POSIPOL 2012 Summary

POSIPOL 2012

32 + 3 webex participants, 33 talks:

http://www.desy.de/POSIPOL2012

- Physics and status of accelerator projects and experiments (12 talks)
- Undulator sources, target and capture prototyping & source modelling (8 talks)
- Polarisation, spin manipulation, polarimetry (4 talks)
- Hybrid sources, granular targets (2 talks)
- Compton sources, optical cavities & lasers (6 talks)
- Truly conventional sources (1 talk)

Physics & status of projects and experiments

- **Physics with polarized beams in the light of LHC results: Mikael Berggren**
  - **SUSY is alive (only simple models ruled out) → analyses profit from e+ polarization**
  - **P(e+) ~ 30% or higher are desired**
- **The Linear Collider Projects: Tsunehiko Omori**
  - **Effort in Japan**
  - **Higgs-like state → start with low energy (250GeV)**
- **ILC, CLIC, LHeC**
  - ILC e+ source status/ general status: Wei Gai
  - CLIC status (including injectors): Steffen Doebert
  - LHeC: Ian Bailey, Louis Rinolfi
- **Super-B-Factories**
  - SuperKEKB e+ source Takuya Kamitani
  - SuperB: Olivier Dadoun
- **RF helical undulator and its application to polarized positron production: Sami Tantawi**
- **FLASH: Mathias Vogt**
- **Polarized beams and projects at MAMI: Kurt Aulenbacher**
- **PEPPo Status, preliminary measurements: Joe Grames**
- **Eli-NP status: Olivier Dadoun**

LHeC: Ian Bailey, Louis Rinolfi

- CDR in July 2012

M. Klein, 14/06/12, Chavannes

→ **There is a strong demand from physics to maximize the positron luminosity too**
(with probably less emphasis to the e^+ beam polarisation which is yet another complication)
→ **A setup with 100 fb-1 electrons and 1 fb-1 positrons is tolerable but requires L+ = O(L-/10)**

If the positron luminosity was much lower than for electrons, one would be tempted not to "waste" running time on positrons and thus the integrated luminosity came out to be even lower, relatively to electrons

- Ring-ring option
  - **No need of polarized e+ (polarization obtained in the ring)**
- Linac-ring
  - **polarized e- injector (feasible, requires R&D)**
  - **Unpolarized e+ (preliminary design exists)**
    - Possibilities:
      - Multiple targets
      - Hybrid targets, target of densely packed spheres
    - further studies + R&D required
  - **Polarized e+ injector**
    - Compton Linac, several CR (ERL 60 GeV)
    - Undulator using spent beam, CL, CR (p – 140GeV)
    - **Extremely demanding, requires strong R&D**

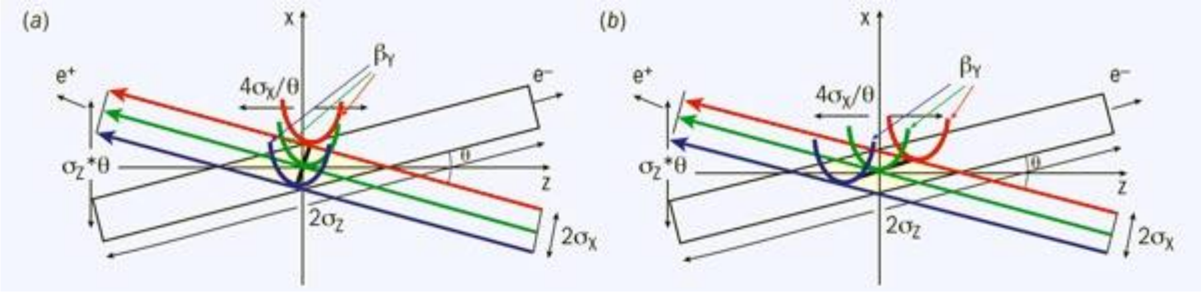
SuperB (Dadoun), SuperKEKB (Kamitani)

Luminosity more than 100 times that of existing B factories:

SuperKEKB: L ~ 8x10^{35}cm^{-2}s^{-1}
SuperB: L ~ 10^{36}cm^{-2}s^{-1}

The crab-waist collision scheme at SuperB, tested at DAΦNE

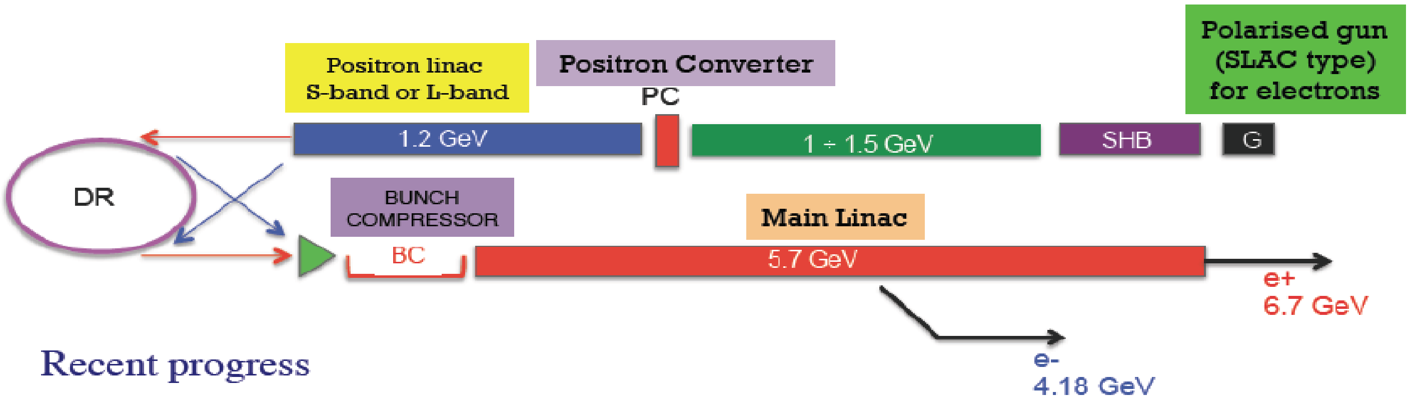
sextupoles off (a) and on (b).



Sextupoles rotate the waist in the β function of one beam → minimum β value is aligned along the trajectory of the other beam,

SuperB status: O. Dadoun

Latest injection system layout

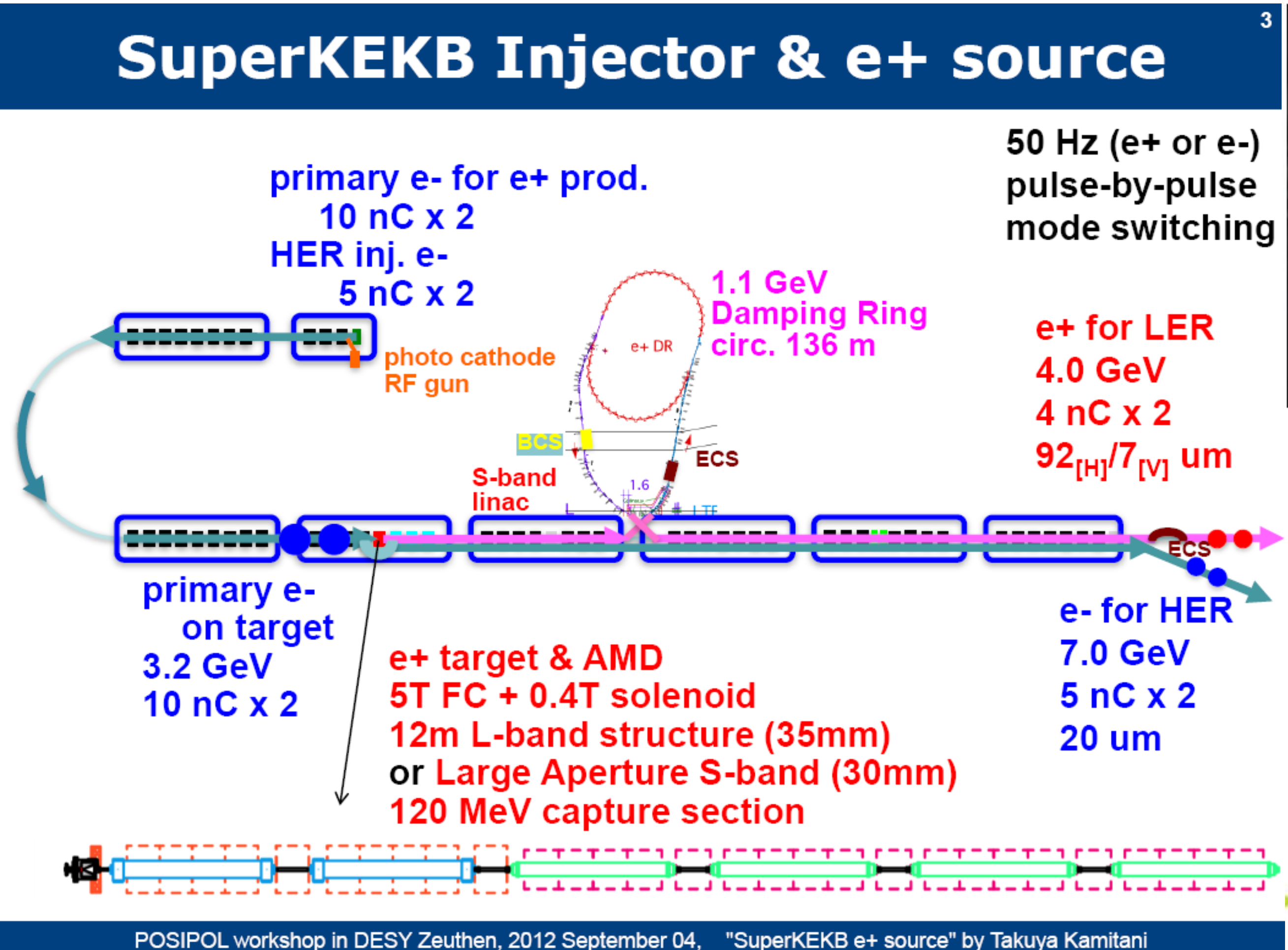


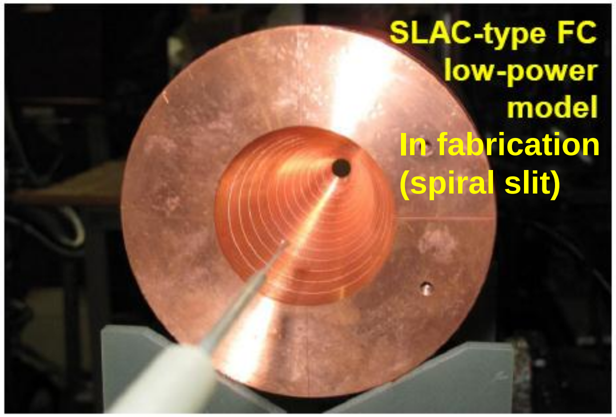
Recent progress

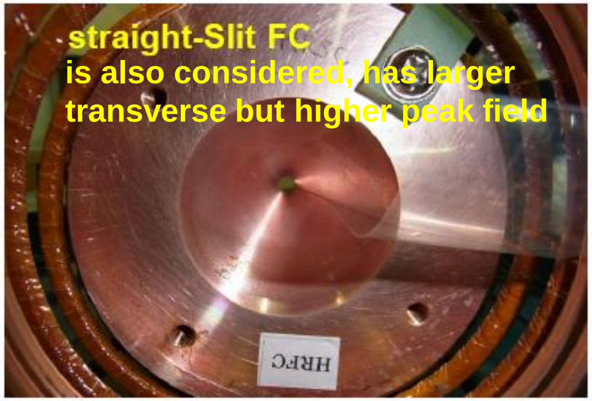
- Final design with DR for electrons too
- Design from the e^+/e^- source to the DR (including the BC)
- e^+ linac S-band and L-Band still open
- Design of the Main Linac
- Main Linac to the HER & LER to be modified
- Design almost finalized in all sub-systems
- The possibility to drive a SASE Hard-X FEL using the 6 GeV e^- linac has been recently considered

SuperKEKB e+ source: Takuya Kamitani

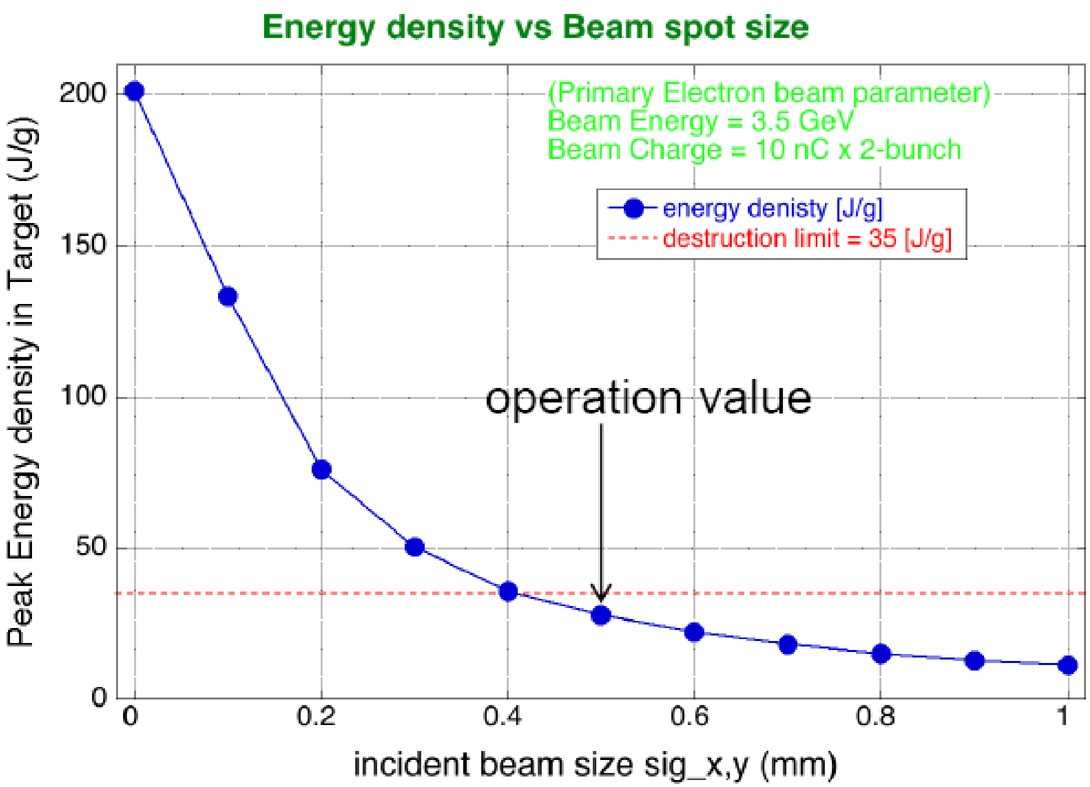
- e+ source upgrade (1→ 4nC), emittance 2000→ 100/7um
- DR introduced for low e+ emittance
- FC for higher energy acceptance (AMD)
- Larger aperture accelerator structures (wider transverse acceptance)

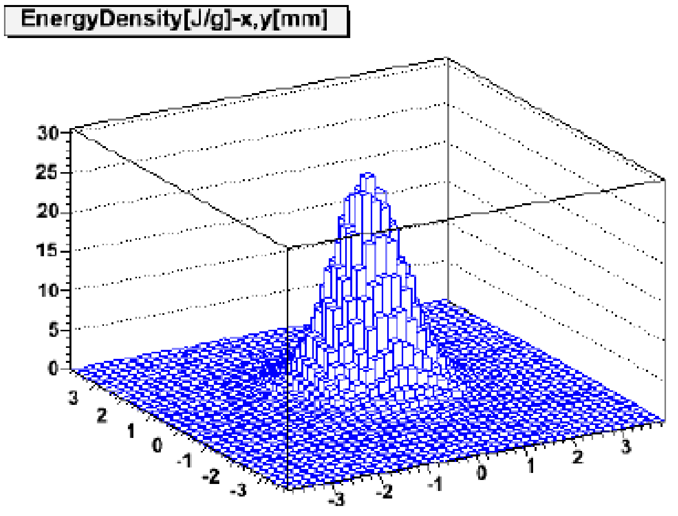


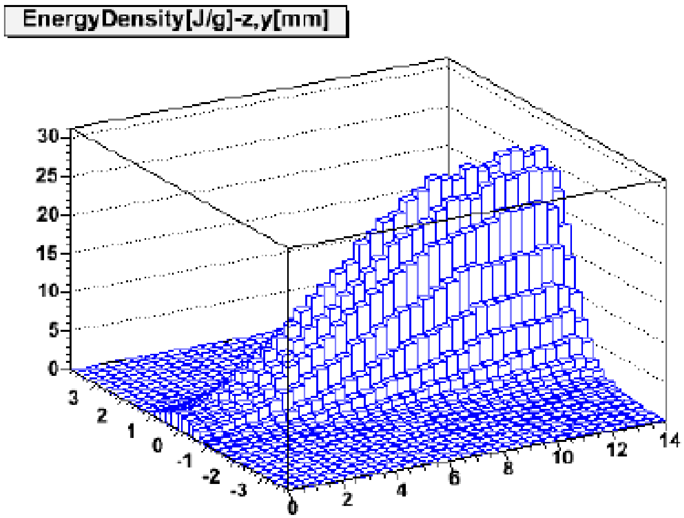




target protection







We do not have enough margin in the PEDD !!

