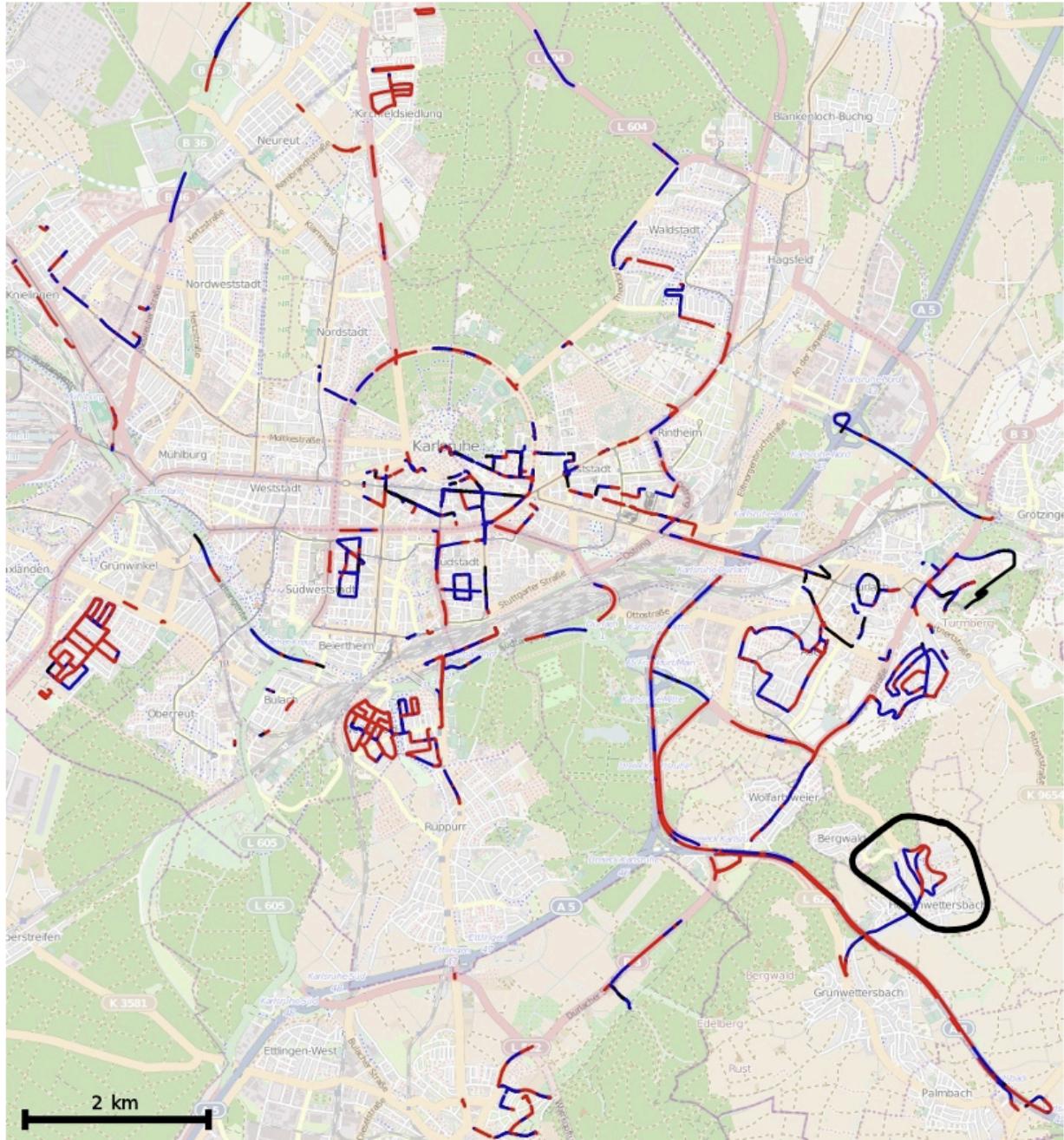


Antenna selection for positioning

Intro

Based on the picture from the email, I have assumed that the area of interest is not the whole Karlsruhe but only the circled zone.



Looking at Google Street View, it seems like a suburb or a separate village. Building height and people density are not too big. ~up to 25m.

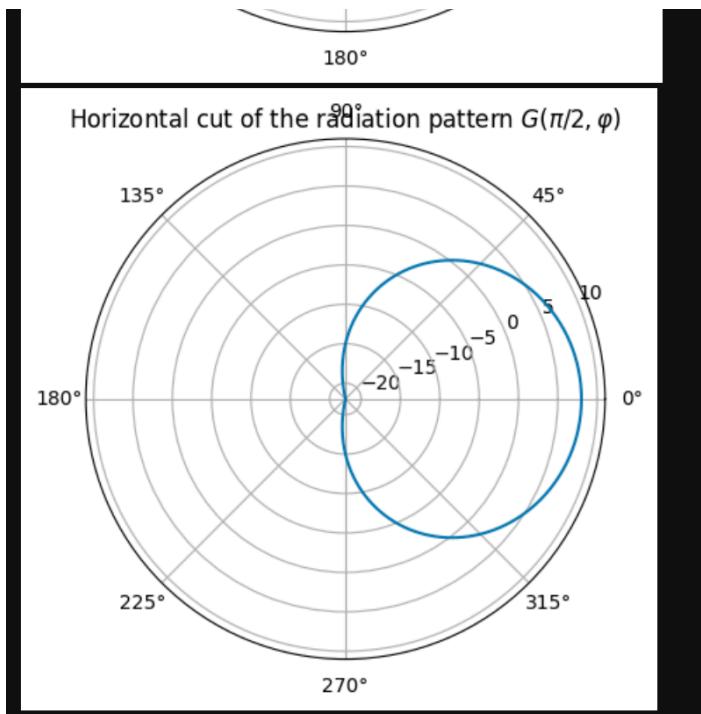


Next getting building model from OSM using Blender.

