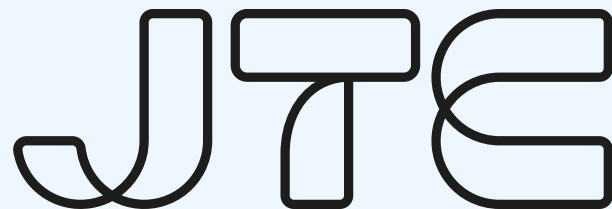




**open
source
imaging**

—



**JUST
TRANSITION
CENTER**

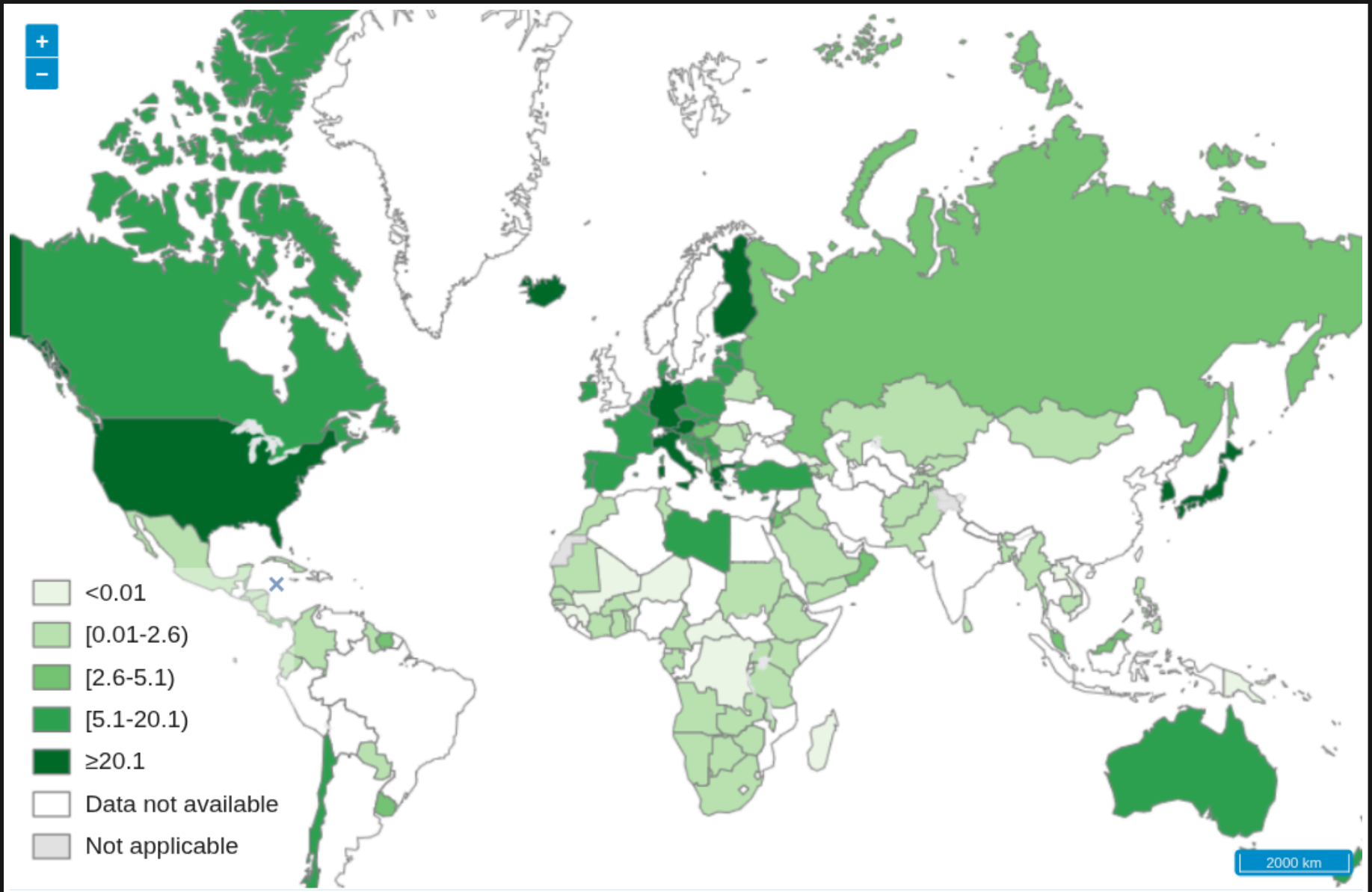
Who should own healthcare?

Who should own healthcare?

How far can we take our claim?



MRIs/Mio. 🧑

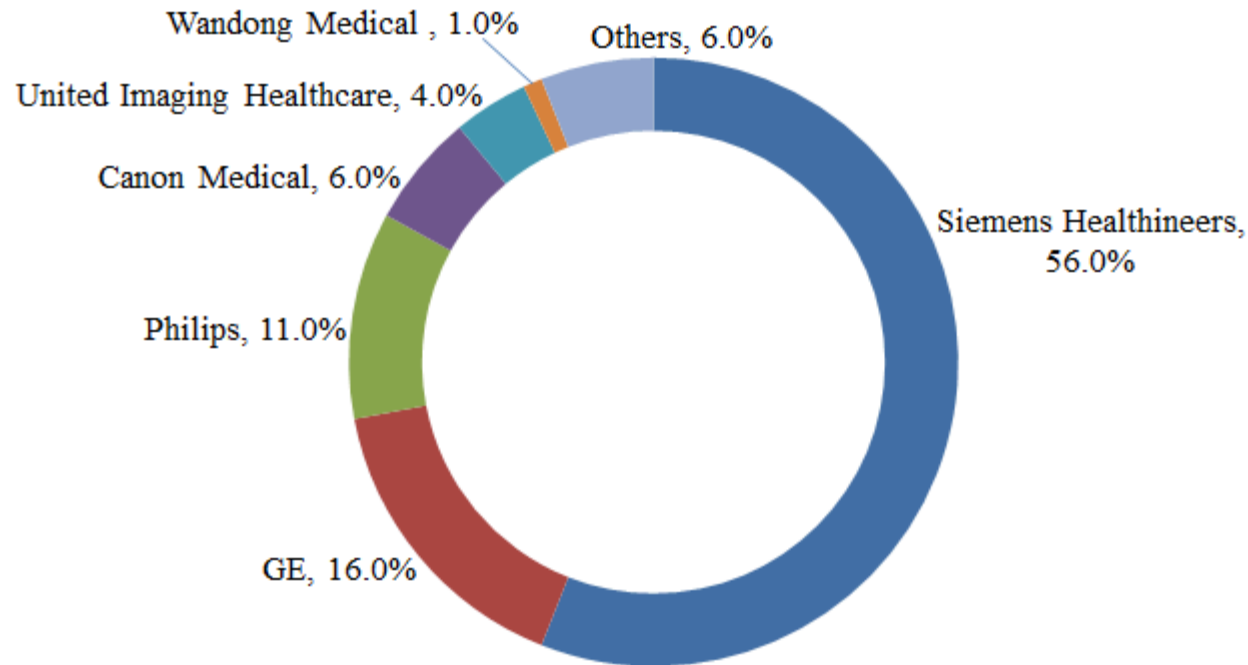


Country	MRI per Million
Netherlands	11.85
Germany	34.24
USA	40.11
Niger	0.00
Ghana	0.23

The MRI Oligopoly

with a ~45 year old patent pool

Global MRI Market Share By Vendors (2021)



**How about making this
technology open-source?**

and so it belongs to all



OSI² ONE



System Specifications

- $B_0 = 50mT \rightarrow$ low-field system
- $\emptyset = 30cm \rightarrow$ scan head & extremities
-
-

System Specifications

- $B_0 = 50mT \rightarrow$ low-field system
- $\emptyset = 30cm \rightarrow$ scan head & extremities
- mobile system
-

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(rebuild in Uganda ≈ 24.000 €)

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(rebuild in Uganda ≈ 24.000 €)

open source

<https://gitlab.com/osii/>

Applications

yet to be evaluated

Goal: clinical in-vivo imaging
e.g. in rural areas for remote diagnoses

-
-
-

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yet to be evaluated

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e.g. in rural areas for remote diagnoses

lower hanging fruits:

-
-
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-
-

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Goal: clinical in-vivo imaging
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lower hanging fruits:

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- industrial (e.g. scanning fertilized eggs)
-

