

# Xi LinHot GRUAN Site Work Progress

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# XilinHot GRUAN site development Plan(2018-2022)

## 1. Layout



### **GRUAN SITE**

ground and Upper air observation, production, data center and laboratory.



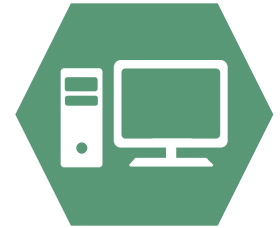
### **Ground-based observation instrument TESTBED**

Construct MWR, MR, Lidar and etc. Ground-based remote sensing instrument testbed.



### **Weather and Environmental Protection Services for Autonomous Region**

Analysis and assessment for Climate Change, Interaction between observation and prediction, Grassland Quality monitor.

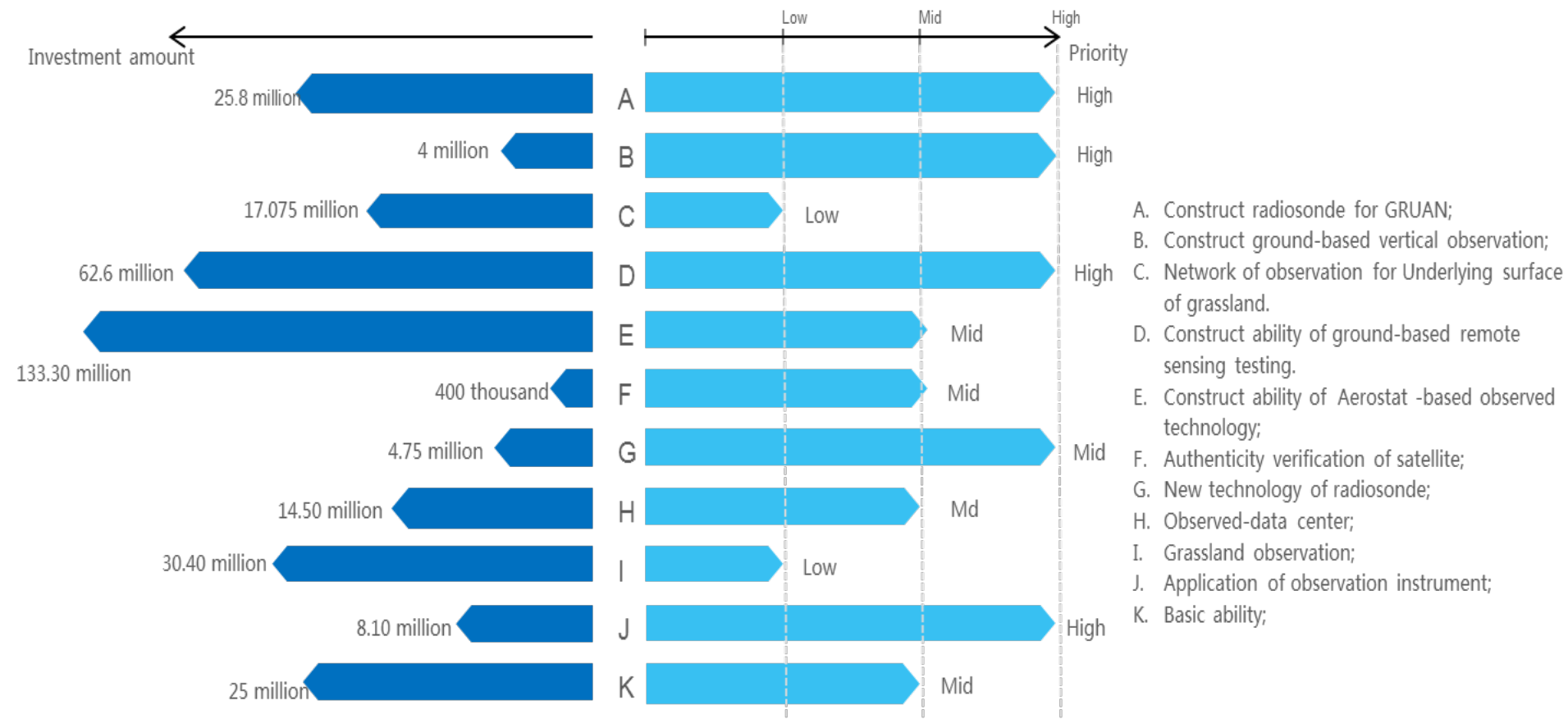


### **National Upper-air observation research centre**

Process/analyze/publish data, product and report by MOC of CMA

## 2. Investment plan (before 2022)

**Total : 325.715 million CNY(about 50 million US dollars),and a toal 4.5 million US dollars have been invested in 2018**



# Progress of XilinHot site work in 2018

## Task

1. RS41 Observation(we have 50 radiosonde funds this year ,once a week this year, should be start before Sep.)
2. Chinese GNSS radiosonde observation(not sure, once a week at least)
3. MWR/wind profile lidar/ Ka band Radar/validation observation and etc. purchasing and installation (1.5 million US dollar)
4. Xilinhhot basic ability upgraded(electric power, instrument maintenance, communication, local data process and etc.)

# Radiosonde Progress

## 1. RS41 Observation

There are 1 MW31 (be modified for RS41) and 3 SHC have been building in Xilinhote, and about 50 RS41 (and balloon) will be purchased by the end of June.

Xilinhote would use RS41 follow the routine base requirement of GRUAN site radiosonde observation work (once a week this year) by the end of September

## 2. High accuracy radiosonde selecting

There are 4 type GNSS(GPS+Beidou) radiosonde may be selected for Xilinhote. And There will be a comparison experiment for CMA to make the decision of choosing the best one, and will apply to GRUAN site.

