Introduction
Past LAL participation

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- Our contributions are mainly focused on:
- Radiator : intense source of photons
  - Polarized : undulator & laser-Compton
  - Unpolarized : amorphous & crystal
- Converter : material with a high Z (W)
- Capture section after the converter
  - Optical Matching Device to focus the e^+
  - Pre-injector to accelerate the beam before injection to DR
  - Linac transport

Introduction

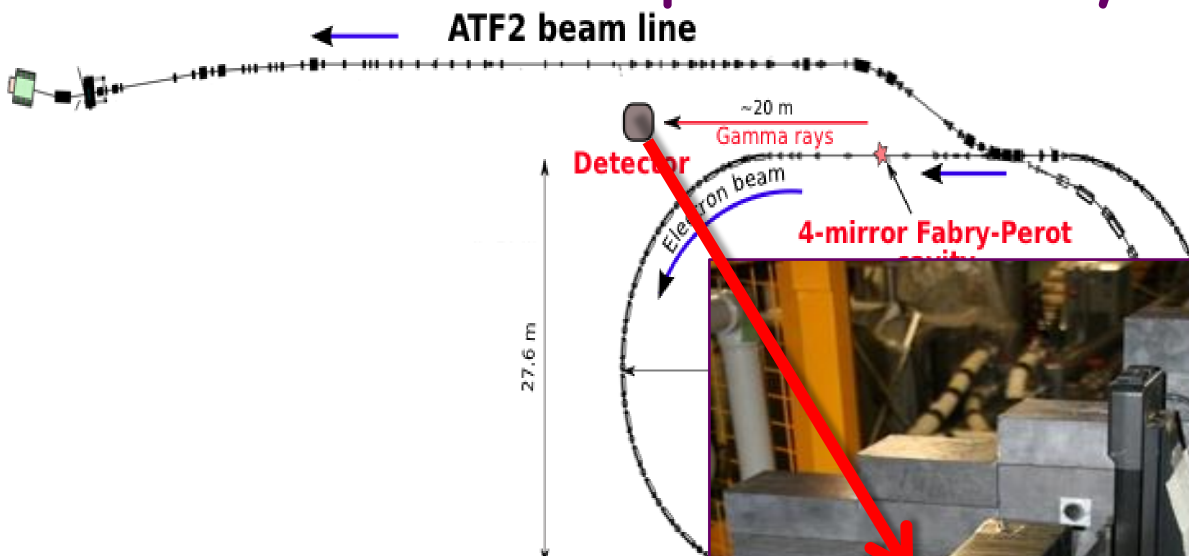
High intensity e^+ requires at ILC / CLIC

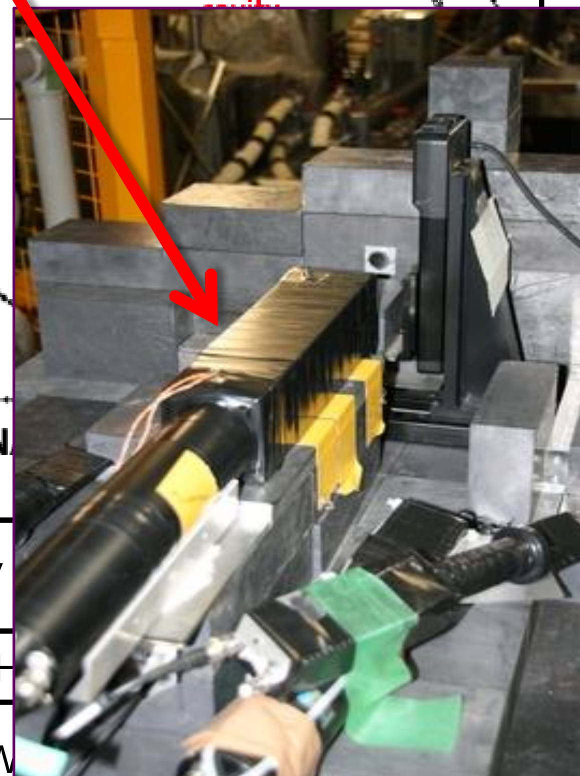
- Radiator : intense source of photons is needed
  - Polarized : undulator & laser-Compton -> CLIC baseline & ILC option
  - Unpolarized : amorphous & crystal -> CLIC baseline & ILC under investigation
- Converter : material with a high Z (W)
- Capture section after the converter
  - Optical Matching Device to focus the e^+
  - Pre-injector to accelerate the beam before injection to DR

