

Cooperation Proposal

- Collaboration between CNNC/SWIP and CEA/ IRFM

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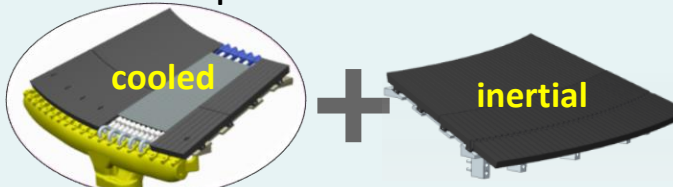
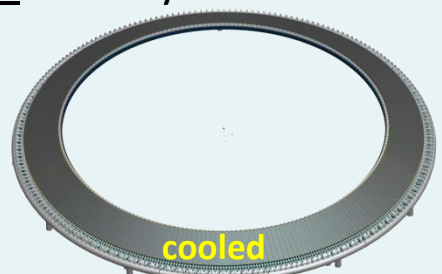


Collaboration plan

- ❑ HL-2A and WEST experimental proposals for 2019 has been discussed and Joint experiments will be carried out according to the proposals on HL-2A and WEST.
- ❑ Collaboration research on high heat flux test of Plasma Facing Components, WEST divertor coil power supply and ITER-like Langmuir Probes will be moved on according to the schedule in 2019.
- ❑ Modeling
 - ✓ The modeling collaborations which is ongoing at present will be put forward continually.
 - ✓ Code development and simulation for HL-2M, WEST, even for ITER, will be done more precisely to make the operation more feasible.
- ❑ Divertor research
 - ✓ Modeling of divertor physics and performed experimental validation in HL-2M and WEST tokamak
 - ✓ Joint development of Advanced Divertor
- ❑ Joint activities on ICRH for WEST experimental operation and next step tokamaks, and IR surveillance.



A staged approach for WEST exploitation

	Phase 1 (2016 - 2018)	Phase 2 (2019 - early 2020's)
PFC	Mix of actively cooled + inertial start up divertor elements 	<u>Full</u> actively cooled divertor 
Pulse length	~ 5-10 s > ITER like PFU time constant	Up to 1000 s
Main focus for PFC testing	Power handling	High particle fluence / long pulse operation

Phase 1

- ITER like PFU prototypes testing @10 MW/m² / low fluence
- PFU misalignment
- Operation with damaged PFU



Urgent design issues for ITER

Phase 2

- Large scale ITER like PFU testing @ 10-20 MW/m² / high fluence
- Long pulse H mode with metallic walls
- Test of innovative PFCs



Divertor operation for ITER / Innovative PFC testing (DEMO)



Human Resource Contributions

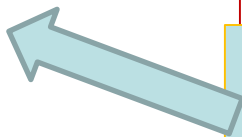
Position n° 1: Mechanical Engineer (one person for 6 months)

Relevant period:

Mid-June 2019 to mid-December 2019

Title :

Surface characterization of PFUs by chromatic confocal microscopy.



**Dr. Wang
JianBao**

Oct . 2019 -Jan. 2020

Period: 4 months

Position n° 2: Mechanical Engineer (two persons for 6 months each)

Relevant period:

Mid-June 2019 to mid-December 2019

Title :

Reception tests for PFU series



Dr. Chen Zhe

Plan: Oct.2019-

Period: tbd

Position n° 3: Mechanical Engineer (two persons for 6 months each)

Relevant period:

Mid-September 2019 to mid-February 2020

Title :

