

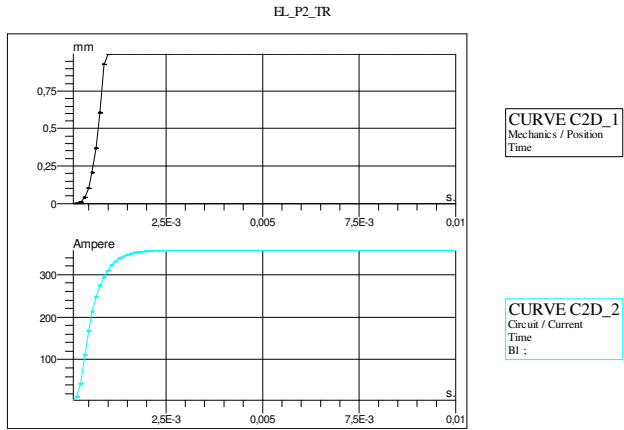
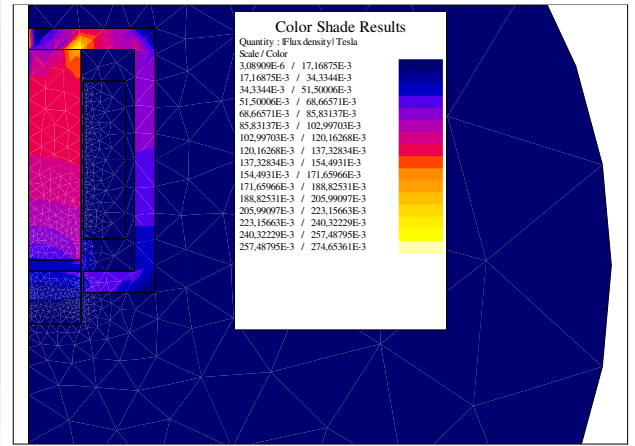
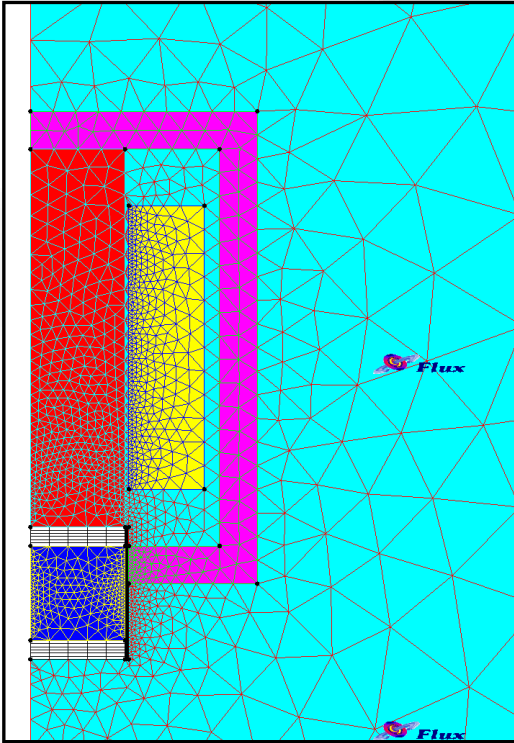
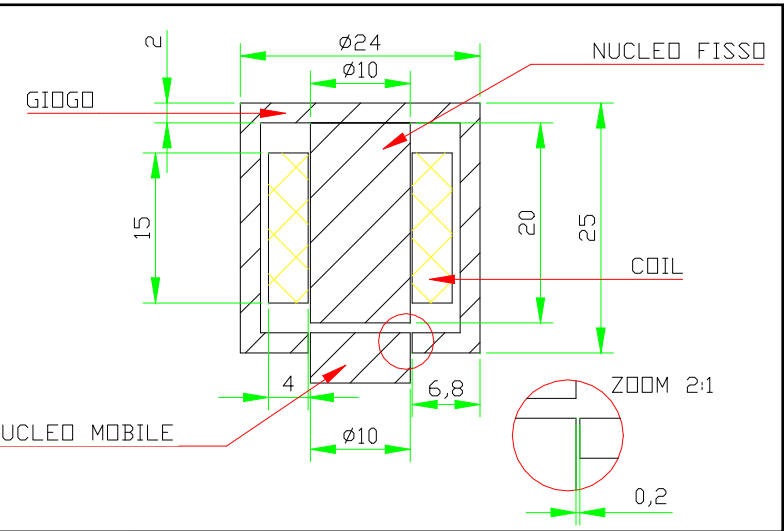
ESERCITAZIONE ELETTROMAGNETE

ESEMPIO FLUX 2D **(Magneto Static, Transient Magnetic)**



ESERCITAZIONE

ELETTROMAGNETE 2D



SOMMARIO

PARTE A:

Applicazione MAGNETO STATIC

Creazione del Modello

- Geometria
 - Mesh
 - Physics

Soluzione

- **Impostazione soluzione parametrica**

Analisi dei Risultati

PARTE B:

Applicazione TRANSIENT MAGNETIC

Creazione del Modello

- Geometria
 - Mesh
 - Physics
 - Circuit

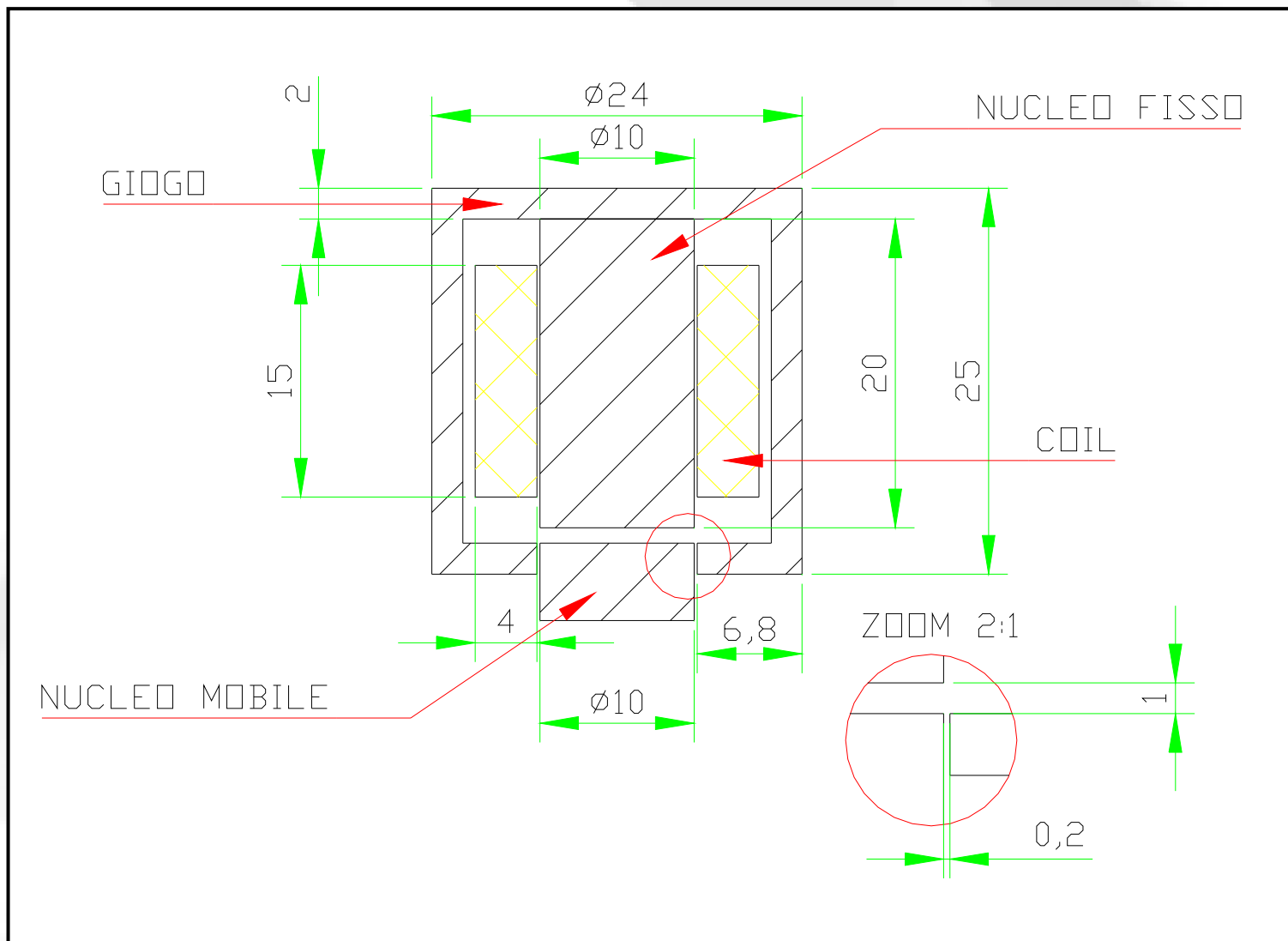
Soluzione

- **Impostazione soluzione parametrica**

Analisi dei Risultati

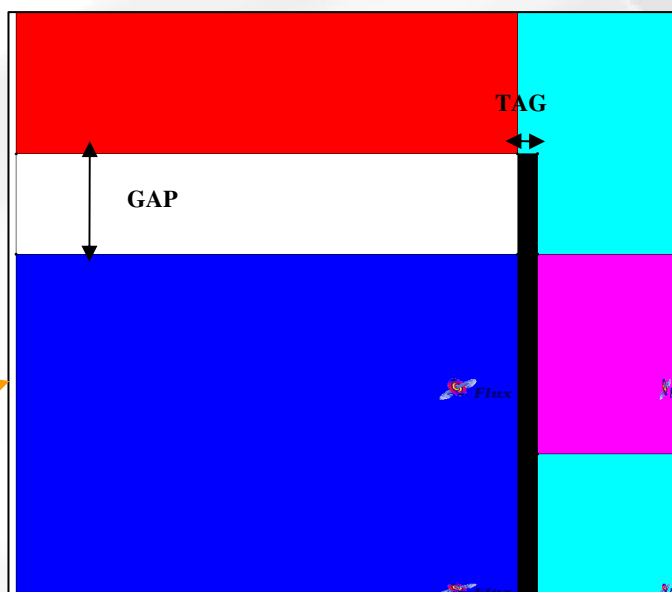
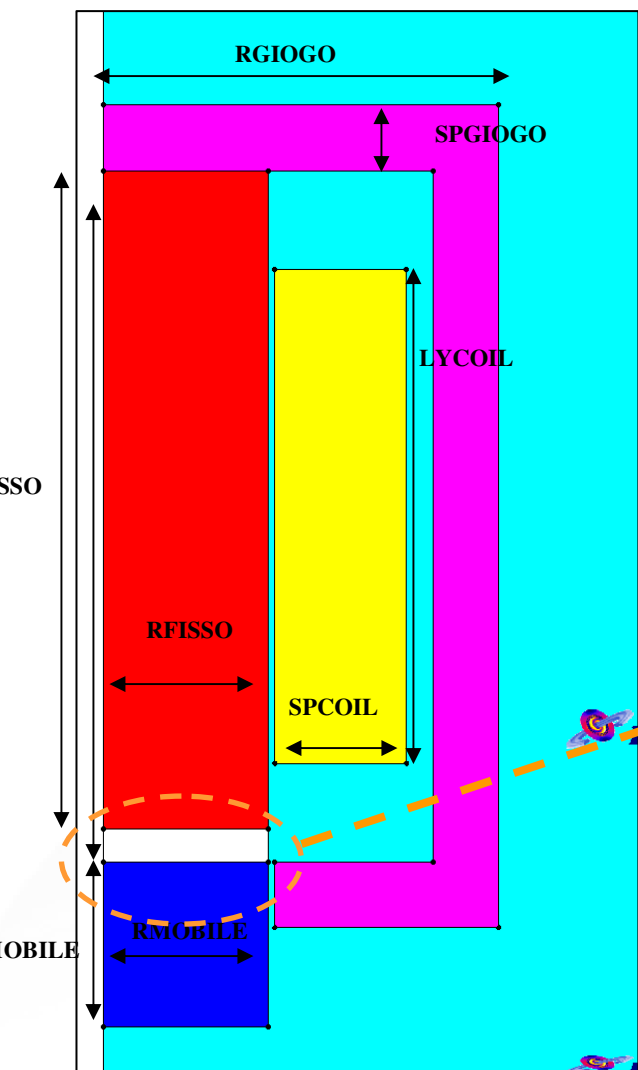
MAGNETO STATIC: Creazione del Modello

➤ Geometria



MAGNETO STATIC: Creazione del Modello

➤ Geometria – Parametrizzazione completa



Parametro	Valore
RGIOGO	12
SPGIOGO	2
RFISSO	5
LYFISSO	20
RMOBILE	5
LYMOBILE	5
GAP	1
TAG	0.2
SPCOIL	4
LYCOIL	15

Nel modello di FLUX2D si sfrutta la simmetria

MAGNETO STATIC: Creazione del Modello

➤ Geometria – definizione dei sistemi di riferimento

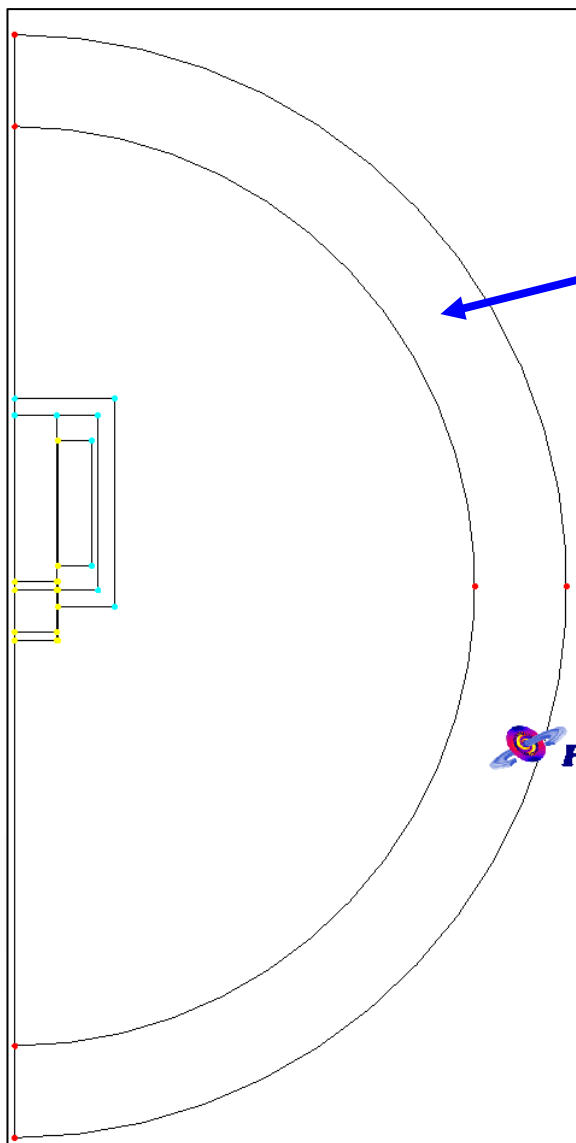


Parametro	Valore
RINTCOIL	5.2
POSY_COIL	2
GAP	1



MAGNETO STATIC: Creazione del Modello

➤ Infinite BOX e Mesh



INFINITE BOX

RINT_ARIA	55.2
REST_AIR	66.2

MESH POINT

TIPO	COLORE	VALORE
SMALL	Yellow	GAP/4
MEDIUM	Cyan	RFISS0/2
LARGE	Red	20

SPIN

Applicazioni Magnetiche S.r.l.