Assigning RF materials: All walls - itu_brick; All roofs - itu_metal; Ground - itu_concrete.

All antennas: scene.tx_array = PlanarArray(

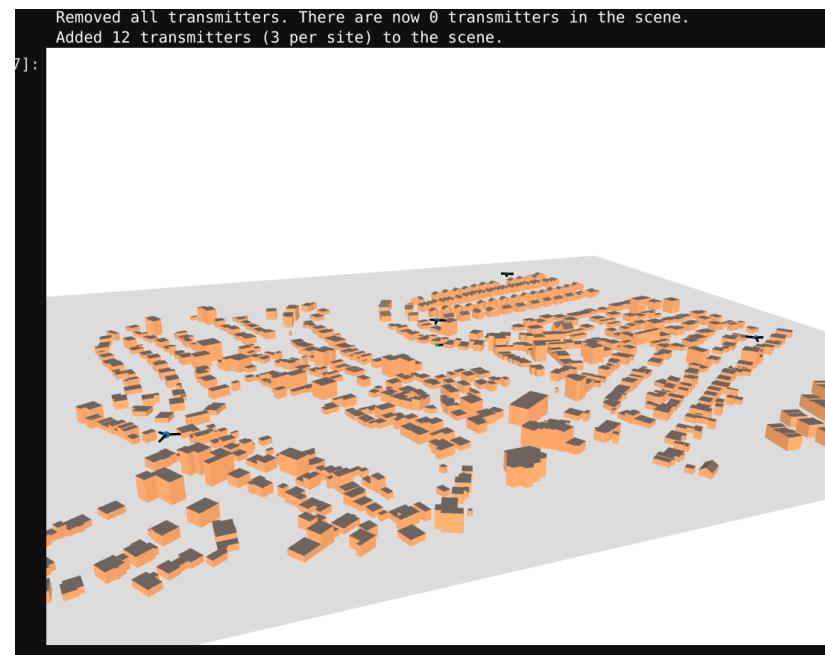
```
    num_rows=4,          # 4 rows
    num_cols=8,          # 8 columns (4x8 = 32T)
    vertical_spacing=0.5, # Spacing between elements in meters
    horizontal_spacing=0.5, # Spacing between elements in meters
    pattern="tr38901",    # 3GPP TR 38.901 antenna pattern for 5G
    polarization="VH",    # Vertical and Horizontal polarization
)
```



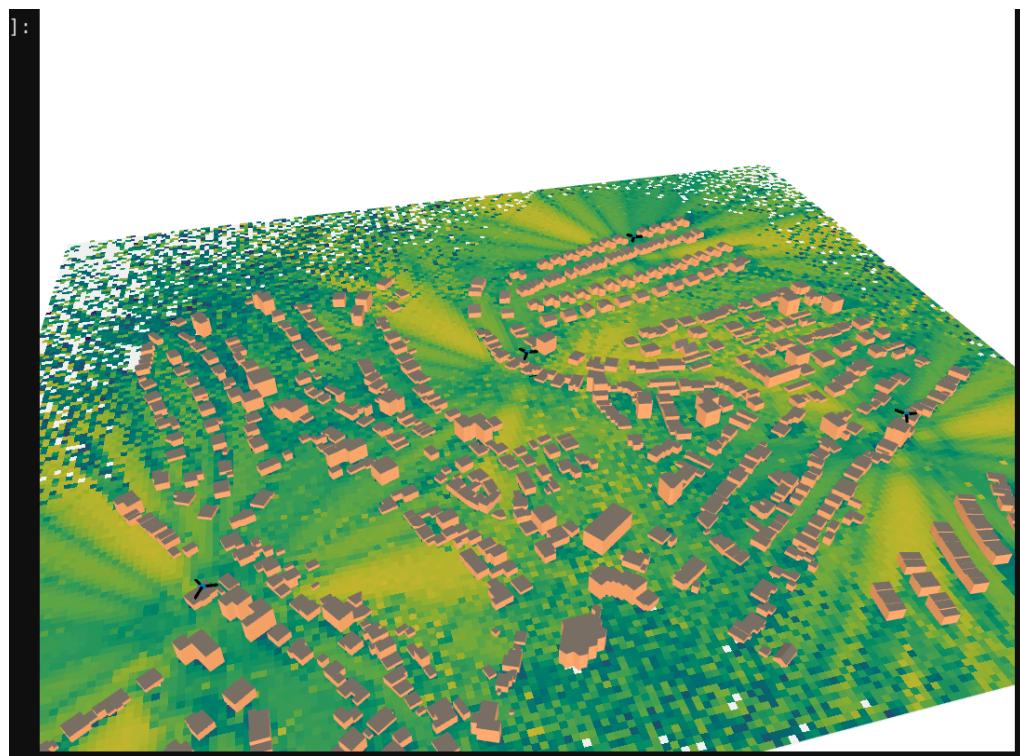
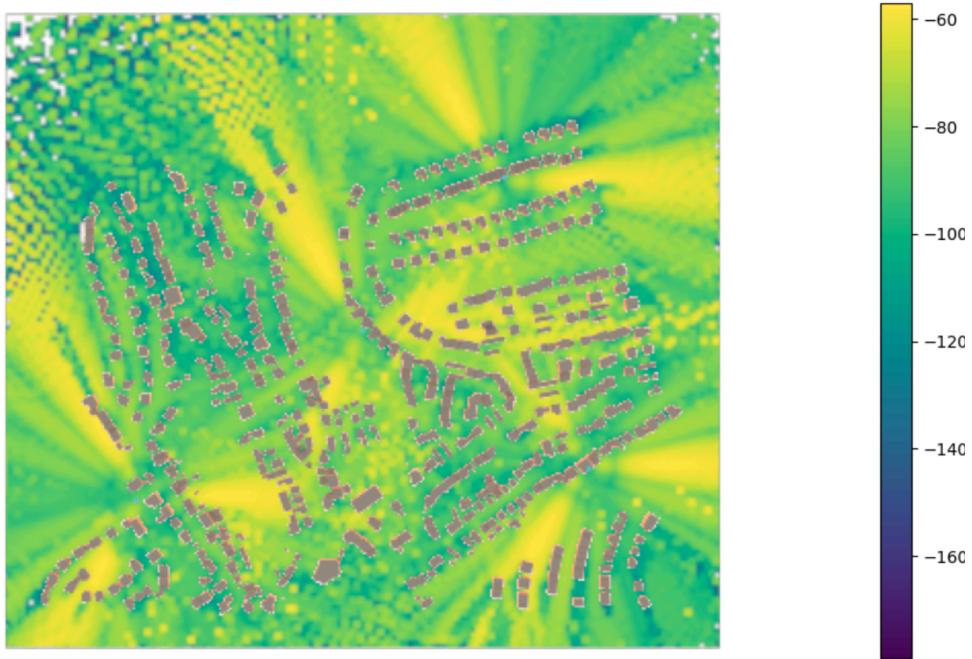
All Base Station with 3 sectors: azimuths_deg = [0.0, 120.0, 240.0]. Looking 6 deg down. Height always 25m.

