# Summary review of the presentations.

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## **3** sessions

- > What are the funding opportunities?
- > What is required / wished ?
- > What exists and what is being worked on ?



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## Various systems in operation

- >SDD based systems
- >Multi-element Ge-systems
- >pnCCD based systems
- CCD and CMOS based systems

- >Bolometers + STJ's for ~ eV resolution range
- > Spectrometers





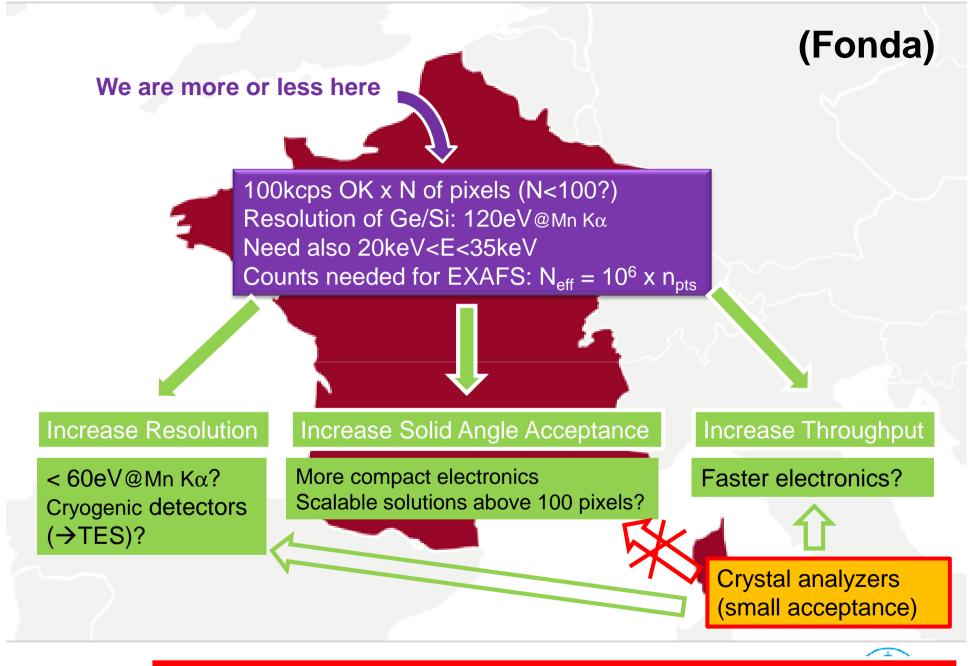
## **Required / wished for**

## (Simionovici)



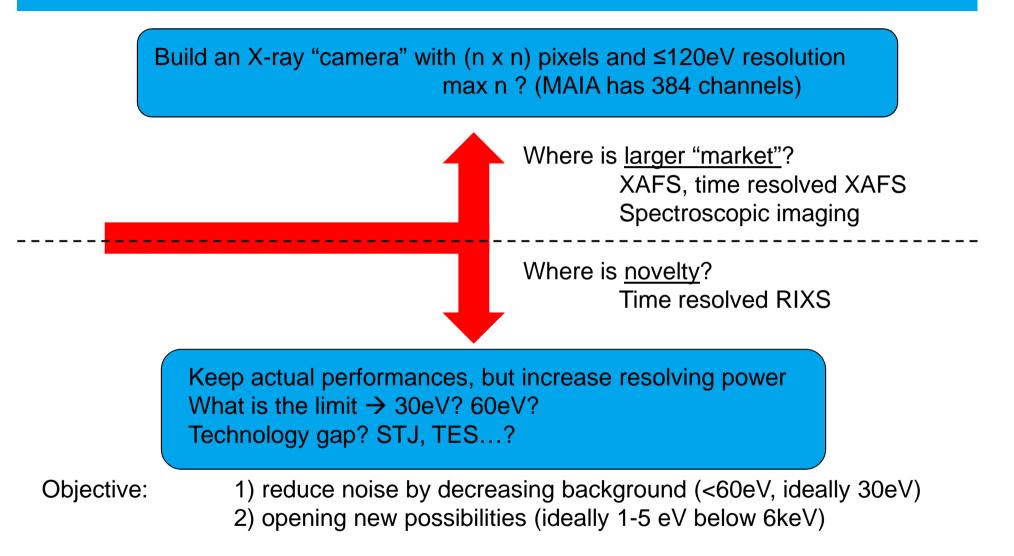
• EDX **PSD**, cheap, demagnified (lenses)





