Threaders

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- Threading @ LEP
- "LHC Threader" tests @ LEP
- Conclusion

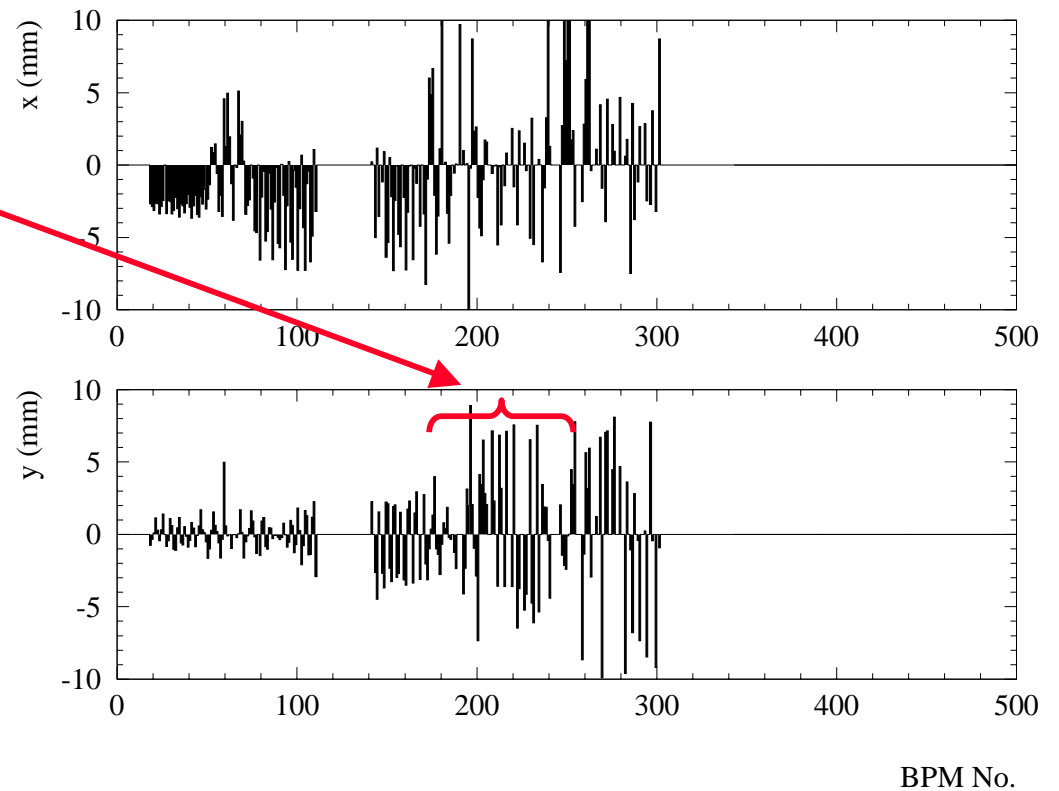# Threading @ LEP

A partially threaded LEP first turn….

Standard threading :

- Select a region for correction
- Correct with 1-2 correctors using a least-square algorithm like MICADO.

Iterate, iterate…

Threading @ LEP

Some facts on threading @ LEP (last LEP years) :

- It took ~30-45 minutes to get a first turn.

- From first turn to closed orbit :
    - improve first turn steering until you get a few turns.
    - get a first estimate of closed orbit from those few turns
        (closing second turn on first rarely (never ?) used).
    - work on this first closed orbit…switch on RF…

- Used ~ twice per year (1 x physics, 1 x polarization optics).

- Little interest to make threading fully automatic :

    ⇒ Effort to write and test such a procedure >> gain of time in PCR.

"LHC Threader"

The **"LHC threader"** was written by H. Grote for MAD. Principle :

• Scan first turn for two BPMs where beam position > given cutoff.
• Flatten the position @ the BPMs using 2 upstream orbit correctors.
• Iterate…

Very effective when there is a "brick wall" where the beam is lost over a small region with a few BPMs, but also very sensitive to bad BPMs !

