



Perovskites Quantum Dots based Broadband Detectors

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- **Motivation**
 - **How to build an X-ray detector**
 - **Project's goals**
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Motivation



Hand mit Ringen (Hand with Rings): a print of one of the **first X-rays by Wilhelm Röntgen** (1845–1923) of the left hand of his wife Anna Bertha Ludwig. It was presented to Professor Ludwig Zehnder of the Physik Institut, University of Freiburg, on 1 January 1896.

Motivation

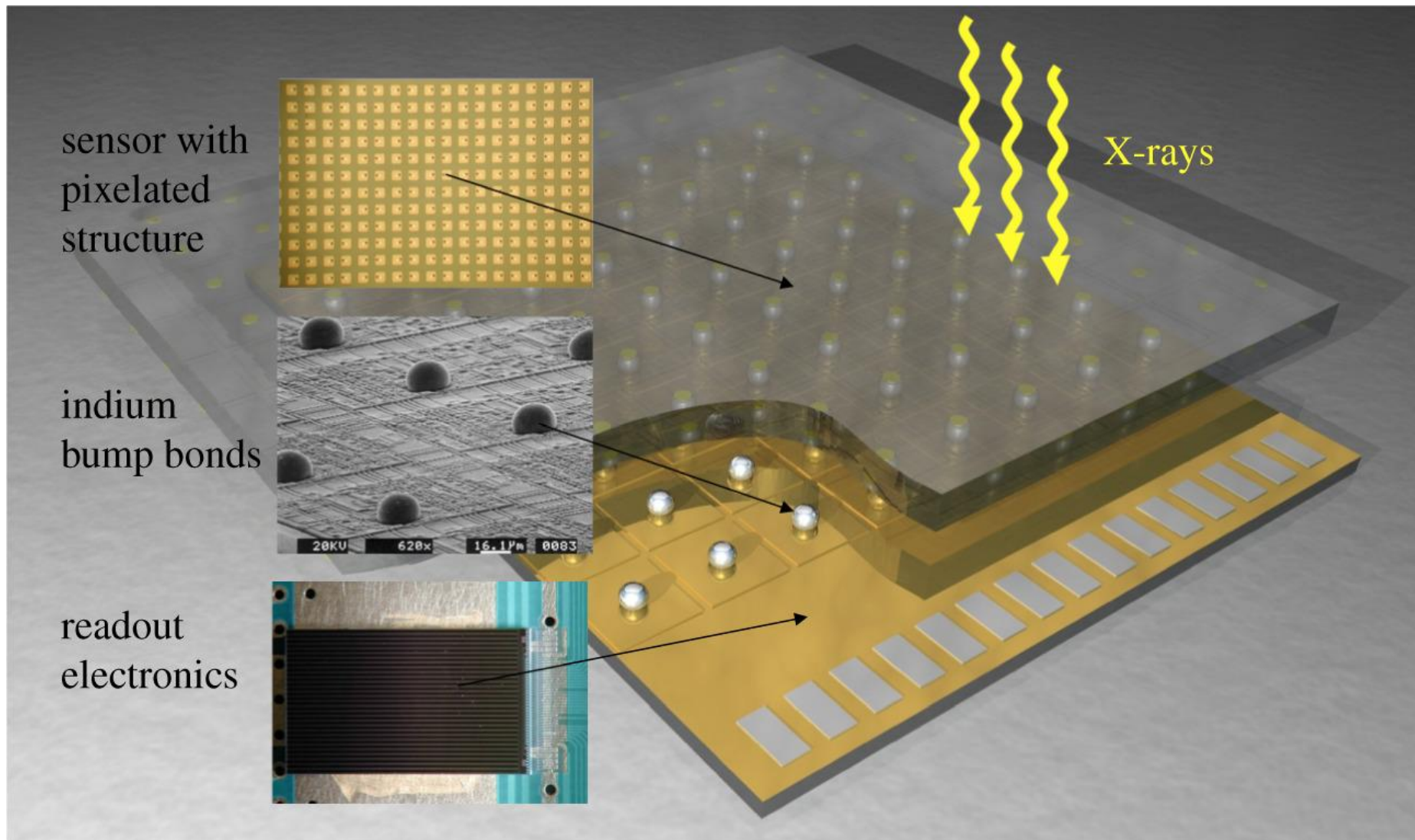


PILATUS3 CdTe detector series for high-energy diffraction and imaging applications



