

# ILC/PT Final Report

RMS Clamp Meter / NAPT-CLAMP-309

Date of Issue: 03/30/2009

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This report presents the measurement results submitted to NAPT along with associated uncertainties. Two comparisons are presented. First, each measurement data point is compared against the established reference value, both in the value reported and the uncertainty associated with that value. Second, each measurement data point is compared to all other test participants along with a comparison of their reported uncertainties.

The ILC/PT consisted of 10 set points. Your organization submitted results for 10 of which 10 had  $E_n$  values greater than -1 and less than 1. Most accreditation bodies require the  $E_n$  value to be between -1 and 1 to be considered a satisfactory performance in an ILC/PT.

To add clarity and simplification in understanding the results, several additional indicators are included for each reported data point. These include: Participant  $E_n$  values, S/U (satisfactory/unsatisfactory) ratings, I W O (in/within/out) ratings, Z-score, mean value of satisfactory results and mean values of all participant reported results. Each set point also has a graph showing additional illustration of the measurement.

The Final Report indicates the performance and capability of multiple laboratories performing like calibrations on a single type of artifact. Results also give each participant a basis for evaluation and perhaps improvement of their calibration performance.

All NAPT ILC/PTs are conducted in accordance with ISO/IEC Guide 43-1 and ILAC-G13:2000, requirements for proficiency testing providers.

Thank you for participating in this evaluation. We hope this process has given you a better understanding of your processes. We look forward to your participation in additional NAPT-Sponsored ILC/PTs.

If you have any comments, concerns, or questions regarding this ILC/PT please do not hesitate to contact the Managing Director who is responsible for the content of this report.

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**Organization Participating:**  
**Results Reported To:**  
**ILC/PT Performed By:**  
**Date of Participation:**

**Digital Measurement Metrology**  
**Raj Sharma**  
**Raj Sharma**  
**03/02/2009**



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## FINAL REPORT

RMS Clamp Meter/NAPT-CLAMP-309  
Digital Measurement Metrology

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Your organization has been identified as **Lab: B24252** throughout the report.

All artifacts used in this ILC/PT are commercially available instruments, chosen based on their ability to provide the wide characterization and spectrum needed. Specific nominal set points for measurements were determined prior to distribution of the artifact(s). A description of the artifacts is listed below.

Model	Serial Number	Attribute	Manufacturer
337	96940051	AC DC Low Freq	Fluke

Participants were instructed to acquire measurements at predefined set points using their standard calibration procedures.

Established reference values were established in accordance with NAPT Quality Procedure 200-306 and NAPT work instruction 304-1. For additional guidance on this report, please refer to NAPT's Supplemental Guide to Interpretation of Reports, available for download at [www.proficiency.org](http://www.proficiency.org).

The final results presented here may be different from the values issued in your Preliminary Report. The reason is because during the course of each ILC/PT, thorough technical reviews are conducted by NAPT's Technical Director and the Technical Advisor(s) assigned to the ILC/PT. This is done to assure test integrity and look for trends and/or anomalies in the data. By performing these reviews on a scheduled basis we are better able to assist you in the event prompt corrective action is necessary. Any change in the established reference value is based on those reviews.

**Notes / Table Descriptors:** *The following bullets are meant to assist reader in reviewing tables.*

- Values are rounded to the resolution of the reference data. Rounding does not effect the data analysis and is for reporting purposes only
- All uncertainties are at (or normalized to) K=2 (coverage factor associated with a 2-sigma, 95%, normal distribution)
- $E_n = (\text{Participant's Reported Value} - \text{Reference Value}) / \text{SQRT}(\text{Participant's Reported Uncertainty}^2 + \text{Reference Uncertainty}^2)$
- **S** (Satisfactory): Participant's Computed  $E_n$  is within range of +1 to -1
- **U** (Unsatisfactory): Participant's Computed  $E_n$  is outside range of +1 to -1
- **I** (In Range): Participant's Reported Value falls in range of Reference Uncertainty
- **W** (Within Range): Participant's Reported Value and Reported Uncertainty overlaps range of Reference Value  $\pm$  Reference Uncertainty
- **O** (Out of Range): neither Participant's Reported Value nor Uncertainty falls in range of (Reference Value  $\pm$  Reference Uncertainty)
- One star "\*" present indicates that the test value is an outlier and falls outside +/- 2 Standard Deviations from the Mean. Two stars "\*\*" present indicates that the test/lab was manually excluded from the calculations and is considered an extreme outlier. . These indicators do not indicate pass or fail performance.
- Z-Score = (Participant's Reported Value - Mean Reference Value) / Standard Deviation
- Blue Text Indicates Revised Data / Red Values Indicate  $E_n$  is greater than one



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Analysis of the data Digital Measurement Metrology submitted to NAPT is shown below. In this table, your reported values are compared against the established reference values only.

Individual performance indicators include:

- Your measurement data at each nominal set point
- Reference values and uncertainties of test artifact(s)
- Participant's  $E_n$  values, S/U (satisfactory/unsatisfactory) ratings, IWO (in/within/out of range) ratings and Z score

Measurement Description	Reported Value / Reference Value	Reported Uncertainty / Reference Uncertainty	$E_n$	S/U	IWO	Z Score
1) DC Voltage 150V	149.8 / 149.8	0.1 / 0.0	0.00	S	I	0.95
2) AC Voltage 150V – 60Hz	149.8 / 149.8	0.1 / 0.1	0.11	S	I	0.32
3) DC Current 100A	99.9 / 99.7	0.3 / 0.6	0.33	S	I	1.84
4) DC Current 200A	200.5 / 199.9	0.5 / 1.5	0.36	S	I	2.70
5) DC Current 500A	502.0 / 500.8	1.2 / 3.1	0.35	S	I	1.90
6) AC Current 100A – 60Hz	100.1 / 100.0	0.3 / 0.8	0.16	S	I	1.04
7) AC Current 190A – 400Hz	190.5 / 190.5	1.0 / 3.2	-0.01	S	I	-0.12
8) AC Current 300A – 400Hz	301.1 / 301.2	1.5 / 4.4	-0.02	S	I	-0.27
9) AC Current 500A – 60Hz	503.3 / 502.4	1.2 / 4.5	0.20	S	I	1.76
10) Resistance 100Ω	100.5 / 100.5	0.1 / 0.1	0.00	S	I	0.00

In the following pages, your reported values are compared to the values reported by other participants enrolled in this ILC/PT. For each nominal set point, mean values of all satisfactory results and mean values of all participant reported results are presented.



