

# Power Quality Issues Due to Electronic Lighting

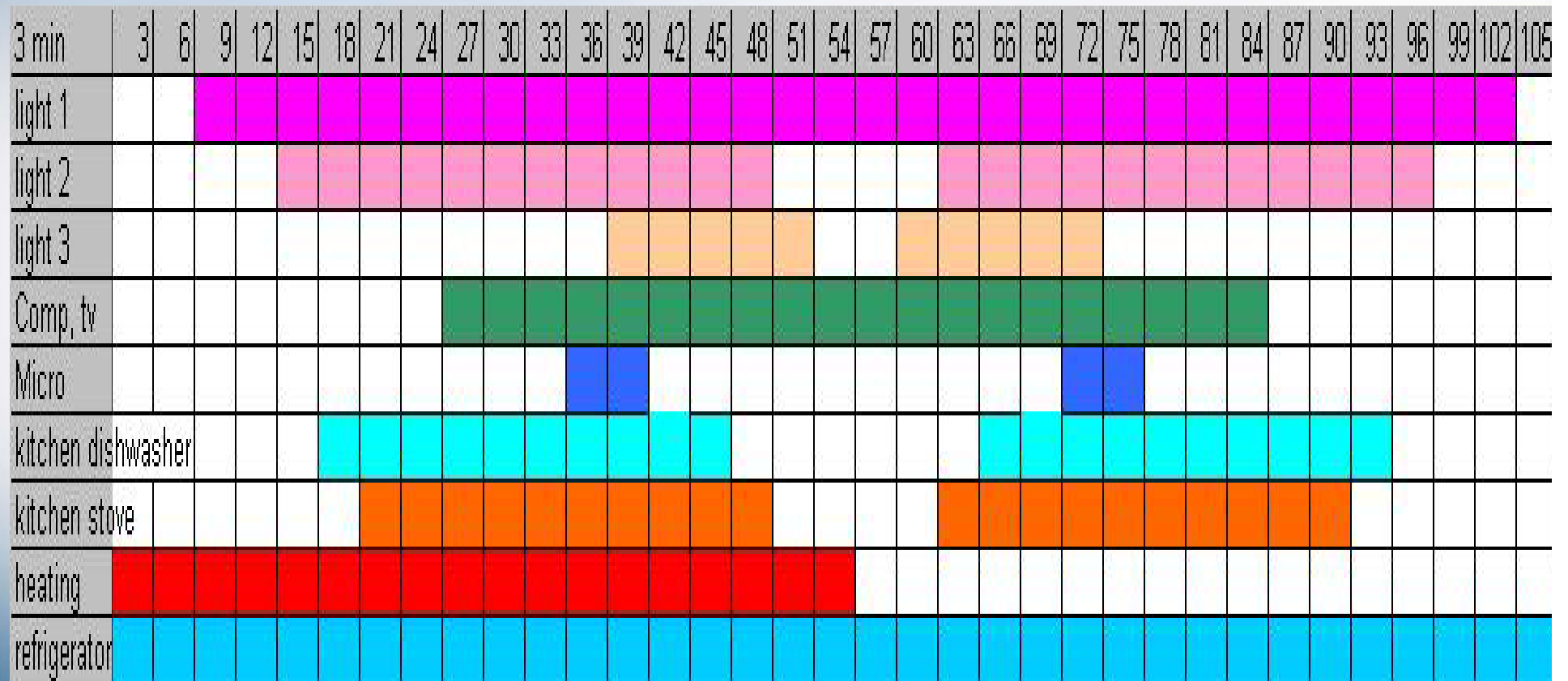
