

Chopper standards and guidelines

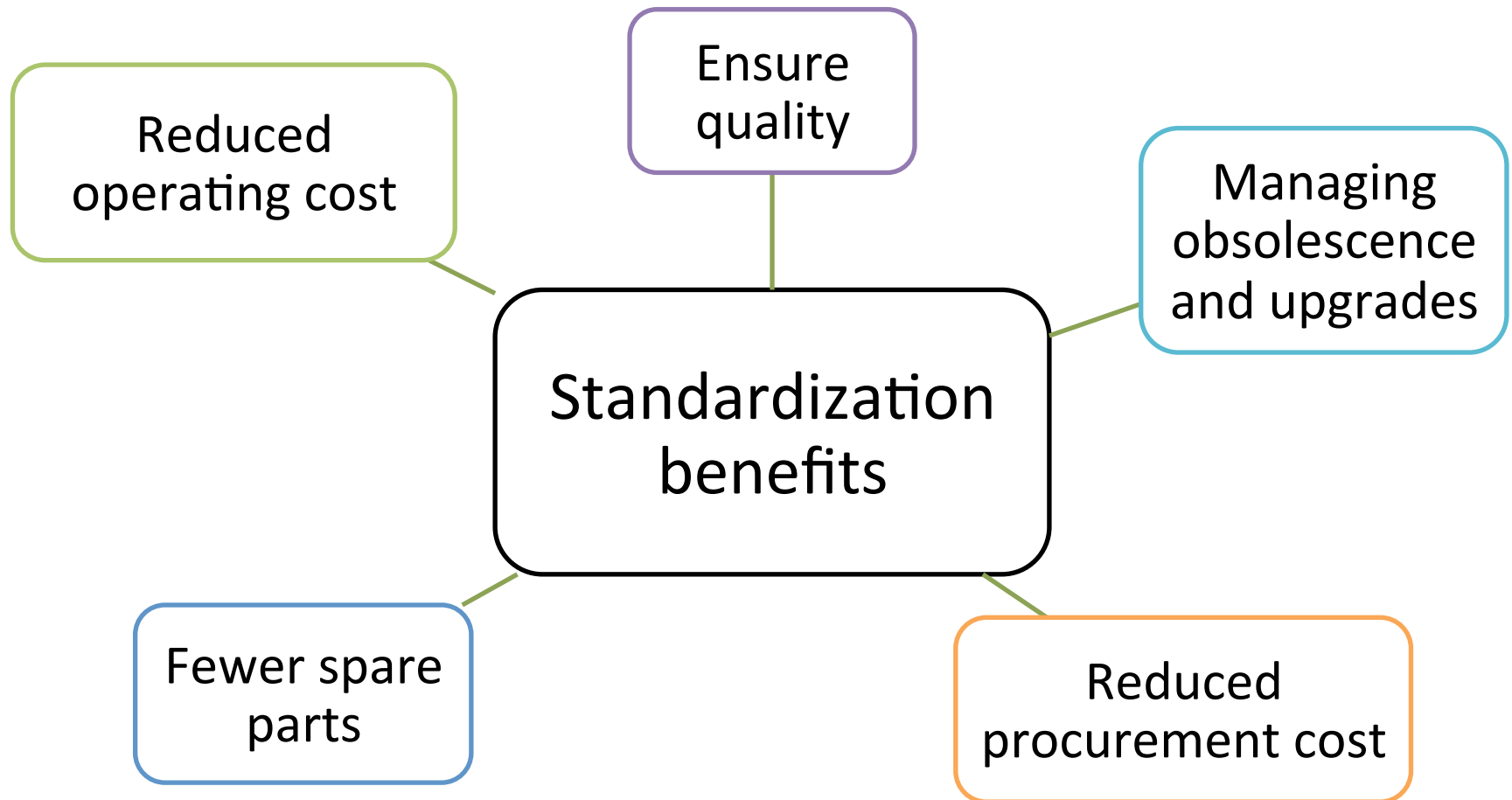
Erik Nilsson
Development engineer

Bringing (some) order to diversity

	DISC CHOPPER LOW SPEED	DISC CHOPPER HIGH SPEED				DISC CHOPPER VERY HIGH SPEED				LARGE FAN/PPSc/Fermi ROTOR				I.Sum	Install
		100-199 Hz	200-299 Hz	300-399 Hz	>400Hz	LR	Fan	PPS	Fermi						
1 Nodi	0 2 1	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	2 1	0	2	0	10	2018					
2 Kolik	0 7 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	7	2018					
4 SpeCies	0 3 0	0 2 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	2 0	0	0	0	7	2018					
3 Freckles	0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	8 0	0	0	0	11	2019					
5 Roy	0 4 0	0 2 0 0 2 0	0 4 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	10	2019					
6 Lager	0 0 0	0 4 0 0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	11	2019					
7 Merad	1 0 0	1 0 1 0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	7	2020					
9 Demhail	0 0 0	0 0 0 0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	4 0	0	0	0	7	2020					
11 tiase	0 1 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	1	2020					
10 Sdika	6 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	6	2021					
8 MX5	0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	3	2021					
12 Ameac	0 0 0	0 0 0 2 0 0	0 2 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	7	2021					
13 Backscatte	0 0 0	0 2 0 0 0 0	0 6 0 0 0 0	0 0 0 0 0 0	0 0	0	0	1	9	2022					