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The technology behind direct-converting X-ray detectors



The characteristics of the most suitable X-ray absorber

I. High absorption cross-section

- requires the use of heavy elements

II. Ability to separate and extract electron-hole pairs

- requires band-gap, i.e. semiconductor

III. Thin thickness

- enables cost-efficient production and mechanical flexibility

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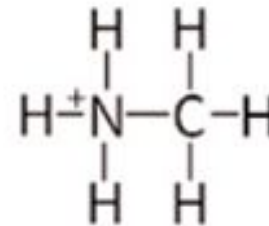
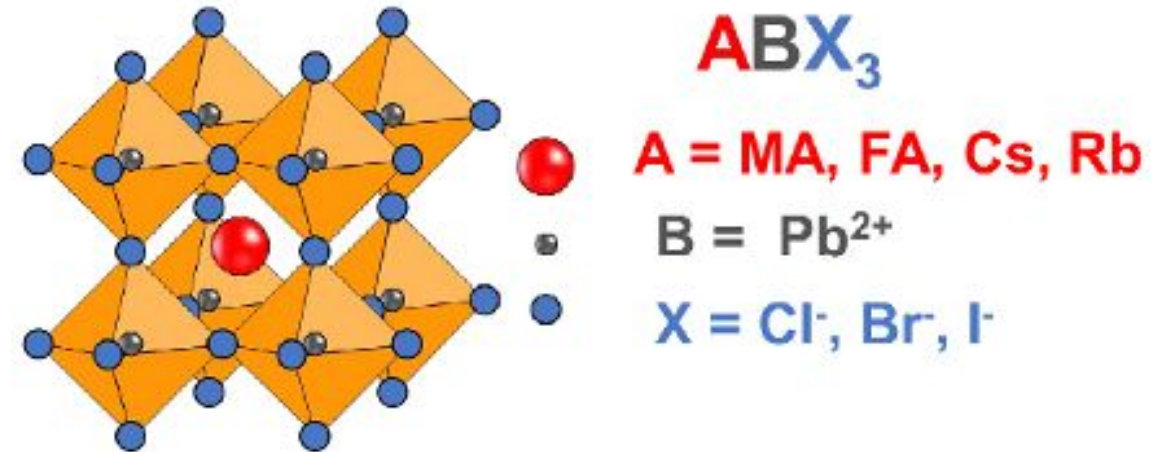
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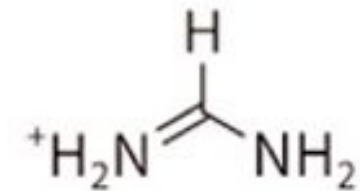
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Metal halide perovskites



Methylammonium (**MA**)

