

Synoptics in CERN's Accelerator Controls

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With input from Pascal Leroux & Anastasiia Moshenska

Stateful Scalable Vector Graphic

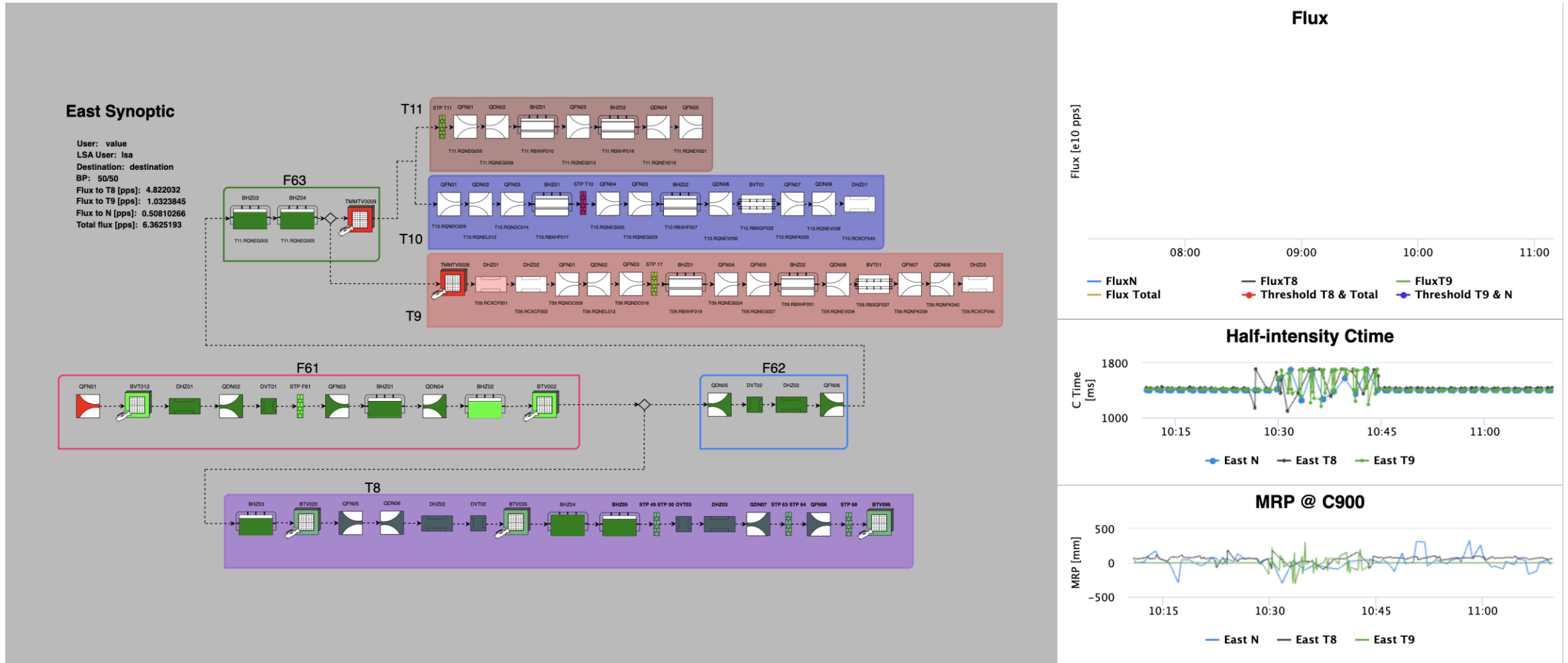
AKA SSVG

SSVG (Stateful SVG)

