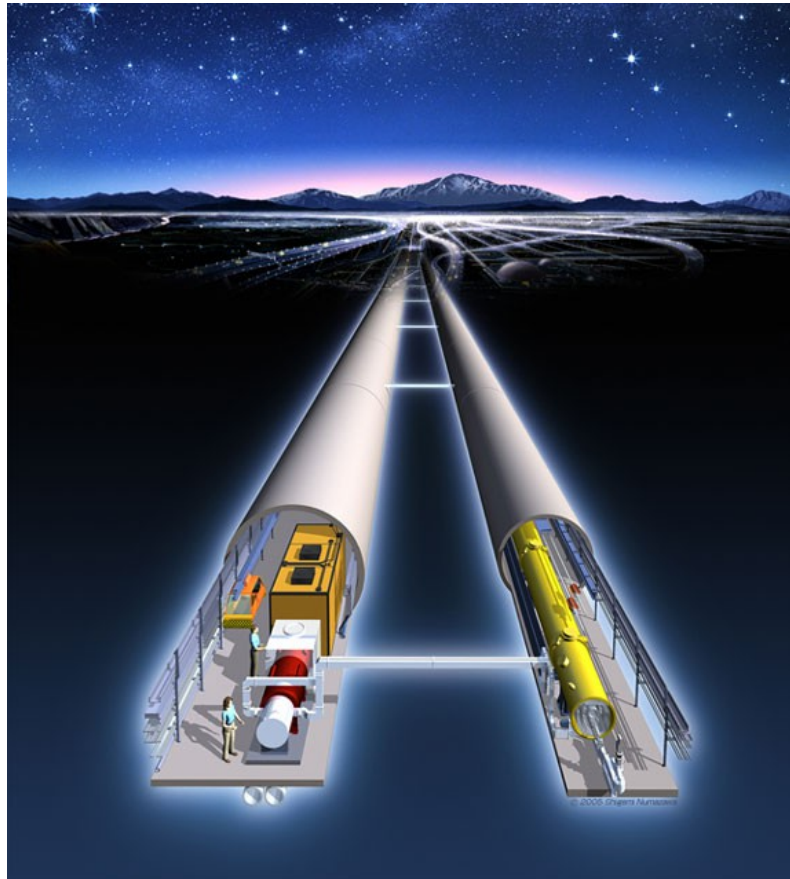




# SiW Ecal Assembly

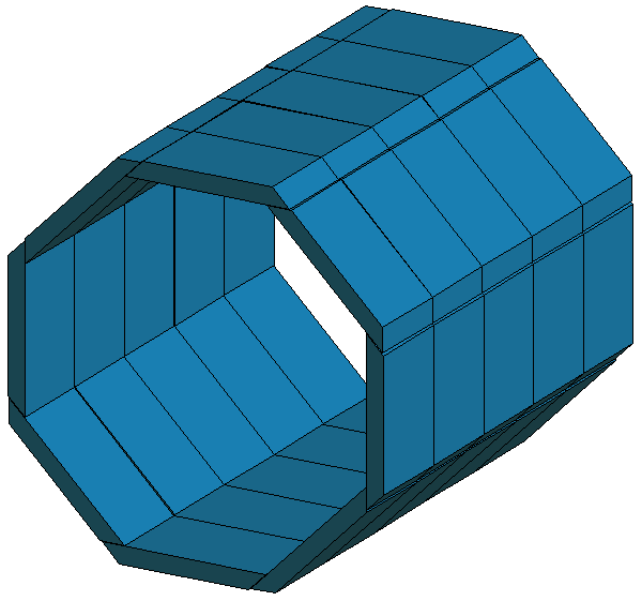


Roman Pöschl



... based on work of  
M. Anduze (LLR), H. Videau (LLR) and  
D. Grondin (LPSC)

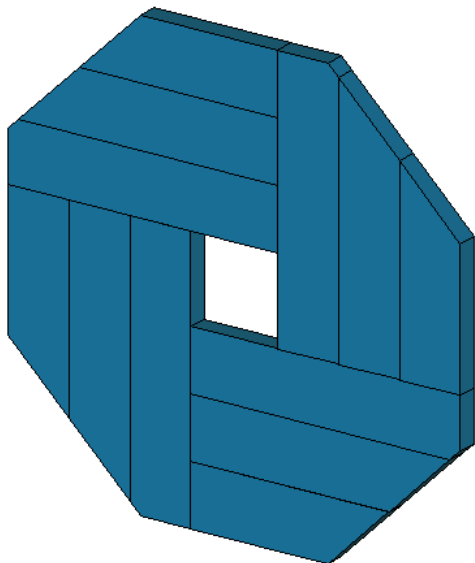
All mistakes are mine



## Ecal Barrel

8 staves each consisting of 5 modules  
 Arranged as cylinder octant

Assembly will happen in units of staves  
 1 stave ~9.5 t and l ~ 4700 mm  
 $R_{\text{octant}} \sim 1843 \text{ mm}$

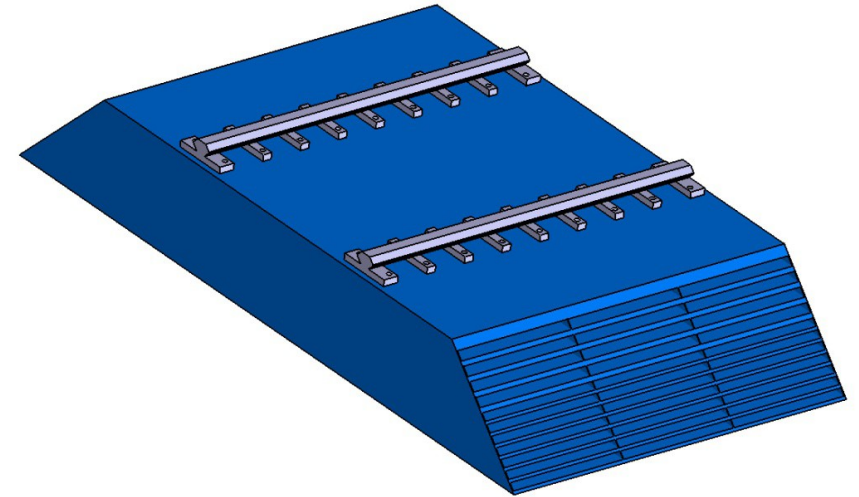
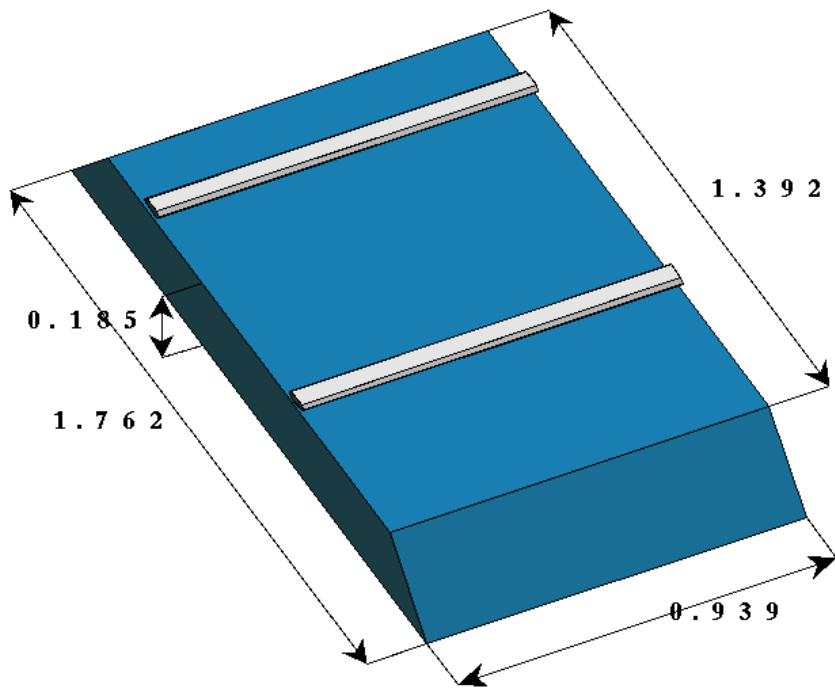


