

MIP-LAP  
 CODMAC Level 5  
 Density Data

# RPC MIP

## Data Set Evaluation Tools

### Staging -

Machine: IBM lenovo T60p ThinkPad

Operating System: Fedora 25 Linux

### Evaluation -

Machine: Dell Precision T3400

Operating System: Fedora 19 Linux

### Data Processing -

Machine: Sun Ultra-350

Operating System: Sun Solaris OS 5.9

# RPC MIP-LAP Data Sets

ro-c-rpcmip\_rpclap-5-esc4-v1.0

ro-c-rpcmip\_rpclap-5-ext3-v1.0

ro-c-rpcmip\_rpclap-5-ext1-v1.0

ro-c-rpcmip\_rpclap-5-prl-v1.0

# Documentation Evaluation

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
aareadme.txt

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
voldesc.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
label/labinfo.txt

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0/label  
miplap\_plasma\_density.fmt

GOOD



ro-c-rpcmip\_rpclap-5-ext3-v1.0  
index/indxinfo.txt

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0

index/index.lbl

index/index.tab

GOOD

ro-c-rpcmip\_rpcclap-5-ext3-v1.0  
index/checksum.lbl  
index/checksum.tab

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
index/browse\_index.lbl

GOOD

# ro-c-rpcmip\_rpclap-5-ext3-v1.0

## index/browse\_index.tab

Excerpt from the browse\_index.tab file. First line is a normal entry, but the second line includes an unknown value in the last field in the line.

```
"BROWSE/RPCMIPP5N2_1608270000_01440.LBL",  
  "RPCMIPP5N2_1608270000_01440.PNG","RPCMIPLAPS51608272052_00089",  
  2019-03-22T15:08:18.000,"PRIMARY "  
"BROWSE/RPCMIPP5N2_1608300000_01440.LBL",  
  "RPCMIPP5N2_1608300000_01440.PNG","RPCMIPLAPS51608302001_00109",  
  2019-03-22T15:08:18.000,"N/A  "
```

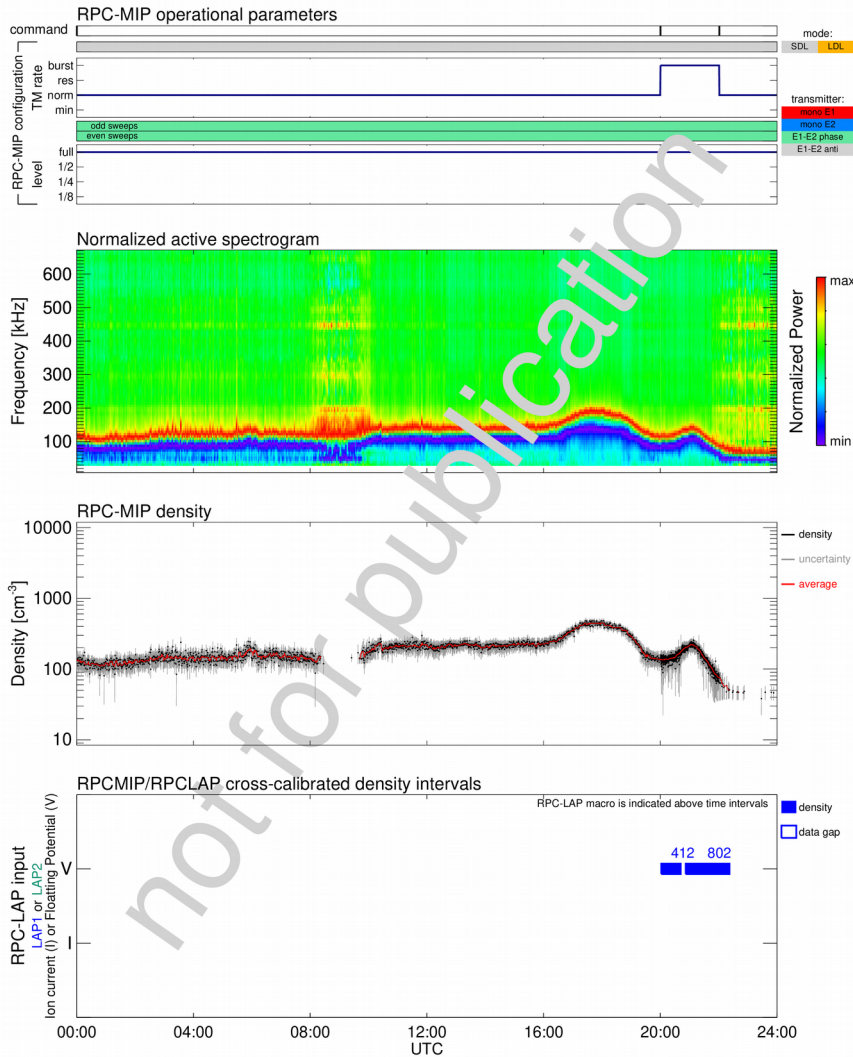
The browse\_index.tab shows the last entry is either PRIMARY or SECONDARY.  
[What does N/A mean here?](#)

```
OBJECT = COLUMN  
BYTES = 9  
START_BYTE = 131  
DESCRIPTION = "Indicates if a browse product is PRIMARY or SECONDARY when a  
                data product has many browse products linked."  
DATA_TYPE = CHARACTER  
NAME = BROWSE_USAGE_TYPE  
END_OBJECT = COLUMN
```

