Search for high mass resonances in di-jet and di-*b*-jet events using 139 fb^{-1} of *pp* collisions at $\sqrt{s}$=13 TeV with the ATLAS detector

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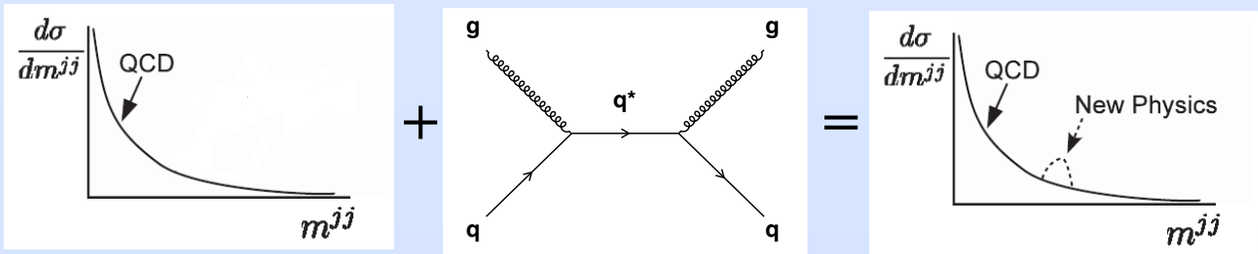
on behalf ATLAS collaboration

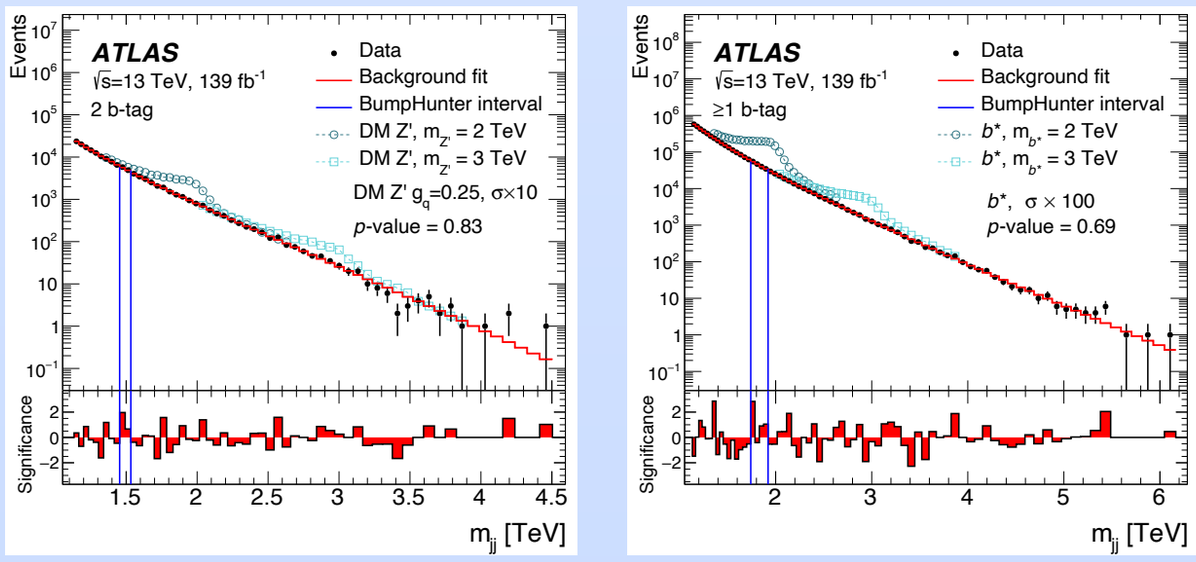
Introduction

Many Beyond Standard Model(BSM) models predict the existence of new heavy particles which couple to quarks and/or gluons. This poster presents the search for high mass resonances in di-jet and di-*b*-jet events using the full Run 2 *pp* collision data corresponding to 139 fb^{-1} collected by the ATLAS detector [1].

Dijet Resonance



- New mediators coupling to quarks and gluons yield a local excess of events in the dijet mass spectrum over the smoothly falling background described by the Standard Model.

