



EUROPEAN  
SPALLATION  
SOURCE

# Status of ESS and the Instrument Selection Process

## ESS Science Symposium on Neutron Particle Physics at Long Pulse Spallation Sources

Status of ESS

Instrument Selection Process

25 March 2013

Richard Hall-Wilton (ESS)





# The European Spallation Source



# The ESS Headlines



- ESS will be the world's best source of neutrons for the study of materials
- ESS will be 30 times brighter than ILL, the world's best research reactor
- ESS will be 10 times more intense than SNS, the world's most powerful spallation source
- **ESS will produce first neutrons in 2019**



# The ESS Headlines

- ESS will be a neutron source for the study of materials
- ESS will be a long-pulse source: 5MW, 2.86ms pulse length, 14Hz
- ESS will have 22 instruments when construction project is completed
- ESS instrument suite is upgradeable
- ESS will produce its first neutrons in 2019
- ESS will cost 1479M€<sub>2008</sub> to construct

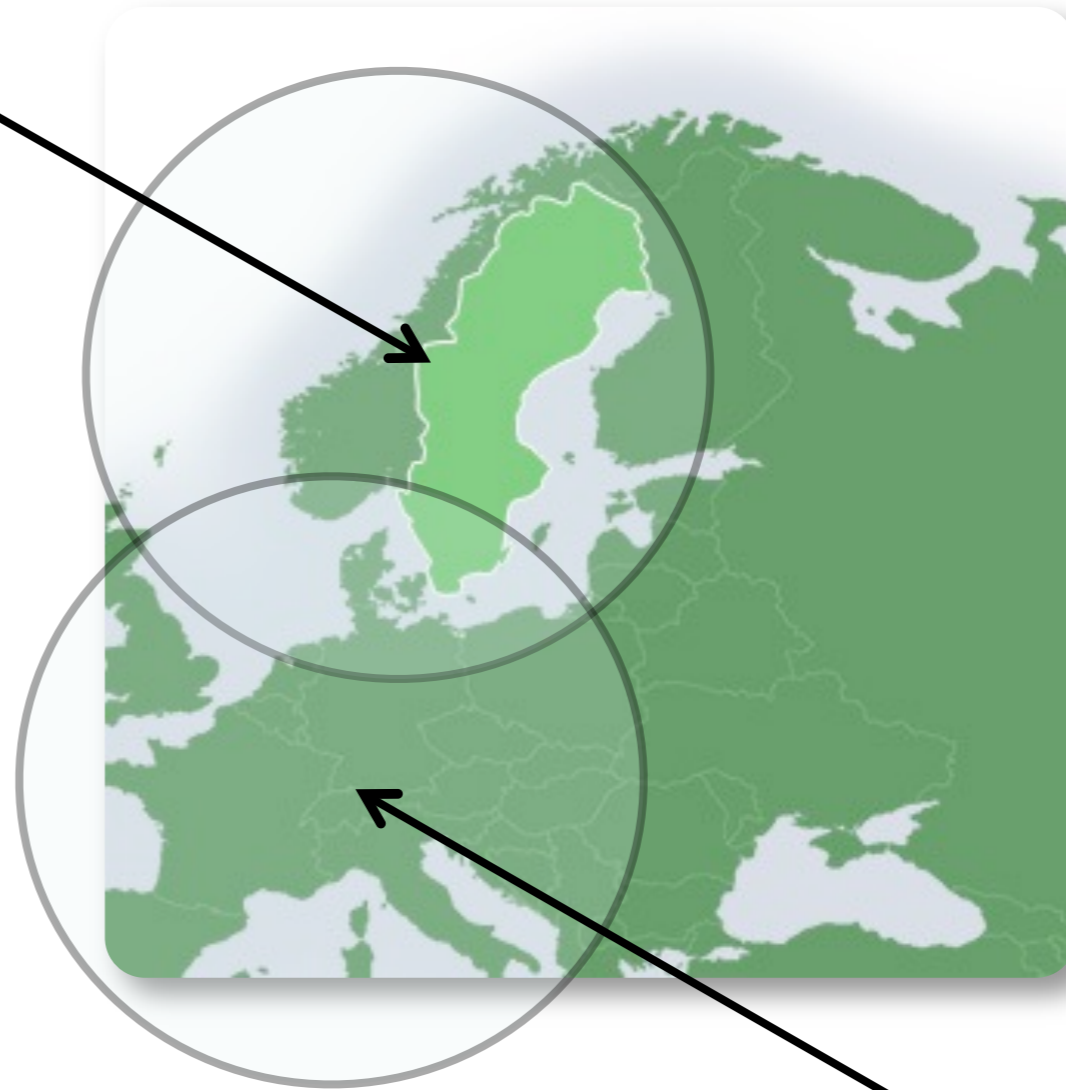




# An International Collaboration



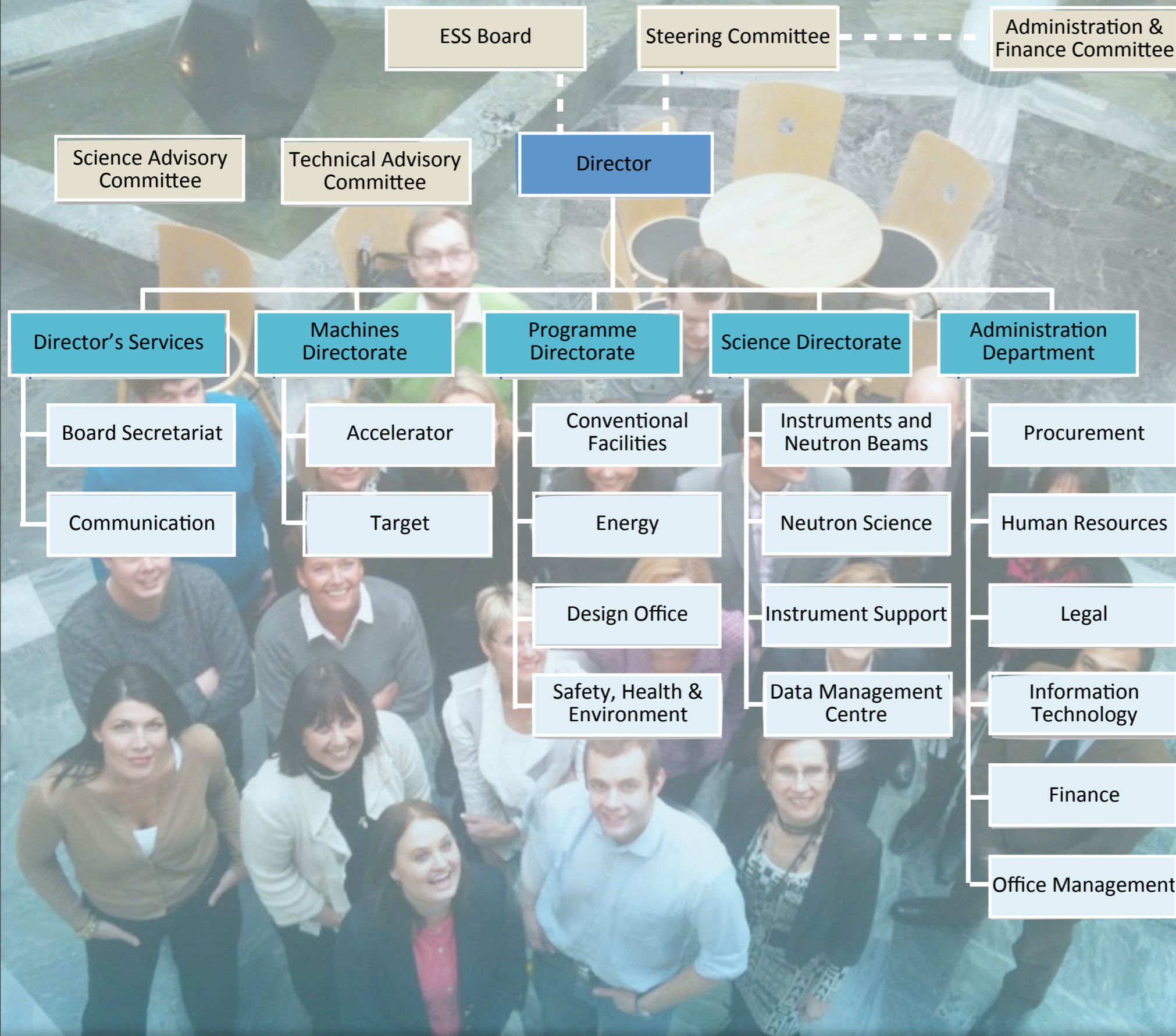
Sweden,  
Denmark and Norway:  
50% of construction and  
20% of operations costs



