

Inaugurazione del Lab XRD al C.I.G.S. Modena, 13/01/05

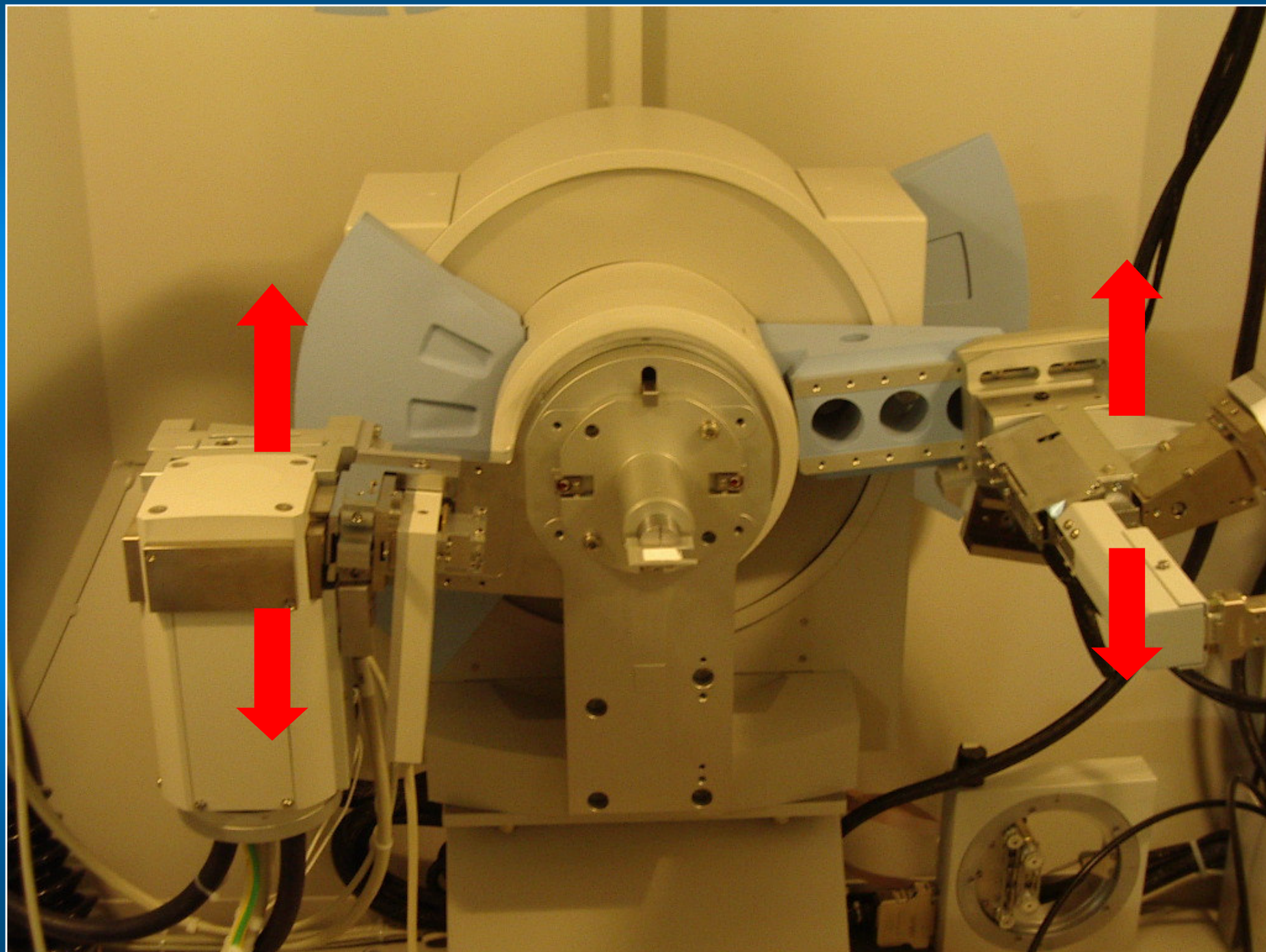
**Il diffrattometro  
per polveri al *Centro  
Interdipartimentale  
Grandi Strumenti  
di Modena***