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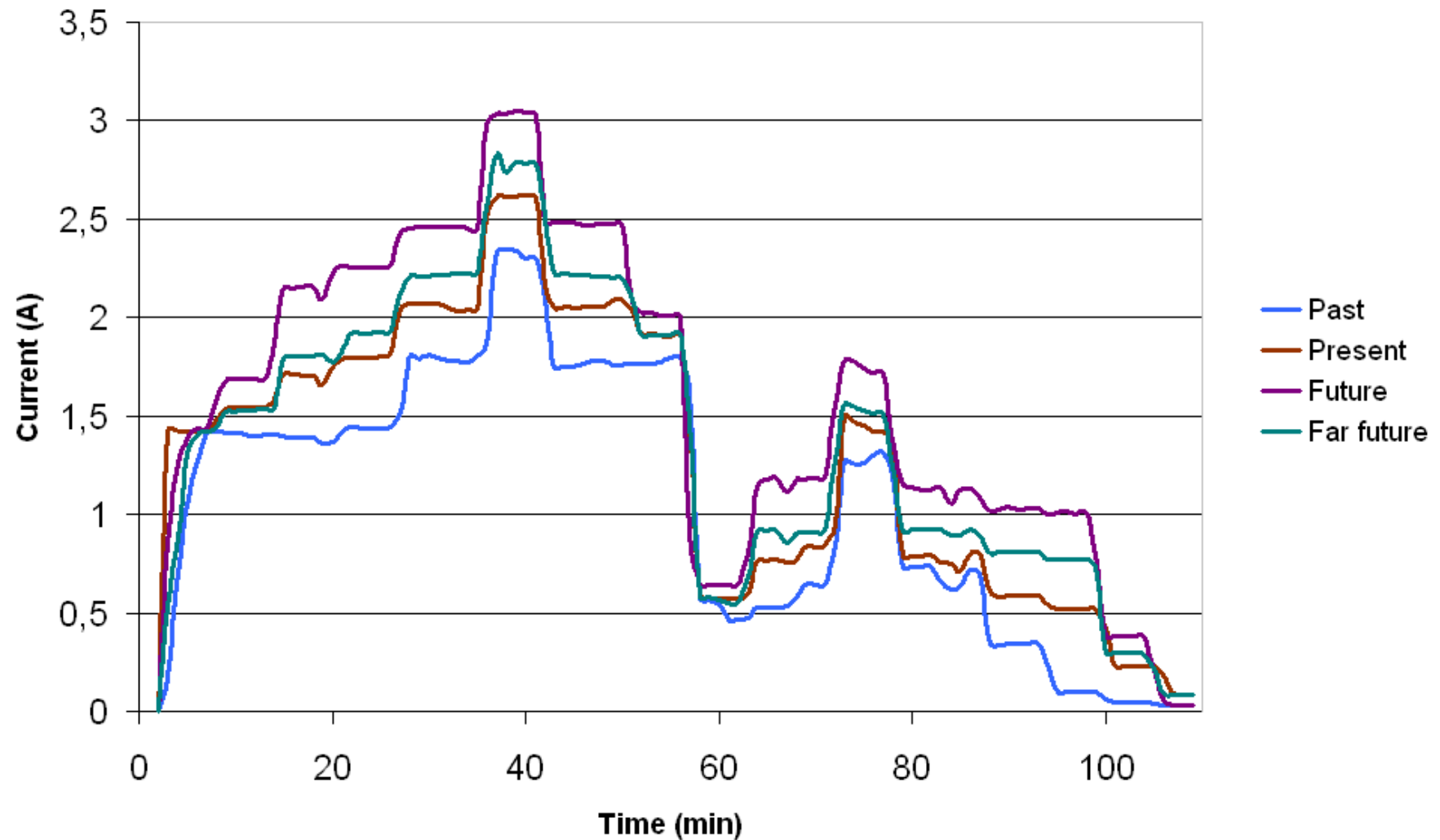
# Laboratory Setup

