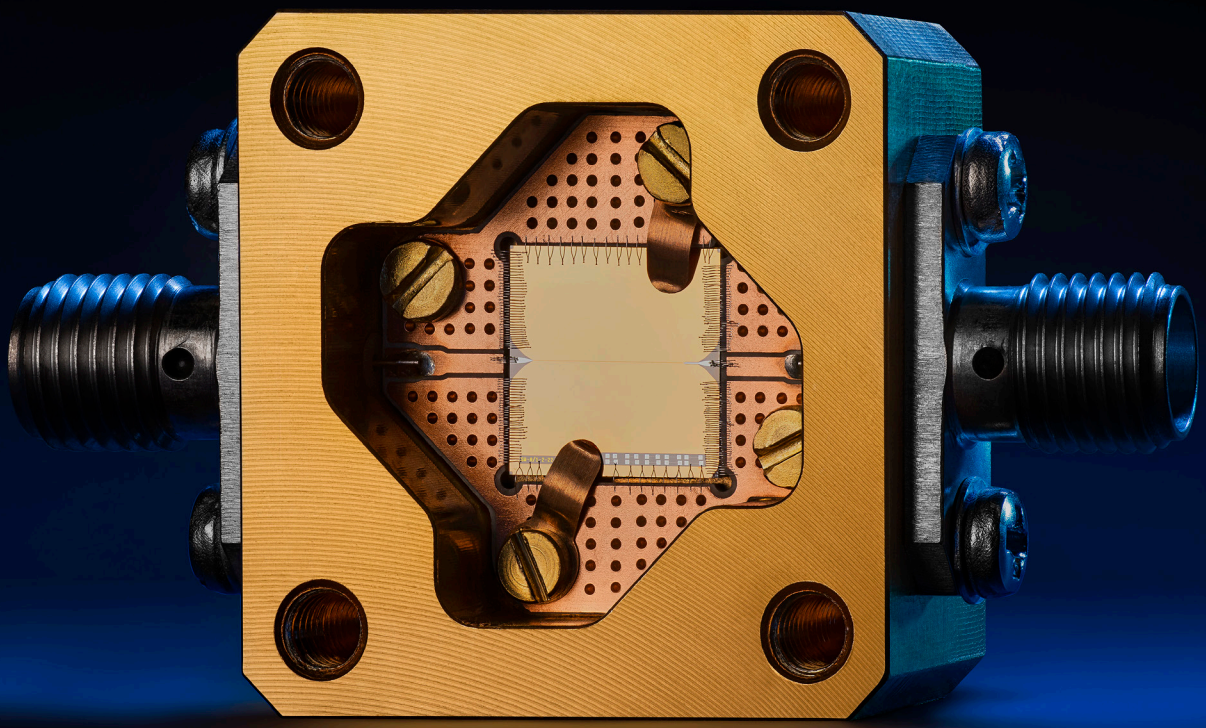
SILENT WAVES



THE ARGO

Photonic crystal
Traveling Wave
Parametric amplifier

Specification sheet

SILENT WAVES

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.

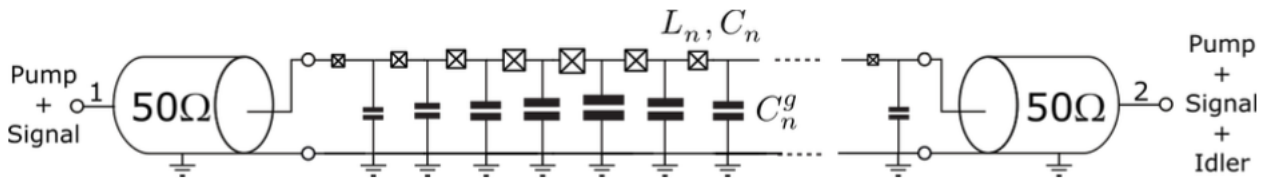
FEATURES

- SMA connectors
- 50 Ω matched
- Plug & Play
- Low pump power
- Flux insensitive

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 amplifiy the input signal.

