# Replicating Open Science Hardware MRI

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**Open Source Hardware (OSH)** is hardware whose design is made **publicly available** so that anyone can <u>study, modify, distribute,</u> <u>make, and sell the design</u> or hardware based on that design.

<u>Open Source Hardware Definition</u> maintained by the Open Source Hardware Foundation

The "open source hardware" logo proposed by <u>OSHWA</u>, one of the main defining organizations



#### **The Open Science Movement**







Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

# <u>Magnetic</u> <u>Resonance</u> <u>Imaging</u> (MRI)

- Magnets and radio waves create detailed pictures of the insides of a person
- Crucial for diagnosing a wide range of medical conditions, from tumours to injuries
- No harmful radiation



**Problem** 



Solution

Timely access is crucial for diagnosing injuries after road accidents



1

Rural areas often lack MRI facilities due to cost limitations



X-rays have limitations in diagnosing soft tissue injuries.



Expensive, scarce, and not easily accessible



Limited access to scientific equipment in Southeast Asia.



Help in availing the equipment at the Primary health care centers



Easier transportation to accident sites or rural locations



Improved Diagnostics of injuries, particularly TBI (Traumatic Brain Injuries).



Makes MRI technology more accessible to low-resource settings.



open-source scientific equipment and tools

# **OSI<sup>2</sup> ONE Prototypes and replications**





# **KEM Hospital**

Established in 1912 (111 years) -

Largest 'not-for-profit' Hospital in Pune -

550-bedded, tertiary-level teaching `institution -

Serves Pune **urban & rural** as well as patients from - neighbouring states



## **Our Research Centers**





ADINE REPORT

- KEMHRC, Pune started in 1973
- runs two research centres studying health in rural Maharashtra (India), covering **1.58 million** people
- The Vadu Rural Health Programme (VRHP) tracks data of **1,80,000** individuals over two decades.
- The Community Health Research Unit (CHRU) focuses on Rural and Tribal areas of Pune



Late Dr. Banoo Coyaji



# **OSI<sup>2</sup> Overview**



#### Magnets

static magnetic field  $B_0$  of ~50 mT

## **B0-shimming**

reduces magnetic field inhomogeneities to improve image quality

#### In-vivo images

3D TSE 2x2x3mm<sup>3</sup> resolution and a total acquisition time of 6min



ISMRM Workshop Low-Field MRI 2022, OSI<sup>2</sup> ONE, Lukas Winter

## 3d Print

Built using CNCs, laser cutters

## Amplifier

RF and gradient power amplifiers

The current material cost **20,000€** 

## **Our team**









## Mr. Tapas Kumar Mohanty

## Mr. Ratiranjan Senapati

## Ms. Uddhavi Kand

#### Mr. Tathagata Bhattacharjee

Overall coordination and workflow follow-up, concept note preparation and publication M.Tech in Communication System Engineering – Contributing the Hardware part M.Sc. In Health Sciences -Looking after the **Human Centric Approach**  MBA (IT)-Contributing to the **Software Part** 

# **Open Science in Action**



#### **Gain experience**

Mercury is the closest planet to the Sun



#### **Foster Development**

Support the LIMCs with adaptable MRI designs



#### **Ethical practices**

Ensuring regulatory standards



#### **Collaborative Effort**

social scientists, medical professionals, and engineers

## **Milestones**



## **Leveraging learnings from Open Source Hardware**





"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world."

-Louis Pasteur

# Thanks

Join us in exploring similar initiatives and contributing to the growth of open science hardware in Southeast Asia and beyond!

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