



南京大學



中国ATLAS组年度报告

刘衍文 中国科学技术大学

代表中国ATLAS组

2017

感谢金山、杨海军、马连良、陈申见、陈新等老师提供材料



队伍规模 (数据日期 : 2017/12/12)

单位	成员	作者	physicists	博士生	硕士生
高能所	57	24	18	20	0
南京大学	6	3	4	2	0
清华大学	5	1	1	4	0
中国科大	58	27	20	20	9
山东大学	25	11	6	6	10
上海交大	19	12	9	10	0
李政道所	3	1	1	4	0
总数	173	79	59	66	19

作者数占ATLAS总数 2.8%

► **Institute of High Energy Physics (高能所)**

娄辛丑 (千人)、Joao Costa (外专千人)、欧阳群、庄胥爱 (百人)、方亚泉 (青千)、朱宏博 (青千)、黄燕萍 (青千)、梁志均 (百人)、史欣 (青千)、李一鸣 (青千)、吕峰、单连友、徐达

► **Nanjing University (南大)**

陈申见、祁鸣、金山 (万人、杰青)

► **Tsinghua University (清华)**

陈新 (青千)

USTC-SJTU-SDU cluster

► Shandong University (山大)

张学尧、马连良（青千）、冯存峰、祝成光、李海峰

► Shanghai Jiao Tong University (上海交大)

杨海军（青千）、李亮（青千）、郭军（青千）、周宁（青千）

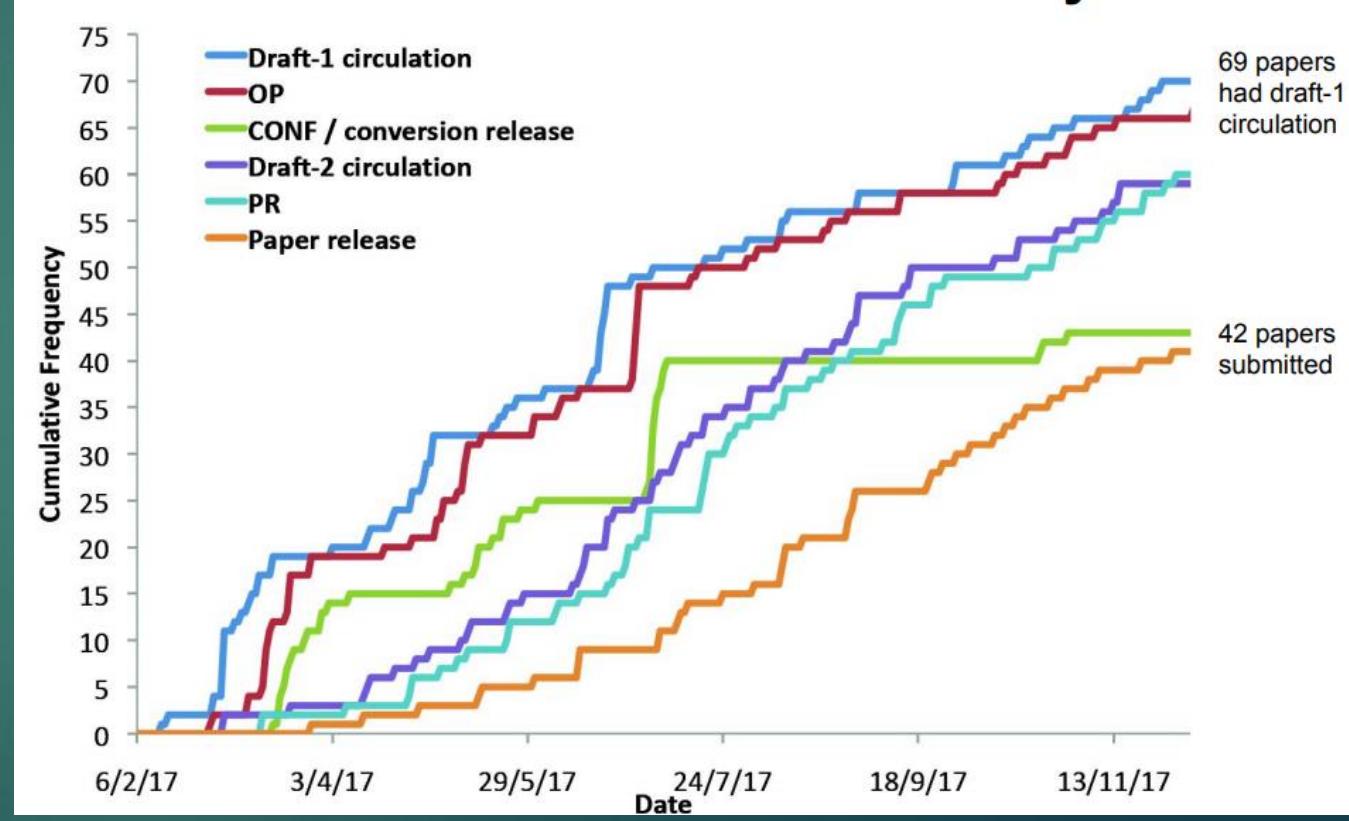
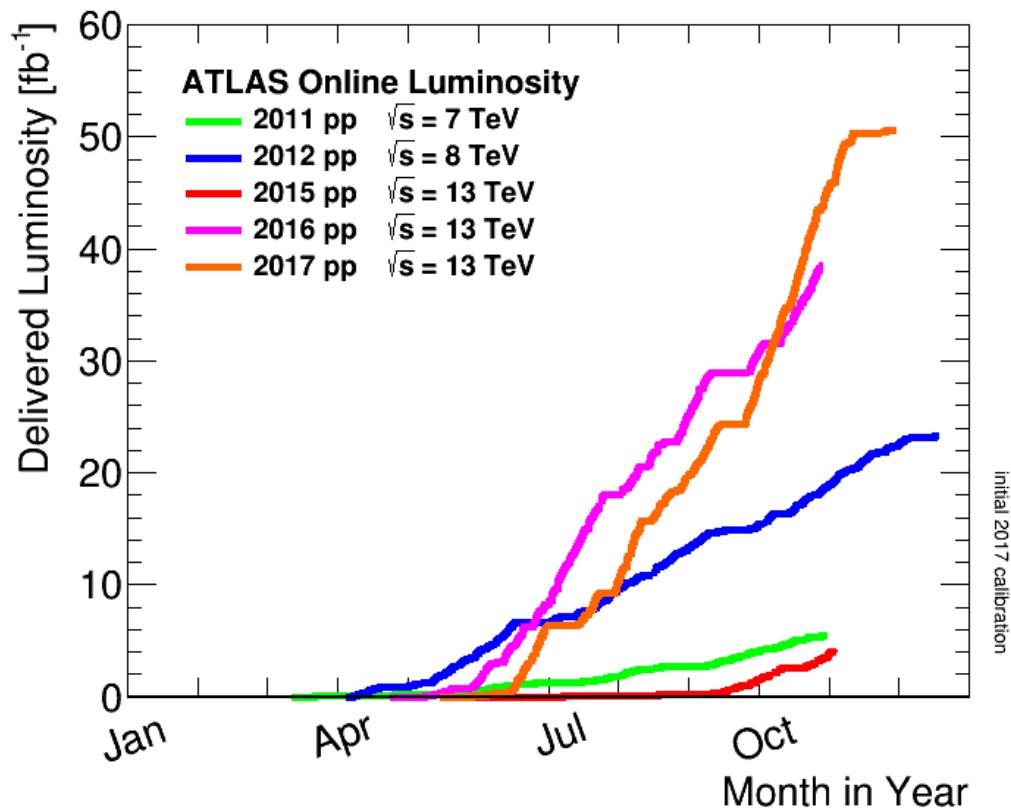
► T. D. Lee Institute (李政道所)

李数

► University of Science and Technology of China (科大)

