

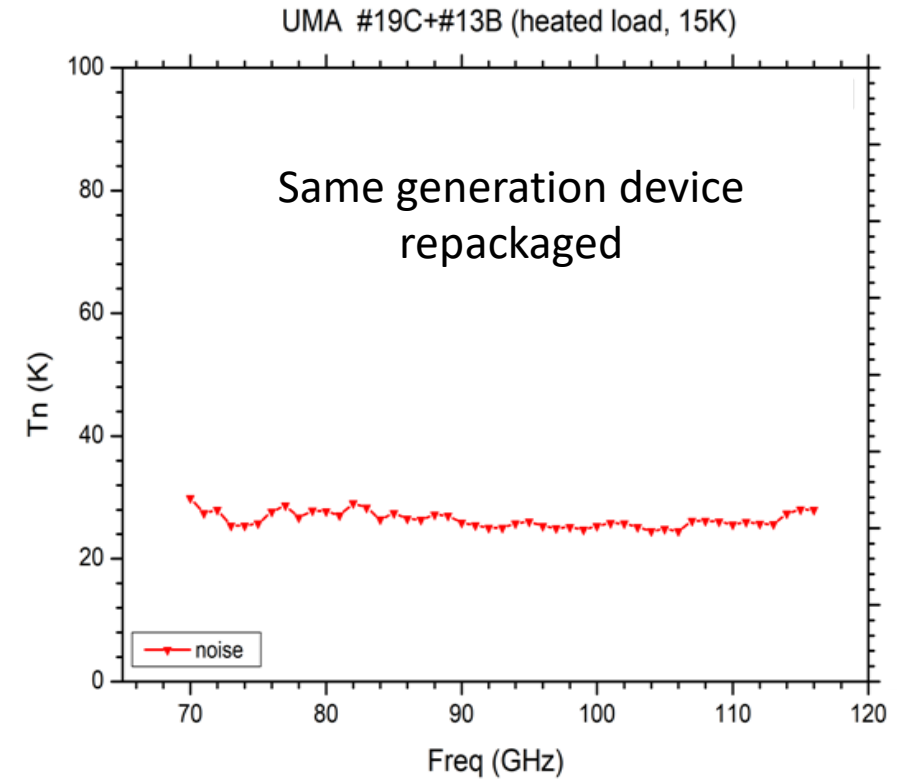
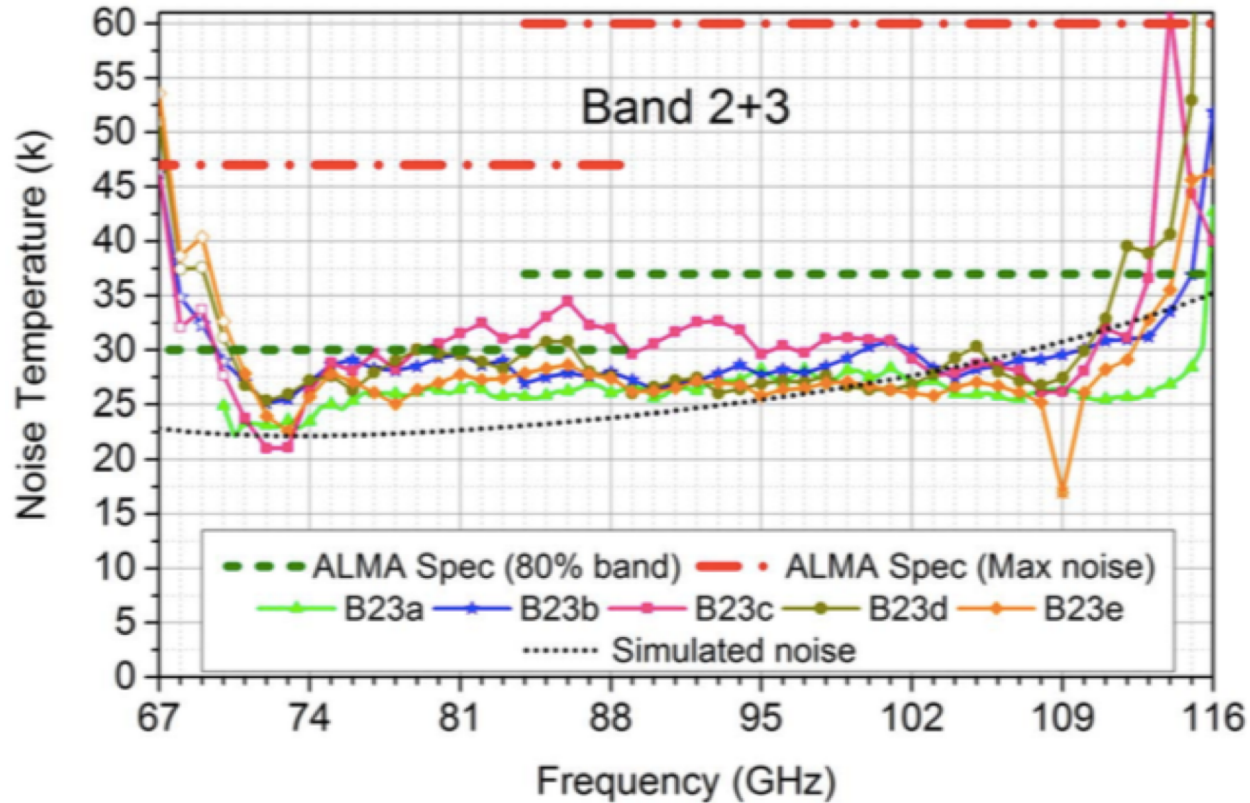
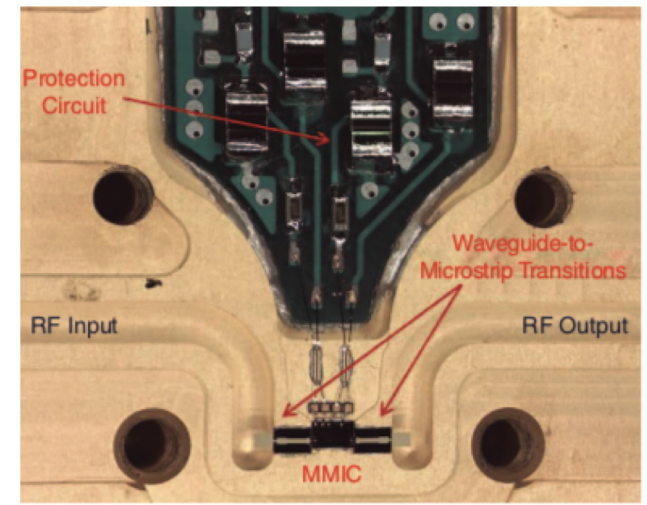
Low Noise Amplifiers at 67 – 116 GHz

