

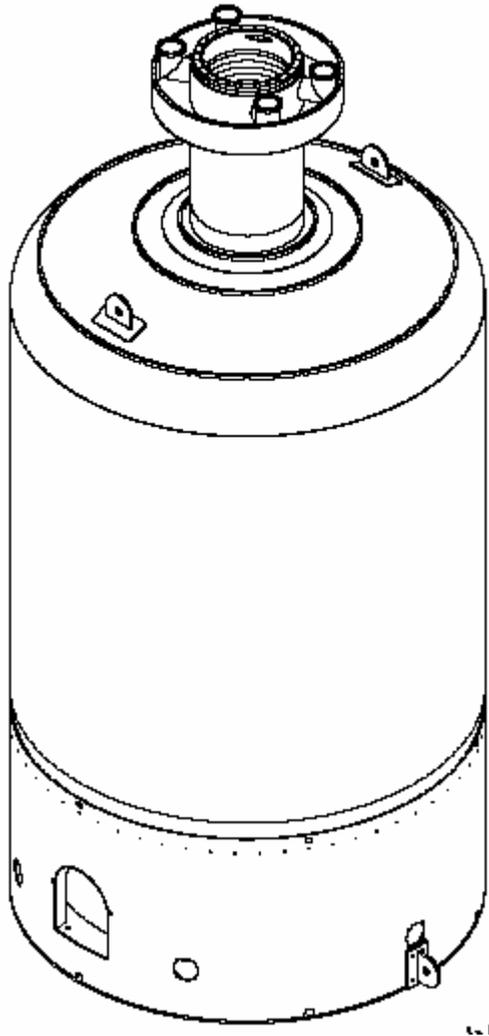
# **GERDA TG4 – Cryogenic Vessel Status Report**

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GERDA Collaboration Meeting at IRMM Geel  
11 – 13 June 2007

# outline

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**status of cryostat**  
**internal copper shield**  
**safety**  
**schedule**  
**conclusions**

# cryostat order history and status

slide of Feb 07

- Aug 11 : TED publication 164333-2006 for tender of dto. **based on Technical Specification V1.0 of August 08** ([www.mpi-hd.mpg.de/GERDA/NTS-V10.pdf](http://www.mpi-hd.mpg.de/GERDA/NTS-V10.pdf) with **drawing GC-1001-2006-5.pdf(dwg)** )
- Sep 29 : Deadline for quotes, 5 quotes for cryostat received, 1 for MLI
- Nov 06/11 : Contract signed by MPI / SIMIC

2006

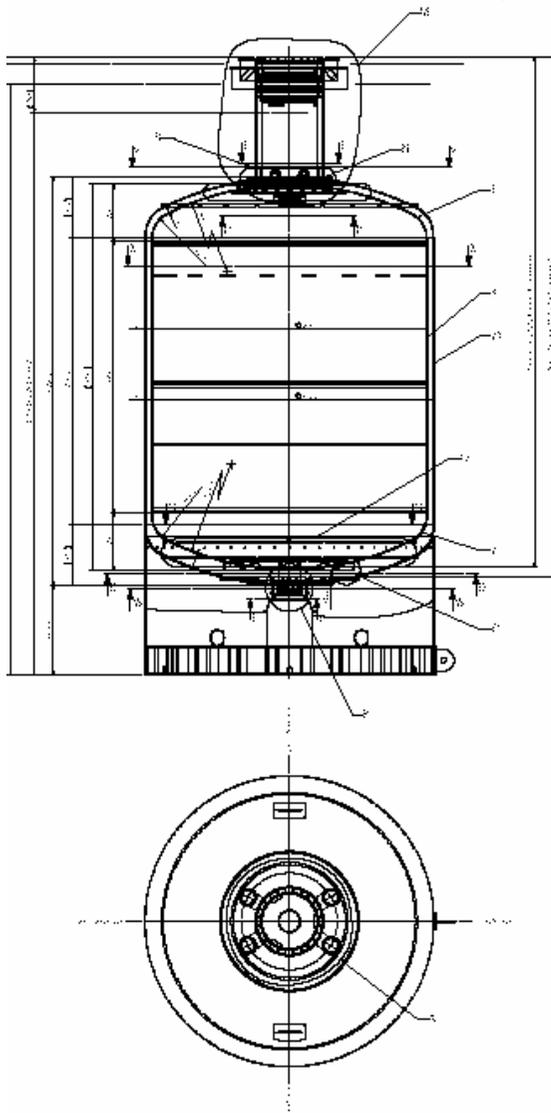
- Jul 25 : Order of **1.4571 sheet material** for vessel heads and walls sheets, ~ 23 tons, at Nironit .
- Aug 8 : Order of **vessel heads** at Antonius, NL.
  - ▶ Production time 7 weeks after delivery of material; material delivered Nov 8 (a bit late) !
- Nov 10 : Order of 20 tons of **copper** at NA for internal shield

