PSNN-2014-0869

Design Change Notice
設計変更通知

Group(担当部門名): Second Electrical System Design & Engineering Gr.		
Approved by (承認)	Reviewed by (調査)	Prepared by (作成)
N. Oda Sept. 28, 2017	N. Oda Sept. 28, 2017	T. Hayashi Sept. 28, 2017

No.	Page	Item (改訂内容)	Current (変更後)	Reference/ Original (参照プラント/ 原設計)	Class (区分)	Reason (理由)	Verification (検証)
1	5	1. Introduction	Qualification Test summary Report Revision 2 incorporates the following: - Correction of minor errors - Correction of Figure of APPENDIX A and B	[None]	None	Clarify what were revised in this revision.	Not required.
2	9	2.4. Modifications	The Hardware configuration was changed during the environmental test after a Test System failure caused by incorrect operation of the environmental chamber, where water condensing on the top of the chamber fell into the powered electronics.	The Hardware configuration was changed during the environmental test due Test System failure caused by incorrect operation of the environmental chamber, condensing water on the top of the chamber that fell into the powered electronics.	None	Wording correction for betterment.	Not required.
3	16	3.3.5.2 Performance Requirements	The ESD was applied to the test points which can be touched by persons during normal operation and the points that can be touched with maintenance personnel with wristband under the administrative permission during maintenance as a special case.	The ESD was applied to the test points which can be touched by persons during normal operation.	None	Clarify the test points.	Not required.
4	22	5. Test Procedure	The initial tests were performed for the assembled Test System in Japan.	Initial tests were performed for the assembled Test System in Japan.	None	Wording correction.	Not required.
5	23	5. Test Procedure	The sequence of tests is shown in Table 5-1 (a), (b) and Figure 5-1 below. Table 5-1 (a) list the Reference page in the ERS, Test procedure document number and the Test Lab test procedure number. Table 5-1 (b) the contents of the Operability Test and the Prudency Test of the PRM.	The sequence of tests is shown in Table 5-1 and Figure 5-5 below.	None	Table 5-1 (b) is added.	Not required.
6	24	5. Test Procedure	Table 5-1 Qualification Test Overview (a)	Table 5-1 Qualification Test Overview	None	Addition of the table sub-number "(a)."	Not required.

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7	25	5. Test Procedure	(b) Operability Test / Prudency Test Pre-Qualification Test: Conducted / Conducted Radiation Exposure: - / - Environmental Test — Before high temperature and high humidity Exposure: Conducted for specific scope (Note 1) / - During high Temperature and high Humidity Exposure: - / - After High Temperature and High Humidity Exposure: Conducted for specific scope (Note 1) / Conducted for specific scope (Note 3) During Low Temperature Exposure: - / - After Low Temperature Exposure: Conducted for specific scope (Note 1) / - During Low Humidity Exposure: - / - After Low Humidity Exposure: Conducted for specific scope (Note 1) / - After all Environmental: Conducted for specific scope (Note 1) / - Seismic Test — Before Seismic Test: - / - During Seismic Test: - / - After Seismic Test: Conducted / - Replacement of Modules (LPRM Modules were replaced with HN2012 from HN2011, AO Modules were replaced with HN2015/2016/2017/2018 from HN2011/2013/2014) EMC Test — Before EMC Test: Conducted for specific scope (Note 2) / - During EMC Test: - / - After EMC Test: - / - Isolation Test(Class 1E to non 1E Test): - / - Post-Qualification Test (Before re-replacement of modules): Conducted for specific scope (Note 2) / - Re-Replacement of Modules (LPRM Modules were replaced with HN2011 from HN2012, AO Modules were replaced with HN2011/2012/2013/2014 from HN2015/2016/2017/2018) Post-Qualification Test(After re-replacement of modules): Conducted / Conducted Notes for this table are listed in the next page.	[None]	III	Table 5-1 (b) is added.	See DVR-E2-201 70928..

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8	26	5. Test Procedure	The Operability Test and the Prudency Test conducted in the Pre-Qualification Test and the Post-Qualification Test(After re-replacement of modules) include following Tests. Operability Test: (1) Linearity test for APRM level, TPM level, and LPRM level at the LPRM gains 40μA/100% (2) Linearity test for APRM level, TPM level, and LPRM level at the LPRM gains 400μA/100% (3) Linearity test for APRM level, TPM level, and LPRM level at the LPRM gains 2400μA/100% (4) APRM Upscale (High-High) trip and TPM Upscale trip response time test at the LPRM gains 40μA/100% (5) APRM Upscale (High-High) trip and TPM Upscale trip response time test at the LPRM gains 400μA/100% (6) APRM Upscale (High-High) trip and TPM Upscale trip response time test at the LPRM gains 2400μA/100% (7) Linearity test for FLOW level (8) APRM Inoperable trip function test (9) DI function test (10) Low voltage power supply failure test for LPRM unit (11) Low voltage power supply failure test for LPRM/APRM unit (12) Low voltage power supply failure test for FLOW unit (13) Watchdog function test for LPRM unit	[None]	III	Note for Table 5-1 (b) are added.	See DVR-E2-201 70928..

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			(14) Watchdog function test for LPRM/APRM unit (15) Watchdog function test for FLOW unit (16) Current value test of Square Root module in FLOW unit (17) Loss of power test (18) Power interruption test Prudency Test: (19) DI Toggling test (20) AI Toggling test (21) Failure simulation test Note 1: Toshiba did not conduct (1),(3),(4),(6),(8),(10),(11),(12),(13),(14),(15). Note 2: Toshiba did not conduct (2),(3),(13),(14),(15),(16), but Toshiba conducted watchdog timer function test for the LPRM module inserted Slot1 of LPRM and LPRM/APRM units. Note 3: Toshiba did not conduct (21).				
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9	33	5.4.3.1.Low-Frequency Conducted Emissions	The frequency range was from 60 Hz to 10 kHz.	The frequency range was from 120 Hz to 10 kHz.	None	Error correction	Not required.

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10	48-50	6.3.2.Data Evaluation (1)Resonance Search	Figures A.1.1 through A.1.15 shows the results for the resonance search along vertical axis. Figures A.1.1, A.1.6, and A.1.11 are the spectra of the test fixtures. Toshiba performed resonance searches in accordance with IEEE Std. 344-1987. Toshiba understands that the seismic tests based on IEEE Std. 344-1987 also satisfy IEEE Std. 344-2004 because the requirements for seismic tests in these versions are essentially the same. Section 7.1.4.1 of IEEE Std. 344-1987 (and Section 8.1.4.1 of IEEE Std. 344-2004) recommends, "...that the resonance search be carried beyond 33 Hz, for example, to 50 Hz, or to the RRS cutoff frequency, whichever is higher, to obtain data on equipment dynamic characteristics that may be valuable to justify qualification for other dynamic loads." The required response spectrum used in the testing has a seismic cutoff frequency of about 40 Hz. Furthermore, since the neutron monitoring system equipment described in the LTR is installed near the control room (versus the reactor building), there are no other higher frequency dynamic loads of interest. Accordingly, Toshiba is only concerned with resonances below 50 Hz. Resonance search data was gathered up to 100 Hz based on the test facility standard practice and equipment capabilities. Three accelerometers for three orthogonal axes were located at the Test table for the acceleration control. Fifteen accelerometers were located for the response of the EUT acceleration. Three for front-back, side to side	Figures A.1.1 through A.1.15 shows the results for the resonance search along vertical axis. Figures A.1.1, A.1.6, and A.1.11 are the spectra of the test fixtures. Compared to these spectra, other spectra which show the response of the Test Specimen Units and the power line panel do not show major resonance.	III	Detailed descriptions are added.	See DVR-E2-201 70928.

