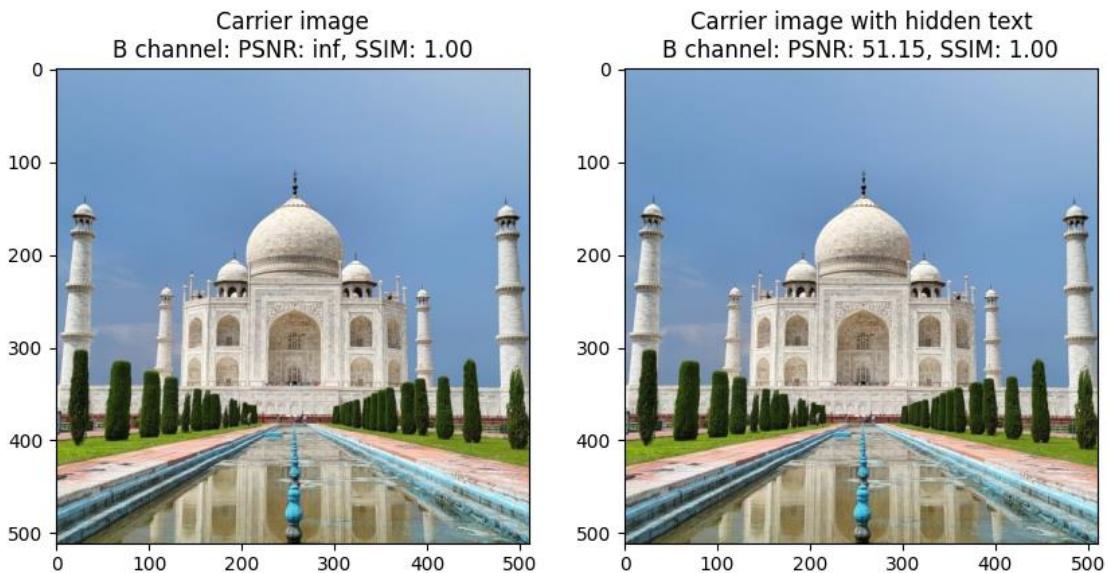


# Steganografia i znaki wodne

## Wojciech Latoś

### Zadanie 1



Tekst ukryty w obrazie: Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley...

Odzyskany tekst: Lorem Ipsum is simply dummy text of the printing and typesetting industry. Lorem Ipsum has been the industry's standard dummy text ever since the 1500s, when an unknown printer took a galley...

Jak widać, tekst został poprawnie ukryty oraz odzyskany. Obrazy nie różnią się wizualnie względem siebie. Wartość SSIM pozostała na poziomie 1, co oznacza, że obrazy są identyczne pod względem strukturalnym.

Natomiast wartość PSNR jest bardzo wysoka, co sugeruje, że różnice między obrazami są minimalne i nie są dostrzegalne gołym okiem.

## Zadanie 2

Carrier image

B channel: PSNR: inf, SSIM: 1.00 R channel



G channel

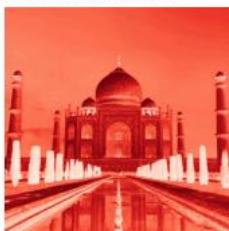


B channel



Carrier with hidden image

B channel: PSNR: 27.53, SSIM: 0.82 R channel



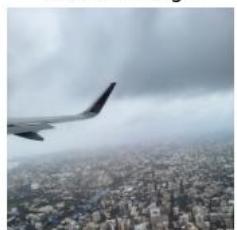
G channel



B channel



Hidden image



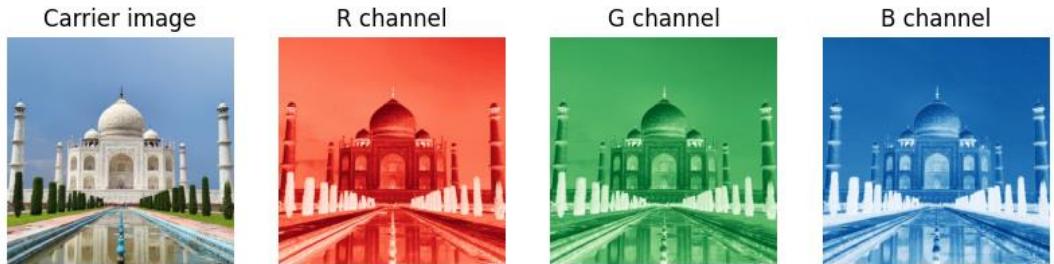
### **Zadanie 3**

Na podstawie poniższych zestawień obrazów, minimalny budżet bitowy, przy którym degradacja obrazu nosiciela staje się zauważalna gołym okiem oceniam na wartość 8. Dla mnie obrazem, który zaczął być zauważalnie zmieniony to ten, dla którego maska wartsw RG była dla 2 bitów - 0b00000011, a dla warstwy B 6 bitów - 0b00111111.

Wartości PSNR oraz SSIM dla kolejnych wartsw RGB były następujące:

27.53, 28.09, 44.19 oraz 0.82, 0.92, 0.98.

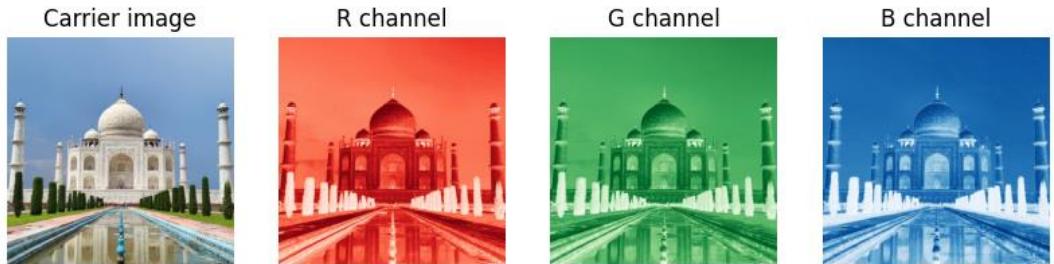
RG mask 0b00000011, B mask 0b00000111



Carrier with hidden image  
R channel: PSNR: 27.53, SSIM: 0.82  
G channel: PSNR: 28.09, SSIM: 0.92  
B channel: PSNR: 44.19, SSIM: 0.98



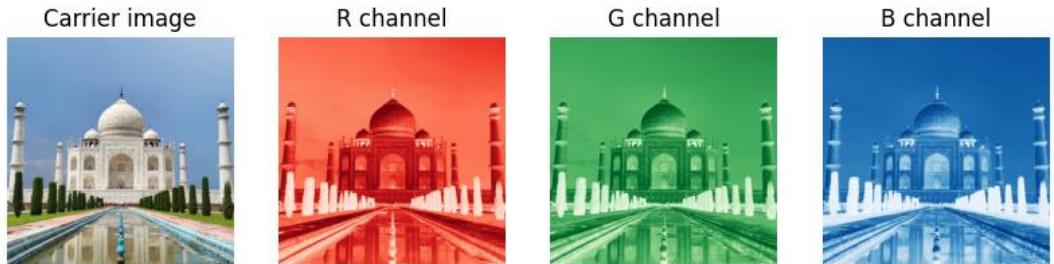
RG mask 0b00000011, B mask 0b00001111



Carrier with hidden image  
R channel: PSNR: 27.53, SSIM: 0.82  
G channel: PSNR: 28.09, SSIM: 0.92  
B channel: PSNR: 44.19, SSIM: 0.98



