

S310-40

Observation of electron number density by NEI

1. Instrument name

Number density measurement of Electron by Impedance probe (NEI)

2. Purpose

The purpose of NEI is electron number density measurement in the ionospheric D and E regions. By using NEI, vertical profile of electron number density in the mid-latitude night-side ionosphere for discussion of radio wave propagation in it.

3. Method

BeCu ribbon antenna with a length of 1.2m and a diameter of 1.2 cm is deployed into the surrounding plasma. Electron number density along the locket trajectory can be determined by detecting probe capacitance minimum at upper hybrid resonance (UHR) frequency.

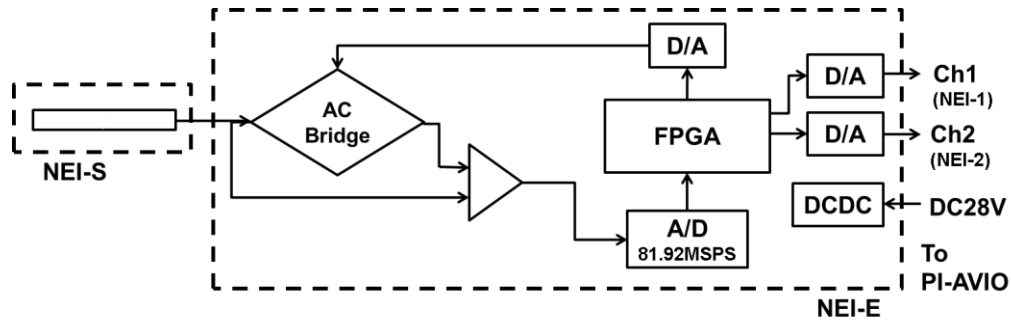
4. Instrument

NEI consists of NEI-S including probe and wire cutter, and NEI-E including electronic circuits of capacitor bridge and signal generator for accurate measurement of probe capacitance.

Specifications

Sensor:	BeCu ribbon antenna with a length of 1.2 m and diameter of 1.2cm
Freq. span:	0.1 - 21.1 MHz
Sweep time:	125 msec
C range:	1 - 1000 pF
Ne range :	10^3 - 2×10^6 el/cc

Block diagram



Definition of frequency step

0.10 MHz	0 kHz/step	0 - 4 step
0.12 - 0.80 MHz	20 kHz/step	5 - 39 step
0.81 - 1.90 MHz	10 kHz/step	40 - 149 step
1.92 - 4.60 MHz	20 kHz/step	150 - 284 step
4.70 - 9.10 MHz	100 kHz/step	285 - 329 step
9.30 - 21.1 MHz	200 kHz/step	330 - 389 step
0.10 MHz	0 kHz/step	390 - 399 step

Telemeter

Double-speed PCM / super commutation channel (3200Hz)

NEI-1 W003,W019,W035,W051 Capacitance (Amplitude)

NEI-2 W011,W027,W043,W059 Capacitance (Phase)

Timer control

NEI antenna deployment: X+61.5 (1.5 s after NC release)

Mass

NEI-S (Sensor, Wire cutter): 0.21 kg

NEI-E (Electronics) : 0.82 kg

Power consumption

+28V, 130mA

5. Observation results

NEI was normally operated through NEI probe deployment, which is 61.5 s after the launch and until the telemeter lock off, and successfully obtained electron number density in an altitude range from 90 km to 179 km along the rocket trajectory.

Electron number density measured by NEI in ascent and decent trajectories is indicated in Fig. 1. Es layers at altitudes of 104 km and 103 km are found in ascent and decent trajectories, respectively. The electron number densities of Es layers were 5.8×10^3 /cc and 6.7×10^3 /cc,

respectively. In addition to Es layers, high density plasma electron number density was found at altitude of 140 km in decent trajectory.

6. PI and manufacturer

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System Keisoku Co.,Ltd.

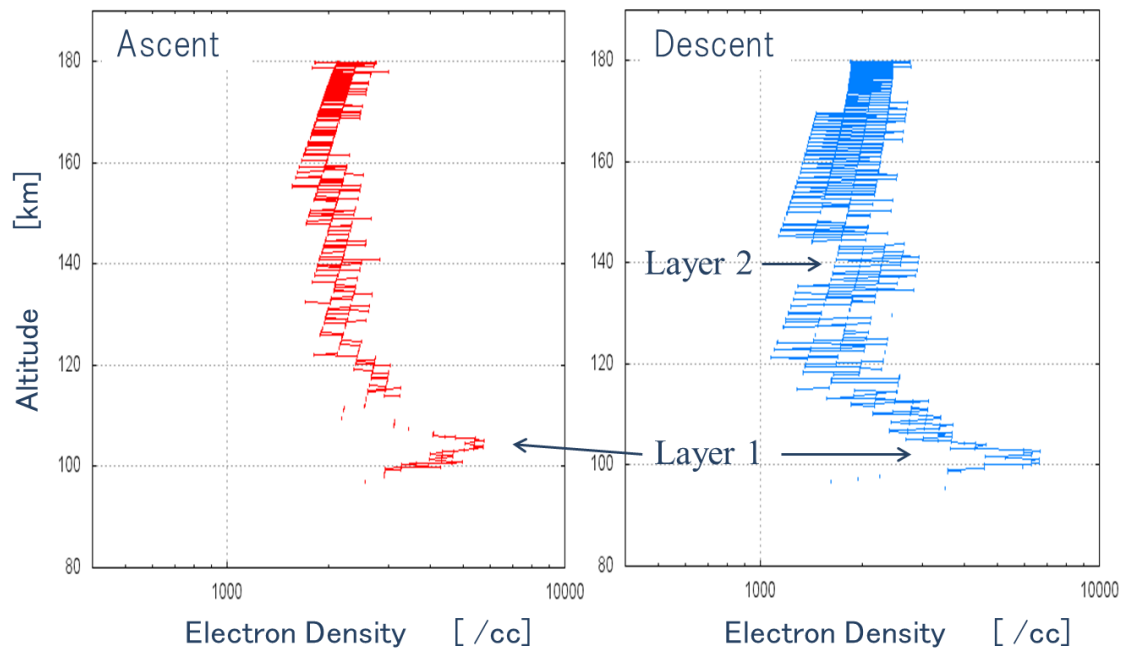


Fig.1: Vertical profile of electron number density based on NEI (a) in the ascent trajectory, and (b) in the descent trajectory