4.8 Monitoring and Calibration

Tests of the TOF system and long term monitoring of the system will be performed in dedicated calibration runs with a pulser. The pulse, synchronised with the 40 MHz clock, will be injected along a dedicated line placed on the MRPC lower cathode PCBs, on the face opposite to the pads. The induced signal will be recorded using the complete readout chain (FEA, TRM, DRM) allowing monitoring of the channel performance. This pulser system will be used throughout the assembly of the modules to verify that all connections between pads and front-end electronics are good. The same system will be used during the installation of the modules inside the magnet, to verify that the full electronics chain for all channels is in a good state.

A temperature sensor in each module is presently foreseen so that monitoring of the calibration constants with temperature will also be possible.

4.9 Grounding scheme

The baseline grounding system of the TOF system follows the prescription given for the ALICE experiment [7]. The HV, FEAs and the readout system will have their own return line to a well defined common grounding point. Each module is in fact a Faraday cage and it is not grounded to the space frame. Ground references will be available, should the necessity arise, at the space frame borders.

4.10 Power consumption estimates

The foreseen power consumption for the electronics placed inside the ALICE magnet is shown in Table 4.1. Including 10% contingency, the total power consumption of the TOF system is about 125 kW. In case the DC/DC converters option is chosen, this number will increase to about 165 kW due to the inefficiency of the conversion and some other losses.

An independent cooling system, similar to the one described for the FEA, will be used to cool the digital modules in the crates.

Table 4.1: Power consumption of the TOF electronics.

	Power/ch.(W)	Power/module (kW)	Power/sector (kW)	Total (kW)
FEA	0.4	0.58-0.77-0.73	3.58	65
	Power/Module(W)	Power/crate (kW)	Power/sector (kW)	Total (kW)
TRM	50	0.63	2.5	45
DRM	25	0.025	0.1	1.8
LTM	30	0.03	0.06	1.1
Total				113

4.11 Basic time resolution of the TOF detector and electronics

The time measurement system described above will have a total time jitter as described in Table 4.2. All contributions have been added in quadrature to obtain the total time jitter foreseen in ALICE TOF following the formula

$$\sigma^2_{Tot} = \sigma^2_{T0} + \sigma^2_{MRPC} + 2\sigma^2_{TDC} + 2\sigma^2_{ClTRM} + \sigma^2_{Clock}$$

Where σ_{T0} is the intrinsic T0 time jitter , σ_{MRPC} is the MRPC intrinsic time jitter, σ_{TDC} is the intrinsic time resolution of the HPTDC, σ_{Clock} is the clock distribution jitter via the TTC system and σ_{ClTRM} is the jitter introduced when distributing the clock in the TRM. The third column makes more conservative assumptions on the MRPC and HPTDC time resolution.

Table 4.2: Time resolution estimation for the ALICE TOF system.

Description	Average time resolution (ps)	Maximum (ps)
σ_{T0}	50	50
σ_{MRPC}	50	80
σ_{TDC}	25	50
σ_{Clock}	15	15
σ_{ClTRM}	10	10
Total	82	120