Joint Comprehensive Plan of Action Opportunity for HIF in Iran

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Cooperation in fusion energy research and high-energy accelerators has been a "bridge over troubled waters" for most of a century. Physics research has traditionally been an international endeavor, involving the earliest accelerator developments, and hitting a hiatus only during World War II. Fusion energy research using magnetic confinement was internationalized by the Geneva meeting in 1958. Iran is and has been a participant in fusion research, even during the troubles of the past couple decades. And, although "laser fusion" was public and acknowledged by the US in 1972, that year Iran hosted "The Future of Lasers" at Esfahan [1].

Unequivocal statements in the 2015 nuclear agreement, the Joint Comprehensive Plan of Action, known in Iran as the barjam, increase the opportunities for collaborative projects to develop fusion as an economic energy source. The clear opportunity for heavy ion fusion is to be forthright about the historic and ongoing conclusion that HIF is the most promising path to fusion energy—especially fusion energy that actually delivers on its promise to be the deep-clean and safe, affordable, abundant energy source that the world desperately needs.

A caveat for Iran about investing too much money or political capital in fusion cooperation is that the world's mainstream fusion energy programs are failing to the extent that no contribution from fusion is anticipated for another several decades, and much of the political classes show serious doubts that it ever will be an important energy source. In this regard, the HIF community shares culpability for having retreated from the vision of 1976. This has been a political failure not a technical one. HIF never was going to be simple or easy [2], but the laser-driven ICF community, viz. the military interests, strenuously opposed HIF [3], the entrenched tokamak community was impervious to the message that there was a better way, and the accelerator community felt no compunction to continue its advocacy until a secure home for HIF had been established [3].

Reflecting the condition of worldwide fusion energy research, the JCPOA specifies "facilitating contribution of Iran to … (ITER)" but continues with "and/or similar projects." JCPOA is silent on ICF, unsurprising given ICF's strong connections to the on-going, and arguably more dire, worldwide problem of the existence of nuclear weapons. This is good for HIF in Iran.

HIF has since its inception always been only about production of energy from fusion, in contrast to "laser-fusion" development being primarily for weapons research, funded almost entirely in the US for national security [4]. JCPOA also specifies cooperative accelerator projects, highlighting the fact that there is no security concern for the HIF driver. We argue there are no security concerns either for HIF's fusion aspects: pellets or potential use of fusion neutrons to breed fissile fuel. First, HIF's best performing, fast-ignited cylindrical pellets as simulated by experts such as Avorin, Meyerter-Vehn, and Basko [5] are *not* classified according to the US classification guide. Second, we expect the world to choose to solve the energy-environment problem by finding a way to handle sensitive EOS and similar information. Third, strong international oversight is obvious, and zero presence of any fission materials can be assured because their radiation signatures would stand out like a sore thumb in the low radiation environment of lithium-protected chambers.

References

[1] N. Bloembergen, *et al.*, *Phys. Today* **25**, 3, 23 (1972)
[2] J. Lawson, *NIMA* **A278** (1989) 22-4
[3] C. M. Stickley, *Phys. Today* **63**,10, 8 (2010)
[4] R.P. Drake, *Phys. Today* **63**, 6, 28 (2010)
[5] R. Ramis and J. Meyer-ter-Vehn, *Laser and Particle Beams* (2014), 32, 41–47.