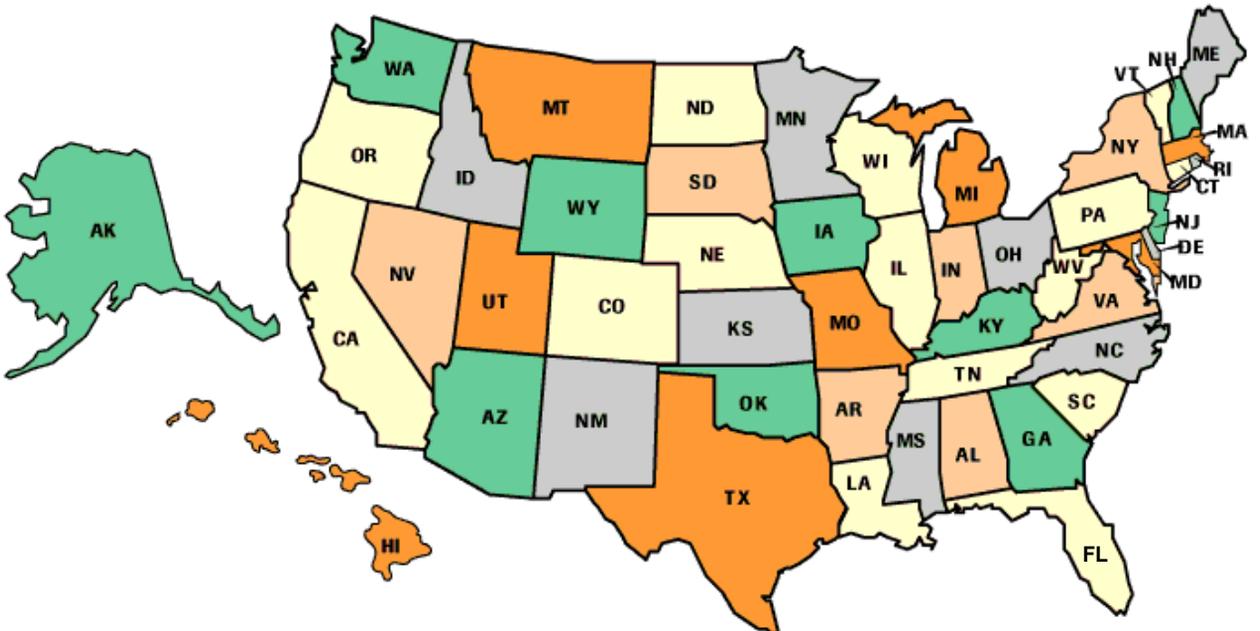


# 2003 State Laboratory Program Workload Survey

Summary Graphs and Data

by

NCWM Metrology Subcommittee



# Table of Contents

	Pages
Introduction	1 – 3
Total Workload (Summary by Device Type)	4 – 5
Total Workload (Summary by Customer Type)	6 – 7
Total Mass (by Customer & Accuracy Type)	8 – 9
Mass Echelon I	10 – 11
Mass Echelon II	12 – 13
Precision Mass (Echelon I & II)	14 – 15
Mass Echelon III	16 – 17
Weight Carts	18 – 19
Length (Tapes)	20 – 21
Length (Rigid Rules)	22 – 23
Volume (Glassware)	24 – 25
Volume (Test Measures)	26 – 27
Volume (Provers)	28 – 29
Temperature	30 – 31
Frequency	32 – 33
Time	34 – 35
Wheel Load Weighers	36 – 37
Other Tests (Summary)	38 – 39
Other Tests (Lottery Balls)	40 – 41
Other Tests (Grain Moisture)	42 – 43
Other Tests (Scales)	44 – 45
Other Tests (Special Linear/Dimensional)	46 – 47
Other Tests (Electrical)	48 – 49
Laboratory Facilities (Age & Size)	50 – 51
Metrology Experience (by Lab)	52 – 53
Metrology Experience (by Individual)	54 – 55
NVLAP Accreditation & WMD Certificate of Traceability Status	56 – 57
Scheduling	58 – 59
Fees	60 – 67
Metrology Position Salary Ranges	68 – 71
Data Summary for 1996 through 2003	72
Additional one-time Questions (Appendix A)	A-1 – A-24

# **2003 NCWM State Laboratory Program Workload Survey**

## **NCWM Metrology Subcommittee:**

Val Miller, NIST, Subcommittee Technical Advisor  
Steve Sumner, New Mexico  
L.F. Eason, North Carolina  
Marcus Harwitz, Wisconsin  
Dan Newcombe, Maine  
José Torres, Puerto Rico  
Joe Rothleder, California

## **Objectives and History of the Survey**

In 1996, the NCWM Metrology Subcommittee surveyed the State Laboratory participants to quantify the workload of the SLP and document its impact on the United States economy. From the survey analysis, it was clear that the workload statistics were dynamic and only provided a snapshot of the workload at the time. Therefore, the Metrology Subcommittee circulated a revised survey April 16, 1999 to update program statistics and to investigate trends in the National workload. The subcommittee has since recommended that the survey be conducted on a biennial basis and that the core survey be kept standardized in order for state labs to develop databases that could automatically generate the information for the survey. Survey data will be used not only to quantify the impact of the State Laboratory Program on the United States economy, but also to plan and maximize its effectiveness. Training and inter-laboratory comparisons will be designed to meet real needs of the workload. Ultimately, the survey information will increase the efficiency of the entire State Laboratory Program and maximize the benefits to the National Economy. The results of previous surveys have been used extensively at NIST to gain support and attention for the State Laboratories and were very helpful in putting together budget proposals. The information from the survey is also very useful in identifying the diversities of the workload on a national level.

## **Standardization of Future Surveys**

Since it is the intention to conduct this survey on a biennial basis, future surveys will be standardized in a format very similar to the 1999 survey. This will facilitate ease of reporting information from the individual laboratories, since the laboratories will be aware of what information must be tracked during the reporting period. From time to time there may be instances that another questionnaire is attached to the survey. For example, the 1999 survey had an attachment that asked for information regarding weight carts. This was a very efficient method for collecting data that was used in the drafting of the new HB105 series handbook that addresses the specifications and tolerances for weight carts. However, the basic format of the survey will be standardized from year to year.

The reporting period has also been standardized. For example, the 2003 survey requested information based on activities performed by each laboratory during the period of January 1, 2002 through December 31, 2002.

The 2001 survey had a few special requests for information. One was job titles and salary ranges of metrologists. Another special request was fee information. The 2003 survey was also accompanied with a questionnaire concerning technical specification standards and regulations.

### **Presentation and Analysis of Data**

As the surveys were completed the data was compiled into an Access database. Queries were developed to access the data that was then copied into Excel spreadsheets. The Excel spreadsheets were used to present the information in graphical form for the different types of standards. The first graph at the top of each page is a map graph in which shading is used to indicate the number of standards each state tested. Also included is a pie graph that provides a further breakdown of the data. The pie graph is automatically placed as an overlay on the map graph and associated with the appropriate State. The bar graph uses the same data as the map graph and provides a further breakdown of the data. The bar graph displays the total number of standards tested above each bar and an average is calculated and plotted.

*Note: Extreme caution should be used when comparing one state's data with data from another state. It was determined in the 1996 survey that laboratory workload is based somewhat on industrial and population densities that vary by geographical location and that the laboratories are attempting to meet the needs of their customers equally.*

Also presented will be some comparisons between the data from the 1996, 1999, 2000, 2001, and 2003 surveys. There was no attempt to compare increases or decreases in the workload of individual laboratories due to the fact that laboratories may have used different calibration intervals for different standards and their annual workload may fluctuate accordingly. For example, a state may have their volumetric glassware on a two-year calibration interval with the majority of these standards calibrated in one twelve month period with very few that are tested in the following twelve-month period. This does not indicate that the workload is decreasing in that state; it is just a reflection of the calibration interval assigned to those devices.

### **Participants**

The State Laboratory Program (SLP) is comprised of 55 metrology laboratories. There are 50 state laboratories and 5 other government laboratories (Puerto Rico, Washington DC, Los Angeles County, USDA-GIPSA, and U.S.-Virgin Islands). Of these 55 laboratories, 4 are not active and 2 were temporarily inactive due to a recent change in staff. The Washington DC metrology lab, the Delaware state metrology lab, the U.S.-Virgin Islands metrology lab, and the Rhode Island state metrology lab were not operational. The Iowa state metrology lab and South Dakota state metrology lab were inactive during the reporting period of this survey due to a change in metrology staff. Of the remaining 49 metrology laboratories, we had 48 respondents.

The following is a list of the SLP laboratories and their participation status in the 1996, 1999, 2000, 2001, and 2003 surveys.

	1996 Survey Participant	1999 Survey Participant	2000 Survey Participant	2001 Survey Participant	2003 Survey Participant
AK	Yes		Yes	Yes	Yes
AL	Yes				Yes
AR	Yes	Yes	Yes	Yes	Yes
AZ	Yes	Yes	Yes	Yes	Yes
CA	Yes	Yes	Yes	Yes	Yes
CO	Yes		Yes	Yes	Yes
CT	Yes	Yes	Yes	Yes	Yes
DE	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
FL	Yes	Yes	Yes	Yes	Yes
GA	Yes	Yes	Yes	Yes	Yes
HI	Yes	Yes	Yes	(inactive)	Yes
IA	Yes	Yes	Yes		(inactive)
ID	Yes	Yes	Yes	Yes	Yes
IL	Yes	Yes	Yes	Yes	Yes
IN	Yes	Yes	Yes	Yes	Yes
KS	Yes	Yes	Yes	Yes	Yes
KY	Yes	Yes	Yes	Yes	Yes
LA	Yes	Yes	Yes	Yes	Yes
MA	Yes		Yes	Yes	Yes
MD	Yes	Yes	Yes	Yes	Yes
ME	Yes	Yes	Yes	Yes	Yes
MI	Yes	Yes	Yes	Yes	Yes
MN	Yes	Yes	Yes	Yes	Yes
MO	Yes	Yes	Yes	Yes	Yes
MS	Yes	Yes		(inactive)	Yes
MT	Yes	Yes	Yes	Yes	Yes
NC	Yes	Yes	Yes	Yes	Yes
ND	Yes	Yes	Yes	Yes	Yes
NE	Yes	Yes		Yes	Yes
NH	Yes	Yes	Yes	Yes	Yes
NJ	Yes	Yes	Yes	Yes	Yes
NM	Yes	Yes	Yes	Yes	Yes
NV	Yes	Yes		Yes	Yes
NY	Yes	Yes	Yes	Yes	Yes
OH	Yes	Yes	Yes	Yes	Yes
OK	Yes	Yes	Yes	Yes	Yes
OR	Yes	Yes	Yes	Yes	Yes
PA	Yes	Yes	Yes	Yes	Yes
RI	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
SC	Yes	Yes	Yes	Yes	Yes
SD	Yes	Yes			(inactive)
TN	Yes	Yes	Yes	Yes	Yes
TX	Yes	Yes	Yes	Yes	Yes
UT	Yes	Yes	Yes	Yes	Yes
VA	Yes	Yes	Yes	Yes	Yes
VT	Yes	Yes	Yes	Yes	Yes
WA	Yes	Yes	Yes	Yes	Yes
WI	Yes	Yes	Yes	Yes	Yes
WV	Yes	Yes	Yes	Yes	Yes
WY	Yes	Yes	Yes	Yes	Yes
USDA-GIPSA	Yes				
Washington DC	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Virgin Islands	(inactive)	(inactive)	(inactive)	(inactive)	(inactive)
Puerto Rico	Yes	Yes	Yes	Yes	Yes
LA County	Yes	Yes	Yes	Yes	Yes
TOTAL	51	46	45	45	48

## Summary of All Standards {Total Number of Standards or Devices Tested}

### Description

The graphs on the following page are a summary of the total number of standards or devices tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices being tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the categories of mass, volume, length, temperature, frequency, time, wheel load weighers, and other. The bar graph at the bottom of the page shows the same breakdown in categories along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

### Findings

The 48 reporting laboratories tested a total of 375,411 standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Surveys

	# Reporting Labs	Total Devices	Lab Average
1996	51	332,587	6,651
1999	46	320,950	6,977
2000	45	352,274	7,828
2001	45	361,600	8,036
2003	48	375,411	7,821

Using the lab averages:

- 1996 to 1999 -- An increase of 7 %
- 1999 to 2000 -- An increase of 12 %\*
- 2000 to 2001 -- An increase of 3 %
- 2001 to 2003 -- A decrease of 3 %

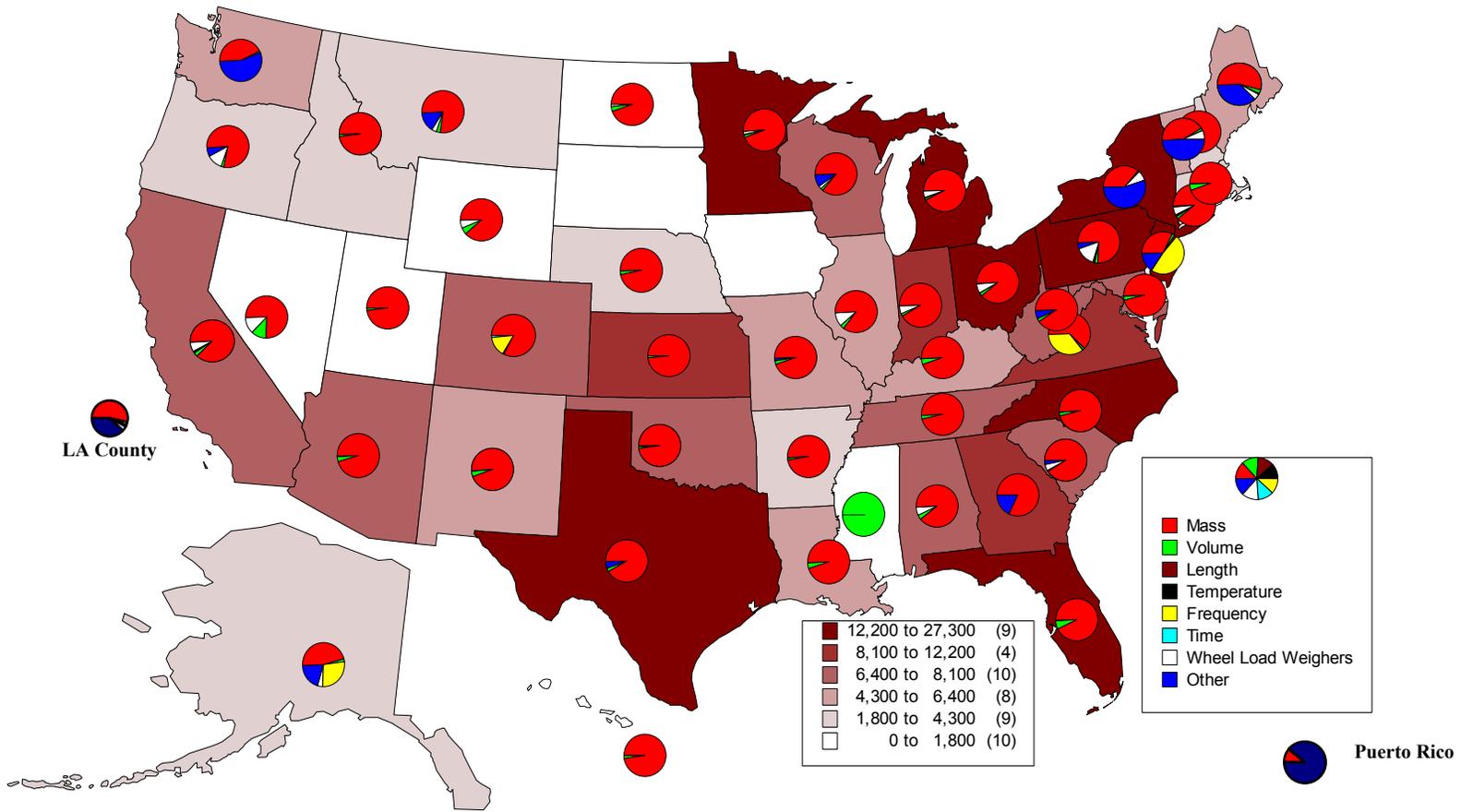
### Notes and Comments

\*Part of the 12 % increase from 1999 to 2000 may be attributed to a new category that was called "Other". These are calibrations done by the laboratory, which did not fall into any of the pre-defined categories of the survey. This category was new for the 2000 survey and was not available for the 1996 and 1999 surveys. There were 25,350 devices reported as "Other" in the 2000 survey, when these are removed from the total it indicates an increase of 4 % over the 1999 survey.

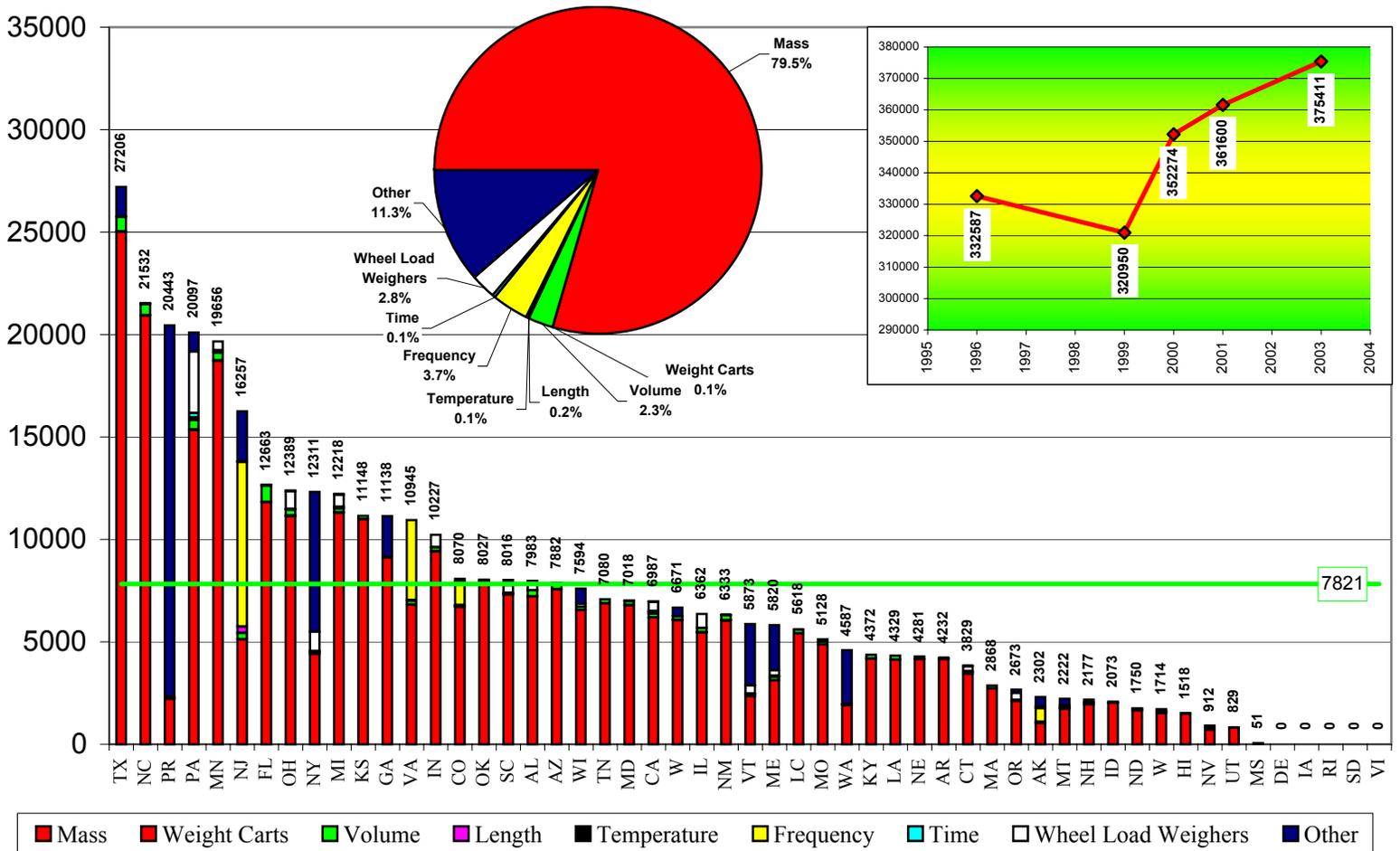
Mass standards accounted for 80 % of the total number of devices tested.

Frequency calibrations constitute a significant portion of total calibrations for the states of New Jersey and Virginia. This is a reflection of their tuning fork calibration programs that provide law enforcement with NIST traceable standards to verify the accuracy of radar devices used for the enforcement of speed limits.

# Summary of All Standards (By Device Type)



**375411 Total Devices**



**Summary of All Standards  
(by customer type)  
{Lab, W&M, Commercial, and External}**

**Description**

The graphs on the following page represent the total number of all mass standards tested by the 48 reporting laboratories. The pie graph provides a breakdown into the customer categories of Lab, W&M, Commercial, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

Lab – work done for the metrology laboratory.

W&M – work done for the weights and measures program.

Commercial – work done for licensed/commercial scale companies.

External – work done for customers who do not fall into any of the above categories.

**Findings**

The 48 reporting laboratories tested a total of 375,411 standards.

**Notes and Comments**

2 % of all standards were calibrated for internal use of the laboratory.

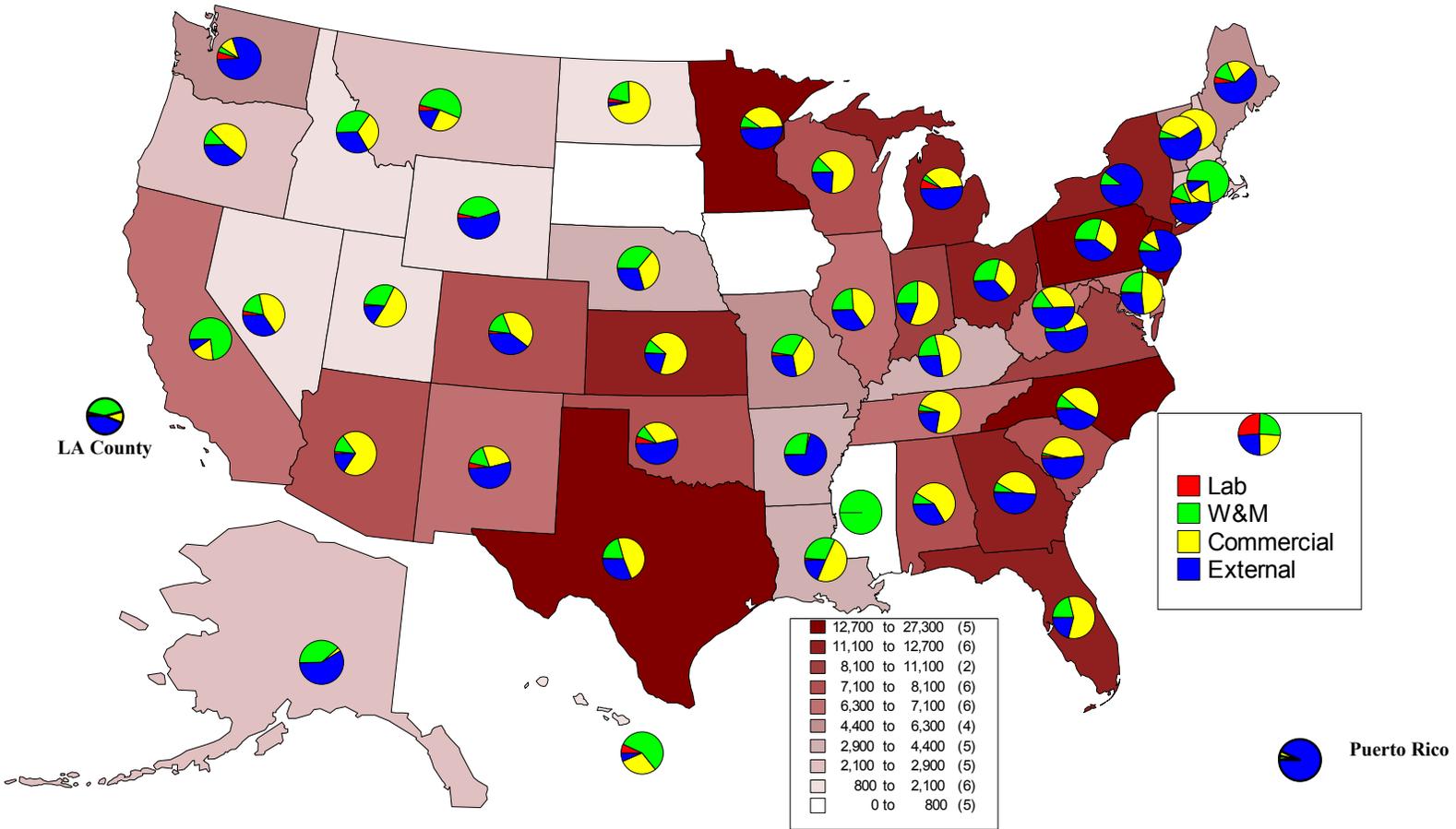
17 % of all standards were calibrated for “Weights & Measures Program”.

37 % of all standards were calibrated for ‘Commercial’ customers.

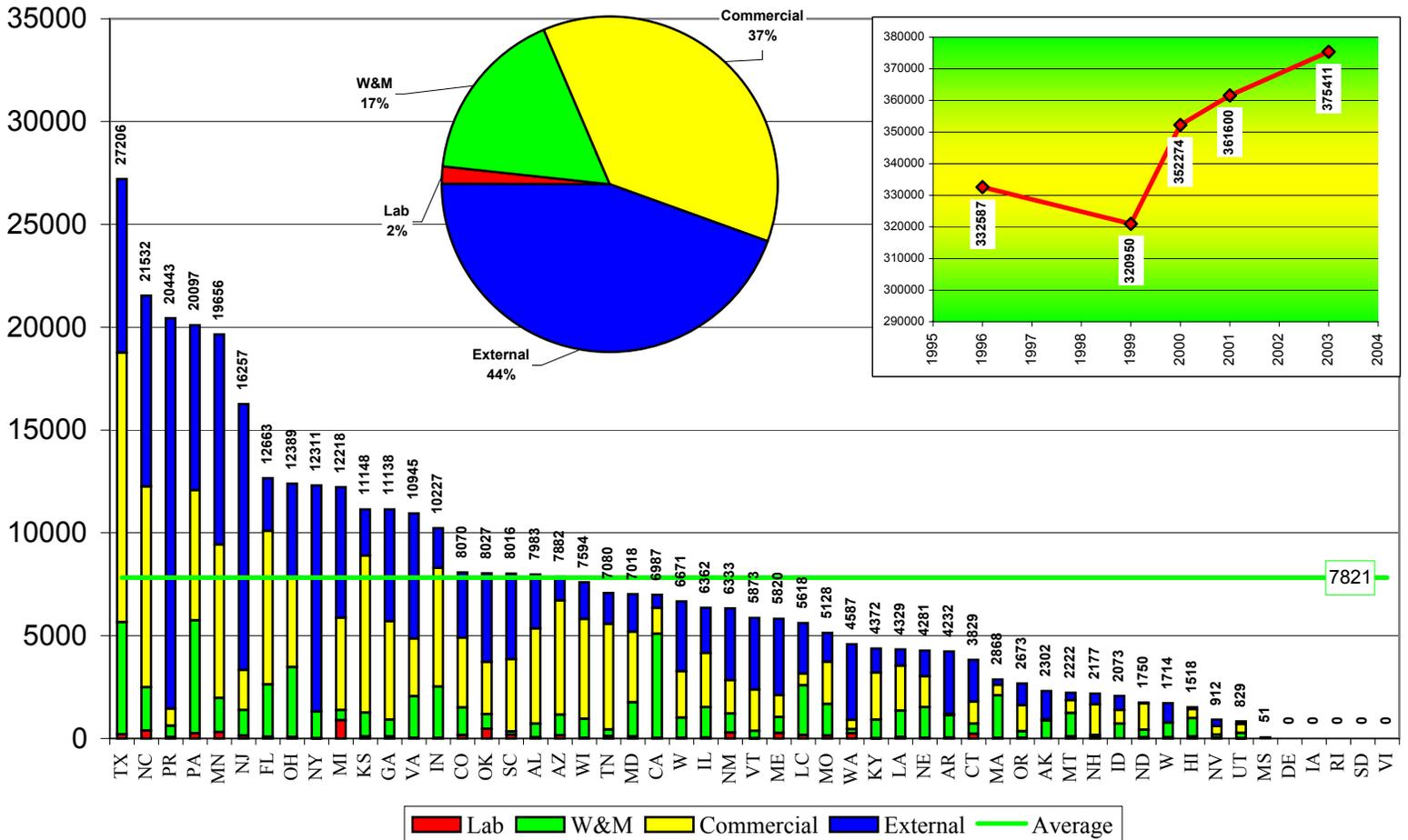
44 % of all standards were calibrated for ‘External’ customers.

This 2 %/17 %/37 %/44 % pattern is very representative of the breakdown of customers. However, it can be noted that the smaller the entire workload of the lab, the greater percentage “Lab” becomes. This reflects the ‘basic maintenance’ workload necessary to make a metrology laboratory operational.

# Summary of All Standards (By Customer Type)



**375411 Total Devices**



## **Mass Total (by customer type) & (by accuracy type)**

### **Description**

The pie graphs on the following page are for the total number mass standards tested by the 48 reporting laboratories. The top pie graph provides a breakdown into the customer categories of Lab, W&M, Commercial, and Other

Lab – work done for the metrology laboratory.

W&M – work done for the weights and measures program.

Commercial – work done for licensed/commercial scale companies.

Other – work done for customers who do not fall into any of the above categories.

The bottom pie graph provides a breakdown in the accuracy echelons of Mass I, Mass II, and Mass III.

Mass I – Precision mass standards that are calibrated using Advanced Weighing Designs and Mass Code Data Reduction regardless of class.

Mass II – Precision mass standards that are usually calibrated using 3-1 weighing designs or double substitutions.

ASTM Class 1, 2, 3

OIML Class E2, F1

(NBS Class M, S, S-1)

Mass III – Mass standards that are usually calibrated using modified or single substitution procedures.

ASTM Class 4, 5, 6, 7

OIML Class F2, M1, M2, M3

NIST Class F

(NBS Class A, B, C, P, Q, T)

### **Notes and Comments**

#### **Mass By Customer Type**

1.8 % of all mass standards were calibrated for internal use by the laboratory.

20.0 % of all mass standards were calibrated for the Weights & Measures Program.

46.2 % of all mass standards were calibrated for 'Commercial' customers.

32.0 % of all mass standards were calibrated for 'Other' customers.

#### **Mass By Accuracy Type**

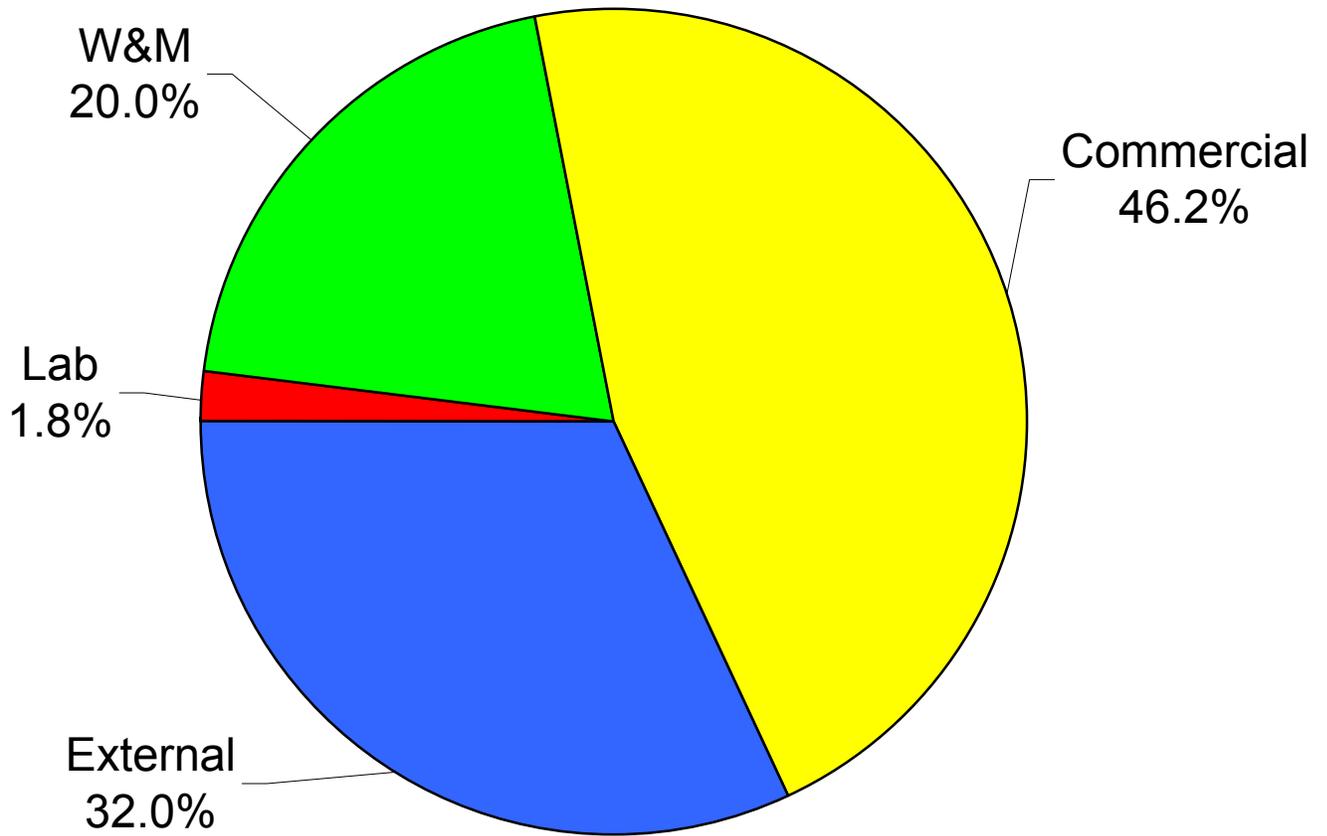
1.8 % (5,288) of all mass standards were calibrated as Mass Echelon I.  
*(compared to 0.9 % in 1999, 2.1 % in 2000, and 1.8 % in 2001)*

8.7 % (25,847) of all mass standards were calibrated as Mass Echelon II.  
*(compared to 8.7 % in 1999, 8.9 % in 2000, and 9.1 % in 2001)*

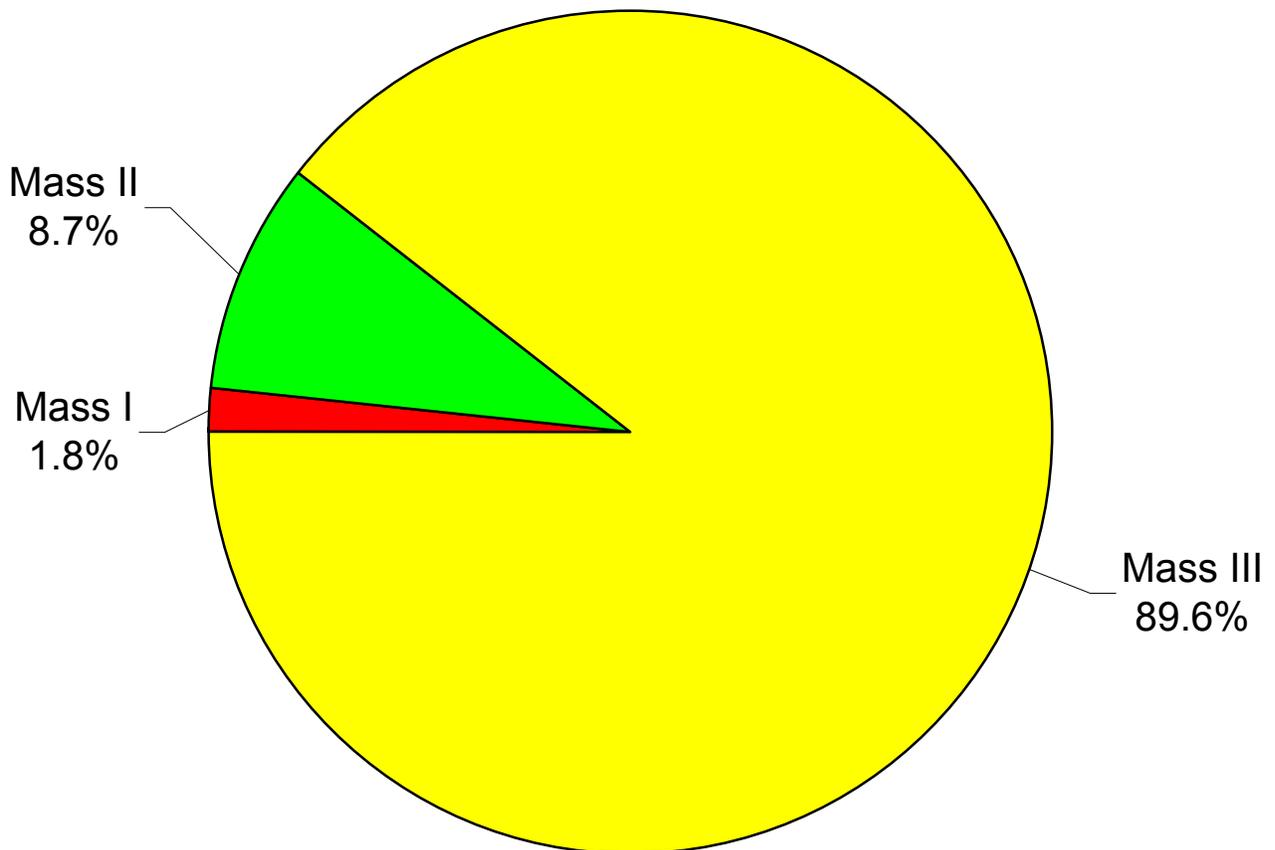
89.6 % (267,240) of all mass standards were calibrated as Mass Echelon III.  
*(compared to 90.4 % in 1999, 89.0 % in 2000, and 89.1 % in 2001)*

It has been estimated that it takes ten times the number of labor hours to calibrate an Echelon I or II weight as compared to an Echelon III weight. When this is taken into consideration, the same total number of labor hours is probably spent on Echelon I & II calibrations as is spent on Echelon III calibrations.