www.spinmag1.it

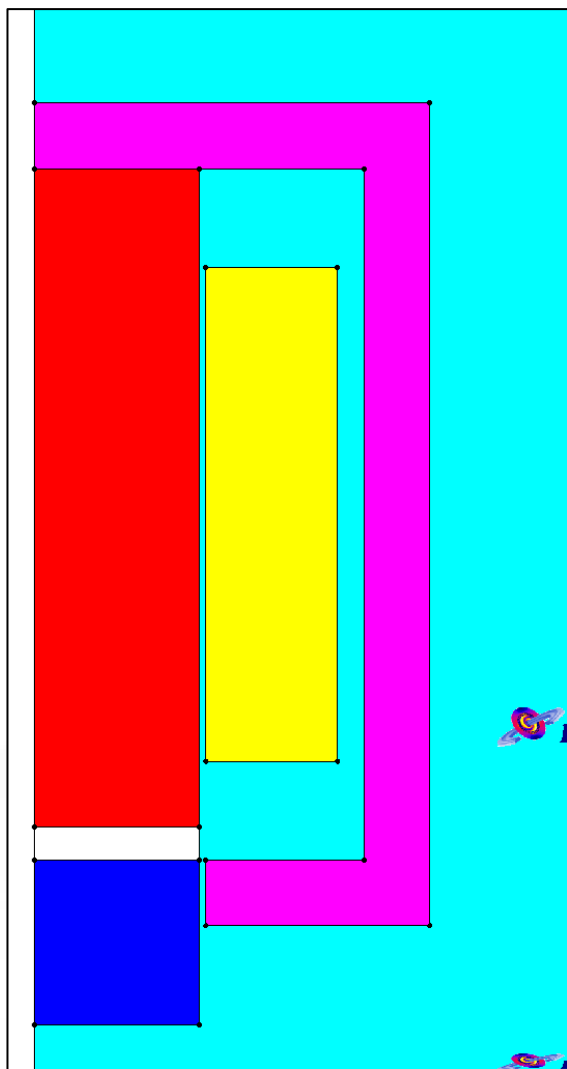
**... OPEN FLUX2D
Geometry & Physics...**

GRUPE
CEDRA

www.cedrat.com

MAGNETO STATIC: Creazione del Modello

➤ PHYSICS – Caratteristiche dei Materiali



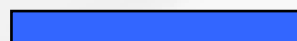
NUCLEO FISSO



GIOGO



NUCLEO MOBILE



COIL



ARIA



CORSA



AISI430

Permeabilità magnetica relativa	Saturazione
800	1.6 T

COPPER

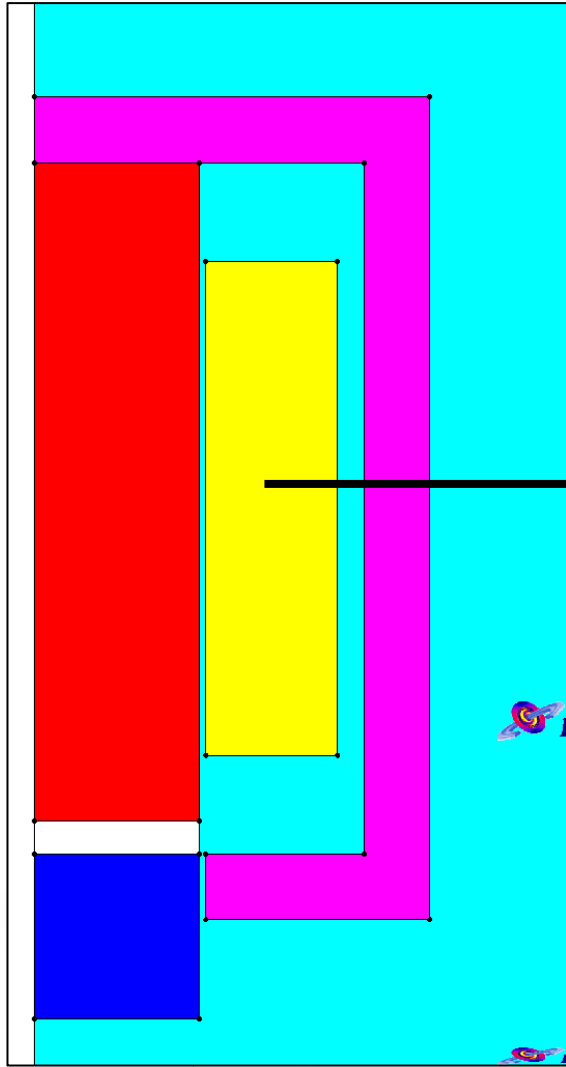
Permeabilità magnetica relativa	Resistività elettrica
1	1.78e-8 Ohm m

ARIA

SPIN

MAGNETO STATIC: Creazione del Modello

➤ PHYSICS – Caratteristiche elettriche



STRANDED COIL CONDUCTOR

Corrente Imposta	Numero di Spire	Fill Factor	Resistenza elettrica
2 A	1900	0.8	60.5 Ohm

SPIN

Applicazioni Magnetiche S.r.l.

www.spinmag1.it

**... OPEN FLUX2D
Geometry & Physics...**



www.cedrat.com

MAGNETO STATIC: Soluzione

➤ Influenza del parametro geometrico TAG

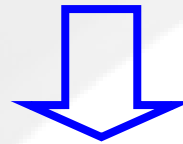
The screenshot shows the 'TAG' configuration window in the SOLVER_2D software. The 'Geometrical parameter 10' table is as follows:

Num	Limit 1	Limit 2	Method	Data
1	0.2	0.5	Value of step	0.1

The 'Values display' dialog box shows the following settings:

- Number of required computations: 4
- Validity domain:]-INFINITY, +INFINITY [
- Variation way: ascending
- Default reference value: 0.2
- New reference value: 0.2

The dialog box also displays a list of values: 0.2, 0.3, 0.4, 0.5.



TAG = 0.2 / 0.3 / 0.4 / 0.5

**... OPEN FLUX2D
Direct...**

MAGNETO STATIC: Soluzione

➤ Influenza del parametro fisico PERMEABILITÀ MAGNETICA RELATIVA

SOLVER_2D - [EL_P2_MS]

File Method Views ?

EL_P2_MS

- Geometry
- materials
 - NUCLEO_FISSO : Isotropic Mu, analytic saturation
 - Magnetic saturation (Tesla)
 - Initial slope
 - NUCLEO_MOBILE : Isotropic Mu, analytic saturation
 - Magnetic saturation (Tesla)
 - Initial slope
 - GIOGO : Isotropic Mu, analytic saturation
- Sources
- others

NUCLEO_FISSO : Isotropic Mu, analytic saturation

Magnetic saturation (Tesla)

Num	Limit 1	Limit 2	Method	Data
-----	---------	---------	--------	------

Variation method

Value of step

Number of steps

List of values

Validity domain : [1.e-35, +INFINITY [

Variation way : any

Default reference value : 1.6

New reference value : 1.6

Repeat Display

Link Delete

Initial slope

Num	Limit 1	Limit 2	Method	Data
1	800.	1200.	Value of step	200.

