UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

INSTITUTO DE PESQUISAS HIDRÁULICAS

Internal Report

Detailing the performance of hydro PV hybrid systems with incomplete energetic complementarity: case studies with κ = 0.975 and κ_t = 0.975

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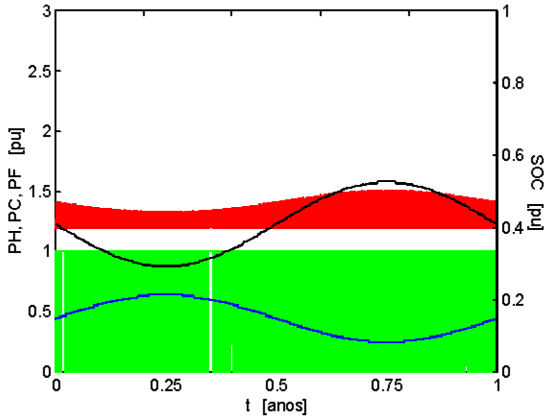
Porto Alegre, May 23, 2014.

CONTENTS

PRESENTATION

This report presents the results of computational simulation of hybrid systems based on PV and hydroelectric energy, as part of the doctoral thesis of the first author. The results were also used to build some graphics used in papers submitted to the journal Renewable Energy, Elsevier.



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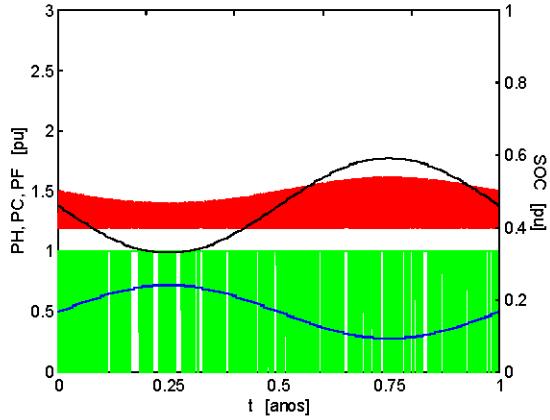

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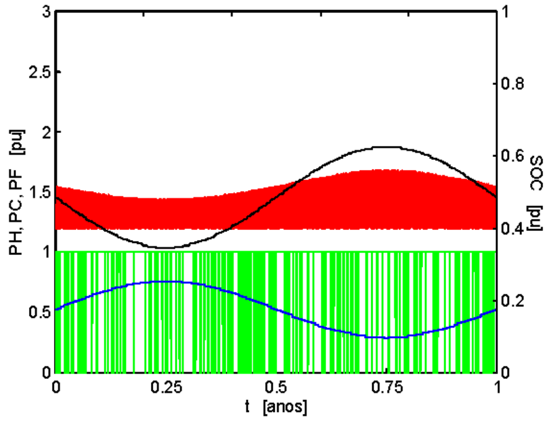

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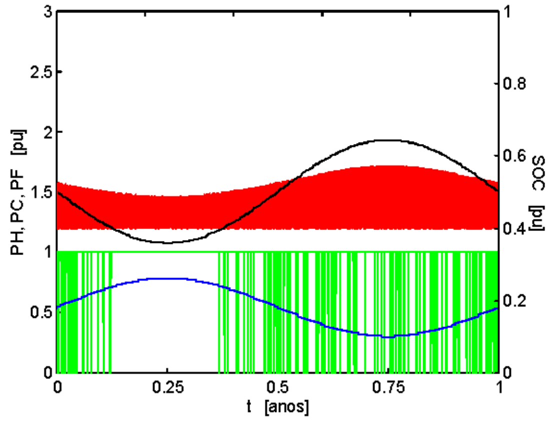

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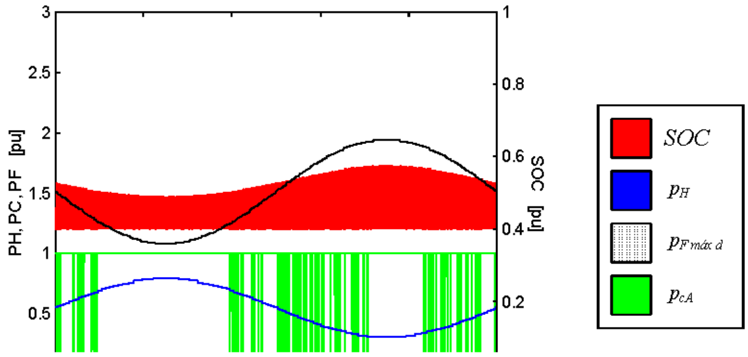

