cern.ch/knowledgetransfer

Technology Transfer Introduction

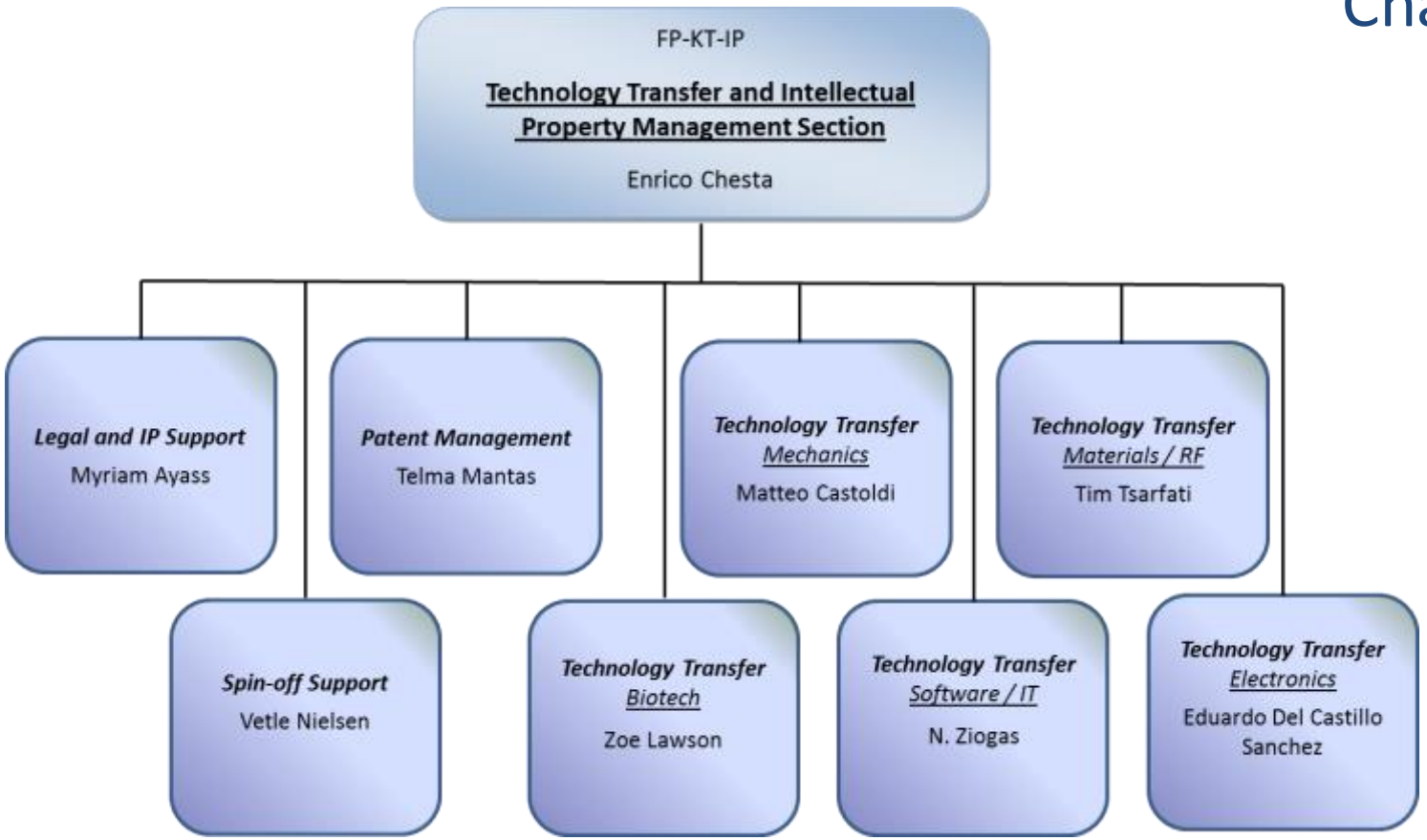
Enrico Chesta

Head of CERN Technology Transfer and
Intellectual Property Management Section

Knowledge Transfer Group – FP Department

CERN FP/KT/IP

Organization Chart



Dual-mode service-oriented operation

Intellectual Property Management Services for CERN Community

- Legal advice on IP issues
- Patentability studies
- Market assessments
- Industrial needs monitoring
- Contract negotiation
- Promotional activities
- Technology scouting
- Financial support to KT projects
- Assistance to spin-off creation

Technology Transfer Support to External Partners

Collaborative R&D model: set-up partnerships with industry to use CERN competences in support of innovative applications and creation of joint IP

Licensing Approach: give access to CERN technology portfolio for scientific and commercial use

BE-KT: How can we do Technology Transfer together?

