



Beam Instrumentation for Run 2B

E. Senes for BI AWAKE

AWAKE Collaboration Meeting, 25 March 2023

For instrumentation, Run 2A and Run 2B are not very different.

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BI continues to:

- **Support** the existing systems
- **Respond** to your occasional exotic needs
- Continue operational system **development** and **R&D**

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Operational support

Routine checks of the first run of the year were performed for the DPS run.

- All systems up and logging
- Minor issues fixed
- Complete test will be repeated before the July run

Instrument	Responsible	Properties in NXCALS	FEC name	Logging 2023
eBPM OK	Michal Krupa David Medina (FESA)	Acquisition	cfc-tsg4-bpmconc	
pBPM OK	Thierry Bogey Stephen Jackson (FESA)	Acquisition ExpertAcquisition	cfv-bb4-bpmlg	Ok
BTV OK	Stephane Burger Ana Guerrero (FESA)	Image Acquisition	cfv-tsg4-btv cfv-tsg4-btv2	Ok
BCT + ICT OK	Tom Levens Athanasios Toupaloudis (FESA)	CaptureAcquisition	cfv-tsg4-bctf	Ok ICT Ok BCT
BLM OK	Christos Zamantzas Fabio Follin (FESA)	Acquisition	UCAP.NODE.SPS.BLM. CONCENTRATOR	Ok
BLM picoscope	Livio Verra (both HW and SW)	FileRead	cfc-tsg41-xeastreak	
Streak Camera OK	Patric Muggli (MPP) David Medina (FESA)	StreakImage	cfc-tsg41-btvstreak cfc-tsg41-xeastreak	Ok BTV Ok MPP
Faraday Cup OK	BI AWAKE / TRIUMF ? Steen Jensen (FESA)	Acquisition	cfv-tsg4-bcf	
Spectrometer OK	David Cooke (UCL) David Medina (FESA)	CameraAcq ImageAcq	cfc-tsg4-xspect	
Pepper Pot	University of Manchester David Medina (FESA)	CameraAcq ImageAcq	cfc-tsg4-xppt	

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Your occasional exotic needs

BI provides support and expertise for non standard systems. DPS

Run example: the 1 μ s cameras

- 2 cameras installed. Unique interface.
- Dedicated acquisition for CoaxPress.
- 8 mm lens compensation.
- FESA workarounds by AWAKE OP.



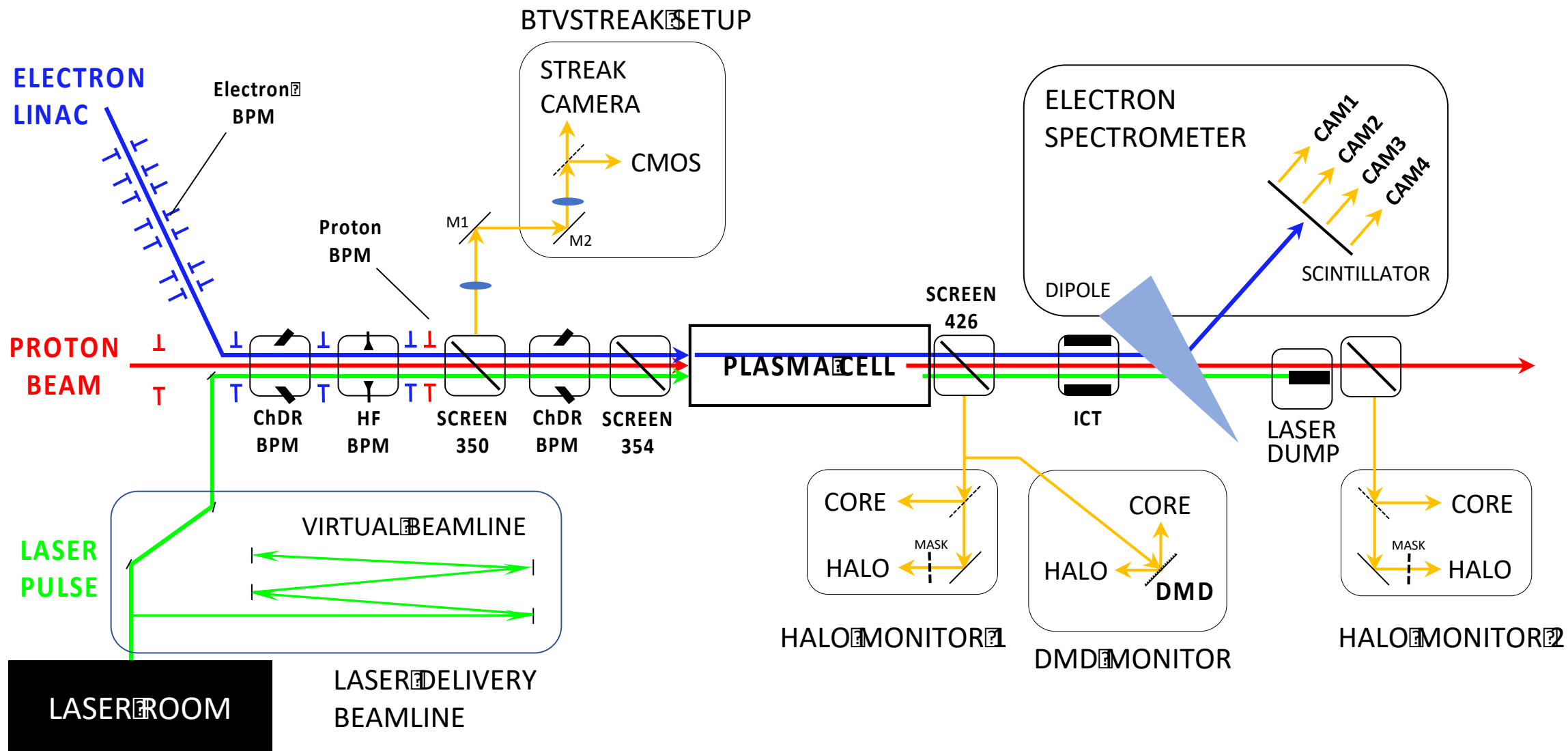
A μ s Basler camera looking at the DPS

For instrumentation, Run 2A and Run 2B are not very different.

