The 19th International Spherical Torus Workshop (ISTW 2017)

September 18-22, 2017

Seoul National Univ., Seoul, KOREA

Program and Abstracts

Program at a Glance

	Mon. 18 Sept.	Tue. 19 Sept.		Wed. 20 Sept.		Thu. 21 Sept.		Fri. 22 Sept.	
8.30 – 8.50am		**Registration**							
8.50 – 9.00am		**Logistics/local info**							
9.00 – 10.15am		Overview	Hwang - Overview of Versatile Experiment Spherical Torus (VEST) toward Advanced Tokamak Study	Overview	Lloyd - MAST Upgrade – Progress & Plans	Overview	Majeski - Progress toward LTX-β	Overview	Hanada - Overview of recent progress on plasma current start-up and long-duration plasma maintenance in QUEST
		Oral	Lee - Study on solenoid-free start-up utilizing outer PF coils with the help of pre-ionization via direct XB mode conversion from low field side injection in VEST	Oral	Elmore - Secondary ELM filaments in MAST	Oral	Raman - Transient CHI Research on STs	Oral	Guttenfelder - Validating gyrokinetic predictions using NSTX-U plasmas
		Oral	Kim - Profile measurements of ion temperature and toroidal rotation velocity from optical emission spectroscopy in VEST	Oral	Waters - Plasma Response, Density Control, and Neutral Fueling: EMC3-EIRENE Analysis of Edge Plasmas at MAST	Oral	Bakharev - The main results of the 0.5 T Globus-M experiments	Oral	Y. Ono - Scaling Study of Reconnection Heating in Torus Plasma Merging Experiments
10.15 – 10.45 am		Coffee Break		Coffee Break		Coffee Break		Coffee Break	
10.45 – 12.00		Overview	Menard - Overview of NSTX Upgrade Initial Results and Modelling Highlights	Oral	Ku - Gyrokinetic heat-flux footprint in NSTX and NSTX-U plasmas	Overview	Bakharev - Status of the Globus-M2 project	Overview	Gryaznevich - First Results from ST40
		Oral	M. Ono - Facility and Diagnostic Commissioning for Initial Operation of the NSTX-U Facility	Oral	Reinke - Requirements, Designs and Plans for NSTX-U High Heat Flux Plasma Facing Components	Overview	Gao - Recent experimental progress on the SUNIST spherical tokamak	(11.20 – 12.00)	Discussion Session & Closing remarks
		Oral	Mueller - NSTX-U Plasma Commissioning and Scenario Development	Overview	Ejiri - Recent activities on TST-2	Oral	Zhong - Study of the tearing instability during the current ramp up stage in the SUNIST Spherical Tokamak		
12.00 – 1.30pm		LUNCH		LUNCH		LUNCH			
1.30pm – 3.05pm		Oral	Park - Non-axisymmetry at the center of NSTX – Lessons to optimize 3D tokamaks	Overview	Tanaka - Overdense plasma production by electron Bernstein wave in the LATE device	**VEST Visit & Tour**			
		Oral	Belova - Numerical simulations of stabilization of Global Alfven Eigenmodes (GAEs) in NSTX-U	Oral	Toit - Kinetic study of plasma current start-up under electron Bernstein wave power in spherical tokamaks				
		Oral	Menard - Next-Step Low-Aspect-Ratio Tokamaks Using High-Temperature Superconductors and Liquid Metal Plasma Facing Components	Oral	Kim - Status of the Lower Hybrid Fast Wave Research on VEST				
		Overview	Alladio - The PROTO-SPHERA experiment, an innovative confinement scheme for Fusion	Oral	Bertelli - The effects of the HHFW wave-field on the evolution of fast ion / beam ion populations in NSTX plasma				
3:05 – 3:40pm		Coffee Break		Coffee Break					
3:40 – 5:30pm		**Posters**		Overview	Bongard - Overview of the Pegasus Non-Solenoidal Startup Research Program				
				Overview	Inomoto - Merging Formation of High-Beta STs in UTST				
				Oral	Yang - Study on MHD Activity during Ohmic Plasma Operation in VEST				
				Oral	Pfefferlé - NSTX Vertical Displacement Event 3D nonlinear modelling with M3D-C1				
6:30 – 8:30pm	**Reception & Registration**			**IEA ST EXCOM**		**Banquet**			

