



Wir schaffen Wissen – heute für morgen

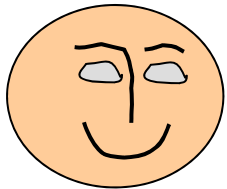
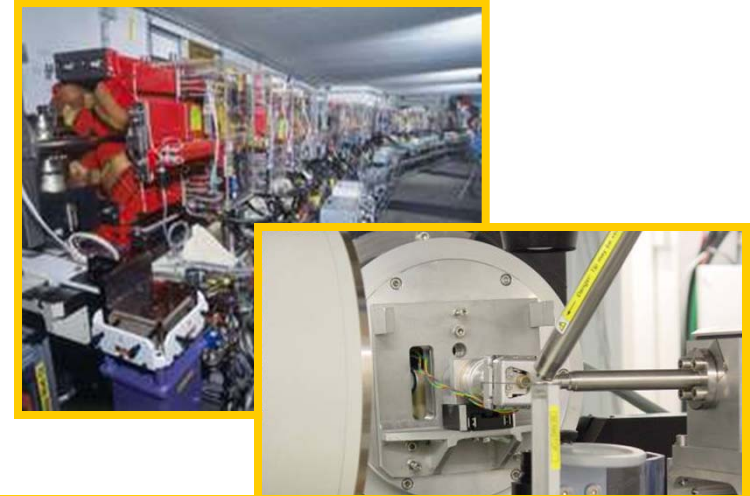
Paul Scherrer Institut

Elke Zimoch

## Purpose and Benefit of Control System Training

# What is the Problem?

Accelerator



Operator  
in Control Room

200 m



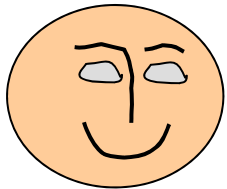


# What is the Problem?

Accelerator



Control System

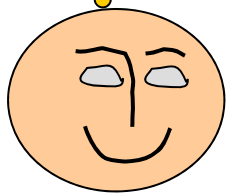


Operator  
in Control Room



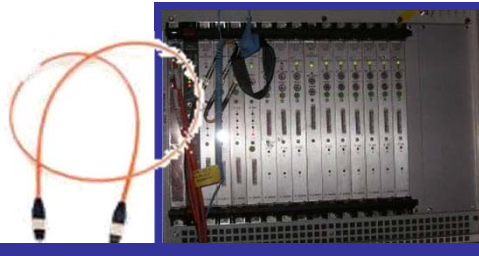
- The control system is the only connection between accelerator and operator

# What is the Problem?



Operator  
in Control Room

Control System



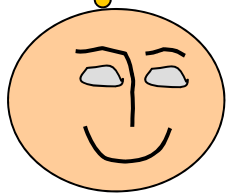
Accelerator



- The control system is the only connection between accelerator and operator



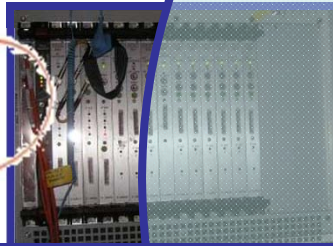
# What is the Problem?



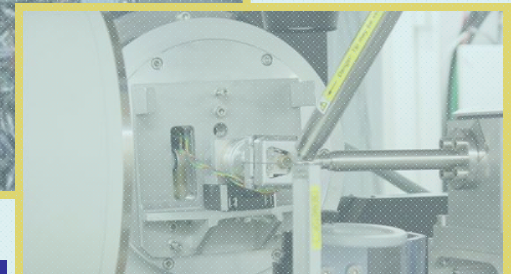
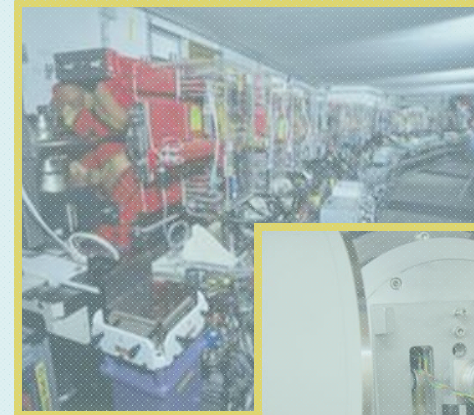
Operator  
in Control Room



