concerning possibility of nuclear power oscillations at some power rates

Data Request from RACE regarding **Thermo-mechanical Issues:**

Objectives: thermo-mechanical assessment of the RACE target during normal and transient conditions (temperature field, stress field, ratchetting risk and fatigue lifetime evaluations).

Required data:

- Target geometry
- Target material:
 - * Temperature-dependent physical properties (density, thermal conductivity)
 - * Temperature-dependent mechanical properties (Young's modulus, Poisson's ratio, thermal expansion coefficient, yield stress)
- Power density distribution inside the target (at least, the expected axial linear power profile)
- Boundary conditions (pressure and cooling conditions around the target) for the target module under normal and transient conditions
- Power time-history (determination of the type and number of cycles imposed to the target)

Data Request from RACE regarding **Instrumentation**:

1) **Instrumentation**:

- A detailed list of available neutron detectors.
- A detailed list of the corresponding signal conditioning electronics (rack, preamp., amp., ...)
- Are Cd-foils available for wrapping neutron detectors in order to turn them into epithermal neutron detectors ? Polyethylene block would work as well.
- Does there exist a mechanism for having a Cf-252 source oscillated ?

2) **External neutron source**:

External neutron source is hereafter referred to as the linac with the target.

- Is the external neutron source continue or pulsed ?
- If pulsed:

What is the frequency range exactly ? From about a few Herz (?) to 60 Hz as already mentioned ?

What is the frequency accuracy ?

Is the pulse width fixed at 3 microseconds only ?

Does there exist a source triggering signal ? What is its shape and amplitude ?

Can this triggering signal be delayed ?

- It has been said that there exists "a prompt, strong-energy gamma ray signal" when the source neutron is produced by the electron beam impinging onto the target.

Could this gamma flash prevent fission chamber from detecting neutrons ? Is there some information on this side-effect ?

- How long can the external neutron source continuously work ? In other words, what is the maximum experimental duration with the external neutron source turned on ?

- How long does a target last ?

3) **Starting neutron source**:

What is the starting neutron source ?

B - Electron accelerator and ADS

Some DAPNIA people have already worked on the possibility of coupling an electron-accelerator and a subcritical neutronic system. A publication on this topic is attached to this mail. In addition, this DAPNIA team should soon answer me the question on the bad side-effect of the flash gamma on fission chamber.