BOOK PROSPECTUS

The Managed Plasma Environment

From Framework to Discipline

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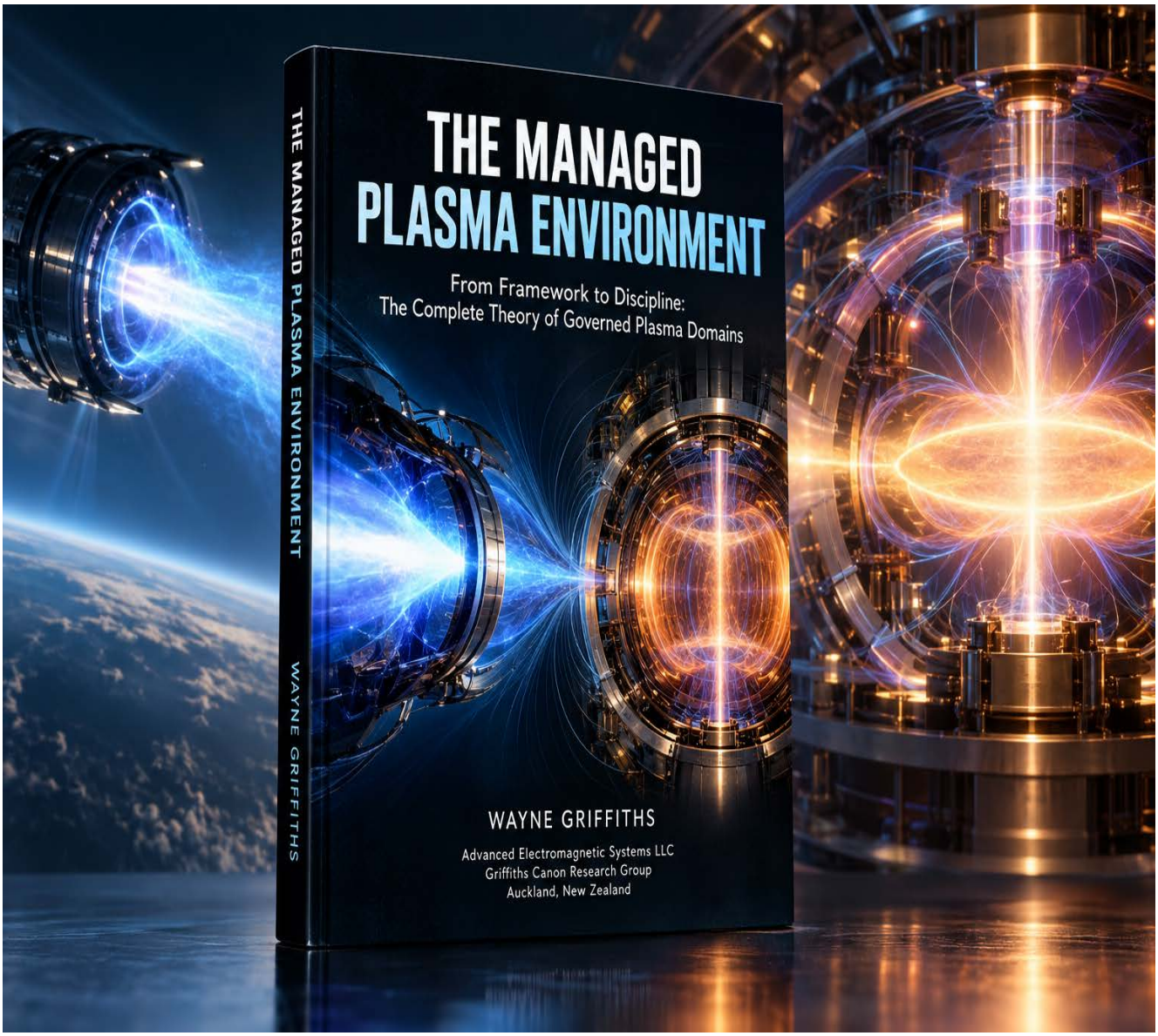
The second book of the Griffiths Canon, following The Governed Field



Executive Overview

This overview is written for a reader who has not met the Griffiths Canon before. It introduces each idea in plain language before its technical name, so that the rest of the prospectus, and the book itself, can be read without prior familiarity with the vocabulary. A one-page table of key terms follows the overview.