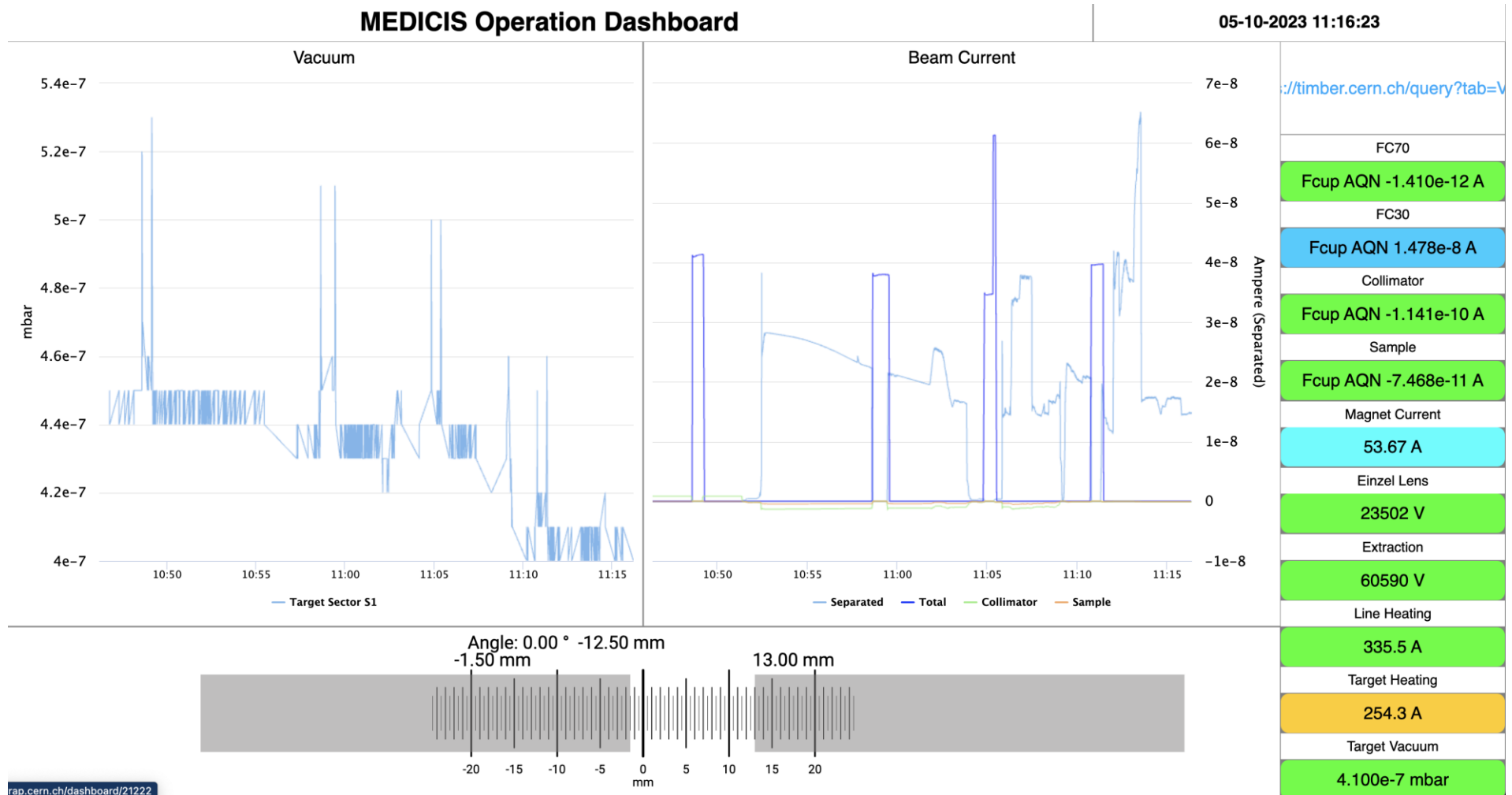
- An SSVG¹ is an SVG image file, extended with additional metadata that is ignored by an SVG renderer.
- WRAP can read this metadata, infer what data sources are accepted and how the SVG image should transform based on the in-coming data source values, e.g. device property updates, WRAP variable.
- Workflow:
 - Inkscape – Design the SVG => static, not leveraging any other information system (exception: CAD export tools)
 - SSVG Editor – Add states and link to SVG elements
 - WRAP editor – Bind the states to controls variables, integrate in your app

