Virtual Institute of Astroparticle physics - science and education online

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Abstract

Virtual Institute of Astroparticle Physics (VIA), integrated in the structure of Laboratory of AstroParticle physics and Cosmology (APC) is evolved in a unique multi-functional complex of $e - science$ and $e - learning$, supporting at distance interactive online participation in conferences and meetings, various forms of collaborative scientific work as well as programs of education. The activity of VIA takes place on its website and includes regular videoconferences with systematic basic courses and lectures on various issues of astroparticle physics, regular online transmission of APC Colloquia, participation at distance in various scientific meetings and conferences, library of their records and presentations, a multilingual Forum. VIA virtual rooms are open for meetings of scientific groups and for individual work of supervisors with their students. The format of a VIA videoconferences was effectively used in the program of XV Bled Workshop to provide a world-wide participation at distance in discussion of the open questions of physics beyond the standard model. The VIA system has demonstrated its high quality and stability even for minimal equipment (laptop with microphone and webcam and WiFi Internet connection) and without any technical assistance at place.

1 Introduction

Studies in astroparticle physics link astrophysics, cosmology, particle and nuclear physics and involve hundreds of scientific groups linked by regional networks (like ASPERA/ApPEC [1,2] and national centers. The exciting progress in these studies will have impact on the knowledge on the structure of microworld and Universe in their fundamental relationship and on the basic, still unknown, physical laws of Nature (see e.g. [3,4] for review).

Virtual Institute of Astroparticle Physics (VIA) [5] was organized with the aim to play the role of an unifying and coordinating structure for astroparticle physics. Starting from the January of 2008 the activity of the
Institute takes place on its website in a form of regular weekly videoconferences with VIA lectures, covering all the theoretical and experimental activities in astroparticle physics and related topics. The library of records of these lectures, talks and their presentations was accomplished by multilingual Forum. In 2008 VIA complex was effectively used for the first time for participation at distance in XI Bled Workshop. Since then VIA videoconferences became a natural part of Bled Workshops’ programs, opening the virtual room of discussions to the world-wide audience. Its progress was presented in [8, 9, 10]. Here the current state-of-art of VIA complex, integrated since the end of 2009 in the structure of APC Laboratory, is presented in order to clarify the way in which VIA discussion of open questions beyond the standard model took place in the framework of XV Bled Workshop.

2 The current structure of VIA complex

2.1 The forms of VIA activity

The structure of VIA complex is illustrated on Fig. 1. The home page, presented on this figure, contains the information on VIA activity and menu, linking to directories (along the upper line from left to right): with general information on VIA (About VIA), entrance to VIA virtual rooms (Rooms),
the library of records and presentations (Previous) of VIA Lectures (Previous → Lectures), records of online transmissions of Conferences (Previous → Conferences), APC Seminars (Previous → APC Seminars) and APC Colloquiums (Previous → APC Colloquiums) and courses, Calender of the past and future VIA events (All events) and VIA Forum (Forum). In the upper right angle there are links to Google search engine (Search in site) and to contact information (Contacts). The announcement of the next VIA lecture and VIA online transmission of APC Colloquium occupy the main part of the homepage with the record of the most recent VIA events below. In the announced time of the event (VIA lecture or transmitted APC Colloquium) it is sufficient to click on "to participate" on the announcement and to Enter as Guest (printing your name) in the corresponding Virtual room. The Calender links to the program of future VIA lectures and events. The right column on the VIA homepage lists the announcements of the regularly up-dated hot news of Astroparticle physics.

In 2010 special COSMOVIA tours were undertaken in Switzerland (Geneva), Belgium (Brussels, Liege) and Italy (Turin, Pisa, Bari, Lecce) in order to test stability of VIA online transmissions from different parts of Europe. Positive results of these tests have proved the stability of VIA system and stimulated this practice at XIII Bled Workshop. These tours involved special equipment, including, in particular, the use of the sensitive audio system KONFTEL 300W [11]. The records of the videoconferences at the XIII Bled Workshop are available on VIA site [12].

