

## AGV Train

- 360km/h
- Fully articulated train
- Distributed power train
- Permanent magnet motors



Motorized bogie



Automotrice Grande Vitesse  
574,8 km/h



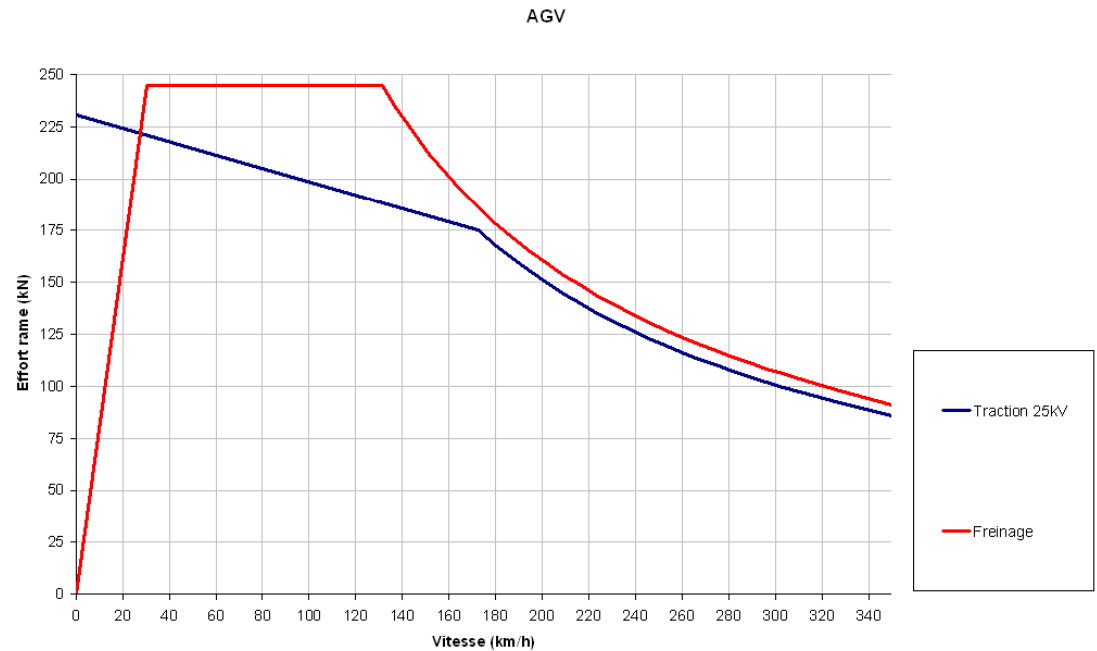
## AGV motor

- Synchronous Permanent Magnet Motor
- Totally Enclosed
- Self Ventilated
- Mounting into the bogie
- Weight 750 kg
- Continuous Power 750 kW
- Efficiency 97%



# Design Constraints

- Performances
- Outline
- Magnetic & Electric
- Noise & Thermal
- Life Time & Environment



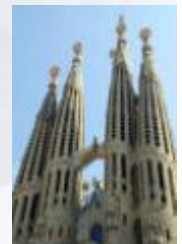
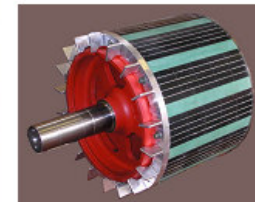
Traction & Braking characteristics



## Outline constraints

### ● Evolution of TGV motors

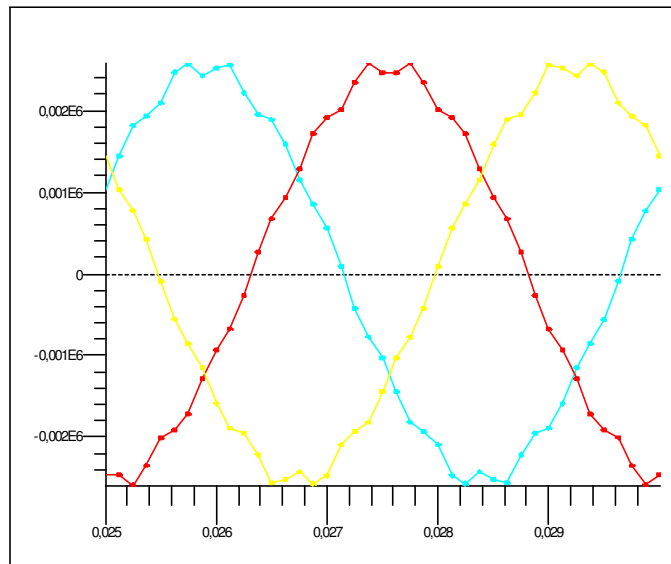
	1981	1989	1994	2004
	TGV Paris-Sud est	TGV Atlantique	Eurostar	AGV Automotrice GV
Type	Courant continu	Synchrone rotor bobiné	Asynchrone	Synchrone Rotor à aimants
Puissance kW	535	1130	1020	750
Masse Kg	1560	1525	1260	750
Ratio Kg/KW	2,9	1,35	1,23	1,00



