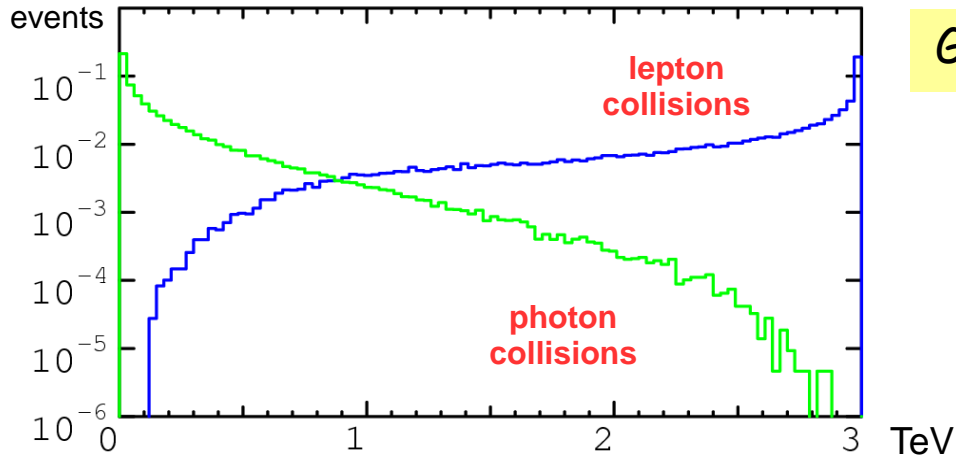




Photon collisions in CLIC

CLIC is not only a lepton collider \Rightarrow

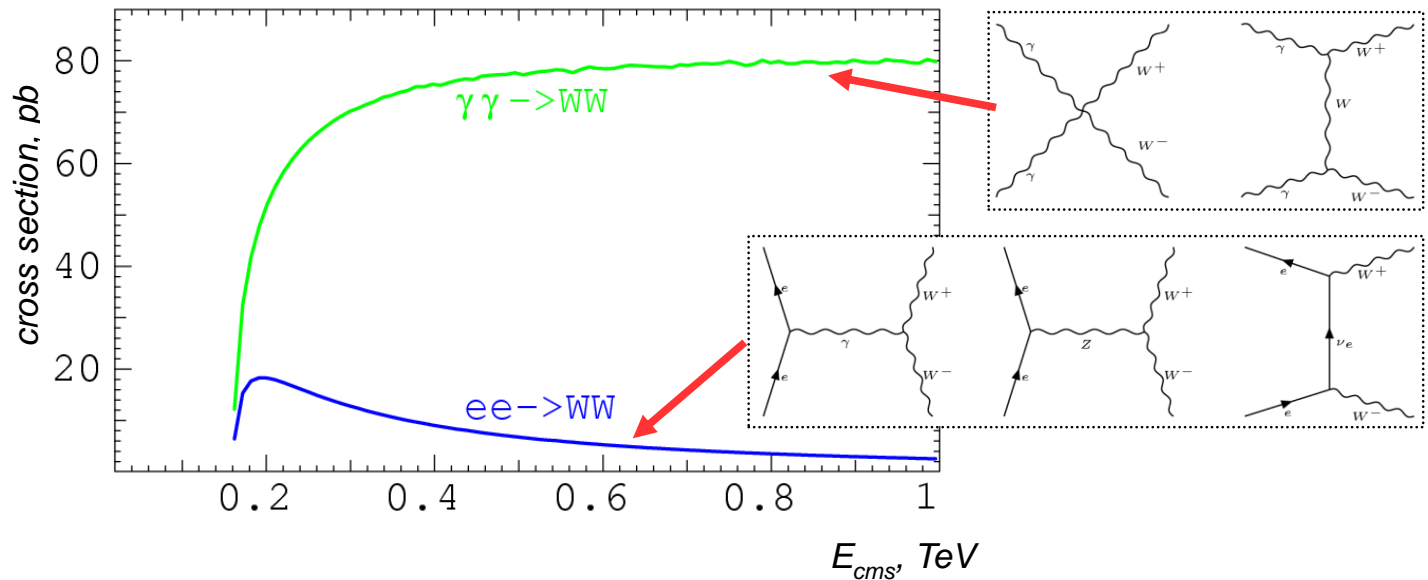


GUINEA-PIG simulation

For 3 TeV beams:

- $L_{ey} / L_{ee} \sim 0.78$
- $L_{yy} / L_{ee} \sim 0.68$
- $L_{yy} / L_{ee} \sim 0.27$ for $E_{yy} > 2 M_W$

$\gamma\gamma \rightarrow WW$:
Cross section
in photonic
collisions is
much higher
than in
leptonic

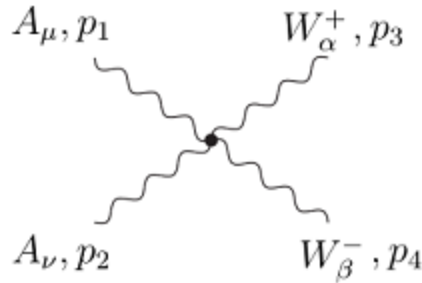


Possible physics in $\gamma\gamma \rightarrow WW$

- Anomalous quartic gauge boson couplings (AQGC) in AAWW-vertex:

Effective field theories can be constructed to quantify potential deviations from the SM by introducing genuine AQGC

Standard model



$$-ie^2 [2g_{\mu\nu}g_{\sigma\rho} - g_{\nu\rho}g_{\mu\sigma} - g_{\rho\mu}g_{\nu\sigma}]$$

$$i\frac{e^2}{8\Lambda^2} \times \{4a_0 g^{\alpha\beta} [(p_1 p_2) g^{\mu\nu} - p_1^\nu p_2^\mu] + a_c [(p_1^\alpha p_2^\beta + p_1^\beta p_2^\alpha) g^{\mu\nu} + (p_1 p_2) (g^{\mu\alpha} g^{\nu\beta} + g^{\nu\alpha} g^{\mu\beta}) - p_1^\nu (p_2^\beta g^{\mu\alpha} + p_2^\alpha g^{\mu\beta}) - p_2^\mu (p_1^\beta g^{\nu\alpha} + p_1^\alpha g^{\nu\beta})] + 4\tilde{a}_0 g^{\alpha\beta} p_{1\rho} p_{2\sigma} \varepsilon^{\mu\rho\nu\sigma}\}$$

$$\mathcal{L}_0 = -\frac{e^2}{16\Lambda^2} a_0 F^{\mu\nu} F_{\mu\nu} \bar{W}^\alpha \bar{W}_\alpha,$$

$$\mathcal{L}_c = -\frac{e^2}{16\Lambda^2} a_c F^{\mu\alpha} F_{\mu\beta} \bar{W}^\beta \bar{W}^\alpha,$$

$$\tilde{\mathcal{L}}_0 = -\frac{e^2}{16\Lambda^2} \tilde{a}_0 F^{\mu\alpha} \tilde{F}_{\mu\beta} \bar{W}^\beta \bar{W}^\alpha,$$

Previous measurements:

CMS:

JHEP 1608 (2016) 119

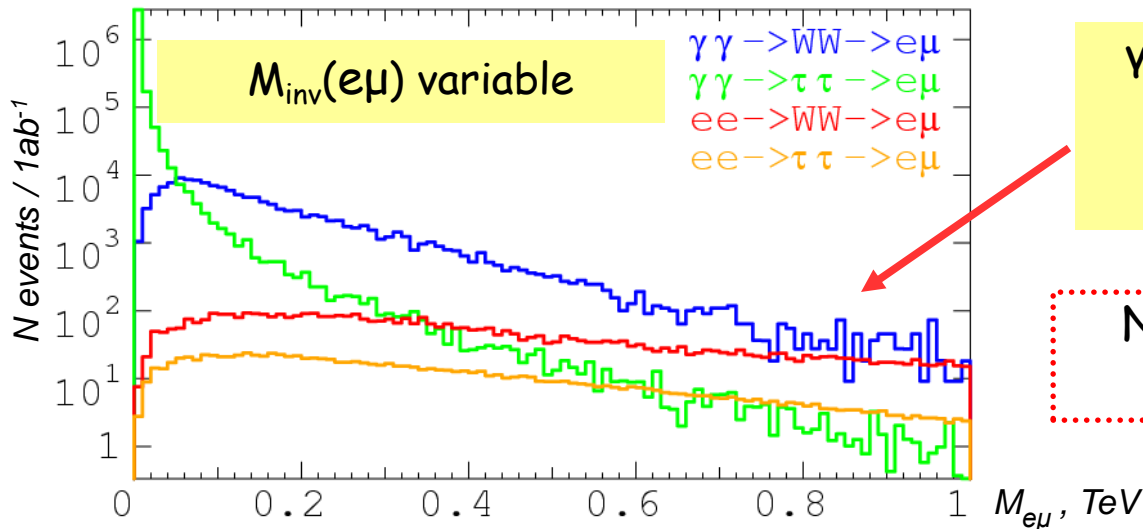
ATLAS:

Phys.Rev.Lett. 115 (2015) no.3, 031802
CERN-EP-2016-167

LEP-2:

Eur.Phys.J. C20 (2001) 201-215
Phys.Rev. D70 (2004) 032005

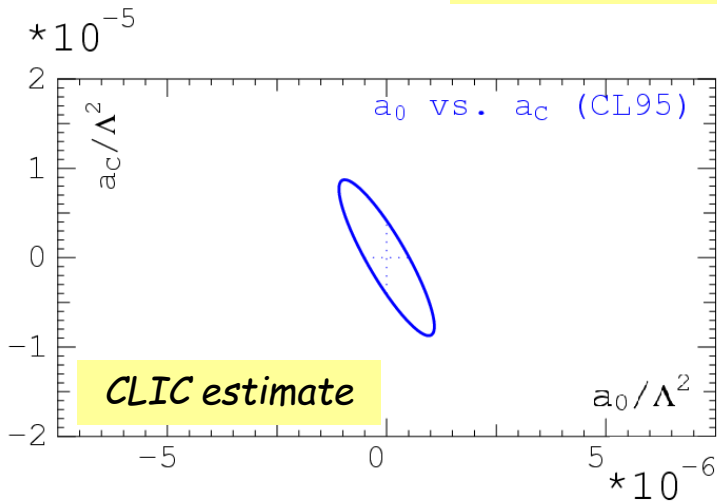
$\gamma\gamma \rightarrow WW \rightarrow$ leptonic decay: $e+\mu$



$\gamma\gamma, ee \rightarrow WW/\tau\tau \rightarrow e\mu\nu_e\nu_\mu$
 3 TeV beams
 e, μ polar angle cut: 10°

No significant background
 in $e-\mu^+$ and $e^+\mu^-$ channels

Signal event number CLIC / LHC'2017 $\sim 10^4$



Constant	$a_0/\Lambda^2, GeV^{-2}$	$a_c/\Lambda^2, GeV^{-2}$
Previous limit (95% CL)	$-1.5 \dots +1.5 \times 10^{-4}$	$-5 \dots +5 \times 10^{-4}$
Estimated CLIC limit (95% CL)	$\sim -1 \dots +1 \times 10^{-6}$	$\sim -4 \dots +4 \times 10^{-6}$

More details in I.Boyko talk at CLIC WS '2017

V. Makarenko, e-mail: makarenko@hep.by

Conclusions

- The background photon collisions may be used for search of new physics $\gamma\gamma WW$ couplings
 - *Other study: how to measure the luminosity of photon-photon collisions*
- The WW decay into *different flavour leptons* looks promising for test of anomalous quartic gauge boson couplings
 - *Semileptonic decay is also considered*
- *Other study: $\gamma\gamma \rightarrow (\text{Anomalous interaction}) \rightarrow ZZ$*

Actual Problems of Microworld Physics 2018

The XIV-th International School-Conference
"The Actual Problems of Microworld Physics"
will be held in Belarus (Grodno)
12-24 August, 2018

All guests are welcome!

The organizers will cover the full cost (but not the flight) for collaboration lecturers.

<http://inp.bsu.by/gomelschool2018/>

