9.1 Assembly of the US-Japan JP-30 and JP-31 HFIR Target Irradiation Experiments —
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OBJECTIVE

This work is being carried out under the collaboration on fusion materials between the U.S. DOE and the Japan Atomic Energy Agency (JAEA). The JP-30 and JP-31 target irradiation capsules are parts of the Phase-VI experimental program with the goal to verify the irradiation response of alloy F82H base metal, its joints and welds in the mid fluence region, i.e., the target dose of 20 dpa at the peak, including identification of the effects of post-weld heat treatments (PWHT).

SUMMARY

Assembly of the JP-30 and JP-31 capsules was completed in November, 2011 and installed in HFIR. Irradiation began with cycle 439, starting November 21, 2011. A detailed specimen loading list for the capsules is provided in this report.

PROGRESS AND STATUS

Introduction

Screening irradiation experiments of several types of joint and weld materials of the reduced-activation ferritic/martensitic (RAFM) steels have been implemented by the past irradiation campaigns such as HFIR MFE-RB-11J, -12J and -15J within the framework of the U.S. DOE-JAEA collaboration on fusion materials. With verifying feasibility of these materials, the new target irradiation experiments (JP-30 and JP-31) are being carried out. The goals of the experiment include investigation of the irradiation stability in the middle fluence region (~20 dpa), evaluation of the impact of PWHT on mechanical properties, and development of engineering data on the fusion candidate alloy F82H and its variants. It is planned to irradiate these capsules for 11 cycles, assuming a dpa rate of 1.9 dpa/cycle, which was calculated with the recent data from all the Greenwood reports for experiments in the target region. This report provides a description of the final design and a detailed list of specimens loaded into the JP-30 and JP-31 capsules.

Description of JP-30 and JP-31

The design of the JP-30 and JP-31 capsules is very similar to that of JP-28 and JP-29 [1]. The main differences between these two sets are irradiation temperature and the type and number of fracture toughness specimens. The JP-30 and JP-31 capsules are designed for higher temperature irradiation (~650 °C for JP-30 and JP-31 vs. ~500 °C for JP-28 and JP-29), as well as irradiation at 300 and 400 °C (no change). All deformation fracture mini-beam (DFMB) specimens and some of multi-3 pre-cracked Charpy V-notch (PCCVN) specimens are replaced by multi-2 PCCVN specimens and disk compact tension (DCT) specimens, respectively. The detailed capsule designs with thermal analysis were described elsewhere [2].

Specimen Loading

The materials used in this experiment are summarized in Table 1. The key materials tested are variations of joints: a hot isostatic pressed (HIP) joint, TIG and electron beam (EB) weld joints, as well as their base metals. Some variations of RAFM steels: heat treatment variations of the F82H IEA heat and new ORNL 9Cr RAFM steels are also irradiated to accumulate the baseline data. In

addition, some variations of high-temperature tolerant oxide dispersion strengthening (ODS) ferritic/martensitic steels are tested by high-temperature irradiation (~650 °C).

The JP-30 and JP-31 capsules include 14 specimen holders for each designed to accommodate 6 types of specimens. The specimen types are (1) a sheet tensile specimen (SS-J3), (2) three types of PCCVN specimens (i.e., M2-, M3- and M5-PCCVN), (3) DCT specimens, (4) transmission electron microscopy (TEM) discs, (5) atom probe specimens (APFIM), and (6) miniature multi-purpose coupons (MMPC). Overall layouts of the JP-30 and JP-31 experiments are shown in Tables 2 and 3, respectively.

The location of each of the specimens in JP-30 and JP-31 is reported in Tables 4 and 5, respectively, which contain a box for each of the 14 specimen holder for each. Because coatings applied to some of the TEM discs required the discs to be loaded in a prescribed manner, the boxes for the TEM specimen holder (position 14) has a column labeled “Engr. Face” to indicate which way the engraved face of the specimen was loaded (if applicable). The multi-type PCCVN specimens (in positions 5, 10, 11, 12, and 13 for JP-30, and 4, 6, 8 and 9 for JP-31) were all loaded with the notches facing towards the center of the holders.

Table 1. Materials list for JP-30 and JP-31 experiments.

