



Deep Tech Startups

Idea to Market

Disclaimers

A lot of information available about startups.

A lot of conflicting views exist as well.

This is not science -> no singular truth.

Take what's relevant to you.

Discard things that don't work for you.

Goals for this talk:



- What is a deep tech startup?
- Challenges
- Suggestions
- Examples

What is a "deep tech" startup?

Why this label? What other types exist?

Startup Jargons and History

Evolution

Startups

All startups were tech based

High growth

Scalable

(High risk)

Tech Startups

Post Google, Facebook, iPhone

Non tech-based companies

High growth & Scaled

Lot of de-risking

Deep Tech Startups

Present day

Wide mix of startups

Fintech, proptech,
trusttech,

Small Business

Companies that may grow and
are risky but cannot scale

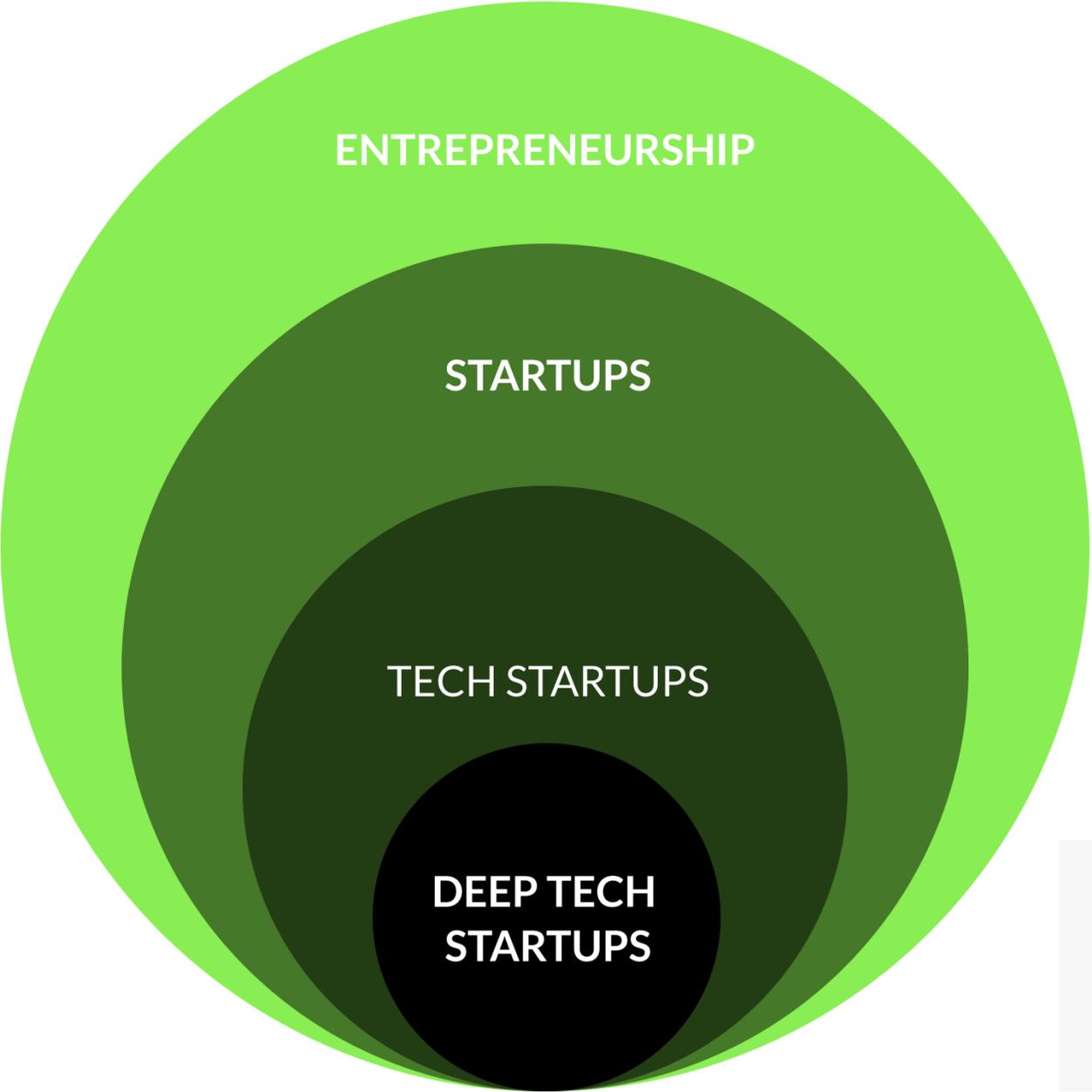


Ever wondered why it's
called Silicon Valley ?