Need idea for target protection.

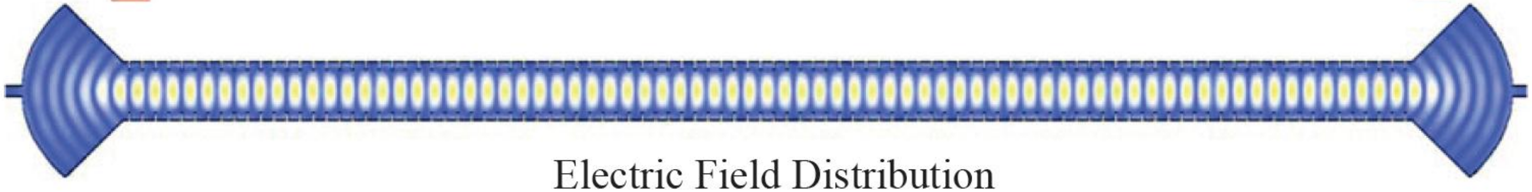
- -> beam spoiler by light material ?
- -> beam spoiler by crystals ?

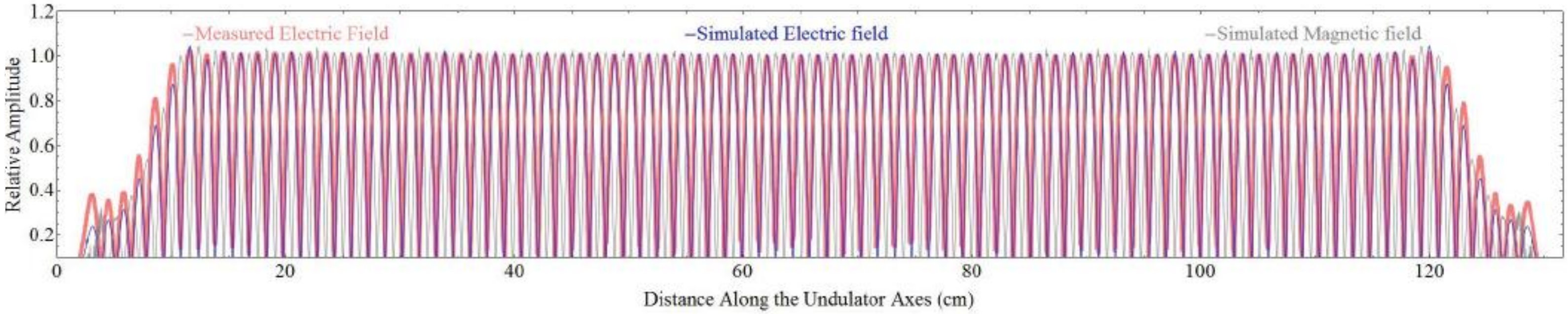
Why RF Undulator?

- Many desirable features
  - Fast dynamic control of
    - Polarization
    - Wavelength
    - K
  - Large aperture (cm vs mm for static undulator)
  - No issue with permanent magnet damage by radiation
  - Economic considerations
  - Potential use as LCLS "After Burner"
  - Dynamic undulator for storage ring

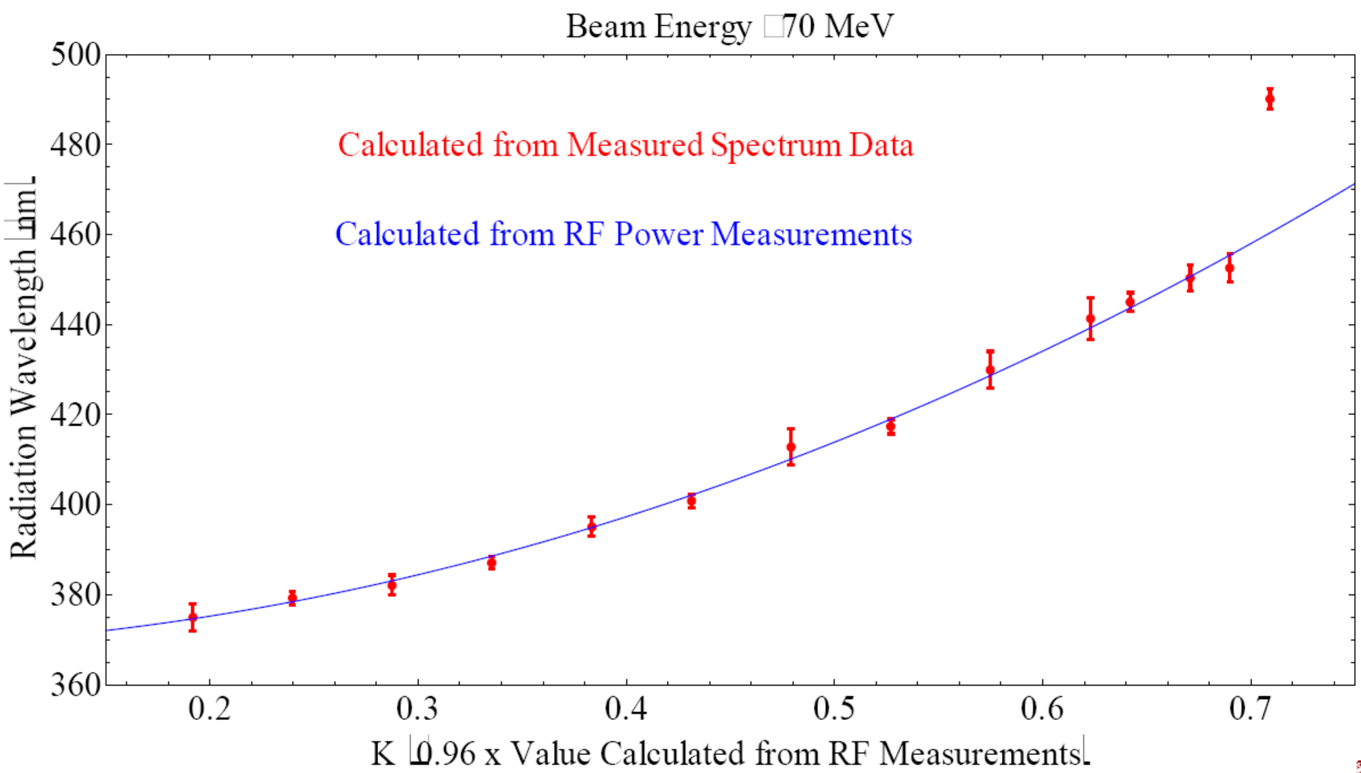
Undulator Design


Undulator Mechanical Structure


Electric Field Distribution



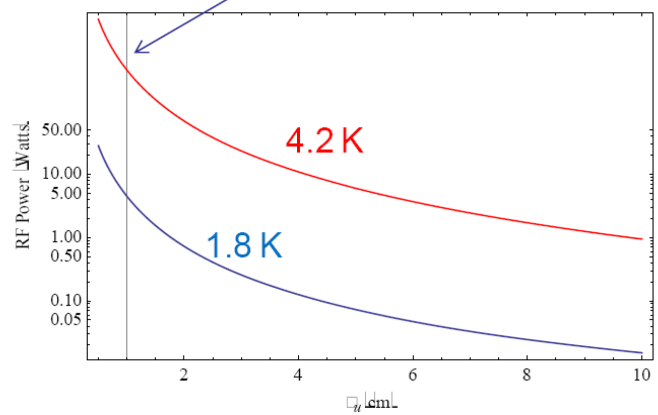
Measurements of the undulator K parameter

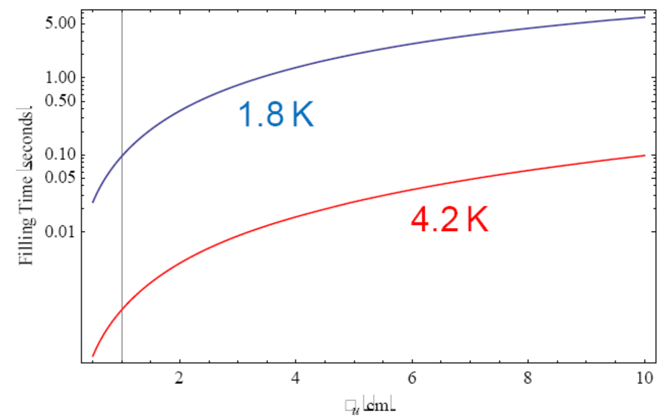


RF helical undulator and its application to polarized positron production: Sami Tantawi

Superconducting Undulator(1 % duty cycle)

Undulator wavelength ~ 1cm imply operating frequency of ~16 GHz.
The undulator test done to date was at 11.4 GHz with undulator wave length of 1.393 cm. Reducing it to 1 cm should be straight forward



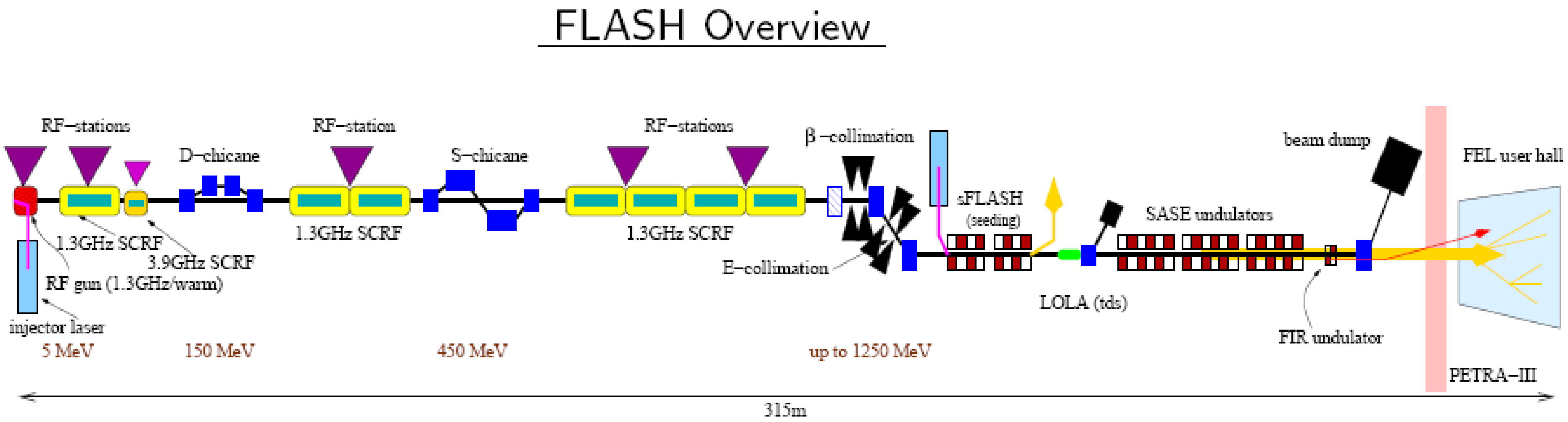


- One could decrease the filling time by decreasing the external Q
- The peak power would increase, of course.
- At a filling time of 1 ms, the peak power required is 50kW/m
- At CW the peak power required is 500 watts/m

Future plans:

- More precision measurements at NLCTA
- After burner for LCLS
- **Short wavelength undulator at 10mm for ILC**
- Short wavelength undulator at 5mm for NGLS
- Superconducting undulators

FLASH: Mathias Vogt



- **FLASH** :=
  Free electr. **LAS**er in **H**amburg

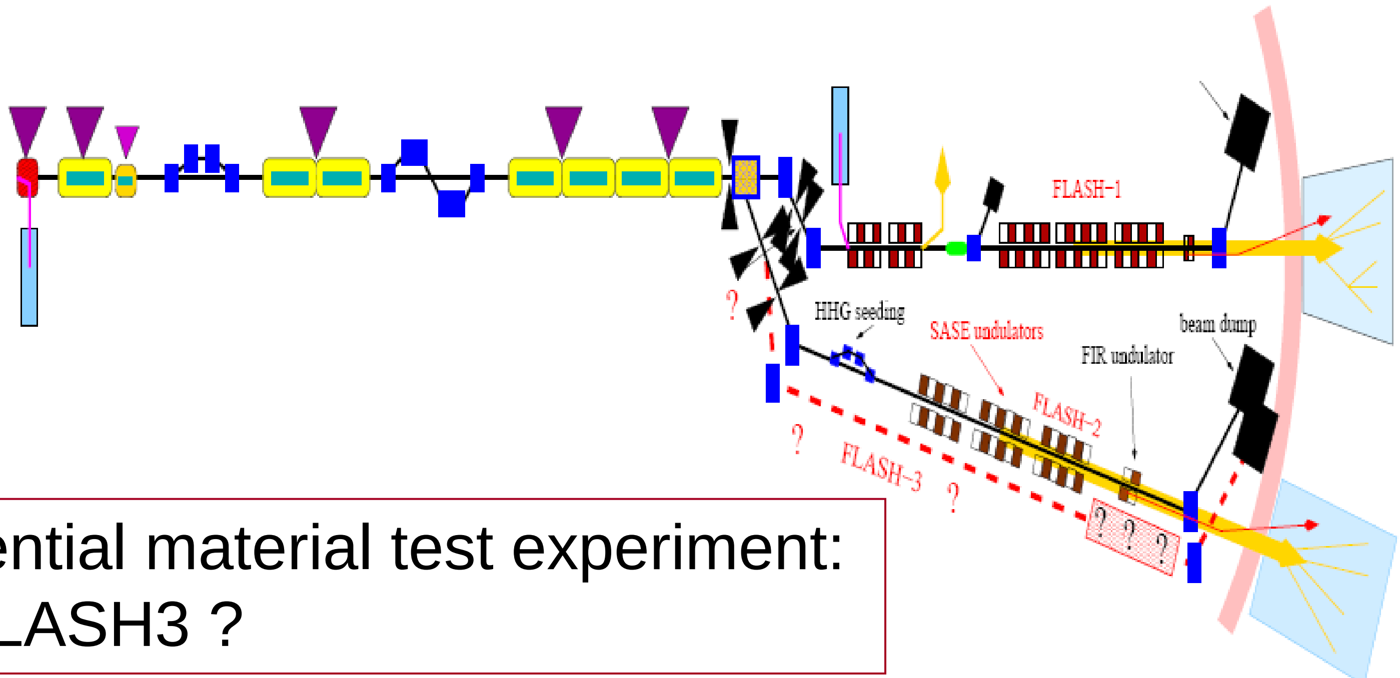
$\Rightarrow$ **High brilliance, short pulse soft X–ray photon source**

- Normalconducting photo cathode RF–gun
- Superconducting (SC) LinAc (TESLA type cavities)
- Fixed gap planar undulator $6\times$ 4.5 m

- "Normal year", time (w/o maintenance):
  - $\rightarrow$ 50% photon users
  - $\rightarrow$ 35% FEL studies (perf. impr. , beamline service)
  - $\rightarrow$ 15% General machine studies

FLASH: Mathias Vogt

X–Xtension : FLASH–3 ?



