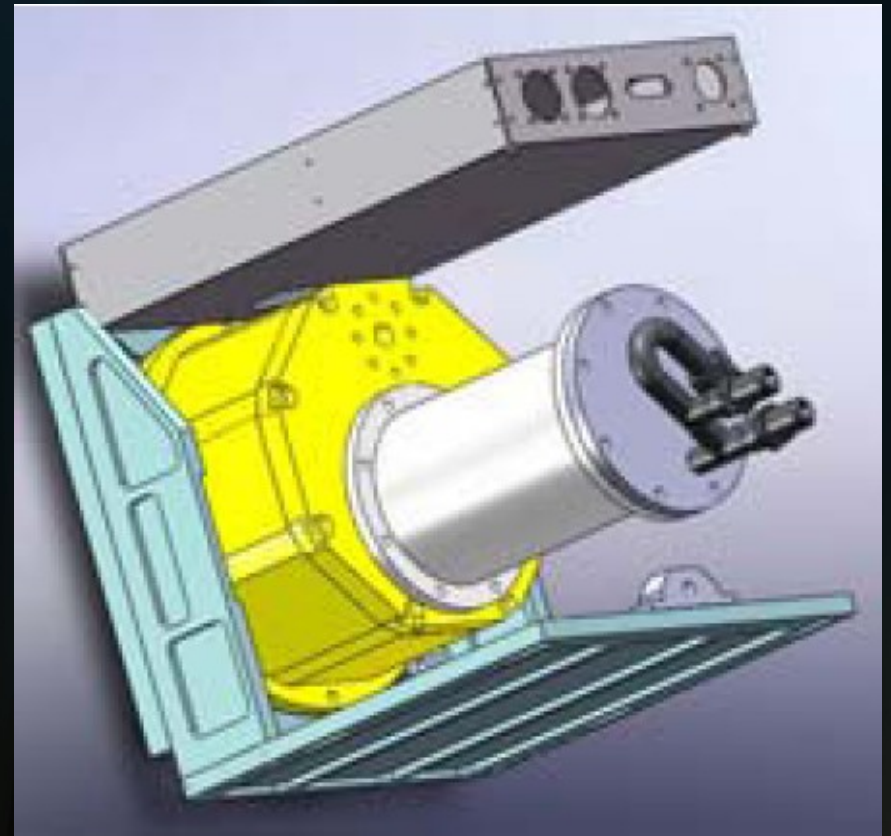# Brazilian Tunable Filter Imager

BTFI EMCCD Controller Development
Denis Andrade

BTFI / 3D-NTT Meeting
Laboratoire d'Astrophysique de Marseille
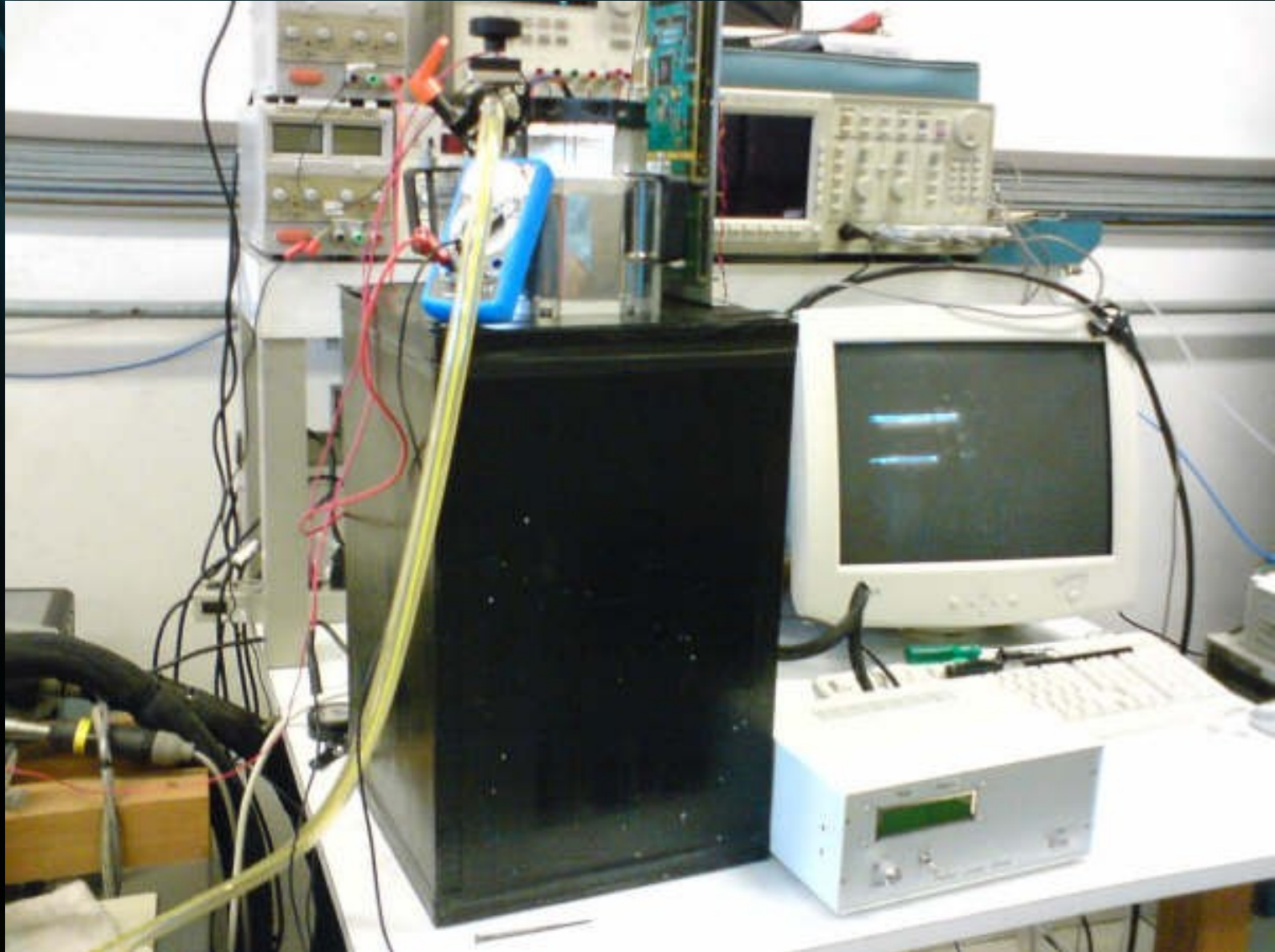03-05th October 2009

Overview

- 2 cameras with E2V EMCCD CCD207-40 (1600x1600 pixels)