Takeaway : Jargons matter



Another way to visualize



Entrepreneurship

All new businesses are created by entrepreneurs

Startups

High growth and highly scalable companies

Tech Startups

Technology (including software/app) based startup companies



- ❑ Biotechnology, Medical devices, medical imaging
- ❑ Advanced materials
- ❑ Advanced manufacturing
- ❑ Robotics – hardware, software...
- ❑ Electronics, Photonics, Quantum...
- ❑ AI/ML, VR/AR...

Characteristics of Deep Tech Startups

Built around novel IP

Underlying IP is unique and hard to recreate; Significant competitive advantage

Technology-first approach

"Solution in search of a Problem"

Capital intensive

Infrastructure and human capital

Developed in a lab

Early results in a controlled environment

Technical risk will be visible later in the product development

Example : LASER

LASER is 61 years old

History

A bit of controversy on who invented LASER.

1951 - Charles Townes proposes MASER

1957 - Gordon Gould coins the term LASER. Sets his company TRG (technical research group)

1960 - First patent granted for Bell Labs. Gould loses patent and fights for 30 years

1963 - Annual sales for commercial sales for LASER- \$ 1 million

1964 - Townes, Basov, Pharkhov receive Nobel Prize in physics.

Charles Townes called it "Solution looking for a problem"

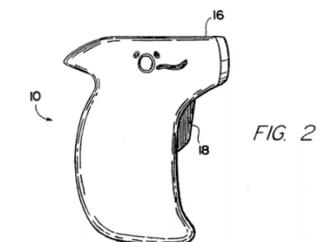
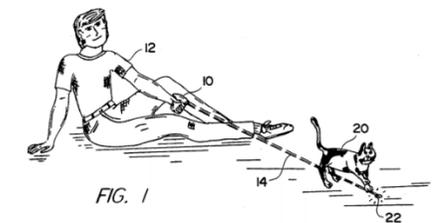
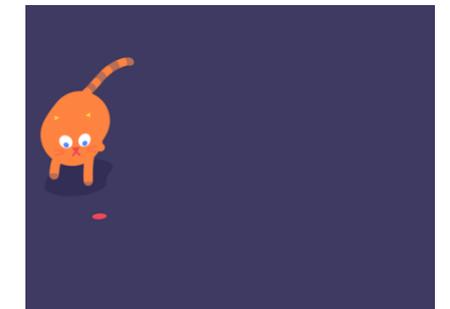
First applications:

1962 - welding of watch springs

1964 - Nd:YAG - cosmetic surgery (Lasik)