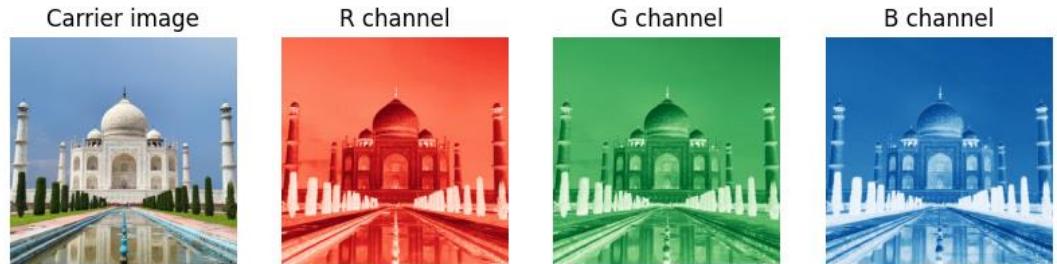
RG mask 0b00000011, B mask 0b00011111



Carrier with hidden image  
R channel: PSNR: 27.53, SSIM: 0.82  
G channel: PSNR: 28.09, SSIM: 0.92  
B channel: PSNR: 44.19, SSIM: 0.98



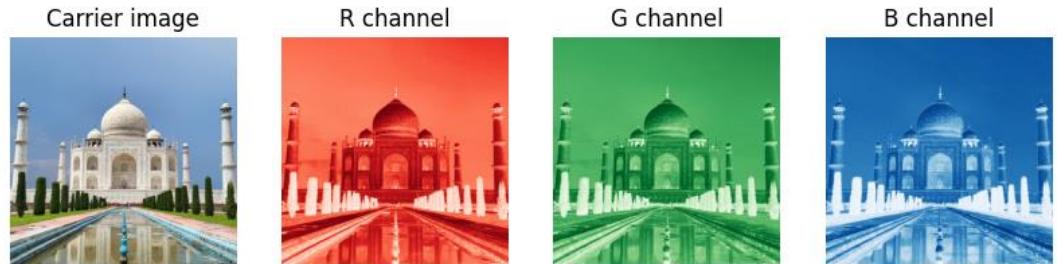
RG mask 0b00000011, B mask 0b00111111



Carrier with hidden image  
R channel: PSNR: 27.53, SSIM: 0.82  
G channel: PSNR: 28.09, SSIM: 0.92  
B channel: PSNR: 44.19, SSIM: 0.98



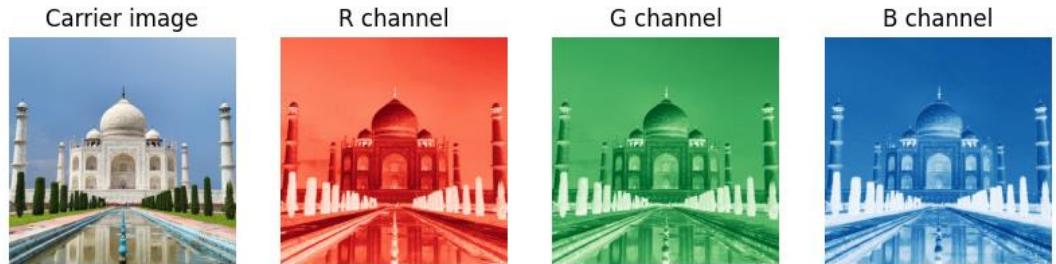
RG mask 0b00000011, B mask 0b01111111



Carrier with hidden image  
R channel: PSNR: 27.53, SSIM: 0.82  
G channel: PSNR: 28.09, SSIM: 0.92  
B channel: PSNR: 44.19, SSIM: 0.98



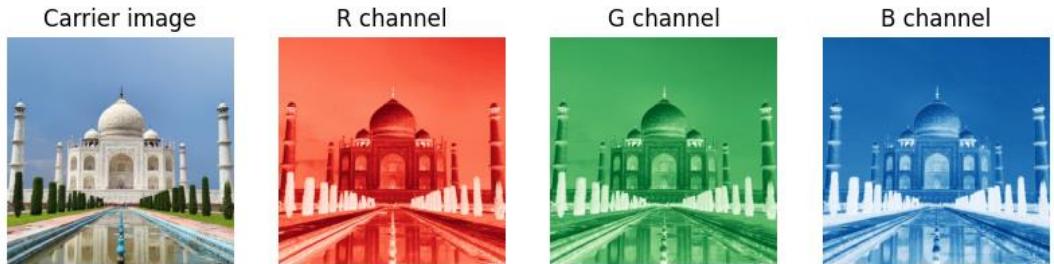
RG mask 0b00000011, B mask 0b11111111



Carrier with hidden image  
R channel: PSNR: 27.53, SSIM: 0.82  
G channel: PSNR: 28.09, SSIM: 0.92  
B channel: PSNR: 44.19, SSIM: 0.98



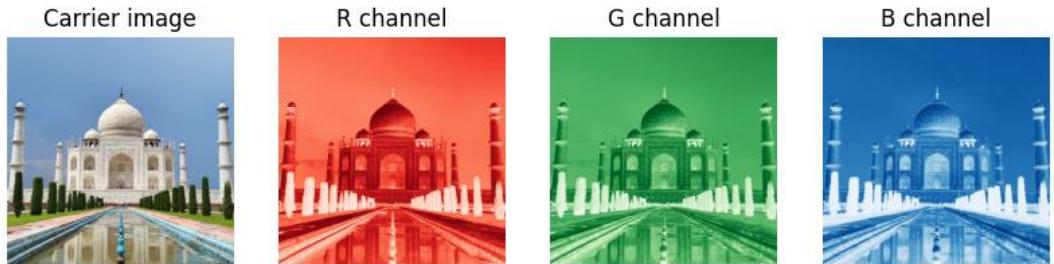
RG mask 0b00000111, B mask 0b00000111



Carrier with hidden image  
R channel: PSNR: 27.54, SSIM: 0.79  
G channel: PSNR: 28.11, SSIM: 0.88  
B channel: PSNR: 38.00, SSIM: 0.94



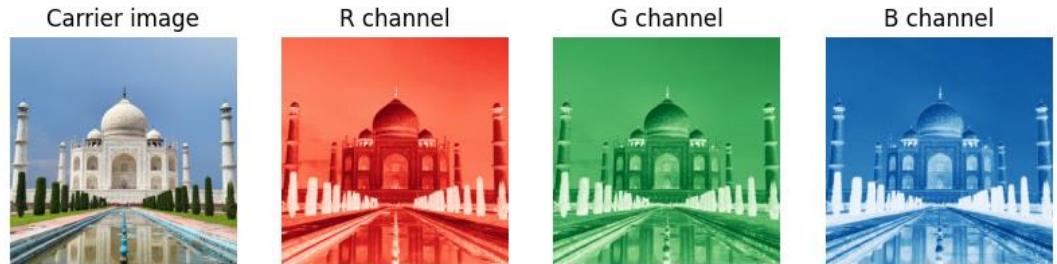
RG mask 0b00000111, B mask 0b00001111



Carrier with hidden image  
R channel: PSNR: 27.54, SSIM: 0.79  
G channel: PSNR: 28.11, SSIM: 0.88  
B channel: PSNR: 38.00, SSIM: 0.94



