



Disruption Analysis

Module 18

August 3, 2005

**M. Ulrickson
Presented on the VLT Call**



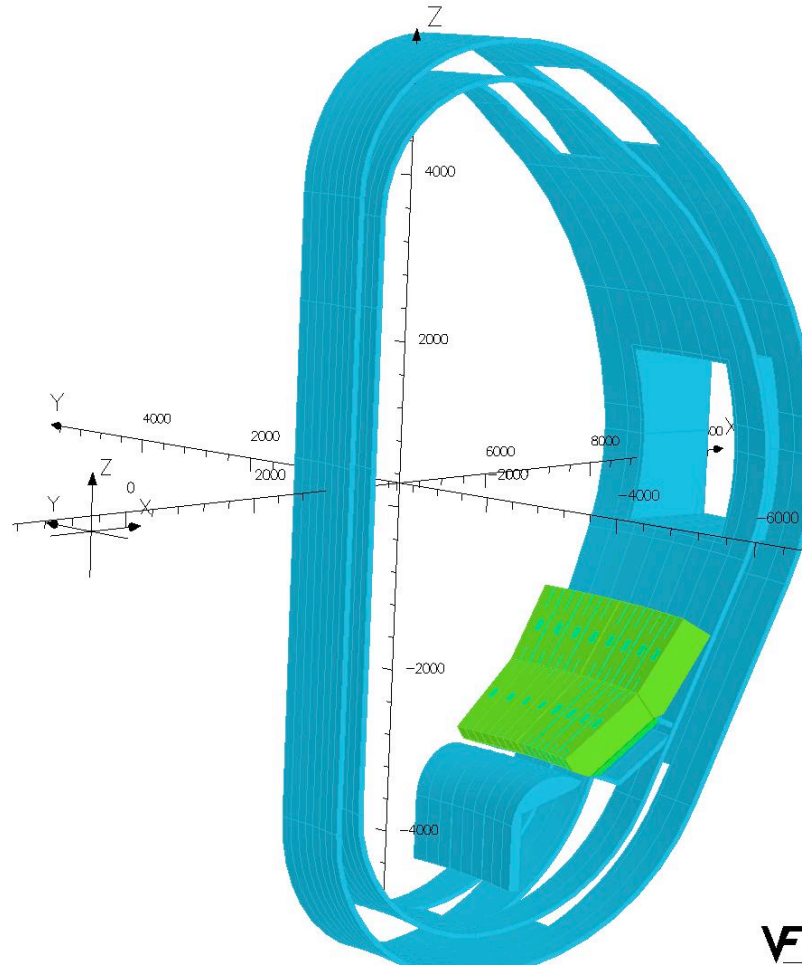
Summary

- **Both ITER disruption cases completed (18 ms exponential and 40 ms linear)**
- **Model includes:**
 - **Vessel (upper, midplane and divertor ports)**
 - **Module 18 and 17 (two modules each 20 deg.)**
 - **Divertor (three modules 20 deg.)**
 - **Lower triangular support**
- **Just a few examples of the results are shown**



