



CMS

CERN-Korea Meeting

22 Oct 2007

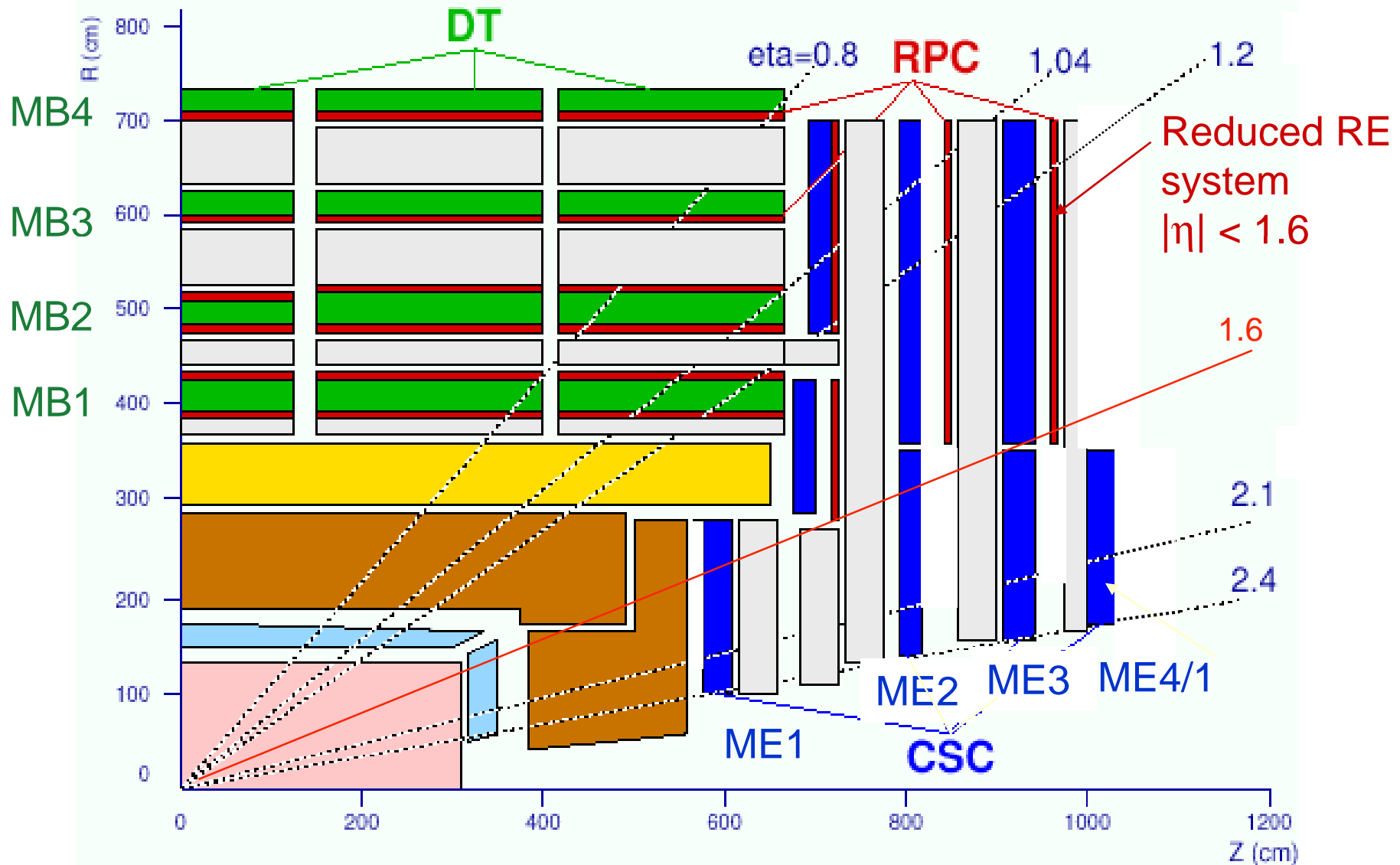
**Status of CMS and Endcap RPCs
Commissioning and Exploitation
Completion of Design Luminosity Detector**