2007

- Jan : all 1.4571 sheet material delivered to SIMIC incl. t=25mm sheets
- Feb 02 : Final amount of copper (22.2 tons) ordered at NA; rolling of t=30 mm copper plates ordered at CSN.
- Feb 12+x : start of vesselhead production at Antonius, delay > 2 months.

# status of cryostat

GC-2-2007-001.pdf(dwg)



## progress -

- Mar 19 : delivery of 3 vessel heads by Antonius
  - ▶ 4th head to be repaired by June 15
- Mar 23 : (almost) final cryostat drawing finished at HD
  - ▶ GC-2-2007-001.pdf(dwg) (8 pages)
- May 02: Inconel Belleville springs delivered
- Jun 02: 1st welding certificate for manual welding of 1.4571 acc. AD2000 received by SIMIC
- Jun 04 : preliminary welding book prepared

**- much slower than planned** despite of five visits at Camerana:

Feb 6, Mar 14, Apr 2, May 22 (with TÜV welding expert), Jun 5

## still lacking:

- HD: Torlon support rods, Makrolon sheets (not yet needed)
- SIMIC: welding certificates, quality plan, production drawings , and more (see below)

# history of vesselhead problems & solutions



March 29 : three GERDA vesselheads at SIMIC

- joint of two 2.5 x 5 m<sup>2</sup> sheets by welding done by Oostendorp
- forming/cutting done by Antonius

## problems -

- at O., no samples for cryogenic temperature certification produced;
- at A., bottom vesselhead of cryostat's inner container exhibits weld joint imperfections, 'Bindefehler', in X-ray test.

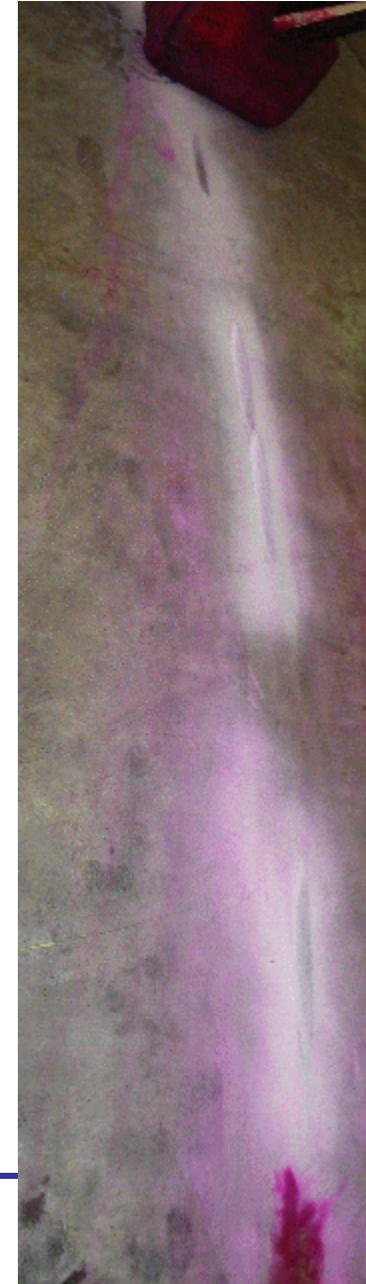
## - solutions:

- ▶ repair procedure certified by TÜV
- ▶ at the same time cryogenic temperature certificate obtained