14 N.Physics	0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	0	2022					
15 Diffraction	0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	2	2022					
16 Hi-res NSE	0 6 0	0 0 0 0 1 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	7	2022					
17 TBD	0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	0	2023					
18 TBD	4 0 0	2 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	1	0	7	2023					
19 TBD	0 0 0	0 0 1 0 0 0	0 4 0 0 1 0	0 0 0 0 0 0	0 1	0	1	0	11	2023					
20 TBD	4 0 0	0 0 0 0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	8	2024					
21 TBD	0 0 0	0 0 0 0 2 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	2	2024					
22 TBD	0 4 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0	0	0	0	4	2024					
Sum	9 48 1	1 12 0 2 11 4	0 16 0 0 3 0	2 15	0 8 1										
Family sum	58	13	17	16	3	20	0	8	1						
Total	136														

22 Instruments ~ 145 axis

Standardization benefits



Different needs at different stages

	Proposal	Design	Manufacturing	Integration	Installation	Commissioning	Operation
ESS Chopper group		★		★	★	★	★
Chopper supplier		★	★	★			
Instrument team	★	★			★	★	
Interfacing group		★			★		
Instrument users							★

Guidelines makes coordination possible

- Collaborative environment
 - Many partners with diverse experience
 - Special new conditions at the ESS
- Guidelines is a way making communication easier
- Standards and guidelines allows grouped procurements and framework agreements