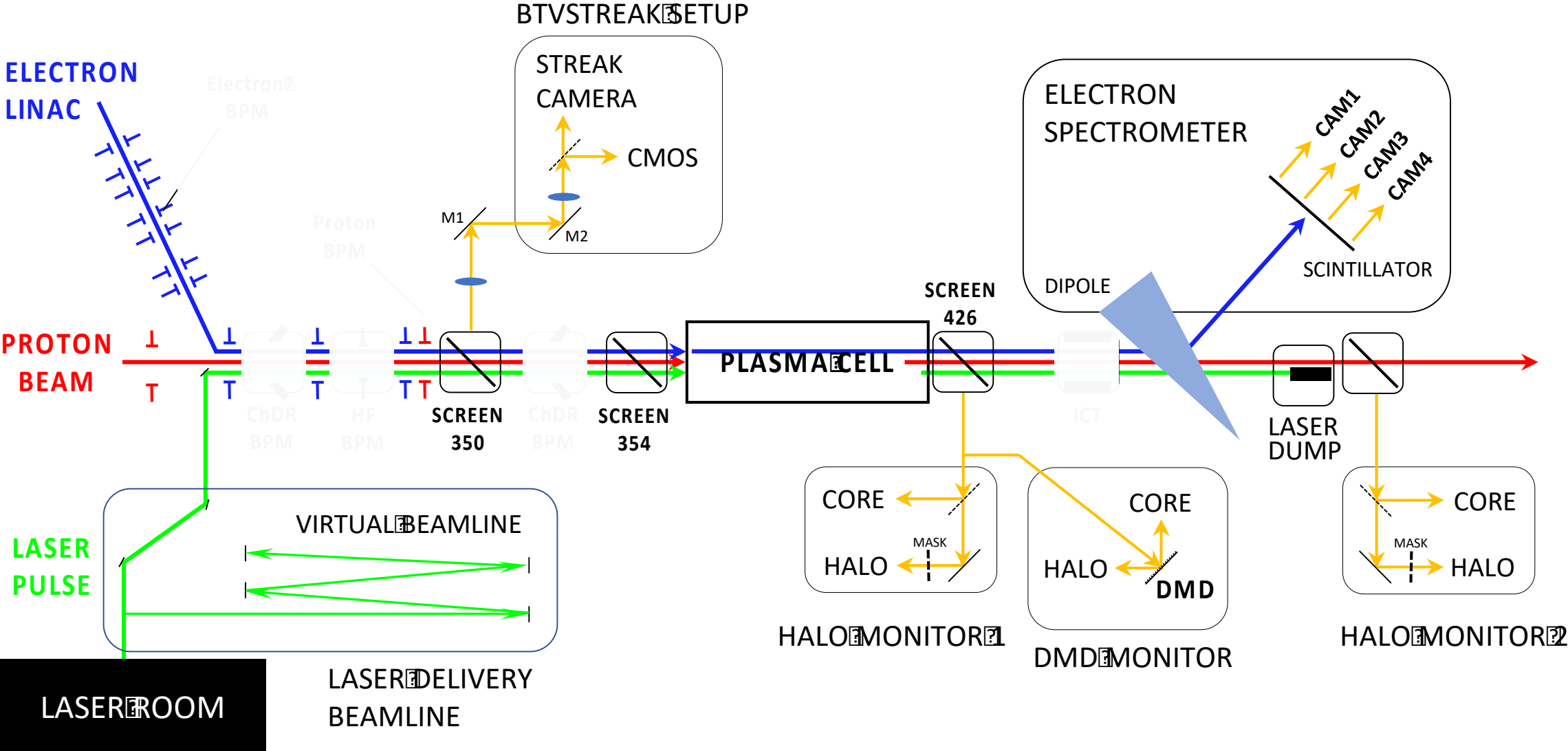
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AWAKE BI Instrumentation Systems