Variation method

Value of step

Number of steps

List of values

Validity domain : [1., +INFINITY [

Variation way : ascending

Default reference value : 800

New reference value : 800

Repeat Display

Link Delete

Values display

Number of required computations : 3

Validity domain : [1., +INFINITY [

Variation way : ascending

Default reference value : 800

New reference value : 800

OK

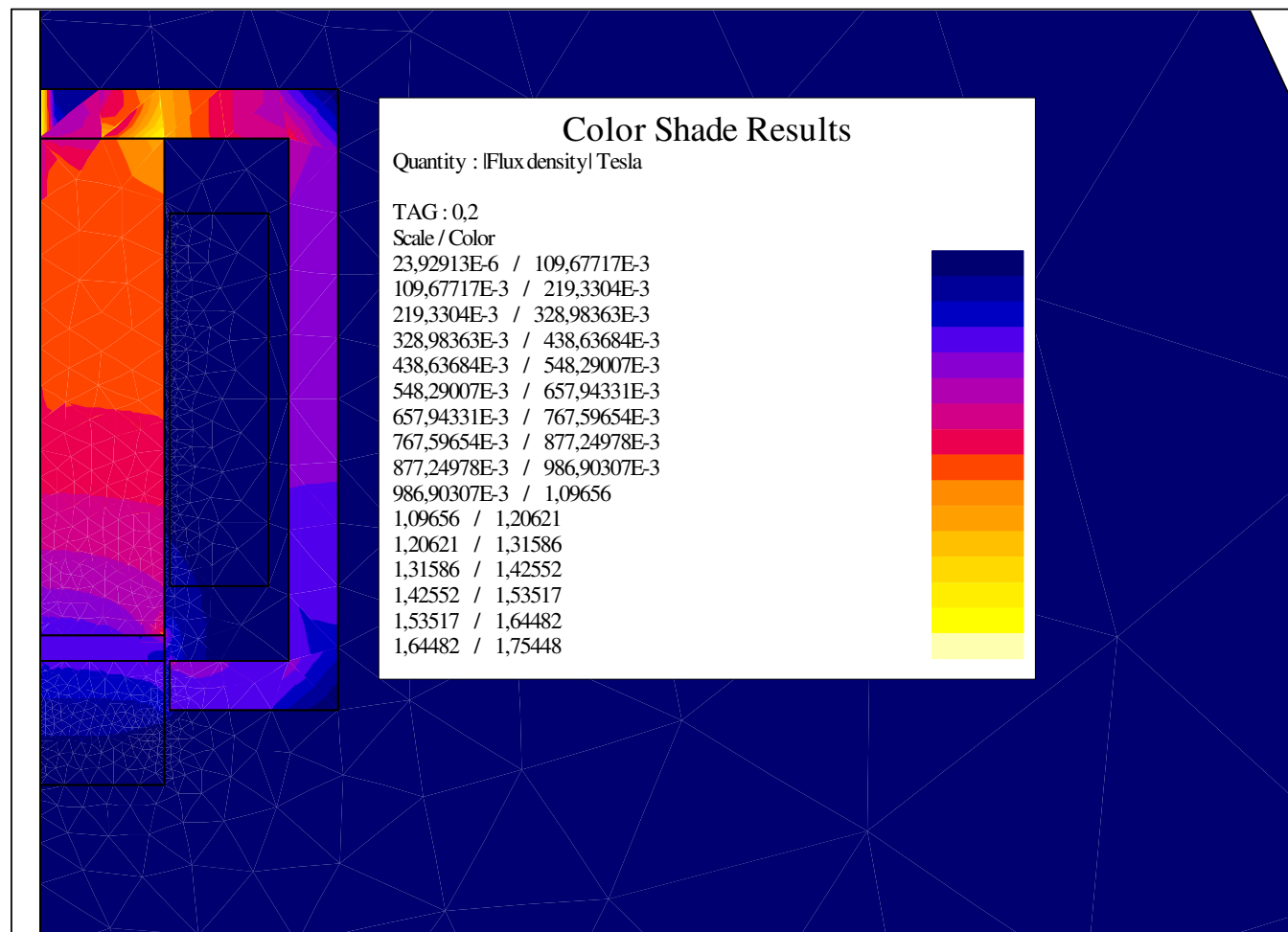
800 / 1000 / 1200

... OPEN FLUX2D
Direct...



MAGNETO STATIC: Analisi dei Risultati

➤ Distribuzione dell' Induzione Magnetica

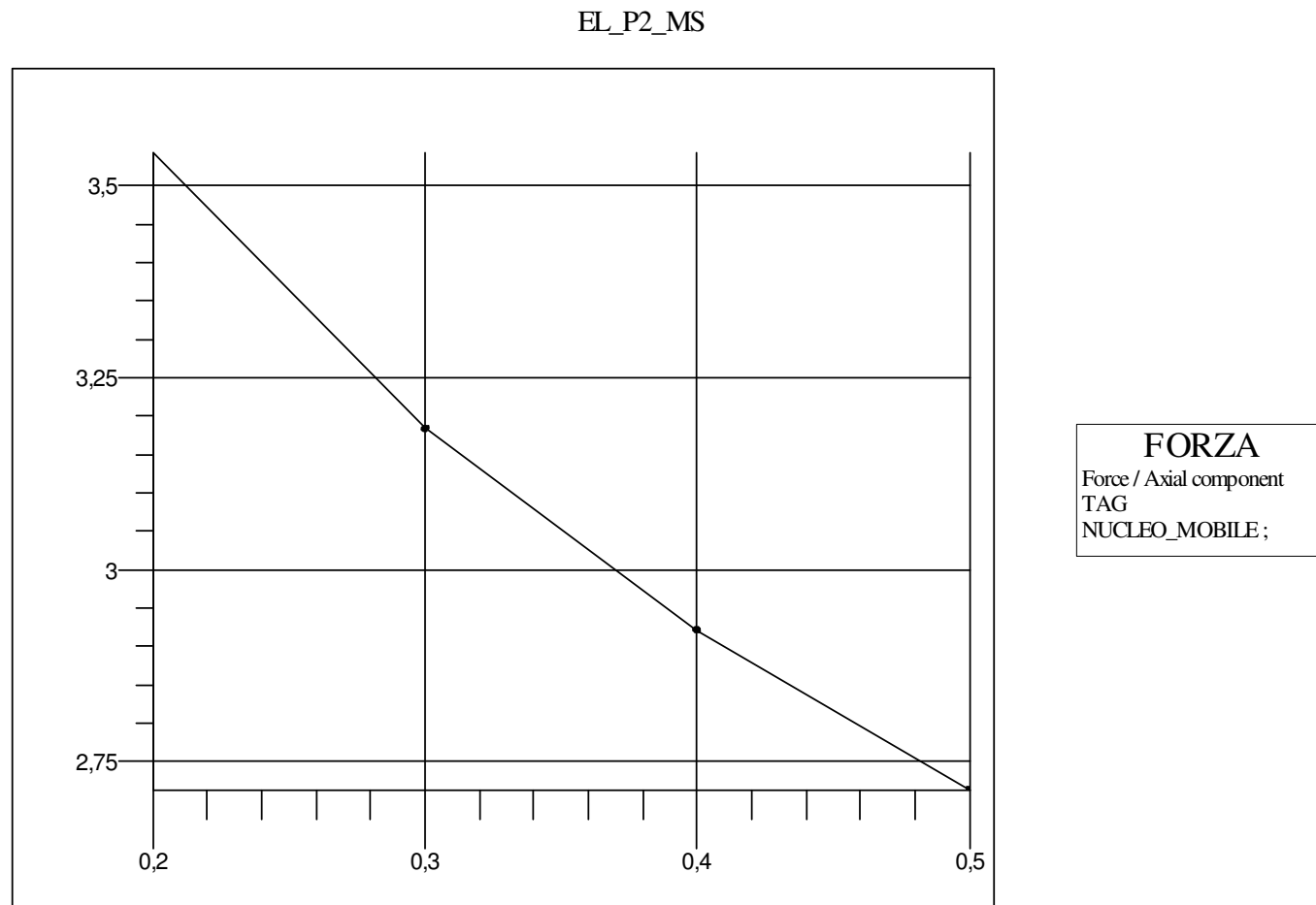


... OPEN FLUX2D
Results...¹²



MAGNETO STATIC: Analisi dei Risultati

➤ Andamento della Forza agente sul NUCLEO MOBILE in funzione del parametro geometrico TAG

