PSNN-2014-1202

Safety-Related

Project Document No.	Rev.	-	3

Commercial Dedication Instruction

Customer Name	N/A (As per each Job Order)
Project Name	N/A (As per each Job Order)
Item Name	N/A (As per each Job Order)
Item Number	N/A (As per each Job Order)
Job Number	N/A (As per each Job Order)

Product Name	CELL module
Model Number	HNS0400

Rev.	Initial Issue Date	Issued by	Approved by	Reviewed by	Prepared by	Document filing No.
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1. Product Identification

a. Part Number: See following table

b. Model Number: HNS0400

c. Drawing Number: 5Q8K0019 Rev.3

d. Manufacturer's Name: TOSHIBA Corporation, Power Systems Company, Power Platform Development Department (PPDD)

Sub supplier:

Toshiba Design and Manufacturing Service Corporation (TDMS)

e. Manufacturer's Model Number: See following table

f. Manufacturer's Catalog Number: N/A

g. Name plate data: N/A

h. Applicable Material/Part Specification Number: N/A

i. Identification of Parent Component: See Section 2.3

j. Software Version: N/A

k. Firmware Version: N/A

FPGA Code Name	FPGA Identification*
[redacted]^{a,c}	107101
[redacted]^{a,c}	107202
[redacted]^{a,c}	107301
[redacted]^{a,c}	107401
[redacted]^{a,c}	107501
[redacted]^{a,c}	107600
[redacted]^{a,c}	107700
[redacted]^{a,c}	107802
[redacted]^{a,c}	107901
[redacted]^{a,c}	108001

* The first 6-digit numeric strings in registration number of FPGA fuse-map

Table 1 Part Number List

Part Number: (Procurement/Purchase Specification Number/ Part Number)	Manufacturer's Model Number	Description
5Q8K0019/P001	HNS0400B00000	-

2. Product Description

2.1 Definitions

a. General Name of Product: CELL module

b. Product Name of Manufacturer: CELL module

c. Description of Terms

- APRM: Average Power Range Monitor, a safety-related subsystem of Neutron Monitoring System (NMS).

- APRM unit: A parent component of the APRM, FLOW, GAF/ST, TRN, RCV, DIO, and LVPS modules. An APRM unit measures Core Flow Level (safety function) and APRM Level (safety function) using the LPRM Levels.
- CELL module: The CELL module mounted on OPRM unit calculates neutron flux oscillation (i.e. Normalized Oscillation Signal) (safety function) using LPRM Levels received from the RCV module mounted in OPRM unit.
- GAF: Gain Adjustment Factor (GAF) is used to adjust the LPRM Icals. The Icals are the LPRM detector currents at 100% power. GAF is a factor to compensate a previous Ical value. For example, when the previous Ical is 1,000μA and GAF is 1.1, then the new Ical becomes 1,100μA.
- LPRM: Local Power Range Monitor, a safety-related subsystem of Neutron Monitoring System (NMS).
- LPRM unit: A parent component of the LPRM, CAL/ST, TRN, RCV, and LVPS modules.
- LPRM module: This module is mounted on the LPRM unit. This module receives current signals from LPRM detectors and provides LPRM Level (safety function) to the CAL/ST module mounted in the LPRM unit. The CAL/ST module transmits the LPRM Level to the TRN module mounted in the LPRM unit.
- LVPS: LVPS module, a low voltage power supply that is used in a unit to supply DC power to modules in the unit. Each unit has two LVPS modules that are redundant power supplies of the unit.
- NMS: Neutron Monitoring System, NMS consists of three safety-related subsystems: Startup Range Neutron Monitor (SRNM), Local Power Range Monitor (LPRM), and Average Power Range Monitor (APRM) which includes Oscillation Power Range Monitor (OPRM). The LPRM, OPRM, and APRM are collectively called the Power Range Neutron Monitor (PRNM).
- OPRM: Oscillation Power Range Monitor, a safety-related subsystem of Neutron Monitoring System (NMS). OPRM is functional sub-system of APRM.
- OPRM unit: A parent component of the CELL, AGRD, PBD, DAT/ST, TRN, RCV, DIO, and LVPS modules.
- PRNM: Power Range Neutron Monitor, the parent system of the LPRM unit, the APRM unit and the OPRM unit. For Advanced Boiling Water Reactor (ABWR) application, four divisions of the PRNM are installed to plant. Each of those four PRNM divisions contains four LPRM units, an APRM unit and an OPRM unit.
- RCV module: This module is used to receive optical signal between units in PRNM, and also used to receive optical signal from external system.
- TRN module: This module is used to transmit optical signal between units in PRNM, and also used to transmit optical signal to external system.