CHOPPER HANDBOOK

DEFINITIONS
GUIDELINES
STANDARDS
& EQUIPMENT

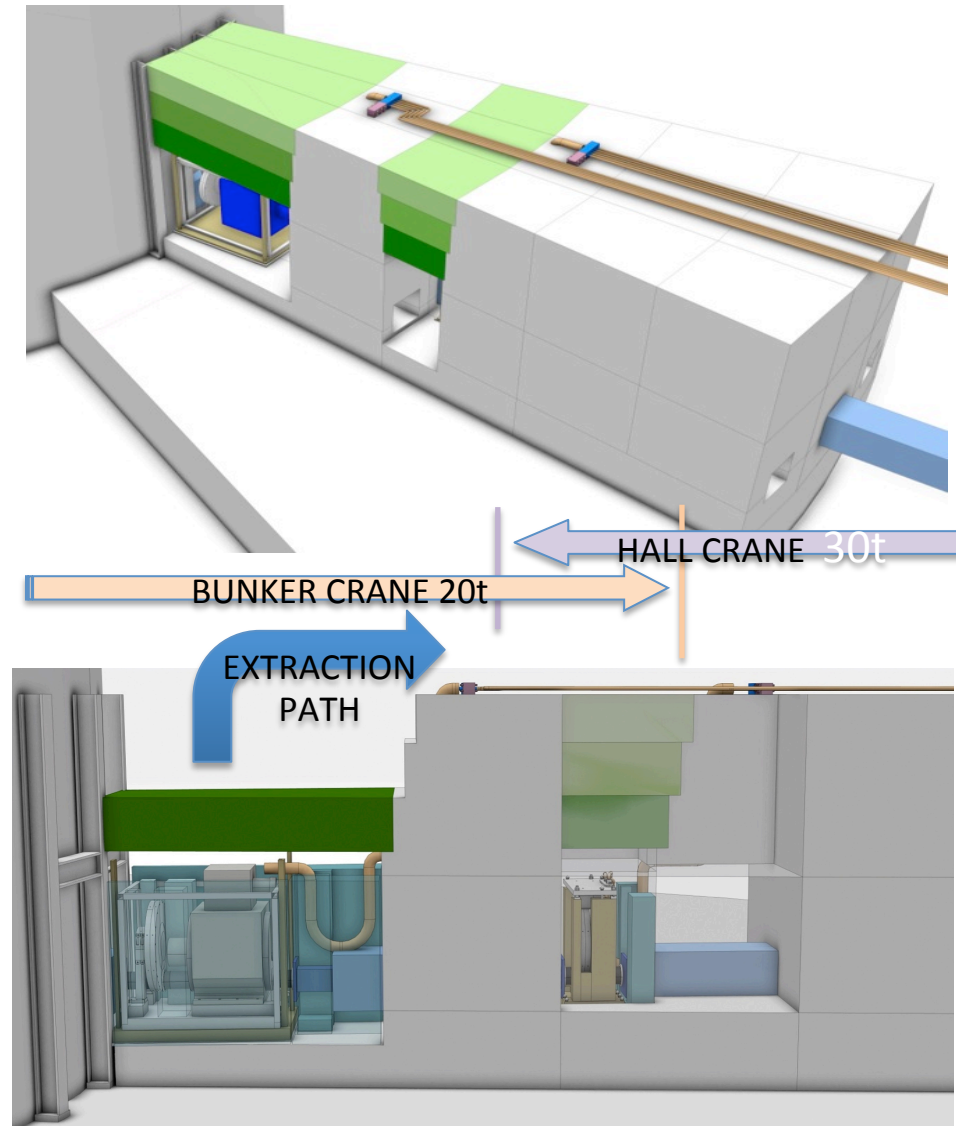
Chopper handbook content

- Definitions
 - Terms
 - Interfaces
- Guidelines
 - Design
 - Construction
 - Installation
- Standards
 - Performance
 - Safety
- Approved equipment



Levels of integration

- (L1) Facility
 - Access
 - Activation
 - Decommissioning
- (L2) Instrument
 - Power, Vacuum, cooling,
 - Optics & Shielding
- (L3) Chopper system
 - Control hardware & software
 - MPS & PSS



Definitions – Terms

- Terms are currently being defined
- Ensures all stakeholders talk the same language
- Allows for standard procedures

Transition

Created by Erik Nilsson, last modified on Jun 30, 2014

Transition state in choppers

The device is considered to be in the transition state over the period during which the transmitted flux is between the open and closed values.

Units

Transition state is a binary function, either yes or no.

No labels ✎

Phase accuracy

Created by Erik Nilsson, last modified by Nicklas Holmberg on Nov 06, 2014

- Definition
- Chopper system phase accuracy performance evaluation method
 - Terminology
 - Process capability
 - Cpk:
 - Ppk:
 - Analogy
 - Process capability calculation
 -
 - Number of samples
 - Evaluation criteria
 - Evaluation procedure
 - Conditions to be met during test
- Phase accuracy limits
- Units
- References
- Current thinking and ideas

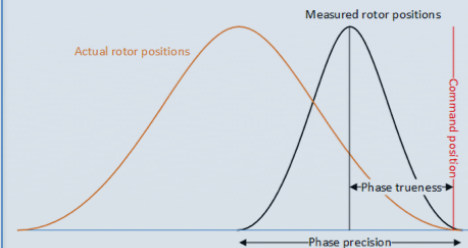
Definition

According to ISO 5725-1, Accuracy consists of Trueness (proximity of a measurement result to the true value) and Precision (repeatability or reproducibility of the measurement).