General Cameras Status



General Cameras Status

2 x 24 digital camera systems fully deployed

~~Analog camera system~~

➤ 0 cameras installed

Laser camera system

➤ 5 cameras installed

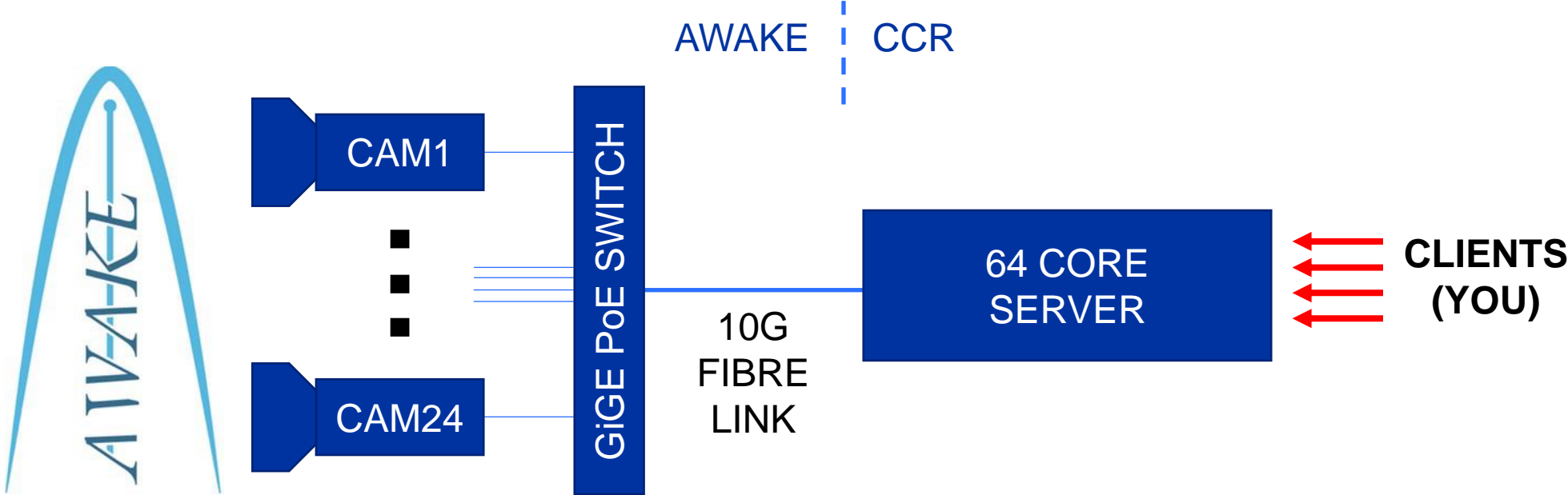
Beamline camera system

➤ 19 cameras installed



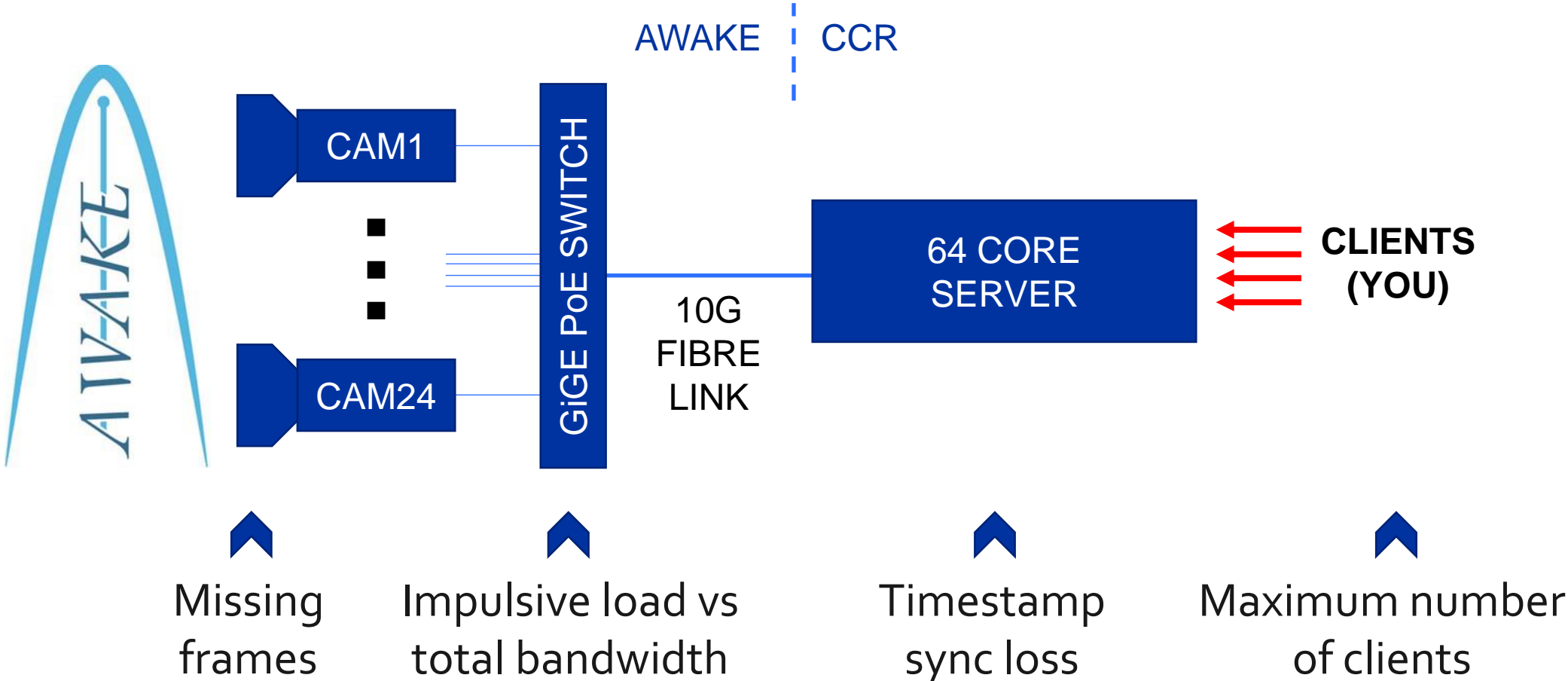
General Cameras Status

2 x 24 camera systems



Sources of malfunction

2 x 24 camera systems: Bottlenecks under investigation



Current status

Current faults status

- The FESA was upgraded to avoid losing synchronization. **Being now tested.**
- Monitoring dashboard created
<https://wrap.cern.ch/dashboard/32646>

Current status

Current faults status

- The FESA was upgraded to avoid losing synchronization. **Being now tested.**

How we will move on

- A specifications document is being drafted
- This document contains **test specifications** to declare the **end of the development phase**



ENGINEERING SPECIFICATION DOCUMENT

The AWAKE digital camera DAQ: system specifications, technical description and test specifications

ABSTRACT:

This document describes updated specifications for the AWAKE camera DAQ, including test specifications. The existing hardware installation is described, together with the software requirements. The software tests are specified.

DOCUMENT PREPARED BY: E. Senes SY-BI	DOCUMENT TO BE CHECKED BY: S. Mazzone SY-BI S. Burger SY-BI A. Topaloudis SY-BI G. Zevi della Porta EP-UFT L. Ranc EP-UFT B. Woolley SY-RF F. Roncarolo SY-BI S. Jackson SY-BI	DOCUMENT TO BE APPROVED BY: E. Gschwendtner BE-ABP T. Lefevre SY-BI
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FOR INFORMATION TO:

EDMS to verify that this is the correct version before use.



5. TEST SPECIFICATION

5.1 TEST #1: Global frame loss

5.1.1 Goal:

Estimate the total number of frames lost over **24 hours**.

