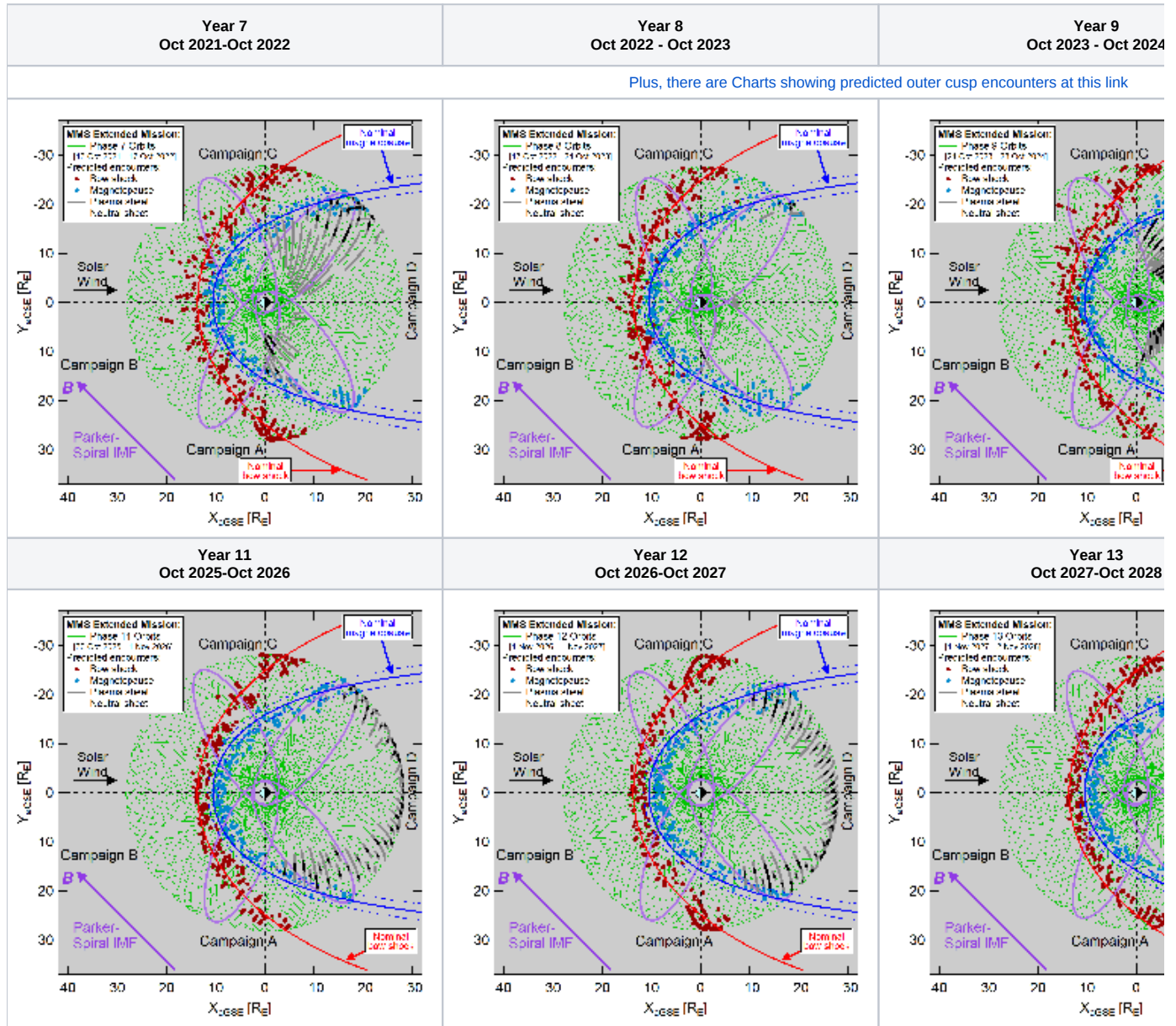
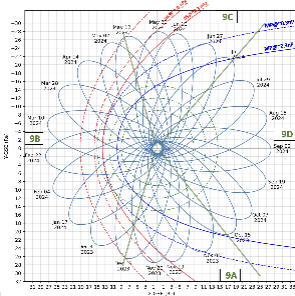
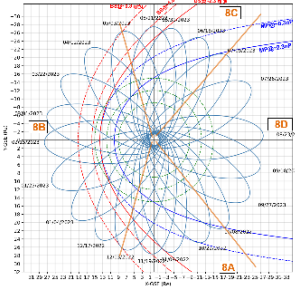
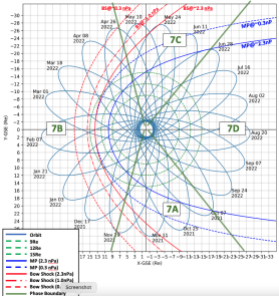
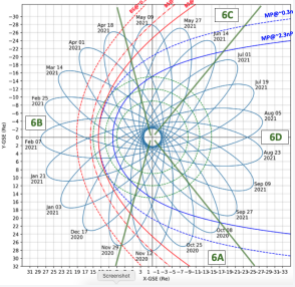
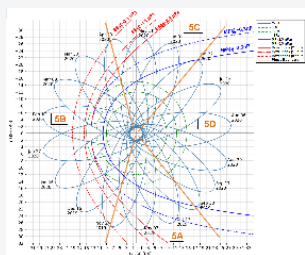