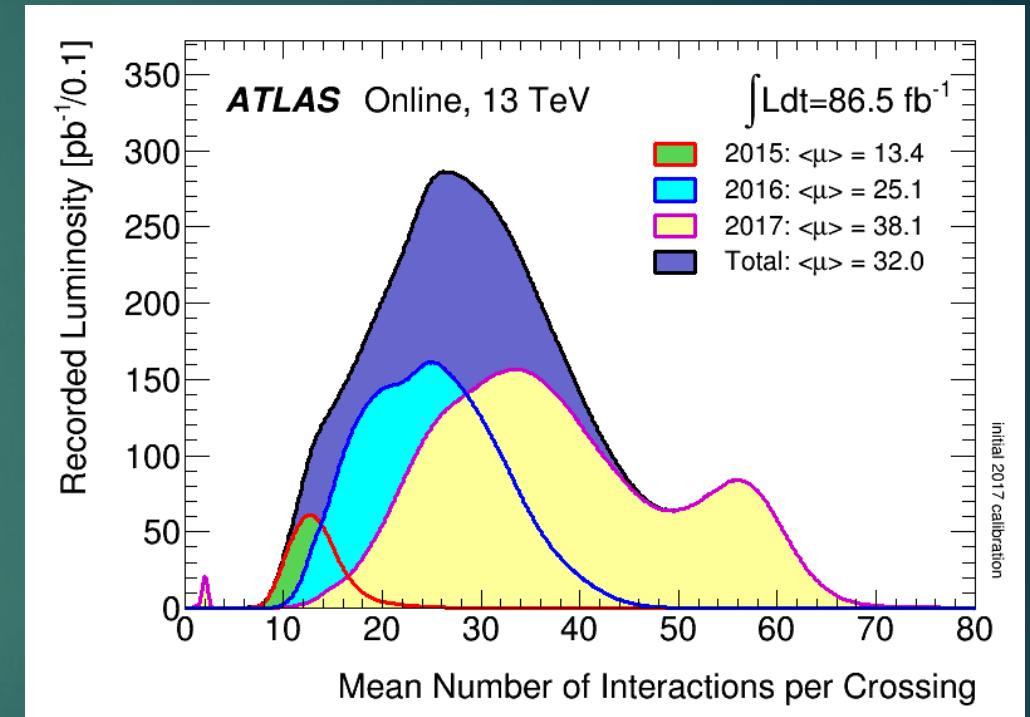
赵政国（院士、千人）、韩良（万人、杰青）、蒋一、刘衍文（优青）、刘建北（青千）、彭海平（杰青、百人）、朱莹春、刘明辉、吴雨生（青千）、Rustem Ospanov

实验总体情况



探测器运行及重建软件相关研究

- ▶ [高能所] τ 重建软件、数据质量监控软件
- ▶ [高能所]顶点重建软件的优化
- ▶ [高能所]像素探测器数据获取
- ▶ [高能所]光子鉴别效率测量、电子对效应比例测量
- ▶ [上交大]喷注能量标定和性能研究
- ▶ [中科大]RPC,BME数据分析、取数监控
- ▶ [中科大]MDT气体系统管理维护
- ▶ [中科大]缪子探测器位置对齐对性能的影响
- ▶ [中科大]B-tagging效率测量
- ▶ [中科大]光子、电子、缪子能量刻度
- ▶ [中科大]前端电子鉴别
- ▶ [中科大]基于多元分析方法的硬过程轻子判选方法



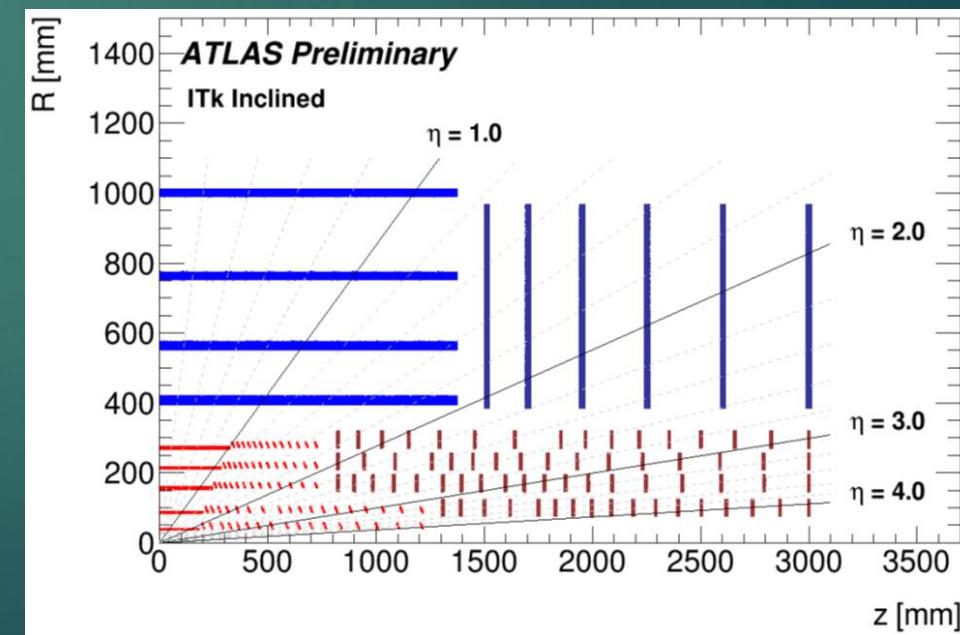
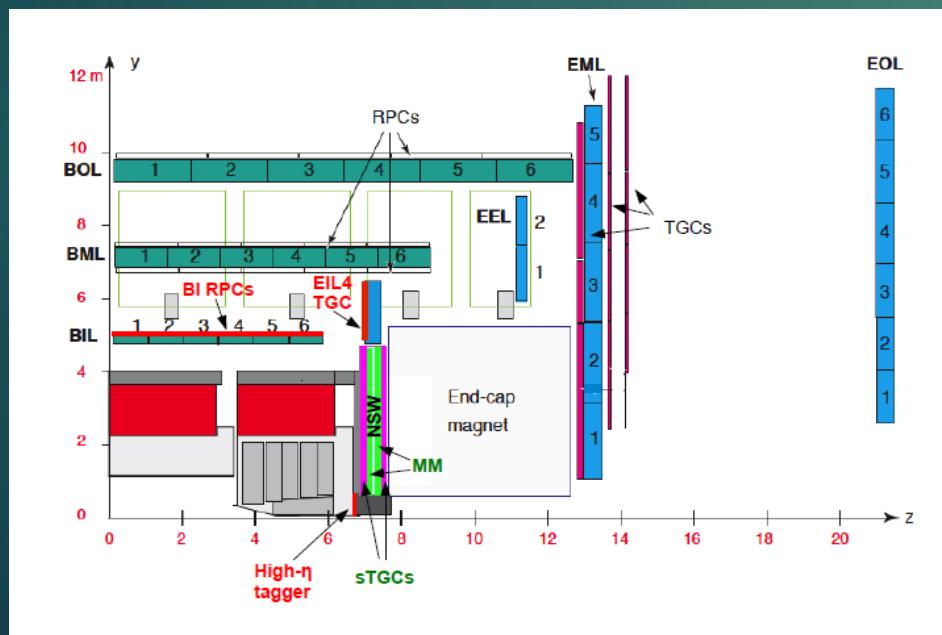
合作组内的重要任命(可能不完整)

- ▶ Speakers Committee Advisory Board member: 陈新
- ▶ Collaboration board Advisory group member: 杨海军
- ▶ Convener of MC Validation subgroup : 李数
- ▶ Convener of Electroweak subgroup : 李数
- ▶ Convener of Onia production and b cross sections: 吴雨生
- ▶ Convener of Photon Identification subgroup: 黄艳萍
- ▶ Deputy Pixel Run Coordinator: Juan Antonio Garcia
- ▶ Pixel DAQ Coordinator: Juan Antonio Garcia
- ▶ Analysis contacts: 很多

探测器升级

见韩良报告
及Upgrade session

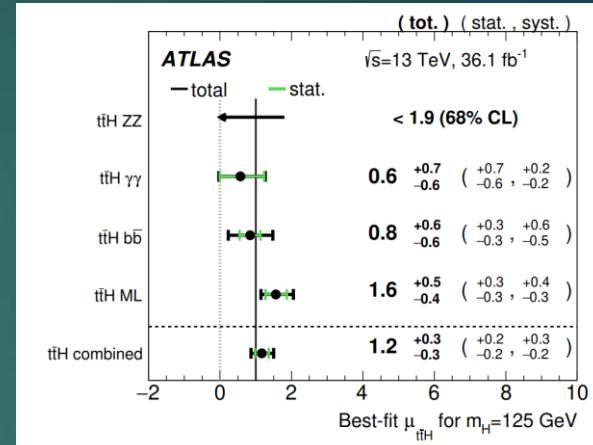
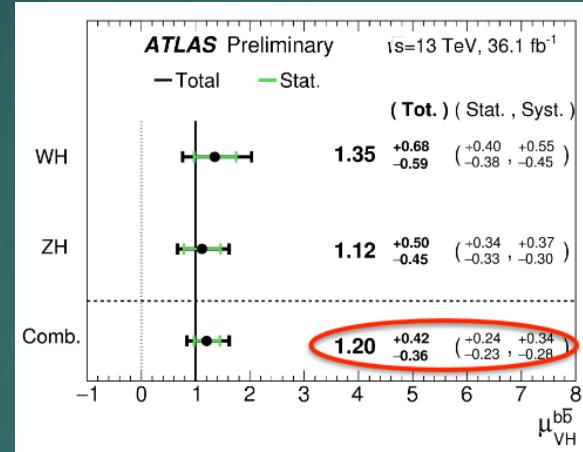
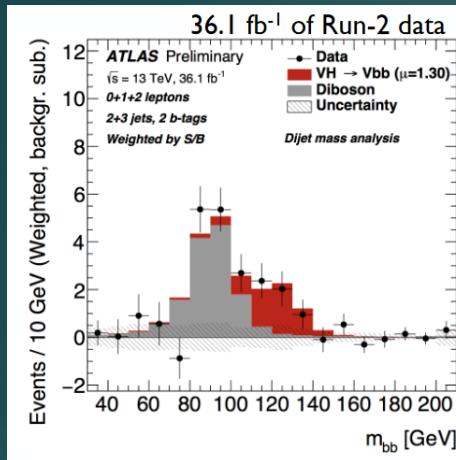
- ▶ [科大+山大] Phase I : NSW sTGC (1/6) + 前端电子学读出板(全部)
- ▶ [科大+山大+交大] Phase II: BIRPC (及电子学), forward tagger(mRWELL)
- ▶ [高能所+清华] Phase II: Si strips



