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Report on the 2023 massive MIMO channel measurement campaign

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This document describes the measurement campaign conducted for the article "Resource Allocation and Pairing Techniques in Multi-User Massive MIMO-NOMA". The campaign was executed on the campus of the University of Lille, precisely the Cité Scientifique location in France, in 2023. The measurements were performed using the maMIMOSA (massive Multiple Input Multiple Output Sounder Architecture) channel sounder, the technical specifications of which can be found in references.¹⁻⁴ To summarize, the channel sounder operates at a frequency of 5.89 GHz with a bandwidth of 80 MHz. The data are modulated using orthogonal frequency-division multiplexing (OFDM) with 8192 subcarriers and a subcarrier spacing of 12.21 kHz prior to transmission. A pilot transmission scheme was employed at the Tx antennas to achieve a frequency spacing of 97.66 kHz between consecutive measured subcarriers on a single antenna. The transmitter (Tx) utilized an 8×8 vertical planar patch antenna array, as depicted in Fig. 1. The Tx was placed on a platform in the P4 building of the campus, on the 4th floor at the height of 10m, as shown in Fig. 2.



Figure 1. Tx antenna array

The receiver (Rx) has 8 EM-6116 omnidirectional antennas, as shown in Fig. 3.

It was moved to 325 different positions within a 300 m radius of the Tx, in order to emulate a cell of radius 300 m with randomly deployed mobile users. At each position of the Rx, the channel matrix was measured. The measurements were conducted both indoors and outdoors to obtain a realistic representation of a cell. The locations of all measurement points can be found on the maps provided at the end of this document.



Figure 2. Platform with Tx



Figure 3. Rx antenna array

Indoors, the majority of measurements were conducted in the P3 building, facing the P4 building. The P3 building is a typical office building consisting of four floors with a similar layout: a central corridor and offices on each side. Building plans with the locations of the measurements for each floor are provided. The locations are indicated with the number of the Rx measurement point. The numbering starts at floor 3 and is increased while going down to the ground floor. After the indoor measurements, outdoor measurements were taken at the parking lot and in the vicinity of the building within a radius of 300 m. Some measurements were also taken on

the ground floor of two other buildings, P2 and P7.

Photos of some of the measurement points are included hereafter.

The photo in Fig. 4 was captured for measurement point 145, which is located in an office on the first floor of the P3 building and facing the Tx. This measurement corresponds to a direct line-of-sight scenario.



Figure 4. Photo of the measurement point 145

In Fig. 5, a photograph was obtained at measurement point 212, situated within an office on the ground floor of the P3 building. The image in Fig. 6 was acquired at measurement point 273, located in the vicinity of the P4 building. Additionally, Fig. 7 depicts the location of measurement point 279, and Fig. 8 illustrates measurement point 251, which is situated in the parking lot behind the P3 building. As previously mentioned, the precise positions of all 325 measurement points are detailed at the end of this document.

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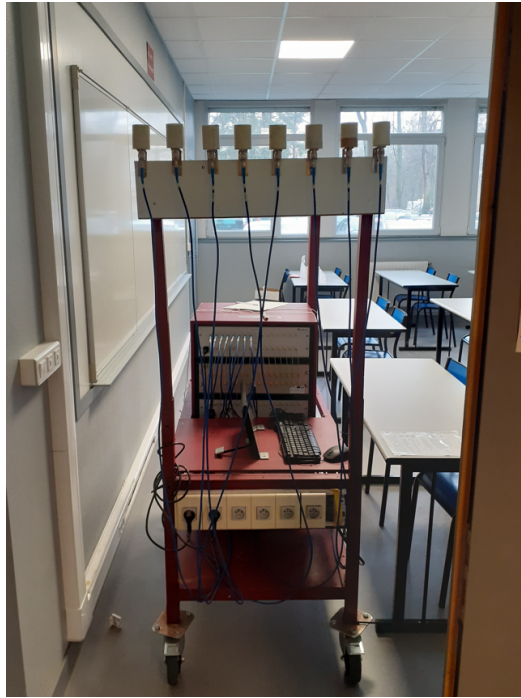