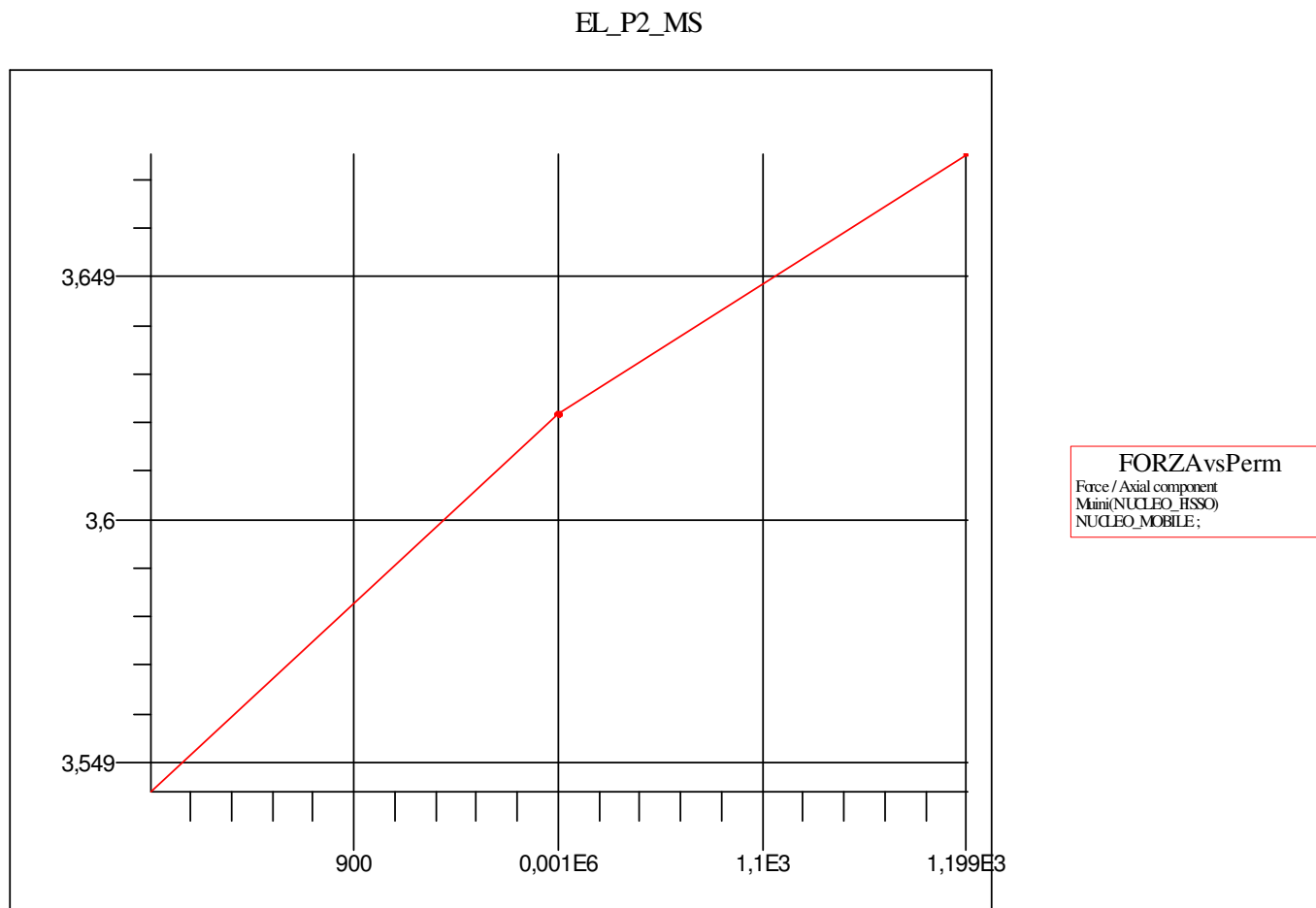


... OPEN FLUX2D
Results...¹³



MAGNETO STATIC: Analisi dei Risultati

➤ **Andamento della Forza agente sul NUCLEO MOBILE in funzione della Permeabilità magnetica relativa**

