Reference : H-P-1-ASP-BT-0813 issue 1 Herschel Planck system pointing budget for CDR

The Herschel APE budget presented at the system CDR (see reference) is the following :

Herschel APE Pointing			x-axis [arcsec]			y-axis [arcsec]			z-axis [arcsec]			
Location	origin	error	Bias	Long Term	Short Term	Bias	Long Term	Short Term	Bias	Long Term	Short Term	Comment
SVM	STR	STR bias	7,4			0,8			0,8			
		STR bias stability		6			0,2			0,2		
		STR bias stability over 1 minute			0,039			0,001			0,001	
		STR spatial bias during stable pointing			0,5			0,04			0,04	
	controller	Command Quantization Error	1E-04			1E-04			1E-04			
		Sensors error contribution to Control performance in pointing mode (LT)		1,23			0,1			0,1		
		Sensors error contribution to Control performance in pointing mode (ST)			1,59			0,16			0,16	
		Actuator torque contribution to Control performance (LT)		0,021			0,011			0,011		
		Actuator torque contribution to Control performance (ST)			0,066			0,036			0,036	
	Structure	SVM structure stability over 1 month		0,025			0,425			0,037		
		SVM misalignment (all effects)	20									
HPLM	Structure	HPLM structure stability over one month		0			0,043			0,004		
		HPLM alignment (all effects)	51,5									
system	calibration	system calibration residual				0,543			0,543			
		Total per frequency class (RSS)	55,74	6,12	1,67	0,97	0,48	0,17	0,97	0,23	0,17	
		Total per axis (linear)	63,53			1,62			1,36			
			Around LOS (arcmin)			LOS (arcsec)						
		Total	1,06			2,12						
		Requirement	3,00			3,70						
		Margin	*1,94*			*1,58*						

The frequency classes definition are the following:
- **bias errors** refer to errors that are constant over the mission. Some equipment can have errors that depend on the pointed direction (as star sensors for instance); they are called spatial biases.
- **long term errors** refer to phenomena that have time constants greater than 1 minute and smaller than the calibration period.
- **short term errors** refer to errors with time constants smaller than 1 minute.

For the particular case of the system calibration, the system calibration residual is not to be considered. During system calibration, the standstill pointing duration will be selected such that thermal conditions are in steady state so long term errors that apply during mission becomes bias errors during system calibration.

The APE during system calibration budget becomes thus the following :

Herschel APE Pointing during system calibration			x-axis [arcsec]			y-axis [arcsec]			z-axis [arcsec]			
Location	origin	error	Bias	Long Term	Short Term	Bias	Long Term	Short Term	Bias	Long Term	Short Term	Comment
SVM	STR	STR bias	7,4			0,8			0,8			
		STR bias stability	6			0,2			0,2			
		STR bias stability over 1 minute			0,039			0,0013			0,0013	
		STR spatial bias during stable pointing			0,5			0,04			0,04	
	controller	Command Quantization Error	0,0001			0,0001			0,0001			
		Sensors error contribution to Control performance in pointing mode (LT)		1,23			0,1			0,1		
		Sensors error contribution to Control performance in pointing mode (ST)			1,59			0,16			0,16	
		Actuator torque contribution to Control performance (LT)		0,021			0,011			0,011		
		Actuator torque contribution to Control performance (ST)			0,066			0,036			0,036	
	Structure	SVM structure stability over 1 month	0,025			0,4249055			0,0367151			
		SVM misalignment (all effects)	20									
HPLM	Structure	HPLM structure stability over one month	0			0,0433333			0,0041667			
		HPLM alignment (all effects)	51,5									
		Total per frequency class (RSS)	56,06	1,23	1,67	0,93	0,10	0,17	0,83	0,10	0,17	
		Total per axis (linear)	58,96			1,20			1,09			
			Around LOS (arcmin)			LOS (arcsec)						
		Total	0,98			1,62						
						overall instrument / ACMS misalignment bias (< 0,47") to be added to this budget						

On top of this budget, the overall misalignment between instrument LOS and STR LOS has to be added. It is less than 0.47°.

Due to the evolution since system CDR, a margin of 20 % has to be applied on the proposed values.