* not provided with the amplifier

Simplified schematic



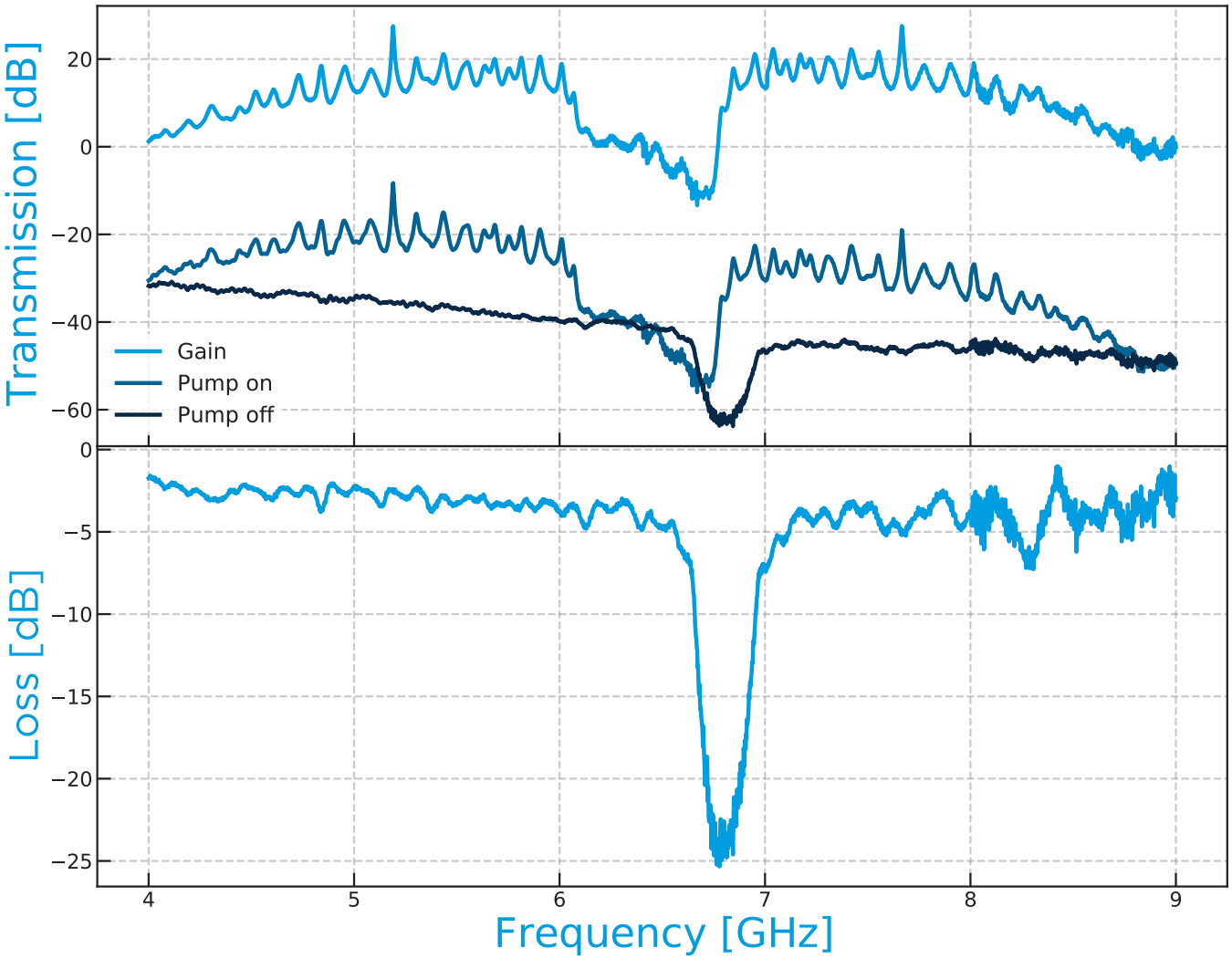
THE ARGO

Electrical specifications at 20 mK

Parameter	Frequency (GHz)	RF Pump power: -70 dBm Min.	Typ.	Max.	Units
Frequency		4		8	GHz
Gain	4.0		5		dB
	5.0		15		
	5.5		15		
	6.75		15		
	7.25		15		
	8.0		5		
Loss	5.0		3.5		dB
	6.0		4.5		
	7.0		5.5		
	7.5		5.5		
SNR improvement*	5.5		6.0		dB
	7.0		6.0		
Input power at 1 dB compression	5.5		-105		dBm
	7.0		-105		