Gary Fuller and Danielle George
Advanced Radio Instrumentation Group

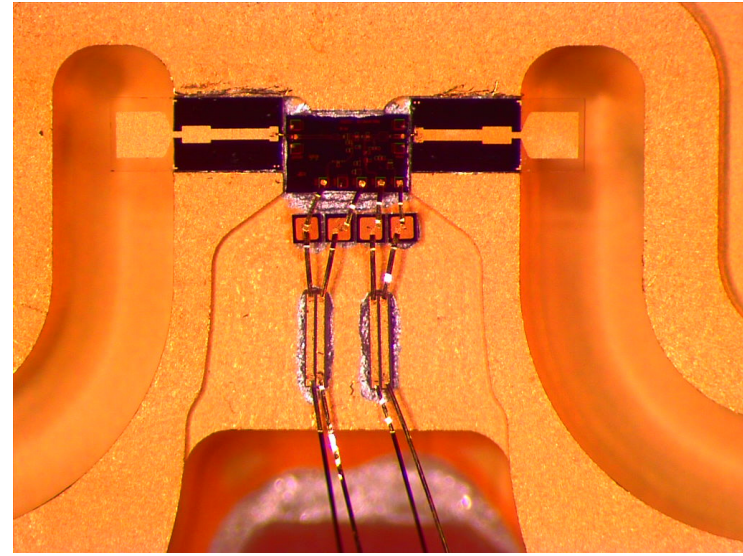
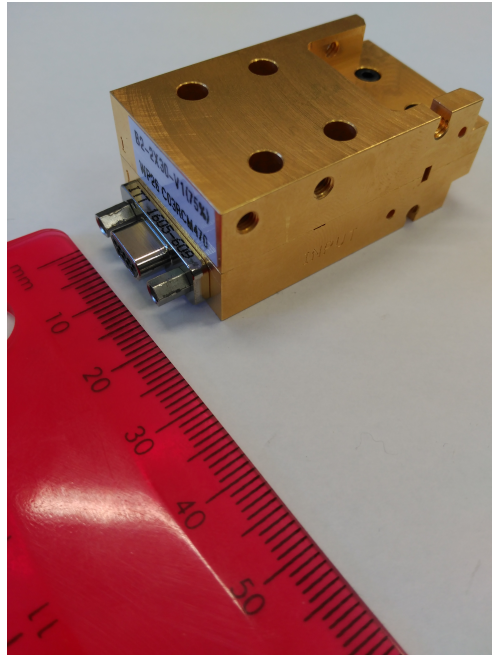
ALMA Band 2+3 LNAs