Applications

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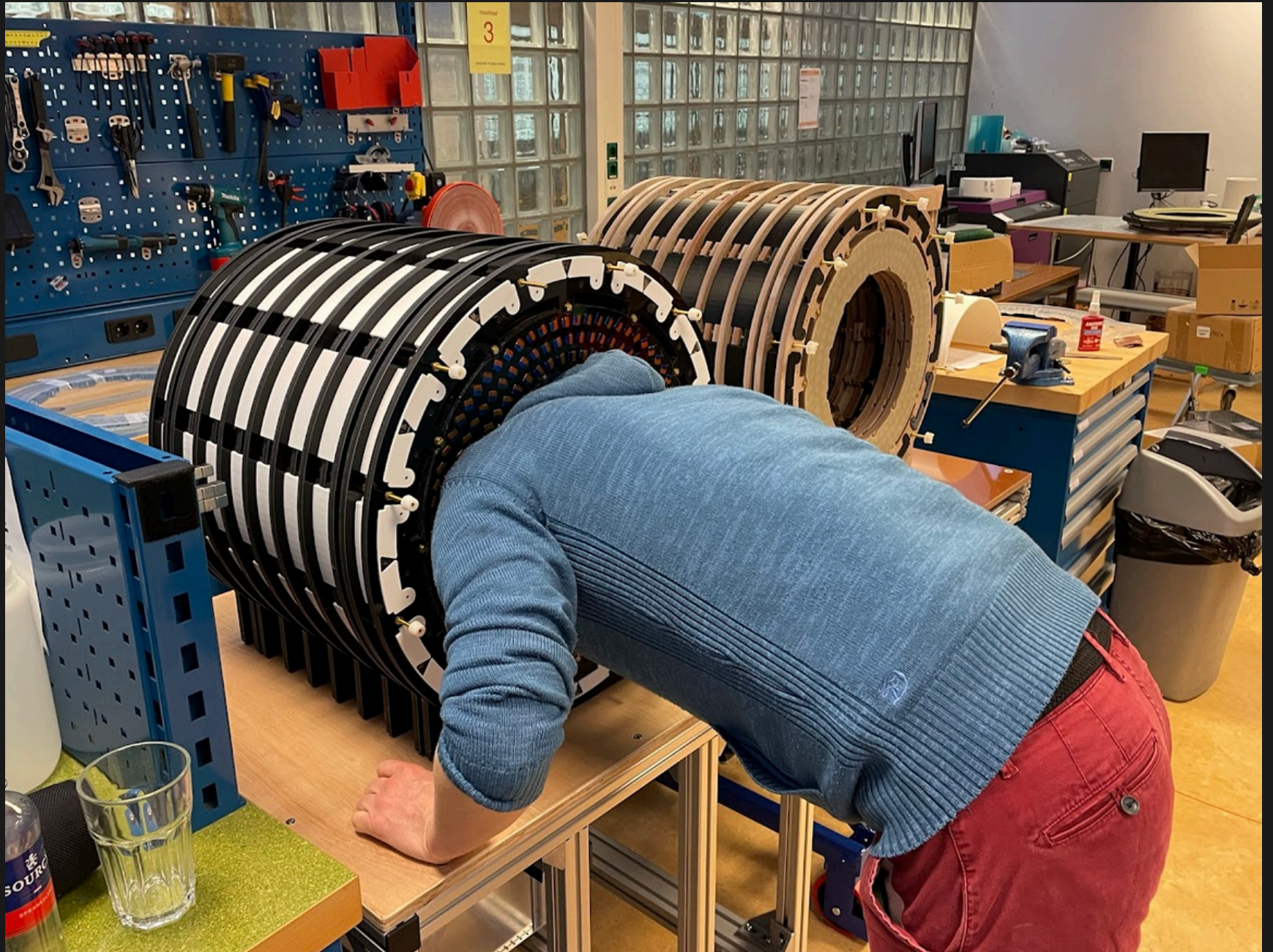
Goal: clinical in-vivo imaging
e.g. in rural areas for remote diagnoses

lower hanging fruits:

- veterinary medicine
- industrial (e.g. scanning fertilized eggs)
- research & education
(MRI scans in the seminar room!)

Prototyping Platform: OSI² Mini



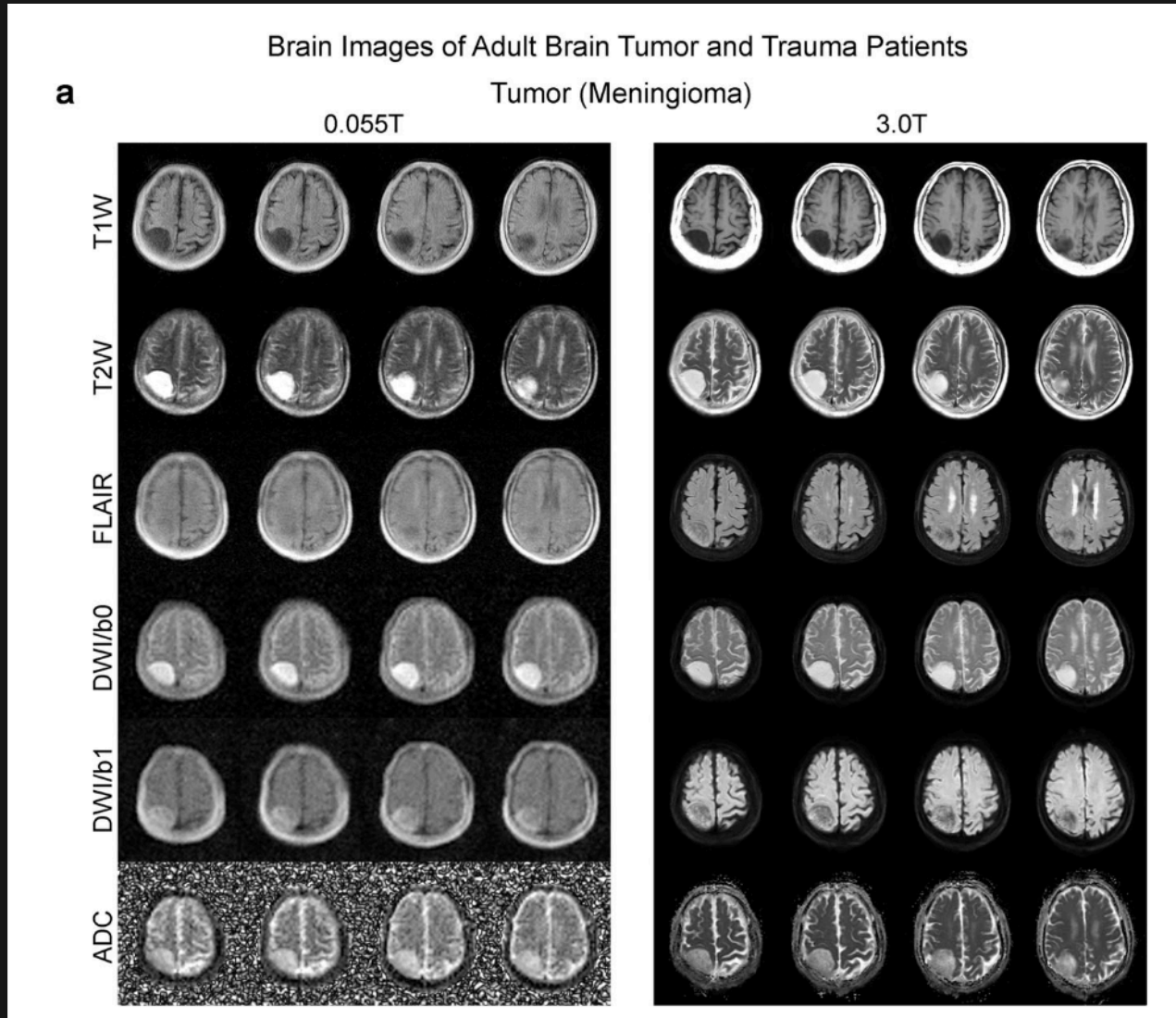


Pictures!

can you see anything yet?

it's low-field, right?

low-field vs. high-field



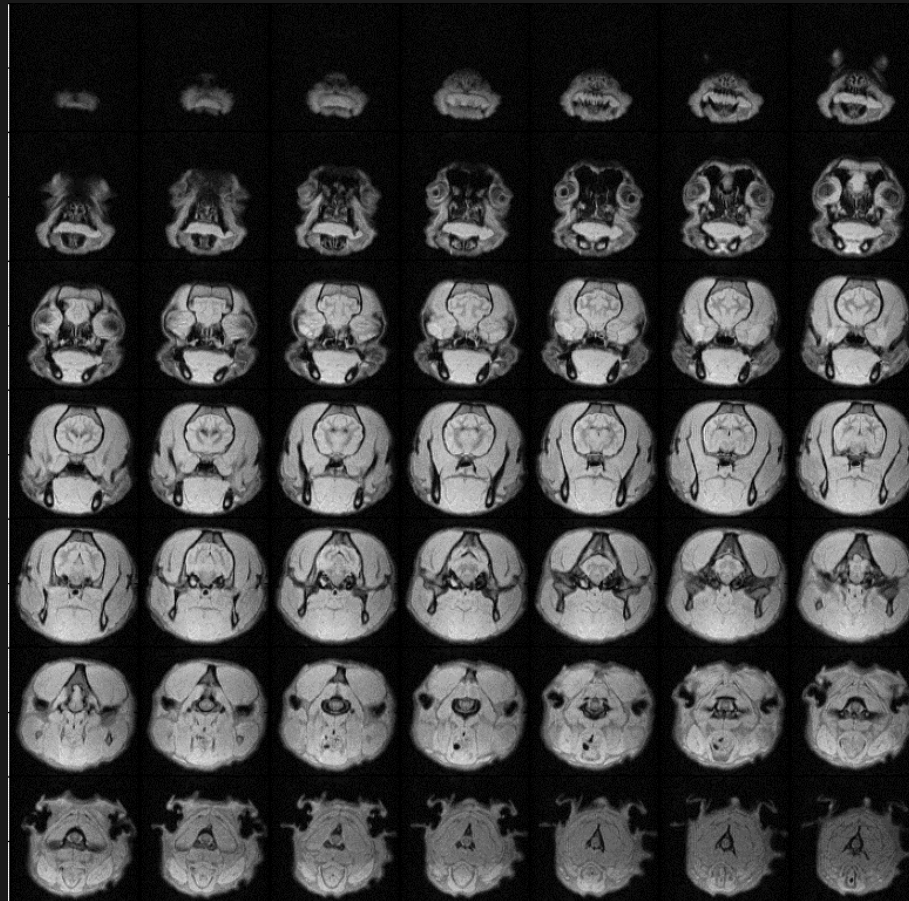
OSI² ONE Images

ready for your knee:



OSI² ONE Images

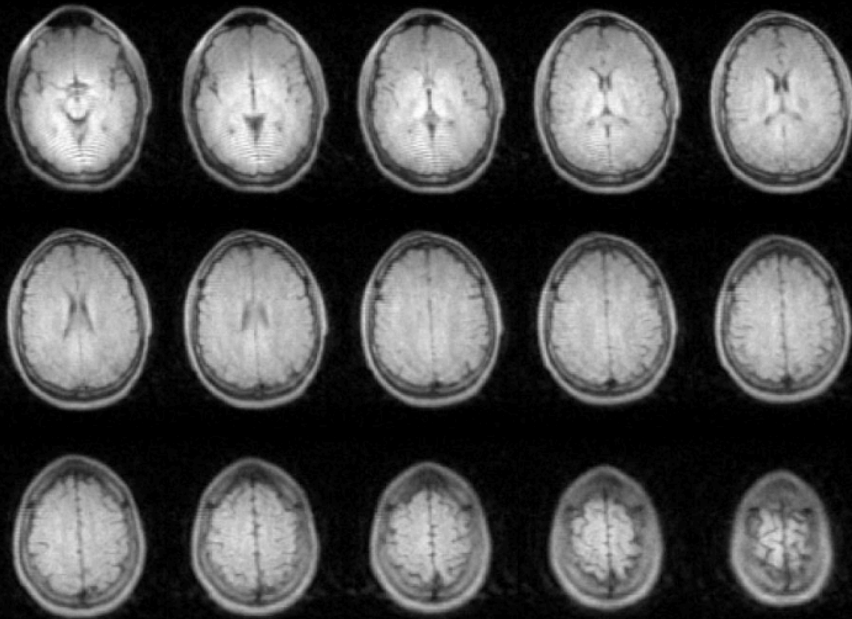
...or (dead) dogs:



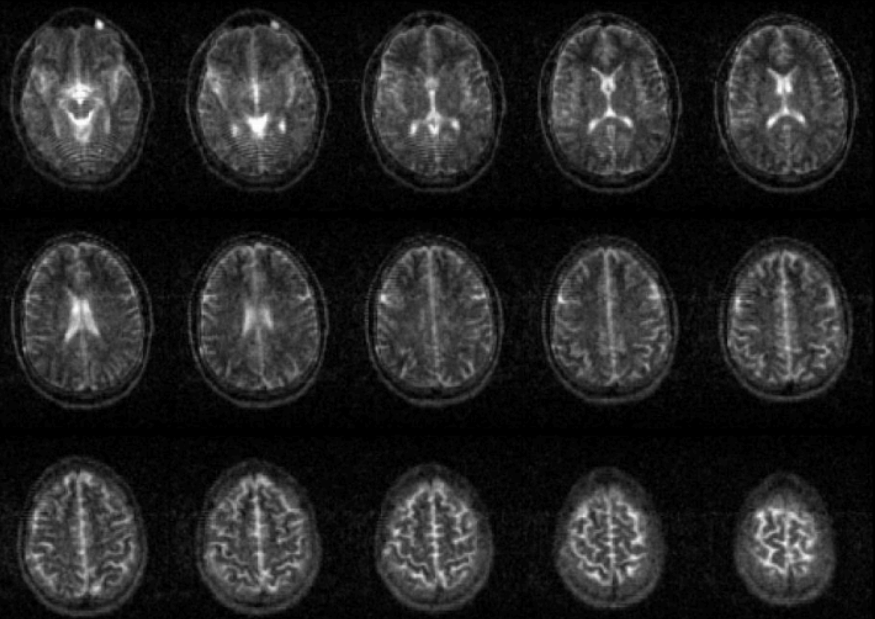
OSI² ONE Images

and developer brains:

T1 weighted 3D TSE
(5 min 52 sec scan time)



T2 weighted 3D TSE
(6 min 28 sec scan time)



Resolution (RO, PE1, PE2): 2 x 2 x 5 mm
Dimensions (RO, PE1, PE2): 120 x 100 x 42 voxel
Field of view (RO, PE1, PE2): 240 x 200 x 210 mm

Schote D., et al., A versatile Console for
Advanced Low-Field MRI, **ISMRM, 2024**

How does it work?

Why is it so cheap?

Magnet

-

-

Magnet

- superconductors

-

Magnet

- superconductors, liquid helium

-

Magnet

- superconductors, liquid helium + infrastructure

-

Magnet

- superconductors, liquid helium + infrastructure
→ expensive, immobile, hard to replicate

