

Index

- Access Committee 71, 72
- access to ancillary services 45
- access to core beamlines 5, 72
 - pricing of access 72
- Access to Major Research Facilities Program (AMRFP), projects funded 2, 55–6, 59
- access to non-core beamlines 72
- acid mine drainage 8, 38, 108
- adsorbate studies 94
- Advanced Light Source at the Lawrence Livermore Laboratories, Berkeley, USA v, 11, 12, 43, 91, 92
- advanced manufacturing, beamline 4, 48, 108–9, 114–6
- advanced materials
 - development 7, 10, 34–6, 86
 - imaging 40, 103
- Advanced Photon Source, Chicago, USA iv, v, 6, 9, 13
 - use of 11, 49, 55, 57–8, 71, 75, 79, 82
- advisory committees to the Board 71
- agriculture 1, 3, 7, 33, 40, 48, 58, 67, 103
- alloys 1, 3, 18, 22, 36, 48, 55–7, 93, 98, 103, 108
- angle resolved photoemission spectroscopy, also angular resolved ultraviolet photoelectron spectroscopy (ARUPS) 22–3, 41, 92, 93, 94
- anomalous dispersion 19, 27, 30, 75, 79
- ANSTO iv, 3, 8, 33, 50, 54–9, 89, 99
- anti-cancer drugs 32, 86, 96, 99
- anti-inflammatory drugs 32, 86
- anti-viral drugs 32
- antibody molecules 34
- arsenic in mine tailings 38
- assessments of potential economic benefits to Australia 66–7
- Auger electron techniques
 - Auger electron spectroscopy 20, 37, 58, 59
 - Auger photoemission coincidence spectroscopy (APECS) 93
- Australian National Beamline Facility (ANBF) at Photon Factory, Tsukuba, Japan, use of 12, 49, 54, 56–7, 79, 85
- Australian research
 - supported by AMRFP 2002–03 59
 - supported by AMRFP 2003–04 55–6
 - supported by ASRP 2002–03 56–8
 - supported by ASRP 2003–04 54–5
- Australian researchers
 - use of overseas synchrotrons 2, 33, 47, 54–9
- Australian Synchrotron
 - beamline capacity 2, 14, 16, 74
 - comparison with others under construction 62–3
 - design objectives 61–2
 - economic benefits 65–7
 - establishment of core beamlines 71–2
 - in the international context 11–12, 61–3
 - industry engagement 3
 - layout 16
 - management and access 71–2
 - overview 7–13
 - ownership 71
 - proposed initial suite of beamlines 4, 43–5
 - regional collaboration 11–12
 - size and purpose 2
 - summary of benefits 3
 - technical specifications 126–7
- Australian Synchrotron Research Program (ASRP) 2, 13, 43, 49, 50, 75, 115
 - projects funded 54–5, 56–8
 - research disciplines funded by 47, 80, 82, 85, 89, 99
- ASRP access model 5, 72
- battery materials 34, 80
- beamline design see specific beamlines, eg. x-ray absorption spectroscopy (beamline 5)
- beamline categories 4, 44, 45
- beamline selection process 12, 43–4
- beamline user communities 47–59
 - see also specific beamlines, eg. circular dichroism (beamline 12)
- beamlines
 - benefits from investment in 2
 - cost estimates 44–5, 119–25
 - energy range 4, 44
 - establishment of core beamlines 71–2
 - full user support needed in use of 73
 - funding proposal 2, 5
 - proposed initial suite 4, 43–5
 - schedules 69
 - source 43, 44
 - see also core beamlines; non-core beamlines
- bending magnet 16
 - as source 44, 78, 81, 88, 94, 97, 101, 106, 110, 113, 116
- benefits to Australian science and industry of Australian Synchrotron 7–8
- BESAC report (1997) (USA) 65
- BESSY (Berlin) v, 55, 59, 71, 92, 94
- BioCARS Beamline at Advanced Photon Source, Chicago, USA, use of 55, 57–8, 75
- biochemical sciences 83, 84, 86, 90, 95, 111
- biological sciences 1, 7, 9, 29–33, 48–9, 75, 83, 86, 94, 112
- bio-informatics 10
- biomedical imaging 38, 103
- biopolymers 96
- bio-remediation 33
- biosensors 33, 34, 94
- biosystems 33, 94
- biotechnology 2, 8, 10, 33, 34, 48, 99, 109
- Board to manage the facility 71
- Boomerang Proposal Part IV (1999), assessment of economic benefits 66
- Boomerang Storage Ring, technical specifications 126–7
- breakthrough science 9–10, 41
- Brookhaven National Laboratory (USA) 11, 79, 95, 118
- building and construction timetable 2, 69
- Business Case for Diamond (UK) 65
- Canadian Light Source v, 2, 12, 49, 60, 61, 62–3, 65, 71, 91, 110
- cancer biology 40–1, 103–4
- capital cost estimates for beamlines 44–5
- carcinogens 86
- catalysts 35–6
- Category A beamlines 4, 44
- Category B beamlines 4, 44
- Category C beamlines 4, 44
- cellular biology 9, 31, 83, 96, 99
- Centre for International Economics, assessment of economic benefits 66–7
- Centre for Strategic Economic Studies, assessment of economic benefits 66
- Chairman's statement i
- chemical sciences 7, 90
- chemical vapour deposition 35, 54, 58, 94
- ChemMat CARS at Advanced Photon Source, Chicago, USA, 48, 55, 58, 79, 82
- chromium complexes 32–3
- circular dichroism (beamline 12) 4, 24–5, 111–13
 - advantages of a synchrotron source 93, 111
 - beam characteristics 113
 - beamline design 113