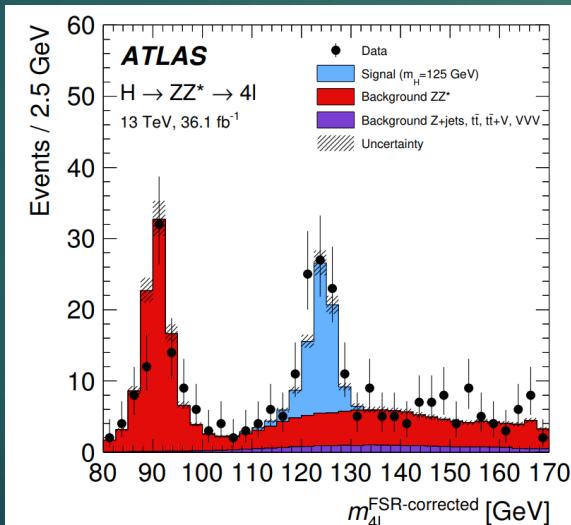
Higgs物理进展（一）

- ▶ bb : (山大、科大、南大) [JHEP 12 (2017) 024]
李昌樵、李海峰、刘衍文、马连良、马延辉
- ▶ $\mu\mu$: (山大、科大) [PRL 119 (2017) 051802] 编辑推荐文章
李海峰、刘彦麟、吴雨生、赵政国
- ▶ $\tau\tau$: (清华) [HIGG-2017-07]
陈新
- ▶ $t\bar{t}H$, (山大、科大、交大、高能所) 多轻子末态[HIGG-2017-02]
王超、王子瑞、冉坤林、Rustem Ospanov
- ▶ $ZZ(4l)$: (科大、交大) JHEP 10(2017)132
李京、王融坤、杨海军、赵政国、Marc Cano Bret

Higgs相关重要结果（一）

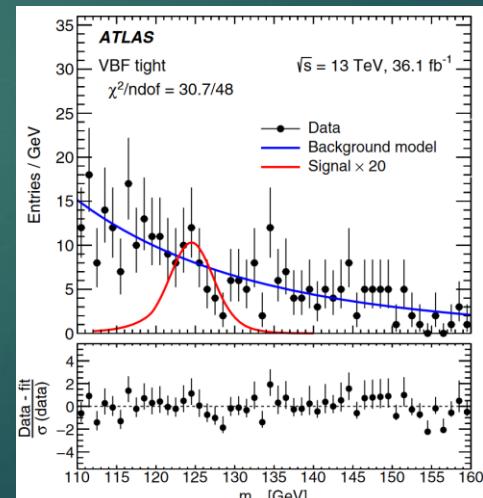


bb: 信号显著度: 3.5σ



ZZ (4l) 检验SM

ttH 信号显著度: 4.2σ

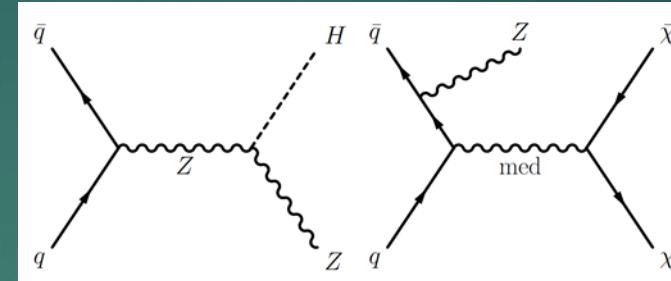
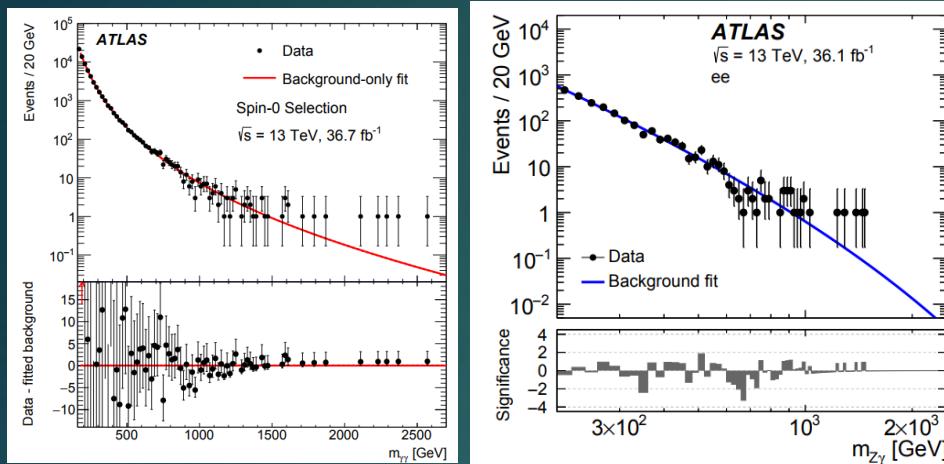


$\mu\mu$: 2.8倍于SM的信号被排除

Higgs物理进展(二)

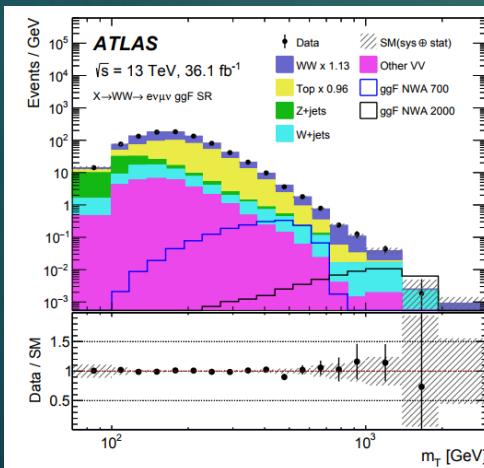
- ▶ $Z\gamma$: (高能所、南大) arXiv:1708.00212
金山、黄艳萍、彭聰、韩朔
- ▶ 高质量 $\gamma\gamma$: (高能所、南大、交大) arXiv:1707.04147
金山、黄艳萍、彭聰、王子瑞、韩朔、杨海军
- ▶ 高质量WW: (山大、科大、高能所) arXiv: 1710.01123
Javier Llorente, Joao Costa, 张学尧、马连良、刘明辉、韩良、朱莹春、Zuzana Blenessy、赵永柯、张广义、韩坤霖、李直、徐钟煜坤
- ▶ 不可见衰变: (科大) [arXiv:1708.09624 , PLB 776 (2017), 318]
吴雨生

Higgs相关重要结果(二)

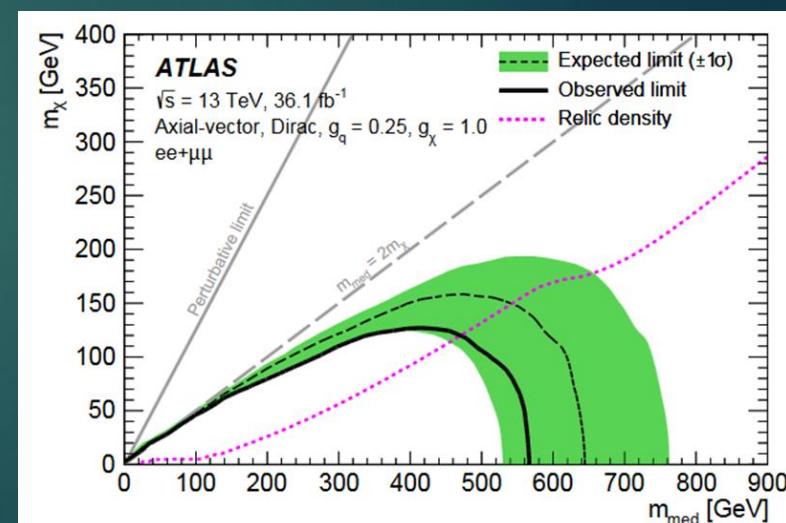
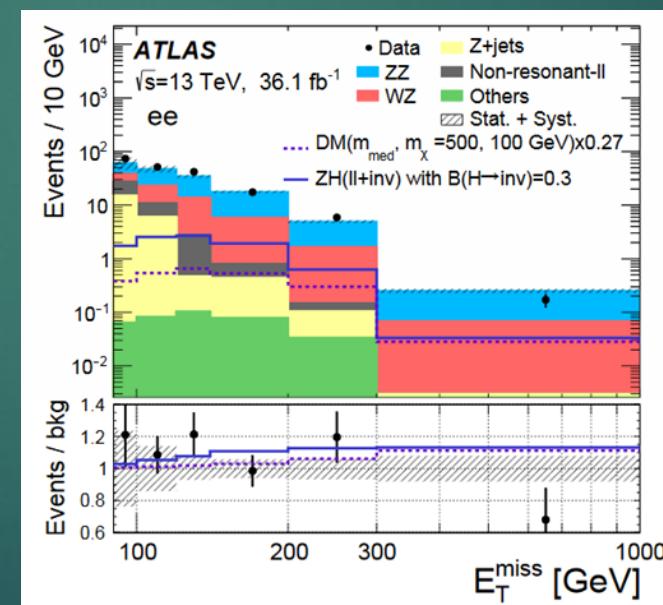


