

パルス偏向電磁石の静磁場計算(3)

2005年6月24日(金)

放射光源研究系

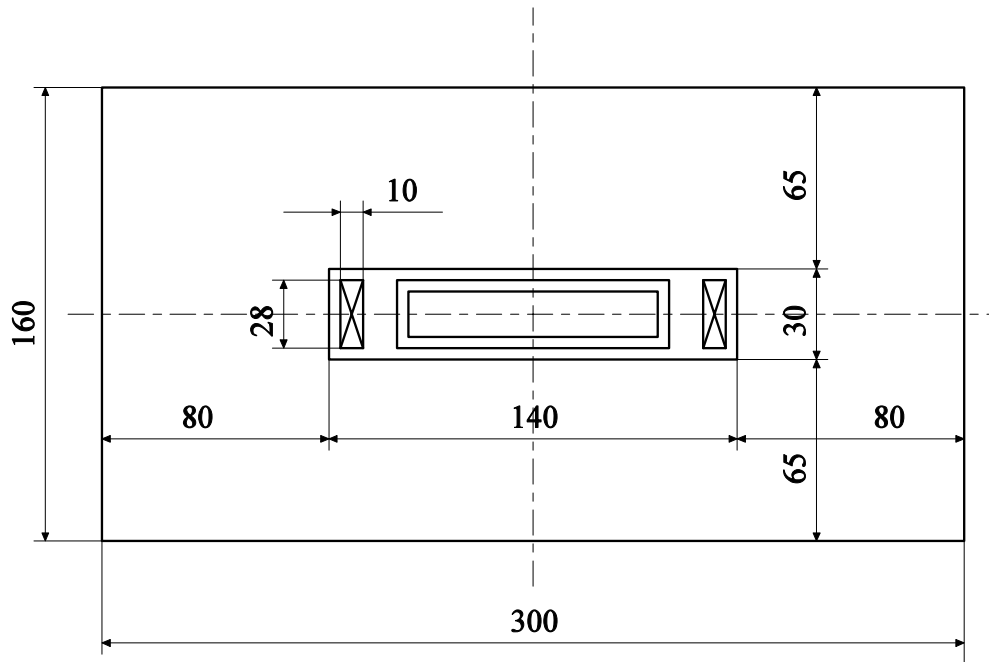
宮島 司

電磁石の基本仕様

- 電磁石の形状: Window-frame type
- ビーム進行方向の長さ: 1 m
- Gap : 30 mm
- 開口部: 140 mm × 30 mm
- コイル巻き数: 1 turn
- コイル断面: 10 mm × 28 mm (冷却水用スペースを除く)
- コイルの巻き方: Bedstead Conductor

電磁石の形状

Pulsed Bending Magnet (Gap = 30 mm, Window frame type)

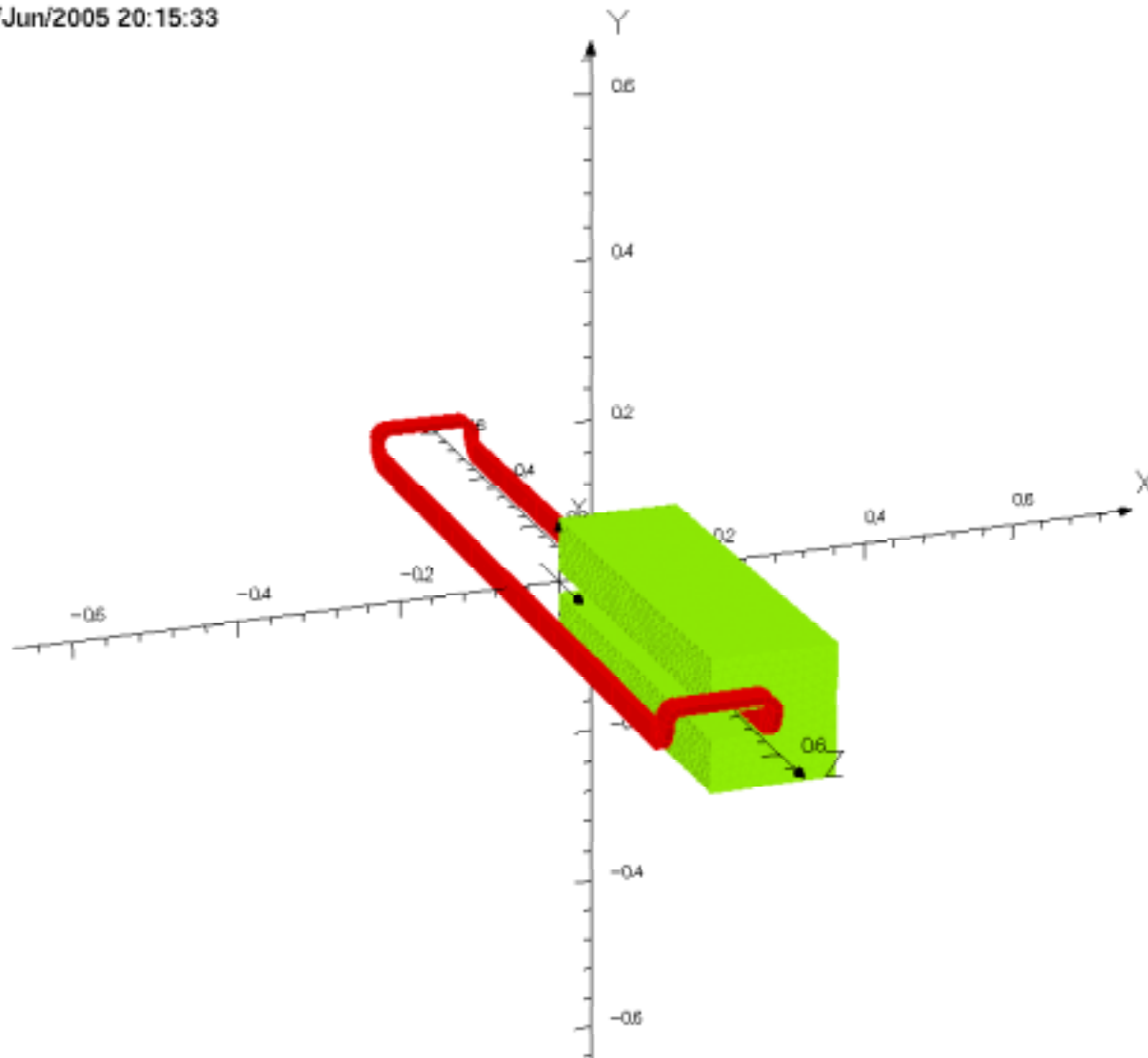


- ビーム進行方向の長さ:
1 m
- Gap : 30 mm
- 鉄心の厚さ
 - 水平方向 : 80 mm
 - 垂直方向 : 65 mm
- 中心から ± 47.5 mm の範囲がセラミックチェンバー

3次元磁場計算

- 端部の影響等を調べるために3次元磁場計算を行った
- Opera-3D を用いて計算
- モデル: 1/4 形状のモデルを作成
- コイルの形状: Bedstead type
- BH 曲線
- Opera 3D Default の BH 曲線を使用 (BH 曲線を変更するためのパネルが立ち上がらなかったため)
 - BH 曲線を入れる方法は？
 - command によって入力可能なことがわかった！
 - 異方性なし, 35z135 90 度方向の BH 曲線でも計算
 - 異方性ありでも計算(y 方向:0 deg, x, z 方向: 90deg)

