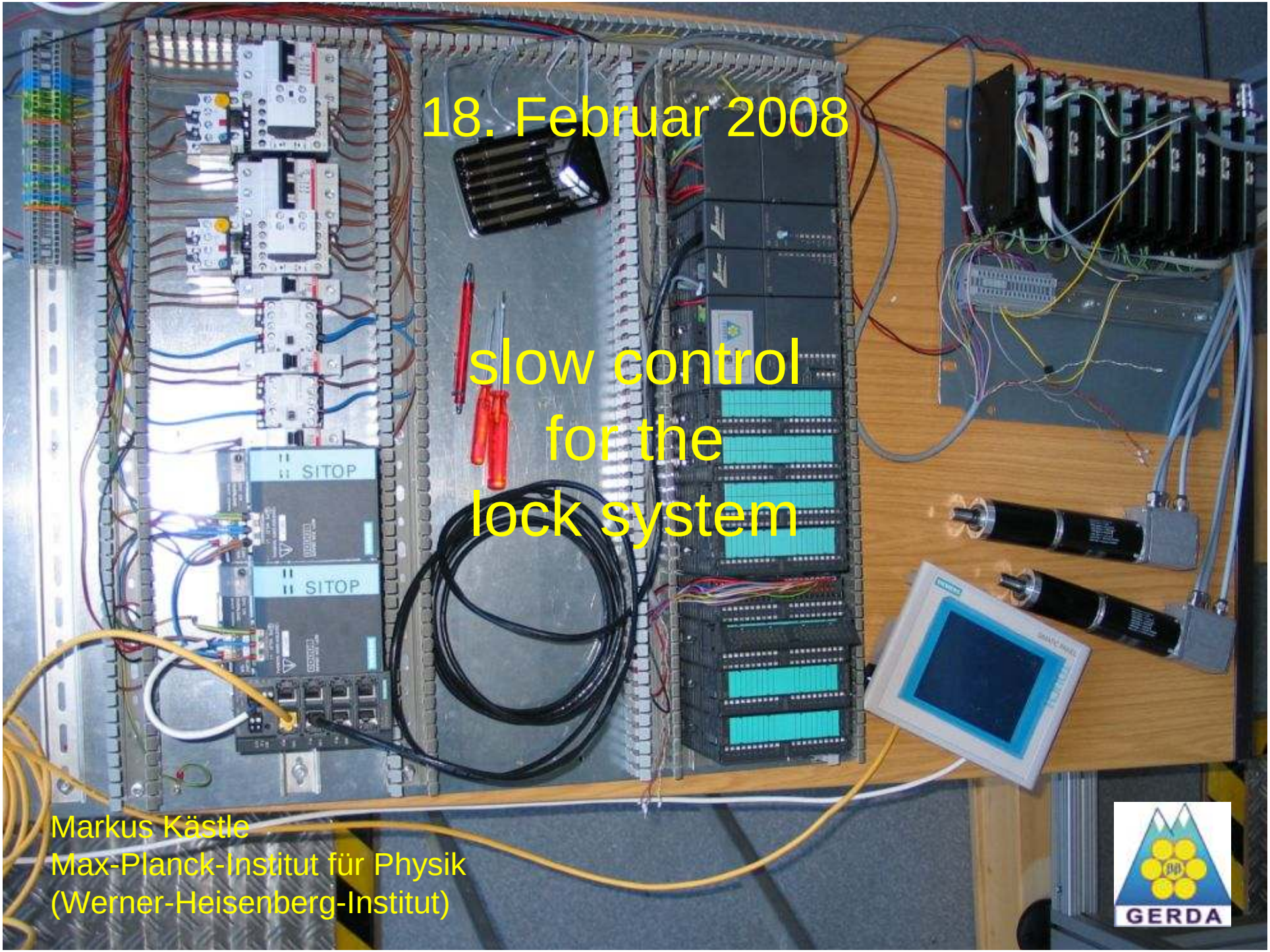

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