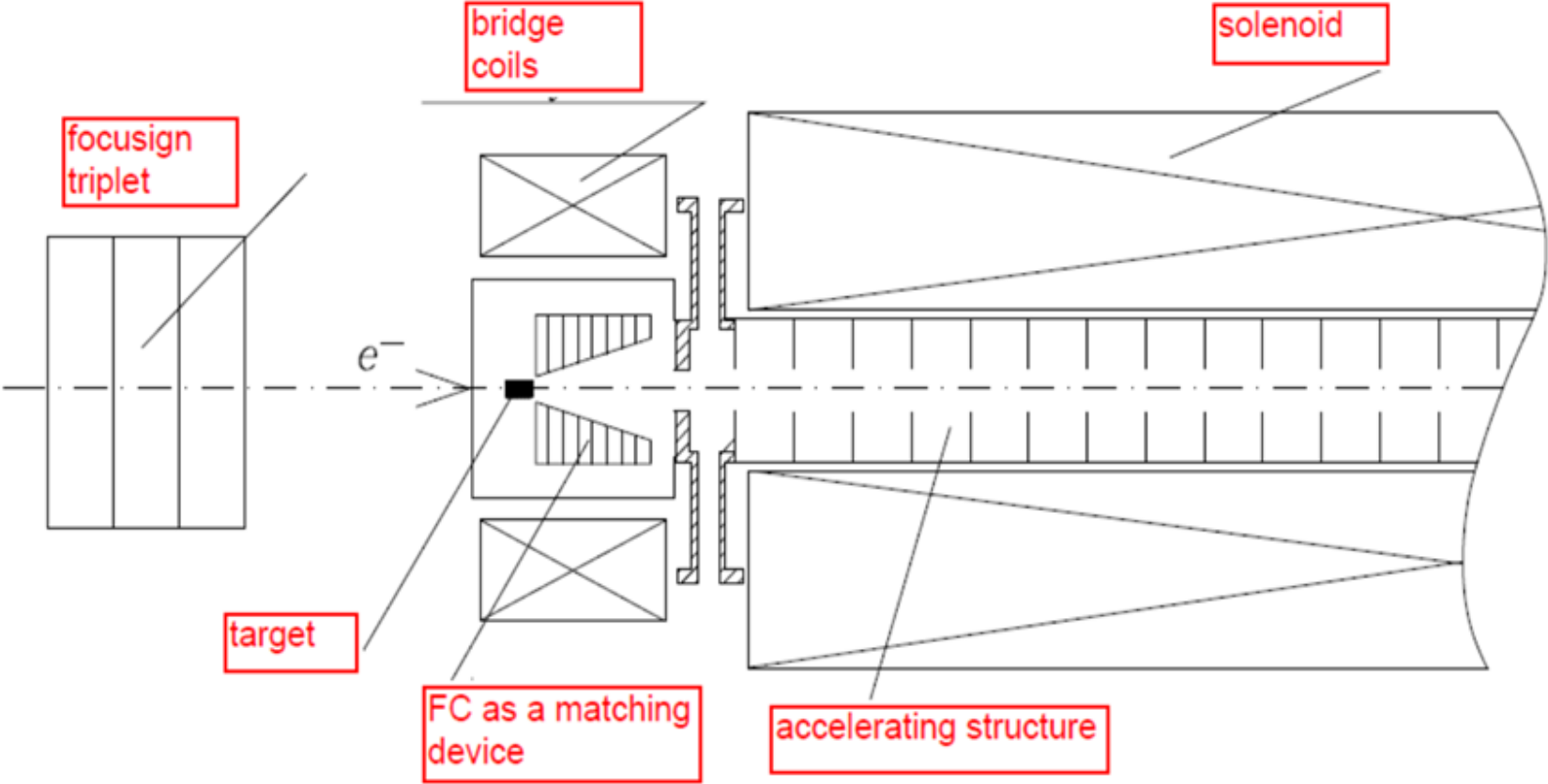
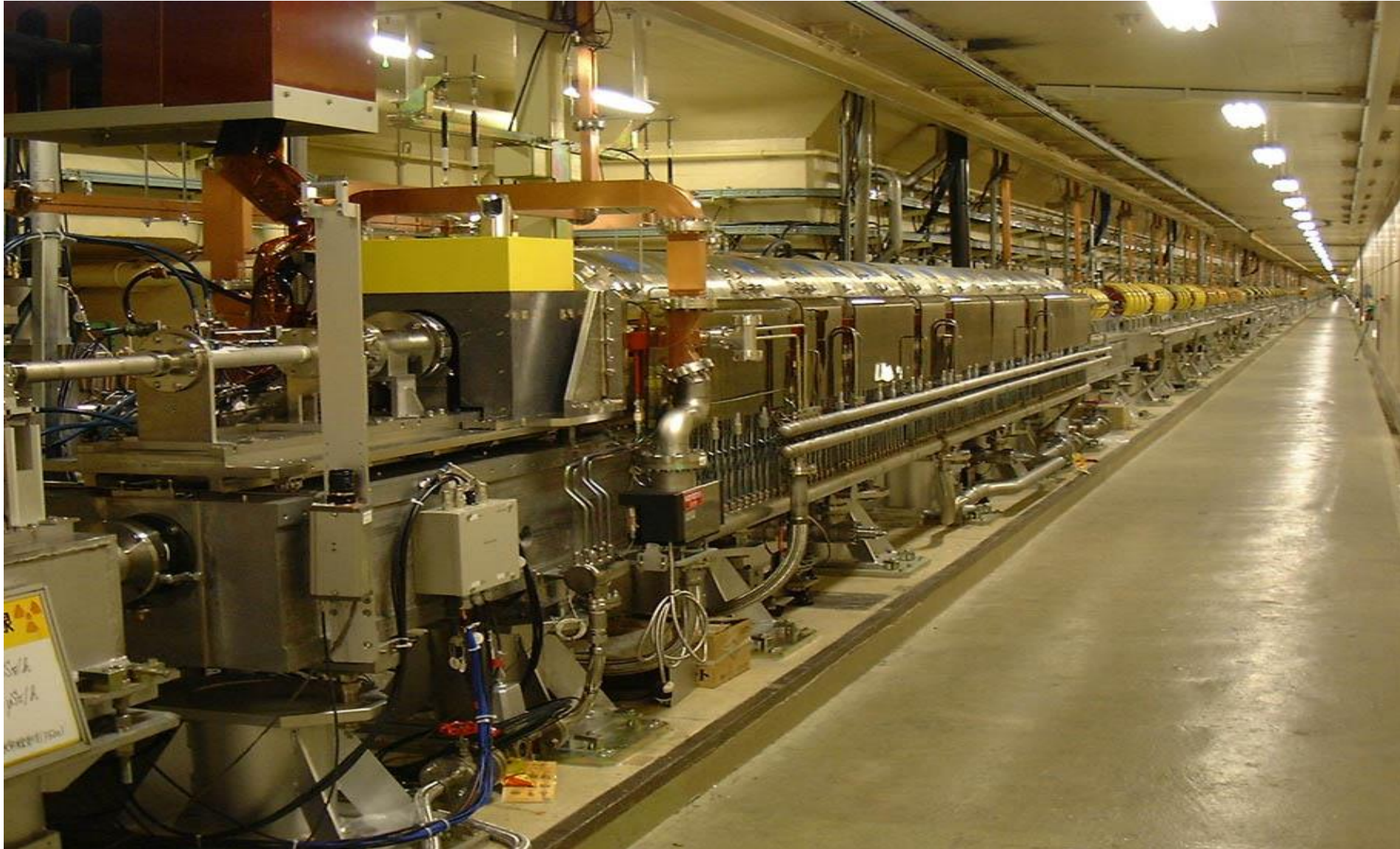