# 1.3 Mission Phases and Science Regions of Interest



| Year 9                                                                                                                | Phase    | Region                       | Timeline Files from S. Petronec<br>These are planning files, not actuals | Spacecraft Separations<br>Additional Notes                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------|----------|------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Extended Mission 3 -<br>Year 1<br> | Phase 9a | 29 R <sub>E</sub> Dusk Flank | <a href="#">MMS_orbit_Phase9A_and_conjunctions_v1a.pptx</a>              |                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                       | Phase 9b | 29 R <sub>E</sub> Dayside    | <a href="#">MMS_orbit_Phase9B_and_conjunctions_v1a.pptx</a>              | <a href="#">fast_mode_times_agse1_2023307-000000_2024176-000000_V007_v2a.txt</a>                                                                                                                                                                                                                                                                             |
|                                                                                                                       | Phase 9c | 29 R <sub>E</sub> Dawn Flank | <a href="#">MMS_orbit_Phase9C_and_conjunctions_v2.pptx</a>               | <a href="#">fast_mode_times_agse1_2024062-000000_2024301-000000_V005_v1_MMS1.txt</a><br><a href="#">fast_mode_times_agse1_2024062-000000_2024301-000000_V005_v1_MMS2.txt</a><br><a href="#">fast_mode_times_agse1_2024062-000000_2024301-000000_V005_v1_MMS3.txt</a><br><a href="#">fast_mode_times_agse1_2024062-000000_2024301-000000_V005_v1_MMS4.txt</a> |
|                                                                                                                       | Phase 9d | 29 R <sub>E</sub> Nightside  |                                                                          |                                                                                                                                                                                                                                                                                                                                                              |