Table of Contents

Committees

Program Committee

- Dr. Jon Menard - Princeton Plasma Physics Lab (USA) - Chair of Program Committee
- Dr. Franco Alladio - ENEA (Italy)
- Prof. Raymond Fonck - University of Wisconsin - Madison (USA)
- Prof. Zhe Gao - Tsinghua University (China)
- Dr. Mikail Gryaznevich - Tokamak Energy, LLC (UK)
- Dr. Vasily Gusev – Ioffe Institute (Russia)
- Prof. T. S. Hahm –Seoul National University (Korea)
- Prof. Kazuaki Hanada - Kyushu University (Japan)
- Prof. Yong-Seok Hwang - Seoul National University (Korea)
- Dr. Brian Lloyd - Culham Centre for Fusion Energy (UK)
- Dr. Gerson Ludwig - Instituto Nacional de Pesquisas Espaciais (Brazil)
- Dr. Masayuki Ono - Princeton Plasma Physics Lab (USA)
- Dr. Yatsushi Ono - University of Tokyo (Japan)
- Prof. Yuichi Takase - University of Tokyo (Japan)
- Prof. Howard Wilson - University of York (UK)

Local Organizing Committee

- Prof. Yong-Seok Hwang (Chair)
- Prof. T.S. Hahm
- Prof. Y.S. Na
- Prof. J.H. Han
- Prof. K.J. Chung

Secretariat of ISTW 2017 : Ms. Hyunjin Lee

Email: soultranscend@snu.ac.kr

Website: http://nuplex.snu.ac.kr/istw2017

General Information

Registration Desk

On-site registration desk is located in front of the entrance of the meeting room. Operating Date and Times are as following:

Monday, September 18th 18:30 – 20:30

Tuesday - Friday, September 19th-22nd 08:30 – 08:50

Oral Session

Oral session will be held at Mugunghwa Hall as following;

Overview: 30 + 5 minutes for presentation + Q&A

Oral: 15 + 5 minutes for presentation + Q&A

Poster Session and Student Poster Award

Poster session will be at Mugunghwa Hall on September 19th. Authors must stand by their posters on their designated time. Two chairs will walk through posters and evaluate student posters for ISTW Student Award.

Poster Size: 47inches×70inches

Coffee and Lunch

Morning and afternoon coffees are served outside of the meeting room. Lunch will be served in Crystal room (B1 floor) of the main building at free of charge.

Internet

Wireless network connection is provided by the venue. Please note that it can be slow due to overload.

