

Follow-up observations of GW170817 with the MAGIC telescopes *(executive summary)*



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 ICRC 2021 - 37th International Cosmic Ray Conference - 12 - 23 July 2021, Berlin.

WHAT IS THIS CONTRIBUTION ABOUT

- search for >100 GeV counterpart of the gravitational wave event GW170817, with follow-up observations by the MAGIC telescopes
- a detailed self-synchrotron Compton model of the late afterglow emission, associated to a short GRB seen off-axis

WHY IT IS RELEVANT AND INTERESTING?

- GW170817 is the first GW event from BNS merger with electromagnetic emission from a *short GRB (seen off-axis)* and a kilonova.
- GRBs afterglows emit > 100 GeV gamma-rays, e.g. GRB 190114C and the short-GRB 160821B by MAGIC and GRB 180720B and GRB 190829a by H.E.S.S.
- X-ray and radio counterpart (the GRB afterglow non-thermal emission) did emerge days after the burst, peaking at 155 days
 - The late increasing afterglow emission is expected by the interaction of an **off-axis jet** with the surrounding medium.

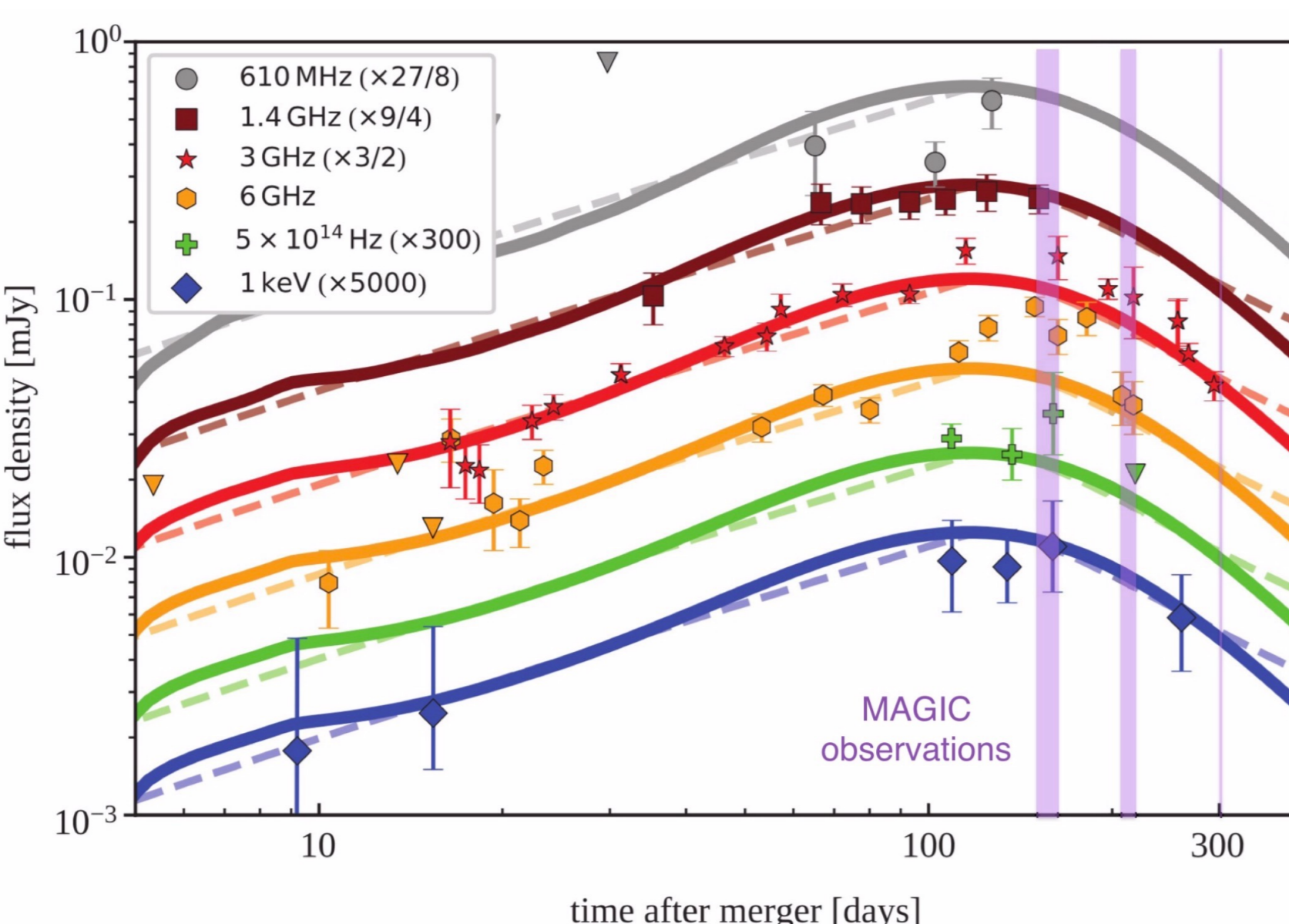
WHAT HAVE WE DONE

- MAGIC follow-up observations: 10 hours, from Jan to June 2018.
- Build the multi-wavelength spectral energy distribution (SED), using the available radio, optical and X-ray data.
- Expected TeV emission computed from a self-synchrotron Compton (SSC) model built on an **evolving structured jet**, seen off-axis.

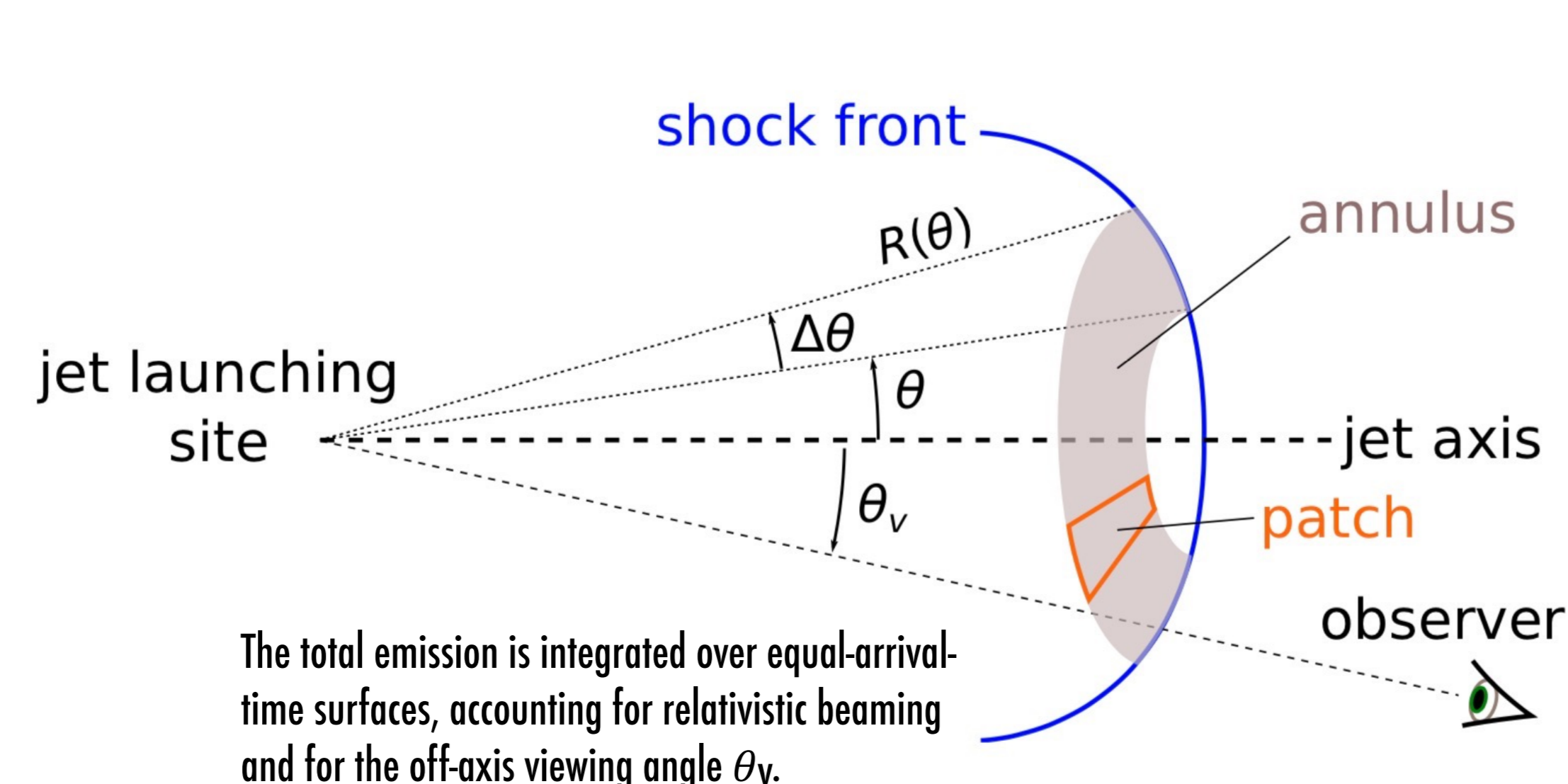
WHAT IS THE RESULT?

