Update on mechanical interfaces for sample environment

Optional subtitle

PRESENTED BY MALCOLM GUTHRIE

2020-02-24

Agenda

1 Introduction: Résumé of mount standard and terminology

2 “Floor” mount – status update

3 “Flange” mount – status update

4 Additional considerations: Magnetic requirements

5 Additional considerations: “Level-S”

Principles of SE equipment interface

Overarching goal is enabling *rapid, accurate* installation of sample environment equipment.

Key elements:

- Shared coordinate system
- Based on principles of kinematic constraint
- Separate standard for floor mounted and flange mounted instruments
- Quantised mounting levels (L0,L1,L2 etc)
- Interface comprises an “instrument” part and an “equipment” part

ESS-0038078 (last release Dec 2019)

James Clerk Maxwell.

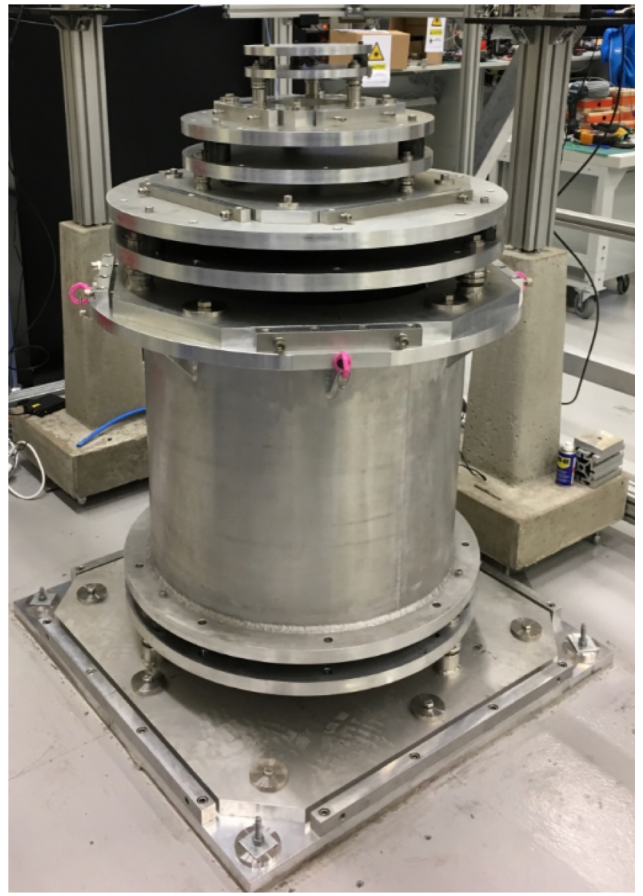
Floor mount interface - Overview

- Mass of equipment rests on the ground
- Most common interface: 73% of initial suite (15)
- 4* quantised mounting levels

Level	Distance to beam (mm)	Weight max. (kg)	Interface dim. (mm)*	Positioning tolerance at sample position (mm)
0	1300	2000*	Ø 800	±2.500 (TBC)
1	500	1000*	Ø 800	*±0.02 (act.)*
2	350	300	Ø 500	*±0.02 (act.)*
3	200	10	Ø 250	±0.01 (TBC)

* Planned 5th SANS-specific level “Level-S” (see later)

- Prototype in Utgård Lab (*ca* Jan 2019)



Floor mount interface - Update

Process

Q4/2019 underwent process to finalise L1 & L2

- Freeze dimensions of standard
- Freeze hardware

Instrument components: Baltec (left) and Kipp (right)

Timeline:

Sept 2019:

- Stakeholders notified
- Established Confluence space*
- Expt. set-up to test hardware

Nov 2019

- Conducted hardware tests with SAMS
- CDR

Dec 2019

- Design work to implement final design (A. Glavic)

Jan 2020

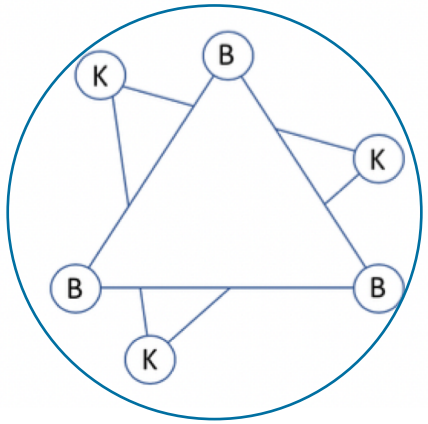
- **Final design released in CHESS (ESS-**

