CNAO
Centro Nazionale di Adroterapia Oncologica

Strada Campeggi 53 27100 PAVIA
Tel. 0382 0781 – www.cnao.it

Numero	*Data*	*Rev.*	*Pagina*
DOC-ML-SB-DCT-00016	23/09/2021	0	1 di 5

Documento tipo / Document type

SPECIFICA TECNICA / TECNICAL SPECIFICATION / DESIGN REPORT…

Titolo / Title

DC – Current Transformer (DCCT) – Technical Specifications

Autori (CNAO se non diversamente indicato) / Authors (CNAO if non differently indicated)

Claudio Viviani

Referente / Contact person

Parole chiave / Keywords

Riassunto / Abstract

Technical Specifications for the supply of nr. 1 DC Current Transformer (DCCT) to be used for the synchrotron of the CNAO Foundation of Pavia, as part of the INSPIRIT project

Emesso / Compiled	*Verificato / Controlled*	*Verificato / Controlled*	*Approvato / Approved*
Claudio Viviani			Luciano Falbo

LISTA DI DISTRIBUZIONE / DISTRIBUTION LIST			
#	*Data / Date*	*Nome / Name*	*Ditta / Society*

ELENCO DELLE VARIAZIONI / HISTORY OF CHANGES			
Ver.	*Data / Date*	*Pag.*	*Descrizione / Description*

INDICE

1 CONTEXT AND INTRODUCTION

The CNAO (National Center for Oncological Hadrontherapy, www.fondazionecnao.it), based in Pavia, is an innovative and technologically advanced structure, established by the Ministry of Health with the aim of treating patients suffering from solid radioresistant tumors through the use of protons and carbon ions, particles called hadrons (hence “hadrontherapy”). For this reason, a "synchrotron" was created at CNAO to accelerate both particles. The generated beams are used for both therapeutic and clinical and physical research purposes.

CNAO is the Lombard research organization leader of the INSPIRIT project, conducted in partnership with INFN and the SME Hifuture, (PROJECT ID 1161908 CUP E18I19000180007) funded by the Lombardy Region under the POR FESR 2014-2020 Call Hub Research and Innovation. The project has among its objectives the realization of an innovative source capable of producing new ionic species that will be accelerated by the synchrotron and directed to the experimental room to be made available for research and industrial activities. The project includes a series of machine upgrades necessary for the operation of the new source, including the supply in question, consisting of a new DC Current Transformer (DCCT) for the synchrotron.

2. OBJECT OF THE SUPPLY

The object of this request for tender is the supply, including packaging, shipment and delivery at CNAO Foundation, of a new DCCT which shall be able to replace the present one with no additional interventions on mechanics either electronics side, either to be installed in a different place, and to work in parallel to the present one.

Together with the supply of the Transformer, the contracting authority asks the following documents as mandatory:

- User manual of DC – Current Transformer (in Italian or English)
- Service Manual of DC – Current Transformer (in Italian or English)
- Technical drawings
- 3D models
- Datasheet

3. DCCT – DC CURRENT TRANSFORMER SPECIFICATIONS

3.1 Mechanics

Sensor longitudinal encumbrance shall be smaller than 150mm.
The vacuum chamber inner diameter cannot be smaller than 147mm; sensor inner diameter cannot be smaller, consequently.
In case a change of these parameters could be necessary, it shall be explicitly agreed by the CNAO experts.

The sensor shall be installed in the beam line, directly. The ceramic gap and the wall current by pass shall be already included.

3.2 Electronics

Electronics full scale range shall be easily adjustable by the user, from ±20mA to ±20A.
Output signal range shall be ±10V and output bandwidth (@ -3dB) shall be not less than 8kHz.

Due to typical beam current intensities, the noise shall be less than 1uA/√Hz; if the noise is less than 0.5uA/√Hz, it is preferred. A linearity error less than 0.1% on the DC-10kHz bandwidth is envisaged.
The sensor shall be provided with 10-turn floating winding for calibration, namely an accurate measurement of the sensitivity factor. Calibration current shall be 2A maximum, on Z>100Ohm.
A 100m PP cable shall be included in the supply.
Output current and calibration signal input shall be driven on isolated BNC connectors, on front and rear panels.

3.3 Additional Features

Since the sensor is installed on the synchrotron, it shall be radiation-tolerant.
Sensor saturation flux shall be 10mT axial and 2mT radial, typically. Sensor sensitivity to external magnetic fields shall be 10uA/mT axial and 1mA/mT radial, typically.
The supply shall include:

- One sensor head;
- One interconnection cable;
- One 19” 3U RF-shielded chassis. Since the basic importance of the device, the chassis shall be equipped with two power supplies and two front end electronics (one in use and one as spare), both ready for the use, in such a way it can be immediately restored in case of failure.

4. WARRANTY

Warranty is required for a minimum of 12 months