-> ILC & CLIC

MIGHTTYLASER DEMONSTRATION EXPERIMENT

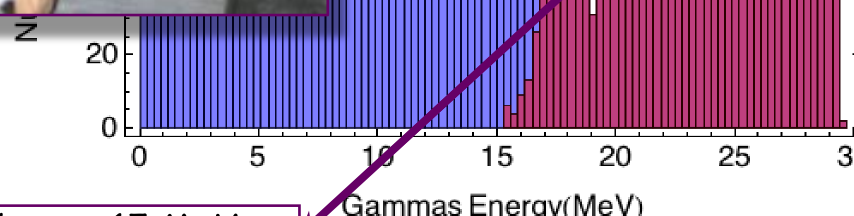
Experience layout





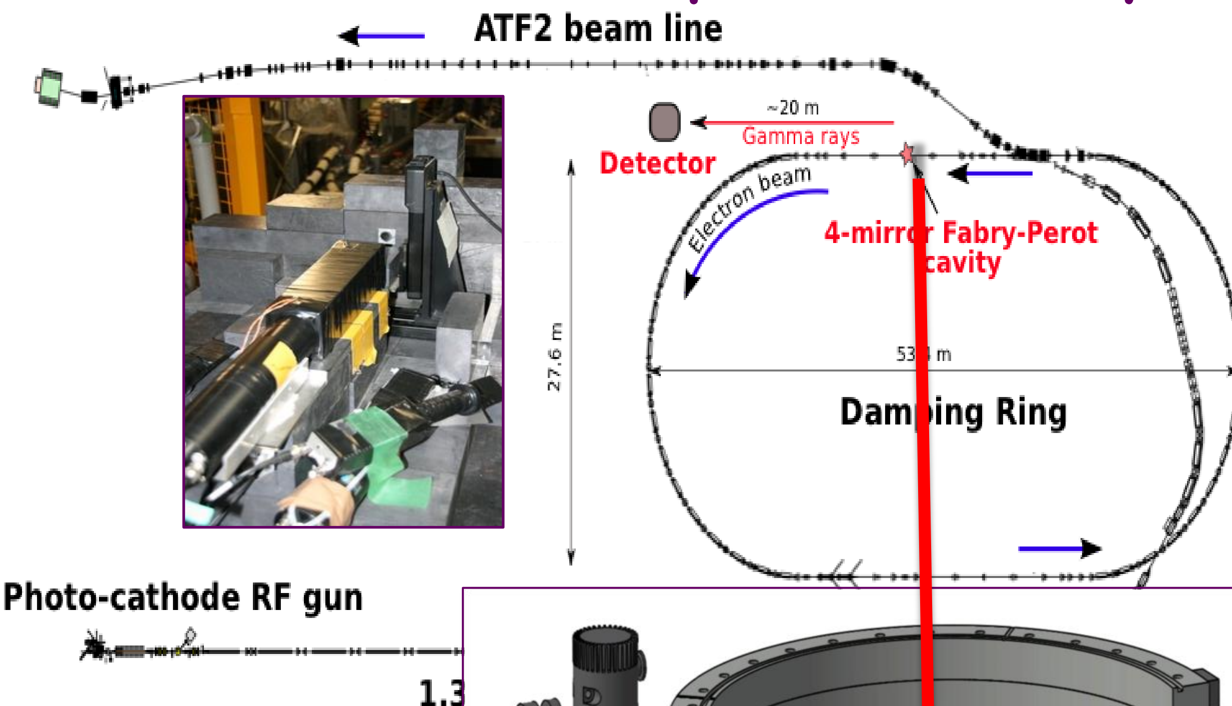
Electron energy	1.28 GeV
Electron charge	~1.6 nC
Revolution period	463 ns
ectron bunch length	25 ps
Bunch spacing	5.6 ns

LASER photon energy	1.2 eV
LASER frequency	178.5 MH
Power stored in cavity	~ 200 W
Crossing angle	8 deg.
LASER pulse length	20 ps



The collimators only accept photons with an energy above ~15 MeV

Experience layout



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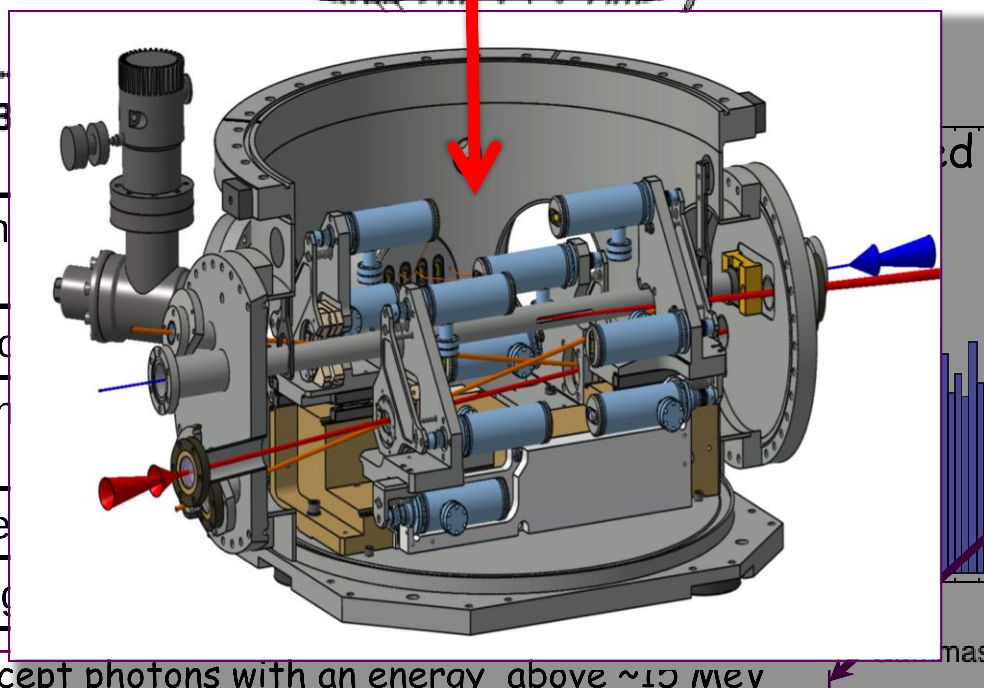

