

A decorative graphic consisting of a cluster of semi-transparent, light blue circles of varying sizes, arranged in a pattern that suggests a particle beam or a diffraction pattern, centered in the upper half of the slide.

Synchronization on ESRF beamlines

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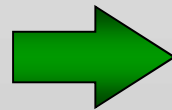
Synchronization on ESRF beamlines

- Radiotherapy Experiment: Hardware Sequencer
- Scanning Imaging: Continuous Scan (0d-1d detectors)
- Tomography: Continuous Scan (2d detectors)
- Hardware Tools
- Conclusion: Next Challenges

Radiotherapy Experiment: Challenges

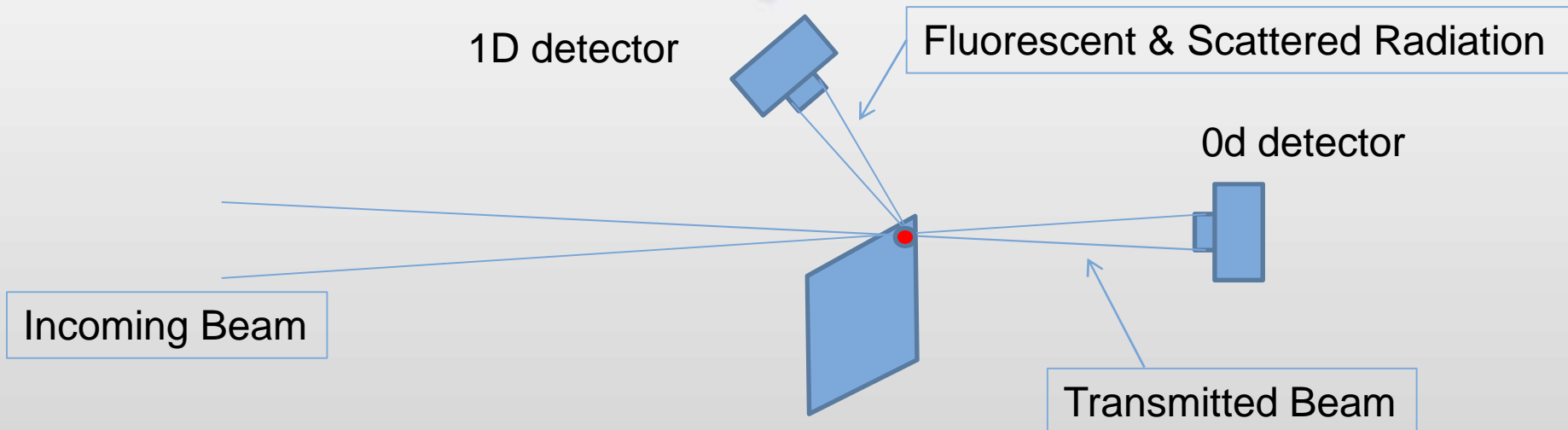


