Proposals for Barrel Module Categories

1. Good

Fully completed and tested module, satisfying all specifications (mechanical and electrical).
For electrical performance, it is expected that the large majority of modules will have considerably less than the 1% bad channels of the specification.
Within **Good** are the subcategories:
1.1 Good for any barrel
1.2 Use only for barrel 5 or 6
(See separate proposal for these subcategories)

2. Pass

The module just misses satisfying one or more of the mechanical specifications. The purpose of the category is to keep modules in the *tails* of the expected mechanical distributions. The number of *Pass* modules should therefore be much less than the number of *Good* modules.
A Pass module must still fully satisfy the electrical specification.
Pass modules are agreed to be usable in ATLAS, without further discussion.
Within **Pass** are the subcategories:
2.1 Pass for any barrel
2.2 Use only for barrel 5 or 6

The limits of quantities as measured for the **Pass** category: see the attached table

3. Hold

These are modules outside one or more of the **Pass** limits. *They are stopped in production at the point they are found to be outside the limit* (ie a hybrid is not fitted if the baseboard-sensor sandwich is outside 'pass' metrology values). They are carefully stored for later assessment by the Barrel Module community.

4. Fail

Modules that could never go in ATLAS – for example broken or badly scratched detectors, gross mechanical errors, many bad channels due to bonding problems, broken ASICs that can't be replaced.

5. Rework

Modules held back for rework that might make them usable – eg replacing an ASIC, gluing on a replacement pitch adapter, re-bonding work.

6. Started

6.1 Total number of 4 wafer assemblies started
6.2 Total number of hybrids mounted

Module categories

(The values are including measurement errors)

Parameters	Good	Pass	Hold
mhx [um]	+/-30	+/-40	>+/-40.000
mhy [um]	+/-30	+/-40	>+/-40.000
msx [um]	+/-100	+/-140	>+/-140.000
msy [um]	+/-30	+/-40	>+/-40.000
sepf [um]	+/-10	+/-20	>+/-20
sepb [um]	+/-10	+/-20	>+/-20
midxf [um]	+/-10		>+/-10
midyf [um]	+/-5	+/-8	>+/-8
a1 [mrad]	+/-0.13		>+/-0.13
a2 [mrad]	+/-0.13		>+/-0.13
a3 [mrad]	+/-0.13		>+/-0.13
a4 [mrad]	+/-0.13		>+/-0.13
stereo [mrad]	+/-0.13		>+/-0.13
maxZlower [mm]	-0.2		>-0.2
maxZupper [mm]	0.2		>0.2
moduleThickness [mm]	+/-0.1		>+/-0.1
optimalMaxZerrorLower [mm]	0.05	0.07	>0.07
optimalMaxZerrorUpper [mm]	0.05	0.07	>0.07
optimalRMSZerrorLower [mm]	0.025		>0.025
optimalRMSZerrorUpper [mm]	0.025		>0.025
loCoolingFacing a [mrad]	+/-0.5		>+/-0.5
b [mrad]	+/-3	+/-5	>+/-5
loCoolingFacingConcavity [mm]	+/-0.03		>+/-0.03
capMaxThickness [mm]	6.44		>6.44

First proposals for Modules to Select for Barrels 3 and 4

1. Series (not pre-series) detectors.

2. No sign of IV 'microdischarge' up to 500V bias (in nitrogen or dry air atmosphere)

3. No history of unexplained bad IV behaviour (eg current very big on first test of module)

5. No bad visual inspection features that could relate to HV robustness (eg unusual amount of debris/marks near detector edges, messy detector-detector bonding that leaves any bonds flat near detector surface, broken bits of bond wire, etc.)

6. Thermistor temperatures are as expected for test setup and difference in their temperature is ≤1 deg C

7. Cooling facing b-angle within specification

8. Any conclusions on irradiation hardness that might be established in future