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			and vertical at the following five locations: 1) the top right corner of the test fixture (EUT were mounted). 2) the right side top center of FLOW Unit chassis. 3) the power module mounting plate. 4) the right side top center of LPRM/APRM Unit chassis. 5) the right side top center of LPRM Unit chassis Note) Right/left in above description means right/left when a person faces the front panel of the FLOW,LPRM/APRM, and LPRM Unit No resonances are identified below 50 Hz on the transmissibility plots. Several resonant peaks are identified above 50 Hz. As discussed above, resonances above the 50 Hz cutoff frequency are not considered consequential. The acceptable seismic test results confirm this conclusion. Resonant peaks are identified in the transmissibility plots at about 75 Hz in the side-to-side (SS) direction and at about 95 Hz in the front-to-back (FB) direction. The results of the transmissibility plots of the test specimens (the Flow unit, the LPRM/APRM unit, and the LPRM unit) can be compared to the transmissibility plot of the test fixture. This comparison shows that the test specimen responses are essentially the same as the test fixture response. Any resonant peaks in the fixture response are mirrored in the test specimen response. Therefore, the test specimens are moving with the fixture and any resonant peaks are a result of the test fixture				
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		Continued	and not the test specimens. The resonant peaks are sufficiently high and outside the frequency range of interest. Furthermore, examination of the survey accelerometer response during the seismic tests show that no filtering of test input occurred below the test facility standard practice 100 Hz frequency limit. Thus, Toshiba evaluates the Test Specimen Units and the power line panel do not show major resonance.		Continued		
11	50-52	6.3.2.Data Evaluation (2)Random Multifrequency Tests (5 OBEs and 1 SSE)	Figures in sections A.2.1 to A.2.5 show the TRS for OBE tests and Figures in Section A2.6 show Test Response Spectra for the SSE test. Figures A2.6.4 to A2.6.6 show the coherent plot of the SSE. Toshiba planned to conduct the seismic test with the RRS provided in Figure 4-5 of EPRI TR-107330 dated October 1997. The TRS listed in figures in Appendix A.2 of the Qualification Test Summary Report were achievable. Toshiba considers that exceedances below about 3.5 Hz are generally acceptable based on IEEE Std. 344 2004 Section 8.6.3.1(j) since there are clearly no resonances below 5 Hz. Toshiba evaluated the higher frequency area. Toshiba found that Figure 4-5 of a later version of EPRI TR-107330 is slightly different from Figure 4-5 in the original October 1997 version which is the basis for the current Toshiba RRS. Toshiba evaluated the difference. The later version (available from the EPRI website) provides Figure 4-5 with a narrow peak spectral band. Specifically, the 5% damped SSE response	Figures in sections A.2.1 to A.2.5 show the TRS for OBE tests and Figures in Section A2.6 show Test Response Spectra for the SSE test. Figures A2.6.4 to A2.6.6 show the coherent plot of the SSE. These test results show that the random multi frequency tests conditions were successfully applied to the Test Specimen Units, with the single exception of not meeting the peak loading for the SSE, based on table limits.	III	Detailed descriptions and a figure are added.	See DVR-E2-201 70928.

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			spectrum control points of Figure 4-5 of the later version of EPRI TR-107330 are (1 Hz, 0.42 g); (4.5 Hz, 14 g); (16 Hz, 14 g); (33 Hz,6.13 g); and (100 Hz, 6.13 g). The original version of Figure 4-5 includes a broader frequency. Specifically, the 5 % damped SSE response spectrum break points of this version of Figure 4-5 are (0.5 Hz, 0.1 g); (1 Hz, 0.8 g); (3 Hz, 14 g); (33 Hz, 14 g); (40 Hz, 7 g); and (100Hz, 7 g). The discussion here refers to the version of EPRI TR-107330 Figure 4-5 of the later version of EPRI TR-107330 as the "narrow" spectrum, and the other version of EPRI TR-107330 Figure 4-5 as the "broad" spectrum. Because of test table limitation of 9.8 g, Toshiba has had to take exception to the EPRI TR-107330 requirement of 14 g in the PRM testing. The PRM testing was conducted at a laboratory where the table could not satisfy the EPRI TR-107330 peak spectral limits. Specifically, the table could only satisfy a peak spectral demand of 9.8 g. PRM test results show that the "narrow" spectrum demand is satisfied with the following exceptions. • The 14 g peak in the narrow spectrum was above the table capacity. The table capacity produced a peak that exceeded 9.8 g. • Exceedances in the frequency lower than 3.5 Hz are acceptable based on Clause 8.6.3.1(j) of IEEE Std. 344-2004 since there are clearly no resonances below 5 Hz. • An additional exception to the "broad" EPRI TR-107330 spectrum				
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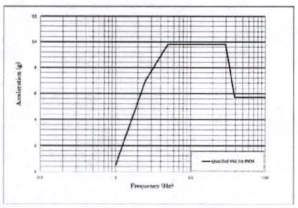
			demand would have to be taken for the exceedance at the peak above 30 Hz. Figure 6.3.1 shows the qualified SSE response of the PRM seismic test.  Figure 6.3.1 Qualified SSE for PRM				
		Continued			Continued		
12	56	6.4.2.1 EMI/RFI Emission Test	From 100 Hz to approximately 1200 Hz, the emission exceeded the limit shown in RG1.180R1.	From 100 Hz to 700 Hz, the emission exceeded the limit shown in RG1.180R1.	III	Data evaluation correction.	See DVR-E2-201 70928.
13	59	6.4.2.3 Surge Withstand Capability Test	·[Line and Neutral] and Ground, only for Ring Wave* *Note: IEC 61000-4-5 (for Combination Wave) does not require the test for "[Line and Neutral] and Ground." Only Edition 1 (1995) of IEC 61000-4-12 (for Ring Wave) required the test for "[Line and Neutral] and Ground," while later Editions of the same standard do not	·[Line and Neutral] and Ground, only for Ring Wave	III	Supplemental descriptions are added	See DVR-E2-201 70928.
14	60	6.4.2.3.Surge Withstand Capability Test	The surges were applied to the test points shown in Tables B10.1 and B10.2. The Test Specimen Units operated normally before,	The surges were applied to the test points shown in Tables B10.1 and B10.2. The Test Specimen Units operated normally	III	Detailed descriptions are	See DVR-E2-201