- NGC 35nm InP process

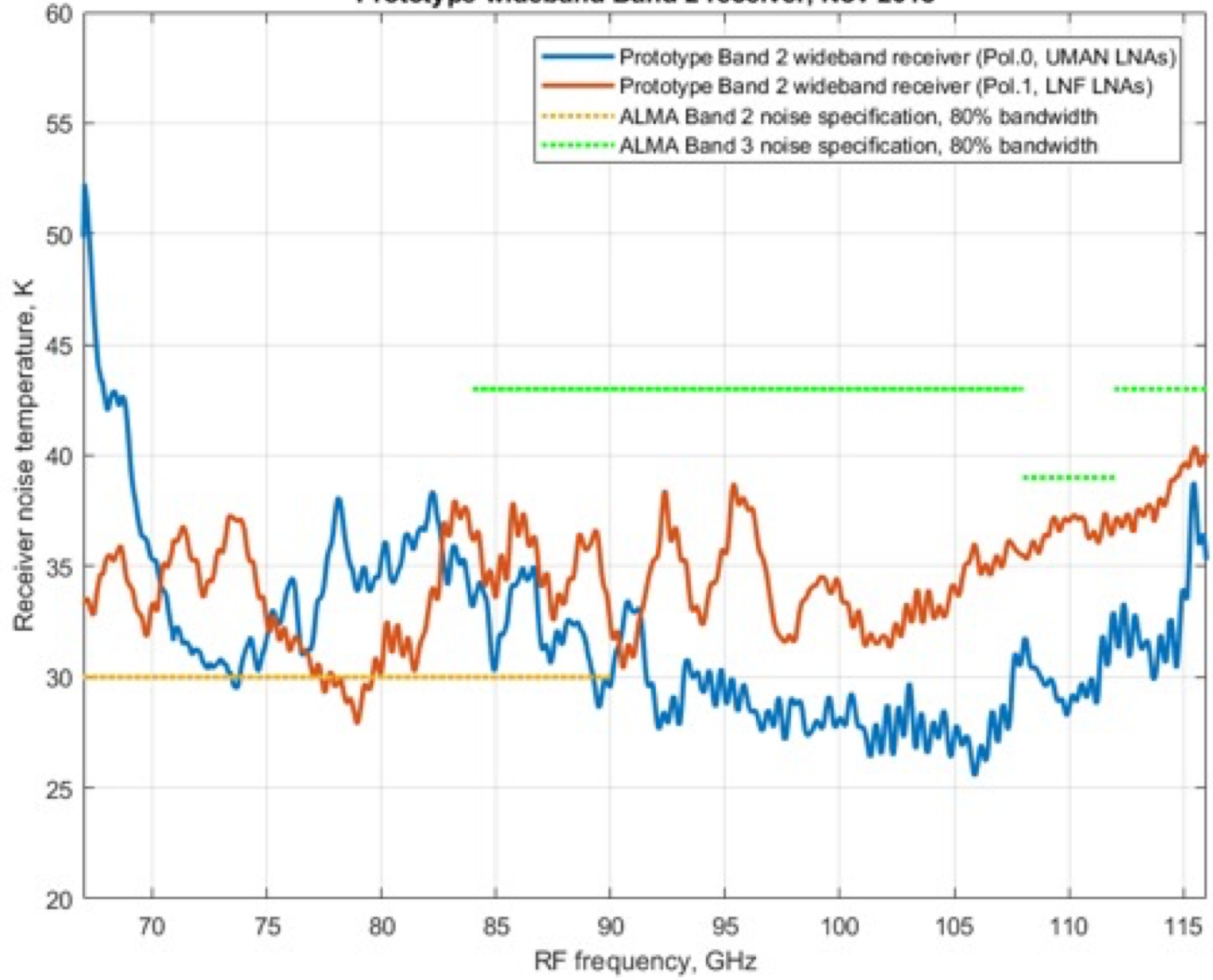
Cuadrado-Calle et al. 2017, IEEE Transactions



June 2018 Delivered LNAs



Prototype wideband Band 2 receiver, Nov 2018



Laboratory facilities at UoM

High frequency test cryostat:

- 2nd stage base temperature 4 K
- 4He or 3He sorption coolers for 1 K and 300 mK
- Ultimate goal temp 50 mK

