

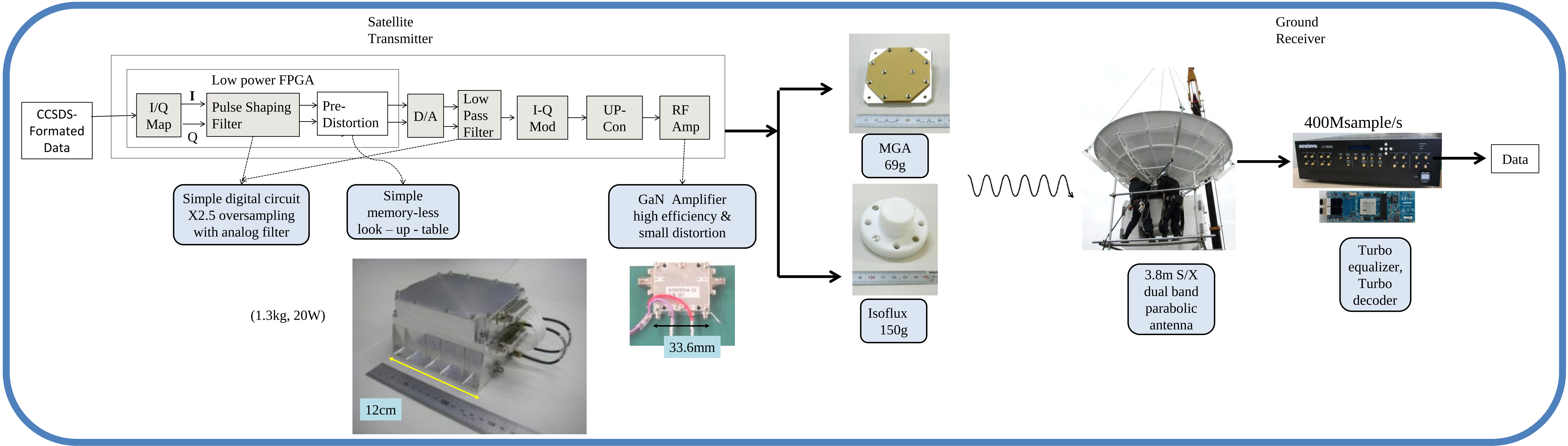
# 小型衛星用X-band高速ダウンリンク通信システム送信機の研究

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## New Challenge to Limitation of Small Satellite (Power & mass)

- To enhance sensor capability (especially SAR)
- To increase data down link speed ⇒ 300 Mbps Down Link for 50kg Satellite Demonstration at Hodoyoshi#4 in 2014

