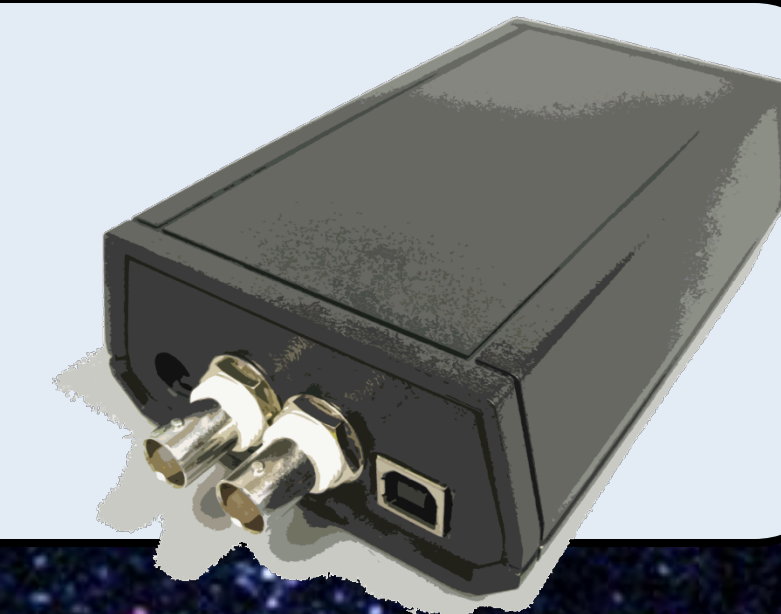


Building a Low-Cost Multichannel Analyzer

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NASA Goddard Space Flight Center



Purpose

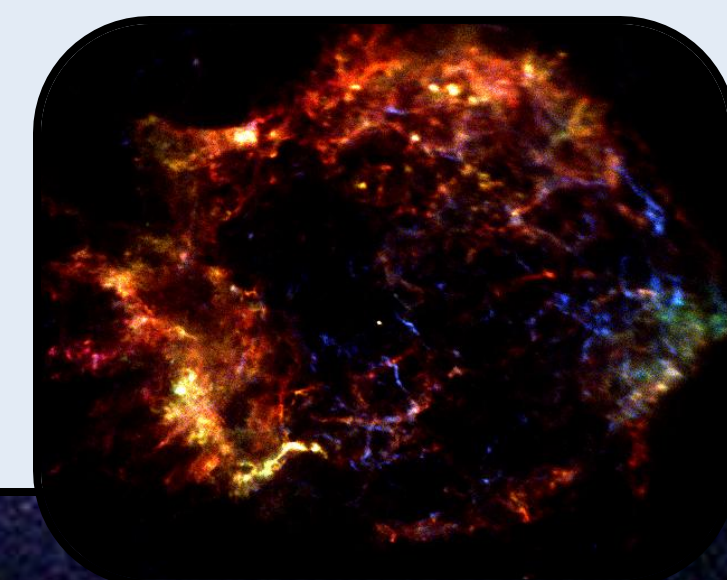
- Current commercial MCAs cost thousands of dollars; NASA scientists wanted a low-cost alternative that they could mass produce for smaller experiments.

