
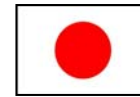


## RPN KNOW-HOW FOR JAPAN PROCUREMENT PACKAGES



WBS	Subassembly	Ref.	Component or operation	 <b>MEMBERS</b>
WBS 1,1	MAGNETS	<u>1,1,1-B</u>	Toroidal Field Magnet Windings (9)	40-30, BOCCARD, BONITEMPO, BUREAU VERITAS, CIMAT, COMEX NUCLEAIRE, FOC TRANSMISSIONS, GMP, GROUPE BONNANS, REEL, ROBATEL, SDMS, SETIS, VELAN
		<u>1,1,2-A</u>	Toroidal Field Magnet Structures (9+1)	
		<u>1,1,2-B</u>	Toroidal Field Magnet Structures (9)	
		<u>1,1,6-A</u>	Toroidal Field Magnet Conductors	
		<u>1,1,6-B</u>	Central Solenoid Magnet Conductors	
WBS 1,6	BLANKET SYSTEM	<u>1,6,1-A</u>	Blanket First Wall	BOCCARD, BONITEMPO, BUREAU VERITAS, CIMAT, COMEX NUCLEAIRE, GMP, GROUPE BONNANS, REEL, ROBATEL, SDMS, SETIS
WBS 1,7	DIVERTOR	<u>1,7,2-A</u>	Outer Target	40-30, BOCCARD, BONITEMPO, BUREAU VERITAS, COMEX NUCLEAIRE, GMP, GROUPE BONNANS, REEL, ROBATEL, SDMS, SITES, SOM NUCLEAIRE
WBS 2,3	REMOTE HANDLING	<u>2,3,1</u>	Blanket Remote Handling Equipment	AMESYS, ASTRIANE, EKIU, COMEX NUCLEAIRE, FIATEQ, GMP, REEL, ROBATEL
WBS 3,2	TRITIUM PLANT	<u>3,2,4</u>	Atmosphere Detritiation (ADS)	40-30, AMESYS, BOCCARD, BUREAU VERITAS, CIMAT, EKIU, COMEX NUCLEAIRE, FIATEQ, GROUPE BONNANS, REEL, ROBATEL, SDMS, SETARAM, SETIS, SITES, SOM NUCLEAIRE, VELAN
WBS 5,2	ELECTRON CYCLOTRON HEATING & CURRENT DRIVE	<u>5,2,1-A</u>	Equatorial Launcher	40-30, AMESYS, BOCCARD, BUREAU VERITAS, EKIU, COMEX NUCLEAIRE, FIATEQ, GMP, REEL, ROBATEL, SDMS, SETIS
		<u>5,2,3</u>	Radio Frequency Power Sources	
WBS 5,3	NEUTRAL BEAM HEATING & CURRENT DRIVE	<u>5,3,2</u>	Beam Source and High Voltage Bushing	40-30, AMESYS, ASTRIANE, BOCCARD, BONITEMPO, CIMAT, EKIU, COMEX NUCLEAIRE, FIATEQ, FOC TRANSMISSIONS, REEL, ROBATEL, SDMS, SETIS, VELAN
		<u>5,3,3</u>	Beamline Components	
		<u>5,3,4</u>	Pressure Vessel & Magnetic Shielding	
WBS 5,5	DIAGNOSTICS	<u>5,5-A</u>	Magnetic measurements	40-30, AMESYS, BUREAU VERITAS, COMEX NUCLEAIRE, EKIU, FIATEQ, FOC TRANSMISSIONS, SDMS, SETARAM, SITES, SOM NUCLEAIRE
		<u>5,5-B</u>	Neutron measurements	
		<u>5,5-C</u>	Optical systems	
		<u>5,5-D</u>	Bolometry	
		<u>5,5-E</u>	Spectroscopic systems	
		<u>5,5-F</u>	Microwave systems	
		<u>5,5-G</u>	Systems for machine operation	
		<u>5,5-N</u>	Diagnostics engineering	

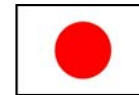


→ WBS 1,1 - MAGNETS

RPN MEMBERS	KNOW-HOW <span style="float: right;">                         ■ Know-how included by RPN                          ■ Non-included know-how                     </span>
<p>40-30 (9)                      BOCCARD (2, 6, 7, 8, 13)                      BONITEMPO (6, 7, 10, 11, 13)                      BUREAU VERITAS (4)                      CIMAT (3, 4, 6, 9, 13)                      COMEX NUCLEAIRE (3, 4, 6, 7, 9, 13)                      FOC TRANSMISSIONS (6, 7, 9)                      GARLOCK (9)                      GMP (2, 4)                      GROUPE BONNANS (2)                      REEL (2, 3, 4, 9, 13)                      ROBATEL (4, 13)                      SDMS (6, 7, 10, 13)                      SETIS (11,13)                      VELAN (7)</p>	<ol style="list-style-type: none"> <li>1. Cable Winding (large length and big section)</li> <li>2. Stainless steel machining (thick plate)</li> <li>3. TIG, MIG processes</li> <li>4. Manual welding</li> <li>5. Vacuum impregnation</li> <li>6. Stainless steel boilermaking</li> <li>7. Cryogenics</li> <li>8. Thermal insulation</li> <li>9. Helium waterproof control</li> <li>10. Large section cable, supraconductor</li> <li>11. Wiredrawing, drawing, forming, rolling</li> <li>12. Heat treatments</li> <li>13. Stainless steel boilermaking (thin plate)</li> </ol>

