

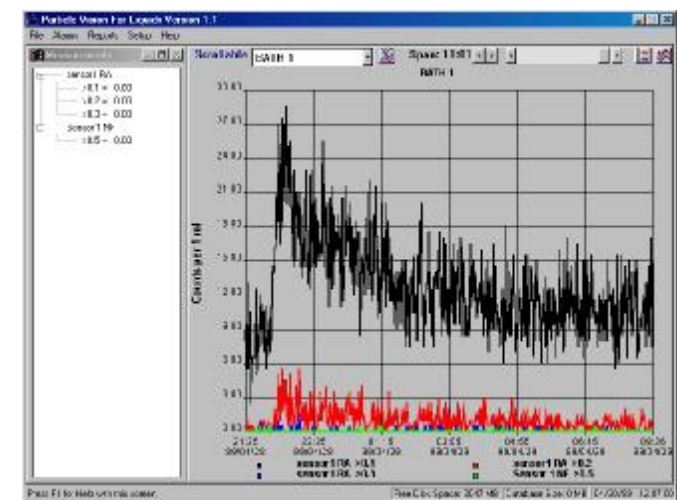
LIQUID PARTICLE COUNTING TECHNOLOGY  
FOR THE  
ELECTRONICS INDUSTRY  
电子行业的液体颗粒技术

# PRESENTATION CONTENT

- ◆ SYSTEMS 系统
- ◆ BASIC LIQUID SENSOR TYPES 液体传感器的类型
- ◆ CALIBRATION AND PERFORMANCE 标定和性能
- ◆ COUNTERS 计数器
- ◆ DATA ANALYSIS 数据分析
- ◆ SAMPLERS 取样器
- ◆ SOFTWARE 软件

# SYSTEMS OVERVIEW

## 系统一览



# FOUR MAJOR SUB-SYSTEMS

## 四个主要的附属系统

### ◆ SENSOR 传感器

Air, Liquid, Vacuum, Gas

空气，液体，真空，气体

### ◆ COUNTER 计数器

Signal processing, memory, sampling control.

信号处理，存储器，取样控制

### ◆ SAMPLER 取样器

Syringe, Pressure, on-line (pump)

注射器，压力，在线（泵）

### ◆ DATA REPORTING 数据报告

Displays, Printouts, Software, Graphs, Reports, Exports

显示，打印输出，软件，图表，报告，输出

# BASIC SENSOR TYPES

## 传感器的基本类型



### EXTINCTION SENSOR

遮光法传感器



### SCATTERING SENSOR

散射法传感器



### DUAL MODE SENSOR

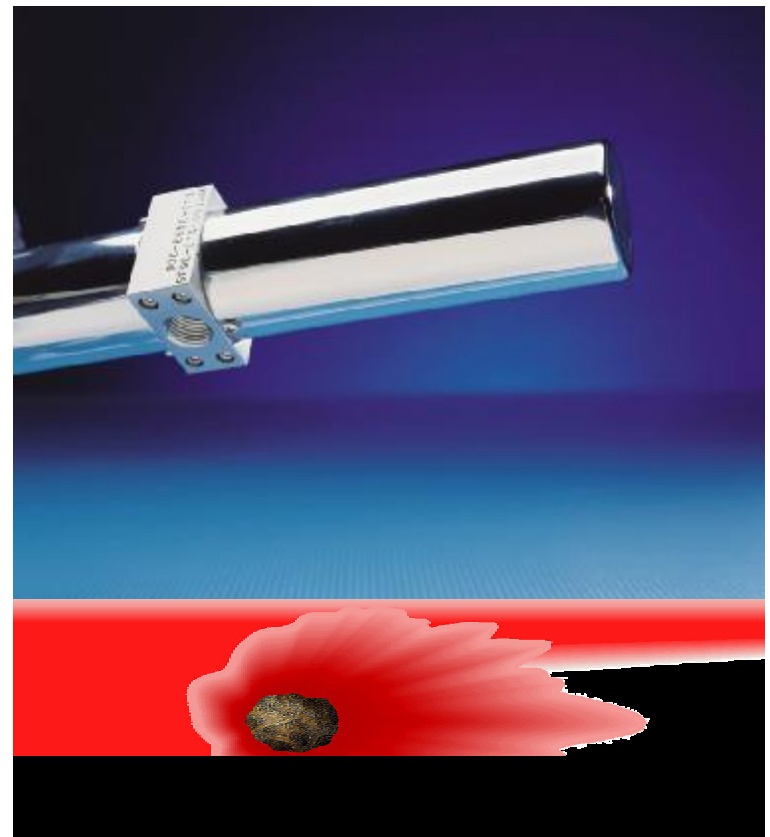
双重模式的传感器

# EXTINCTION SENSORS 遮光法传感器



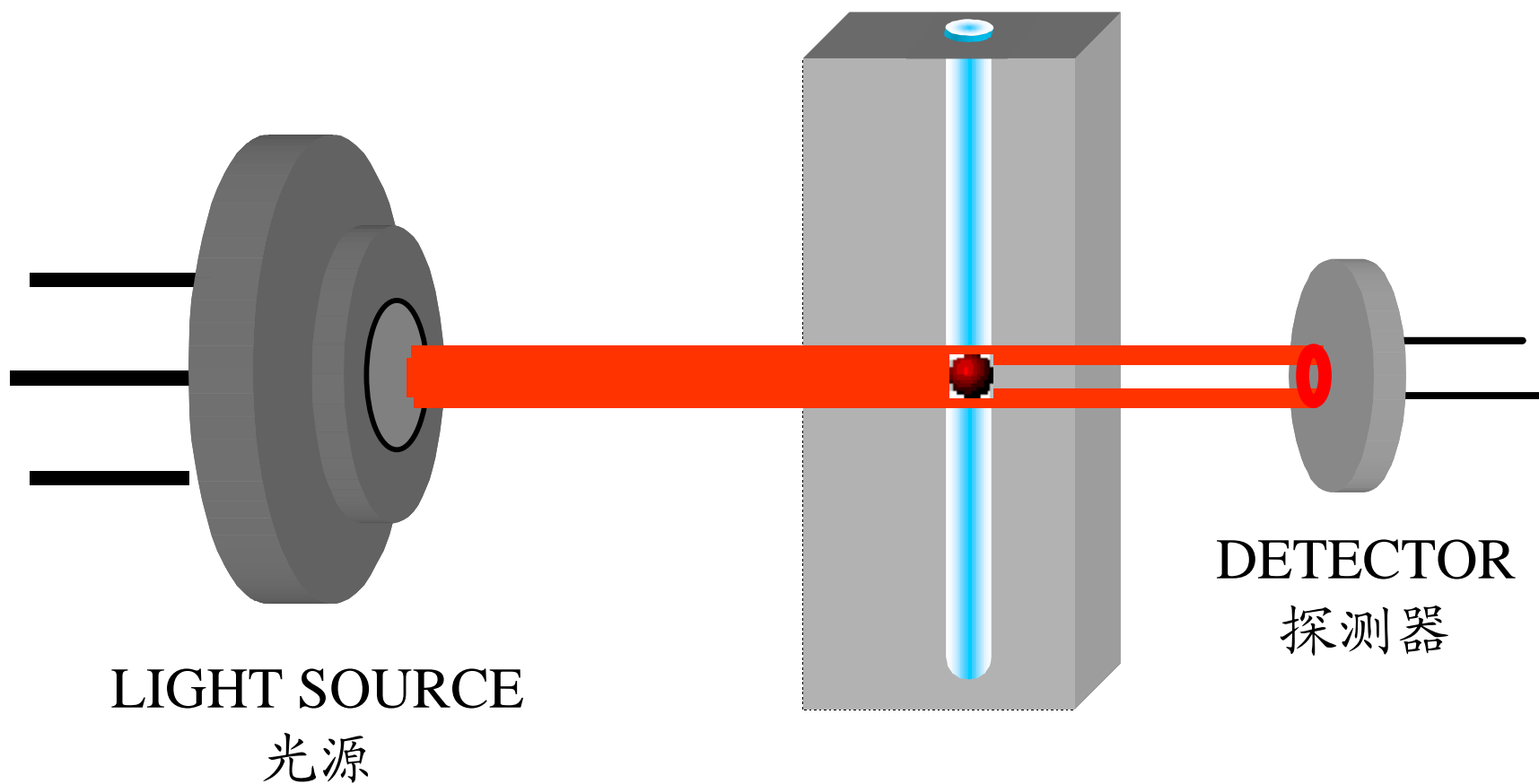
## TECHNOLOGY 技术

- Light Extinction 消光法
- Light blocking 光阻法
- Light Obscuration 光遮蔽
- “HIAC” Method  
“HIAC”方法



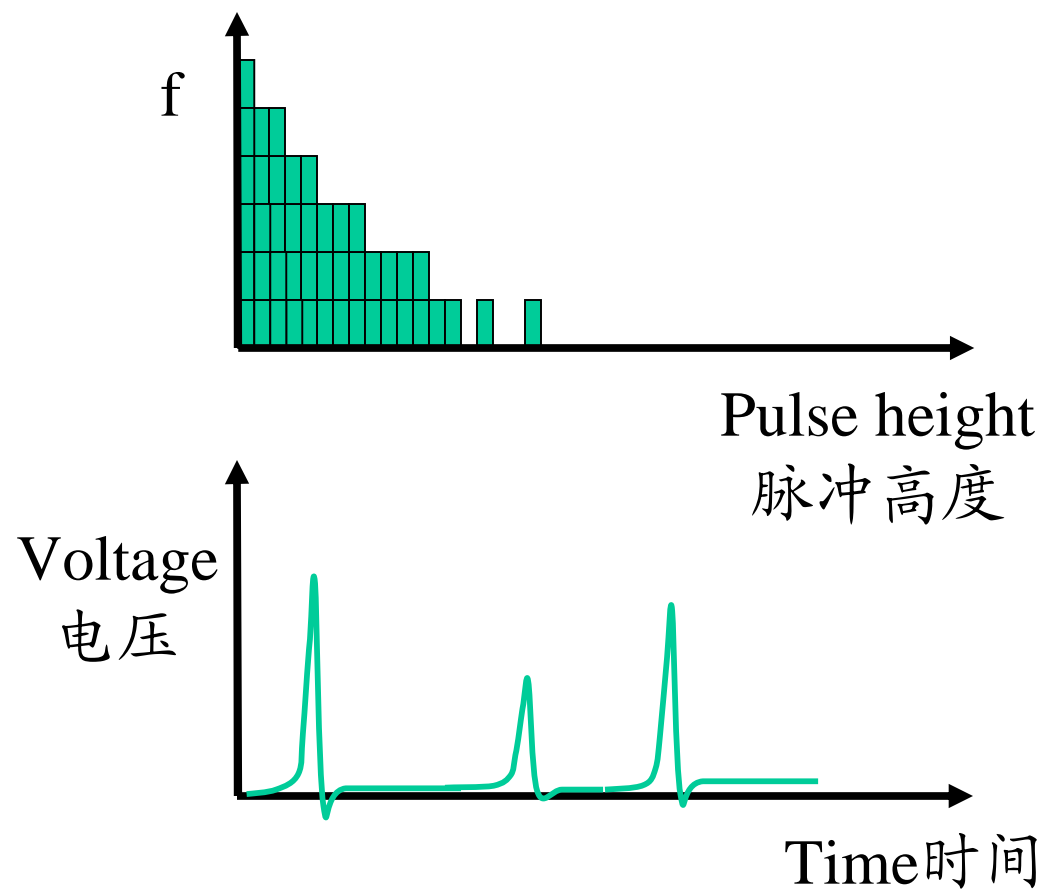
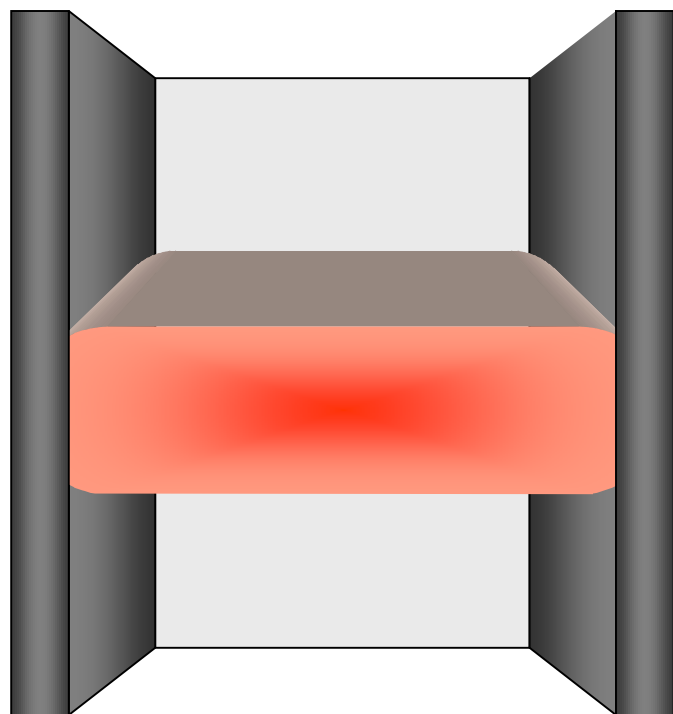
# EXTINCTION SENSORS