1- Identifying innovative technology => *Disclosure Process*

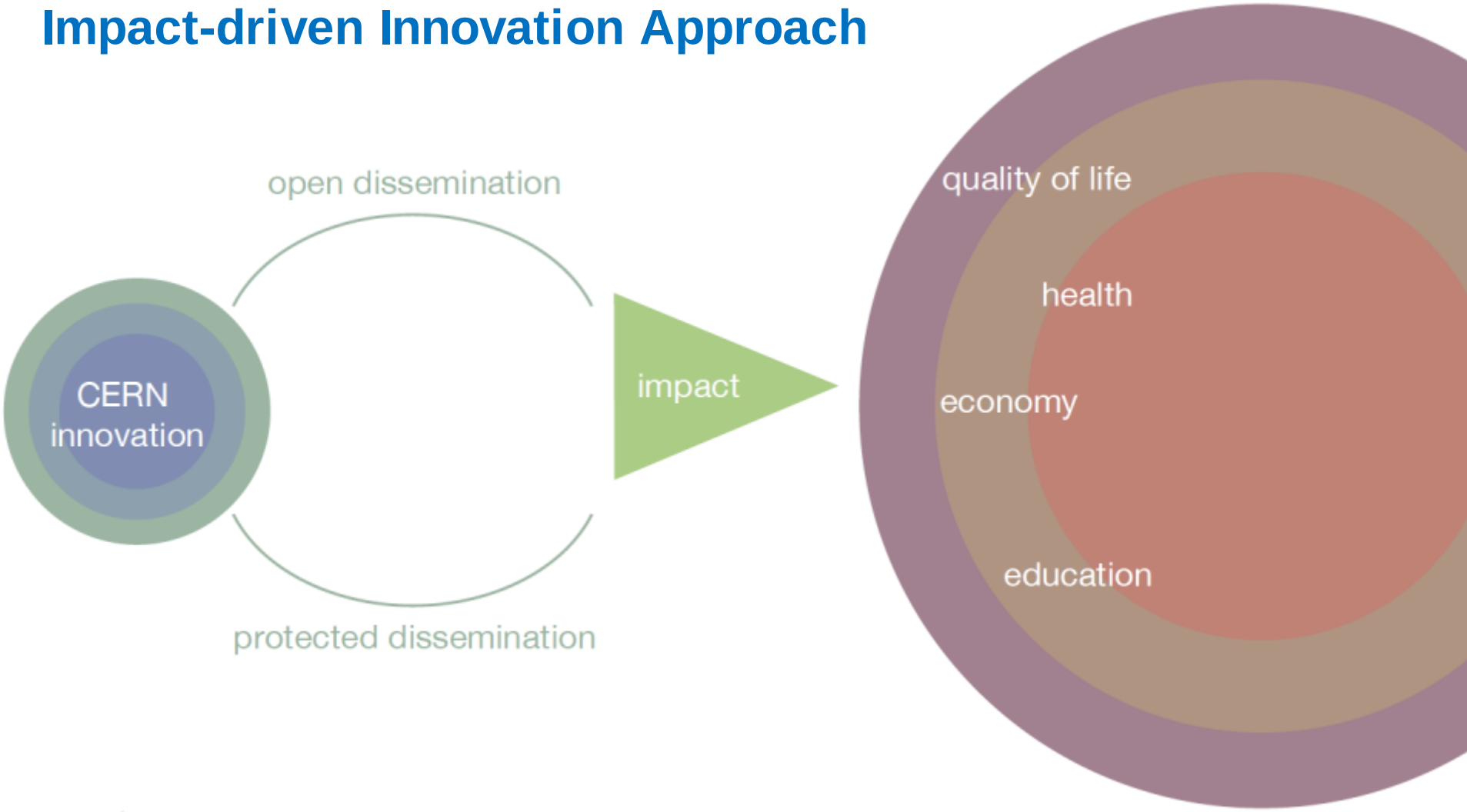
2- Deciding best dissemination model => *Open vs. Protected*

3- Taking it closer to the market => *KT Fund*

4- Setting-up exploitation partnerships with:

- Industry => *Whole spectrum*
- Partner research organizations => *e.g. Easy Access IP*
- Start-up companies => *CERN BIA*

Impact-driven Innovation Approach



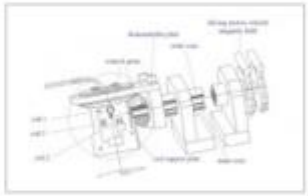
CERN Easy Access IP

CERN Easy Access IP is a new opportunity to benefit of CERN's Intellectual Property.

The scheme involves making some of CERN's technologies available free of royalties, released only to partners who can best develop them to benefit the economy and society.
If you would like to know more about CERN Easy Access IP or other technology transfer opportunities, please contact CERN's Technology Transfer Office.

The following technologies are available under the CERN Easy Access IP scheme:

3D Magnetic sensor calibrator



This is an innovative device for calibrating magnetic field with high resolution. The technology measures all three axes of the magnetic field, by performing a scan over the full unit sphere, independent of its orientation relative to the magnetic field.

[read more]

RF Waveguide Vacuum Valve

This device enables low-loss RF power transmission in a waveguide across a gap, where a liftable instrument is positioned.

[read more]

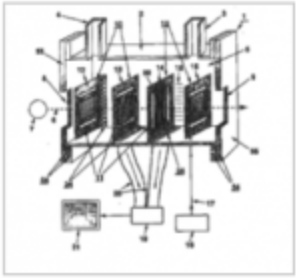
Thermally insulatable vessel

The Thermally insulatable vessel is a simple container system for hot substances, incorporating a temperature display within the vessel's cap or lid.

The key element in this technology is an integrated infra-red thermometer developed with Micro-Electro-Mechanical systems on a common silicon substrate through micro fabrication technology.