Compact Muon Solenoid

T. Virdee

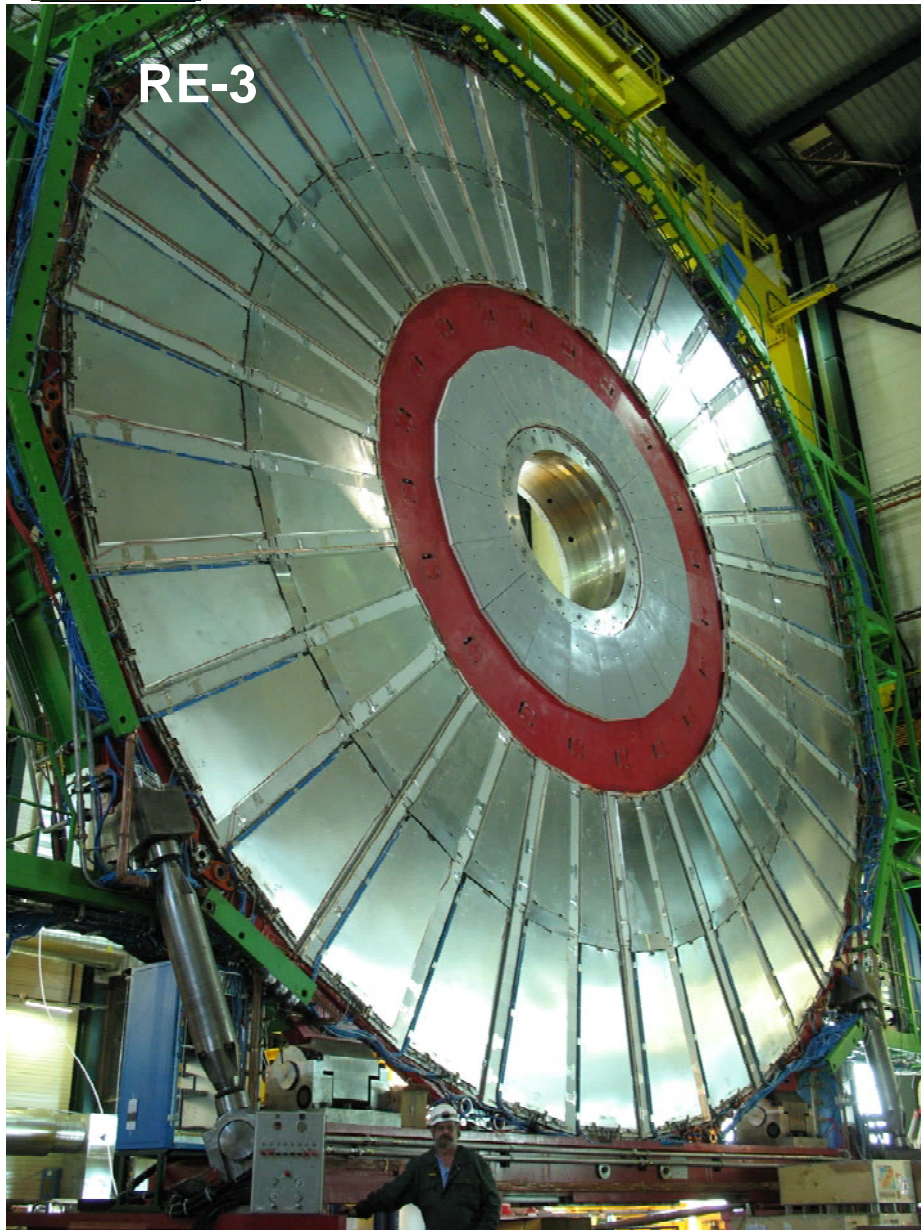


Muon System





Endcap RPCs



Installation of all Endcap RPC chambers (432) has been completed

**All gaps were produced in Korea
All Koreans concerned are to be congratulated.**

Station RE-3 is connected to services
Pre-commissioning done.