ID	Alloy Code	Description
F82H IEA	0	8Cr-2W RAF/Ms, F82H IEA heat (F82H-mod.)
F82H-IEA TIG WM	1	TIG weld metal of F82H joint
F82H-IEA TIG WJ	2	TIG weld joint of F82H joint
F82H-IEA TIG FG HAZ	21	Fine grained HAZ from TIG weld joint, heated above A_{C1} transformation temperature
F82H-IEA TIG OT HAZ	22	Over tempered HAZ from TIG weld joint, heated below A_{C1} transformation temperature
F82H-IEA EB WJ	25	Weld joint of F82H Electron Beam weld joint
F82H-IEA EB OT HAZ	26	Over tempered HAZ from EB weld joint, heated below A_{C1} transformation temperature
F82H-IEA EB WM	27 (or E)	Weld metal of F82H Electron Beam weld joint
F82H HIP	BA	HIP joint of F82H processed at 1100 °C followed by heat treatment at 960 °C and 750 °C
F82H-IEA EB BM (Std-PWHT)	XS	Base metal of F82H Electron Beam weld joint
F82H-IEA TIG BM (Std-PWHT)	XT	Base metal of F82H TIG weld joint
F82H-IEA EB BM PWHT1 (720C,1h/FCx3)	XW	Base metal of F82H Electron Beam weld joint with PWHT(720 °C,1h/FCx3)
F82H-IEA EB WM PWHT1 (720C,1h/FCx3)	XX	Weld metal of F82H Electron Beam weld joint with PWHT(720 °C,1h/FCx3)
F82H-IEA EB BM PWHT2 (680C,7h/FCx1)	XY	Base metal of F82H Electron Beam weld joint with PWHT(680 °C,7h/FCx1)
IEA CW20	C2	20% cold worked F82H IEA
IEA CW45	C5	45% cold worked F82H IEA
IEA CW80	C8	80% cold worked F82H IEA
F82H-mod3	H	F82H with 0.1% of Tantalum
US NFA1	YA	ORNL ODS steel (14YWT-SM12a-PR)
US NFA2	YB	ORNL ODS steel (14YWT-SM12c-PR)
US NFA3	YC	ORNL ODS steel (14YWT-SM12d-PR)
US NFA4	YD	ORNL ODS steel (14YWT-SM12d-CR)
U14YWT-HIP-D	HD	UCSB ODS steel
U14YWT-D1	Y	UCSB ODS steel
U14YWT-D2	G	UCSB ODS steel
NF616TMT	NF	Commercial ferritic boiler steel with TMT
US FM 1539T5	YJ	ORNL modified ferritic steel
US FM 1538T5	YK	ORNL modified ferritic steel
US FM 1537T5	YM	ORNL modified ferritic steel
US Modified NF616	YN	US Modified NF616
MA957Fr	ZQ	Commercial ODS steel (Inco MA957)
MA957US	ZS	Commercial ODS steel
MA956	MB	Commercial ODS steel
T91	TA	Commercial ferritic boiler steel
HP9Cr2WC	HPA	High-purity Fe-9Cr-2W-0.1C model alloy
KU15ODS	CB	ODS steel (Fe-15Cr-2W-0.2Ti-0.35Y_2O_3)
W/KU15ODS	(No ID)	KU15ODS alloy with a plasma splayed W layer

Table 2. Layout of the JP-30 experiment.

Position Number	Specimen Type	Design Temp. (°C)	Distance above HMP* (in)	
1	SS-J3, APFIM, MMPC	400	U	9.076
			D	8.440
2	DCT	650	1	7.815
			2	7.677
			3	7.539
			4	7.401
			5	7.263
			6	7.125
			7	6.987
			8	6.849
			9	6.711
3	SS-J3, APFIM, MMPC	300	U	6.085
			D	5.449
4	DCT	300	1	4.989
			2	4.851
			3	4.713
			4	4.575
			5	4.437
			6	4.299
			7	4.161
			8	4.023
			9	3.885
5	M3-PCCVN	300	U	3.387
			M	3.030
			D	2.673
6	DCT	400	1	2.051
			2	1.913
			3	1.775
			4	1.637
			5	1.499
			6	1.361
			7	1.223
			8	1.085
			9	0.947
7	SS-J3, APFIM, MMPC	400	U	0.487
			D	-0.149
8	DCT	400	1	-0.609
			2	-0.747
			3	-0.885
			4	-1.023
			5	-1.161
			6	-1.299
			7	-1.437
			8	-1.575
			9	-1.713
9	SS-J3, APFIM, MMPC	650	U	-2.296
			D	-2.932
10	M2-PCCVN	300	U	-3.602
			M	-3.956
			D	-4.310
11	M3-PCCVN	300	U	-4.872
			M	-5.229
			D	-5.585
12	M3-PCCVN	300	U	-6.322
			M	-6.679
			D	-7.035
13	M3-PCCVN	300	U	-7.772
			M	-8.129
			D	-8.485
14	TEM	300	-	-9.130

*HMP – Horizontal mid-plane of the HFIR

Table 3. Layout of the JP-31 experiment.

