COSMOGRID

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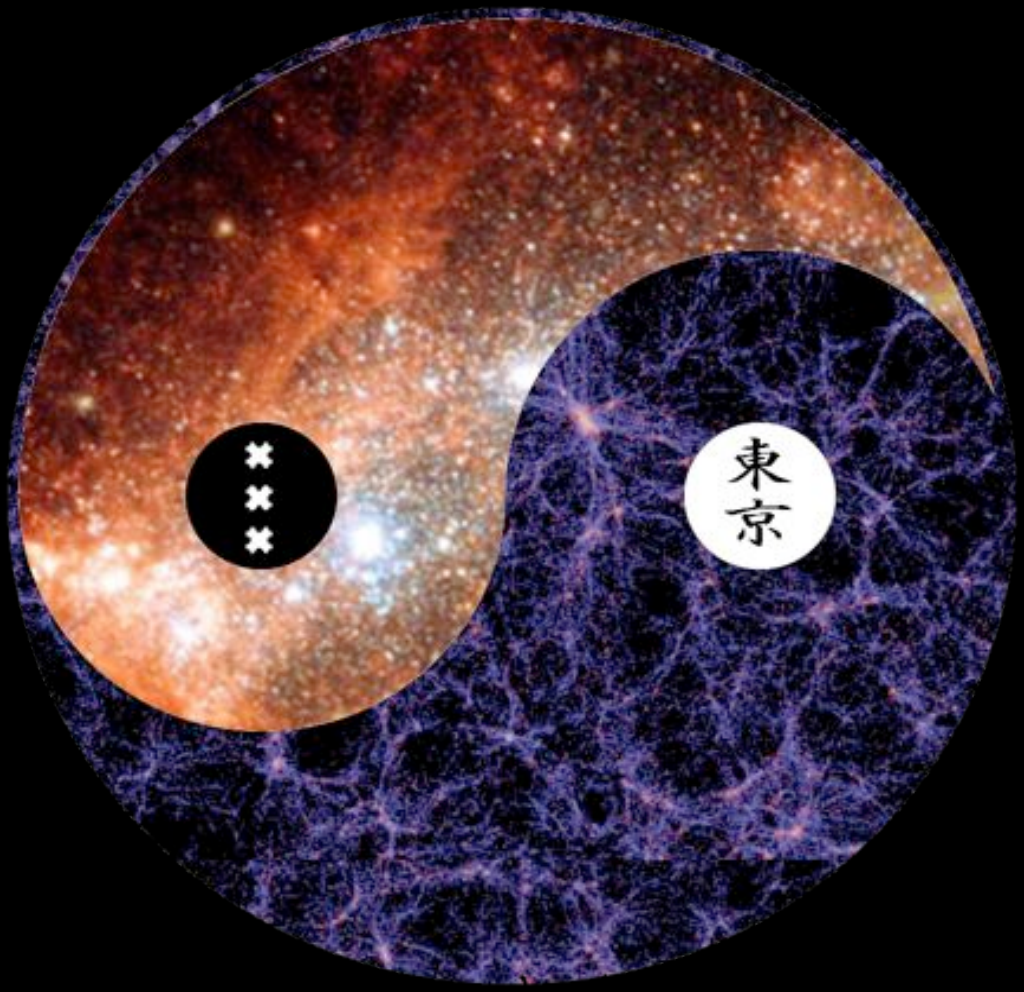
CosmoGrid

