

our ref. ASG/6.608/RC/as

Spett.
INFN Sezione di Genova
Via Dodecaneso, 33
16146 Genova
Att. Dr. Renzo Parodi

Genova, 26 July 2006

**Subject Superconducting Solenoid for PANDA Project
Our Budget Offer No. 20612**

Dear Dr. Parodi,

following your request, we quote hereunder our budget offer for the magnet under subject.

A) Scope of supply

For the elaboration of this budget offer we have considered a magnetic system complete with yoke in ferromagnetic material similar to that manufactured for the FINUDA magnetic system (INFN-LNF). In the evaluation of the budget offer we have taken in consideration the reduced dimensions with respect to the above mentioned project.

In detail, our budget offer is referred to the manufacturing of a "thin" solenoid constructed with a NbTi superconductive cable ("Rutherford" configuration) coextruded in a pure aluminium matrix.

The winding foreseen presents two conductor layers having different heights (high current density area and low current density area). However the winding comes up to be more complicated compared to the Finuda one, being necessary to insert the locking rings of the three different sections of the winding.

The magnet is "indirectly" cooled by liquid helium at 4.2° K by means of a hydraulic circuit welded on the containment cylinder.

The containment cylinder shall be made of an Al 5083 aluminium alloy.

The winding shall be carried out according to the "internal winding" technique and then vacuum impregnated with epoxy resin.

The estimated cold mass weight (winding + containment cylinder) is 3500 kg.

The magnet shall be equipped with a cryostat in austenitic stainless steel AISI 304L, complete with turret for current leads/hydraulic connections (estimated weight of cryostat 5000 kg).

Besides we foresee to carry out a thermal shielding of the solenoid cooled by helium gas at 60°K, in order to make the system independent from liquid nitrogen.

The yoke in ferromagnetic material, having octagonal structure, shall be made of Fe360 steel plates having thickness 100-200 mm, properly worked and assembled (weight of 120 ton). Finally a support/translation trolley for the magnetic system translation out of the beam axis has been foreseen.

ASG Superconductors spa
Società con Socio Unico soggetta a direzione e coordinamento di Castel S.A.

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Notes:

The elaboration of this Budget Offer has been made on the basis of the paper "Solenoid Magnet and Flux Return" received by INFN, Dr. Parodi in June 2006.

Our previous Budget Offer (n. 20427 dated 9 Nov 2004) has been revised as regards costs, due to the updating of our subsuppliers quotations, and the items listed below that have been evaluated on the basis of new information received by INFN.

1 - Superconducting cable No. 6 lengths

No. 4 lengths, dimensions 24x2.5 mm (high current density area), 1500 m each

No. 2 lengths, dimensions 24x4.25 (low current density area), 1000 m each

Total about 8000 m of superconducting cable, while in our previous Budget Offer we supposed 5000 m.

The updated quotation of the cable cost is about 50% more with respect to our previous cost. The fact is that in our previous budget offer we had not been able to request a quotation by suppliers being the cable not yet defined. Therefore we had deduced the cost from that of the Finuda cable.

Obviously, increasing the cable length, the winding time is increased as well as the cost of all insulating materials for the turn insulation.

2 - Door opening system (Finuda type)

The door opening system, not requested in the former configuration and therefore not quoted before, has been included in this Budget Offer.

3 - Winding line

We have considered to use, where possible, some of our tooling, duly modified.

After the positive results of CMS, we intend to adopt the same winding method used for winding the CMS superconducting solenoid. Such method is more complicated than the one used for Finuda/BaBar solenoids owing to the presence of locking rings dividing the solenoid into three parts.

For the above reasons the costs of outer mandrel/containment cylinder and manpower are now increased.

4 - Price updating

Our previous Budget Offer was dated November 2004. In the meantime material costs have been significantly increased, and the present cost estimation has been consequently increased.

5 - Precisation

We think that during the final offer elaboration it will still be possible to define with INFN all technical details, studying and agreeing any possible solution able to reduce costs.

B) Price

The budget price is € 4.592.000,00, excluding VAT.

The economic conditions shall be agreed during the final offer.

C) Breakdown of price

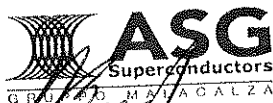
C1) Engineering + Manufacturing design + Technical coordination	€	558.000,00
C2) Material for solenoid (S/C cable, insulation, resin)	€	655.000,00
C3) Components	€	1.970.000,00
cryostat with turret, thermal shields, containment cylinder, yoke in ferromagnetic material, support and handling trolley, pumping group, feeder, QD, DA, valves, sensors, pipe fittings, vacuum instrumentation		
C4) Tooling	€	705.000,00
winding line, impregnation tool, assembly tool, magnetic measurements tooling, transportation device, transfer line for testing in ASG		
C5) Solenoid manufacturing and assembly inside the cryostat	€	352.000,00
C6) Magnetic/cryogenic tests in ASG	€	104.000,00
C7) Delivery of the system to GSI-Darmstadt	€	108.000,00
C8) Assembly and test c/o Darmstadt	€	140.000,00

D) Commercial Conditions

The commercial conditions will be defined, in case of your formal request, during the elaboration of the final Offer.

Being available for any further information you may require, we remain

Yours sincerely,



ASG
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GRUPPO MALACALZA

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