Beam Diagnostic case study : HEBT

Antoine BEAUDOUIN, Arnaud CIEPLAK, Lisa Beate DINGELDEIN, Florent HERVY, Tomas Albert PASTOR JURO, Vincent PRUY, Jason ROMAIN

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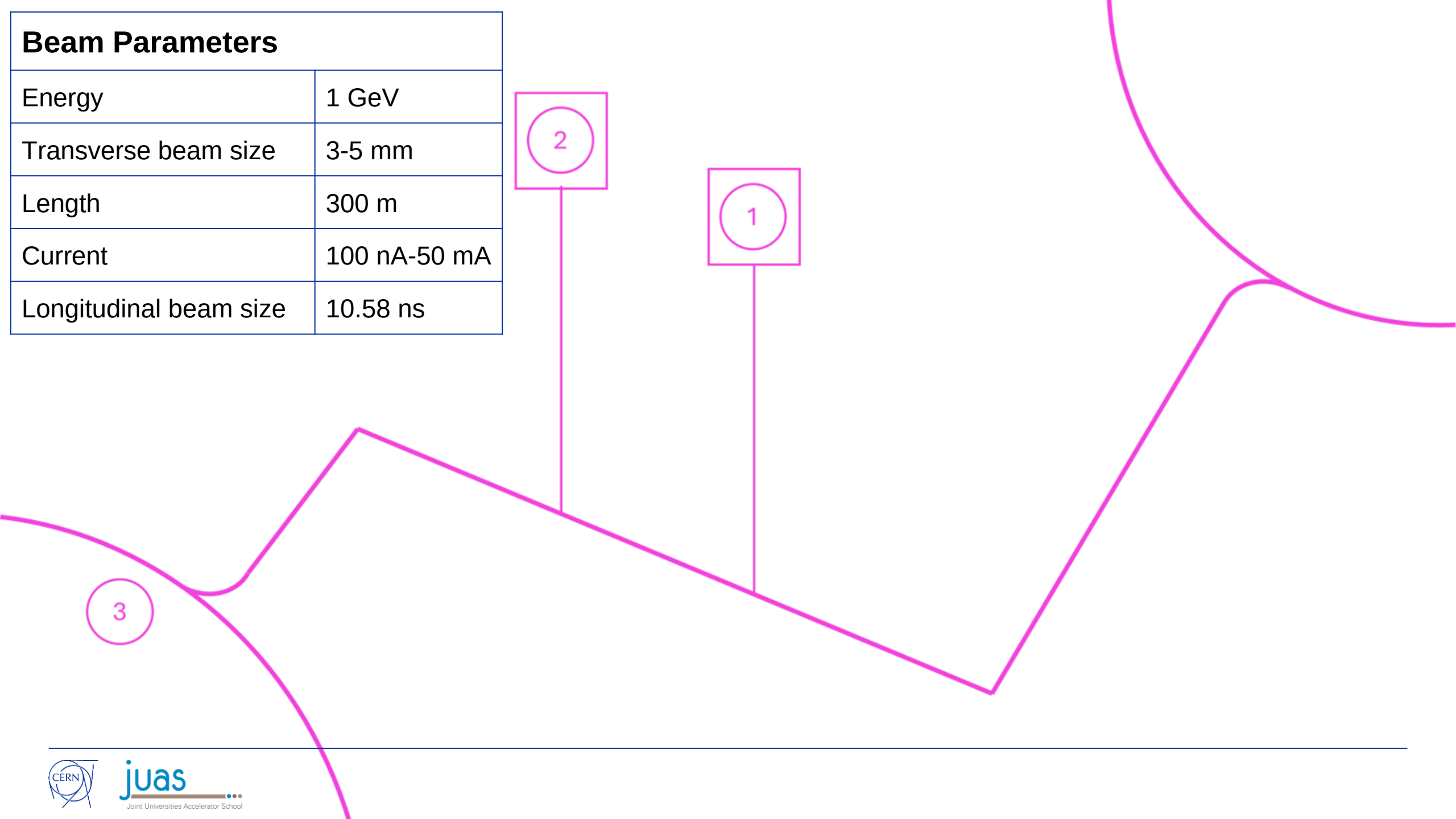
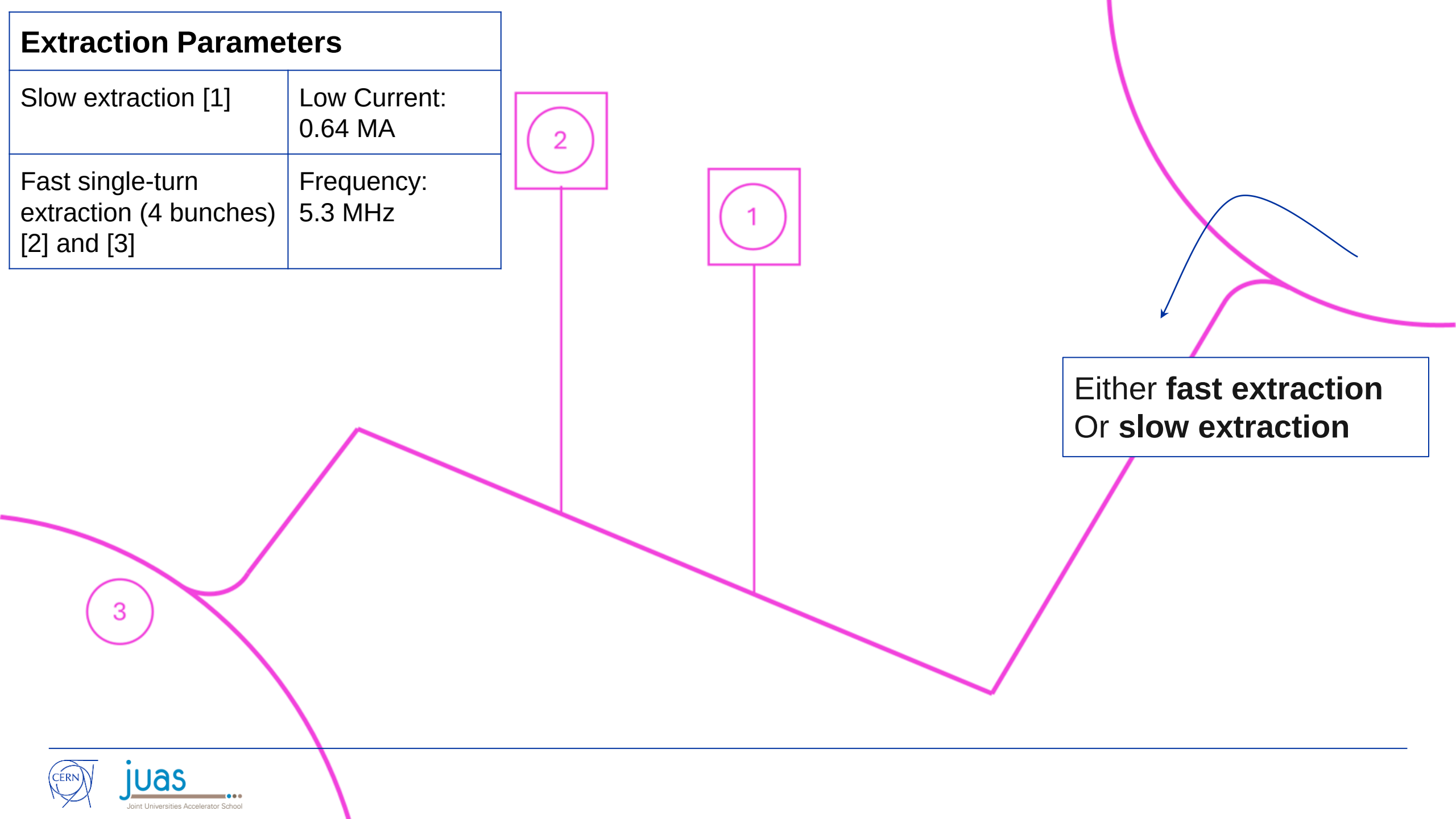
Beam Parameters	
Energy	1 GeV
Transverse beam size	3-5 mm
Length	300 m
Current	100 nA-50 mA
Longitudinal beam size	10.58 ns