Source: Photonics.com

Unintended consequences

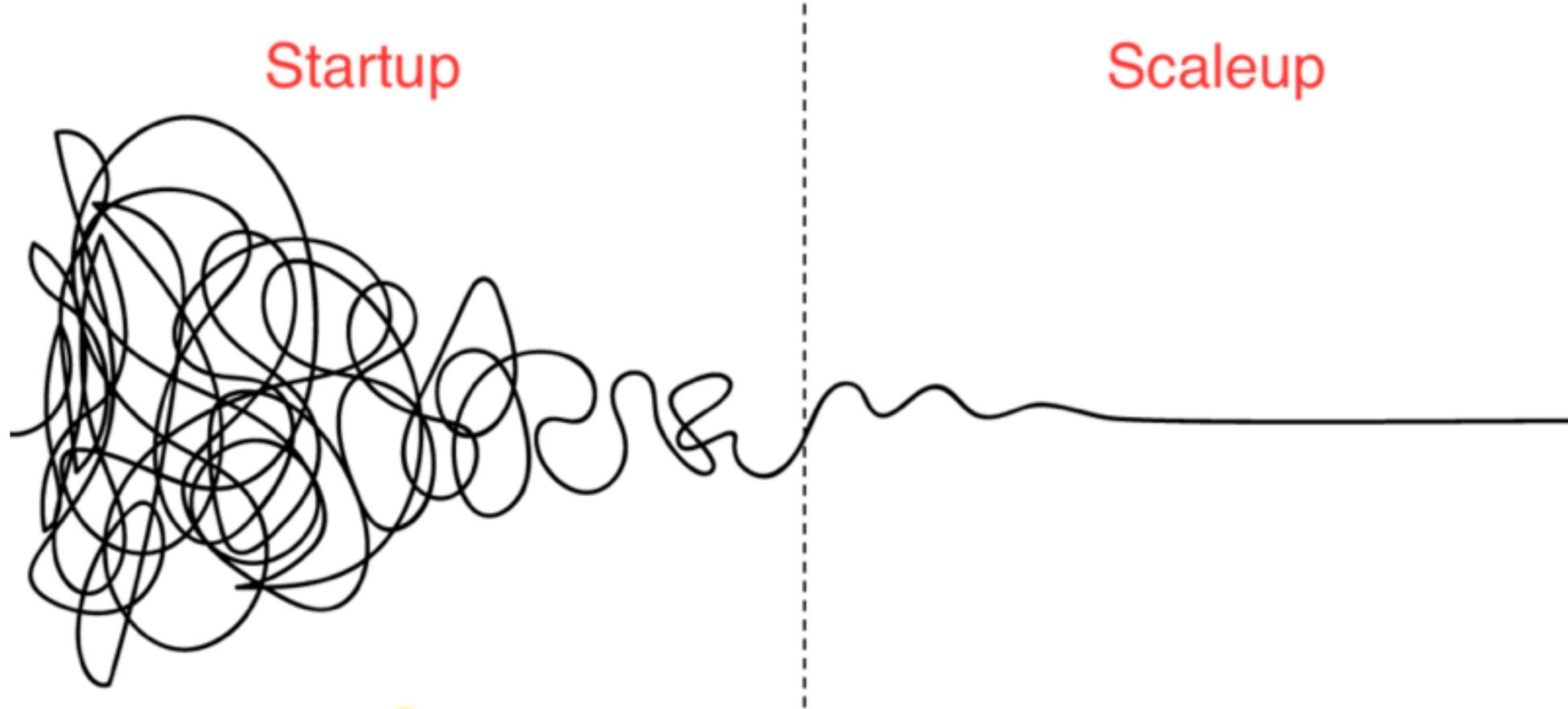


Method of exercising a cat

US Patent: 5,443,036

Startup

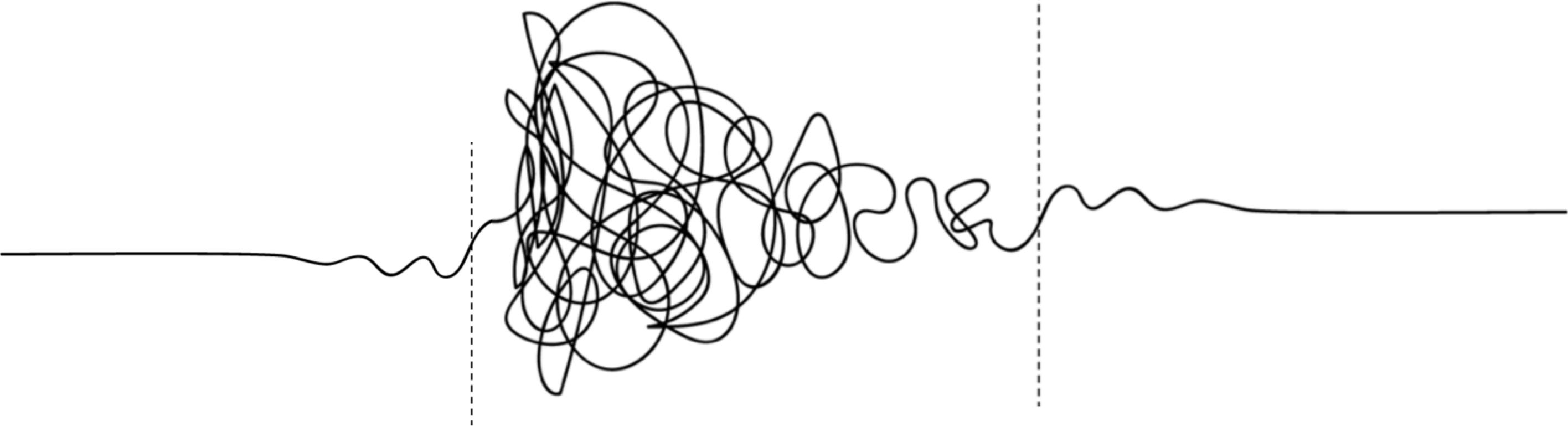
Scaleup



Lab

Startup

Scaleup



Lab

Startup

Scaleup

Searching for a problem fit
for technology solution

Searching for Validation towards
Product Market Fit (PMF)

Optimizing for growth
Channel Product Fit (CMF)

Minimum Viable Product
(MVP) = Prototype

MVP

PMF

CPF





Evaluating the scope of the problem

Problem

What problem are you solving?

Why is this a problem? for whom?

How many people have this problem?

How often do they have this problem?

What is their next best alternative?

Only way to find out is to talk with people

Good Read - Finding a Problem worth Solve

Three Needs for Startup founders

People

Co-founders - Better if you have some to share the work, ideas, joy and sorrows

Expertise - leading technical experts in your field or your required product segment

Mentors - people who have made the journey before, expertise in sales, marketing, etc.

Money

Early stage funds - Proof of Concept funds (Ex: CERN KT Fund), Grants, competitions, etc. This is non-dilute funding

Venture capital (VC):
Choose the right VC with deep tech experience, sector or other investments in the past. So, they understand complexity

Technology

Technology licensing from labs, universities, etc.

Other complementary or competing technology from other labs.

Successful lab prototype might not scale to a successful product!

Story telling

Highlight your big vision

Investors want to invest in the next greatest idea.

Top hires want to work on projects that are bold and visionary

Showcase the Intellectual Property

Not on "what" but address the "so what"

