LPP Programme in 2003-2009

- Physics motivations
- Programme of the approved projects
- Future trends and perspectives

Physics motivations

Particle Physics is studing the very fundamental aspects of Nature

- Higgs boson
- Supersymmetry
- Quark/lepton compositness

New interesting facts and challenging ideas:

Dark energy and dark matter

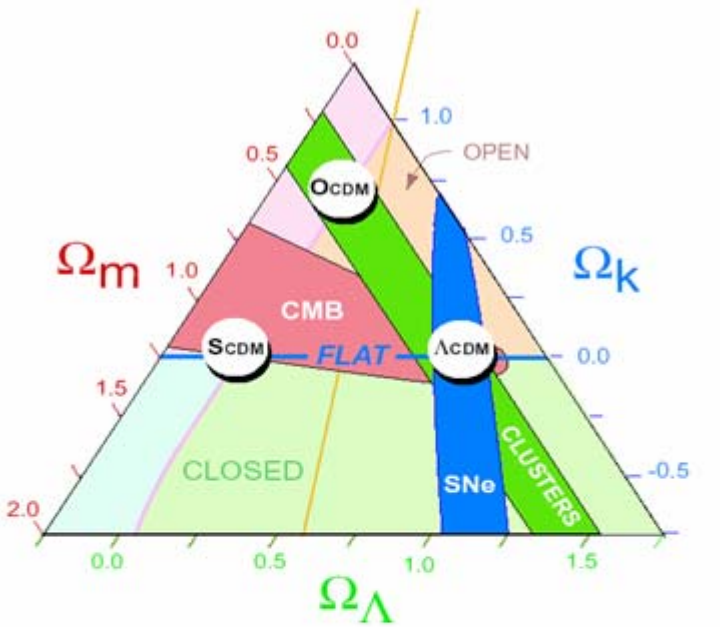


Figure 2: **The Cosmic Triangle Observed** represents current observational constraints. The tightest constraints from measurements at low red shift (clusters, including the mass-to-light method, baryon fraction, and cluster abundance evolution), intermediate red shift (supernovae), and high red shift (CMB) are shown by the three color bands (each representing 1-σ uncertainties). Other tests discussed in the paper are consistent with but less constraining than the constraints illustrated here. The cluster constraints indicate a low-density universe; the supernovae constraints indicate an accelerating universe; and the CMB measurements indicate a flat universe. The three independent bands intersect at a flat model with $\Omega_m \sim 1/3$ and $\Omega_\Lambda = 2/3$; the model contains a cosmological constant or other dark energy.

- **The Universe is flat**
  $\Omega=\rho/\rho_c = 1.02\pm0.06$
  (Boomerang)
- Dark energy

$\Omega_\Lambda = 0.75\pm0.10$

- Matter density

$\Omega_M = 0.33\pm0.035$

- Baryon density

$\Omega_B = 0.032\pm0.005$

(N.Bahcall et al, astro-ph-9906463)