Cryogenic on-wafer probe station

- < 4 K stage
- Current configuration to 67 GHz

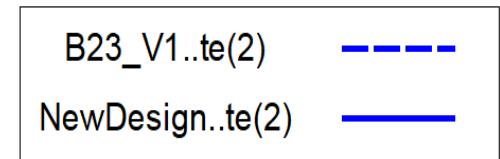
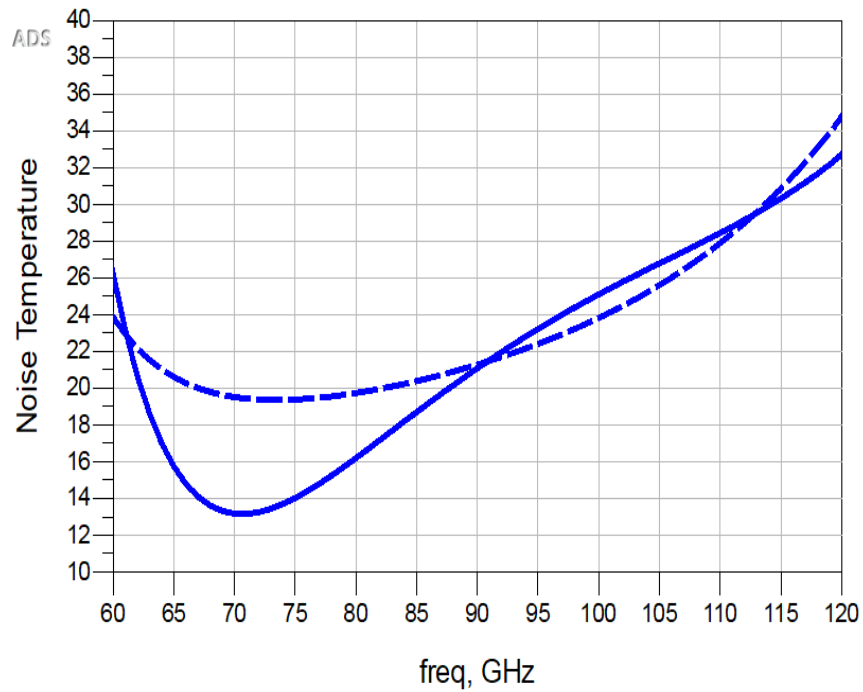
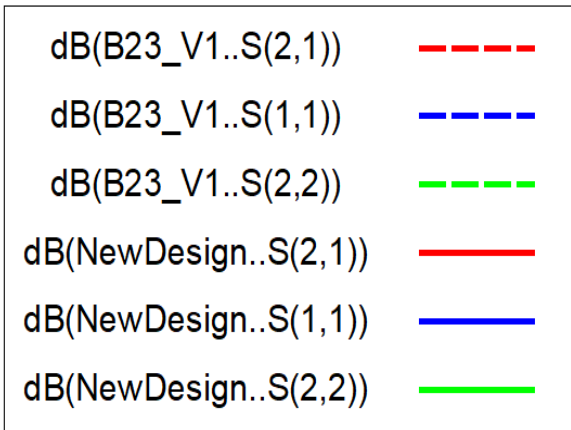
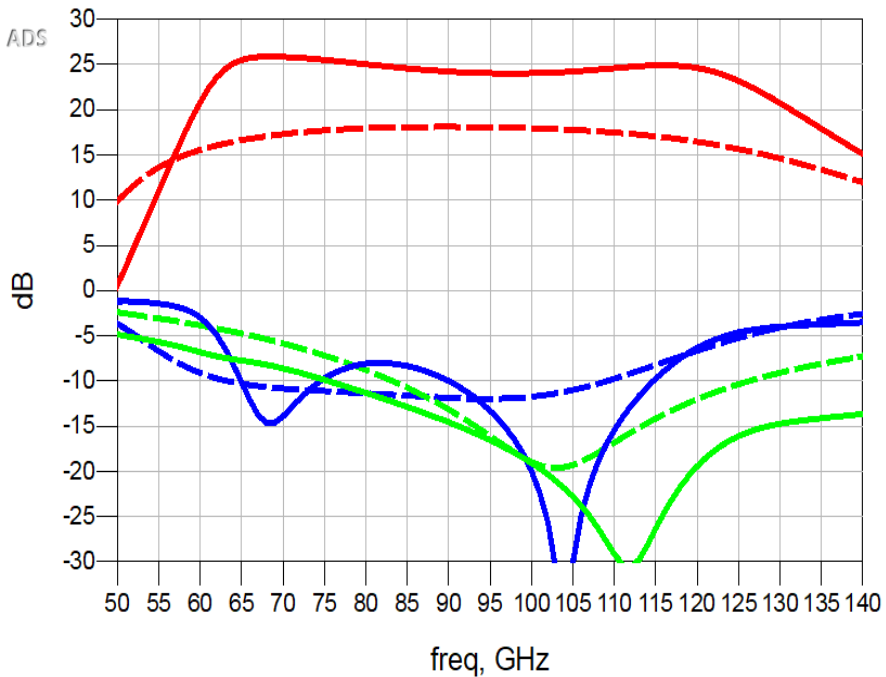
Noise and Gain