## End caps

4 quadrants subdivided into 3 modules each  
 $D_{\text{endcap}} = 4188 \text{ mm}$   
 Weight of endcap ~ 25.5 t

Disclaimer: Will concentrate on barrel assembly  
 Most of the thoughts apply similarly to the endcaps

Trapezoidal barrel modules  
 length, 0.939m  
 thickness , 0.185m  
 front face width 1.76m  
 distance between rails : front face width / 2.5 = 0.72



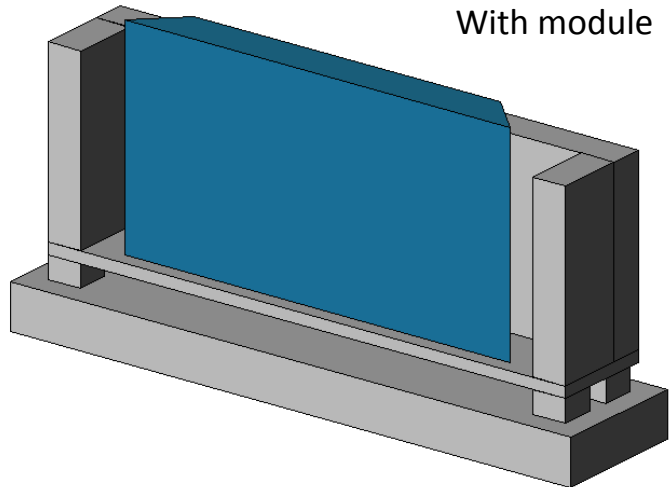
Alveolar structure  
 With alveoli (like mailboxes) to host  
 Ecal layers

There are 5 alveoli rows per module,  
 each containing 15 alveoli

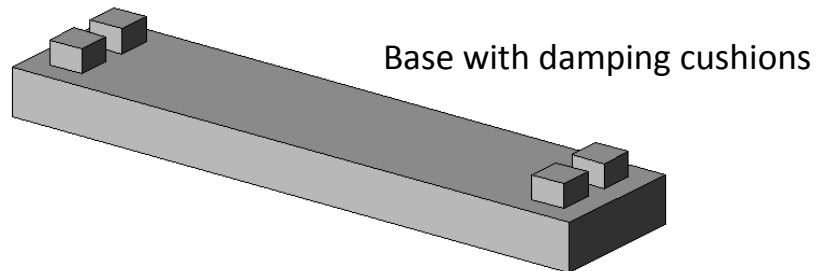
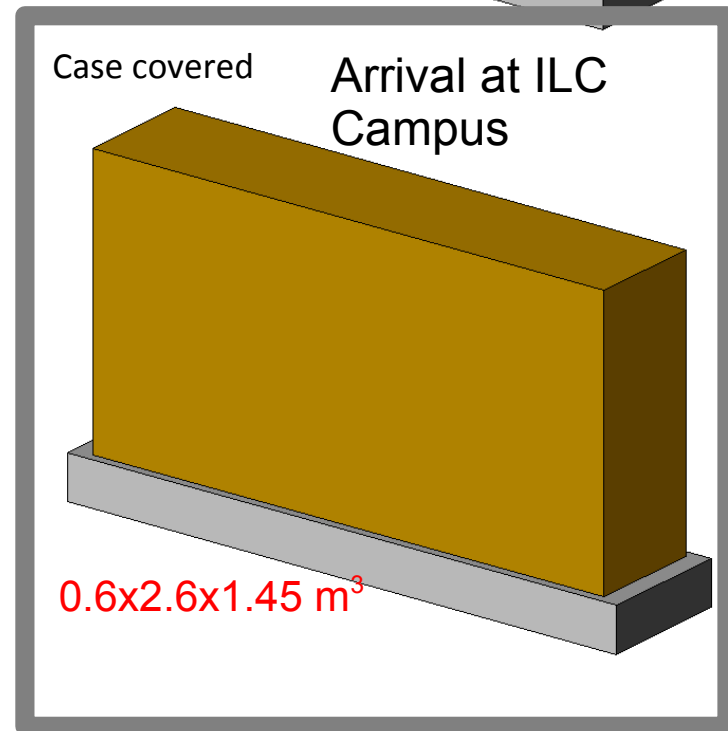
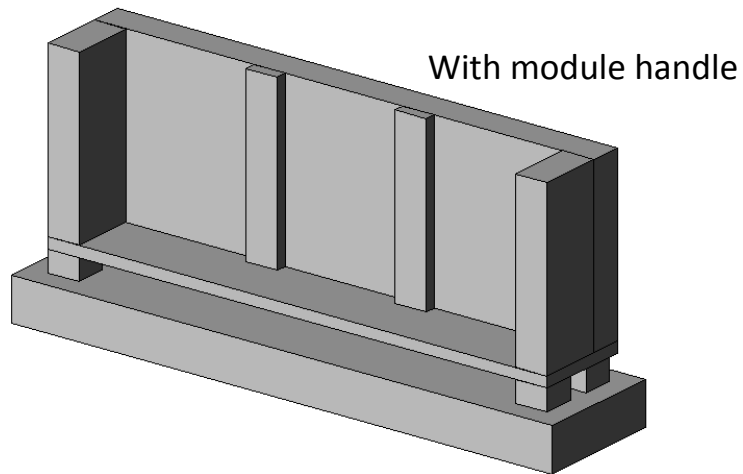
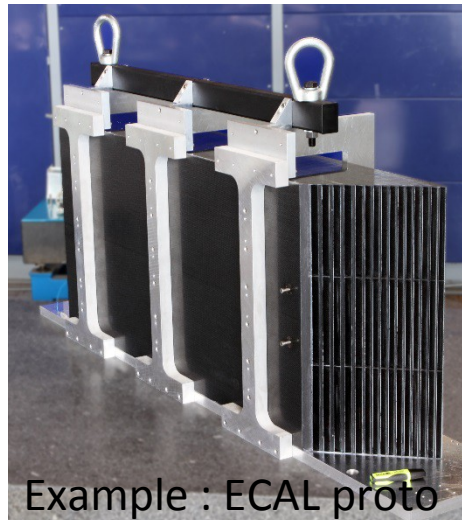
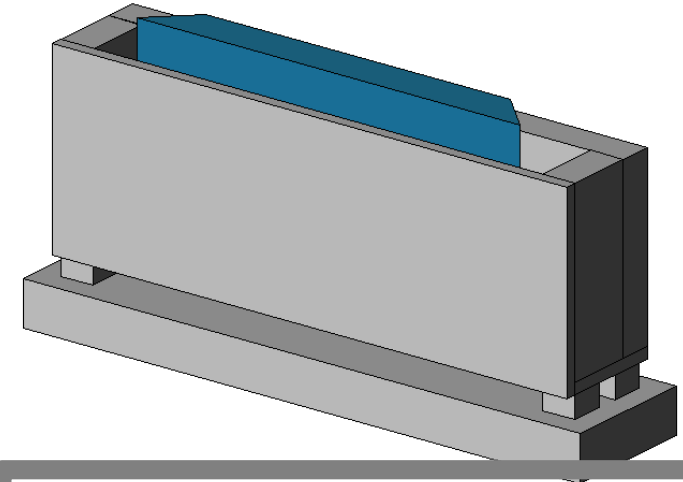
Barrel				
	Inner rad.	Outer rad.	Length	Weight
	1843mm	2028mm	4700mm	76t
	#	weight	length	width
Staves	8	9.5t	4700mm	1790mm
Modules	5/stave 40	1.9t fully equipped	940mm	
Slabs	75/module 3000	10 to 15 kg	1350 to 1750mm	
Beam + stave	8	11.5t	5200mm	2400mm
Cradle + stave	8	14t	5200mm	2400mm
Insertion tool	1	100t	7500mm	7500mm

The new models are smaller and lighter.

