



ATLAS Note

GROUP-2024-XX

15th September 2024



Draft version 0.1

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Serial Number Definitions for HGTD Module Components

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The ATLAS Collaboration

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This document describes the definitions of the serial numbers for components that are used to build the HGTD modules, and the components that these modules connected to.

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0.1 HGTD Serial Number Convention

Unique serial numbers are used in the HGTD production database to identify the components that are used in constructing the modules of the HGTD detector. Each serial number is consisted of a 14-digit alphanumeric code. The digits in the serial number encode severel type of information. These information include the ATLAS experiment, sub-detector project, component type, vendor, production batch, and counter. Table 1 gives a description on the general convention of the HGTD module component serial number definiton.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4 or 4,5		Component type
...		
...,12,13,14		Counter

Table 1: General convention of the HGTD module component serial number definiton.

31 **0.2 Serial Number Definitions for the Components of the HGTD Modules**

32 **0.2.1 Wafer**

33 A serial number of the wafer component looks like : 20 W S0 M P BB O NNNN.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	S0	S=sensor, 0=sensor wafer
6	M	Manufacturer/Vendor: M=0 (IHEP-IME), M=1 (USTC-IME)
7	P	Production: P=0 (Pre-production), P=1 (Production)
8,9	BB	Batch number (BB=00, 01, 02, ...)
10	O	Wafer orientation (O=...???)
11,12,13,14	NNNN	Wafer number (NNNN=0001, 0002,)

Table 2: Wafer serial number definition (version from December 11th 2023).

34 **0.2.2 Sensor**

35 A serial number of the sensor component looks like : 20 W S M T BB NNNN XY. A picture of a wafer
 36 with the main sensor and partial sensor locations is shown in Figure 1.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4	S	S=sensor
5	M	Manufacturer/Vendor: M=1 (IHEP-IME Pre-production), M=2 (IHEP-IME Production), M=3 (USTC-IME Pre-production) M=4 (USTC-IME Production)
6	T	Sensor type: T=0 (main sensor), T=1 (QC-TS of main sensor), T=2 (main partial sensor), T=3 (QC-TS of main partial sensor) QC=quality control, TS=test structure
7,8	BB	Batch number (BB=00, 01, 02, ...)
9,10,11,12	NNNN	Wafer number, match to NNNN in wafer serial number
13,14	XY	Location in wafer (main sensor: XY=01-52, partial sensor: XY=61-76)

Table 3: Sensor serial number definition (version from January 8th 2024).