Coverage for communications

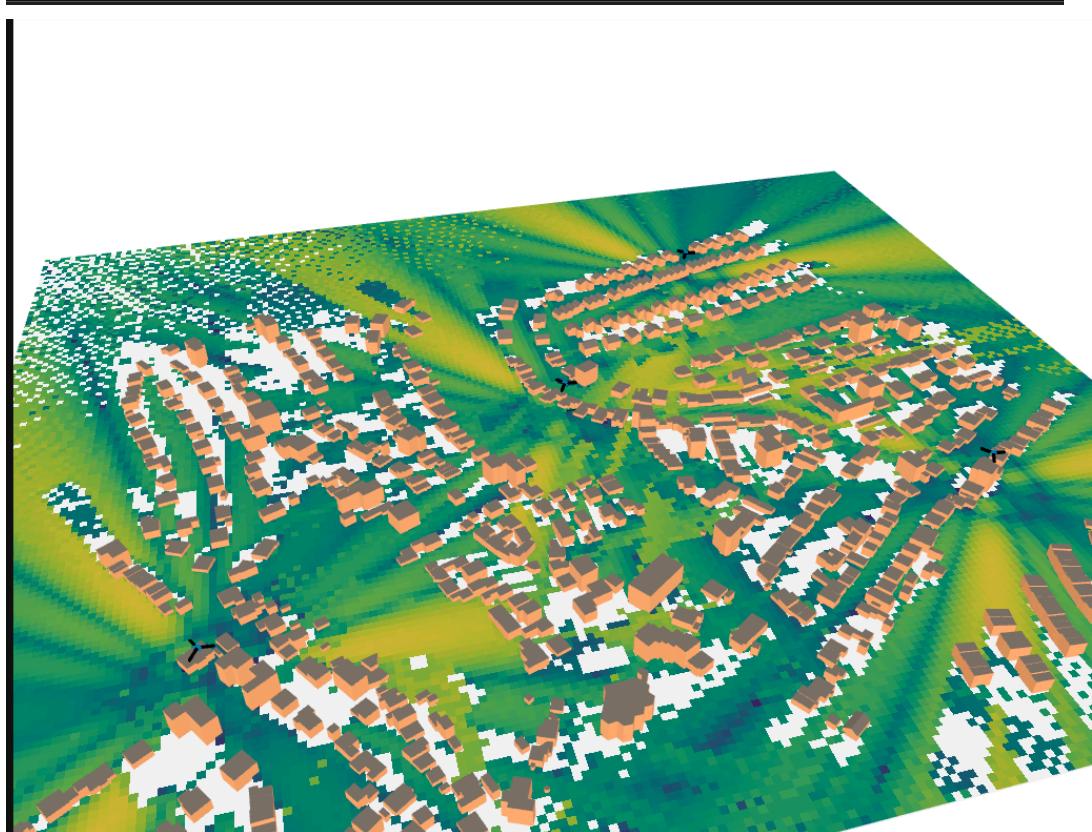
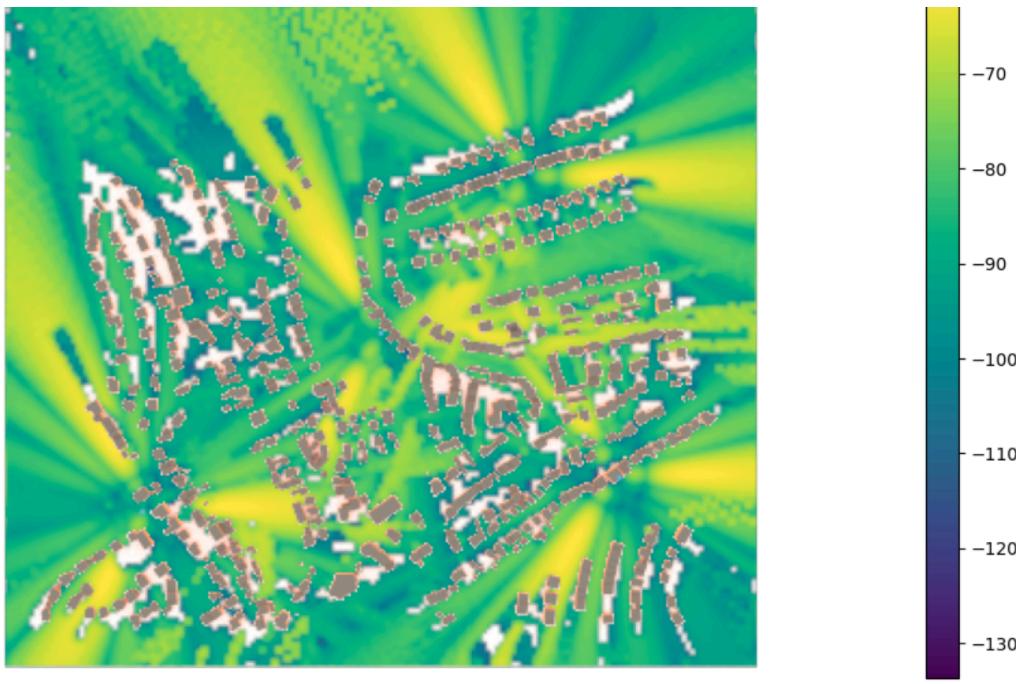
For such an area 900 m x 800 m in suburban 4 base stations are very good (expensive). Let's simulate coverage for my chosen positions.



