Working group #1:
Fundamental physics and cosmology

(extented to:

Fundamental physics and high energy astrophysics)

questions: cosmology

- reacceleration of the expansion / nature of dark energy ($\rho(z)$, $w(z)=P/\rho$)
  - SNIa, SNII to larger z : ELTs, JDEM
  - weak lensing (sources or CMB): Planck/inflation probe, LSST, SKA, GDEM
  - cosmological parameters, Hubble constant with primary indicators matter oscillation seen in sources: ELTs, SKA
  - clusters of galaxies counts: Planck, SZ ground surveys
- dark matter / supersymetry (physics beyond the standard model) sterile neutrinos
  - indirect detection, gamma rays: INTEGRAL, HESS , GLAST
  - indirect detection, neutrinos: ANTARES,ICECUBE KM3,
  - Direct detection: underground detectors
  - mapping of dark matter potentials by weak lensing (contraints on interaction with ordinary matter): Planck/inflation probe, LSST, SKA, GDEM

questions: cosmology

- topological defects, cosmic strings / phase transitions associated with symetry breaking
  - direct detection by lensing Planck/inflation probe, LSST, SKA, GDEM
  - high energy CR, neutrinos: AUGER, HESS, ANTARES, ICECUBE, KM3
- variations of physical constants
  - radio, millimeter and optical spectroscopy: ELTs, ALMA, SKA
  - change of G from pulsars: SKA
- statistical properties of the fluctuations (non Gaussianity)
  - CMB: Planck
  - redshift surveys: SKA, ELTs
- Topology of the universe search for ghosts images of sources or in CMB
- primordial nucleosynthesis

questions cosmology: early universe

- big bang questions: flatness, large scale homogeneity, monopoles, generation of fluctuations / inflation physics, cyclic universe reheating , quantum gravity, string theory, extra dimensions, branes
  - indirrect detection of tensor perturbations: CMB polarization Planck, Inflation probe
  - direct detection of tensor perturbations: BBO(LISA2), pulsars timing array, GAIA?
- baryogenesis, leptogenesis, matter-antimatter asymetry / CP symetry breaking
  - LHC, particle physics experiments

questions: high energy astrophysics

- theory of gravity, tests of GR weak fields

- theory of gravity: strong field) / gravitational waves from accreting black holes, binary black holes and pulsars (merging), properties of bh, microquasars
  - VIRGO,LIGO, LISA
  - CON X, XEUS
  - pulsars SKA
- equation of state at ultra high densities / neutron stars, other ultra dense stars