

# ESKLUSTERI: Springboard from Ecosystem to European Applied Superconductivity Cluster

**Antti Stenvall**

Tampere University

Department of Electrical Engineering

Research Group on Modelling and Superconductivity

Tampere, Finland

[www.tuni.fi](http://www.tuni.fi)

[antti.stenvall@tuni.fi](mailto:antti.stenvall@tuni.fi)



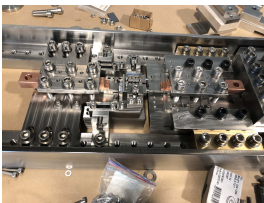
**Human  
Potential  
Unlimited.**

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- ▶ Superconductivity and cryogenics in Finland
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# Background

- ▶ 10 year history with **CERN in superconducting magnet technology** development: (3 EC projects, 1 direct contract, visits)
  - EuCARD (2009-2012)
  - EuCARD<sup>2</sup> (2013-2016)
  - EuroCirCol (2016-2019)
  - Quench protection database
  - 2 doctoral student visits, 1 post doc, 1 doctoral student



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- ▶ Currently we are **8 people**
  - Me (adjunct professor, project manager)
  - One lecturer (in the group since from 1984)
  - Two post docs
  - Two doctoral students
  - Two master students

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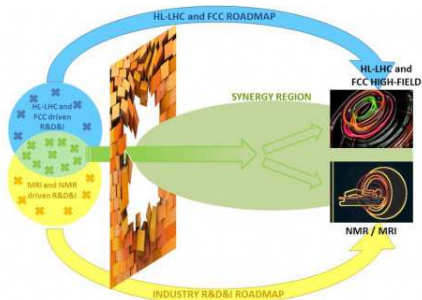
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  - Development of database systems and web services

# International network

- ▶ FuSuMaTech, CERN and CEA driven EU FET-CSA initiative, duration 18 months → 30.4.2019

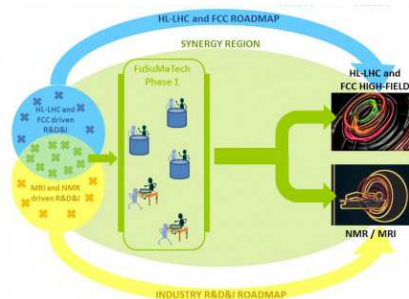


## Synergies between HEP and industry for the development of sustainable European superconductivity cluster

<http://fusumatech.web.cern.ch/>

# International network

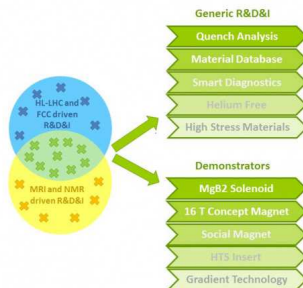
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**Form working groups on selected topics**  
→ **get projects for the topics**

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**One of the topics: sustainable material property database for materials used at cryogenic temperatures**

# Status in Finland for superconductivity and cryogenics

- ▶ **Several** research groups
  - University of Turku (HTS materials science)
  - Aalto University (MRI and MEG, low temperature lab)
  - University of Jyväskylä (Spintronics, basic physics)
  - VTT Espoo (quantum computing, basic physics)
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- ▶ Very **few companies** directly working with SC or cryogenic technology
  - Luvata: LTS conductors
  - BlueFors: dilution refrigerators (down to few mK)
  - IECO: power sources for special needs – especially MRI
  - Elekta Neuromag: Brain imaging with squids (MEG)

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- ▶ **Possibilities** of companies in outsourcing chains and in CERN
  - Special machining (CNC very low tolerances)
  - Special materials (steels and composites)
  - Special cranes (for moving things in tunnels)
  - 3-D printing of metals (i.e. additive manufacturing)
  - Vacuum components
  - Future possibilities: Superconductivity in energy sector and transportation

# Backbone for business opportunities i.e. why bother?

- ▶ FCC costs  $\sim$  30 BEUR
- ▶ Several prospectful superconducting technologies, will they break?
- ▶ HTS conductor technology is finally maturing for applications
- ▶ Cryogenics of today is cryogen free  $\rightarrow$  no special knowledge needed to operate systems
- ▶ Industry is becoming more interested in superconductivity
  - Growth of silicon in semiconductor industry
  - Induction heating
  - Magnetic separation
  - Conventional energy applications
  - Fusion
  - And new openings

# Our mission

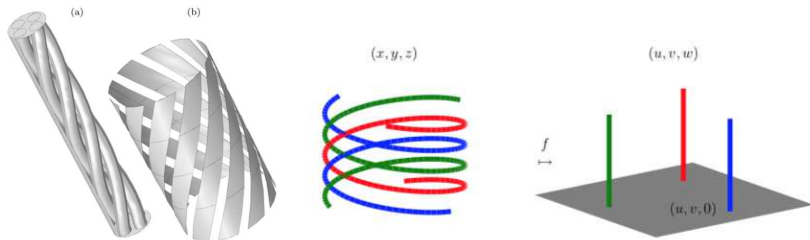
- ▶ Participate and **contribute** to the development program for LHC successor **Future Circular Collider**

