



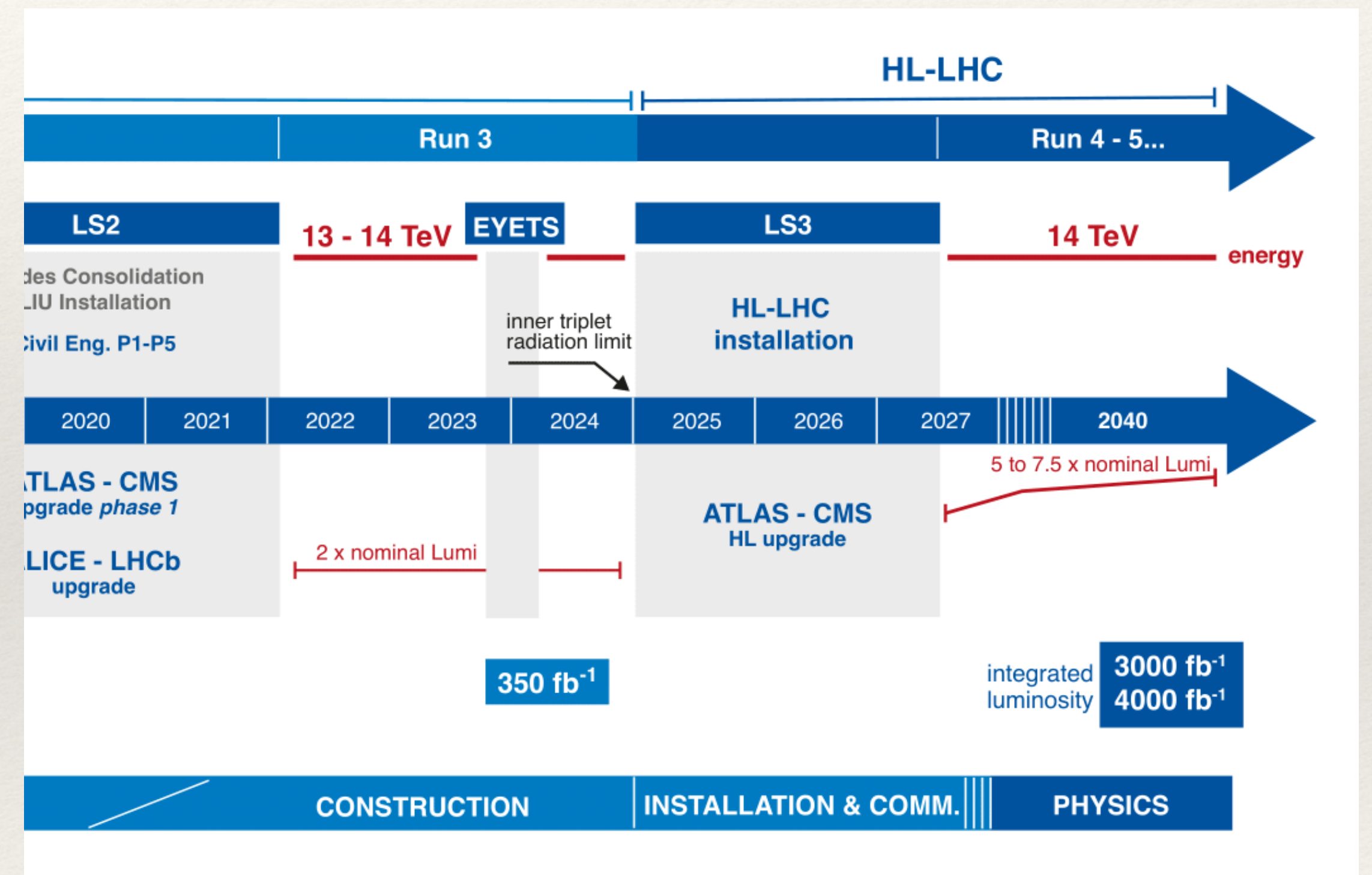
Australian ITk programme

*CDM annual meeting
29 November 2021*

James Webb

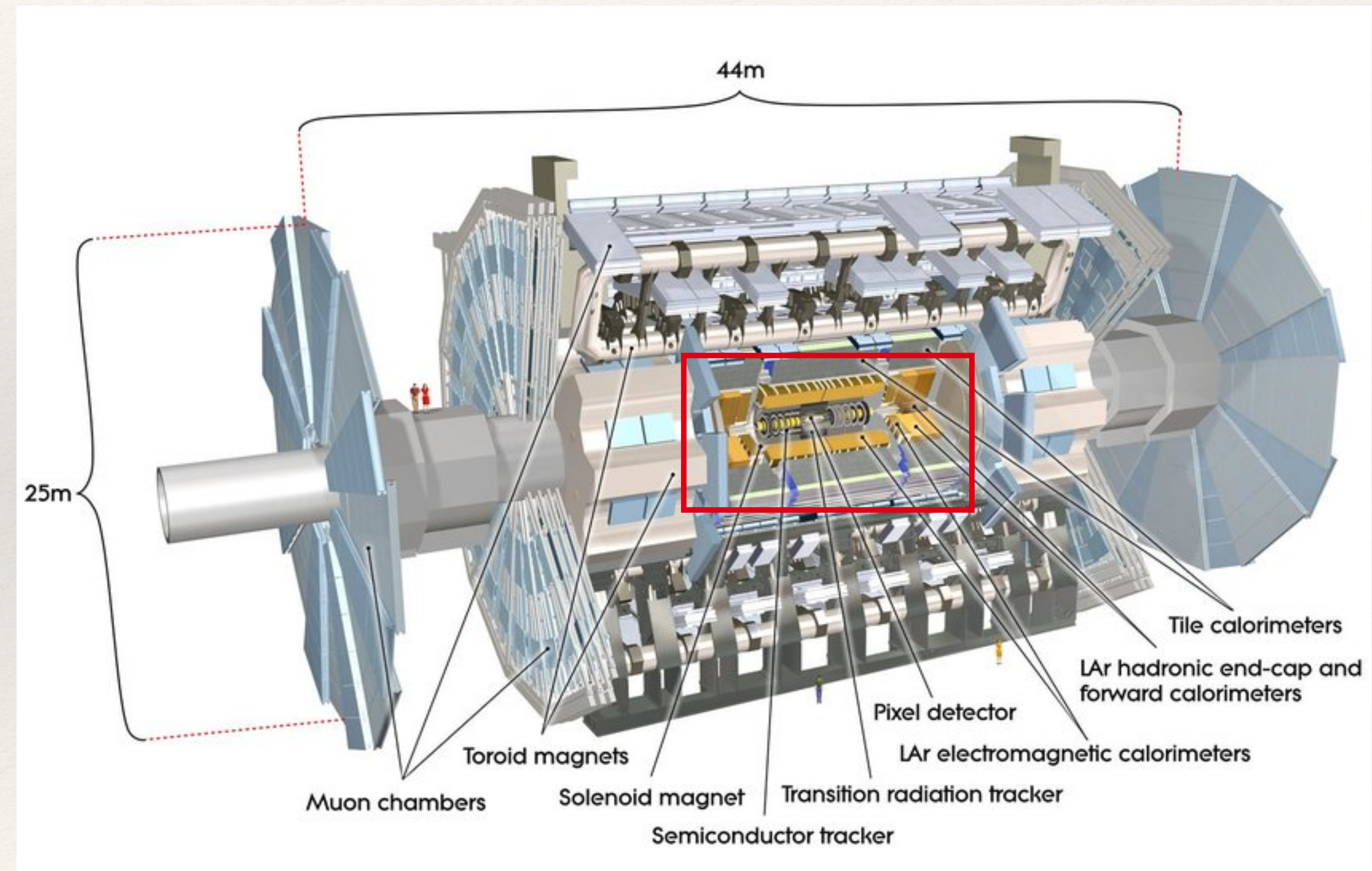
HL-LHC

- ❖ Intense data collection phase
- ❖ Aim to increase $\mathcal{L}_{peak} = 7 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$, 3000 - 4000 fb^{-1} data-set over ~10 year operation
- ❖ 200 p-p collisions per beam crossing