Vessel, Shield and Divertor

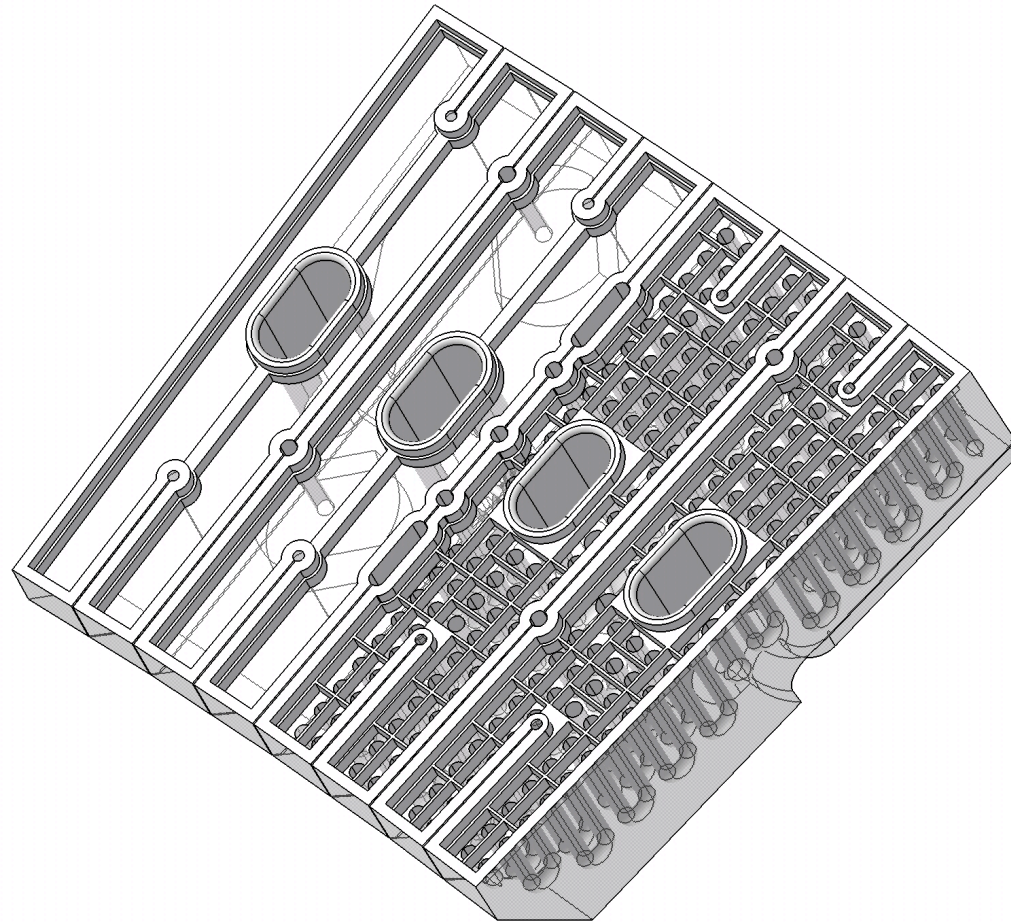
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V VECTOR FIELDS



Shield-layout

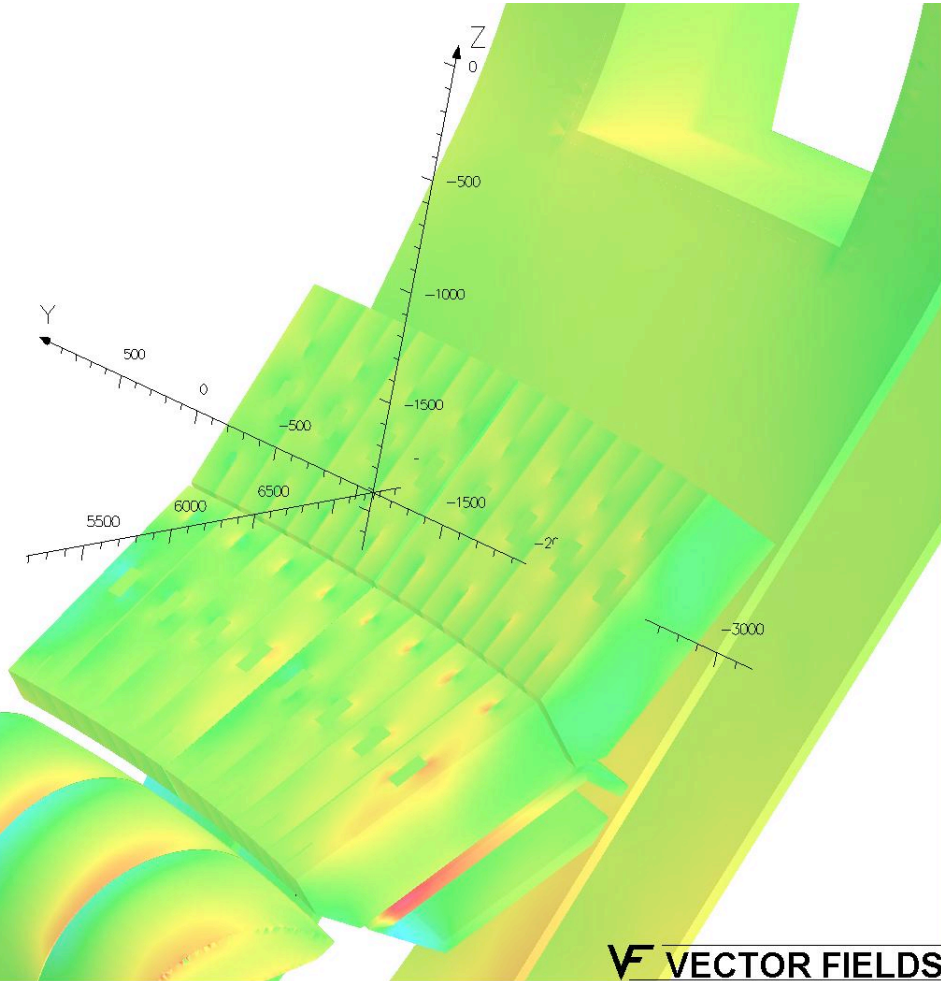
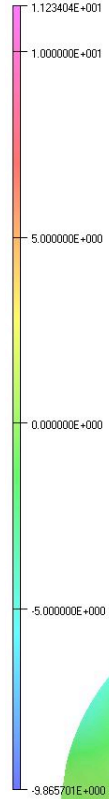




