



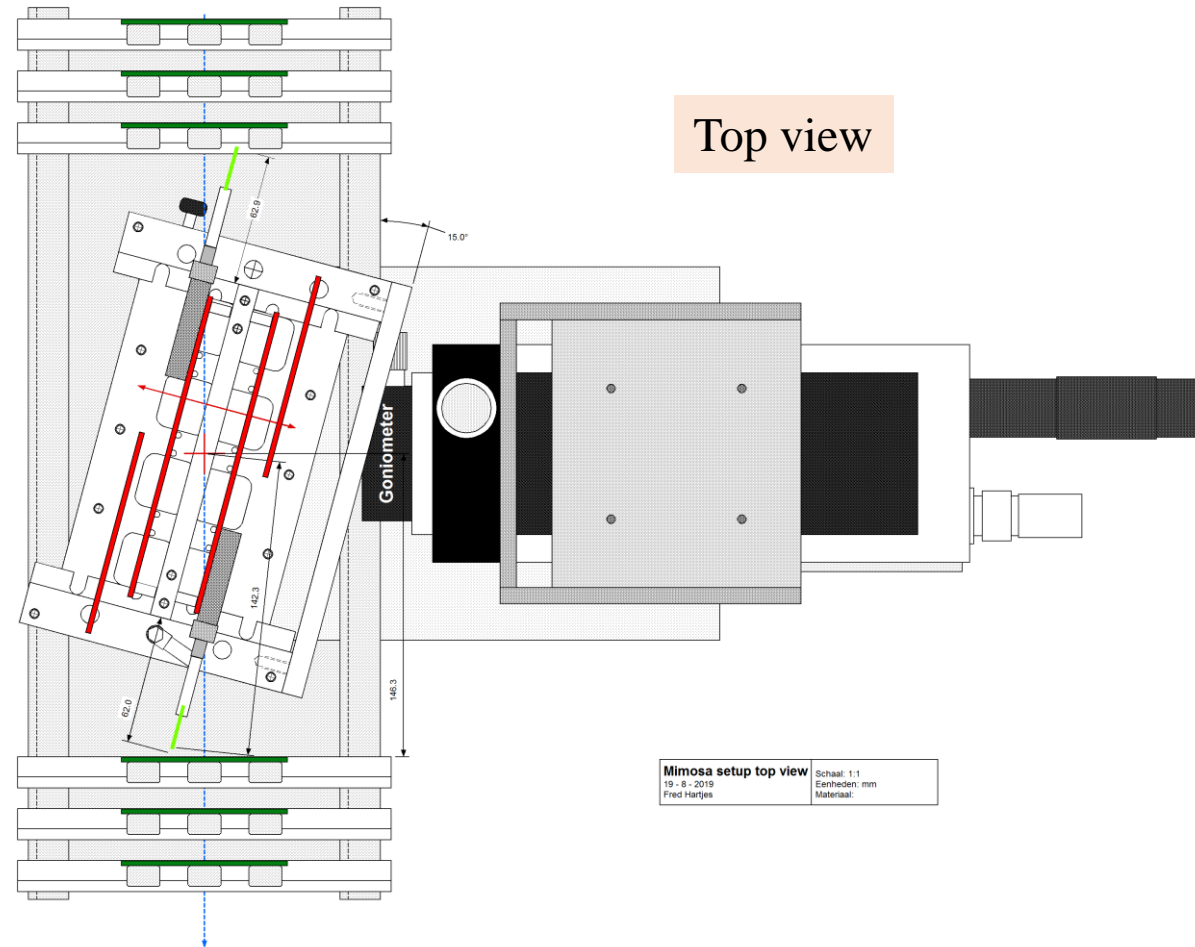
# DESY testbeam UV-laser scans

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**NIKHEF**

Nikhef/Bonn LepCol meeting  
September 9, 2019

# Preparations for Bonn testbeam

- Setup hardware finished
- But preparation for DESY started



# DESY testbeam

- In magnet of LC-TPC magnet in TB24/1
- => non-magnetic components needed
  - Stages
  - Actuators