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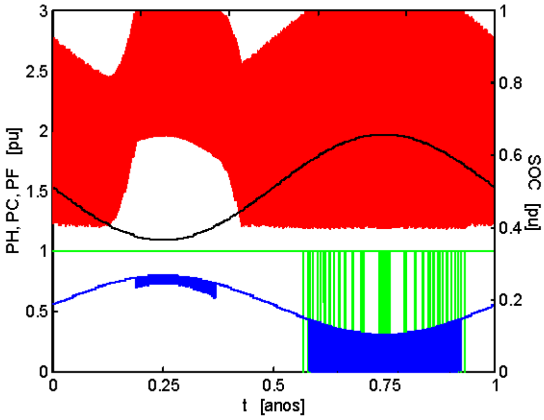
FIGURE 1. Effects of different proportions between energy available for consumption and energy demanded by loads (p_{dd}) on the performance of a system with κ_t=1,00, κ_e=1,00 [p_{sh}=1,00], κ_a=1,00 [p_{Mm}=1,00, df=1,1496, dh=df], κ=1,00, with $p_{he\,máx}$=$p_{c\,máx}$, with bank of batteries with capacity for 2 days, with discharge until 40% and charge until 100% of maximum capacity, without water reservoir and with constant load demand profile. Proportions: (1) p_{dd}=0,8000, a_f=19,69, (2) p_{dd}=0,9000, a_f=22,15, (3) p_{dd}=0,9500, a_f=23,38, (4) p_{dd}=0,9800, a_f=24,12 and (5) p_{dd}=0,9850, a_f=24,25. Conventions: SOC: state of charge of the batteries, p_H: power made available by the hydro generator set, $p_{F\,máx\,d}$: maximum daily power made available by the PV generator set, p_{cA}: power delivered to the loads.



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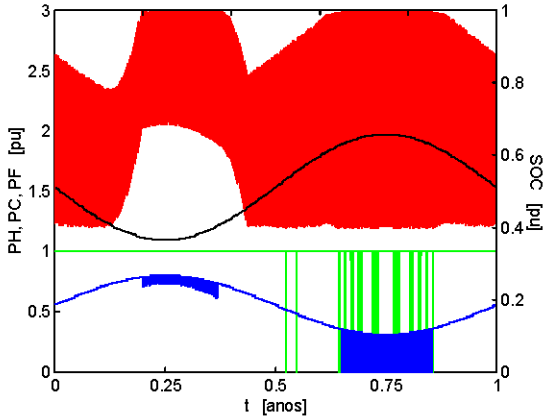

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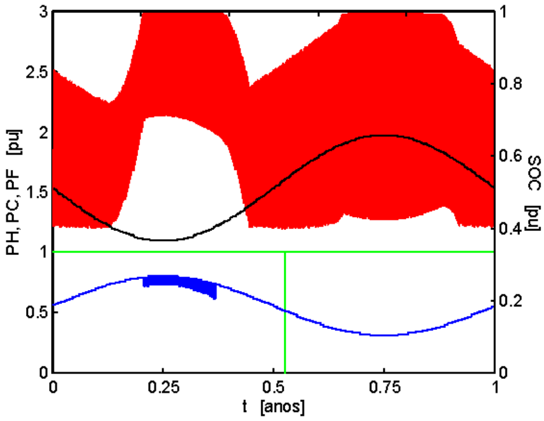

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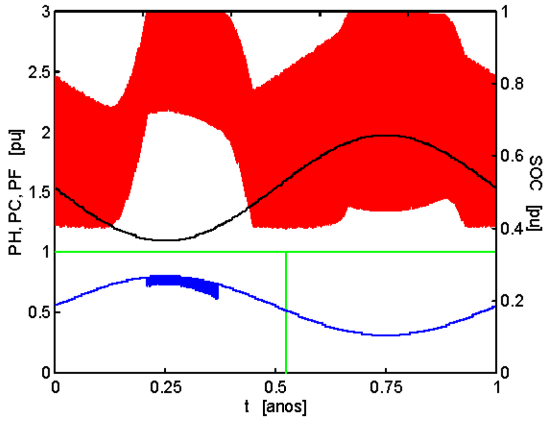