→ WBS 1,6 - BLANKET SYSTEM

RPN MEMBERS	KNOW-HOW <span style="float: right;">                         ■ Know-how included by RPN                          ■ Non-included know-how                     </span>
<p>BOCCARD (6, 7, 9)                      BONITEMPO (1, 4, 6, 7, 10)                      BUREAU VERITAS (3, 9)                      CIMAT (6, 7)                      COMEX NUCLEAIRE (2, 3, 5, 6, 9)                      GMP (1, 4)                      GROUPE BONNANS (1, 4)                      REEL (2, 4, 6, 9)                      ROBATEL (6)                      SDMS (2, 3, 5, 6, 7, 9, 10)                      SETIS (4, 6)</p>	<ol style="list-style-type: none"> <li>1. Beryllium, copper machining</li> <li>2. Heterogeneous Material liaison (soldering, electron beam welding ..)</li> <li>3. Leak tight weld connection of stainless piping for pressurized water (TIG or laser processes)</li> <li>4. Stainless steel machining, Forming , Titanium machining</li> <li>5. Plasma deposition, TIG welding or laser</li> <li>6. Boilermaking</li> <li>7. Stainless steel piping</li> <li>8. Isostatic compression on stainless steel (HIP)</li> <li>9. TIG and electron beam welding on stainless</li> <li>10. Mounting, copper alloy parts cooling down (CuCrZr)</li> </ol>

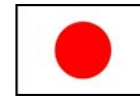


→ WBS 1,7 – DIVERTOR

RPN MEMBERS	KNOW-HOW <span style="float: right;">                         ■ Know-how included by RPN                          ■ Non-included know-how                     </span>
40-30 (7) BOCCARD (1, 2) BONITEMPO (1) BUREAU VERITAS (3, 7, 10, 11) COMEX NUCLEAIRE (2, 3, 4, 7, 10, 11) GARLOCK (1) GMP (6) GROUPE BONNANS (1, 6, 7) REEL (1, 2, 10) ROBATEL (10) SDMS (10) SITES (7) SOM NUCLEAIRE (8)	1. Inconel and Stainless steel machining 2. HIP, Electron Beam welding, soldering 3. Leak tight weld connection of stainless piping for pressurized water (TIG or laser processes) 4. Metallurgy 5. Heat treatment 6. Copper machining W et CFC 7. NDE Testing 8. Isostatic thermo-mechanics of stainless steel parts 9. High dimension compression (HIP) 10. Leak tight weld by TIG or FE processes on Inconel or Stainless steel 11. Thermal characteristics quality control of components

→ WBS 2,3 - REMOTE HANDLING

RPN MEMBERS	KNOW-HOW <span style="float: right;">                         ■ Know-how included by RPN                          ■ Non-included know-how                     </span>
AMESYS (1, 4, 5) ASTRIANE (1, 2, 3, 4, 5) COMEX NUCLEAIRE (1, 2, 3, 4, 5) EKIUUM (4, 5) FIATEQ (1, 5) GARLOCK (2) GMP (2) REEL (1, 2, 4, 5) ROBATEL (3)	1. Robotics 2. High precision mechanical structure 3. Shielding of components submitted to radiation 4. System integration 5. Remote Handling

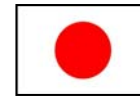


## → WBS 3,2 - TRITIUM PLANT

RPN MEMBERS	KNOW-HOW
40-30 (5, 7, 10, 11, 14) AMESYS (7, 11, 12) BOCCARD (3, 4, 5, 6, 13, 15) BUREAU VERITAS (5, 6) CIMAT (2, 3, 6, 9, 13, 15) COMEX NUCLEAIRE (1, 15) EKIUM (7, 8, 10, 12) FIATEQ (7, 12) GARLOCK (5) GROUPE BONNANS (1) REEL (1, 2, 5, 6, 13, 15) ROBATEL (6, 13) SDMS (2, 3, 4, 5, 6, 13, 14, 15) SETARAM (10, 11, 13) SETIS (1, 2, 9) SITES (11, 12, 14) SOM NUCLEAIRE (5) VELAN (4, 5)	<div style="text-align: right;"> <span style="color: red;">■</span> <i>Know-how included by RPN</i>  <span style="background-color: gray; display: inline-block; width: 10px; height: 10px; vertical-align: middle;"></span> <i>Non-included know-how</i> </div> <ol style="list-style-type: none"> <li>1. Precision mechanics</li> <li>2. Clean room boilermaking</li> <li>3. Piping</li> <li>4. Cryogenic engineering</li> <li>5. Knowledge of vacuum technology and pressure devices</li> <li>6. Welding and assembly</li> <li>7. Electricity and automation control</li> <li>8. Chemical engineering</li> <li>9. Assembly</li> <li>10. Installation of physico-chemical measuring device</li> <li>11. Physical measuring</li> <li>12. Industrial computing and field network</li> <li>13. Integration in glove box or containment vessel</li> <li>14. Implementation of operation monitoring sensors</li> <li>15. Mechanical realization with piping and components integration</li> </ol>