Position Number	Specimen Type	Design Temp. (°C)	Distance above HMP* (in)	
1	TEM	400	-	9.381
2	SS-J3, APFIM, MMPC	400	U	8.775
			D	8.139
3	SS-J3, APFIM, MMPC	650	U	7.357
			D	6.721
4	M2-PCCVN	300	U	6.063
			M	5.709
			D	5.355
5	DCT	300	1	5.019
			2	4.881
			3	4.743
			4	4.605
			5	4.467
			6	4.329
			7	4.191
			8	4.053
			9	3.915
6	M3-PCCVN	300	U	3.416
			M	3.060
			D	2.703
7	SS-J3, APFIM, MMPC	300	U	2.005
			D	1.369
8	M5-PCCVN	400	U	0.549
			UM	0.193
			M	-0.163
			MD	-0.519
			D	-0.875
9	M5-PCCVN	650	U	-1.733
			UM	-2.089
			M	-2.445
			MD	-2.801
			D	-3.157
10	SS-J3, APFIM, MMPC	300	U	-3.977
			D	-4.613
11	DCT	300	1	-5.116
			2	-5.254
			3	-5.392
			4	-5.530
			5	-5.668
			6	-5.806
			7	-5.944
			8	-6.082
			9	-6.220
12	SS-J3, APFIM, MMPC	300	U	-6.722
			D	-7.358
13	SS-J3, APFIM, MMPC	300	U	-8.017
			D	-8.653
14	TEM	650	-	-9.382

*HMP – Horizontal mid-plane of the HFIR

Table 4. JP-30 specimen and dosimetry loading list.

Pos. 1 JP-30	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **XXG1**	1. **0G5**	1. **0001**
	1b. outer **2G1**		
	2a. inner **XXG2**	2. **2G5**	2. **0002**
	2b. outer **2G2**		
	3a. inner **XXG3**	3a. **XXG4**	3. **0003**
	3b. outer **2G3**	3b. **XXG5**	
	4a. inner **HDG1**	4a. **HDG1+HGAh**	4. **0004**
	4b. outer **2G4**	4b. **YEG1**	
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **XWG1**	5. **25G5**	5. **0005**
	5b. outer **25G1**		
	6a. inner **XWG2**	6. **HGJ**	6. **0006**
	6b. outer **25G2**		
	7a. inner **XWG3**	7a. **XWG4**	7. **0007**
	7b. outer **25G3**	7b. **XWG5**	
	8a. inner **HDG2**	8a. **YGG1**	8. **0008**
	8b. outer **25G4**	8b. **HGT**	

Pos. 2 JP-30	DCT Specimen
	1. **YCHG**
	2. **YCHH**
	3. **YCHJ**
	4. **YCHK**
	5. **YCHL**
	6. **YCHM**
	7. **YCHN**
	8. **YCHP**
	9. **YCHQ**

Pos. 3 JP-30	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **2E1**	1. **0EAp**	1. **0009**
	1b. outer **2E3**		
	2a. inner **2E2**	2. **2E7**	2. **0010**
	2b. outer **2E4**		
	3a. inner **1E1**	3. **2E8**	3. **0011**
	3b. outer **25E3**		
	4a. inner **1E2**	4. **HEA**	4. **0012**
	4b. outer **25E4**		
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **27E1**	5. **0EAr**	5. **0013**
	5b. outer **0E1**		
	6a. inner **27E2**	6. **25E7**	6. **0014**
	6b. outer **0E2**		
	7a. inner **25E1**	7. **25E8**	7. **0015**
	7b. outer **0E3**		
	8a. inner **25E2**	8. **HEB**	8. **0016**
	8b. outer **0E4**		