* compared to HEMT only (see p.7)

Transmission



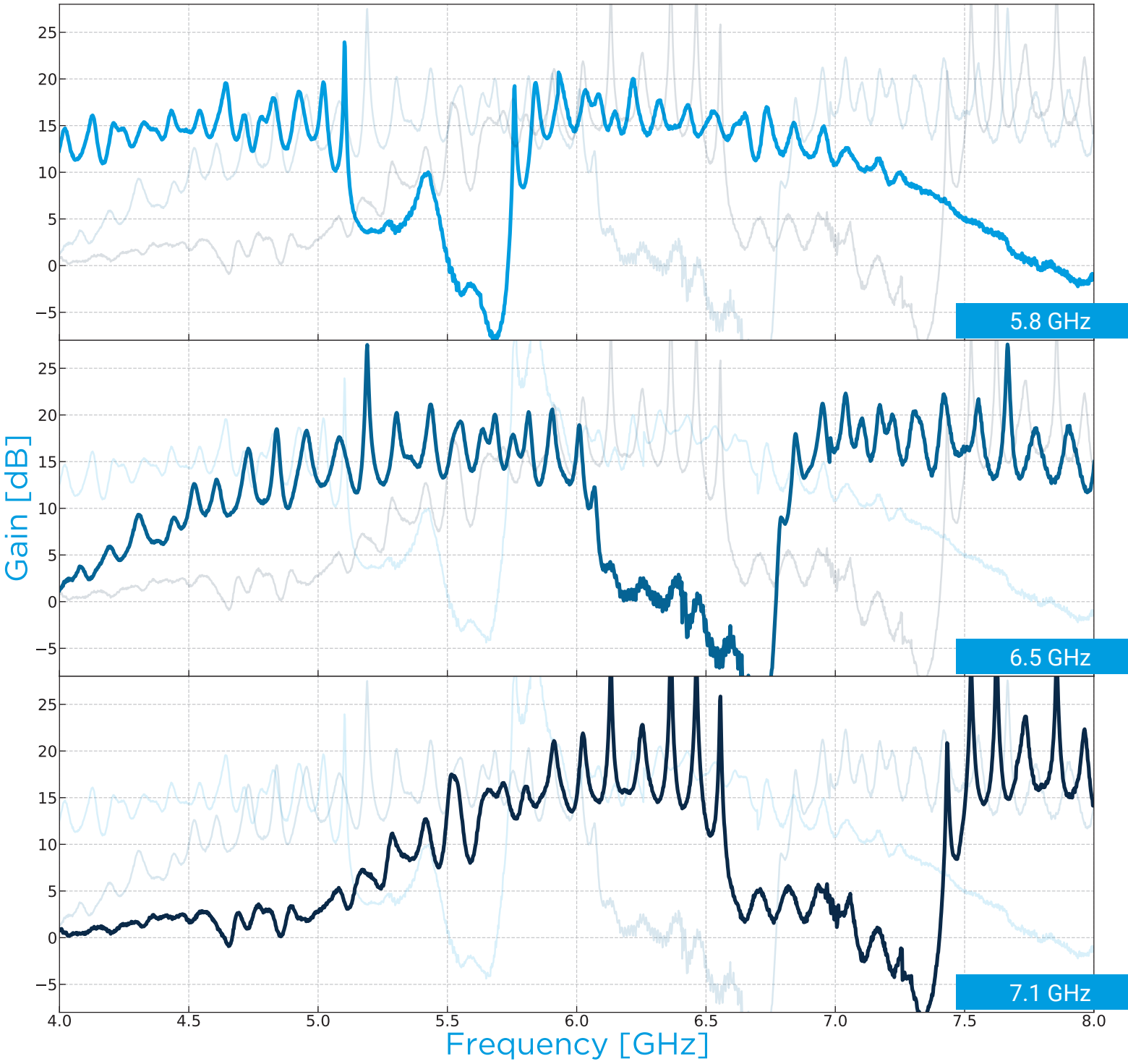
To achieve high-gain across a bandwidth exceeding 2 GHz, phase-matching between the pump, the signal and the idler is required.