## Total Mass (by Customer Type)



## Total Mass (by Accuracy Type)



# Mass Echelon I

## Description

The graphs on the following page represent the total number of Mass Echelon I standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, Commercial, and Other. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Scale Co – work done for licensed/commercial scale companies.

Other – work done for customers who do not fall into any of the above categories.

## Findings

Of the 48 reporting laboratories, 15 labs tested a total of 5,288 Mass I standards.

## Comparison of the 2003, 2001, 2000 and 1999 Surveys

The number of laboratories performing Mass I calibrations appears to have stabilized in the range of 14 to 16. There were 10 labs in 1999, 15 labs in 2000, 16 labs in 2001, and 15 in 2003.

	# Labs Reporting Mass Echelon I	Total Devices	Lab Average	Change using lab averages
1999	10	2,667	267	--
2000	15	5,985	399	+ 50 %
2001	16	5,227	327	- 18 %
2003	15	5,288	353	+ 8 %

*Results for Mass I cannot be compared to the 1996 survey. The 1996 survey did not use Mass Echelon I as a category. It used 'Precision Mass' as the category that included both Mass Echelon I and Mass Echelon II calibrations.*

## Notes and Comments

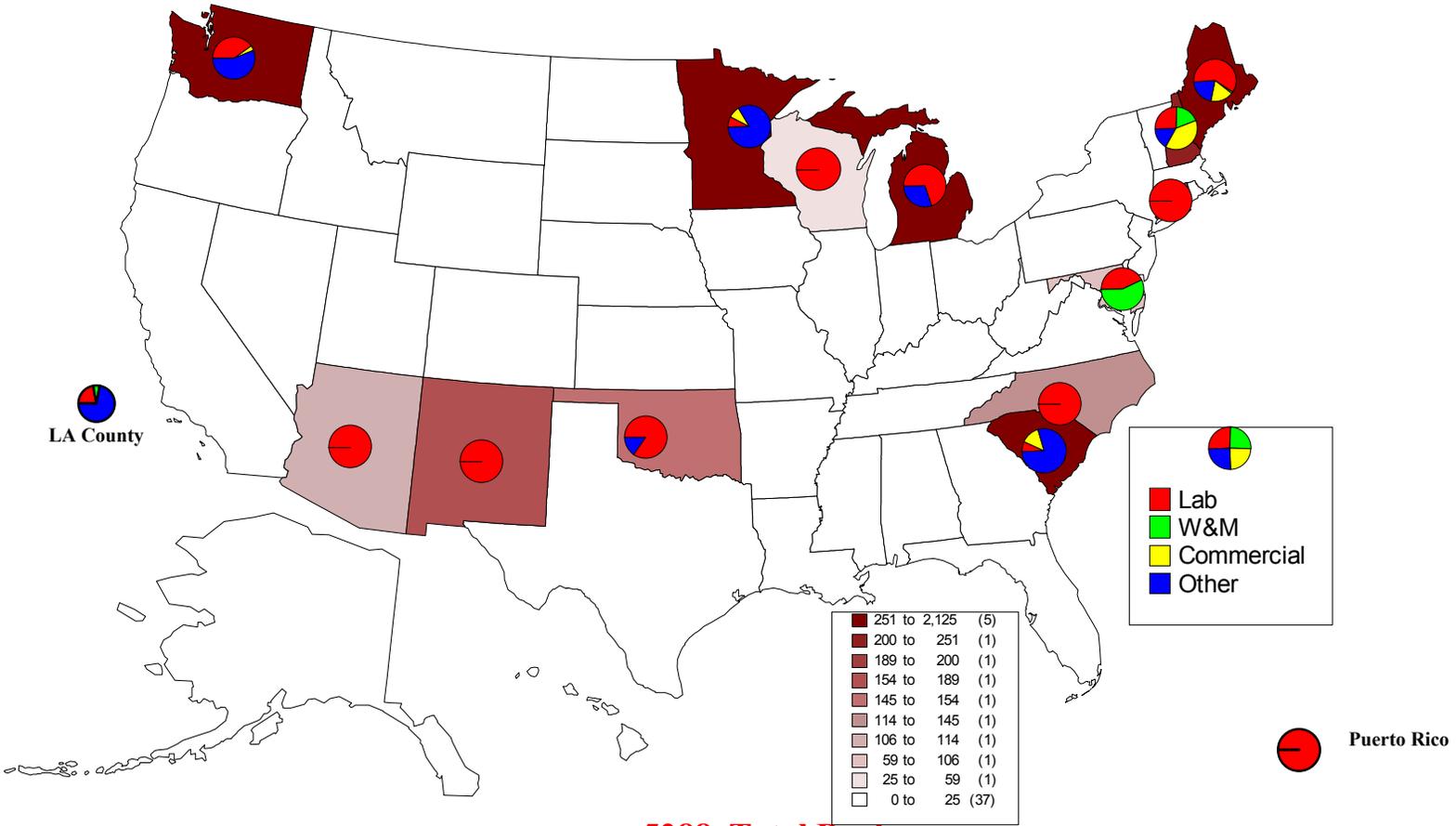
36 % of all Mass I standards were calibrated for internal use by the laboratory.

2 % of all Mass I standards were calibrated for the weight and measures program.

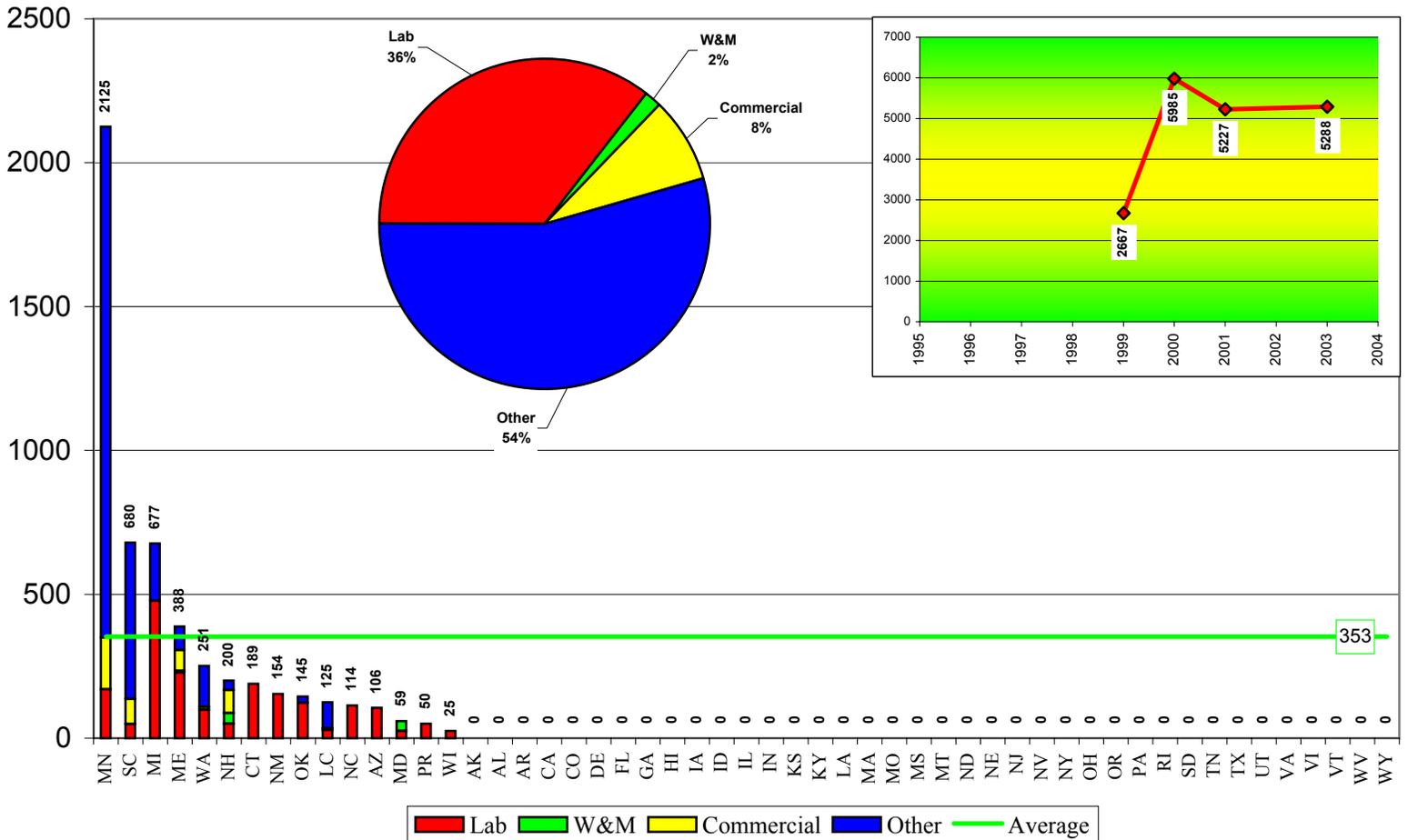
8 % of all Mass I standards were calibrated for commercial scale companies.

54 % of all Mass I standards were calibrated for other customers.

# Mass Echelon I



**5288 Total Devices**



## Mass Echelon II

### Description

The graphs on the following page represent the total number of Mass Echelon II standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, Commercial, and Other. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested above each laboratory. There is also a smaller line graph indicating the totals from the 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Scale Co – work done for licensed/commercial scale companies.

Other – work done for customers who do not fall into any of the above categories.

### Findings

Of the 48 reporting laboratories, 37 labs tested a total of 25,847 Mass II standards.

### Comparison of the 2001, 2000 and 1999 Surveys

	# Labs Reporting Mass Echelon II	Total Devices	Lab Average	Change using lab averages
1999	36	24,926	692	--
2000	35	25,807	737	+ 6 %
2001	38	26,428	695	- 6 %
2003	37	25,847	699	+ 0 %

*Results for Mass II cannot be compared to the 1996 survey. The 1996 survey did not use Mass Echelon II as a category. It used 'Precision Mass' as the category that included both Mass Echelon I and Mass Echelon II calibrations.*

### Notes and Comments

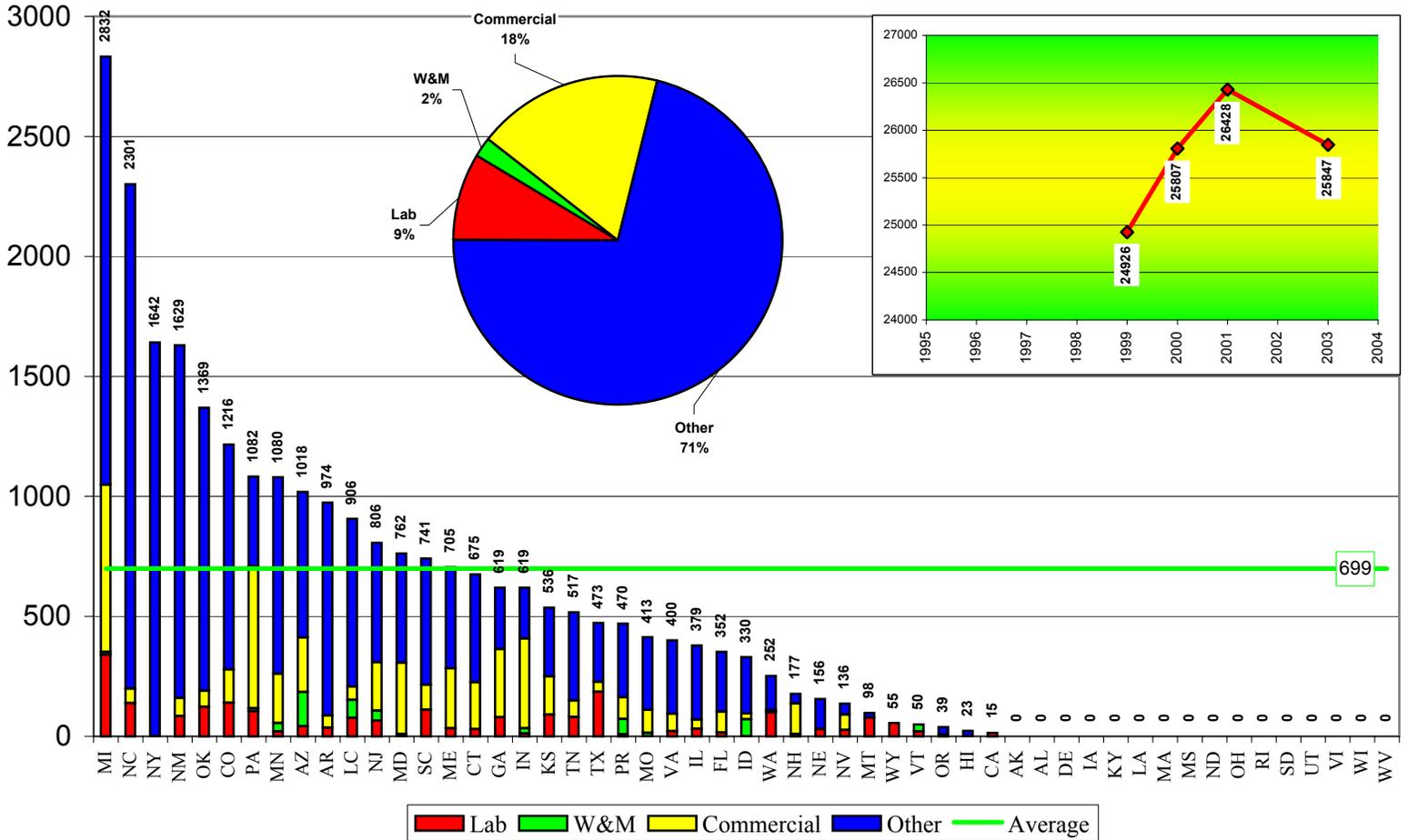
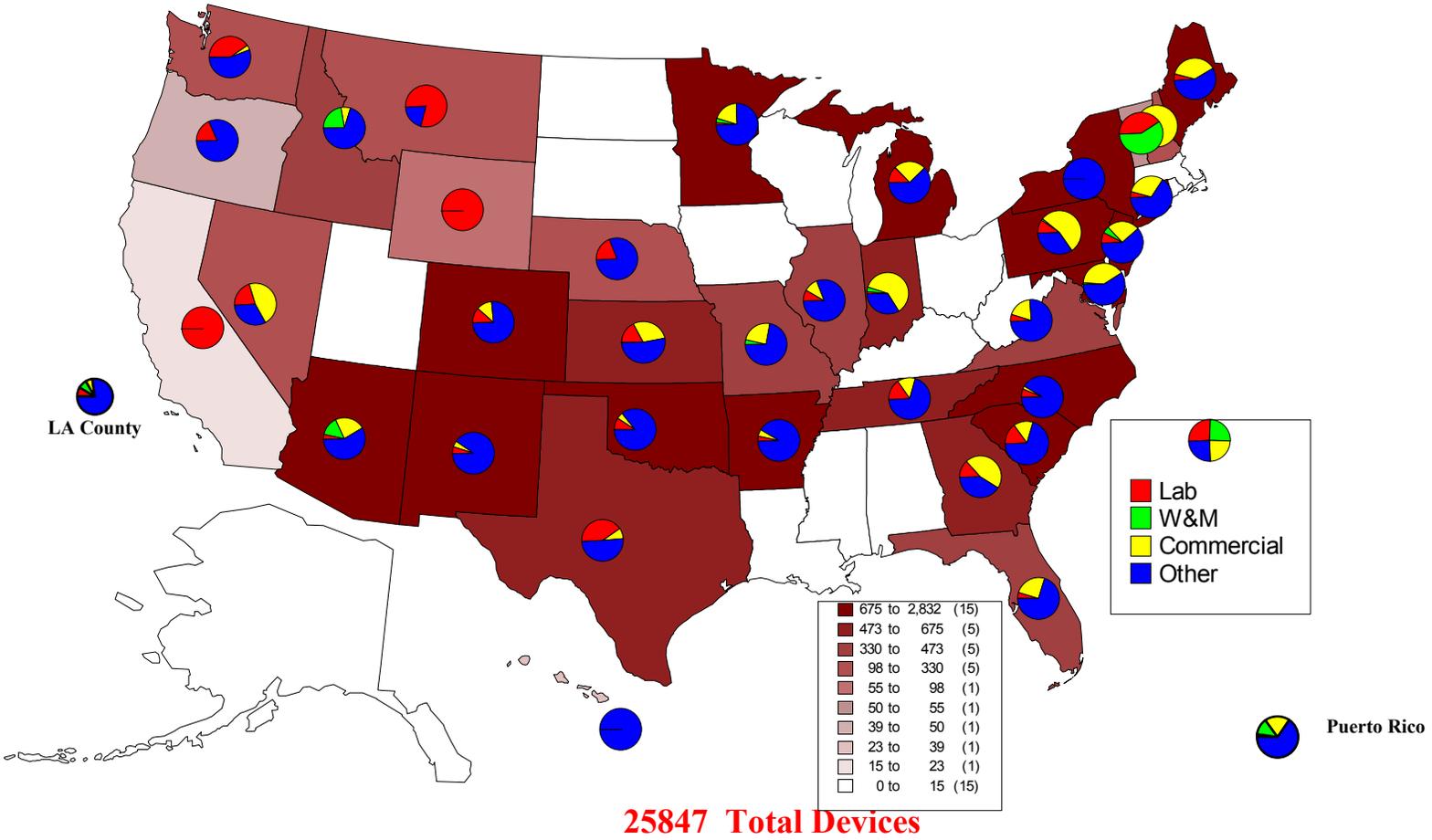
9 % of all Mass II standards were calibrated for the internal use of the laboratory.

2 % of all Mass II standards were calibrated for the weights and measures program.

18 % of all Mass II standards were calibrated for commercial scale companies.

71 % of all Mass II standards were calibrated for other customers.

# Mass Echelon II



## Precision Mass (Mass Echelon I & II)

### Description

The graphs on the following page represent the total number of all Precision Mass (includes both Mass Echelon I and Mass Echelon II) standards tested by the 48 reporting laboratories. The graphs combine the data Mass Echelon I and Mass Echelon II so that they may be compared to the 1996 survey data. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, Commercial, and Other. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Commercial – work done for licensed/commercial scale companies.

Other – work done for customers who do not fall into any of the above categories.

### Findings

Of the 48 reporting laboratories, 38 labs tested a total of 31,135 Precision Mass standards (Mass I and Mass II standards combined).

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Mass I & II	Total Devices	Lab Average	Change from previous survey
1996	50	37,662	753	--
1999	36	27,593	766	+ 2 %
2000	36	31,792	883	+ 15 %
2001	38	31,655	833	- 6 %
2003	38	31,135	819	- 2 %

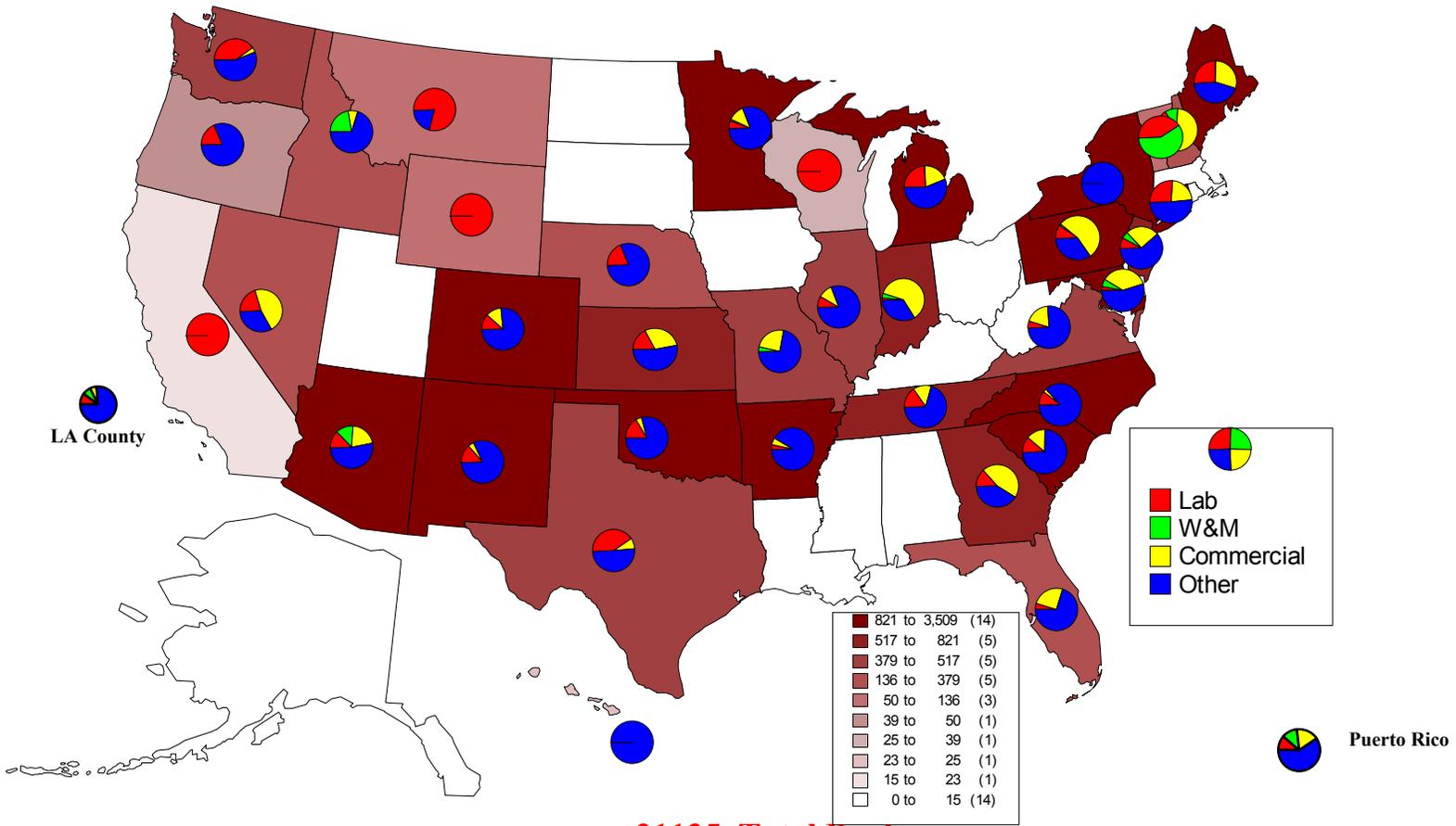
### Comparing later surveys with the 1996 Survey

\*The data shows an apparent decrease of 27 % in the total number of Precision Mass standards calibrated from 1996 to 1999. However, because there was not a clear definitive separation between “precision calibrations” and “tolerance testing”, in 1996, some labs may have shown some of their “tolerance testing” as “precision testing”, which would inflate the value for the number of precision mass standards tested in 1996.

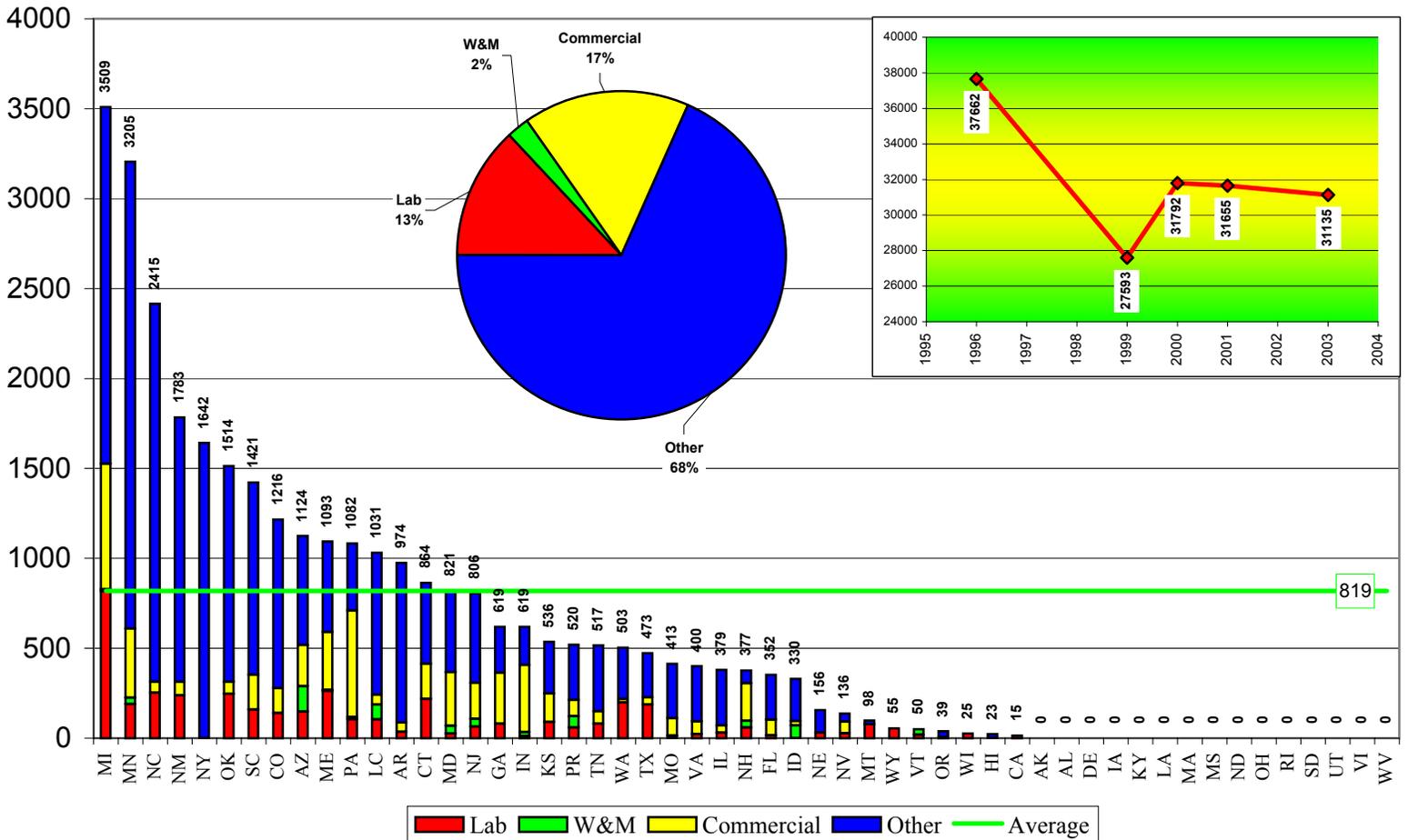
### Notes and Comments

13 % of all Precision Mass standards were calibrated for the internal use of the laboratory.  
2 % of all Precision Mass standards were calibrated for the weights and measures program.  
17 % of all Precision Mass standards were calibrated for commercial scale companies.  
68 % of all Precision Mass standards were calibrated for other customers.

# Precision Mass (Echelon I & II)



**31135 Total Devices**



## Mass Echelon III

### Description

The graphs on the following page represent the total number of Mass Echelon III standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, Commercial, and Other. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph indicating the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Commercial – work done for licensed/commercial scale companies.

Other – work done for customers who do not fall into any of the above categories.

### Findings

Of the 48 reporting laboratories, 47 labs tested a total of 267,240 Mass III standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Surveys

	# Labs Reporting Mass III	Total Devices	Lab Average	Change from previous survey
1996	51	259,713	5,092	--
1999	46	259,463	5,640	+ 11 %
2000	45	257,938	5,732	+ 2 %
2001	45	260,072	5,779	+ 1 %
2003	47	267,240	5,686	- 2 %

### Notes and Comments

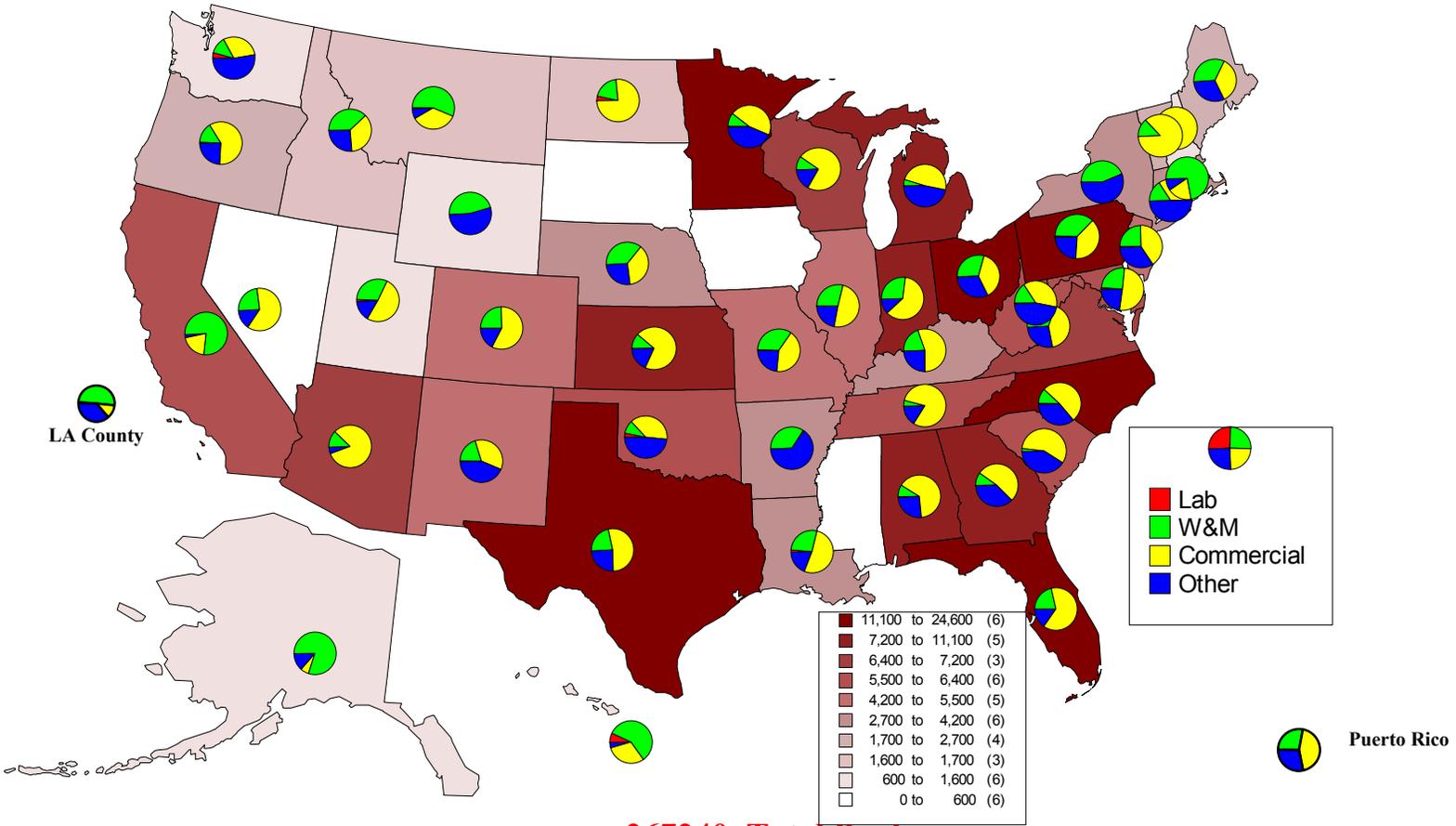
1 % of all Mass III standards were calibrated for the internal use of the laboratory.

22 % of all Mass III standards were calibrated for the weights and measures program.

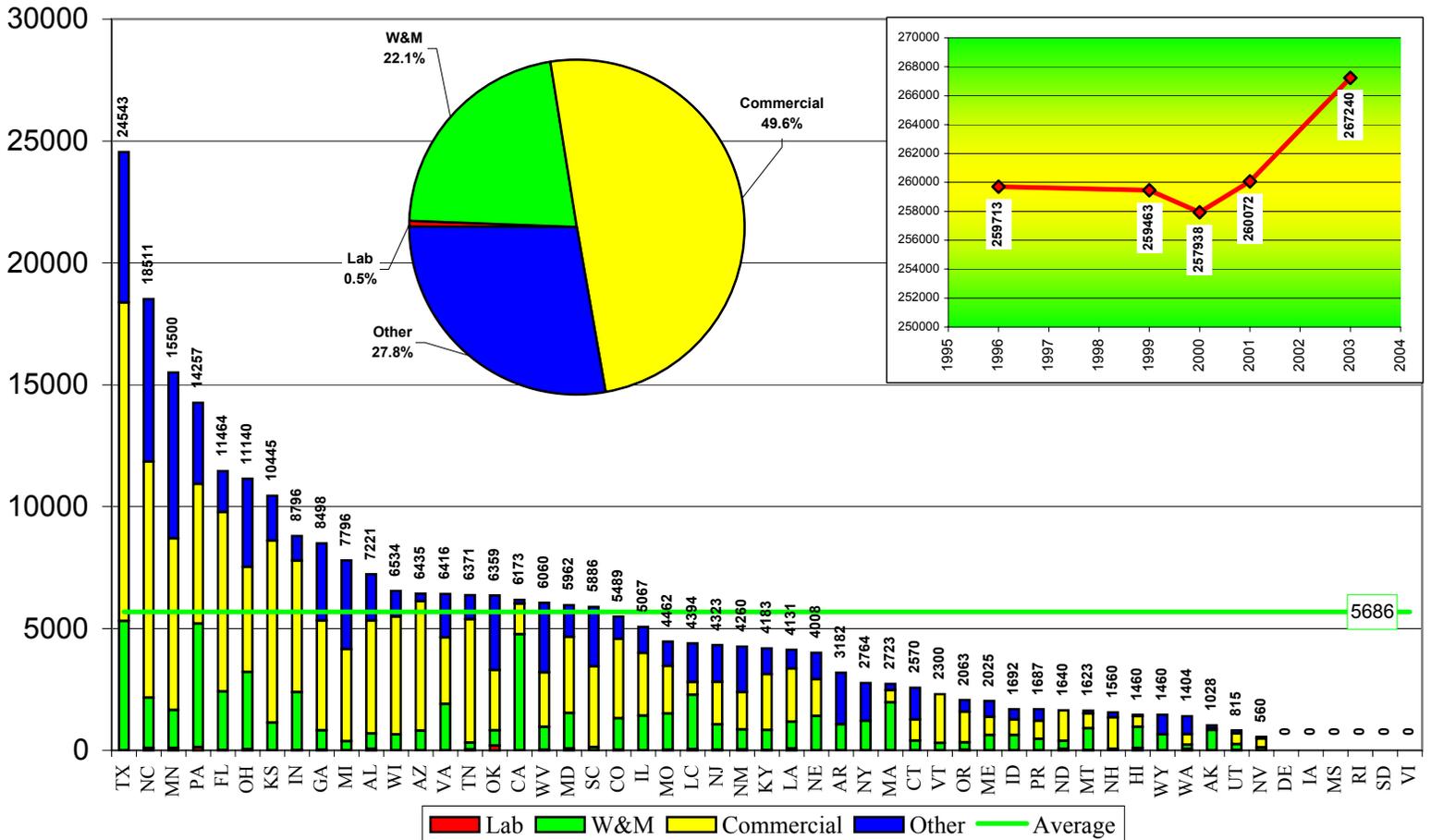
49 % of all Mass III standards were calibrated for commercial scale companies.

28 % of all Mass III standards were calibrated for other customers.

# Mass Echelon III



**267240 Total Devices**



# Weight Carts

## Description

The graphs on the following page represent the total number of weight cart mass standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1999, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Commercial – work done for licensed commercial scale companies.

Other – work done for customers who do not fall into any of the above categories.

## Findings

Of the 48 reporting laboratories, 29 labs tested a total of 388 weight cart mass standards.

### Comparison of the 2003, 2001 and 1999 Survey

	# Labs Reporting Weight Cart Tests	Total Devices	Lab Average	Change from previous survey
1999	30	297	9.9	--
2001	27	344	12.7	+ 29 %
2003	29	388	13.4	+ 5 %

### Notes and Comments

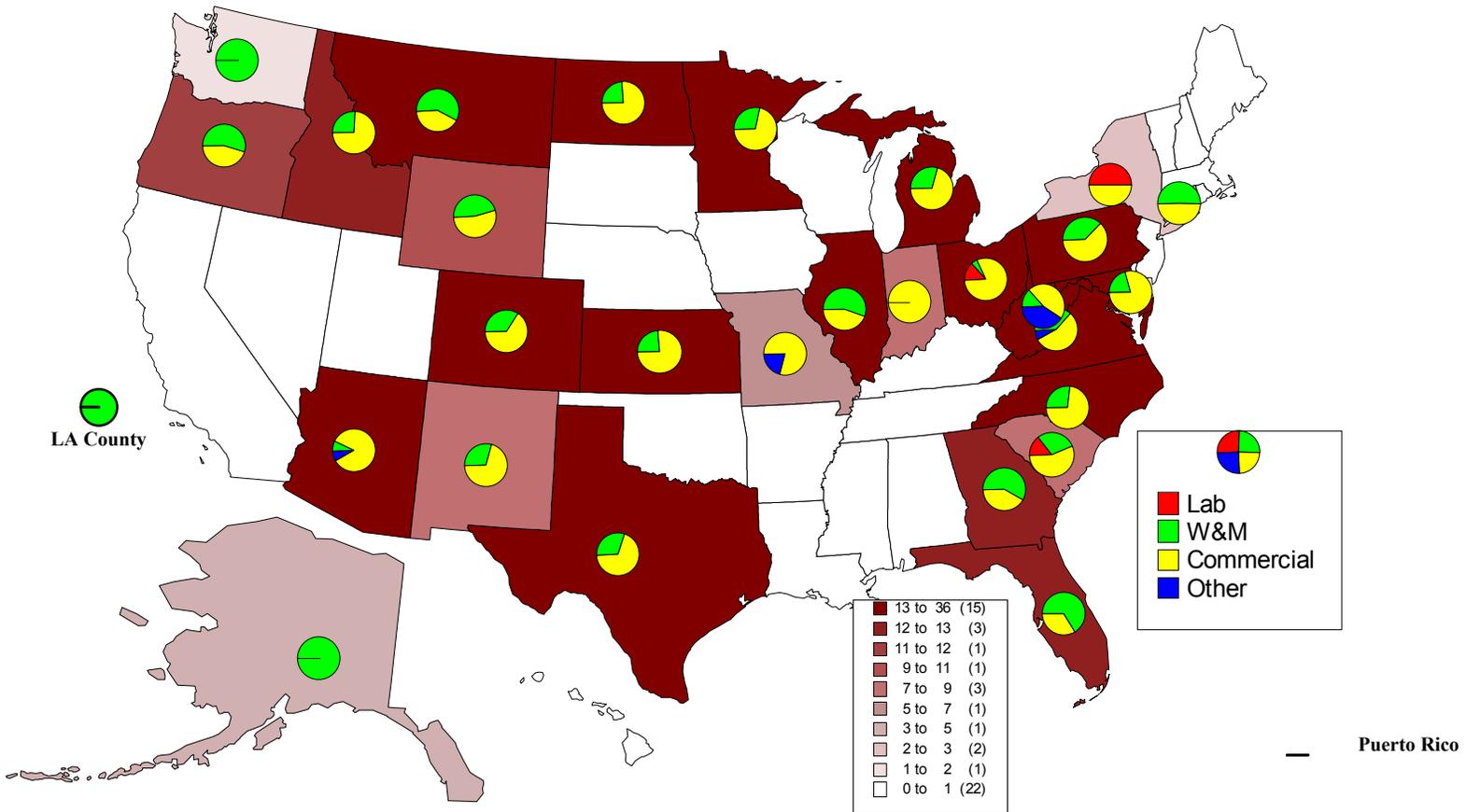
1 % of all weight cart standards were calibrated for the internal use of the laboratory.