- Currently up to 50 GHz
- Setting up system for 110 GHz

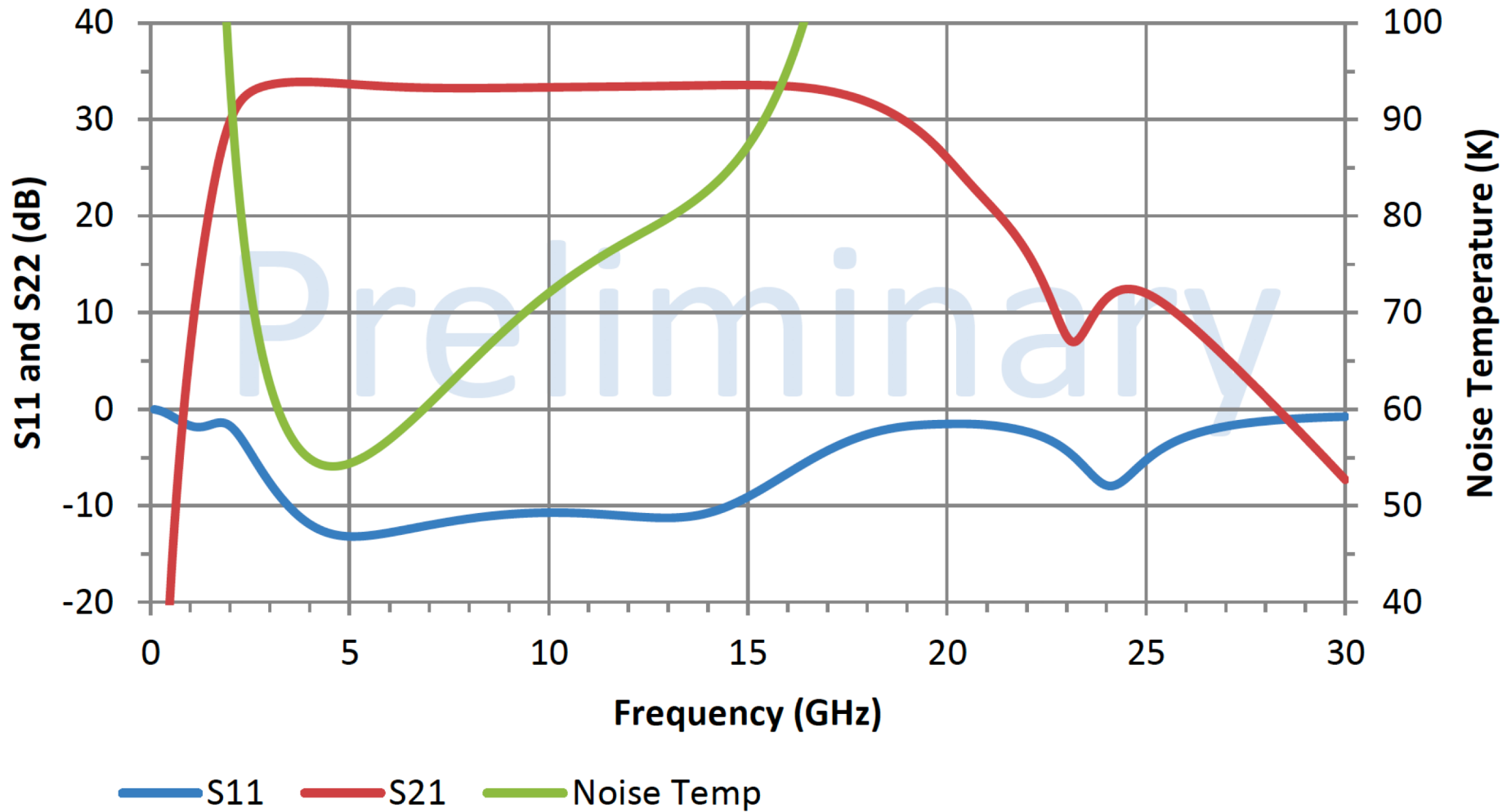
Seeking funds for provision up to 500 GHz