Antonius June 07, 2007



## vesselhead repair



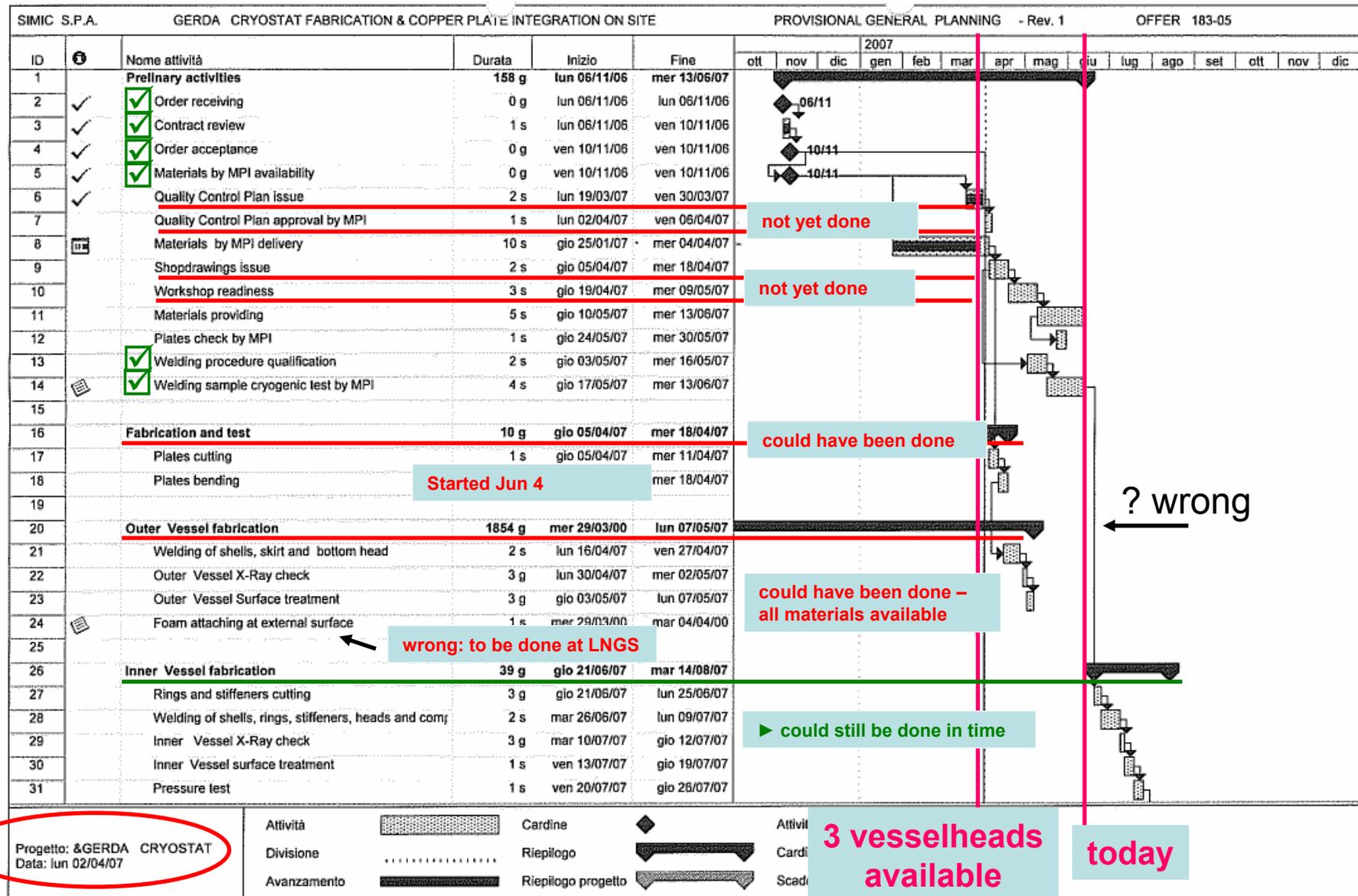




# truck for vesselhead transport



# Updated Schedule by SIMIC (1)



## note on cryostat cleaning

default cleaning procedure – minimum program (see paper by G.Z. & H.S.):