# 3. WMR observation experiment

## WMR-RS92 20 flight



MP3000



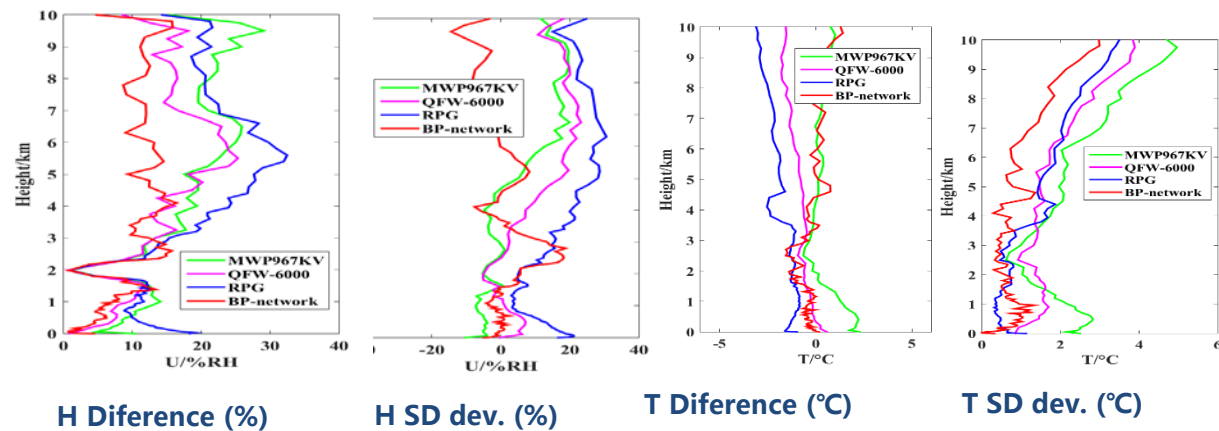
MWP967KV



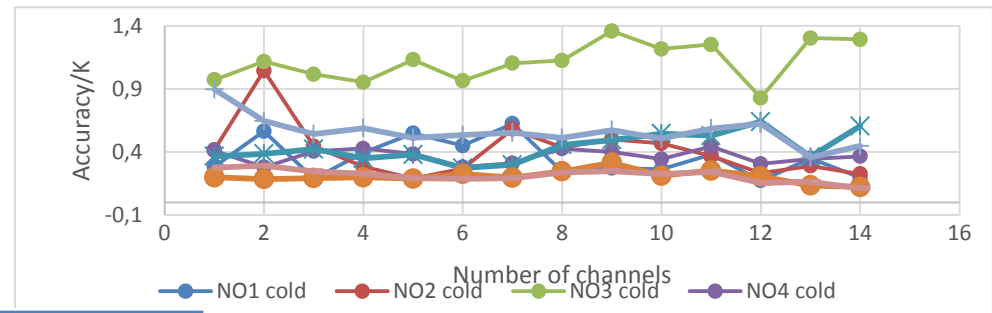
RPG



QFW-6000



## Joint calibration test

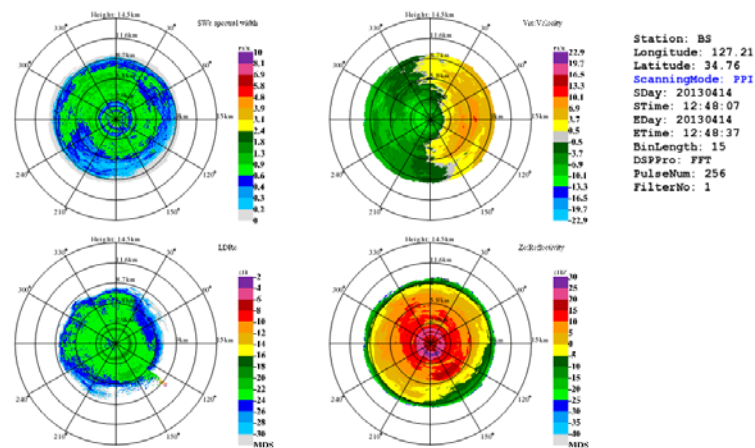


- ❑ **Methods:** LN2 and built-in blackbody were used as radiation standard source to calculate the brightness temperature error of each channel.
- ❑ **Result:** RPG and MP3000 Tb measurement error is ~0.5k.
- ❑ **RPG T** deference between RS92 1-2K
- ❑ **RPG H** deference between RS92 <20%

Site	owner	type	Entry time
Meteorological Observation Test Bed of CMA	Airda, Beijing	RPG*2	Nov 2016
	206 Research Institute, Xi'an	MWP967KV	Nov 2016
	Shallow-Sea , Beijing	MP-3000A	Nov 2016
	22 Research Institute, Qingdao	QFW-6000	Feb 2017
	Beijing Normal University	RPG	Feb 2017



# 4. Ka Band Scanning Millimeter Wave Cloud Radar



Data Display of PPI Scan Mode



Scanning Cloud Radar

## Technical specifications of millimeter wave cloud radars

- 1. The radar adopts the all-solid state system.
- 2. The radar has a high detection sensitivity(-30dBz@5km), and is more capable of detecting weak targets such as weak clouds and fog.
- 3. Dual polarization system can be used to detect more polarization information such as ZDR, KDP, ROHV and so on.
- 4. The radar has a high range resolution (30 meters) and a great speed detection range(25m/s).