d. Abbreviation

ABWR	Advanced Boiling Water Reactor
AQ	Augmented Quality
CC	Critical Characteristics
CCD	Critical Characteristics for Design
CCA	Critical Characteristics for Acceptance
CDI	Commercial Dedication Instruction
CFI	Counterfeit and Fraudulent Item
CG	Commercial Grade

C of C	Certificate of Conformance
DC	Direct Current
DDS	Detailed Design Specification
DR	Design Review
ELCS	Engineered Safety Features Logic & Control System
EMC	Electromagnetic Compatibility
EQ	Equipment Qualification
FD	Flat Display
FPGA	Field Programmable Gate Array
FMEA	Failure Mode and Effect Analysis
IV&V	Independent Verification and Validation
MDS	Module Design Specification
NICSD	Nuclear Instrumentation and Control Systems Department
NICS-QA	Quality Assurance Group for Nuclear Instrumentation & Control Systems
NICS-QC	Quality Control Group for Nuclear Instrumentation & Control Systems
NISD	Nuclear Instrumentation Systems Development & Designing Group
NSR	Non-Safety-Related
PPDD	Power Platform Development Department
QA	Quality Assurance
QC	Quality Control
SR	Safety-Related
TDMS	Toshiba Design and Manufacturing Service Corporation
WDT	Watch Dog Timer

2.2 Function of Product

A CELL module is used mounted on an OPRM unit that is parent component specified in Section 2.3.

The CELL module receives 52 LPRM Levels included in LPRM Unit Data from the RCV module in the OPRM unit. The CELL module calculates Normalized Oscillation Signals of 44 OPRM Cells using the LPRM Levels. The CELL module sends the Normalized Oscillation Signals to the AGRD, PBD and DAT/ST modules.

The CELL module receives an APRM Level and Core Flow Level included in APRM Unit Data from the RCV module in the OPRM unit. The CELL module generates an OPRM Inoperative signal under specific conditions. The CELL module determines if the APRM Level and Core Flow Level are in the OPRM Region or not. When the APRM Level and Core Flow Level are not in the OPRM Region, the CELL module sends an OPRM Automatic Bypass signal to the DIO module.

2.3 Function of Parent Component

Table 2 Function of Parent Component

Part No.	Model No.	Parent Component	Function of Parent Component (Safety Function)	Functional Classification of Parent Component
P001	HNS0400	OPRM unit	Neutron flux oscillation (Normalized Oscillation Signal) Growth Rate-Based Trip Amplitude-Based Maximum Trip Period-Based Trip OPRM Inoperative Providing the data signals, bypass state, trip state, annunciator, and operation state to the Engineered Safety Features Logic & Control System (ELCS) Flat Display (FD).	Safety Related

3. Safety Related Function

The CELL module is required to perform before, during, and after abnormal environmental conditions (seismic,

environmental and Electromagnetic Compatibility (EMC) conditions). The CELL module shall perform the safety related functions described in the following table. The environmental and EMC qualification of the CELL module are not performed as a standalone item. The verification of environmental and EMC qualification will take place at a higher level as part of system equipment qualification effort (Refer to Section 6.2.1).

Table 3 Safety Related Function

Part No.	Model No.	Safety Related Function	Functional Classification
P001	HNS0400	<OPRM application 1 (ABWR Application)> The CELL module is mounted on and electrically connected to OPRM unit which has safety-related functions. The CELL module receives 52 LPRM Levels included in LPRM Unit Data from the RCV module in the OPRM unit. The CELL module calculates Normalized Oscillation Signals (safety function) of 44 OPRM Cells using the LPRM Levels. The CELL module sends the Normalized Oscillation Signals (safety function) to the AGRD, PBD and DAT/ST modules. The CELL module generates an OPRM Inoperative signal (safety function) to the DIO module and DAT/ST module under specific conditions.	Safety Related (Having a safety function)
		The CELL module receives an APRM Level and Core Flow Level included in APRM Unit Data from the RCV module in the OPRM unit. The CELL module determines if the APRM Level and Core Flow Level are in the OPRM Region or not. When the APRM Level and Core Flow Level are not in the OPRM Region, the CELL module sends an OPRM Automatic Bypass signal to the AGRD, PBD module to bypass OPRM trip function.	Safety Related (Having an effect on performance of the system safety function)

The CELL module is required to operate during and after the defined design basis events.