Full commissioning of RPC stations in
the underground cavern underway

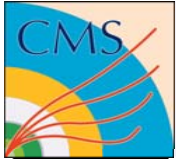
**Expect to have the minus-end cap
down before Xmas to start full
commissioning.**

**Need to rapidly construct 6 RE1/1
chambers in Korea to test
performance in this staged region**



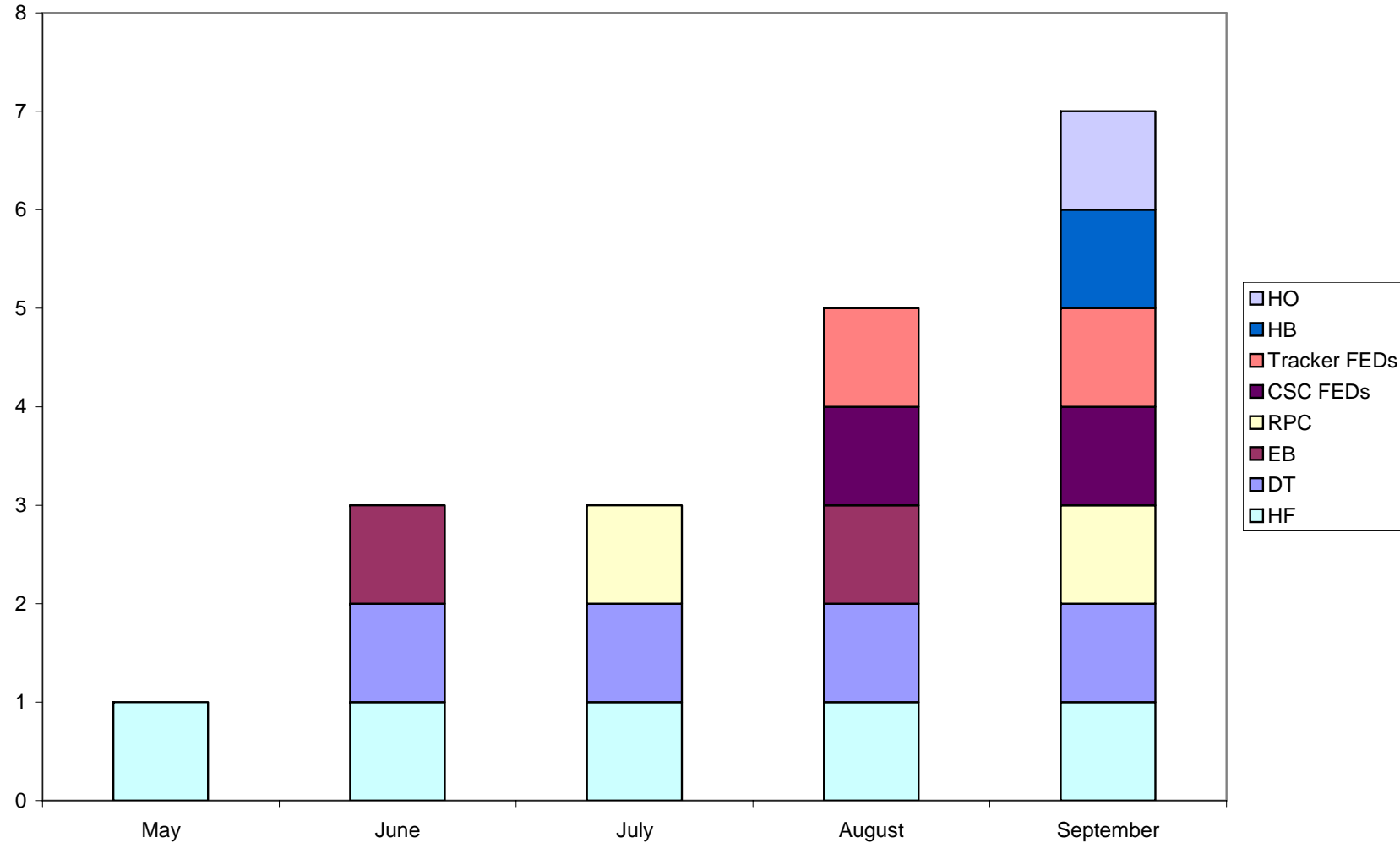
Situation in the Underground Cavern





Commissioning

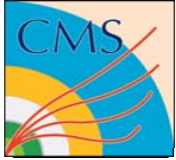
Participating Subsystems in Global Runs





Preparation for Physics

- **Prior to beam: early detector commissioning**
 - Readout & trigger tests, runs with all detectors (cosmics, test beams)
- **Early beam, up to 10pb^{-1} :**
 - Detector synchronization, alignment with beam-halo events, minimum-bias events. Earliest in-situ alignment and calibration
 - Commission trigger, start “physics commissioning”:
 - Physics objects; measure jet and lepton rates; observe W, Z, top
 - And, of course, first look at possible extraordinary signatures...
- **Physics collisions, 100pb^{-1} : measure Standard Model, start search**
 - $10^6 W \rightarrow l \nu$ ($l = e, \mu$); $2 \times 10^5 Z \rightarrow ll$ ($l = e, \mu$); $10^4 t\bar{t} \rightarrow \mu + X$
 - Improved understanding of physics objects; jet energy scale from $W \rightarrow j j'$; extensive use (and understanding) of b-tagging
