



HAL
open science

Report on the massive MIMO channel measurement campaign

Eric Pierre Simon, Joumana Farah, Pierre Laly, Gauthier Delbarre

► **To cite this version:**

Eric Pierre Simon, Joumana Farah, Pierre Laly, Gauthier Delbarre. Report on the massive MIMO channel measurement campaign. [Research Report] université de lille. 2021. hal-03343733

HAL Id: hal-03343733

<https://hal.science/hal-03343733>

Submitted on 14 Sep 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Report on the massive MIMO channel measurement campaign

Eric Pierre Simon^a, Joumana Farah^b, Pierre Laly^a, and Gauthier Delbarre^a

^aUniversity of Lille and IEMN lab, Villeneuve d'Ascq, France. E.P. Simon is also a member of IRCICA. e-mail: eric.simon@univ-lille.fr

^bDepartment of Electricity and Electronics, Faculty of Engineering, Lebanese University, Roumieh, Lebanon. e-mail: joumanafarah@ul.edu.lb

ABSTRACT

This document describes the measurement campaign that was carried out for the article: *A New Gradual Resource Allocation Technique for Massive MIMO-NOMA*. The campaign took place on the campus of the University of Lille, called Cité Scientifique, in France.

Keywords: Massive MIMO, channel, measurements.

1. INTRODUCTION

The measurements were carried out with the maMIMOSA channel sounder, all of the technical details of which can be found in references.¹⁻³

The transmitter (Tx) is equipped with an 8×8 vertical planar patch antenna array, and the receiver (Rx) with a single EM-6116 omni-directional antenna. The Tx is placed on a platform in the P4 building of the campus, on the 4th floor, 10 m high. As for the Rx, it was moved to 650 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 of dimension $N \times M$ is measured, where $N = 1024$ is the number of measured subcarriers, and $M = 64$ is the number of Tx antennas.

The photos in Fig. 1 and 2 illustrate the Tx located on the platform of the P4 building. The photo in Fig. 3 shows the Tx antenna array before installation on the platform.

The photos in Fig. 4 illustrate the Rx.

The measurements were carried out indoors and outdoors, to get the most faithful possible representation of a cell. All the measurement points can be found on the five maps provided at the end of the document.

Indoors, the majority of the measurements (400) are carried out in the P3 building, facing P4 building. It is a typical office building, consisting of 4 floors with a similar configuration: a central corridor and offices on either side of the corridor. The building plan with the locations of the measurements is provided for each floor. The locations are indicated with a dot followed by the number of the Rx measurement points. Numbering starts at floor 3 up to ground floor. After the indoor part, we left the building to take measurements on the parking lot and in the vicinity of the building, within a radius of 300 m. Some measurements were taken on the ground floor of two other buildings, P2 and P7.

In the following, some of the measurement points are illustrated by photos.

The photo in Fig. 5 was taken for the measurement point .28 situated in the corridor of the 3rd floor of P3 building.

The photo in Fig. 6 was taken for the measurement point .286 located in an office of the first floor of P3 building, facing the Tx. This measure corresponds to a direct line of sight.

The photo in Fig. 7 was taken for the measurement point .499 located in the parking lot of P3 building.

