产品手册

CONVeYI

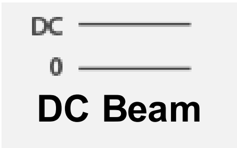
北京科维泰信科技有限公司

法国 Bergoz Instrumentation 公司，35 年专业研发，致力于**粒子加速器束流测量诊断**领域。

---

1 - NPCT

新型束流传感器



非拦截式
束流测量

带 宽	分辨率
DC to 10kHz	< 0.5μArms √ Hz

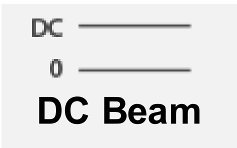
测量范围：±20mA 到 ±20A
线性误差<0.1%

Page
-4-

---

2 - IPCT

集成束流传感器



非拦截式
束流测量

带 宽	分辨率
DC to 4kHz	10μA

测量范围：±1mA to ± 5A
线性误差<0.1%

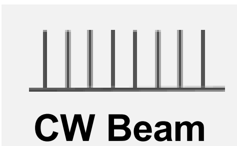
-5-

---

3 - CWCT&BCM-CW

NEW!

连续脉冲传感器 & 束流电荷积分监测器



连续脉冲与宏脉冲, ADS, SNS, HPPA

平均流强分辨率	快束损联锁
1 μA	1 μs

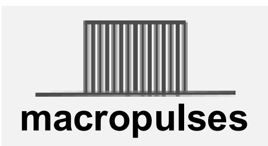
脉冲频率范围：15 - 500MHz
平均流强范围：10μA - 200mA
100Hz 输出噪声：0.5μA

-6-

---

4 – ACCT

AC 束流传感器



长脉冲与宏脉冲

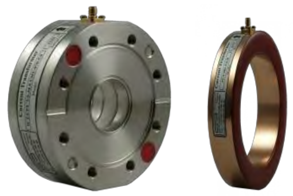
带 宽	分辨率
< 3Hz to 1MHz	10μA

测量范围：±10mA to ±2A
10mA 噪声：≈1.5μArms

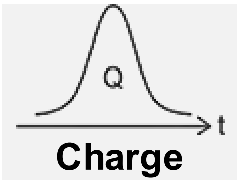
-7-

---

5 - ICT



电荷积分器



电荷积分

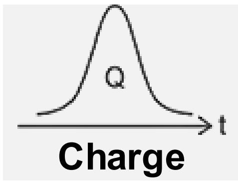
灵敏度	分辨率
0.5Vs/C - 20Vs/C	400pC - 800nC

温度范围: 100°C, 155°C, 185°C
单脉冲噪声： 0.55pCrms

-8-

6 - Turbo-ICT

集成束流传感器



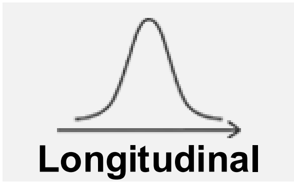
电荷积分

	测量范围	束流频率	噪声
CW Beam & Macropulse	3.5μA-3mA	10-230MHz	0.1μA
Single Bunch	50fC-300pC	<2MH	10fC

-9-

7 – FCT

快束流传感器



纵截面测量

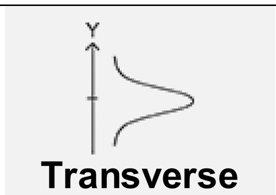
带 宽	上升时间
Up to 2 GHz	< 200 ps

温度范围: 100°C, 155°C, 185°C
分辨率： 0.5V/A to 10V/A

-10-

8 – VWM

振动线传感器



横截面测量

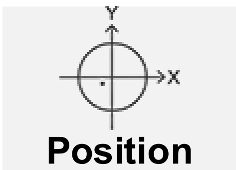
质子流分辨率	电子流分辨率
3pA	70pA

动态范围: > 1E6
Beam transverse profile and position Beam Halo measurement

-11-

9 - BPM

束流位置探测器



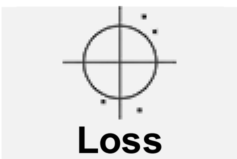
位置测量

Non-intercepting beam position measurement
for electron/positron storage rings single-pass short bunches S-band /L-band cancer therapy synchrotrons

-12-
-13-
-14-
-15-

10 - BLM

束损探测器



束流损失

Single particle detection
1E8 linear dynamic range
Background noise: 1 spurious count in 10 seconds.
Spurious count rate: <0.1Hz
Maximum count rate: >10MHz

-16-

Others Include, 其他产品包括:

-17-

Beamline Profiler, Faraday Cup, Emittance Scanner, Magnet

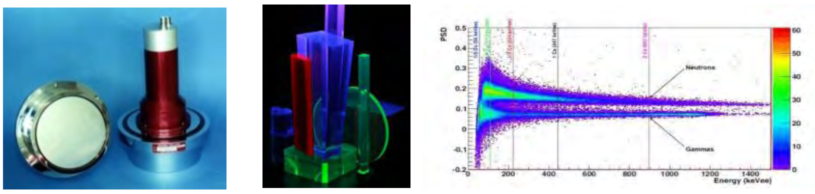
加拿大 **D-PACE**
束流截面
法拉第杯
丝靶
磁铁

-18-

Magnet Power Supply, Picoammeter, Beamline Control

意大利 **CAENels**
磁铁电源
皮安表
束线控制

-19-



Scintillation Particle Detector

荷兰 **SCIONIX**
闪烁体 -
粒子探测器

-19-

Particle Detector Emulator, ET Photomultiplier

意大利 **CAEN**
粒子探测器
-仿真器
ET 光电倍增管

-19-

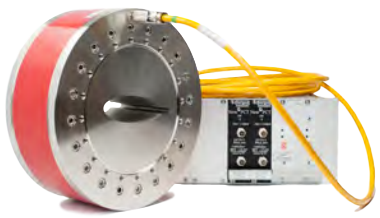
HV Power Supply

德国 ISEG
英国 Genvolt
高压电源

新型束流传感器

NPCT – New Parametric Current Transformer

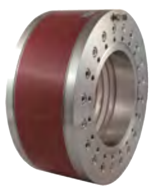
Non-Destructive
Beam Measurement DCCT



Specifications

Full scale ranges	±20mA to ±20A
Range control	2 TTL DB9
Output	±10 V
Output over range	up to ±12V
Output bandwidth (-3dB)	8 kHz in 20-mA range 10 kHz in other ranges
Response time (@90%)	< 50 us
Resolution	
Standard model	< 5μ Arms/sqrt(Hz)
High Resolution	< 1μ Arms/sqrt(Hz)
Very High Resolution	< 0.5 μArms/sqrt(Hz)
Output accuracy	±0.1% ± zero-offset ±magnetic field sensitivity ± temperature drift
Linearity error	< 0.1%

Temperature coefficient	< 0.5uA/K typ.
Operating temperature	-40...80℃
Output impedance	100Ω
Output current	10mA max, source or sink
Output connectors	Isolated BNC on rear panel and front panel
Test function	Injects +100mA
Test control	TTL line DB9
Calibration winding	10-turn floating calibration winding
Calibr. current	from external source (2A max, Z > 100Ω)
Calibr. connectors	Isolated BNC on rear panel and front panel



In-flange NPCT sensor to mountin the beam line

In-air NPCT sensor for installation over the vacuum chamber

NPCT Chassis with NPCT-E electronics and power supplies

Application

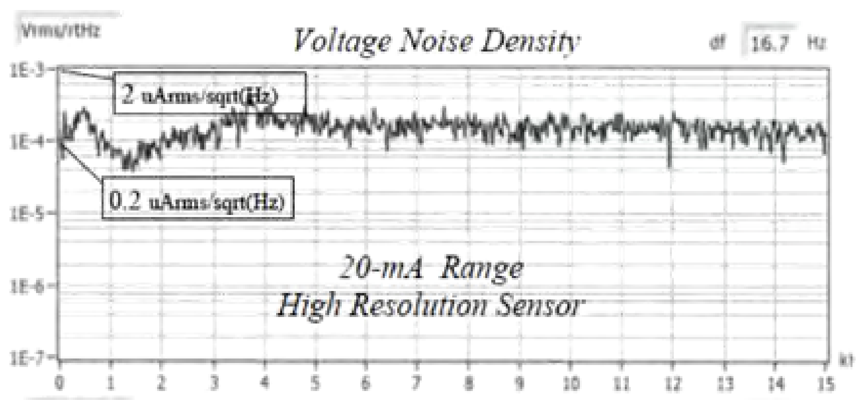
The Parametric Current transformer is used on most particles accelerators in the world to measure the average beam current. It is an essential instrument for accelerator tuning and operation. It is primarily used on particle sources, cyclotrons, medical synchrotrons, HEP research accelerators and light sources.

