



IIT MADRAS

Indian Institute of Technology Madras

Technology Transfer Office
TTO - IPM Cell



Industrial Consultancy & Sponsored Research (IC&SR)

DUAL MODALITY CAMERA FOR X-RAY AND FLUORESCENCE IMAGING SYSTEM

IITM Technology Available for Licensing

Problem Statement

- It is noted that hybrid imaging systems used with radiations such x-rays and visible light in the application area such as pre-clinical studies, like imaging mice.
- Non-invasive in-vivo imaging of these mice over time provides important bio-markers for **pharmaceutical research & development**.
- Further, commonly used one of the hybrid imaging system consists of an **X-ray micro-CT scanner & an optical fluorescence imaging scanner**, which are **separate and placed** in such a manner that there is no interference during imaging.
- Based on literature survey, it is found that **expensive flat panel detectors (FDP)** are used for X-ray imaging & highend cooled CCD cameras are used for capturing the fluorescence signal, wherein said prior arts include a few issues like high cost & too slow for imaging fast processes.
- Hence, it is needed a **device** to mitigate above challenges & provide **efficient solution** in **cost-effective** manner.

Technology Category/ Market

Technology: Dual Modality Camera;
Industry: Hospitals, Diagnostic Imaging Centres; **Applications:** Cardiology, Oncology;
Market: The global hybrid imaging market size is projected at a **CAGR of 4.5%** during period of 2019-**2026**.

Intellectual Property

IITM IDF Ref:1460
Patent Application No. 201641030379

TRL (Technology Readiness Level)

TRL- 4, Proof of Concept, tested & validated

Research Lab

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 Dept. of Engineering Design,

Technology

- Present invention describes an **apparatus** for imaging an object to be imaged, wherein the apparatus is an X-ray detector.
- Said apparatus comprises of
 1. **an electromagnetic radiation source;**
 2. A **photo-sensitive means** to convert into visible light the radiation passing through the object to be imaged;
 3. a **deflector** is deflect the visible light to a camera with a means to capture and record the image optically coupled to it.
- Said **Photo-sensitive means** is a **scintillator made of Casium Iodide doped with Thallium**.
- Further, said invention discloses an **X-ray detector** that perform **high resolution optical imaging** which is achieved using **CsI scintillator**.
- Moreover, scintillator screen is coupled with a **high frame rate CMOS camera**.
- Facilitates **multi modality imaging** with a single camera.

Key Features/Value Proposition

❖ **Technical Perspective:**

- The camera can be used in a system to perform **Soft X-ray Radiography, X-ray CT, Fluroscopy, UV, Visible and NIR optical imaging**.
- **Non-trivial imaging device** that performs **X-ray & optical imaging alternatively**.
- **Motorized scintillator** helps in positioning the component through software.
- The **Auto-focus detector module** integrated with the **X-ray/visible source** helps to perform dual imaging at different magnifications.

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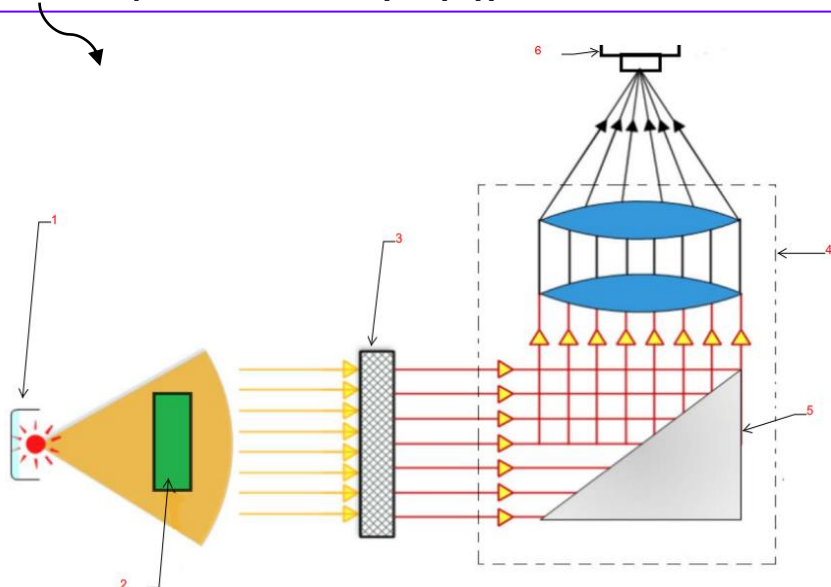
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Images of Claimed Apparatus of X-ray detector