General Information

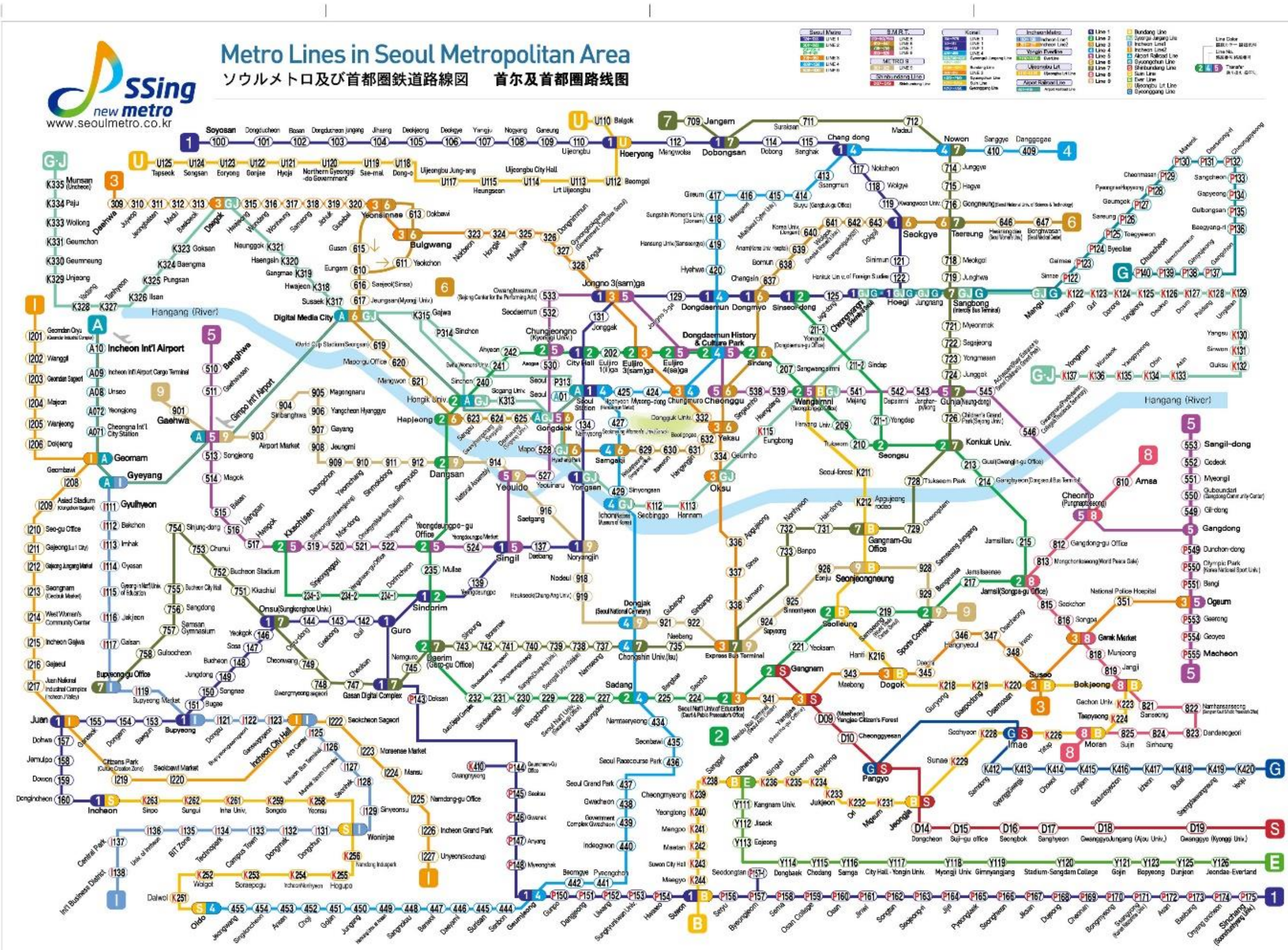
Tour information

- VEST Tour (from 1:30 to 2:50 p.m. on Thursday, September 21)
- VEST (Versatile Experiment Spherical Torus) has been operating as a low cost, educational device with the main parameters R=0.4 m, R/a>1.3, and B = 0.1 T on axis. The Ohmic operation of VEST has been successfully carried out, generating the plasma currents of up to 100 kA with the pulse duration of ~15 ms. The advanced fusion research topics have been studied such as the innovative start-up schemes, the wave heating and current drive, and various profile diagnostics.
- The Namsangol Hanok Village Tour (from 4:00 to 6:00 p.m. on Thursday, September 21)
- The Namsangol Hanok Village consists of 5 hanoks, Gugakdang(Traditional Theater), Traditional Garden and Seoul Millennium Time Capsule Square. It is place full of pleasure for those who seek traditional culture. NHV presents a new value to tradition and suggests a contemporary living culture.

