

K. Slizhevskii<sup>1</sup>, M. Savina<sup>2</sup>, S. Shmatov<sup>1</sup> <sup>1</sup>Meshcheryakov Laboratory of Information Technologies, JINR <sup>2</sup>Bogoliubov Laboratory of Theoretical Physics, JINR

# INTRODUCTION

We explore a models for the production of DM that can contribute to final state with Z boson that subsequently decay into a pair of leptons and a pair of dark matter (DM) particle that are interpreted as large transverse momentum.



Feynman diagrams of BSM process pp -> Z (l<sup>+</sup>l<sup>-</sup>) + MET( $\chi\chi$ )

# THEORETICAL MODEL

Two Higgs Doublet Model (2HDM) with pseudoscalar (scalar) boson a(S):



Simplest gauge-invariant and renormalisable extension of simplified pseudoscalar model.



The m<sub>T</sub> distributions for events in the signal region without jets

Process	0-jet category	1-jet category
$WZ \rightarrow 3\ell\nu$	$1479\pm53$	$389 \pm 16$
ZZ	$670\pm27$	$282\pm13$
Nonresonant background	$384 \pm 31$	$263\pm22$
DY	$502\pm94$	$1179\pm 64$
Other background	$6.3 \pm 0.7$	$6.8\pm0.8$
Total background	$3040 \pm 110$	$2120\pm76$
Data	3053	2142

Observed number of events and post-fit background estimates.

• There is no signal above the background

### CMS RUN3 DATA ANALYSIS



#### CMS RUN2 RESULTS



Monte Carlo data sets for signal process was created used:

- Generator: MadGraph5MC@NLO.2.9.2 (PS, frag./hadr. Pythia 8)
- Detector response simulation: CMSSW\_13\_0\_X (based on Geant4, using HTCondor)



signal region for 2022 year data

### SUMMARY

- A search for dark matter particles can be performed using events with a Z boson and large missing transverse momentum it show RUN2 analysis.
- Analysis of CMS RUN3 in progress.