1.1 MMS and FPI Science Goals

Science operations were guided by the following priorities during the time periods indicated.

Prime Mission Science Goals (9/2015 - 9/2017)

The scientific objective of the MMS mission is to:

Understand the microphysics of magnetic reconnection by determining the kinetic processes occurring in the electron diffusion region that are responsible for collisionless magnetic reconnection, especially how reconnection is initiated.

Specifically, and in priority order, MMS will address three specific objectives:

1. Determine the role played by electron inertial effects and turbulent dissipation in driving **magnetic reconnection in the electron diffusion region**.
2. Determine the r**ate of magnetic reconnection** and the parameters that control it.

Determine the **role played by ion inertial effects** in the physics of magnetic reconnection.

Extended Mission #1 Priority Science Goals (9/2017-9/2020)

1. Investigate magnetic reconnection in the near-Earth space environment

1.1 Reconnection in the nightside magnetosphere
1.2 Magnetic reconnection at the magnetopause, including inside Kelvin-Helmholtz vortices at the tail flanks
1.3 Reconnection in the solar wind and in the magnetosheath
1.4 Reconnection spatial scales

2. Study the processes that heat plasma populations and accelerate particles to large energies

2.1 The dissipation of magnetic energy during reconnection – electron and ion heating
2.2 Particle acceleration by dipolarization fronts

3. Study the way turbulent processes interact on kinetic scales

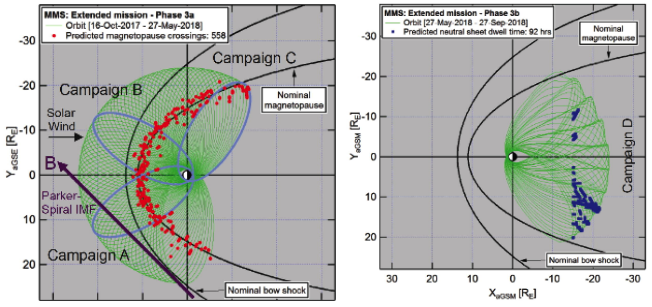
3.1 Turbulence in the Magnetosheath and Soalr Wind
3.2 Pickup ions

4. Investigate the microphysics of collisionless shocks

4.1 Transient ion foreshock phenomena
4.2 Electron heating in collisionless shocks

Table 5.2-1 MMS campaigns during the extended mission

Campaign	Spacecraft Location	PSGs addressed
A	Duskside bow shock, solar wind, and dusk flank magnetopause	1.2, 1.3, 2.1, 3.1, 3.2 3.3, 4.1, 4.2, 4.3
B	Dawnside bow shock and fore-shock region	1.2, 1.3, 3.1, 3.2 3.3, 4.1, 4.2, 4.3
C	Dawn flank magnetopause	1.1, 1.2, 2.1
D	Magnetotail	1.1, 1.4, 2.1, 2.2



MMS orbits projected into the X-Y GSE and GSM planes for the first year of the extended mission. Each year is divided into two phases, a dayside phase (3a, 4a, etc.) and a nightside phase (3b, 4b, etc.). The spacecraft locations during these phases enable four distinct campaigns with new science foci, in addition to extending the magnetopause and magnetotail science that was conducted during the prime mission.

Extended Mission #1 System Observatory Science Goals (9/2017-9/2020)

foreshock phenomena and effect on bow shock and magnetopause	downstream propagation of transients	near-Earth neutral line, transport and energization of plasma throughout magnetos

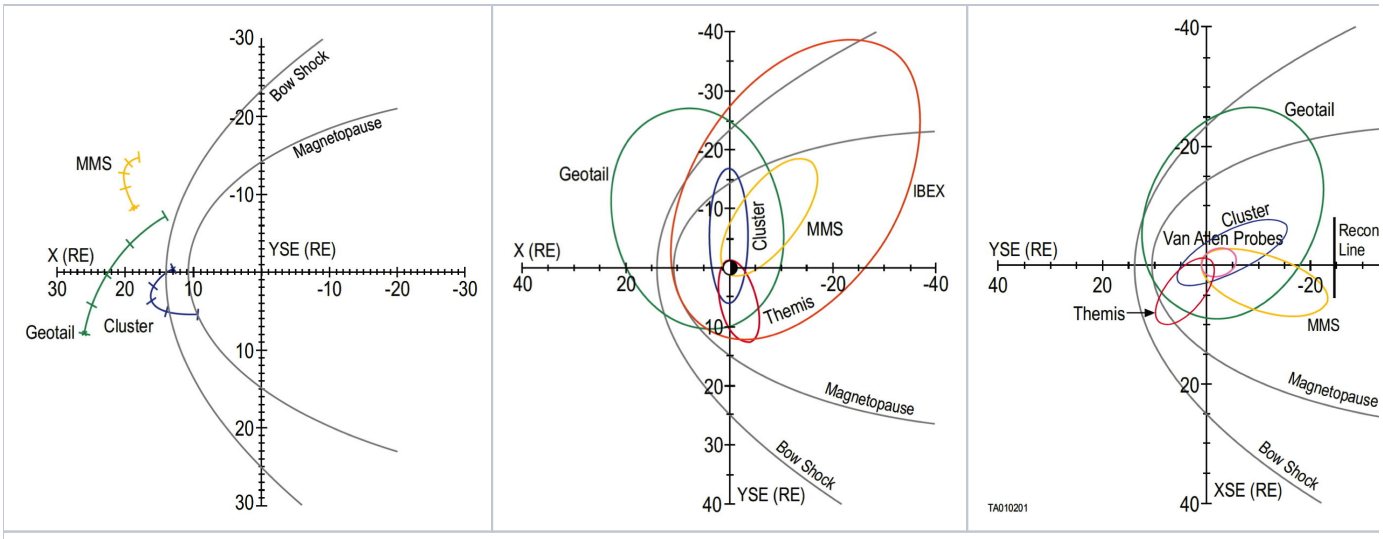


Table 5.4-1 MMS instrument contributions to the Heliospheric System Observatory Studies

Heliospheric System Observatory Correlative Study	FPI	HPCA	FIELDS	EPD
5.4.1 Particle energization at the bow shock and foreshock	S	P	S	P
5.4.2 Effects of upstream structures on the magnetosphere	P	S	P	S
5.4.3 Nature and Extent of reconnection in the magnetotail	P	S	P	S
5.4.4 Transport & energization of plasma from the tail into the near-Earth magnetosphere	P	P	P	P
5.4.5 Shock and reconnection line dimensions in the solar wind.	P	S	P	S
P = primary contributions to the science, S = secondary or supporting contributions to the science				