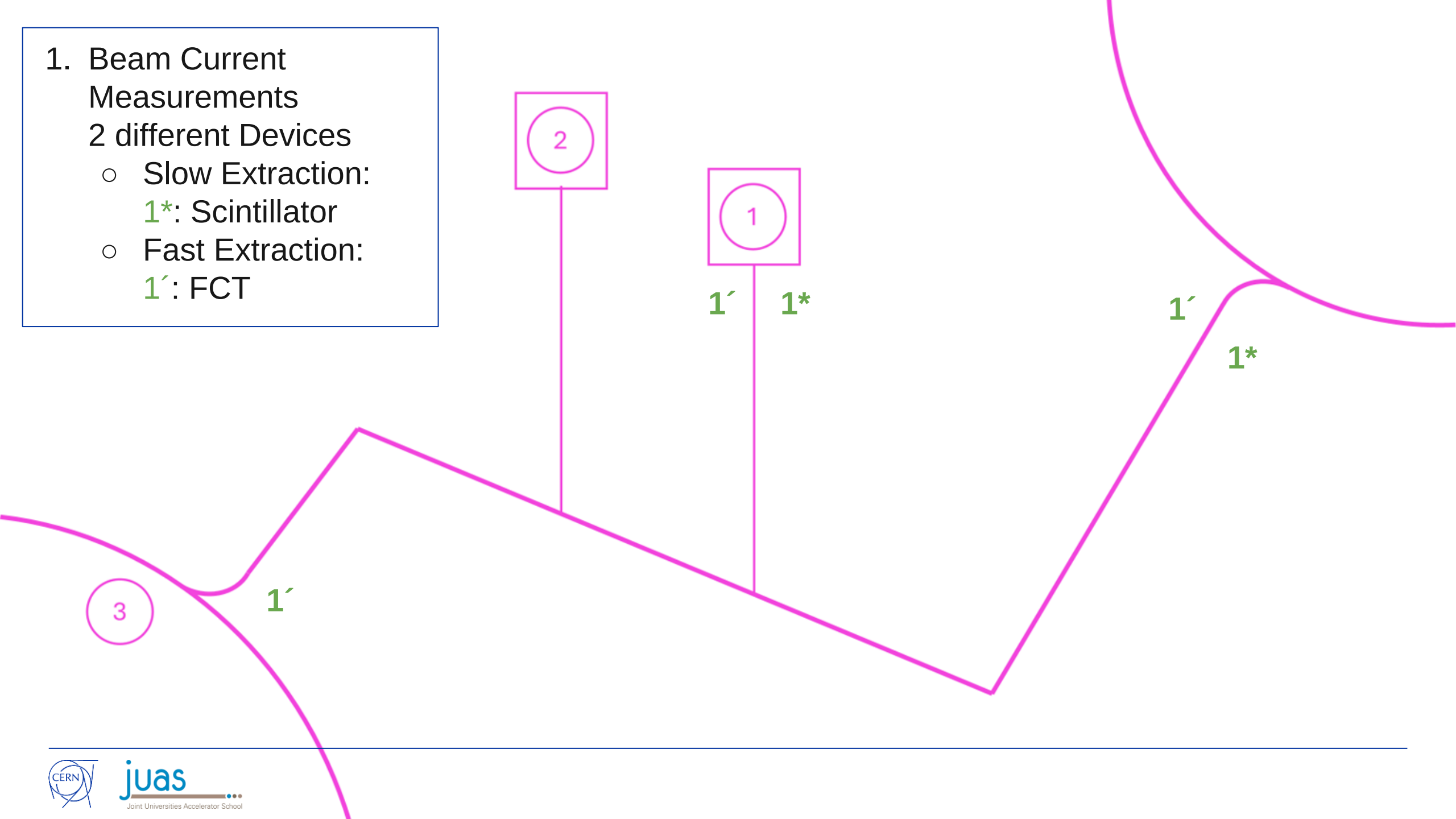


Extraction Parameters	
Slow extraction [1]	Low Current: 0.64 MA
Fast single-turn extraction (4 bunches) [2] and [3]	Frequency: 5.3 MHz



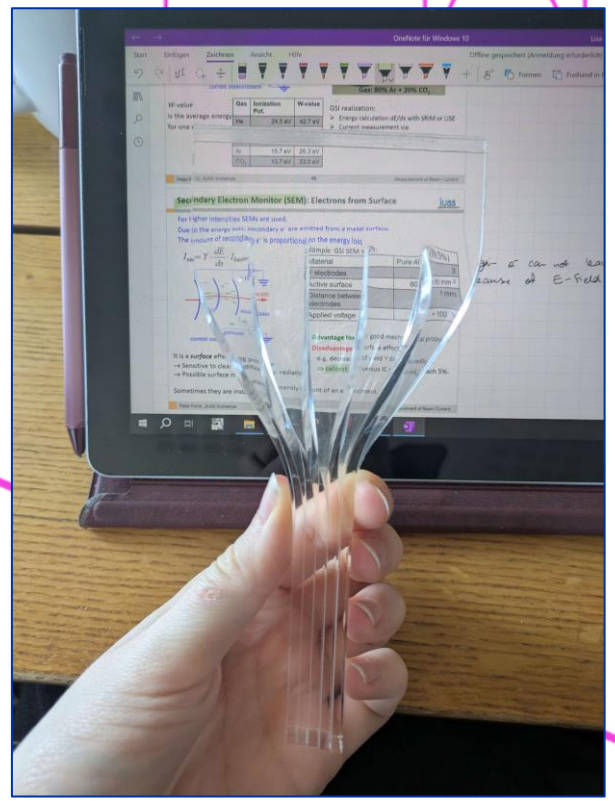
Either **fast extraction**
Or **slow extraction**

1. Beam Current Measurements
   2 different Devices
   - Slow Extraction:
     1*: Scintillator
   - Fast Extraction:
     1´: FCT



1. Beam Current Measurements
   2 different Devices
   - Slow Extraction:
     1*: Scintillator
   - Fast Extraction:
     1´: FCT