RID: RPCMIP-US-RF-001

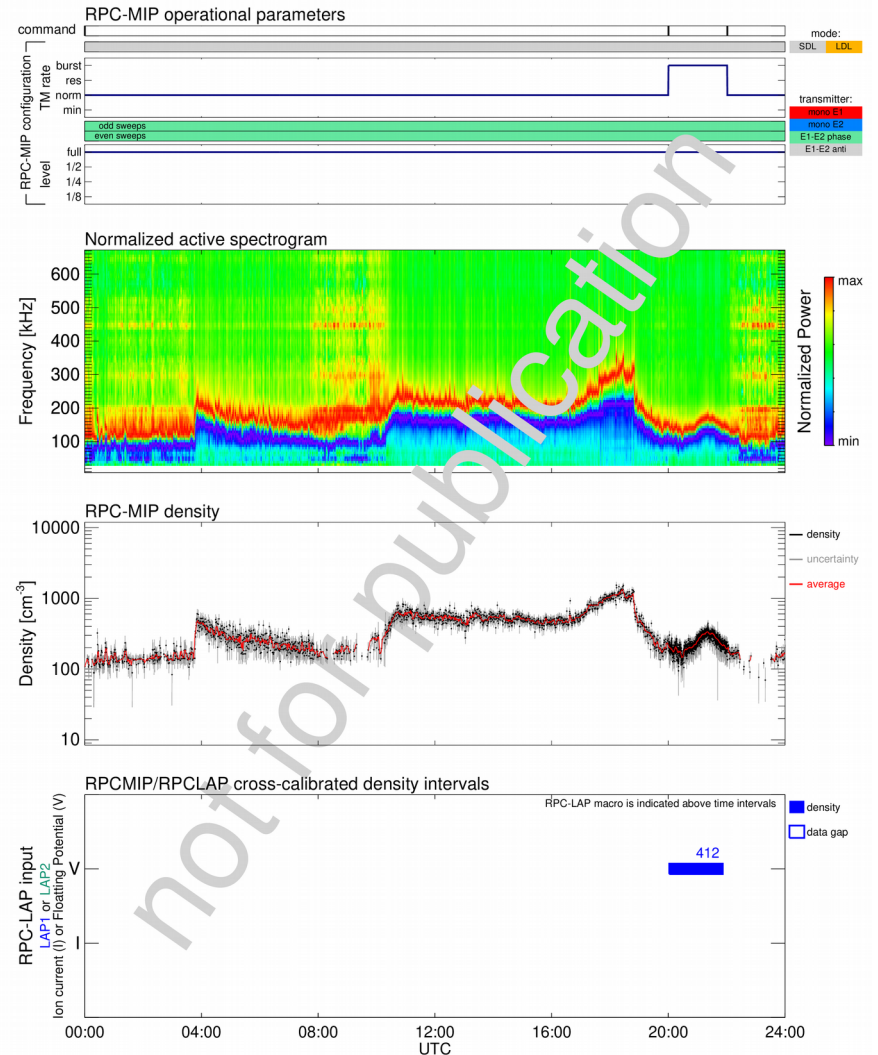
ro-c-rpcmip\_rpclap-5-ext3-v1.0browse/  
 rpcmipp5n2\_1608270000\_01440.lbl/png  
 rpcmipp5n2\_1608300000\_01440.lbl/png

RPC-MIP density summary - 20160827



WHY?

RPC-MIP density summary - 20160830



BROWSE\_USAGE\_TYPE is PRIMARY

BROWSE\_USAGE\_TYPE is N/A

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/catinfo.txt

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/dataset.cat

GOOD



ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/ref.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/software.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/person.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/rpcmip\_inst.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/rpclap\_inst.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/insthost.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
catalog/mission.cat

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
document/docinfo.txt

GOOD



ro-c-rpcmip\_rpclap-5-ext3-v1.0  
document/eriksson2007a.lbl  
document/eriksson2007a.pdf

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
document/eriksson2008a.lbl  
document/eriksson2008a.pdf

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
document/trotignon2007.lbl  
document/trotignon2007.pdf

GOOD

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
document/rpc\_miplap\_crosscal\_report.pdf

Some Editorial Comments Submitted

ro-c-rpcmip\_rpclap-5-ext3-v1.0  
document/rpc-mip-ug-lpc2e.lbl

GOOD

# ro-c-rpcmip\_rpcclap-5-ext3-v1.0/document rpc-mip-ug-lpc2e.pdf – 1 of 5

Please insert ( $n_e$ ).



Please insert ( $\Delta n_e$ ).



The electron density and associated uncertainty are then derived through:

$$n_e = \frac{f_{pe}^2}{\alpha}$$
$$\Delta n_e = \frac{2}{\alpha} \cdot f_{pe} \cdot \Delta f_{pe}$$

Where  $\alpha$  is a constant given by:  $\alpha = \frac{e^2}{4\pi \epsilon_0 m} = 80.7 \text{ kHz}^2 \cdot \text{cm}^3 \dots$

# ro-c-rpcmip\_rpclap-5-ext3-v1.0/document rpc-mip-ug-lpc2e.pdf – 2 of 5

## 7.3 Documents

A number of documents describing the instrument and the archives content are available in the DOCUMENT directory, as described below.

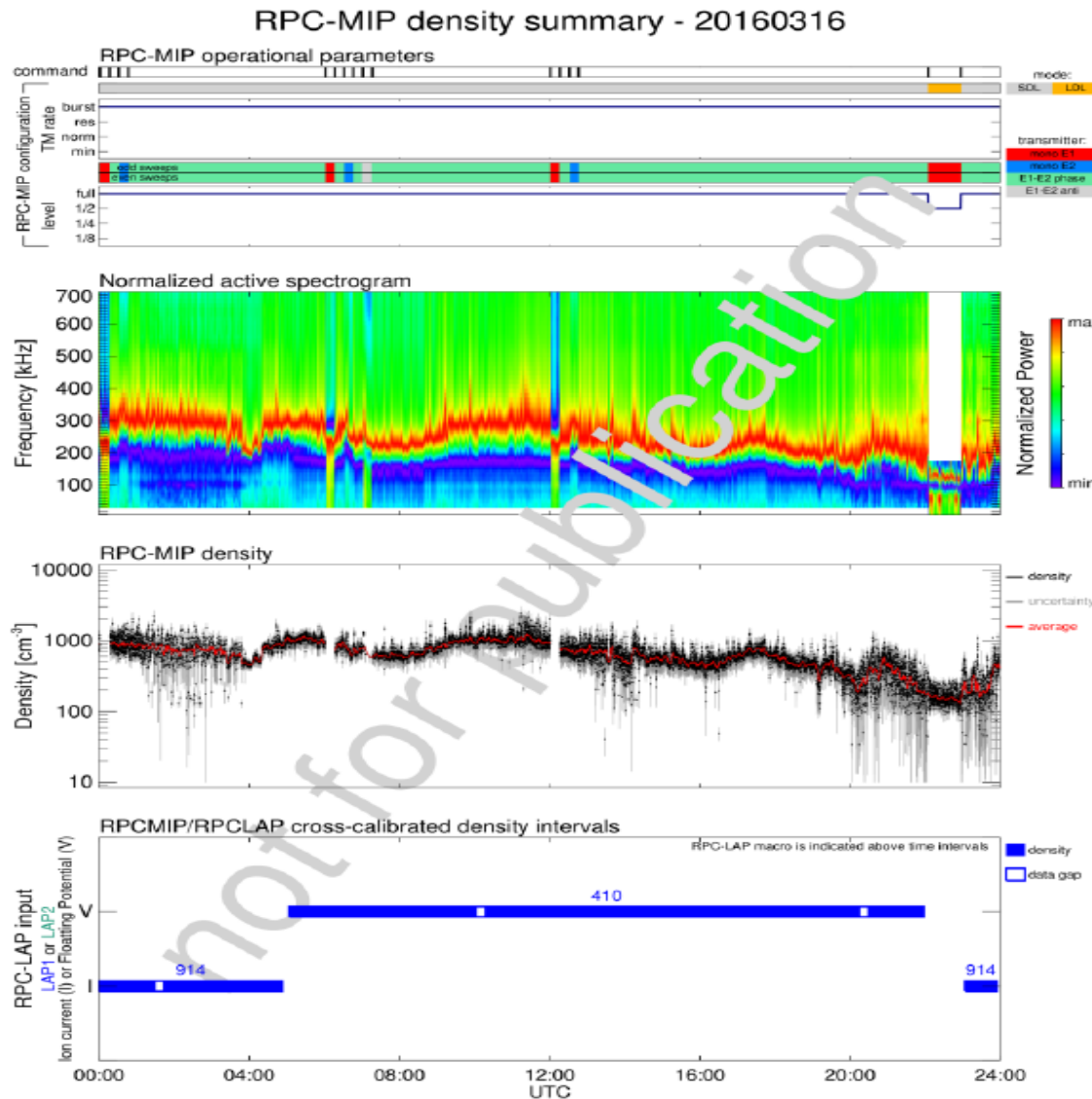
Document name	Content	Available in		
		L3	RPC-MIP L5	Cross-calibrated L5
RO_RPCMIP_LOGBOOK_xxx.TXT	A logbook, containing information on the instrument operations or caveats (one single file for the mission lifetime)	✓		
BOARD_PROC_xx.PDF	MIP experiment Onboard Data Handling	✓	✓	✓
MIP_PIU_INTERF_xx.PDF	MIP/PIU Data Handling Interface	✓	✓	✓
RPC_UM_xx.PDF	Rosetta plasma consortium users' manual	✓	✓	✓
RPC-MIP-UG-LPCE.PDF	User Guide to the RPC-MIP datasets in the ESA's PSA (this document)	✓	✓	✓
RPC_USER_GUIDE.PDF	RPC user guide	✓	✓	✓
MIP_EXP_OVERVIEW.PDF (L3) or TROTIGNON2007.PDF (L5)	RPC-MIP experiment description: Trotignon et al (2007)	✓	✓	✓
ERIKSSON2007A.PDF ERIKSSON2008A.PDF	RPC-LAP experiment description: Eriksson et al (2008)			✓
RPC_MIPLAP_CROSSCAL_REPORT.PDF	RPCMIP/RPCLAP cross-calibration report describing the RPCMIP/RPCLAP cross-calibrated science dataset on the PSA			✓