Increase Beamline flux to  $10^{13}$  ph/s  $\rightarrow$  large beam spot or destroy sample

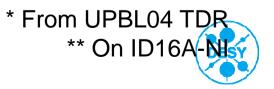
(Fonda) Objective: reduce noise by increasing acceptance, keeping background steady





|                      | <b>Required</b> *                     | Achieved**                    |
|----------------------|---------------------------------------|-------------------------------|
| Energy Range         | 1-20 keV (1-70 keV)                   |                               |
| Energy Resolution    | ~ 140 eV                              | ~ 140 eV                      |
| Integration Time     | 1 ms                                  | 50 ms                         |
| Total count rate     | 10 <sup>7</sup> -10 <sup>8</sup> ph/s | 10 <sup>6</sup> ph/s @ 1µs PT |
| Solid angle coverage | > 1 steradian                         | 0.5-0.9 sr                    |
| Price                | ?                                     | Known                         |

- Compatible with confined space and environment of nanoprobes
- Robust software well integrated with motion control



(Cloetens)



- New pulse processor
  - Cross talk correction
  - Coincidence detection
- Detector head miniaturization



# **Preliminary requirements list** (Fiorini) (contributions are welcome!)

- > Energy range: 0.2keV 25keV (Si detection region)
- > Energy resolution vs. counting rate:

i) best resolution (e.g. 123eV@Mn-K $\alpha$ ) at moderate rates

ii) maximized throughput (e.g. ~ 1Mcps/ch.) with <150eV

- > Geometrical constraints:
  - fitting synchrotron exp. chamber (e.g. 60 mm max. flange inner diameter)
  - scattering minimization ("90° geometry")
  - maximize count rate (detector close to the sample, e.g. 1cm)
- > Peltier cooler, better if operations close to room T
- > Operations in vacuum or in air (with window)
- > Modularity, scalability, easy replacement of units



## What is required / wished for ?

#### > Photon Energies:

- work at higher energies: > 25 keV
- > Count-rates
  - count-rates up to 1Mcps per element; keeping the energy resolution close to fano-limit. Note: Ultimate Storage Rings will boost the flux on sample by ~ 100!
- > Geometries:
  - special geometries (annular)
  - ~1-2 sterradians angular coverage
  - smaller detector heads (get closer to sample in complicated environment)
- Fast and user-friendly data analysis software
- > Better than fano energy resolution



## **Ongoing developments:**

- 1. Optimization of existing systems and technologies:
  - Multi-element Germanium (Cross-talk correction)
  - SDD's with and without integrated FET
  - MAJA-II (not shown)
  - Electronics
  - • •
- 2. New systems or technologies:
  - SDD's without integrated FET (ARDESIA, simpler sensor, more performing ASIC)
  - DePFET active pixel cameras (briefly mentioned)
  - · · · · ·



## **Questions for discussions:**

### Questions:

- How far do these developments meet the requirements ?
- Are there ideas for future developments ?
- How do we deal with the energies above 25 keV? Is germanium a solution? What would be needed to get this working ?
- What about a consorted effort on software for data handling, data processing, data analysis and result presentation ?
- Funding:
  - H2020. Is this attractive? Is it enough ?
  - Are there (other) National funding opportunities ?
  - Can facilities put (enough/significant) money on the table ?

The challenges are common to many SR facilities.

