The visible matter alone is not able to explain some astrophysical and cosmological phenomena (gravitational lensing, velocity of rotation of the galaxies, distribution of the CMB). It is therefore necessary to modify the gravitational laws or introduce a new type of matter that does not emit radiation.

The WIMP paradigm is challenged by LHC. A new idea introduces a messenger with the new type of matter through the beam-target interaction point. Experiment requirement on beam spatial resolution < 1 mm (spatial resolution ~0.06 mm: the missing mass resolution improves depending on the carbon. The Z=6 improve signal/background).

Active Target Calibration
The linearity of the average beam position measured with the charge weighting algorithm was studied moving the target in the X direction.

Diamond sensor: 2 x 2 cm² area and 100 μm thickness.
Graphite strips [2]: 19x19, Instrumented strips 16x16Y, 1 mm pitch, 0.15 mm interstrip distance and electric resistance ~2.9kΩ.

The comparison of the data in a standard run (20000 e+/bunch) with a special run (same beam configuration) with the target off the beam line allows to establish clear signatures for the processes of two photon production and bremsstrahlung.

EM Interactions on the Target
$e^+e^- \rightarrow \gamma\gamma$

PADME Preliminary
Special run without the target
Selection:
Sum of the energy of two photons in $e^-e^-$ annihilation candidate events. In red events with the target in the default position in the beam line. In blue events with the target off the beam line.

The PADME detector observes the two standard electromagnetic processes only when the diamond target is crossed by the positron beam.