Preparation and Installation of PFU sectors for WEST divertor

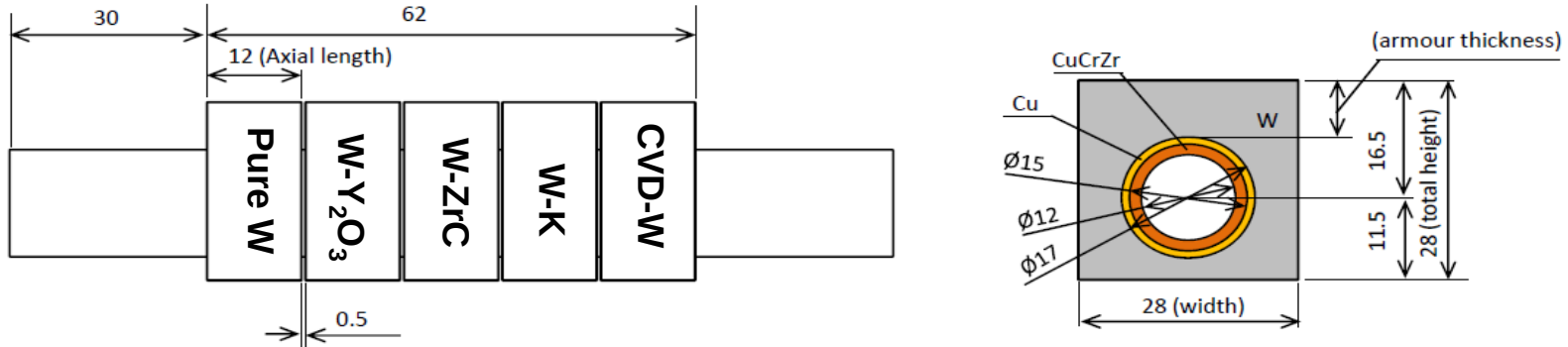


**Dr. Huang
YunCong**

Might be start: 2020

New Tungsten (W) Materials Test

(1) Small-scale mock-ups manufacturing and testing (by 2019. Aug.)



(2) Prototypes manufacturing (finished by 2019. Nov.)



(3) PWI of new W materials(Start from 2020-)

Co-study on PWI issues of new grades W materials based on the
WEST scenario



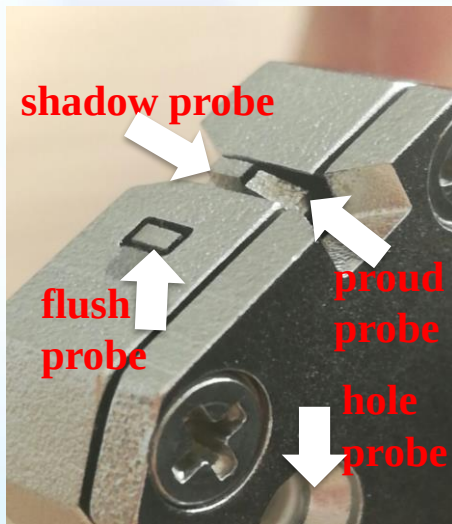
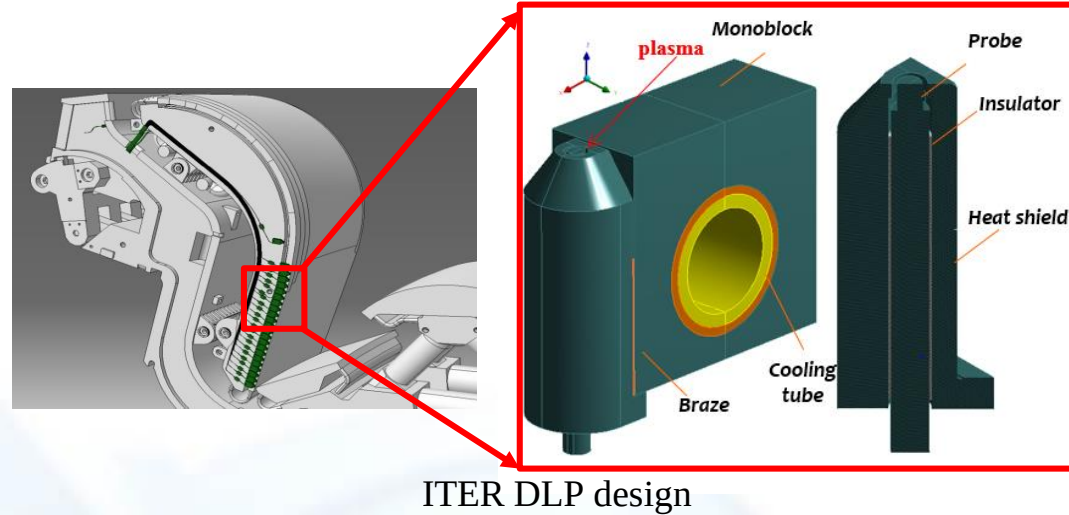
ITER-like Langmuir Probes TEST

- Test ITER-like Langmuir probe work conditions

Mr. Zhao Wei (Might be Aug. 2020)

- Test power supply

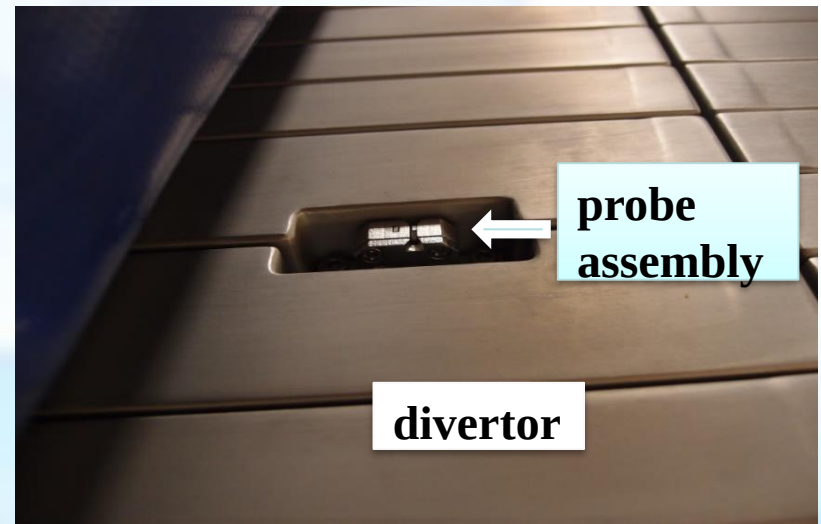
Ms. Wang Yali (Might be Jul. 2020)



