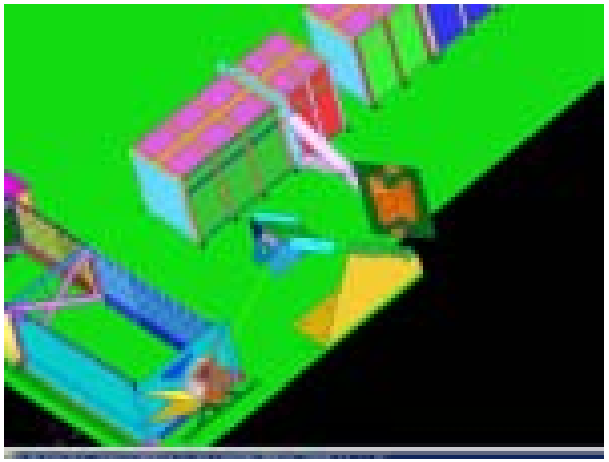
AMS 02 RADIATOR MASS REDUCTION

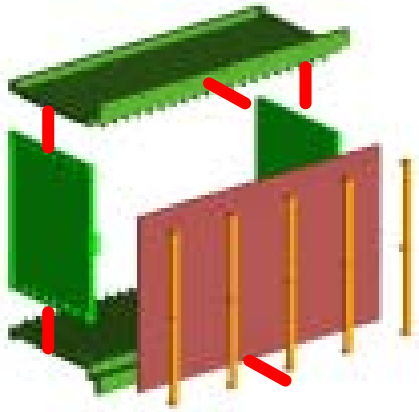
Introduction

M. Molina, A. Franzoso, M. Olivier

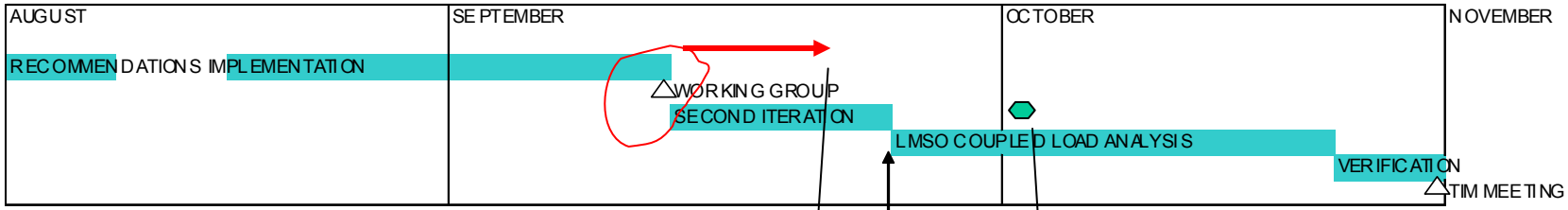
Recommendations from the meeting

- CRATES
  - 1) structural optimization (neglecting thermal)
    - Customized design
  - 2) Specific design (RAM/WAKE)
- RADIATOR
  - 3) Attachment points for the brackets
    - Number
    - Interface area
  - 4) doublers
- TOP BRACKETS
  - 5) Shear plate
- MID BRACKETS
  - 6) Reduce length
  - 7) Outside the radiator
  - 8) TTCS box combination
- MISCELLANEA
  - 9) Modelling techniques
  - 10) Remove "some" brackets