* https://confluence.esss.lu.se/display/SA/Process+to+Finalise+design%3A+floor-mount+interface+for+sample+environment+equipment

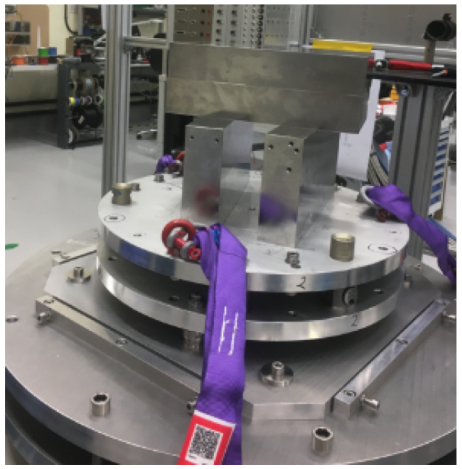
Floor mount interface - Update

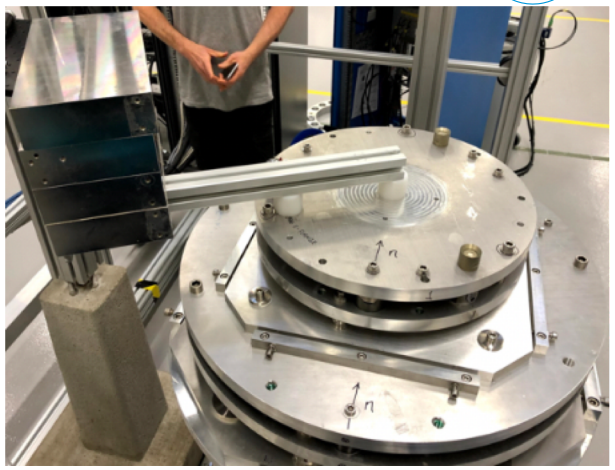
Hardware tests

- Comparison of Kipp and Baltec components.
- Tested with L2 of Utgård prototype
- Single flange with both interfaces (30° separated)



- Tested: Repeated installation; “sloppy” installation; different loading scenarios





Axial loading (left) and off-centre loading (right). Data from 3 tracking points used to determine position

- Both systems demonstrated good repeatability of <0.010 mm (even with sloppy installation)

Test (mass)	Kipp (mm)	Baltec (mm)
unloaded	0.010	0.010
axial load (80 kg)	0.016	0.050
off centre (20 kg)	0.02-0.08	0.02-0.03
off centre (80 kg)	0.2	0.2

Floor mount interface - Update

Finalised design

- L1 and L2 mounting definitions are finalised (mass and location)
- **Kipp hardware will be interface standard** (L0,L1 & L2)
- Reference location is upper contact surface of instrument part
- L3 interface definitions unchanged. Hardware still not finalis
- Kipp component is 8.7 mm taller than baltec (prototype from Baltec)
- Ongoing: magnetic considerations (see later)

