# ALBA phase III BL proposals:

## - Instrument development & innovation BL

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# Instrument development & innovation BL

**Main characteristics**:

1. Key for metrology and tests in the development of ALBA.
2. Very important for developments in optics.
3. It may have a leading role for detector development and testing (the synergies with IFAE and CNM are clear as these institutions are developing detectors).
4. Flexible BL that could tackle unforeseen issues.
5. It would be also used for training.
6. *Inexpensive BL (located at a bending magnet).*

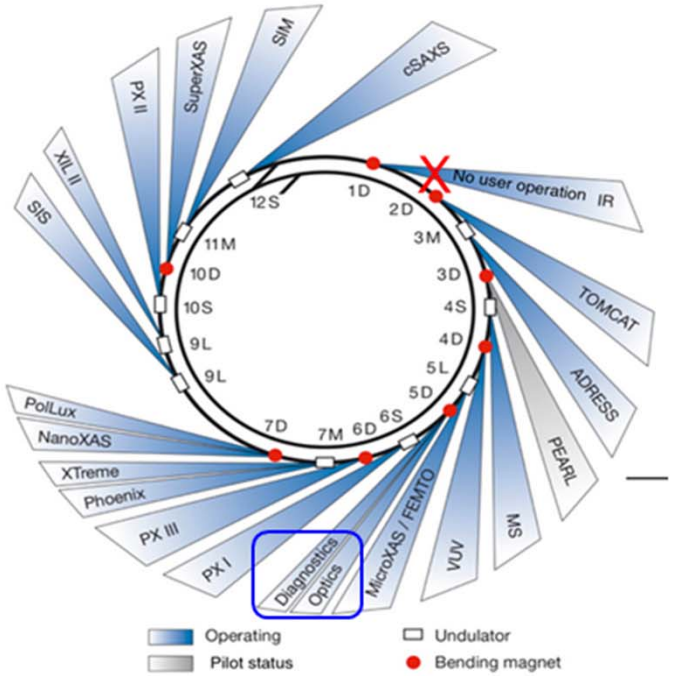
**[ It was included in the ALBA strategic plan 2013-2016 ]**

# Instrument development & innovation BL

SLS Beamlines

**BLs:** 17 (operational) + 3 (commissioning) + 1 (construction) = **21**

Each beamline at SLS is optimised for a specific technique. Actually 17 beamlines are in the operational mode, Phoenix, NanoXAS and XTreme are in the pilot phase and PEARL is under construction. Depending on the type of radiation source, there are two types of beamlines (insertion-device and bending-magnet). In the layout they are indicated as open boxes and black dots, respectively.




**NanoXAS - X07DB;** *BM*: Scanning Transmission X-Ray Microspectroscopy / Scanning Probe Microscopy, 40 nm beam size

**PolLux - X07DA;** *BM*: soft XR scanning transm. Microspectroscopy

**SIS-X09LA: Surf/Interface-Spectroscopy;** *Electromag. elliptical U.* High-resol. ARPES & **COPHEE** for spin- & angle-resolved ARPES

**XIL-II (X09LB): Extreme Ultraviolet Interference Lithography**

**SuperXAS - X10DA;** *BM*: BL for XAS & XES

**cSAXS - X12SA;** *U19-short length;* **4-19 keV**
Coherent Small-Angle X-ray Scattering

**TOMCAT - X02DA: Tomography;** *2.9 T superbend;* **8-45 keV**
A beamline for TOmographic Microscopy and Coherent rAdiology experimenTs

**ADRESS - X03MA: Advanced Resonant Spectroscopies;** *soft-X-ray undulator*
The ADvanced RESonant Spectroscopies (ADRESS) BL
2 endstations: i) Angle-Resolved Photoelectron Emission (ARPES)
& ii) Resonant Inelastic X-ray Scattering (RIXS).

**PEARL - X03DA: Photoemission and Atomic Resolution Laboratory;** *BM*
ARPES & photon energy-scanned X-ray photoelectron diffraction (XPD).
Scanning tunneling microscopy (STM) will be available.