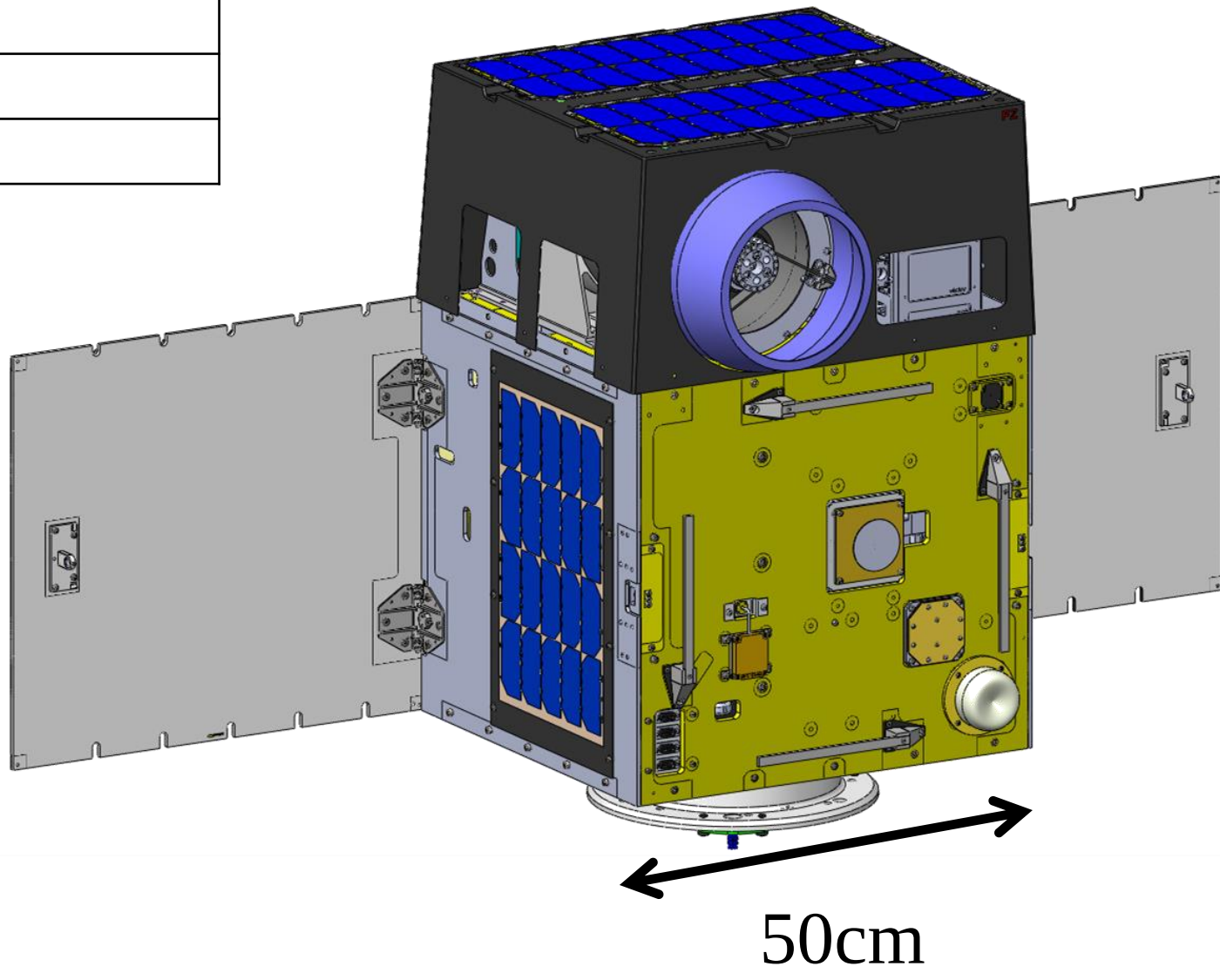
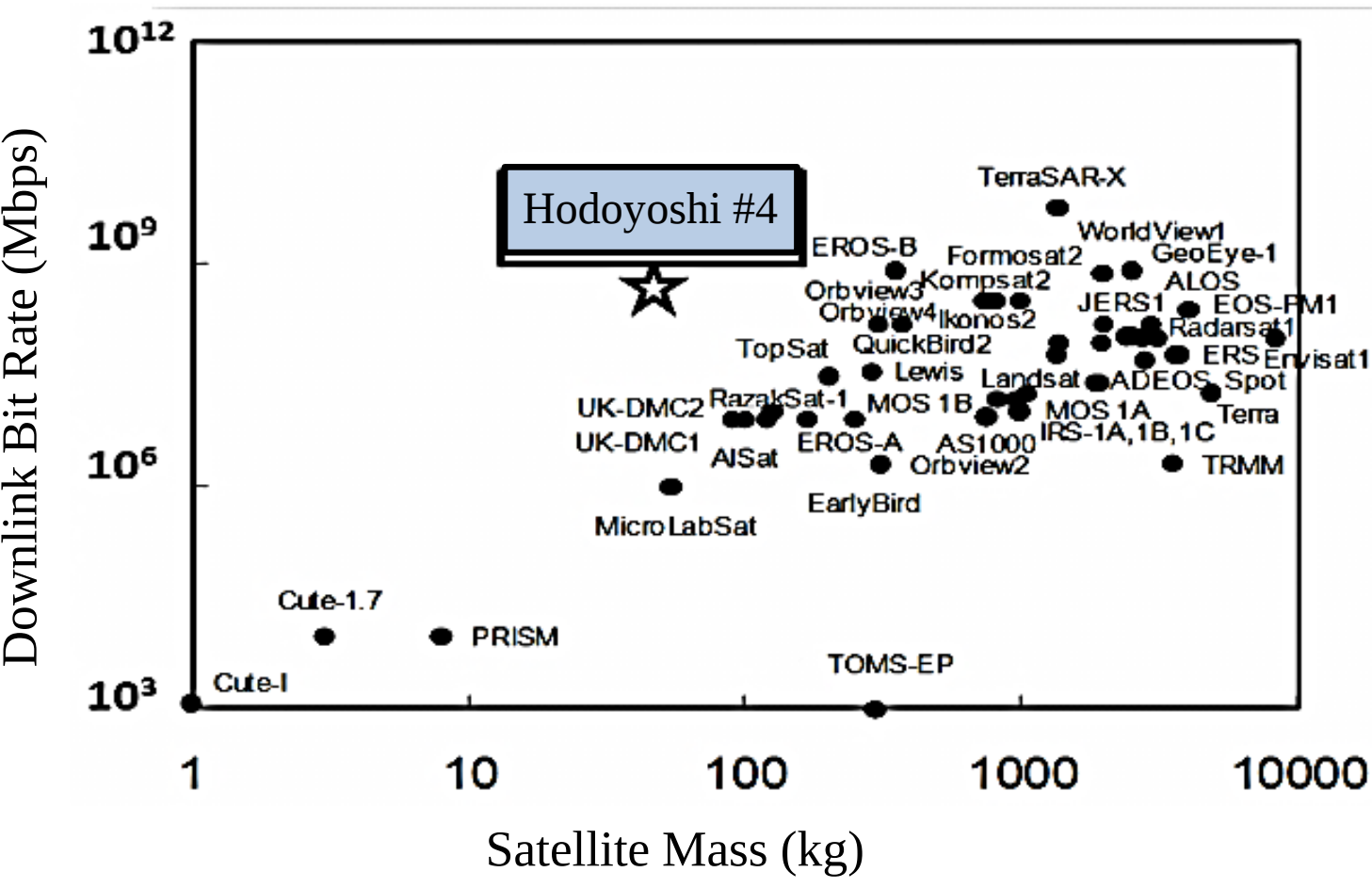