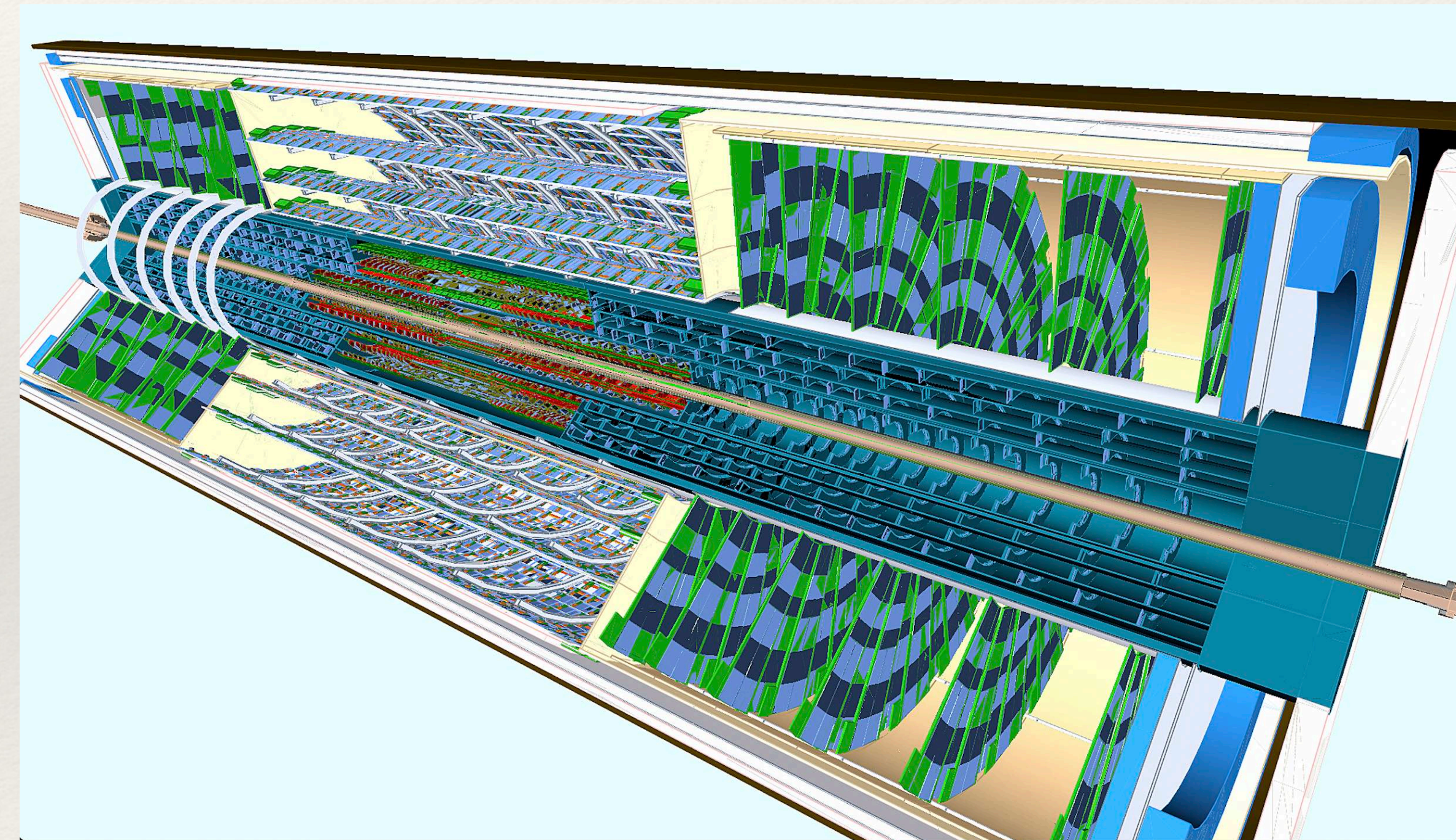
Towards a full silicon tracker

- ❖ Current inner-tracker (Pix, SCT, TRT) limited by readout rate and radiation damage, unsuitable for HL-LHC
- ❖ Moving to a fully silicon based tracker



