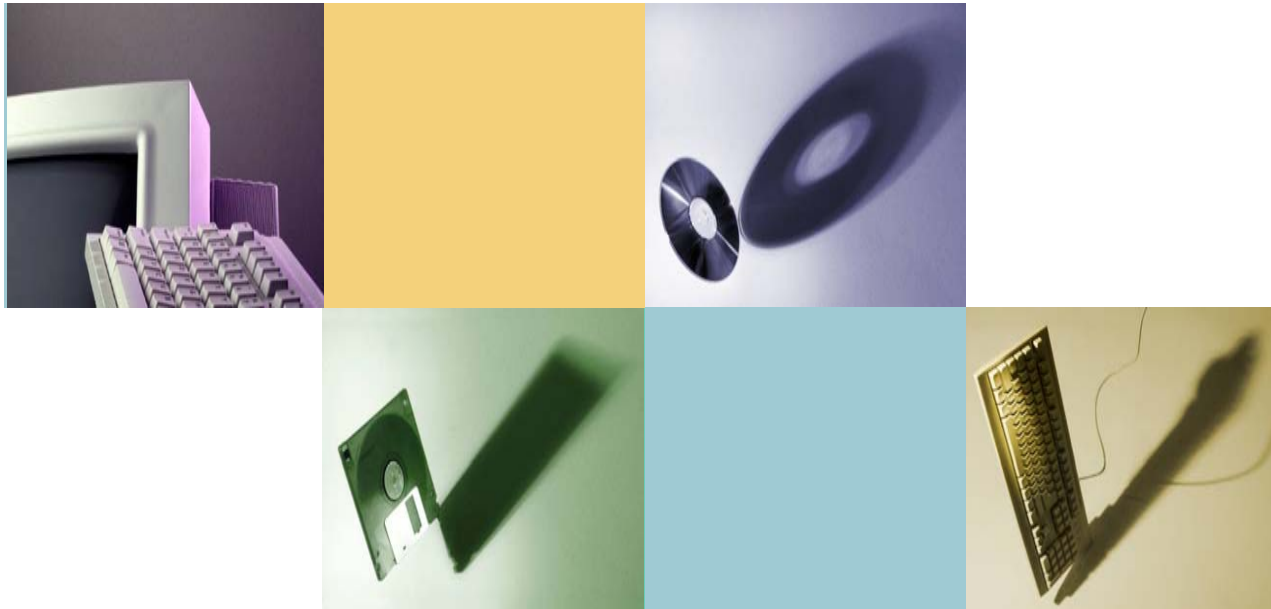# The ALICE Computing Model

Strategy, Requirements and Resources

ALICE computing model

- Why do we do the exercise now ?
  - To learn: It is not too early to try to formalize the model, even if the model is going to change later;
  - To seek external competences:
    - The LHCC will review our model and its implications on January 18, 2005;
    - The Computing TDR is due in summer 2005
  - To collect the required resources: Funding Agencies will sign the Computing MoU in Autum 2005.
  - To collect input from the collaboration
    - Draft is on the WEB
 - To be ready for data taking start in summer 2007.

ALICE computing model

- ## Objective:
  - Reconstruct and analyze real pp and heavy-ion data;
  - Produce, reconstruct and analyze Monte-Carlo data.

- ## Requirements:
  - Serve a large community of users distributed around the world;
  - Process an enormous amount of data.

- ## Solution:
  - Exploit resources distributed worldwide;
  - Access these resources within a GRID environment.

ALICE computing model

- ## Hierarchic model or democratic model
  - A strict hierarchy of computing sites to which well defined tasks are assigned: Tier0, Tier1, Tier2,…
  - In the democratic model any task can be assigned to sites with adequate free resources.
  - The choice of the GRID middleware will favor one model over the other.

- ## ALICE model(s)
  - Initial phase: low luminosity, less computing resources, learning the detection systems, training the algorithms;
  - Standard data taking phase
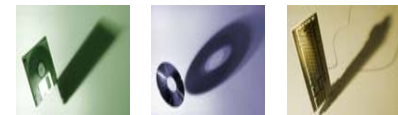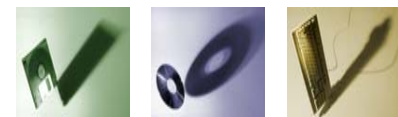
ALICE computing model

- The assumptions:
  - A standard data taking year:
    - 7 months pp (10^7s);
    - 1 month heavy-ion (10^6s);
    - 4 months shutdown.
  - Staging of resources deployment during the initial period:
    - 2007   20%;
    - 2008   40%;
    - 2009   100%
  - Reconstruction and simulation are scheduled tasks (PWG, PB)
  - Analysis are chaotic tasks eventually prioritized within PWG

ALICE computing model

- ## The assumptions:
  - ### MONARC model (only to establish requirements)
    - Tier0: collects and distributes 1 copy of raw data; performs quasi on line first reconstruction pass; keeps on permanent storage one full copy of raw data, a share of ESD;
    - Tier1: performs additional reconstruction passes; keeps on permanent storage a share of the raw data copy, ESDs;
    - Tier2: produces Monte-Carlo data and performs analysis.