[read more]

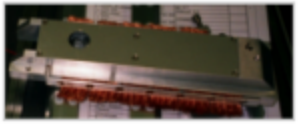
Multifunctional detector



A multifunctional, versatile position-sensitive detector for measuring characteristics of a beam of particles.
The technology consists of a microwire-based monitor that allows measuring non-destructively the spatial profile, divergence, and intensity of UV, x-ray, and charged particle beams, including anti-particles.

[read more]

Cryogenic optical fiber temperature sensor



The technology consists in a simple and relatively cheap cryogenic temperature sensor, composed of an optical fiber and a Brillouin spectral analyzer for measuring one or more temperature dependent Brillouin scattering parameters.

[read more]

Easy Access IP was first trialled by Easy Access Initiative, a collaborative project between the University of Glasgow, King's College London and the University of Bristol.

CERN Easy Access IP Exclusive Licence agreement
CERN Easy Access IP Non-Exclusive Licence agreement

CERN Open Hardware License

A legal framework to facilitate knowledge exchange across the electronic design community.

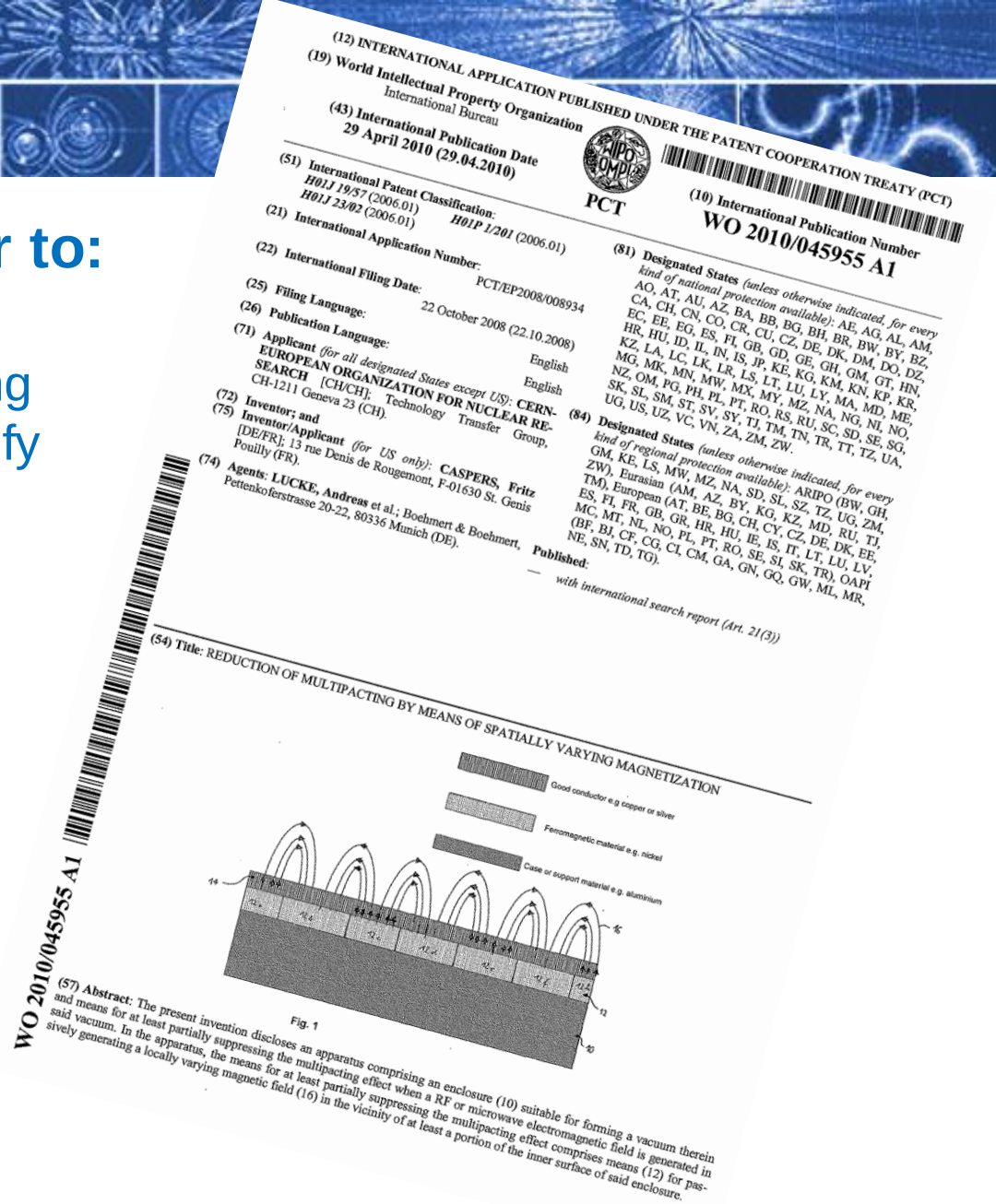
In the spirit of knowledge and technology dissemination, the CERN OHL was created to govern the use, copying, modification and distribution of hardware design documentation, and the manufacture and distribution of products.

Hardware design documentation includes schematic diagrams, designs, circuit or circuit-board layouts, mechanical drawings, flow charts and descriptive texts, as well as other explanatory material.