5.1.2 Method:

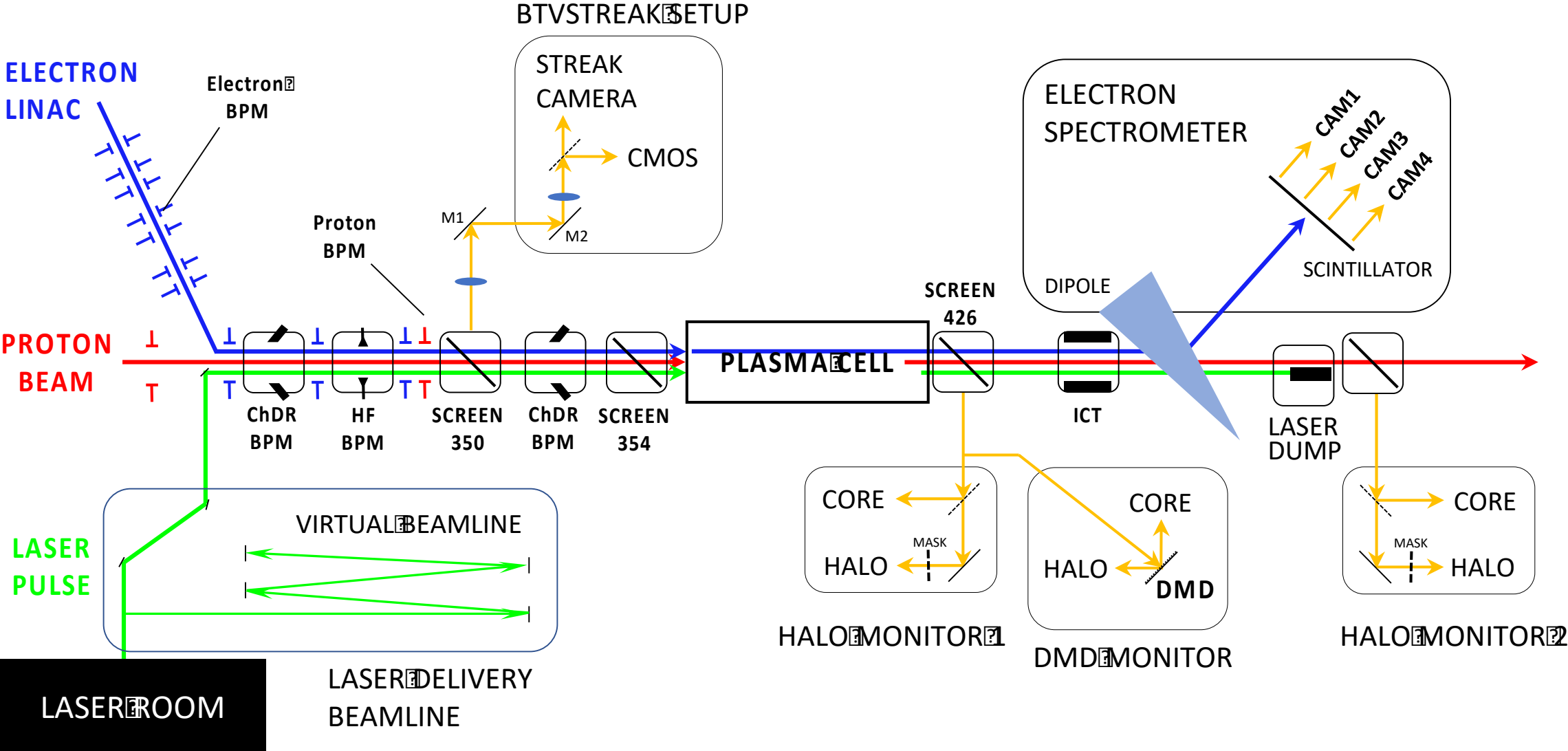
A finite number of triggers is sent to the cameras during the test period. A test client subscribes to the publication of the 10 Hz images of all the cameras on the server simultaneously. The frames received from each camera are counted and the timestamps are logged. At the end of the test, the data are analysed and the number and pattern of lost frames are estimated.

5.1.3 Definition of success:

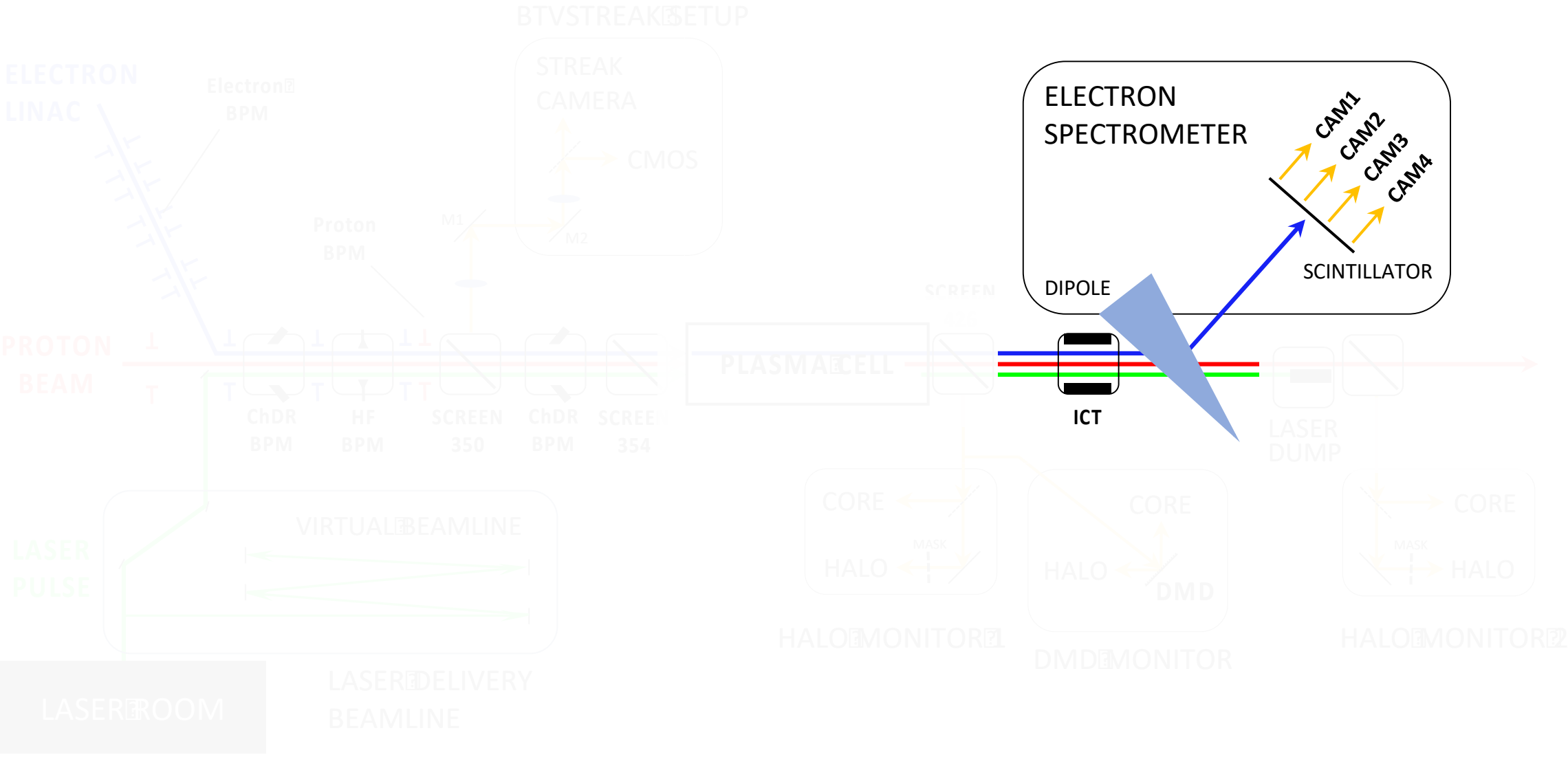
The downsampled frame loss over the test period complies with the specifications.