Band 2 + 3 new design

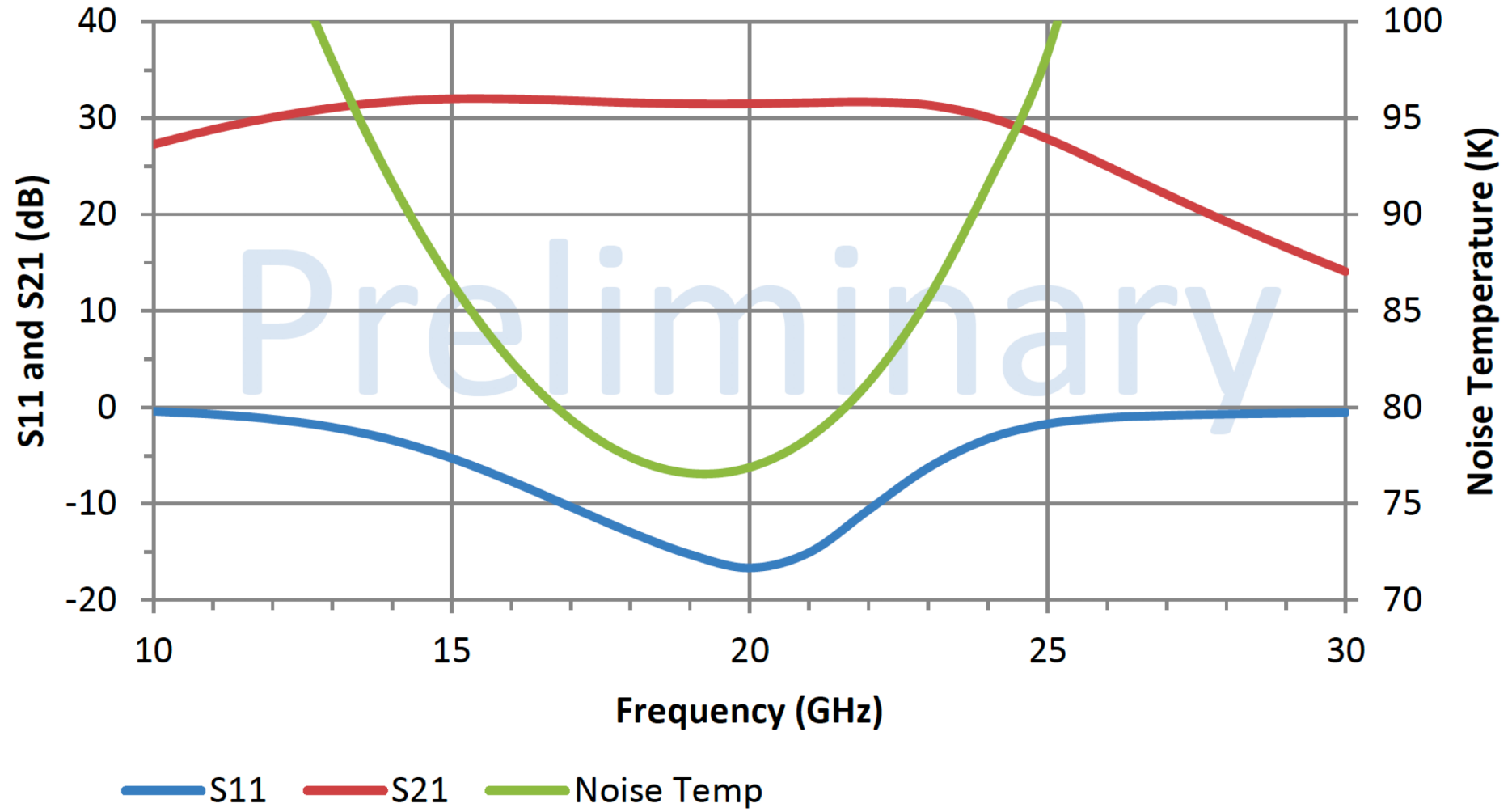
Simulated S-parameters of the new Band 2+3 LNA (solid curves) and the original design (dashed curves).