Shield Current (Preliminary)

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Surface contours: DX



UNITS
Length mm
Magn Flux Density T
Magn Field A m⁻¹
Magn Scalar Pot A
Magn Vector Pot Wb m⁻¹
Elec Flux Density C m⁻²
Elec Field V m⁻¹
Conductivity S mm⁻¹
Current Density A mm⁻²
Power W
Force N
Energy J

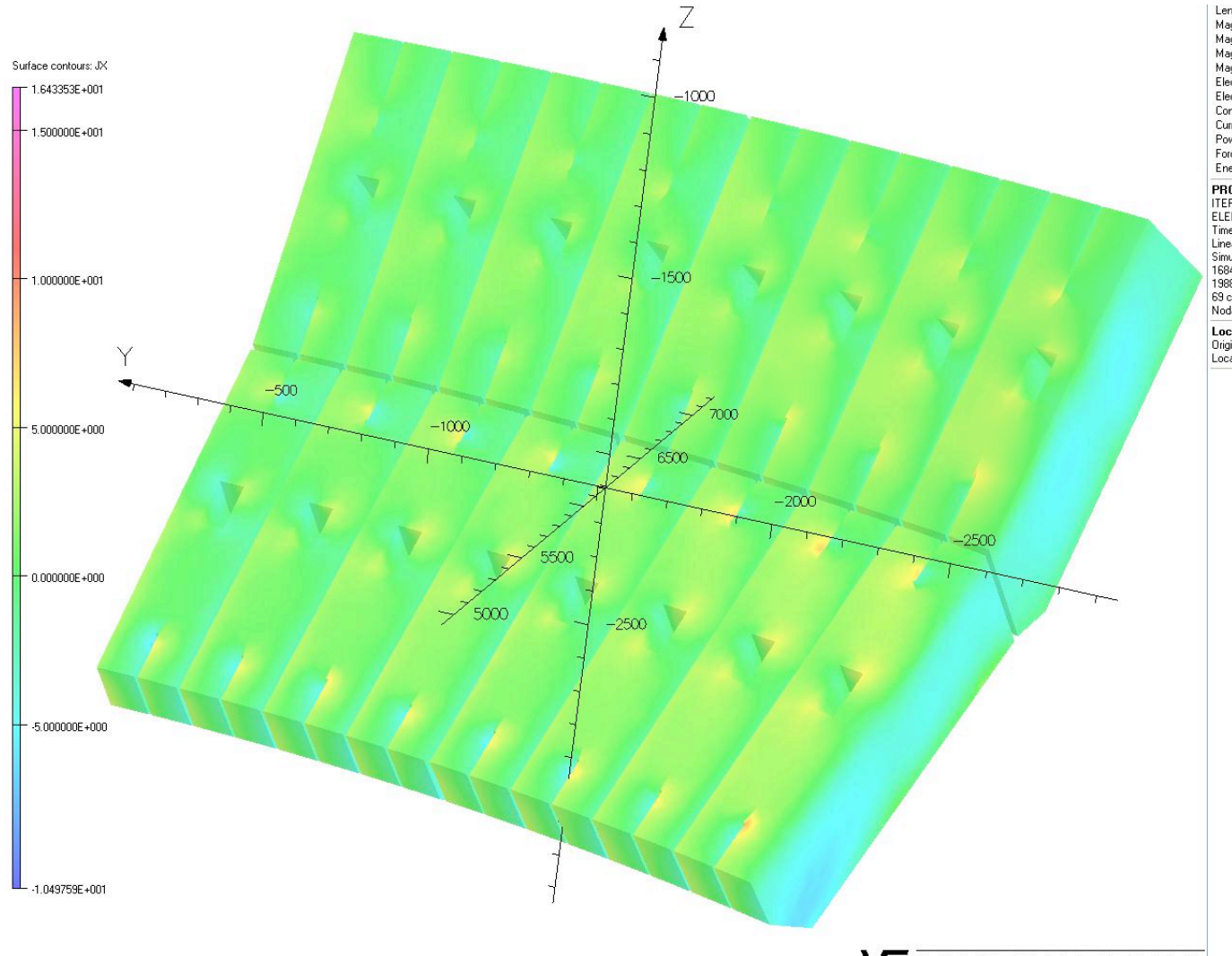
PROBLEM DATA
mod_10_exp_transient.op3
ELEKTRA Transient
Time = 0.02
Linear materials
Simulation No 16 of 29
3014366 elements
3563942 edges
63 conductors
Nodally interpolated fields