In 2011 VIA facility was used for the tasks of the Paris Center of Cosmological Physics (PCCP), chaired by G. Smoot and for the public programme "The two infinities" conveyed by J.L. Robert. It has effectively supported participation at distance at meetings of the Double Chooz collaboration: the experimentalists, being at shift, took part in the collaboration meeting in such a virtual way. The simplicity of VIA facility for ordinary users was demonstrated at XIV Bled Workshop. Videoconferences at this Workshop had no special technical support except for WiFi Internet connection and ordinary laptops with their internal video and audio equipments. This test has proved the ability to use VIA facility at any place with at least decent Internet connection. Of course the quality of records is not as good in this case as with the use of special equipment, but still it is sufficient to support fruitful scientific discussion as can be illustrated by the record of VIA presentation "New physics and its experimental probes" given by John Ellis from his office in CERN (see the records in [13]).

In 2012 VIA facility, regularly used for programs of VIA lectures and transmission of APC Colloquiums, has extended its applications to support M.Khlopov's talk at distance at Astrophysics seminar in Moscow, videoconference in PCCP, participation at distance in APC-Hamburg-Oxford
network meeting as well as to provide online transmissions from the lectures at Science Festival 2012 in University Paris7. VIA communication has effectively resolved the problem of referee’s attendance at the defence of PhD thesis by Mariana Vargas in APC. The referees made their reports and participated in discussion in the regime of VIA videoconference.

The discussion of questions that were put forward in the interactive VIA events can be continued and extended on VIA Forum. The Forum is intended to cover the topics: beyond the standard model, astroparticle physics, cosmology, gravitational wave experiments, astrophysics, neutrinos. Presently activated in English and Russian with trivial extension to other languages, the Forum represents a first step on the way to multilingual character of VIA complex and its activity.

One of the interesting forms of Forum activity is the educational work. For the last four years M.Khlopov’s course ”Introduction to cosmoparticle physics” is given in the form of VIA videoconferences and the records of these lectures and their ppt presentations are put in the corresponding directory of the Forum [13]. Having attended the VIA course of lectures in order to be admitted to exam students should put on Forum a post with their small thesis. Professor’s comments and proposed corrections are put in a Post reply so that students should continuously present on Forum improved versions of work until it is accepted as satisfactory. Then they are admitted to pass their exam. The record of videoconference with their oral exam is also put in the corresponding directory of Forum. Such procedure provides completely transparent way of estimation of students’ knowledge.

2.2 VIA lectures, online transmissions and virtual meetings

First tests of VIA system, described in [5, 7, 8, 9], involved various systems of videoconferencing. They included skype, VRVS, EVO, WEBEX, mar-ratech and adobe Connect. In the result of these tests the adobe Connect system was chosen and properly acquired. Its advantages are: relatively easy use for participants, a possibility to make presentation in a video contact between presenter and audience, a possibility to make high quality records and edit them, removing from records occasional and rather rare disturbances of sound or connection, to use a whiteboard facility for discussions, the option to open desktop and to work online with texts in any format. The regular form of VIA meetings assumes that their time and Virtual room are announced in advance. Since the access to the Virtual room is strictly controlled by administration, the invited participants should enter the Room as Guests, typing their names, and their entrance and successive ability to use video and audio system is authorized by the Host of the meeting. The format of VIA lectures and discussions is shown on Fig.
Figure 2: Videoconference with discussion of the sensational news about superluminal neutrinos "OPERA versus Maxwell and Einstein" by John Ellis, has gathered the excessive number of participants.

illustrating the talk "OPERA versus Maxwell and Einstein" given by John Ellis from CERN. The complete record of this talk and is available on VIA website [15]. The sensational character of the exciting news on superluminal propagation of neutrinos acquired the number of participants, exceeding the allowed upper limit. For the first time the problem of necessity in extension of this limit was put forward and it was resolved by creation of a virtual "infinity room", which can host any reasonable amount of participants.

The ppt or pdf file of presentation is uploaded in the system in advance and then demonstrated in the central window. Video images of presenter and participants appear in the right window, while in the upper left window the list of all the attendees is given. To protect the quality of sound and record, the participants are required to switch out their microphones during presentation and to use lower left Chat window for immediate comments and urgent questions. The Chat window can be also used by participants, having no microphone, for questions and comments during Discussion. The interactive form of VIA lectures provides oral discussion, comments and questions during the lecture. Participant should use in this case a "raise hand" option, so that presenter gets signal to switch out his microphone and let the participant to speak. In the end of presentation the central window can be used for a whiteboard utility as well as the whole structure of windows can be changed, e.g. by making full screen the window with
the images of participants of discussion.

