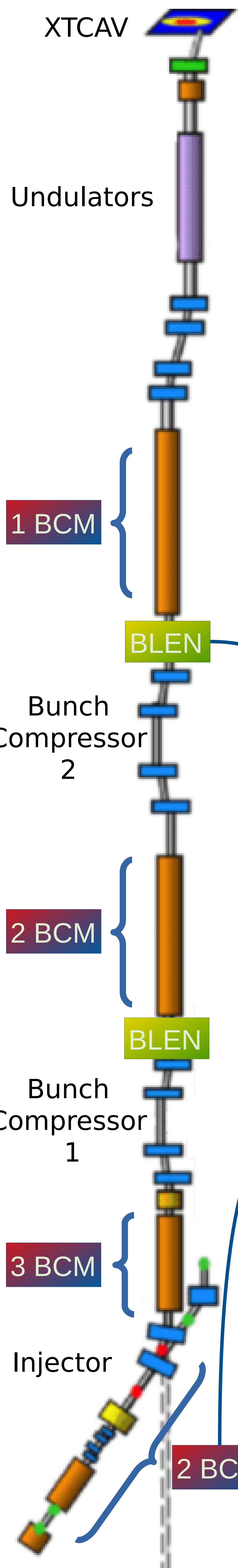


# Upgrade of the Bunch Length and Bunch Charge Control for the SLAC LCLS

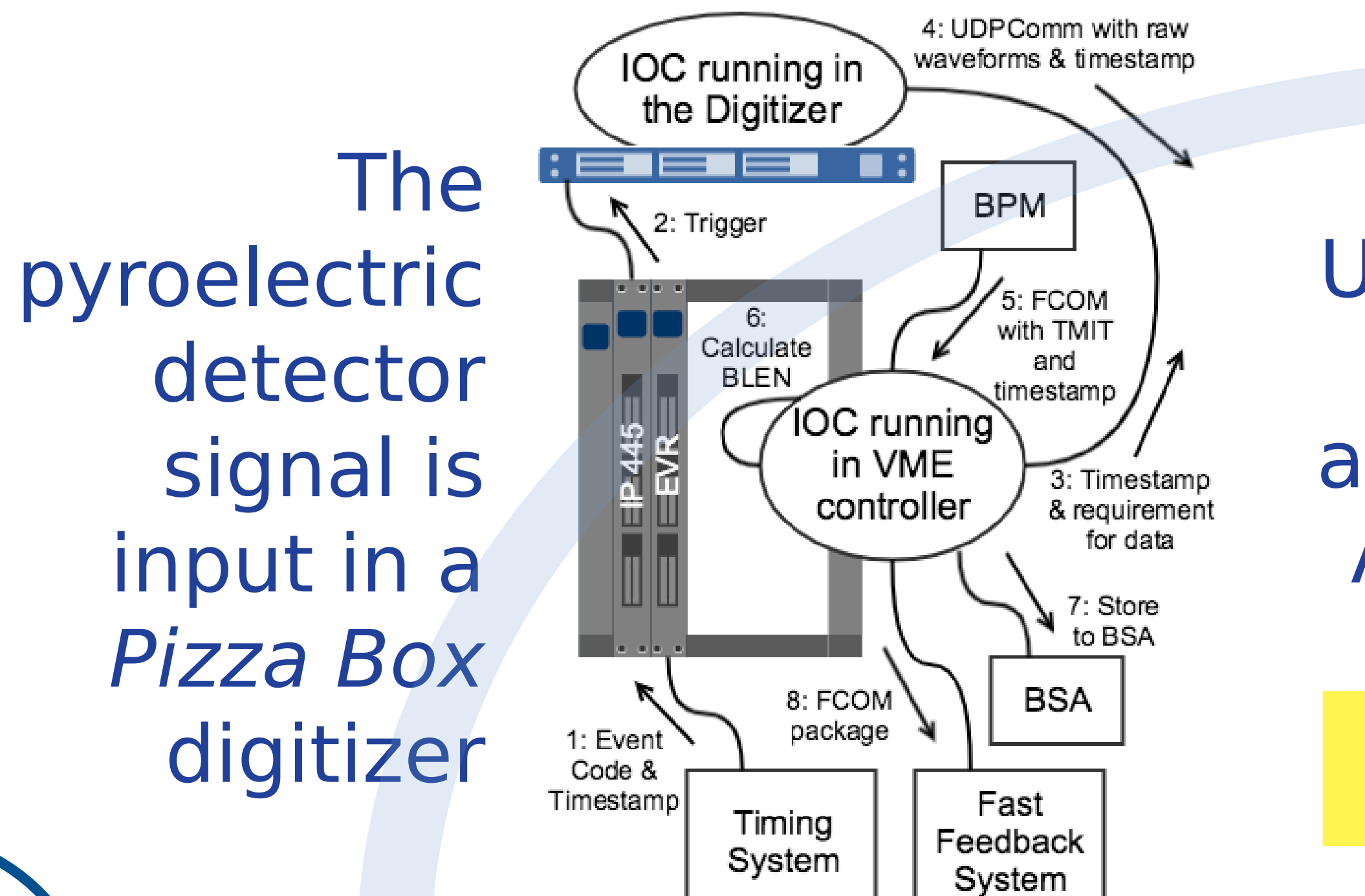
M. P. Donadio, A. S. Fisher, L. Sapozhnikov, SLAC, Menlo Park, USA

