Req. SPT510 Time Constants for Flux Changes in Spectroscopy

SPT510 - A. History

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Author(s)</th>
<th>Change description</th>
</tr>
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<tbody>
<tr>
<td>1.0</td>
<td>September 18, 2008</td>
<td>C. Jean</td>
<td>First issue</td>
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SPT510 - B. Summary

This report presents the data obtained from the tests performed on August 26th, 2008 in order to estimate the time constants as a function of flux changes for the PACS spectrometer.

SPT510 - C. Data Reference Sheet

<table>
<thead>
<tr>
<th>Telemetry file</th>
<th>Date</th>
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<tbody>
<tr>
<td>FIST_SPT_Spec510_20080826.tm</td>
<td>26-Aug-2008</td>
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SPT510 - D. Test Description

After the initial setup, the grating was put to the following positions: 150000, 350000, 150000, 550000, 150000, 725000, 150000, 925000 and 150000. Except for the last one, the grating has stayed at each position for 4 minutes. The chopper was pointed towards the calibration source CS1 during all the test.

![Figure 1: The grating and the chopper positions as a function of time](image-url)
SPT510 - E. Analysis

For both channels, for each grating position and for each pixel (except rows 0 and 17 and columns 4, 9, 14, 19 and 24), an exponential model with one time constant was fitted to the signal. The fit did not give valid results in every case and we kept the results when the standard deviation of the fitted time constant was both less than $10^{-2}$ (reset$^{-1}$) and less than half the fitted value of the time constant.

Due to a bug (or a feature?) in the fitRamps task of the pipeline (see PACS SPR-1042), the signal and the grating position reported in the Frames drop down to 0 when the grating moves.

The figures 2 and 3 show the grating positions and the signal, for three different pixels, as a function of time. We can see the gaps between each grating position, which are not real but due to a bug in the pipeline.

![Blue channel](image)

Figure 2: Evolution, as a function of time, of the signal of three different pixels in the blue channel and of the grating positions. The gaps between each grating position are not real.

SPT510 - F. Results

SPT510 - F.1. At a given grating position

The figure 4 presents, for the blue and the red channels, the fitted time constants as a function of the final level reached for each grating position.

The mean upwards time constants are approximately $1.293 \times 10^{-3} \pm 3.518 \times 10^{-4}$ s$^{-1}$ for the blue channel and $3.326 \times 10^{-3} \pm 8.879 \times 10^{-4}$ s$^{-1}$ for the red channel.
Figure 3: Evolution, as a function of time, of the signal of three different pixels in the red channel and of the grating positions. The gaps between each grating position are not real.

**SPT510 - F.2. Back to the default grating position**

For the blue channel, no downwards time constant could have been fitted whatever the initial level of the signal. This time constant should be close to 0.

The figure shows the time constants as a function of the signal reached before the grating moves back to its default position, i.e. 150000.

For the red channel, the mean downwards time constant is approximately $4.147 \times 10^{-3} \pm 1.246 \times 10^{-3} \text{ s}^{-1}$.

**SPT510 - G. Conclusions**

The time constants vary from pixel to pixel and depend on the difference of signal between the two grating positions. The “upwards” time constants seem to increase when the difference increases. On the other hand, the “downwards” time constants for the red channel do not show a clear tendency whereas they seem to be very small for the blue channel.

Compared to previous FM ILT data, the signal of these data is globally higher but the behaviour of the pixels does not seem to have changed.
Figure 4: Time constants in s\(^{-1}\) as a function of the asymptotic level reached by the signal, for the two channels.

Figure 5: Time constants in s\(^{-1}\) as a function of the starting level of signal for the red channel.