Local Coordinates
Origin: 0.0, 0.0, 0.0
Local XYZ = Global XYZ

V VECTOR FIELDS

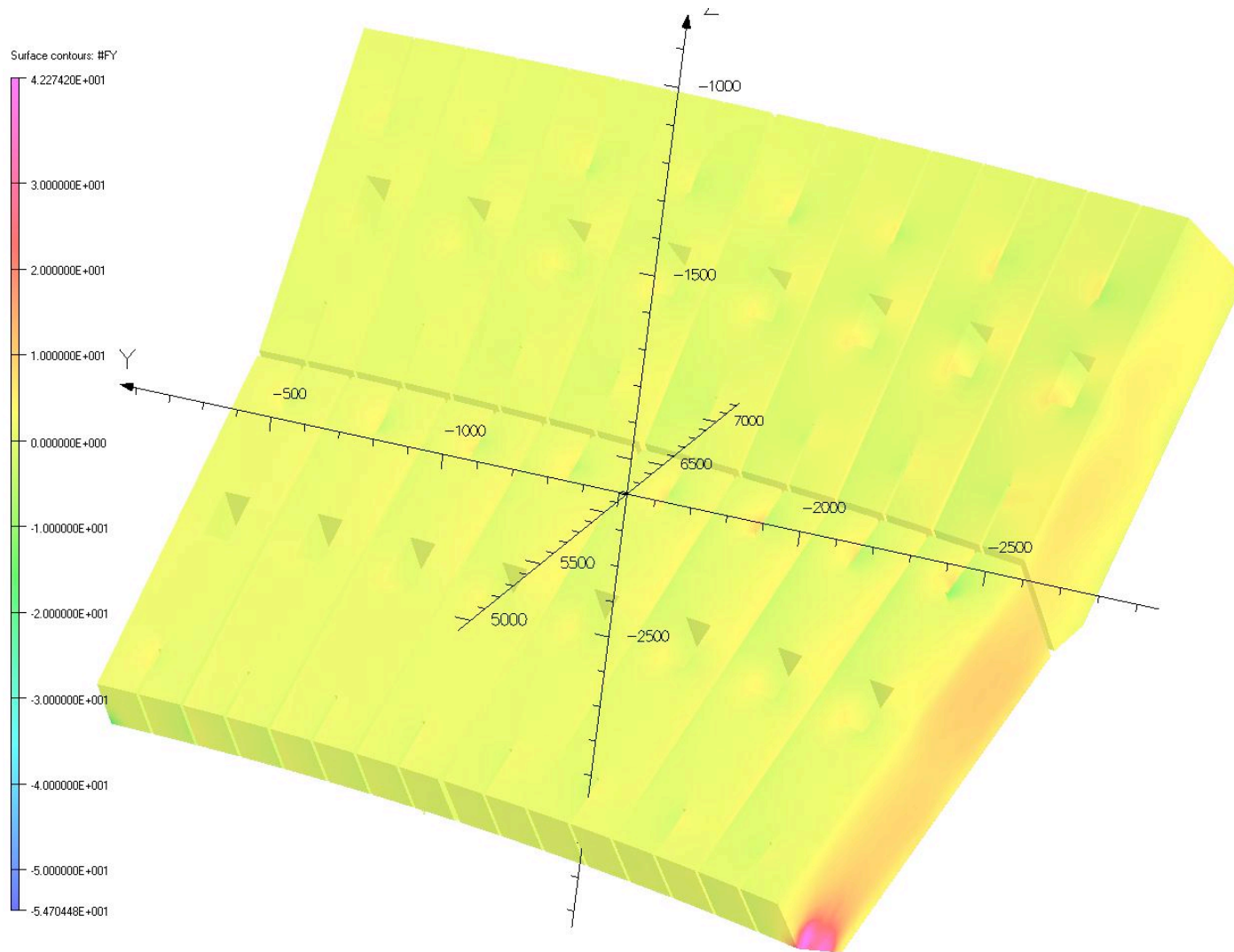


Radial Current Density