 - Measure/understand backgrounds to SUSY and Higgs searches
 - Initial MSSM (and some SM) Higgs sensitivity
 - Early look for excesses from SUSY & Z'/jj resonances. SUSY hints (?)
- **Physics collisions, 1000pb^{-1} : entering Higgs discovery era**
 - Also: explore large part of SUSY and resonances at \sim few TeV



Exploitation of Physics

What CMS is currently doing

Computing-Software-Analysis (2007) challenge to mimic one month of operation at 50% of real capacity

Analysis: Concentrate on physics we can do with $< 1 \text{ fb}^{-1}$.

Chart out the “how” of this work, and to prepare methods, tools and people.

From Jan'08 to May'08

Have all the analyses (geared for 10 pb^{-1} & 100 pb^{-1}) & organization (code + people) in place ready to absorb the data

Remarks - reminder

- Physics exploitation is usually closely connected with the use of the hardware built.
- Natural for Korean groups to do the above for the RE and DAQ systems and follow through with work in HLT and physics using muons.
- CMS will do its best to help the Korean groups to integrate into, and contribute to, physics analyses.**



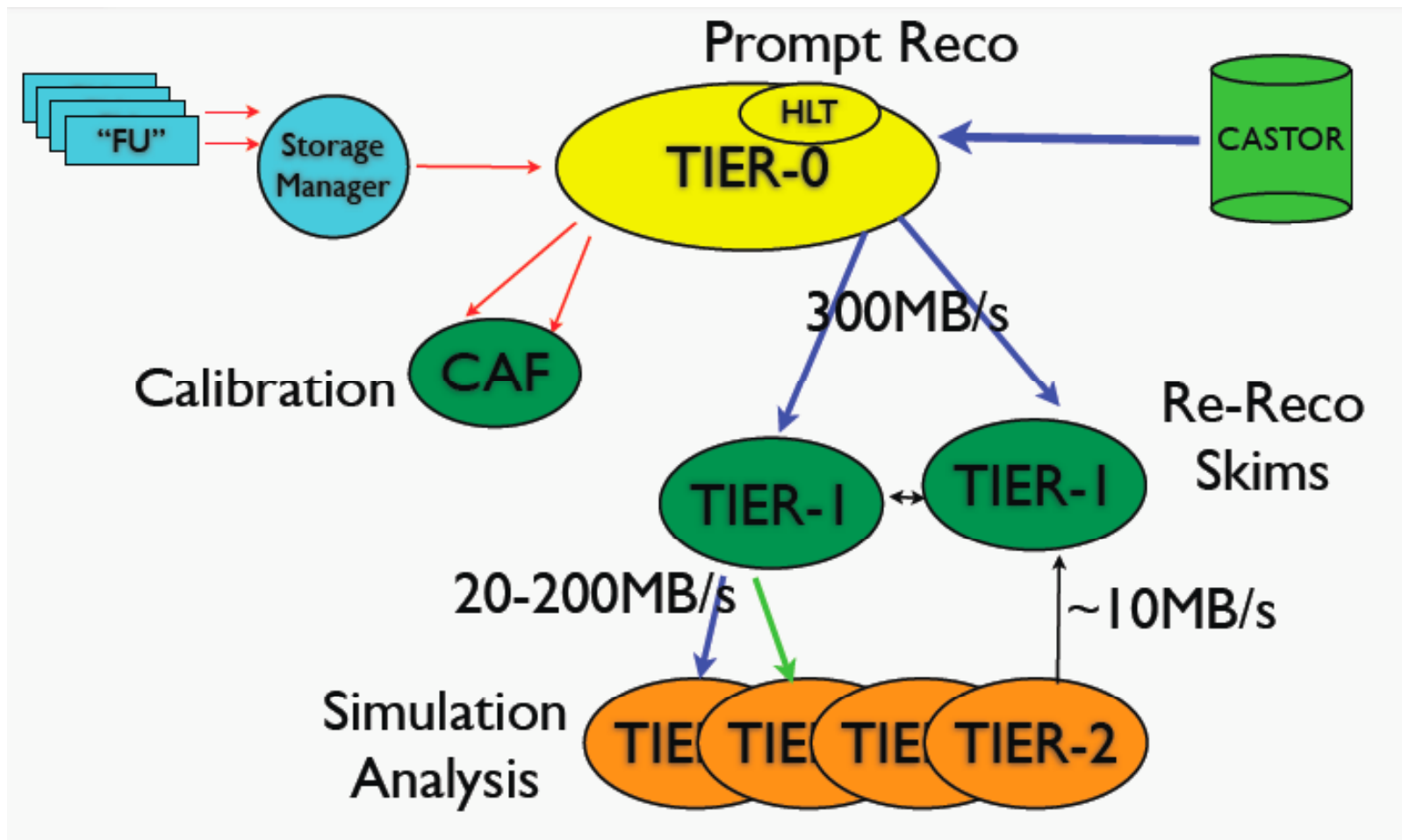
CMS Computing Software and Analysis Challenge: CSA07

