**DB Notes: HGCAL Si Wafers & Sensors**

**The HGCAL DB consists of**

**Si Sensor Wafers**

Wafers: **Kind of Part names**

120um HD Si Sensor Wafer

200um LD Si Sensor Wafer

300um LD Si Sensor Wafer

Wafer **Attributes:** Sensor Wafer Substrate

**Attribute Names** **Values**

Wafer Substrate STD, DD, FZ thin, Epi

Wafer Polarity n, p

Wafer Class prototype, pre-series, pre-production, production

**Sensor Attributes (Sensor only):**

* Sensors inherit wafer attributes.
* Sensor P-Stop: individual, common, none

**Module & Component Geometries**

**HD (high density) HGCAL Module Geometries -**

A picture containing drawing, door, kite

Description automatically generated Chart, treemap chart

Description automatically generated A picture containing chart

Description automatically generated

HD Full (**HD Type 0**) HD Top (**HD Type 1**) HD Bottom (**HD Type 2**)

Shape, polygon

Description automatically generated Shape, polygon

Description automatically generated Shape

Description automatically generated

HD Left (**HD Type 3**) HD Right (**HD Type 4**) HD Five (**HD Type 5**)

Left(-) Right(-)

* **HD module geometries**

HD Full HD Type 0 hexagonal

HD Top HD Type 1 half-hexagon (upper)

HD Bottom HD Type 2 ChopTwo

HD Left HD Type 3 Left (-)

HD Right HD Type 4 Right (-)

HD Five HD Type 5 Five

* Define in the DB
  + 6 types of HD EM Si Modules (120um Sensor)
  + 6 types of HD HAD Si modules (120um Sensor)

**LD (low density) HGCAL Module Geometries**

A picture containing drawing, door, kite

Description automatically generated Chart, treemap chart

Description automatically generated Chart, treemap chart

Description automatically generated

**LD Full (LD Type 0) LD Top (LD Type 1) LD Bottom (LD Type 2)**

Shape, polygon

Description automatically generated Shape, polygon

Description automatically generated Shape

Description automatically generated

**LD Left (LD Type 3) LD Right (LD Type 4) LD Five (LD Type 5)**

Left Right

A close up of a logo

Description automatically generated

**LD Three (LD Type 6) LD Full+Three (LD Type 7) - multiple versions to be defined**

* **LD module geometries**

LD Full LD Type 0 hexagonal

LD Top LD Type 1 half-hexagon (upper)

LD Bottom LD Type 2 half-hexagon (lower)

LD Left LD Type 3 Left (half)

LD Right LD Type 4 Right (half)

LD Five LD Type 5 Five

LD Three LD Type 6 valid **only for Si sensors**

LD (Full+Three) LD Type 7 valid for Module, Protomodule, PCB,

& Baseplate

* Define in the DB
  + 7 types of LD EM Si Modules (120um Sensor)
  + 7 types of LD HAD Si modules (120um Sensor)

**DB Definitions for Si Sensors – HD & LD**

**DB: Kind of Part Names – Si Sensor Wafers**

**Kind of part name** **- HD & LD Si Wafers**

HD 120um Si Sensor Wafer

LD 200um Si Sensor Wafer

LD 300um Si Sensor Wafer

* Label Colours
  + **Blue: HD & LD geometries identical**
  + **Red: HD & LD geometries different**

