Detector Development Activities at ALBA

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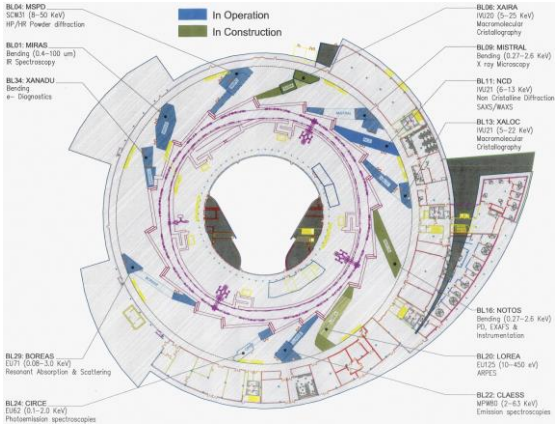
Detector Development Activities at ALBA

- **3rd generation synchrotron light source (3 GeV) at Barcelona (Spain).**
- **8 operating beamlines + 3(4*) under construction.**
- **No pure detector development group exists (Electronics Section – 14 people)**

Beamlines	
BL01 MIRAS	Infrared Microespectroscopy
BL04 MSPD	Materials Science And Powder Diffraction Beamline
BL06 XAIRA	Microfocus Beamline For Macromolecular Crystallography
BL09 MISTRAL	Soft X-ray Microscopy
BL11 NCD-SWEET	Non-crystalline Diffraction
BL13 XALOC	Macromolecular Crystallography
BL16 NOTOS	Absorption, Diffraction & Instrumentation
BL20 LOREA	Angle Resolved Photoemission Spectroscopy
BL22 CLAESS	Core Level Absorption & Emission Spectroscopies
BL24 CIRCE	Photoemission Spectroscopy And Microscopy
BL29 BOREAS	Resonant Absorption And Scattering
BLxx FAXTOR*	Fast X-ray Tomography & Radioscopy Beamline



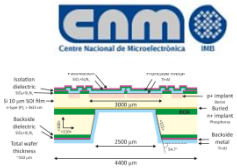
Detector Development Activities at ALBA

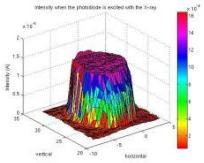
- All beamlines in operation use commercial detectors.
- Our group give instrumentation support to beamlines (but not only related to detectors).
- Projects Developed:

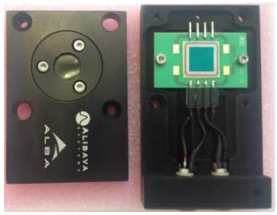
X-Ray Diagnostic Devices

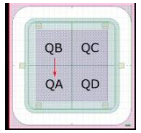
10 µm width transmissive diode

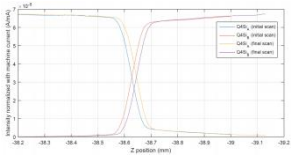
- Two models: One quadrant & Four quadrant device Monitor I_0 and position.
  - Sensitivity 102 nA/µm (Beam: 4·1011 ph/s @ 10 keV Beam size: ~100 µm FWHM)
- Radiation hardness studies.
- Possible extent to SiC (involved ESRF*)







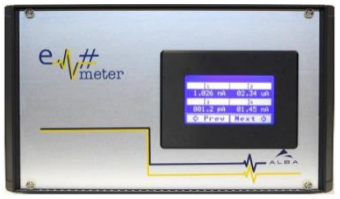


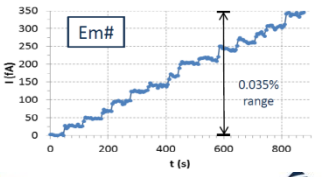


Beamline Instrumentation

Four channel performant electrometer

- From 10mA to 100pA range
- Up to 1kV bias operation
- 4 arbitrary analog outputs
- Designed for Closed loops implementation
- Acquisition Engine based in FPGA (timestamp, pre-processing, etc…)





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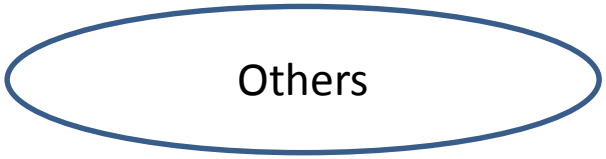

Electronics Design Integrating commercial detectors

- SiPM
- APDs
- PMTs
- …

- **Short terms plans:**
  - Continue the development of projects with real application for our beamlines.
    - Transmissive diodes included permanently in all our hard X-ray beamlines (BL04, BL11, BL13 and BL22*)
  - Development of 5µm width transmissive diode (with CNM).
  - Continue learning about radiation hardness under Synchrotron Light.
  - Integration of transmissive diode+ Em#+piezo to create a beam tracker with nm sensitivity at frequency close to kHz regime.

- **Future plans:**
  - Development of a Detectors Group is in ALBA Strategic Plan for following years (limited resources)
  - Foster development activities with nearby institutes with strong background in detector development (mainly for high energy physics):
    - Institut de Física de Altes Energies (IFAE)
    - Centro Nacional Microelectrónica (CNM)
  - NOTOS new beamline devoted to instrumentation development including detectors development explicitly [4.5-30 keV flux 10^{11} ph/s]

Thank you!