Multilepton signatures from tZq interactions in the SM and top-FCNC

On behalf of the CMS collaboration
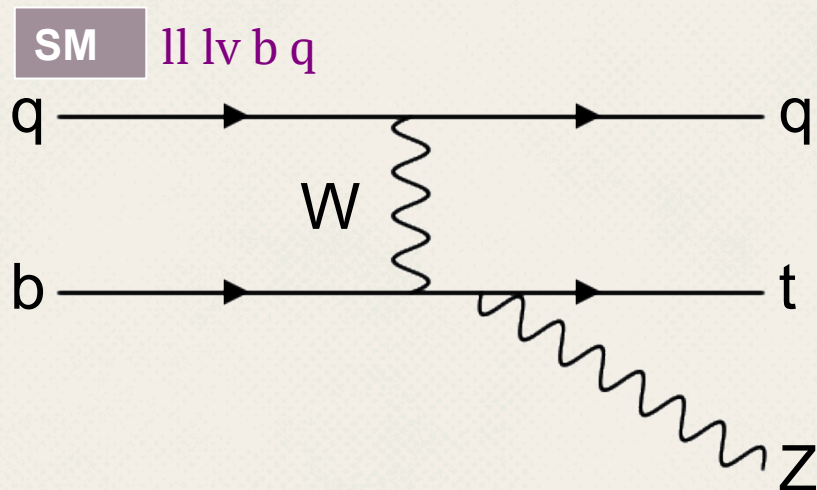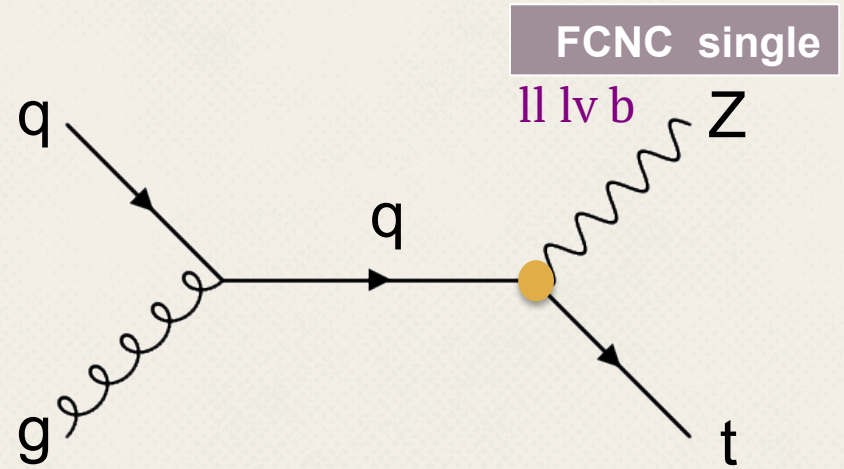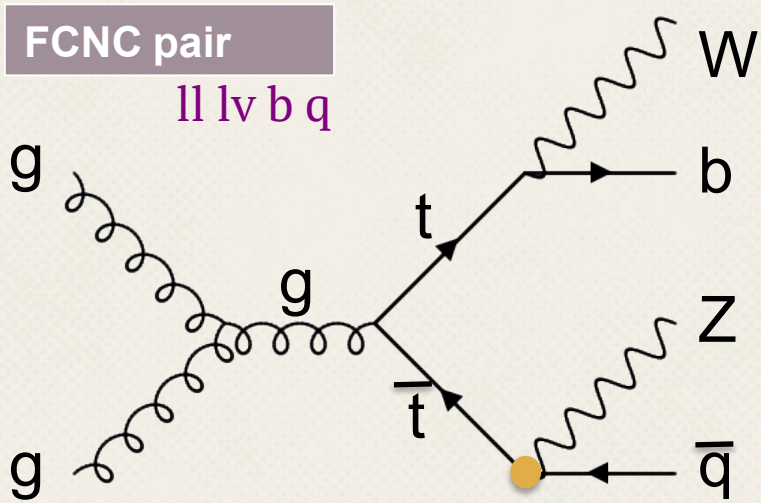Isis Van Parijs – VUB - IIHE
YSF TOP2016