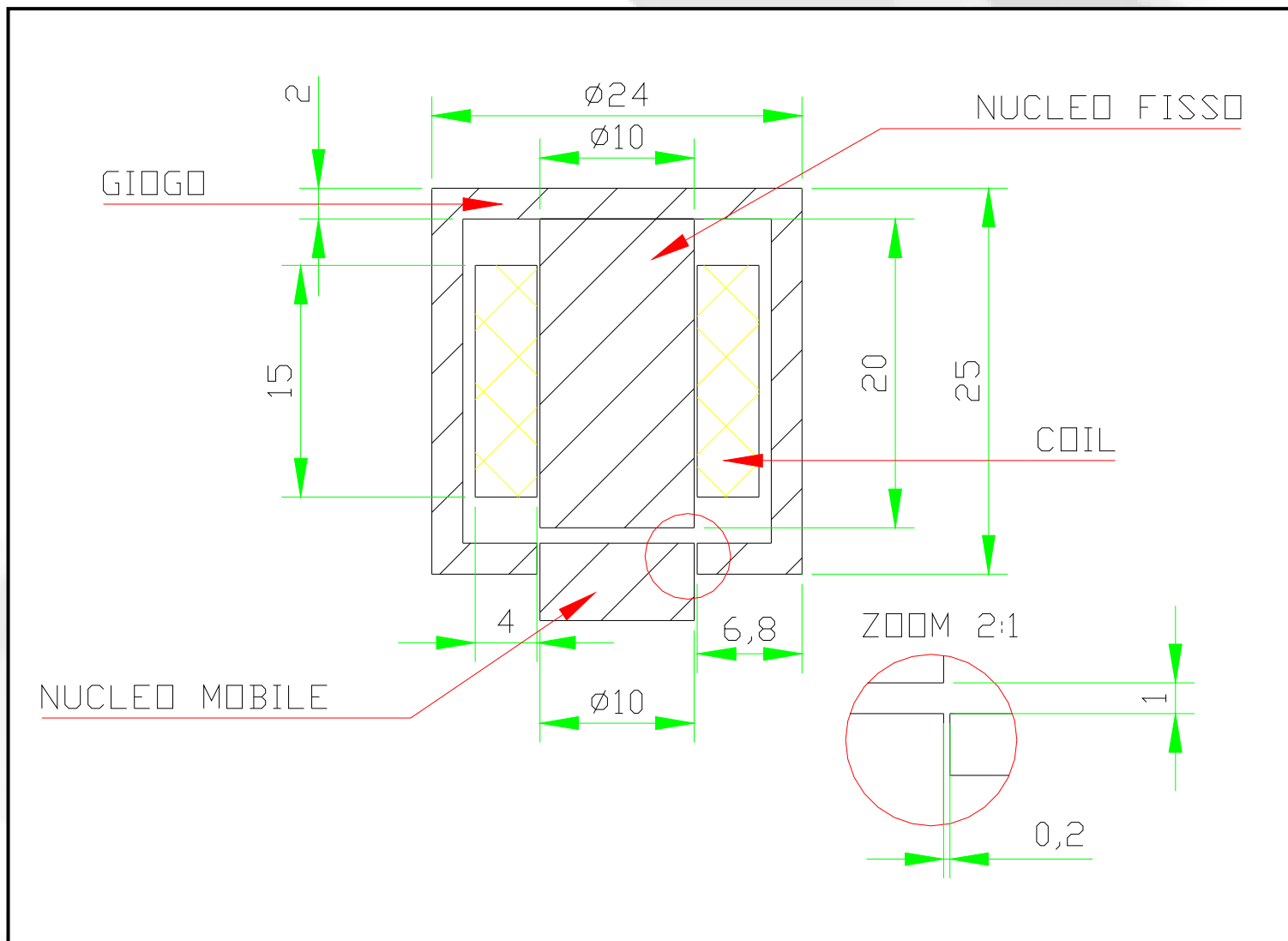


**... OPEN FLUX2D
Results...**



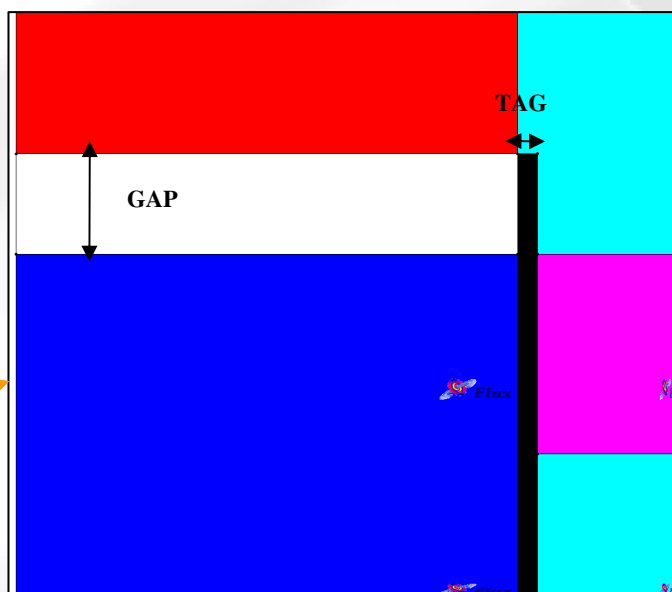
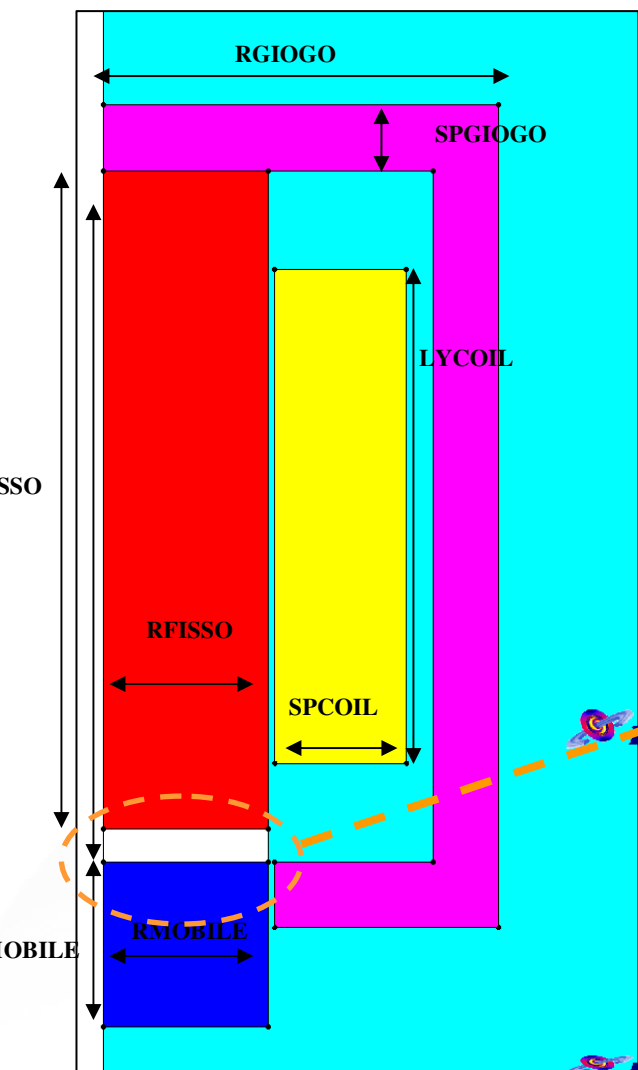
TRANSIENT MAGNETIC: Creazione del Modello

