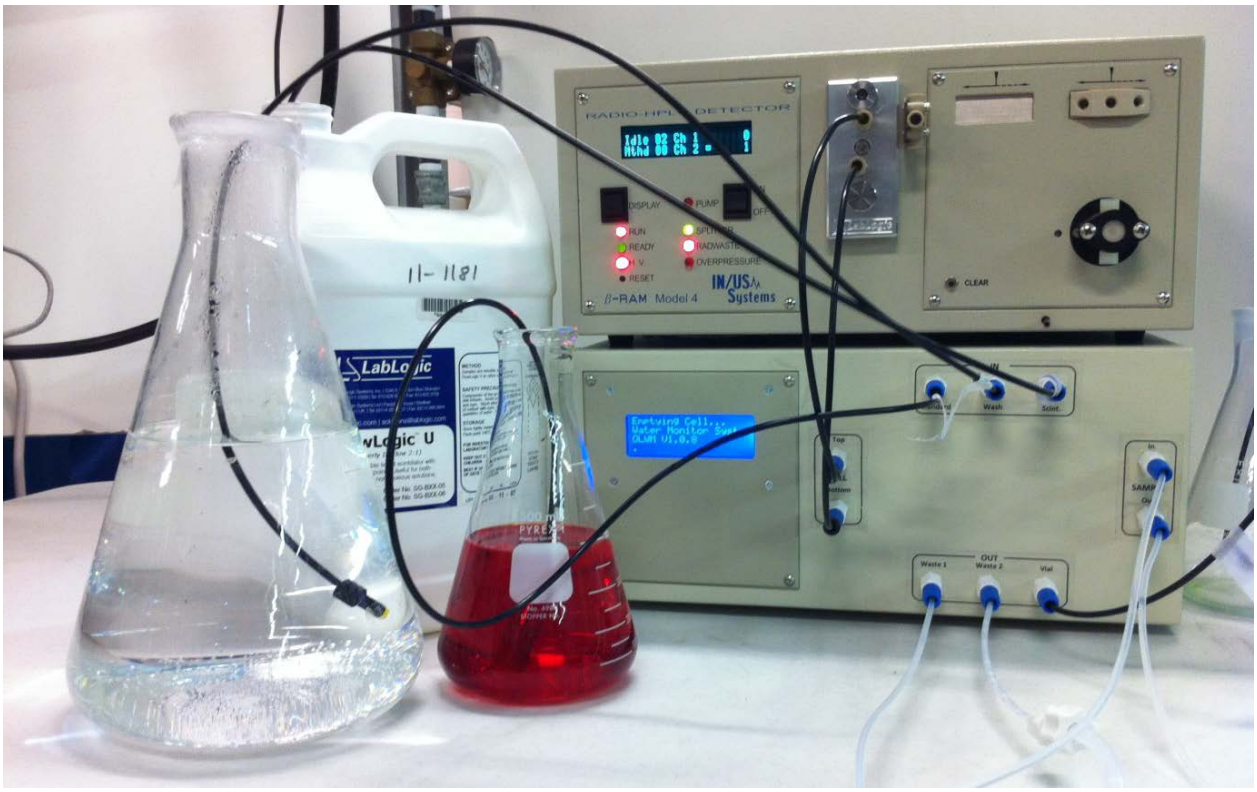
Introducing **WILMA**, a newly developed on-line water monitoring system for detection of low-level beta radioisotopes in water...



LabLogic's on-line water monitor system consists of a liquid handling module (Walter), a coincidence LSC-based detector module with liquid flow cell (B-RAM), an integral multi-channel analyser (MCA) and a control and data acquisition software system (Wilma).

Introduction

The on-line water monitor (WILMA) from LabLogic was purposely designed for real time low-level detection of tritium and other beta isotopes in water. Wilma can be used in industrial environments such as nuclear power plants for monitoring changes in tritium levels found in cooling water; for homeland security applications, such as on-line monitoring of radioisotope contamination in drinking water; and for other custom applications.

WILMA has been developed to meet the targets and detection level requirements published by the EPA and NRC. For example, the EPA has established a dose-based drinking water standard of 4mrem per year, which translates to a set maximum contaminant level of 20,000pCi/L for tritium. The NRC annual offsite dose objective is 3 rmem. Nuclear power plants cannot exceed half of this radiation dose level in a calendar quarter. Although the exact criteria for meeting these standards and calculating the detection level requirements for any specific application differ among potential users, our aim was to easily exceed most requirements within a one-hour counting cycle. This includes reaching desired detection levels for tritium (^{3}H) to meet USA and European drinking water guidelines; 740Bq/L and 100Bq/L respectively, in a reasonable amount of time.