3 lepton signatures from tZq interactions in the SM and top-FCNC

On behalf of the CMS collaboration
Isis Van Parijs – VUB - IIHE
YSF TOP2016

8 TeV

Searching for the three lepton final state in

① **Top pair production**
② **Single top production**

FCNC pair

ll lν b q

g

g

g

$\bar{t}$

t

W

b

Z

$\bar{q}$

FCNC single

ll lν b

q

q

g

Z

t

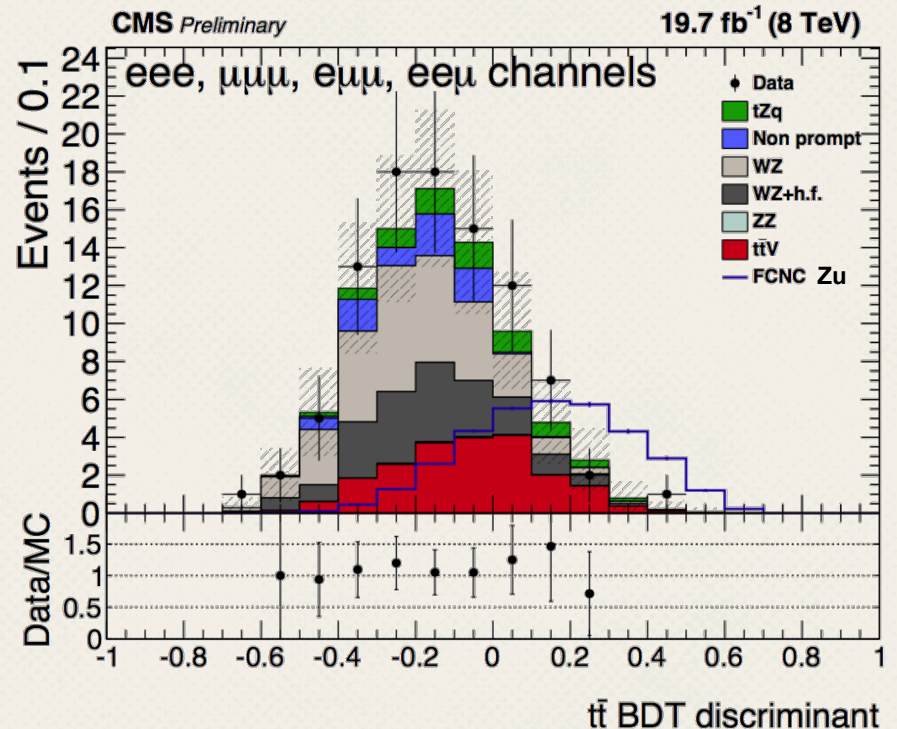**SM** ll lν b q

q

b

W

q'