37 **0.2.3 ASIC**

38 A serial number of the ASIC component looks like : 20 W AS T P XXXXYYYY .

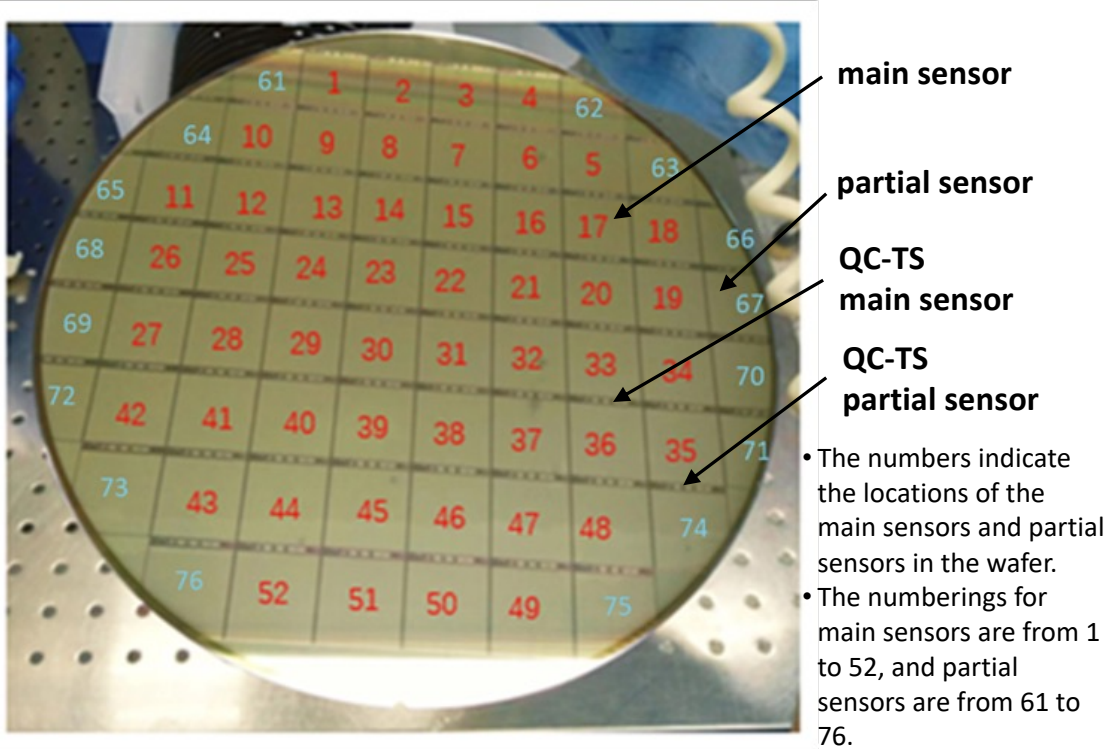


Figure 1: A wafer with the main sensor and partial sensor locations indicated.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	AS	AS=ASIC
6	T	Test site: T=1 (IHEP), T=2 (IJCLab)
7	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
8,12,13,14	XXXXYYY	Wafer_ID: Wafer_ID=Wafer_Nr*1000 + Chip_ID Chip_ID: is given by geometrical position in wafer Wafer_ID=XXXXYYY, XXXX=Wafer_Nr, YYY=Chip_ID

Table 4: ASIC serial number definition.

39 **0.2.4 Hybrid**

40 A serial number of the hybrid component looks like : 20 W HY M P NNNNNNNN .

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	HY	component: Hybrid
6	M	Manufacturer/Vendor: M=1 (IFAE), M=2 (IHEP), M=3....
7	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
8...,12,13,14	NNNNNNN	Counter (NNNNNNN=0000000,...9999999)

Table 5: Hybrid serial number definition.

41 **0.2.5 Module Flex**

42 A serial number of the module flex component looks like : 20 W MF M G P B NNNNNN .

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	MF	component: Module Flex
6	M	Manufacturer/Vendor: M=1 (IHEP)
7	G	Grounding scheme: G=A,B,C,...
8	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
9	B	Batch number (B=1,2,...9,A,B,...Z)
10,...,14	NNNNN	Counter (NNNNN=00001,...,99999)

Table 6: Module flex serial number definition.

43 **0.2.6 Glue**

44 A serial number of the glue component looks like : 20 W GL M P NNNNNNNN .

45 **0.2.7 Module**

46 A serial number of the module component looks like : 20 W MO S P B NNNNNNNN .

47 **0.2.8 Flex Tail**

48 A serial number of the flex tail component looks like : 20 W FT M B P O TT NNN .

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	GL	Component: Glue
6	M	Manufacturer/Vendor: M=...
7	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
8,...,14	NNNNNNN	Counter (NNNNNNN=0000001,...,9999999)

Table 7: Glue serial number definition.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	MO	Component: Module
6	S	Assembly site: S=1 (IFAE), S=2 (IHEP), S=3 (IJCLab), S=4 (Mainz), S=5 (MASCIR), S=6 (USTC)
7	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
8	B	Batch number (B=1,2,...9,A,B,...Z)
9,...,14	NNNNNNN	Counter (NNNNNNN=000001,...,999999)

Table 8: Module serial number definition.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	FT	Component: Flex Tail
6	M	Manufacturer/Vendor: M=G (Germany), M=C (China), M=S (Slovenia)
7	B	Batch number (B=1,2,...9,A,B,...Z)
8	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
9	O	Readout: O=R (single readout), O=F (full readout)
10,11	TT	Type: 53 types, TT=01 (30mm), ... TT=53 (700 mm)
12,13,14	NNN	Counter (NNN=001,...,999)

Table 9: Flex tail serial number definition.

49 **0.2.9 Support Unit**

50 A serial number of the support unit component looks like : 20 W SU M P S R TT NNN.

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	SU	Component: Support Unit
6	M	Manufacturer/Vendor: M=1 (China), ...
7	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
8	S	Side of HGTD disk: S=F (front), S=B (back)
9	R	Ring: R=I (inner), R=M (middle), R=O (outer)
10,11	TT	Type of SU: TT=1 to 6 or 1 to 11
12,13,14	NNN	Counter: number of a specific SU type (NNN=001,....,999)

Table 10: Support unit serial number definition.