Potential material test experiment: at FLASH3 ?

— not yet funded . . . however, dump pit already exists.

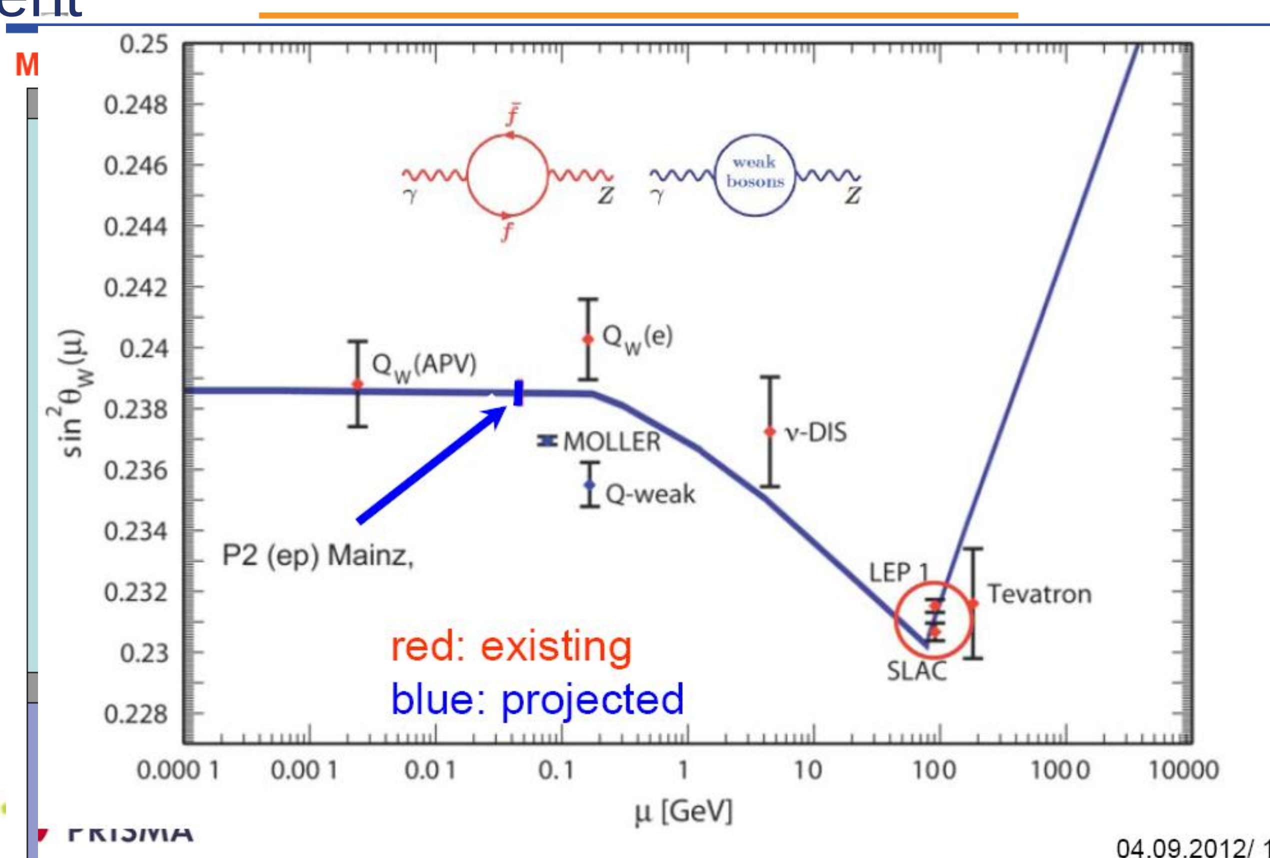
- Plan: build FLASH–2→3 extraction soon.
- no beam line designed so far. . . — Unclear if γ or "experimental" !
- LAOLA (LaserPlasmaWakefieldAcceleration) and others ?

Polarized beams and projects at MAMI: Kurt Aulenbacher

- Facilities do not focus at polarized e+ but possible
  - Channeling, Pair production, ‘ISOL’ of (γ,n) produced isotopes (15-O)
- Precision polarimetry
  - **(non-invasive Hydro-Moller could be interesting for e+ source)**
- Planned experiment (MESA facility):

to measure sin2θw
with 0.15% precision
at low energies

⇔ $\Delta P/P = 0.5\%$

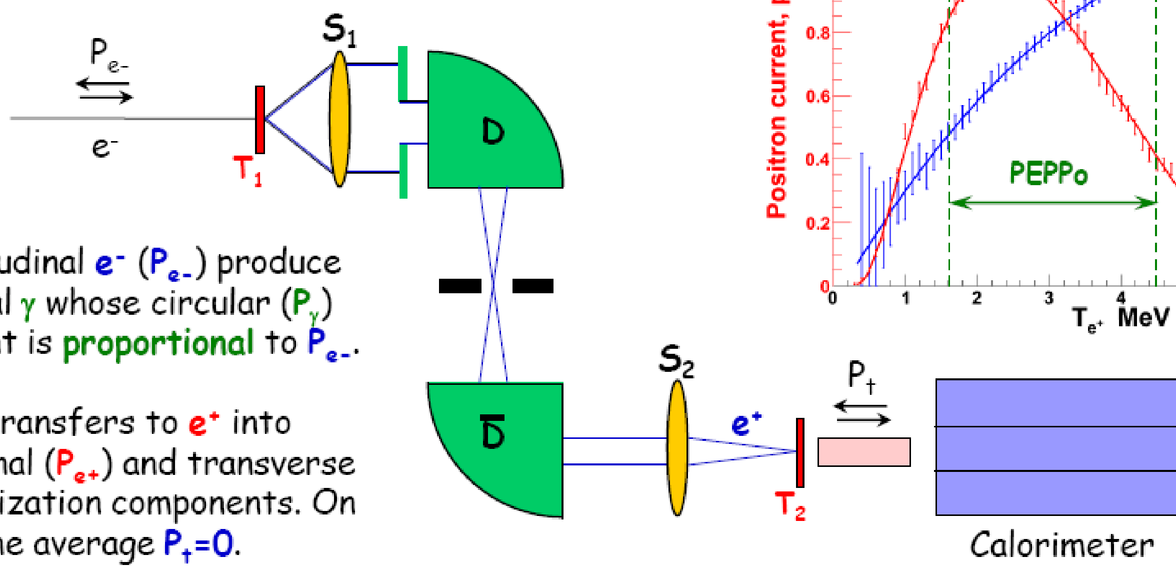


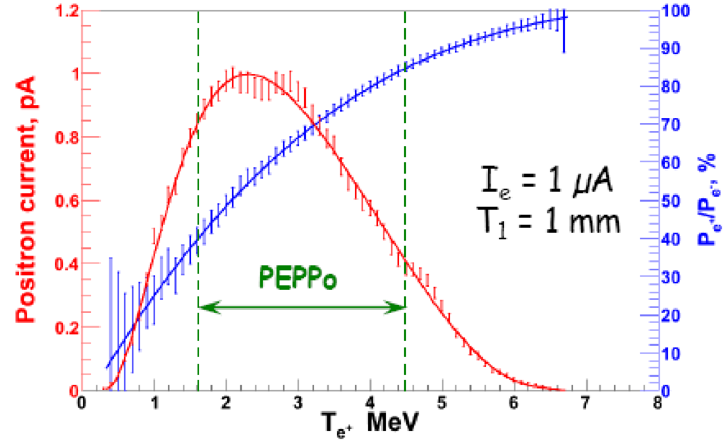
MESA = Mainz energy recovering superconducting accelerator

PEPPo Status: Joe Grames, Erica Fanchini

PEPPo
a Proof-of-Principle Experiment
Polarized Electrons for Polarized Positrons

PEPPo Concept @ JLab





- Longitudinal e^- (P_{e-}) produce elliptical γ whose circular (P_γ) component is **proportional** to P_{e-}.
- P_γ transfers to e^+ into longitudinal (P_{e+}) and transverse (P_+) polarization components. On the average $P_+=0$.

PEPPo is proposing to **measure** the **polarization transfer** from longitudinal electrons to longitudinal positrons in the **3-7 MeV/c momentum range**.

A natural "next step" after PEPPo would be an experimental test of the **optimization** of a **positron collection** system and a scheme to **define the phase space** of the **positron beam** for **CEBAF acceleration**.

Eli-NP: Olivier Dadoun

Eli – NP = Extrem Light source Nuclear Physics

ELI is on the research priority list of the European Strategy Forum on Research Infrastructures

It consists on 3 pillars

- Atto-second Laser Science (Szeged, Hungary)
- Laser matter interaction (Prague, Czech Republic)
- Laser based Nuclear Physics (Magurele, Romania)

2 sources of "extreme light" with 8 experimental areas

- 2 Multi-PW Apollon type lasers
- Brillant γ beam facility up to 20 MeV produced by Compton scattering

Some Eli-NP research

At the ELI-NP pillar is approached a new frontier in physics - the laser-nuclear physics frontier:

- Laser induced nuclear reactions
- Nuclear resonance fluorescence and applications
- Positrons source
- Accelerated particle beams induced by high power laser beams (0,1/1 PW) at high repetition rates
- Intense electron and gamma beams induced by high power (multi-PW) laser
- Experiments with combined laser and gamma beams
- Nuclear reactions induced by high energy gamma beams

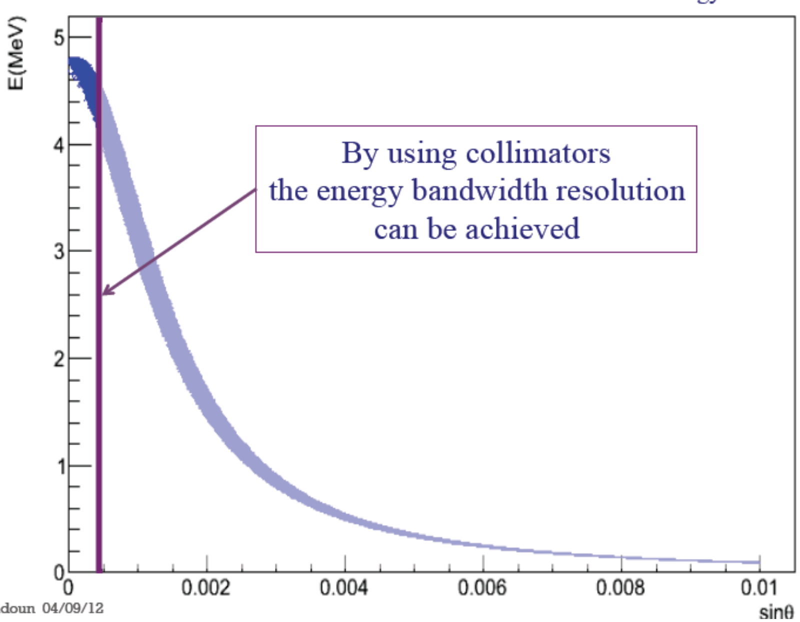
O. Dadoun 04/09/12

Eli-NP: Olivier Dadoun

Use collimator to achieve the energy bandwidth

Gamma @ the IP: energy vs angle (low energy)

e^- drive beam energy 360 MeV



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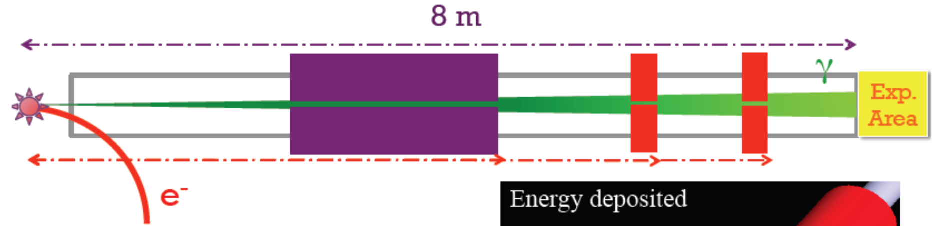
Geant4 collimation line simulation (first baseline)



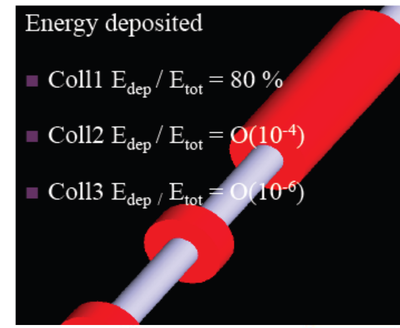
- Collimator 1 [Cu]

  d = 6 m, r = 0.4 mm, l = 30 cm
  used @ E166 (r = 0.425 mm)

- Collimator 2 & 3 [W]

  d = 6.5 & 7.0m, r = 0.4 mm, l = 4 cm

- Beam pipe [Fe]



