

# SOMMARIO

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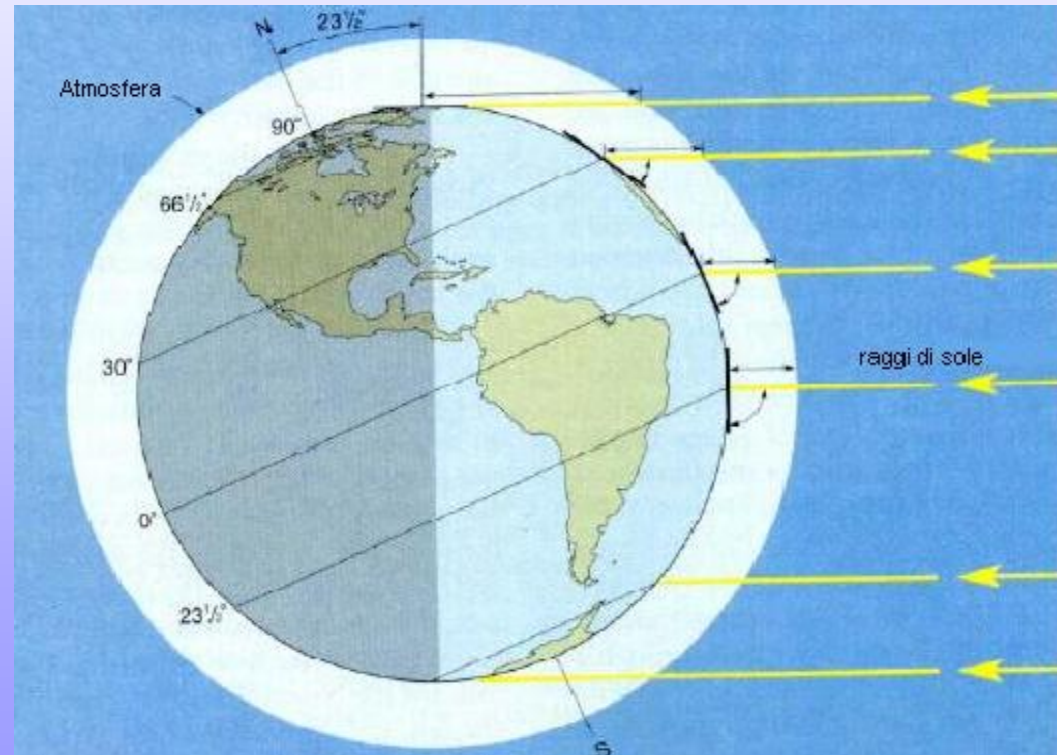
- Le Misure con le Celle Solari
- Le Misure con il Magnetometro

# Lo Spettro del Sole 1/3

L'energia emessa dal Sole che arriva sulla Terra è espressa in termini di **Costante Solare**:

*energia che incide in 1 s su una superficie di 1 m<sup>2</sup> posta ortogonale alla direzione del Sole, appena fuori dall'atmosfera terrestre*

La Costante Solare varia tra  
1326 W/m<sup>2</sup> e 1418 W/m<sup>2</sup>  
**1368 W/m<sup>2</sup>**



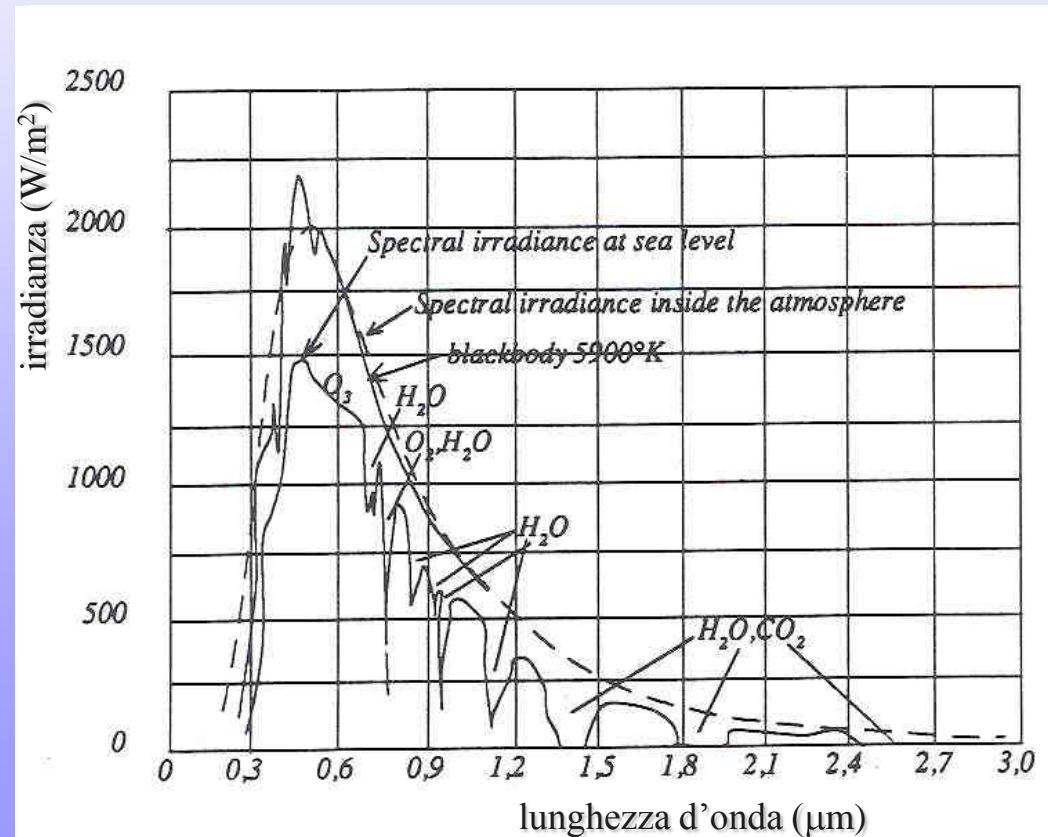
# Lo Spettro del Sole 2/3

Per considerare gli effetti dell'atmosfera, si definisce la massa d'aria unitaria **AM1 Air Mass One** che rappresenta lo spessore di atmosfera perpendicolare alla superficie terrestre e misurato a livello del mare