Schedule of the RoadMap

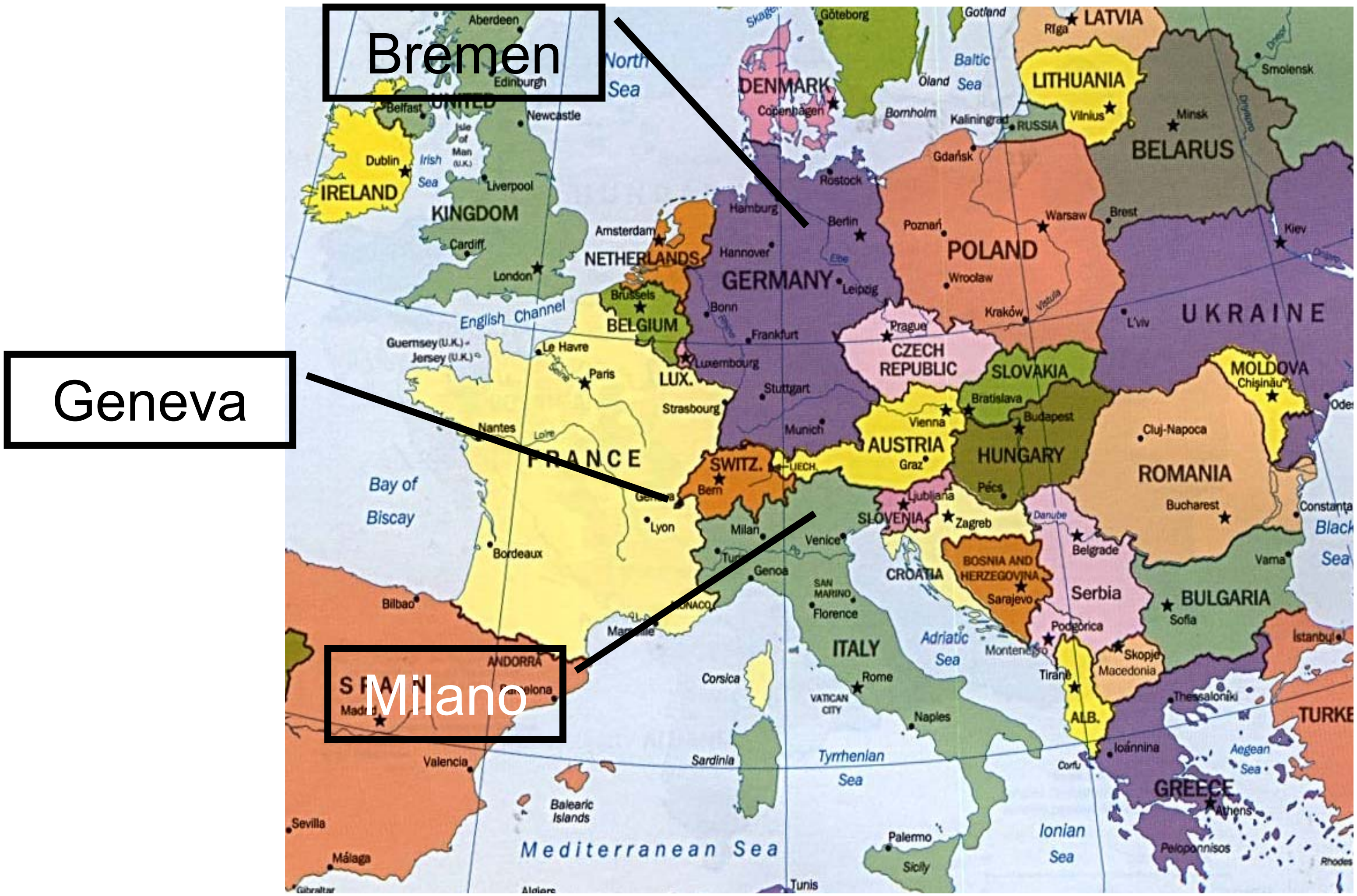


Today, 22/09/2003

Overall AMS Mass optimization meeting 3/10/2003

AMS 02 –Thermal Control

System Design



Team

- CGS
  - M. Molina, A. Franzoso, C. Vettore, M. Olivier, R. Zambra, A. Salsi, L. valsecchi, L. De Franchis, R. Bursi
- OHB-System
  - H. Segelke, R. Schlitt, B. Hollenbach, A. Pistorius
- CERN-MIT
  - R. Becker, Y. Wang, J. Burger, M. Capell

Purpose of the teams work

- CGS
  - overall optimization, brackets new design
- OHB
  - redesign with carbon fiber structures perspective
- CERN
  - innovative ideas and cross-checks

TABLE OF CONTENT

- WAKE RADIATOR
  - Influence of brackets design on CLA results
  - Upper bracket optimization
- Upper bracket
    - titanium
    - shear plates
- RAM radiator
  - dedicated accomodation

TABLE OF CONTENT

- OHB-system
  - Mid bracket ‘spacing-tube’ concept
  - Carbon fiber options
- Thermal analysis
  - crates optimization
  - warnings and test level definition
- Electronic board reduction

