

ATLAS Pixel – Status



✓ Currently 77 non operable modules (out of 1744, i.e. **4.4%**). 0.2% bad FEs.

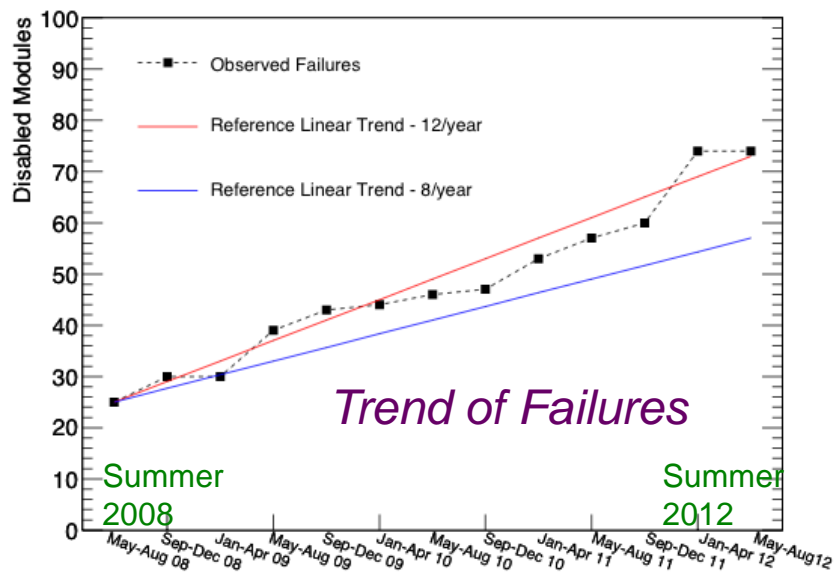
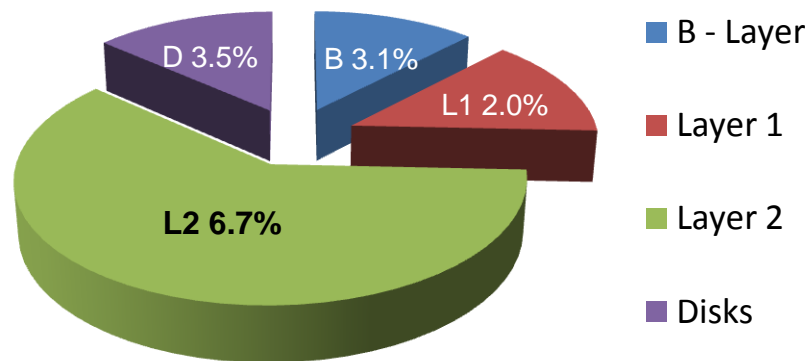
- In 2008, after the installation, 25 non operable modules: in average, the failure increase is of **0.6-0.7% per year**.
- Outermost layer seems to be more fragile.
- An additional set of 7 B-layer modules (2%) is problematic in these days - under investigation.

✓ Failures are highly correlated with cooling stops. We tried to reduce the thermal shock whenever possible.

✓ Not always possible to identify the **exact reason and location** (detector or internal services) for the failure.

✓ Despite that, very stable operation.