32 % of all weight cart standards were calibrated for the weights and measures program.

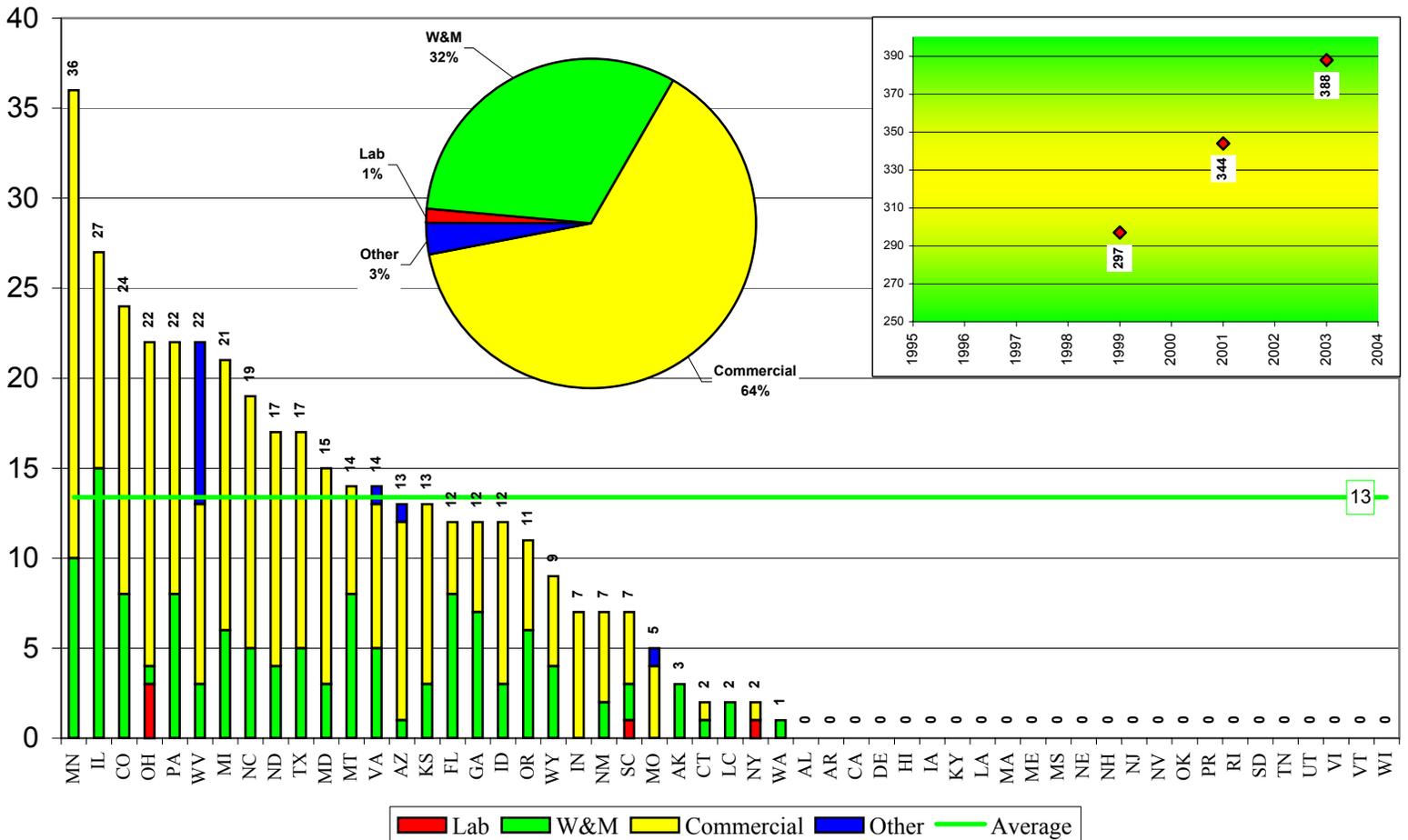
64 % of all weight cart standards were calibrated for commercial scale companies.

3 % of all weight cart standards were calibrated for other customers.

# Weight Carts



**388 Total Devices**



## Length -- Tapes

### Description

The graphs on the following page represent the total number of length (tapes) standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

### Findings

Of the 48 reporting laboratories, 21 labs tested a total of 584 length (tape) standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Length Tape Tests	Total Devices	Lab Average	Change from previous survey
1996	27	707	26	--
1999	29	537	19	- 29 %
2000	21	566	27	+ 46 %
2001	22	487	22	- 18 %
2003	21	584	28	+ 26 %

### Notes and Comments

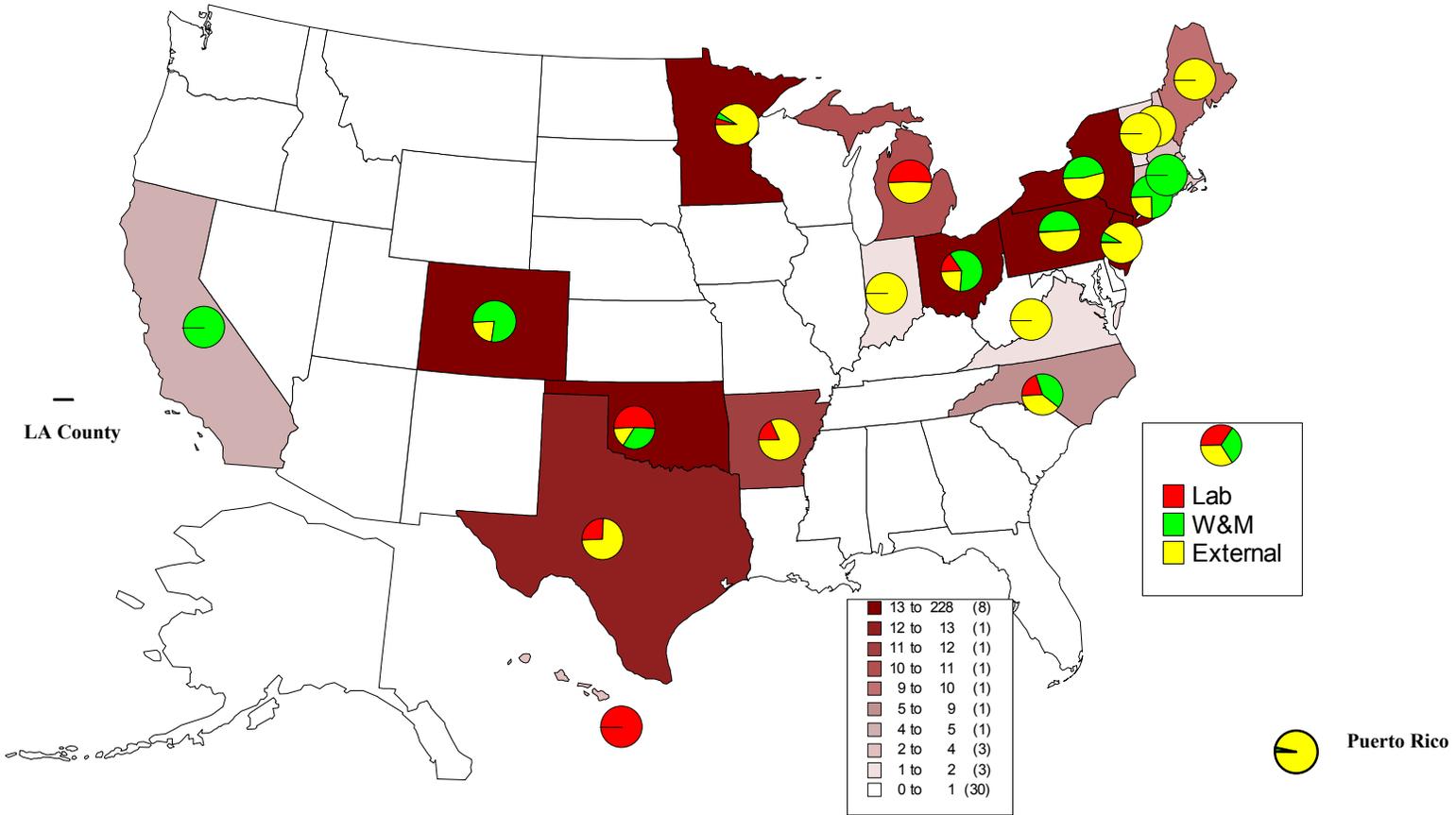
5 % of all length (tape) standards were calibrated for the internal use of the laboratory.

23 % of all length (tape) standards were calibrated for the weights and measures program.

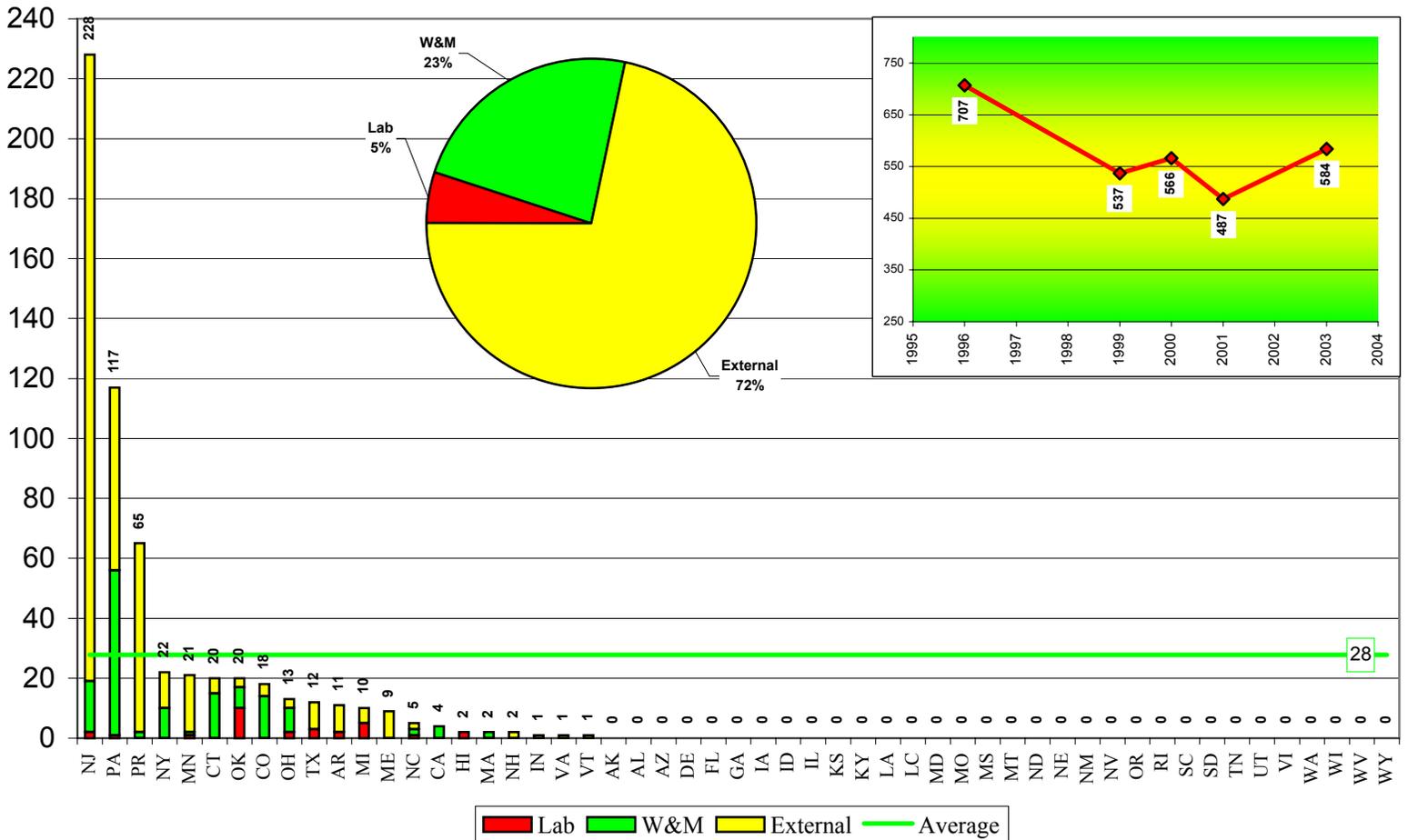
72 % of all length (tape) standards were calibrated for other customers.

New Jersey's heavy workload is a result of a state law that requires calibration of all length standards that are used by law enforcement to check vehicle axle distances.

# Length Tape



**584 Total Devices**



## Length – Rigid Rules

### Description

The graphs on the following page represent the total number of length (rigid rules) standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

### Findings

Of the 48 reporting laboratories, 14 labs tested a total of 138 length (rigid rule) standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Rigid Rule Tests	Total Devices	Lab Average	Change from previous survey
1996	26	582	22.4	--
1999	29	269	9.3	- 59 %
2000	20	413	20.6	+ 123 %
2001	16	164	10.2	- 50 %
2003	14	138	9.9	- 4 %

### Notes and Comments

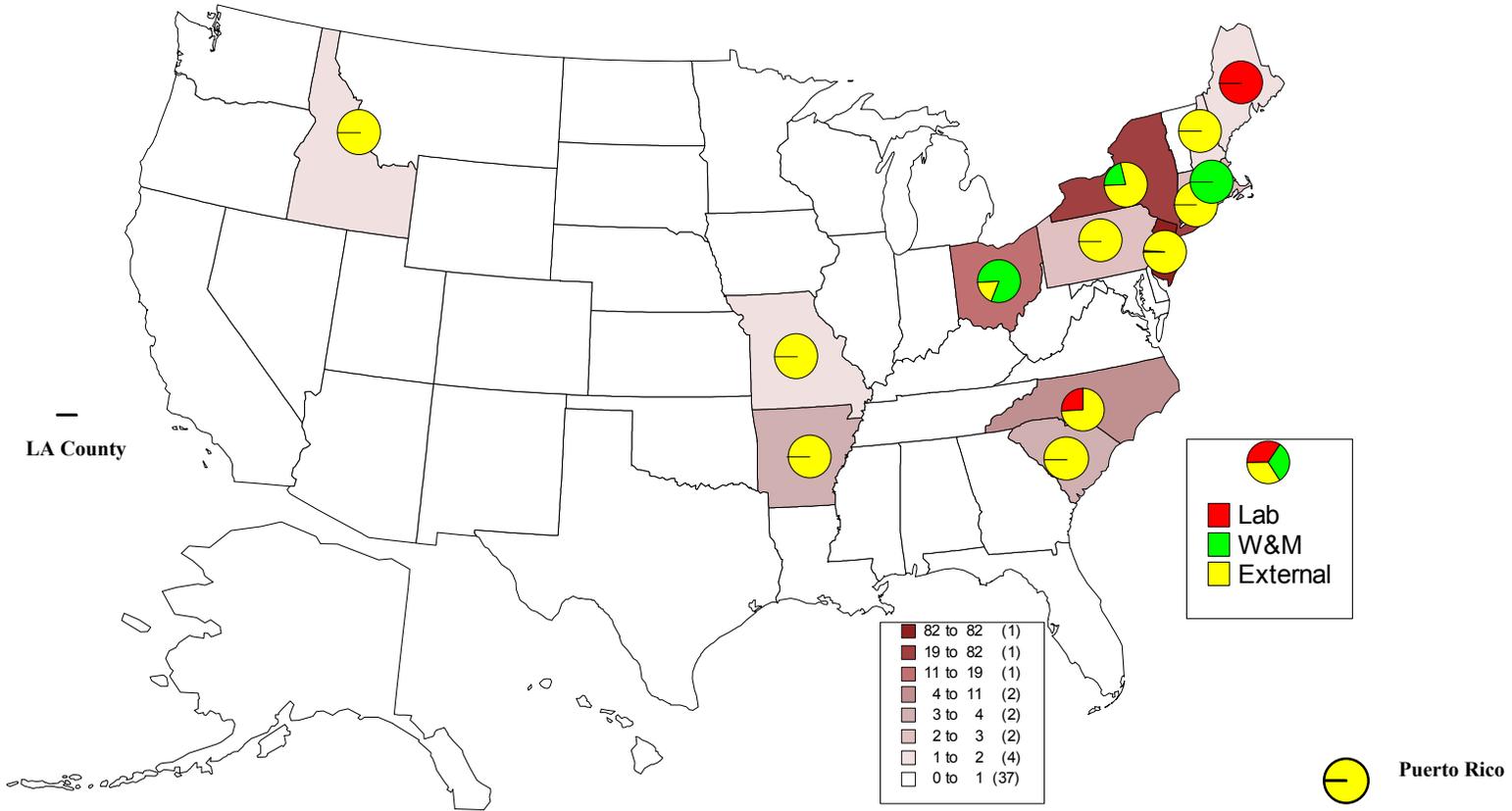
2 % of all length (rigid rule) standards were calibrated for the internal use of the laboratory.

11 % of all length (rigid rule) standards were calibrated for the weights and measures program.

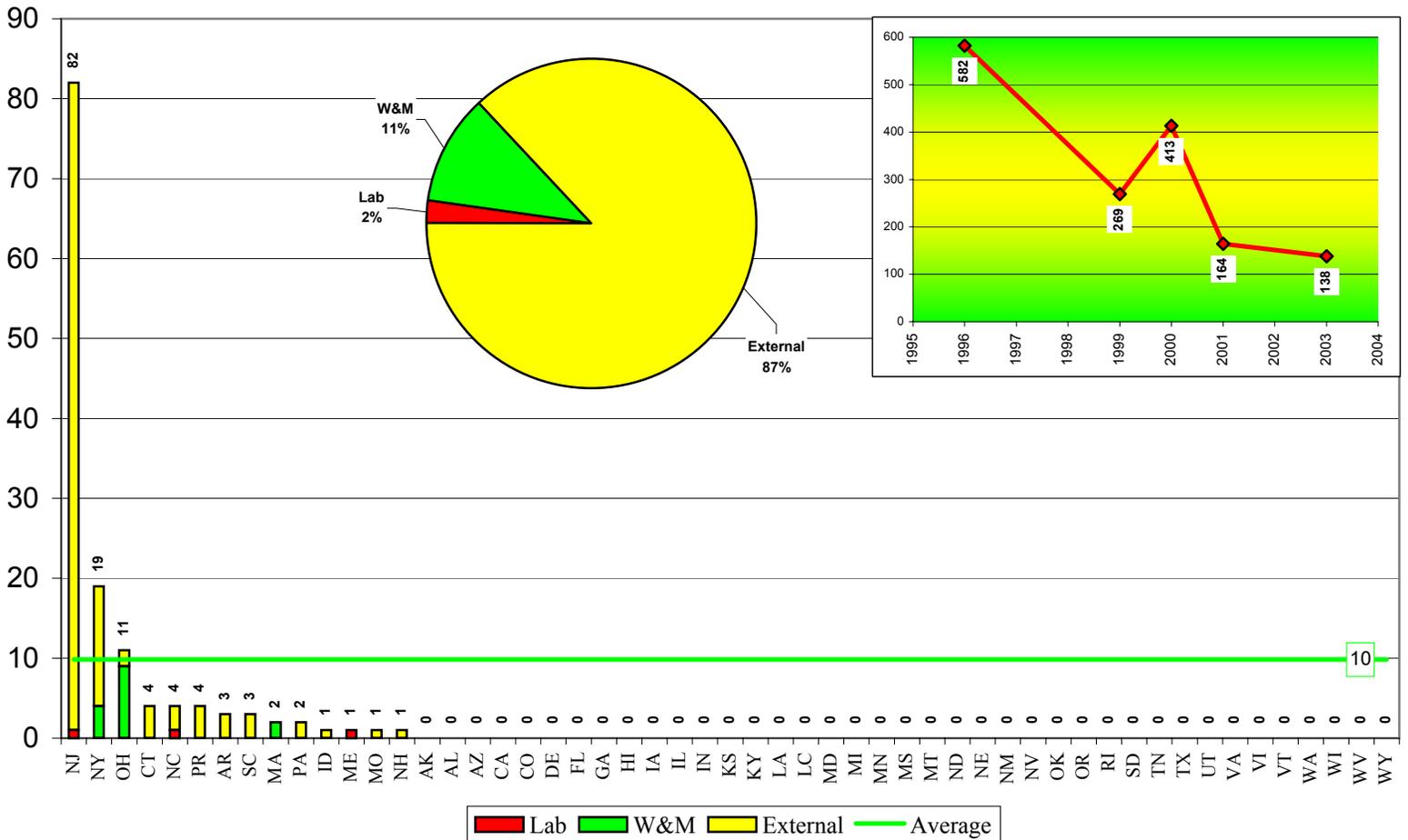
87 % of all length (rigid rule) standards were calibrated for external customers.

New Jersey's heavy workload is a result of a state law that requires calibration of all length standards that are used by law enforcement to check vehicle axle widths.

# Length Rule



**138 Total Devices**



## Volume -- Glassware

### Description

The graphs on the following page represent the total number of volume (glassware) standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

### Volume Categories:

- Glassware – most glassware are kits that contain volumetric standards from 1 gallon to 2 fluid ounces.
- Test Measures – most are metal volumetric standards nominally 5 gallons or less.
- Provers – most are metal volumetric standards nominally larger than 5 gallons.

### Findings

Of the 48 reporting laboratories, 24 labs tested a total of 555 volumetric glassware standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Glassware Tests	Total Devices	Lab Average	Change from previous survey
1996	29	1,205	42	--
1999	24	844	35	- 15 %
2000	25	853	34	- 3 %
2001	27	668	25	- 27 %
2003	24	555	23	- 7 %

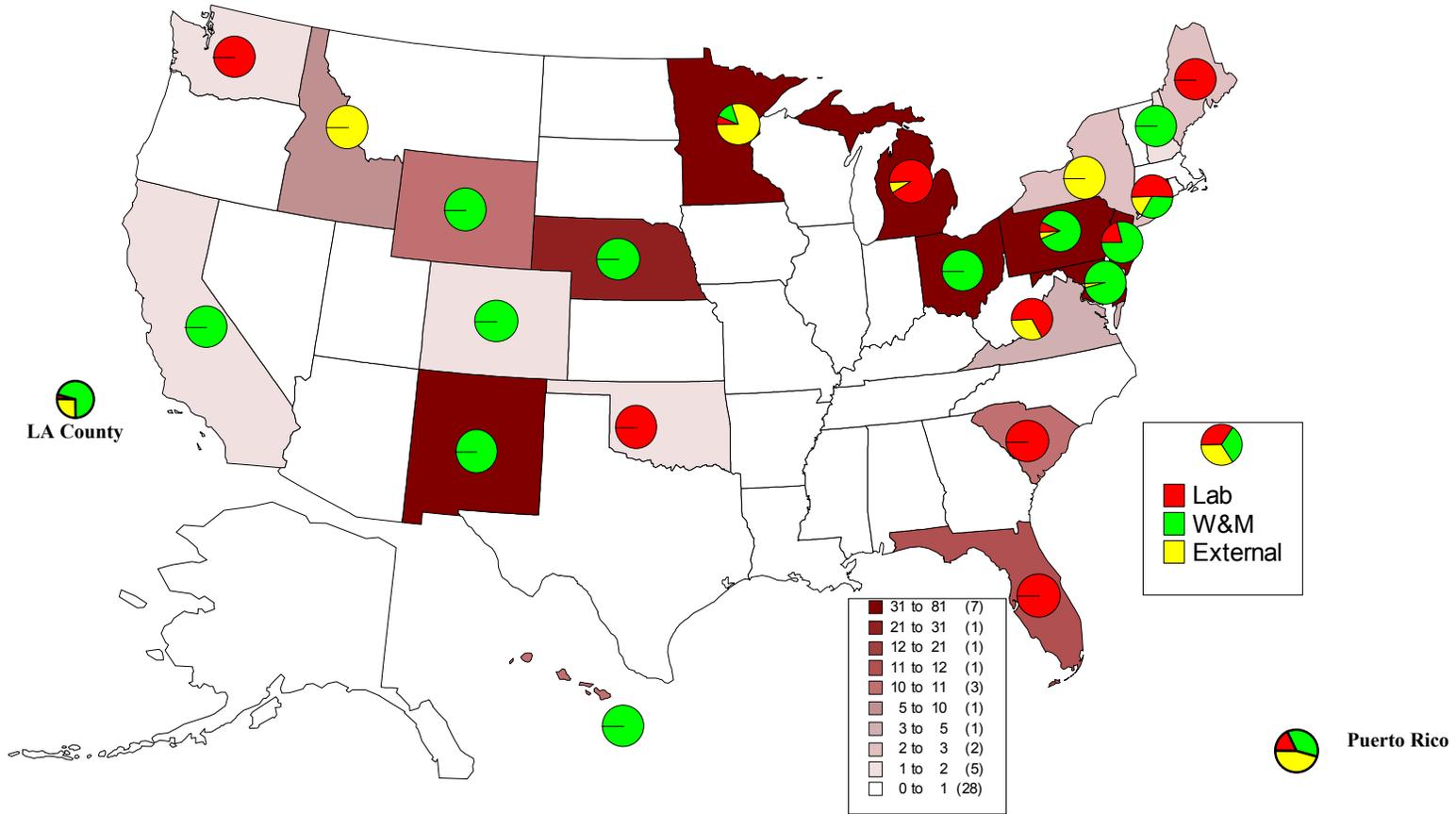
### Notes and Comments

16 % of all volume (glassware) standards were calibrated for the laboratory.

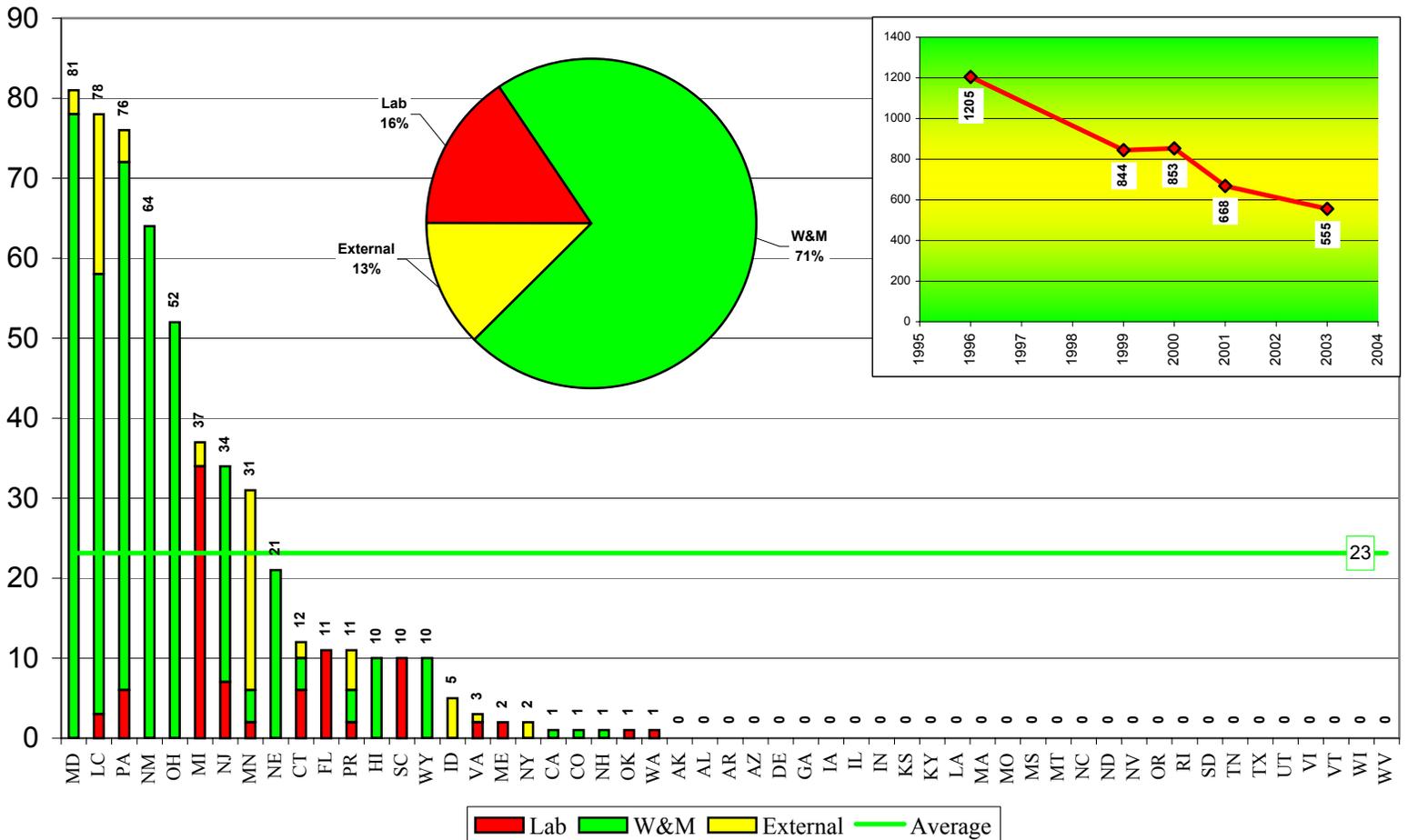
71 % of all volume (glassware) standards were calibrated for weights and measures program.

13 % of all volume (glassware) standards were calibrated for external customers.

# Volume Glassware



**555 Total Devices**



## Volume – Test Measures

### Description

The graphs on the following page represent the total number of volume (test measure) standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

### Volume Categories:

- Glassware – most glassware are kits that contain volumetric standards from 1 gallon to 2 fluid ounces.
- Test Measures – most are metal volumetric standards nominally 5 gallons or less.
- Provers – most are metal volumetric standards nominally larger than 5 gallons.

### Findings

The 48 reporting laboratories tested a total of 6,966 volume (test measure) standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Test Measures	Total Devices	Lab Average	Change from previous survey
1996	48	8,290	173	--
1999	46	6,861	149	- 14 %
2000	45	6,986	155	+ 4 %
2001	45	7,368	164	+ 5 %
2003	48	6,966	145	- 11 %

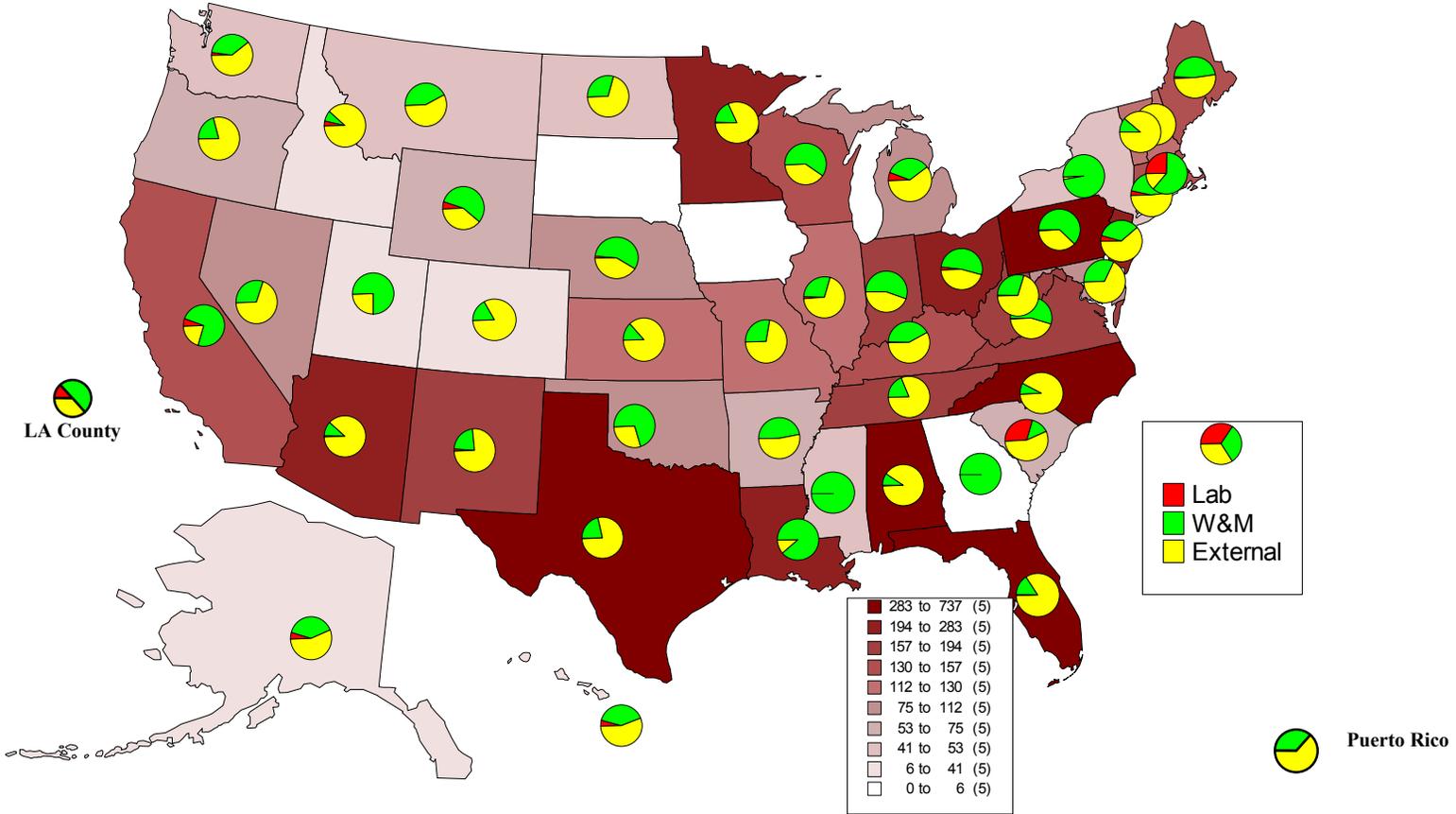
### Notes and Comments

2 % of all volume (test measure) standards were calibrated for the laboratory.

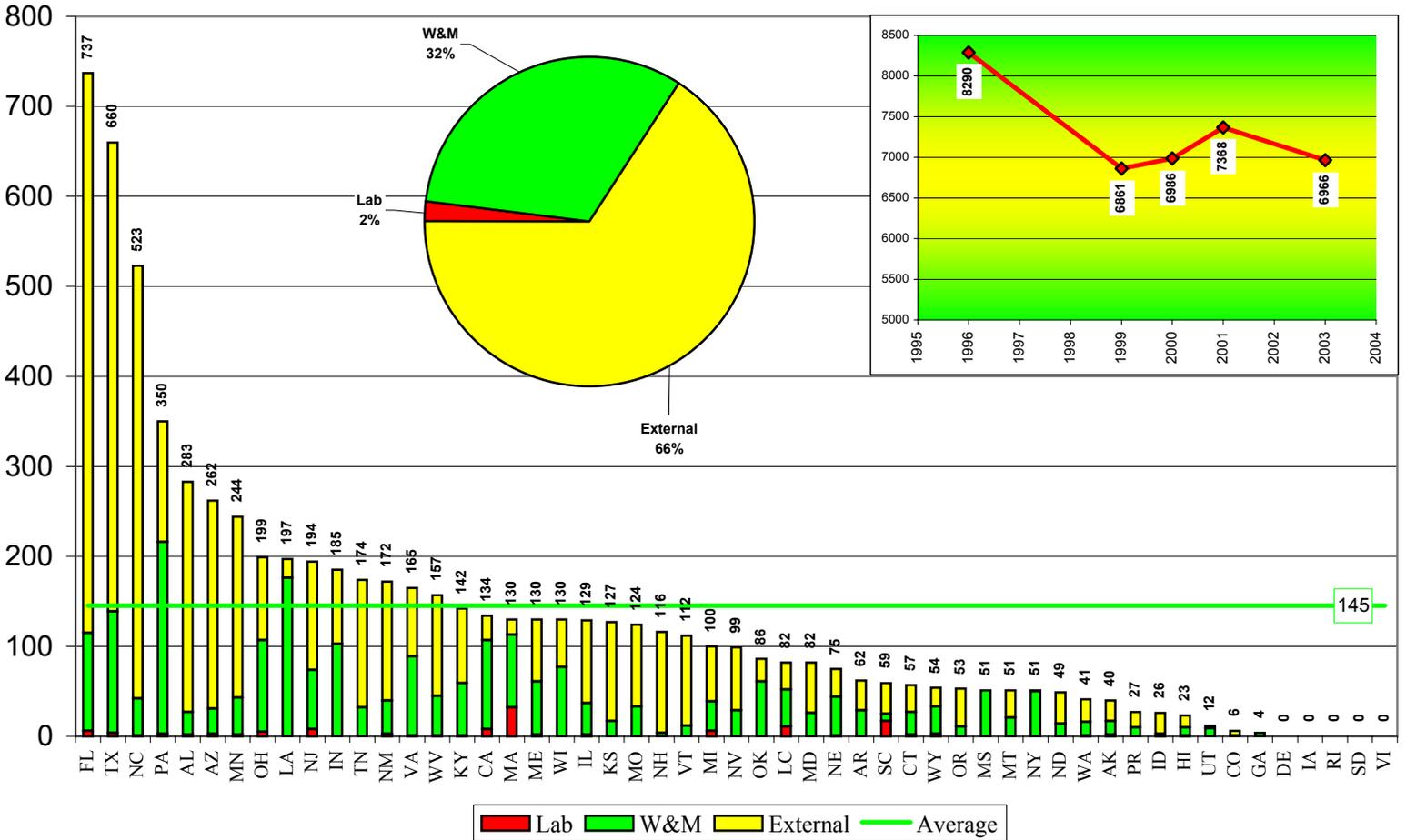
32 % of all volume (test measure) standards were calibrated for weights and measures program.