Details at: http://wiki.2048x2048x2048.org

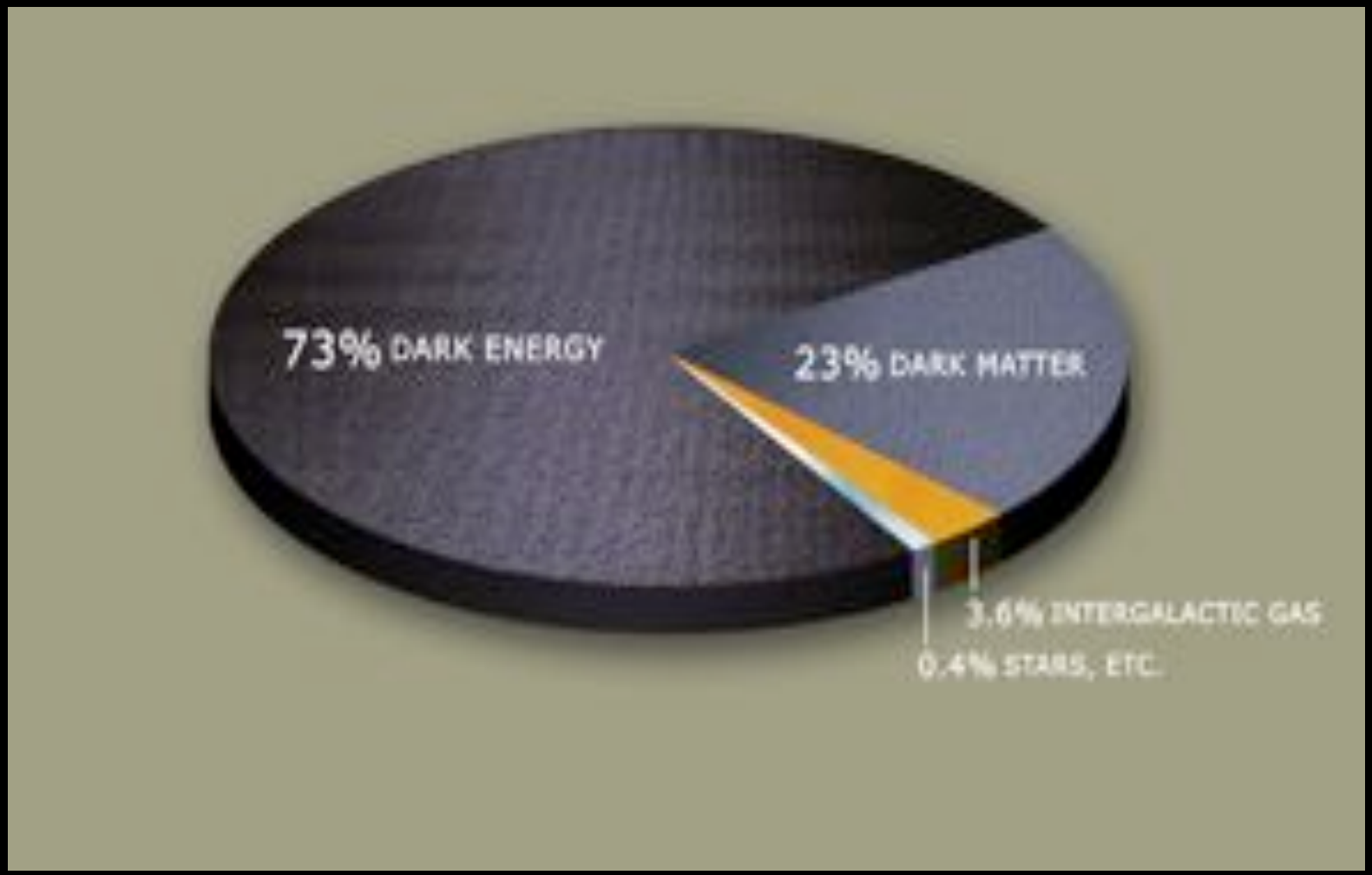
- A cosmological N-body simulation with 10 billion particles
- Higher resolution, higher accuracy and better performance



CosmoGrid:

A large scale cosmological simulation of a limited volume

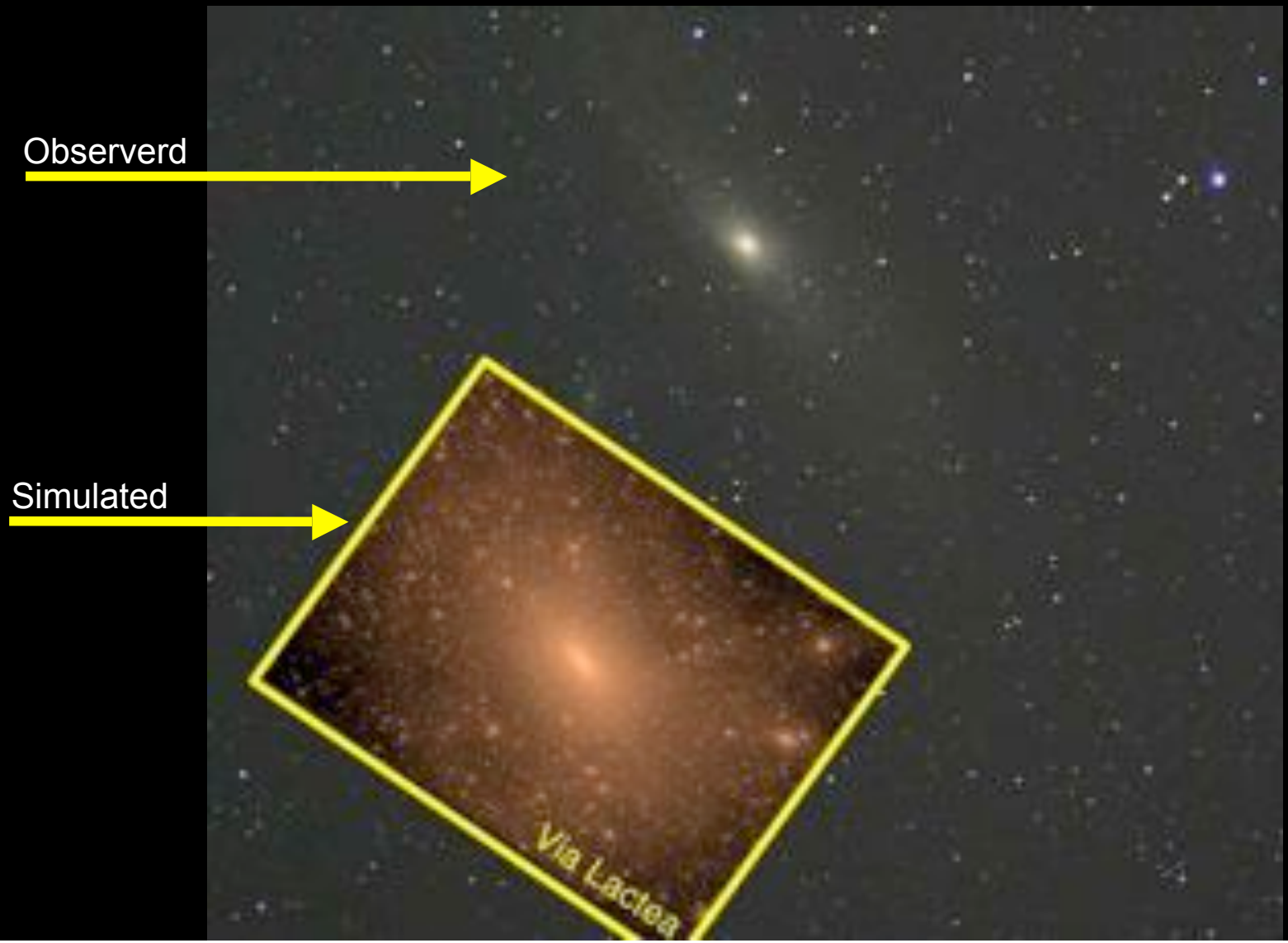
Composition of the Universe



The CosmoGrid project

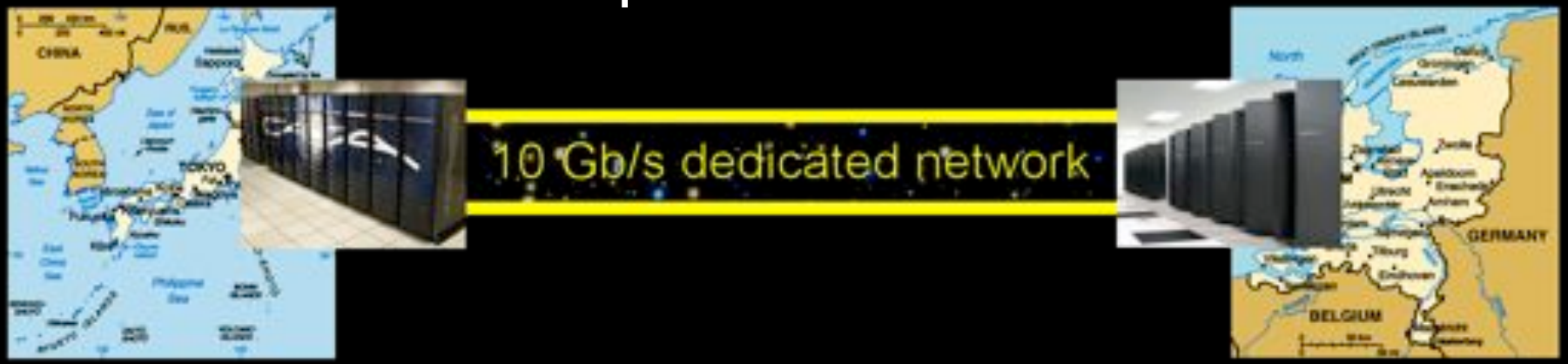
- Motivation: **previous simulations found >100 times more substructure than is observed**
- Simulate large structure formation in the Universe
  - Dark Energy (cosmological constant)
  - Dark Matter (particles)
- Method: Cosmological *N*-body code
- Computer: Intercontinental supercomputer grid