Phase trueness is the sum of *Phase measurement trueness* and *Phase control trueness*.

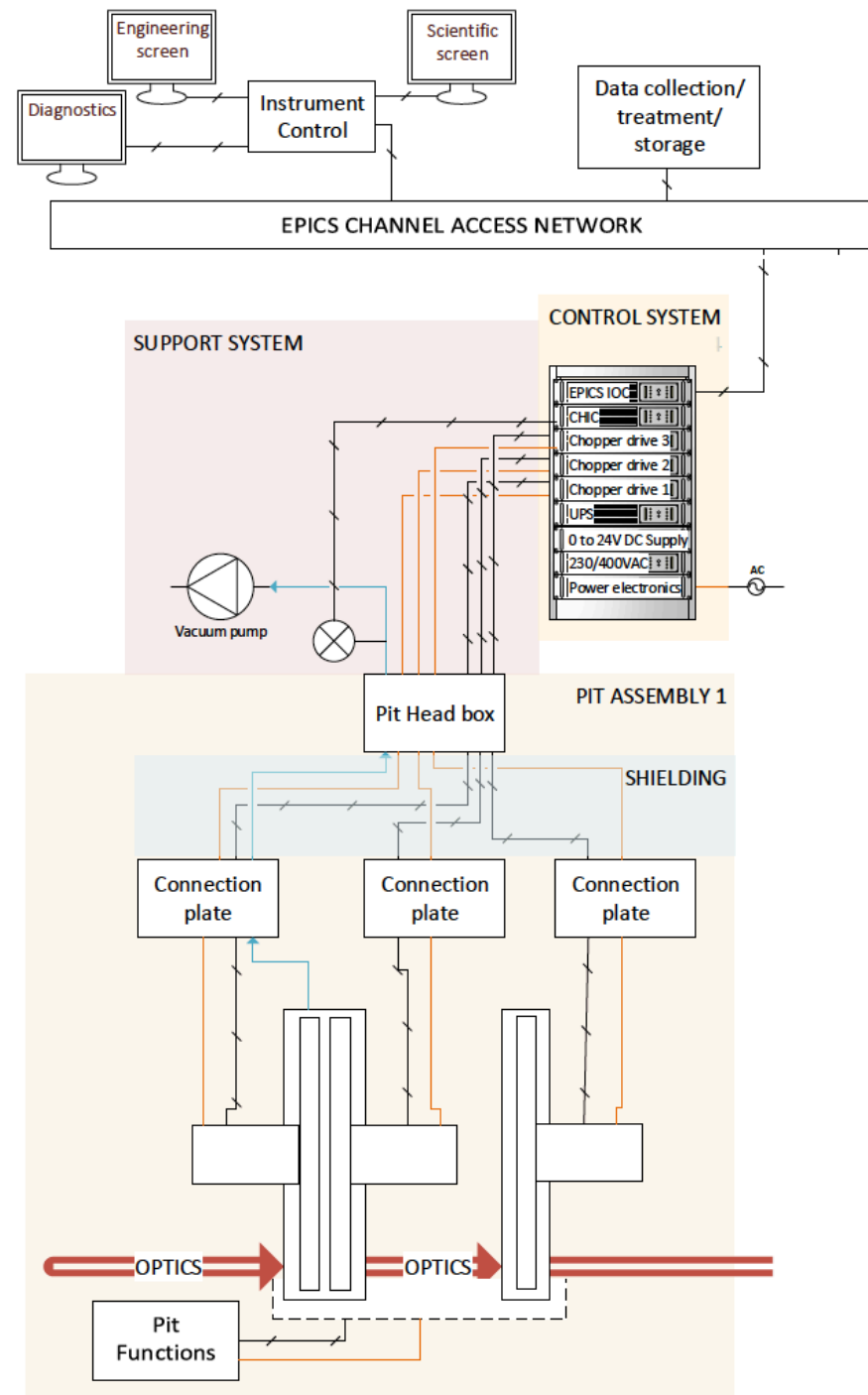
Phase precision is the sum of *Phase measurement precision* and *Phase control precision*.