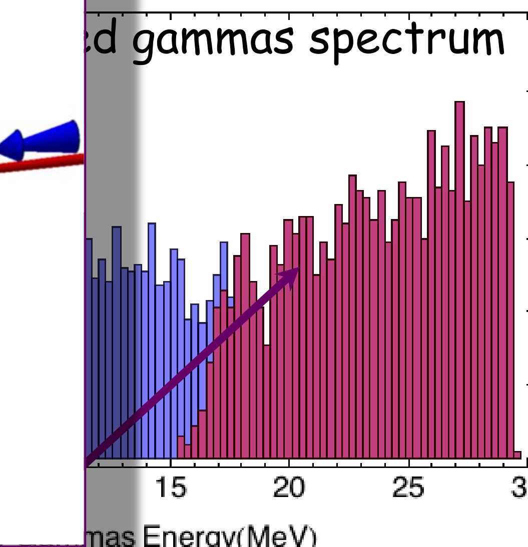

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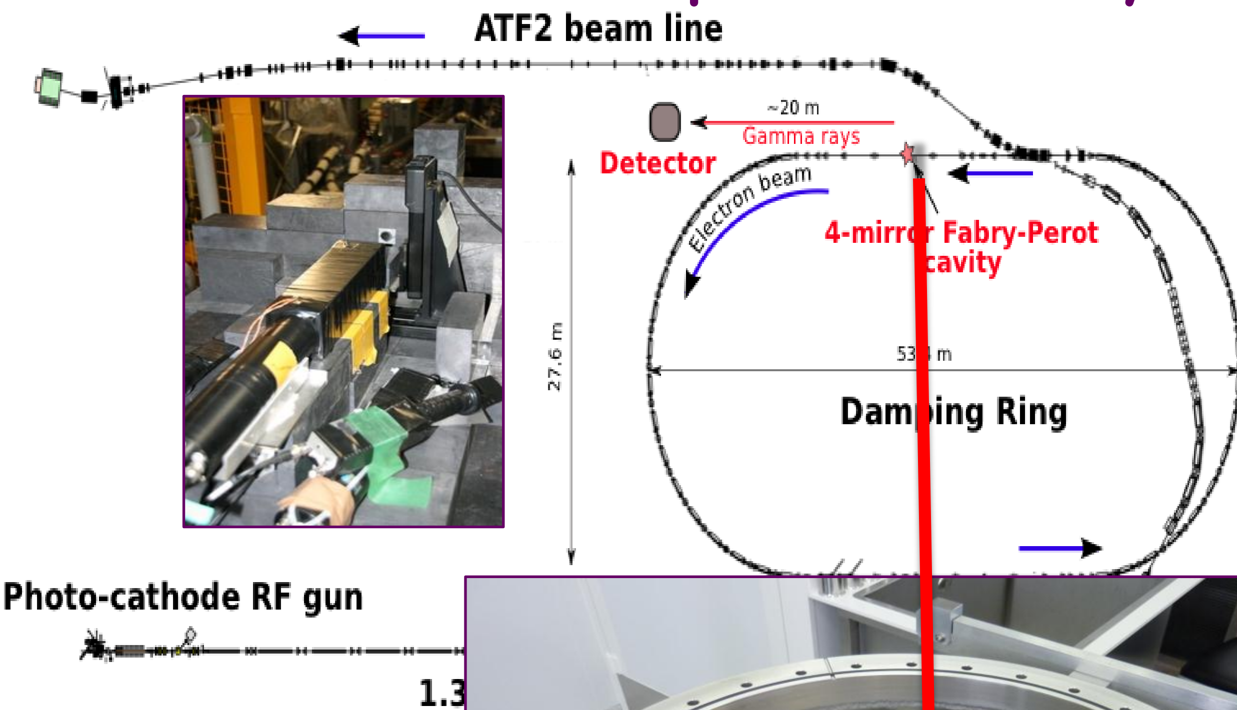