Large extra dimensions:
a new arena for Particle Physics*

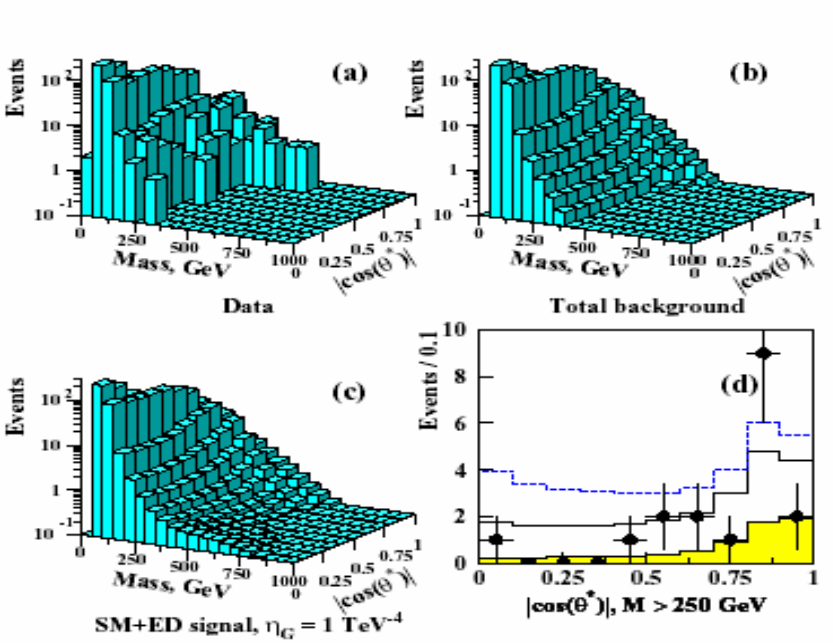


FIG. 2: Two-dimensional distributions in di-EM mass and $|\cos\theta^*|$ for: (a) data, (b) background, (c) background and ED signal for $\eta_G = 1$ TeV^{-4}, and (d) $|\cos\theta^*|$ distribution for events with $M > 250$ GeV, where the filled circles correspond to the data, instrumental background is shown shaded, the entire background from SM sources is given by the solid line, and the dotted line corresponds to the sum of SM and ED for $\eta_G = 1$ TeV^{-4}.

- Real gravitons emission

$M_D > 1.4$ TeV (n=2)

