

Status of the new Sum-Trigger system for the MAGIC telescopes

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- Magic Telescopes: What happens after the camera?
- Low energy observations: Goals & Difficulties
- A solution: Sum-Trigger-II
 - **Concept & Implementation Focus on: Sum-Trigger control Status & Importance**

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MAGIC TELESCOPES

What Happens After the Camera?



Signal PMT optical transmitted (VCSEL)

Trigger signal:

The level-zero trigger set the discriminator threshold in real time for each pixel in the trigger region, excluding the electronic noise and part of thenight sky background (NSB).

Each telescope separately hasa level-one digital trigger with the 3 next neighbour (3NN) topology, it means that it only selects close compact events that should include at least 3 next neighbouring pixels.

Only events that trigger both telescopes are recorded.

The stereo trigger, level-three, makes a tight time coincidence betweenboth telescopes.

LOW ENERGY OBSERVATIONS

GOALS Sgh 10-6 10 Fluence, 50-300 keV (ergs cm⁻²) GRBs AGNs **PULSARs** DM Quamtum Gravity effects OVERLAP IP 250 1.00 J.R. García , MAGIC-MPG

LOW ENERGY OBSERVATIONS



LOW ENERGY OBSERVATIONS

Goals & Difficulties



A Solution



- Sum of analog signals of a patch of PMTs
- Use small photon signals below the single channel threshold
- Integration of larger area (size of shower) increases S/N

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A Solution



To correct PMTS and optical fibers delay

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A Solution



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A Solution



THE SUM-TRIGGER-II HARDWARE DEVELOPMENT



THE SUM-TRIGGER-II SUM-TRIGGER SOFTWARE CONTROL: CRISTAL



CLIP-BOARD Hardware Development



SUM-BOARD Hardware & Software Development



1) Sum of analog signals of a macrocells (3 mac./board)

2) Consequent signal compared with programable Threshold

3) Trigger generated when it excess

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Atro-Board Hardware & Software Development



CRISTAL: Multi-thread program

ASTRO-BOARD:

- Interface with Central Contrl Software
- Processes the macrocell trigger rate
- Automatic calibration
 Delay, amplitud, clipping



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THE SUM-TRIGGER-II THE EXPECTED PERFORMACE

Comparison stereo energy threshold MMcEvt.fEnergy {(MMcEvt.fEnergy<100 && MMcTrig.fNumSumLevel && (MRawEvtHeader.fStereoEvtNumber:-0))/MMcEvt.fEnergy} 30 Sumtrigger 30 GeV 25 20 15 **3NN** 10 about 47 GeV 5 0 40 100 20 60 80 MMcEvt.fEnergy

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THE SUM-TRIGGER-II IMPORTANCE: I.E PULSARS PHYSICS



Phase-resolved energy spectra of the Crab pulsar in the range of 50-400GeV measured with the MAGIC telescopes

MAGIC Collaboration. A&A, 540 (2012) A69

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A. A. Abdo et al. 2010 ApJ 720 272

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THANKS!