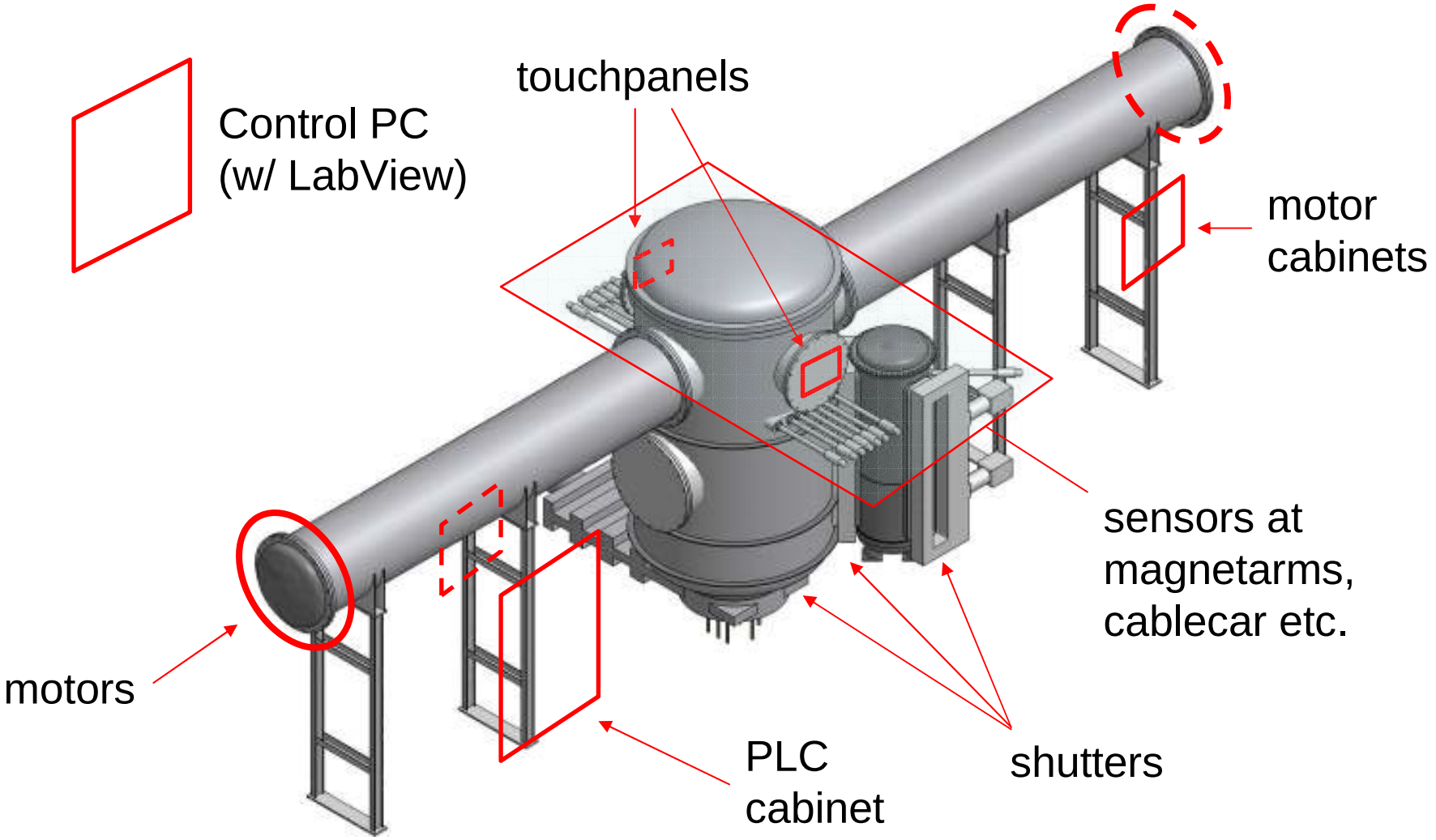
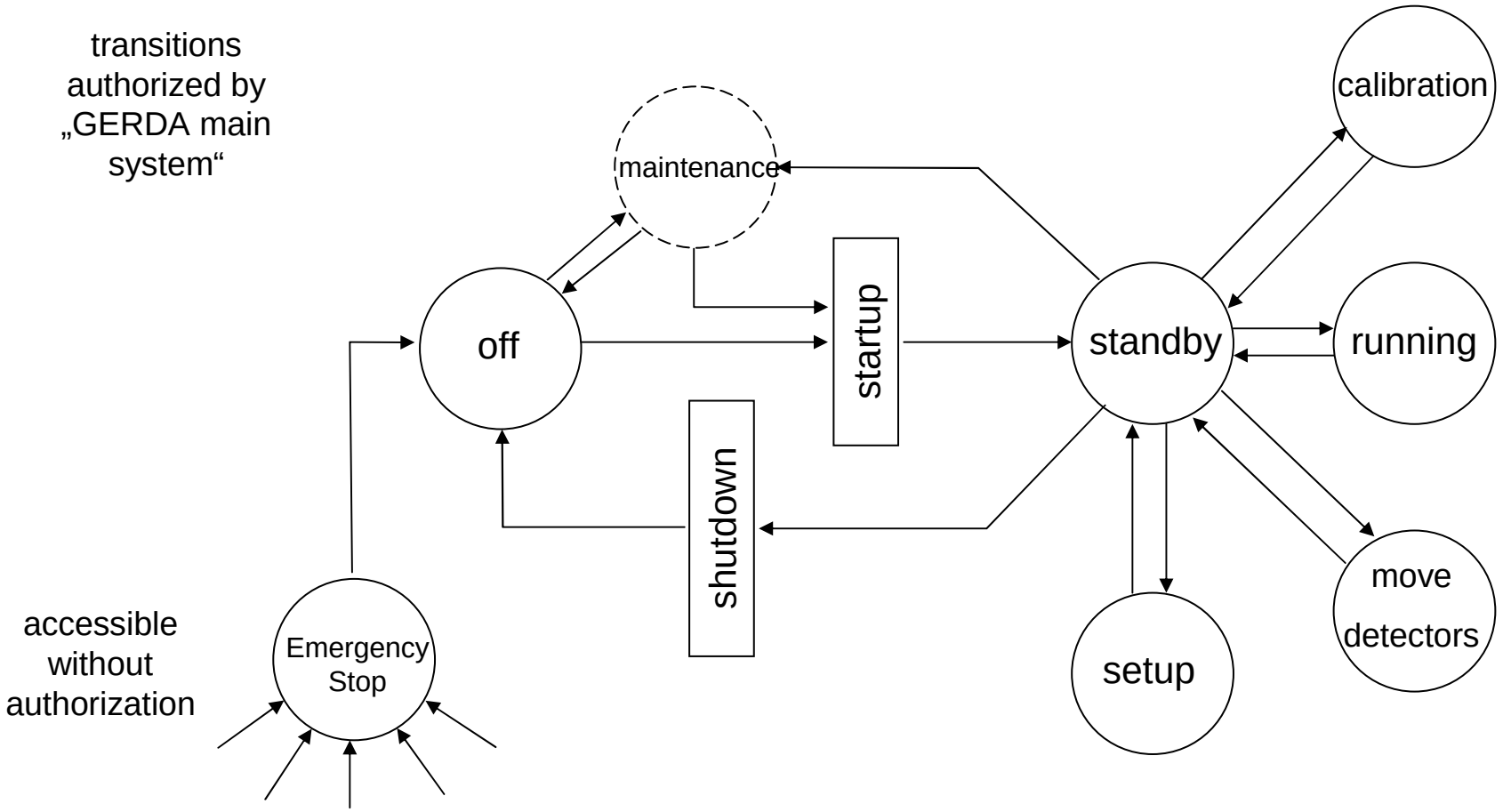
- slow control parts and locations
- lock system slow control tasks
- system states
- user interface
- communication with other systems
- next steps

