

AVANTIX

Avancement Simulateur IQ



BT 100 InterMerger

10/01/2024

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BT 100 InterMerger

$f_s = 4\text{GSps}$

$N_{\text{iq}} = 131072 * 128$

$\text{NPERSEGS} = [128, 256, 512, 1024, 2048, 8192, 32768, 131072]$

Tous les spectrogrammes sans overlap et sans fenêtrage :

- $x = x.\text{reshape}(\text{nperseg}, -1)$
- $X = \text{fftshift}(\text{fft}(x))$
- $\text{sxx} = |X|^2 / \text{nperseg}$
- $\text{sxx_dB} = 10 * \log_{10}(\text{sxx} / \sigma_{\text{noise}}^2)$
- $\text{sxx_scaled} = \text{sxx} / ((-\ln(0,9)) * \sigma_{\text{noise}}^2)$ pour l'IA
- $\text{sxx_dB} = 10 * \log_{10}(\text{sxx_scaled} * (-\ln(0,9)))$

Seuil de binarisation « optimal » = 0 dB

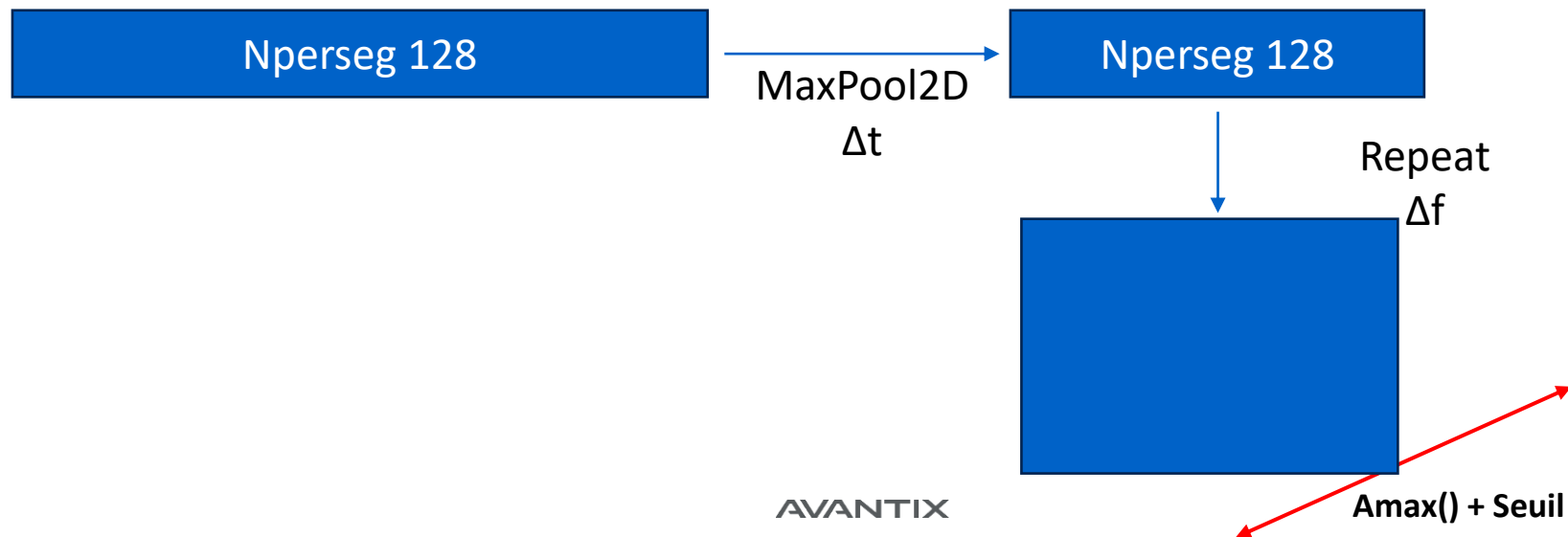
Résolution du masque : ~1MHz en freq et ~1μs en temps

Définition du masque : 4096, 4096

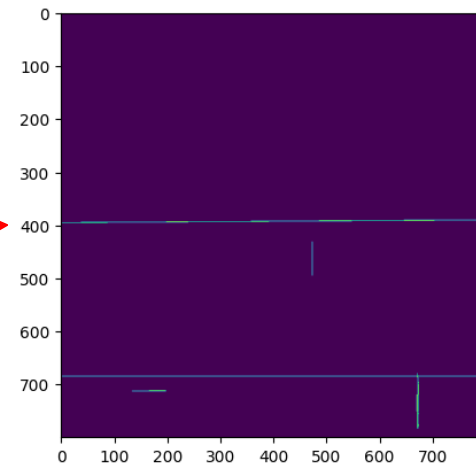
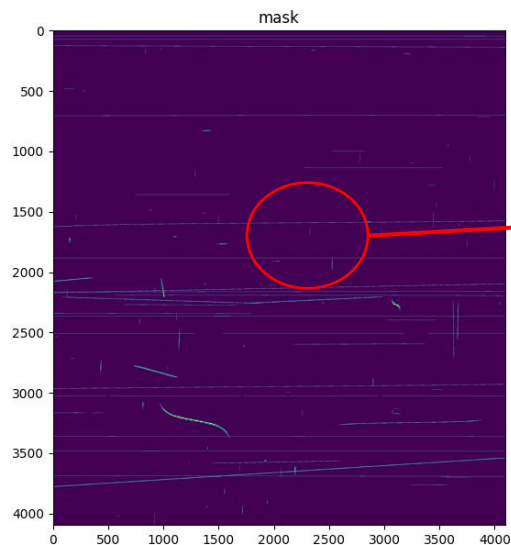
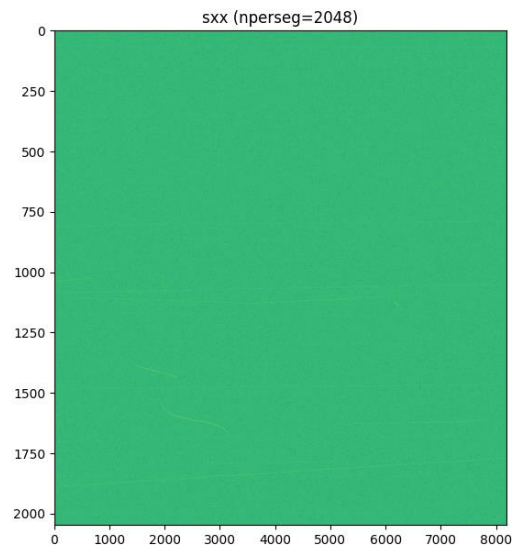
BT 100 InterMerger

