

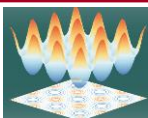
MATURATION :
**Algorithmes PIC sur grilles parcimonieuses
massivement parallèles pour la simulation des
plasmas froids hors-équilibres**
ANR-22-CE46-0012

CE46 - Modèles numériques, simulation, applications



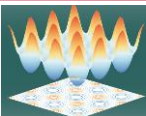
DUREE : 2023 - 2027 (4,5 ANS)
BUDGET : 1 341 072 €
AIDE : 355 470 €

label



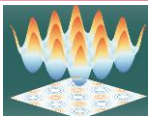
Ordre du jour

- **9h30-9h45** : Point administratif (L. Garrigues)
- **9h45-10h30** : Derniers résultats Laplace (L. Garrigues)
- **10h30-11h30** : Revue des travaux MdS (M. Chung-To-Sang, M. Lobet)
- **11h30-12h30** : Derniers résultats IMT (P. Pace)
- **12h30-13h45** : Repas
- **13h45-14h30** : Revue des travaux INRIA (C. Guillet)
- **14h30-16h45** : Discussion générale



Point administratif

- **Pas de rapport intermédiaire, uniquement un rapport final**
- **Recrutements de post-doctorants**
 - 05/2025, MdS : recrutement de MARC CHUNG-TO-SANG pour deux ans (05/2025 – 05/2027)
 - 02/2026 - INRIA 1 an de financement de post-doc à pourvoir après la démission de CAMILLA BRESSAN
- **Recrutement d'un étudiant de Master**
 - 04/2026, MdS, durée 5-6 mois
- **Demande puis obtention d'un prolongement de l'ANR jusqu'au 01/07/2027 (à prolonger à nouveau ?)**



Production Scientifique au 04/03/2026

- 5 publications

Physics of PlasmasARTICLEpubs.aip.org/aip/pop

Acceleration of particle-in-cell simulations using sparse grid algorithms. I. Application to dual frequency capacitive discharges

Cite as: Phys. Plasmas 31, 073907 (2024); doi: 10.1063/5.0212127
Submitted: 29 March 2024 · Accepted: 30 June 2024 ·
Published Online: 24 July 2024



L. Garrigues,^{1,✉} M. Chung-To-Sang,¹ G. Fubiani,¹ C. Guillet,^{1,2} F. Deluzet,² and J. Narski²

SIAM J. NUMER. ANAL.
Vol. 63, No. 3, pp. 1281–1314

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HIGH-ORDER SPARSE-PIC METHODS: ANALYSIS AND NUMERICAL INVESTIGATIONS*

FABRICE DELUZET[†], CLÉMENT GUILLET[‡], JACEK NARSKI[†], AND PAUL PACE[†]

Physics of PlasmasARTICLEpubs.aip.org/aip/pop

Acceleration of particle-in-cell simulations using sparse grid algorithms. II. Application to partially magnetized low temperature plasmas

Cite as: Phys. Plasmas 31, 073908 (2024); doi: 10.1063/5.0212220
Submitted: 29 March 2024 · Accepted: 30 June 2024 ·
Published Online: 24 July 2024



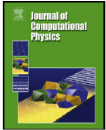
L. Garrigues,^{1,✉} M. Chung-To-Sang,¹ G. Fubiani,¹ C. Guillet,^{1,2} F. Deluzet,² and J. Narski²

Journal of Computational Physics 524 (2025) 113739

Contents lists available at ScienceDirect

Journal of Computational Physics

journal homepage: www.elsevier.com/locate/jcp



Energy-conserving Particle-In-Cell scheme based on Galerkin methods with sparse grids

C. Guillet[✉]

Sorbonne Université, CNRS, LIP6, Paris, France



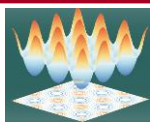
MULTISCALE MODEL. SIMUL.
Vol. 22, No. 2, pp. 891–924