Pos. 4 JP-30	DCT Specimen
	1. **0EQ**
	2. **0ER**
	3. **0ES**
	4. **0ET**
	5. **0EU**
	6. **0EZ**
	7. **0EAa**
	8. **YCEA**
	9. **YCEB**

Pos. 5 JP-30	M3-PCCVN Specimen	Passive Thermometry	
	1. outer **0E9**	1. **0111**	2. **0112**
	2. inner **27E9**		
	3. inner **27E0**		
	4. outer **0E0**		
	5. outer **0EA**		
	6. inner **27EA**		
	7. inner **27EB**		
	8. outer **0EB**		

Pos. 6 JP-30	DCT Specimen
	1. **1G5**
	2. **1G6**
	3. **1G9**
	4. **1G0**
	5. **1GA**
	6. **1GB**
	7. **HGV**
	8. **HGZ**
	9. **HGAb**

Pos. 7 JP-30	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **1G1**	1. **0G6**	1. **0017**
	1b. outer **0G1**		
	2a. inner **1G2**	2. **2G6**	2. **0018**
	2b. outer **0G2**		
	3a. inner **1G3**	3. **25G6**	3. **0019**
	3b. outer **0G3**		
	4a. inner **1G4**	4. **HGK**	4. **0020**
	4b. outer **0G4**		
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **27G1**	5a. **HGG**	5. **0021**
	5b. outer **HGP**	5b. **HGH**	
	6a. inner **27G2**	6a. **YJG1**	6. **0084**
	6b. outer **HGQ**	6b. **YNG1**	
	7a. inner **27G3**	7a. **YAG0**	7. **0023**
	7b. outer **HGR**	7b. **YAG1**	
	8a. inner **27G4**	8a. **YCG0**	8. **0083**
	8b. outer **HGS**	8b. **YCG1**	

Pos. 8 JP-30	DCT Specimen
	1. **27G5**
	2. **27G6**
	3. **27G9**
	4. **27G0**
	5. **27GA**
	6. **27GB**
	7. **HGAc**
	8. **HGAe**
	9. **HGAf**

Pos. 9 JP-30	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	1a. inner **HDH1**	1a. **YNH1**	1. **0025**
	1b. outer **YMH1**	1b. **YMH1**	
Top Half	2a. inner **HDH2**	2a. **HDH1+HDH2**	2. **0026**
	2b. outer **YMH2**	2b. **YEH2**	
	3a. inner **HDH3**	3a. **HDH3+HDH4**	3. **0027**
	3b. outer **YAHA**	3b. **YGH1**	
	4a. inner **HDH4**	4a. **YEH1**	4. **0028**
	4b. outer **YAHB**	4b. **YGH2**	
	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **YBHA**	5a. **YKH1**	5. **0090**
	5b. outer **YJH1**	5b. **YJH1**	
Bottom Half	6a. inner **YBHB**	6. **YDH0**	6. **0030**
	6b. outer **YJH2**		
	7a. inner **YCHA**	7a. **YEH3**	7. **0031**
	7b. outer **YKH1**	7b. **YEH4**	
	8a. inner **YCHB**	8a. **YGH3**	8. **0032**
	8b. outer **YKH2**	8b. **YGH4**	

Pos. 10 JP-30	M2-PCCVN Specimen	Passive Thermometry	
	1. outer **23E2**	1. **0101**	2. **0102**
	2. inner **24E1**		
	3. inner **24E2**		
	4. outer **23E3**		
	5. outer **23E4**		
	6. inner **24E3**		
	7. inner **24E4**		
	8. outer **23E6**		

Pos. 11 JP-30	M3-PCCVN Specimen	Passive Thermometry	
	1. outer **HER**	1. **0113**	2. **0121**
	2. inner **1E9**		
	3. inner **1EA**		
	4. outer **HES**		
	5. outer **HET**		
	6. inner **1EB**		
	7. inner **YJE3**		
	8. outer **HEU**		

Pos. 12 JP-30	M3-PCCVN Specimen	Passive Thermometry	
	1. outer **YME1**	1. **0115**	2. **0122**
	2. inner **YKE1**		
	3. inner **YKE2**		
	4. outer **YME2**		
	5. outer **YME3**		
	6. inner **YKE3**		
	7. inner **YJE1**		
	8. outer **YJE2**		