## The challenge: from 120 Hz to 1 MHz

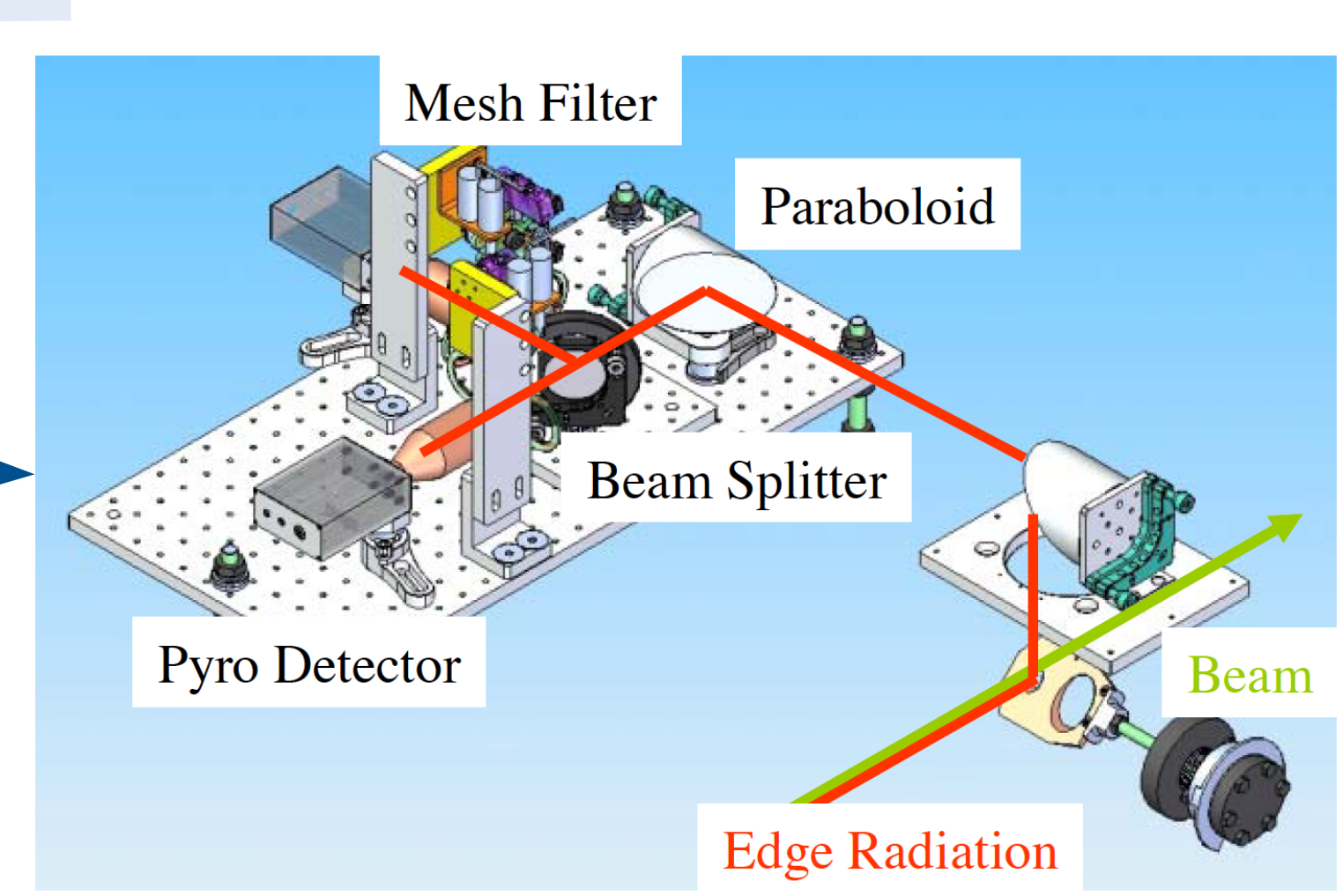
The new SLAC Superconducting Linac will operate with 1 million electron bunches per second, compared to the 120 bunches per second of the 2009 Copper Linac. Software running in VME was able to deal with 120 Hz, but a new architecture was needed to operate at 1 MHz: ATCA-based with FPGA in the carrier boards. Two components were used to test the new architecture in the Copper Linac, still at 120 Hz: the Bunch Length (BLEN) monitors based on pyroelectric detectors and the Bunch Charge Monitors (BCM) based on toroids. This upgrade is part of the Mission Readiness Program.