HOW MANY LOAD CASES

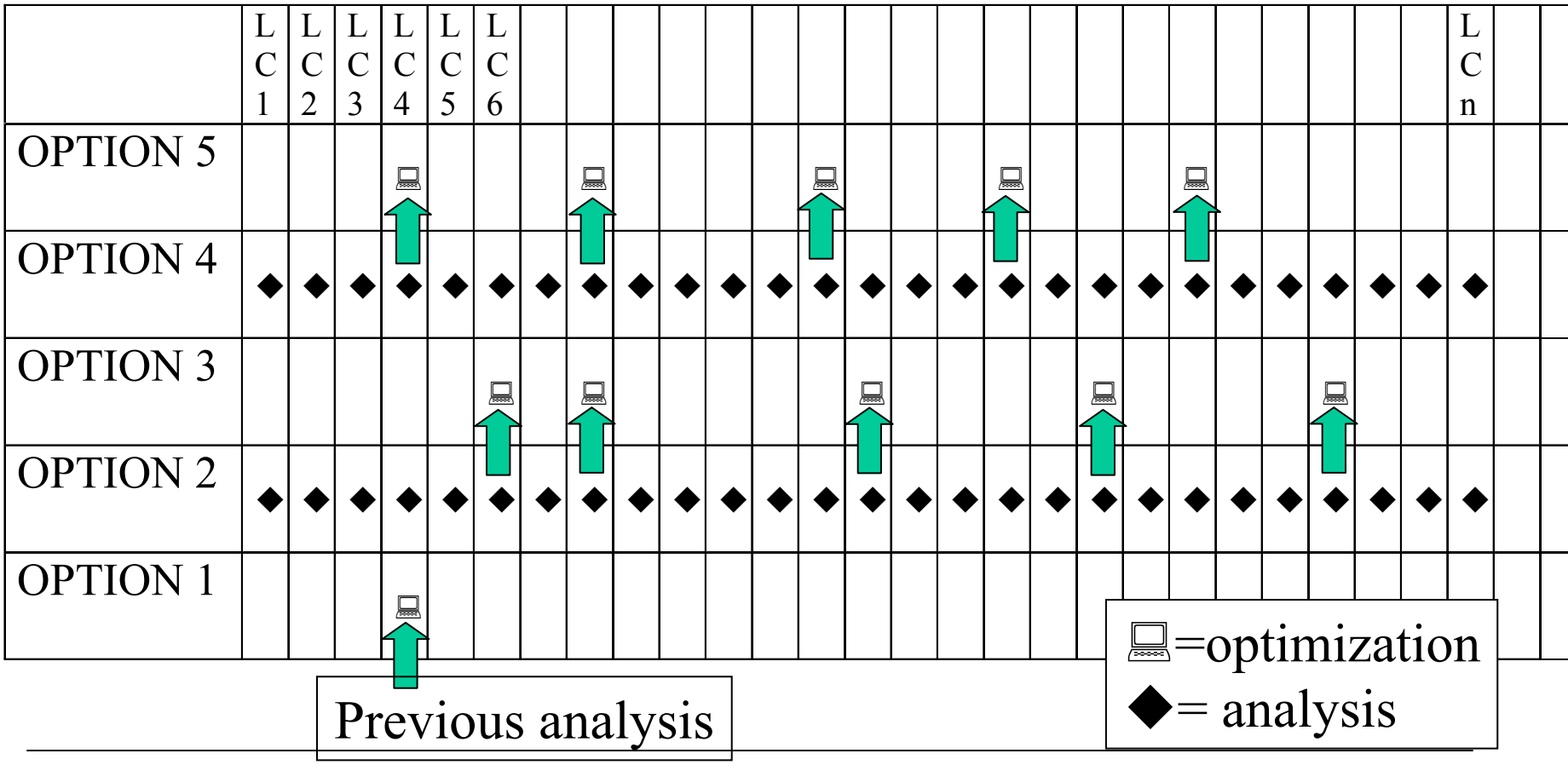
are representative?

1 ?

10 ?

128 ?