Order code

In-flange	ID
NPCT-CF2"1/8-22.2-	22.2
NPCT-CF2"3/4-34.9-	34.9
NPCT-CF4"1/2-60.4-	60.4
NPCT-CF6"-96.0-	96
NPCT-CF8"-147.6-	147.6
NPCT-CF10"-198.4-	198.4
In-air	**ID**
NPCT-055-	55
NPCT-075-	75
NPCT-115-	115
NPCT-130-	130
NPCT-175-	175
NPCT-195-	197
NPCT-203-	203
NPCT-245-	245

Operating principle

The NPCT works on the second harmonic detection principle. Two cores are modulated to deep saturation in opposite phase. A primary DC current flowing through the cores shifts the cores' working point in opposite polarity which generates a second harmonic of the modulator frequency.The primary current AC component is detected by an AC Hereward transformer. The two circuits are cascaded in a common feedback loop to generate a magnetic flux which always cancel the primary current flux. The NPCT output is the voltage developed by the feedback current passing through a precision resistor.



Specifications

Full scale range	Any value from ± 1mA to ± 20A, factory preset
Over range	120% full scale permanently
Saturation	>120% full scale
Damage level	DC: unlimited, AC: > 20Arms
Discharge:	> 100kA 4/10µs
Voltage isolation	5kV current conductor to ground
Resolution See	"Resolution" table below
Linearity error	<0.1% FS
Absolute accuracy	± 0.2% FS
Calibration	External current can be applied
Ripple	7kHz and even harmonics
See	"Ripple" table below
Bandwidth	DC to 3.8kHz (-3dB), See "Bandwidth" table below
Output	±10V, buffered, 20 mA max stands permanent short circuit
Zero adjust	20-turn front-panel potentiometer
Power supply	+-15V, 100mA
Connection	DB-9 male on front panel
Temperature drift	<5µA/K
Stabilization after overload	10ms max.
Magnetic field	50µA/Gauss typ. sensitivity
Mass	0.5 Kg

The IPCT is a DC Current Transformer
Large aperture 82mm (3.23")
Widely used for Xray installations periodic recalibration
Full scale from ±1 mA to ±20 A factory preset
±10V analog output
DC to 3.8 kHz (-3dB) response
Accuracy independent of primary conductor position
Withstands 100kA 4/10µs discharges
100 times more precise than Hall effect devices
Increased sensitivity with multiple primary turns

Resolution, bandwidth and ripple

Range	Resolution (Noise)	Bandwidth -3 dB	Ripple (7kHz)
+- 1 mA	1 uA/ √ Hz	> 150 Hz	< 80 mV rms
+- 10 mA	10 uA/ √ Hz	> 800 Hz	< 70 mV rms
+- 100 mA	10 uA/ √ Hz	> 3 kHz	< 70 mV rms
+- 2A	30 uA/ √ Hz	> 3.8 kHz	< 12 mV rms
+- 20 A	200 uA/ √ Hz	> 2 kHz	<12 mV rms

Connections

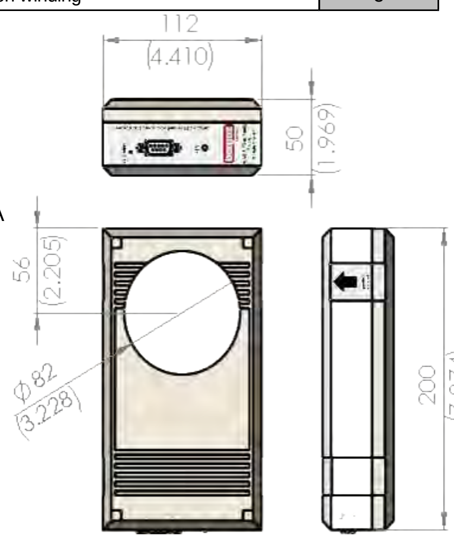
Function	Pin
Power supply -15V	4
Power supply +15V	9
Power supply ground	5
Output (-10V to +10V)	2
Output ground	7
Optional external resistor	1
Optional external resistor	6
Calibration winding +	8
Calibration winding -	3

Operating principle

The IPCT works on the principle of the DCCT, invented at CERN, the European Particle Physics Laboratory, by K.Unser in 1969. The DC component of the current flowing through the toroid sensor is detected by a magnetic modulator, also called fluxgate or second harmonic detector. The AC component is detected by an active Hereward transformer. The two circuits are cascaded in a common feedback loop to generate a magnetic flux which always cancels the primary current flux. The IPCT output is the voltage developed by the feedback current passing through a precision resistor.

Order code

IPCT-XXXmA:
Integrated Parametric Current Transformer. Factory-preset
Any range XXXmA up to ±20 A



Options

IPCT-0.01%	High accuracy calibration 0.01% ±10µA
IPCT-CALCERT	IPCT initial certificate of Calibration with test report
IPCT-PS-BNC	90-245Vac power supply & BNC output for IPCT

连续脉冲束流传感器

CWCT & BCM-CW - CW Current Transformer & Beam Charge Monitor for CW beams and macropulses

Non-Destructive

For ADS, SNS, HPPA

Specifications

Beam repetition frequency	15~500 MHz
Average beam current	10 µA - 200 mA
Average current resolution	1 µA resolution
Fast beam loss interlock	1 µs
Linearity error	<1.5%
Beam loss resolution	<1 %
Output voltage (in 1 MΩ)	-4 V … +4 V
Output noise at 100 Hz	0.5 µA
Output noise at 10 Hz	1 µA

Based on our extensive knowledge of current transformers and analog electronics, the CWCT and the BCM-CW-E were designed by Hervé Bayle, Laurent Dupuy, Frank Stulle and Julien Bergoz.

Early sampling prototypes were developed by Hanjiao Chen, SINAP, Shanghai, during his internship at Bergoz Instrumentation.

Independent of bunch shape and width

EMI, RFI, field and temperature immune

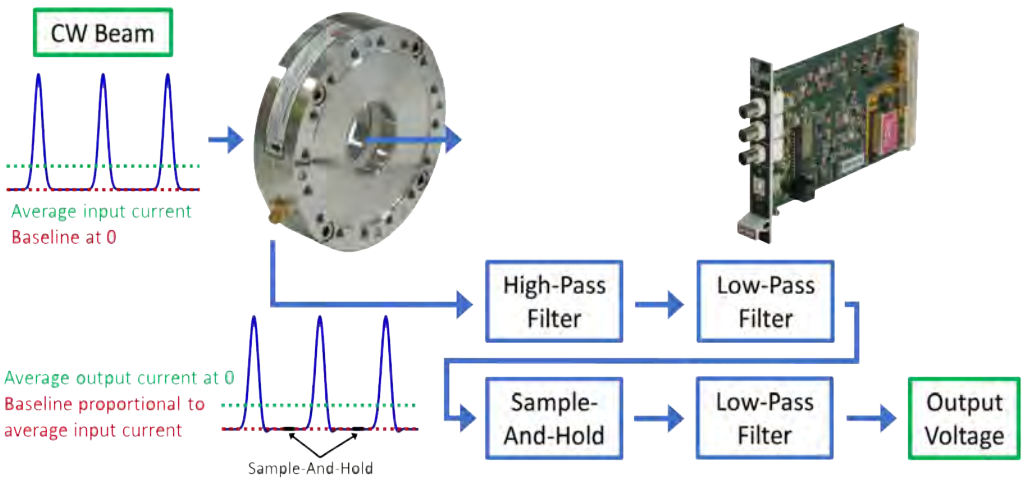
Operating principle

The CWCT is a current transformer with strict limits on lower and upper cut-off frequencies, tailored to the beam RF. Its lower cut-off assures negligible droop between bunches. Yet, droop is high enough to allow fast differentiation.