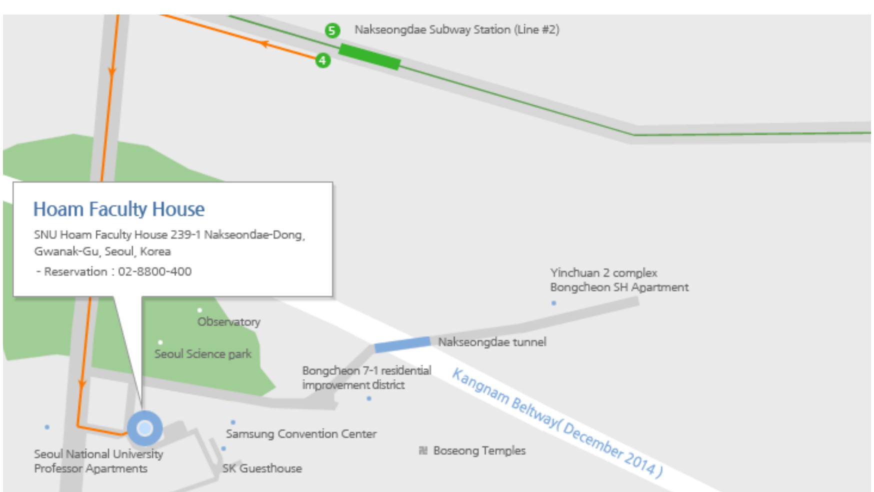
Banquet information

- The banquet will be held at "KOREA HOUSE" which is surrounded by traditional *Hanok* architecture and exudes an aura of the real calm and dignity. (from 6:30 to 8:30 p.m. on Thursday, September 21)
- The traditional performance arts of KOREA HOUSE was initially showcased in 1981 by the performance artist groups of the Korea Cultural Heritage Foundation, and has been presenting the beauty of Korean performance arts to the global audience.

Local Transportation



Public Transportation from Naksungdae Subway Station to Hoam : 1000 KRW (one-way)



Conference Venue

Hoam Faculty House:

Convention center and Main building.

Mugunghwa Hall (2nd F.)

Reception Location
- Garden Place -

Workshop Program

Monday, September 18

18:30 – 20:30 Registration and Reception, Garden place at Hoam

Tuesday, September 19

08:30 – 08:50 Registration
08:50 – 09:00 Logistics/ Local Information

Session 1 **Chair: J. Menard**

09:00 – 09:35 Overview of Versatile Experiment Spherical Torus (VEST) toward Advanced Tokamak Study, Y.S. Hwang (SNU, Korea)
09:35 – 09:55 Study on solenoid-free start-up utilizing outer PF coils with the help of pre-ionization via direct XB mode conversion from low field side injection in VEST, H.Y. Lee (SNU, Korea)
09:55 – 10:15 Profile measurements of ion temperature and toroidal rotation velocity from optical emission spectroscopy in VEST, Y.S. Kim (SNU, Korea)

10:15 – 10:45 Coffee Break

Session 2 **Chair: F. Alladio**

10:45 – 11:20 Overview of NSTX Upgrade Initial Results and Modelling Highlights, J. Menard (PPPL, USA)
11:20 – 11:40 Facility and Diagnostic Commissioning for Initial Operation of the NSTX-U Facility, M. Ono (PPPL, USA)
11:40 – 12:00 NSTX-U Plasma Commissioning and Scenario Development, D. Muller (PPPL, USA)

Workshop Program

Tuesday, September 19

12:00 – 13:30 Lunch

Session 3 **Chair: T. S. Hahm**

13:30 – 13:50 Non-axisymmetry at the center of NSTX – Lessons to optimize 3D tokamaks, J.K. Park (PPPL, USA)

13:50 – 14:10 Numerical simulations of stabilization of Global Alfven Eigenmodes (GAEs) in NSTX-U, E. Belova (PPPL, USA)

14:10 – 14:30 Next-Step Low-Aspect-Ratio Tokamaks Using High-Temperature Superconductors and Liquid Metal Plasma Facing Components, J. Menard (PPPL, USA)

14:30 – 15:05 The PROTO-SPHERA experiment, an innovative confinement scheme for Fusion, F. Alladio (ENEA, Italy)