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.

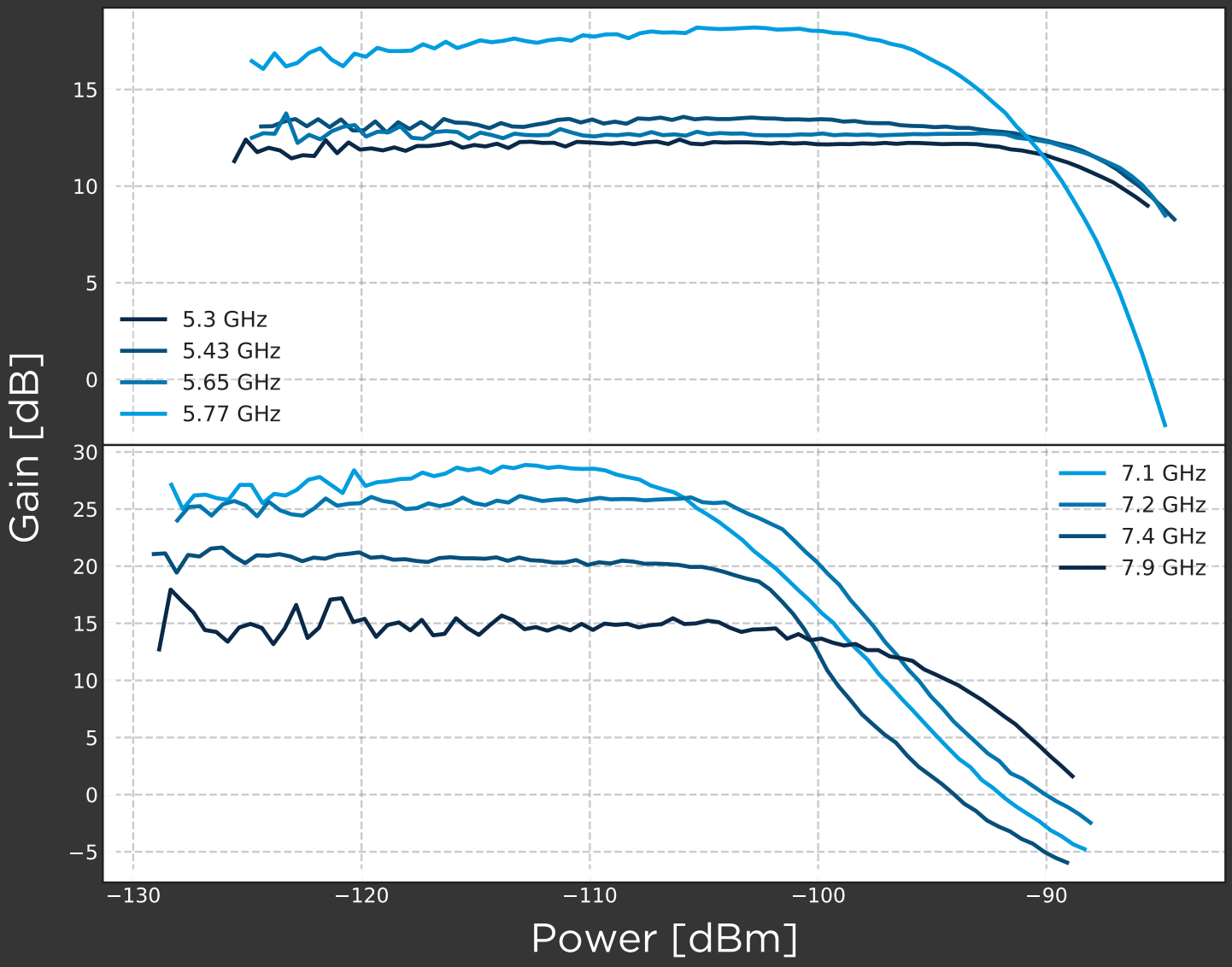
The position of the gap can be customized to ensure the highest gain at the targeted readout frequencies

