Date: 2010-Sep-22

Synthesis on PLM heaters reduction (2010)

1 Introduction

PLM heaters were reduced in Dec-2008 and in Oct-2009.
Based on the effect of such reduction and taking into account temperatures during last “cold season”, another PLM reduction is proposed here after.

This additional reduction is aimed at decreasing power consumption, cooling the upper panels, especially the ones where SWAN instruments are located (+ and –Z).

This note is a synthesis of a more detailed analysis (reference: SOHO/PRG/TN/720).

2 PLM temperatures

The Table hereafter gives all PLM temperatures on June 30 2009.
Temperatures that were above 20C are highlighted in Orange.
Temperatures within 5C of one of their Yellow Low Limits are in Yellow.

Panel	zone TCS	Description	QT	30-Jun-09 (daily average)	Yellow Limits min	MAX
sun shield		OSR	QTR28	5.4	-30	35
		OSR	QTR29	17.5	-30	35
		FPSS plate	QTR26	40.8	10	52
		FPSS leg	QT1920A	24.6	10	37
+X		VIRGO sensor TRP	QTVR1	22.3	3	35
	1		QT01	22.0	5	35
	2		QT02	19.0	5	35
		SAS/AAD	QTR21	44.1	-70	60
		CELIAS DPU TRP	QTFR5	20.0	8	36
		CEPAC EPHIN TRP	QTHR2	18.6	8	31
		EPHIN internal	QTHI2	17.2	-13	26
	3		QT03	19.0	5	35
		CEPAC ERNE TRP	QTHR5	19.7	5	35
		ERNE internal	QTHI1A	35.6	10	48
		CEPAC LION TRP	QTHR1	18.6	5	35
		LION internal	QTHI3	17.5	0	30
		CEPAC LVPC	QTHR3	21.3	-3	34
		CEPAC DPU	QTHR4	19.7	4	33
	4		QT04	21.6	5	35
		VIRGO PSU TRP	QTVR2	23.0	5	33
+Y	5-6	UVCS sensor TRP	QTUR1	23.4	5	35
		UVCS sensor internal	QTUI1A	9.4	5	40
			QT05	18.6	5	35
		EIT telescope TRP	QTLR3	20.1	5	35
		EIT internal	QTLI1A	17.1	5	30
			QTLI1B	17.9	5	30
			QT06	17.2	5	35
-Y upper	8	MTOF sensor TRP	QTFR2	20.4	5	35
		MTOF internal	QTFI2A	6.9	-40	40
			QT08	15.5	5	35
		GOLF sensor TRP	QTGR1	17.5	5	35
		GOLF internal	QTGI1A	28.2	5	40
		SSU 1	QTRA1	5.4	0	20
		SSU 2	QTRA2	7.1	0	20
	9	**MDI sensor TRP**	QTMR1	20.4	5	35
		MDI internal	QTMI1B	21.6	10	35
			QT09	18.6	5	35
-Y lower	7	PDU 1	QTR22	7.3	-15	45
		PDU 2	QTR23	8.4	-15	45
			QT07	10.7	5	35
		MDI elec TRP	QTMR2	10.8	5	35
		MDI elec internal	QTMI2	14.7	0	40
+Z upper	10-11	CTOF sensor TRP	QTFR1	21.6	5	35
		CTOF internal	QTFI3A	11.8	-15	37
			QT10	17.5	5	35
		SWAN sensor 1 TRP	QTNR1	9.9	0	35
		SWAN 1 internal	QTNI1A	13.2	5	30
		CDS sensor TRP	QTCR1	20.4	5	35
			QTCI1A	20.3	10	30
			QT11	18.6	5	35
		STOF sensor TRP	QTFR3	19.3	5	35
			QTFI1A	12.0	-15	35
		STOF elec TRP	QTFR4	16.0	7	30
+Z lower	18	CDS3 elec TRP	QTCR3	13.5	6	34
		CDS2 elec TRP	QTCR2	10.6	6	30
		UVCS elec TRP	QTUR2	13.0	5	30
		GOLF PSU TRP	QTGR2	11.2	7	25
		GOLF DPU TRP	QTGR3	8.0	2	35
-Z upper	12	SUMER 1 TRP	QTSR1	14.6	5	35
		SUMER 1 internal	QTSI1A	21.6	15	33
		SUMER TDC internal	QTSI2A	18.2	5	29
			QT12	19.6	5	35
	13	LASCO sensor TRP	QTLR1	16.0	5	35
		LASCO COB internal	QTLI2A	15.5	5	30
			QTLI2B	15.8	5	30
			QT13	17.1	5	35
		SWAN sensor 2 TRP	QTNR2	9.1	0	35
		SWAN 2 internal	QTNI2A	20.5	5	30
-Z lower	19	SUMER2 elec TRP	QTSR2	10.0	5	34
		SUMER 4 elec TRP	QTSR3	10.3	2	27
		SWAN elec TRP	QTNR3	10.8	2	31
		LASCO LEB TRP	QTLR2	10.8	5	35
		LEB internal	QTLI3A	1.5	-10	20

3 Proposal for additional PLM heaters reduction

The following PLM heaters duty cycles may be decreased:

Thermistor	PTCS zone	COBS circuit	Heater power (W)	Description	Duty Cycle					Heating power (W)		Proposed heating reduction (W)
					ST4	Before Dec 2008	Dec 2008 to Oct 2009	after oct 2009	Proposal	After Oct 2009	Proposal	
QTRA2	8	33	5.1	for SSU-B	100%	100%	**80%**	**60%**	60%	3.1	3.1	0.0
QT05	5	44	15.1	+Y panel -Z side	30%	70%	**50%**	**40%**	**30%**	6.0	4.5	-1.5
QT06	6	58	9.7	+Y panel +Z side	30%	90%	**70%**	**60%**	**50%**	5.8	4.9	-1.0
QT07	7	45	5.1	-Y lower panel	30%	80%	80%	80%	80%	4.1	4.1	0.0
QT08	8	59	16	-Y panel +Z side	30%	80%	**70%**	**60%**	60%	9.6	9.6	0.0
QT09	9	46	10.3	-Y panel -Z side	30%	70%	**60%**	**50%**	**40%**	5.2	4.1	-1.0
QT10	10	60	12.3	+Z panel +Y side	30%	80%	**60%**	60%	**40%**	7.4	4.9	**-2.5**
QT11	11	47	14.2	+Z panel -Y side	30%	80%	**70%**	**60%**	**50%**	8.5	7.1	-1.4
QT12	12	48	14.2	-Z panel -Y side	30%	70%	**60%**	60%	**50%**	8.5	7.1	-1.4
QT13	13	49	18.3	-Z panel +Y side	30%	70%	60%	**50%**	**30%**	9.2	5.5	**-3.7**
QTSR3	19	56	1.8	-Z Lower Panel	30%	80%	80%	80%	80%	1.4	1.4	0.0
QTGR3	18	54	3	+Z lower panel	30%	80%	80%	80%	80%	2.4	2.4	0.0
									Total	71.16	58.7	-12.5

The total PLM heating power reduction proposed here is **12.5W** (hence less than what was done in December 2008 and just 3W more than in Nov 2009).

It is estimated that such PLM heaters reduction will have a cooling effect of:

- 2 to 3C for SWAN interfaces (+Z and –Z upper panels)
- 1C for +X panel
- 2C for +Y and –Y upper panels.

At SVM level, it will induce a cooling effect of less than 1C, which is acceptable.