**MS - X04SA: Materials Science;** *cryogenically cooled, permanent-magnet Und.*
Powder diffraction (PD), In-situ surface diffraction (SD), A SAXS/WAXS setup employing both Mythen and Pilatus 2M detectors is being commissioned.

**VUV - X04DB: VUV Spectroscopy;** *BM*
A beamline for Vacuum Ultraviolet Radiation.

**MicroXAS - X05LA: Environmental & Materials Sciences; 5-20 keV;** *U19*
XAS & XRF experiments requiring high spatial resolution (up to 1 μm).
The BL will host the FEMTO project (time-dependent, femtosecond, studies).

**OPTICS - X05DA and Metrology Laboratory;** *BM*
Optics and instrumentation related R & D, in-house research and training.

**MX → X06SA – PXI;** *U19* **X10SA – PXII;** *U19* **X06DA – PXIII;** *BM*
**PXI:** MAD, large structures, μcrystals; **PXII:** partly-industry; **PXIII:** partly-industry.

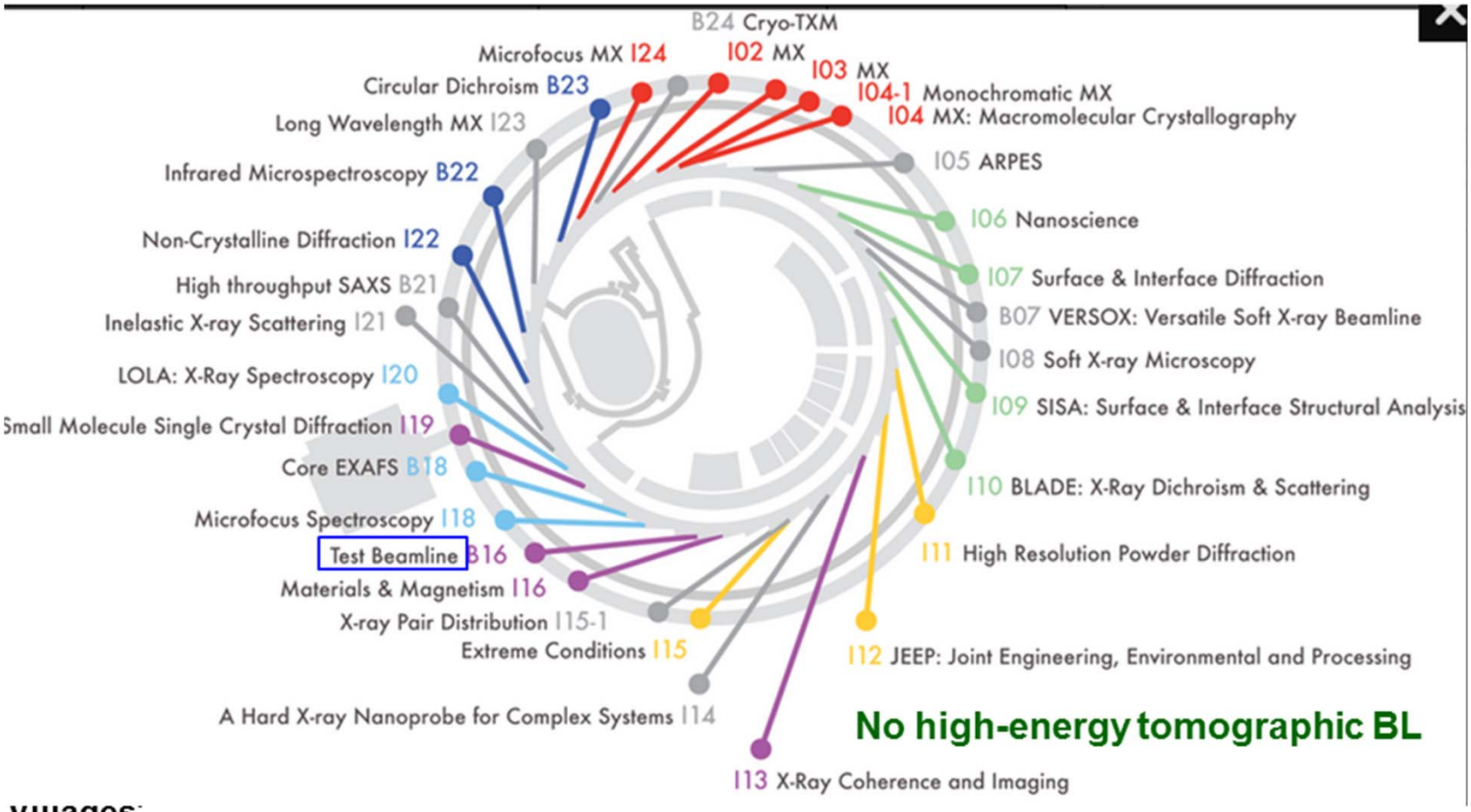
**PHOENIX X07MA/B - μ-XAS & μ-XRF;** *APPLE II*
Two branches, 0.8 - 8.0 keV PHOENIX I, 0.2 - 2.0 keV PHOENIX II

