Dechirper longitudinal phase space (LPS) measurements for beginners

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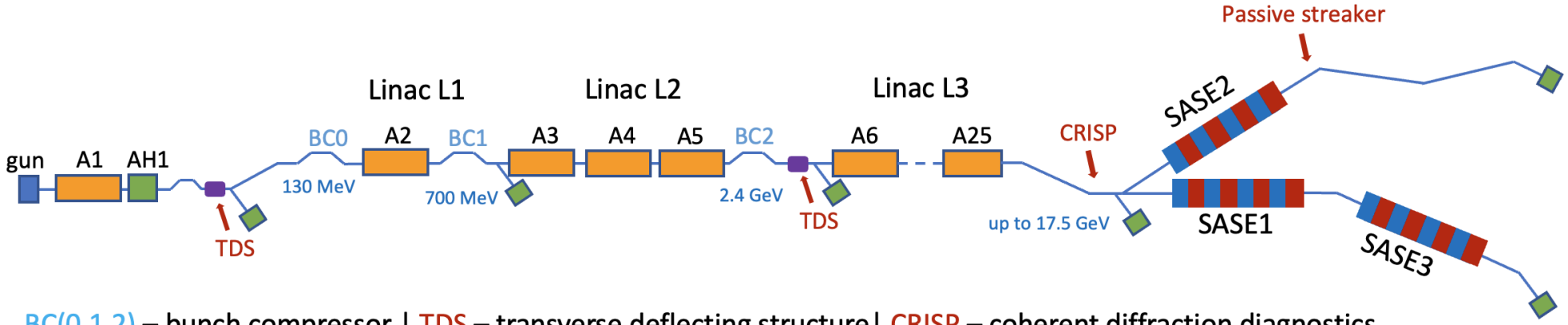
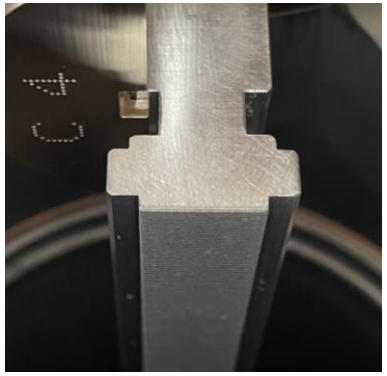
Disclaimer

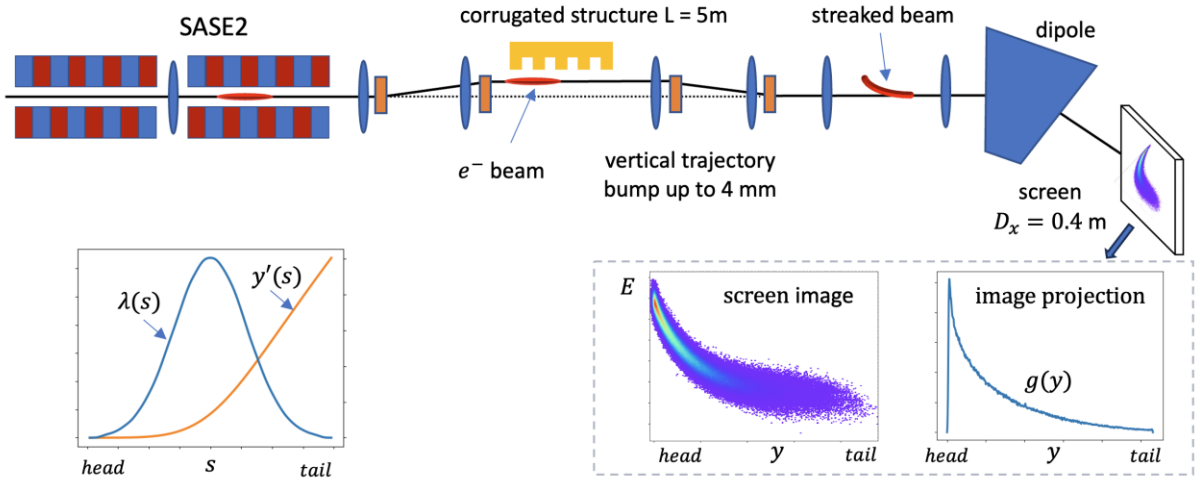
- LPS measurements with the post-SASE2 dechirper are easy to perform and relatively safe for the machine.
- **Always save the machine file before conducting measurements or making any changes to the machine. This is a good practice!**
- Minimize beam usage to reduce radiation load.
- Note: Passive streaker = dechirper = corrugated structure = wakefield structure = chirper.