t

Z

MORE INFO ↘

FCNC tZ(q) at 8TeV
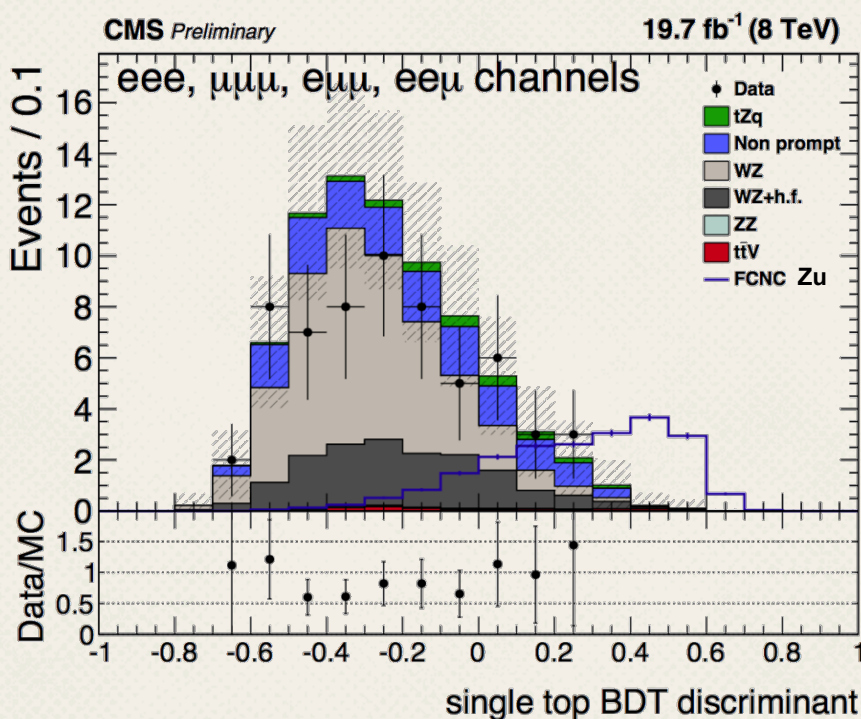
Signal Region

2 leptons compatible with Z

1 lepton from W

Top pair: At least 2 jets with at least 1
b-tagged (b-tag ε=85%, mis-ID ε=10%)

Single top: Exactly one jet, b-tagged

BDT
trained
against
SM bkg

FCNC tZ(q) at 8TeV

Signal Region

2 leptons compatible with Z

1 lepton from W

- Top pair: At least 2 jets with at least 1 b-tagged
- Single top: Exactly one jet, b-tagged

WZ Control region

2 leptons compatible with Z

1 lepton from W

1-2 jets with **NONE** b-tagged

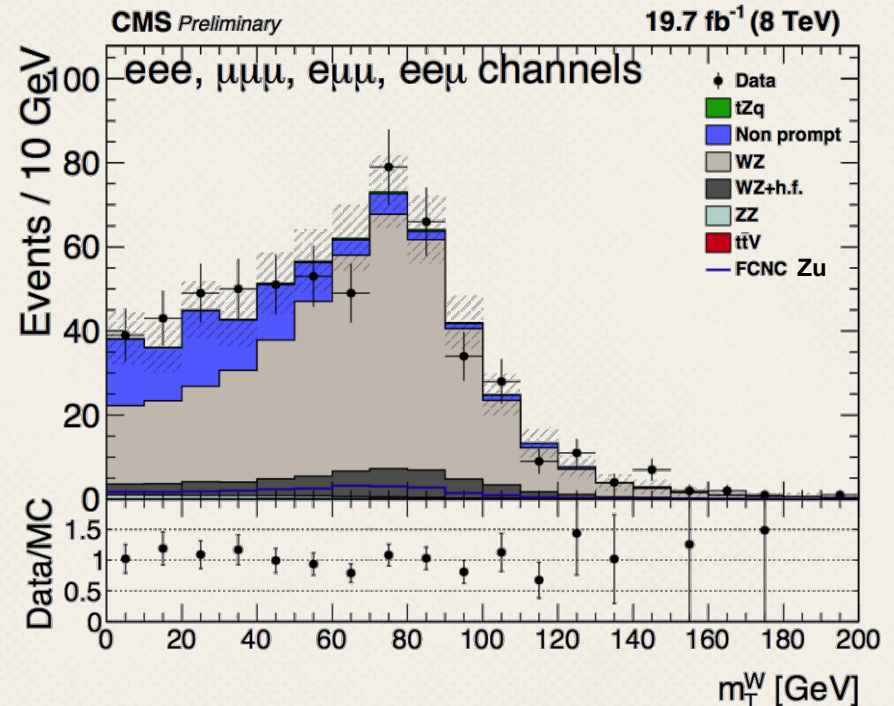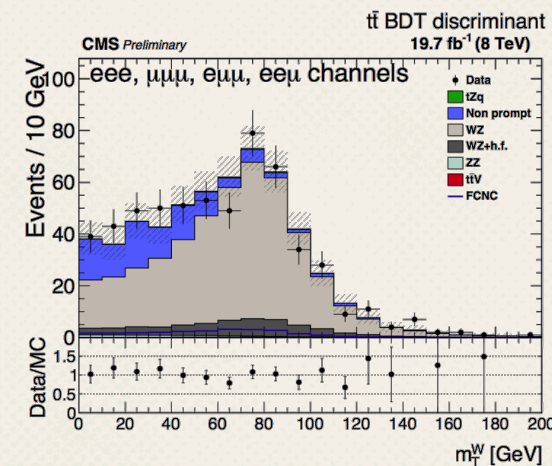## Fake leptons are handled via data driven templates