Specifications

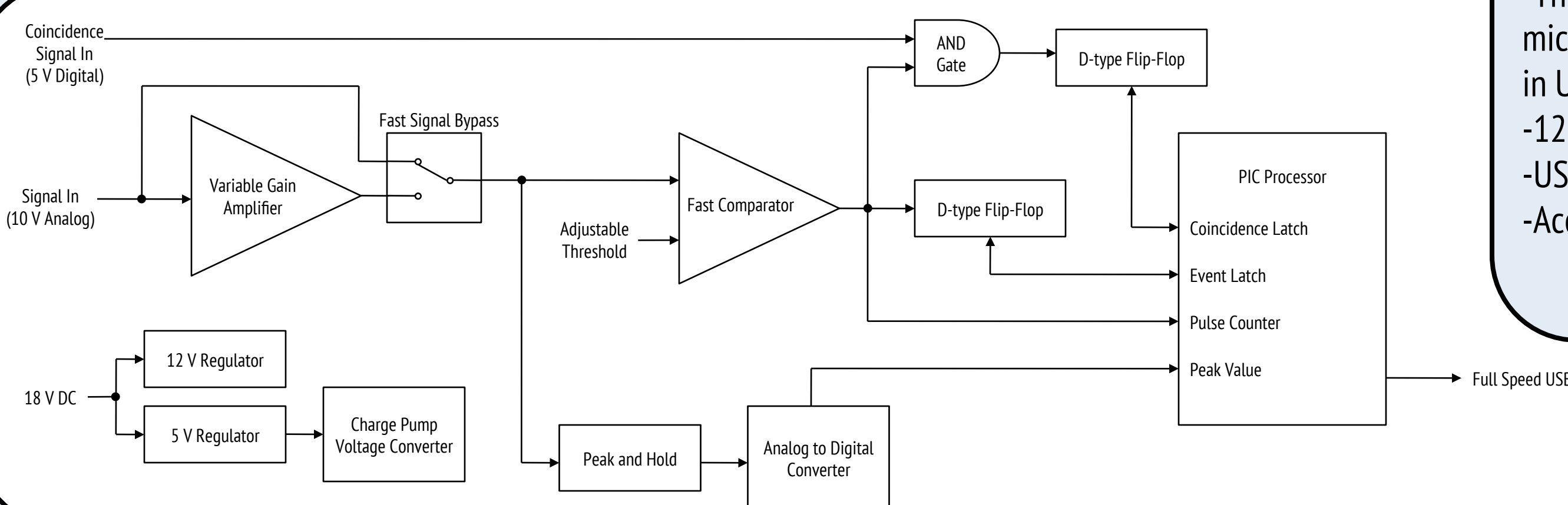
- Be able to measure pulses 100 ns to 100 μ s long
- Handle >100,000 counts per second
- Create histogram of pulse heights
- Print results to an ASCII file and display results on a GUI
- Total component cost under \$25

What is an MCA?

- A multichannel analyzer, or MCA, is a device that counts the number of pulses in specified amplitude ranges.
- For most detectors, these pulses are proportional to the energy of the particle being measured.
- They are useful in a wide array of applications including:
 - Radiation detection
 - X-ray spectroscopy
 - Non-destructive testing
 - Environmental analysis



Hardware Diagram

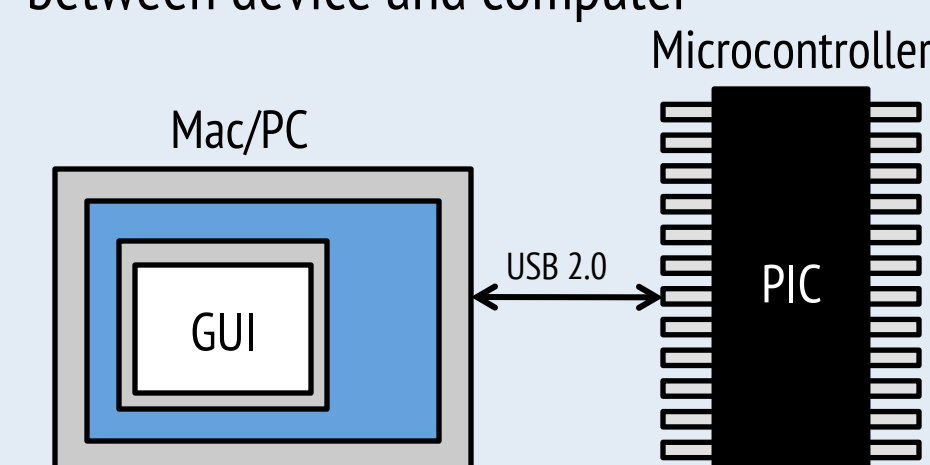


PIC Processor

- The Olin MCA uses PIC18F2455 microcontroller for its low cost and built-in USB functionality
- 12 Mega Instructions Per Second (MIPS)
- USB peripheral device
- Accumulates on-board histogram