- CERN OHL v1.1 Launched in 2011, great interest from the worldwide community
- More than 50 hardware designs licensed under CERN OHL
- 16 companies involved!
- The license is being used by people outside our community as well (and for any kind of hardware)
- Thanks to the interactions with the community, we are improving the license and preparing v1.2
- Visit: http://www.ohwr.org

Patents are taken in order to:

- Increase the probability of having the technology transferred (justify development investments from industry)
- Significantly enhance the commercial value of the technology
- Ensure CERN's recognition as the originator of an invention



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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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Published:
— *with international search report (Art. 21(3))*

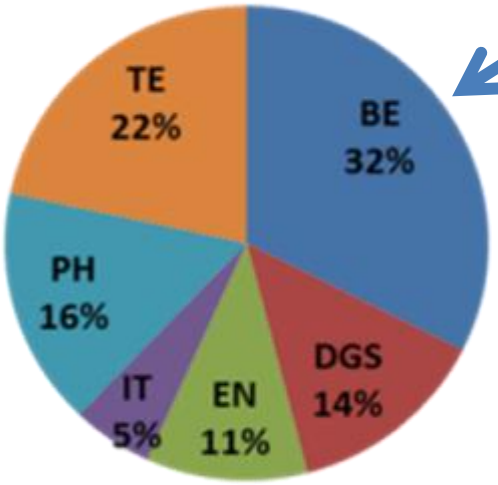
WO 2010/045955 A1

(54) Title: REDUCTION OF MULTIPACTING BY MEANS OF SPATIALLY VARYING MAGNETIZATION

Fig. 1

(57) Abstract: The present invention discloses an apparatus comprising an enclosure (10) suitable for forming a vacuum therein and means for at least partially suppressing the multipacting effect when a RF or microwave electromagnetic field is generated in said vacuum. In the apparatus, the means for at least partially suppressing the multipacting effect comprises means (12) for passively generating a locally varying magnetic field (16) in the vicinity of at least a portion of the inner surface of said enclosure.

Typical Technology Transfer Process Steps



In 2012…

External Request of Support

Internal Invention Disclosure

Transfer Potential Technico-Economical Assessment

IP Rights Protection

Internal Ressources Availability Check

External Partner(s) Identification

Deal Negotiation (Terms and Conditions)

Contractual Agreement Formalization

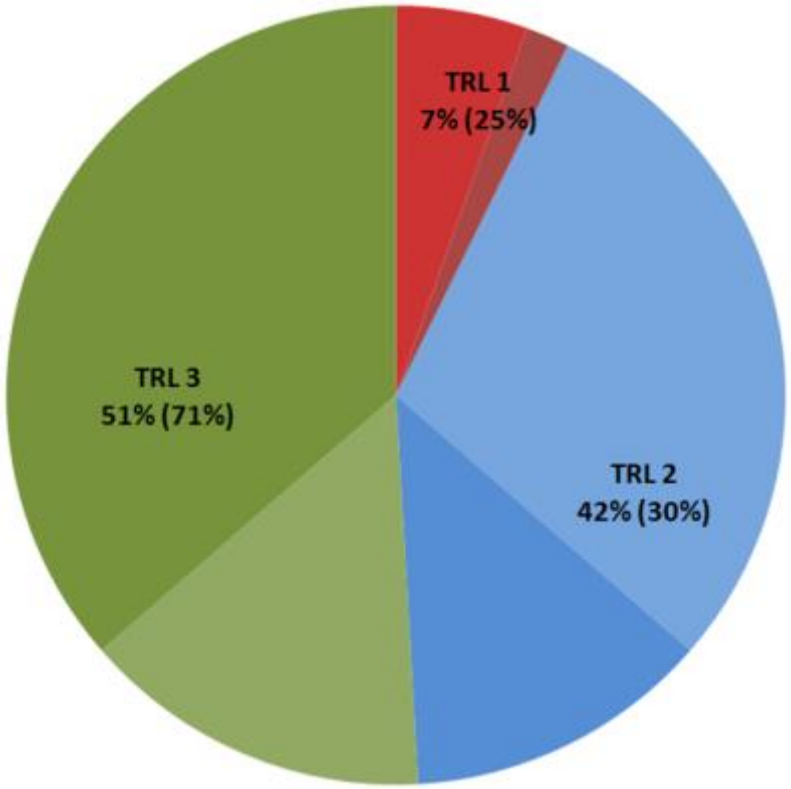
Project Follow-up and Results Valorization

Technology Portfolio

Some approximate numbers:

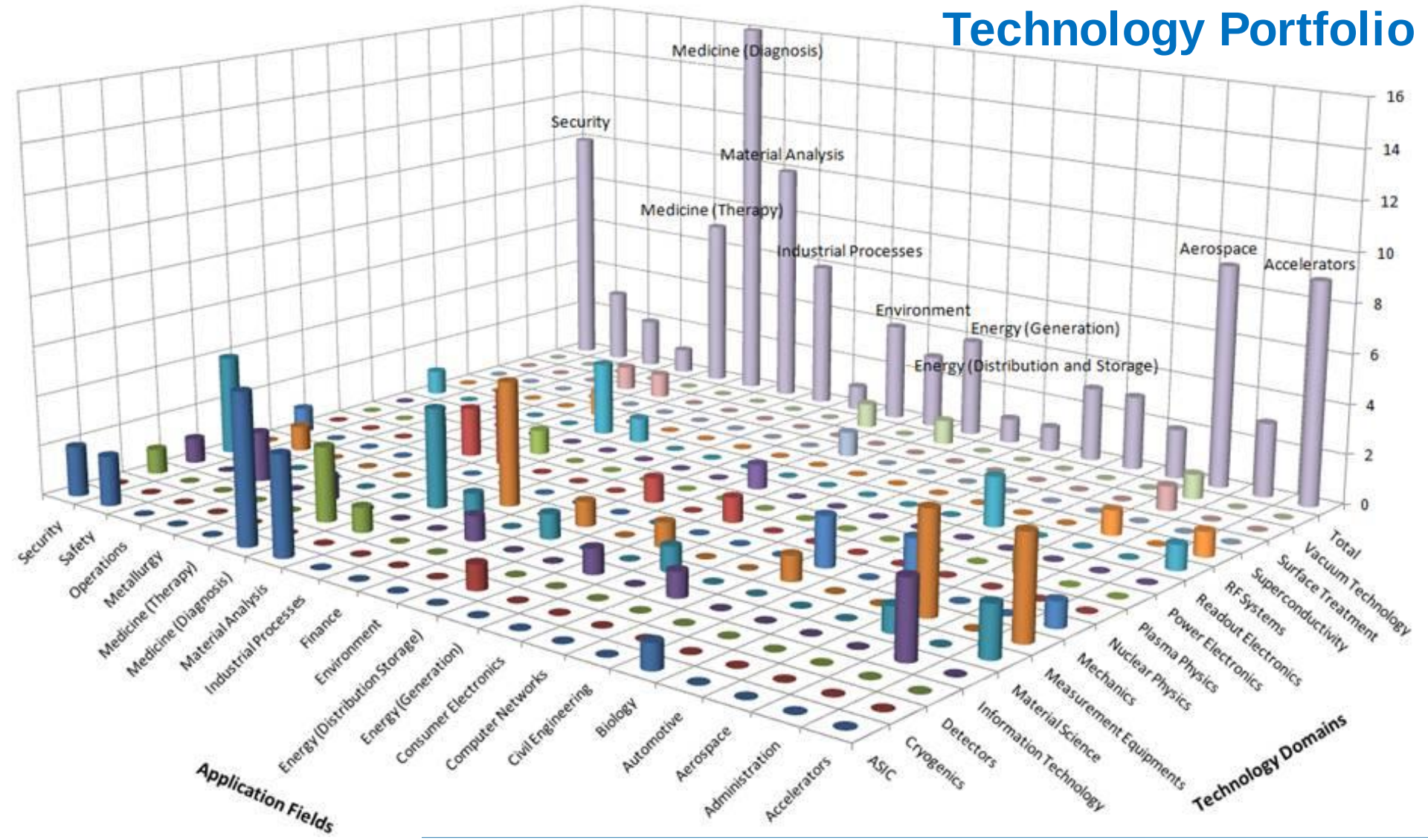
- 200 TT cases (30% open)
- 20 invention disclosures per year
- 40 patent families (50% exploited)

Technology Readiness Levels	Simplified Definition
1	Technology application formulated and basic concept demonstrated
2	Functional validation in laboratory environment
3	Representative prototype fully qualified (technology ready to transfer)



Technology Readiness and "Exploitation" Levels

Technology Portfolio



The KT Fund

- The KT Fund is a tool introduced 2 years ago, using resources generated by the exploitation of CERN IP portfolio complemented by DG budget.
- Typically, it can be used to fund projects to build proof of concepts or prototypes; overall target: bringing CERN technologies closer to the market
- The requests are evaluated by a Committee composed by all the Department Heads and members of the KT Group
- 6 projects were approved and financed in 2011, 6 more in 2012
- For 2013, 500 kCHF are available
- Requests can be submitted anytime, the selection committee usually meets in Autumn
- More information can be found on the KT Group web site

CERN Business Ideas Accelerator (BIA) Concept

Network of European Universities providing technical students

Individual entrepreneurs including staff from CERN or partner organizations

BIA Admission Conditions:
-1 year max
-no revenue generation
-pre-incubation contract

CERN pre-incubator
-Part-time support from CERN inventors
-Use of Lab facilities and CERN infrastructure
-Business Creation and IP support

BIA Outcome:
-Business Plan
-Demonstrators

Projects flow

National Innovation Funds

National incubator 1 UK-STFC

National incubator 2 ?

National incubator n

Investors

Spin-off companies

STFC

Search Go

STFC CERN Business Incubation Centre

technology

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  - About STFC
  - About CERN
  - About Our Partners
- What we offer
- How to apply
- News and events
- Our successes
- Location
- Contact us

About us

A 3D image of the LHC machine at CERN (Credit: CERN)

The STFC CERN Business Incubation Centre (the BIC) is a collaboration between two prestigious science institutions, the Science and Technology Facilities Council (STFC) in the UK and the European Organisation for Nuclear Research (CERN) in Geneva.

Both STFC and CERN are world leaders in science, technology and engineering, and this collaboration is the first of its kind.