Probe assembly integrated on mousetrap device



To simulate ITER probe work conditions



Simulate ITER DLP work conditions in WEST



IRFM, ASIPP and SWIP have agreed to establish a joint team to operate existing ICRH systems with the aim to master long pulse ICRH operation, and to develop an innovative concept of ICRH antenna for future fusion devices.

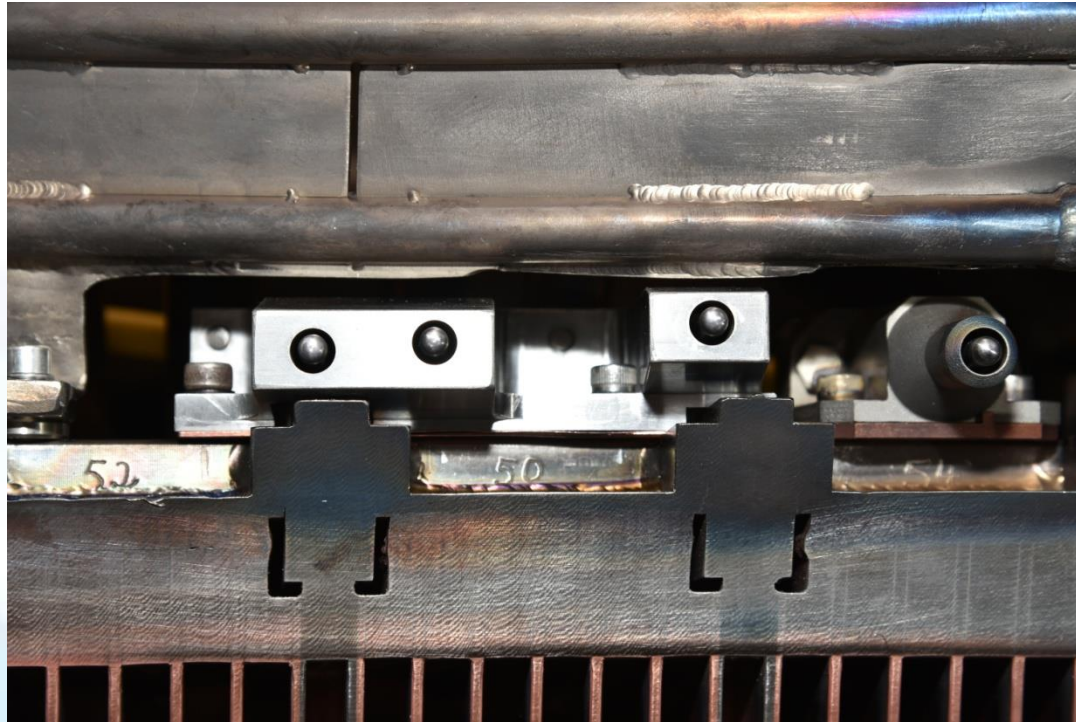


The Project includes two Phases:

- ☐ Phase I is the object of the present SPA, lasting 2 years from 2019.
- ☐ Phase II is an object of a future SPA or amendment. The Phase II, depending on the success of Phase I, consists in implementing and testing a new concept antenna prototype in WEST. Experiments in WEST will be in compliance with the rules of WEST exploitations defined by the WEST Governing Board.



Probes for LHCD system in WEST



- ❑ The probes of the DCEDRE2 diagnostic is now installed in WEST, dedicating to LHCD physics.



Experimental proposal on WEST

- Experimental proposal mainly focused on:

Competency	Offered participation in experiments and tasks		
	Experiment / Task1	Experiment / Task 2	Experiment / Task 3
Plant System	"HIGH CONFINEMENT" scenario development	Ohmic confinement characterization	L-H power threshold studies at large A
Plasma Wall Interaction	High power test of ITER plasma-facing components and their shaping	High power test of ITER plasma-facing components, exposure of pre-damaged PFC	Long pulse experiments on W coatings using the actively cooled upper divertor
Plasma Heating & Current Drive	LHCD coupling studies in L and H mode	LHCD efficiency at high density	LHCD modeling
Confinement and/or MHD	ELM mitigation	ELM triggering	Confinement characterization of type I ELMy H mode



Thank you for your attention!

