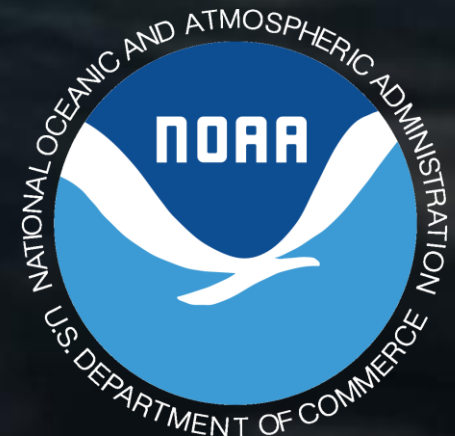


# Operational Instrument Requirements

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# NOAA L1 Solar Wind Requirements

## Magnetic field vector measurements

- a. At least one vector measurement per minute ( $B_x$ ,  $B_y$ ,  $B_z$ )
- b. Must deliver data in GSM coordinates in real time
- c. Range: 0.1 to 100 nT for each component (along positive or negative axis)
- d. 0.1 nT relative accuracy with 2.0 nT absolute accuracy

## Plasma Ion Measurement

- a. At least one measurement of the solar wind velocity vector ( $V_x$ ,  $V_y$ ,  $V_z$ ), average ion temperature, and ion density moments every minute
- b. Must deliver data in GSM coordinates in real time
- c. Velocity range 200 to 1500-km/sec with 5% relative accuracy
- d. Temperature range: 40,000 to 2,000,000 K with 20% relative accuracy
- e. Density range: 1 to 100  $\text{cm}^{-3}$ , with 20% absolute accuracy

## Characterization of Low Energy ION Particle population

- a. At least one set complete set of measurements every 5 minutes
- b. At least 4 different differential flux channels covering the energy range from 50 keV to 1 MeV
- c. Relative accuracy of 20%

Data must be delivered to the NOAA Space Weather Prediction Center at Boulder, CO

# Conceptual Solar Wind Sensor Characteristics

## Magnetometer

Established heritage on deep space missions

Nominal range +/- 256 nT full scale, 12-bit resolution per axis, 0.0625 nT digital resolution per sample

0.1 nT relative accuracy and 2.0 nT absolute accuracy

Mass 1 kg, power 1 W, data rate ~300 bps

## Plasmas Ion (Faraday Cup Design)

Electrostatic analyzer (ESA) with energy range from 100 eV -22 keV

One instrument covers entire range

Two heads for 3 axis stabilized design, one head for a spinner

Heritage on many spaceflight missions

Energy range and accuracy well within heritage sensors

Mass 3.5 kg; power 4.0 Watts, data rate ~600 bps per unit

## Low Energy Ion Particle Population

Mass 2.2 kg, power 3 W, data rate ~500 bps

## 4. Common power and data unit



# NOAA L1 Coronagraph Requirements

**Pointing Knowledge** - The line of sight pointing knowledge shall be 25 arc-secs, (Goal: 12.5 arc-secs). The direction of solar north shall be known to within  $1^\circ$  (Goal:  $0.5^\circ$ ). Data must be of useable quality during all levels and types of disturbed space weather

**Field of View** - The field of view (FOV) shall be an annulus, centered on the Sun. The inner radius of the annulus shall be 3.7  $R_{\text{sun}}$ . The outer radius of the annulus shall be at least 17  $R_{\text{sun}}$ .

**Point Response** - the image spatial resolution shall be 50 arc-secs. This requirement shall be met at the radius which is the average of the inner and outer radii of the FOV.

**Absolute Accuracy** - The data shall be calibrated to an absolute accuracy of 25%.

**Data Cadence** - The sensor shall be capable of achieving a cadence of at least one full-FOV image at least every 15 min. The sensor shall be capable of meeting the requirements with an exposure time of less than 15 seconds.

**Data Latency** - Data latency shall not exceed 15 minutes (delivery to NOAA/SWPC). Goal is 2 minutes.

# Conceptual CME Sensor Characteristics

Mass: 17 kg

Dimensions:

1. 517 X 175 mm cylinder
2. 680 X 130 mm cylinder

Power ~ 12 W

Field of View alternatives:

- 1 - 4.5 degrees (4-17 solar radii) coronagraph
- 0.75 - 5 degrees (3-20 solar radii) coronagraph

\*The preceding information is from the “NOAA 2020” mission RFI “RFISolarWind” released 06-Feb-2014.