Los, reflection, and diffraction [Failed to configure on my poor GPU. Running on CPU. It eats 16GB of RAM and 32GB of swap :)]. Not looking to Rx power, just visually looks well covered.

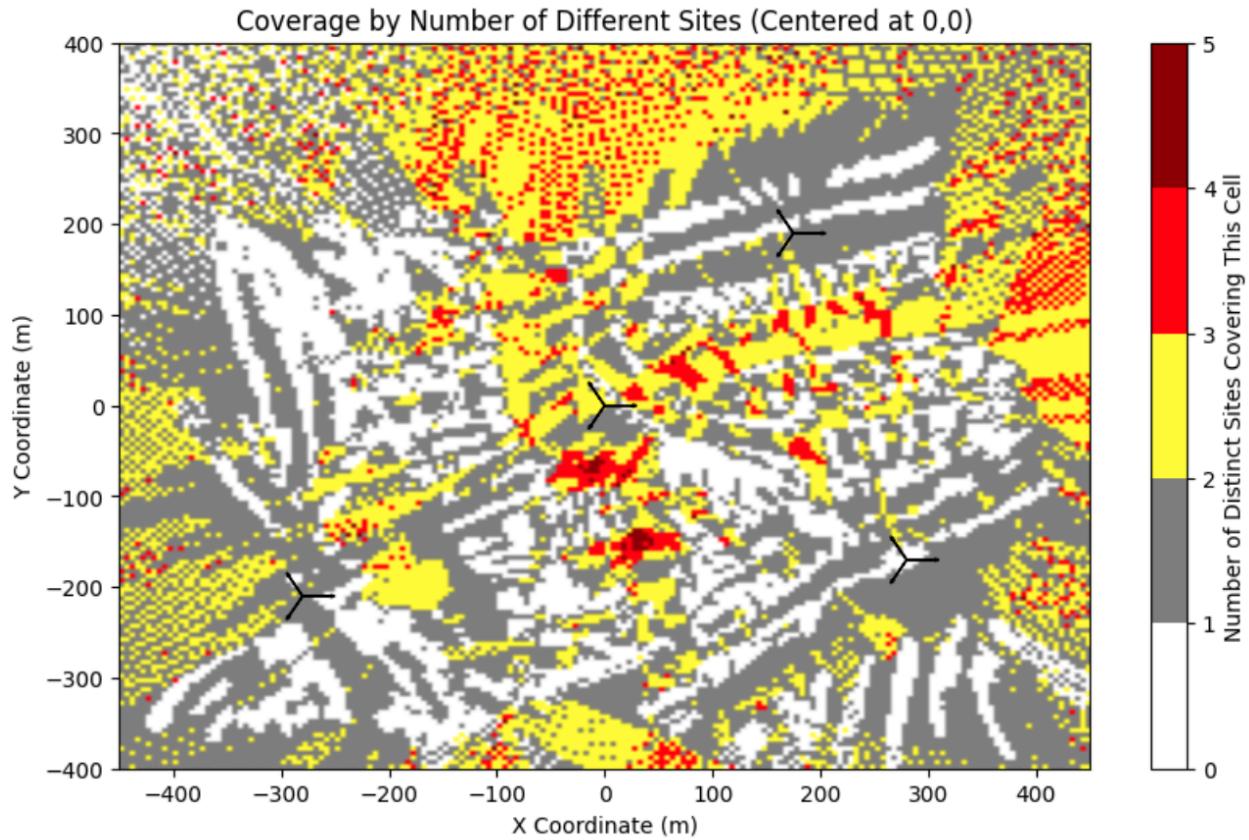


LOS only - what we need for positioning.



But for positioning, we need at least 3 Tx in LOS.

Let's count each grid cell (5×5 meters) by the number of Tx signals (any levels). More correct number of signals from different base stations **in LOS**.