Its upper cutoff is high enough to allow output signal return to baseline after each bunch, yet low enough to assure an output duty factor close to 50%. Thus it is tailored to the bunch length, allowing the measurement of short bunches.

The BCM-CW-E is the electronics module processing the CWCT output signal. By applying fast sample-and-hold techniques it measures the average beam current with microsecond response time. Properly adjusted` signal amplification and filtering improves the resolution of small beam current fluctuations.

CWCT&BCM-CW sensitivity	20V/A			10V/A			5V/A		
Gain	0dB	20dB	40dB	0dB	20dB	40dB	0dB	20dB	40dB
Full scale	100mA	20mA	2mA	200mA	40mA	4mA	400mA	80mA	8mA
Resolution	0.1%	0.05%	0.05%	0.1%	0.05%	0.05%	0.1%	0.05%	0.05%



Order code

Part Number	ID
CWCT-CF3"3/8-22.2-	22.2
CWCT-CF4"1/2-34.9-	34.9
CWCT-CF4"1/2-38.0	38.0
CWCT-CF6"-47.7-	47.7
CWCT-CF6"-60.4-	60.4
CWCT-CF6"3/4-96.0-	96.0
CWCT-CF8"-96.0-	96.0
CWCT-CF10"-147.6-	147.6
CWCT-CF12"-198.4	198.4

Proper adjustment of the CWCT bandwidth allows to achieve fast response times and low noise. Combined with fast sample-and-hold electronics, high repetition rate beams are measurable.

Proton CW accelerators need compact instruments immune to magnetic stray fields and temperature to measure beam loss at low/medium energy and abort the beam quickly.

AC束流传感器

ACCT - AC Current Transformer

Non-Destructive

for long pulses and macropulses

Specifications

Full scale range	±10mA to ±2A
Output full scale	±10V
Bandwidth	3Hz to 1MHz
Noise at 10mA FS	≈1.5μArms
Noise at 100mA FS	<5μArms
Lower cutoff (-3dB)	<3Hz
Droop	<2%/ms
Upper cutoff (-3dB)	1MHz
Risetime	350ns (10% - 90%)
Output offset	0.2mV typ. 0.5mV max.
Power supply	+15Vdc and -15Vdc, 100mA ea.
Power supply unit	5U15-15B recommended Mains voltage 95-125Vac /215-245Vac
Connectors	Sensor: BNO (Twin BNC) tronics input: BNO (Twin BNC) Electronics output: BNC

Sensor cable	Twisted pair Up to 20 meters Above 20 meters overshoot may appear and rise time may increase
Primary DC current	1A max
Ratio accuracy error	<0.1% FS
Destructive level	DC current: Unlimited Spikes >100mC AC current >20Arms
Output current limit	±20mA max.
Mag. field sensitivity	When low currents are measured using"in-air" sensor, MSH optional magnetic shield is recommended.
Sensor saturation	External magnetic field: 2mT max. Can be exceeded with optimal additional shielding
Temperature drift	Negligible

Operating principle

The ACCT is an evolution of the active transformer first proposed by Hereward in 1960.
Compared to the Hereward transformer, the ACCT presents much lower noise, a DC offset of the output reduced to a very small value and excellent longterm stability.

The sensor is built with a single winding, which requires only one wire pair between sensor and electronics; this allows much better EMI rejection when long cables are used.
The electronics circuit is multistage, implementing the best low-noise operational amplifier available for this application.

3 packaging types for the ACCT sensor

In-flange ACCT is mounted in the beam line. Short axial length, includes a ceramic gap vacuum-brazed to kovar.
Does not require bellows, wall current bypass nor electromagnetic shield.
Available from CF3 "3/8 to CF8," Bakeable up to 185°C
UHV compatible

In-air ACCT installation, over the vacuum chamber Requires installation of a "gap" to prevent the wall current from flowing through the ACCT aperture. The gap can be a brazed ceramic ring or an organic material O-ring depending on the vacuum requirements.

Typical installations include bellows, a wall current bypass and an electromagnetic shield enclosing the ACCT completely.

In-air ACCT with optional magnetic shield for high resolution measurement in noisy environment.

Special shielding available on option

Order code

In-flange models		Unshielded In-air		Shielded In-air	
Part No.	ID	Part No.	ID	Part No.	ID
ACCT-CF3"3/8-22.2-	22.2	ACCT-S-016	16	ACCT-S-055-MSH	55
ACCT-CF4"1/2-34.9-	34.9	ACCT-S-028	28	ACCT-S-075-MSH	75
ACCT-CF4"1/2-38.0-	38.0	ACCT-S-055	55	ACCT-S-115-MSH	115
ACCT-CF6"-47.7-	47.7	ACCT-S-082	82	ACCT-S-130-MSH	130
ACCT-CF6"-60.4-	60.4	ACCT-S-122	122	ACCT-S-175-MSH	175
ACCT-CF6"3/4-96.0-	96.0	ACCT-S-178	178	ACCT-S-197-MSH	*198
......	......			......	......
Axial length: 40		Axial length: 22		Axial length: 102	

Bergoz Instrumentation
Espace Allondon Ouest
01630 Saint Genis Pouilly, France
www.bergoz.com
sales@bergoz.com

电荷积分器

ICT & BCM-IHR Integrating Current Transformer & Beam Charge Monitor

Non-Destructive

for low bunch charge and current

Specifications

ICT integrates bunch charge without loss For FEL, transfer lines, injection/extraction monitoring For laser-plasma, wakefield accelerators

Sensitivity (nominal)	0.5	1.25	2.5	5.0	10	20	Vs/C
Turns ratio (old reference)	50:1	20:1	10:1	05:1	N/A	N/A	
Max. pulse train length	7.5	1.2	0.35	0.1	0.1	0.1	μs
With Low droop option	20	4	10:01	0.25	0.25	0.25	μs

Integrating Current Transformer

Position dependence	Negligible
ICT output connectors	SMA, Radiation tolerant on option

Beam Charge Monitor - Integrate-Hold-Reset

Full scale ranges	Selectable in a range of 50:1 by TTL
Most sensitive range	800pC, using 5Vs/C ICT
Least sensitive range	400nC, using 0.5 Vs/C ICT
Range control	Full scale and polarity (4 TTL bits)
Noise on single bunch	0.55pCrms, limited by dynamic range
Dynamic range	>35'000, limited by resolution
Output	±8V, available 50μs after trigger, held for 350μs (up to 10ms on option)
Trigger	TTL, ≥10ns (NIM on option)
Trigger frequency	20kHz max. (ask factory for preset)
Front panel connectors	BNC 50Ω for oscilloscope: Signal View, Output View, Timing View
Back panel connectors	SMA Input, SMA Trigger input, SMA Output, DB9 for control lines
Front-panel controls	Integration window time potentiometer Trigger delay potentiometer
Calibration pulses	1pC, 10pC, 100pC, 1nC, accuracy ±2%
Calibration controls	Enable, polarity and charge, by TTL
Front-panel control	Calibration ON/OFF switch Calibration pulse delay potentiometer

Operating principle

ICT combines two nested transformers: a shorted one-turn current transformer loads the full bunch charge instantly into capacitors. Then the charge is transferred to the output by a readout transformer, at a slow pace, to avoid core loss. Cores are specially annealed to lower their coercive field and further minimize core loss. The ICT signal is integrated by BCM-IHR, a boxcar type asynchronous differential detector. The output voltage proportional to the beam pulse charge is available 30μs after the trigger. It is maintained up to 400μs, then reset. Another pulse can then be measured.