Construction du masque :

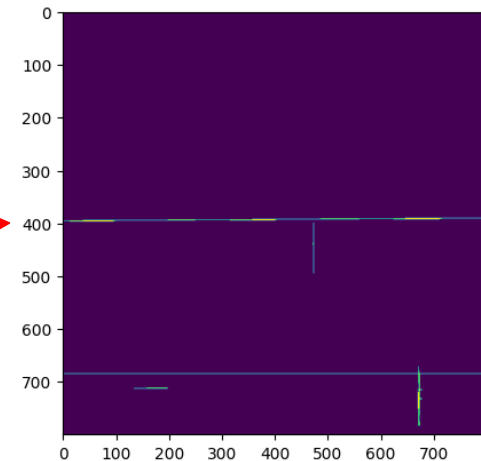
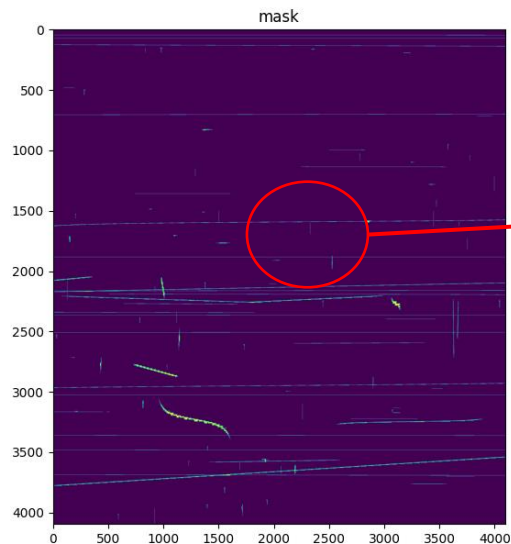
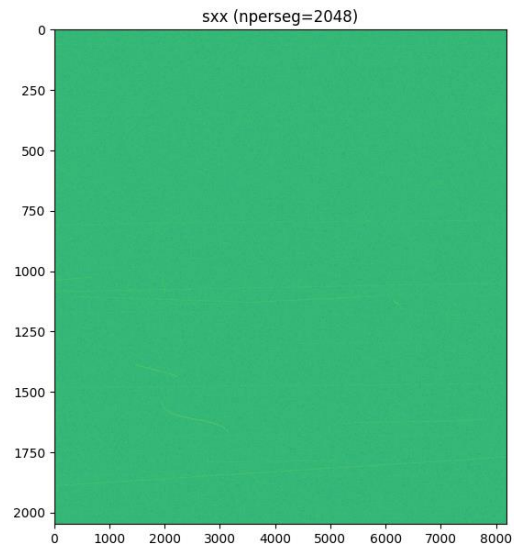
1. Sur noiseless_sxx à tous les nperseg :
 - MaxPool sur la dimension la plus grande jusqu'à atteindre 4096
 - UpSampling en répétant sur l'autre dimension jusqu'à atteindre 4096
2. $\text{AMAX}(\text{noiseless_sxx_resized}) > 0 \text{ dB}$



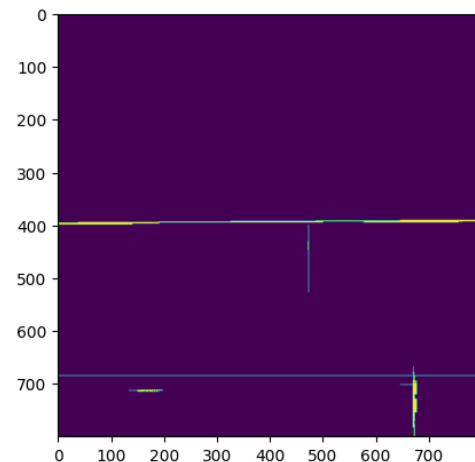
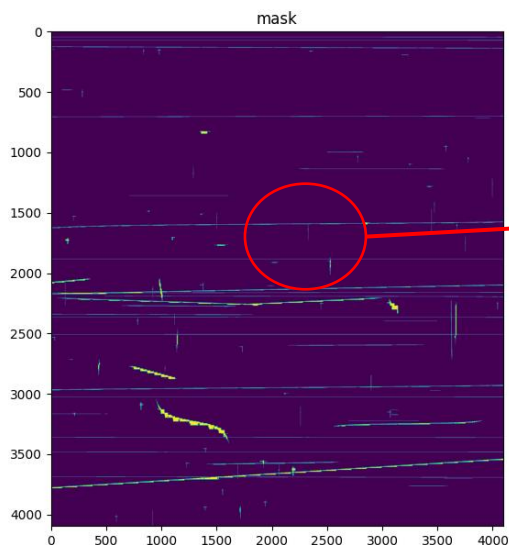
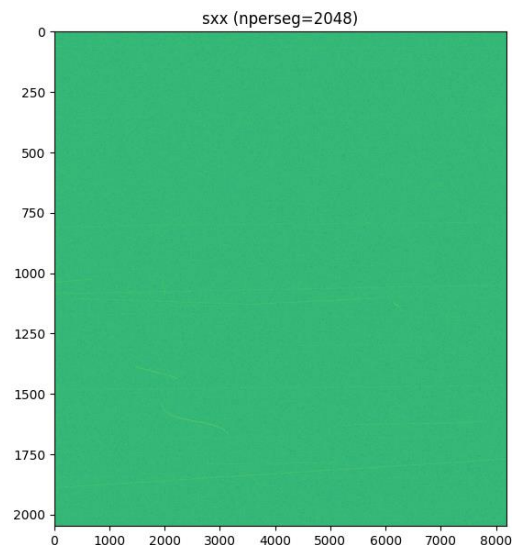
BT 100 InterMerger Seuil « optimal » = 3 dB