# Magnetic & Electric constraints

## No load voltage

3550C3\_001

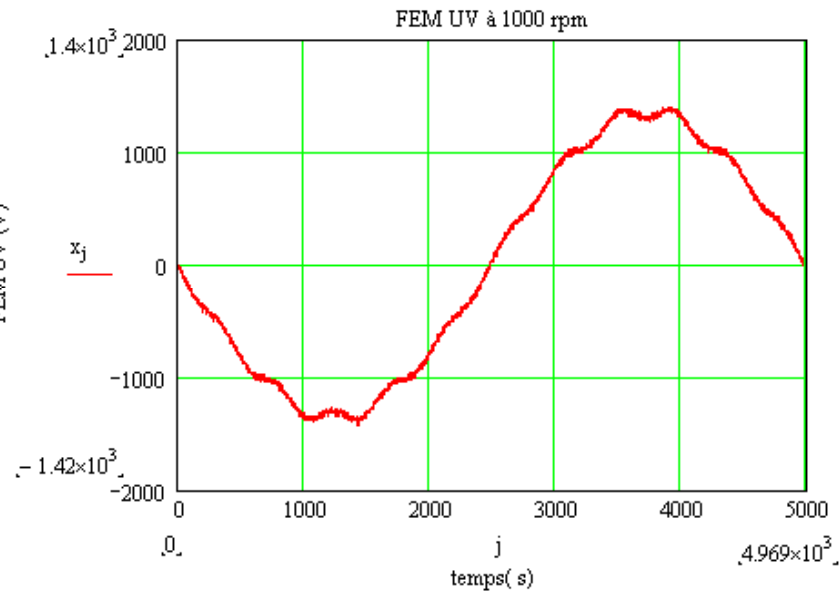


Calculated No load voltage

COURBE  
Circuit / Tension  
Temps  
S13 ;

COURBE  
Circuit / Tension  
Temps  
S14 ;

COURBE  
Circuit / Tension  
Temps  
S15 ;

