

§8. Directory on Recent Information about Operational Experiences on Large Superconducting and Cryogenic System in Fusion and Particle Accelerator

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PURPOSE:

The research is intended to collect and evaluate the newest operational technology and safety management methodology in the relevant field. This enables us to develop a world common technical standard and also to demonstrate its importance to the public.

PROCEDURE and PROGRESS IN FY 2013:

Since FY 2011, the work has been continued to collect the past 20 year's research papers published at several international conferences such as ICEC, ACE and some of other proceedings. The collected papers were firstly classified according to institution / device, secondly written in PC tables about device specification and list of paper title by Microsoft Excel. The tables contribute to facilitate later addition / revision. Thirdly, convert them into a Filemaker-PRO table in order to

facilitate the key word query search. Since the data base includes similar information on particle accelerator / collider, the present two expertise in accelerator were asked to join the research and to supervise from FY 2012.

The number of collected papers during FY 2013 counted up 100 and accumulated about 900 on cryogenic system and 130 on magnets (since 2006) in total. Also their facility tables were written as addition to the existing tables. The numbers of the device / institution are counted 91 and 150 respectively. The revised Filemaker-PRO table was inquired by several key words accordingly; stored energy: MJ, colliding energy: eV and 4K He refrigeration capacity: kW. The number of event are 11, 37 and 42 and they are classified into three categories i.e. fusion, accelerator and miscellaneous. This indicates that 2/3 out of total 42 refrigerators contribute to accelerators. Filemaker-PRO table also provides each information about device name, device / component specification, operation history, institution and published papers so that a comparative survey can be made among resulted query events. Table 1 shows a portion of resulted information about fusion device.

A complete information will be presented in a coming transaction „TEION KOUGAKU „, which is in under preparation state. (NIFS11KVXP007)

Table 1 Magnetic-confinement Fusion using Superconducting and Cryogenic System

Card No	facility type /name of device /institute /country /mission of experiment /operation status	reference
1	heliotron/LHD/NIFS/ Japan/. 13year's operation since the first plasma at march 1998.	4)Hamaguchi S et.al. ACE vol.81 2008
2	TOKAMAK/JT60-SA/JAEA/Japan/. Japan-Europe ITER satellite tokamak program. procurement of sc conductor from 2007, completion of whole system 2014. Building, power source, NBI are reused / upgraded from resistive tokamak JT60.	3) Michel F et al. ICEC 22 2008 643-648
4	TOKAMAK/TRIAM-1M/Kyusyu U, /Japan/. Started 1986 and operated more than 10 years. Plasma disruption does not cause quench in the superconducting toroidal magnets. TRIAM-1M has successfully demonstrated more than 2-hour steady-state discharge. (as of 1996)	1) Itoh S et al. NIFS Toki Symp. 1996
5	TOKAMAK/Demo-Coils for ITER/JAEA, Naka/ Japan	8) Hamada K et al. ACE 47 2001 407
45	TOKAMAK/TORUS SUPRA/Euratom-CEA/France/. 23years since 1988	3)Minott F, Gravit B et.al. ICEC17 1998.
46	TOKAMAK/ITER/ITER organisation/France/. Procurement agreements for Superconducting cables of TF, PF, CS magnets and VV are signed in 2008. Completion(2017), first plasma(2018) are expected as of Nov. 2008.	5) Mitchell N et al. IEEE Trans. ASC 2008 435-440.
53	Stellarator/Wendelstein 7-X/ Max-Planck-Inst. für Plasmaphysik/ Germany/. underconstruction. 2008 Plant Test, 2013 First Plasma scheduled (as of 8-2010)	3) A Kuendig, C P Dhard et.al. ICEC22 2008 653-656
75	TOKAMAK/T-15/,KIAE, Moscow/Russia/. First plasma at 1989. Has Nb3Sn CICC 24 superconducting toroidal field magnets and physics experiments being continued. (as of 1996)	5) Duzhev V E et al. ACE41 1996 pp745-750
80	TOKAMAK/HT-7U-EAST/CASIPP/China/, design for HT-7U was switched to that for EAST at 2003. Since the first commissioning in Feb. 2005, EAST experiment were made 6 times (as of 2010).	5) Ming Zhuang et al. ICEC 23 2010 abstract #21M-PS-2-13
86	TOKAMAK/ KSTAR/Korea/. First plasma at July 2008.	4) Chang, H-S et al. ICEC22 2008 pp675-680.
89	TOKAMAK/SST-1/IPR, Gandhinagar/ India/. Steady state Tokamak. It's 1.35kW eq. @4.5K was accepted 2004. Plasma Operation is expected to begin by 2011	6) Tank J et al. ICEC 23 2010 abstract no. 20M-OR-1-05