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## FINAL REPORT: BLOCK COMPARISON

**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 1) DC Voltage 150V

Discipline: Electrical - DC/LF Voltage - DC

Nominal Value: 150.0

Measurement Units: V

Established Reference Value: 149.8

Established Reference Uncertainty: 0.0

Mean Value (Satisfactory Results): 149.8

Mean Uncertainty (Satisfactory Results): 0

Mean Value (All Participants): 149.8

Mean Uncertainty (All Participants): 0

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	149.8	0.0	0.00	S	I	0.95
A04217	149.8	0.0	0.00	S	I	0.95
A40500	149.8	0.0	0.00	S	I	0.95
*A50057	149.8	0.1	0.00	S	I	Over 10
A52328	149.8	0.0	0.00	S	I	0.95
A60938	149.8	0.0	0.00	S	I	0.95
A62808	149.8	0.0	0.00	S	I	0.95
*B11952	149.8	0.1	0.00	S	I	Over 10
B20417	149.8	0.0	0.00	S	I	0.95
B24252	149.8	0.1	0.00	S	I	0.95
B60805	149.8	0.2	0.00	S	I	0.95
B63318	149.8	0.0	0.00	S	I	0.95



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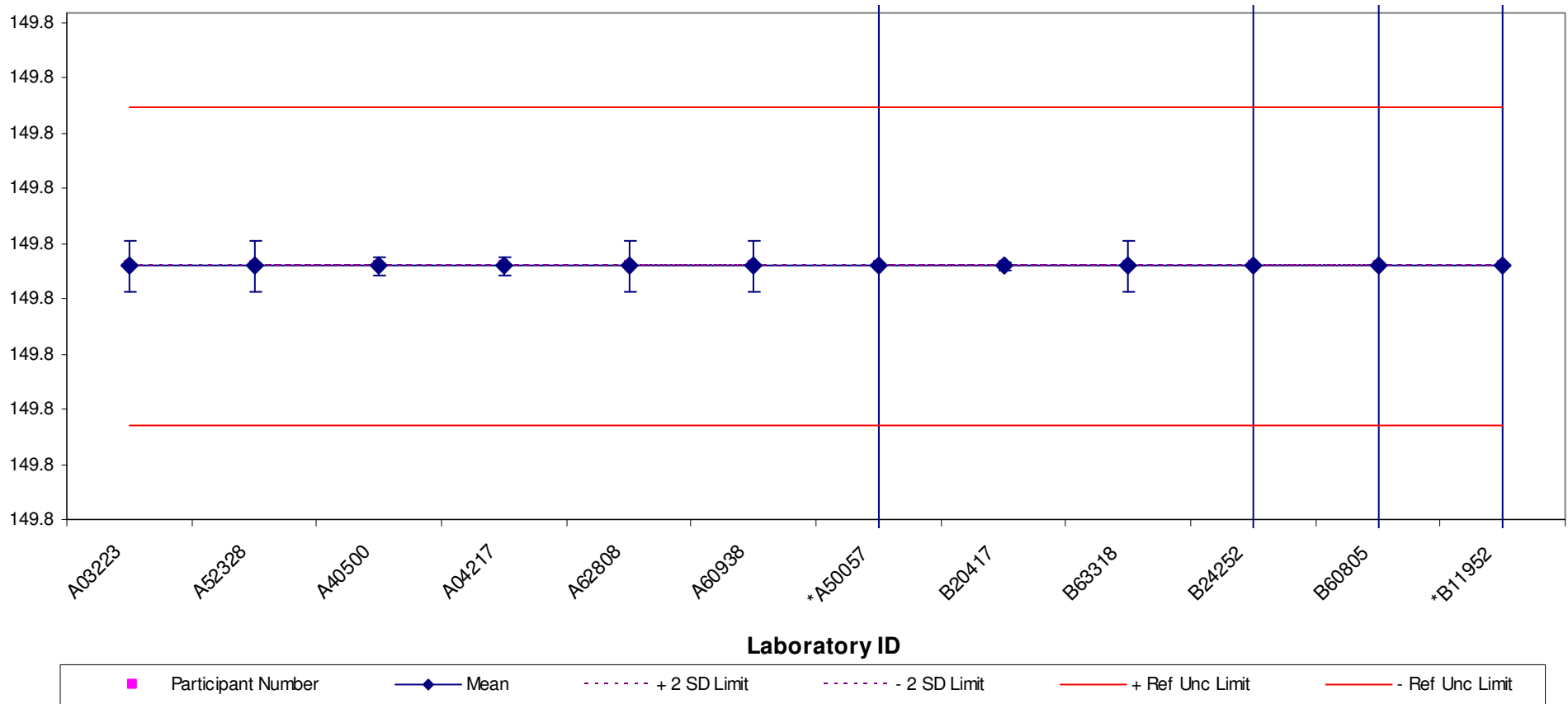
RMS Clamp Meter /NAPT-CLAMP-309  
Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 1) DC Voltage 150V

### BLOCK COMPARISON:





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**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 2) AC Voltage 150V – 60Hz

Discipline: Electrical - DC/LF Voltage - AC

Nominal Value: 150.0

Measurement Units: V

Established Reference Value: 149.8

Established Reference Uncertainty: 0.1

Mean Value (Satisfactory Results): 149.8

Mean Uncertainty (Satisfactory Results): 0.1

Mean Value (All Participants): 149.8

Mean Uncertainty (All Participants): 0.1

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	149.8	0.0	0.16	S	I	0.32
*A04217	149.9	0.1	0.99	S	W	3.48
A40500	149.8	0.1	0.09	S	I	0.32
*A50057	149.7	0.1	-0.78	S	W	-2.85
A52328	149.8	0.0	0.16	S	I	0.32
A60938	149.8	0.0	0.16	S	I	0.32
A62808	149.8	0.0	0.16	S	I	0.32
*B11952	149.7	0.1	-0.78	S	W	-2.85
B20417	149.8	0.0	0.17	S	I	0.32
B24252	149.8	0.1	0.11	S	I	0.32
B60805	149.8	0.2	0.05	S	I	0.32
B63318	149.8	0.0	0.16	S	I	0.32