LOAD CASES AND OPTIONS



Two more remarks before starting

1. Reference and target mass

Alberto Franzoso

TARGET MASS

Thermal + Electronics

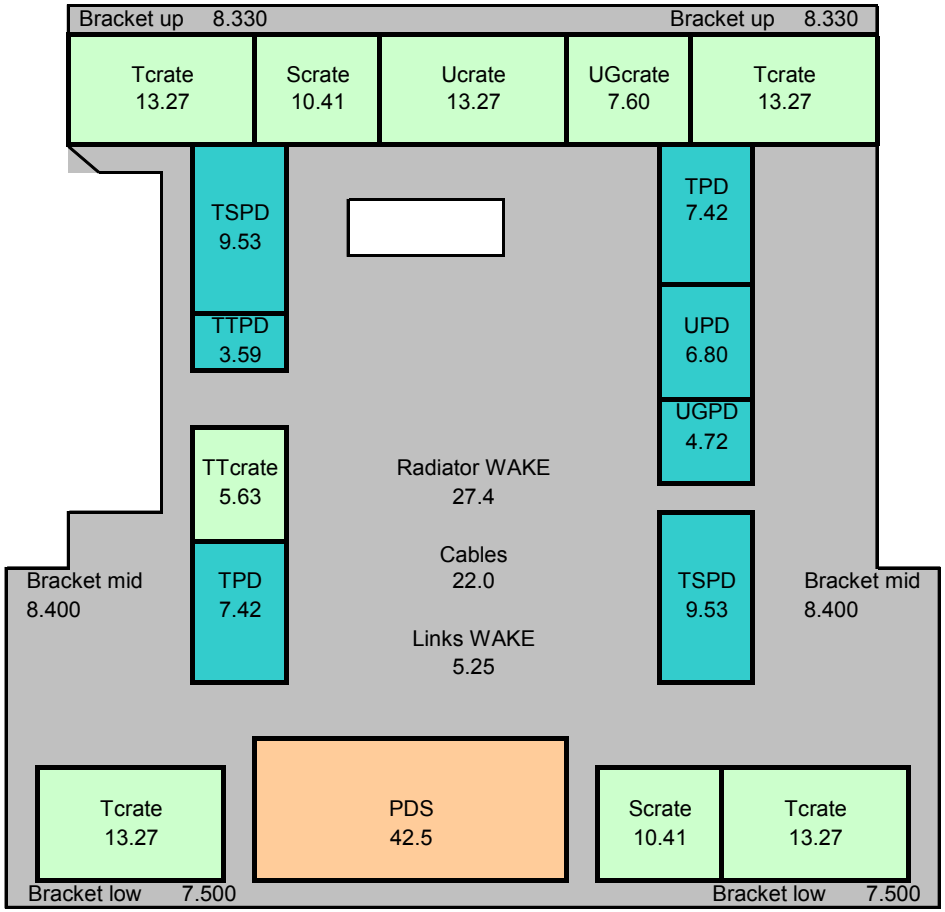
311+460=771 Kg

Thermal control + structure mass budget (total was 310.9 since January 2002)

TRD	0 (MLI in LM budget
TOF	8.0
TRACKER	72.9
RICH	10.5
ECAL	14.0
System	~~205.5~~ 204.3
TOTAL	**~~310.9~~ 309.7**

Ram radiator (incl. Brackets)	54 Kg
Tracker RAM	13+5.5 (brackets)
Wake radiator (incl. Brackets)	54 Kg
Tracker WAKE	13+5.5 (brackets)
"Large" Zenith radiator (8 attachment points + pin to TRD upper plate)	~~35.5~~ 34.3 Kg
Ecal and RICH crates radiators incl. brackets	25 Kg

Mass breakdown (end August 2003, unofficial)