Al di fuori dall'atmosfera: **AM0 Air Mass Zero**

Spettro:

InfraRosso	52 %
Visibile	41%
NUV	<7%
EUV	0.1%
Radio	0.1%
X	<0.1%



# Lo Spettro del Sole 3/3

Sito web <http://snowdog.larc.nasa.gov/jin/rtset.html>

Coupled Ocean and Atmosphere Radiative Transfer (COART)

OUTPUT:

Integrated fluxes ( $\text{W}/\text{m}^2$ ) from 0.25 to 4  $\mu\text{m}$  in spectral resolution of 0.01  $\mu\text{m}$   
TOA, Surface, 0.4 km above surface

INPUT:

JulianDay: 76, GMT (hour): 15.00, Latitude: 45.644 N, Longitude: 13.836 E  
Select an atmospheric model: MID-LATITUDE WINTER

Dati in uscita:

$\theta$	H(km)	Total Down	
68.7	100.000	5.009E+02	$\Rightarrow \alpha = 62.2\%$
68.7	0.000	3.117E+02	attenuazione atmosferica

Moltiplicando la costante solare per l'attenuazione  $\alpha$  o correggendo "total down" per  $\theta$ , troviamo la potenza che incide sulla cella:  $P \sim 850 \text{ W}/\text{m}^2$

If checked, input your **integrated ozone amount (atm-cm)**:  (1 atm-cm=1000 Dobson)  
 You can also **change these trace gas amounts** by a **factor** (1.0 for no change) of --> **CO<sub>2</sub>**:   
**CH<sub>4</sub>**:

Select **Mixed layer aerosol**:  & **Stratospheric aerosol**:

Select a method to specify aerosol loading (To be ignored if "No aerosol" selected above):

by **Visibility (km)**:   by **AOT at 0.5um**:   by **AOT at 0.55um**:   
 If checked, input aerosol optical properties in the table below (not required to fill all elements, undefined numbers will be fit in by the selected model above):

<b>λ(um):</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>AOT:</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>SSA:</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>g:</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

If checked, upload **aerosol phase function** file:

Select **Cloud**:  **Bottom(km)**:  **Top(km)**:  ; size **RE(um)**:   
 **LWP(g/m<sup>2</sup>)**:  or  **OpticalDepth(0.6um)**:  (**RE** is effective size for nonspheric)

## Ocean

**Wind speed(m/s)**:  **Depth (m)**:  **Bottom albedo**:  **Chl (mg/m<sup>3</sup>)**:   
 (Chlorophyll)

Particle scattering coefficient (m<sup>-1</sup>):  $b_p(\lambda) = b_0(550/\lambda)^n \times [Chl]^k$ ; Input **b<sub>0</sub>**: , **n**:   
 and **k**:

Particle scattering **phase function**  If use **F-F** func., input **bb/b**:

If checked, input absorption **a(m<sup>-1</sup>)**:  (Override the default parameterization)

If checked, input your **a<sub>440</sub><sub>DOM</sub>(m<sup>-1</sup>)**:  (DOM absorption coefficient at 440nm)

If checked, ignore surface roughness and assume **Flat ocean surface**.

\*Note: Input *Depth=0* will ignore the ocean and ocean inputs above (no water, same as atmosphere-land case).

. . . Not clear on some input? Read "The Input" section [Here](#)



For comments/questions contact [Zhonghai Jin](#), but to read this [NOTE](#) first may help you.

Responsible NASA Official: [Dr. Thomas Charlock](#) Questions: [Zhonghai Jin](#) Last Updated: 2014/04/22 [NASA Privacy Statement](#) [Feedback on Langley Products and Services](#)

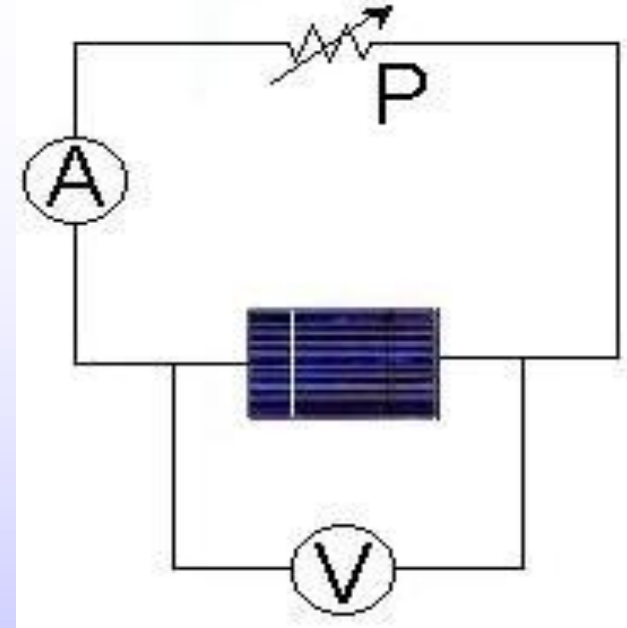
# L'Esperimento 1/2

La disposizione della cella dev'essere ortogonale al Sole: si appoggia la base di un cilindretto cavo a un vetrino parallelo alla struttura. Quando vediamo nell'ombra della base il Sole ("ombra a cerchietto") i raggi sono ortogonali alla struttura