- SiW Ecal modules and layers are produced outside of ILC Campus
- They will be shipped to the ILC site from abroad
- The material that will be delivered to the ILC Campus will be
  - 40 barrel modules and 12 endcap modules
  - 3000 boxes with Ecal barrel slabs and 524 boxes with Ecal endcap slabs
  - Assembly cradles for barrel and endcaps 8 + 4
- The material that will/should be delivered to the IP Campus
  - Integration cradle for barrel
  - Integration cradle for endcaps



Handle closed

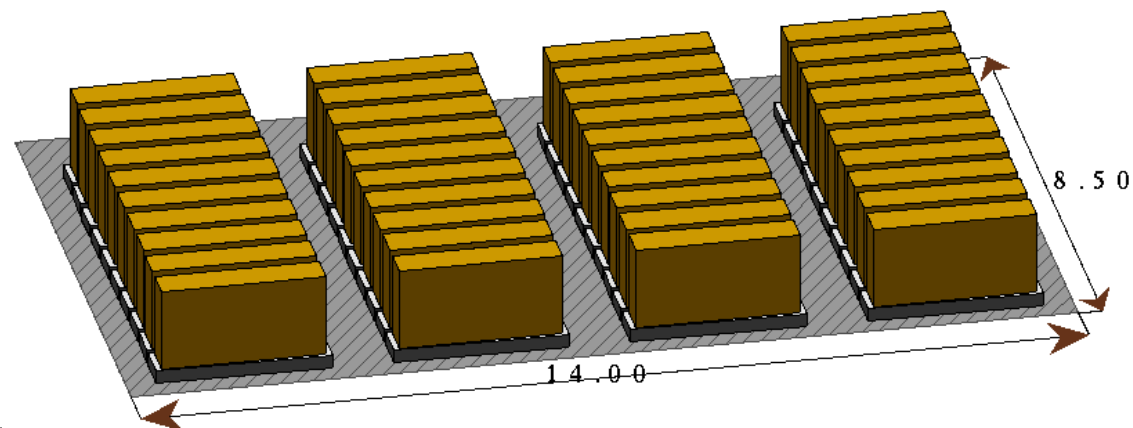
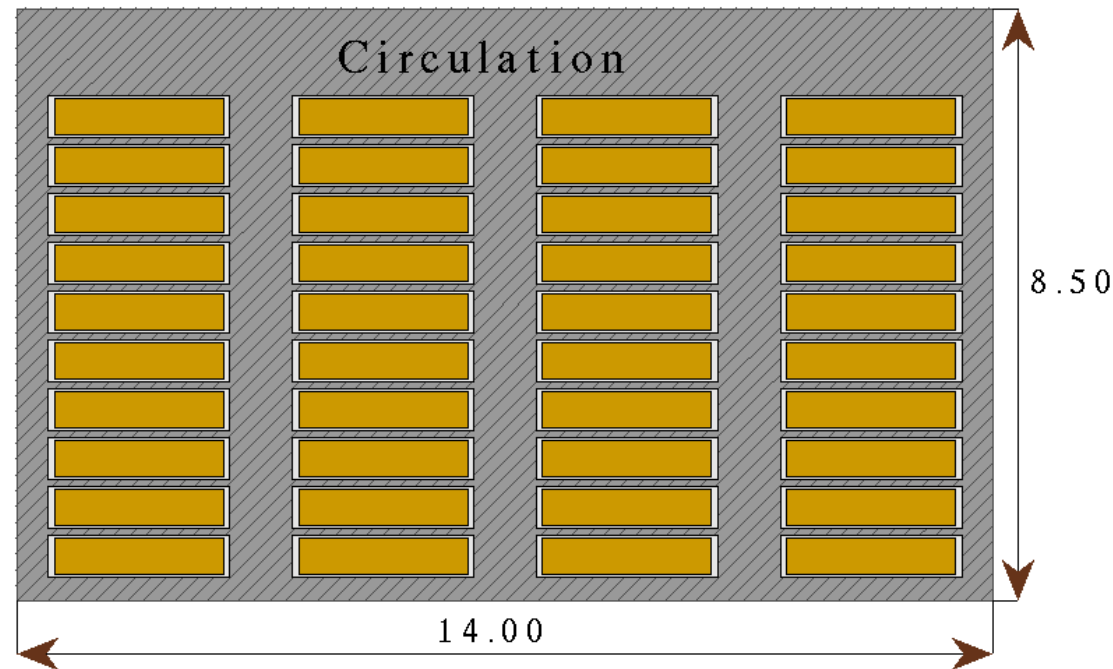


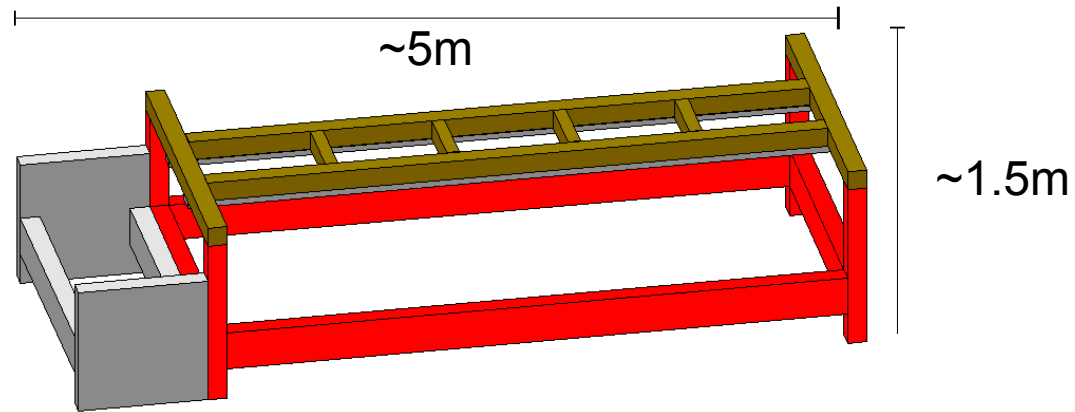
Step 0: Unpacking and inspection as modules arrive ~ 30m<sup>2</sup> space needed

The cases are stored as packed as possible  
But leaving enough space to install the  
lifting slings

Module storage area 120 m<sup>2</sup>  
Progressively freed after ~2-3 months

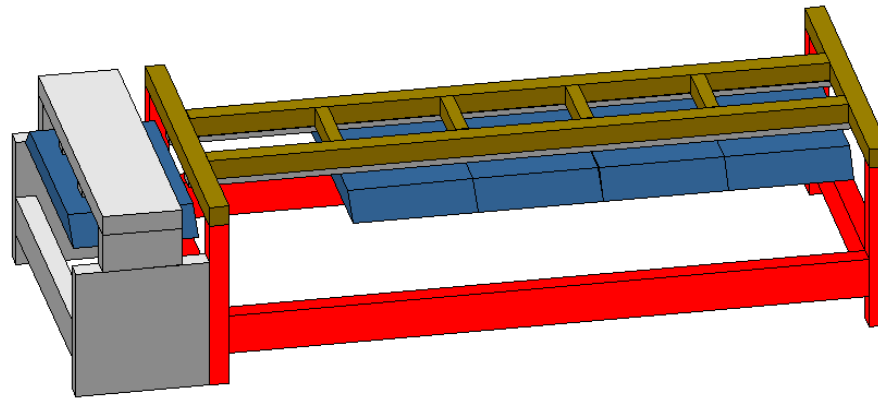
Storage of empty cases?  
Can be piled up somewhere