slow control parts and locations

slow control GERDA lock system



- security issues
  - personnel
    - separate cryostat and clean room (shutters)
  - material
    - smooth detector string movements
    - only controlled shutter movements (prevent lock damage)
- precise detector string positioning
  (well defined measurement conditions)
- clearly structured user interfaces
  - prevent operating errors
  - quick status overview


transitions authorized by „GERDA main system“
maintenance
calibration
off
startup
standby
running
shutdown
move detectors
setup
accessible without authorization
Emergency Stop

state descriptions

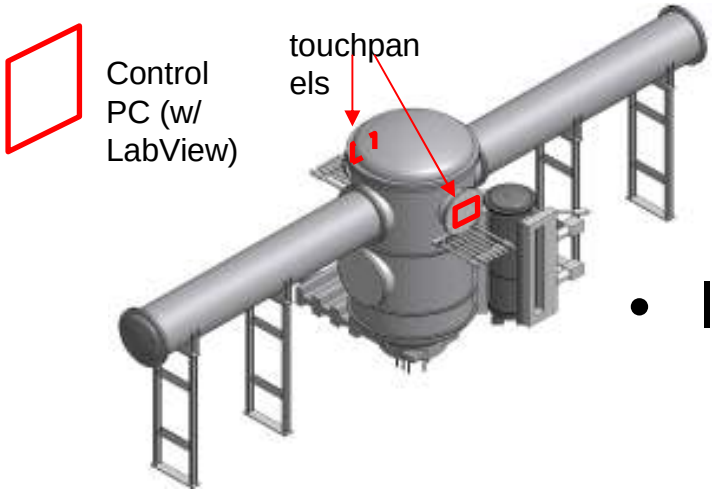
off	before startup / after a shutdown
startup	test and adjust lock system sensors and actuators
standby	system ready to switch to running (sensors tested)
move detectors	system controls detector movement
calibration	experiment calibration (calibration sources)
running	no movements allowed in lock system
shutdown	bring actuators to standard position, switching off
setup	change standard system parameters (velocity, current, …)
maintenance	subsystem is decoupled, each single actor can get activated independently (password)
Emergency Stop	immediate shutdown

error state descriptions

each system state supports four different error levels

ok	ready to operate
warning	system is working with minor errors
fault	system is not working, errors are not dangerous
fatal	system is not working, errors ARE dangerous