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UNITS

Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

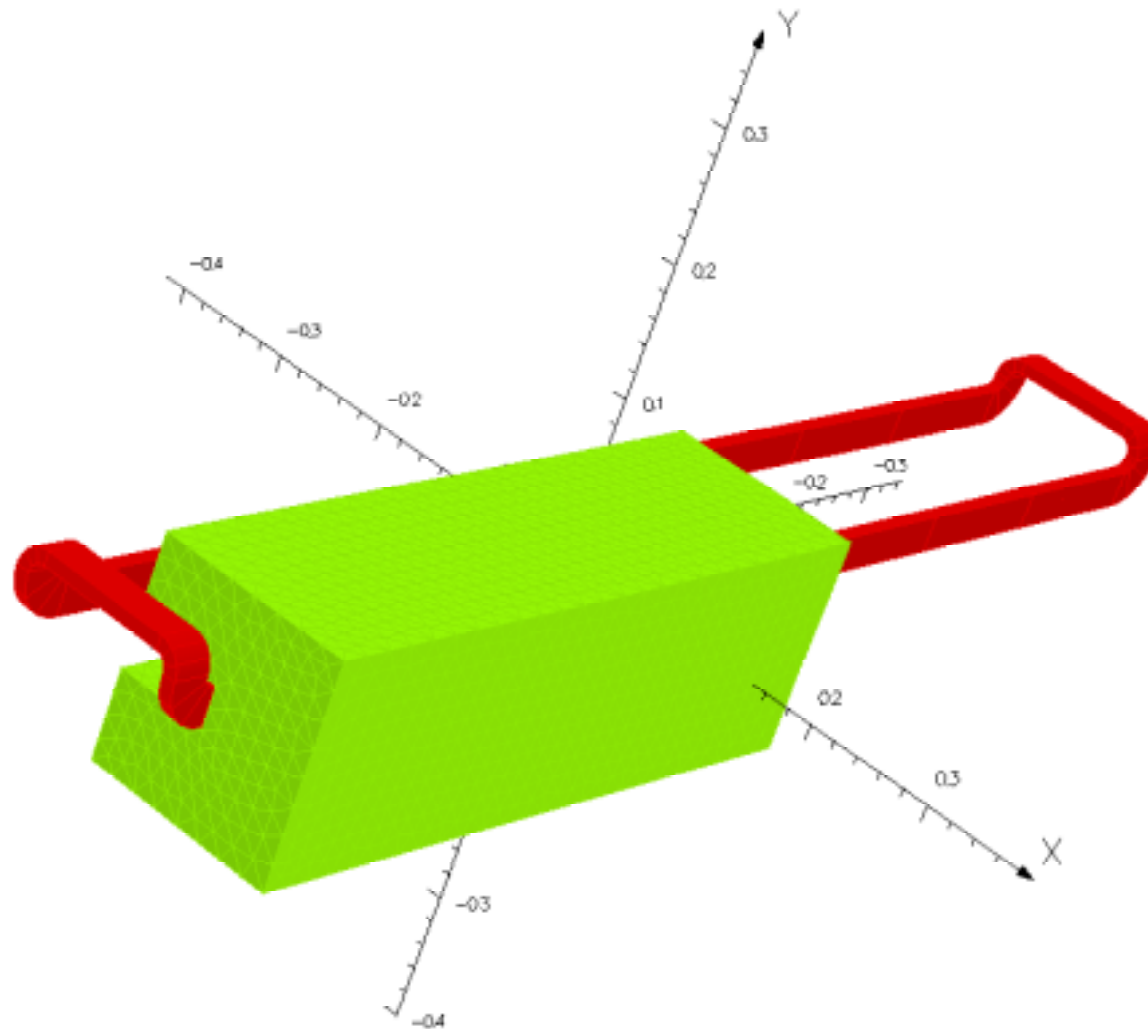
PROBLEM DATA

g30w1_db.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

Local Coordinates

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

V VECTOR FIELDS



UNITS

Length	m
Magn Flux	T
Density	
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	$S\ m^{-1}$
Current Density	$A\ m^{-2}$
Power	W
Force	N
Energy	J

PROBLEM DATA

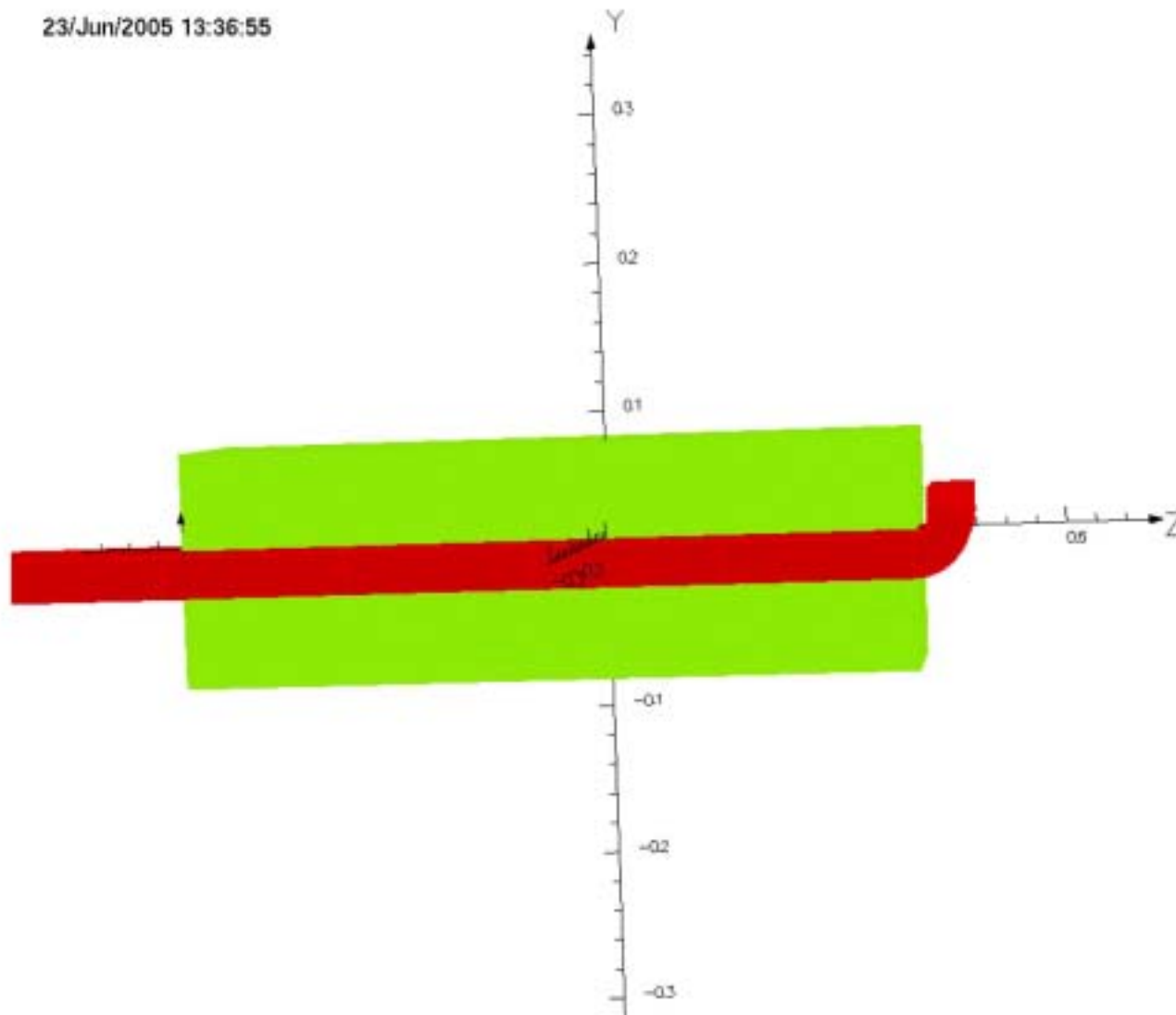
g30w1_db.op3
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 75020 nodes
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 Nodally interpolated fields