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			during, and after testing. Toshiba and the Test Lab cannot find the record of the impedance value used. R.G. 1.180 Revision 1 does not specify the impedance, and references IEEE Std. C62.41-1991. IEEE Std. C62.41 specifies 12 Ω for the Category B Location. Toshiba conducted the IEC 61000-4-12 test at Low Exposure for a Category B Location; therefore the impedance was likely 12 Ω. A HAEFLEY PIM 110 was used for the surge test and the factory default impedance is 12 Ω. The test was intended to be performed at 12 Ω, but Toshiba and the Test Lab cannot confirm the actual setting used. Test results show that the specimen passed the short circuit test that was performed. This leaves two possibilities. First, the test was actually performed at the 12 Ω setting, and there is no issue. This is the default setting of the test equipment and the most likely scenario. However, there is still a possibility that the test was performed with 30 Ω. For this case, the test results are not confirmed against 12 Ω for Category B location test that brings more energy to the test specimen. Toshiba considers that it should be assumed that 30 Ω was applied for the test to take conservative position for the appropriate evaluation in a situation where the impedance value cannot be confirmed. Toshiba considers that the assumption of 30 Ω is appropriate, because the PRM is designed to be connected to the end of the power supply system in nuclear power plants. Therefore, Toshiba assumes either impedance is workable, and	before, during, and after testing.		added	70928.
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Job No.	DCN No.	Rev. No.	Doc. Title, No. and Rev. No.
FPG	DCN-FPG-TRT-C51-0101-002	0	Qualification Test Summary Report, FPG-TRT-C51-0101 Rev.2

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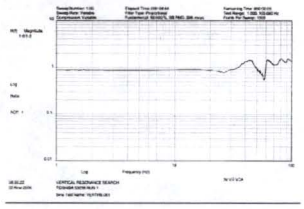
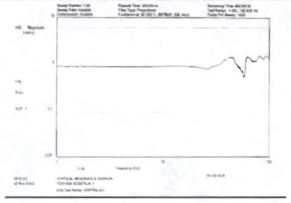
			that the higher impedance would not impact the surge withstand capabilities of the PRM.				
15	61-62	6.4.2.5.ESD Test	Temporary degradation or recoverable loss of function were identified when the ESD transients were applied to the rear panels, or the parts placed on these panels, which will not be exposed to ESD during normal operation. There is no reason for an operator to access the rear panels. Technicians accessing the rear panels will do so under work order, with the equipment bypassed. The work order will specify that grounded wrist straps are required. The back panels in the units are accessible only when locked cabinet doors are opened. Thus, the back panels are not normally exposed to ESD.	Temporary degradation or recoverable loss of function were identified when the ESD transients were applied to the rear panels, or the parts placed on these panels, which will not likely be exposed to ESD during normal operation.	None	Additional descriptions are added	Not required.
16	70	Figure A.1.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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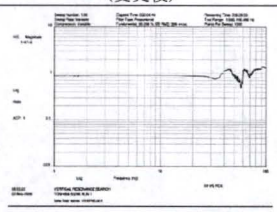
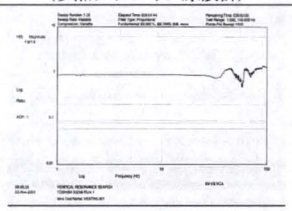
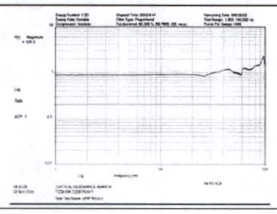
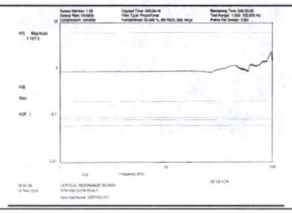
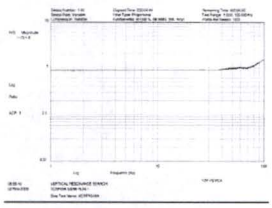
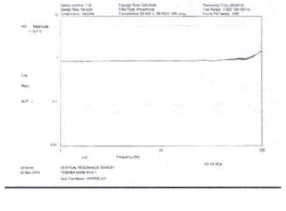
17	70	Figure A.1.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
18	71	Figure A.1.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
19	71	Figure A.1.4			None	Replace the figure with the clearer figure with grid lines.	Not required.

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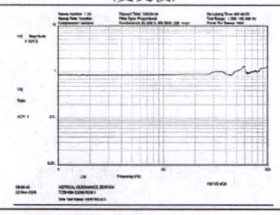
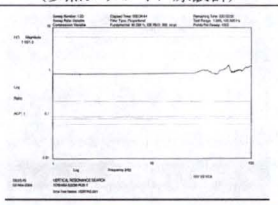
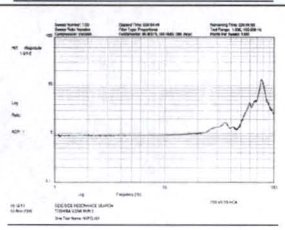
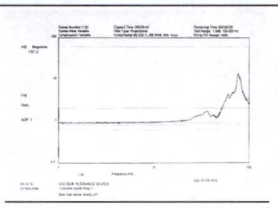
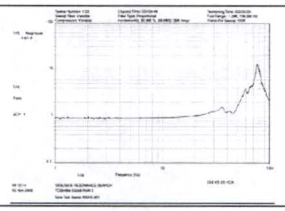
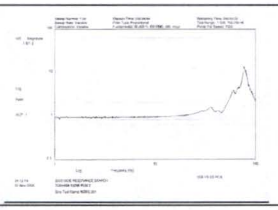
20	72	Figure A.1.5			None	Replace the figure with the clearer figure with grid lines.	Not required.
21	72	Figure A.1.6			None	Replace the figure with the clearer figure with grid lines.	Not required.
22	73	Figure A.1.7			None	Replace the figure with the clearer figure with grid lines.	Not required.

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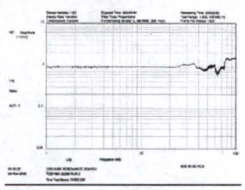
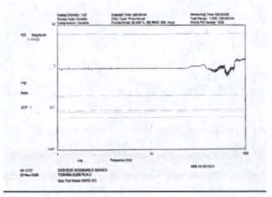
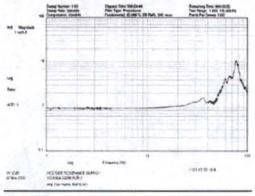
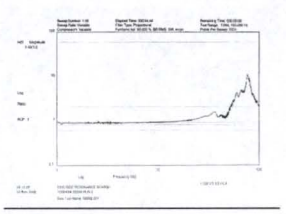
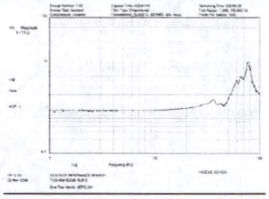
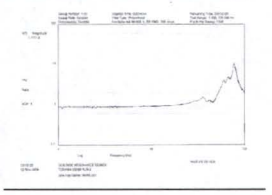
23	73	Figure A.1.8			None	Replace the figure with the clearer figure with grid lines.	Not required.
24	74	Figure A.1.9			None	Replace the figure with the clearer figure with grid lines.	Not required.
25	74	Figure A.1.10			None	Replace the figure with the clearer figure with grid lines.	Not required.