- Cryotiger cooling

- CCCP v2

    - (CCD Controller for Counting Photons) from Olivier Daigle (Université de Montréal)
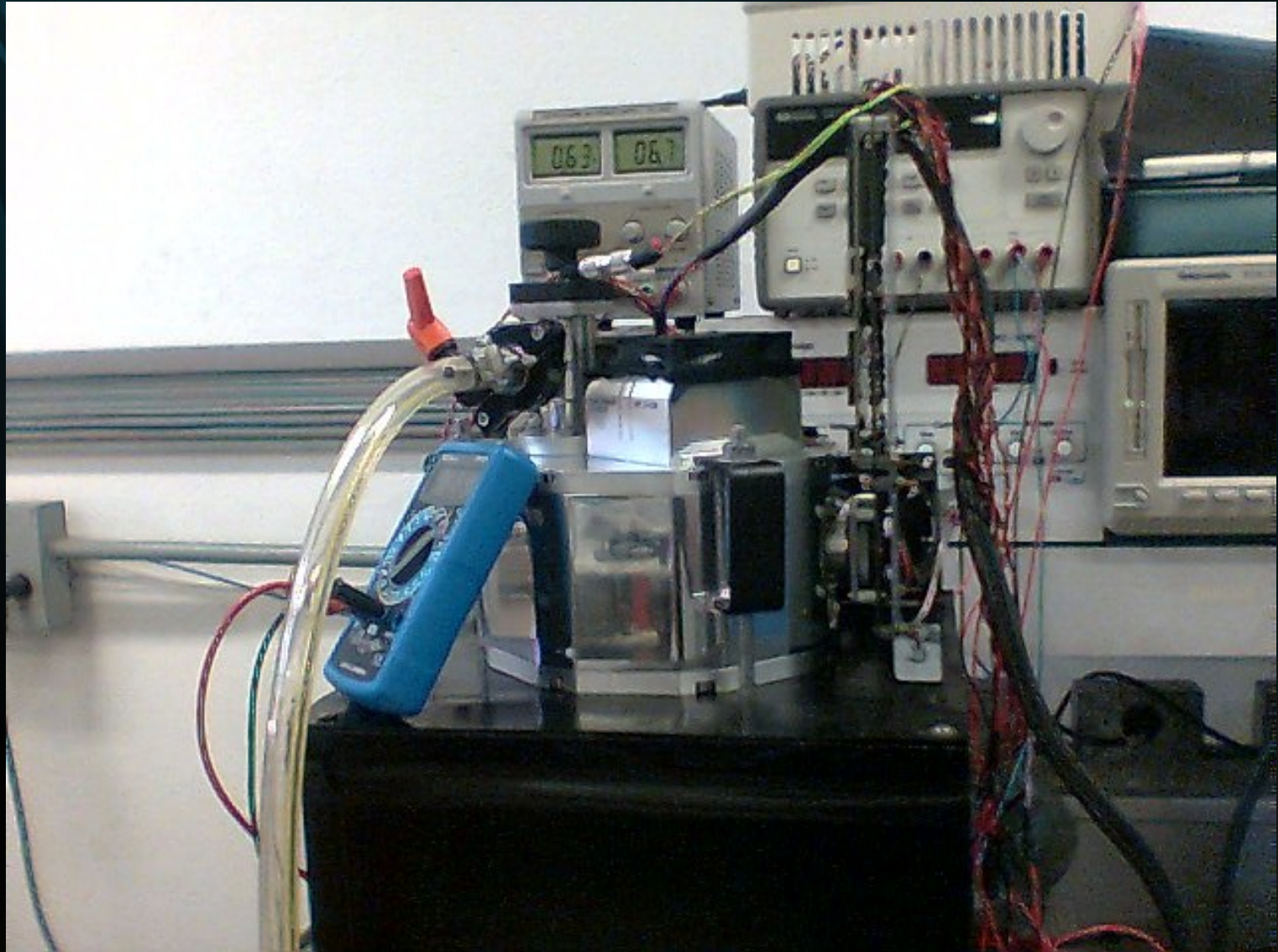
Tests in Brazil