Control System

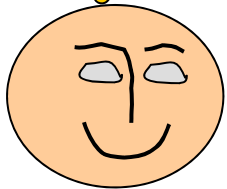


Accelerator



- The control system is the only connection between accelerator and operator

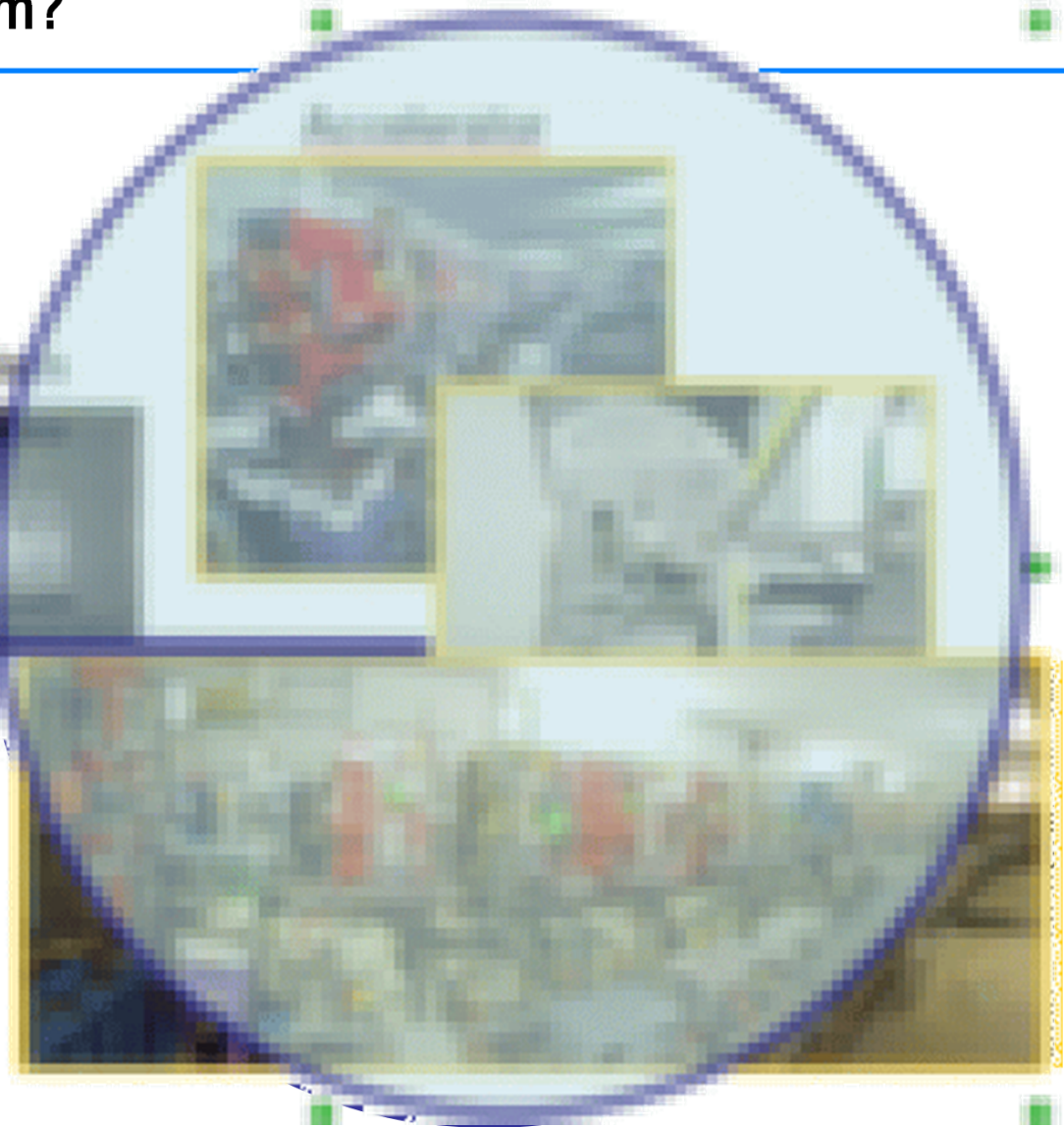
# What is the Problem?