*Per info:*

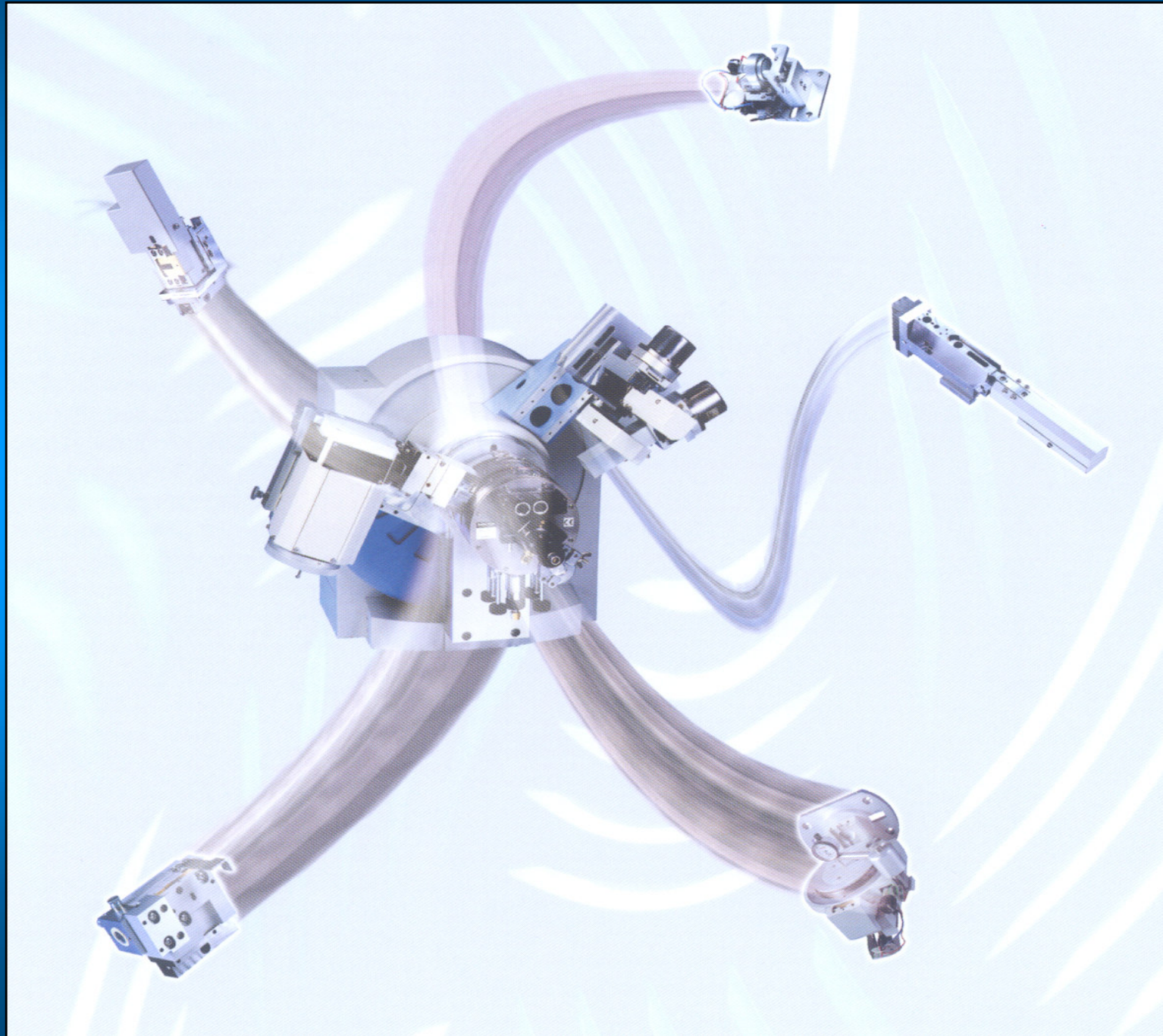
*<http://www.cigs.unimo.it/>*



# X'Pert PRO in geometria sperimentale $\theta$ - $\theta$



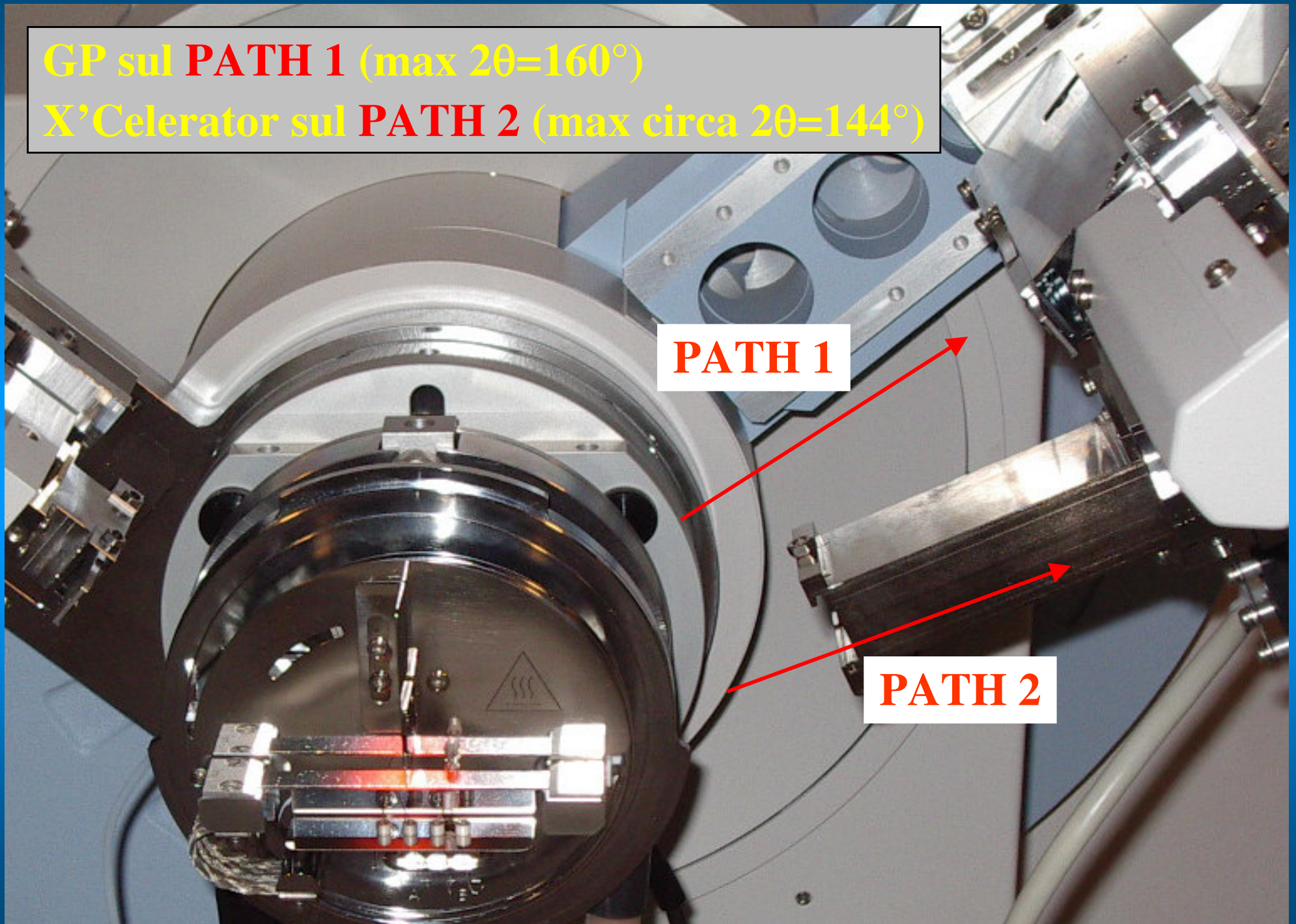
# Strumento modulare a configurazione multipla



# Il “double arm”

GP sul **PATH 1** (max  $2\theta=160^\circ$ )

X'Celerator sul **PATH 2** (max circa  $2\theta=144^\circ$ )



**PATH 1**

**PATH 2**

# Le diverse possibili configurazioni

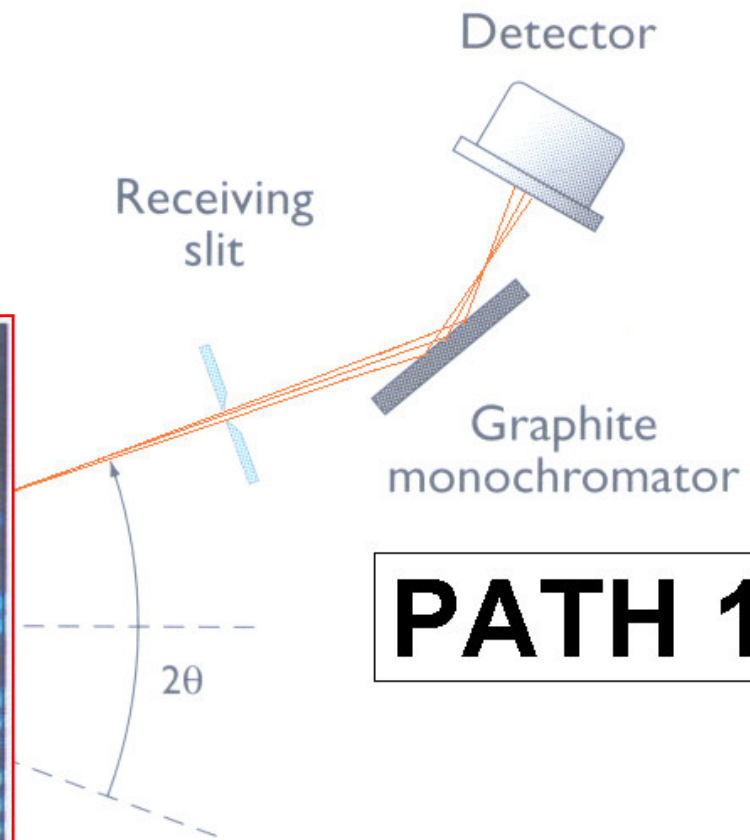
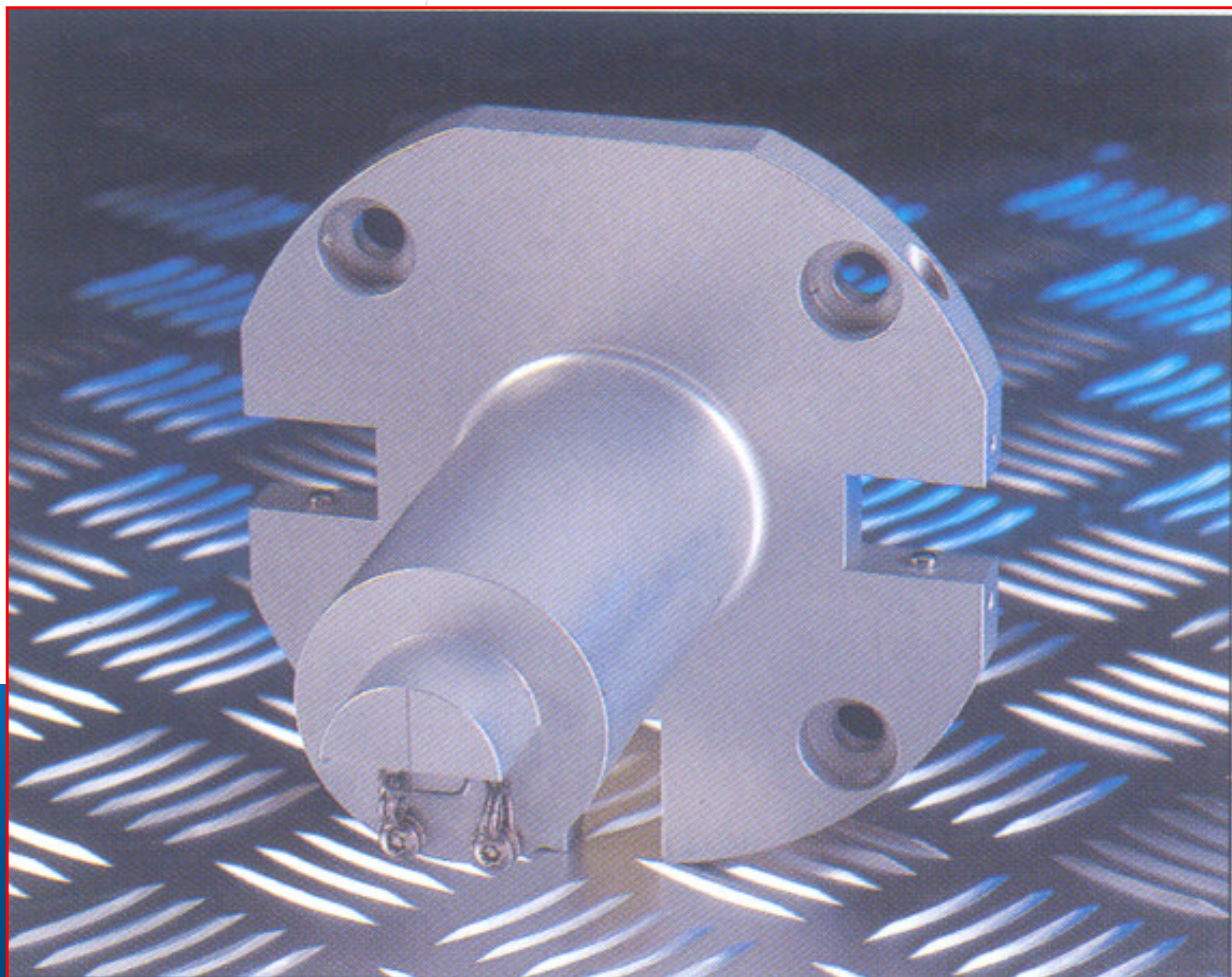
- > Configurazione 1: base
- > Configurazione 2: alta temperatura
- > Configurazione 3: campioni massivi
- > Configurazione 4: incidenza radente e riflettometria
- > Configurazione 5: stress residuo e tessitura
- > Configurazione 6: capillare