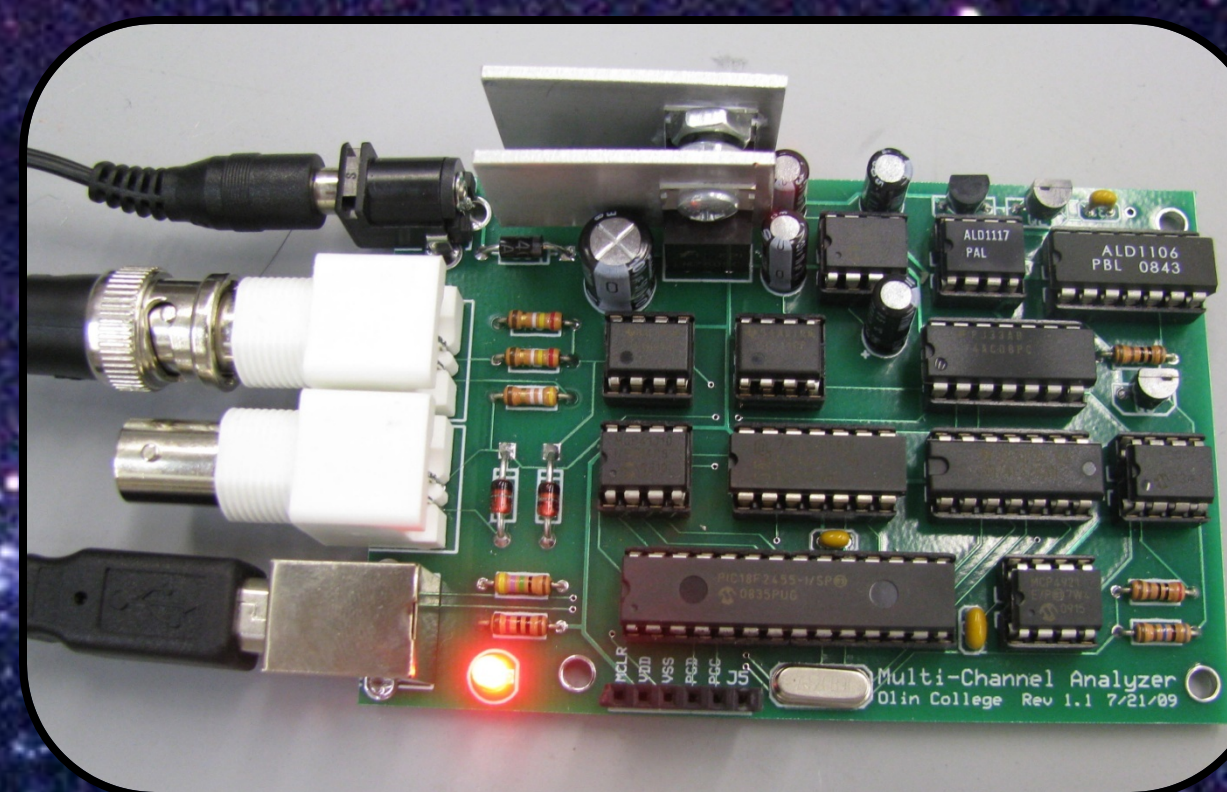
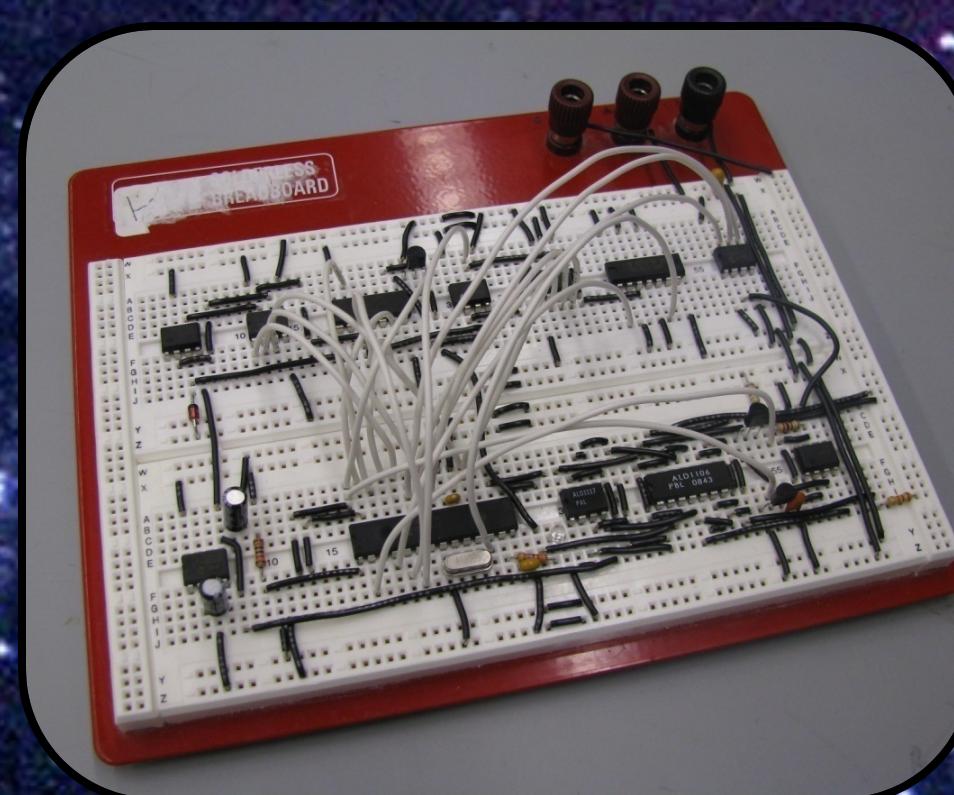
USB