A parte c'è un fotodiiodo a cui viene connesso un voltmetro per controllare che la cella sia sempre ortogonale al Sole, facendo attenzione che la tensione letta sia sempre massima

Cella al Silicio Si

- dimensioni: ....
- degradamento all'anno: 3.75%
- degradazione inerente  $I_d$ : 1



V - voltmetro

A - amperometro

P – potenziometro  
& resistenze

# L'Esperimento 2/2

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Moltiplicando  $P=850 \text{ W/m}^2$  per l'area della cella abbiamo la potenza che incide sulla cella:  $P_{s \text{ teorica}} \sim \text{xxx W}$

## Parametri caratteristici:

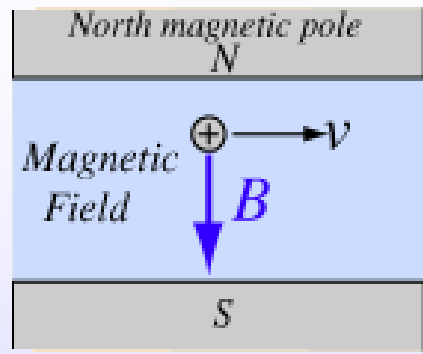
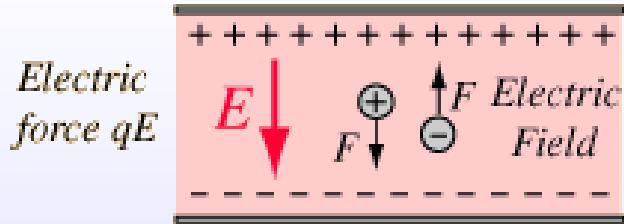
$V_{oc}$  = Open Circuit Voltage - tensione se la corrente non passa attraverso il circuito = xxx V

$I_{sc}$  = Short Circuit Current - corrente dove il voltaggio è zero = xxx A

$\Rightarrow P_{s \text{ misurata}} = \text{area sotto la curva} \sim V_{oc} \times I_{sc} = \text{xxx W}$

$$\Rightarrow \eta = P_{s \text{ misurata}} / P_{s \text{ teorica}} = \sim 15 \%$$

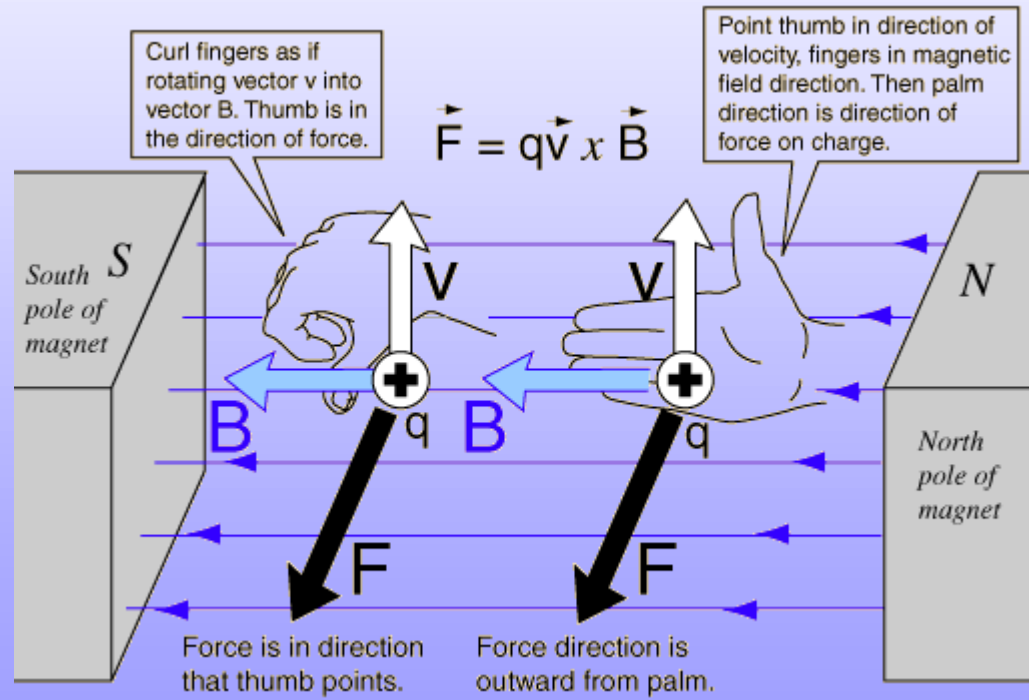
# Effetto Hall 1/5



Magnetic force of magnitude  $qvB\sin\theta$  perpendicular to both  $v$  and  $B$ , away from viewer.

$$\vec{F} = q\vec{E} + q\vec{v} \times \vec{B}$$

Electric force                      Magnetic force





# Effetto Hall 2/5

$F = qvB$   
 $F$ ,  $B$ , and  $v$  are three mutually perpendicular vectors.