(1) pickling

(2) rinsing with clean water

(3) Rn measurement \*



however, new option possible ►

### ► electropolishing of cryostat's inner vessel:

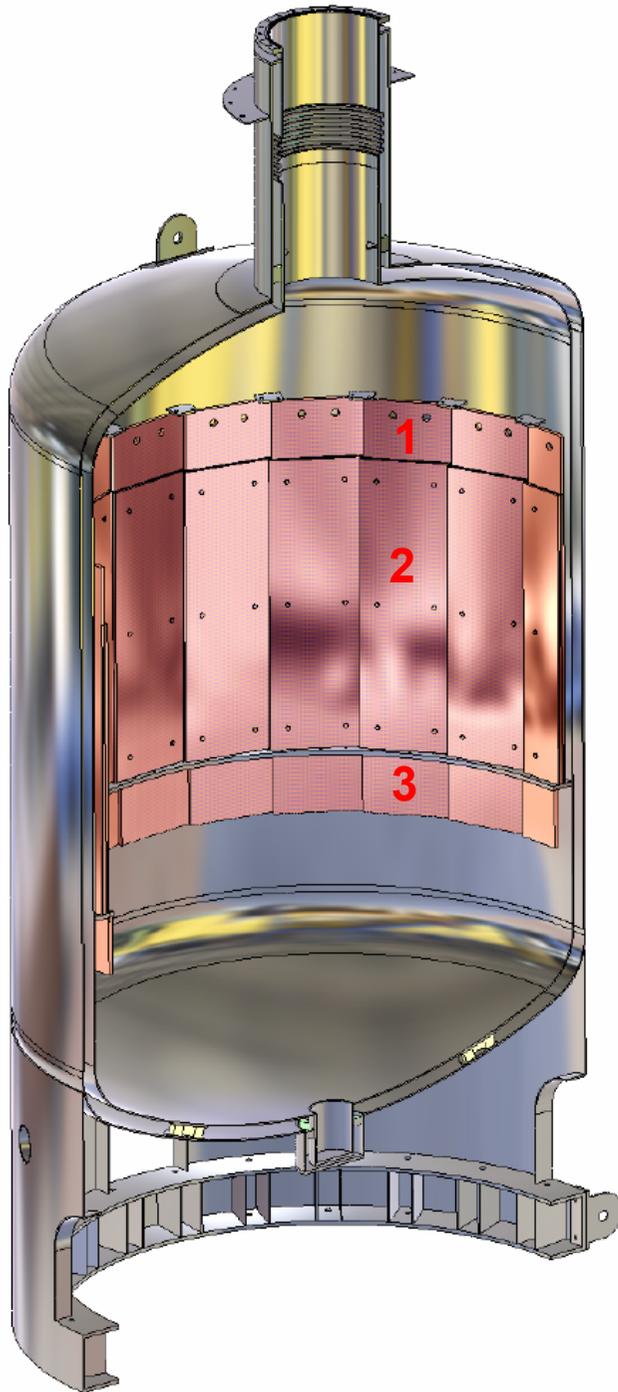
Josefa has identified a company, Henkel, which offers on-site electropolishing of stainless steel vessels, polishing either

- (a) the complete inner surface, or
- (b) the welds only.

A quotation is being worked out. At present, option (b) seems to still fit into our budget, option (a) might be beyond it....

\* Rn emanation of welds will be measured with test weld pieces

## internal copper shield



20 partially overlapping segments (15.8 t in total),  
each consisting of 3 copper sheets (H x W x T))

1) 2400 x 615 x 30 (394 kg)

2) 2000 x 615 x 30 (328 kg) 1&2 screwed together

3) 400 x 615 x 30 ( 66 kg)

### progress:

Apr 16 : OFPR copper delivered by NA

May 25: OFPR copper sheets rolled by CSN

120 M20 copper bolts fabricated by MPI HD

( E-Cu copper, Werkstoff 2.0060 (CW 004A),  
nuts & washers from stainless steel )

Jun 11: start of assembly & vacuum boxing at CSN

cleaning procedure :

(1) pickling in sulfuric acid

(2) rinsing with 'VE' water (apparatus: Werner)

↓  
'voll-entsalzt' i.e. de-ionized

## (very) short note on safety

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### **Official OK of LNGS directorate for GERDA experiment:**