Support

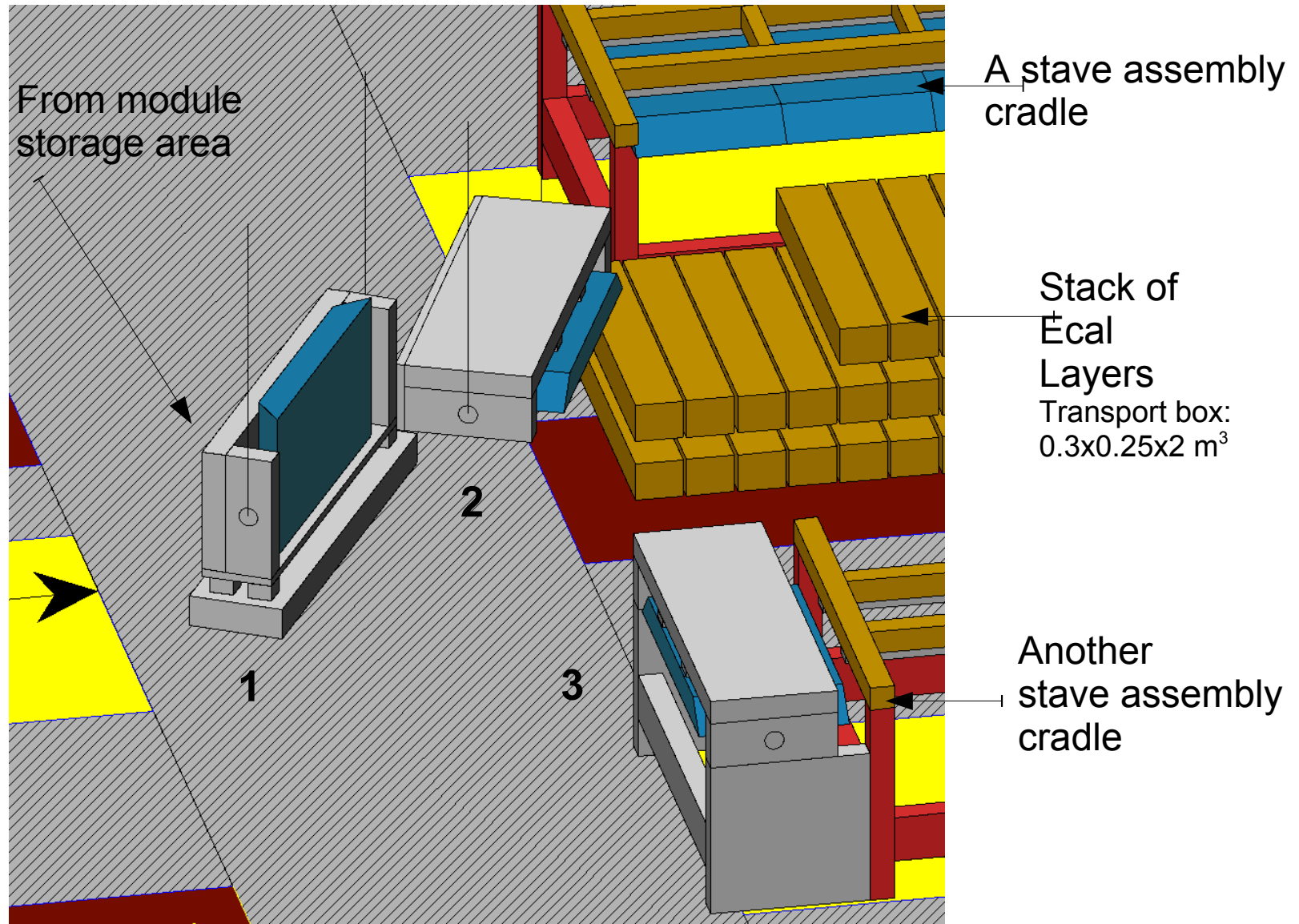
Assembly cradle



Support  
+  
module

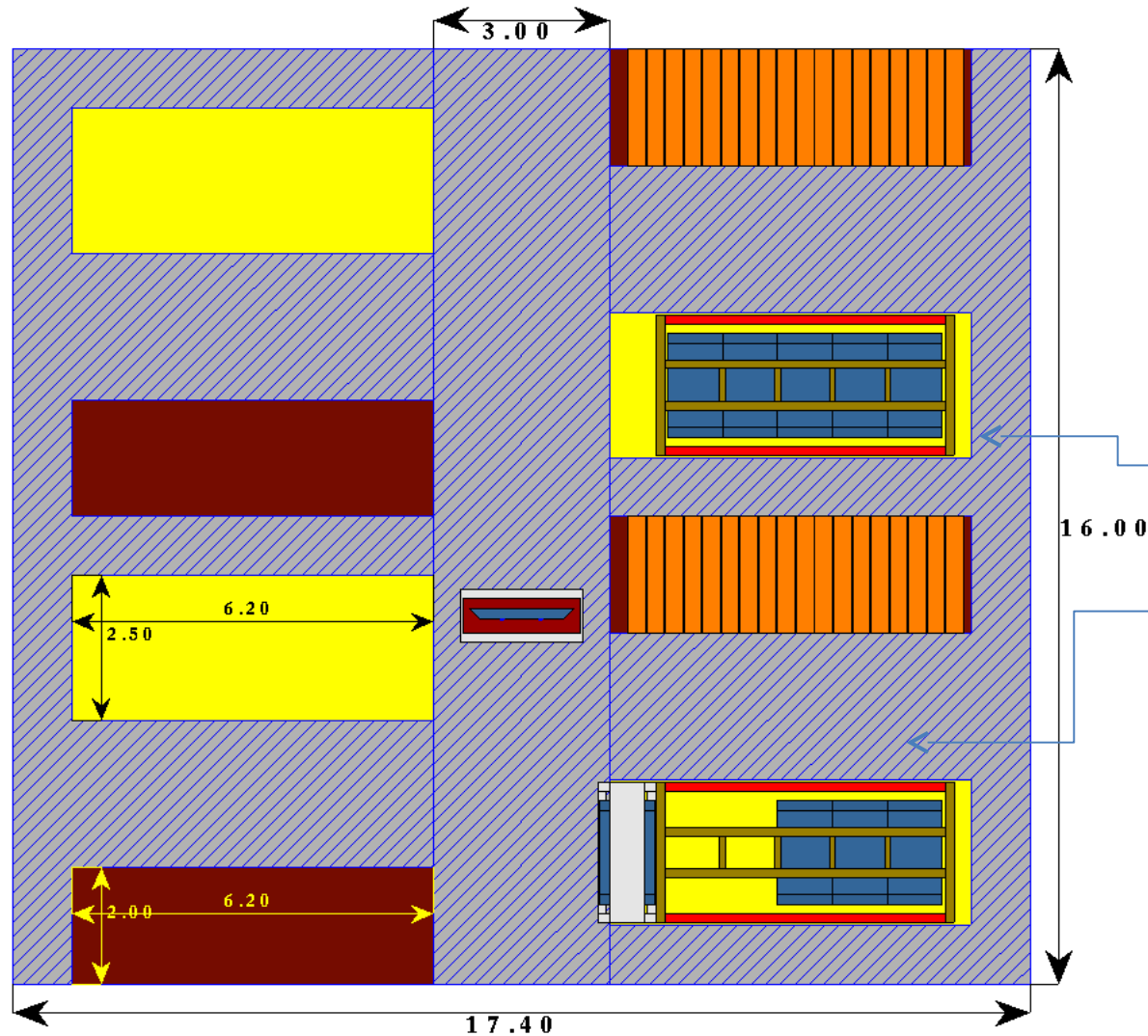
Assembly cradle  
with  
modules





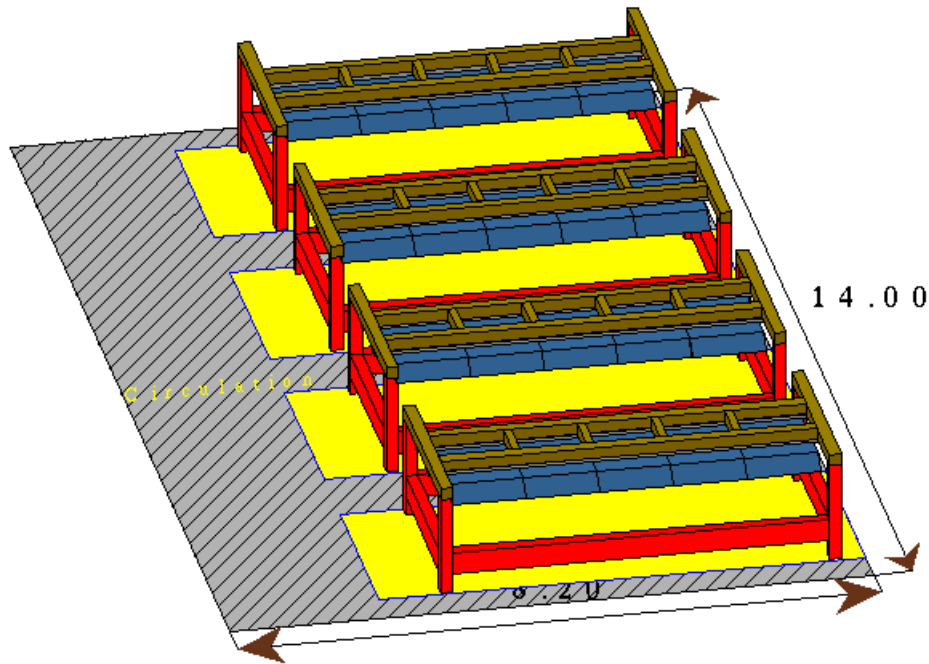
Total surface 278 m<sup>2</sup>

Placeholders  
for  
Cradles  