Not Included.

Incorrect File Name

Table 4: Available documentation.

# ro-c-rpcmip\_rpclap-5-ext3-v1.0/document rpc-mip-ug-lpc2e.pdf – 3 of 5



RID: RPCMIP-US-RF-004

Page 29, Section 8.2.2.


Wrong Date

Figure 4: Example of a 24-hour browse image associated with L5 products, for March 3<sup>rd</sup>,



# ro-c-rpcmip\_rpcclap-5-ext3-v1.0/document rpc-mip-ug-lpc2e.pdf – 4 of 5

- For RPCMIP/RPCLAP cross-calibrated density datasets, two quality indexes are provided for each density value (more details can be found in RD4):
  - (i) A normalized quality of the inputs of the cross-calibration process, taken into consideration the quality of the RPC-MIP data and the quality of the RPC-LAP measurements.
  - (ii) A normalized quality describing the cross-calibration process.



This first quality value was removed from the L5 cross-calibration data files and they now include only the second quality value.

ro-c-rpcmip\_rpcclap-5-ext3-v1.0/document  
rpc-mip-ug-lpc2e.pdf – 5 of 5

Some Editorial Comments Submitted

ro-c-rpcmip\_rpcclap-5-ext3-v1.0  
document/rpc\_user\_guide.lbl

GOOD

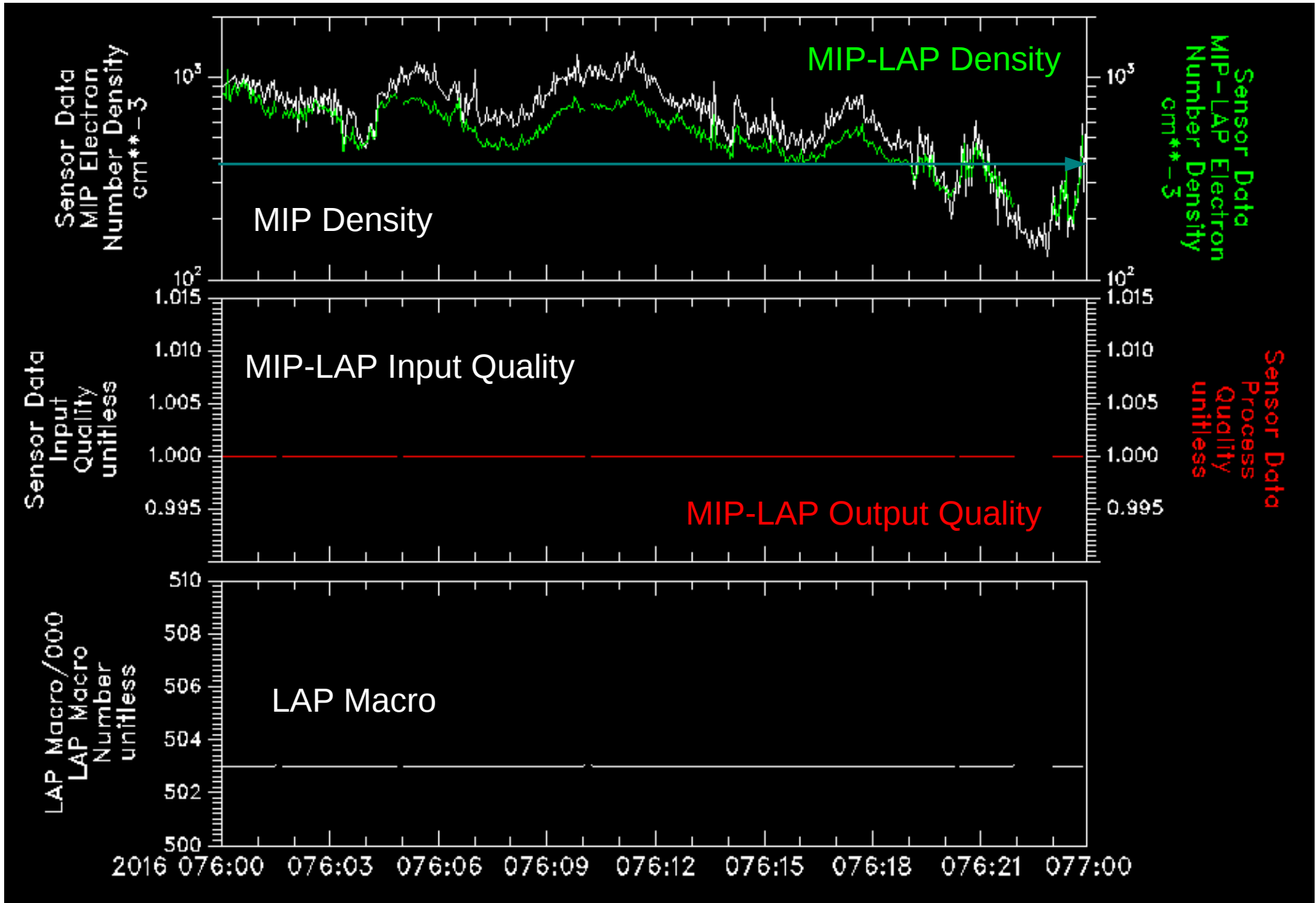
ro-c-rpcmip\_rpcclap-5-ext3-v1.0  
document/rpc\_user\_guide.pdf

Rudy has not looked at this yet....