Local Coordinates

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

∇ VECTOR FIELDS

23/Jun/2005 13:36:55



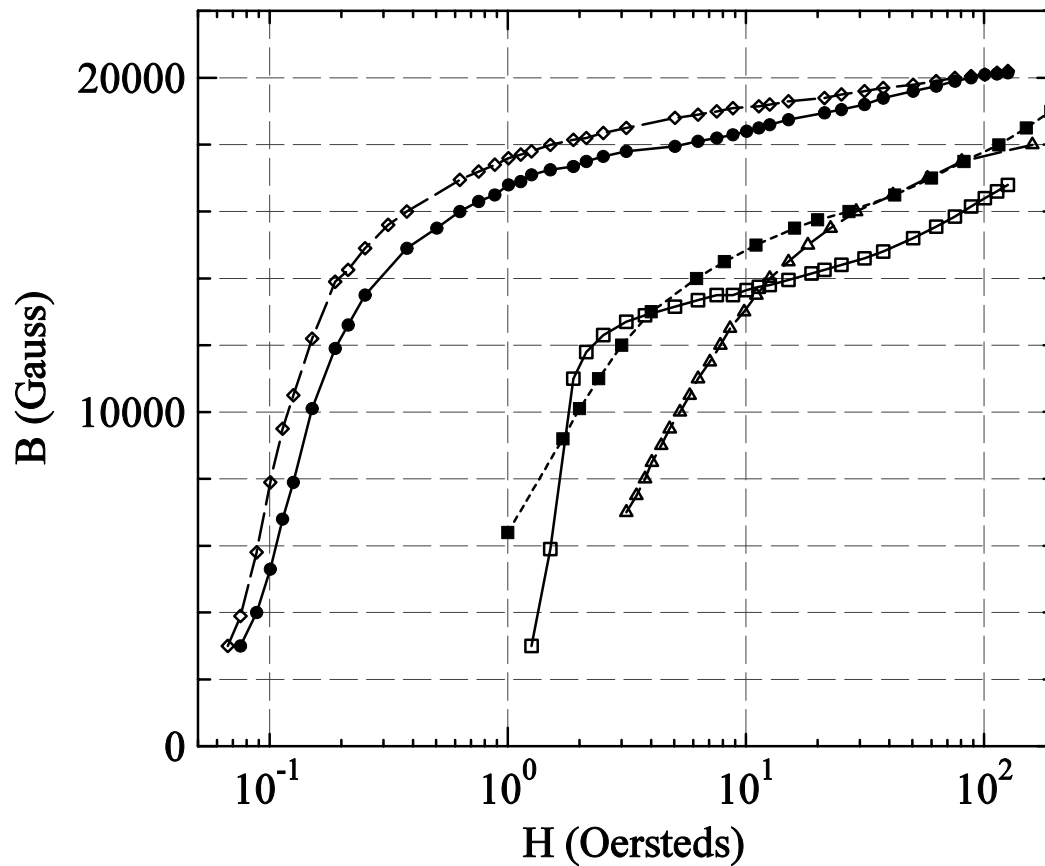
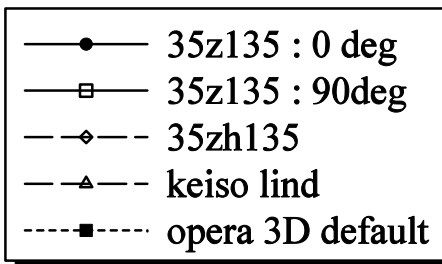
UNITS	
Length	m
Magn Flux	T
Density	
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

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

V VECTOR FIELDS

BH 曲線

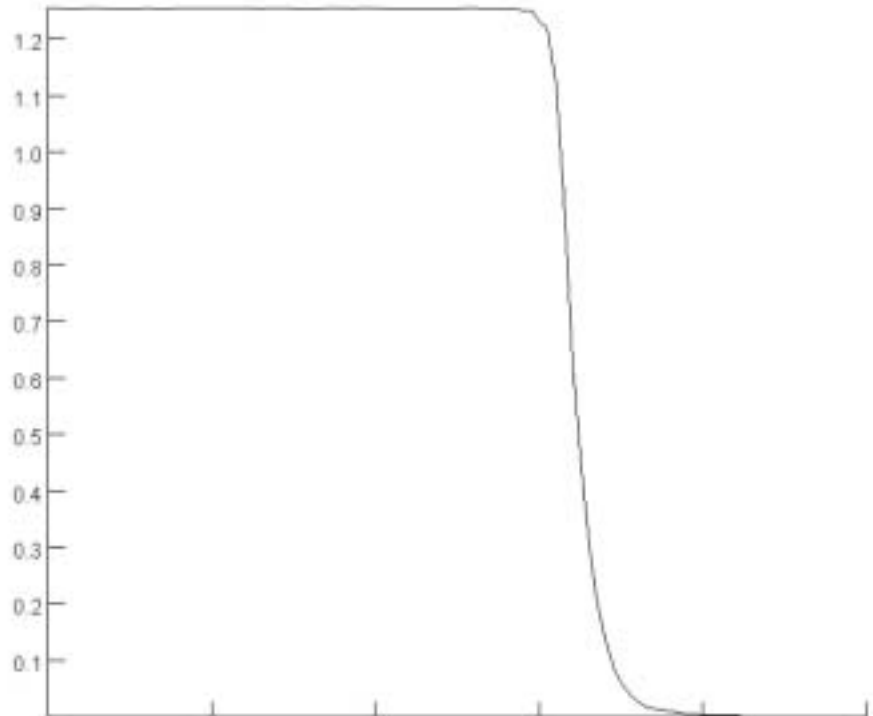


計算結果 (BH 曲線 : Opera3d default)

- 励磁電流 : 30000 A
- コイルの電流密度 : 1.071×10^8 (A/m²)
- BH 曲線 : 全方向 Opera3d default
- $x = y = z = 0$ mm (電磁石中心)での磁場
 $B_y = 1.2549$ (T)
- z 軸方向の積分磁場
 $B_y L_{\text{eff}} = 1.2989$ (T m)

B_y (ビーム進行方向: 0 ~ 0.8 m)

23/Jun/2005 09:41:44



Local X coord 0.0 0.0 0.0 0.0 0.0 0.0
Local Y coord 0.0 0.0 0.0 0.0 0.0 0.0
Local Z coord 0.0 0.16 0.32 0.48 0.64 0.8
Component: $B_y^*[-1]$, Integral = 0.64946889587343 : z [m]

UNITS	
Length	m
Magn Flux	T
Density	
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	$S m^{-1}$
Current Density	$A m^{-2}$
Power	W
Force	N
Energy	J

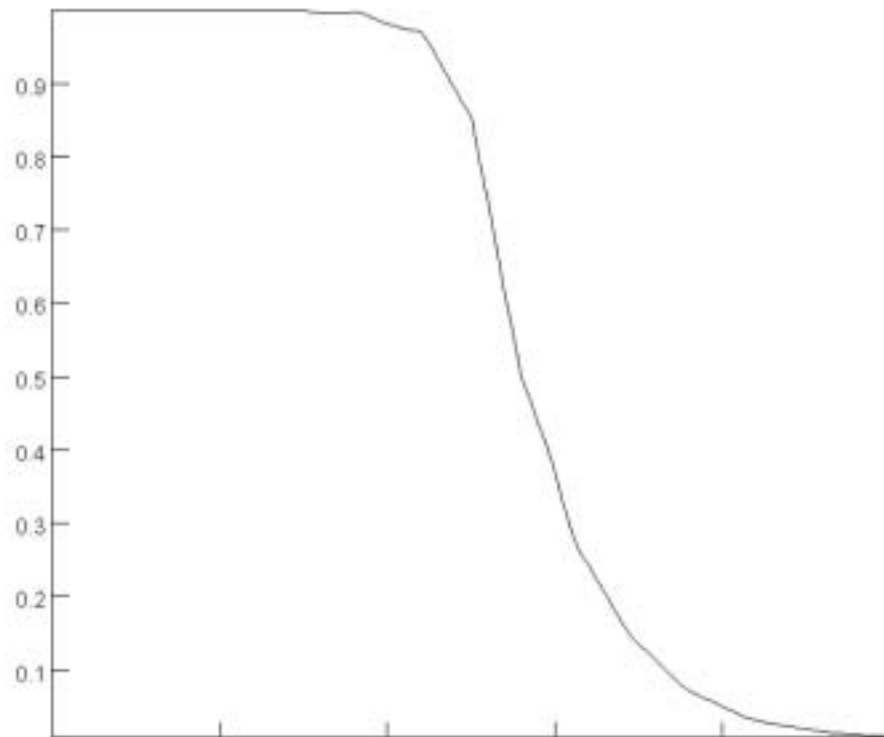
PROBLEM DATA
g30w1_db.op3
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Non-linear materials
Simulation No 1 of 1
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75020 nodes
1 conductor
Nodally interpolated fields

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

V VECTOR FIELDS

B_y/B_{y0} (ビーム進行方向: 0.4 ~ 0.6 m)

23/Jun/2005 09:45:11



Local X coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.4	0.44	0.48	0.52	0.56	0.6

Component: BY*(-1)^1.254909, Integral = 0.1172882276998 : z (m)