STFC and CERN are also working with other partners to make the BIC even better, notably Sci-Tech Daresbury, the Cockcroft Institute and the European Space Agency.

Find out more about STFC, CERN and the other partners that work with the BIC:

- **About STFC**
- **About CERN**
- **About our partners**

A whole spectrum of opportunities to collaborate with industry

Licensing

Service and Consultancy

R&D collaborations

BE-KT Innovation Day

03/06/2013

Final Agenda

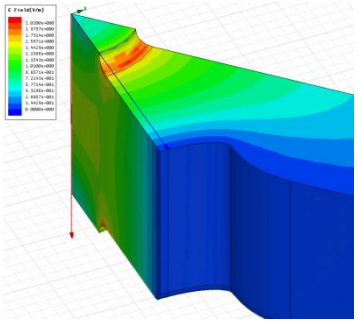
		Introduction	
9h00	9h15	BE Opening	Paul Collier, Fritz Caspers
9h15	9h30	KT Opening	Giovanni Anelli
9h30	9h45	Technology Transfer Introduction	Enrico Chesta
		New disclosures	
9h45	10h00	Ultra-low phase gradient X-band resonators for continuous Cs beam clocks	Walter Wuensch
10h00	10h15	Space tomography application to Medical Imaging	Steven Hancock
10h15	10h30	Octopus Temperature Mapping System for SPL Cavities	Kitty Chia-Chi Liao
10h30	11h00	*Coffee Break*	
11h00	11h15	C++ based mathematica stub for control system acquisitions and MD analysis	Michael Ludwig, Alexandros Verikios
11h15	11h30	GEM Technology Transfer to GSI and HIT	Jens Spanggaard
11h30	11h45	A Methodology for Producing Identical Double Precision Floating-Point Results	Frederick (Eric) McIntosh
11h45	12h00	Measurement technique for electromagnetic (EM) material characterization	Christine Vollinger
12h00	12h15	Arc detectors for high power RF systems	Olivier Brunner, Daniel Valuch
12h15	12h45	TULIP, High Gradient Structures for Medical Linacs KT Fund project and new challenges related to RF modulator/klystron systems	Ugo Amaldi, Walter Wuensch
12h45	13h00	Feedback and suggestions from the audience	All
13h00	14h00	*Lunch - R3*	
		On-going projects	
14h00	14h15	KT Fund project - High Temperature, High Power RF Loads for Energy Recovery	Silke Federmann, Michael Betz
14h15	14h30	KT Fund project - Ion source for the LEIR based biomedical facility	Detlef Kuchler
14h30	14h45	SEY Reduction by Magnetic Surface Roughness	Mounir Driss Mensi (TE) and Fritz Caspers
14h45	15h00	BBQ (Bunched Beam Q-meter) - success story	Marek Gasior
15h00	15h15	Open Hardware for Technology Transfer	Erik Van Der Bij
15h15	15h30	Wrap-up and conclusions	Paul Collier, Fritz Caspers, Giovanni Anelli, Enrico Chesta
15h30	16h00	*Coffee Break*	

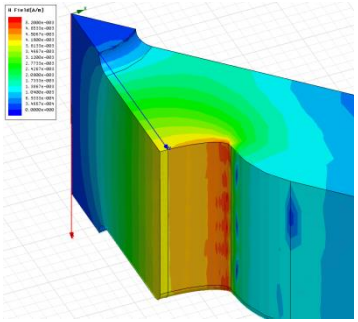
Development of ultra-low phase gradient X-band resonators for continuous beam Cs clocks

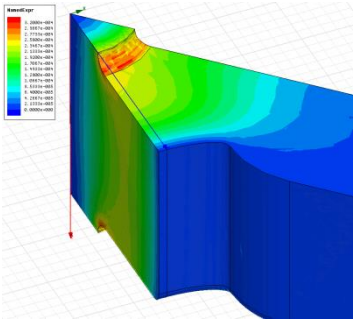
W. Wuensch and
Igor Syratchev
BE-KT day
3-6-2013

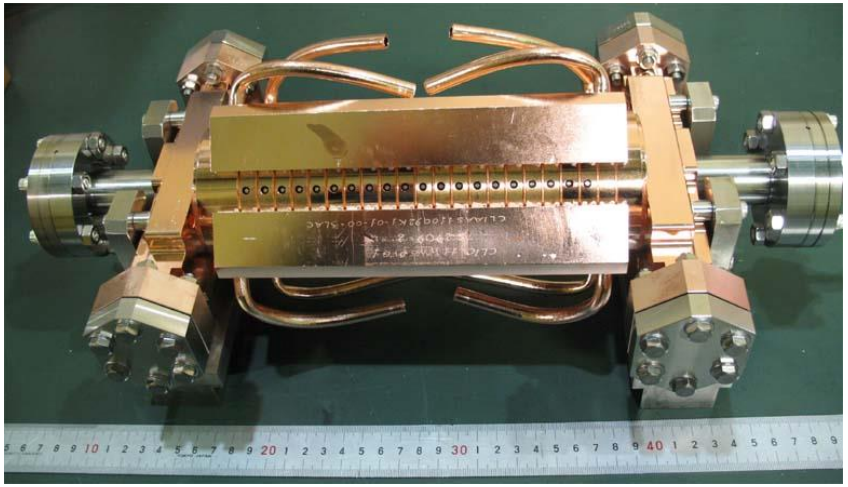
CLIC accelerating structure development

In the context of the study of a TeV-range linear colliders – NLC/JLC and CLIC - we have developed advanced rf design techniques combined with advanced rf component and accelerating structure assembly techniques.