Figure 5. Photo of the measurement point 212



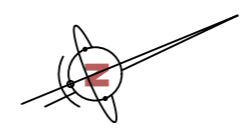
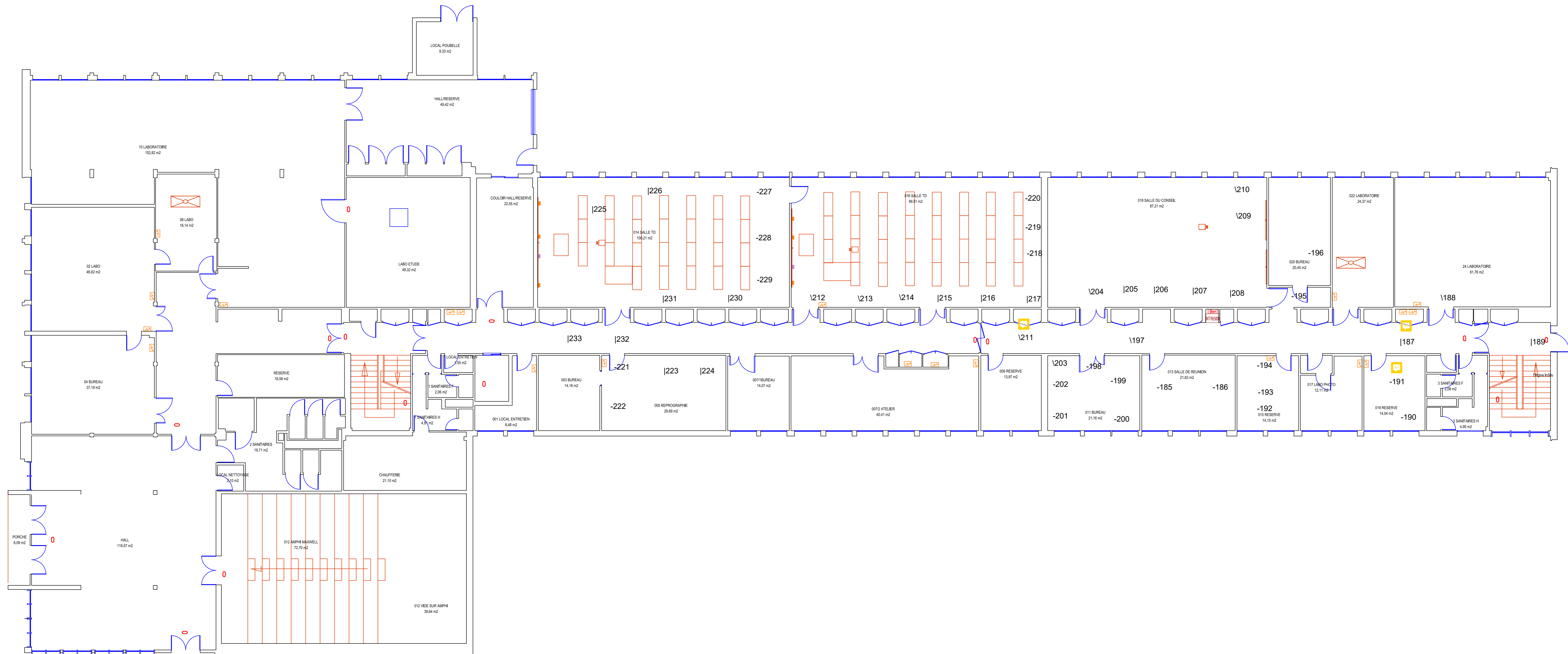
Figure 6. Photo of the measurement point 273