Positive test charge

$F = qvB$

Positive charge moving through magnetic field

Positive charge moving through stationary wire in magnetic field.

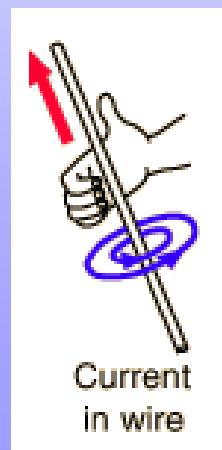
$F = ILB$

Wire moved through magnetic field by external force.

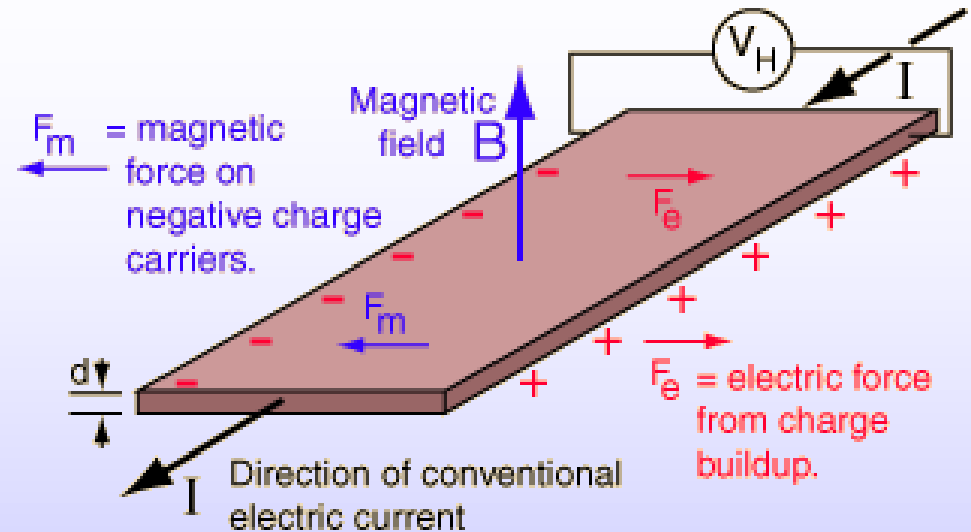
force on positive charge

induced voltage

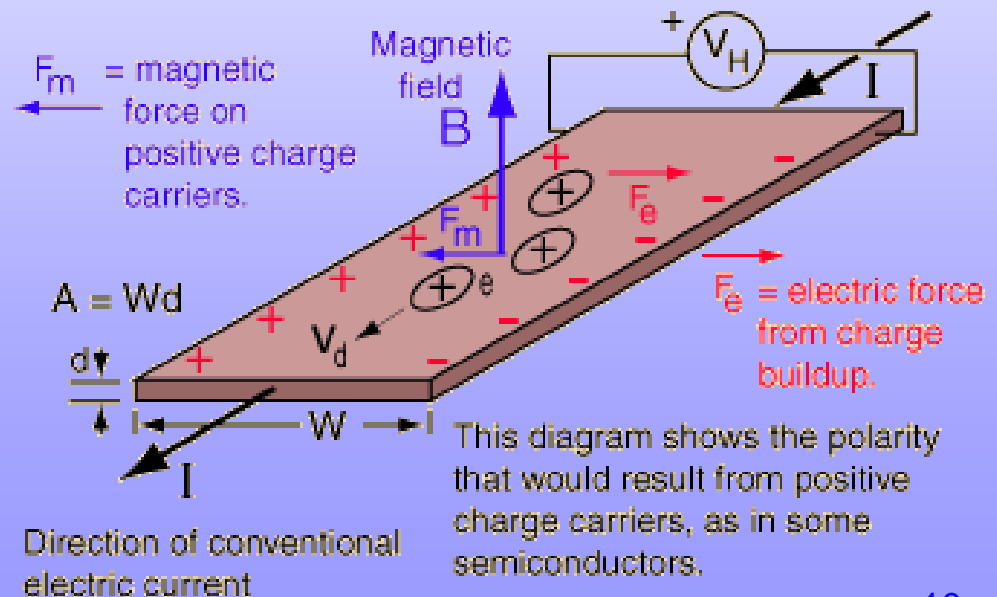
$emf = vBL$