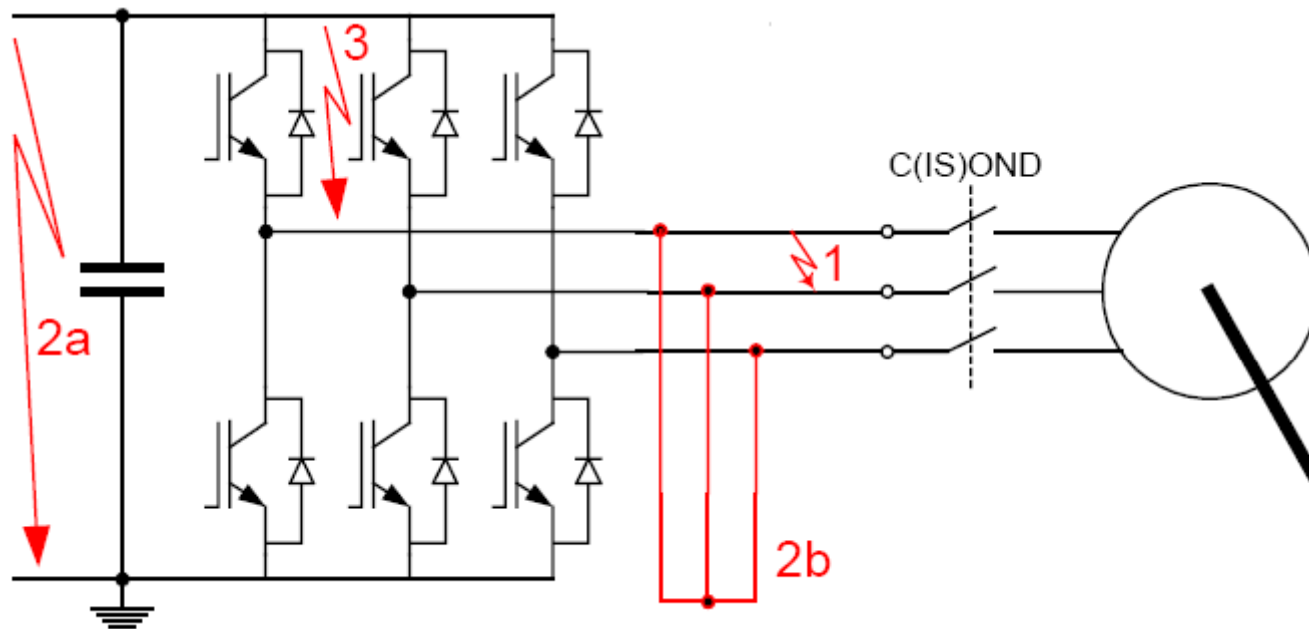


Measured No load voltage



# Magnetic & Electric constraints

## Faults conditions



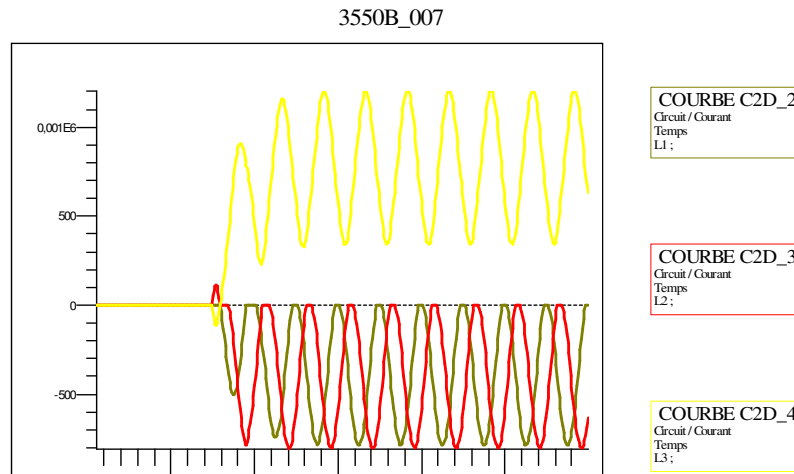
- 1 : 2-phase short-circuits
- 2a-2b : 3 phases short-circuits
- 3 : single interrupter short-circuit  
« asymmetrical short-circuit »



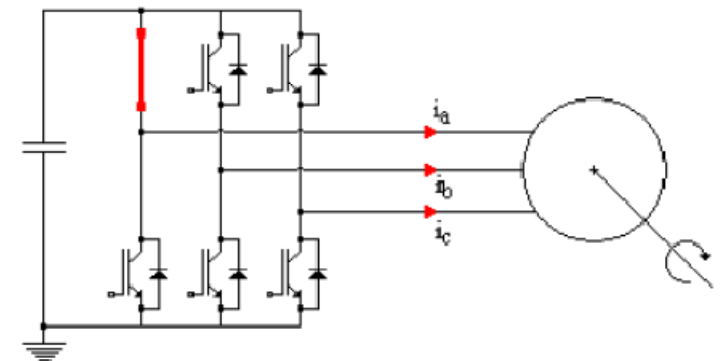
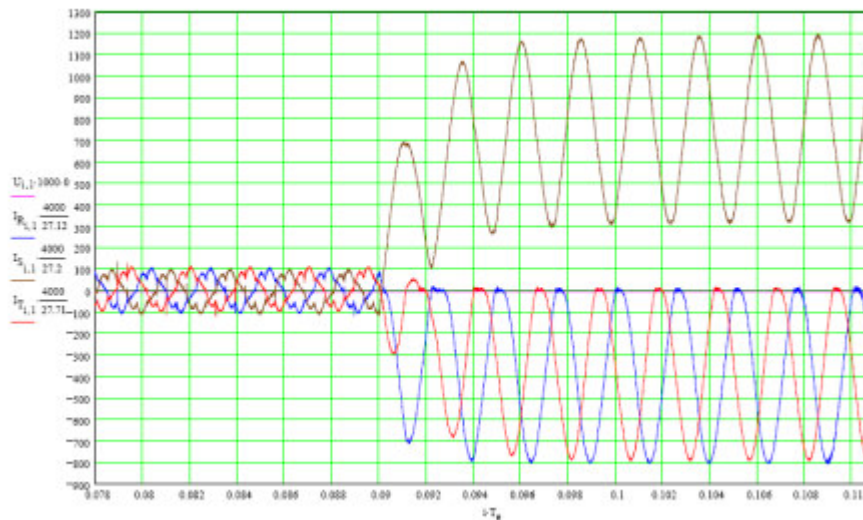
# Magnetic & Electric constraints