- October at USP:
  - AstroInventions Test Dewar
  - CCCP v2 (w/CameraLink interface)
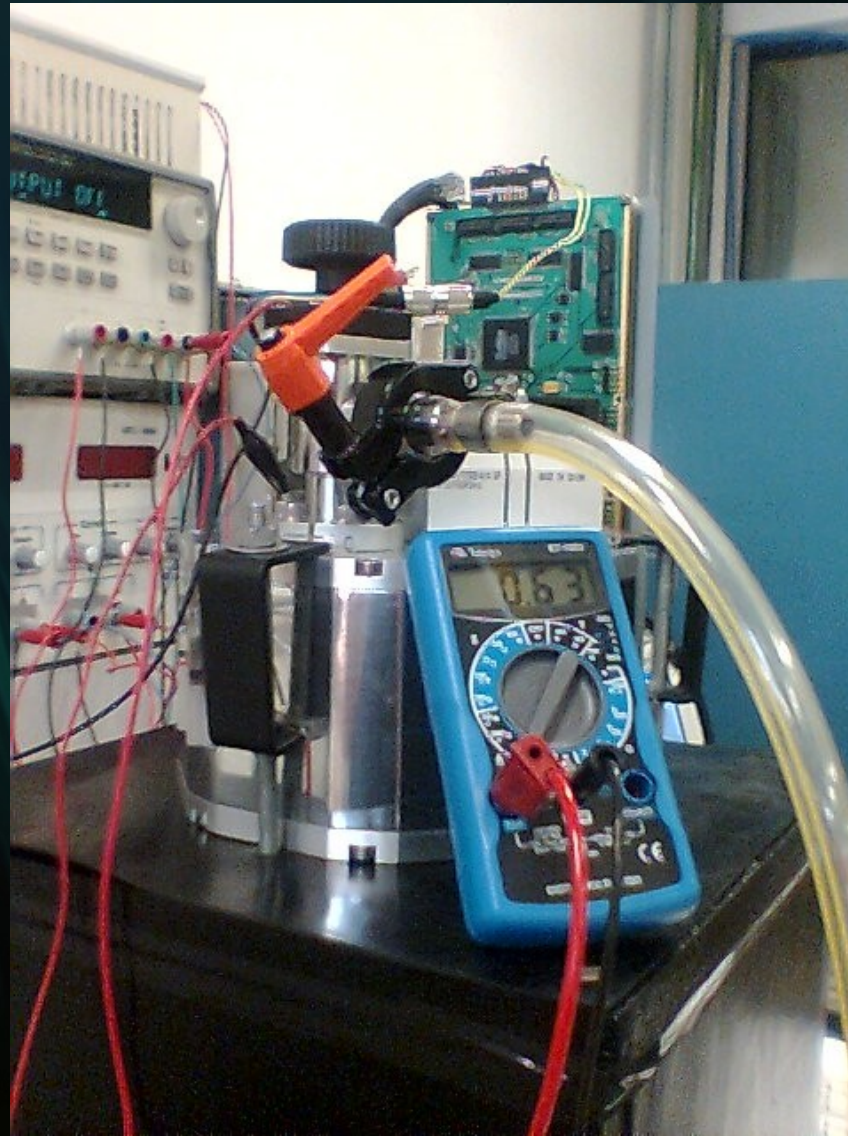 - CCD97 EMCCD (from Montreal)
  - CameraLink Frame-Grabber in PC