66 % of all volume (test measure) standards were calibrated for external customers.

# Volume Test Measures



**6966 Total Devices**



## Volume -- Provers

### Description

The graphs on the following page represent the total number of volume (provers) standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

### Volume Categories:

- Glassware – most glassware are kits that contain volumetric standards from 1 gallon to 2 fluid ounces.
- Test Measures – most are metal volumetric standards nominally 5 gallons or less.
- Provers – most are metal volumetric standards nominally larger than 5 gallons.

### Findings

Of the 48 reporting laboratories, 43 labs tested a total of 1,053 volume (prover) standards.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Prover Tests	Total Devices	Lab Average	Change from previous survey
1996	48	1,187	25	--
1999	46	867	19	- 24 %
2000	42	1,112	26	+ 40 %
2001	43	1,260	29	+ 11 %
2003	43	1,053	24	- 17 %

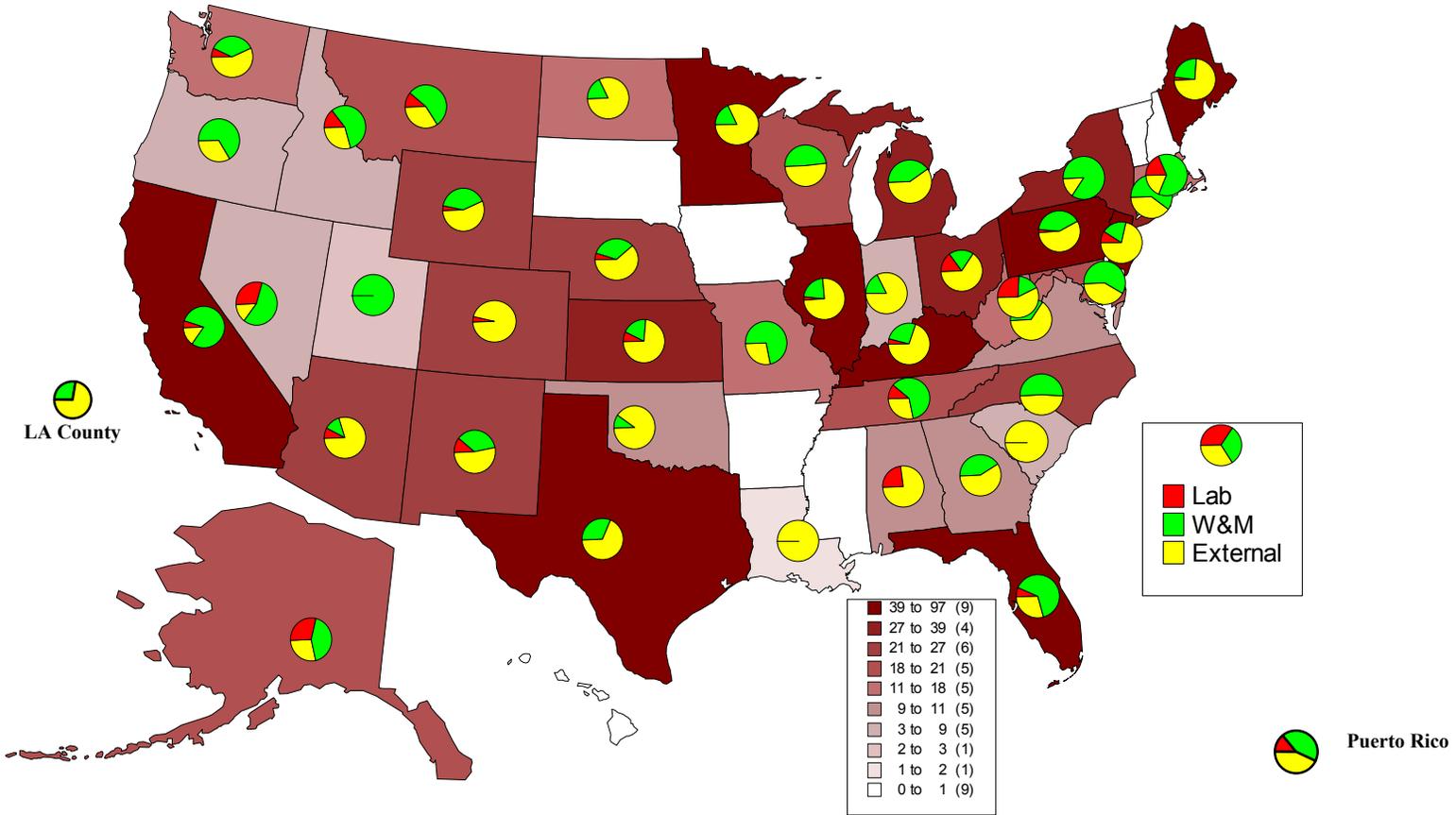
### Notes and Comments

5 % of all volume (prover) standards were calibrated for the laboratory.

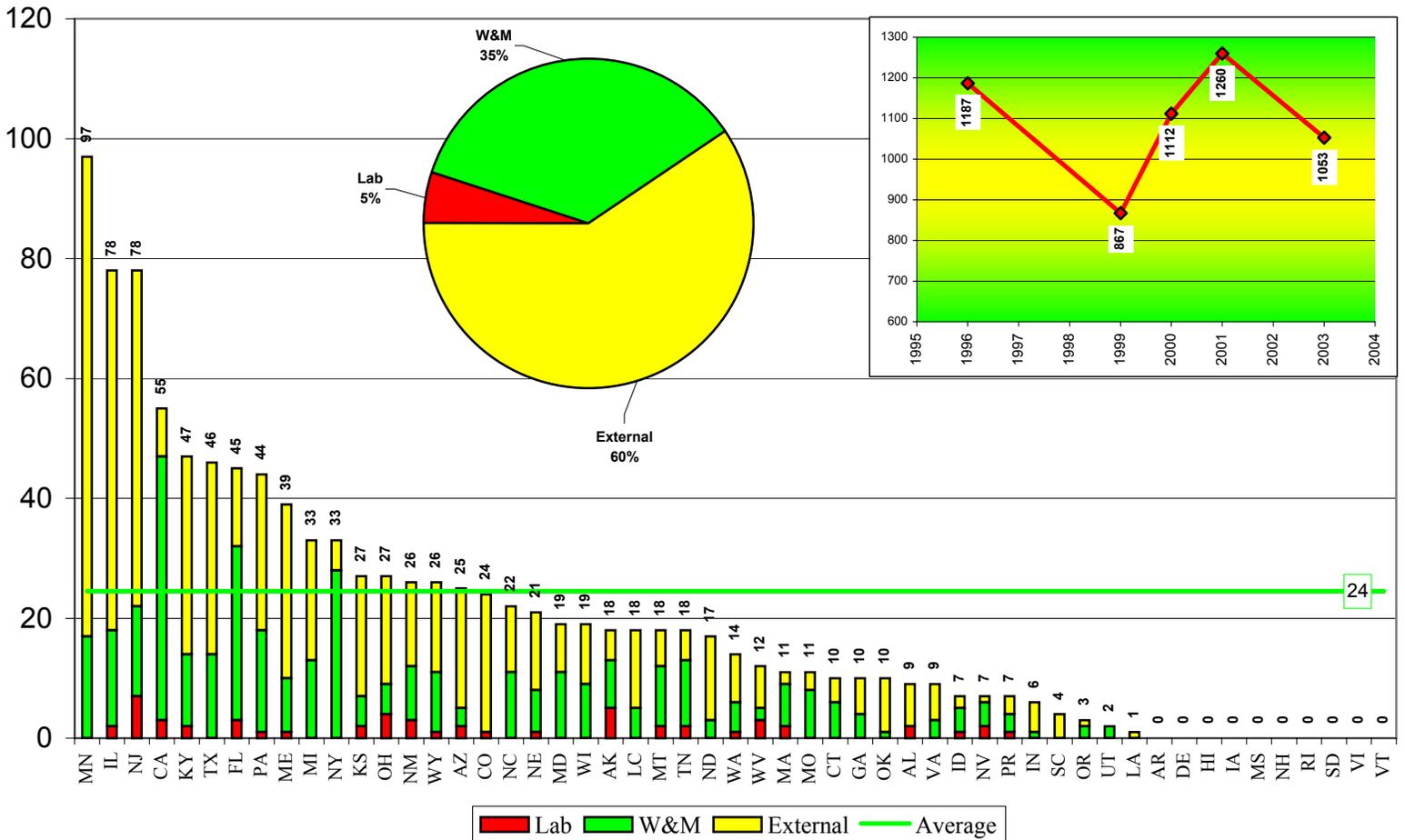
35 % of all volume (prover) standards were calibrated for weights and measures program.

60 % of all volume (prover) standards were calibrated for external customers.

# Volume Provers



**1053 Total Devices**



# Temperature

## Description

The graphs on the following page represent the total number of temperature standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

## Findings

Of the 48 reporting laboratories, 13 labs tested a total of 456 temperature standards.

## Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Temperature tests	Total Devices	Lab Average	Change from previous survey
1996	20	447	22	--
1999	11	378	34	+ 54 %
2000	12	514	43	+ 25 %
2001	16	460	29	- 33 %
2003	13	456	35	+ 22 %

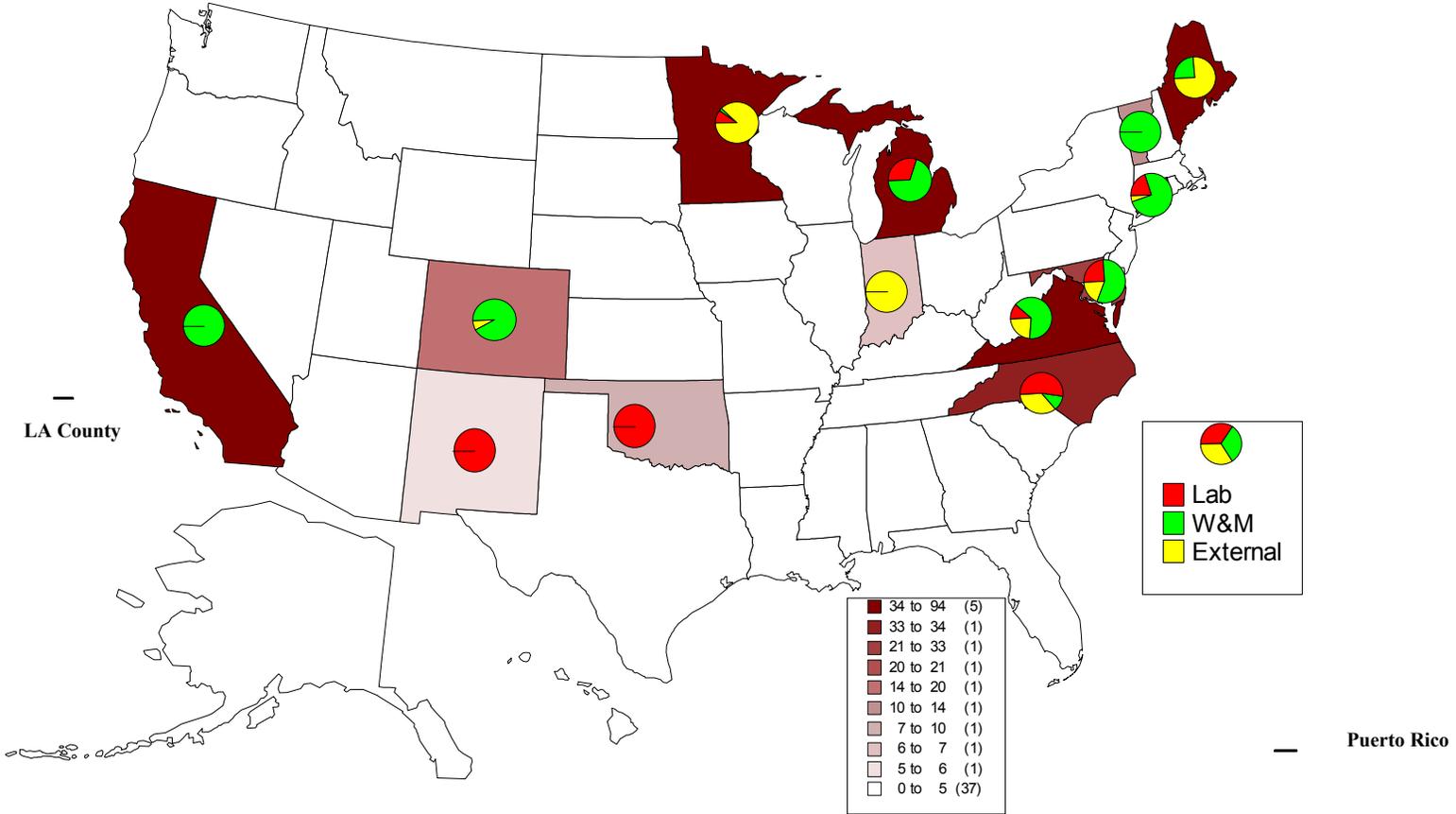
## Notes and Comments

16 % of all temperature standards were calibrated for the laboratory.

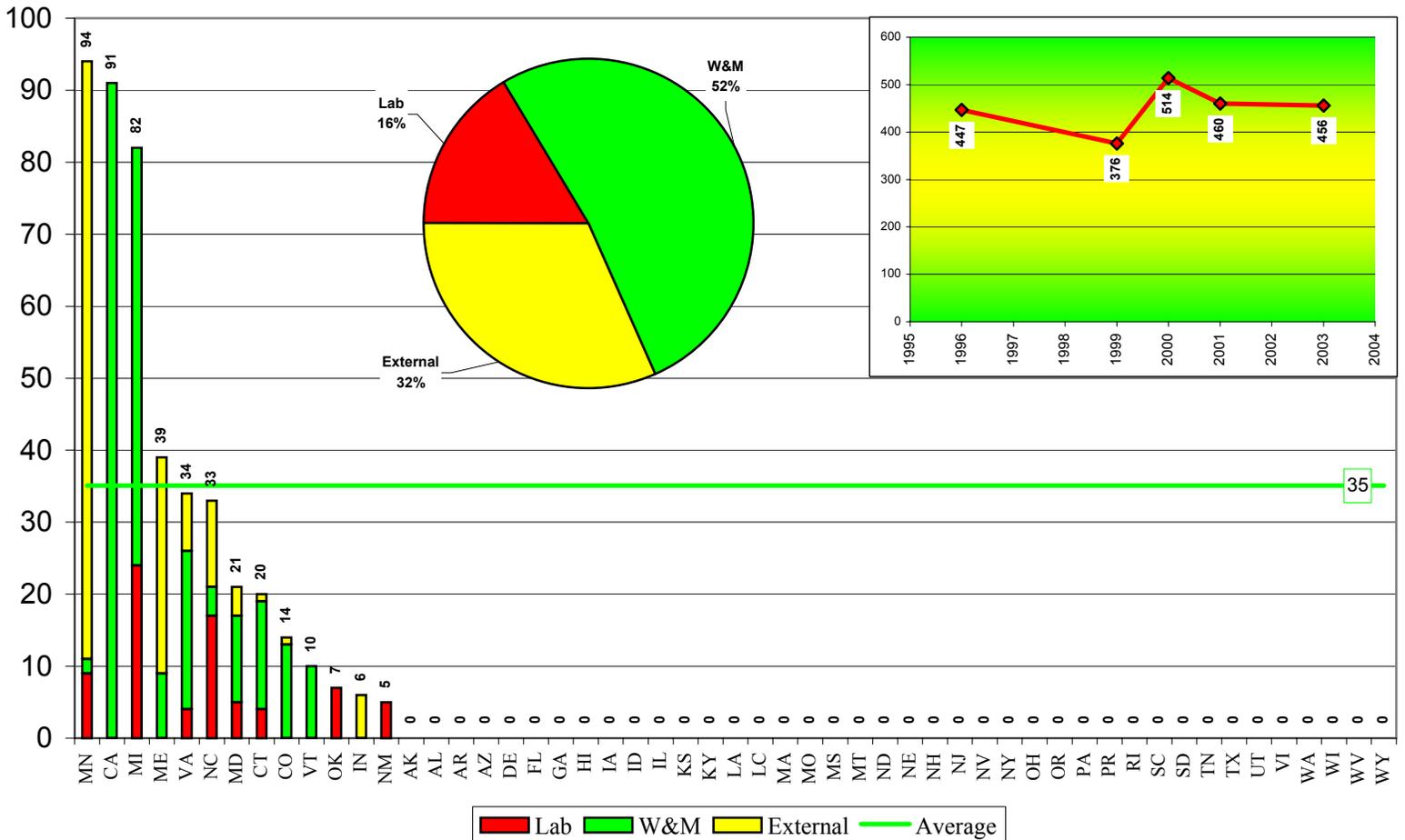
52 % of all temperature standards were calibrated for weights and measures program.

32 % of all temperature standards were calibrated for external customers.

# Temperature



**456 Total Devices**



# Frequency

## Description

The graphs on the following page represent the total number of frequency standards tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

## Findings

Of the 48 reporting laboratories, 6 labs tested a total of 13,785 frequency standards.

## Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Frequency Tests	Total Devices	Lab Average	Change from previous survey
1996	6	12,518	2,086	--
1999	4	11,561	2,890	+ 39 %
2000	5	13,518	2,704	- 6 %
2001	7	14,670	2,096	- 22 %
2003	6	13,785	2,298	+ 10 %

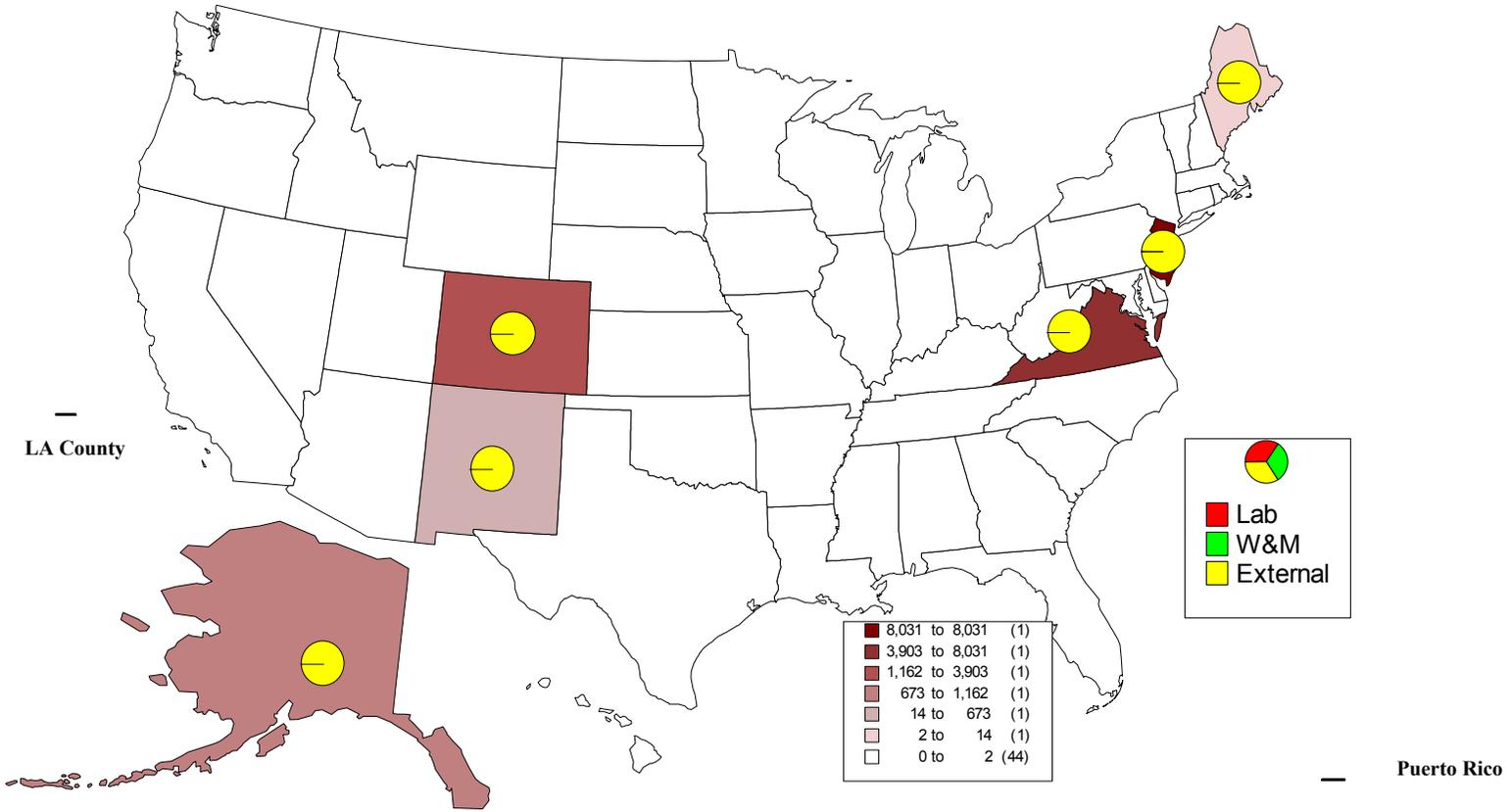
## Notes and Comments

0 % of all frequency standards were calibrated for the laboratory.

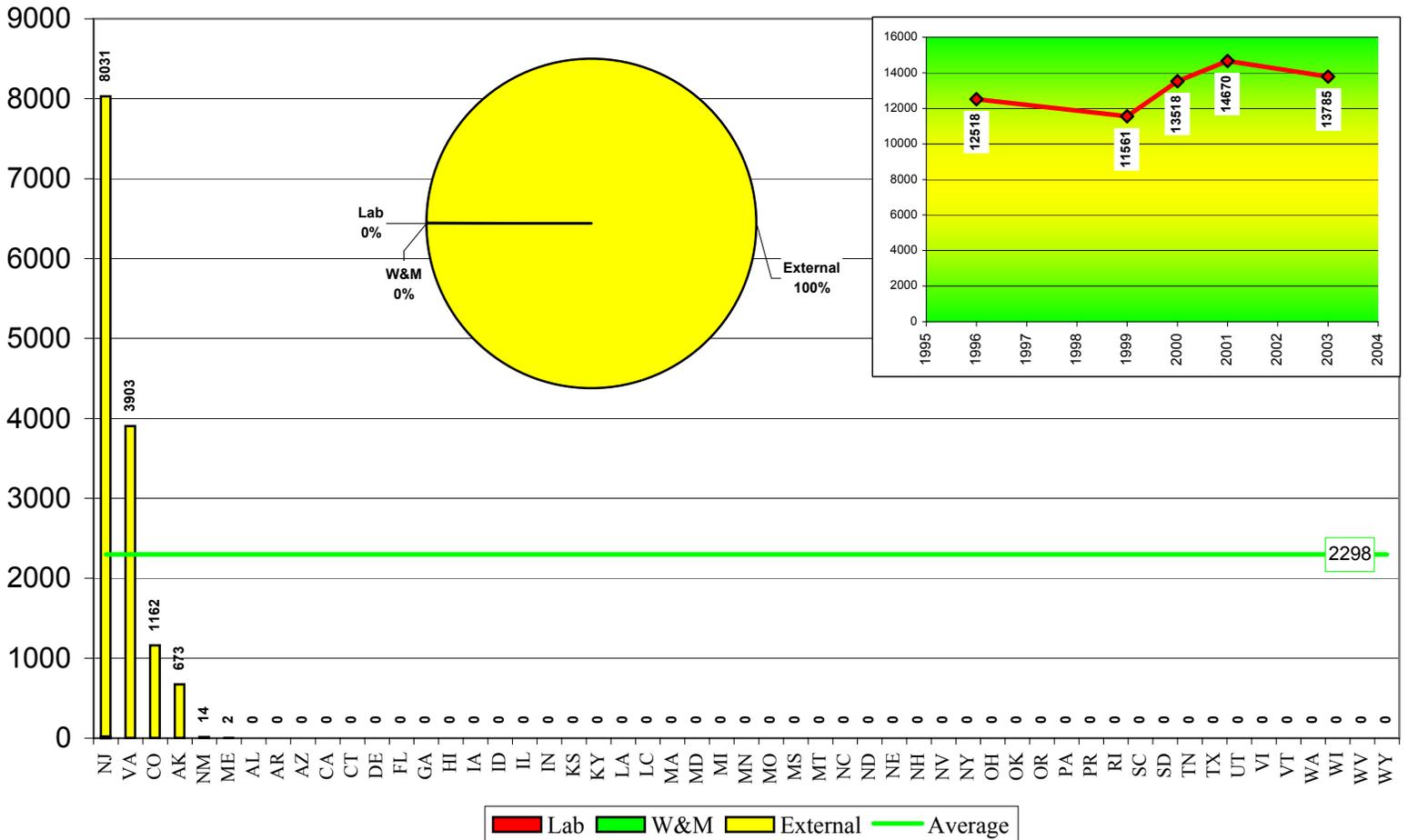
0 % of all frequency standards were calibrated for weights and measures program.

100 % of all frequency standards were calibrated for external customers.

# Frequency



**13785 Total Devices**



## Time

### Description

The graphs on the following page represent the total number of timing devices tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1996, 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

### Findings

Of the 48 reporting laboratories, 11 labs tested a total of 479 timing devices.

### Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Time Tests	Total Devices	Lab Average	Change from previous survey
1996	13	161	12	--
1999	11	380	35	+ 179 %
2000	14	451	32	- 7 %
2001	13	554	43	+ 32 %
2003	11	479	44	+ 2 %

### Notes and Comments

5 % of all timing devices were calibrated for the laboratory.

32 % of all timing devices were calibrated for weights and measures program.

63 % of all timing devices were calibrated for external customers.



# Wheel Load Weighers

## Description

The graphs on the following page represent the total number of wheel load weighers tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. There are pie graphs located on the map for each individual lab and a larger pie graph that reflects the totals. The pie graphs provide a breakdown into the customer categories of Lab, W&M, and External. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory. There is also a smaller line graph that reflects the totals from the 1999, 2000, 2001, and 2003 surveys.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

## Findings

Of the 48 reporting laboratories, 23 labs tested a total of 10,350 wheel load weighers.

## Comparison of the 2003, 2001, 2000, 1999, and 1996 Survey

	# Labs Reporting Wheel Load Weigher Tests	Total Devices	Lab Average	Change from previous survey
1999	19	12,178	641	--
2000	20	12,781	639	0 %
2001	22	13,699	623	- 3 %
2003	23	10,350	450	- 28 %

## Notes and Comments

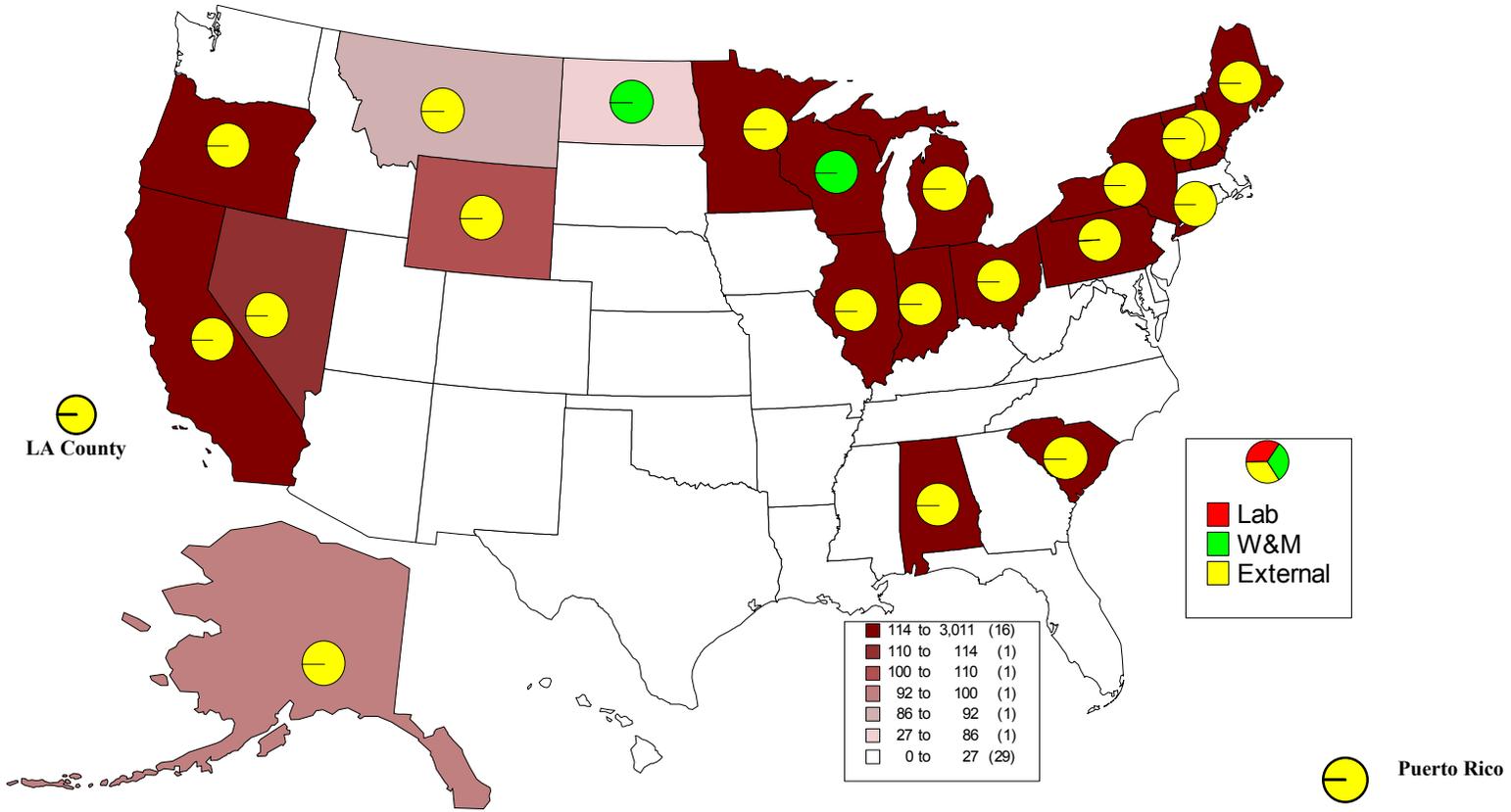
0 % of all wheel load weighers were calibrated for the laboratory.

2 % of all wheel load weighers were calibrated for weights and measures program.

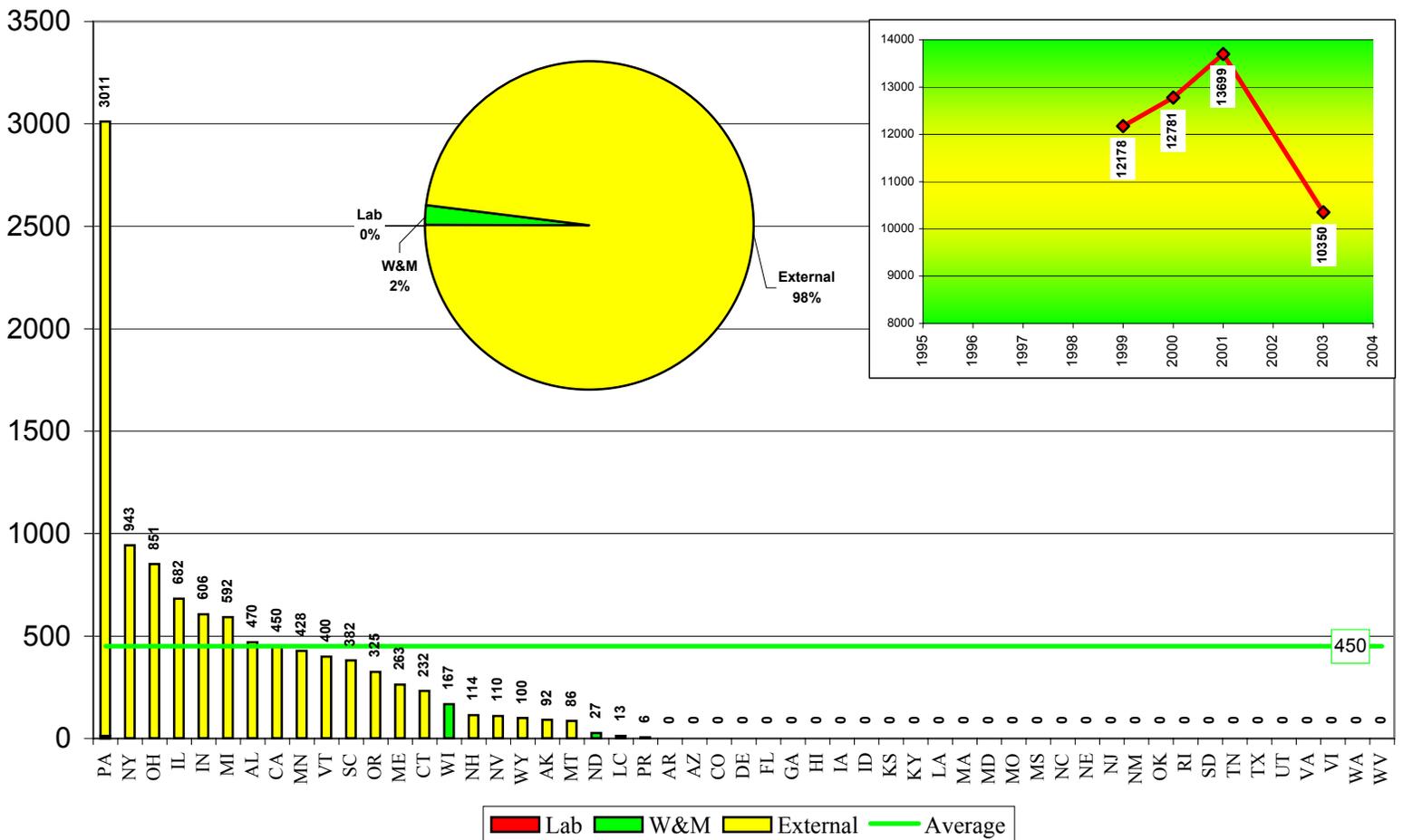
98 % of all wheel load weighers were calibrated for external customers.

Pennsylvania laboratory performed 3,011 tests on wheel load weighers (29 % of the national total).

# Wheel Load Weighers



**10350 Total Devices**



## Summary of “Other Tests”

### Description

The category “Other Tests” was for tests performed by the metrology laboratory that did not fit into any of the listed categories in the survey.

The graphs on the following page represent the total number of “Other Tests” performed by 24 reporting laboratories. The pie graph provides a further breakdown into the following categories:

Lottery Balls *	(11 laboratories)	(35,818 tests)
Hydrometers	(1 laboratory)	(3,000 tests)
Filters-EPA	(1 laboratory)	(2,145 tests)
Grain Moisture *	(4 laboratories)	(186 tests)
Radar Units †	(1 laboratory)	(439 tests)
Special Linear/Dimensional *	(4 laboratories)	(83 tests)
Scales *	(7 laboratories)	(180 tests)
Special Volume	(8 laboratories)	(266 tests)
Electrical *	(2 laboratories)	(50 tests)
Railroad Test Cars	(2 laboratories)	(3 tests)
Special Mass	(2 laboratories)	(112 tests)

\* *(Individual graphs are presented for these categories)*

† *(Includes electronic testing of the radar unit, not just calibration of the tuning forks)*

The bar graph at the bottom of the page shows the same breakdown in categories along with the total number of “Other Tests” performed above each laboratory.

Lab – work done for the internal use of the metrology laboratory.

W&M – work done for the weights and measures program.

Other – work done for customers who do not fall into any of the above categories.