- Exposition: 1-2 s
- Experiment: 20-30 s



- Hardware start/stop/status
- Hardware sequencing
- Storage of all events

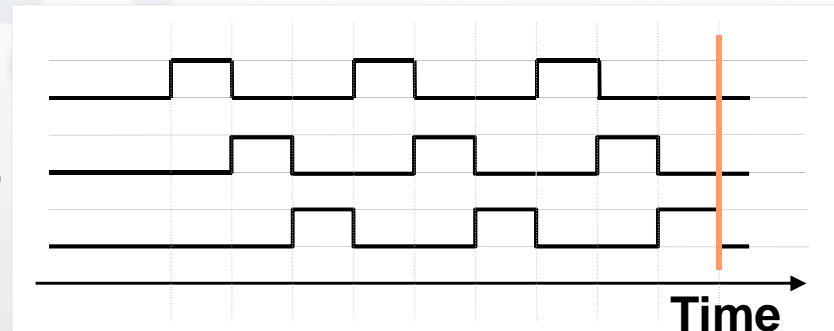
Scanning imaging: Sequence



Scanning imaging: Challenges

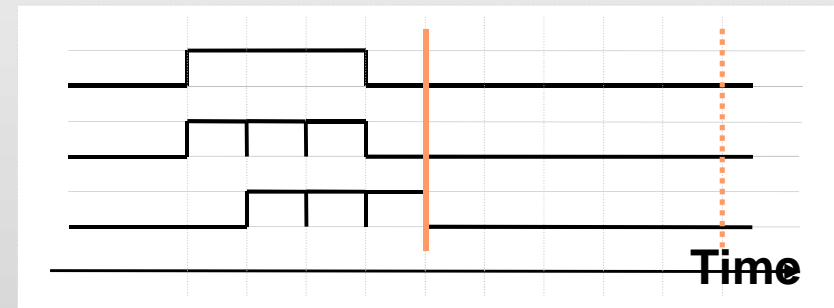
- *From Sequential*

MOVE
EXPOSURE
READOUT



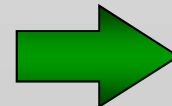
- *To Paralell*

MOVE
EXPOSURE
READOUT



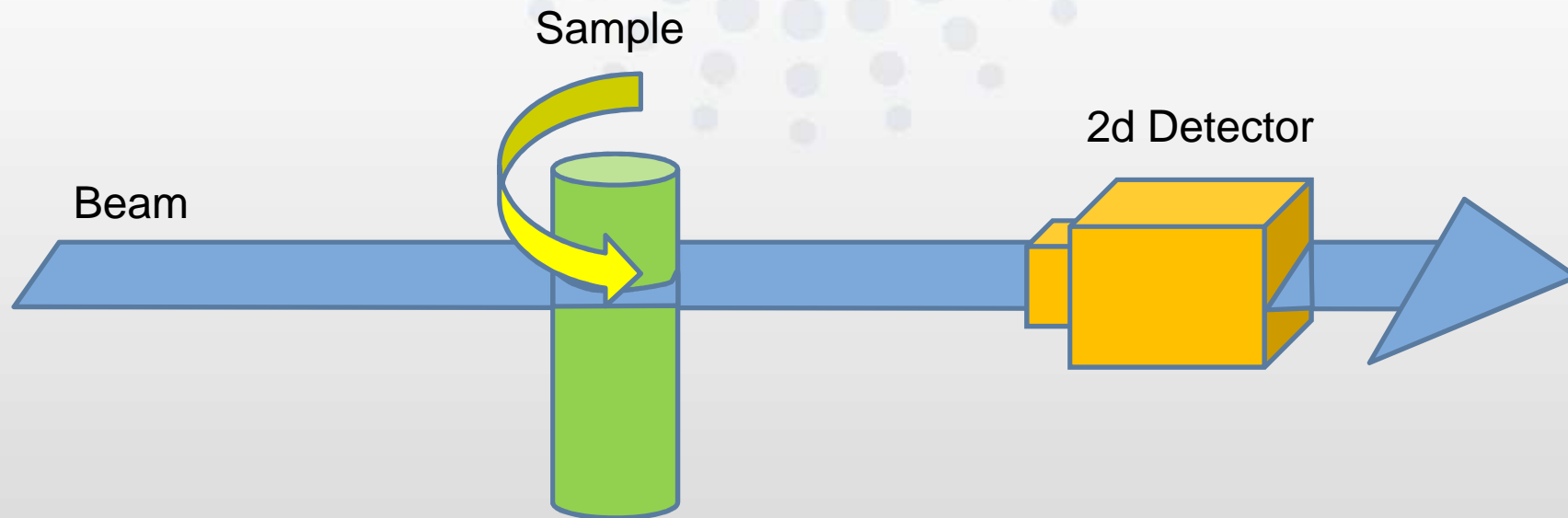
- *Practical Issues*

- Distributed System
- Multiple detectors
- Short exposure time

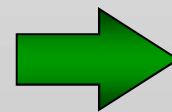


- Synchronization
- Data Buffering

Tomography: Challenges



- Same constraints as in previous example