INITIAL MASS

295.0 Kg
(Electronic: 206;
Mechanics: 75.8)

TARGET MASS

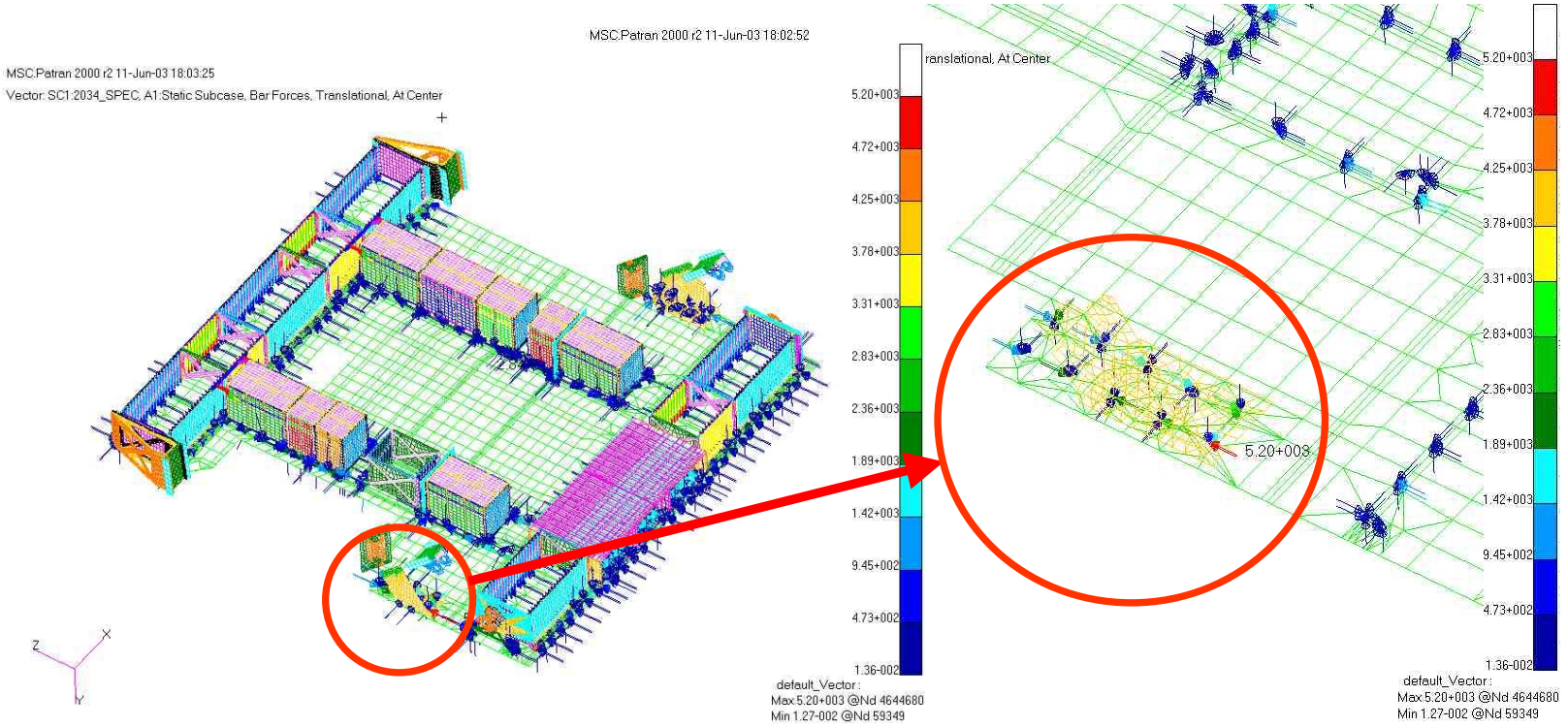
249.5 Kg
(Electronic: ~387.5/2;
Mechanics: 55.8)

2. Inserts strength

Massimiliano Olivier

STRESS ANALYSIS RESULTS

- HONEYCOMB INSERTS IF FORCES : 5200 N (SHEAR)



STRESS ANALYSIS RESULTS

- MID BRACKETS MOS CALCULATION

MARGINS OF SAFETY FOR STRENGHT FAILURE (STRESS)										
ITEM	LC	EID	MATERIAL	Fty [MPa]	Ftu [MPa]	Limit stress [MPa]	$S.F._Y$	$S.F._U$	MoS_Y	MoS_U
HONEYCOMB SKIN	2034	2520092 (LAYER1)	AL 2024 T81 AMS-QQQ-A-250/5	372	427	162	1.25	2	0.837	0.318
X-Y BRACKET	2034	2517581 (LAYER1)	AL 7075 T7351 AMS-QQ-A-250/12	400	448	201	1.25	2	0.592	0.114
Z BRACKET	2034	2519636 (LAYER1)	AL 7075 T7351 AMS-QQ-A-250/12	400	448	199	1.25	2	0.608	0.126

- HONEYCOMB INSERTS MOS CALCULATION

Applied forces are much higher than the currently selected inserts capability:

Pss ≈ 1200 N (insert limit load in axial dir.)

Qss ≈ 2800 N (insert limit load in shear dir.)