Order code

In-flange	ID
ICT-CF3"3/8-22.2-	22.2
ICT-CF4"1/2-34.9-	34.9
ICT-CF4"1/2-38.0-	38.0
ICT-CF6"-47.7-	47.7
ICT-CF6"-60.4	60.4
ICT-CF6"3/4-96.0-	96.0
In-air	**ID**
ICT-016-xx	16
ICT-028-xx	28
ICT-055-xx	55
ICT-082-xx	82
ICT-122-xx	122
for more dimensions and sensitivities, visit bergoz.com	

In-flange ICT are mounted directly in the beam line. UHV compatible. Available for many pipe diameters from 1" to 250mm. Also with elliptical aperture or other arbitrary shape aperture. Ceramic gap, shields and wall current bypass are included. Bellows are not required.

In-air ICT are installed over the vacuum chamber. It requires a "gap" in the vacuum chamber to prevent the wall current from flowing through the ICT aperture. The gap can be a brazed ceramic ring or an organic material O-ring depending on the vacuum requirements. Typical installations include bellows, a wall current bypass and an electromagnetic shield enclosing the ICT.

Turbo电荷积分器

Turbo-ICT & BCM-RF Turbo Integrating Current Transformer & RF Beam Charge Monitor

Non-Destructive

for low bunch charge and current

Specifications

Beam type	CW beam and macropulses	Single bunch
BCM-RF set to	Track-Continuous Mode	Sample&Hold Mode
Measurement range	0.5µA - 3mA	50fC - 300pC
Bunch repetition frequency	10MHz - 350MHz	Single bunch <2MHz
Output specifications		
Voltage	0 - +5V log of beam current	0 - +5V log of bunch charge
Risetime	<70ns	<70ns
Reaction time	100ns for RF=100MHz 300ns for RF=10MHz	500ns to >99% final value
Noise	0.1µArms or 1% of current	10fC or 1% of charge
Non-linearity	≈2%	≈2%
Time response	Reports current variations to 10MHz	Hold till next bunch

Innovative features of Turbo-ICT and BCM-RF

A low-loss alloy to limit core losses below 1% up to 350MHz. Improved EMI/RFI immunity by a narrow-band transmission between Turbo-ICT and BCM-RF over an RF frequency carrier.

Turbo-ICT made with 1, 2 or 4 cores adjacent or superposed in a single In-flange package to achieve higher sensitivity. Turbo-ICT amplifier and RF modulator powered by BCM-RF via the coaxial transmission cable to avoid ground loops.

BCM-RF allows two modes of operation:
- Track-Continuous mode for CW beam and long macropulses.
- Sample&Hold mode for single bunch, with auto trigger feature.
Output is logarithmically proportional to beam current or bunch charge.

Order code

In-flange	ID
ICT-CF3"3/8-22.2-	22.2
ICT-CF4"1/2-34.9-	34.9
ICT-CF4"1/2-38.0	38.0
ICT-CF6"-47.7-	47.7
ICT-CF6"-60.4-	60.4
ICT-CF6"3/4-96.0-	96.0
or ICT-CF8"-96.0-	96.0
ICT-CF10"-147.6-	147.6
ICT-CF12"-198.4-	198.4
In-vacuum	**ID**
ICT-VAC-055-	55.0
ICT-VAC-082-	82.0

Two modes of operation

CW and macropulse average current measurement

Typical measurement range
0.5µA – 3mA can be adapted for max currents up to 100mA
RF from 10 MHz to 350MHz
Output bandwidth >5MHz
Total noise ~0.1µArms over 5MHz

Single bunch charge measurement

For sub-nanosecond bunches
Typical measurement range **50fC – 300pC**
Noise in single bunch measurement 10fCrms
Output DC voltage held until next bunch
Maximum bunch repetition rate 2 MHz

Turbo-ICT is mounted directly on the beam line
UHV compatible to 1E-10 mbar
Improved radiation tolerance on option
Ceramic gap vacuum-brazed over kovar transitions
Material AISI-304, 316LN on option
Arbitrary shape aperture on option
1 core, 2 cores or 4 cores on option
Calibrated charge generator on option

Turbo-ICT-VAC is installed in a laser-plasma vacuum enclosure
Vacuum compatible to 1E-7 mbar
Calibrated charge generator option not available
1 core or 2 cores on option

The very low charge to be measured is **a challenge**. Sensor magnetic noise and electronics noise must be very low:
To measure 1 pC with 1% resolution, measurement noise has to be at 10 fC.

Non-Destructive

for pulsed or CW beams

Technology

Composite* magnetic cores of Cobalt-based amorphous and nanocrystalline alloys provide high permeability and very fast risetime. Alloys are thermally and magnetically processed inhouse, to obtain unequalled performance. Annealing techniques are the result of 20 years experience with cobalt-based alloy processing. Proprietary multithread winding techniques and numerically analyzed modelling to assure uniform field density in magnetic core.
* Amorphous / nanocrystalline composite cores are made from two or more alloy composition batches. Alloy batches are individually annealed to give each of them specific characteristics. Hightemperature annealing is performed under fixed or 4π-radrotating magnetic field.

Order code

In-flange	ID
FCT-CF3"3/8-22.2-	22.2
FCT-CF4"1/2-34.9-	34.9
FCT-CF4"1/2-38.0-	38.0
FCT-CF6"-47.7-	47.7
FCT-CF6"-60.4	60.4
FCT-CF6"3/4-96.0-	96.0
In-air	**ID**
FCT-016-xx	16
FCT-028-xx	28
FCT-055-xx	55
FCT-082-xx	82
FCT-122-xx	122
for more dimensions and sensitivities, visit bergoz.com	

Specifications

Wideband models (standard)

Technology: Predominantly amorphous

Sensitivity (nominal)	0.25	0.5	1.25	2.5	5.0	10	V/A
Turns ratio (old reference)	100:1	50:1	20:1	10:1	5:01	N/A	
Rise time (typ.)*	0.60	0.30	0.20	0.30	0.39	1.30	ns
Droop	<1	<3	<6	<10	<32	<32	%/μs
Upper cutoff frequency -3dB typ.*	0.58	1.17	1.75	1.17	0.9	0.27	GHz
Lower cutoff frequency -3dB	<1.6	<4.8	<9.5	<16	<32	<32	kHz
L/R time constant (min.)	100	35	1.75	10	5	5	μs
Max. charge/pulse (pulses <1ns)	2	1	0.4	0.2	0.1	0.1	μC
Max. peak current (pulses >1ns)	2	2	0.4	0.2	0.1	0.1	kA
Max. rms current (f >10kHz)	14	14	5.6	2.8	1.4	1.4	A

* Depends on FCT sensor dimensions and selected options

Low droop (-LD) models on option

Technology: Predominantly nanocrystalline

Sensitivity (nominal)	0.25	0.5	1.25	2.5	5.0	10	V/A
Turns ratio (old reference)	100:1	50:1	20:1	10:1	5:01	N/A	
Rise time (typ.)*	1.00	0.54	0.40	0.50	0.78	1.30	ns
Droop	<0.05	<0.2	<1	<3	<8	<8	%/μs
Upper cutoff frequency -3dB typ.*	350	650	850	700	450	270	GHz
Lower cutoff frequency -3dB	<0.08	<0.32	<1.6	<5	<13	<13	kHz
L/R time constant (min.)	2000	500	100	30	12	12	μs
Max. charge/pulse (pulses <1ns)	3.8	1	0.4	0.2	0.1	0.1	μC
Max. peak current (pulses >1ns)	2	2	0.4	0.2	0.1	0.1	kA
Max. rms current (f >10kHz)	50	25	10	5	2.5	2.5	A