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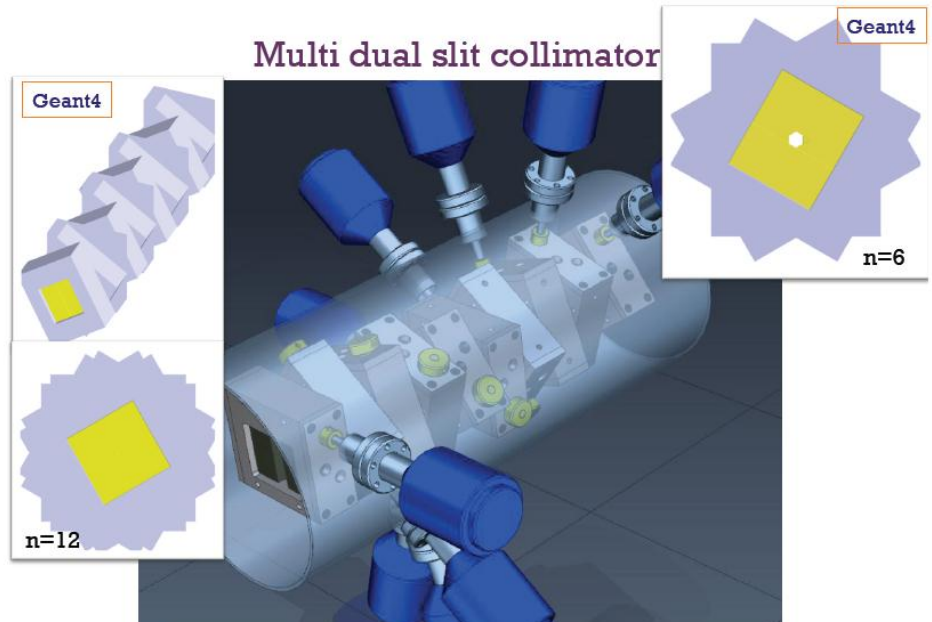
Multi dual slit collimator



Two set of collimators parameters (L.E. & H.E.) have been found which satisfied the bandwidth requirement

O. Dadoun 04/09/12

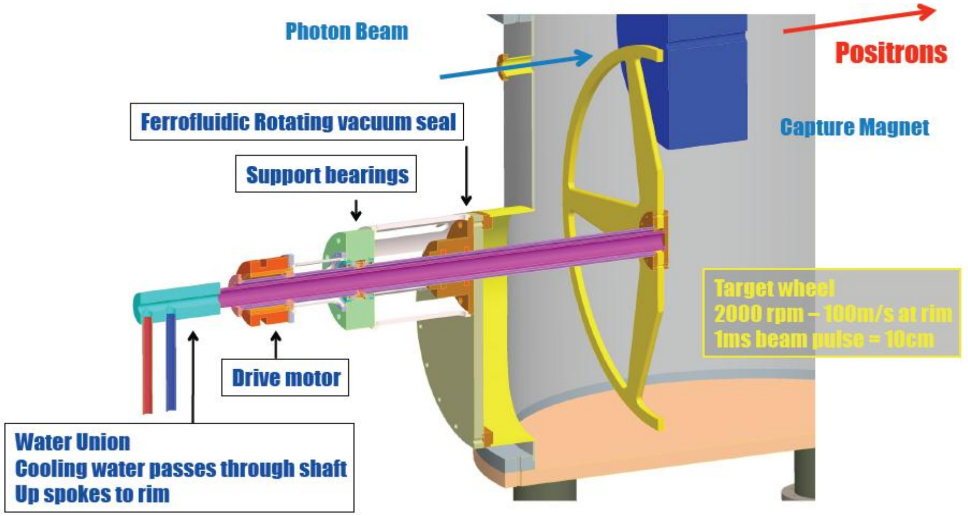
20

Undulator sources, modelling, prototyping

- **ILC/CLIC undulator simulation studies, LHeC thoughts: Mike Jenkins**
  - Multitarget positron source (6 targets use photon beam)
  - Realistic undulator spectra
    → polarization increases
    → yield at high energies increases
- **Prototyping:**
  - ILC Target prototype developments: Jeff Gronberg
  - Flux concentrator prototyping: Jeff Gronberg
- **Update on eddy currents: Ian Bailey**
- **Target remote handling: Xuejun Jia, presented by Wei Gai**
- **Photon collimator design: Friedrich Staufenbiel**
- **Upgrade options:**
  - Upgrade to high ILC energies: Wanming Liu
  - ILC source modeling up to 1 TeV: Andriy Ushakov

ILC Target prototyp developments: Jeff Gronberg

Prototype of rotating shaft with ferro-fluidic vacuum seal



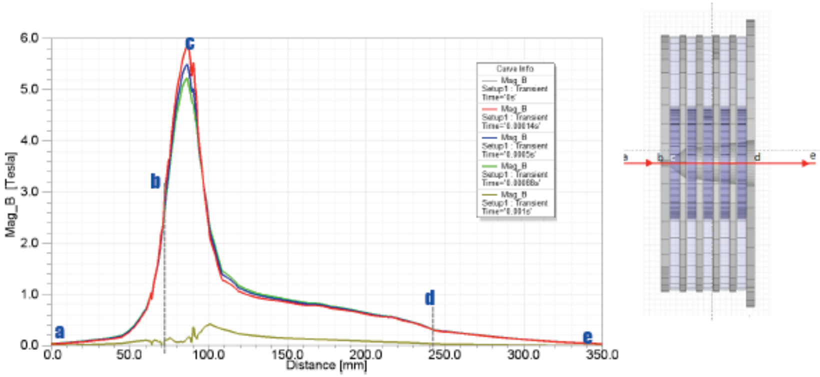
Speed → significant heat dissipation
(impr. cooling design for any future system needed)

ferrofluid 1: higher outgassing than expected,
worked normally until O-ring failure
ferrofluid 2: ran rough on test stand,
better outgassing than ff1
ferrofluid 3: mounted on test stand

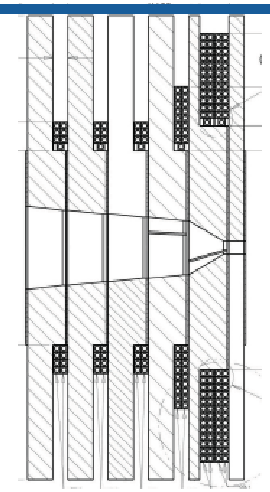
Future development on ferrofluid concept to be in partnership with manufacturers to create design optimized for our needs

Flux concentrator prototyping: Jeff Gronberg

Pulsed Flux Concentrator to increase capture efficiency and reduce magnetic field at the target



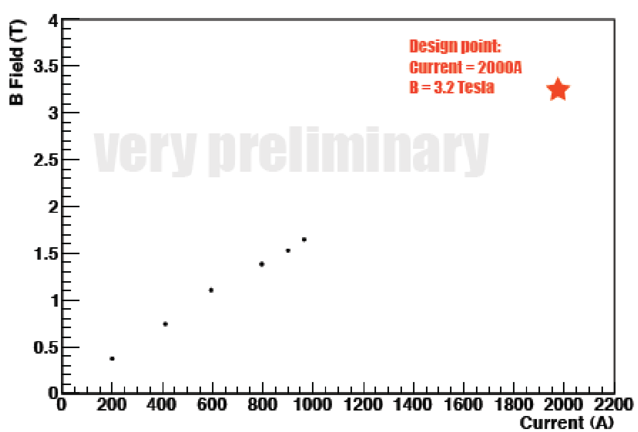
Water cooling and room temperature greatly simplifies the design



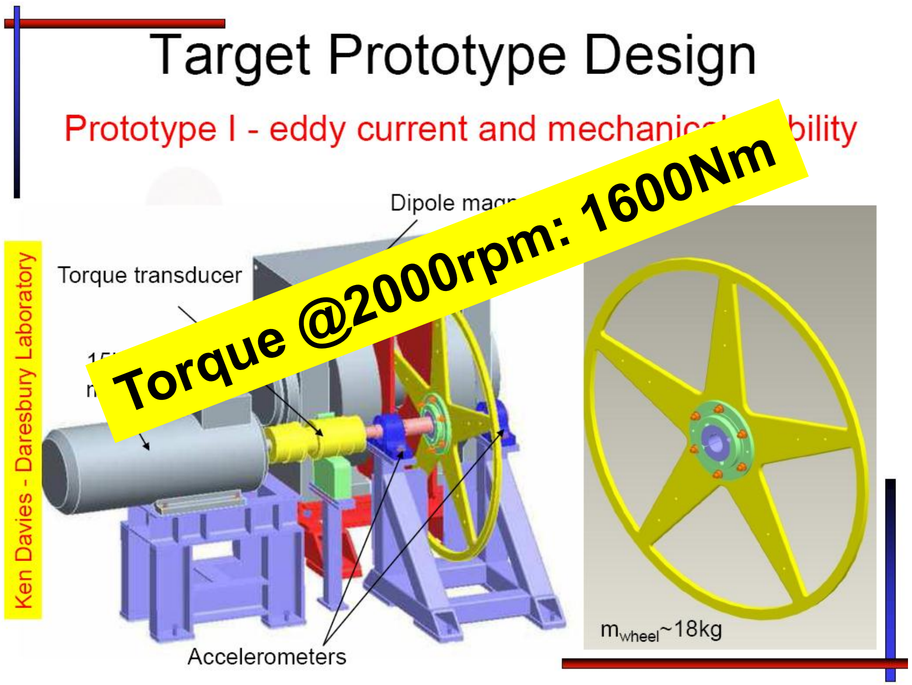
- Device sits in the vacuum
- All power and cooling connections move to the rim
  - Coils are kapton wound, hollow copper, water cooled
  - Plates are OFHC copper with water cooling pipes soldered in
  - Only metal in the high radiation areas
- Plates and coils stack and bolt together

Measured peak axial magnetic field out to 1000A peak current

- magn fields and deposited energy has been simulated
- Will be calculated:
  - **Heat flow and T for final cooling**
  - **Forces an stress**
- Shielding and potential damage of 1st plate



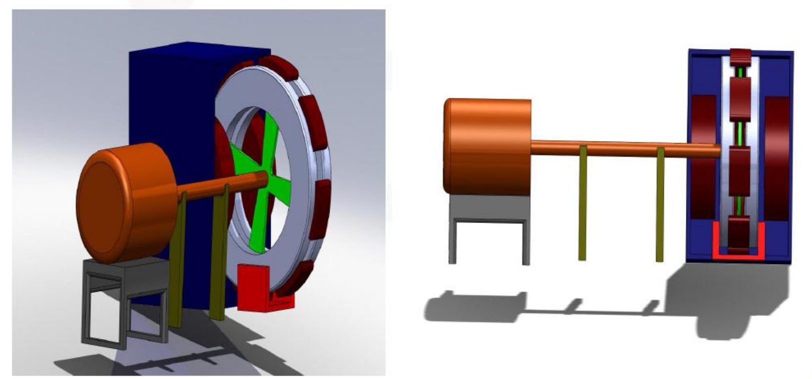
Update on eddy currents: Ian Bailey



Fully immersed target:

Use C-magnets (12) to reduce the torque; model with connected iron yoke → τ_Z ~ 0.1Nm

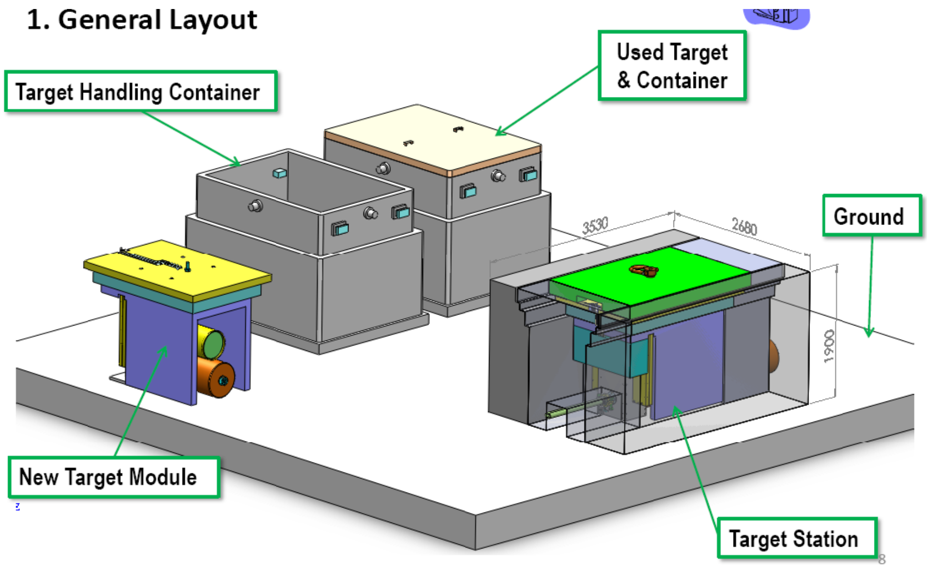
Mock-up of a fully-immersed target



Conclusion:

- **In principle it may be possible to reduce the breaking torque of 1600Nm to 20Nm for a target rotation at 2000rpm in the field of s/c AMD with a peak field ~6T**
- **Long way from a fully-engineered solution**

Target remote handling: Xuejun Jia



vertical

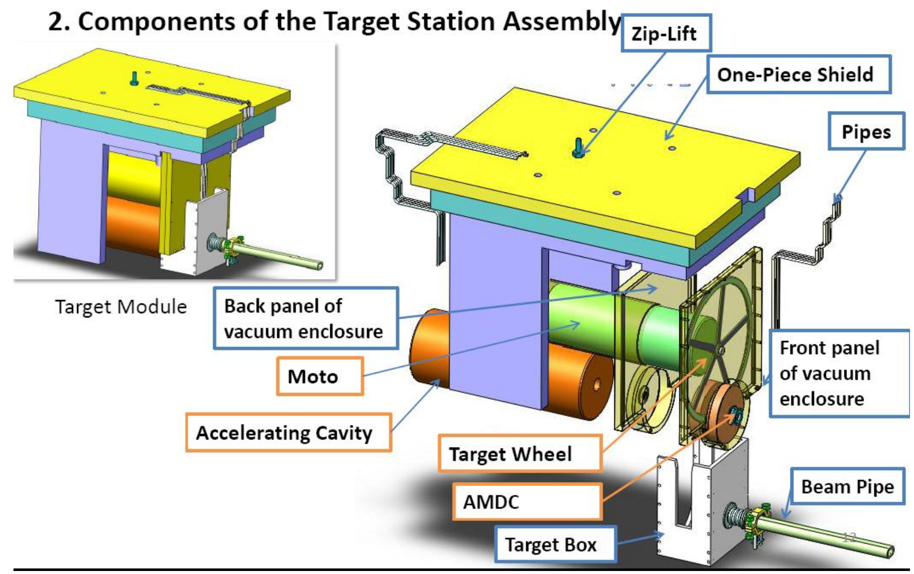
Whole plug replacement

Not hot-cell, but plug storage pit (or area)

Short period requirement

Less shielding, less tunnelling

All connections hands-on



Estimated cost

- Pillow seal: 2X150k
- Supporting structure, alignment : 300k
- Replaceable seal : 2X 80k
- Zip-lift, Remote handling tools: 300k
- Transfer cask and supporting : 300k
- Utilities: 150k (?)
- Crane : 100k (20tons)
- Required storage area : ≈ 60 m^2

~1600k

Photon collimator design: Friedrich Staufenbiel

- Collimator design ⇔ components below fatigue stress limits
- Dynamical ANSYS simulations are still ongoing