European partners  
pays the rest



# ESS AB in Lund





# Time Plan

- 2010 - **ESS Company set up**
- 2010 - 2012 **Technical Design Review**
- 2010 - 2012 **Pre-Construction & Site Planning**
- 2009 - 2012 **Licensing and Planning**
- 2010 - 2012 **Finalisation of international negotiations**
  
- 2013 - 2019 **Construction Phase - 7 instruments**
- 2019 - 2025 **Completion Phase - all 22-33 instruments in place**
  
- 2026 - 2066 **Operations Phase**
- 2066 – 2071 **Decommissioning Phase**



# Time Plan

2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2065

## ESS Programme

PRE-  
CONSTRUCTION

### programme phases

CONSTRUCTION

OPERATIONS

DECOMM

ACCELERATOR  
DESIGN

### ESS sub-projects

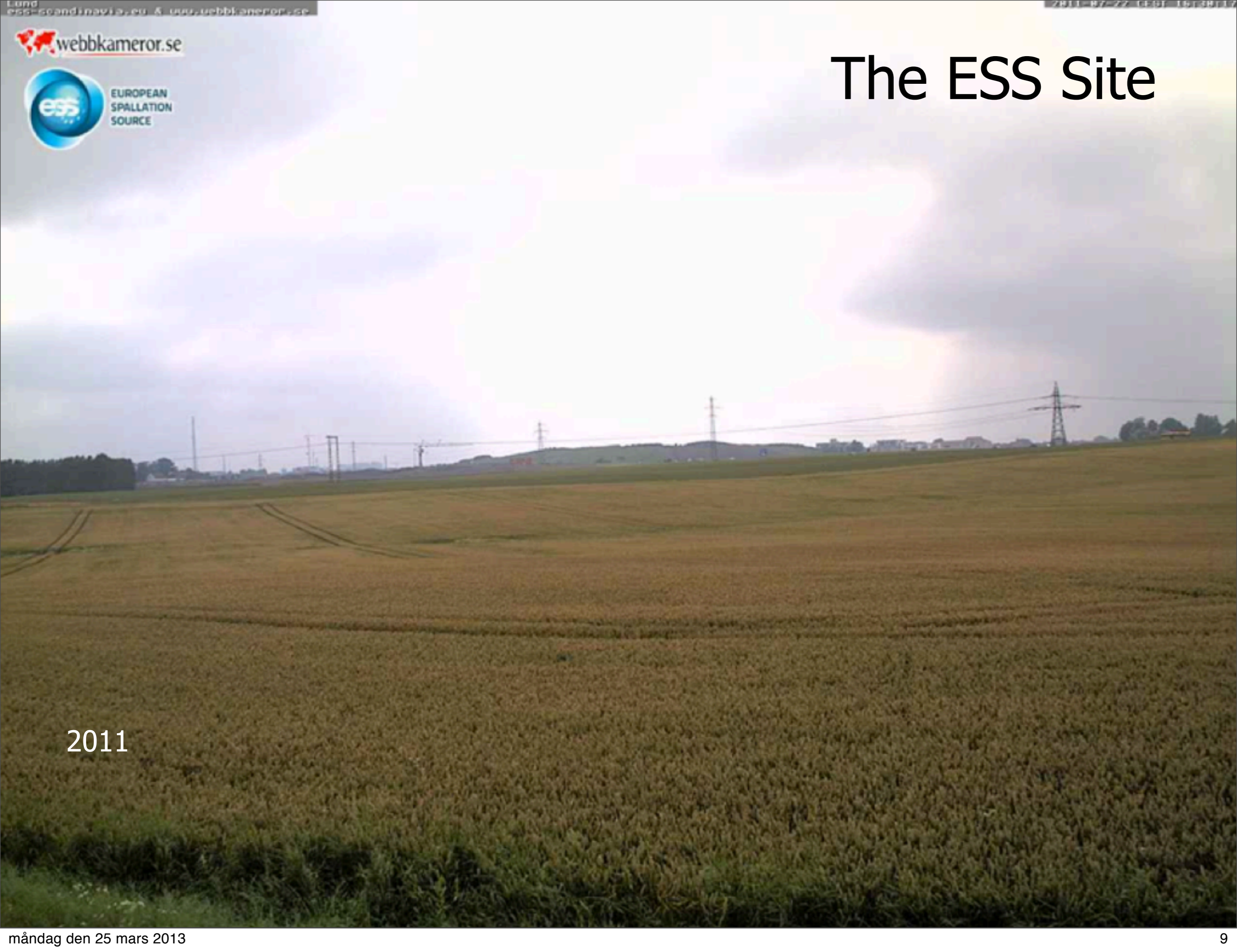
ACCELERATOR  
PREPARE TO BUILD

ACCELERATOR  
CONSTRUCTION

ESS COMMISSIONING (INSTRUMENTS)