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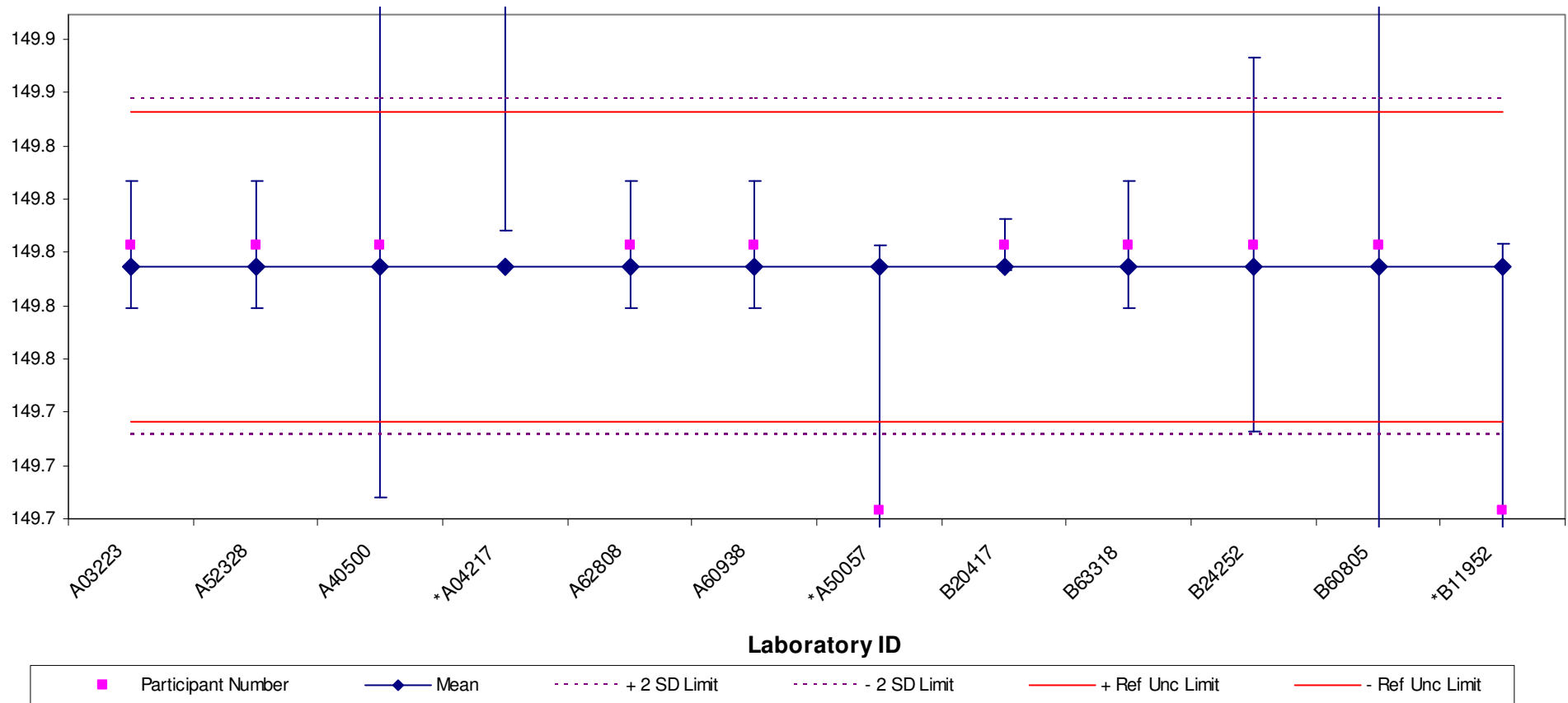
RMS Clamp Meter / NAPT-CLAMP-309  
Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 2) AC Voltage 150V – 60Hz

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**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 3) DC Current 100A

Discipline: Electrical - DC/LF Current - DC

Nominal Value: 100.0

Measurement Units: A

Established Reference Value: 99.7

Established Reference Uncertainty: 0.6

Mean Value (Satisfactory Results): 99.7

Mean Uncertainty (Satisfactory Results): 0.6

Mean Value (All Participants): 99.7

Mean Uncertainty (All Participants): 0.6

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	99.7	0.6	0.03	S	I	0.24
A04217	99.5	0.6	-0.19	S	I	-1.36
*A40500	99.4	0.6	-0.29	S	I	-2.16
A50057	99.7	0.9	0.03	S	I	0.24
A52328	99.8	0.6	0.14	S	I	1.04
A60938	99.6	0.6	-0.08	S	I	-0.56
A62808	99.7	0.6	0.03	S	I	0.24
B11952	99.5	0.9	-0.15	S	I	-1.36
*B20417	100.0	0.6	0.36	S	I	2.64
B24252	99.9	0.3	0.33	S	I	1.84
B60805	99.7	0.7	0.03	S	I	0.24
B63318	99.6	0.6	-0.08	S	I	-0.56





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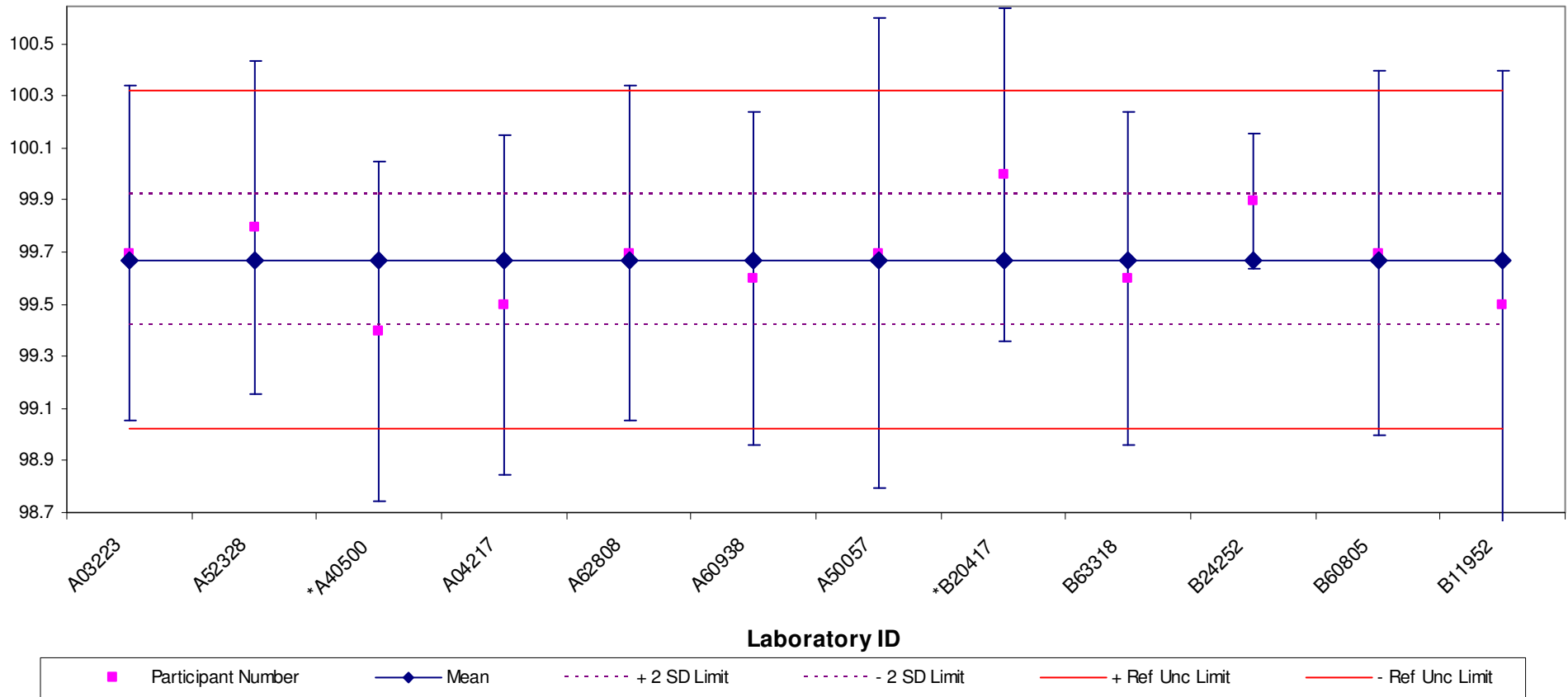
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Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 3) DC Current 100A