## Configurazione 1: base

- Analisi Qualitativa
- Analisi strutturale con il metodo Rietveld
- Analisi quantitativa con metodo Rietveld+R.I.R.
- Analisi microstrutturale

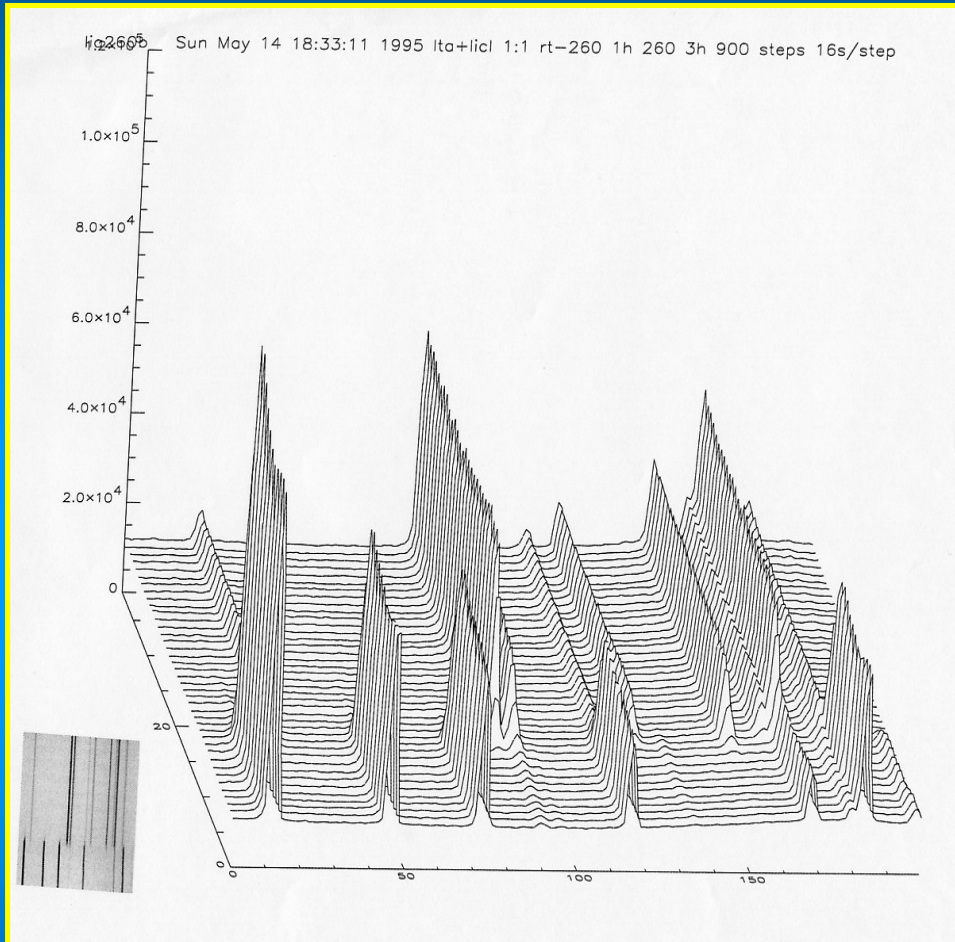
# Configurazione 1: base

Divergence slit



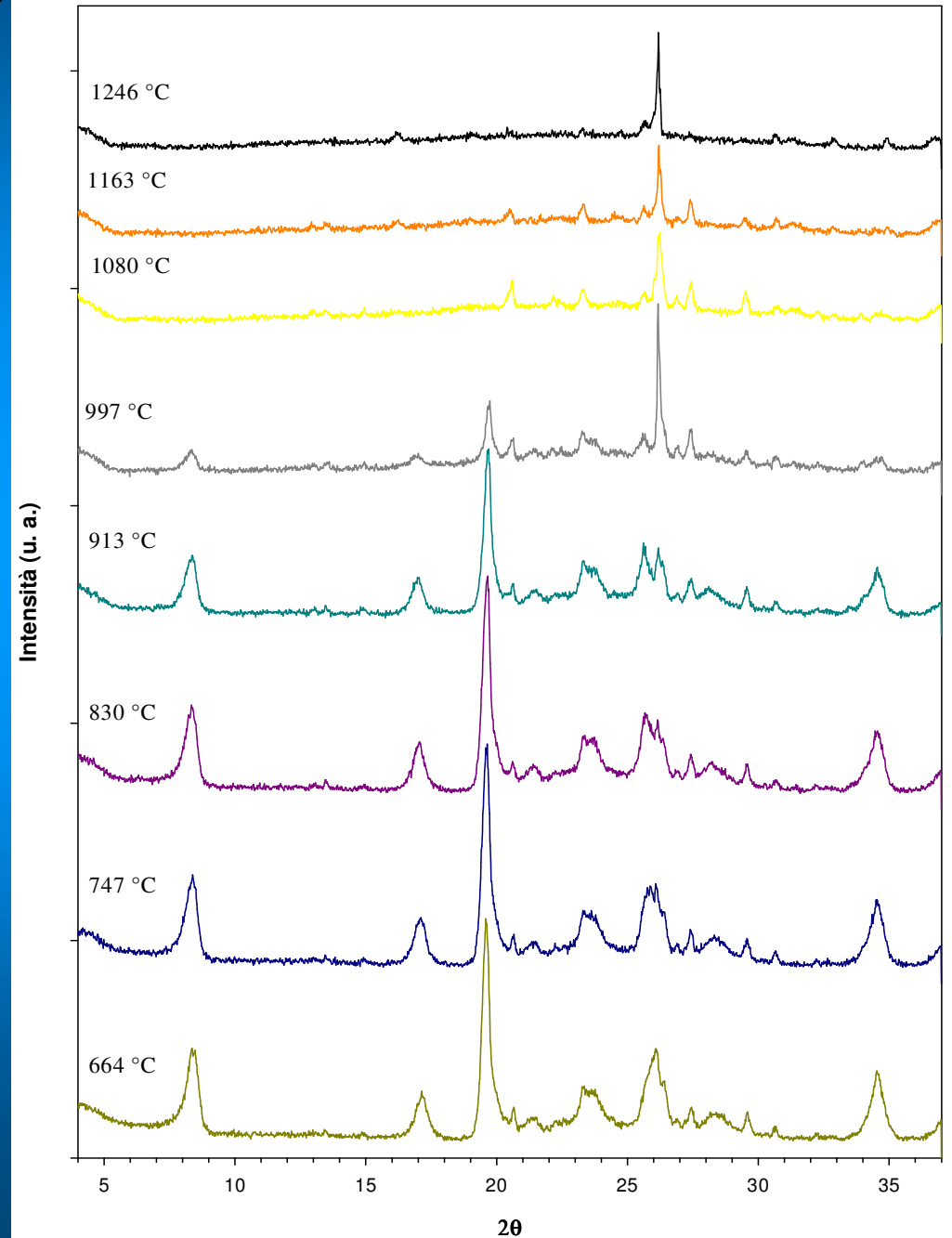
# Configurazione 2: alta temperatura

## Studi di cinetiche di reazione



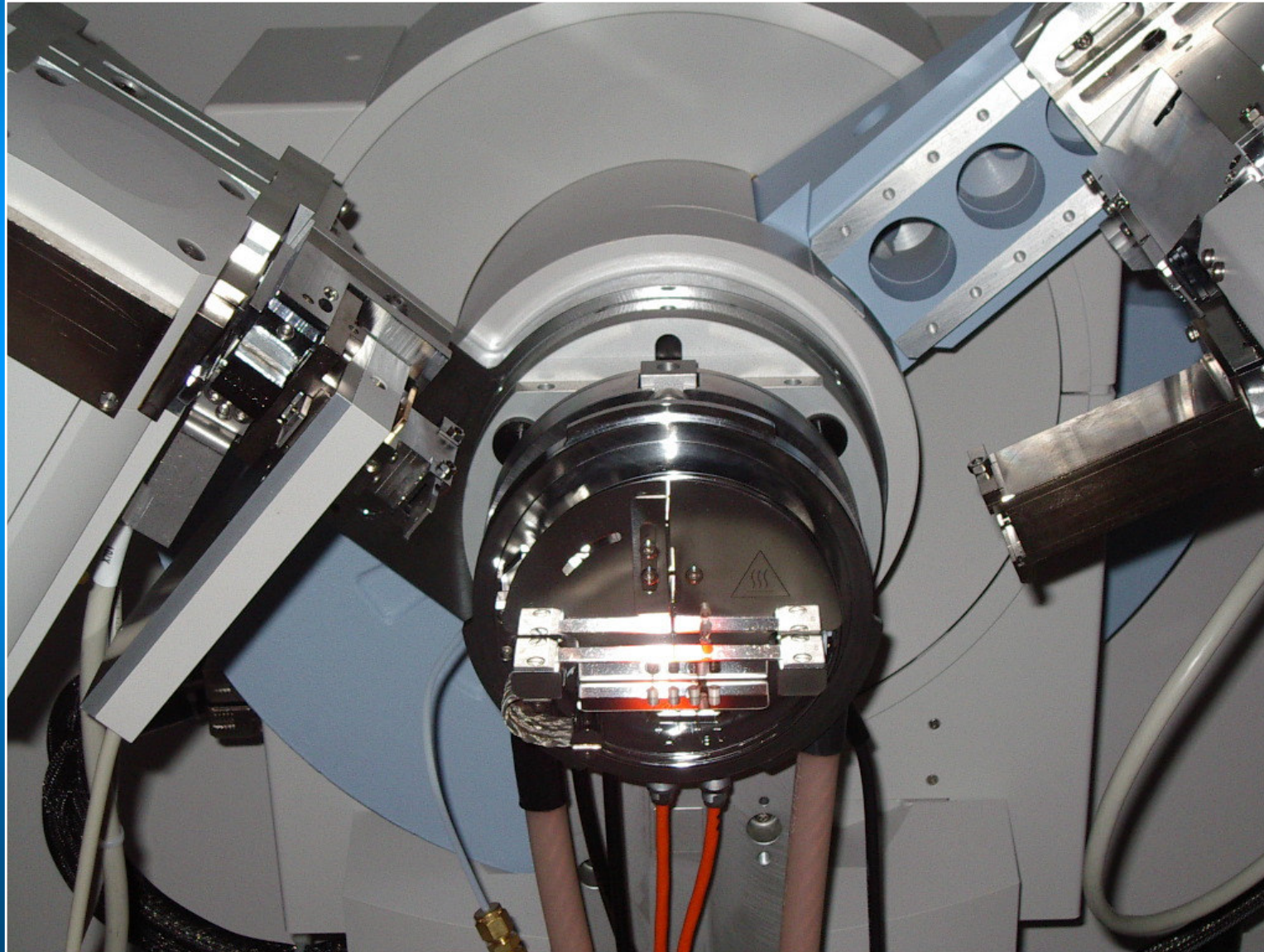
*Diffratogramma  
tridimensionale con variabili in  
 $2\theta$ , tempo, intensità*