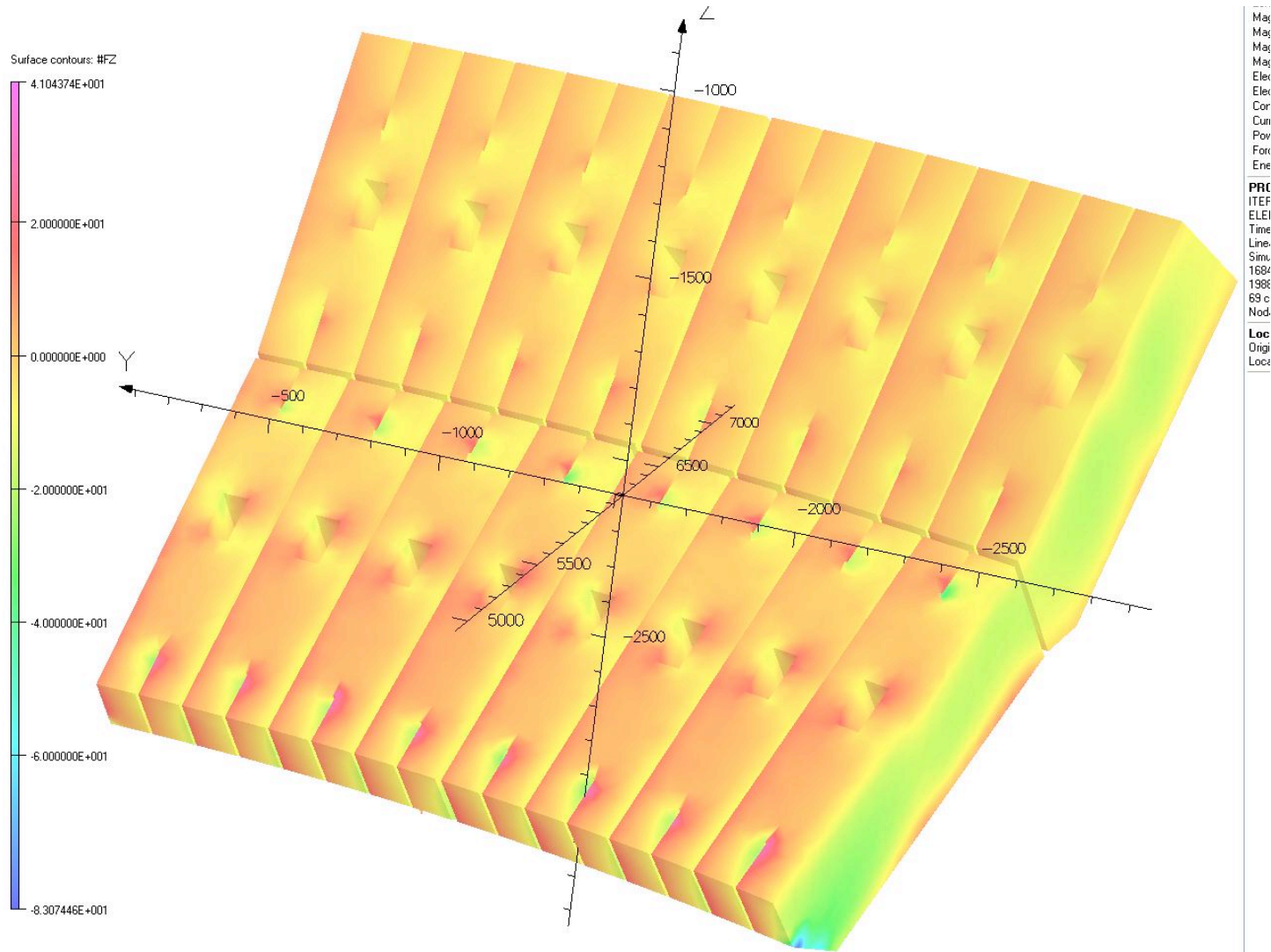
Toroidal Current Density



M
M
M
E
E
C
C
P
P
E
P
I
T
E
L
T
L
S
I
T
E
1
E
6
E
N
L
O
L



Vertical Force Density (JXB)