15:05 – 15:30 Coffee Break

15:30 – 17:30 **Poster Session** **Chairs: A. Ejiri/M. Bongard**

Lists of Poster Presentations

3:40 – 5:30 pm, Tuesday 19 September

Poster	Author last name	Author first name	Author e-mail address	Author home institution name	Abstract title
P-1	Canal	Gustavo	gpaganin@pppl.gov	PPPL	Study of the impact of pre- and real-time deposition of lithium on plasma performance on NSTX
P-2	Canal	Gustavo	gpaganin@pppl.gov	PPPL	Resistive kink/peeling modes as the triggering mechanism of ELMs on NSTX
P-3	Cho	Y.W.	tshahm@snu.ac.kr	SNU	Study of Ion Thermal Internal Transport Barrier Formation in Reversed Shear Plasmas Based on Role of Mode Energy Transfer
P-4	Elserafy	H.	elserafy@triam.kyushu-u.ac.jp	Kyushu Univ.	Preparation of high field side injection of X-mode for EBW conversion experiment in QUEST
P-5	Hong	SeulChan	ysna@snu.ac.kr	SNU	Development of Real-Time Controllable Power Supply System for VEST
P-6	Jang	J.Y.	yhwang@snu.ac.kr	SNU	Development of optical probe for local emission profile and electron density measurements in VEST
P-7	Jo	JongGab	lsko603@snu.ac.kr	SNU	Coupling study of Lower Hybrid Fast Wave in VEST
P-8	Kim	Y.G.	ysna@snu.ac.kr	SNU	Development of Thomson scattering diagnostic system on VEST
P-9	Kim	D.Y.	yhwang@snu.ac.kr	SNU	Data Analysis of Thomson Scattering System at VEST
P-10	Kim	E.H.	ehkim@pppl.gov	PPPL	Full-wave simulation of high-harmonic fast waves in the scrape-off layer of NSTX
P-11	Kim	D.	dkim@pppl.gov	PPPL	ORBIT modelling of fast particle redistribution induced by sawtooth instability
P-12	Kim	S.C.	sungfe90@snu.ac.kr	SNU	Development of 0-D Tokamak Discharge Model in VEST
P-13	Lee	C.Y.	ysna@snu.ac.kr	SNU	Predictive Modelling of High Performance Operation with Neutral Beam Injection in VEST
P-14	Lopez	N.A.	nalopez@princeton.edu	Princeton Univ.	On the feasibility of EC/EBW startup on NSTX-U
P-15	McNamara	Steven	sam611@ic.ac.uk	Imperial College London	The spherical tokamak route to fusion power and associated challenges
P-16	Podesta	Mario	mpodesta@pppl.gov	PPPL	Destabilization of counter-propagating Alfvénic instabilities by off-axis, co-current neutral beam injection
P-17	Ribeiro	Celso	celso_ribeiro@hotmail.com	Consultant in Plasma Physics	The Versatile High Field Ultra-Low Aspect Ratio Tokamak Experiment
P-18	Sugawara	T.	sugawara@ts.k.u-tokyo.ac.jp	Univ. Tokyo	Experimental Evaluation of NBI Heating for ST Formed by Merging Start-up Method in UTST
P-19	Tsujii	N.	tsujii@k.u-tokyo.ac.jp	Univ. Tokyo	Numerical modeling of lower-hybrid current drive with outboard-launch and top-launch antennas on TST-2
P-20	Ushiki	T.	ushiki@ts.t.u-tokyo.ac.jp	Univ. Tokyo	Plasma shape reconstruction of merging spherical tokamak
P-21	Choi	G.J	tshahm@snu.ac.kr	SNU	3D Field Induced Zonal Flow Decay in Axisymmetric Fusion Plasmas
P-22	Wang	J.	yhwang@snu.ac.kr	SNU	Design and Installation of a Multi-chord Interferometer System on VEST
P-23	Jung	Bongki	bkjung@kaeri.re.kr	KAERI	Design features and Commissioning of the a pulsed arc ion source for the VEST NBI system

Workshop Program

Wednesday, September 20

08:30 – 08:50 Registration
08:50 – 09:00 Logistics/ Local Information

Session 4 **Chair: M. Inomoto**
09:00 – 09:35 MAST Upgrade – Progress & Plans, B. Lloyd (UKAEA, UK)
09:35 – 09:55 Secondary ELM filaments in MAST, S. Elmore (UKAEA, UK)
09:55 – 10:15 Plasma Response, Density Control, and Neutral Fueling: EMC3-EIRENE Analysis of Edge Plasmas at MAST, I. Waters (Univ. of Wisconsin-Madison, USA)