Ralf Diener, Norbert Meyners, Marcel Stanitzki - DESY Test Beam Coordinators

## DESY Test Beam Schedule 2019 - Version 8 02/08/2019



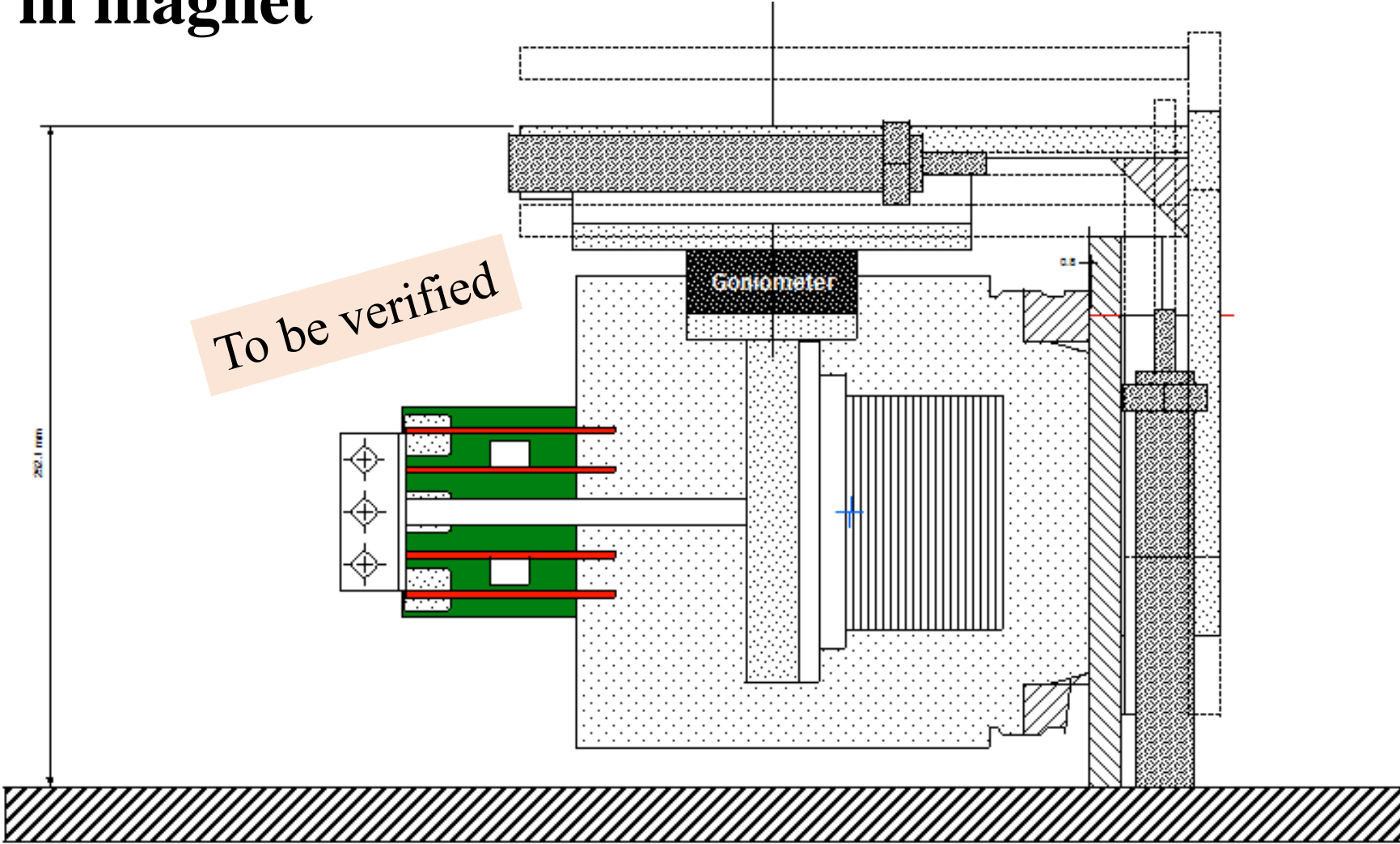
	Week		TB21		TB22		TB24/1		TB24		ANNOUNCED
				DATURA		DURANTA	PCMAG	Telescope in PCMAG		AZALEA	
2-Sep-19	36		CMS-Pixel-Phase2		Setup Time						
9-Sep-19	37		CMS-Pixel-Phase2	X	ATLAS-ITk-Strips	X			CEPC-STCF	X	
16-Sep-19	38		AFP-TOF	X	Mu3e	X			CEPC-STCF	X	
23-Sep-19	39		CLIC PIXEL	X	ATLAS-ITk-Pixel	X	TPEX		TOTEM	X	
30-Sep-19	40		X-Ray-Crystal-Rad	X	ATLAS-ITk-Pixel	X	TPEX				
7-Oct-19	41										
14-Oct-19	42		BL4S	X	SHiP-SplitCAL				ATLAS-ITk-TJCMOS		
21-Oct-19	43		BL4S	X	SHiP-SciFi						
28-Oct-19	44		CMS-Pixel-Phase2	X	SHiP-SciFi				SHiP-Emulsion+Ship-SBT		
4-Nov-19	45		CMS-Pixel-Phase2	X	ATLAS-HGTD	X			LHCb-ECAL	X	
11-Nov-19	46		FCAL	X	ATLAS-HGTD	X			LHCb-ECAL	X	
18-Nov-19	47				Setup Time						
25-Nov-19	48		CMS Outer Tracker	X	ATLAS-ITk-Strips	X			ATLAS-ITk-Pixel	X	
2-Dec-19	49		CMS Outer Tracker	X	ATLAS-ITk-Strips	X			ATLAS-ITk-Pixel	X	
9-Dec-19	50		ELIOT		CMS-Pixel-Phase2	X			Mu3e	X	
16-Dec-19	51	Beam till 20/12 0800	ELIOT		CMS-Pixel-Phase2	X			CLIC PIXEL	X	
23-Dec-19	52		Shutdown								
30-Dec-19	1										