¹ developed by Sylvain Fargier (BE-CEM)

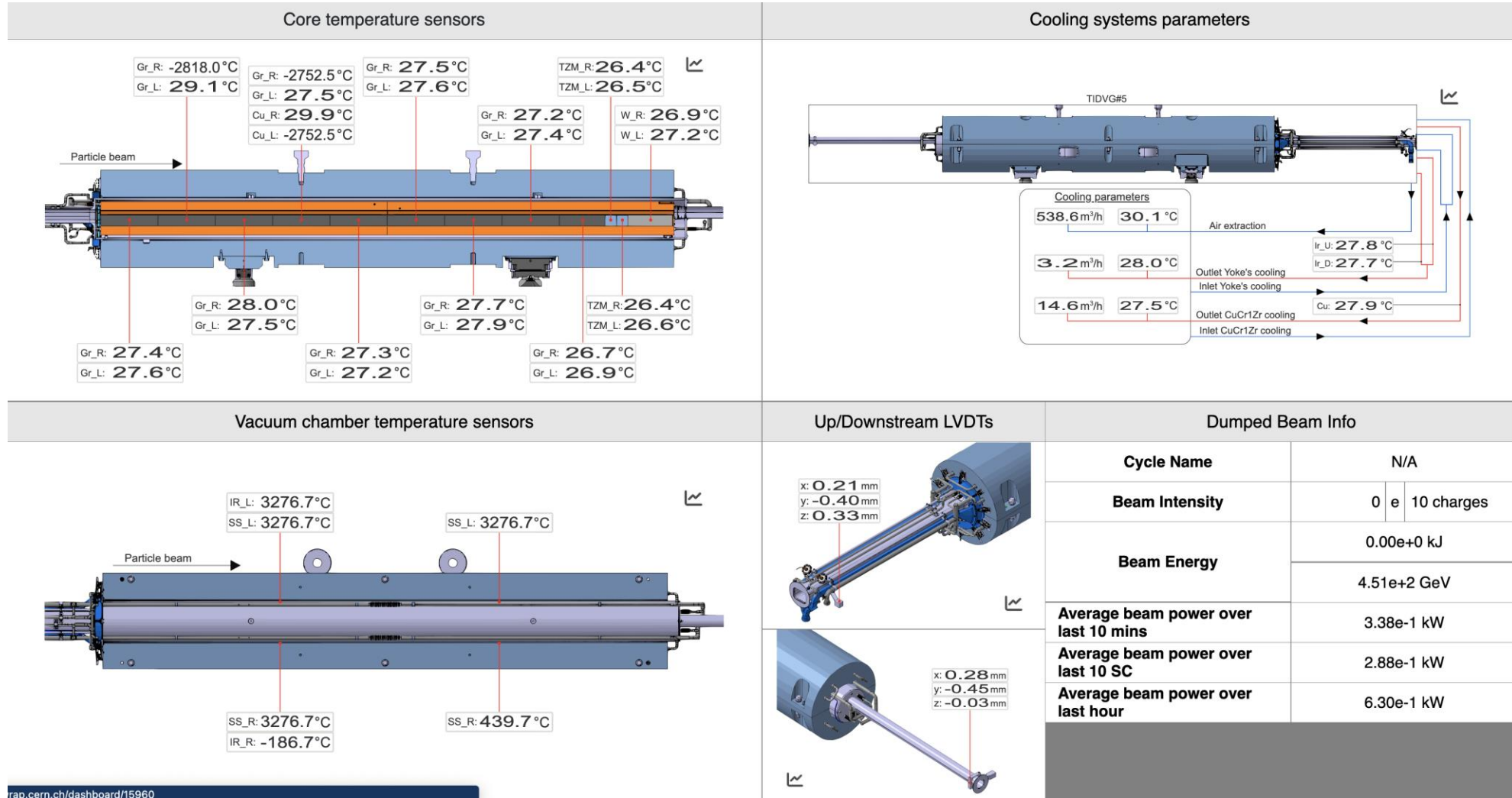
Proton Synchrotron Experimental Area



A picture is worth a 1'000 words



CAD export example



Leveraging Layout Data

Current Layout web interface

MACHINE hierarchy <
Edit assembly Edit points Publish to EAM Delete element New version Add element

MACHINE hierarchy

- SPS North Area
 - SPS North Area - H2 Line
 - SPS North Area - H4 Line
 - SPS North Area - H6 Line
 - SPS North Area - H8 Line
 - SPS North Area - P42 (P4, P4:6, P42)
 - SPS North Area - P4 Transfer Line**
 - TBACA.X0400000
 - TBID.241150
 - TCMAA.X0400001
 - XVW.X0400001
 - MTN.X0400003
 - XVB.X0400005
 - MTN.X0400007
 - XVB.X0400009
 - XVA.X0400011
 - XVA.X0400010
 - XVC.X0400010
 - XVC.X0400013
 - XVW.X0400017
 - XTAX.X0430018
 - XTAX.X0430020
 - XCIO.X0430021
 - XVW.X0430020
 - MSN.X0430022
 - XVC.X0430026
 - MSN.X0430029
 - QSL.X0430033