遮光法传感器



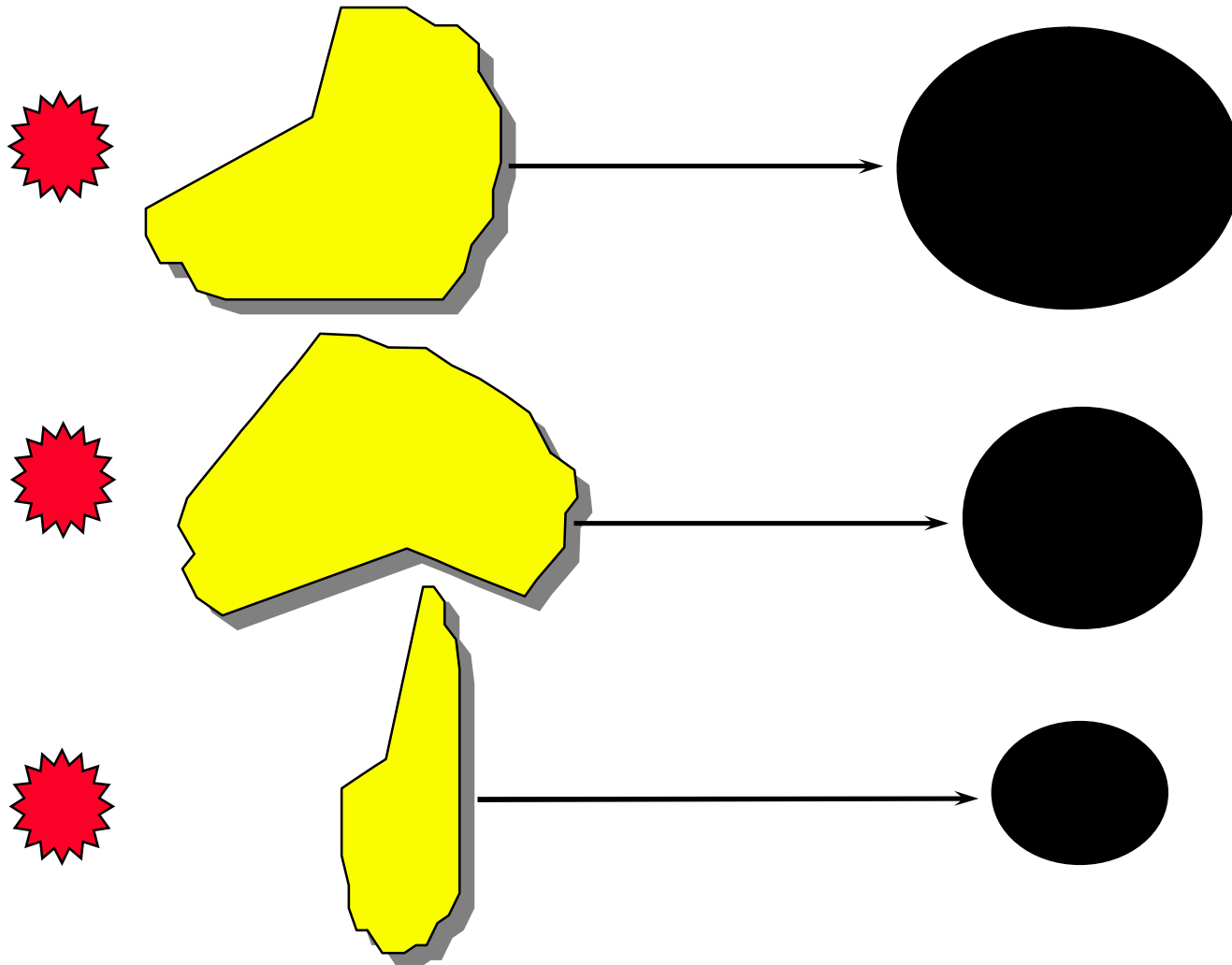
# EXTINCTION SENSORS BASIC THEORY

遮光法传感器的基本原理





# Particle Orientation 粒子方向



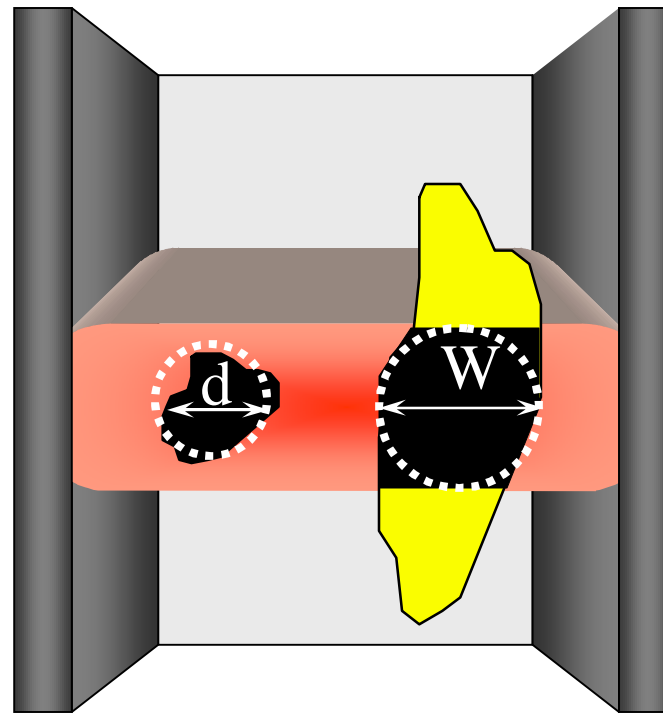
Projected  
Area for the  
same particle  
同一粒子在  
不同方向上  
的投影

# View Area ( window) of Sensor

## 传感器的观察面积

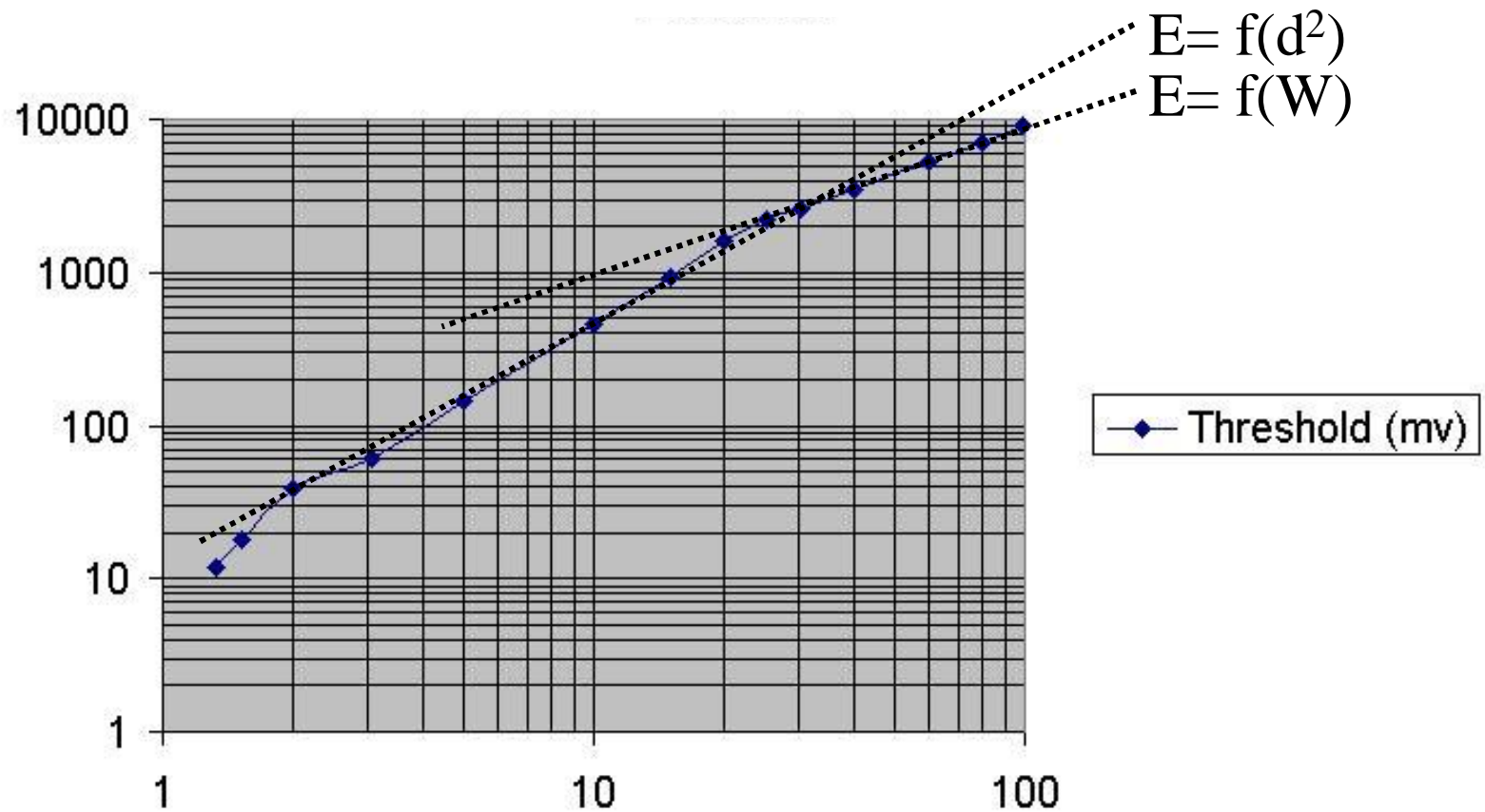
Projected  
Area Extinction  
消光法的投影区  
Signal E  
信号E

$E = f(d^2)$   
For particles with diameter  
< the height of the beam  
适合于粒子的直径  
< 光束的高度



$E = f(W)$   
For particles with diameter  
> the height of the beam  
适合于粒子的直径  
> 光束的高度