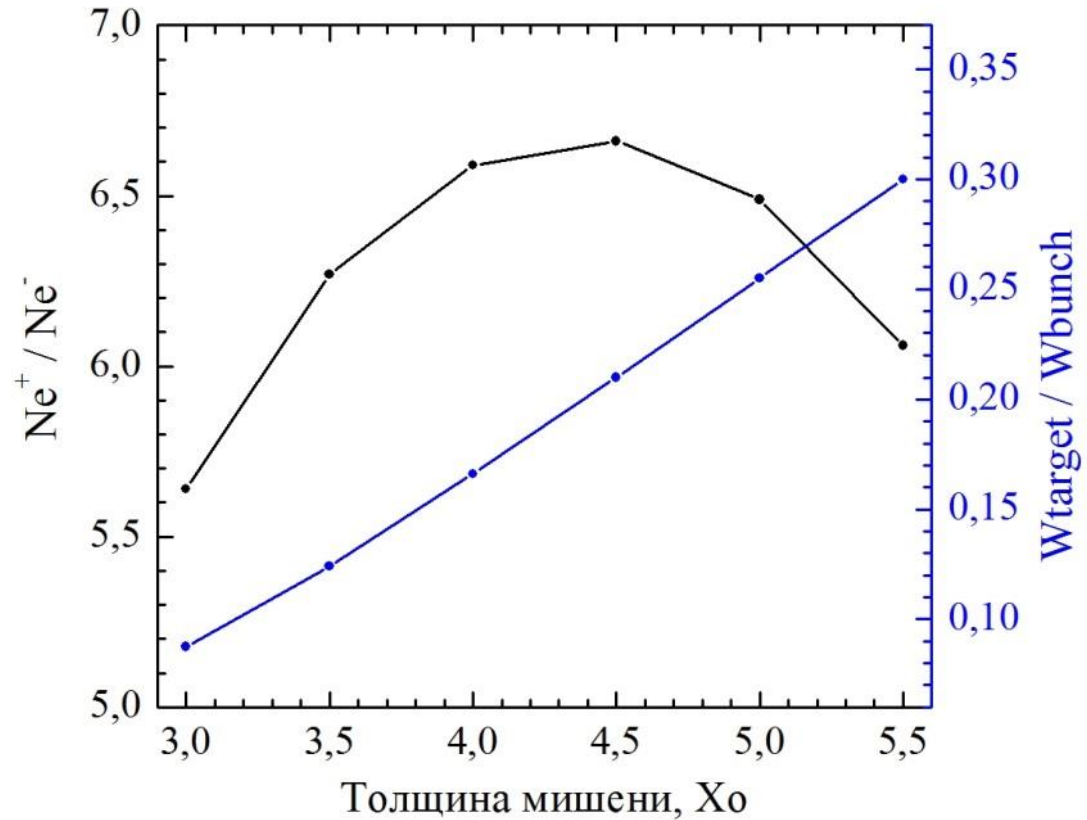
Схема позитронного источника



Positron source



*Число позитронов после мишени (слева),
общее энерговыделение в мишени (справа)*

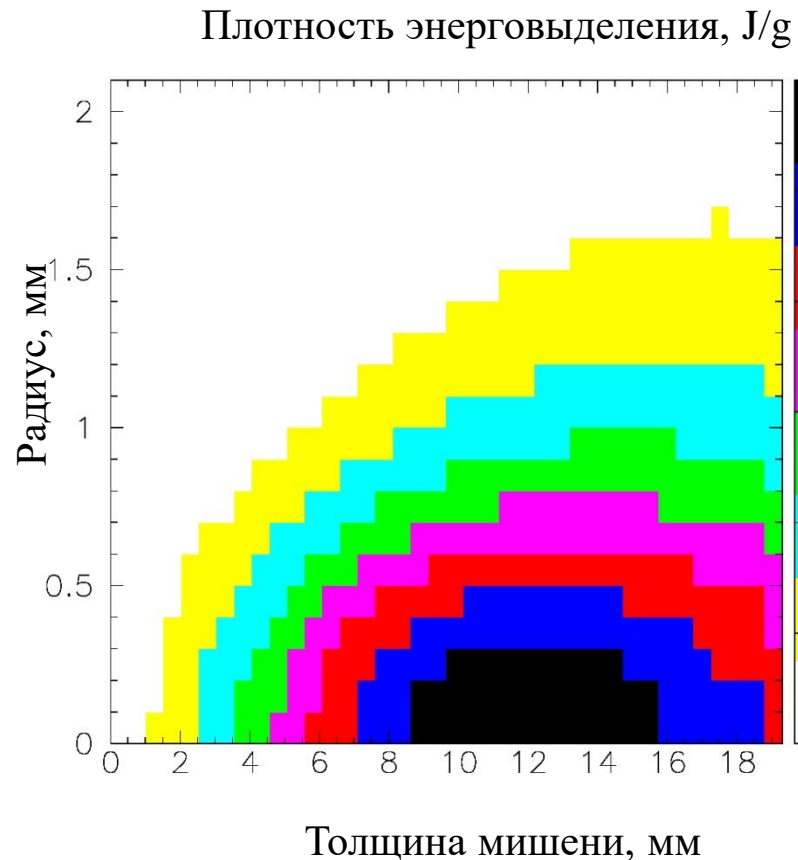
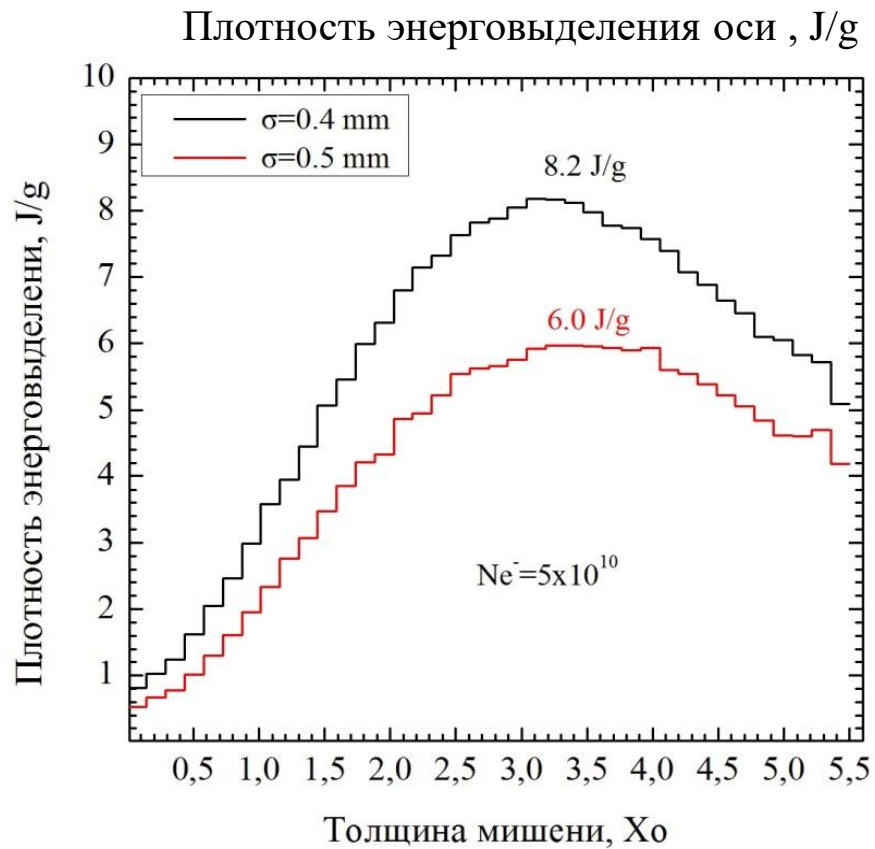


Энергия электронов 2.5 GeV
Мишень W74Re26 (возможно Тантал)
Радиационная длина $X_0 = 3.5$ мм

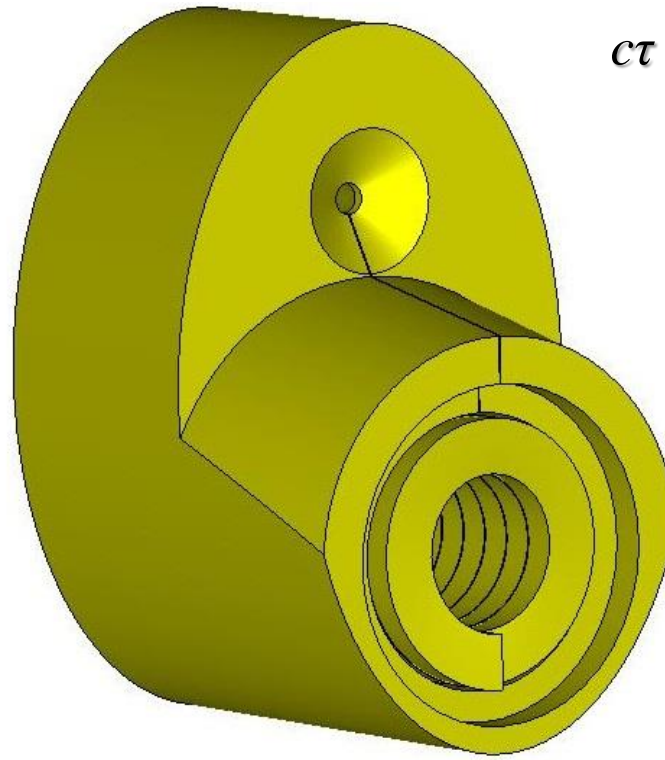
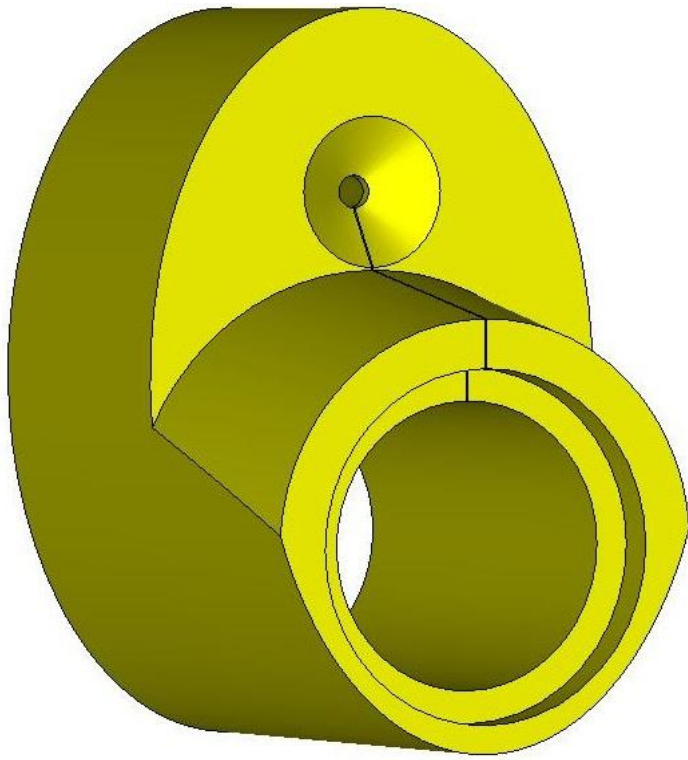
Средняя мощность энерговыделения в мишени 2×100 W
число e^- 5×10^{10}
толщина мишени $4.5 X_0$
частота повторения 25 Гц

Плотность энерговыделения от одного сгустка электронов

Пороговая плотность энерговыделения в W74Re26 35J/g (SLAC)

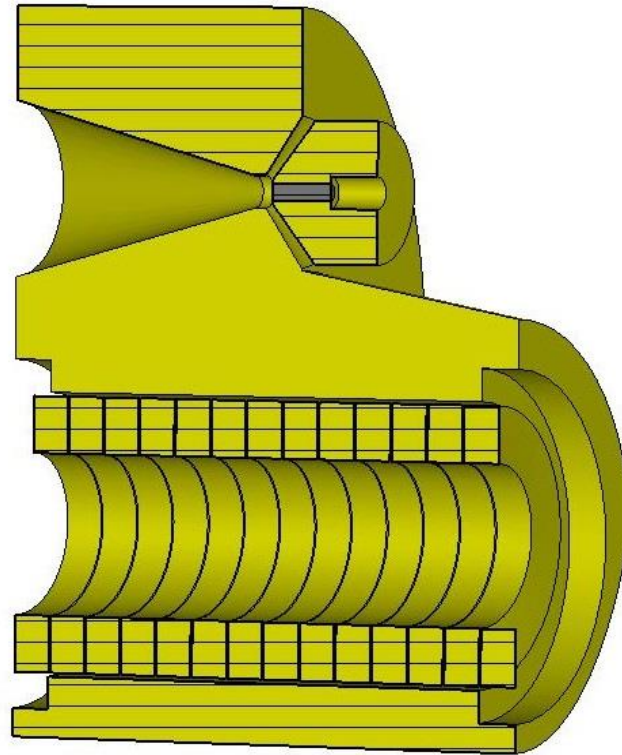
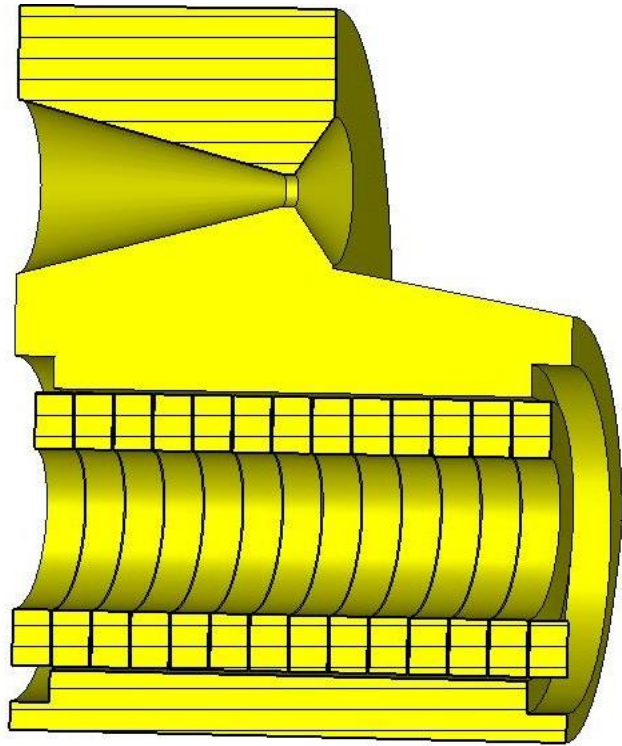


ct Flux Concentrator (FC) computer model



- Elliptical cylinder 120x180 mm
- Total length is 140 mm
- Conical part length is 70 mm
- Min cone diameter is 8 mm
- Max cone diameter is 44 mm
- Cone angle is ≈ 30 degrees
- Cylindrical hole diameter is 70 mm
- Coil has 13 turns

- Current profile is a half of sine with a pulse length of $25 \mu\text{s}$
- Gap between coil turns is 0.4 mm
- Gap between coil and FC body is 1 mm
- Turns size is 9.6x14 mm