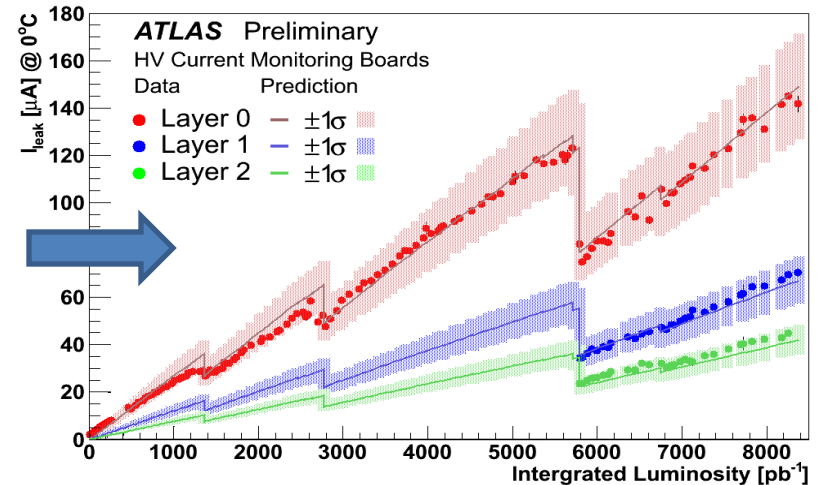
Module failures by layer



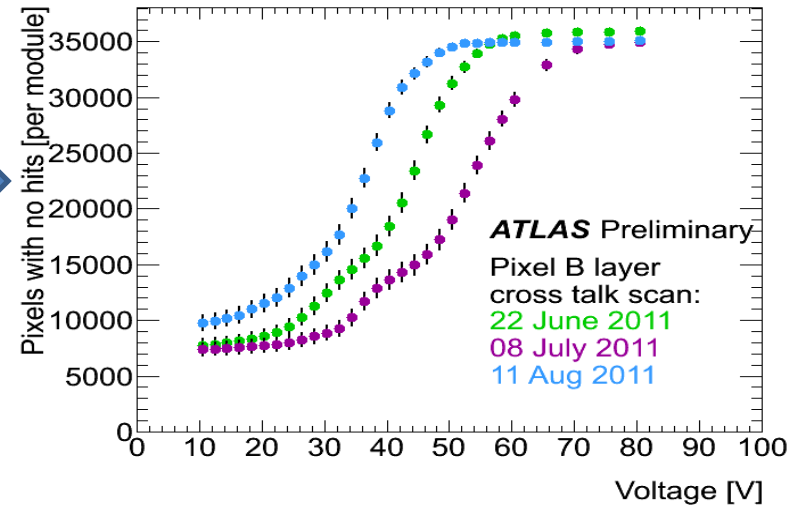
ATLAS Pixel – Status



- ✓ Radiation effects are starting to be measurable, in agreement with expectation.
 - Increase of leakage current
 - increase with luminosity and the effect of the annealing.



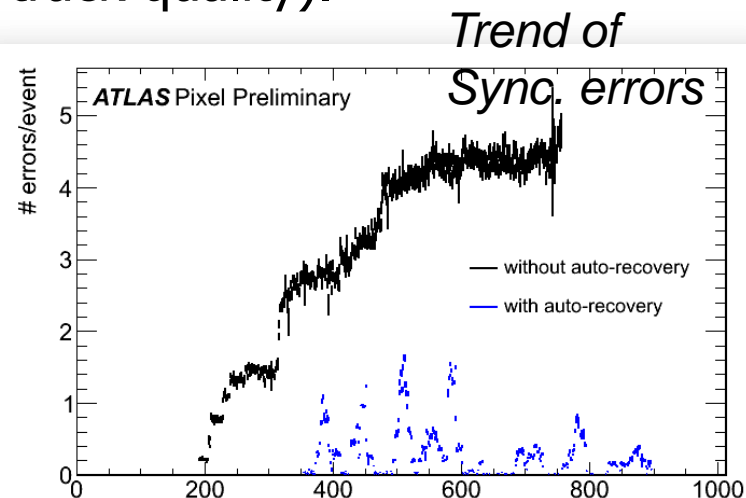
- Increase of Depletion voltage



ATLAS Pixel – Facing Luminosity increase



- ✓ The Pixel Detector is now operating in a very reliable way at $7 \cdot 10^{33} \text{cm}^{-2} \text{s}^{-1}$ @ 50 ns.
 - today's occupancy is larger than the one expected at design luminosity $1 \cdot 10^{34} \text{cm}^{-2} \text{s}^{-1}$ @ 25 ns.
 - extrapolations of the present running conditions indicate that even at 2-3 times the design luminosity, the occupancy looks tolerable for the read-out system.
- ✓ Specific tuning (e.g. higher threshold or faster shaping time) could be beneficial at high luminosity (possibility to reduce the load on the read-out system at some expense of the track quality).
- ✓ Effect of SEU, is visible even now as an increased rate in module de-synchronizations at the beginning of each LHC fill.
 - ✓ read-out electronics capabilities are exploited to detect and correct these effects in real-time (blu line).



