IVICFA's Fridays **COMPUTING in PHYSICS**

October 30th, 2015

From **9:15** to **13:30 h.**
Event's organizers: ***Pilar Hernandez*** *(IFIC),* ***M. Angel Aloy*** *(U. Valencia),* ***Jose Salt*** *(IFIC).*

Welcome and introduction *– at 9:15 -*

Title: **Measuring the strength of QCD interactions at all distances**. *30'+ 5'* *- at 9:30 -*
Speaker: Alberto Ramos, CERN

Quantum ChromoDynamics (QCD) is the theory that describes how quarks and gluons interact. Despite looking relatively simple, it is full of very rich phenomena: at very small distances the strong interaction becomes weak, with quarks and gluons behaving almost as free particles, but at large distances the interaction becomes strongly coupled, with quarks and gluons confined inside the protons, neutrons and many other hadrons. By using large computing resources and clever algorithms lattice field theory simulations provide not only a conceptually appealing way to understand the transition between the weakly and strongly coupled regimes of QCD, but also a powerful method able to help us determining with high precision the fundamental parameters of the Standard model.

Title: **Comparison of divergence-free techniques in relativistic magneto hydrodynamic simulations**
Speaker: Jin Matsumoto, RIKEN. *30'+ 5'* *- at 10:05 -*

Magnetohydrodynamic (MHD) simulations are powerful tools for understanding space and astrophysical phenomena. Although the divergence-free property of the magnetic field is automatically satisfied in one-dimensional simulations, it is not easy to maintain the divergence-free condition in multi-dimensional MHD simulations. Numerical divergence of the magnetic field results in unphysical results and unexpected termination of the simulation in multi-dimensions. Therefore, the treatment of the divB=0 is crucial for the result of calculations and the most important issue in computational MHD. We have recently constructed a new relativistic MHD code based on upwind constrained transport method (Londrillo& Del Zanna 2004; Minoshima et al. 2015). In this talk we will compare results of test problems calculated by our new divergence-free technique with those using other methods.

Title: **The ATLAS Distributed Computing project for LHC Run-2 and beyond** *35' + 5' - at 11:10-*
Speaker: Eric Lançon, ATLAS Computing Coordinator

The ATLAS Distributed Computing infrastructure has evolved after the first period of LHC data taking in order to cope with the challenges of the LHC Run2. An increased data rate and computing demands of the Monte-Carlo simulation, as well as new approaches to ATLAS analysis, dictated more dynamic workload management and data management systems, overcoming the boundaries imposed by the design of the Run1 computing model. The use of opportunistic resources such as HPC, cloud, and volunteer computing is embedded in the new computing model. The data access mechanisms have been enhanced; network topology and performance are now deeply integrated into the core of the operation model. Moreover, a new data management strategy, based on defined lifetime for each dataset, has been implemented to better manage the lifecycle of the data. In this presentation, the overview of the operational experience of the new system and its evolution is presented

Title: **Higgs physics on the lattice: the b quark mass** *30'+ 5'* *- at 11:50 -*

Speaker: Michele Della Morte

I will discuss the importance of theoretical determinations of the b-quark mass for Higgs physics. I will then review recent results using the lattice approach to QCD. In particular I will focus on the challenges associated to simulating heavy quarks on the lattice and describe how the use of Effective Theories such as Heavy Quark Effective Theory allows to circumvent them.

Title: **The Scheduled Relaxation Jacobi method for the numerical solution of elliptic partial differential equations,** *30'+ 5'* *- at 12:25-*

Speaker: Isabel Cordero-Carrión, (DMA), UV

Elliptic partial differential equations (ePDEs) appear in a wide variety of areas of mathematics, physics and engineering. Typically, ePDEs must be solved numerically, which sets an ever growing demand for efficient and highly parallel algorithms to tackle their computational solution. The Scheduled Relaxation Jacobi (SRJ) is a promising class of methods, atypical for combining simplicity and efficiency, that has been recently introduced for solving linear Poisson-like ePDEs. The SRJ methodology relies on computing the appropriate parameters of a multilevel approach with the goal of minimizing the number of iterations needed to cut down the residuals below specified tolerances. The efficiency in the reduction of the residual increases with the number of levels employed in the algorithm. Applying the original methodology to compute the algorithm parameters with more than 4 levels notably hinders obtaining optimal SRJ algorithms, as the mixed (non-linear) algebraic-differential equations from which they result become notably stiff. Here we present a new methodology for obtaining the parameters of SRJ schemes that overcomes the limitations of the original algorithm and provide parameters for SRJ schemes with up to 15 levels and resolutions of up to 2^{15} points per dimension, allowing for acceleration factors larger than several hundreds with respect to the Jacobi method. Furthermore, we extend the original algorithm to apply it to certain systems of non-linear ePDEs.

Title: **ATLAS Event Index Project** *20' + 5'* *- at 13:00-*

Speaker: Javier Sánchez Martínez, Tier-2 project /IFIC and ATLAS Event Index Project .

The EventIndex is the complete catalogue of all ATLAS events, keeping the references to all files that contain a given event in any processing stage. For each event it contains its identifiers, the trigger pattern and the GUIDs of the files containing it. Major use cases are event picking, feeding the Event Service used on some production sites, and technical checks of the completion and consistency of processing campaigns. This talk describes the high level system architecture, the technical design choices and the deployment process and issues.