and  
Slab storage



Placeholders  
with  
corresponding  
material

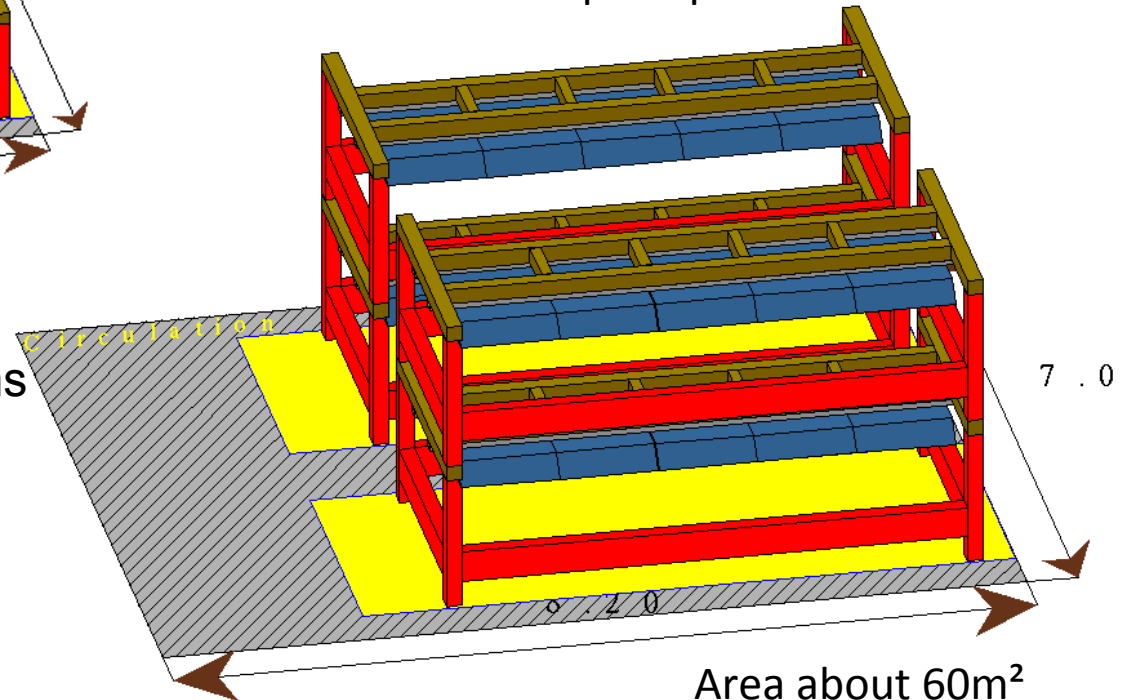
Time needed to mount, equip (with layers) and cable one stave ~ 1 month  
e.g. 4 teams with 4 people => 2 – 3 months for stave mounting and cabling in total



