Gruppo III PAVIA

- **Esperimenti CSN-IIII a Pavia:**

In corso

AEGIS → A.Fontana
MAMBO → P.Pedroni
FAMU → A- Menegolli
PANDA.DTZ → G.Boca (in chiusura)

Proposta apertura nuova sigla locale

ALICE.DTZ (!) → G. Bonomi

Resp. Nazionale: R. Nania– BA
misure ad LHC – quark-gluon plasma e tanto altro ….

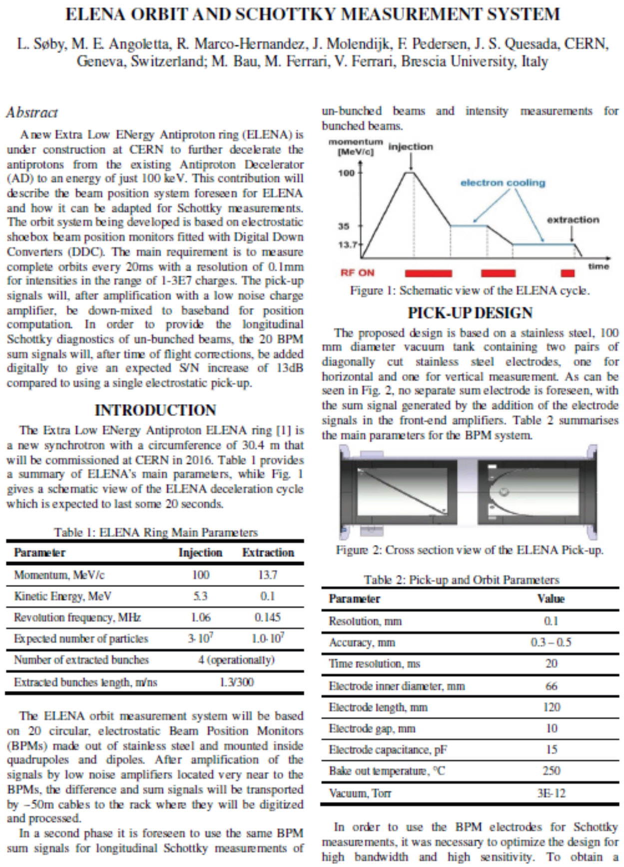
	Posizione	Qualifica	AEGIS	ALICE	FAMU	MAMBO	PANDA
Boca Gianluigi	Inc. Ric.	Ricercatore		30			20 %
Bonomi Germano	Associato	Ricercatore	50	50			
Braghieri Alessandro	Dipendente	Ricercatore				30	
Costanza Susanna	Assegn.	Assegnista		70		30	
De Bari Antonio	Inc. Ric.	Ricercatore			40		
De Vecchi Carlo	Dipendente	Tecnologo			50		
Donzella Antonietta	Associato	Tecnico Cat. D	50				
Fontana Andrea	Dipendente	Ricercatore	50				
Menegolli Alessandro	Inc. Ric.	Ricercatore			40		
Montagna Paolo	Inc. Ric.	Ricercatore				30	
Pagano Davide			30	70			
Pedroni Paolo	Dipendente	Primo Ric.				100	
Rossella Massimo	Dipendente	Tecnologo			20		
Tomaselli Alessandra	Associato	Ricercatore			30		
Rotondi Alberto	Inc. Ric.	Prof. Ordinario	30	50			20
Zenoni Aldo	Associato	Prof. Ordinario		40			
Zurlo Nicola	Inc. Ric.	Ricercatore	100				
FTE TOTALI : 10.3			**3,1**	**3.1**	**1,8**	**1,9**	**0,4**

Gruppo III - Brescia

	Posizione	Qualifica	ASACUSA
Artoni Maurizio	Associato	Prof. Associato	30
Bianconi Andrea	Inc. Ric.	Prof. Associato	70
Leali Marco	Associato	Tecnico cat.B	100
Venturelli Luca	Inc.Ric.	Prof. Associato	100
Mascagna Valerio	Assegnista	Assegnista	100
FTE TOTALI :			**4.0**
Nuove Proposte			
Ferrari Marco	*Associato*	*Prof. Associato*	*50*
Ferrari Vittorio	*Associato*	*Prof. Associato*	*50*
Baù Marco	*Assegnista*	*Assegnista*	*50*
Solazzi Luigi	*Associato*	***Ricercatore***	*50*

