

## **MK simulation of electromagnetic calorimeter work in GEANT4**

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MK simulation of electromagnetic calorimeter by means GEANT4 is carried out for soft photon registration in pp and pA interactions. The studying of excess of such photon yield is planned to fulfill at U-70 accelerator of IHEP, Protvino, Russia.

## **Alignment Task at data processing**

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The important task of any experimental project at the reconstruction procedure is the alignment. It is necessary to provide the correcting geometry of setup for reconstruction of tracks in space and the finding of their characteristics. For these purposes the programme packet based on ideas of Millepede packet have been designed. The linear and nonlinear parameters of alignment can be found through few iteration.

## **On electromagnetic interaction of Majorana fermions**

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We evaluate the interaction of Majorana fermion (e.g. WIMP) with ordinary nucleus by electromagnetic field. It may be interesting for the search of dark matter particles.

## **Controlled collision of two pulsed laser beams in nonlinear media**

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We present the study of interplay between pulsed beams in nonlinear media. Particular attention is paid to the effect of total reflection of signal from the reference. Cascade three-wave interactions at a large phase mismatch create the cross-modulation of signal refractive index. We give the results of numerical

simulation of three-wave equations and analyze the formation of the trajectories of the pulsed beams centers in the space-time domain. The results of the collisions depend on initial conditions: pulse time delay, angle of beam intersection, the effect of synchronization in space and time, the ratio of their lengths, widths and amplitudes.

### **Ultra wide band direct chaotic transceivers for wireless body area networks**

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Contemporary idea of public health care is based on servicing people in the net of clinics and hospitals. This idea proved good in XXth century, but now it doesn't answer modern needs and is be revised. One of the most important directions of changing approach to health care is monitoring physiology, physical activity and illness by a person itself. Rapid development of electronics, personal communications, computer science, passive detectors of physiological parameters, and active means of self-treatment adds to this approach and shifts the focus of health care to the man and to monitoring his state by himself. In this context, wireless networks of sensors placed in, on and around the human body to observe its state, have great potential for future treatment technologies. BANs support a vast field of medicine and consumer electronics applications. For example, BANs allow long-time remote monitoring of patient's health without restricting his normal activities. Research in the field of BANs began in 1960s. However, only since the beginning of 2000s BANs are being implemented in medical practice with the appearance and massive use of personal communications. In the report, requirements for wireless communication devices for WBANs are discussed. Ultra wide band direct chaotic transceivers are described and prospects of their use in wireless sensor networks of the new standard IEEE 802.15.6 (WBAN) are analyzed.

### **Finite-dimensional models of diffusion chaos**

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Some parabolic systems of the reaction–diffusion type exhibit the phenomenon of diffusion chaos. Specifically, when the diffusivities decrease proportionally, while the other parameters of a system remain fixed, the system exhibits a chaotic attractor whose dimension increases indefinitely. Various finite-dimensional models of diffusion chaos are considered that represent chains of coupled