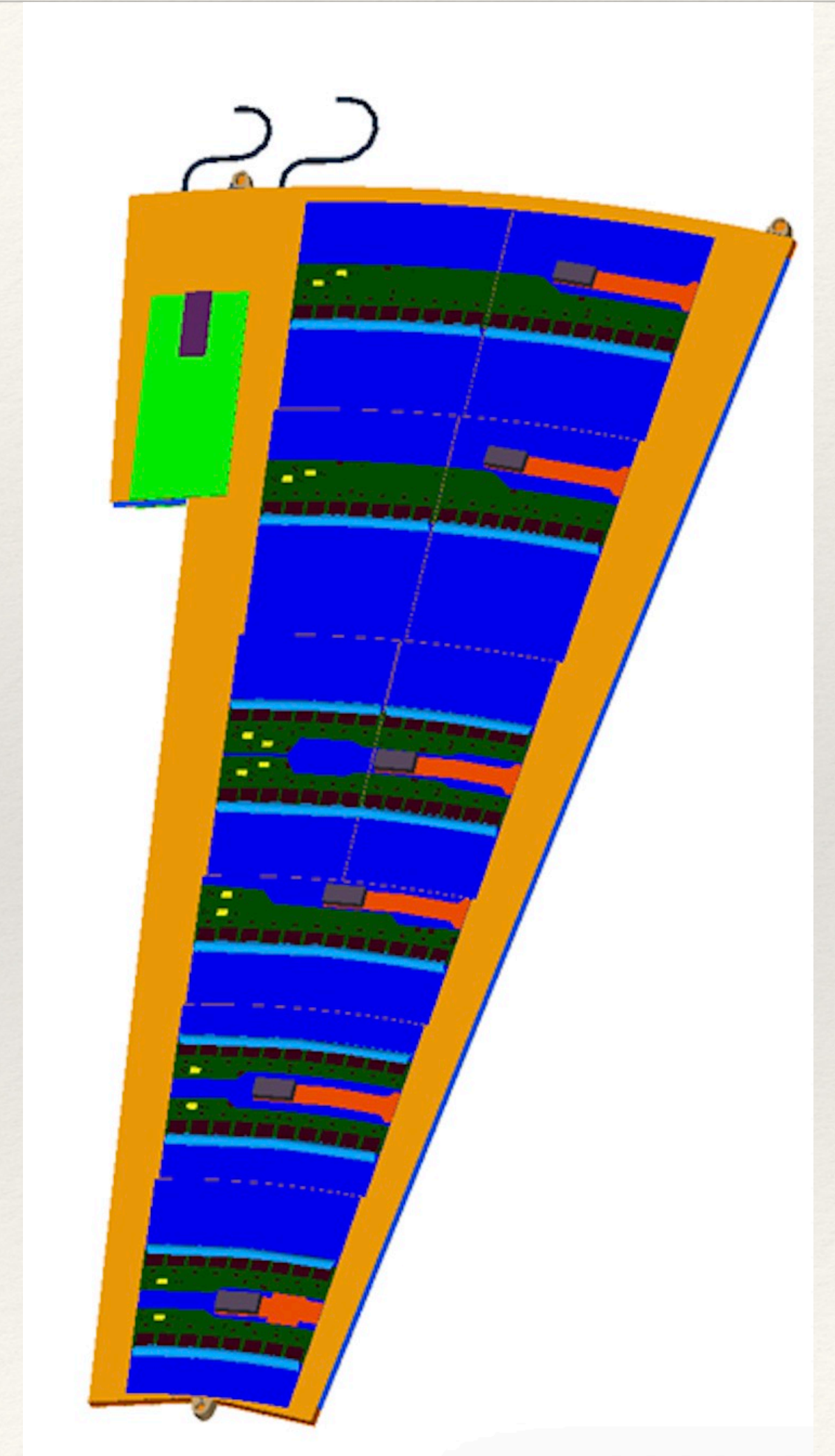
ITk strips

- ❖ Strip detector is comprised of two sections: barrel and the end-caps
- ❖ Redesign of inner tracker, extending geometry, sensitivity to larger $\Delta\eta$
- ❖ New readout chips (ABCstar) and increased strip granularity