Expected at low $m_T(W)$

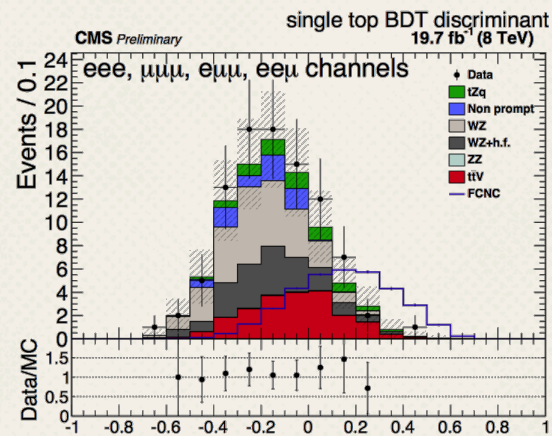$$m_{T,W} \equiv \sqrt{2 \cdot E_{T,miss} \cdot p_{T,l}\left(\cos\left(\phi_{E_{T,miss}} - \phi_l\right)\right)}$$

CMS *Preliminary*   19.7 fb^{-1} (8 TeV)

eee, μμμ, eμμ, eeμ channels

- Data
- tZq
- Non prompt
- WZ
- WZ+h.f.
- ZZ
- ttV
- FCNC Zu

Events / 10 GeV

Data/MC

m_T^W [GeV]
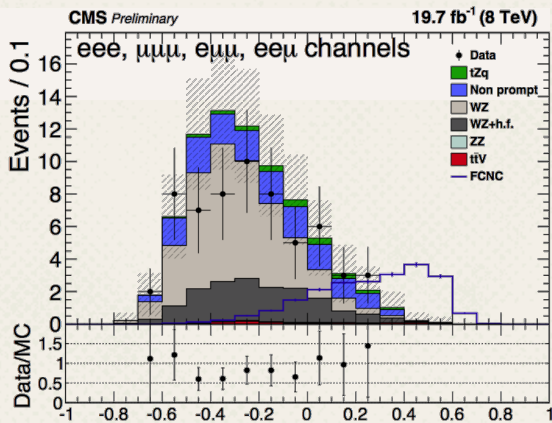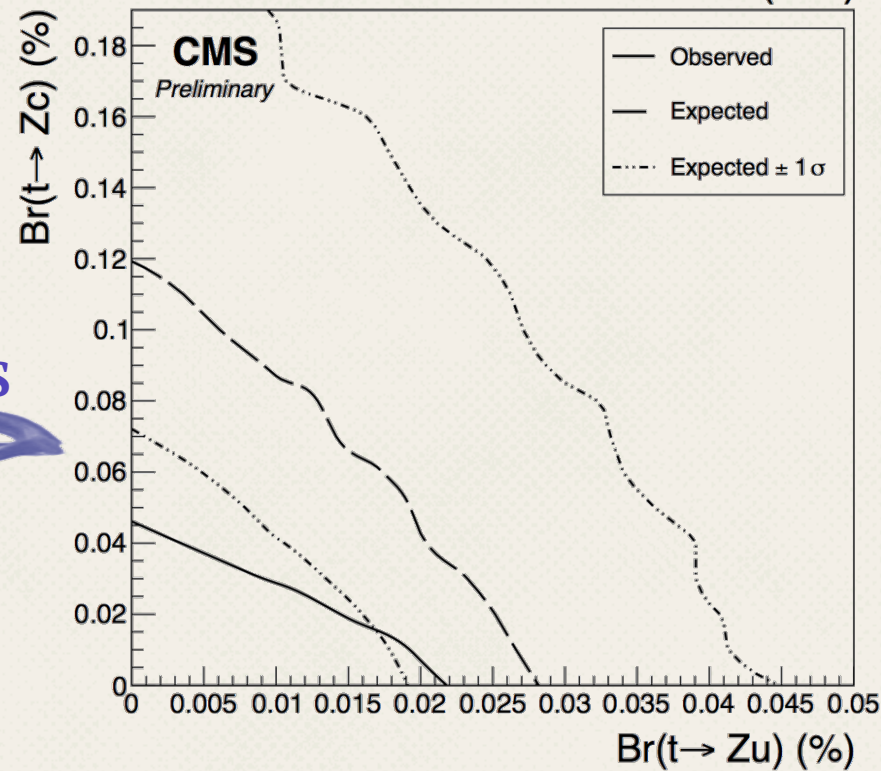
	Exp. Branching ratio Zut (%) [1σ band]	0.027 [0.018-0.42]
Independent limit for tZu (tZc = 0)	Observed BR Zut (%)	0.022

