



SILENT WAVES



THE **ARGO**

PHOTONIC CRYSTAL
TRAVELING WAVE
PARAMETRIC AMPLIFIER

SPECIFICATION SHEET

THE ARGO

The Argo is our very first traveling-wave parametric amplifier. Designed with user-friendliness in mind, effortless installation, and immunity to flux noise, it is the perfect fit for a high-fidelity single-shot qubit readout that does not require complex changes to your experimental set-up.



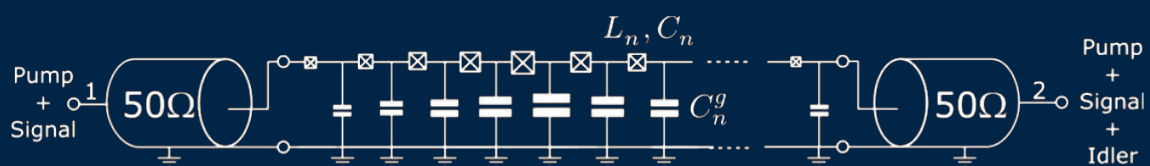
FEATURES

- SMA compatible connectors
- 50 Ω matched
- Plug & play
- High saturation point
- Flux insensitive
- No magnetic bias

The Argo is a photonic crystal traveling-wave parametric amplifier. It is powered by a microwave source* and makes use of a highly non-linear metamaterial, made of Josephson Junctions, to amplify the input signal.

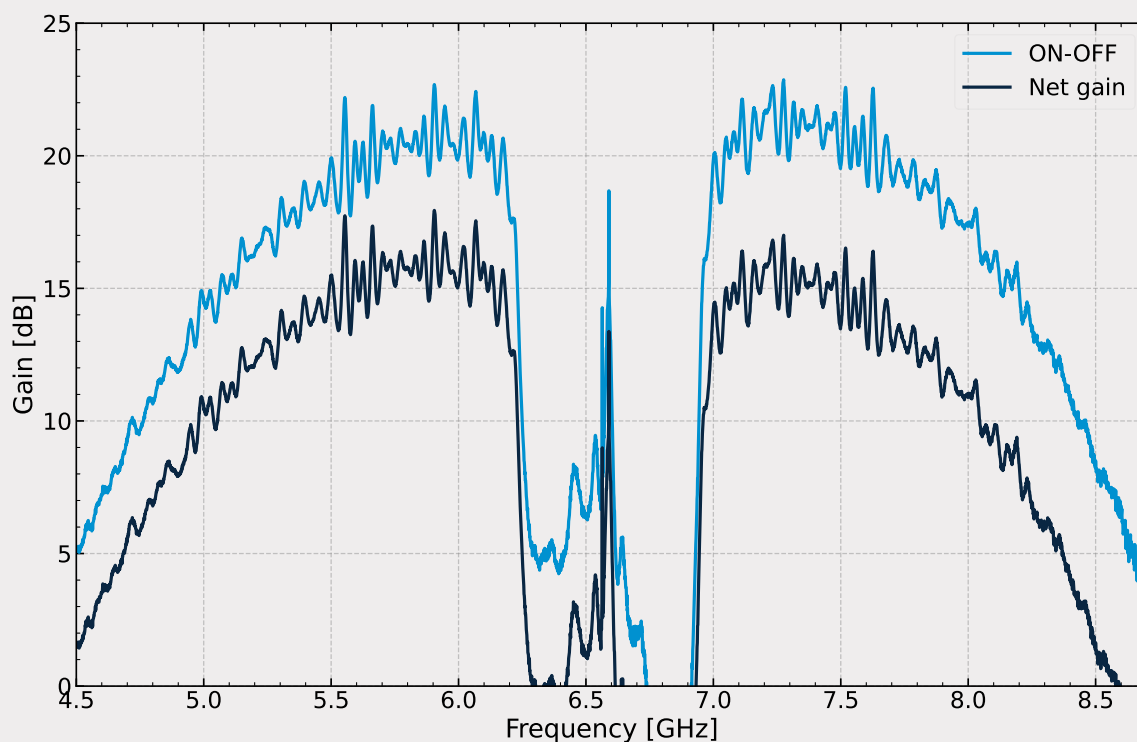
* not provided with the amplifier

SIMPLIFIED SCHEMATIC



THE ARGO

GAIN PROFILE



To achieve high-gain across a bandwidth exceeding 1.5GHz, phase-matching between the pump, the signal and the idler is required.

