	Definitions of the barrel modules and link with the SCT database - Internal to the barrel community		
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(DRAFT)

Definitions of the barrel modules and link with the SCT database - Internal to the barrel community

Abstract

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Distribution List

History of Changes

Rev. No.	*Date*	*Pages*	*Description of changes*
A	13/12/2002	All	First draft
B	8/1/2003	4	Section 2.3, adding a description of the GELPACK route
C	23/1/2003	5	Section 3.1, clarified metrology data sections to associate to bmSB and bmMODULE items, and clarified ZPROFILEdata and ZPROFILErawData
			Section 3.3, clarified to store “measured” values in the SCTDB database
D	31/1/2003	6	Comment on dropping the GELPACK assembly-disassembly method
E	16/2/2003	4	Clarify the unit of table attributes in bmSurveyXY to be mm while that in the rawdata is um
		6	

1. Introduction

A database was established for the objects being and to be used in the SCT. The database is called "SCT database" [1]. The data of the silicon microstrip sensors are stored and utilised successfully [2][3]. The highest object in the barrel modules is the module that is made of several lower-level objects, such as sensors, baseboard (BB), and hybrids with ASICs (ASIC-Hybrid).

The objects that are stored in the database shall have barcode labels. There is, however, difficulty to put several barcode labels in a module because (1) there is not enough space to put several labels and (2) multiple labels will confuse the operator, in testing, which barcode to be used. Because of this difficulty, the barrel module community has chosen a scheme for identifying the objects.

Assembly and metrology data are stored locally in the assembly sites in the form of text file or of an EXCEL file [4][5]. The database needs definition of data files for these data to be stored in the database. The DAQ data and the data files are described in a separate document [6].

2. Database items definition

2.1 Items definition

A barrel module is made of four silicon microstrip sensors, a baseboard, 12 ASICs, and a wrap-around hybrid (with passive components), together with other small pieces. In the SCT database, it is practical to define only those macro objects that are handled by other users. Small pieces relevant only in the manufacturers can be stored in the data of the macro objects. The macro objects of a barrel module are

(1) Silicon microstrip sensors (bmSiDetectorOut)

(2) A baseboard with BeO facings (bmBB)

(3) ASICs (ABCD3)

(4) PC-hybrid (bmHPC)

These macro objects are assembled into upper level macro objects:

(1) Sensor-baseboard sandwich (bmSB) made of four sensors (bmSiDetectorOut) and a baseboard (bmBB); four sensors are glued on to a baseboard

(2) ASIC-hybrid (bmHASIC) made of 12 ASICs (ABCD3) and a PC-hybrid (bmHPC); 12 ASICs are glued with electrically conductive epoxy and wire-bonded on a PC-hybrid

(3) Module (bmMODULE) made of a sensor-baseboard sandwich (bmSB) and an ASIC-hybrid (bmHASIC); an ASIC-hybrid is glued on the BeO facings of the sensor-baseboard sandwich

The items definition and the assembly chain of the items are shown in Figure 1.

2.2 Database serial numbers definition

The barcode labels on the objects must be understood correctly in the sites and the persons responsible since the serial numbers on the labels are the ones for the “final” assembly items of the objects. For example, the barcode label on the facing of the baseboard is the serial number of the “sensor-baseboard” sandwich. The sandwich is the final object of the assembly chain associated with that number. The “sensor-baseboard” sandwich is to be assembled into the “module” for which the serial number is the one on the pigtail of the hybrid. The same caution must be applied to the sites in assembling the PC- and ASIC-hybrids.

In addition, the barrel modules will use a common profile of the upper and lower surfaces of the modules, or multiple of profiles for number of ranges of the modules. A common profile is a mapping of (X, Y, Z) points

of the surfaces averaged over number of modules which data are obtained in the Out-of-Plane survey.

Internal to the barrel modules, we propose to assign the following systematic rule for the serial numbers of the items for the last free 7 digits (yyyyyyy) of the 14 digits of the atlas id number, 2022xxxyyyyyyy, in the barcode of the object:

(1) Database internal Sensor-Baseboard sandwich: yyyyyyy = yyyyyyy (as in the barcode in the facing, 2022xxxyyyyyyy)

(2) Database internal baseboard: 8yyyyyy = 8000000 + last 6 digits of yyyyyyy

(3) Database internal Module: yyyyyyy = yyyyyyy (as in the barcode in the pigtail of hybrid, 2022xxxyyyyyyy)

(4) Database internal ASIC-hybrid: 8yyyyyy = 8000000 + last 6 digits of yyyyyyy

(5) Database internal PC-hybrid: 7yyyyyy = 7000000 + last 6 digits of yyyyyyy

An example of the systematic way of serial numbers is shown in Figure 1. In order to clarify the serial numbers are "database internal", those "database internal" serial numbers are enclosed with parentheses "( )".

When handling the baseboards (BB), sensor-baseboard sandwiches (SB), PC-hybrids (PH), ASIC-hybrids (AH), and modules (Module), it is recommended to associate the acronyms (BB, SB, PH, AH, M (or bb, sb, ph, ah, m) together with the barcode numbers. For example, a baseboard can be called as 20220480110001BB (which, in the database, will be identified as 20220488110001, according to the systematic rule in the above.)

