

Compass Stability Problems with the ELMB

Introduction

The COMPASS experiment (Valeri Falaleev) has experienced problems with unstable inputs in one of their twenty ELMB+MB setups at the experiment. The problems concerned two types of inputs. The first one is a temperature measurement using a simple ‘home-made’ adapter of two Pt100 sensors. The second one is a measurement of a battery voltage measured also with a ‘home-made’ attenuator. It has been observed repeatedly that both kinds of the measurements are not stable with time (see Figure 1 and 2). The temperature measurements slowly drifted reasonably reflecting day-night temperature variation, but the measurements jumped time to time suddenly up to 50%. The voltage measurements jumped too in the same range and stayed at that value! All three measurements jumped simultaneously, but with different magnitude. It was observed that rather often coincidentally with the jumps the ELMB was rebooted.

The voltage range of the ELMB used for the measurements is 100mV at 4Hz. In order to understand the problems several tests were done by COMPASS without results and therefore the help from ATLAS-ATE was requested.

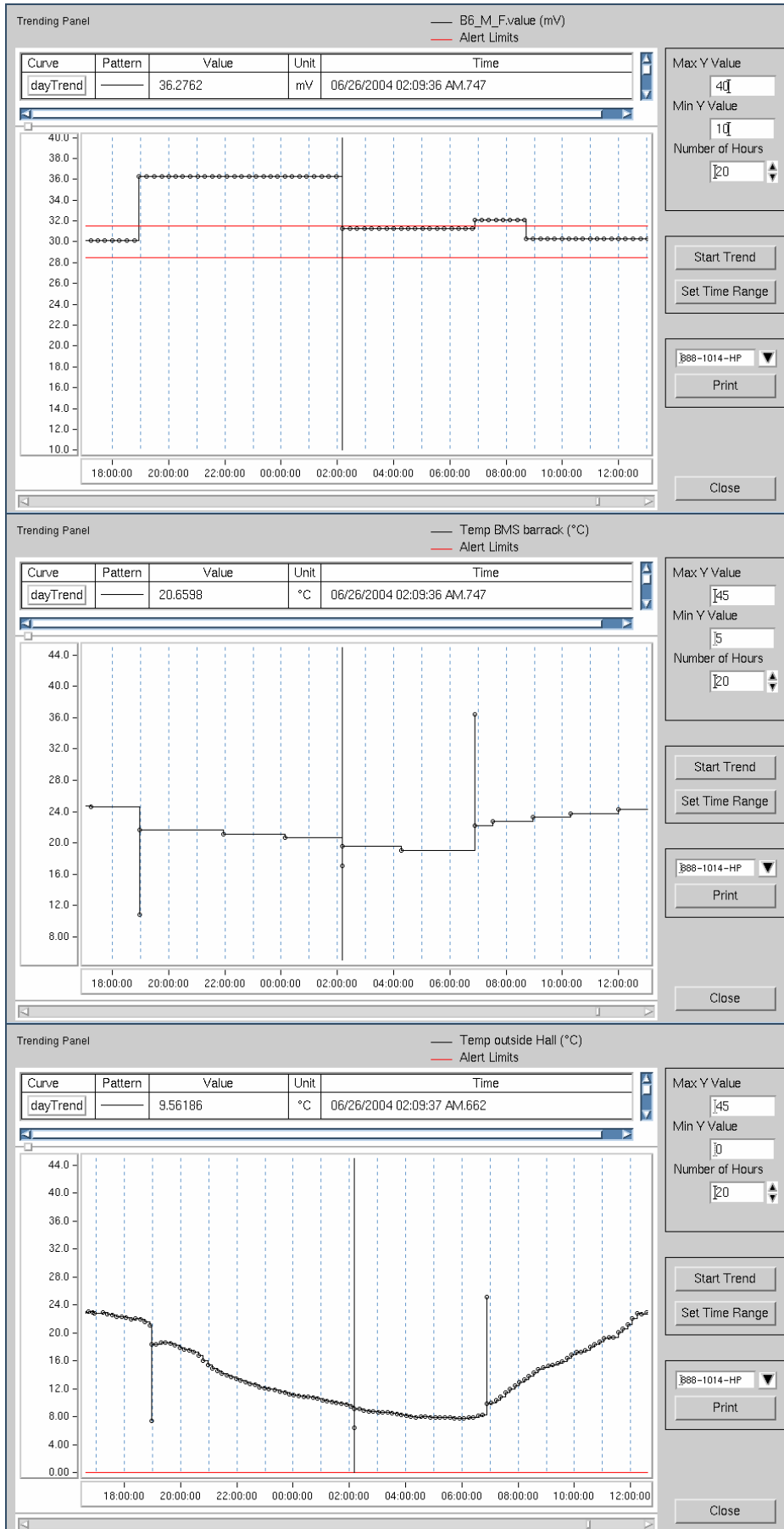


Figure 1 Typical measurement patterns before intervention (note the spikes)