Operator  
in Control Room



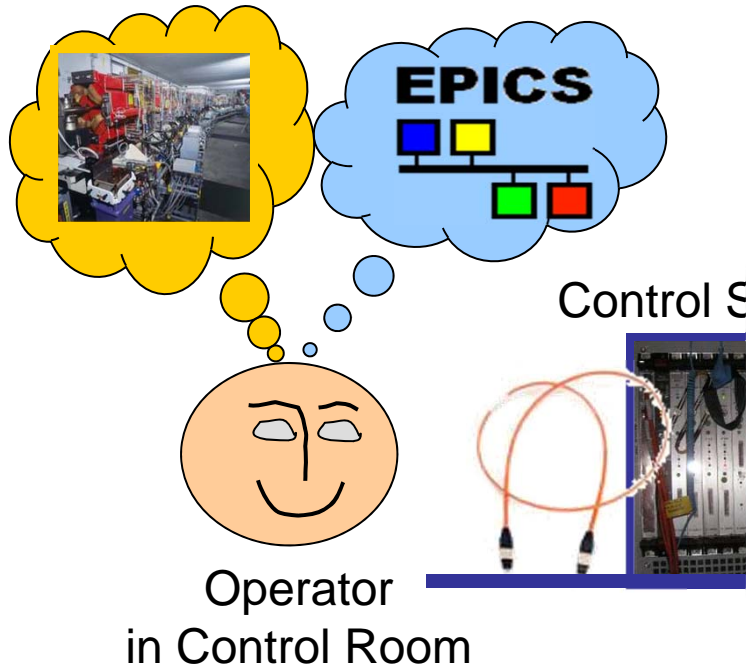
Control S



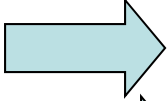
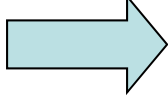
- The control system is the only connection between accelerator and operator

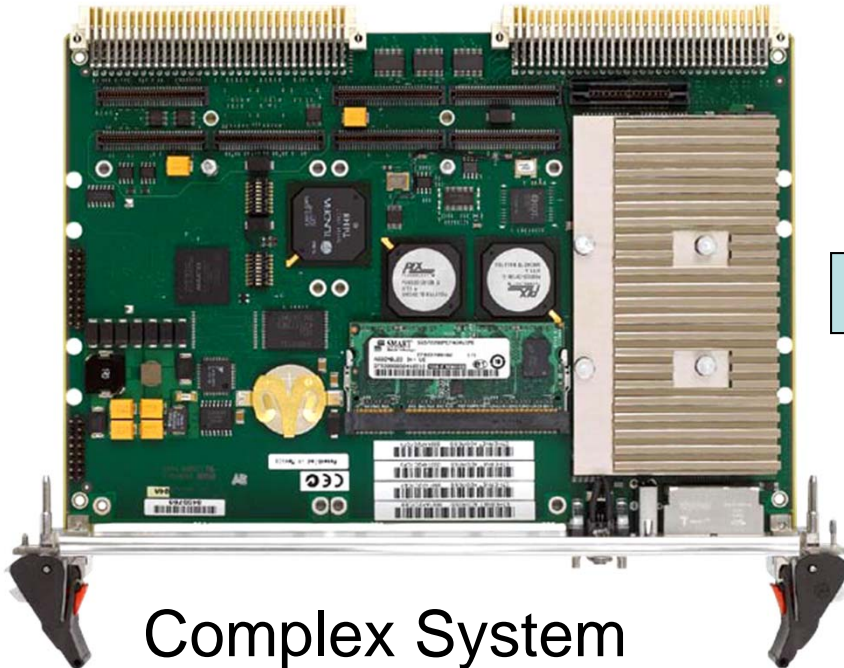


# What is the Problem?

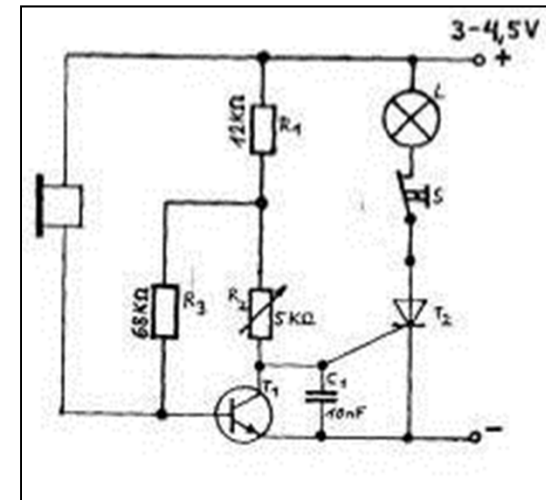


- The control system is the only connection between accelerator and operator

- Simplify complex systems (not necessarily correct)
- Allow reason about behavior of complex systems
- Represent aspects we learn/know about  Step 1
- Automatically constructed from experience  Step 2



