

Medical Applications at CERN

Steve Myers

Head of CERN Medical Applications

Former Director of Accelerators and Technology,

Geneva, Switzerland

Short Mandate

Facilitate transfer of **CERN's technologies** (developed for particle physics) to healthcare and medicine

CERN's technologies

- Accelerating particles
- Detecting particles
- Large scale computing and data (Grid)

What has happened since 2000 on the technology side?

- LHC accelerator technology development
 - Operation of 8T magnets
 - Testing of 11T magnets for Luminosity upgrade
 - Development of 18-20T magnets for energy upgrade

MRI, and superconducting gantries
- LHC Detectors developments
 - Crystal scintillators improvements
 - Medipix proliferation and enhancements
 - Developments of new vertex detectors for LHC luminosity upgrade
 - Development of TOF resolution for Luminosity Upgrade

Medical Imaging and Diagnostics
- CLIC
 - Accelerating structure frequency reduced from 30GHz to 12GHz
 - Development of room temperature structures for 100MV/m gradient
 - Proposals for structures of 3 and 5.7 GHz with 30 and 50 MV/m for medical applications

Compact Accelerators Protons and Light Ions
- LHC Grid
 - Demonstration of the efficiency and reliability
 - Rapid adoption to new domains; Medicine

Large scale medical data storage, transfer and analysis
- Developments of medical simulations with FLUKA/GEANT
 - Treatment planning, medical research

The 7 CERN Initiatives

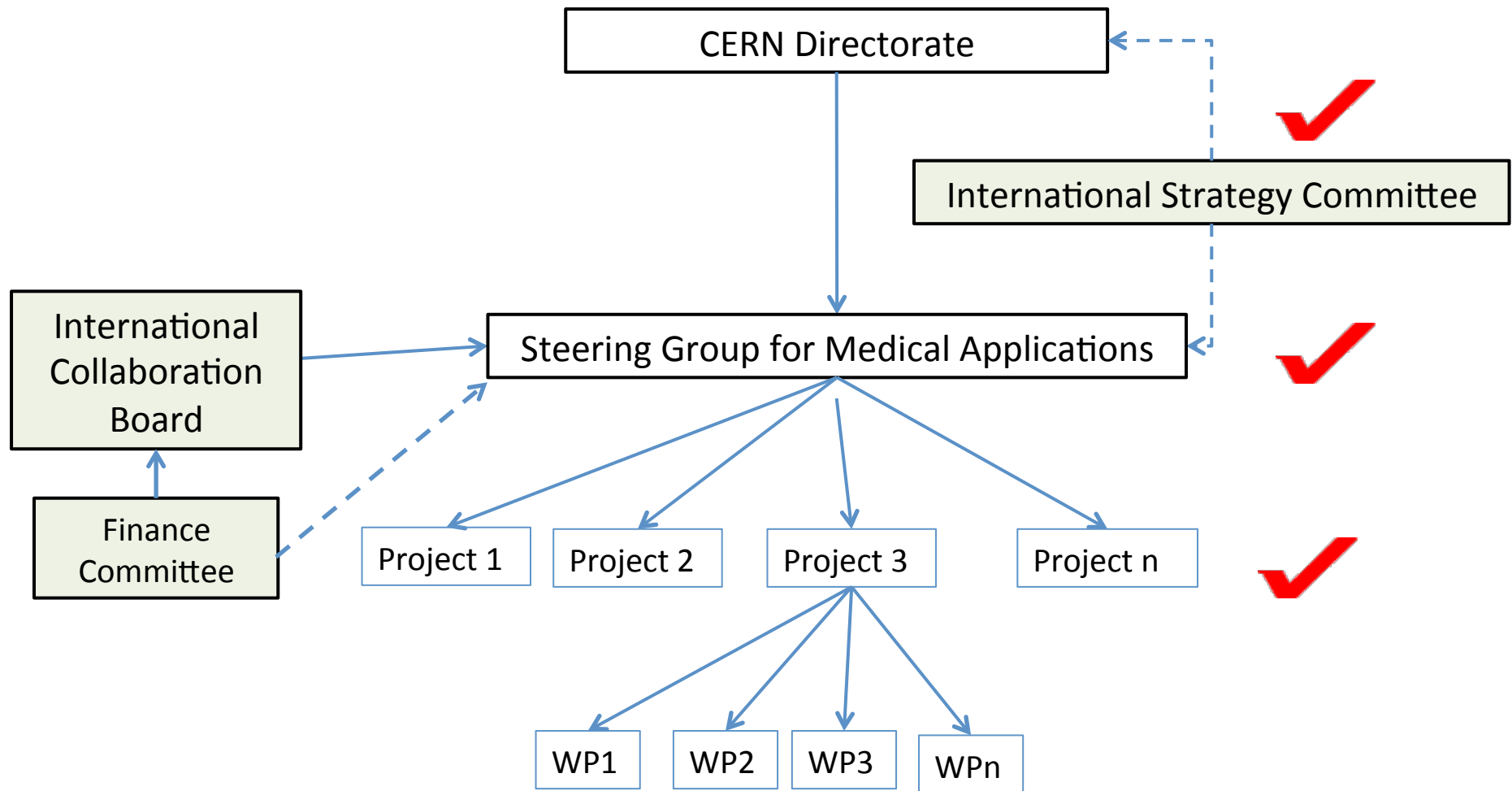
- Radio-Isotopes (imaging and possibly treatment)
- **Detectors** for beam control and medical **Diagnostics and Dosimetry (pot)** for radiation
- Biomedical Facility
 - creation of a facility at CERN that provides **beams of different types and energies to external users** for radiation detector development
 - Iterative experimental verification of simulation results
- Large Scale Computational Simulations, treatment planning telemedicine
- Computer Simulations for Medical Applications
- New Upgrade Accelerator Design
 - coordinated international collaboration to design a **new compact, cost-effective facility**, using the most advanced technologies
- “Cancer Applications; Ablative Therapies...”