51 **0.2.10 Detector Unit**

52 A serial number of the detector unit component looks like : 20 W DU S P S R TT NNN .

Digit	Represent	Comment
1,2	20	ATLAS experiment
3	W	HGTD sub-detector project
4,5	DU	Component: Support Unit
6	S	Sites that install modules on support unit. S=...
7	P	Production: P=0 (main production), P=1 (demonstrator), P=2 (test), P=3 (other)
8	S	Side of HGTD disk: S=F (front), S=B (back)
9	R	Ring: R=I (inner), R=M (middle), R=O (outer)
10,11	TT	Type of DU: TT=1 to 6 or 1 to 11
12,13,14	NNN	Counter: number of a specific DU type (NNN=001,....,999)

Table 11: Detector unit serial number definition.

53 **0.2.11 Peripheral Electronics Board (PEB)**

54 A serial number of the PEB component looks like : 20 W HY M P NNNNNNNN .

55 **0.2.12 VTRX**

56 A serial number of the VTRX component looks like : 20 W HY M P NNNNNNNN .

Pre-production

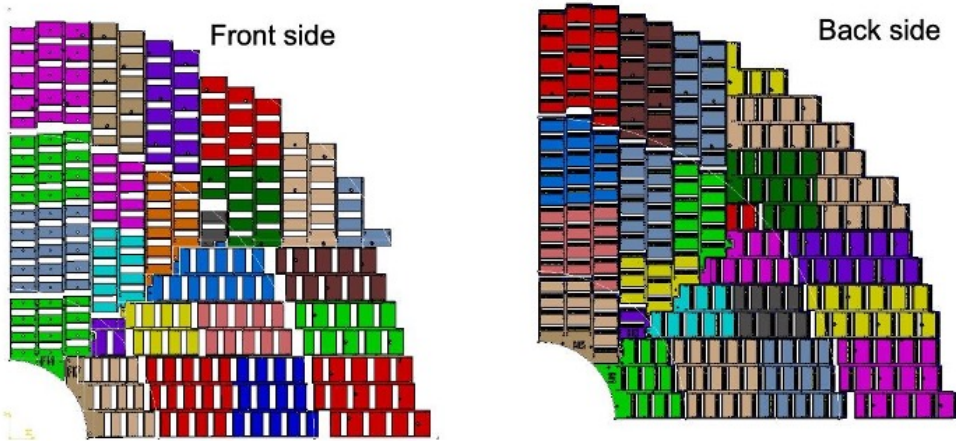


Figure 2: Front side and back side of the detector units in a HGTD quarter disk.

Table 2 Number and percentage of modules per detector unit for a quarter of the front disk

PEB	Detector Unit Type	Number of modules	Calculated percentage of modules	Rounded percentage
1F	FO01DU	15	5,97609562	6
	FM02DU	12	4,78087649	5
	FM01DU	15	5,97609562	6
	FI01DU	12	4,78087649	5
2F	FO02DU	12	4,78087649	5
	FM04DU	8	3,187251	3
	FM03DU	9	3,58565737	3,5
	FO03DU	12	4,78087649	5
	FI10DU**	3	1,19521912	1
	FM05DU	10	3,98406375	4
3F	FO04DU	11	4,38247012	4
	FO05DU	10	3,98406375	4
	FM06DU	2	0,79681275	1
	FO06DU	11	4,38247012	4
	FO07DU	5	1,99203187	2
	FO08DU	10	3,98406375	4
	FM08DU	12	4,78087649	5
2B	FO10DU	10	3,98406375	4
	FM10DU	10	3,98406375	4
	FM09DU	8	3,187251	3
	FO12DU	15	5,97609562	6
1B	FM12DU	13	5,17928287	5
	FM11DU	14	5,57768924	5,5
	FI12DU	12	4,78087649	5
Total	One quarter	251	100%	100%

3. Detector unit types

A quarter disc of a given side (front or back) includes 24 different types of detector units. The four quarters have the same types of detector units and are positioned in rotation. One side therefore requires 96 detector units.

Figure 1 Types of detector unit for a quarter of the front disk

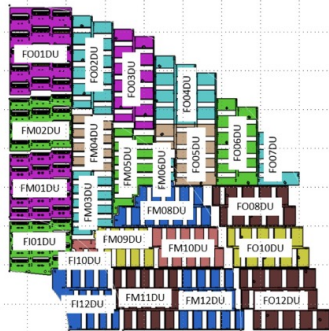


Figure 3: Types of detector unit for a quarter of the front disk.