M. Baù, M. Ferrari, V. Ferrari,
Low-Noise Charge Preamplifier for Electrostatic Beam Position Monitoring Sensor at ELENA

IPAC 2015



ELENA ORBIT AND SCHOTTKY MEASUREMENT SYSTEM

L. Søby, M. E. Angoletta, R. Marco-Hernandez, J. Molendijk, F. Pedersen, J. S. Quesada, CERN, Geneva, Switzerland; M. Bau, M. Ferrari, V. Ferrari, Brescia University, Italy

Abstract

A new Extra Low ENergy Antiproton ring (ELENA) is under construction at CERN to further decelerate the antiprotons from the existing Antiproton Decelerator (AD) to an energy of just 100 keV. This contribution will describe the beam position system foreseen for ELENA and how it can be adapted for Schottky measurements. The orbit system being developed is based on electrostatic shoebox beam position monitors fitted with Digital Down Converters (DDC). The main requirement is to measure complete orbits every 20ms with a resolution of 0.1mm for intensities in the range of 1-3E7 charges. The pick-up signals will, after amplification with a low noise charge amplifier, be down-mixed to baseband for position computation. In order to provide the longitudinal Schottky diagnostics of un-bunched beams, the 20 BPM sum signals will, after time of flight corrections, be added digitally to give an expected S/N increase of 13dB compared to using a single electrostatic pick-up.

INTRODUCTION

The Extra Low ENergy Antiproton ELENA ring [1] is a new synchrotron with a circumference of 30.4 m that will be commissioned at CERN in 2016. Table 1 provides a summary of ELENA's main parameters, while Fig. 1 gives a schematic view of the ELENA deceleration cycle which is expected to last some 20 seconds.

Table 1: ELENA Ring Main Parameters

Parameter	Injection	Extraction
Momentum, MeV/c	100	13.7
Kinetic Energy, MeV	5.3	0.1
Revolution frequency, MHz	1.06	0.145
Expected number of particles	$3 \cdot 10^7$	$1.0 \cdot 10^7$
Number of extracted bunches	4 (operationally)	
Extracted bunches length, m/ns	1.3/300	

The ELENA orbit measurement system will be based on 20 circular, electrostatic Beam Position Monitors (BPMs) made out of stainless steel and mounted inside quadrupoles and dipoles. After amplification of the signals by low noise amplifiers located very near to the BPMs, the difference and sum signals will be transported by ~50m cables to the rack where they will be digitized and processed.

In a second phase it is foreseen to use the same BPM sum signals for longitudinal Schottky measurements of un-bunched beams and intensity measurements for bunched beams.

Figure 1: Schematic view of the ELENA cycle.

PICK-UP DESIGN

The proposed design is based on a stainless steel, 100 mm diameter vacuum tank containing two pairs of diagonally cut stainless steel electrodes, one for horizontal and one for vertical measurement. As can be seen in Fig. 2, no separate sum electrode is foreseen, with the sum signal generated by the addition of the electrode signals in the front-end amplifiers. Table 2 summarises the main parameters for the BPM system.

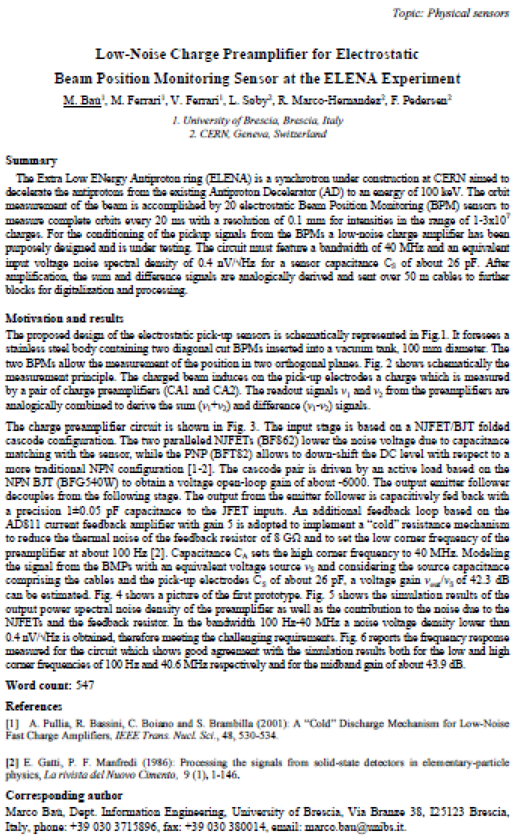
Figure 2: Cross section view of the ELENA Pick-up.