60 m<sup>2</sup>  
+ little more  
For cooling and DAQ systems

**Cosmic calibration for about 4 months**  
=> 1% precision of calibration

Alternative: pile up 2 cradles like



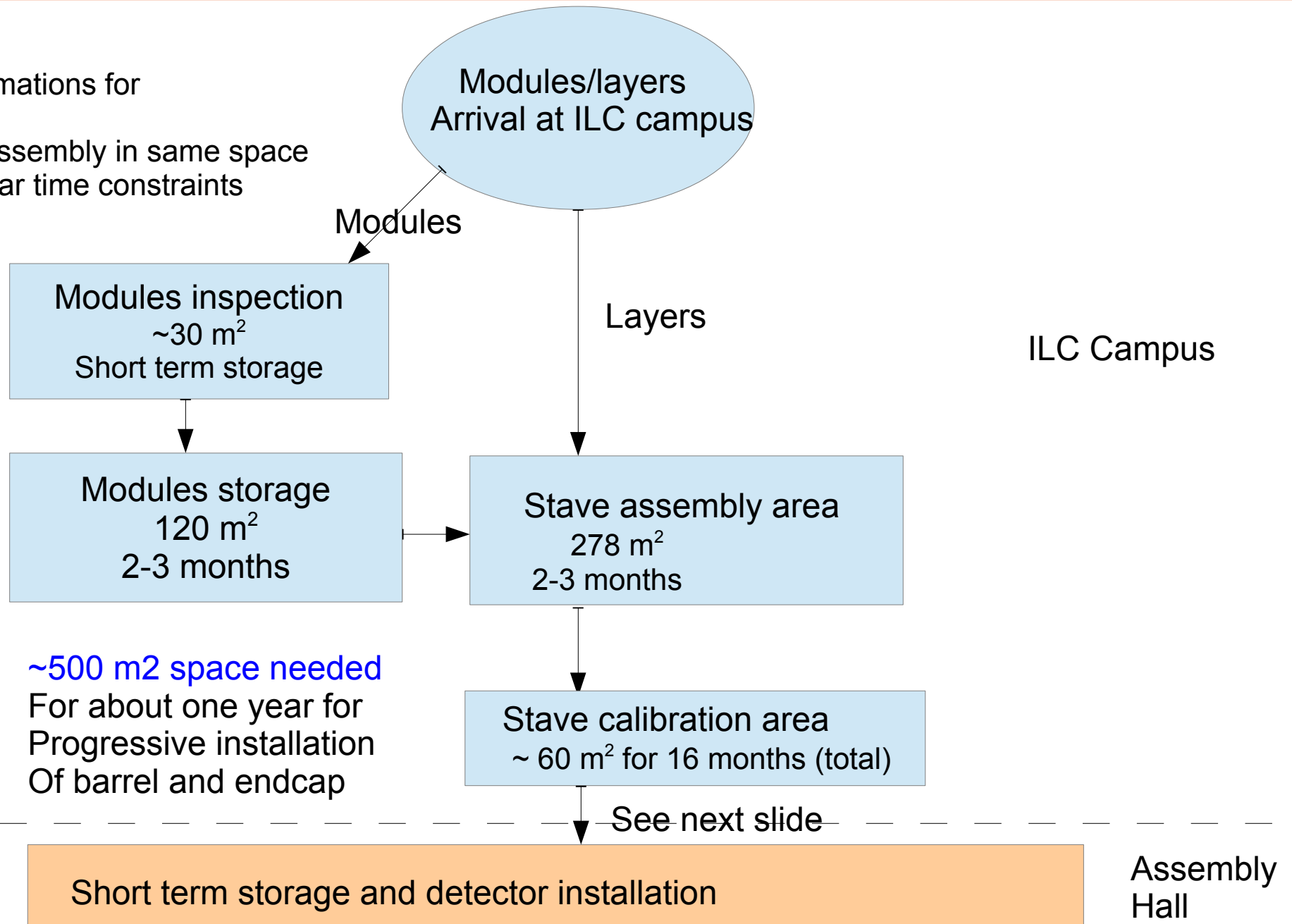
Area about 60m<sup>2</sup>

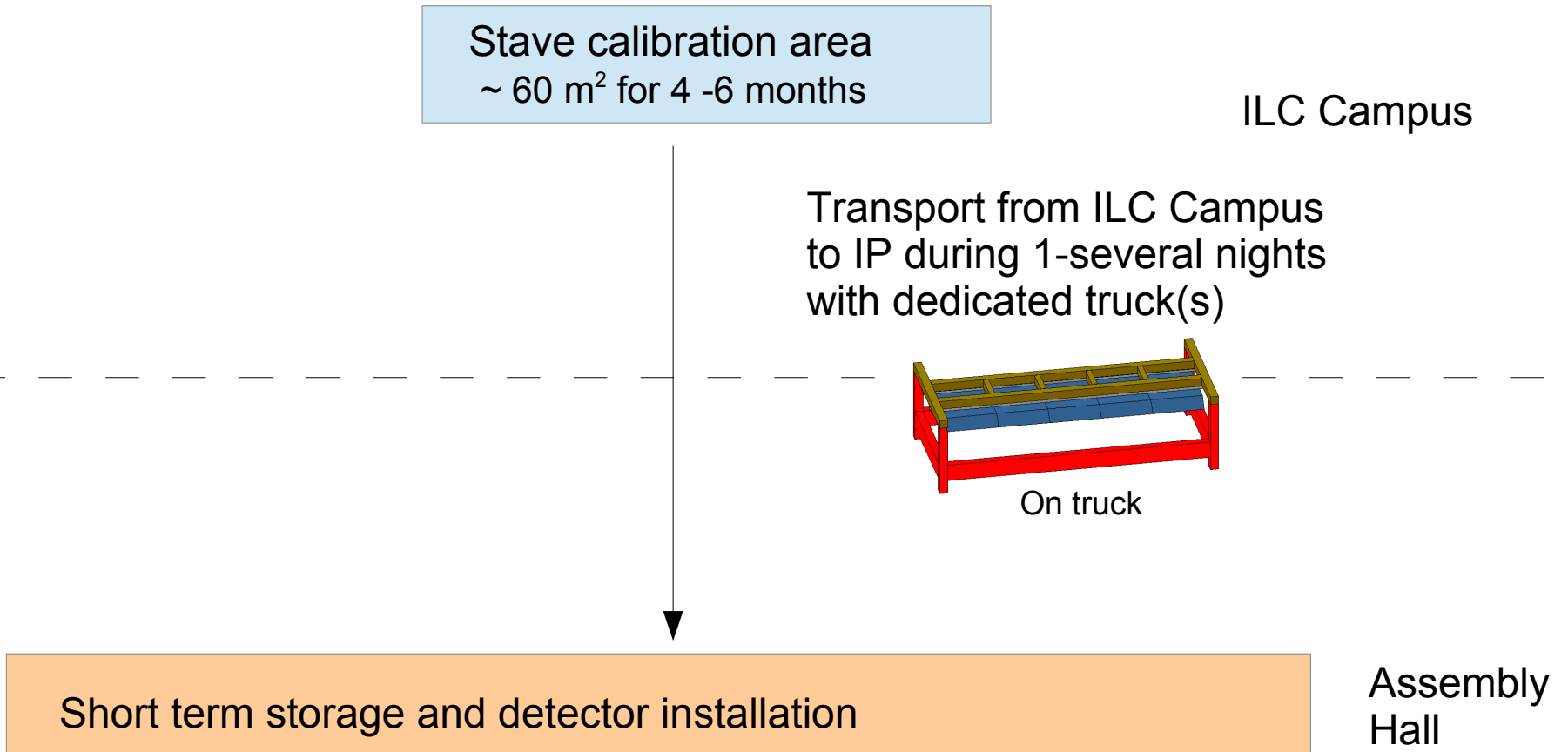
Area 60 + 132 + 278 = 470

Tests in  
Stave area only or  
Stave area + assembly area

**Remark:**

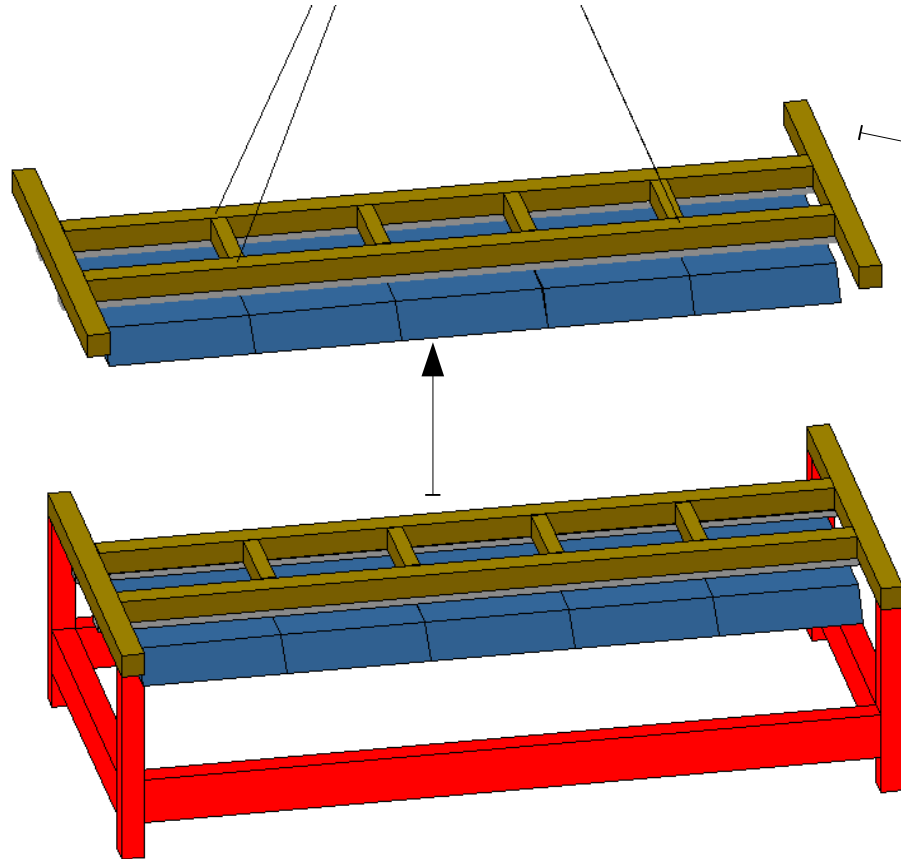
Time estimations for  
 Barrel  
 Endcap assembly in same space  
 With similar time constraints