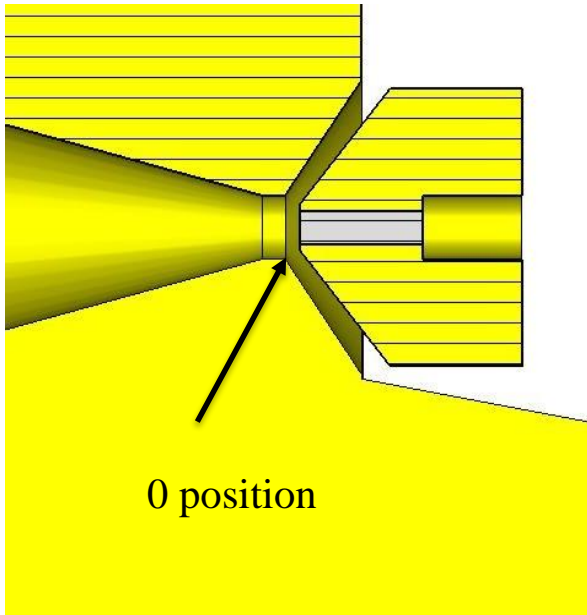


- Elliptical cylinder 120x180 mm
- Total length is 140 mm
- Conical part length is 70 mm
- Min cone diameter is 8 mm
- Max cone diameter is 44 mm
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- Turns size is 9.6x14 mm

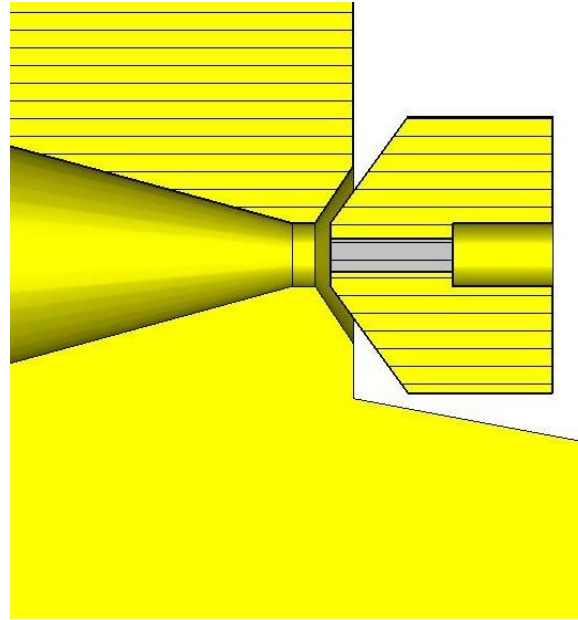
- Target rod (W74Re26) diameter is 4 mm, length is 15.7 mm
- External target unit diameter is 35 mm

Modifications of target position and FC front face

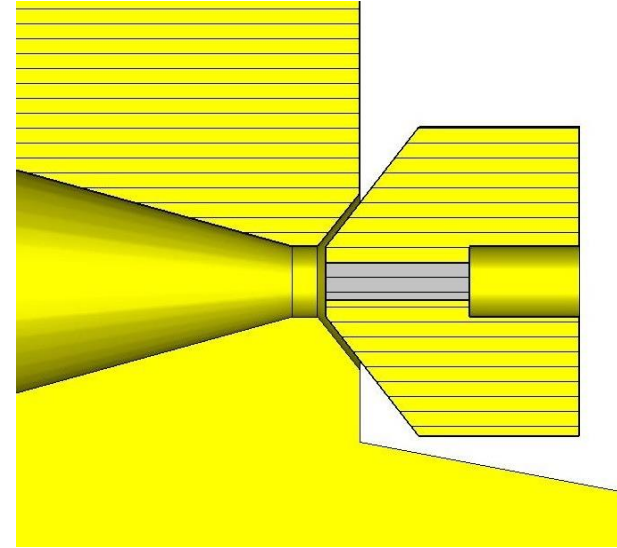


Model 1.

Target position of end face
is -2mm

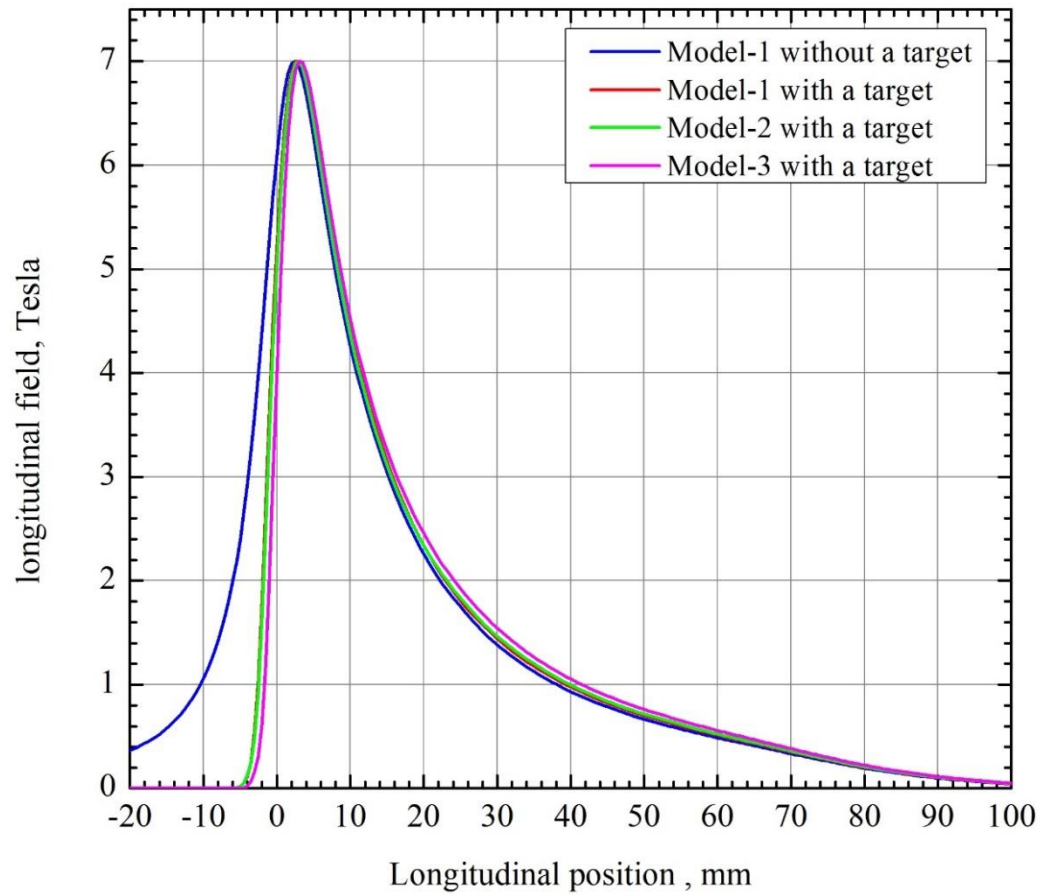


Model 2. Modification of FC
front face around of a target

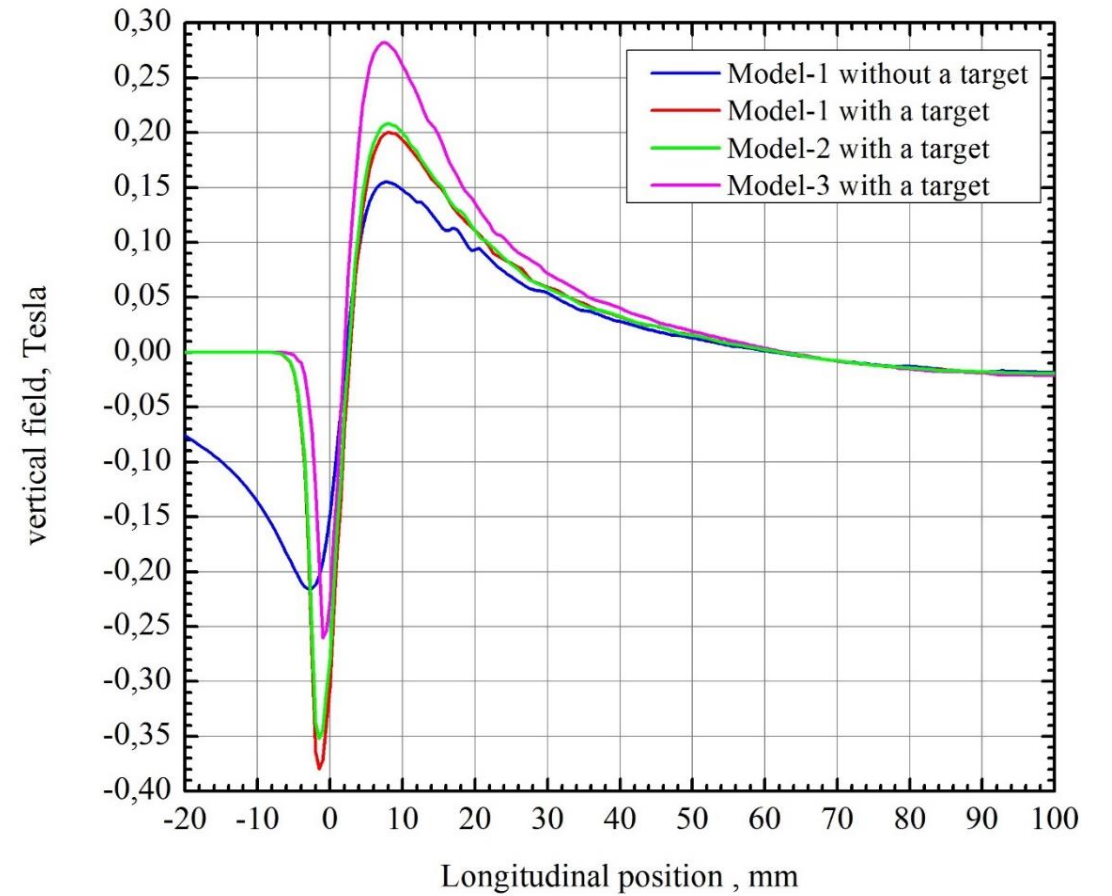


Model 3. Modification of gap between
FC front face and target
Target position of end face is -1mm

Min cone diameter is 8 mm

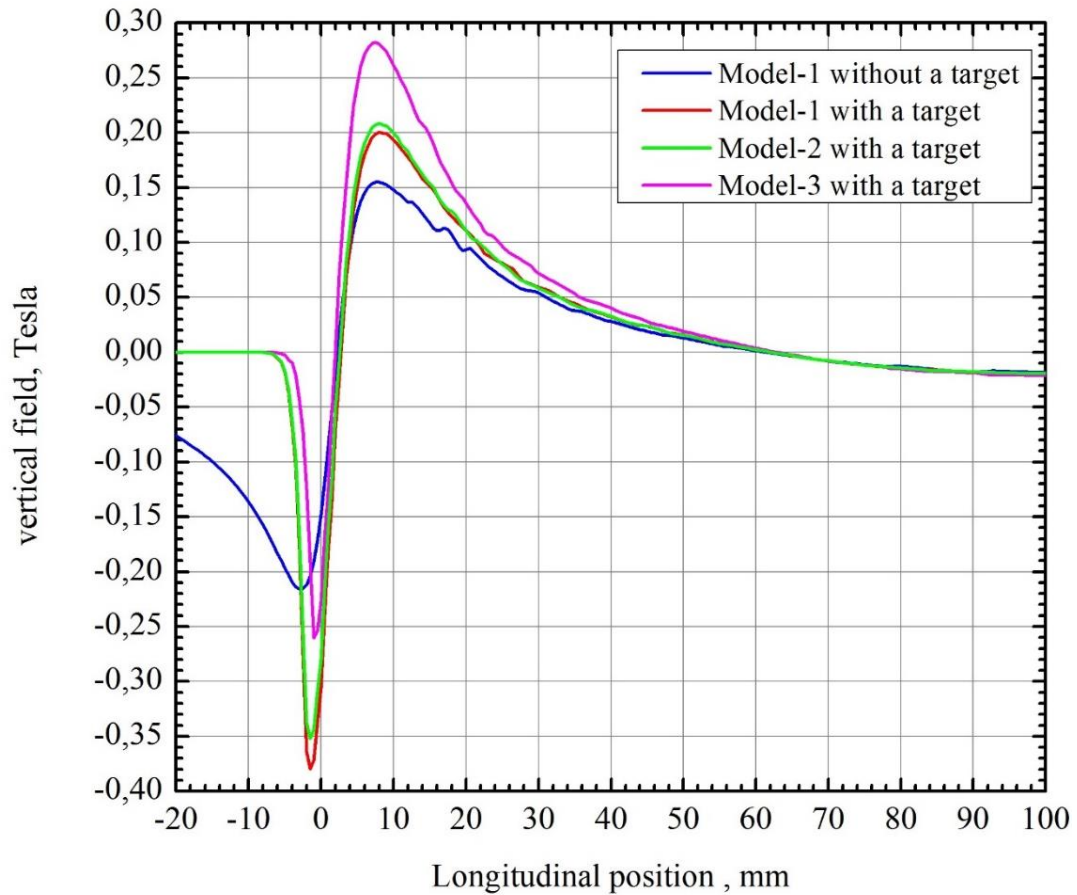


Longitudinal magnetic field component on axis of Flux Concentrator. Peak field position is 3 mm