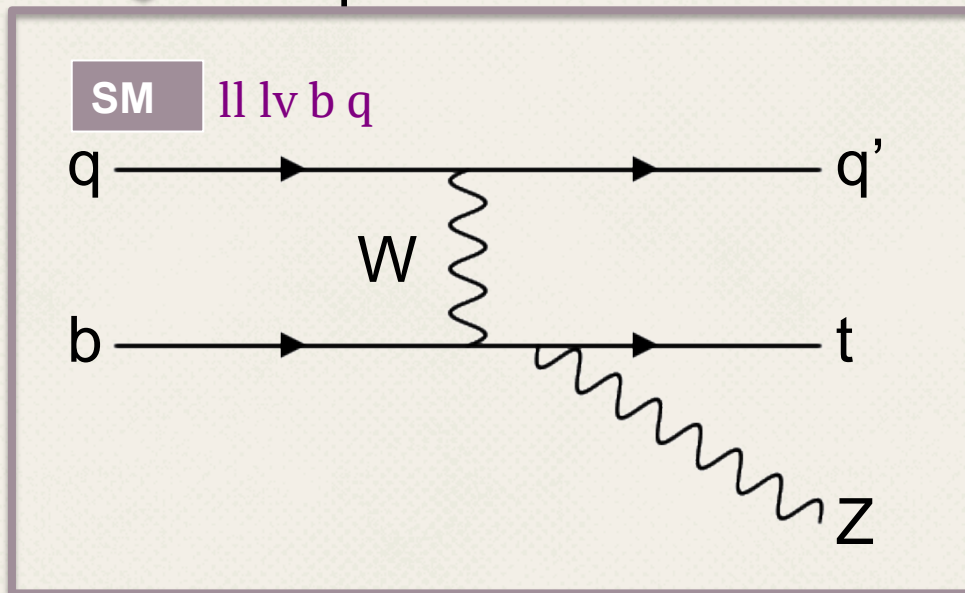|	Exp. Branching ratio Zct (%) [1σ band]	0.118 [0.071-0.222]
Independent limit for tZc (tZu = 0)	Observed BR Zct (%)	0.049

Searching for the three lepton final state in

The Standard Model

FCNC pair

ll lv b q

g

g

t

g

$\overline{t}$

W

b

Z

$\overline{q}$

FCNC single

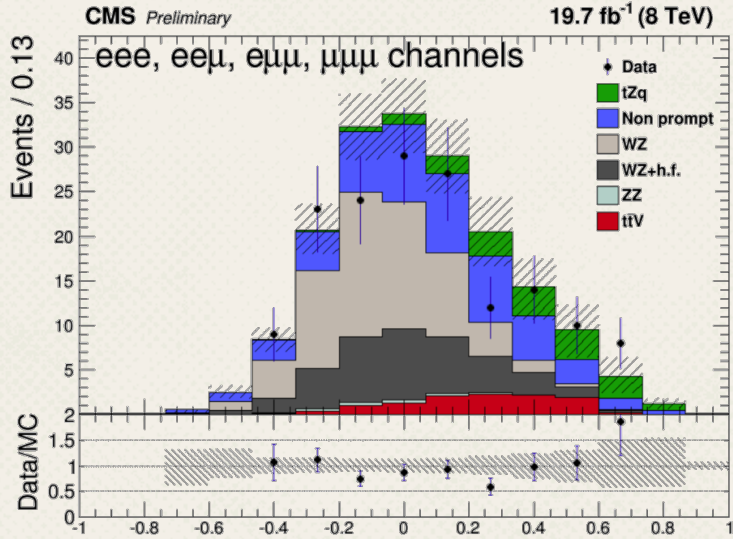ll lv b

q

q

g

Z

t

SM ll lv b q

q

b

W

q'

