Thanks to:

Tobias H. B. Persson, Michi Hostettler, Andrea Calia,
Delphine Jacquet, Joschua W. Dilly, Ewen H. Maclean,...

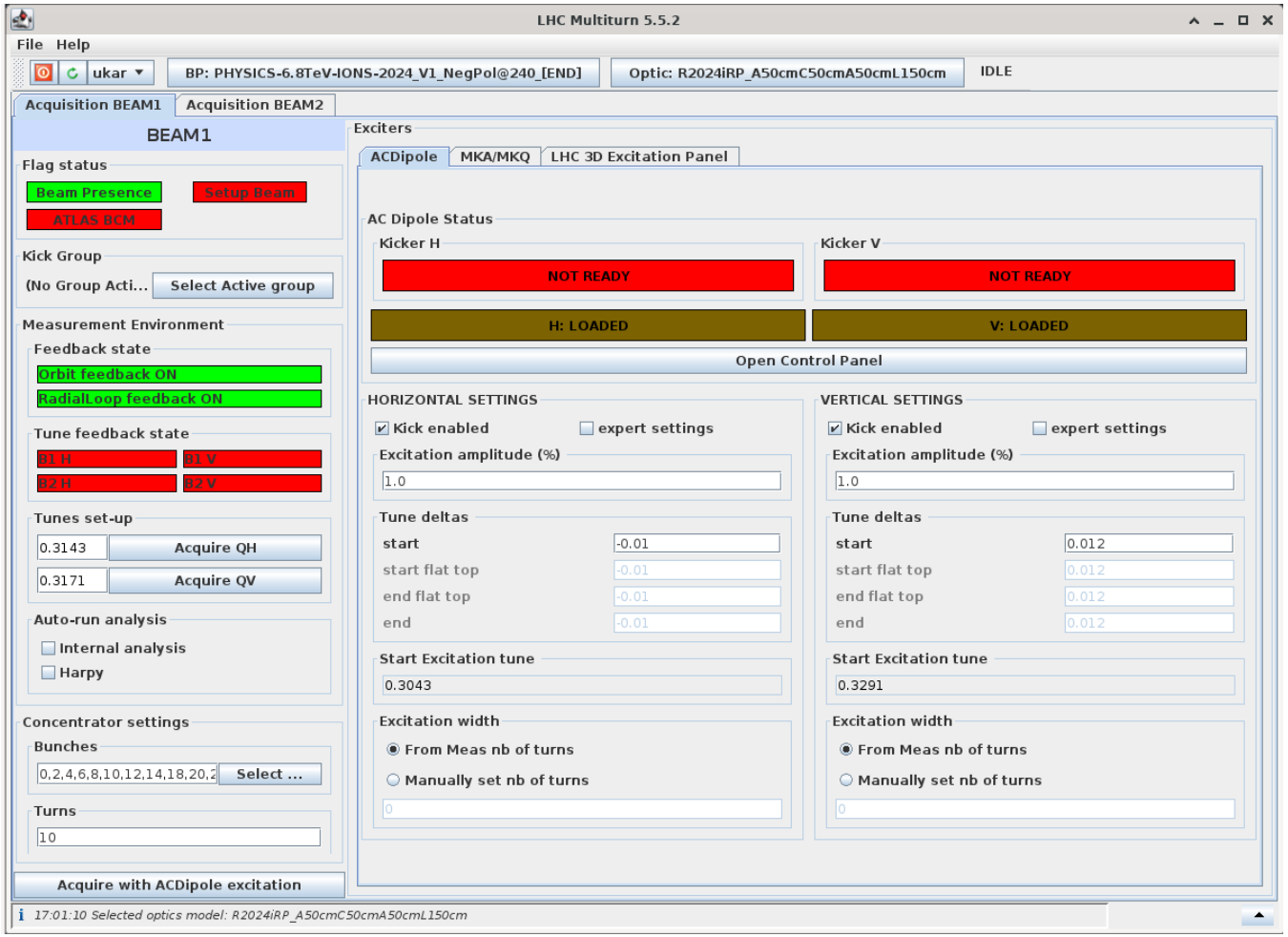
Automating Linear Optics Measurements

And Update for ADT AC Dipole in Multiturn

Ujani Kar

Outline

- **Part 1:**
  - **Updates in Multiturn – ADT AC Dipole**
- **Part 2:**
  - **Automate Optics Measurements - Multiturn**