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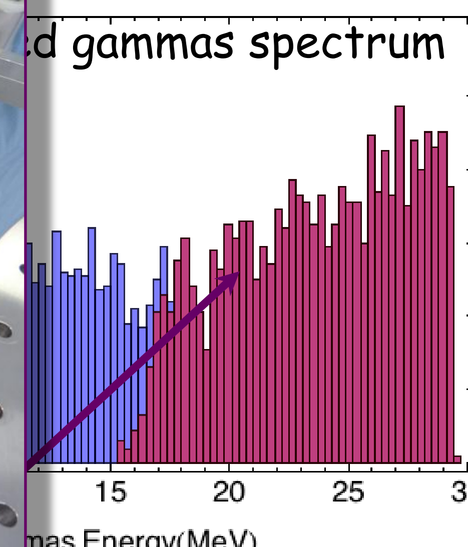

LASER photon energy	
LASER frequenc	
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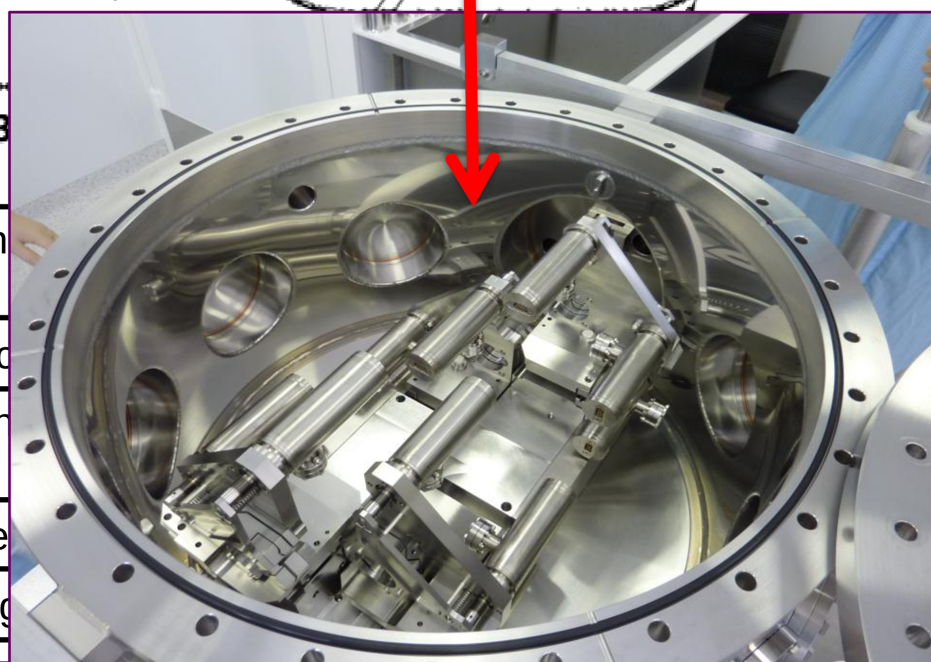