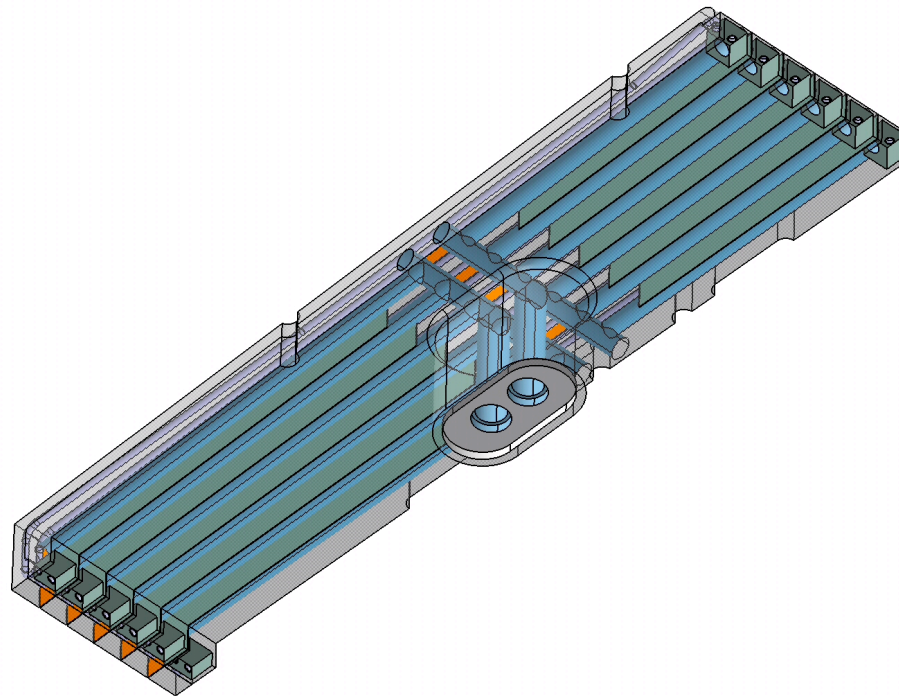


First Wall Disruption Response

- **The first wall is very finely cut to reduce eddy currents in the copper heat sink layer**
- **Both disruption cases have been calculated**
- **The forces in the first wall are less than those in the shield**
- **Halo currents have also been simulated in the First Wall**
- **Halo currents can lift the fingers of the FW off the shield module**