## → WBS 5,2 - ELECTRON CYCLOTRON HEATING & CURRENT DRIVE

RPN MEMBERS	KNOW-HOW
40-30 (9) AMESYS (8, 9) BOCCARD (2, 4, 5) BUREAU VERITAS (3) COMEX NUCLEAIRE (2, 3) EKIUM (8, 9) FIATEQ (9) GARLOCK (4) GMP (2) REEL (2, 3) ROBATEL (2) SDMS (1, 2, 3, 6, 7) SETIS (2, 5)	<div style="text-align: right;"> <span style="color: red;">■</span> <i>Know-how included by RPN</i>  <span style="background-color: gray; display: inline-block; width: 10px; height: 10px; vertical-align: middle;"></span> <i>Non-included know-how</i> </div> <ol style="list-style-type: none"> <li>1. Technology of high-frequency components : corrugated stainless steel piping</li> <li>2. Machining and Welding – nuclear quality</li> <li>3. Vacuum Leak tight TIG welding for pressurized water, copper mirrors and SS screens</li> <li>4. Vacuum Leak tight , metal gaskets, water cooling</li> <li>5. Piping supporting systems</li> <li>6. Aluminum corrugated waves guides</li> <li>7. Associated cryogenic systems</li> <li>8. Associated electrical systems</li> <li>9. Electrical engineering</li> </ol>



**→ WBS 5,3 - NEUTRAL BEAM HEATING & CURRENT DRIVE**

RPN MEMBERS	KNOW-HOW <span style="color: red;">■</span> <i>Know-how included by RPN</i> <span style="color: gray;">■</span> <i>Non-included know-how</i>
40-30 (3, 11) AMESYS (3, 5) ASTRIANE (1, 2, 3, 6) BOCCARD (1) BONITEMPO (6) CIMAT (2, 6) COMEX NUCLEAIRE (1, 2, 3, 4, 5, 6, 7, 11) EKIUUM (5) FIATEQ (3, 5) FOC TRANSMISSIONS (2, 6) GARLOCK (11) REEL (6) ROBATEL (6) SDMS (1, 6, 7, 11) SETIS (6) VELAN (11)	<ol style="list-style-type: none"> <li>1. Mechanics, cryogenics, vacuum</li> <li>2. Handling</li> <li>3. Electrical engineering</li> <li>4. Water cooling</li> <li>5. Monitoring, automation – control, barometric, instrumentation</li> <li>6. Mechanics, boilermaking</li> <li>7. Vacuum, gas vacuum injection</li> <li>8. Winding</li> <li>9. Mass isolation</li> <li>10. High voltage (1MV) electrotechnical components wiring, isolating control</li> <li>11. Cryogenics, connection of cryo wires, vacuum waterproof</li> </ol>

**→ WBS 5,5 - DIAGNOSTICS**

RPN MEMBERS	KNOW-HOW <span style="color: red;">■</span> <i>Know-how included by RPN</i> <span style="color: gray;">■</span> <i>Non-included know-how</i>
40-30 (5) AMESYS (1, 2, 5, 8, 11) BUREAU VERITAS (11) COMEX NUCLEAIRE (8, 9, 10, 11, 12, 13) EKIUUM (6, 11) FIATEQ (1, 2, 5, 6, 11) FOC TRANSMISSIONS (12) SDMS (6, 12, 13) SETARAM (1, 2, 13) SITES (1, 3, 10, 11) SOM NUCLEAIRE (11, 12, 13)	<ol style="list-style-type: none"> <li>1. Design, Sensor manufacturing, connectors, electronics</li> <li>2. Design, Instruments manufacturing for neutron measures</li> <li>3. Optics</li> <li>4. Laser cutting</li> <li>5. Electronics</li> <li>6. Design, Instruments manufacturing for measuring radiation (bolometric cameras)</li> <li>7. Spectroscopic</li> <li>8. Imagery signal processing</li> <li>9. Micro-wave technology, radar specialist</li> <li>10. Optics and infrared radiation</li> <li>11. Engineering</li> <li>12. Mechanics</li> <li>13. Thermal</li> <li>14. Connectors</li> <li>15. Wiring</li> </ol>