

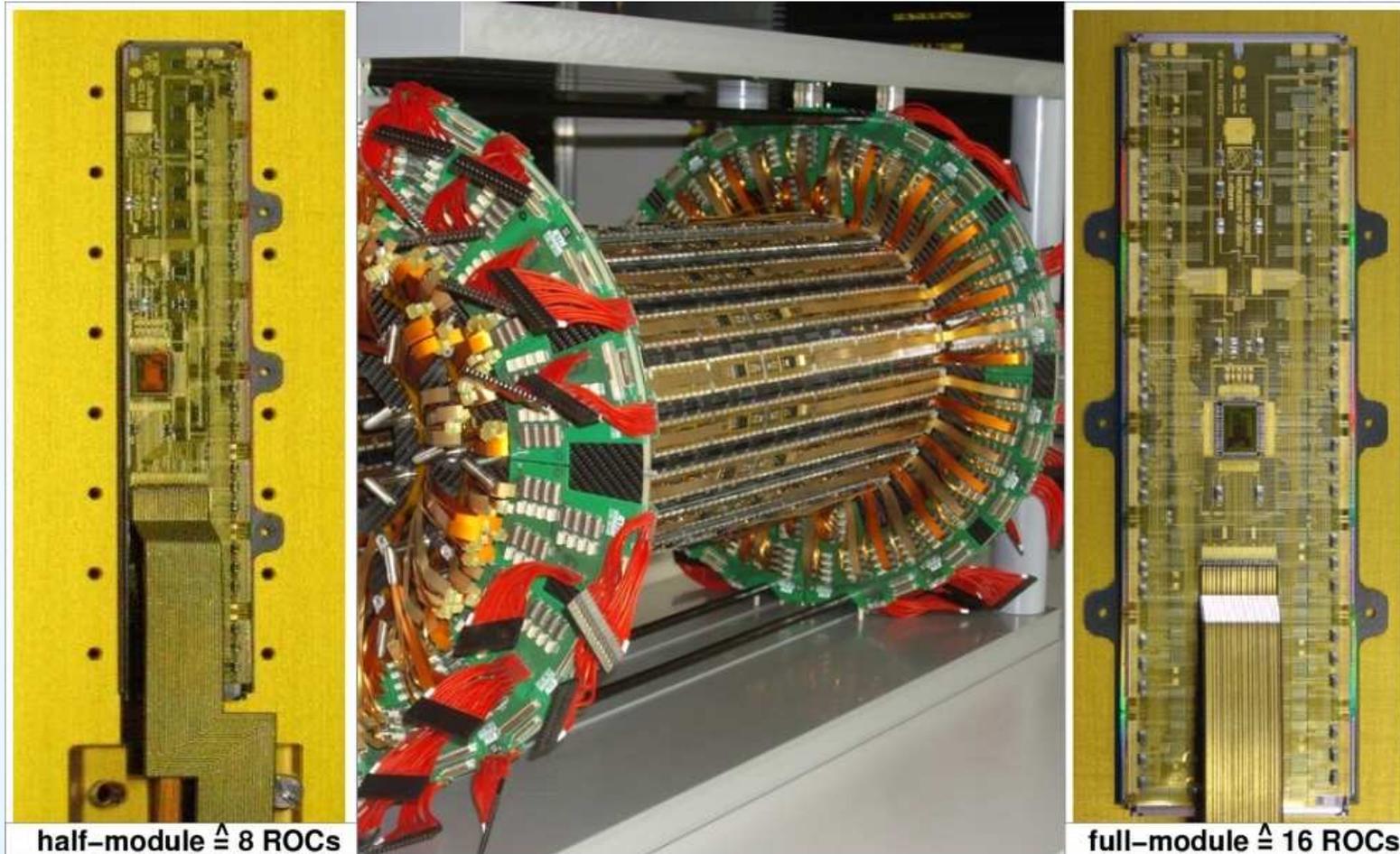


BPIX Integration: Lessons learned
2013 Pixel Replacement/Upgrade Discussion
Meeting

