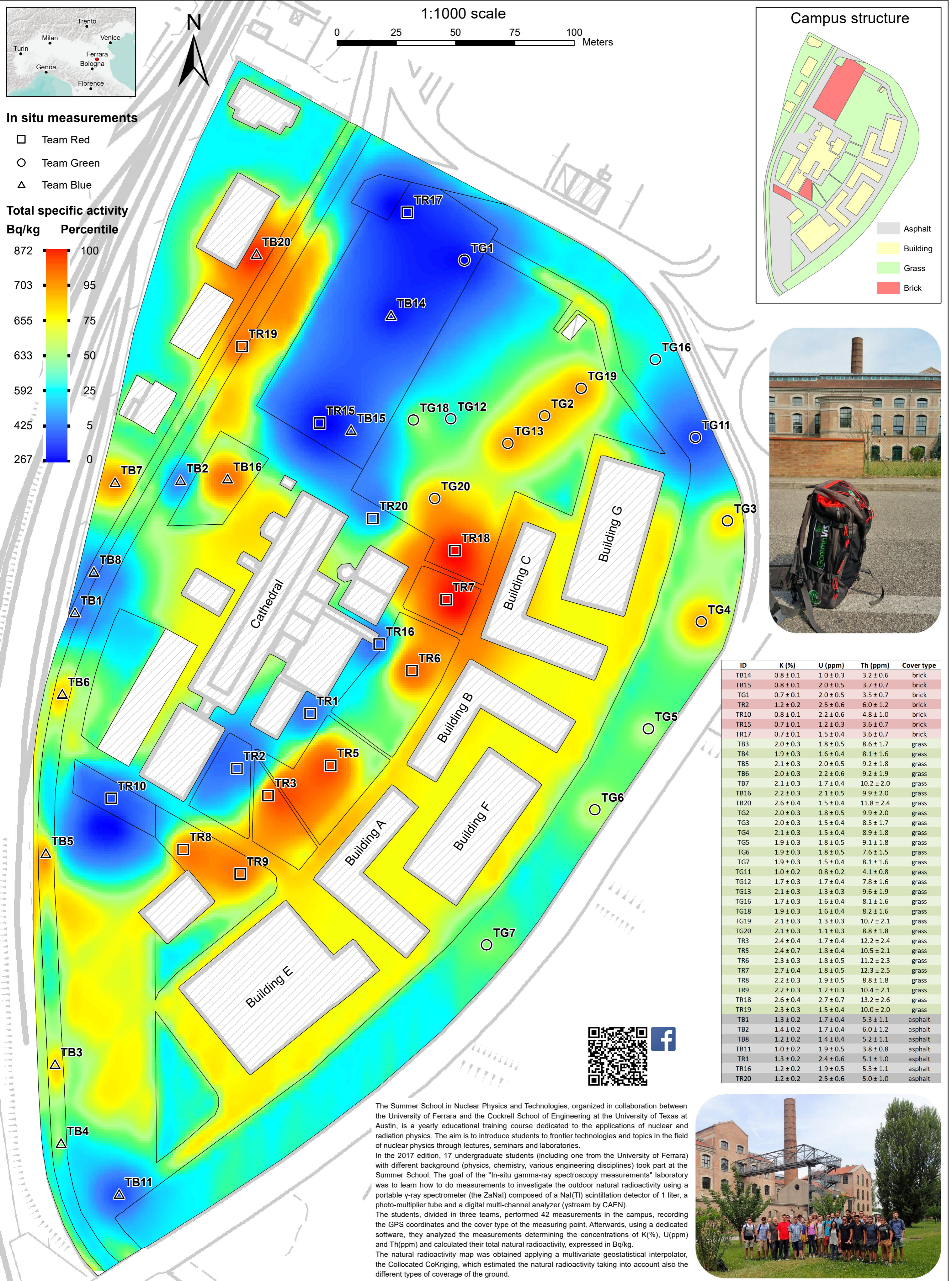


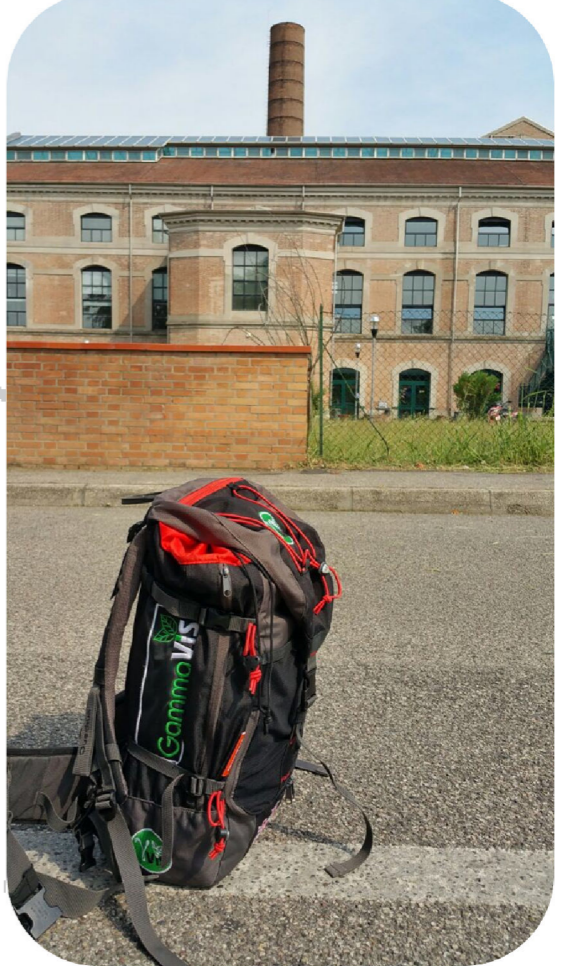
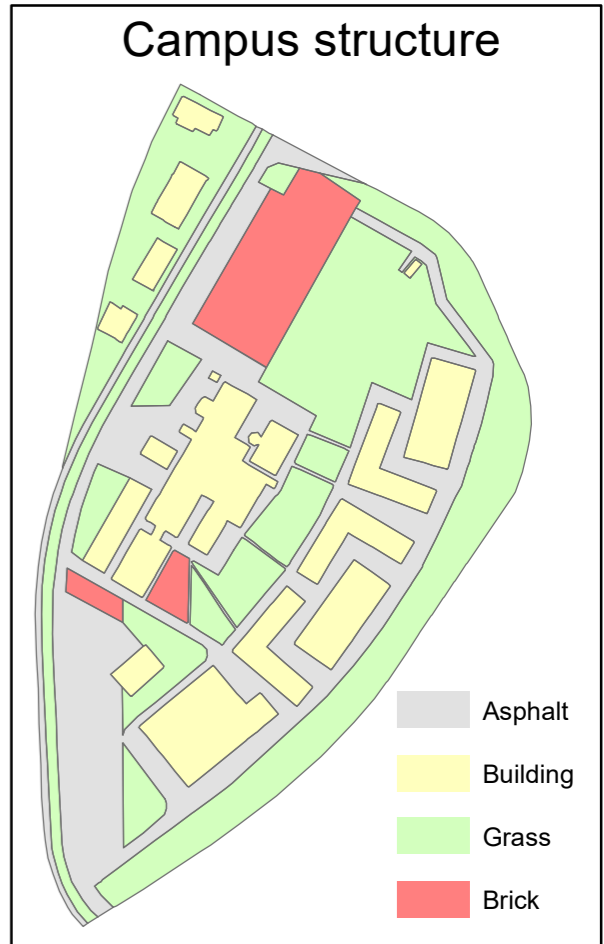
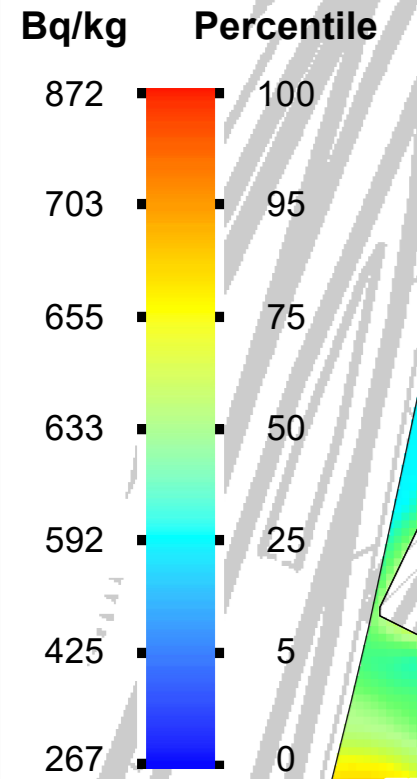
Matteo Albèri, Blake Anderson, Marica Baldoncini, Brianna Sue Barth, Carlo Bottardi, Enrico Chiarelli, Narayan Manish Desai, Conner William Dimoush, Brandon Michael Estrada, Kevin A. Horstmeyer, Gabriel Dj Ko, Sheldon Landsberger, Madeline Lincoln, Fabio Mantovani, Samantha Jean Morey, Daniel Andres Nieto, Henykumari Patel, Ray Earnest IV Pool, Francesco Poppi, Cassandra Giulia Cristina Raptis, Mitchell James Sommer, Jacob Aaron Stehsel, Virginia Strati, Austen Daniel Tkel, Anthony Ryan Whittemore, Collin Wood.