# The ESS Site



2011



webbkameror.se



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# The ESS Site



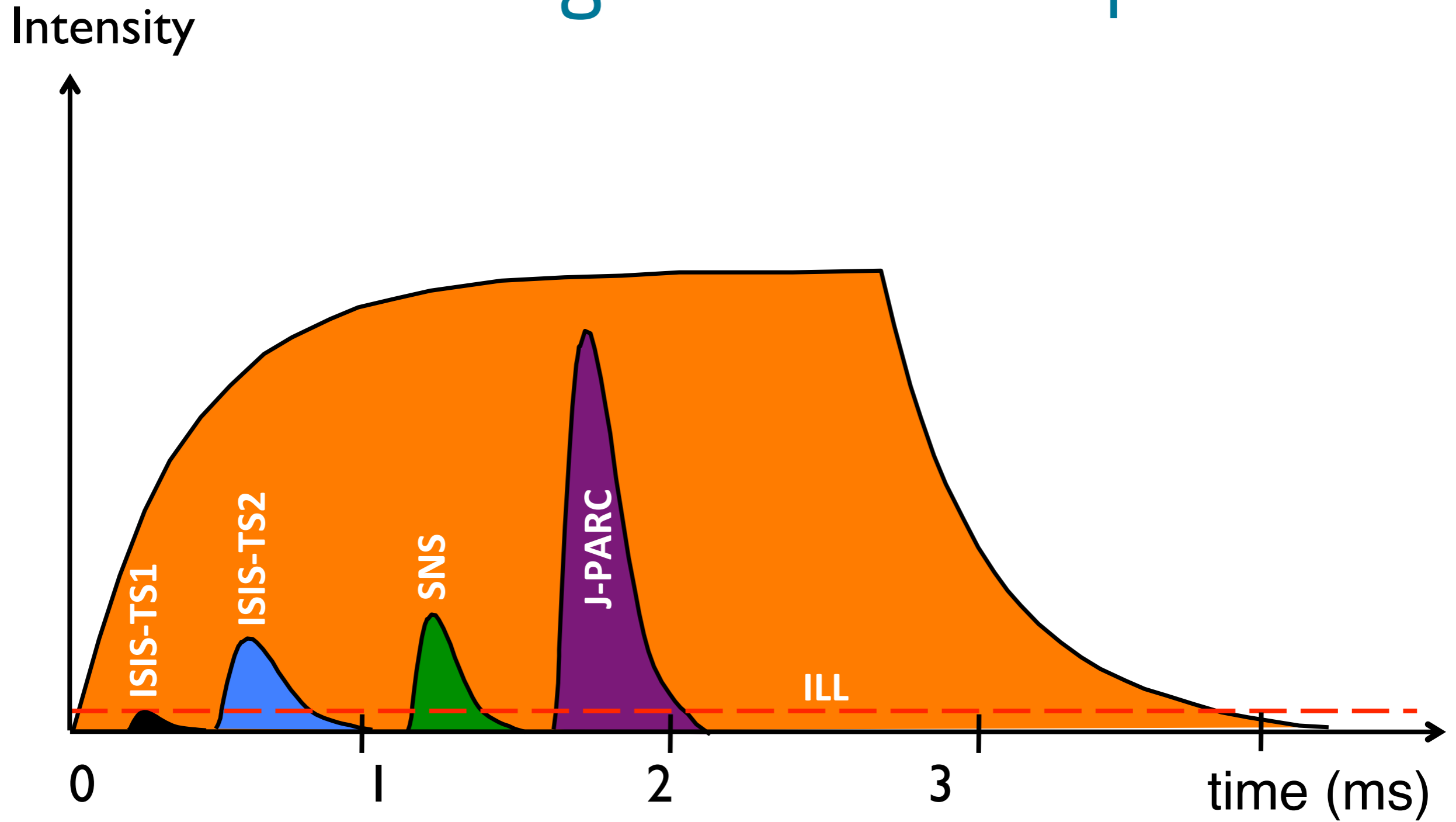
23 October 2012



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SPALLATION  
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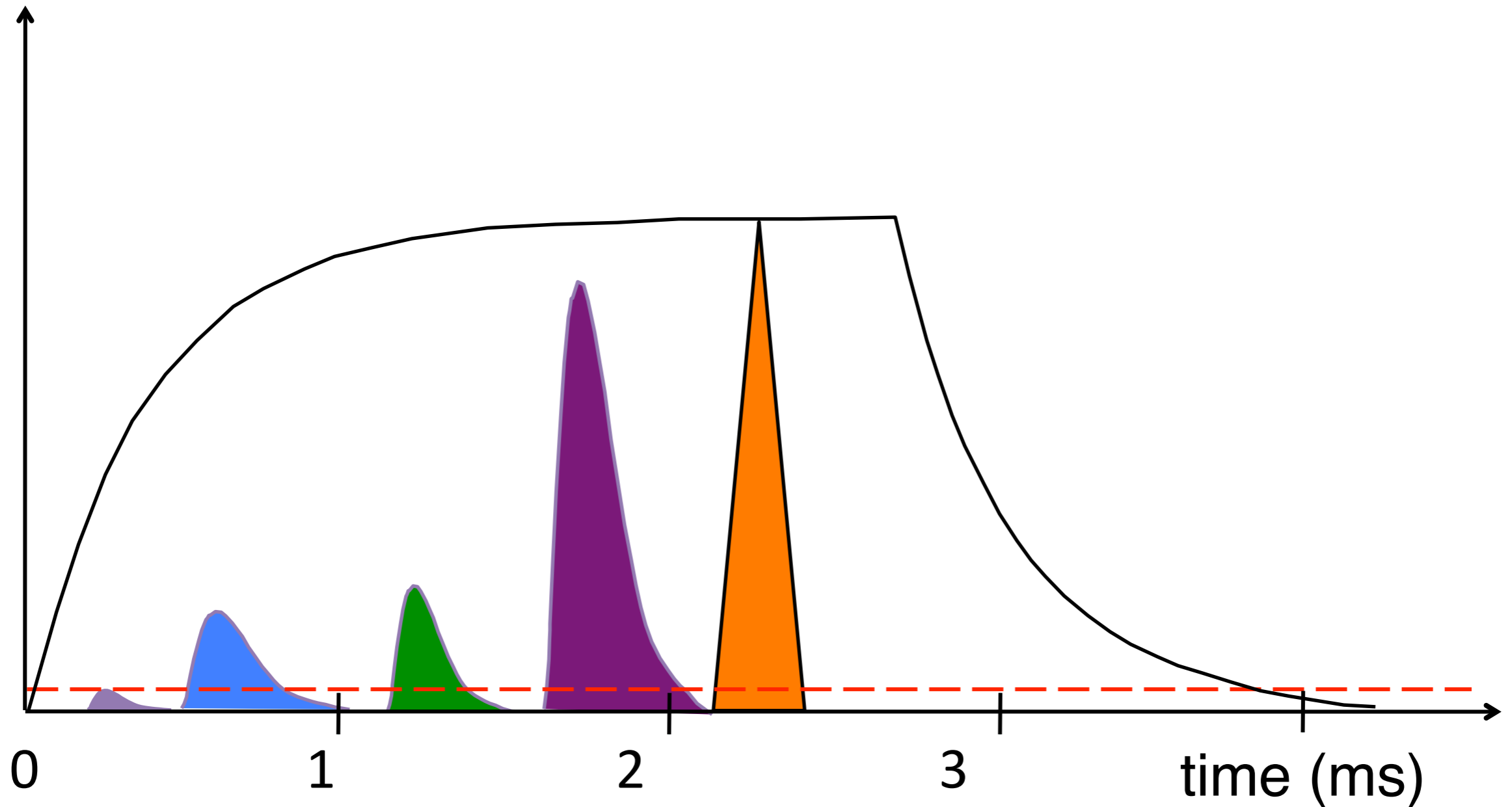
# Long-Pulse Principle