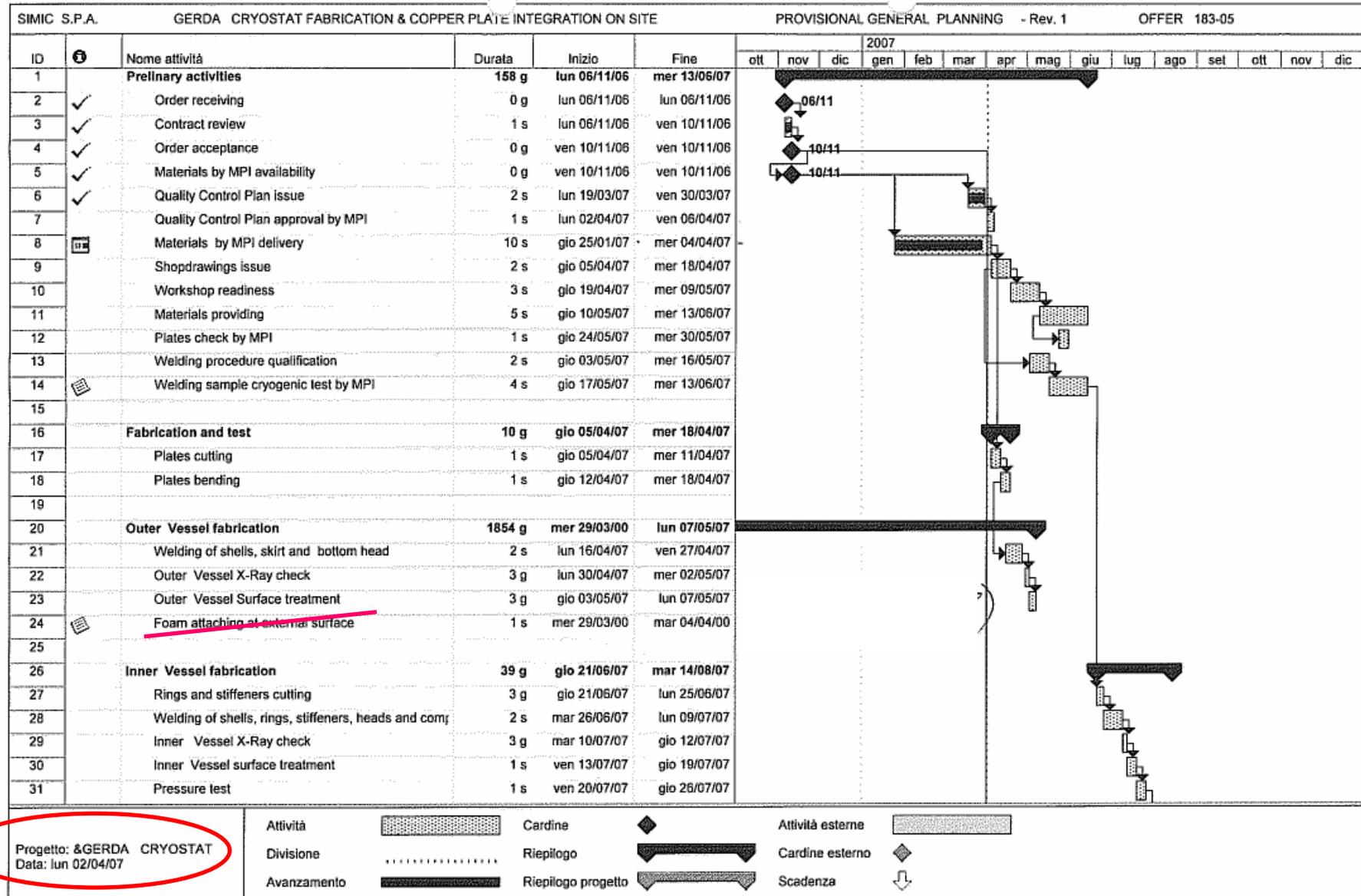
During the last SC, it has been stated in public that the LNGS directorate is satisfied with both the results of the NIER risk analysis and the independent '3rd' opinion.

- ▶ 3rd opinion document at LNGS directorate since June 1.

However, LNGS will give its formal OK to GERDA not before the text of the NIER risk analysis is available in Italian language.

- ▶ Italian version (English → Italian!) just done by now !!