Similarly, data have been put into the datasheets (excel files) with the barcode serial number in the object, together with the "event type" which is a combination of "item" (and "test type" if needed) which must be selected from pre-defined choices (in the excel files). There are or will be datasheets of assemblies, tests, shipments, etc.

It is a plan to provide the barrel module community an interface program for uploading the datasheets. The program will identify the item with the barcode serial number on the object and the associated object type (already in the datasheets and/or confirming the operator for the object type), deduce the database internal serial number of the item, and interface to the database default uploading programs. One can upload the items by using the database default uploading programs manually as long as the database internal serial number rule is followed.

2.3 ASIC identification

{The ASIC identifying scheme has been implemented in the database [1]. The ASICs picked up from a wafer are packed into a GELPACK at an ASIC packing site, and then the ASICs are picked from the GELPACK and stuffed into a hybrid at a ASIC-hybrid assembly site. In the database, the ASIC-packing site makes "assembly" of the GELPACK information into the database. The ASIC-hybrid assembly site makes "disassembly" of the GELPACK and "assembly" of the ASIC hybrid. Through this chain, the location of the ASICs in the wafer is linked with the database serial number of the ASIC. } (This method is dropped in the database uploading as of 16/2/2003 since the "disassembly" of GELPACK is done chip-by-chip manually, through a web interface program, and the implementation of disassembly in batch is not foreseen.)

The assembly of ASIC-hybrids, however, has been started before the database serial number of the ASIC has been assigned for the ASICs and following the above database identification route in some assembly sites. Those ASICs are identified, in the ASIC packing and the ASIC-hybrid assembly sites, according to the location of the ASIC in a wafer, as

"Test site"-"Process lot number"-"Wafer number"-"Chip site sequence number in the wafer",

E.g., SCIPP-Z40800-W01-1.

The above convention is to name the chip sites sequentially in a wafer. There is another convention for naming the chip sites in a wafer: “XY coordinates”. The definition of the correspondence between the "sequence number" and the "XY coordinates" is tabulated in Table 1. There may be cases that the “Test site” is dropped from the ASIC identification.

The uploading interface program will check (or will be instructed) whether the GELPACK assembly data exists or to translate the location of the ASICs in the datasheet to the database serial number of the ASIC (by querying the SCT DB, e.g.) and upload the ASIC-hybrid assembly data. Once the GELPACK assemblies exit (for the ASICs), the program will follow the route of disassembling the GELPACKs and assembling ASIC-hybrids (of the ASICs).

3. Definition of Data Files

3.1 Data sections definition

The objects are first defined by the data section %Item. When they are assembled from lower-level objects, they are further defined by the data section %Assembly. The data (or the content of datasheets) associated with the objects are stored in the "%Test_Rawdata" section of the data sections following the %NEWTEST,

%bmBBdata, %bmSBdata, %bmHPCdata, %bmHASICdata, %bmMODULEdata

for the baseboard (bmBB), Sensor-Baseboard sandwich (bmSB), PC-Hybrid (bmHPC), ASIC-Hybrid (bmHASIC), and Module (bmMODULE) items, respectively.

The measurement data such as of metrology are stored in the data sections following the %NEWTEST,

%bmSurveyXY, and %bmSurveyZ

for the survey "In-plane" and the survey "Out-of-plane", respectively. The %bmSurveyXY and %bmSurveyZ sections have database "table attributes" and are to appear in both bmSB and bmMODULE items as these metrologies are made for both.

All id's of the modules being used to derive a "Common profile" are written in the %bmZPROFILEdata section of the FIRST (and only in the FIRST) module (bmMODULE) item. The common profile raw data is stored in the "%Test_Rawdata" section of the %bmZPROFILEdata.

3.2 EVENT definition

The same types of measurements, e.g., %bmSurveyXY, will be carried out after various conditions, such as after assembly, thermal cycling, long-term test, etc. [7]. In order to identify the measurements, an attribute, EVENT, is associated in the table definitions of %bmSurveyXY and %bmSurveyZ. The character strings of EVENT are defined to be,

IN: measurement after assembly

TC: measurement after thermal cycling test

LT: measurement after long-term test

LTL: measurement after long-term test at cold temperature (hybrid temp. = 0 +/- 3 C)

IRR: measurement after irradiation

The character strings will be expanded as necessity arises.

3.3 Data file formats

Complete definitions of the module data file formats are given in an accompanying document, the EXCEL file,

ModuleDBdataAttributes.xls.

The datasheets of the barrel modules are to be stored in the rawdata sections of relevant item's test tables. The tables, bmSurveyXY, bmSurveyZ, and a few others, have table attributes. Although there are number of duplicated information in the table and in the rawdata in some items, storing all information in the rawdata is simpler and it allows possibility to use the programs, that handle the content of datasheets, to the rawdata in the database with the minimum modification.

The convention of the table attributes of metrology is to store "measured" values in the SCTDB database. The datasheet of SurveyXY_idAction2.4.1.x.ls is storing "deviations" in the parameters. Note, however, in the Z survey, the datasheet of SurveyZ_idAction2.4.1.xls is storing "measured" values. The principle of the datasheets is to show "deviations" for straightforward understanding. The fact that most of the design values of the XY parameters are non-zero's while those of Z parameters are zero's leads to storing the deviations in the XY while the measured values in the Z datasheet. In order to store the consistent data into the SCTDB database, the upload interface program translates the "deviations" in the datasheet of the SurveyXY_idAction2.4.1.xls to the "measured" values by adding the "deviations" to the "design" values of the parameters.