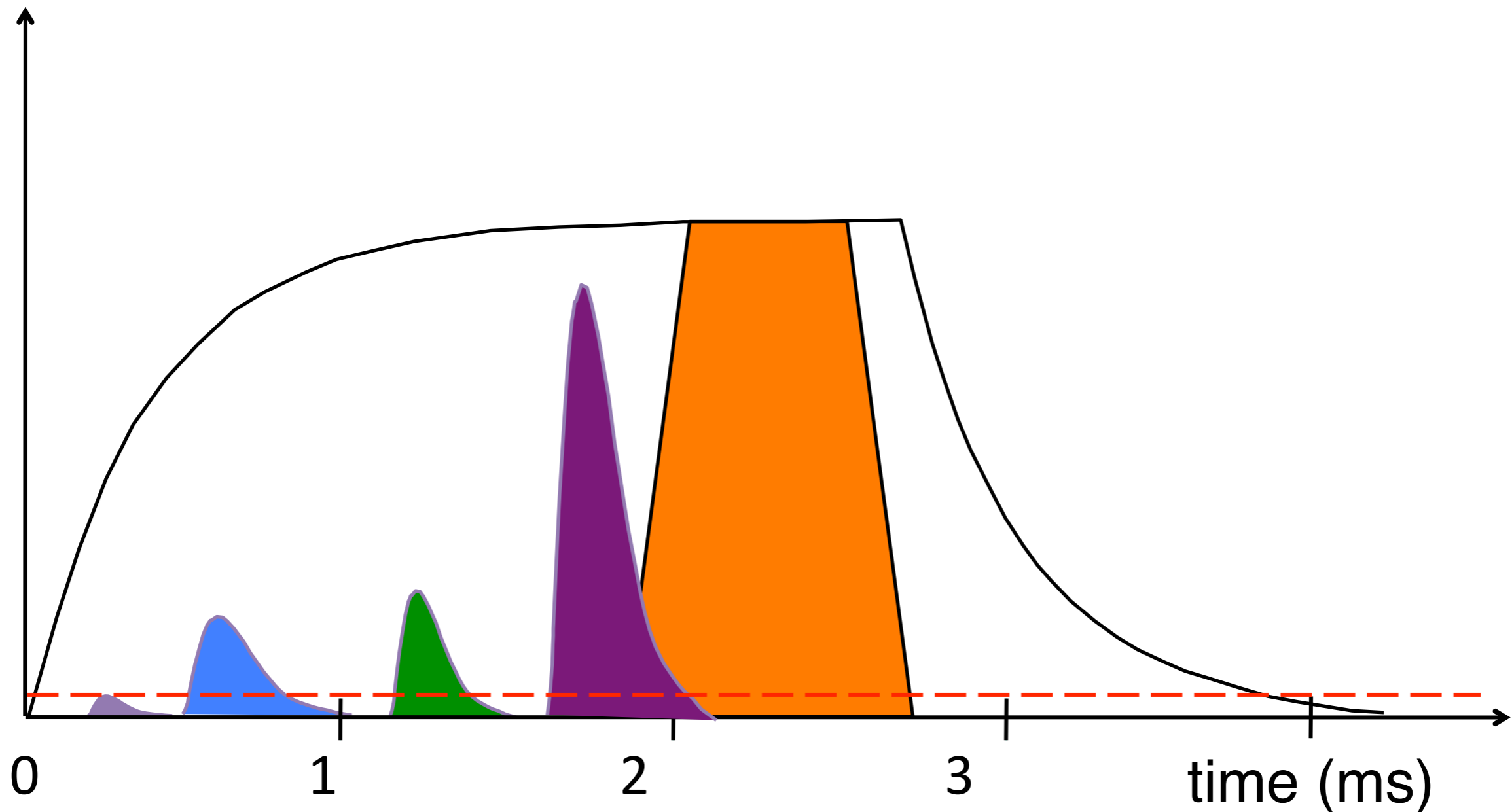
# Long-Pulse Principle

Intensity



# Long-Pulse Principle

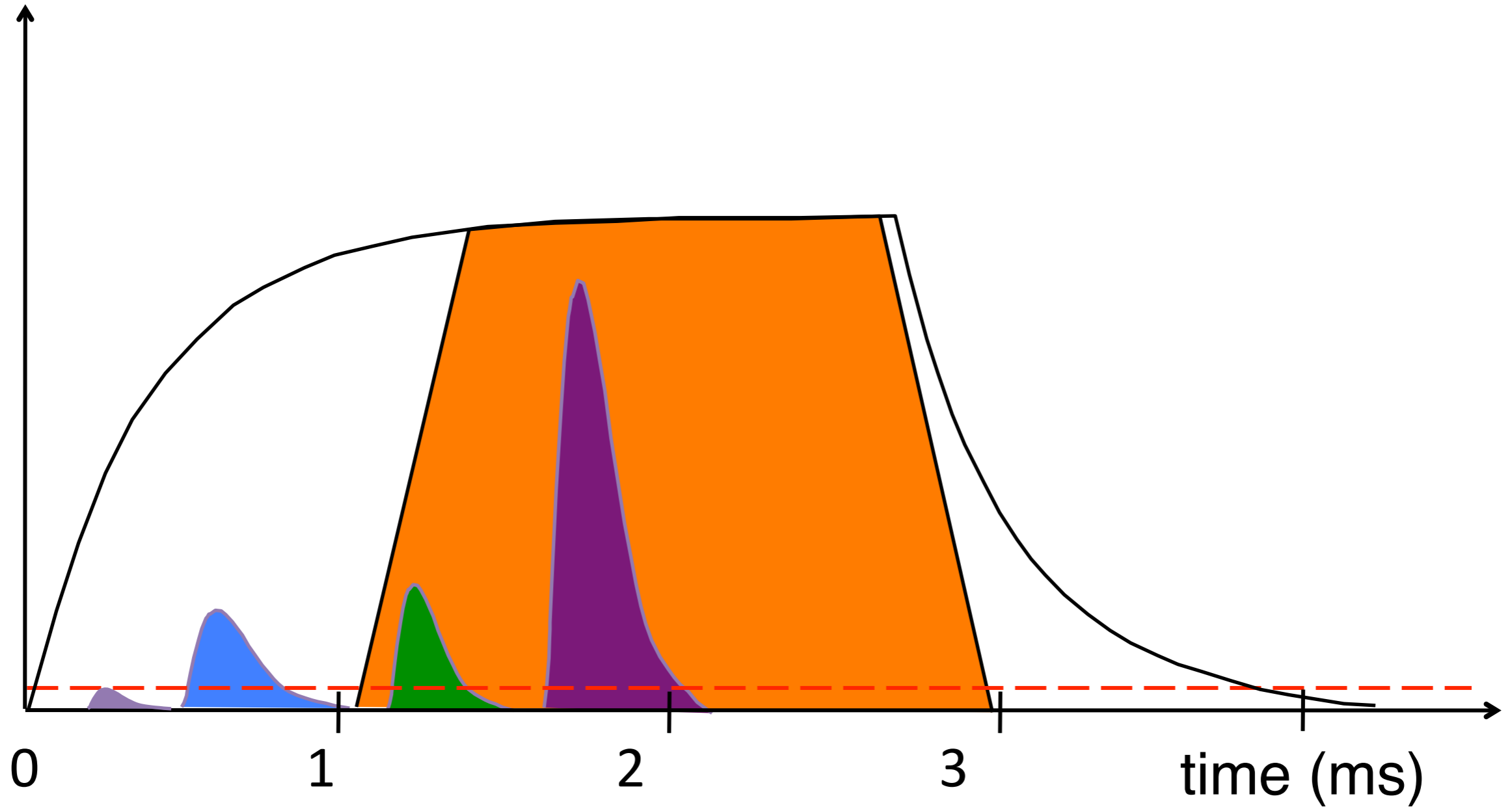
Intensity





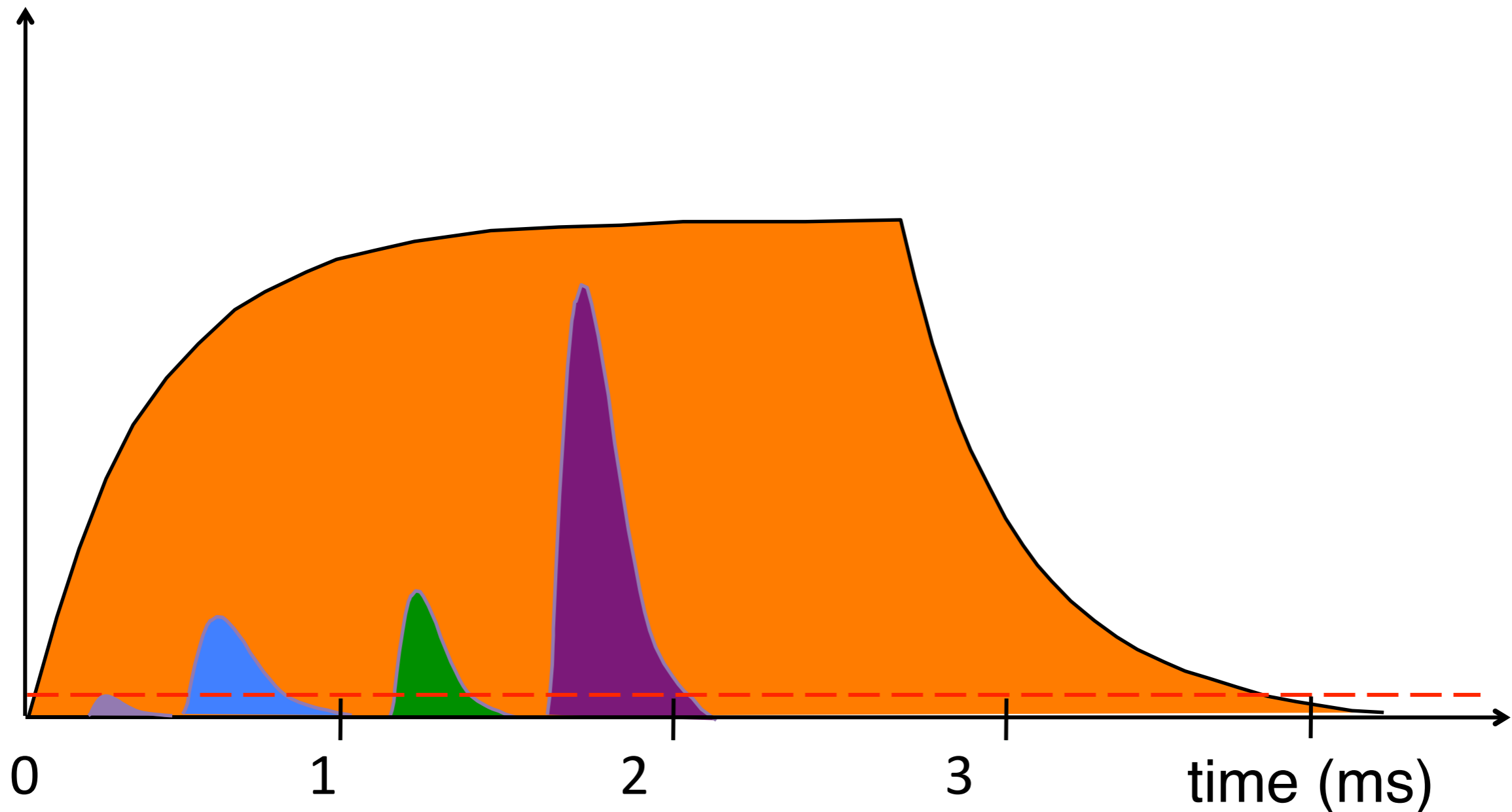
# Long-Pulse Principle

Intensity



# Long-Pulse Principle

Intensity





# Design Update

- **Currently in Pre-Construction Phase**
  - governed by 17-nation MoU signed in February 2011
  - Design Update Project: ends with submission of agreed deliverables in February 2013
  - Founding Agreement in negotiation
- **Design Update Deliverables**
  - Executive Report
  - Programme Plan
  - Design Proposal
    - Conceptual Design Report
    - Technical Design Report
    - Project Specification for Construction Phase
    - Preliminary Project Specification for Operations Phase
    - Preliminary Project Specification for Decommissioning Phase
    - Transition Plan –Construction to Operations
    - ESS Framework Project
  - Detailed Budget and Cost Book
  - Risk Management Plan

# 2012-13 Milestones

	Q1, 2012	Q2, 2012	Q3, 2012	Q4, 2012	2013
Executive Report		03-23	08-03	11-01 12-03	
Programme Plan	03-19	06-11		10-01 12-03	01-21
Technical design Report		06-25		10-01 10-29 12-03	
Project Specifications, Construction		06-11		10-29	01-21
Prel. Project Spec., Operations				10-01	01-01
Prel. Project Spec., De-comm.				10-01	01-01
Transition Plan to Operations			08-15	10-01	01-21
Budget and Cost Book		06-11		10-01 12-03	01-21
Risk List Summary	01-23		07-02	10-01 12-03	01-21
ESS Framework Project (QMP)	03-31 06-30 09-30 12-31				
ESS Board Meetings	01-11/12 02-08 03-20	04-24 05-10/11 06-04	08-14 08-24 09-13/14	10-24 11-16	12-17/18 01-18
STC meetings		04-12	07-02/03	11-13/14	
AFC meetings		03-21/22	06-07/08	11-29/30	
SAC meetings	02-15/17		06-27/28	11-14/15	
TAC meetings					