Collaboration with METAS

METAS is the national standards laboratory for Switzerland. They have an on-going continuous beam Cs clock development project. Cs clocks are the current standard for the second, so of crucial importance all throughout society and industry

Through a series of visits we have realized that we could make a significant contribution to their continuous-beam Cs clock project.

A critical component which is limiting their performance is the X-band resonator, in which the atomic interaction occurs. In particular they require extreme phase flatness – micro-radians.

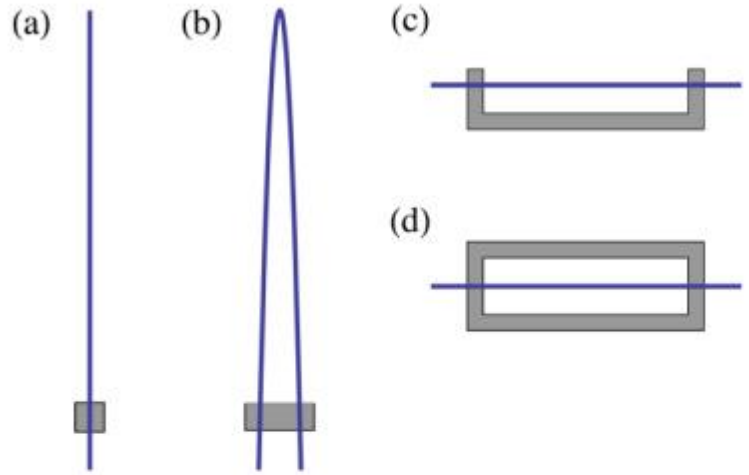
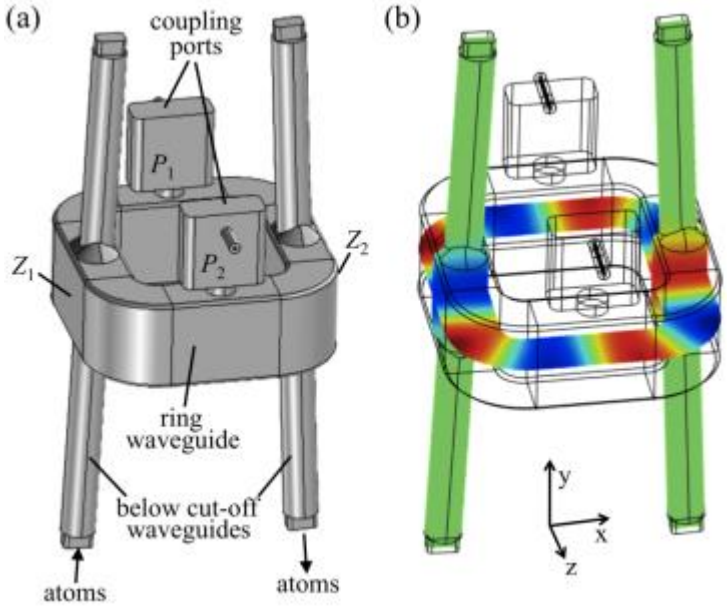
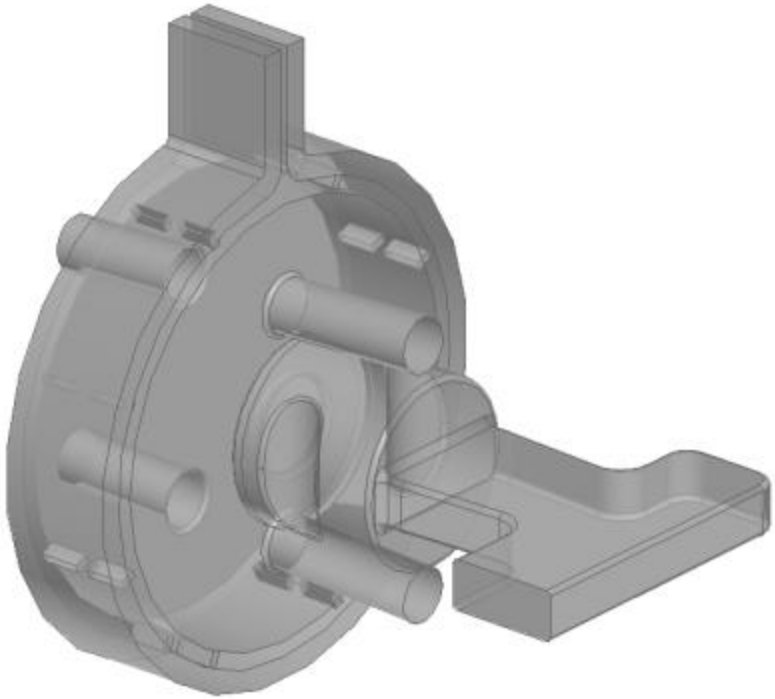


FIG. 1: Atomic beam and microwave cavity configurations for different atomic clocks. The continuous line shows the average atomic trajectory. (a) Pulsed fountain clock configuration. (b) Continuous fountain clock configuration. (c) Thermal beam configuration. (d) Space clock beam configuration.