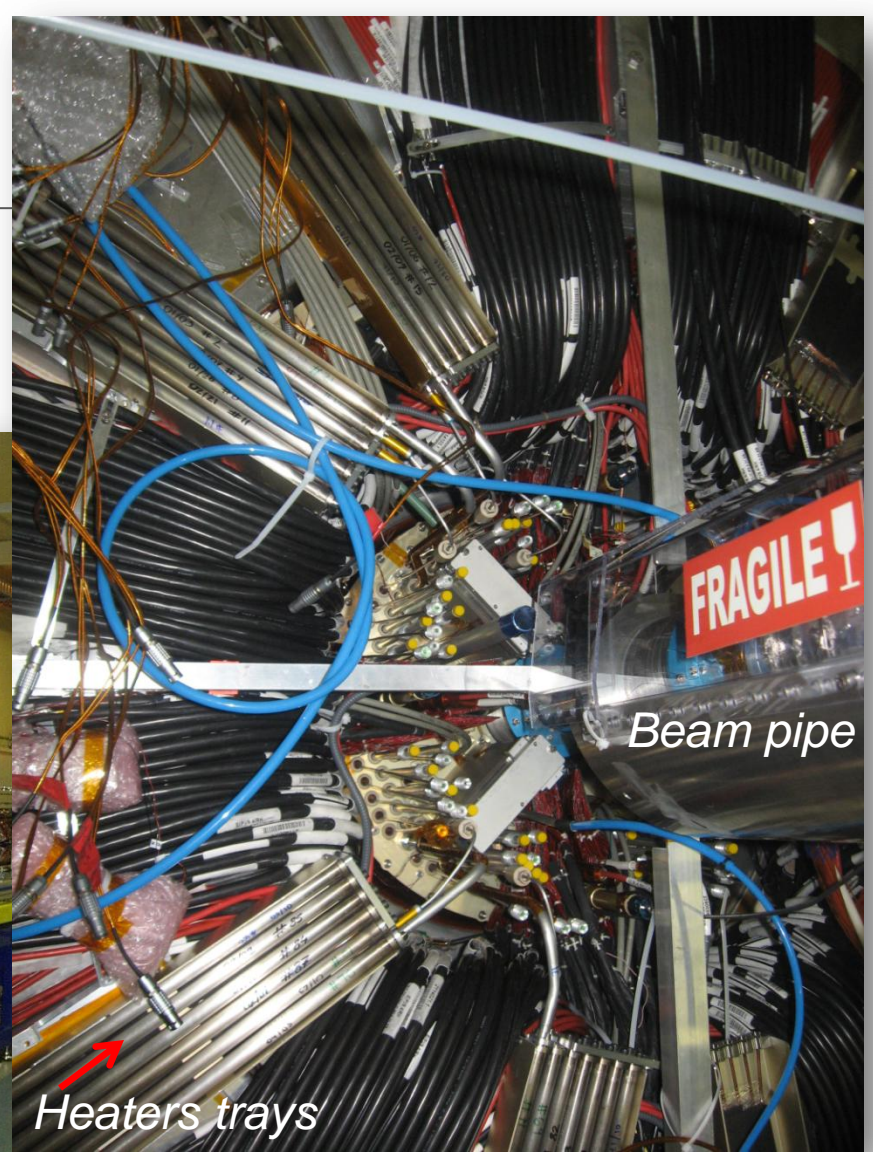
