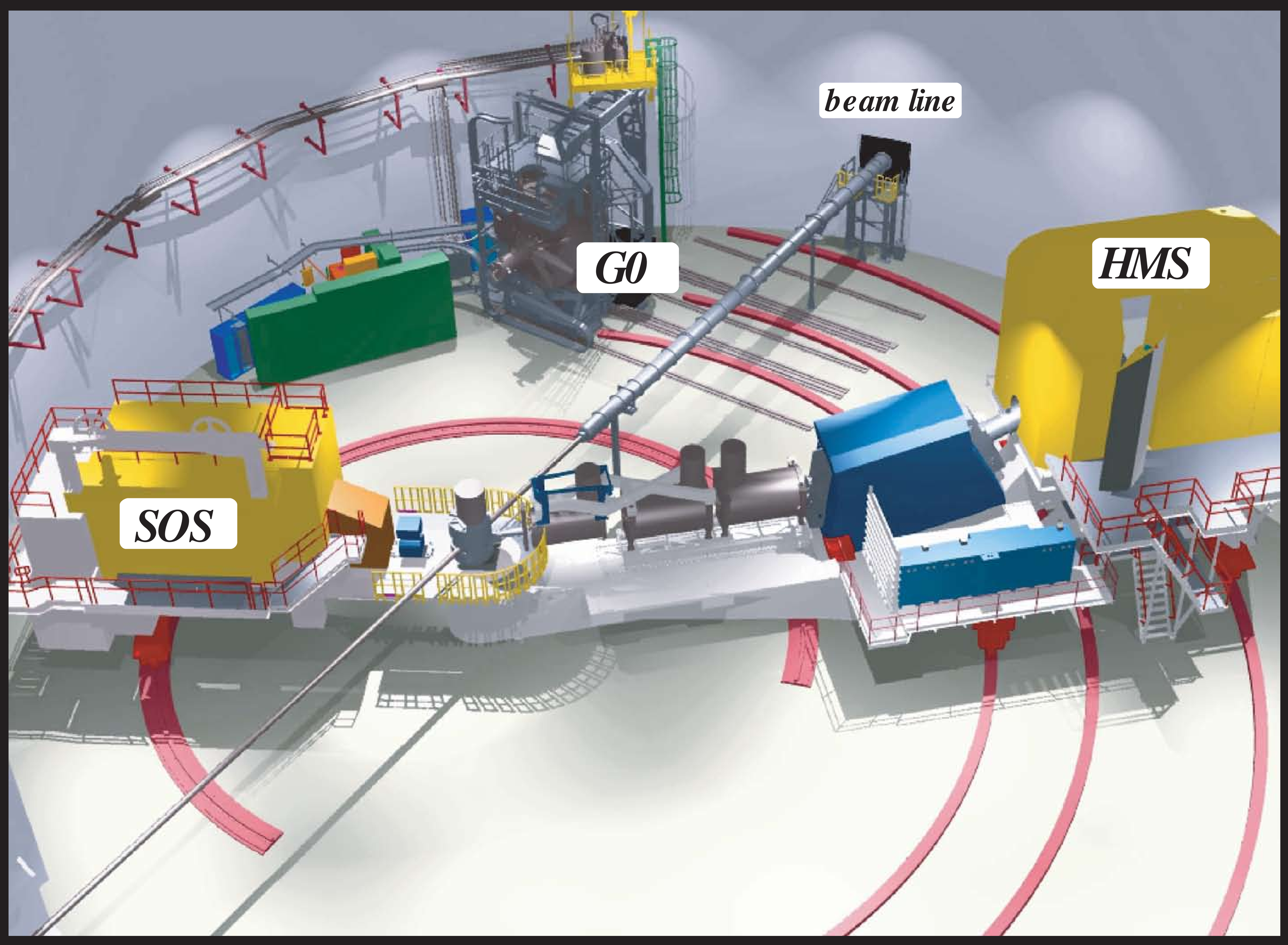
Jefferson Lab's

Experimental Hall C

Hall C AT PRESENT (6 GeV)