## High Speed Downlink System

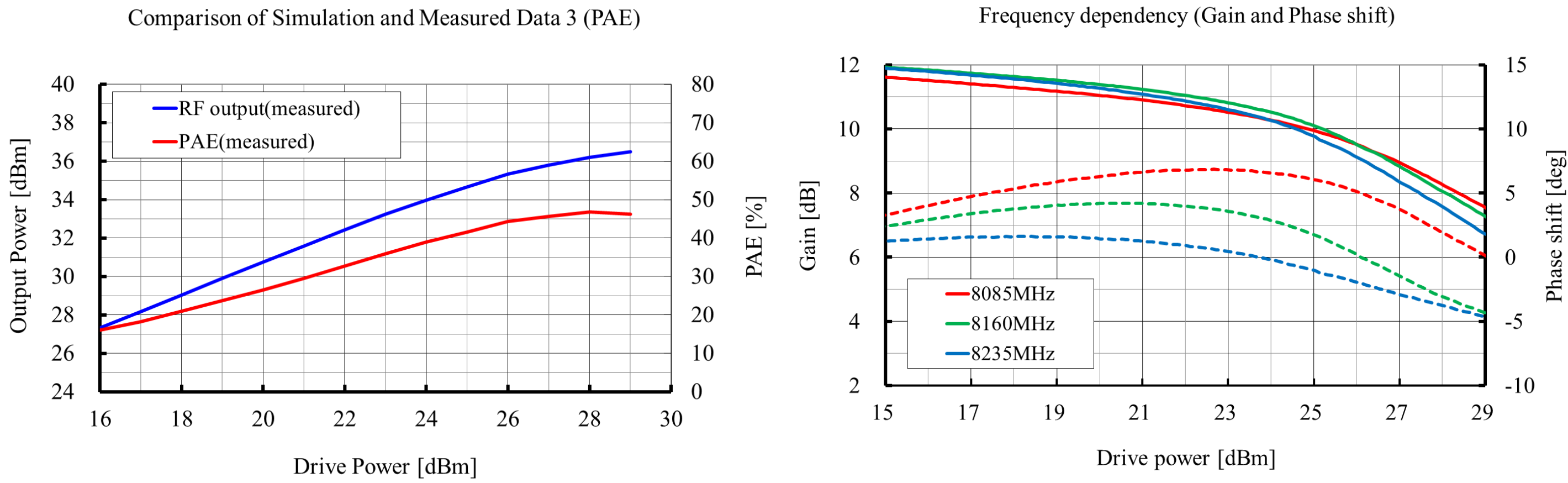
Down Link Over 300 Mbps for 50kg Satellite  
Demonstration at Hodoyoshi#4 in 2014