Regular activity of VIA as a part of APC includes online transmissions of all the APC Colloquia and of some topical APC Seminars, which may be of interest for a wide audience. Online transmissions are arranged in the manner, most convenient for presenters, prepared to give their talk in the conference room in a normal way, projecting slides from their laptop on the screen. Having uploaded in advance these slides in the VIA system, VIA operator, sitting in the conference room, changes them following presenter, directing simultaneously webcam on the presenter and the audience.

3 VIA Sessions at XV Bled Workshop

VIA sessions of XV Bled Workshop have developed from the first experience at XI Bled Workshop [7] and their more regular practice at XII, XIII and XIV Bled Workshops [8, 9, 10]. They became a regular part of the Bled Workshop’s programme.

In the course of XV Bled Workshop meeting the list of open questions was stipulated, which was proposed for wide discussion with the use of VIA facility. The list of these questions was put on VIA Forum (see [16]) and all the participants of VIA sessions were invited to address them during VIA discussions. During the XV Bled Workshop the test of not only minimal necessary equipment, but either of the use of VIA facility by ordinary users was undertaken. VIA Sessions were supported by personal laptop with WiFi Internet connection only, as well as for the first time the members of VIA team were physically absent in Bled and all the videoconferences were directed by M.Khlopov at distance from Paris. It proved the possibility to provide effective interactive online VIA videoconferences even in the absence of any special equipment and qualified personnel at place. Only laptop with microphone and webcam together with WiFi Internet connection was shown to be sufficient not only for attendance, but also for VIA presentations and discussions.

In the framework of the program of XV Bled Workshop, P. Belli, staying in his office in Rome, gave his talk "DAMA/LIBRA results and perspectives" (Fig. 3) and took part in the discussion of puzzles of dark matter searches, which provided a brilliant demonstration of the interactivity of VIA in the way most natural for the non-formal atmosphere of Bled Workshops (see [17]). In the course of this discussion N.S. Mankoč Borštnik and G. Bregar, being in Bled, have considered possible dark matter candidates that follow from the approach, unifying spins and charges, and Maxim Khlopov presented from Paris the state-of-art of composite dark matter scenario, stipulating the open problems of this solution for the puzzles of
direct dark matter searches. VIA sessions were finished by the VIA talk "The ATLAS experiment at the LHC: present status and its future" by A.S Romanionouk and discussion of problems of experimental search for new physics at accelerators.

VIA sessions provided participation at distance in Bled discussions for M.Khlopov (APC, Paris, France), P. Belli (Rome Tor Vergata, Italy), E. Soldatov (CERN, Switzerland), K.Belotsky, N.Chasnikov and A.Mayorov (MEPhI, Moscow), J.-R. Cudell and Q.Wallemacq (Liege, Belgium), R.Weiner (Marburg, Germany) and many others.

4 Conclusions

Current VIA activity is integrated in the structure of APC laboratory and includes regular weekly videoconferences with VIA lectures, online transmissions of APC Colloquiums and Seminars, a solid library of their records and presentations, together with the work of multi-lingual VIA Internet forum.

The Scientific-Educational complex of Virtual Institute of Astroparticle physics can provide regular communications between different groups and scientists, working in different scientific fields and parts of the world, get the first-hand information on the newest scientific results, as well as to support various educational programs at distance. This activity would easily allow finding mutual interest and organizing task forces for different scientific topics of astroparticle physics and related topics. It can help in the elaboration of strategy of experimental particle, nuclear, astrophysical and cosmological studies as well as in proper analysis of experimental data.
It can provide young talented people from all over the world to get the highest level education, come in direct interactive contact with the world known scientists and to find their place in the fundamental research. VIA applications can go far beyond the particular tasks of astroparticle physics and give rise to an interactive system of mass media communications.

VIA sessions became a natural part of a program of Bled Workshops, opening the room of discussions of physics beyond the Standard Model for distant participants from all the world. The experience of VIA applications at Bled Workshops plays important role in the development of VIA facility as an effective tool of science and education online.

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