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JAXA DCS processing system

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1. Current DCS processing system

1.1 JAXA DCS processing system

- JAXA has two systems for DCS data reception, processing and delivery, those are for ADEOS-II and for NOAA satellites.
- Unfortunately, ADEOS-II was lost on October 24, 2003 UT. Accordingly, the operation of the ADEOS-II DCS processing system was terminated and the function of delivering global DCS data from EOC Hatoyama to CLS was lost.
- According to the budget restriction, except for the NOAA DCS data processing and delivery, all the DCS related operation is suppressed, currently.
- The data reception and processing system for NOAA satellites regional data have been operating consistently in EOC.
- EOC receives the HRPT data of NOAA 12, 14, 15, 16 and 17, and extracts DCS data, produce Level 0 data and transmit them to CLS Toulouse, altogether about 18 passes data per day.
- EOC receives 2LE orbital data of NOAA satellites from CLS everyday.
- DCS processing system for NOAA satellites operates autonomously.

1.2 EOC DCS related configuration

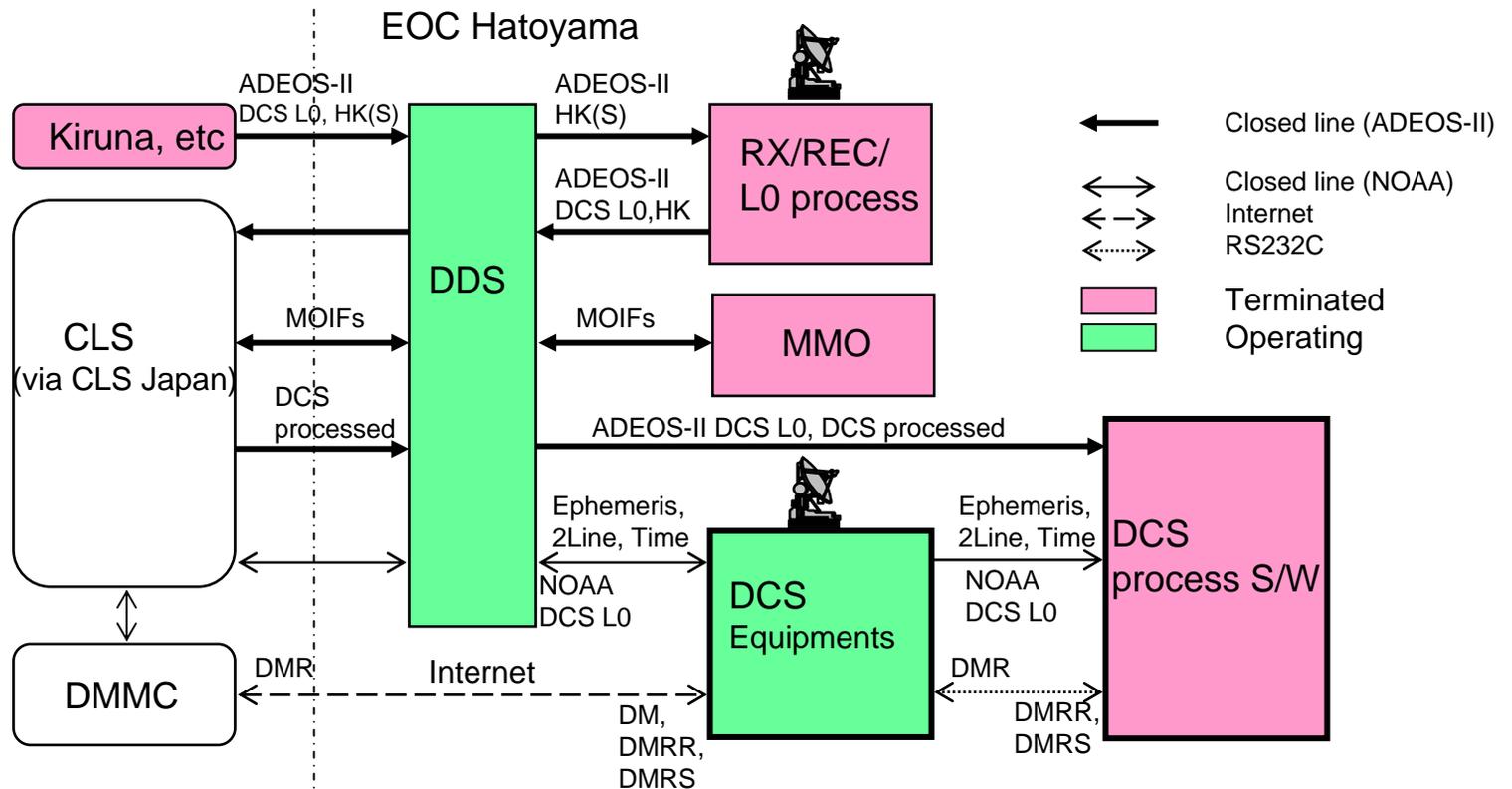


Fig. 1-1 DCS Configuration in EOC Hatoyama

1.3 DCS equipments in EOC

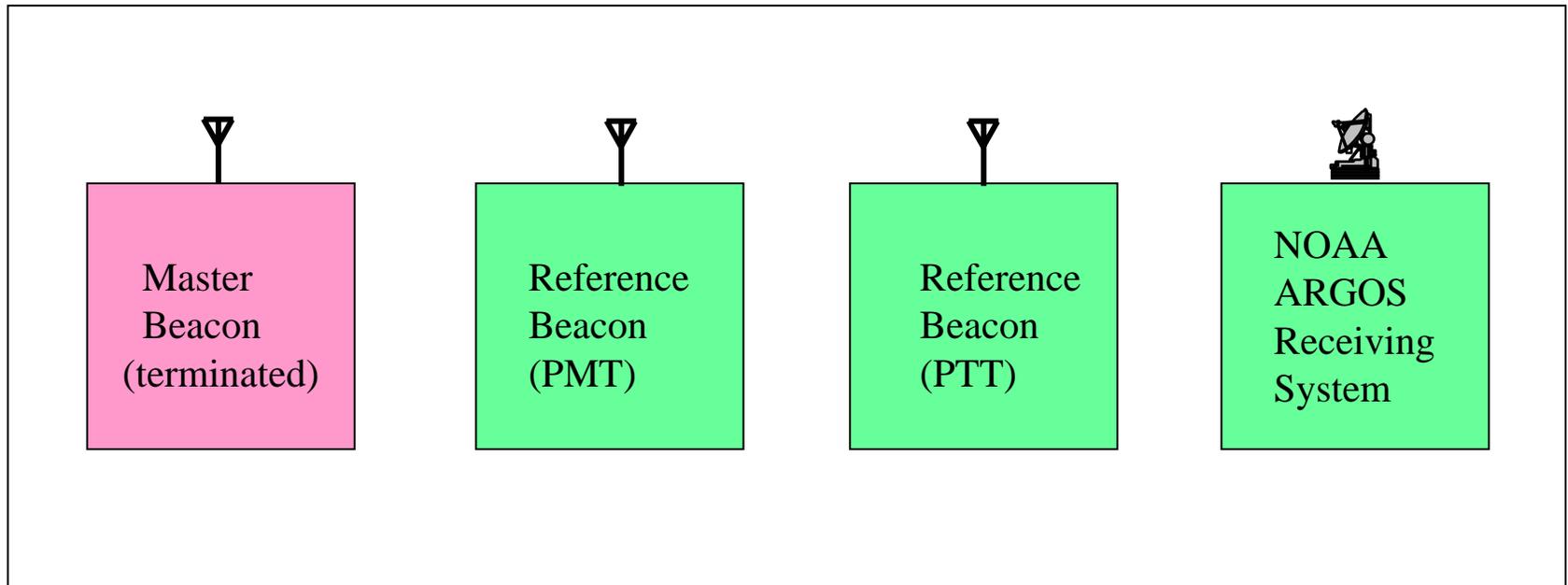


Fig. 1-2 DCS equipments in EOC Hatoyama

1.4 NOAA ARGOS receiving system in EOC

NOAA
12,14,15,16,17

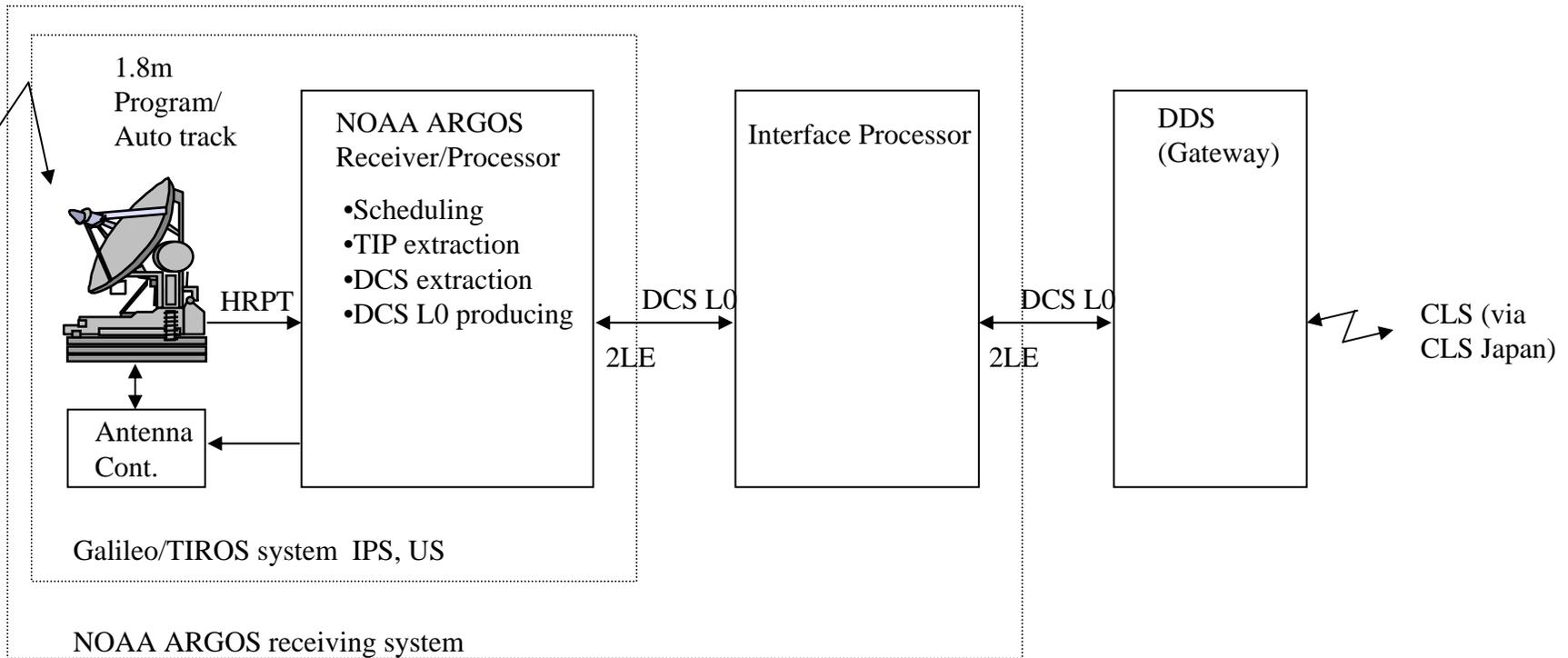


Fig. 1-3 NOAA ARGOS receiving system in EOC Hatoyama

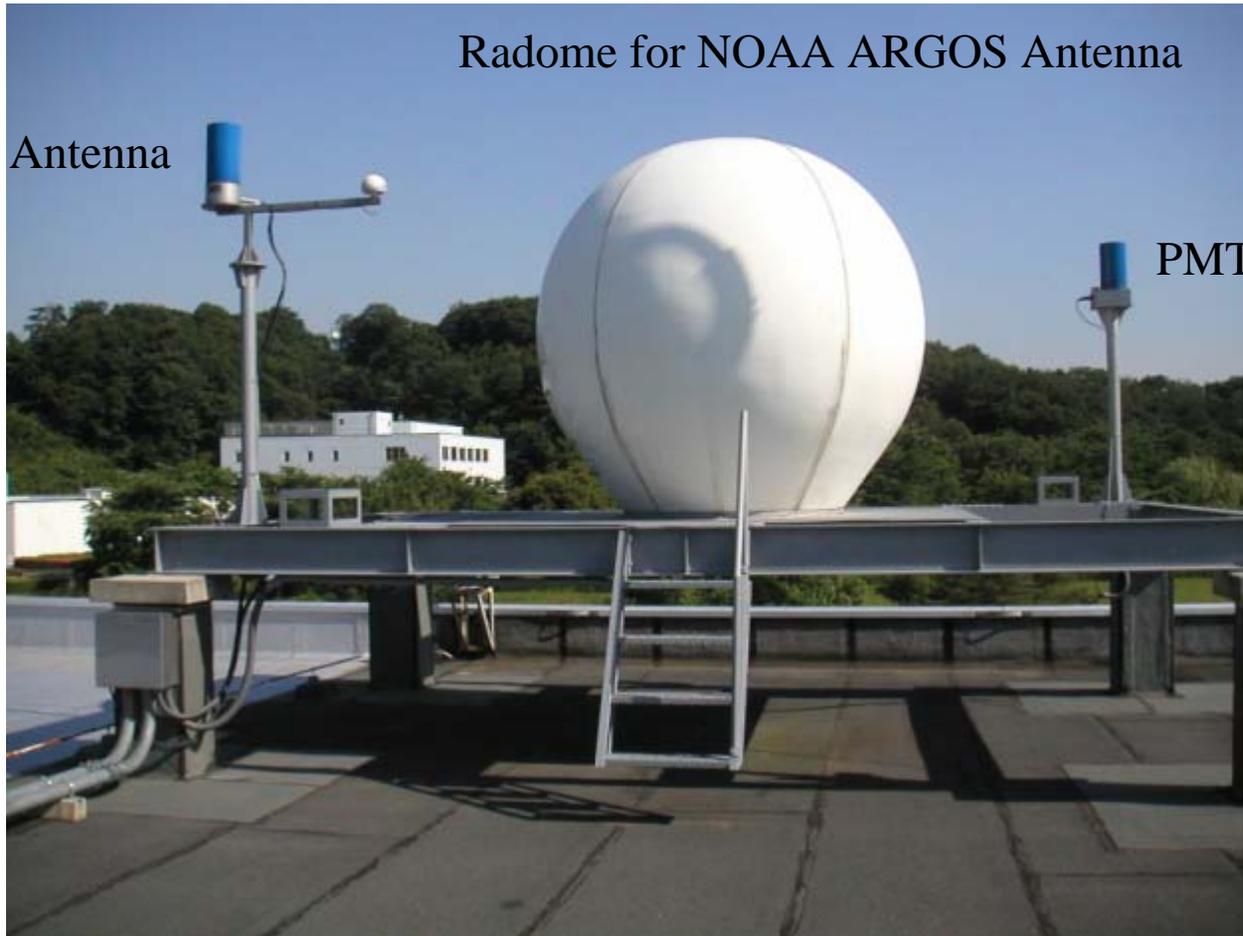


Photo 1-1 DCS Antennas in EOC



Photo 1-2 NOAA ARGOS receiver and processor



Photo 1-3 Interface processor

2. ADEOS-II DCS operation result

2.1 Over view of ADEOS-II DCS operation

Under the MOU (1996) between JAXA (ex-NASDA) and CNES, “Argos-Next” DCS instrument was developed jointly and installed on ADEOS-II satellite. The satellite was launched in December 2002, from Tanegashima successfully.

1.5 months after the launch, onboard DCS was turned on, and initial checkout was started. In parallel, DCS ground segment was checked in JAXA and CNES/CLS, and the evaluation result for both onboard equipment and ground segment were good.

From April 2, 2003, ADEOS-II DCS global data were continuously delivered to CLS, and from May, CLS started to use ADEOS-II DCS data in operational.