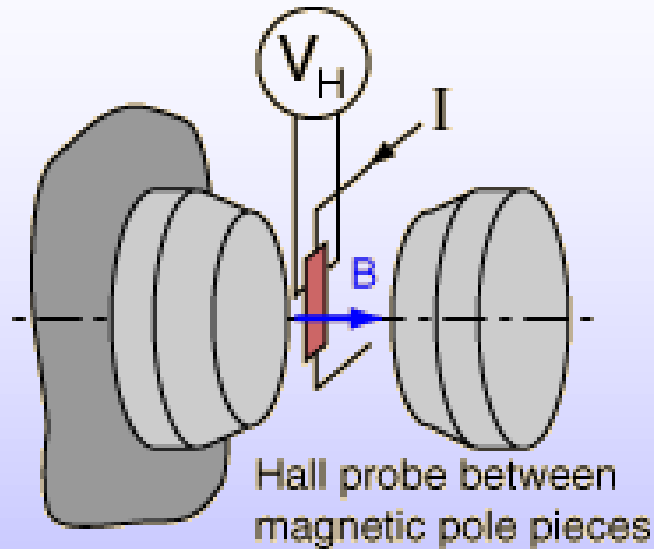
# Effetto Hall 3/5



$$V_H = \frac{IB}{ned}$$

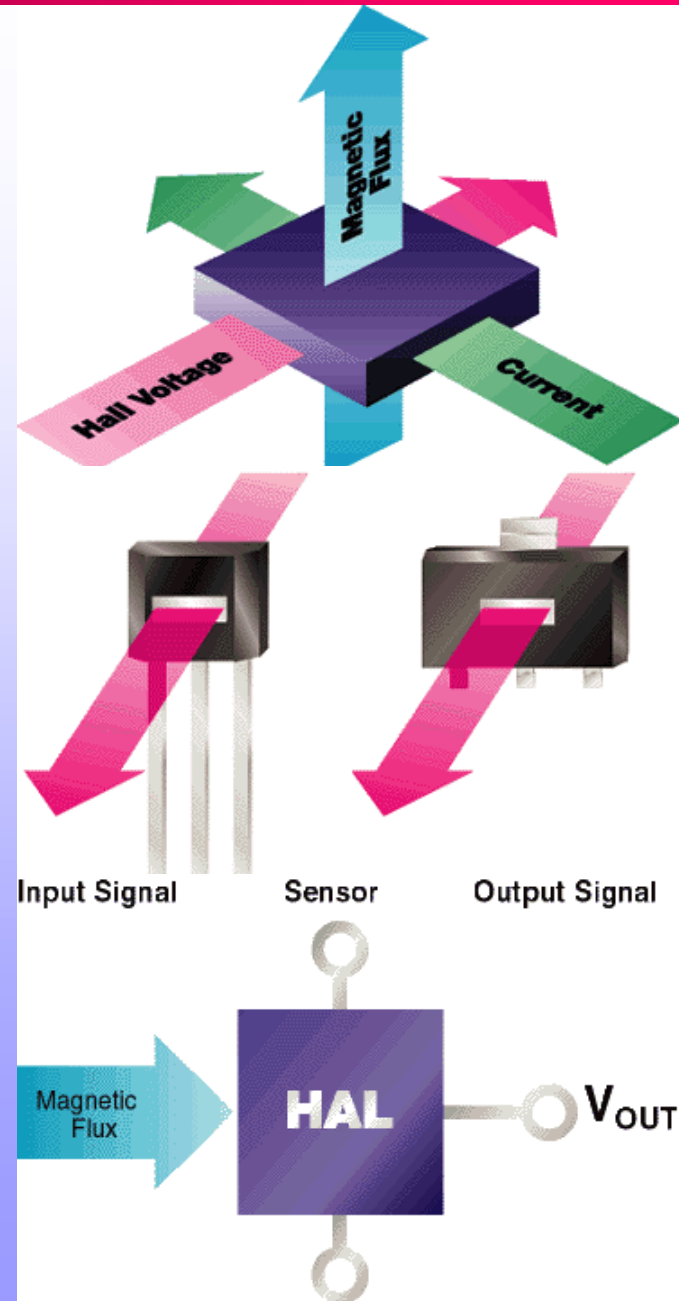


# Effetto Hall 4/5

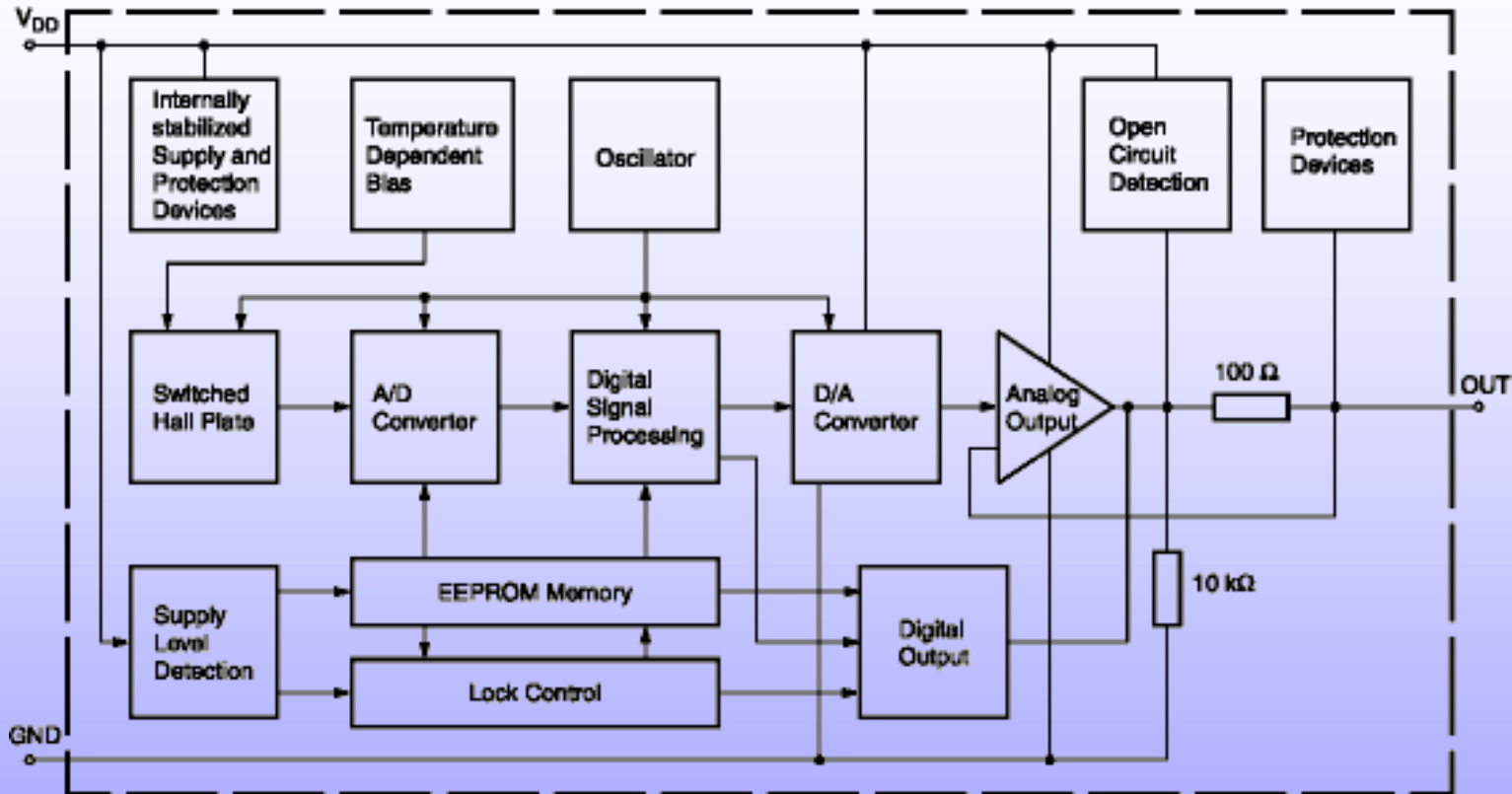


The polarity of the Hall voltage for a copper probe shows that electrons are the charge carriers.

$$n_{\text{rame}} = 8.47 \cdot 10^{28} \text{ e}^-/\text{m}^3$$



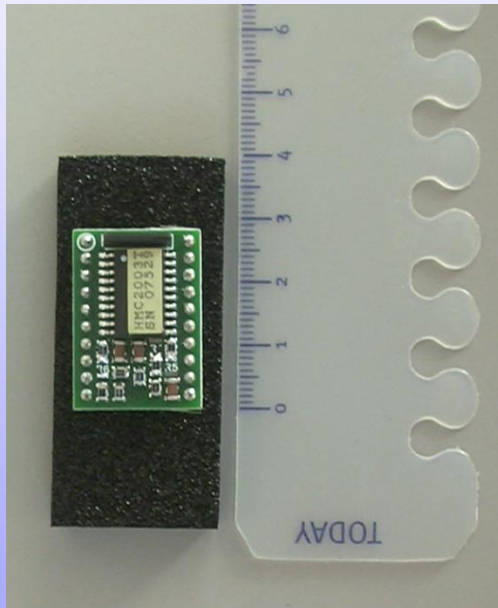