I. ADT AC Dipole in Multiturn

Purpose

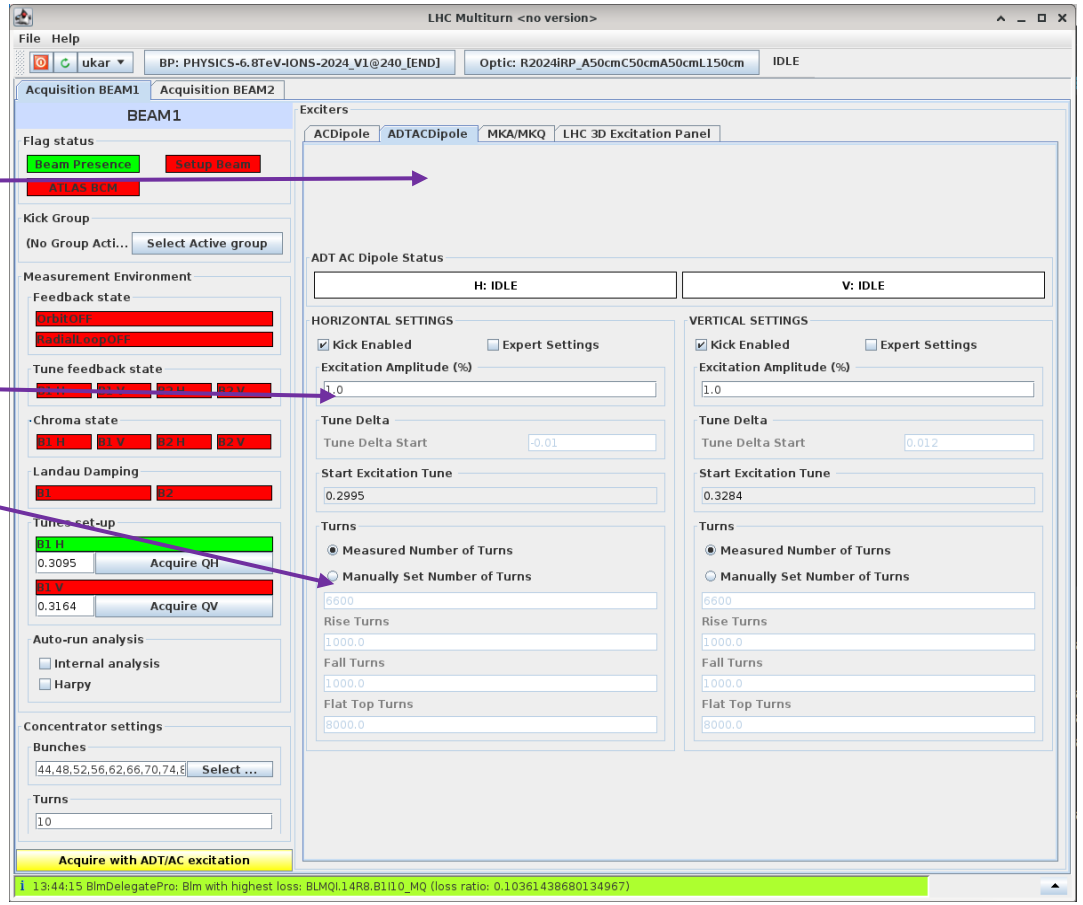
- Current measurements of ADT AC Dipole using the AccPit goes to Coupling Server, and overloads it.
- Putting the tab in the Multiturn directly writes the kick data to the OMC logbook. Easier to keep track of the data generated.

Adding the ADT AC Dipole Tab in Multiturn

ADT AC Dipole controls on the Multiturn, showing status and allowing controls

Required expert controls here: (Similar to AccPit)

- Excitation Amplitude
- Controlled number of turns for Rising, Falling and Flat top in the ADT AC Dipole instead of default settings.



II. Automating Linear Optics Measurements

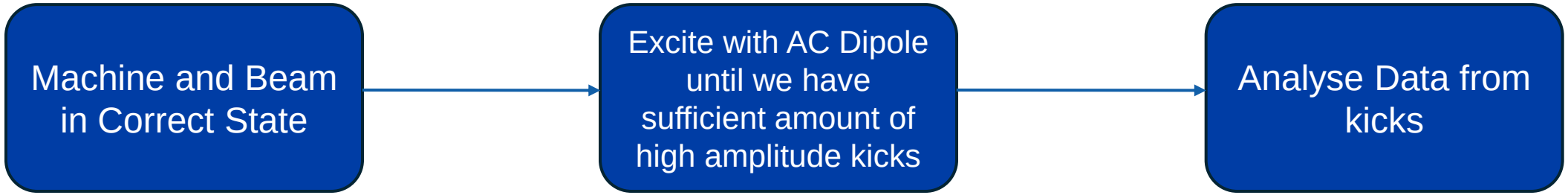
Objective:

To Automate Linear Optics Measurements in LHC

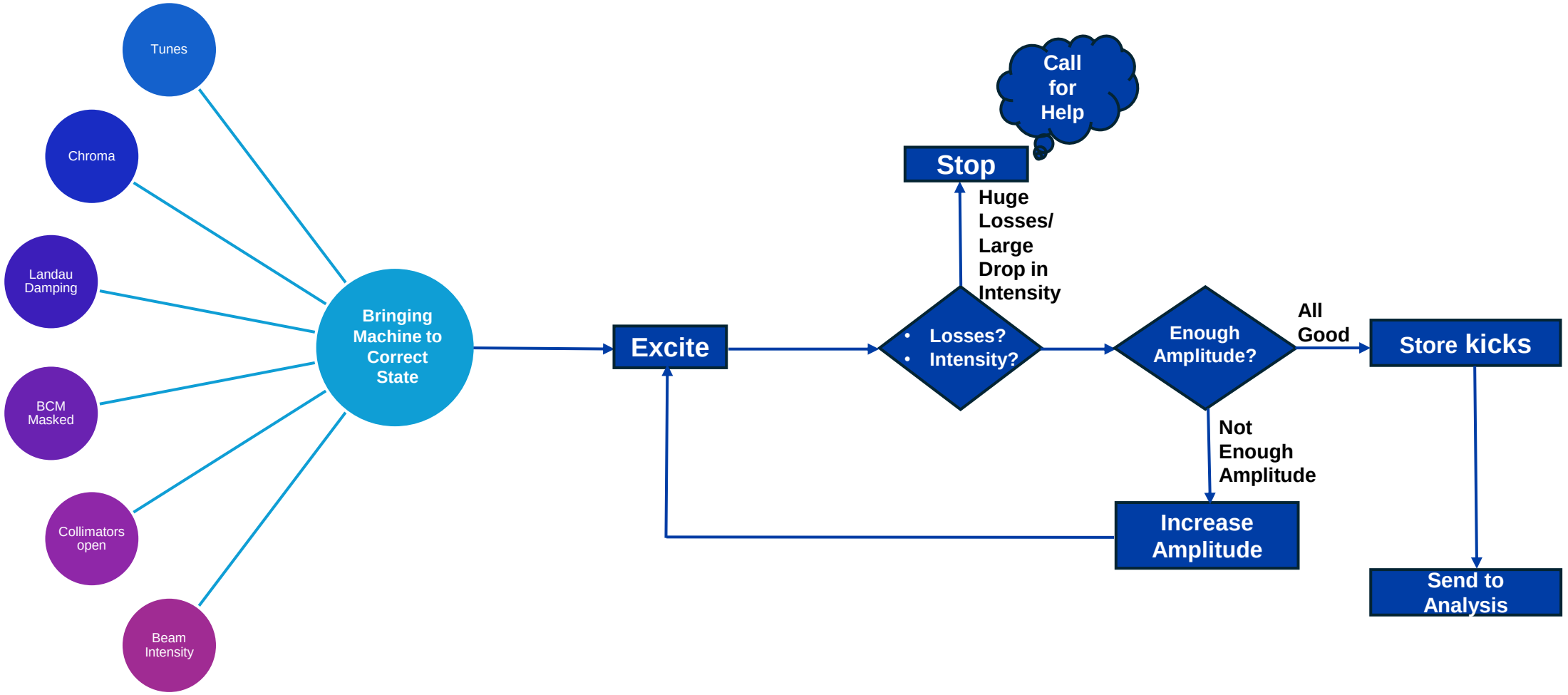
Motivation:

Make Linear Optics Measurements easier for non-experts, reducing the workload of experts.

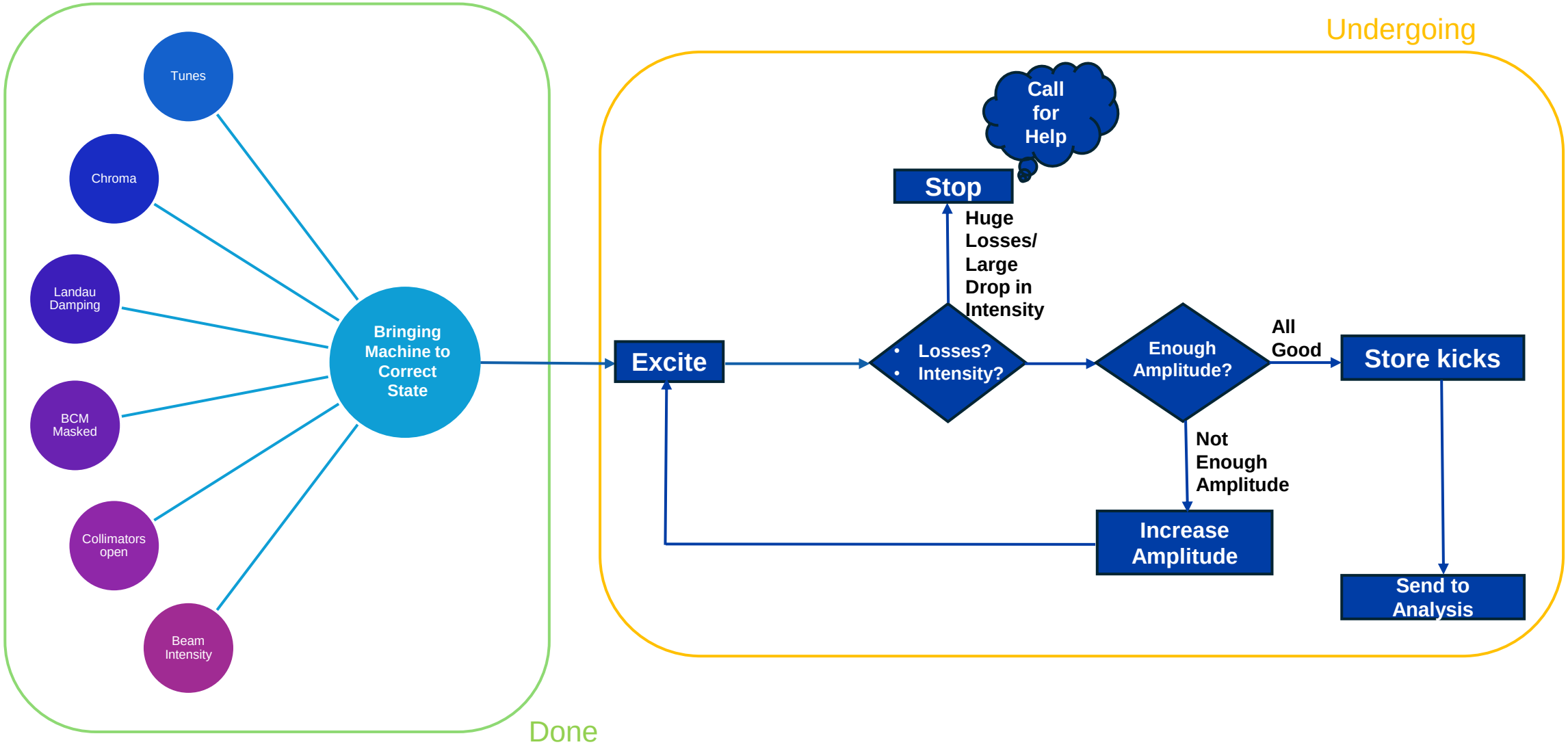
How Optics Measurements are done