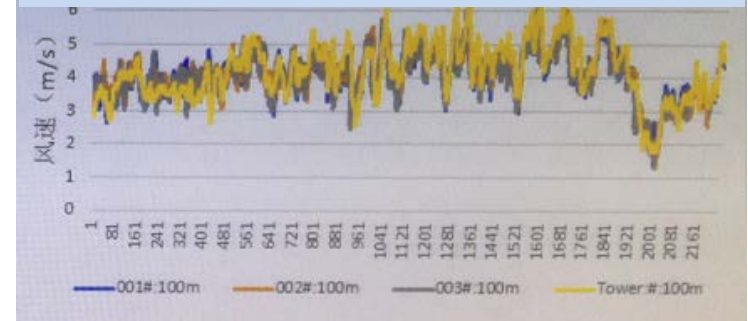
Radar Name	Ka-SACK	D3R(Ka band system)	HMB-KST
Produced by	Department of Energy U.S.A	NASA U.S.A	BIRM China
Center Frequency	35.3GHz	35.56GHz	33.44GHz
Sensitivity	-27.8dBZ@5km	-19.5dBZ@5km	-30dBZ@5km
Operational range resolution	25m	150m	30m
Maximum range	20km	30km	30km
Angular coverage	0~360° Az -0.5~90° EL	0~360° Az -0.5~90° EL	0~360° Az -2~90° EL
Nyquist velocity	10.6m/s	25m/s	25m/s
Antenna size	1.82m	0.6m	1.8m
Transmitter type	Klystron amplifier	Solid-state	Solid-state

# 5. Coherent Doppler Wind Lidar

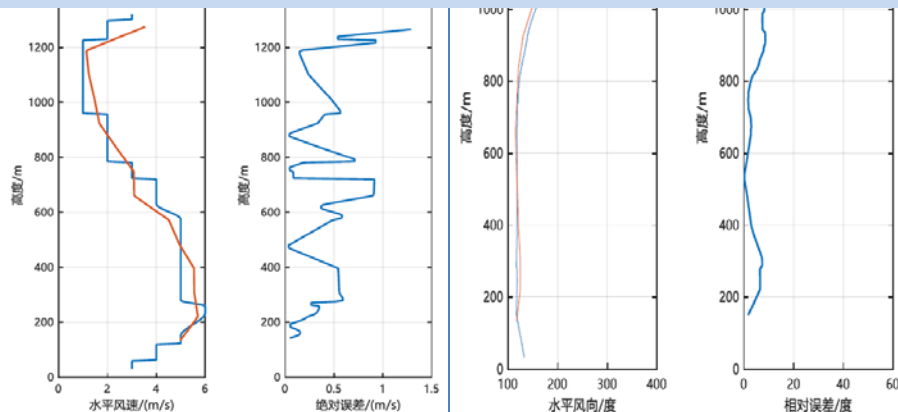
Experimental comparison : lidar vs radiosonde(GTS1,6 times), lidar vs wind tower (below 100 meter ,3days



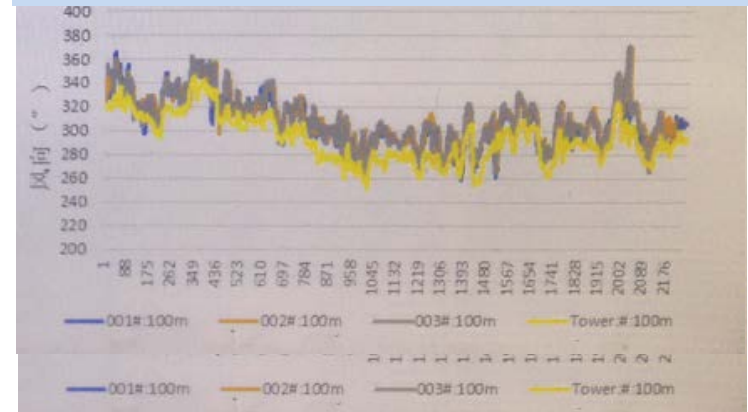
## Lidar vs. 100meter tower: velocity



## Lidar vs. radiosonde:velocity(L),Direction(R)



## Lidar vs. 100 m tower: direction



Range resolution: 20m/30m/50m/75m/100m      Temporal resolution: < 1 min

Detection range: 0-75m/s      Error: < 1m/s, <0.6°

(1)The performance of local lidar meet the requirement of the task this year.

(2)Need for long term stable operation assessment.