2

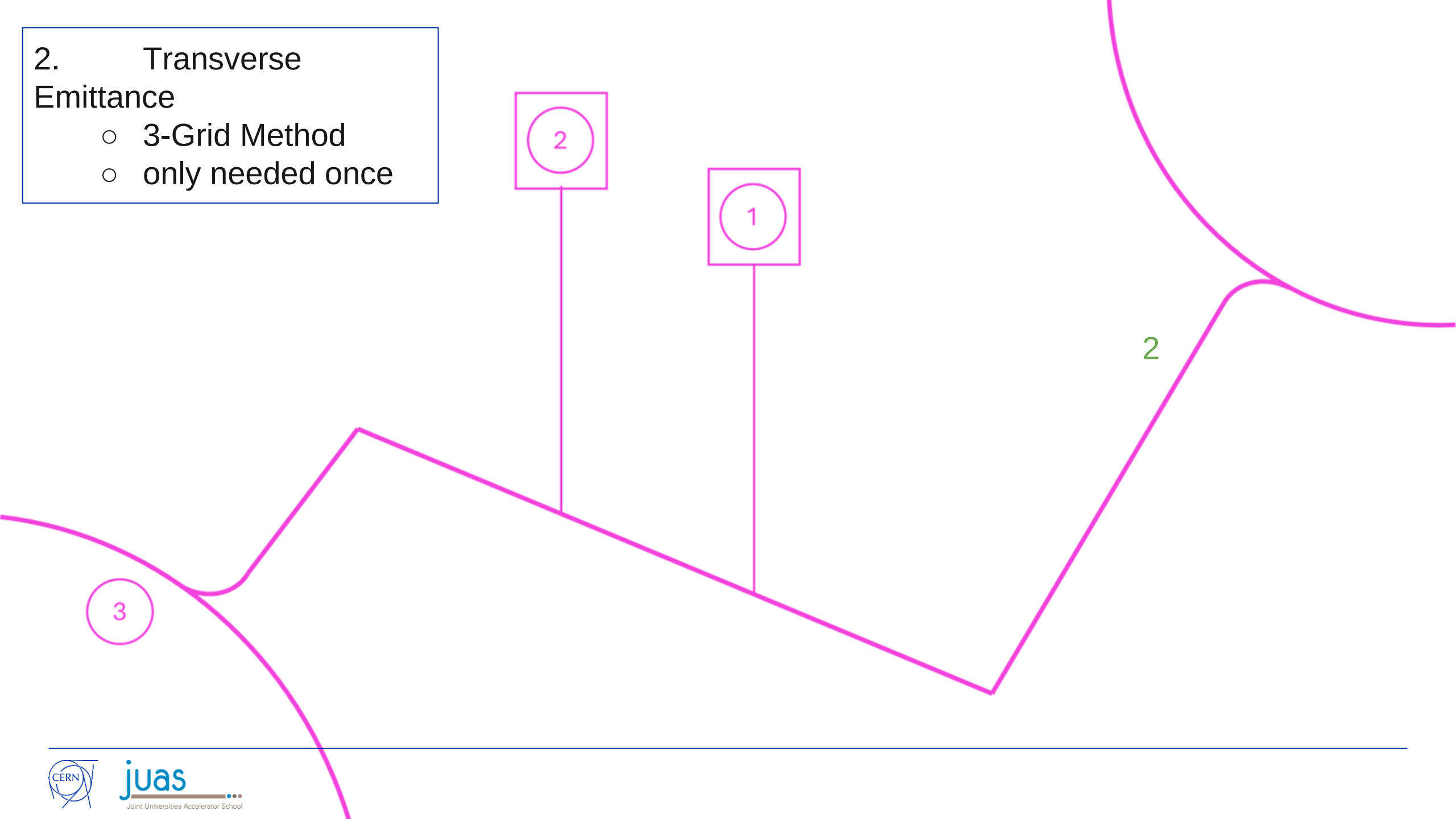


3

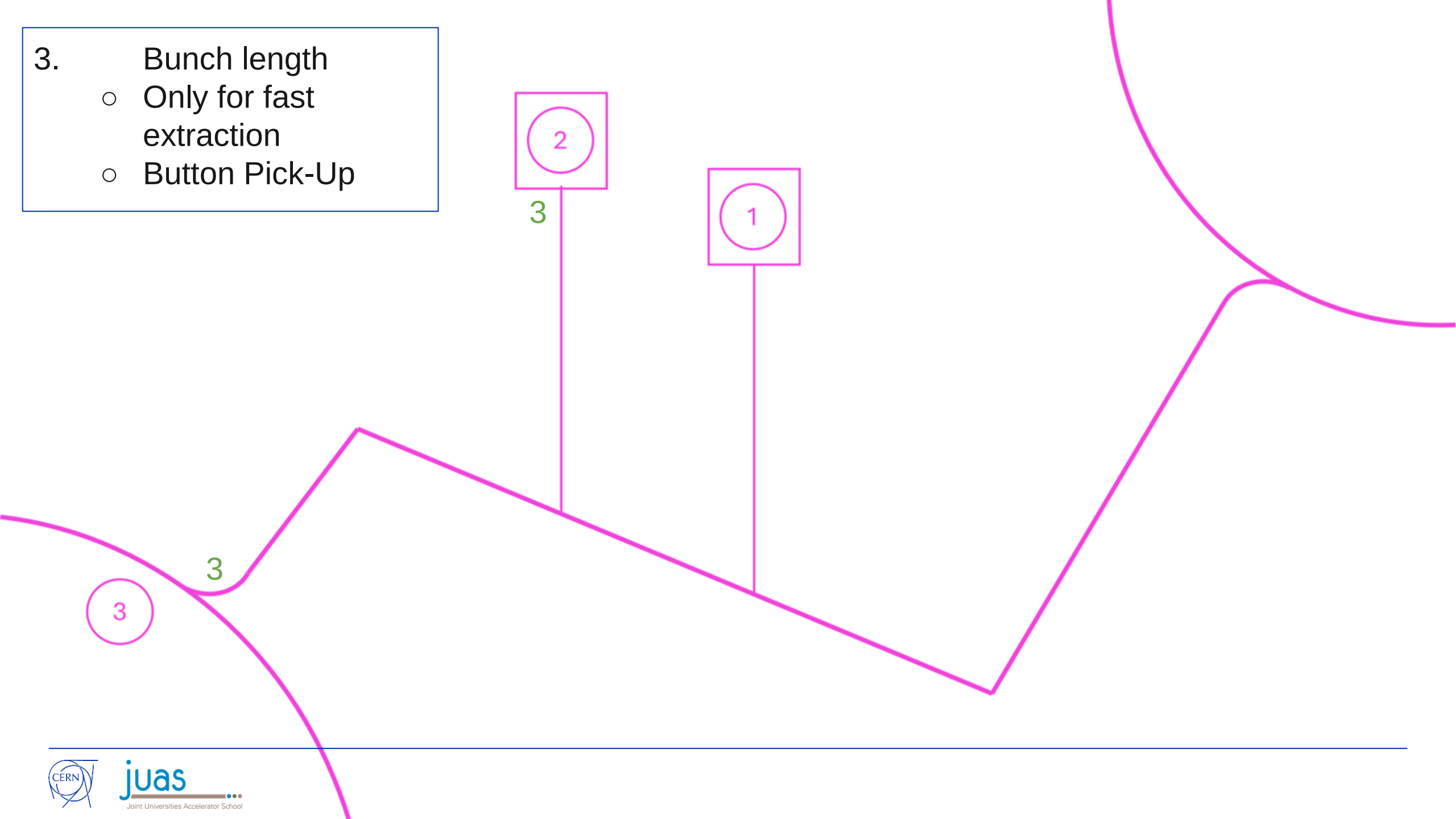
1´

2. Transverse Emittance