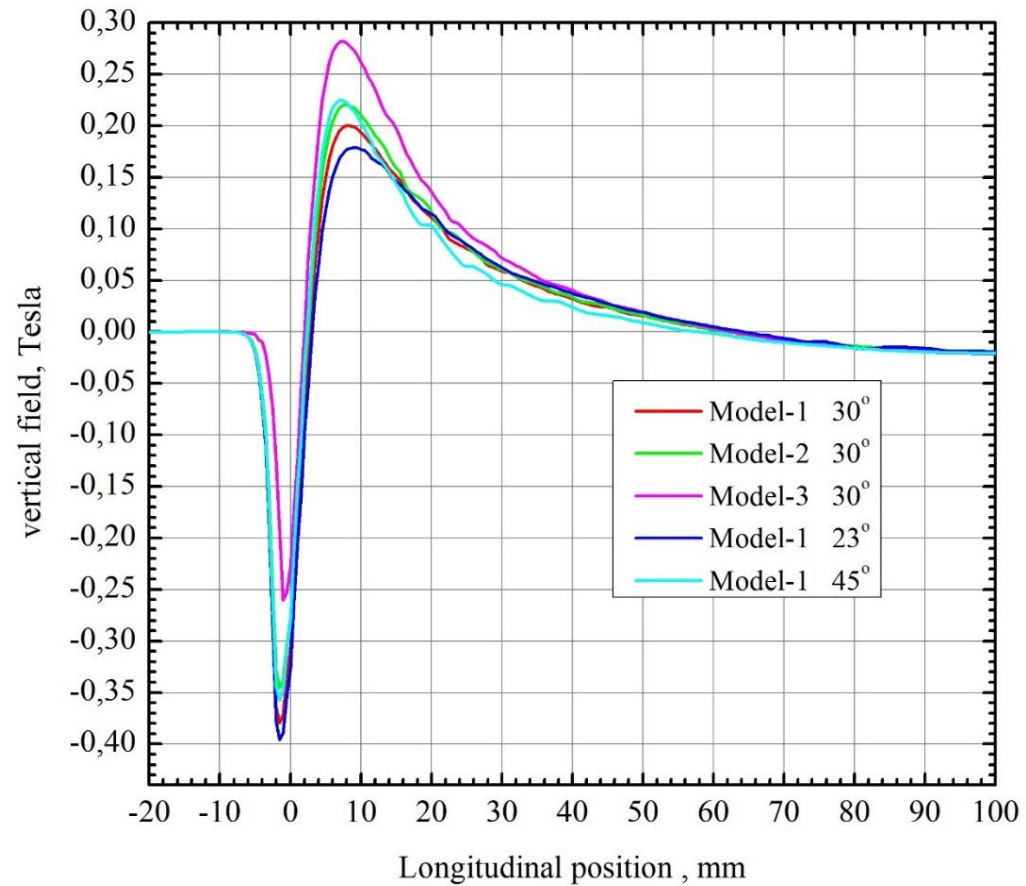


Transverse magnetic field components on axis of Flux Concentrator

Transverse magnetic field components on axis of Flux Concentrator

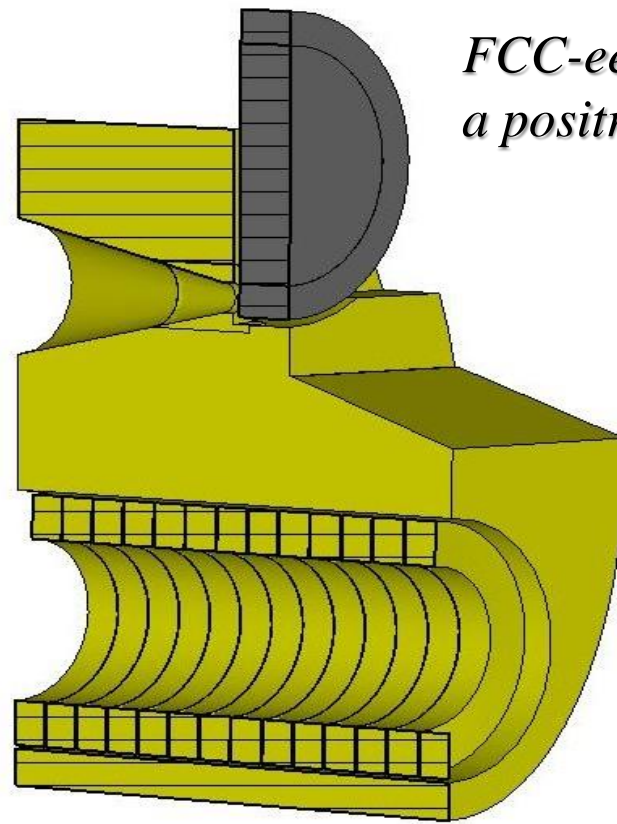
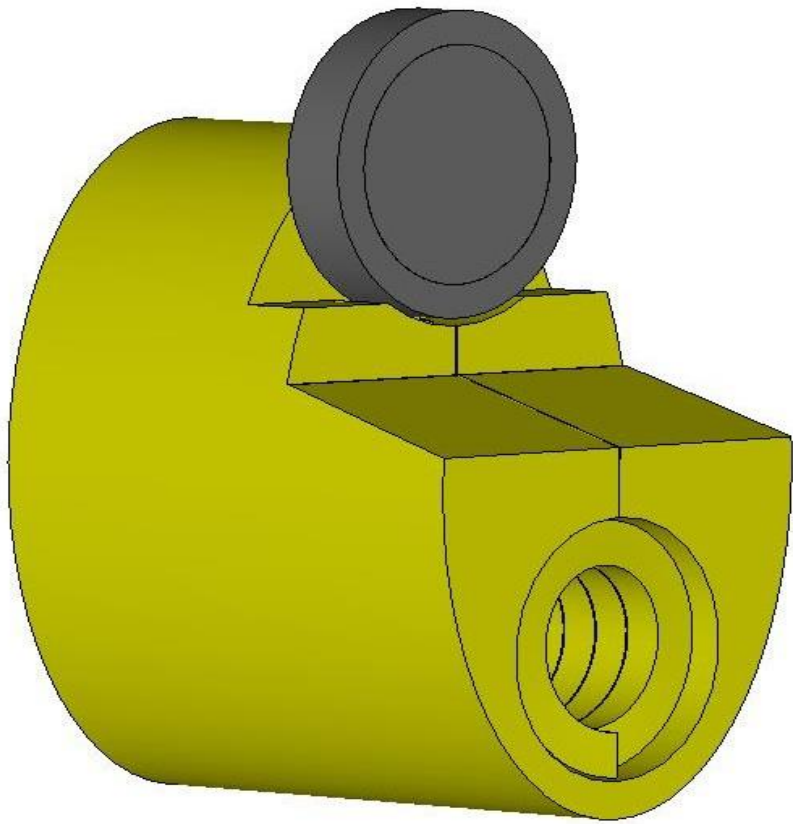


Peak field position is 8 mm
Cone angle is 30°



Cone angle modification with 23° and 45°

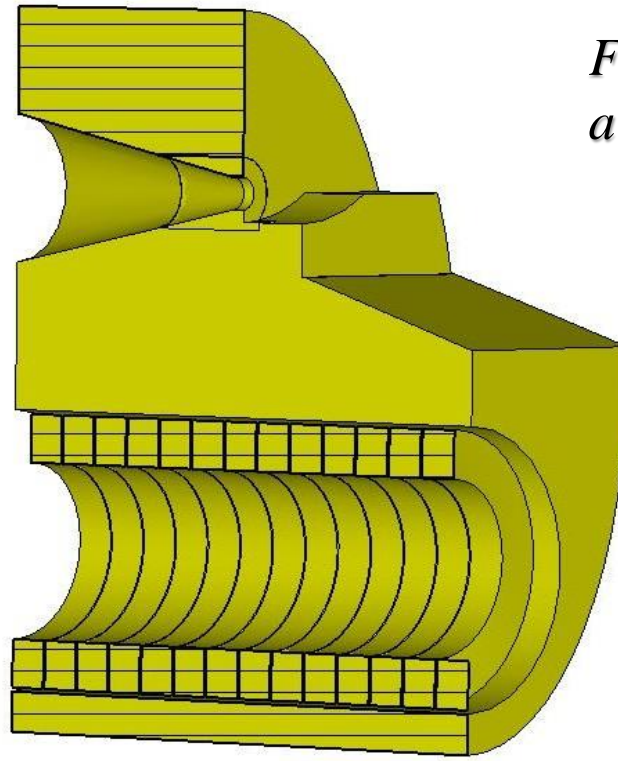
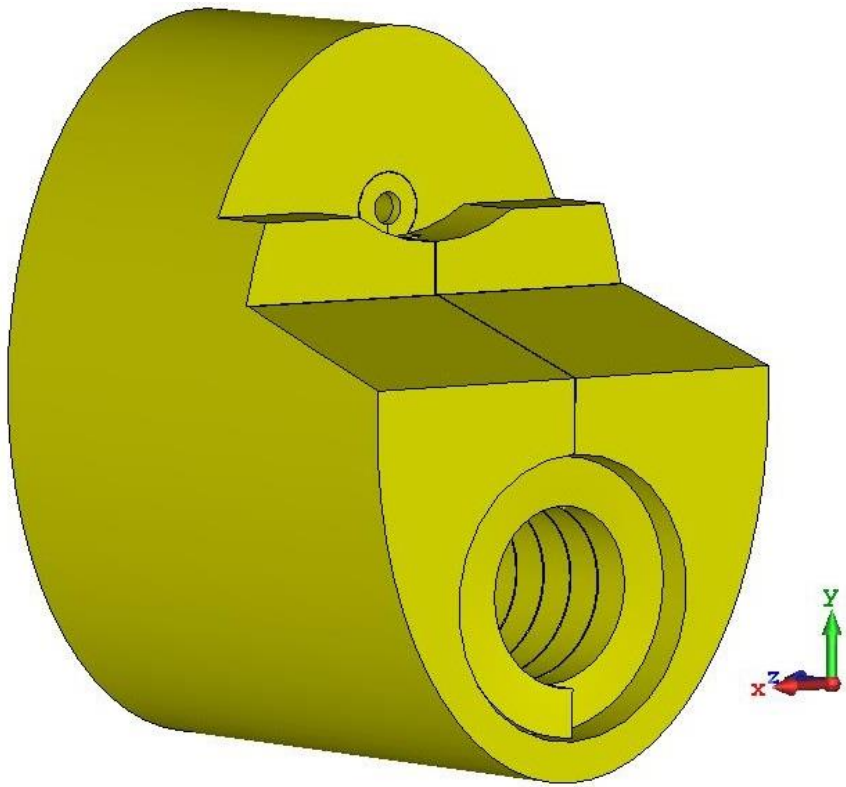
*FCC-ee FC Computer model with
a positron production target*