- 5. micro unmanned rotorcraft  
meteorological observation -For validation



Measuring the temperature、humidity、pressure、wind direction&speed of boundary layer (Also the Captive balloon )

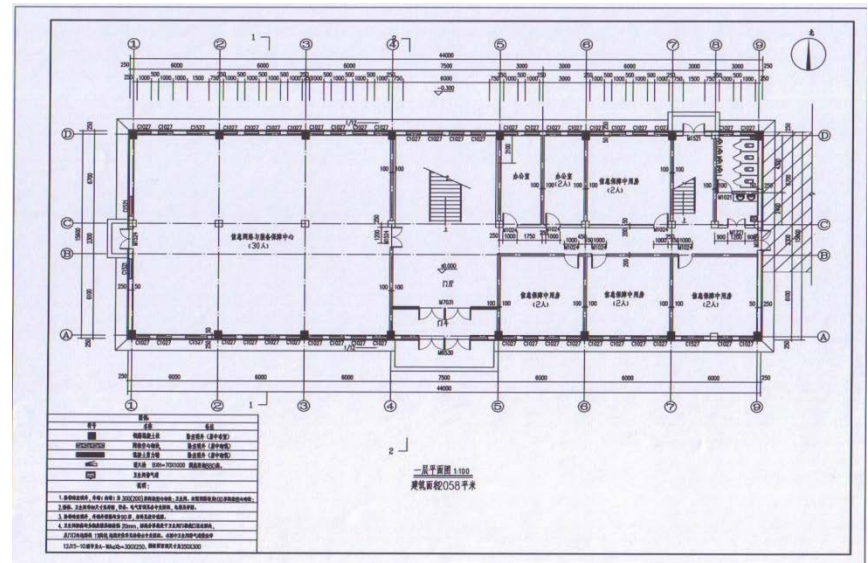
Parameter of rotorcraft	
Ceiling	≥1500m
Endurance	≥30min
Payload	≤5kg
Hovering accuracy	Vertical: ±0.5m
	Horizon: ±1.5m

Parameter of observation instrument	
temperature	measurement range: +40~-40℃ resolution:±0.1K
humidity	measurement range: 100~20%RH resolution:±2%
pressure	measurement range:1050~500hPa resolution:±0.5hPa
Wind direction	measurement range: 0.5~60m/s accuracy:±0.5m/s
Wind speed	measurement range: 0~360° accuracy:±5°

- 6. The data processing center (DPC)

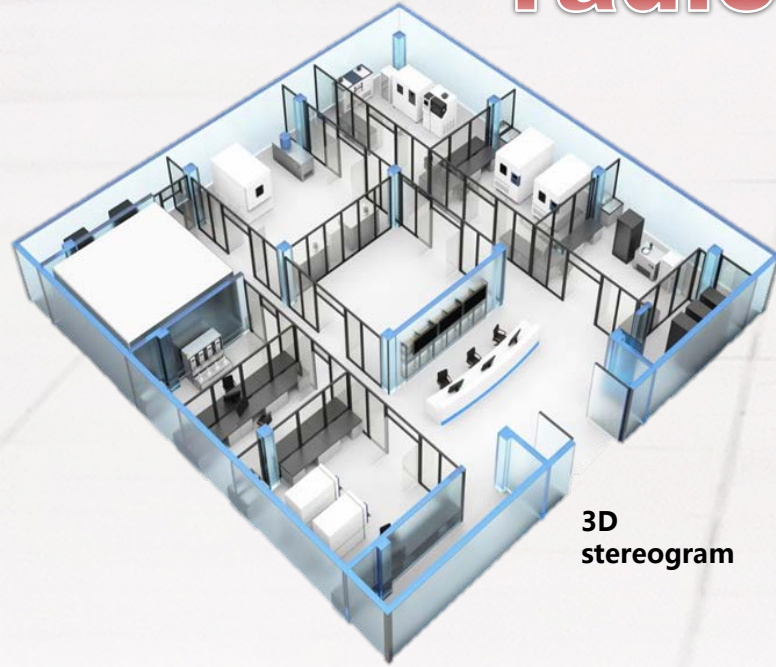
Xilinhote Government have invested 3 million US dollars of DPC and the power supplyment upgrade since last year

DPC has a construction area of 2224 square meters, which includes an expert research room, an information and technology guarantee center, and a network maintenance center. After DPC completed, the network operation capability is planned to be built into the digital link of the different operators dual 100 MSDH and more than 100M in the intranet of CMA.