Short introduction into passive streaker LPS measurement





BC(0,1,2) – bunch compressor | TDS – transverse deflecting structure| CRISP – coherent diffraction diagnostics

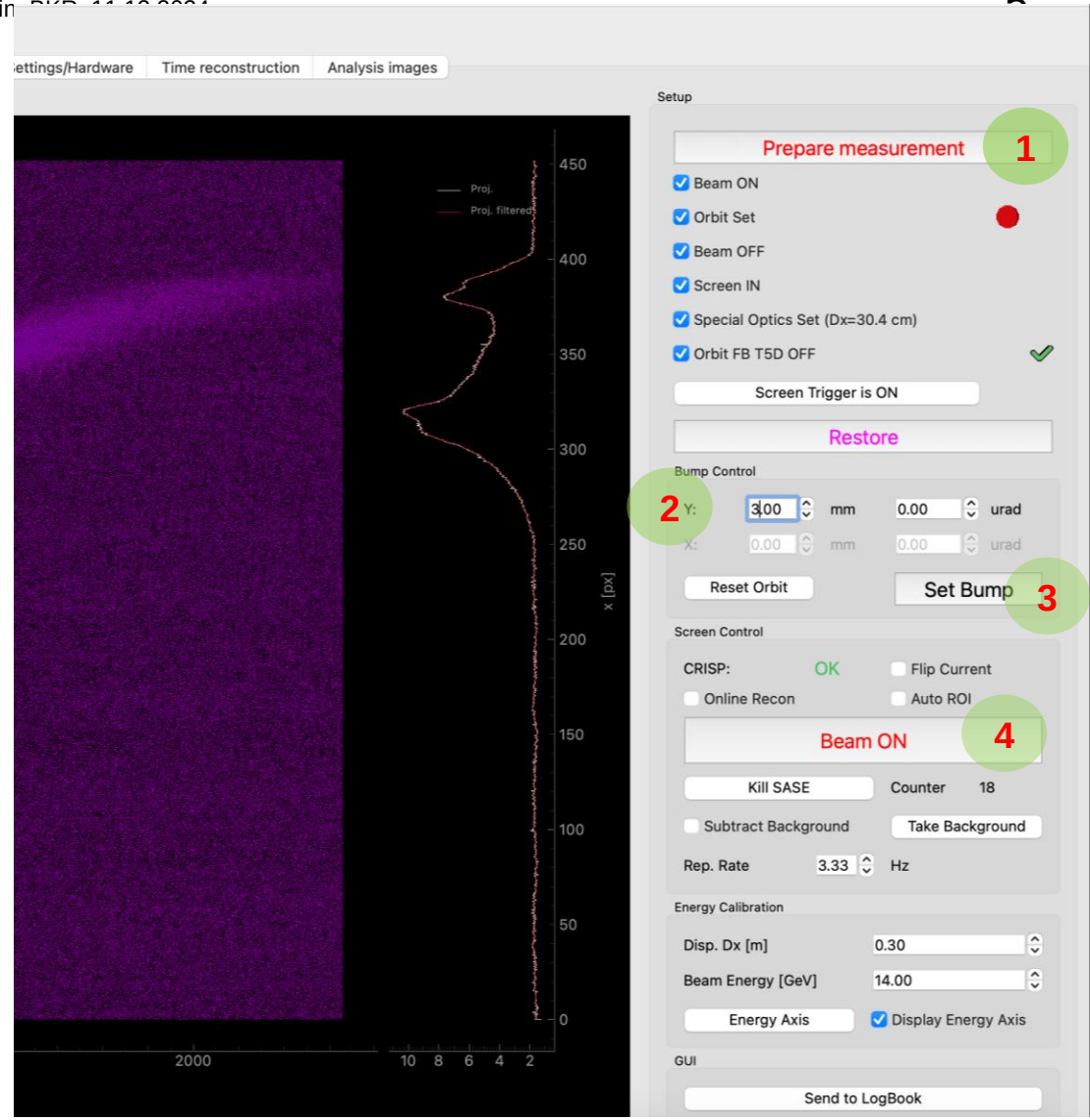


What systems/devices we change or can potentially change during usage of the dechirper tool. Or how to restore the machine manually