- Standard protocol to communicate between device and computer



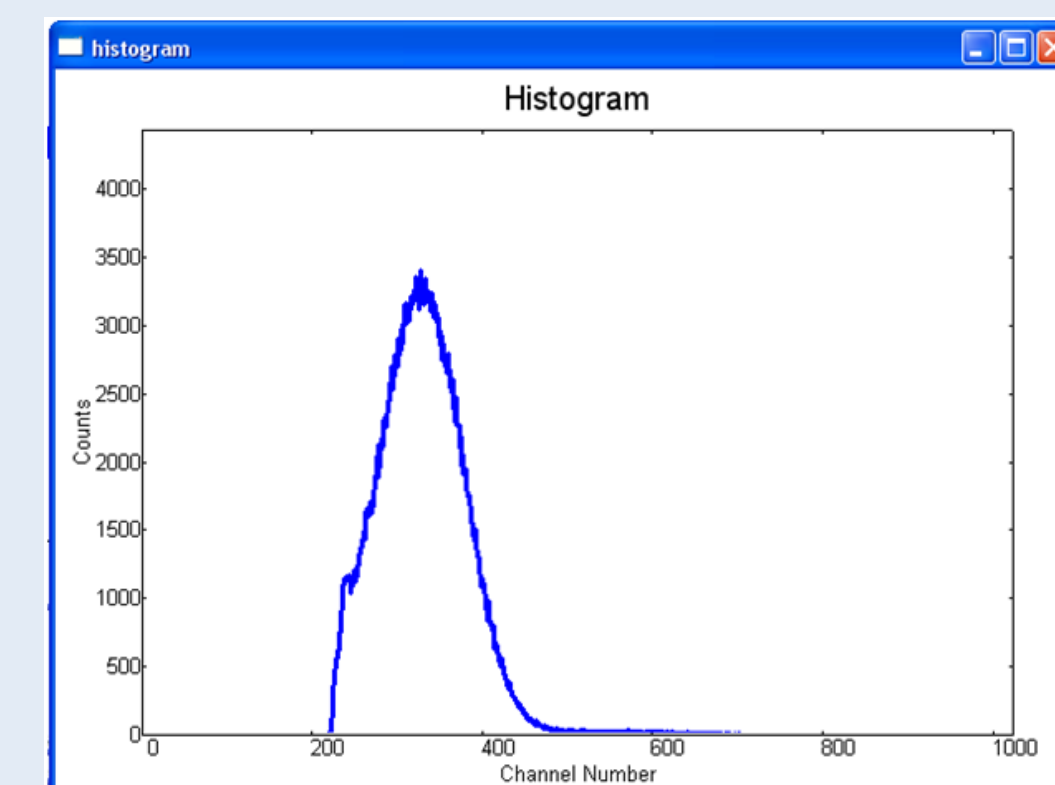
System Improvements

- Refine software
- Improve the Olin MCA to the level of a commercial, portable MCA
- Implement faster data transfer rate via double-buffering
- Measure the system's limitations



Graphical User Interface

- Multiplatform
- Control settings
- Save to ASCII option
- Decodes USB data, and updates the master histogram
- Updates the histogram and flux graphs



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