Table 2: Pick-up and Orbit Parameters

Parameter	Value
Resolution, mm	0.1
Accuracy, mm	0.3 – 0.5
Time resolution, ms	20
Electrode inner diameter, mm	66
Electrode length, mm	120
Electrode gap, mm	10
Electrode capacitance, pF	15
Bake out temperature, °C	250
Vacuum, Torr	3E-12

In order to use the BPM electrodes for Schottky measurements, it was necessary to optimize the design for high bandwidth and high sensitivity. To obtain a

EUROSENSOR 2015



Topic: Physical sensors

Low-Noise Charge Preamplifier for Electrostatic Beam Position Monitoring Sensor at the ELENA Experiment

M. Bau[1], M. Ferrari[1], V. Ferrari[1], L. Soby[2], R. Marco-Hernandez[2], F. Pedersen[2]

1. University of Brescia, Brescia, Italy
2. CERN, Geneva, Switzerland

Summary

The Extra Low ENergy Antiproton ring (ELENA) is a synchrotron under construction at CERN aimed to decelerate the antiprotons from the existing Antiproton Decelerator (AD) to an energy of 100 keV. The orbit measurement of the beam is accomplished by 20 electrostatic Beam Position Monitoring (BPM) sensors to measure complete orbits every 20 ms with a resolution of 0.1 mm for intensities in the range of $1\text{-}3 \times 10^7$ charges. For the conditioning of the pickup signals from the BPMs a low-noise charge amplifier has been purposely designed and is under testing. The circuit must feature a bandwidth of 40 MHz and an equivalent input voltage noise spectral density of 0.4 nV/√Hz for a sensor capacitance C_S of about 26 pF. After amplification, the sum and difference signals are analogically derived and sent over 50 m cables to further blocks for digitalization and processing.

Motivation and results

The proposed design of the electrostatic pick-up sensors is schematically represented in Fig.1. It foresees a stainless steel body containing two diagonal cut BPMs inserted into a vacuum tank, 100 mm diameter. The two BPMs allow the measurement of the position in two orthogonal planes. Fig. 2 shows schematically the measurement principle. The charged beam induces on the pick-up electrodes a charge which is measured by a pair of charge preamplifiers (CA1 and CA2). The readout signals v_1 and v_2 from the preamplifiers are analogically combined to derive the sum (v_1+v_2) and difference (v_1-v_2) signals.

The charge preamplifier circuit is shown in Fig. 3. The input stage is based on a NJFET/BJT folded cascode configuration. The two paralleled NJFETs (BF862) lower the noise voltage due to capacitance matching with the sensor, while the PNP (BFT82) allows to down-shift the DC level with respect to a more traditional NPN configuration [1-2]. The cascode pair is driven by an active load based on the NPN BJT (BFG540W) to obtain a voltage open-loop gain of about -6000. The output emitter follower decouples from the following stage. The output from the emitter follower is capacitively fed back with a precision 1±0.05 pF capacitance to the JFET inputs. An additional feedback loop based on the AD811 current feedback amplifier with gain 5 is adopted to implement a "cold" resistance mechanism to reduce the thermal noise of the feedback resistor of 8 GΩ and to set the low corner frequency of the preamplifier at about 100 Hz [2]. Capacitance C_A sets the high corner frequency to 40 MHz. Modeling the signal from the BMPs with an equivalent voltage source v_S and considering the source capacitance comprising the cables and the pick-up electrodes C_S of about 26 pF, a voltage gain v_{out}/v_S of 42.3 dB can be estimated. Fig. 4 shows a picture of the first prototype. Fig. 5 shows the simulation results of the output power spectral noise density of the preamplifier as well as the contribution to the noise due to the NJFETs and the feedback resistor. In the bandwidth 100 Hz-40 MHz a noise voltage density lower than 0.4 nV/√Hz is obtained, therefore meeting the challenging requirements. Fig. 6 reports the frequency response measured for the circuit which shows good agreement with the simulation results both for the low and high corner frequencies of 100 Hz and 40.6 MHz respectively and for the midband gain of about 43.9 dB.