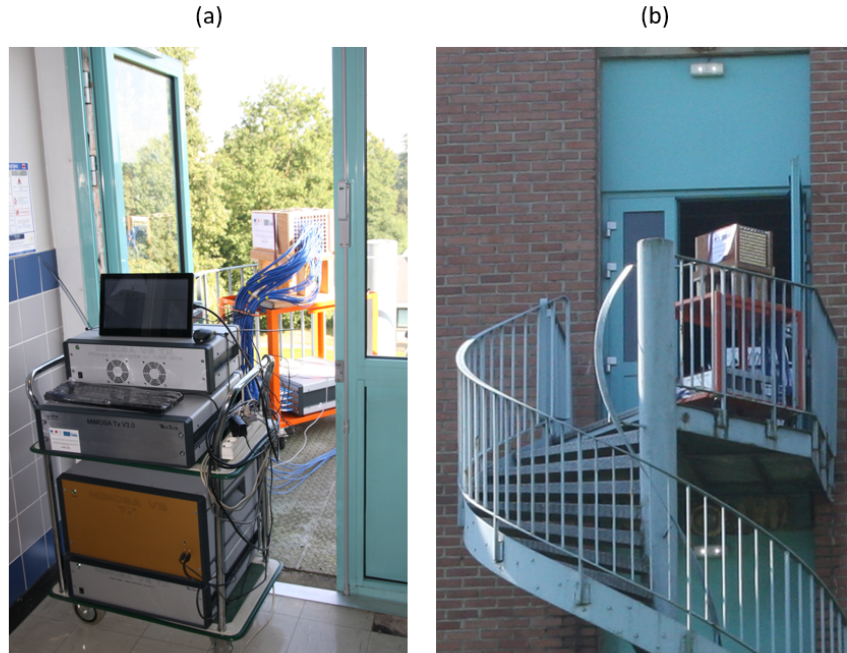


Figure 1. (a) back of Tx, (b) front of Tx

REFERENCES

- [1] Laly, P., Gaillot, D. P., Liénard, M., Degauque, P., Tanghe, E., Joseph, W., and Martens, L., “Flexible real-time MIMO channel sounder for multidimensional polarimetric parameter estimation,” in *[2015 IEEE Conference on Antenna Measurements & Applications (CAMA)]*, 1–3, IEEE (2015).
- [2] Laly, P., Gaillot, D. P., Delbarre, G., Van den Bossche, M., Vermeeren, G., Challita, F., Tanghe, E., Simon, E. P., Joseph, W., Martens, L., et al., “Massive radio channel sounder architecture for 5G mobility scenarios: MaMIMOSA,” in *[14th IEEE European Conference on Antennas and Propagation (EuCAP)]*, 1–5 (2020).
- [3] Gaillot, D., Laly, P., Dahmouni, N., Delbarre, G., Van den Bossche, M., Vermeeren, G., Tanghe, E., Simon, E., Joseph, W., Martens, L., et al., “Measurement of the V2I massive radio channel with the MaMIMOSA sounder in a suburban environment,” in *[2021 15th European Conference on Antennas and Propagation (EuCAP)]*, 1–4, IEEE (2021).