Customization



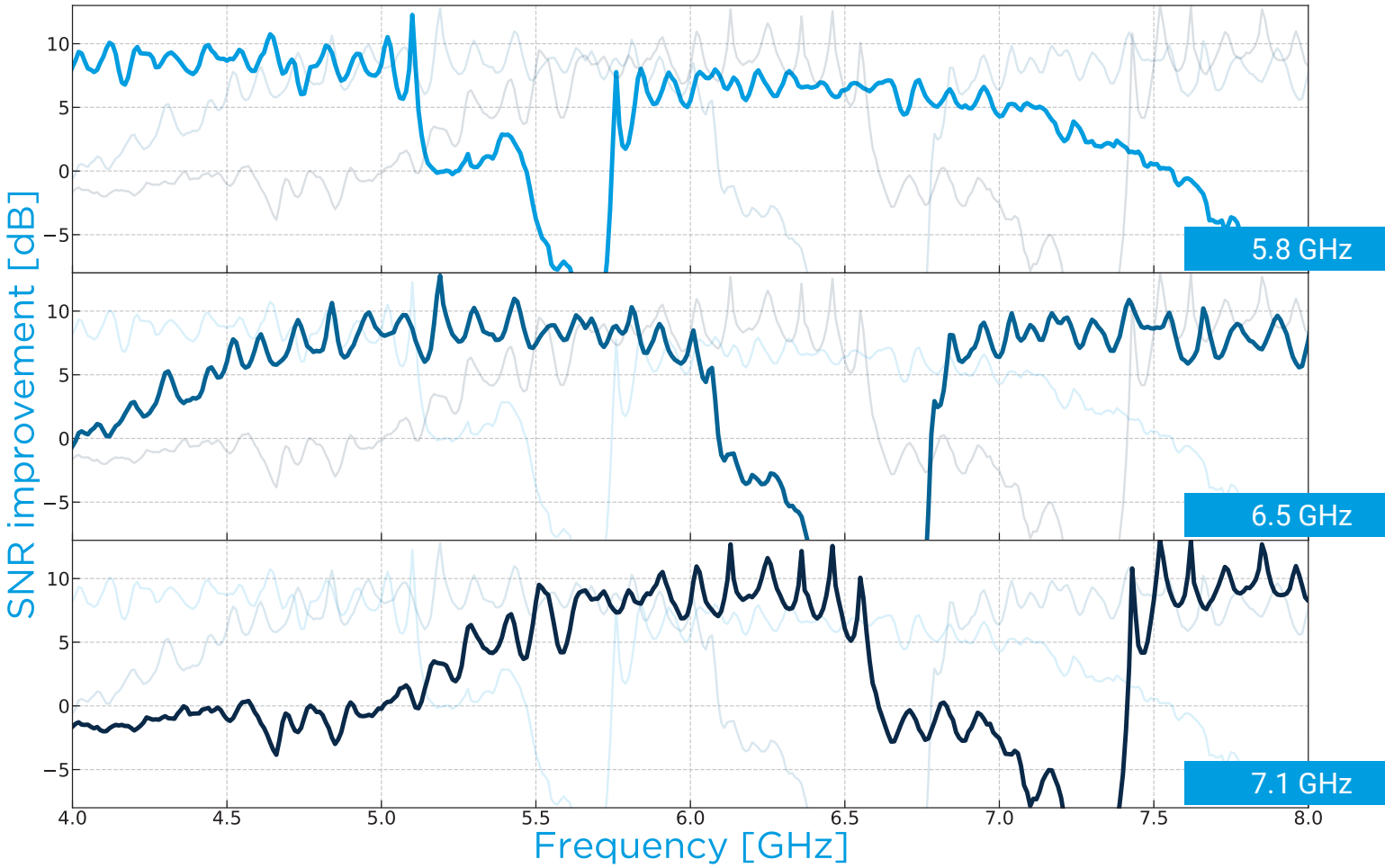
The gain figures above correspond to different devices where the gap has been engineered to suit different frequency bands.

