

Progress in the $h \rightarrow aa$ (NMSSM) analysis

- Up to now: focused on 4 scenarios of m_h : 115, 118, 123, 124 GeV and m_a : 56, 41, 35, 59 GeV, respectively.

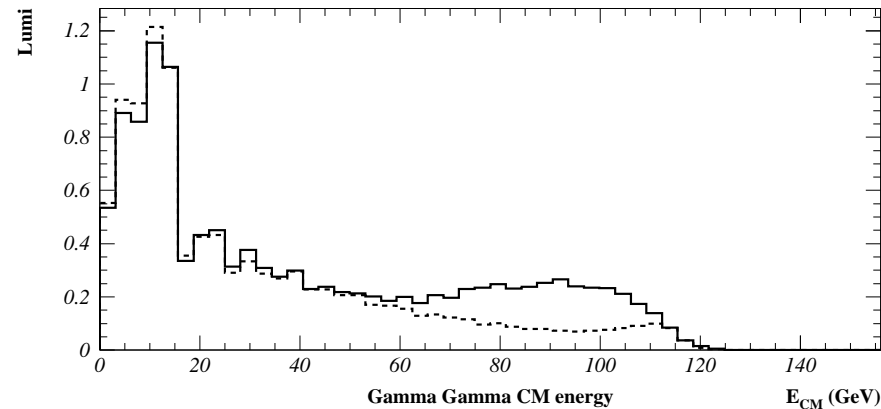
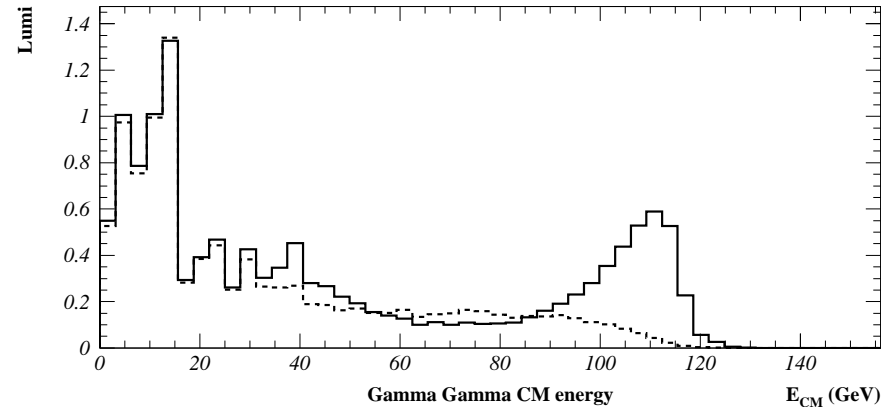
- Now: a whole new region to study. Grid points selected: $m_h = 80, 90, 100, 110$ GeV, $m_a = 20, 35, 50$ GeV, and all kinematically allowed combinations (9 in total) studied.

- Focus on the $4b$ final state to start with.

Backgrounds: $\gamma\gamma \rightarrow b\bar{b}b\bar{b}, b\bar{b}c\bar{c}, c\bar{c}c\bar{c}$ - the same as before, but need to extend the energy range down to 70 GeV - new cross section computations and event generation with WHIZARD 1.24.

Signal: CAIN+Pythia 6.158 - generation of events for each m_h, m_a combination.

- Up to now: used CLIC 1 spectrum peaked at 115 GeV (top). Now: broad band spectrum (bottom), but $E_e = 75$ GeV \rightarrow not practical for higher m_h .



- Total cross sections for $\gamma\gamma \rightarrow h_{SM}$ from Pythia: 31.8, 40.8, 40.4, 32.2 fb for $m_h = 80, 90, 100, 110$ GeV, respectively.

Event reconstruction: FastMC.

Analysis and selection criteria exactly the same as before for $bbbb$:

- exactly 4 reconstructed jets.
- $|\cos\Theta_j| < 0.9$ for each jet.
- Calculate 2-jet invariant masses, take the combination which gives two values closest to each other.
- Require $|M_{12} - M_{34}| < 10$ GeV.
- Calculate 4-jet invariant mass of surviving events.
- Assume $b\bar{b}$ tagging efficiency of 50% and a 3.5% probability of $c\bar{c}$ (mis)tagging (same as before).

4-JET INV. MASS - SIGNAL on top of BACKGROUND