- ■ Seismic Sensitive Part/Assembly
- □ Not Seismic Sensitive
- □ Application Does Not Require Seismic Adequacy

The CELL module is attached to a parent system, and the seismic integrity of the CELL module is verified by qualification testing (Refer to Section 6.2.1).

3.1 Functional Classification

The functional mode and functional classification were evaluated and identified as follows.

a. Functional Mode :
- ■ Active Functional Mode
- □ Passive Functional Mode

b. Functional Classification :
- ■ Safety-Related (SR)
- □ Non-Safety-Related (NSR)
- □ Augmented Quality (AQ)

4. Critical Characteristics for Design

Table 4-1 shows the Critical Characteristics for Design (CCD) and technical evaluations. Table 4-2 shows the result of Failure Mode and Effect Analysis (FMEA). This evaluation is performed base on technical requirements for the CELL modules of OPRM application (ABWR application).

Nuclear Instrumentation Systems Development & Designing Group (NISD) evaluated following supplier's module design:

Manufacturer's Model Number : HNS0400A10000 (Commercial use)

Module Design Specification :5G8HB767 Rev.6 (Reference (2))

This module was developed under the ISO-9001 Quality Assurance (QA) process but not verified with the Independent Verification and Validation (IV&V) process under the Nuclear Instrumentation and Control Systems Department (NICSD) Appendix-B QA program. For dedication of this module, NICSD requires PPDD to apply additional QA and documentation requirements specified in Purchase Specification (Reference (1)). By applying additional requirements based on the Purchase Specification (Reference (1)), manufacturer's model number is changed to the following to distinguish the commercial use and US safety-related use. NISD also evaluated following supplier's module design:

Manufacturer's Model Number : HNS0400B00000 (US safety-related use)

Module Design Specification : 5G8HC104 Rev.1 (Reference (7))

Table 4-1 CCD and Technical Evaluation

Part No.	No	CCD	Manufacturer's specification	Technical Evaluation
P001	1	Physical Characteristics -Dimension Section 6 of purchase specification*1 (91.1W × 172.9H × 232.4D mm) Permissible deviations for dimensions are specified in receiving inspection specification (Reference (5)). -Mass Section 6 of purchase specification*1 (800g or less)	Dimension is specified in Section 4.1.1 of MDS*2 (91.1W × 172.9H × 232.4D mm) Mass is specified in Section 4.1.2 of MDS*2 (800g or less)	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, this characteristic related to item compatibility, form or fit is important when considering replacement and Counterfeit and Fraudulent Items (CFI) issues. Mass is a factor which may affect seismic capability of parent component.
	2	Physical Characteristics -General configuration and shape Module configuration and shape is described in Section 6 of purchase specification*1	Module configuration is described in Section 4.1 of MDS*2	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, this characteristic related to item compatibility, form or fit is important when considering replacement and CFI issues. These characteristics contribute to Equipment Qualification (EQ) and EMC capability.
	3	Performance Characteristics -Data transmission function Sections 5.2.1-1, and -2 of Unit DDS*3 specifies data transmission functions of safety related signals. -Safety signal generating function Normalized Oscillation Signal calculation and OPRM Inoperative signal generation function (Safety functions) specified in Section 5.2.1-3 of Unit DDS*3.	Data transmission function is specified in Sections 5.1 and 5.2 of MDS*2. Safety functions of the CELL module are specified in Sections 6.1.1 thorough 6.1.8, 6.1.10, and 6.1.11.	Manufacturer's item meets the purchaser requirement. This characteristic contributes to safety function of parent component.
	4	Performance Characteristics -Fault Management and Diagnostics Sections 9 of Unit DDS*3 specifies functions of FPGA operation monitor (Watch Dog Timer (WDT)), and data transmission monitor. Section 5.2.1 -3 of Unit DDS*3 specifies OPRM Alarm Judgment Function. Section 8 of Unit DDS*3 specifies initializing processes (power on reset function).	Fault management functions are specified in Section 10 of MDS*2. WDT function is specified in Sections 6.1.10 and 6.1.11 of MDS*2. Power on reset function is specified in Section 9 of MDS*2.	Manufacturer's item meets the purchaser requirement. This characteristic does not directly contribute to safety function. However, the failure of fault management and diagnostic function may lead to failure to detect malfunctions of item's safety functions.