Phase accuracy consists of *Phase trueness*, or bias (proximity of the actual rotor positions and the commanded position) and *Phase precision*, or standard deviation (repeatability or reproducibility of the actual rotor positions). For practical reasons, only the measured positions, not the actual positions, can be taken into account, which makes the Phase accuracy equal to Phase control accuracy. An assumption is made that Phase measurement trueness and Phase measurement precision are small enough to be approximated to zero. This assumption is verified by a Phase measurement accuracy test.



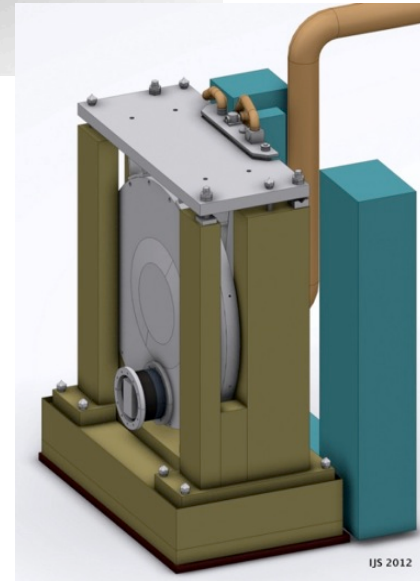
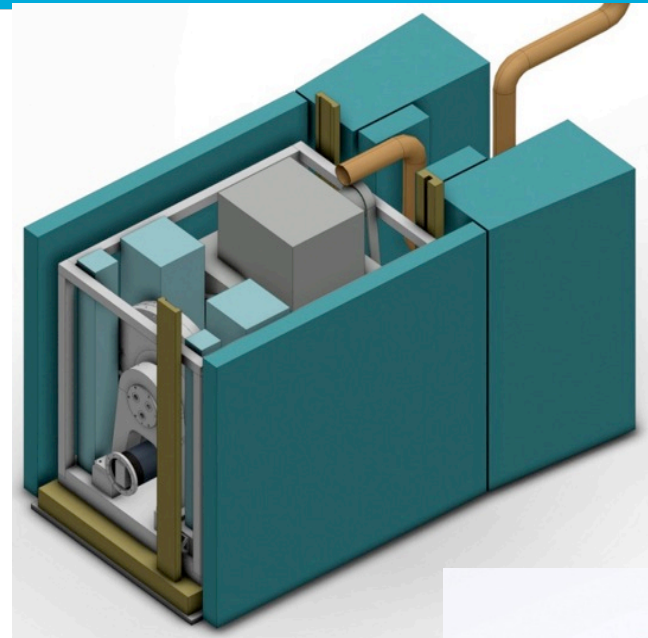
Definitions – Interfaces

- Interface control documents will be part of the handbook
- External and internal interfaces are defined



Guidelines

- Guidelines for design
 - Packaging constraints
 - Beam height
 - System structure
- Facility requirements
 - Provisions for component access
 - Levels of reliability & serviceability
 - Constraints on Installation packaging
 - Definitions of Interface ESS facility systems
- Project guidelines
 - TRL
 - Models