Figure 2. Tx on the P4 building platform



Figure 3. Tx antenna array

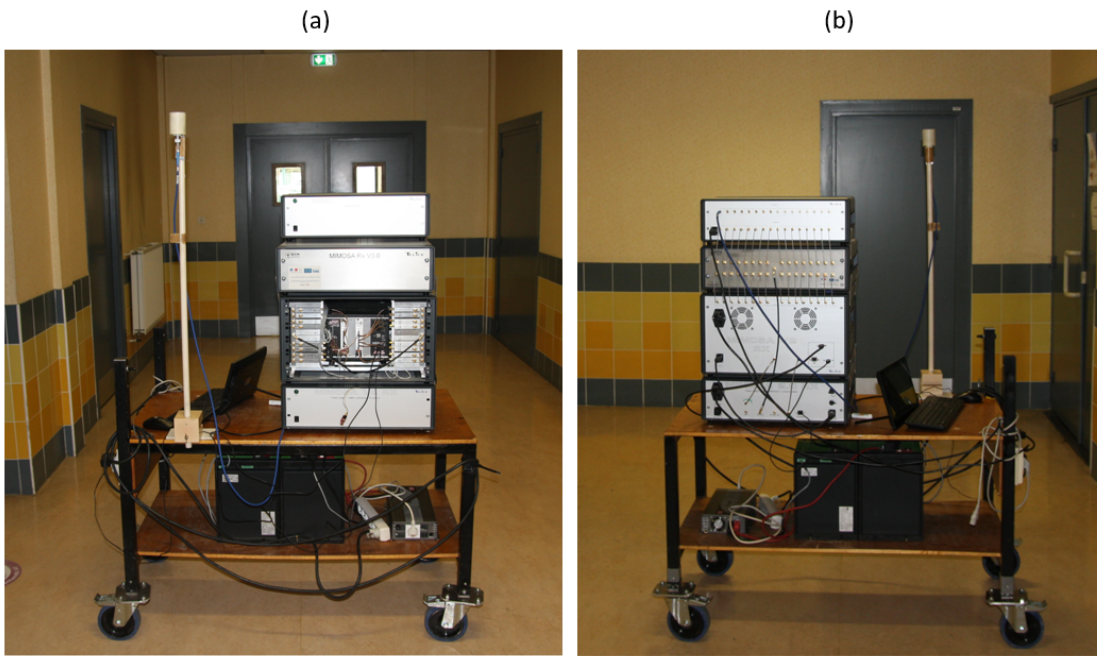


Figure 4. (a) front of Rx, (b) back of Rx



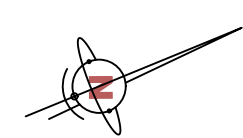
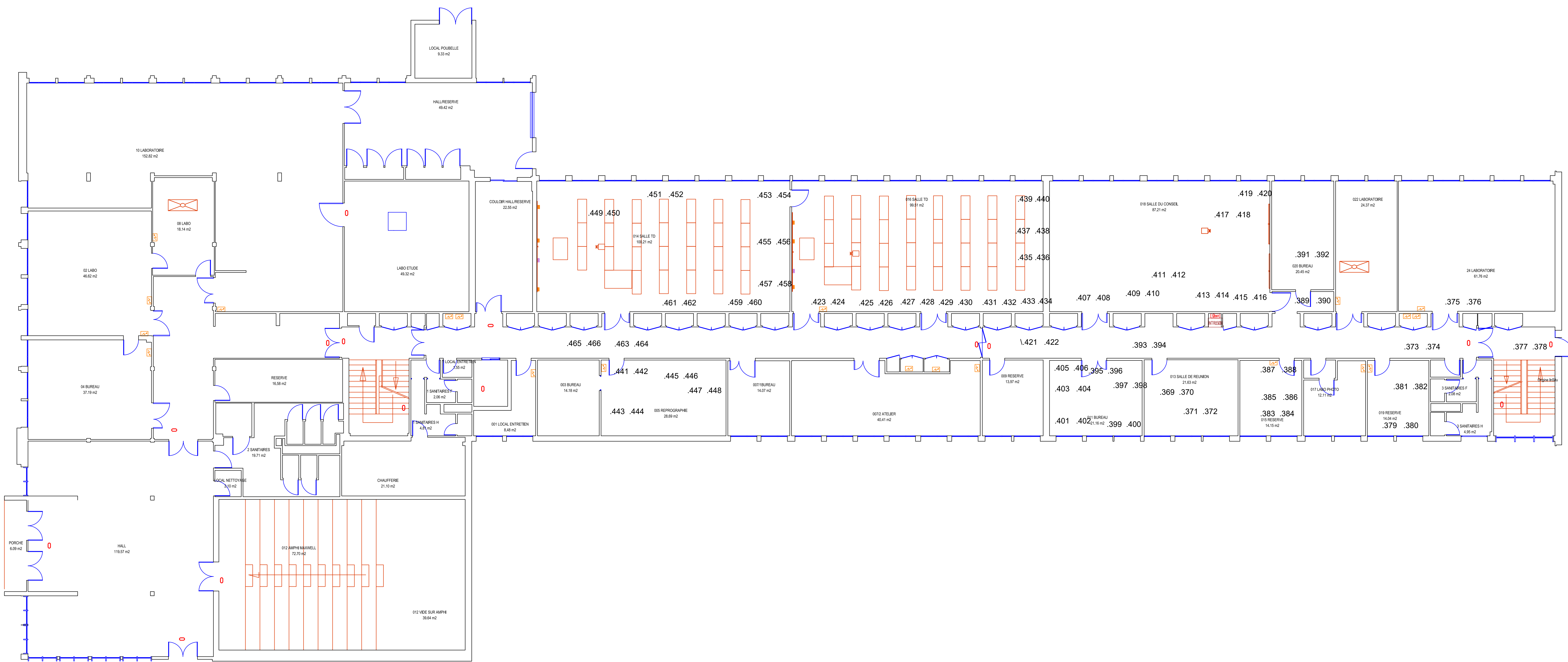
Figure 5. Rx at the measurement point .28