- Readout time of 2D detector



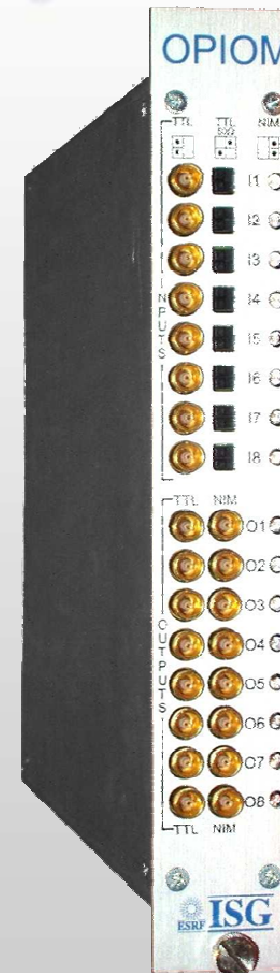
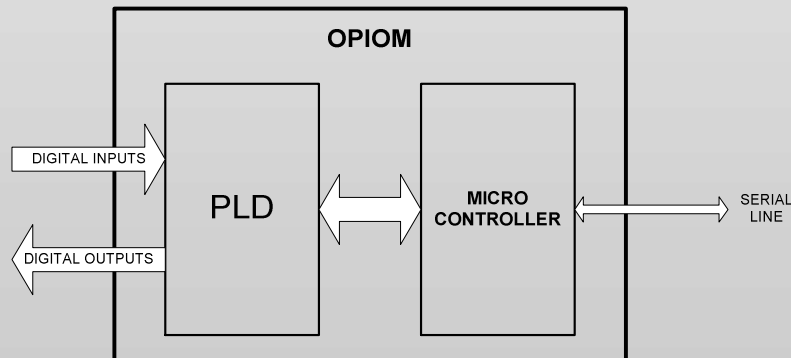
- Synchronization
- Data Buffering

Hardware Devices for synchronization

- *Synchronization with time* :
 - Counter Timer boards (**Vct6, P201**)
 - **OPIOM** boards

OPIOM – Programmable I/O

- Octal Programmable I/O Module
 - NIM and TTL Input/Outputs
 - Timing features:
 - Measurement:
 - Pulse counting
 - Delay between two signals
 - Period of a signal
 - Frequency divider
 - Pulse generation
 - Time pattern generation
 - PWM generation
 - Fully controllable from the host computer
 - Programmable logic between inputs and outputs