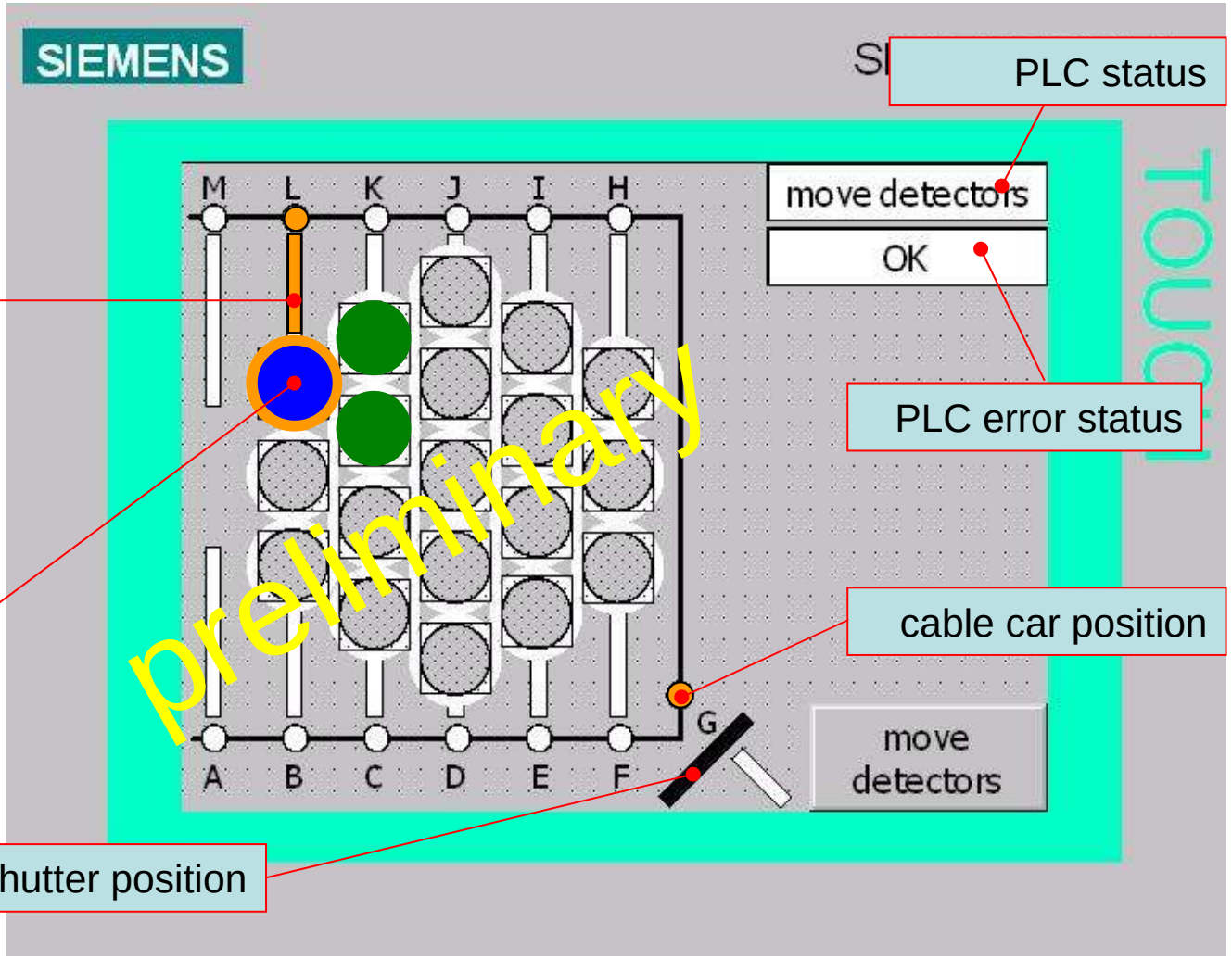
overview control panels



- lock system control (LabView-PC)
  - display and control the whole lock system
- touchpanels
  - display the rail system by the related sensors
  - motor control (lift and lower detectors)

