# HSTD12 - Development and Application of Semiconductor Tracking Detectors

Proceedings of the 12th International “Hiroshima” Symposium on the Development and Application of Semiconductor Tracking Detectors (HSTD12)
15 - 18 December 2019
International Conference Center Hiroshima, Hiroshima, Japan



Guest editors
Yoshinobu Unno (managing guest editor)
*KEK, Tsukuba, Japan*
Yasushi Fukazawa
*Hiroshima University, Higashi-Hiroshima, Japan*
Suen Hou
*Academia Sinica, Taipei, Taiwan*
Luise Poley
*Simon Fraser University/TRIUMF, Vancouver, Canada*
Hartmut F.-W. Sadrozinski
*University of California, Santa Cruz, CA, USA*
Hongbo Zhu
*IHEP, Chinese Academy of Sciences, Beijing, China*

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## Section VIII. Applications in astrophysics, biology, medicine, etc.



## Section IX. New ideas and future applications

# Editorial

The $12^{th}$ International "Hiroshima" Symposium on the Development and Application of Semiconductor Tracking Detectors (HSTD12) was held on December 15 - 18, 2019, at the International Conference Center Hiroshima, Hiroshima, Japan. The symposium's primary goal is to bring together experts in the design, processing, and applications to discuss experiences, lessons learned, and new ideas in early development stages. The series of "Hiroshima" symposia has been held traditionally in the Pacific Rim region since the first symposium in Hiroshima in 1993. The symposia proceedings have been published in Nuclear Instruments and Methods [1, 2, 4, 5, 6, 7, 8, 9, 10, 11].

To the $12^{th}$ symposium, a total number of 163 participants were registered with 143 contributions, among which 55 were assigned to oral presentations and 88 to posters. The topics of the contributions covered the field of semiconductor detectors and related areas, from technologies and simulations (10 and 2 contributions, respectively), pixel sensors for tracking and imaging (24 and 14), strip sensors (10), radiation damage and radiation tolerant materials (20 total), ASICs (20), large scale application in particle physics experiments (14), applications in astrophysics, biology, medicine, etc. (12 total), and new ideas and future applications (14 total). Following the tradition, oral sessions were held as plenaries only, while posters sessions were scheduled throughout the entire symposium for presentation and discussion, with coffee, tea, and cookies, during the coffee/tea/lunch breaks.

In past symposia, we witnessed the development of silicon-based tracking devices, shown in Fig. 1. The first generation of this evolution were strip sensors, followed by pixel sensors as the second generation. In this symposium, we have seen the birth of silicon-based fast timing detectors in large-scale applications for the ATLAS and CMS experiments that will be operational in the mid-2020's.

The social programme of the symposium included:

- A welcome reception in the Conference Center in the evening of Saturday, December $14^{th}$.
- An excursion to Miyajima island to visit the world-heritage Itsukushima shrine and the sacred mountain "Misen" during a half-day break in the afternoon of Monday, December $16^{th}$.
- The symposium dinner in the evening of December $17^{th}$ at Hiroshima-city Bunka Koryu Kaikan.

During the dinner, the participants enjoyed the "Kagura" (dance in dedication to the gods) performance by the dancing team "Saniwa Kagura-Dan", provided by the Hiroshima Convention & Visitors Bureau. The group performed "Yamata no Orochi" - the story of a god who saved the life of an old couple's daughter who was offered in sacrifice to a giant, eight-headed snake, embodied by three snakes in the dance. The god charmed the serpent to sleep with "sake" and then defeated it.

The symposium was supported by the Hiroshima Convention & Visitors Bureau, through Ms. A. Sawada of the MICE promotion department, which partially covered the fee for the Conference Center, organized a welcome message from the mayor of Hiroshima City, and the entertainment at the symposium dinner. The symposium was made possible by the excellent contributions of the local organizers, Profs. H. Takahashi and T. Mizuno of Hiroshima University, who not only managed and executed the symposium but also complemented a guest editor, Y. Fukazawa.

Among the 143 contributions, 109 papers were included for publication in these proceedings. Like previous issues, the papers were peer-reviewed with the help of many anonymous reviewers in the field and a special guest editor, D. Bortoletto, in case of a conflict of interest of the managing guest editor, to whom the organizers wish to extend their appreciation. We also appreciate the support of the publisher's editorial team: V. Letizia, L. Li, S. Vikram, and others.

The next Symposium will be held in Vancouver, Canada, in 2022[1].

Guest Editors

[1] Due to the pandemic of the new corona virus COVID-19, the $13^{th}$ symposium is postponed by one year, from 2021 to 2022.