Too much substructure in simulations



The hardware setup

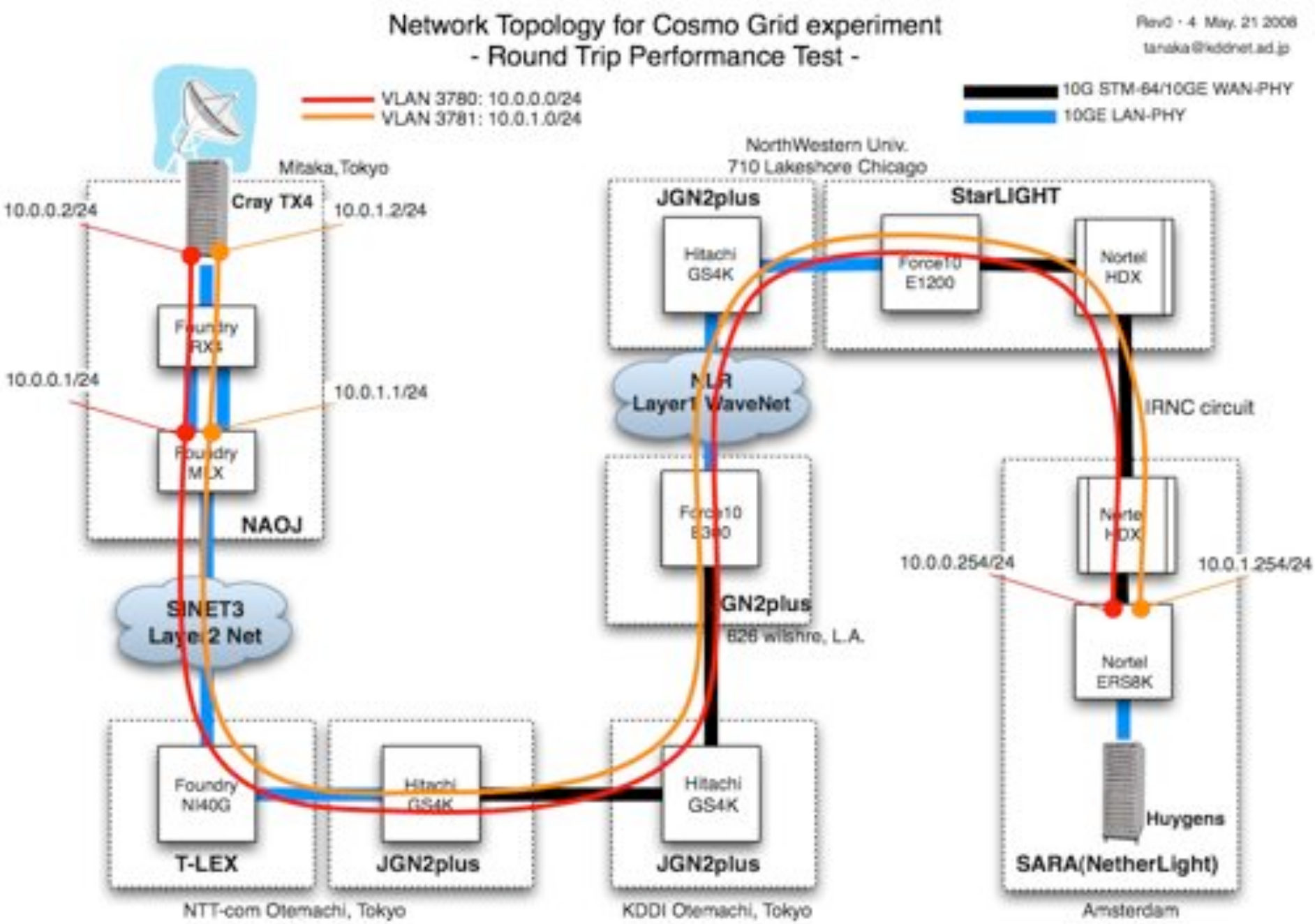
- 2 supercomputers :
  - 1 in Amsterdam (60Tflops Power6 @ SARA)
  - 1 in Tokyo (30Tflops Cray XD0-4 @ CFCA)
- Both computers are connected via an intercontinental optical 10Gbit/s network



