



Automation of the ReAccelerator Linac Phasing

D. Barofsky, A. Henriques, D. Crisp, T. J.
Kabana, A. Lapierre, S. Nash, A. Plastun, A. C.
C. Villari

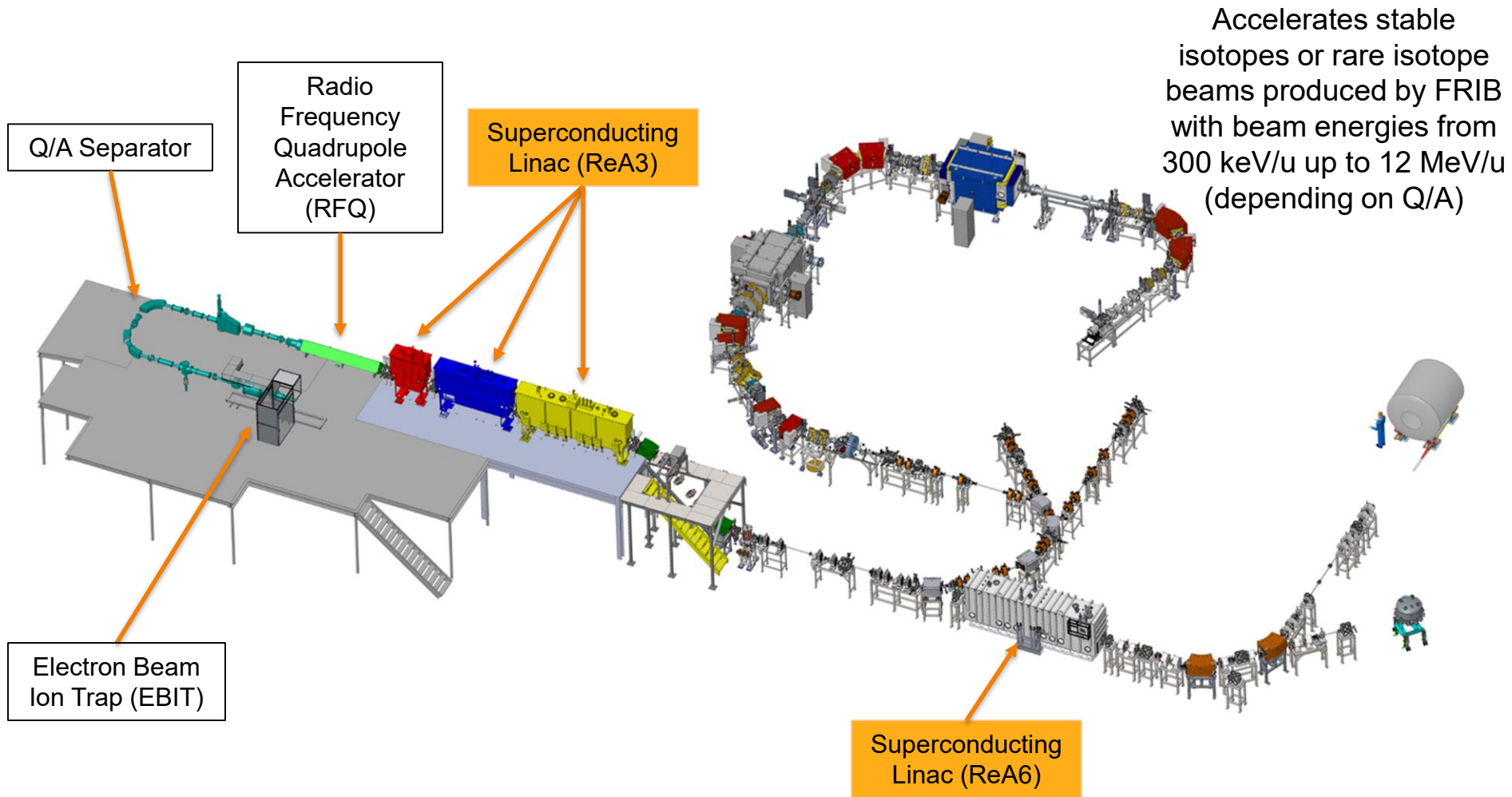
MICHIGAN STATE
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ENERGY

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What is the ReAccelerator?