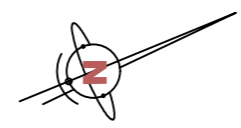
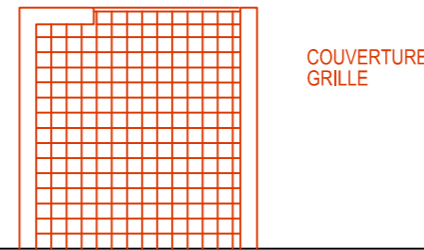
Figure 7. Photo of the measurement point 279



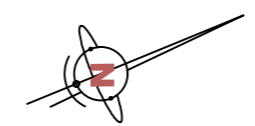
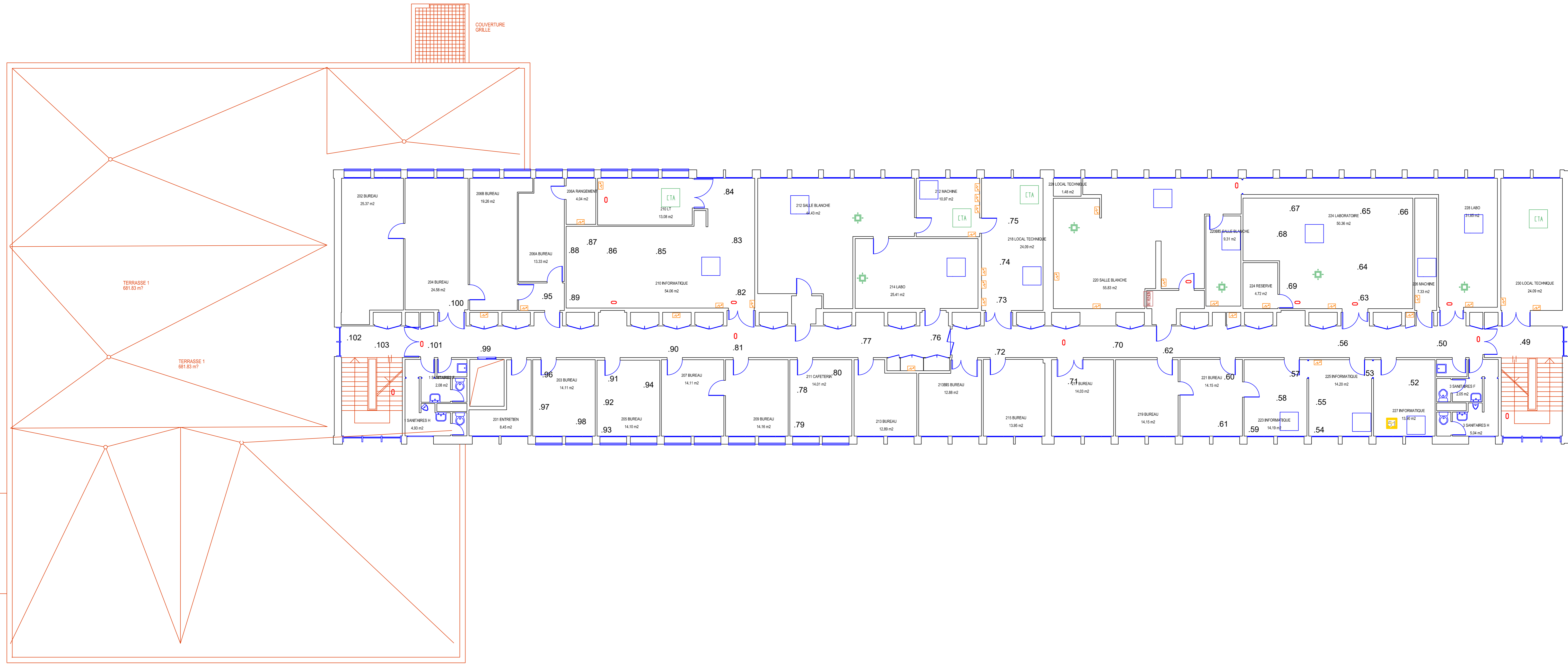
Figure 8. Photo of the measurement point 251