- Elliptical cylinder 120x180 mm
- Total length is 140 mm
- Conical part length is 70 mm
- Min cone diameter is 8 mm
- Max cone diameter is 44 mm
- Cone angle is ≈ 29 degrees
- Cylindrical hole diameter is 70 mm
- Coil has 13 turns

- Current profile is a half of sine with a pulse length of $25 \mu\text{s}$
- Peak current is ~ 20 kA (peak field is 7 Tesla)
- Gap between coil turns is 0.4 mm
- Gap between coil and FC body is 1 mm
- Turns size is 9.6x14 mm

- Target (W74Re26) diameter is 90 mm, thickness is 15.7 mm
- Gap between target and FC front face is 2mm



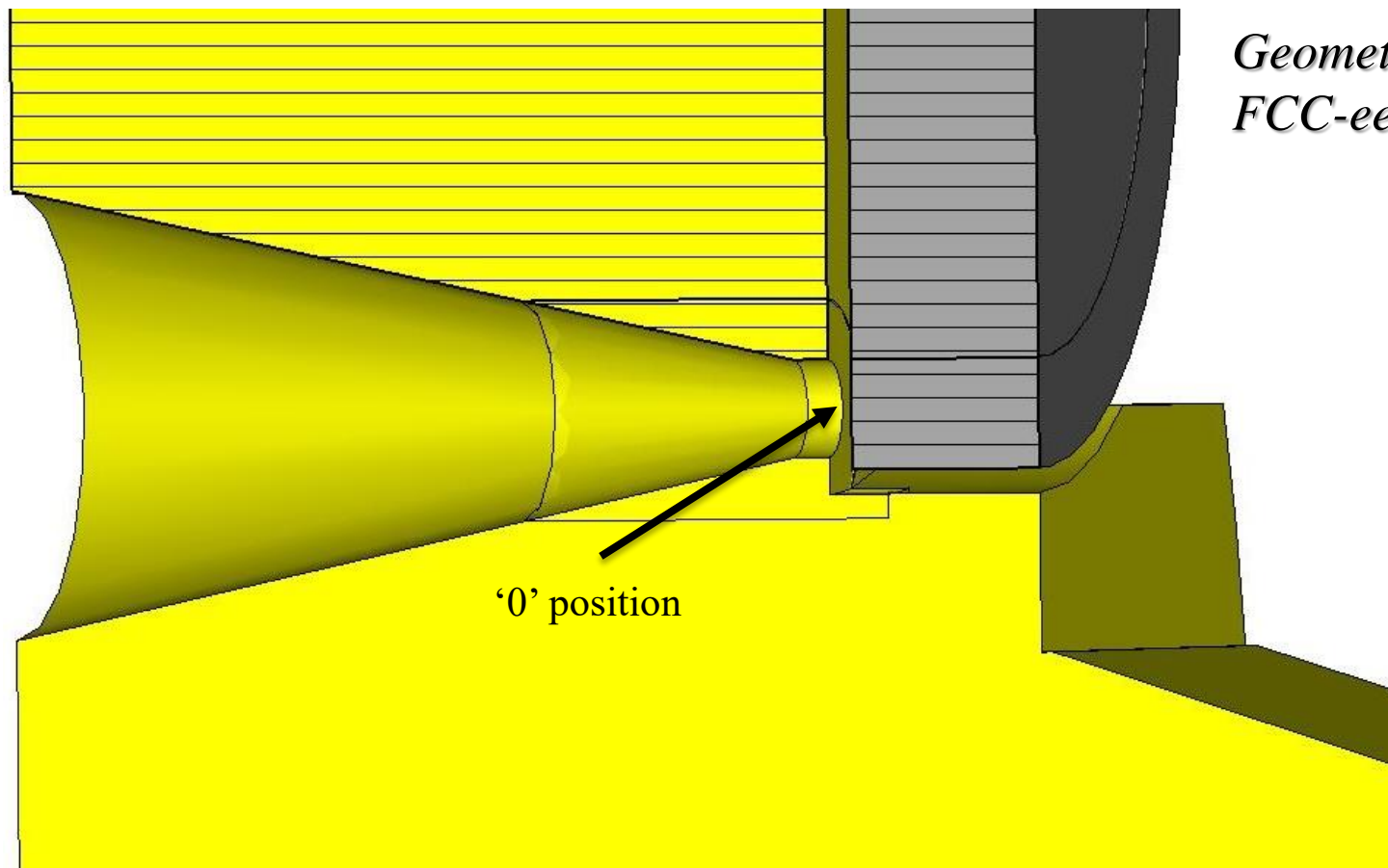
FCC-ee FC Computer model with a positron production target

- Elliptical cylinder 120x180 mm
- Total length is 140 mm
- Conical part length is 70 mm
- Min cone diameter is 8 mm
- Max cone diameter is 44 mm
- Cone angle is ≈ 29 degrees
- Cylindrical hole diameter is 70 mm
- Coil has 13 turns

- Current profile is a half of sine with a pulse length of $25 \mu\text{s}$
- Peak current is $\sim 20 \text{ kA}$ (peak field is 7 Tesla)
- Gap between coil turns is 0.4 mm
- Gap between coil and FC body is 1 mm
- Turns size is $9.6 \times 14 \text{ mm}$

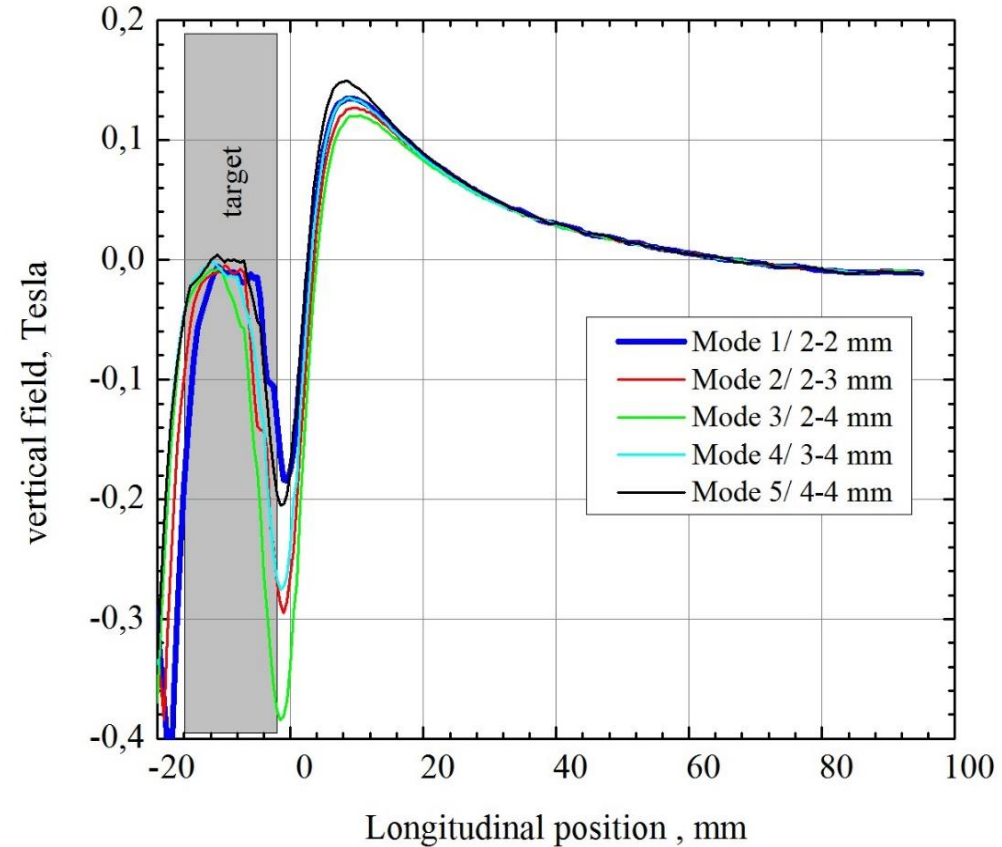
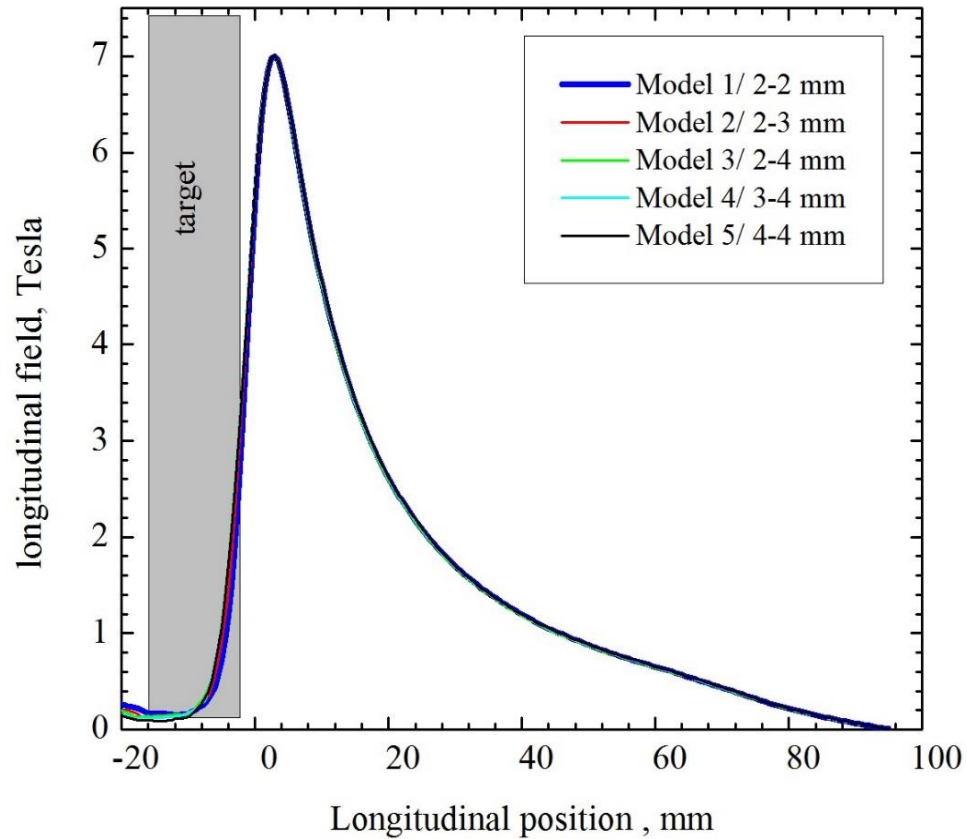
- Target (W74Re26) diameter is 90 mm, thickness is 15.7 mm
- Gap between target and FC front face is 2mm