- costings 124
- research applications/fields 27, 48, 111, 112–13
- user community 49, 111–12
- composite materials 48, 82, 83, 96, 100
- computed tomography (CT) therapy 40, 41, 104
- construction schedule for Australian Synchrotron 2, 69
- core beamlines
 - access to 5, 72
 - capabilities 26–7
 - establishment 71–2
 - funding proposal 2, 5, 43
 - pricing of access to 72
- cost estimates of proposed initial suite of beamlines 5, 45, 119–25
 - capital cost estimates 44–5
 - operating costs 5, 45
- crystallography 1, 9, 11, 18–19, 30, 55, 75–7
- crystallography & diffraction beamlines 4, 27, 43, 44–5, 48–9, 50, 69, 73, 75–84
- CSIRO 3, 34, 45, 98, 99, 104
- current status of the project 2
- deep x-ray lithography (DXRL) 116
- detector, beamline 78, 81, 88, 101, 106, 107, 109, 113
- detector, cost estimates 120–124
- detector technology industry 3, 8, 104, 105
- detectors, beamline 19, 23, 31, 40
- Diamond synchrotron (UK) 62–3, 65, 77, 115
- diffraction enhanced x-ray imaging 25, 56–9, 105
- diffraction/scattering 18–20
- diseases, dynamic processes 83
- double photo-ionisation 93
- drug design, 2, 8, 9, 48
 - research examples 54, 86
 - techniques for 24, 32, 78, 81, 102, 111
- DSTO 3, 11, 13, 50
- earth sciences 37–8, 86, 89–90, 96, 99–100
- economic benefits of the Australian Synchrotron 65–7
 - assessments of potential benefits to Australia 66–7
 - intangible economic benefits 67
 - international reviews 65
- education and research training 2, 11
- electron-beam ion trap 87
- electronic materials 35, 90
- Elettra (Trieste) 56, 59, 92
- end station design 75–8, 81, 84, 88, 91, 94, 97, 101, 105, 109, 113
- energy range of Australian Synchrotron 4, 15
- engineered components 36–7
- environmental sciences 38, 86, 89–90, 96, 100, 108
- environmentally sustainable Australia 8
- ESRF (France) 39, 56, 59, 71, 79
- Executive summary 1–5
- experimental techniques 18–25
 - using proposed initial suite of beamlines 27
- extended x-ray absorption fine structure (EXAFS) 21, 37, 38, 85
- extraterrestrial materials, analysis 100
- fast-scanning/time-resolved measurements 25–6, 87
- fermentation 96
- fine particulate air pollution 8
- 'first light' 43, 69
- flotation reagents, interaction with surfaces of minerals 37
- food science 2, 9, 35, 48, 84
- forensic science 1, 3, 11, 23, 32, 48, 96, 109
