Another important combustion characteristic analyzed was the duration of the initial and the main stages of combustion process. Considered as the main duration of combustion, measured in crank angle degrees, being the difference between the angle where 90% of the total mass fraction was burned (CA90) and the angle where 5% of the total mass fraction was burned (CA05), is presented in the Fig. 3. In addition, the duration of initial stage of combustion was calculated from the ECU ignition command signal (spark advance) to the angle where 5% of the total mass fraction was burned (CA05). This duration contains few initial steps which have an important effect on the duration of the main combustion. The trends obtained for different spark timings and different λ values are presented in Fig.4.

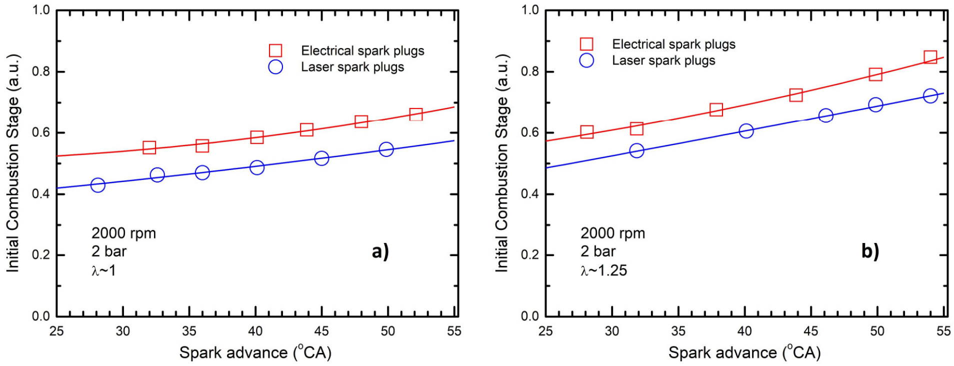

Fig. 4. Duration of the initial stage of combustion versus spark advance for 2000 rpm speed, BMEP= 2 bar for **a)** air-fuel ratio λ~1.0. **b)** air-fuel ratio λ~1.25.

4. Conclusions

Some conclusions can be addressed based on the preliminary results that were obtained in this study:

1. A significant improvement in fuel efficiency conversion by 5% for stoichiometric mixture, λ~1 and by 21% for lean mixtures at λ~1.25 was achieved at low speed and light load;
2. A better stability in engine operation condition expressed by a reduction of COV_{IMEP} by 44% for λ~1 and by 25% for λ~1.25;
3. These results registered for optimum spark timings are correlated with 17% reduction of initial combustion stage duration for λ~1 and with 12% for lean mixture at λ~1.25;
4. Similar reductions were registered also for the main combustion stage duration by 15% for λ~1 and by 21% for lean mixture λ~1.25 emphasizing the major influence exercised on combustion by the initial formation and development of the flame kernel.

At this stage of the study further analysis is necessary in order to discuss on a clear trend regarding emissions. Results will be presented at the conference time.

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