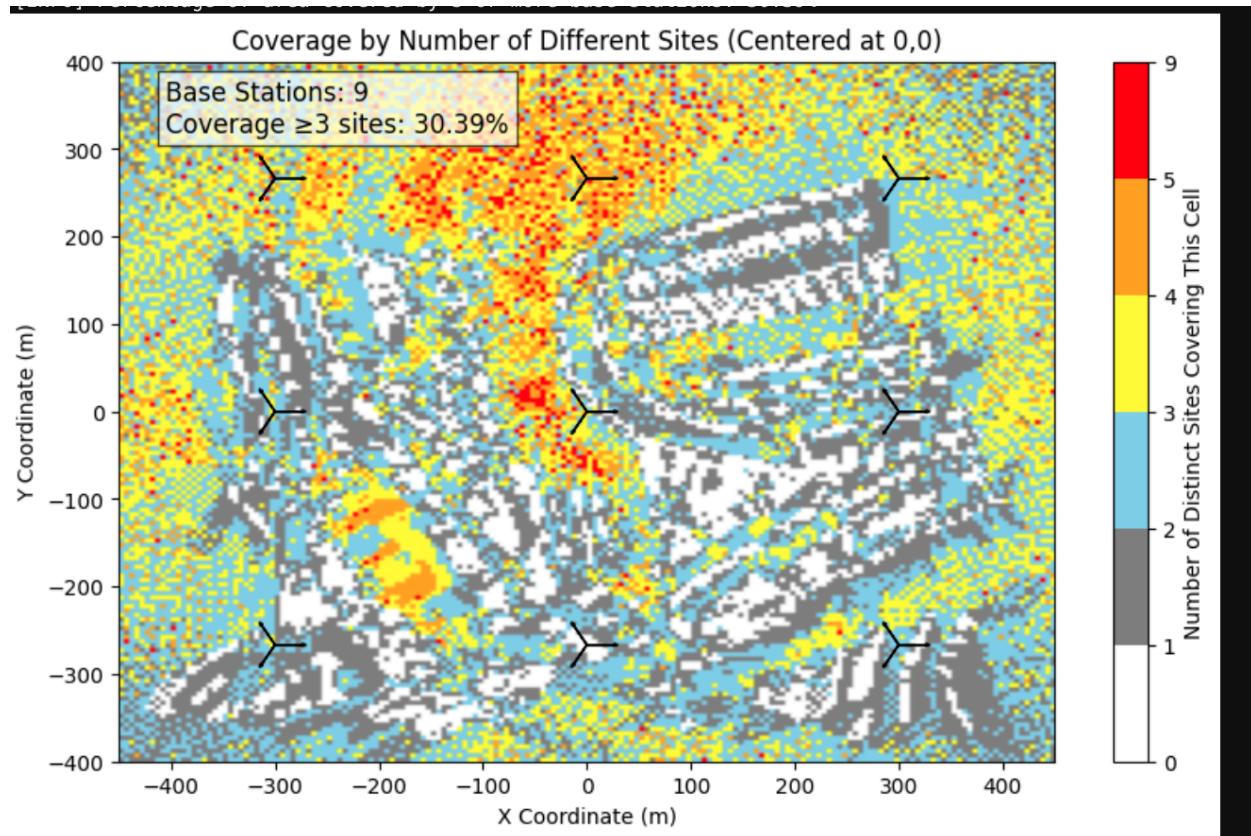
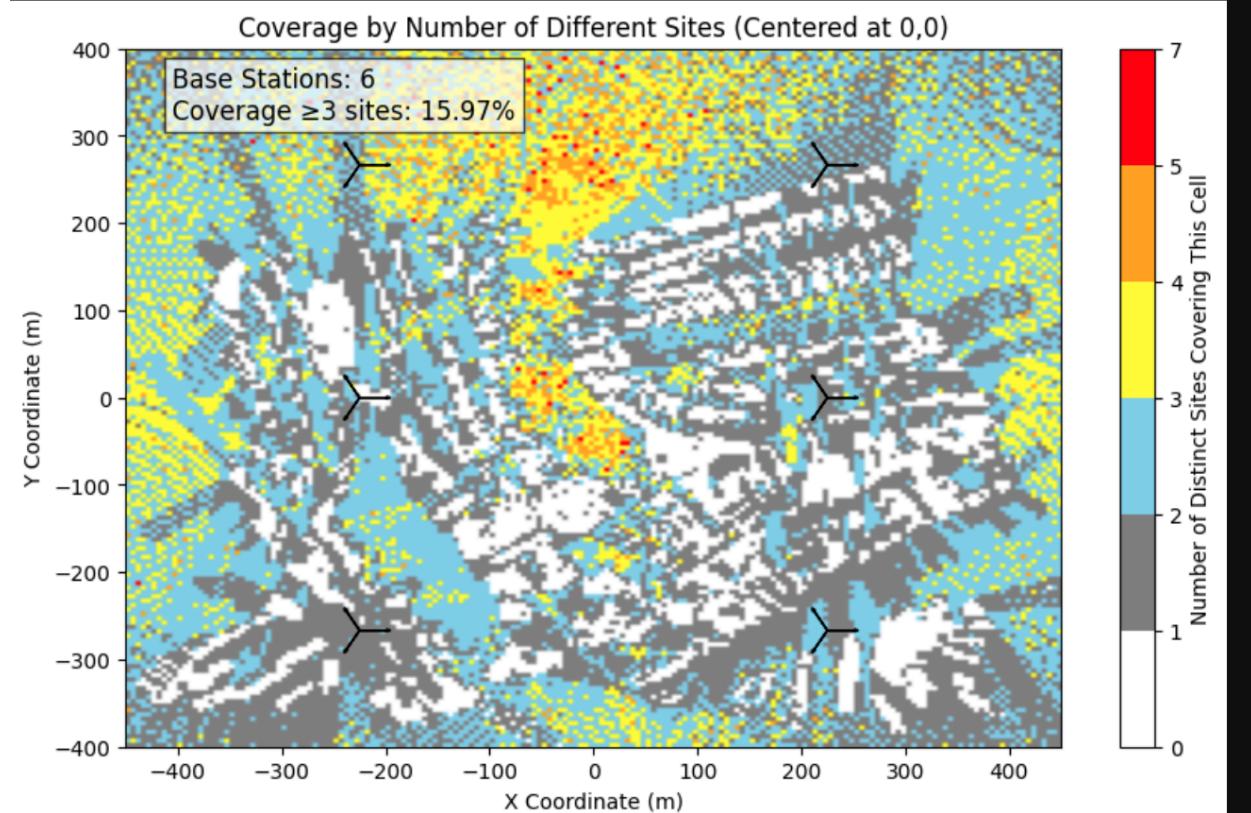