Hodoyoshi #4 project

|                   |                   |
|-------------------|-------------------|
| Center frequency  | 8.16 GHz (X-band) |
| Band width        | 150 MHz           |
| Modulation scheme | QPSK, 16QAM       |
| Data rate         | > 300Mbps         |
| Avg. RF power     | 33 dBm (2W)       |



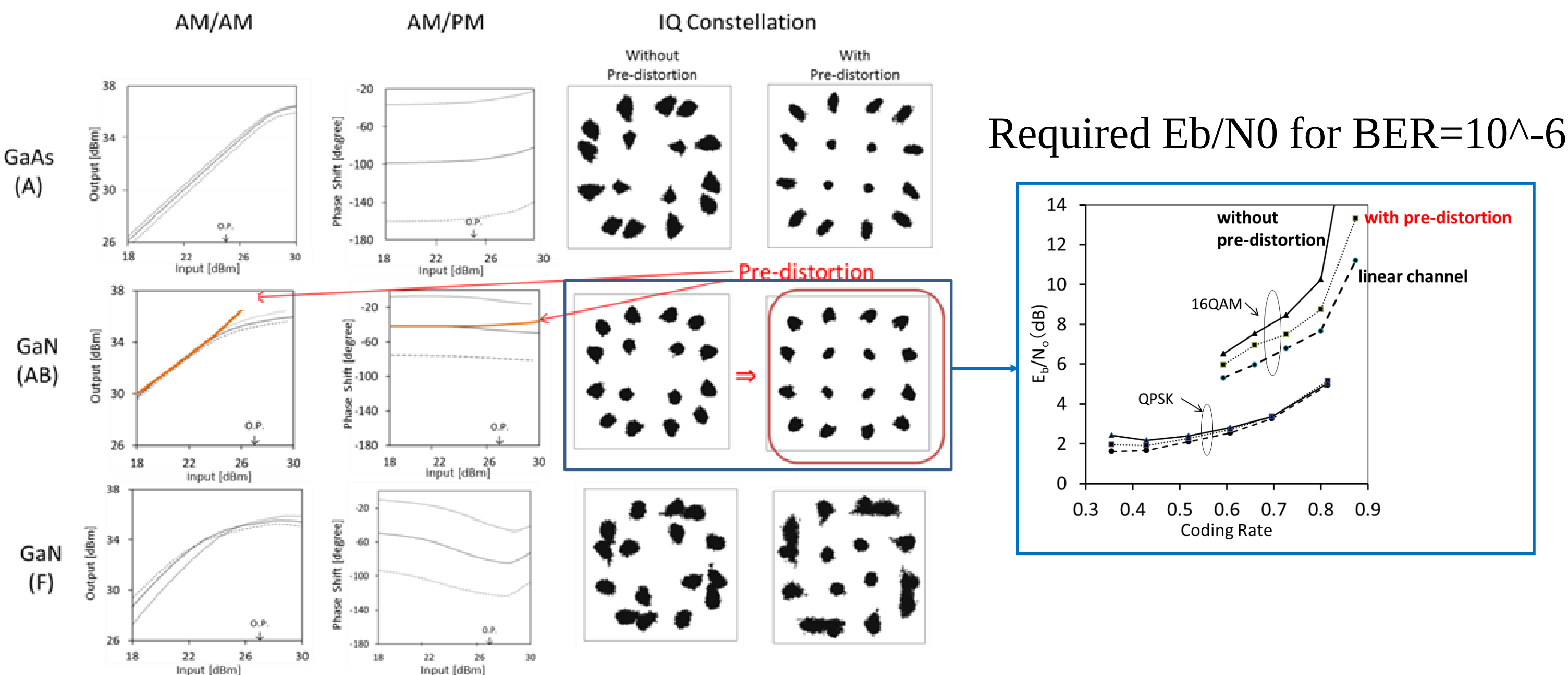
## High Efficiency and Low Distortion GaN Power Amplifier