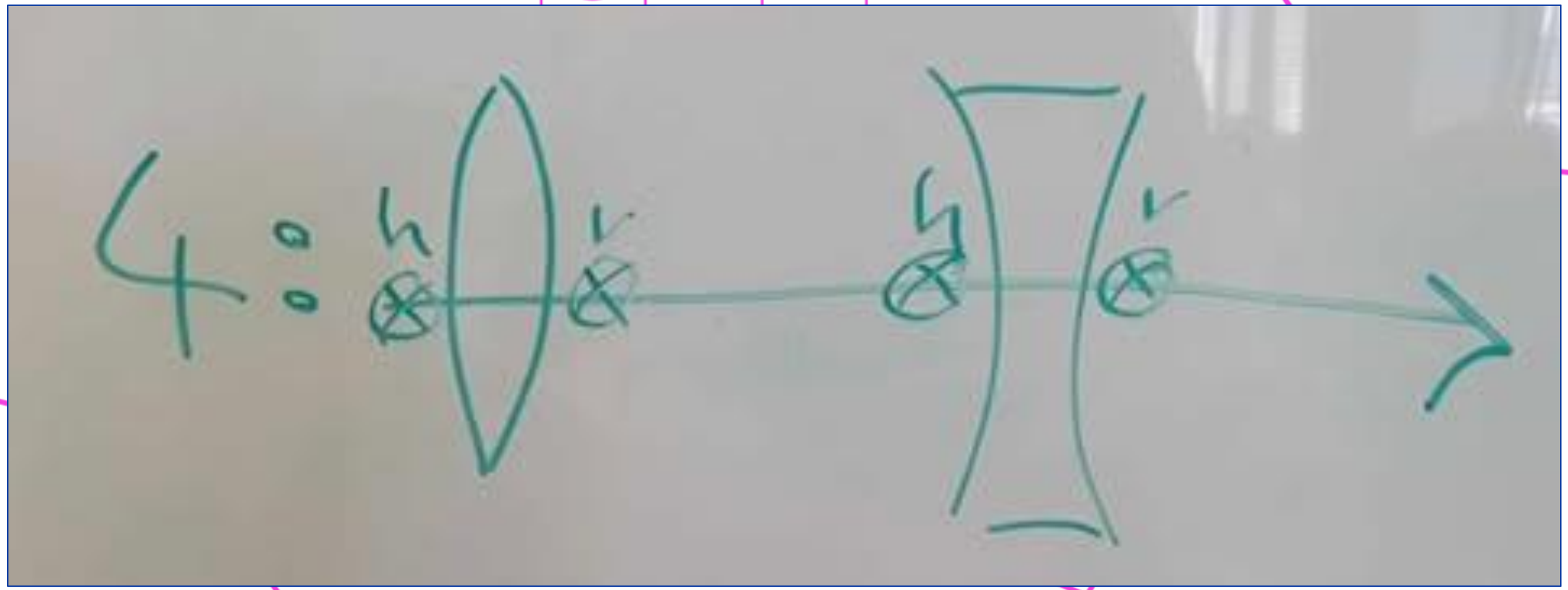
- 3-Grid Method
- only needed once



3. Bunch length