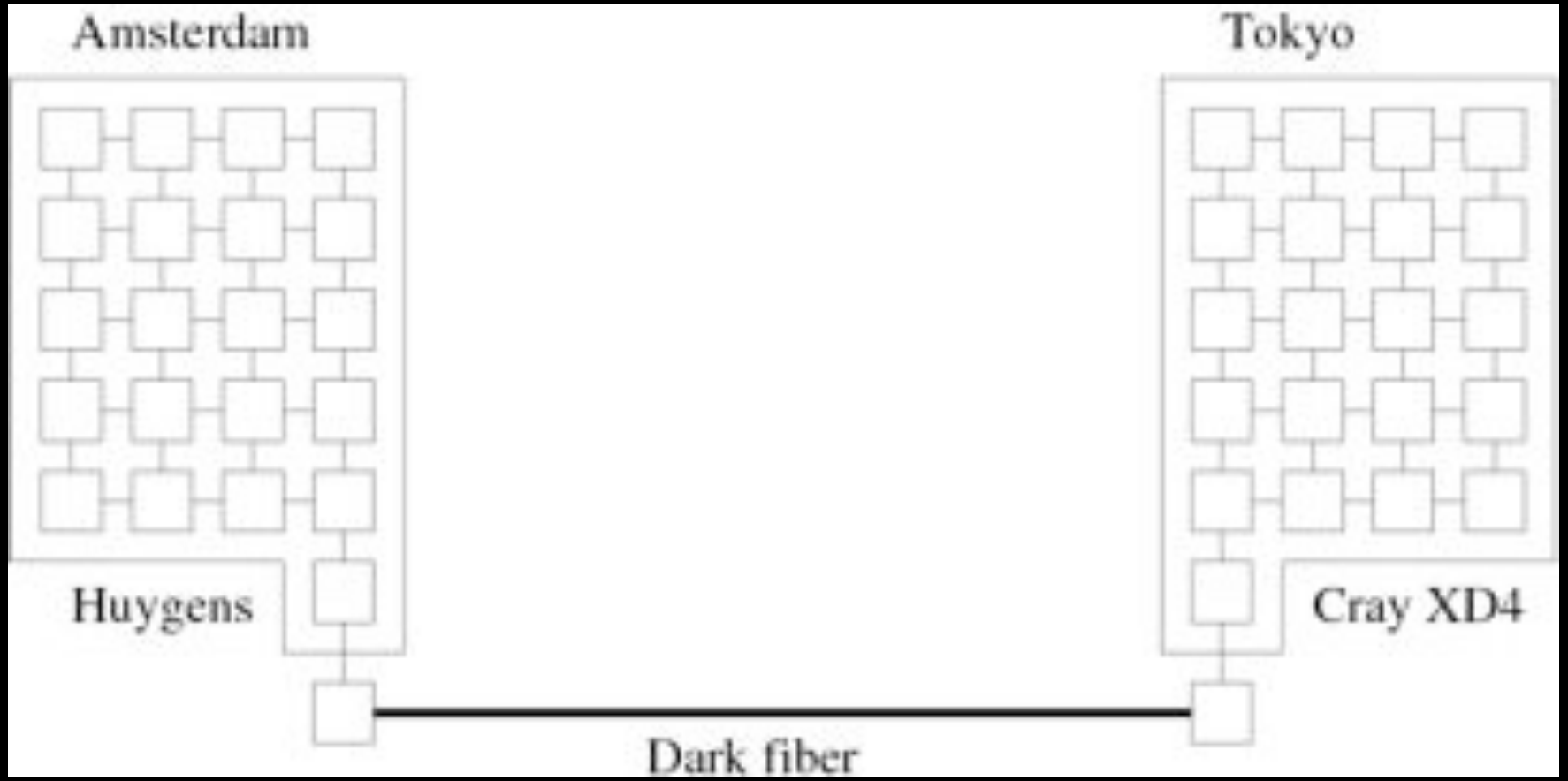
Z=0 result of test calculation ($N=128^3$)