## Decomposizione dell'illite



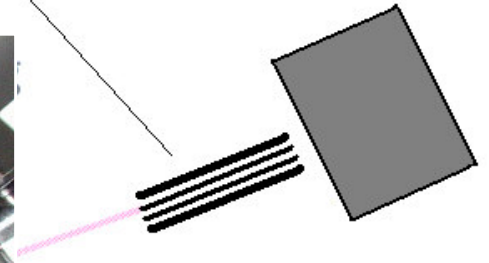


# Configurazione 2: alta temperatura



antiscatter  
shield +  
soller slits

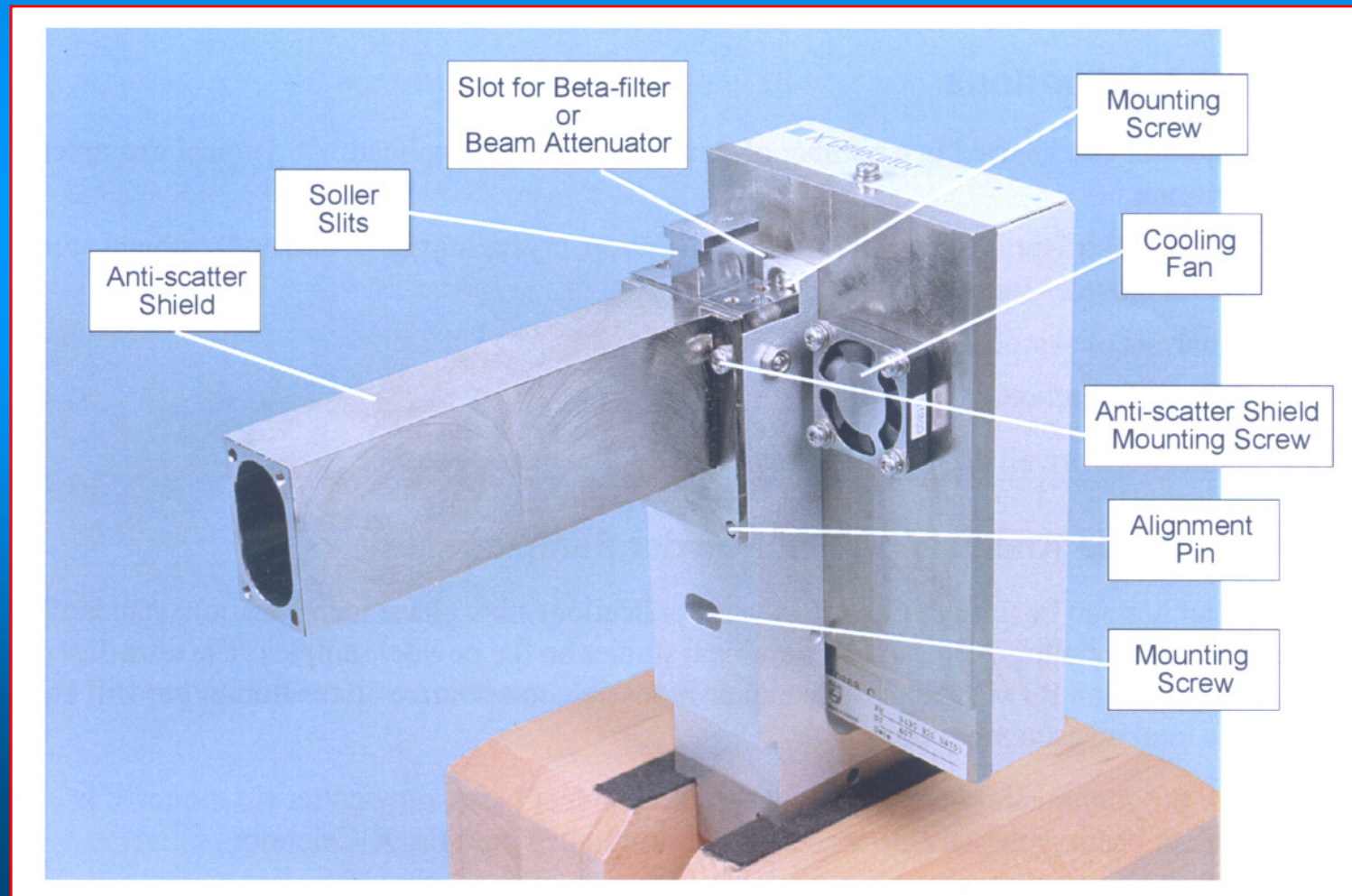
Detector  
X'Celerator



**PATH 2**

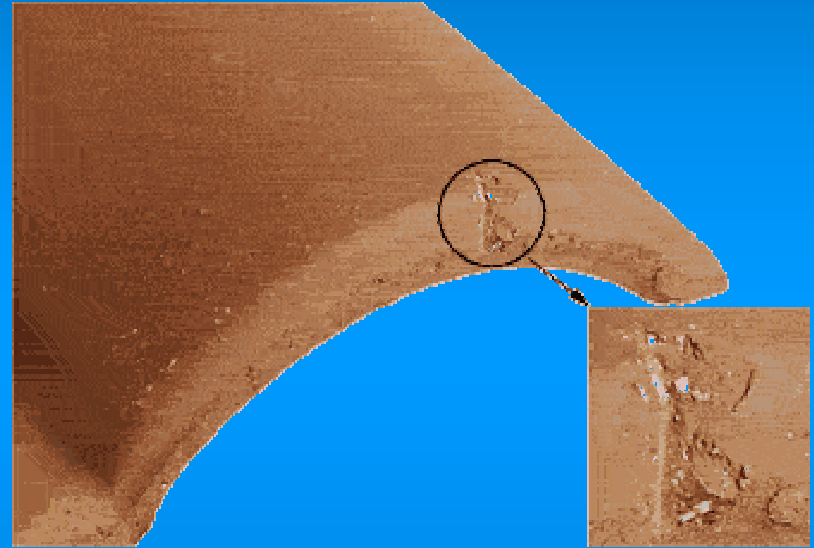
## Configurazione 2: alta temperatura, l'X' Celerator

- Tecnologia RTMS (Real Time Multiple Strip), composto da un array di 128 micro-rivelatori a stato solido con un'area attiva max di circa  $2^\circ 2\theta$ .
- Permette di acquisire spettri in pochi minuti conservando intensità e risoluzione