# updated schedule by SIMIC (1)

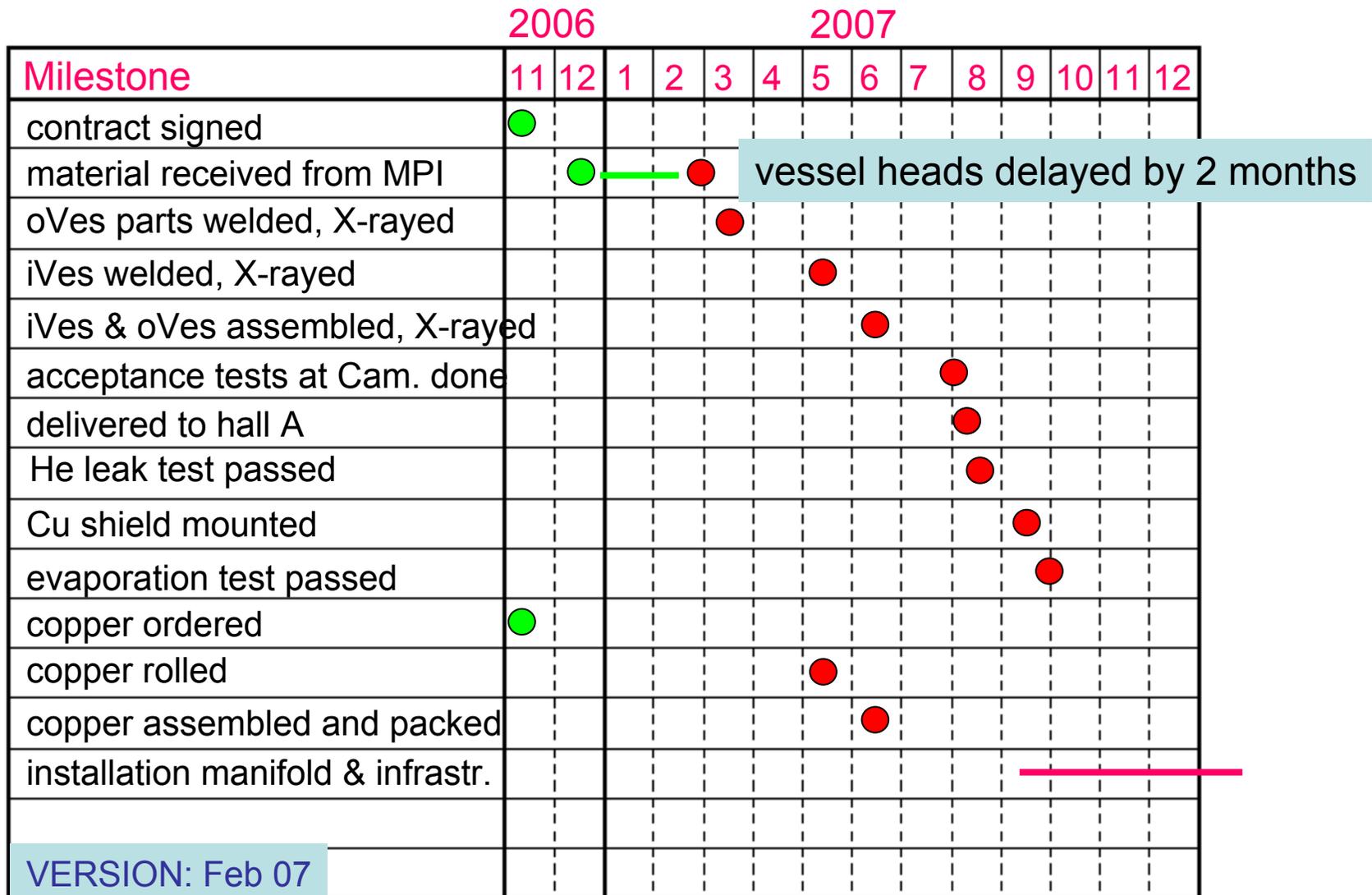




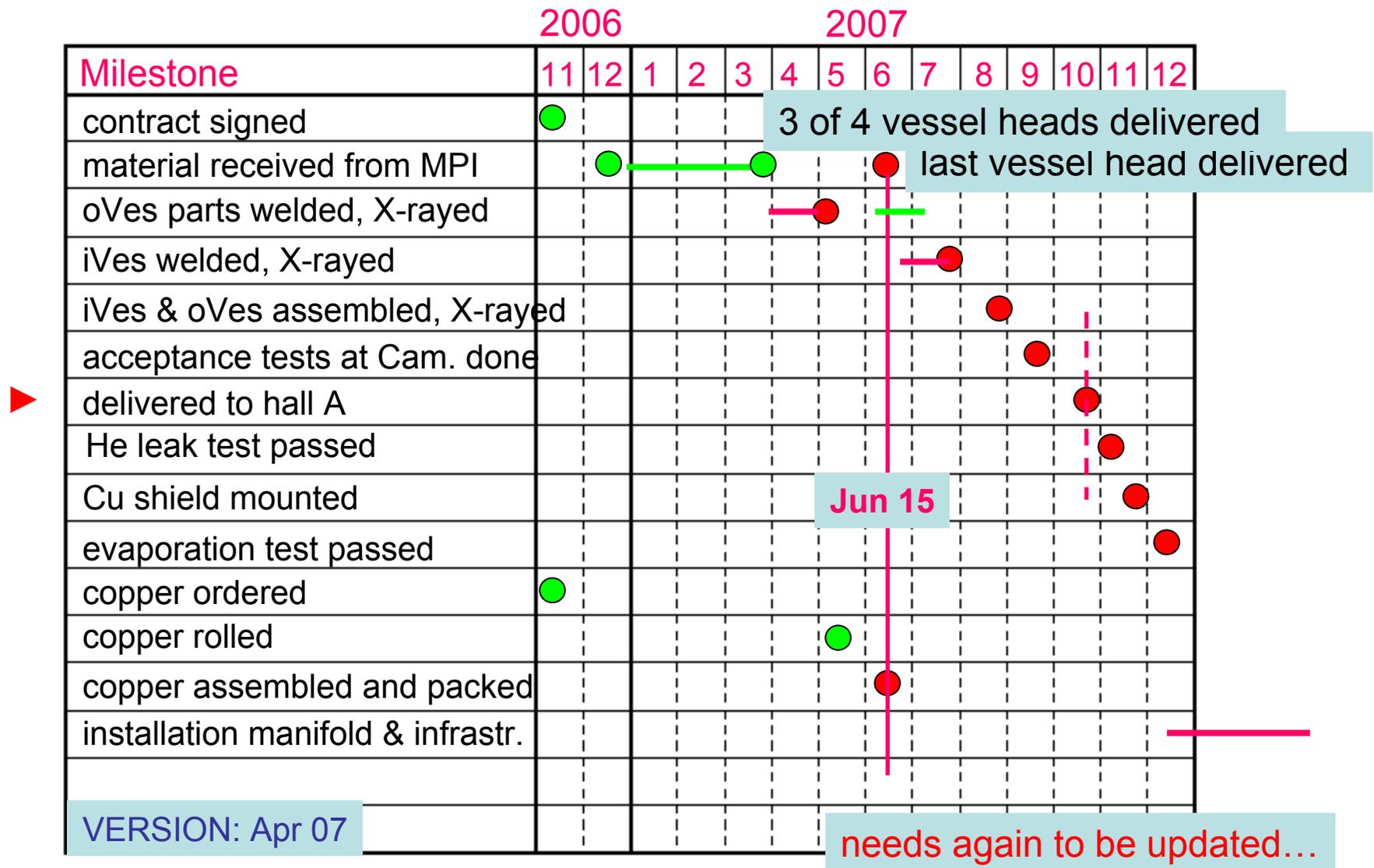
# Milestones for Cryostat & Copper Shield (0)

Milestone	2006				2007									
	11	12	1	2	3	4	5	6	7	8	9	10	11	12
contract signed	●													
material received from MPI		●												
oVes parts welded, X-rayed			●											
iVes welded, X-rayed				●										
iVes & oVes assembled, X-rayed					●									
acceptance tests at Cam. done							●							
delivered to hall A								●						
He leak test passed									●					
Cu shield mounted										●				
evaporation test passed											●			
copper ordered	●													
copper rolled					●									
copper assembled and packed						●								
installation manifold & infrastr.										—				
VERSION: Nov 06														