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**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 4) DC Current 200A

Discipline: Electrical - DC/LF Current - DC

Nominal Value: 200.0

Measurement Units: A

Established Reference Value: 199.9

Established Reference Uncertainty: 1.5

Mean Value (Satisfactory Results): 199.9

Mean Uncertainty (Satisfactory Results): 1.4

Mean Value (All Participants): 199.9

Mean Uncertainty (All Participants): 1.4

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	200.2	1.6	0.13	S	I	1.30
A04217	199.9	1.6	-0.01	S	I	-0.09
*A40500	199.5	1.6	-0.19	S	I	-1.95
A50057	199.6	1.5	-0.15	S	I	-1.49
A52328	200.2	1.6	0.13	S	I	1.30
A60938	200.0	1.6	0.04	S	I	0.37
A62808	200.1	1.6	0.08	S	I	0.84
B11952	199.6	1.5	-0.15	S	I	-1.49
B20417	199.9	1.6	-0.01	S	I	-0.09
*B24252	200.5	0.5	0.36	S	I	2.70
B60805	199.9	0.8	-0.01	S	I	-0.09
B63318	199.8	1.6	-0.05	S	I	-0.56



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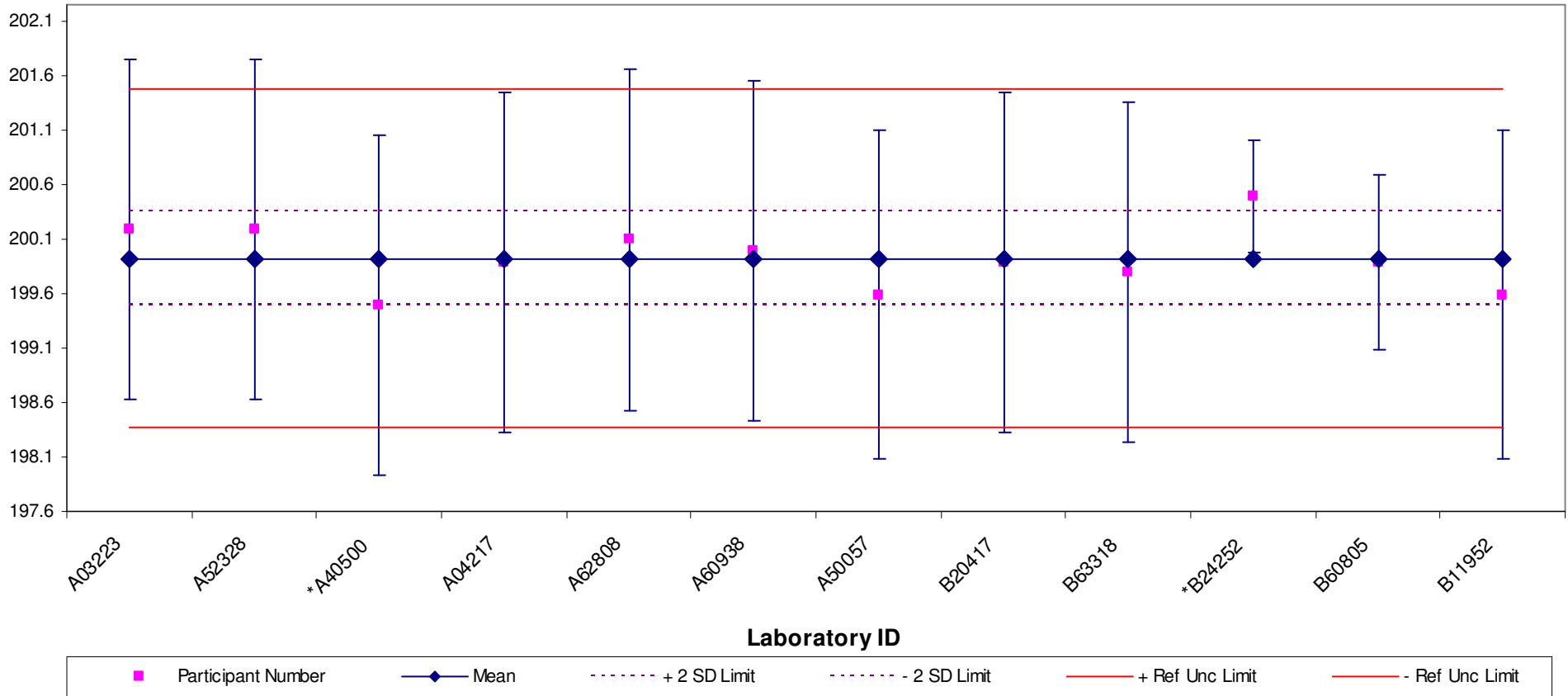
RMS Clamp Meter /NAPT-CLAMP-309  
Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 4) DC Current 200A