## TYPICAL EXTINCTION SENSOR RESPONSE



# SCATTERING SENSORS

## 散射法传感器



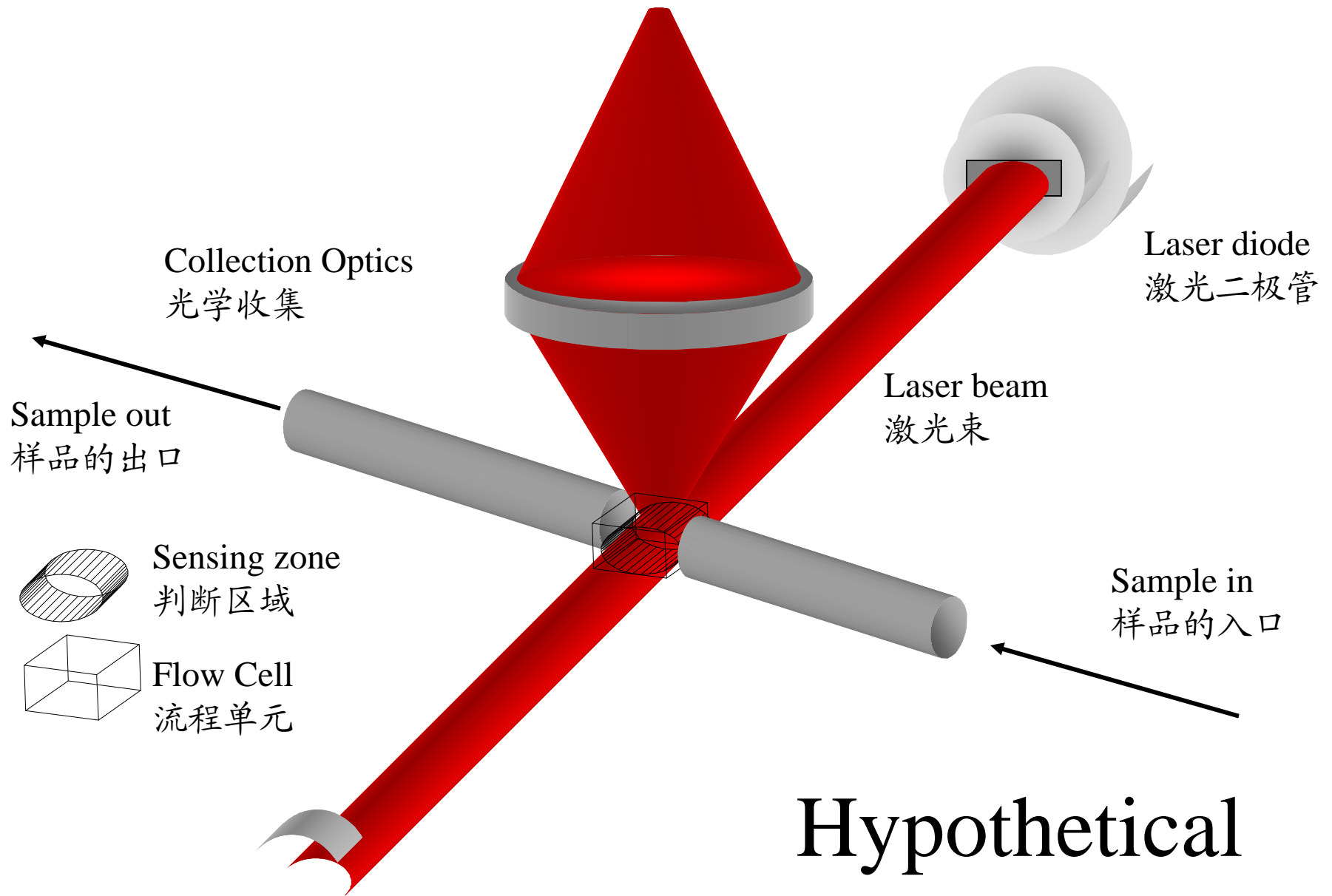
### TECHNOLOGY 技术

- Higher sensitivity than Extinction.  
比遮光法更灵敏
- Higher cost  
更高的费用



Scattering

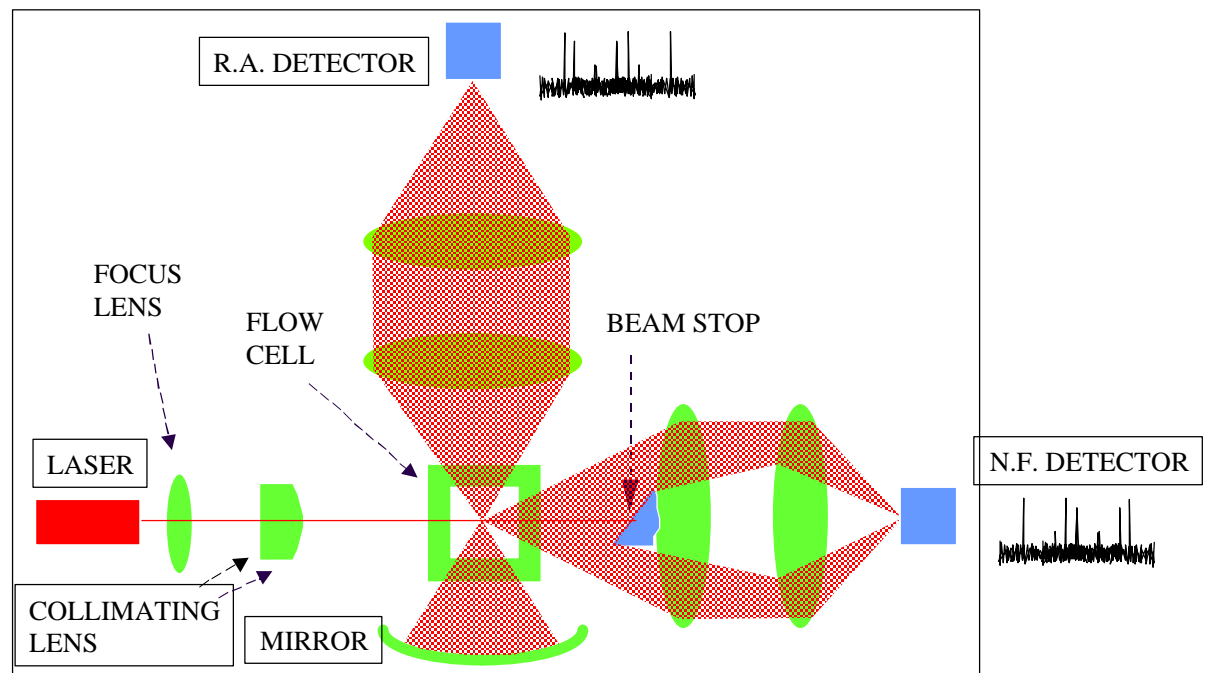
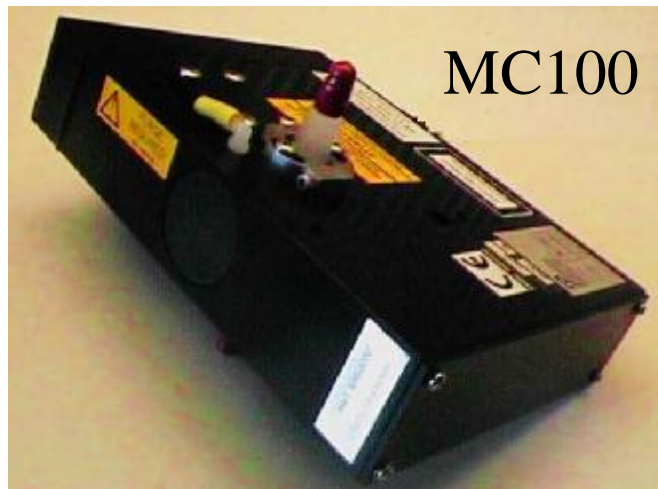
Extinction