In mid April 2003, JAXA completed the initial checkout review, and in Routine Operation Readiness Review, held in May 2003, all the related organization, gathered at Tsukuba, confirmed that all ADEOS-II onboard equipments keep their performance before the launch, and confirmed their readiness to shift to next operation phase.

Regarding to DCS, system tuning and preparation works of ground segments for starting “ARGOS-Next” service, were continued. And most of the preparation works for the general users were finished at the middle of October.

It was quite regretful, but ADEOS-II suddenly lost all the functions on October 24, 2003.

According to the loss of ADEOS-II, user service of ARGOS-Next was not started, but effectiveness of downlink messaging service was confirmed, and also, almost all the functions and performance of newly developed components necessary for downlink messaging service were confirmed.

2.2 ADEOS-II DCS major events

- ADEOS-II Launch ; December 14, 2002 (jst)
- DCS Ant. Deploy ; December 18, 2002
- DCS operational mode setting ; January 29, 2003
- Last DRU(#1) turned on ; February 13, 2003
- DCS global data continuous
delivery start ; April 2, 2003
- Initial Checkout review ; April 14, 2003
- ADEOS-II DCS in operation ; May, 2003
- RORR ; May 20, 2003
- Loss of ADEOS-II ; October 25, 2003

2.3 On Board DCS initial checkout evaluation result

1. Antenna deployment: OK

2. UHF Tx/Rx: OK

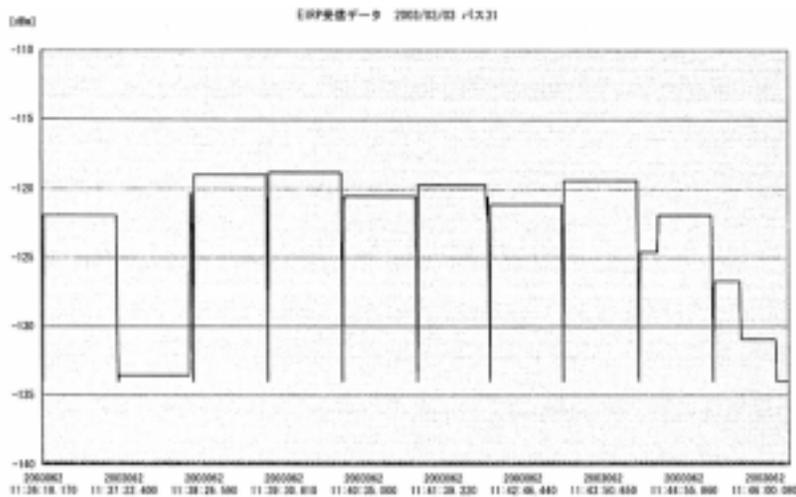
Analysis of On Board DCS Antenna pattern

- Onboard DCS antenna pattern was analyzed.
- NASDA reference DCP (PMT) measured 22 passes of DCS UHF down link level in Broadcasting mode, with a support of CNES/CLS.
- “Estimated pattern” was calculated from PMT measured reception level and onboard DCS transmitting power in HK data. “Estimated pattern” was compared with ADEOS-II DCS “scale model antenna pattern”. Both patterns fit fairly well.
- DCS antenna pattern is OK.