Message should be if you competitor started today, it will take them X years and \$Y to get to where you are already

Who are you? Team. Why now?

Why are you the best team/person to solve this problem.

If you have world leading experts in your team, it provides validation that you can convince them to support/join you

Speak the language - Jargon matters

Good to understand what the trends and the jargons

Reach out for help if you are new and don't know for other founders/ TTO

Story telling matters.
Practice. Practice.

Remember: You have already solved the tougher part, that is the science.

A Kilometer-range Distributed Relative Humidity Sensor

Tiago Neves, CERN

CERN's use case

Measure Temperature (T) and Relative Humidity(RH) in detector complex

Why it matters: Any water vapor in the cavern will be catastrophic

Specifications: Must be radiation tolerant

Low tolerance between trackers in CMS

Cost sensitive for large scale

Technology

Fibre Bragg Grating (FBG) Phase OTDR ; Rayleigh back scattering to measure T and RH

Funding

CERN Knowledge Transfer (KT) Fund - For prototype development (Equipment & Salary)

Why it matters

RH & T needs to be monitored, controlled and mapped for a few industries:

- Food manufacturing and storage (think chocolate)
- Pharmaceutical manufacturing and storage
- Semiconductor manufacturing and storage
- Aerospace

Existing solutions

- Spot Probes
- Large sensors and not volumetric measures
- Tolerance for harsh conditions

Joint PhD project



EP-DT
Detector Technologies



Welcome validation: Construction

Cement Curing Process

Depends on environmental conditions- 24 to 48 hours

Exothermic reaction - expels a lot of heat during the chemical reactions during curing

Cracking is big issue; Curling, bubbling - not big ones but still issues.

