

A Synchrotron Under Construction

A Tour of the NSLS II – November 2011





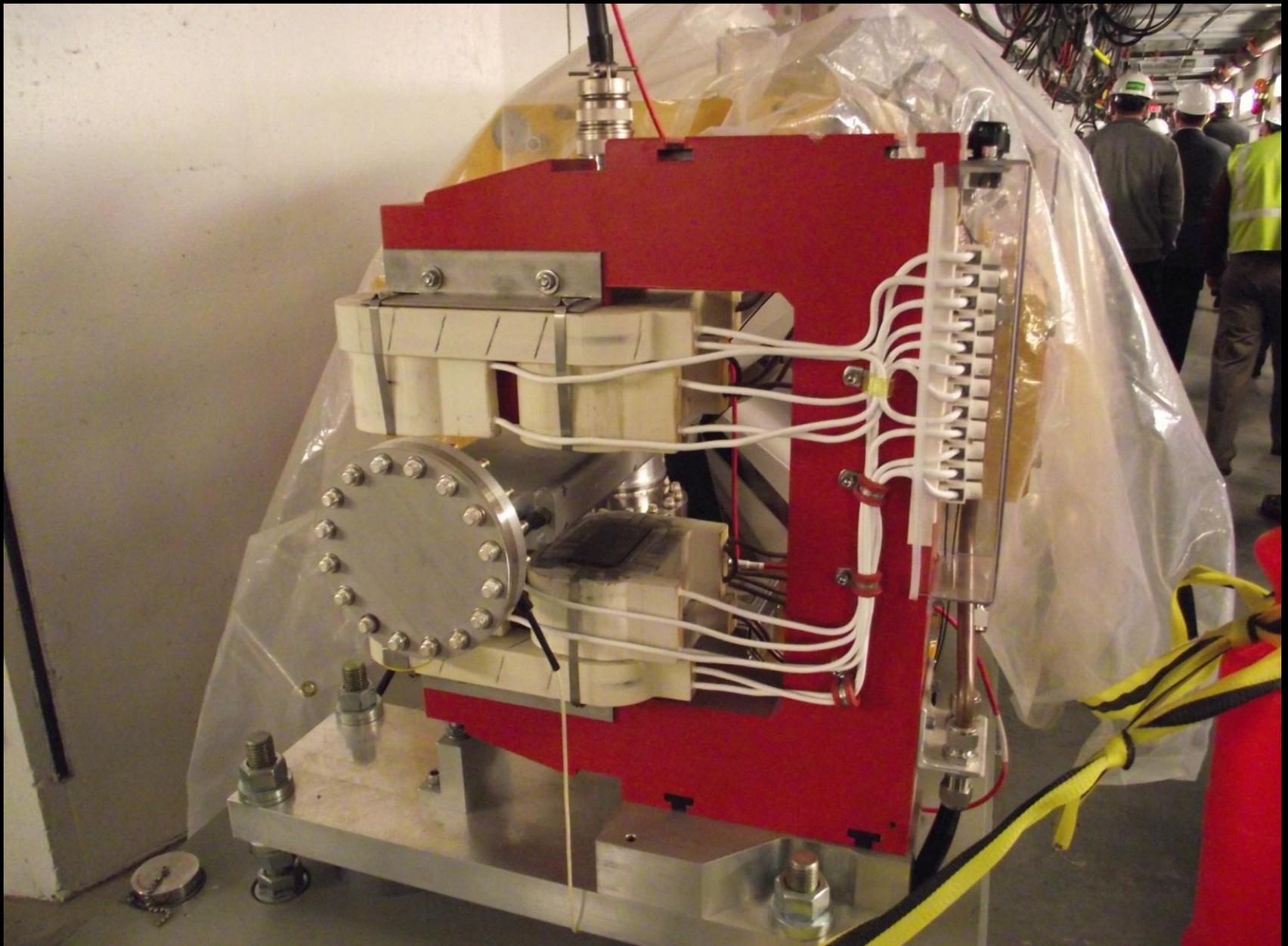
The building that will house the NSLS II is a large ring. You can see the curvature of the building clearly in this photo. We are standing in the experimental hall. Some day soon, this hall will be packed with synchrotron beam lines, detectors, computers, tinfoil covered equipment and researchers. The wall to the right separates the experimental hall from the synchrotron itself. The wall to the left is the exterior wall of the building.