Test Bench

Test Bench

Test Bench

Tests in Brazil

- Steps
  - **CCCP tests to get familiar with:**
    - HV clock tests
    - Pixel output circuit (video chain)
    - Camera Link configuration
    - Lab Function Generator simulating pixel output
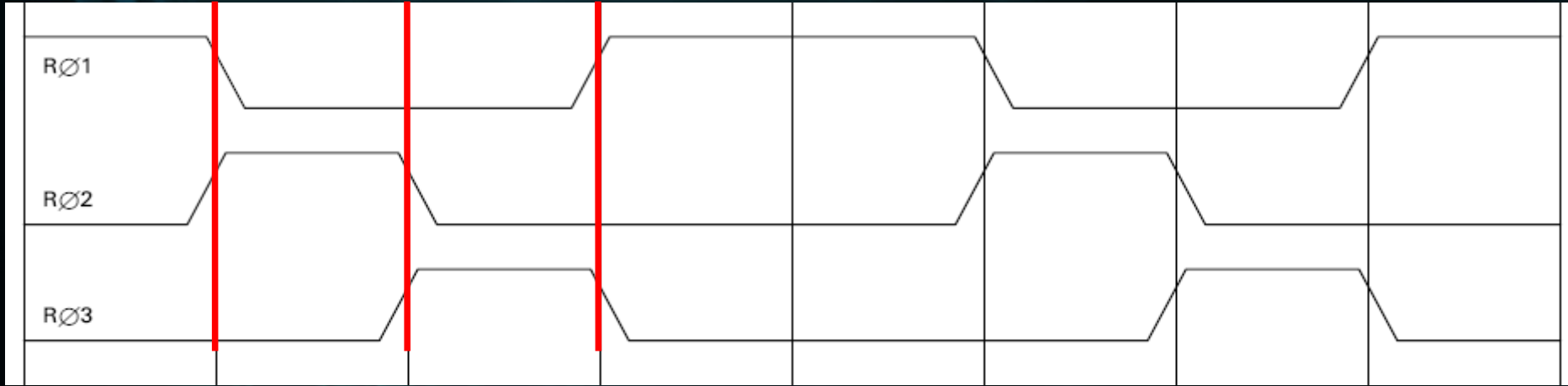   - Power supply performance (voltage drop in lines)

Tests in Brazil

- Steps
  - **CCD97 waveforms**
    - Olivier adapted CCD97 waveforms from CCCP v1 to v2
    - Analyzed an checked with CCD datasheet
    - Understand CCCP specific signals: Clocks, AFE, etc.
    - Calibrate and adjust the clocks