To satisfy this condition, we introduce a feature in the dispersion relation : a photonic gap engineered by spatially modulating the Josephson Junctions.

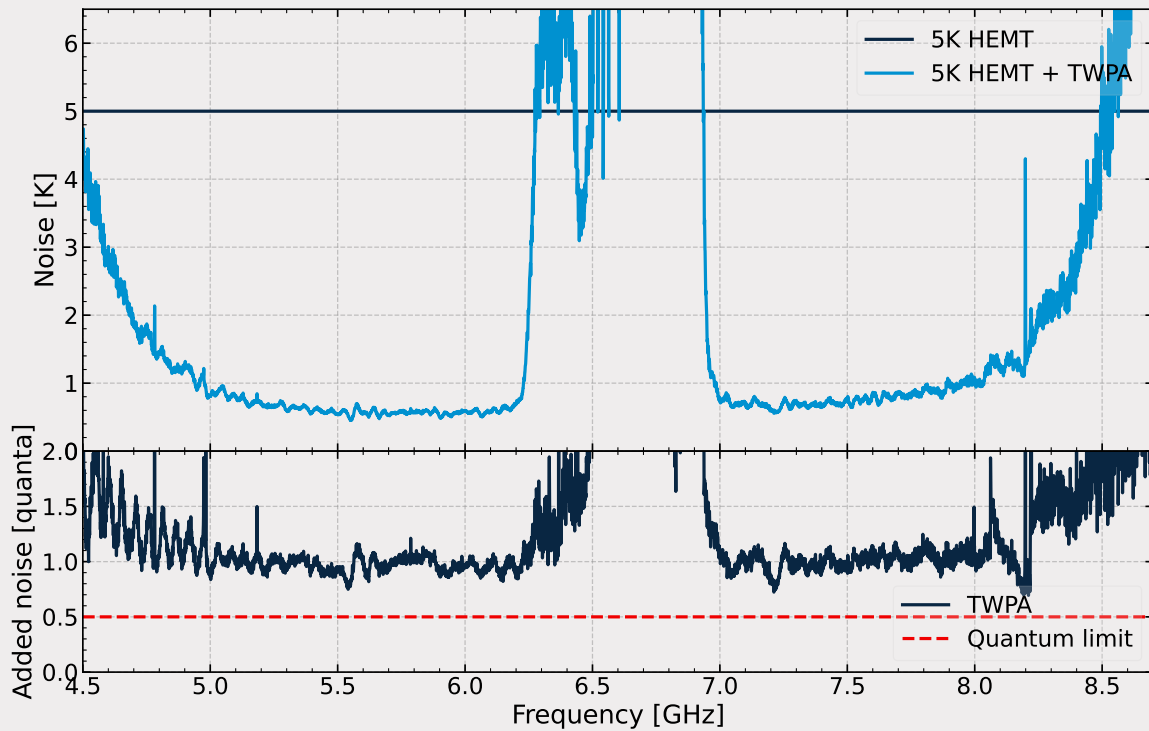
This translates in a dip of around 0.4 GHz in the transmission profile.

The position of the gap can be customized to ensure the highest gain at the targeted readout frequencies.

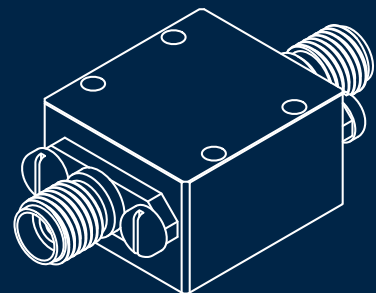
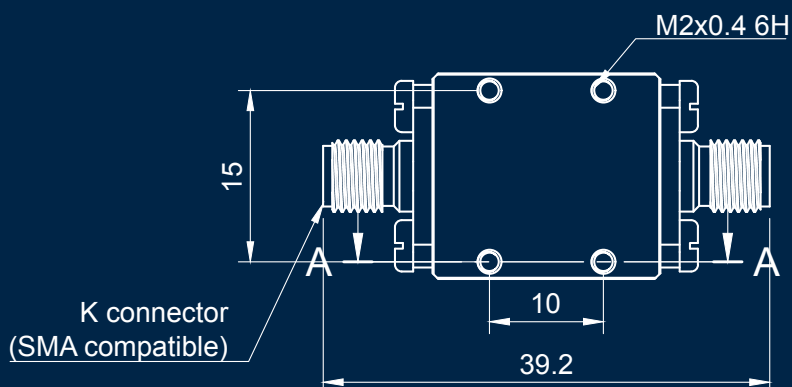