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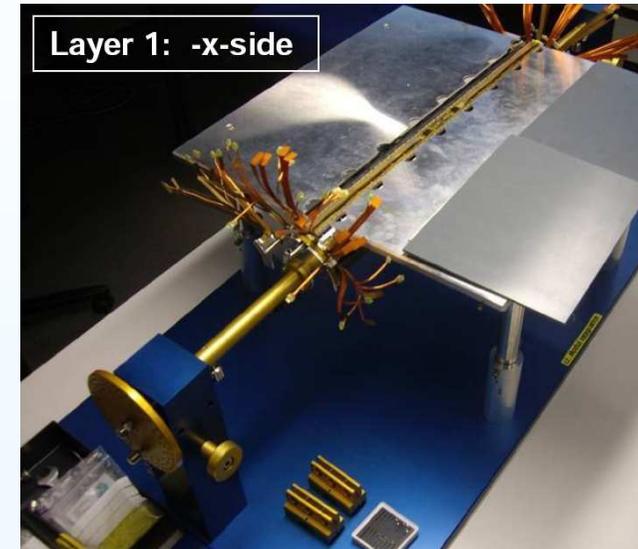
The Task



- integrate 700/100 full/half modules on 2x3 barrel shells
- verify function & connectivity through endring prints
- test HV connections

The Tools

- module mounting tools
- integration DB + web-interface:
 - draw the right module
 - cut/set right properties
 - record keeping
- testboard + Laptop for testing
- HV-connection test:
 - multimeter, torchlamp + HV-supply



 A screenshot of a web-based database interface titled "CMS Pixel Barrel Production Database". The interface includes a navigation menu at the top with options like "Modules", "Vacuums", "Power Wafers", "SOCs", "SOX-Wafers", "HDB", "HDB Back", "Spacers", "Powerable", "Bumpage", "TRN", and "TRN Back". The main content area is divided into several sections:

- modules**: A table listing various module identifiers and their properties. The table has columns for "id", "serial", "type", "lot", "date", "status", "description", "part", "material", "weight", "volume", "length", "width", "height", "mass", "density", "color", "finish", "notes", "created", "updated", "deleted", "locked", "checked", "checked_date", "checked_by", "checked_status", "checked_message", "checked_error", "checked_warning", "checked_info", "checked_debug", "checked_log", "checked_trace", "checked_alert", "checked_notification", "checked_notification_date", "checked_notification_by", "checked_notification_status", "checked_notification_message", "checked_notification_error", "checked_notification_warning", "checked_notification_info", "checked_notification_debug", "checked_notification_log", "checked_notification_trace", "checked_notification_alert", "checked_notification_notification", "checked_notification_notification_date", "checked_notification_notification_by", "checked_notification_notification_status", "checked_notification_notification_message", "checked_notification_notification_error", "checked_notification_notification_warning", "checked_notification_notification_info", "checked_notification_notification_debug", "checked_notification_notification_log", "checked_notification_notification_trace", "checked_notification_notification_alert", "checked_notification_notification_notification".
- filters**: A section for filtering the data, including fields for "id", "serial", "type", "lot", "date", "status", "description", "part", "material", "weight", "volume", "length", "width", "height", "mass", "density", "color", "finish", "notes", "created", "updated", "deleted", "locked", "checked", "checked_date", "checked_by", "checked_status", "checked_message", "checked_error", "checked_warning", "checked_info", "checked_debug", "checked_log", "checked_trace", "checked_alert", "checked_notification", "checked_notification_date", "checked_notification_by", "checked_notification_status", "checked_notification_message", "checked_notification_error", "checked_notification_warning", "checked_notification_info", "checked_notification_debug", "checked_notification_log", "checked_notification_trace", "checked_notification_alert", "checked_notification_notification".
- parameters**: A section for defining parameters, including fields for "id", "serial", "type", "lot", "date", "status", "description", "part", "material", "weight", "volume", "length", "width", "height", "mass", "density", "color", "finish", "notes", "created", "updated", "deleted", "locked", "checked", "checked_date", "checked_by", "checked_status", "checked_message", "checked_error", "checked_warning", "checked_info", "checked_debug", "checked_log", "checked_trace", "checked_alert", "checked_notification", "checked_notification_date", "checked_notification_by", "checked_notification_status", "checked_notification_message", "checked_notification_error", "checked_notification_warning", "checked_notification_info", "checked_notification_debug", "checked_notification_log", "checked_notification_trace", "checked_notification_alert", "checked_notification_notification".
- threshold**: A section for defining thresholds, including fields for "id", "serial", "type", "lot", "date", "status", "description", "part", "material", "weight", "volume", "length", "width", "height", "mass", "density", "color", "finish", "notes", "created", "updated", "deleted", "locked", "checked", "checked_date", "checked_by", "checked_status", "checked_message", "checked_error", "checked_warning", "checked_info", "checked_debug", "checked_log", "checked_trace", "checked_alert", "checked_notification", "checked_notification_date", "checked_notification_by", "checked_notification_status", "checked_notification_message", "checked_notification_error", "checked_notification_warning", "checked_notification_info", "checked_notification_debug", "checked_notification_log", "checked_notification_trace", "checked_notification_alert", "checked_notification_notification".
- steps**: A section for defining steps, including fields for "id", "serial", "type", "lot", "date", "status", "description", "part", "material", "weight", "volume", "length", "width", "height", "mass", "density", "color", "finish", "notes", "created", "updated", "deleted", "locked", "checked", "checked_date", "checked_by", "checked_status", "checked_message", "checked_error", "checked_warning", "checked_info", "checked_debug", "checked_log", "checked_trace", "checked_alert", "checked_notification", "checked_notification_date", "checked_notification_by", "checked_notification_status", "checked_notification_message", "checked_notification_error", "checked_notification_warning", "checked_notification_info", "checked_notification_debug", "checked_notification_log", "checked_notification_trace", "checked_notification_alert", "checked_notification_notification".

