

**EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
ORGANISATION EUROPEENNE POUR LA RECHERCHE NUCLEAIRE
CERN - PS DIVISION**

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**TECHNICAL SPECIFICATION FOR THE CONSTRUCTION OF
AN RF SHIELDED ENCLOSURE**

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Abstract

This Specification concerns the supply to CERN of an RF shielded enclosure of minimum internal dimensions 3.6m x 3m x 4m (LxWxH) to house the RF amplifiers of the Decelerating RFQ.

The enclosure must have an attenuation ≥ 100 dB at 200 MHz and provide filtered connections for electricity, cooling water and control signals and non-filtered connections for low level RF cables, a 40 kV high voltage cable and a rigid coaxial RF line.

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1. INTRODUCTION

In the frame of a project for the deceleration of antiprotons, CERN needs to operate in an RFI sensitive environment an old pulsed RF amplifier chain (202.56 MHz fixed frequency, 2 MW peak power, 200 W average power) built in 1956 without any concern for EMC.

The preferred solution for minimising the interference level with nearby electronics is to install the amplifiers inside an RF-shielded enclosure.

The dimensions of the units to be installed inside the enclosure are:

- 2 high power amplifiers, app. size 1m x 0.8m x 3.7m (L x W x H), weight 900 kg
- 2 racks of electronics and low power amplifier stage.

2. TECHNICAL DESCRIPTION OF THE SUPPLY

2.1 Attenuation

The enclosure must have an attenuation ≥ 100 dB at 200 MHz frequency.

2.2 Size

The overall dimensions of the enclosure are:

- minimum internal dimensions: 3.6m x 3m x 4m (L x W x H).
- maximum external dimensions: 4.5m x 3.5m x 4.5 m (L x W x H).

The enclosure will be placed with the L side against a wall made of concrete blocks about 2m high.

2.3 Access

A door of approximately 1m x 2m (WxH) has to be provided on the W side for access of personnel and light equipment.

Two accesses of minimum dimensions 600 mm x 600 mm have to be provided on the roof for special maintenance. These accesses can consist of a removable panel screwed on the enclosure, with a maximum of 60 screws. The roof should stand the weight of a person, else a platform for access to the panels on the roof has to be constructed.

2.4 Floor load

The floor of the enclosure must support a maximum load of 1000 kg/m².

2.5 Ventilation

Ventilation of the equipment in the enclosure is provided via:

- Three honeycomb filters on the sides (inlets), app. dimensions 600mm x 600 mm.
- Two honeycomb filters in the removable panels on the roof (outlets), approximate dimensions 350mm x 350 mm.
- One honeycomb filters on the roof (outlet), app. dimensions 600 mm x 600 mm.

2.6 Electricity Connections

The enclosure must provide filtered connections for:

1. Two power lines 3x380 V, 50 Hz, 15 A.
2. Two power lines 220 V, 50 Hz, 65 A.
3. One power line 3x380 V, 50 Hz, 15 A.

2.7 Cooling Water connection

The enclosure must provide filtered connections for demineralised water inlet and outlet (in stainless steel or other corrosion-free metal). Water flow 30 l/min at 6 bars pressure, maximum pressure drop 2 bars, temperature 20-30 degrees C.

2.8 High Voltage connection

The enclosure must provide a (non necessarily filtered) crossing for a 40 kV HV connection. The HV is connected via a RG218/U coaxial cable. Filtering of the 200 MHz RF across the HV cable is made by CERN, as an integrated part of the RF amplifier.

If the manufacturer can provide an additional filter for 202.56 MHz frequency to be applied to the HV crossing on the enclosure wall, it can be included as an option in the offer.

In case an appropriate crossing can not be provided by the bidder, on the enclosure has to be included a removable metallic panel (minimum size 300mm x 300mm) where the CERN workshop can machine a suitable HV crossing (see sketch in annex).

2.9 RF connections

The enclosure must provide two 50 Ω coaxial crossings for RF signals at 202 MHz, voltages up to 700 V, equipped preferably with N connectors.

2.10 RF rigid coaxial line connection

The enclosure must provide a crossing for a rigid coaxial line of external diameter 150 mm (RF power output). A transition for the 6"1/8 EIA standard is acceptable.

In case an appropriate crossing can not be provided by the bidder, on the enclosure has to be included a removable metallic panel (minimum size 300mm x 300mm) where the CERN workshop can machine a suitable coaxial line crossing (see sketch in annex).

2.11 Control, timing and interlock connections

The enclosure must include a panel with filtered crossings for the following control, timing and interlock signals, all with operating voltage 24 V and maximum frequency 1 MHz:

1. 10 cables of the 2 pins type, presently equipped with LEMO connectors (details in annex). Any other standard 2-pin connector can be used, and its type specified in the offer.
2. 5 coaxial cables, preferably equipped with BNC connectors.
3. 4 interlock cables of the 12 pin type, presently equipped with BURNDY connectors (details in annex). Any other multi-pin connectors can be used, for a total of about 48 pins, and its type specified in the offer.

2.12 Ground connection

Appropriate ground connections must be available inside and outside of the enclosure.

2.13 Position of elements

The drawing in annex specifies the position of ventilation openings, removable panels, coaxial line crossing and other connections in case of an enclosure 3714mm x 3067mm. The connections can be grouped in a panel of maximum dimensions 900 mm (L) x 4000 mm (H) on one side of the enclosure, including from the bottom, water, RF, control, electricity and HT connections.

2.14 Reduction of Internal Q-value (optional)

The enclosure could be covered with RF absorbing material (foam) on the inside, to reduce the Q-value to < 30 in the range 195-205 MHz. This feature can be added as an additional option to the offer.

3. SAFETY OF PLASTIC MATERIALS

All plastic materials used in the construction must have minimal or low levels of fire contribution and be halogen-free, in accordance with CERN Safety Instruction 41 (The Use of Plastics and other Non-Metallic Materials at CERN with respect to Fire Safety and Radiation Resistance, http://cern.web.cern.ch/CERN/Divisions/TIS/safdoc/IS/is41/is41_en.html#C5).

4. DELIVERY SCHEDULE, INSTALLATION AND TESTS

Before construction of the enclosure, the manufacturing drawings have to be approved by CERN.

The enclosure will be delivered to CERN, Meyrin site, Geneva, Switzerland.

The assembly of the enclosure on the CERN site can be included as an option in the offer, else detailed instructions for the assembly have to be provided with the enclosure.

The construction technique of the enclosure must take into account the fact that the RF amplifiers can not enter the enclosure through the access door or panels, i.e. they have to be installed before completion of the enclosure.

The enclosure has to be installed at CERN in week 40 (October 2nd-6th, 2000).

After installation of the enclosure an acceptance test will be made by CERN. After completion of the test provisional acceptance will be granted.

5. CERN CONTACT PERSONS

Persons to be contacted for technical matters:

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6. ANNEXES

1. Layout of the RF shielded enclosure with position of elements.
2. Sketch of possible solutions for the HV input and the rigid coaxial RF output.
3. Standard flanges for the 6"1/8 EIA rigid coaxial line.
4. LEMO and BURNDY multi-pin connectors presently used in the installation.