10:15 – 10:45 Coffee Break

Session 5 **Chair: N. N. Bakharev**
10:45 – 11:05 Gyrokinetic heat-flux footprint in NSTX and NSTX-U plasmas, S. Ku (PPPL, USA)
11:05 – 11:25 Requirements, Designs and Plans for NSTX-U High Heat Flux Plasma Facing Components , M. L. Reinke (ORNL, USA)
11:25 – 12:00 Recent activities on TST-2 , A. Ejiri (Univ. Tokyo, Japan)

Workshop Program

Wednesday, September 20

12:00 – 13:30 Lunch

Session 6 **Chair: M. Ono**

13:30 – 14:05 Overdense plasma production by electron Bernstein wave in the LATE device, H. Tanaka (Kyoto Univ., Japan)

14:05 – 14:25 Kinetic study of plasma current start-up under electron Bernstein wave power in spherical tokamaks, E.J. du Toit (York Univ., UK)

14:25 – 14:45 Status of the Lower Hybrid Fast Wave Research on VEST, S. H. Kim (KAERI, Korea)

14:45 – 15:05 The effects of the HHFW wave-field on the evolution of fast ion / beam ion populations in NSTX plasma, N. Bertelli (PPPL, USA)

15:05 – 15:40 Coffee Break

Session 7 **Chair: : B. Lloyd**

15:40 – 16:15 Overview of the Pegasus Non-Solenoidal Startup Research Program , M. Bongard (Univ. of Wisconsin-Madison, USA)

16:15 – 16:50 Merging Formation of High-Beta STs in UTST, M. Inomoto (Tokyo Univ., Japan)

16:50 – 17:10 Study on MHD Activity during Ohmic Plasma Operation in VEST, J. H. Yang (SNU, Korea)

17:10 – 17:30 NSTX Vertical Displacement Event 3D nonlinear modelling with M3D-C1, D. Pfefferlé (PPPL, USA)

18:30 – 20:00 IEA ST EXCOM

Workshop Program

Thursday, September 21

08:30 – 08:50 Registration
08:50 – 09:00 Logistics/ Local Information

Session 8 **Chair: Z. Gao**
09:00 – 09:35 Progress toward LTX-β, R. Majeski (PPPL, USA)
09:35 – 09:55 Transient CHI Research on STs, R. Raman (PPPL, USA)
09:55 – 10:15 The main results of the 0.5 T Globus-M experiments, N. N. Bakharev (Ioffe institute, RF)

10:15 – 10:45 Coffee Break

Session 9 **Chair: H. Tanaka**
10:45 – 11:20 Status of the Globus-M2 project, N. N. Bakharev (Ioffe institute, RF)
11:20 – 11:55 Recent experimental progress on the SUNIST spherical tokamak , Z. Gao (Tsinghua Univ., China)
11:55 – 12:15 Study of the tearing instability during the current ramp up stage in the SUNIST Spherical Tokamak, H. Zhong (Tsinghua Univ., China)

12:05 – 13:35 Lunch

13:35 – 18:30 VEST Visit & Tour

18:30 – 20:30 Banquet

Workshop Program

Friday, September 22

08:30 – 08:50 Registration
08:50 – 09:00 Logistics/ Local Information

Session 10 **Chair: M. Gryaznevich**
09:00 – 09:35 Overview of recent progress on plasma current start-up and long-duration plasma maintenance in QUEST, K. Hanada (Kyushu Univ., Japan)
09:35 – 09:55 Validating gyrokinetic predictions using NSTX-U plasmas , W. Guttenfelder (PPPL, USA)
09:55 – 10:15 Scaling Study of Reconnection Heating in Torus Plasma Merging Experiments , Y. Ono (Tokyo Univ., Japan)

10:15 – 10:45 Coffee Break

Session 11 **Chair: Y. S. Hwang**
10:45 – 11:20 First Results from ST40 , M. Gryaznevich (Tokamak Energy, UK)
11:20 – 12:00 Discussion Session & Closing Remarks