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SYSTEM NOISE AND ADDED NOISE

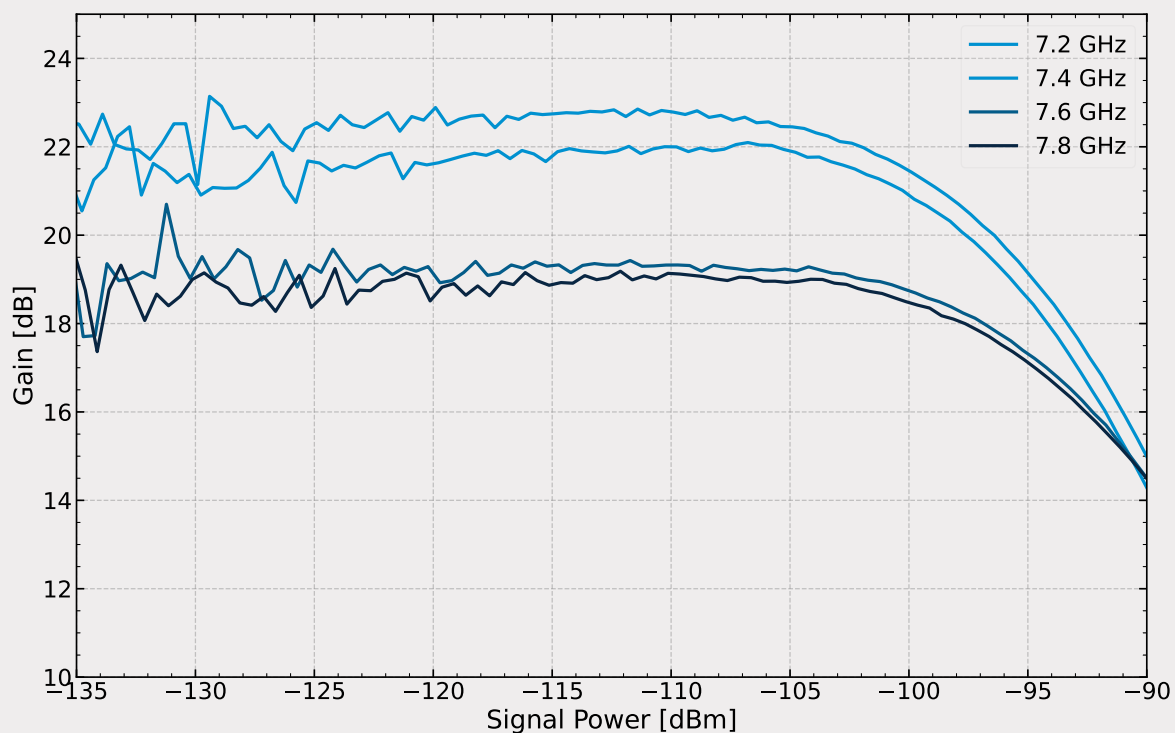


The figure above shows the total system noise (top panel, in kelvin) and the TWPA added noise (bottom panel, in quanta). The total system noise when the TWPA is on (light blue) has been measured with an effective HEMT noise of 5K (accounting for loss between the TWPA and the HEMT).



