

IMPROVEMENT OF THE SINGLE TOP-QUARK DETECTION  
IN THE S-CHANNEL AT THE CMS EXPERIMENT

Genti Saliu

Department of Physics  
Karlsruhe Institute of Technology (KIT)

BACHELOR THESIS

*Referee: Dr. Nils Faltermann*  
*Co-Referee: Dr. Thorsten Chwalek*  
*Institute of Experimental Particle Physics*

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Accepted by the first referee of the bachelor thesis.  
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**(Dr. Nils Faltermann)**



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I hereby certify that the enclosed thesis is my own work, that I have not sought or used inadmissible help of third parties to produce this work and that I have clearly referenced all sources used in the text.

**Karlsruhe, XX MONTH 2018**

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(Genti Saliu)



# Abstract





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# 1 Theoretical Foundation

## 1.1 The Standard Model of Particle Physics

**Table 1.1:** The fermions of the standard model. Source: [Pov14]

Fermions	Generation			Electric charge	Color	Weak isospin		Spin
	1	2	3			left-handed	right-handed	
Leptons	$\nu_e$	$\nu_\mu$	$\nu_\tau$	0	—	$1/2$	—	$1/2$
	e	$\mu$	$\tau$	−1			0	
Quarks	u	c	t	$+2/3$	r, b, g	$1/2$	0	$1/2$
	d	s	b	$-1/3$			0	

**Table 1.2:** The bosons of the standard model. Source: [Pov14]

Interaction	Acts on	Carrier of the force	Mass (GeV)	$J^P$
strong	color charge	8 gluons (g)	0	$1^-$
electromagnetic	electric charge	Photon ( $\gamma$ )	0	$1^-$
weak	weak charge	$W^\pm, Z^0$	80.4, 91.2	1

## 1.2 The Top Quark



## 2 Experiment

2.1 The Large Hadron Collider

2.2 The Compact Muon Solenoid Experiment



## 3 Statistical Methods





## 4 Event Simulation



## 5 Event Reconstruction



## 6 Analysis

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# Bibliography

[Pov14] Bogdan Povh, *Teilchen und Kerne : Eine Einführung in die physikalischen Konzepte*, 2014.





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