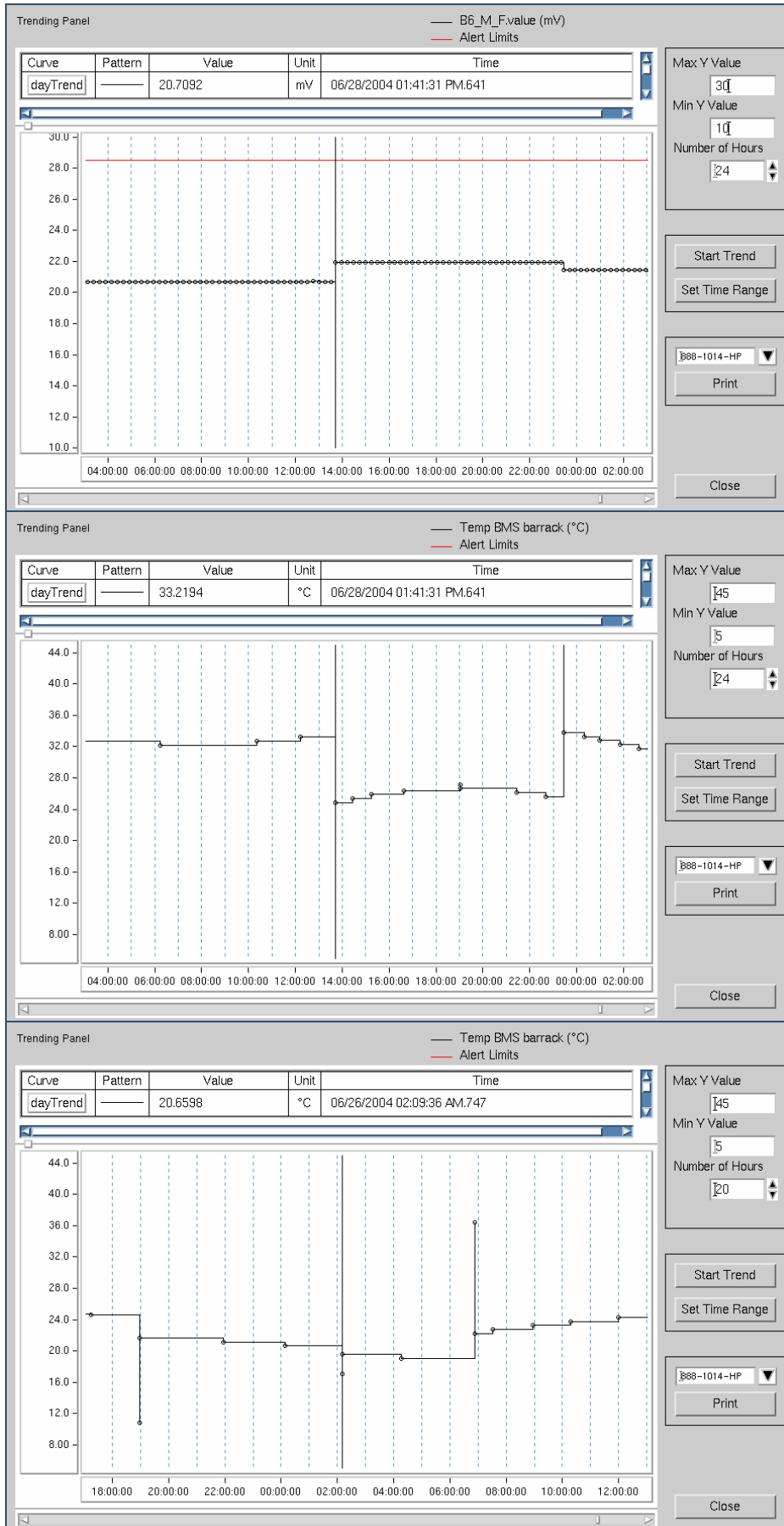


Figure 2 Typical measurement before intervention

Findings *(as reported by Valeri Falaleev)*

A visit to the experiment showed that the ELMB + MB were mounted on an aluminium panel (isolated from ground) in normal experimental rack. There were several low voltage high current power supplies with fans in the proximity. The problem disappeared when:

- ELMB+MB were moved from the proximity of the power supplies.
- Voltage measurement was connected to analogue ground (via a 100k resistor) at one side instead of being completely floating.
- All cable shielding were connected to ground

It should be noted the inputs of the ELMB are very high impedance (about 10^{10} ohms!). It is possible that the common mode voltage range was exceeded due to noise pickup.