Pos. 13 JP-30	M3-PCCVN Specimen	Passive Thermometry	
	1. outer **XWE4**	1. **0117**	2. **0118**
	2. inner **XSE4**		
	3. inner **XSE5**		
	4. outer **XWE5**		
	5. outer **XWE6**		
	6. inner **XSE6**		
	7. inner **XYE4**		
	8. outer **XYE6**		

Pos. 14 JP-30	TEM Specimen Numbers									Passive Thermometry in Center Hole
		Hole No. 1	Engr. Face	Hole No. 2	Engr. Face	Hole No. 3	Engr. Face	Hole No. 4	Engr. Face	
Bottom	1	**H 04**	Down	**HPA 07**	Either	**2 02**	Down	**YJE1**	Either	No ID
	2	**O 03**	Up	**TA 09**	Down	**E 2**	Up	**YJE2**	Either	
	3	**H 05**	Down	**C8 02**	Up	**MB 04**	Down	**YJE3**	Either	
	4	**O 04**	Up	**HD 06**	Down	**C2 02**	Up	**YKE1**	Either	
	5	**2 04**	Down	**Y B**	Up	**MB 05**	Down	**YKE2**	Either	
	6	**E 3**	Up	**HD 09**	Down	**C2 01**	Up	**YKE3**	Either	
	7	**2 05**	Down	**Y 2**	Up	**NF 01**	Down	**YME1**	Either	
	8	**E 4**	Up	**HD 11**	Down	**C5 02**	Up	**YME2**	Either	
	9	**2 06**	Down	**G 2**	Up	**NF 03**	Down	**YME3**	Either	
	10	**HPA 03**	Up	**CB 01**	Down	**C5 01**	Up	**YNE1**	Either	
	11	**MB 01**	Down	**G E**	Up	**TA 07**	Down	**YNE2**	Either	
	12	**C2 03**	Up	**CB 03**	Down	**C8 01**	Up	**YNE3**	Either	
	13	**MB 02**	Down	**HPA 12**	Up	**TA 08**	Down	**YAE2**	Either	
	14	**C5 03**	Up	**NF 07**	Up	**C8 11**	Up	**YAE3**	Either	
	15	**MB 03**	Down	**NF 06**	Up	**CB 05**	Down	**YAE4**	Either	
	16	**C8 04**	Up	**H 01**	Down	**HPA 14**	Up	**YAE5**	Either	
	17	**TA 01**	Down	**O 01**	Up	**CB 04**	Down	**YBE2**	Either	
	18	**C2 04**	Up	**H 02**	Down	**HPA 01**	Up	**YBE3**	Either	
	19	**TA 05**	Down	**O 07**	Up	**HD 01**	Up	**YBE4**	Either	
	20	**C5 04**	Up	**2 01**	Down	**HD 02**	Up	**YBE5**	Either	
	21	**NF 04**	Down	**E 1**	Up	**O 13**	Either	**YCE2**	Either	
	22	**(no ID)**	* 1	**CB 02**	Down	**C2 11**	Either	**YCE3**	Either	
	23			**(no ID)**	*1	**C5 11**	Either	**YCE4**	Either	
	24					**C8 08**	Either	**YCE5**	Either	
	25							**HD 28**	Either	
	26							**Y 9**	Either	
Top	27							**G 3**	Either	

*1 W/KU15ODS, shinier side to face down

Table 5. JP-31 specimen and dosimetry loading list.