In situ measurements

- Team Red
- Team Green
- △ Team Blue

Total specific activity



ID	K (%)	U (ppm)	Th (ppm)	Cover type
TB14	0.8 ± 0.1	1.0 ± 0.3	3.2 ± 0.6	brick
TB15	0.8 ± 0.1	2.0 ± 0.5	3.7 ± 0.7	brick
TG1	0.7 ± 0.1	2.0 ± 0.5	3.5 ± 0.7	brick
TR2	1.2 ± 0.2	2.5 ± 0.6	6.0 ± 1.2	brick
TR10	0.8 ± 0.1	2.2 ± 0.6	4.8 ± 1.0	brick
TR15	0.7 ± 0.1	1.2 ± 0.3	3.6 ± 0.7	brick
TR17	0.7 ± 0.1	1.5 ± 0.4	3.6 ± 0.7	brick
TB3	2.0 ± 0.3	1.8 ± 0.5	8.6 ± 1.7	grass
TB4	1.9 ± 0.3	1.6 ± 0.4	8.1 ± 1.6	grass
TB5	2.1 ± 0.3	2.0 ± 0.5	9.2 ± 1.8	grass
TB6	2.0 ± 0.3	2.2 ± 0.6	9.2 ± 1.9	grass
TB7	2.1 ± 0.3	1.7 ± 0.4	10.2 ± 2.0	grass
TB16	2.2 ± 0.3	2.1 ± 0.5	9.9 ± 2.0	grass
TB20	2.6 ± 0.4	1.5 ± 0.4	11.8 ± 2.4	grass
TG2	2.0 ± 0.3	1.8 ± 0.5	9.9 ± 2.0	grass
TG3	2.0 ± 0.3	1.5 ± 0.4	8.5 ± 1.7	grass
TG4	2.1 ± 0.3	1.5 ± 0.4	8.9 ± 1.8	grass
TG5	1.9 ± 0.3	1.8 ± 0.5	9.1 ± 1.8	grass
TG6	1.9 ± 0.3	1.8 ± 0.5	7.6 ± 1.5	grass
TG7	1.9 ± 0.3	1.5 ± 0.4	8.1 ± 1.6	grass
TG11	1.0 ± 0.2	0.8 ± 0.2	4.1 ± 0.8	grass
TG12	1.7 ± 0.3	1.7 ± 0.4	7.8 ± 1.6	grass
TG13	2.1 ± 0.3	1.3 ± 0.3	9.6 ± 1.9	grass
TG16	1.7 ± 0.3	1.6 ± 0.4	8.1 ± 1.6	grass
TG18	1.9 ± 0.3	1.6 ± 0.4	8.2 ± 1.6	grass
TG19	2.1 ± 0.3	1.3 ± 0.3	10.7 ± 2.1	grass
TG20	2.1 ± 0.3	1.1 ± 0.3	8.8 ± 1.8	grass
TR3	2.4 ± 0.4	1.7 ± 0.4	12.2 ± 2.4	grass
TR5	2.4 ± 0.7	1.8 ± 0.4	10.5 ± 2.1	grass
TR6	2.3 ± 0.3	1.8 ± 0.5	11.2 ± 2.3	grass
TR7	2.7 ± 0.4	1.8 ± 0.5	12.3 ± 2.5	grass
TR8	2.2 ± 0.3	1.9 ± 0.5	8.8 ± 1.8	grass
TR9	2.2 ± 0.3	1.2 ± 0.3	10.4 ± 2.1	grass
TR18	2.6 ± 0.4	2.7 ± 0.7	13.2 ± 2.6	grass
TR19	2.3 ± 0.3	1.5 ± 0.4	10.0 ± 2.0	grass
TB1	1.3 ± 0.2	1.7 ± 0.4	5.3 ± 1.1	asphalt
TB2	1.4 ± 0.2	1.7 ± 0.4	6.0 ± 1.2	asphalt
TB8	1.2 ± 0.2	1.4 ± 0.4	5.2 ± 1.1	asphalt
TB11	1.0 ± 0.2	1.9 ± 0.5	3.8 ± 0.8	asphalt
TR1	1.3 ± 0.2	2.4 ± 0.6	5.1 ± 1.0	asphalt
TR16	1.2 ± 0.2	1.9 ± 0.5	5.3 ± 1.1	asphalt
TR20	1.2 ± 0.2	2.5 ± 0.6	5.0 ± 1.0	asphalt

The Summer School in Nuclear Physics and Technologies, organized in collaboration between the University of Ferrara and the Cockrell School of Engineering at the University of Texas at Austin, is a yearly educational training course dedicated to the applications of nuclear and radiation physics. The aim is to introduce students to frontier technologies and topics in the field of nuclear physics through lectures, seminars and laboratories.

In the 2017 edition, 17 undergraduate students (including one from the University of Ferrara) with different background (physics, chemistry, various engineering disciplines) took part at the Summer School. The goal of the "In-situ gamma-ray spectroscopy measurements" laboratory was to learn how to do measurements to investigate the outdoor natural radioactivity using a portable γ -ray spectrometer (the $ZnNaI$) composed of a $NaI(Tl)$ scintillation detector of 1 liter, a photo-multiplier tube and a digital multi-channel analyzer (ystream by CAEN).

The students, divided in three teams, performed 42 measurements in the campus, recording the GPS coordinates and the cover type of the measuring point. Afterwards, using a dedicated software, they analyzed the measurements determining the concentrations of $K(\%)$, $U(ppm)$ and $Th(ppm)$ and calculated their total natural radioactivity, expressed in Bq/kg .

The natural radioactivity map was obtained applying a multivariate geostatistical interpolator, the Collocated CoKriging, which estimated the natural radioactivity taking into account also the different types of coverage of the ground.