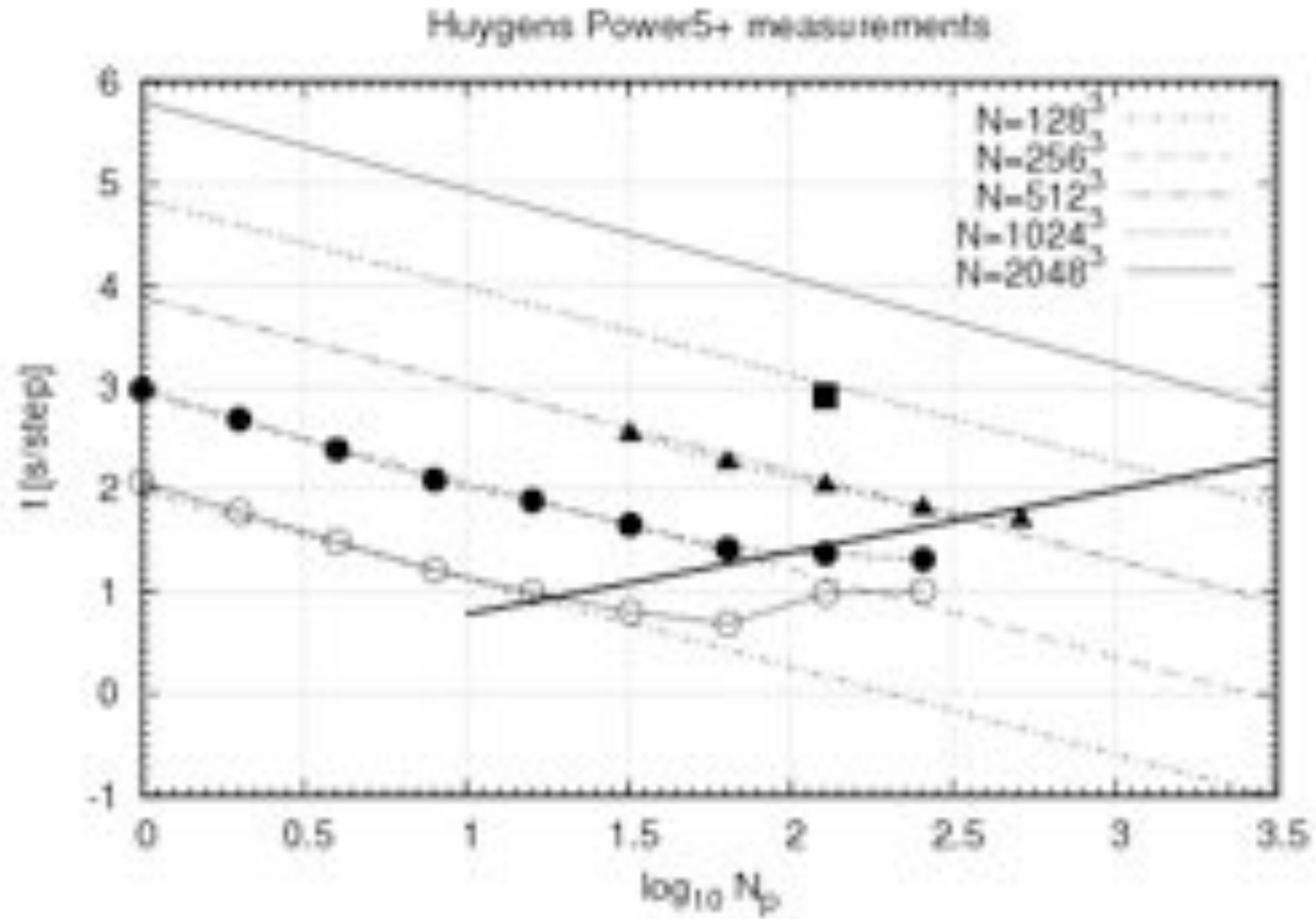
30Mpc on the side
32nodes Amsterdam
32nodes Tokyo
Regular network

CosmoGrid network



Network and parallelization strategy




Huygens Power5+ measurements
N=128^3
N=256^3
N=512^3
N=1024^3
N=2048^3
I [ions/step]
log10 Np
6
5
4
3
2
1
0
-1
0
0.5
1
1.5
2
2.5
3
3.5

Questions ?