In-Flange FCT is mounted in the beam line. Short axial length, includes a ceramic gap vacuum-brazed to kovar. Does not require bellows, wall current bypass nor electromagnetic shield.
Available from CF3"3/8 to CF8"
Bakeable up to 185°C
UHV compatible

In-Air FCT installation, over the vacuum chamber Requires installation of a "gap" to prevent the wall current from flowing through the FCT aperture. The gap can be a brazed ceramic ring or an organic material O-ring depending on the vacuum requirements. Typical installations include bellows, a wall current bypass and an electromagnetic shield enclosing the FCT completely.

bergoz INSTRUMENTATION

VWM – Vibrating Wire Monitor

Beam transverse profile and position Beam Halo measurement

Fixed or moving sensor for protons, ions, electrons, photons, neutrons:

Electron beam scan in vacuum
- 20 MeV electrons
- 70pA wire-intercepted current resolution

Proton beam scan in vacuum
- 15 GeV protons
- 3pA wire-intercepted current resolution

Photon beam scan in vacuum
- 14 keV photon mean energy
- 1.4E+7 ph/s wire-intercepted flux resolution

Photon beam scan in air
- 100 keV photon mean energy
- 3E+13 ph/s wire-intercepted flux resolution

Specifications

Frequency resolution		<0.01Hz
Thermal resolution per wire material		
Stainless steel SS		0.3mK
Bronze B		0.6mK
Tungsten W		1.0mK
Deposited heat power resolution		
	In vacuum	In air
Stainless steel SS	7E-9 W	1E-6 W
Bronze B	5E-8 W	2.6E-6 W
Tungsten W	3E-7 W	5.4E-6 W
Response time	In vacuum	In air
Stainless steel SS	20s	0.23s
Bronze B	9s	0.21s
Tungsten W	2s	0.16s

Order codes

VWM-S-1W-A__mm	Sensor, 1 wire, __mm free aperture Possible apertures: 5, 20, 40, 60mm
-SS	Stainless steel wire
-B	Bronze wire
-W	Tungsten wire
VWM-FEE	Front-end electronics for 2 wires
VWM-RFC	Chassis housing up to 6 boards
VWM-2WB	Board supporting 2 wires
VWM-RJC/xx	RJ45 cable Cat.5, max 50m

VWM was developed on the basis of Suren Arutunian Vibrating Wire Scanner.
Dr. Arutunian received the Faraday Cup 2008 for this innovation

VWM system components

- VWM 1-wire Sensor
- Twisted pair cable from Sensor to Front-End Electronics
- Front-End Electronics box, each supports 2 Sensors
- Front-end to chassis RJ45 cable, up to 50 meters
- Chassis, can support up to 6 Front-End Electronics

DISTRIBUTORS

U.S.A.: GMW Associates
www.gmw.com
sales@gmw.com

India: GEEBEE International
www.geebeeinternational.com
info@geebeeinternational.com

Japan: REPIC Corp.
www.repic.co.jp
sales@repic.co.jp

China: Beijing Conveyi Limited
www.conveyi.com
sales@conveyi.com

MANUFACTURER

BERGOZ Instrumentation
www.bergoz.com
Espace Allondon Ouest
01630 Saint Genis Pouilly, France
sales@bergoz.com

Specifications

Beam intensity range	>75dB
Input signals	+5dBm…–70dBm, 50Ω
Operating frequency	60…800MHz
Noise rms	<2mV [0…1 kHz] in +-10V @ +5dBm <5mV [0…1 kHz] in +-10V @ –35dBm <50mV [0…1 kHz] in +-10V @ –60dBm
Linearity error	On-center: <5mV [+5dBm…–35dBm] 2-mm off: <20 mV [+5dBm…–35dBm]
Sensitivity	User's choice. 1 V/mm recommended
X and Y gain	factory set according topickup aperture
Buttons sampling	2 kSamples/s with internal clock Up to 10 kSamples/s with external clock
Local oscillator	Factory-set frequency
Intermediate frequency	21.4 MHz or 10.7 MHz, depending on ƒrev.
Outputs	X: ±10V, A–B–C+D, or D–B Y: ±10V, A+B–C–D, or A–C. Sum: A+B+C+D, constant value (≈3V)
Front panel LED	PLL in lock
Single button sampling	Enable and Reset TTL commands
Button address	Two TTL addressing lines
Fast gate mode	Enable TTL command
Fast gate option	IM (50Ω negative-going –16mA pulse)
Power supply	+15V, <200 mA, –15V, <40 mA
Connectors	Rear connector: DIN41612-M, 24+8 coax Coaxial connectors: 1.0/2.3 (4 units) Front panel connectors: DB9 female for test signal

Operating principle Button scanning mode

The signals from the four button electrodes are fed into the BPM module. The module processes the signals sequentially to give 3 analog output voltages: X, Y and Sum.

Four on-board variable 1-dB attenuators are used to equalize the button signals. Four on-board microstrip low-pass filters eliminate the unwanted beam harmonics before the signals are multiplexed by four GaAs switches. The switches close one at a time under the control of a local clock, sampling each button 2000 times per second. An external clock signal can override this onboard clock, to sample every button up to 10 000 times per second.

The outputs of the four switches give a sequential signal, which is filtered by an onboard tunable band-pass filter. This filter allows easy selection of the chosen beam harmonic to be used.

A low-noise preamplifier amplifies the signal under automatic gain control. A superheterodyne receiver processes the signal.

A mixer gives the intermediate frequency using its own on-board synthesized local oscillator. The LO frequency is given by a string of bits generated by a plug-in programmable frequency key. The automatic gain control of the intermediate frequency amplifier normalizes the sum of all button signals. A PLL synchronous demodulator provides high linearity. The demodulated signal is filtered and memorized by four sample-and-hold circuits under the control of the button scanning clock. The X and Y positions are obtained from the memorized value of the four buttons.

Only additions and subtractions are needed to obtain the X and Y positions, because the sum of all four buttons is normalized at all times to a constant value.

Accessories

Table-top test kit for one BPM. SMA connectors for button inputs, DB9 for external controls and DB15 for output signals.

Module extender for one BPM module. Allows one BPM module to be extended out of the chassis. Includes 1.0/2.3 coaxial connector extensions.

RF service module. Same size as BPM module, without electronics. When inserted in a station, connects the button signals from the chassis to four front-panel BNC.

TTL controls service module. Same size as BPM module, without electronics. When inserted in a station, connects the external control signals from the chassis to a front panel DB9.

Order codes

MX-BPM-xxxMHz-	BPM plug-in module, tuned to xxx-MHz operating frequency
-XxxxV/%-YxxxV/%	X and Y sensitivity
MX-BPM/CUS.xxx	One-time customizing charge for new frequency

Options:

MX-BPM-FG Fast NIM gate

bergoz INSTRUMENTATION

束流位置探测电子学

LR-BPM – Log-Ratio BPM Electronics

Non-Destructive

for single-pass short bunches Linacs, transfer lines, first turns fast-cycling synchrotrons, boosters

Specifications

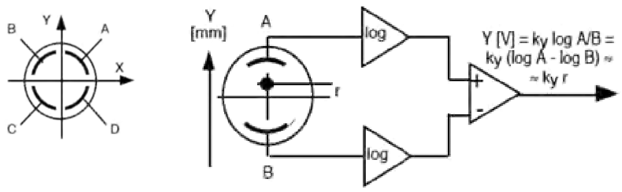
Measures from single-pass bunch up to X-band under certain conditions.
Below 5MHz repetition rate, individual position is reported.
Above 5MHz repetition rate, average position is reported, with 5MHz response.
The input filter frequency *ƒ* determines the acceptable bunch width.
Filter frequency *ƒ* is specified in Ordering Code LR-BPM-xxxMHz. Max. 500MHz.