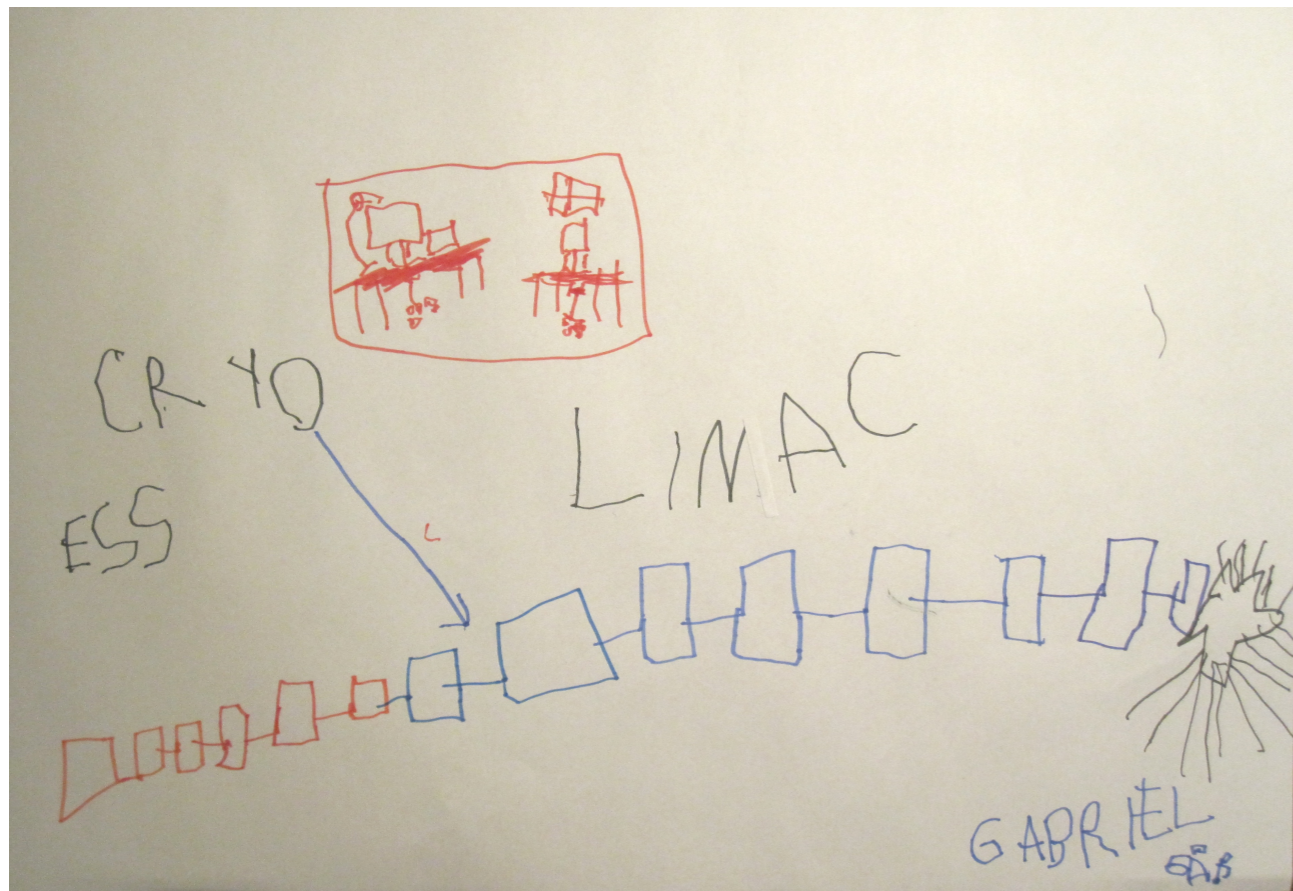
# ESS Technical Design Report

- ESS TDR due in Feb'13
- Significant increase in maturity and detail
- Input to governmental agreement
- Will serve as a baseline for construction



Feb '12

## ESS Conceptual Design Report



## ESS Technical Design Report



Editors: S. Peggs, R. Kreier, ...

Contributors: K. Andersen, et cetera .....

Figure credits: Advanced Cyclone Systems, et cetera .....