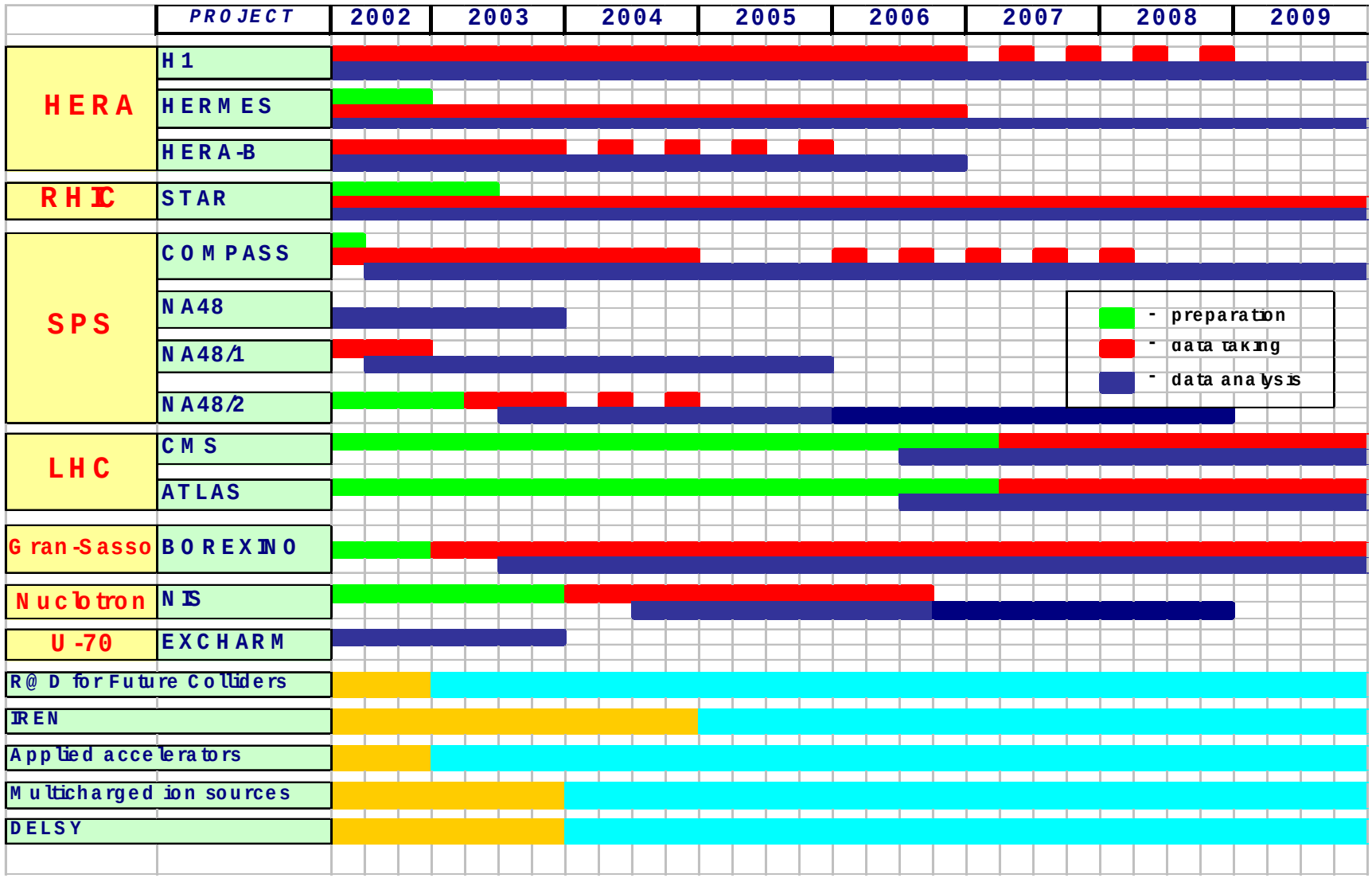
- Black holes production
- Brane World

*)N.Arkani-Hamed, S.Dimopoulos, G.Dvali, Phys.Today. Febr.2002, p.35

LPP activities

- **Past**
  - Structure of nucleon (NA4, I.A.Golutvin,I.A.Savin)
  - Collective methods of acceleration (V.P.Sarantsev)
- **Present**
  - Structure of nucleon (COMPASS, HERMES, H1, STAR, NIS)
  - Fundamental symmetries (NA48,NA48/1,2)
  - SMC, ATLAS, LHC Damper system
  - BOREXINO, HERA-B, EXCHARM
  - Future accelerators development (TESLA, CLIC)
  - IREN, multicharged ion sources
  - Applied researches

Approved Projects Schedule



New initiatives

- TESLA
  - H1 and HERMES physicists
  - FEL at TTF
- HESR (GSI, Darmstadt)
  - Antiproton storage ring for 1-15 GeV
- Neutrino factory
  - Physical case for the Near Detector
- CNGS

LPP – cluster for Particle Physics for JINR member states

- Increasing role of the home site:
  - Detectors production
  - Data processing
  - Data analysis
  - On-line experiment control
  - Videoconferences
- Experiments at the world best accelerators in the “remote” mode
- Powerful computing facilities

Main principles:

- Original physical ideas (NA48/2,COMPASS)
- Important contribution to the detector systems – SMC, COMPASS
- Participation in the accelerator developments
- RDMS model for the international collaborations

Computing at Particle Physics

- A typical example – COMPASS
- 3 TB/day
- 15 days run – second place in 2001 among the CERN users (after NA48)
- COMPASS PC farm at CERN – 200 CPU
- LPP PC farm – 20 PC

LPP-LHE PC-farm

Current status

CPU: 1.2 kSI95 (20 PC's)
Disks: 3 TB
Tapes: 1 TB

60 k$

per year

At 2009 (Level of Tier 2)

CPU: 32 kSI95 (64 PC's)
Disks: 70 TB
Tapes: 100 TB

Network for Particle Physics

In 2009:

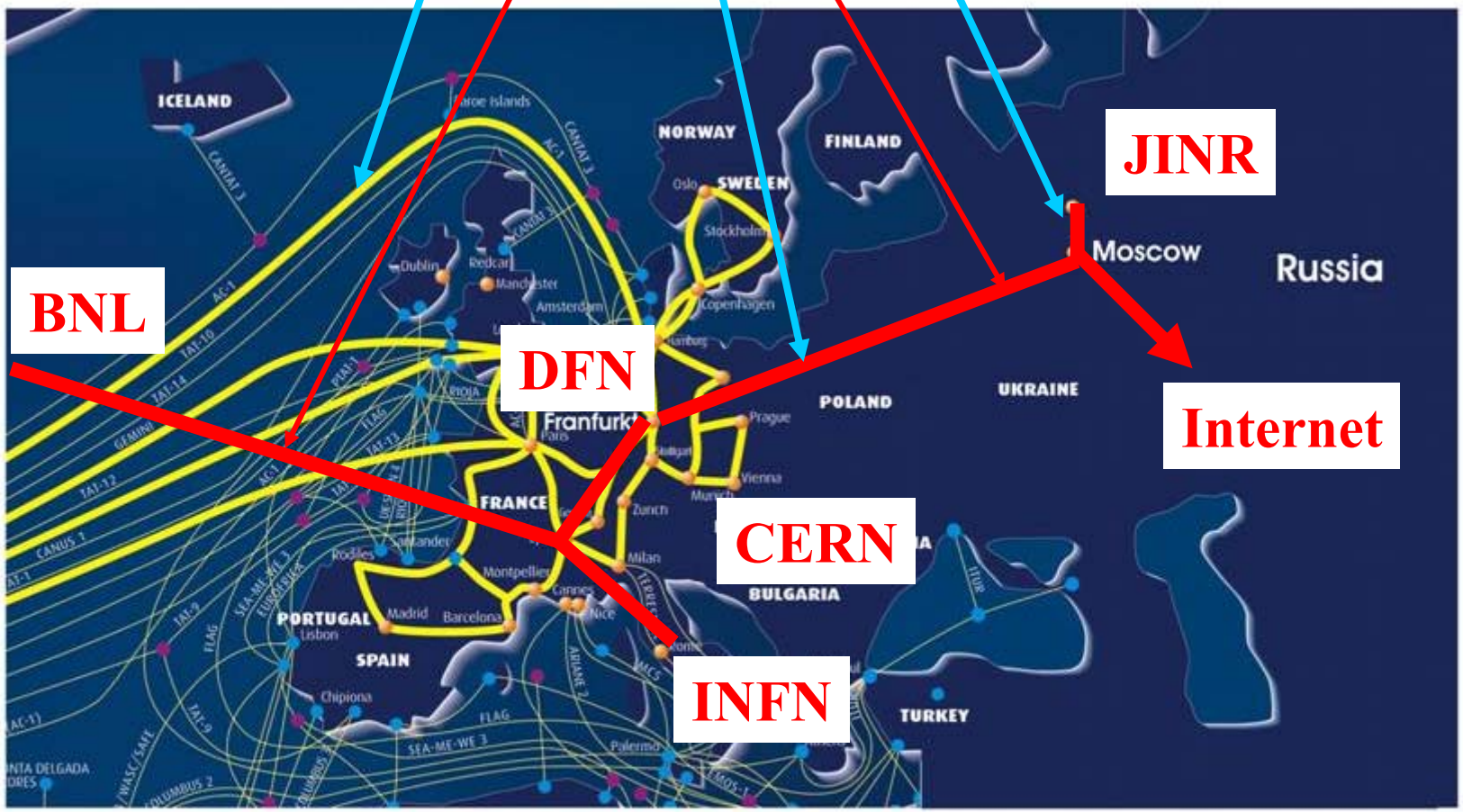
Current status:

1 Gb/s

1 Mb/s

10 Mb/s

30 Mb/s



TELEGLOBE

Conclusions

- The future of Particle Physics is even more promising than earlier
- LPP scientific programme reflects new challenges
- Main organisational task - infrastrusture of the Particle Physics cluster for JINR member states