What the book is about

Plasma, the hot electrically charged gas found in lightning, neon signs, fusion experiments and spacecraft thrusters, is notoriously hard to hold steady. Left alone it develops ripples, wobbles and breakups, known as instabilities, which grow in fractions of a second and destroy whatever the plasma was meant to do. Engineers have traditionally dealt with this in one of two ways: build the machine so that the dangerous ripples cannot form, or find a narrow set of operating conditions where the plasma happens to behave, and stay there.

This book sets out a third way. It treats a plasma as something that can be actively governed: measured continuously, compared against where it should be, and nudged back by electromagnetic fields faster than any ripple can grow. A plasma held this way is called a Managed Plasma Environment, or MPE. The book turns that idea into an engineering discipline, with definitions, a single test for success, a control architecture, and an experimental programme designed to prove or disprove it.

The core idea: act faster than the problem grows

A driver on a windy road stays in lane because steering corrections come much faster than the wind can push the car sideways. If the gusts came faster than the driver could react, no amount of skill would help. Plasma control works the same way. What matters is not how strong the controls are, but how fast they respond compared with how fast the trouble develops.

The book captures this in one number, the Governance Ratio, written R. It is the speed of the control system divided by the growth rate of the fastest instability. If R is above 10, the controls are at least ten times faster than the problem, and the plasma is governed. Between 1 and 10 control is possible but unreliable. Below 1 the plasma runs away. The factor of ten is a deliberate safety margin, in the same way that bridges are built well beyond their expected load.

This single number turns out to be surprisingly powerful. It sets the minimum length of a thruster nozzle, the fastest disturbance a hydrogen burner can correct, and the safest speed at which a machine can change from one operating mode to another. The book works each of these out with numbers a reader can check.

Four very different machines, one rule

Plasma machines are normally studied in separate fields that rarely talk to each other. The book applies the same rule to four machines drawn from four of those fields:

Short name	Full name	What it is, in plain terms	Why it is in the book
CSMMC	Curvature-Stabilised Microwave-sustained Magnetised Cavity	A tabletop microwave plasma reactor	Cheapest place to test the whole idea first
REMN	Rotating Electromagnetic Nozzle	A spacecraft thruster that shapes its exhaust with rotating magnetic fields	Plasma that flows through and leaves the machine
CSFR	Curvature-Stabilised Fusion Reactor	A fusion reactor that uses field shape to remove its most dangerous instabilities	Plasma held inside a closed magnetic bottle

H2EM	Hydrogen Electromagnetic system	A hydrogen burner whose flame is steadied electromagnetically	Shows the rule also works for combustion, not only plasma

Table E1. The four machine classes covered by the book.

The thruster and the fusion reactor sit at opposite ends of a spectrum. In the thruster the magnetic field lines are open and the plasma streams through. In the reactor the field lines close on themselves and the plasma is trapped. The book calls this the topology of the field, and much of its technical content is about governing plasma at both ends of that spectrum and in the transitions between them.

How the control is organised

No single controller can handle events that range from millionths of a second to whole seconds. The book uses a three-layer control architecture called DIGSP (Distributed Intelligent Governance and Supervisory Protection). The top layer plans and supervises, deciding what mode the machine is in and whether it is safe to change. The middle layer shapes the magnetic field. The bottom layer reacts locally, within millionths of a second, at each point where a field can be applied. Each layer can overrule the one below it. The same three layers are used in all four machines; only the hardware they drive changes.

How it will be tested, and what would prove it wrong

The book does not claim that any of this has been demonstrated in hardware. It says so plainly, and it sets out how the claims will be tested in three stages, called gates. Each stage must pass before money is committed to the next.

