

VERTEX2022 organized

The 31st Vertex2022 (International Workshop on Vertex Detectors) was held at Chiba Tateyama Resort Hotel from October 24th to 28th, 2022. This series of workshops has been organized annually since the 1st meeting in Sweden. The last two meetings Vertex2020 and 2021 were, however, operated in virtual, so Vertex2022 was the first in-person meeting after two years. Japan hosted Vertex first time in 2005 at Nikko Chuzenji-lake and this was second time, hosted by Vertex2022 Local Organizing Committee (chair, K. Hara – U. Tsukuba) members composed by researchers from University of Tsukuba, KEK and University of Tokyo. Co-sponsor is Tomonaga Center for the History of the Universe, U. Tsukuba and supported by TIA (Tsukuba Innovation Arena) and four companies and LGAD KAKENHI.



Tateyama Resort Hotel (courtesy: Tateyama Resort Hotel)



Ms. Kita (U. Tsukuba) and Dr. Tsuboyama (KEK) at the Registration Desk (courtesy : Vertex2022 LOC)

“VERTEX” refers to the particle’s decay point. In high-energy physics experiments, high-energy particles are collided and we observe the emerging particles from the collision to study the properties of the elementary particles in detail or to discover un-known particle. Such a process includes, for example, Higgs particle decaying into two Z particles, with each Z decaying into a pair of electrons or of muons. This process happens in a distance within a nucleon size. Other particles, however, may survive for a distance of mm and decay finally into light particles. Determination of such vertex points at an overwhelming precession is a key in understanding which kind of process is involved in the process. Vertex workshop provides precious opportunity to exchange information on the status of development and operation of such detectors that enable precision determination of vertex points.

At Vertex2022, in total of 67 participated from the groups such as the four large experiments (ATLAS, CMS, LHCb and ALICE) at CERN LHC and Belle II experiment at KEK SuperKEKB, and discussed the status of running detectors

and of detector upgrade for future higher precision experiments. The sessions dedicated for development of leading-edge detectors were programmed for monolithic sensors combining the sensor and readout electronics in the same semiconductor chip, and timing detectors that enable high precision determination of the space and time on the same chip. The updated developments status and new ideas were presented. New radiation-hard detector materials and the detector systems for future collider experiments were also presented.

The Vertex meetings used to be programmed only with 30-min invited talks. Poster presentations were added since Vertex2016 and after two-years of virtual meetings, Vertex2022 added short presentations (15 min) in place of posters presumably for young researchers. The presentations at Vertex2022 counted 36 invited and 17 short talks. The leaders of some of detector development groups also participated and together with experienced researchers exchanged opinions with young researchers to the details of the presentations, which would not be probable in large symposium-style meetings.



Snapshot of the workshop (courtesy : Vertex2022LOC)

From Tomonaga Center of University of Tsukuba, Dr. Hirose, a member researcher of Photon and Particle Detector Division, presented Quality assurance result of the ATLAS ITk strip sensors, and Ms. Kita, a member of Experimental Particle Group, talked on Electrode size minimization of AC-LGAD sensors for realizing 4-D detector. Hara, the PPD Division leader and Dr. Nakamura of KEK, a collaborated member of the Division, organized and operated the meeting as LOC members.

The Vertex meetings have been situated by water (sea or lake) and isolated, since the 1st meeting in Basto Island, to concentrate on the meeting. Therefore, Vertex2022 was in a hotel located in very south of the Boso peninsular where the transportation to/from the city area is not convenient.



Snapshot of the workshop (courtesy : Vertex2022LOC)

In international meetings such as Vertex workshops where many foreigners get together, excursion is regarded as an important occasion to let the participants be in touch with the local culture.



Sutra experience at Tanjo-ji Temple. courtesy : Vertex2022LOC)



Killer Whale show at Kamogawa Sea World (courtesy : Vertex2022LOC)

In Vertex2022, an excursion to Kamogawa city, 1+ hr away by bus, was set. Sutra copying experience at Tanjyo-ji Temple – Nichiren was born 800 years ago in a village nearby— and Kamogawa Sea World Shows by Killer Whales, Dolphins, Seals and Beluga entertained a lot the participants.

The Vertex2022 workshop was concluded by the summary talk provided by Hara, the chair of LOC, the talk extended the allocated one hour. In the closing remark, Dr. Nakamura announced that the Italian Genova group will host Vertex2023. He is going to take over the place of Hara as an International Advisory Committee member from Vertex2023.



Hara started the summary talk with explanation of the posters and Web banners for Vertex2020 turned to be virtual and Vertex2022. (courtesy: Vertex2022 LOC)

In the beginning of the workshop preparation, there was little prospect for in-person meeting as Vertex needs to invite many foreigners – Vertex2022 counted 56 foreigners out of 67 participants. July 1st is the day when we decided in-person Vertex2022 at Tateyama Resort Hotel evaluating the restrictions such as visa

requirement and maximum number of inbounds per day. These restrictions were set void on October 11st, just two weeks before the workshop after all foreigners had obtained visa. Eating meals together, chatting face-to-face, ... are possible on in-person meeting and very important to know each other. During the workshop presentation, one of the leaders complained about other's data as no information had been provided to him. Then the person answered, "We haven't talked three years". This was an exact moment when we felt in-person Vertex2022 was successful.

University of Tsukuba,

Kazuhiko Hara, October 11, 2022