# Hypothetical Particle Sensor

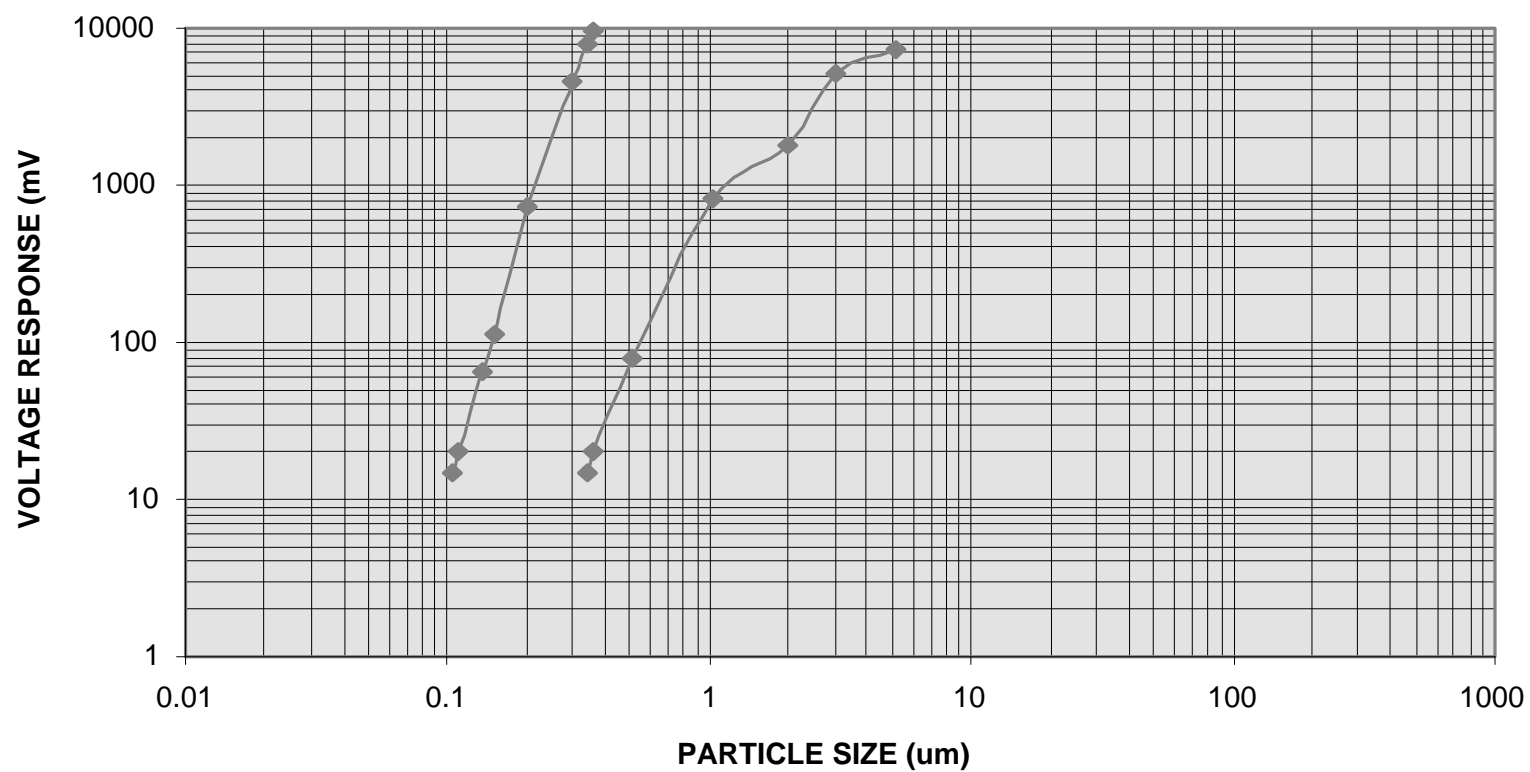
# MICROCOUNT SCATTER SENSOR DESIGN

MicroCount 散射法传感器的设计

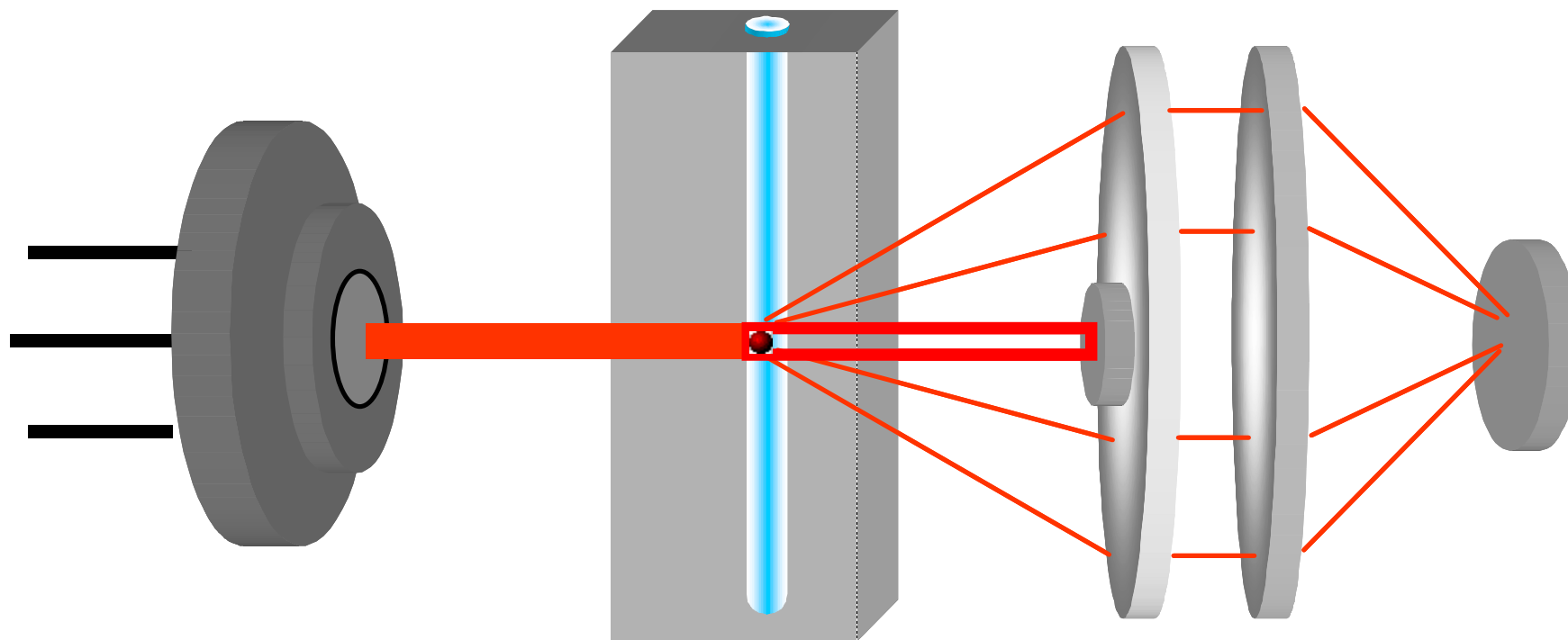


# MICROCOUNT CALIBRATION MicroCount的标定

MC100S SN 95060063



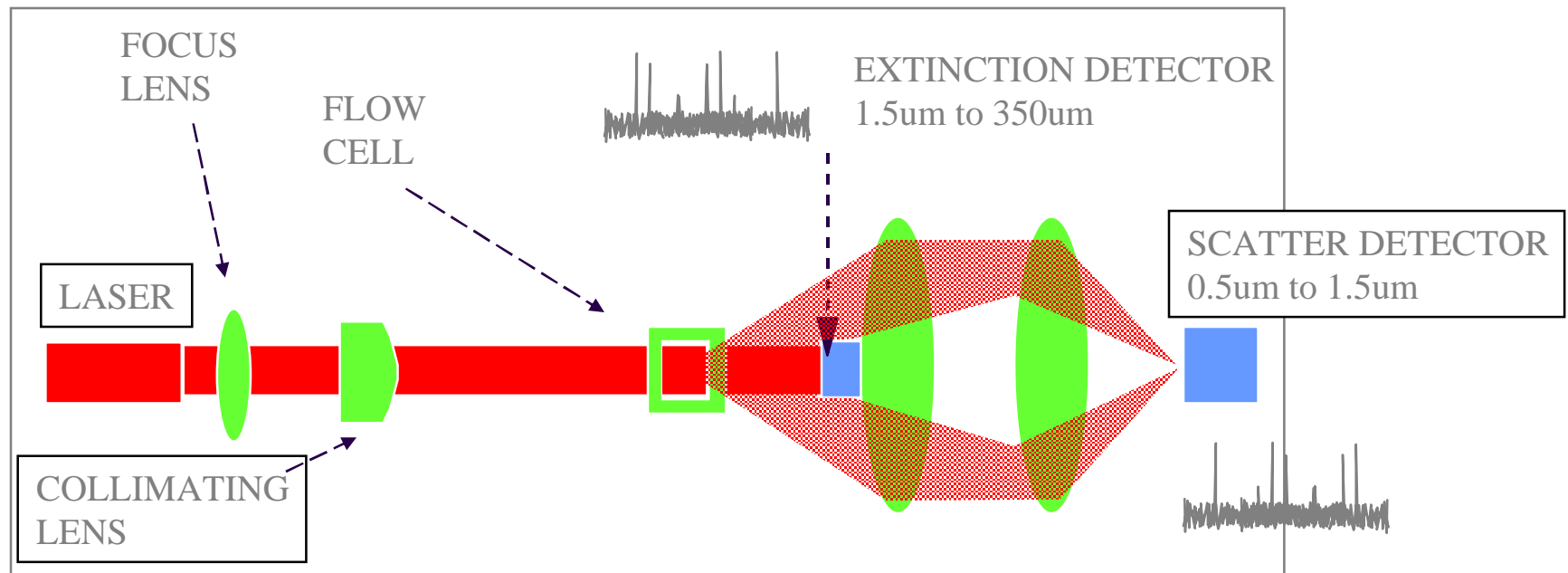
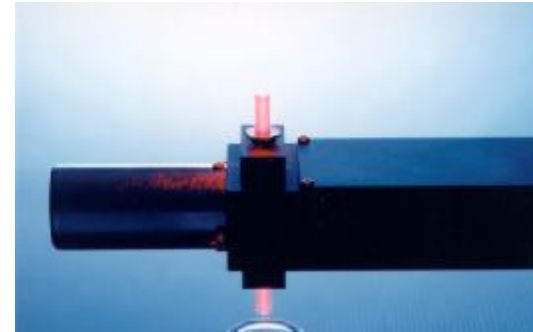
## Dual Mode Sensors 双重模式的传感器



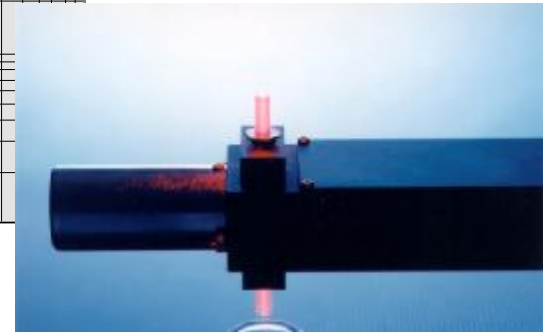
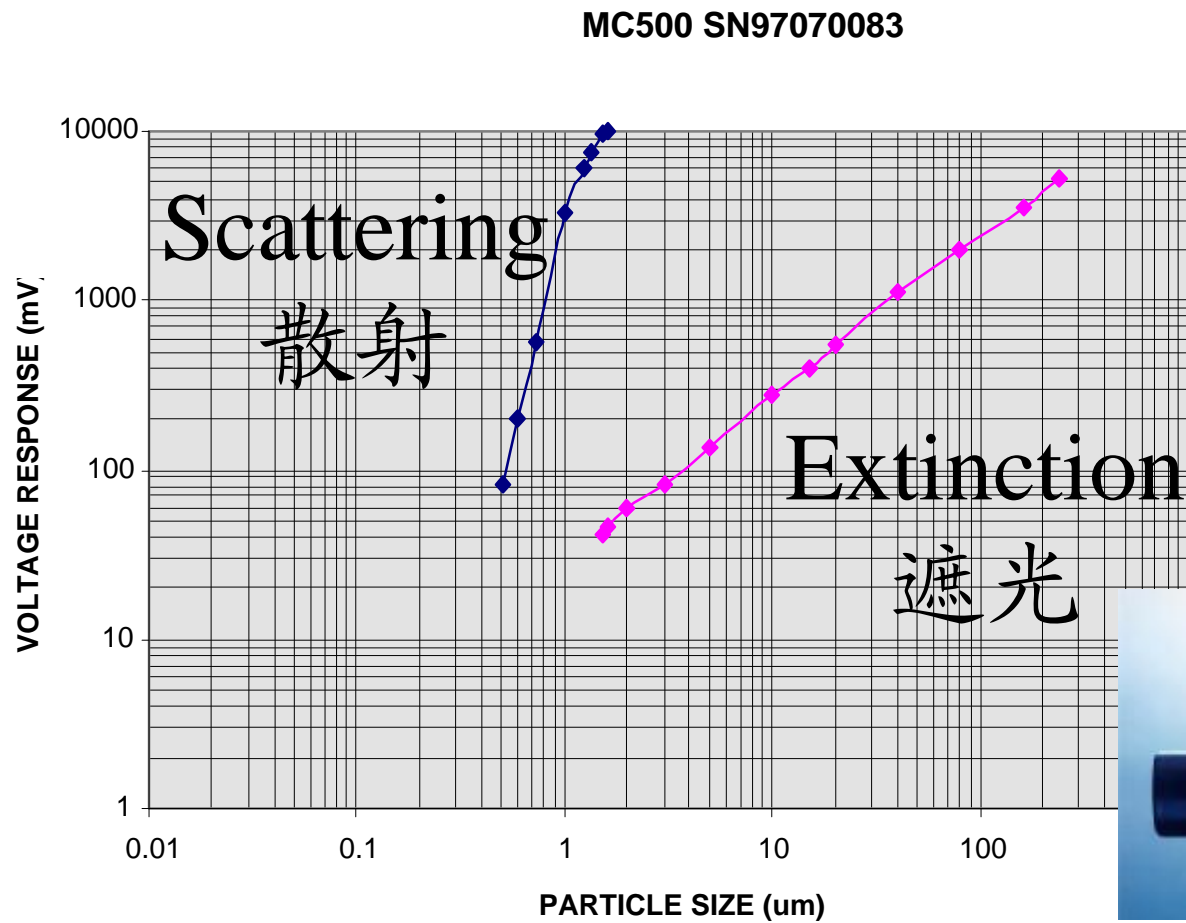


# Microcount500 Design

## MicroCount500 的设计



# Calibration



# CALIBRATION AND PERFORMANCE

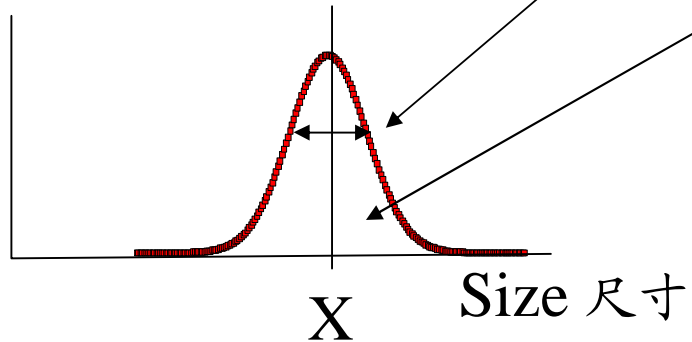
## 标定和性能

- ◆ CALIBRATION METHODS 标定方法
- ◆ CALIBRATION STANDARDS 标定标准
- ◆ SENSITIVITY 灵敏度
- ◆ RESOLUTION 分辨率
- ◆ ACCURACY 精确度
- ◆ VIEW VOLUME 可视体积
- ◆ FLOW RATE 流速
- ◆ CONCENTRATION LIMIT 浓度限制



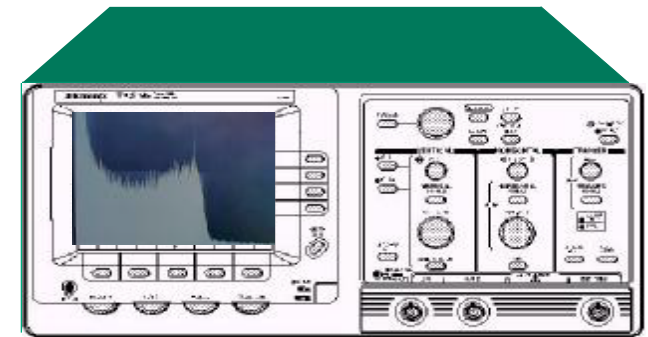
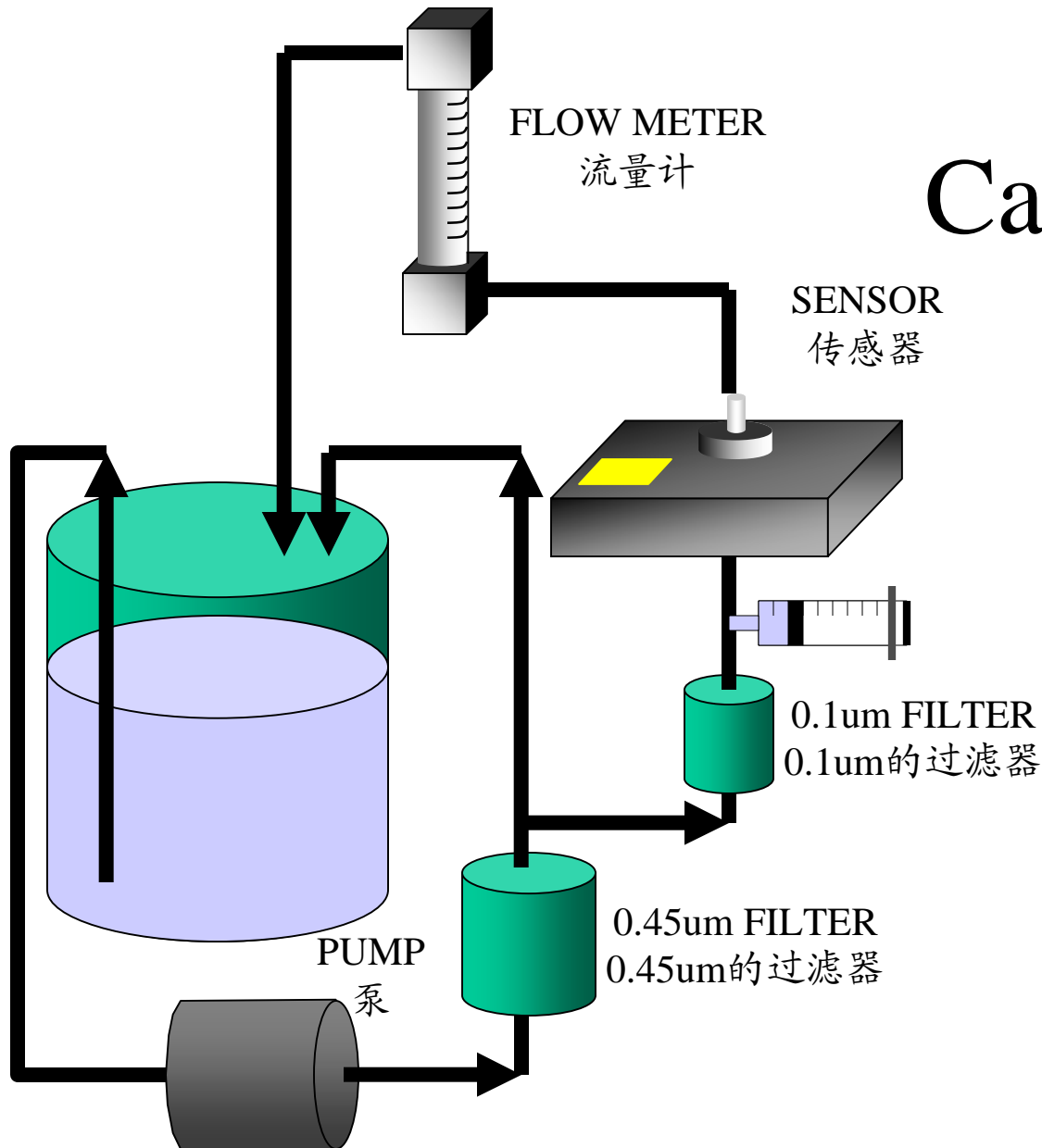
# PSL 悬浮微粒子（固体）产生器

- ◆ DUKE PSL  
悬浮微粒子（固体）产生器
- ◆ SIZE Information  
尺寸信息
- ◆ CV (Variance) data  
偏差数据
- ◆ Also available with count data  
也有计数的数据