In the bmSurveyXY table, the attributes are expressed in the unit of milli-meter [mm], while the corresponding parameters in the rawdata are expressed in micro-meter [um]. This is to make the table attributes of the bmSurveyXY to be consistent with what is defined in the SCTDB already. The upload interface program translates the units automatically.

4. References

[1] D. Ferrere et al., SCT database, ATLAS note ATL-INDET-2002-015, http://melb.unige.ch/phyprdwww/sctprd/welcome.html

[2] Y. Unno et al., Barcode and database entry of the series production of silicon microstrip detectors

[3] Data file format: http://dpnc.unige.ch/atlas/atlaspage/db/doc/mfr_upload/specifications.html

[4] Assembly sheets: http://jsdhp1.kek.jp/~unno/SCTSGmod/production/assemblySheets3.4.1.xls

[5] Survey sheets: XY: http://jsdhp1.kek.jp/~unno/SCTSGmod/production/surveyXY_idAction2.4.1.xls, Z: http://jsdhp1.kek.jp/~unno/SCTSGmod/production/surveyZ_idAction2.4.1.xls

[6] P.W.Phillips et al., Data structure of the electrical measurement of the modules

[7] SCT Barrel Module FDR document, "SCT Barrel Module: Module QA", SCT-BM-FDR-7

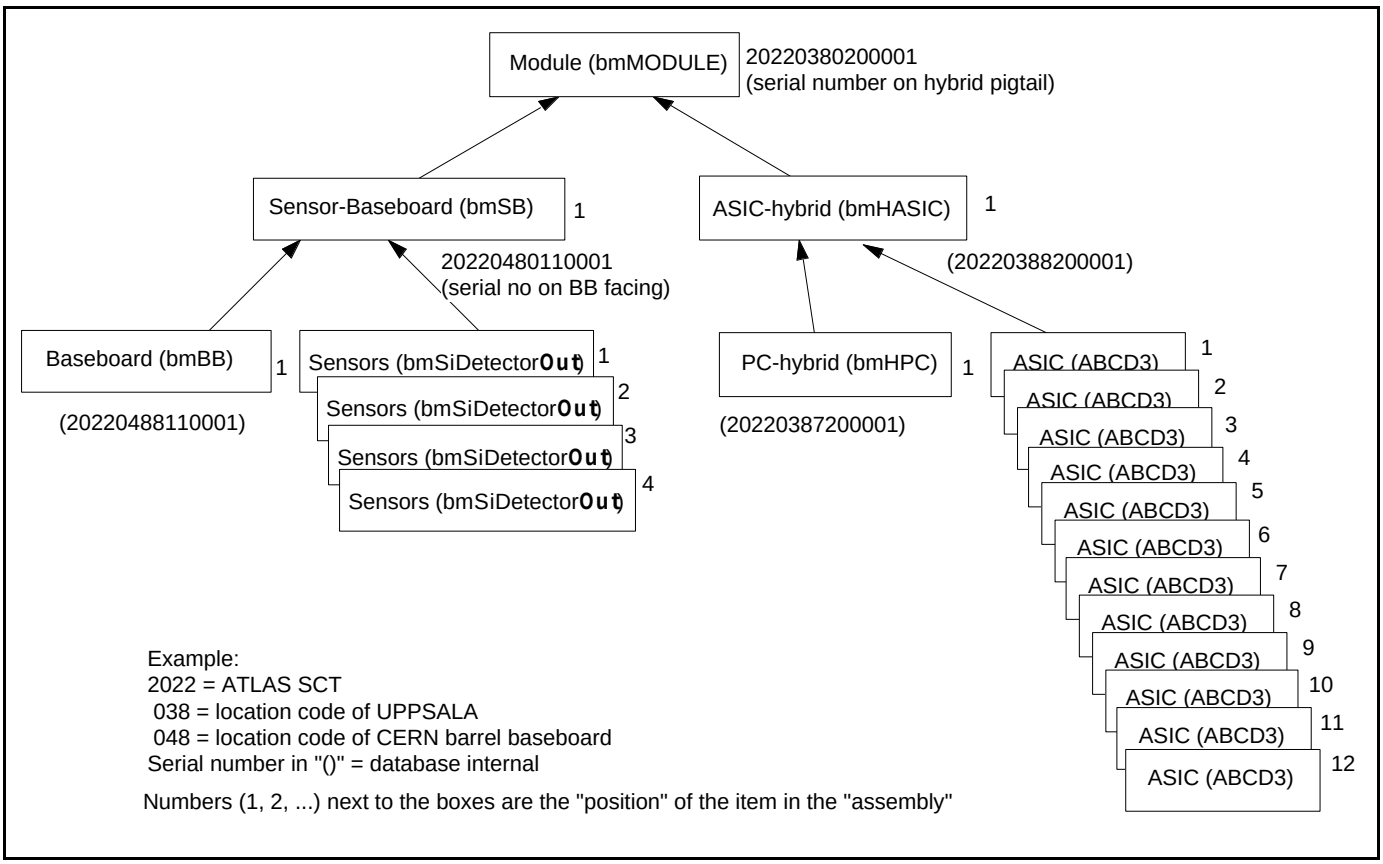

Figure 1 Definition of "Items" in the module part of the SCT database. The arrows show the "Assembly" of the barrel modules. The serial numbers of the sensors and ASICs are defined separately

