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# Trans-impedance Amplifier for ECL Analyzer

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## Abstract

Since routine ECL analyses are characterized by registration of a weak light during electrolysis of a sample solution, photomultiplier tubes (PMT) frequently are used as a detector in ECL analyzers. For carrying out electrochemiluminescent analysis, a combination of luminescent and electrochemical devices is required. Various electrochemical potentiostats support a data collection in an additional channel thus an attractive opportunity is to use their combination with PMT as a base for ECL analyzer.

The common technical problem of a direct connection of PMT to a data acquisition system is a general problem well known as data integrity. As PMT has a current signal at the output so the current-to-voltage transformation is required. After this conversion, the output signal should match to input characteristics of the data acquisition system.

In this work, the requirements to signal processing which satisfy signal integrity requirements have been analyzed. According to managed recommendations for data processing, the apparatus "Spark" is designed for integration a photodetector with a current output and a potentiostat.

"Spark" includes the current-to-voltage converter, the output filter, and the high voltage source, that are sufficient to combine a photomultiplier tube with a different analytical instrumentation. The signal integrity in the developed apparatus that couples PMT and an external data acquisition device is provided by 2nd order Butterworth low pass filter. The choice of the latter is due to the flat frequency response in the passband. The filter parameters were calculated accordingly with the analog-to-digital converter resolution and the data sampling rate in the potentiostat.

Use of apparatus "Spark" with electrochemical station CHI 800C CH Instrument and photomultiplier tube CR-105 by Hamamatsu Photonics is shown by over an electrochemiluminescent assay of the test solution.

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