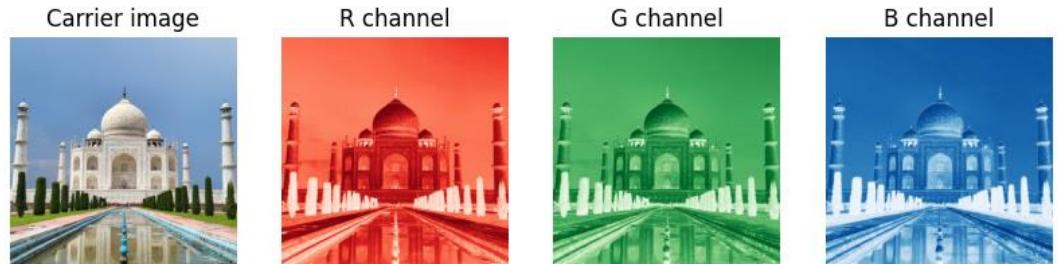
RG mask 0b00000111, B mask 0b00011111



Carrier with hidden image  
R channel: PSNR: 27.54, SSIM: 0.79  
G channel: PSNR: 28.11, SSIM: 0.88  
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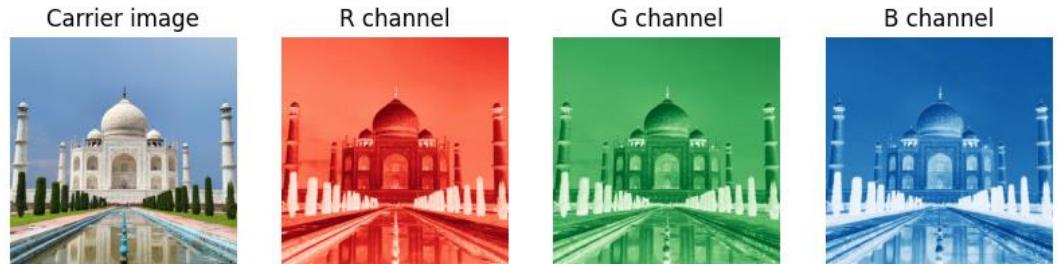
RG mask 0b00000111, B mask 0b00111111



Carrier with hidden image  
R channel: PSNR: 27.54, SSIM: 0.79  
G channel: PSNR: 28.11, SSIM: 0.88  
B channel: PSNR: 38.00, SSIM: 0.94



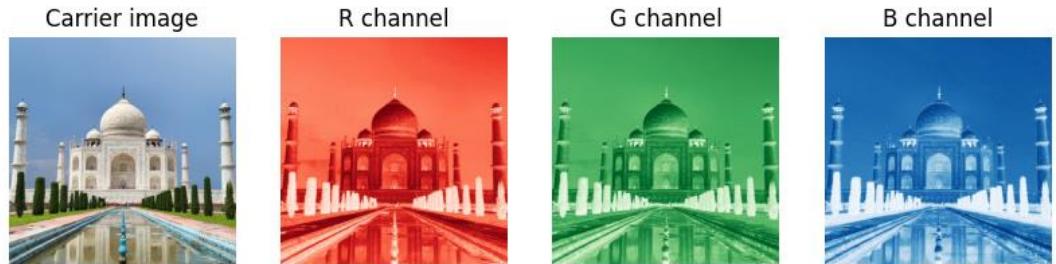
RG mask 0b00000111, B mask 0b01111111



Carrier with hidden image  
R channel: PSNR: 27.54, SSIM: 0.79  
G channel: PSNR: 28.11, SSIM: 0.88  
B channel: PSNR: 38.00, SSIM: 0.94



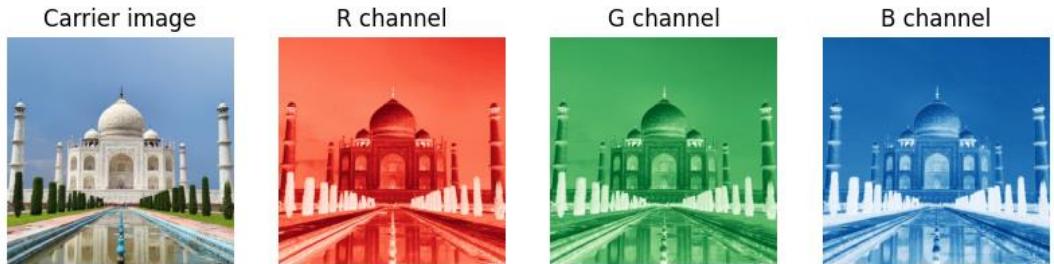
RG mask 0b00000111, B mask 0b11111111



Carrier with hidden image  
R channel: PSNR: 27.54, SSIM: 0.79  
G channel: PSNR: 28.11, SSIM: 0.88  
B channel: PSNR: 38.00, SSIM: 0.94



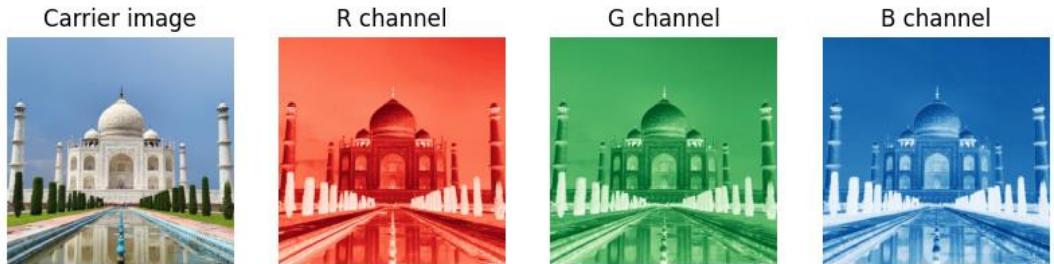
RG mask 0b00001111, B mask 0b00000111



Carrier with hidden image  
R channel: PSNR: 27.68, SSIM: 0.70  
G channel: PSNR: 28.09, SSIM: 0.78  
B channel: PSNR: 31.87, SSIM: 0.84



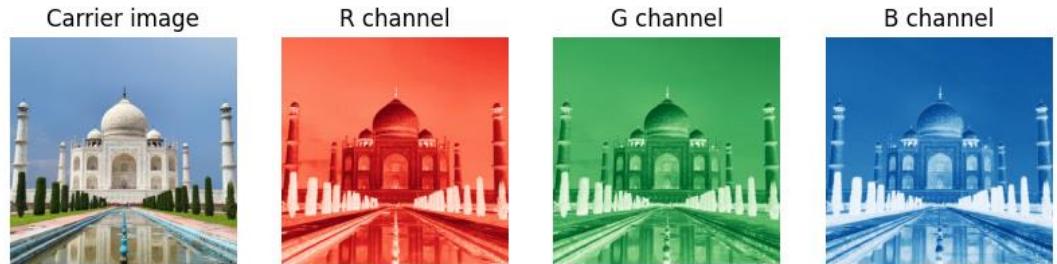
RG mask 0b00001111, B mask 0b00001111



Carrier with hidden image  
R channel: PSNR: 27.68, SSIM: 0.70  
G channel: PSNR: 28.09, SSIM: 0.78  
B channel: PSNR: 31.87, SSIM: 0.84



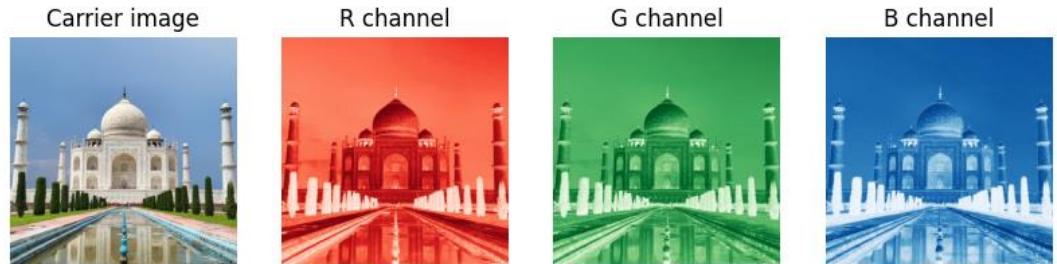
RG mask 0b00001111, B mask 0b00011111



Carrier with hidden image  
R channel: PSNR: 27.68, SSIM: 0.70  
G channel: PSNR: 28.09, SSIM: 0.78  
B channel: PSNR: 31.87, SSIM: 0.84