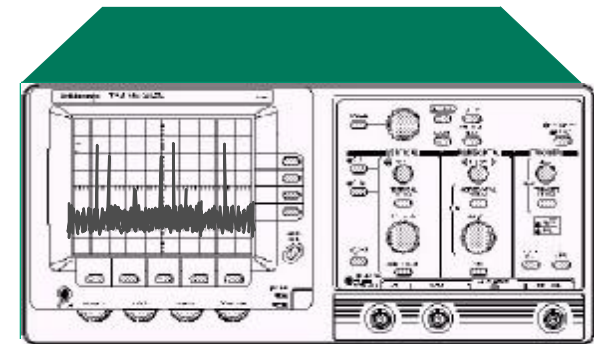




# Calibration 标定



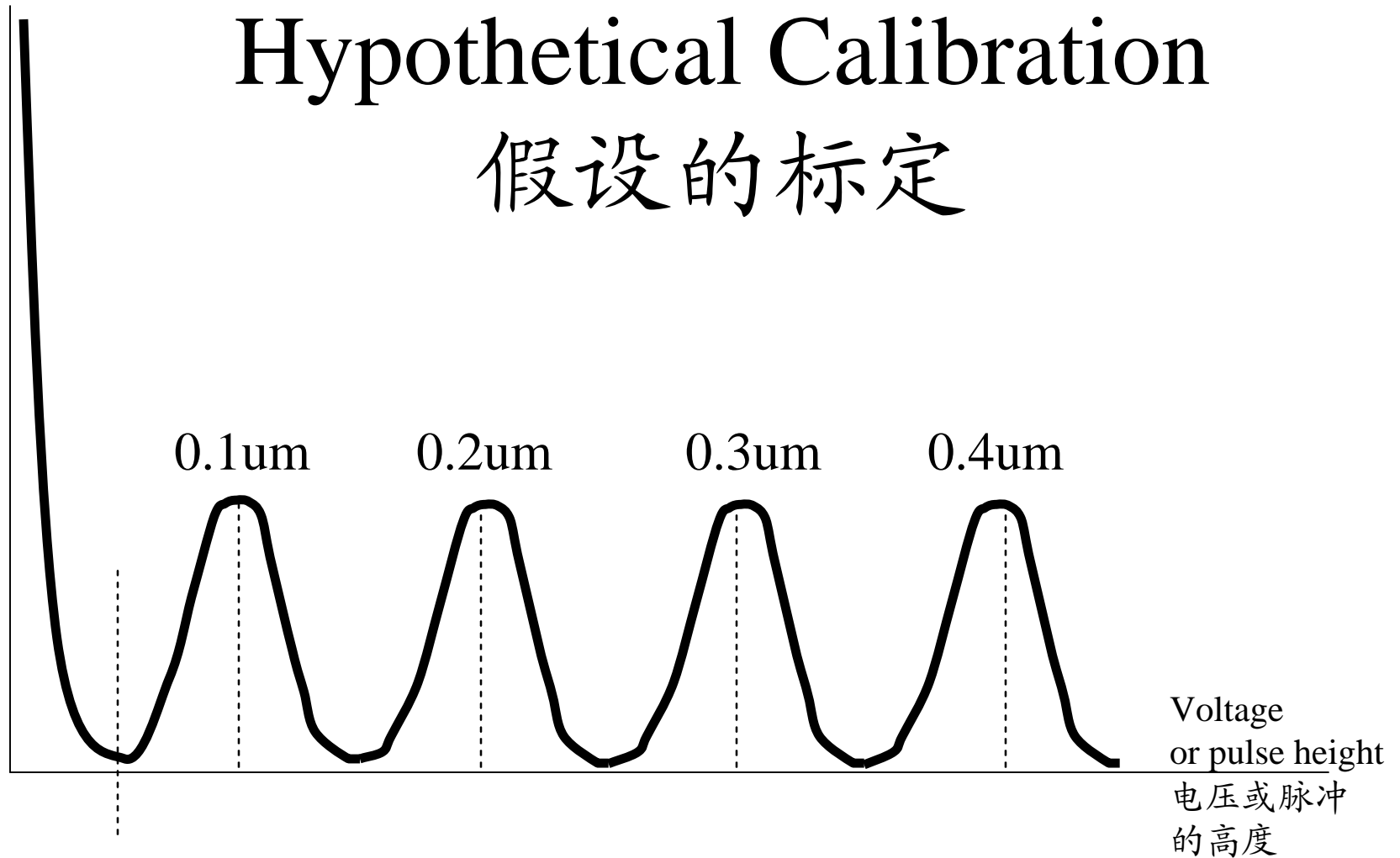
Pulse Height Analyser 脉冲高度分析仪



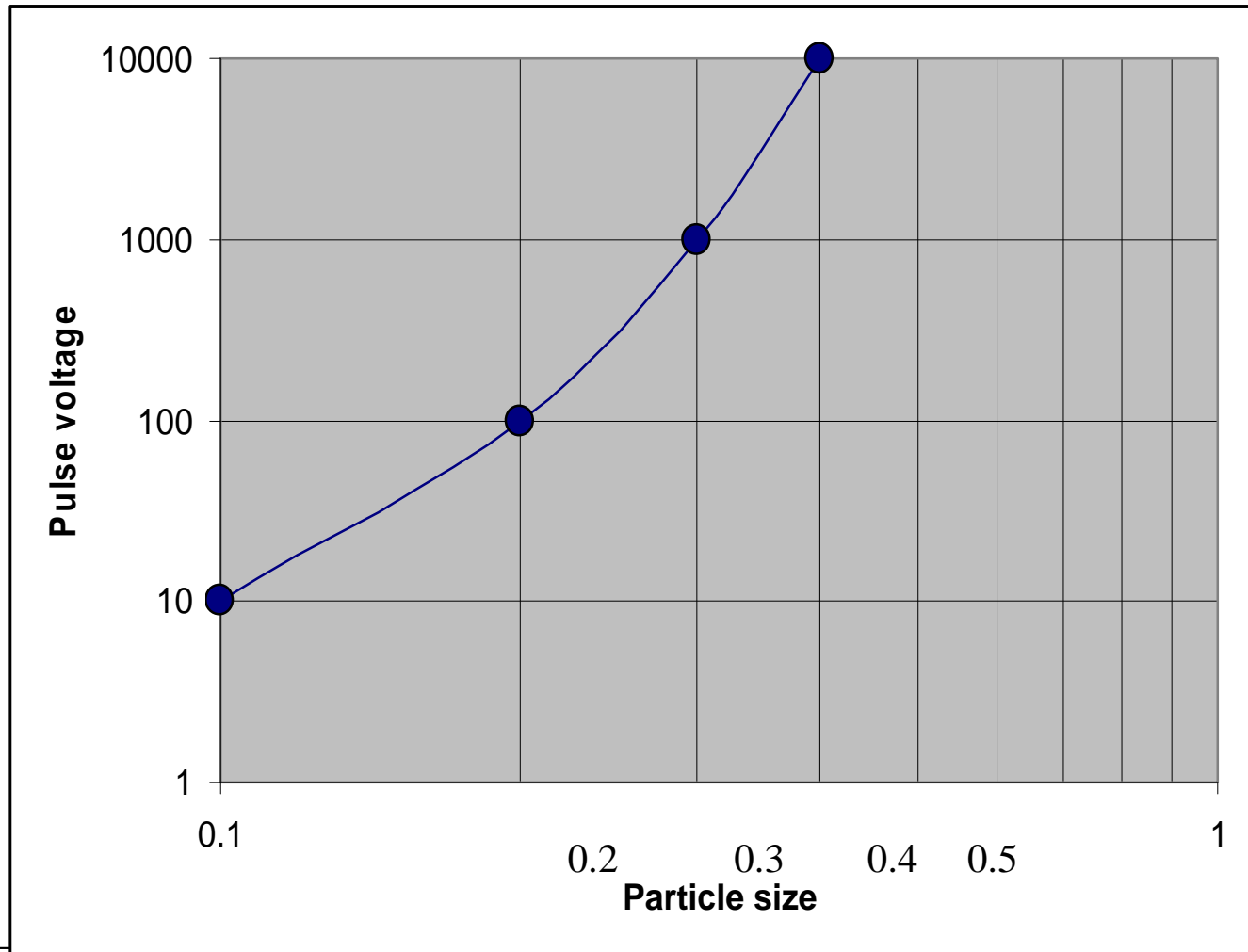
Oscilloscope  
示波器

# Hypothetical Calibration

## 假设的标定



# Hypothetical Calibration





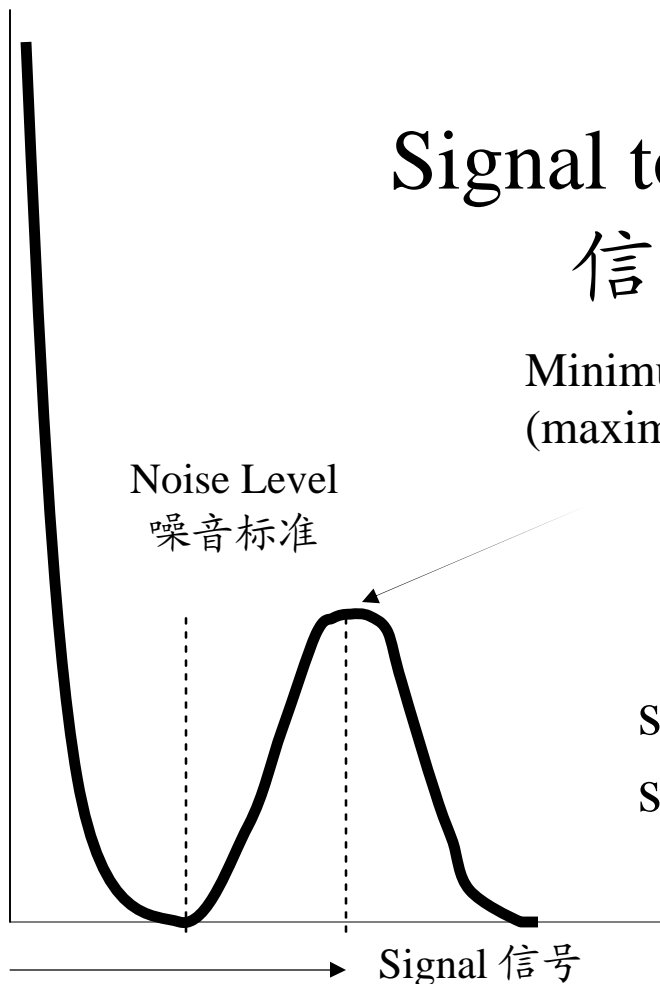
# SENSITIVITY 灵敏度

Signal to Noise Ratio s:n

信号与噪音比

Minimum specified size 指定大小的最小值  
(maximum sensitivity ????) (最大的灵敏度)

Noise Level  
噪音标准



$$s:n = \frac{\text{SIGNAL (mV) 信号}}{\text{NOISE (mV) 噪音}}$$

$s:n > 2$  TYPICAL 典型的

$s:n > 1.5$  MINIMUM FOR NO FALSE COUNTS  
适合于没有错误计数的最小值

# COUNT ACCURACY

## 计数的精确性

WHAT WILL EFFECT COUNT ACCURACY ?

什么会影响计数的精确性



VIEW VOLUME 可视体积



CONCENTRATION LIMIT (COINCIDENCE)