The test must be repeated for at least 3 days. Hardware and software reboot is allowed between the tests. The test can be carried out in parallel with Test #2.

AWAKE BI Instrumentation Systems



Spectrometer instrumentation



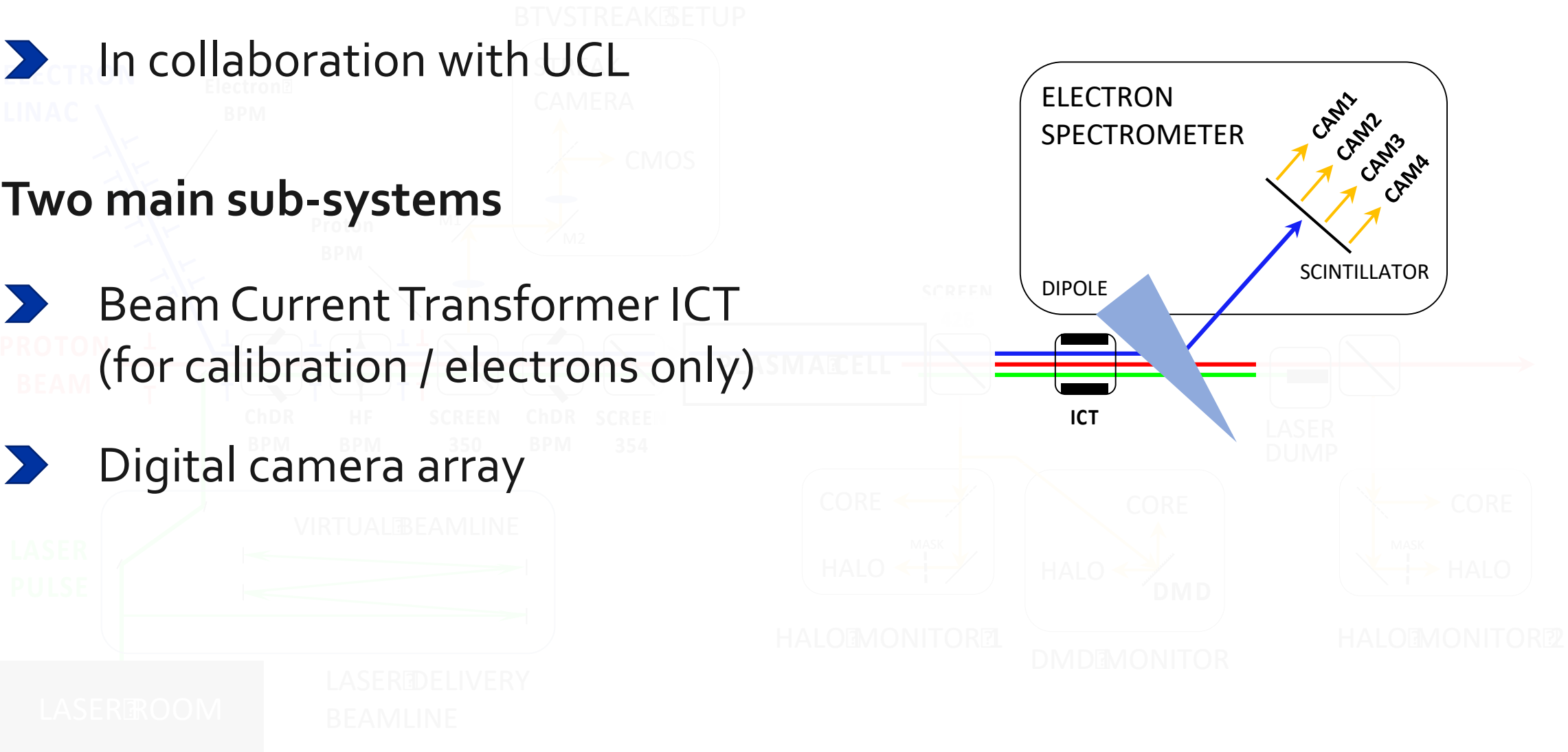
Spectrometer instrumentation

➤ In collaboration with UCL

Two main sub-systems

➤ Beam Current Transformer ICT (for calibration / electrons only)