- framework materials 80
- frontier technologies 2, 9–10, 29–41, 48
- fuel cell studies 8, 36, 100, 115
- funding proposal 2, 5
- gas phase studies 93–4
- gene maps 99
- geo-polymers 10
- geochemistry 108
- geological indicators 99
- geology see earth sciences
- health promotion and maintenance 2, 9
- heterochemicals, chemical forms 90
- high temperature superconductors 9
- high-throughput protein crystallography see protein crystallography (beamline 1)
- human genome 9, 29
- imaging 18, 25, 38–40
 - advanced materials 40, 103
 - biomedical 38, 103
 - fundamental physics of 104
 - manufactured products 40, 103
 - medical 38–9
 - plants 7, 40, 103
- imaging & medical therapy (beamline 10) 4, 102–6
 - beam characteristics 106
 - beamline design 105–6
 - costings 123
 - dectectors 106
 - research fields/applications 27, 48, 102–5
 - user community 49, 102
- imaging beamlines 4, 27, 43–5, 48–9, 50, 69, 73, 102–110
- industry engagement 3, 107–8, 114–5
- industry applications
 - advanced manufacturing 41, 48, 82, 96, 103, 108–9, 115
 - agriculture 7, 33, 40, 48, 58, 67, 103
 - automotive 8, 36, 40, 49, 102–3
 - biotechnology 8, 10, 33, 34, 48, 99, 109
 - defence 3, 8, 11, 34, 49, 65, 96, 102
 - engineering 1, 27, 33, 36, 48, 81, 83, 87, 96, 103, 108–9, 115
 - food manufacturing 9, 35, 48, 84, 96
 - health 7, 9, 29–33, 38–41, 48–9, 65, 66, 75, 76, 81, 83, 86, 90, 94, 96, 99, 102–4, 109, 112, 115
 - information and communications technology 9, 10, 21, 34, 35, 80, 90, 96, 105, 109, 115
 - manufacturing and engineering 44, 48, 108–9, 115
 - materials 7, 10, 20, 34–6, 48, 80, 83, 86, 94, 96, 100, 103, 115
 - micro/nanotechnology 7–8, 26, 33, 48–9, 83, 86, 115
 - mining and minerals 7, 8, 37–8, 48, 80–1, 86, 90, 96, 99, 103, 108
 - oil and gas 7, 8, 36, 40, 48, 66, 103
 - pharmaceuticals 8, 48, 65, 66, 81, 102
 - scientific equipment 8, 33, 34, 93, 94, 96, 115
 - waste & pollution management 2, 8, 37, 90, 99, 100
- infrared spectroscopy (beamline 8) 4, 23–4, 31, 95–7
 - advantages of synchrotron source 95
 - beam characteristics 97
 - beamline design 96–7
 - costings 122
 - research fields/applications 27, 31, 48, 95, 96
 - user community 49, 95
- initial suite of beamlines
 - capital and operating costs 44–5, 119–25
 - proposed 4, 43–5
 - techniques available using 27

- insecticides 33
- International Machine Advisory Committee v, 2, 62
- International Scientific Advisory Committee v, 2, 43
- investment in beamlines 2, 5
- life sciences
 - beamline use 7, 48
 - see also biological sciences
- LIGA 8, 26–7, 49, 114, 115
- lithography (beamline 13) 4, 8, 26, 34, 114–16
 - advantages of a synchrotron source 114
 - beam characteristics 116
 - beamline design 116
 - costings 125
 - partnering 115
 - research fields/applications 27, 48, 114, 115
 - user community 49, 114–15
- lung imaging 25, 39, 55, 59
- macromolecular structures and function 30, 76, 112–13
- magma oxidation 86, 99
- magnetic x-ray circular dichroism 24
- magneto-resistance materials 35, 80, 93
- mammography 38–9
- management of the facility 5, 71–2
 - access to beamlines 71–2
 - operation of the facility 71
 - ownership of the facility 71
 - pricing of access to core beamlines 72
 - provision of user support 73
- manufactured products, imaging 40, 103
- manufacturing 3, 4, 44, 48, 108–9
- map strain in metal fabrication 109
- materials sciences 7, 10, 34–6, 40, 80, 86, 90, 96, 100, 103
- medical devices, implants 33, 94, 96, 109, 115
- medical imaging 38–9, 103
- membrane proteins 112
- merit-based access 5, 72
- metal complexes 9, 35–6, 86
- metal sulfides, surface chemistry 37, 98
- metallo-enzymes 35, 99
- metallo-proteins 99
- micro-machining by x-ray lithography 26
- microalgae toxicity 33
- microbeam radiation therapy (MRT) 40, 41, 104
- microdiffraction and fluorescence probe (XDR & XRF mapping) (beamline 11) 4, 107–10
 - advantages of a synchrotron source 107
 - beam characteristics 110
 - beamline design 109–10
 - costings 124
 - development of the concept 110
 - research fields/applications 27, 48, 107, 108–9
 - user community 49, 107–8
- microelectronics 109
- microporous materials 36, 80
- microspectroscopy (submicron-XAS, XANES, & XRF) (beamline 9) 4, 31, 98–101
 - advantages of a synchrotron source 98
 - beam characteristics 101
 - beamline design 100–1
 - costings 122
 - research fields/applications 27, 48, 98, 99–100
 - user community 49, 98–9
- microtechnology 7–8, 26, 48–9, 115
- mine wastes 8, 38, 99
- mineral beneficiation 37–8, 48
- mineral exploration 1, 3, 7, 48, 86, 99, 108
- mineral processing 37, 80–1, 99
- mineralogy 96
- minerals industry 7, 37–8
 - environmental issues 38, 108
- Minister for Innovation, State Government of Victoria, statement iii
- Monash University iv, v, 38, 45, 51, 103
 - research 9, 20, 25, 31, 33, 104
- multipole wiggler 17
 - as source 44, 81, 88, 106
- multiple wavelength anomalous dispersion (MAD) 19, 27, 30, 75
- museums 96
- nanotechnology 33–4, 83, 86, 115
- National Research Priorities 2
 - contributions to 8–11
- National Science Case 1
- National Scientific Advisory Committee v, 1, 2, 5, 43
- national security and defence 3, 8, 11, 49, 96, 102
- National Synchrotron Light Source (USA) (NSLS) 11, 59, 65, 79, 95, 118
- National Synchrotron Research Centre (NSRC), Thailand 11, 12, 13, 49
- near edge x-ray absorption fine structure (NEXAFS) 21, 37
- New South Wales synchrotron scientists iv, v, 52, 54–9
- New Zealand synchrotron scientists 12, 50–53, 71, 75, 89, 96
- Nobel Prizes for research with x-rays 29, 40
- non-core beamlines 72
- oil and gas industry 1, 2, 7, 8, 36, 40, 48, 66, 103
 - operating costs 5, 45
 - operation of the facility 71
- optics, beamline 78, 81, 84, 104–6
 - costings 120–125
 - optics research 10, 33, 55, 59
- opto-electronic materials 35, 90
- ore body evaluation 37, 86
- ore metals 86
- organic nanostructures 10
- overseas synchrotron facilities 2
 - Australian researchers use of 47, 54–9
 - comparison with Australian Synchrotron 62–3
 - regional cooperation 11–12
 - research training 11
- ownership of Australian Synchrotron 71
- oxide based materials 34–5, 80
- Pacific Rim synchrotron community 11–12
- pharmaceuticals 8, 19, 31, 32, 39, 86, 81, 99, 111
 - industry 65, 66, 102
- phase contrast x-ray imaging 25, 27, 36, 38–40, 102–4
- phase mapping 81
- photo-excitation of free molecules 93
- photon activation therapy 40–1, 104
- Photon Factory, Japan see Australian National Beamline Facility at Photon Factory, Tsukuba, Japan
- photonics 3, 10
- photonic crystals 115
- photonic devices 10, 21, 34, 86
- photovoltaic materials 100
- physical sciences, beamline use 7, 48, 90, 113
- plants and crops 2, 8, 48
- plants, imaging 7, 40, 103

- plastic products 20, 108, 109
- polarimetry 4, 18, 24–5
- polarimetry beamline 4, 111–3
- polymer crystallisation 100
- polymer science and engineering 1, 3, 7, 10, 19, 20, 47–9, 82–4, 96, 100, 109, 114
- polysaccharide gels 84
- powder x-ray diffraction (beamline 3) 4, 19, 33, 34, 79–81
 - advantages of a synchrotron source 79
 - beam characteristics 81
 - beamline design 81
 - costings 121
 - end stations 81
 - research fields/applications 27, 48, 79, 80–1
 - user community 49, 79–80
- PricewaterhouseCoopers Feasibility Study, assessment of economic benefits 67
- pricing of access to core beamlines 72
- principal investigators, and beamlines of interest 50–3
- priority access 72
- promoting and maintaining good health 2, 9
- proposal 12–13
 - scientific context 13
- proposed initial suite of beamlines 4, 43–4
 - access to ancillary services 45
 - capital and operating cost estimates 44–5, 119–25
 - techniques available using 27
- protein crystallography 9, 18, 19, 30, 75, 83, 86
- protein crystallography (beamline 1) 4, 75–8
 - beam characteristics 78
 - beamline design 77
 - costings 120
 - research fields/applications 27, 48, 75, 76
 - user community 49, 75–6, 77
- protein folding 112
- protein microcrystal & small molecule x-ray diffraction (beamline 2) 4, 75–8
 - beam characteristics 78
 - beamline design 77–8
 - costings 120
 - research fields/applications 27, 48, 75, 76
 - user community 49, 75–6, 77
- protein structures , 25, 30, 40, 76, 99, 112
- proteomics 7, 10, 30, 31, 76
- quantitative phase imaging 10
- Queensland synchrotron scientists iv, v, 31, 50–53, 54–9
- radionuclides in the marine environment 86
- radiotherapy 40–1, 103–4
- rational drug design 9, 32
- recommendations of National Science Case 5
- redox speciation 86
- regional collaboration, promotion of 11–12
- research applications 48, see also specific beamlines, eg. lithography (beamline 13)
- research organisations, and beamlines of interest 50–3
- residual strain fields 36–7, 81
- safeguarding Australia 3, 11, 34, 96
- SARS enzyme structure 9
- science
 - and economic context 1
 - enabled by the synchrotron 29–41
- Scientific Committee 71
- scientific context for the proposal 13
- scientific instruments sector 8
- self-assembling structures, imaging 41
- semiconductors 21, 34, 86, 96
- Singapore Synchrotron Light Source v, 11, 12, 62
- single-crystal diffraction 6, 18, 30, 35, 56, 75, 92, 107
 - users 49, 76
- small and wide angle x-ray scattering (beamline 4) 4, 82–4
 - advantages of a synchrotron source 82
 - beam characteristics 84
 - beamline design 84
 - costings 121
 - research fields/applications 27, 48, 82–4
 - user community 49, 82
- small angle x-ray scattering (SAXS) 19, 20, 82
- small lattice distortions 34, 80
- small molecule diffraction 76
- smart information 10–11
- soft x-ray spectroscopy (beamline 6) 4, 41, 89–91
 - beam characteristics 91
 - beamline design 90–1
 - costings 122
 - research fields/applications 27, 48, 89–90
 - user community 49, 89
- solid metal oxides 34–5, 80
- solid state studies 92–3
- South Australian synchrotron scientists iv, v, 51–3, 55–6, 91, 110
- spectroscopy 7, 9, 18, 20–4, 31, 32–8
- spectroscopy beamlines 4, 27, 43–5, 48–9, 50, 54–9, 69, 73, 85–101
- spin-electronics 9
- SPring-8, Japan 12, 39, 56, 59, 79
- SRI-CAT at Advanced Photon Source, Chicago, USA, use of 58
- Stanford Synchrotron Radiation Laboratory, Stanford Linear Accelerator Center, Stanford University, Menlo Park, USA v, 12
- starch granule structure 84
- status and timetable of the project 2, 69
- stress/strain mapping 36–7, 81, 109
- structural biology 29–31, 65, 83, 111
- structural genomics 19, 76, 112
- sub-micron technology 99
- superconductors 9, 19, 35, 80, 93
- support for beamline users 73
- surface chemistry, metal sulfides 37, 90
- surface corrosion 36, 96, 100, 109
- surface mapping 37, 38, 81, 90, 98–9, 107–9
- surface science 9, 18, 22–3, 27, 33–5, 37, 65, 92, 94, 96
- synchrotron
 - science enabled by 29–41
 - what is it? 1
- synchrotron applications 7–11, 20, 212, 29–41, 48, see also specific beamlines, eg soft x-ray spectroscopy (beamline 6)
 - recent events providing information on 128
- synchrotron light
 - characteristics 15
 - creation 16–17
- synchrotron radiation 9, 16, 100, 104, see also synchrotron light
- synchrotron radiation based circular dichroism (SRCD) 24, 111–12
- Synchrotron Radiation Infrared (SRIR) Users Group 95, 96
- synchrotron research, importance of 2–3
- synchrotron science 1, 15–27
- synchrotron techniques 18–27, 41
- T-ray (terahertz region) imaging 41, 97
- Taiwan National Synchrotron 11, 59, 62
 - ASRP access to 12, 13, 49, 89, 91, 95
- Tasmanian synchrotron scientists, 53