标准模型 $H \rightarrow ZZ \rightarrow l\bar{l}l\bar{l}$ 分支比为 $1.06E-03$
双轻子 + 丢失横动量末态限制暗物质模型

$\gamma\gamma$: 质量谱上无共振结构 $Z\gamma > 6.6$ 倍SM被排除



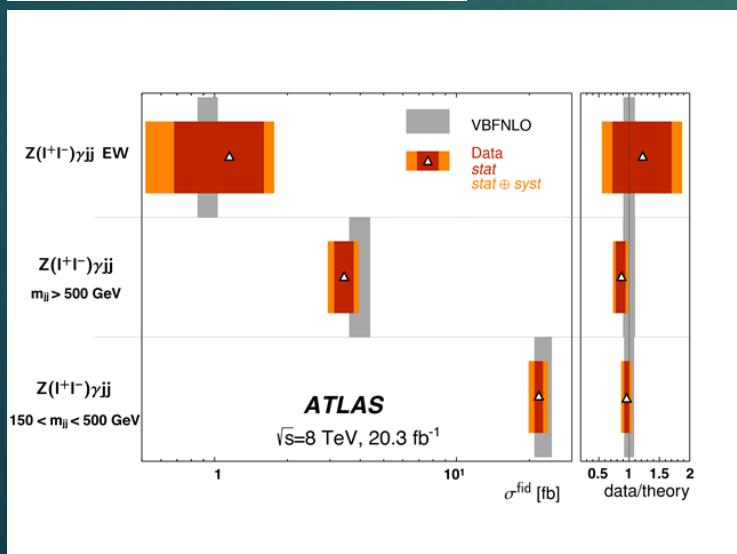
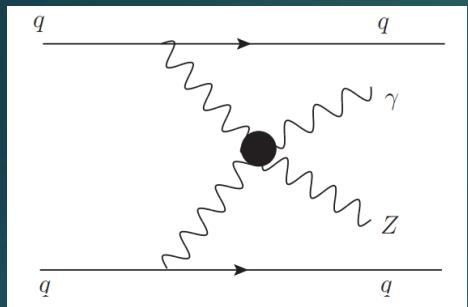
WW: 数据与本底一致



标准模型测量进展（一）

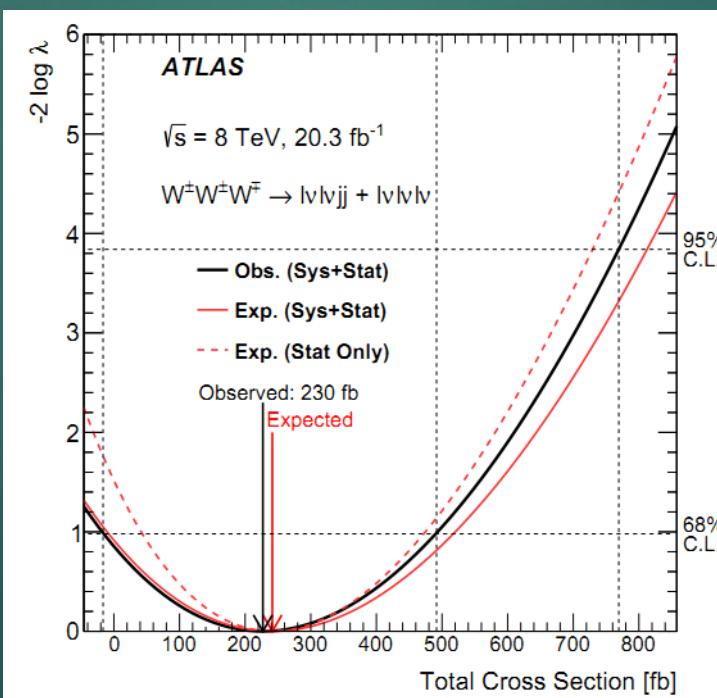
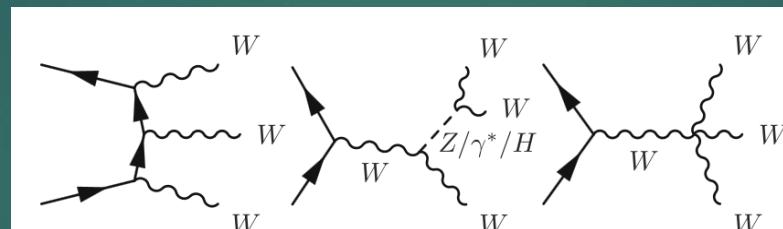
Z γ VBS JHEP07(2017)107

李数、梁志均
李政道所、高能所

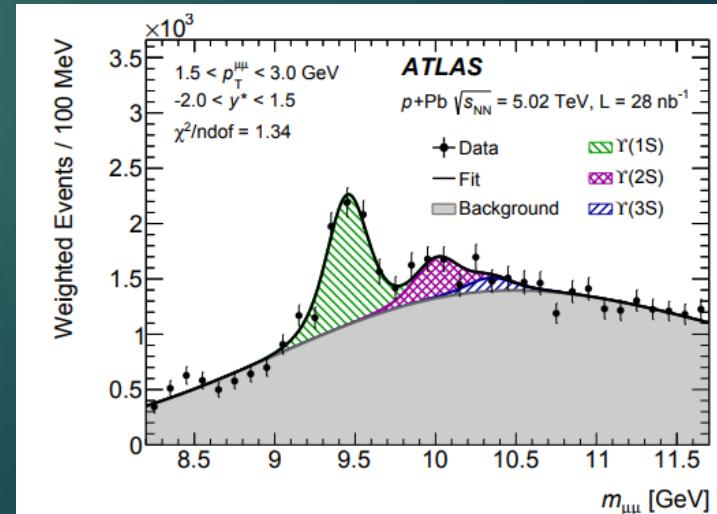
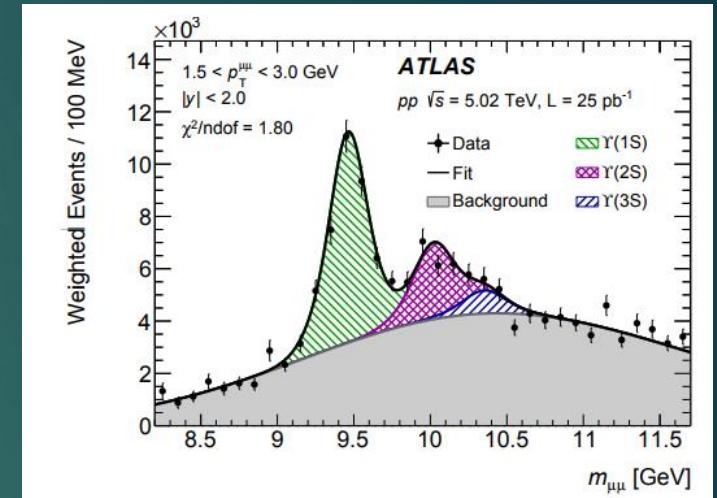