Tests in Brazil

Serial Clocks

Tests in Brazil

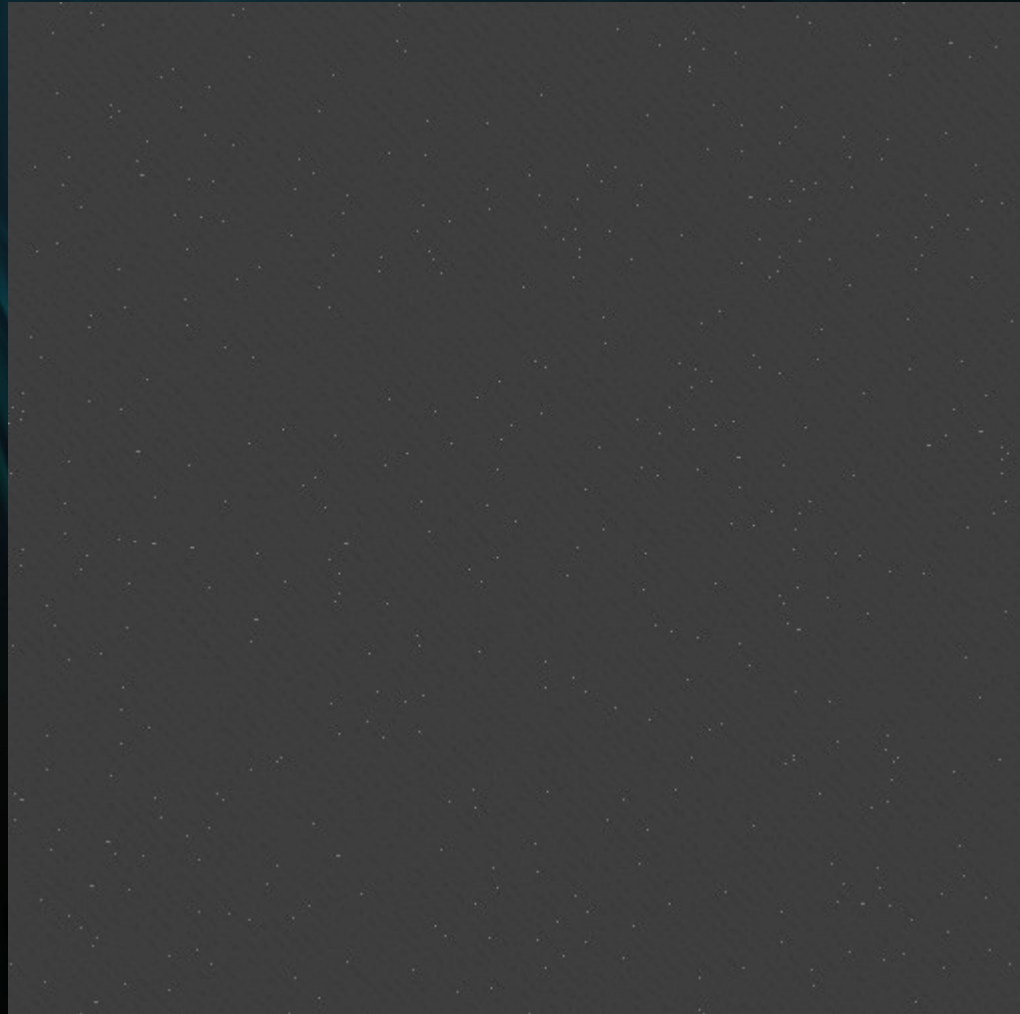- Steps
  - **Acquiring images**
    - Acquired images in different conditions