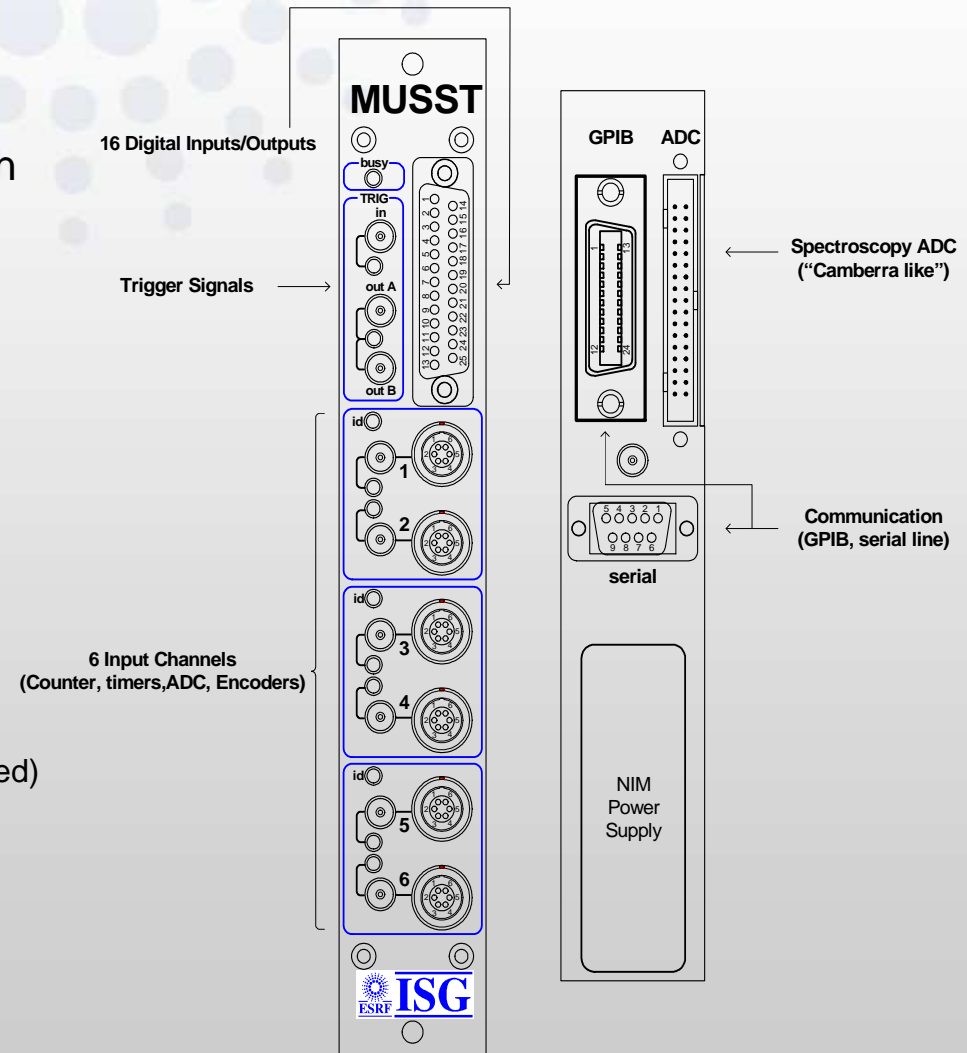


Hardware Devices for synchronization

- *Synchronization is done by hardware :*
 - Synchronization with time :
 - Counter Timer (**Vct6, P201**)
 - **OPIOM** boards
 - Need more : motor position, mixed time/position, ...
 - **MUSST** boards

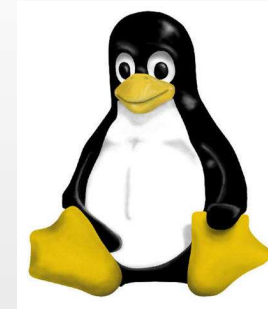
MUSST – Synchronisation/Triggering Unit

- Programmable module for generation of trigger and synchronisation signals.
- Can be operated also as a data acquisition unit.
- MUSST hardware resources:
 - 6 main input channels (counters, incremental and absolute encoders, analog signals, ...).
 - 1 32-bit timer
 - 16 general purpose I/O TTL lines
 - 4 dedicated trigger signals
 - 1 interface for spectroscopy ADCs (MCA)
 - 2 MB of internal RAM
 - GPIB interface (> 1MB/sec)
- An internal programmable sequencer (FPGA based)
 - Fast comparators (20 ns resolution)
 - Microcode execution module
 - Internal general purpose data registers
- External or internal events can be combined to generate trigger sequences



Data Buffering

- Software implementation : **HOOK**
 - Kernel driver + TACO device server
 - Hardware readout + buffering
 - Software event generator
 - For In-house developed hardware
 - PCI and VME boards
- Hardware implementation :
 - **MUSST**
 - Encoders, motor steps
 - Counters, ADC
 - Canberra MCA (ICB)
 - XMAP
- Data handling:
 - SPEC polls data buffers
 - Counters / motors saved by SPEC



Conclusion: Next Challenges

- Framework for continuous scan
- Common interface for:
 - Data handling (buffering) of 0-1-2 Dim detectors
 - Device configuration
- Trajectories