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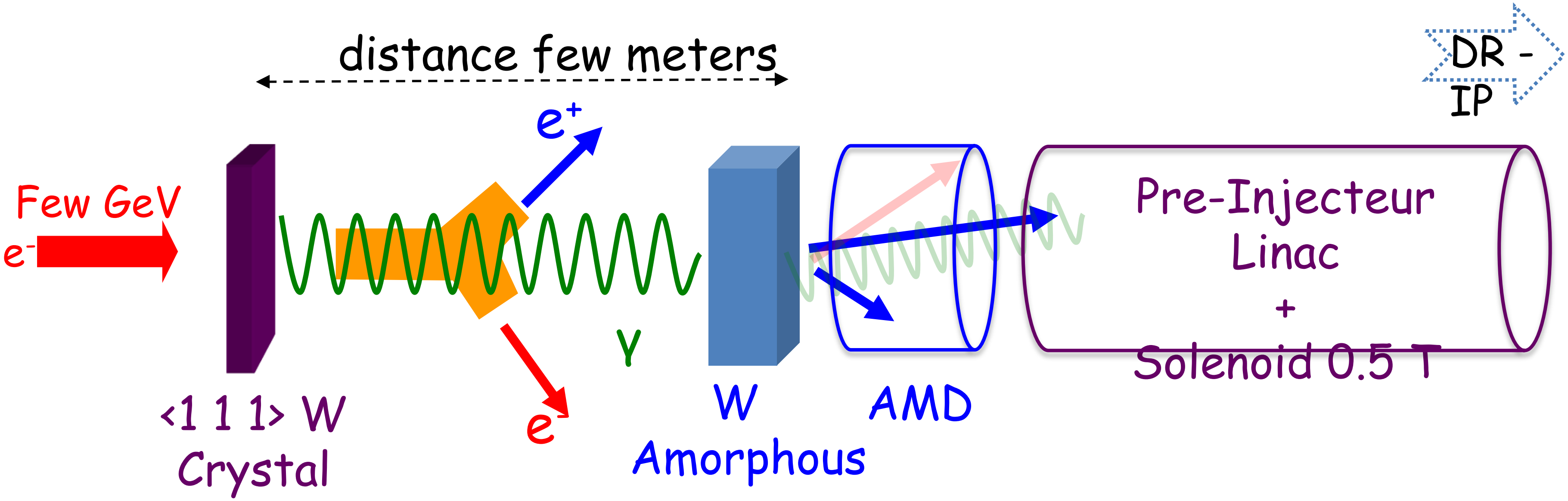
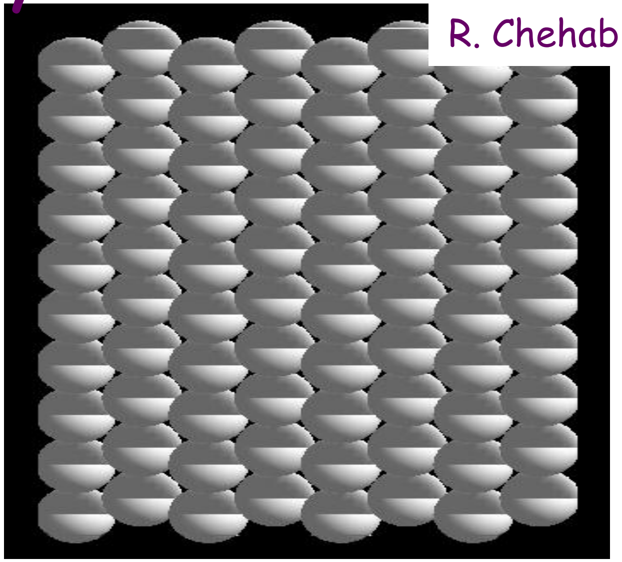
Hybrid scheme : presentation



1. Crystal W thickness few mm
2. Amorphous thickness several mm
3. Optical Matching Device
4. Pre-injector linac encapsulated in axial magnetic field

Amorphous study

As already pointed out (see P. Pugnat, P. Sievers)
[J. Phys. G. Nucl. Part. Phys. 29 (2003) 1797-1800]



