The CTF3 provides a high current (28A), high frequency (12GHz) electron beam, which is used to generate high power radiofrequency pulses at 12GHz by decelerating the electrons in resonant structures. A Test Beam Line (TBL) is currently being built in order to prove the efficiency and the reliability of the RF power production with the lowest level of particle losses. As the beam propagates along the line, its energy spread grows up to 60%. For instrumentation, this unusual characteristic implies the development of new and innovative techniques. One of the most important tasks is to measure the beam energy spread with a fast time resolution. The detector must be able to detect the energy transient due to beam loading in the decelerating structures (nanosecond) but should also be capable to measure bunch-to-bunch fluctuations (12GHz). This paper presents the design of the spectrometer line detectors.

The Test Beam Line (TBL) is a test bench for the CLIC decelerator, where 12GHz RF power is generated when the beam passes through resonating RF structures, called Power Extraction and Transfer Structures (PETS) (~5 MeV energy loss per PETS).

Deceleration in the Test Beam Line
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Spectrometer Beam line at TBL
The spectrometer line consists of a bending magnet which provides an energy dependent horizontal deflection to the particle. By measuring the beam position and size one can thus estimate the beam energy and its energy spread.

- Two types of detectors:
  - High spatial resolution imaging system based on the use of an OTR screen
  - Segmented dump for time resolved measurements

Design of a segmented dump for TBL
In order to estimate the deposited energy, the resulting temperature increase and the spatial resolution of the device, simulations were performed with the Monte Carlo code FLUKA.

Perspectives
- FLUKA simulations to quantify the impact of secondary particles on the measured charge.
- Continue studies of the thermal effects and radiation dose for the long-term response of the detector.
- Optimisation of drift length and B field for maximum resolution.
- Investigate other options in order to reach higher resolution both spatial and in time (e.g. Cherenkov radiation detector)

From the TBL to CLIC Decelarator
- Higher beam energy: 2.3 GeV (deceleration from 2.3 GeV to 0.23 GeV)
- Large energy spread: up to 90% 
- Extremely high current: ~180 A