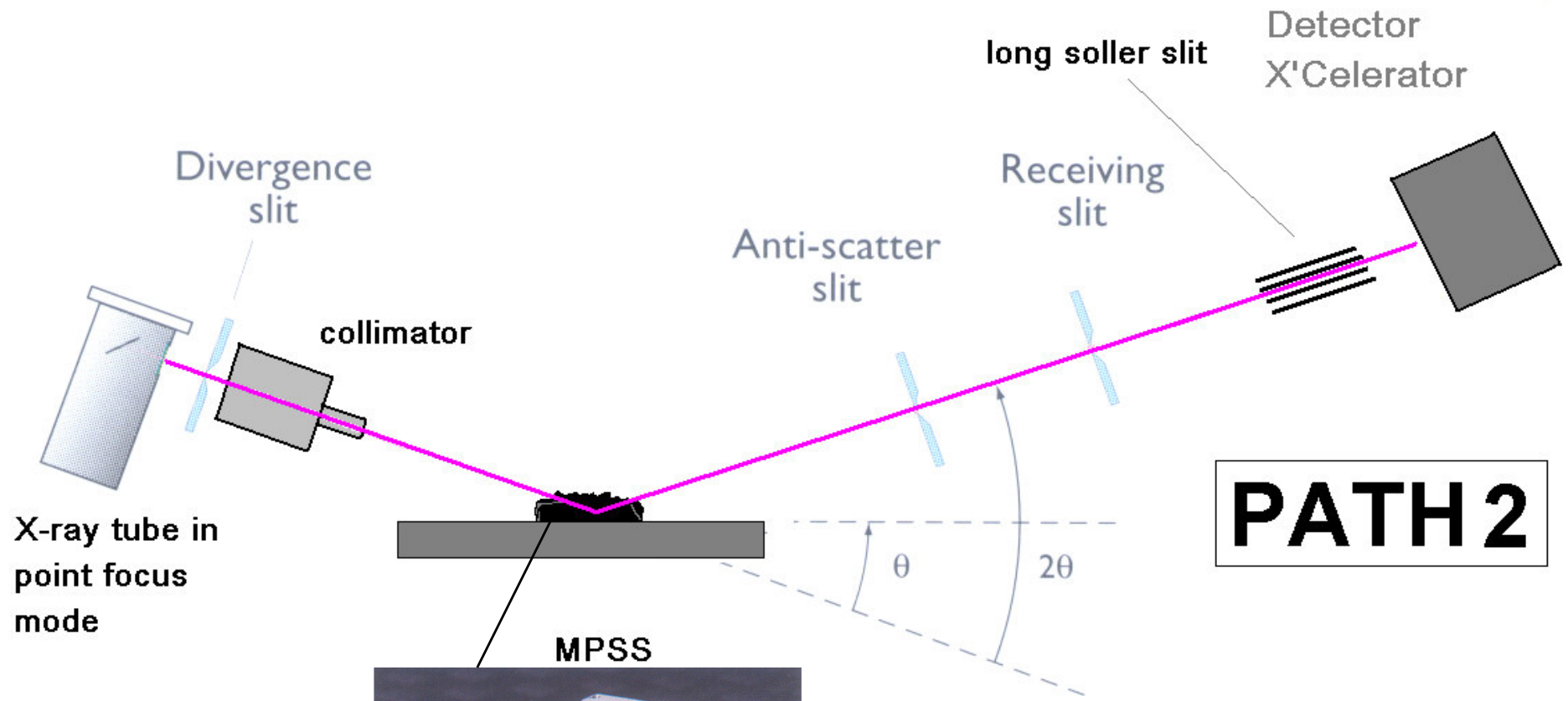


## Configurazione 3: campioni massivi

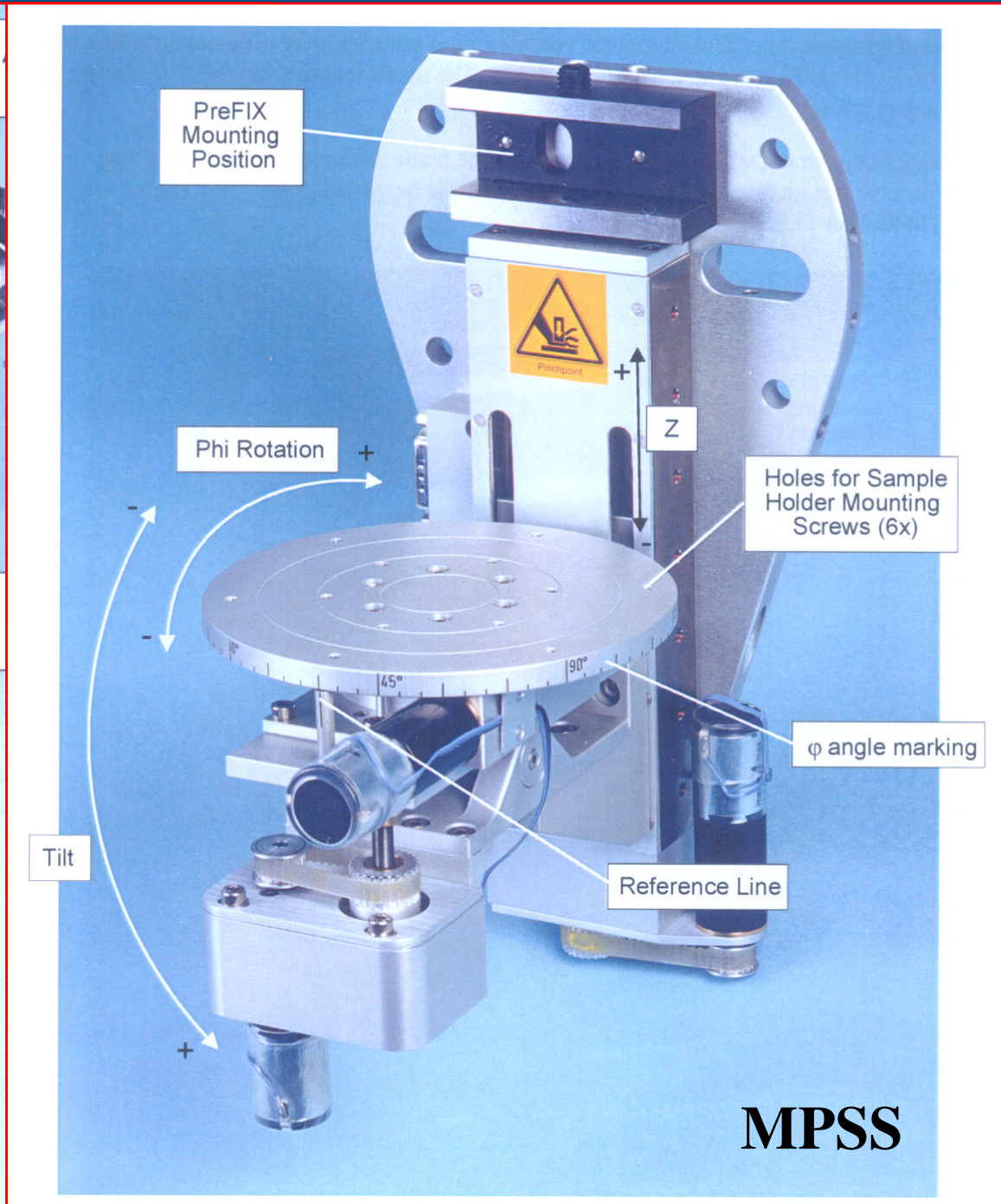
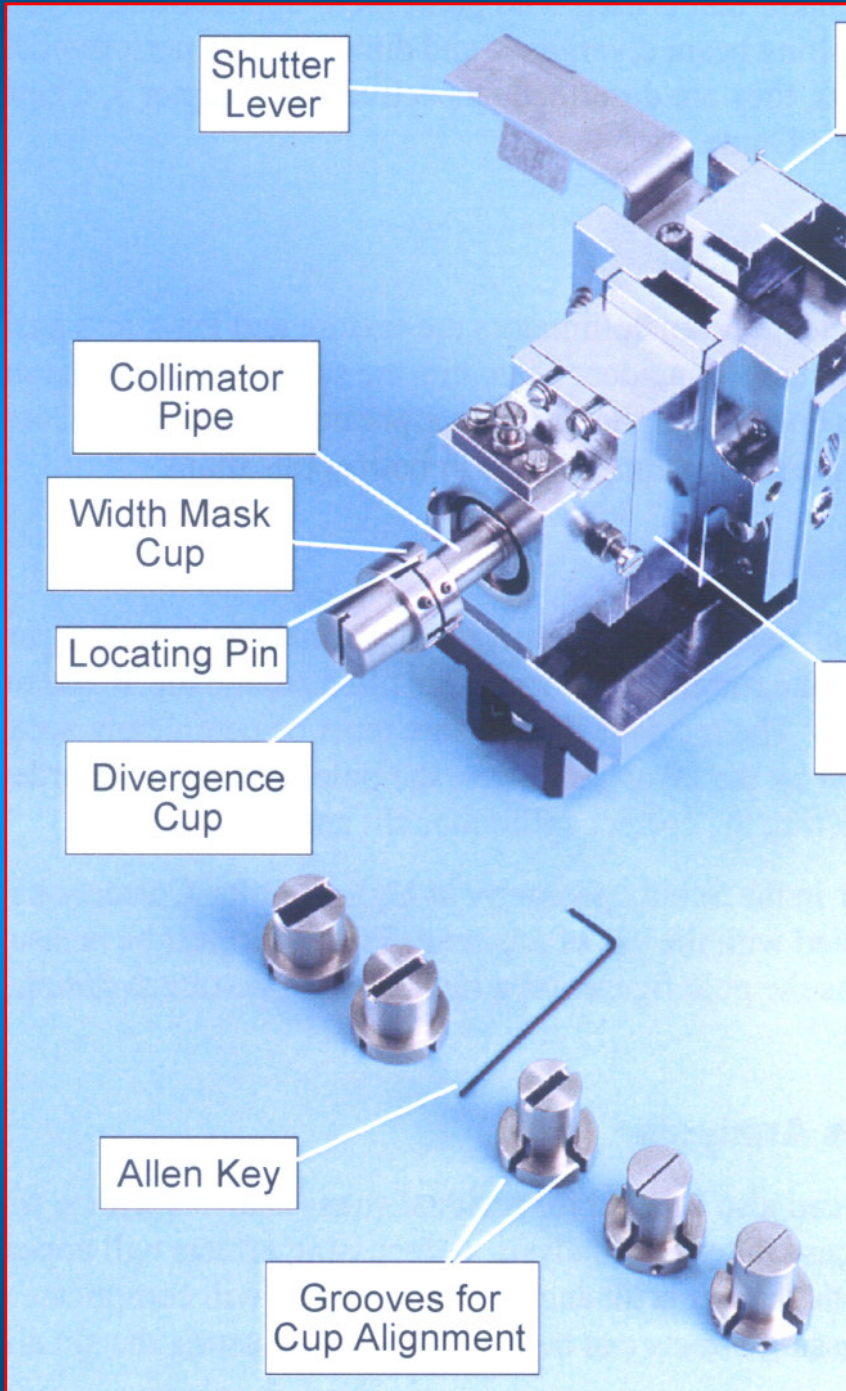
Svariate applicazioni: archeometrico, beni culturali, chimico, chimico in senso lato, mineralogico-petrografico, paleontologico, scienza dei materiali, etc dove, per diverse ragioni, non è possibile ridurre il materiale in polvere