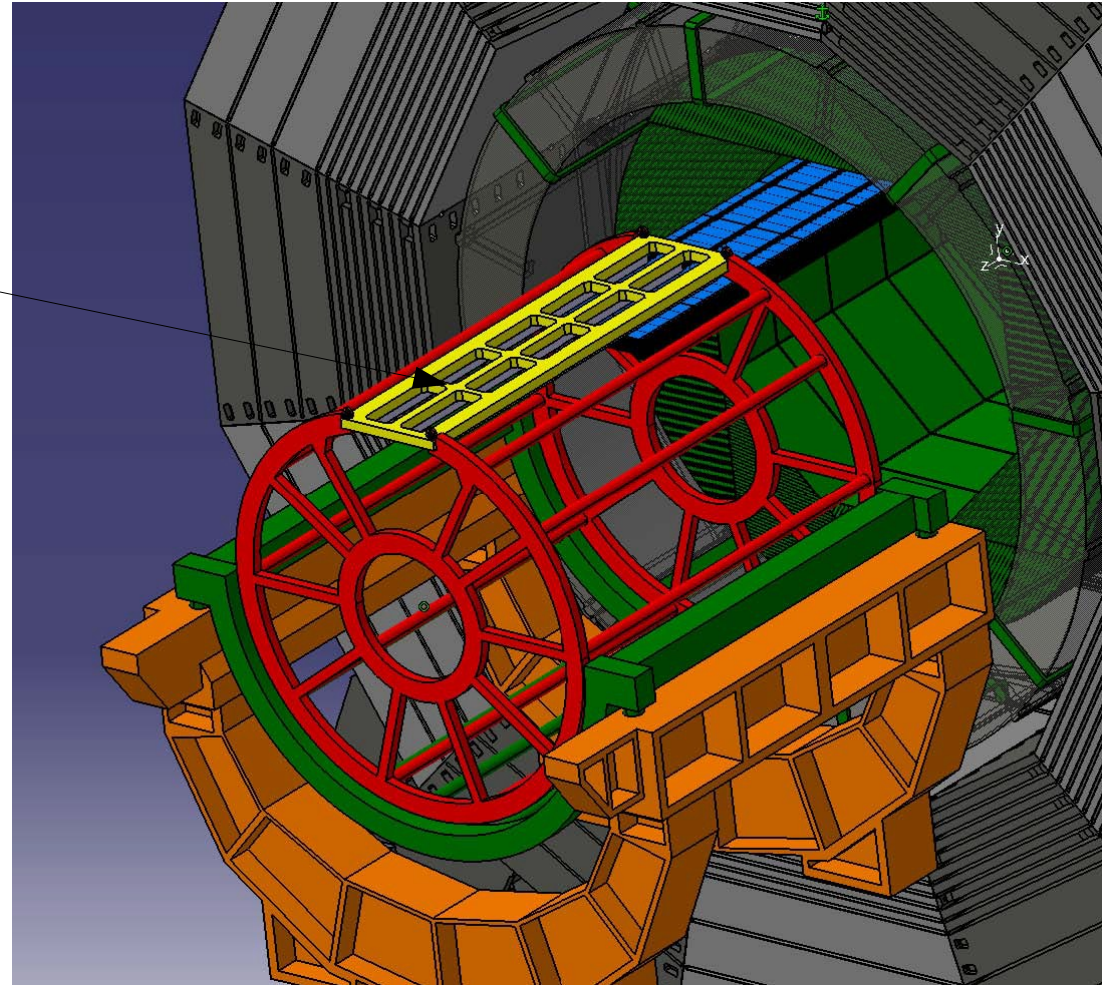


Moving of cradles to assembly area requires 15 t crane

Lifting of stave cradle and insertion  
Into assembly cradle

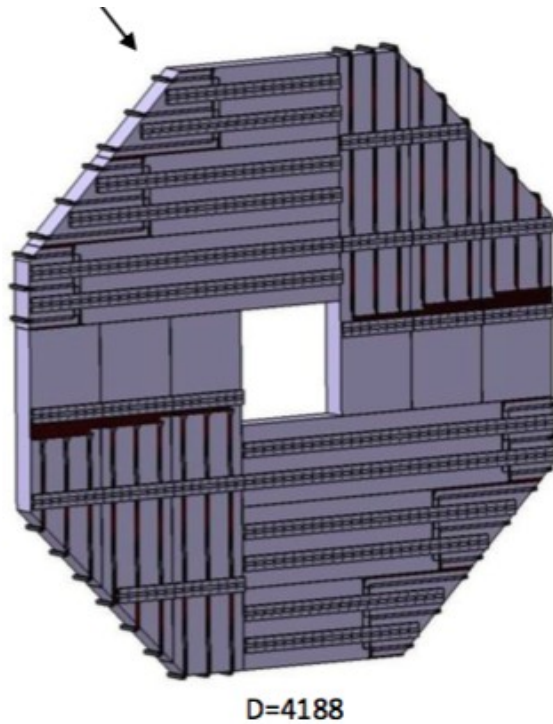


~ 1 stave/day



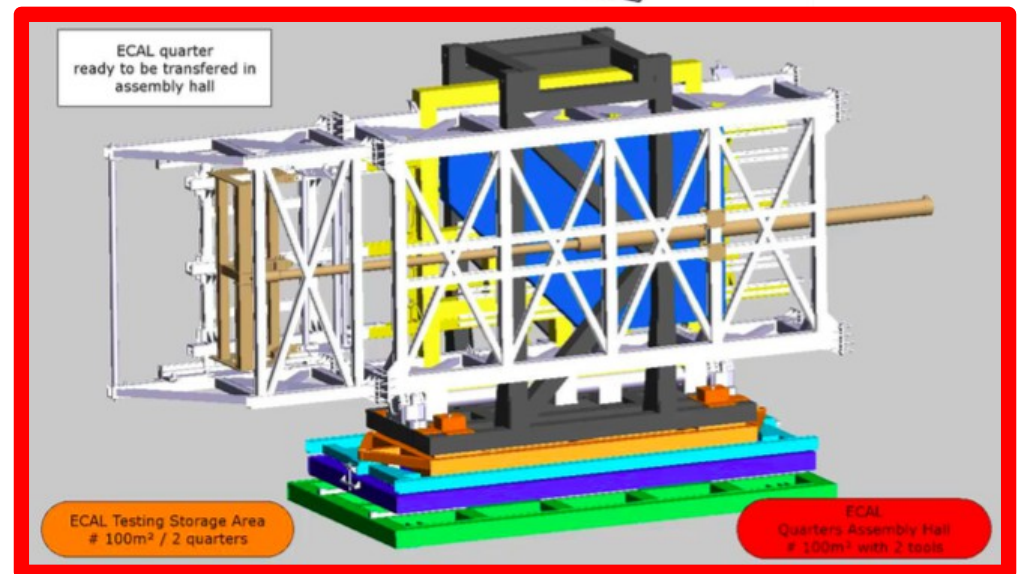
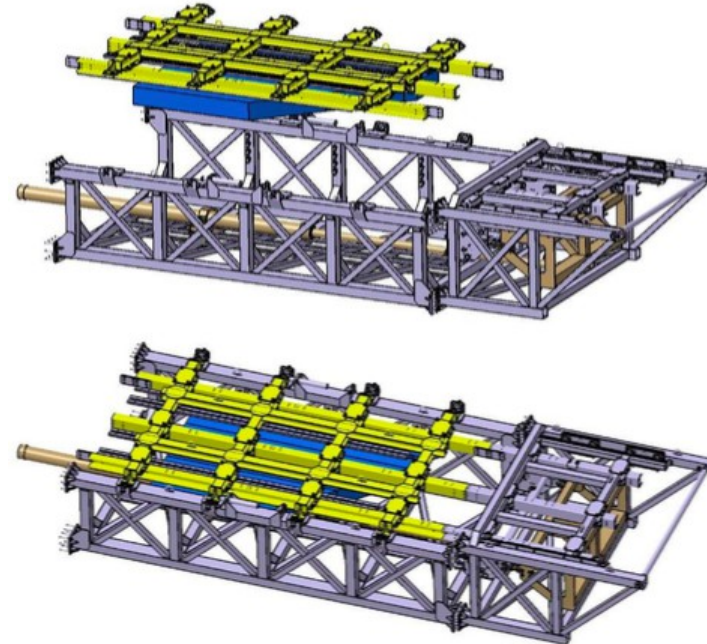
Volume of the cradle:  $6 \times 6 \times 6 \text{ m}^3$   
Need 3 times the space for assembly:  $100 \text{ m}^2$   
Weight estimated around 100t