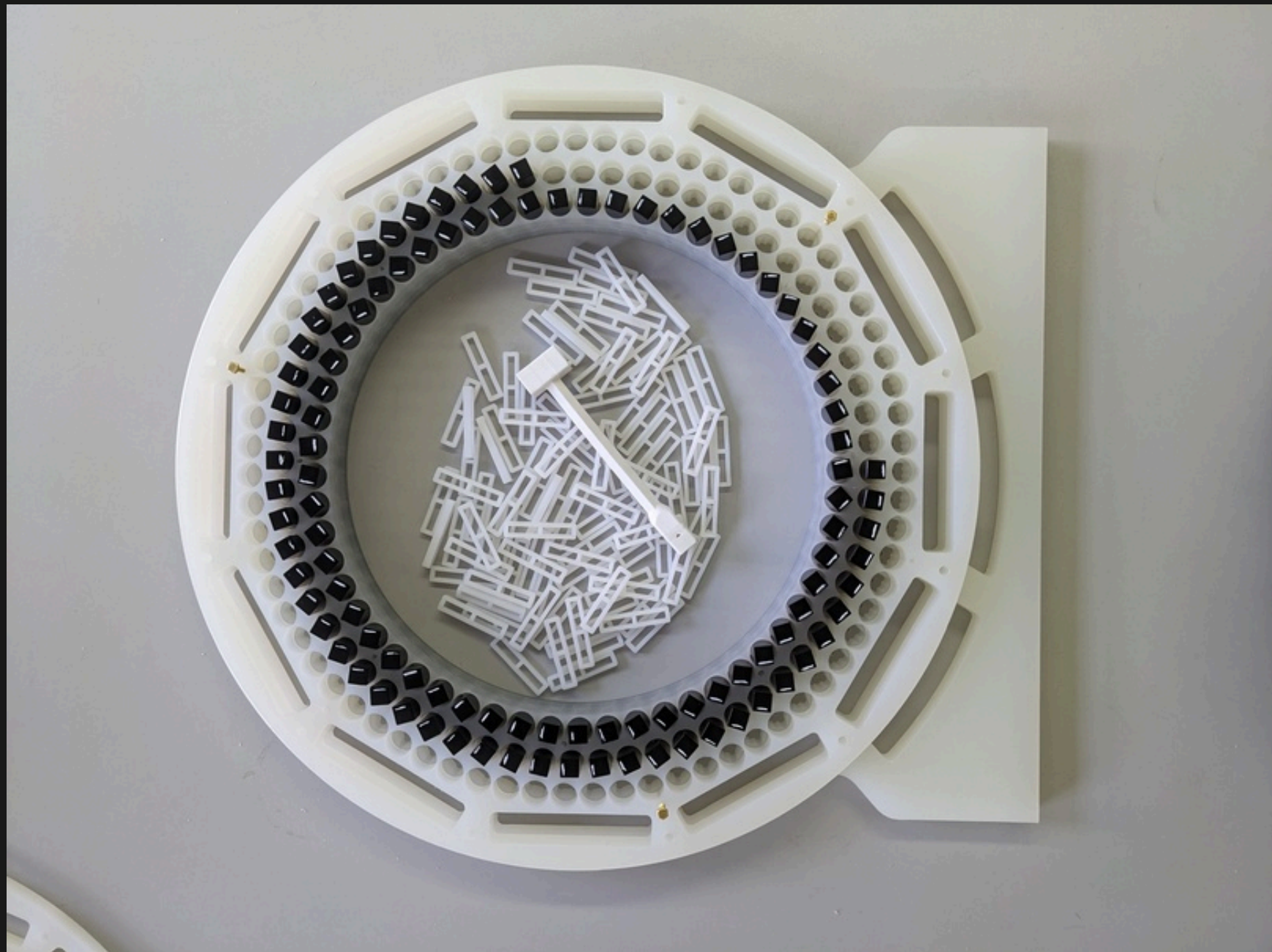
-

Magnet

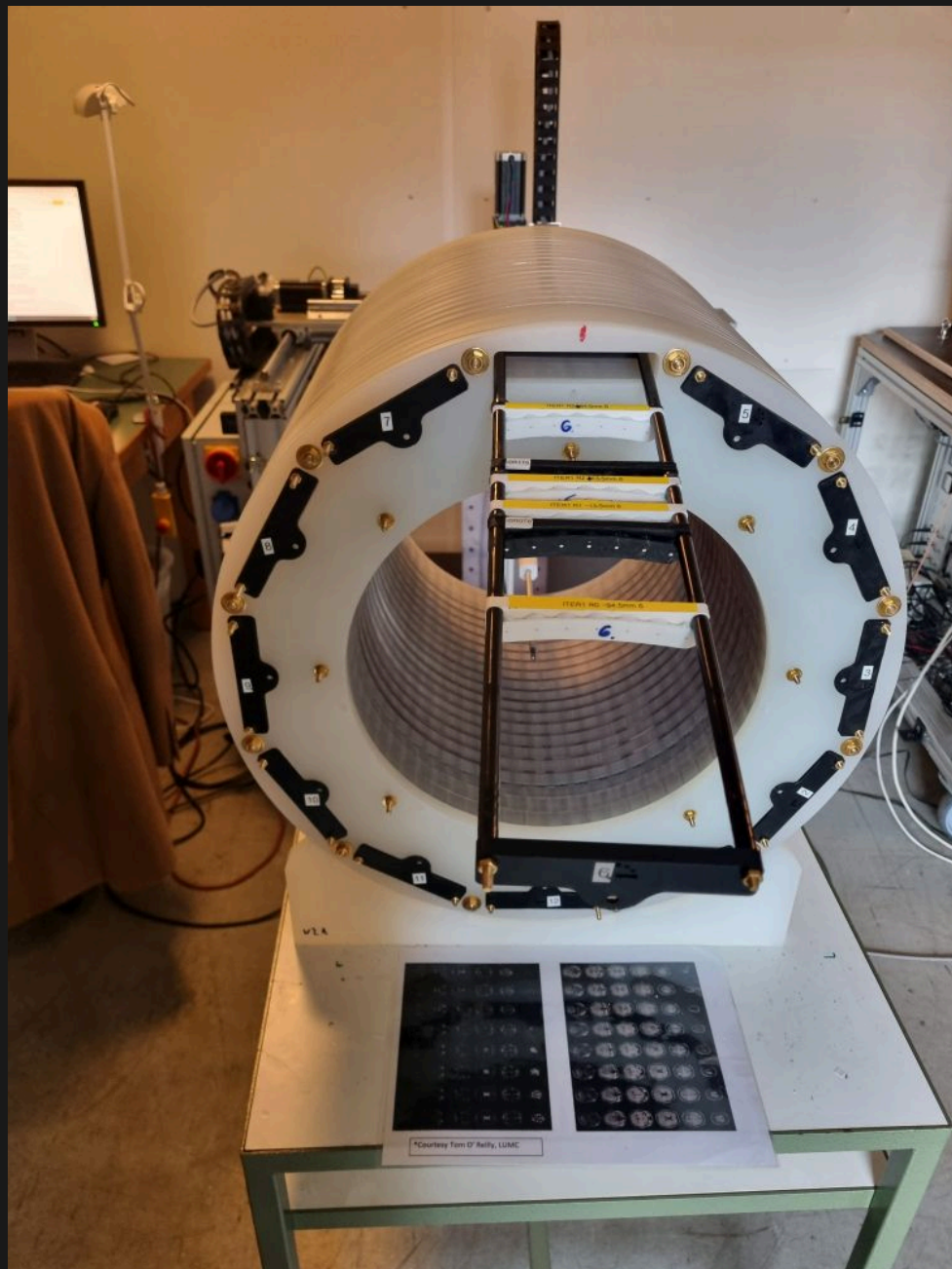
- superconductors, liquid helium + infrastructure
→ expensive, immobile, hard to replicate
(especially in LMIC settings)
-

Magnet

- superconductors, liquid helium + infrastructure
→ expensive, immobile, hard to replicate
(especially in LMIC settings)
- instead: permanent magnets
in Halbach (/ROME) array

