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Redesign of a High Voltage Test Bed for Marxes on Z

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The Sandia National Laboratories Z machine is the world's most powerful and efficient laboratory radiation source, capable of producing over 2 MJ and 300 TW of x-rays. For primary energy storage, Z uses thirty-six separate Marx banks, each comprised of sixty 2.6 μF capacitors rated for up to 100 kV. The total energy storage on Z is 25 MJ at maximum operating voltage (95 kV). Regular operation of Z requires high reliability of these sub-systems –a failure rate of only 1% would imply a malfunction about every three shots. One way to ensure the reliability of the Marxes is to charge them to high voltage and trigger them into a dummy load to 'certify' them before installation on Z.

The Marx Test Bed is the system that allows Z operations to conduct this testing. After many years, we have upgraded the Test Bed with new charging supplies and an updated gas handling and control system. In addition to making the Test Bed itself easier to maintain, the upgrades will allow for more operational flexibility going forward. A further consideration during the upgrade is to provide the Z facility with a more general high voltage testing environment –opening up the opportunity to conduct small-scale high voltage testing on components besides Marxes. Here we present an overview of the Test Bed system, as well as a discussion of the protection and filtering required for the HVAC and HVDC portions of the new charging circuit.

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