Each Initiative is part of a package but also is important as a stand-alone project

CMA Initiatives: Where are we?

- Obtained some “seed” funding from CERN, as well as donations from outside
- “CERN Medical Applications Workshop” followed the ICTR-PHE (15-16 February, 2014)
- Attracted ~80 top experts from all over the globe
- Funding, governance,... “institute or..”
- International Strategy Committee (First Meeting Nov 2014, second April 2015)
- CERN as a medical data repository (HUG, EPFL, CHUV, NCI)
 - VRE Proposal to the EC
- Radio-isotopes project well under way
- A “White” paper well under way
- HF-RFQ (750MHz) development

DRAFT Structure (to be decided)



Members of the ISC

chairs

	Surname	First Name	Institute	Country	Speciality
1	Amaldi	Ugo	TERA	Italy	Physics
2	Baumann	Michael	Dresden	Germany	Radiobiology/oncology
3	Debus	Jurgen	HIT	Germany	Physics
4	Del Guerra	Alberto	Uni Pisa	Italy	Physics
5	Dosanjh	Manjit	CERN	Switzerland	biology
6	Durante	Marco	GSI	Germany	Radiobiology
7	Hausterman	Karin	Leuven	Belgium	Radio-oncology
8	Hoeschen	Christoph	Munich	Germany	
9	Jones	Bleddyn	Oxford	UK	Scientific secretary
10	Lambin	Philippe	Maastru	Netherland	Medicine
11	Lewensohn	Rolf	Karolinska	Sweden	Physics
12	Mayer	Ramona	Med-austron	Austria	Radio-oncology
13	Mazal	Alejandro	Institut Curie	France	Physics
14	Mohan	Radhe	MDAnderson	USA	Radio-oncology
15	Myers	Stephen	CERN	Switzerland	Accelerators
16	Orecchia	Roberto	CNAO	Italy	Medicine
17	Overgaard	Jens	Aarhus	Denmark	Radio-oncology
18	Poetter	Richard	Vienna	Austria	Senior Advisor
19	Prior	John	CHUV	Switzerland	Radio-oncology
20	Prise	Kevin	QUB	UK	Radiobiology
21	Schippers	Marco	PSI	Switzerland	Physics
22	Townsend	David	NUHS	Singapore	Physics
23	Tsujii	Hirohiko	NIRS	Japan	Radio-oncology
24	Vikram	Bhadrasain	NCI-NIH	USA	Senior Advisor
25	Waligorski	Mike	INP, Krakow	Poland	Physics
26	Zhang	Shen	Shanghai	China	Medicine

Endorsement for OPENMED (bio-LEIR)

So far we have endorsements from

- **ISC members (25 prominent medical specialists)**
- **Editors in Chief of Radiotherapy and Oncology; M. Baumann, and Jens Overgaard**
- **President/Vice Chancellor of Queens' University Belfast**
who also write to:
 - Lee Helman, Norm Coleman and Doug lowy at **NCI**.
- **Christie, Manchester (Karen Kirkby, Hywel Owen, Simon Jolly)**

- **Vikram (NCI)** who also suggested
 - **Dr. Abdel-Wahab**. Director - Division of Human Health IAEA
 - **Dr. Varghese**, Coordinator, Management of Noncommunicable Diseases (MND) Management of Noncommunicable Diseases, Disability, Violence and Injury Prevention Department (NVI) World Health Organization
- IAEA **Oleg Belyakov** wrote to
 - International Association for Radiation Research (IARR), the current President Prof Mary Helen Barcellos-Hoff;
 - (USA) Radiation Research Society, the current President Prof Gayle E Woloschak ;
 - European Radiation Research Society (ERRS), the current President Prof Wolfgang Dörr,
 - **Dr Hans-Georg Menzel**, ex CERN member of staff and current ICRU Chairman.
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- **Radhe Mohan (MD Anderson) wrote to**
 1. Stephen Hahn, Head and Professor, Division of Radiation Oncology, MD Anderson Cancer Center
 2. Steven Frank, Professor and Director, Proton Therapy Center, MDACC
 3. David Grosshans, Associate Professor, MDACC
 4. Hak Choy, Professor and Head, Department Radiation OPncology, UT Southwestern, Dalla, TX
 5. Michael Story, Professor, UTSW
- **France-Hadron: Denis Dauvergne, and Jacques Balosso.**
- **IFIMED Valencia, Jose Bernabeu** (suggested by A. Faus-Golfe)
- **John Adams Institute (Oxford)**
- **Cockcroft Institute (Daresbury UK)**

Thank you.