**X-Treme / X07MA;** *Elliptical undulator UE54*
X-ray absorption spectroscopy at high magnetic fields and low temperature

**SIM-X11MA: Surfaces/Interfaces Microscopy–PEEM;** *Elliptical undulator UE54*

# Instrument development & innovation BL

**BLs at Diamond:** 22 (operational) + 11 (construction) = **33**




**Villages**:

**i) Engineering & Environment:** I11, I12, I15 = **3 + 1** *construction:* I15-1 (X-PDF)

**ii) Materials:** I13, B16, I16, I19 = **4**

**iii) MX:** I02, I03, I04, I04-1, I24 = **5 + 3** *construction:* I23 (long λ), I02-1(Versatile MX) & **B24 (cryo-TXM)**

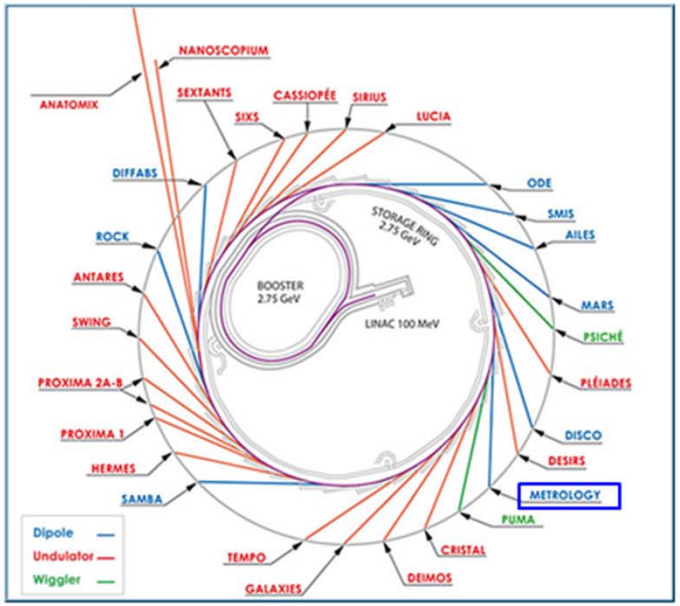
**iv) Soft Condensed Matter:** B22, I22, B23 = **3 + 1** *construction:* B21(high throughput SAXS)

**v) Spectroscopy:** I18, B18, I20=**3+4** *construct:* **I08(sXR microscop)**, I14(hXR nanoprobe), I20-1(EXAFS), I21(inelastic)

**vi) Surfaces and Interfaces:** I06, I07, I09, I10 = **4 + 2** *construction:* I05 (ARPES), B07 (versatile sXR, includ. NAPP)

# Instrument development & innovation BL

SOLEIL Synchrotron beamlines




The charts here below list all the SOLEIL beamlines as well as the four French CRG beamlines at ESRF which are integrated in joint calls for proposal with SOLEIL opened beamlines.