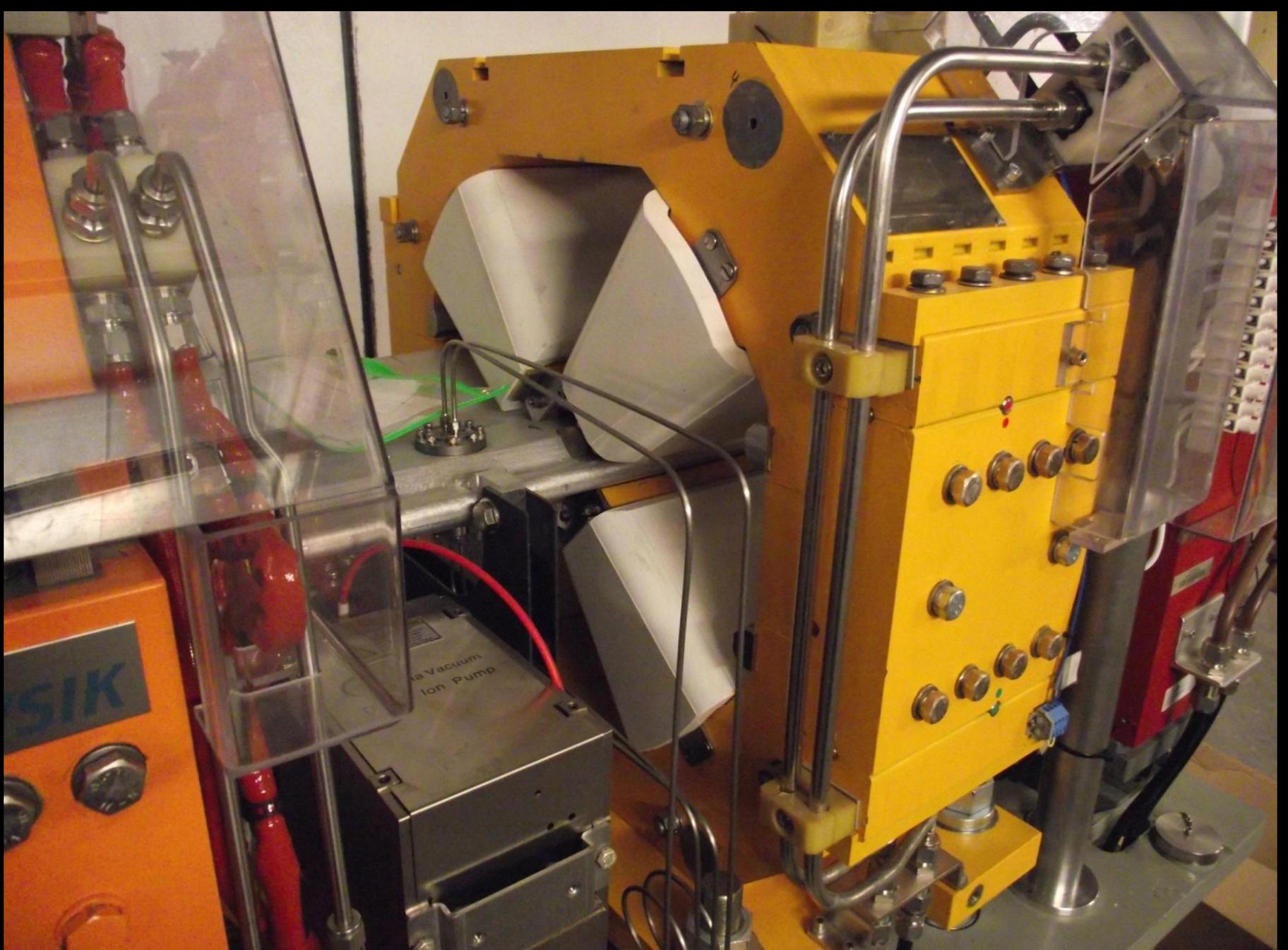
We are now in the “tunnel” that will house the synchrotron. The tunnel is at the same level as the experimental hall. Its thick roof and walls are composed of concrete and lead shielding. Some of the bending and focusing magnets that will be used to steer the electrons around the ring can be seen underneath under plastic drop cloths. The electrical leads used to bring power to the magnets hang from the ceiling.



The bending and focusing magnets rest on heavy steel beams (grey) that are tied to the floor. The magnets must be aligned so that the center of the electron beam as it exits a magnet is within 100 microns of the center of the beam pipe in the subsequent magnet.



The electron beam will interact with any matter that it encounters including gas molecules in the atmosphere. Therefore, it must be enclosed in a high vacuum all the way around the ring. A section of the evacuated beam pipe can be seen in the center of the red magnet. Although the flange is round, the beam pipe beyond it is flat.



This is a quadrupole magnet that is used to focus the beam. The beam pipe can be seen running through the center of the magnet.



Steve Dierker (the project director for the NSLS II) in the blue hard hat is explaining how the ring will be constructed. The depression in the floor is for an insertion device that will generate one of the x-ray beams. The beams will leave the beam pipe tangent to its curvature and pass through ports in the tunnel wall (grey panels seen to the left) into the experimental hall beyond.