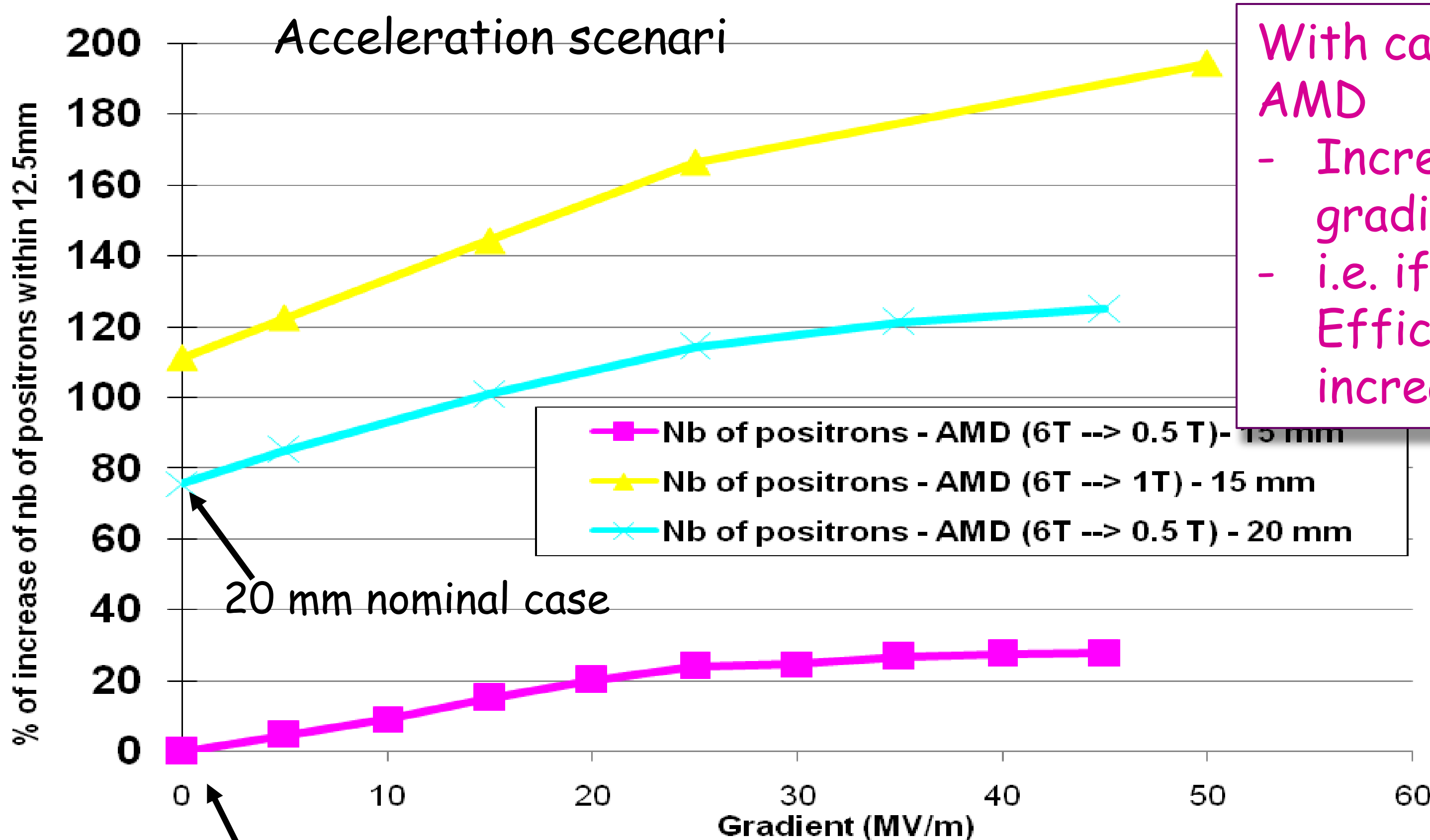
R. Chehab

A granular converter made of small spheres of few mm radius offers the advantages of presenting a relatively high [surface/volume] ratio which is interesting for the power dissipation.

	Thickness	Yield	PEDD	ΔE_{dep}	N-layers	spheres number	Effective density
Unity	mm	e+/e-	GeV/cm^3 /e-	MeV/e-			g.cm^{-3}
Compact	8	13.3	2.18	523			19.3
Granular r=1mm	10.16	12.18	1.88	446	3	864	13.9
Granular r= 0.5mm	11.60	13.45	2.33	613	7	8064	13.9

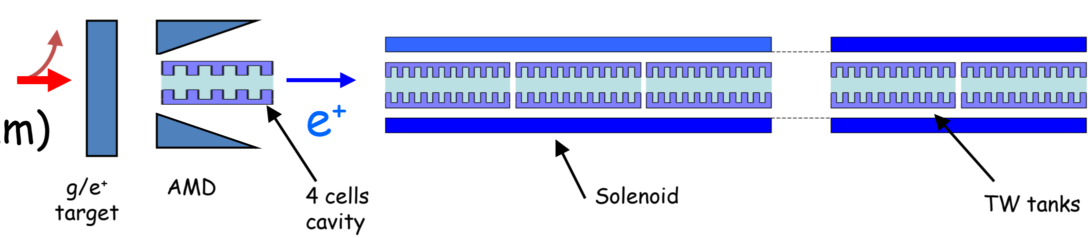
AMD study

F. Poirier



With cavity within the AMD
- Increase of gradient
- i.e. if 4cell=10MV/m, Efficiency is increased by 10%

Case (AMD 6T → 0.5 T and no cavity inside the AMD, but AMD inner r=15mm)