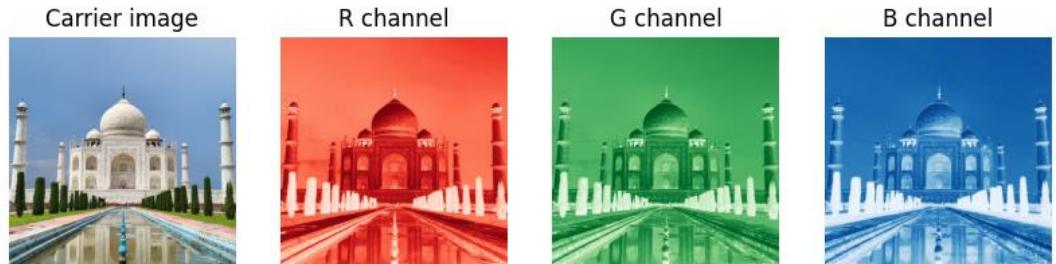
RG mask 0b00001111, B mask 0b00111111



Carrier with hidden image  
R channel: PSNR: 27.68, SSIM: 0.70  
G channel: PSNR: 28.09, SSIM: 0.78  
B channel: PSNR: 31.87, SSIM: 0.84



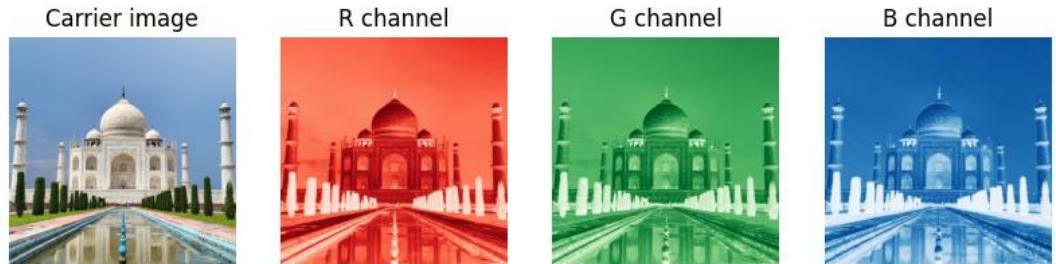
RG mask 0b00001111, B mask 0b01111111



Carrier with hidden image  
R channel: PSNR: 27.68, SSIM: 0.70  
G channel: PSNR: 28.09, SSIM: 0.78  
B channel: PSNR: 31.87, SSIM: 0.84



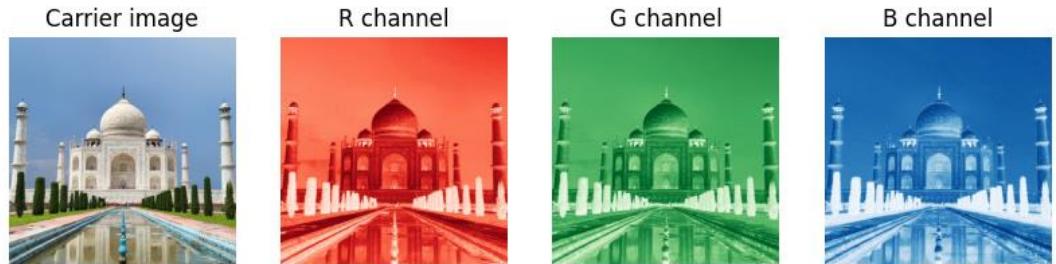
RG mask 0b00001111, B mask 0b11111111



Carrier with hidden image  
R channel: PSNR: 27.68, SSIM: 0.70  
G channel: PSNR: 28.09, SSIM: 0.78  
B channel: PSNR: 31.87, SSIM: 0.84



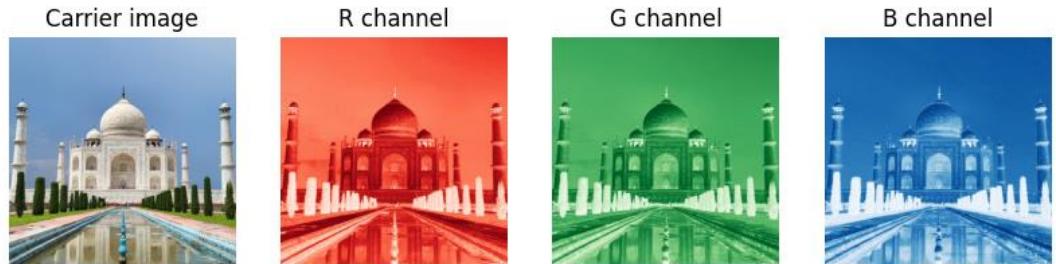
RG mask 0b00011111, B mask 0b00000111



Carrier with hidden image  
R channel: PSNR: 27.75, SSIM: 0.54  
G channel: PSNR: 28.02, SSIM: 0.60  
B channel: PSNR: 29.47, SSIM: 0.64



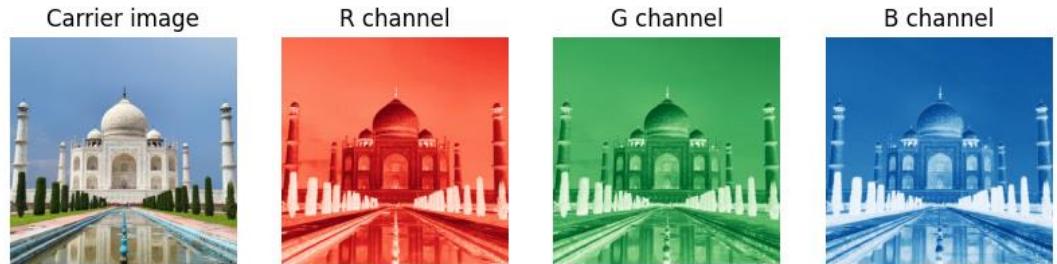
RG mask 0b00011111, B mask 0b00001111



Carrier with hidden image  
R channel: PSNR: 27.75, SSIM: 0.54  
G channel: PSNR: 28.02, SSIM: 0.60  
B channel: PSNR: 29.47, SSIM: 0.64



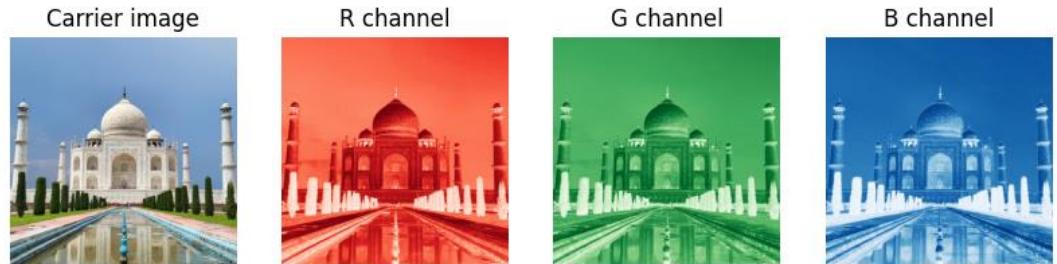
RG mask 0b00011111, B mask 0b00011111



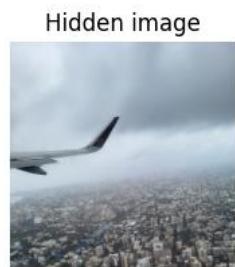
Carrier with hidden image  
R channel: PSNR: 27.75, SSIM: 0.54  
G channel: PSNR: 28.02, SSIM: 0.60  
B channel: PSNR: 29.47, SSIM: 0.64