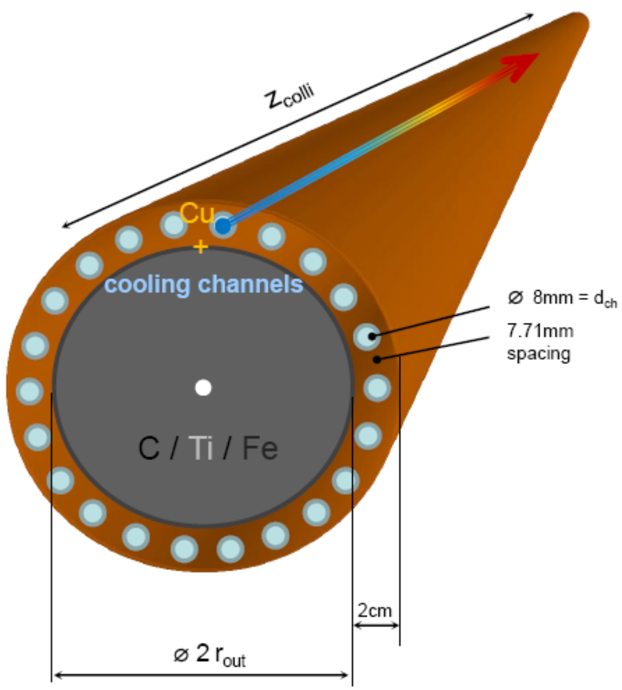
collimator cooling

$$\overset{\text{cyl.}}{\longrightarrow}\ Q = \frac{\lambda\, 2\pi\, z_{colli}\, \Delta T}{\ln(r_{out}/r_{in})}$$

$$Q_{cool}/_{chan.} \approx 0.3\ \mathrm{kW}/_{m^2 K} \quad \Leftrightarrow \quad \bar{v}_{water} = 2\ m/_s \xrightarrow{d_{ch}=8mm} 0.1\ l/_s$$

$$Re = \frac{\bar{v}_{water}\, d_{ch}}{\nu(T = 30°C)_{kin\ vis}} = \frac{\bar{v}_{water}\, d_{ch}\, \rho}{\eta(T = 30°C)_{dyn\ vis}} \approx 2000 < 2300 = Re_{krit,\ laminar}$$

$$r_{out} = \begin{cases} 7.5\mathrm{cm} \Rightarrow Q_{cool}(34\ \mathrm{ch}) \approx 10.2\ \mathrm{kW}/_{m^2\,K} \\ 4.0\mathrm{cm} \Rightarrow Q_{cool}(20\ \mathrm{ch}) \approx 6.0\ \mathrm{kW}/_{m^2\,K} \\ 3.0\mathrm{cm} \Rightarrow Q_{cool}(16\ \mathrm{ch}) \approx 4.8\ \mathrm{kW}/_{m^2\,K} \end{cases}$$



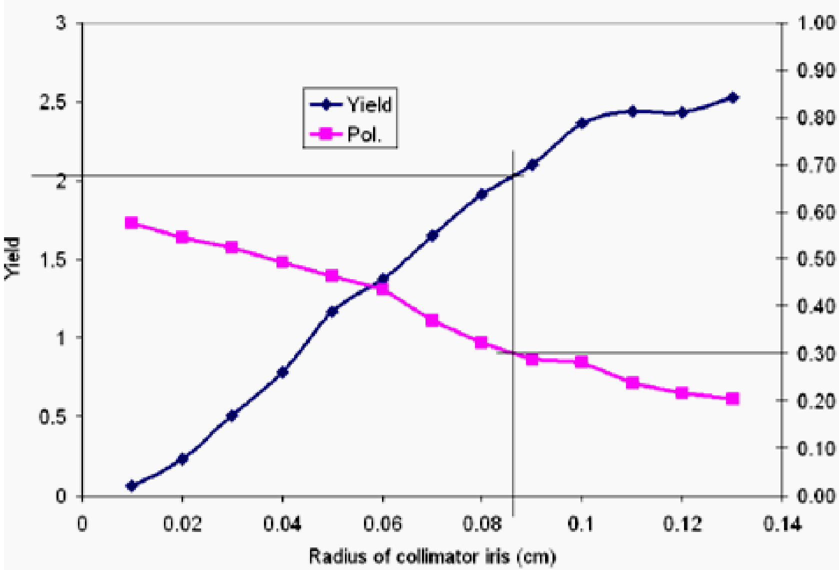
$$\Delta T = T_{in} - T_{out}(20°C) = \frac{Q_0 \ln(r_{out}/r_{in})}{\lambda\, 2\pi\, z_{colli}}$$

$$\xrightarrow{+\ cooling} \quad T_{in} = \frac{Q_0 \ln(r_{out}/r_{in})}{\lambda\, 2\pi\, z_{colli}} + \mathrm{Tout}(20°C) + \underbrace{\frac{Q_{0\ norm}}{Q_{cool}}}_{\text{cooling}}$$

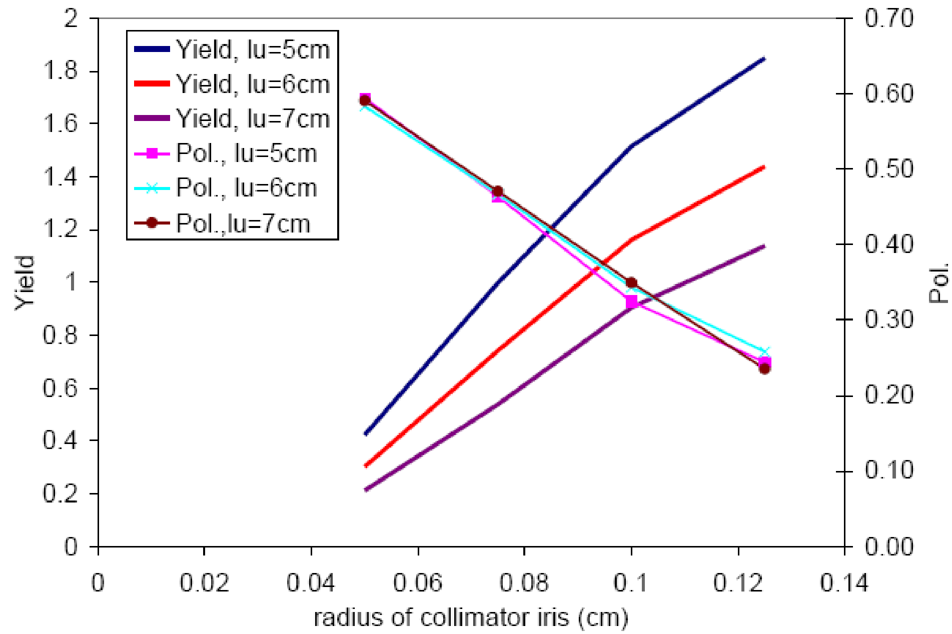
$$Q_{0\ norm} = \frac{Q_0}{2\pi\, r_{out}\, z_{colli}}\ \mathrm{kW}/_{m_2}$$

Upgrade to high ILC energies: Wanming Liu

- With K=1 and λu = 4.3cm 30% polarization
- Longer undulator + collimator → higher polarization
- Final choice of λu will depend on energy deposition, impact on drive beam, etc.
- More studies and optimization needed

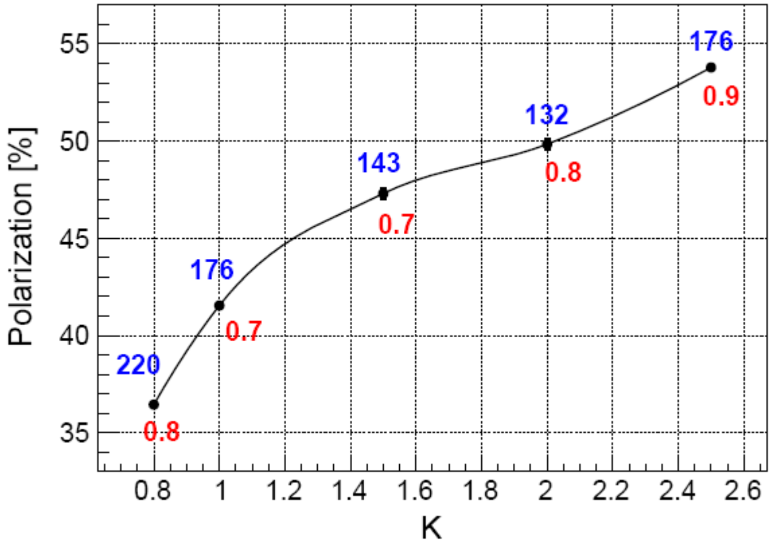


K=1, λu=3cm



ILC source modeling up to 1 TeV: Andriy Ushakov

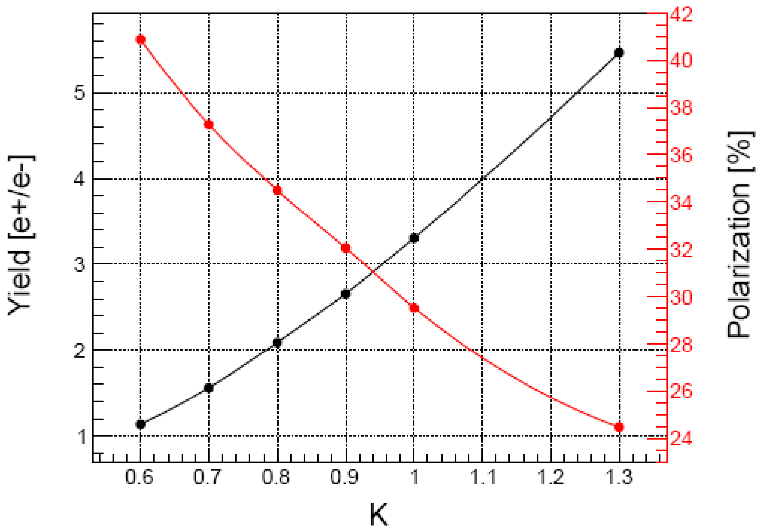
1TeV:



K	# Modules	e+ Yield [e+/e-]
0.8	20	1.556
1.0	16	1.507
1.5	13	1.523
2.0	12	1.499
2.5	16	1.511

blue numbers – required active undulator length [m]
red numbers – aperture radius of collimator [mm]

125GeV e-



Low energies: Nb3Sn undulator

- 54% e+ polarization can be achieved for K=2.5 and rcoll = 0.9mm (25% for K=0.4 w/o coll)
- Undulator with low period (9mm) and high field (1.5T) could be used down to 100GeV (at 5Hz)

Polarisation, spin manipulation, polarimetry

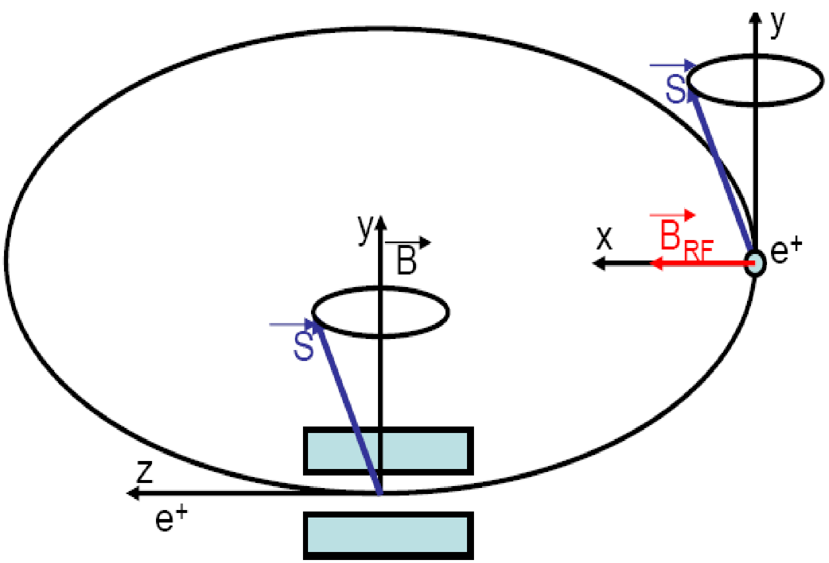
- **Measurement of transversely polarized beams at the IP: Itai Ben Mordechai**
  - High precision polarization measurement (≤0.5%) is possible with transverse Compton polarimeter
  - Setup requires pixel detector (400um x 50um) to record (x,y) position of scattered e±
- **Polarization of final electrons/positrons during multiple Compton backscattering process: Alexander Potylitsin**
  - Developed model to describe photon beam polarisation after multiple CS
- **Resonant depolarization in the ILC damping ring with RF dipoles: Valentyn Kovalenko**

Resonant depolarization in the ILC damping ring: Valentyn Kovalenko

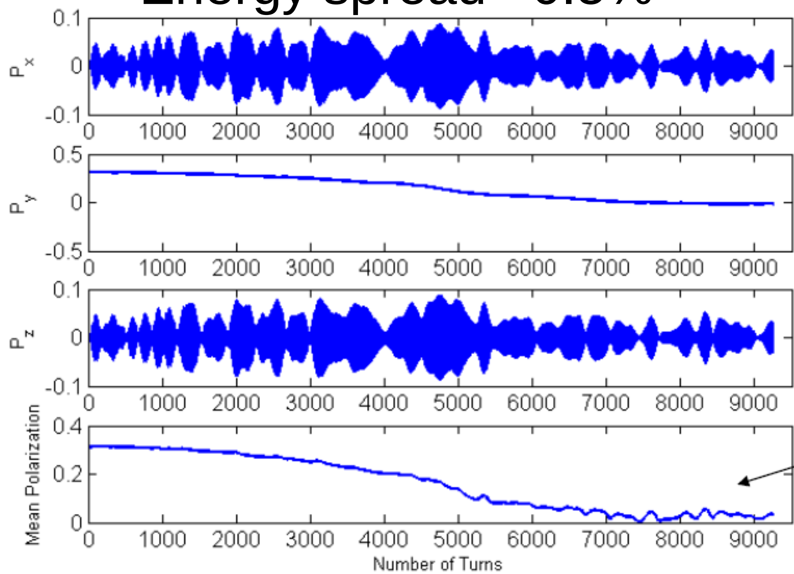
Depolarize beam when P is too low (Simulation is ongoing)

Simplified model: RF dipole followed by continuous bending magnet

- Initial polarization (vertical): 30%
- Spin tune Gγ=11.35
- Revolution frequency=92.5 kHz
- Resonance frequency=60.17 kHz
- Number of turns (N)=9256



Energy spread ~0.5%



Mean polarization goes to 0

$$\sqrt{P_x^2 + P_y^2 + P_z^2}$$

Hybrid sources, special targets

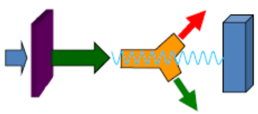
- Hybrid targets: tests and studies: Tohru Takahashi
- Granular vs compact positron converters: advantages and application to hybrid sources: Peter Sievers

Hybrid targets: tests and studies: Tohru Takahashi

systematic data for hybrid target R&D:

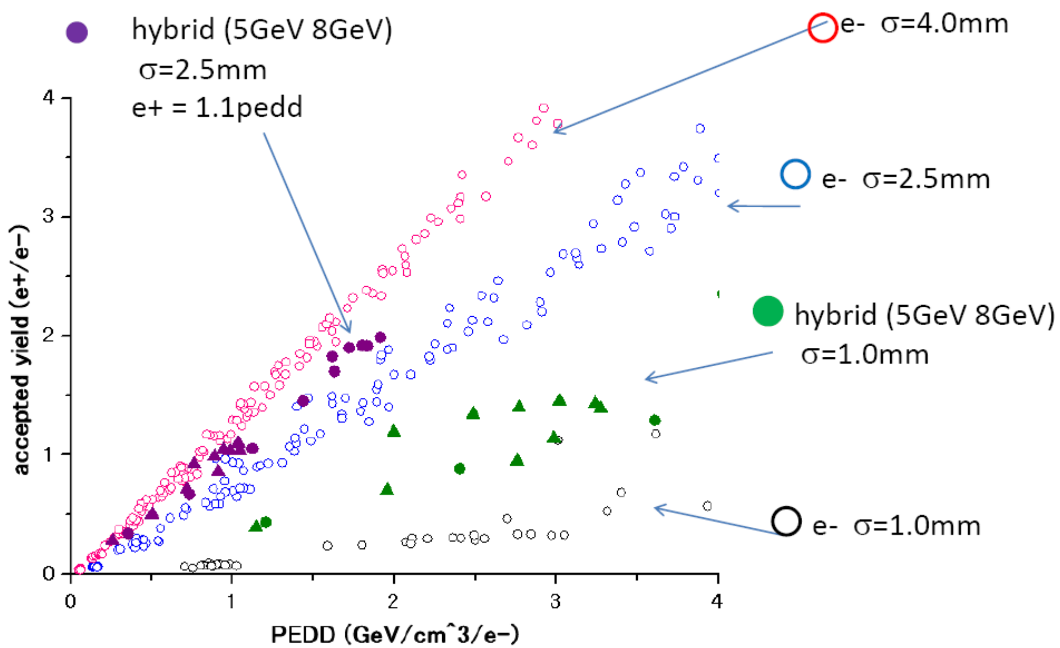
- **e+ yield, momentum for different target thickbesses**
- **comparison data and simulation (in progress)**

E_{dep}, T: data in next experiment, G4 simulation is ready

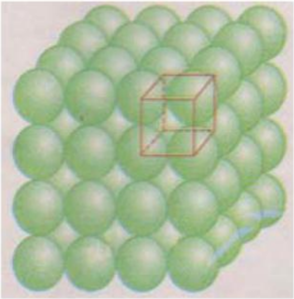


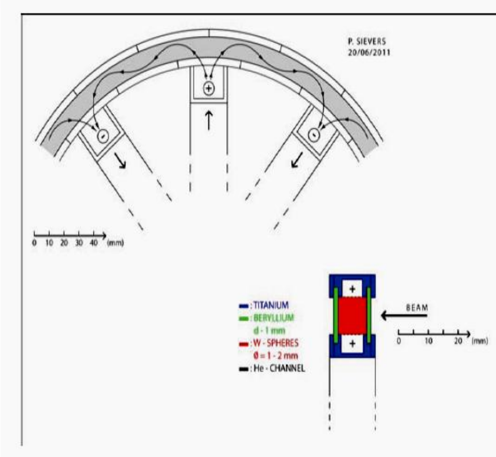
e+(accepted) v.s. PEDD

~G4 Simulation~

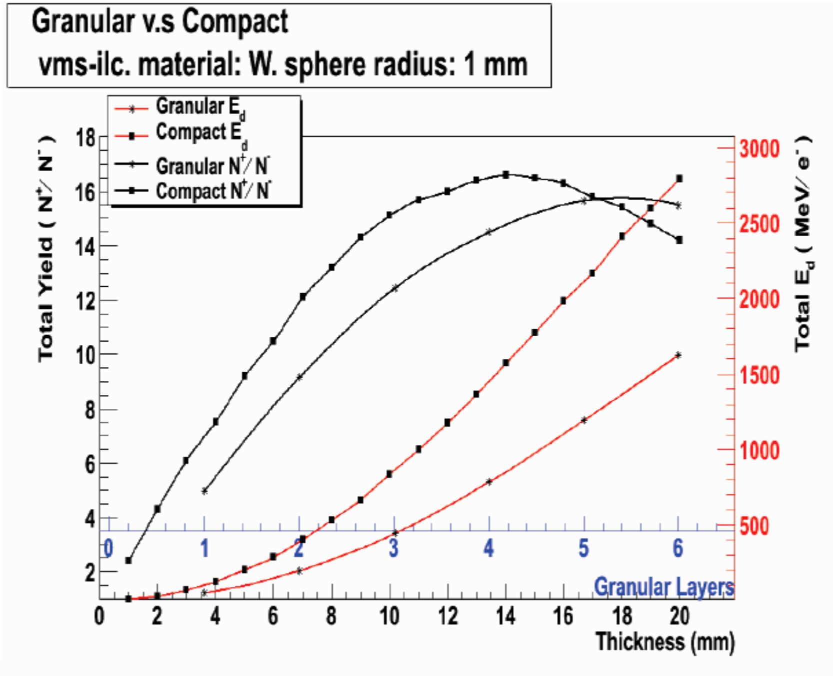


Granular vs compact positron converters: Peter Sievers



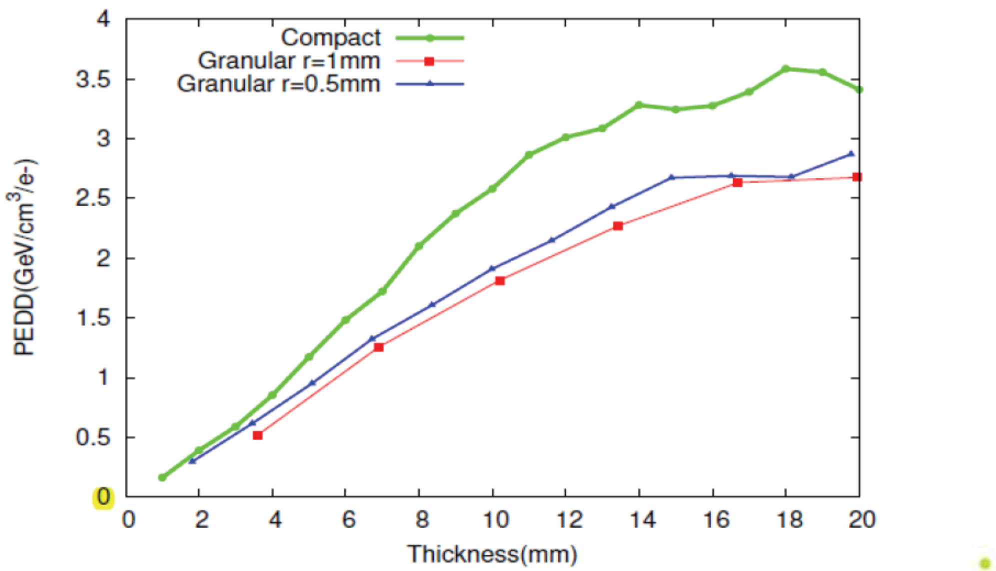


- use spheres (radii ~1mm) instead of solids inside containers of low Z material
- Cooling with circulating He gas jet taking away the heat
- **Lower PEDD**
- Studies concerning shock waves etc. are ongoing



COMPARISON GRANULAR/COMPACT→PEDD:

The data corresponds to ILC case=>> E-=10 GeV; l(Xtal)= 1 mm



Compton sources, optical cavities & lasers

– 4 –mirror cavities:

- Recent progress for 4-Mirror Compton cavity at KEK: Junji Urakawa
- Experiment of the 4-Mirror Compton cavity at KEK-ATF: Tohru Takahashi

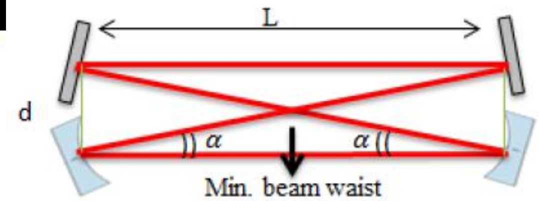
– Compton sources

- Compact several MeV Gamma-ray source based on Compton scattering: Junji Urakawa
- An ultimate Compton ring for positron production and cooling: Eugene Bulyak
- Compton ring with CO2 laser for polarized positrons source: Peter Gladkikh
- 3.5 GeV superconducting stacking ring for polarized positrons source: Peter Gladkikh

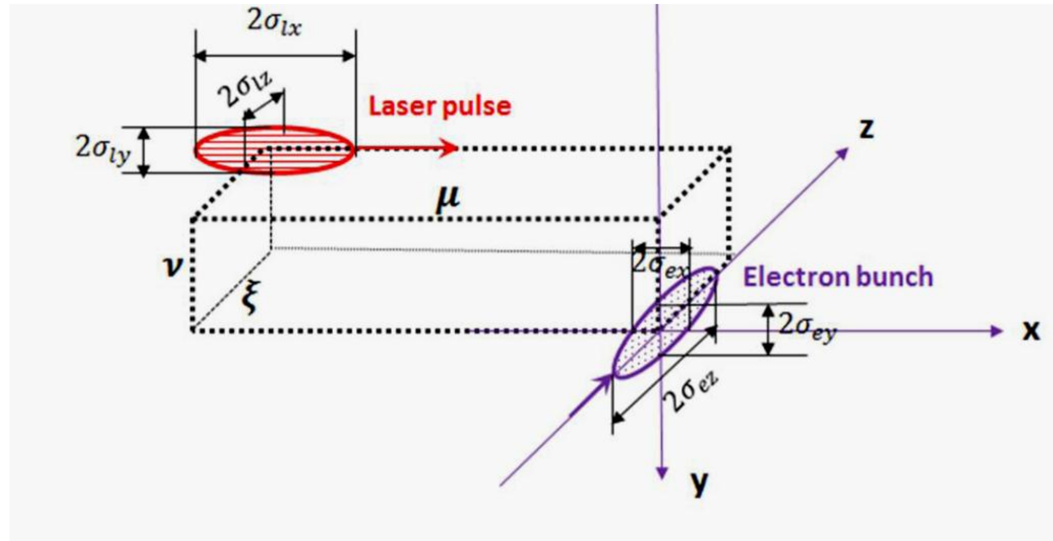
Recent progress for 4-Mirror Compton cavity at KEK: Junji Urakawa

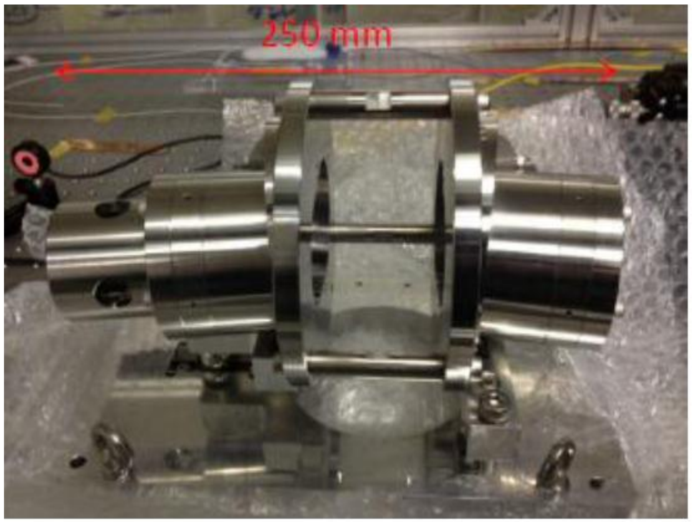
- Projects to develop 4-mirror optical cavity system for accumulating the energy of the laser pulse
  - **3D 4-mirror for laser-Compton to create polarized γ (→ Tohru)**
  - **2D 4-mirror optical cavity to generate hard X-ray (LUCX project)**
    - Start X-ray generation in Nov
    - 8mJ laser pulse energy in cavity (surface damage of mirrors in 2-mirror cavity for energies 2-6mJ)
  - **2D 4-mirror cavity to generate X-ray with two cylindrical lenses instead of two plane mirrors**
  - **Compact 2D 4-mirror optical cavity for fast laser wire scanner to measure beam profile**
    - Few seconds instead of ~30min to measure beam profile
- Mirror development
- Laser system development for 4-mirror cavity
- Plan: high brightness X-ray generation at Compact ERL

Recent progress for 4-Mirror Compton cavity at KEK: Junji Urakawa



Compact fast scanning laser wire cavity

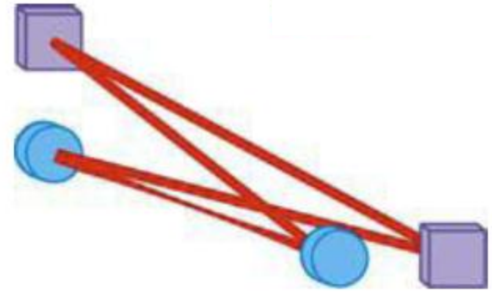




Electron beam energy	**1.28 GeV**
Electron beam size (σ_{ex}, σ_{ey})	**(80 , 10) μm**
Electron beam longitudinal size (σ_{ez})	**30 ps**
Number of electrons in one bunch	10^{10}
Circulation frequency of electron beam	**2.16 M Hz**
Single bunch electron beam current (I_e)	**3.456 mA**
Laser pulse energy	**100 µJ**
Laser minimum waist size (σ_{ly}, σ_{lz})	**(5, 14) μm**
Laser longitudinal size ($\sigma_{l\,pulse}$)	**7.25 ps**
Laser wavelength (λ)	**532 nm, Green laser**

Experiment of the 4-Mirror Compton cavity at KEK-ATF: Tohru Takahashi

Laser-Compton for LC

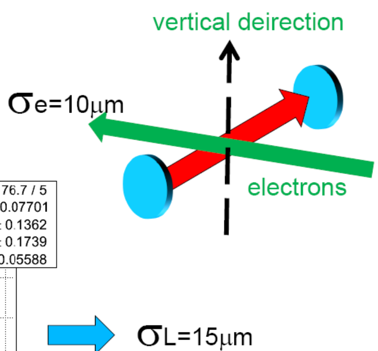


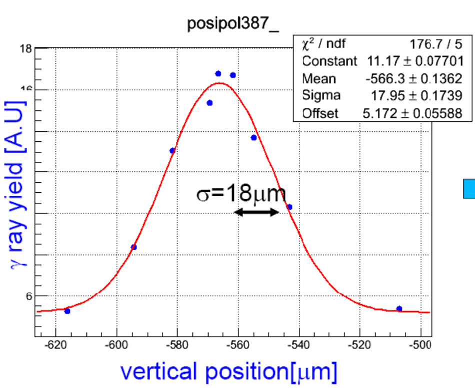
3D (or twisted) 4M ring cavity

- **3D 4-mirror cavity to achieve small spot size**
  - Resonates only for circularly polarized γ, polarization switching
- two 4-mirror cavities are installed at KEK:

▶ 2.6KW stored as of 25 May 2012
- 30 γs / bunch -> 150 γs /train
- correspond to 3.3 × 10^8 γ/s

Laser spot size 15μm achieved





it was 30μm w/ 2 M cavity

KEK-Hiroshima
installed 2011
relatively simple control system
employs new feed back scheme

LAL-Orsay
installed summer 2010
sophisticated control
digital PDH feedback

Compact several MeV γ-ray source based on Compton scattering: Junji Urakawa

- Nuclear waste problem: excite difficult-to-identify isotopes with nuclear resonance fluorescence (NRF)
- Need changeable, monochromatic γ-rays → select nuclear reaction
- Proposal: Develop compact system: transportable, extremely high brightness γ-source which includes 300Hz Linac, Compton ring and laser system
- proposal is under the process to select new project at MEXT