   - Only for fast extraction
   - Button Pick-Up



4. BPM
   - Only for Fast Extraction
   - Shoe-Box

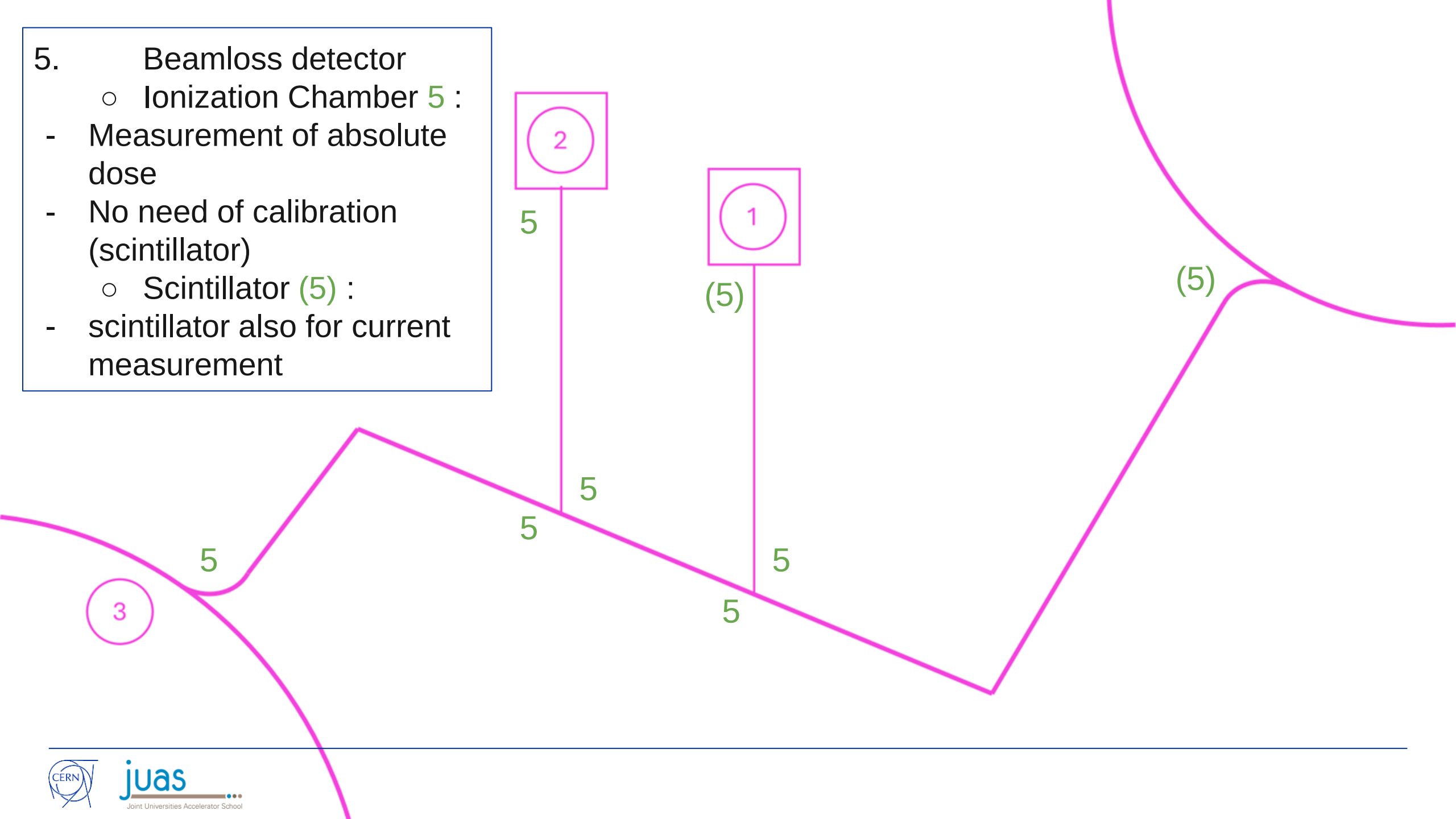


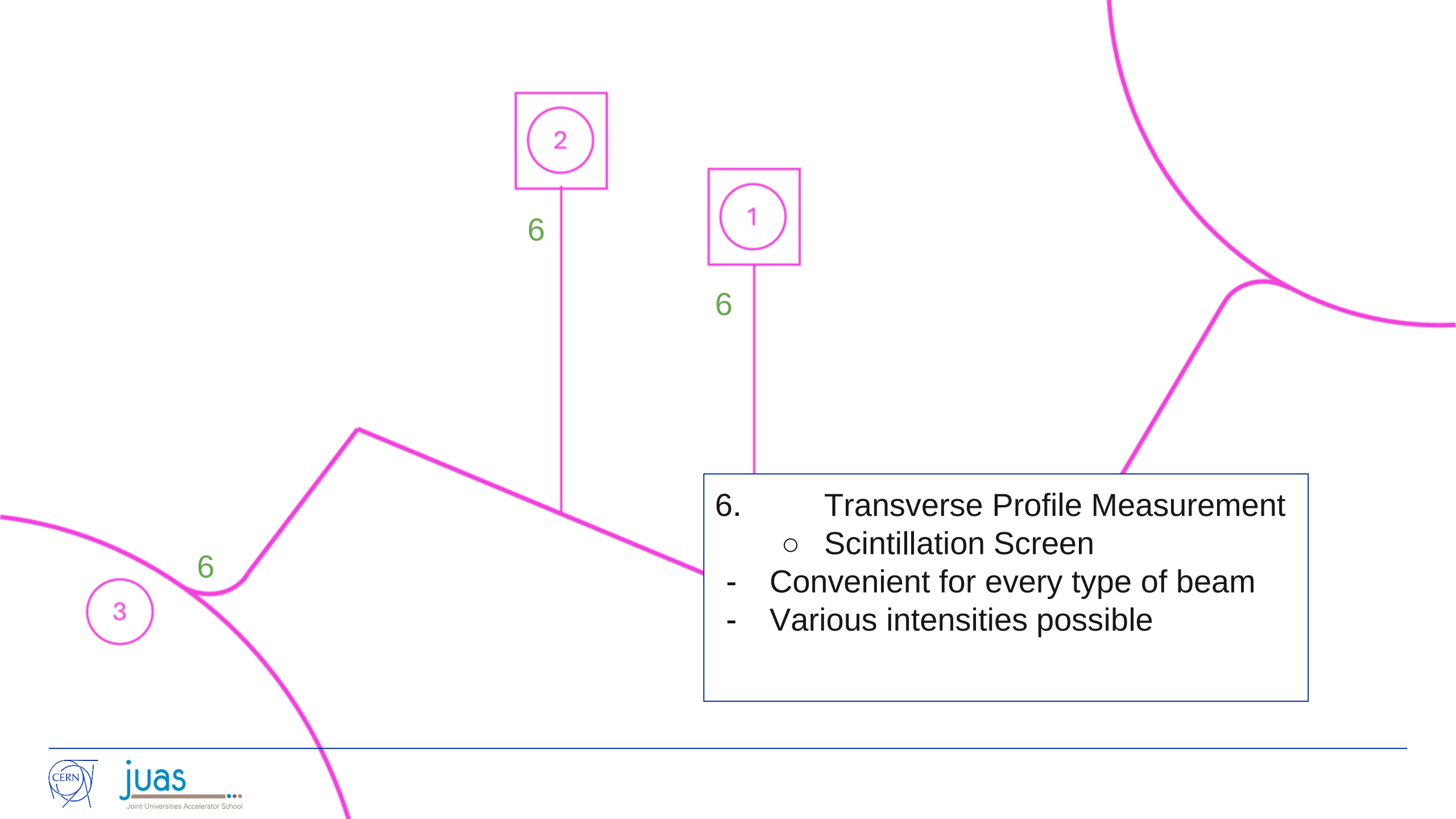
One before and one after each quadrupole