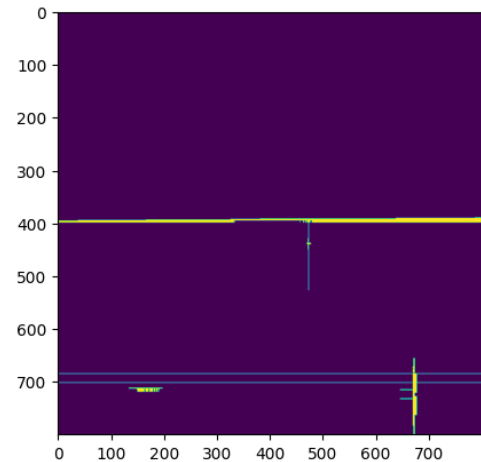
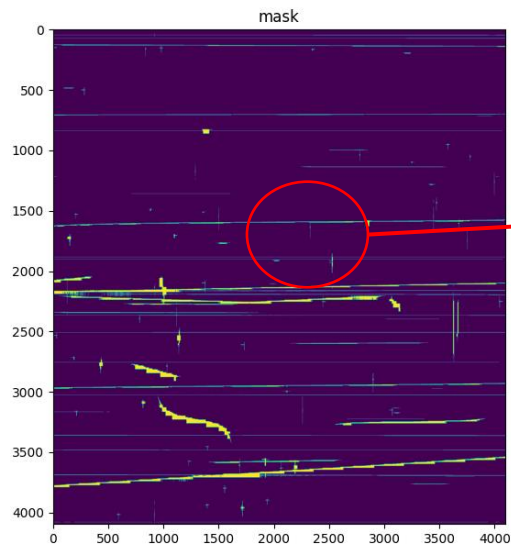
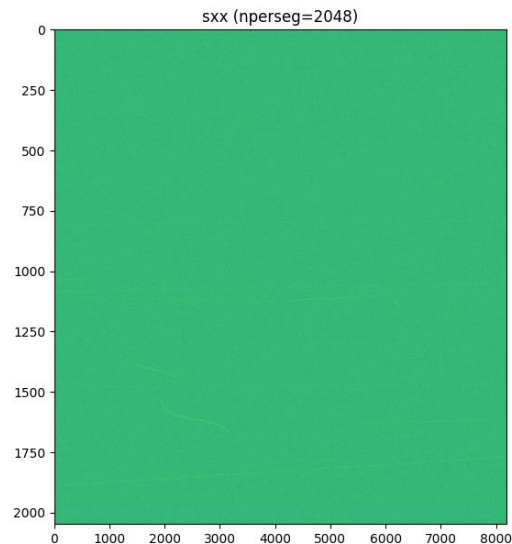
BT 100 InterMerger Seuil « optimal » = 0 dB