Pos. 1 JP-31	TEM Specimen Numbers									Passive Thermometry in Center Hole
		Hole No. 1	Engr. Face	Hole No. 2	Engr. Face	Hole No. 3	Engr. Face	Hole No. 4	Engr. Face	
Bottom	1	**H 07**	Down	**HPA 13**	Either	**2 08**	Down	**YJG1**	Either	No ID
	2	**O 08**	Up	**TA 18**	Down	**E 6**	Up	**YJG2**	Either	
	3	**H 08**	Down	**C8 09**	Up	**MB 06**	Down	**YJG3**	Either	
	4	**O 05**	Up	**HD 12**	Down	**C2 05**	Up	**YKG1**	Either	
	5	**2 07**	Down	**Y 3**	Up	**MB 11**	Down	**YKG2**	Either	
	6	**E 7**	Up	**HD 13**	Down	**C5 05**	Up	**YKG3**	Either	
	7	**2 09**	Down	**Y 4**	Up	**NF 05**	Down	**YMG1**	Either	
	8	**E 8**	Up	**HD 18**	Down	**C2 09**	Up	**YMG2**	Either	
	9	**2 10**	Down	**G 3**	Up	**NF 10**	Down	**YMG3**	Either	
	10	**HPA 06**	Up	**CB 09**	Down	**C5 10**	Up	**YNG1**	Either	
	11	**MB 08**	Down	**G 4**	Up	**TA 13**	Down	**YNG2**	Either	
	12	**C2 07**	Up	**CB 11**	Down	**O 09**	Up	**YNG3**	Either	
	13	**MB 09**	Down	**HPA 08**	Up	**TA 17**	Down	**YAG2**	Either	
	14	**C5 06**	Up	**NF 08**	Up	**C8 06**	Up	**YAG3**	Either	
	15	**MB 10**	Down	**NF 09**	Up	**CB 06**	Down	**YAG4**	Either	
	16	**C8 07**	Up	**H 03**	Down	**HPA 10**	Up	**YAG5**	Either	
	17	**TA 10**	Down	**O 06**	Up	**CB 14**	Down	**YBG2**	Either	
	18	**C2 08**	Up	**H 06**	Down	**HPA 15**	Up	**YBG3**	Either	
	19	**TA 15**	Down	**C8 05**	Up	**HD 15**	Up	**YBG4**	Either	
	20	**C5 09**	Up	**2 03**	Down	**HD 03**	Up	**YBG5**	Either	
	21	**CB 10**	Down	**E 5**	Up	**O 10**	Either	**YCG2**	Either	
	22	**(no ID)**	*1	**NF 12**	Down	**C2 10**	Either	**YCG3**	Either	
	23			**(no ID)**	*1	**C5 07**	Either	**YCG4**	Either	
	24					**C8 10**	Either	**YCG5**	Either	
	25							**HD 22**	Either	
	26							**Y 6**	Either	
Top	27							**G D**	Either	

*1 W/KU15ODS, shinier side to face down

Pos. 2 JP-31	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **XYG1**	1. **0G7**	1. **0033**
	1b. outer **YJG3**		
	2a. inner **XYG2**	2. **2G7**	2. **0034**
	2b. outer **YKG1**		
	3a. inner **YJG1**	3. **25G7**	3. **0035**
	3b. outer **XTG1**		
	4a. inner **YJG2**	4. **HGM**	4. **0036**
	4b. outer **XTG2**		
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **YKG2**	5a. **YMG1**	5. **0037**
	5b. outer **XSG1**	5b. **YKG1**	
	6a. inner **YKG3**	6a. **XSG4**	6. **0038**
	6b. outer **XSG2**	6b. **XSG5**	
	7a. inner **YMG1**	7a. **XYG4**	7. **0039**
	7b. outer **XSG3**	7b. **XYG5**	
	8a. inner **YMG2**	8. **0G8**	8. **0040**
	8b. outer **XYG3**		

Pos. 3 JP-31	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **YAHC**	1. **YDH1**	1. **0041**
	1b. outer **YCHC**		
	2a. inner **YAHD**	2. **YDH2**	2. **0042**
	2b. outer **YCHD**		
	3a. inner **YBHC**	3. **YDH3**	3. **0043**
	3b. outer **YDHE**		
	4a. inner **YBHD**	4a. **YAH2**	4. **0044**
	4b. outer **YDHF**	4b. **YCH2**	
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **YAHE**	5a. **YAH0**	5. **0045**
	5b. outer **YCHE**	5b. **YAH1**	
	6a. inner **YAHF**	6a. **YBH0**	6. **0046**
	6b. outer **YCHF**	6b. **YBH1**	
	7a. inner **YBHE**	7a. **YCH0**	7. **0047**
	7b. outer **YDHG**	7b. **YCH1**	
	8a. inner **YBHF**	8. **YDH4**	8. **0048**
	8b. outer **YDHH**		

Pos. 4 JP-31	M2-PCCVN Specimen	Passive Thermometry	
	1. outer **23E7**	1. **0103**	2. **0104**
	2. inner **24E5**		
	3. inner **24E6**		
	4. outer **23E8**		
	5. outer **23E9**		
	6. inner **24E7**		
	7. inner **24E8**		
	8. outer **23E10**		

Pos. 5 JP-31	DCT Specimen
	1. **27E7**
	2. **27E8**
	3. **27EC**
	4. **27EE**
	5. **27EG**
	6. **27EH**
	7. **27EJ**
	8. **YCEC**
	9. **YCED**