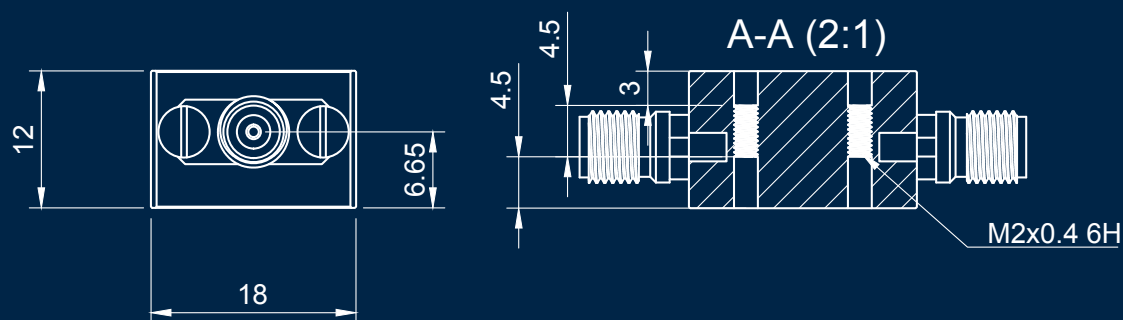
THE ARGO

POWER SATURATION



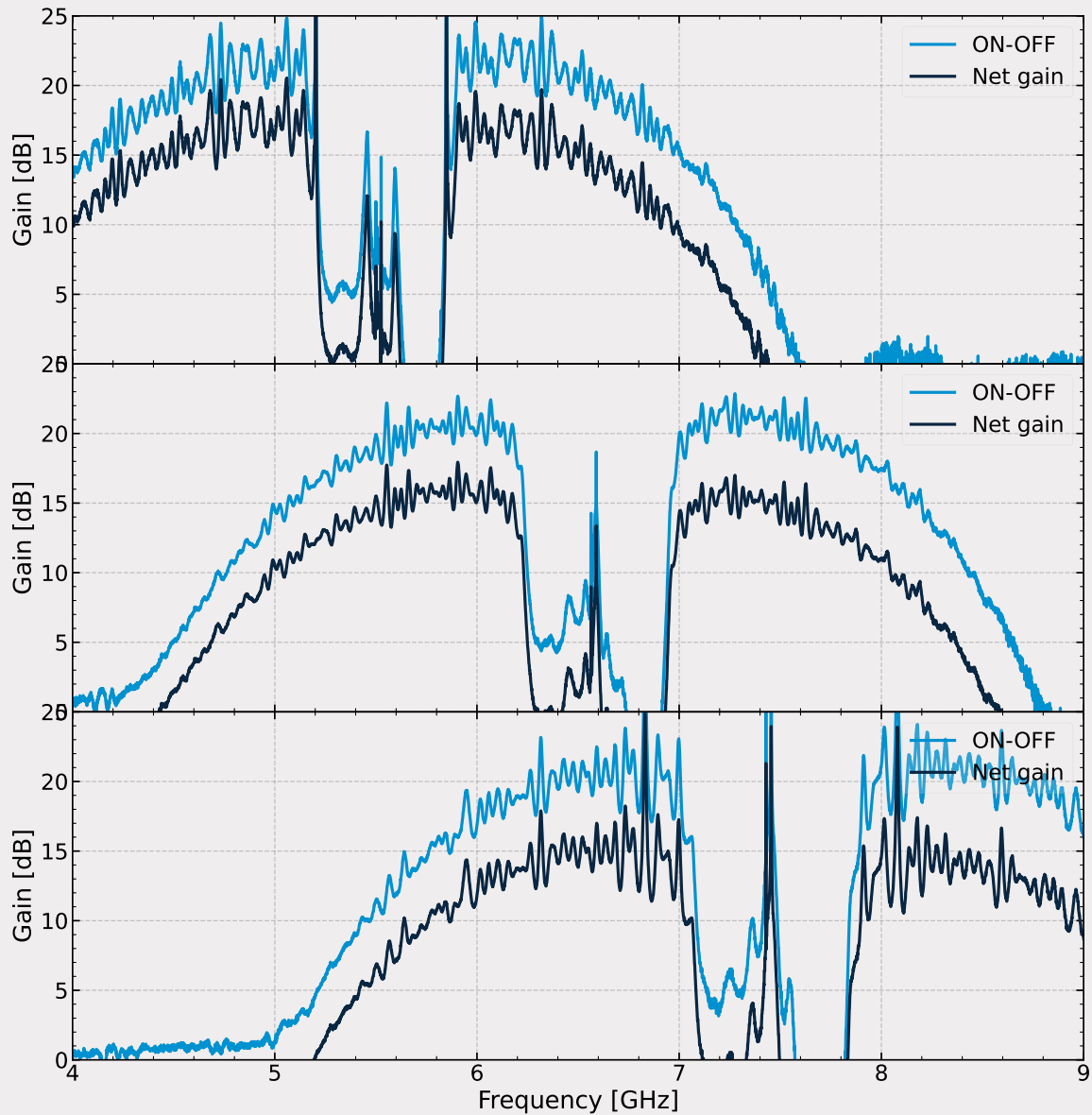
In addition, the Argo shows a high dynamic range.

