Future Accelerator Projects and Collaboration with Industry

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1 BACKGROUND AND SCOPE OF THE SESSION

It is a tradition, since long that industrial firms with accelerator related product lines are invited to exhibit sample products and information material at the occasion of accelerator confrences.

After the EPAC '90 the Organizing Comittee (OC) was approached by industrial representatives expressing their which to be more associated to the conference performance and to be explicitly informed about future accelerator projects as being a potential subject of their commercial interest.

As it was ever since, only a fraction of new accelerator projects, appearing in the conference programme, are going to be realized, and the OC has certainly not the prognostic power to tell, which one is likely to be the winner. (Judging from the EPAC '92 presentation, 11 new projects are in a more or less advanced proposal phase. In addition, 12 synchrotron light sources are proposed as a justified need.) In view of the fact that time allows only a very few presentations, the selected projects should be of an exemplaric nature of the various accelerator choices. The projects should be European and preferably distributed among several countries. Projects, which already are in a progressing realization phase, were not considered, because contacts to industry are assumed to be well etablished. To this end, the following projects were selected:

BESSY II	Germany	D. Krämer, BESSY I.
DAFNE	Italy	G. Vignola, INFN Frascati
Tau-Charm	Spain	Y. Baconnier, CERN
LHC	CERN	Ch. Rufer, CERN

A paper on a nearly completed European project, outlining in retrospect the gained experience in the collaboration with industry, was found to be an appropriate introduction to the subsequent project presentations. This paper, given by I.M. Lefebvre, is included int he proceedings. The other projets are assumed to described in separate reports or conference proceedings. They will be briefly reviewed in this summary in view of their procurement modalities.

2 ESRF PROJECT COMPLETED, EXPERIENCE WITH INDUSTRY

[1] [2] The accelerator team round the European Synchrotron Light Source was small, because the institute was newly founded and had neither an experienced staff nor development infrastructures at its disposal. Furthermore, as at similar factory type accelerators, where no modifications of the machine complex is envisaged, the staff is experted to remain deliberately limited for the future.

Injector linac, magnets, magnet power supplies, rf systems for both rings, off-the shelf vacuum components and the control system was contracted to the industry on terms of specifications. Those subsystems were delivered turnkey-ready to the satisfaction of the institute. Only for the automatic levelling system and the dipole chambers with various kinds of photon absorbers or windows could not been found to be made by industry just on specifiaction. Prototypes and manufacturing procedures had to be provided by the institute. Also the quality assurance by industry for ultra high vacuum components was found to be inadequate and had largely to be assisted. The performance of the architect engineer in supervising subcontracts, like the cooling water system, was found to be unsatisfactory. In conclusion, it was stated that it would be unthikable to have the whole accelerator complex managed by one general industrial contractor and if one would have to build the facility again, one would practice the same share in the role of industry and institute staff.

3 FUTURE PROJECTS

3.1 *BESSY II*

[3] This future synchrotron light source, proposed to be embedded in an existing institute environment in the eastern part of Berlin, benefits from the BESSY I staff during the design and realisation phase. Workshop facilities, laboratory and test ground space, as well as crafts and technicians are at the disposal from the left-overs of an closed-down governmental research establisment. This led to the consideration of inhouse production of technologically not demanding components. Purchasing the classical subsystems from industry is envisaged in the same way as described for the ESRF.

3.2 DAFNE at Frascati

[4] This two rings, high intensity 0,51 GeV electron positron collider with a full energy linac and a small accumulator ring is under construction since beginning of 1991 and is planned to be completed five years later. The buildings of the decommissioned ADONE ring will be reused. Since the project is said to be understaffed, the engineering design, quality assurance and final testing of classical subsystems are included in the delivery contracts. The responsibility for the magnet performance, including field calculations and final field mapping, lies entirely with the manufacturer. Power supplies are expected to be procured turn-key-ready. All ring and transferline vacuum chambers are expected to arrive with guaranted vacuum performance. The institute provides the manufacturers with computer composed survey drawings, outlining overall dimensions. Further engineering and preparation of manufacturing drawings and documentation are provided by industry. The institute, of course, responsible for the machine physics, will do the rf system engineering, precision alignment of components and will provide guidance for final installation.

3.3 Tau-charm Factory in Spain

[5] An entirely new particle physics laboratory is planned to be constructed near Sevilla. It comprises a two ring high intensity 2.5 GeV electron positron collider, charged by a full energy fast cycling booster synchrotron. The machine design was done by accelerator experts at CERN. It is also expected that CERN engineers will place all component procurement orders to industry according to the well experienced CERN standards. However, if contracts are unavoidably awarded to high technology firms outside Spain, they should include a considerable part of subcontracts to Spanish companies. The training of Spanish engineers and technicians is envisaged to be included in the component procurement contracts to a much larger extent than just participating at acception tests. This novel component in the relation to industry is said to be practiced by a Swedish company delivering a synchrotron light source to Taiwan. As a more conservative way of educating accelerator personel, CERN consents to employ Spanish engineers and technicians for a limited time on their own accelerator activities as recompensation for CERN staff members doing the machine physics and initiating the project on the whole. The time schedule includes in the mid of the project the move of the whole activity to the new laboratory. The staffing concept envisages major technical services for facility maintenance and improvements from local companies. The funding of the Tau-charm Factory is not a reality yet, nor is the role of CERN stipulated in the context of this project.

