

**In Memoriam:
Dr. Gerardo Dutto**

By Tianjue Zhang, Beijing, 9 December 2022

At the age of 81 Gerardo Dutto, the former Head of the TRIUMF Cyclotron Division, passed away in Nanaimo, Canada on February 13, 2020. Over the years Gerardo made many contributions to the development of cyclotron technology at TRIUMF and around the world, and also to the good relations and collaborations between TRIUMF and other Institutes including China Institute of Atomic Energy (CIAE) all over the world.

Gerardo Dutto was born on August 8, 1938 in Berlin, Germany. He received his doctorate in physics in 1971 from the University of Rome La Sapienza. Soon after Gerardo arrived at TRIUMF, he first worked on the Centre Region Cyclotron, a 3 MeV full-sized prototype of the main cyclotron center region. His beam dynamics support and other innovations improved the cyclotron's beam-current performance by a factor of three over the original 100 μA design specification. After that, Gerardo became part of the 500 MeV cyclotron commissioning team. Over the next few years, he headed the task force which worked on increasing the cyclotron beam current to its design level of 100 microamps, where he initiated many upgrades required to obtain the requisite licensing. These upgrades improve reproducibility and eliminate problems found with beam intensity limitations in the Centre Region.

Gerardo became the TRIUMF Cyclotron Division Head in 1981, a position he maintained until his retirement in 2003. Under his leadership, the cyclotron team demonstrated that 420 μA was possible, quadruple the initial 100 μA design goal. Perhaps even more impressive was Gerardo's commitment to cyclotron reliability. Now 46 years after first acceleration, the cyclotron has consistently achieved >90% availability, in large part due to the culture and expertise that Gerardo cultivated. During his final years at TRIUMF, Gerardo was involved in beam intensity stability developments for the multiple extracted beams, which was particularly important for ISAC to maximize production since the targets were being run near their limits.

Gerardo was a 'people' person with an amazing ability to bring people together. This ability extended far beyond the TRIUMF offices and included many memorable social gatherings. His global reach extended beyond well-known major labs in the USA and Europe to China. He developed meaningful and productive bridges with China during last 30 years.

Around 2000, CIAE started to design a 100 MeV compact cyclotron CYCIAE-100. This is the first time we have developed such a high intensity compact cyclotron with energy up to 100 MeV. Since then, Dr. Gerardo Dutto had visited CIAE in person year by year to introduce his experience

to CIAE's cyclotron team and supervised our young researchers for the cyclotron development. And according to the needs of the design and construction, he also timely recommended and helped to invite the cyclotron experts from TRIUMF, PSI, INFN and GANIL etc. to visit Beijing and have cooperative research. More importantly, he helped us to organize two technical meetings of cyclotron experts in Tokyo in 2004 and Sicily in 2007 to discuss problems in the design and construction of CYCIAE-100. Our cyclotron successfully extracted the first proton beam in 2014 and achieved 520 μA on the beam dump in 2018, which is inseparable from his original help.

He also comprehensively promoted the technical collaboration between TRIUMF and CIAE for more than 15 years. The collaboration for the past years has proved to be very productive in many aspects, especially in the field of Accelerator Science and Technology. The mutual exchange of personnel within the framework of the collaboration has taken place. According to available statistics, the visitors including: Gerardo Dutto, Igor Sekachev, Ken Fong, George Mackenzie, Mike Craddock, Qiwen Zheng, Shuyao Fang, Tom Kuo, Dick Yuan, Paul Schmor, Alan Shotter, Bruce Milton, Yi-Nong Rao, Yuri Bylinski, Robert Laxdal, Michael Laverty, Richard Baartman, Nigel Lockyer, Jonathan Bagger, etc. from TRIUMF and, Tianjue Zhang, Chengjie Chu, Hongjuan Yao, Yinlong Lv, Bin Ji, Sumin Wei, Zhenguo Li, Jiansheng Xing, Gaofeng Pan, Fang Yan, Zhiguo Yin, Xianlu Jia, Yanyun Ma, Xiaoliang Fu, Baoqun Cui, Weiping Liu, etc. from CIAE.

Dr. Gerardo Dutto was awarded "Friendship Award" in 2015, which is the upmost prize set by Chinese government for foreign experts who has made great contribution during Chinese cause of modernization and reform and opening up. This is the most top Chinese national-level prize for foreign experts for their contributions of the country. The premier and vice premier of the State Council presented at this awarding ceremony and exchanged ideas with the awarded scientists, every year. However, Dr. Dutto was absent at this awarding ceremony at the Great Hall of the People in October 2015 for his health reason.

Consul General of P. R. China in Vancouver Madame Liu Fei awarded the prize on behalf of Chinese government to Dr. Dutto and his family in the Coast Bastion Hotel in Nanaimo, on April 20, 2016. I, on behalf of CIAE and Prof. Bagger, on behalf of TRIUMF attended the event and share a pleasant reward for our continuing cooperation in the past years.

Here that: feel good when somebody miss you, feel better when somebody loves you, but feel best when somebody never forgets you. We mourn and miss Dr. Dutto. He may be out of our sight, but not out of our mind; He may be out of our reach, but not out of our heart. At this moment, and forever, let's remember Dr. Gerardo Dutto's contribution to the cyclotron Community.