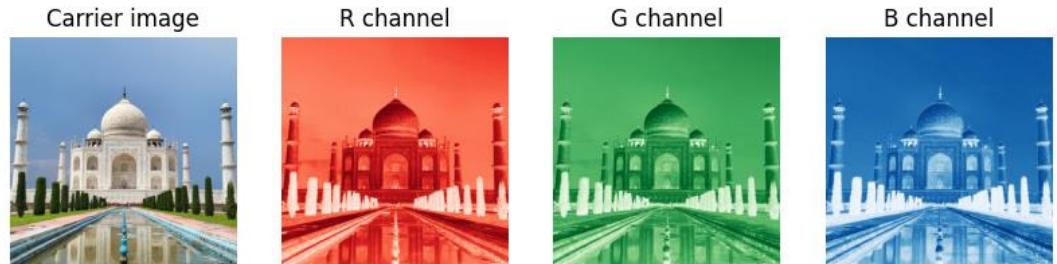
RG mask 0b00011111, B mask 0b00111111



Carrier with hidden image  
R channel: PSNR: 27.75, SSIM: 0.54  
G channel: PSNR: 28.02, SSIM: 0.60  
B channel: PSNR: 29.47, SSIM: 0.64



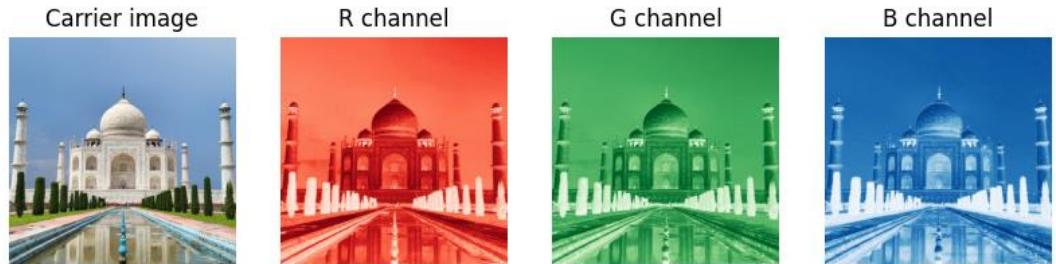
RG mask 0b00011111, B mask 0b01111111



Carrier with hidden image  
R channel: PSNR: 27.75, SSIM: 0.54  
G channel: PSNR: 28.02, SSIM: 0.60  
B channel: PSNR: 29.47, SSIM: 0.64



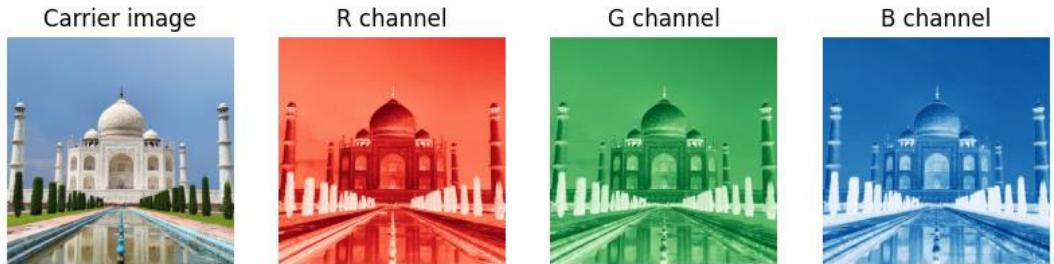
RG mask 0b00011111, B mask 0b11111111



Carrier with hidden image  
R channel: PSNR: 27.75, SSIM: 0.54  
G channel: PSNR: 28.02, SSIM: 0.60  
B channel: PSNR: 29.47, SSIM: 0.64



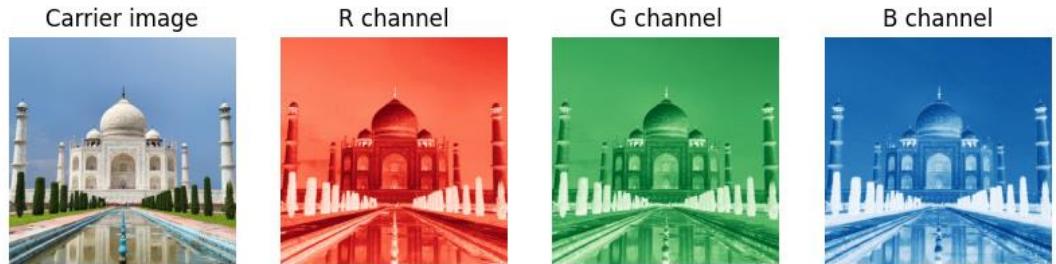
RG mask 0b00111111, B mask 0b00000111



Carrier with hidden image  
R channel: PSNR: 27.96, SSIM: 0.32  
G channel: PSNR: 27.97, SSIM: 0.36  
B channel: PSNR: 28.29, SSIM: 0.39



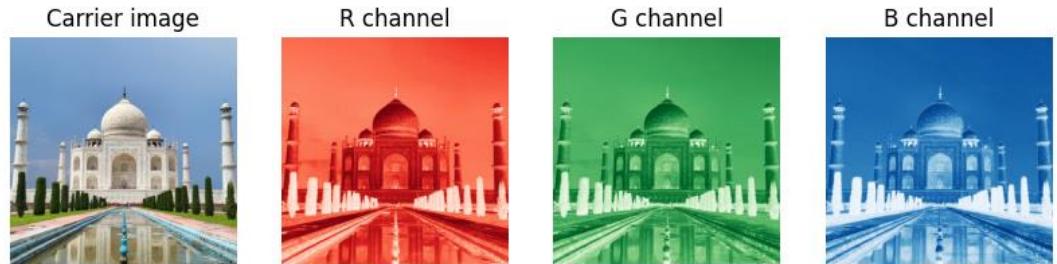
RG mask 0b00111111, B mask 0b00001111



Carrier with hidden image  
R channel: PSNR: 27.96, SSIM: 0.32  
G channel: PSNR: 27.97, SSIM: 0.36  
B channel: PSNR: 28.29, SSIM: 0.39



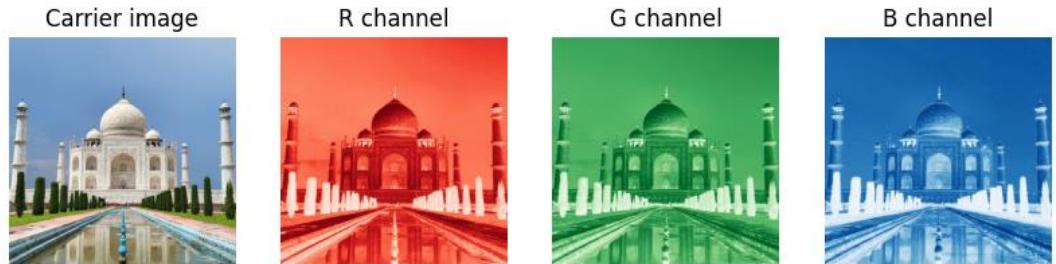
RG mask 0b00111111, B mask 0b00011111



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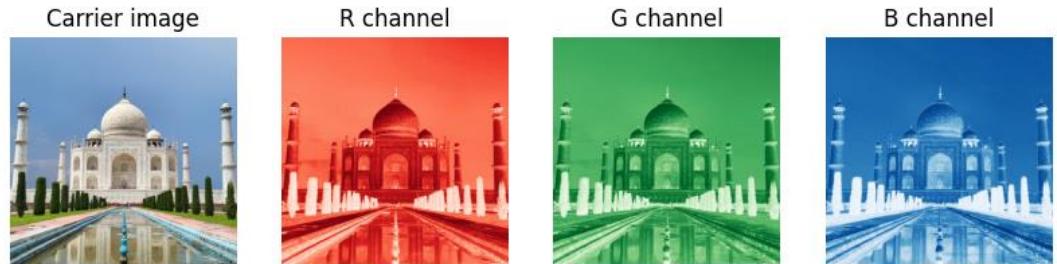
RG mask 0b00111111, B mask 0b00111111