Table 1 Correspondence of the ASIC chip site "sequence numbers" and the "XY coordinates"

Sequence	Xn-Ym	Sequence	Xn-Ym	Sequence	Xn-Ym	Sequence	Xn-Ym
1	X07-Y00	65	X06-Y06	129	X07-Y10	193	X08-Y14
2	X08-Y00	66	X07-Y06	130	X08-Y10	194	X09-Y14
3	X09-Y00	67	X08-Y06	131	X09-Y10	195	X10-Y14
4	X10-Y00	68	X09-Y06	132	X10-Y10	196	X11-Y14
5	X05-Y01	69	X10-Y06	133	X11-Y10	197	X12-Y14
6	X06-Y01	70	X11-Y06	134	X12-Y10	198	X13-Y14
7	X07-Y01	71	X12-Y06	135	X13-Y10	199	X14-Y14
8	X08-Y01	72	X13-Y06	136	X14-Y10	200	X15-Y14
9	X09-Y01	73	X14-Y06	137	X15-Y10	201	X02-Y15
10	X10-Y01	74	X15-Y06	138	X16-Y10	202	X03-Y15
11	X11-Y01	75	X01-Y07	139	X01-Y11	203	X04-Y15
12	X12-Y01	76	X02-Y07	140	X02-Y11	204	X05-Y15
13	X04-Y02	77	X03-Y07	141	X03-Y11	205	X06-Y15
14	X05-Y02	78	X04-Y07	142	X04-Y11	206	X07-Y15
15	X06-Y02	79	X05-Y07	143	X05-Y11	207	X08-Y15
16	X07-Y02	80	X06-Y07	144	X06-Y11	208	X09-Y15
17	X08-Y02	81	X07-Y07	145	X07-Y11	209	X10-Y15
18	X09-Y02	82	X08-Y07	146	X08-Y11	210	X11-Y15
19	X10-Y02	83	X09-Y07	147	X09-Y11	211	X12-Y15
20	X11-Y02	84	X10-Y07	148	X10-Y11	212	X13-Y15
21	X12-Y02	85	X11-Y07	149	X11-Y11	213	X14-Y15
22	X13-Y02	86	X12-Y07	150	X12-Y11	214	X15-Y15
23	X03-Y03	87	X13-Y07	151	X13-Y11	215	X03-Y16
24	X04-Y03	88	X14-Y07	152	X14-Y11	216	X04-Y16
25	X05-Y03	89	X15-Y07	153	X15-Y11	217	X05-Y16
26	X06-Y03	90	X16-Y07	154	X16-Y11	218	X06-Y16
27	X07-Y03	91	X01-Y08	155	X01-Y12	219	X07-Y16
28	X08-Y03	92	X02-Y08	156	X02-Y12	220	X08-Y16
29	X09-Y03	93	X03-Y08	157	X03-Y12	221	X09-Y16
30	X10-Y03	94	X04-Y08	158	X04-Y12	222	X10-Y16
31	X11-Y03	95	X05-Y08	159	X05-Y12	223	X11-Y16
32	X12-Y03	96	X06-Y08	160	X06-Y12	224	X12-Y16
33	X13-Y03	97	X07-Y08	161	X07-Y12	225	X13-Y16
34	X14-Y03	98	X08-Y08	162	X08-Y12	226	X14-Y16
35	X03-Y04	99	X09-Y08	163	X09-Y12	227	X03-Y17
36	X04-Y04	100	X10-Y08	164	X10-Y12	228	X04-Y17
37	X05-Y04	101	X11-Y08	165	X11-Y12	229	X05-Y17
38	X06-Y04	102	X12-Y08	166	X12-Y12	230	X06-Y17
39	X07-Y04	103	X13-Y08	167	X13-Y12	231	X07-Y17
40	X08-Y04	104	X14-Y08	168	X14-Y12	232	X08-Y17
41	X09-Y04	105	X15-Y08	169	X15-Y12	233	X09-Y17
42	X10-Y04	106	X16-Y08	170	X16-Y12	234	X10-Y17
43	X11-Y04	107	X01-Y09	171	X01-Y13	235	X11-Y17
44	X12-Y04	108	X02-Y09	172	X02-Y13	236	X12-Y17
45	X13-Y04	109	X03-Y09	173	X03-Y13	237	X13-Y17
46	X14-Y04	110	X04-Y09	174	X04-Y13	238	X14-Y17
47	X02-Y05	111	X05-Y09	175	X05-Y13	239	X04-Y18
48	X03-Y05	112	X06-Y09	176	X06-Y13	240	X05-Y18
49	X04-Y05	113	X07-Y09	177	X07-Y13	241	X06-Y18
50	X05-Y05	114	X08-Y09	178	X08-Y13	242	X07-Y18
51	X06-Y05	115	X09-Y09	179	X09-Y13	243	X08-Y18
52	X07-Y05	116	X10-Y09	180	X10-Y13	244	X09-Y18
53	X08-Y05	117	X11-Y09	181	X11-Y13	245	X10-Y18
54	X09-Y05	118	X12-Y09	182	X12-Y13	246	X11-Y18
55	X10-Y05	119	X13-Y09	183	X13-Y13	247	X12-Y18
56	X11-Y05	120	X14-Y09	184	X14-Y13	248	X13-Y18
57	X12-Y05	121	X15-Y09	185	X15-Y13	249	X05-Y19
58	X13-Y05	122	X16-Y09	186	X16-Y13	250	X06-Y19
59	X14-Y05	123	X01-Y10	187	X02-Y14	251	X07-Y19
60	X15-Y05	124	X02-Y10	188	X03-Y14	252	X08-Y19
61	X02-Y06	125	X03-Y10	189	X04-Y14	253	X09-Y19
62	X03-Y06	126	X04-Y10	190	X05-Y14	254	X10-Y19
63	X04-Y06	127	X05-Y10	191	X06-Y14	255	X11-Y19
64	X05-Y06	128	X06-Y10	192	X07-Y14	256	X12-Y19