Part No.	No	CCD	Manufacturer's specification	Technical Evaluation
	5	Dependability	-	FPGA modules that include FPGA logic need special attention when indentifying CCDs. Dependability becomes significantly more important when dedicating digital equipment. If there is a problem in the FPGA logic that degrades the dependability of a FPGA-based module, it reflects a design error that was built into the FPGA-based module, or a mismatch between the functional requirements and the FPGA-based module design. The "Dependability" is a CCD of FPGA-based module.

*1 Purchase Specification, 5Q8K0019 Rev.3 (Reference (1))

*2 MDS: Module Design Specification, 5G8HC104 Rev.1 (Reference (7))

*3 Unit DDS: Unit Detailed Design Specification, 5B8K0041 Rev.2 (Reference (3))

Table 4-2 Failure Mode and Effect Analysis

No.	Function	Failure Mode	Failure Mechanism	Effect on System	Method of Detection	Effect on Plant Operation	Remarks
1	Power on reset function	Fail on during module operating	Device failure	All FPGAs in the CELL module will halt. This failure can be detected by WDT on the module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
		Fail off when initializing	Device failure	All FPGAs in the module will not restart (initialize) once it shuts down.	This failure error will be detected with a surveillance test during periodic inspection.	Loss of one division trip function. Unless the OPRM unit is shut down, it operates normally.	
2	DC/DC converter (+2.5V power supply to FPGA)	Fail low	Circuit failure	All FPGAs in the CELL module will halt. This failure can be detected by WDT on the module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
		Fail high	Circuit failure	This failure may cause damage to FPGA device.			
3	LPRM Signal Input Processing function	Incorrect LPRM Unit 1-4 Data input	Circuit failure Contact failure of middle-plane connector	The FPGA1/2 will detect a parity error or time out error. The CELL module generates an LPRM Unit Receiving error signal to the DAT/ST module. The CELL module generates "OPRM Minor Failure" signal.	The "FAIL" indicator on the CELL module turns on.	The display in main control room indicates 'NMS' alarm.	
		Fail on (LPRM Unit 1-4 Data Input Error Signal output)	Circuit failure Contact failure of middle-plane connector	The CELL module generates "OPRM Minor Failure" signal.	The "FAIL" indicator on the CELL module turns on.	The display in main control room indicates 'NMS' alarm.	
		Fail off (LPRM Unit 1-4 Data Input Error Signal output)	Circuit failure Contact failure of middle-plane connector	None	This failure error will be detected with a surveillance test during periodic inspection.	None	
		Incorrect serial data output to FPGA4	FPGA1, FPGA2 failure Circuit failure Contact failure of middle-plane connector	The FPGA4 will detect the incorrect data input. This failure can be detected by WDT on the CELL module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	

