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# Tuning event trigger generators for burst searches

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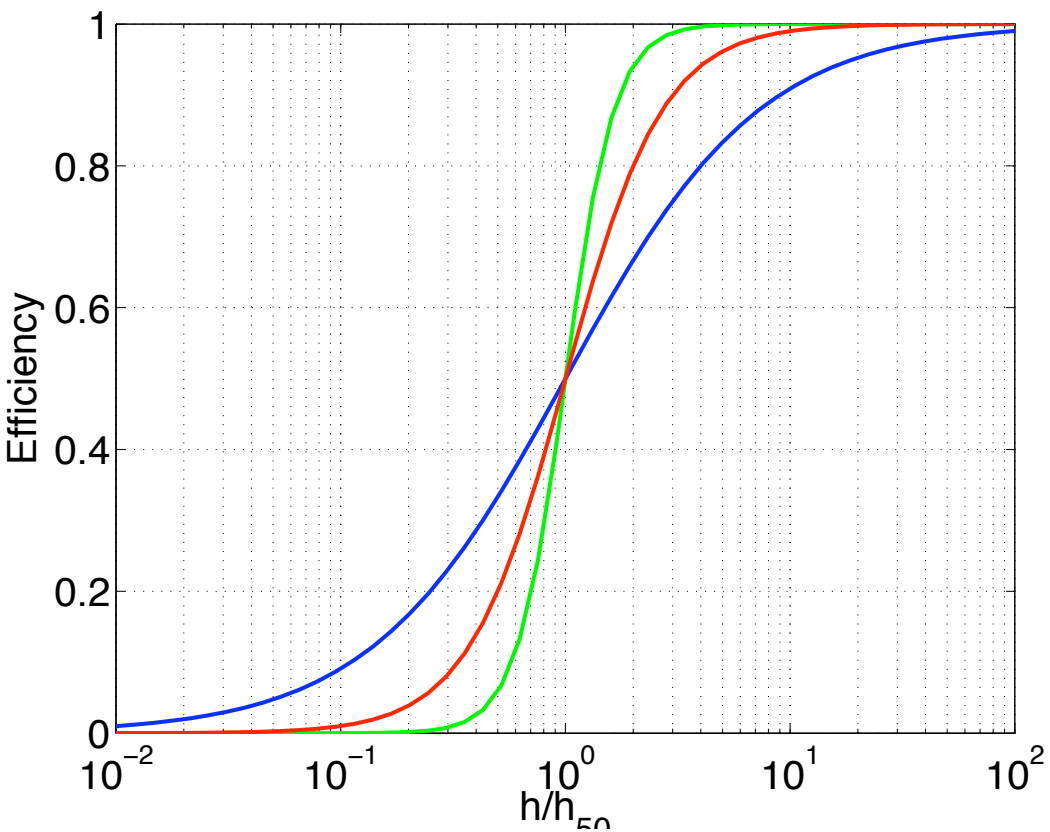
# What should guide event trigger tuning?

- Goal of event trigger generator: identify events
- Tuning generally involves several parameter choices
  - » Tuning affect false rate
  - » Tuning affects efficiency in multiple ways
    - – $h_{50}$, “slope”, etc.
- What should tuning optimize?



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# A Tuning Goal

- Maximize detected event rate at fixed false rate
- Fixed false rate?
  - » High $h_{50}$, shallow slope; low $h_{50}$, steep slope
- Detected event rate?
  - » "Physical" events: i.e., drawn from representative spatial distribution
  - » The greater the increase in sources with volume the more favored a shallow slope (reaching to low signal strength and greater distances)

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# Quantitative Criterion

- θ = source population model characterization
  - » E.g., galaxy model, binary synthesis model
  - » P(θ) prior over pop models (could be δ function)
- ξ = source characterization in model θ
  - » E.g., supernova spin, mass, orientation, etc.
  - » P(ξ|θ) distribution or prior over source params
- ψ = tuning parameters
  - » E.g., TFCLUSTER black pixel prob, etc.
- ϵ(ξθψ) = fraction of events ξ in source model θ detected for tuning param ψ
- Monte Carlo compute figure of merit $\epsilon_0(\psi)$ proportional to number detected events

$$\epsilon_0(\psi) = \int_\theta d\theta\, P(\theta) \int_\xi d\xi\, P(\xi|\theta)\epsilon(\xi\theta\psi)$$

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# Summary

- Shape of detection efficiency curve depends on tuning parameters. What goal should guide choice of parameters?
- Proposal: Maximize the detected rate of “physical” events at fixed false alarm rate
  - » Physical: expected source distribution (galactic, isotropic, etc.), source parameters
- Will investigate this tuning on BlockNormal burst search