      - EM Gain
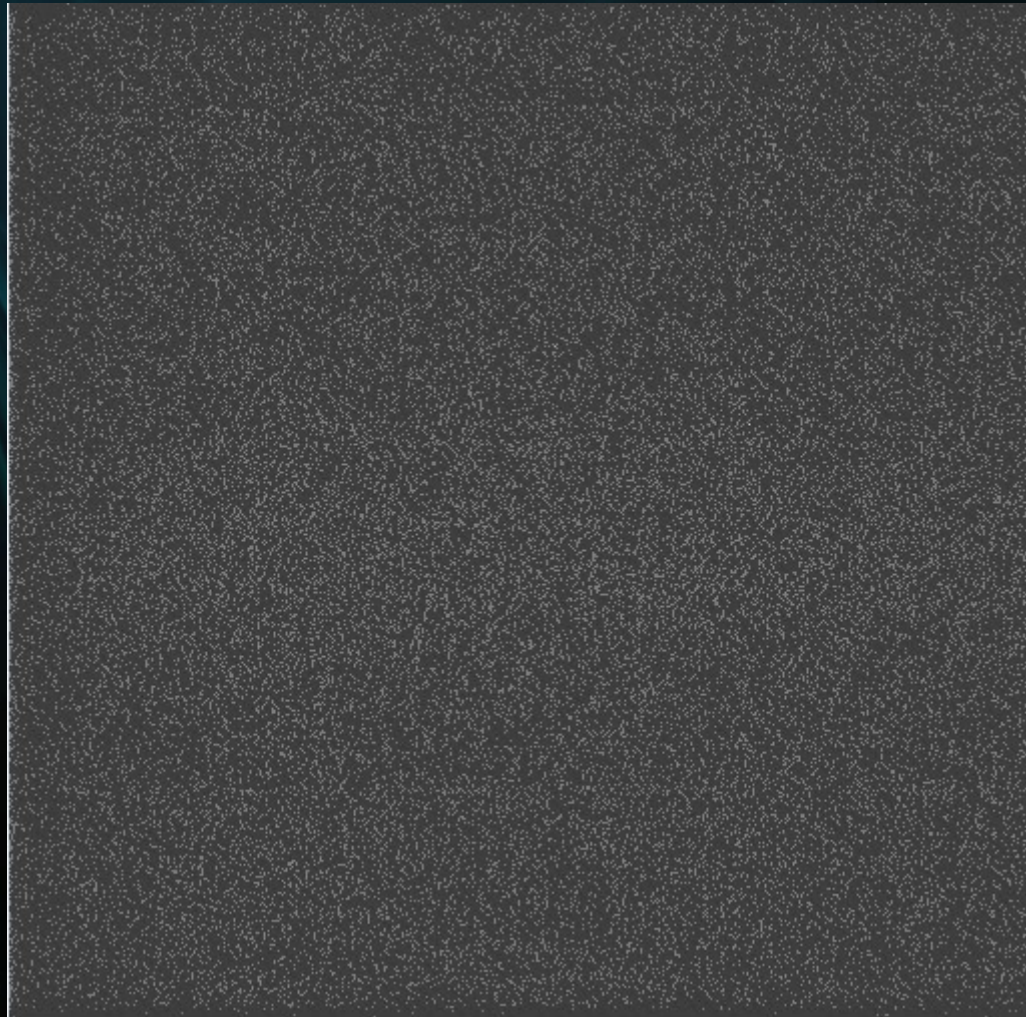   - Level of Illumination
      - Exposure Time
- First photons from CCCP v2!
  - Probably the only EMCCD working in Brazil!