**\*\*\* THIS INTERMEDIATE DRAFT IS \*\*\***  
**\*\*\* UNDER ACTIVE DEVELOPMENT \*\*\***

October 31, 2012



# ESS Technical Design Report



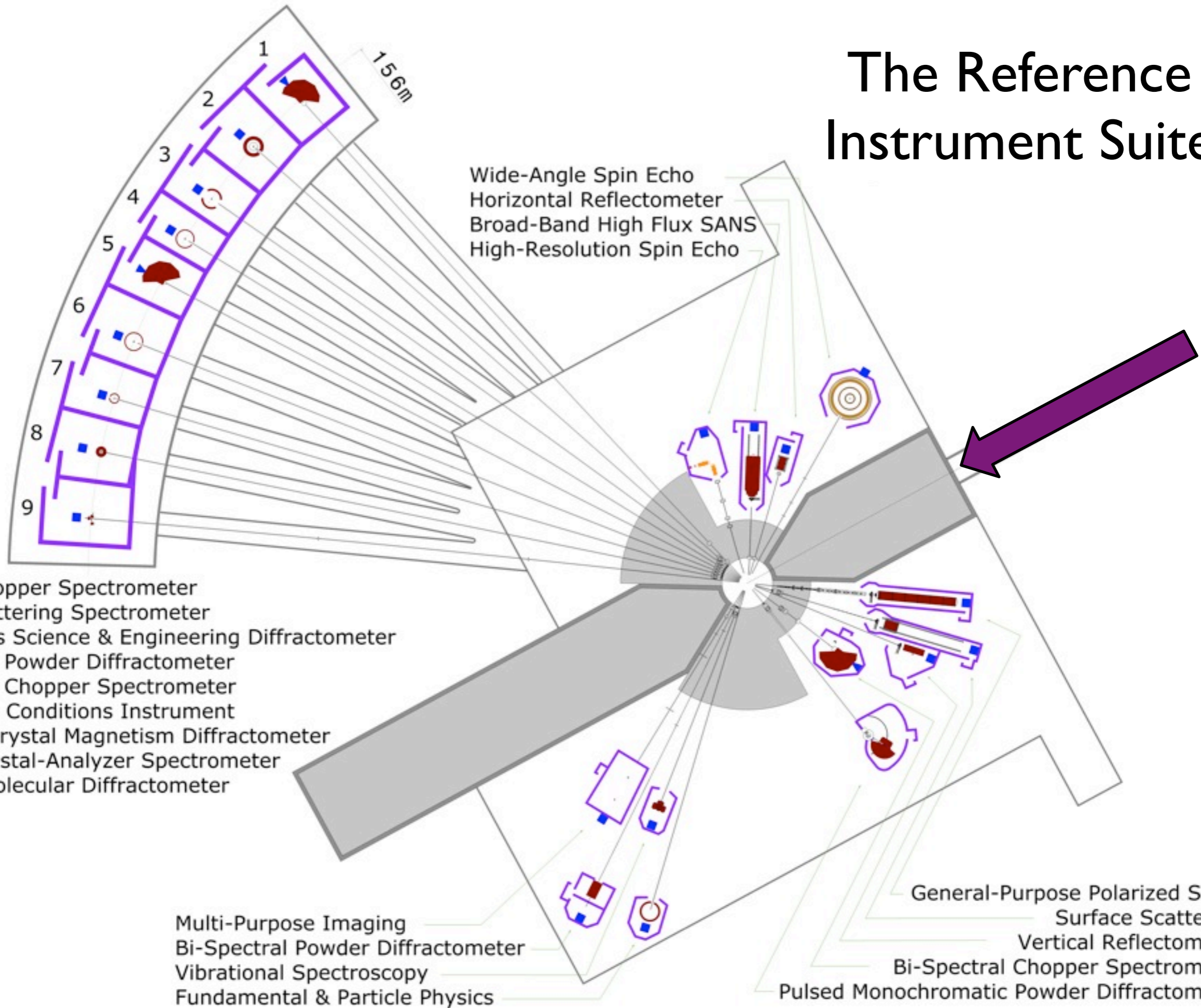
**Release 2.0**

February 5, 2013

- available soon



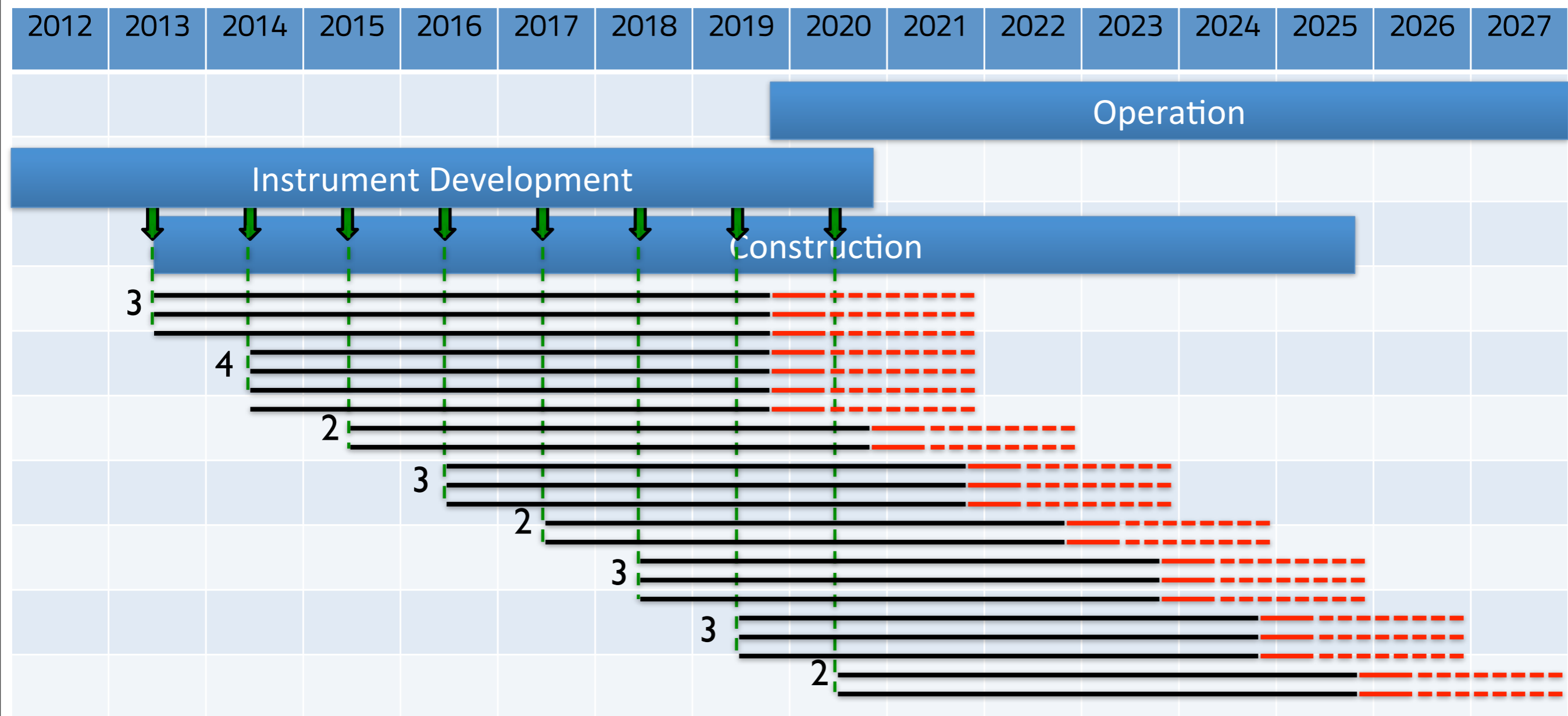
# The Reference Instrument Suite



# Instrument Selection Process



# Instrument Timeline



# Instrument Design & Selection

- First contact and preparation of work unit
- Incorporation into the ESS programme
- Development of conceptual design
- Instrument proposal is submitted to ESS (end-October)
- Review of instrument proposal
  - Internal evaluation: boxes filled in, technical groups, crazy concepts
  - External evaluation: STAPs
    - criteria: impact, demand, performance, uniqueness, technical maturity, cost
- Detailed feedback and revisions (end-February)
- Decision on instrument construction (SAC, StC, ESS management)



# Instrument Work Units

Manag. IC1	SANS IC2	Reflectometers IC3	Macromol. Diffraction IC4	Single Crystal Diffraction IC5	Powder Diffraction IC6	Materials Engin. Diffraction IC7	Imaging IC8	Direct Geom. Spectroscopy IC9	Indirect Geom Spectroscopy IC10	Spin-Echo IC11	Fundam. Physics IC12
	Conventional SANS Full DU for fast conv. ext. q-range SANS, SD004DE/ab	Reflectometer for liquid surfaces and soft matter Full DU for wide q and add- ons, SD003DE/a	Macromol. Diffraction. Full DU, potent. farm SD036ESS	Single Crystal Mag. Diffraction. Full DU SD060ESS	Bispectral Powder Diffraction Full DU, wfm, gen. purp., SD005DE/a	Engineering Diffraction SPEED full DU plus prototyping tests, SD005DE/b	Multi-Purpose High-Res Imaging Full DU in close collab. with CH, dark-field, Bragg edge, polarized SD006DE	Cold Chopper Spectrometer Full DU, high res., RRM and pol. cap., SD001DE/a	Phase Space Transformers Full DU, incl. feasibility studies, focussing, SD007DE/a	High Resolution NSE Full DU, small sample, SD002DE/a	Fund. Physics Full DU Not covered
	Small- sample SANS Full DU SANS, SD004DE/c	Reflectometer for magnetic layers Full DU, focus. pol., SD003DE/b		Single Crystal Mag. Diffraction. Full DU French collaboration	Multi Purp. Extreme Environ. Diff. Full DU, tests, SD008DE	CEED Full DU, tests, PM, SD033CZ	Larmor Label. Full DU, TOF DF imaging SD006NL	Bispectral Chopper Spectrometer Full DU, RRM pol., SD001DE/b	CAMEA Full DU plus tests and prototyping, SD016DC	Wide Angle NSE Full DU, SD002DE/b	UCN Full DU Not covered
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	Compact SANS Full DU, incl. Monochr. mode, SD018DC	Horizontal focusing reflectometer Full DU, SELENE, plus prototype tests, design full instrument, SD017DC/b			Thermal Powder Diff. Full DU, variable to high res. SD035ESS		Multi-Purpose High-Res Imaging  TOF conceptual design SD040ESS	Cold Chopper Spectrometer Full DU, RRM and pol. cap. SD064ESS	Vibrational Spectrometer Full DU, SD063ESS, Italian collaboration	Focussing optics Full DU, SD007DE/c	
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	VSANS/ GSANS Full DU French collaboration	Spin-Echo label. in Pol. Reflectom.  SD055NL			Larmor label. in diff. (TOFLAR) SD057NL						
Simulation software development, general simulations, supporting GER simulations, VITESS SD065DE											
General simulations, in-house supporting simulations, interface moderator-beam extraction, McStas SD022DK											

- ca. 40 instrument concepts at the present time

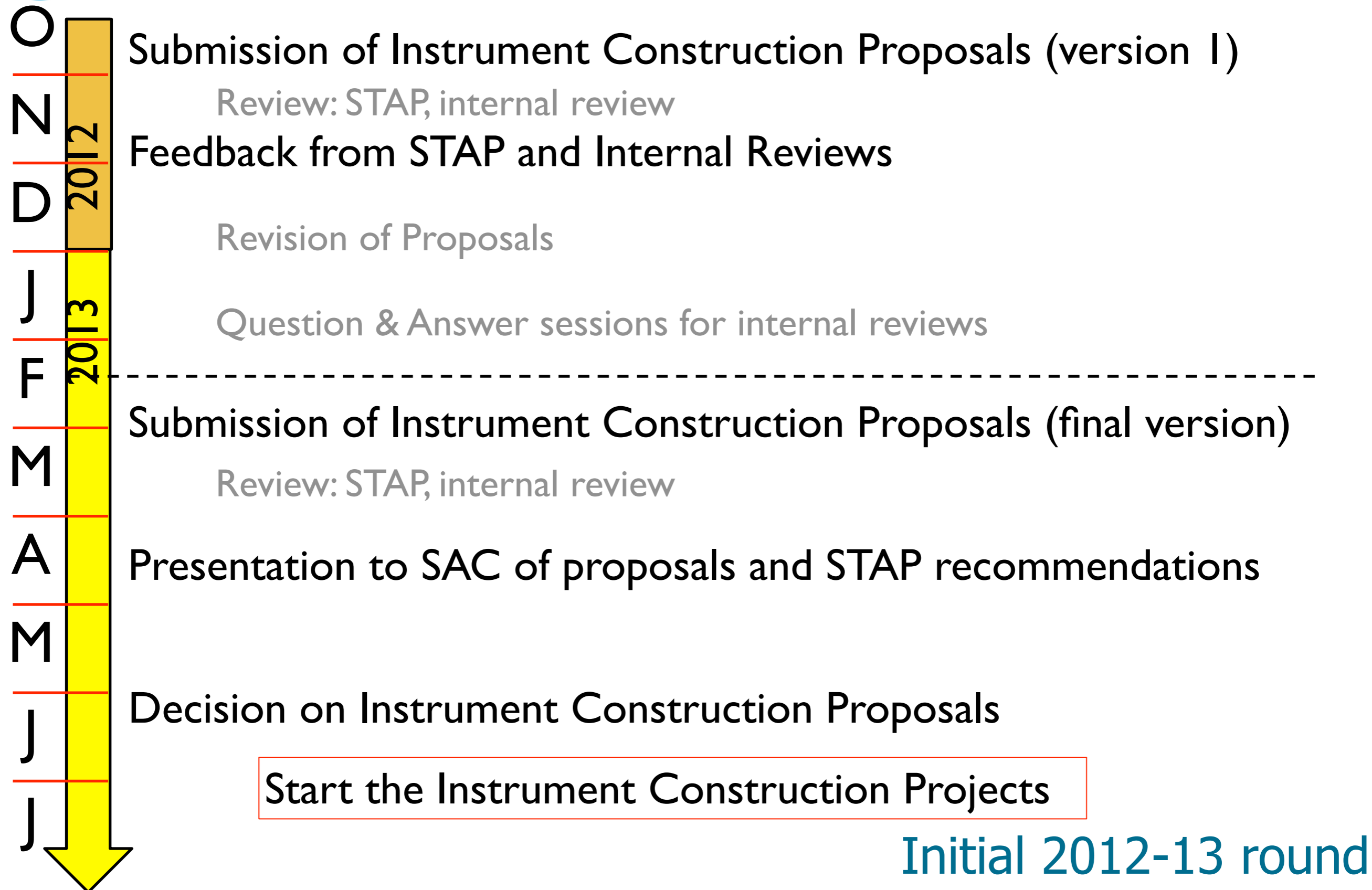
# Instrument Construction Process (1/2)