# Milestones for Cryostat & Copper Shield (1)



# milestones for cryostat and copper shield (2)

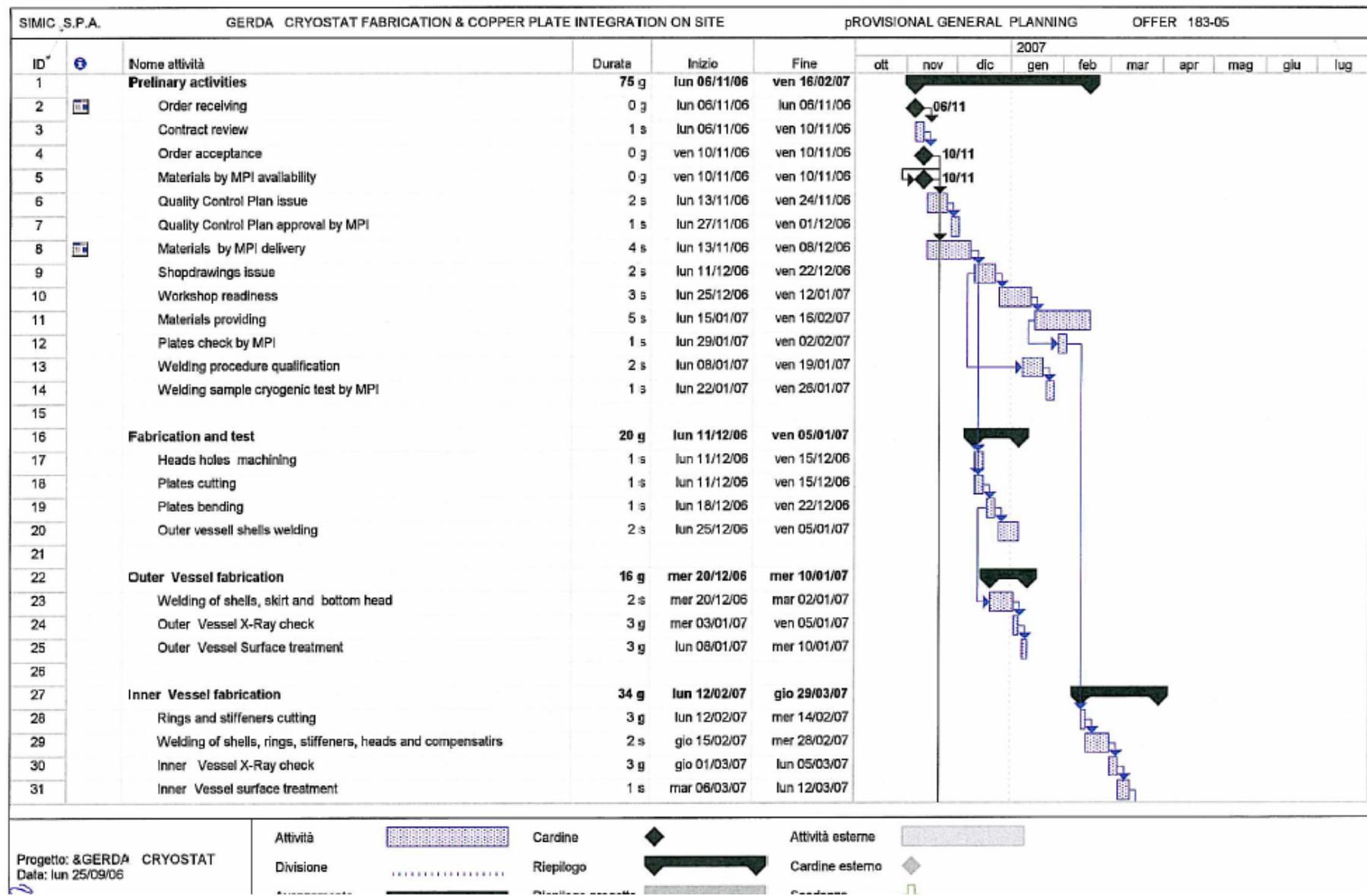


# Concluding Remarks

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- cryostat further delayed due to delay in vesselhead production and slow start of production at SIMIC
  - ▶ new date for delivery: October 2007 – might be too optimistic;
  - ▶ design frozen except for height and some minor fabrication details;
  - ▶ new schedule for vessel fabrication & tests including Rn emanation measurements at SIMIC needed
  - ▶ internal copper shield on schedule
  - ▶ design of manifold-bellow in progress.
- GERDA safety concept accepted by LNGS
  - ▶ all for LNGS now given
- shifting focus now to cryogenic infrastructure and system integration
  - ▶ next talk

# Original Schedule by SIMIC (1)



# Original Schedule by SIMIC (2)