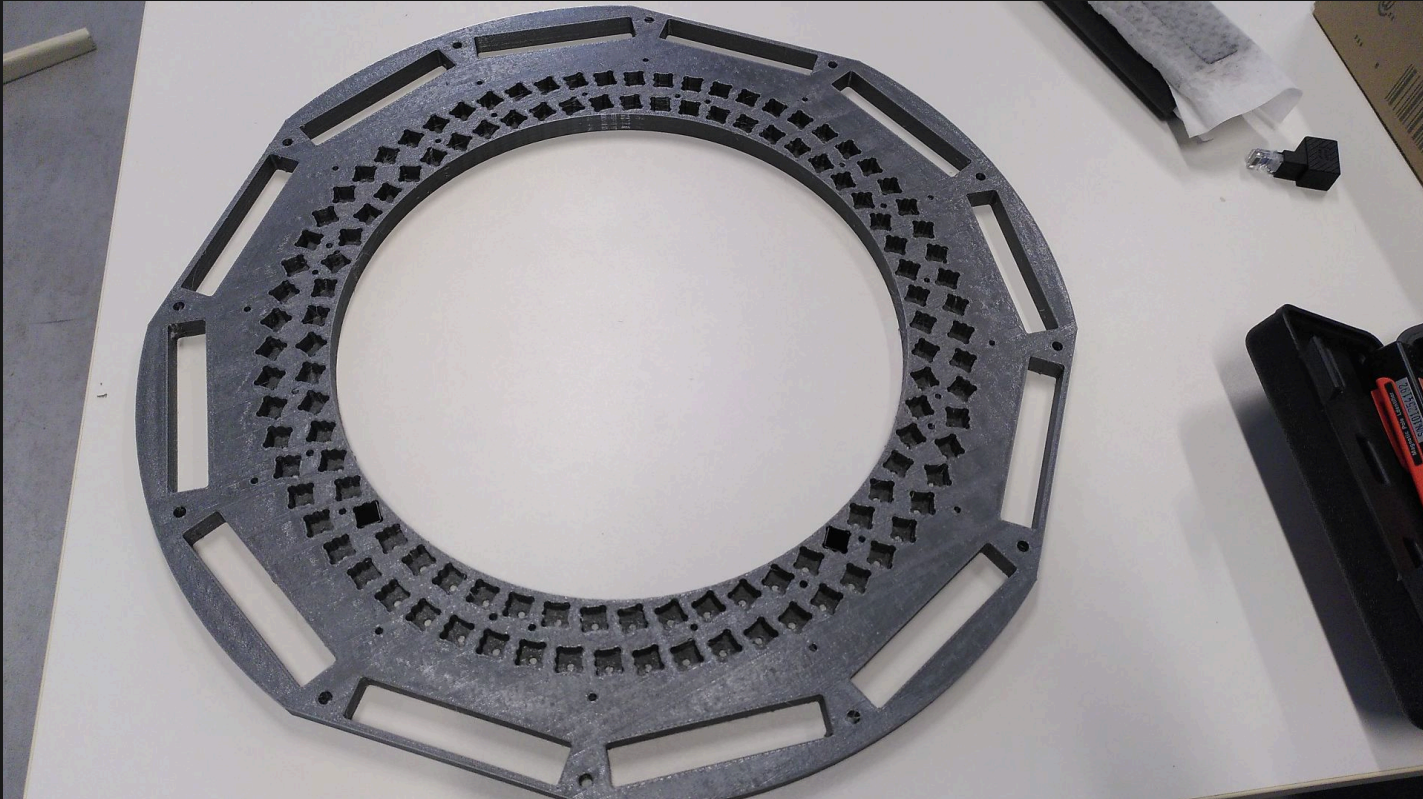


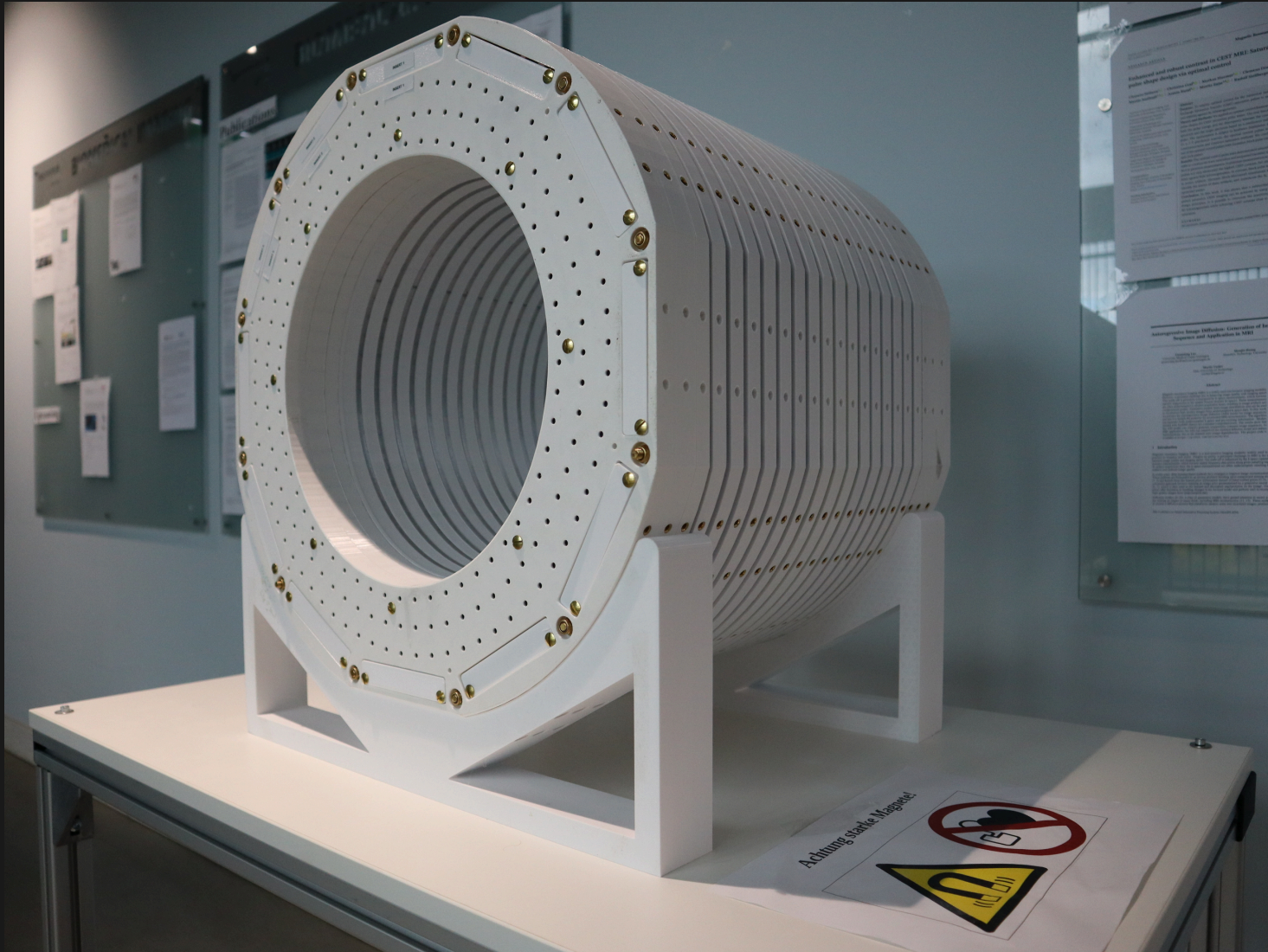




TU Graz cut the costs by 90% 🤯

by 3D printing the rings on a DIY printer





I want more!

Geek peek on the other modules:

OSI² Build Workshop 2023

History

How could this happen?

Airing the Idea

“What if MRI Scanners Were Open-Source?”
(2016 @ISMRM)

-

-

Airing the Idea

“What if MRI Scanners Were Open-Source?”
(2016 @ISMRM)

Reaction:

- “MRIs can’t be done open-source; far too complex.”

-

Airing the Idea

“What if MRI Scanners Were Open-Source?”
(2016 @ISMRM)

Reaction:

- “MRIs can’t be done open-source; far too complex.”
-VS.-
- “True! MRIs should be done open-source, because of the complexity.”

Forming the Hard Core

-

-

-

Forming the Hard Core

- get the pioneers together
(communication platform)
-
-

Forming the Hard Core

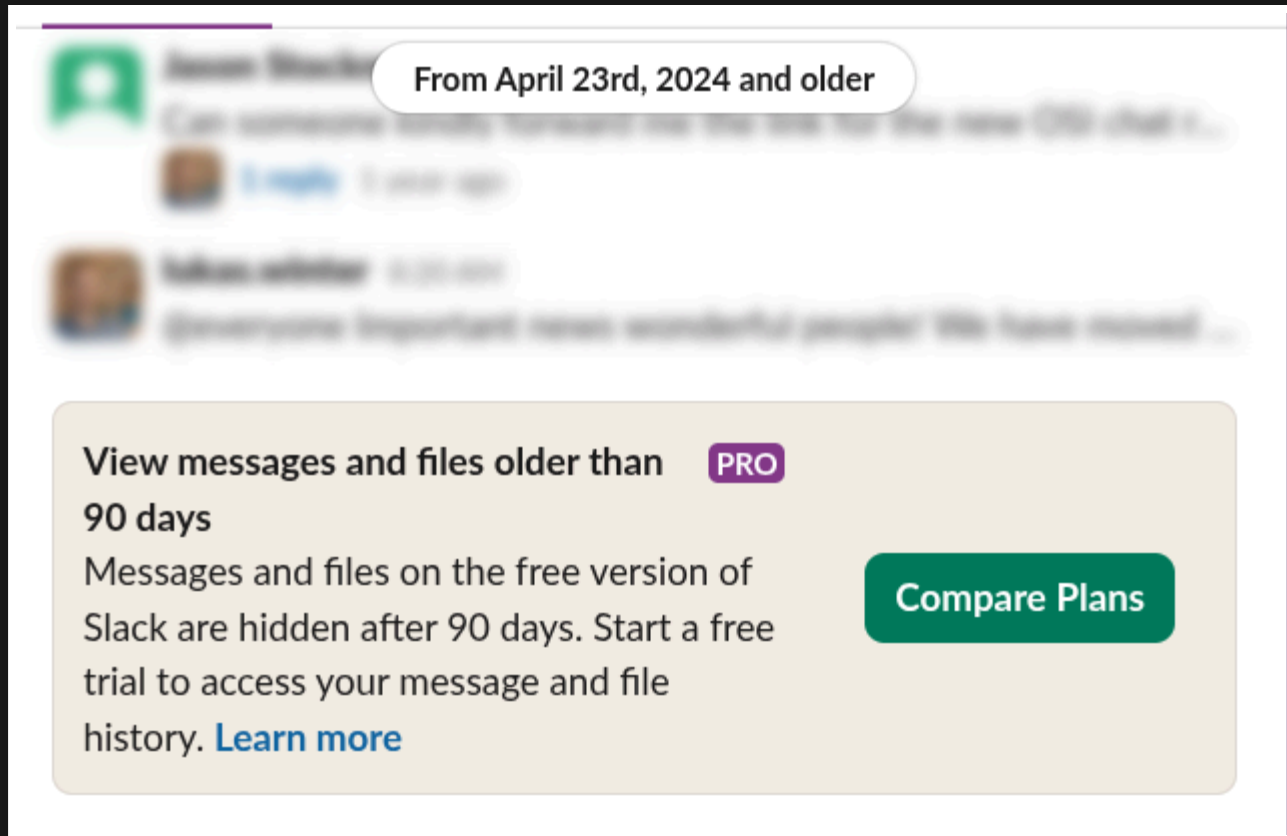
- get the pioneers together
(communication platform)
- start with essential, but controllable projects
(documentation platform)
-

Forming the Hard Core

- get the pioneers together
(communication platform)
- start with essential, but controllable projects
(documentation platform)
- make the ecosystem visible
(PR)

Slack

Slack



The screenshot shows a Slack channel interface. At the top, a message history cutoff is displayed: "From April 23rd, 2024 and older". Below this, there are two blurred messages. The first message is from a user with a green profile picture, and the second is from a user with a brown profile picture. Below the messages, there is a light beige promotional banner. The banner contains the text "View messages and files older than 90 days" followed by a purple "PRO" badge. Below this, it says "Messages and files on the free version of Slack are hidden after 90 days. Start a free trial to access your message and file history. [Learn more](#)". To the right of this text is a green button with the text "Compare Plans".

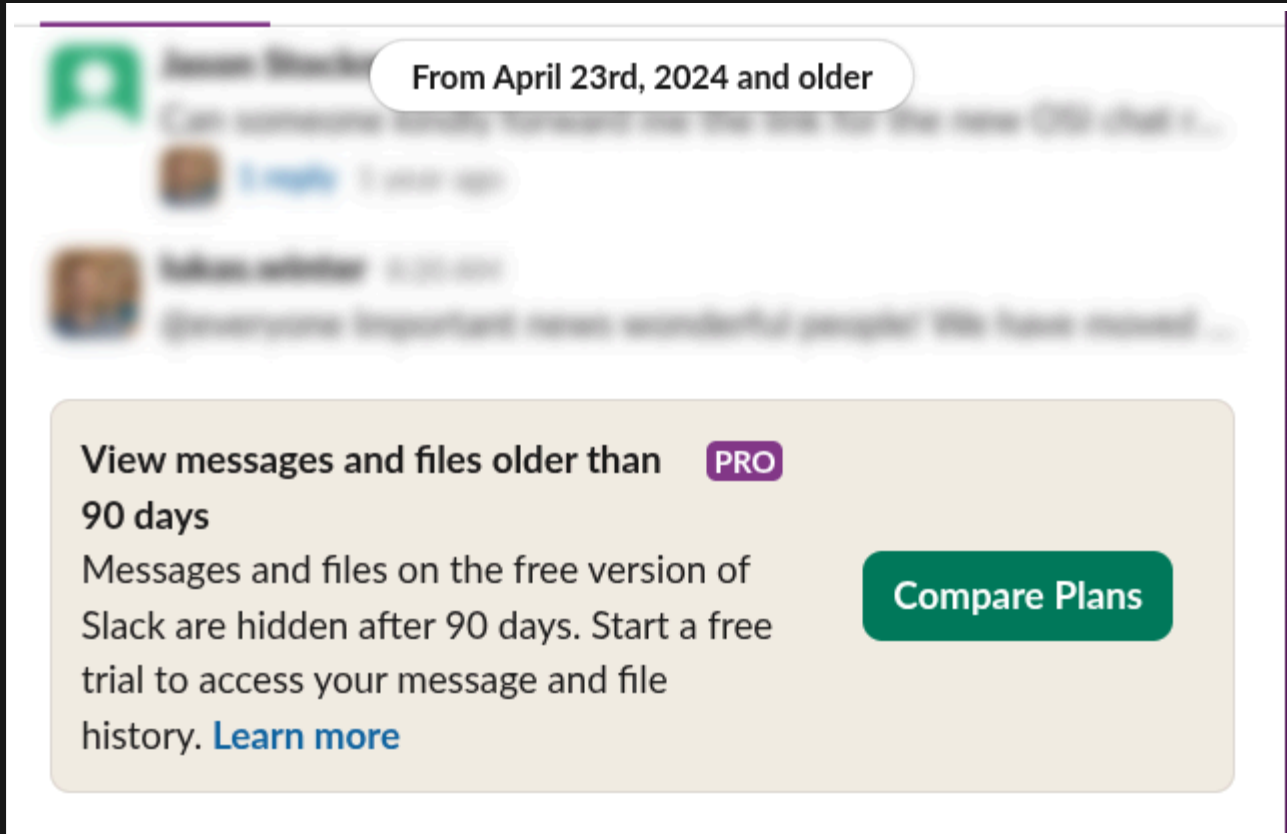
From April 23rd, 2024 and older

View messages and files older than **PRO** 90 days

Messages and files on the free version of Slack are hidden after 90 days. Start a free trial to access your message and file history. [Learn more](#)