### GaN class AB amplifier

- High Efficiency: PAE Max49%, 37%@5dB OBO
- Low Distortion: Phase shift < 7°
- Great tolerance to total dose

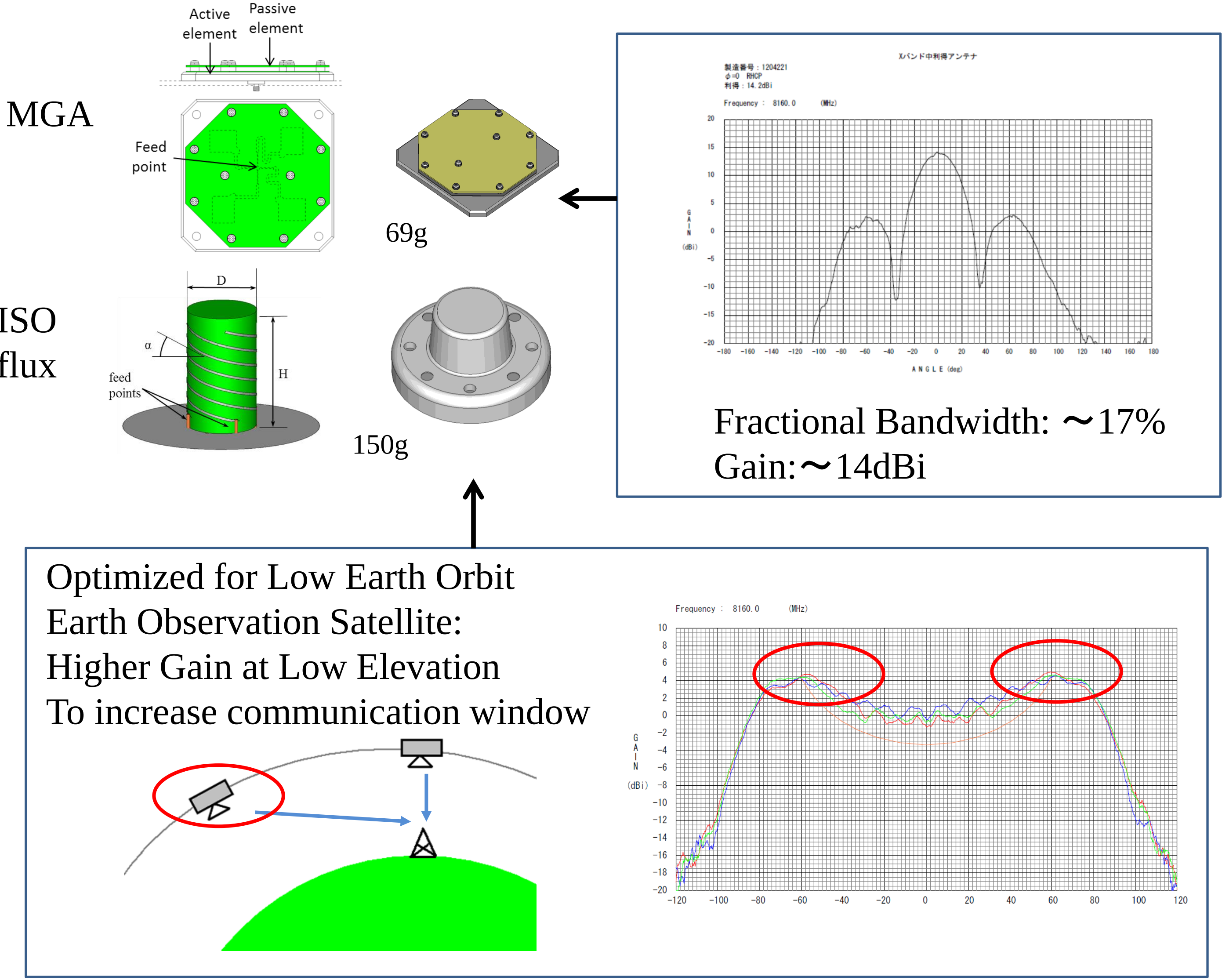
## 16QAM and Digital Predistortion Simulation