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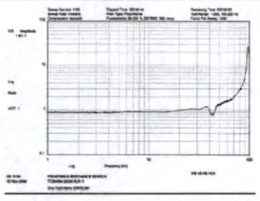
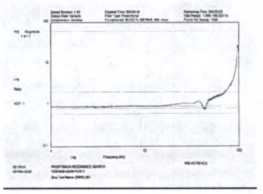
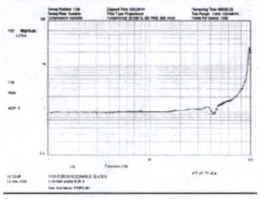
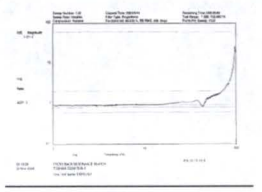
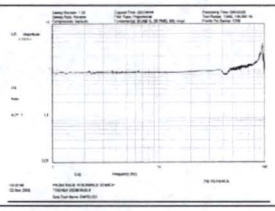
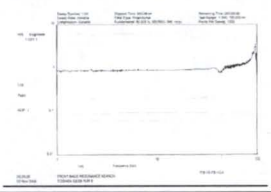
26	75	Figure A.1.11			None	Replace the figure with the clearer figure with grid lines.	Not required.
27	75	Figure A.1.12			None	Replace the figure with the clearer figure with grid lines.	Not required.
28	76	Figure A.1.13			None	Replace the figure with the clearer figure with grid lines.	Not required.

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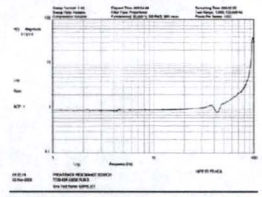
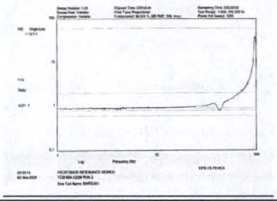
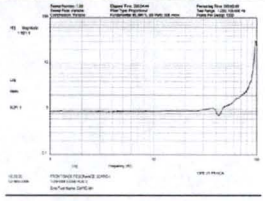
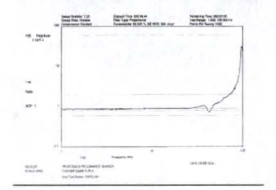
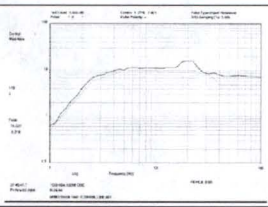
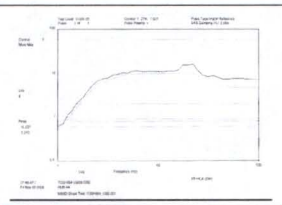
29	76	Figure A.1.14			None	Replace the figure with the clearer figure with grid lines.	Not required.
30	77	Figure A.1.15	 Figure A.1.15 LPRM Unit's spectrum for Horizontal (East to West) vibration	 Figure A.1.14 LPRM Unit's spectrum for Horizontal (East to West) vibration	None	Replace the figure with the clearer figure with grid lines. Error correction.	Not required.
31	78	Figure A.2.1.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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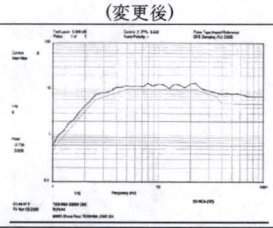
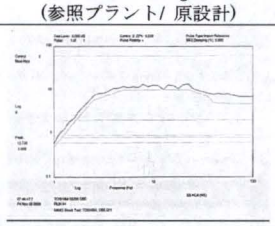
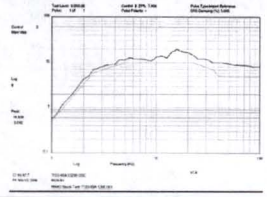
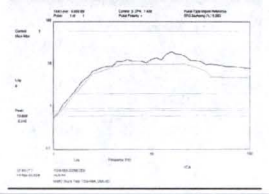
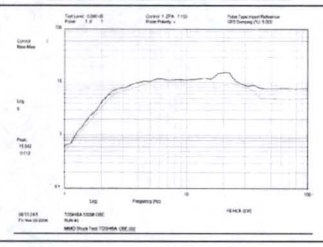
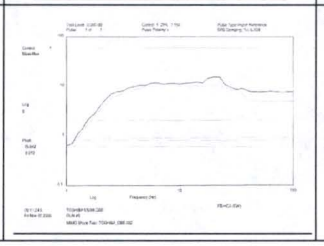
32	78	Figure A.2.1.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
33	79	Figure A.2.1.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
34	79	Figure A.2.2.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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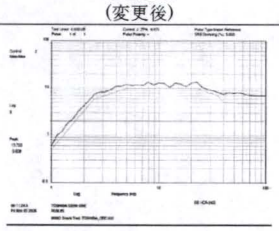
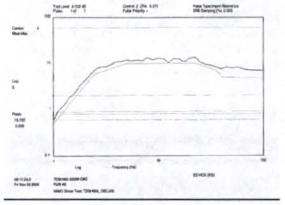
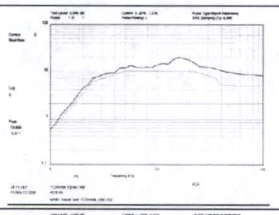
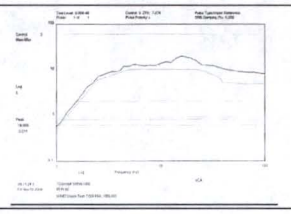
35	80	Figure A.2.2.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
36	80	Figure A.2.2.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
37	81	Figure A.2.3.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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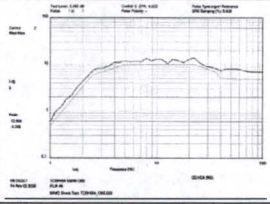
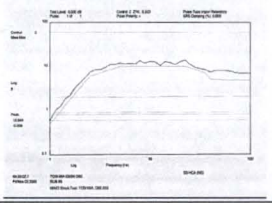
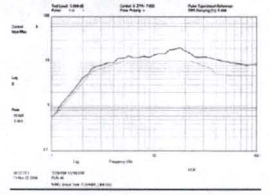
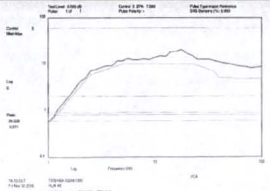
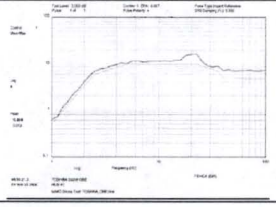
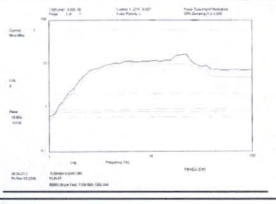
38	81	Figure A.2.3.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
39	82	Figure A.2.3.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
40	82	Figure A.2.4.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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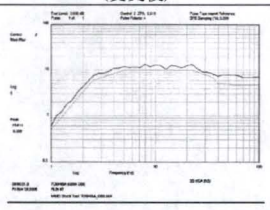
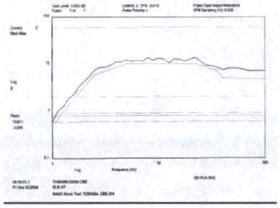
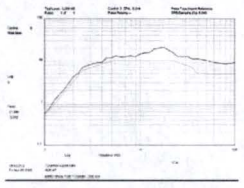
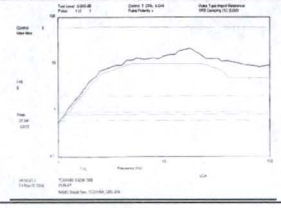
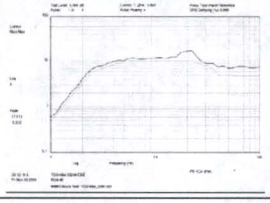
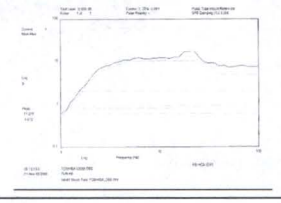
41	83	Figure A.2.4.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
42	83	Figure A.2.4.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
43	84	Figure A.2.5.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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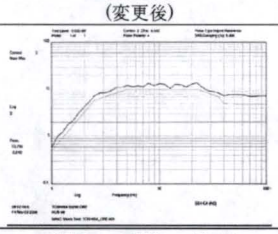
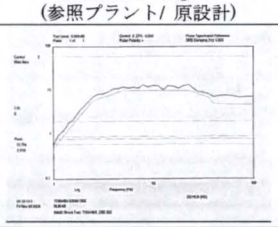
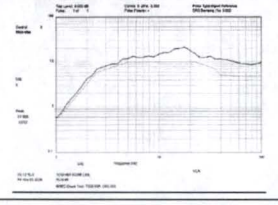
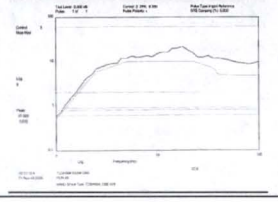
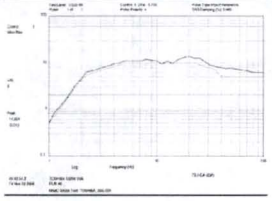
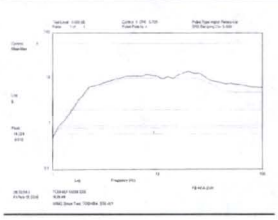
44	84	Figure A.2.5.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
45	85	Figure A.2.5.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
46	85	Figure A.2.6.1			None	Replace the figure with the clearer figure with grid lines.	Not required.