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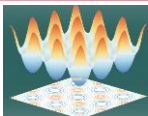
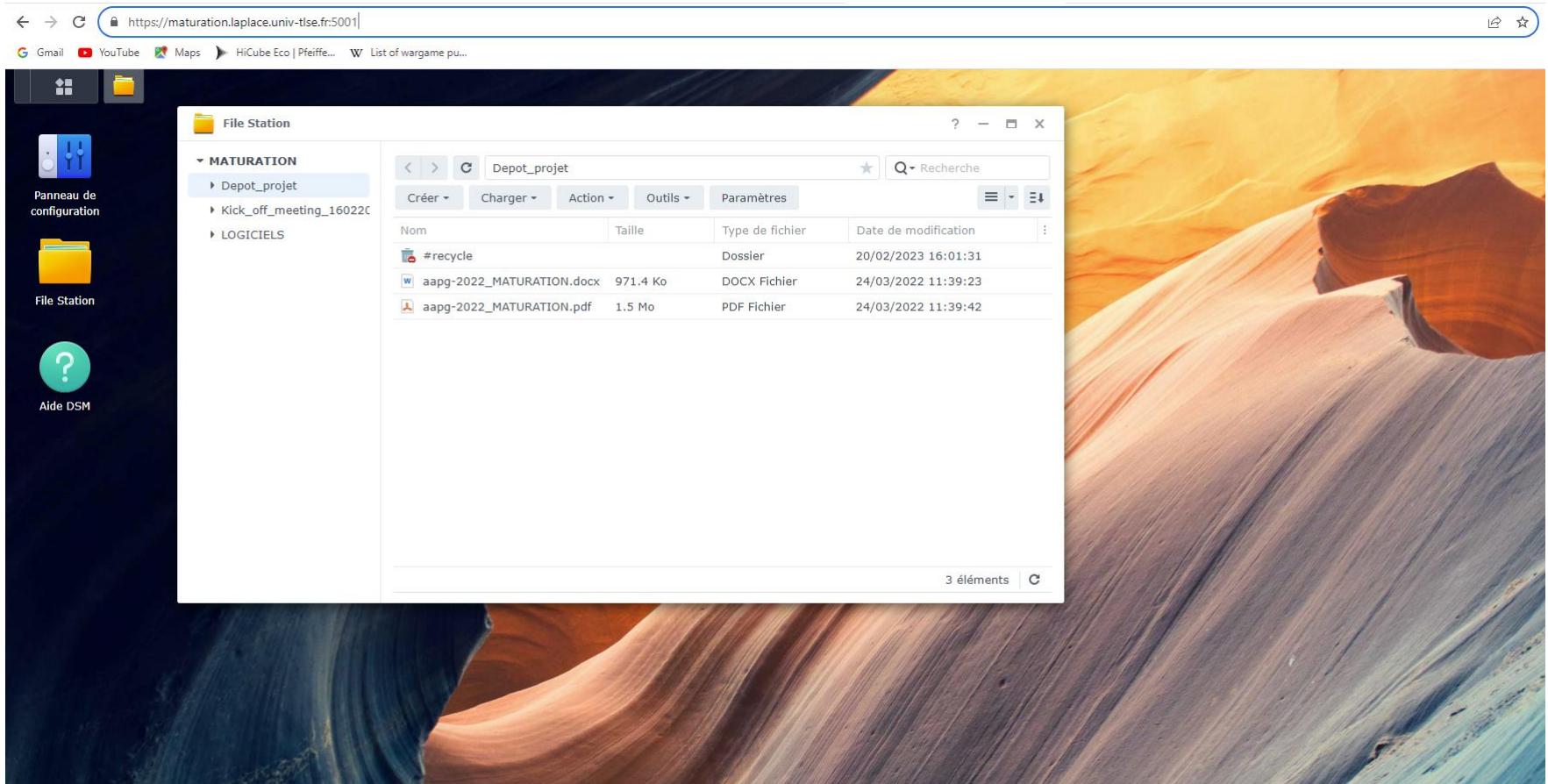
SEMI-IMPLICIT PARTICLE-IN-CELL METHODS EMBEDDING SPARSE GRID RECONSTRUCTIONS*