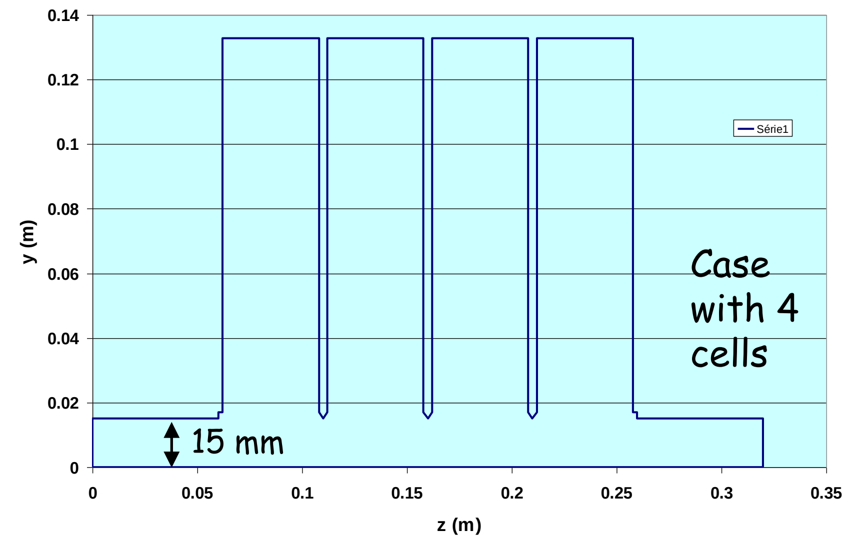
Capture study

P. Lepercq, F. Poirier

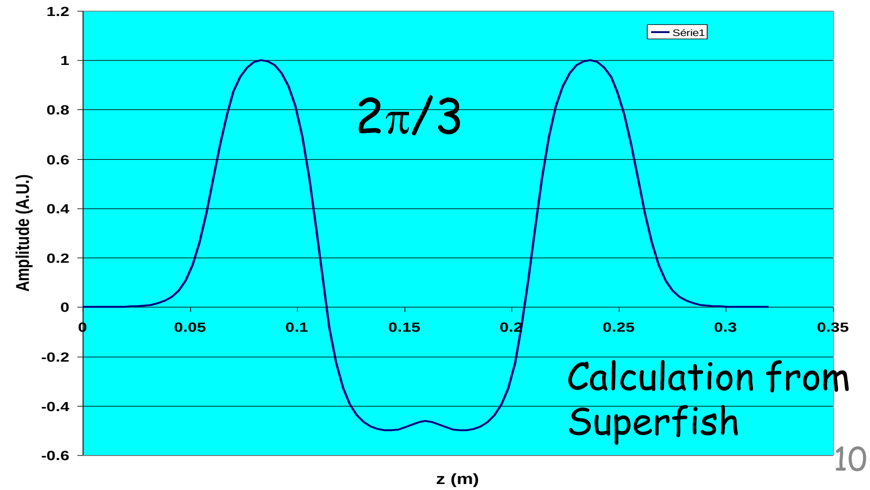
- 2 GHz
- 84 accelerating cells constitute the TW tanks
  - Note: 84 cells + 2 half cells for couplers within ASTRA
  - $2\pi/3$ operating mode
- 4.36 m long
- 15 MV/m
- Up to 5 tanks are used to accelerate e+ up to 200 MeV

First optimisation done on 15 mm iris (radius aperture) tanks but final results with 20 mm iris tanks

Typical cells dimension for the TW tanks



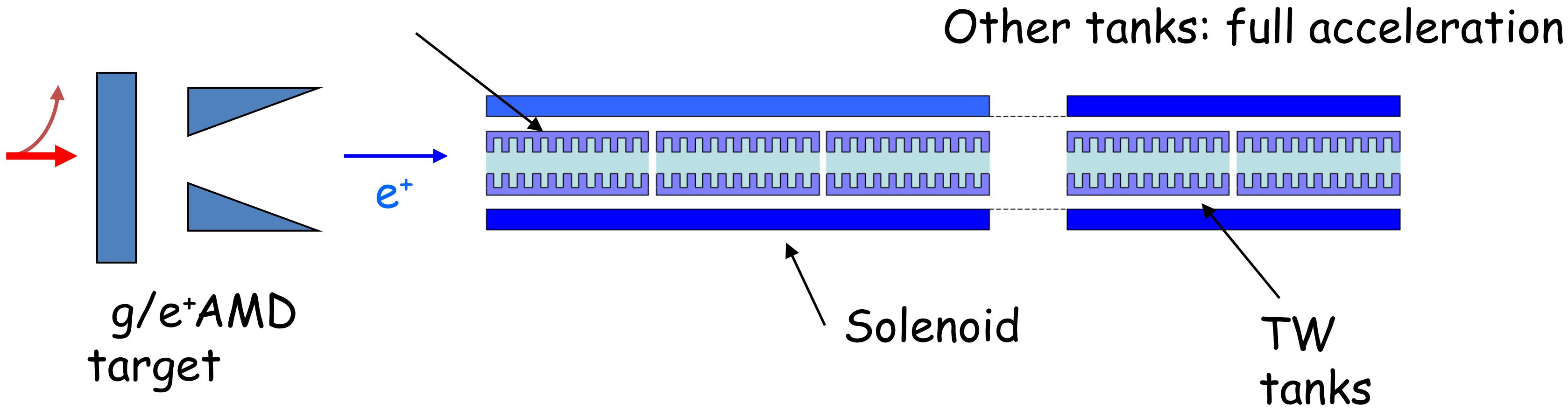
Typical electric field for the 4 cells cavity



Capture study

F. Poirier

Capture strategy of the first tank?



- Acceleration: Phase of the first tank tuned for use of maximum accelerating gradient for the first tank