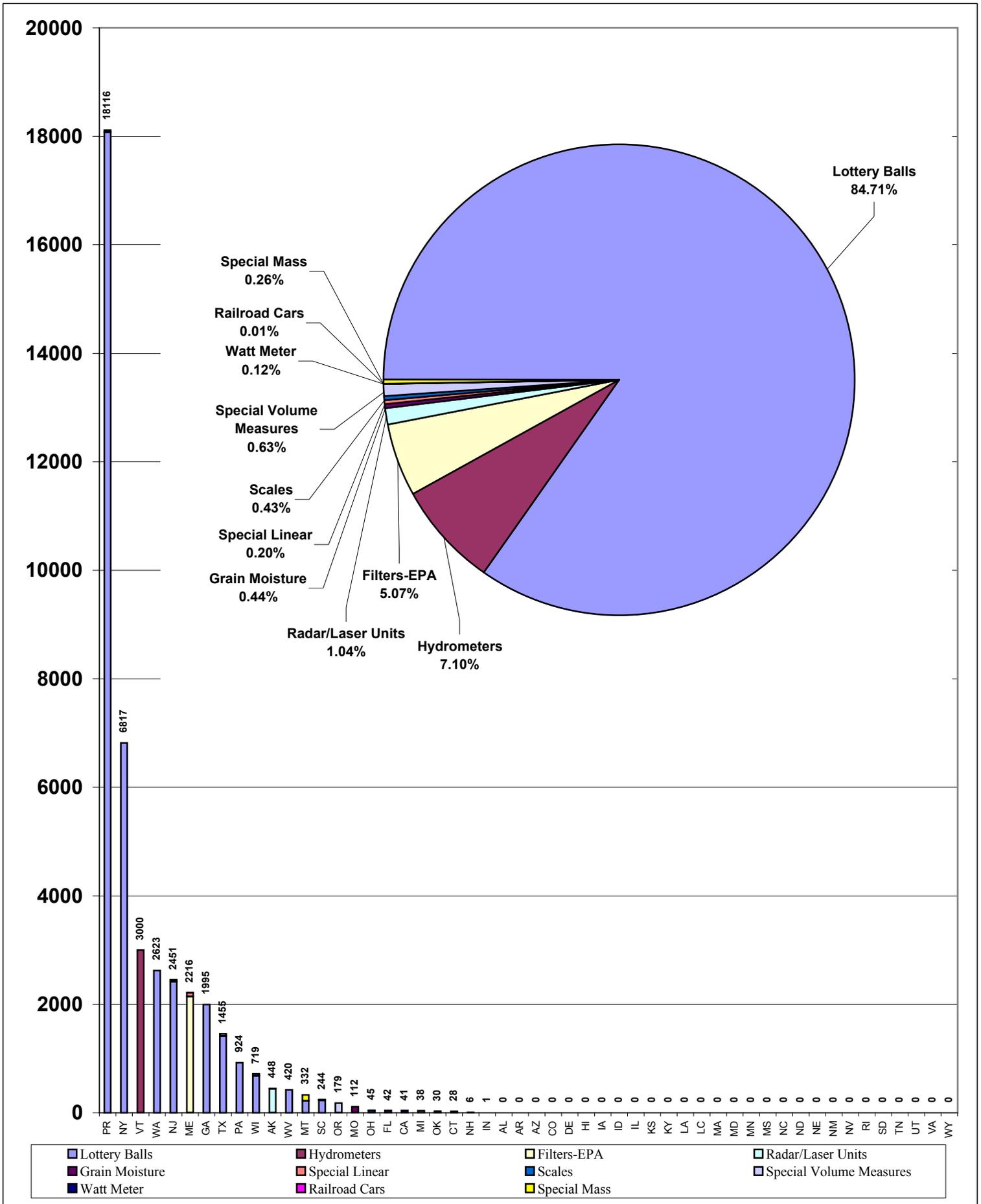
### Findings

	# Labs Reporting Other Tests	Total Devices Tested	Lab Average	Change from previous survey
2000	24	25,350	1,056	--
2001	26	30,199	1,162	+ 10 %
2003	24	42,282	1,762	+ 52 %

The 24 reporting laboratories performed a total of 42,282 ‘Other Tests’, which is an increase of 40 % over the 30,199 other tests from 2001.

# Summary of Other Tests

**42282 Total Devices**



## “Other Tests” -- Lottery Balls

### Description

The graphs on the following page represent the total number of lottery balls tested by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

### Findings

Of the 48 reporting laboratories, 11 labs tested a total of 35,818 lottery balls.

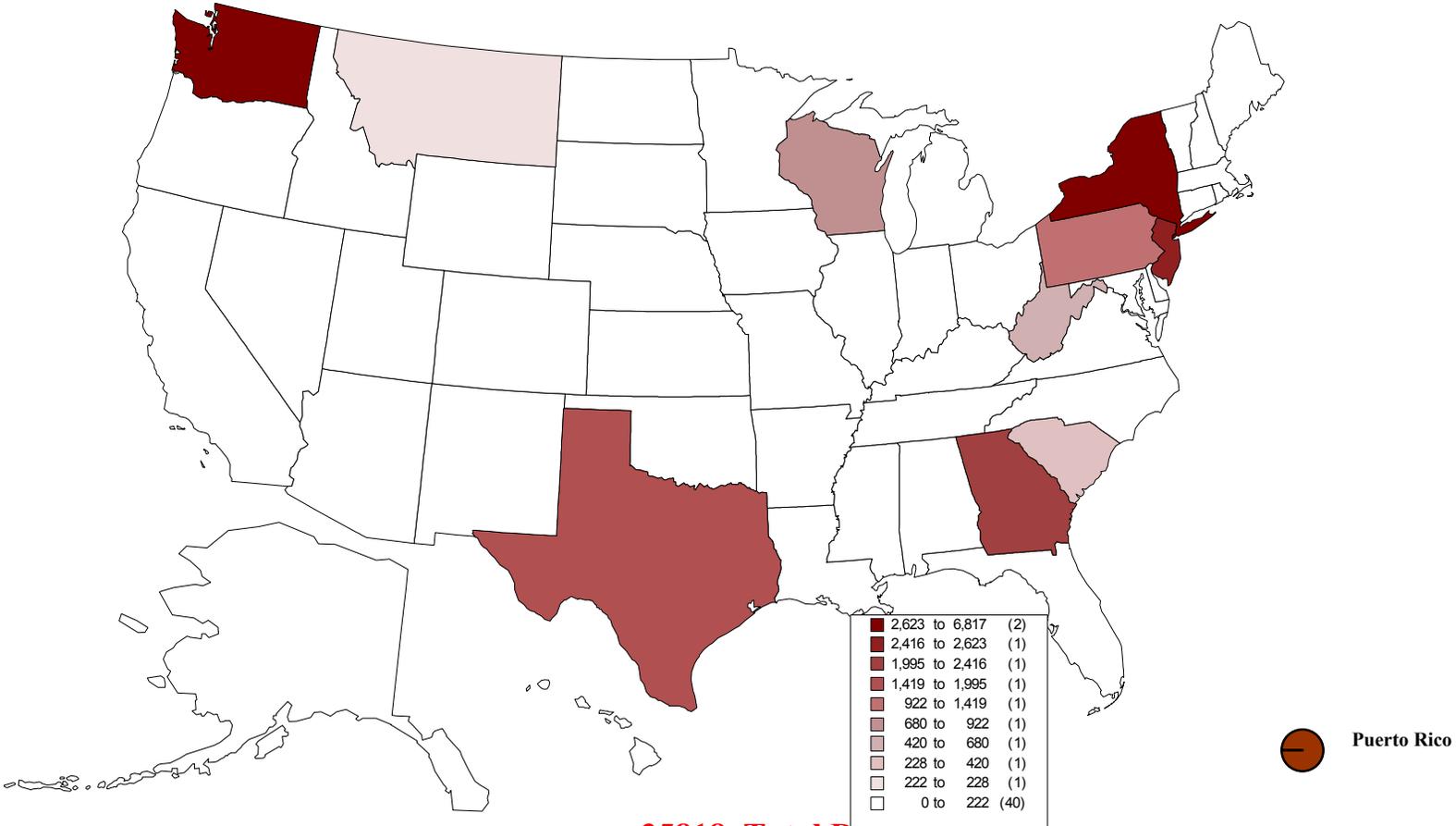
	# Labs Reporting Lottery Ball Tests	Total Tested	Lab Average	Change from previous survey
2000	9	19,982	2,220	--
2001	13	24,702	1,900	- 14 %
2003	11	35,818	3,256	+ 71 %

### Notes and Comments

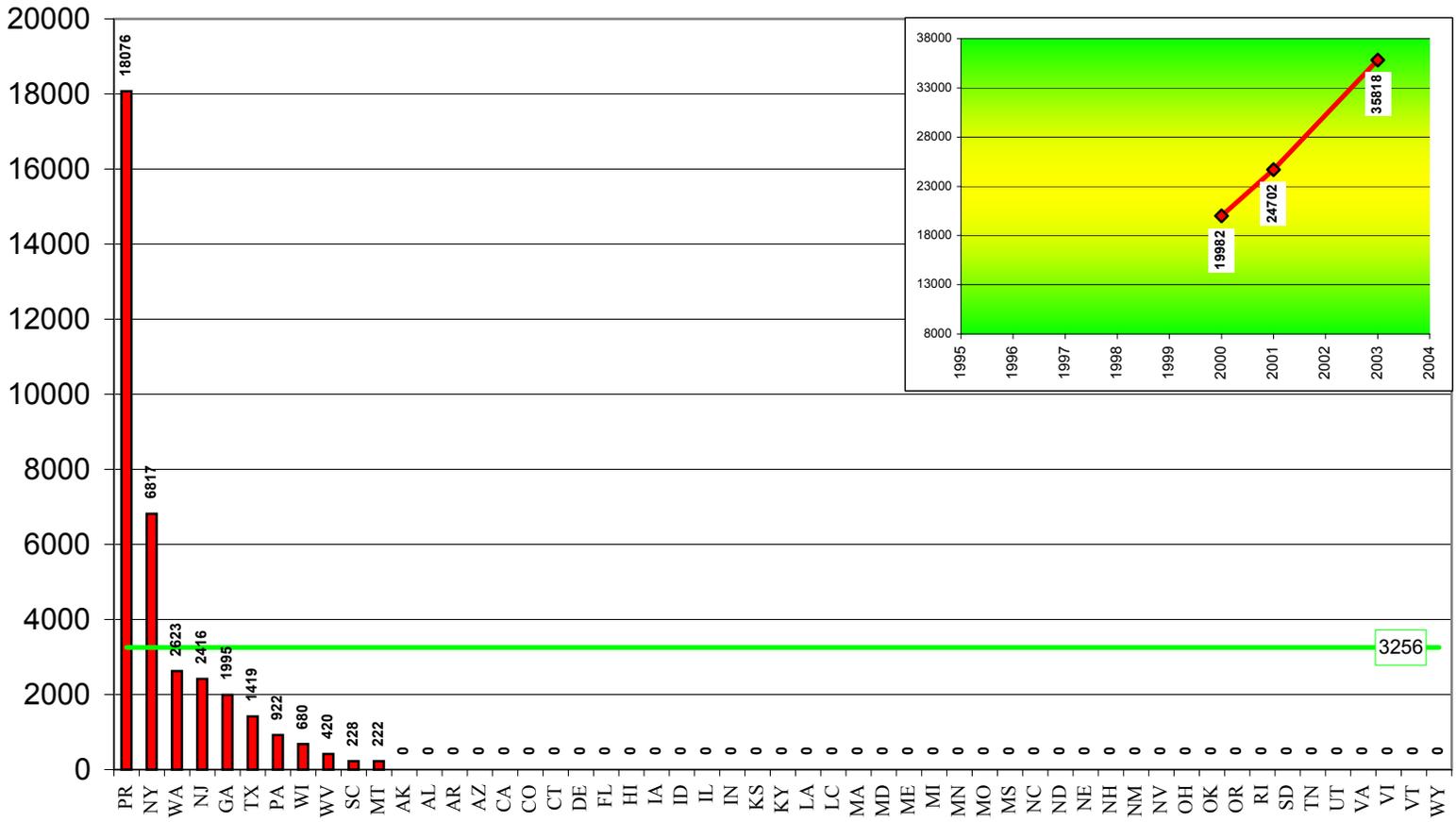
Most of the testing of lottery balls involved only the determination of mass although some also required dimensional measurements.

There were 11 laboratories reporting the testing of lottery balls. There may be other laboratories that do this type of testing that reported the items under one of the mass categories.

# Lottery Balls



**35818 Total Devices**



## “Other Tests” -- Grain Moisture

### Description

The graphs on the following page represent the total number of grain moisture tests performed by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory

### Findings

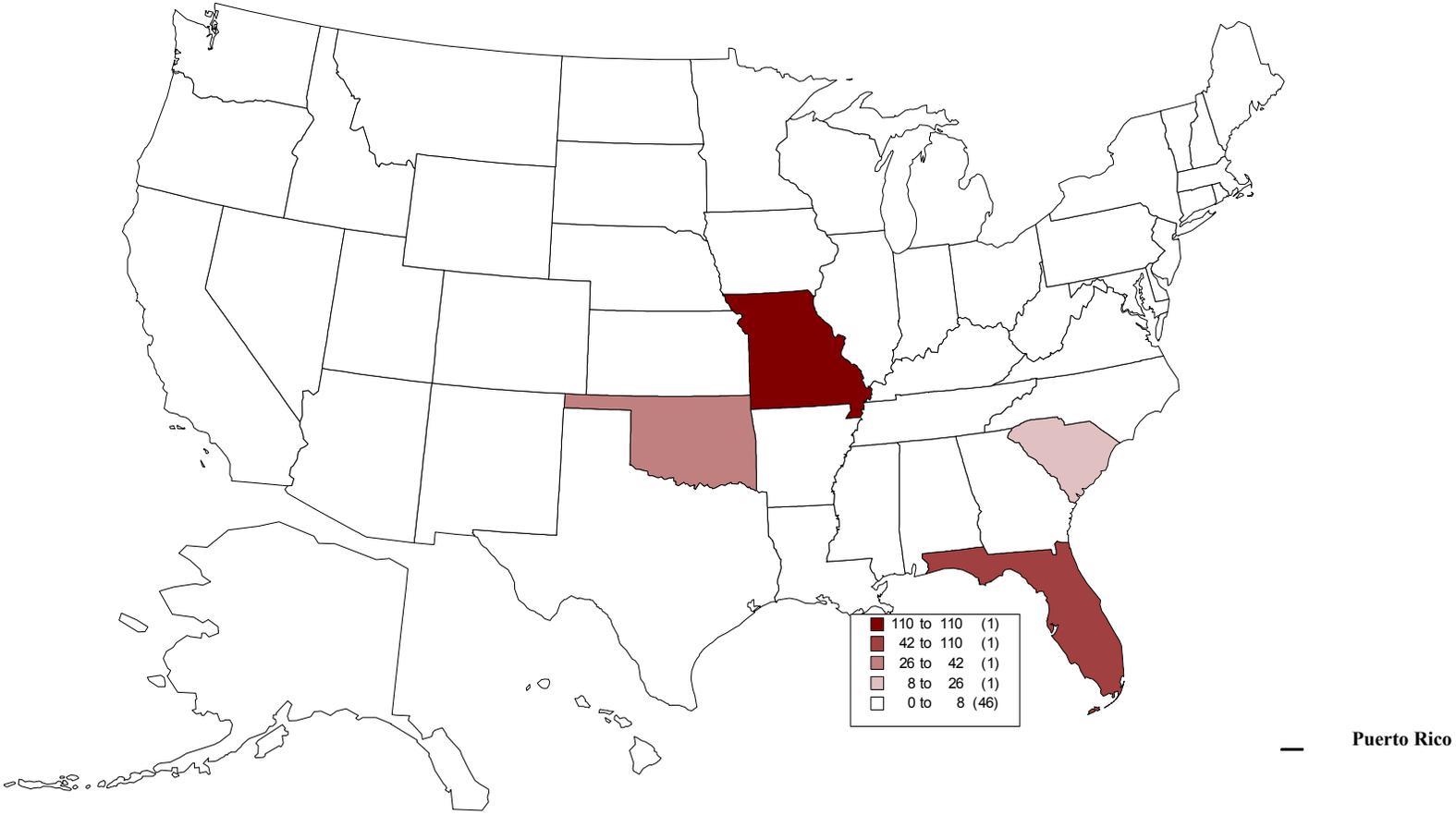
Of the 48 reporting laboratories, 4 labs performed a total of 186 grain moisture tests.

	# Labs Reporting Grain Moisture Tests	Total Tests	Lab Average	Change from previous survey
2000	4	353	88	--
2001	3	259	86	- 2 %
2003	4	186	46	- 47 %

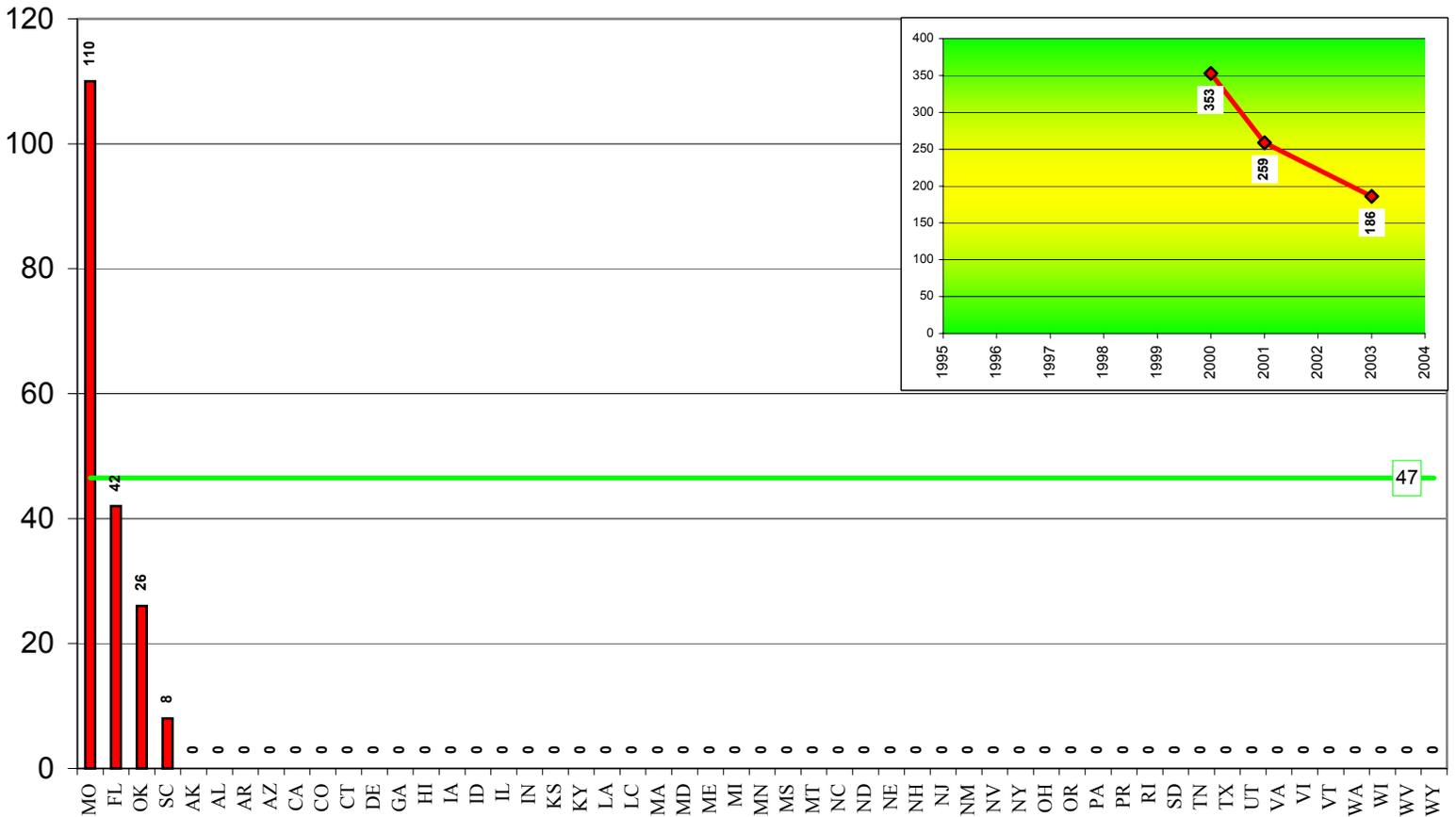
### Notes and Comments

There were 4 laboratories that reported doing grain moisture tests. There are some states in which the grain moisture testing is performed by some other entity other than the metrology lab.

# Grain Moisture



**186 Total Devices**



## “Other Tests” -- Scales

### Description

The graphs on the following page represent the total number of scale tests performed by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

### Findings

Of the 48 reporting laboratories, 7 labs tested a total of 180 scales.

	# Labs Reporting Scale Tests	Total Tests	Lab Average	Change from previous survey
2000	5	92	18	--
2001	9	189	21	+ 14 %
2003	7	180	26	+ 24 %

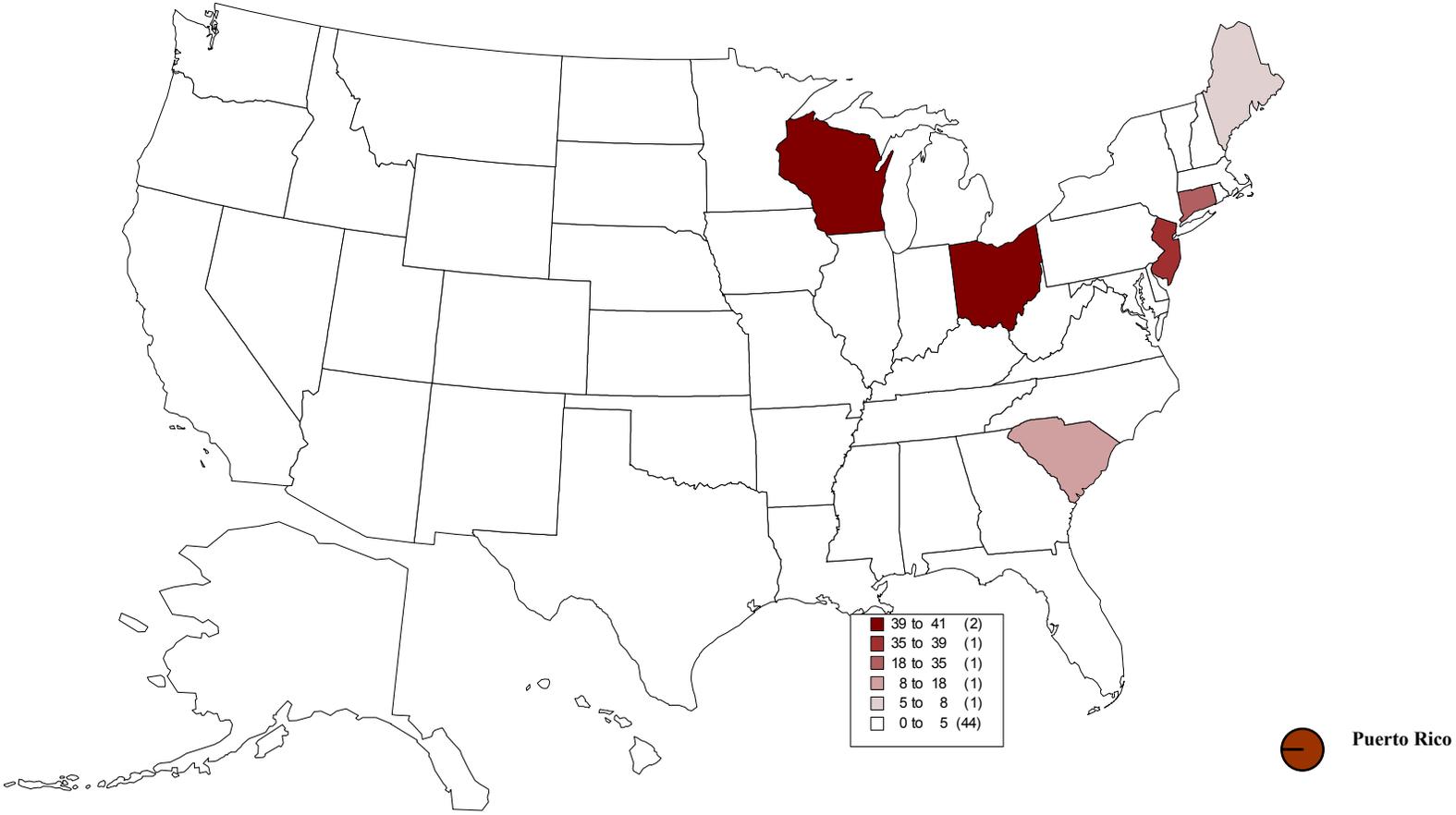
### Notes and Comments

There were 7 laboratories that reported the testing of scales.

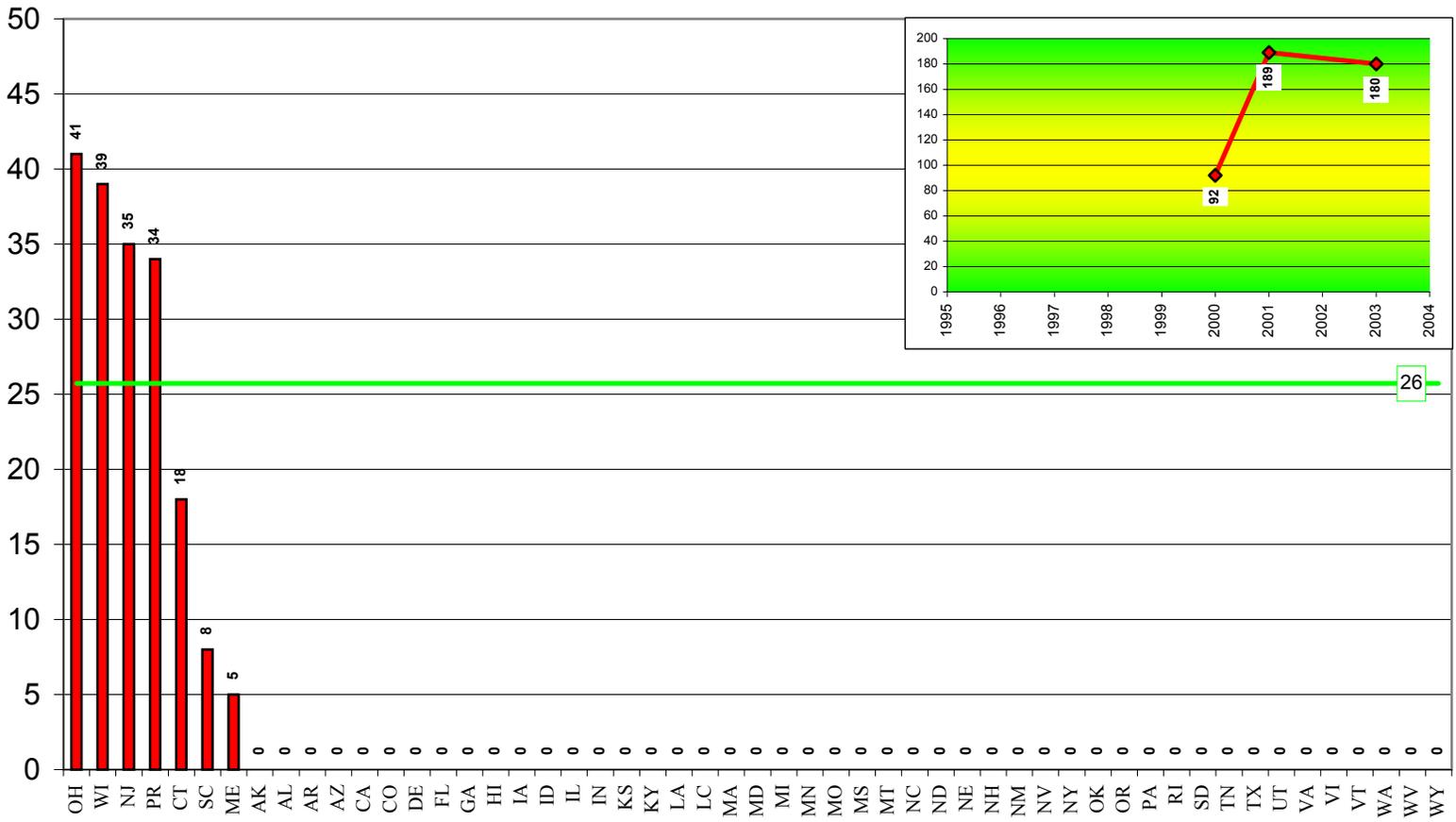
The type of scales tested by these metrology labs included:

- Package checking scales
- Force gauges
- Fish scales
- Produce scales
- Doctor-Type Scales
- Assorted electronic/mechanical/spring scales

# Scales



**180 Total Devices**



## “Other Tests” -- Special Linear/Dimensional

### Description

The graphs on the following page represent the total number of special linear/dimensional tests performed by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

### Findings

Of the 48 reporting laboratories, 4 labs performed a total of 83 special linear/dimensional tests.

	# Labs Reporting Special Linear Tests	Total Tests	Lab Average	Change from previous survey
2000	3	209	70	--
2001	4	258	64	- 7 %
2003	4	83	21	- 68 %

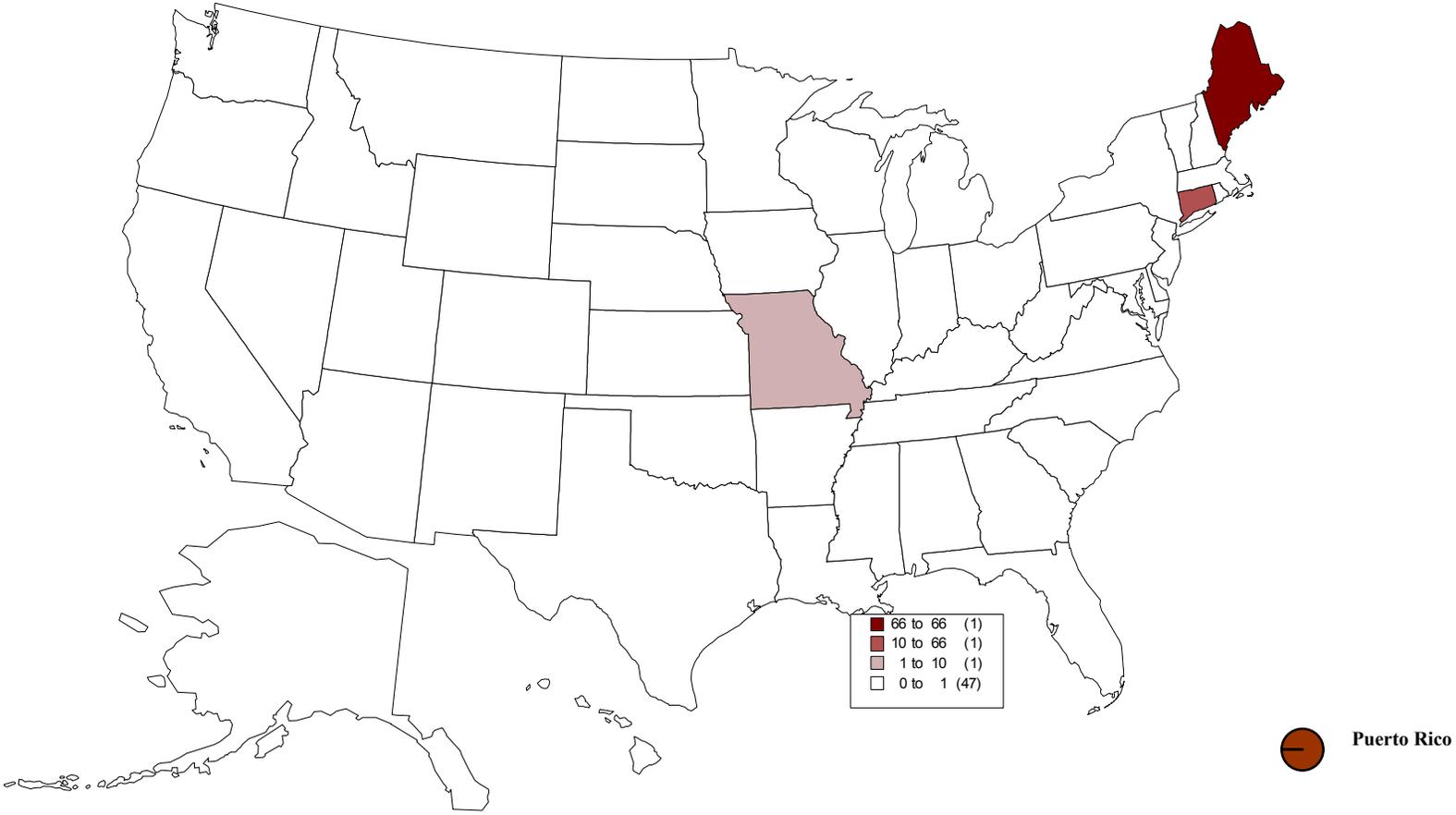
### Notes and Comments

There were 4 laboratories that reported the testing of special linear/dimensional devices.

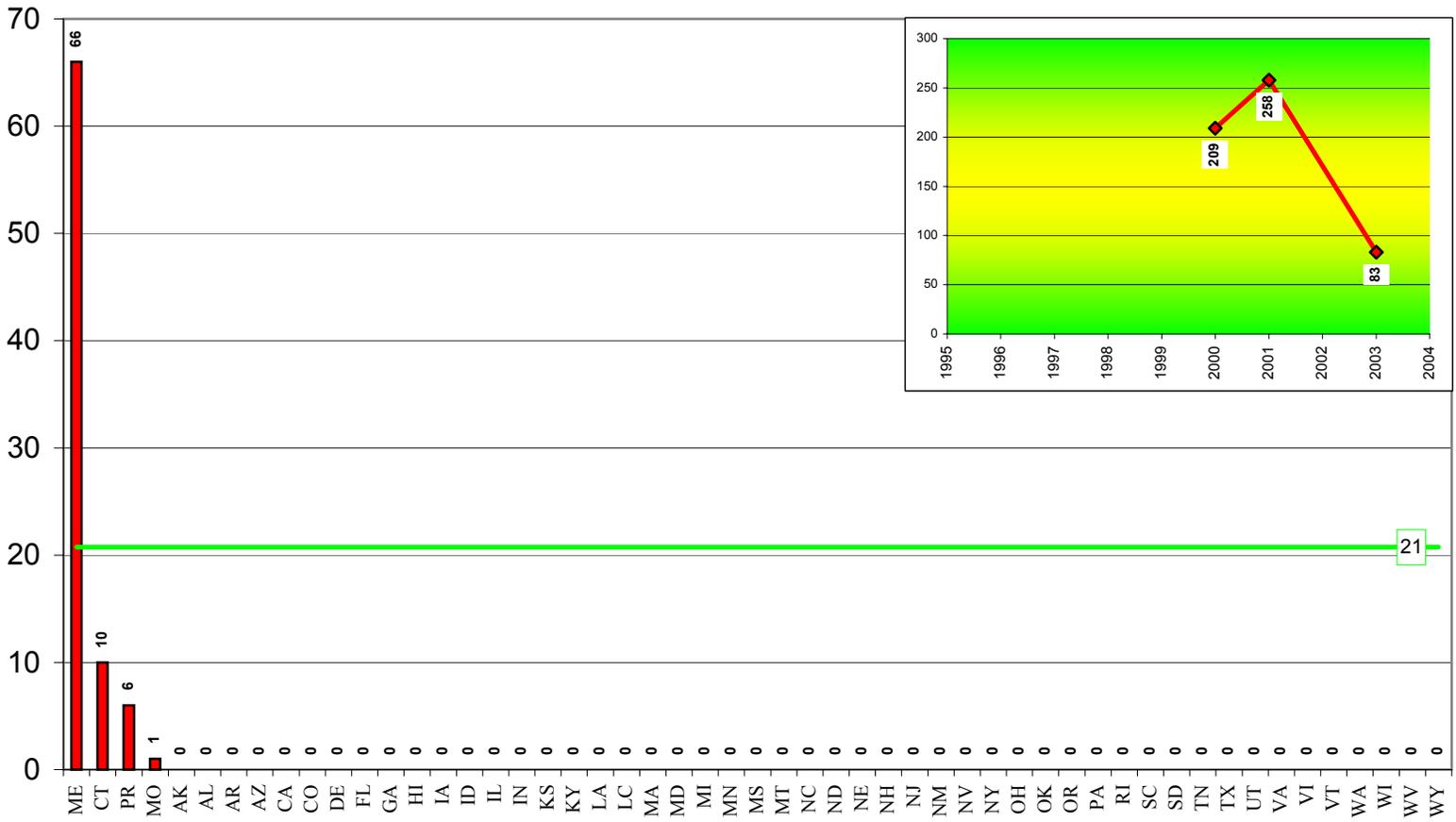
The Special Linear/Dimensional devices consisted of the following types:

- Vent Gage & Lobster Plugs
- Fish/Lobster/Shellfish linear standards
- 6"x 6" plates (before & after processing)
- Fifth-Wheel mileage measuring devices

# Special Linear



**83 Total Devices**



## “Other Tests” -- Electrical

### Description

The graphs on the following page represent the total number of electrical tests performed by the 48 reporting laboratories. The map graph gives a geographical distribution of these standards. Darker shading indicates more devices were tested. The bar graph at the bottom of the page shows the same breakdown along with the total number of devices tested by each laboratory.

### Findings

Of the 48 reporting laboratories, 2 labs performed a total of 50 electrical tests.