➤ Digital camera array



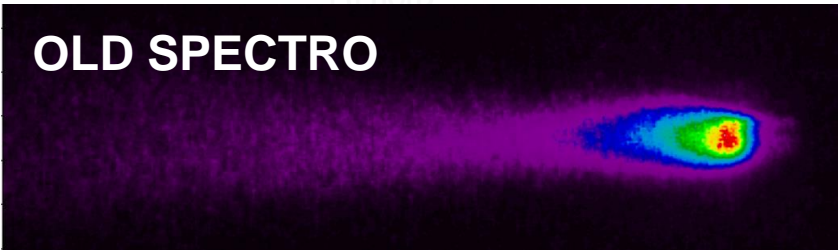
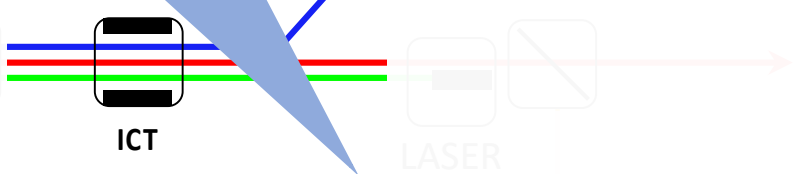
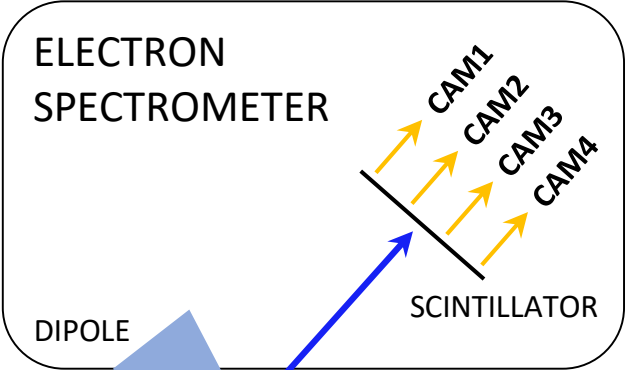
Spectrometer instrumentation

ICT status

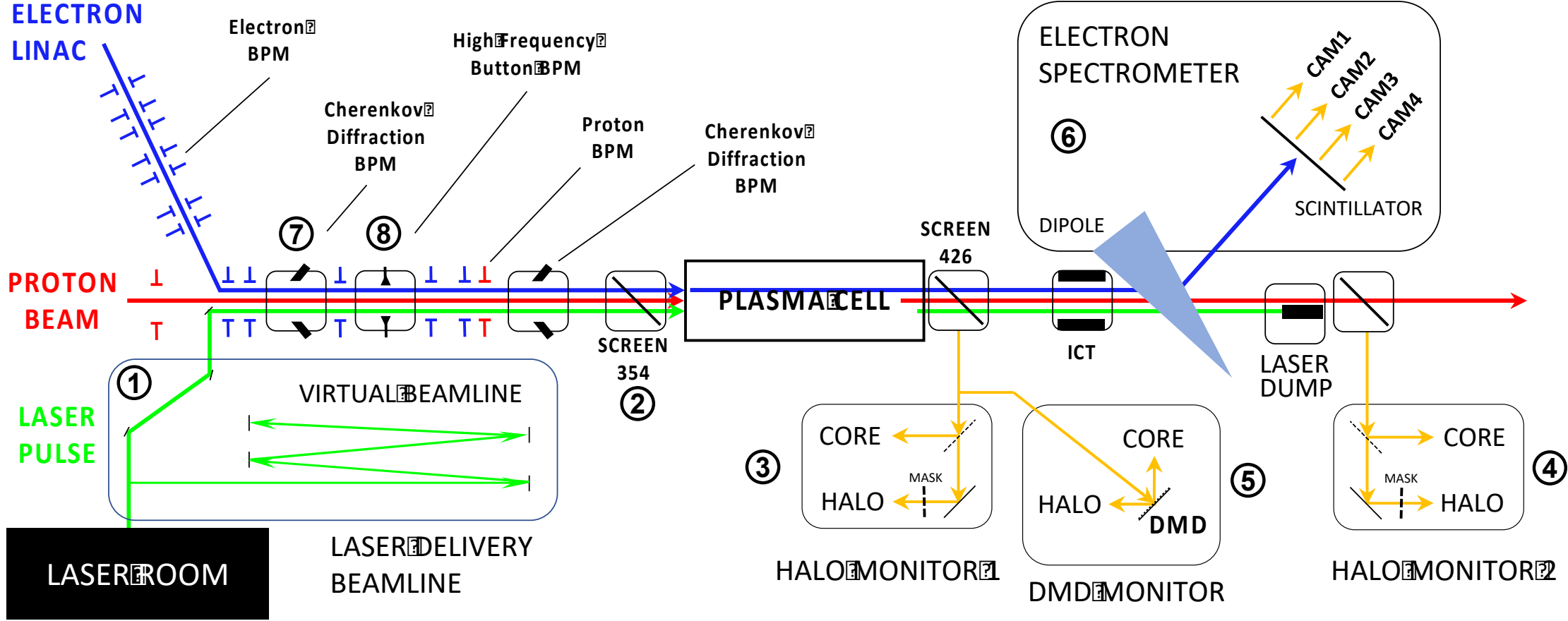
- The range was adjusted after the last TB indication