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**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 5) DC Current 500A

Discipline: Electrical - DC/LF Current - DC

Nominal Value: 500.0

Measurement Units: A

Established Reference Value: 500.8

Established Reference Uncertainty: 3.1

Mean Value (Satisfactory Results): 500.9

Mean Uncertainty (Satisfactory Results): 2.8

Mean Value (All Participants): 500.9

Mean Uncertainty (All Participants): 2.8

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	501.5	3.1	0.15	S	I	1.08
A04217	500.2	3.1	-0.15	S	I	-1.05
A40500	500.1	3.1	-0.17	S	I	-1.21
A50057	500.2	3.1	-0.15	S	I	-1.05
A52328	501.4	3.1	0.13	S	I	0.92
A60938	500.8	3.1	-0.01	S	I	-0.07
A62808	501.7	3.1	0.20	S	I	1.41
B11952	500.1	3.1	-0.17	S	I	-1.21
B20417	501.3	3.1	0.11	S	I	0.75
B24252	502.0	1.2	0.35	S	I	1.90
B60805	500.9	1.4	0.02	S	I	0.10
B63318	500.3	3.1	-0.12	S	I	-0.88



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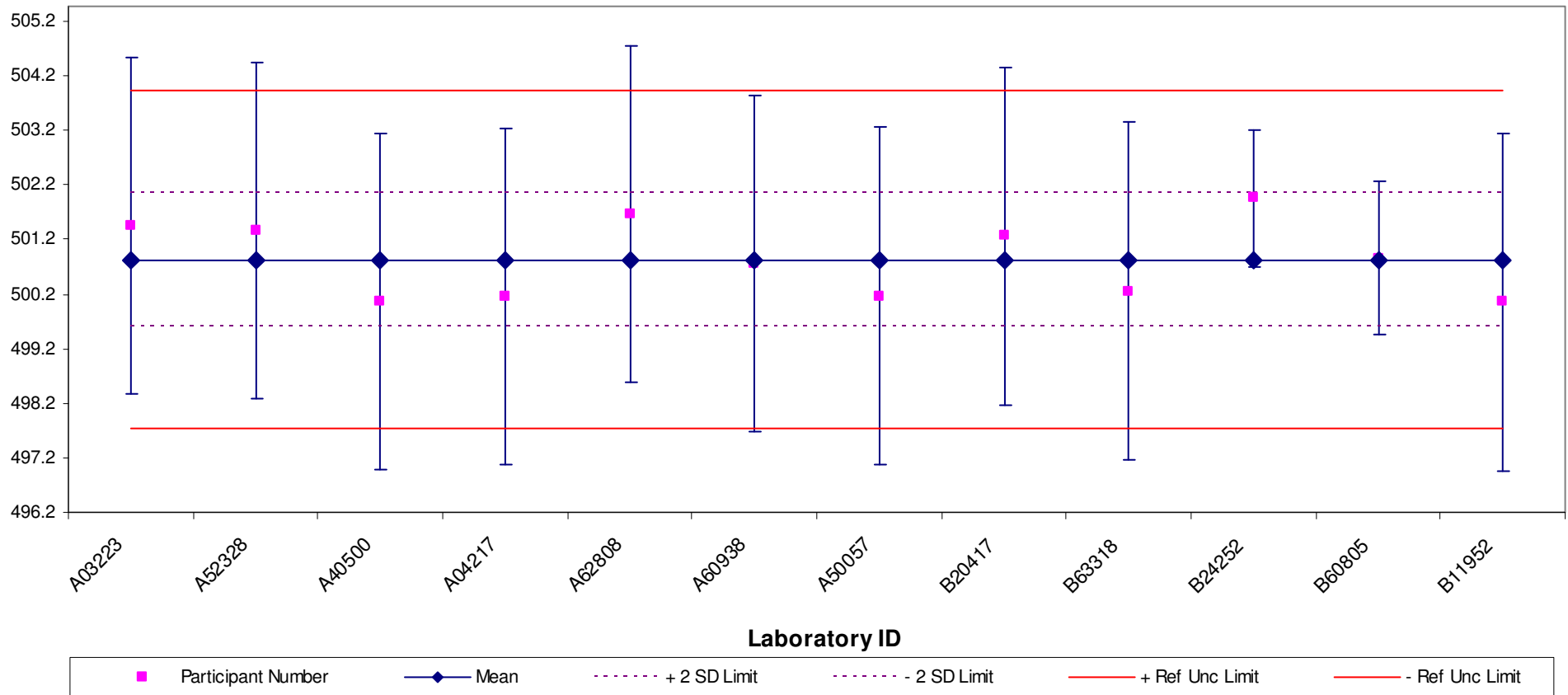
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Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 5) DC Current 500A

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## FINAL REPORT: BLOCK COMPARISON

**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 6) AC Current 100A – 60Hz

Discipline: Electrical - DC/LF Current - AC

Nominal Value: 100.0

Measurement Units: A

Established Reference Value: 100.0

Established Reference Uncertainty: 0.8

Mean Value (Satisfactory Results): 100

Mean Uncertainty (Satisfactory Results): 0.8

Mean Value (All Participants): 100

Mean Uncertainty (All Participants): 0.8

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	100.1	0.8	0.12	S	I	1.04
A04217	99.8	0.9	-0.13	S	I	-1.19
A40500	99.7	0.9	-0.22	S	I	-1.93
A50057	99.9	1.0	-0.05	S	I	-0.44
A52328	100.1	0.8	0.12	S	I	1.04
A60938	99.9	0.8	-0.05	S	I	-0.44
A62808	100.2	0.8	0.21	S	I	1.78
B11952	99.8	1.0	-0.12	S	I	-1.18
B20417	100.1	0.8	0.12	S	I	1.04
B24252	100.1	0.3	0.16	S	I	1.04
B60805	100.0	0.7	0.04	S	I	0.30
B63318	99.8	0.8	-0.14	S	I	-1.19



