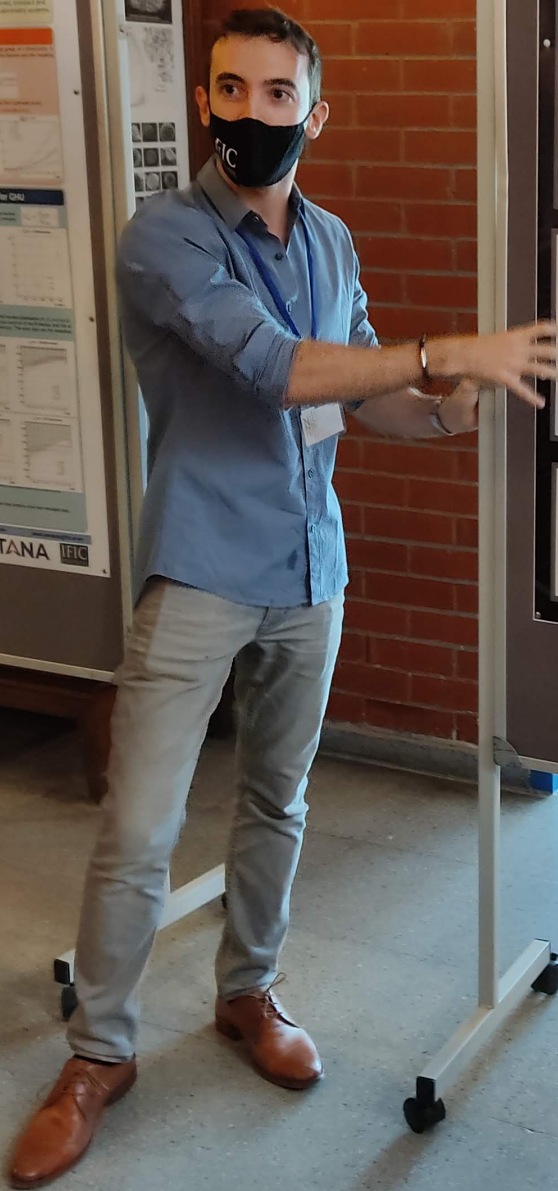




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### Top quark mass measurements using $t\bar{t} + 1jet$ events in the ATLAS detector at 7, 8 and 13 TeV

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#### The Standard Model

The Standard Model (SM) of particle physics is the most successful theory of nature that we have. It describes the interactions of the elementary particles and their properties. The SM is a quantum field theory based on the gauge principle of relativity and quantum mechanics. It is a renormalizable theory, which means that it can be used to calculate the probabilities of various processes. The SM is a beautiful theory, but it is not complete. It does not include gravity, and it does not explain the matter-antimatter asymmetry of the universe. There are many new physics models that extend the SM, and they are being tested by experiments like the ATLAS detector.

#### The ATLAS detector

The ATLAS detector is a general purpose particle detector at the Large Hadron Collider (LHC). It is designed to study the properties of the top quark and other particles produced in high energy collisions. The ATLAS detector is composed of several sub-detectors: the inner detector (ID), the calorimeters, and the muon spectrometer. The ID is used to identify and measure the momenta of charged particles. The calorimeters are used to measure the energy of particles. The muon spectrometer is used to identify and measure the momenta of muons. The ATLAS detector is one of the largest and most complex detectors ever built.

#### Importance of a precise top quark mass measurement

The top quark mass is one of the most important parameters in the SM. It is the heaviest of the known elementary particles, and it plays a key role in the stability of the universe. A precise measurement of the top quark mass is essential for testing the SM and for searching for new physics. The ATLAS detector has measured the top quark mass at 7, 8, and 13 TeV. The results are shown in the following plots.

#### Observable definition with $t\bar{t} + 1jet$ events

The top quark mass is defined as the pole mass in the SM. It is a physical quantity that is independent of the renormalization scale. The ATLAS detector has measured the top quark mass using the  $t\bar{t} + 1jet$  events. The results are shown in the following plots.

#### Top quark mass measurement results at 7 and 8 TeV

The top quark mass has been measured at 7 and 8 TeV. The results are shown in the following plots.

$$m_t^{pole} = 173.7 \pm 1.5 (stat) \pm 1.4 (sys) \pm 0.9 (theo) \text{ GeV}$$
$$m_t^{pole} = 171.1 \pm 0.4 (stat) \pm 0.9 (sys) \pm 0.9 (theo) \text{ GeV}$$

#### Prospects for a 13 TeV measurement

The top quark mass will be measured at 13 TeV. The results are shown in the following plots.