Plan to Automate Optics Measurements – A Flow Chart

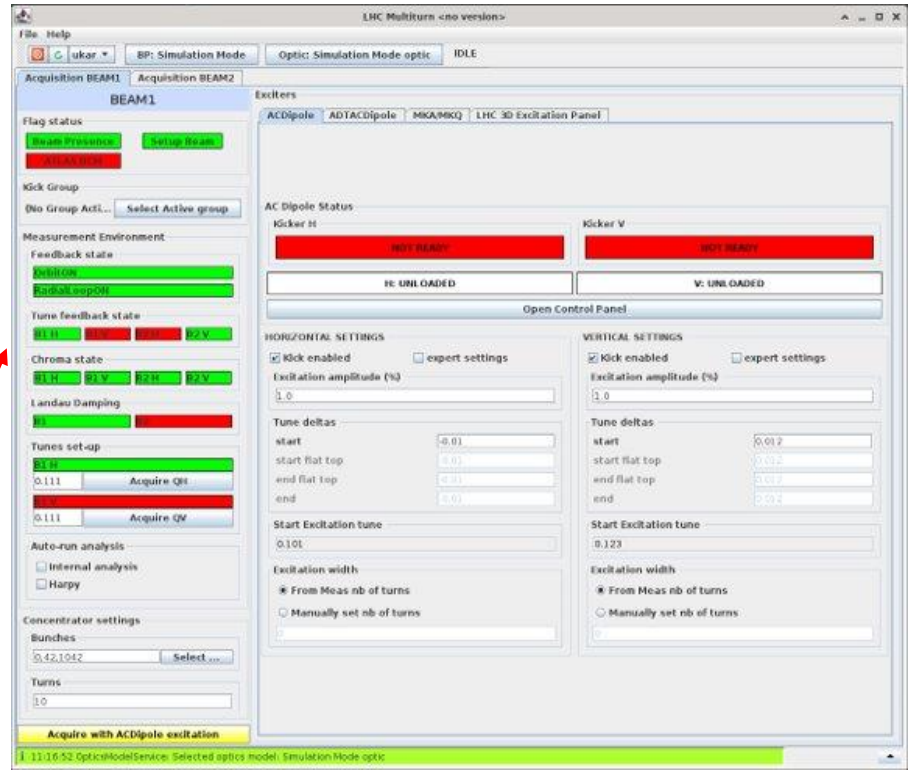


Plan to Automate Optics Measurements

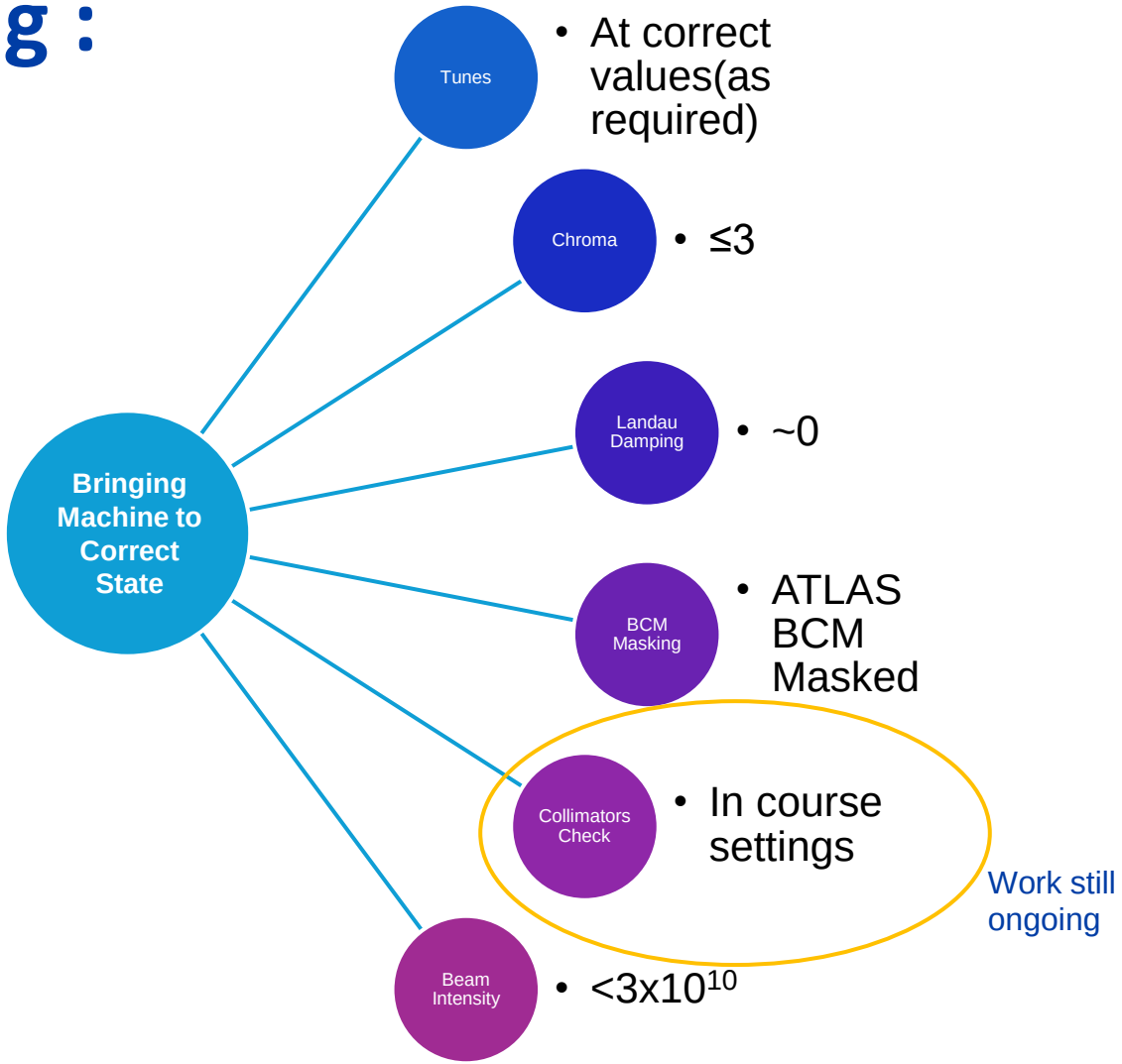


Step 1: Before Kicking/Exciting :

