Radiocarbon dating of iron and the chronology of ancient monumental architecture

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The time scale covered by the Radiocarbon dating method is particularly well suited to study the development of the human cultures through the dating of artefacts discovered in archaeological sites or monuments. For years, organic remains like charcoal, wood, seeds or bones were chosen mainly because of their rich carbon content. With the development of Accelerator Mass Spectrometers that reduced dramatically the quantity of sample needed (1 mg to 10 µg of carbon), radiocarbon laboratories could consider more complex materials. It is the case of iron that constitutes an important witness of ancient societies for 3000 years.

At least until the 19th century, the charcoal was used to reduce iron ore into metal. During the reduction process, the carbon present in the charcoal diffuses into the metal of the ferrous alloys. It is therefore possible by radiocarbon dating to date the ferrous archaeological objects.
We present here the original methodology developed by the LMC14 and the LAPA to reliably radiocarbon date ferrous alloys. Through two studies carried on architectural iron objects sampled in French gothic cathedrals and Angkorian monuments, we show the effectiveness of radiocarbon dating of iron when it is combined with a full archaeometric study of the objects.