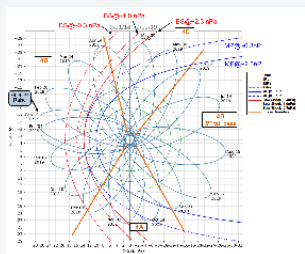
|                                                                                                                                                                                                       |              |                              |                                                                                                                                                                            |                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Year 8</b><br><br><b>Extended Mission 2 - Year 3</b><br><br>                                                      |              |                              |                                                                                                                                                                            |                                                                                                                                                                                         |
|                                                                                                                                                                                                       | <b>Phase</b> | <b>Region</b>                | <b>Timeline Files from S. Petrinec</b><br>These are planning files, not actuals                                                                                            | <b>Spacecraft Separations</b><br><b>Additional Notes</b>                                                                                                                                |
|                                                                                                                                                                                                       | Phase 8a:    | 29 R <sub>E</sub> Dusk Flank | <a href="#">MMS_orbit_Phase8A_and_conjunctions_v1.pptx</a>                                                                                                                 |                                                                                                                                                                                         |
|                                                                                                                                                                                                       | Phase 8b:    | 29 R <sub>E</sub> Dayside    | <a href="#">MMS_orbit_Phase8B_and_conjunctions_v1.pptx</a>                                                                                                                 |                                                                                                                                                                                         |
|                                                                                                                                                                                                       | Phase 8c:    | 29 R <sub>E</sub> Dawn Flank | <a href="#">MMS_orbit_Phase8C_and_conjunctions_v1.pptx</a>                                                                                                                 |                                                                                                                                                                                         |
|                                                                                                                                                                                                       | Phase 8d:    | 29 R <sub>E</sub> Nightside  | <a href="#">MMS_orbit_Phase8D_and_conjunctions_v2.pptx</a>                                                                                                                 | <a href="#">fast_mode_times_agse1_2023125-000000_2024002-000000_V005_v3.dat</a>                                                                                                         |
| <b>Year 7</b><br><br><b>Extended Mission 2 - Year 2</b><br><br>                                                     | Phase 7a:    | 29 R <sub>E</sub> Dusk Flank | <a href="#">MMS_Ph7_ConOps_20210809c.pptx</a><br><a href="#">MMS_Ph7A_ConOps_20210914.pptx</a>                                                                             | <a href="#">fast_mode_times_agse1_2021240-000000_2022114-000000_V004_v1.txt</a>                                                                                                         |
|                                                                                                                                                                                                       | Phase 7b:    | 29 R <sub>E</sub> Dayside    | <a href="#">MMS_orbit_Phase7B_and_conjunctions.pptx</a>                                                                                                                    | <a href="#">fast_mode_times_agse1_2021296-000000_2022171-000000_V004_v1.dat</a>                                                                                                         |
|                                                                                                                                                                                                       | Phase 7c:    | 29 R <sub>E</sub> Dawn Flank | <a href="#">MMS_orbit_Phase7C_and_conjunctions.pptx</a>                                                                                                                    |                                                                                                                                                                                         |
|                                                                                                                                                                                                       | Phase 7d:    | 29 R <sub>E</sub> Nightside  | <a href="#">MMS_orbit_Phase7D_and_conjunctions_v3.pptx</a><br><a href="#">MMS_orbit_Phase8B_and_conjunctions_v1.pptx</a><br>(adjustments due to Artemis-1 Launch attempts) | <a href="#">fast_mode_times_agse1_2022107-000000_2022343-000000_V004_v3.dat</a><br><a href="#">LongShadows_update19July2022.pptx</a>                                                    |
|                                                                                                                                                                                                       |              |                              |                                                                                                                                                                            |                                                                                                                                                                                         |
| <b>Year 6</b><br><br><b>Extended Mission 2 - Year 1</b><br><br><br><a href="#">MMS_Year6_Orbits&amp;Phases.png</a> | Phase 6a:    | 29 R <sub>E</sub> Dusk Flank | <a href="#">MMS_Ph6A_ConOps_20200908[1].pptx</a>                                                                                                                           | <a href="#">fast_mode_times_agse1_2020200-000000_2021075-000000_V005_v1.dat</a>                                                                                                         |
|                                                                                                                                                                                                       | Phase 6b:    | 29 R <sub>E</sub> Dayside    | <a href="#">MMS_Ph6B_ConOps_20201118.pptx</a>                                                                                                                              | <a href="#">Cluster_conjunctions_fast_mode_times_agse1_2020200-000000_2021075-000000_V005_v1.dat</a><br><a href="#">fast_mode_times_agse1_2020291-000000_2021159-000000_V004_v3.dat</a> |
|                                                                                                                                                                                                       | Phase 6c:    | 29 R <sub>E</sub> Dawn Flank | <a href="#">MMS_Ph6C_ConOps_20210319.pptx</a>                                                                                                                              | <a href="#">fast_mode_times_agse1_2021030-000000_2021268-000000_V005_v2.dat</a>                                                                                                         |
|                                                                                                                                                                                                       | Phase 6d:    | 29 R <sub>E</sub> Nightside  | <a href="#">MMS_Ph6D_ConOps_20210518.pptx</a>                                                                                                                              | <a href="#">fast_mode_times_agse1_2021121-000000_2021360-000000_V005_v2.dat</a>                                                                                                         |
|                                                                                                                                                                                                       |              |                              |                                                                                                                                                                            |                                                                                                                                                                                         |