# Non-magnetic components

- Stage 152 mm long, 66.5 mm wide
  - 100 mm stroke
  - Al housing, Si-N balls
- Pneumatic cylinder
  - 80 mm stroke
  - 2 reproducible positions
  - More possible with pneumatic stops
- **Double acting cylinder** => A gentle movement can be adjusted
  - Still maintaining the full drive force of 200 N
- We need compressed air
  - From DESY?
  - Alternative: own compressor
- Still need to order NI relay driver, pneumatic valves



# Possible setup in magnet

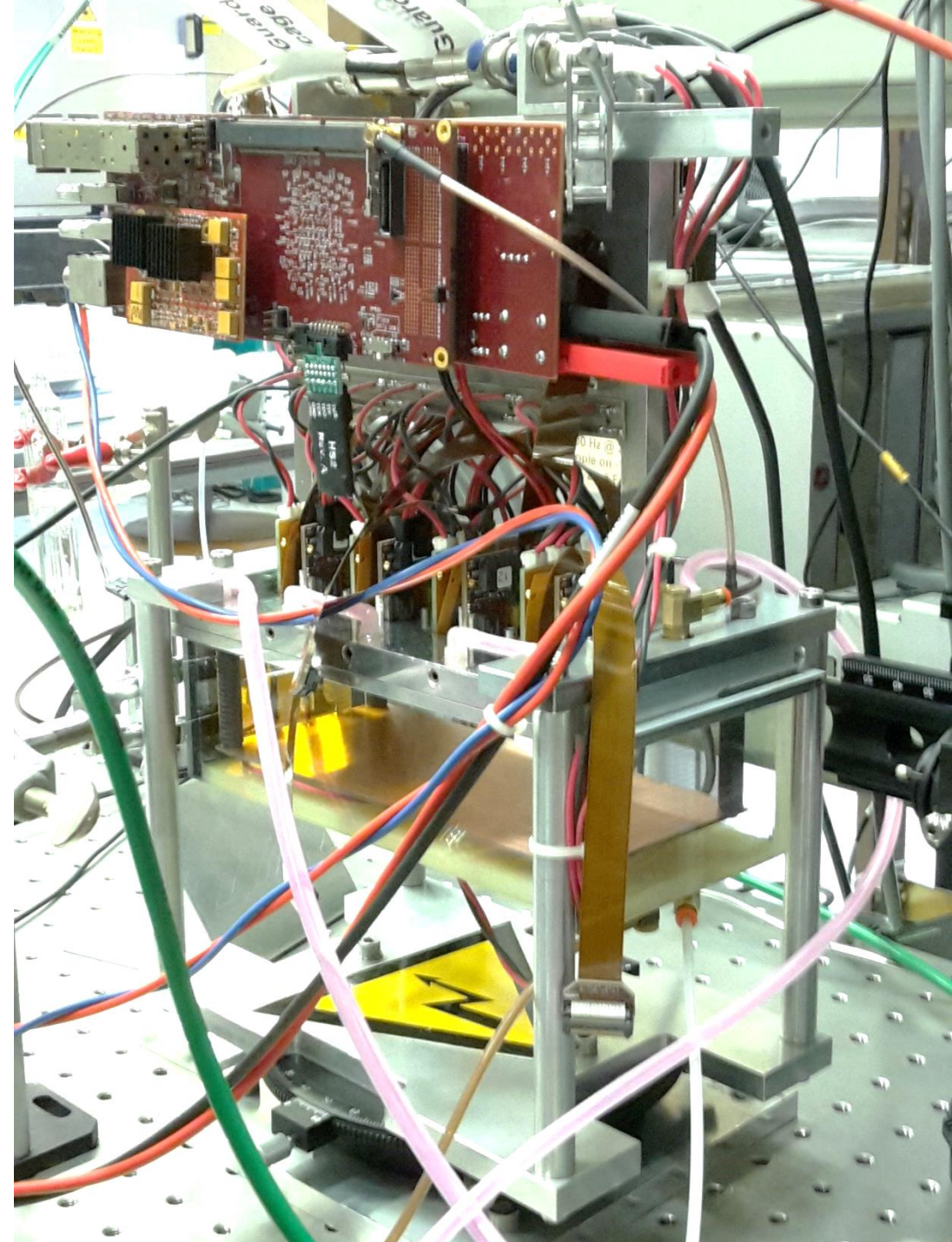


Mimosa setup Desy	Schalt: 1.1
3 - 9 - 2019	Gezeichnet: mm
Fred Marjess	Material:



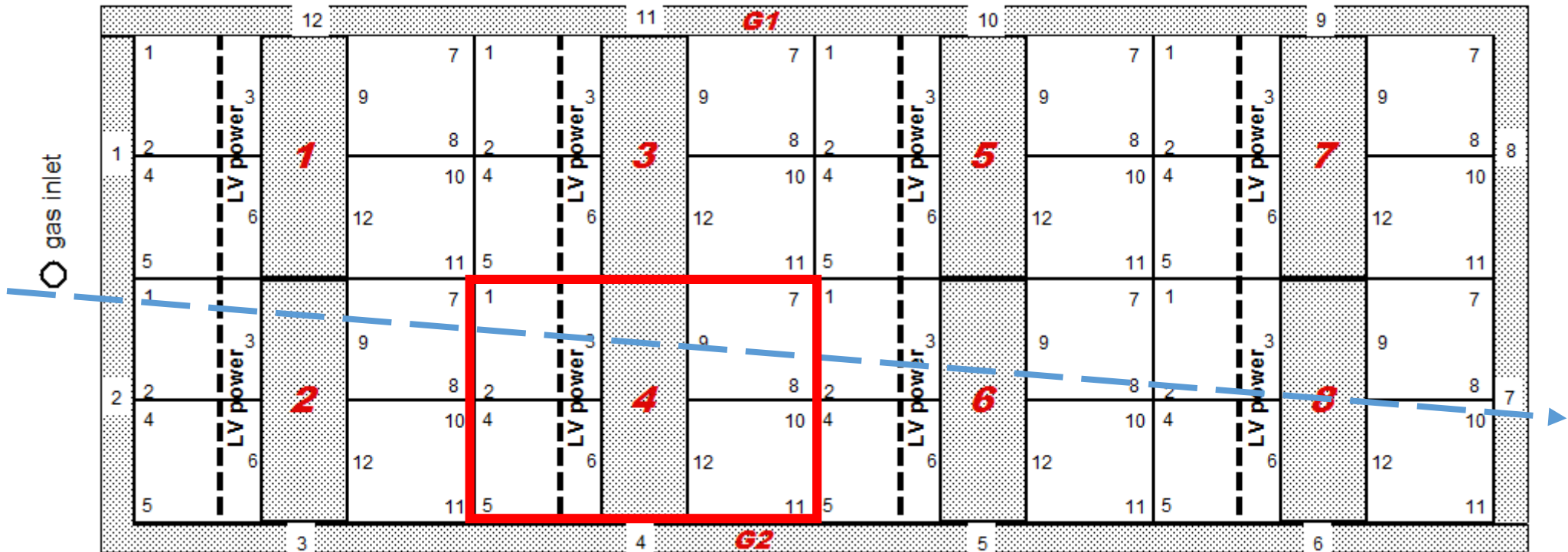
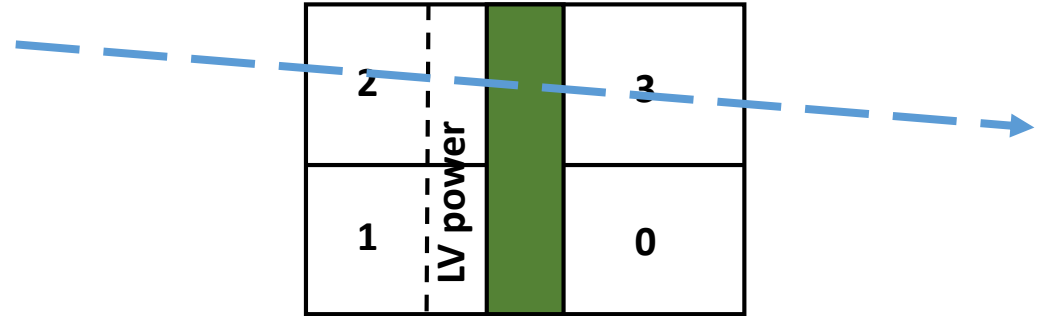
# Laser measurements

- Parallel laser beam through 8-quad textbox
- 1 cm above grids
- 15 runs 969 to 984
  - Run 970 discarded
- Each run has 10 stage positions of 200 laser shots each
  - $\Rightarrow$  ~ 2000 triggers per run
  - Step size 0.2 mm
- Run duration 14 min
- In total 15 runs of 2 mm range
  - $\Rightarrow$  30 mm covered  $\Rightarrow$  Full quad surface