Integration of a Module

- draw one mounting group (4 modules) from storage *
- verify module usability (Hub id's possible & cables long enough) *
- set Hub-ID *
- put module in protective cover
- cut cables *
- prepare powercable & solder & pott new power plug
- bend & scotch cables *
- mount modules on strukture *
- connect cables to endprint

* with help of DB webinterface

...testing

- layer 1+2:
 1. test modules after mounting
 2. test through endprint after shells are combined
- layer 3:
 - test modules as group through endprint
- final testing done with supply tubes attached



...Problems???

found in first test stage(s):

- wrong Hub-ID \Rightarrow easy replacement/repair
- cables too short \Rightarrow replacement/reusing on other position possible
- (unstable) connection \Rightarrow replugging/resoldering power plug

found in system test mostly/only:

- bad HV connection undetected before/ created during final handling
- strange/no readout in test with final configuration

each of the latter caused disassembly of whole 3 layer system:

- MUCH WORK - repair not 100% efficient!

after 3 iterations decided to stay with given result

lessons learned

- try to avoid human factor in cable cutting/resoldering next time
- reduce need/number of un/plugging modules next time - individually handle-& testable layers!
- testprocedures during/before integration and in final system should exactly match to avoid system effects (1% of modules!)
- manual mounting of modules worked like a charm! - KEEP THIS!!!
- only ONE type of modules next time!
- record keeping work intensive & only possible with local production DB - KEEP!
- at least TWO integration tools/stations next time !
(reduced working peoples 'deadtime' esp. @ the end)

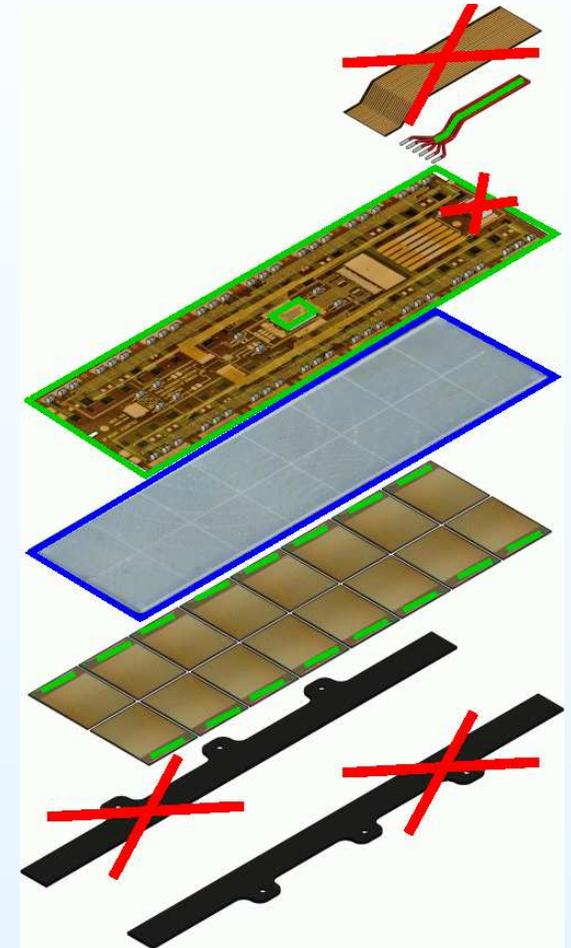
next talk...