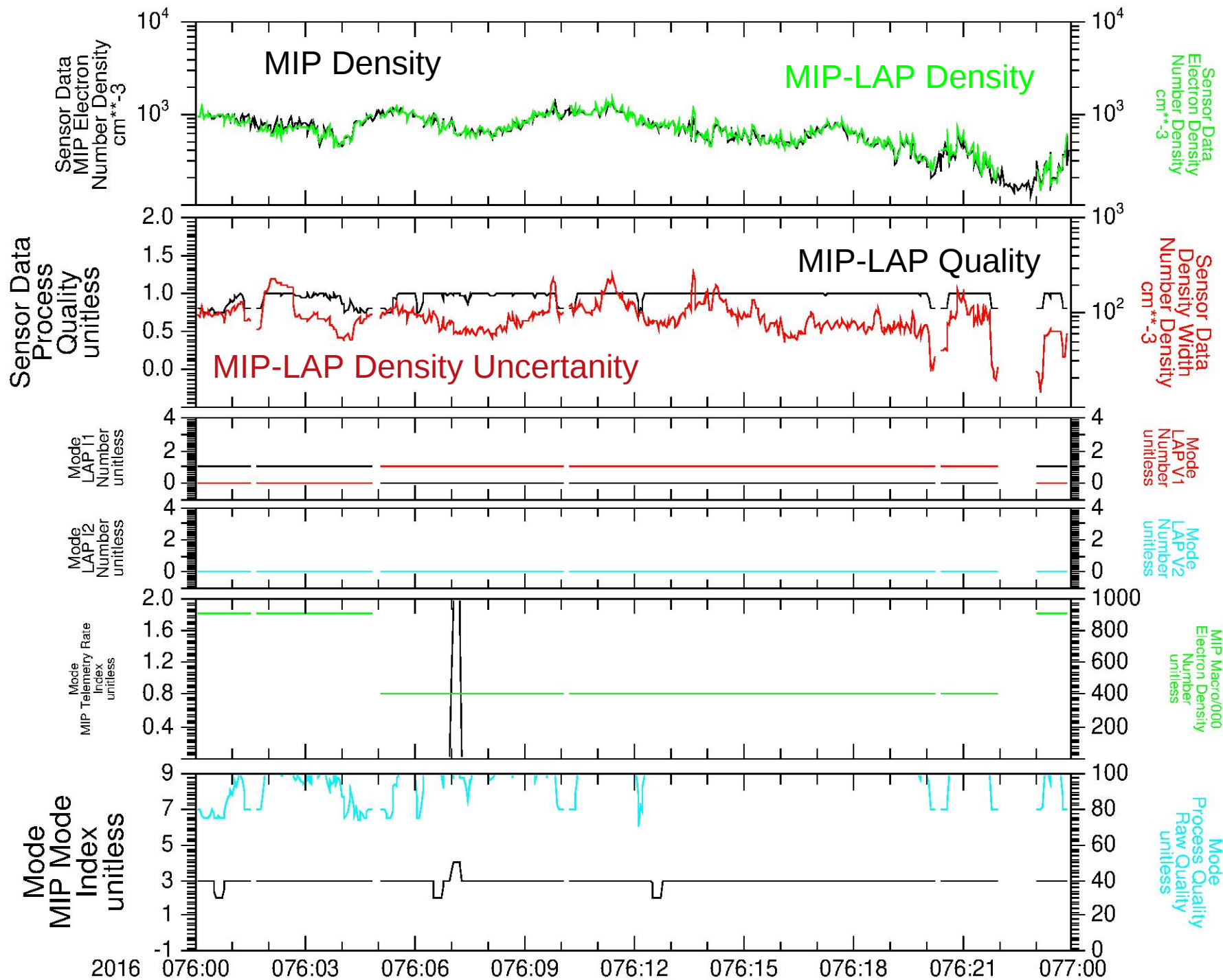
# Data Evaluation

OLD SLIDE

# MIP-LAP Density Data

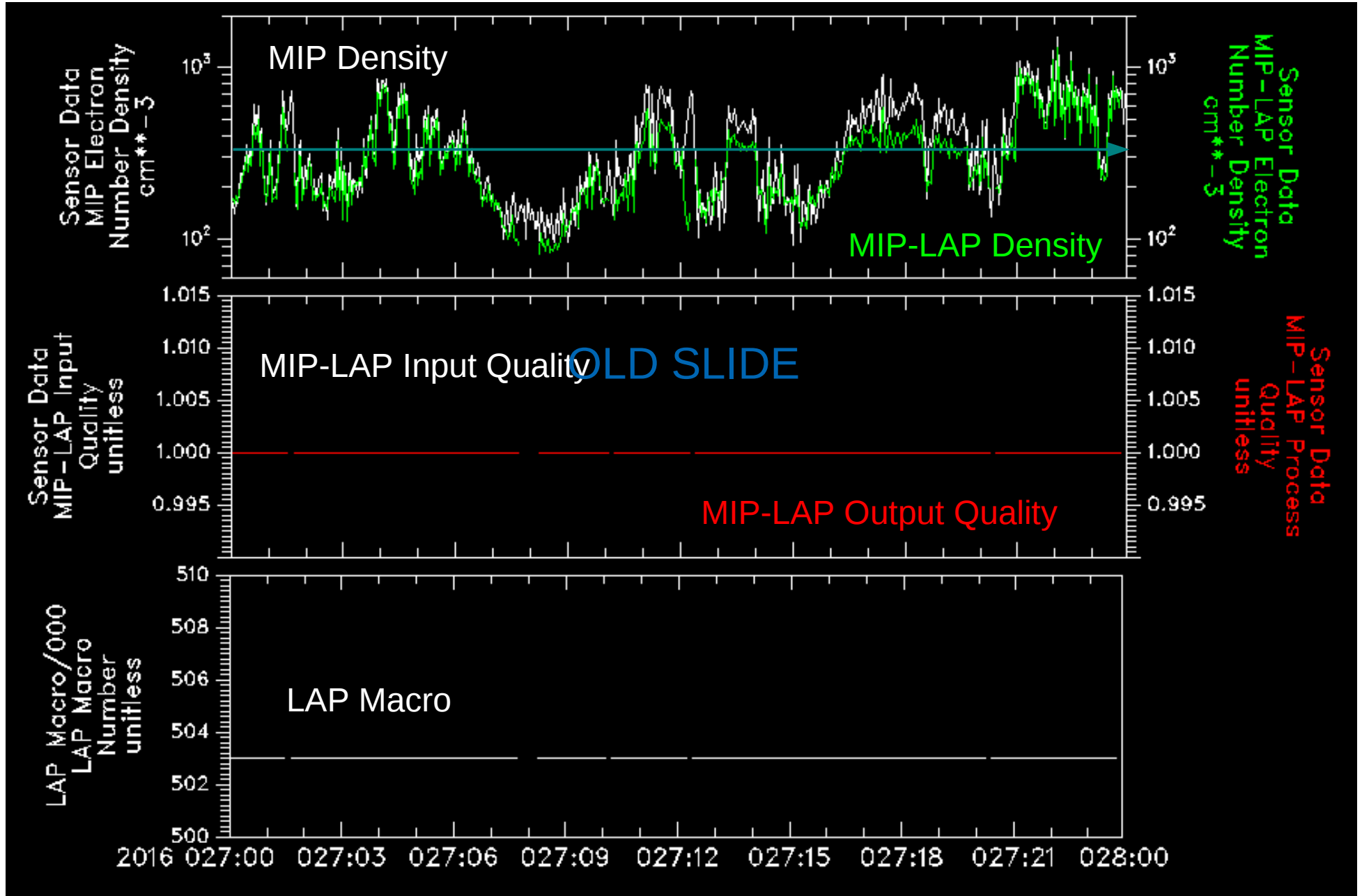


# NEW SLIDE



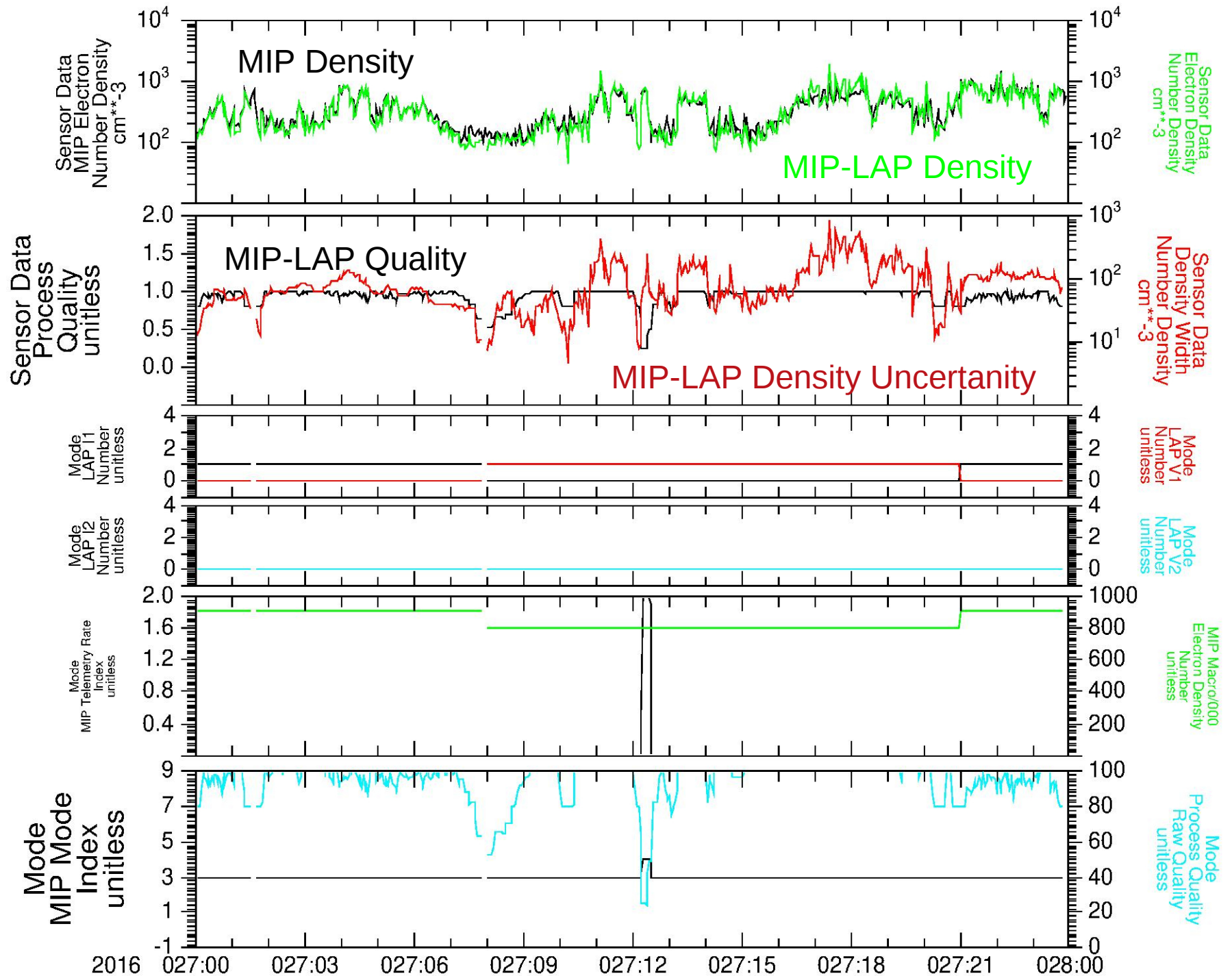
OLD SLIDE

# MIP-LAP Density Data



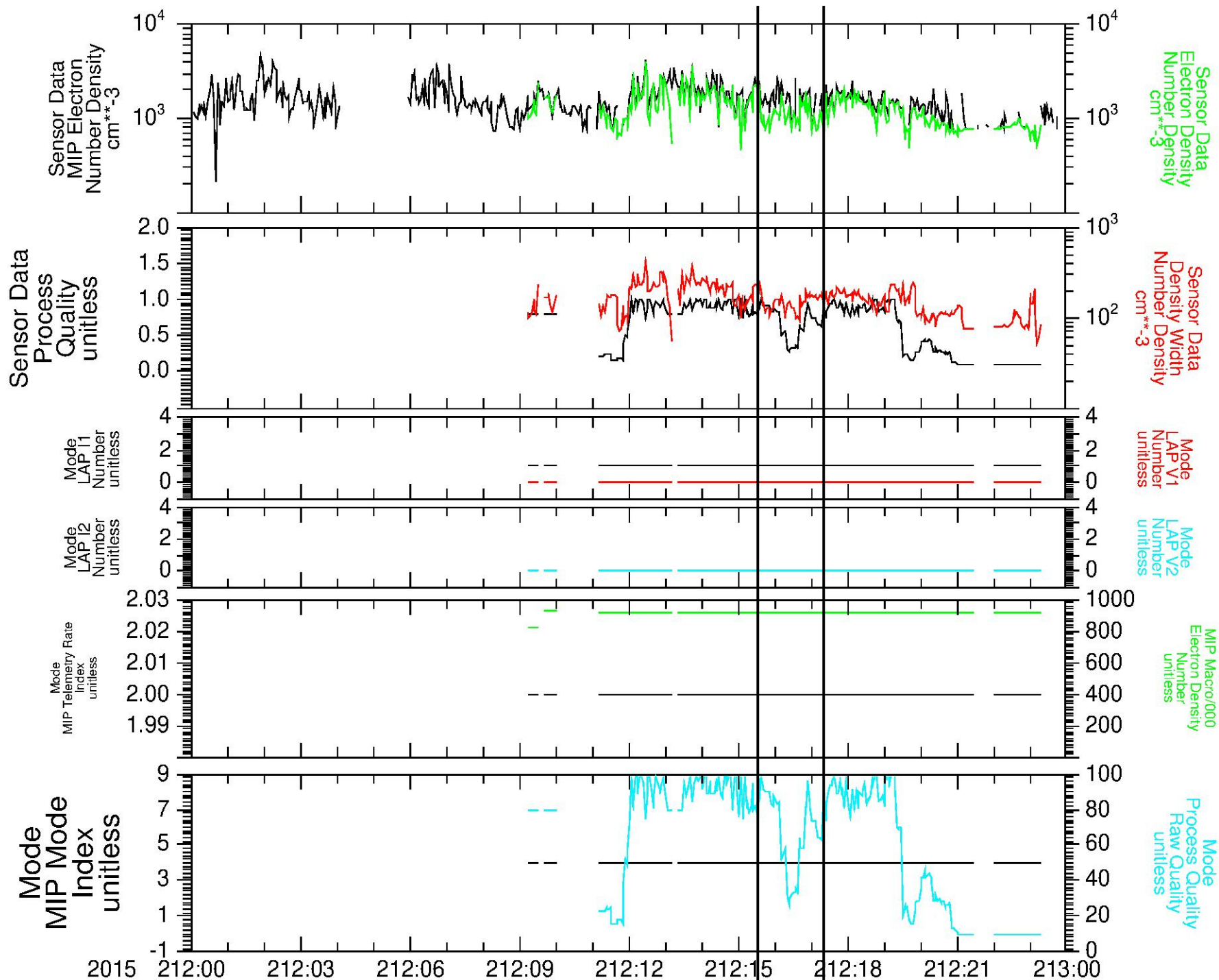