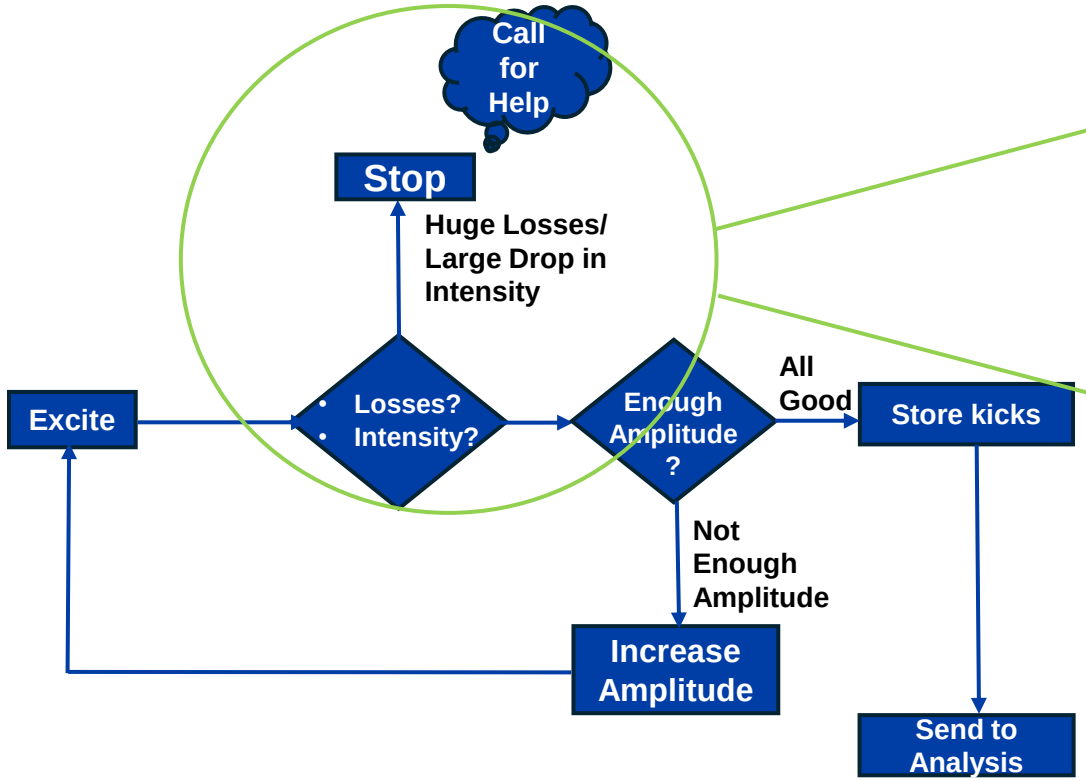
- Make all the manual checks semi-automatised.
- Check every time before kicking- individual steps



Status indicators for visual checks

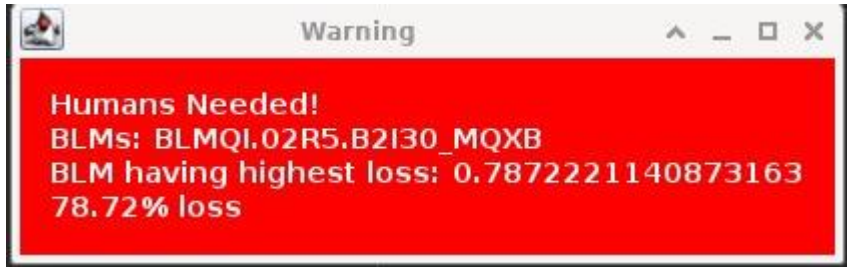


Step 2 : Condition Checks after each Kick

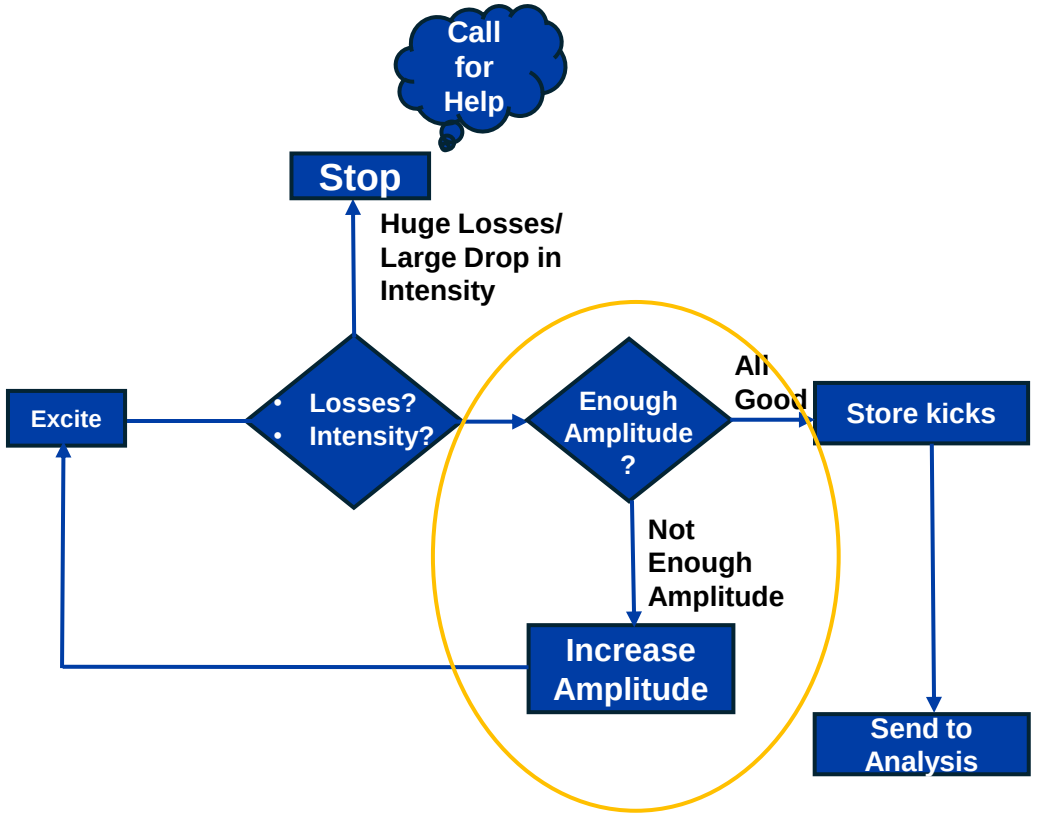


Requests for human help when out of set limits in BLMs or Intensity

Message boxes providing immediate updates on acquisition and control parameters.