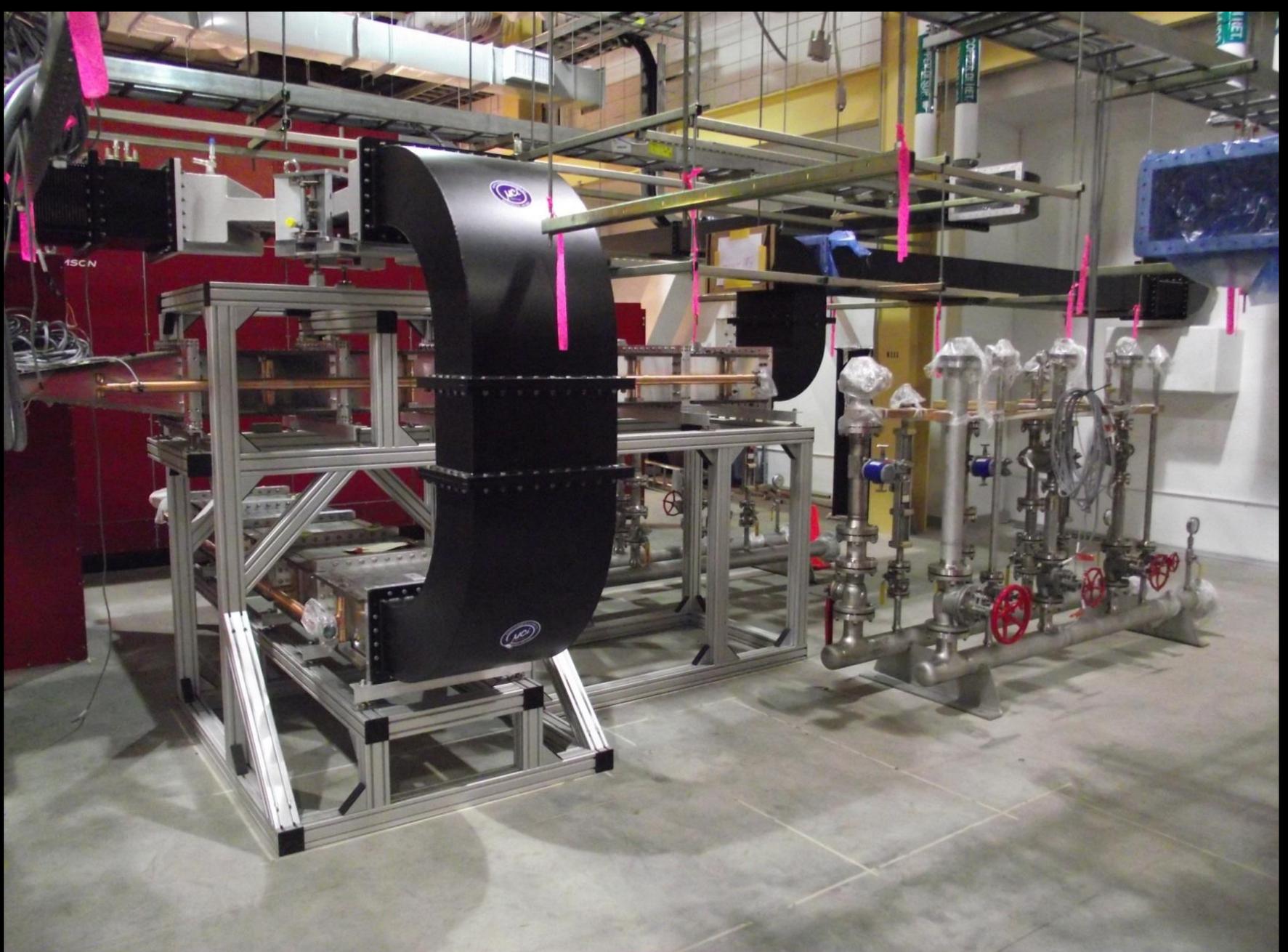
This is the outside wall of the tunnel. The hole in the wall will allow a synchrotron beam to exit into the experimental hall.



This photo was taken on top of the tunnel. The blue cabinets contain the power supplies for the magnets. The grey boxes on the side of each cabinet house cooling water systems.



Klystrons are used to supply radio-frequency energy to the ring to replenish the energy that the electrons lose through synchrotron radiation. The klystrons are located within the ring. The wall of the tunnel is located to the right. I am taking the photo with my back to the exterior wall. Since synchrotron x-rays radiate tangentially outwards from the beam pipe, there is no useful radiation within the ring. Therefore this is a good place to put much of the equipment needed to make the synchrotron work.