UNITS	
Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

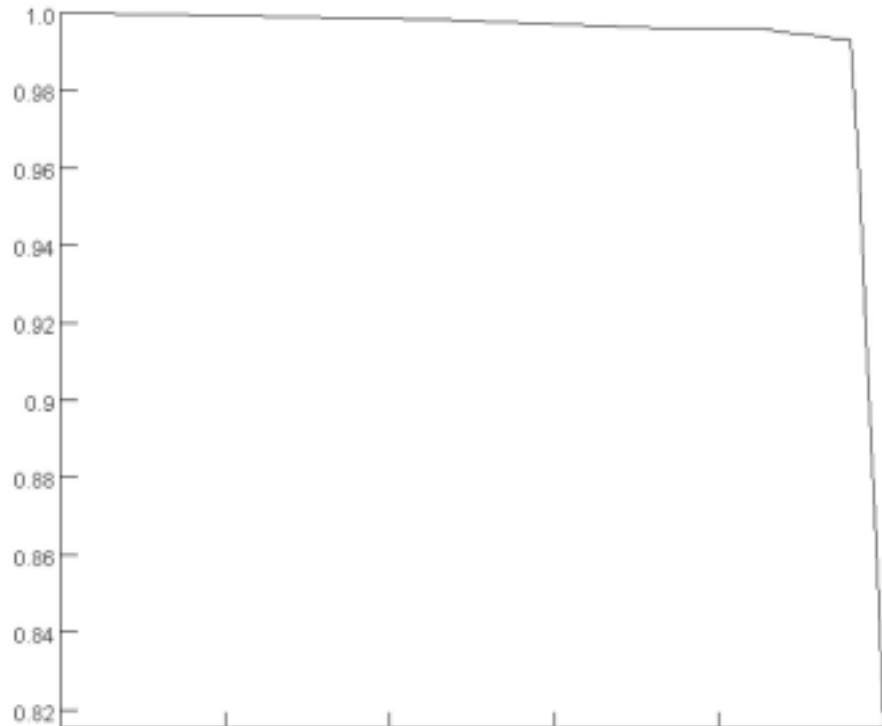
PROBLEM DATA
g30w1_db.op3
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Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.0$ m)

23/Jun/2005 09:49:58



Local X coord	0.0	0.012	0.024	0.036	0.048	0.06
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.0	0.0	0.0	0.0	0.0	0.0

Component: BY*-1Y1.254909, Integral = 0.05964433273223

UNITS

Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA

g30w1_db.op3
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 Non-linear materials
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 200520 elements
 75020 nodes
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 Nodally interpolated fields

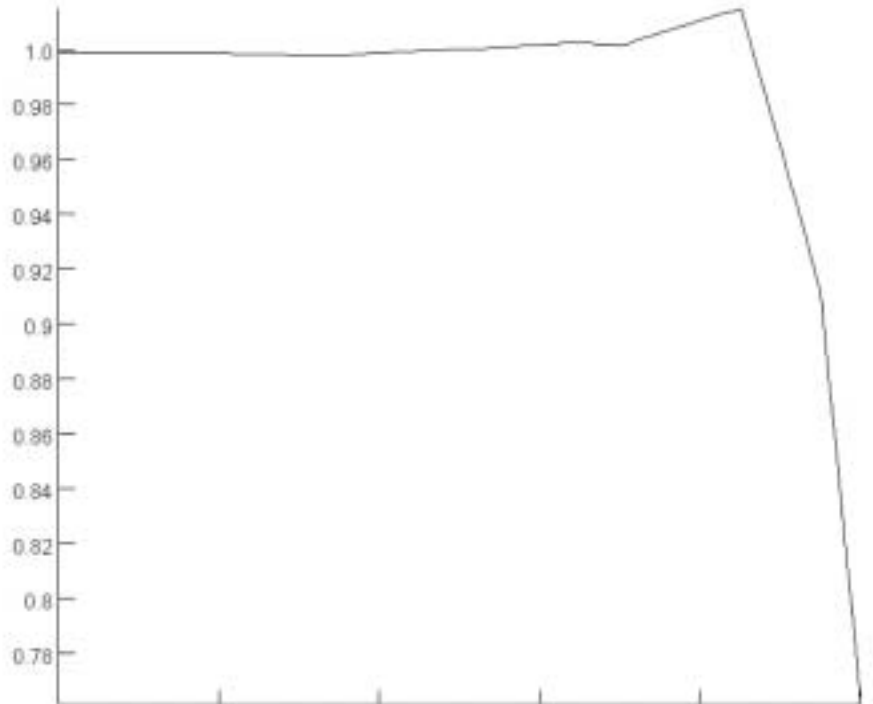
Local Coordinates

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.45$ m)

23/Jun/2005 09:51:44



Local X coord 0.0 0.012 0.024 0.036 0.048 0.06
 Local Y coord 0.0 0.0 0.0 0.0 0.0 0.0
 Local Z coord 0.45 0.45 0.45 0.45 0.45 0.45

— Component: $B_y^*[-1]y^1$, 254900, Integral = 0.0593506164789 : x (m)

UNITS

Length	m
Magn Flux	T
Density	
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	$S\ m^{-1}$
Current Density	$A\ m^{-2}$
Power	W
Force	N
Energy	J

PROBLEM DATA

g30w1_db.op3
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 Non-linear materials
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 1 conductor
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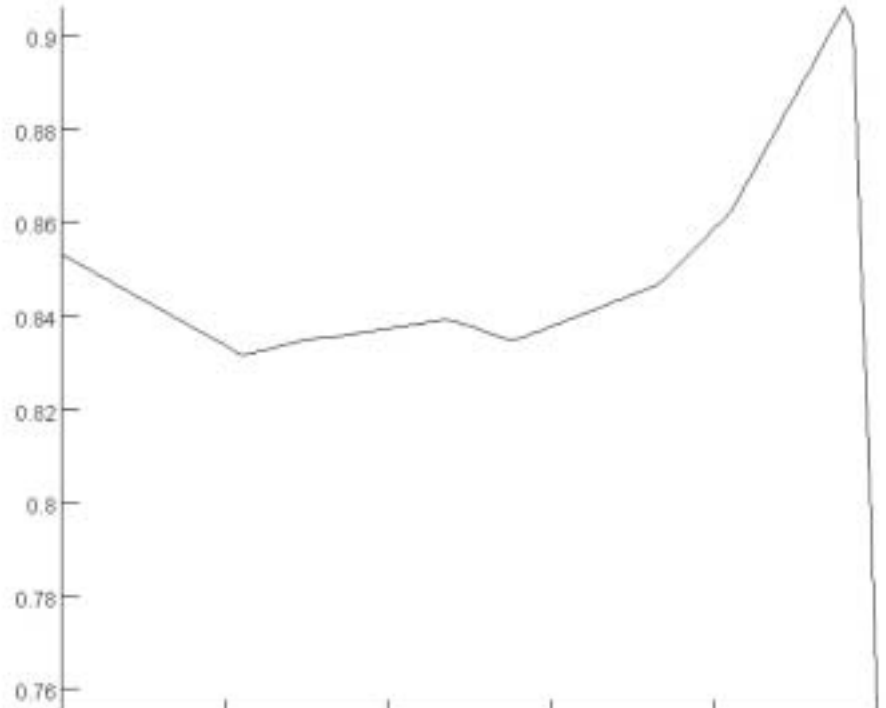
Local Coordinates

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.50$ m)

23/Jun/2005 09:52:43



Local X coord	0.0	0.012	0.024	0.036	0.048	0.06
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.5	0.5	0.5	0.5	0.5	0.5

Component: $B_y^*(-1)/1.254909$, Integral = 0.05062836830973 : x (m)

UNITS	
Length	m
Magn Flux	T
Density	
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	$S\ m^{-1}$
Current Density	$A\ m^{-2}$
Power	W
Force	N
Energy	J

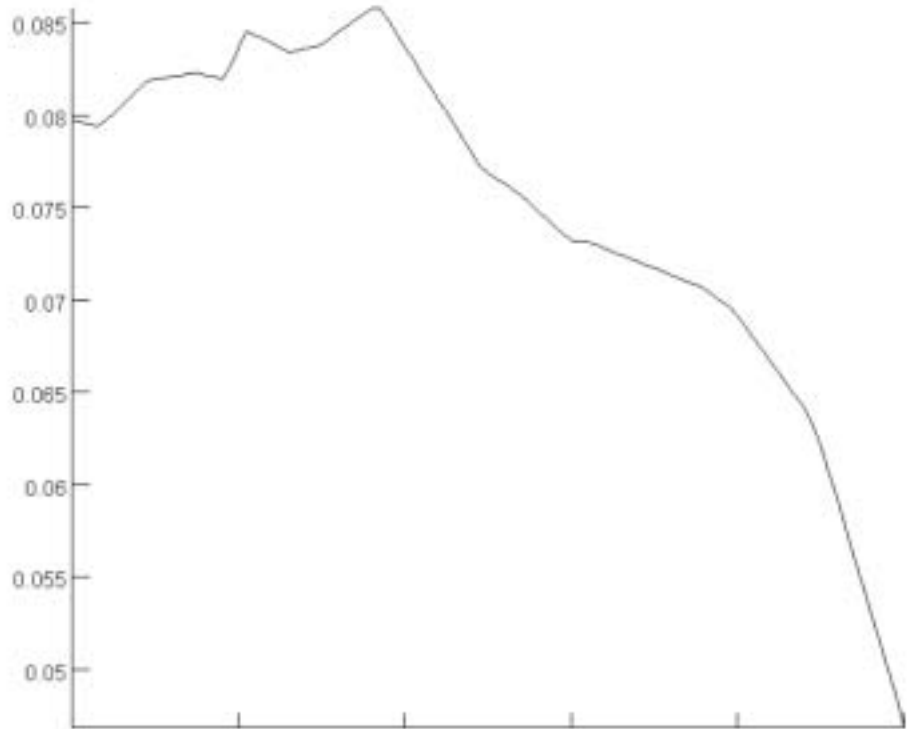
PROBLEM DATA
g30w1_db.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.55$ m)

