

Thanks to...

To your trusty planners, organizers, caretakers:

- **Carol Ann Austin, Joanne Savino**
- **Jennifer Jones, Jeanne Jackson-DeVoe, Kate Harkness**

To your tour guides:

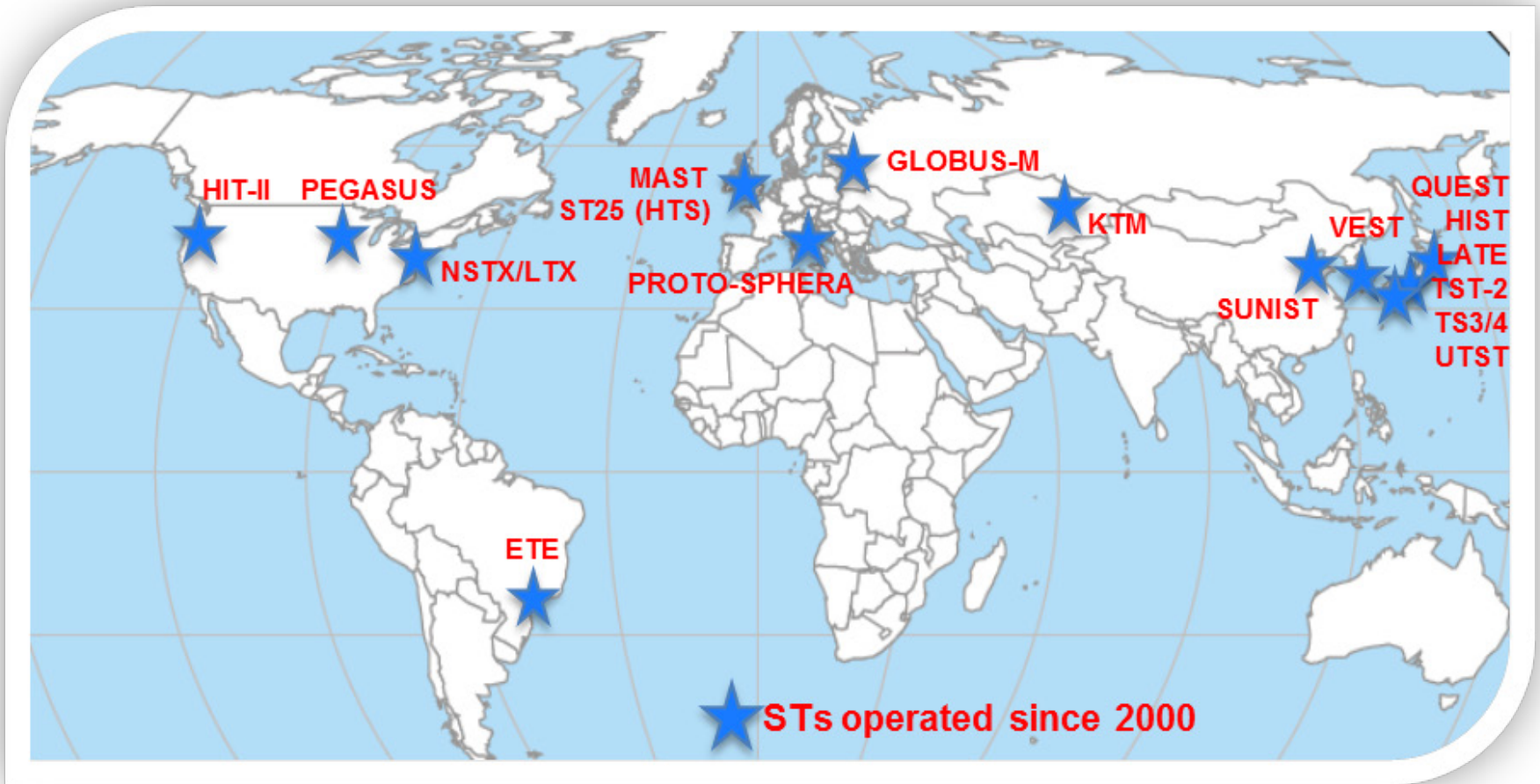
- **Stan Kaye, Mike Jaworski, Bob Kaita**

To our tour facility hosts:

- **Hantao Ji, Masaki Yamada, Sam Cohen, Dick Majeski**
- **David Gates, Brian Kraus**
- **Devon Battaglia, Stefan Gerhardt, Al Von Halle**

Thank you!

- For the great presentations and conversations
- For the strong international participation



Created new International Energy Agency (IEA) ST Implementing Agreement website <http://iea-st.pppl.gov>

M. Peng, S. Eckstrand, B. Lloyd, Y. Takase led efforts in mid 2000's to form IEA-ST IA



IEA Implementing Agreement for Co-operation on Spherical Tori

HOME

The purpose of this website is to share and archive information for the IEA Implementing Agreement for Co-operation on Spherical Tori.

IEA PAGES:

- [REPORTS AND MEETINGS](#)
- [FILE ARCHIVE](#)
- [IMPLEMENTING AGREEMENT](#)
- [ABOUT THE IEA](#)

GENERAL ST PAGES:

- [WORLD SPHERICAL TORI](#)
- [ST WORKSHOPS](#)
- [A3 FORESIGHT PROGRAM](#)

Overview:

The spherical torus (ST) machine has emerged as an innovative example of fusion confinement that could allow progress to be made in fusion energy development. Though ST devices have the capacity to operate at high temperatures (more than 60 million degrees centigrade), the magnets are potentially simpler than conventional tokamaks and may have lower construction and operating costs. Although the ST plasmas are similar to the standard aspect ratio tokamak plasmas in many ways, the range of physics parameters can lead to important new plasma behaviours such as increased stability. In addition, creating plasma in a spherical torus reduces transport because of the flow shear and geometric configuration.