A “50% of 2008” data challenge of the CMS data handling model.

1) **Scaling:**

Need to reach 100% of system scale and functionality by Spring 08

2) **Transition to sustainable operations.**



**1) Detector Installation,
Commissioning & Operation**

V36 Schedule

Tracker Insertion
Test Magnet at low current

CMS Cosmic Run CCR_0T
Several short periods Dec-Mar)

Beam-pipe Closed and Baked-out
1 EE endcap Installed, Pixels installed
Cosmic Run CCR_4T

Master Contingency

Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May

**2) Preparation of Software,
Computing & Physics Analysis**

S/w Release 1_6 (CSA07)
CSA07

S/w Release 1_7 (CCR_0T, HLT Validation)

2007 Physics Analyses Completed

S/w Release 1_8 (Lessons of '07)

S/w Release 2_0
(CCR_4T, Production of startup MC samples)

MC Production for Startup

All LHC Expt Data Challenge: CSA08

2nd ECAL Endcap Ready for Installation end Jun'08



CMS Global Financial Plan

Reminder from October 2006 (RRB23)

Upon the recommendation of the CERN management CMS prepared a **global financial plan** up to 2010 evaluating not only the shortfall for the low luminosity detector, but also the funds needed to introduce the staged items for the design luminosity ($10^{34} \text{ cm}^{-2}\text{s}^{-1}$).

The items were presented in a **prioritized way in 3 steps**.

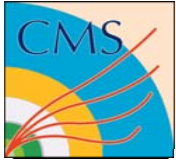
Step 1: complete the low luminosity detector (17.5 MCHF).

Step 2: complete the DAQ (8.4 MCHF).

Step 3: upgrade to design-luminosity detector (16.6 MCHF).

The rescoping of the forward RPC (RE) system was also proposed and is to be built via in-kind contributions.

CMS is very grateful to the Korean Funding Agency for the support provided over the long construction period.



Rescoping the Endcap RPC System

The restoration of the RPC system is now proposed to be done in two phases, the first for the geometric region at lower eta ($|\eta| < 1.6$) and the second for the region at $1.6 < |\eta| < 2.4$.

