

Механизмы сосуществования стационарных биологических сообществ в пространствах разных размерностей

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Глава 1.

Введение

В 1916 году в [?] Альберт Эйнштейн (Albert Einstein) предложил концепцию вынужденного излучения (stimulated emission) — возникновение колебаний возбужденных электронов, индуцированное существующей световой волной: согласно предложенной теории, данный процесс порождает набор разнофазовых эквиамплитудных волн, *конкурентная самоорганизация* которых в стационарном положении образует равномерно колеблющуюся волну. Таким образом, процесс самоорганизации мультиагентной естественной системы лежит в основе явления, известного как *лазерное излучение* [?].

Глава 2.

The LHCb experiment

«There, sir! that is the perfection of vessels!»

— Jules Verne, 1828–1905

2.1. The LHC

The Large Hadron Collider (LHC) at CERN is a new hadron collider, located in the same tunnel as the Large Electron-Positron collider (LEP) [?]. Where LEP's chief task was the use of 90–207 GeV $e^+ e^-$ collisions to establish the precision physics of electroweak unification...

2.2. The LHCb experiment

Since both b-hadrons are preferentially produced in the same direction and are forward-boosted along the beam-pipe, the detector is not required to have full 4π solid-angle coverage. LHCb takes advantage of this by using a wedge-shaped single-arm detector with angular acceptance 10–300 mrad in the horizontal (bending) plane [?].

⋮

the overall scale of the experiment and the surrounding cavern structure.

The single-sided detector design was chosen in preference to a two-armed design since the detector dimensions are restricted by the layout of the IP8 (ex-Delphi) cavern in which LHCb is located. Using all the available space for a single-arm spectrometer more than compensates in performance for the $\sim 50\%$ drop in luminosity.

2.3. The Čerenkov mechanism

A Huygens construction in terms of spherical shells of probability for photon emission as the particle progresses along its track shows an effective “shock-front” of Čerenkov emission. This corresponds to an emission cone of opening angle θ_C around the momentum vector for each point on the track,

$$\cos \theta_C = \frac{1}{n\beta} + \frac{\hbar k}{2p} \left(1 - \frac{1}{n^2} \right) \quad (2.1a)$$

$$\sim \frac{1}{n\beta} \quad (2.1b)$$

where $\beta \equiv v/c$, the relativistic velocity fraction.

2.4. Trigger system

An overview of the LHCb trigger characteristics broken down by level

	L0	L1	HLT
Input rate	40 MHz	1 MHz	40 kHz
Output rate	1 MHz	40 kHz	2 kHz
Location	On detector	Counting room	Counting room

Таблица 2.1.: Characteristics of the trigger levels and offline analysis.

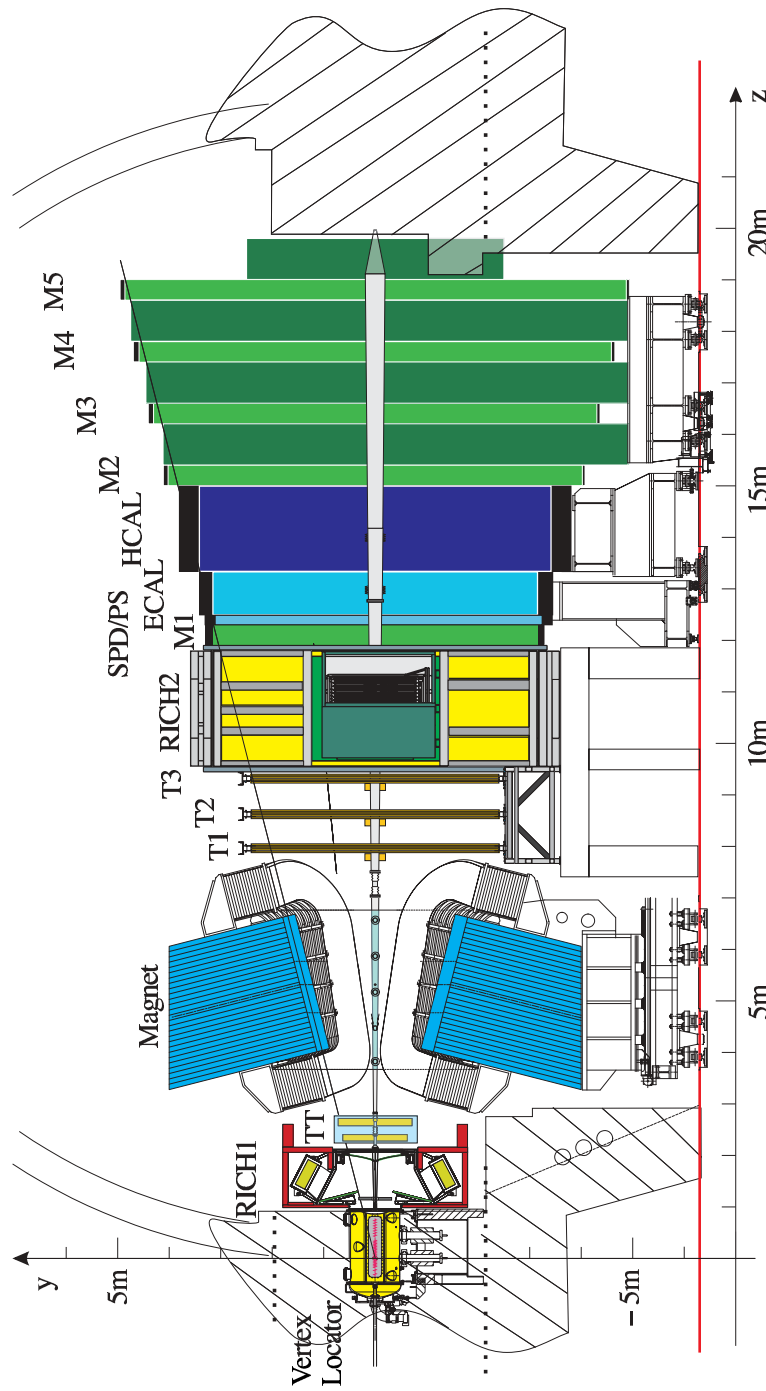


Рис. 2.1.: Cross-section view of LHCb, cut in the non-bending y - z plane.

Приложение А.

Pointless extras

*«Le savant n'étudie pas la nature parce que cela est utile;
il l'étudie parce qu'il y prend plaisir,
et il y prend plaisir parce qu'elle est belle.»*
— Henri Poincaré, 1854–1912

Appendixes (or should that be “appendices”?) make you look really clever, 'cos it's like you had more clever stuff to say than could be fitted into the main bit of your thesis. Yeah. So everyone should have at least three of them...

A.1. Like, duh

Padding? What do you mean?

A.2. $y = \alpha x^2$

See, maths in titles automatically goes bold where it should (and check the table of contents: it *isn't* bold there!) Check the source: nothing needs to be specified to make this work. Thanks to Donald Arsenau for the teeny hack that makes this work.

Литература

- [1] A. Einstein. Strahlungs-Emission und Absorption nach der Quantentheorie. *Deutsche Physikalische Gesellschaft*, 18, 1916.
- [2] W. Steen. 'light' industry: an introduction to laser processing and its industrial applications. In J. Lawrence, , J. Pou, , D. Low, , and E. Toyserkani, editors, *Advances in Laser Materials Processing*, Woodhead Publishing Series in Welding and Other Joining Technologies, pages 3 – 19. Woodhead Publishing, 2010.

Список иллюстраций

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