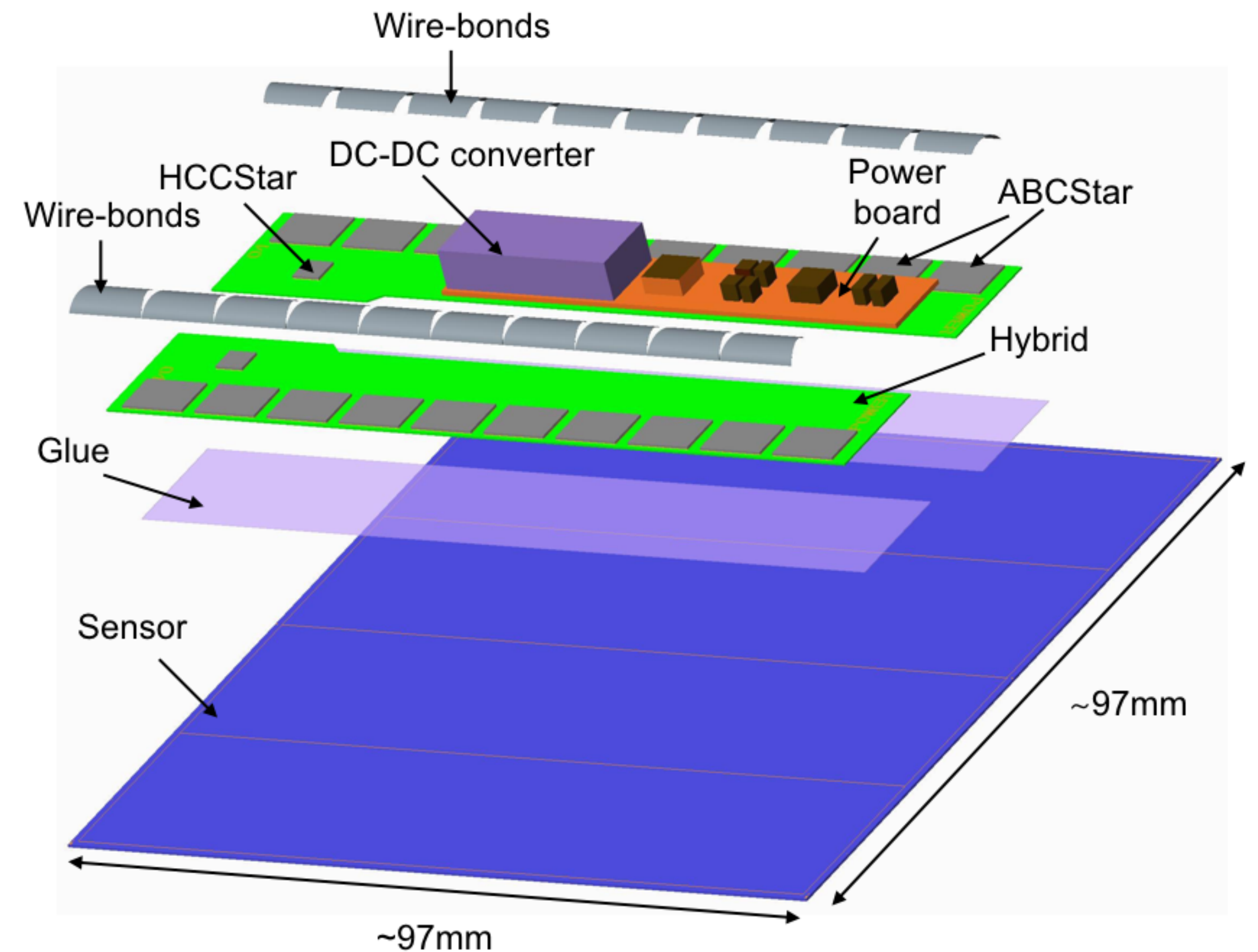
Endcap petals

- ❖ End-caps comprised of 'petals'
- ❖ Each petal consists of six modules denoted R0 - R5
- ❖ Melbourne to build R1 and R4 modules, early prototyping done with R0
- ❖ 32 petals comprise a single end-cap disk



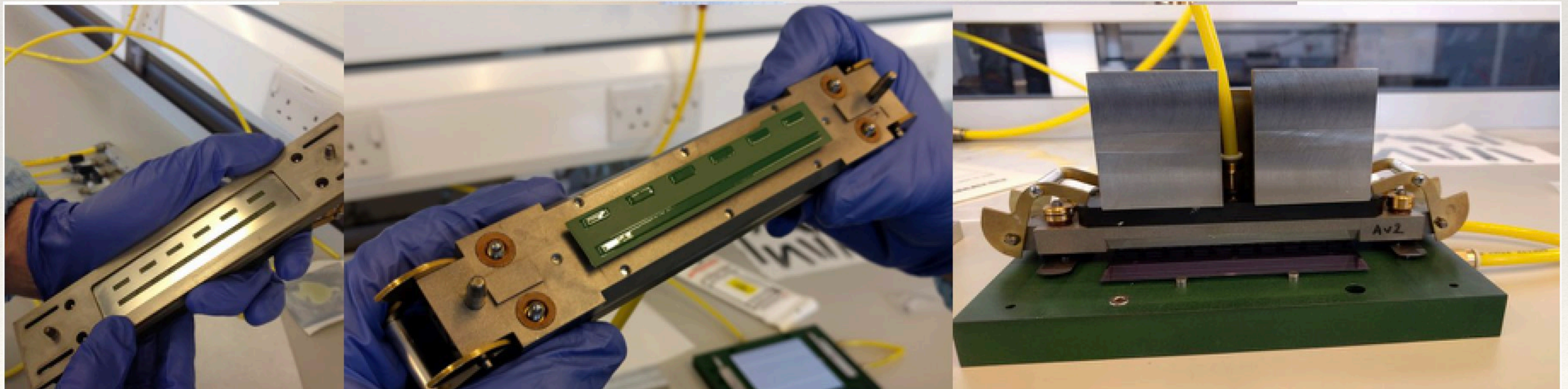
Module assembly

- ❖ Relatively simple design, full assembly requires only a few jigs.
- ❖ Gluing performed with stencil - squeegee jig system.
- ❖ Hybrids to arrive pre-populated with ASICs (Not for prototyping).



Module assembly II

- ❖ Controlling glue spread during hybrid gluing quite precarious
- ❖ Moving to gluing robot to ensure systematic glue application



