6 Components of the SEE-LS

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The different components needed for building a light source are shown in Fig. 6.1. The colour of each box represents the division responsible for the component: green for the Accelerator Division, blue for the Engineering Division, and pink for the Computer Division.

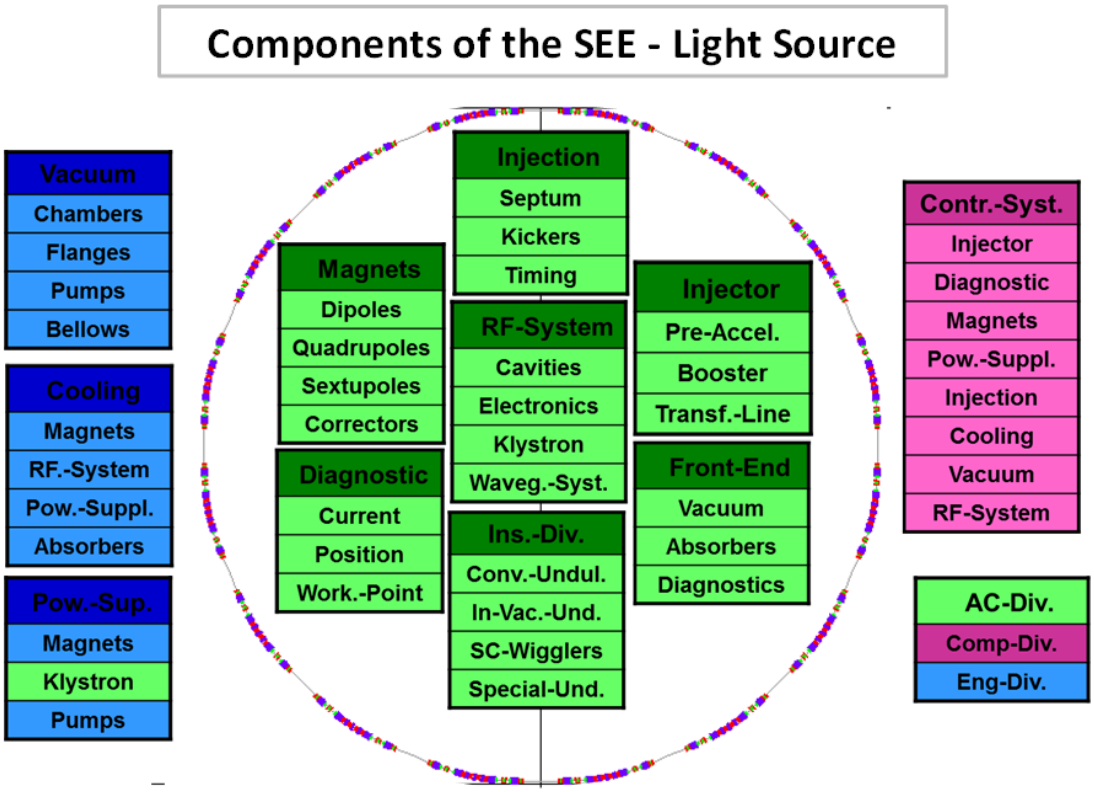

Fig. 6.1: Overview of the different components needed for an accelerator (synchrotron light source)

The magnets include the dipoles, quadrupoles, sextupoles, and correctors needed for the storage ring and booster synchrotron. No sextupoles are needed for the transfer lines. The dipoles perform the deflection and focusing, while the quadrupoles perform the focusing and defocusing; the sextupoles compensate partly for the energy dependency of the focusing of the quadrupoles, and the correctors compensate for some deflection errors due to the dipoles and quadrupoles. The details of the design of the magnets are described in chapter 7. The magnets have to be fixed on a rigid and very stable girder system, which is described in chapter 8.

The power supplies are needed to power the different magnets with high accuracy, the amplifier of the RF system, and the vacuum pumps. The power supplies for the magnets are described in detail in chapter 11.

The injection elements consist of the kicker, septum, and timing system. The kickers are fast magnets with a low magnetic field for kicking the beam out of or into the accelerator. The septa are the first or last elements of the transfer line that move the beam out of or into the transfer line. Sometimes the septum is also a fast magnet, but it is generally much slower than the kickers. The kicker and septa need a very accurate timing system to power the magnets at the right time with an accuracy of the order of nanoseconds.

The RF system has to compensate, by the electrical field in the cavities, the losses from emitting the synchrotron radiation. It consists of amplifiers (klystrons, inductive output tube, and solid-state

https://doi.org/10.23731/CYRM-2020-001.59

amplifier), which connect via the waveguide system to the cavities. The low-level electronics are needed to control the whole RF system, which is described in more detail in chapter 10.

To make various measurements of the stored beam (current, position, tunes, chromaticity, emittance, etc.) in the transfer lines, booster synchrotron, storage ring, and front end, a diagnostic system is required. To measure each characteristic of the beam a special device is needed. The diagnostic system for a synchrotron light source is described in detail in chapter 12.

The vacuum system, comprising the chambers, pumps, bellows, flanges, etc., has to deliver an ultra-high vacuum in all the chambers of the accelerator chain in order to achieve a long lifetime in the storage ring and minimize the electron losses for a low dose rate. To avoid instabilities, the chamber in the storage ring must have a small impedance. The vacuum system is described in more detail in chapter 9.

The heart of the accelerator is the control system; it is connected more or less to every component of the accelerator complex for the controls, settings, measurements, etc. The control system is described in more detail in chapter 15.