Camera array status

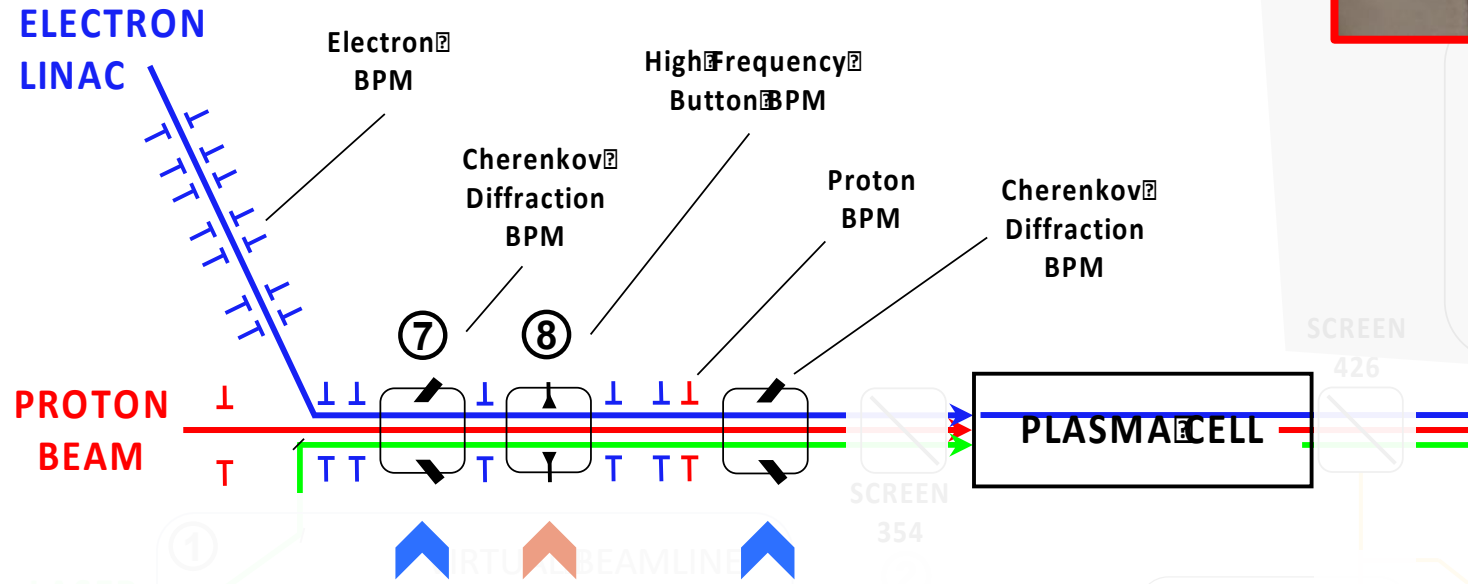
- Work in progress on both camera array and scintillator. Full setup in the lab.
- See Fern's talk !