Stage	Hardware	What must happen to pass
Gate 1	Tabletop reactor (CSMMC)	Governance Ratio above 10 held for at least 100 control cycles, and a governed run producing a better result than an ungoverned one under identical conditions
Gate 2	Sub-scale thruster (REMN)	Governance held in all five zones of the nozzle at once while plasma flows
Gate 3	Fusion proof-of-principle (CSFR)	Governance held against the reactor's remaining instabilities

Table E2. The three experimental gates.

The book lists thirty-eight specific predictions, each with a result that would count as failure. The theory would be in serious trouble if the Governance Ratio could not actually be measured on the tabletop rig, if governing the plasma made no measurable difference, or if the boundary between controlled and uncontrolled behaviour turned out to be far from the predicted value of 10. Stating these failure conditions in advance is what makes the work a research programme rather than a set of claims.

Where the evidence stands today

The theory is set out in eleven research papers and a unifying paper, one of which (MPE-2) is published in the Journal of Computational Methods in Engineering Science. The book separates, number by number, what has been derived by calculation, what comes from computer simulation, what is a design target, and what has been measured. At the time of writing nothing has yet been measured on programme hardware; the first measurements will come from the tabletop rig at Gate 1. This honesty is deliberate and is one of the book's strengths with technical reviewers.

Why it matters

If the Gate 1 results hold, the discipline offers a common language and a common test for plasma control across propulsion, fusion, industrial plasma processing and hydrogen combustion: fields that currently develop control methods independently. For universities and laboratories it offers testable predictions and a staged programme to collaborate on. For funders and reviewers it offers a clear view of what is claimed, what is not, and exactly which experiment will settle the first question.

How the book relates to The Governed Field

The Governed Field, the first book of the Canon, sets out the general worldview: that electromagnetic fields can be engineered and governed as deliberately as any other part of a machine. The Managed Plasma Environment is the operational doctrine for one domain. It is narrower, more structured, and tied directly to experiments, which makes it the natural entry point for plasma researchers, laboratories and technical reviewers.

Key Terms

The terms below recur throughout the book. Each is defined in full where it first appears; this table gives the plain-language meaning.

Term	Plain-language meaning
Plasma	Gas hot or energised enough that its atoms lose electrons, making it electrically conducting and responsive to magnetic fields
Instability	A ripple or distortion in the plasma that grows by itself if not corrected
Governance	Continuous measurement and correction of a plasma by electromagnetic fields, faster than its instabilities can grow
MPE (Managed Plasma Environment)	A plasma held within defined bounds by governance
Governance Ratio (R)	Control speed divided by instability growth rate. Above 10 means governed
DIGSP	The three-layer control architecture: supervise (Tier 0), shape the field (Tier 1), react locally (Tier 2)
Topology	The shape and connection of the magnetic field lines: open (plasma flows through) or closed (plasma is trapped)
Topology index (tau)	A single number from 0 (fully open) to 1 (fully closed) describing the field shape
Curvature (kappa)	How sharply the field lines bend; it can help or harm stability
Topology state vector Psi(t)	The five numbers that together describe the state of a governed plasma at any moment
DTG (Dynamic Topology Governance)	The rules for safely changing a plasma from one field shape to another while it runs
Forbidden corridor	A range of conditions where no control system can keep the plasma governed, so transitions must route around it
CSMMC, REMN, CSFR, H2EM	The four machine classes: tabletop reactor, thruster, fusion reactor and hydrogen burner (Table E1)
Lambda	The air-to-fuel ratio of a flame; the quantity governed in the hydrogen burner
Lineages	The two families of machine: isolated plasma (thruster, reactor) and propellant-coupled (burner, hybrid thruster)
Gate	A stage of the experimental programme with a pass or fail criterion
Kill condition	A pre-stated measurement result that would falsify a prediction
MMS (MPE Measurement Standard)	The minimum sensors and accuracy needed to measure the Governance Ratio
REBCO	A high-temperature superconducting tape used to make very strong, compact magnets

Table E3. Key terms.