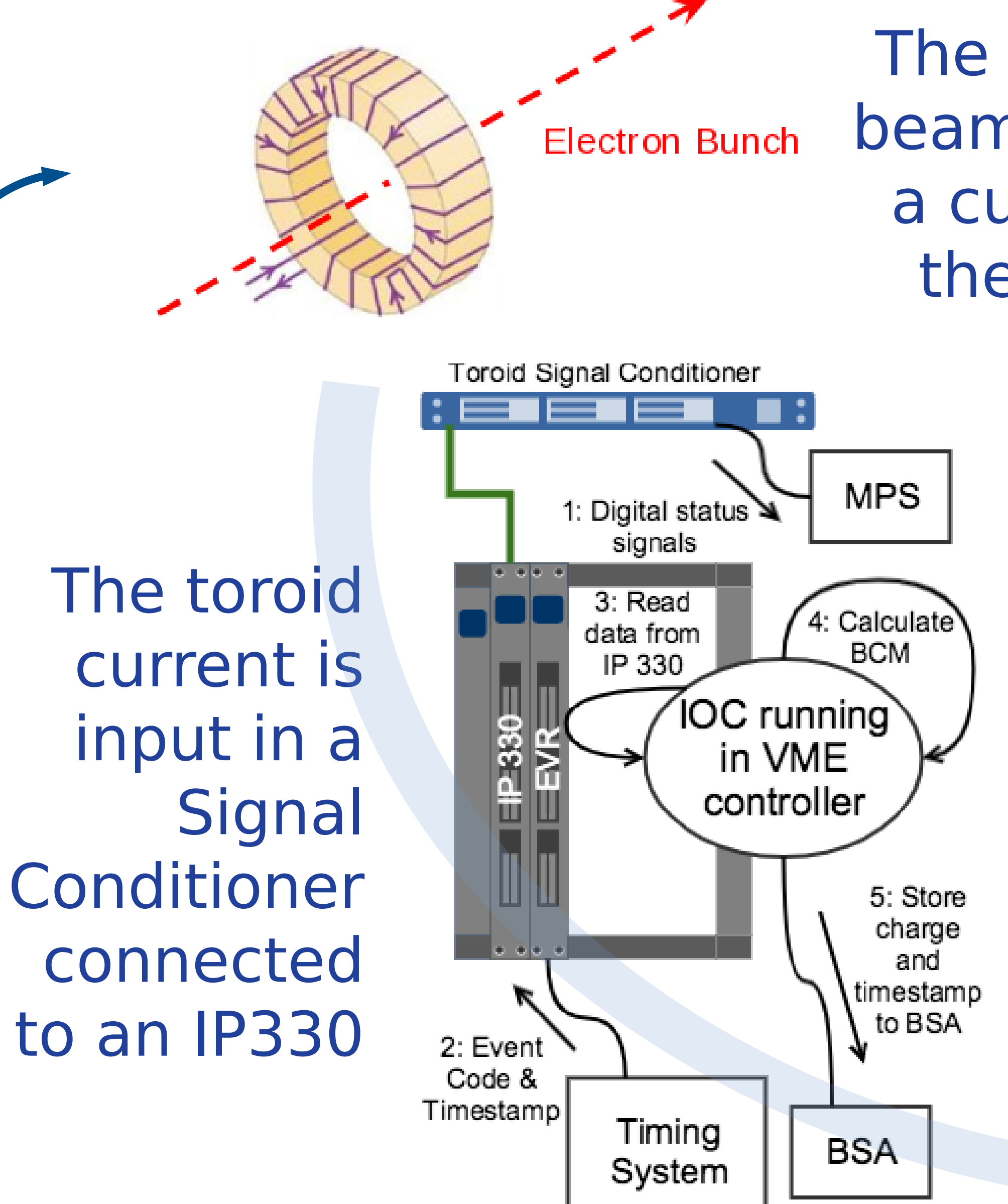
### Previous VME-based system



The pyroelectric detector signal is input in a *Pizza Box* digitizer