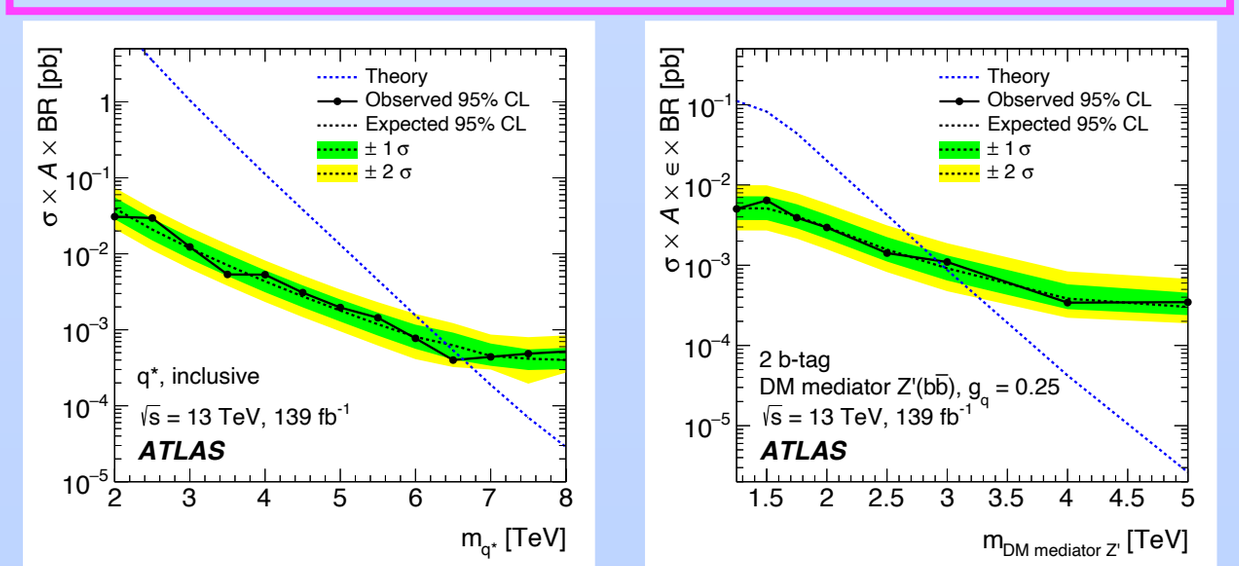


- An analytical function is used in Sliding Window Fitting to estimate background,

$$f(x) = p_1(1-x)^{p_2}x^{p_3+p_4 lnx}, x = m_{jj}/\sqrt{s}$$

- The BumpHunter algorithm is employed to to compare data and background to give a global *p*-value indicating the presence of a local excess.