Pos. 6 JP-31	M3-PCCVN Specimen	Passive Thermometry	
	1. outer **0EC**	1. **0119**	2. **0120**
	2. inner **XXE6**		
	3. inner **XXE7**		
	4. outer **0EE**		
	5. outer **0EH**		
	6. inner **XXE0**		
	7. inner **XYE5**		
	8. outer **0EJ**		

Pos. 7 JP-31	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **1E3**	1. **0EAe**	1. **0049**
	1b. outer **2E5**		
	2a. inner **1E4**	2. **2E9**	2. **0050**
	2b. outer **2E6**		
	3a. inner **1E5**	3. **2E0**	3. **0051**
	3b. outer **25E5**		
	4a. inner **1E6**	4a. **HE9**	4. **0052**
	4b. outer **25E6**	4b. **HE0**	
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **27E3**	5. **0EAf**	5. **0053**
	5b. outer **0E5**		
	6a. inner **27E4**	6. **25E9**	6. **0054**
	6b. outer **0E6**		
	7a. inner **27E5**	7. **25E0**	7. **0055**
	7b. outer **0E7**		
	8a. inner **27E6**	8a. **0EAb**	8. **0056**
	8b. outer **0E8**	8b. **0EAc**	

Pos. 8 JP-31	M5-PCCVN Specimen	Passive Thermometry	
	1. outer **0G9**	1. **0135**	2. **0132**
	2. inner **1G7**		
	3. inner **1G8**		
	4. outer **0G0**		
	5. outer **YJG1**		
	6. inner **27G7**		
	7. inner **27G8**		
	8. outer **YJG2**		

Pos. 9 JP-31	M5-PCCVN Specimen	Passive Thermometry	
	1. outer **YJH3**	1. **0136**	2. **0138**
	2. inner **YDHA**		
	3. inner **YDHB**		
	4. outer **YJH4**		
	5. outer **YJH1**		
	6. inner **YDHC**		
	7. inner **YDHD**		
	8. outer **YJH2**		

Pos. 10 JP-31	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **21E1**	1. **0EAg**	1. **0057**
	1b. outer **26E1**		
	2a. inner **21E2**	2. **2EA**	2. **0058**
	2b. outer **26E2**		
	3a. inner **22E1**	3. **25EA**	3. **0059**
	3b. outer **26E3**		
	4a. inner **22E2**	4. **HEC**	4. **0060**
	4b. outer **22E3**		
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **XXE1**	5. **0EAh**	5. **0061**
	5b. outer **HEK**		
	6a. inner **XXE2**	6. **HEE**	6. **0087**
	6b. outer **HEM**		
	7a. inner **XXE3**	7. **HEG**	7. **0088**
	7b. outer **HEP**		
	8a. inner **XXE4**	8a. **XXE8**	8. **0089**
	8b. outer **HEQ**	8b. **XXE9**	

Pos. 11 JP-31	DCT Specimen
	1. **1E7**
	2. **1E8**
	3. **1EC**
	4. **1EE**
	5. **1EG**
	6. **1EH**
	7. **1EJ**
	8. **YCEE**
	9. **YCEF**

Pos. 12 JP-31	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **YCE6**	1. **0EAk**	1. **0065**
	1b. outer **YME1**		
	2a. inner **YCE7**	2a. **YNE1**	2. **0066**
	2b. outer **YME2**	2b. **YME1**	
	3a. inner **YCE8**	3a. **YAE0**	3. **0067**
	3b. outer **YME3**	3b. **YCE0**	
	4a. inner **YCE9**	4a. **YAE1**	4. **0068**
	4b. outer **YME4**	4b. **YCE1**	
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **YJE1**	5. **0EAm**	5. **0069**
	5b. outer **YKE1**		
	6a. inner **YJE2**	6a. **YJE1**	6. **0070**
	6b. outer **YKE2**	6b. **YKE1**	
	7a. inner **YJE3**	7a. **YBE0**	7. **0086**
	7b. outer **YKE3**	7b. **HDE1+HDE2**	
	8a. inner **HDE1**	8a. **YBE1**	8. **0072**
	8b. outer **HDE2**	8b. **HDE3+HDE4**	