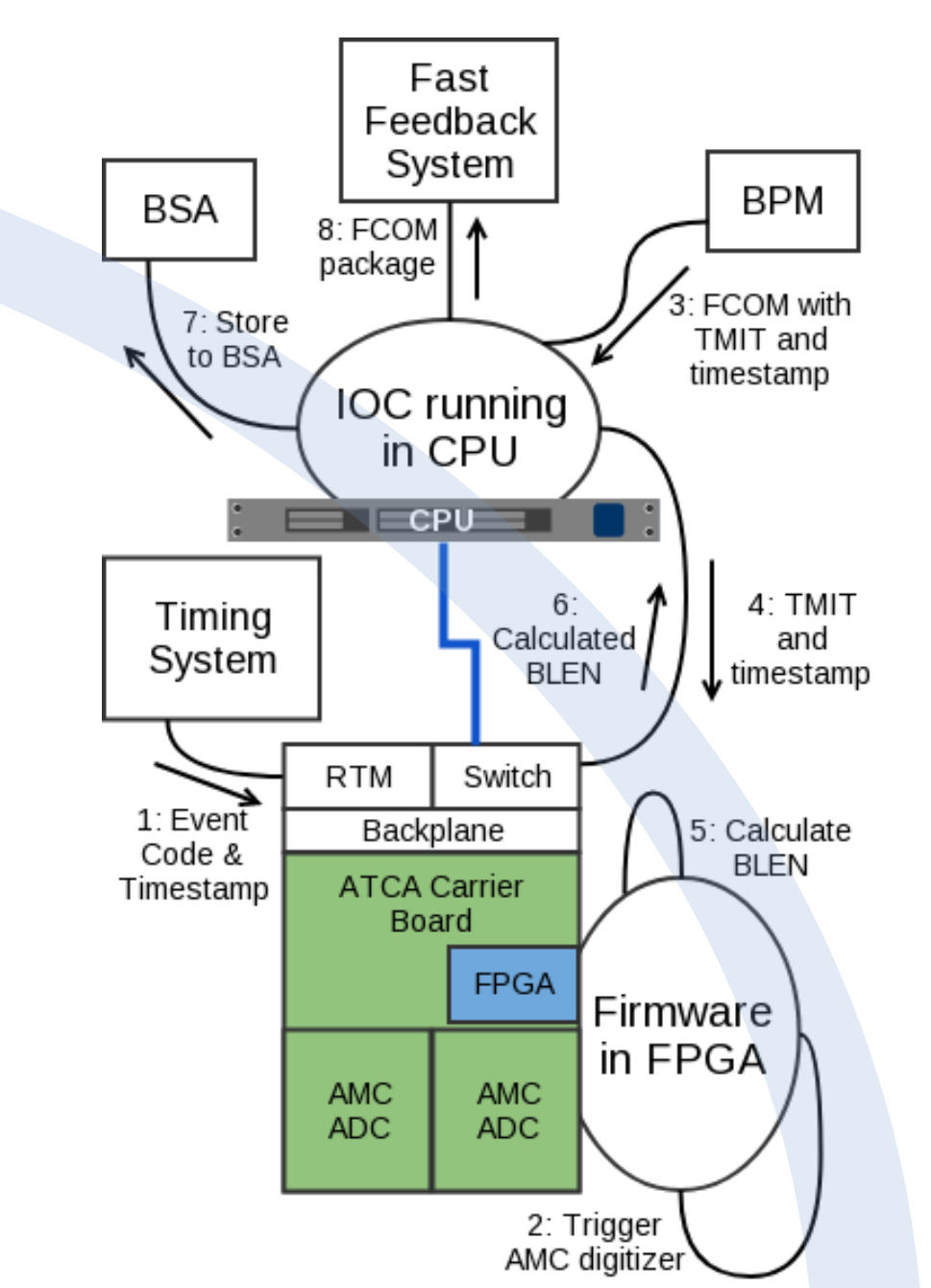
Edge radiation from the last dipole of the BC is measured by pyroelectric detectors