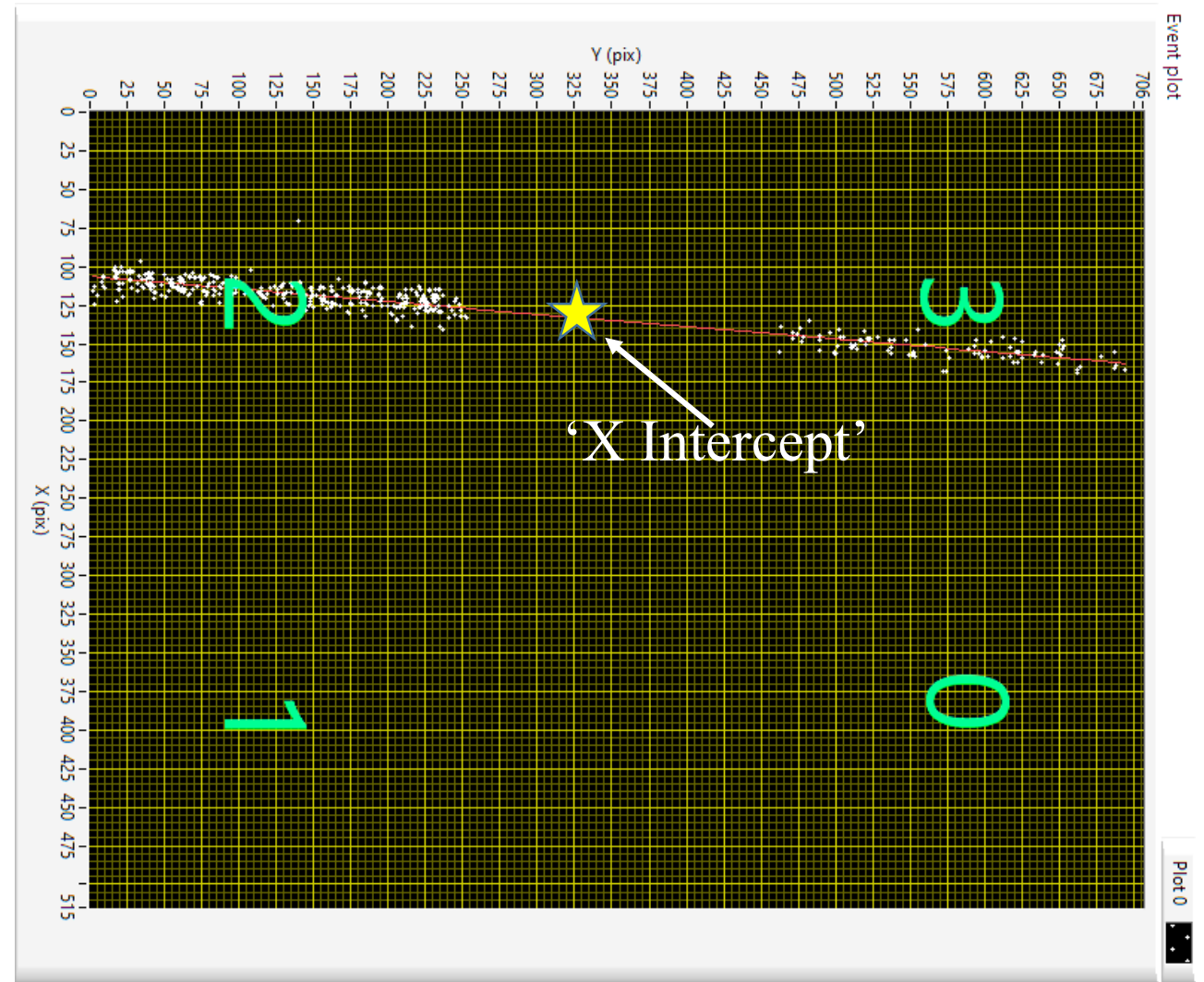
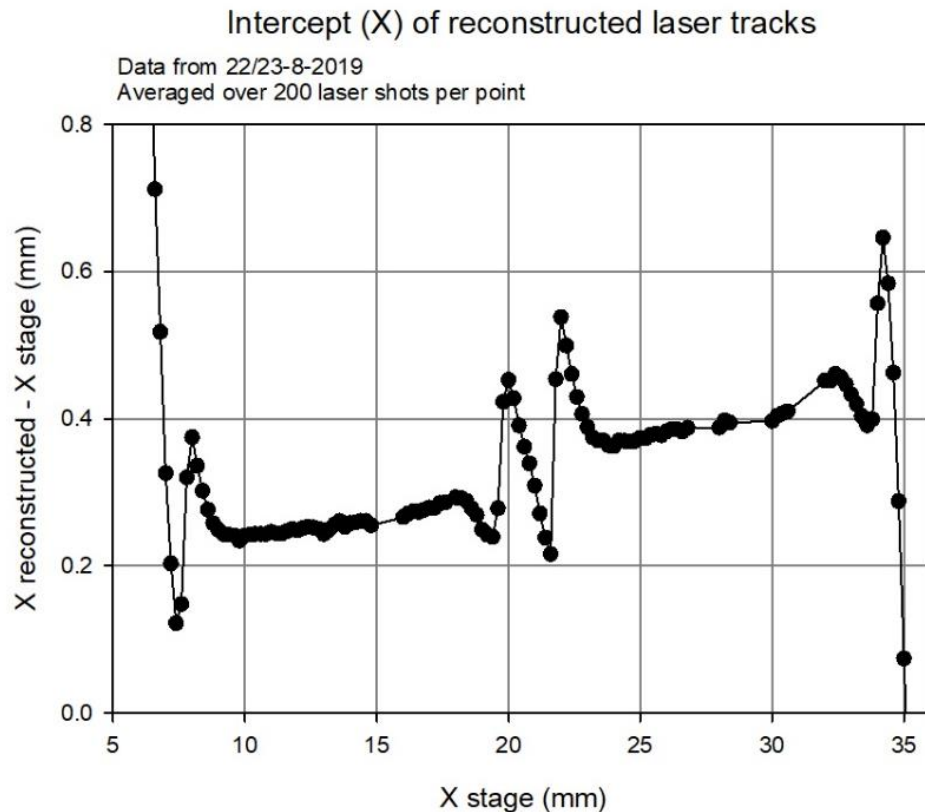
# Scan with UV-laser beam