No.	Function	Failure Mode	Failure Mechanism	Effect on System	Method of Detection	Effect on Plant Operation	Remarks
4	APRM Signal Input Processing function	Incorrect APRM Unit Data 1,2 input	Circuit failure Contact failure of middle-plane connector	The FPGA1/2 module will detect a parity error or time out error. The CELL module generates an APRM Unit Receiving error signal to the DAT/ST module. The CELL module generates "OPRM Minor Failure" signal.	The "FAIL" indicator on the CELL module turns on.	The display in main control room indicates 'NMS' alarm.	
		Fail on (APRM Unit Data 1,2 Input Error Signal output)	Circuit failure Contact failure of middle-plane connector FPGA3 failure	The CELL module generates an APRM Unit Receiving error signal to the DAT/ST module. The CELL module generates "OPRM Minor Failure" signal.	The "FAIL" indicator on the CELL module turns on.	The display in main control room indicates 'NMS' alarm.	
		Fail off (APRM Unit Data 1,2 Input Error Signal output)	Circuit failure Contact failure of middle-plane connector FPGA3 failure	None (FPGA3 selects another APRM input that provides correct data.)	This failure error will be detected with a surveillance test during periodic inspection.	None	
		Fail on (OPRM Automatic Bypass signal)	Circuit failure Contact failure of middle-plane connector FPGA3 failure	The CELL module generate spurious OPRM Automatic Bypass signal	The "BYP" indicator on the CELL module turns on.	Loss of one division trip function	
		Fail off (OPRM Automatic Bypass signal)	Circuit failure Contact failure of middle-plane connector FPGA3 failure	The CELL module continues to perform Normalized Oscillation Signal calculation.	This failure error will be detected with a surveillance test during periodic inspection. (OPRM unit has APRM level and FLOW level test input functions)	One division of APRM (OPRM) operates outside the OPRM Armed Region.	
		Fail on (APRM Inop signal to FPGA9)	Circuit failure Contact failure of middle-plane connector FPGA3 failure	The CELL module generates a spurious OPRM Inoperative signal	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
		Fail off (APRM Inop signal to FPGA9)	Circuit failure Contact failure of middle-plane connector FPGA3 failure	The FPGA9 detects APRM Unit Data 1.2 Input Errors. The CELL module generates an OPRM Inoperative signal. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
		FPGA operation halt	FPGA3 failure	This failure can be detected by WDT on the CELL module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
5	Normalized Oscillation Signal calculation function	Incorrect serial data output (OPRM Calculation Data)	Circuit failure Contact failure of middle-plane connector	The DAT/ST module will detect a parity error. The DAT/ST module generates "OPRM Minor Failure" signal.	The "FAIL" indicator on the DAT/ST module turns on.	The display in main control room indicates 'NMS' alarm.	-
		Incorrect serial data output (OPRM CELL Data)	Circuit failure Contact failure of middle-plane connector	The AGRD and/or PBD module will detect a parity error and/or data frame error. The AGRD/PBD module generates "OPRM Inoperative" signal.	The "INOP" indicator on the AGRD/PBD module turns on.	One division of APRM (OPRM) Inoperative	-
		FPGA operation halt	FPGA4,5,6,7 failure Disconnections between main and sub PCB	This failure can be detected by WDT on the CELL module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
		Incorrect data transfer between devices	Disconnections between main and sub PCB	This failure can be detected by WDT on the CELL module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
			SRAM failure EEPROM failure	This failure can be detected by SRAM/EEPROM error detection function in FPGAs. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	

No.	Function	Failure Mode	Failure Mechanism	Effect on System	Method of Detection	Effect on Plant Operation	Remarks
6	Parameter storage function	Incorrect parameter	Rotary switch on PCB failure	The CELL module may generate an incorrect Normalized Oscillation Signal. The CELL module may perform incorrect OPRM Region judgment.	The setpoint displayed on CELL module will be incorrect value. This failure error will be detected with a surveillance test during periodic inspection.	This failure may lead to one division spurious trip signal or loss of one division trip function.	
			FPGA8 failure	This failure can be detected by WDT function on the CELL module. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
7	Fault management function (OPRM Inoperative signal, OPRM Minor Failure signal)	Fail off	WDT circuit failure Output circuit failure	None	This failure error will be detected with a surveillance test during periodic inspection.	Loss of one division trip function	
		Fail on	WDT circuit failure Output circuit failure	The CELL module generates a spurious "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
8	HMI -HMI controller FPGA	FPGA operation halt	FPGA10, FPGA11 failure	The CELL module detects HMI FPGA failure. The CELL module generates "OPRM Minor Failure" signal.	The "FAIL" indicator on the CELL module turns on.	Operator can not perform front panel operations. The display in main control room indicates 'NMS' alarm.	
9	HMI -Front panel display	Fail off (turn off)	Device failure Circuit failure Cable disconnection	Numerical displays and LED indicators turn off.	This failure error will be detected with a surveillance test during periodic inspection.	None	
10	HMI -Mode key switch	Fail on	Device failure Circuit failure Cable disconnection	The CELL module goes into "STANDBY" mode. The CELL module generates "OPRM Inoperative" signal.	The "INOP" indicator on the CELL module turns on.	One division of APRM (OPRM) Inoperative	
		Fail off					
11	HMI -Button switches	Fail on	Device failure Circuit failure Cable disconnection	None	This failure error will be detected with a surveillance test during periodic inspection.	Operator can not perform front panel operations. One division of APRM (OPRM) Inoperative	
		Fail off					