# NEW SLIDE



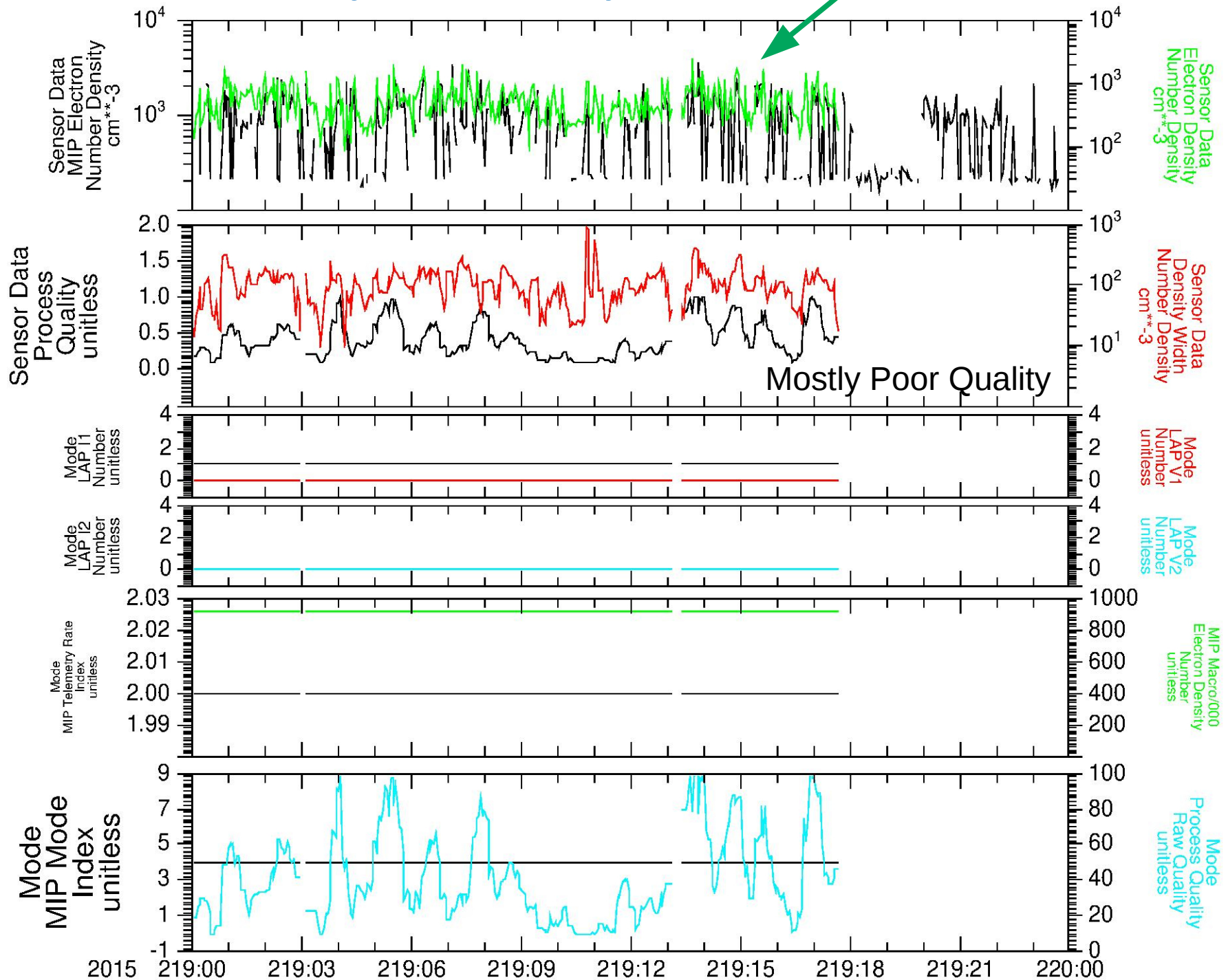
# NEW SLIDE – Mostly Good Quality

## Quality Change



# NEW SLIDE – Mostly Poor Quality

Density Well Represented



# Certification

The MIP-LAP cross-calibrated density data issues have been solved to the point that the MIP-LAP cross-calibrated density data seems at times to be better than the MIP density data. Therefore I recommend this data be certified after the documentation has been addressed.

