

**Overview on the recent
di-photon excess at the LHC
Run 2**

Report of Contributions

Contribution ID: 0

Type: **not specified**

Interpretation of the diphoton resonance in effective field theory

Friday, 8 January 2016 10:00 (30 minutes)

We discuss the potential interpretation of the diphoton excess at the LHC with a new resonance in effective field theory and present a concrete example with Kaluza-Klein graviton as the diphoton resonance, playing a role of the mediator of dark matter. We also show how the spin information of the resonance can be extracted from the kinetic distribution of the decay products.

Presenter: Prof. LEE, Hyun Min (Chung-Ang University)

Session Classification: Talks

Contribution ID: 1

Type: **not specified**

QCD axion from aligned axions and diphoton excess

Friday, 8 January 2016 11:00 (30 minutes)

We argue that the QCD axion can arise from many aligned axions with decay constants much smaller than the conventional axion window. If the typical decay constant is of $O(100)$ GeV to 1 TeV, one or more of the axions or saxions may account for the recently found diphoton excess at ~ 750 GeV. Our scenario predicts many axions and saxions coupled to gluons with decay constants of order the weak scale, and therefore many collider signatures by heavy axions and saxions will show up at different energy scales. In particular, if the inferred broad decay width is due to multiple axions or saxions, a non-trivial peak structure may become evident when more data is collected. We also discuss cosmological implications of the aligned QCD axion scenario.

Presenter: Prof. JEONG, Kwang Sik (Pusan National University)

Session Classification: Talks

Contribution ID: 2

Type: **not specified**

Registration and Coffee

Contribution ID: 3

Type: **not specified**

The 750 GeV diphoton excess and its implications for Z'

Friday, 8 January 2016 15:00 (30 minutes)

We discuss a possible connection between the 750 GeV diphoton excess and a heavy neutral gauge boson (Z') in view of the idea of the grand unified theory. The unification of the gauge coupling constants is a guiding principle in our scenario. There, the gauged B-L symmetry is naturally introduced. We point out a simple fact that a new scalar boson of 750 GeV would imply a TeV-scale Z' which might be within the reach of the LHC Run 2 experiments.

Presenter: Dr KANETA, Kunio (IBS CTPU)

Session Classification: Talks

Contribution ID: 4

Type: **not specified**

Glue to light signal of a new particle

Friday, 8 January 2016 10:30 (30 minutes)

Any new particle charged under SU(3)_C and carrying electric charge will leave an imprint in the di-photon invariant mass spectrum as it can mediate gg to gamma gamma process through loops. The combination of properties of loop functions and gluon pdfs results in a peak-like feature in the di-photon invariant mass around twice the mass of a given particle. Using recent ATLAS analysis, we set upper limits on the combined SU(3)_C and electric charge of new particles and indicate future prospects. We briefly discuss the possibility that the excess of events in the di-photon invariant mass spectrum around 750 GeV originates from loops of a particle with mass around 375 GeV.

(My talk is based on the paper, arXiv:1512.08221.)

Presenter: Prof. KIM, Hyung Do (Seoul National University)

Session Classification: Talks

Contribution ID: 5

Type: **not specified**

Dark matter indirect signature and 750 GeV diphoton resonance

Friday, 8 January 2016 14:00 (30 minutes)

Motivated by the recently reported diphoton resonance at 750 GeV, we study a new axion-like bosonic portal model of dark matter physics. When the resonance particle is identified as the pseudo-scalar mediator, via which the standard model sector would interact with the dark matter sector, the data from collider physics would provide profound implications to dark matter phenomenology. In this work, we first identify the preferred parameter space of the suggested portal model from the results of the 13 TeV LHC run, and then we examine the dark matter signature taking into account the data from cosmic-ray experiments including Fermi-LAT dwarf galaxy gamma-ray search, HESS gamma-line search, and future CTA diffuse gamma-ray and gamma-line searches.

Presenter: Prof. PARK, Jong-Chul (Chungnam National University)

Session Classification: Talks

Contribution ID: 6

Type: **not specified**

Possible implications of 750 GeV diphoton excess on BSM

Friday, 8 January 2016 16:00 (30 minutes)

I describe possible BSM scenarios which can accommodate the 750 GeV diphoton excess in a generic way.

Presenter: Prof. KO, Pyungwon (KIAS)

Session Classification: Talks

Contribution ID: 7

Type: **not specified**

How Resonance-Continuum Interference Changes 750 GeV Diphoton Excess: Signal Enhancement and Peak Shift

Friday, 8 January 2016 16:30 (30 minutes)

We discuss that the interference between 750 diphoton resonance and continuum background has two considerable effects: (1) enhancing or suppressing diphoton signal rate due to the imaginary-part interference and (2) distorting resonance shape due to the real-part interference. We find that the resonance contribution to the 750 GeV excess can be enhanced by a factor of 2(1.6) for 3(6) fb signal rate and the 68%(95%) CL best-fit mass range can shift by 1-4 (any $\mathcal{O}(1)$) GeV.

Presenter: Dr YOON, Yeo Woong (Konkuk University)

Session Classification: Talks

Contribution ID: 8

Type: **not specified**

The 750 GeV Diphoton Excess May Not Imply a 750 GeV Resonance

Friday, 8 January 2016 14:30 (30 minutes)

We discuss non-standard interpretations of the 750 GeV diphoton excess recently reported by the ATLAS and CMS Collaborations which do not involve a new, relatively broad, resonance with a mass near 750 GeV. Instead, we consider the sequential cascade decay of a much heavier, possibly quite narrow, resonance into two photons along with one or more invisible particles. The resulting diphoton invariant mass signal is generically rather broad, as suggested by the data. We examine three specific event topologies | the \antler”, the \sandwich”, and the 2-step cascade decay, and show that they all can provide a good fit to the observed published data. In each case, we delineate the preferred mass parameter space selected by the best fit. In spite of the presence of invisible particles in the final state, the measured missing transverse energy is moderate, due to its anti-correlation with the diphoton invariant mass. We comment on the future prospects of discriminating with higher statistics between our scenarios, as well as from more conventional interpretations

Presenter: Dr CHO, Won Sang (IBS CTPU)**Session Classification:** Talks

Contribution ID: 9

Type: **not specified**

Discussions

Contribution ID: **10**

Type: **not specified**

Radion (Diaton) Explanations

Friday, 8 January 2016 11:30 (30 minutes)

Presenter: Dr SPRAY, Andrew (IBS CTPU)

Session Classification: Talks

Contribution ID: 11

Type: **not specified**

LHC 750 GeV Diphoton excess in a radiative seesaw model

Friday, 8 January 2016 13:30 (30 minutes)

We investigate a possibility for explaining the recently announced 750 GeV diphoton excess by the ATLAS and the CMS experiments at the CERN LHC in a model with multiple doubly-charged particles, which was originally suggested for explaining tiny neutrino masses through a three-loop effect in a natural way. The enhanced radiatively generated effective coupling of a new singlet scalar S with diphoton, with multiple charged particles in the loop, enlarges the production rate of S in $pp \rightarrow S+X$ via photon fusion process and also the decay width of $S \rightarrow \gamma\gamma$ even without assuming a tree level production mechanism. Very interestingly, we find that the branching ratio of $S \rightarrow \gamma\gamma$ is about 60% fixed by quantum numbers and the model is consistent with all the constraints from 8TeV LHC data.

Presenter: Dr NISHIWAKI, Kenji (KIAS)

Session Classification: Talks

Contribution ID: 12

Type: **not specified**

TBA

Presenter: Dr FLACKE, Thomas (Korea University)