5. Critical Characteristics for Acceptance, Verification Methods and Responsibilities

5.1 Verification of Physical and Performance Characteristics Depending on Supplier Testing

The physical characteristics and performance characteristics are able to be measured as CCAs by the supplier testing and Nuclear Instrumentation and Control Systems Department (NICSD) intends to receive Certificate of Conformance (C of C) and the supplier's test record during the receiving inspection, the following supplier's process to control CC shall be verified as CCAs, as a minimum, through Commercial Grade (CG) survey of PPDD and receiving inspection.

- Design Control (Document Control)
- Inspection and Test Control
- Measuring and Test Equipment Control

To supplement verification of the general configuration and shape, supplier's control capability regarding "Configuration Control and Traceability of Hardware" shall be verified through CG Survey of PPDD, evaluation of sub-suppliers, and receiving inspection. Refer to Table 5-1.

5.2 Verification of "Dependability" of Module

To verify the dependability of modules, the following CCAs related to supplier's control capability of CC shall be verified through CG survey of PPDD, evaluation of sub-suppliers, receiving inspection, oversight of design review meeting, review of supplier documents, oversight of supplier testing, and witness of FPGA implementation.

- Built-in Quality
- Configuration Control and Traceability of Software and Hardware

Refer to Table 5-1.

Table 5-1 CCA and Verification Method

Item No	Critical Characteristics for Acceptance	Verification Method for Qualification	Responsibility	Verification Method for Production	Responsibility
1	Physical Characteristics -Dimension -Mass -General Configuration and Shape	-	-	Receiving Inspection (Receiving C of C and supplier's test record, Section 6.1.1)	NICS-QC
2	Performance Characteristics -Data Transmission Function -Safety signal generating function -Fault Management and Diagnostics	-	-	Receiving Inspection (Receiving C of C and supplier's test record, Section 6.1.1)	NICS-QC
3	Design Control (Document Control)	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Receiving Inspection (Receiving C of C, Section 6.1.1)	NICS-QC
4	Inspection and Test Control	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Receiving Inspection (Receiving C of C, Section 6.1.1)	NICS-QC
5	Measuring and Test Equipment Control	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Receiving Inspection (Receiving C of C, Section 6.1.1)	NICS-QC
6	Build in Quality	CG Survey of PPDD (Section 6.2.2)	NICS-QA	Oversight of design review meeting (Section 6.1.2)	NICS-QC
				Review of supplier documents (Section 6.1.3)	NICSD IV&V Team
				Oversight of supplier testing (Section 6.1.4)	NICSD IV&V Team
7	Configuration Control and Traceability of Software and Hardware	CG Survey of PPDD, Evaluation of sub-suppliers (Section 6.2.2)	NICS-QA	Witness of FPGA implementation (Section 6.1.5)	NICS-QC

NICSD Nuclear Instrumentation and Control Systems Department

NICS-QA	Quality Assurance Group for Nuclear Instrumentation & Control Systems
NICS-QC	Quality Control Group for Nuclear Instrumentation & Control Systems
IV&V	Independent Verification and Validation

6. Verification Instruction

6.1 Recurring Activities

6.1.1 Receiving Inspection

Receiving inspectors or QC inspectors from NICS-QC shall implement the receiving inspection in accordance with the "Receiving Inspection Procedure (Section 9-(1))" and the "Standard Receiving Inspection Specification (Section 9-(2))." The verification results are recorded in the form of "Receiving Inspection Check List/Report (Section 7-(1))."

6.1.2 Oversight of Design Review Meeting

NICSD shall perform oversight of Design Review (DR) meetings conducted by PPDD in accordance with Section 9.1.1 of the Commercial Dedication Instruction (Reference (6)).

6.1.3 Review of Supplier Documents

NICSD shall perform review of supplier documents in accordance with Section 9.1.2 of the Commercial Dedication Instruction (Reference (6)).

6.1.4 Oversight of Supplier Testing

NICSD shall perform oversight on FPGA Testing and Module Validation Testing conducted by PPDD supplier documents in accordance with Section 9.1.3 of the Commercial Dedication Instruction (Reference (6)).