Conclusions

The ELMB+MB can be sensitive to EMC pickup in noisy environments when it is not mounted in a shielded metal enclosure or mounted away from noise sources.

Example of normal stability of the ELMB+MB

A DC test pattern was connected to all 64 inputs of the ELMB+ MB (ELMB128 #B081 and #MB3-0151). Figure 2 shows the pattern and schematic is shown in Figure 3. An extract of the test results from 3 days run are shown in Figure 4, 5 and 6. A temperature effect due to the MB and high-value resistor change can be seen.

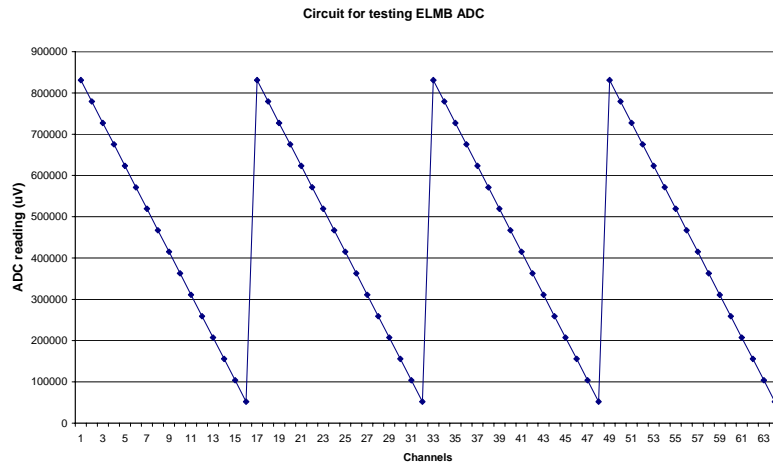


Figure 3 The DC test pattern used (repeating with a modulus of 16)