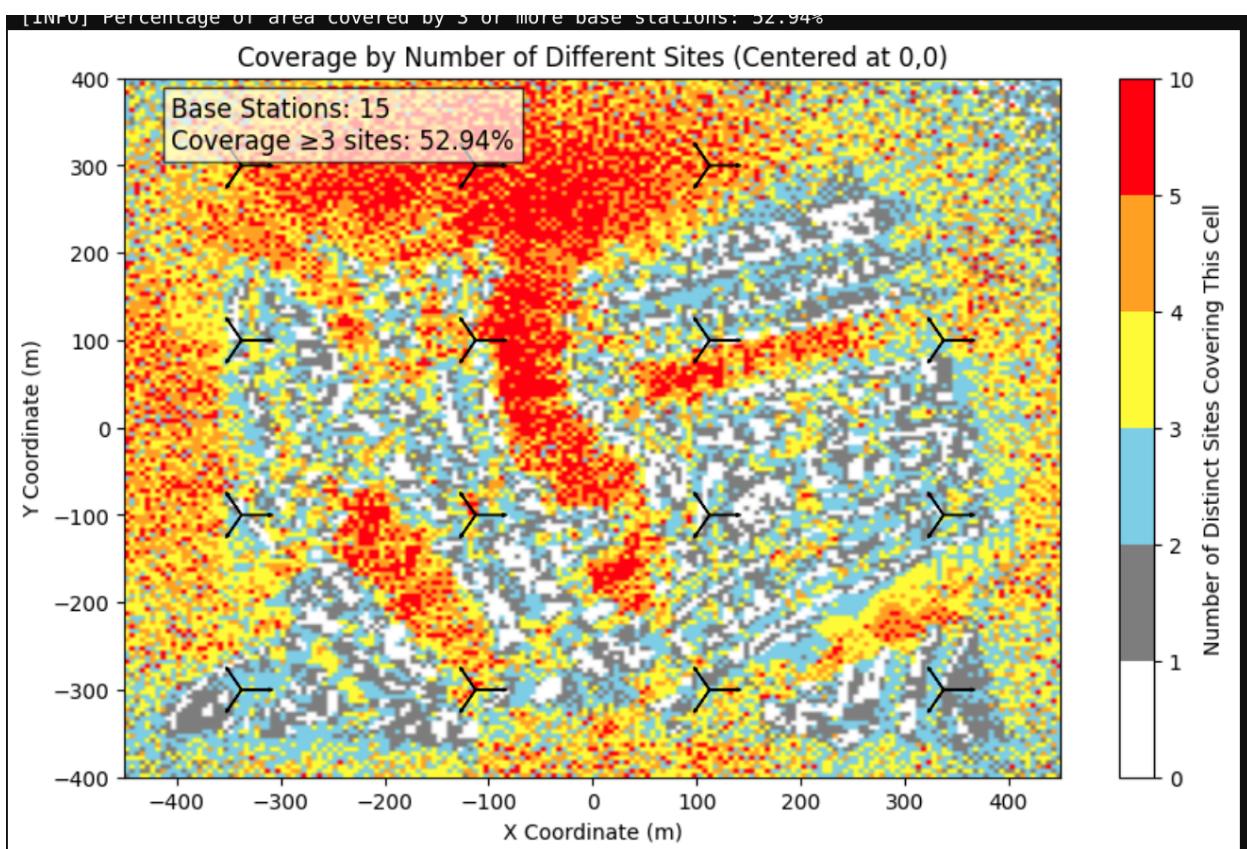
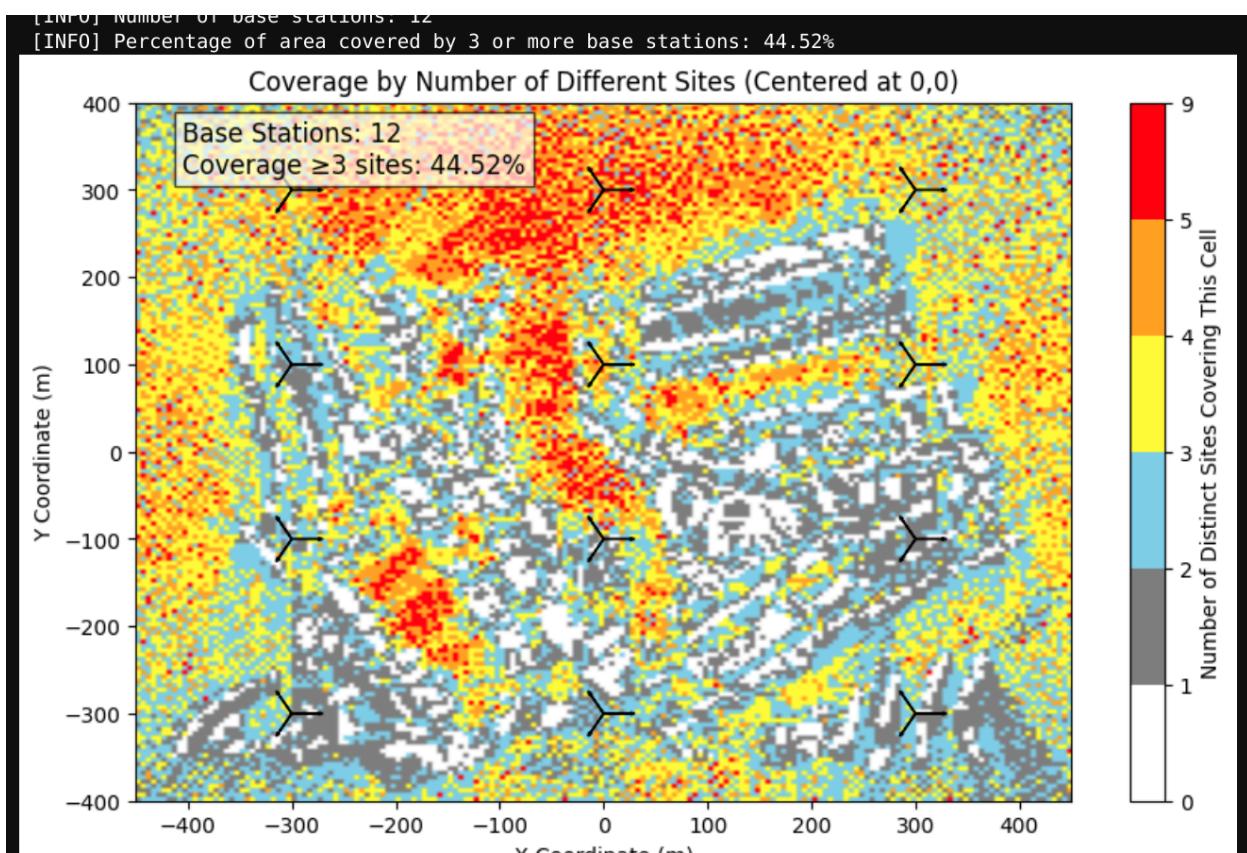
There are not so many places with 3.