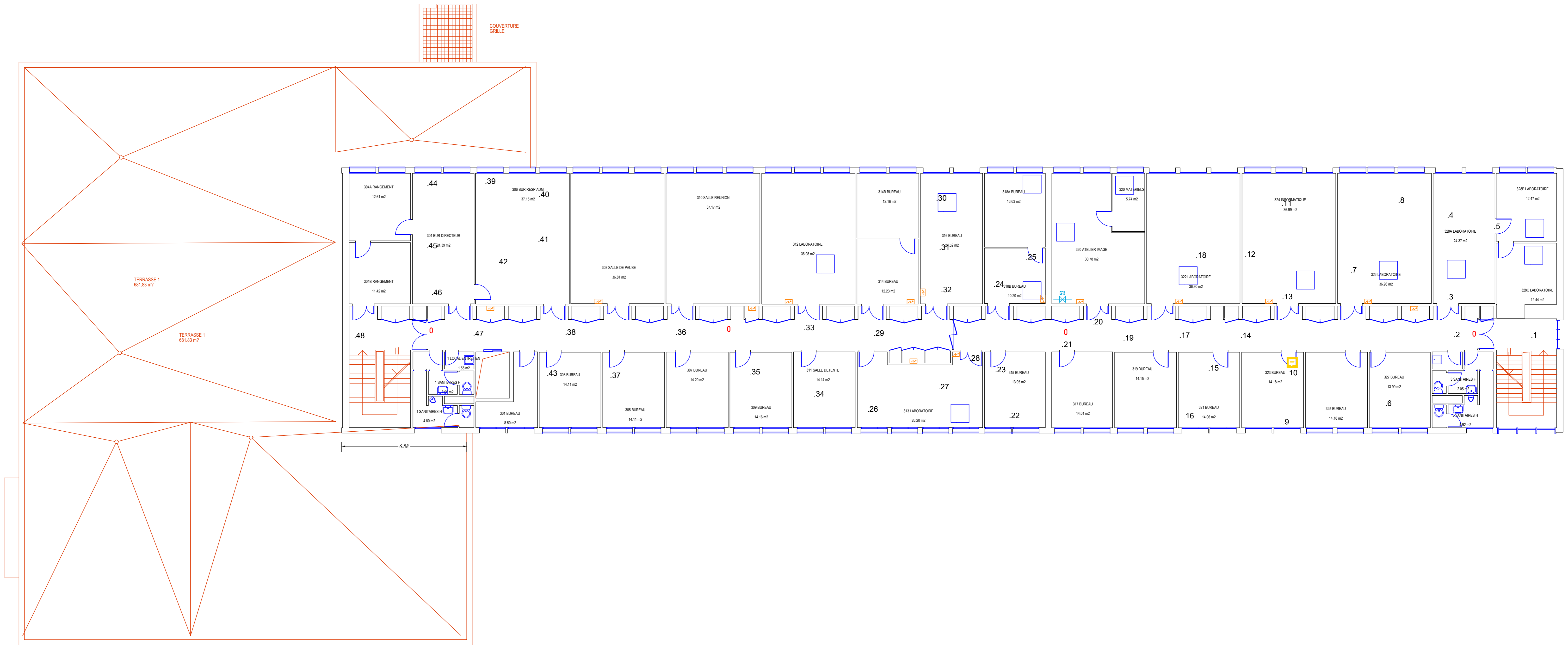
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Université Lille 1 Sciences et technologies Service P.C.E.T Pôle Patrimoine Cité Scientifique 59655 VILLENEUVE D'ASCQ CEDEX Tel: 03 20 43 68 24 Fax: 03 20 33 70 00 Email: matthieu.depin@univ-lille1.fr		



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