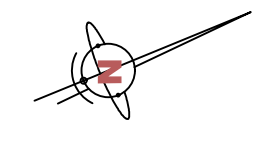
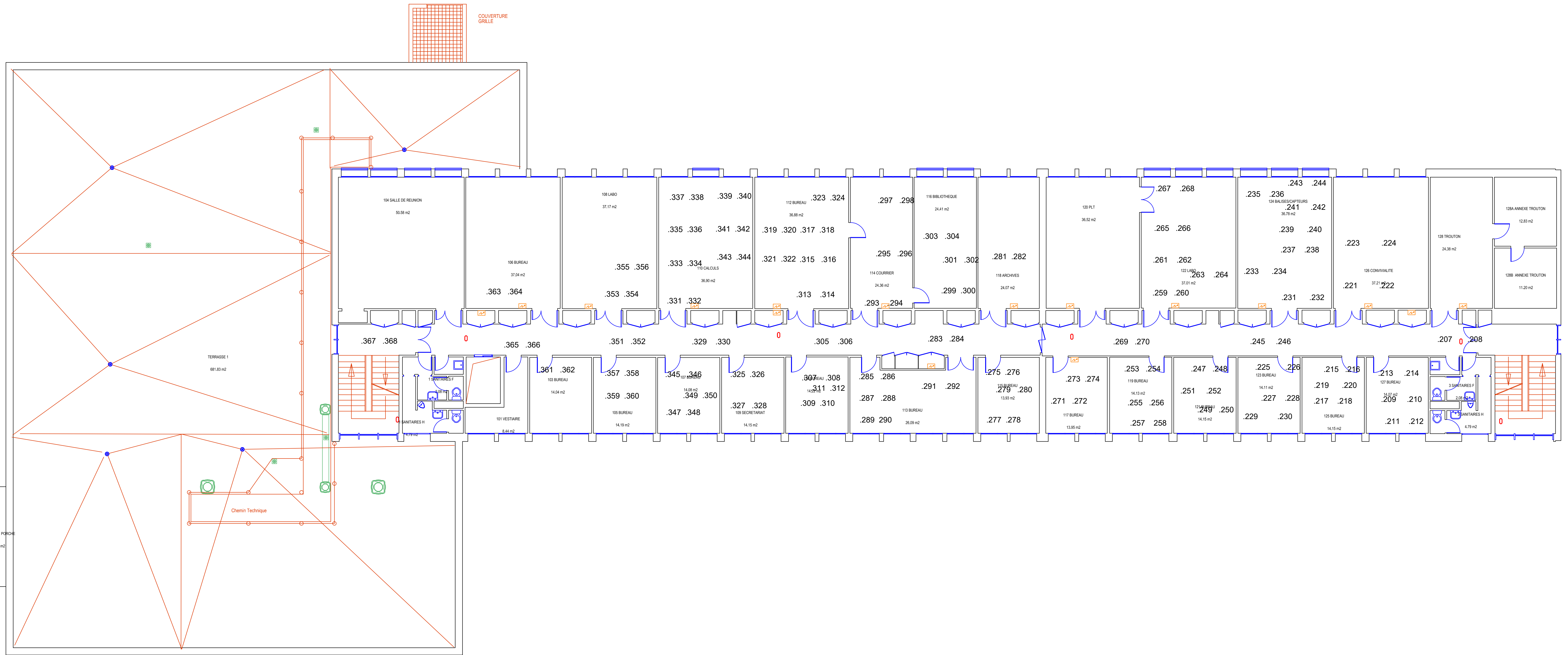
Figure 6. Rx at the measurement point .286