*Geometry Variations of
FCC-ee FC Computer model*



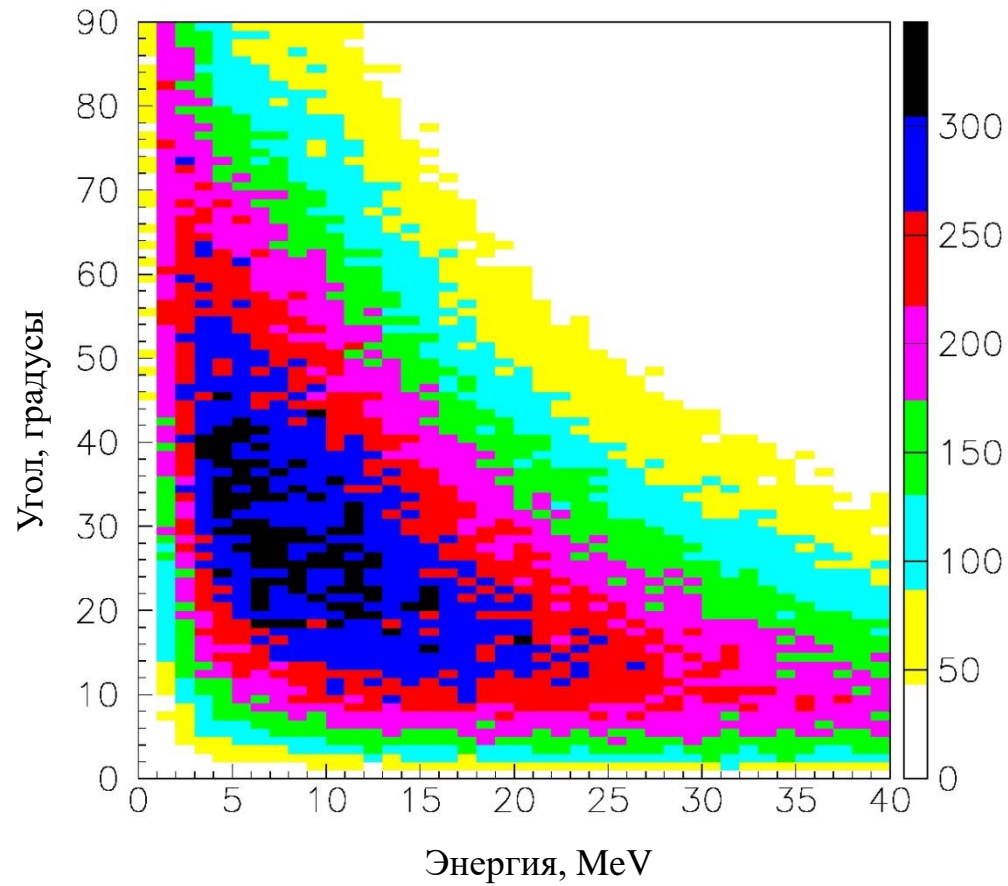
- Model #1 grooving gap is 2 mm, gap between FC front face and target is 2 mm
- Model #2 grooving gap is 2 mm, gap between FC front face and target is 3 mm
- Model #3 grooving gap is 2 mm, gap between FC front face and target is 4 mm
- Model #4 grooving gap is 3 mm, gap between FC front face and target is 4 mm
- Model #5 grooving gap is 4 mm, gap between FC front face and target is 4 mm

Field profiles on FC axis

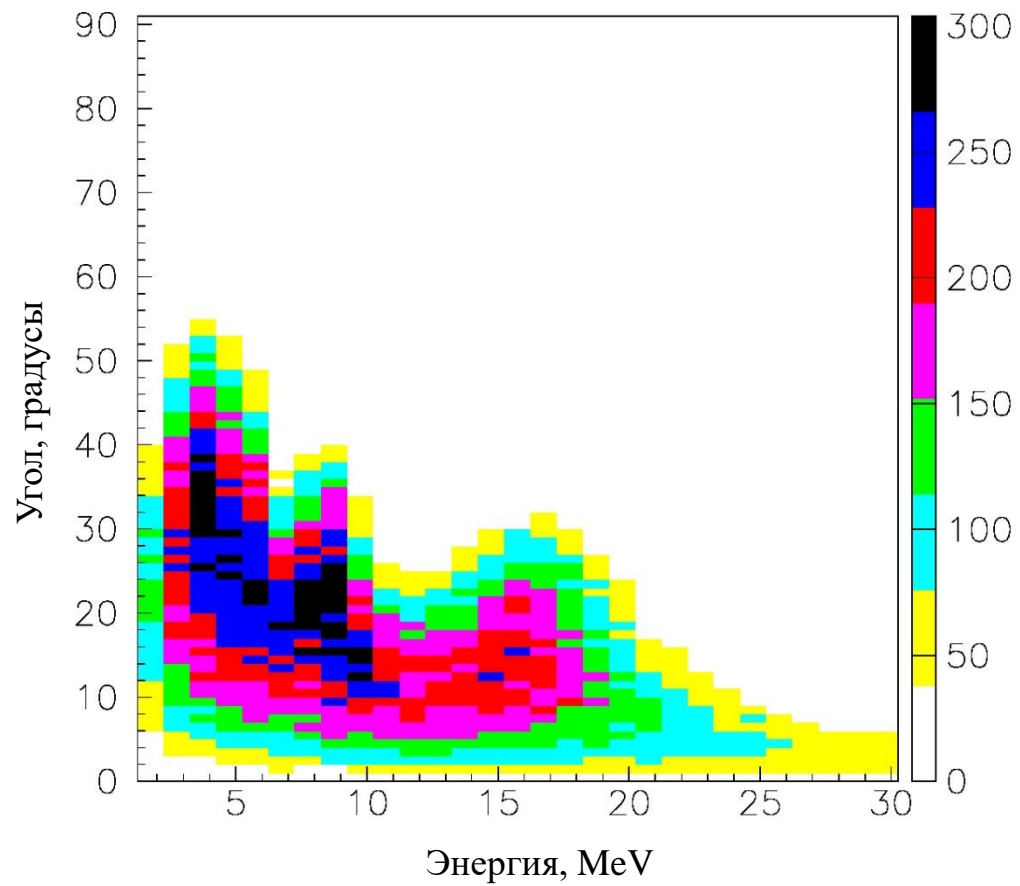


- Model #1 grooving gap is 2 mm, gap between FC front face and target is 2 mm
- Model #2 grooving gap is 2 mm, gap between FC front face and target is 3 mm
- Model #3 grooving gap is 2 mm, gap between FC front face and target is 4 mm
- Model #4 grooving gap is 3 mm, gap between FC front face and target is 4 mm
- Model #5 grooving gap is 4 mm, gap between FC front face and target is 4 mm

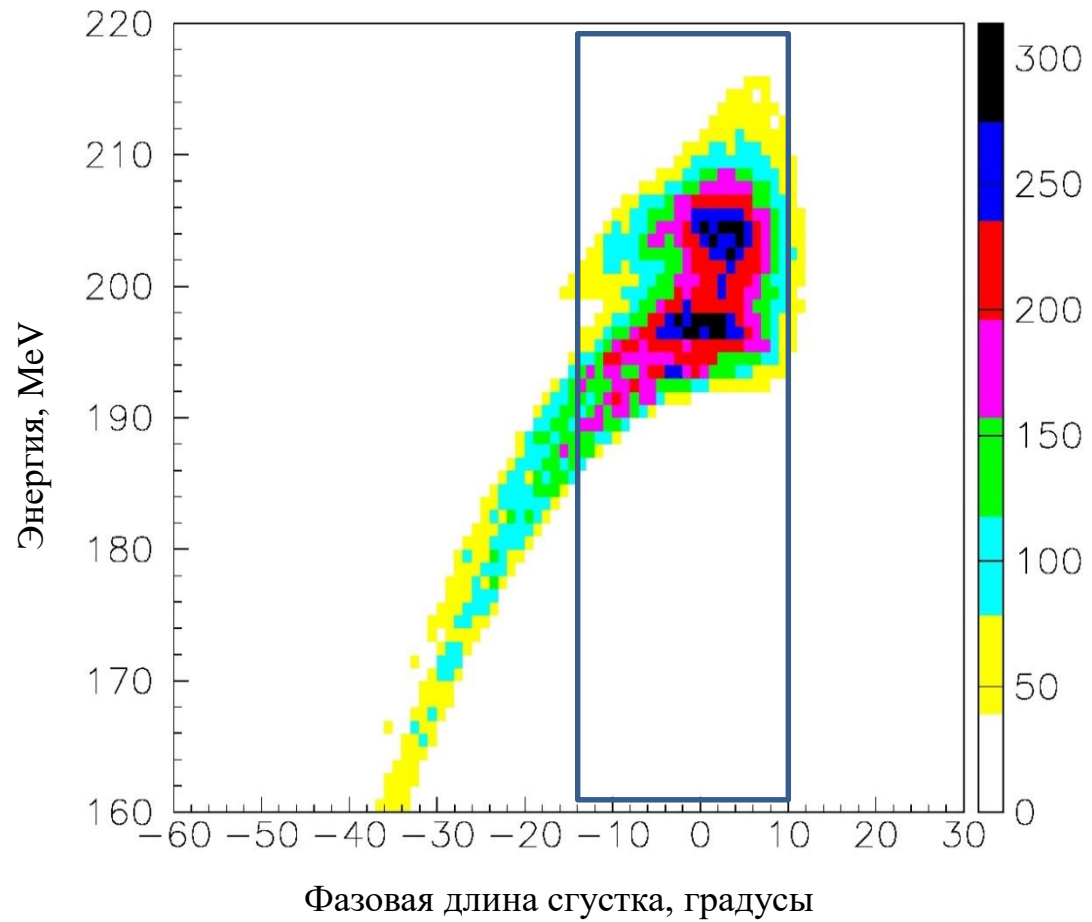
Энергетически-угловое распределение
позитронов после мишени



Энергетически-угловое распределение
позитронов после мишени (захват)