# **National Radiosonde Quality Test Lab(NRTL)-GRUAN radiosonde testing**



- As a unified platform for detection of sounding instruments, the NRTL covers the comprehensive testing items, such as sensor testing, electrical performance testing and environmental adaptability testing.
- CMA have invested 300 thousand US dollars for high quality radiosonde uncertainty testing ability upgrade last year.

# Lab Function

## • Sensor Testing



## Temperature Testing

(First Class Platinum Resistance)

- Sensitivity:  $0.1\Omega/^{\circ}\text{C}$
- Drift Rate:  $<0.001^{\circ}\text{C}/100\text{hrs}$

(Calibration Bath )

- Range:  $-95^{\circ}\text{C}\sim+95^{\circ}\text{C}$
- Uniformity:  $\leq 0.01^{\circ}\text{C}$



(First Class 373  
Dew Point Mirror)

- Frost/dew point range:  
 $-95\sim+20^{\circ}\text{C}$
- Accuracy:  $\leq \pm 0.1^{\circ}\text{C}$   
(Frost/dew)



(First Class 473  
Dew Point Mirror)

- Frost/dew point range:  
 $-20\sim+70^{\circ}\text{C}$
- Accuracy:  $\leq \pm 0.1^{\circ}\text{C}$   
(Frost/dew)

## Humidity Testing



(The WLS-V type of two-  
pressure  
humidity generator)

- Range:  $10\%\sim 95\%\text{RH}$
- Temperature uniformity  
in test room:  $\leq \pm 0.1^{\circ}\text{C}$
- Accuracy:  
 $-50\sim+50^{\circ}\text{C}, \pm 1\%\text{RH}$   
 $-60\sim-50^{\circ}\text{C}, \pm 2\%\text{RH}$



## Pressure Testing

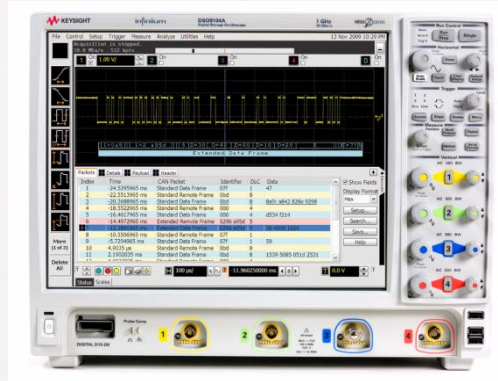
(745-23A Pressure Standard)

- Ranges:  $5\text{hPa}\sim 1100\text{hPa}$
- Accuracy:  $\pm 0.08\text{hPa}$



# Lab Function

- **Electrical Performance Testing**



- **KEYSIGHT DSO9104A Oscilloscope:**  
**1 GHz, 4 Analog Channels**

- **Environmental Adaptability Testing**

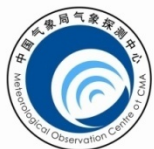


- **SPIRENT GSS6300M**  
**Multi-channel GPS/BeiDou signals**



# Radiosonde Progress

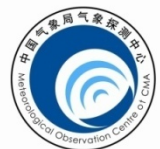
- We now have 4 types of GNSS (GPS+BeiDou) radiosonde, which are better than ChangFeng in 2010 CIMO intercomparison.
- A comparison test should be taken for choosing one for GRUAN site.
- Would LC attend this comparison?  
(Plan and data process)





**Data sharing , Technical cooperation and Operating expenses is not clear yet for CMA.**

**XilinHot GRUAN site work process need more clear international frame for CMA.**



**Thanks for your attention!**