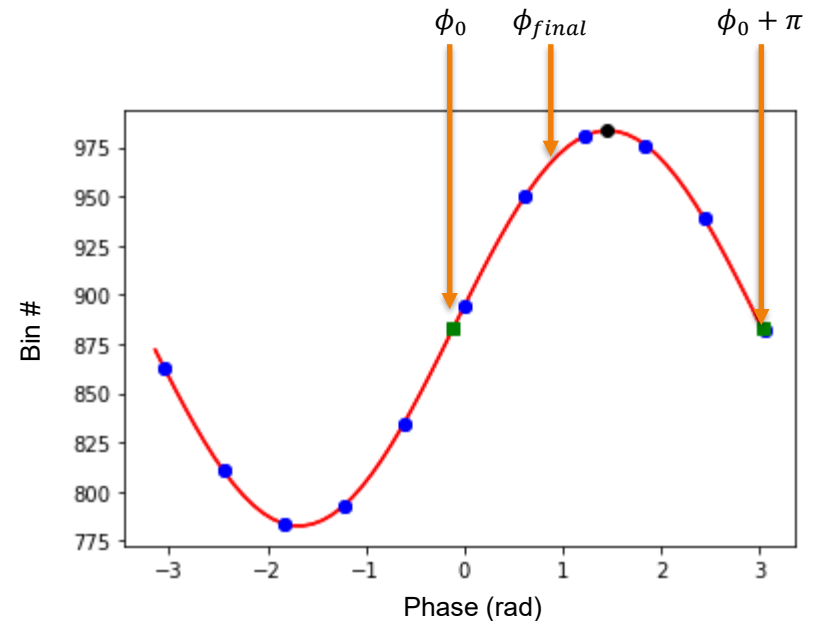


Linac Phasing

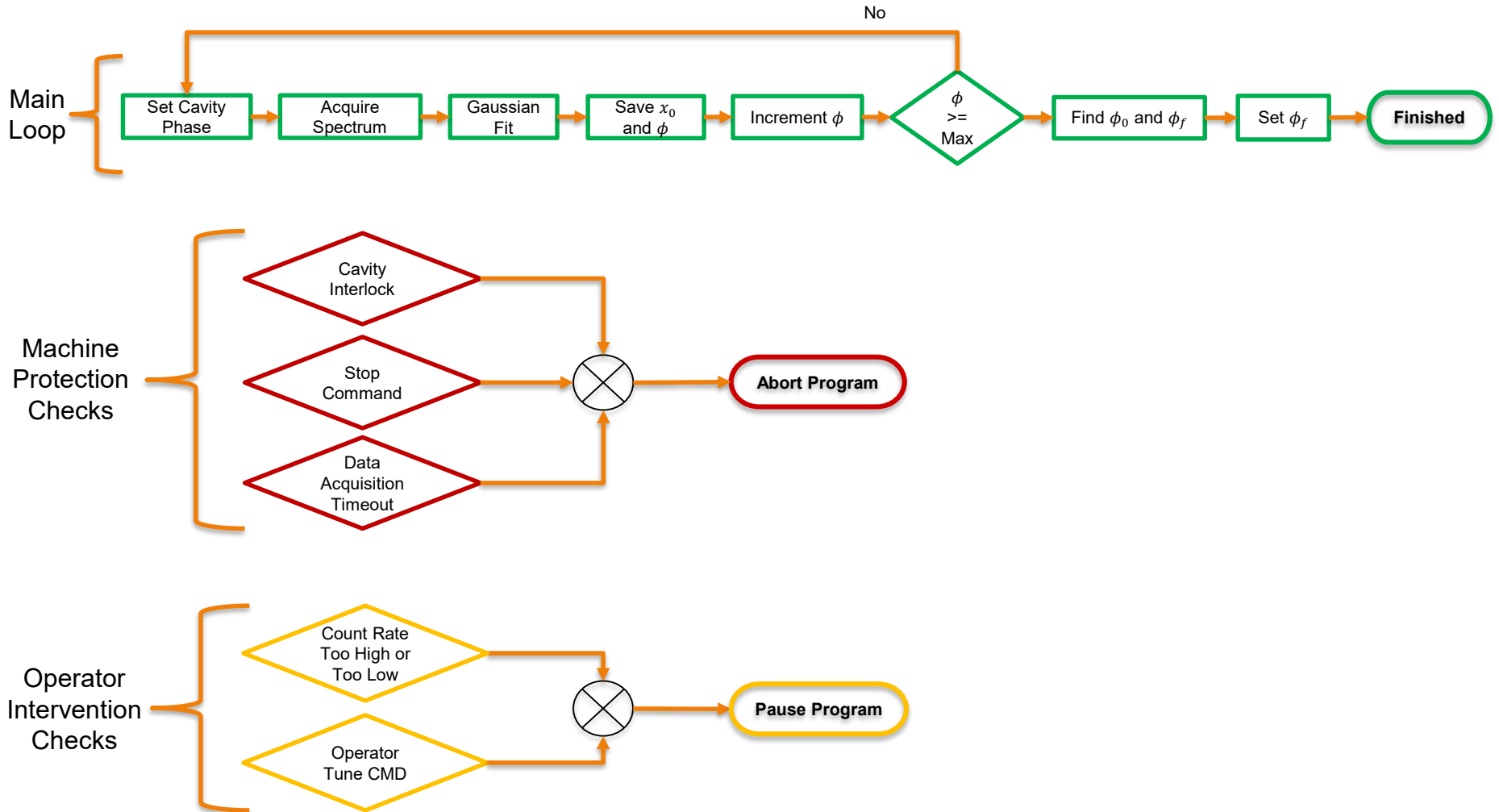
- Determining the phase delay of the RF cavities to achieve desired beam acceleration