First Wall layout

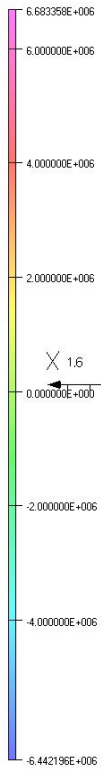




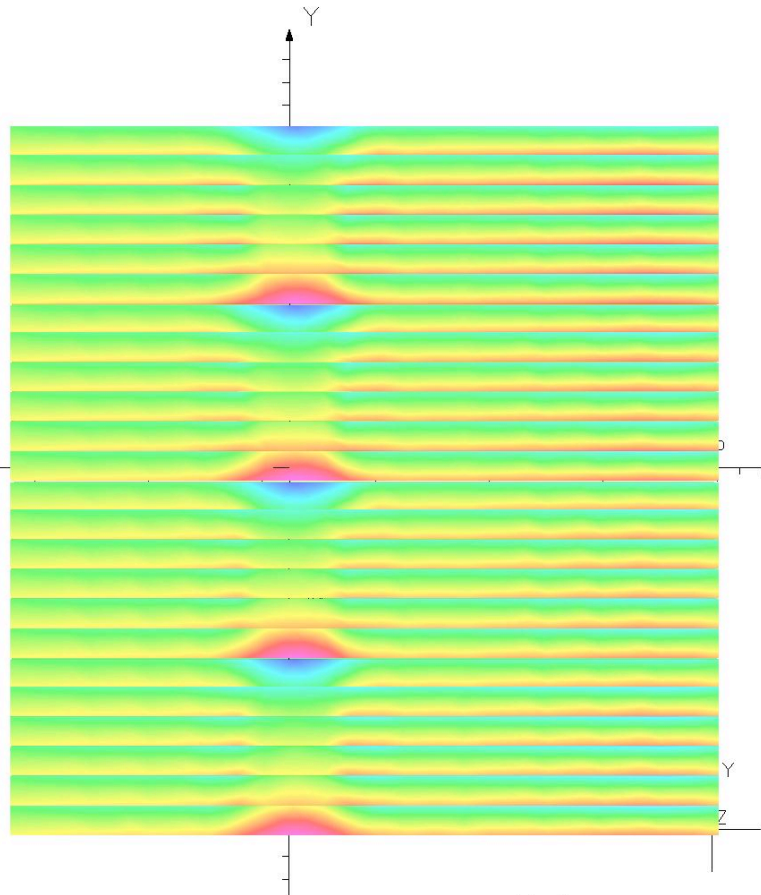
Disruption Current in the First Wall

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Surface contours: JX



X 1.6 1.4



V VECTOR FIELDS

UNITS

Length	m
Magn Flux Density	T
Magn Field	A m ¹
Magn Scalar Pot	A
Magn Vector Pot	V/b m ¹
Elec Flux Density	C m ²
Elec Field	V m ¹
Conductivity	S m ¹
Current Density	A m ²
Power	W
Force	N
Energy	J

PROBLEM DATA

Six_Fingers_A.op3
ELEKTRA Transient
Time = 0.02
Linear material:
Simulation No 3 of 11
188001 elements
224786 edges
1 conductor
External field: 0.0, 2.78521E+06, 0.0
Nodally interpolated fields

Local Coordinates

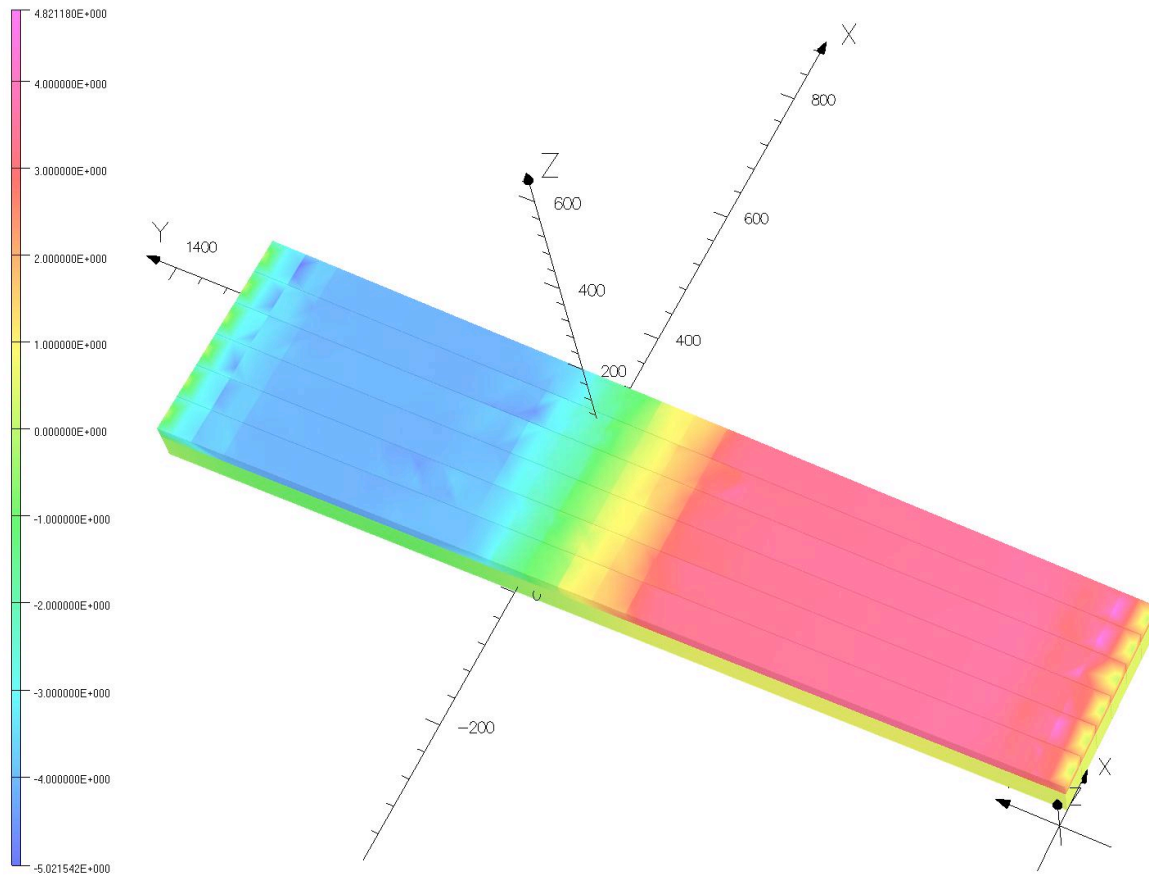
Origin: 0.0, 0.0, 0.0
Local XYZ = Global XYZ