Extended Mission 1 -  
Year 3

MMS Year5 Orbits&amp;Phases.png

|                                       |                              |                                                                                                                                                                  |                                                                                                                                                                                                                                                                                              |
|---------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Phase 5a:<br>~09/30/1019 - 11/24/2019 | 29 R <sub>E</sub> Dusk Flank | <a href="#">MMS_EM5A_orbits_20190821.pptx</a><br><a href="#">timelines_orbs1046_1061.pdf</a><br><a href="#">fast_mode_times_agse1_EM5A.dat</a> offsets submitted | 3 SROI                                                                                                                                                                                                                                                                                       |
| Phase 5b:<br>~11/24/2019 - 04/23/2020 | 29 R <sub>E</sub> Dayside    | <a href="#">MMS_Ph5B_ConOps_20191029.pptx</a>                                                                                                                    | 3 SROI<br><br>Parker Solar Probe perihelion alignment<br><br>11/28-11/30 - formation resize to <20km><br><br>11/26 (DOY 330) - 34% moon shadow<br><br>12/27 (DOY 361) - 73% moon shadow - <a href="#">timeline</a><br><br>Solar Wind SROI: FPI electrons: 4eV-940eV / FPI ions: 197eV-9222eV |
| Phase 5c:<br>~04/23/2020 - 06/19/2020 | 29 R <sub>E</sub> Dawn Flank | <a href="#">MMS_Ph5C_ConOps_20200227.pptx</a>                                                                                                                    | Formation resize to 40km: planned for 4/14-16/2020                                                                                                                                                                                                                                           |
| Phase 5d:<br>~06/22/2020 - 10/02/2020 | 29 R <sub>E</sub> Nightside  | <a href="#">MMS_Ph5D_ConOps_20200519.pptx</a>                                                                                                                    | Long Eclipses (~5.124 hr): 8/13/2020 and 8/17/2020                                                                                                                                                                                                                                           |