$$E_{Beam} = qV \cos(\phi - \phi_s)$$

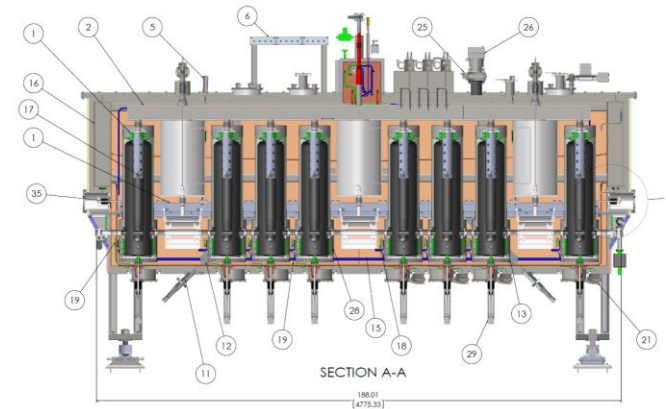
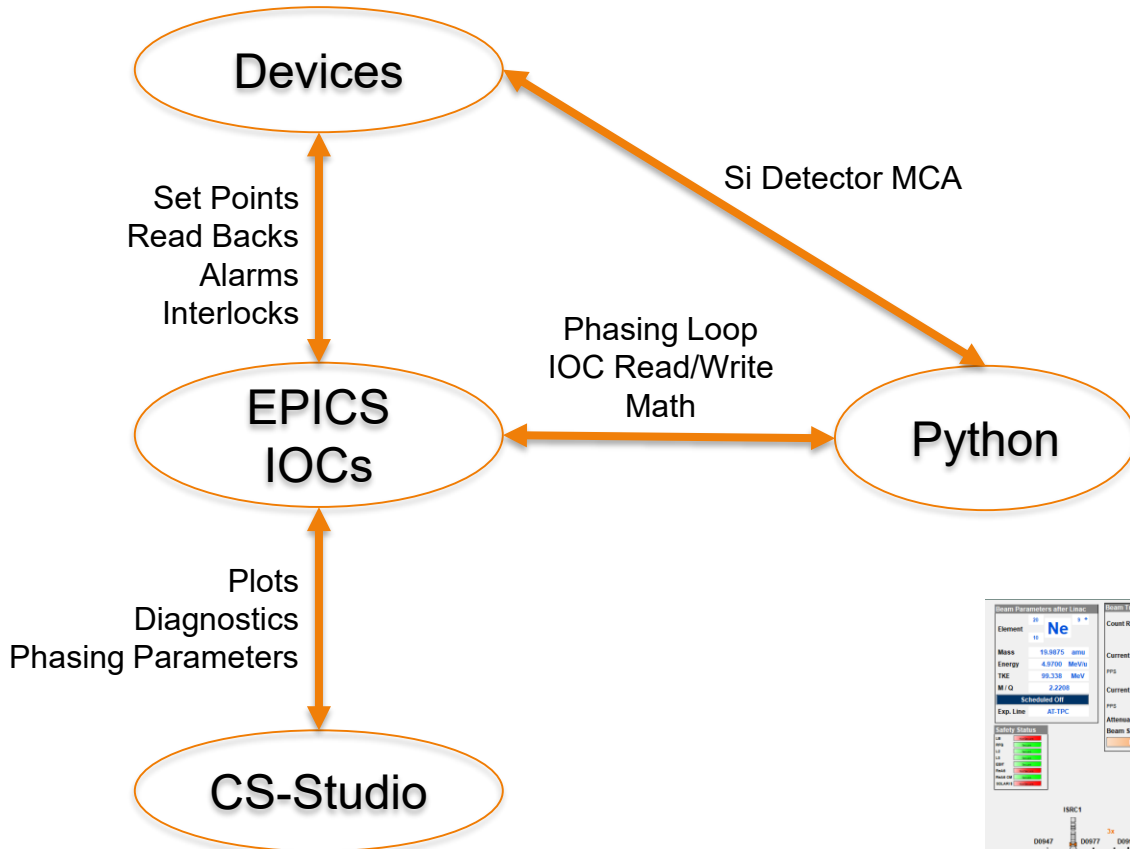
- Using a silicon detector
 - Diagnostic boxes after ReA3 and ReA6 cryomodules
- Historically phased manually