- **Correctors in the T3 section (after SA2) and the last air coils in SA2:** *These correctors are used to create a bump and adjust the beam to get a better spot on the screen*.
- **Quadrupoles in the T3 section:** *Beam optics are adjusted here.*
- **Screen OTRC.2560.T3** *Can be still in*
- **Corrector CFX.2154.T1** in front of SA2. We suppress SASE with this corrector
- **Orbit FBs SA2 and T5D** *can be switched off*
- **Number of bunches in SA2 branch.** *Likely to be set to 0.*
- **Bunch pattern –** restore 1 Hz operation
- **Only if measuring dispersion!** (not part of the standard procedure)
  - CL energy FB
  - A24 or A25 table/scalar mode and voltage

How to start measurements

- **Update CRISP**
- **Save machine file**
- **Set 1 bunch in SA2**
- **Open dechirper tool**
- **Click “Prepare measurements”**
  - *The tool adjusts the orbit, inserts and powers the screen, and applies special optics.*
  - *You might need to acknowledge that the orbit is not optimal and the screen is not yet powered (this may require a bit more time).*
- **Using the bunch pattern builder, set 3 Hz in the SA2 branch.**
- **Click “Beam ON” button. You should see unstreak beam**
- **Adjust bump amplitude. 2 mm is good starting point. Around 3 mm is our usual bump amplitude**
- **Done!**