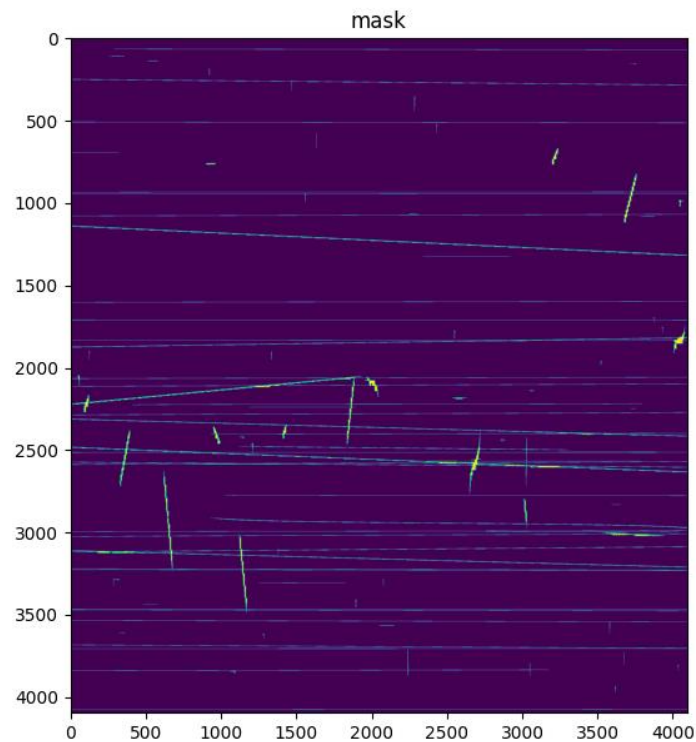
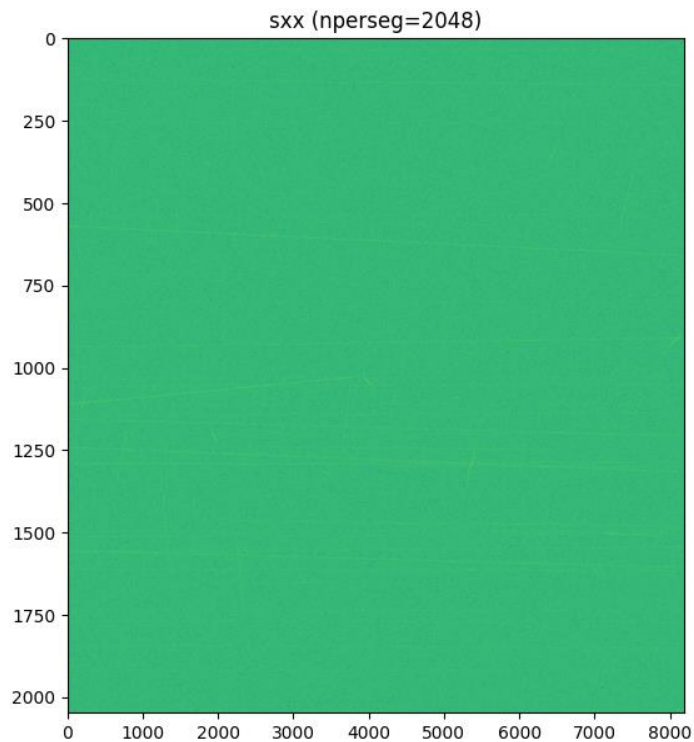
BT 100 InterMerger Seuil « optimal » = -3 dB



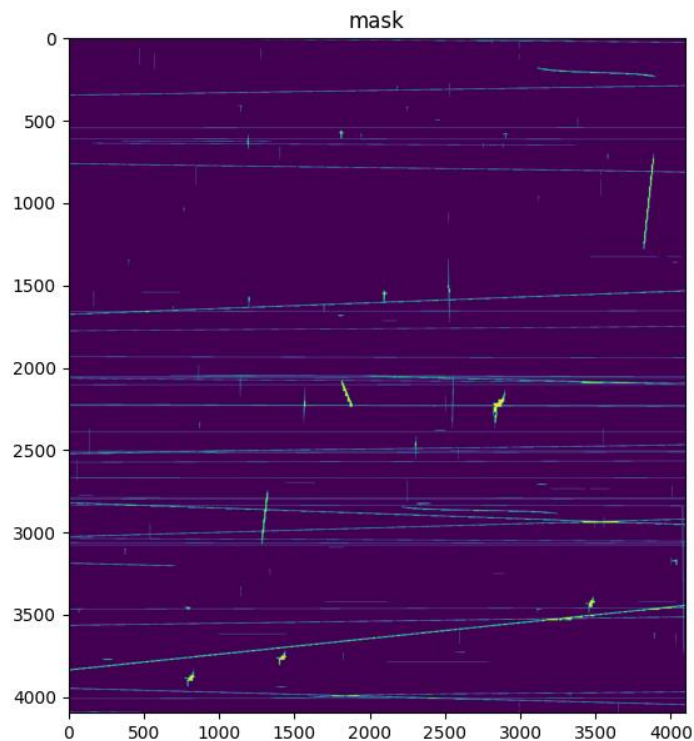
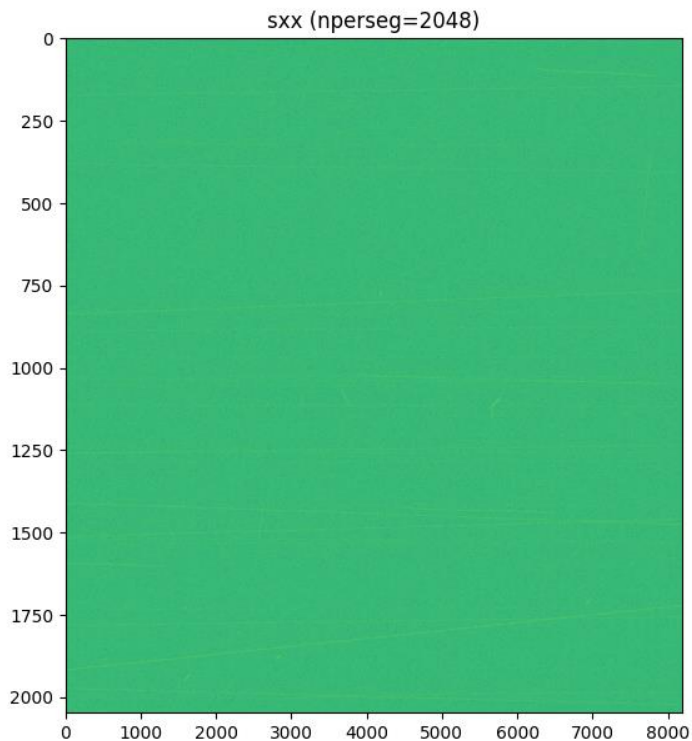
BT 100 InterMerger Seuil « optimal » = -6 dB