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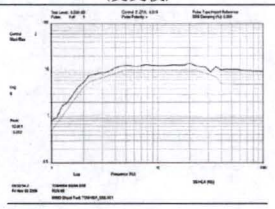
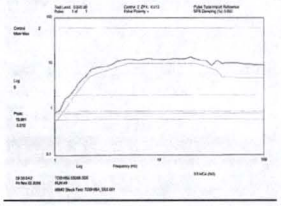
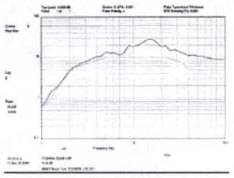
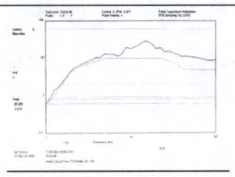
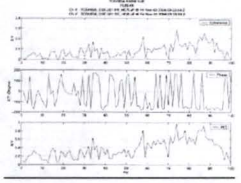
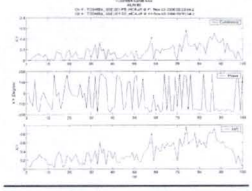
47	86	Figure A.2.6.2			None	Replace the figure with the clearer figure with grid lines.	Not required.
48	86	Figure A.2.6.3			None	Replace the figure with the clearer figure with grid lines.	Not required.
49	87	Figure A.2.6.4	 Figure A.2.6.4 Coherent Plot between Horizontal Axes (East to West and North to South).	 Figure 2.6.4 Coherent Plot between Horizontal Axes (East to West and North to South).	None	Replace the figure with the clearer figure with grid lines. Error correction.	Not required.

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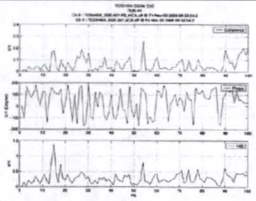
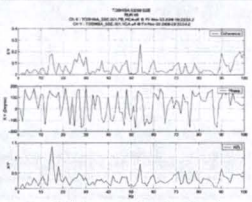
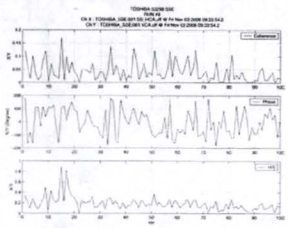
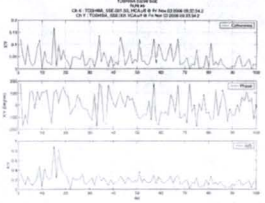
No.	Page	Item (改訂内容)	Current (変更後)	Reference/ Original (参照プラント/ 原設計)	Class (区分)	Reason (理由)	Verification (検証)
50	87	Figure A.2.6.5	 Figure A.2.6.5 Coherent Plot for Horizontal Axis (East to West) and Vertical Axis.	 Figure 2.6.5 Coherent Plot for Horizontal Axis (East to West) and Vertical Axis.	None	Replace the figure with the clearer figure with grid lines.	Not required.
51	88	Figure A.2.6.6	 Figure A.2.6.6 Coherent Plot for Horizontal Axis (North to South) and Vertical Axis.	 Figure 2.6.6 Coherent Plot for Horizontal Axis (North to South) and Vertical Axis.	None	Replace the figure with the clearer figure with grid lines.	Not required.

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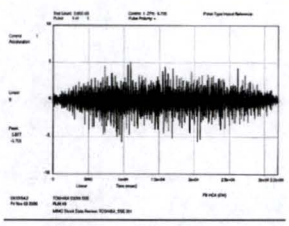
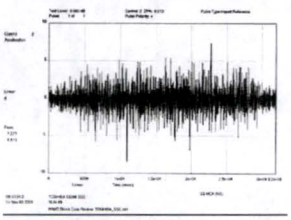
No.	Page	Item (改訂内容)	Current (変更後)	Reference/ Original (参照プラント/ 原設計)	Class (区分)	Reason (理由)	Verification (検証)
52	88	Figure A.2.6.7	 Figure A.2.6.7 Time History for SSE for Horizontal Axis (East to West)	[None]	None	Addition of the figure.	Not required.
53	89	Figure A.2.6.8	 Figure A.2.6.8 Time History for SSE for Horizontal Axis (North to South)	[None]	None	Addition of the figure.	Not required.

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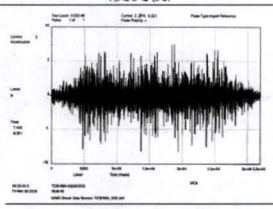
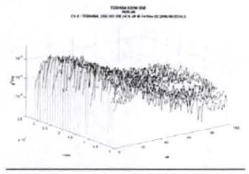
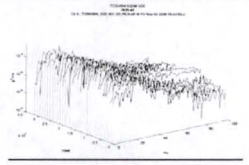
No.	Page	Item (改訂内容)	Current (変更後)	Reference/ Original (参照プラント/ 原設計)	Class (区分)	Reason (理由)	Verification (検証)
54	89	Figure A.2.6.9	 Figure A.2.6.9 Time History for SSE for Vertical Axis	[None]	None	Addition of the figure.	Not required.
55	90	Figure A.2.6.10	 Figure A.2.6.10 Time-interval PSD coherence plot for SSE for Horizontal Axis (East to West)	[None]	None	Addition of the figure.	Not required.
56	90	Figure A.2.6.11	 Figure A.2.6.11 Time-interval PSD coherence plot for SSE for Horizontal Axis (North to South)	[None]	None	Addition of the figure.	Not required.