## Year 4

Extended Mission 1 -  
Year 2

MMS\_Year4\_Orbits&Phases.png  
MMS\_2019Orbits\_GSE.tiff

| SROI PROPOSAL FOR APOECOE RAISE, TURBULENCE<br>CAMPAIGN, AND R-IN-MANAGER OF PHASE 4B |      |        |          |            |              |                |                  |                    |                      |
|---------------------------------------------------------------------------------------|------|--------|----------|------------|--------------|----------------|------------------|--------------------|----------------------|
| SL                                                                                    | SLN  | SLD    | SLT      | SLU        | SLV          | SLW            | SLX              | SLY                | SLZ                  |
| 1                                                                                     | 1.1  | 1.1.1  | 1.1.1.1  | 1.1.1.1.1  | 1.1.1.1.1.1  | 1.1.1.1.1.1.1  | 1.1.1.1.1.1.1.1  | 1.1.1.1.1.1.1.1.1  | 1.1.1.1.1.1.1.1.1.1  |
| 2                                                                                     | 2.1  | 2.1.1  | 2.1.1.1  | 2.1.1.1.1  | 2.1.1.1.1.1  | 2.1.1.1.1.1.1  | 2.1.1.1.1.1.1.1  | 2.1.1.1.1.1.1.1.1  | 2.1.1.1.1.1.1.1.1.1  |
| 3                                                                                     | 3.1  | 3.1.1  | 3.1.1.1  | 3.1.1.1.1  | 3.1.1.1.1.1  | 3.1.1.1.1.1.1  | 3.1.1.1.1.1.1.1  | 3.1.1.1.1.1.1.1.1  | 3.1.1.1.1.1.1.1.1.1  |
| 4                                                                                     | 4.1  | 4.1.1  | 4.1.1.1  | 4.1.1.1.1  | 4.1.1.1.1.1  | 4.1.1.1.1.1.1  | 4.1.1.1.1.1.1.1  | 4.1.1.1.1.1.1.1.1  | 4.1.1.1.1.1.1.1.1.1  |
| 5                                                                                     | 5.1  | 5.1.1  | 5.1.1.1  | 5.1.1.1.1  | 5.1.1.1.1.1  | 5.1.1.1.1.1.1  | 5.1.1.1.1.1.1.1  | 5.1.1.1.1.1.1.1.1  | 5.1.1.1.1.1.1.1.1.1  |
| 6                                                                                     | 6.1  | 6.1.1  | 6.1.1.1  | 6.1.1.1.1  | 6.1.1.1.1.1  | 6.1.1.1.1.1.1  | 6.1.1.1.1.1.1.1  | 6.1.1.1.1.1.1.1.1  | 6.1.1.1.1.1.1.1.1.1  |
| 7                                                                                     | 7.1  | 7.1.1  | 7.1.1.1  | 7.1.1.1.1  | 7.1.1.1.1.1  | 7.1.1.1.1.1.1  | 7.1.1.1.1.1.1.1  | 7.1.1.1.1.1.1.1.1  | 7.1.1.1.1.1.1.1.1.1  |
| 8                                                                                     | 8.1  | 8.1.1  | 8.1.1.1  | 8.1.1.1.1  | 8.1.1.1.1.1  | 8.1.1.1.1.1.1  | 8.1.1.1.1.1.1.1  | 8.1.1.1.1.1.1.1.1  | 8.1.1.1.1.1.1.1.1.1  |
| 9                                                                                     | 9.1  | 9.1.1  | 9.1.1.1  | 9.1.1.1.1  | 9.1.1.1.1.1  | 9.1.1.1.1.1.1  | 9.1.1.1.1.1.1.1  | 9.1.1.1.1.1.1.1.1  | 9.1.1.1.1.1.1.1.1.1  |
| 10                                                                                    | 10.1 | 10.1.1 | 10.1.1.1 | 10.1.1.1.1 | 10.1.1.1.1.1 | 10.1.1.1.1.1.1 | 10.1.1.1.1.1.1.1 | 10.1.1.1.1.1.1.1.1 | 10.1.1.1.1.1.1.1.1.1 |
| 11                                                                                    | 11.1 | 11.1.1 | 11.1.1.1 | 11.1.1.1.1 | 11.1.1.1.1.1 | 11.1.1.1.1.1.1 | 11.1.1.1.1.1.1.1 | 11.1.1.1.1.1.1.1.1 | 11.1.1.1.1.1.1.1.1.1 |
| 12                                                                                    | 12.1 | 12.1.1 | 12.1.1.1 | 12.1.1.1.1 | 12.1.1.1.1.1 | 12.1.1.1.1.1.1 | 12.1.1.1.1.1.1.1 | 12.1.1.1.1.1.1.1.1 | 12.1.1.1.1.1.1.1.1.1 |
| 13                                                                                    | 13.1 | 13.1.1 | 13.1.1.1 | 13.1.1.1.1 | 13.1.1.1.1.1 | 13.1.1.1.1.1.1 | 13.1.1.1.1.1.1.1 | 13.1.1.1.1.1.1.1.1 | 13.1.1.1.1.1.1.1.1.1 |
| 14                                                                                    | 14.1 | 14.1.1 | 14.1.1.1 | 14.1.1.1.1 | 14.1.1.1.1.1 | 14.1.1.1.1.1.1 | 14.1.1.1.1.1.1.1 | 14.1.1.1.1.1.1.1.1 | 14.1.1.1.1.1.1.1.1.1 |
| 15                                                                                    | 15.1 | 15.1.1 | 15.1.1.1 | 15.1.1.1.1 | 15.1.1.1.1.1 | 15.1.1.1.1.1.1 | 15.1.1.1.1.1.1.1 | 15.1.1.1.1.1.1.1.1 | 15.1.1.1.1.1.1.1.1.1 |
| 16                                                                                    | 16.1 | 16.1.1 | 16.1.1.1 | 16.1.1.1.1 | 16.1.1.1.1.1 | 16.1.1.1.1.1.1 | 16.1.1.1.1.1.1.1 | 16.1.1.1.1.1.1.1.1 | 16.1.1.1.1.1.1.1.1.1 |
| 17                                                                                    | 17.1 | 17.1.1 | 17.1.1.1 | 17.1.1.1.1 | 17.1.1.1.1.1 | 17.1.1.1.1.1.1 | 17.1.1.1.1.1.1.1 | 17.1.1.1.1.1.1.1.1 | 17.1.1.1.1.1.1.1.1.1 |
| 18                                                                                    | 18.1 | 18.1.1 | 18.1.1.1 | 18.1.1.1.1 | 18.1.1.1.1.1 | 18.1.1.1.1.1.1 | 18.1.1.1.1.1.1.1 | 18.1.1.1.1.1.1.1.1 | 18.1.1.1.1.1.1.1.1.1 |
| 19                                                                                    | 19.1 | 19.1.1 | 19.1.1.1 | 19.1.1.1.1 | 19.1.1.1.1.1 | 19.1.1.1.1.1.1 | 19.1.1.1.1.1.1.1 | 19.1.1.1.1.1.1.1.1 | 19.1.1.1.1.1.1.1.1.1 |
| 20                                                                                    | 20.1 | 20.1.1 | 20.1.1.1 | 20.1.1.1.1 | 20.1.1.1.1.1 | 20.1.1.1.1.1.1 | 20.1.1.1.1.1.1.1 | 20.1.1.1.1.1.1.1.1 | 20.1.1.1.1.1.1.1.1.1 |
| 21                                                                                    | 21.1 | 21.1.1 | 21.1.1.1 | 21.1.1.1.1 | 21.1.1.1.1.1 | 21.1.1.1.1.1.1 | 21.1.1.1.1.1.1.1 | 21.1.1.1.1.1.1.1.1 | 21.1.1.1.1.1.1.1.1.1 |
| 22                                                                                    | 22.1 | 22.1.1 | 22.1.1.1 | 22.1.1.1.1 | 22.1.1.1.1.1 | 22.1.1.1.1.1.1 | 22.1.1.1.1.1.1.1 | 22.1.1.1.1.1.1.1.1 | 22.1.1.1.1.1.1.1.1.1 |
| 23                                                                                    | 23.1 | 23.1.1 | 23.1.1.1 | 23.1.1.1.1 | 23.1.1.1.1.1 | 23.1.1.1.1.1.1 | 23.1.1.1.1.1.1.1 | 23.1.1.1.1.1.1.1.1 | 23.1.1.1.1.1.1.1.1.1 |

