




ELECTRICAL RESEARCH AND DEVELOPMENT ASSOCIATION

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TEST REPORT

Sheet no. 1 of 5

NAME AND ADDRESS OF CUSTOMER Diamond Power Transformer Limited Plot No. – 101 / B / 7, Road No. 2, G.I.D.C. Estate, Road No. 2, Village Ranoli – 391 350, Dist : Vadodara.	REPORT NO : EPEI/01/09-10/223 DATED : 08/05/2009 CUSTOMER REF.: DPTL/RNL/ERDA/01 DATED : 20/04/2009 DATE OF TESTING 07/05/2009	
SAMPLE DESCRIPTION Transformer Rated kVA: 10 MVA Voltage ratio: 33 kV / 6.9 kV Current ratio: 174.95 A / 836.74 A Phases: 3 Vector group: Dyn11	SAMPLE IDENTIFICATION Serial No.: DPTL - 6621 ERDA ID No.: EPEI - 070	
TEST DETAILS Harmonic measurements in the no load voltage and current of the transformer manufactured by Diamond Power Transformer Limited, Vadodara.	TEST SPECIFICATION As per customer's requirement.	
RESULTS: As per enclosures Note: Measurements were carried out at the customer's premises. Only the measurements asked for by the customer have been carried out. Measurement witnessed by: Mr. R M Mistry, IOCL. Mr. Vishal D. Panchal, DPTL.		
PREPARED BY 	CHECKED BY 	APPROVED BY 

- Note : 1. This report relates only to the particular sample received in good condition for testing at customer's premises.
2. This report cannot be reproduced in part under any circumstances.
3. Publication of this report requires prior permission in writing from Director, ERDA.
4. Only the measurements asked for by the customer have been carried out.

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Report no. EPEI/01/09-10/ 223 dated: 08/05/2009

Sheet no.2 of 5

1.0 EQUIPMENT DETAILS:

D) LMG 500 Precision Power Analyzer

2.0 DETAILS OF MEASUREMENT:

The arrangement for measurements is given in figure 1. Measurements were carried out to find out the harmonic content in the no-load voltage and current at 33 kV side of the transformer under test.

Harmonics in voltage and current were measured and analyzed using the LMG 500 power analyzer at 90%, 100% and 110% of the rated voltage. The voltage and current signals were fed to the recording device through CT's and PT's. The voltage and current waveforms were analyzed for different order of harmonics (upto the 25th) using the Fast Fourier Transform (FFT) algorithm. The total harmonic distortion (THD %) was then computed as given below:

$$THD = \sqrt{\sum_{n=2}^{n=25} h_n^2}$$

Where, n is the order of harmonics,

h_n is the individual harmonic expressed as a percentage of fundamental.

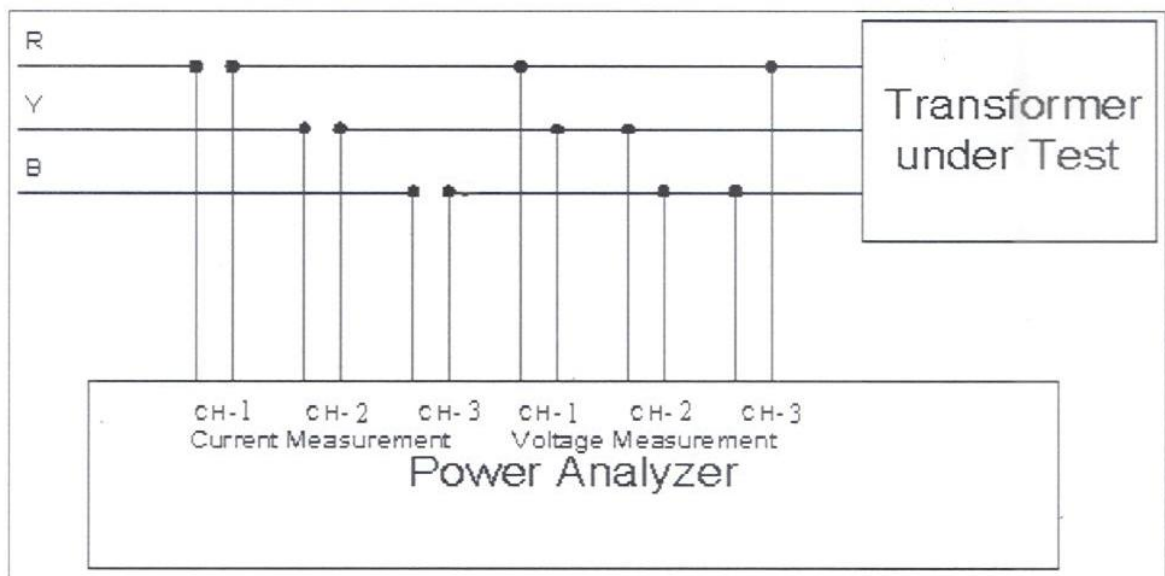


Figure 1 Arrangement for harmonic measurement

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V. R. Mehta



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Report no. EPEI/01/09-10/ 223 dated: 08/05/2009 Sheet no.3 of 5

Harmonics in voltage and current (as a percentage of fundamental)

Date of measurement: 07/05/2009

Location: 33 kV side of 10 MVA, 33 kV / 6.9 kV transformer (Sr. No. DPTL - 6621)
 (ERDA ID No.: EPEI - 070) energized at 90% of rated voltage.