FILE FORMAT:

%Item		
Serno	<tab>	<20221231234567>
ctype	<tab>	bmSB
EDate	<tab>	<DD/MM/YYYY>
ASSM	<tab>	<YES/NO>
PASS	<tab>	<YES/NO>
Initls	<tab>	*
LocnName	<tab>	*
Mfr	<tab>	*
MSerno	<tab>	<string>
RDate	<tab>	<DD/MM/YYYY>
#		
%Assembly		
ASSEMBLY ITEM	<tab>	<20221231234567>
# CompSerNo	Position	Date (DD/MM/YYYY)
<BMBB serial number>	1	<DD/MM/YYYY>
<BMDetector serial number>	1	<DD/MM/YYYY>
<BMDetector serial number>	2	<DD/MM/YYYY>
<BMDetector serial number>	3	<DD/MM/YYYY>
<BMDetector serial number>	4	<DD/MM/YYYY>
# end of file		

DATA FORMAT:
Attributes:

%Item			
Serno	:	Integer [20220000000000..20229999999999]	Function(serial number on facing [2022xxxyyyyyyy], eventDescription=SENSOR_BASEBOARD) = 2022xxxyyyyyyy
ctype	:	bmSB	
EDate	:	String(10) DD/MM/YYYY	
ASSM	:	String in [YES/NO]	
PASS	:	String in [YES/NO]	
Initls	:	*	
LocnName	:	*	
Mfr	:	*	
MSerno	:	String(32)	
RDate	:	String(10) DD/MM/YYYY	
%Assembly section:			
ASSEMBLY ITEM	:	Integer [20220000000000..20229999999999]	
<BMBB serial number>	:	Integer [20220008000000..20229998999999]	e.g., 2022***8******
<BMDetector serial number>	:	Integer [20220000000000..20229999999999]	

FILE FORMAT:

%NEWTEST
SERIAL NUMBER <tab> <20221231234567>
TEST MADE BY <tab> *
LOCATION NAME <tab> *
Run number <tab> <string>
TEST DATE <tab> <DD/MM/YYYY>
PASSED <tab> <YES/NO>
PROBLEM <tab> <YES/NO>
#
%bmSBdata
%Test_Rawdata
FILENAME <tab> <string>
end of file

DATA FORMAT:
Attributes:

%NEWTEST section:

SERIAL NUMBER	:	Integer [20220000000000..20229999999999]	Function(serial number on facing [2022xxxyyyyyyy], eventDescription=SENSOR_BASEBOARD) = 2022xxxyyyyyyy
TEST MADE BY	:	*	
LOCATION NAME	:	*	
Run number	:	String(32)	
TEST DATE	:	String(10) DD/MM/YYYY	
PASSED	:	String in [YES/NO]	
PROBLEM	:	String in [YES/NO]	

%Test_Rawdata section:

FILENAME	:	String(256)	file content in bmSBrawData

atlasPartsId	<data>
manufacturerSerialNo	<data>
eventDescription	SENSOR_BASEBOARD
dateEntry [dd/mm/yyyy]	<dd/mm/yyyy>
location [instituteCode(DB)]	<data>
personInitial	<data>
problem [YES/NO]	<data>
pass [YES/NO]	<data>
comments	<data>
SENSORLeftUpper(#1)	<atlas parts id>
SENSORRightUpper(#2)	<atlas parts id>
SENSORLeftLower(#3)	<atlas parts id>
SENSORRightLower(#4)	<atlas parts id>
biasVoltage [V]	350
temperature(xx.x) [C]	<data>
leakCurrentLeftUpper [mircoA]	<data>
leakCurrentRightUpper [microA]	<data>
leakCurrentLeftLower [microA]	<data>
leakCurrentRightLower [microA]	<data>
leakCurrentSum [microA]	<data>
nDefectiveStrips	<data>
defectiveStrips	<data>
BASEBOARD	<data>
dateAssemblySide1 [dd/mm/yyyy]	<dd/mm/yyyy>
AssemblyJigID	<data>
EOTITEP102	<atlas parts id>
ARALDITE2011	<atlas parts id>
BN FILLER	<atlas parts id>
assemblyTemperature(xx.x) [C]	<data>
cureTemperature(xx) [C]	<data>
cureDurationTime [hrs]	<data>
dateAssemblySide2 [dd/mm/yyyy]	<dd/mm/yyyy>
AssemblyJigID	<data>
EOTITEP102	<atlas parts id>
ARALDITE2011	<atlas parts id>
BN FILLER	<atlas parts id>
assemblyTemperature(xx.x) [C]	<data>
cureTemperature(xx) [C]	<data>
cureDurationTime [hrs]	<data>
dateI_V-SENSOR_BASEBOARD TEST	<dd/mm/yyyy>
dateI_STABILITY-SENSOR_BASEBOARD TEST	<dd/mm/yyyy>
dateSURVEY_XY-SENSOR_BASEBOARD	<dd/mm/yyyy>
dateSURVEY_Z-SENSOR_BASEBOARD	<dd/mm/yyyy>