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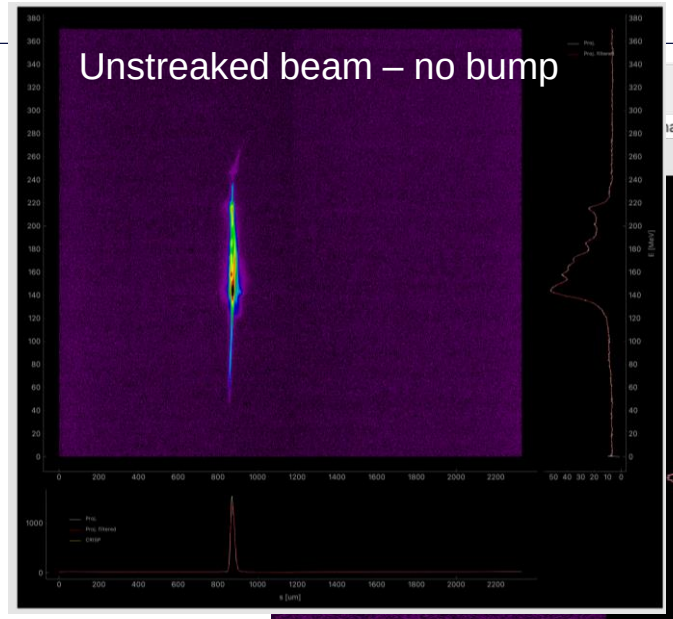