1. The Book in One Paragraph

The Managed Plasma Environment establishes plasma governance as an engineering discipline. It gives one quantitative test for whether a plasma is under control, the Governance Ratio R = omega_c / gamma_nl, and applies that test across four machine classes that are normally treated in separate literatures: a tabletop microwave plasma reactor (CSMMC, Curvature-Stabilised Microwave-sustained Magnetised Cavity), an electromagnetic propulsion nozzle (REMN, Rotating Electromagnetic Nozzle), a fusion reactor (CSFR, Curvature-Stabilised Fusion Reactor) and a hydrogen field burner (H2EM, Hydrogen Electromagnetic). A single three-tier control architecture, DIGSP (Distributed Intelligent Governance and Supervisory Protection), governs all four. The book states thirty-eight falsifiable predictions, assigns each to a staged experimental gate, and classifies every principal number by whether it is analytic, simulated, experimental or a design target.

2. The Problem the Book Addresses

Plasma engineering is split between two traditions. Confinement physics designs instability out through geometry and field strength. Discharge and process engineering runs plasmas inside empirically stable windows. Control engineering, meanwhile, has mature tools for bandwidth, margin and delay that are rarely applied to the plasma itself as a governed object. None of these traditions offers a common measure for comparing control authority across a thruster, a reactor and a burner.

The book supplies that measure and builds a discipline around it: definitions, a state vector, an architecture, a failure ladder, a theory of governed topology transitions, a measurement standard and an experimental programme with explicit kill conditions.

3. What Makes It Distinctive

- One governing quantity across machine classes. The Governance Ratio sets real design dimensions: minimum nozzle throat length, the governable disturbance band of a burner, the safe speed of a topology transition.
- Falsification built in. Thirty-eight predictions, each with a pass criterion and a quantitative kill condition, organised into three experimental gates with go or no-go criteria.
- Evidential honesty. Appendix D classifies every principal numerical value by source and states plainly that no value in the book is yet an experimental result of the programme.
- Worked numbers throughout. Each chapter carries order-of-magnitude calculations with SI inputs that a reader can reproduce.
- Rooted in a published series. The book consolidates eleven MPE research papers and a unifying paper; MPE-2 (MNPP) is published in JCMES 2026;1(3), DOI 10.56578/jcmes010304.

4. Audience

Reader	What they take from the book	Entry point
University plasma physicists and fusion researchers	A cross-class governance criterion and falsifiable predictions to test or challenge	Chapters 0, 3, 6, 7
Control and systems engineers	Transfer-function, margin and delay analysis applied to plasma and combustion domains	Chapters 8, 9, 10
Electric propulsion engineers	Open-topology governance of the REMN nozzle and the throat-length rule	Chapters 4, 5, 12

Programme managers and research funders	The three-gate programme, the go or no-go criterion at each gate, and what would end the programme	Chapters 0, 11, 14
Investors and technical due-diligence reviewers	A clear separation of analysis, simulation, targets and data	Chapter 0, Appendix D
Graduate students	A structured route from definitions to experiments with worked examples	Parts I to V in order

Table 1. Target readership.

5. Specifications

Item	Detail
Title	The Managed Plasma Environment: From Framework to Discipline
Author	Wayne Griffiths
Status	Complete first edition (v5), in review; opens with a five-page Executive Discipline Summary (Chapter 0)
Length	88 pages; approximately 32,000 words
Structure	Chapter 0 plus 14 chapters in seven parts; four appendices
Figures and tables	20 figures; 32 tables
Predictions	38 falsifiable predictions with kill conditions
Source base	MPE-1 to MPE-11, MPE Unifying Paper; related Canon papers
Series	Griffiths Canon, Book 2 (following The Governed Field)
Format	Digital edition via the AEMS website, as for The Governed Field; print-ready PDF available
Style	Navy scheme consistent with the Canon book series

Table 2. Book specifications.

