The BlackGEM Array

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BlackGEM Consortium

Tarantula & LMC
MeerLICHT
Science:
- *Gravitational wave counterparts*
- Southern All Sky Survey
- Fast Transients & Variables
- Nearby Universe Survey

Phase 1:
- 3 wide field telescopes (8.1 square degr. total)
- Primary mirror: 65cm diameter
- Sensitivity: $g=23$ in 5 minutes
- Location: ESO La Silla
- Seeing limited: 0.9” median
- Camera: 1 CCD/telescope, 0.56”/pixel
- $u,g,q,r,i,z$ filter set

Phase 2:
- Expansion to 15 telescopes (funding required)
- 40 square degrees total field of view (@ 0.56”/pix)
- Location: ESO La Silla; or ESO, NZ and SA

*BlackGEM Phase 1 operational end 2018*
BlackGEM Data Flow

- All BlackGEM transient alerts public (TNS, Atel, VOEvent)
  * RA, Dec
  * Time
  * Magnitude(s), Filter(s)

- Transient detection delay after data taking: 
  ~ 10 minutes
Science Verification

- Instantaneous Photometric calibration using SDSS/PanStarrs/SkyMapper

Zeropoint MeerLICHT
Detected q-band 23.95

Expected for BlackGEM:
Zero-point q-band 24.2
BlackGEM Team & Consortium

Principal Investigator: Paul Groot (Radboud University)
Project Scientist: Peter Jonker (Radboud University/SRON)
Project Manager: Steven Bloemen (Radboud University)

Consortium Institute Partners

NOVA = Amsterdam, Leiden, Groningen, Radboud

Radboud Universiteit

KU Leuven

Weizmann Institute, Potsdam University, UC Davis, Hebrew University, Manchester University, Tel Aviv University, U Canterbury at PI-level

Possibility for new partners (for 5 year operation):

• 150 kEuro to join at PI-level (one faculty member + PDRAs/PhDs)
  (all data, science team, lead a science case)
• 1 MEuro to join at Institute level (full institute)
  (all data, science team, lead a science case, consortium board)

www.blackgem.org ; @BlackGEM_Array
BlackGEM Science

- **BlackGEM Trigger Mode: 'Transients Galore'**
  - GW error box coverage in multiple colours
  - 100s of sqd in multiple times over ~week time scale down to $g=23$
    - (TDEs, SN of all types, Dwarf Novae, SN Ia, SN Iax, etc.)

- **BlackGEM Southern Sky Survey: 'Southern Sloan'**
  - 30,000 sqd down to $22^{nd}$ mag in $u,g,q,r,i,z$ at 1” median seeing
  - By itself a fantastic resource for all kinds of science:
    - (galactic streams/structure, dwarf galaxies, stellar populations, 'gems', quasars, weak lensing, high-z galaxies, etc.)
  - Includes a 1-minute integration $q$-band scan of available Southern Sky (10000 sqd) every two weeks, down to $q\sim 21.5$

- **BlackGEM Fast Synoptic Survey**
  - High cadence (1 min), multi-colour (simultaneous), wide-field
  - Kepler Short Cadence-type sampling on millions of objects
  - Deep drilling fields: thousands of exposures over weeks time-scale
  - Local Universe transient program at 3hr cadence ($uqz$)
  - Flexibility for experiments: continuous read-out, six filters, etc.
    - (fast transients, asteroids, KBOs, early SN, interacting binaries, eclipses etc.)

- **BlackGEM Twilight Program**
  - Every twilight (30 minutes) Local Universe galaxies in 3 bands ($u,q,z$) for new transients (incl. SMC/LMC, Fornax Cluster, Cen A/M83 group, etc.). Fifteen fields (120sqd) per twilight.