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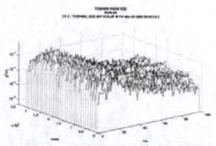
No.	Page	Item (改訂内容)	Current (変更後)	Reference/ Original (参照プラント/ 原設計)	Class (区分)	Reason (理由)	Verification (検証)
57	91	Figure A.2.6.12	 Figure 2.6.12 Time-interval PSD coherence plot for SSE for Vertical Axis	[None]	None	Addition of the figure.	Not required.
58	98	Table B.3.1	Test Point / Compliant with Specification Cable#10 (Line) / No (approximately 100Hz to approximately 1200Hz emission exceeds the limit) Cable#10 (Neutral) / No (approximately 100Hz to approximately 1200Hz emission exceeds the limit) Cable#10 (Ground) / Yes Cable#10 (Line) with choke-coil (100 mH) / Yes Cable#10 (Neutral) with choke-coil (100 mH) / Yes Cable#10 (Ground) with choke-coil (100 mH) / Yes Cable#10 (Line) with choke-coil (120 mH) / Yes Cable#10 (Neutral) with choke-coil (120 mH) / Yes Cable#10 (Ground) with choke-coil (120 mH) / Yes	Test Point / Compliant with Specification Cable#10 (Line) / No (approximately 100Hz to 700Hz emission exceeds the limit) Cable#10 (Neutral) / No (approximately 100Hz to 700Hz emission exceeds the limit) Cable#10 (Ground) / Yes Cable#10 (Line) with choke-coil (100 mH) / Yes (Note: Mitigation was re-calculated according to the peak amplitude at 60 Hz) Cable#10 (Neutral) with choke-coil (100 mH) / Yes (Note: Mitigation was re-calculated according to the peak amplitude at 60 Hz) Cable#10 (Ground) with choke-coil (100 mH) / Yes Cable#10 (Line) with choke-coil (120 mH) / Yes (Note: Mitigation was re-calculated according to the peak amplitude at 60 Hz) Cable#10 (Neutral) with choke-coil (120 mH) / Yes (Note: Mitigation was re-calculated according to the peak amplitude at 60 Hz) Cable#10 (Ground) with choke-coil (120 mH) / Yes	III	Data evaluation correction.	See DVR-E2-201 70928.
59	98	Table B.3.2	Frequency (Hz) / Peak Amplitude (dB micro A) / CE101 Limit (dB micro A) / CE101 Relaxed Limit (dB micro A) / Margin (dB micro A) / Compliant with Specification 60.499 / 122.9 / 119.9 / 122.9 / 0.0 / Yes 180.614 / 122.1 / 108.8 / 111.8 / 10.3 / No 299.465 / 120.3 / 103.7 / 106.7 / 13.6 / No 419.315 / 117.6 / 100.2 / 103.2 / 74.3 / No 540.910 / 113.4 / 97.7 / 100.7 / 12.7 / No 660.572 / 107.2 / 95.6 / 98.6 / 8.6 / No 780.040 / 98.6 / 93.9 / 96.9 / 1.7 / No 899.038 / 96.8 / 92.5 / 95.5 / 1.1 / No CE101 Relaxed Limit = CE101 Limit + 20Log(Fundamental Current) Margin = Peak Amplitude – CE101 Relaxed Limit	Frequency (Hz) / Peak Amplitude (dB micro A) / CE101 Limit (Approximation) (dB micro A) / CE101 Limit (Corrected with actual amplitude at 60 Hz) (dB micro A) / Margin (dB micro A) / Compliant with Specification 60.499 / 122.9 / 119.9 / 122.9 / - / - 180.614 / 122.1 / 108.8 / 111.8 / 10.3 / No 299.465 / 120.3 / 103.7 / 106.7 / 13.6 / No 419.315 / 117.6 / 100.2 / 103.2 / 74.3 / No 540.910 / 113.4 / 97.7 / 100.7 / 12.7 / No 660.572 / 107.2 / 95.6 / 98.6 / 8.6 / No 780.040 / 98.6 / 93.9 / 96.9 / 1.7 / No 899.038 / 96.8 / 92.5 / 95.5 / 1.1 / No	III	Clarification of description and data evaluation correction.	See DVR-E2-201 70928.

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61	100	Table B.3.4	Frequency (Hz) / Peak Amplitude (dB micro A) / CE101 Limit (dB micro A) / CE101 Relaxed Limit (dB micro A) / Margin (dB micro A) / Compliant with Specification 60.6 / 122.7 / 119.9 / 122.7 / 0.0 / Yes 180.4 / 111.3 / 106.8 / 111.8 / -0.3 / Yes 299.9 / 101.5 / 103.7 / 106.5 / -5.0 / Yes 419.4 / 94.3 / 100.2 / 103.0 / -8.7 / Yes 540.9 / 87.8 / 97.7 / 100.5 / -12.7 / Yes 560.5 / 81.7 / 97.4 / 100.2 / -36.6 / Yes 780.0 / 74.9 / 93.9 / 96.7 / -21.8 / Yes 899.5 / 67.6 / 92.5 / 95.3 / -27.7 / Yes 530.0 / 86.0 / 97.9 / 100.7 / -34.7 / Yes 192.7 / 71.8 / 108.1 / 110.9 / -39.1 / Yes 125.7 / 67.1 / 112.5 / 115.3 / -48.2 / Yes 129.1 / 65.8 / 112.2 / 115.0 / -49.4 / Yes 132.6 / 65.1 / 111.9 / 114.7 / -49.6 / Yes 110.8 / 66.7 / 113.8 / 116.6 / -49.9 / Yes 75.0 / 69.6 / 117.7 / 120.5 / -50.9 / Yes 82.5 / 68.3 / 116.8 / 119.6 / -51.3 / Yes 86.5 / 67.2 / 116.3 / 119.1 / -51.9 / Yes 90.3 / 66.6 / 115.8 / 118.6 / -52.0 / Yes 77.6 / 66.5 / 117.4 / 120.2 / -53.7 / Yes 84.1 / 64.7 / 116.6 / 119.4 / -54.7 / Yes CE101 Relaxed Limit = CE101 Limit + 20Log(Fundamental Current) Margin = Peak Amplitude – CE101 Relaxed Limit	Frequency (Hz) / Peak Amplitude (dB micro A) / CE101 Limit (Approximation) (dB micro A) / CE101 Limit (Corrected with 60 Hz actual Data) (dB micro A) / Margin (dB micro A) / Compliant with Specification 60.6 / 122.7 / 119.9 / 122.7 / - / - 180.4 / 111.3 / 106.8 / 111.8 / -0.3 / Yes 299.9 / 101.5 / 103.7 / 106.5 / -5.0 / Yes 419.4 / 94.3 / 100.2 / 103.0 / -8.7 / Yes 540.9 / 87.8 / 97.7 / 100.5 / -12.7 / Yes 560.5 / 81.7 / 95.8 / 98.4 / -17.0 / Yes 780.0 / 74.9 / 93.9 / 96.7 / -21.8 / Yes 899.5 / 67.6 / 92.5 / 95.3 / -27.7 / Yes 530.0 / 86.0 / 97.9 / 100.7 / -34.7 / Yes 192.7 / 71.8 / 108.1 / 110.9 / -39.1 / Yes 125.7 / 67.1 / 112.5 / 115.3 / -48.2 / Yes 129.1 / 65.8 / 112.2 / 115.0 / -48.4 / Yes 132.6 / 65.1 / 111.9 / 114.7 / -49.6 / Yes 110.8 / 66.7 / 113.8 / 116.6 / -49.9 / Yes 75.0 / 69.6 / 117.7 / 120.5 / -50.9 / Yes 82.5 / 68.3 / 116.8 / 119.6 / -51.3 / Yes 86.5 / 67.2 / 116.3 / 119.1 / -51.9 / Yes 90.3 / 66.6 / 115.8 / 118.6 / -52.0 / Yes 77.6 / 66.5 / 117.4 / 120.2 / -53.7 / Yes 84.1 / 64.7 / 116.6 / 119.4 / -54.7 / Yes	III	Clarification of description and data evaluation correction.	See DVR-E2-201 70928.