Beam intensity range	>50dB. Single bunch 30pC ... 10nC
Single bunch	width ≤1/2*ƒ* E.g. for *ƒ*=50MHz: 10ns max width;
(or group of bunches)	*ƒ*=500MHz: 1-ns max width
Bunch/group trains	*ƒ* = repetition rate or multiple of rate *ƒ*max=500MHz
Output frequency	<5-MHz rep rate, individual position is measured
	>5-MHz rep rate, average position is reported with 5-MHz bandwidth
Input signal max.	
-Single bunch	10V in 1ns, 50Ω
-Bunch trains	depends on *ƒ*. At 500MHz: +5dBm, 50Ω
Outputs	X and Y: -2V...0...+2V, 40mA max, Sum of logs: 0...+2V, 40mA max.
X and Y gain	1.5V = 1/2 of aperture radius for orthogonal pickups
	1.0V = 1/2 of aperture for rotated pickups
Noise rms	
-Single bunch	<3.5E-3 of aperture, e.g. <150µm in 20mm radius.
	Below 10pC (≈ 6E7 e-), increases 20dB/decade
-Bunch trains	<2E-3 of aperture, in 0...5 MHz bandwidth,
	e.g. <100µm in 20mm radius
	Below -40dBm, increases 20dB/decade.
	Decreases with square root of bandwidth:
	E.g. <15µm above -40dBm in 100 kHz in 20mm radius.
Beam intensity position dependence	
-On center	Near zero.
-Off-center	Worst case when beam is 6dB off center (e.g. ±7mm
	in a 20mm radius aperture): ±3%
Temperature drift	0.6E-3 of aperture per degree, e.g. 25µm/K in 20mm radius aperture
Trigger output	>10-ns trigger after single bunch
Power supply	+15V, <300 mA; –15V, <300 mA

Operating principle

TBased on the pioneering work of Robert E. Shafer at Los Alamos Laboratory, the Log-Ratio BPM derives beam position from logarithm of the ratio of opposite pickup signals: Log(A/B). Position measured by this method is more linear, over a wider range, than difference-over-sum.

The position of the beam from rotated pickups is obtained by axes translation to the vertical resp. horizontal plane by wideband analog circuits.



Order codes

LR-BPM-xxxMHz	Log-ratio BPM plug-in module

Signal processing

Signals from the pickups are stretched to produce bursts. This is essential to measure the single pass of a bunch. Four parallel logarithmic amplifiers detect the burst envelopes. Amplifiers' response is log of amplitude. Logs of opposite pickups are subtracted. If pickups are rotated, axes are translated to obtain X and Y positions. The process is all-analog, wideband.

Packaging

LR-BPM module is 3U-high x 160mm shielded Euromodule; 20-mm wide.
Interchangeable / plug-compatible with Bergoz Instrumentation Multiplexed BPM modules. Both logratio and multiplexed BPMs can be installed in same chassis for mixed applications.
LR-BPM can be supplied as a custom-built daughter card for user installation on DSP mother boards.

Bergoz Instrumentation
Espace Allondon Ouest
01630 Saint Genis Pouilly, France
www.bergoz.com
sales@bergoz.com

Specifications

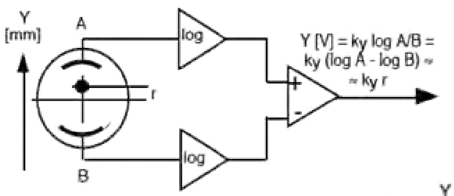
S–BPM measures beam position from buttons or stripline pickups. It can measure CW beams or single pass of single bunches and macropulses up to 2 MHz repetition rate.
The position output of CW beams has 5 MHz bandwidth.
The operating frequency is determined by the FEFA Front-End Filter / Amplifier frequency. E.g. S-FEFA/2856MHz.
For S-band, 2 frequencies are standards: 2.856 GHz and 2.999 GHz.
For L-band, all filter frequencies are made to order.

Single bunch range	10 pC ... 10 nC*
Macropulse and CW	36 uA ... 36 mA*
Repetition rate	5 MHz max, or CW
Outputs	X and Y: -2V... 0...+2V, 40mA max Sum of logs:0...+2V, 40mA max
X and Y gain	1.5V = half of radius for orthogonal pickups 1.0V = half of radius for rotated pickups

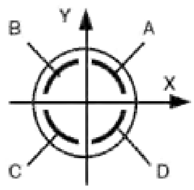
X and Y noise	For CW beam: <200μVrms, e.g. 2μm rms in a 40-mm pickup aperture For macropulse and single bunch: <7mVrms, e.g. 70um rms in a 40-mm pickup aperture
Intensity dependence	On center: Negligible Off-center: <3% gain error
Temperature drift	6E-4 of aperture per degree, e.g. 25μm/K in a 40-mm pickup aperture
ADC trigger output	When X and Y ready: positive or negative edge
Power supply	+ 15V, <500 mA; – 15V, <500 mA includes power for front-ends

Operating principle

Based on the pioneering work of Robert E. Shafer at Los Alamos Laboratory, the Log-Ratio BPM derives beam position from logarithm of the ratio of opposite pickup signals: Log(A/B).
Position measured by this method is more linear, over a wider range, than difference-over-sum.



The position of the beam from rotated pickups is obtained by axes translation to the vertical resp. horizontal plane by wideband analog circuits.



Signal processing

Signals from the pickups are stretched to produce bursts. This is essential to measure the single pass of a bunch. Four parallel logarithmic amplifiers detect the burst envelopes. Amplifiers' response is log of amplitude. Logs of opposite pickups are subtracted. If pickups are rotated, axes are translated to obtain X and Y positions. The process is all-analog, wideband.

Order codes

S-FEFA/xxxMHz	Front-end Filter / Amplifier Operating frequency xxxMHz One unit for each pickup electrode
S-BPM	S-band / L-band plug-in module

Front-end Filter / Amplifier FEFA

One Front-end Filter / Amplifier is required for every BPM pickup electrode. It is tuned to the beam RF or an harmonic and powered from the S–BPM module via the coaxial cable linking them together. S-BPM FEFA must be installed close to the BPM pickup block, e.g. 1 meter.

Non-Destructive

For cancer therapy synchrotrons for proton/carbon beams

Specifications

	BB-BPM-FEFA Amplifier and filter	BB-BPM Log-Ratio processor
Input intensity range	0dB or +40dB switchable gain	>70dB continuous gain
Frequency range	200kHz -.25MHz	200kHz -.25MHz
Input signal	High impedance 2.5Vmax	-70dBm -+5dBm
Input noise floor	25nV/ √ Hz	<-70dBm
Controls	Gain control by FO Daisy chain	N/A
Power supply max	+15V, 1.5W supplied by BB-BPM	±15V, 9W includes supply to BB-BPM-FEFA
Output to external LLRF	50Ω unity gain pickup image	None
Outputs	**When measured in 50Ω load or 100Ω differential load**	**When measured in high-impedance load**
X & Y Narrowband for close orbit on front panel DB9	-2V…0...+2V 0V on center 25MHz bandwidth	-5V...0...+5V 0V on center 25MHz bandwidth
X & Y Wideband for machine study on front panel DB9	-2V…0...+2V 0V on center 25MHz bandwidth	-5V...0...+5V 0V on center 25MHz bandwidth
X&Y gains Orthogonal	0.75V for ½ radius	1.5V for ½ radius
X&Y gains Rotated PU	0.5V for ½ radius	1.0V for ½ radius
Output noise rms for input >1mV	<0.1% of pickup radius, e.g. 100µm in 100mm radius	<1% of pickup radius, e.g. 100µm in 100mm radius
Linearity error As % of pickup radius	**On-center** <1% e.g. 100µm in 100mm radius	**On-center** <1% e.g. 100µm in 100mm radius
Temperature drift As % of pickup radius	300 ppm/K e.g. 30µm/K in 100mm radius	

Order code

BB-BPM-E — Eurocard format 100 x 160mm, 20mm wide to be plugged into one BPM-RFC chassis station. May be mixed with LR-BPM-E and MX-BPM-E in same chassis

BB-BPM-FEFA/xxdB — W40mm, L80mm, H22mm front-end Filter and amplifier with F.O. selectable gain 0dB or xxdB. Features four 3-mm mounting holes.