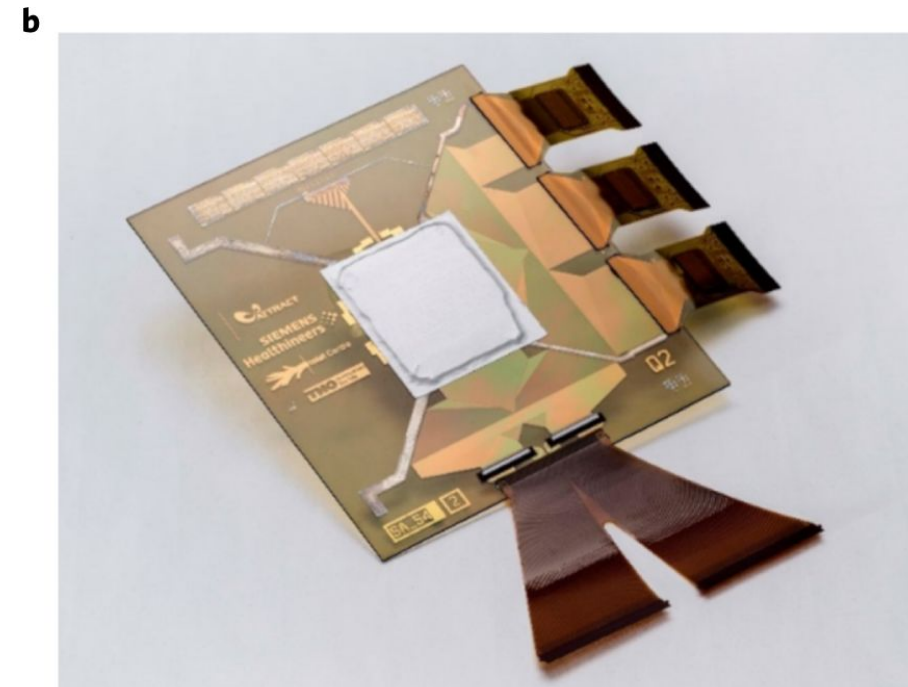
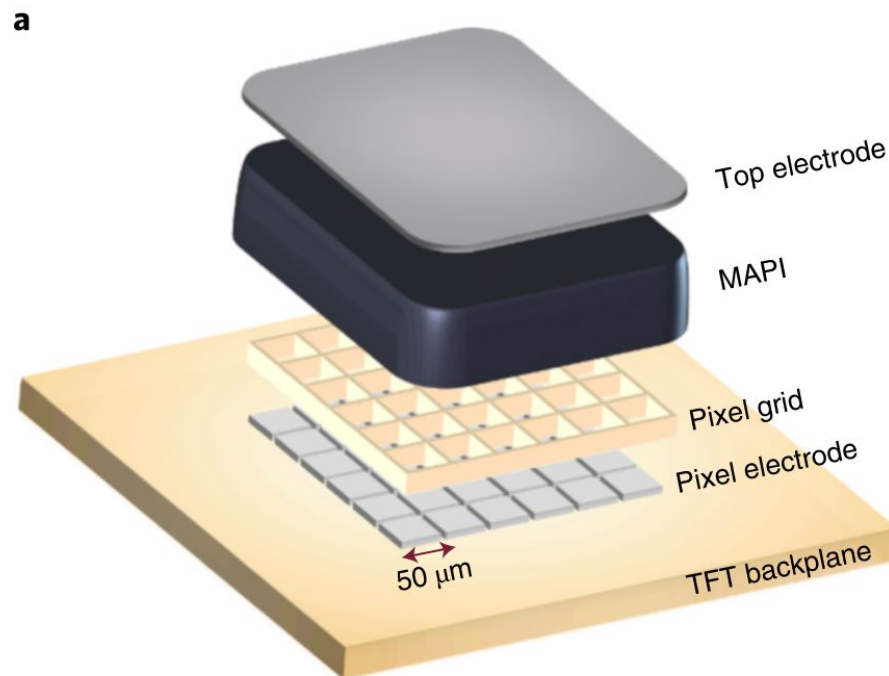


Formamidinium (**FA**)