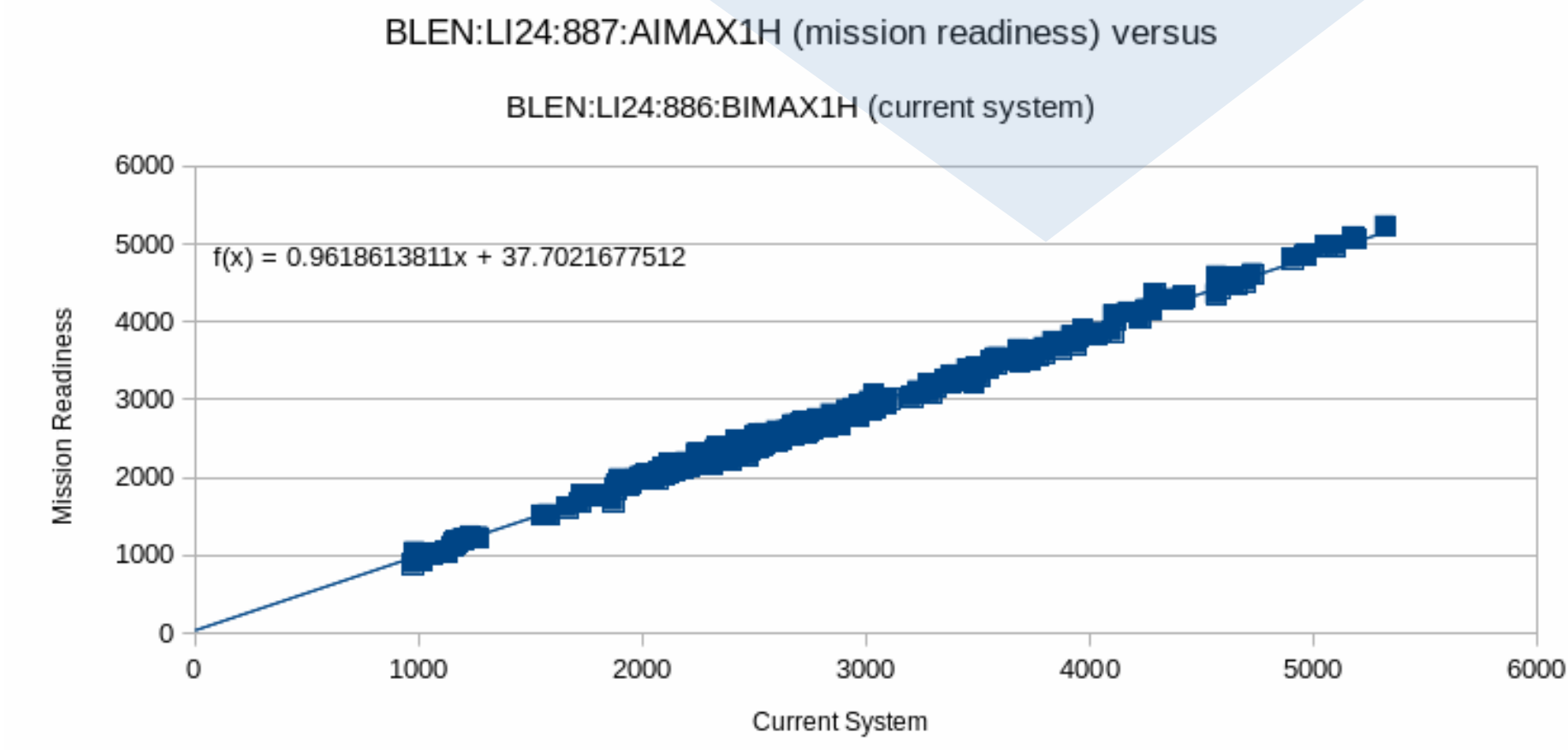
The toroid current is input in a Signal Conditioner connected to an IP330