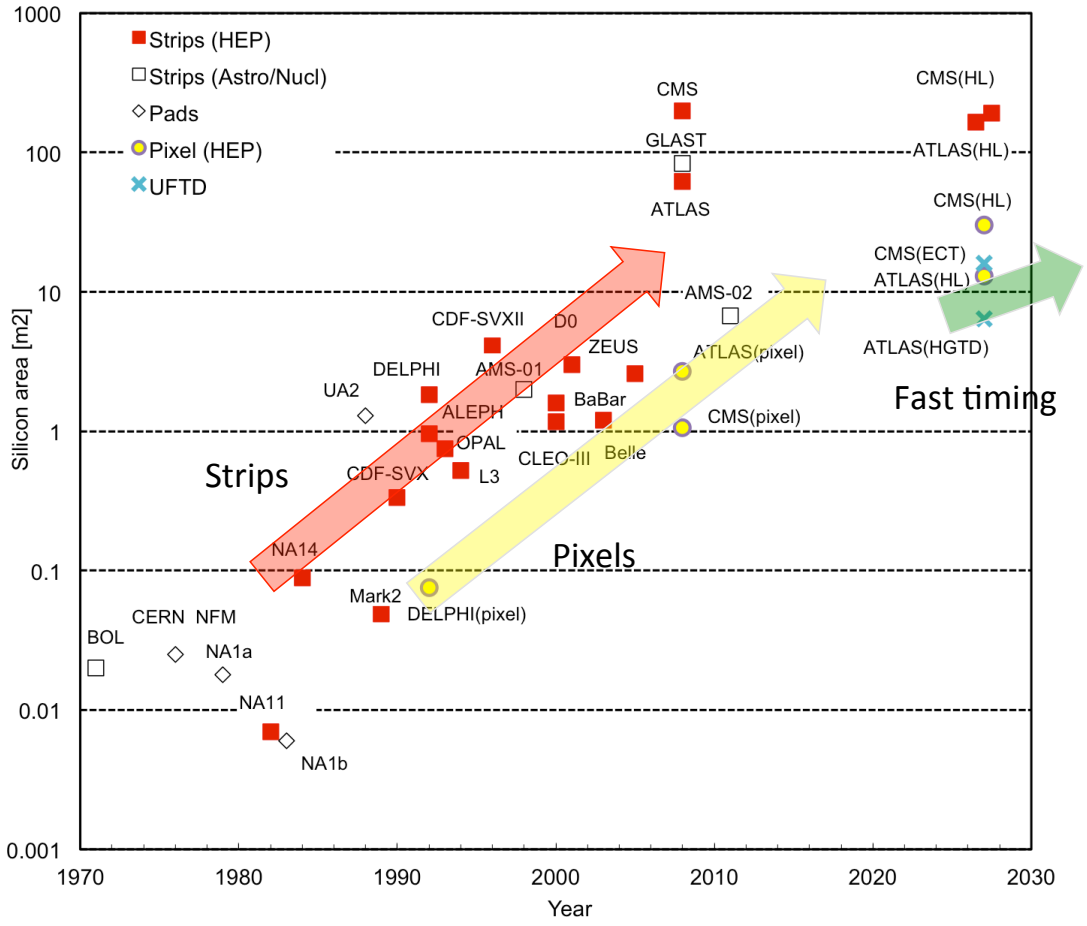


Fig. 1: Evolution of the area of silicon-based detectors. The first wave were strip sensors, followed by a second wave of pixel sensors. A new generation of fast timing detectors with large-scale applications is being developed.

## References


[1] 1993 Hiroshima (Nucl. Instr. Meth. A342, 1-308, 1994)
[2] 1995 Hiroshima (Nucl. Instr. Meth. A383, 1-266, 1996)
[3] 1997 Melbourne (not published)
[4] 2000 Hiroshima (Nucl. Instr. Meth. A466, 243-428, 2003)
[5] 2004 Hiroshima (Nucl. Instr. Meth. A541, 1-466, 2005)
[6] 2006 Carmel (Nucl. Instr. Meth. A579, 557-914, 2007)
[7] 2009 Hiroshima (Nucl. Instr. Meth. A636 Supplement 1, S1-S256, 2011)
[8] 2011 Taipei (Nucl. Instr. Meth. A699, 1-250, 2013)
[9] 2013 Hiroshima (Nucl. Instr. Meth. A765, 1-296, 2014)
[10] 2015 Xi'an (Nucl. Instr. Meth. A831, 1-448, 2016).
[11] 2017 Okinawa (Nucl. Instr. Meth. A924, 1-484, 2019)

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H. Takahashi, Hiroshima University
Y. Unno, KEK