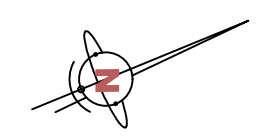
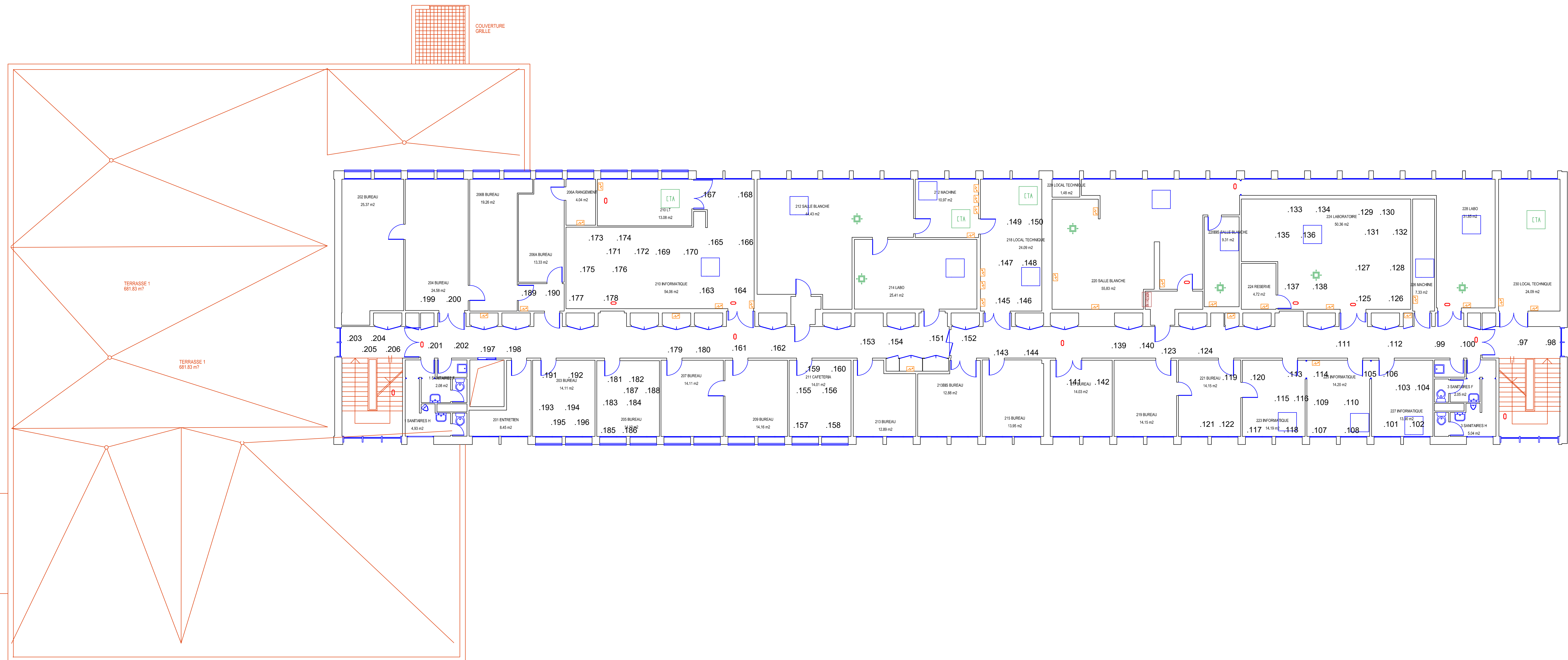
Figure 7. Rx at the measurement point .499