The electron beam induces a current in the toroid

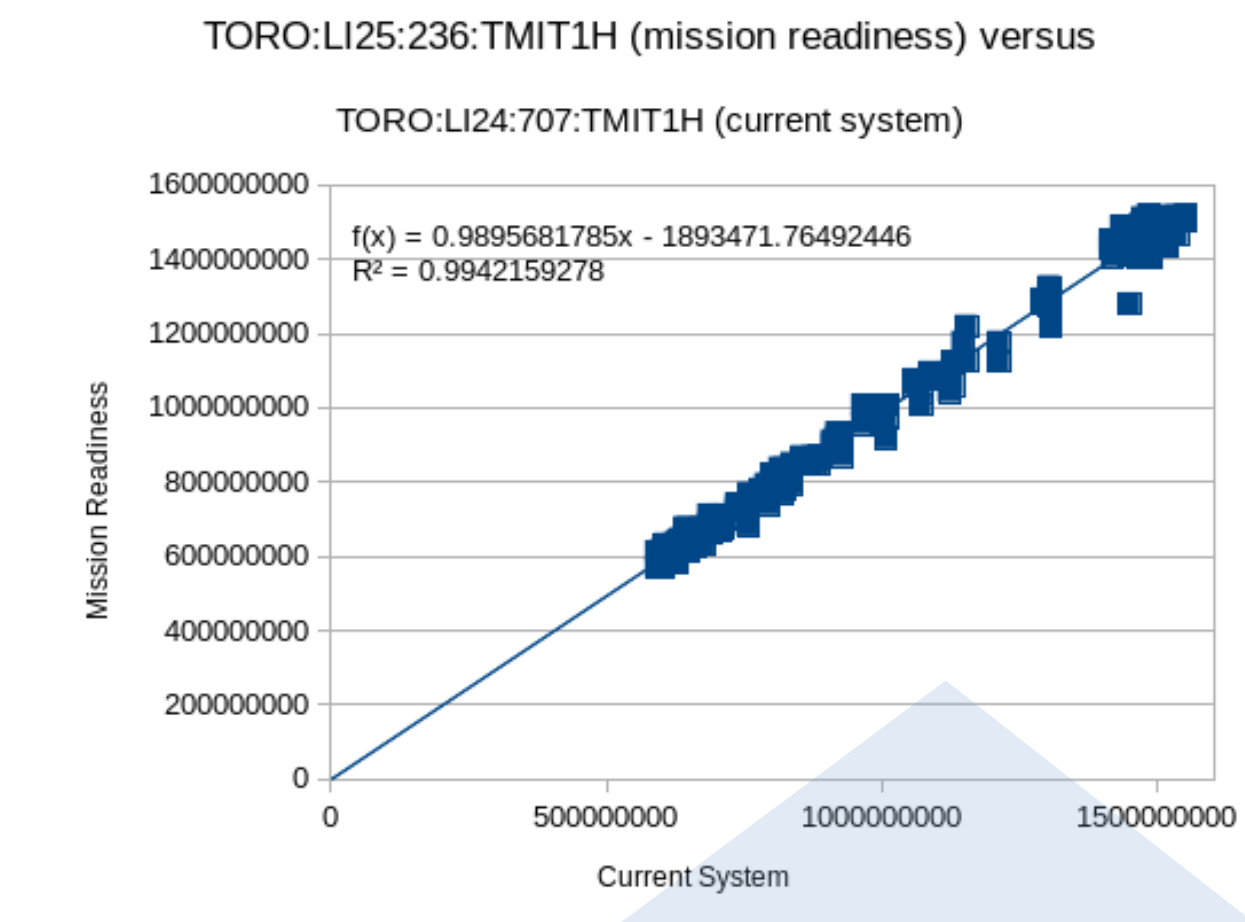
### New ATCA-based system



The pyroelectric detector signal is input in an AMC card in the ATCA



Successful results: correlation 1 between the VME-based calculation and the ATCA-based calculation for BLEN and BCM



The toroid current is input in a Signal Conditioner connected to an ATCA AMC card

### Previous VME-based system

### New ATCA-based system