6. PARTICIPATION IN THE MAST PROGRAMME

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6.1. INTRODUCTION

The Portuguese participation in the MAST programme has been mainly focussed on two research areas:

- Microwave reflectometry;
- Control and data acquisition.

6.2. MICROWAVE REFLECTOMETRY

The following main activities were performed:

- Installation of the waveguide and antenna on the MAST port;
- Testing in vacuum and calibration of the reflectometry system and adjustment of the reference pin;
- First evaluation of the diagnostic performance;
- Design and construction of the detection amplifiers;
- Construction of the drivers for fast sweeping of the HTO oscillators;
- Calibration of the HTO oscillators;
- Installation of the rack with the electronics and the microwave equipment in the cubicle, final tests of the system and first measurements with plasma.

The diagnostic is ready for operation as soon as some problems related with high level of noise due to ground loops will be solved.

6.3. CONTROL AND DATA ACQUISITION

6.3.1. Main activities

The following main activities were carried out:

- Finalization of the development and test of the CAMAC version of the MAST timing and event management system;
- Collaboration in the integration of the system in the MAST control and data acquisition system.

6.3.2. Design of the CAMAC event and pulse node module

The Fusion Laboratories own a huge platform of CAMAC digital instrumentation, which they must keep on using due to economic reasons, although recognizing the limitations of this bus, in particular those associated with its low data transfer throughput. In this context, the module "Event and Pulse Node" (EPN) of the "Trigger and Timing System", initially developed for VME was converted to the CAMAC bus.

The CAMAC version of this module was designed in order to be, as much as possible, electrically and logically similar to the VME version. Nevertheless, some incompatibilities of these standards (the VME version uses 32 bit accesses to the registers which are not permitted by CAMAC) have inhibited the total transparency of the bus interface on both versions from the point of view of the software.

Figure 6.1 presents some of the electrical and mechanical transformations made on the EPN VME module to convert it to CAMAC.

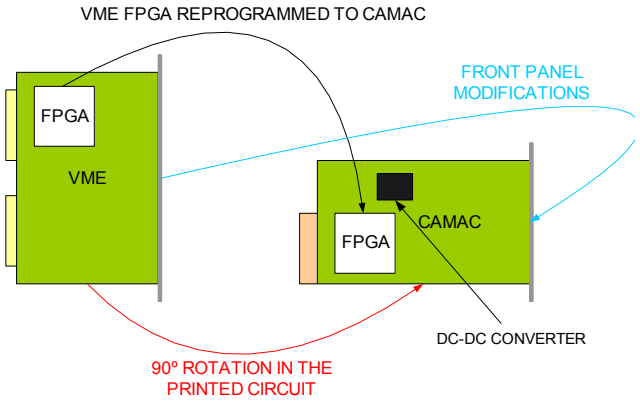

Figure 6.1 – EPN module conversion steps to the CAMAC version

The front panel, which has different dimensions from the VME one, was reorganized in accordance to the cabling functionality, the mechanical robustness, and esthetical considerations. The connectors were positioned to allow a good cabling layout without compromising the correct visualization of the optical displays and functions labels (Figure 6.2). The printed circuit layout was rotated by 90º to avoid the necessity of rerouting all tracks, restricting this task to a small set of tracks.

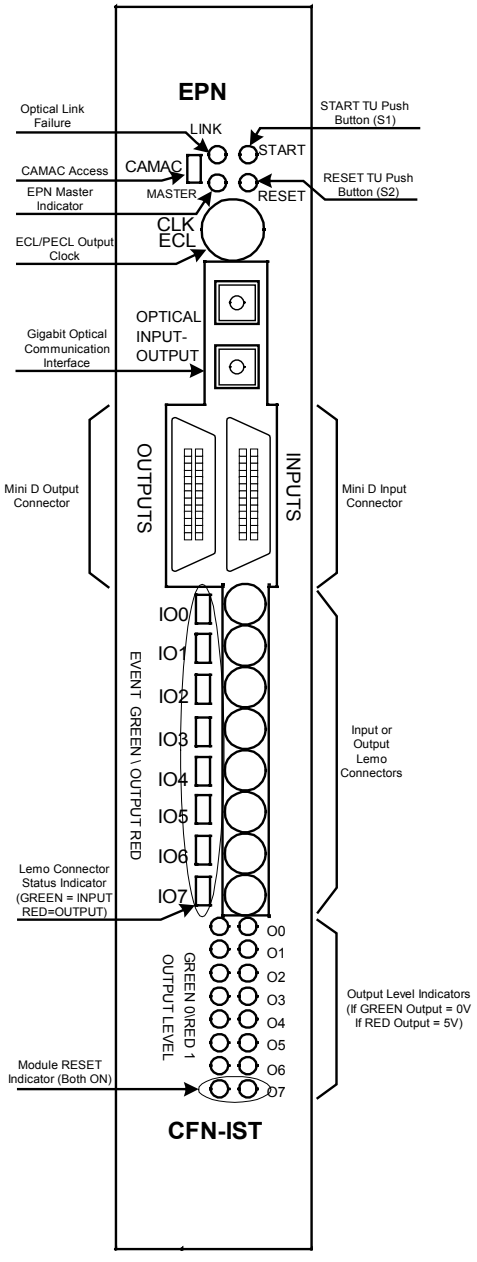

Figure 6.2 – EPN CAMAC module front panel

The problem originated by the insufficient maximum current supplied by the CAMAC +5 V power supply, was solved incorporating a DC-DC converter, powered by the ±24 V CAMAC power supply, which can source more power, allowing a more efficient utilization of the available electrical power, without adding new power supplies when several EPN modules are present in the crate.

The host bus interface to the "Event and Pulse Node" module was implemented in a programmable logic device (FPGA). The original VME version was designed to be easily ported to other busses, including the CAMAC bus, by making a small number of modifications in the logic equations. This approach eased the porting of the module device driver, which was modified for the CAMAC interface details. Codes were developed, in C, over the OS-9 operational system, for a 68000 series processor, to control the EPN CAMAC module. The implemented routines names and parameters are equal to those of the VME version and allow setting, testing, arm, and triggering, testing if triggered, processing the events in real-time, abort, collect data, or reset the EPN device.