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Margin = Peak Amplitude – CE101 Relaxed Limit
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<tr><td>124.3</td><td>65.4</td><td>112.6</td><td>115.2</td><td>-49.8</td><td>Yes</td></tr>
<tr><td>131.2</td><td>66.1</td><td>112.0</td><td>114.6</td><td>-48.5</td><td>Yes</td></tr>
<tr><td>180.4</td><td>109.3</td><td>108.8</td><td>111.4</td><td>-2.0</td><td>Yes</td></tr>
<tr><td>299.9</td><td>99.8</td><td>103.7</td><td>106.3</td><td>-6.4</td><td>Yes</td></tr>
<tr><td>419.5</td><td>92.4</td><td>100.2</td><td>102.8</td><td>-10.3</td><td>Yes</td></tr>
<tr><td>530.0</td><td>65.3</td><td>97.9</td><td>100.5</td><td>-35.2</td><td>Yes</td></tr>
<tr><td>540.9</td><td>85.9</td><td>97.7</td><td>100.3</td><td>-14.4</td><td>Yes</td></tr>
<tr><td>660.4</td><td>79.3</td><td>95.6</td><td>98.2</td><td>-18.9</td><td>Yes</td></tr>
<tr><td>779.9</td><td>73.0</td><td>93.9</td><td>96.5</td><td>-23.4</td><td>Yes</td></tr>
<tr><td>899.3</td><td>66.4</td><td>92.5</td><td>95.1</td><td>-28.8</td><td>Yes</td></tr>
</table>
</td><td>III</td><td>Clarification of description and data evaluation correction.</td><td>See DVR-E2-201 70928.</td></tr>
<tr><td>63</td><td>103</td><td>Table B.3.6</td><td>
<table>
<tr><th>Frequency (Hz)</th><th>Peak Amplitude (dB micro A)</th><th>CE101 Limit (dB micro A)</th><th>CE101 Relaxed Limit (dB micro A)</th><th>Margin (dB micro A)</th><th>Compliant with Specification</th></tr>
<tr><td>60.6</td><td>122.4</td><td>119.9</td><td>122.4</td><td>0.0</td><td>Yes</td></tr>
<tr><td>74.3</td><td>70.0</td><td>117.8</td><td>120.4</td><td>-50.4</td><td>Yes</td></tr>
<tr><td>75.2</td><td>64.7</td><td>117.7</td><td>120.3</td><td>-55.6</td><td>Yes</td></tr>
<tr><td>77.4</td><td>69.5</td><td>117.4</td><td>120.0</td><td>-50.5</td><td>Yes</td></tr>
<tr><td>79.0</td><td>64.7</td><td>117.2</td><td>119.8</td><td>-55.1</td><td>Yes</td></tr>
<tr><td>80.7</td><td>63.7</td><td>117.0</td><td>119.5</td><td>-55.8</td><td>Yes</td></tr>
<tr><td>83.7</td><td>67.1</td><td>116.6</td><td>119.2</td><td>-52.1</td><td>Yes</td></tr>
<tr><td>87.6</td><td>65.8</td><td>116.2</td><td>118.7</td><td>-52.9</td><td>Yes</td></tr>
<tr><td>125.3</td><td>66.4</td><td>112.5</td><td>115.1</td><td>-48.7</td><td>Yes</td></tr>
<tr><td>132.1</td><td>64.2</td><td>112.0</td><td>114.5</td><td>-50.3</td><td>Yes</td></tr>
<tr><td>166.9</td><td>84.0</td><td>109.6</td><td>112.2</td><td>-28.2</td><td>Yes</td></tr>
<tr><td>180.4</td><td>109.3</td><td>108.8</td><td>111.4</td><td>-2.1</td><td>Yes</td></tr>
<tr><td>299.9</td><td>99.7</td><td>103.7</td><td>106.2</td><td>-6.5</td><td>Yes</td></tr>
<tr><td>419.4</td><td>92.0</td><td>100.2</td><td>102.8</td><td>-10.8</td><td>Yes</td></tr>
<tr><td>530.0</td><td>63.3</td><td>97.9</td><td>100.4</td><td>-37.1</td><td>Yes</td></tr>
<tr><td>540.9</td><td>85.3</td><td>97.7</td><td>100.2</td><td>-14.9</td><td>Yes</td></tr>
<tr><td>660.3</td><td>78.5</td><td>95.6</td><td>98.2</td><td>-19.7</td><td>Yes</td></tr>
<tr><td>780.0</td><td>71.6</td><td>93.9</td><td>96.5</td><td>-24.7</td><td>Yes</td></tr>
<tr><td>899.3</td><td>65.0</td><td>92.5</td><td>95.1</td><td>-30.1</td><td>Yes</td></tr>
</table>
CE101 Relaxed Limit = CE101 Limit + 20Log(Fundamental Current)
Margin = Peak Amplitude – CE101 Relaxed Limit
</td><td>
<table>
<tr><th>Frequency (Hz)</th><th>Peak Amplitude (dB micro A)</th><th>CE101 Limit (Approximation) (dB micro A)</th><th>CE101 Limit (Corrected with 60 Hz actual Data) (dB micro A)</th><th>Margin (dB micro A)</th><th>Compliant with Specification</th></tr>
<tr><td>60.6</td><td>122.4</td><td>119.9</td><td>122.4</td><td>-</td><td>-</td></tr>
<tr><td>74.3</td><td>70.0</td><td>117.8</td><td>120.3</td><td>-50.383</td><td>Yes</td></tr>
<tr><td>75.2</td><td>64.7</td><td>117.7</td><td>120.2</td><td>-55.484</td><td>Yes</td></tr>
<tr><td>77.4</td><td>69.5</td><td>117.4</td><td>119.9</td><td>-50.445</td><td>Yes</td></tr>
<tr><td>79.0</td><td>64.7</td><td>117.2</td><td>119.7</td><td>-55.034</td><td>Yes</td></tr>
<tr><td>80.7</td><td>63.7</td><td>117.0</td><td>119.5</td><td>-55.869</td><td>Yes</td></tr>
<tr><td>83.7</td><td>67.1</td><td>116.6</td><td>119.1</td><td>-51.979</td><td>Yes</td></tr>
<tr><td>87.6</td><td>65.8</td><td>116.2</td><td>118.7</td><td>-52.93</td><td>Yes</td></tr>
<tr><td>125.3</td><td>66.4</td><td>112.5</td><td>115.0</td><td>-48.603</td><td>Yes</td></tr>
<tr><td>132.1</td><td>64.2</td><td>112.0</td><td>114.5</td><td>-50.308</td><td>Yes</td></tr>
<tr><td>166.9</td><td>84.0</td><td>109.6</td><td>112.1</td><td>-28.082</td><td>Yes</td></tr>
<tr><td>180.4</td><td>109.3</td><td>108.8</td><td>111.3</td><td>-2.012</td><td>Yes</td></tr>
<tr><td>299.9</td><td>99.7</td><td>103.7</td><td>106.2</td><td>-6.555</td><td>Yes</td></tr>
<tr><td>419.4</td><td>92.0</td><td>100.2</td><td>102.7</td><td>-10.690</td><td>Yes</td></tr>
<tr><td>530.0</td><td>63.3</td><td>97.9</td><td>100.4</td><td>-37.082</td><td>Yes</td></tr>
<tr><td>540.9</td><td>85.3</td><td>97.7</td><td>100.2</td><td>-14.928</td><td>Yes</td></tr>
<tr><td>660.3</td><td>78.5</td><td>95.6</td><td>98.1</td><td>-19.602</td><td>Yes</td></tr>
<tr><td>780.0</td><td>71.6</td><td>93.9</td><td>96.4</td><td>-24.805</td><td>Yes</td></tr>
<tr><td>899.3</td><td>65.0</td><td>92.5</td><td>95.0</td><td>-30.066</td><td>Yes</td></tr>
</table>
</td><td>III</td><td>Clarification of description and data evaluation correction.</td><td>See DVR-E2-201 70928.</td></tr>
</table>