## Asymmetrical short-circuit

Calculated currents

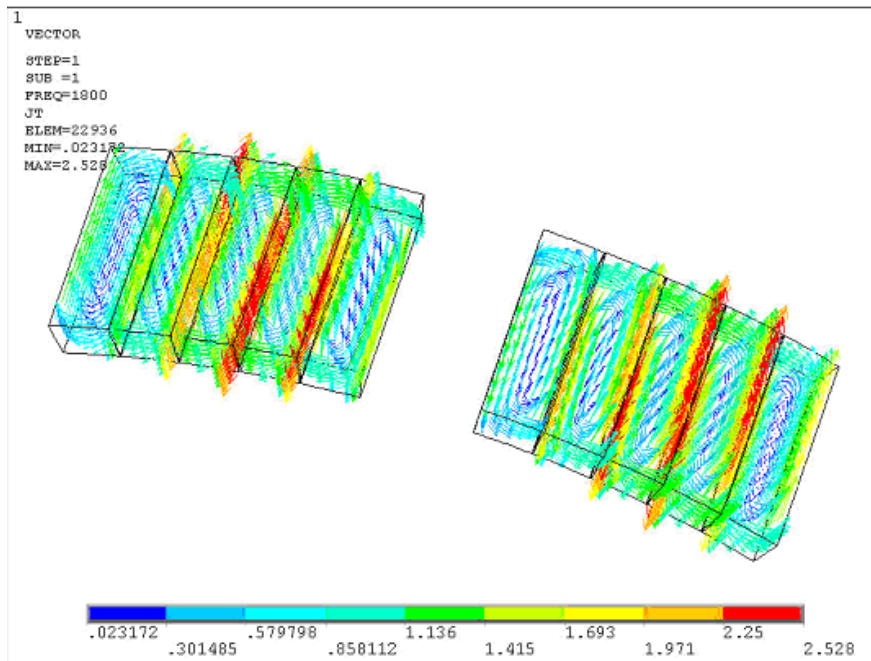


Measured currents

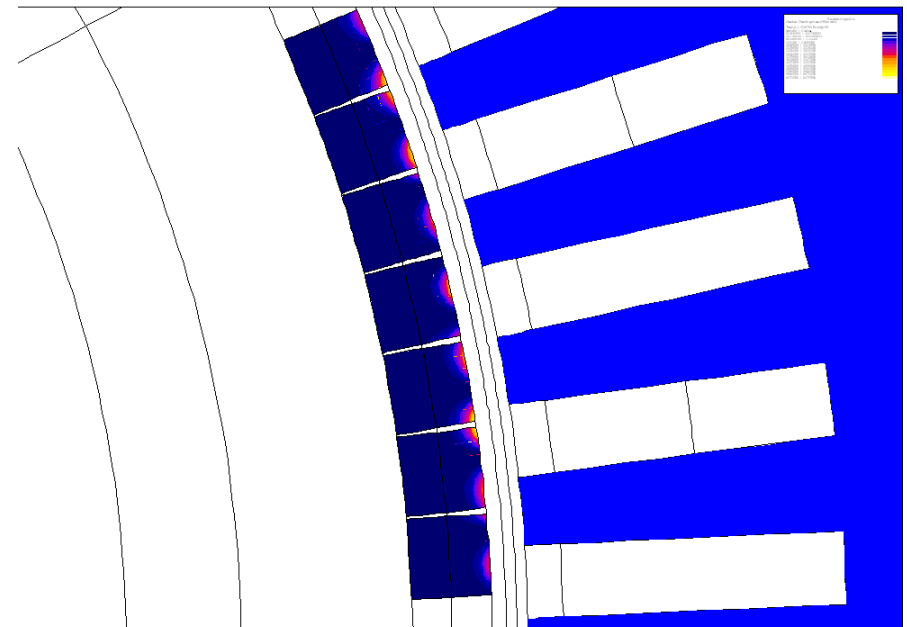