23/Jun/2005 09:53:29



Local X coord 0.0 0.012 0.024 0.036 0.048 0.06
 Local Y coord 0.0 0.0 0.0 0.0 0.0 0.0
 Local Z coord 0.55 0.55 0.55 0.55 0.55 0.55

Component: $B_y^*(-1)/1.254909$, Integral = 4.5023207778E-03 ; x (m)

UNITS	
Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA
 g30w1_db.op3
 TOSCA Magnetostatic
 Non-linear materials
 Simulation No 1 of 1
 200520 elements
 75020 nodes
 1 conductor
 Nodally interpolated fields

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

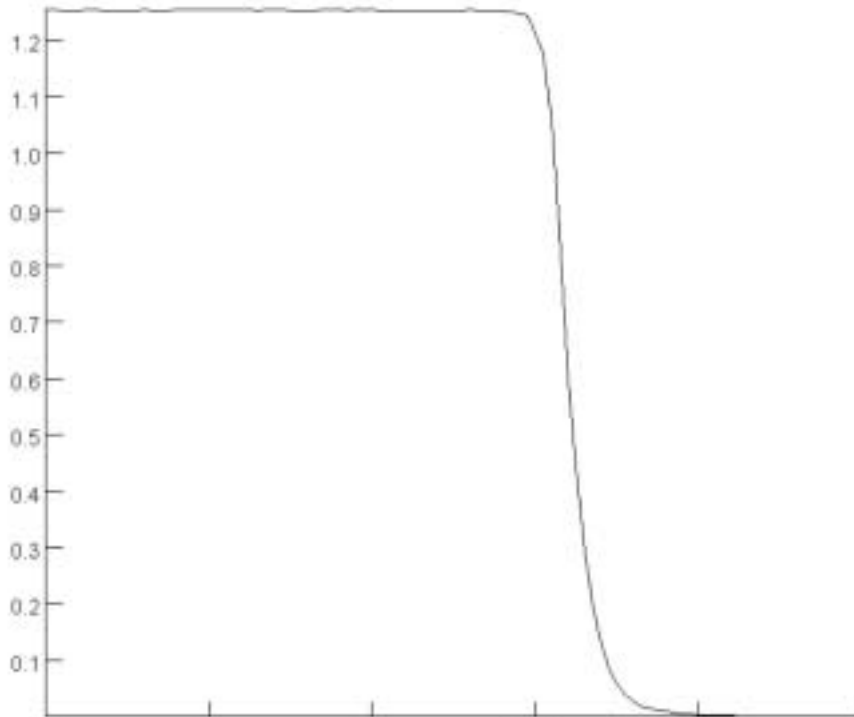
V VECTOR FIELDS

計算結果 (BH 曲線 : 35z135-90deg)

- 励磁電流 : 30000 A
- コイルの電流密度 : 1.071×10^8 (A/m²)
- BH 曲線 : 全方向 35z135-90 deg (飽和の早い方向)
- $x = y = z = 0$ mm (電磁石中心)での磁場
 $B_y = 1.2547$ (T)
- z 軸方向の積分磁場
 $B_y L_{\text{eff}} = 1.2948$ (T m)

B_y (ビーム進行方向: 0 ~ 0.8 m)

23/Jun/2005 20:14:44



Local X coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.0	0.16	0.32	0.48	0.64	0.8

Component: $B_y^*(-1)$, Integral = 0.64720410317547

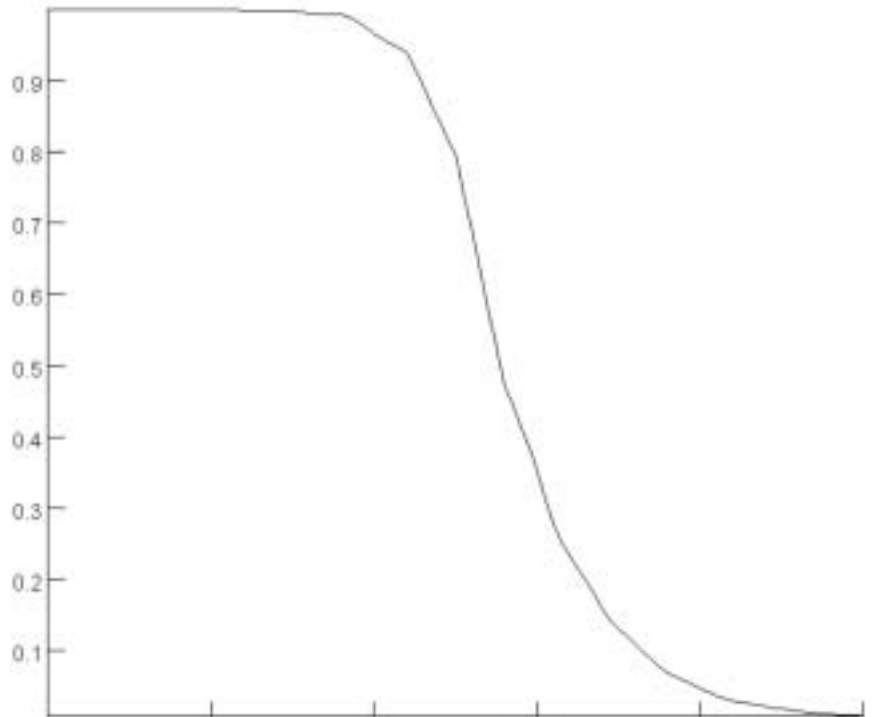
UNITS	
Length	m
Magn Flux	T
Density	
Magn Field	$A\ m^{-1}$
Magn Scalar Pot	A
Magn Vector Pot	Wb
	m^{-1}
Elec Flux Density	$C\ m^{-2}$
Elec Field	$V\ m^{-1}$
Conductivity	$S\ m^{-1}$
Current Density	$A\ m^{-2}$
Power	W
Force	N
Energy	J

PROBLEM DATA
g30w2_db01.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

B_y/B_{y0} (ビーム進行方向: 0.4 ~ 0.6 m)

23/Jun/2005 20:19:30



Local X coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.4	0.44	0.48	0.52	0.56	0.6

Component: BY*(-1)/1.25479, Integral = 0.11552875246044

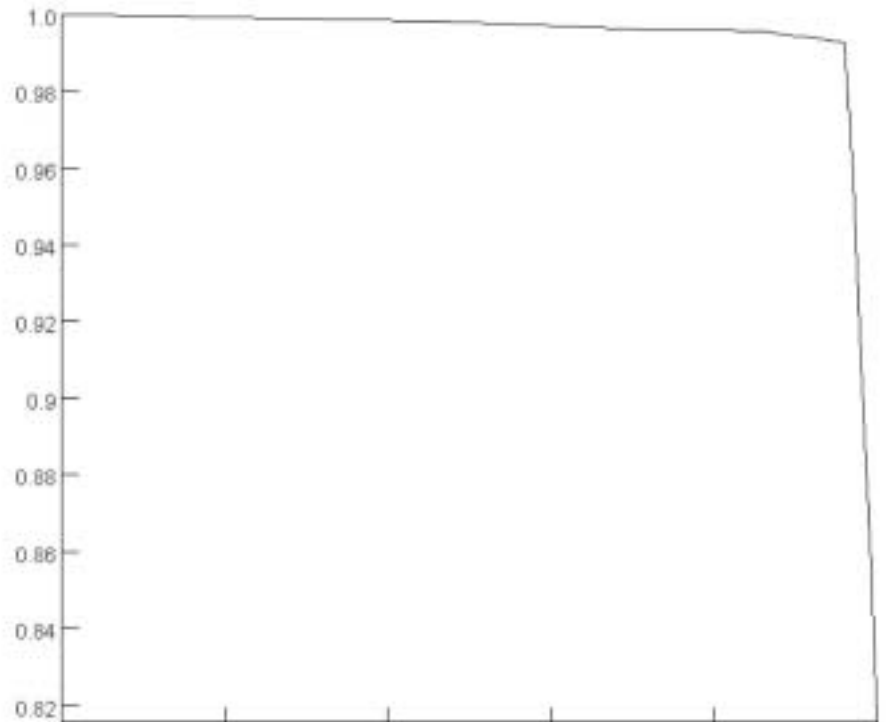
UNITS	
Length	m
Magn Flux	T
Density	
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb
	m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA
g30w2_db01.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.0$ m)

