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Overview of CRAFT project progress

Jiangang Li[1,2], Penguin Fu for CRAFT team

Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Sciences, Hefei, Anhui 230031, China

[2]Institute of Energy, Hefei Comprehensive National Science Center, Hefei, Anhui 230026, China

Email: j_li@ipp.ac.cn

Comprehensive Research fAcility for Fusion Technology (CRAFT) is a national big science project to develop key technologies and systems for Chinese Fusion Engineering Testing Reactor (CFETR). There are 20 subsystems within the project which cover the key technology and prototype system for CFETR [1-2]. The CRAFT project aims to establish the method and standard for manufacture and test the key materials, components and key system for CFETR.

The construction of CRAFT started on Sept. 20, 2019, and significant progress has been made during the past 5 years. CRAFT used not only the technologies from ITER, but also those which need to be developed in future with significant challenges and efforts. Several new materials aimed at future reactor, which have better performance than those used in ITER, such as Nb_3Sn [3], N50, ODS-Cu, ODS-Steel, were developed. Most of testing facilities have been finished which include superconducting material testing facility, TF testing facility, CS testing facility, plasma wall interaction facility (shown as Fig.1), blanket testing facility, high heat load testing facility (20MW/m^2), vacuum chamber testing facility. Extensive experimental testing has been done during the past few years.

Fig.1 Superconducting Plasma Wall interaction testing facility. $B_T = 3$ T, 20MW/m^2, plasma flux 1X10^{24}/s m^2 operates for over 24 hours.

Most of key prototype subsystems, such as ICRF system (3MW, 40-90MHz, CW), LHCD (4MW, 4.6GHz, CW), ECRH (2MW, 170GHz, CW), 1/8 vacuum chamber, CS model coil, CW plasma control system, water cooled blanket system, divertor system and its RH system have been finished. Different kinds of testing for these systems have been done. Fig.2 shows the proto-type ICRF system which includes generator, matching, transmission line, 3DB coupler, load and antenna.

Fig.2 ICRF system. 3MW, 40-90MHz, CW. All components have been tested up to full power.

Several key components and subsystems which are beyond ITER technology, such as TF coil (14.5T, 2.5GJ), CS HTc coil(20T), Co2 cooled supercritical blanket system with LiPb lead and superconducting magnet testing facility, blanket RH system, superconducting conductor testing facility(15T) are close to the end of construction. The full performance testing for each of the systems will be done at the end of this year. All the progress of the CRAFT project will be made in this talk.

References:

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