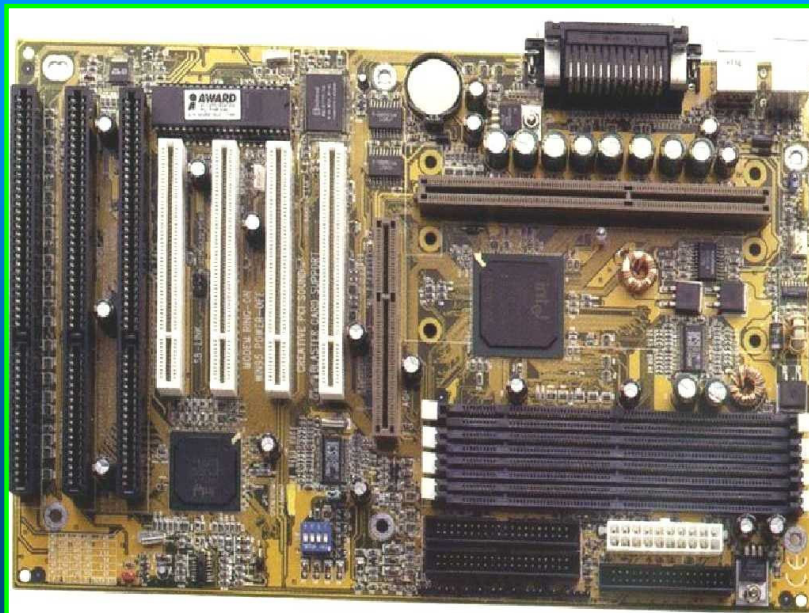
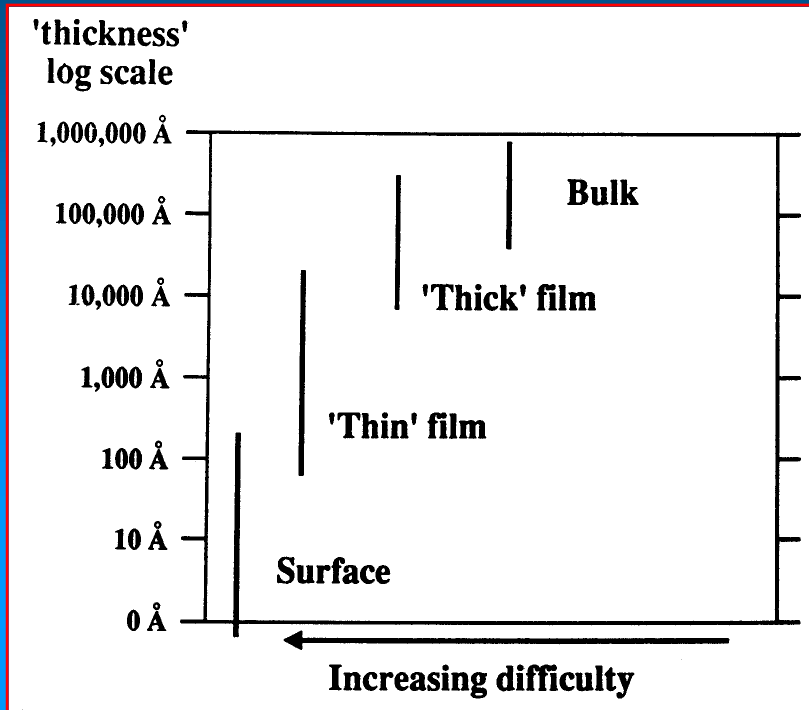
# Configurazione 3: campioni massivi



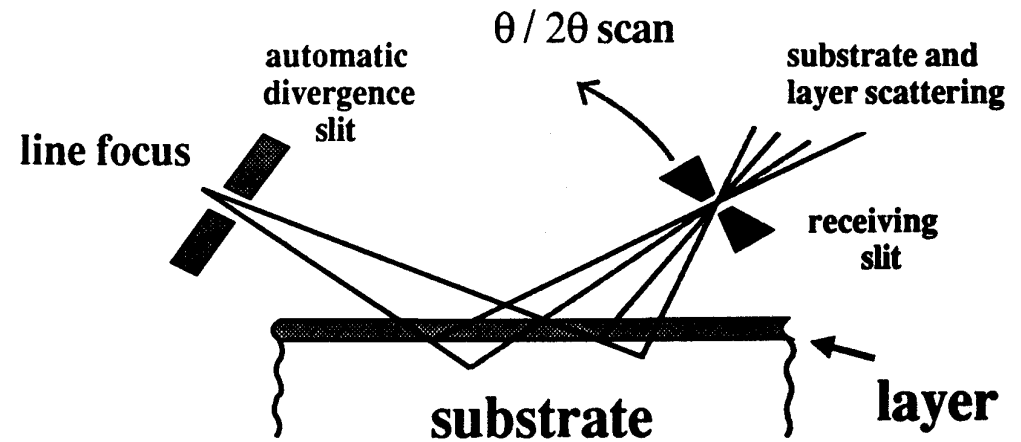
# Configurazione 3: campioni massivi



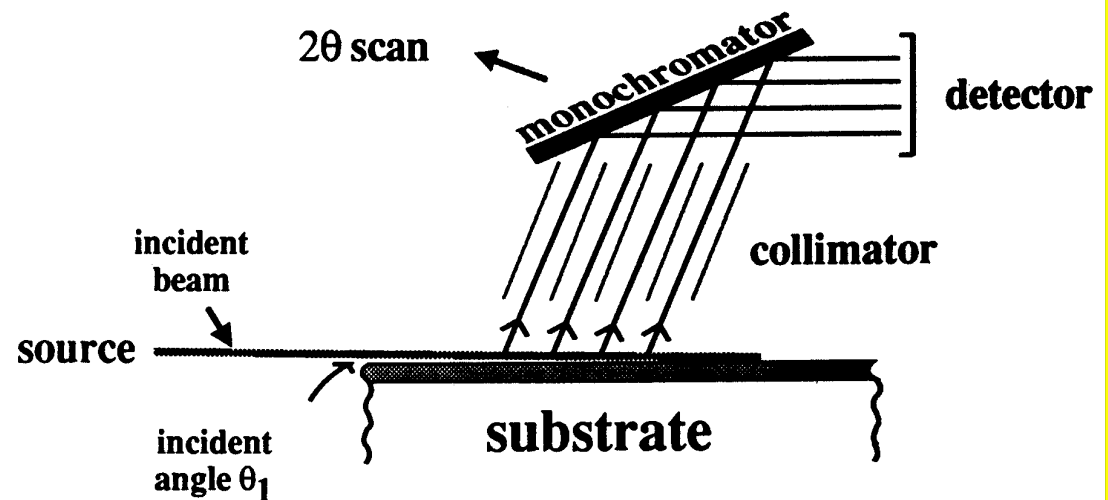
# Configurazione 4: incidenza radente e riflettometria



## A. Bragg - Brentano - *Symmetric*



## B. Glancing - incidence - *Asymmetric*



# Configurazione 4: incidenza radente e riflettometria

## Studi di films sottili con riflettometria

### **Application: Reflectivity measurement of a chromium coating on glass**

As an example of the applicability of the positioning stages, the reflectivity curve of a chromium coating on a glass substrate was recorded. In this experiment, an X'Pert PRO MPD system was equipped with a hybrid monochromator and a diffracted beam X-ray mirror with a programmable receiving slit. The PW3075/61 Positioning Stage with Motorized X, Y, Z, Tilt and Phi movements was used as sample stage. The reflectivity curve presented in fig. 1 shows a high dynamic range and clear fringes up to a  $2\theta$  angle of  $1.6^\circ$ .

The curve was fitted using the X'Pert Reflectivity software. The fitting results revealed the presence of a surface layer on top of the chromium layer and an interface oxide layer between the coating and the glass substrate.