浓度限制（重叠性）



FLOW RATE 流速

Sample Statistics -High

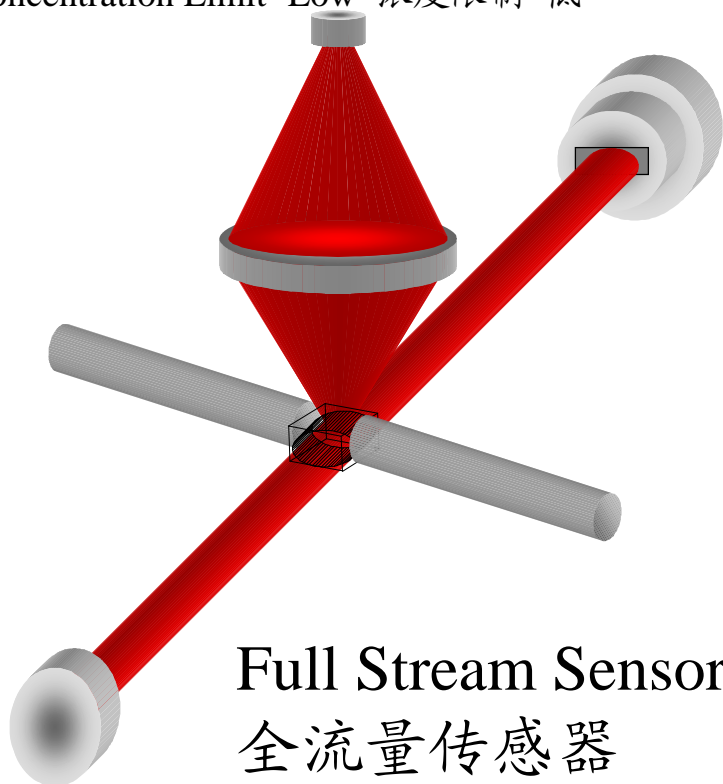
样品统计-高

Sizing Accuracy (resolution) -High

大小的精确性-高

Sensitivity -Low 灵敏度-低

Concentration Limit -Low 浓度限制-低



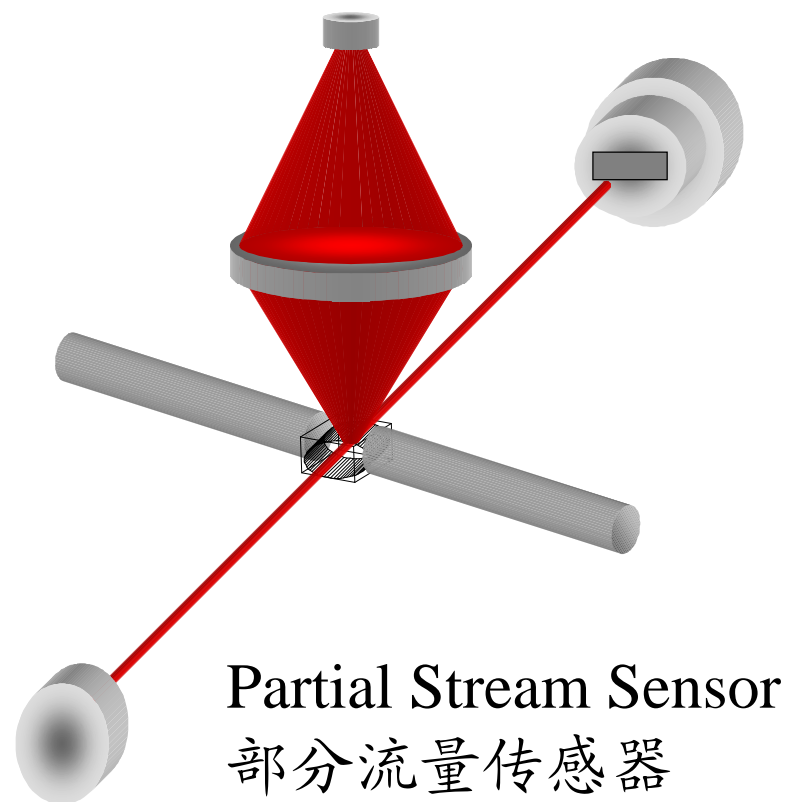
Sample Statistics -Low 样品统计-低

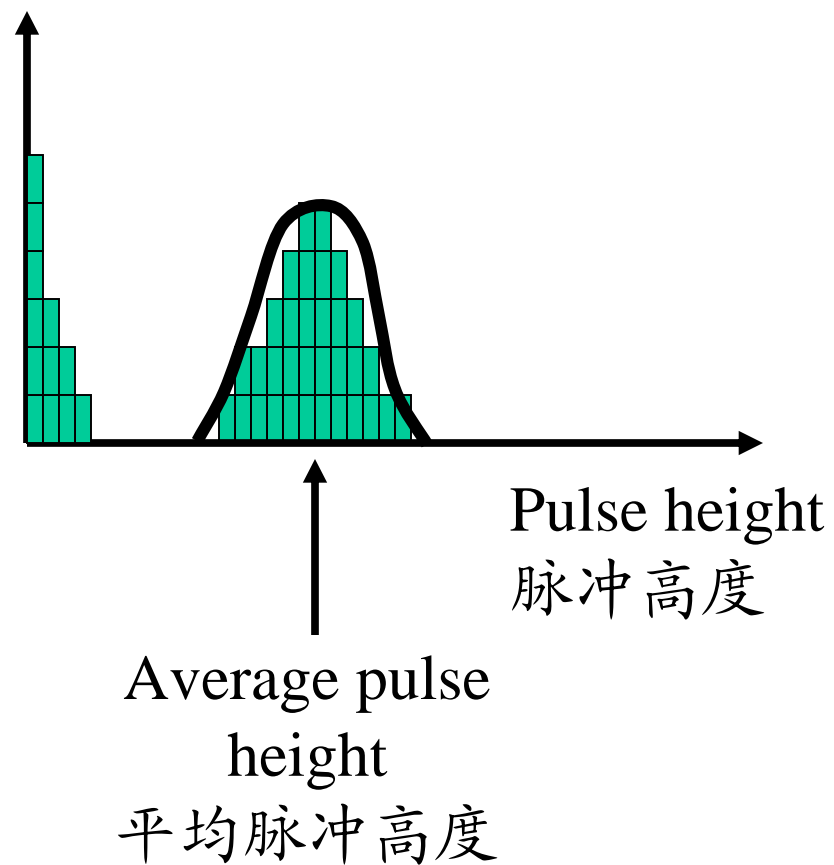
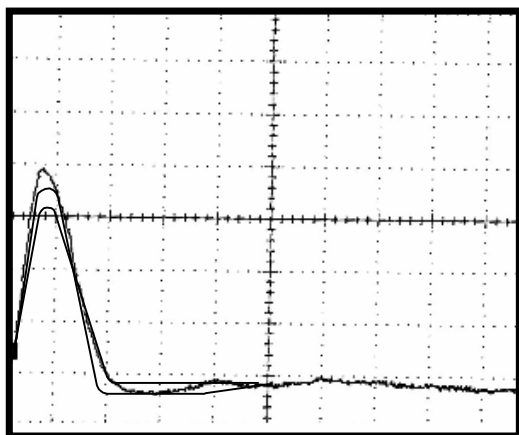
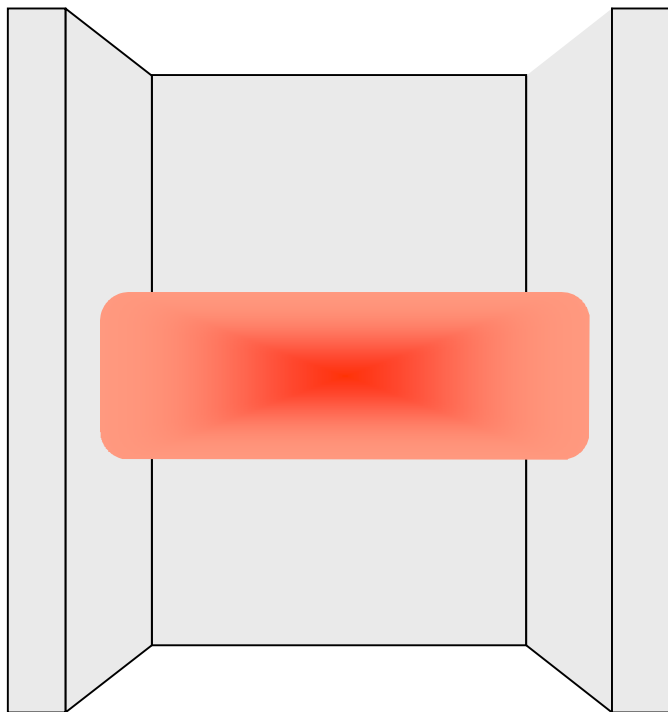
Sizing Accuracy (resolution) -Low

大小的精确性-低

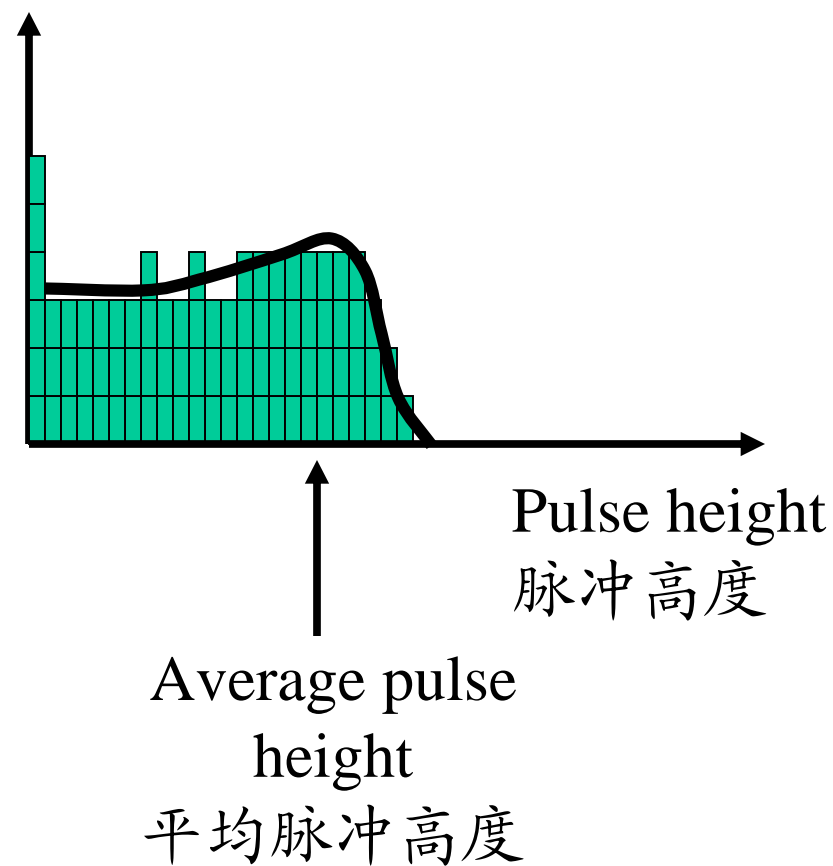
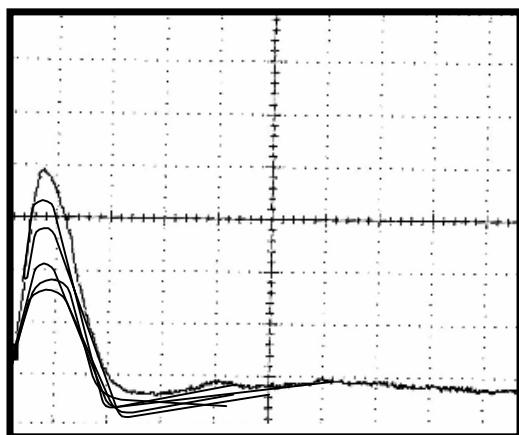
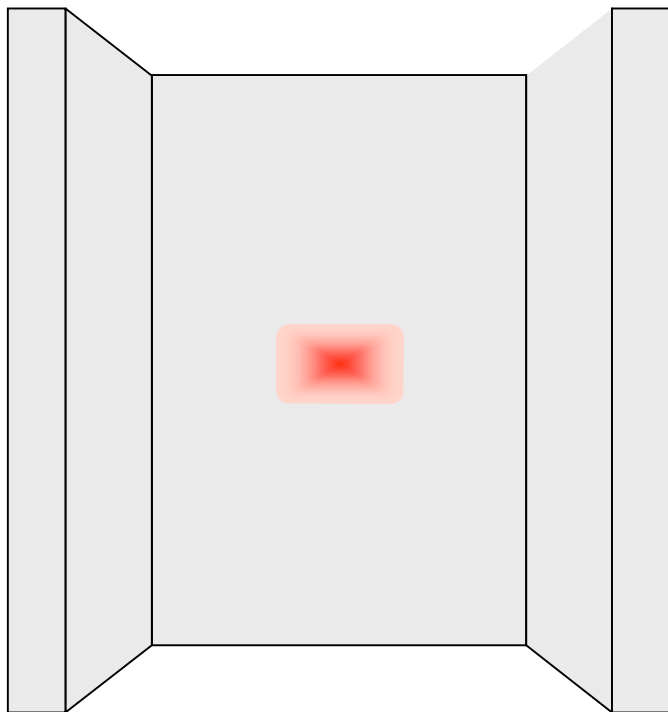
Sensitivity -High 灵敏度-高

Concentration Limit -High 浓度限制-高





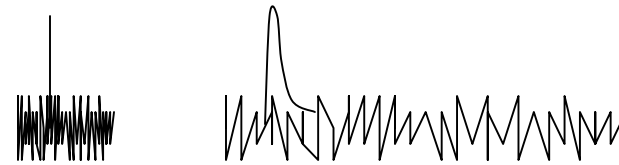
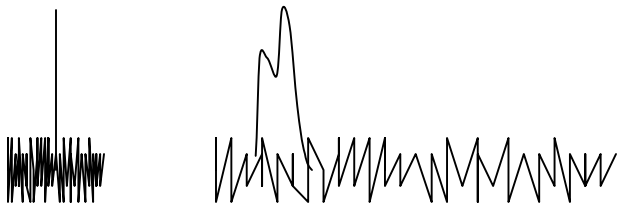
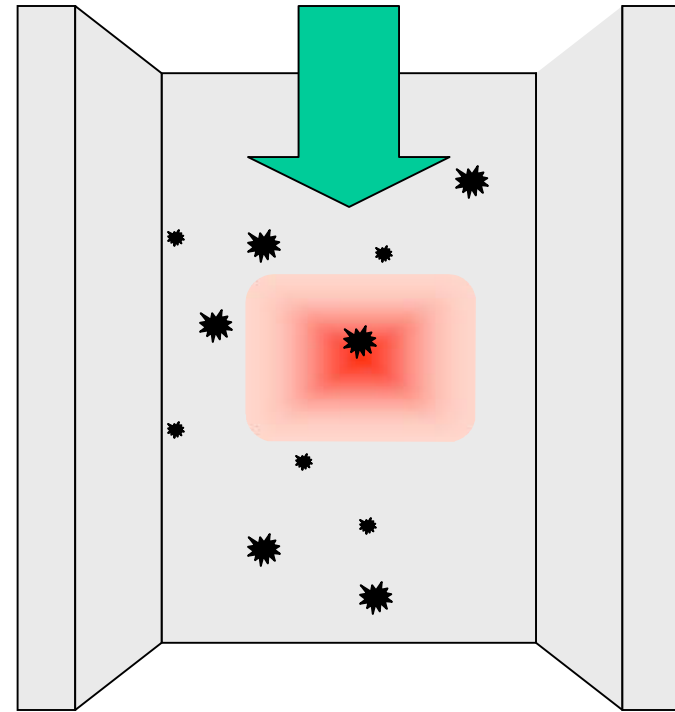
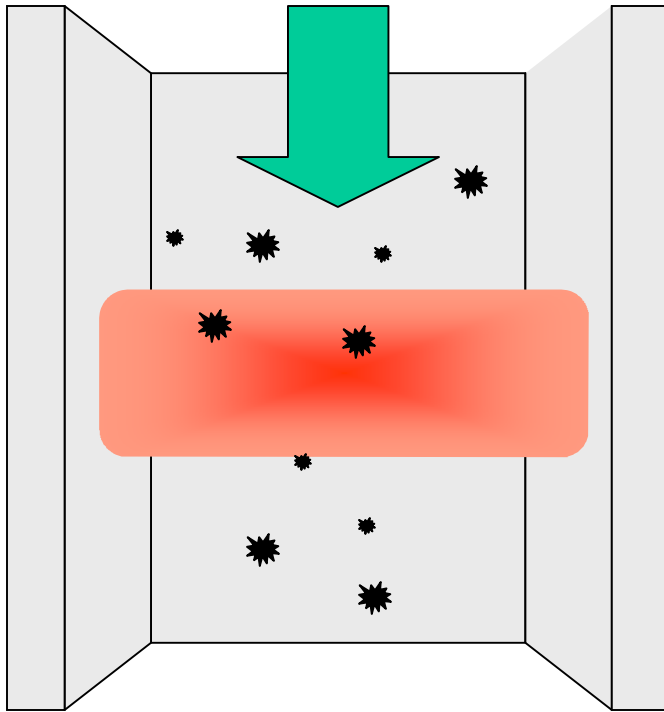
FULL STREAM SENSOR  
or HIGH VIEW VOLUME  
全流量传感器或高可视体积