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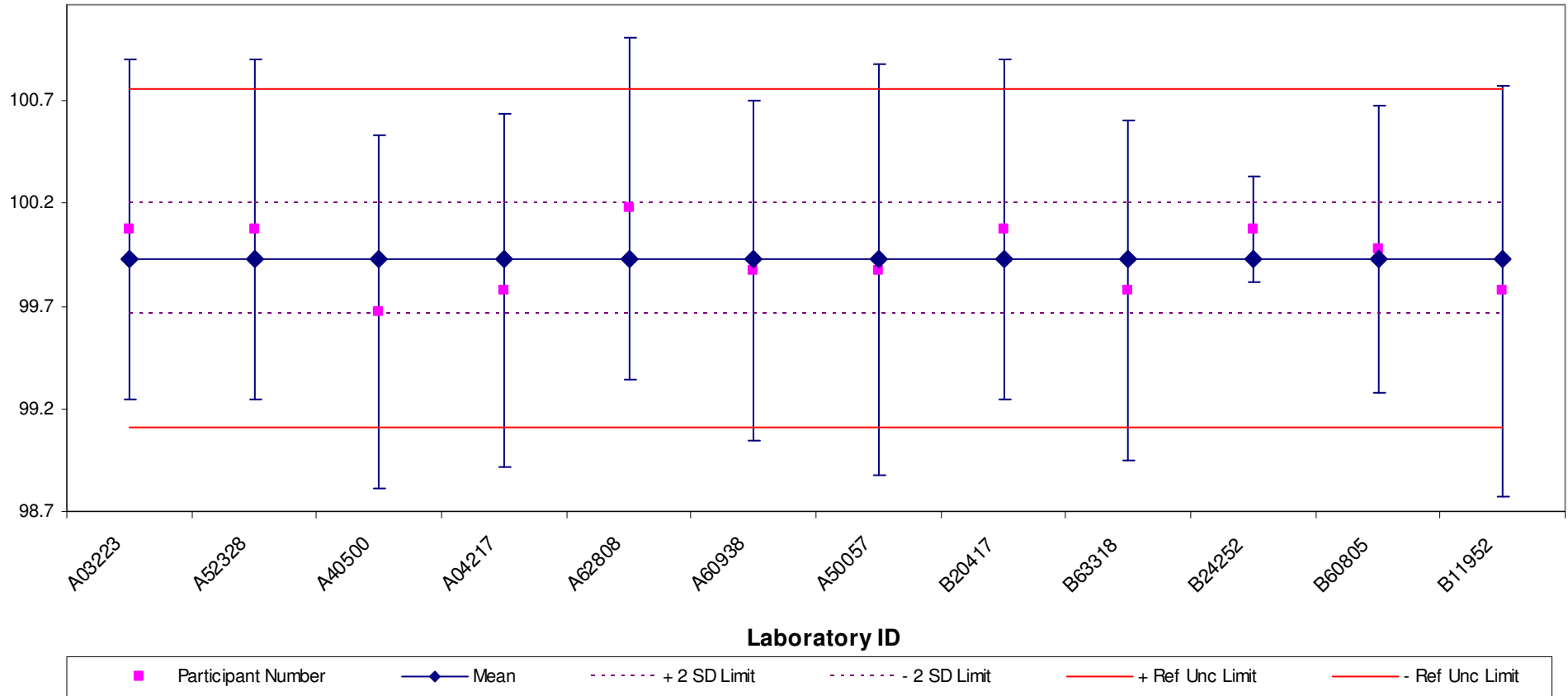
RMS Clamp Meter /NAPT-CLAMP-309  
Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 6) AC Current 100A – 60Hz

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RMS Clamp Meter/NAPT-CLAMP-309  
Digital Measurement Metrology

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 7) AC Current 190A – 400Hz

Discipline: Electrical - DC/LF Current - AC

Nominal Value: 190.0

Measurement Units: A

Established Reference Value: 190.5

Established Reference Uncertainty: 3.2

Mean Value (Satisfactory Results): 190.5

Mean Uncertainty (Satisfactory Results): 2.8

Mean Value (All Participants): 190.5

Mean Uncertainty (All Participants): 2.8

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	190.7	3.3	0.04	S	I	1.07
A04217	190.3	3.3	-0.05	S	I	-1.30
A40500	190.2	3.3	-0.07	S	I	-1.90
A50057	190.3	2.8	-0.05	S	I	-1.30
A52328	190.7	3.3	0.04	S	I	1.07
A60938	190.3	3.3	-0.05	S	I	-1.30
A62808	190.7	3.3	0.04	S	I	1.07
*B11952	190.1	2.8	-0.10	S	I	-2.49
B20417	190.6	3.3	0.02	S	I	0.47
B24252	190.5	1.0	-0.01	S	I	-0.12
B60805	190.5	0.8	-0.01	S	I	-0.12
B63318	190.6	3.3	0.02	S	I	0.47





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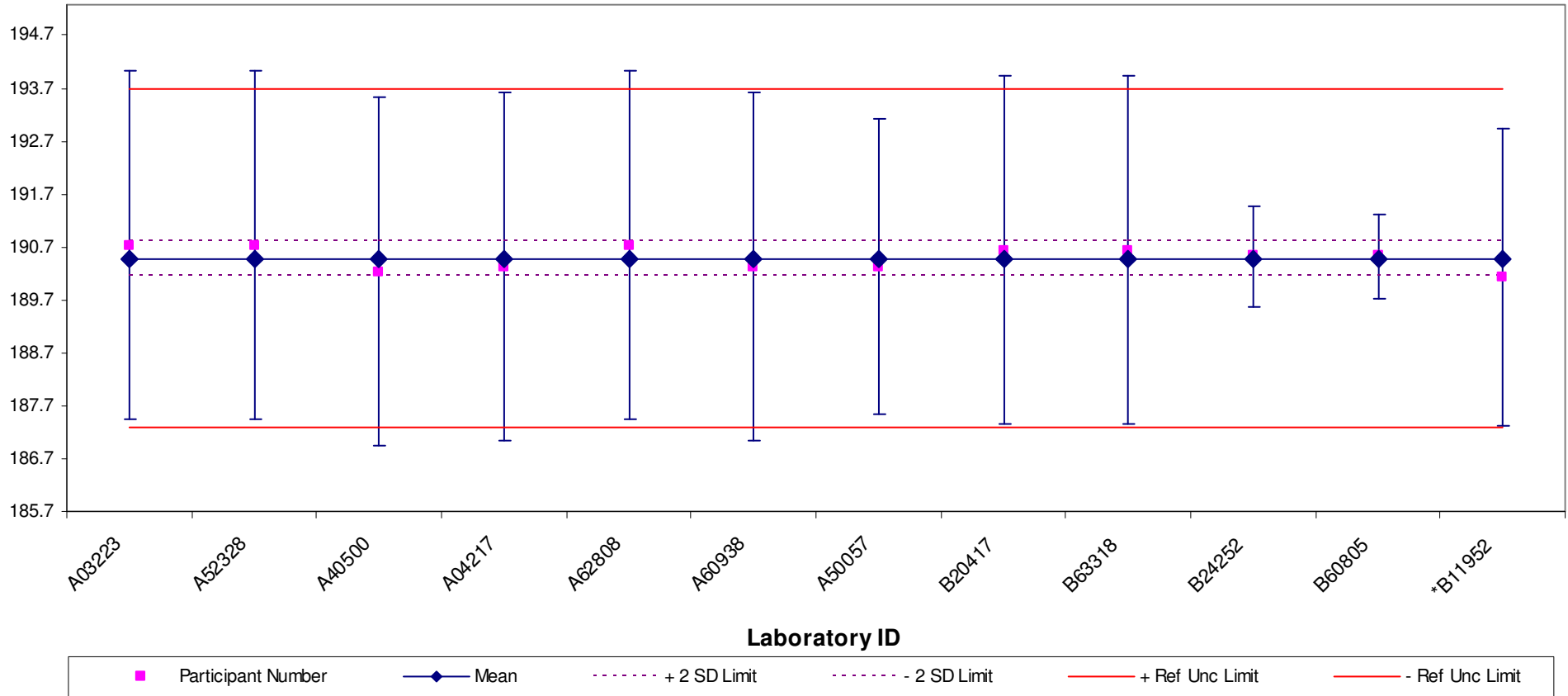
RMS Clamp Meter /NAPT-CLAMP-309  
Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 7) AC Current 190A – 400Hz