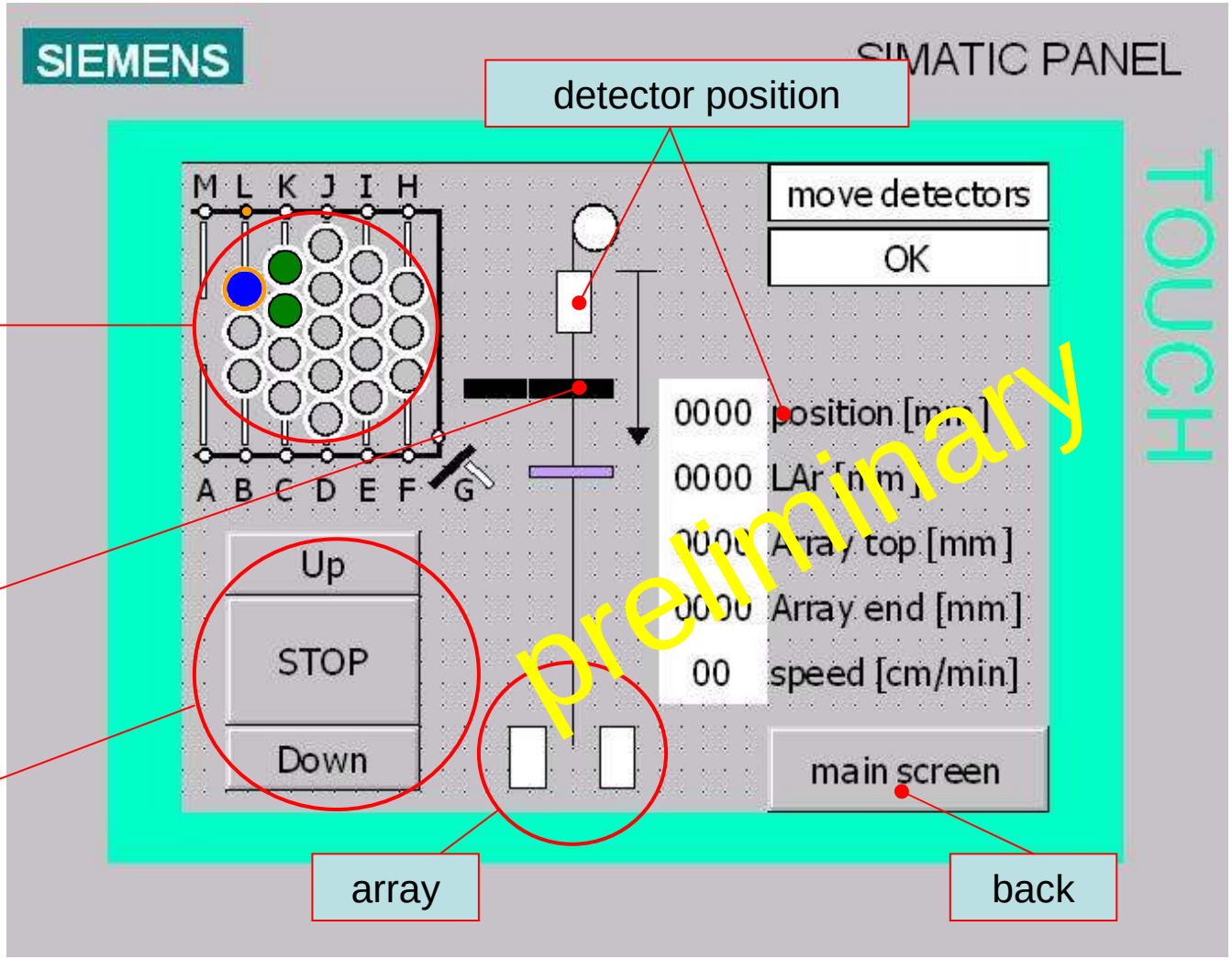
screen

„choose string“

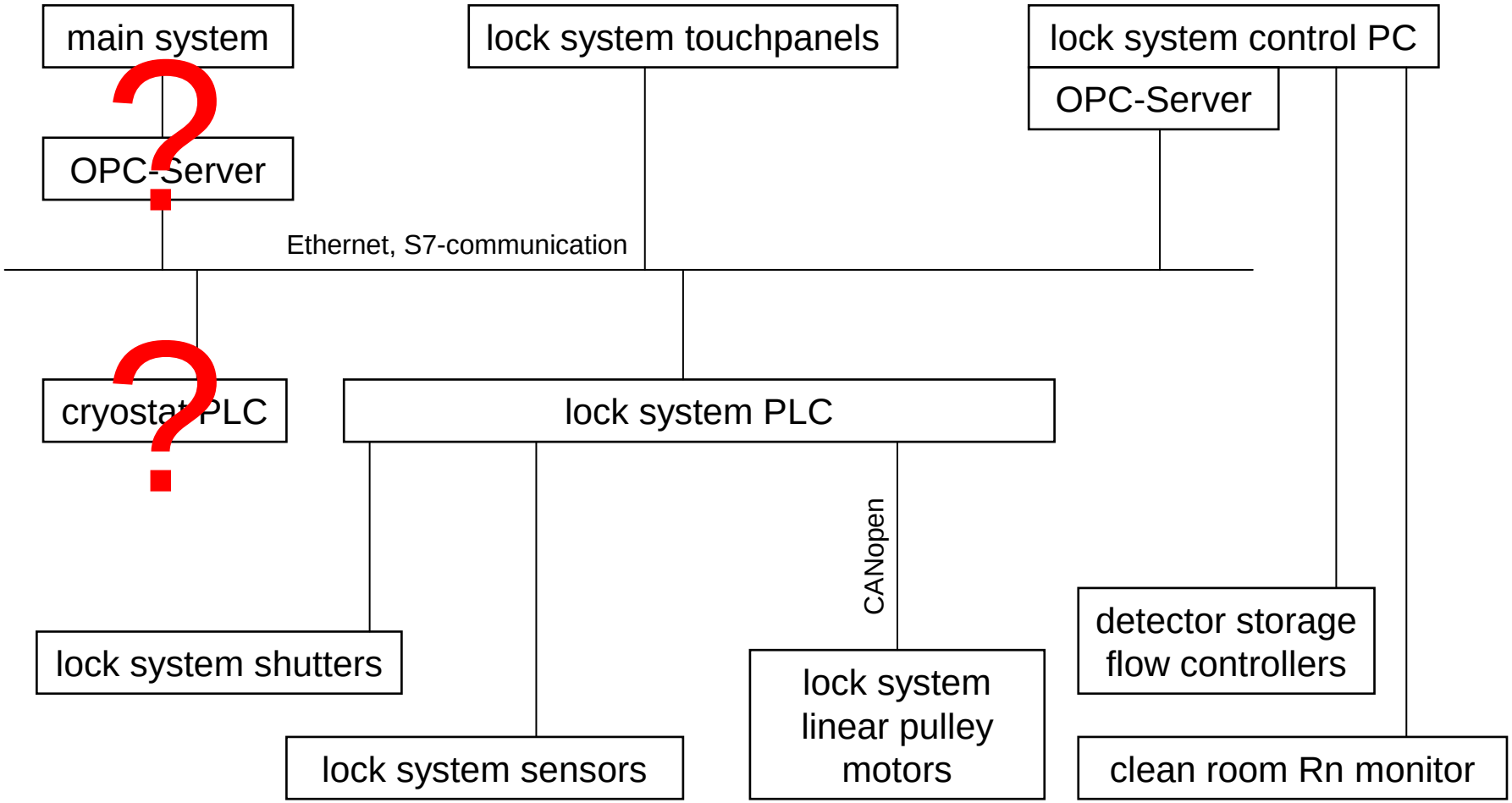


screen

„move string“



communication slow control GERDA lock system



communication interfaces

- cryostat slow control (still defining)
  - protocol: S7 communication on ethernet
  - variables
    - PLC status, PLC error status
    - cryostat shutter open / closed
    - lock purging valves open / closed
    - more valve states, pressures, temperatures…
- slow control main system (suggestion)
  - protocol: OPC - S7 communication on ethernet
  - variables
    - PLC status, PLC error status
    - state transition request / authorization
    - detector positions, pressures, shutter states…

- define interfaces
- wiring
- program PLC
- program touchpanels
- program LabView PC
- test programs
- definition / tests of precise movement parameters
  - immersion speed
  - motor currents
  - cable warming time (for detector upward movements)
  - ...

conclusion

- control concept is worked out
- system interfaces are partly defined
- main hardware parts are delivered
- basic control tests are successful

→ lock system slow control is on the way