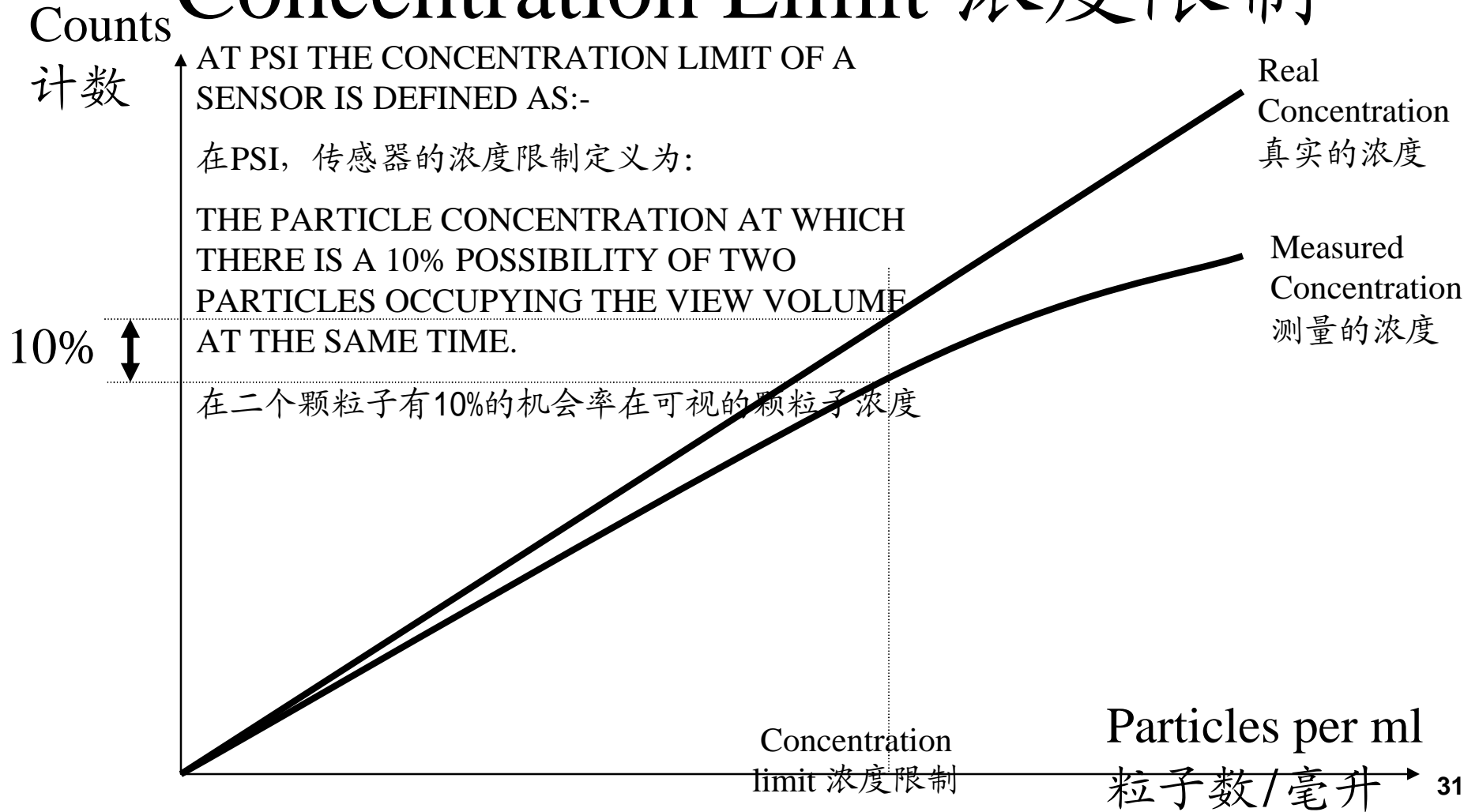
PARTIAL STREAM SENSOR  
or LOW VIEW VOLUME

部分流量传感器和低可视体积

# Concentration Limit 浓度限制

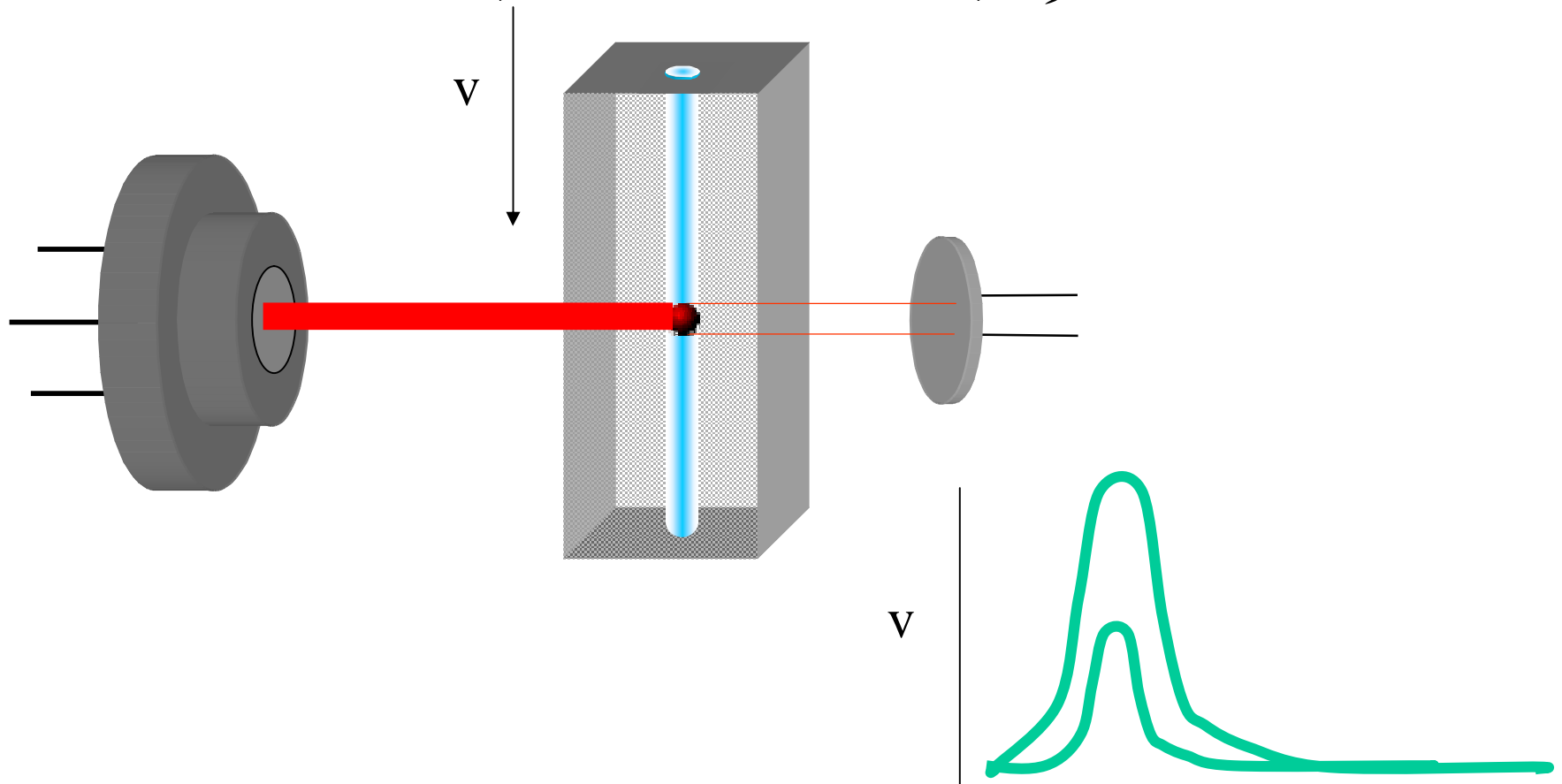


# Concentration Limit 浓度限制



# Effect of Flow Rate on Sizing

## 流速对粒子大小的影响





# COUNTERS 计数器

## PARTICLE SIZE CHANNELS

通道的粒子大小

- FIXED THRESHOLDS 固定极限（门槛电压）
- SOFT THRESHOLDS 不可确定的极限

## DATA OUTPUT 数据输出

 DISPLAY 显示

 PRINT-OUTS 打印输出

 COMMUNICATIONS 通讯

# FIXED THRESHOLDS

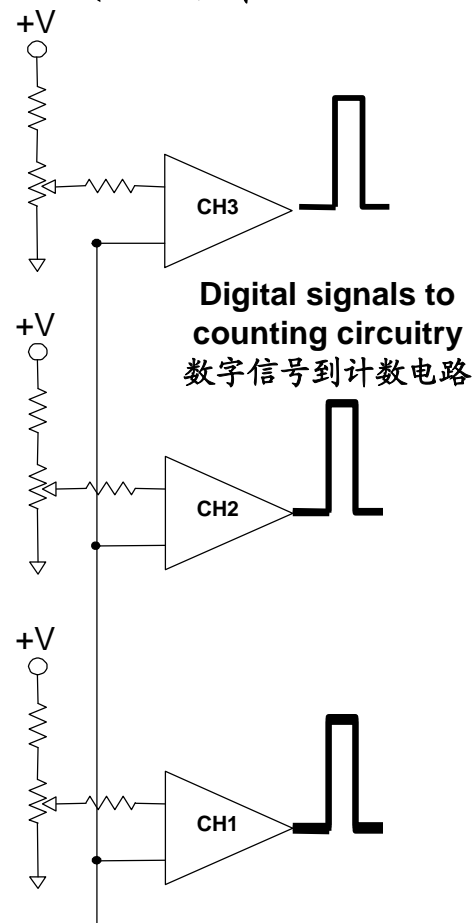
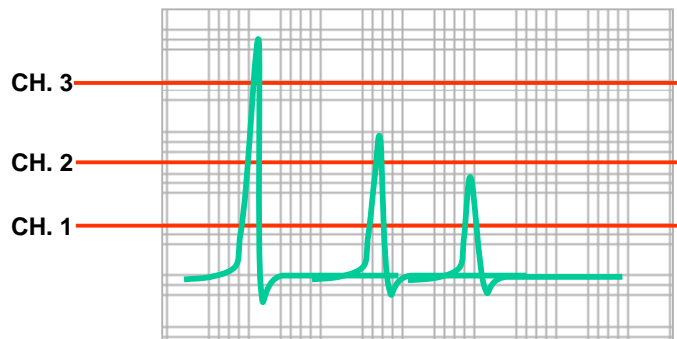
## 固定极限（门槛电压）

### Threshold Circuit

This circuitry is duplicated from one channel up to seven channels depending on the model counter

极限电路  
这个电路是根据计数器的第一到第七通道而复制出来的

Analog Signal in 模拟信号输入



The particle size thresholds for each size channel are factory set.

每一通道，粒子门槛电压的大小是由厂家设定的

This applies to the model 2000 counter.

这仅适合于2000计数器

# USER SETTABLE THRESHOLDS

## 使用者可设定的极限（门槛电压）

Some particle counters  
allow the operator to  
select different sizes

一些粒子计数器允许操作  
者选择不同的大小

The particle size  
thresholds for each size  
channel are  
automatically set to the  
users requirement.