# Magnetic & Electric constraints

## Time & Space harmonic losses



Time harmonics

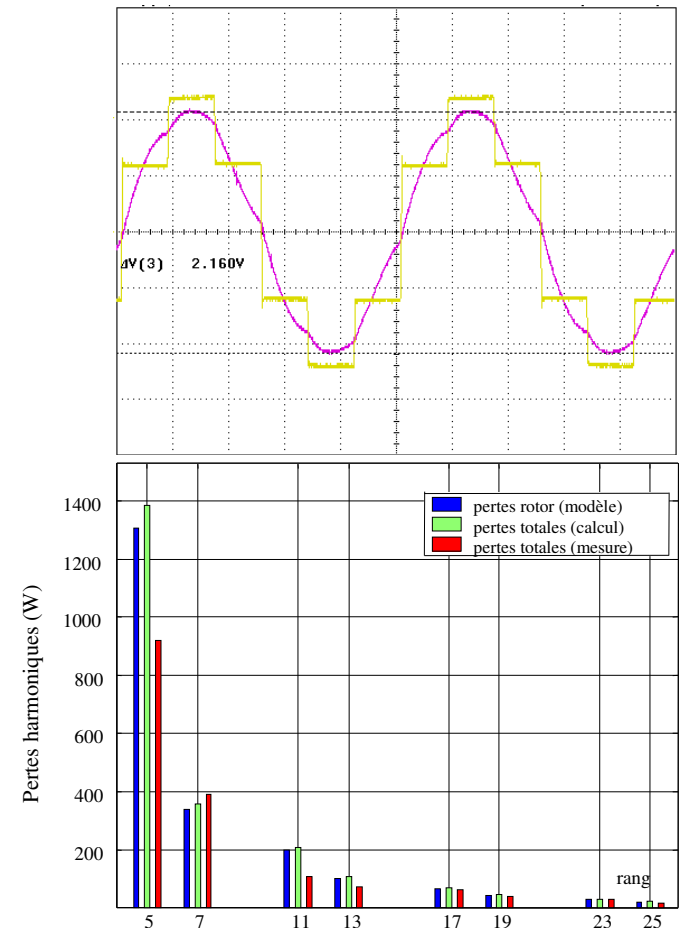
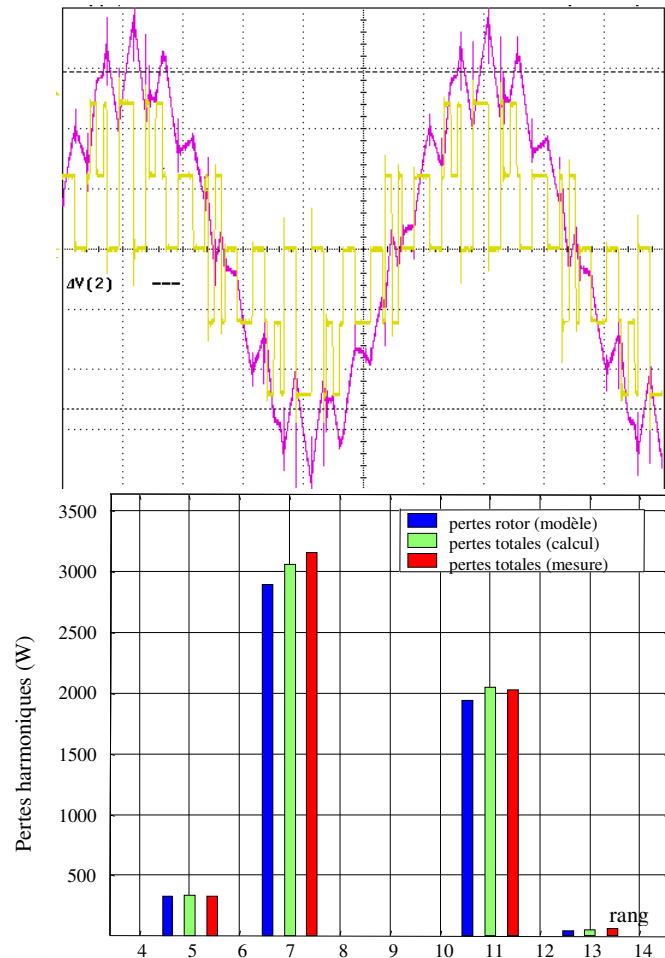