FILE FORMAT:

```
%NEWTEST
SERIAL NUMBER           <tab>  <20221231234567>
TEST MADE BY            <tab>  *
LOCATION NAME           <tab>  *
Run number              <tab>  <string>
TEST DATE               <tab>  <DD/MM/YYYY>
PASSED                  <tab>  <YES/NO>
PROBLEM                 <tab>  <YES/NO>
#
%bmSurveyXY
EVENT                   <tab>  <IN/TC/LT/LTL/IRR>                          Design    from bmSurveyXYrawData
MACHINE                 <tab>  <string>                                =             measurementJigID
TEMPERATURE (C)         <tab>  <floating value>                        =             temperature(xx.x) [C]
MHX (mm)                <tab>  <floating value>                  = (    -6500  +  mhx [um]      ) / 1000.
MHY (mm)                <tab>  <floating value>                  = (   -37000  +  mhy [um]      ) / 1000.
MSX (mm)                <tab>  <floating value>                  = (    38500  +  msx [um]      ) / 1000.
MSY (mm)                <tab>  <floating value>                  = (   -37000  +  msy [um]      ) / 1000.
SEPF (mm)               <tab>  <floating value>                  = (    64090  +  sepf [um]     ) / 1000.
SEPB (mm)               <tab>  <floating value>                  = (    64090  +  sepb [um]     ) / 1000.
MIDXF (mm)              <tab>  <floating value>                  = (        0  +  midxf [um]    ) / 1000.
MIDYF (mm)              <tab>  <floating value>                  = (        0  +  midyf [um]    ) / 1000.
A1 (mrad)               <tab>  <floating value>                  = (        0  +  a1 [mrad]     )
A2 (mrad)               <tab>  <floating value>                  = (        0  +  a2 [mrad]     )
A3 (mrad)               <tab>  <floating value>                  = (        0  +  a3 [mrad]     )
A4 (mrad)               <tab>  <floating value>                  = (        0  +  a4 [mrad]     )
HALFSTEREO (mrad)       <tab>  <floating value>                  = (      -20  +  stereo [mrad] )
HYMXF (mm)              <tab>  <floating value>                  = (   7698.5  +  hymxf [um]    ) / 1000.
HYMYF (mm)              <tab>  <floating value>                  = (   -154.0  +  hymyf [um]    ) / 1000.
HYMAF (mm)              <tab>  <floating value>                  = (    -20.0  +  hymaf [mrad]  )
HYMXB (mm)              <tab>  <floating value>                  = (   7698.5  +  hymxb [um]    ) / 1000.
HYMYB (mm)              <tab>  <floating value>                  = (    154.0  +  hymyb [um]    ) / 1000.
HYMAB (mm)              <tab>  <floating value>                  = (     20.0  +  hymab [mrad]  )
CONP1X (mm)             <tab>  <floating value>                  = (   3611.8  +  conp1x [um]   ) / 1000.
CONP1Y (mm)             <tab>  <floating value>                  = ( -69451.1  +  conp1y [um]   ) / 1000.
#
%Test_rawdata
FILENAME                <tab>  <string>                                finename of bmSruveyXYrawData, I.e., surveyXY_idAction2.4.1.xls
# end of file
```