23/Jun/2005 20:20:18



Local X coord	0.0	0.012	0.024	0.036	0.048	0.06
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.0	0.0	0.0	0.0	0.0	0.0

Component: BY*(-1)/1.25479, Integral = 0.05964236180593

UNITS	
Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

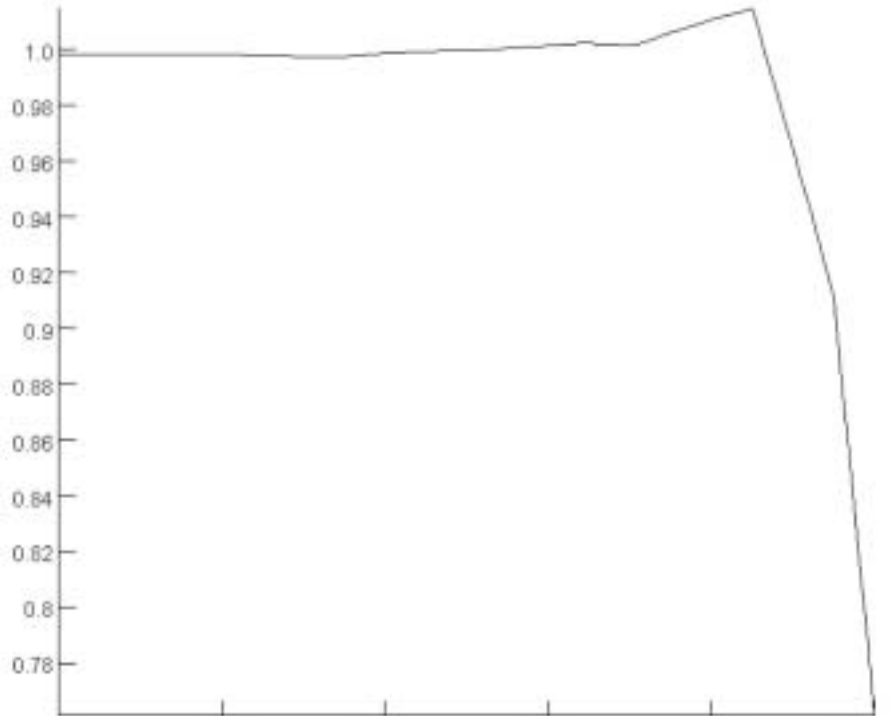
PROBLEM DATA
g30w2_db01.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.45$ m)

23/Jun/2005 20:20:53



Local X coord	0.0	0.012	0.024	0.036	0.048	0.06
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.45	0.45	0.45	0.45	0.45	0.45

Component: BY*(-1)/1.25479, Integral = 0.05931391516258

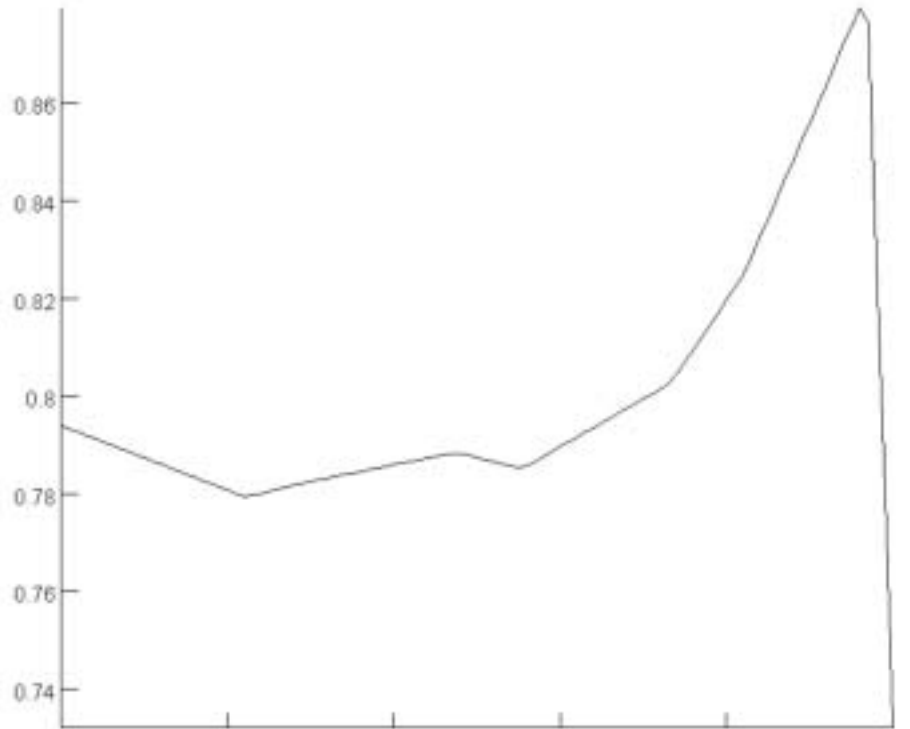
UNITS	
Length	m
Magn Flux	T
Density	
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA
g30w2_db01.op3
TOSCA Magnetostatic
Non-linear materials
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200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.50$ m)

23/Jun/2005 20:22:01



Local X coord	0.0	0.012	0.024	0.036	0.048	0.06
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.5	0.5	0.5	0.5	0.5	0.5

Component: BY*(-1)Y1.25479, Integral = 0.04801930224581 : x (m)

UNITS

Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA

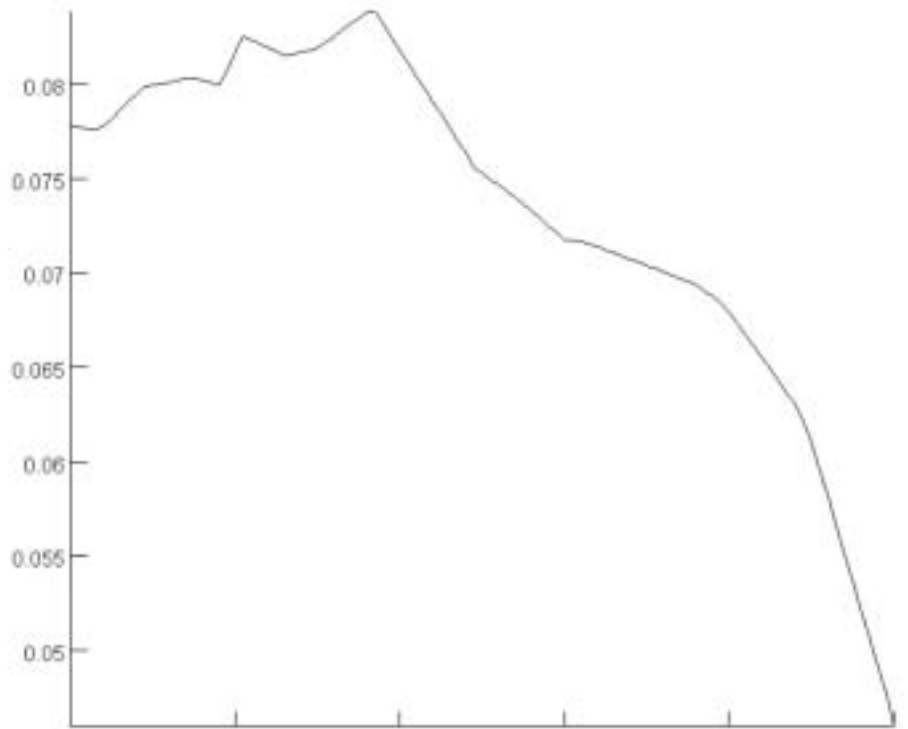
g30w2_db01.op3
 TOSCA Magnetostatic
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 Simulation No 1 of 1
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 Nodally interpolated fields

Local Coordinates

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

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.55$ m)

23/Jun/2005 20:22:42



Local X coord	0.0	0.012	0.024	0.036	0.048	0.06
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.55	0.55	0.55	0.55	0.55	0.55