Word count: 547

References

[1] A. Pullia, R. Bassini, C. Boiano and S. Brambilla (2001): A "Cold" Discharge Mechanism for Low-Noise Fast Charge Amplifiers, *IEEE Trans. Nucl. Sci.*, 48, 530-534.

[2] E. Gatti, P. F. Manfredi (1986): Processing the signals from solid-state detectors in elementary-particle physics, *La rivista del Nuovo Cimento*, 9 (1), 1-146.

Corresponding author

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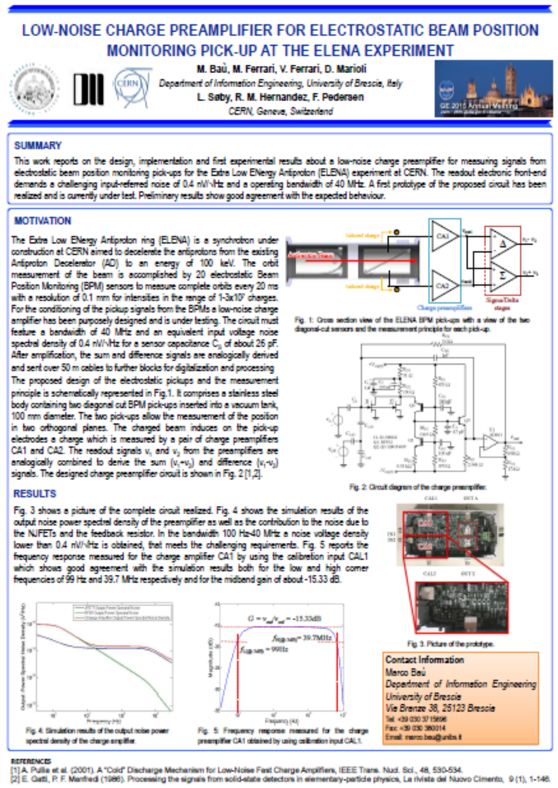
GE 2015



ESPERIMENTO AEGIS

PREVENTIVI 2016

AEGIS-PV 2016: IMPEGNI E RICHIESTE

RESP. NAZ.: G. TESTERA (GE)
RESP. LOC.: A. FONTANA (PV)

PERSONALE:		**% PER 2016**
RICERCATORI		
BONOMI	PA	0.5
FONTANA	RI	0.5
PAGANO	AS	0.3
ROTONDI	PO	0.3
ZURLO	RU	1.0
TECNOLOGI		
DONZELLA	TC	0.5
TOTALE FTE PV		**3.1**

MISSIONI		
MEETINGS DI COLLABORAZIONE CERN		4.0
RIUNIONI COLLABORATORI ITALIANI	2.0	
TURNI DI MISURA		40.0
CONSUMO		
METABOLISMO		1.0
SPESE PER SERVIZI		
NOLEGGIO POOL CERN	6.0	
TOTALE		***53.0***

The 2015 data taking

OBIETTIVI PER IL RUN 2015

1. **positroni**:
   trasferire i positroni nel magnete 1T
   produrre positronio nel magnete 1T

2. **antiprotoni:**
   migliorare l'efficienza di trasferimento nel magnete 1T

3. **anti-idrogeno:**
   produzione di anti-idrogeno

4. **Rivelazione:**
   rivelare e misurare i parametri di produzione dell'anti-idrogeno

(Misura di g: 2016 e 2017, prima della pausa per l'installazione di ELENA)

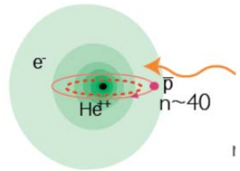
ESPERIMENTO ASACUSA

PREVENTIVI 2016

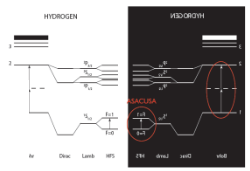
ASACUSA Experiments

Studies of *CPT symmetry* by atomic spectroscopy

1) • laser spectroscopy of antiprotonic helium :
→Antiproton mass

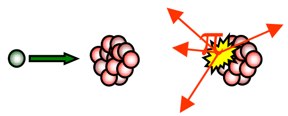


2) • Microwave spectroscopy of antihydrogen :
→Ground-state hyperfine structure



Nuclear collisions with antiprotons

3) • total annihilation cross-section σ.



