Optical(and NIR) Facilities

For Very High Energy Astrophysics

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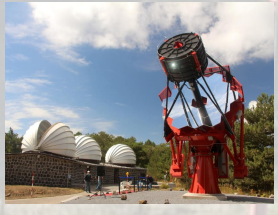
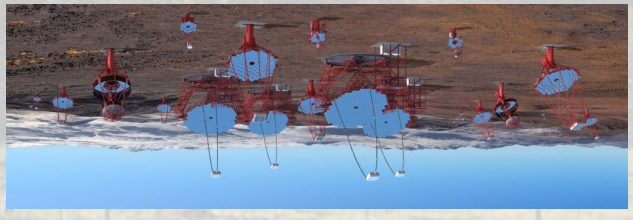
Optical/NIR facilities

- The next decade will see (yet another) epocal change about the optical/NIR facilities available for the community.
- My talk is definitely affected by a regional (European) bias, but the above statement holds anyway.
- I will mainly refer to ground-based facilities.
- The scientific drive is simple: VHE facilities are mature and competitive, and have solid (i.e. well based) multi-wavelength requirements.



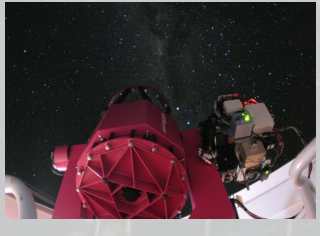


Optical/NIR facilities

- In the next few years we are going to deal with:
  - Giant (30-40m) collecting area telescopes (e.g. ELT, etc.).
  - Transient factories (i.e. sky monitoring), including the Vera Rubin telescope, more effective than ever.
  - Massive implementation of AI techniques in the management, reduction and analysis of astronomical data.
  - Highly specialized instruments for 8m class facilities (CUBES, etc.)
  - A family of intermediate class spectrograph (e.g. for rapid classification of transients).
  - More efficient (and accessible) networks of small size telescopes for (quasi) latitude/longitude and weather independent observations.

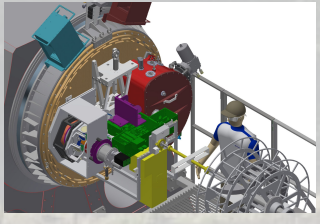
VHE facility requirements

- I think we can single out at few different situations:
  - Monitoring of highly variable VHE sources (i.e. blazars, etc.).
    - Typically planned observations, but also ToOs.
    - Two key requirements here:
      - optical/NIR time-resolution should be at least as good as the detectable variability time with VHE facilities.
      - Multi-filter observations (i.e. in order to get basic spectral info) are needed.
        - Possibility to sign agreements with various collaborations should be considered.



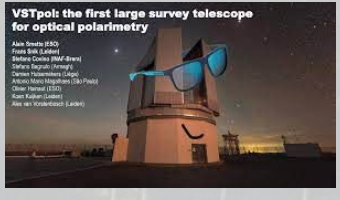
VHE facility requirements

- I think we can single out at few different situations:
  - Spectral monitoring of highly variable VHE sources (i.e. again blazars, etc.).
    - This might seem a similar requirement, but facilities able to do that are much less numerous and easy to access (i.e. standard GO competition is probably the only way).
      - The growing set of intermediate (2-3m) telescope spectroscopic facilities for transient classification (SOXS@NTT, NTE@NOT, etc.) offer a very interesting perspective.



VHE facility requirements

- I think we can single out at few different situations:
  - Polarimetry of particle accelerators (and not only):
    - This is always a problem if time-resolved polarimetry is needed.
      - Large collecting areas are needed, unless just a sparse monitoring is enough.
      - Moving from 1m class instruments to larger facilities the number of (fully available!) polarimeters decreases steeply.
      - For specific observations GO proposals are a good choice, but a more demanding monitoring dedicated “not-too-small” facilities (as the VSTPol) are required.



VHE facility requirements

- I think we can single out at few different situations:
  - Large FOV sources or structures (SN remnants, young star clusters, etc.):
    - An almost full sky monitoring with good collecting area is likely to be secured in the next years.
    - Nevertheless, if simultaneous, with the VHE facilities, observations are needed this is difficult to achieve

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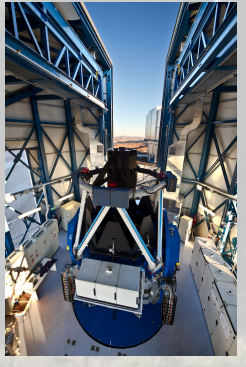
      - Very few facilities are available, although the situation is likely to improve.
      - Dedicated large FoV instruments “co-pointing” with VHE facilities would be valuable assets (again just as the VST).



VHE facility requirements

- I think we can single out at few different situations:
  - Transient identification, if transients are discovered by VHE facilities:
    - This is closely related to the large FoV case and is also a relatively new scenario, but definitely of interest for newer facilities.
      - Simultaneous optical monitoring would be of great value (or even essential).
  - However, a real-time analysis system is also required in order to be really effective.
    - Again, a non negligible effort.

Conclusions and suggestions

- The possibility of a (well organized) program of GO proposals to secure access to optical/NIR facilities for specific programs is definitely worth the efforts.
    - Not always the needed skills are available in VHE communities.
- Devoted facilities require a proper organizational scheme, yet they guarantee the best coupling with VHE needs.
    - Clearly this might be beyond the possibilities of a given consortium, even because different technical skills are needed.
- The possibility to negotiate an agreement with optical/NIR facilities is also a potentially rewarding route.