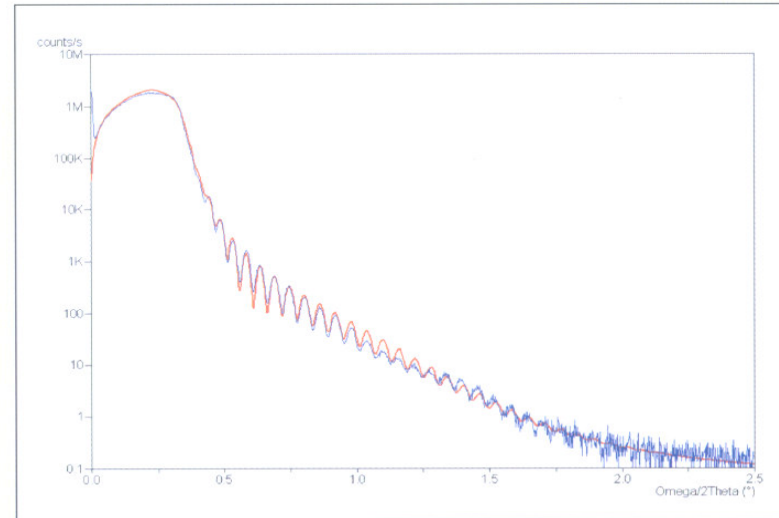
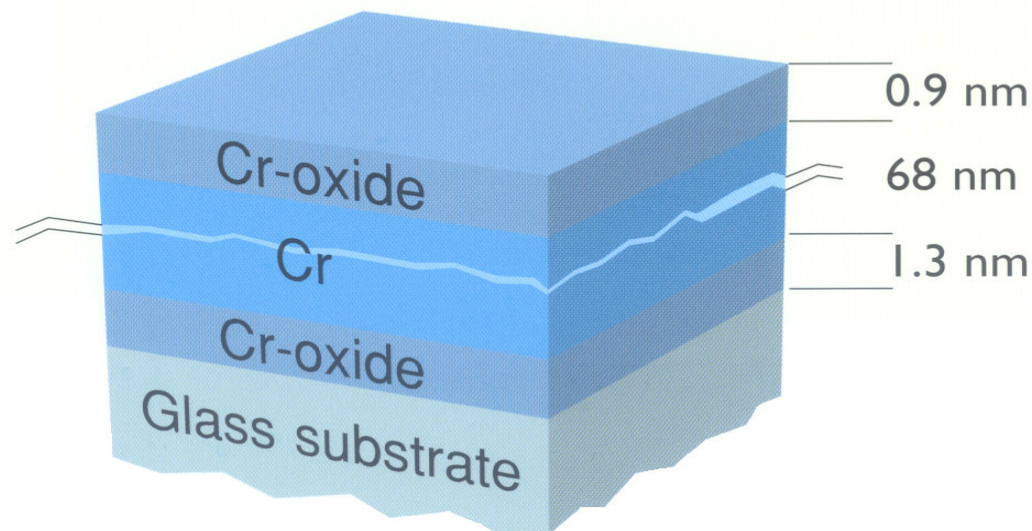
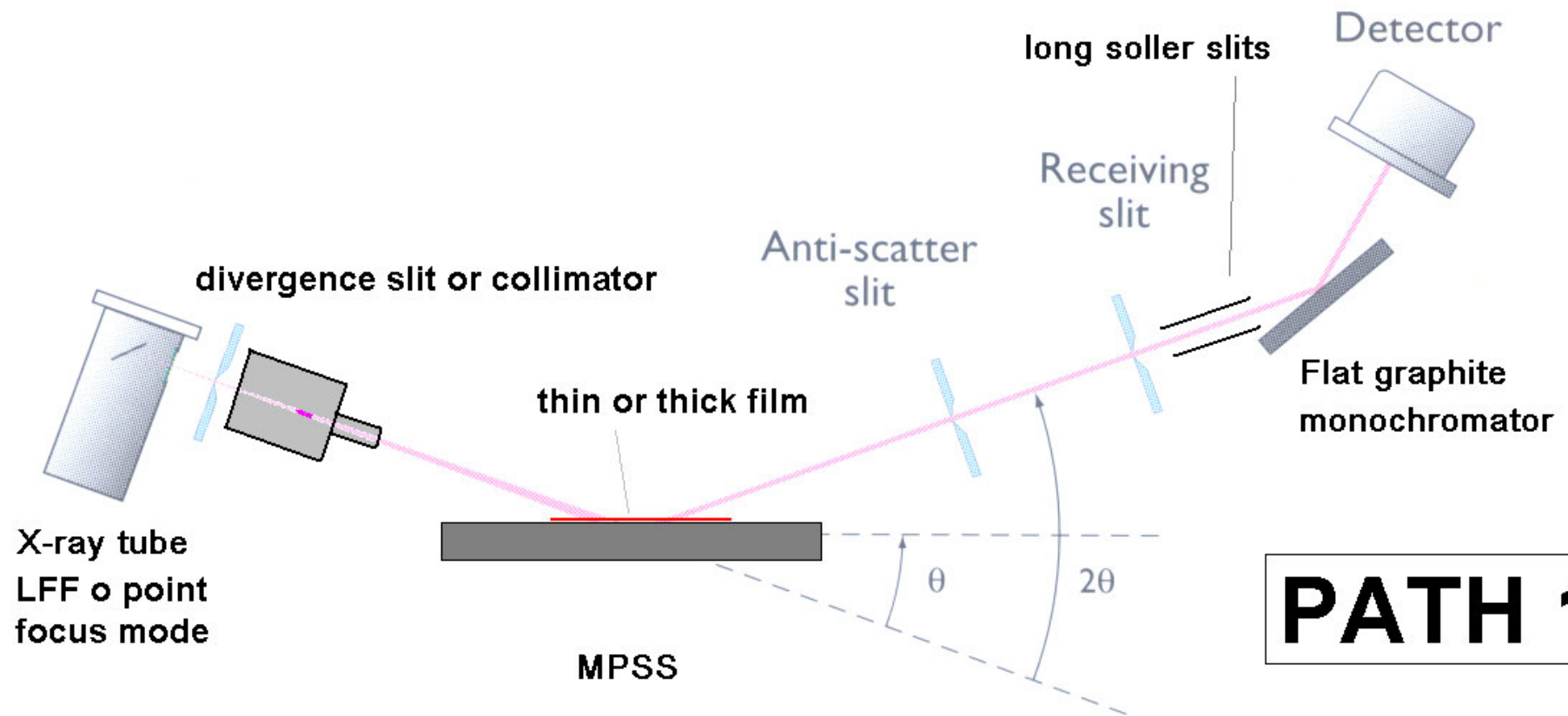


Fig. 1: Measured and fitted reflectivity curve of a chromium coating on a glass substrate.



# Configurazione 4: incidenza radente e riflettometria



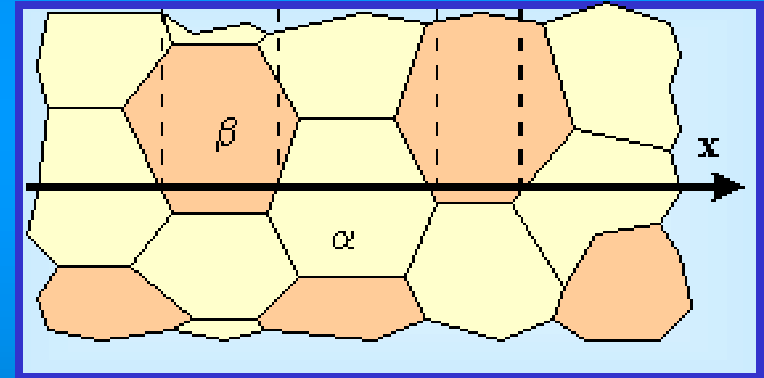
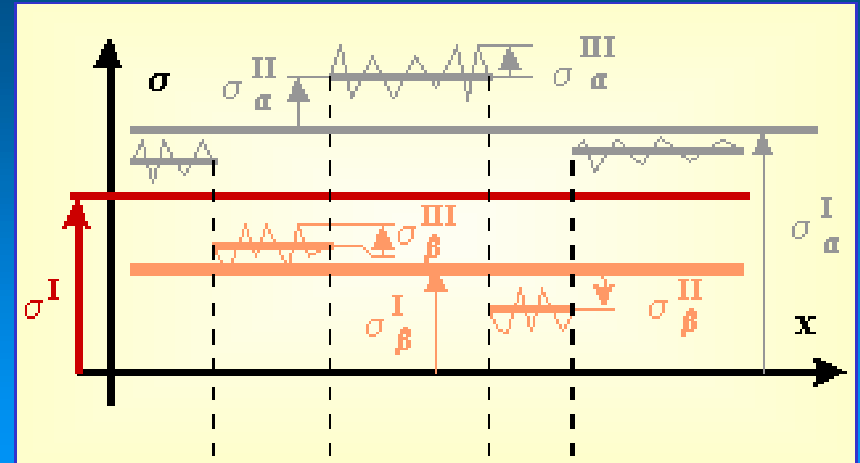
Le slitte di divergenza sono molto strette (meno di  $1/12^\circ =$  fascio lineare o puntiforme)



## Configurazione 5: stress residuo e tessitura

Stress (residuo): tensione o compressione presente in un materiale in assenza di sforzo meccanico/termico esterno