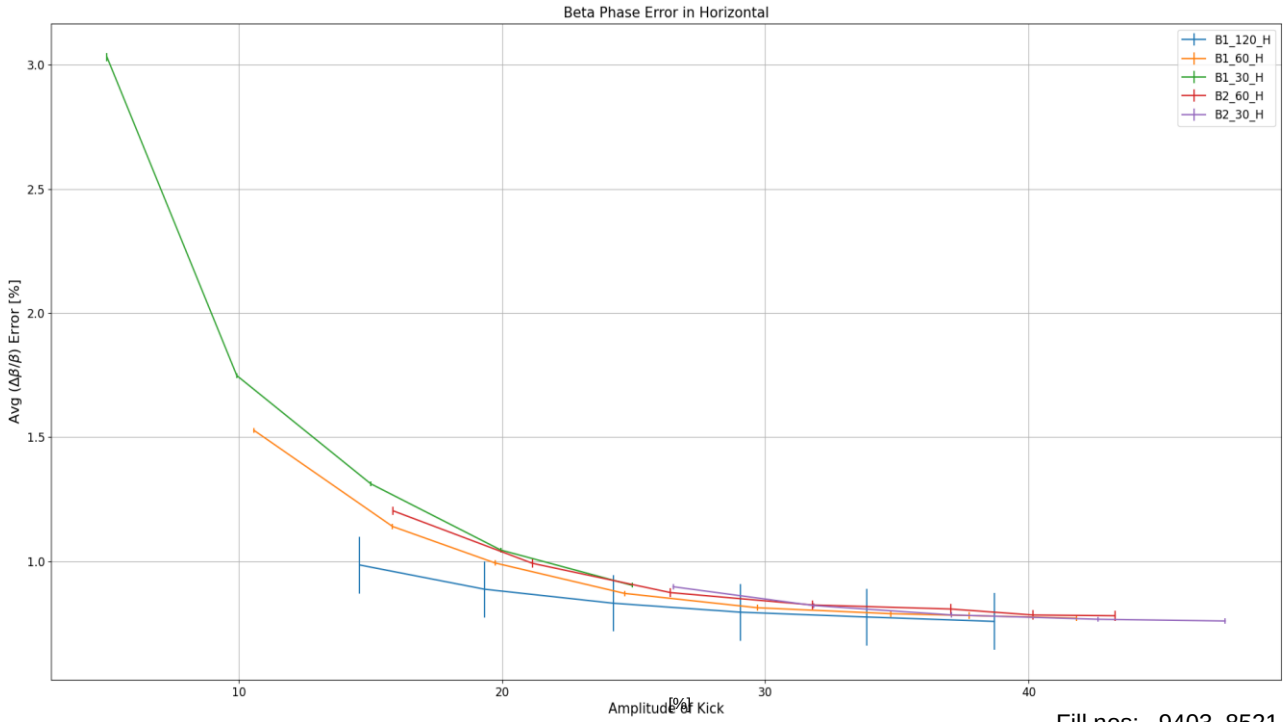


Step 3 : Excite based on Amplitude



[Only works if there are no major changes in the optics/beam set up, such as in 60 degrees]

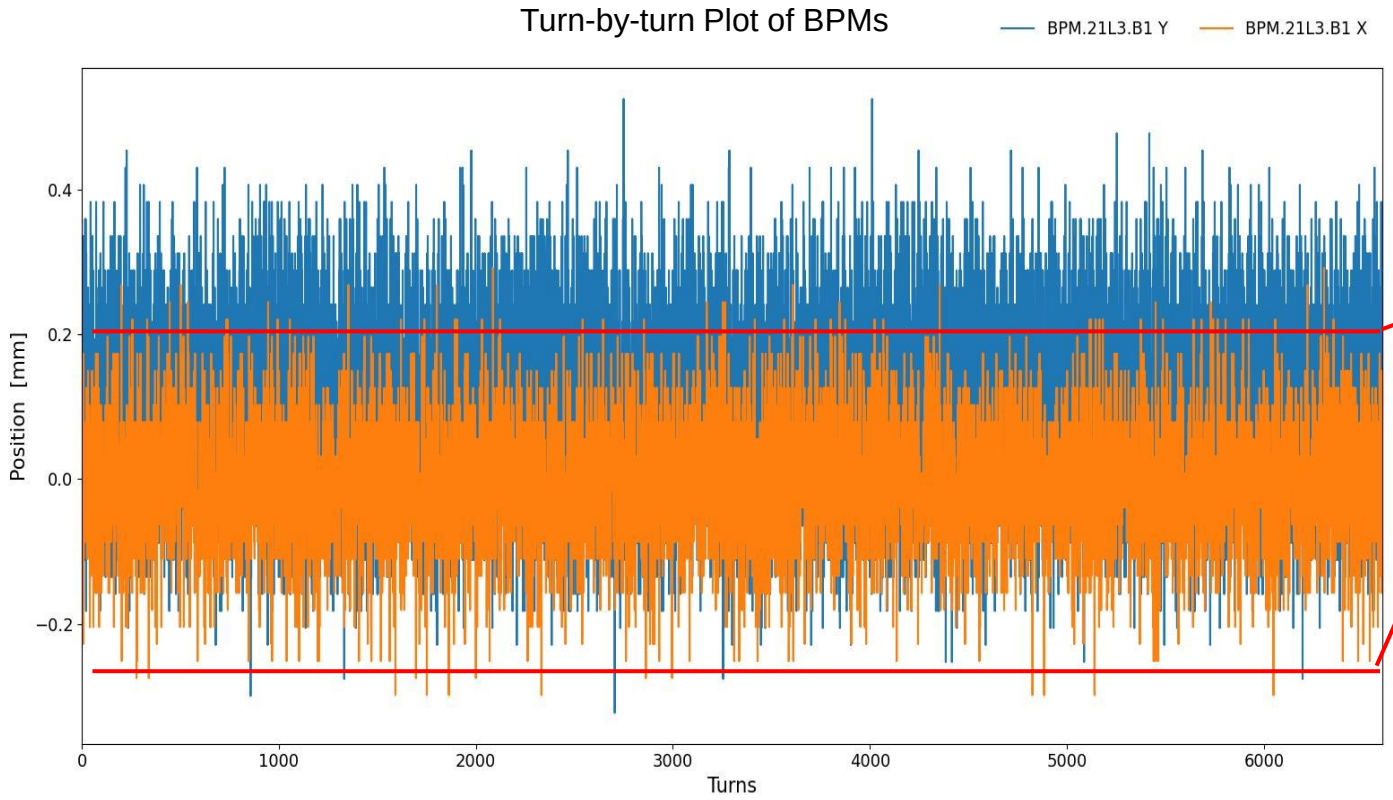
1. Analysis of Error in Beta Beat for Every Kick