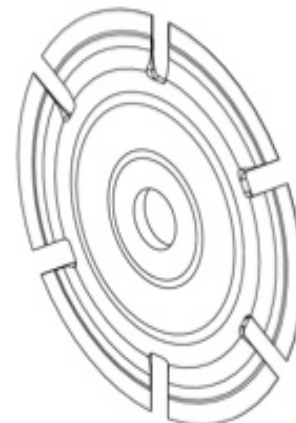
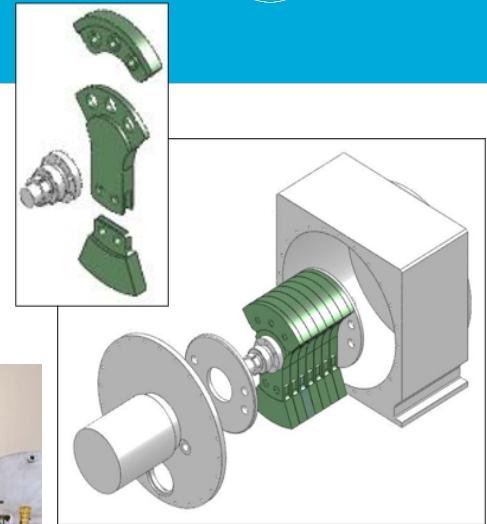


Standards

Standardization to ensure compatibility between equipment from suppliers & serviceability

Standard interfaces

- Spindle – Rotor
- Spindle – Enclosure
- Enclosure – support structure
- Beam windows
- Monitoring signals and warnings



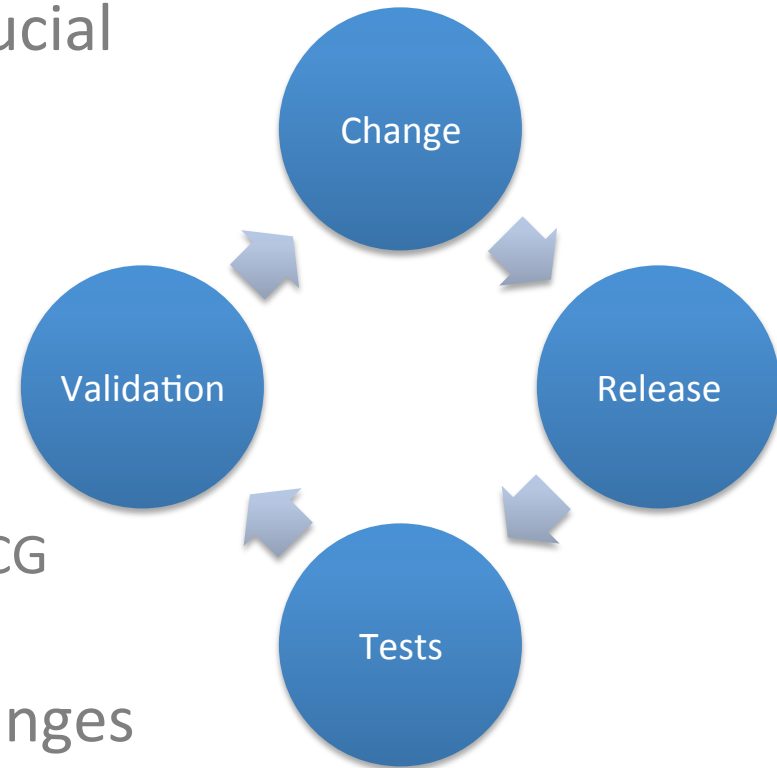
Approved equipment

- Tested to meet functional and non-functional requirements
- Testing is performed following procedures
- Different groups can test equipment
 - NCG
 - ESS group
 - Partners
- Possibility of advantageous procurement
- Example of components
 - Vacuum components and pumps
 - O-rings and seals
 - Fluids and lubricants
 - Sensors
 - Fasteners
 - Connectors and electronics
 - Test equipment

