



Main considerations for vacuum system design of particle accelerators

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Charge particle accelerators are very complicated facility that includes results of hundreds or even thousands of scientists, engineers, PhD students and technicians in various fields. Designing a vacuum system for such facility is a challenging task which requires investigated and considering an impact of all other accelerator systems on vacuum design and vice versa. This work requires to have theoretical knowledge and practical experience in vacuum science and technology, thermodynamics, surface science and gas dynamics, as well as have some basic knowledge in particle accelerators.

A vacuum chamber is often considered as 'just an envelope' for collisionless travel of charged particles, and vacuum chamber components should (ideally) take only a little space but provide the highest specifications. Vacuum system design cycles include:

- 1) an analysis of experimental data that should be used as inputs to analytical models;
- 2) an understanding of what physical and chemical processes are happening in the vacuum chamber with and without a beam;
- 3) choosing and applying a gas dynamics model;
- 4) interpreting and implementing the results into a vacuum system design;
- 5) participating in a mechanical and electrical design of vacuum system.

These design cycles and key components at each stage will be discussed in the talk.