Fig.1: Illustrates X-ray detector that uses inorganic scintillator cesium iodide doped with thallium (CsI(Tl)).

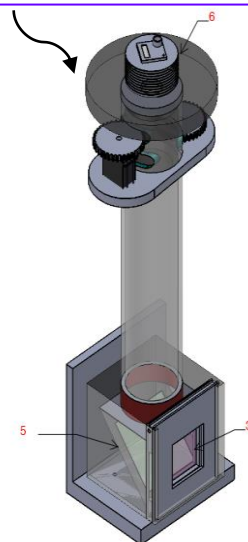


Reference

No. :

- 1.A Source;
2. An object;
- 3.A scintillator lens;
4. A box like frame;
- 5.45° polished mirror surface;
- 6.CMOS camera;

Fig.2: Illustrates 3-D view of said Apparatus



Key Features / Value Proposition

❖ Industrial Perspective:

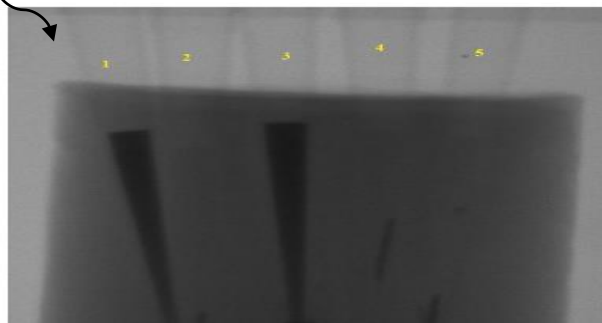
1. **Cost-effective and compact in size.**
2. **Large area scintillators are readily available** & are an order of **magnitude cheaper than** flat panel detector systems for X-ray imaging.
3. **Commercial CMOS cameras** are used in the proposed system are **cheaper**.
4. Provides **High temporal resolution** in a laboratory setting.
5. **Economic hybrid system** for X-ray & fluorescence imaging.
6. This setup has applications in **small animal fluorescence imaging**.

❖ User Perspective:

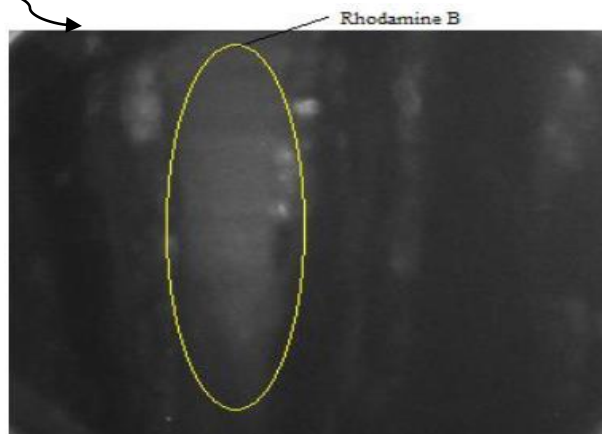
1. Ensures **more reliable & user-friendly apparatus**.
2. The apparatus includes a **motorized aperture and focus mechanism** enabling **easy set-up** & use when switching between **x-ray imaging** and **fluorescence imaging mode**.

Experimental Images

Image of X-ray projection shown herein:



Fluorescence image of Rhodamine B shown herein:



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