3. CNES components OK

2.4 On Board DCS Antenna pattern evaluation

2003/03/03 path31



2003/03/03 path35

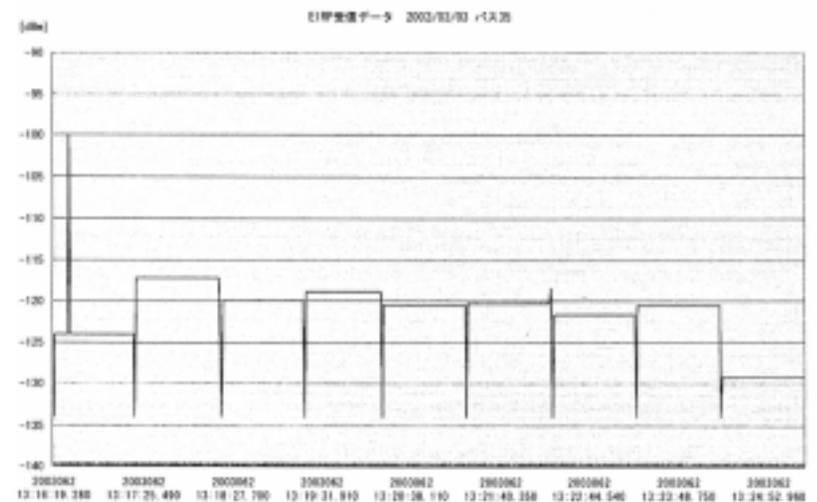


Fig. 2-1 DCS downlink level measured by JAXA's PMT

2.4 On Board DCS Antenna pattern evaluation

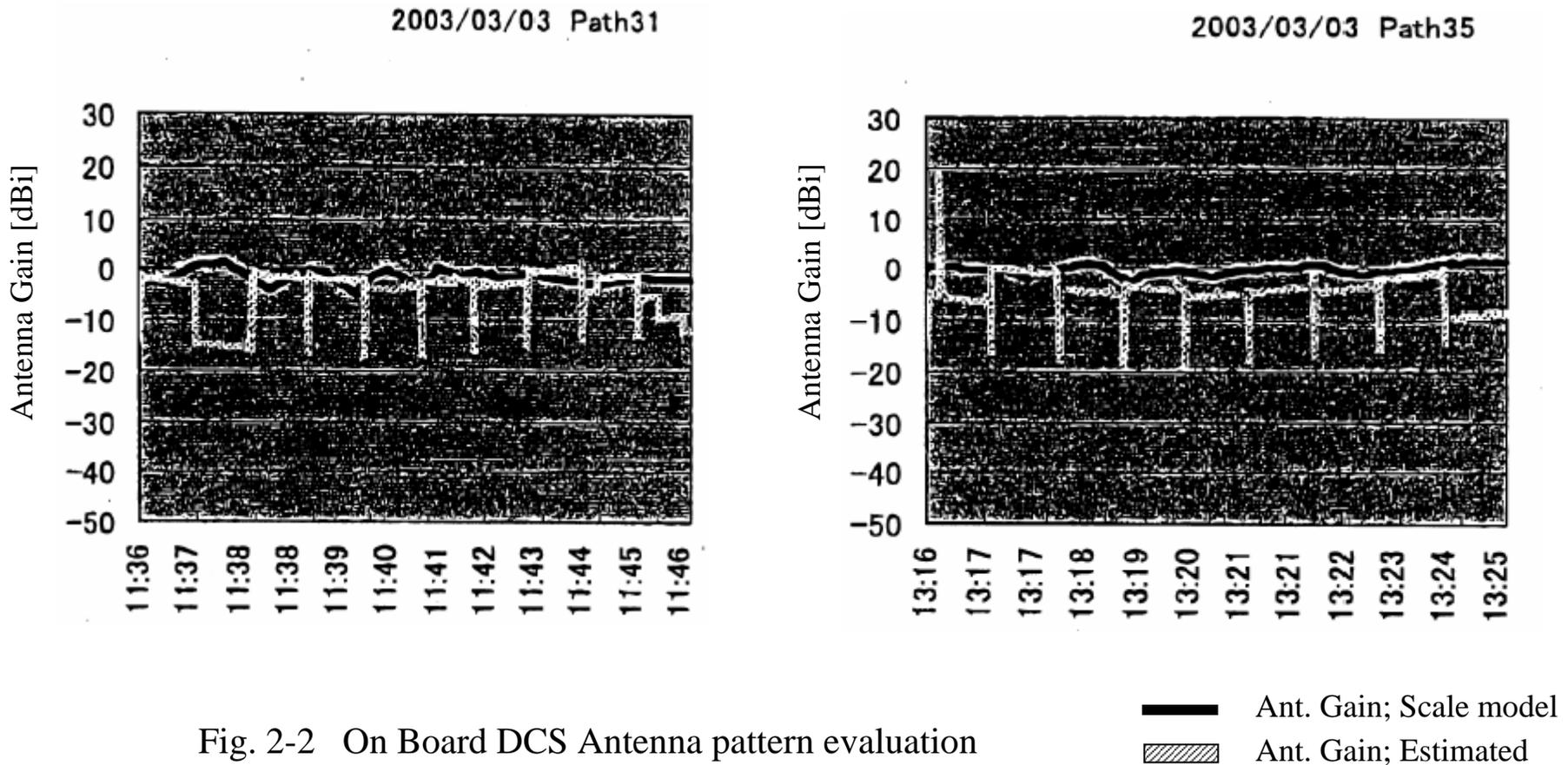


Fig. 2-2 On Board DCS Antenna pattern evaluation

2.5 DCS Ground segment function check result

In Initial Checkout phase, basic ADEOS-II related connection between EOC Hatoyama, DMMC and the DCS onboard were confirmed. After the C/O phase, following functions were checked and had good results.

No.	Item	Evaluation Criteria	Result
1	Downlink Message Request (DMR) transmission from EOC to DMMR	To be accepted by CNES/CLS	OK
2	Downlink Message transmission from Master Beacon at EOC	Downlink Message should be transmitted properly to PMT at EOC	OK
3	Switching DCS operation Mode from Nominal Mode to Interactive Mode, and vice-versa	Operation mode should be switched	OK
4	Interactive Mode operation between Hatoyama Master Beacon and ADEOS-II	Confirm the Interactive Mode operation	OK

2.6 ADEOS-II DCS Mission operation result

- Onboard DCS was maintained properly and worked normally in the mission operation period.
- Mission planning and management were successfully done, in corporation with internal and external parties.
- Global data acquisition, using Data Relay Test Satellite (DRTS), was successfully done.
- 98 % of planned DCS global data were sent to CLS Toulouse.
95 % of regional data were transmitted to CLS in agreeing with time requirement (10 min. from data reception completed)
94 % of global data were transmitted to CLS in agreeing with time requirement (3 hrs from onboard data recording start)

2.6.1 DCS UHF transmit power during mission operation

DCS UHF transmit power was quite stable. HK telemetry showed 37.5 – 37.6 dBm in mission operation period.