**Beamlines per beam spot size**

| Beam spot size | List of Beamlines |
|---|---|
| <10µm | ANTARES, GALAXIES, HERMES, IF*, LUCIA, PROXIMA 2A, SEXTANTS, NANOSCOPIUM, SMIS |
| From 10 to 100µm | D2AM*, DEIMOS, FAME*, GALAXIES, PSICHÉ, PLÉIADES, SEXTANTS, SIXS, TEMPO, MARS |
| From 100 to 300µm | D2AM*, DESIRS, DISCO, IF*, FAME*, FIP*, MARS, MÉTROLOGIE, PLÉIADES, PROXIMA 1, ROCK, SAMBA, SIRIUS, SIXS, SWING, PSICHÉ |
| More than 300µm | D2AM*, DEIMOS, MÉTROLOGIE, PLÉIADES, ROCK, SAMBA, PSICHÉ |

*French CRG Beamlines located at ESRF (Grenoble)

SOLEIL beamlines in alphabetical orde
- AILES
- ANTARES
- CASSIOPÉE
- CRISTAL
- DEIMOS
- DESIRS
- DIFFABS
- DISCO
- GALAXIES
- HERMES
- LUCIA
- MARS
- MÉTROLOGIE
- NANOSCOPIUM
- ODE
- PLÉIADES
- PROXIMA 1
- PROXIMA 2
- PSICHÉ
- ROCK
- SAMBA
- SEXTANTS
- SIRIUS
- SIXS
- SMIS
- SWING
- TEMPO

French CRG beamli at ESRF in alphabet
- D2AM
- FAME
- FIP
- IF

**CASSIOPEE** (8-1500 eV), **ANTARES** (12-1000 eV): ARPES

**AILES** (8-1000 cm$^{-1}$), **SMIS** (1.5-50 µm): IR microspectroscop.

**ODE** (3.5-25 keV): EXAFS, XMCD

**LUCIA** (0.8-8 keV, 2.5 x 2.5 µm$^2$): µ-XAS, µ-XRF

**SIRIUS** (1.4-11 keV): mainly GIXD & GISAXS

**SIXS** (5-20 keV): Surface Interface X-ray Scattering

**SEXTANTS** (50-1800 eV): RIXS, XRMS & CXI

**NANOSCOPIUM** (5-20 keV, >30nm) µ-XAS,µ-XRF, phase-contrast imag.

**ANATOMIX**

**DIFFABS** (3-23 keV, possibility for 10 x 10 µm$^2$): XRD, XAS, XRF

**ROCK** (4-40 keV), **SAMBA** (4-43 keV): XAS, Quick-EXAFS (rock)

**SWING** (5-17 keV): SAXS, WAXS & GISAXS

**PROXIMA 1; PROXIMA 2-A, 2-B** (5-15 keV, 5 x 5 µm$^2$): MX

**HERMES** (70-2500 eV): Branch X-PEEM & Branch STXM

**TEMPO** (50-1500 eV): XMCD, XMLD, Photoemission, ms

**GALAXIES** (2.3-12 keV): IXS & HAXPES

**DEIMOS** (350-2500 eV): XMCD & XMLD

**CRISTAL** (4-30 keV): XRPD, XRSC, CDI, Ptychography

**PUMA**: hXR 1- spectro-microscopy, 2D & 2- micro-tomography

**METROLOGY & TEST**(few eV-28 keV): new instrumentation

**DESIRS** (5-40 eV): XRPD, XRSC, CDI, Ptychography

| | |
|---|---|
| Diffraction | D2AM*, CRISTAL, DIFFABS, IF*, PSICHÉ, MARS, PROXIMA 1, PROXIMA 2A, SEXTANTS, SIRIUS, SIXS |
| Diffusion | D2AM*, GALAXIES, IF*, MARS, SEXTANTS, SIRIUS, SIXS, SWING |
| Reflectivity | D2AM*, IF*, SEXTANTS, SIRIUS, SIXS, MÉTROLOGIE |