COST Estimate	Phase 1 kCHF)	Phase 2 (kCHF)
	4210	2740

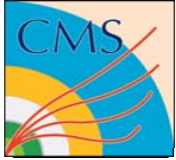
FUNDING Countries	Contributions kCHF	Comments
Belgium	420	Likely to use its Step 3 funds for RPC system
China		Requesting 580 kCHF
India	800	Request made
Iran		Discussing. Request made in Oct06 RRB was for 800 kCHF
Korea		Initial request to produce all gaps (estimated at ~580 kCHF)
Pakistan	1250	Granted



Status of Additional Funding for Steps 1, 2 & 3

In bold input since Apr07 RRB

	Step 1	Step 2	Step 3	Comment
Austria				Discussing
Belgium-FNRS	136	56		
Belgium-FWO	136	56		
Brazil	n.a.			Request made for Step 2
Bulgaria				Awaiting response
CERN	4,569 Endcap	297	1,119	
China	RPC	Endcap RPC	Endcap RPC	Discussing request
Croatia	15			
Cyprus				Awaiting response
Estonia	5	8		
Finland	272	49		Funding in 2010 and 2011
France-CEA				Discussing
France-IN2P3	n.a.	2,000	n.a.	
Germany BMBF	919	118	637	Step 1&2 almost paid, Rest - Commitment
Germany DESY	n.a.	2,000	n.a.	New Agency
Greece				News in Oct RRB
Hungary				Discussing
India	Endcap RPC	Endcap RPC	Endcap RPC	Request Submitted, News in Oct RRB
Iran	Endcap RPC	Endcap RPC	Endcap RPC	Discussing
Ireland	n.a.	4	16	
Italy	2,500			Step 1 likely to partially covered
Korea	Endcap RPC	Endcap RPC	Endcap RPC	Discussing
Mexico	n.a.			Awaiting Response
New Zealand	n.a.	12		Step 2 OK, Step 3 discussing
Pakistan	Endcap RPC	Endcap RPC	Endcap RPC	Commitment made
Poland	132	49		+ve response, request in 2008
Portugal	108	21		Likely OK for Steps 1&2
RDMS-DMS				Discussing
RDMS-Russia				Discussing
Serbia	20			
Spain	344	140		Likely OK for Steps 1 & 2
Switzerland	n.a.	124	466	Apply in 2008
Taipei	121	45		Request for Steps 1&2 in 2009/2010
Turkey				Awaiting response
United Kingdom	575	202	762	
USA-DoE/NSF	5,252	1,722		
Sum	15,100	6900	3000	
Requested	17,530	8,400	16,600	
% covered	86%	82%	18%	



Conclusions

The construction, installation and commissioning of the low-luminosity CMS detector is now close to being completed. CMS is very grateful to MOST for the support provided over the construction period.

CMS is on track to be closed and taking cosmics at 4T in Apr'08 in anticipation of collisions.

With 100pb^{-1} measure the Standard Model and establish CMS as a physics-producing engine

Also look for hints of new physics

With 1fb^{-1} enter the Higgs discovery era. With a few fb^{-1} : firm discovery
“SUSY” explorable over very large area with 1fb^{-1} ; possible new resonances

Korean physicists will have equal opportunities to participate in data analysis.

CMS now urgently requests Korea to make commitments to the rescoping of the RE system.



Korea in CMS

Korean Contribution to CMS:

- Common Project (815 kCHF, manufacture of swiveling platform, etc.)
- Forward RPCs (500 kCHF, RPC gap manufacture)
- Online Data Acquisition hardware (500 kCHF, PCs and monitors, still to be realised)

Historical Perspective

- CERN-Korea Cooperation Agreement was signed in Nov. 2006
- Original MoU (1998) foresaw Korea making the full Korea Forward RPC (RE) system
- Due to lack of Funding the RE system was descope
- China and Pakistan joined in the construction of de-scoped RE system
- Korea has successfully manufactured all the gaps for the RE system.
This contribution has been vital.
- Korea is just starting to contribute to the DAQ system.
- The full RE system has to be rescope for design luminosity running in 2010-2011.**