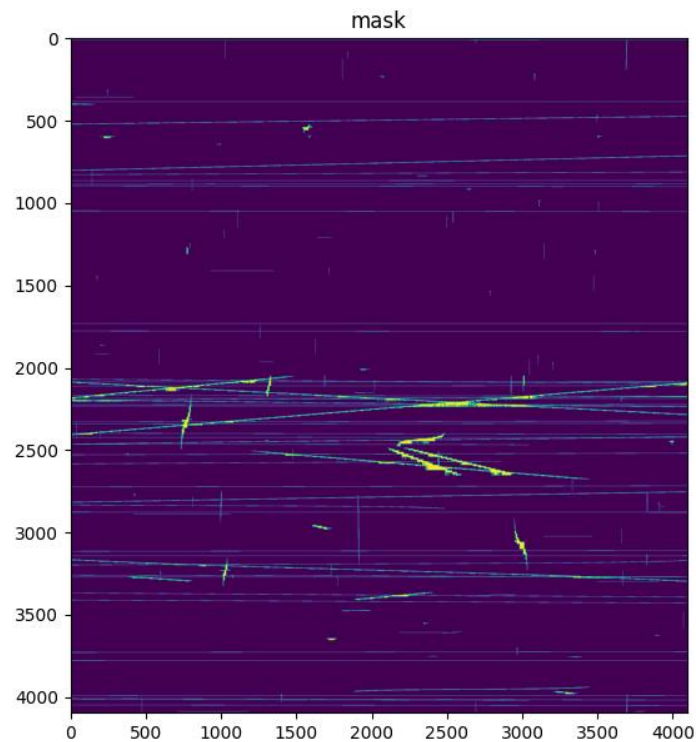
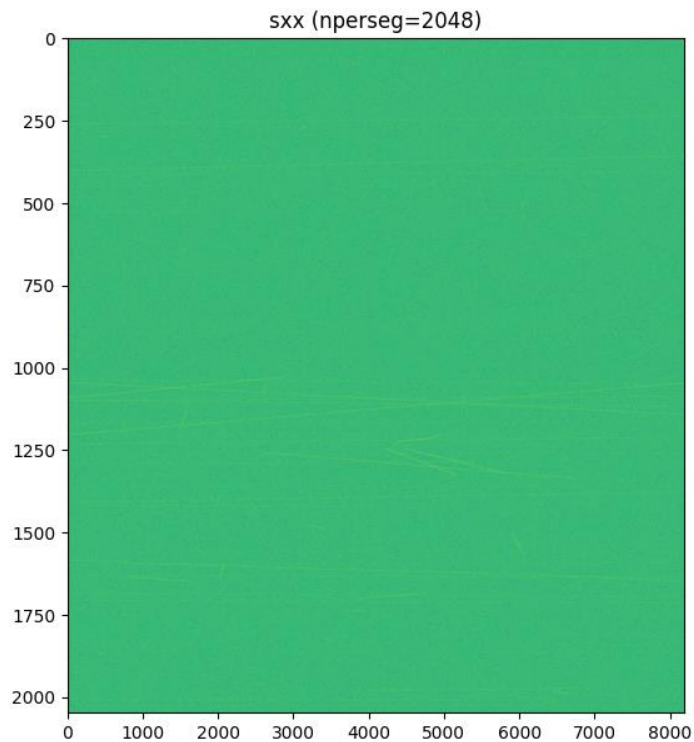
BT 100 InterMerger Seuil « optimal » = 0 dB



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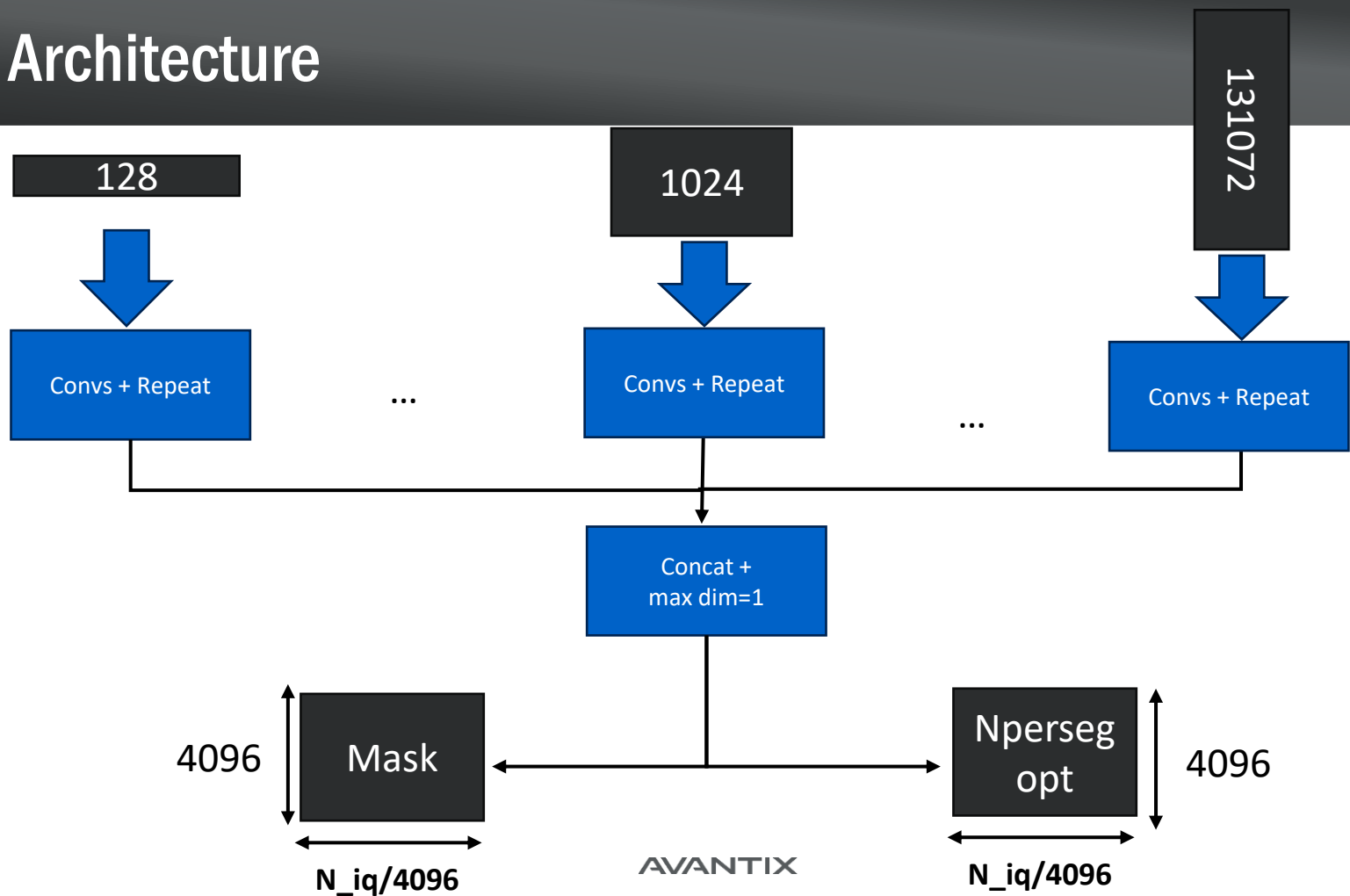


