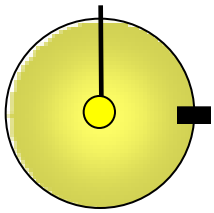


*Rolf Bergman*  
*Consulting*



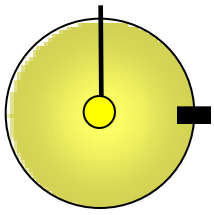
# NVLAP Proficiency Test Round 12

by  
Rolf S. Bergman  
Consultant



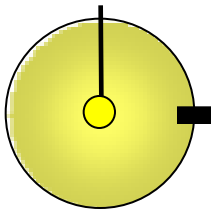
# Outline of Presentation

- NVLAP Proficiency Testing
- Test Structure / Test Procedure
- Labs Participating
- Results
  - Incandescent Lamps
  - Compact Fluorescent Lamps
  - Linear Fluorescent Lamps
- Conclusions



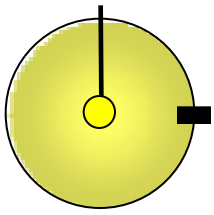
# NVLAP Proficiency Testing

- Required by all labs seeking accreditation through NVLAP for Energy Efficient Lighting
- New Test done every couple of years or so
  - First test conducted in early 1990's
- Conducted by a coordinator through contract with NVLAP
  - Structure of test developed jointly between coordinator and NVLAP Program director
- NVLAP provides final Tech Brief on test



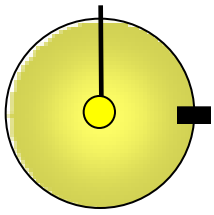
# Proficiency Test Structure

- Three lamp types to be tested by lab
  - 5 incandescent halogen lamps (60-W Halogena type)
  - 5 integral screw-in CFLs (13-W)
  - 6 linear fluorescent lamps (F32T8 lamps) two each at three different colors
- Incandescent and CFL split into 5 groups
  - Both lamp types shipped together in one case
  - Labeled A, B, ...E (A, B & C sent initially, D for labs starting later and E for reserve)
  - Measured initially by a Central Lab (CL) (different CL for incandescent and CFL)



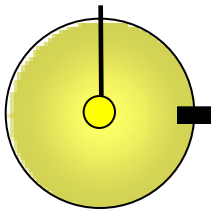
# Proficiency Test Structure (cont.)

- Linear Fluorescent lamps
  - 6 T8 32-W lamps, 2 each at 3000K, 4100K and 6500 K
  - to be operated on a reference ballast at 300V/60 Hz line input
  - Expected only 10-12 labs to participate so only two groups were prepared, labeled A, B
  - Group B lamps abandoned after second lab due to breakage of 4 of the 6 lamps in shipment
  - Group A lamps sent to each lab (10 participating labs)



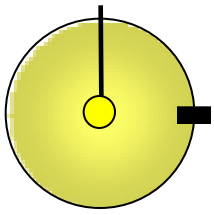
## Proficiency Test Structure (cont.)

- Central lab measured all lamps of a given type before and after the round
  - Major lamp manufacturer's labs were central labs
  - One lab did CFLs
  - Other lab did Incandescent and LFLs
- NIST measured Incandescent and LFLs
  - Two of five incandescent prior to star, all five after finish of test, except Group D
  - All LFLs before and after the test



# Lab Measurement Procedure

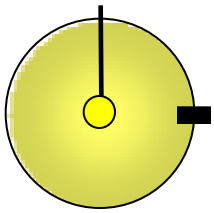
- Coordinator sends instructions, form and EXCEL data sheet for each test (show)
  - Lab to read instructions
  - Lab to fill out form during test
  - Lab to provide requested data using EXCEL workbook
- Lab to make three separate measurements on each lamp
  - Pre-burn lamps as described
  - Measure over two days
  - Prescribed randomize order



# Labs Participating

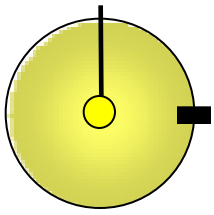
- Labs in the USA
  - AITL OH
  - CSA GA
  - GE OH
  - ITL CO
  - LRC NY
  - OSI MA
  - UL NY
  - BAACL CA
  - EYE OH
  - ITS NY
  - Litetronics IL
  - Musco IA
  - Philips KS
  - Westinghouse PA





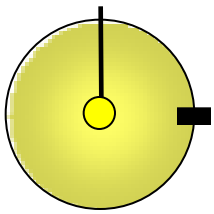
## Labs Participating (cont.)

- Labs in the Foreign Countries
  - GE Hungary
  - Audix Shenzhen China
  - BTS Shenzhen China
  - GE Shanghai China
  - ITS Hangzhou China
  - NLTC Beijing China
  - AITL Shanghai China
  - BACL Shenzhen China
  - CTI Shanghai China
  - ITS Hong Kong
  - Lisheng Xiamen China



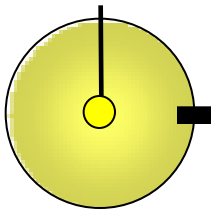
# Data Analysis

- Collect form and data from each lab
- Create EXCEL workbook containing all data of given lamp type (show CFL example)
  - Use data set of each lab
  - One each for Incandescent, CFL and LFL
    - One worksheet per group A, B, C and D
  - Assign lab numbers based on efficacy ranking within group, e.g., A1 through A7
  - Correct for efficacy depreciation for CFL
  - Align Group averages based on CL Initial data



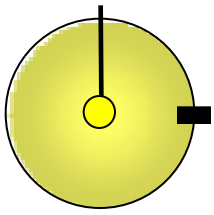
## Data Analysis (cont.)

- Summarize Data of Each lab on separate worksheet (show)
- Plot values (show samples)
  - Average values of input power, lumen output and efficacy
  - Average values of color parameters for CFL (one lamp) and LFL (all lamps)
  - Correlation of labs (% variation) to Central Lab initial values, NIST final values and grand mean
  - Power, lumens and efficacy for each lamp by lamp number
  - Percent deviation of lumen output for three measurements on a given lamp



# Issues

- Time for PT
  - Took two years to complete test; expected one
  - Delay caused by broken/inoperable lamps and e-mail communication problems with some Chinese labs
  - One lab in China took eight months to provide LFL results
- Grand mean for incandescent 1 % lower than CL initial data, even 0.6 & lower than NIST final data
  - Likely cause is Chinese NIM reference is lower than NIST by 1 to 2 %
- Incandescent lamp stability



# Conclusions

- Time for PT
  - Need different structure to conduct test in less than one year
- Industry Performance
  - Two labs were outliers in CFL; lowest and highest
  - No outliers in Incandescent and LFL
  - CFL lab variation from Grand Mean about the same as that of PT 11 with 50 % increase in number of labs