➢ **First test at LEP** (H. Grote, G. Roy,… ~ 1998) :
  • "heavy" procedure : orbit data had to be exported to MAD and corrections computed by MAD had to be re-imported into the LEP orbit program. Made life difficult !
  • Unable to get beyond a small fraction of the ring.
  • Correction did not "converge" – thrown back by bad BPMs..

"LHC Threader"

➤ **Second test** (2000) :

• LHC threader was implemented inside the LEP orbit application.
• It was possible to thread the beam, but the threader had to be instructed manually which BPMs to use.
  → very time consuming procedure, which required much more effort than the standard threader. It only worked somehow thanks to the very flexible LEP orbit application.

Thread-buster

BPM No.
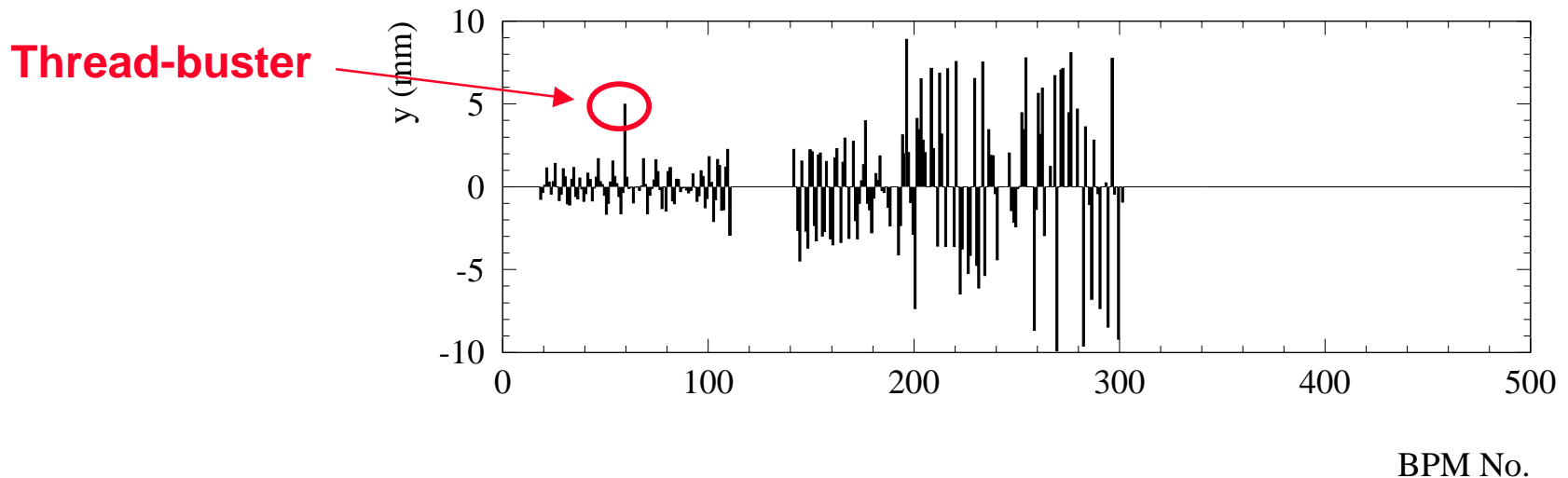
My wish for LHC commissioning

- We need a powerful orbit application similar to what we had at LEP during the last years (and have at the SPS). So far I was planning to provide an upgraded and renovated application including all (and more) LEP/SPS goodies…

- We should have both threaders available (or even others…).

- I doubt that during commissioning a fully automated procedure will work since we will potentially hit :
  - bad BPMs.
  - BPMs with wrong cabling (inverted planes, signs).
  - orbit correctors with wrong polarity.
  - BPM signals spoiled by losses ?
  - …

Lots of automatic thread busters !