**>> DB Relationship:**

Parent: HD 120um Si Sensor Wafer

Children: HD 120um Si Sensors defined below

+ six 120um HD Halfmoons

**DB: Kind of Part Names – HD 120um Si Sensors**

**Kind of part name** **Geometry Description LPNAME**

120um Si Sensor HD Full Full **120um Sensor HD Type 0**

120um Si Sensor HD Top Top(half) **120um Sensor HD Type 1**

120um Si Sensor HD Bottom Bottom(ChopTwo) **120um Sensor HD Type 2**

120um Si Sensor HD Left Left(-) **120um Sensor HD Type 3**

120um Si Sensor HD Right Right(-) **120um Sensor HD Type 4**

120um Si Sensor HD Five Five **120um Sensor HD Type 5**

120um Si Sensor HD Halfmoon-N hlfmoon-Top

120um Si Sensor HD Halfmoon-S hlfmoon-Bot

120um Si Sensor HD Halfmoon-NW hlfmoon-Tleft

120um Si Sensor HD Halfmoon-SW hlfmoon-Bleft

120um Si Sensor HD Halfmoon-SE hlfmoon-Bright

120um Si Sensor HD Halfmoon-NE hlfmoon-Tright

**Kind of Part Names – LD 200um Sensors**

**>> DB Relationship:**

Parent: LD 200um Si Sensor Wafer

Children: LD 200um Si Sensors defined below

+ Six 200um HD Halfmoons

**Kind of part name Geometry Description LPNAME**

200um Si Sensor LD Full Full **200um Sensor LD Type 0**

200um Si Sensor LD Top Top(half) **200um Sensor LD Type 1**

200um Si Sensor LD Bottom Bottom(half) **200um Sensor LD Type 2**

200um Si Sensor LD Left Left(half) **200um Sensor LD Type 3**

200um Si Sensor LD Right Right(half) **200um Sensor LD Type 4**

200um Si Sensor LD Five Five **200um Sensor LD Type 5**

200um Si Sensor LD Three Three **200um Sensor LD Type 6**

200um Si Sensor LD Halfmoon-N halfmoon-Top

200um Si Sensor LD Halfmoon-S halfmoon-Bot

200um Si Sensor LD Halfmoon-NW halfmoon-Tleft

200um Si Sensor LD Halfmoon-SW halfmoon-Bleft

200um Si Sensor LD Halfmoon-SE halfmoon-Bright

200um Si Sensor LD Halfmoon-NE halfmoon-Tright

**Kind of Part Names – LD 300um Sensors**

**>> DB Relationship:**

Parent: LD 300um Si Sensor Wafer

Children: LD 300um Si Sensors defined below

+ Six 300um LD Si Halfmoons

**Kind of part name Geometry Description LPNAME**

300um Si Sensor LD Full Full **300um Sensor LD Type 0**

300um Si Sensor LD Top Top(half) **300um Sensor LD Type 1**

300um Si Sensor LD Bottom Bottom(half) **300um Sensor LD Type 2**

300um Si Sensor LD Left Left(half) **300um Sensor LD Type 3**

300um Si Sensor LD Right Right(half) **300um Sensor LD Type 4**

300um Si Sensor LD Five Five **300um Sensor LD Type 5**

300um Si Sensor LD Three Three **300um Sensor LD Type 6**

300um Si Sensor LD Halfmoon-N halfmoon-Top

300um Si Sensor LD Halfmoon-S halfmoon-Bot

300um Si Sensor LD Halfmoon-NW halfmoon-Tleft

300um Si Sensor LD Halfmoon-SW halfmoon-Bleft

300um Si Sensor LD Halfmoon-SE halfmoon-Bright

300um Si Sensor LD Halfmoon-NE halfmoon-Tright

**Tables to Store Si Sensor Data in DB**

Description of information listed below

* **Kind of condition name:** descriptive name of data type
* **Table:** name of table for the data

**Kind of condition: HGC CERN Sensor IV**

**Table: HD**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_CERN\_SENSOR\_IV**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_NANOAMP FLOAT(126) NOT NULL,**

**ERR\_CURNT\_NANOAMP FLOAT(126),**

**TOT\_CURNT\_NANOAMP FLOAT(126),**

**ACTUAL\_VOLTS FLOAT(126),**

**TIME\_SECS FLOAT(126),**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**CELL\_NR NUMBER(10)**

**)**

**Kind of condition: HGC CERN Sensor IV Summary**

**Table: HGC\_CERN\_SENSOR\_IV\_SUMRY**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_CERN\_SENSOR\_IV\_SUMRY**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**TOT\_CURNT\_NANOAMP\_600V FLOAT(126),**

**TOT\_CURNT\_NANOAMP\_800V FLOAT(126),**

**NUM\_BAD\_CELLS NUMBER(10),**

**PASS CHAR(1 BYTE),**

**GRADE CHAR(10 BYTE),**

**NUM\_BAD\_ADJ\_CELLS NUMBER(10)**

**)**

**Kind of condition: HGC CERN Sensor CV**

**Table: HGC\_CERN\_SENSOR\_CV**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_CERN\_SENSOR\_CV**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CPCTNCE\_PFRD FLOAT(126) NOT NULL,**

**ERR\_CPCTNC\_PFRD FLOAT(126),**

**TOT\_CURNT\_NANOAMP FLOAT(126),**

**ACTUAL\_VOLTS FLOAT(126),**

**ORG\_CPCTNC\_PFRD FLOAT(126),**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**IMP\_OHM FLOAT(126),**

**PHS\_RAD FLOAT(126),**

**TIME\_SECS FLOAT(126),**

**CELL\_NR NUMBER(10)**

**)**

**Kind of condition: HGC CERN Sensor CV Summary**

**Table: HGC\_CERN\_SENSOR\_CV\_SUMRY**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_CERN\_SENSOR\_CV\_SUMRY**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**SNSR\_THCKNESS FLOAT(126),**

**DEPL\_VOLTS FLOAT(126),**

**MAX\_DEPL\_VOLTS FLOAT(126),**

**DEPL\_UNIF\_VOLTS FLOAT(126),**

**SNSR\_THKNES\_UNIF FLOAT(126),**

**PASS CHAR(1 BYTE),**

**GRADE CHAR(10 BYTE)**

**)**

**Kind of condition: HGC PQC Summary**

**Table: HGC\_PQC\_SUMRY**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_SUMRY**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VFLATBAND\_VOLT FLOAT(126),**