 - XVC.X0430036
 - QNL.X0430040
 - XTCX.X0430042
 - BLMH.X0430043
 - XVC.X0430045
 - MCXCA.X0430048
 - XVB.X0430048
 - QNL.X0430050
 - QNL.X0430054
 - XVC.X0430059
 - XVB.X0430062
 - QNL.X0430064
 - MBW.X0430069
 - BLMH.X0430073
 - MBW.X0430076

P4 TRANSFER LINE P4 Transfer Line ID 55333560
SPS North Area - P4 Transfer Line
LS1 ENDLESS

Type MACHINE 2122091 Expert Name X043
 Location P4 TRANSFER LINE Machines P42
 Owner Group BE-EA Responsible Giulia Romagnoli Sequences P42 BEAM LINE
 Links P4 in GIS

Positioning SmarTeam / DMU

Distances

Referential	From point	To point	S [m]	U [m]	V [m]	Valid from	Valid till
Distance type = BOUNDING BOX WIDTH/LENGTH							
P42.START	P4 TRANSFER LIN	P4 TRANSFER LI	162....	0	0	LS1	ENDLESS

3 items shown

Transformations

Domain Properties

Expert Names

Distance

Anchor

GIS Integration

P4 TRANSFER LINE (X043, P4 Transfer Line) in the CERN Geographic Information System

