

# Imaging: summary of discussions

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# Attendees + slide presenters

11 (+1+1) attendees

1. Alberto del Guerra: EXPLORER concept
2. Gabriella Llosa: Compton camera in beam monitoring
3. Ulli Koester: 3 gamma imaging PET and Compton Camera for triple gamma positron emitters
4. Michael Campbell: Hybrid pixels with Medipix4

# General comments

1. From the clinical community: it want diversity from the hadron therapy focus.
2. CERN decide how they can market technological breakthroughs (shopping paradigm).
3. Note that CERN is out of loop with animal experiments.
4. Internal people restricted to getting involved with interdisciplinary R&D; are there internal issues getting in the way of cross discipline studies ?
5. Not sufficient clinicians at the meeting.
6. Where is industry (no attendees from industry)?
7. Promote High Energy Physics collaboration culture towards medical imaging R&D projects, e.g. through setting up interdisciplinary collaborations with external users at CERN, which will favour dialog that helps to identify what the end users want versus what particle physicists can do.
8. Identify synergetic topics whenever possible (shared needs between High Energy Physics and medical imaging).
9. Bring medical physicists at CERN as a go between particle physicists and end users of medical devices.
10. Input not just ESTRO-ESR, EANM, EFOMP-balance from RO/radiology/nuclear medicine. Not just/European level-outside Europe.

# What are the big challenges

1. Spectral CT: imaging of several contrast agents at a time
2. Molecular imaging:
  - < 10 ps TOF-PET
    - > reconstructionless PET
  - High sensitivity (x 40)
    - > low dose (/40)
    - > Total Body PET
  - Improve quantitation
    - > Movement correction
    - > multiparametric imaging (simultaneous PET/MR)
3. Range imaging in hadrontherapy/carbon therapy
  - PET
  - Prompt gamma imaging
    - > Collimated camera
    - > Compton camera

# Views of new developments

1. Request for **BIO LEIR** to have an accelerator so that it can be a test for in beam monitoring cameras (€15M).  
Aware of the radiobiology needs case.  
A clear business plan is needed.  
US doing randomised clinical trials.
2. Hybrid Pixels (Medipix) TSV to assemble large surface CdTe detector able to handle clinical X-ray flux and to build large surface particle tracker for pCT.
3. Microelectronic developments are strong at CERN
4. Three gamma imaging: long lived isotopes positron plus gamma emitter (e.g. Sc-44).  
Three gamma detector/Compton camera.  
Problems due to limited field-of-view.
5. Total body imaging-lots with EXPLORER programme
6. Interventional imaging: e.g. surgery, combine = image augmented reality with different multimodality systems/technical issues-integration of complex system/miniaturisation/data acquisition.  
Industry not present at the workshop, so may be doing it-we need to be complementary.

# Building a Global Perspective

1. Time to healthcare market 10-15 years for a medical device. Industry needs confidence since money is the end point.
2. Different market from experiments at CERN since commerce cannot have redundancy.
3. Where is CERN unique-and add to imaging: highest temporal TOF & detector read-out microelectronic.
4. Big data handling for many uses in medicine/imaging.
5. CERN in comparison with the reported fast developments in -Asia – South Korea/China (but they at present appear to lack a strategy).
6. CERN needs to shorten the path between good ideas and the economy.  
USA better organised to translate to market.
7. Act as a coordinator/platform/facilitator for applied physics.