Complex System

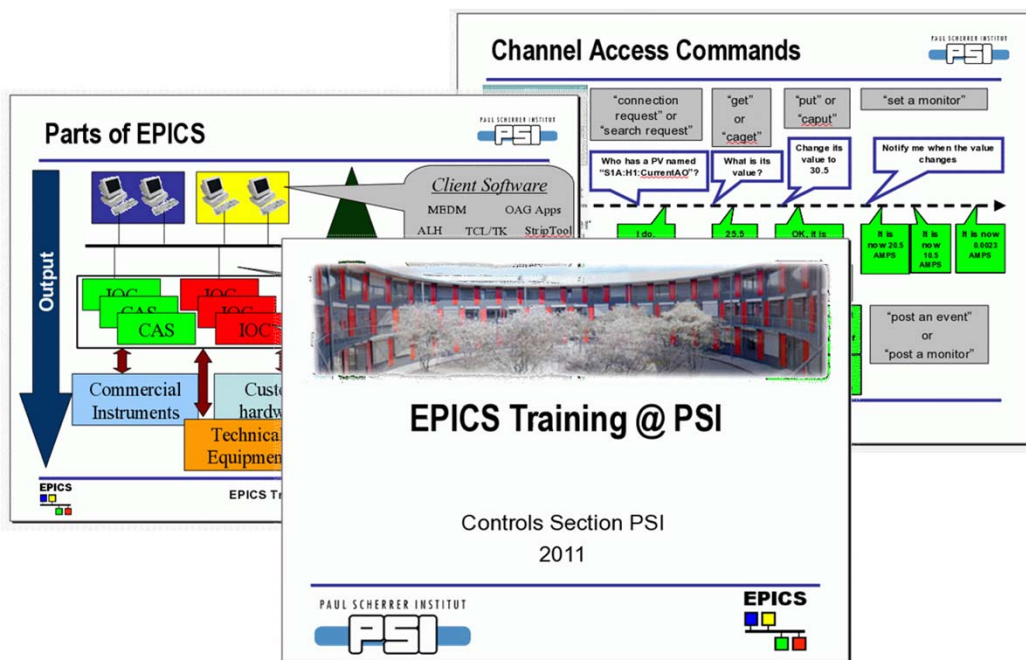


Mental Model



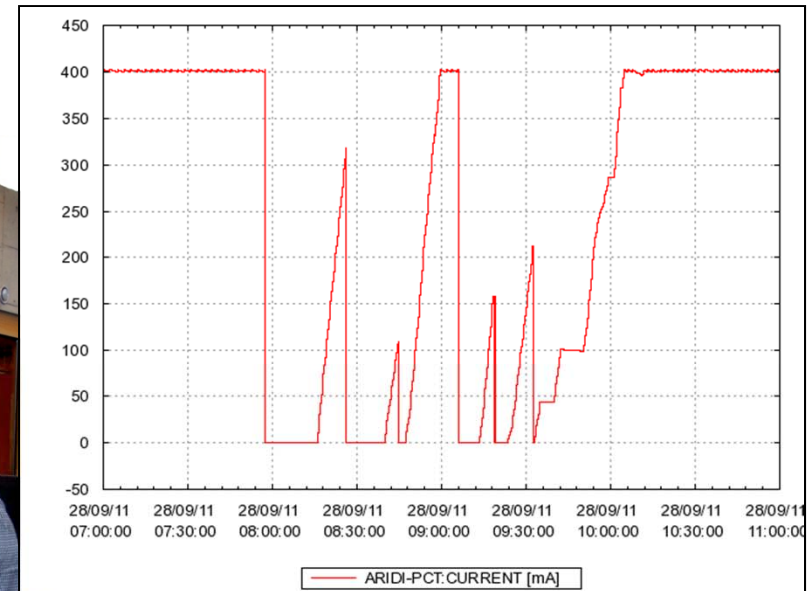
## Lay model foundation:

- Lectures: theoretical basis
- Hands-on training: learning by playing
- Hardware for every participant
- In native language of Operators (German)
- Small groups (4 participants)



## Second Step: Experience for Operators

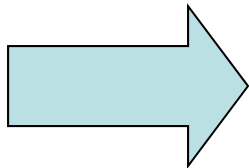
- SLS availability 99% (year 2010) = Experience decay
- Solution: special Operator training at SLS
- “sabotage” accelerator (cause beam loss)
- Real accelerator, real environment, real problems
- Operator solves problem while monitored by trainer
- Mental model refresh





A correct mental model of the control system enables Operators to

- Distinguish between accelerator and controls problems
- See through the control system blur
- Use the control system more efficiently



Control System Training is necessary to build correct mental models