5. Beamloss detector
   - Ionization Chamber 5 :

- Measurement of absolute dose
- No need of calibration (scintillator)
   - Scintillator (5) :

- scintillator also for current measurement

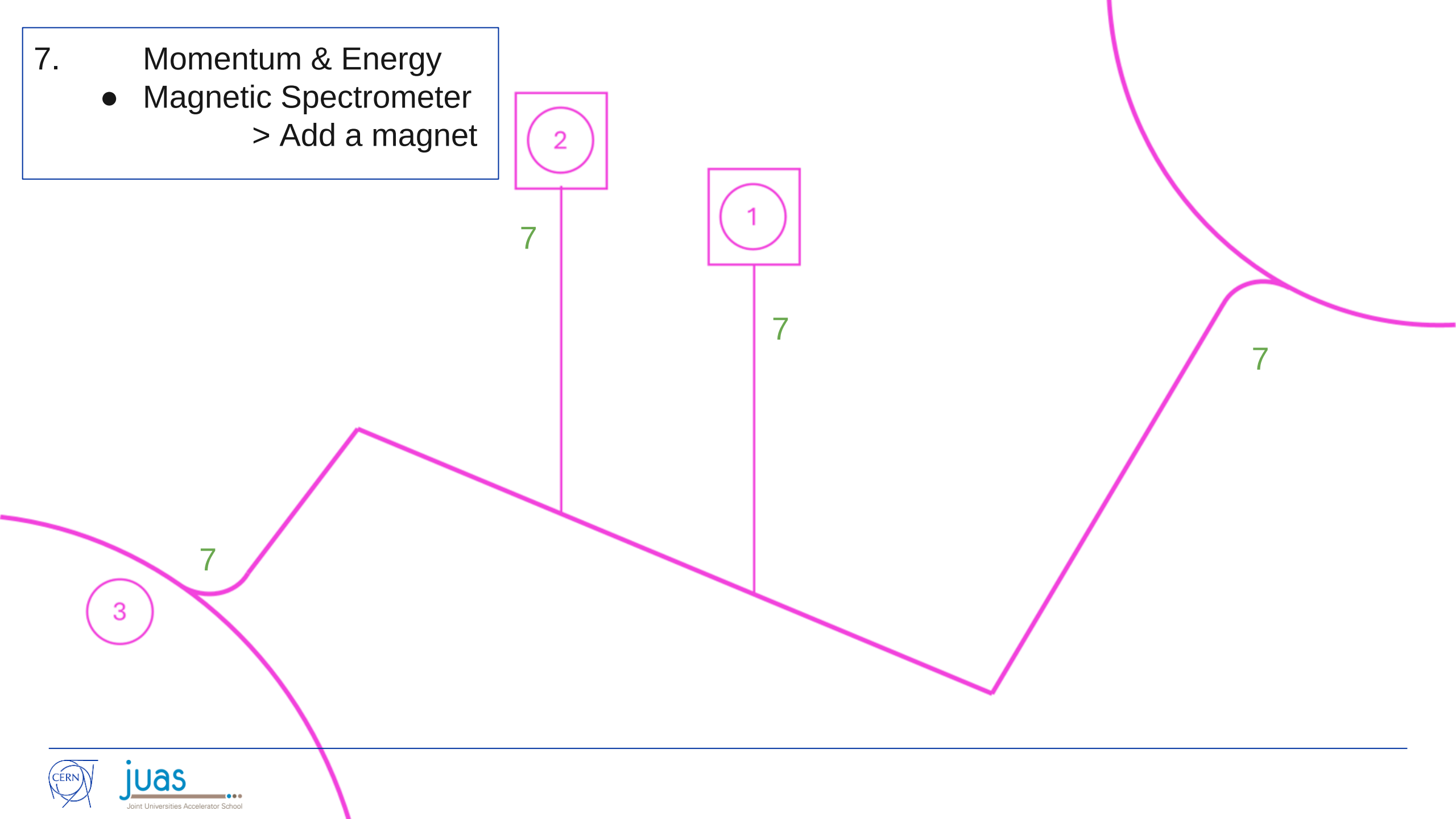




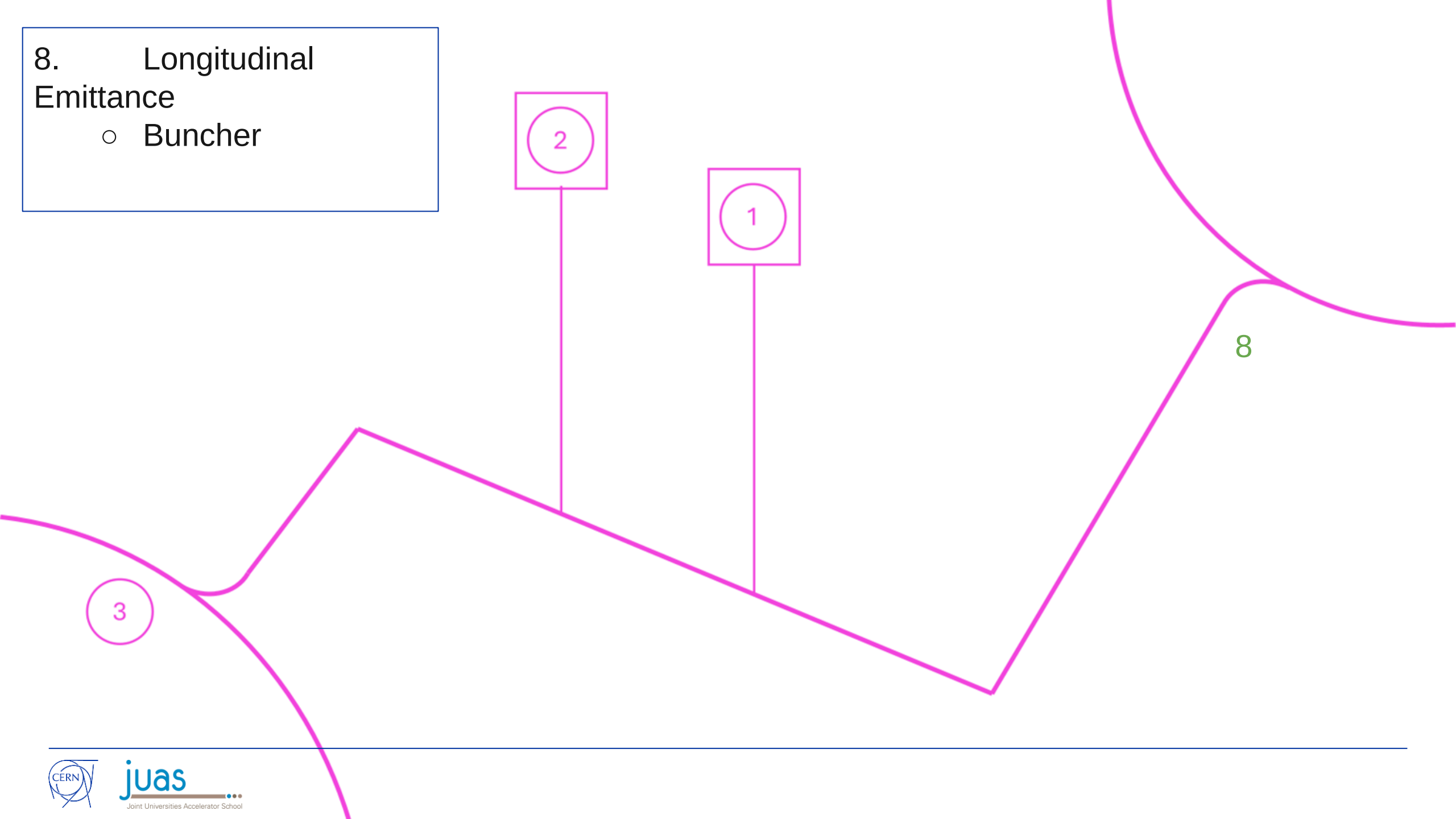
6. Transverse Profile Measurement
   - Scintillation Screen
- Convenient for every type of beam
- Various intensities possible

7. Momentum & Energy