- Full-scale electrical model of a house
  - Computer, television, microwave, dishwasher, induction stove, heat pump, refrigerator
  - Past - incandescent
  - Present - incandescent and compact fluorescent
  - Future – LED and compact fluorescent
  - Far Future - LED

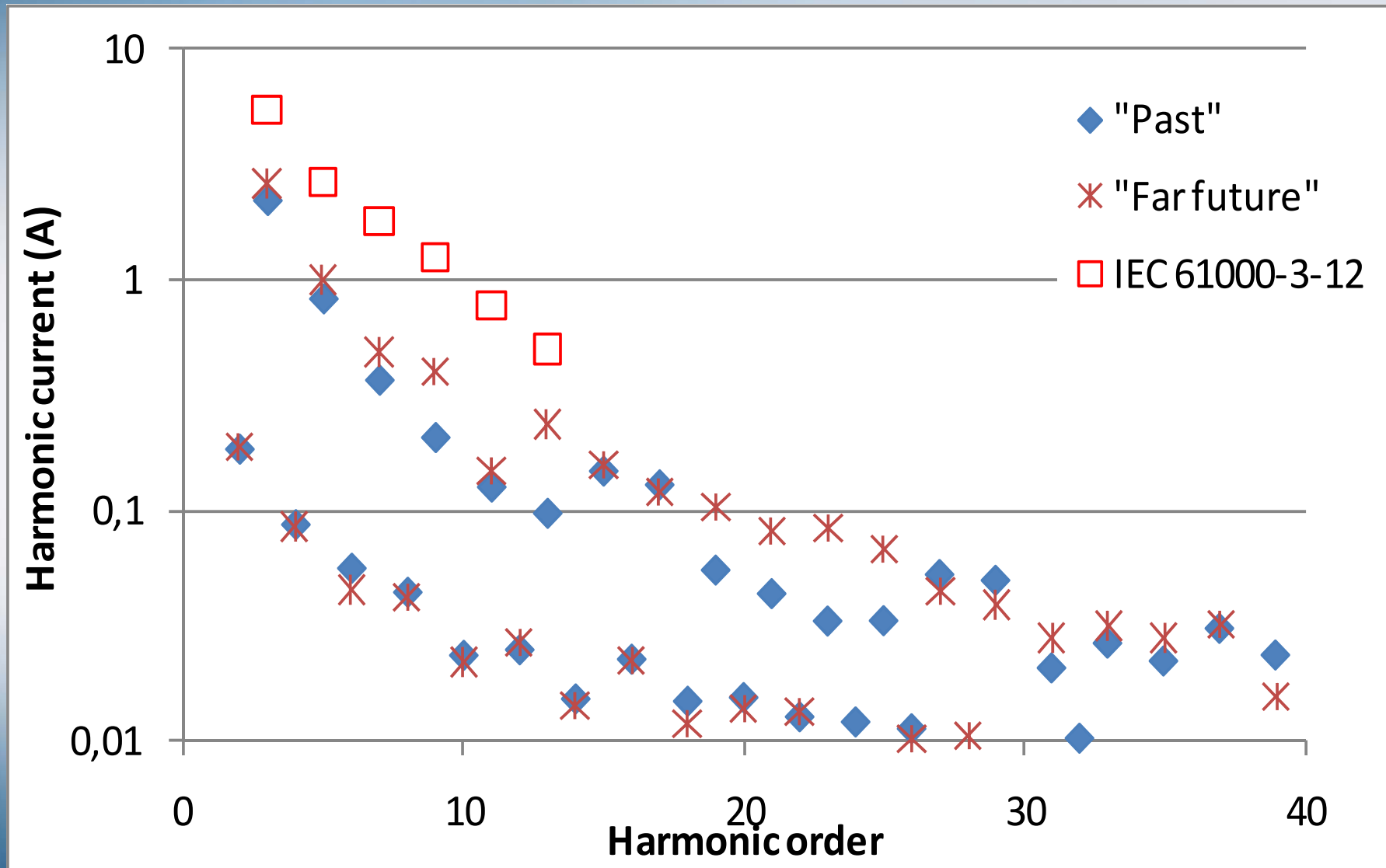
# 108-minute load-switching pattern

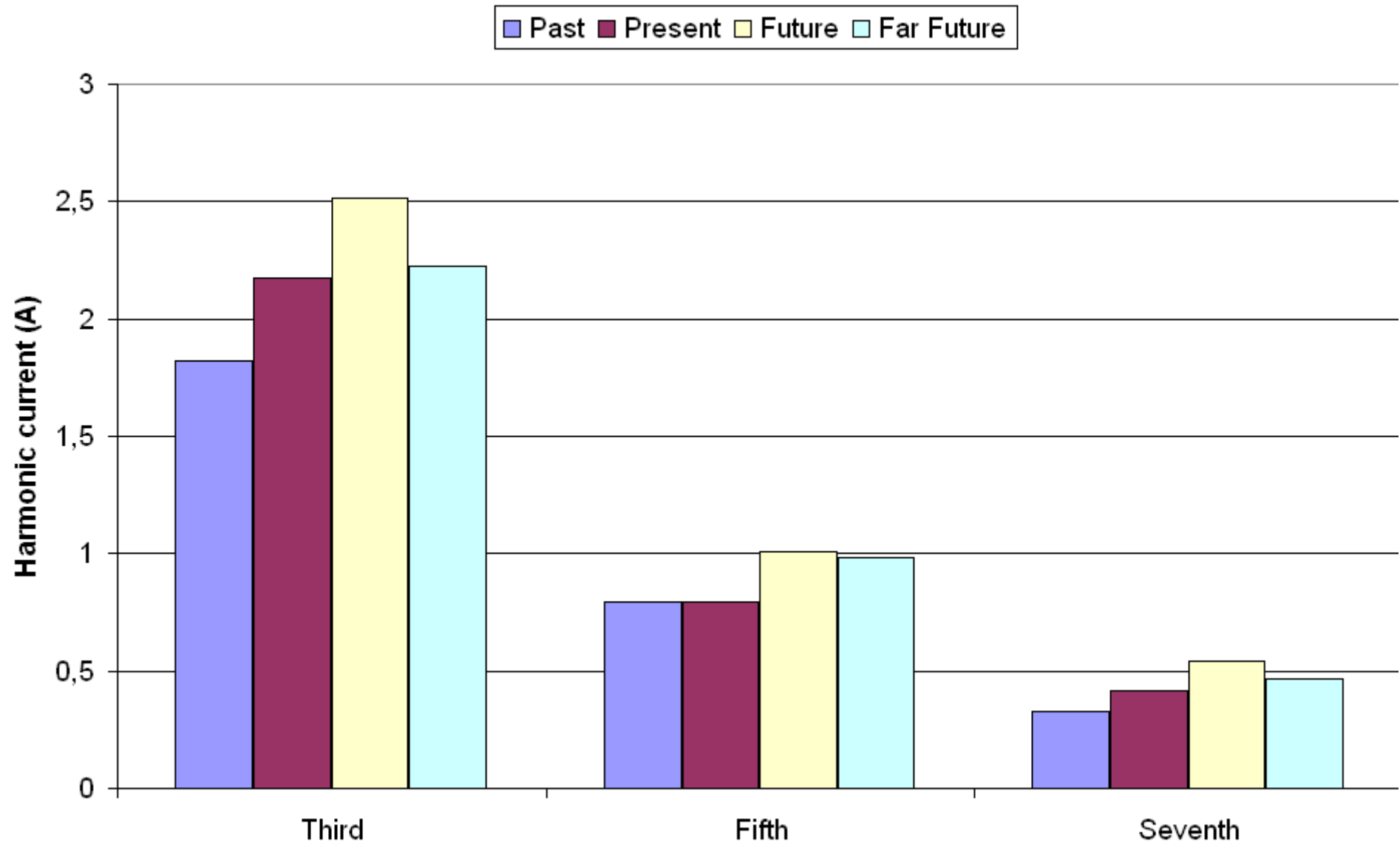


# ITHD in Ampere

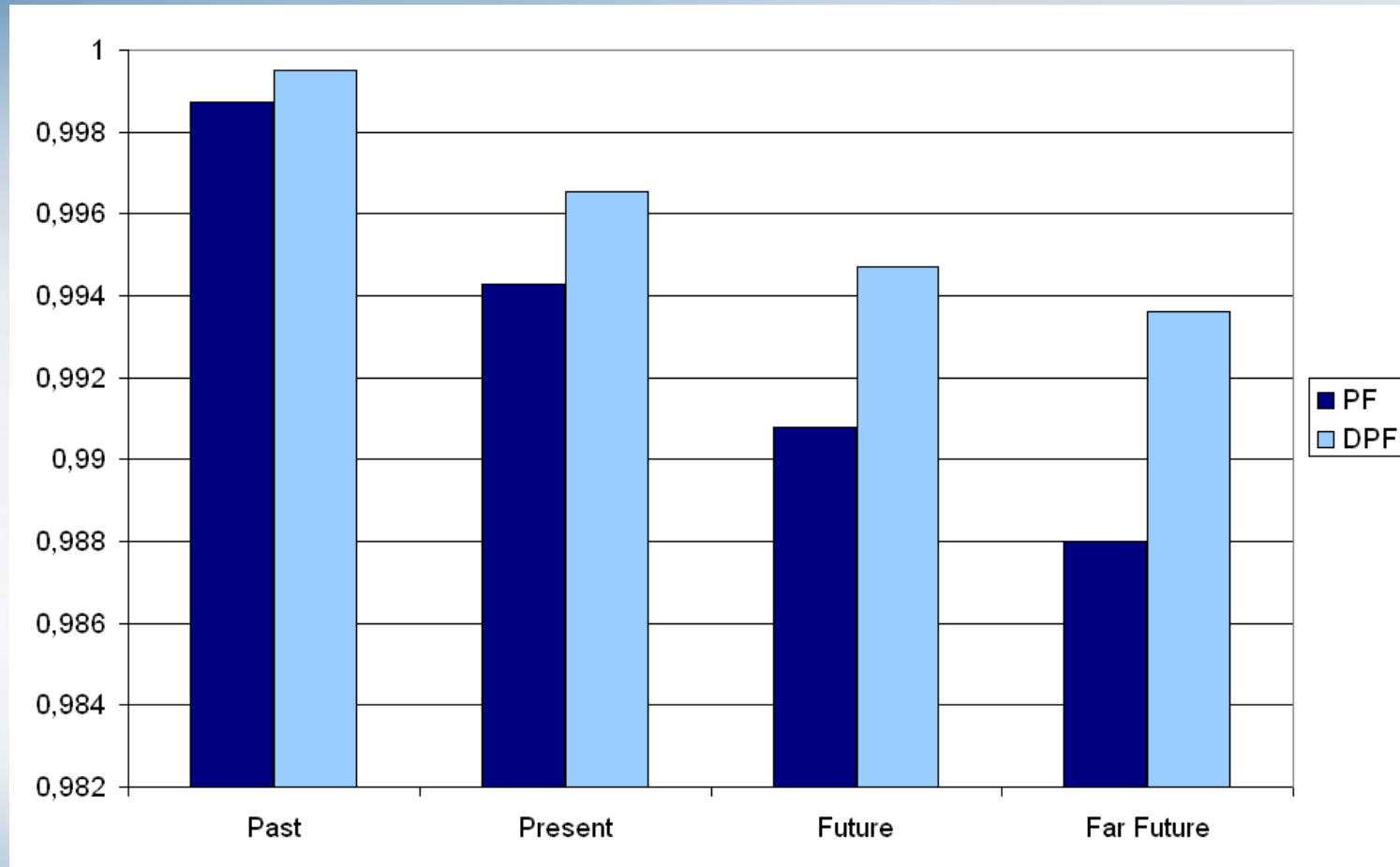


# Harmonic spectrum (99%)





# 95% value of the Power