BOX SCHEMATIC



THE ARGO

CUSTOMIZATION

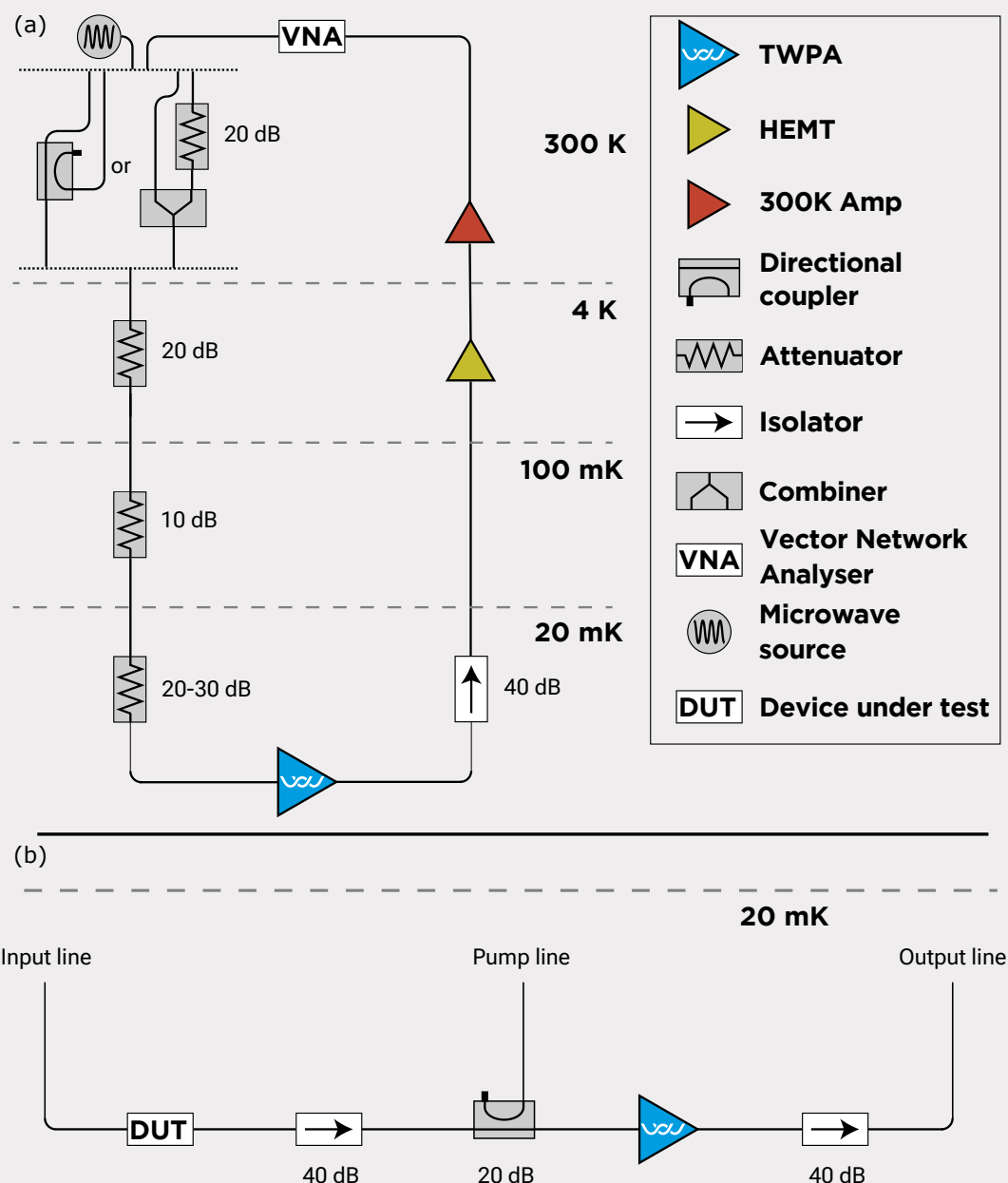


The gain figures above correspond to different devices where the gap has been engineered to suit different frequency bands.



THE ARGO

CHARACTERIZATION CIRCUIT



Typical setups for testing/using the TWPA. (a) Ideal setup for testing the TWPA. (b) TWPA in a readout line (at the mixing chamber stage).



**A NEW GENERATION OF AMPLIFIERS
ENABLING ULTRA-LOW NOISE
MICROWAVE READOUT**

We specialize in developing
and manufacturing state-of-the-art
quantum hardware using superconducting
circuits for readout applications.

Our products are the result
of years of intensive research.

Currently, we focus on the
development of Josephson
Traveling-Wave Parametric Amplifiers
(JTWPA) for high-fidelity
multiplexed qubit readout.



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