Component: $B_y \setminus -1 \setminus 1.25479$, Integral = $4.4061724453E-03$; x (m)

UNITS

Length	m
Magn Flux	T
Density	
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	$S \ m^{-1}$
Current Density	$A \ m^{-2}$
Power	W
Force	N
Energy	J

PROBLEM DATA

g30w2_db01.op3
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Local Coordinates

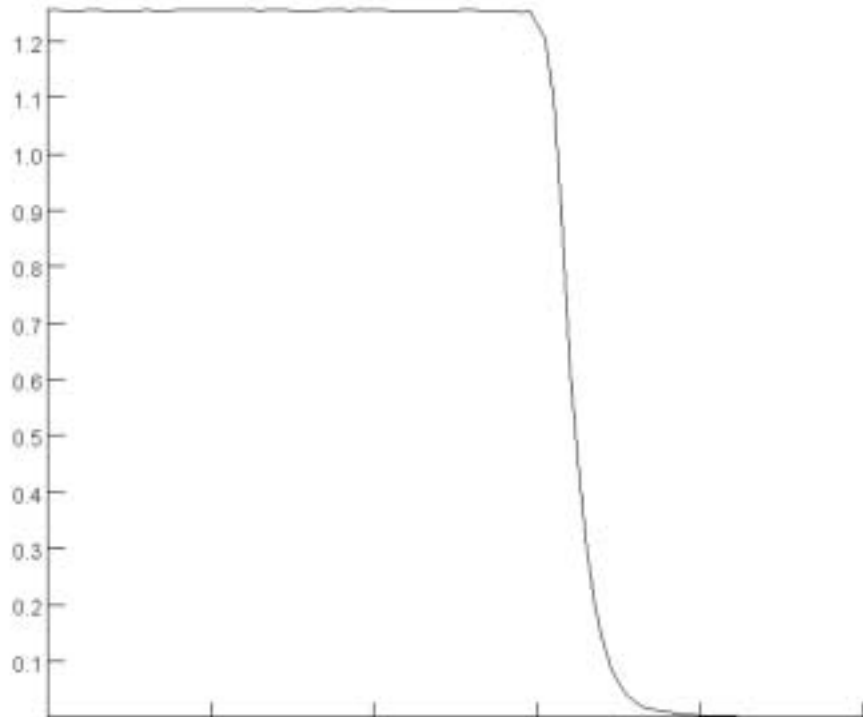
Origin: 0.0, 0.0, 0.0
 Local XYZ = Global XYZ

計算結果 (BH 曲線 : 異方性あり)

- 励磁電流 : 30000 A
- コイルの電流密度 : 1.071×10^8 (A/m²)
- BH 曲線 :
 - y 方向: 35z135-00 deg (磁場の飽和が遅い)
 - x, z 方向: 35z135-90 deg (磁場の飽和が早い)
- $x = y = z = 0$ mm (電磁石中心)での磁場
 $B_y = 1.2557$ (T)
- z 軸方向の積分磁場
 $B_y L_{\text{eff}} = 1.2982$ (T m)

B_y (ビーム進行方向: 0 ~ 0.8 m)

23/Jun/2005 21:07:24



Local X coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.0	0.16	0.32	0.48	0.64	0.8

Component: $B_y(-1)$, Integral = 0.64908493540454 : z (m)

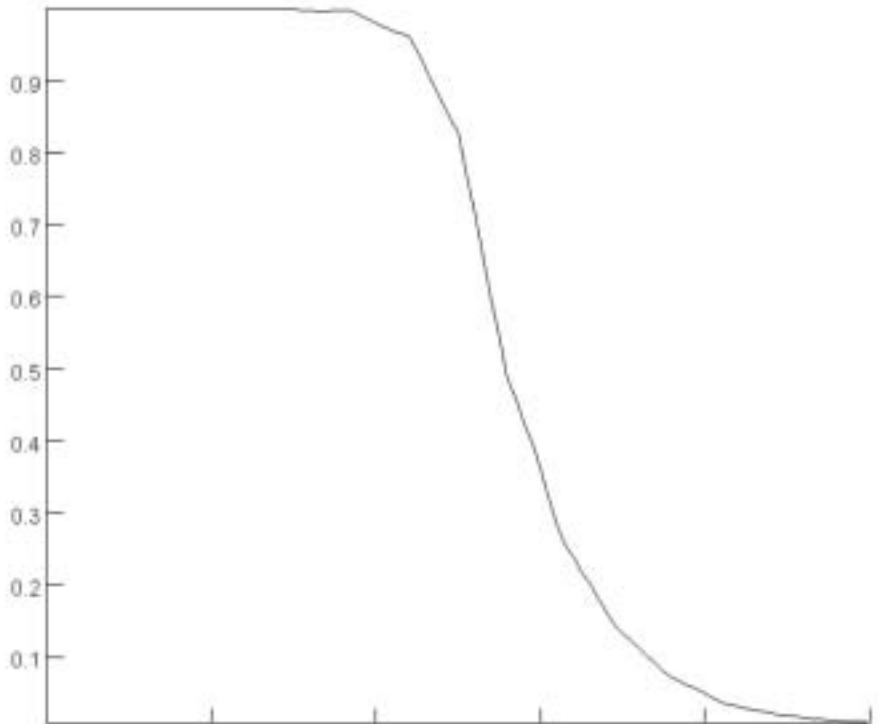
UNITS	
Length	m
Magn Flux	T
Density	
Magn Field	$A\ m^{-1}$
Magn Scalar Pot	A
Magn Vector Pot	Wb
	m^{-1}
Elec Flux Density	$C\ m^{-2}$
Elec Field	$V\ m^{-1}$
Conductivity	$S\ m^{-1}$
Current Density	$A\ m^{-2}$
Power	W
Force	N
Energy	J

PROBLEM DATA	
g30w3_db01.op3	
TOSCA Magnetostatic	
Non-linear materials	
Simulation No 1 of 1	
200520 elements	
75020 nodes	
1 conductor	
Nodally interpolated fields	

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

B_y/B_{y0} (ビーム進行方向: 0.4 ~ 0.6 m)

23/Jun/2005 21:09:34



Local X coord 0.0 0.0 0.0 0.0 0.0 0.0
 Local Y coord 0.0 0.0 0.0 0.0 0.0 0.0
 Local Z coord 0.4 0.44 0.48 0.52 0.56 0.6

Component: $B_y(-1)1.255692$, Integral = 0.11664184991259 : z (m)

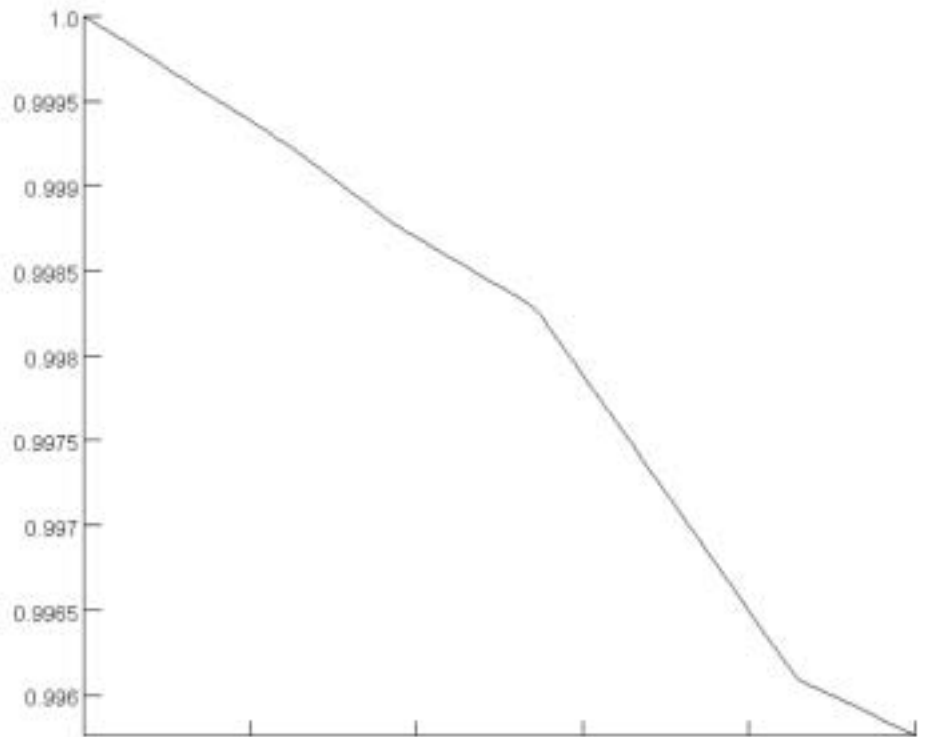
UNITS	
Length	m
Magn Flux	T
Density	
Magn Field	A m ⁻¹
Magn Scalar Pot	A
Magn Vector Pot	Wb
	m ⁻¹
Elec Flux Density	C m ⁻²
Elec Field	V m ⁻¹
Conductivity	S m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA	
g30w3_db01.op3	
TOSCA Magnetostatic	
Non-linear materials	
Simulation No 1 of 1	
200520 elements	
75020 nodes	
1 conductor	
Nodally interpolated fields	

