[RT] It is useful to keep in mind that pyrofusion is not thermonuclear fusion. Pyrofusion is like accelerator-based ejection of D ions on to a D or T target - the same way pulsed neutron generators have worked for over 30 years.

[HL] Putterman accelerates deuterons up to 100 keV. According to my information, this is sufficient for "thermonuclear" fusion, which we non-physicists call "hot fusion" due to a lack of better knowledge. Not right?

Subject: Re: Hot Fusion vs Accelerator-based nuclear reaction(rpt->haiko,7/5/05)
Date: Tue, 05 Jul 2005 16:17:57 -0500
From: Rusi Taleyarkhan <rusi@ecn.purdue.edu>
To: Haiko Lietz <hl@haikolietz.de>

Haiko:

Thermonuclear fusion involves setting up a plasma (either rarefied as for ITER like Tokamaks or for inertial confinement like in NIF or bubble fusion). Accelerators on the other hand impart energy of several hundred keV or even to GeV levels to particles passing through two electrodes at a given potential difference. When such ions get a given level of energy their chance of interaction with the nucleus of target atoms changes and nuclear reactions can take place. Unfortunately,such systems can not produce net energy. Here is why:

When an accelerated nucleus hits the target it not only triggers a nuclear reaction (as for a D-D or D-T reaction) but also other processes of which ionization is key. The probability of atom ionization from a high energy incident charged nucleus is about 10**8 times greater than for a nuclear reaction. Therefore, for each nuclear reaction between say D and T atoms that produces about 20 MeV of energy, there will be at a minimum about 10**8 times 40eV of energy required for a total of about 40 GeV (the actual amount is greater). This is at a minimum about 200 times greater than the energy that comes out from D-T nuclear reactions due to which an accelerator based system can of-course produce nuclear reactions and neutrons of the D-D fusion type but never of the type required for net energy production due to which this approach is not taken for ITER, NIF or others.

For net energy generation from conventional "hot fusion" the process needs to be based on thermonuclear conditions and plasmas which offers the possibility to permit scaling to higher and higher levels (based on confinement, temperature and density). Accelerator based systems have been around for over 50y now and these can be used to produce and study a very large range of nuclear reactions (fission, fusion, etc.) and are very handy for laboratory-scale nuclear investigations. The most widely used table-top systems around the world (for explosives detection, gamma spectroscopy, etc.) produce up to 10**8 neutrons/s continuously for over 1,000h of operation ; indeed, we used one such accelerator based neutron generator for our sonofusion experiments. The pyrofusion

apparatus that was described in Nature recently produces about 100 neutrons/s on average over several seconds and is single-shot type. That is, the pyrocrystal has to be re-cooled and then reheated to produce about 100 neutrons/s for a few seconds of run-time. In any case, this is not thermonuclear in process and is not interesting for energy production. Unfortunately, this aspect was not appreciated by many press releases; however, PhysicsWorld caught on to this after conferring with several people.

Rusi