SAS Housekeeping Calibration Functions

	Name and function	Date	Signature
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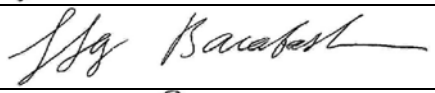
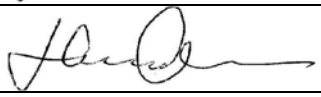
Approved by:	Stas Barabash	2007-06-15	
Isued by:	Herman Andersson	2007-06-15	

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CHANGE RECORD

Version		Date	Changed Paragraphs	Remarks
Issue	**Rev**			
Draft	0	2007-06-13	All	New document
1	0	2007-10-04	4.3	
1	1	2007-10-31	Editorial	
1	2	2007-12-20	CENA HV_TOF functions changed	

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1 INTRODUCTION

This document describes how housekeeping data (monitors) are transformed into physical units.

2 APPLICATION

This document shall be used for design of quick-look software as well as for the data processing on ground. The functions described here apply to temperature and high voltage monitors independent of how the data was obtained, i.e. through housekeeping channel or through science channel.

3 REFERENCES

RD1 CHA-SARA-DS-0005 (SWIM Software Interface Control Document)
RD2 CHA-SARA-DS-0006 (CENA Software Interface Control Document)

4 CALIBRATION FUNCTIONS

4.1 Function type

All functions used are quadratic polynoms of the type:

$$\mathbf{y = ax^2 + bx + c}$$

where: **a,b,c** are tabulated coefficients for each monitor value,
x the recorded monitor (ADC value) or reference (DAC value) and
y the corresponding value in physical units.

Note that x is always a positive value resulting e.g. in positive high voltages readings, independent of the actual sign of the voltage.

4.2 SWIM

4.2.1 Monitor values

Coefficients to transform monitor values to physical units:

HK monitor	Coefficient a	Coefficient b	Coefficient c	physical unit
Main	0.0	1.3567	-6.4155	Volts
CEM	2.0e-5	1.2784	0.0	Volts
Defl. upper	0.0	1.2053	-4.0	Volts
Defl. lower	0.0	1.2085	-4.0	Volts
Anyz	0.0.	1.1979	-3.2	Volts
Cell	7.0e-5	1.1484	8.9559	Volts
Temp	0.0	0.101725	-244.08	degC

Table 1 SWIM monitors

4.2.2 Prediction of voltages using references

Coefficients to transform reference values to expected resulting physical units. These values should be used if the monitor readings can not be used for any reason. If the predicted value for a voltage is negative the result must be treated with caution as depending on temperature the prediction may be invalid.

Programmed reference	Coefficient a	Coefficient b	Coefficient c	physical unit for y
Main	0.0	15.585	221.56	Volts
CEM	5.0e-4	16.694	-144.48	Volts
Defl. upper	-1.0e-6	1.0201	-274.71	Volts
Defl. lower	-7.0e-7	1.0191	-272.26	Volts
Anyz	-4.0e-6	0.9994	-251.80	Volts
Cell	0.0	5.5277	-90.340	Volts

Table 2 SWIM references

4.3 CENA

4.3.1 Monitor values

Coefficients to transform monitor values to physical units:

HK monitor	a	b	c	physical unit for y
HV_Ref (HV_Main)(1)	0.0	1.22070(2)	0.0	Volts
HV_StartMCP	0.0	1.22070	0.0	Volts
HV_StopMCP	0.0	1.22070	0.0	Volts
HV_Def	0.0	1.22070	0.0	Volts
HV_TOF(4)	0.0.	1.0	0.0	Volts
SV_WAVE1 (any level)	0.0.	1.22070	0.0	Volts
SV_WAVE2A (any level)	0.0.	1.22070	0.0	Volts
SV_WAVE2B (any level)	0.0.	1.22070	0.0	Volts
SV_LENS (any level)	0.0.	1.22070	0.0	Volts
Temp_HVPS	0.0	0.196888(3)	-273.16	decC
Temp_IFE	0.0	0.196888	-273.16	degC

Table 3 CENA monitors

(1) HV_Main is another name for HV_Ref
(2) The exact value is equal to 5000.0 / 4096.0
(3) The exact value is equal to 5000.0 / (4096.0 * 6.2)
(4) HV_TOF is internally directly connected to reference. No HV is generated.

Note: A monitor value equal to 4095 (or 0xFFF) indicates that no A/D conversion was done due to timing constraints and padding was inserted in the data stream. This occurs e.g. in engineering mode for the sweeping voltages SV_xxxx. Such values should be ignored.

4.3.2 Prediction of voltages using references

Coefficients to transform reference values to expected resulting physical units. These values should be used if the monitor readings can not be used for any reason. If the predicted value for a voltage is negative the result must be treated with caution as depending on temperature and reference the predicted value may be invalid.

Programmed reference	Coefficient a	Coefficient b	Coefficient c	physical unit for y
HV_Ref (HV_Main)(1)	0	22.33	243.9	Volts
HV_StartMCP	0	14.80	-267.2	Volts
HV_StopMCP	0	14.86	95.3	Volts
HV_TOF(2)	0	16.0	0	Volts
HV_Deflection	0	1.299	-203.3	Volts
SV_WAVE1 (any level)	0	1.395	-404.6	Volts
SV_WAVE2A (any level)	0	1.400	-411.2	Volts
SV_WAVE2B (any level)	0	0.523	-153.3	Volts
SV_LENS (any level)	0	1.000	-719.9	Volts

Table 4 CENA references

(1) HV_Main is another name for HV_Ref
(2) HV_TOF is internally directly connected to reference. No HV is generated.

5 ABBREVIATIONS

ADC Analog to Digital Converter
DAC Digital to Analog Converter
HV High Voltage