Carrier with hidden image  
R channel: PSNR: 27.96, SSIM: 0.32  
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B channel: PSNR: 28.29, SSIM: 0.39



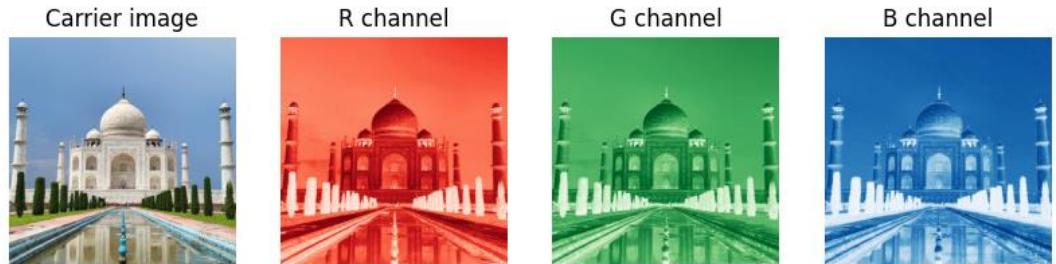
RG mask 0b00111111, B mask 0b01111111



Carrier with hidden image  
R channel: PSNR: 27.96, SSIM: 0.32  
G channel: PSNR: 27.97, SSIM: 0.36  
B channel: PSNR: 28.29, SSIM: 0.39



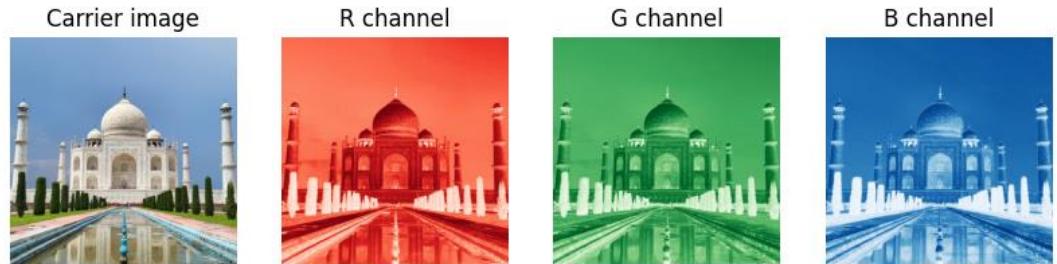
RG mask 0b00111111, B mask 0b11111111



Carrier with hidden image  
R channel: PSNR: 27.96, SSIM: 0.32  
G channel: PSNR: 27.97, SSIM: 0.36  
B channel: PSNR: 28.29, SSIM: 0.39



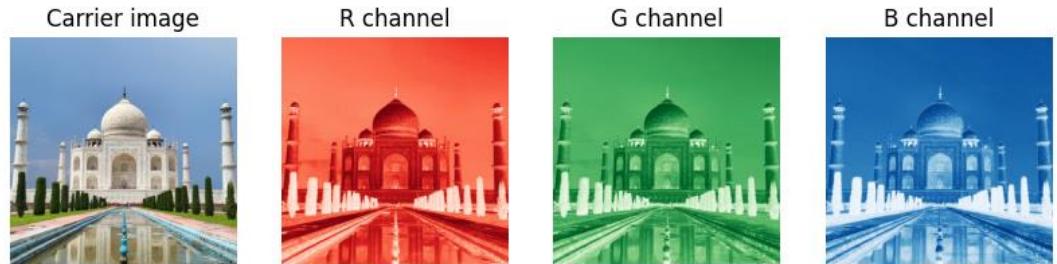
RG mask 0b01111111, B mask 0b00000111



Carrier with hidden image  
R channel: PSNR: 27.92, SSIM: 0.12  
G channel: PSNR: 27.92, SSIM: 0.14  
B channel: PSNR: 27.88, SSIM: 0.15



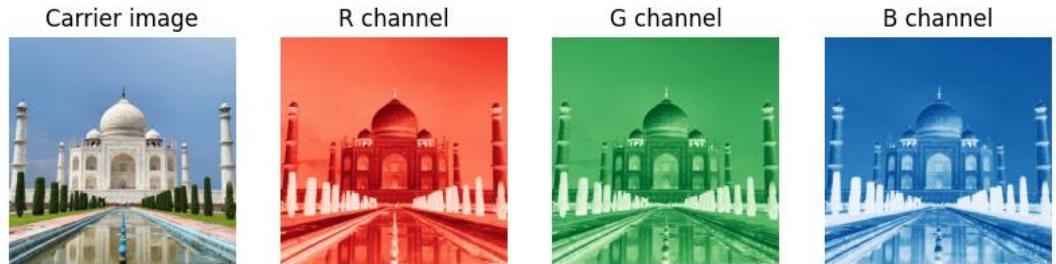
RG mask 0b01111111, B mask 0b00001111



Carrier with hidden image  
R channel: PSNR: 27.92, SSIM: 0.12  
G channel: PSNR: 27.92, SSIM: 0.14  
B channel: PSNR: 27.88, SSIM: 0.15



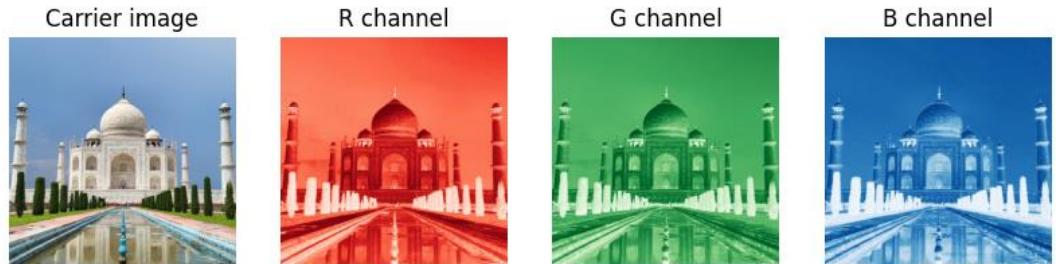
RG mask 0b01111111, B mask 0b00011111



Carrier with hidden image  
R channel: PSNR: 27.92, SSIM: 0.12  
G channel: PSNR: 27.92, SSIM: 0.14  
B channel: PSNR: 27.88, SSIM: 0.15



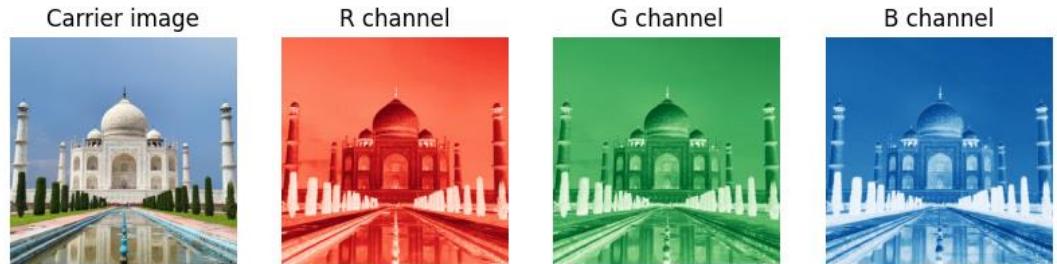
RG mask 0b01111111, B mask 0b00111111



Carrier with hidden image  
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B channel: PSNR: 27.88, SSIM: 0.15