## Venue

International Conference Center Hiroshima
1-5 Nakajima-cho, Naka-ku, Hiroshima-shi, Hiroshima-ken 730-0811, Japan
http://www.pcf.city.hiroshima.jp/icch/english.html

## Contact and Web page

E-mail: hstd@ml.post.kek.jp
https://indico.cern.ch/event/803258/

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Silicon-On-Insulator Pixel Detector Project (SOIPIX), KEK

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Crystals and Applications (C&A) Corporation, 6-6-40 Aramaki-Aza-Aoba, Aoba-ku, 980-8579 Sendai-shi, Japan
HAMAMATSU PHOTONICS, K.K., 1126-1 Ichino-cho, Higashi-ku, 435-8558 Hamamatsu-shi, Japan
HAYASHI-REPIC K.K., 1-28-3 Kita-Otsuka, Toshima-ku, 170-0004 Tokyo, Japan

# List of Participants

| First name Last name | Affiliation |
|---|---|
| Pengcheng Ai | Central China Normal University |
| Kazuyoshi Carvalho Akiba | nikhef |
| Philip Patrick Allport | University of Birmingham (UK) |
| Yasuo Arai | KEK |
| Roberta Arcidiacono | Università del Piemonte Orientale e INFN Torino (IT) |
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| Takeharu Etoh | Ritsumeikan University |
| Vitaliy Fadeyev | University of California, Santa Cruz (US) |
| Yunyun Fan | Chinese Academy of Sciences (CN) |
| Javier Fernandez-Tejero | CNM-Barcelona (ES) |
| Leyre Flores Sanz De Acedo | University of Glasgow (GB) |
| Sam Flynn | University of Birmingham |
| Giulio Tiziano Forcolin | Università degli Studi di Trento e INFN (IT) |
| Yasushi Fukazawa | Hiroshima University |
| Alessandro Gabrielli | Università e INFN, Bologna (IT) |
| Akiko Gädda | Helsiki Institute of Physics |
| K.K. Gan | The Ohio State University (US) |
| Chaosong Gao | Central China Normal University |
| Vjaceslav Georgiev | University of West Bohemia |
| Datao Gong | Southern Methodist University (US) |
| Di Guo | Central China Normal University |
| Kouichi Hagino | Tokyo University of Science |
| Geoff Hall | Imperial College (GB) |
| Yubo Han | Chinese Academy of Sciences (CN) |
| Kazuhiko Hara | University of Tsukuba (JP) |
| Kiyoshi Hayashida | Osaka University |
| Timon Heim | Lawrence Berkeley National Lab. (US) |
| Ryan Heller | Fermi National Accelerator Lab. (US) |
| Viktoria Hinger | HEPHY Vienna (AT) |
| Naoyoshi Hirade | Hiroshima University |
| Michael Holik | FEE - UWB in Pilsen (CZ); IEAP - CTU in Prague(CZ) |
| Suen Hou | Academia Sinica (TW) |

| | |
|---|---|
| Fabian Huegging | University of Bonn (DE) |
| Christian Irmler | HEPHY Vienna |
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| Jia-Hao Li | National Taiwan University |
| Zhijun Liang | Institute of High energy physics, Chinese Academy of Sciences |
| Chao Liu | Northwestern Polytechnical University |
| Manwen Liu | Ludong University |
| Peilian Liu | Chinese Academy of Sciences (CN) |
| Yanwen Liu | University of Science and Technology of China (CN) |
| Abdenour Lounis | Laboratoire de l'Accélérateur Linéaire |
| Yunpeng Lu | Institute of High Energy Physics |
| Maria Manna | Centro National de Microelectronica - CNM-IMB-CSIC |
| Valentina Mariani | Universita e INFN, Perugia (IT) |
| John Matheson | STFC Rutherford Appleton Laboratory |
| Lukas Meduna | Czech Technical University (CZ) |
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| Shunsaku Nagasawa | Kavli IPMU |
| Koji Nakamura | High Energy Accelerator Research Organization (JP) |
| Ryutaro Nishimura | High Energy Accelerator Research Organization (KEK) |
| Daiki Nobashi | Nagoya University Graduate School of Science |
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| Qun Ouyang | Institute of High Energy Physics |
| Hwanbae Park | Kyungpook National University |
| Giovanni Paternoster | Fondazione Bruno Kessler |
| Peter Paulitsch | HEPHY Vienna |