Pos. 13 JP-31	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
Top Half	1a. inner **XTE1**	1. **0EAn**	1. **0073**
	1b. outer **XSE1**		
	2a. inner **XTE2**	2a. **XWE7**	2. **0074**
	2b. outer **XSE2**	2b. **XSE7**	
	3a. inner **XWE1**	3a. **XWE8**	3. **0075**
	3b. outer **XSE3**	3b. **XSE8**	
	4a. inner **XWE2**	4. **HEZ**	4. **0085**
	4b. outer **XTE3**		
Bottom Half	SS-J3 Tensile Specimen	APFIM/MMPC Specimen	Passive Thermometry
	5a. inner **XYE1**	5. **0EAo**	5. **0077**
	5b. outer **BAE1**		
	6a. inner **XYE2**	6a. **XYE7**	6. **0078**
	6b. outer **BAE2**	6b. **YEE2**	
	7a. inner **XYE3**	7a. **XYE8**	7. **0079**
	7b. outer **BAE3**	7b. **YGE1**	
	8a. inner **XWE3**	8a. **YEE1**	8. **0080**
	8b. outer **BAE4**	8b. **YGE2**	

Pos. 14 JP-31	TEM Specimen Numbers									Passive Thermometry in Center Hole
		Hole No. 1	Engr. Face	Hole No. 2	Engr. Face	Hole No. 3	Engr. Face	Hole No. 4	Engr. Face	
Bottom	1	**MB 15**	Down	**MB 18**	Down	**NF 11**	Down	**YJH1**	Either	No ID
	2	**ZS 03**	Up	**ZS 02**	Up	**ZQ 12**	Up	**YJH2**	Either	
	3	**MB 12**	Down	**MB 07**	Down	**NF 14**	Down	**YJH3**	Either	
	4	**ZQ 07**	Up	**ZQ 05**	Up	**ZQ 15**	Up	**YKH1**	Either	
	5	**MB 13**	Down	**MB 14**	Down	**HD 16**	Down	**YKH2**	Either	
	6	**ZQ 08**	Up	**ZQ 04**	Up	**Y 8**	Up	**YKH3**	Either	
	7	**MB 16**	Down	**MB 17**	Down	**HD 08**	Down	**YMH1**	Either	
	8	**ZQ 10**	Up	**ZS 11**	Up	**G D**	Up	**YMH2**	Either	
	9	**NF 15**	Down	**NF 02**	Down	**CB 19**	Up	**YMH3**	Either	
	10	**ZS 06**	Up	**ZS 12**	Up	**CB 21**	Either	**YNH1**	Either	
	11	**NF 17**	Down	**NF 13**	Down	**CB 23**	Either	**YNH2**	Either	
	12	**ZS 08**	Up	**Y 7**	Up	**ZQ 13**	Either	**YNH3**	Either	
	13	**NF 18**	Down	**NF 16**	Down	**ZQ 03**	Either	**YAH2**	Either	
	14	**ZS 10**	Up	**Y 5**	Up	**ZS 01**	Either	**YAH3**	Either	
	15	**HD 19**	Down	**HD 05**	Down	**ZS 05**	Either	**YAH4**	Either	
	16	**Y E**	Up	**Y C**	Up	**HD 23**	Either	**YAH5**	Either	
	17	**HD 20**	Down	**HD 14**	Down	**HD 24**	Either	**YBH2**	Either	
	18	**Y A**	Up	**G 5**	Up	**Y 1**	Either	**YBH3**	Either	
	19	**HD 21**	Down	**HD 17**	Down	**Y D**	Either	**YBH4**	Either	
	20	**G 9**	Up	**G 7**	Up	**G A**	Either	**YBH5**	Either	
	21	**CB 12**	Down	**CB 08**	Down	**G 8**	Either	**YCH2**	Either	
	22	**G 6**	Up	**G B**	Up	**CB 15**	Up	**YCH3**	Either	
	23	**CB 17**	Down	**CB 20**	Up	**CB 18**	Down	**YCH4**	Either	
Top	24	**(no ID)**	*1	**CB 16**	Up	**(no ID)**	*1	**YCH5**	Either	

*1 W/KU15ODS, shinier side to face down

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[2] J. McDuffee, D. Heatherly, and N. Cetiner, Fusion Materials Semiannual Progress Report for Period Ending December 31, 2010, DOE/ER-0313/49, U. S. Department of Energy, 115.