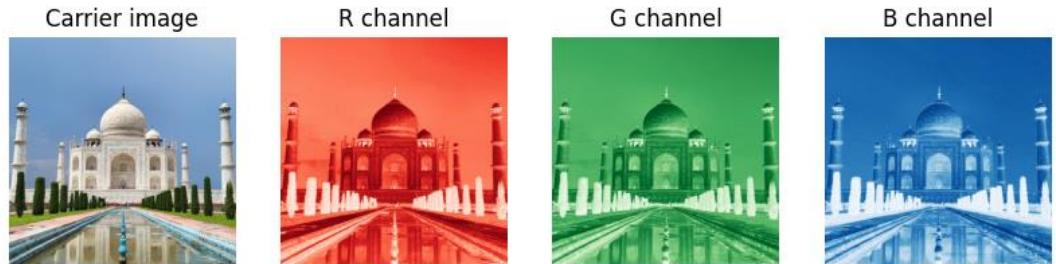
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Carrier with hidden image  
R channel: PSNR: 27.92, SSIM: 0.12  
G channel: PSNR: 27.92, SSIM: 0.14  
B channel: PSNR: 27.88, SSIM: 0.15



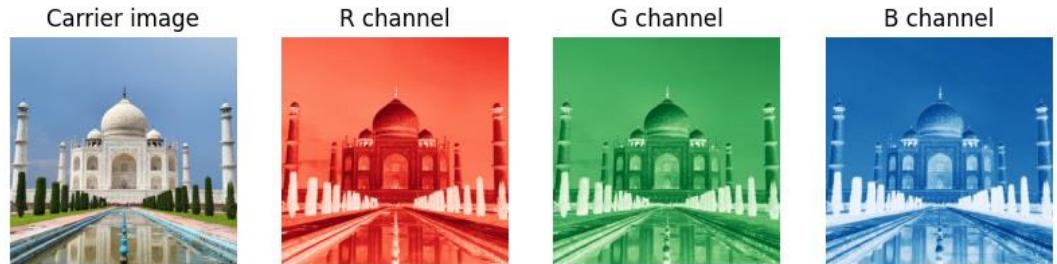
RG mask 0b01111111, B mask 0b11111111



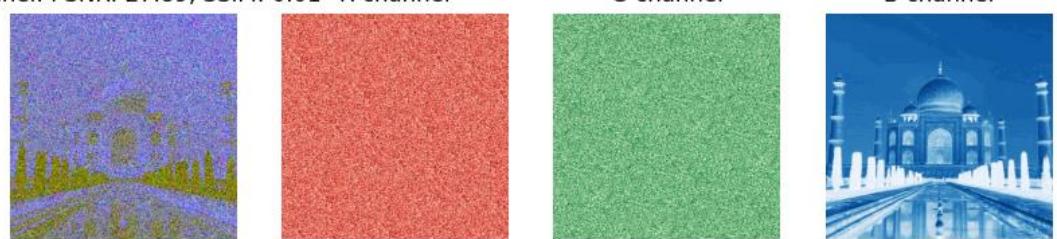
Carrier with hidden image  
R channel: PSNR: 27.92, SSIM: 0.12  
G channel: PSNR: 27.92, SSIM: 0.14  
B channel: PSNR: 27.88, SSIM: 0.15



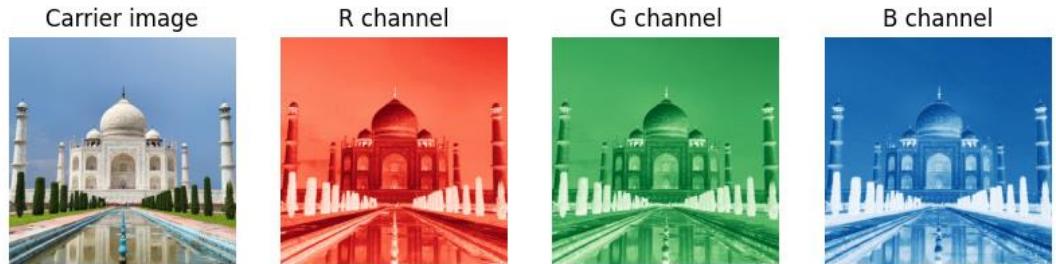
RG mask 0b11111111, B mask 0b00000111



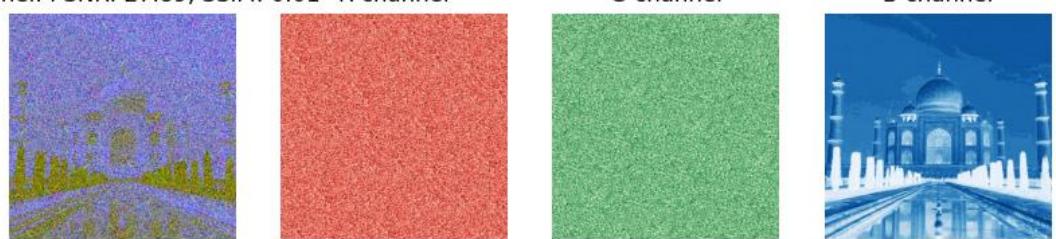
Carrier with hidden image  
R channel: PSNR: 27.90, SSIM: 0.01  
G channel: PSNR: 27.89, SSIM: 0.01  
B channel: PSNR: 27.89, SSIM: 0.01



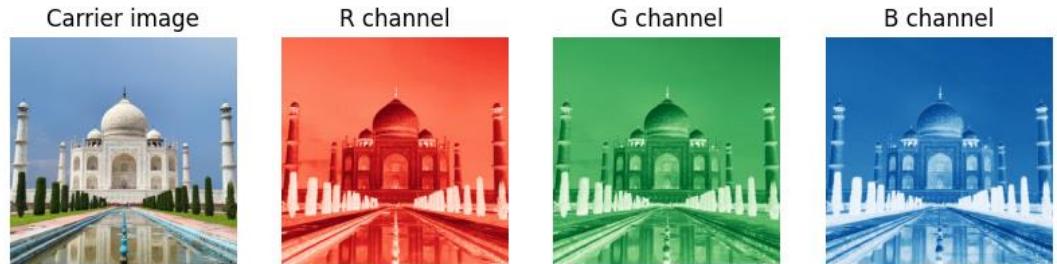
RG mask 0b11111111, B mask 0b00001111



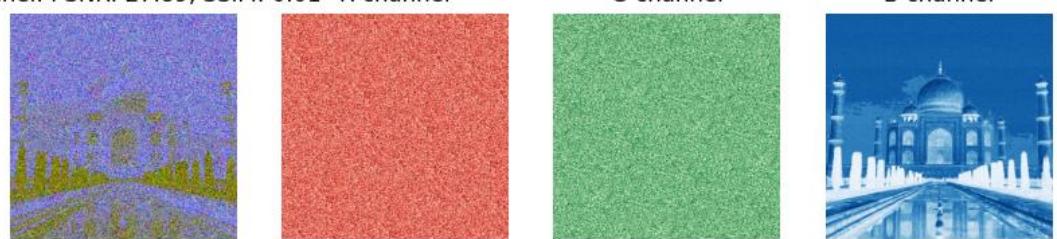
Carrier with hidden image  
R channel: PSNR: 27.90, SSIM: 0.01  
G channel: PSNR: 27.89, SSIM: 0.01  
B channel: PSNR: 27.89, SSIM: 0.01