Power saturation



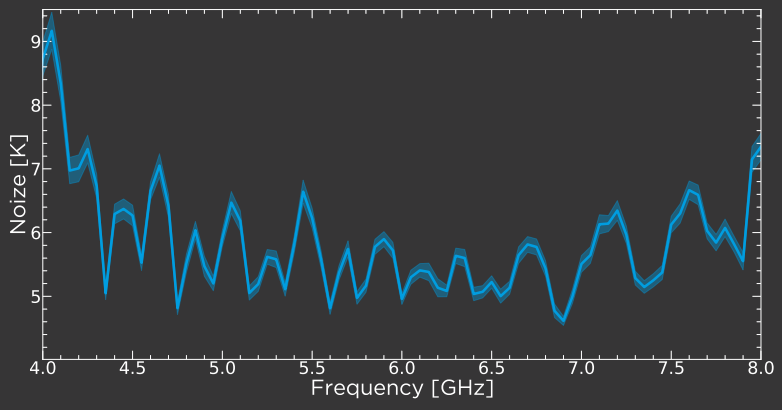
In addition, the Argo shows a high dynamic range.

Signal-to-noise ratio



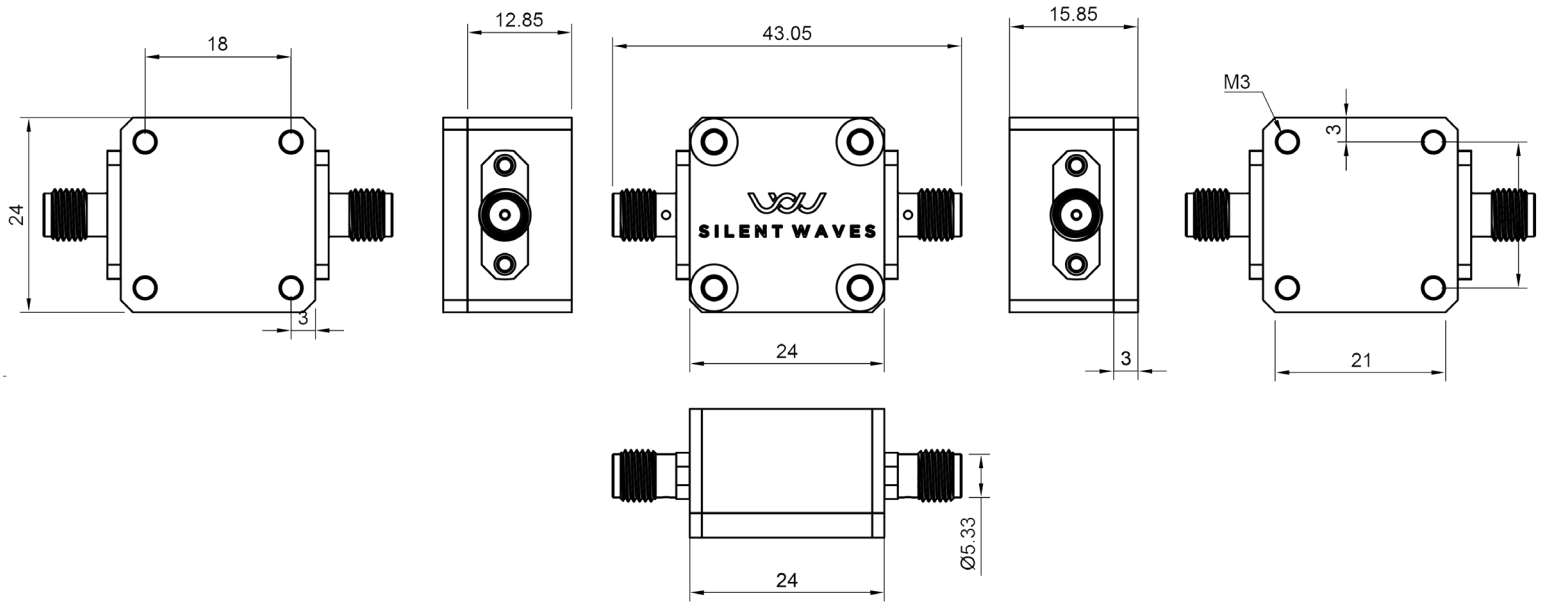
The figure above shows the SNR improvement when the TWPA is on compared to when it is bypassed. Bypassing the TWPA alows to get the SNR with the HEMT only. It results in the genuine improvement offered by the TWPA, as it includes its internal losses.

Noise



Typical noise of the setup used to characterize the devices (HEMT only).

Box schematic



Characterization circuit