- Quad 12 on position 4 investigated
  - Other quads not powered, only HVs applied
- Beam angle  $\sim 82$  mrad
- Straight line fitted through detected hits



# Reconstructing laser tracks

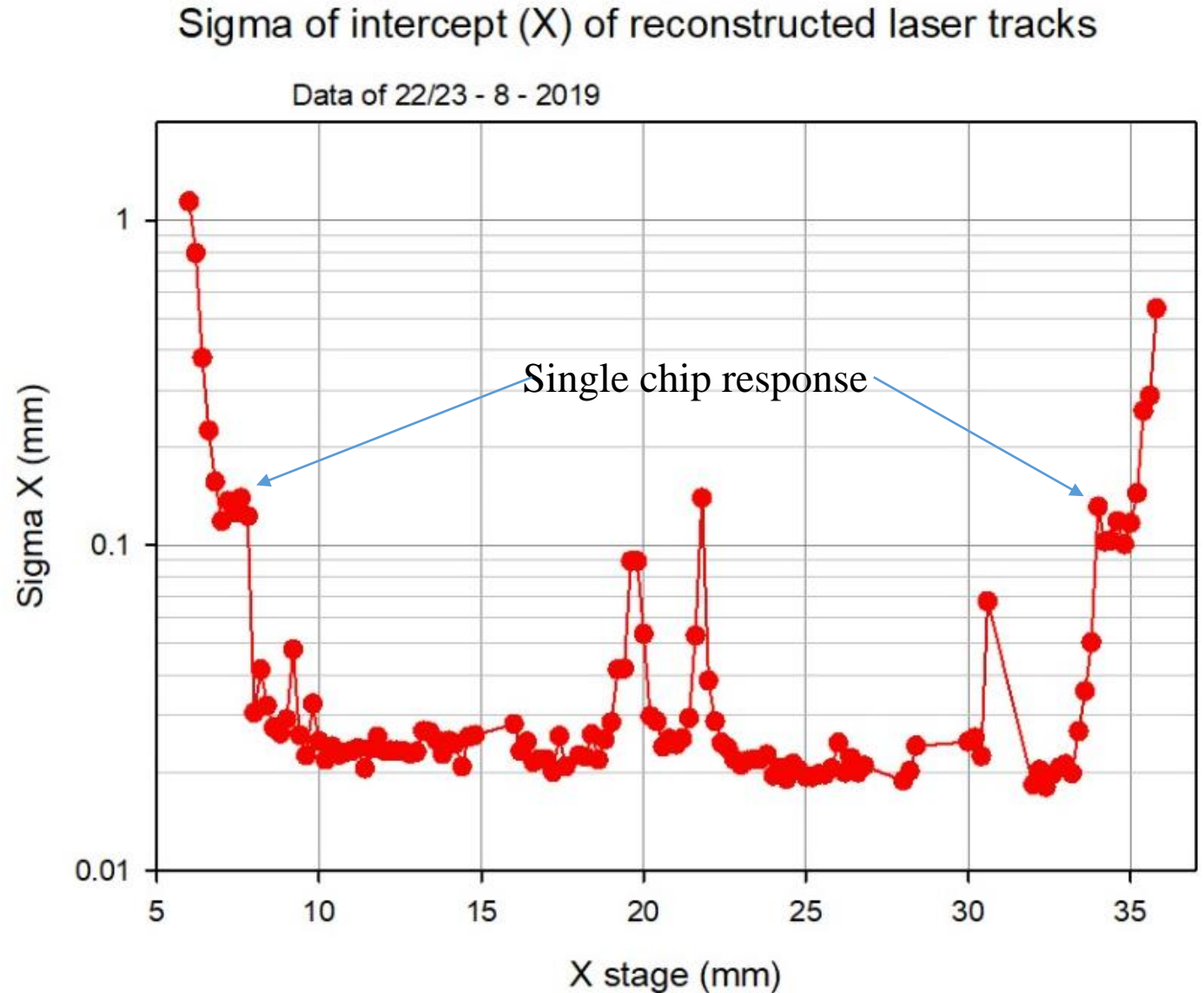
- Drift time selection
  - -40 to 400 ns from trigger time
- Drift times < 100 ns rejected
  - => hits from spurious laser light
- Slope in curve partly caused by cosine effect (beam not parallel to detector)
  - =>  $20 \times \cos(0.082) = 0.067$  mm