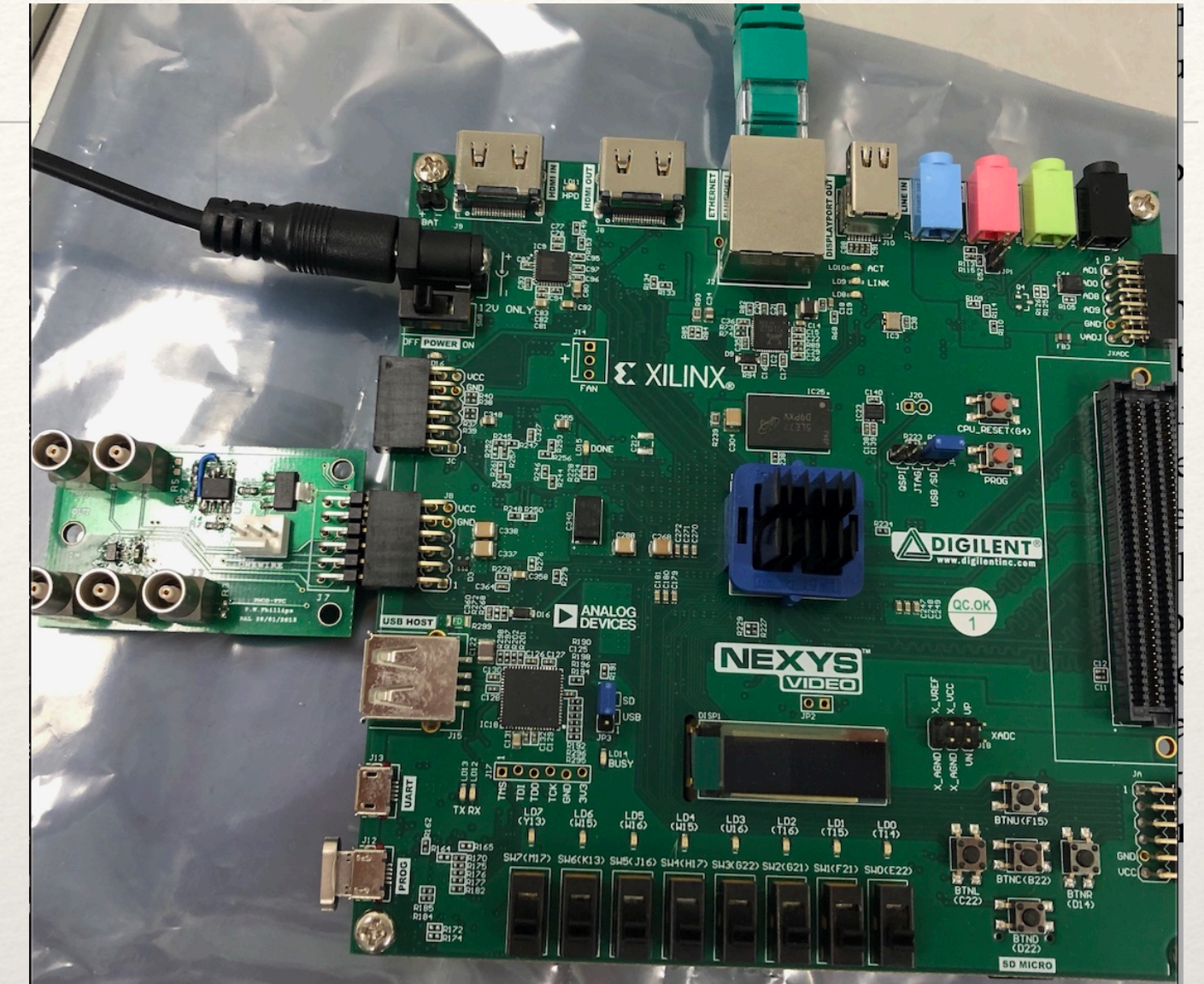
Module assembly III

- ❖ Two prototype R0 modules already assembled, a further module partially assembled.
- ❖ Electrical issues with current modules (large dark currents) a result of undesirable glue spread
- ❖ Readout chips, good functionality



Module testing

- ❖ All electrical testing performed with generic FPGA boards.
- ❖ Electrical characterisation and thermal cycling to be performed at Adelaide.
- ❖ Cold-box for thermal cycling currently being built at DESY.