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## FINAL REPORT: BLOCK COMPARISON

**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 8) AC Current 300A – 400Hz

Discipline: Electrical - DC/LF Current - AC

Nominal Value: 300.0

Measurement Units: A

Established Reference Value: 301.2

Established Reference Uncertainty: 4.4

Mean Value (Satisfactory Results): 301.1

Mean Uncertainty (Satisfactory Results): 3.9

Mean Value (All Participants): 301.1

Mean Uncertainty (All Participants): 3.9

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	301.6	4.5	0.07	S	I	1.24
A04217	301.0	4.5	-0.03	S	I	-0.57
A40500	300.6	4.5	-0.09	S	I	-1.78
A50057	300.9	4.0	-0.05	S	I	-0.87
A52328	301.4	4.5	0.03	S	I	0.63
A60938	301.0	4.5	-0.03	S	I	-0.57
*A62808	301.8	4.5	0.10	S	I	1.84
B11952	300.6	4.0	-0.10	S	I	-1.78
B20417	301.6	4.5	0.07	S	I	1.24
B24252	301.1	1.5	-0.02	S	I	-0.27
B60805	301.2	1.0	0.00	S	I	0.03
B63318	300.6	4.5	-0.09	S	I	-1.78



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## FINAL REPORT: BLOCK COMPARISON

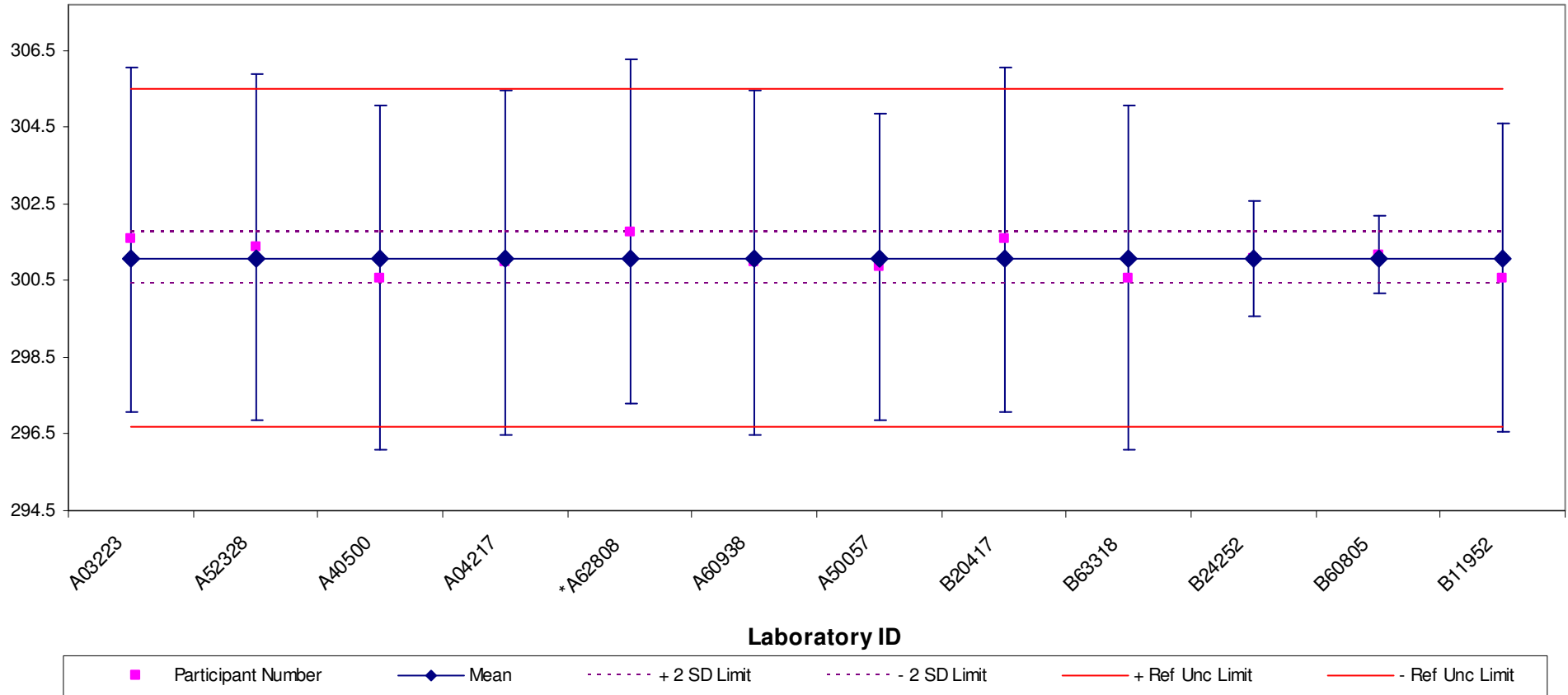
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Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 8) AC Current 300A – 400Hz

### BLOCK COMPARISON:





# National Association for Proficiency Testing

*A Non-Profit Organization Dedicated to Excellence in Metrology & Test Measurement*