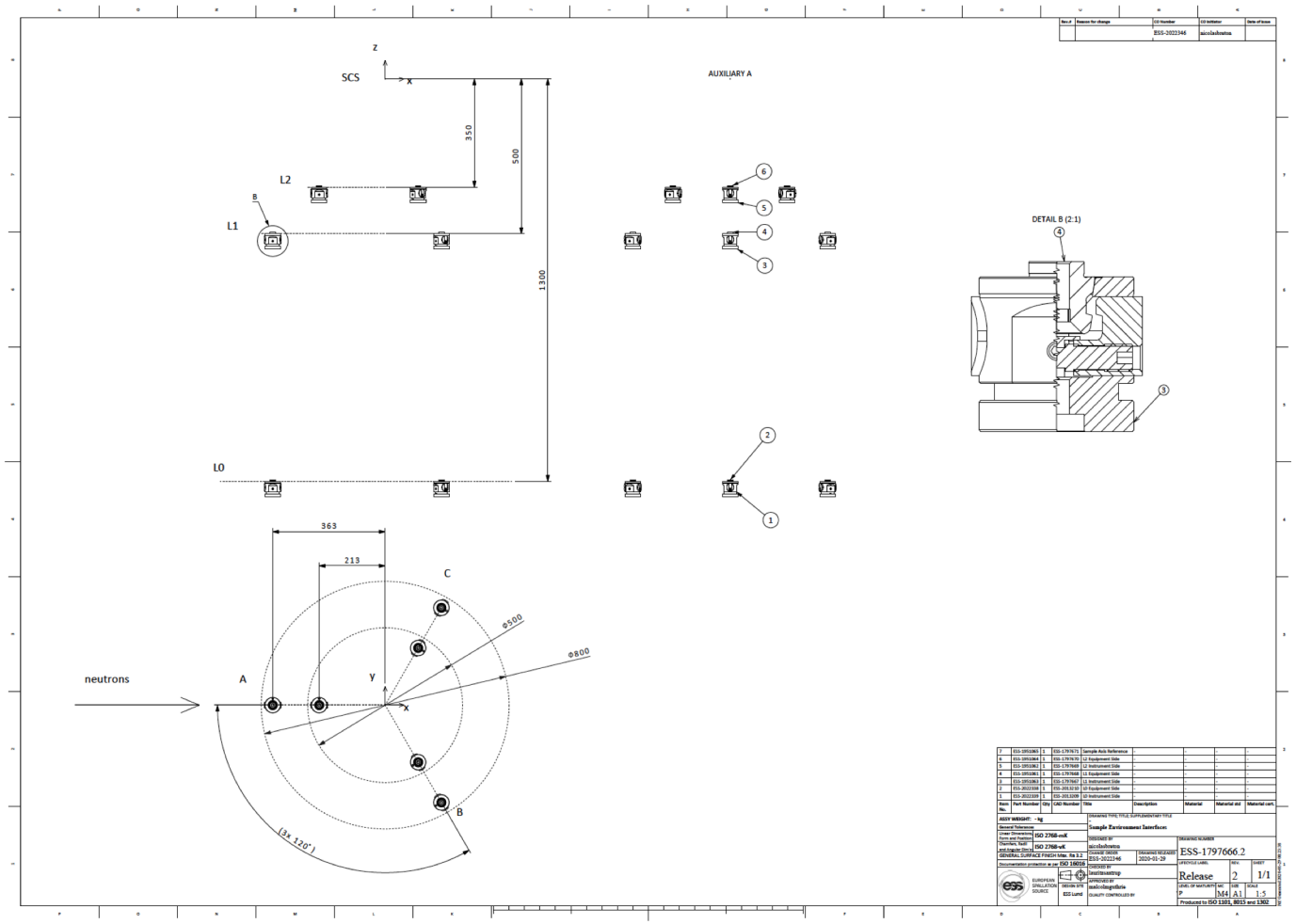
Approx costs: €1250 (set of three) instrument; €93 (set of three) equip*

(* off the shelf components)

Kipp components: instrument part (left) equipment part (right). Each interface consists of three pairs