ReA Phasing Automation Logic

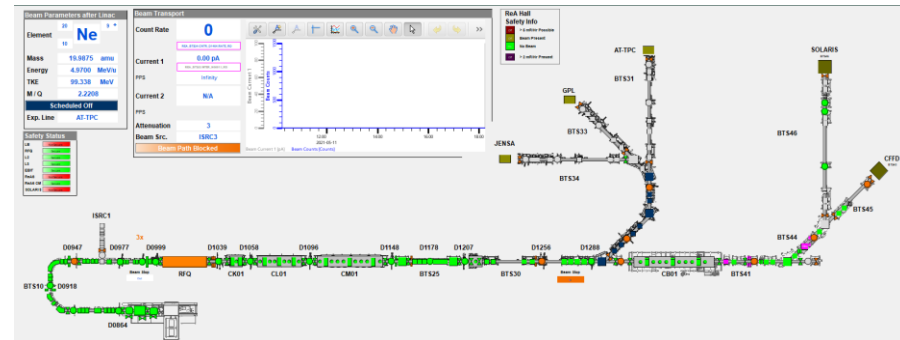


Tools Used & Testing

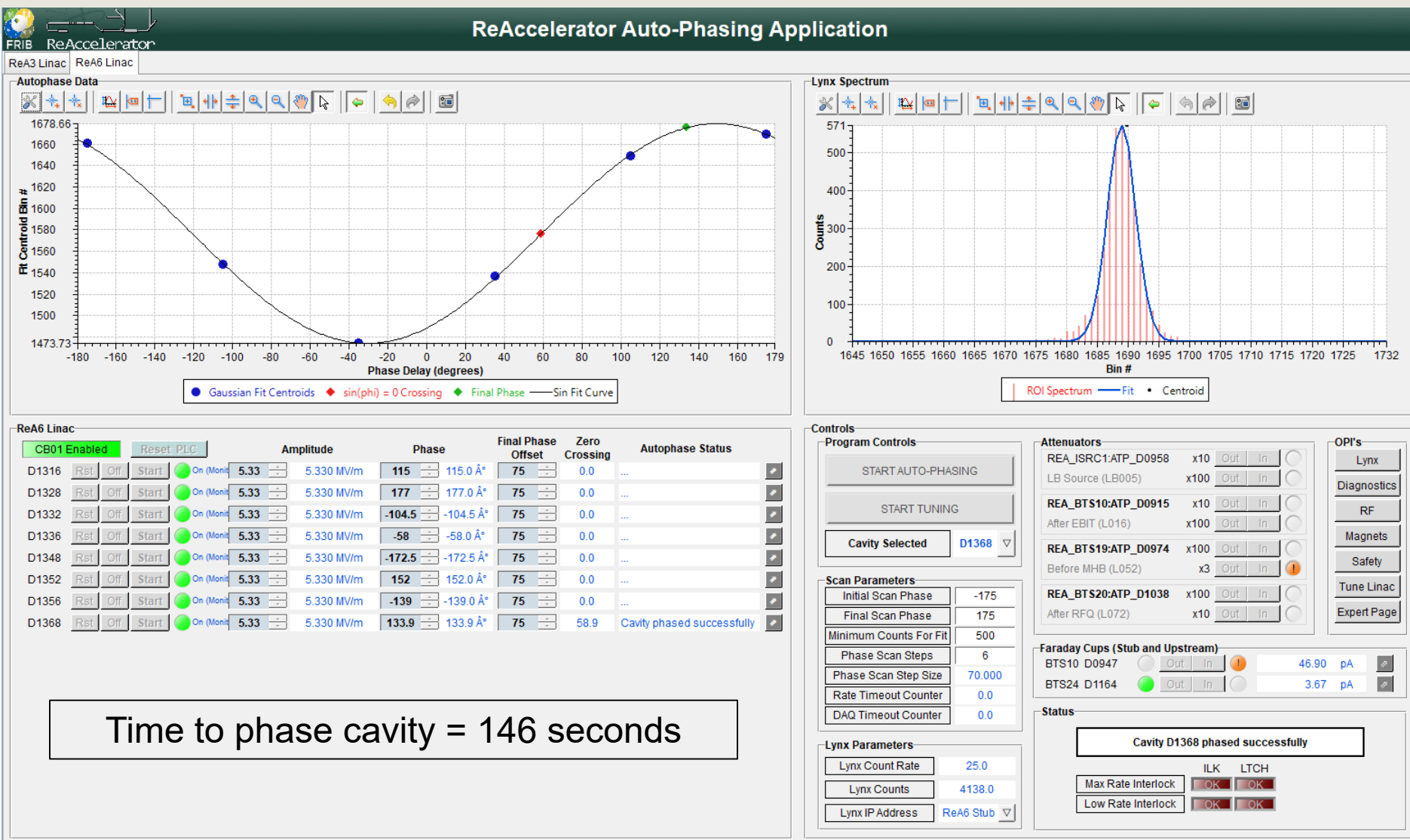


```

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    field(VAL, "0")
}
record(ao, "${PRE}_${SUB}:${DEV}_${LOC}:AP_SYNC_PHASE") {
    field(VAL, "${SYNC}")
}
record(stringin, "${PRE}_${SUB}:${DEV}_${LOC}:AP_STATUS"){
    field(VAL, "...")
}
    
```



