

Take 5 for Safety

P. Cirnigliaro

March 24, 2015

BROOKHAVEN
NATIONAL LABORATORY

a passion for discovery



EVENT at ERL March 18, 2015

During a controls system test, remotely operating power supplies for the ERL injection system injection magnets, two extraction quadrupole magnets were inadvertently energized above their design parameters

QUADRUPOLES UNDER TEST



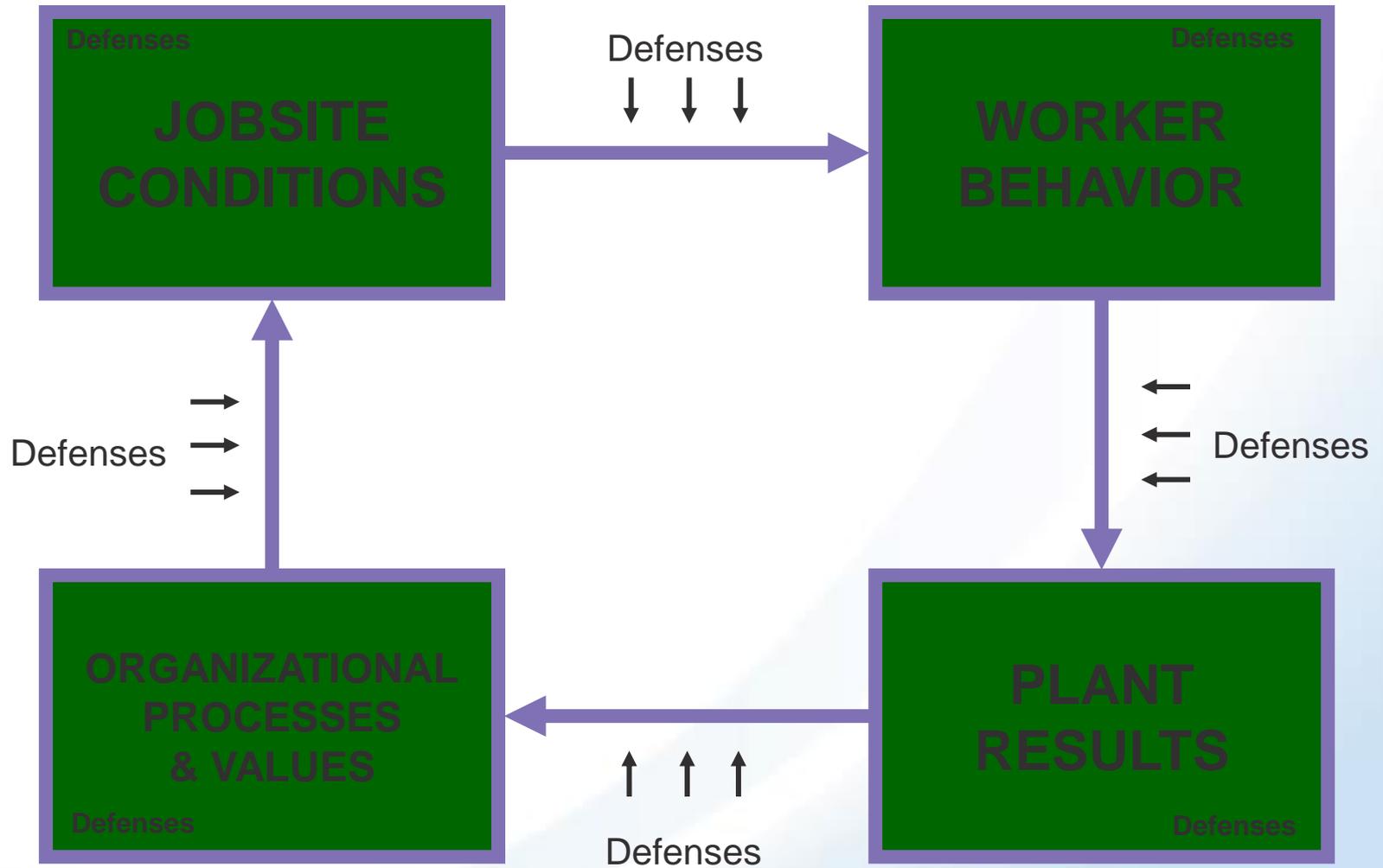
Work Practices

- **Software engineer used spreadsheet generated by ERL Magnet Power Supply design Engineer to input Power supply parameters in to test software for injection magnet string.**
- **Quadrupoles not part of injection string, PS in same bucket on rack.**
- **Quadrupoles installation not complete, no engineered protection installed (klixon)**



03/18/2015 22:45

The Performance Model



Defense in Depth



Work Practice - Defense in Depth

Human Performance Anticipate error likely situations: Unexpected equipment conditions

SELF CHECK

CHECK OTHERS

MINIMIZE CONFUSING DISPLAYS/CONTROLS

- ▶ Use checklists and peer checking
- ▶ Use Configuration control of Spreadsheet PS information
- ▶ Use “White Sheets” as final check of operational status of power supplies / magnets.
- ▶ Label Magnets and Power Supplies