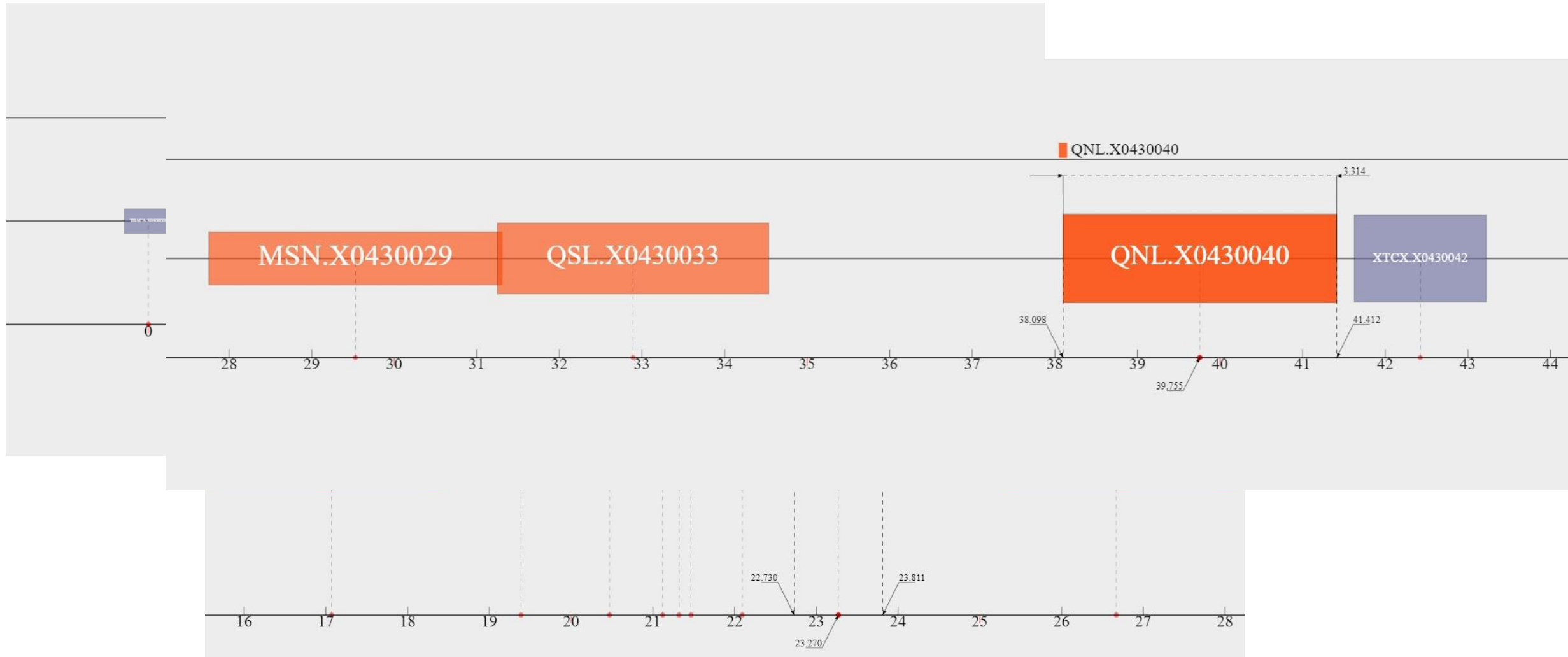
LS1 YETS 2015-2016 EYETS 2016-2017 YETS 2017-2018 LS2 YETS 2021-2022 YETS 2022-2023 TODAY YETS 2023-2024 EYETS 2024-2025 LS3 1.5 LS3 1.6 LS3 1.7 LS3 1.8 LS4

Use cases from CERN's North Area

- Interactive synoptics (i.e. filtering of elements, details, etc.)
- REST API
 - Static synoptics from beam-line selection + element selection
 - API returns JSON with layout data and meta-data to describe synoptics
 - In the future, the result could be integrated with live controls data
- Rendering: SVG or Three.JS
 - All based on data provided by Layout (coordinates, colour, etc.)
 - Simple approach, one element becomes a box with at-scale dimensions.
 - Proper position on the x-axis
 - Hover function to indicate the name and the dimensions
- Next steps:
 - Filtering by element types (today only the beam-line is supported), Layout version, etc.
 - Out-of-scale representation

Examples - WIP

- Measurements (length, cumulative distance, etc.)
- Viewpoint (side view, top view)
- Could be used to debug data (e.g. overlapping elements)



Challenge for rendering

- At-scale synoptics
 - Problem of scale (14m dipole magnet vs 10cm fieldbus connection box)
 - How to label the elements?
 - Scale of the accelerator (e.g. I want 1km of LHC)
 - Clustering of data at low-zoom level
 - Observation window
 - How to declutter the elements and labels?