Swivelling Platform - Insertion of Coil

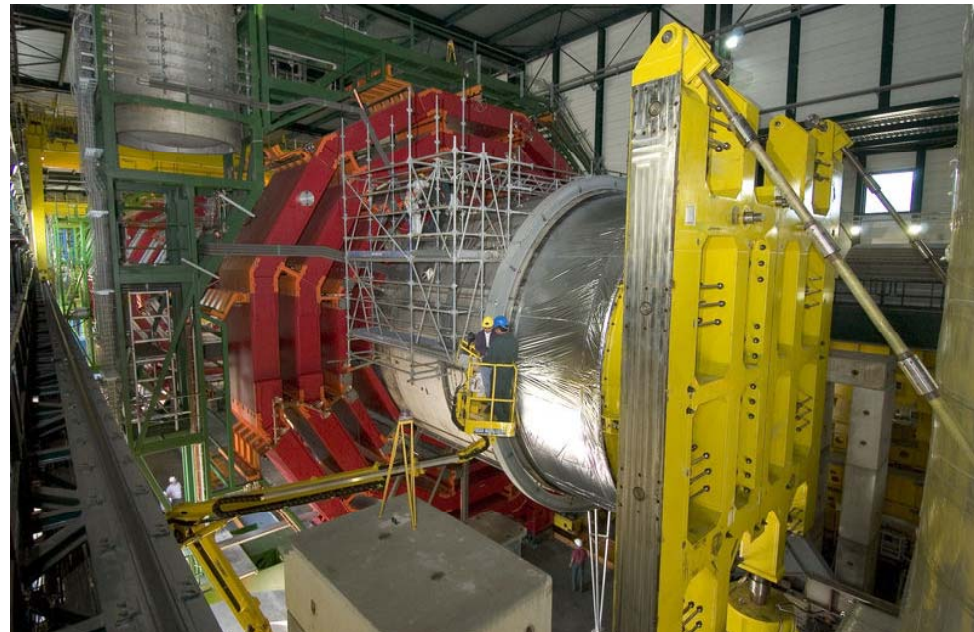


Table 2
CERN-RRB-2006-105

	PhDs	MoU Funding 2002	CTC1 RRB15 Oct02	CTC2 RRB20 Apr05	Constr. Funding 2006	STEP 1 Low Lumi (Constr.)	STEP 2 DAQ (PhD)	STEP 3 Rest (PhD)	Total Design Lumi
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Austria	11	3,900	600	275	4,775	211	45	171	427
Belgium	27	5,000	870	300	6,170	272	111	420	803
Brazil	9				0	0	37	140	177
Bulgaria	5	600	0	0	600	26	21	78	125
CERN	72	85,200	13,500	4,800	103,500	4,569	297	1,119	5,984
<i>China</i>	13	4,315	500	300	5,115				<i>in kind RPC</i>
Croatia	7	280	49	20	349	15	29	109	153
Cyprus	3	600	106	0	706	31	12	47	90
Estonia	2	90	16	6	112	5	8	31	44
Finland	12	5,000	870	300	6,170	272	49	187	508
France CEA	14	5,600	1,687	445	7,732	341	58	218	617
France IN2P3	38	19,700	2,000	2,000	23,700		2,000	0	2,000 <i>Pledg</i>
Germany BMBF	41	17,000	2,709	1,100	20,809	919	169	637	1,725
Germany DESY	5				0	0	2,000	0	2,000 <i>New</i>
Greece	17	5,000		0	5,000	221	70	264	555
Hungary	6	1,000	58	0	1,058	47	25	93	165
<i>India</i>	26	4,400	300	500	5,200				<i>in kind RPC</i>
<i>Iran</i>	3	510	700	0	1,210				<i>in kind RPC</i>
Ireland	1				0	0	4	16	20
Italy	181	55,000	8,927	4,000	67,927	2,998	746	2,813	6,557
<i>Korea</i>	12	1,315	500	147	1,962				<i>in kind RPC</i>
Mexico	5				0	0	21	78	98
New Zealand	3				0	0	12	47	59
<i>Pakistan</i>	3	2,445	230	149	2,824				<i>in kind RPC</i>
Poland	12	3,000		0	3,000	132	49	187	368
Portugal	5	2,000	300	140	2,440	108	21	78	206
RDMS	72	18,862	2,211	1,657	22,730	1,003	297	1,119	2,419
Serbia	3		450	0	450	20	12	47	79
Spain	34	6,000	1,350	450	7,800	344	140	528	1,013
Switzerland	30	86,500		200	86,700	0	124	466	590
Taipei	11	2,330	410	0	2,740	121	45	171	337
Turkey	18	1,000	58	0	1,058	47	74	280	401
UK	49	9,100	918	3,000	13,018	575	202	762	1,538
USA	418	104,320	12,800	1,868	118,988	5,252	1,722	6,497	13,471
Sum	1,168	450,067	52,119	21,657	523,843	17,530	8,400	16,600	42,530
Requested			63,000	32,000					