信号显著度: 2σ

WWW: Eur. Phys. J. C (2017) 77: 141
科大: 刘建北、刘衍文、章瑞麒



夸克偶素产(pp,pPb)arXiv:1709.03089
科大: 胡启鹏、陈婧、韩坤霖、朱莹春



标准模型测量进展（二）

α_s Eur. Phys. J. C (2017) 77:872

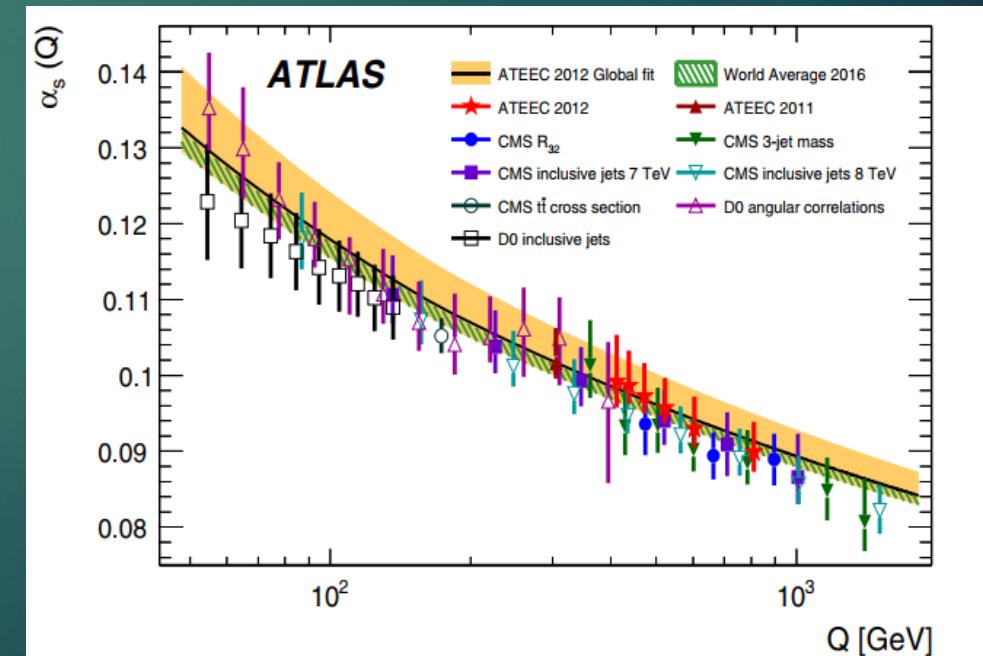
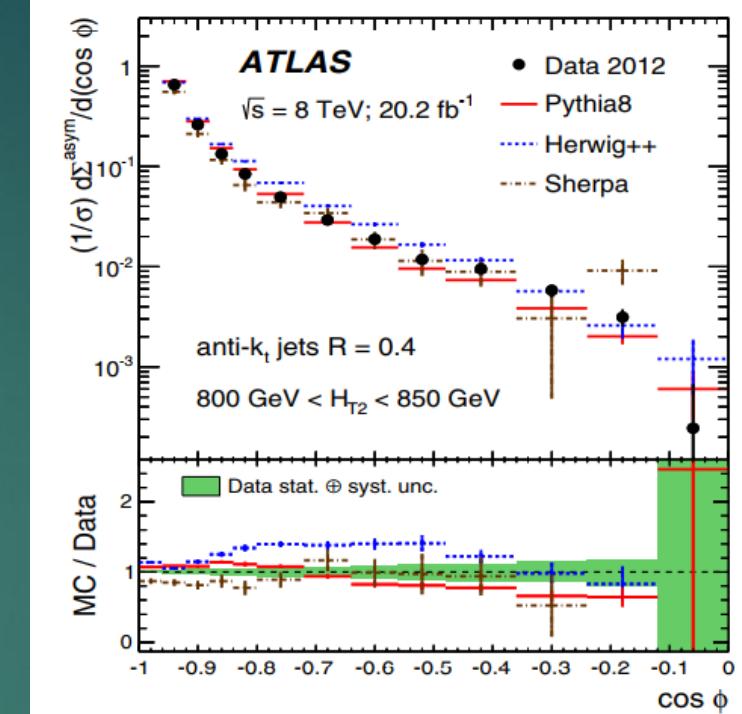
Javier LLORENT MERINO,

高能所

$$\begin{aligned} \frac{d\Sigma}{d\cos\phi} &\equiv \frac{1}{\sigma} \sum_{ij} \int \frac{d\sigma}{dx_{Ti} dx_{Tj} d\cos\phi} x_{Ti} x_{Tj} dx_{Ti} dx_{Tj} \\ &= \frac{1}{N} \sum_{A=1}^N \sum_{ij} \frac{E_{Ti}^A E_{Tj}^A}{\left(\sum_k E_{Tk}^A\right)^2} \delta(\cos\phi - \cos\phi_{ij}) \end{aligned}$$

N: Number of multi-jet events

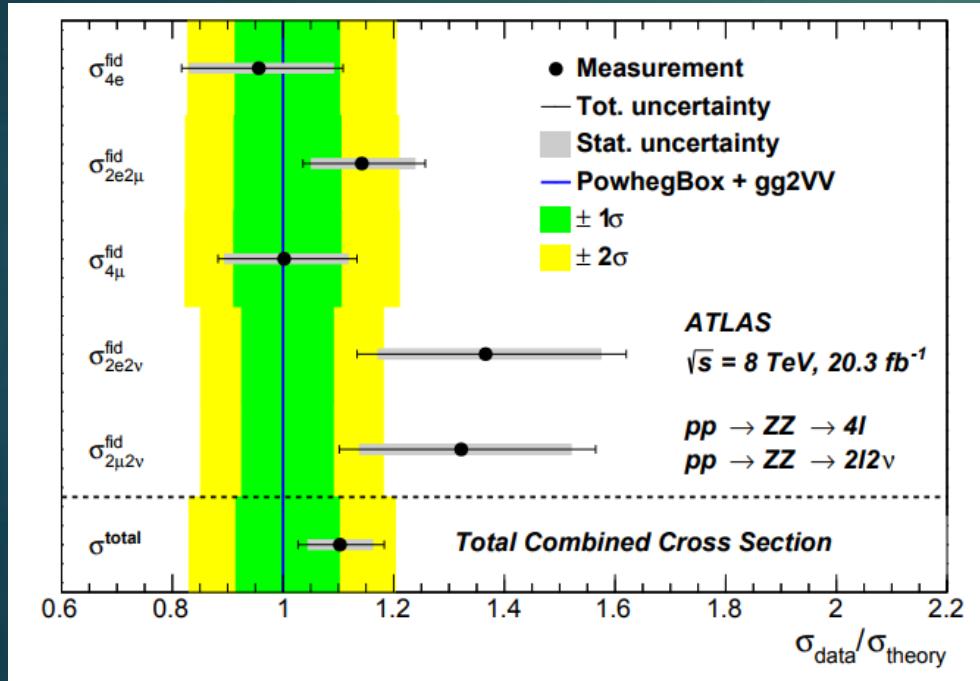
$$\frac{1}{\sigma} \frac{d\Sigma^{\text{asym}}}{d\cos\phi} \equiv \frac{1}{\sigma} \frac{d\Sigma}{d\cos\phi} \Big|_\phi - \frac{1}{\sigma} \frac{d\Sigma}{d\cos\phi} \Big|_{\pi-\phi}$$



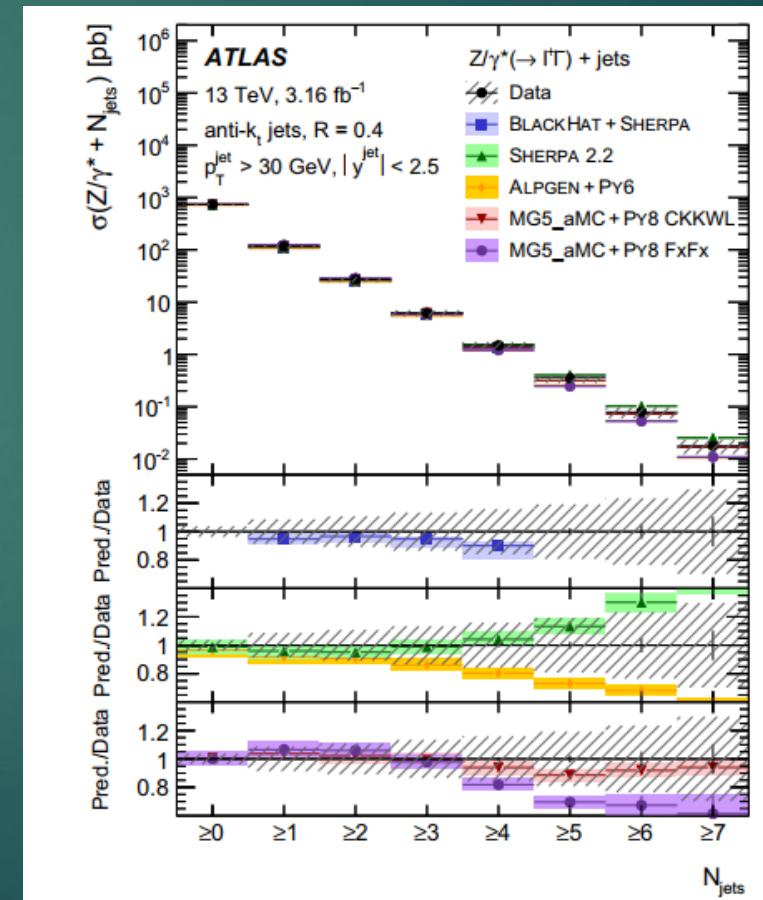
标准模型测量进展（三）

ZZ in 4L JHEP 01 (2017) 099

梁志均、赵政国
高能所、科大



Z+jets Eur. Phys. J. C77 (2017) 361
单连友, Joao Costa
高能所



SUSY进展

高能所、南大

- 利用双tau事例寻找stau [arXiv:1708.07875]