Compare Plans

Slack → Matrix 👉



The screenshot shows a Slack channel interface. At the top, a green header bar contains the text "From April 23rd, 2024 and older". Below this, a message from a user with a brown profile picture is visible, followed by a message from a user with a blue profile picture. A large, light beige callout box is overlaid on the bottom half of the screen. It contains the text "View messages and files older than 90 days" in bold, followed by "Messages and files on the free version of Slack are hidden after 90 days. Start a free trial to access your message and file history. [Learn more](#)". To the right of this text is a green button with the text "Compare Plans".

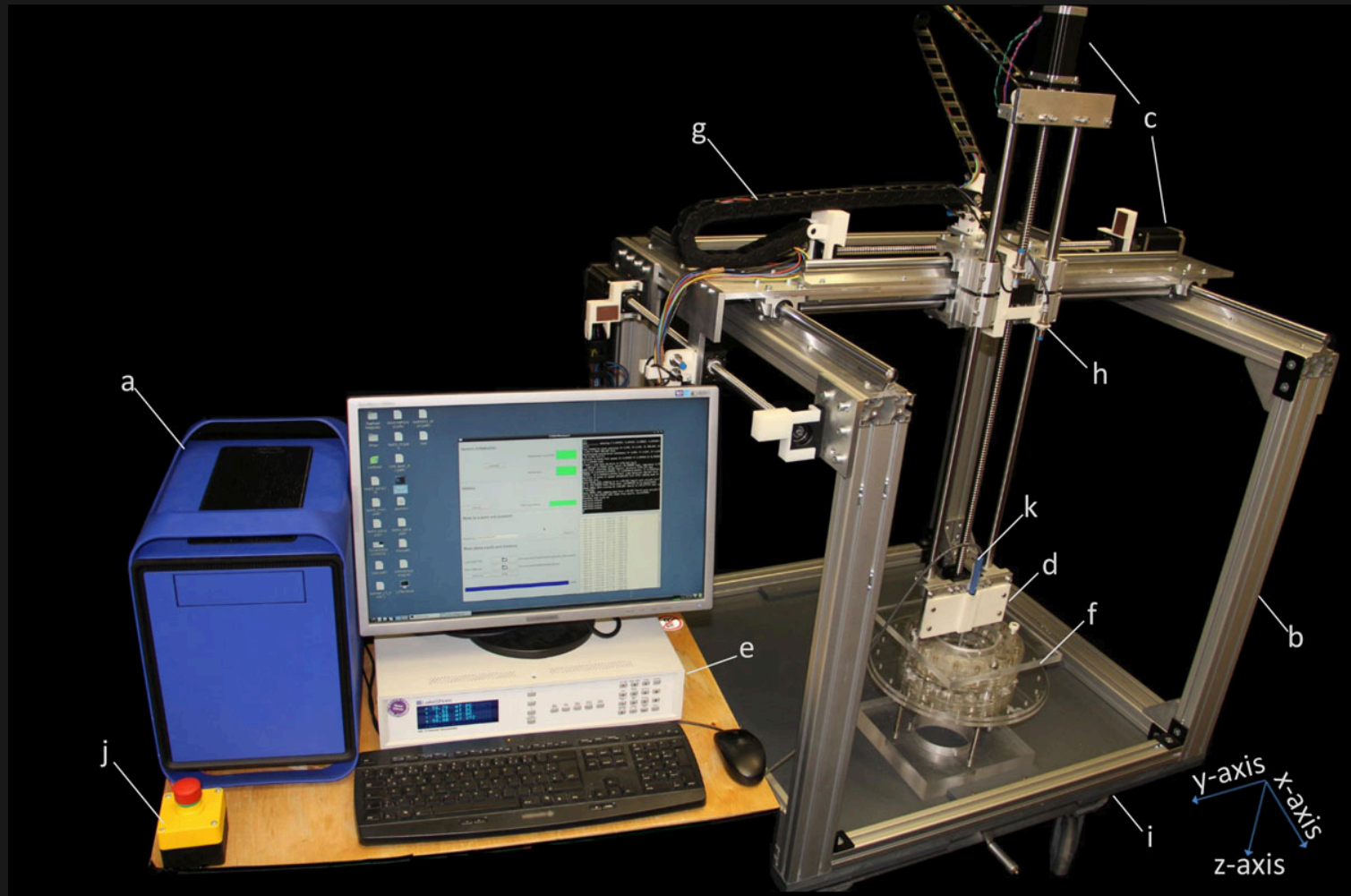
From April 23rd, 2024 and older

View messages and files older than **90 days**

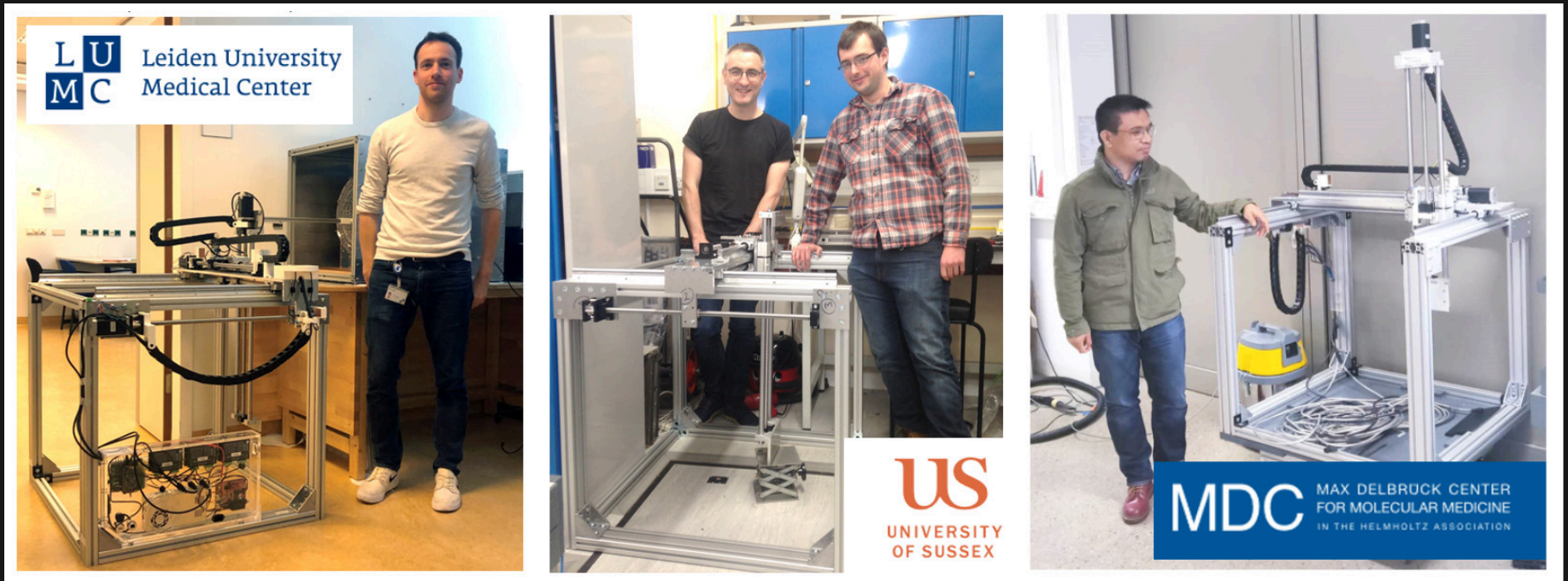
Messages and files on the free version of Slack are hidden after 90 days. Start a free trial to access your message and file history. [Learn more](#)