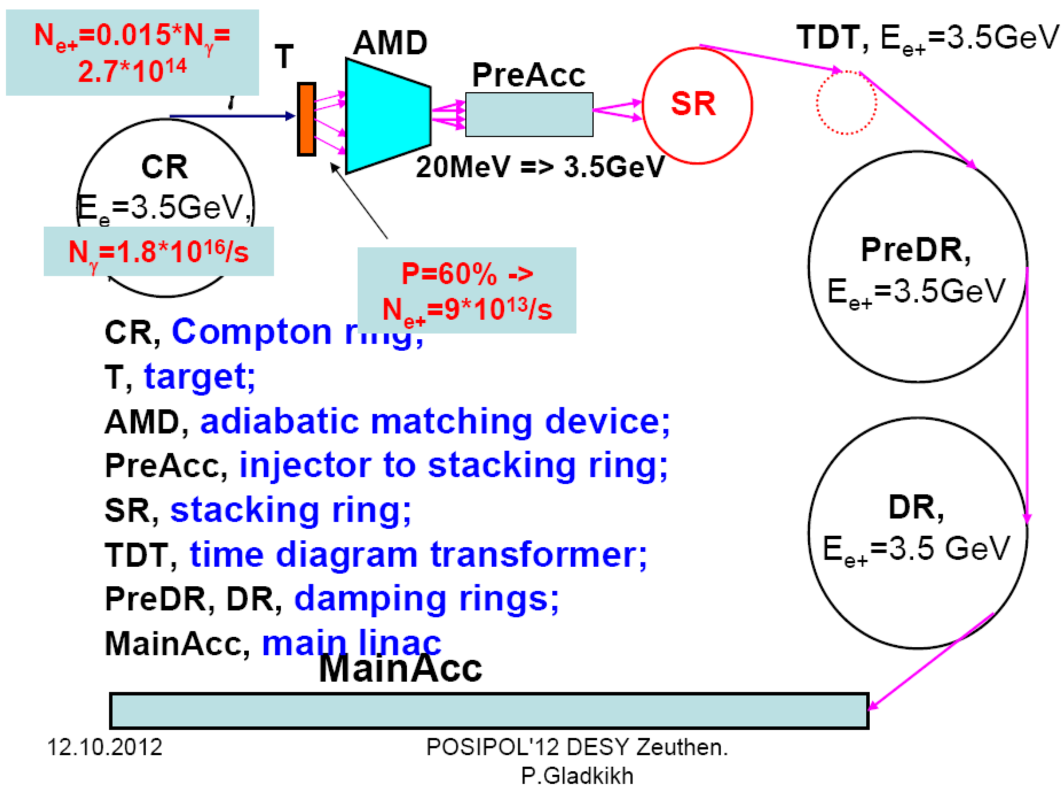
Compton ring with CO2 laser for polarized positron source: Peter Gladkikh

E.Bulyak[(3)], P.Gladkikh[(3)], T.Omori[(2)], L.Rinolfi[(1)], S.Skomorokhov[(3)], J.Urakawa[(2)], A.Variola[(4)], F.Zimmermann[(1)], F.Zomer[(4)]

CLIC e+ polarized source

- At present, Compton ring with solid state lasers is a high risk design for polarized e+ source
- Mode locked C02 laser is best candidate
- Mode locked CO2 lasers are not developed yet but there are some ideas for their development

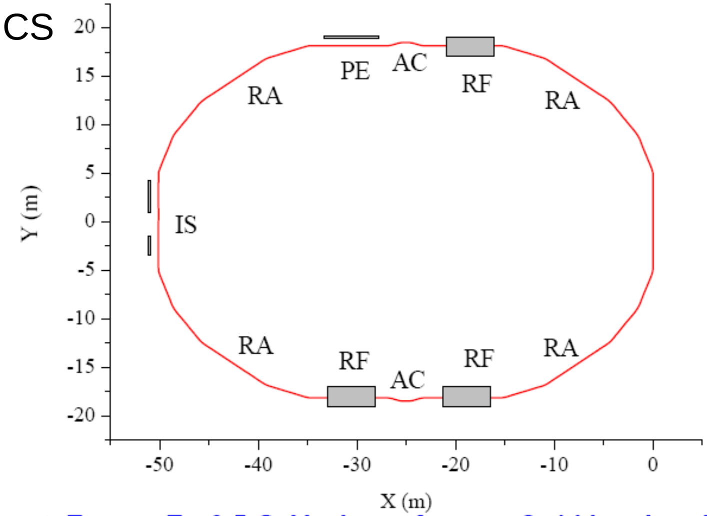
Layout of positron complex



3.5 GeV superconducting stacking ring for polarized positrons source: Peter Gladkikh

E.Bulyak[(3)], P.Gladkikh[(3)], A.Kalamaiko[(3)], L.Rinolfi[(1)], T.Omori[(2)], J.Urakawa[(2)], K.Yokoya[(2)], F.Zimmermann[(1)]

- Conclusion at Summer 2010 Miniworkshop, KEK:
  - **For continuous positron injections we need stacking ring with damping time of 100us**
  - **Possible ways:**
    - Injection in longitudinal plane
    - Fast damping under exrtremely intense CS
    - Superconducting ring
- Proposal: **stacking ring with superconducting bendings**

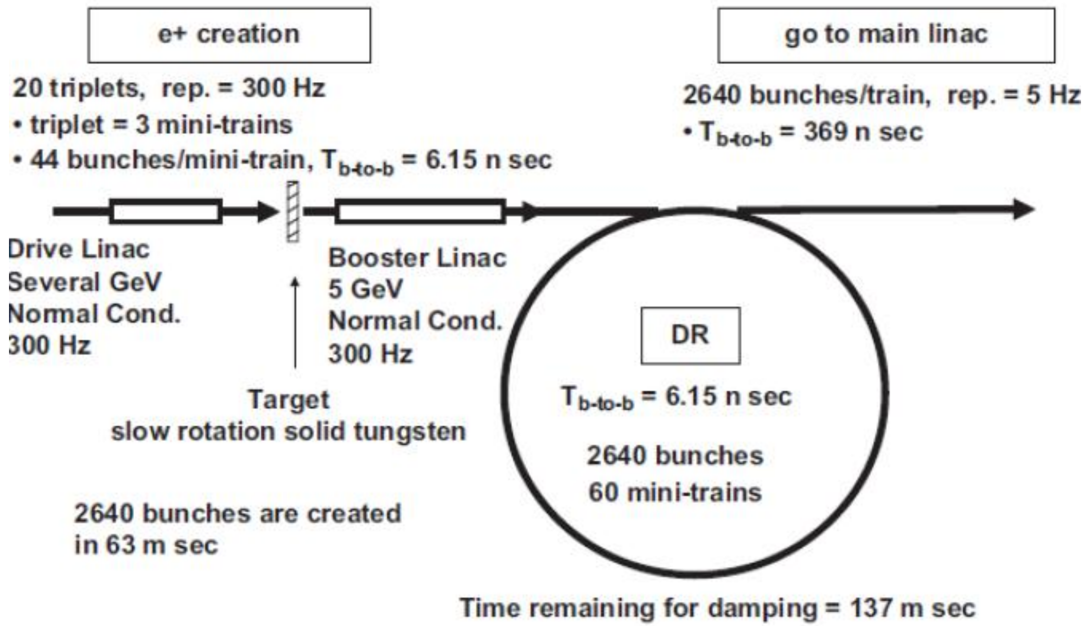


Ring layout. Energy E_0=3.5 GeV, circumference C≈144 m, bend.field B=6 T, energy losses ΔE≈9.4 MeV / turn, synchrotron damping time τ_s≈250 μs. RA, regular arcs; AC, additional chicanes; IS, injection septums; RF, rf-sections; PE, positron extraction.

  - **Injection efficiency into proposed SR is close to 95%**
  - **Proposed ring can be used as base for further development**

Conventional source developments: Junji Urakawa

- Stretching pulse length ⇔ reduce thermal load on target
- T. Omori et al., NIMA 672 (2012) 52-56



- Cost estimate after optimization and improvement:

26793M\-12571M\=14222M\, which is 142 Oku-Yen for 300Hz 6GeV Drive Linac and 5GeV positron Linac.

Summary

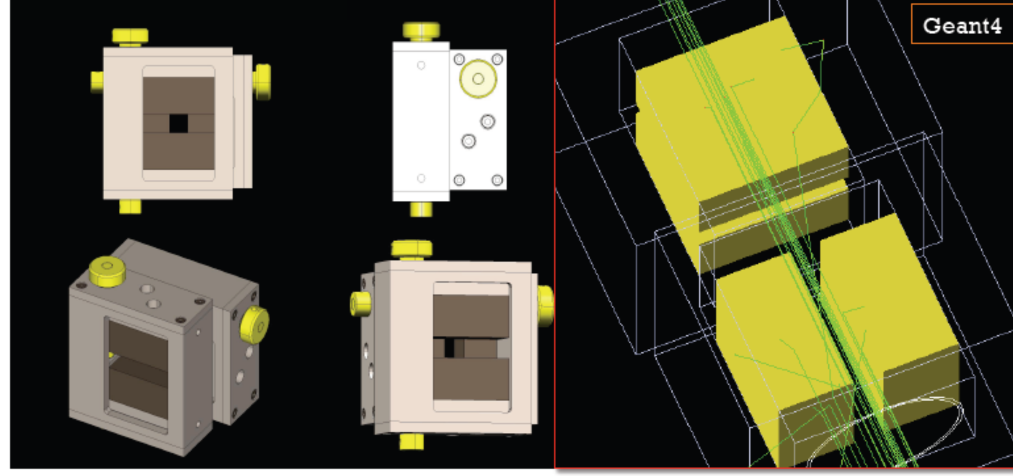
- Proceedings of POSIPOL 2011 are ready – many thanks to Wei and Wanming – and all authors
- Interesting and encouraging discussion at POSIPOL 2012
- Highlights and steps since POSIPOL 2011
  - **New: RF undulator**
  - **PEPPo experiment @JLab: polarization transfer from polarized e- beam to e+ in conventional targets**
  - **SuperB factories**
  - **Prototype development for ILC target and FC**
  - **Laser cavity development**
  - **Simulations towards ILC with Ecm = 1TeV**
- Next POSIPOL
  - **At ANL (?)**
  - **Date to be fixed**

Backup slides

•

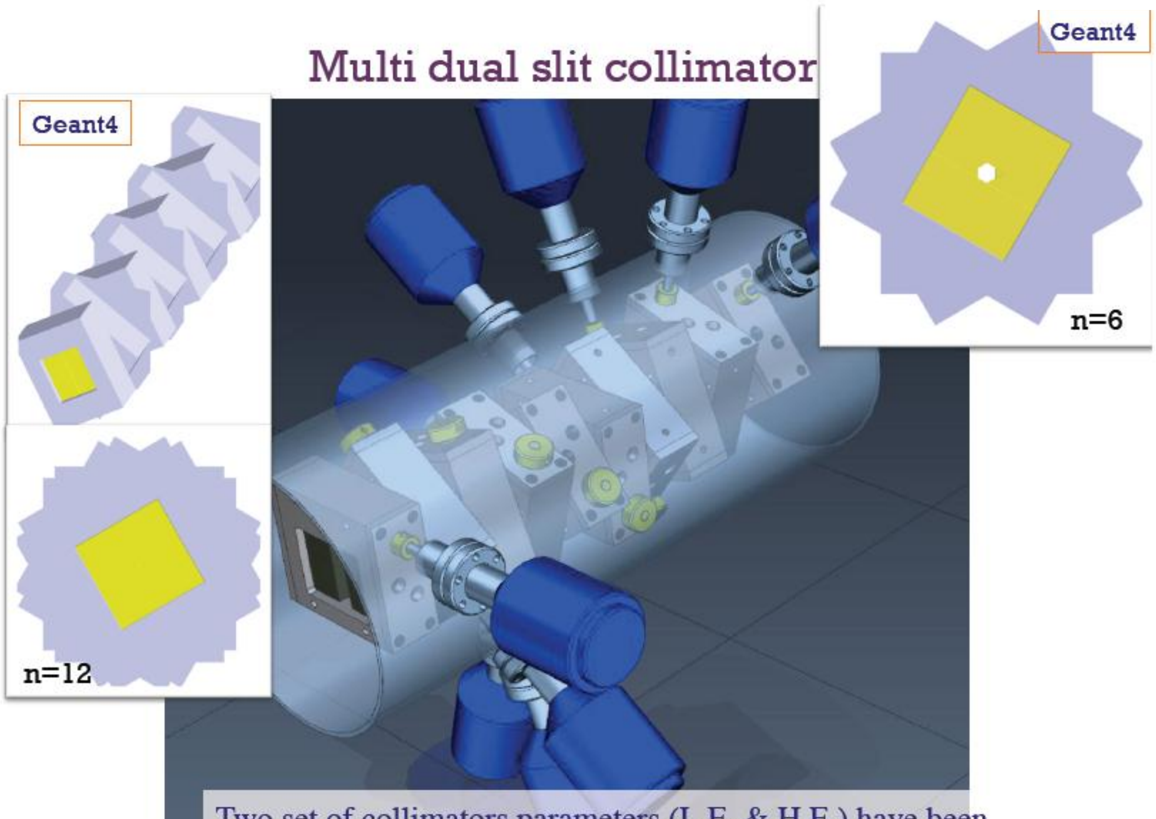
Actual baseline : dual slit collimator [W]

The choice has been made on a dual slit collimator already designed and assembled at INFN-Ferrara for a high energy X ray experiment [NIM-B Gambaccini et al]



Very high energy and intensity gamma beam need an association of multi-dual slit collimator

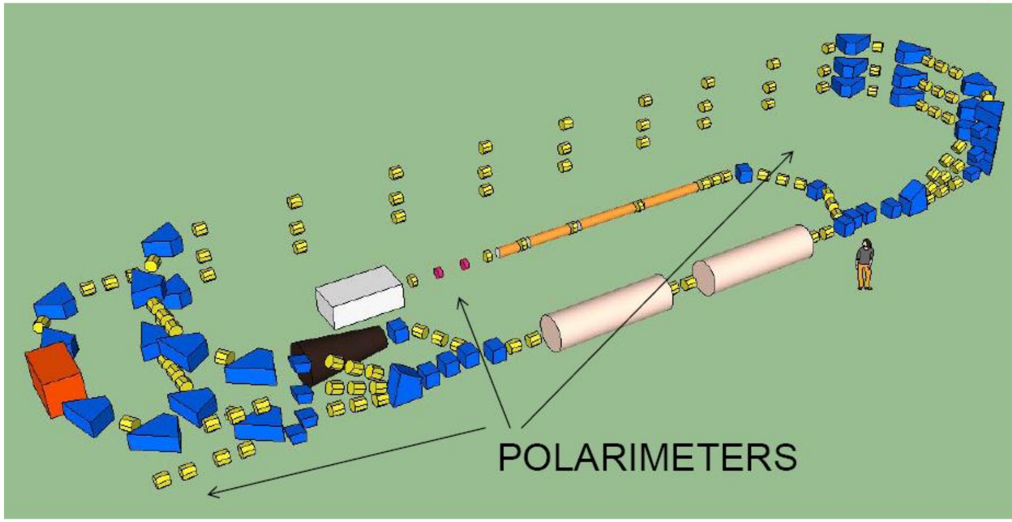
Multi dual slit collimator



Two set of collimators parameters (L.E. & H.E.) have been found which satisfied the bandwidth requirement

Polarized beams and projects at MAMI: Kurt Aulenbacher

•two independent polarimeters with ΔP/P <0.5% each. (LCP does not work!)
• source energy (0.1-0.2 MeV): double scattering polarimeter (invasive)
• experiment energy (200 MeV): Hydro Möller (non invasive)
• different beam intensities connected by " Mott & Compton absorber (lower absolute accuracy, but high reproducibility& dynamic range)