- (1) Macrostress  $\rightarrow$  n grani
- (2) Microstress 2<sup>a</sup> specie  $\rightarrow$  singolo grano
- (3) Microstress 3<sup>a</sup> specie  $\rightarrow$  variazioni all'interno del singolo grano



*“Lo stress residuo è prodotto da deformazioni plastiche eterogenee, trattamenti termici, transizioni/trasformazioni di fase”*

# Configurazione 5: tessitura

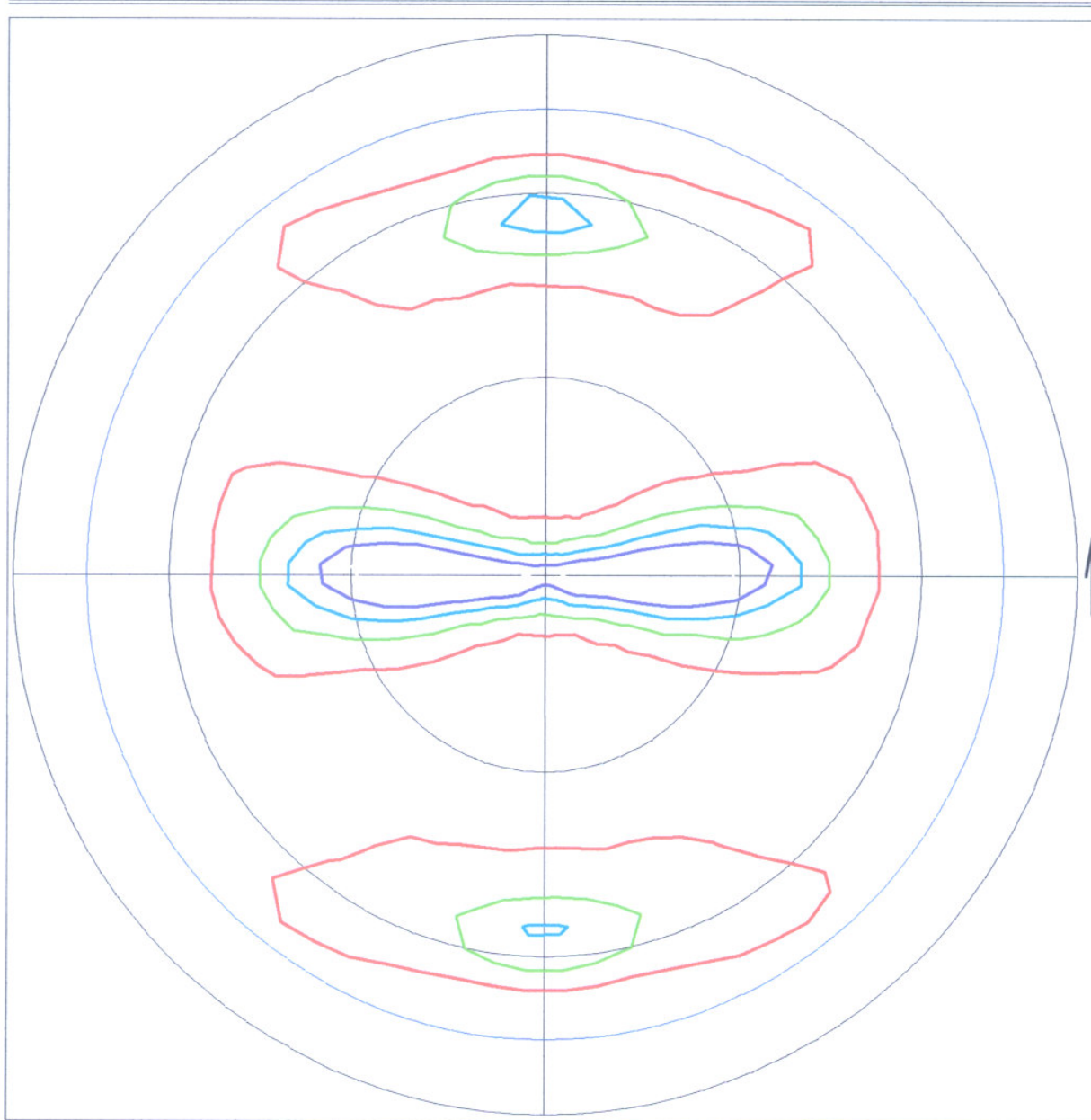
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Philips Analytical

X'Pert Texture

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ODF project:

C:\...ips\X'Pert Texture\Cu220.rw1

Pole figure: 220 Raw

Intensities:

	Psi	Phi	Intensity
Min	75.0	267.5	2809.000
Max	20.0	182.5	30032.890

Dimension: 2D

Projection: Schmidt

Scale: Linear

Colour map: Default

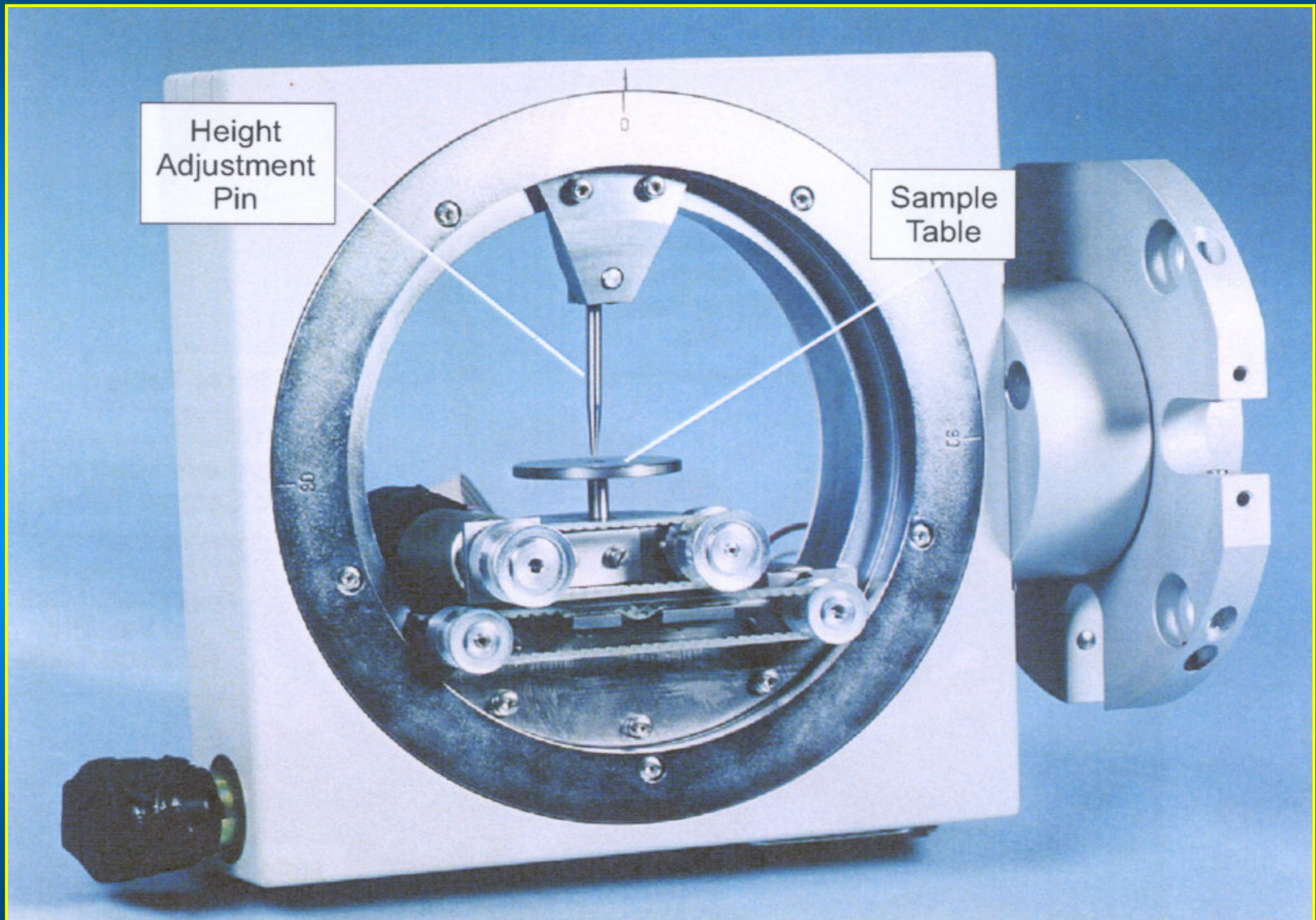
Contours: 5

	Intensity	Colour
1	7346.315	Red
2	11883.630	Orange
3	16420.945	Yellow
4	20958.260	Green
5	25495.575	Blue

Grid settings:

	Psi	Phi
First	0	0
Last	90	360
Step	30	90

# Configurazione 5: stress residuo e tessitura



## Configurazione 6: capillare

Svariate applicazioni in diversi campi: archeometrico, beni culturali, chimico, bio-chimico, mineralogico-petrografico, paleontologico, scienza dei materiali, etc dove, per diverse ragioni, è disponibile poco materiale (microvolumi), materiali con tessitura, frammenti, materiali che reagiscono all'aria, etc

