ADT AC-Dipole mode
Verification of kick strength and excitation speed
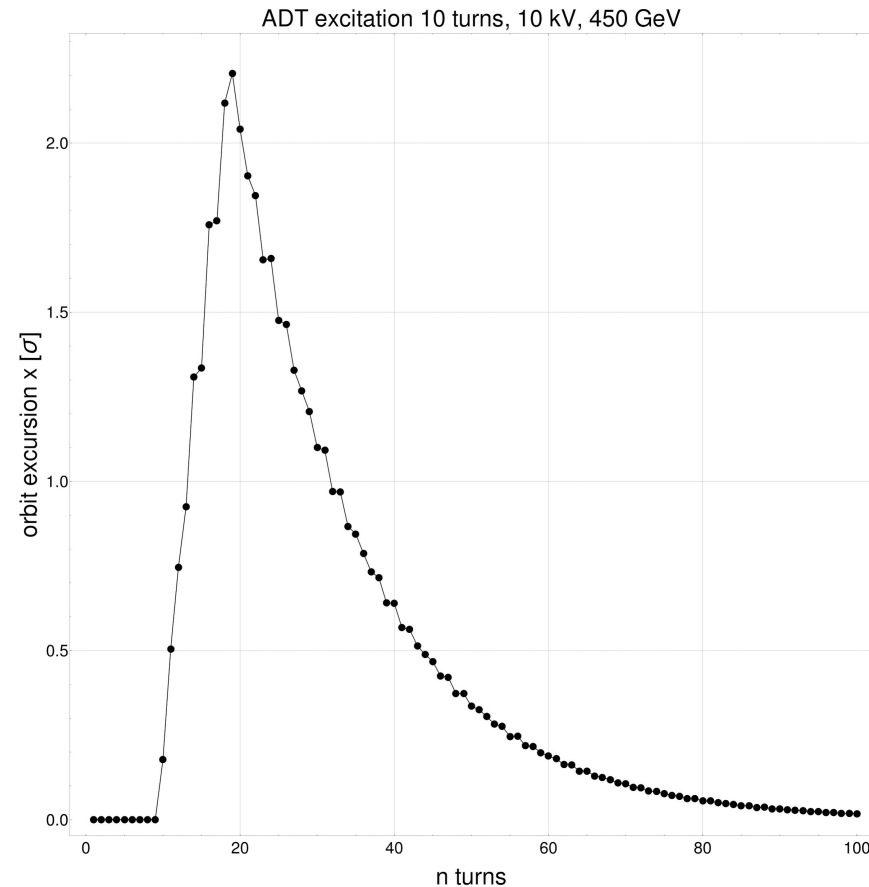
Björn Lindström (TE-MPE-PE)

146th MPP – 28th April 2017

Motivation

- **ADTs** are strong **transversally** acting elements - new **AC-Dipole mode** allows **coherent excitation**
  - To be used during standard operation with high intensity beam
    - Verification of kick + excitation speed for allowed settings