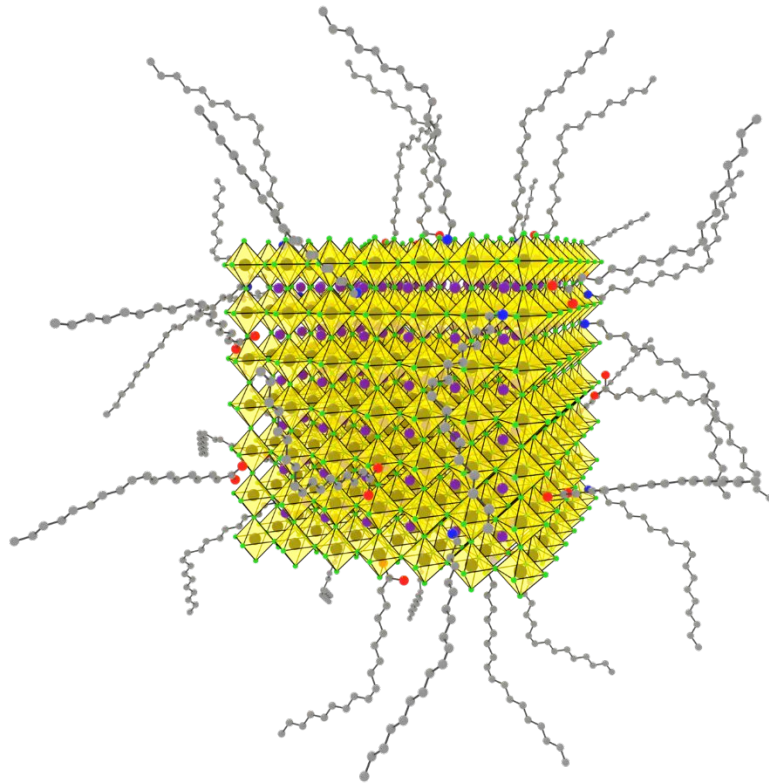
OPEN

High-sensitivity high-resolution X-ray imaging with soft-sintered metal halide perovskites



Project's goals

The main objective of the project is to study the **perovskite QDs (PeQDs)** as **an active medium for direct broadband detectors with high sensitivity in the X-ray spectral region.**



Advantages PeQDs

Easy and cost-effective processing

Possibility to form flexible thin-film

Inherit many advantages of 3D
perovskites, i.e. band-gap, large
cross-section etc.

● Pb

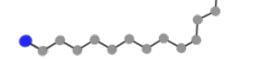
● Cs, MA or FA

● Cl, Br, or I

OA



OLA



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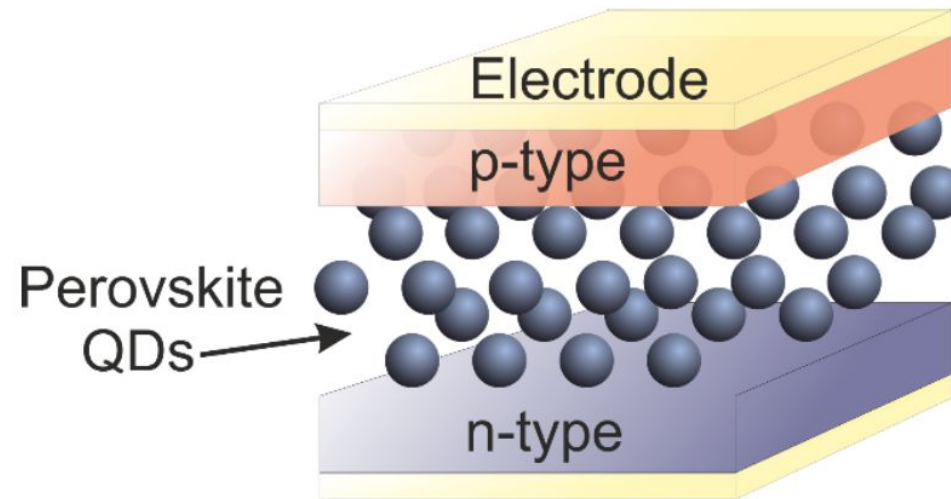
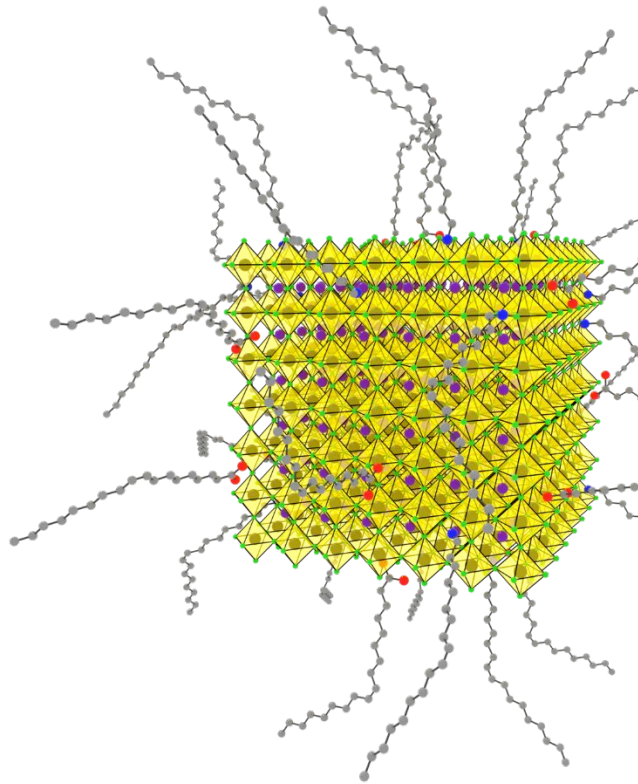