| | |
|---|---|
| IR Spectroscopy | AILES, SMIS |
| UV-VUV Spectroscopy | DESIRS, DISCO, PLÉIADES |
| X-ray Spectroscopy | CASSIOPÉE, D2AM*, DEIMOS, DIFFABS, FAME*, GALAXIES, HERMES, LUCIA, NANOSCOPIUM, ODE, PLÉIADES, ROCK, SAMBA, SEXTANTS, TEMPO, MARS |

| | |
|---|---|
| Electronic and magnetic studies | ANTARES, CASSIOPÉE, DEIMOS, DESIRS, GALAXIES, HERMES, ODE, PLÉIADES, SEXTANTS, SIRIUS, TEMPO |

| | |
|---|---|
| IMAGING | ANTARES, DISCO, HERMES, LUCIA, NANOSCOPIUM, SEXTANTS, SMIS |
| TOMOGRAPHY | PSICHÉ |

**DISCO** (VUV-VIS): 1- CD; 2- mass spectrometry; 3- imaging

**PSICHÉ** (20-50 keV): x-ray diffraction under extreme conditions (P&T) & absorption contrast tomography

**PLÉIADES** (10-1000 eV): spectroscopy of atomic & molecular physics

**MARS** (3.5-36 keV): radioactive materials studied by XDR, XAS, XRF

**IPANEMA**: Ancient materials research platform. It supports access to BLs

# Instrument development & innovation BL

## THE BEAMLINES

Details of the public ESRF beamlines as well as those operated by Collaborating Research Groups (CRG) are given in Tables 5 and 6. Figure 167 shows the location of the beamlines in the experimental hall.

- Public beamlines
- CRG beamlines
- Instrumentation test and development beamlines
- Free bending magnet ports