Floor mount interface - Update

Finalised design

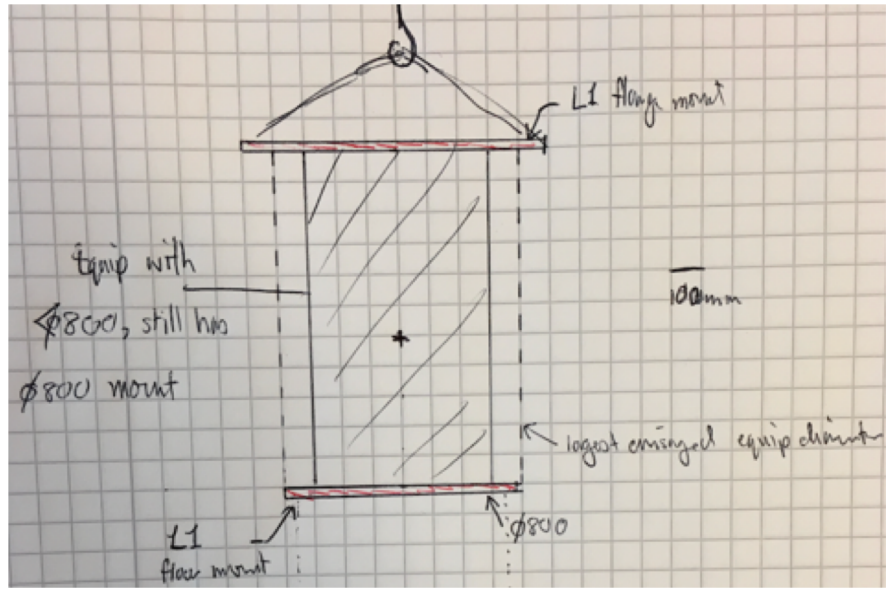


ESS-1797666.2

Flange mount interface - Overview

- Mass of equipment hangs from above (usually tank)
- Less common interface: 33% of initial suite (15)
- 3 quantised mounting levels

Level	Distance to beam (mm)	Weight max. (kg)	Interface opening. (mm)	Positioning tolerance at sample position (mm)
1	600	1000*	Ø 805	*±1-2 (TBC)*
2	600	300	Ø 505	*±0.25 (TBC)*
3	600	5	Ø 255	±0.01 (*TBC*)



- **Possible for equipment to simultaneously have both floor and flange mounts!**
- Floor equip interface sits within diameter of 740 mm (L1), 450mm (L2)

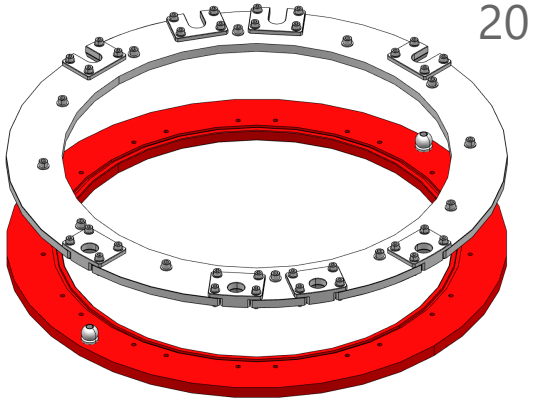
Flange mount interface - Update

Current Status

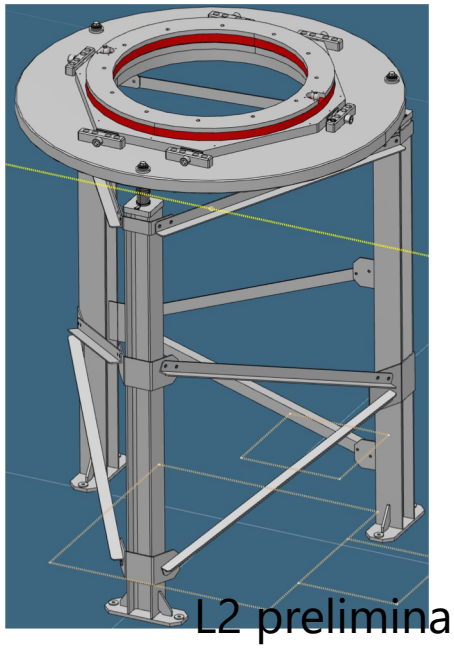
- L1 Interface design complete Q4 2017
- Utgård Prototype design completed Q1 2019
- *Redesign* Q3-Q4 2019
- Drawings being finalised Q1 2020
- *Procurement expected during Q2 2020*
- Install (in E03) Q3 2020

- L2 preliminary design Q4/2019 (P. Luna)

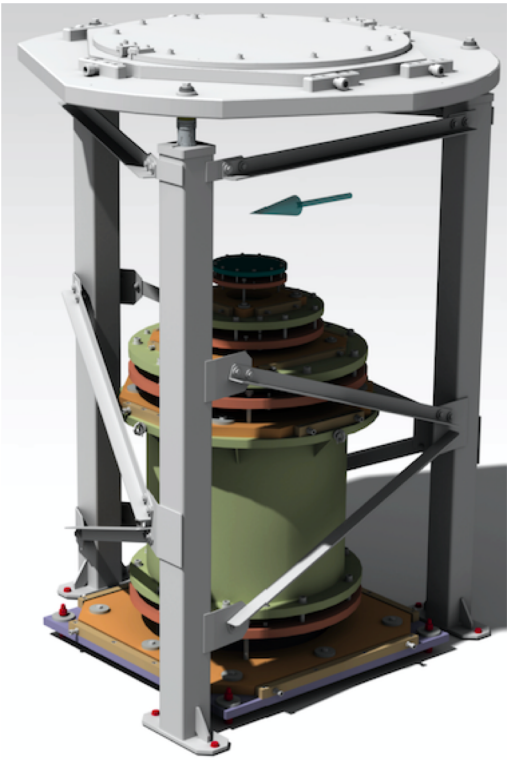
2017



2019



2020



L2 preliminary design Q4/2019 (P. Luna)

