

STATUS OF CLOUD PROFILING RADAR FOR MDS

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Outline of design for Cloud Profiling Radar (CPR) for Mission Demonstration Satellite is presented. The frequency of CPR is 94 GHz, where the frequency band 94.0 - 94.1 GHz was newly allocated for the earth observation services particularly for cloud profiling radar. The radar observes cloud vertical profile in the nadir direction with vertical resolution of 500 m. Instantaneous antenna foot print is less than 1 km. The horizontal resolution depends on the number of incoherent pulse integration, the typical resolution is 1 x 5 km. The target radar sensitivity is -32 dBZ. The window for data collection in vertical direction is between surface and 20 km above surface. The pulse compression technique can be applied to this radar to attain higher sensitivity than short pulse system particularly for high level clouds. The radar weight and power consumption is 140 kg and 310 W, respectively based on preliminary study.

Communications Research Laboratory has just completed an airborne cloud radar at 95 GHz. Results of the first airborne experiment is reported separately. The aircraft equipped with the radar is Gulfstream II with nominal cruising altitude is 12 km. We will start to collect simulation data and to study retrieving algorithms for satellite observation.

Recent Topics of CPR

- > New frequency allocation for spaceborne cloud radar was authorized (94.0 – 94.1 GHz) at WRC97 Meeting (Nov. '97)
- > Airborne CPR (95 GHz) of CRL first test flights conducted (Jan 98); Next flight is scheduled in March.
- > CPR design for MDS is ongoing.

Main feature of CPR for MDS/ATMOS-B

- > Nadir pointing (fixed)
- > Target sensitivity is -32 dBZ (short pulse) and -38 dBZ (pulse compression).
- > Low loss antenna feed system
- > High power transmitter EIA
- > Development: 1998 – 2002
- > Technical feasibility proved by development of an airborne system