Fill nos: 9403, 8521

- Betabeat analysed for different kick to find an acceptable level of errorbars in beta amplitude to get a good kick.
- Higher amplitude kicks -> Signal-to-noise ratio gets better

2. Conditional Kicking Based on Peak-to-Peak Amplitude

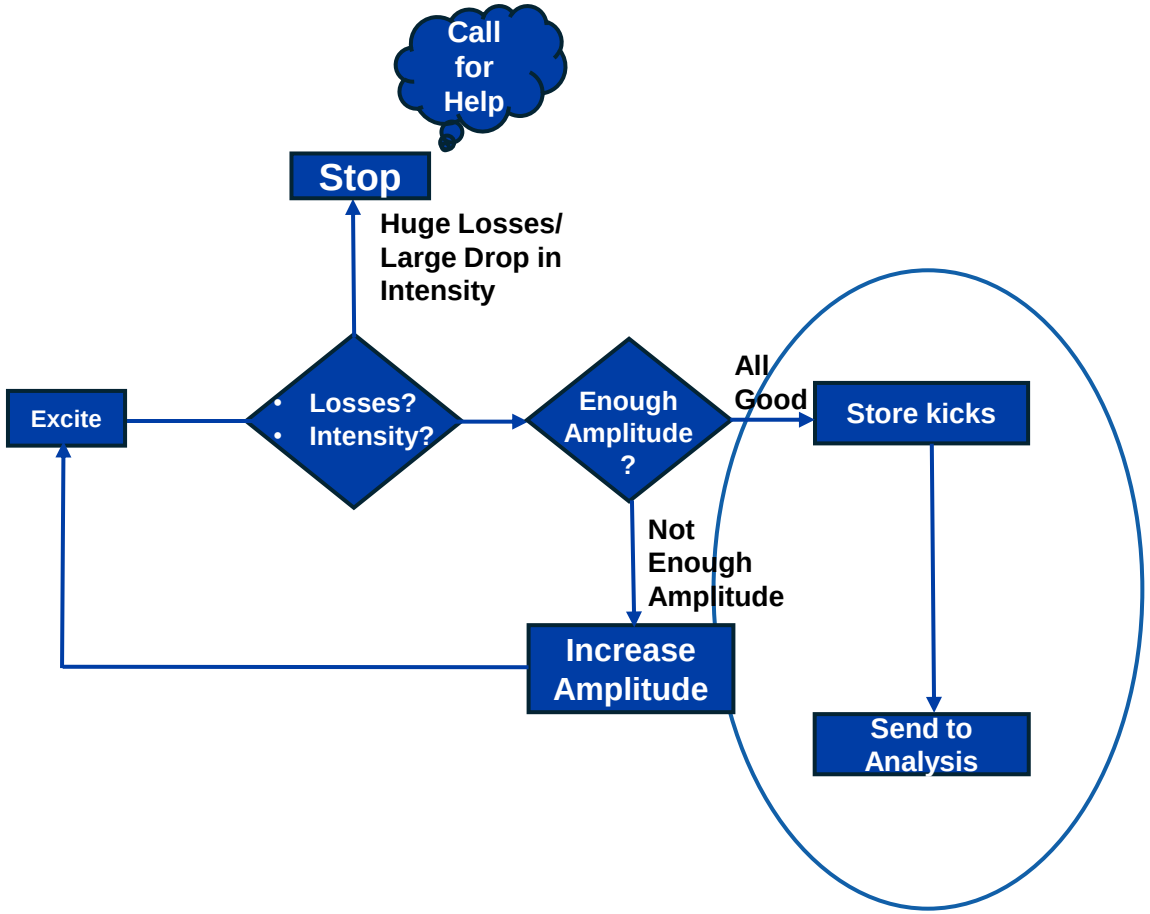


Peak-to-peak amplitude is computed for individual BPM in Non-ATS arc and checked.

[Non-ATS arcs as they stay constant]

- If the BPMs peak-to-peak is above ~2mm --> acceptable for the errorbars of betabeat --> Programmed exit.