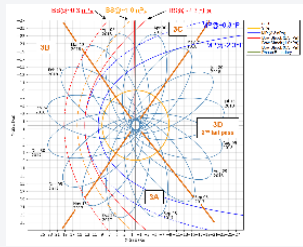
SWCampaign timeline.jpeg

|                                                          |                                                                               |                                                                                                                                                                                                                                                                                                                   |                                                                                                      |
|----------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Phase 4a:<br><br>September 28, 2018                      | 25R <sub>E</sub> Dusk Flank<br><br>(Dwell time outside BS (0.3 nPa < 10 hrs)  | <a href="#">MMS_4A_SROIs_v2.pptx</a>                                                                                                                                                                                                                                                                              | 3 SROI<br><br>20 km Oct 18                                                                           |
| Phase 4b:<br><br>November 29, 2018                       | 25R <sub>E</sub> Dayside<br><br>(Dwell time outside BS (0.3 nPa) > 10 hrs)    | before apogee raise: <a href="#">MMS_half4B_SROIs_v2.pptx</a><br>after apogee raise: <a href="#">MMS_4B_turbulencampaign_SROIs_Final.pptx</a><br>+ <a href="#">timeline charts</a><br><br>Ref: from Ergun --> guidelines for Solar Wind Turbulence Campaign<br>Ref: from MOC --> TurbulenceCampaignFinalDates.ppt | 3 SROI<br><br>Apogee raise to 29R <sub>E</sub><br>20 km Mar 13<br><br>Solar Wind Turbulence Campaign |
| Phase 4c:<br><br>~April 16, 2019 -<br>~June 28, 2019     | 29R <sub>E</sub> Dawn Flank<br><br>(Dwell time outside BS (2.3 nPa) < 10 hrs) | <a href="#">MMS_proposed_SROIs_EM4C_26mar2019.zip</a>                                                                                                                                                                                                                                                             | 3 SROI<br><br>40 km May 22                                                                           |
| Phase 4d:<br><br>~June 29, 2019 -<br>~September 29, 2019 | 1st 29R <sub>E</sub> Nightside<br><br>(Apogee within avg. MP (~2.3 nP))       | <a href="#">MMS_EM4D_orbits_20190520.pptx</a>                                                                                                                                                                                                                                                                     | 3 SROI<br><br>06/04/2019 (DOY 155) 09:17:13.29495 - MMS3 Processor reset<br><br>30 km Sep 8          |