## FINAL REPORT: BLOCK COMPARISON

**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 9) AC Current 500A – 60Hz

Discipline: Electrical - DC/LF Current - AC

Nominal Value: 500.0

Measurement Units: A

Established Reference Value: 502.4

Established Reference Uncertainty: 4.5

Mean Value (Satisfactory Results): 502.4

Mean Uncertainty (Satisfactory Results): 4.1

Mean Value (All Participants): 502.4

Mean Uncertainty (All Participants): 4.1

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	502.8	4.3	0.07	S	I	0.80
A04217	501.9	4.2	-0.08	S	I	-0.92
A40500	501.7	4.2	-0.11	S	I	-1.30
A50057	502.3	6.0	-0.01	S	I	-0.15
A52328	502.7	4.3	0.05	S	I	0.61
A60938	502.0	4.3	-0.06	S	I	-0.73
A62808	503.2	4.3	0.13	S	I	1.57
B11952	501.7	6.0	-0.09	S	I	-1.30
B20417	503.0	4.3	0.10	S	I	1.19
B24252	503.3	1.2	0.20	S	I	1.76
B60805	502.7	1.4	0.07	S	I	0.61
*B63318	501.3	4.3	-0.17	S	I	-2.07



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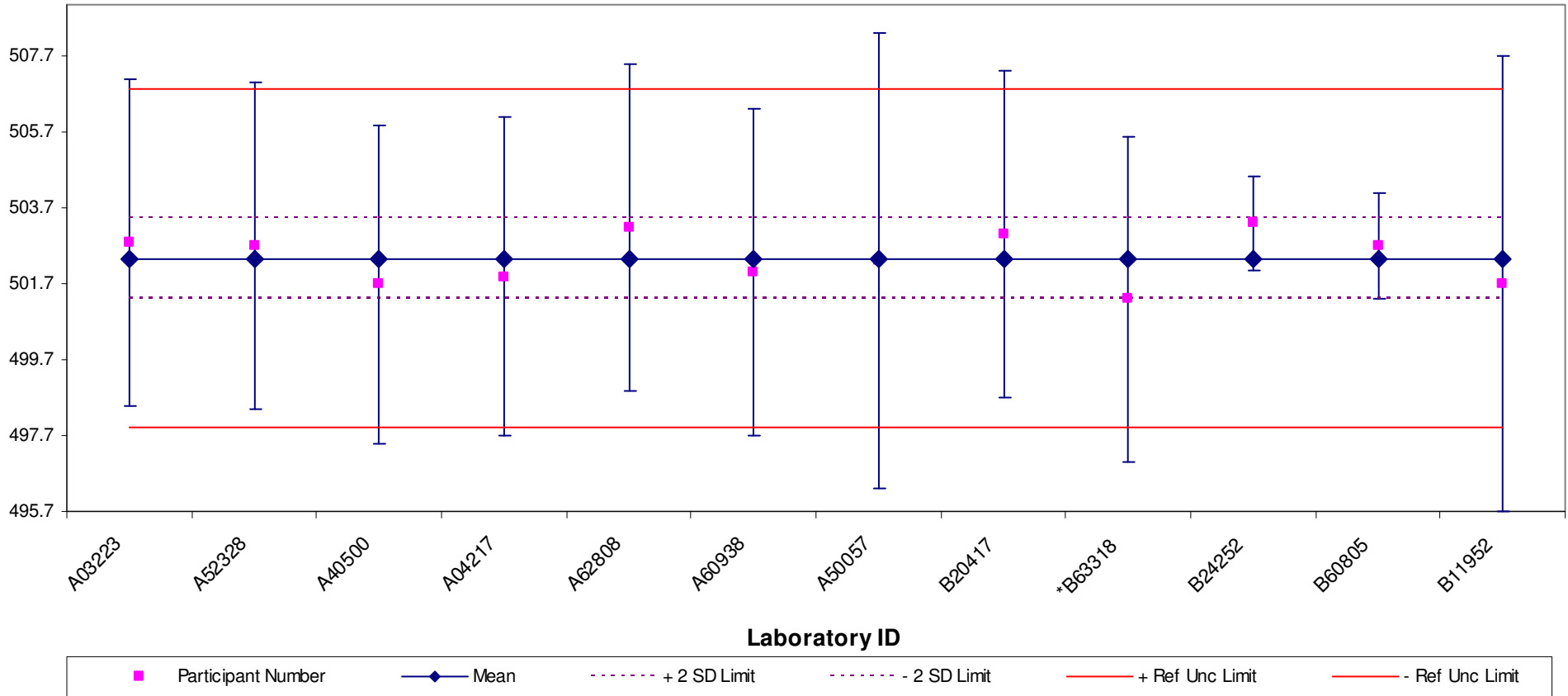
RMS Clamp Meter /NAPT-CLAMP-309  
Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
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Measurement Description: 9) AC Current 500A – 60Hz

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**RMS Clamp Meter/NAPT-CLAMP-309**  
**Digital Measurement Metrology**

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

### Measurement Description: 10) Resistance 100Ω

Discipline: Electrical - DC/LF Resistance

Nominal Value: 100.0

Measurement Units: ohms

Established Reference Value: 100.5

Established Reference Uncertainty: 0.1

Mean Value (Satisfactory Results): 100.5

Mean Uncertainty (Satisfactory Results): 0.1

Mean Value (All Participants): 100.5

Mean Uncertainty (All Participants): 0

Test ID #	Reported Value	Reported Uncertainty	$E_n$	S/U	IWO	Z Score
A03223	100.6	0.0	1.48	U	O	1.16
A04217	100.5	0.0	0.00	S	I	0.00
A40500	100.5	0.0	0.00	S	I	0.00
A50057	100.4	0.1	-0.83	S	W	-1.16
A52328	100.5	0.0	0.00	S	I	0.00
A60938	100.6	0.0	1.48	U	O	1.16
A62808	100.6	0.0	1.48	U	O	1.16
B11952	100.5	0.1	0.00	S	I	0.00
B20417	100.5	0.0	0.00	S	I	0.00
B24252	100.5	0.1	0.00	S	I	0.00
B60805	100.5	0.2	0.00	S	I	0.00
B63318	100.6	0.0	1.48	U	O	1.16



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Digital Measurement Metrology

OUTLIERS EXCLUDED

Report Date: 03/30/2009  
Date of Participation in ILC/PT: 03/02/2009

Measurement Description: 10) Resistance 100Ω

### BLOCK COMPARISON:

