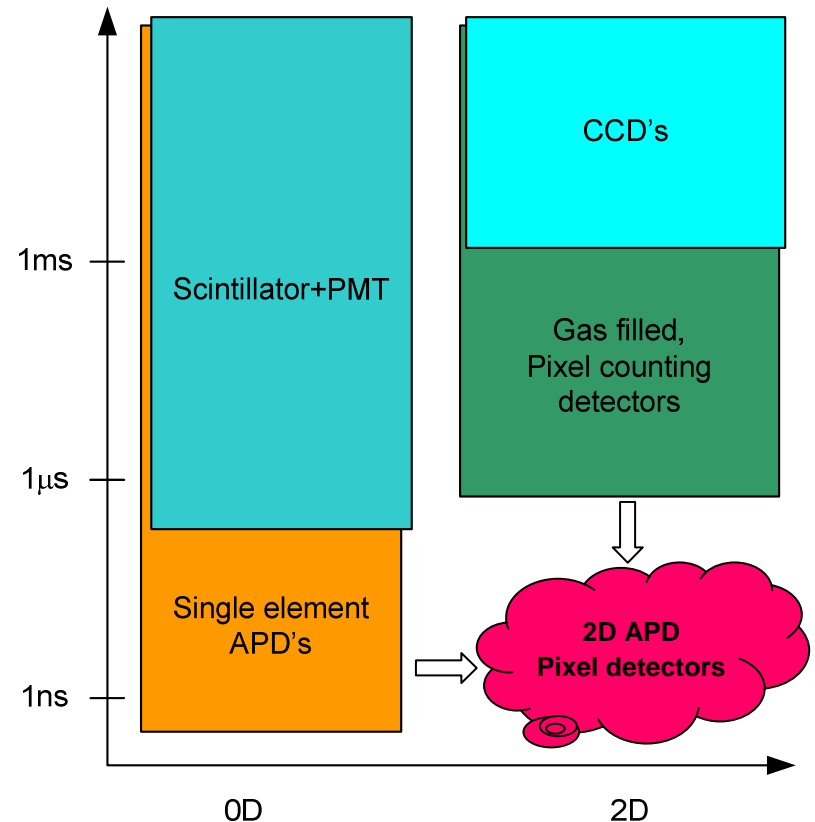

2D APD pilot project

- Motivation
 - Goal specifications
 - Pilot project vs. JRA
-

2D APD pixel detector project

- ❑ 2D X-ray detector with ns time resolution for SR applications
- ❑ Adapted to Nuclear Resonant X-ray Scattering and to a diversity of elastic scattering experiments (time-resolved diffraction, photon correlation spectroscopy, ...).
- ❑ Linked to the ESRF long term strategy. Time-resolved experiments are a key goal for the ESRF Upgrade Program.



Types of experiments considered

- ❑ Nuclear resonant scattering.

X-ray flash (prompt) + decay of excited states in the nanosecond range

- ❑ In use: fast OD with < 1ns time resolution
- ❑ In development: 1D arrays with discrete electronics

- ❑ Elastic scattering – time structure given by the storage ring.

Bunch spacing 2 – 3ns (2.84 ns @ ESRF)

- ❑ 2D detectors:

- ❑ In use: CCD based (few frames/sec in integration mode) or gas-filled (μ s resolution but strongly count rate limited)
 - ❑ In development: Si PIN pixel detectors (ex. MAXIPIX = MEDIPIX2 based @ 1 Kframe/sec)
-

Sensor specifications

Sensor:

- pixellated Si APD operating in linear mode
 - thickness: 100 μm (and 200 μm)
 - active area: 10 \times 10 mm^2
 - pixel size: \sim 300 μm \times 300 μm
 - number of pixels: 1024 (32 \times 32)
 - detection efficiency:
 - @ 5 keV > 50%
 - @ 15 keV 20% (100 μm sensors)
 - 37% (200 μm sensors)
-

Readout specifications

Readout ASIC

- 4 chips per sensor: 256 (16 × 16) pixels each
 - Technology: 0.18 μ m CMOS
 - Timing specifications:
 - photon pair discrimination: < 2 ns
 - recovery time after veto < 2 ns
 - time resolution:
 - (event-by-event readout) < 1 ns (for 100 μ m sensors)
 - (framing mode) < 10 ns (limited by framing time)
 - max count rate:
 - (event-by-event readout) > 10⁷ ph/sec (whole detector)
 - (framing mode) ~ 10⁸ ph/sec/pixel
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Pilot project

The project is already starting:

- DESY and ESRF will provide the basic funding
 - Sensor and ASIC development done by “external” experts
 - Assembly, readout electronics and software will be developed by DESY and ESRF
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And the JRA?

- Initially (June 97) submitted with the aim of expanding the scope of the project.
- Now (september 97), the JRA is seen as a way of alleviating the manpower effort from DESY and ESRF.

Project budget:

manpower: 970 k€

other: 370 k€

Total: 1.34M€

400 k€ requested for manpower through JRA#5