6. Contents and Chapter Summaries

Part	Chapter	Summary
	0 Executive Discipline Summary	The whole discipline in five pages: definition, R, DIGSP, lineages, gates and what would kill the theory
I Foundation	1 Introduction	Scope, audience, the five claims, relationship to The Governed Field
	2 What Is a Managed Plasma Environment	Definition, state parameters, microgravity, three-tier architecture, topology state vector
	3 The Governance Ratio	R, the three operational states, why R > 10, worked examples for REMN, CSFR and H2EM
II Open Topology	4 REMN as a Governed Plasma Domain	Rotating-field nozzle, REBCO Phase-2 insert, performance envelope, MHD Skirt, REMN+
	5 REMN Internal Dynamics	Five-zone nozzle, Kelvin-Helmholtz dynamics, throat transit budget, mirror physics
III Closed Topology	6 Curvature-Stabilised Fusion as an MPE	CSFR governance ratio, mode taxonomy, phase-aligned eigenmode control, failure ladder
	7 CSFR Internal Dynamics	Flux surfaces, transport, energy balance, disruption avoidance

IV Governance Architecture	8 DIGSP as Topology Governor	Tier 0, 1 and 2 responsibilities, authority and communication
	9 Lambda-Governance: Combustion Control	E-gate transfer function, margins, flame coupling physics, disturbance band, delay budget
	10 Dynamic Topology Governance	Manifold velocity, governed transitions, forbidden corridors, conservation-law candidate
V Experimental Path	11 Experimental Governance Protocols	Three-anchor programme, CSMMC bench rig, MPE Measurement Standard
VI Integration	12 Propellant-Coupled MPE	Coupled governance ratio and multi-physics integration
	13 The Two Lineages	Structural unification of isolated-plasma and propellant-coupled machines
VII Closure	14 What the Discipline Claims	Claims, non-claims, what the first bench test settles, the path forward
Appendices	A to D	Prediction register; paper index and key results; Canon cross-reference map; source classification of numerical results

Table 3. Contents.

7. Place in the Griffiths Canon

Level	Publication	Role
Framework book	The Governed Field (first edition, 73 pages)	General electromagnetic governance: the Griffiths Equation, governance tensor, DIGSP
Discipline book	The Managed Plasma Environment (this book)	Governance instantiated for plasma and reacting-flow domains
Research papers	MPE-1 to MPE-11 and the Unifying Paper	Derivations, simulations and experimental designs behind each chapter

Table 4. Canon publication hierarchy.

The Governed Field tells the reader what governance is. This book shows it working as a discipline in one physical domain, with the numbers, architecture and tests a practitioner needs.

8. Comparable Titles

No existing text unifies control-bandwidth governance across propulsion, fusion, process plasma and combustion. The book sits alongside, rather than against, the standard references in each field:

Title	Author, publisher	Relationship
Introduction to Plasma Physics and Controlled Fusion	F. F. Chen, Springer	Standard plasma physics foundation; no governance framework
Plasma Physics and Fusion Energy	J. P. Freidberg, Cambridge University Press	Fusion physics and stability; single machine class
Tokamaks	J. Wesson, Oxford University Press	Deep single-concept reference; control treated within tokamak context

Fundamentals of Electric Propulsion	D. M. Goebel and I. Katz, Wiley	Propulsion engineering; plasma control not framed as governance
Principles of Plasma Discharges and Materials Processing	M. A. Lieberman and A. J. Lichtenberg, Wiley	Process plasma reference; empirical operating windows
Feedback Systems	K. J. Astrom and R. M. Murray, Princeton University Press	Control theory foundation this book applies to plasma domains

Table 5. Comparable titles.

9. About the Author

Wayne Griffiths is the founder and President of AEMS LLC (Advanced EM Systems LLC) and leads the Griffiths Canon Research Group in Auckland, New Zealand. He is a self-funded independent inventor and researcher whose Griffiths Canon spans electromagnetic field governance, plasma physics, radioisotope power systems, industrial processing and aerospace architecture. He is the author of the MPE research series, including MPE-2 (MNPP), published in the Journal of Computational Methods in Engineering Science, and of The Governed Field, the framework book of the Canon.