WILMA is basically a system which collects water samples from either an on-line source or reservoir and mixes the sample with liquid scintillator (LS cocktail) for measurement of beta isotopes in a flow cell. The samples are counted for a predetermined amount of time in the detector module during which an MCA spectrum is produced. Once the counting cycle is completed, the sample solution (water + cocktail) is sent to a waste container or can be diverted to a collection flask based on a pre-set threshold for further analysis. The counting cell is then cleaned and the whole process repeats.

WILMA's design allows the system to run unattended for a period of about 30 days. Once the desired detection levels and resulting counting cycles are determined for a given installation, the necessary amount of consumables (liquid scintillator and wash solution) can be determined so that the system can run continuously and unattended for several weeks or even months.

WILMA's Software

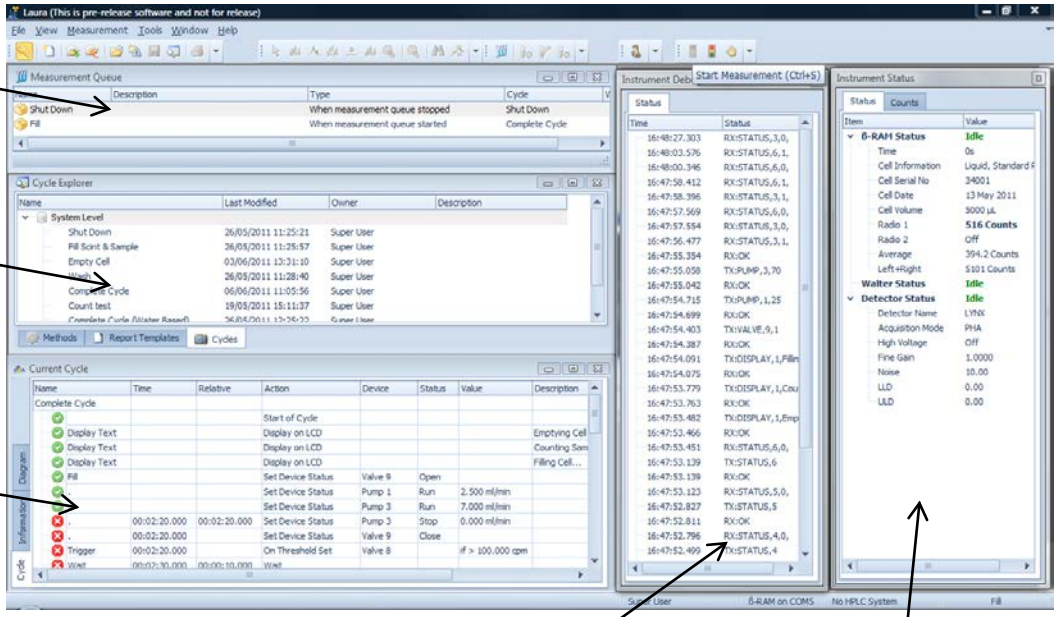
The software for the on-line water monitor (also known as WILMA) has been specifically developed so that the system can be used by a technician and left unattended over several weeks. All of the system's parameters for collecting, sampling and flushing a sample are based on pre-defined methods and each counting cycle has a corresponding data file which is saved and can be later retrieved for analysis. The methods can be easily altered to suit different installation types, unique user requirements, as well as desired detection levels (based on counting times).

Software Main Screen: The screen shot below shows the main elements of the software. Each window can be selected to be either viewed or minimized and can be resized according to user's preferences.

Measurement Queue Window – lists the different cycles that have been set up to run.

Cycle Explorer Window – lists all cycles created (also has access to methods and report formats) which can be edited from here.