	# Labs Reporting Electrical Tests	Total Tests	Lab Average	Change from previous survey
2000	2	19	10	--
2001	2	39	20	+ 105 %
2003	2	50	25	+ 28 %

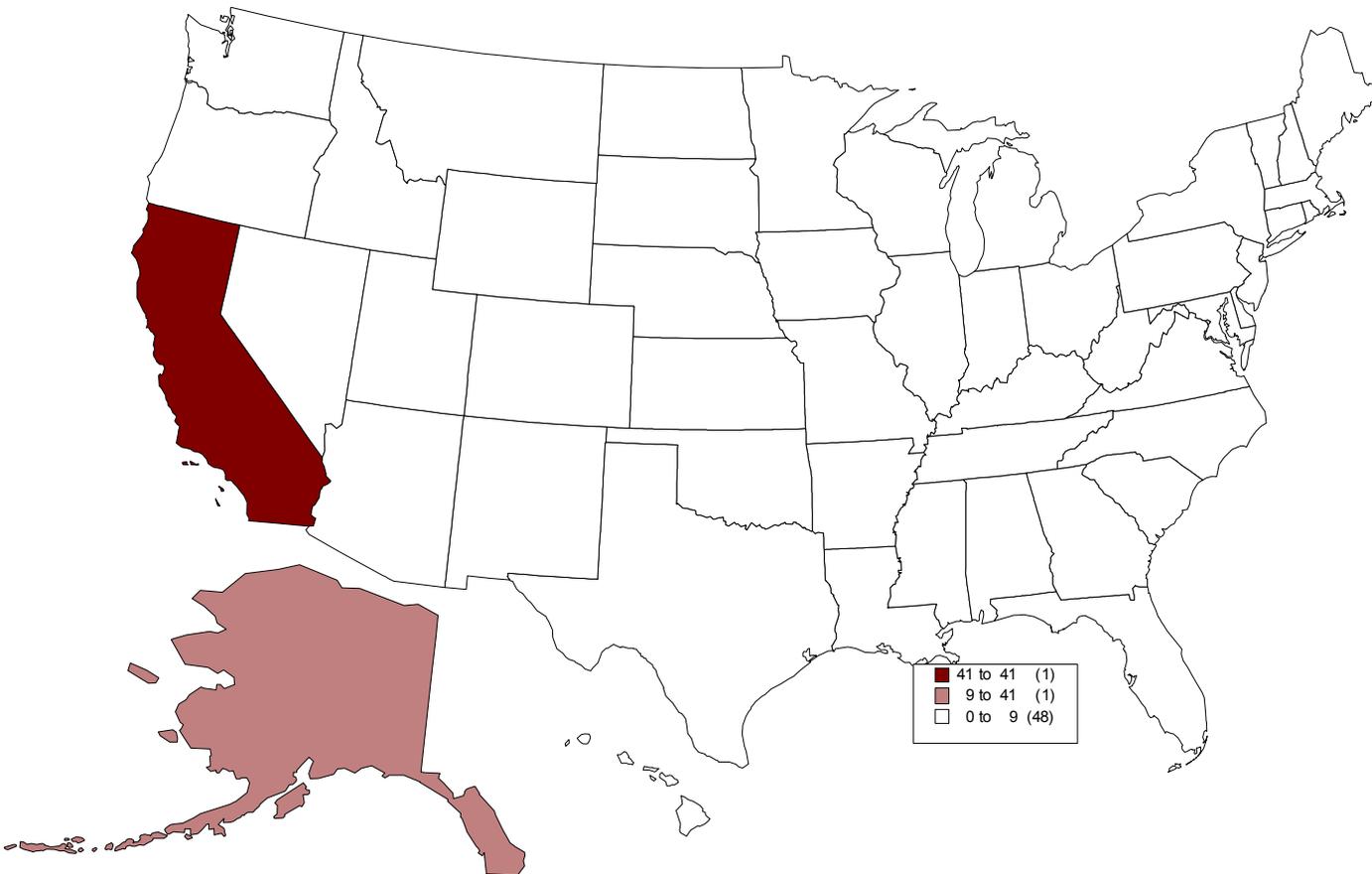
### Notes and Comments

There were 2 laboratories that reported the testing of electrical devices.

The electrical devices consisted of the following:

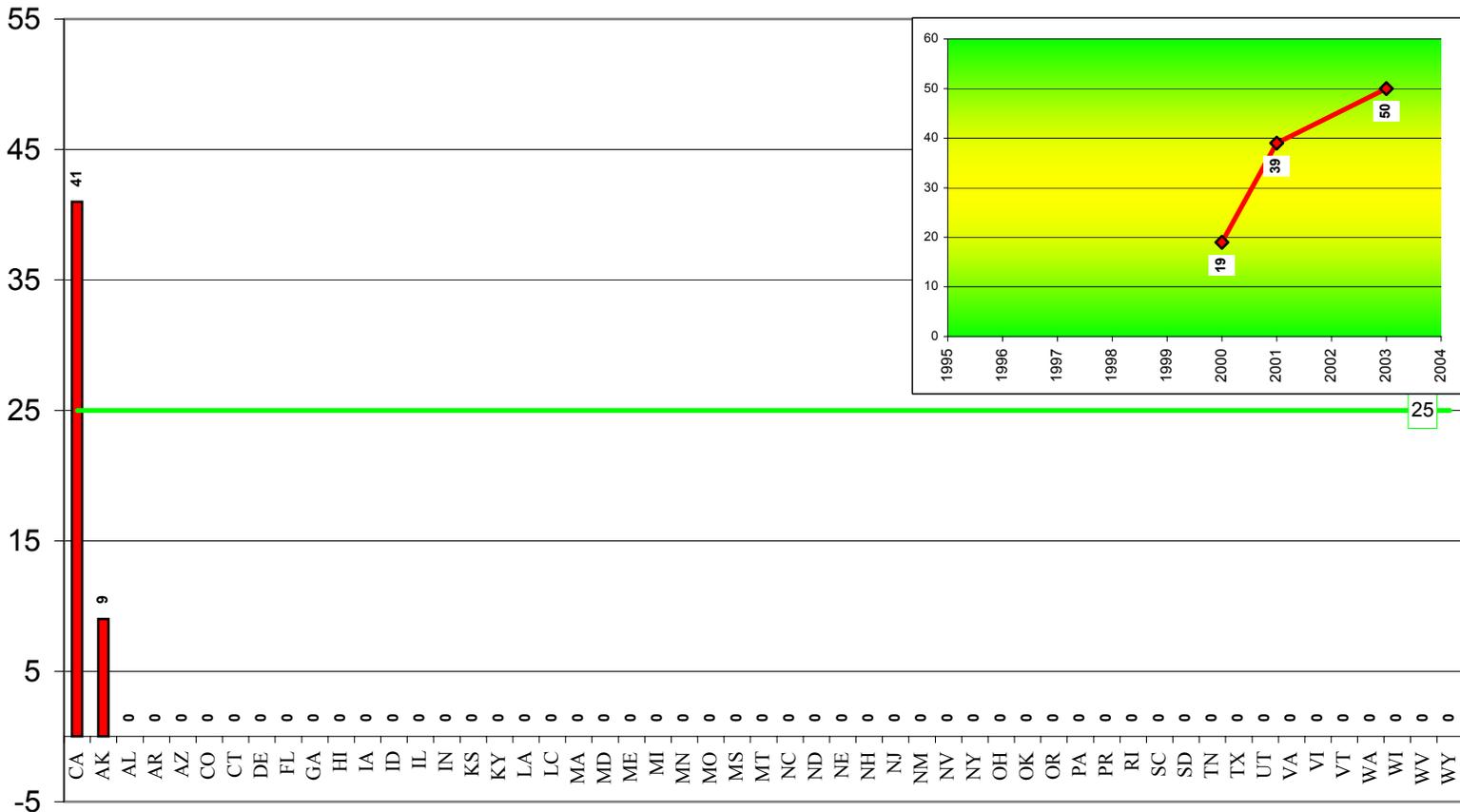
Watt Meters

# Electrical



— Puerto Rico

**50 Total Devices**



## Laboratory Facilities

### Description

#### Size of Laboratory Facility:

The top graph on the next page represents the size of the laboratory facility in square feet as reported by each laboratory.

#### Age of Laboratory Facility:

The bottom graph on the next page represents the age of the laboratory facility as reported by each laboratory.

### Notes and Comments

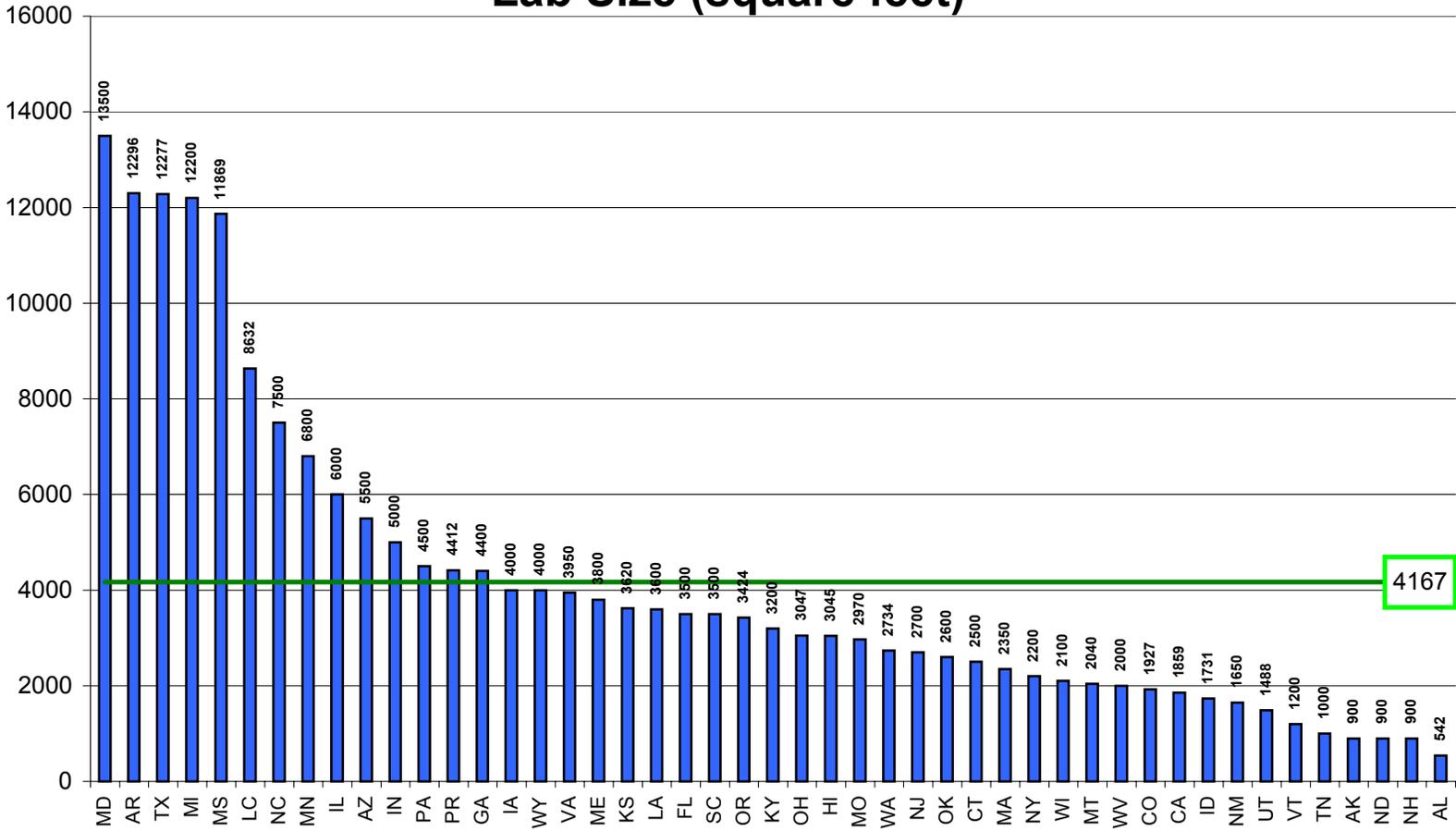
#### Size of Laboratory Facility:

Average	4,167 sq ft
Maximum	13,500 sq ft
Minimum	542 sq ft

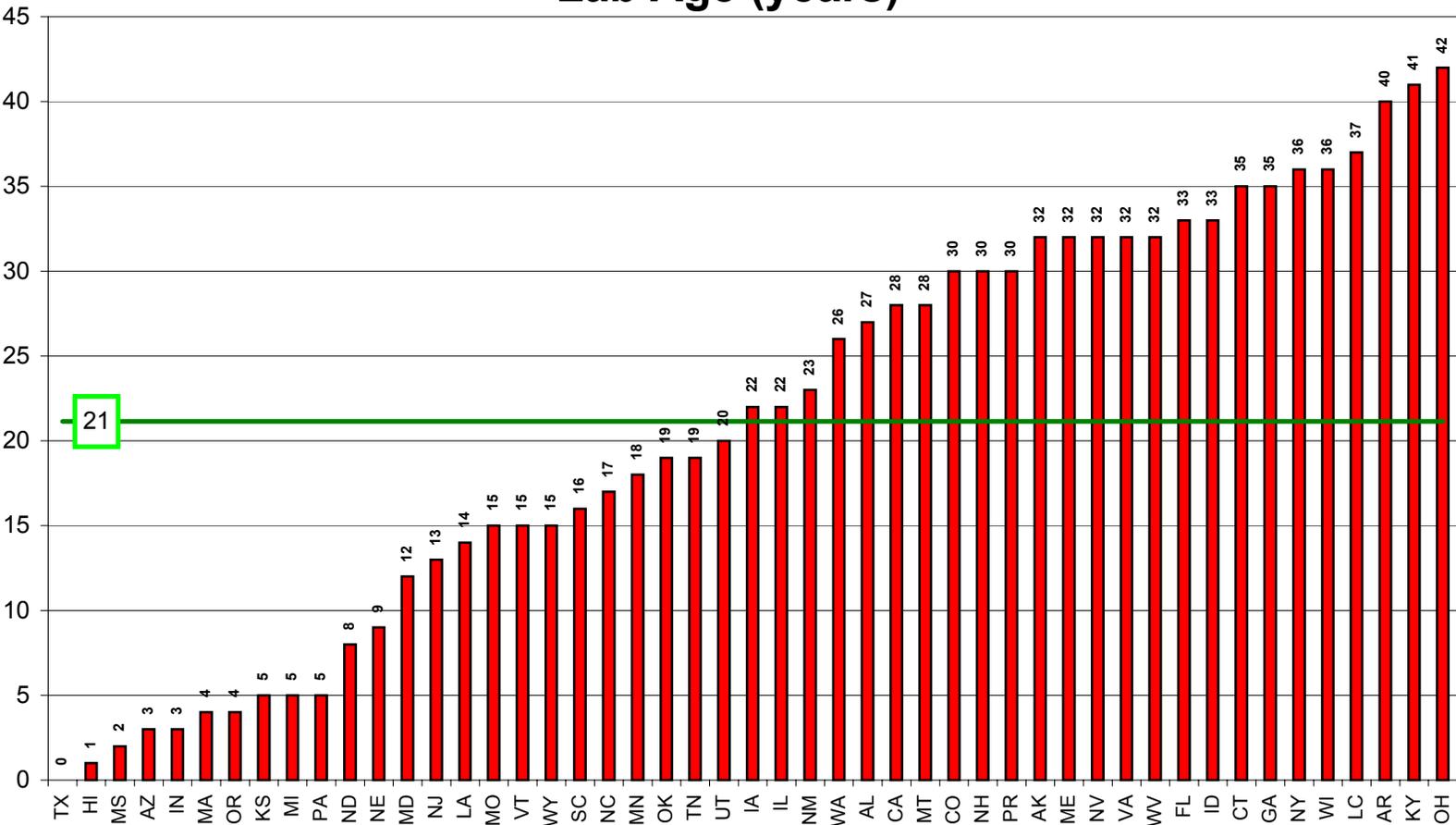
#### Age of Laboratory Facility:

Average	21 years
Maximum	42 years
Minimum	0 years

# Lab Size (square feet)



# Lab Age (years)



## **Metrology Experience**

### **Description**

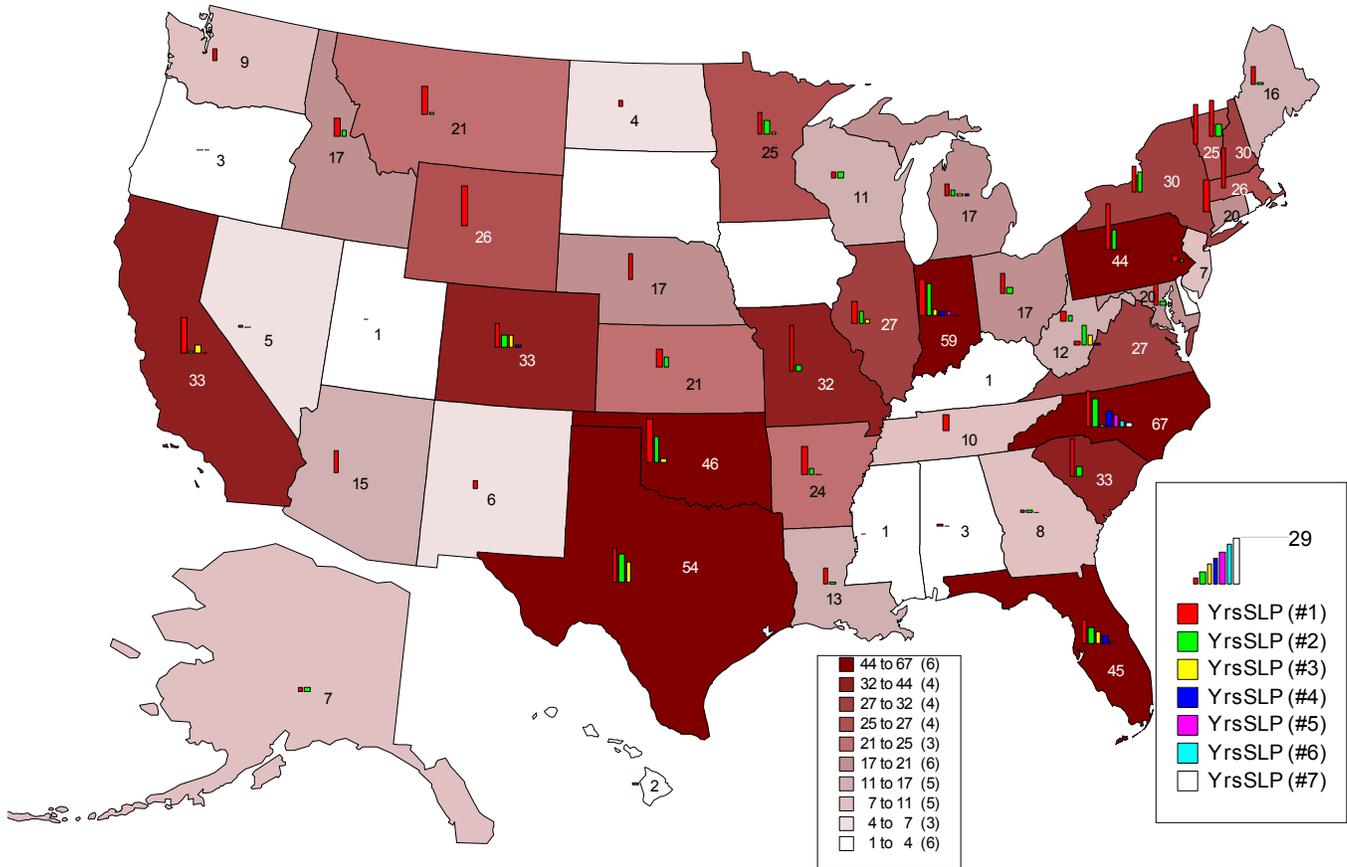
#### Experience in State Metrology Laboratory Program

The top graph on the next page represents the years of metrology experience gained in a state metrology laboratory. The shading of the state is based on the sum of state metrology lab experience for all metrologists that perform measurements for that lab. The bar graph in each state represents the breakdown for each individual metrologist in that state.

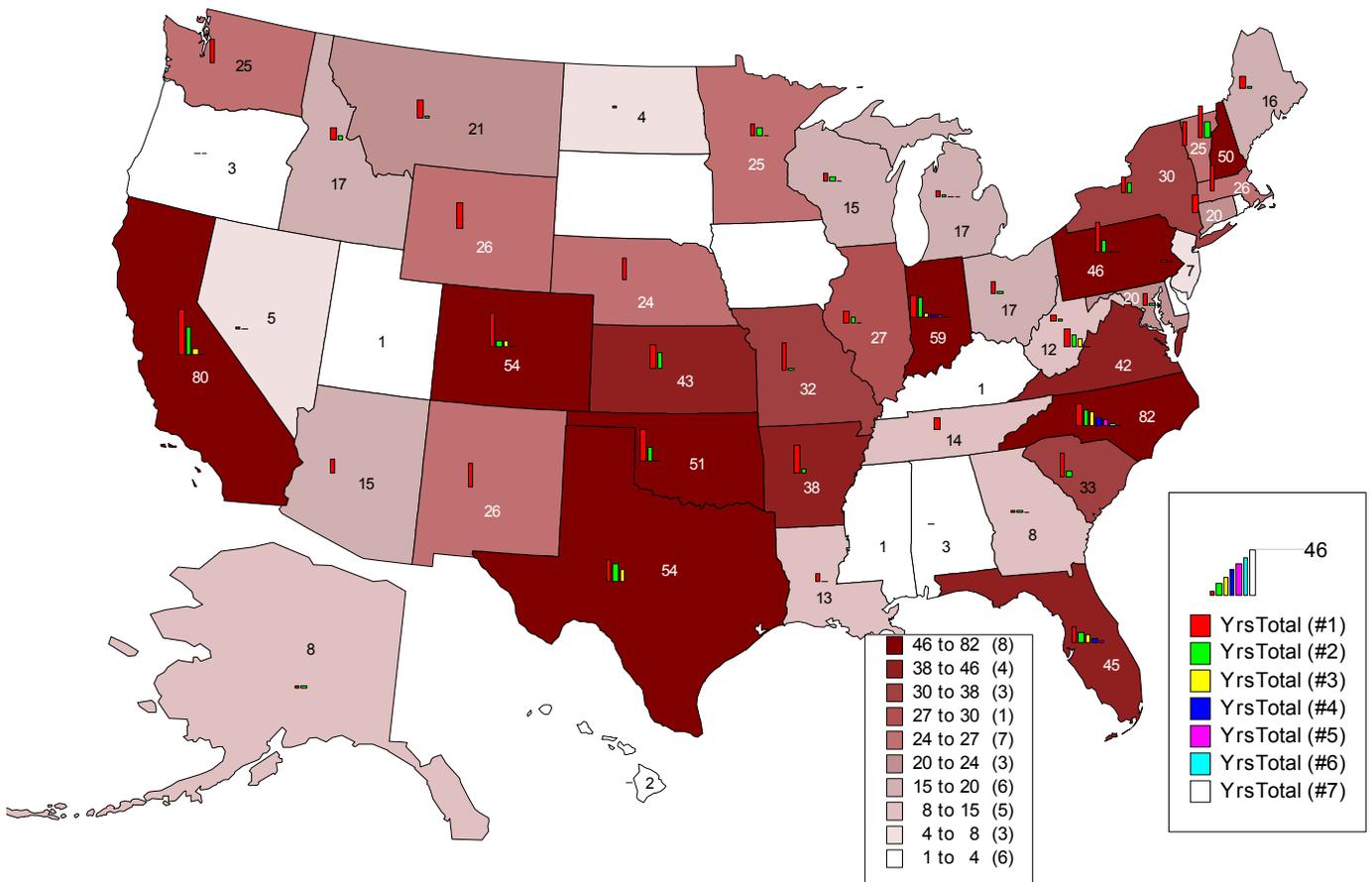
#### Total Metrology Experience:

The bottom graph on the next page represents the total metrology experience gained in any metrology laboratory. The shading of the state is based on the sum of all metrology experience for that lab. The bar graph in each state represents the breakdown for each individual metrologist in that state.

## Experience in State Metrology Laboratory



## Total Metrology Experience



## **Metrology Experience (By Individual)**

### **Description**

Total Metrology Experience:

The bar graph on the next page represents the total metrology experience by individual metrologist. The graph is a stacked bar, the blue portion represents “other metrology experience” and the red portion represents “state laboratory program experience”.

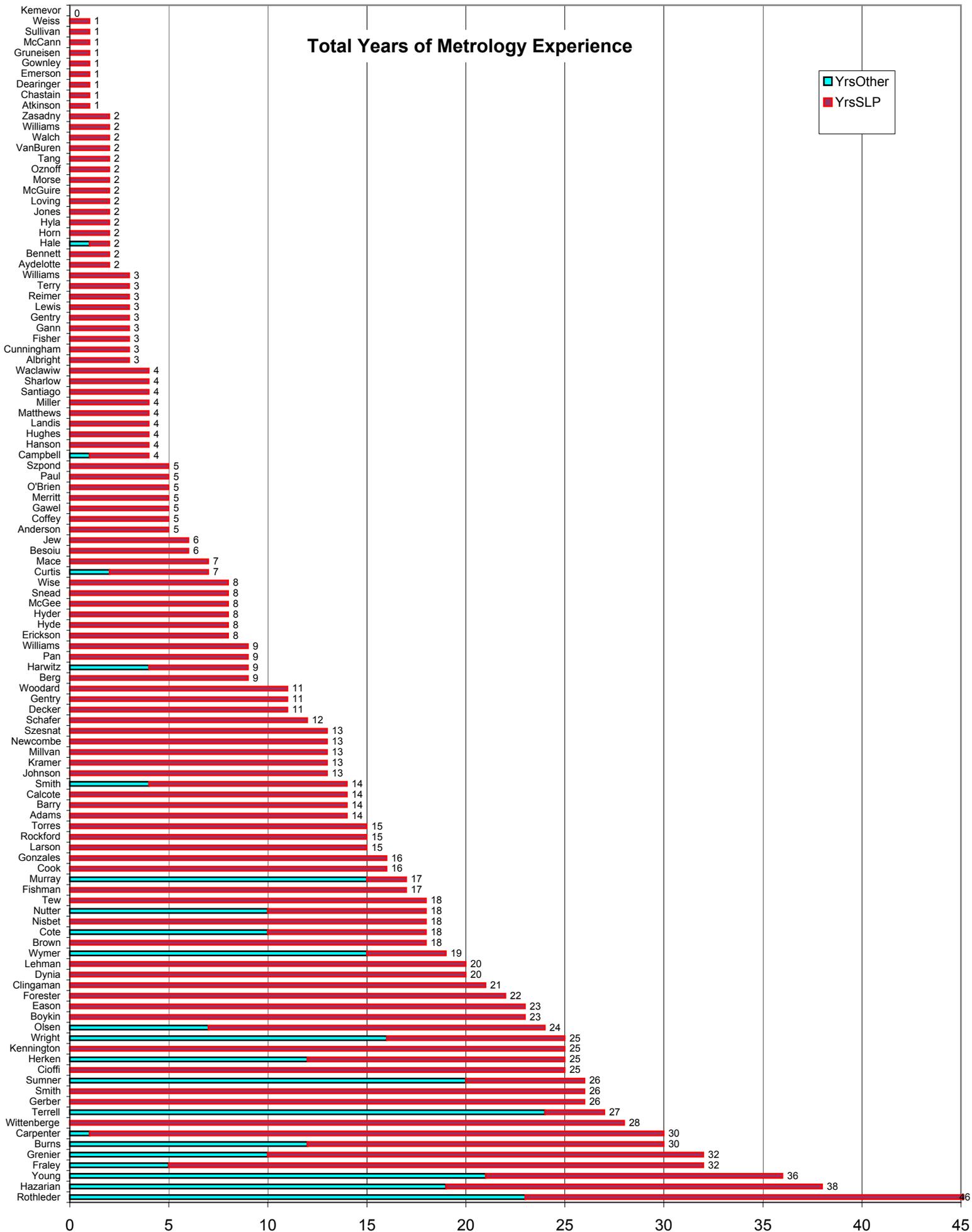
### **Comparison of the 2003 and 2001 Survey**

	Number of Metrologists	Average SLP Experience	Average Other Experience	Average Total Experience
2001	111	8.7	2.4	11.0
2003	113	9.1	2.1	11.2

### **Comments:**

Of the 48 responding laboratories:  
113 individual metrologists  
Average SLP experience – 9.1 years  
Average Other experience – 2.1 years  
Average Total experience – 11.2 years

# Total Years of Metrology Experience



**NIST/OWM**  
**Certificates of Traceability**  
**(as of June 2003)**

**Description**

The top map graph on the following page represents the status of each state.

**Comments:**

Colorado – Waiting on additional information.

Wyoming – Waiting on additional information.

New Jersey – Waiting on additional information.

Utah – No Certificate of Measurement Traceability.

South Dakota – No Certificate of Measurement Traceability.

Iowa – No Certificate of Measurement Traceability.

Mississippi – No Certificate of Measurement Traceability.

Delaware – No Certificate of Measurement Traceability.

Rhode Island – No Certificate of Measurement Traceability.

District of Columbia – No Certificate of Measurement Traceability.

**NVLAP**  
**Accreditation Status**  
**(as of June 2003)**

**Description**

The bottom map graph on the following page represents the NVLAP accreditation status of each state. Four additional laboratories have received their NVLAP accreditation since the last survey.

**Comments:**

34 laboratories have not applied for NVLAP accreditation.

1 laboratory has applied for accreditation and is awaiting review of the quality manual.

New Mexico.

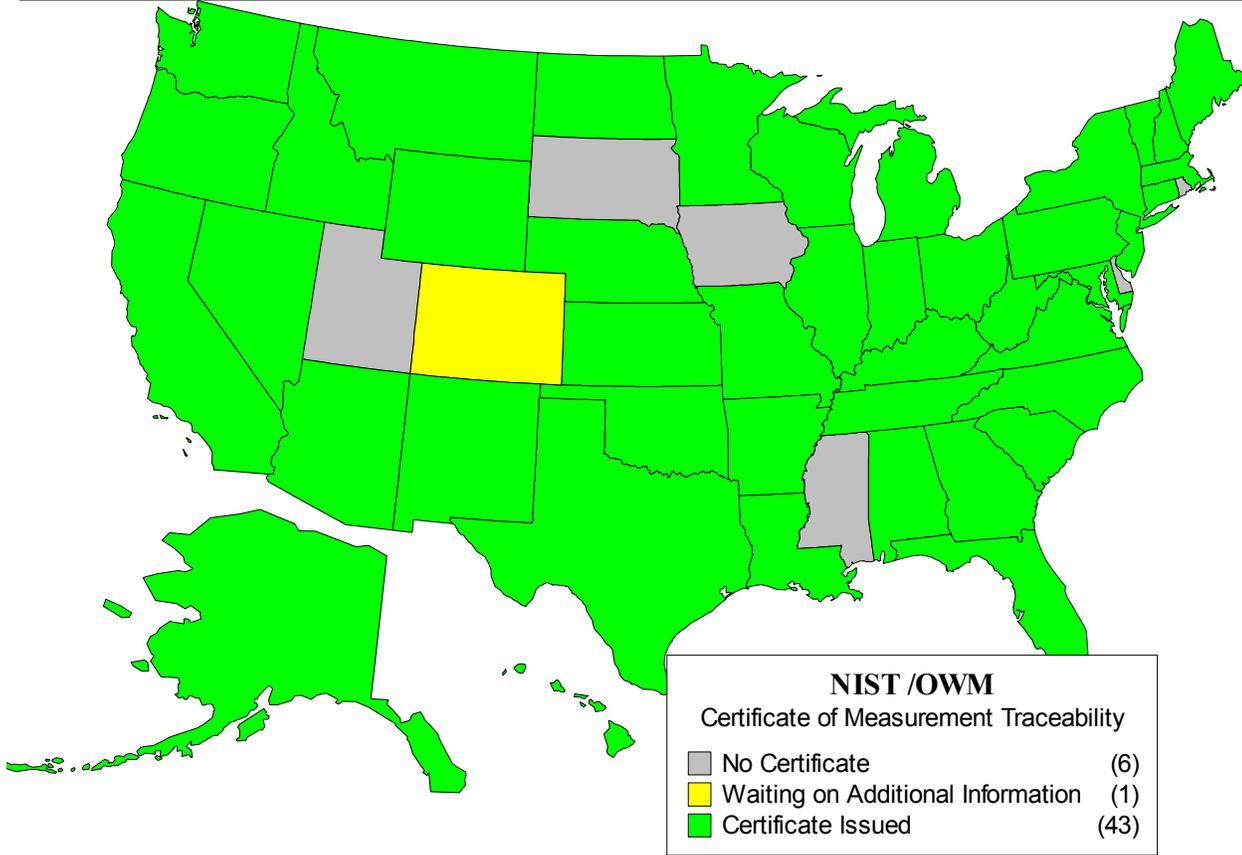
5 laboratories have completed their onsite audits and are awaiting accreditation.

Oregon, Illinois, Ohio, Maryland, New York.

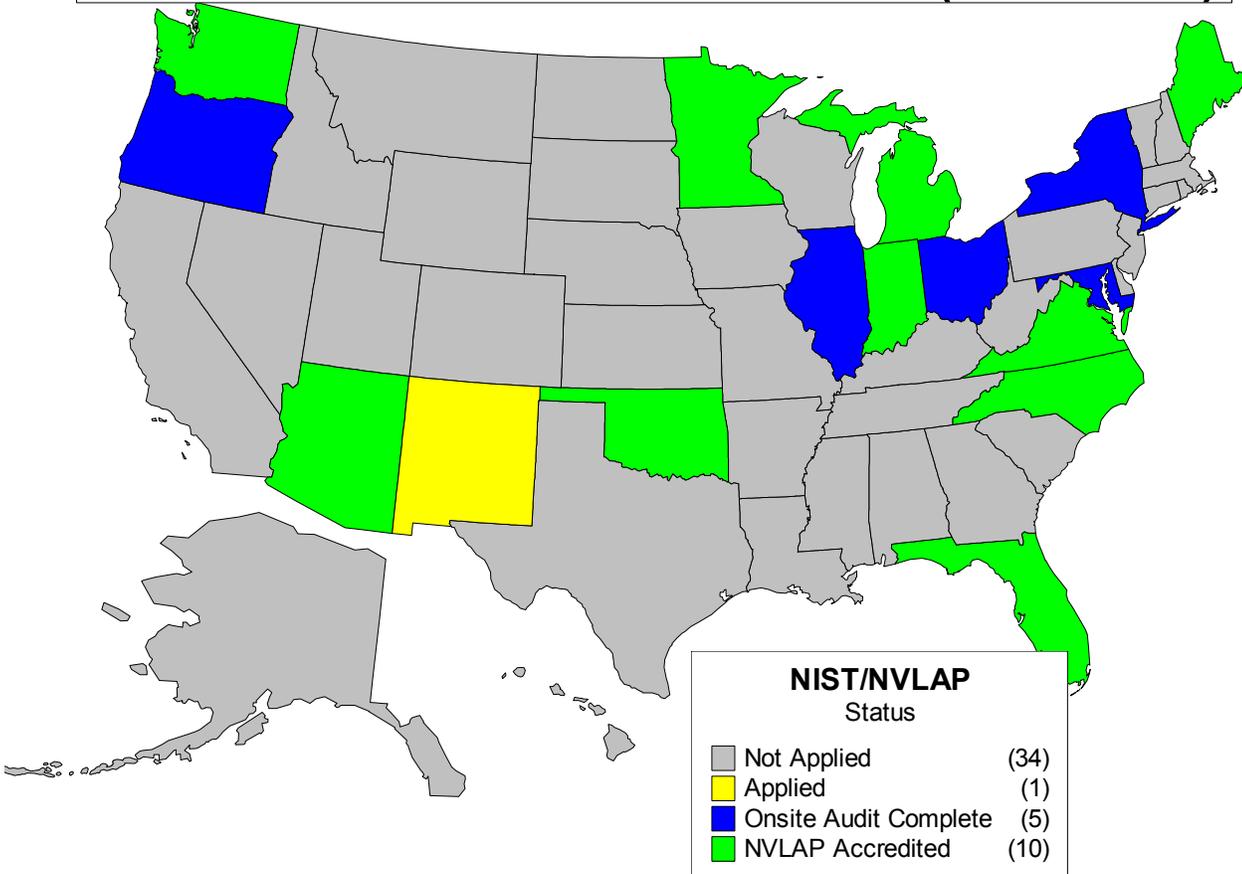
10 laboratories are currently accredited by NVLAP.

Arizona, Maine, North Carolina, Florida, Indiana, Michigan, Minnesota, Oklahoma, Virginia, Washington.

# NIST/OWM Certificate of Measurement Traceability



# NIST/NVLAP Accreditation Status (June 2003)



## Scheduling

Does your laboratory require most work to be scheduled?

Yes – 41 laboratories

No – 7 laboratories

What is your average scheduling lead time (time from a customer's call until a scheduled date)?