Figure. 1. Schematics of PeQD-based detector. PeQDs are sandwiched between the p- and n-type transporting layers. The yellow layers represent the conductive layers composed of low-dimensional materials, including graphene, CNTs, Au QDs, etc.

st-effective processing

form flexible thin-film

advantages of 3D
i.e. band-gap, large
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V4 – Japan Consortium

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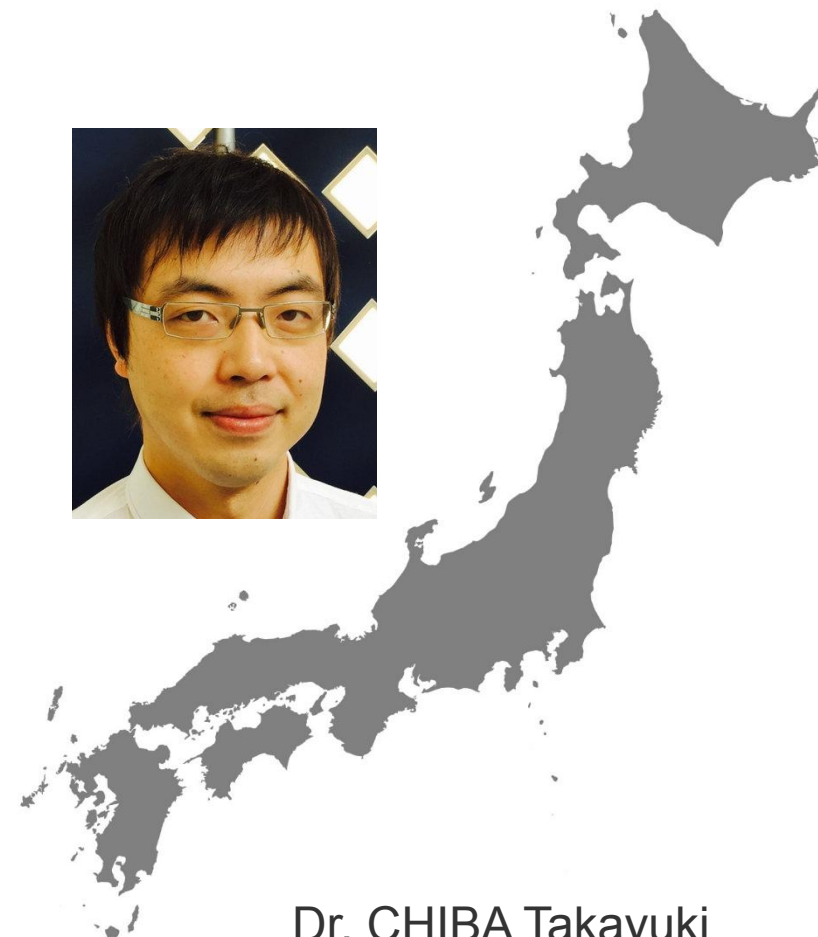
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