### Year 3

## Extended Mission 1 - Year 1

|                                   |                                |                                                                                                             |                                                                  |
|-----------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| Phase 3a:<br>September 1,<br>2017 | 25R <sub>E</sub> Dusk<br>Flank | <a href="#">MMS_3a_SROIs_792-817_dusk_timelines.pdf</a>                                                     | 1 SROI<br><br>Perigee Raise Oct 3<br>30 km Oct 11<br>20 km Nov 8 |
| Phase 3b:<br>November 14,<br>2017 | 25R <sub>E</sub> Dayside       | <a href="#">MMS_3b_SROIs_818-860_dayside_timelines.pdf</a>                                                  | 3 SROI, 1st use of SW modes                                      |
| Phase 3c:<br>March 13, 2018       | 25R <sub>E</sub> Dawn<br>Flank | <a href="#">MMS_orbs_860_885_mp_timelines.pdf</a><br><br><a href="#">xy_aGSE_orb EMC_mp_bs_sw_final.png</a> | 3 SROI<br><br>40 km May 16                                       |



MMS\_Year3\_Orbits&Phases.png

Phase 3d:  
May 25, 2018

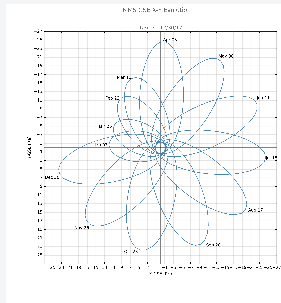
2nd 25R<sub>E</sub>  
Nightside

[MMS\\_3d\\_SROIs\\_886\\_930\\_mtail\\_timelines.pdf](#)

3 SROI

## Year 2

### Prime Mission - Year 2



MMS\_2017Orbits\_GSE.png

Phase 2a:  
January 31, 2017

Apogee raise,  
Dawn

No science ROIs planned in  
Phase 2A

No FPI ops  
60 km Feb 1  
Apogee Raise Feb 9  
160 km Apr 26

Phase 2b:  
May 1, 2017

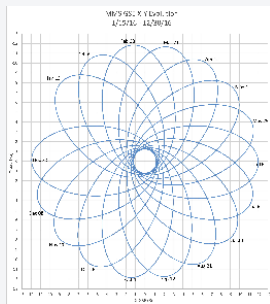
1st 25R<sub>E</sub>  
Nightside  
Completion of  
Prime Mission

[MMS\\_2b\\_SROIs\\_748-793\\_mtail\\_timelines.pdf](#)

1 SROI  
60 km May 18  
30 km Jun 1  
20 km Jun 29

## Year 1

### Prime Mission - Year 1



MMS\_2016Orbits\_GSE.jpg

Phase 1a:  
September 1,  
2015

1st 12R<sub>E</sub>  
Dayside

[Petricin\\_UPDATE\\_Sliding\\_ROI\\_timelines\\_ph1a.pdf](#)

60 km DOY 259/260 (Sept 16/17)  
25 km DOY 273/274 (Sept 30/Oct 1)  
10 km DOY 287/288 (Oct 14/15)  
40 km Dec 16  
10 km Jan 13

Phase 1x:  
March 8, 2016

12R<sub>E</sub> Dawn,  
Nightside, Dusk

No science ROIs planned in  
Phase 1x

No FPI Ops  
40 km Mar 24  
10 km Sep 1

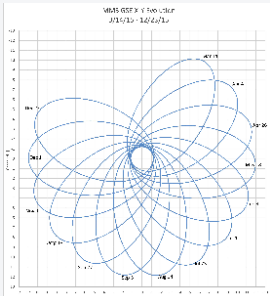
Phase 1b:  
Sept 12, 2016

2nd 12R<sub>E</sub>  
Dayside

[MMS\\_ph1b\\_avg13.5hr\\_pref1\\_v2.pdf](#)

7 km Sep 15

Commissioning:



MMS\_2015Orbits\_GSE.jpg

March 15, 2015

Nightside -->  
Dusk Flank

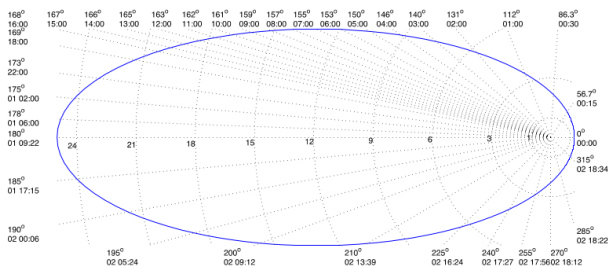
160 km DOY 188/190 (July 7/9)

Selected datasets only  
BBF campaign

12R<sub>E</sub> Orbit

similar graphic needs to be created

25R<sub>E</sub> Orbit



MMS\_25RE\_Orbit.jpg

29R<sub>E</sub> Orbit

similar graphic needs to be created