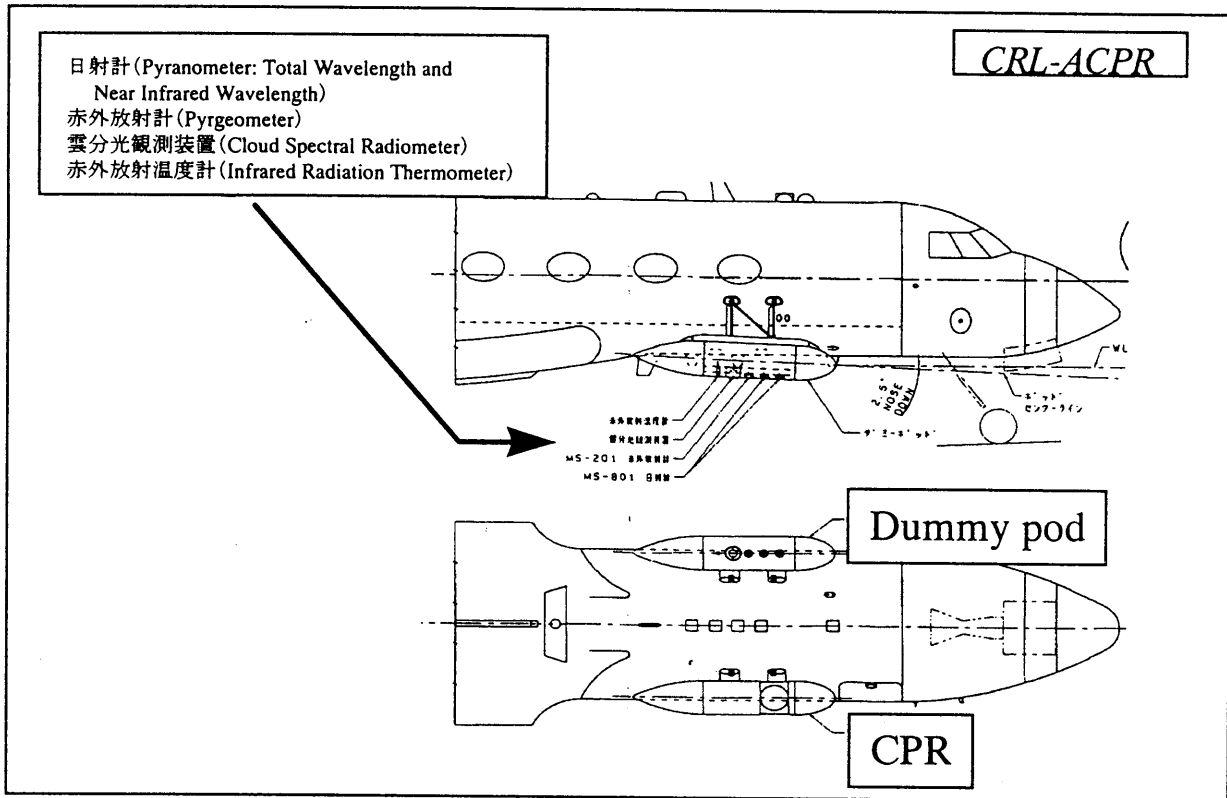
Radar budget

Short pulse mode

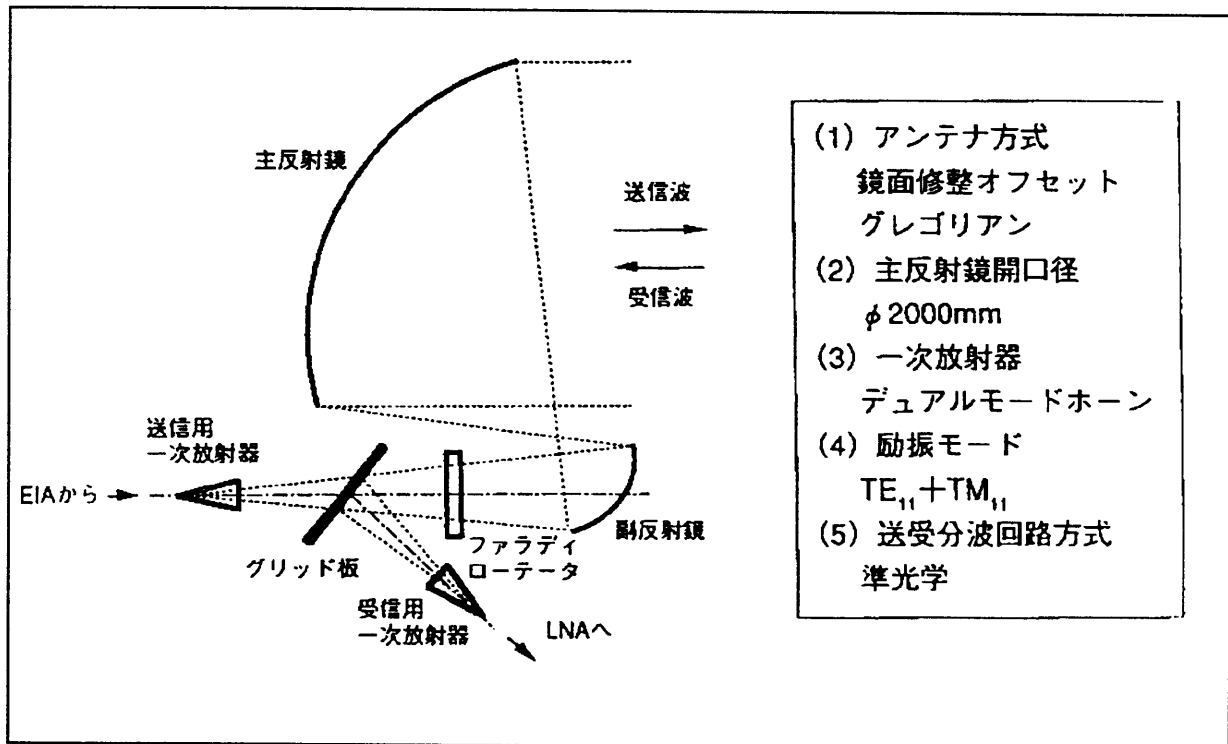
Altitude	450 km	
Tx power	1.5 kW	
Frequency	94.05 GHz	
Antenna aperture	2 m	
Antenna gain	64.7 dB	
Antenna beam width	0.1 deg	
Rx NF	5 dB	
TR path loss	1.2 dB	
Attenuation (O ₂ , H ₂ O, LW)	1.4 dB	
Horiz. resolution	0.8 km x 5km (Pulse integ. ~2600)	
Data window	0 – 20 km	
Target minimum dBZ	-32 dBZ	
Pulse width	3.33 μs (500 m)	1.67 μs (250 m)
SNR	+2.9 dB	-3.1 dB

Weight and power consumption

	Weight (kg)	Power consumption (W)
Antenna	27	
T/R	50	250
Data system	20	30
Power supply	3	15
Thermo-control	5	20
Structure	30	
Integration	10	
Total	145	315



Configuration of sensors for airborne CPR experiment



Antenna and feed system