- texture mapping 81
- thin films, for electronic and opto-electronic devices 3, 10, 23, 24, 27, 35, 90
- time dependent studies 25–6, 36, 83, 94, 95, 98, 103, 111
- timetable for beamline construction 43, 69
- toxicology 1, 32–3, 86, 100
- transition-metal complexes 35–6, 86
- turbid solutions 112
- ultra deep x-ray lithography (UDXRL) 116
- ultra-dilute measurements 87
- undulator 17
 - as source 44, 78, 84, 91, 94, 101
- University of Melbourne iv, v, 99, 103, 104
 - synchrotron research 25, 52, 54–8, 98
- University of Sydney iv, v, 31, 33, 53, 54–9, 99
- User Committee 71
- user communities and beamlines of interest to them 47–59
 - see also specific beamlines, eg. small and wide angle scattering (beamline 4)
- vacuum ultraviolet circular dichroism (VUV CD) 24–5, 111–3, see also circular dichroism
- vacuum ultraviolet (VUV) (beamline 7) 4, 33, 92–4
 - advantages of a synchrotron source 7, 22, 92
 - beam characteristics 94
 - beamline design 94
 - costings 122
 - research fields/applications 27, 48, 92–4
 - user community 49, 92
- Victorian Government, funding and role in the project i, iii, 2, 3
- Victorian Government potential users 53
- Western Australian synchrotron scientists iv, v, 50–53, 54–8
- wide angle x-ray scattering (WAXS) 19, 20, 82–4, see also small and wide angle x-ray scattering (beamline 4)
- wiggler, see multipole wiggler
- x-ray absorption microspectroscopy 31
- x-ray absorption near edge structure (XANES) 21, 85, 90
- x-ray absorption spectroscopy (XAS) (beamline 5) 4, 20–1, 32, 33–4, 36, 38, 85–8
 - advantages of a synchrotron source 85
 - beam characteristics 88
 - beamline design 87–8
 - costings 121
 - research fields/applications 27, 48, 85, 86–7
 - user community 49, 85–6
- x-ray Auger electron spectroscopy (XAES) 20, 37, 58, 89
- x-ray circular dichroism 24, see also circular dichroism (beamline 12); vacuum ultraviolet circular dichroism; synchrotron radiation circular dichroism
- x-ray diffraction 18–19
 - for health sciences 8, 9, 30, 75–7
 - for physics and chemistry 7, 10, 34, 36
 - research 37, 54, 56, 58, 59
- x-ray emission spectroscopy (XES) 20, 21–2, 100
- x-ray fluorescence–x-ray diffraction (XRF–XRD) 38, 107–9
- x-ray imaging 9, 25, 27, 36, 38–40, 102–6
- x-ray lithography 26, 27, 34, 114–6
- x-ray microspectroscopy 31, see also microspectroscopy (beamline 9)
- x-ray phase contrast imaging 25, 27, 36, 38–40, 102–4
- x-ray photoelectron spectroscopy (XPS) 20, 22, 35, 55, 89
- x-ray/photoelectron emission microscopy (XPEEM) 41
- XOR-CAT at Advanced Photon Source, Chicago, USA, use of 55
- zeolites 19, 36, 57, 58, 80
- zircon crystals, 56, 58, 59, 99

Proposed Initial Suite of Beamlines

Beamlines 1 & 2: Crystallography of macro- and small molecules

Beamline 3: Powder diffraction

Beamline 4: Small and wide angle scattering

Beamline 5: X-ray absorption spectroscopy

Beamline 6: Soft x-ray spectroscopy

Beamline 7: Vacuum ultraviolet spectroscopy

Beamline 8: Infrared spectroscopy

Beamline 9: Microspectroscopy

Beamline 10: Imaging and medical therapy

Beamline 11: Microdiffraction and fluorescence probe

Beamline 12: Circular dichroism

Beamline 13: Lithography