Factor and Displacement Power Factor



PF = ratio between active power and apperent power with all harmonics factored in.

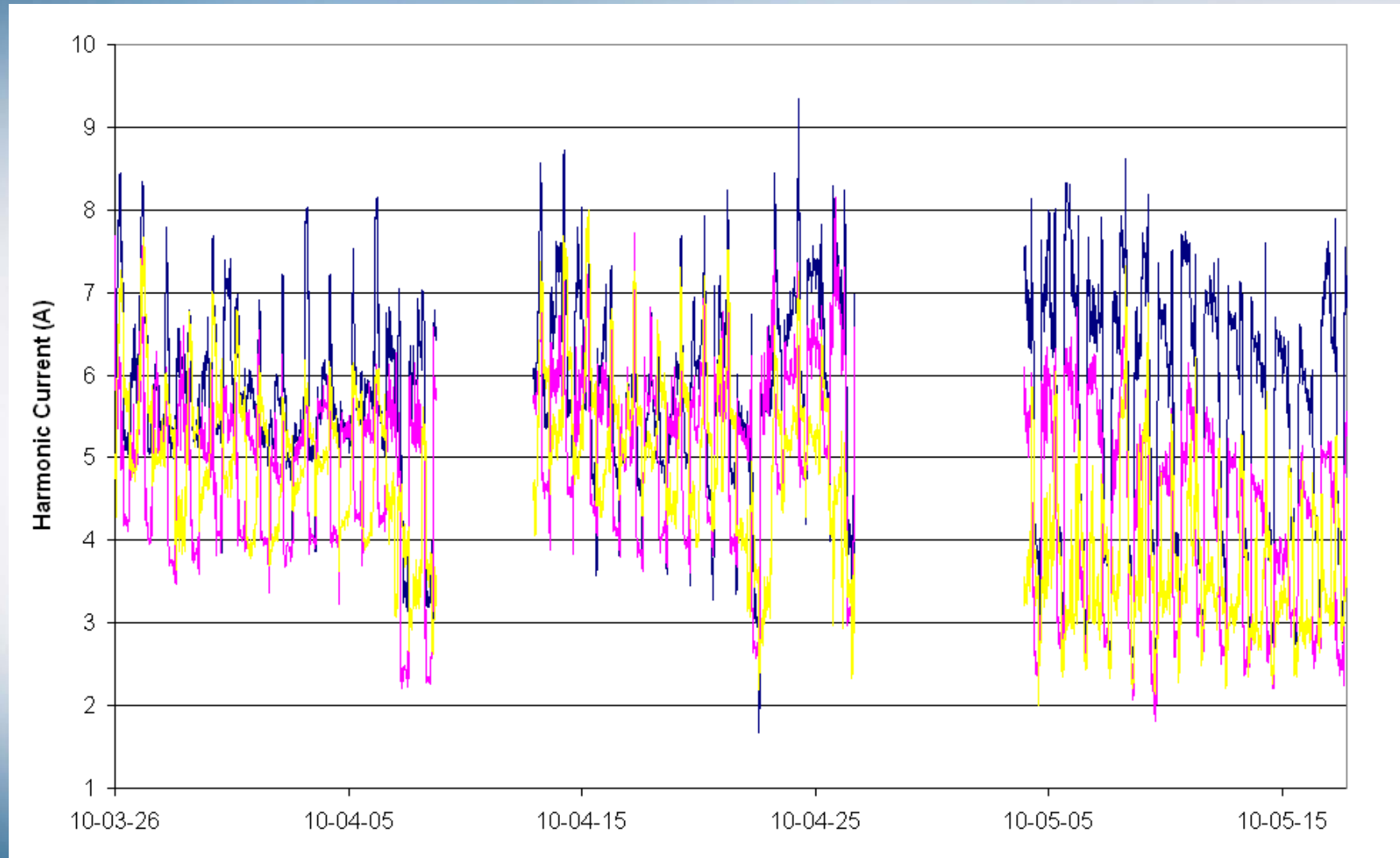
DPF = cosine of the phase angle between the fundamental voltage and the fundamental current

