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A high performance Front End Electronics for Drift Chamber readout in MEG experiment upgrade

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The new positron tracker for the spectrometer of the MEG experiment at Paul Scherrer Institut (Zurich), based on a high resolution drift chamber, produces typical time separation between consecutive ionization acts in helium-based gas mixture of few nanoseconds.

Therefore the electronic readout interface has to be able to process such high speed signals. In order to reach this goal we propose a high performance eight-channels front end electronics which amplifies weak signals from MEG drift chamber tracker. The front end board is designed and tested at INFN of Lecce electronics laboratory and it is based on commercial devices.

Each front end channel is a multistage amplifier: the first gain stage is performed by an ADA4927 from Analog Devices: a low noise, ultralow distortion, high speed, current feedback differential amplifier; a THS4509 from Texas Instruments is used as wideband signal output driver. Dedicated networks guarantees protection, matching and decoupling from high voltage wires supply. Careful consideration of design rules preserves signal integrity by minimizing crosstalk between channels. In order to compensate the attenuation introduced by the output cable a double stage of pre-emphasis is implemented to produces a high frequency peak in frequency response.

Simulation performed by Spice shows a 3dB bandwidth around 1GHz and a voltage gain of the order of 10. Preliminary measurements show a good agreement with simulation.

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