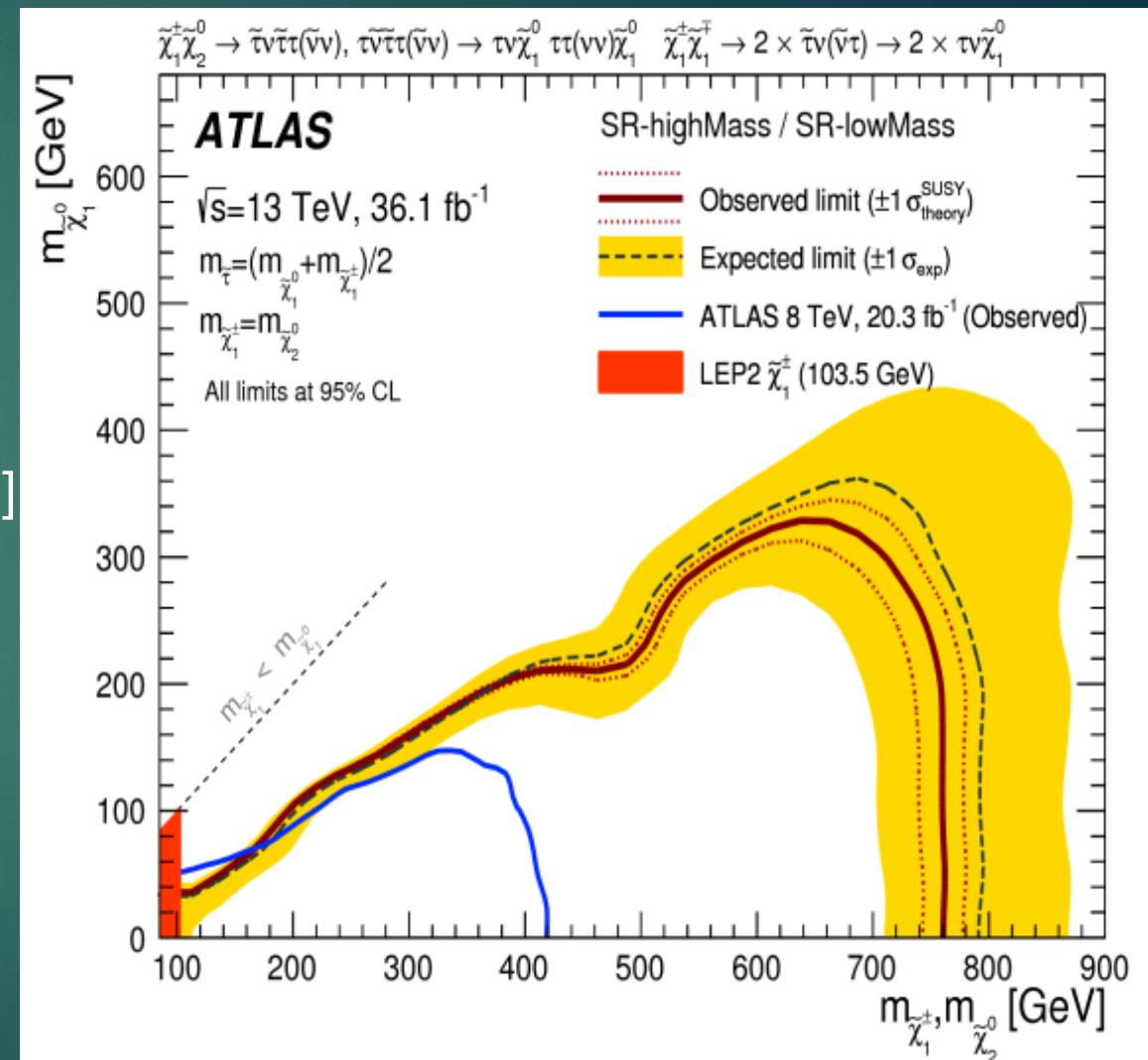
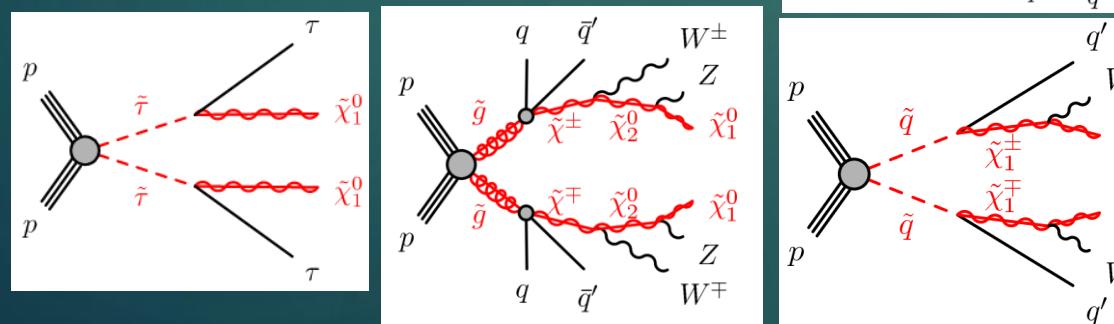
庄胥爱、徐达、金山、祁鸣、程华杰、张鹏

- 利用单轻子事例寻找SUSY [arXiv:1708.08232]

徐达，庄胥爱，金山，程华杰

- 利用三轻子/同号二轻子寻找SUSY [arXiv:1706.03731]

庄胥爱、金山、刘洋、仁欢



超出标准模型新物理的寻找（一）

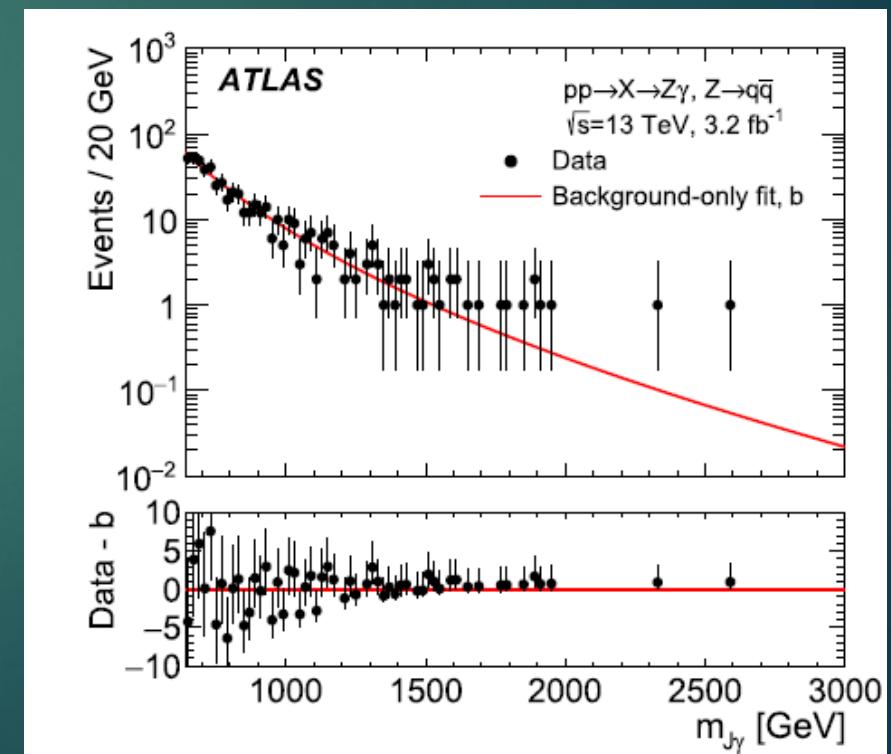
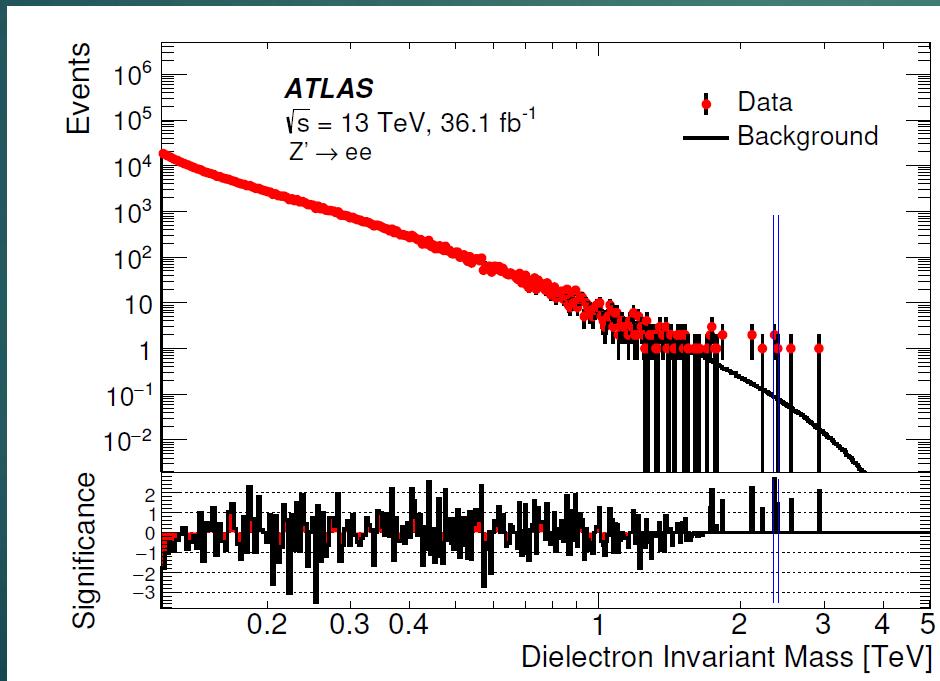
17