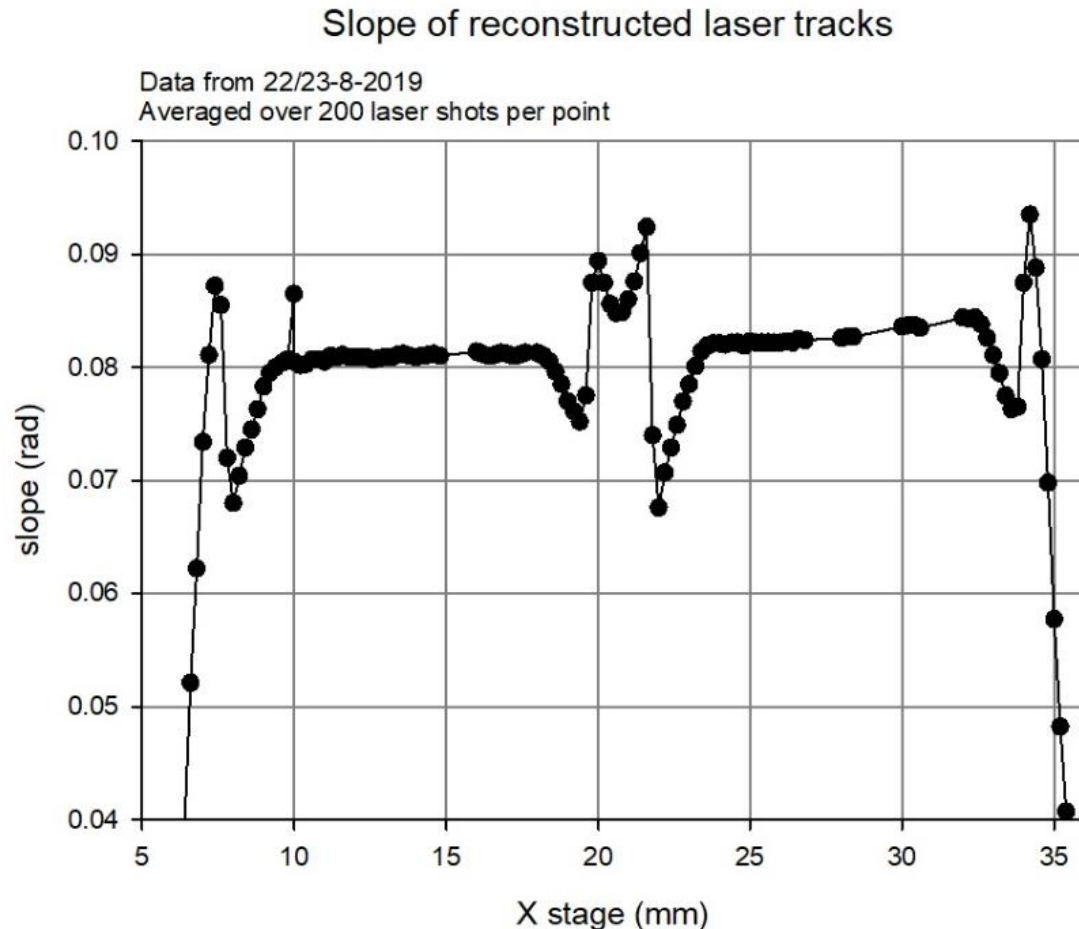
# Track-to-track resolution in X

- Single track resolution in X: 20 – 25  $\mu\text{m}$
- May be affected by stochastic variation of the laser beam from shot to shot