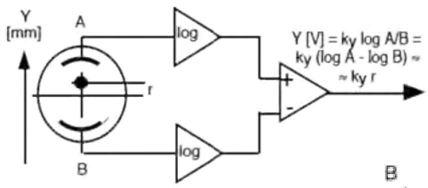
BPM-RFC/xx — 19"x3U RF-shielded chassis with xx wired stations (power-limited to up to 8 stations)
AC mains 90-245Vac, 50/60Hz

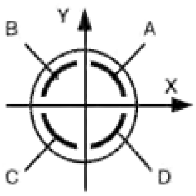
Front-end Filter and Amplifier BB-BPM-FEFA

Four BB-BPM-FEFA are required for each BB-BPM plugin module, one per pickup.
BB-BPM-FEFA has been specifically developed to measure low intensity ion beams. It is best to install it very close to the stripline or shoebox pickups to minimize capacitive loading.
Control of BB-BPM-FEFA gain is done by FO fiber optics, one per front-end amplifier.
A single control FO can be daisy-chained to all frontend amplifiers. The FO signal is under user's control.
The user must provide FO with a high level to switch the gain from 0dB to nominal value.

Operating principle

Based on the pioneering work of Robert E. Shafer at Los Alamos Laboratory, the Log-Ratio BPM derives beam position from logarithm of the ratio of opposite pickup signals: Log(A/B).
Position measured by this method is more linear, over a wider range, than difference-over-sum.



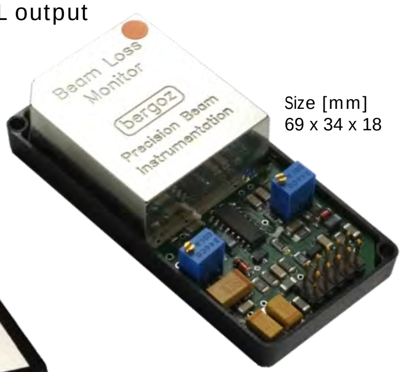


The position of the beam from rotated pickups is obtained by axes translation to the vertical resp. horizontal plane by wideband analog circuits.

Bergoz Instrumentation
Espace Allondon Ouest
01630 Saint Genis Pouilly, France
www.bergoz.com
sales@bergoz.com

BLM – Beam Loss Monitor

BLM-SE
with single-ended TTL output
on HE10 connector



Size [mm]
69 x 34 x 18

BLM-DIF
with differential output
on RJ45 connector

Size [mm]
96 x 46 x 21

K. Wittenburg was awarded the Faraday Cup in 2000 for the design of the PIN photodiode Beam Loss Monitor and its implementation at HERA. Bergoz Instrumentation was granted a license by DESY to use Wittenburg's original development.

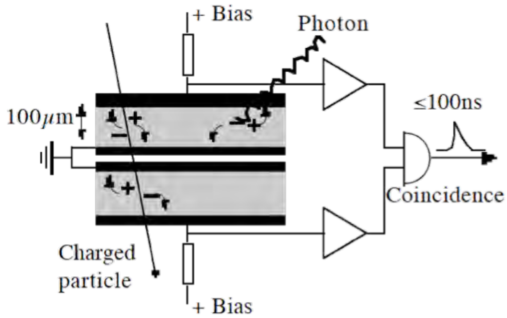
Largest dynamic range
Lowest cost of any BLM

This Beam Loss Monitor (BLM) is a new approach to measure and localize beam losses.
Very small size and low unit cost make it possible to monitor all locations where beam loss is predicted.
Vacuum quality around the storage ring can be measured based on BLM count rate.
Two PIN-photodiodes mounted face-to-face detect charged particles. Coincidence counting make it insensitive to synchrotron radiation photons.
Spurious count very low: < 1 count in 10 s
Up to 10MHz counting: dynamic range > 1E8
Recovers 100 ns after a hit
Choice of detector solid angle: Large PIN-diodes can be user installed.
Output is a TTL compatible pulse: easy counting
Tested successfully up to 1 MGray for hardness.

Specifications

Single particle detection efficiency	>30%
PIN-photodiode surface	7.34 mm^2
Spurious count rate	<0.1Hz
Maximum count rate	>10MHz
Count rate @ 6kGray/yr SR photons	≈ 100 Hz
Same with 3cm lead shielding	≈ 1Hz
Output	positive TTL 50Ω pulse
Cable driving capability	>200m RG213
Output female connector	10-pin HE10
Power supply	+5V <50mA; 45mA typ.
	–5V <80mA; 72mA typ.
	+24V <10mA; 4mA typ.

Operating principle



The charged particle crosses both PIN diodes, causing a coincidence.
Synchrotron radiation photons, if stopped by either PIN-diode, do not cause a coincidence.

Order codes

BLM-SE	BLM with single-ended output
BLM-DIF	BLM with differential output

DISTRIBUTORS

U.S.A.: GMW Associates
www.gmw.com
sales@gmw.com

India: GEEBEE International
www.geebeinternational.com
info@geebeinternational.com

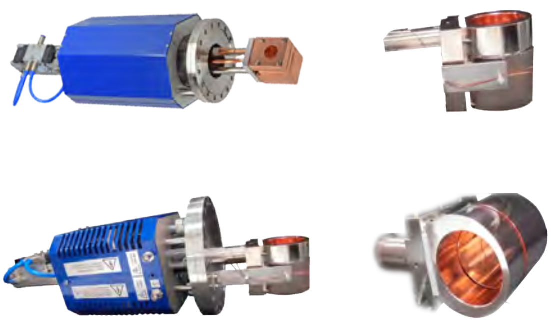
Japan: REPIC Corp.
www.repic.co.jp
sales@repic.co.jp

China: Beijing Conveyi Limited
www.conveyi.com
sales@conveyi.com

MANUFACTURER

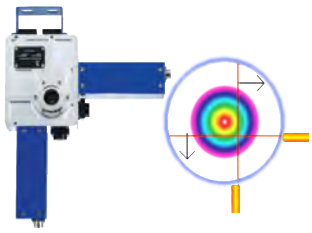
BERGOZ Instrumentation
www.bergoz.com
Espace Allondon Ouest
01630 Saint Genis Pouilly, France
sales@bergoz.com

法拉第杯, 束流截面测量, 束线与磁铁 -
Faraday Cup, Beam Profiler, Beamline and Magnet



Faraday Cups

Measures low-energy charged-particle beam currents up to 50W, 600W, 3kW
Secondary-electron suppression electrode
Water/Air-cooled for simplicity
Beam current read back
End stop limit switches



UniBEaM* - Beam Profiler

Measures beams from keV to GeV & pA to mA
Maximum beam diameter 25 mm
Maximum deposited beam energy density 1 W/mm^2
Insertion length of just 70mm
No vacuum box required
Scintillating sensor fibers
Dual X & Y axis profiles, In-plane scanning
Radiation resistant – no electronics in the probe
*D-Pace Licensed from U. Bern.