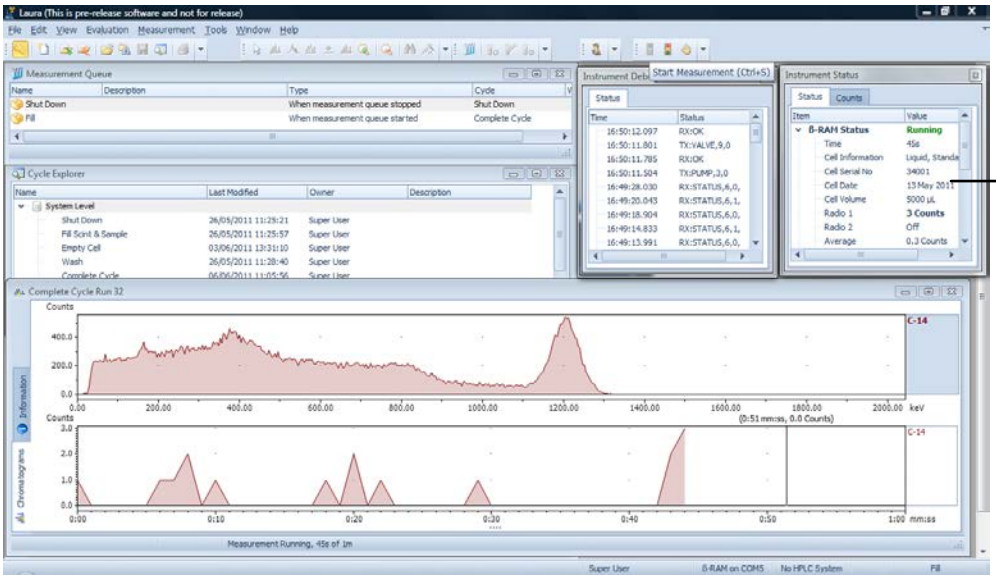
Counting Cycle Window - Shows the current step in the counting cycle and each control line in the current method.



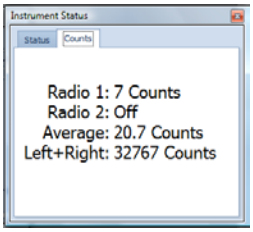
Debug Window - shows commands being transferred between modules and data received.

Instrument Status – displays key information from the liquid handling module, detector module, and MCA.

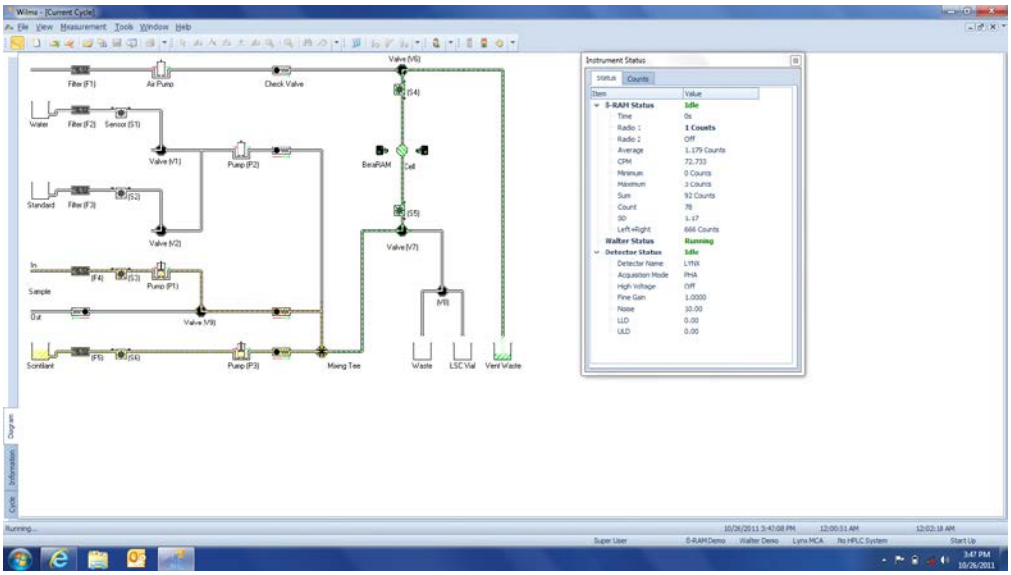
During a counting cycle, the following window below opens showing the obtained spectrum from the MCA, counts over the determined counting period and instrument status.

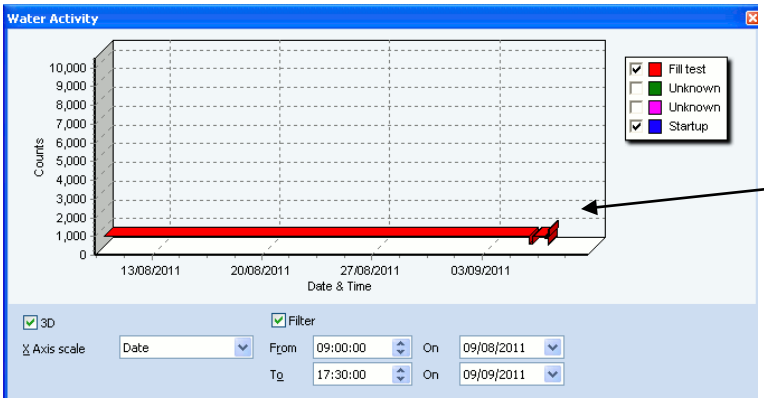


Instrument status window can also be changed to show the average counts



The current Cycle window can be switched from the list view to a diagram view which shows component animation and liquid flow paths…