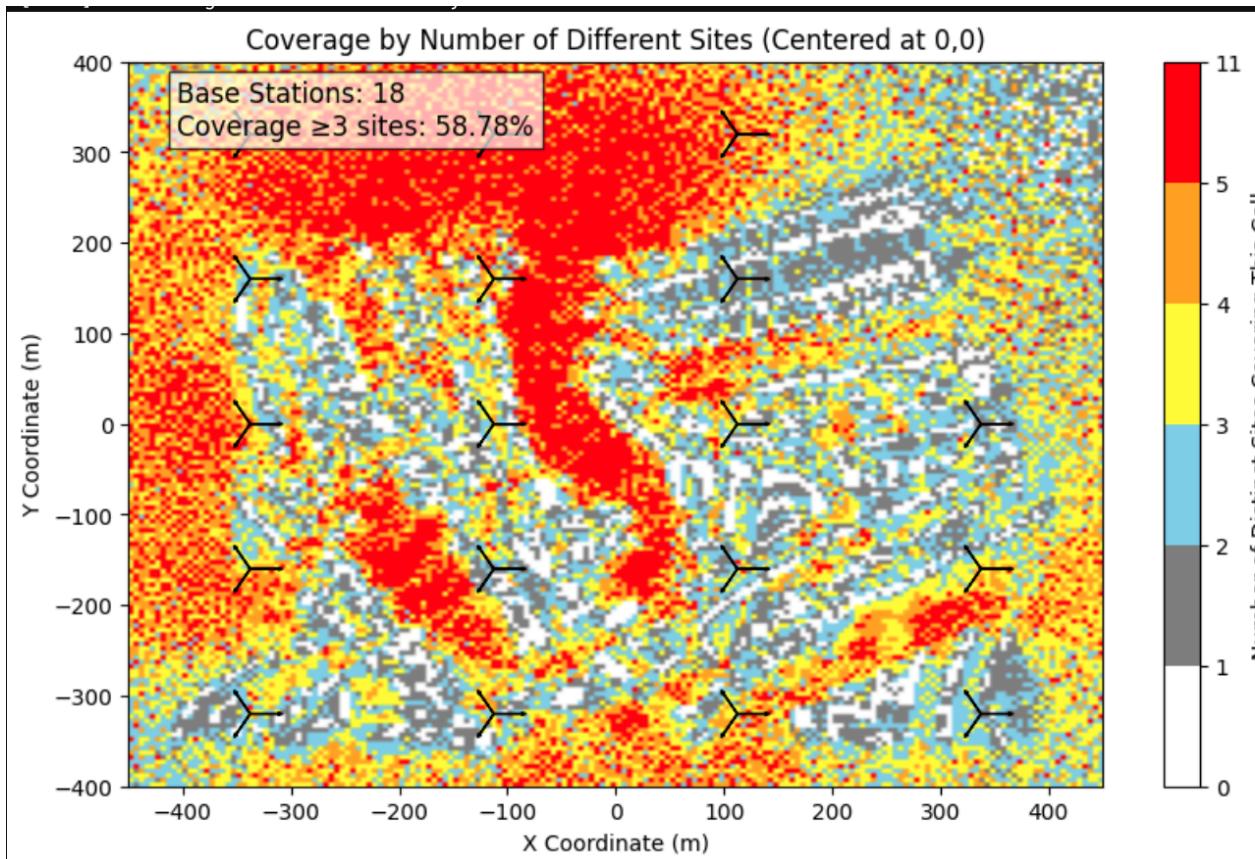
Coverage for positioning

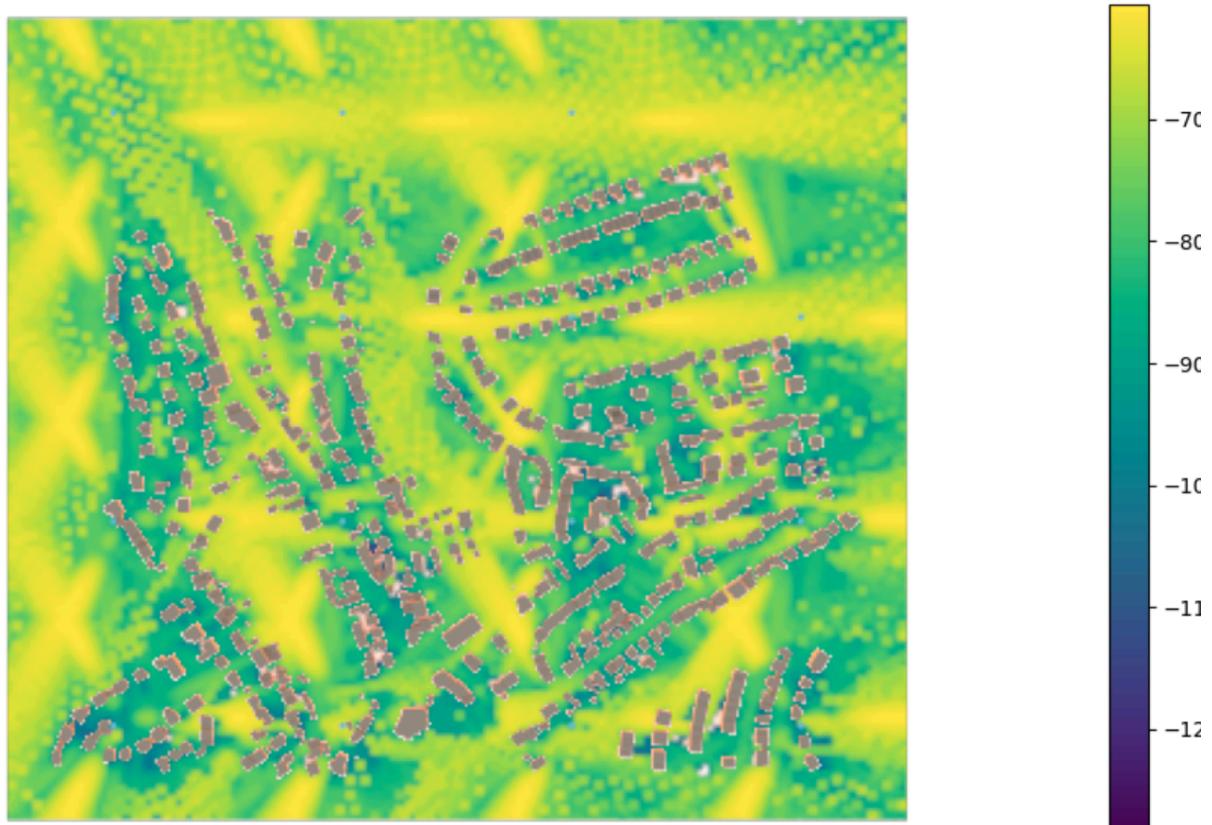
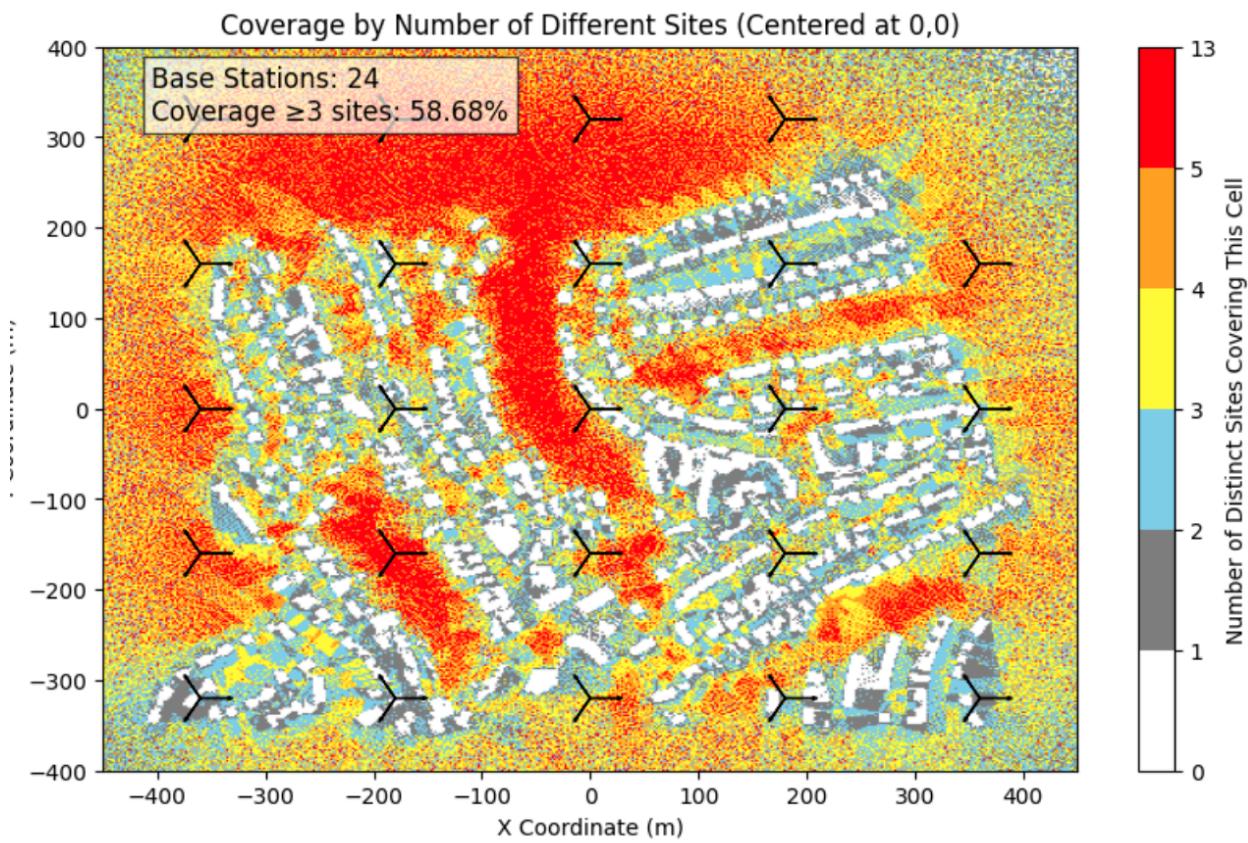
Let's add (by hand, visual evaluation, guess). I decided to distribute equally more base stations.

[INFO] Percentage of area covered by 3 or more base stations: 15.97%









```
scene.preview(show_orientations=True, coverage_map=cmi_tos)
```