# Effetto Hall 5/5



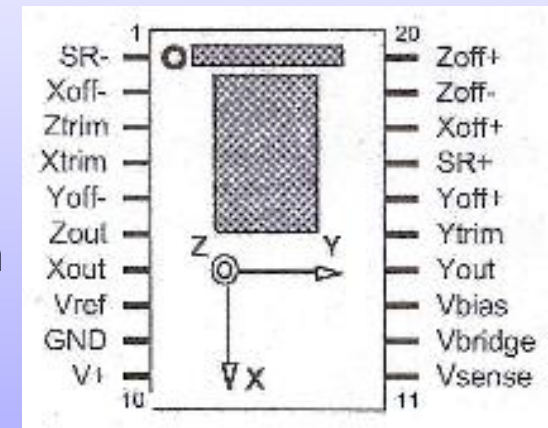
# Magnetometro 1/5

## COMPORAMENTO E TARATURA DEL SENSORE MAGNETICO

### HONEYWELL HMC2003



- misure sui tre assi
- range: 2 gauss
- sensibilità: 40  $\mu$ gauss
- dimensioni: 28,4 mm  $\times$  19,1 mm
- peso: 4 g



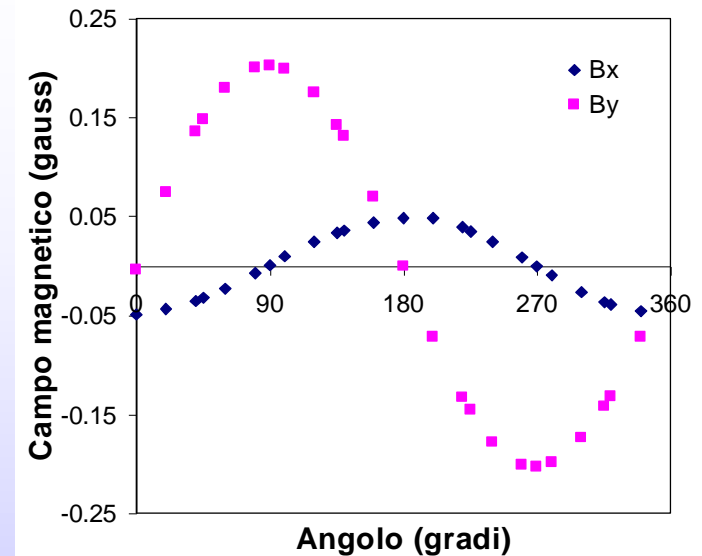
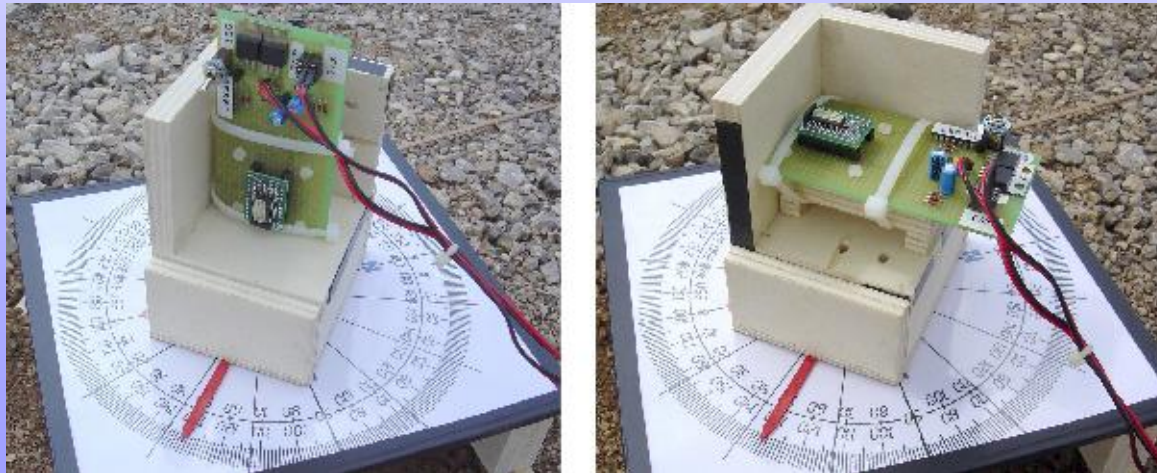
- 1 volt  $\Leftrightarrow$  1 gauss
- offset: 2.3 2.5 volt