t

Z

MORE
INFO ↘

TOP-12-039

7
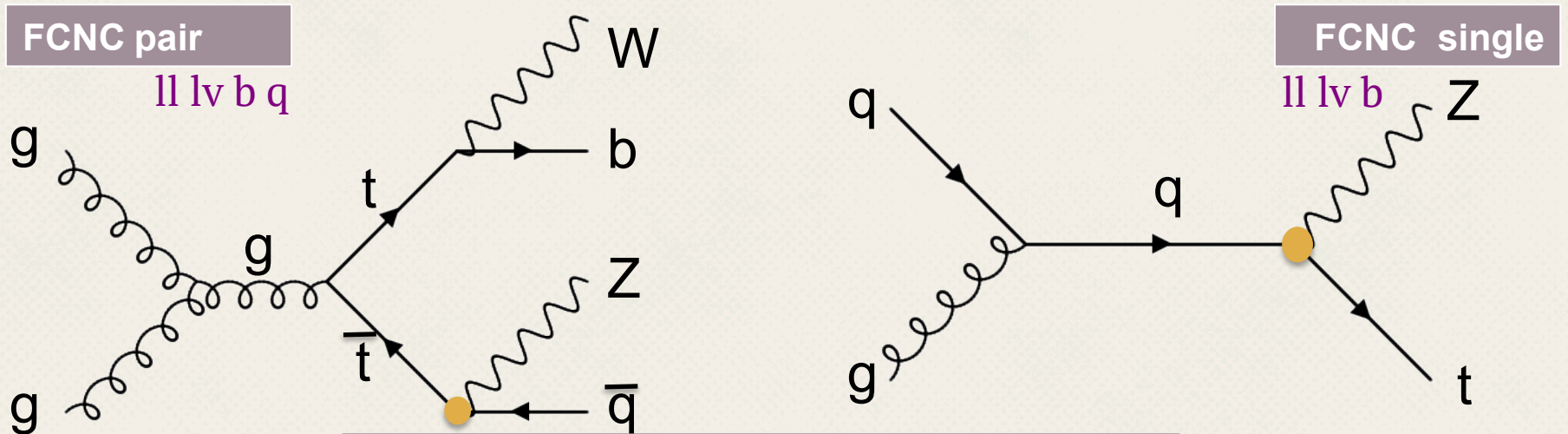
SM tZq at 8TeV

Strategy is similar to FCNC, recoil jet tends to go forward

↳ $|\eta| < 4.5$ instead of <2.4

BDT Trained against ttZ + WZ
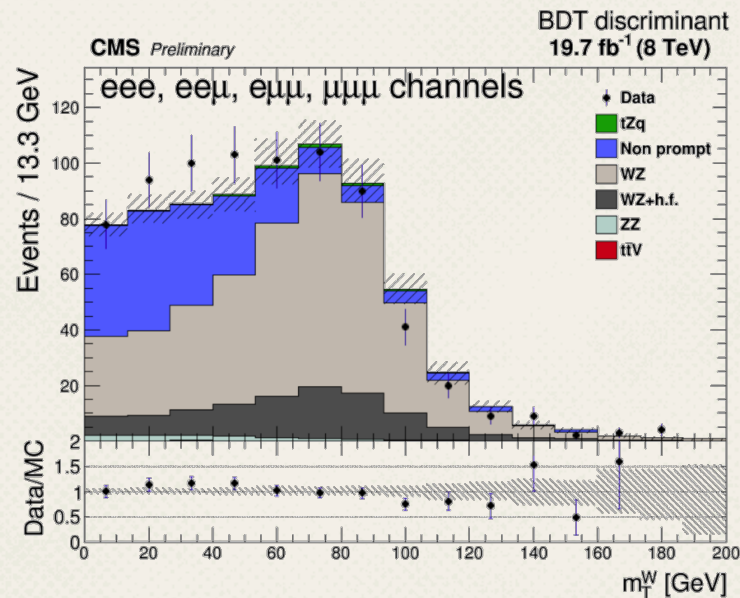
SIMULTANEOUS FIT

Signal strength [1σ band]	1.2 [0.6-1.9]
Cross section (fb)	$10^{+8.2}_{-7.0}$
Significance Observed (Expected)	2.4 (1.8) σ

SM prediction in 3l: $\sigma = 8.2^{+0.06}_{-0.03}$ fb

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