    Tier0,1,2 can do any of these tasks depending on resources availability and on the demand at any given time.
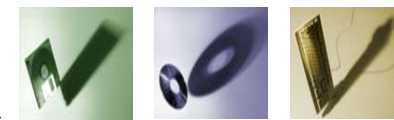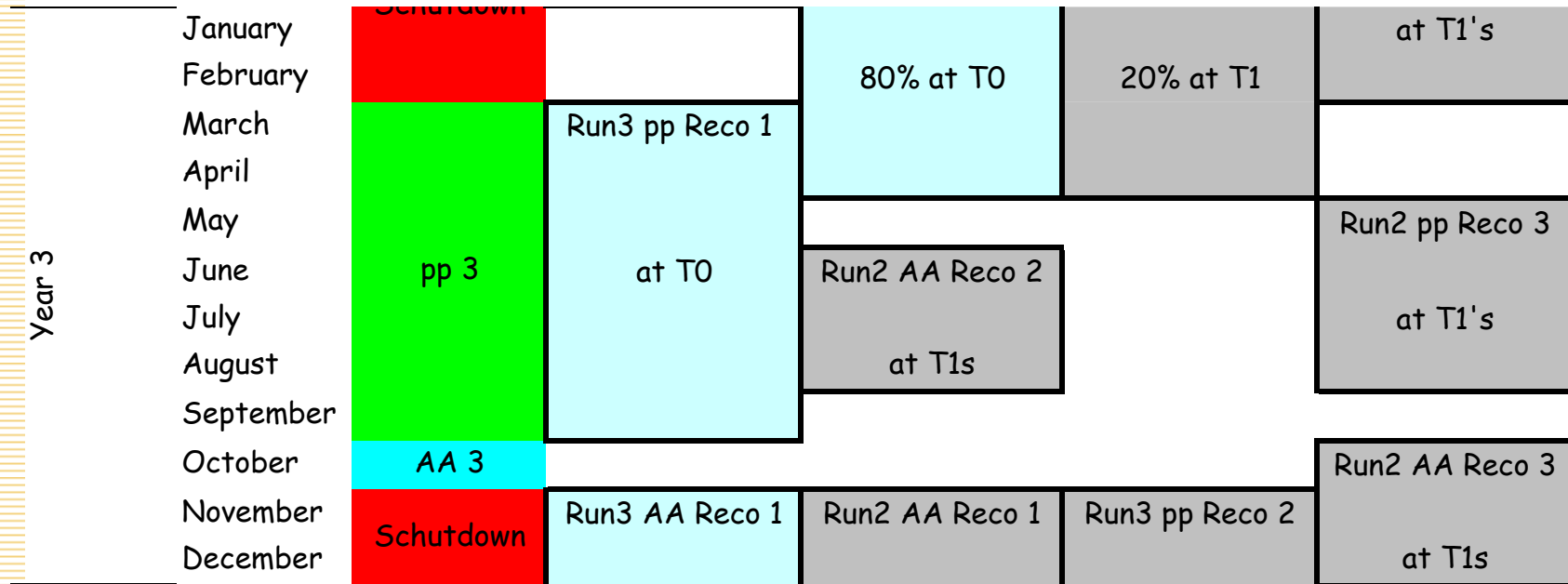
ALICE computing model

- A processing strategy
  - An early and fast first reconstruction at T0;
  - Additional 1 or 2 fully tuned and complete reconstructions distributed in T1s;
  - Slightly different in
    - pp: on line first reconstruction
    - AA: after data taking over 6 months maximum
  - Additional reconstruction over shorter periods
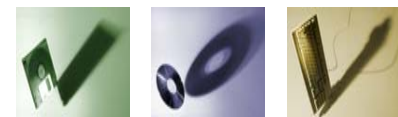
Processing strategy