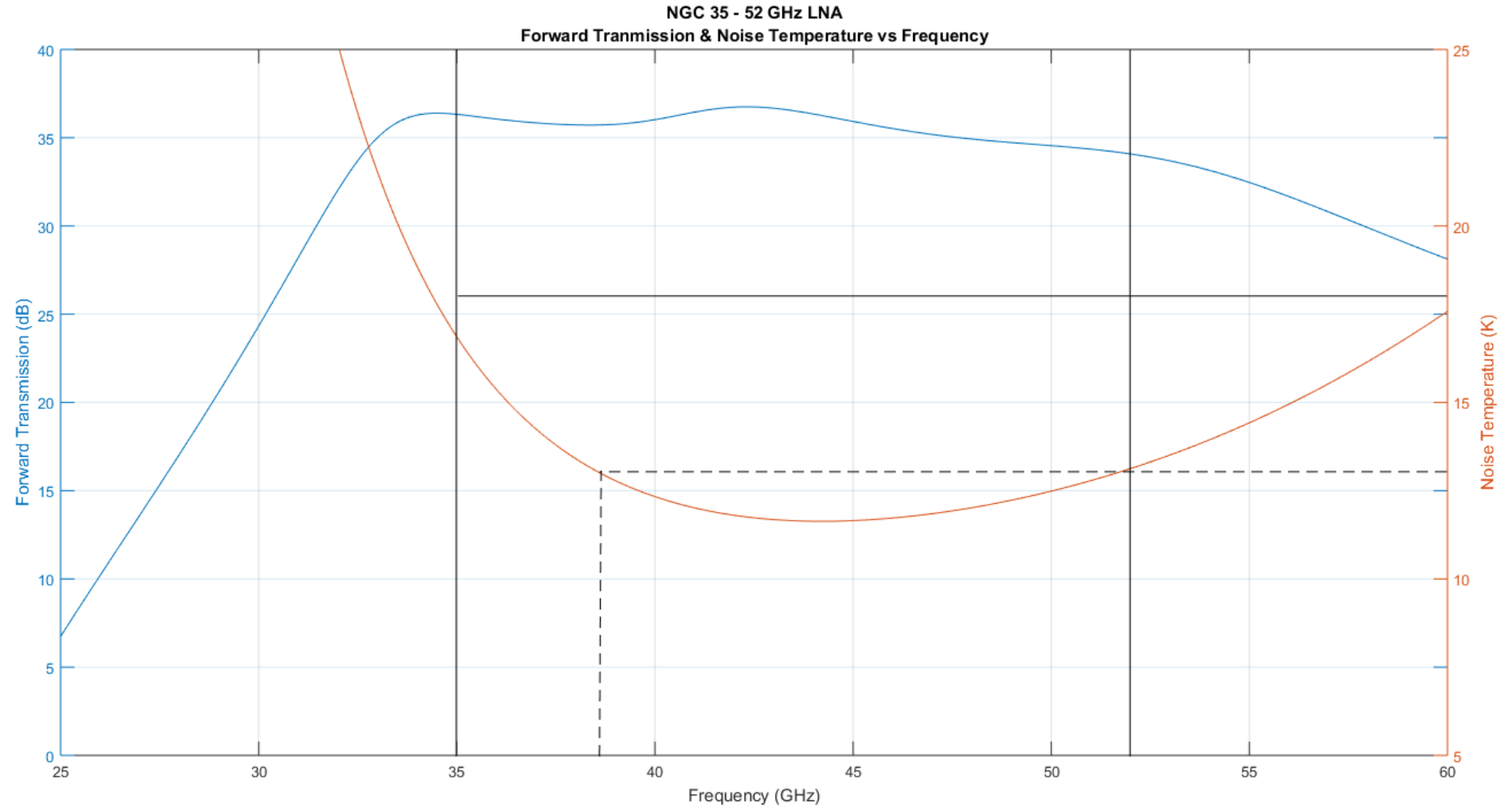
Simulated 4-14GHz LNA



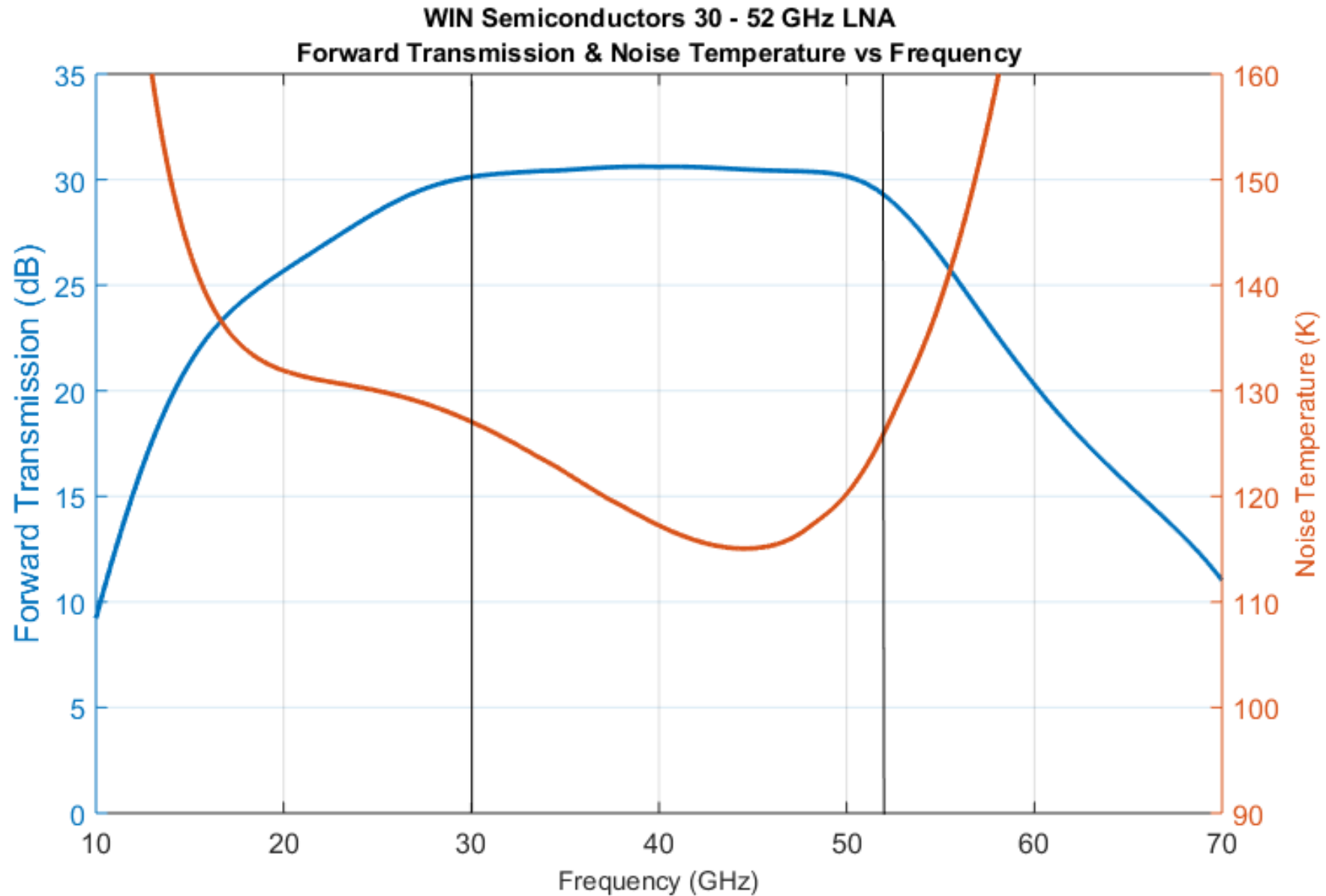
Simulated 14-24GHz LNA



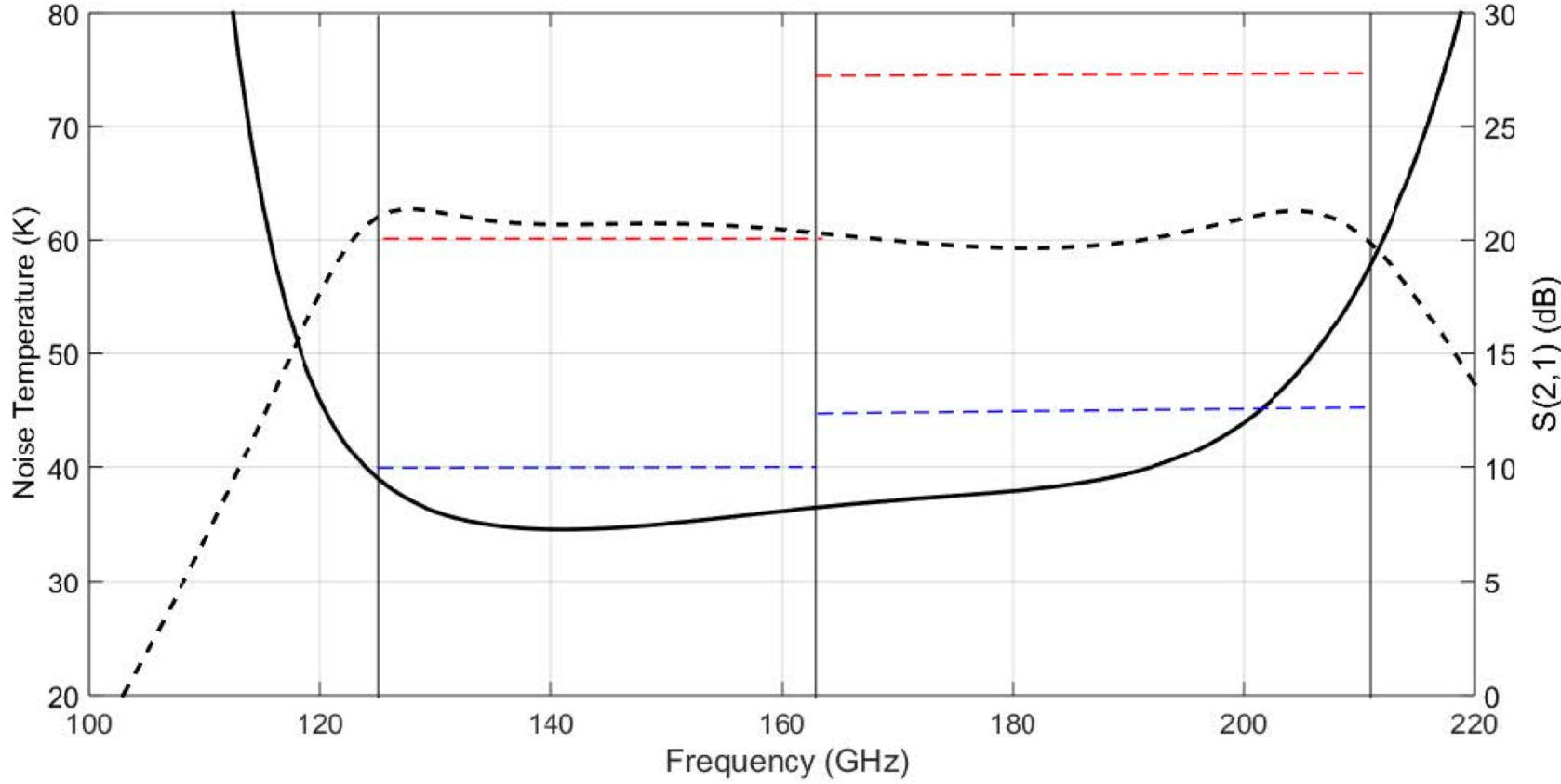
35 – 52 GHz LNA



30 – 52 GHz LNA (Room Temp, commercial process)



125 – 211 GHz LNA simulation



Next Steps

- LNA integration and characterization
 - 4 designs inc update of original design
 - Optimizing LNA packaging
- Designs for next 35nm as well as 25nm runs
 - 67 – 116 GHz
 - 125 – 211 GHz
 - 211 – 373 GHz
 - 4 – 14 GHz
 - 14 – 24 GHz