- Assembly of instrument project team
  - lead scientist (overall responsible)
  - lead engineer
  - planner
- Lead scientist
  - develops performance specifications
  - most likely one of the proposers
  - needs to be based in Lund (ESS staff or seconded)
- Lead engineer
  - develops engineering & technical specifications
  - needs to be based in Lund (ESS staff or seconded)
- Planner
  - develops cost & schedule
  - fills in Work Breakdown Structure
- Phase 1:
  - Break down work into Work Packages
  - Identify construction partners for each WP
    - priority given to proposing team
  - Assemble Instrument Advisory Team
  - produce preliminary engineering design, costing and WBS
    - MS: move forward with approved baseline design, cost and schedule



- Phase 2
  - Final engineering design and installation plan
  - MS: engineering review
- Phase 3
  - Construction and installation
  - MS: safety systems review
- Phase 4
  - Beam testing and cold commissioning
  - MS: readiness for hot commissioning
- Commissioning and Operations

# Instrument Construction Proposals





# Instrument Work Units

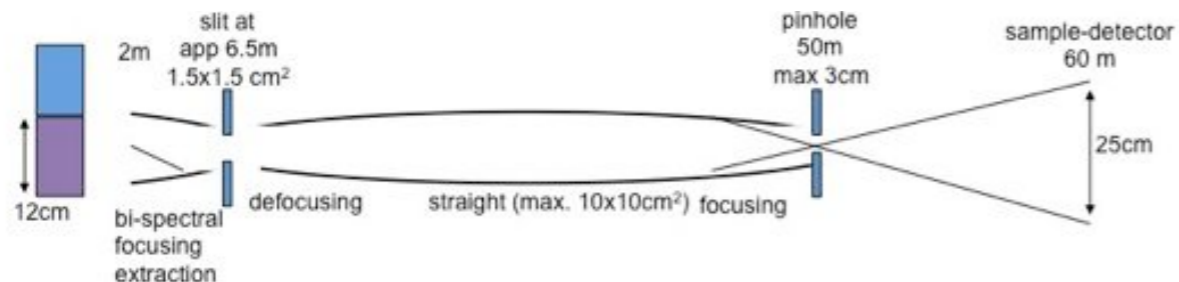
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Simulation software development, general simulations, supporting GER simulations, VITESS SD065DE											
General simulations, in-house supporting simulations, interface moderator-beam extraction, McStas SD022DK											

2012-13

# ESS Instrument Proposal Round 2013

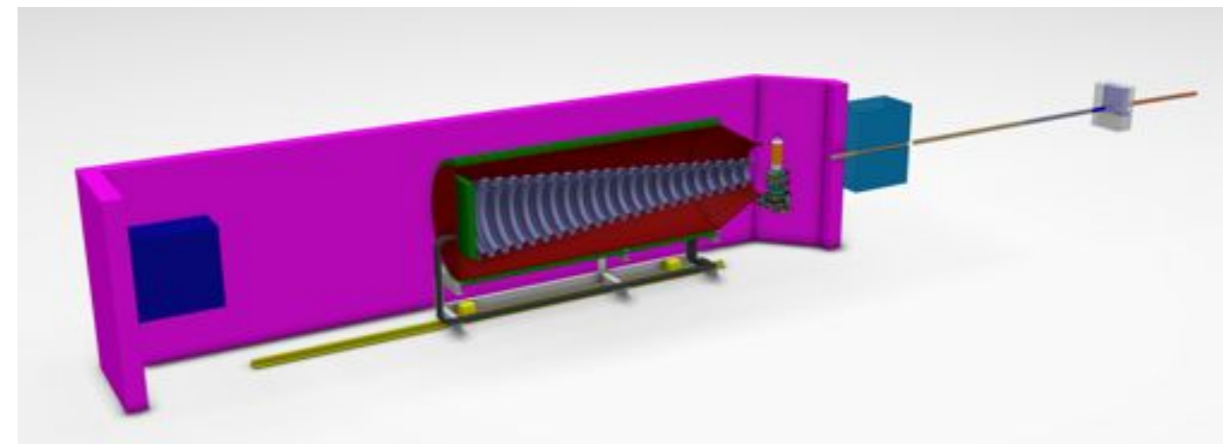
- Closed october
- 4 proposals received
- Up to 3 instruments chosen by mid 2013

## ESS Instrument Construction Proposal <<ODIN – Optical and Diffraction Imaging with Neutrons>>



	Name	Affiliation
ESS Instrument WP coordinator	M. Strobl	ESS
ESS Partners	-	-

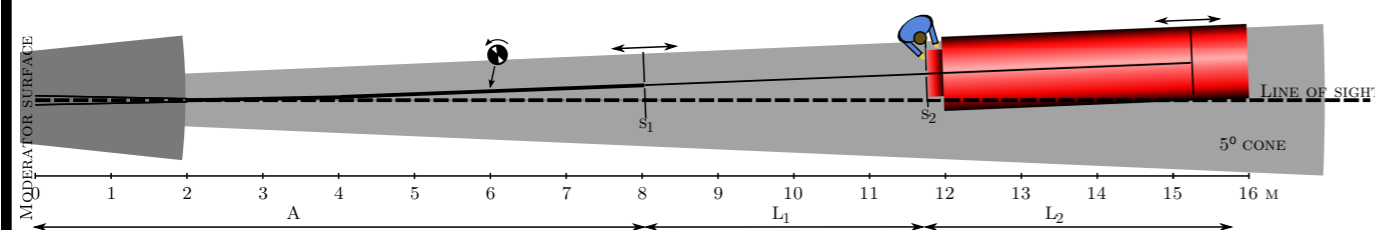
## ESS Instrument Construction Proposal LoKI - A broad-band SANS Instrument



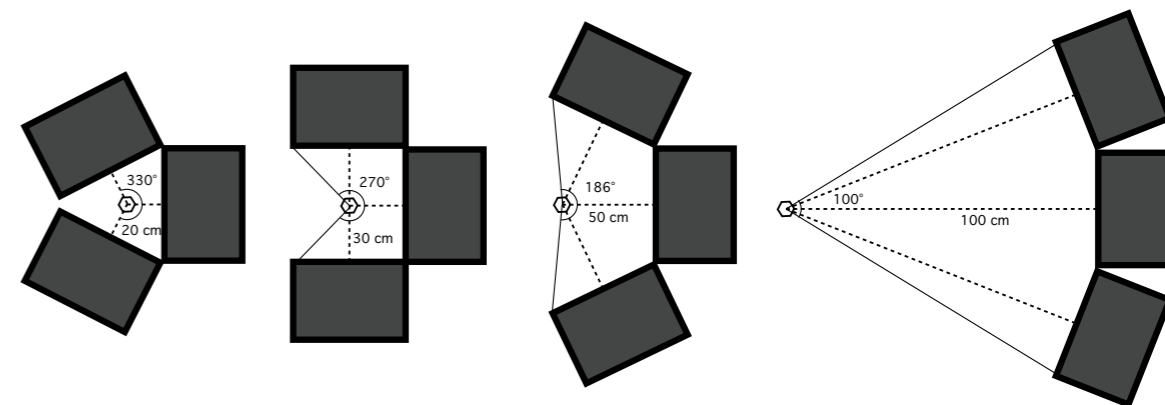
	Name	Affiliation
ESS Instrument WP coordinator	Andrew Jackson	ESS
ESS Partners	Andrew Jackson Kalliopi Kanaki	ESS ESS