# Hotel Measurements

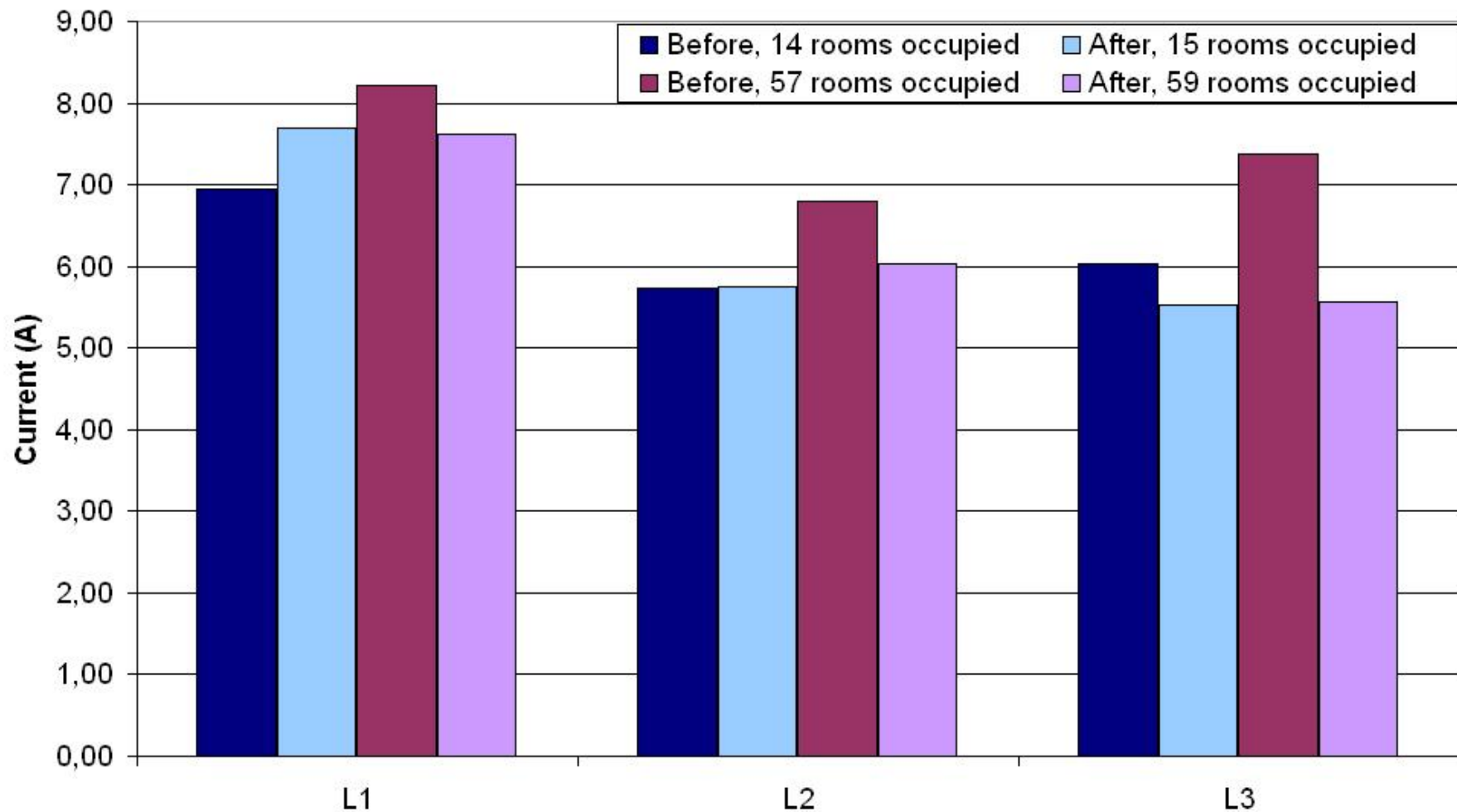
- 76-room hotel
  - 563 x 40-W incandescent
  - 447 LED + 116 CFL
- Measurements before, during and after the replacement.