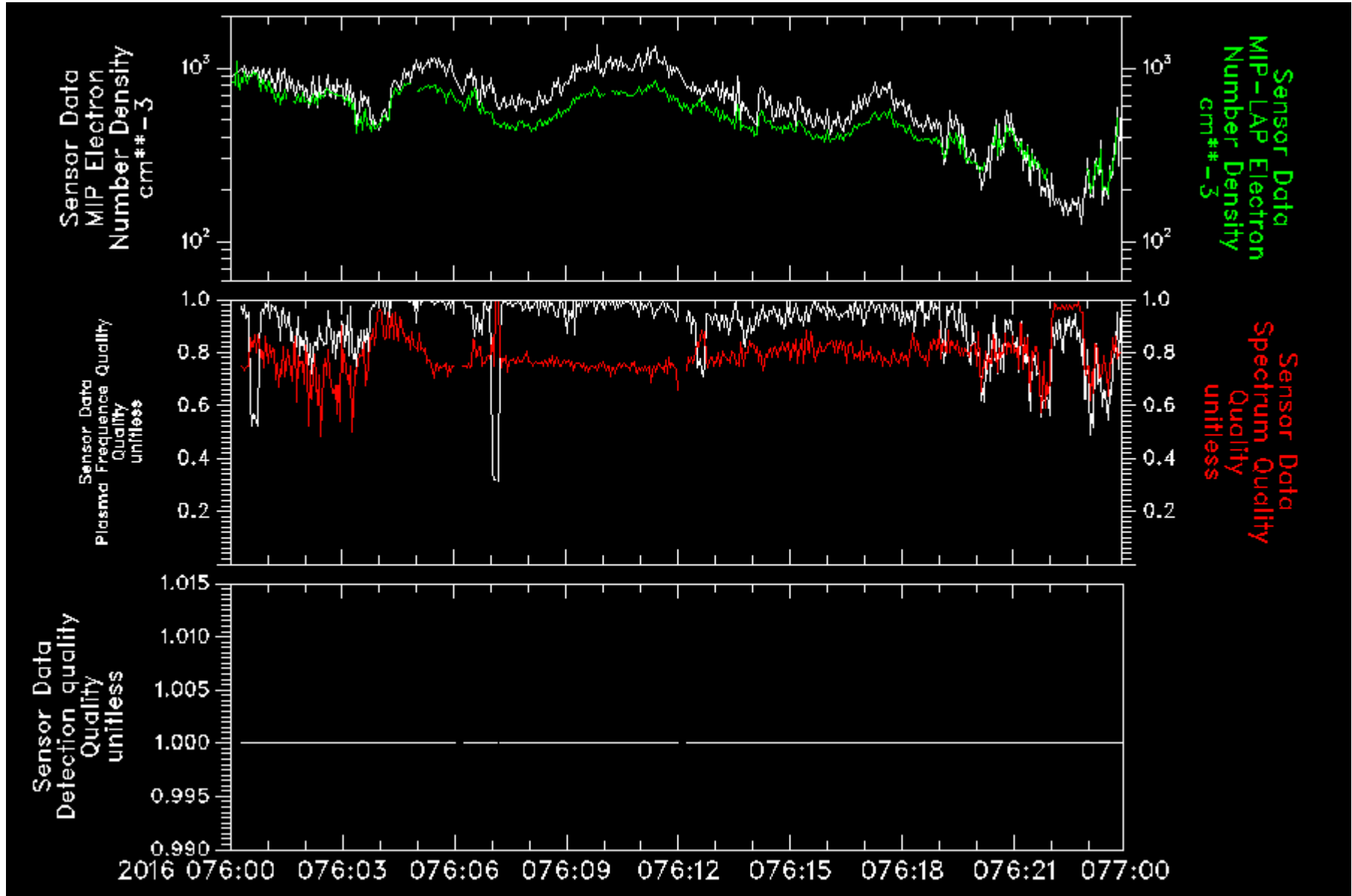
Backup Slides

# MIP-LAP Density Data Timing

Not enough timing information was provided in the Density files to describe the time location of the MIP-LAP cross-calibration density data. The following assumptions were made in order to visualize the Level 5 cross-calibration data.

- 1) The L5 data files contain only a time stamp at each record; however, it is not known when this time stamp occurs. It is assumed that the time stamp occurs at the start of acquiring data.
- 2) The accumulation time was assumed to be 10 ms. This value was set based on an examination of the ASCII data which allows the timing of the density points not to overlap.