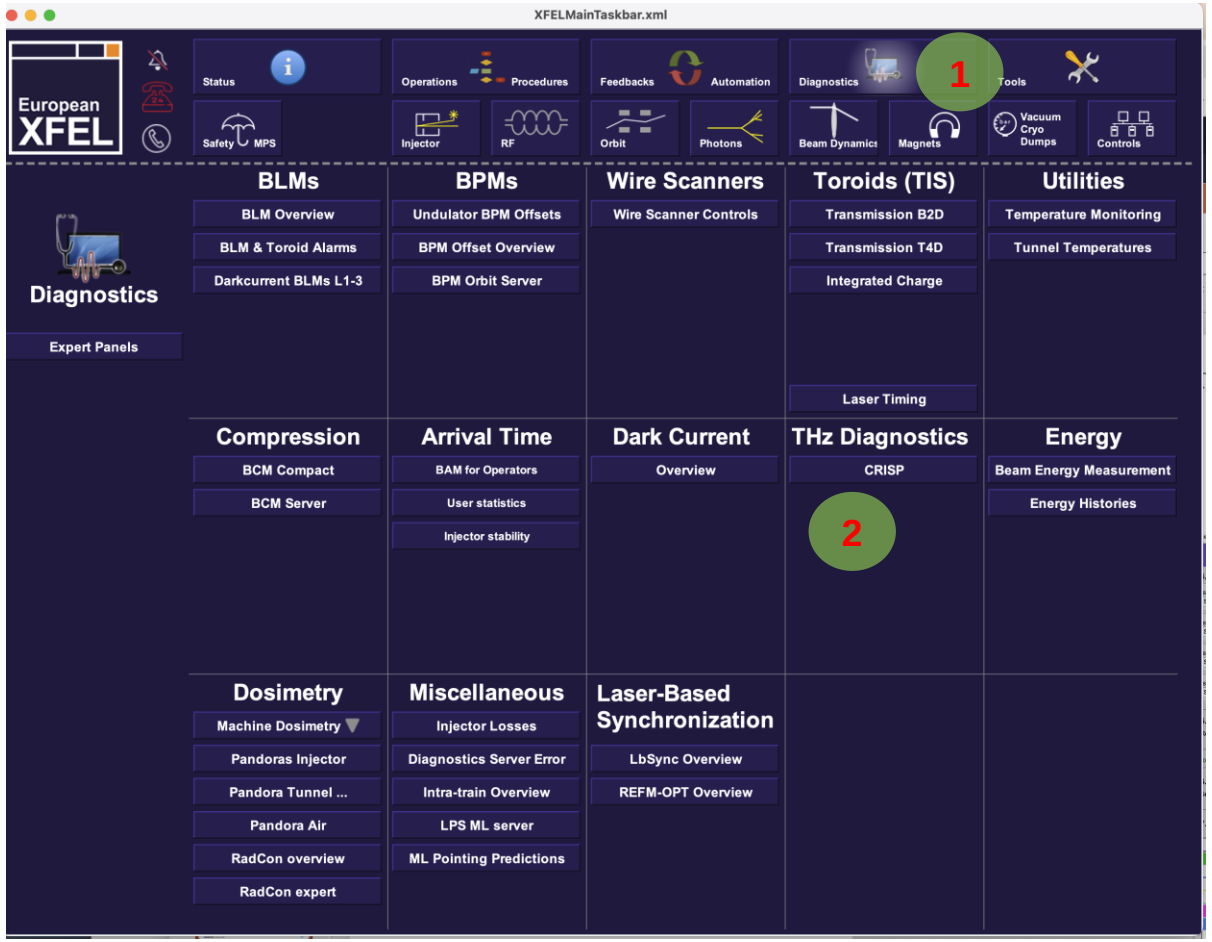
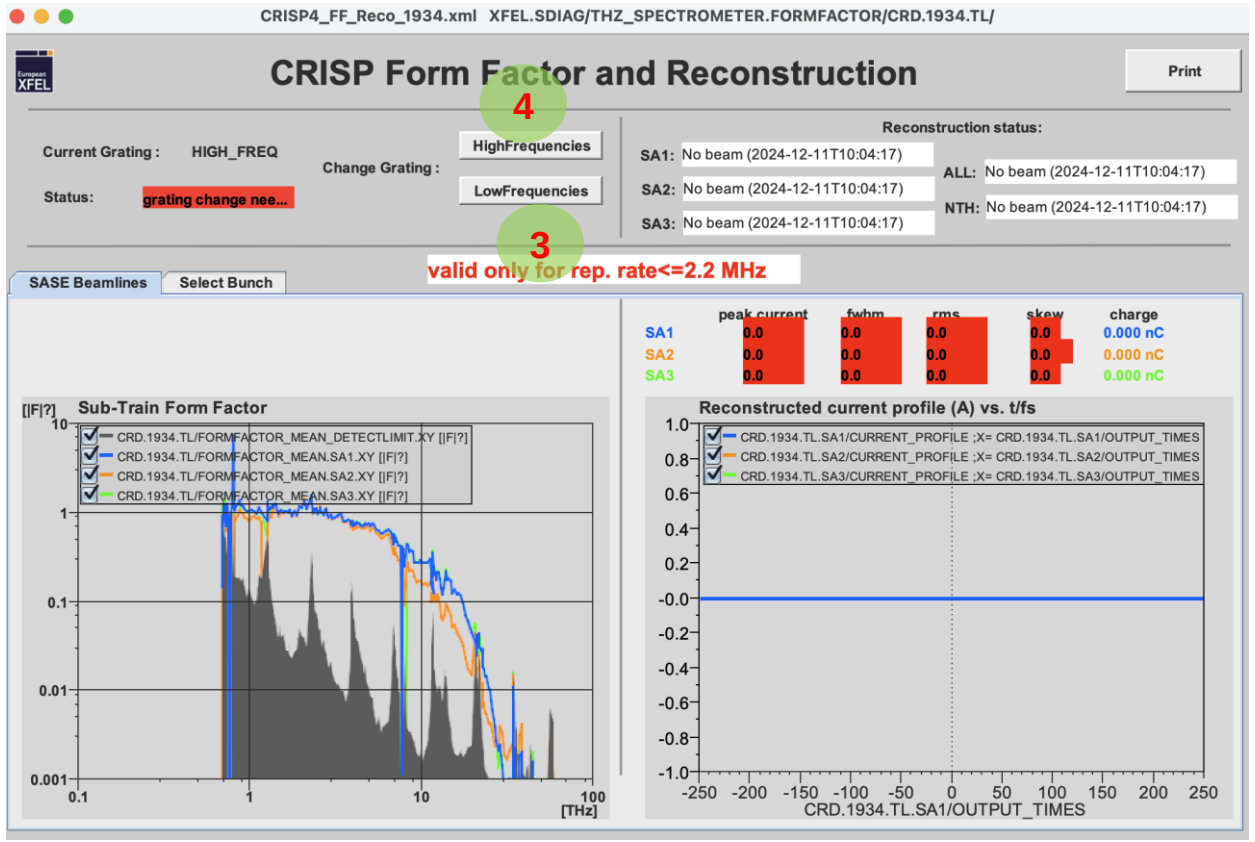