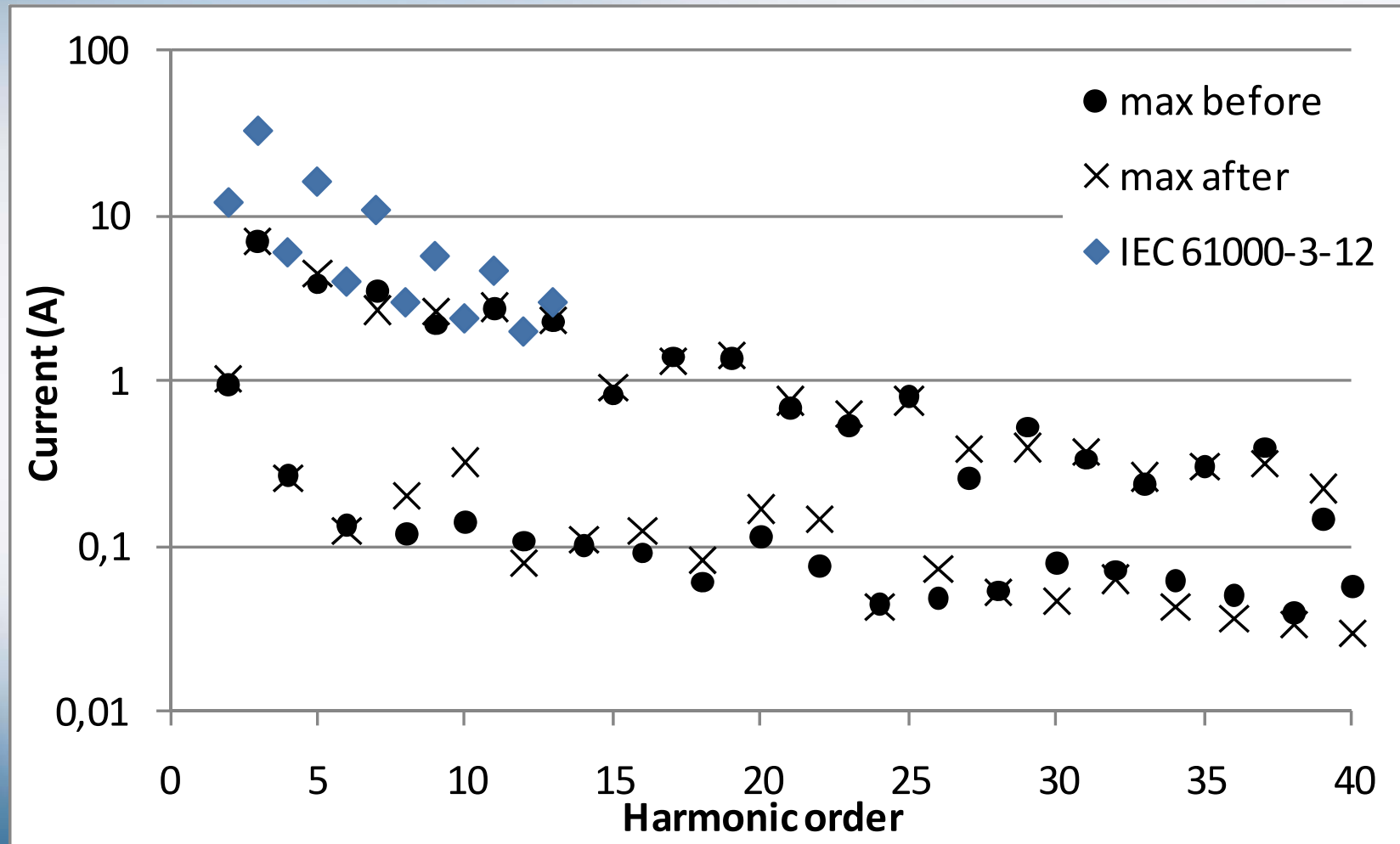
# Total harmonic distortion of the current before, during and after the change