Compare Plans

COSI Measure



COSI Copies



opensourceimaging.org



Ecosystem Mapping



Grow and Connect

-

-

-

Grow and Connect

- decentralized development
-
-

Grow and Connect

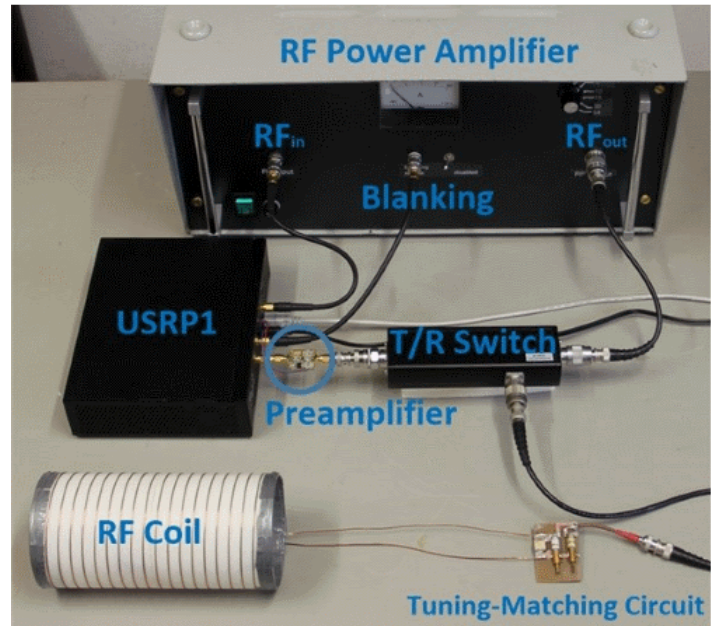
- decentralized development
open MRI modules as research
-
-

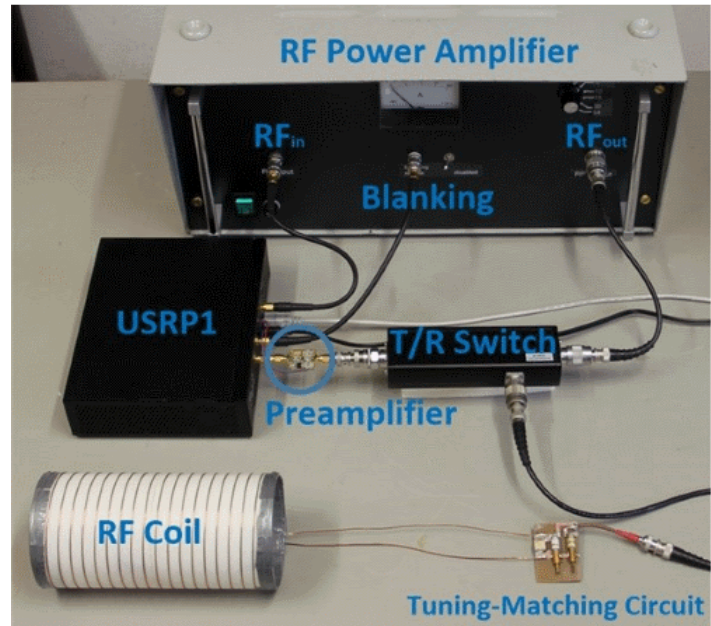
Grow and Connect

- decentralized development
open MRI modules as research
- contribution to policy briefs
-

Grow and Connect

- decentralized development
open MRI modules as research
- contribution to policy briefs
- and standards





DIN SPEC 3105

Draft Agenda

Kickoff Workshop DIN SPEC 3105 "Open Source Hardware"
on 2019-04-17 in Berlin

10:00 Uhr
15:00 Uhr

Schriftführer

N 3

N 1

TOP
1

2

3

4

5

6

7

8

9

10

Opening of the meeting

Presentation on DIN SPEC procedure

Review of the business plan and potential comments on the business plan

Approval of the business plan

Election of the workshop convenor and co-convenor

Review of concept and contents of the DIN SPEC 3105

Next steps

Any other business

Date and place of the next meeting

Closure of the meeting

and then

and then it finally happened

and then it finally happened
we could harvest the first fruits



and then it finally happened
we could harvest the first fruits
and had the foundation for the next steps forward



Q1/22:



And the price:

-
-
-
-
-

And the price: more work :)

-
-
-
-
-

And the price: more work :)

- improving documentation
-
-
-
-

And the price: more work :)

- improving documentation
- sustainable community building
-
-
-

And the price: more work :)

- improving documentation
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- quality control
-
-

And the price: more work :)

- improving documentation
- sustainable community building
- quality control
- clinical certification
-

And the price: more work :)

- improving documentation
- sustainable community building
- quality control
- clinical certification
- commercialization

OSI² CAB

DIN SPEC 3105-2: Community-Based Comformity Assessment

-
- -
 -
-

OSI² CAB

DIN SPEC 3105-2: Community-Based Comformity Assessment

- OSI² heavily relies on a healthy ecosytem
- -
 -
-

OSI² CAB

DIN SPEC 3105-2: Community-Based Comformity Assessment

- OSI² heavily relies on a healthy ecosytem
- however, sometimes:
 -
 -
-

OSI² CAB

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OSI² CAB

DIN SPEC 3105-2: Community-Based Conformity Assessment

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OSI² CAB

DIN SPEC 3105-2: Community-Based Conformity Assessment

- OSI² heavily relies on a healthy ecosystem
- however, sometimes:
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- developing and promoting community standards for technical documentation

OSI² CAB

DIN SPEC 3105-2: Community-Based Conformity Assessment

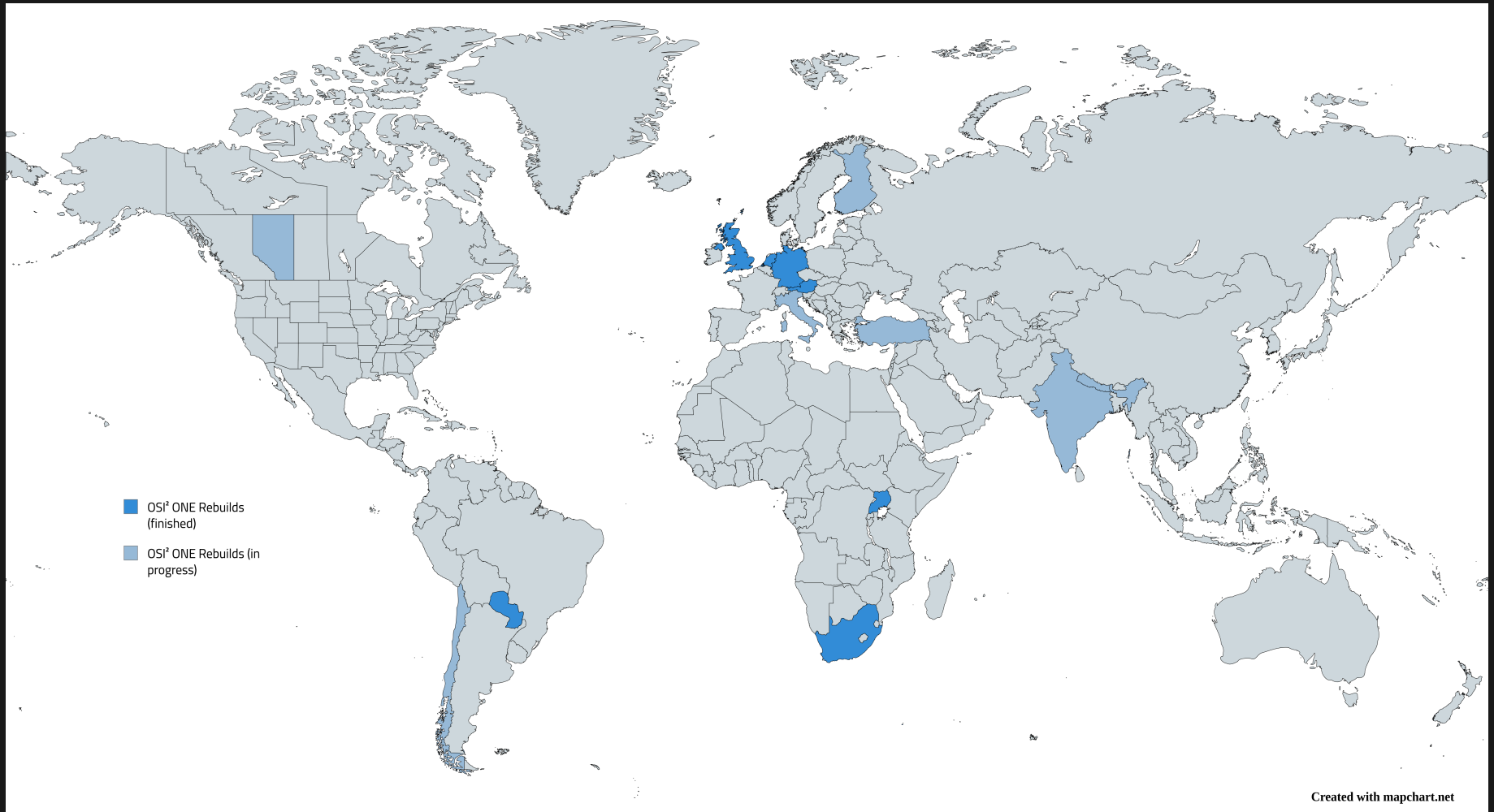
- OSI² heavily relies on a healthy ecosystem
- however, sometimes:
 - very mixed documentation quality
 - unreliable licensing
- developing and promoting community standards for technical documentation

We need reviewers!