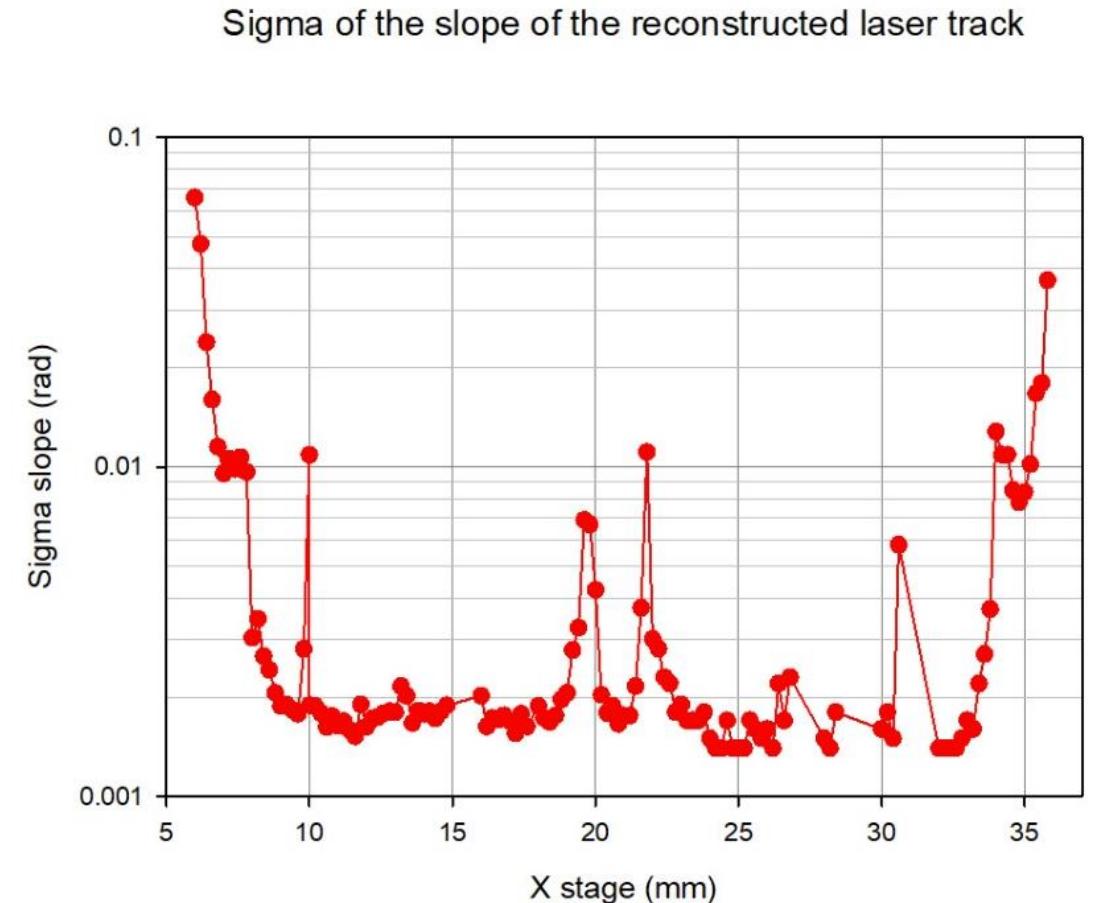


- Systematic variation of 8 mrad across the quad
  - => inhomogeneity of the drift field?
- Track to track variation: 1.5 – 2 mrad

# Slope reconstruction

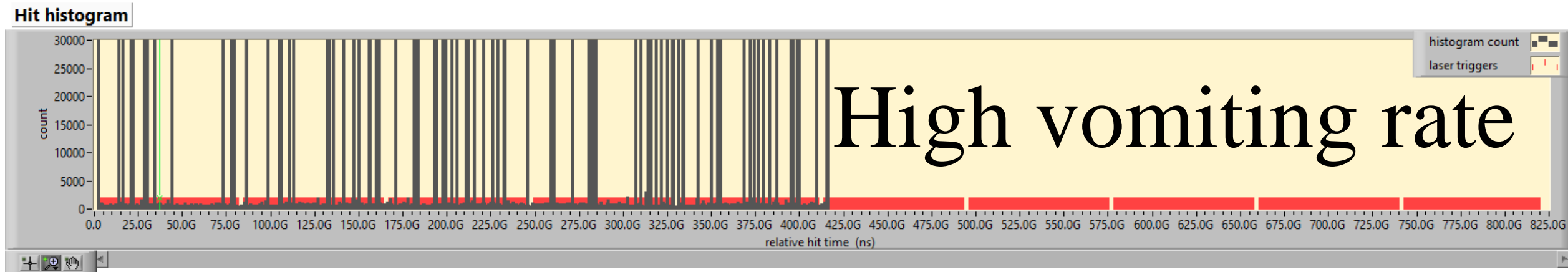
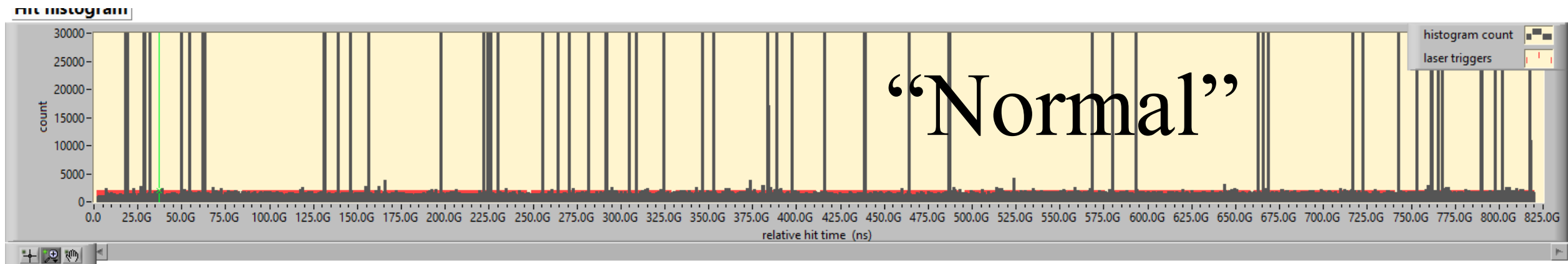


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- Certain runs had high vomiting rate
  - => could only partly be read out
  - Maximum file size 220 Mb per chip => memory overflow
- What if we have  $> 8 \times$  this data rate with the concentrator?
  - => higher threshold => lower SE efficiency
- Will be probably different for each quad

## ‘Vomiting’ problems



# Reference



- During testbeam we may easily have 30 – 40 V potential drop across protection layer
- $\Rightarrow$  we need an extended working range