# Magnetometro 2/5

## IL CIRCUITO

- attivazione del circuito di set/reset
- costruzione di una struttura cubica per permettere la rotazione del sensore sui piani x-y, y-z e x-z

## LA STRUTTURA DI TEST

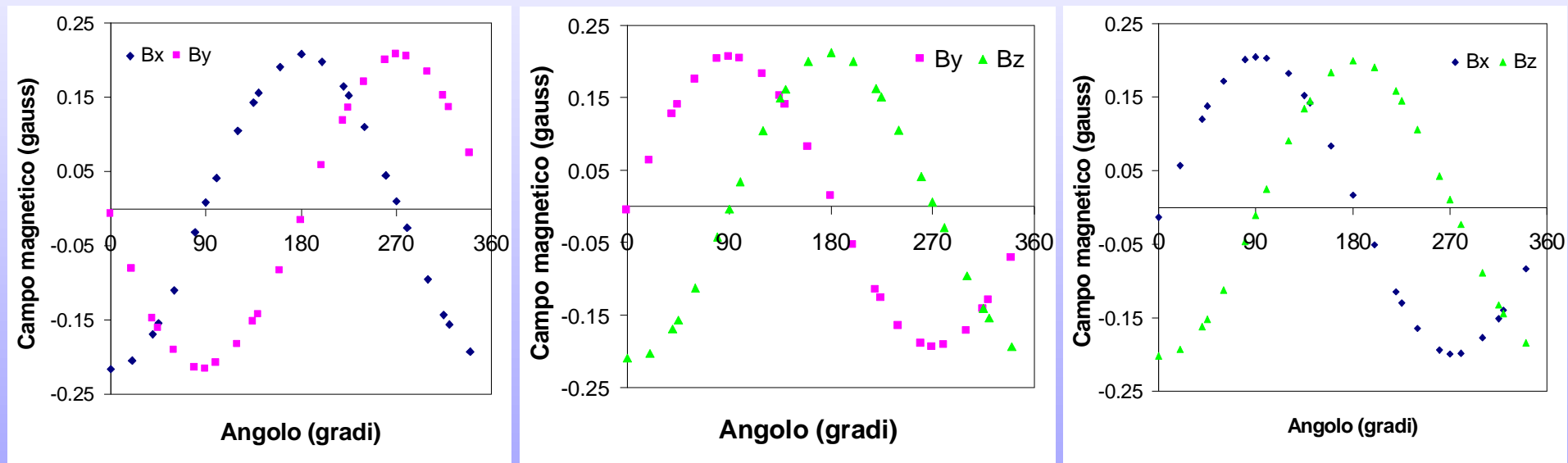


# Magnetometro 3/5

Le misure effettuate sulle tre seguenti configurazioni

- rotazione sul piano x-y
- rotazione sul piano y-z
- rotazione sul piano x-z

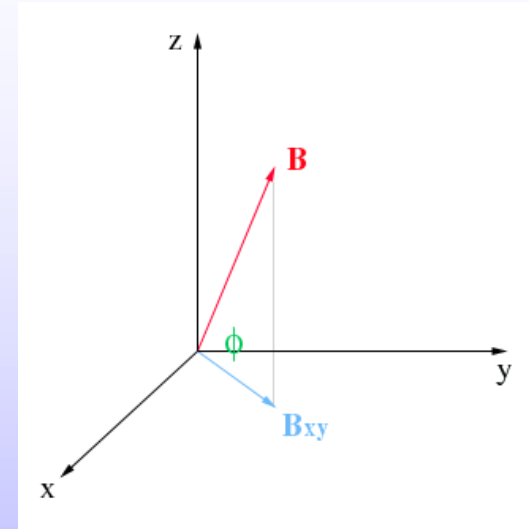
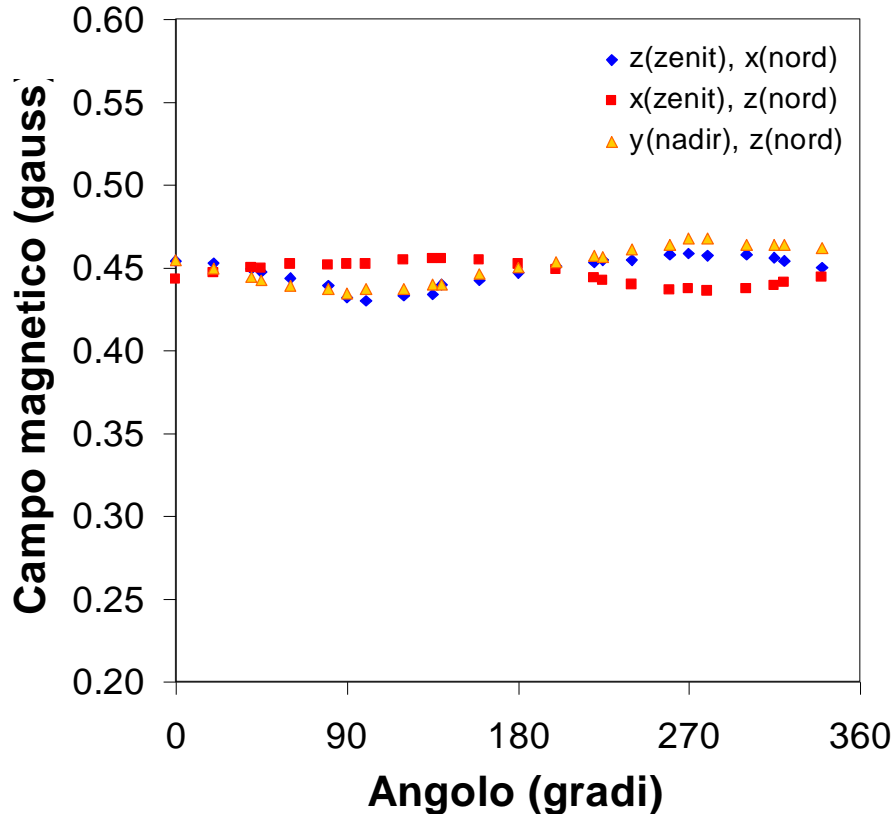
hanno permesso di ricavare gli andamenti delle componenti di B



e di ricavare gli offset relativi ai tre assi