➤ Geometria



TRANSIENT MAGNETIC : Creazione del Modello

➤ Geometria – Parametrizzazione completa



Parametro	Valore
RGIOGO	12
SPGIOGO	2
RFISSO	5
LYFISSO	20
RMOBILE	5
LYMOBILE	5
GAP	1
TAG	0.2
SPCOIL	4
LYCOIL	15

Nel modello di FLUX2D si sfrutta la simmetria

TRANSIENT MAGNETIC : Creazione del Modello

➤ Geometria – definizione dei sistemi di riferimento

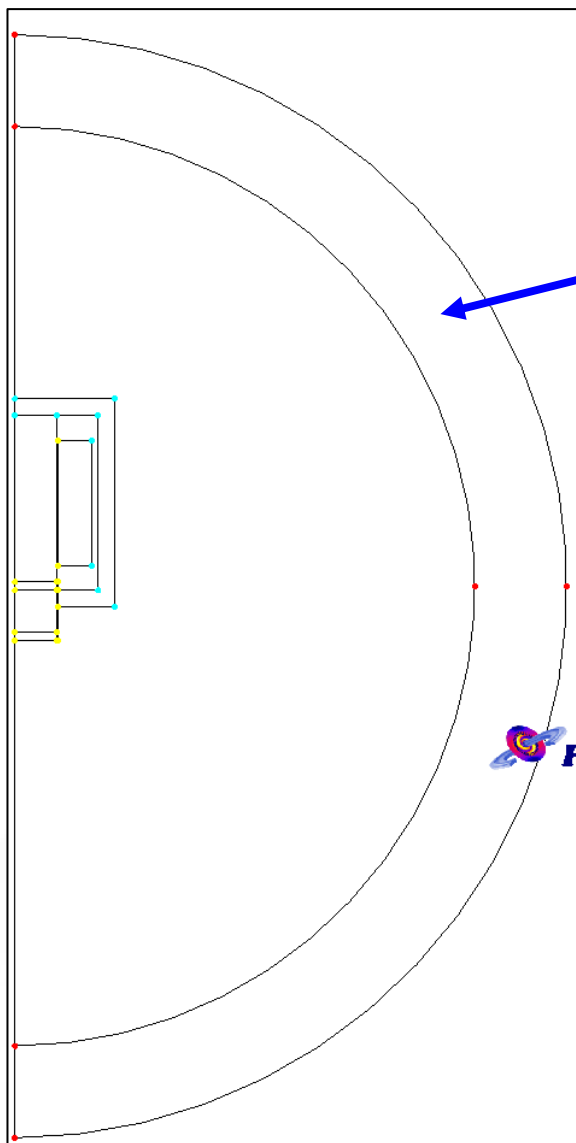


Parametro	Valore
RINTCOIL	5.2
POSY_COIL	2
GAP	1



TRANSIENT MAGNETIC : Creazione del Modello

➤ Infinite BOX e Mesh



INFINITE BOX

RINT_ARIA	55.2
REST_AIR	66.2

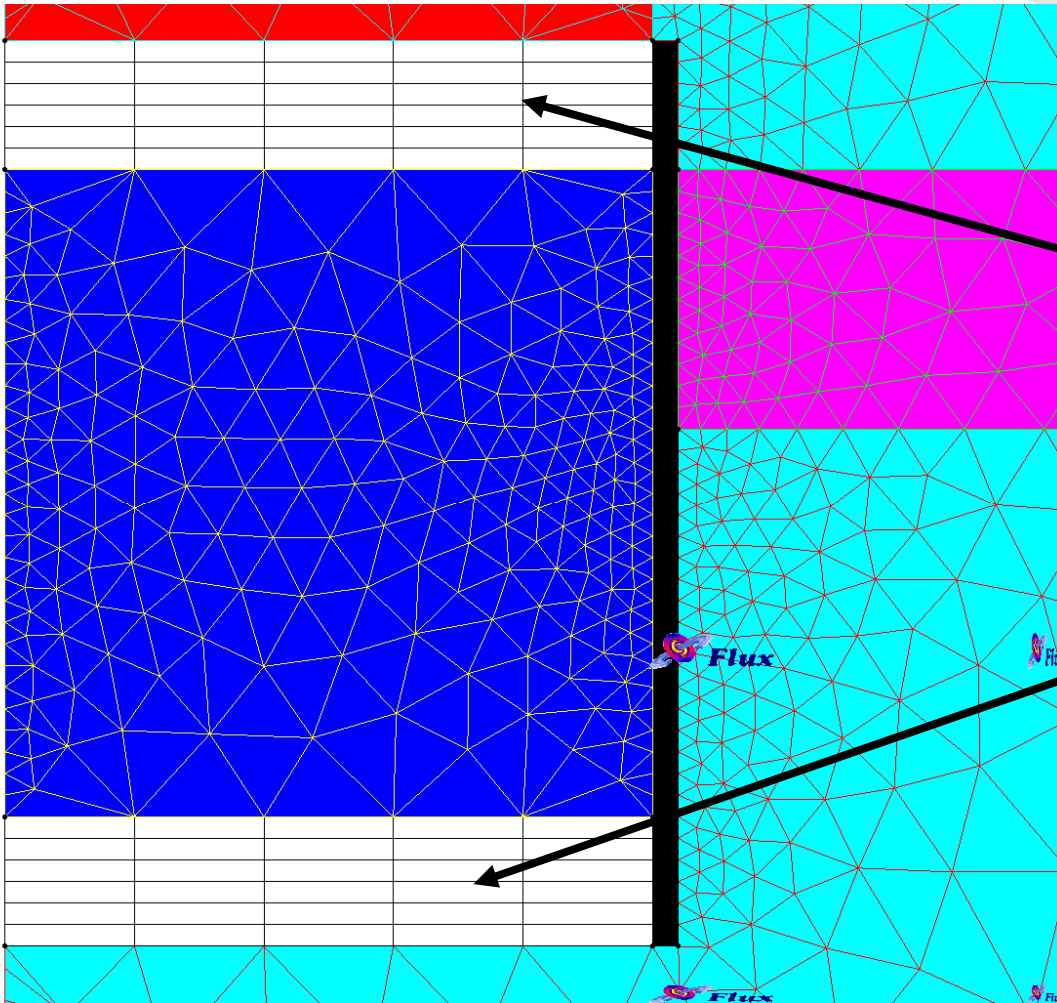
MESH POINT

TIPO	COLORE	VALORE
SMALL	Yellow	GAP/4
MEDIUM	Cyan	RFISS0/2
LARGE	Red	20

SPIN

TRANSIENT MAGNETIC : Creazione del Modello

➤ Infinite BOX e Mesh



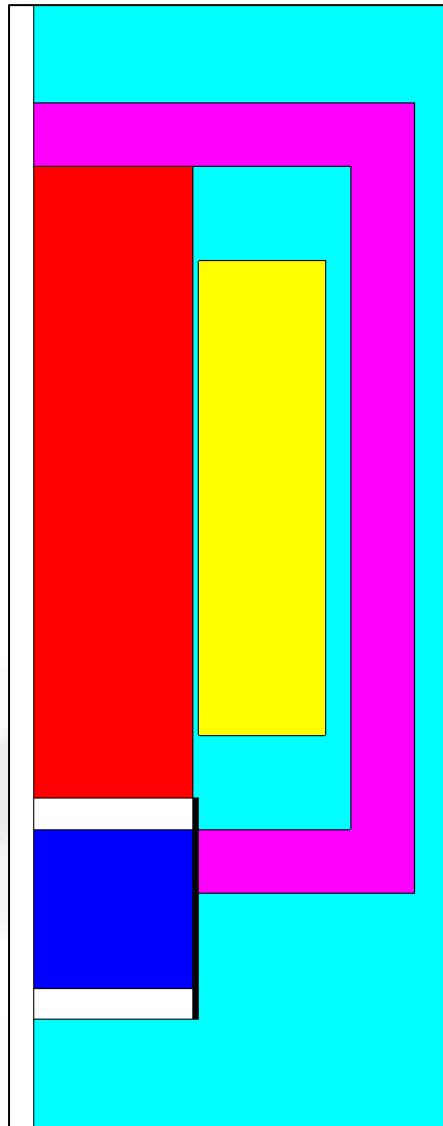
- **MESH MAPPED**

- **Numero di elementi in orizzontale uguale**



TRANSIENT MAGNETIC : Creazione del Modello

➤ PHYSICS – Caratteristiche dei Materiali



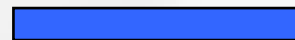
NUCLEO FISSO



GIOGO



NUCLEO MOBILE



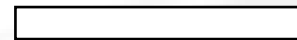
COIL



ARIA



CORSO



TAG



AISI430

Permeabilità magnetica relativa	Saturazione
800	1.6 T

COPPER

Permeabilità magnetica relativa	Resistività elettrica
1	1.78e-8 Ohm m

ARIA



TRANSIENT MAGNETIC : Creazione del Modello

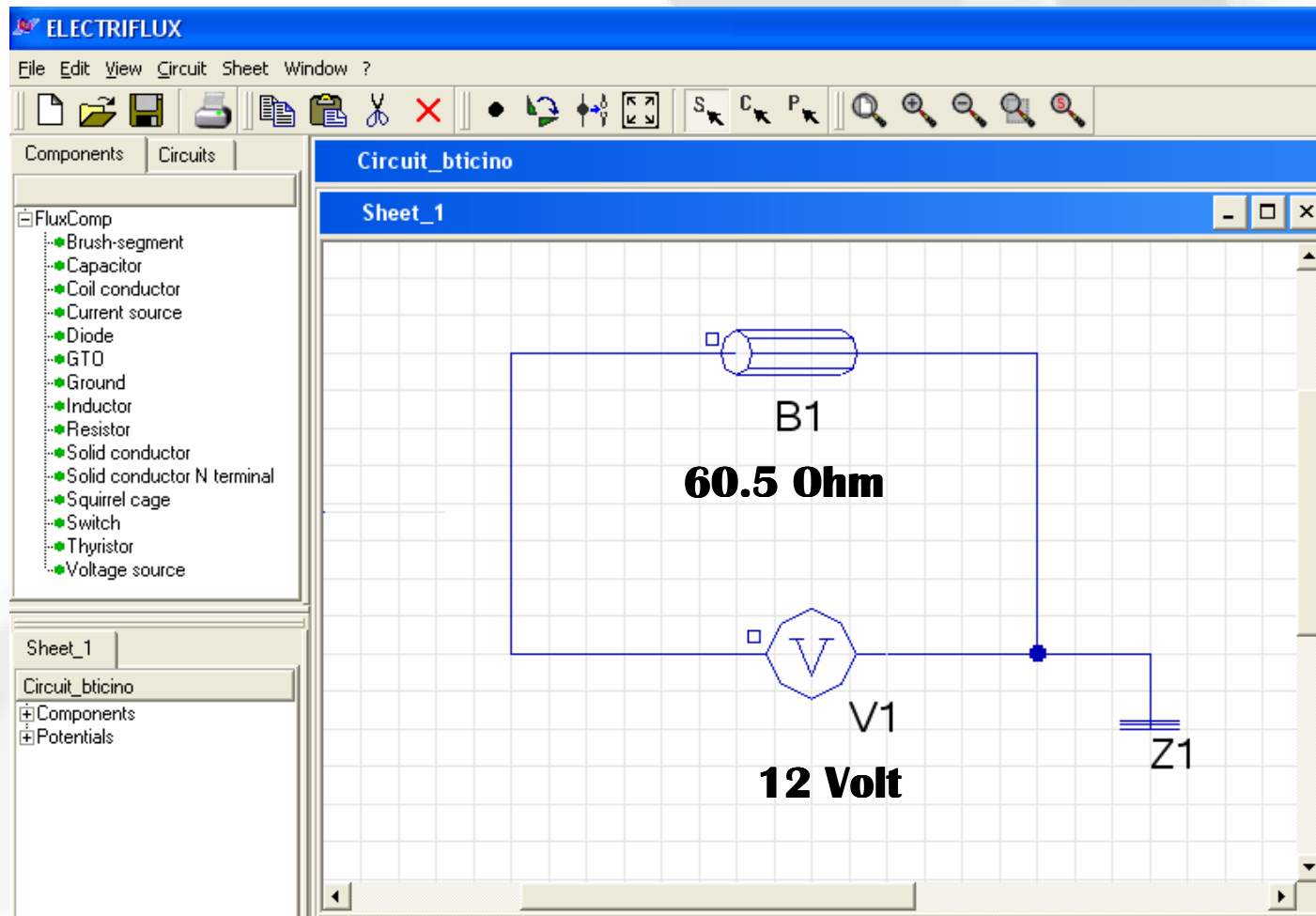
➤ PHYSICS – Mechanical SET

REGION	Tipo	Caratteristiche
NUCLEO FISSO	Fixed	
GIOGO	Fixed	
COIL	Fixed	
NUCLEO MOBILE	Moving	<ul style="list-style-type: none">• Moto traslatorio lungo l'asse y• Massa = 10 g
CORSA	Compressible	Remeshing
TAG	Compressible	Remeshing