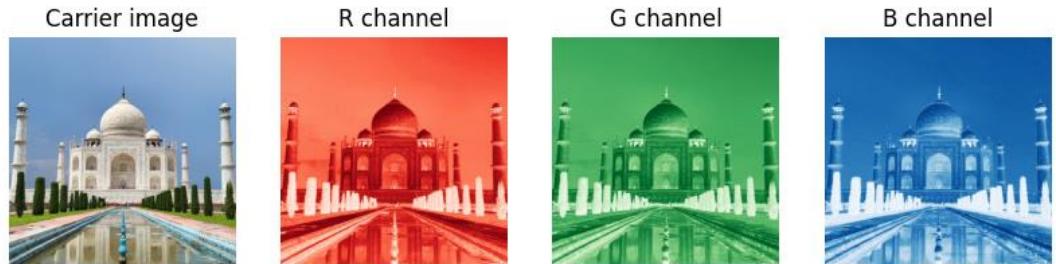
RG mask 0b11111111, B mask 0b00011111



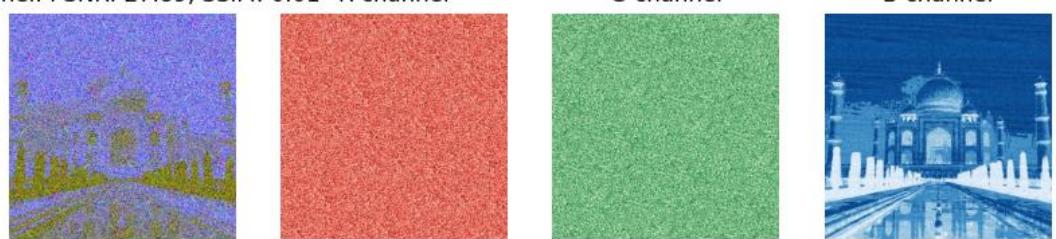
Carrier with hidden image  
R channel: PSNR: 27.90, SSIM: 0.01  
G channel: PSNR: 27.89, SSIM: 0.01  
B channel: PSNR: 27.89, SSIM: 0.01



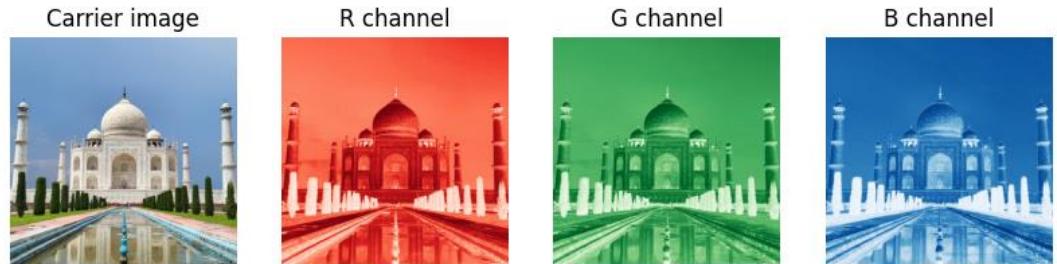
RG mask 0b11111111, B mask 0b00111111



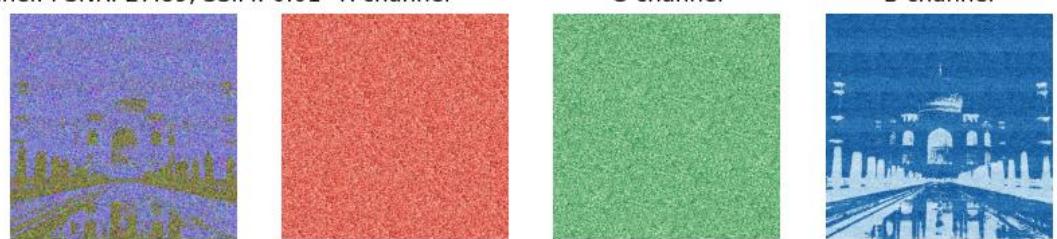
Carrier with hidden image  
R channel: PSNR: 27.90, SSIM: 0.01  
G channel: PSNR: 27.89, SSIM: 0.01  
B channel: PSNR: 27.89, SSIM: 0.01



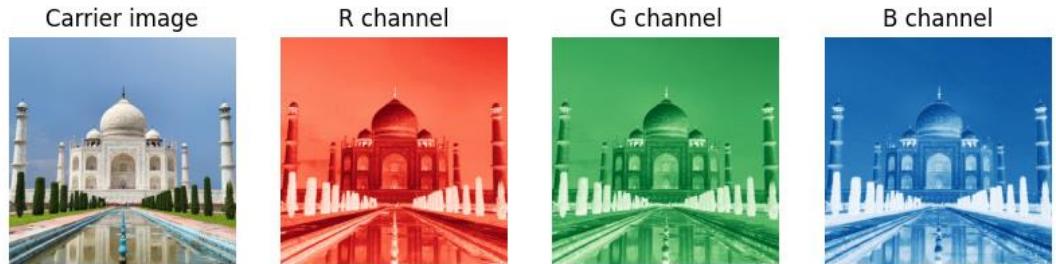
RG mask 0b11111111, B mask 0b01111111



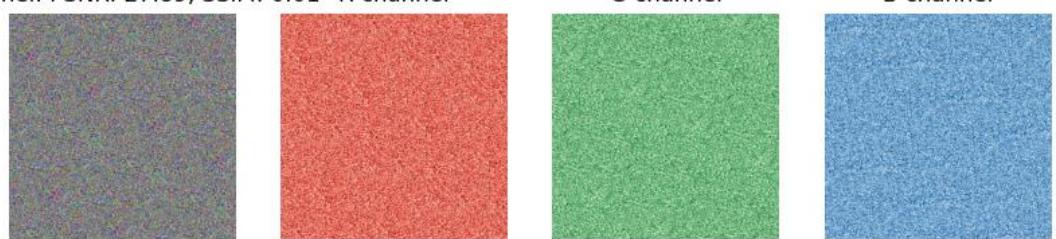
Carrier with hidden image  
R channel: PSNR: 27.90, SSIM: 0.01  
G channel: PSNR: 27.89, SSIM: 0.01  
B channel: PSNR: 27.89, SSIM: 0.01



RG mask 0b11111111, B mask 0b11111111

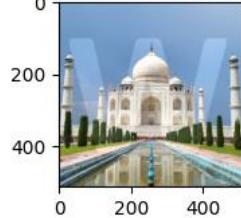


Carrier with hidden image  
R channel: PSNR: 27.90, SSIM: 0.01  
G channel: PSNR: 27.89, SSIM: 0.01  
B channel: PSNR: 27.89, SSIM: 0.01

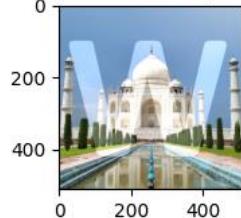


## Zadanie 4

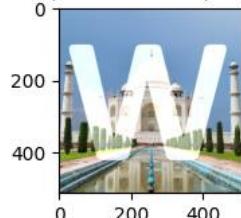
Alpha: 0.1, PSNR: 28.87, SSIM: 0.8683



Alpha: 0.25, PSNR: 29.42, SSIM: 0.8214



Alpha: 0.5, PSNR: 29.05, SSIM: 0.7499



Jak widać na powyższych zdjęciach wraz ze znakami wodnymi, wartość PSNR wzrasta wraz ze wzrostem wartości alpha.

Natomiast SSIM maleje wraz ze wzrostem wartości alpha.

Oczywiście - im większa wartość alpha tym znak jest bardziej widoczny.