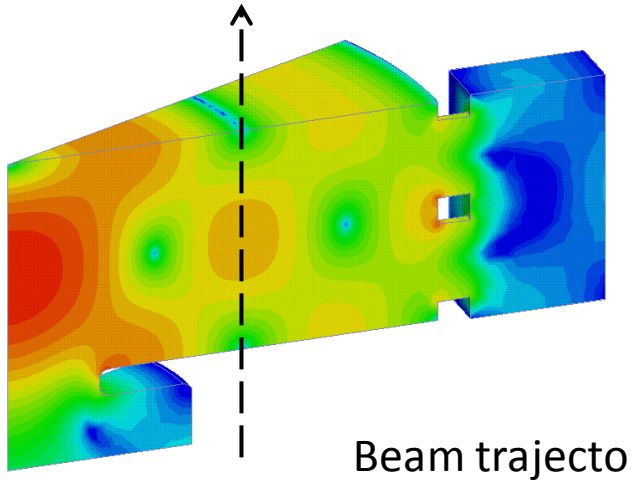
Our potential contribution in innovative rf design





Current design

Possible improvement



Beam trajectory

Design Summary

1. The $TE_{0,N(N>1)}$ cavity with opposite RF power flow can provide "flat-phase" zones with RF phase variation < 1microradian in the area of ~ 7x7 mm^2.
2. This cavity can host multiple beam lines.
3. We have designed (built already) all the specific components like TE_{11}-> TE_{01} mode converter.
4. The presented results mostly illustrate the concept, more detailed evaluation will certainly be needed (TE_{03}?, more then 8 coupling slots?, sensitivity analysis…etc.)

Our proposal

- Design study of ultra-low phase gradient resonator configurations.
- Realization of a prototype resonator.
- Electrical characterization of the prototype using rf techniques and test with Cs beam in the clock at METAS.

By means of a PhD student jointly supervised by the Laboratoire Temps-Fréquence (LTF) of the University of Neuchatel and CERN.

We plan to apply for KT funding for partial support of the student. METAS will manufacture/supply the prototype cavity and measurements will occur at both laboratories.

An ns-FFAG for Medical Applications

Particle Accelerators Corporation and FNAL (US)
and
Huddersfield University
STFC (UK)

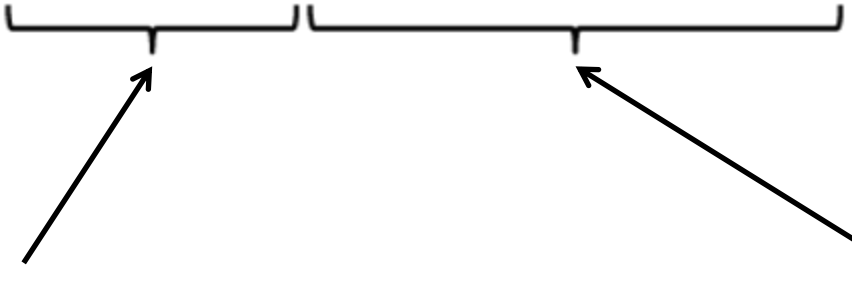
- ^{99m}Tc and ^{99}Mo production using accelerators
- Introduction to our FFAG accelerator
- Benefits for medical applications
- Use for radioisotope production
- Status and plans

Rob Edgecock

FFAGs

- Our solution: novel type of non-scaling FFAG

Fixed Field Alternating Gradient accelerator



Important feature of cyclotrons:
- Ease of operation
- Rapid cycling
- High beam current potential

Important feature of synchrotrons:
- Better beam control
- Smaller losses
- Easier beam extraction
- Smaller magnets

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Inspiring tomorrow's professionals

FFAGs

- Non-scaling FFAGs:
  - Invented at PAC 97/99 for muon acceleration in a Neutrino Factory
  - Do not obey scaling law → more flexibility
    → ~unique
  - Necessary to build proof-of-principle machine
  - EMMA construction started in 2007 at DL, Cheshire
  - Completed and commissioned in 2011
  - Experimental programme still on-going

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Our ns-FFAG

- Cyclotrons are the current standard for:
  - radioisotope production
  - proton therapy
  - SC cyclotrons being developed for carbon therapy
- Our ns-FFAG is more cyclotron-like:
  - fixed magnetic fields
  - ~isochronous to ~2 GeV → fixed RF frequency, CW operation
  - easy, reliable operation
- But with stronger focussing:
  - ring of individual, smaller magnets
  - smaller emittance beams
  - smaller beam loss
  - smaller orbit excursion (usually)
  - variable beam energy extraction
  - multiple extractions

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Next Steps

(1) Extension of existing design to 14 MeV:

- Conceptual design
- Engineering design if this looks OK

(2) Prototyping, in particular, ring magnet

(3) Construction of accelerator

- We are seeking funding for the conceptual design
- For more details, come to the EuCARD2 Accelerator Applications Network meeting on Friday 14th June in the Council Chamber, see:

  http://indico.cern.ch/conferenceDisplay.py?confId=247757