Modèle InterMerger

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Architecture

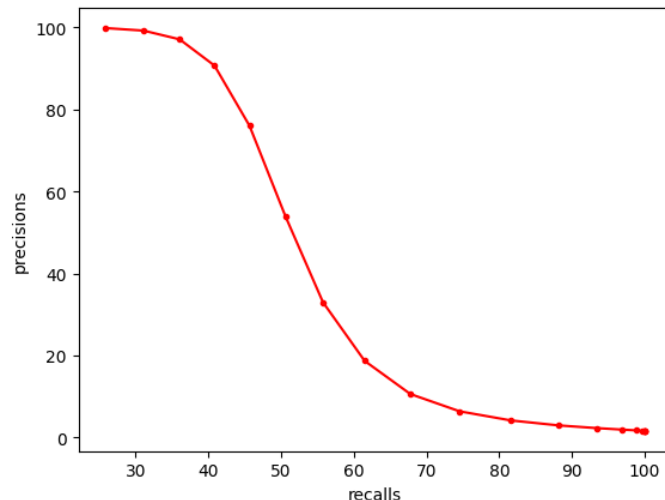
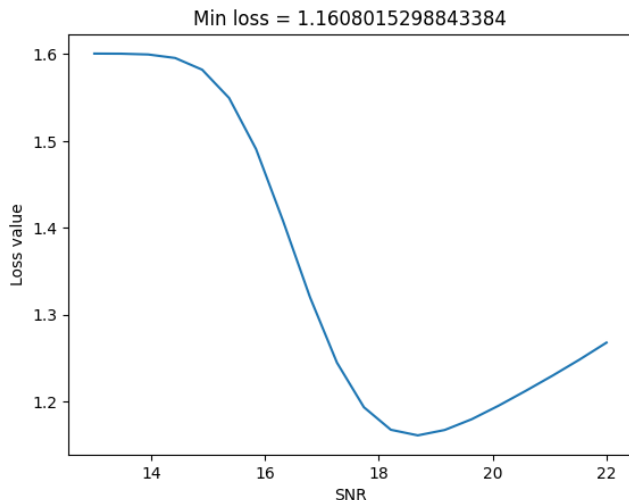


Performance naïve

Principe :

Construire la prédiction de la même manière que l'on construit des masques à partir des spectrogrammes