Magnetic issues - Kipp

How to define magnetic requirements?

- Stock Kipp components are hardened steel (magnetic)
- Problem for to HF magnets and He^3 analysers
- Discussion with Kipp Q3 2019
- Agreement to develop NM variant based on order of 10 sets (5 instruments)
- Kipp began testing alternatives Q1 2020
- **Need to define magnetic requirements…**
- Preliminary consultation with CSPEC, BIFROST and MAGIC
- **Please let me know what instruments are stakeholders!**

Initial info from instruments:

Instrument	Max rel. μ	Notes
CSPEC	1.01	Distance dependence?
BIFROST	1.1	Distance dependence?
MAGIC	Equiv to BIFROST OK	

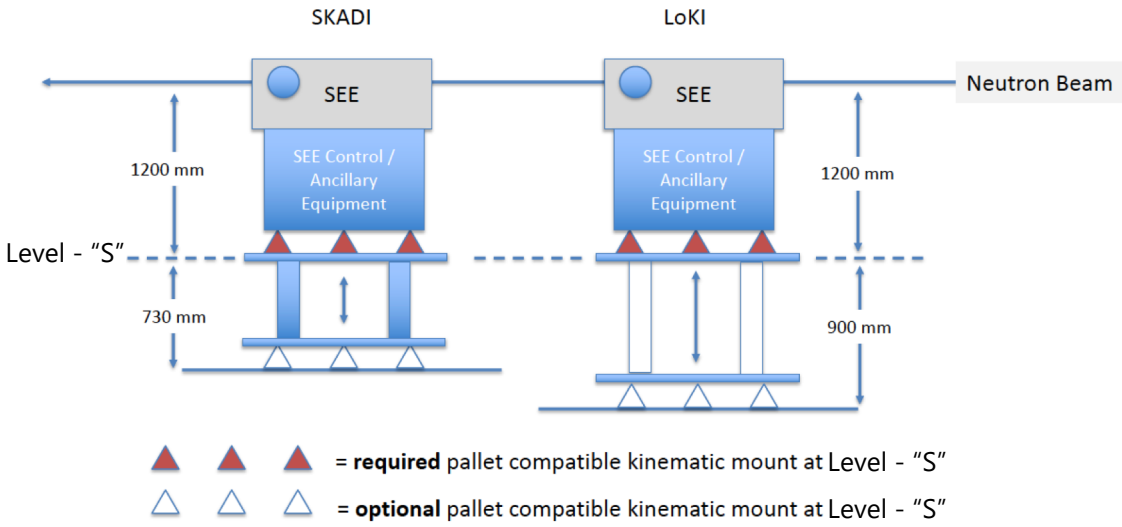
Materials under consideration:

Material	comments	Rel. μ	Hardness *	Activation
316/L steel	Machining/heat treatment can induce magnetism. As can stray field from magnet	1.01-1.06	80 HRB	16-18% Cr
Ti		1.00005	36 HRC	None
Al		1.000022	60 HRB	None
Inconel 718		1.0011	30-40 HRC	17-21% Cr;<1% Co

Level-S

SANS-specific interface

- Realisation of conflict (both distance to beam and orientation) of L0 with SANS constraints
- L0 already implemented in other instruments ∴ define new interface = "Level S"
- Stakeholders LOKI, SKADI and SAD
- Key elements under discussion:
  - placement of interface: isosceles (vs equilateral) triangle and/or rotation of triangle
  - dimensions of interface (Europallet?)
  - distance to beam (~ 1200mm vs 1300 L0 standard)
- Then develop adapter to L1/L2 SEE



(courtesy A. Jackson)

Finish presentation