3.4 The LHC project and the LHC procurement list

[6] The large Hadron Collider is entiteled by the CERN Council to be the most attractive and rewarding project for CERN's future role in European particle physics research by colliding two 7.7 GeV protron beams. It contains 1600 two bore superconducting dipoles each 10 m long with the ambitious field strength of 10 T. About 400 superconducting quadrupoles of 6.7 m length are inserted between dipole strings. The required amount of superconducting cable totals up to the honorable figure of 3000 km. Upgrading of existing cryoplants and 4 new plants of 18 kW at 4.5 K and 1.8 kW at 1.8 K with many tens km of transfer lines are associated. In view of the enormous quantity numbers, the procurement contracts will be awarded to several companies in parallel and these companies are assumed to subcontract mass product items to a variety of specialized manufactures. It could be possible as well that CERN purchases the whole quantity of a key product, SC cables for instance, and distributes it to several component contractors. The unavailability of large scale cryor plants at the magnet and cryostat assembly firms leaves the burden of testing and field measuring to the CERN lab.

In the context of the LHC project presentation the procurement list system was outlined as a well established practice in the collaboration with industry. These well concieved and condensed documentations, available by remote computer file access, gives short term specifications and quantity numbers to the industry well in advance of a future project.

The backbone of this information system is the list of CERN Activity Codes with a 3 decimal hierarchy. One example is given. 200: Electrical Engineering, 250: Power Supplies and Converters, 255: HV Power Rectifiers. For each of the last digit items the CERN purchasing department has a list of potential industrial supplies among CERN member states or even abroad. Companies are periodically invited to help in updating the CERN supplier files by marking on the Activity Code listing the items or product fields for which they have interest to be considered in tendering. The CERN project specialists give their short term specifications with proper classification according the Activity Code with quantity and cost level and the name of the technical responsible into a centralized data base, from which the Procurement List for one or the other future project can be made available. Such listing can be voluminous for a large project. But any industrial supplier can quickly scan the list by searching for his product items, identified by the printed decimals of the Activity Code.

Of course, the international status of CERN must reflect a comprehensive knowledge of an international supplier market for typical accelerator related products. National institutes tend to keep the multiplicity of potential supplier choices low and classified to previous experience. But for a new project with possibly new and different component and service needs, it is highly recommended to benefit from the outlined CERN systems.

4 SUMMARY REMARKS

After the presentation of the above reviewed future projects, the writer adressed a few and very accidential remarks to the audience of industrial representatives and accelerator laboratory collegues:

1. At present it seemes not realistic to search for a general contractor for a turn-key-ready accelerator facility. But in view of the increasing competence of industry in supplying engineering services, more and more complete facility subsystems can be expected to be delivered and commissioned by a company or a consortium of companies. For a dedicated medical accelerator this is a must.

2. Selecting an architect engineer for accelerator buildings and associated utilities, a company experienced in managing the construction of electrical power plants is recommended. Issues of cooling systems, cable routing, geodaetic surveying of machine components, foundation settlements, shielding management and personel safety can be expected to be in good hands.

3. The recommendation of industry to promote much more component standardisation in case of apparently similar accelerator projects was met with reluctance from the side of the accelerator builder. Research facilities are understood to have their individual flavor, which reflects down to the magnet design.

4. When a research lab is understaffed in the specification phase, and much time is traditionally lost in this phase, industry considers but not yet openly offers, manpower assistance.

5. On the other sider, contract responsibles in accelerator laboratories regret the commonly slow start of contract execution in industry, neglecting possibly early precocious for quality assurance and final testing. Reporting on production progress and preparation of final technical documentation is often found to be neglected as well.

6. Concerning the obligation from the side of the purchaser to the party of the executive contractor to include local subcomponent suppliers of a particular country, there was no reaction of industry in the session. However, in conversations there after, there were encountered particularly distinct statements from the side of industrial representatives. In short: executive companies would refuse guarantee, which they don't do easely, because their name and reputation is involved nevertheless. Or, they had to include time delay and additional expences for testing the components, in case they were obliged to relie on hitherto not explored subcontractor product quality.

Personal contacts of the writer with company representatives after the session confirmed that industry would be pleased to see the continuation of such a program segment at future accelerator conferences, however, with an offered opportunity for a more active role in the dialogue.

5 REFERENCES

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