## ESS Instrument Construction Proposal Compact SANS Optimised for Biological Samples

K. Klenø<sup>1</sup>, S. Kynde<sup>1</sup>, G. Nagy<sup>2</sup>, N. Skar-Gislinge<sup>1</sup>, K. Mortensen<sup>1</sup>,  
K. Lefmann<sup>1</sup>, J. Kohlbrecher<sup>2</sup>, L. Arleth<sup>1</sup>,  
<sup>1</sup>Niels Bohr Institute, University of Copenhagen, Denmark  
<sup>2</sup>SINQ, Paul Scherrer Institute, Switzerland



## ESS Instrument Construction Proposal Macromolecular Diffractometer



	Name	Affiliation
ESS Instrument WP coordinator	Esko Oksanen	ESS
ESS Partners	Esko Oksanen	ESS



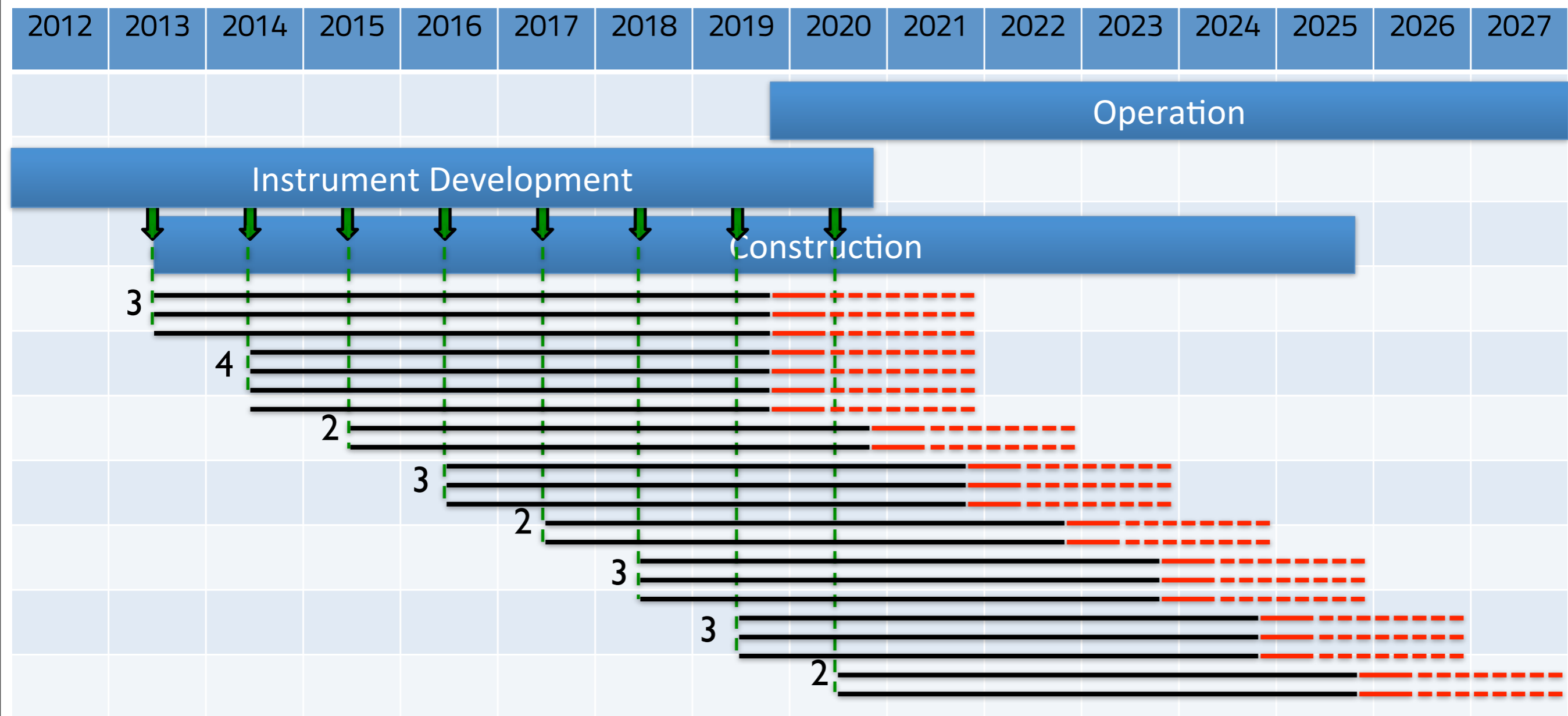
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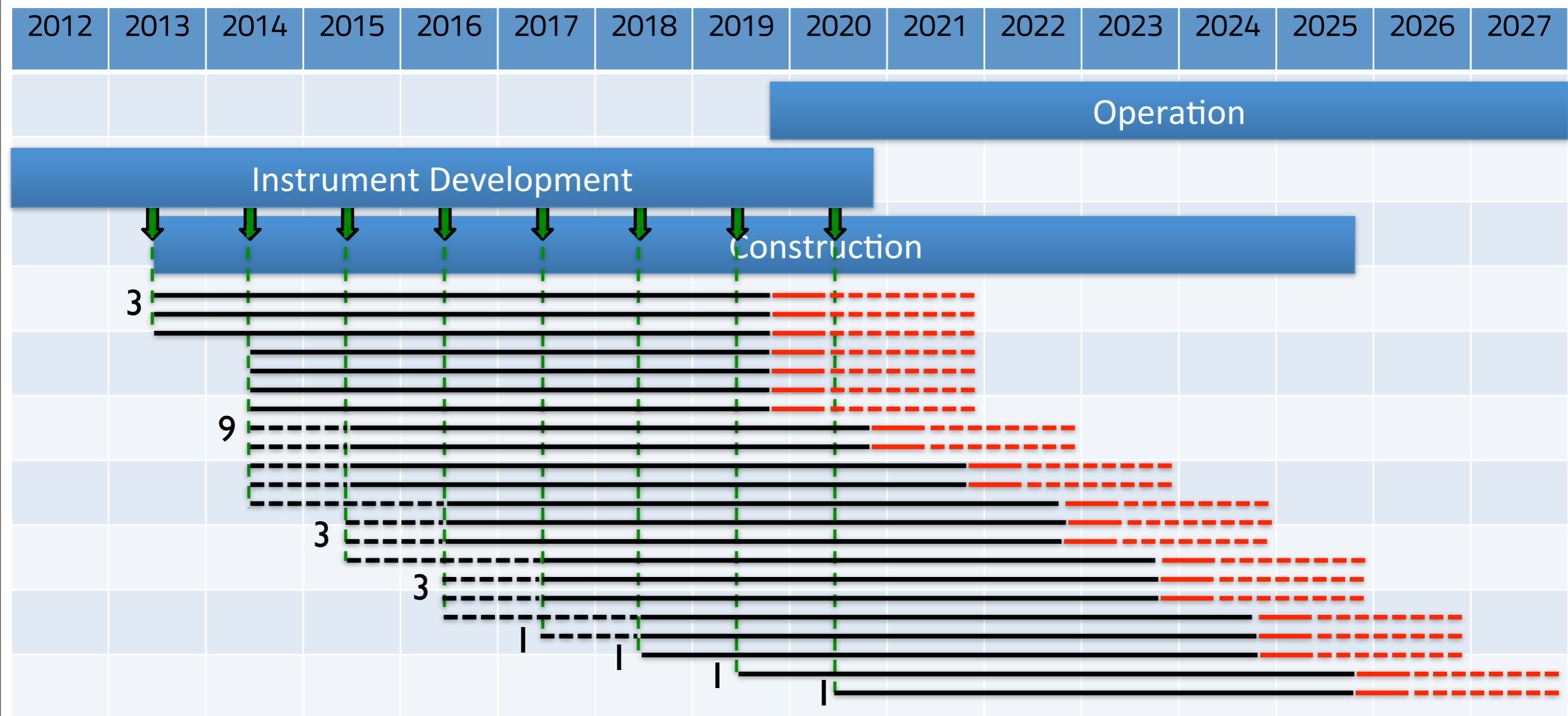
2012-13

2013-14

# Instrument Timeline – guess 1



# Instrument Timeline – guess 2





Thank You!