Harm No.	Current I_R in %	Current I_R in Amps	Voltage V_{RY} in %	Current I_Y in %	Current I_Y in Amps	Voltage V_{YB} in %	Current I_B in %	Current I_B in Amps	Voltage V_{BR} in %
1	100.00	0.36	100.00	100.00	0.31	100.00	100.00	0.32	100.00
2	0.38	0.00	0.03	0.64	0.00	0.03	0.31	0.00	0.03
3	7.00	0.03	1.83	13.01	0.04	0.07	5.57	0.02	1.81
4	0.19	0.00	0.04	0.45	0.00	0.05	0.22	0.00	0.02
5	16.79	0.06	5.05	18.49	0.06	4.77	17.76	0.06	6.79
6	0.19	0.00	0.01	0.06	0.00	0.01	0.16	0.00	0.02
7	3.21	0.01	0.97	2.42	0.01	0.84	1.75	0.01	1.83
8	0.03	0.00	0.05	0.06	0.00	0.04	0.06	0.00	0.02
9	0.60	0.00	0.26	1.46	0.00	1.35	0.72	0.00	1.65
10	0.03	0.00	0.03	0.03	0.00	0.04	0.03	0.00	0.07
11	0.52	0.00	0.50	0.95	0.00	1.15	0.56	0.00	1.65
12	0.03	0.00	0.01	0.03	0.00	0.04	0.03	0.00	0.03
13	0.08	0.00	0.57	0.67	0.00	1.04	0.72	0.00	1.65
14	0.00	0.00	0.01	0.03	0.00	0.02	0.03	0.00	0.03
15	0.27	0.00	0.70	0.35	0.00	0.92	0.53	0.00	1.67
16	0.03	0.00	0.03	0.00	0.00	0.03	0.03	0.00	0.05
17	0.60	0.00	0.89	0.32	0.00	0.83	0.50	0.00	1.74
18	0.03	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.04
19	0.58	0.00	0.79	0.03	0.00	0.86	0.69	0.00	1.69
20	0.03	0.00	0.03	0.00	0.00	0.03	0.03	0.00	0.06
21	0.99	0.00	0.96	0.25	0.00	0.85	0.91	0.00	1.85
22	0.03	0.00	0.03	0.00	0.00	0.03	0.03	0.00	0.07
23	1.07	0.00	0.93	0.10	0.00	1.05	1.22	0.00	2.02
24	0.05	0.00	0.04	0.00	0.00	0.04	0.06	0.00	0.08
25	1.23	0.00	0.99	0.16	0.00	1.03	1.32	0.00	2.07
THD %	18.61		5.93	22.83		5.73	18.87		9.02
Parameter measured	0.37		30.00 kV	0.32		30.08 kV	0.32		29.41 kV

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Harmonics in voltage and current (as a percentage of fundamental)

Date of measurement: 07/05/2009

Location: 33 kV side of 10 MVA, 33 kV / 6.9 kV transformer (Sr. No. DPTL - 6621)
 (ERDA ID No.: EPEI - 070) energized at 100% of rated voltage.