Need more details?

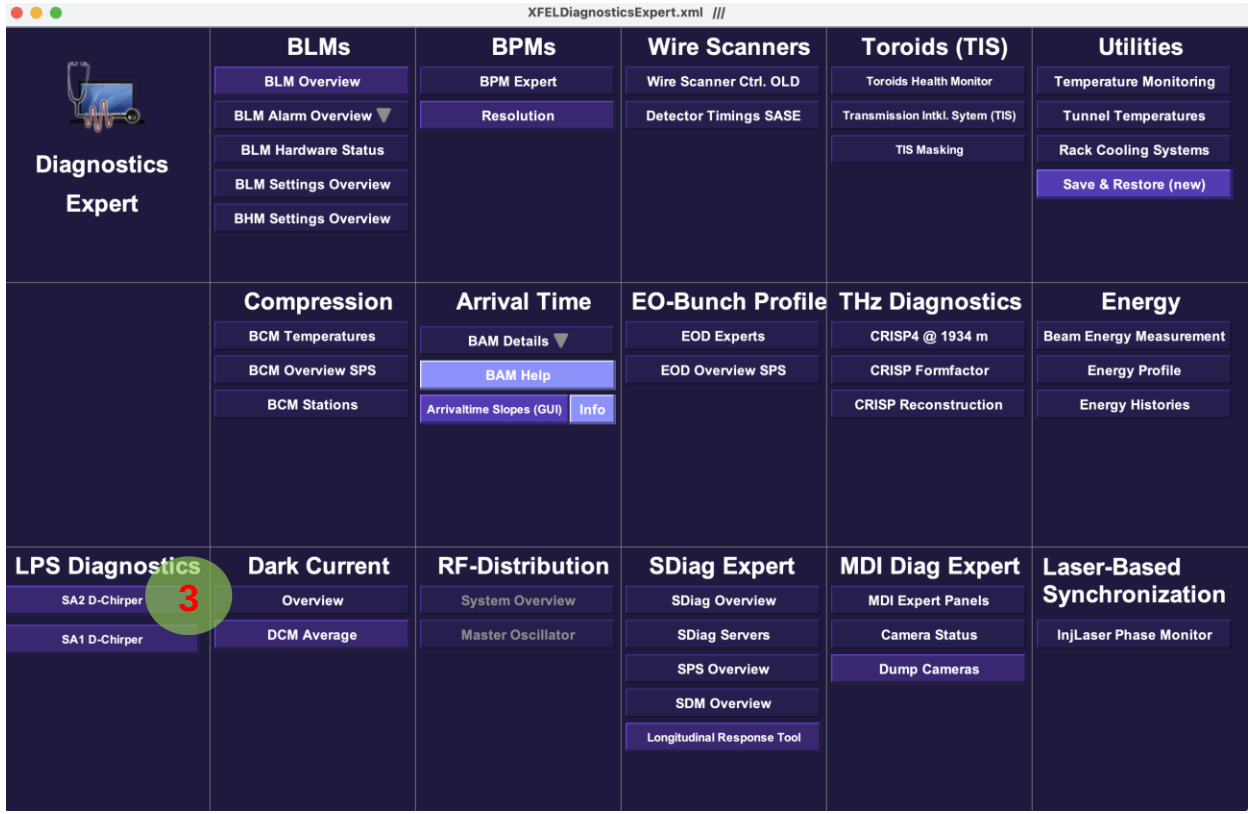
How to update CRISP





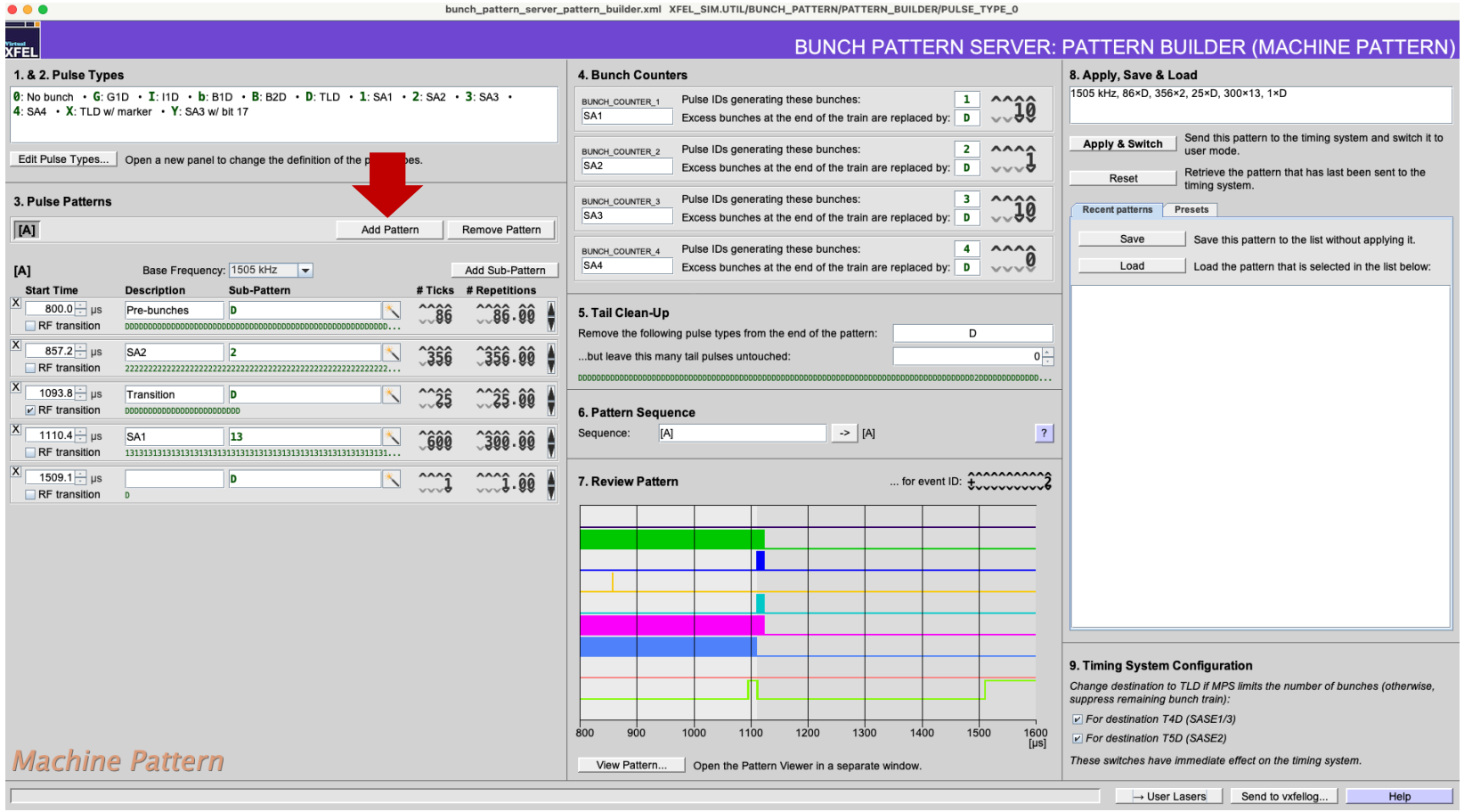
- Press Low Frequencies and wait
  - Current Grating: LOW_FREQ
- Press High Frequencies and wait
  - Current Grating: HIGH_FREQ
- Whole procedure will take about couple of minutes