DATA FORMAT:
Attributes:

```
%NEWTEST section:
SERIAL NUMBER           :  Integer [20220000000000..20229999999999]   serial number of bmSB or bmModule
TEST MADE BY            :  *
LOCATION NAME           :  *
Run number              :
TEST DATE               :  String(10) DD/MM/YYYY
PASSED                  :  String in [YES/NO]
PROBLEM                 :  String in [YES/NO]

%bmSurveyXY section:
EVENT                   :  String in [IN/TC/LT/LTL/IRR]
MACHINE                 :  String(30)                                                                  design +/-20xtolerance      *rounding/physiccal boundary
TEMPERATURE (C)         :  double in [-50.0..+150.0] C          Parameter      Design  Tolerance  Lower      Upper      Lower      Upper
MHX (mm)                :  double in [-7.100..-5.900]           mhx [um]       -6500        30    -7100      -5900      -7100      -5900
MHY (mm)                :  double in [-37.600..-36.400]         mhy [um]      -37000        30   -37600     -36400     -37600     -36400
MSX (mm)                :  double in [+36.500..+40.500]         msx [um]       38500       100    36500      40500      36500      40500
MSY (mm)                :  double in [-37.600..-36.400]         msy [um]      -37000        30   -37600     -36400     -37600     -36400
SEPF (mm)               :  double in [+63.890..+64.290]         sepf [um]      64090        10    63890      64290      63890      64290
SEPB (mm)               :  double in [+63.890..+64.290]         sepb [um]      64090        10    63890      64290      63890      64290
MIDXF (mm)              :  double in [-0.200..+0.200]           midxf [um]         0        10     -200        200       -200        200
MIDYF (mm)              :  double in [-0.100..+0.100]           midyf [um]         0         5     -100        100       -100        100
A1 (mrad)               :  double in [-3.0..+3.0]               a1 [mrad]          0      0.13     -2.6        2.6         -3          3
A2 (mrad)               :  double in [-3.0..+3.0]               a2 [mrad]          0      0.13     -2.6        2.6         -3          3
A3 (mrad)               :  double in [-3.0..+3.0]               a3 [mrad]          0      0.13     -2.6        2.6         -3          3
A4 (mrad)               :  double in [-3.0..+3.0]               a4 [mrad]          0      0.13     -2.6        2.6         -3          3
HALFSTEREO (mrad)       :  double in [-23.0..-17.0]             stereo [mrad]    -20      0.13    -22.6      -17.4        -23        -17
HYMXF (mm)              :  double in [+5.600..+10.000]          hymxf [um]      7698.5       100   5698.5     9698.5       5600      10000
HYMYF (mm)              :  double in [-2.200..+2.000]           hymyf [um]      -154.0       100  -2154.0     1846.0      -2200       2000
HYMAF (mrad)            :  double in [-100.0..+50.0]            hymaf [mrad]     -20.0  3.144654    -82.9       42.9       -100         50
HYMXB (mm)              :  double in [+5.600..+10.000]          hymxb [um]      7698.5       100   5698.5     9698.5       5600      10000
HYMYB (mm)              :  double in [-2.000..+2.200]           hymyb [um]       154.0       100  -1846.0     2154.0      -2000       2200
HYMAB (mrad)            :  double in [-50.0..+100.0]            hymab [mrad]      20.0  3.144654    -42.9       82.9        -50        100
CONP1X (mm)             :  double in [-3.000..+10.100]          conp1x [um]     3611.8  320.1258   -2790.7    10014.3      -3000      10100
CONP1Y (mm)             :  double in [-71.500..-67.000]         conp1y [um]   -69451.1       100  -71451.1   -67451.1      -71500     -67000
%Test_rawdata section:
FILENAME                :  String(256)
```

FILE FORMAT:

%NEWTEST
SERIAL NUMBER <tab> <serial number of bmSB or bmMODULE>
TEST MADE BY <tab> *
LOCATION NAME <tab> *
Run number <tab> <string>
TEST DATE <tab> <DD/MM/YYYY>
PASSED <tab> <YES/NO>
PROBLEM <tab> <YES/NO>
#
%bmSurveyZ
EVENT <tab> <IN/TC/LT/LTL/IRR> from bmSurveyZrawData
MACHINE <tab> <string> = measurementJigID
COMZPROFILE <tab> <20221231234567> very 1st serial number of the modules of ZPROFILE in %bmZPROFILE(s)
TEMPERATURE (C) <tab> <floating value> = temperature [C]
MAXZLWR (mm) <tab> <floating value> = maxZlower [mm]
MAXZUPR (mm) <tab> <floating value> = maxZupper [mm]
LEFT_A <tab> <floating value> = Left a
LEFT_B <tab> <floating value> = b
LEFT_C <tab> <floating value> = c
RIGHT_A <tab> <floating value> = Right a
RIGHT_B <tab> <floating value> = b
RIGHT_C <tab> <floating value> = c
MIDPLHGHT (mm) <tab> <floating value> = midplaneHeight [mm]
MODTHKNSS (mm) <tab> <floating value> = moduleThickness [mm]
OPTMAXZERRLWR (mm) <tab> <floating value> = optimalMaxZerrorLower [mm]
OPTMAXZERRUPR (mm) <tab> <floating value> = optimalMaxZerrorUpper [mm]
OPTRMSZERRLWR (mm) <tab> <floating value> = optimalRmsZerrorLower [mm]
OPTRMSZERRUPR (mm) <tab> <floating value> = optimalRmsZerrorUpper [mm]
MODCNCVTY_X (mm) <tab> <floating value> = moduleConcavity x [mm]
MODCNCVTY_Y (mm) <tab> <floating value> = y
SNSRSKW_X (mm) <tab> <floating value> = sensorSkew x [mm]
SNSRSKW_Y (mm) <tab> <floating value> = y
CTBTHKNSS (mm) <tab> <floating value> = coolingTabThickness [mm]
FTBTHKNSS (mm) <tab> <floating value> = farTabThickness [mm]
HLFTBTHKNSS (mm) <tab> <floating value> = halfTabThickness [mm]
TBSEW_Y (mm) <tab> <floating value> = tabSkew y [mm]
ADHTHKNSSTTL (mm) <tab> <floating value> = adhesiveThicknessTotal [mm]
ADHASYMMTRY (mm) <tab> <floating value> = adhesiveAsymmetry [mm]
LOCOOLNGF_A (mrad) <tab> <floating value> = loCoolingFacing a [mrad]
LOCOOLNGF_B (mrad) <tab> <floating value> = b [mrad]
LOCFCNCVTY (mm) <tab> <floating value> = loCoolingFacingConcavity [mm]
HYB1NRH (mm) <tab> <floating value> = hyb1NearH [mm]
HYB1FRH (mm) <tab> <floating value> = hyb1FarH[mm]
HYB2NRH (mm) <tab> <floating value> = hyb2NearH [mm]
HYB2FRH (mm) <tab> <floating value> = hyb2FarH [mm]
HYB1CNCVTY (mm) <tab> <floating value> = hyb1Concavity [mm]
HYB2CNCVTY (mm) <tab> <floating value> = hyb2Concavity [mm]
HYB1CMAXH (mm) <tab> <floating value> = hyb1CapMaxH [mm]
HYB2CMAXH (mm) <tab> <floating value> = hyb2CapMaxH [mm]
HYBMAXTHKNSS (mm) <tab> <floating value> = hybridMaxThickness [mm]
CMAXTHKNSS (mm) <tab> <floating value> = capMaxThickness [mm]
#
%Test_rawdata
FILENAME <tab> <string> finename of bmSurveyZrawData, i.e., Datasheet of SurveyZ_idAction2.4.1.xls
end of file