Loss weighted BCE = 1,16



1^{er} apprentissage

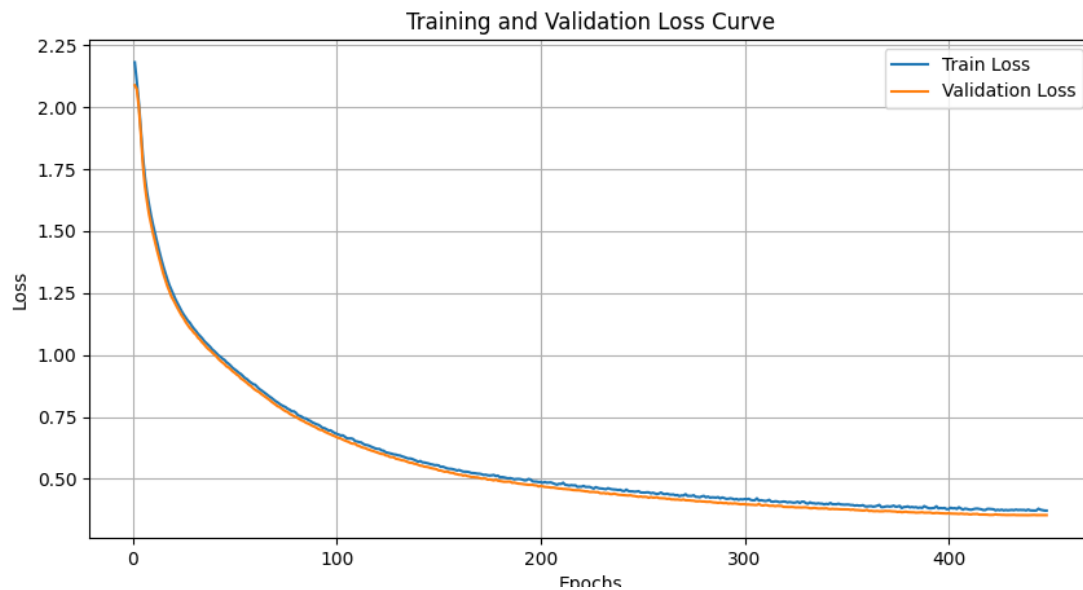
Loss weighted BCE = 0,35

Num_kernels = 4

Masque : 4096x4096

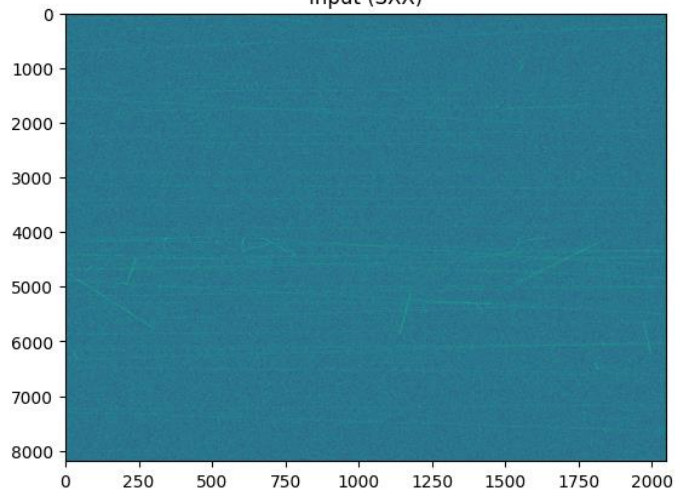
Act = false

Bias = false

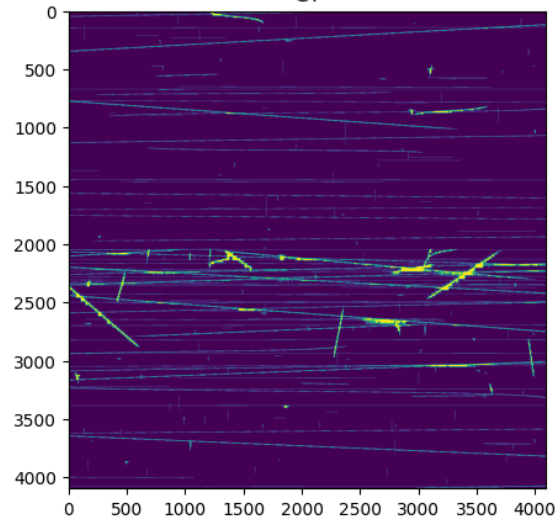


Résultats 1^{er} apprentissage

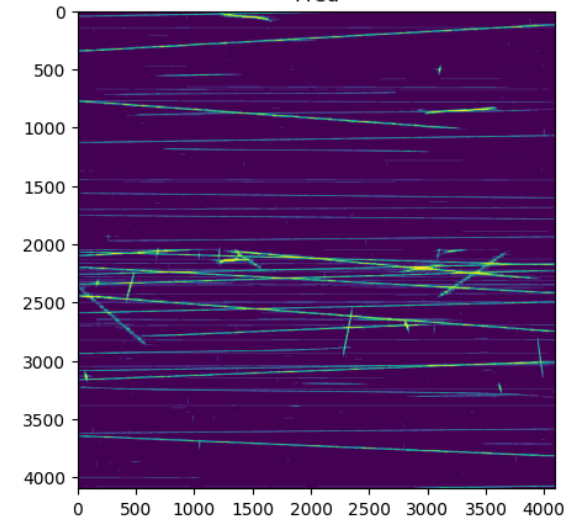
Input (SXX)



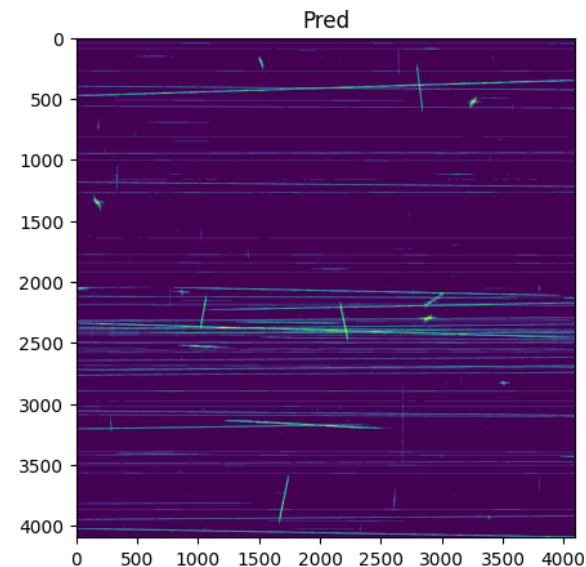
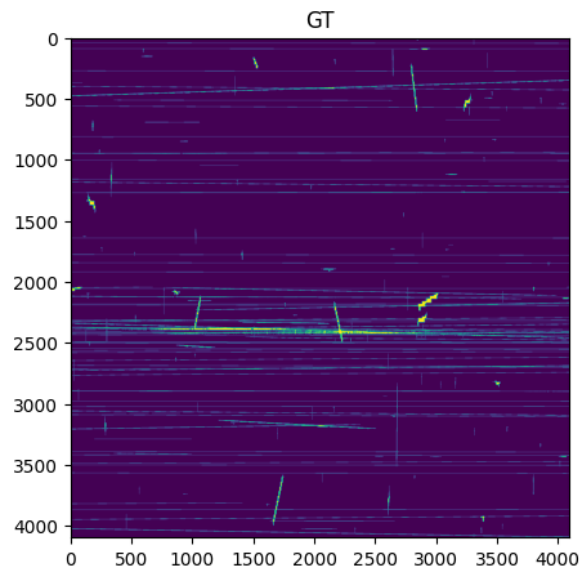
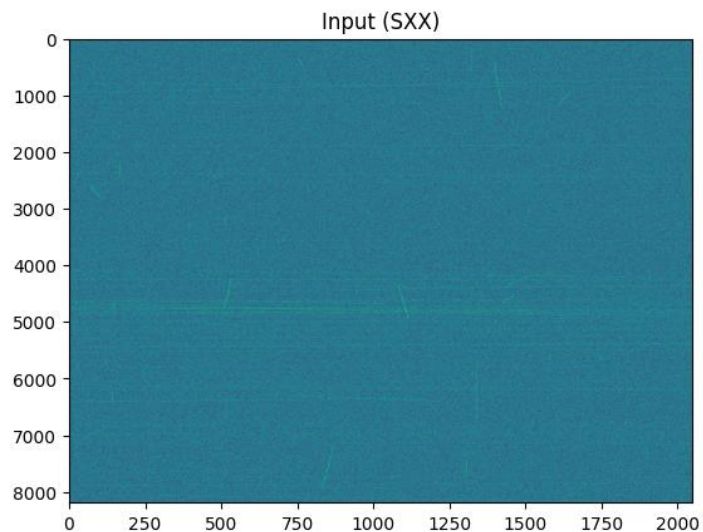
GT