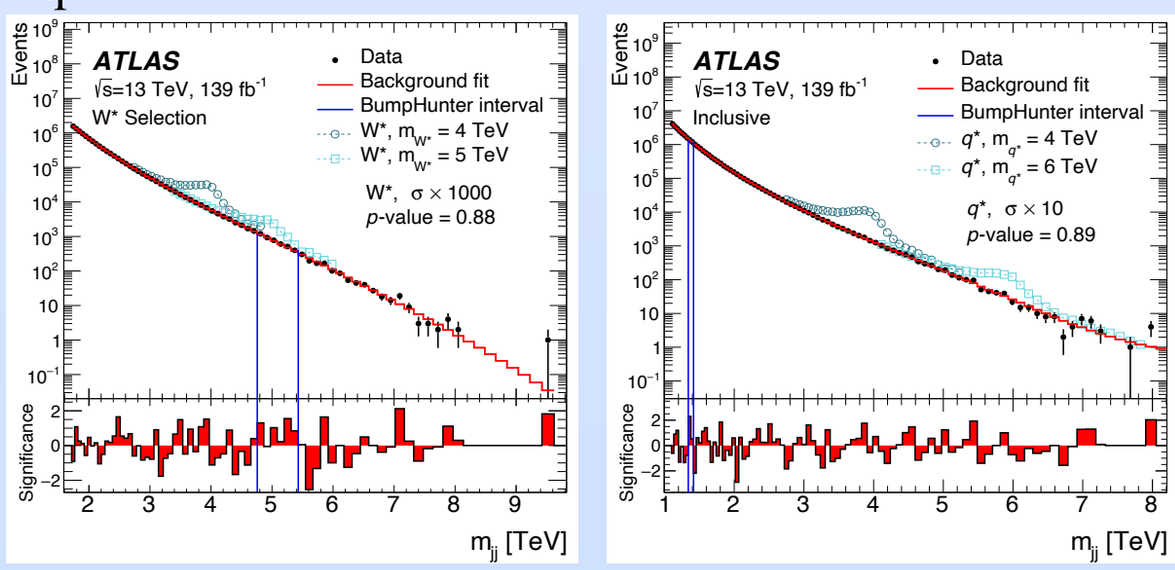
Limit Setting



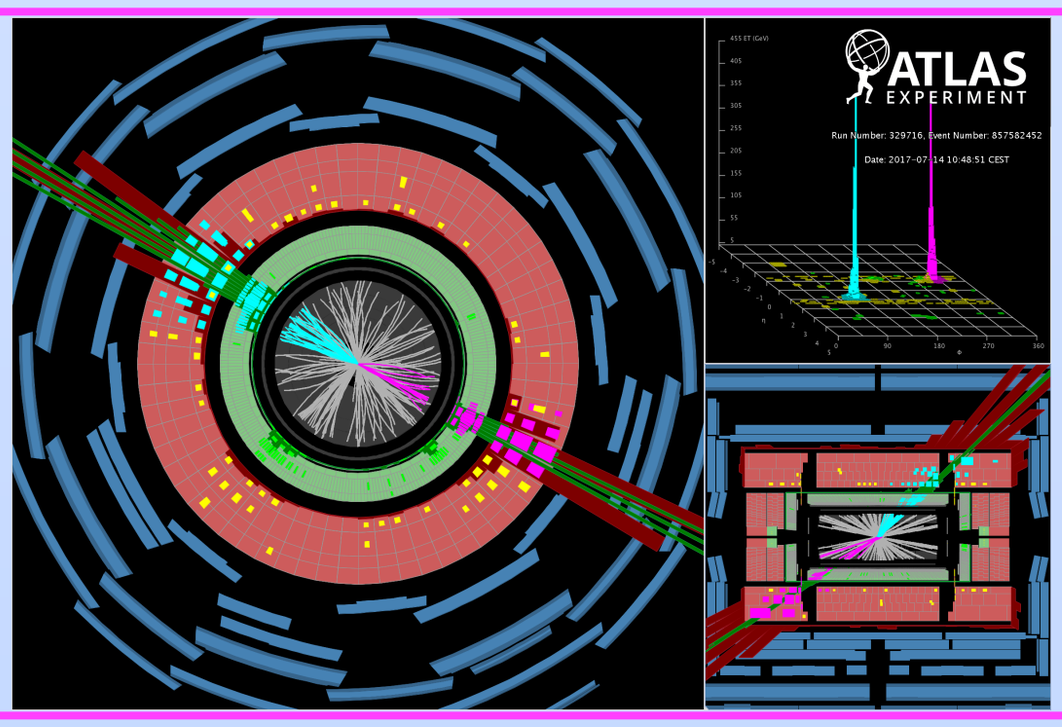
- CL_s technique is used to set upper limits on hypothetical models at 95% *CL*.
- Excited quark(*q**) with masses below 6.7 TeV, Sequential Standard Model(SSM) *Z'* with masses below 2.7 TeV have been excluded, more in [1].

Di-b-jet Resonance

- Depending on the BSM scenario, new mediators may decay preferentially into *b*-quarks, e.g. excited *b*-quarks.



Dijet Event Display



Summary

- No Significant excess is observed in all four search regions.
- So far, the strongest exclusion limits have been set on several benchmark models, like excited quark (*q**), heavy bosons (*W'*, *Z'*), excited boson (*W**).

Category	Model	Lower limit on signal mass at 95% CL	
		Observed	Expected
Inclusive	q^*	6.7 TeV	6.4 TeV
	QBH	9.4 TeV	9.4 TeV
	W'	4.0 TeV	4.2 TeV
	W^*	3.9 TeV	4.1 TeV
	DM mediator Z', $g_q = 0.20$	3.8 TeV	3.8 TeV
	DM mediator Z', $g_q = 0.50$	4.6 TeV	4.9 TeV
$1b$	b^*	3.2 TeV	3.1 TeV
$2b$	DM mediator Z' $g_q = 0.20$	2.8 TeV	2.8 TeV
	DM mediator Z', $g_q = 0.25$	2.9 TeV	3.0 TeV
	SSM Z',	2.7 TeV	2.7 TeV
	graviton, $k/\overline{M}_{PL} = 0.2$	2.8 TeV	2.9 TeV

Reference[1]: *J. High Energ. Phys. 2020, 145 (2020)*

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