SiW ECAL Endcap



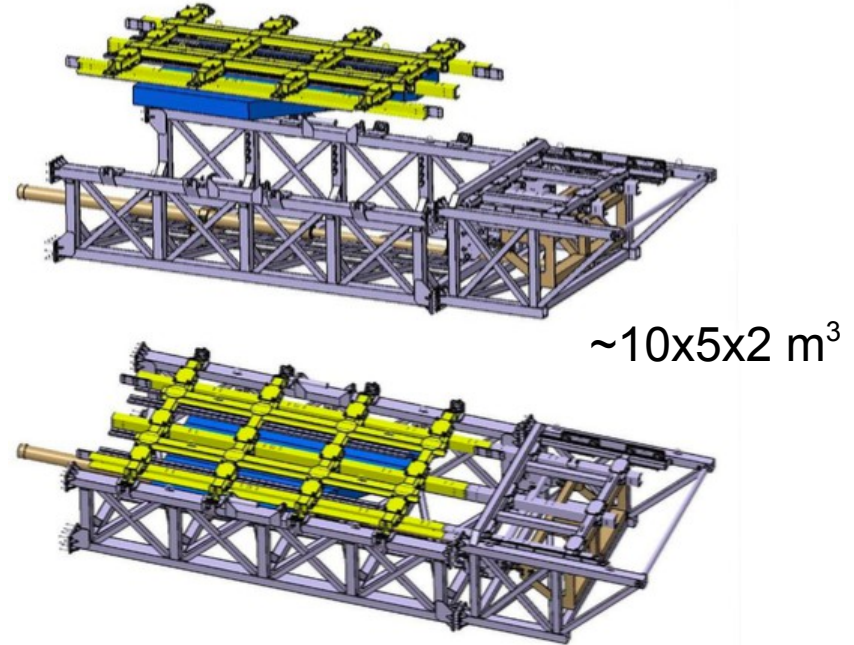
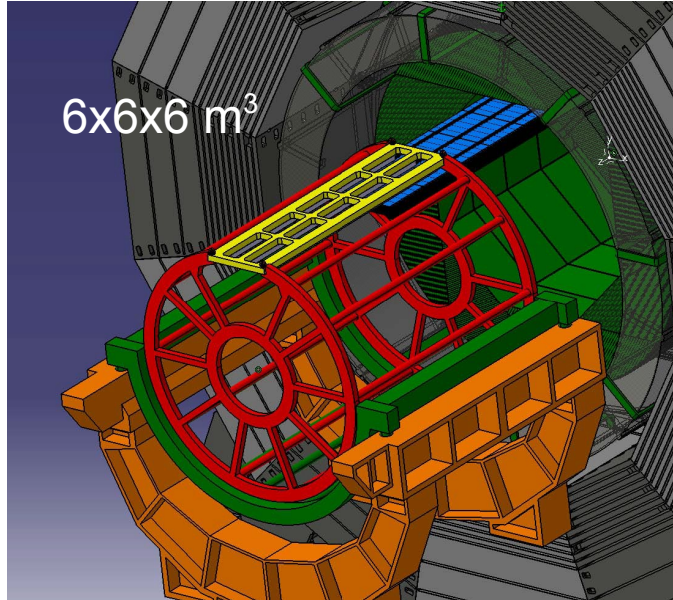
D=4188

Endcap facts:  
 Weight 2x25.5 t  
 2x4 Quadrants  
 2x12 = 24 modules

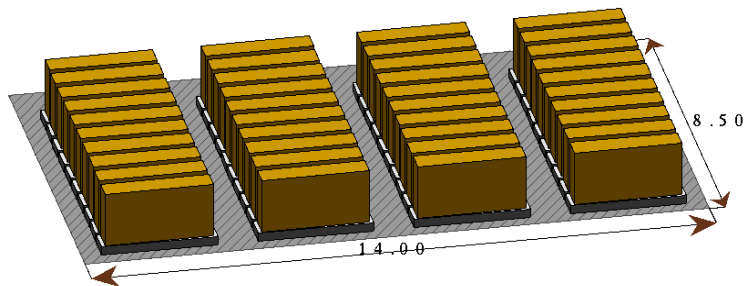


Watch out for lateral space in assembly area!

## Assembly cradles for barrel and endcaps

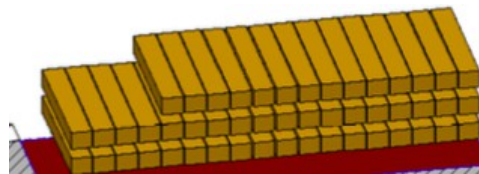


Module transport boxes



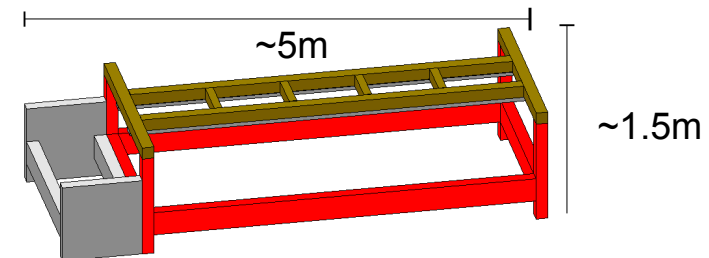
Surface 60m<sup>2</sup> -> 7x6.5x3 m<sup>3</sup>  
+ Endcap boxes

Slab transport boxes



Reminder one box: 0.3x0.25x2 m<sup>3</sup>  
Space needed for 3000 boxes  
~100m<sup>2</sup> surface and 5 m height  
(estimation R.P.)  
+ 524 endcap boxes

Assembly cradles



X8 (can be piled up)  
6x3x3 m<sup>3</sup> + endcaps



- **Plans for the SiW Ecal assembly are about to emerge**  
Planning focusses on barrel but endcaps will follow shortly  
Working group: M. Anduze, D. Grondin, H. Videau
- **About 500 m<sup>2</sup> space needed ILC Campus**  
~440 m<sup>2</sup> for assembly proper for 1 year, ~60m<sup>2</sup> for long term calibration  
Less than reserved in yesterday's talk (500 m<sup>2</sup> + 310 m<sup>2</sup>)  
More space => less assembly time
- **During this year about 20 people will be on site (estimation R.P.)**
- **Plan assumes that material arrives basically in one go**  
What if several deliveries?  
Not a principal problem but manning the stations may be more involved
- **Considerable storage space needed after installation**  
... may be a non-issue with 25000 m<sup>2</sup> assembly space

**Backup ....**