DATA FORMAT:
Attributes:

%NEWTEST section
SERIAL_NUMBER : * serial number of bmSB or bmMODULE
TEST MADE BY : *
LOCATION NAME : *
Run number : String(32)
TEST DATE : String(10) DD/MM/YYYY
PASSED : String in [YES/NO]
PROBLEM : String in [YES/NO]

%bmSurveyZ section:
EVENT : String in [IN/TC/LT/LTL/IRR]
MACHINE : String(30)
COMZPROFILE : Integer [20220000000000..20229999999999] Design+/-20*tolerance *rounding/physical boundary
TEMPERATURE (C) : double in [-50.0..+150.0]

Parameters	Design	Tolerance	Lower	Upper	Lower	Upper
maxZlower [mm]	0	-0.2	-4	4	-4	0
maxZupper [mm]	0	0.2	-4	4	0	4
Left a	0	0.003	-0.06	0.06	-0.06	0.06
b	0	0.003	-0.06	0.06	-0.06	0.06
c	0.47	0.038	-0.29	1.23	0	1.3
Right a	0	0.003	-0.06	0.06	-0.06	0.06
b	0	0.003	-0.06	0.06	-0.06	0.06
c	0.47	0.038	-0.29	1.23	0	1.3
midplaneHeight [mm]	0.47	0.038	-0.29	1.23	0	1.3
moduleThickness [mm]	1.15	0.1	-0.85	3.15	0	3.2
optimalMaxZerrorLower [mm]	0	0.05	-1	1	0	1
optimalMaxZerrorUpper [mm]	0	0.05	-1	1	0	1
optimalRMSZerrorLower [mm]	0	0.025	-0.5	0.5	0	0.5
optimalRMSZerrorUpper [mm]	0	0.025	-0.5	0.5	0	0.5
moduleConcavity x [mm]	0	0.1	-2	2	-2	2
y	0	0.1	-2	2	-2	2
sensorSkew x [mm]	0	0.4	-8	8	-8	8
y	0	0.4	-8	8	-8	8
coolingTabThickness [mm]	0.94	0.075	-0.56	2.44	0	2.5
farTabThickness [mm]	0.94	0.075	-0.56	2.44	0	2.5
halfTabThickness [mm]	0.47	0.038	-0.29	1.23	0	1.25
tabSkew y [mm]	0	0.075	-1.5	1.5	-1.5	1.5
adhesiveThicknessTotal [mm]	0.16	0.08	-1.44	1.76	0	2
adhesiveAsymmetry [mm]	0	0.08	-1.6	1.6	-2	2
loCoolingFacing a [mrad]	0	0.5	-10	10	-10	10
b [mrad]	0	3	-60	60	-60	60
loCoolingFacingConcavity [mm]	0	0.03	-0.6	0.6	-1	1
hyb1LeftNearH [mm]	1.18	0.19	-2.62	4.98	0	5
hyb1LeftFarH [mm]	1.18	0.19	-2.62	4.98	0	5
hyb2LeftNearH [mm]	1.18	0.19	-2.62	4.98	0	5
hyb2LeftFarH [mm]	1.18	0.19	-2.62	4.98	0	5
hyb1Concavity [mm]	0	0.15	-3	3	-3	3
hyb2Concavity [mm]	0	0.15	-3	3	-3	3
hyb1CapMaxH [mm]	2.43	0.3	-3.57	8.43	0	8.5
hyb2CapMaxH [mm]	2.43	0.3	-3.57	8.43	0	8.5
hybridMaxThickness [mm]	3.3	0.45	-5.7	12.3	0	13
capMaxThickness [mm]	5.8	0.67	-7.6	19.2	0	20

%Test_rawdata section:
FILENAME : String(256)