Precision polarimetry:

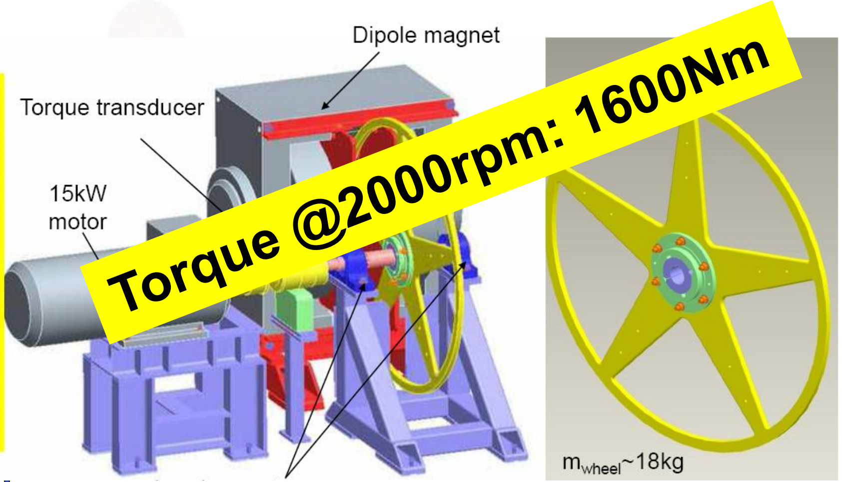
- **High and low energy**
- **Hydro-Moller polarimeter (non-invasive) + double scattering polarimeter (→ eliminate Seff) needed to achieve ΔP/P < 0.5%**
- **Hydro-Moller polarimeter (non-invasive) could be useful for diagnostics at the e+ source**

Investigation of bremsstrahlungs processes

Update on eddy currents: Ian Bailey

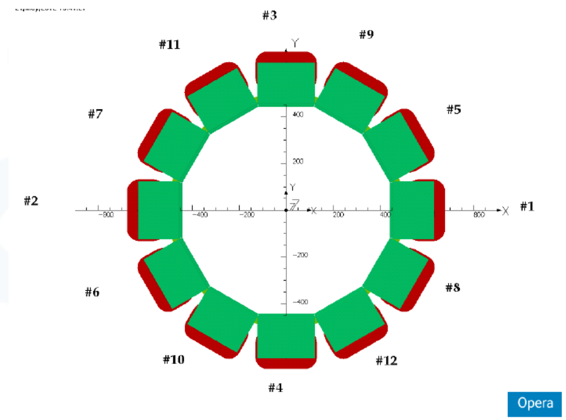
Target Prototype Design

Prototype I - eddy current and mechanical stability

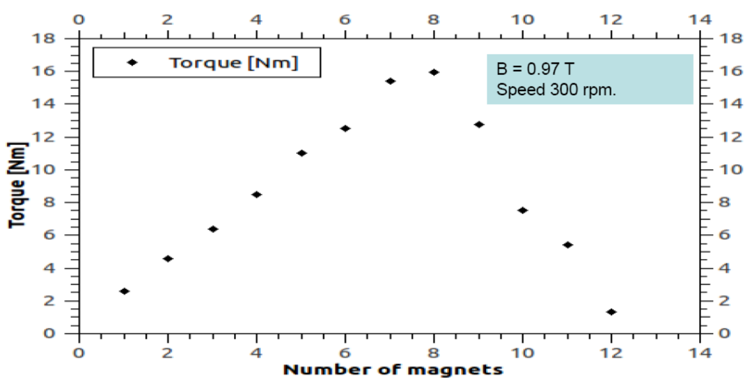


Ken Davies - Daresbury Laboratory

Fully-immersed target model

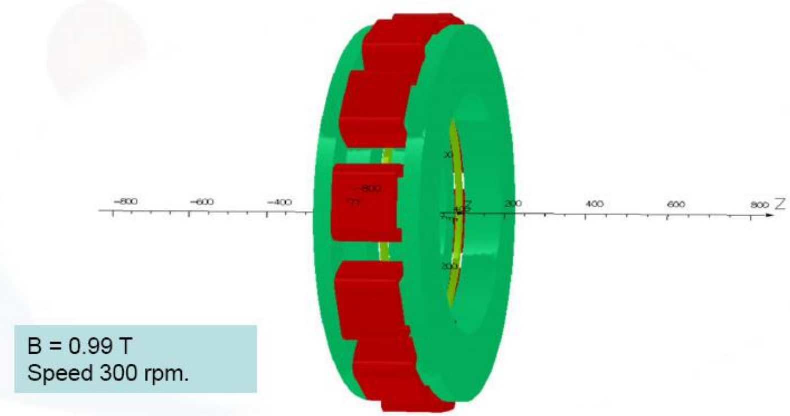


Torque as a function of the number of C-magnets



τ_z when 12 C-magnets introduced reduced to 1.3 Nm

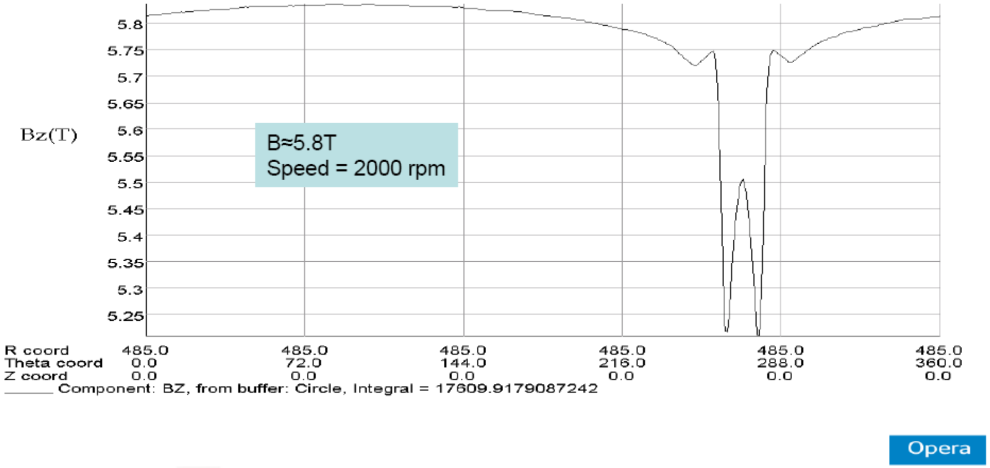
Model with connected iron yoke



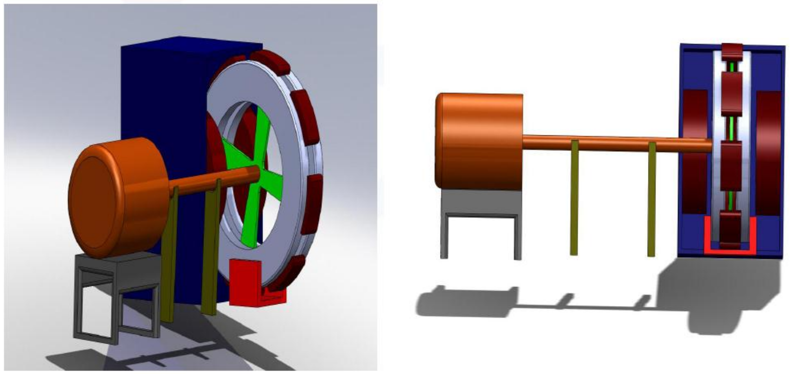
τ_z after the C-magnet models connected reduced to 0.09814 Nm

Update on eddy currents: Ian Bailey

Field variation after introducing the AMD



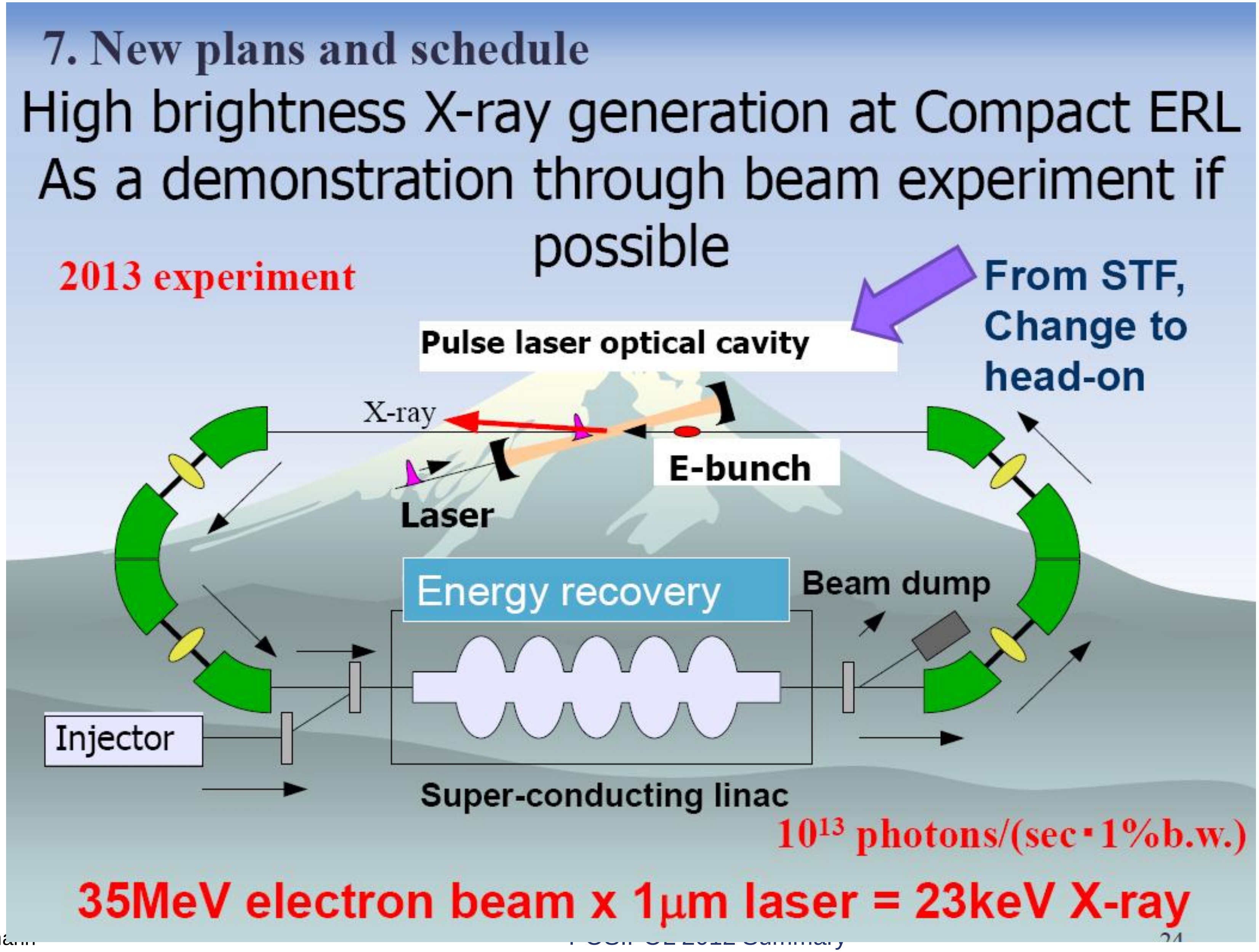
Mock-up of a fully-immersed target



τ_z =20.41 Nm

- Conclusion:
  - **In principle it may be possible to reduce the breaking torque of 1600Nm to 20Nm for a target rotation at 2000rpm in the field of s/c AMD with a peak field ~6T**
  - **Long way from a fully-engineered solution**

Recent progress for 4-Mirror Compton cavity at KEK: Junji Urakawa

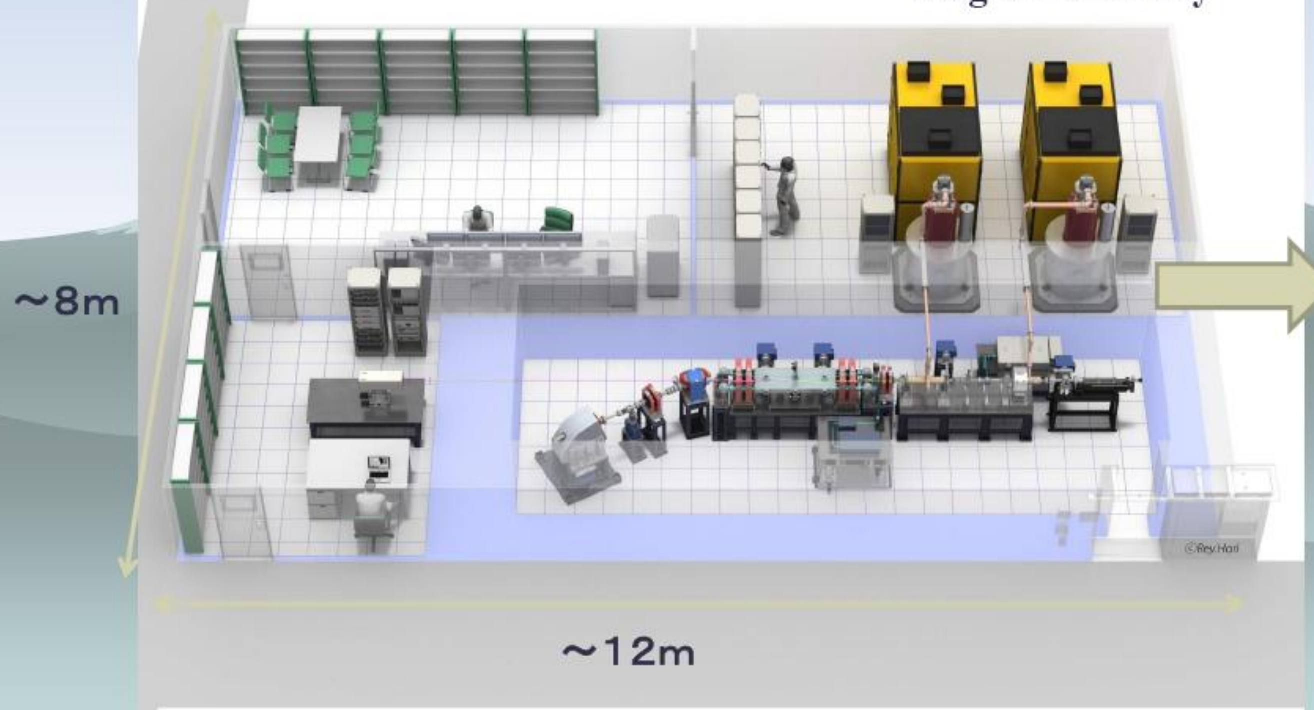


Recent progress for 4-Mirror Compton cavity at KEK: Junji Urakawa

New Quantum Beam Technology Program(QBTP) supported by MEXT from 2013.4 to 2018.3 (5 years project)

Approved project should include two Japanese Companies at least and the development for CW super conducting acceleration technologies. Normal conducting accelerator system and super conducting accelerator system for compact high brightness X-ray source should be realized by joint research with companies.

Normal conducting accelerator system for compact high brightness X-ray



Downsizing to 6m x 8m

25

Compact several MeV Gamma-ray source based on Compton scattering: Junji Urakawa