6.1.5 Witness of FPGA Implementation

NICSD shall perform witness of the FPGA implementation work by TDMS in accordance with Section 9.1.4 of the Commercial Dedication Instruction (Reference (6)).

6.2 Periodic Activities

6.2.1 Environmental Conditions Qualification

Equipment qualification testing and EMC qualification testing are performed in a type test using test specimen. Successful completion and continued application of qualification testing verifies that the item is capable of performing its intended safety function. Any time a design change is made to the item or item is used in another application, impact on all previous qualification programs shall be evaluated to determine if re-qualification is required.

The responsible design engineers from NISD shall identify a test report in Section 7 of this Commercial Dedication Instruction (CDI) after qualification test, which shows successful compliance with qualification test requirements. If any changes are made to a configuration as the result of qualification test, the responsible design engineers shall identify a baseline after change in the CDI. The responsible design

engineers evaluates any changes to an item that are made after baseline establishment, determines the need for an additional qualification test, and documents the evaluation result in the CDI. In order to continuously purchase items with same configuration, the "Configuration Control and Traceability of Hardware" of supplier shall be verified through CG Surveys as described in Section 6.2.2.

6.2.2 Vendor Evaluation

NICSD shall perform CG Survey of PPDD and evaluation of sub-suppliers in accordance with Section 9.2 of the Commercial Dedication Instruction (Reference (6)).

7. Acceptance Documentation

(1) Receiving Inspection Check List/Report (Attachment to NQ-3024 (Reference (4)))
(2) Certificate of Conformance (Attachment to Reference (1))
(3) Test record by supplier (As per supplier's form)
(4) Nuclear Instrumentation & Control Systems Department
Environmental Qualification Report for Safety-Related Oscillation Power Range Monitor (OPRM)
FC51-7513-1000 Rev.0 (5B8K0077 Rev.0)
(5) Nuclear Instrumentation & Control Systems Department
Dynamic Qualification Report for Safety-Related Oscillation Power Range Monitor (OPRM)
FC51-7513-1003 Rev.0 (5B8K0094 Rev.0)
(6) Nuclear Instrumentation & Control Systems Department
EMC Qualification Report for Safety-Related Oscillation Power Range Monitor (OPRM)
FC51-7513-1001 Rev.0 (5B8K0078 Rev.0)

8. References

(1) PURCHASE SPECIFICATON for in-house (5Q8K0019 Rev.3)
(2) CELL Module Equipment Design Specification (5G8HB767 Rev.6)
(3) OPRM Unit Detailed Design Specification for Power Range Neutron Monitor (5B8K0041 Rev.2)
(4) Receiving Inspection Procedure, NQ-3024
(5) Standard Receiving Inspection Specification for Modules from Power Platform Development Department (5T8K0001 Rev.1)
(6) Commercial Dedication Instruction for Dedication of Modules from Commercial Supplier (Common Requirements) (9B8K0057 Rev.1)
(7) CELL Module HNS0400 Series Module Design Specification (5G8HC104 Rev.1)

9. Inspection and Test Procedure

(1) Receiving Inspection Procedure (Reference (4))
(2) Standard Receiving Inspection Specification (Reference (5))

10. Supplements

N/A

変 更 記 録 REVISIONS						
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(1) Jul.17, 2012	3, 7, 8, 13	For detailed changed contents and impact evaluation, refer to DECN-9B8K0047-01 Rev.0.	K. Wakita Jul. 17, 2012	T. Tarumi Jul. 17, 2012	T. Furusawa Jul. 17, 2012	H. Ito Jul. 17, 2012
(2) Aug.22, 2012	-	For detailed changed contents and impact evaluation, refer to DECN-9B8K0047-02 Rev.0.	K. Wakita Aug.22, 2012	T. Tarumi Aug.20, 2012	T. Furusawa Aug.20, 2012	K. Tamura Aug.22, 2012
(3) Jan.16.2014	-	For detailed changed contents and impact evaluation, refer to DECN-9B8K0047-03 Rev.0.	K.Wakita Jan.16.2014	T. Tarumi Jan.16,2014	T. Furusawa Jan.16,2014	H. Ito Jan.16.2014