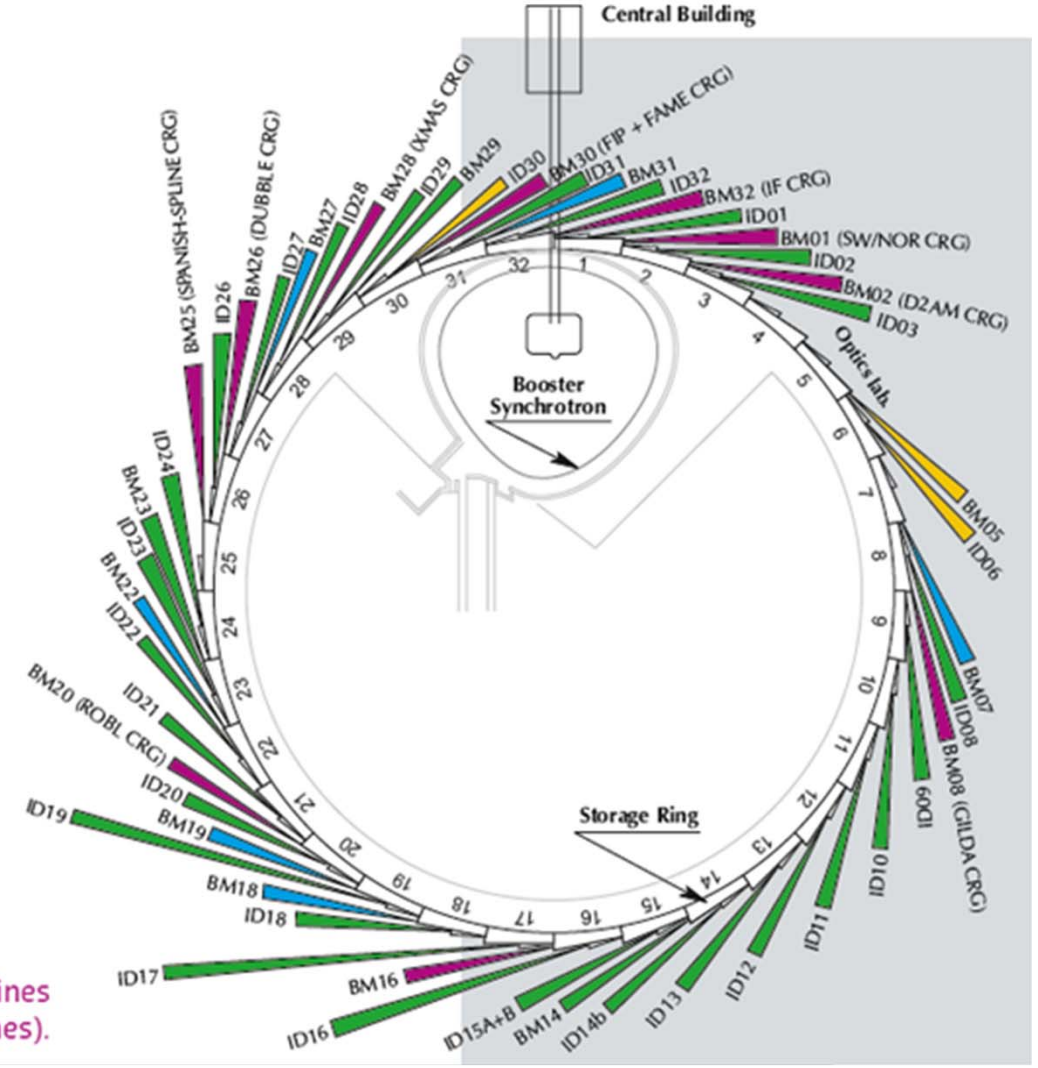



Fig. 167: Experimental hall showing location of the beamlines (public and CRG beamlines).

# Instrument development & innovation BL

**I. Person or group of at most three persons, who would lead the proposal in case it was pre-selected:**

Miguel A.G. Aranda & Josep Nicolas (ALBA)

**II. User groups supporting the proposal:**

ALBA-team. It is not foreseen to be open to users through the call-for-proposal scheme.

However, it could be open to collaborations, IFAE, CNM, etc.

## III. Preliminary brief scientific case:

1. Important for metrology and tests of optics components.
2. Leading role for detector development and testing.
3. It would allow SAT tests for components of phase III BLs without the need of proper conditioning at the BL.
4. It can be used for training/teaching purposes.
5. It would allow fast response to any interesting challenge as it is not fully committed well in advance.

## IV. Possible connection with priority lines of H2020:

1. Excellent science.

Future and emerging technologies.

2. Industrial leadership.

Leadership in enabling and industrial technologies (LEITs)

3. Societal challenges

Not applicable.

## V. Possible synergies with the techniques and human resources currently available at ALBA / Bellaterra:

1. Strong synergies within the Optics, Metrology & Support section of ALBA experiments Division
2. Many synergies with initiatives in Bellaterra's Campus with the detectors developments at IFAE and CNM.

**VI. Possible returns of the beamline investment to society (commercial use, regional development, …):**

1. Much direct commercial use is not expected, at this moment, although it could be offered for testing of devices (nationally and internationally).
   Very well suited for collaborations for developments
2. It would contribute to national and regional development as initiatives in detectors, crystals, etc. may lead to setup new companies.

**VII. Any other relevant feature(s):**

Not applicable

# General

| Name-BL | Scientific case interest | Return to society[#] | Social impact[$] | User support | ALBA / Bellaterra synergy | Horizon 2020 synergy | Any other parameter[%] | Spokesperson(s) involvement |
|---|---|---|---|---|---|---|---|---|
| **Microfocus-MX** | | | | | | | | |
| **Microfocus-XANES** | | | | | | | | |
| **Microfocus-SCD** | | | | | | | | |
| **High-energy-tomography** | | | | | | | | |
| **Surface-diffraction** | | | | | | | | |
| **E-P-scattering** | | | | | | | | |
| **Biomedical BL** | | | | | | | | |
| ***Instrument development*** | | | | | | | | |
| ***Skiron*** | | | | | | | | |
| **HRPD-XAS** | | | | | | | | |

[#] *Economic impact: industrial use, regional/local technological development, ...*

[$] *Importance of the scientific case for tackling current society problems; ALBA visibility in the media; outreach possibilities...*

[%] *To be properly justified.*

Thanks for your

help and involvement with ALBA

assistance to the workshop

& attention