Space harmonics

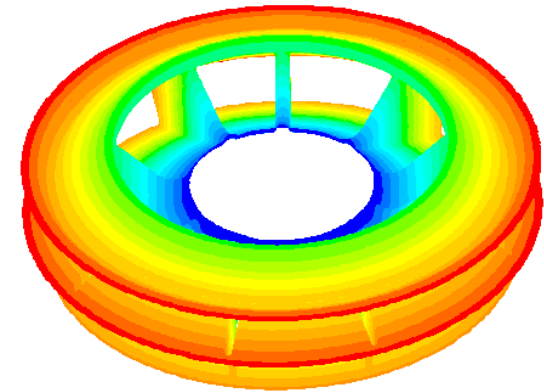


# Magnetic & Electric constraints

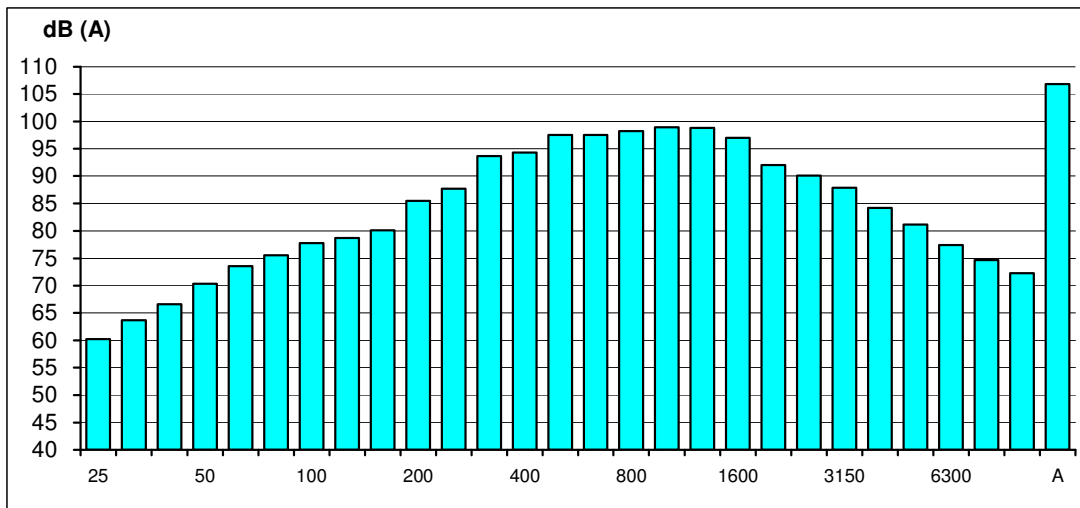
- Measured and calculated current, voltage and Harmonic losses



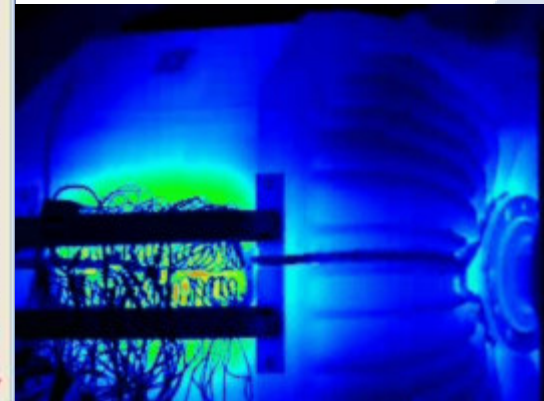
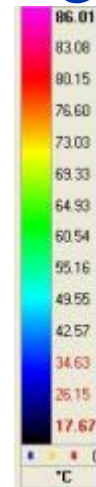
# Noise & thermal constraints



CFD simulation on fan



Measured acoustic power noise



# Life Time & Environment constraints

- Life Time : 30years or 17 million of kms
- 550 000 kms/ year
- Efficiency : 97%