每一通道粒子的极限大小  
能自动设定成使用者所需  
要的

# PRINTOUT or DISPLAY

2001-04-24 11:23:00  
Run 1 of 10

CH	SIZE	CUM	DIFF
1	0.1um	1200	860
2	0.2um	340	140
3	0.3um	200	80
4	0.5um	120	60
5	0.6um	60	30
6	0.8um	30	15
7	1.0um	15	11
8	2.0um	4	4

2001-04-24 11:23:00  
Run 1 of 10

CH	SIZE	CUM	DIFF
1	0.1um	1200	860
2	0.2um	340	140
3	0.3um	200	80
4	0.5um	120	60
5	0.6um	60	30
6	0.8um	30	15
7	1.0um	15	11
8	2.0um	4	4

2001-04-24 11:23:00  
Run 1 of 10

CH	SIZE	CUM	DIFF
1	0.1um	1200	860
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5	0.6um	60	30
6	0.8um	30	15
7	1.0um	15	11
8	2.0um	4	4

2001-04-24 11:23:00

Run 1 of 10

CH	SIZE	CUM	DIFF
1	0.1um	1200	860
2	0.2um	340	140
3	0.3um	200	80
4	0.5um	120	60
5	0.6um	60	30
6	0.8um	30	15
7	1.0um	15	11
8	2.0um	4	4

start

setup

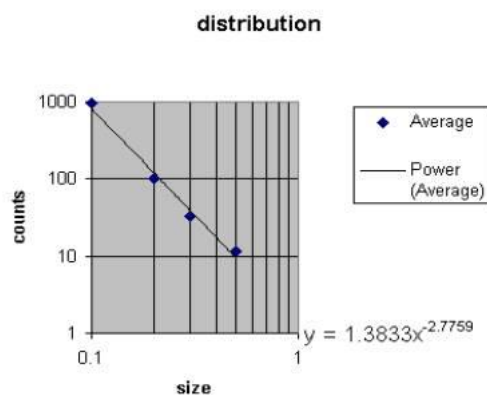
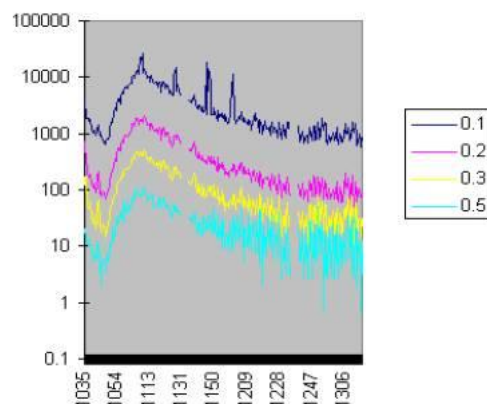
cal

print

host

# EXPORTS 输出

Time	0.1	0.2	0.3	0.5
1035	3963.333	716	166.6667	20.66666
1035	2015.333	302	89.33333	14.66667
1036	1823.333	405.3333	167.3333	16
1037	1837.333	216	52.66666	11.33333
1037	1898.667	166	46.66666	9.999999
1038	1535.333	180.6667	47.33333	12
1038	1780.667	192	61.33333	13.33333
1039	1220	133.3333	33.33333	8.666666
1039	1044.667	113.3333	25.33333	5.333333
1040	1140	108	29.33333	8
1041	1115.333	130	37.33333	8
1041	913.3333	90	20	6
1042	1064.667	108.6667	27.33333	6
1042	1126	173.3333	52	12
1043	1438.667	209.3333	66.66666	10.66667
1044	920	96.66666	28.66666	6
1044	908.6666	78.66666	17.33333	2
1045	884	90.66666	19.33333	4
1045	774.6666	92.66666	24.66666	5.333333
1046	704.6666	91.33333	22	6
1047	637.3333	71.99999	19.33333	4.666667
1047	722	67.33333	14.66667	3.333333
1048	778	90.66666	19.33333	8
1048	800.6666	96	24	5.333333
1049	915.3333	116	33.33333	7.333333
1050	1352.667	155.3333	43.33333	10.66667
1050	1444.667	172	47.33333	9.999999
1051	1859.333	230	59.33333	14
1051	1544	211.3333	63.33333	22.66666
1052	2355.333	280	71.33333	12.66667
1052	2800.667	355.3333	79.99999	18



NOTES: Sampling performed at end of line sample station. A sample run prior to the results presented here showed the chemical to consistently out of specification with 0.2um counts at around 600 per ml and normal third power contamination distribution. This is not untypical for new installations where there is no return loop to the CDM and hence no means to recirculate chemical. Concluding that the line was contaminated chemical was left to run to drain for a few hours while another CDM was qualified. The H3PO4 line was then attempted again the following day. Particle levels (shown here) exhibited a downward trend for around 20 minutes and then rapidly increased to a clearly defined peak before commencing a gradual clean-up trend finally stabilising around 12:40. The cause of the initial excursion is unknown although count/size distribution was stable throughout indicating good data. For the purposes of qualification the statistics below were generated for the period after stability had been achieved. It would however

Size	0.1	0.2	0.3	0.5
Average	974.7708	99.49999	32.71875	11.625
sd	296.55	34.12726	16.2959	9.612509
RSD%	30.42254	34.29876	49.80599	82.68826
95% UCL	1047.998	107.9271	36.74272	13.99863
Spec		300		

NOTE: Stats calculated from 12:39 to 13:17

CDM		1000		
DATE				
OPERATOR		BOB LATIMER		
#samples		275		
sample volume		1.5ml		
meas period		2hr 45mins		

# SAMPLERS 取样器

 PRESSURE SAMPLERS

压力取样器

 SYRINGE SAMPLERS

注射器取样器

 ON-LINE SAMPLERS

在线取样器

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# PRESSURE SAMPLERS 压力取样器

◆ Chemical Compatible

化学品的兼容性

◆ Eliminates Bubbles

消除气泡

◆ Compatible with 兼容性

◆ Microcount100

◆ Microcount200

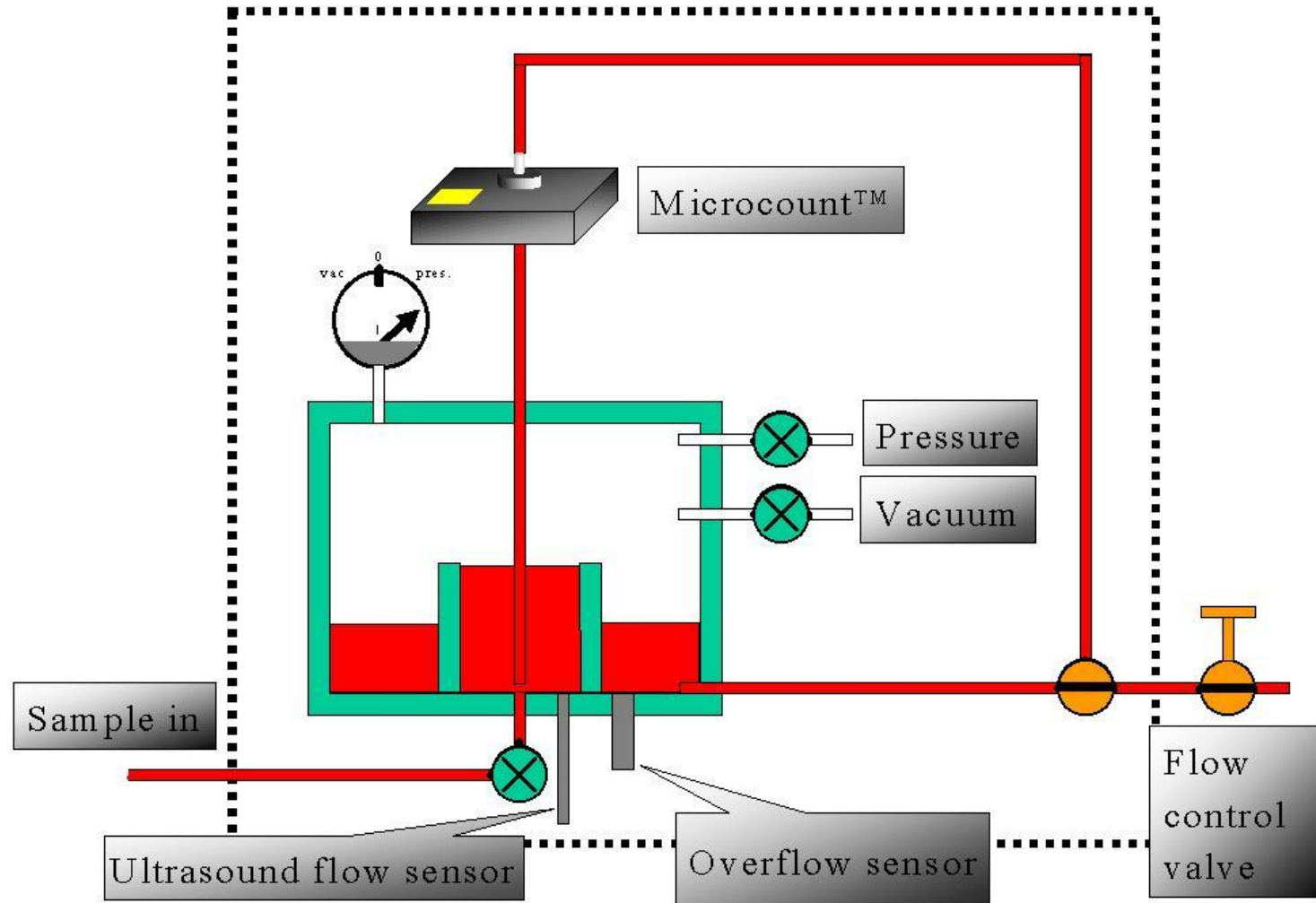
◆ Ideal for QA of Bottled chemical

理想的质量保证-瓶装化学品



# AFCS PRESSURE SAMPLER

AFCS 压力取样器





# SYRINGE SAMPLERS

## 注射器取样器



Version for aqueous.

水溶性的版本



Parts cleaning application

局部清洁应用



Version for Chemical

化学品的版本



Specialty chemical

专业化学品



Solvents 溶剂



VERY clean system

非常干净的系统

# ON-LINE SAMPLERS

在线取样器

◆ Direct on-line connection.

在线的直接连接

◆ DI Water systems 纯水系统

◆ Chemical Delivery 化学品传输

◆ Wet Baths 湿缸

◆ Cleaning Stations 清洁站

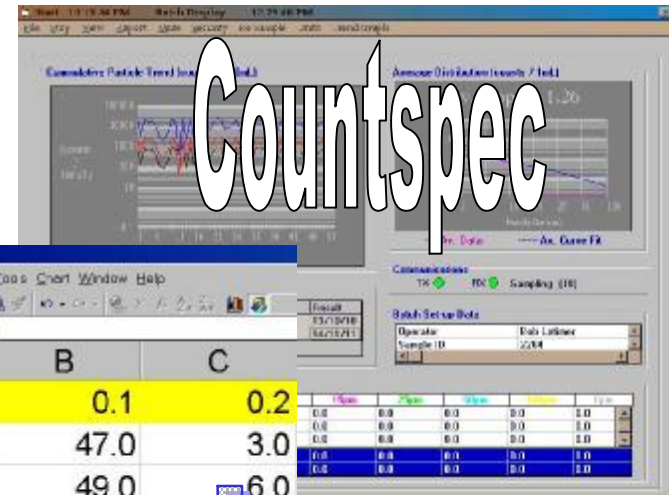
◆ Spray Tools 喷淋工具



# SOFTWARE SOLUTIONS

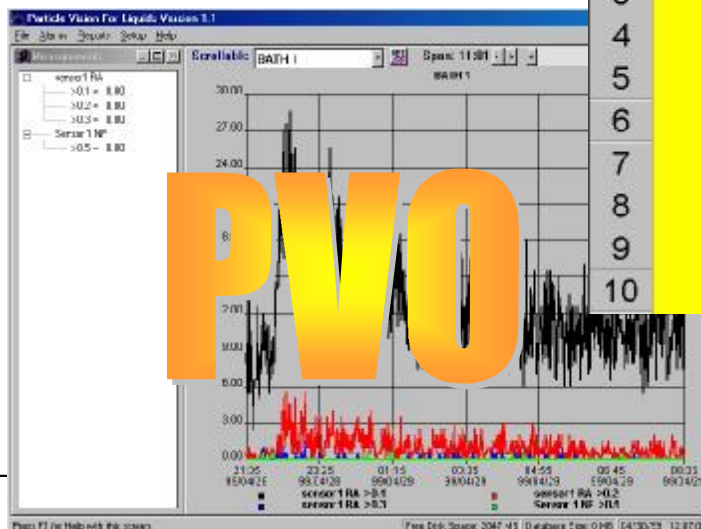
软件的解决方案

- ◆ HIAC REPORTS 报告
- ◆ HIAC EXPORTS 输出
- ◆ HIAC BATCHING 分批处理
- ◆ HIAC TRENDING 趋势



Excel

	A	B	C
1	Time	0.1	0.2
2	1021	47.0	3.0
3	1022	49.0	6.0
4	1022	46.0	3.0
5	1023	40.0	5.0
6	1023	40.0	5.0
7	1024	40.0	3.0
8	1024	40.0	6.0
9	1024	42.0	6.0
10	1025	31.0	2.0



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