TRANSIENT MAGNETIC : Creazione del Modello

➤ PHYSICS – Caratteristiche elettriche



TRANSIENT MAGNETIC : Soluzione

➤ Analisi nel tempo

The screenshot displays the SOLVER_2D software interface for transient magnetic computation. The main window is titled "SOLVER_2D - [EL_P2_TR]" and includes a menu bar (File, Parametrisation, Computation, Views) and a toolbar. The "Main data" tab is active, showing "Transient magnetic computation" with a status of "computation in progress". A table below lists "Time computation" with a value of 0 and a unit of "?". An "Information" table lists "Time step" (s), "Force" (N), "Position" (mm), and "Velocity" (m/s). The "Definition of time data" dialog box is open, showing the following settings:

- Restarting mode: New computation, initialised by static computation
- Restart at time step: [dropdown menu]
- Keep the previous time steps: (selected)
- Erase the previous steps:
- Time values:
 - Initial value of the time step: s
 - Study time limit: s
 - Limit number of time steps:
 - Maximum value of the time step: s
 - Minimum value of the time step: s
- Storage of time steps: one step on (selected)
- None:
- user subroutine USRSTK:

A warning message is displayed: "WARNING circuit equations need to lock the time step. Be careful when defining the time step." The dialog box has "OK" and "STOP" buttons.

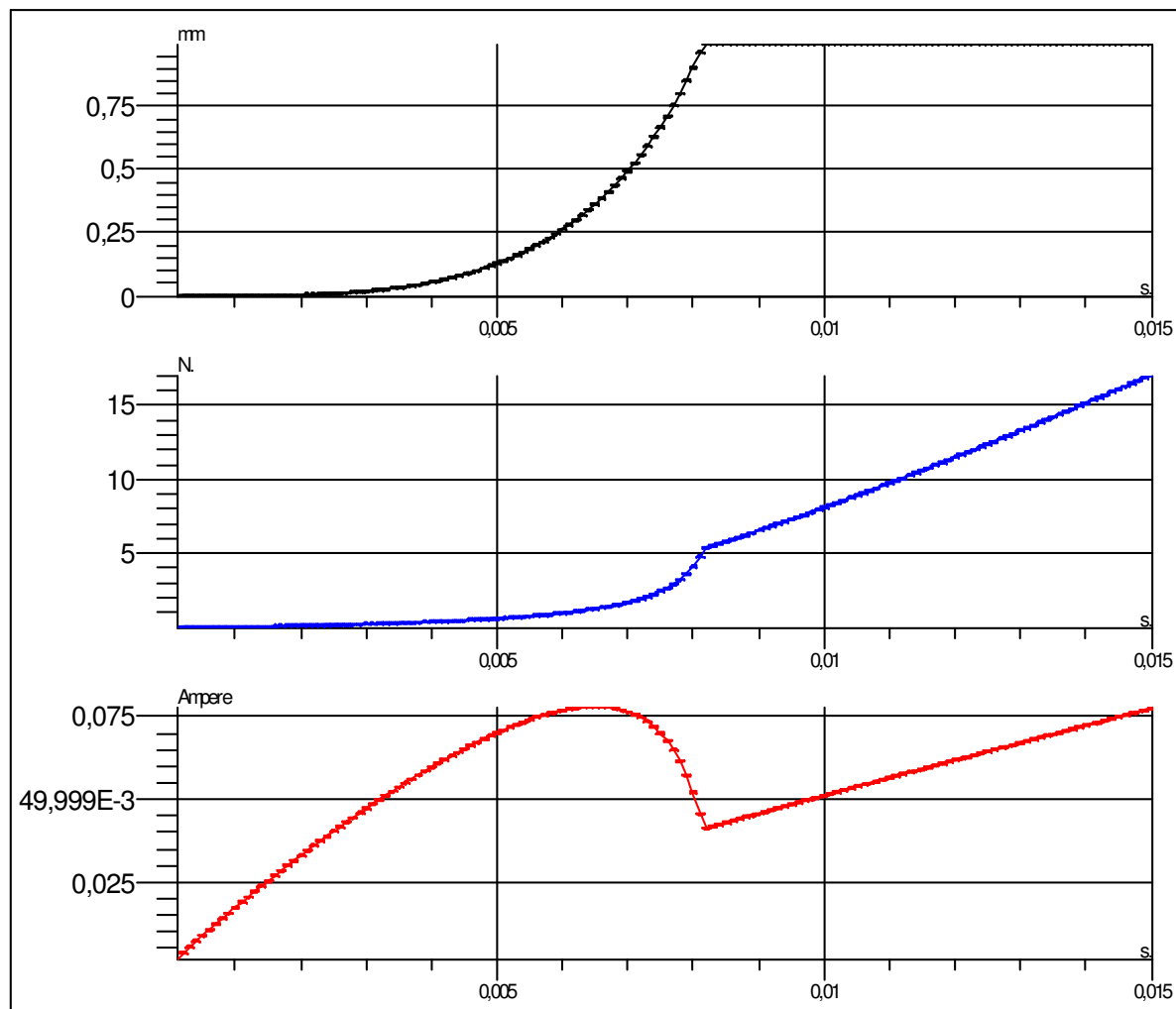
- **da 0 ms a 15 ms**

- **Time Step = $1e-4$ s**

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TRANSIENT MAGNETIC : Analisi dei Risultati

EL_P2_TR



POSIZIONE
Mechanics / Position
Time

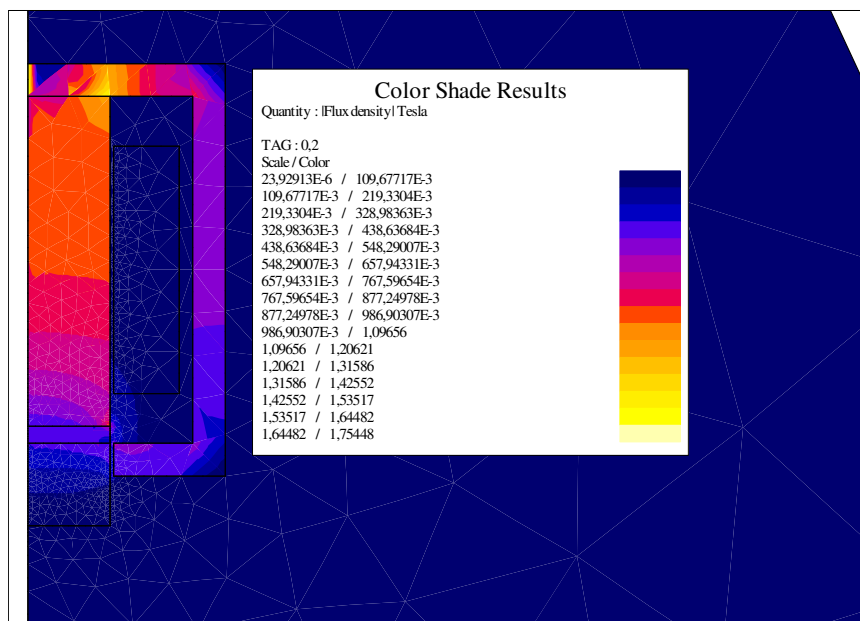
FORZA
Mechanics / Force
Time

CORRENTE
Circuit / Current
Time
B1 ;

**... OPEN FLUX2D
Results...**



TRANSIENT MAGNETIC : Analisi dei Risultati



- **Animazione Video**

... **OPEN FLUX2D**
Results...