# Day 76 with MIP Quality



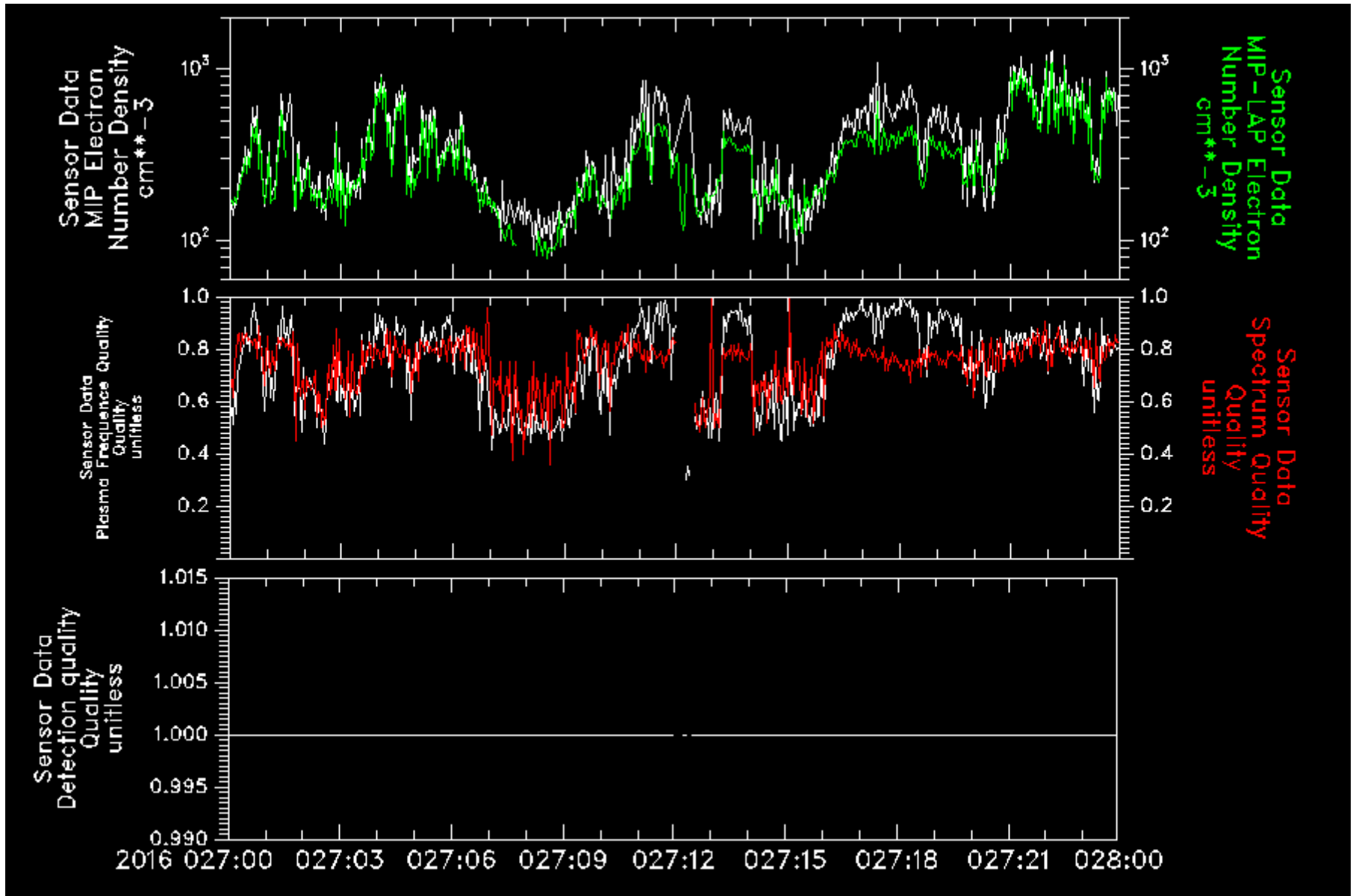


# 16 March (76) 2016 Comparison

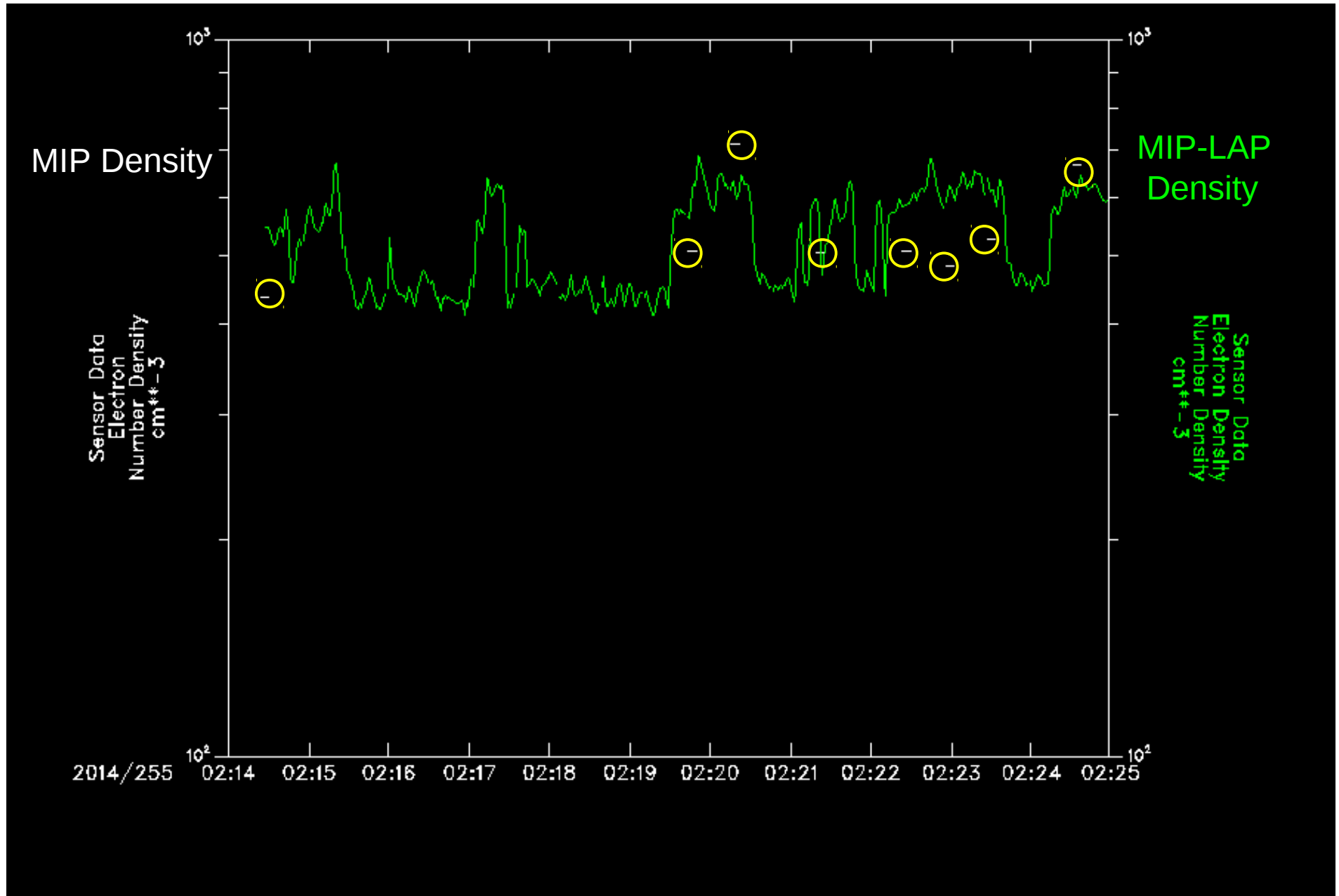
The density level at  $350 \text{ cm}^{-3}$  is shown in Blue. The MIP and MIP-LAP densities seem to agree toward the beginning and end of the day, when the density is high and below the  $350 \text{ cm}^{-3}$  line; however, the MIP-LAP density is below the MIP density during the midday. There is nothing unusual shown in the quality parameters. I am not sure why the density seems to agree at the high level at the start of the day.



# Day 27 with MIP Quality



# Comparison of MIP Density to MIP-LAP Density



# 27 January (27) 2016 Comparison

The density level at  $350 \text{ cm}^{-3}$  is shown in Blue.

The MIP and MIP-LAP densities again agree toward the beginning and end of the day (before 07 hr and after 21 hr), even when the density is high and above the  $350 \text{ cm}^{-3}$  line; however, there are times during the day when the MIP density is below the  $350 \text{ cm}^{-3}$  line when MIP-LAP density is below the MIP density (e.g. 08-11 hr). There is nothing unusual shown in the quality parameters. I am not sure why the density seems to agree at the low density level.

# 27 January (27) 2016 Comparison

Notes: At about 12 hr, density increases in MIP above the  $350 \text{ cm}^{-3}$  line, but the MIP-LAP density decreases in the opposite direction. No explanation is seen in the quality data. In the 13-14 hr and 17-21 hr time periods, when the MIP data is above the  $350 \text{ cm}^{-3}$  line, the MIP-LAP density is lower than the MIP density. It is assumed these issues will be discussed in the unwritten sections of the cross calibration report.

# General Failures of Supplied MIP-LAP density data

The MIP-LAP Density contains no uncertainty values. Density uncertainty values should be included within the data files of the MIP-LAP cross-calibrated set of data.

It is also unclear why any MIP-LAP data is reported when the density is above  $350 \text{ cm}^{-3}$ . According to the `rpc-mip-ug-lpc2e.pdf` document, RPC-MIP can not retrieve plasma densities above  $350 \text{ cm}^{-3}$  when in LDL mode, e.g., when LAP drives transmission for MIP.