## **Volume 3 - The Hadron Collider (FCC-hh)** **Conceptual Design Report**

**P R E P R I N T** submitted to *Eur. Phys. J. ST*  
**20 December 2018**

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- ▶ **Develop sustainable e-infrastructures** to fund us in a long run (FuSuMaTech materials property database)
- ▶ **Encourage (and network) companies in and from Finland in superconducting business**



# Challenges

- ▶ Limited business field
- ▶ Limited number of companies in Finland
- ▶ Nearly impossible to penetrate to matured MRI technology business without large capital
- ▶ Expensive technology for developing something new
- ▶ Challenges internal to university (no laboratory personnel, no laboratory, no permanent positions, no possibility to save money)

# Next steps

- ▶ **Workshop 12.2.2019 in Tampere**
- ▶ Preparation for the **co-innovation phase**



## EUROPEAN SUPERCONDUCTIVITY CLUSTER

### Extend technological limits through CERN collaboration

Does your company have special knowhow? Can you manufacture something extraordinary? Are you flexible in developing technologies to produce something that nobody ever produced before? Can you do diagnostics more accurately than anyone else? If you said yes, CERN might need your products and services. Start developing your technology in collaboration with CERN!

CERN is developing cutting edge technologies e.g. in superconducting magnets. These developments require various extraordinary materials and devices. We are searching Finnish companies and their abilities to offer technological competences to CERN. CERN collaboration opens to companies new business opportunities in superconducting technology and other technological and special businesses.


Tampere University (until 2018 Tampere University of Technology) has been working with CERN in superconducting magnet technology for ten years. Now new opportunities are arising for companies to join the CERN collaboration. The survey is kickstarted with workshop organized in collaboration with *Smart machines and manufacturing competence center (SMACC)* [www.smacc.fi](http://www.smacc.fi) in February 2019. Read more and sign-up at [www.sct2019.fi](http://www.sct2019.fi)!

#### Learn more in workshop

 12.2.2019

 9.30

 Tampere

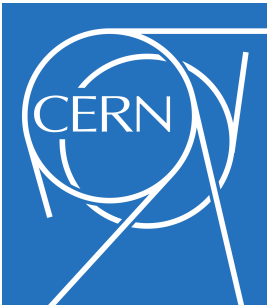
 [www.sct2019.fi](http://www.sct2019.fi)  
together with e.g.


Further Information    Electrical engineering: Antti Stenvall    ✉ [antti.stenvall@tut.fi](mailto:antti.stenvall@tut.fi)    ☎ 050 491 0413  
 Mechanical engineering: Kari Koskinen    ✉ [kari.t.koskinen@tut.fi](mailto:kari.t.koskinen@tut.fi)    ☎ 040 063 4242

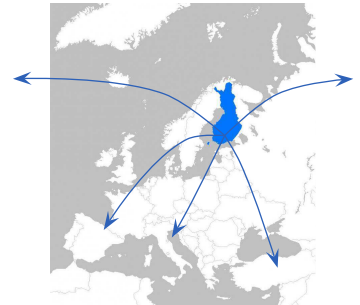


## BUSINESS OPPORTUNITIES IN SUPERCONDUCTING TECHNOLOGY

- ✓ Outsourcing in applications utilizing superconductivity:  
*special materials and products, machining, 3-D printing of metals*
- ✓ High precision electronics and power electronics
- ✓ Low temperature and vacuum infrastructures and components
- ✓ Management of production processes
- ✓ Energy applications
- ✓ Big science projects in the future



**Leverage  
from CERN  
to technology  
and networks**



★ References    🏠 Future technologies    ✈ Runway to networks

**Selected companies go to CERN 1-2.4.2019.**  
Possibility to present your company's products and services in CERN.  
Companies will be selected at the end of February based on interest and survey.



Date and time: **12.2.2019 9.30 - 15.30** Language: **English** Workshop is free of charge

Location: **Lapland Hotels Tampere, Yliopistonkatu 44, 33100 Tampere, Finland**

Sign-up at at latest **31.1.2018** at [www.sct2019.fi](http://www.sct2019.fi). Number of seats is limited.

Futher information: Antti Stenvall ([antti.stenvall@tut.fi](mailto:antti.stenvall@tut.fi), +358504910413)

### Program

- 9.00-9.30 Arrival
- 9.30-10.00 **Welcome and Overview of the technological areas of superconductor and low temperature applications**, Antti Stenvall, Tampere University
- 10.00-10.30 **Accelerator magnets meet Finnish industry**, Daniel Schoerling, CERN Switzerland
- 10.30-10.50 Coffee
- 10.50-11.20 **Sustainable superconductor production for big science projects and MRI devices**, Ben Karlemo, Luvata oy
- 11.20-11.50 **Superconducting magnet industry**, Cristian Boffo, Bilfinger Noel gmbh Germany
- 11.50-13.00 Lunch (free lunch)
- 13.00-13.30 Short presentations from selected participating companies (5 mins each)
- 13.30-14.00 **Industry - academia collaboration in the field of superconductor technology in Germany: a view on energy applications of superconductivity**, Francesco Grilli, Karlsruhe Institute of Technology Germany
- 14.00-14.30 **R&D&I funding possibilities in university - business collaboration in Finland**, Sakari Karpinen, Business Finland
- 14.30-15.30 Coffee, and one-to-one discussions (possibility to prebook)
- 15.30 The end