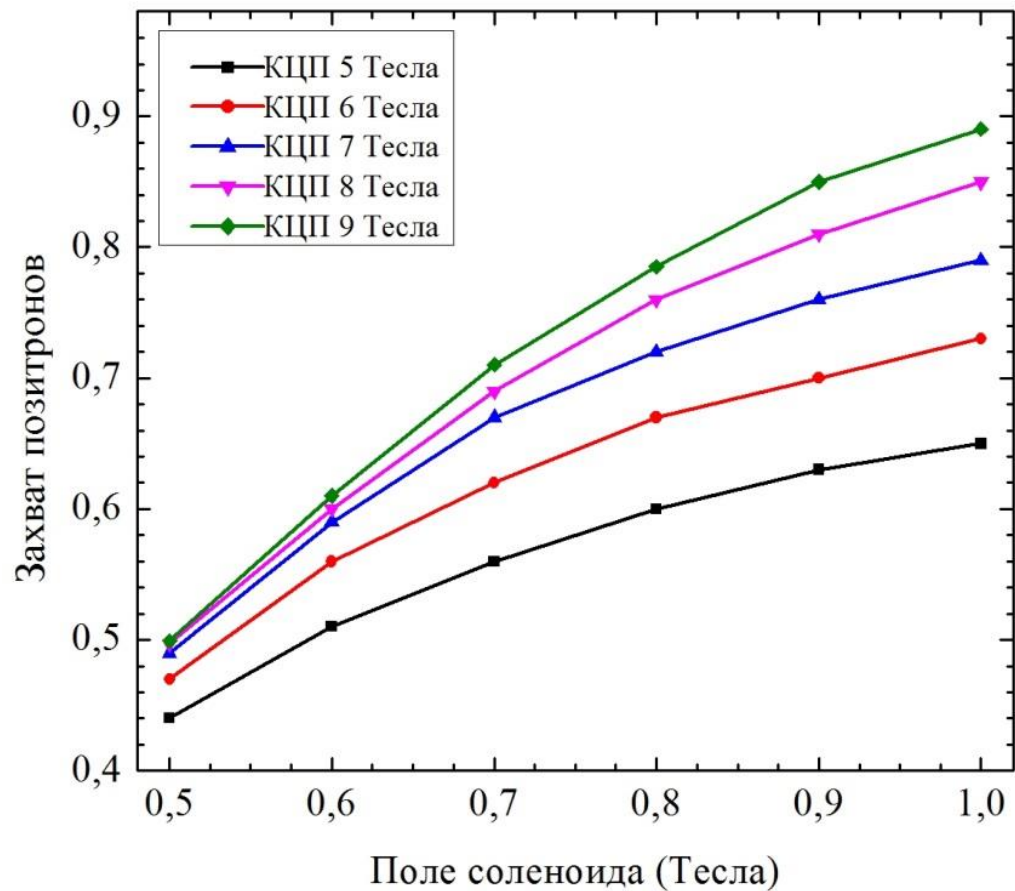
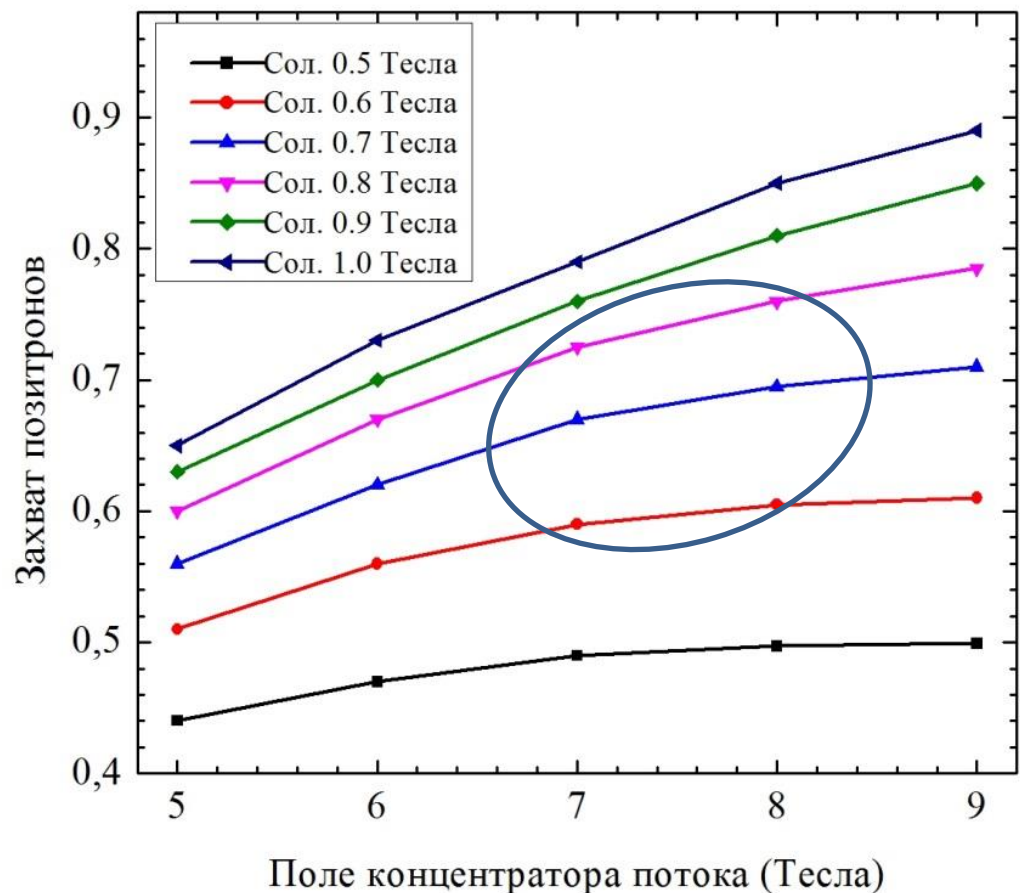
*Фазово-энергетическое распределение сгустка
позитронов после соленоида*



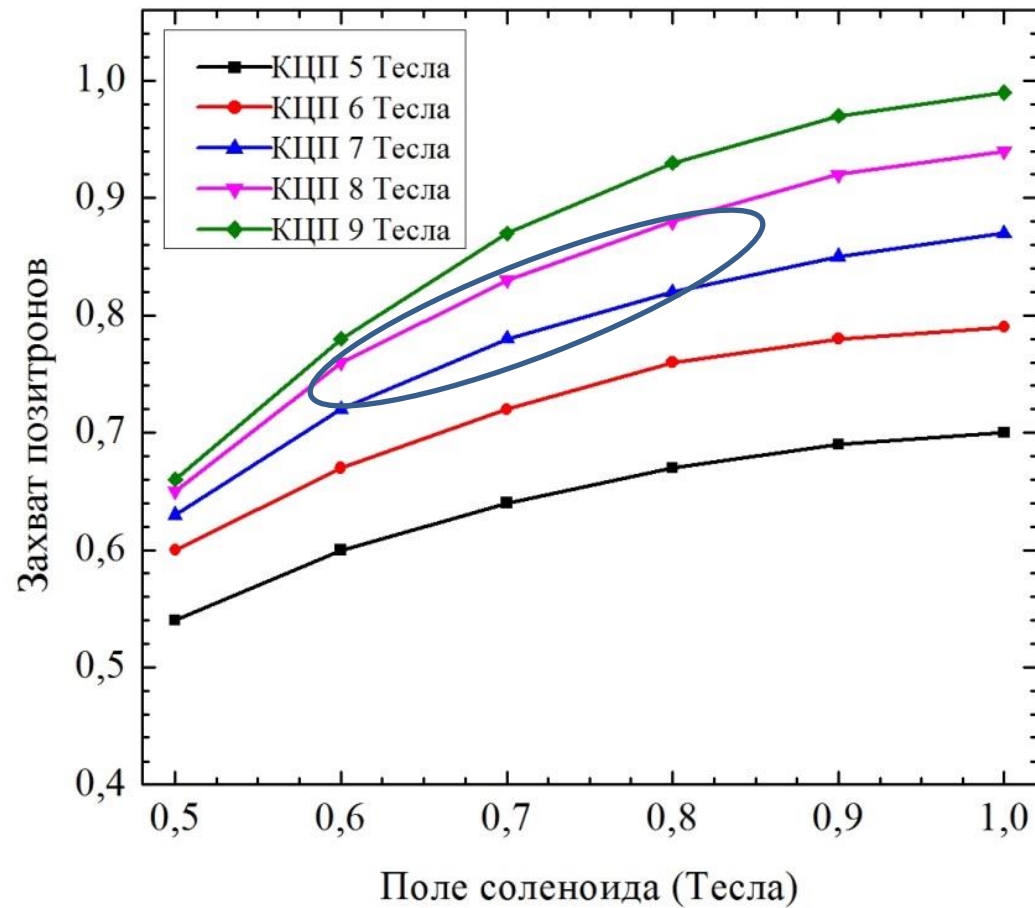
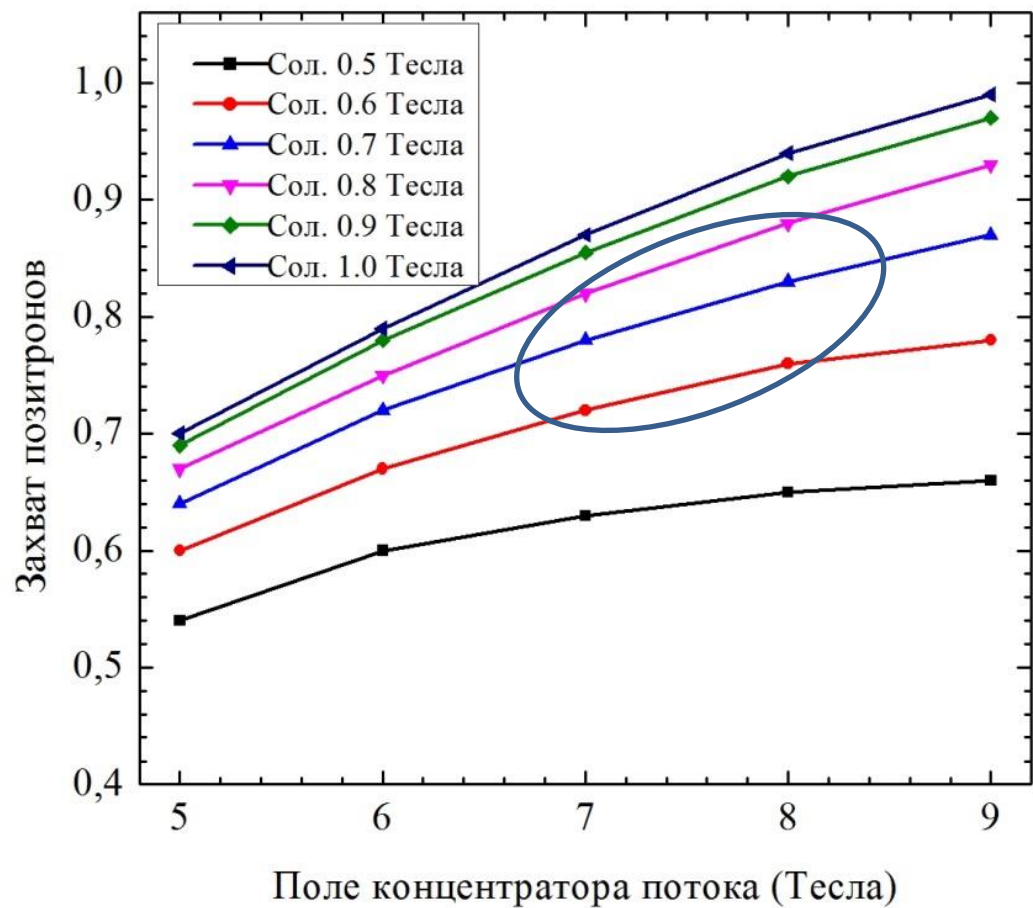
Поперечный размер e- (σ) 0.5 мм