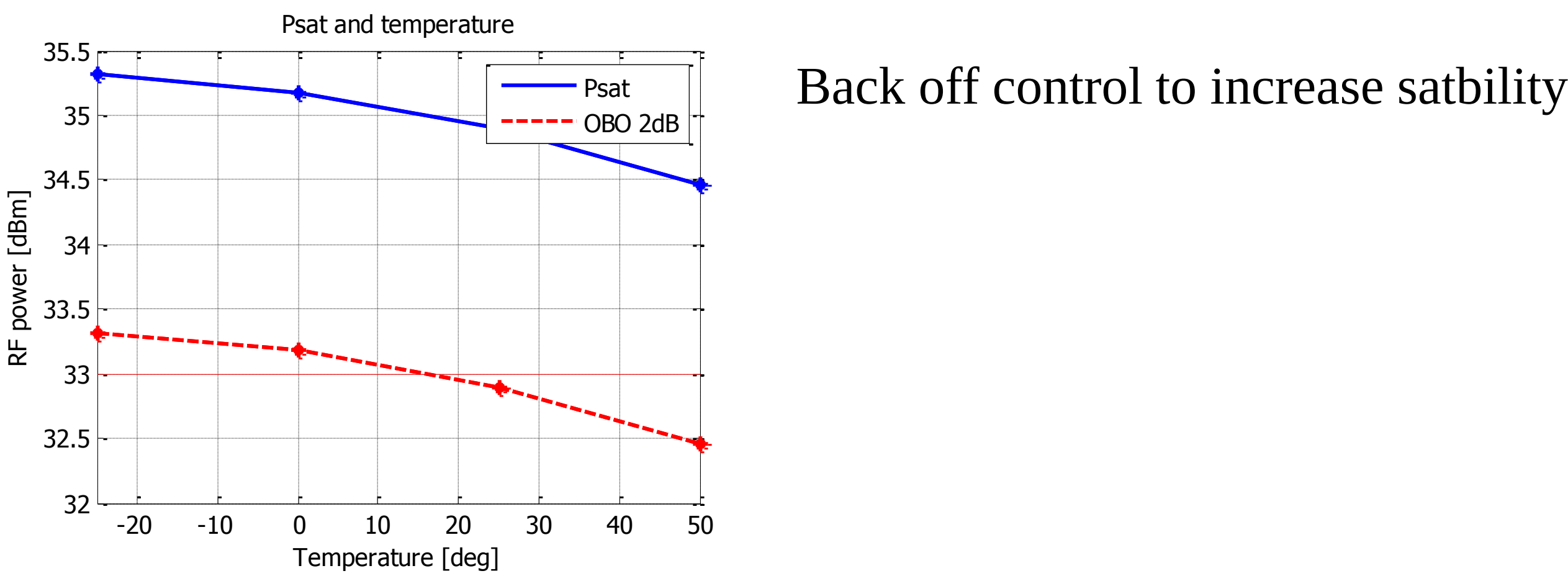
### Comparison

Linearity: GaN(AB) > GaAs(AB) > GaN(F)  
Efficiency: GaN(F) > GaN(AB) >> GaAs(AB)

## MGA and ISO flux Antenna



## Distortion control system



Back off control to increase satbility

## Demodulation test