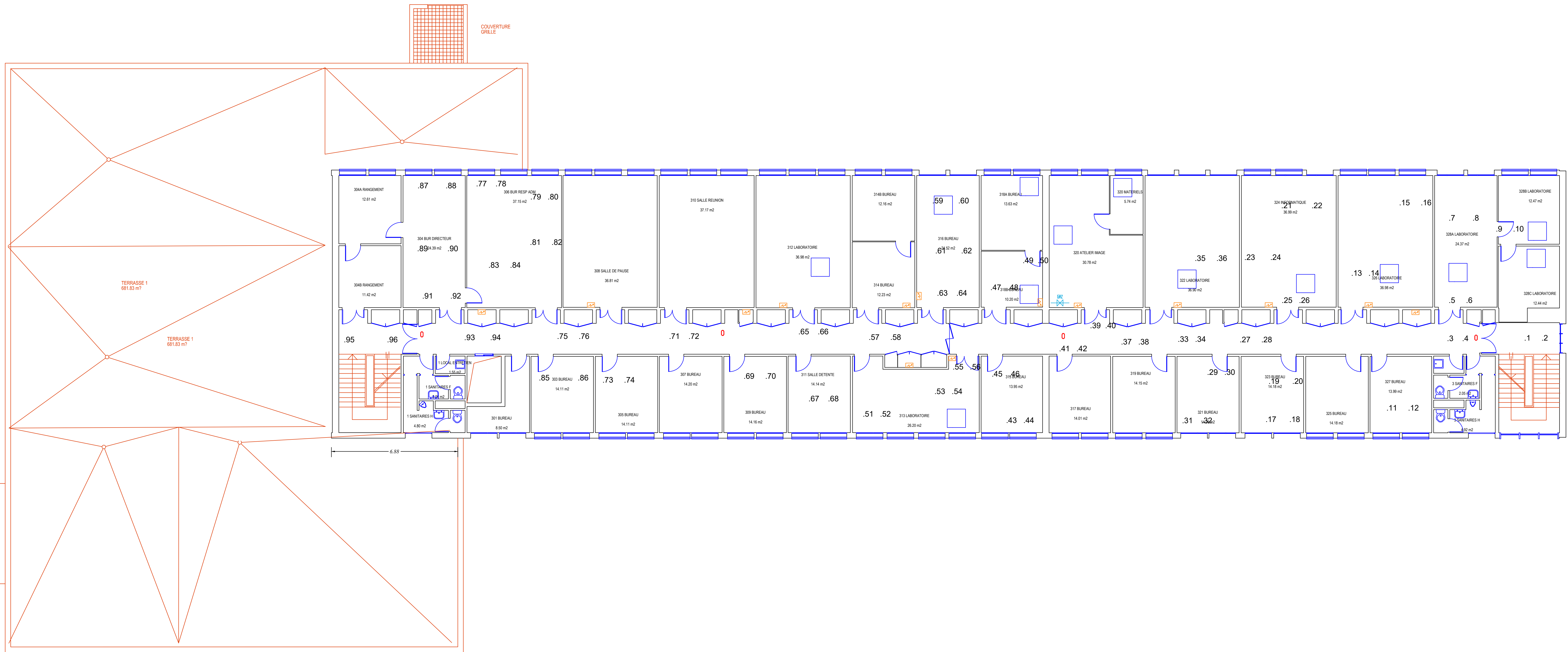
P3		
	Echelle: 1/100ème Nom Fichier: CCS047 - P3 Bâtiment: P3	Date Impression: 06/09/2018 UNIVERSITE LILLE 1 Sciences et Technologies Cité Scientifique 59655 VILLENEUVE D'ASQ
Plan Numéro 10730		PLAN DE RDC
Université Lille1 Sciences et technologies Service P.C.E.T Pôle Patrimoine Cité Scientifique 59655 VILLENEUVE D'ASQ CEDEX Tél: 03 20 43 68 24 Fax: 03 20 33 70 00 Email: matthieu.depin@univ-lille1.fr		



P3		
Université de Lille	Échelle: 1/100ème	Université de Lille
Nom Fichier: CCS047 - P3	Date Impression: 10/07/2018	
Bâtiment: P3 UNIVERSITÉ LILLE 1 Sciences et Technologies Cité Scientifique 59655 VILLENEUVE D'ASQ		
Plan Numéro	PLAN DE 1ER ETAGE	
10731		
<small>Université Lille1 Sciences et technologies Service P.C.E.T Pôle Patrimoine Cité Scientifique 59655 VILLENEUVE D'ASQ CEDEX Tel: 03 20 43 68 24 Fax: 03 20 33 70 00 Email: matthieu.depin@univ-lille.fr</small>		



P3		
	Échelle: 1/100ème	Date Impression: 10/07/2018
Nom Fichier: CCS047 - P3 Bâtiment: P3 UNIVERSITÉ LILLE 1 Sciences et Technologies Cité Scientifique 59655 VILLENEUVE D'ASCQ		
Plan Numéro	PLAN DE 2EME ETAGE	
10732		
Université Lille1 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-lille.fr		



P3		
	Échelle: 1/100ème	Date Impression: 10/07/2018
Nom Fichier: CCS047 - P3		Bâtiment: P3
UNIVERSITÉ LILLE 1 Sciences et Technologies Cité Scientifique 59655 VILLENEUVE D'ASCQ		
Plan Numéro		PLAN DE
10733		3EME ETAGE
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: mathieu.depin@univ-lille.fr		