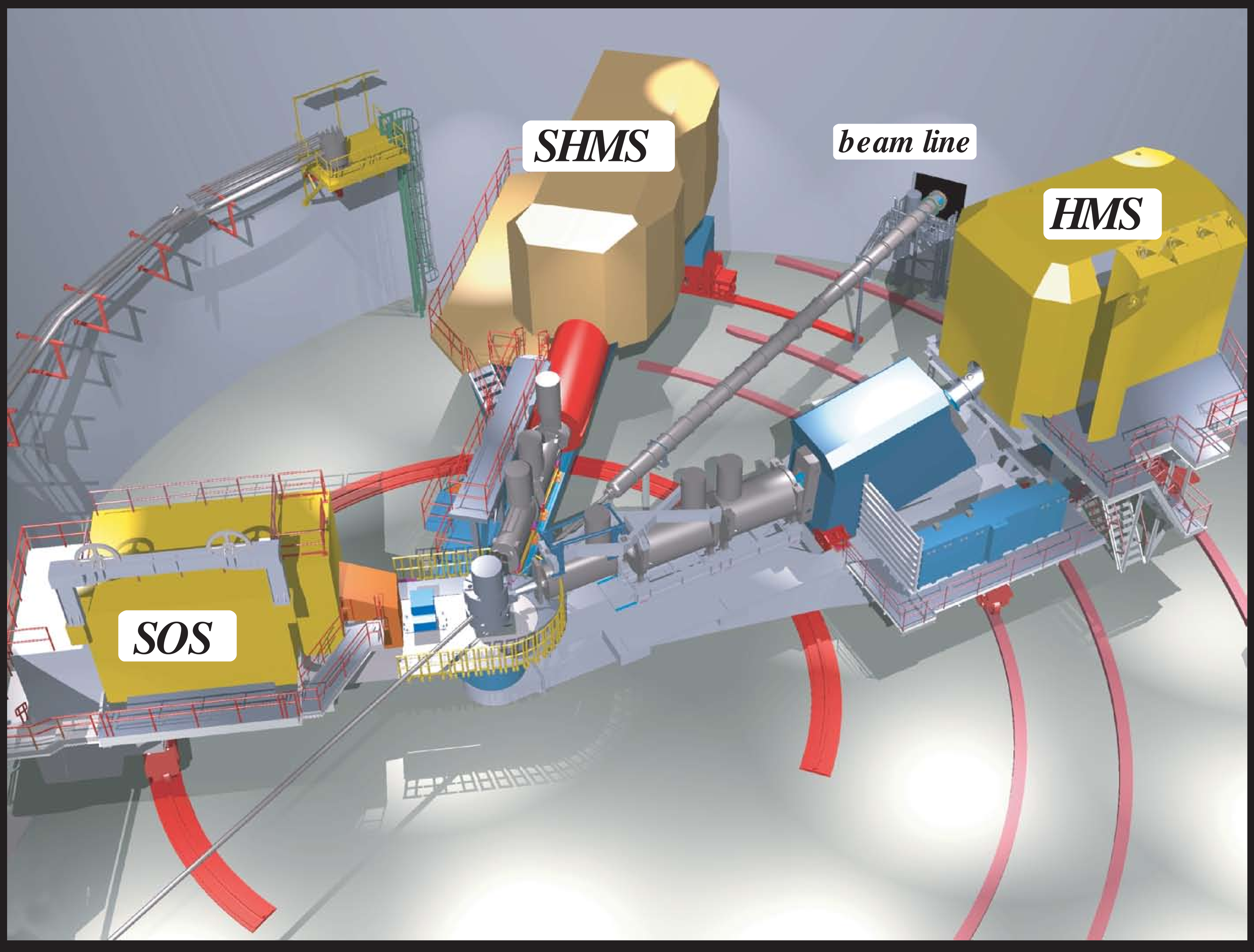


Hall C's High Momentum Spectrometer, Short Orbit Spectrometer and specialized equipment for studying:

- The strange quark content of the proton
- Form factors of simple quark systems
- The transition from hadrons to quarks
- Nuclei with a strange quark embedded

Hall C AFTER the 12 GeV Upgrade

Add a Super-High Momentum Spectrometer for studying:



- *Form factors of simple quark systems*

  Nuclear Physics in terms of protons, neutrons and pion exchange is a very good effective model. To measure the spatial extension of these nuclear building blocks down to the highest spatial resolution has been a holy grail for decades. With 12 GeV we can, for the first time, map the detailed spatial extension of the simplest quark system of Nature, the pion.

- *The transformation of quarks into hadrons*

  Quarks are never alone. At high energies, an efficient description in terms of quarks and gluons exists, but these quasi-free quarks must transform into the hadrons found in Nature. Dedicated measurements can shed light on the mechanism and devolution of this hadron formation.

- *Super-fast quarks*

  99% of our mass is due to stored energy. One quark can be solely responsible for this energy. Although this is very improbable, it directly highlights the symmetries that exist between the quarks inside nucleons. In a nucleus, one quark can even obtain more than the energy of the proton in which it exists. This probability may be enhanced due to exotic 6-quark clusters.

- *Quark structure of nuclei: origin of the "EMC effect"*

  The observation that the quarks inside nucleons behave differently in nuclei stunned much of the community 25 years ago. Now there are ~1000 papers on the topic, with still no unique explanation. The high intensity and excellent properties of the 12 GeV electron beam allows measurements to discover what it is that alters the quark momentum in the nucleus.

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Office of Nuclear Physics

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