- ▶ 双轻子共振峰 [arXiv:1707.02424, JHEP 10 (2017) 182] 科大、交大

Marc Cano Bret, 刘彦麟、赵政国、郭军、杨海军

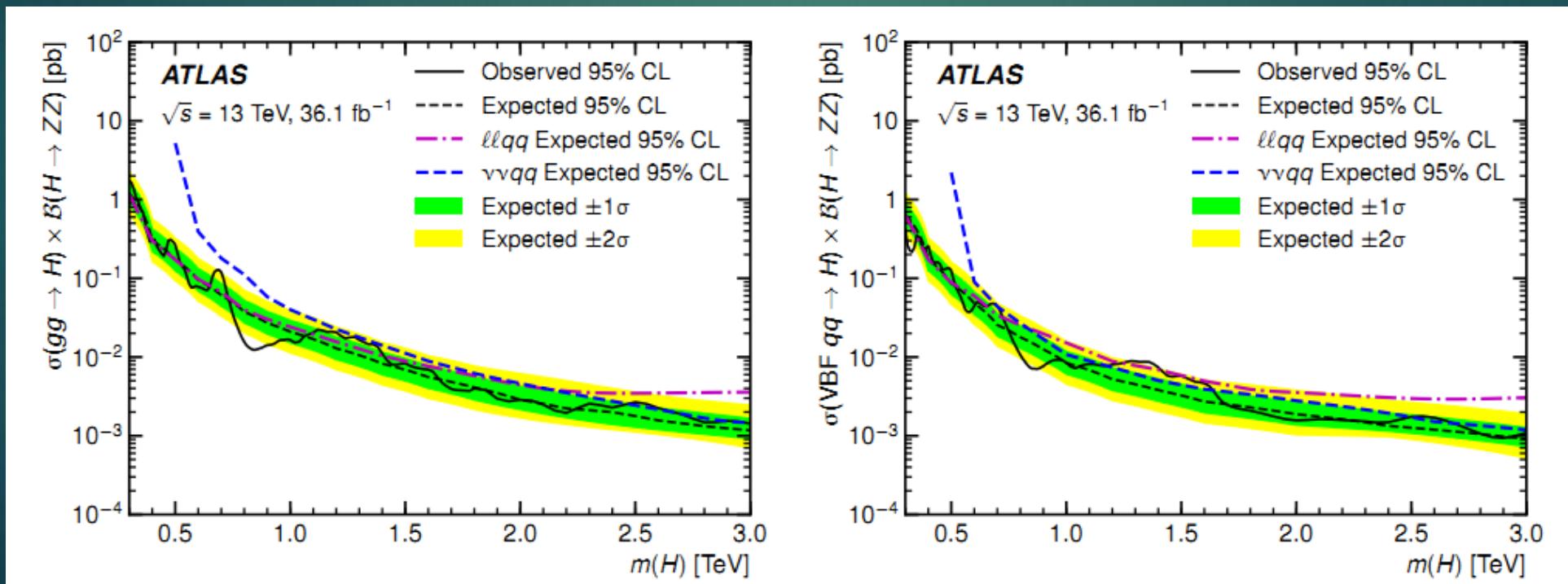
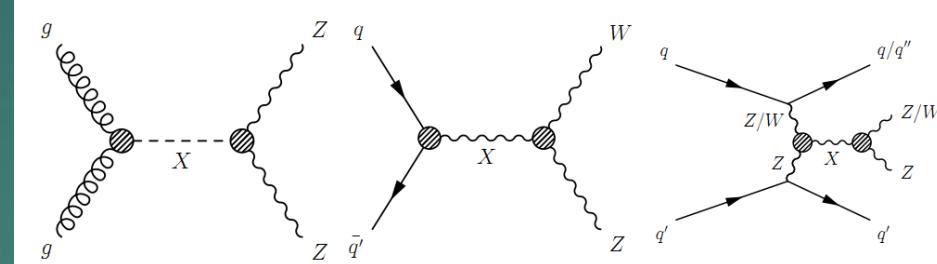
- ▶ $Z\gamma$ 共振峰 [Phys. Lett. B 764 (2017) 11] 高能所、交大、李政道所、南大

方亚泉，周宁、金山、梁志均、李数、黄艳萍、李亮、彭聪、韩朔、Nishu Nishu



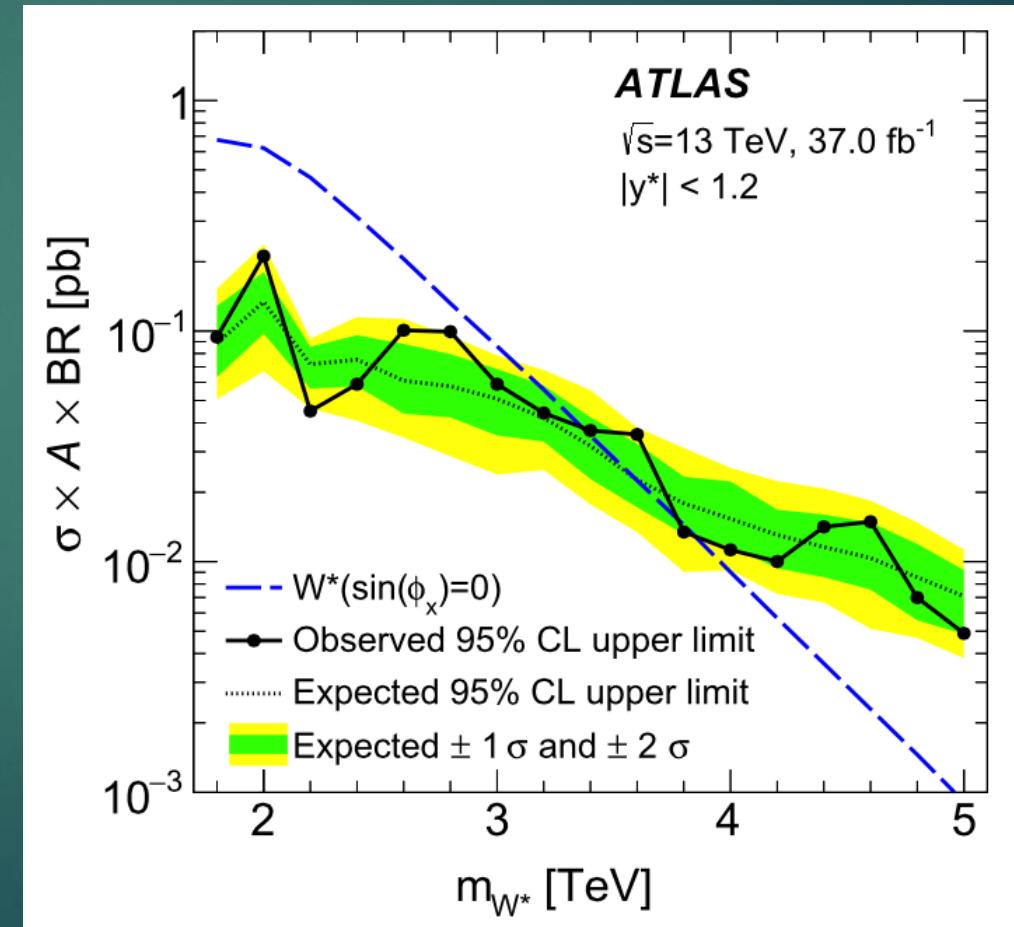
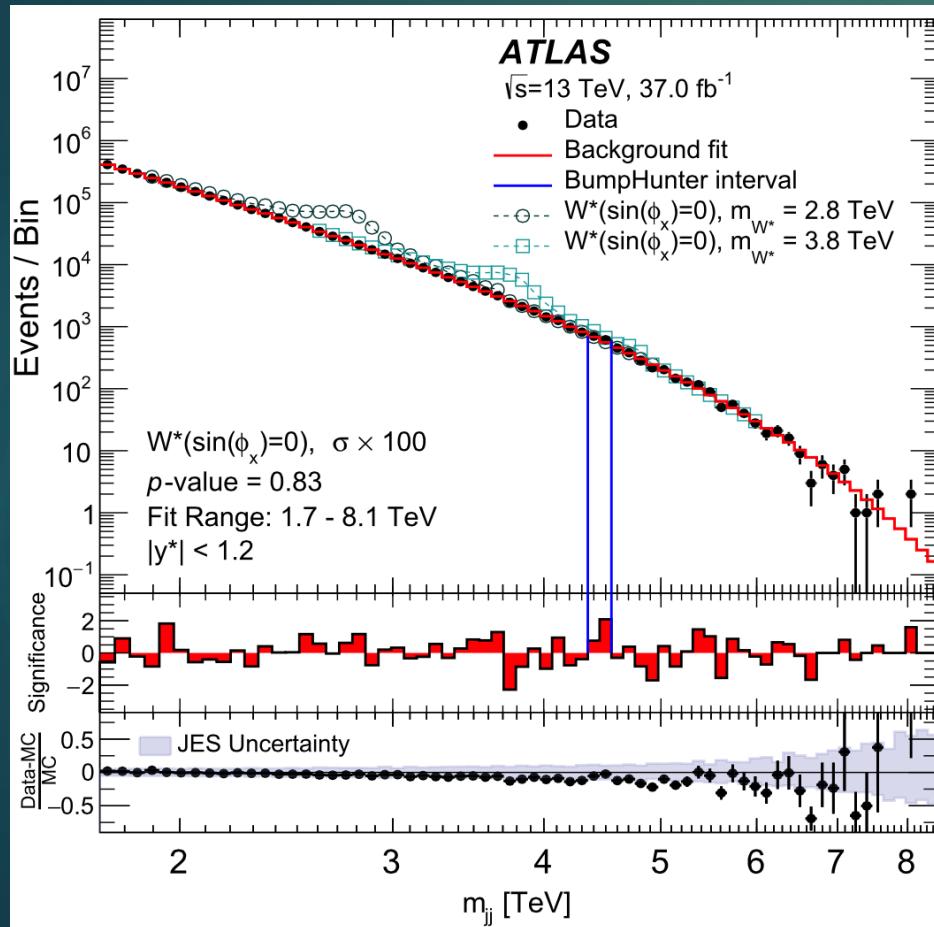
超出标准模型新物理的寻找（二）