- MAGIC UL calculated for $E > 400$ GeV is 3.6×10 erg/cm²/s (note: H.E.S.S. derived deeper UL with ~ 50 hrs)
- Radio to X-ray data are well described by a single power-law, without an indication of a turnover up to ~ 10 keV.
- The predicted SED at 155 days post-merger is computed, from the SSC model with best fit parameters from the multi-wavelength data, with the constraints from the measurement of the radio VLBI centroid.

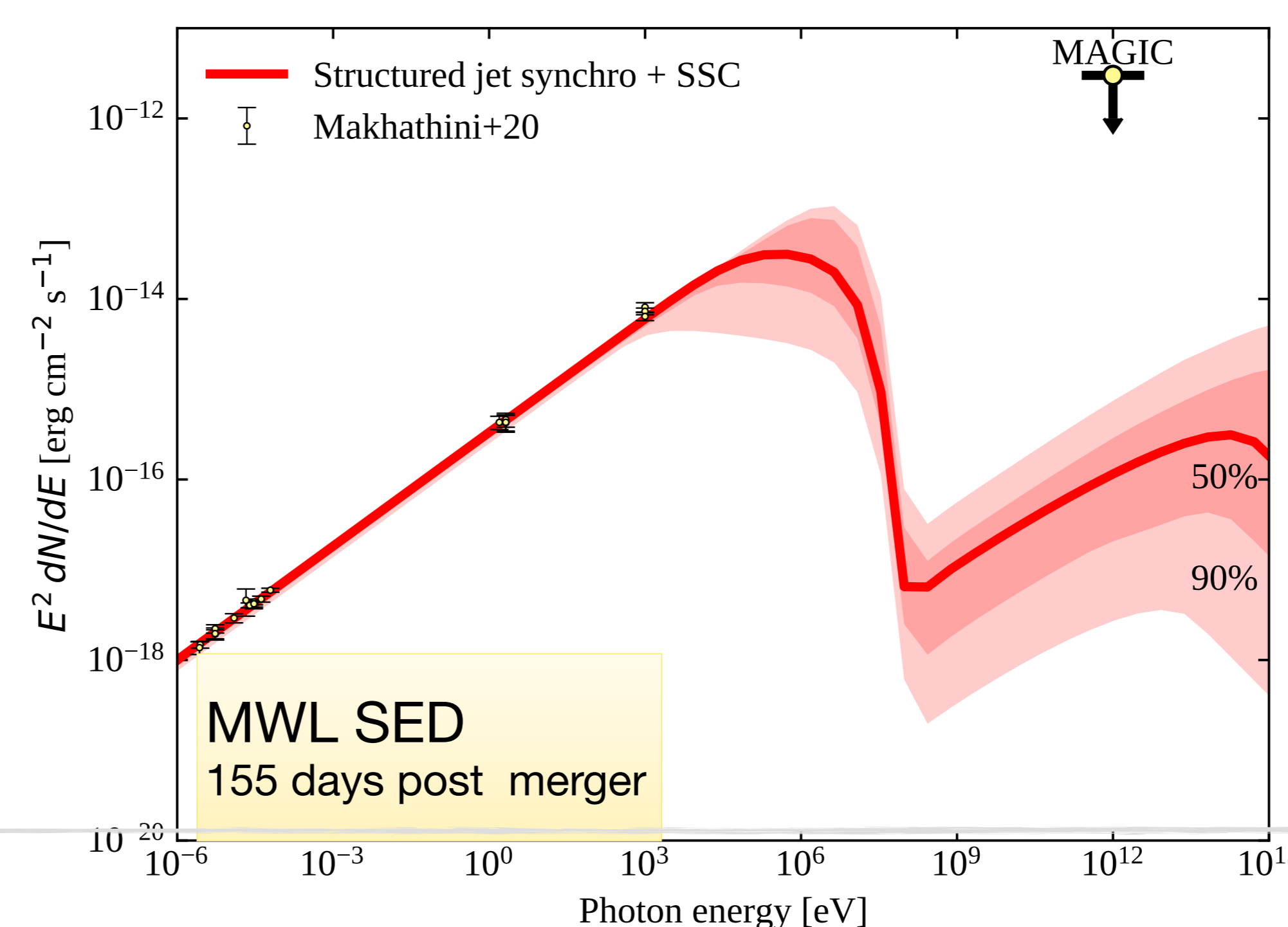
The radio-X-ray and MAGIC follow-up



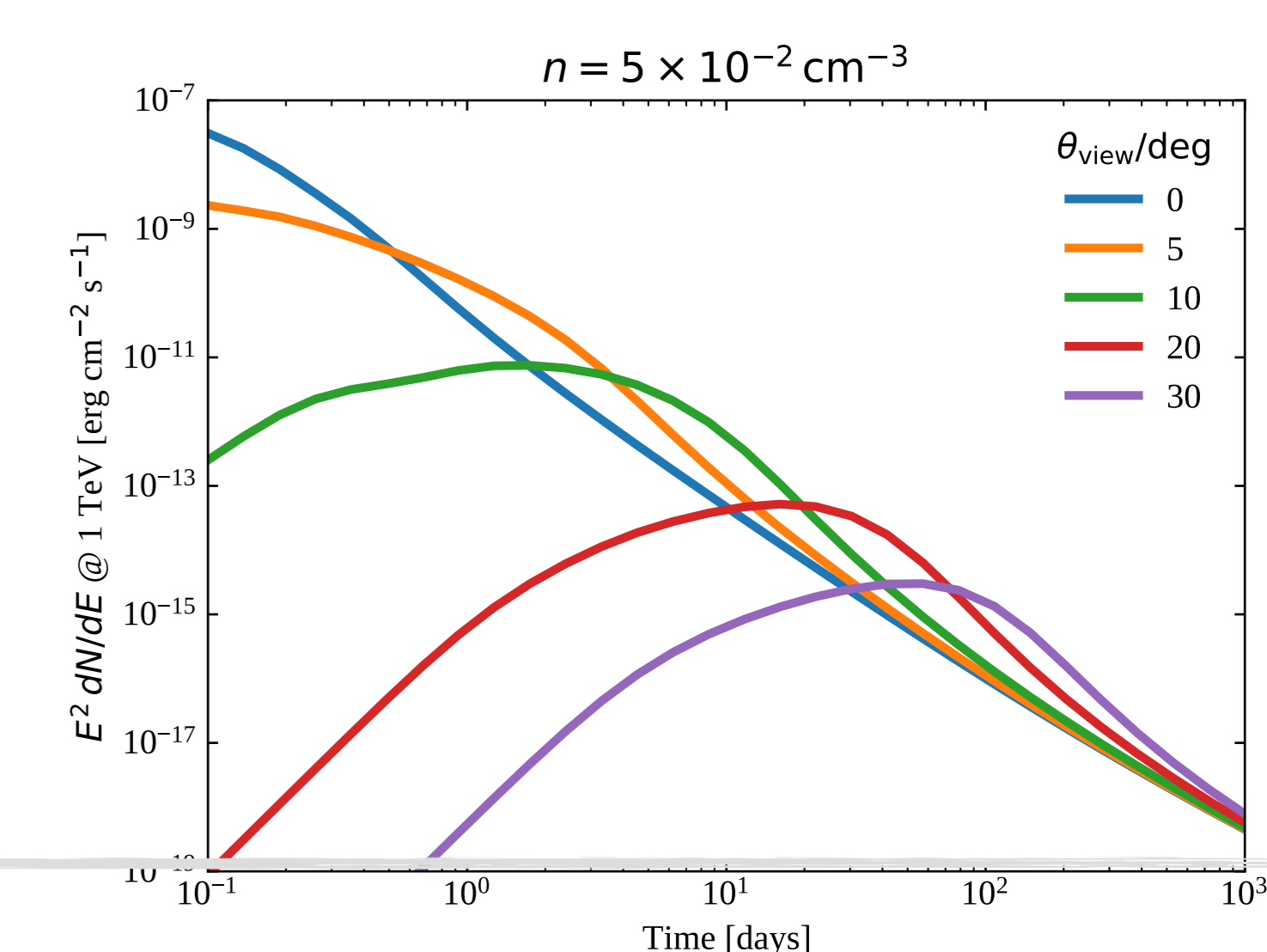
Geometry of the off-axis structured jet afterglow model.



Results: Multifrequency SED and SSC model



Results: expected light curves at different viewing angles with higher ISM density



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- SSC model from a structured jet shows that TeV emission from short-GRBs seen off-axis (>10 - 20 deg) is challenging for the present generation of Cherenkov telescopes.
- The detection of an energetic component from GW and BNS counterparts by Cherenkov telescopes is expected with either smaller off-axis angle $< \sim 10$ deg and denser interstellar medium density, or an additional emission component.