Продольный размер e- (σ) 1.0 мм

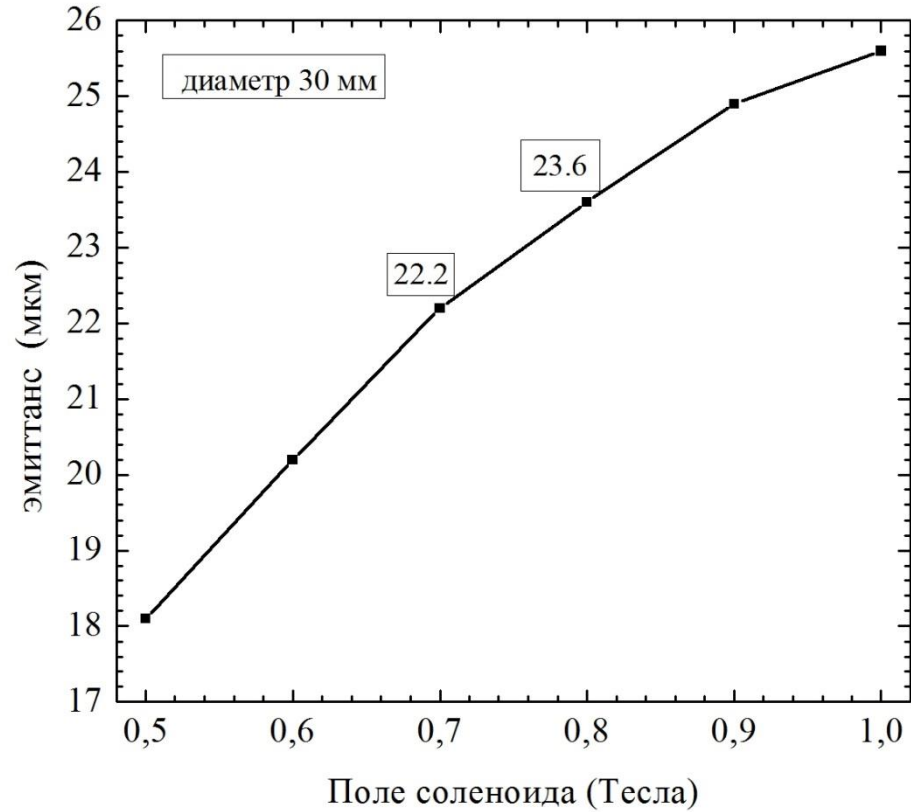
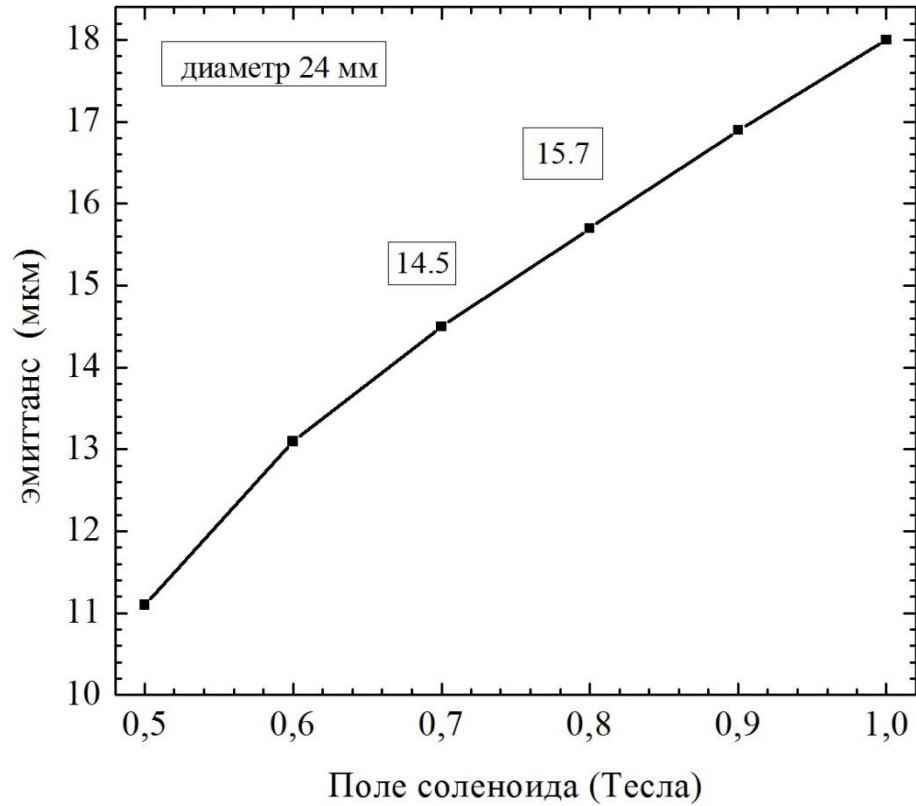
Оценочный захват позитронов (e^+ энергия ~ 200 MeV после соленоида)
Диаметр структуры 24мм



Оценочный захват позитронов (e^+ энергия ~ 200 MeV после соленоида)
Диаметр структуры 30мм

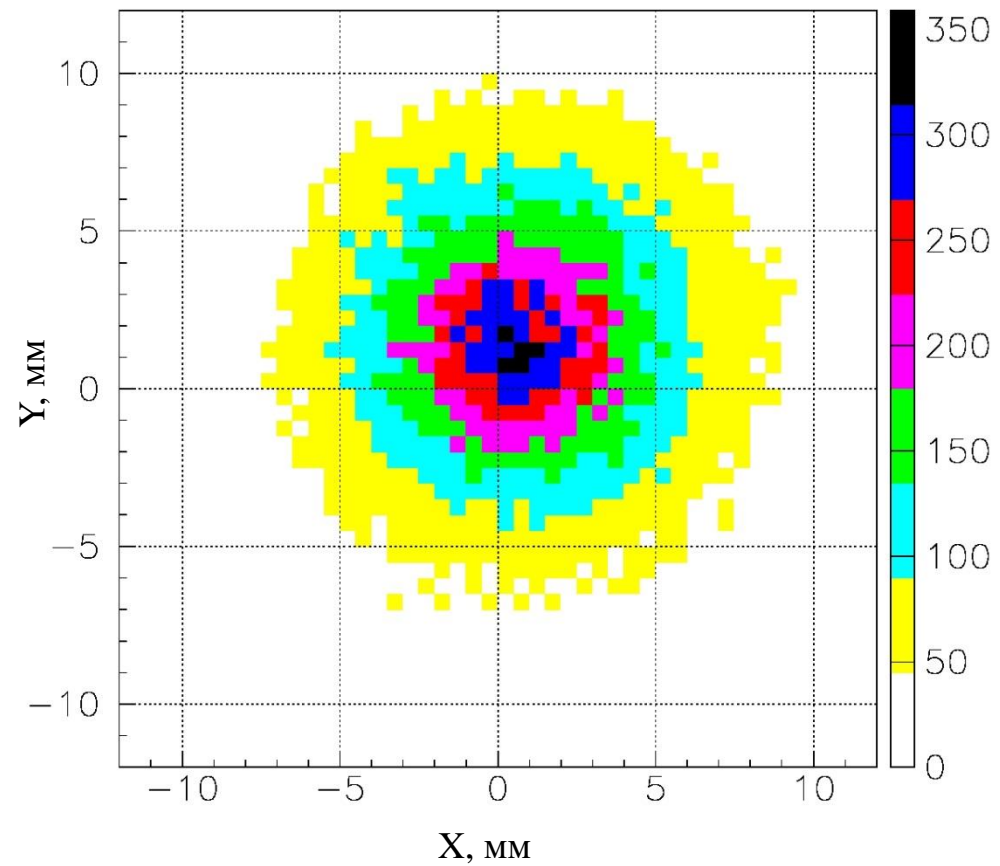


Эмиттанс позитронного сгустка (e^+ энергия ~ 200 MeV после соленоида)



Эмиттанс не зависит от поля концентратора потока

Размер позитронного сгустка (e^+ энергия $\sim 200\text{MeV}$)



Поле концентратора 80 кГс

Поле соленоида 7 кГс

RMS размер $\sim 4.1\text{ mm}$

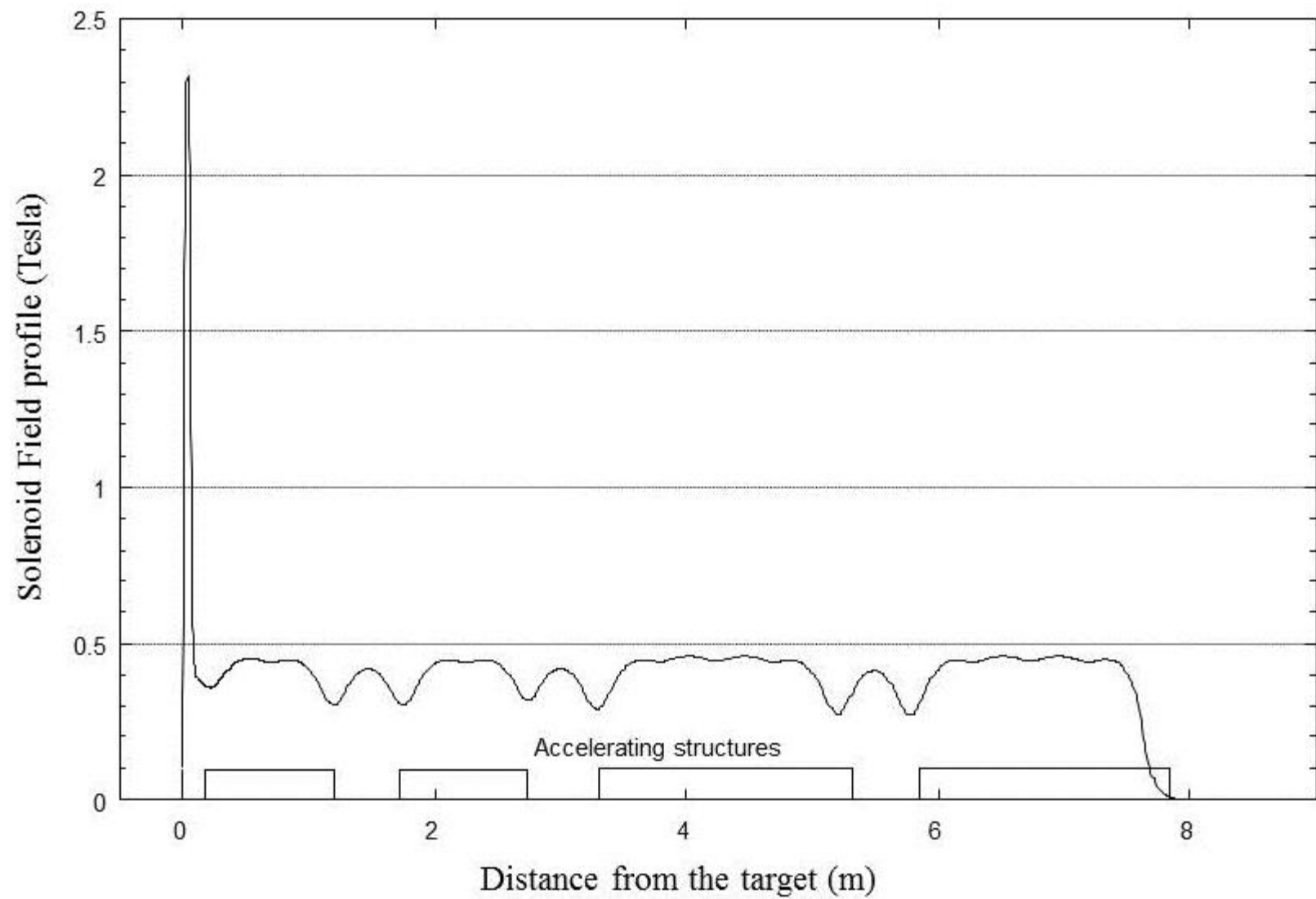
Горизонтальное смещение $\sim 0.6\text{ mm}$

Вертикальное смещение $\sim 1.2\text{ mm}$

Expected positron yield (e^+ energy $\sim 200\text{MeV}$)

	FC–Solenoid field, Tesla					
	8-0.6		8-0.7		8-0.8	
Acc. Structure diameter, mm	24	30	24	30	24	30
Positron yield Ne^+/Ne^-	0.6	0.76	0.69	0.83	0.76	0.88
Emittance, μm	13.1	19.6	14.5	22.2	15.7	23.6
Vertical offset, mm	1.1	1.2	1.2	1.2	1.1	1.25
Horizontal offset, mm	0.76	0.7	0.6	0.8	0.6	0.7

“Safety factor” of a positron system is about 2



positron beam line