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

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.0$ m)

23/June/2005 21:14:39



Local X coord	0.0	1.0E-02	0.02	0.03	0.04	0.05
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.0	0.0	0.0	0.0	0.0	0.0

Component: BY*(-1)/1.255892, Integral = 0.04990324525119 : x (m)

UNITS	
Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

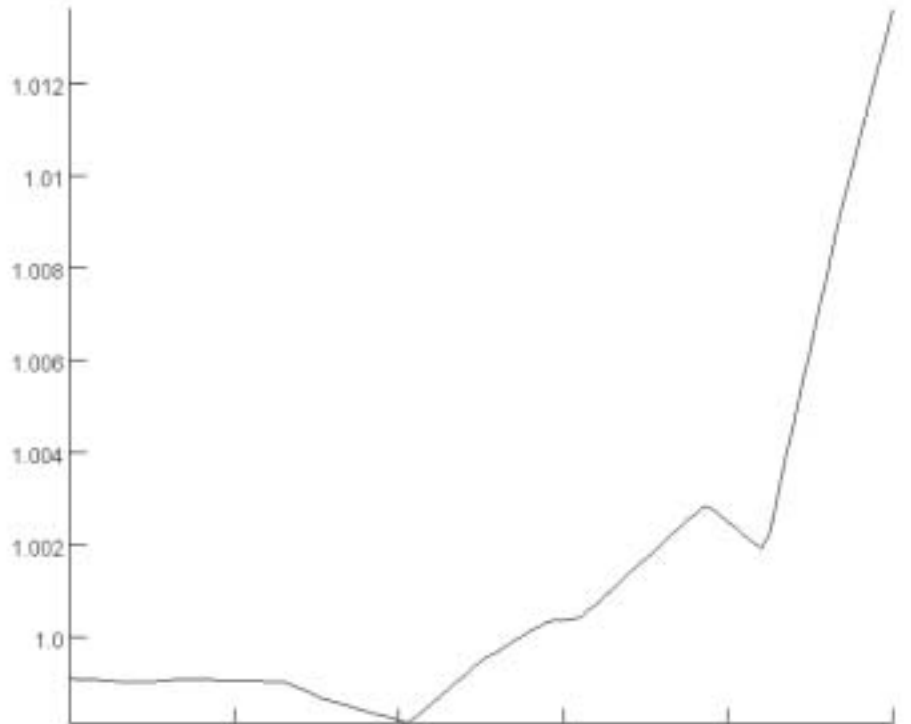
PROBLEM DATA
g30w3_db01.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.45$ m)

23/Jun/2005 21:15:03



Local X coord	0.0	1.0E-02	0.02	0.03	0.04	0.05
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.45	0.45	0.45	0.45	0.45	0.45

Component: BY\(-1\)/1.255892, Integral = 0.05005449047244 : x (m)

UNITS	
Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J
PROBLEM DATA	
g30w3_db01.op3	
TOSCA Magnetostatic	
Non-linear materials	
Simulation No 1 of 1	
200520 elements	
75020 nodes	
1 conductor	
Nodally interpolated fields	
Local Coordinates	
Origin: 0.0, 0.0, 0.0	
Local XYZ = Global XYZ	

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.50$ m)

23/Jun/2005 21:15:54



Local X coord	0.0	1.0E-02	0.02	0.03	0.04	0.05
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.5	0.5	0.5	0.5	0.5	0.5

Component: BY*(-1)1.255692, Integral = 0.040854745329 : x (m)

UNITS	
Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

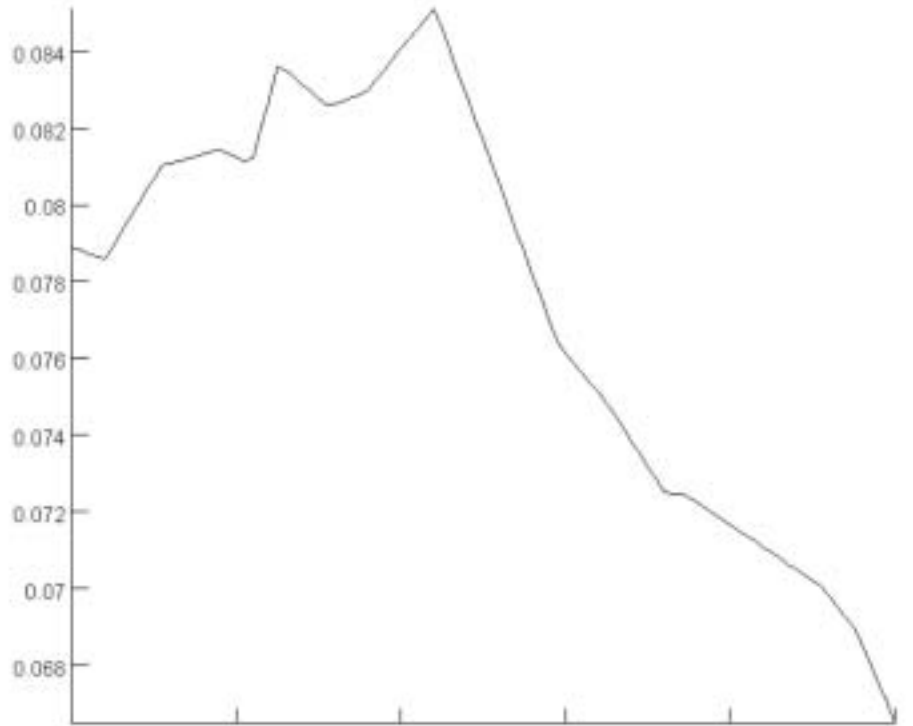
PROBLEM DATA
g30w3_db01.op3
TOSCA Magnetostatic
Non-linear materials
Simulation No 1 of 1
200520 elements
75020 nodes
1 conductor
Nodally interpolated fields

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

V VECTOR FIELDS

B_y/B_{y0} (水平方向: 0 ~ 6.0 cm, $z = 0.55$ m)

23/Jun/2005 21:16:21



Local X coord	0.0	1.0E-02	0.02	0.03	0.04	0.05
Local Y coord	0.0	0.0	0.0	0.0	0.0	0.0
Local Z coord	0.55	0.55	0.55	0.55	0.55	0.55

Component: BY\{-1\}1.255692, Integral = 3.8771306959E-03 : x (m)

UNITS

Length	m
Magn Flux	T
Density	
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 m ⁻¹
Current Density	A m ⁻²
Power	W
Force	N
Energy	J

PROBLEM DATA

g30w3_db01.op3
 TOSCA Magnetostatic
 Non-linear materials
 Simulation No 1 of 1
 200520 elements
 75020 nodes
 1 conductor
 Nodally interpolated fields

Local Coordinates

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

まとめ (1)

- Window frame type, Gap 30 mm のモデルに対して、3次元磁場計算を行った
- Opera-3D を用いて計算

- 使用した BH 曲線 : Opera-3D default
- BH 曲線を切り替えるウィンドウを立ち上げるとmodellerが落ちてしまい、変更できなかった。何故か？
command から変更できることがわかった

まとめ (2)

- 計算結果 (BH 曲線, Opera3d default)
 - 中心磁場: $B_y = 1.2549$ (T)
 - 積分磁場: $B_y L_{\text{eff}} = 1.2989$ (T m)
- 計算結果 (BH 曲線, 35z135-90 deg)
 - 中心磁場: $B_y = 1.2547$ (T)
 - 積分磁場: $B_y L_{\text{eff}} = 1.2948$ (T m)
- 計算結果 (BH 曲線, x, z 方向: 90 deg, y 方向: 0 deg)
 - 中心磁場: $B_y = 1.2557$ (T)
 - 積分磁場: $B_y L_{\text{eff}} = 1.2982$ (T m)