- ZZ,ZW共振峰 (H, W' , 引力子) $W/Z \rightarrow qq$ (双喷注或单喷注) [arXiv:1708.09638] 科大
郭毅成、赵政国



超出标准模型新物理的寻找（三）

- ▶ 双喷注共振峰[arXiv:1703.09127, PRD 96(2017)052004] 山大
张登峰



2017年文章总结（投稿、发表 20篇）

20

- ▶ 希格斯相关：7（6家单位全体参与）
- ▶ 标准模型：6（科大，高能所、李政道所）
- ▶ SUSY：3（高能所、南大）
- ▶ 超标准模型：4(科大、山大、交大、李政道所、高能所)
- ▶ 此次CLHCP: 3个大会报告+22 个分会报告 + 12 张墙报

- ▶ PANIC17 , Production of b and c hadrons with the ATLAS detector , 陈婧
- ▶ SQM2017, Recent heavy-flavour results from ATLAS, 陈婧
- ▶ EPS-HEP 2017 , Vector boson scattering, triple gauge-boson final states and limits on anomalous quartic gauge couplings with the ATLAS detector, 李冰
- ▶ QFTHEP 2017, Overview of Standard Model Measurements with the ATLAS Detector 刘衍文
- ▶ LHCP 2017, SUSY strong production (hadronic) with ATLAS 刘明辉
- ▶ DIS 2017 , Searches for new phenomena in final states involving 'leptons and jets' or involving leptons using the ATLAS detector 刘彦麟
- ▶ MoriondQCD 2017, QCD with jets and photons at Atlas and CMS Zuzana Blenessy

- ▶ LP2017, A search for the Higgs boson produced via vector boson fusion and decaying to $b\bar{b}$ with the ATLAS detector 梁志均
- ▶ EPS-HEP 2017 , Measurements of the production of jets in association with a W or Z boson with the ATLAS detector, 单连友
- ▶ QFTHEP 2017 Searches for electroweak production of supersymmetric gauginos and sleptons with the ATLAS detector 程华杰
- ▶ Blois2017 Searches for Supersymmetry in ATLAS 徐达
- ▶ LHCP 2017 Higgs results with direct top and b-Yukawas with ATLAS 梁志均
- ▶ LHCP 2017, SUSY RPV Searches 庄胥爱
- ▶ DIS 2017 , QCD and Electroweak Measurements at the LHC Joao Barreiro Guimaraes da Costa
- ▶ TIPP 2017, Expected performance of the ATLAS Inner Tracker at High Luminosity LHC, Jason Dhia Mansour
- ▶ PSD 11, Operational Experience and Performance with the ATLAS Pixel detector, Juanan Garcia

- ▶ BSM 2017 , Summary of ATLAS SM results 李兴国
- ▶ GRC2017, Dark Matter Searches in Colliders, 周宁
- ▶ DIS 2017 , Measurements of the production of jets in association with a W or Z boson with the ATLAS detector , Natalia Kondrashova
- ▶ IHEP-T2E 2017 Searches in ATLAS Natalia Kondrashova

- ▶ HC 2017, Higgs production in electroweak processes, 马连良
- ▶ Corfu2017 , Search for ttH production in the 3 lepton final state at ATLAS 王超
- ▶ Pheno 2017, Top quark properties and mass measurements with the ATLAS detector 祝成光

墙报(posters : 21)

25

1. PANIC2017, Search for di-Higgs production with the ATLAS detector , 周茂森 高能所
2. PANIC2017, "Search for the 125 GeV Higgs boson in the ttH production mode with the ATLAS detector" 胡舒旸 交大
3. PANIC2017, Measurement of jet production with the ATLAS detector and extraction of the strong coupling constant , Javier Llorente Merino , 高能所
4. EPS-HEP 2017 , Property measurements of the Higgs boson in the diphoton decay channel with the ATLAS detector at the LHC , 胡袆凡、 高能所
5. PANIC17, Searches for supersymmetry in resonance production, R-parity violating signatures and events with long-lived particles with the ATLAS detector,刘洋 , 高能所
6. LHCP 2017,Search for high-mass Zgamma resonances and for the Zgamma decays of the 125 GeV Higgs boson in di-lepton plus photon final states with 13 TeV pp collisions with the ATLAS detector 韩朔 , 高能所
7. LHCP 2017 Measurements of the Higgs Boson fiducial and differential cross sections in the 4l decay channel at 13 TeV with the ATLAS detector 彭聪 , 高能所
8. LHCP 2017, Measurement of simplified template cross sections in the H->gammagamma decay channel with 13 TeV proton-proton collision data with the ATLAS detector 张慧君 南大
9. LHCP 2017, Measurement of VBF Higgs boson production at $\sqrt{s}=13$ TeV in the diphoton final state with the ATLAS detector 章宇 高能所
10. LHCP 2017, Search for a high mass Higgs boson in the H->WW->e nu mu nu channel in pp collisions at $\sqrt{s}=13$ TeV with the ATLAS detector 赵永柯 山大
11. LHCP 2017, Search for supersymmetry in final states with two hadronically decaying tau leptons at ATLAS, 程华杰 高能所
12. LHCP 2017, Search for squarks and gluinos in final states with two same-sign or three leptons at ATLAS 刘洋, 高能所
13. LHCP 2017 Search for a Standard Model Higgs boson produced in association with a vector boson and decaying to a pair of b-quarks in p p collisions at 13 TeV using the ATLAS detector , 马延辉 , 山大
14. LHCP 2017 Search for Higgs boson pair production in the final state of $yyWW^*(-->lnujj)$ using collision data recorded at $\sqrt{s}=13$ TeV with the ATLAS detector 李奇 , 高能所
15. LHCP 2017 Search for new phenomena in different-flavour high-mass dilepton final states in proton-proton collisions at a centre-of-mass energy of 13 TeV, Marc Cano Bret, 交大
16. LHCP 2017 Search for di-jet resonances with one or two jets identified as b-jets in proton-proton collisions at 13 TeV with the ATLAS detector Nishu Nishu 清华
17. LHCP 2017 Search for new phenomena in dijet events with the ATLAS detector at $\sqrt{s} = 13$ TeV 张登峰 , 山大
18. LHCP 2017 Measurements of photon identification efficiencies with the 2015 and 2016 pp collision data in ATLAS at $\sqrt{s}= 13$ TeV 韩朔 , 高能所
19. LHCP2017 , Measurements of integrated and differential cross sections for isolated photon pair production in pp collisions at $\sqrt{s} = 8$ TeV with the ATLAS detector , 李兴国
20. QM2017 Measurement of bottomonium production in p+Pb and pp collisions at 5 TeV with ATLAS detector 陈婧 , 科大
21. LP17, Muon identification and performance in the ATLAS experiment 张丽青 科大

总结

- ▶ ATLAS-CN: 不断成长，目前包含7家单位，作者数占总数~2.8%。在合作组中发挥越来越大的作用。
- ▶ 2017年：
 - ▶ 对Higgs所知越多，越“像” 标准模型。费米子衰变方面取得重大进展。
 - ▶ 标准模型：开始研究稀有的电弱过程。
 - ▶ SUSY: 超对称粒子更大质量范围被排除
 - ▶ Exotics: 双轻子、双玻色子、双喷注事例中未见新粒子迹象。
- ▶ 2018年: 完成Run 2取数，期待更多有意思的物理结果！