Irreversible process (and costly)

If there is a crack, indicators of water seepage show later and might be harder to

CERN's needs

CERN has 57 km of tunnels - currently upgraded during LS2

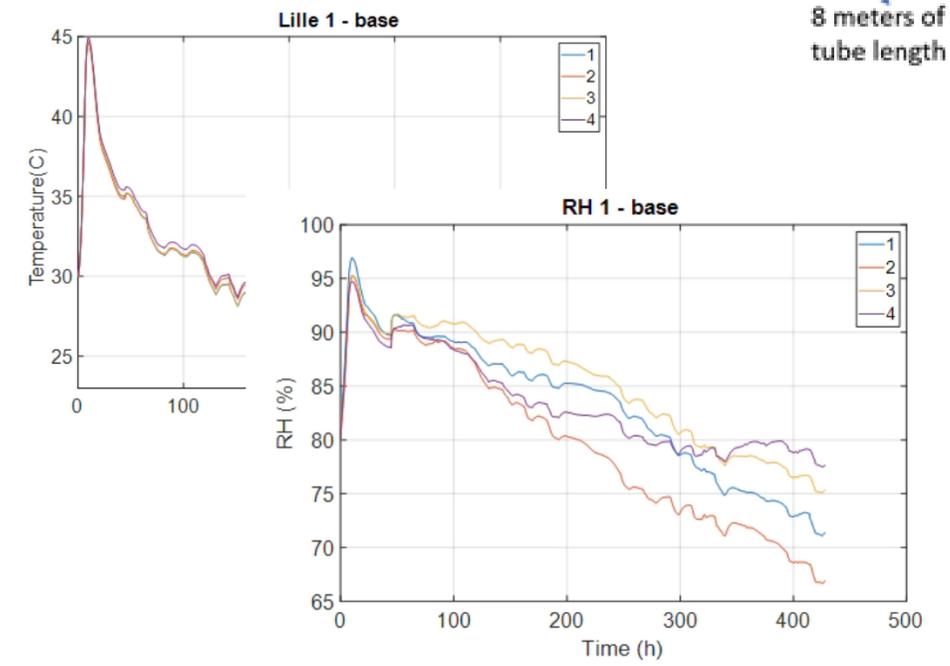
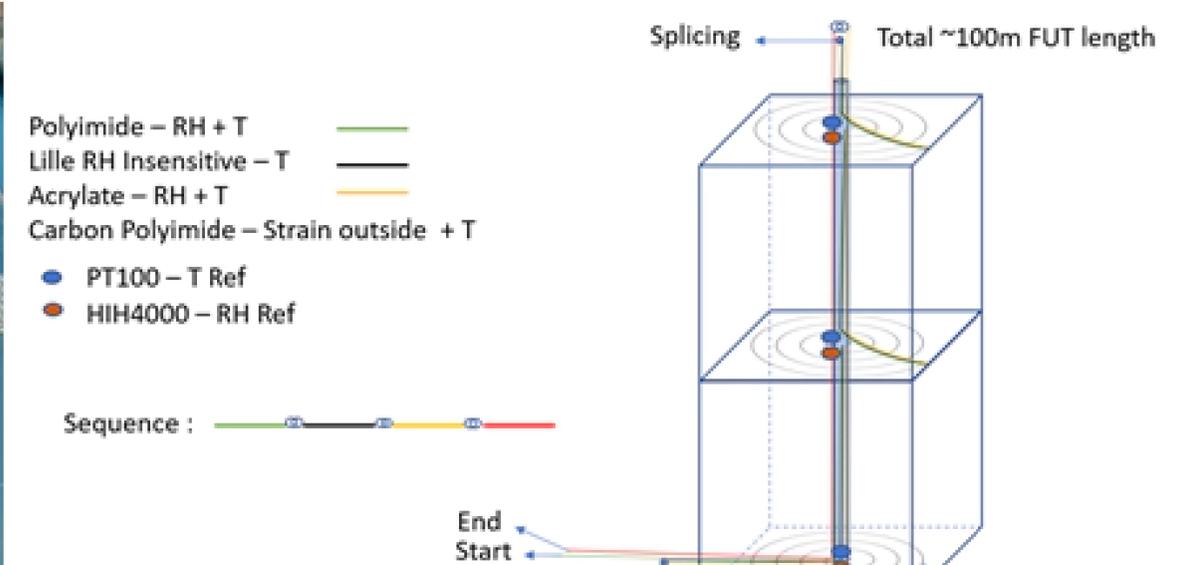
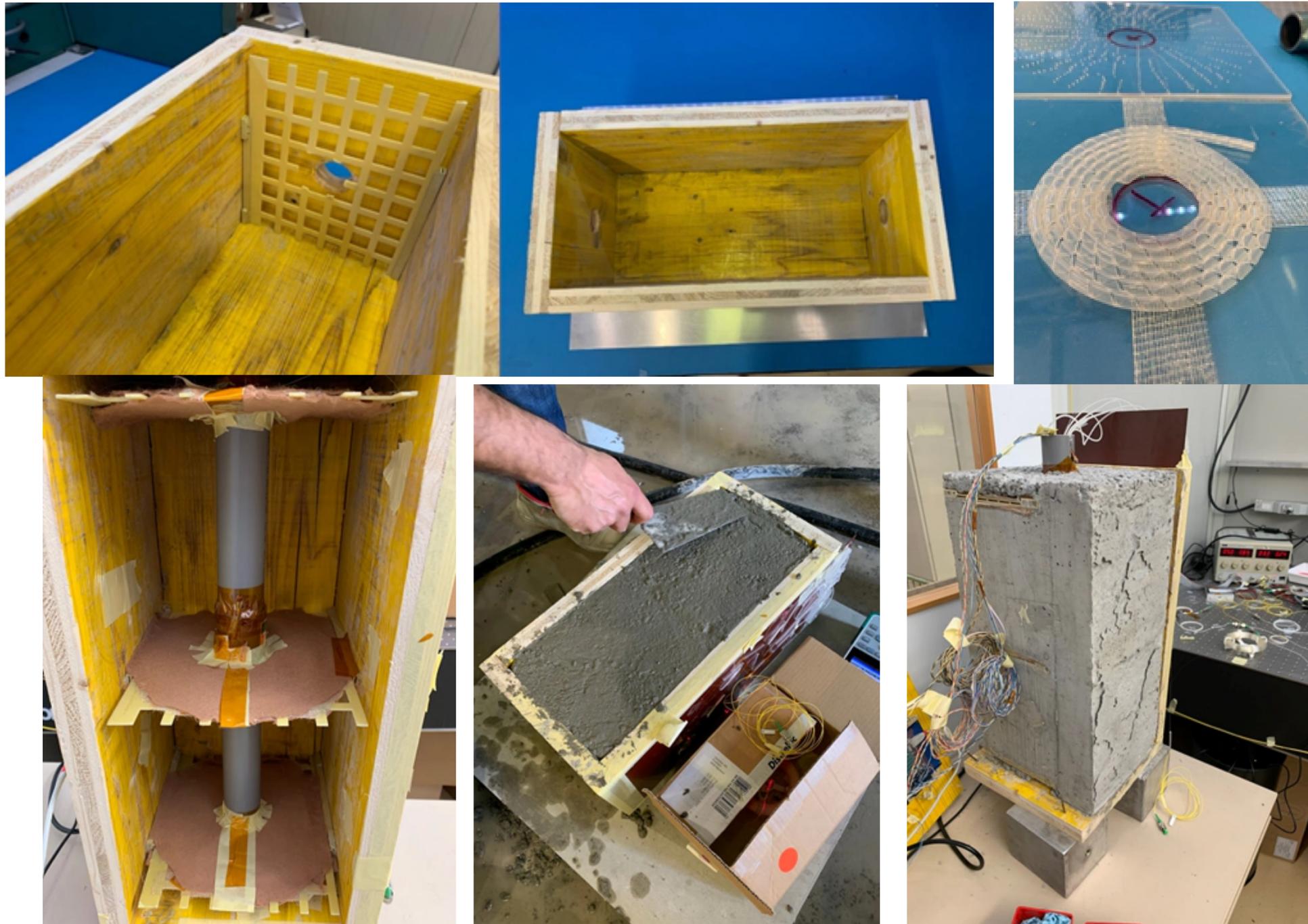
Potentially 100 km of new tunnels for FCC

Interest from CERN civil engineering team to install

Results needed to be validated



Prototype - Minimal Viable Product



Next steps

- Explore validation for concrete curing from other players
- Product design and miniaturization of electronics
- Pilot test

Learnings

- Don't assume applications
- Needs might be in the markets that you least expect
- This application was all due to Tiago's determination

Thanks!

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*The Birth of **NETFLIX** and
the Amazing Life of an Idea*



That Will **NEVER** Work

MARC RANDOLPH

CO-FOUNDER AND FIRST CEO OF NETFLIX

Thanks!
Feel free to contact me
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