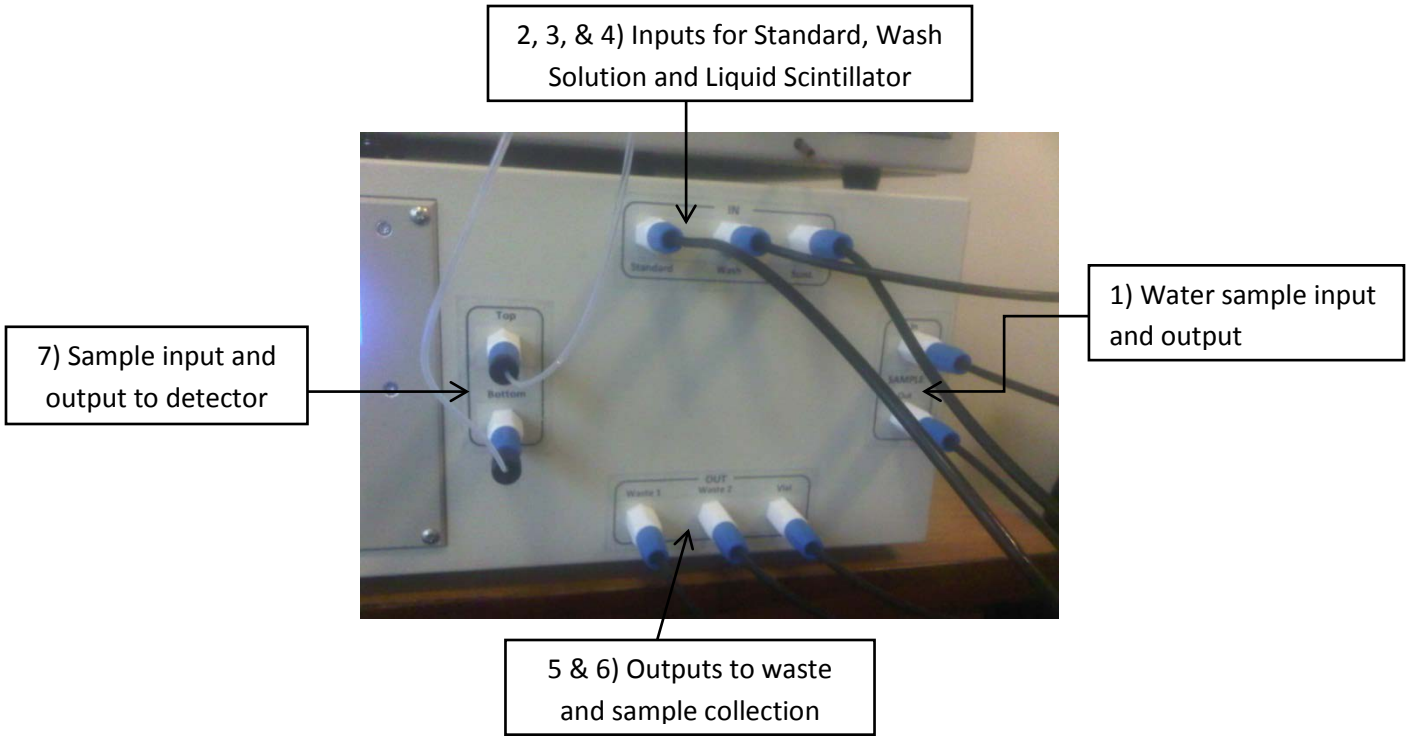




Analysis of individual data files as well as count rates over a specified period of time can be easily graphed for detailed analyses.

WILMA's Liquid Handling Module (Walter)

Walter includes connections for 1) water sample input and output; 2) input for either a discrete sample or standard; 3) input for wash solution; 4) input for liquid scintillator; 5) two waste lines; 6) sample collection line; and 7) sample input and output to the flow cell in the detector module.



WILMA's Detector Module

Wilma's detector module is based on LabLogic's (formerly IN/US Systems) industry standard radio-HPLC detector, the B-RAM, which has been in production for over 20 years. It is commonly found in pharmaceutical and academic research labs.

The detector module uses two photo multiplier tubes (PMT) in coincidence mode and the flow cell has been re-designed to accommodate up to 5mL of sample; of which 50% is normally water and 50% is liquid scintillator (cocktail).

LabLogic Systems, Inc. • 1040 East Brandon Blvd., Brandon, FL 33511-5509 • USA

Telephone 1-813-626-6848 • Toll Free 1-800-875-4687 • Fax 1-813-620-3708

E-mail: sales@lablogic.com • www.lablogic.com