AWAKE BI Instrumentation Systems

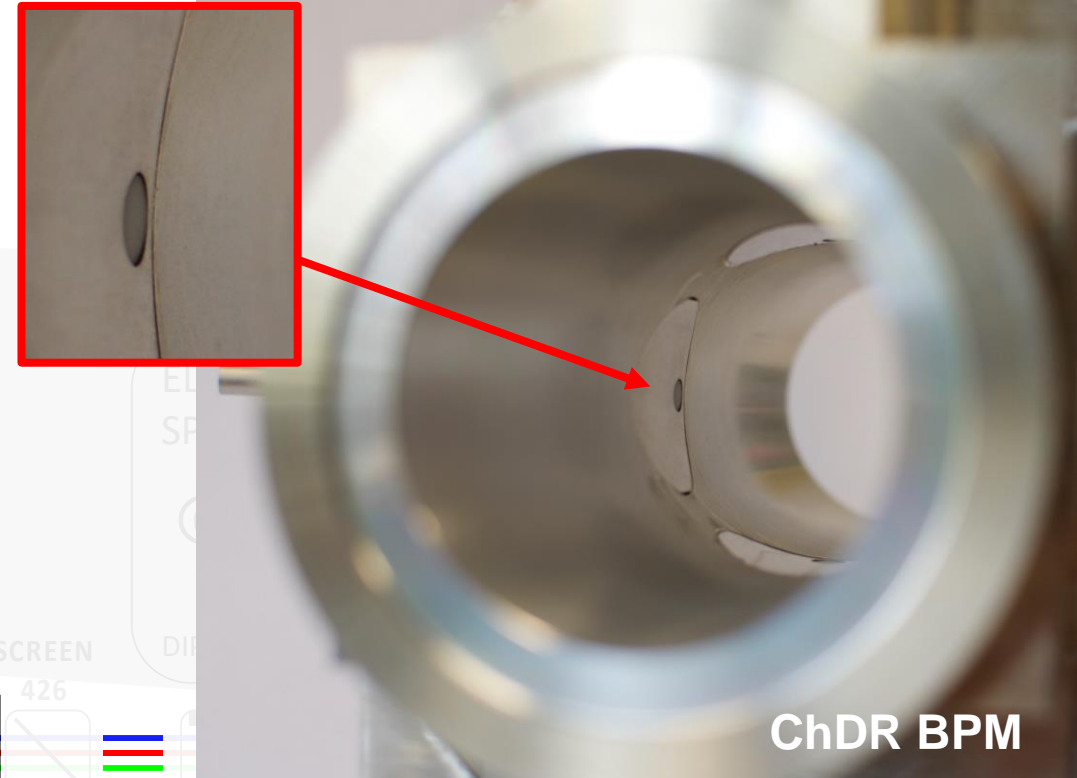


BPM research in AWAKE

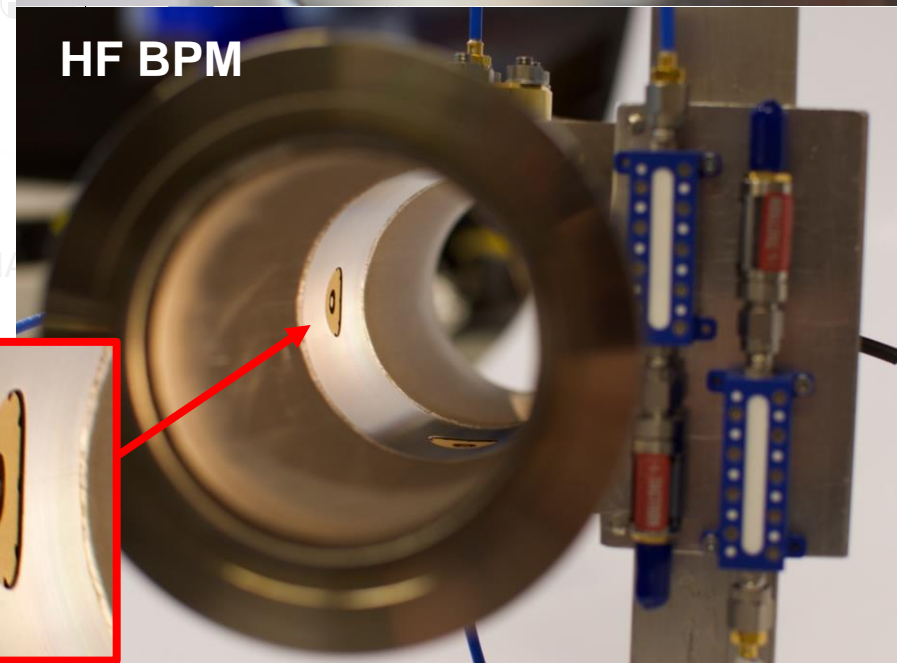


Currently installed in the common line

- ChDR 2x ChDR BPMs
- HF 1x HF BPM

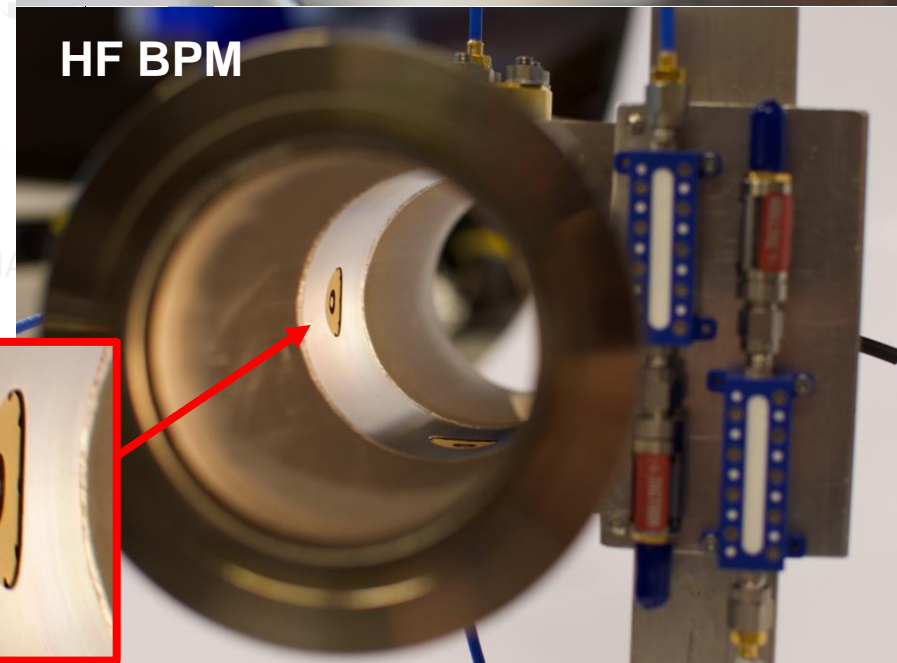
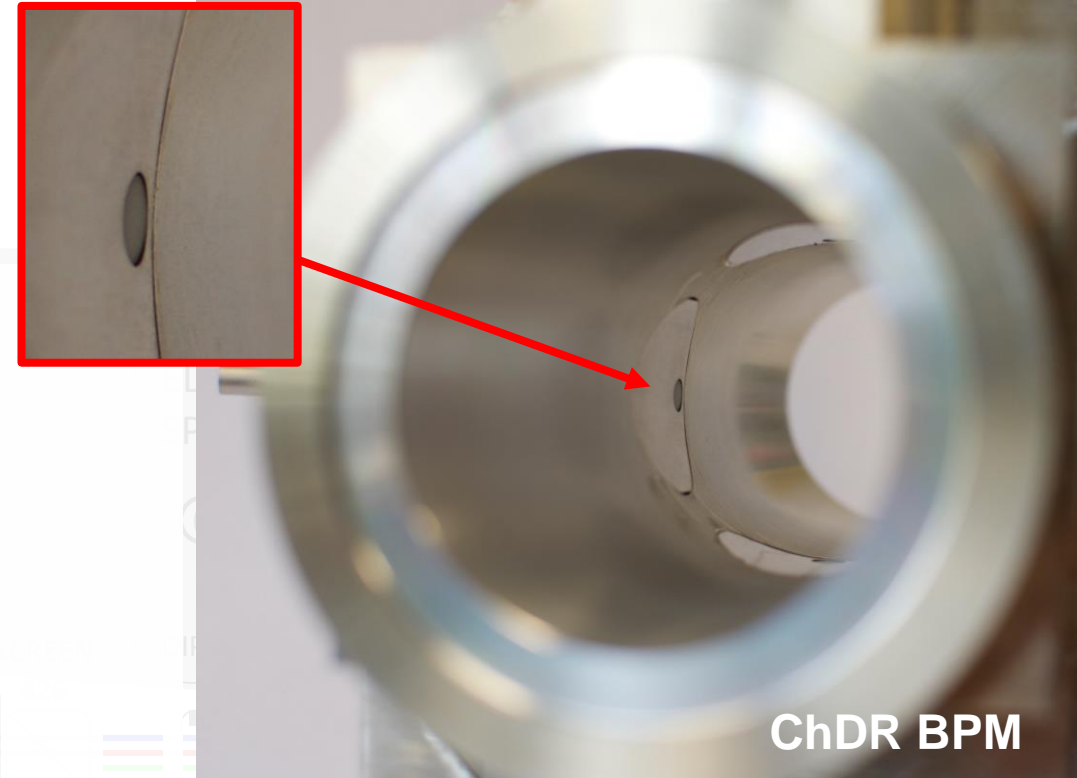


ChDR BPM



HF BPM

BPM research in AWAKE





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