

uSOP: an embedded Linux board for the Belle2 detector controls

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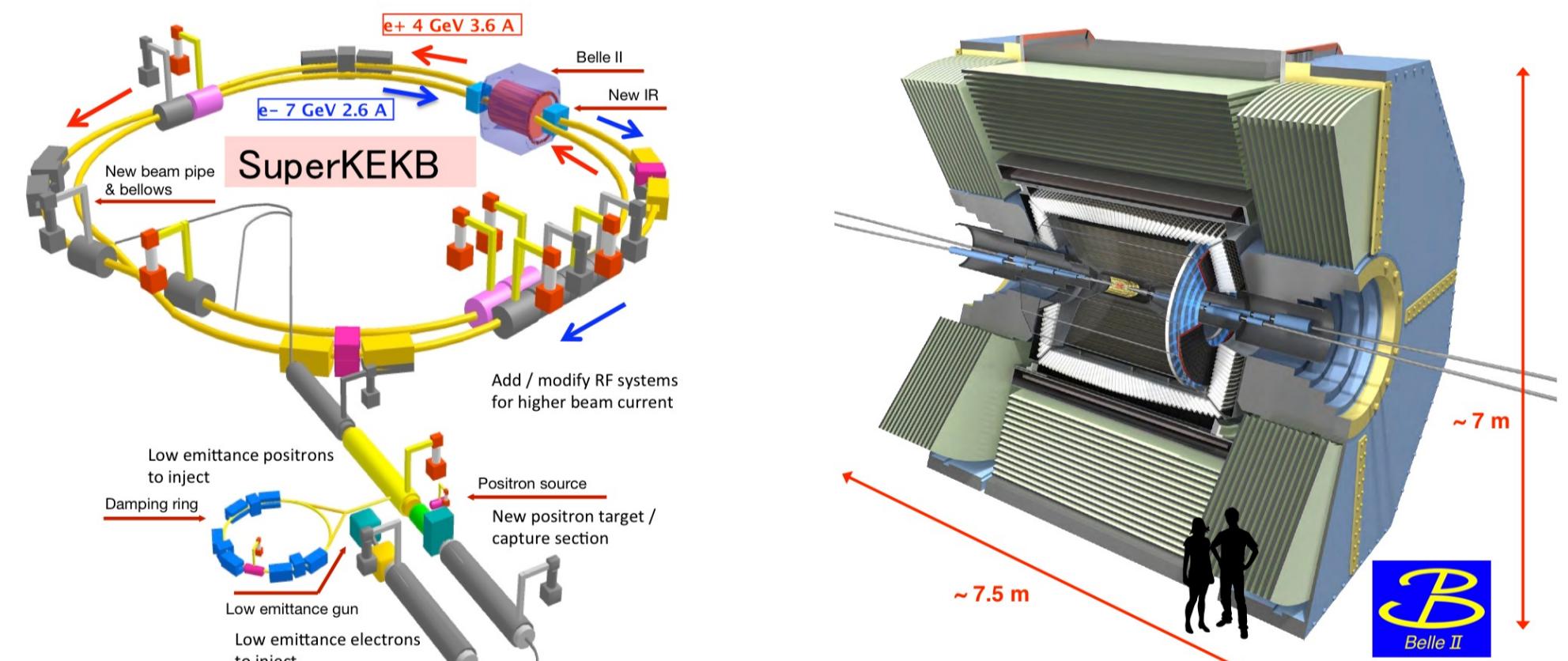
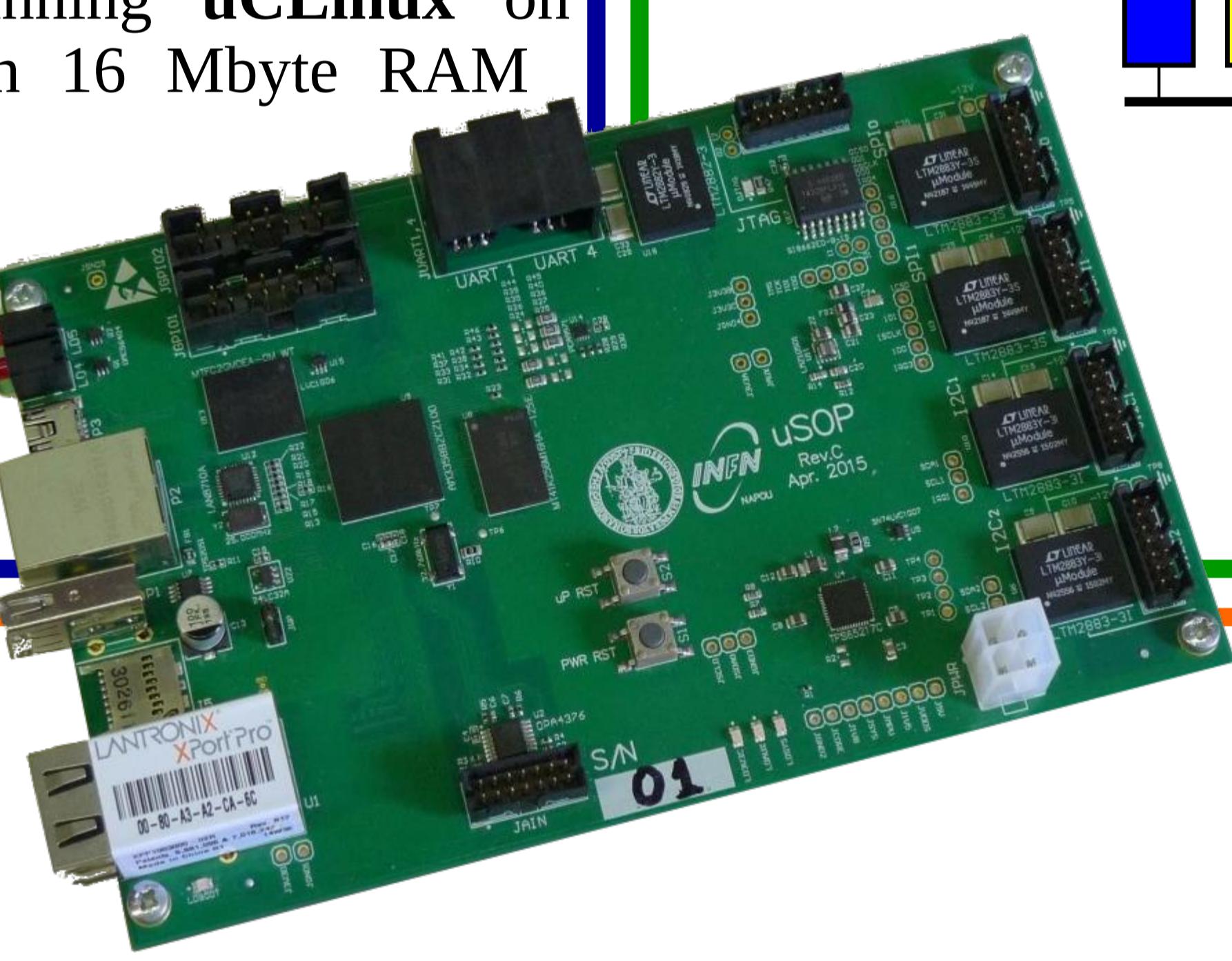
Hardware