ASACUSA richieste finanziarie 2016

	keuro	di cui s.j
MISSIONI (AD→28 weeks: May-Nov)		
Prese dati (Hbar & pbar-He) CERN 1.5 FTE x 21 weeks	31.5	23
Prese dati (sigma_ann) CERN 4 FTE 3 weeks	12	12
Installazione apparato CERN 3 FTE 1.5 weeks	4.5	
Riunioni di Collaborazione	2	
TOT	50	35
TRASPORTI	1	
INVENTARIABILE		
pompa turbo (in sostituzione)	4.5	
SPSERVIZI		
common fund	10	
TOT	**65.5**	**35**

ESPERIMENTO FAMU

PREVENTIVI 2016

FAMU-PV: Attività 2016

- Realizzazione di una corona completa di rivelatori Pr:LuAG (collaborazione con gruppo spettroscopia Raman per misure ottiche e con Chimica Fisica per i depositi di riflettore) e suo utilizzo nel test run 2016 a RIKEN-RAL.

- Upgrade dei due monitor di fascio e test a RIKEN-RAL per misura del profilo del fascio.

- Disegno e realizzazione dello stadio di pre-amplificazione per i rivelatori a Germanio di INFN Milano Bicocca.

- Partecipazione ai test run 2016 (un test run a BTF/CERN e uno a RIKEN-RAL).

FAMU-PV: Preventivi 2016

Capitolo	Richiesta (Keuro)
Missioni	15.0
Consumo	9.5
Inventariabile	6.5
Apparati	1.0
Trasporti	2.0
TOTALE	34.0

FAMU-PV: Dettaglio richieste 2016

1) Missioni:

- Test run 2016 al RIKEN-RAL:	4.5 Keuro
- Test run del setup sperimentale a BTF/CERN:	3.0 Keuro
- Meeting di Collaborazione:	5.5 Keuro
- Incontri di lavoro:	2.9 Keuro

2) Consumo:

- Materiale e lavorazioni per taglio e depositi riflettori cristalli FAMU:	2.0 Keuro
- Materiale di consumo per stampante 3D (odoscopio e supporti cristalli):	1.5 Keuro
- Passante da vuoto rotante per depositi riflettori:	1.0 Keuro
- Consumo elettronica Germani (circuiti stampati e componenti):	5.0 Keuro

ESPERIMENTO MAMBO

PREVENTIVI 2015

Manpower 2015

		FTE
PV	A.Braghieri (50%), S.Costanza (50%), P.Pedroni (100%)	2.0
CT(ME)		2.8
ISS	Numeri provvisori !	1.0
LNF		1.2
RM2		2.2
TO		0.9
TOTALE	(15 ricercatori)	10.1

Attività 2016

- **MAMI (Mainz):**

=) Continuazione runs di misura in fascio (bersagli di di protoni/deutoni (non) polarizzati)

=) Manutenzione camere a fili

ELSA (Bonn):

=) Continuazione runs di misura in fascio

=) Manutenzione camere a fili

=) Costruzione set di camere di riserva (per Mainz e/o Bonn)

Richieste 2016 (in kEuro)

- Missioni 30,5 (Principalmente per prese dati Mainz e Bonn)

- Materiale consumo 2,5 (gas per camere a fili e materiale vario)

- Materiale Inventariabile 6,5 (Modulo HV spare per Bonn per Bonn)

  4,5 (Modulo ADC spare per MAinz Mainz)

TOTALE 43 Keuro

3 mesi/uomo officina meccanica 4 mesi/uomo serv. elettronico

ESPERIMENTO PANDA

PREVENTIVI 2016

- Tempistica di FAIR è tuttora completamente incerta
- Non si sa quanto del progetto originale verrà effettivamente realizzato
- Anche nell'ipotesi più ottimistica PANDA slitta in avanti di diversi anni

SIGLA PANDA chiude (con una piccola coda nel 2016 per terminare le attività in corso)

PANDA.DTZ : solo missioni
9 kE per partecipazione meetings di collaborazione
e riunioni gruppo tracking