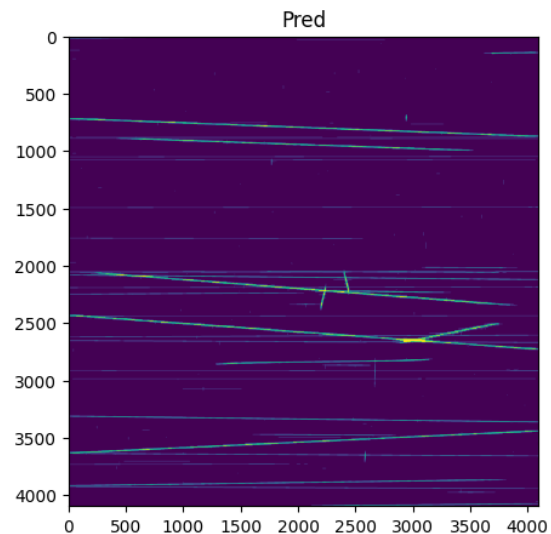
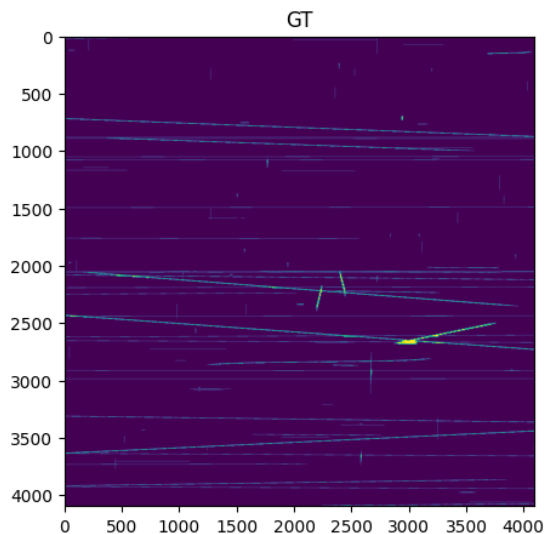
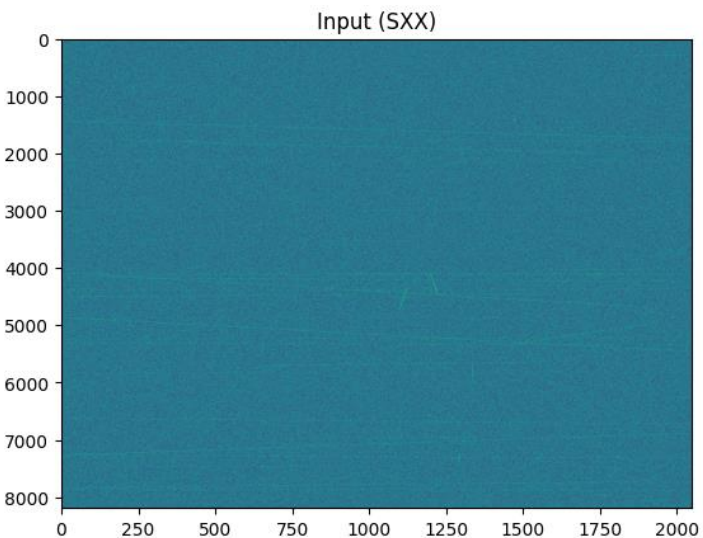
Pred



Résultats 1^{er} apprentissage



Résultats 1^{er} apprentissage



Ratio temps réel modèle InterMerger

fs=4GSps

n_iq = 131072 * 128

dt_iq = 4,2ms

8 npersegs sans overlap

RTR sur V100

Num_kernels	RTR		RTR H100	
	4096x4096 1024x4096		4096x4096 1024x4096	
8	13	7,8	1,5	0,9
4	8,2	5,3	1	0,6
2	3,8	2,4	0,4	0,3
1	1,7	0,9	0,2	0,1

Modèle actuel

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MERCI