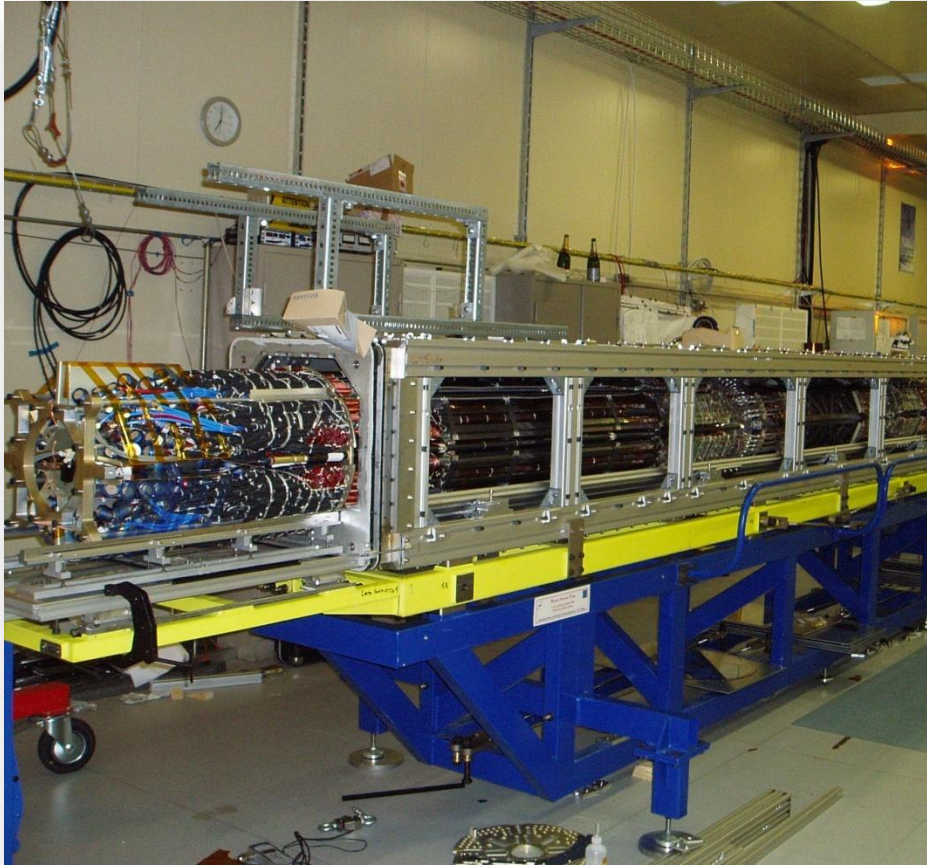
ATLAS Pixel – LS