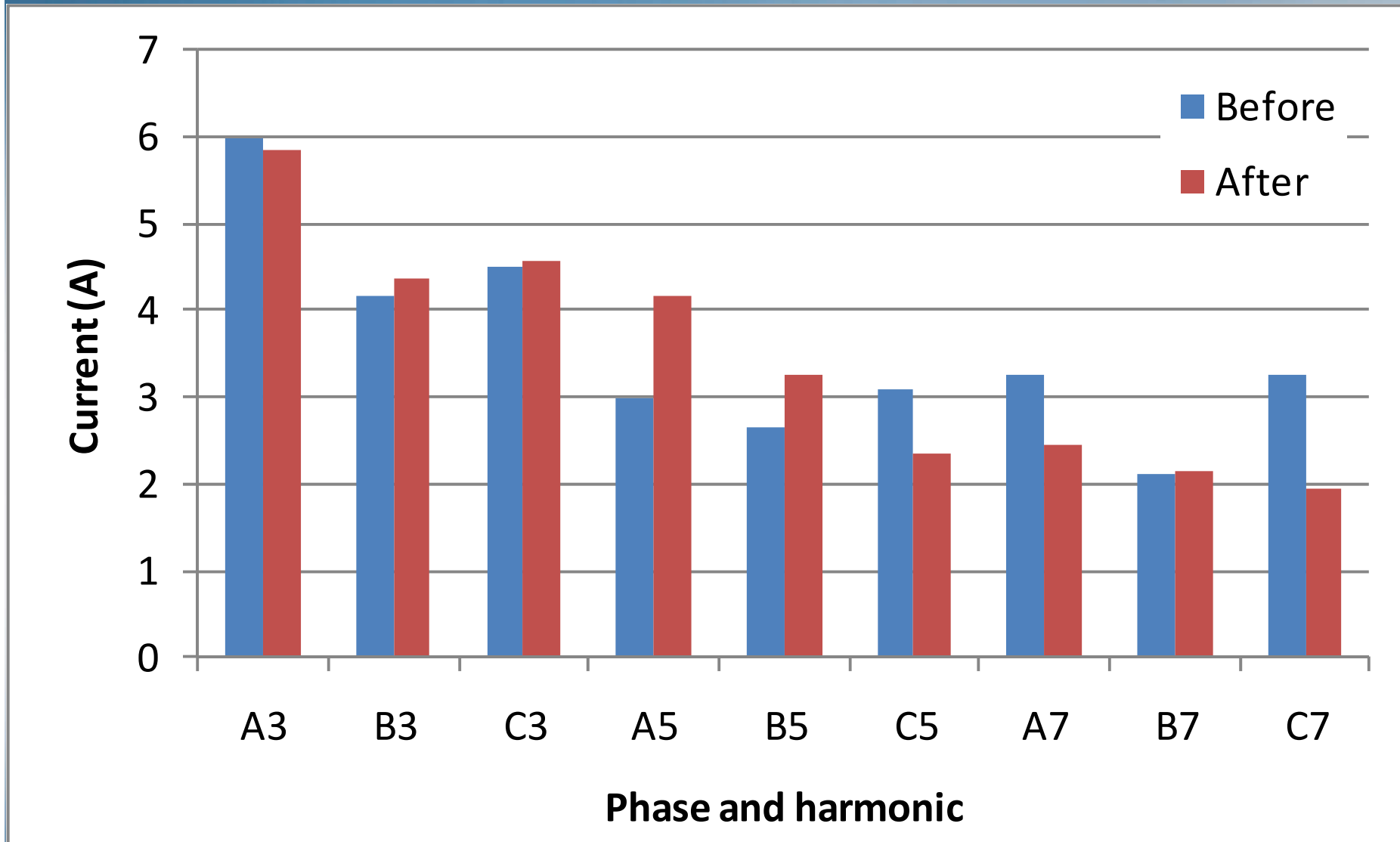


# 95% Value of the Current THD



# Harmonic spectrum (99%)





# Conclusions

- Minor increase in emission with a domestic customer.
- No change in emission with the hotel.
- Power-factor alone is not sufficient to quantify emission.
- Current distortion should be expressed in ampere and not percent