Harm No.	Current I _R in %	Current I _R in Amps	Voltage V _{RY} in %	Current I _Y in %	Current I _Y in Amps	Voltage V _{YB} in %	Current I _B in %	Current I _B in Amps	Voltage V _{BR} in %
1	100.00	0.81	100.00	100.00	0.68	100.00	100.00	0.67	100.00
2	0.44	0.00	0.07	0.56	0.00	0.15	0.37	0.00	0.08
3	3.88	0.03	2.09	16.26	0.11	1.21	11.68	0.08	0.91
4	0.14	0.00	0.08	0.41	0.00	0.09	0.27	0.00	0.01
5	24.17	0.20	7.28	25.56	0.17	6.50	24.74	0.17	8.91
6	0.18	0.00	0.04	0.06	0.00	0.04	0.19	0.00	0.06
7	6.94	0.06	1.09	5.93	0.04	0.52	5.65	0.04	0.61
8	0.04	0.00	0.05	0.07	0.00	0.02	0.02	0.00	0.05
9	0.77	0.01	0.45	0.93	0.01	1.27	0.64	0.00	1.75
10	0.02	0.00	0.02	0.03	0.00	0.04	0.01	0.00	0.04
11	0.31	0.00	0.66	0.16	0.00	0.94	0.35	0.00	1.62
12	0.00	0.00	0.01	0.02	0.00	0.02	0.02	0.00	0.02
13	0.98	0.01	0.35	0.96	0.01	0.93	0.29	0.00	1.27
14	0.01	0.00	0.03	0.01	0.00	0.03	0.01	0.00	0.07
15	0.23	0.00	0.74	0.06	0.00	0.76	0.23	0.00	1.52
16	0.01	0.00	0.02	0.02	0.00	0.02	0.01	0.00	0.03
17	0.21	0.00	0.73	0.03	0.00	0.74	0.26	0.00	1.50
18	0.01	0.00	0.03	0.00	0.00	0.03	0.01	0.00	0.06
19	0.14	0.00	0.66	0.06	0.00	0.73	0.18	0.00	1.41
20	0.01	0.00	0.03	0.00	0.00	0.04	0.01	0.00	0.07
21	0.36	0.00	0.76	0.18	0.00	0.70	0.27	0.00	1.48
22	0.01	0.00	0.03	0.00	0.00	0.03	0.02	0.00	0.07
23	0.37	0.00	0.67	0.13	0.00	0.88	0.52	0.00	1.58
24	0.02	0.00	0.04	0.01	0.00	0.04	0.02	0.00	0.09
25	0.46	0.00	0.79	0.04	0.00	0.82	0.55	0.00	1.63
THD %	25.49		7.91	30.90		7.14	27.97		10.09
Parameter measured	0.83		33.37 kV	0.71		33.56 kV	0.70		33.07 kV

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Harmonics in voltage and current (as a percentage of fundamental)

Date of measurement: 07/05/2009

Location: 33 kV side of 10 MVA, 33 kV / 6.9 kV transformer (Sr. No. DPTL - 6621)
 (ERDA ID No.: EPEI - 070) energized at 110% of rated voltage.

Harm No.	Current I _R in %	Current I _R in Amps	Voltage V _{RY} in %	Current I _Y in %	Current I _Y in Amps	Voltage V _{YB} in %	Current I _B in %	Current I _B in Amps	Voltage V _{BR} in %
1	100.00	0.96	100.00	100.00	1.02	100.00	100.00	0.91	100.00
2	0.17	0.00	0.20	0.14	0.00	0.26	0.13	0.00	0.22
3	5.66	0.05	13.40	2.94	0.03	3.10	2.99	0.03	15.29
4	0.03	0.00	0.06	0.08	0.00	0.16	0.10	0.00	0.22
5	4.15	0.04	33.89	7.11	0.07	41.32	7.48	0.07	52.45
6	0.04	0.00	0.07	0.02	0.00	0.21	0.03	0.00	0.21
7	5.78	0.06	27.56	8.06	0.08	26.65	4.81	0.04	15.81
8	0.05	0.00	0.15	0.06	0.00	0.20	0.05	0.00	0.37
9	2.34	0.02	9.71	0.54	0.01	2.35	3.06	0.03	12.38
10	0.04	0.00	0.22	0.03	0.00	0.21	0.05	0.00	0.05
11	0.25	0.00	6.56	1.73	0.02	8.58	2.17	0.02	14.09
12	0.03	0.00	0.20	0.02	0.00	0.12	0.03	0.00	0.35
13	1.56	0.02	11.66	1.67	0.02	10.36	0.62	0.01	2.50
14	0.01	0.00	0.14	0.02	0.00	0.14	0.01	0.00	0.13
15	1.18	0.01	6.38	0.26	0.00	3.07	1.54	0.01	7.09
16	0.02	0.00	0.09	0.01	0.00	0.03	0.02	0.00	0.12
17	0.67	0.01	2.76	0.54	0.01	3.00	1.24	0.01	5.34
18	0.01	0.00	0.11	0.01	0.00	0.03	0.02	0.00	0.14
19	0.59	0.01	3.79	0.36	0.00	5.19	0.34	0.00	3.22
20	0.01	0.00	0.08	0.01	0.00	0.10	0.02	0.00	0.11
21	0.11	0.00	2.05	0.30	0.00	2.15	0.29	0.00	3.75
22	0.01	0.00	0.02	0.00	0.00	0.02	0.01	0.00	0.03
23	0.22	0.00	0.56	0.24	0.00	1.60	0.39	0.00	1.61
24	0.01	0.00	0.01	0.01	0.00	0.06	0.01	0.00	0.07
25	0.28	0.00	0.57	0.24	0.00	1.24	0.23	0.00	1.21
THD %	9.64		49.28	11.44		51.65	10.34		60.83
Parameter measured	0.97		39.59 kV	1.03		41.01 kV	0.91		38.54 kV

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