C. GUILLET[†]

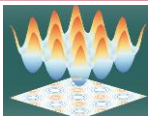
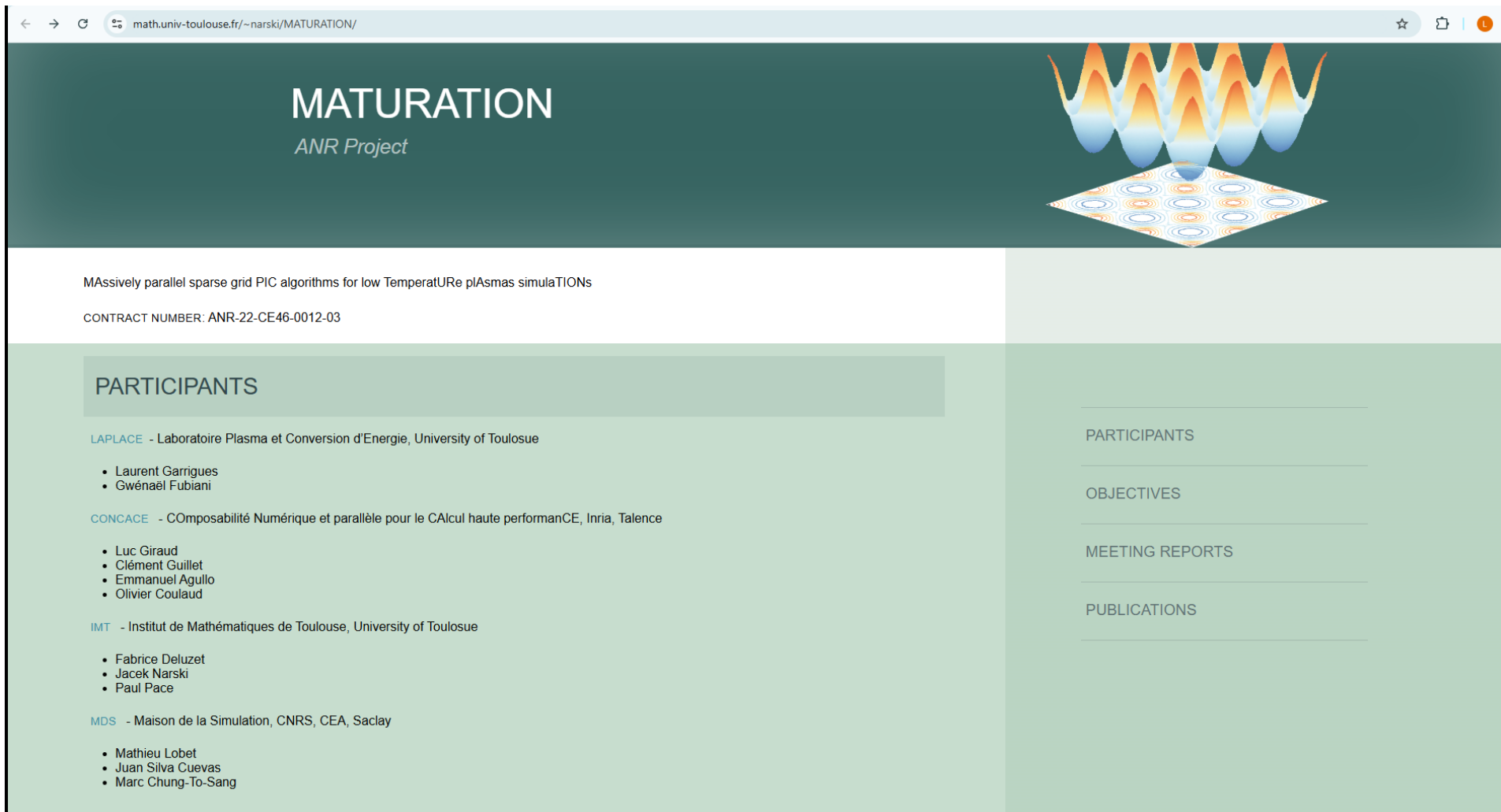
- 2 Conférences invitées
- 2 oraux
- 1 séminaire