- ✓ La piu' importante modifica al Pixel detector durante lo shutdown e' l'aggiunta dell'IBL e il commissioning del rivelatore a 4-layer.
 - **Decisione se estrarre i Pixel e sostituire i servizi interni e' ancora in standby.**
 - Permetterebbe recupero di parte dei canali disabilitati (tra il 45-77% a seconda della localizzazione delle failure), migliorerebbe performance ad alta luminosita' e faciliterebbe l'inserimento dell'IBL.
 - Costituisce ovviamente un'operazione rischiosa e complicata (next) con vantaggi limitati sulle performance.
- ✓ **Nessuna richiesta che non rientri in M&O e' fatta per lo Shutdown.**
- ✓ Le modifiche ai servizi saranno graduali negli anni. Nello shutdown ci si preparera' in modo che lo staging possa essere fatto in maniera trasparente anche durante stop brevi:
 - **Principalmente le modifiche riguardano la DAQ con installazione nuovi ROD (IBL-like) per i due layer esterni (soldi gia' chiesti nel 2010 pensando ai vecchi ROD).**

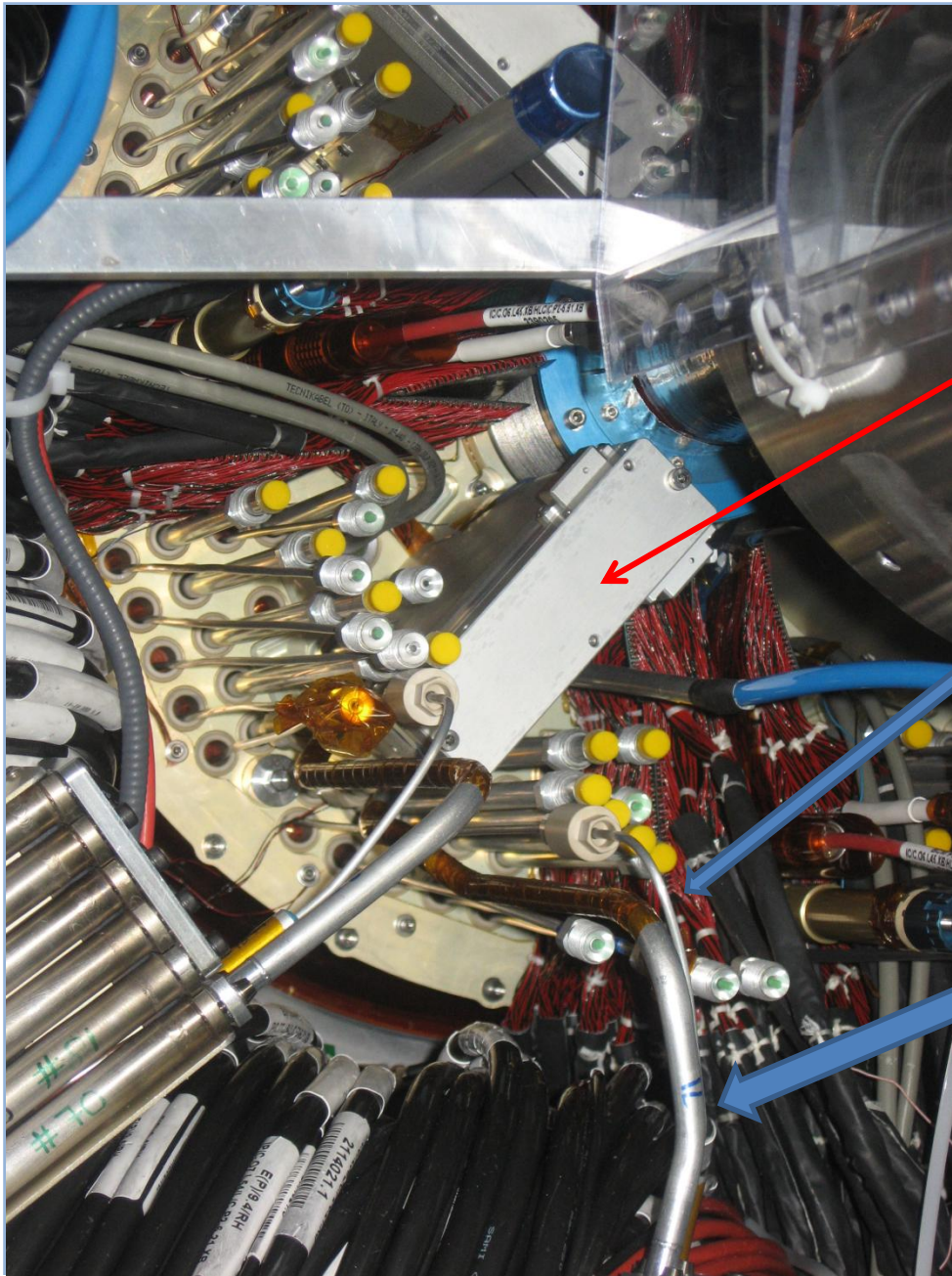
Responsabilita' Pixel						TOT MU
	nome	responsabilita'	Livello	mu	commenti	
GE	Morettini	Pixel DAQ	L2	2		
	Gagliardi	Pixel Dbase	L2	1.5		
MI	Andreazza	Pixel offline	L2	1		
	Troncon	ID speaker co	L2	1		
						5.5