Background:

There are currently three Contracting Parties (EU, Japan, USA) to the Implementing Agreement for Co-operation on Spherical Tori (ST IA). Created in 2007, the aims of the ST IA are to enhance the effectiveness and productivity of fusion energy science and technology in preparation for ITER by:

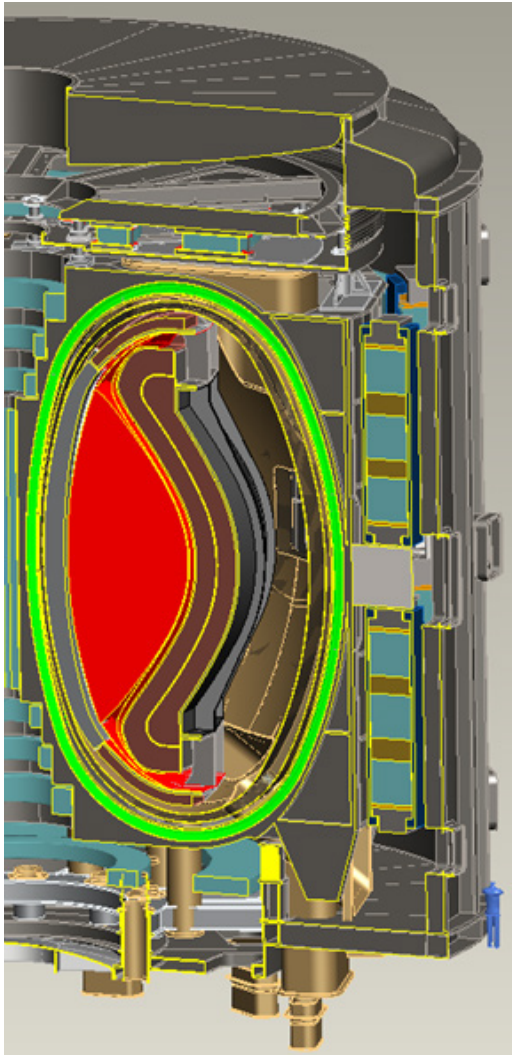
- Strengthening co-operation among spherical torus research programmes and facilities
- Contributing to and extending the scientific and technology database of toroidal confinement concepts to the ST physics regime
- Providing a scientific and technological basis for the successful development of fusion power using the spherical torus

Information from the IEA on the Energy Technology Initiative related to fusion and the ST-IA can be found [here](#).

Please visit the pages listed on the left-hand side of this webpage for additional information.

Recent/new collaboration on HTS ST FNSF concepts

$R=3\text{m}$, $A=2$, $B_T = 4\text{T}$, $I_p = 12\text{MA}$
 $P_{\text{fusion}} \sim 560\text{MW}$, $Q_{\text{eng}} \sim 1-1.5$



- Collaboration topics recently initiated
 - MHD stability – global, pedestal (PPPL, CCFE)
 - AE stability, energetic particles (PPPL, CCFE)
 - Turbulence and transport simulations (York)
 - Self-consistent transport and stability (SNU)
 - Cross check shielding, TBR calculations (CCFE)
 - Assess solid breeder to complement US DCLL?
- Future work (near-term)
 - Layout of NNBI (PPPL)
 - Need for TRANSP runs, fusion and CD calculations
 - Port geometry/apertures, 3D TBR
 - NNBI sustainment modelling (PPPL)
 - Start-up, Ramp-up modelling (U. Wash, PPPL)
 - 3D shielding and TBR studies (UW-Madison)

Possible topic for reviving ST IA – Annex II:
“Co-operation on the Physics and Technology of Future
Spherical Torus Devices”

Spherical Tori (ST) Implementing Agreement – Annex II

- Co-operation on the Physics and Technology of Future Spherical Torus Devices
- Purpose:
 - “The purpose of this Annex is to accelerate progress of research on the physics and technology of future ST devices through co-ordination of activities and exchange of technical information relating to the physics and technology challenges which are common to a range of future ST devices”

Spherical Tori (ST) Implementing Agreement – Annex II Activities

- a. Experiments and modelling to establish the physics basis of future devices. Review and validation of physics assumptions.
- b. Sharing of information on, and review of, the Mission and design point strategy of future devices.
- c. Exchange of technical information and co-operation on addressing key engineering design issues e.g. load assembly and first wall, TF magnetic design, PF system design, central column (solenoid-free, retractable solenoid), heating & current drive systems etc.
- d. Plasma exhaust and material interaction studies including advanced divertors and exhaust concepts e.g. super-X divertors, snow-flake divertors, liquid metal walls etc.
- e. Additional topics, as necessary, which arise during the course of these studies.
- f. Organization and participation in relevant expert meetings.

- Whether we (re-)initiate the IEA-ST IA Annex II or not...

Please let us know if/how you wish to participate in any of these next-step ST scoping studies

Possible venue for 19th International ST Workshop in 2017: Seoul National University (SNU)

- SNU Nuclear Engineering Dept. has new ST (VEST)
 - Studying non-solenoidal start-up, improved breakdown, ...
- ST workshop not previously held in S. Korea
 - Seoul obviously has plenty of interesting attractions
- Prof. Y.S. Hwang agreeable if nobody else volunteers



• **Any other volunteers? (let us know ASAP!)**

Thank you!