uSOP board is a Single-Board Computer (SBC) derived from **BeagleBone Black** Open-source Hardware project.



- TI Sitara AM335x Cortex A8 @ 1 GHz
- Programmable Real Time Units (PRU) (2)
- 4 Gbyte eMMC
- 512 Mbyte RAM
- RS-232 (2) / JTAG (1) / I2C (2) / SPI (1) available on connectors through galvanic isolator modules
- 12-bit ADC (4)
- 16 GPIO on expansion connectors
- USB host (1) / USB device (1)
- Fast Ethernet 10/100 Mbps (1)
- uSD slot for external storage
- 3U Eurocard form factor
- DC Vin 5V

Remote management of board (power on/off, console, boot selection) by a dedicated out-of-band connection with **Lantronix XPort Pro** module running **uClinux** on Freescale Coldfire @160 Mhz with 16 Mbyte RAM and 16 Mbyte flash



Temperature and relative humidity in the two **BelleII ECL endcaps** are monitored by a **uSOP-based network**. Each endcap is read out by four uSOP boards placed in a 19-inches 6U crate. Each uSOP unit is hosted in a 6U carrier box with **ADC unit** for readout of **thermistors and humidity probe** readout.

A specialized **EPICS IOC** has been developed to interface uSOP with LTC2983 ADC through SPI bus. Each temperature and humidity value is published on BelleII EPICS network and stored in an **EPICS Archiver**.

Control System Studio (CSS) is the visualization tool selected by BelleII. ECL temperature and humidity values are monitored with various control panels.

Linux Debian has been selected as distribution for uSOP board. Sitara AM335x processor is supported by **BeagleBoard.org Foundation** that provides open-source Linux kernel drivers and patches.

Using an **image-builder** scripts set it is possible to generate (on a separate PC) a root filesystem image based on last ARM Linux kernel with a selection of packages ports. The rootfs image is suitable for **eMMC/micro-SD** installation or **network booting**.

Last **EPICS** base (R3.15.5) is selected for uSOP and EPICS IOC development can be done directly on board using C/C++, Python and related utilities.