Average – 5.6 weeks

Range – 1 to 52 weeks

### Turn around times (see graphs on facing page):

One-5 gallon test measure

Average – 3.4 days

Range – 1 to 30 days

One-100 gallon prover

Average – 2.8 days

Range 1 to 30 days

One-100 foot tape or 18 inch rule

Average – 9.6 days

Range 1 to 30 days

One-Precision mass set (100g to 1mg)

Average – 11.7 days

Range – 2 to 49 days

One-31 lb Class F weight set

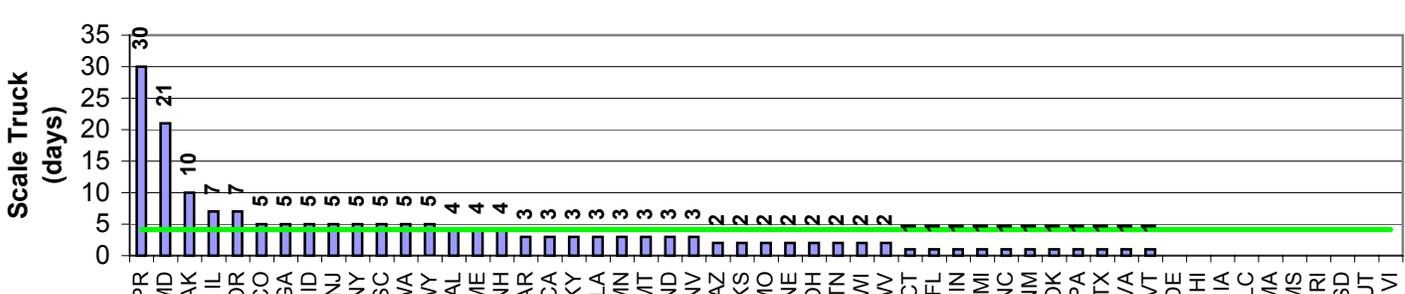
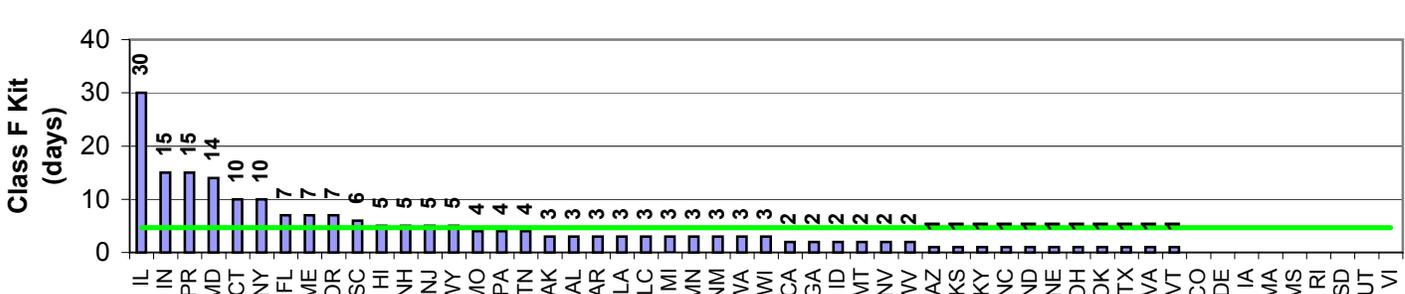
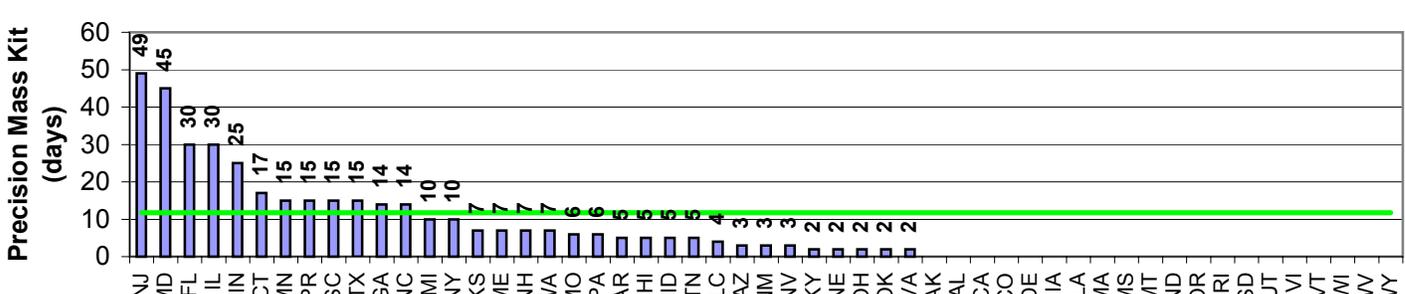
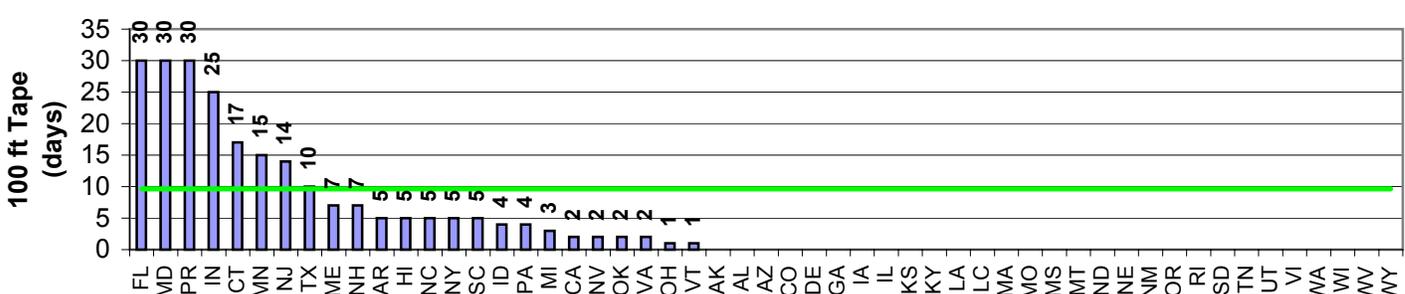
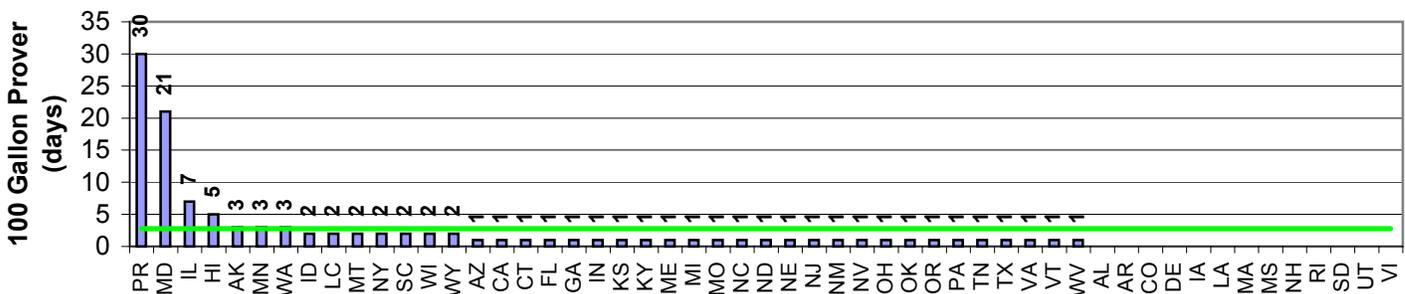
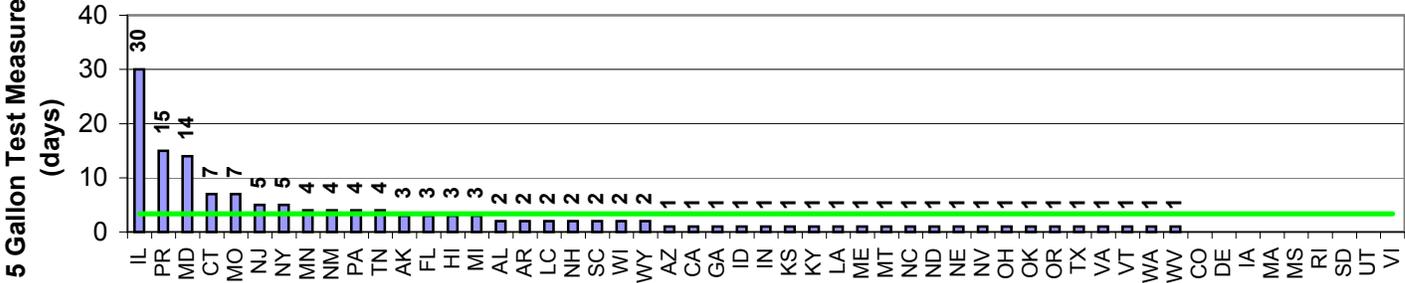
Average – 4.7 days

Range – 1 to 30 days

Scale test truck (24-1000 lb wts, 20-50 lb wts & 2-31 lb weight kits)

Average – 4.2 days

Range – 1 to 30 days



## Fees

### Description

The committee felt that this information would be valuable for those labs that are attempting to implement fees for the first time and also to those labs that may be in the process of amending their fees.

This is the second survey that requested information on fees.

The 2001 Survey included a copy of each states fee schedule in an appendix. The individual fee schedules will not be included this year in order to save on printing costs.

The following is a summary of each laboratory's response.

AK	Fee Schedule (\$75/hr for services not covered in fee schedule) [2001]
AL	Free to Registered Servicemen, otherwise \$60.00/hr
AR	No Fees
AZ	\$40.00 /hr with a \$24.00 minimum
CA	\$75.00 /hr (Fee Schedule for approximations based on \$75/hr)
CO	\$20.00 /hr
CT	Fee Schedule with a \$75.00 minimum based on \$75/hr (Not changed since 1991)
DE	
FL	Fee Schedule (\$50.00/hr for special tests)
GA	Fee Schedule (based on \$55/hr for Mass III and \$65/hr for Mass II)
HI	No Fees
IA	
ID	No Fees for in state work
IL	\$91.00 /hr
IN	Fee Schedule
KS	\$50.00 /hr
KY	No Fees
LA	Fee Schedule
LC	\$59.70 /hr
MA	\$45.00 /hr
MD	Fee Schedule (\$75/hr for special mass; \$45/hr for special length and volume) [2001]
ME	\$40.00 /hr
MI	\$80.00 /hr
MN	\$125.00 /hr
MO	\$25.00 /hr (\$35/hr for Mass II)
MS	Not Available (In process of being updated)
MT	\$75.00 /hr
NC	Fee Schedule
ND	\$15.00 per quarter hour (\$60.00/hr)
NE	\$80.00 /hr and Fee Schedule
NH	Fee Schedule (\$70/hr for services not covered in fee schedule)

NJ	Fee Schedule
NM	Fee Schedule
NV	\$40.00 /hr (\$80/hr for Mass II)
NY	Fee Schedule
OH	Fee Schedule
OK	Fee Schedule (\$50/hr for special tests)
OR	Fee Schedule
PA	Newly Proposed Fees of \$75.00/hr
PR	\$65.00 /hr (Volume additional \$0.50/gallon in excess of 5 gallon; \$20/hr for cleaning)
RI	
SC	No Fees
SD	
TN	Fee Schedule
TX	Fee Schedule
UT	\$32.00 /hr
VA	Fee Schedule
VT	\$40.00 /hr (\$45 per F weight kit; \$45 per test can; \$1.50 per syrup hydrometer; \$3 per sap hydrometer)
WA	\$77.46 /hr
WI	\$100.00 /hr and Fee Schedule
WV	No Fees
WY	\$20.00 /hr (1 hr minimum)

Of the 48 reporting laboratories, 6 laboratories do not charge fees for their services.

The next three pages contain six graphs. It is an attempt to show graphically the fees that would be charged for a particular artifact by each laboratory. A problem arises when using hourly rates. The time it takes to calibrate a particular artifact will vary from state to state depending on weight handling equipment, balances, experience and number of employees. Another factor is that one state track the total time it takes to log in, unpack, test, re-pack, and log out an item while another state may only track actual test time. The time picked for the graph is just an estimate.

## **Fees**

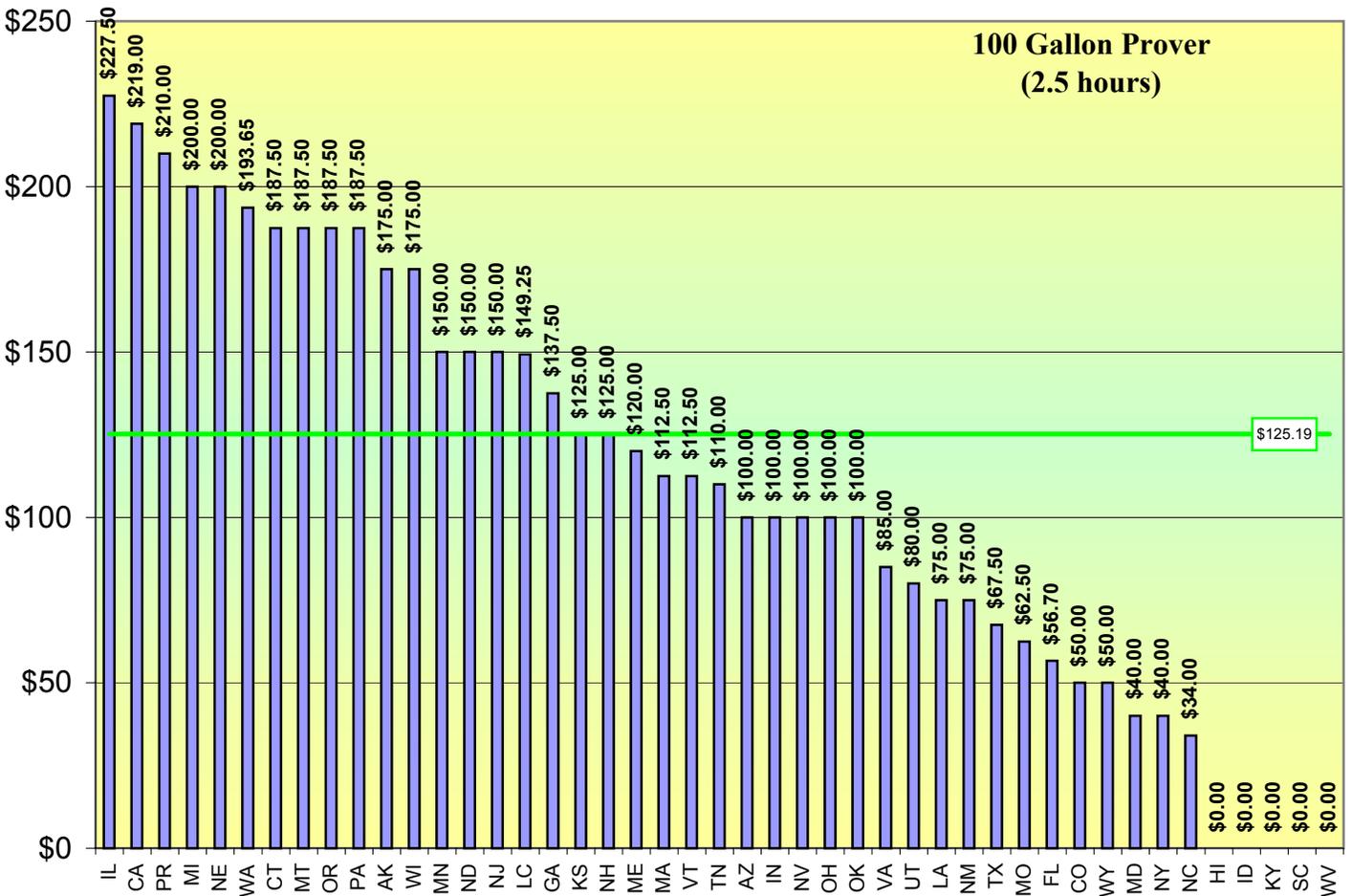
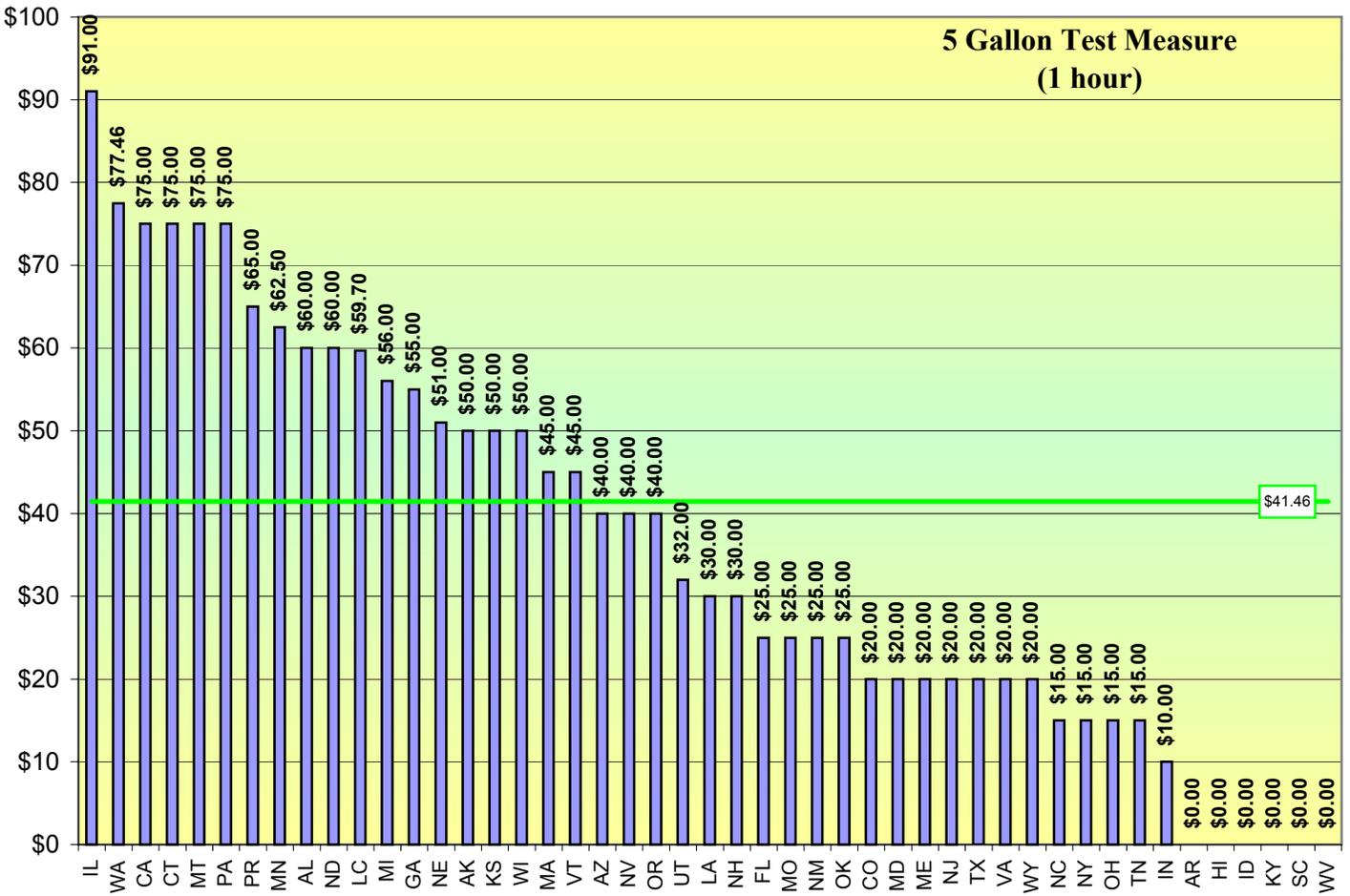
### **5 Gallon Test Measure**

### **100 Gallon Prover**

#### **Description**

The top graph represents the fees charged for a 5-gallon test measure. One hour was used for those labs that charge only by the hour. The average fee charged was \$41.46 for the 2003 survey, which is an 18 % increase over the \$35.00 average from the 2001 survey.

The bottom graph represents the fees charged for a 100-gallon prover. Two and a half hours was used for those labs that charge only by the hour. The average fee charged was \$125.19 for the 2003 survey, which is a 16 % increase over the \$108.00 average from the 2001 survey.



## **Fees**

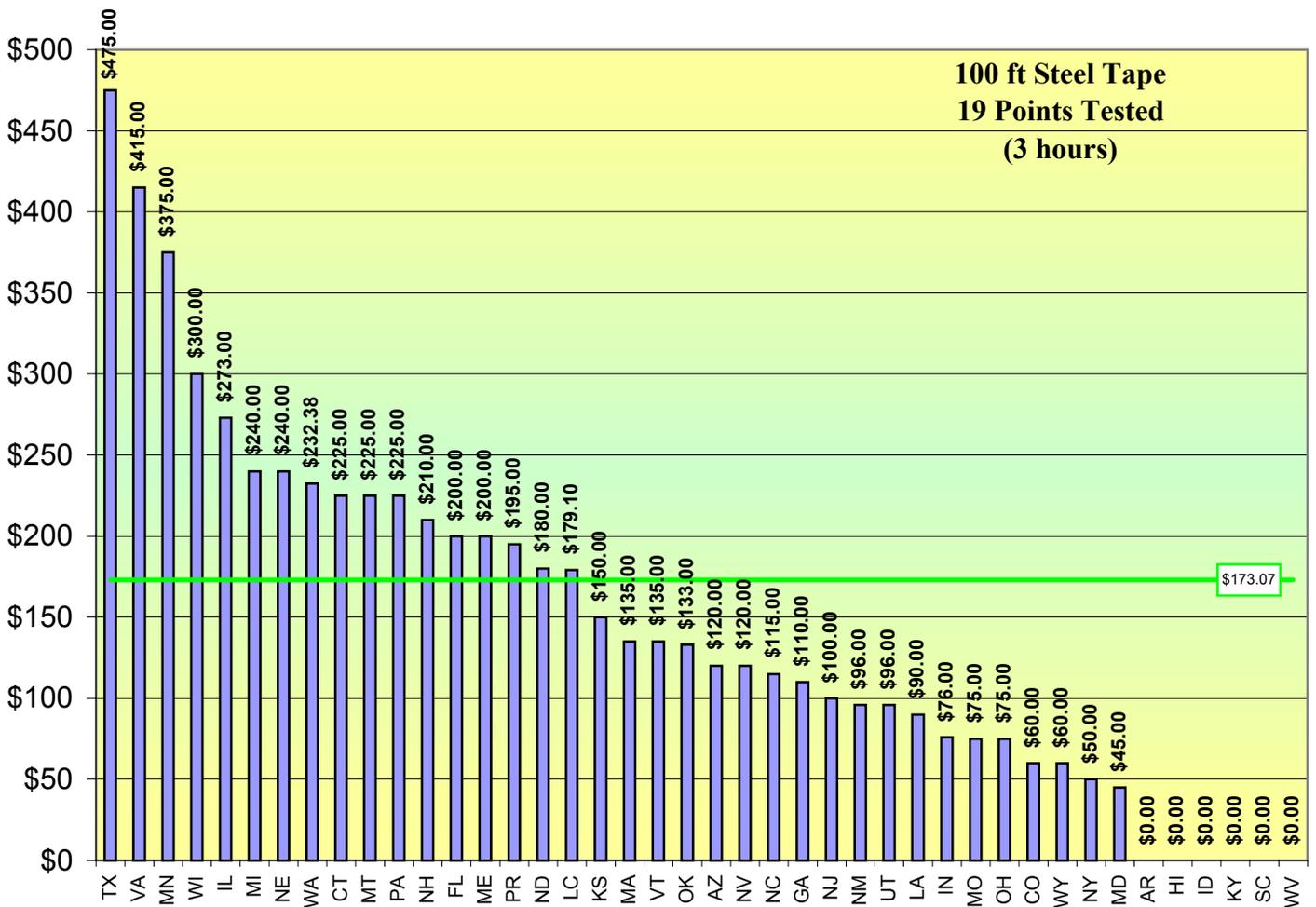
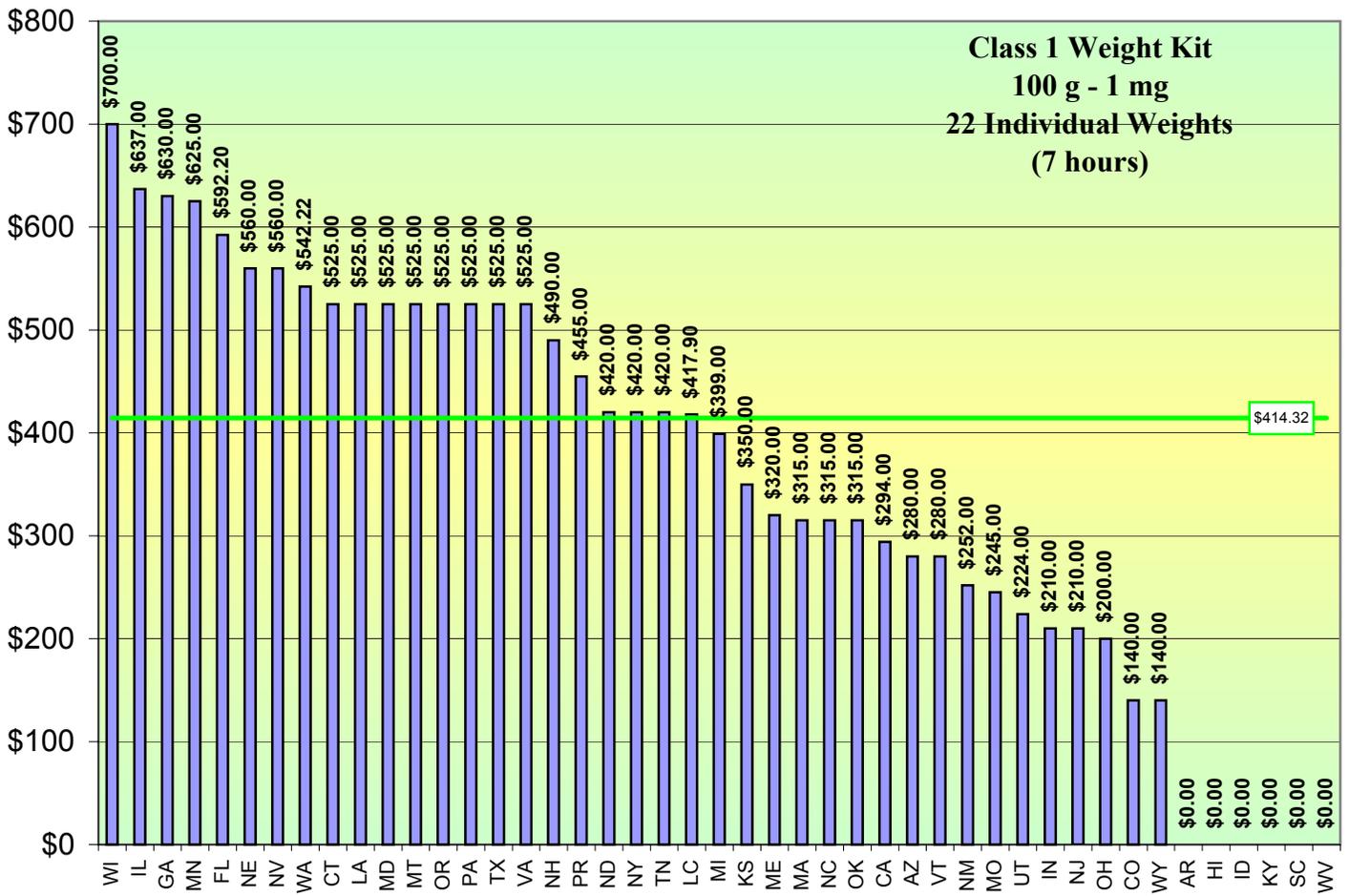
### **Class 1 Precision Weight Kit**

#### **100 foot Tape**

##### **Description**

The top graph represents the fees charged for calibrating a Class 1 precision weight kit that contains 22 individual weights from 100 gram down to 1 milligram. Seven hours was used for those labs that charge only by the hour. The average fee charged was \$414.32 for the 2003 survey, which is an increase of 24 % over the \$334.00 average from the 2001 survey.

The bottom graph represents the fees charged for a 100 foot steel tape that contained 19 points to be calibrated. Three hours was used for those labs that charge only by the hour. The average fee charged was \$173.07 for the 2003 survey, which is an increase of 30 % over the \$133.00 average from the 2001 survey.



## **Fees**

### **Class F Weight Kit**

#### **Large Capacity Scale Truck**

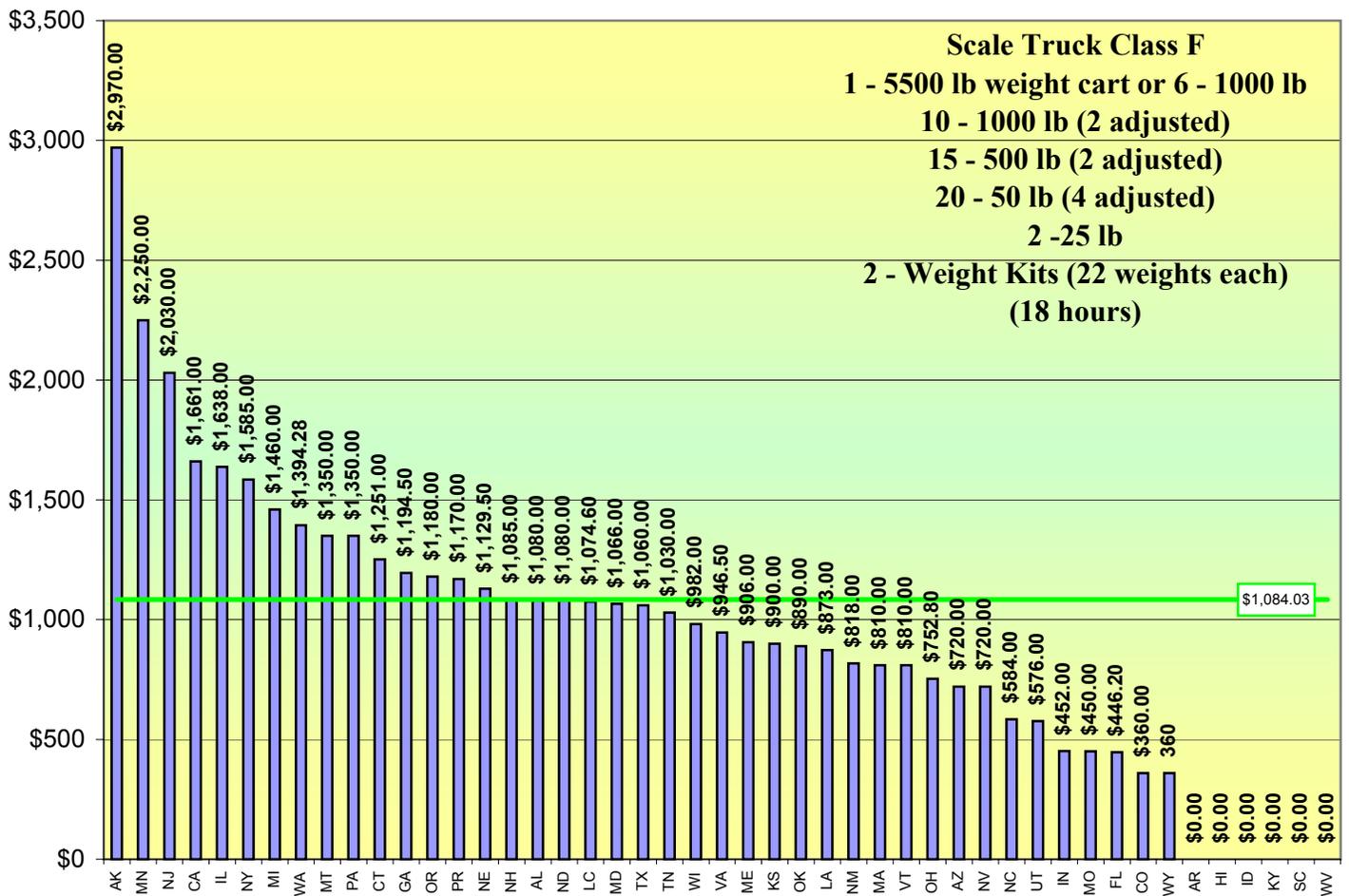
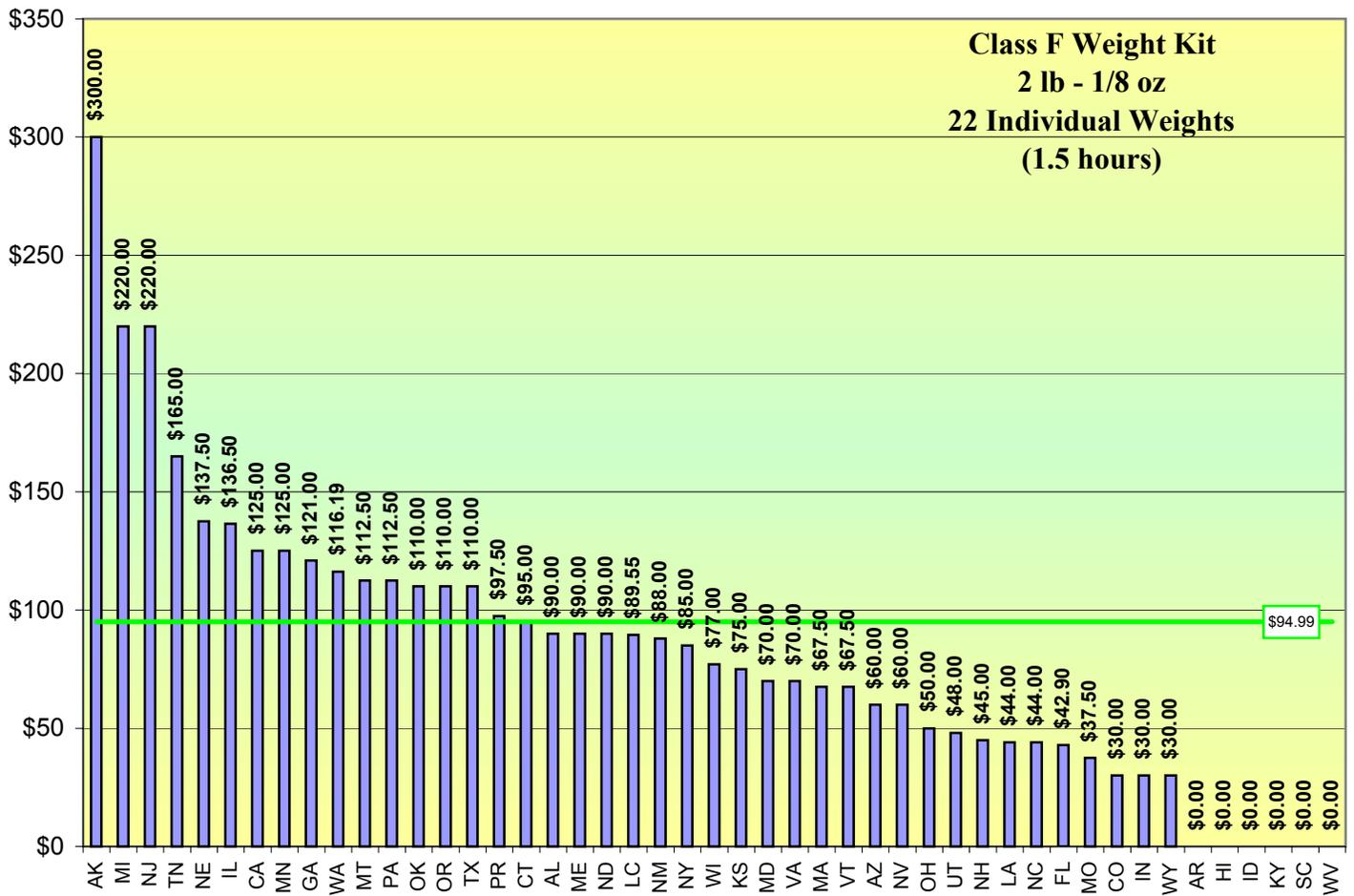
##### **Description**

The top graph represents the fees charged for calibrating a Class F weight kit that contains 22 individual weights from 2 pounds down to 1/8 ounce. One and a half hours was used for those labs that charge only by the hour. The average fee charge was \$94.99 for the 2003 survey, which is an increase of 23 % over the \$77.00 average from the 2001 survey.

The bottom graph represents the fees charged for a large capacity scale truck. The truck contains the following Class F standards for calibration:

- 1 – 5500 lb weight cart or 6 – 1000 lb
- 10 – 1000 lb (2 adjusted)
- 15 – 500 lb (2 adjusted)
- 20 – 50 lb (4 adjusted)
- 2 – 25 lb
- 2 – weight kits (22 weights in each kit, all 2 lb and smaller)

Eighteen hours was used for those labs that charge only by the hour. The average fee charged was \$1,084.03 for the 2003 survey, which was an increase of 17 % increase over the \$924.00 average from the 2001 survey.



## Metrology Positions - Salary Ranges

### Description

Listed in the table below are the position titles for each position that performs metrology functions.