Month	Accelerator	Process		
January	Schutdown			
February				
March	pp 1	Run1 pp Reco 1 at T0		
April				
May				
June				
July				
August				
September				
October	AA 1			
November	Schutdown	Run1 AA Reco 1 80% at T0	Run1 AA Reco 1 20% at T1	Run1 pp Reco 2 at T1's
December				
January				
February				Run2 pp Reco 1 at T0
March	pp 2		Run1 pp Reco 3 at T1's	
April				
May		Run1 AA Reco 2 at T1s		
June				
July				
August				
September				
October	AA 2	Run1 AA Reco 3 at T1s	Run2 AA Reco 1	Run2 AA Reco 1	Run2 pp Reco 2
November	Schutdown			
December				

Year 1 — Year 2

Processing strategy

Year 3						
January	Schutdown			80% at T0	20% at T1	at T1's
February						
March	pp 3	Run3 pp Reco 1				
April						
May		at T0				Run2 pp Reco 3
June			Run2 AA Reco 2			
July						at T1's
August			at T1s			
September						
October	AA 3					Run2 AA Reco 3
November	Schutdown	Run3 AA Reco 1	Run2 AA Reco 1	Run3 pp Reco 2		
December						at T1s

ALICE computing model

- Parameters of the model
  - see excel file

Used resources profile

kSI2K

AA reconstruction

T0
T1s

month

pp

AA

shutdown

T0
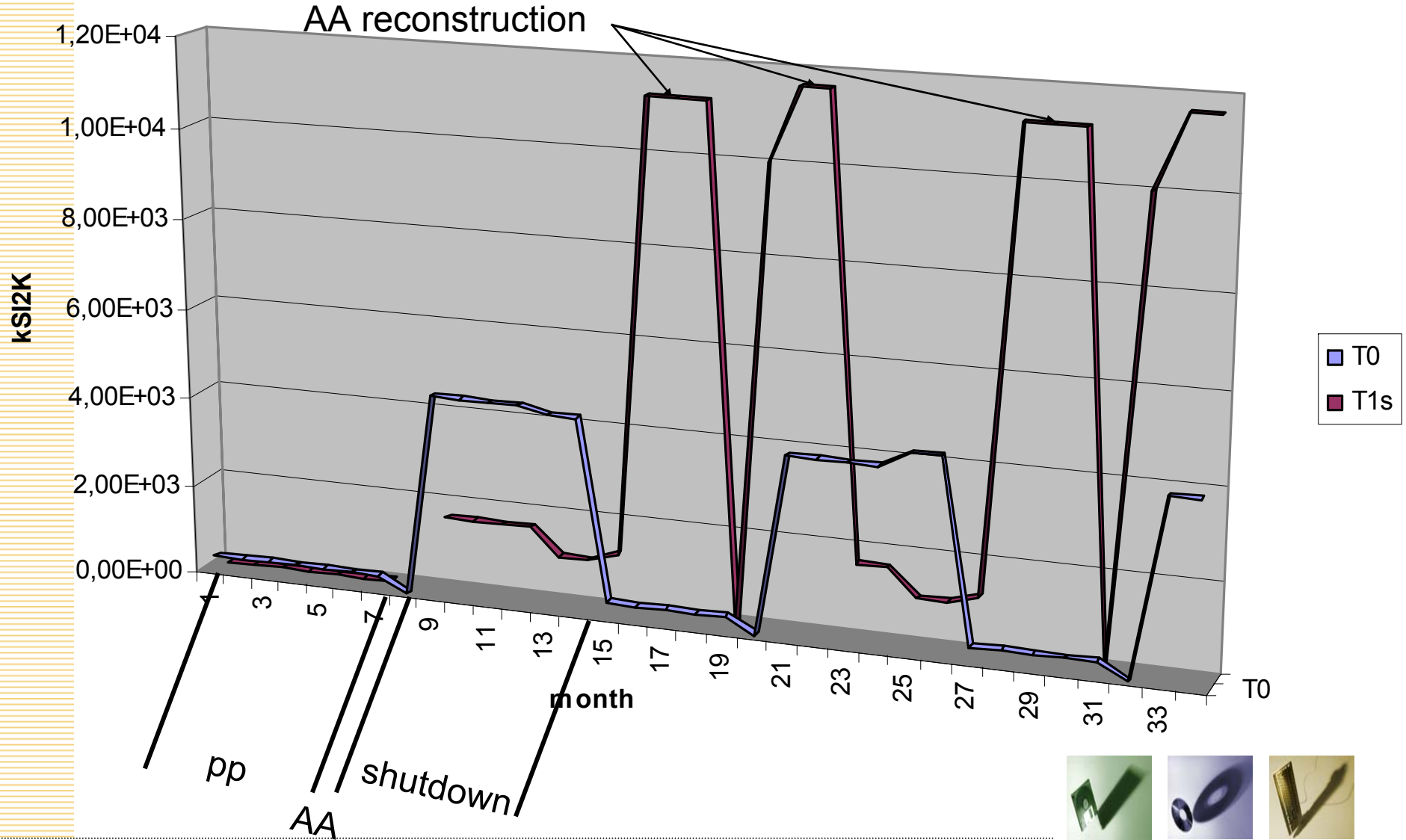
ALICE computing model

- Parameters of the model for simulation
  - See excel file
- Total required resources (peak values):

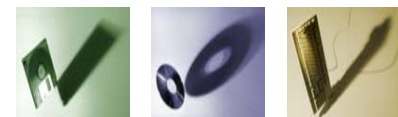| Summary of Computing Capacities required by ALICE			
	Tier0	Tier1	Tier2	Total
CPU (MSI2K)	4,52	11,65	19,22	3,54E+01

ALICE computing model

- Long term data storage (per year):
  - Original set of raw data at T0
  - One copy of raw data distributed in T1
  - ESD+AOD+TAG+Calibration are replicated in each T0 and T1s
  - One copy of Monte-Carlo data at T0 and one at T1s
- Short term storage:
  - 3% of raw data + ESD from one reconstruction pass at T0
  - 15% of raw data + ESD from all reconstruction passes at each T1
  - All AOD+TAG in each T2 + shared simulated data in T2s