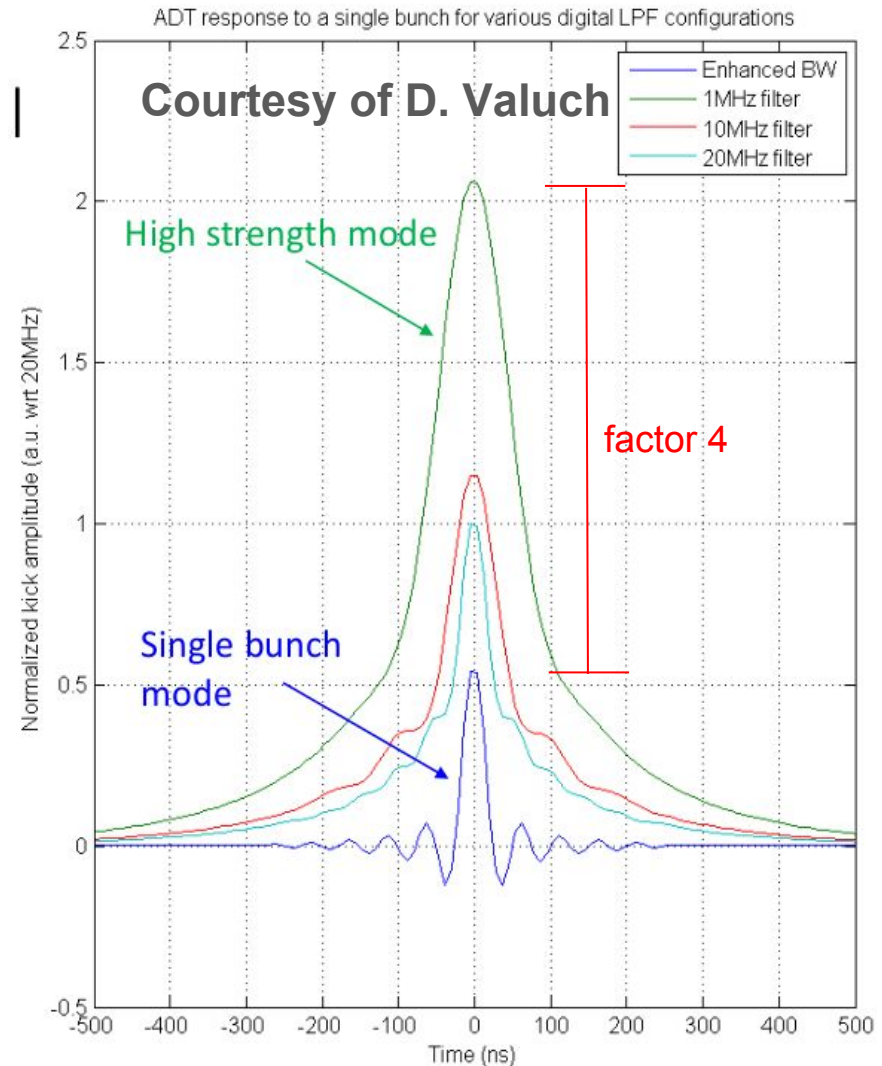 - Expected max kick **~2.5 μrad @ 450 GeV**
    ~0.2 μrad @ 6500 GeV

ADT excitation 10 turns, 10 kV, 450 GeV

Parameters

- Main parameters:
  - Voltage, Excitation length, Bandwidth, Number of bunches

Courtesy of D. Valuch

ADT response to a single bunch for various digital LPF configurations

Enhanced BW
1MHz filter
10MHz filter
20MHz filter

High strength mode

factor 4

Single bunch mode

Goals

- **MD Goals:**
  - Verification of the limits for the **ADT AC-Dipole** settings (voltage/bandwidth, excitation windows, …)
    - User parameters
    - Expert parameters
  - Benchmarking of the MAD-X simulation model (by B.Lindstrom) and the kick estimator (by D.Valuch)

- **Required observables:**
  - BPMs (ADT - Obs box) for bunch-by-bunch orbit excursion and tune
  - BCTs for bunch-by-bunch intensity
  - Bunch-by-bunch emittance, before and after each separate excitation
  - ADT settings and actual voltage (from estimator)
  - BLMs in IR7 (including diamond BLMs for turn-by-turn losses)

- **Masks:**
  - BPMS IP6
  - SIS orbit interlock
  - BLMs

Measurements Proposal

- **Only pilot bunches**

Energy [GeV]	Bandwidth	Voltage [kV]	Excitation length (turns)	# of repetitions	Comments
450	Low	1	10	2	Re-excite used bunch after a minutes
	High	3	10	2	
			30	2	
	Low	3	10	2	
			30	2	
	Low	1	200	2	
	High	10.5	10	2	
	Low	10.5	10	2	
			Total bunches	16	
			Total measurements	32	

Energy [GeV]	Bandwidth	Voltage [kV]	Excitation length (turns)	# of repetitions	Comments
6500	Low	2	10	2	Re-excite used bunch after a few minutes
	High	10.5	10	2	
			30	2	
	Low	10.5	10	2	
			30	2	
	Low	2	300	2	
			Total bunches	12	
			Total measurements	24	

Follow up tests:
- Excitation of nominal bunches
- In case two different pilots do not show coherent response to excitation, do more for statistics

Thank you for Listening!

Equilibrium between excitation and damping

Damping is still active during excitation, giving a max orbit excursion per set voltage

ADT excitation – damping equilibrium – 1 kV, 450 GeV