**VTHRESHOLD\_VOLT FLOAT(126),**

**ISURF\_AMP FLOAT(126),**

**RSHEET\_N\_OHMSQ FLOAT(126),**

**RSHEET\_P\_OHMSQ FLOAT(126),**

**RSHEET\_PSTOP\_OHMSQ FLOAT(126),**

**VBD\_DIODE\_VOLT FLOAT(126),**

**VBD\_OXIDE\_VOLT FLOAT(126)**

**)**

**Kind of condition: HGC PQC Diode IV**

**Table: HGC\_PQC\_DIODE\_IV**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_DIODE\_IV**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_NANOAMP FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Diode CV**

**Table: HGC\_PQC\_DIODE\_CV**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_DIODE\_CV**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CPCTNCE\_FRD FLOAT(126) NOT NULL,**

**RESISTANCE\_OHM FLOAT(126),**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Metal Oxide Semiconductor**

**Table: HGC\_PQC\_MOS**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_MOS**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CPCTNCE\_FRD FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Field Effect Transistor**

**Table: HGC\_PQC\_FET**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_FET**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_AMP FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Gate Controlled Diode**

**Table: HGC\_PQC\_GCD**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_GCD**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_AMP FLOAT(126) NOT NULL,**

**BIAS\_VOLT FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Van Der Pauw N**

**HGC PQC Van Der Pauw PEdge**

**HGC PQC Van Der Pauw PStop**

**Table: HGC\_PQC\_VAN\_DER\_PAUW**

**Note: This table hosts 3 different types of data**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_VAN\_DER\_PAUW**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_AMP FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Linewidth N**

**HGC PQC Linewidth PEdge**

**HGC PQC Linewidth PStop**

**Table: HGC\_PQC\_LINEWIDTH**

**Note: This table hosts 3 different types of data**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_LINEWIDTH**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_AMP FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC PQC Oxide Breakdown**

**Table: HGC\_PQC\_OXIDE\_BREAKDOWN**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_PQC\_OXIDE\_BREAKDOWN**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**VOLTS FLOAT(126) NOT NULL,**

**CURNT\_AMP FLOAT(126) NOT NULL,**

**TEMP\_DEGC FLOAT(126),**

**HUMIDITY\_PRCNT FLOAT(126),**

**TIME\_SECS FLOAT(126)**

**)**

**Kind of condition: HGC Sensor Irradiation Summary Data**

**Table: HGC\_SENSOR\_IRRADIATION\_SUMRY**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_SENSOR\_IRRADIATION\_SUMRY**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**DOPING VARCHAR2(32 BYTE),**

**IRRAD\_FACILITY VARCHAR2(126 BYTE),**

**FLUNCE\_TARGET\_NEQV FLOAT(126),**

**FLUNCE\_NOMNL\_NEQV FLOAT(126),**

**ERR\_FLUNCE\_NOMNL FLOAT(126),**

**FULL\_DPLTN\_VOLT FLOAT(126),**

**LKCURNT\_DNSTY\_MA\_CM3 FLOAT(126),**

**ERR\_LKCURNT\_DNSTY FLOAT(126),**

**ANNEALED VARCHAR2(16 BYTE),**

**FLUNCE\_XTRACTD\_NEQV FLOAT(126),**

**ERR\_FLUNCE\_XTRACTD FLOAT(126)**

**)**

**Kind of condition: HGCAL Sensor Defect Checks**

**Table: HGC\_SENSOR\_DEFECT\_CHECKS**

**CREATE TABLE CMS\_HGC\_HGCAL\_COND.HGC\_SENSOR\_DEFECT\_CHKS**

**(**

**RECORD\_ID NUMBER(38) NOT NULL,**

**CONDITION\_DATA\_SET\_ID NUMBER(38) NOT NULL,**

**SCRATCH\_FRNT VARCHAR2(8 BYTE),**

**SCRATCH\_BCK VARCHAR2(8 BYTE),**

**RESIDL\_ON\_BNDPADS VARCHAR2(8 BYTE),**

**LOW\_IV\_BRKDWN\_VLTS VARCHAR2(8 BYTE),**

**HIGH\_DRKCURNT VARCHAR2(8 BYTE),**

**UNSTBL\_DRKCURNT VARCHAR2(8 BYTE),**

**SHORTD\_CHANS VARCHAR2(8 BYTE)**

**)**

**Instructions to Load Data in DB**

Copy your XML files to the spool area of the HGCAL DB loader to load the data in the DB

**Command to Load Data in HGCAL INT2R database**

scp <file> xml [joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/int2r](mailto:joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/int2r)

**Command to Load Data in HGCAL CMSR database**

scp <file> xml [joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/cmsr](mailto:joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/cmsr)

1. Copy xml or zip file to spool area, e.g.

Development DB – int2r

scp <file> xml [joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/int2r](mailto:joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/int2r)

Production DB – cmsr

scp <file> xml [joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/int2r](mailto:joshi@dbloader-hgcal.cern.ch:/home/dbspool/spool/hgcal/int2r)

The DB loader process will pick up the files, read the data contained, and write into the DB.

1. Check the state of your job

View the contents of the file */home/dbspool/state/hgcal/int2r/filename.xml*

0 🡪 success

Not 0 🡪 error

No such file 🡪 pending

1. Check the log file */home/dbspool/logs/hgcal/int2r/filename.xml* for log information.