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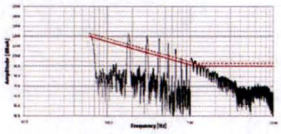
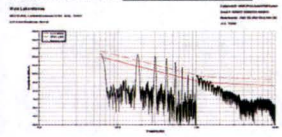
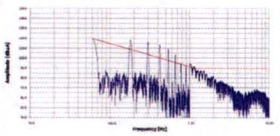
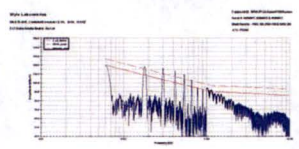
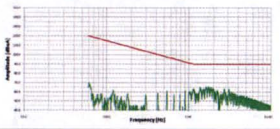
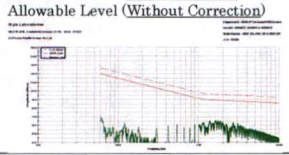
64	103	Figure B.3.1	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
65	103	Figure B.3.2	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
66	104	Figure B.3.3	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.

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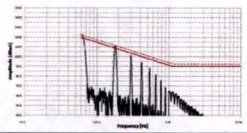
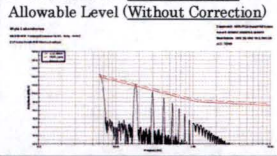
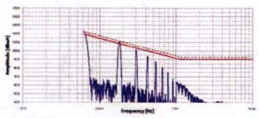
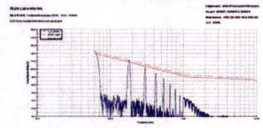
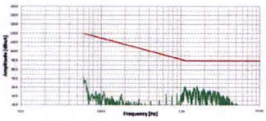
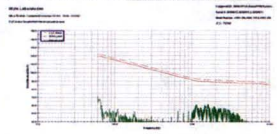
67	104	Figure B.3.4	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
68	105	Figure B.3.5	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
69	105	Figure B.3.6	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.

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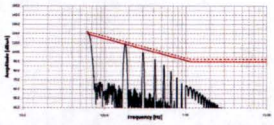
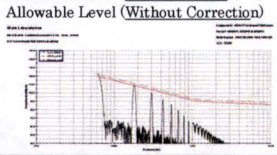
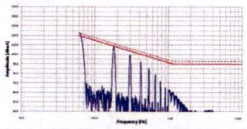
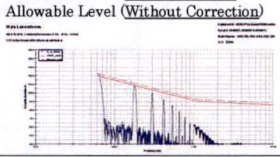
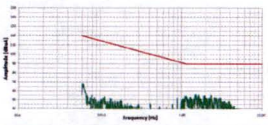
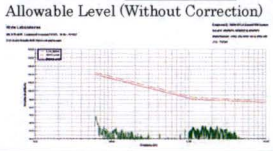
70	106	Figure B.3.7	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
71	106	Figure B.3.8	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
72	107	Figure B.3.9	Allowable Level (CE101 Relaxed Limit) Allowable Level (CE101 Limit) 	Allowable Level (With Correction) Allowable Level (Without Correction) 	III	Data evaluation correction.	See DVR-E2-201 70928.
73	118	Table B10.1	Note: The ring wave test was expected to be performed with 12 Ω coupling impedance. This is the default setting of the test equipment and the most likely scenario. However, this is not described in the record and it cannot be reconfirmed that the test was performed with 12 Ω, not 30 Ω. If the possibility that the test was performed with 30 Ω cannot be fully denied, in this possibility, the test results are	[None]	III	Detailed description added.	See DVR-E2-201 70928.

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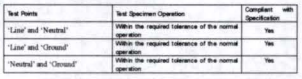
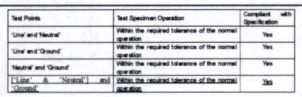
		Continued	not confirmed against 12 Ω that brings more energy to the test specimen. Toshiba considers that it should be assumed that 30 Ω was applied for the test to take conservative position for the appropriate evaluation in a situation where the impedance value cannot be confirmed. Toshiba considers that the assumption of 30 Ω is appropriate, because the PRM is designed to be connected to the end of the power supply system in nuclear power plants. Therefore, Toshiba assumes either impedance is workable, and that the higher impedance would not impact the surge withstand capabilities of the PRM.			Continued	
74	118	Table B10.2			III	Error correction	See DVR-E2-201 70928.
75	129	Table B13.1	Between pin L and pin R of the output connector( )of HNS518 AO module installed in BSL1 of FLOW Unit Between pin L and pin R of the output connector( )of HNS516 AO module installed in BSL2 of FLOW Unit Between pin L and pin R of the output connector( )of HNS517 AO module installed in BSL3 of FLOW Unit	Between pin JJ and pin PP of the output connector( )of HNS518 AO module installed in BSL1 of LPRM/APRM Unit Between pin JJ and pin PP of the output connector( )of HNS516 AO module installed in BSL2 of LPRM/APRM Unit Between pin A and pin E of the output connector( )of HNS515 AO module installed in BSL3 of LPRM/APRM Unit	None	Editorial error correction.	Not required.

Job No.	DCN No.	Rev. No.	Doc. Title, No. and Rev. No.
FPG	DCN-FPG-TRT-C51-0101-002	0	Qualification Test Summary Report, FPG-TRT-C51-0101 Rev.2

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76	130	Table B13.2	Between pin L and pin R of the output connector( )[a,c] of HNS518 AO module installed in BSL1 of FLOW Unit Between pin L and pin R of the output connector( )[a,c] of HNS516 AO module installed in BSL2 of FLOW Unit Between pin L and pin R of the output connector( )[a,c] of HNS517 AO module installed in BSL3 of FLOW Unit	Between pin JJ and pin PP of the output connector( )[a,c] of HNS518 AO module installed in BSL1 of LPRM/APRM Unit Between pin JJ and pin PP of the output connector( )[a,c] of HNS516 AO module installed in BSL2 of LPRM/APRM Unit Between pin A and pin E of the output connector( )[a,c] of HNS515 AO module installed in BSL3 of LPRM/APRM Unit	None	Editorial error correction.	Not required.