Mini-PET Beamline

Mass(Weight): 54kg
Combined quadrupole/steering doublet achieves focusing and steering in both horizontal and vertical directions, for optimized beam on target
Ideal for use with 12-19 MeV proton beams for radioisotope production

Emittance Scanner**

Measure magnitude of emittance for low-energy charged particles (<1MeV)

Beam Power up to 1.5kW & 10kW and 500W/cm^2

Determine phase space ellipses by percentage of total beam or by RMS emittance

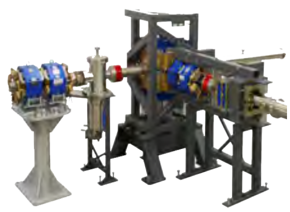
**D-Pace licensed from TRIUMF

About D-Pace

D-Pace supplies complete turnkey beamline systems, and beamline sub-components such as: magnets, beam diagnostics, vacuum chambers, supports and shielding to the international commercial accelerator industry. In addition D-Pace provides auxiliary ion source systems, and spectrometer and energy analysis systems.

Ion Source

H^-/D^- current >15/5 mA DC



Beamline for BNCT System

Magnets:AC Scanning, Quadrupole, Dipole DC XY Steer

Custom Vacuum Box

CONVe-YI 北京科维泰信科技有限公司
www.conveyi.com sales@conveyi.com
Representative of
D-Pace,Inc.
Suite 305, 625 Front Street
Nelson British Columbia Canada
www.d-pace.com
info@d-pace.com
+1.250.352.5162

CAENels Gear For Science

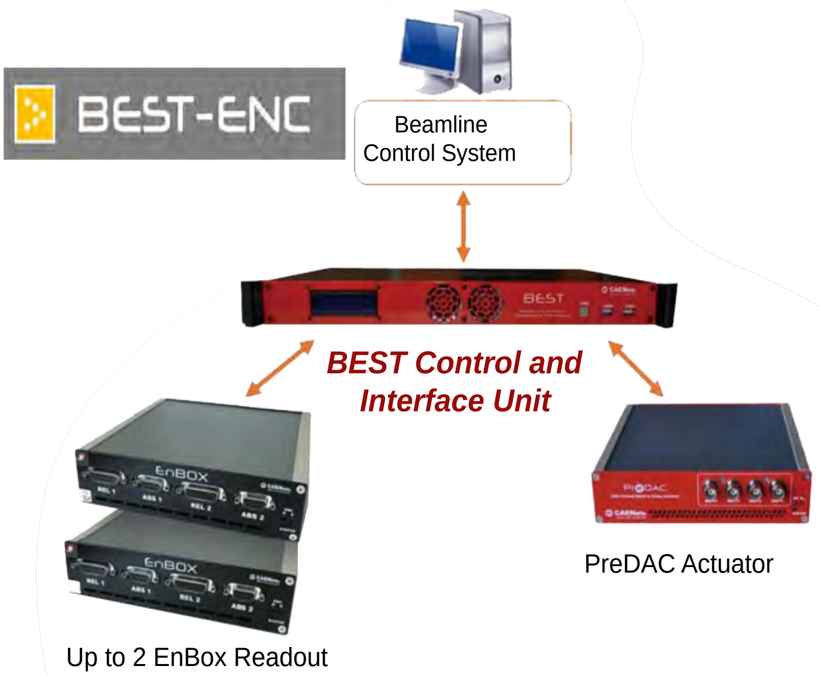
磁铁电源，皮安表, 束线控制 - Magnet Power Supply, Picoammeter, Beamline Control

NGPS - High-Stability Digital Power Supply Series
Up to 200A - 50V (10 kW), 10-kHz update rate
10ppm, Parallel solution, Temperature stabilization
Remote Sensing and Analog Control capability

FAST-PS-1K5
1500W Bipolar Digital Voltage and Current-controlled Fast Power Supply
up to ±100A, ±100V

FAST-PS
Bipolar Digital Voltage and Current -controlled Fast Power Supply
up to ±30A, ±80V

EASY-DRIVER
Compact Digital Bipolar Power Supply Series
up to ±10A, ±20V



TetrAMM
4-channel Fast Interface Bipolar
Picoammeter
with Integrated HV Source

The BEST-ENC (Beamline Enhanced Stabilization Technology – ENCoders) is a powerful instrumentation and software suite specially designed to provide the capabilities for real-time control of beam properties in X-ray beamlines. Its readout module – i.e. TetrAMM – for photon BPM

Photon Beam Stabilization **APPLICATIONS**

粒子探测器 与 高压电源

Partical Detector and High Voltage Power Supply

荷兰SCIONIX闪烁体探测器

Advantages of scintillators :

-large efficiency (density up to approx. 9 g / cc)

-inorganic crystals possible with large Z (La, Ce, Cs, Bi,Cd)

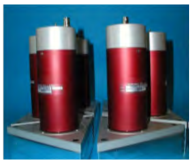
-speed (ns-microseconds)

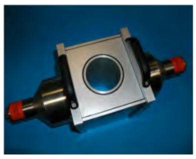
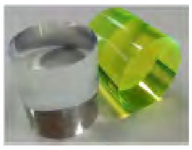
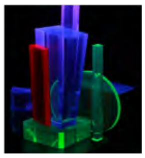
-special shapes possible

-usually no cooling needed (unlike HpGe)

-can be relatively inexpensive (compete γ-ray spectr). < 4k€

Some crystals easy machinable (soft) like CsI(Tl)




意大利 CAEN 粒子探测器仿真

The DT5810B is the model of the Detector Emulator family with the fastest signal output. Thanks to an updated and faster DAC it is now possible to emulate the behavior of some of the fastest detectors on the market with 1 ns rise time. The Digital Detector Emulator is the only synthesizer of random pulses that is also an emulator of radiation detector signals with the possibility to configure energy and time distribution.

1 ns Rise Time

Pulser/Emulator/Function Generator operating modes

Energy spectrum emulation

Time distribution emulation

Custom signal shape emulation

Pile-up emulation

英国 ET 光电倍增管

Timing and linearity performance of the range of dynode structures. The transit time jitter for single photoelectron events is given as fwhm. There is a 5 % departure from linear gain at the peak anode current and interdynode voltage (Vd-d) given in the table.

			peak anode current mA			
			at Vd-d=100 V		at Vd-d=300V	
dynode structure	rise time ns	jitter, ns fwhm	dynode SbCs	surface BeCu	dynode SbCs	surface BeCu
venetian blind	1.8-2.7	1.0-2.5	30	50	100	150
circular focused	1.5-2.5	0.8-2.0	10	20	30	50
box and grid	12-18	8.0-16.0	0.1	0.2	0.5	1
linear focused	8-15	5.0-12.0	2	4	5	20





德国ISEG高精度高压电源， 英国Genvolt实验室高压电源

输出电压范围：100, 500, 1k, 1.5k, 10k....150kV　电流范围： 0.1, 0.5, 1, 2, 5, 10, 12, 20, 30..mA　单极性或正负可调
精度范围： $1*10^{-3}$ 至 $1*10^{-5}$ 可为各种探测器，电容器供电。 制式有NIM,VME,集成多路输出， 或桌面台式电源。

--From Bergoz Instrumentation new product

➢ 联系我们 – Contact Us

北京科维泰信科技有限公司

北京昌平区霍营科星西路国风美唐 2 号楼 306

邮编：102208

手机：189-0120-5447　136-7111-8525

电话传真：010-8075 3647

邮件：sales@conveyi.com

网址：www.conveyi.com　www.bergoz.com

微信公众号：conveyi123/粒子加速器束流测量诊断

Skype ID：justinlee.conveyi

Beijing Conveyi Limited

Room 306 Building No.2 Guofengmeitang Kexingxilu

Huoying Changpin Beijing 102208 China

Mob: +86-189 0120 5447 +86-136 7111 8525

Tel / Fax: +86 10-8075 3647

Email: sales@conveyi.com

Web: www.conveyi.com www.bergoz.com

Weixin: conveyi123/粒子加速器束流测量诊断

SkypeID:justinlee.conveyi