QUALITY CONTROL OF HCS FLUORESCENCE IMAGING SYSTEMS

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It is nowadays recognized by the microscopists community and the microscopes manufacturers that controlling the quality and assessing the performance of fluorescence microscopes is an important issue that needs to be addressed. This topic has been in the program of the Core Facility Satellite Meeting of the ELMI meetings every two years since 2015. Besides, a new ISO norm was recently published to provide guidelines about measuring confocal fluorescence microscopes performance [1].

High-content screening (HCS) relies on automated images acquisition and analysis of cells in culture, that allows to get information such as the number of cells, the distribution of a target protein in each cell, the morphologic features or the co-localization between different objects. As any microscope introduces a bias, it is important to measure it, to prevent from misinterpretation of the results, wrong conclusions and non-reproducible research. For example, it is important to measure the co-registration accuracy of the imaging system before any co-localization experiment. Besides, as HCS imaging campaigns can last for days, weeks or even months, periodic quality controls during the campaign is recommended, to ensure the system performance did not fluctuate.

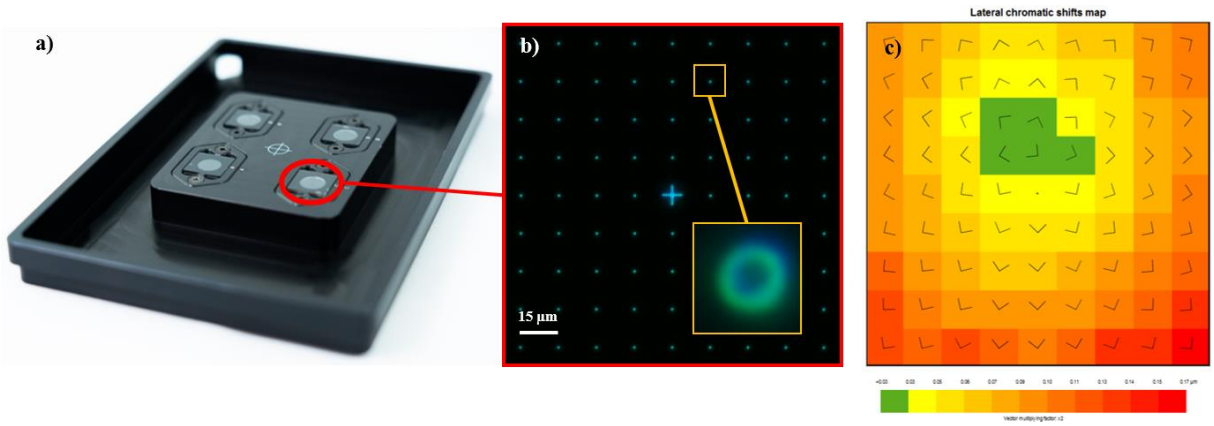

Figure 1: Picture of the new quality control plate (a), composed of glass containing fluorescent patterns (b), from which it is possible to extract, for example, chromatic shift measurement between different channels (c).

In this work, we present a new device (Fig. 1-a) containing long-term fluorescent patterns with sub-micrometer sizes in 2D and 3D inside glass (Fig. 1-b), on a carrier featuring a 96 well-plate. Based on images of these "ground truth" patterns and on dedicated image analysis algorithms, it is possible to measure the bias introduced by the imaging system, take it into account and eventually correct it. An example is provided regarding the measurement of the chromatic shifts between two channels (Fig. 1-c), important for co-localization studies.

[1] ISO 21073-2019, "Optical data of fluorescence confocal microscopes for biological imaging" (2019).