Remote site qualification (QA)

- ❖ Due to pandemic, in-person site reviews not possible. Quick transition to online, piece-wise evaluation site evaluation.
- ❖ Production readiness QA well underway.
- ❖ On track for pre-production early next year.

Block	Step Number	Qualification Step	Status	Ready for Review?	Object Swapped	Document Link	Video link	DB Entry
HV Tab Attach	1.1	Bonding Procedures	Needs Development	No	No	Melbourne		
	3.1	Sensor Reception	Needs Development	No	No			
Sensor Reception	3.2	Sensor Storage	Qualification Ready	Yes	Not needed	https://www.dropbox.com/s/fboeh2jweidkav/Melb		
	3.3	Sensor I-V	Review Docs Incomplete	No	No			
PB Reception	6.1	PB Reception	Needs Development	No	No			
	6.2	PB E tests	Needs Development	No	No			
	6.3	PB Vis Insp	Needs Development	No	No			
	6.4	PB Storage	Qualification Ready	Yes	Not needed	https://www.dropbox.com/s/fboeh2jweidkav/Melb		
Hybrid Reception	10.1	Reception: hybrids	Needs Development	No	No			
	10.2	Storage of hybrids	Qualification Ready	Yes	Not needed	https://www.dropbox.com/s/fboeh2jweidkav/Melb		
	8.7	Visual inspection: hybrids	Qualification Ready	Yes	Not needed	https://www.dropbox.com/s/afmm7r2e90cyyao/SQ		
	8.11	hybrid QC: single panel testing	Requires Setup	No	No			
Module Assembly/Testing	11.1	Storage of modules	Qualification Ready	Yes	Not needed	https://www.dropbox.com/s/fboeh2jweidkav/Melb		
	11.2	Cleaning module jigs	Qualification Ready	Yes	Not needed	https://www.dropbox.com/s/ab5r5d6211xujwm/Melb		
	11.4	Storage + shipping of glue	Requires Parts	No	No			
	11.5	Removing hybrids from panel	Needs Development	No	No			
	11.6	Module Assembly	Review Docs Incomplete	No	No			
	11.7	Metrology: modules	Needs Development	No	No			
	11.8	Bonding procedures: modules	Needs Development	No	No			
	11.9	Visual inspection: modules	Qualification Ready	Yes	No	https://www.dropbox.com/s/va8aiq42mp3tf39/2021		
	11.11	Single module Electrical Tests	Needs Development	No	No			
Module Shipping	12.1	Shipping modules	Requires Parts	No	No			
	13.1	Cleanroom standards	Qualification Ready	Yes	No	https://www.dropbox.com/s/0i18j9	https://www.dropbox.com/s/0i18j9	
General	13.2	ASIC Compliance & Handling	Qualification Ready	Yes	No	https://www.dropbox.com/s/1993r8hwqma12aj/Melb		
	13.3	Bond Pulling Procedure	Qualification Ready	Yes	No	https://www.dropbox.com/s/a3u5iotlp6dcpf/13.3%2		

Block	Step Number	Qualification Step	Status	Ready for Review?	Object Swapped	Document Link	Video link	DB Entry
Module Assembly/Testing	11.1	Storage of modules	Requires Setup	No				
	11.9	Visual inspection: modules	Requires Setup	No				
	11.10	Module Thermal Cycling	Requires Setup	No				
	11.11	Single module Electrical Tests	Requires Setup	No				
Module Shipping	12.1	Shipping modules	Requires Setup	No				
General	13.1	Cleanroom standards	Requires Setup	No				
	13.2	ASIC Compliance & Handling	Qualification Ready	Yes	Not needed	Sent to Karola and Felix 15th July 2021		
Module Reception	14.1	Module Reception	Needs Development	No				

Adelaide

Future outlook

- ❖ On track to complete site qualification early next year.
- ❖ Pre-production (A/B) to follow (detector ready modules).
- ❖ Melbourne to produce 40 R1 / R4 modules per year (2-3 year production run).
- ❖ See Scott Williams poster for more info on module assembly.