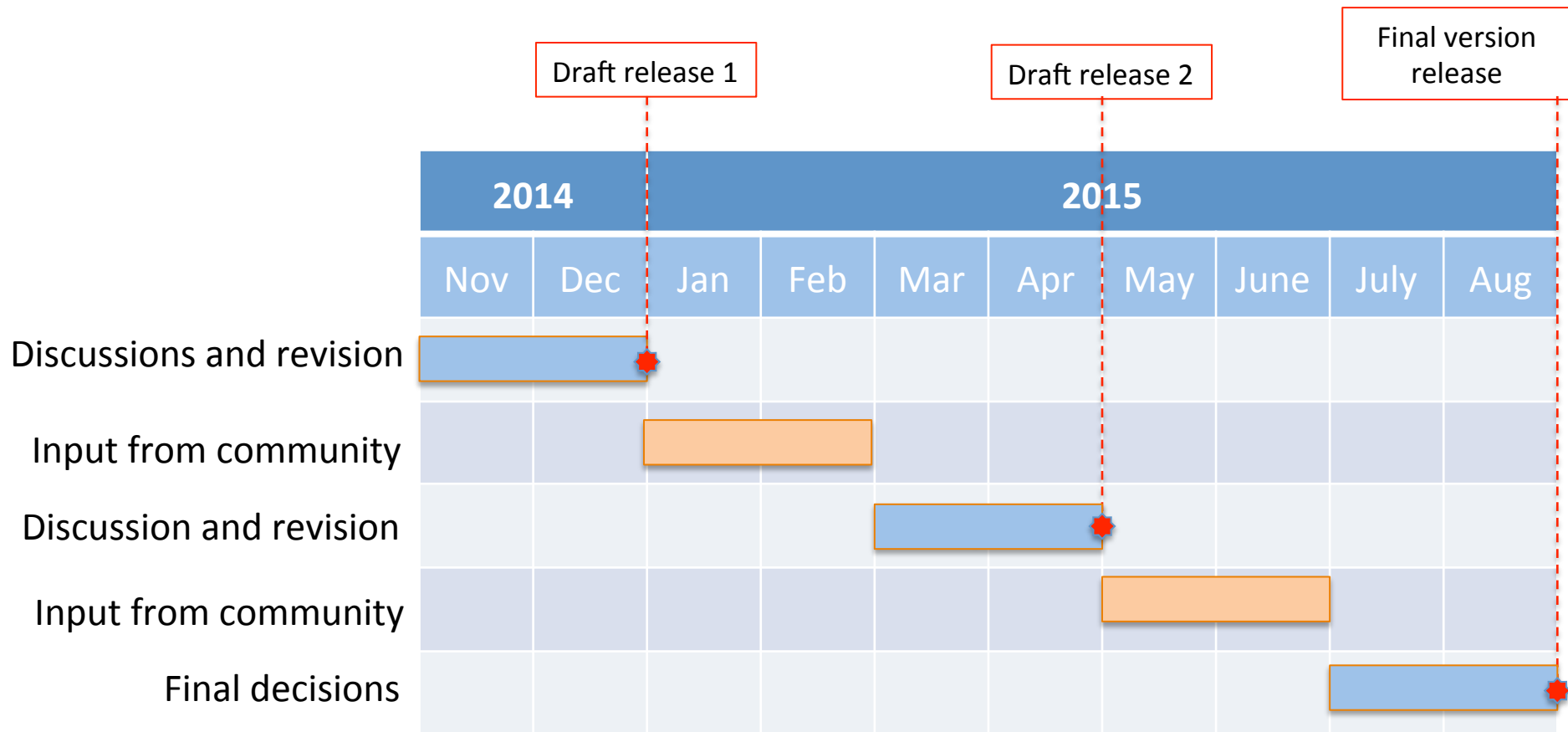


Interaction

- Inputs from stake-holders are crucial
 - Chopper group
 - Partners
 - Suppliers
 - Partners/Suppliers with interfaces
- Wiki based
 - Comments on wiki or straight to NCG members
- After release of final version, changes will be controlled
 - Change control
 - Revisions



Timeline for implementation



THANK YOU FOR LISTENING

You are all invited to participate in
the development of the ESS chopper
standards and guidelines