



Photon Collimators in the Undulator

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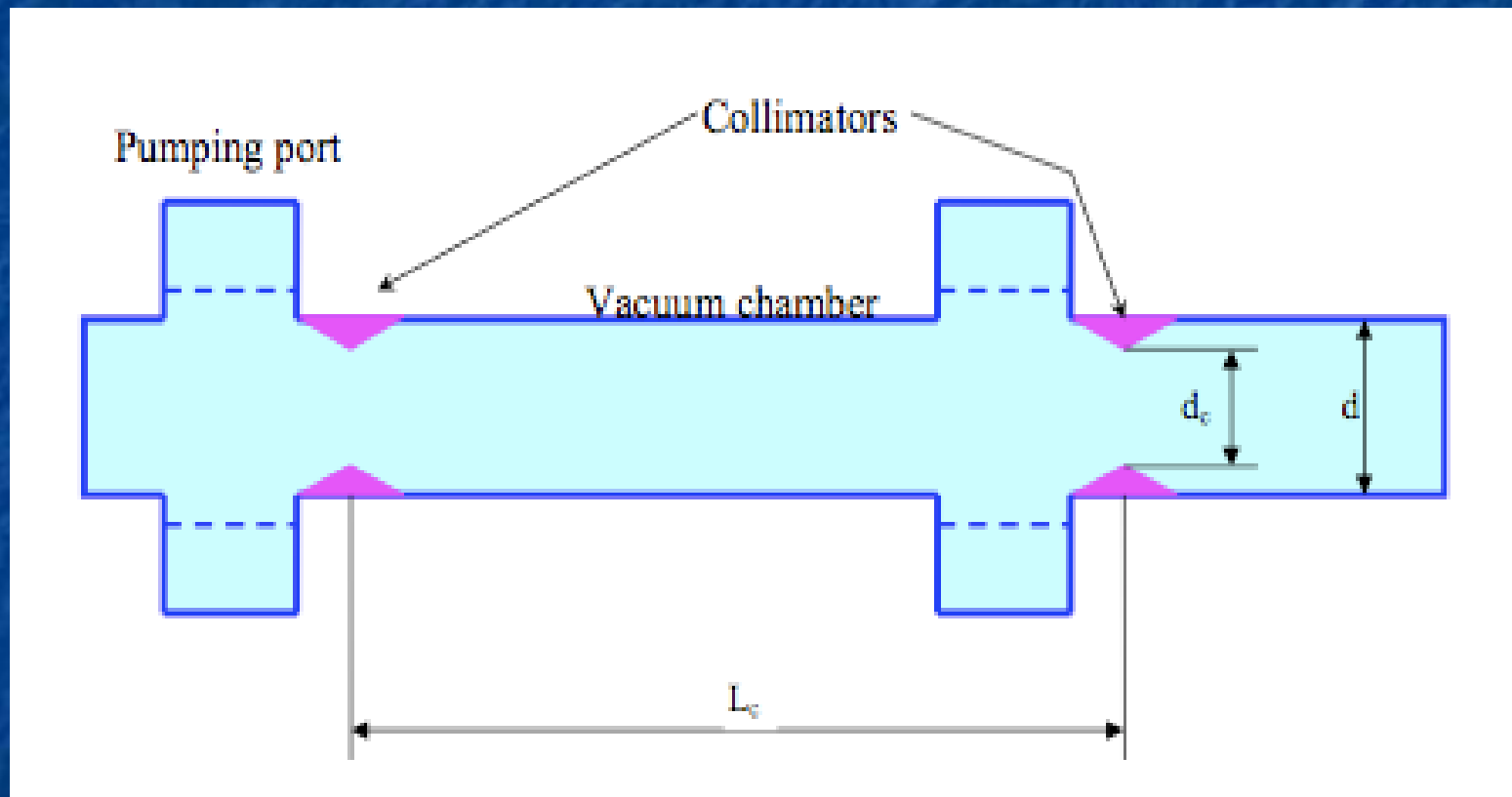
Helical Undulator Parameters

- Photons produced using a helical undulator and an electron beam at 150 GeV
- Length: 100-200 m
- Peak field ~ 0.8 T with periods ~ 12 mm
- Aperture is small 4-6 mm
- Vacuum pressure: less than 100 nT