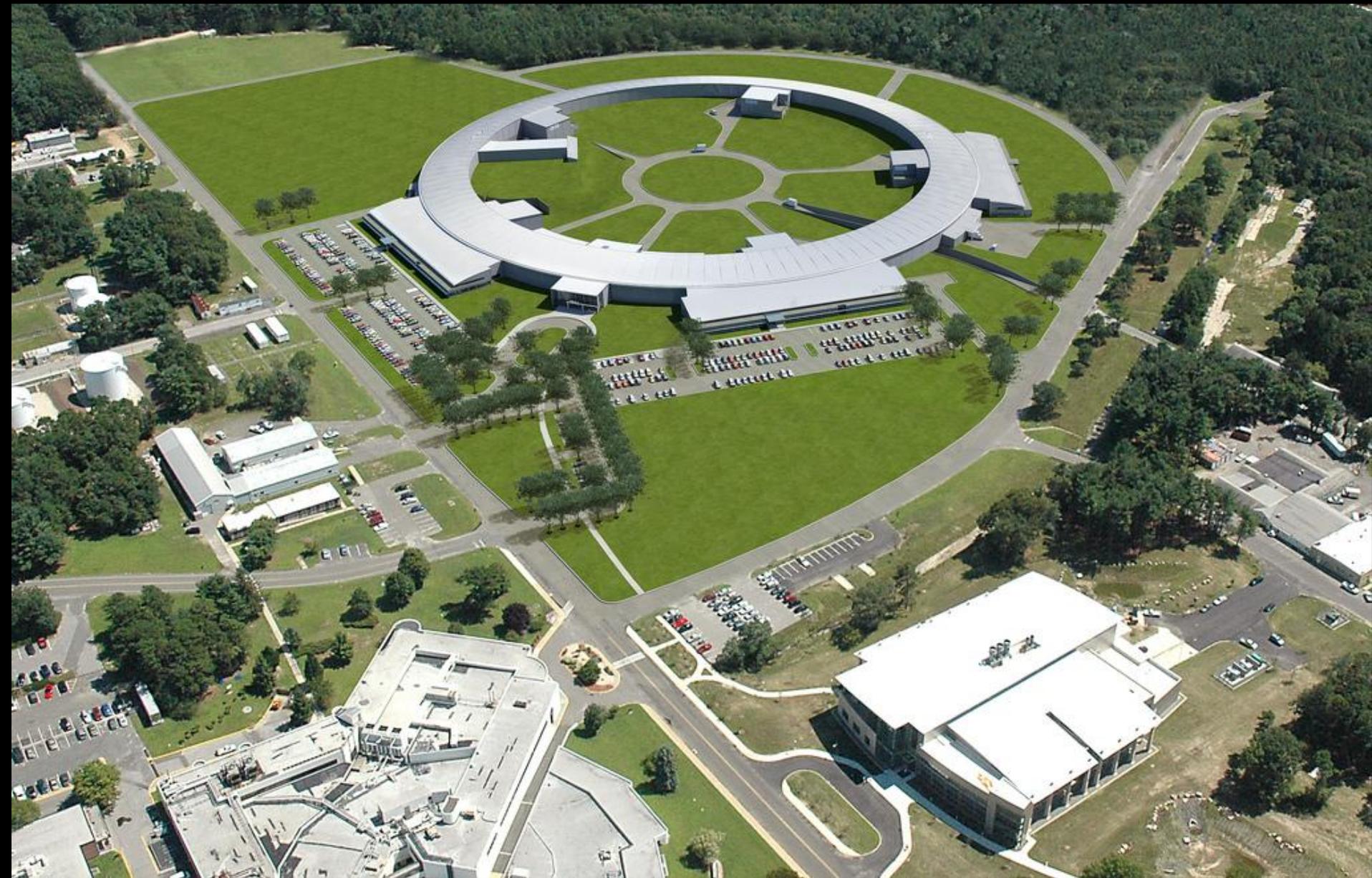
The rectangular tubes (black) are wave guides that carry the radio-frequency energy into the beam pipe. The wall to the tunnel is on the right side of the photo. A klystron (in red) can be seen in the background).



This is the “in field” – the area inside the ring. The injector which generates the electron beam and sends it into the ring is buried beneath an earthen berm inside the ring. To the right you can see a tunnel under the ring that allows vehicular access to the in field. The berm on the left side of the photo is the earthen cover over the injector – the part of the synchrotron that provides the high energy electrons.



In this satellite photo (from Bing) taken in 2009, you can see the circular area where the injector will be constructed in the upper right hand corner of the ring.



This is an artists rendering of what the NSLSII will look like when it is complete.