How to open Dechirper tool



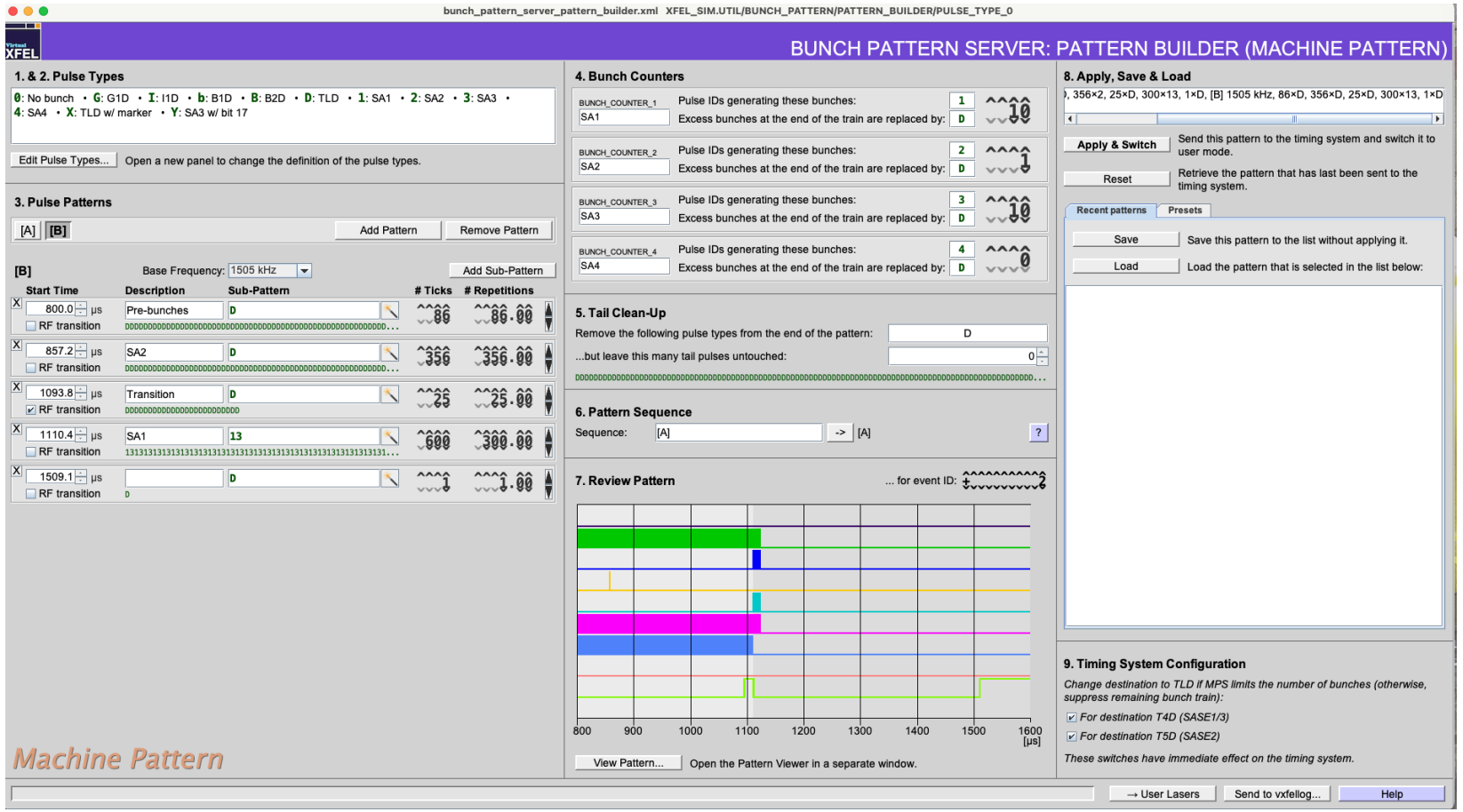
How to make 3 Hz

- Set 1 bunch in SA2 brunch
- Open bunch pattern builder
- Press Add Pattern



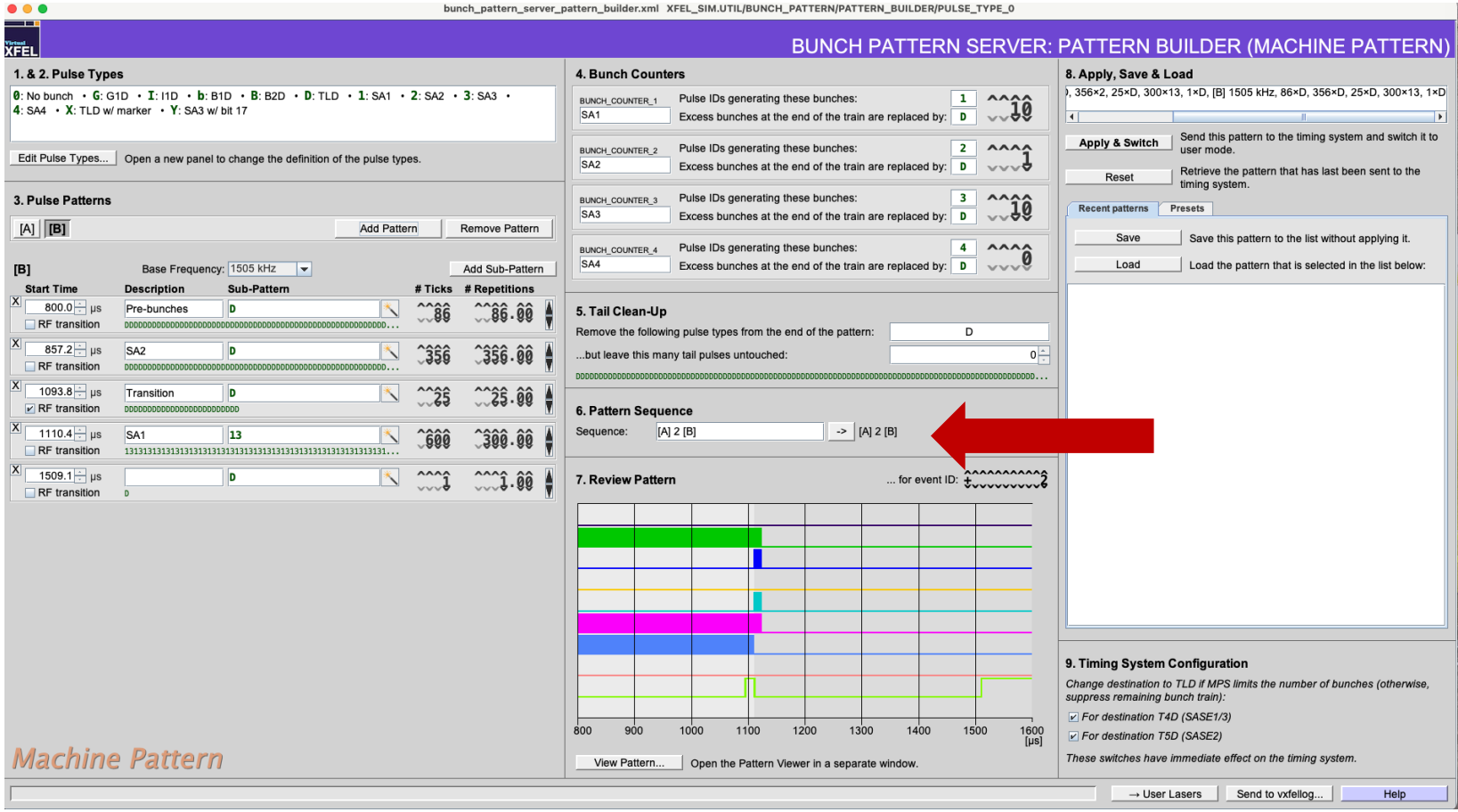
How to make 3 Hz

- **Set 1 bunch in SA2 brunch**
- **Open bunch pattern builder**
- **Add pattern**
- **In B Pattern set D** instead of **2**