No light / 275us (min) exposure time

Max light / 275us (min) exposure time

Max light / 100ms exp. time

Tests in Brazil

- Conclusions:
  - CCCP is very powerful: from a hardware and software perspective
    - HV Clock is not easy to calibrate before installing the detector
  - Need to change our power supply: use remote sensing lines to avoid voltage drop in lines (important for observatory installation)
 - CCCP will open possibilities to reach excellent results

Test Dewar Plans

- Get experience in CCD tests with AstroInventions' Test Dewar while the scientific cameras are fabricated
- Fine adjust in CCD97 waveforms clock
- Implement Characterization tools for EMCCD
- Minimize CIC noise shaping phases (Julian's MSc research)

Communication Board
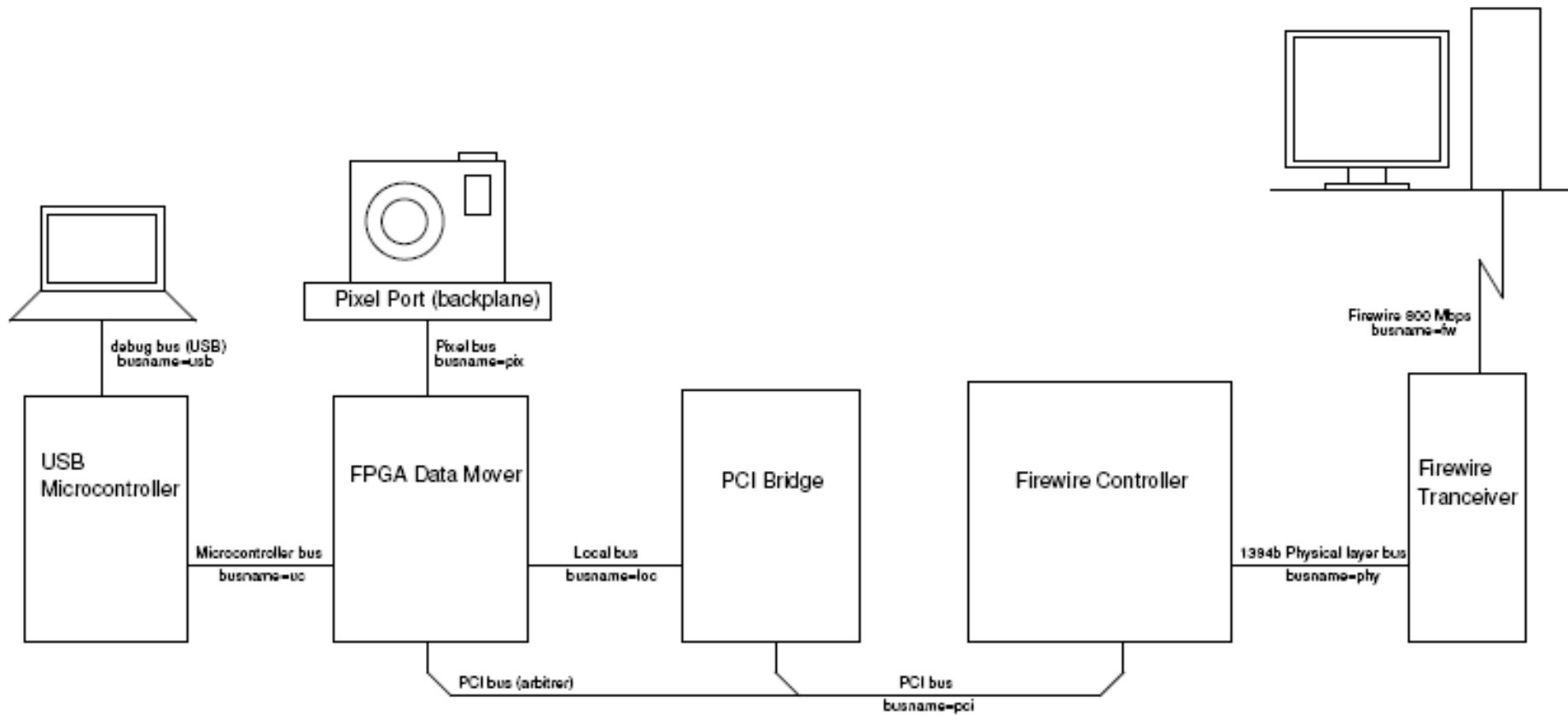
Communication Board
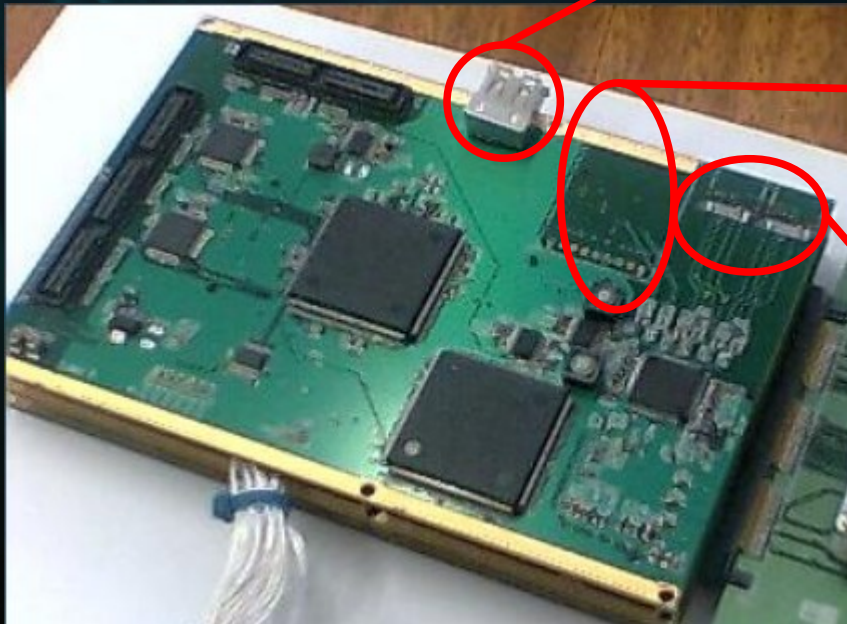
Programming
USB interface

Optical Fiber
Firewire

Conventional
Firewire 9pins

Communication Board

- Firewire 1394b communication
  - Conventional 9 pins cable
  - Fibre Optics link
- VHDL code for FPGA has been simulated in computer, but has not been programmed as firmware yet
- First tests and start debugging process by the end of Nov'08

C'est fini!

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