Lab ID	Title	Minimum	Maximum	Mid-Point
AK	State Metrologist II	\$3,806.00	\$5,420.00	\$4,613.00
AK	State Metrologist I	\$3,304.00	\$4,742.00	\$4,023.00
AL	Engineer/Metrologist	\$2,746.00	\$3,743.33	\$3,244.67
AL	Consumer W&M Protection Specialist	\$1,935.05	\$3,240.69	\$2,587.87
AR	Laboratory Supervisor	\$2,396.92	\$4,713.67	\$3,555.30
AR	Metrologist	\$1,980.67	\$3,894.33	\$2,937.50
AR	Grain Moisture Lab Tech	\$1,980.67	\$3,894.33	\$2,937.50
AZ	Admin Services Officer II	\$2,962.25	\$5,074.56	\$4,018.41
AZ	Metrology Tech	\$1,044.58	\$3,815.69	\$2,430.14
CA	Principal State Metrologist	\$5,618.00	\$6,194.00	\$5,906.00
CA	Measurement Standards Specialist III	\$3,654.00	\$4,441.00	\$4,047.50
CA	Measurement Standards Specialist II	\$3,040.00	\$3,651.00	\$3,345.50
CA	Staff Services Analyst	\$2,507.00	\$3,049.00	\$2,778.00
CO	Chief Metrologist III	\$3,379.00	\$4,896.00	\$4,137.50
CO	Metrologist II	\$3,066.00	\$4,442.00	\$3,754.00
CO	Metrologist I	\$2,856.00	\$4,138.00	\$3,497.00
CT	Consumer Protection Metrologist	\$3,463.00	\$5,013.00	\$4,238.00
FL	Senior Metrologist	\$2,709.30	\$4,526.48	\$3,617.89
FL	Metrologist	\$2,304.30	\$3,644.33	\$2,974.32
FL	Coordinator	\$2,192.94	\$3,434.35	\$2,813.65
FL	Lab Technician IV	\$2,084.13	\$3,243.45	\$2,663.79
GA	State Metrologist	\$2,686.50	\$4,568.50	\$3,627.50
GA	Assistant State Metrologist	\$2,448.50	\$4,159.50	\$3,304.00
GA	Metrologist II	\$1,837.00	\$3,127.00	\$2,482.00
GA	Metrologist I	\$1,667.50	\$2,835.00	\$2,251.25
HI	Metrologist IV	\$3,219.00	\$4,583.00	\$3,901.00
HI	Metrologist III	\$2,859.00	\$4,073.00	\$3,466.00
HI	Metrologist II	\$2,643.00	\$3,765.00	\$3,204.00
HI	Metrologist I	\$2,445.00	\$3,481.00	\$2,963.00
ID	Program Manager/Metrologist	\$3,458.00	\$5,725.00	\$4,591.50
IL	Metrologist-Public Service Administrator	\$2,996.00	\$6,558.00	\$4,777.00
IL	Inspector	\$2,795.00	\$3,626.00	\$3,210.50
IL	Metrologist Associate	\$2,488.00	\$3,519.00	\$3,003.50
IN	Metrologist	\$1,796.00	\$2,669.00	\$2,232.50
IN	Field Inspector I	\$1,865.00	\$2,647.00	\$2,256.00
IN	Field Inspector II	\$1,685.00	\$2,413.00	\$2,049.00
KS	State Metrologist	\$3,215.33	\$4,203.33	\$3,709.33
KS	Ag Inspector II	\$2,916.33	\$3,809.00	\$3,362.67
KY	Program Coordinator	\$2,149.24	\$3,545.44	\$2,847.34
LA	Assistant Director	\$4,032.00	\$7,266.00	\$5,649.00
LA	Metrology Supervisor	\$2,687.00	\$4,841.00	\$3,764.00
LA	Metrologist II	\$2,347.00	\$4,228.00	\$3,287.50
LA	Metrologist I	\$2,193.00	\$3,950.00	\$3,071.50
LC	Metrologist	\$3,000.00	\$4,000.00	\$3,500.00
LC	Inspector	\$2,400.00	\$3,300.00	\$2,850.00
MA	Inspector of Standards II	\$2,493.52	\$3,381.50	\$2,937.51
MD	Laboratory Program Manager	\$2,726.25	\$4,225.00	\$3,475.63
MD	Metrologist II	\$2,555.33	\$3,955.67	\$3,255.50
MD	Metrologist I	\$2,395.75	\$3,704.42	\$3,050.09
MD	Metrologist Trainee	\$1,976.83	\$3,045.08	\$2,510.96
ME	Metrologist	\$2,623.00	\$3,593.00	\$3,108.00
ME	Metrologist Assistant	\$2,311.00	\$3,123.00	\$2,717.00

Lab ID	Title	Minimum	Maximum	Mid-Point
MI	Metrologist Manager 14	\$3,958.40	\$5,449.60	\$4,704.00
MI	Metrology Specialist 13	\$3,716.27	\$5,049.20	\$4,382.74
MI	Metrology Specialist 12	\$3,406.00	\$4,617.60	\$4,011.80
MI	Metrologist PII	\$3,196.27	\$4,246.67	\$3,721.47
MN	Metrology Supervisor	\$3,850.00	\$5,250.00	\$4,550.00
MN	Metrologist	\$3,050.00	\$4,500.00	\$3,775.00
MO	Metrologist I	\$3,190.00	\$4,755.00	\$3,972.50
MO	Metrologist Specialist I	\$2,374.00	\$3,463.00	\$2,918.50
MS	Director V	\$2,448.74	\$4,285.29	\$3,367.02
MS	State Metrologist	\$1,775.02	\$3,106.29	\$2,440.66
MS	Asst Metrologist	\$1,604.34	\$2,807.59	\$2,205.97
MT	Metrologist	\$2,213.33	\$4,956.17	\$3,584.75
NC	Standards Laboratory Manager	\$3,242.00	\$4,695.00	\$3,968.50
NC	Metrologist II	\$2,622.00	\$3,741.00	\$3,181.50
NC	Metrologist I	\$2,411.00	\$3,412.00	\$2,911.50
NC	Standards Inspector II	\$1,858.00	\$2,985.00	\$2,421.50
ND	State Metrologist	\$2,364.00	\$3,940.00	\$3,152.00
NH	Program Specialist II	\$2,643.83	\$3,583.08	\$3,113.46
NH	Metrologist	\$2,333.50	\$3,236.50	\$2,785.00
NJ	Inspector I	\$4,493.59	\$6,291.68	\$5,392.64
NJ	Inspector II	\$3,881.44	\$5,434.90	\$4,658.17
NJ	Inspector III	\$3,352.88	\$4,695.57	\$4,024.23
NM	Specialist III	\$2,831.75	\$4,247.58	\$3,539.67
NV	Metrologist	\$3,170.28	\$4,496.16	\$3,833.22
NV	Deputy State Sealer/Inspector II	\$2,796.18	\$3,935.88	\$3,366.03
NY	Metrologist	\$3,404.00	\$4,237.00	\$3,820.50
NY	Specialist II	\$3,044.00	\$3,855.00	\$3,449.50
NY	Specialist I	\$2,570.00	\$3,276.00	\$2,923.00
OH	Laboratory Technician	\$2,560.00	\$3,328.00	\$2,944.00
OK	Metrologist III	\$2,702.83	\$4,504.83	\$3,603.83
OK	Metrologist II	\$2,213.67	\$3,689.42	\$2,951.55
OK	Metrologist I	\$1,842.08	\$3,070.25	\$2,456.17
OR	Metrologist	\$3,060.00	\$4,265.00	\$3,662.50
PA	Supervisor	\$3,270.00	\$4,450.00	\$3,860.00
PA	Metrologist	\$2,860.00	\$4,350.00	\$3,605.00
SC	Director	\$2,675.00	\$4,949.00	\$3,812.00
SC	Assistant Metrologist	\$2,198.00	\$4,067.00	\$3,132.50
TN	Metrologist	\$2,509.00	\$3,988.00	\$3,248.50
TX	Metrologist III	\$2,723.00	\$3,744.00	\$3,233.50
TX	Metrologist II	\$2,136.00	\$2,900.00	\$2,518.00
TX	Metrologist I	\$2,021.00	\$2,420.00	\$2,220.50
TX	Laboratory Technician	\$1,921.00	\$2,327.00	\$2,124.00
VA	Lab Manager	\$2,909.00	\$5,970.00	\$4,439.50
VA	Metrologist	\$2,227.00	\$4,570.00	\$3,398.50
VA	Program Support Technician	\$1,705.00	\$3,498.00	\$2,601.50
VT	Weights & Measures Specialist	\$4,000.00	\$4,000.00	\$4,000.00
WA	State Metrologist	\$2,712.00	\$3,460.00	\$3,086.00
WI	State Metrologist	\$3,093.72	\$6,187.44	\$4,640.58
WV	Labor Program Specialist/Metrologist	\$2,020.00	\$3,475.00	\$2,747.50
WV	Labor Inspector I/Metrology	\$1,539.00	\$2,695.00	\$2,117.00

## **Metrology Positions**

### **Salary Graph**

The following graph is the metrology positions of each reporting laboratory. It was requested that each position that performed metrology functions be listed along with the salary pay band. On the graph, each lab is allowed up to four positions. They are presented in order from “laboratory management positions” (red) to “metrology technician positions or entry-level positions” (green) for each state.



# DATA SUMMARY for 1996 thru 2003

	2003	2001	2000	1999	1996
<b>Number of Reporting Laboratories:</b>	<b>48</b>	<b>45</b>	<b>45</b>	<b>46</b>	<b>51</b>
<b>Total Number of Customers:</b>	<b>11,617</b>	<b>12,109</b>	<b>12,795</b>	<b>14,700</b>	<b>19,400</b>
Average	242	269	320		403
Maximum	1,837	1,758	1,695		1,555
Minimum	1	32	12		25
<b>Total Number of Calibrations:</b>	<b>375,411</b>	<b>361,600</b>	<b>352,274</b>	<b>320,950</b>	<b>332,587</b>
Mass Total	298,763	292,071	289,730	287,056	297,375
Length Total	722	651	979	825	1,206
Volume Total	8,574	9,296	8,951	8,572	10,682
Temperature Total	456	460	514	378	447
Frequency Total	13,785	14,670	13,518	11,561	12,518
Time Total	479	554	451	380	161
Wheel Load Weighers Total	10,350	13,699	12,781	12,178	
Other Total	42,282	30,199	25,350		10,198

## Detailed Breakdown of Above Categories:

### Mass by accuracy type:

Mass Echelon I	5,288	5,227	5,985	2,667	
Mass Echelon II	25,847	26,428	25,807	24,926	37,662
Mass Echelon III	267,240	260,072	257,938	259,463	259,713
Weight Carts	388	344	99	297	

### Length by device type:

Tapes	584	487	566	542	707
Rigid Rules	138	164	413	283	499

### Volume by device type:

Glassware	555	668	853	844	1,205
Test Measures	6,966	7,368	6,986	6,861	8,290
Provers	1,053	1,260	1,112	867	1,187

### Other by categories:

Lottery Balls	35,818	24,702	19,982		
Hydrometers	3,000	2,505	2,500		
Filters-EPA	2,145	1,764	1,764		
Grain Moisture	186	259	353		10,198
Radar Units	439	417	268		
Special Linear	83	258	209		
Scales	180	189	92		
Special Volume	266	45	43		
Electrical	50	39	19		
Density		6	7		
Railroad Test Cars	3	12	6		
Relative Humidity		3	2		
Special Mass	112				
Load Cells			6		

**Additional information was requested for the 2003 Workload Survey. The following pages display the compiled responses to those questions.**

This page was intentionally left blank.

2003 Survey Information

Question	Yes	No	N/A
Has your state adopted legislation prohibiting or restricting the use of instruments containing mercury (e.g., Mercury-in-glass thermometers, barometers)?	3	27	16
Has your state/jurisdiction used other specification standards (e.g., procurement specifications for standards or other equipment)?	20	25	1
Has your state/jurisdiction developed internal procurement specifications for the purchase of weight carts?	2	44	
Has your state/jurisdiction developed internal procurement specifications for the purchase of bottom drain 5-gallon provers?	1	45	
Has your state/jurisdiction developed internal procurement specifications for the purchase of any other field standard?	4	41	1
Does your laboratory maintain 'as found' data for field standards?	30	15	1
Do you require specific safety training for laboratory staff?	12	29	5
Has your laboratory or administration used the Laboratory Workload Survey information to initiate changes in your laboratory operations?	10	31	3

## 2003 Survey Information

Do you have requirements that standards be submitted in a specific condition?

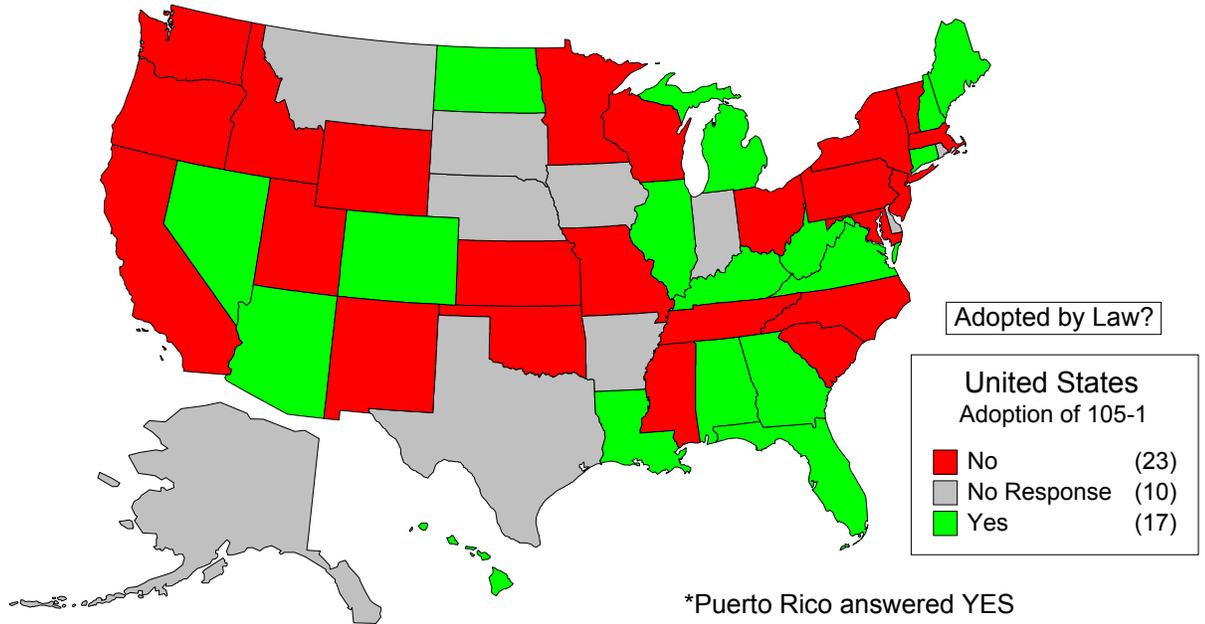
- 45 said YES
- 1 said NO
- 0 had NO RESPONSE

### Number of Requirements for Specific Conditions

Mass Standards:	In "As Used" condition	Cleaned	Painted	Paint Touched Up	Opened
Large Cast Iron	3	42	32	16	0
Stainless Steel Field Weights	13	33	1	1	0
Precision Mass Standards	19	18	0	0	0
Volume Standards:	In "As Used" condition	Detergent & Water Cleaned	Steam Cleaned	Petroleum Residue Free	Mild Steel Painted
Test Measures ( $\leq 5$ gal, $\leq 20$ liters)	4	21	0	30	9
Provers ( $> 5$ gal, $> 20$ l)	5	19	5	28	6
LPG Provers	12	5	1	16	4

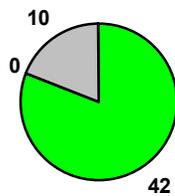
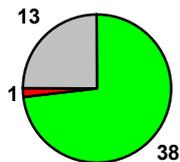
# NIST HB 105-1

## Specifications and Tolerances for Field Standard Weights (NIST Class F)

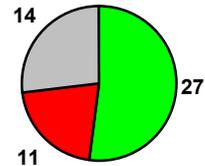


### Used to Evaluate Calibration Standards for Compliance?

#### Used as Specifications for Purchasing?



#### Allowed Exemptions, Exceptions, or Grandfathered Old Standards?

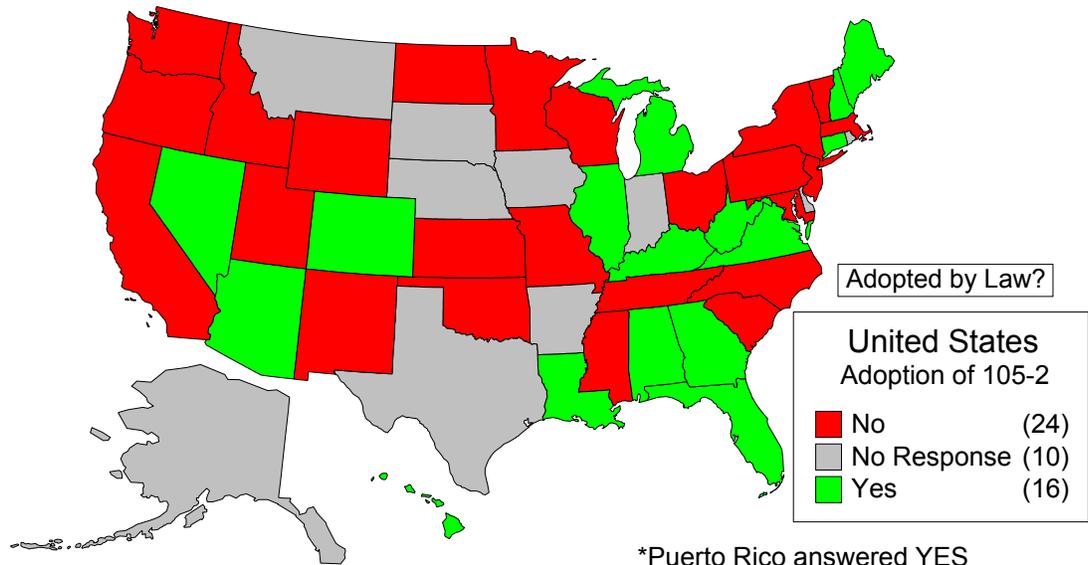


■ Yes ■ No ■ No Response

This page was intentionally left blank.

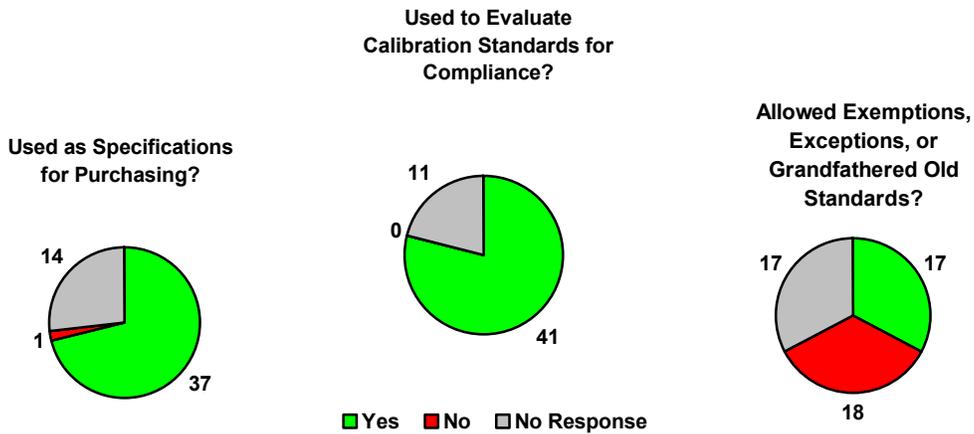
## NIST HB 105-2

### Specifications and Tolerances for Field Standard Measuring Flasks



\*Puerto Rico answered YES

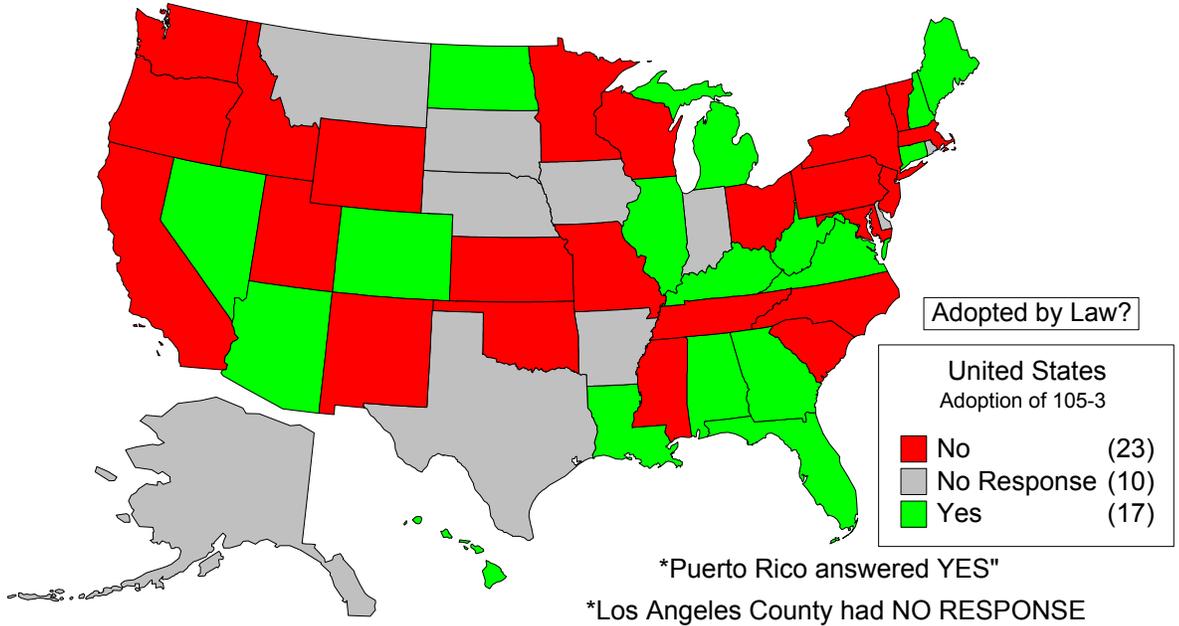
\*Los Angeles County had NO RESPONSE



This page was intentionally left blank.

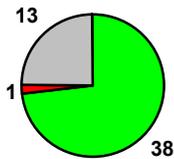
# NIST HB 105-3

## Specifications and Tolerances for Graduated Neck Type Volumetric Field Standards

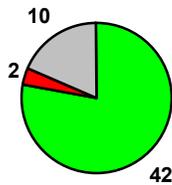


### Used to Evaluate Calibration Standards for Compliance?

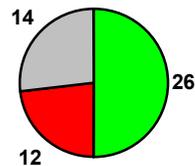
#### Used as Specifications for Purchasing?



#### Used to Evaluate Calibration Standards for Compliance?



#### Allowed Exemptions, Exceptions, or Grandfathered Old Standards?

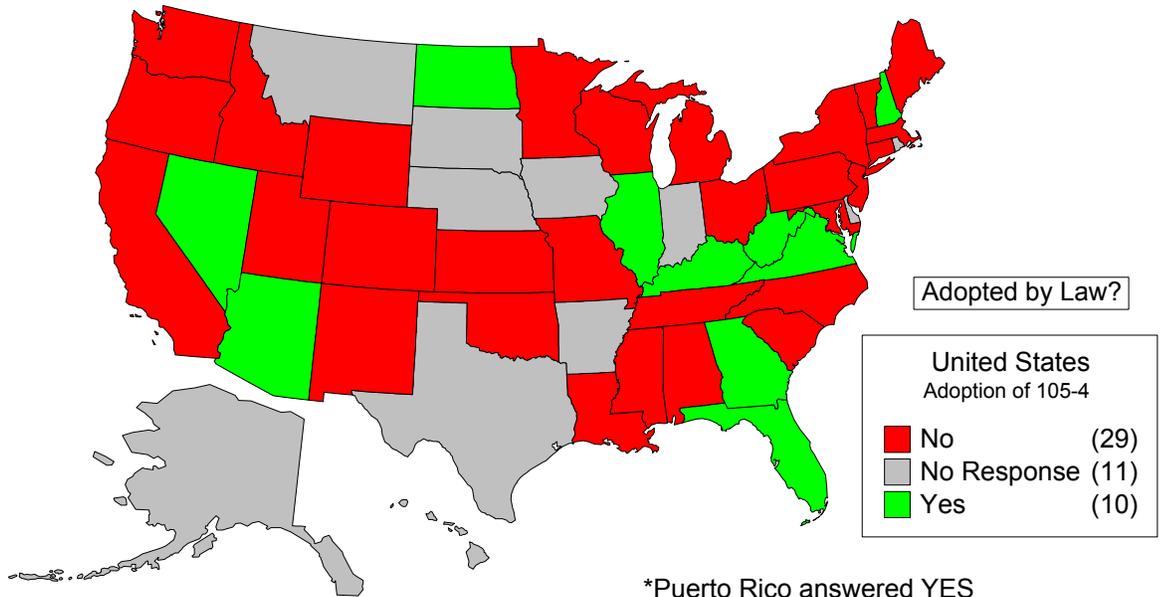


■ Yes ■ No ■ No Response

This page was intentionally left blank.

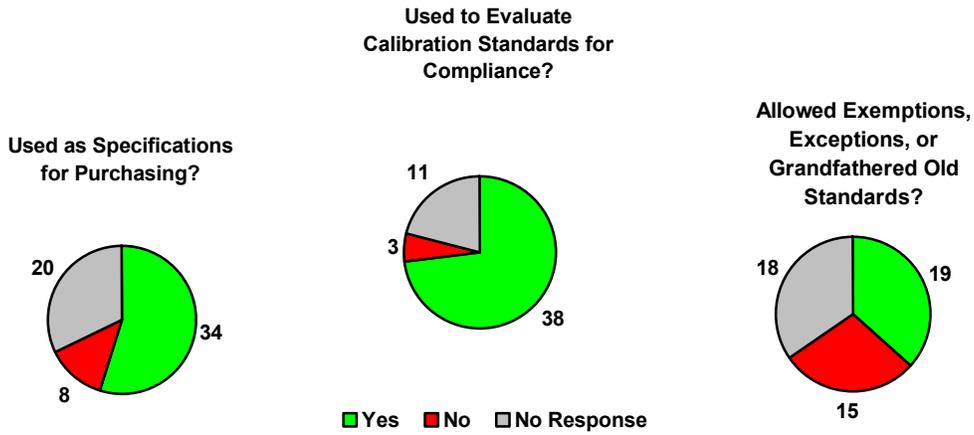
# NIST HB 105-4

Specifications and Tolerances for Liquid Petroleum Gas and Anhydrous Ammonia Liquid Measuring Provers



\*Puerto Rico answered YES

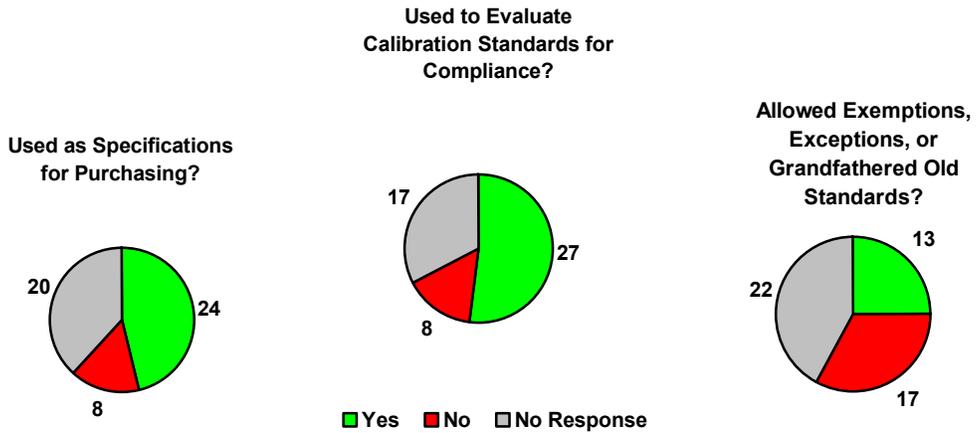
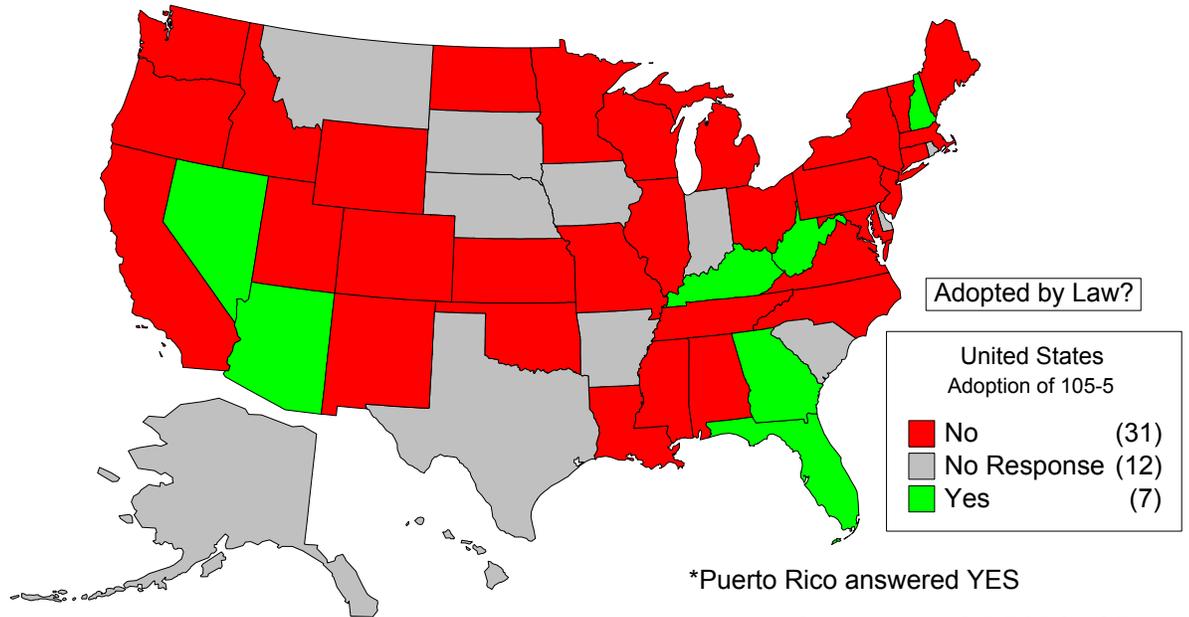
\*Los Angeles County had NO RESPONSE



This page was intentionally left blank.

# NIST HB 105-5

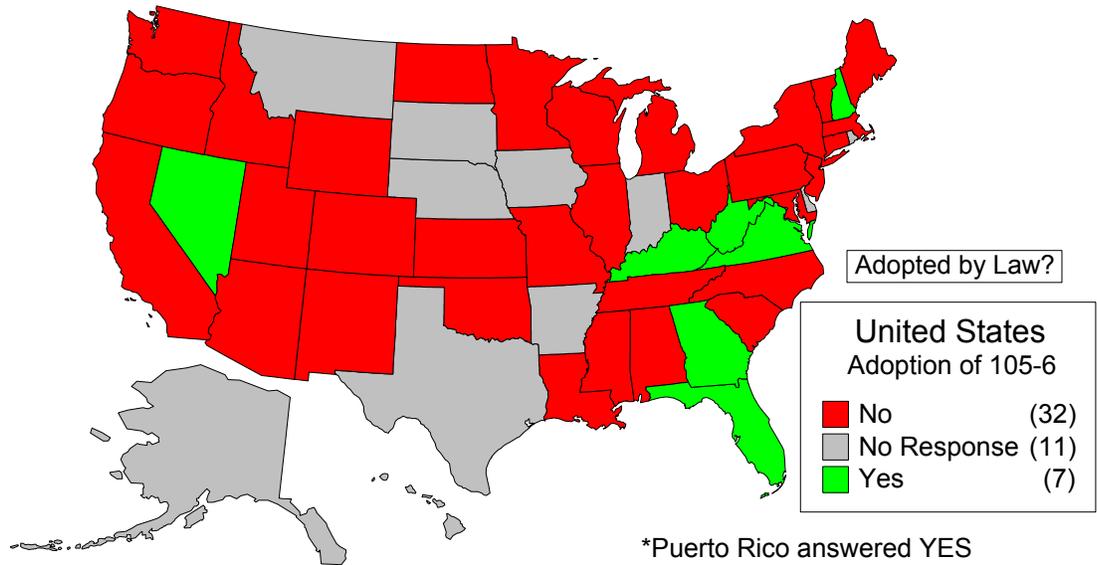
## Specifications and Tolerances for Field Standard Timing Devices



This page was intentionally left blank.

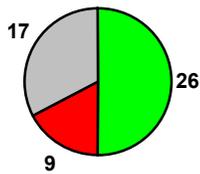
# NIST HB 105-6

## Specifications and Tolerances for Field Standard Thermometers

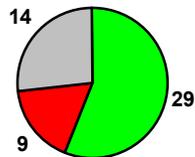


### Used to Evaluate Calibration Standards for Compliance?

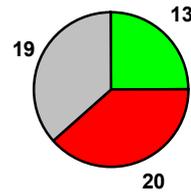
#### Used as Specifications for Purchasing?



■ Yes ■ No ■ No Response



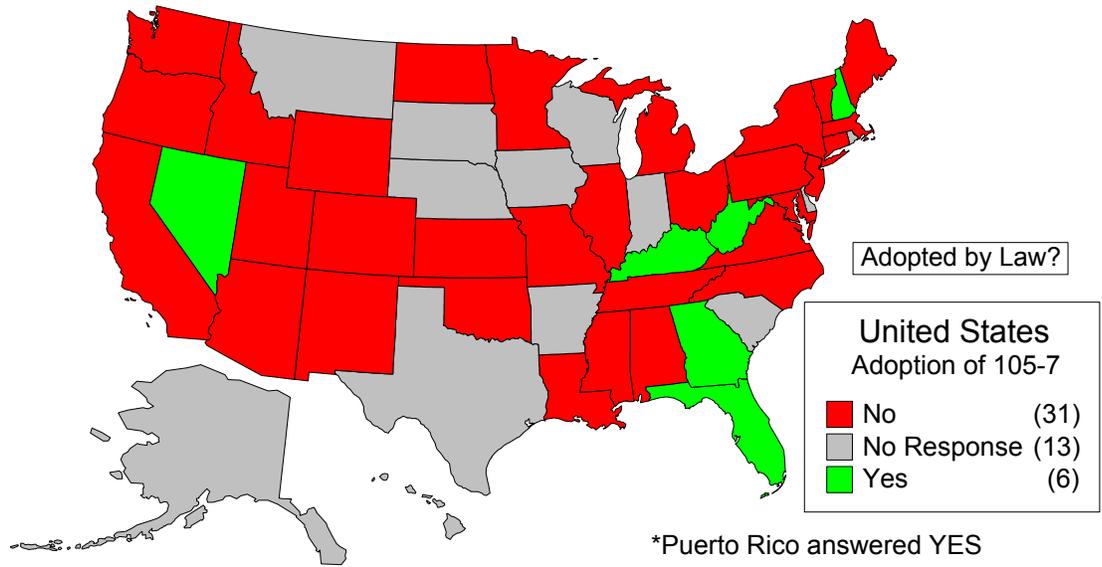
#### Allowed Exemptions, Exceptions, or Grandfathered Old Standards?



This page was intentionally left blank.

# NIST HB 105-7

## Specifications and Tolerances for Dynamic Small Volume Provers

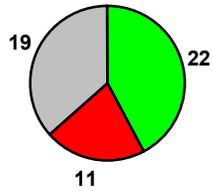
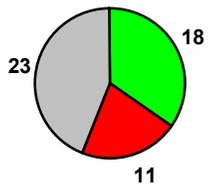


\*Puerto Rico answered YES

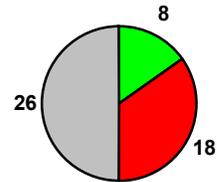
\*Los Angeles County had NO RESPONSE

### Used to Evaluate Calibration Standards for Compliance?

#### Used as Specifications for Purchasing?



#### Allowed Exemptions, Exceptions, or Grandfathered Old Standards?



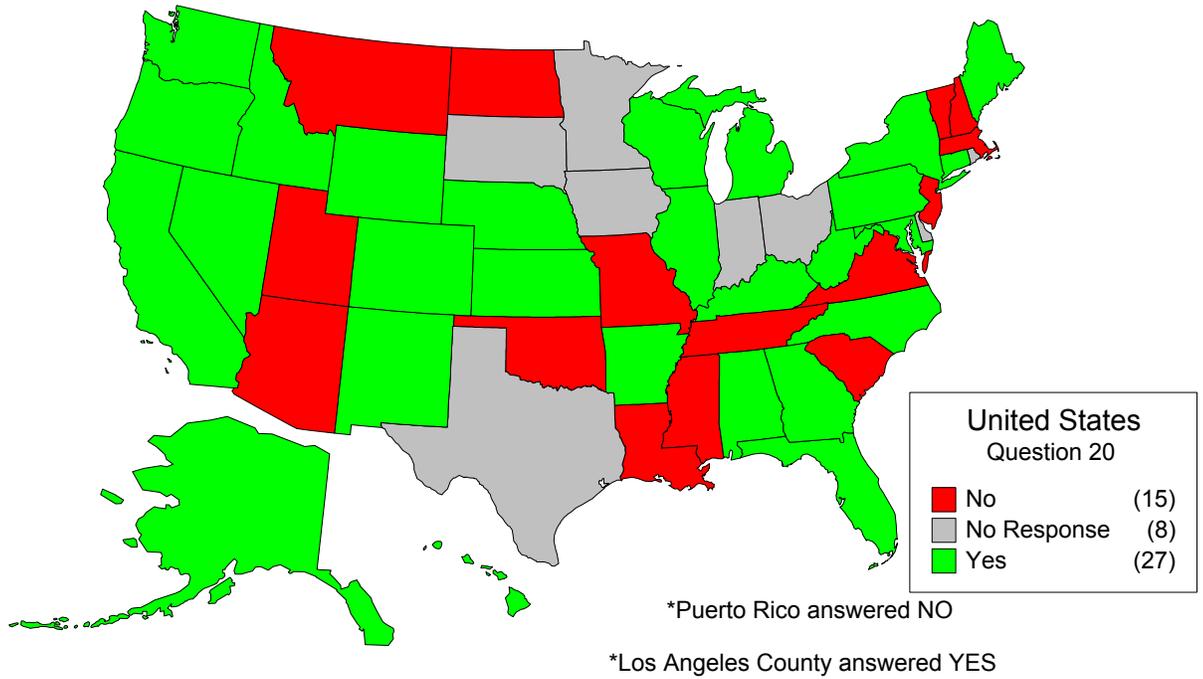
■ Yes ■ No ■ No Response

This page was intentionally left blank.



This page was intentionally left blank.

Have special ergonomic accommodations been made in laboratory for routinely handling large or heavy items?



This page was intentionally left blank.

2003 Survey Information

Do you have field standards calibrated in your laboratory that have no specifications for use as field standards? Please indicate types and *estimated* numbers:

- 13 said YES
- 30 said NO
- 2 had NO RESPONSE

Device/Standard	Number Tested Annually	Device/Standard	Number Tested Annually	Device/Standard	Number Tested Annually
Master Meters	66	5-Gallon Bottom-Drain Test Measures	238	Compact Small Volume Provers	
Mass Flow Meters	2	Load Cells	2		

Do you have field standards used in your state that your laboratory does not have the ability to calibrate? Please indicate *estimated* numbers:

- 22 said YES
- 19 said NO
- 3 had NO RESPONSE

Device/Standard	Number Tested Annually	Device/Standard	Number Tested Annually	Device/Standard	Number Tested Annually
Master Meters	10	Large Volume Provers	12	Compact Small Volume Provers	17
LPG Provers	10	Wheel Load Weighers	1484	Weights > 52 kg	100
Weight Carts	14	Turbine Meters	3	Thermometers	21
Load Cells	2				

## 2003 Survey Information

Do you calibrate field standards “outside your laboratory walls” (either outside or at other locations/facilities) or use calibration instruments that are not the property of the jurisdiction? If yes, note number of devices/standards and types of facilities (state building, maintenance yard, farmers’ market covered shed, etc.):

- 21 said YES
- 23 said NO
- 1 had NO RESPONSE

Device/Standard	Number Tested Annually	Device/Standard	Number Tested Annually
Weight Carts	45	5-Gallon Test Measures	1695
Large Volume Provers	289	Wheel Load Weighers	4209
10,000 lb weights	25	Stadiometer	1
25 & 50 lb weights	1650	Water Meter Calibration Tanks	3
Axle Load Scales	6		

2003 Survey Information

Estimate the percentage of your laboratory's time that is used for:	Average Percentage	Minimum Percentage	Maximum Percentage	*Total Number of Respondents
Echelon I Mass Calibration	5.71	1	20	13
Echelon II Mass Calibration	13.64	1	50	36
Echelon III Mass Calibration	51.93	24	90	44
Volume Calibration	10.70	1	39	45
Length Calibration	2.26	0.5	10	21
Thermometer Calibration	2.4	0.3	6	12
Other Calibration/Testing (e.g. Frequency, Lottery Ball, Scales, Wheel Load Weighers, etc.)	7.58	0.3	40	30
For Maintaining Quality System, e.g., RMAP or other Round Robins, Quality Manual, SAPs, OWM & NVLAP?	12.65	1	50	44
Responding to Customer Inquiries on Accreditation, Quality Systems, Uncertainty Analysis, Calibration Procedures, etc.	4.15	1	40	37

\* Average was determined only by the number of respondents to each question

2003 Survey Information

Estimate the percentage of you laboratory's work time that is for:	Average Percentage	Minimum Percentage	Maximum Percentage	*Total Number of Respondents
For Laboratory Standards	8.14	0.8	30	43
For Local W&M Programs	18.54	2	58	43
For Other W&M Programs	9.47	1	70	22
For Scale Repair Companies	40.08	3	87	43
For Non W&M Customers	27.86	1	80	41

\* Average was determined only by the number of respondents to each question