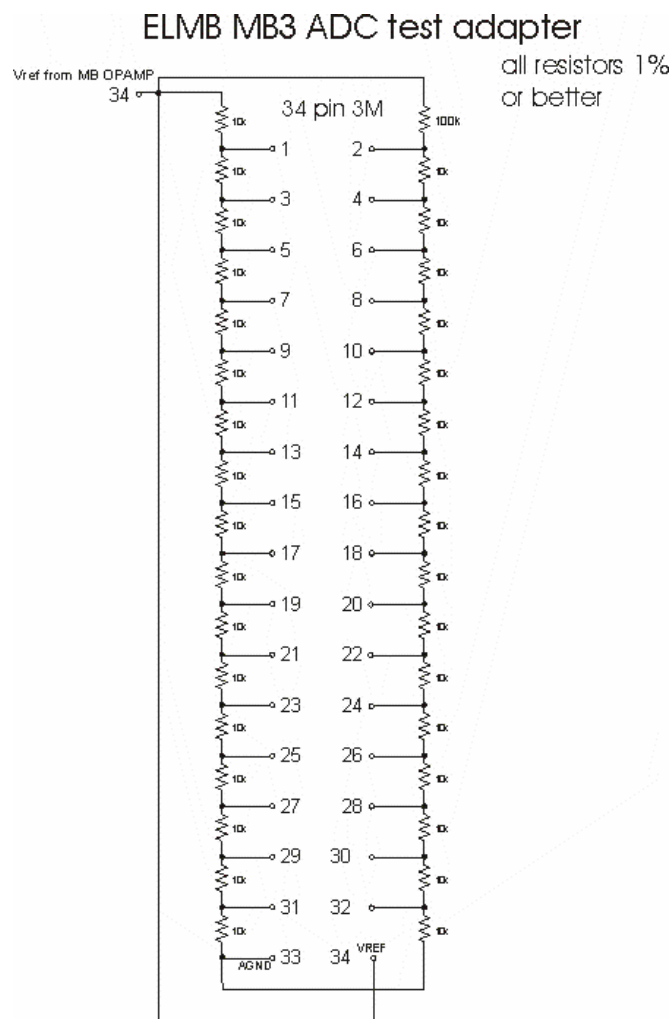


Figure 4 Schematic of the test circuit

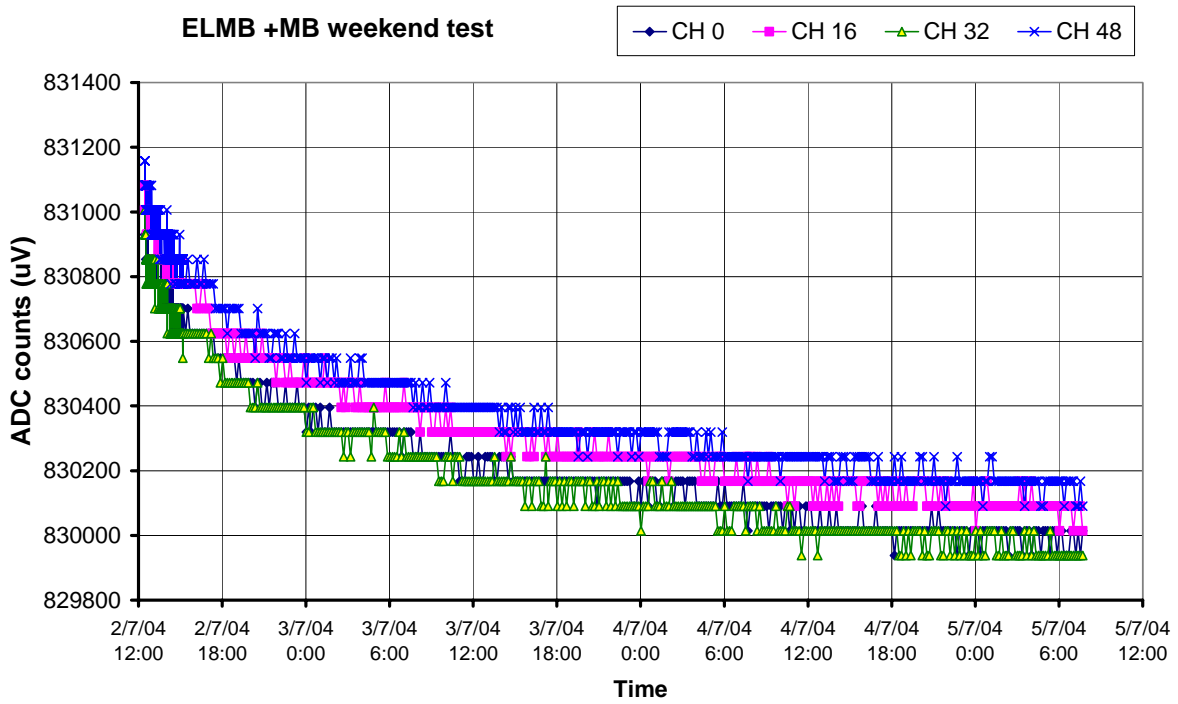


Figure 5 Change of the top