Data replication on disk will be self organized by the GRID

ALICE computing model
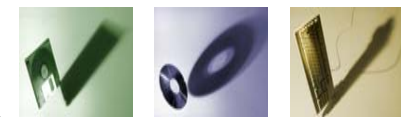
Summary of Computing Capacities required by ALICE				
	Tier0	Tier1	Tier2	Total
CPU (MSI2K)	4,52	11,65	19,22	3,54E+01
DisK (Pbytes)	0,30	6,30	6,69	1,33E+01
MS (Pbytes/year)	2,65	8,79	0,00	1,14E+01

ALICE computing model

- Resources sharing:

|	Tier1	Tier2
CPU (MSI2K)	1,94	1,75
DisK (Pbytes)	1,05	0,61
MS (Pbytes/year)	1,5	0,00

ALICE computing model

- Potential resources
  - Tier 1 services:
    1. CCIN2P3: ALICE share under discussion
    2. CNAF: ....
    3. FZK
    4. RAL: small contribution but contribution
    5. NIKHEF
    6. Nordic consortium: not all settled
  - Tier2 services (>12 sites identified not all have provided with data):
    - (Bari), Bucharest(?), Catania, France(Clermont-Ferrand?, Nantes?, Saclay?), Houston?, GSI, Kolkota, (Muenster), Ohio?, Padova, Russia, Seoul(?), Slovakia, Torino.

ALICE computing model

Summary of Computing Capacities pledged for ALICE							
	2005	2006	2007	2008	2009	2010	Comments
Tier1							
CPU (MSI2K)	0,47	1,12	2,11	9,17	9,58	9,91	
DisK (Pbytes)	0,07	0,28	0,50	1,50	1,73	2,02	
MS (Pbytes)	0,15	1,53	1,61	8,54	9,79	10,87	
Tier2							
CPU (MSI2K)	0,47	1,42	2,44	3,12	3,53	3,94	
DisK (Pbytes)	0,11	0,33	0,60	1,01	1,30	1,68	
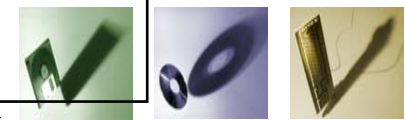
ALICE computing model

- How far/close are we ?

Required versus pledged

	2007	2008	2009
	20%	40%	100%
CPU (%)	0,74	1,00	0,42
Disk (%)	0,42	0,48	0,23
MS (%)	0,92	2,43	0,56
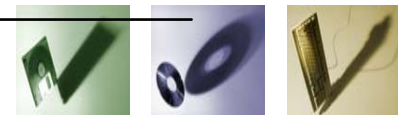
ALICE computing model

- What's next
  - Finalize the model to be delivered to LHCC (December 15, 2004 !)
  - The preliminary text is in chapter 7 of the TDR (check web)
  - Tune the parameters
  - Collect complete information of potential resources
  - Provide this information to C-Task Force preparing the C-MoU (beginning next year)
  - ….