OSI² CAB



OSI² Replication Map



inter-everything developer community

-

-

inter-everything developer community

- Dutch, German, Italian, Portuguese, Austrian



inter-everything developer community

- Dutch, German, Italian, Portuguese, Austrian
Paraguayan, Russian, Turkish, Indian
-

inter-everything developer community

- Dutch, German, Italian, Portuguese, Austrian
Paraguayan, Russian, Turkish, Indian
Canadian, South-African, Japanese [...]
-

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- Dutch, German, Italian, Portuguese, Austrian
Paraguayan, Russian, Turkish, Indian
Canadian, South-African, Japanese [...]
- atheist, buddhist, muslim, jewish, christian [...]

inter-everything developer community

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Governance





Governance



- OSI²eV (non-profit)



Governance

- OSI²eV (non-profit) ()





Governance



-
- OSI²eV (non-profit) ()
 - owns community assets
 - -
 -

-



Governance



-
- OSI²eV (non-profit) ()
 - owns community assets (trademark etc.)
 - -
 -
 -



Governance



- OSI²eV (non-profit) ()
 - owns community assets (trademark etc.)
 - neutral legal body





Governance



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- OSI²eV (non-profit) ()
 - owns community assets (trademark etc.)
 - neutral legal body
 - for public funding, projects, donations
 -

•



Governance



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- OSI²eV (non-profit) ()
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-



Governance



- OSI²eV (non-profit) (🇩🇪)
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•



Governance



-
- OSI²eV (non-profit) ()
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 - neutral legal body
 - for public funding, projects, donations
 - contracts with other parties (for-profits, non-profits)
 - Vision:



Governance



-
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 - Vision: network of organizations



Governance



- OSI²eV (non-profit) (🇩🇪)
 - owns community assets (trademark etc.)
 - neutral legal body
 - for public funding, projects, donations
 - contracts with other parties (for-profits, non-profits)
- Vision: network of organizations with common governance model

Open Regulatory Commons

-
-

Open Regulatory Commons

- [A4IM](#): open-source MDR
-

Open Regulatory Commons

- [A4IM](#): open-source MDR
- collecting resources from other communities (e.g. [Tidepool](#), [COSMIC](#), [OpenMind Consortium](#))

Open Regulatory Commons

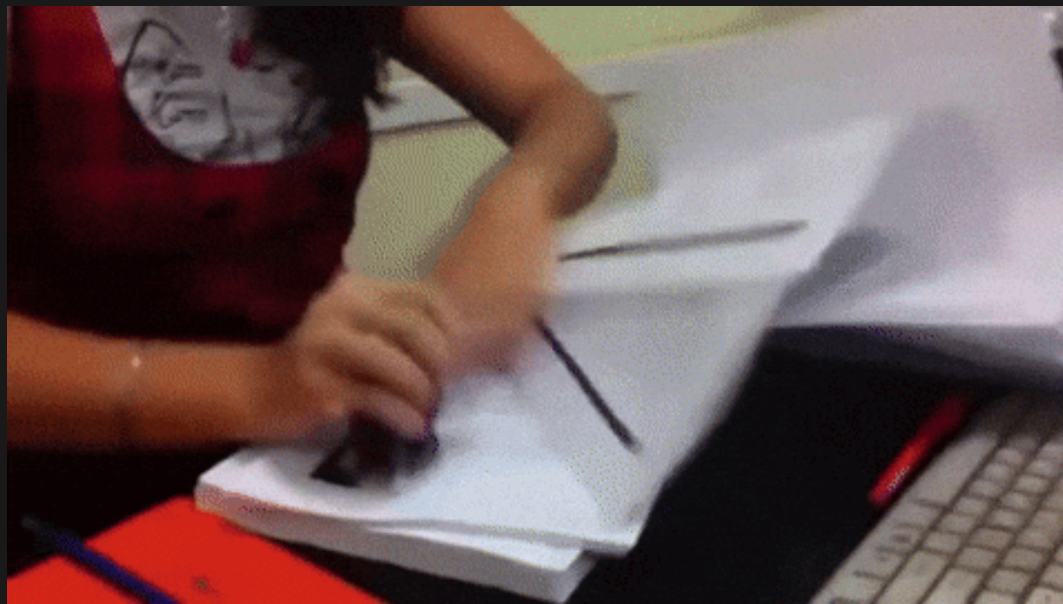
- [A4IM](#): open-source MDR
- collecting resources from other communities (e.g. [Tidepool](#), [COSMIC](#), [OpenMind Consortium](#))

Vision:

Open Regulatory Commons

- [A4IM](#): open-source MDR
- collecting resources from other communities (e.g. [Tidepool](#), [COSMIC](#), [OpenMind Consortium](#))

Vision: Getting the paperwork done together



**Why haven't I heard from it,
yet??**

Why haven't I heard from it, yet??

Please consider joining our PR team :)

Who should own healthcare?

Is an open-source license enough?

Democratic Technology

requirement:

Democratic Technology

requirement: cost of change $\propto$ representativeness

Democratic Technology

requirement: cost of change $\propto$ representativeness

—

low cost of change:

Democratic Technology

requirement: cost of change $\propto$ representativeness

—

low cost of change:

Software can be forked & maintained by anyone?

Democratic Technology

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→ Governance model doesn't matter,

Democratic Technology

requirement: cost of change $\propto$ representativeness

—

low cost of change:

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→ Governance model doesn't matter,
dictators are forced to be benevolent;

Democratic Technology

requirement: cost of change $\propto$ representativeness

—

low cost of change:

Software can be forked & maintained by anyone?

→ Governance model doesn't matter,
dictators are forced to be benevolent;
same goes for for-profits/non-profits

conflict resolution:

conflict resolution:



Democratic Technology | Proposal 1

high cost of change:

-

-

-

Democratic Technology | Proposal 1

high cost of change:

Hardware replication needs special equipment & significant investments?

-

-

-

Democratic Technology | Proposal 1

high cost of change:

Hardware replication needs special equipment & significant investments?

- design decisions can impact replicability, maintainability [...] *for entire regions*
-
-

Democratic Technology | Proposal 1

high cost of change:

Hardware replication needs special equipment & significant investments?

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- unequal resources (to drive development)
= unequal representation
-

Democratic Technology | Proposal 1

high cost of change:

Hardware replication needs special equipment & significant investments?

- design decisions can impact replicability, maintainability [...] *for entire regions*
- unequal resources (to drive development)
= unequal representation
- dedicated governance model
vs. dominant actors

conflict resolution:



as e.g. in de jure standardization

Open-Source Reference Technology

- -
 -
-
-
-

Open-Source Reference Technology

- OS project hosted by a non-profit
 -
 -
-
-
-

Open-Source Reference Technology

- OS project hosted by a non-profit
 - non-profit = standardization platform
 -
-
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Open-Source Reference Technology

- OS project hosted by a non-profit
 - non-profit = standardization platform:
ensures representative & due process
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-

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Open-Source Reference Technology

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- distribution via private market
-
-

Open-Source Reference Technology

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e.g. for trademark use and voting rights
-

Open-Source Reference Technology

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(trademark, spin-offs etc.)
- distribution via private market
- certification of for-profit partners
e.g. for trademark use and voting rights
- Goal: Commons Public Partnerships for public infrastructure

Utopic Vision

collaborative ecosystem of atomic organization

R&D, production tools, manufacturing,
storage & logistics, marketing, legal support,...

all under community-based governance

Proposal 2:

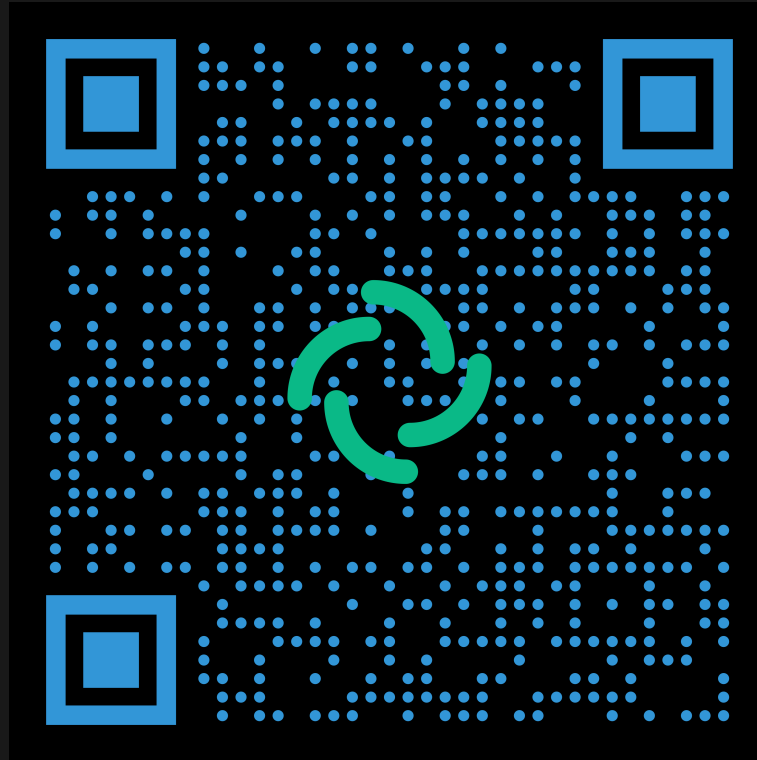
Proposal 2: tell me over beer :)

Thanks!

Let's have a brief

Q&A

Get in touch with OSI²



<https://matrix.to/#/#osii:matrix.org>

info@opensourceimaging.org

Get in touch with JTC



martin.haeuer@jura.uni-halle.de