channels (0, 16, 32 and 48) showing a slow temperature drift

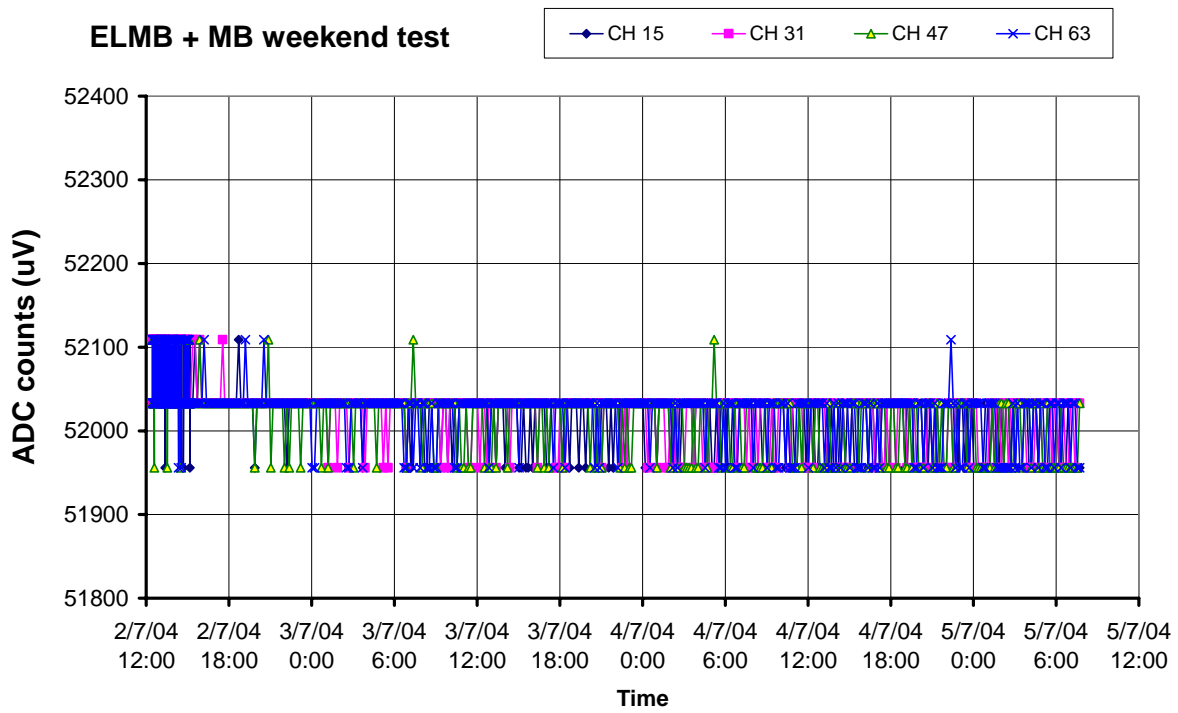


Figure 6 Change in the lowest channel (15, 31, 47 and 63)