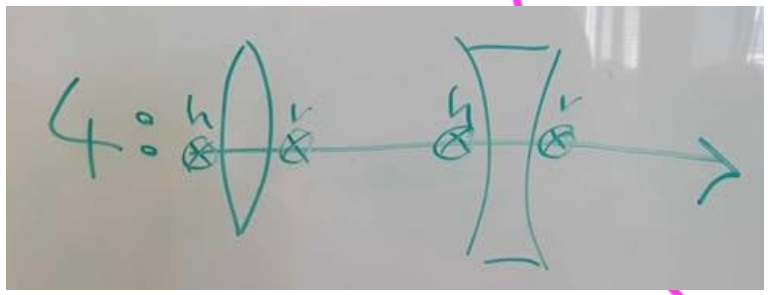
- Magnetic Spectrometer
  > Add a magnet



8. Longitudinal Emittance
   - Buncher



Current	FCT	1’
	Scintillator	1*
Transverse Emittance	3-Grid method	2
Butch Length	Button Pick-up	3
Beam Position Monitor	Shoe-box (fast)	4



Beam loss (in 1*)	Ionization chamber or Scintillator	5 or (5)
Transverse Profile	Scintillating screen	6
Momentum and Energy	Magnetic spectrometer	7
Longitudinal Emittance	Buncher	8