Photon Collimators - Motivation

- The vacuum design should allow for continuous operation of the undulator for at least half a year without warming up
- Photon collimators are required to keep the gas density at an acceptable level
- Collimators installed at a reasonable distance apart inside the vacuum chamber
- Geometry design and material choice must be specified

Layout of the collimators



O.Malyshev et al -
EUROTeV Report 2006-086

Collimator distance

Distance from the start of the undulator (m)	Distance Between Collimators (m)	
	Gas Density always below the required limit	Gas Density below the required limit for 150 days
10	≤ 20	< 20
20	≤ 10	≤ 20
30	≤ 6	≤ 14
40	≤ 4	≤ 7.5
50	≤ 3	≤ 4.5

- Required distance depends on the ratio $d_c:d$
- From simple geometry calculations:
 $L_c < 15$ m for $d_c:d=1:2$
 $L_c < 7.5$ m for $d_c:d=3:4$

Oleg Malyshev

Schedule

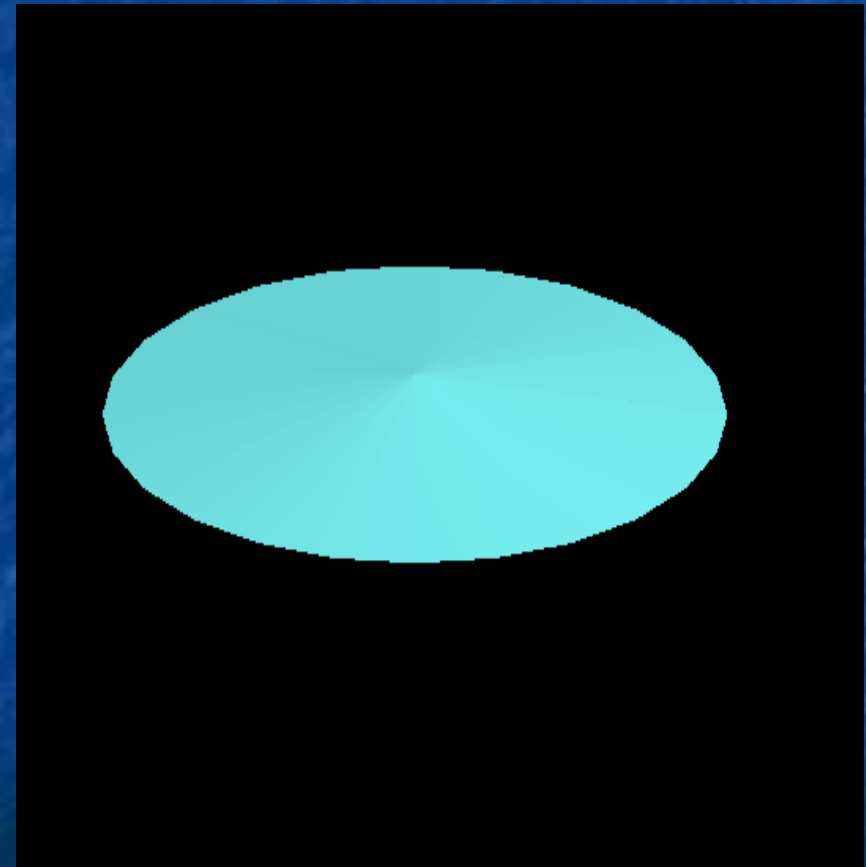
- Photon collimator work started in March 2008
- Geometry and Beam Features Implementation in Geant4 - April
- First results with Beam Parameters from SPECTRA/SPUR code - May
- Final decision on dimensions, material etc - early June
- EPAC 2008 - paper on photon collimators

Geometry and Dimensions

First parameters:

- Geometry: cone
- Vacuum pipe radius: 2.9 mm
- Half gap: 2.2 mm
- Distance from source for first collimator ~30 m

Final dimensions and geometry decided by simulations!



Geant4 simulations- current status

- Geometry of the collimators implemented
- Beam built from files provided by SPECTRA code - energy and flux - for distance $d=50$ m away from the source
- More realistic results for $d=30$ m away from the source - SPUR code (Nick and Duncan)

Goals - first stage

- Particle deposition on collimators
- Multiplicities
- Optimal distance for the first collimator

->the vacuum requirements must be met !

Next stage

- Energy deposition with Geant4
- Instantaneous temperature rise (Root)
- Choice of material (copper, titanium alloy, aluminium)

->produce a final engineering design for the photon collimators

More suggestions ...