Pixel Package on surface



Cables and part of the cooling system connected in the pit

*Zoom in of the pp1 connection
location for fibers and cooling
pipes.*



Faceplate hides a 10x4 matrix
where 40 fiber ribbons has to be
connected

Inlet pipe

Exhaust pipe

Overall :

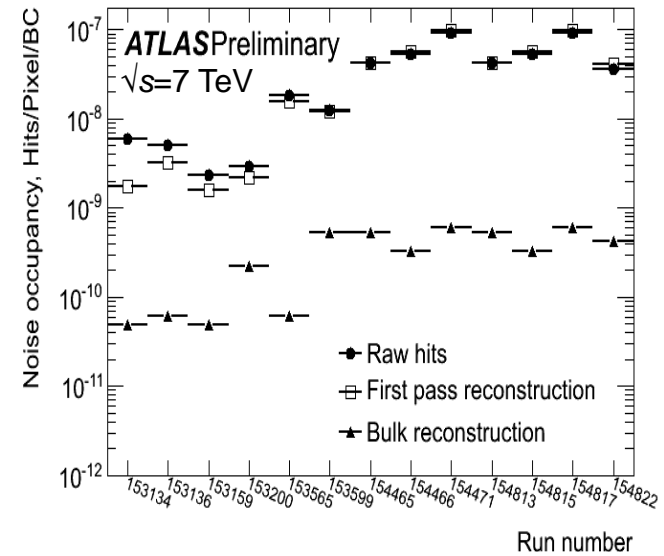
- 512 cables
- 320 fiber ribbons
- 88 cooling circuits



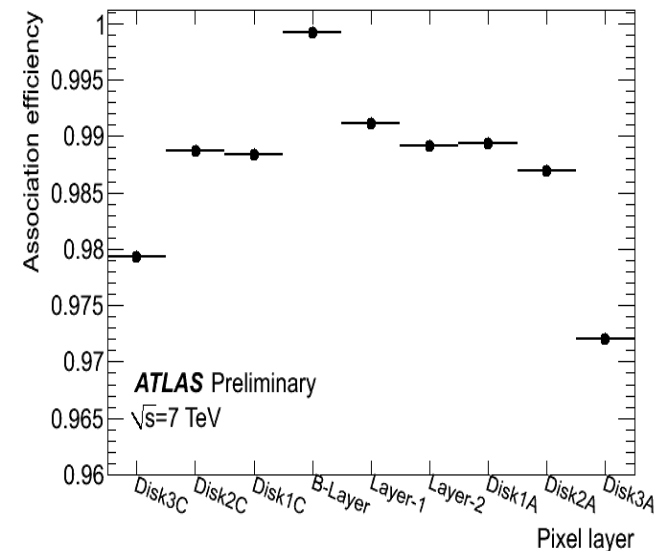
ATLAS Pixel – Status



✓ Occupancy per pixel/BC is below $\sim 10^{-9}$, masking less than 0.02% of the pixels.



✓ Typical **hit inefficiencies** are of the order of **0.2%**. (excluding the effect of dead modules).



Occupancy extrapolation

The Pixel Detector is now **operating in a very reliable way at $7 \cdot 10^{33} \text{cm}^{-2}\text{s}^{-1}$ @ 50 ns**. But after the shutdown LHC luminosity will increase. Extrapolations of the expected occupancies due to minimum bias are done for 3 LHC luminosities: **1, 2 and $3 \cdot 10^{34} \text{cm}^{-2}\text{s}^{-1}$ @ 25 ns** (2015-2017).

today's occupancy is larger than the one expected at design luminosity. But even at 3 times the design luminosity, the occupancy looks tolerable for the read-out system.