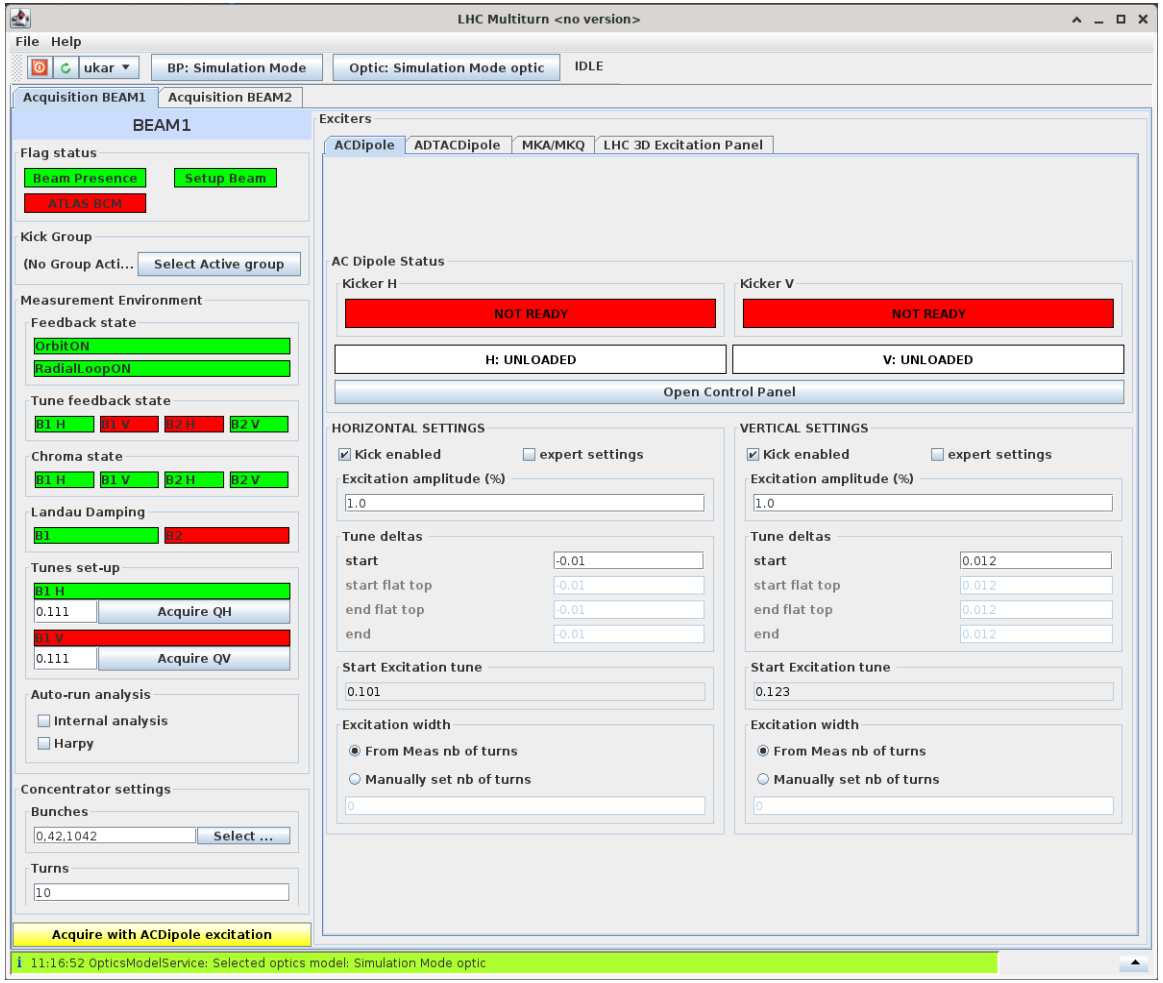
Step 4 : Store kicks, Send for Analysis



- Every good kick has to be stored and sent for analysis automatically.
- Analysis can be done in a very similar way as in a coupling server--> reusable.
- Next step in the direction of automating the Optics Measurements.

Conclusions

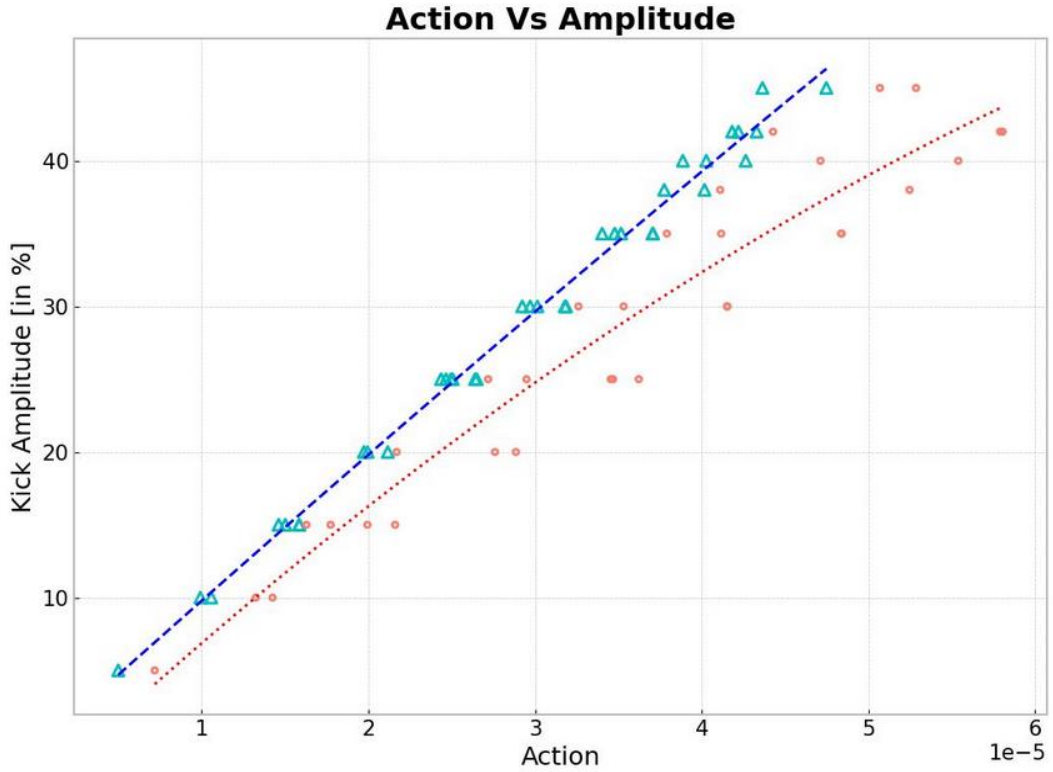
- **Done**: The precondition checks and ongoing checks during kicks
- **Undergoing**: The Analysis for the excitation amplitude and programming a higher kick or exit based on this analysis.
- **Future Prospect :** Integrating with Optics Measurement tools for a complete automated Optics Measurement in LHC.



Thank You

Extra Slides

Action Vs Amplitude(kick)



With Amplitude --> Model invariant (except for 60degs) --> Else we have to normalise and make a model of AC Dipole