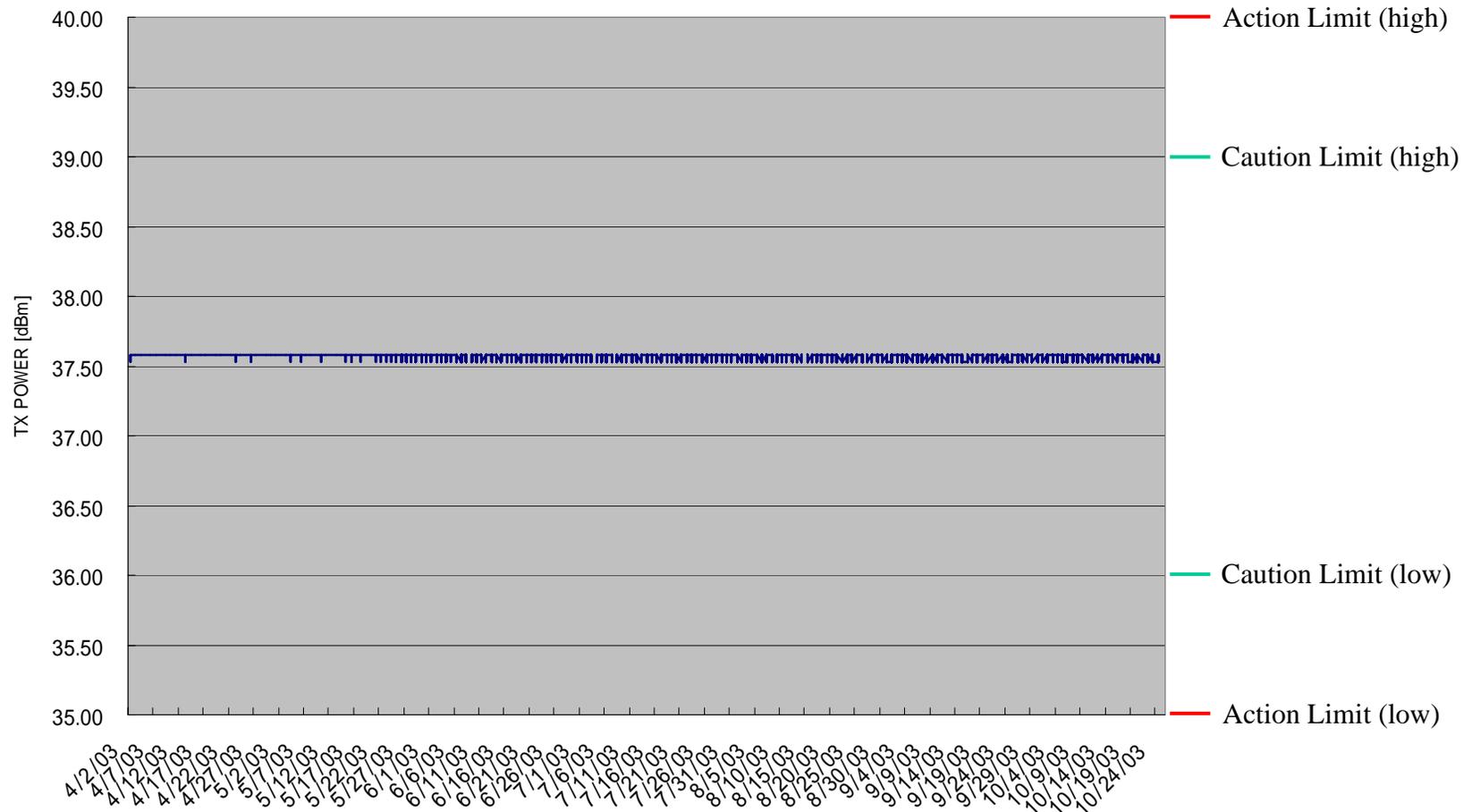


Fig. 2-3 DCS UHF transmit power telemetry data during mission operation

2.6.2 ADEOS-II Level 0 processing result

Table 2-1 ADEOS-II Level 0 processing result in mission operation (April 2 – October 24)

Sensor	Plan	OK	NG	NO L0RL ^{*1}	Data delivery %
GLI-1km	4,084	4,016	67	1	98.3
GLI-250m	4,066	3,976	66	24	97.8
AMSR	4,084	4,017	65	2	98.4
DCS (global)	3,450	3,382	67	1	98.0
SeaWinds	3,450	3,387	63	0	98.2
ILAS-II	3,448	3,385	63	0	98.2

*1; L0RL: Level0 processing result file, Information of L0 processing result at receiving station

2.6.3 Time line evaluation of Level 0 delivery

Table 2-2 Result of the agreement of the data delivery time requirement (April 2 – October 24)

L0 Data	To	Standard	Planned pass	OK	NG	%
DCS EOC Regional	CLS Japan	Within 10 min, From data reception complete at EOC	922	880	42	95.4
DCS Kiruna Regional		Within 15 min, From data reception complete at Kiruna	1194	1131	63	94.7
DCS Global		Within 180 min, From data recording start	3450	3235	215	93.8
SeaWinds	JPL, NOAA	Within 160 min, From data recording start (more than 80 %)	2386 (EOC,Kiruna)	2170	216	90.9
ILAS-II	NIES	Within 4/5 hrs (DRTS/ DT), From data recording start	2063/ 1385	1926/ 1259	137/ 126	93.4/ 90.9

3. Conclusions

- NOAA DCS data delivery from JAXA EOC to CLS is continuing.
- JAXA launched ADEOS-II in December 2002 and lost it in October 2003, on which “ARGOS-Next” DCS instrument was on boarded.
- ADEOS-II DCS global data delivery from EOC Hatoyama to CLS became impossible.
- While ADEOS-II was alive, almost all the functions for ARGOS-Next system were confirmed in both onboard DCS and ground segments at JAXA EOC and CNES/CLS, and also, the effectiveness of Downlink Messaging service was confirmed.
- Preparation works for ARGOS-Next user service was almost completed, but just before the completion, ADEOS-II was died.
- The loss of ADEOS-II is quite regretful, but JAXA thinks the experience and result acquired from ADEOS-II program made contribution to the evolution of ARGOS system.