Halo Current Flow In The First Wall

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Surface contours: JY

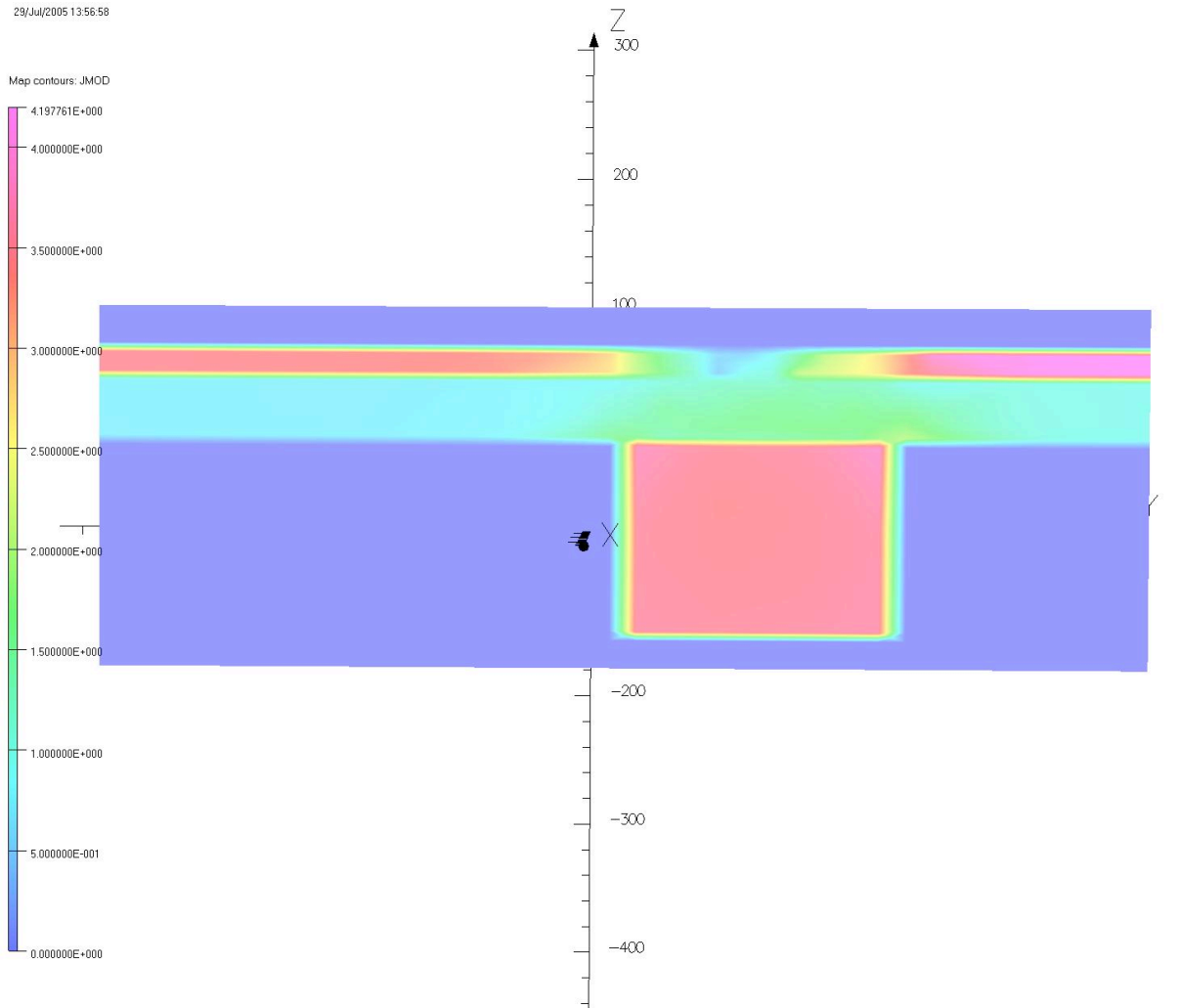


V VECTOR FIELDS





Halo Currents Flow Mainly in the Cu



VF VECTOR FIELDS