**Implementing Agreement for Co-operation on Tokamak Programmes
2017–2022**

***Introduction***

**Background**

Fusion energy is an environmentally responsible technology that can make a major contribution to the reduction of CO2 emissions in the second half of the 21st century. Fusion technologies are inherently safe, with the fusion fuel abundant worldwide.

**Scope**

The Implementing Agreement on Co-operation on Tokamak Programmes, also known as the Technology Collaboration Programme on Tokamak Programmes (CTP TCP), supports the development of fusion energy by contributing to the ITER physics basis and DEMO design optimisation. The CTP TCP provides a forum for tokamak programmes of the ITER Members to work closely together in coordinating their tokamak research by carrying out scientific and technological exchanges, and holding workshops and meetings for the purpose of advancing the tokamak concept towards fusion energy and support ITER physics and technology needs.

The CTP TCP is one of the main agreements for the implementation of the International Tokamak Physics Activity (ITPA), which coordinates activities among the domestic programmes of the signatories to the ITER Agreement. The ITPA, which now operates under the auspices of the ITER organisation (ITER IO), will provide most of the programmatic guidance to the CTP TCP, with close input from the ITER IO on its needs to resolve the remaining key technical issues for the ITER design and, importantly, for preparation of its operating phases.

**Relevance**

Fusion research under the CTP TCP is well aligned with the IEA’s goals of energy security, economic growth, environmental protection and engagement worldwide. Fusion energy research under the CTP TCP is also highly relevant to the IEA Medium-Term Strategy for Energy Research and Technology, in particular, to help to accelerate the development and deployment of a broad range of energy technology options and to support continued research and development collaboration efforts and innovation for basic science and frontier or emerging technologies for long-term solutions.

***Planned activities 2017-2022***

The next critical step in demonstrating the scientific feasibility of fusion energy is to demonstrate burning plasmas in long pulses. As achieving this mission is a great challenge, and there are many scientific and technological issues to be resolved, this is the primary mission of the ITER IO and of tokamak research programmes worldwide.

The tokamak experiments operating or under construction around the world, together with the accompanying theory and modelling programmes, strive to resolve these issues. The Joint Experiments (JEX) programme jointly supported by ITER and the International Tokamak Physics Activity (ITPA) contributes substantially to enhancing the understanding of the complex fusion science and engineering issues. The consolidation of scientific exchanges among all tokamaks operating within the ITER Members’ research programmes enhance the planning of such experiments and efficient implementation of scientific exchanges.

The CTP TCP enhances close cooperation and coordination of tokamak research, including experiments, theory, advanced computing and scientific exchanges. These activities provide valuable insights on the complex and non-linear coupling among the different scientific issues, integration to achieve high-performance plasmas in steady-state conditions, and to extrapolate them to burning plasmas for the ITER experiment.

The ITPA topical group structure is effective in organising the joint research activities under the CTP TCP, namely: transport and confinement physics, divertor/sol physics, integrated operating scenarios, pedestal physics, MHD, and energetic particles and diagnostics. These groups discuss and propose plans for specific joint research tasks and review the results every year. The CTP TCP Executive Committee (ExCo) approves the plans and the reports of the activities implemented under the CTP TCP.

In addition, the CTP TCP maintains strong links with all the other fusion-related TCPs. This close cooperation helps to ensure complementarity between research programmes executed by the Contracting Parties. It enables the co-ordinated exchange of personnel and equipment, avoiding unnecessary duplication of effort.

Given advances in tokamak research during 2012-2017, a particular focus of the CTP TCP during 2017-2022 will be the ITER research priority areas, addressing the avoidance, control and mitigation of the key plasma instabilities, protection of the plasma facing components and access to good confinement plasma regimes in ITER. In particular, a specific test for one of the systems to be installed in ITER to mitigate the consequences of the abrupt termination of the plasma “Disruptions” will be installed on JET. This system will use the injection of a shatter pellet into the plasma and the effectiveness of this approach will be studied within the CTP TCP.

**Meetings and workshops**

The CTP TCP ExCo meets annually in December at the ITER Headquarters. These meetings are organised together with the ITPA Joint Experiments Workshop (JEX) in order to maximise the synergy between the two activities. International workshops on “Theory and Simulation of Disruptions” (one of the most critical areas for ITER operation) and on the coordination of tokamak programmes will be organised annually.

**Membership and outreach**

The CTP TCP ExCo will continue their efforts to extend the activities to other members and Partner countries and observers will be invited to attend Executive Committee meetings, in particular, regarding the participation of Russia and Australia. The aim is that Australia and Russia become Contracting Parties to the CTP TCP during the next term (2017-2022).

**Communications and dissemination**

The results obtained by joint research under the CTP TCP are discussed with the ITER IO through the ITPA. The results of research carried out under the CTP TCP will be reported widely at international conferences and workshops and in leading journals. The website will continue to be developed ([http://ctp.jet.efda.org/lt/)](http://ctp.jet.efda.org/lt/%29). The CTP TCP will continue to generate articles for inclusion in the IEA biennial publication *Technology Collaboration Programmes*. Now that the website is active, the CTP TCP plans to announce developments through the [*OPEN Bulletin*.](http://www.iea.org/openbulletin/)