| | |
|---|---|
| Giulio Pellegrini | Centro Nacional de Microelectrónica (IMB-CNM-CSIC) (ES) |
| Heinz Pernegger | CERN |
| Vasilije Perovic | ETH Zurich (CH) |
| Luise Poley | Lawrence Berkeley National Lab. (US) |
| Chaoyue Qu | Institute of High Energy Physics |
| Petra Riedler | CERN |
| Suvankar Roy Chowdhury | INFN Sezione di Pisa, Università e Scuola Normale Superiore di Pisa |
| Frederik Ruehr | Albert Ludwigs Universitaet Freiburg (DE) |
| Hartmut Sadrozinski | UC Santa Cruz |
| Sai Neha Santpur | Lawrence Berkeley National Lab. (US) |
| Toshihiko Sasaki | Kanazawa University |
| Katsuya Sato | University of Tsukuba (JP) |
| Shogo Sato | Waseda university |
| Yutaro Sato | High Energy Accelerator Research Organization |
| Rudolf Schimassek | Karlsruhe Institute of Technology (KIT) |
| Changwoo Seo | Yonsei University |
| Fan Shen | Central China Normal University |
| Xin Shi | Chinese Academy of Sciences (CN) |
| Kenta Shigaki | Hiroshima University (JP) |
| Roland Sorge | IHP GmbH |
| Viros Sriskaran | EPFL - Ecole Polytechnique Federale Lausanne (CH) |
| Asutosh Srivastava | Jawaharlal Nehru University |
| Georg Steinbrueck | Hamburg University (DE) |
| Hiromasa Suzuki | The University of Tokyo |
| Hiromitsu Takahashi | Hiroshima University |
| Ayaki Takeda | University of Miyazaki |
| Hikaru Tanigawa | Univ. of Tokyo |
| Stefano Terzo | IFAE |
| Kazuki Todome | Università e INFN, Bologna (IT) |
| Hidenori Toyokawa | Japan Synchrotron Radiation Research Institute |
| Toru Tsuboyama | High Energy Accelerator Research Organization, KEK, Japan |
| Takeshi Tsuru | Kyoto University |
| Hiroyuki Uchida | Kyoto University |
| Kirika Uchida | Imperial College (GB) |
| Miguel Ullan Comes | CNM-Barcelona (ES) |
| Yoshinobu Unno | KEK, High Energy Accelerator Research Organization (JP) |
| Ondřej Urban | FEL - UWB in Pilsen |
| Hui Wang | Central China Normal University |
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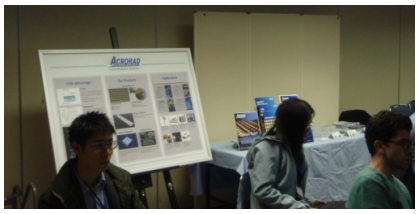
| Kewei Wu | Chinese Academy of Sciences (CN) |
| Zhigang Wu | Institute of high energy physics |
| Le Xiao | Central China Normal University |
| Yuanyuan Xue | Northwest Institute of Nuclear Technology |
| Kazutaka Yamaoka | Nagoya University |
| Xiao Yang | University of Science and Technology of China (CN) |
| Yuzhen Yang | Institute of High Energy Physics, Chinese Academy of Sciences (CN) |

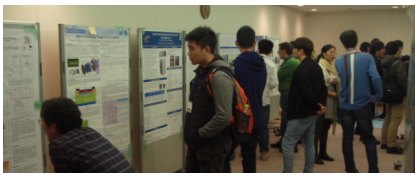
| | |
|---|---|
| Hua Ye | DESY |
| Masao Yoshino | Tohoku University |
| Bihui You | Central China Normal University |
| Chengjun Yu | Institute of High energy physics , Chinese Academy of Sciences |
| Iveta Zatocilova | Czech Academy of Sciences (CZ) |
| Hui Zhang | Karlsruher Institut für Technologie |
| Ying Zhang | Institute of High energy physics, Chinese Academy of Sciences (CN) |
| Yuezhao Zhang | Institute of Modern Physics, Chinese Academy of Sciences |
| Cong Zhao | Central China Normal University |
| Yang Zhou | Institute of High Energy Physics, CAS, Beijing, China |
| Hongbo Zhu | Institute of High Energy Physics |

# Symposium Photos

on the steps of “the Conference Center relief”


Plenary session



Poster sessions during the symposium

Poster sessions during the symposium

Peace Memorial Park at sunrise, Conference Center on the left

Welcome Reception the night before the Symposium

Excursion to Miyajima Island: ferry, shrine, and town

View from ”Lion’s nose” of mount “Misen”with Hiroshima city in the background

Symposium dinner at Hiroshima City Bunka Kouryu Kaikan

Participants enjyoing the feast

The “Kagura” dance in dedication to the gods performed by “Yamata no Orochi”

Symposium dinner opening and closing by the founders of the symposium