

Bonn  
October 20  
(Year not written in letter.)

Dear Bill,

Thanks for your letter. I was glad to see that that business worked out. Could I make a small remark about the conductor. If you don't mind I would like to use the notation of my notes on the Artin  $L$ -functions. For an equivalence class  $\omega$  of representations of the Weil group of a non-archimedean local field  $F$  one has

$$\epsilon(s, \omega, \psi_F) = a(\omega) |\varpi_F|^{m(\omega) + (\dim \omega)n(\psi_F)} s$$

where  $a(\omega)$  is independent of  $s$  and

$$\mathfrak{P}_F^{m(\omega)}$$

is the Artin conductor of  $\omega$ . For a representation of  $\mathrm{GL}(2, F)$  one has

$$\epsilon(s, \pi, \psi_F) = a(\pi) |\varpi_F|^{m(\pi) + 2n(\psi_F)} s$$

In this case one should take  $\mathfrak{P}_F^{m(\pi)}$  as the conductor of  $\pi$ . This definition probably agrees with yours but I think it is more natural. For quaternion algebras it is not quite the usual normal conductor.

Thanks also for your old letter. Various things you mentioned there are probably now cleared up. Namely you should have got the preprints you asked for. Also in the meantime I received a letter from Kayk which you probably also received (at least your name was on the list) announcing plans for the conference you had in mind.

What's the state of the quaternion algebras? I am going to try to have a seminar here on Shimura's stuff. Very beautiful things are there as you of course know but oh so complicated and with so many unanswered questions.

The best of luck,  
Bob Langlands

Compiled on December 22, 2023.