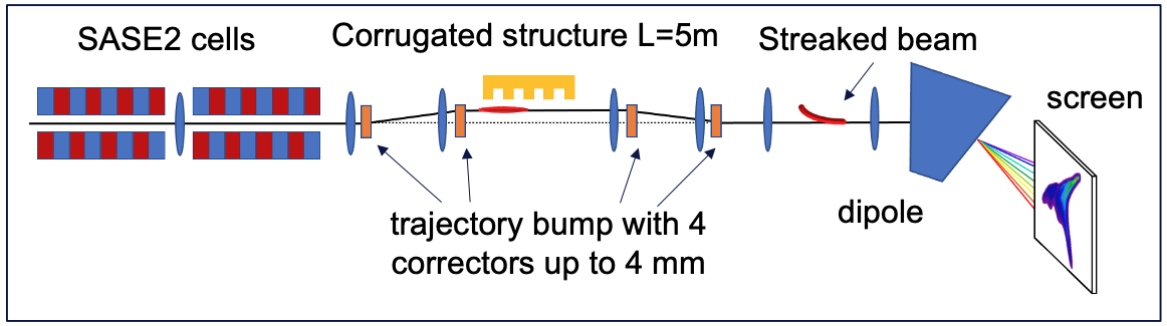
How to make 3 Hz

- **Set 1 bunch in SA2 brunch**
- **Open bunch pattern builder**
- **Add pattern**
- **In B Pattern set D** instead of **2**
- **Set new Pattern Sequence [A] 2 [B]**
- **Apply & Switch**



Passive streaker tool improvements

- Online reconstruction. Video from BKR



Video from BKR