    4 tanks are needed to reach ~200 MeV

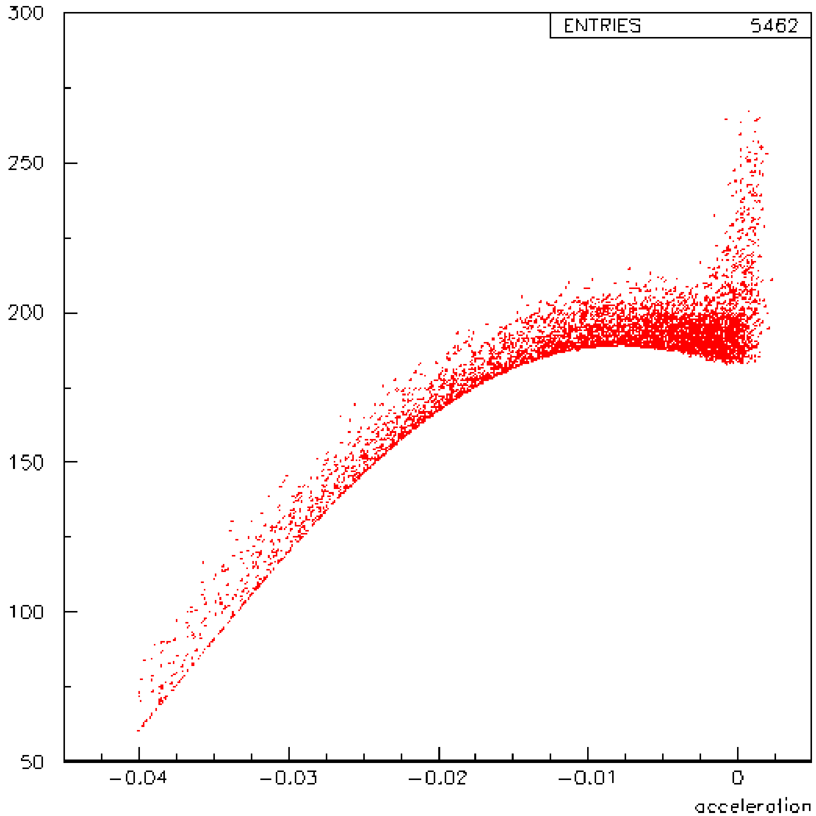
- Deceleration: adapt the phase and gradient of the first tank to capture a maximum of positrons

    5 tanks are needed to reach ~200 MeV

Capture study

F. Poirier

Acceleration scenario

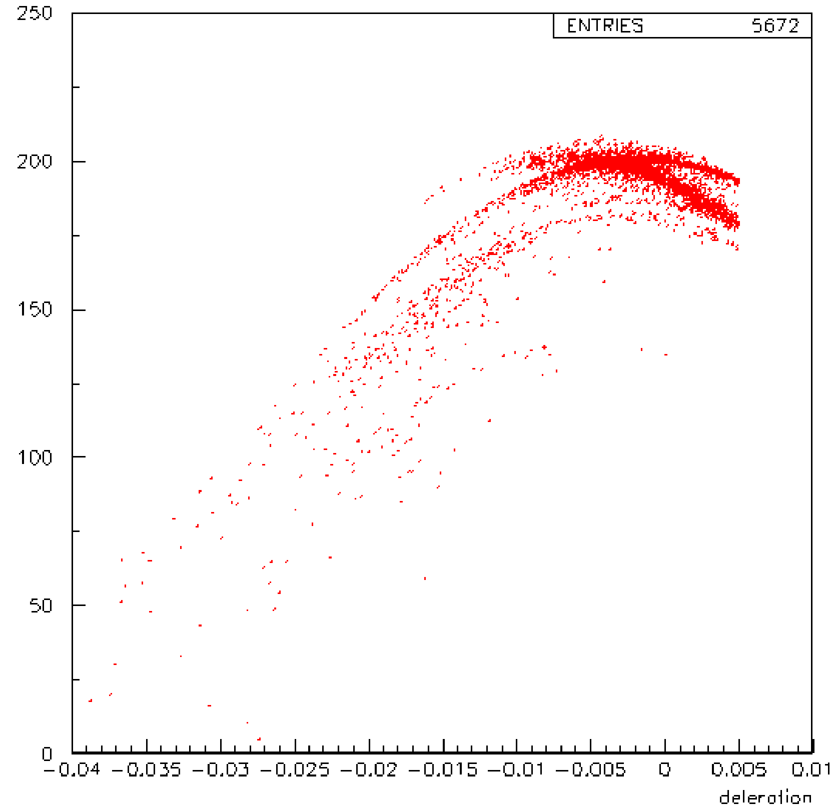


Total yield=0.9

Efficiency >165MeV=4621/6000= 0.77

(was 0.4 for 15 mm aperture)

Deceleration scenario



Total yield=0.95

Efficiency >165MeV=5335/6000= 0.89

(was 0.53 for 15 mm aperture)

Conclusion

- As far as the positron source is concerned I think that we have provided a strong contribution. The Hybrid source proposed solve the PEDD problem, but still engineering to be done.
- Man power and different LAL project
  - We finished the studies for CLIC (in the framework of the exceptional French contribution to CERN) and for the granular target.
  - We intend to maintain the effort on Mighty Laser and (in the limit of our possibilities) the activity on the hybrid target.
  - At present our “little” group is strongly engaged in other different projects (XFEL, ThomX, SuperB..). So in the next future we will be not able to pursue our effort on Linear Colliders projects if the present ‘boundary conditions’ will not change.