Phasing Interface



Summary and Acknowledgements

- Automated the ReAccelerator phasing process
 - Sped up process

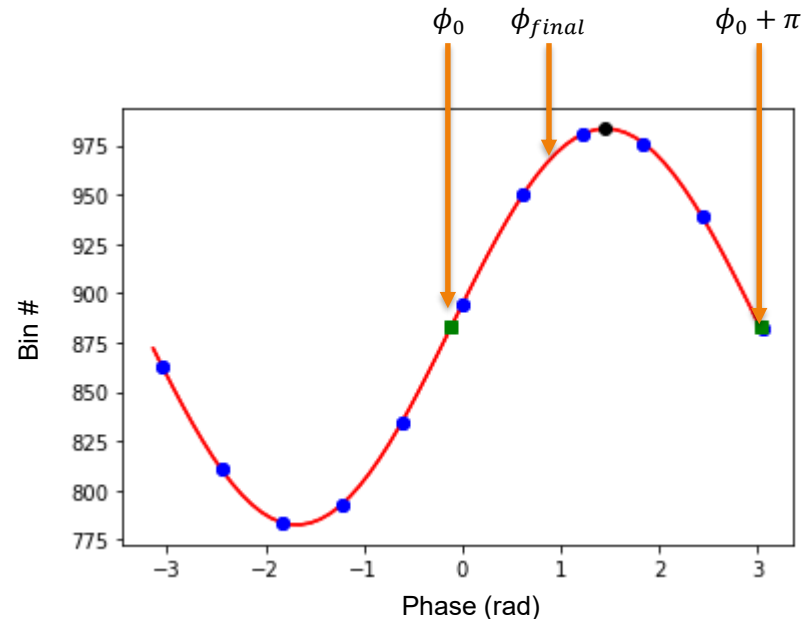
- Now a standard part of our beam preparation procedure

- Thanks to the generous help and support from:
 - National Science Foundation grant No. PHY-1565546
 - ReAccelerator Division
 - Human Machine Interface Development Group
 - Accelerator Physics Group
 - Accelerator Operations Department

Appendix: Phasing Procedure

■ Phasing procedure:

- Record beam energy with RF cavity off
- Turn cavity on, vary phase, record beam energy
- Find phase where beam energy is the same as with the cavity off
- Verify it's the correct zero crossing
- Add final phase offset



Appendix: Expanded Program Logic