Site web à diffusion interne

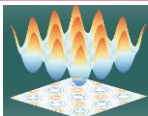


Site web à diffusion externe



Tâches – diagramme de Gantt

Work Packages &Tasks	LAPLACE	CONCAC	IMT	Mds	Year 1				Year 2				Year 3				Year 4				
					T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	T1	T2	T3	T4	
WP0 Project management	☒	x	x	x																	
T0.1 – data management	x	x	x	x	M0.1																
T0.2 – meetings	x	x	x	x	D0.1	D0.2		D0.6		D0.3		D0.7		D0.4		D0.8		D0.5		D0.9	
T0.3 – hiring of persons	x	x	x	x					M0.2				M0.3		M0.4						
T0.4 – annual reports	x	x	x	x					D0.10				D0.11		D0.12				D0.13		
T0.5 – collaborative tool	x	x	x	x	M0.5																
WP1 Opt. 3D sparse PIC model	☒	x	x	x																	
T1.1 – construction	x	x	x	x													D1.1				
T1.2 – scalability	x	x	x	x															D1.2		
WP2 Benchmarks	☒	x	x																		
T2.1 – definition of test cases	x				M2.1																
T2.2 – implementation	x	x	x						M2.2				D2.1								
T2.3 – verification	x	x	x										M2.3				D2.2				
WP3 Numerical analysis	x	x	☒																		
T3.1 – Sparse grid reconstruction	x	x	x						M3.1								D3.1				
T3.2 – hierarchization strategy	x	x	x						M3.2								D3.1				
T3.2 – Vlasov-Maxwell system	x	x	x										M3.3				D3.2				
WP4 3D solvers & parallelization	x	☒	x	x																	
T4.1 – 3D parallelization	x	x	x	x					M4.1								D4.1				
T4.2 – parallel Poisson solver	x	x	x						M4.2								D4.1				
T4.3 – parallel perform. benc.	x	x	x														D4.1				
WP5 Sparse PIC optimization	x	x		☒																	
T5.1 – cache-based optimization	x	x		x									M5.1								
T5.2 – vectorization	x	x		x											M5.2		D5.1				
WP6 Commun. & dissemination	x	x	☒	x																	
T6.1 – communication	x	x	x	x	M6.1																
T6.2 – archive	x	x	x	x	M6.2																
T6.3 – dissemination	x	x	x	x	D6.1		D6.2		D6.3		D6.4		D6.5		D6.6		D6.7		D6.8		



Budget

	Partner 1 LAPLACE	Partner 2 Concace	Partner 3 IMT	Partner 4 MdS
Staff expenses	103 196 € (2-year post-doc)	48 000 € (1-year post-doc)	57 180 € (1-year post-doc)	3 900 € (1 Master Internship)
Instruments and material costs (including the scientific consumables)	13 000 €	3 000 €	14 000 €	4 000 €
Building and ground costs	0 €	0 €	0 €	0 €
Outsourcing / subcontracting	2 000 €	2 000 €	2 000 €	2 000 €
General and administrative costs & other operating expenses	17 200 €	22 000 €	15 200 €	5 900 €
Administrative management & structure costs (13 %)	17 601 €	9 750 €	11 489 €	2 054 €
Sub-total	152 997 €	84 750 €	99 869 €	17 854 €
Requested funding	355 470 €			

