

# Standardization, quantification and reproducibility in fluorescence widefield and confocal microscopy

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The use of confocal and widefield fluorescence microscopy has been strongly increased in many areas of natural science in the last decade. New instrumentation and promising techniques are quickly evolving. However, often it is difficult to evaluate their potential for the desired applications .

The aim of this talk is to discuss in more detail which quantities need to be compared, standardized and/or quantified in fluorescence microscopy; and giving a short overview with examples of the existing materials and tools.

Why are standards and standardized procedures for the performance validation of fluorescence microscopes needed?

- Control of instrument specifications
- Control and if possible adjustment of instrument performance in terms of alignment, intensity, field flatness, sensitivity, linearity, spectral reproducibility....
- Evaluation of the longterm stability of instrument performance
- Improved comparison of instrument and instrumentation performances (objective to objective, instrument to instrument, brand to brand, wide field to confocal, confocal to deconvolution)
- Tools for the comparison of data acquired with different instruments. In core facilities data often have to be obtained on more than one instrument, so combining of data from different instruments would be very useful. The same is often necessary for work done in a collaborative effort of many scientific groups.
- Quantification of fluorescence signals.

Why are easy quantification tools needed in the near future?

- Descriptive and/or nice images are often not enough any more in many scientific areas.
- Long term experimental studies are often needed or already performed (hours, days, years?)
- Complicated instrumentation can or already leads to wrong conclusions, as multiple instrumental variations are possible over time all more or less directly influencing image properties.
- Comparison and combination of data between labs is urgently needed and actually necessary.
- Medical research and routine often needs quantitative results, but also other research needs more and more quantification for example for calculations of models in systems biology. Instrumentation, which should or can be used in this area will need performance and calibration certification.

The following talks of this session will give a perspective of new approaches in this field and hopefully we can collect and discuss together ideas on how to proceed in this area and also increase the interest and efforts of the manufacturers on this subject.