trimm fat @ modules for 'Phase-1':

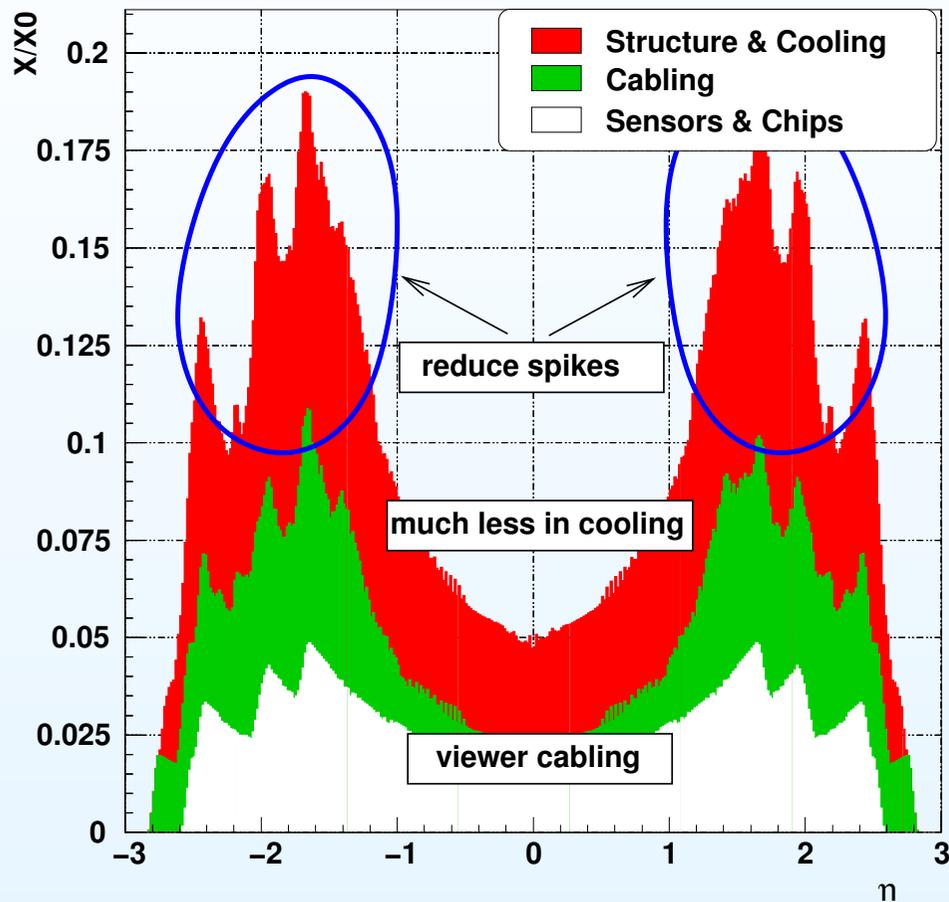
- fewer/thinner but longer cables
 - less connectors
 - move connectors/portcards out of active
 - compatible with fast digital transmission
- no/smaller HV-capacitor
- thinner ROCS ($175\mu\text{m} \Rightarrow 75\mu\text{m}$)
- no basestrips (modules glued on structure)

module production almost 'as is' - verify/develop:

- bumpbonding of thinner chips
- connection of long cables to HDI



trimm fat @ modules for 'Phase-1' - Outcome



reduction potential (incl. CO2):

- structure, cooling & cabling ~ 50%
- module: ~30%
- extra reduction in spikes:
 - connectors/portcards moved out of active
 - no cooling manifolds
- overall ~33%

phase I SCMS pixel tracker could have three layers for the material of two...