# Magnetometro 4/5

## MODULO DEL CAMPO MAGNETICO



Componenti  
tangenziali  
e radiale



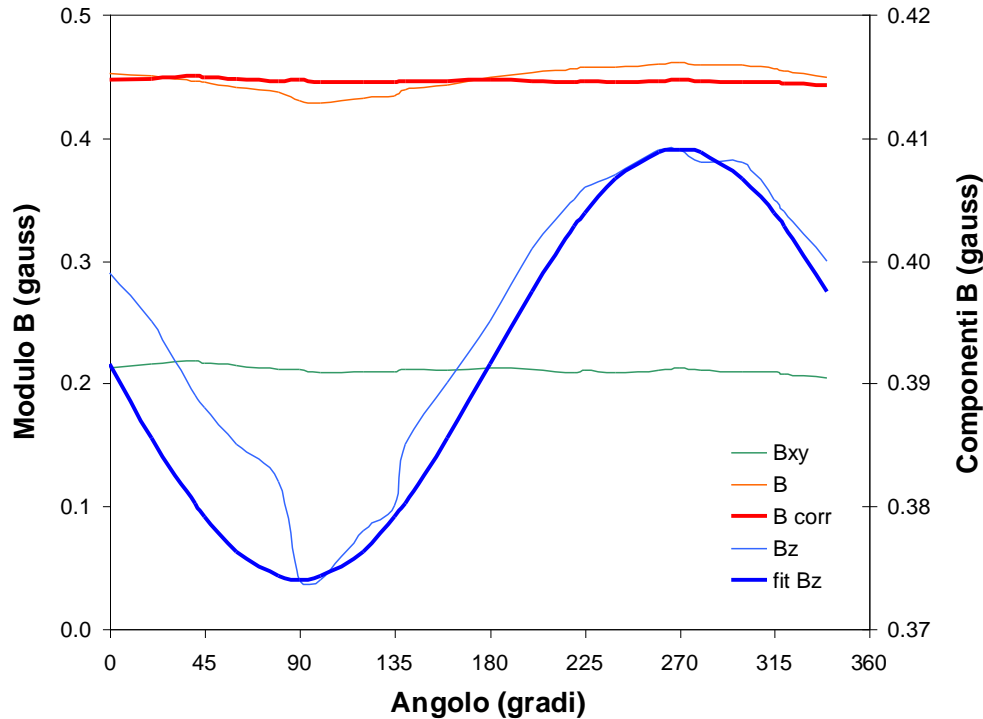
Inclinazione di B  
rispetto  
al suolo



$\phi_{\text{HMC2003}} = 58$   
 $\phi_{\text{IGRF}} = 61$



# Magnetometro 5/5



$\alpha$  = angolo tra gli assi z e z'

$$\alpha = 4.7$$



Componente sottostimata del 2.4%

**CONFRONTO CON UNO  
STRUMENTO GIÀ TARATO**

## Misura simultanea:

- magnetometro di Scienze Geologiche, Ambientali e Marine:  $B = 0.474$  gauss

- magnetometro HMC2003:

$$B_{\text{HMC2003}} = 0.460 \text{ gauss}$$

$$= 0.466 \text{ gauss (dopo correzione)}$$