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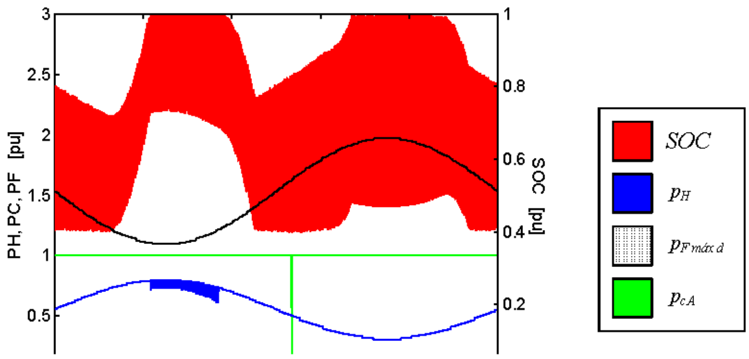

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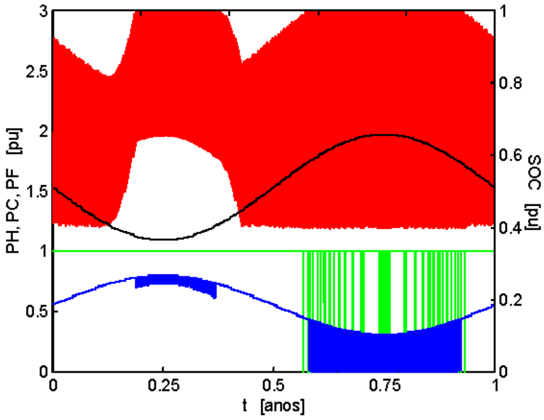
FIGURE 2. Effects of different dimensions of bank of batteries on the performance of a system with p_{dd}=1,00, κ_t=1,00, κ_e=1,00 [p_{sh}=1,00], κ_a=1,00 [p_{Mm}=1,00, df=1,1496, dh=df], κ=1,00, with $p_{he\ máx}=p_{c\ máx}$ and a_f=24,61, without water reservoir and with constant load demand profile. Banks of batteries with capacity for (1) 0,500 day, (2) 0,550 day, (3) 0,600 day, (4) 0,625 day and (5) 0,650 day, with discharge until 40% and charge until 100% of maximum capacity. Conventions: SOC: state of charge of the batteries, p_H: power made available by the hydro generator set, $p_{F\ máx\ d}$: maximum daily power made available by the PV generator set, p_{cA}: power delivered to the loads.



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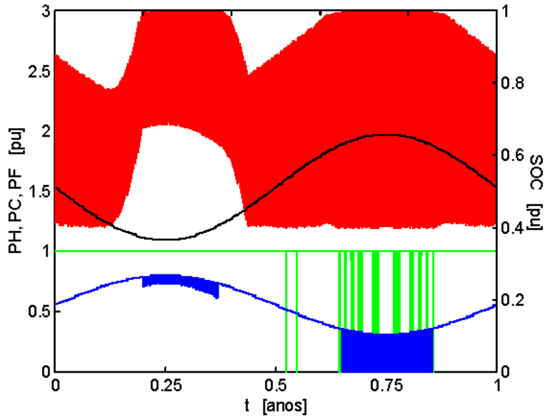

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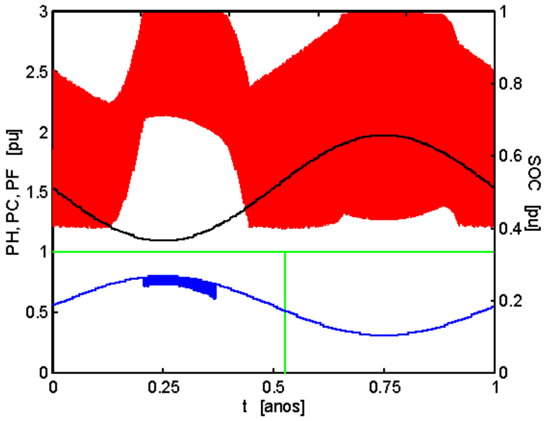

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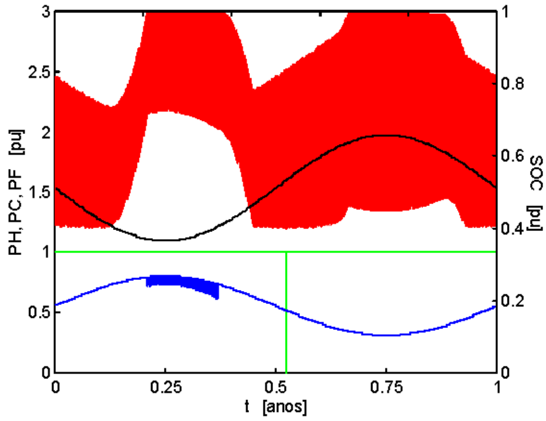

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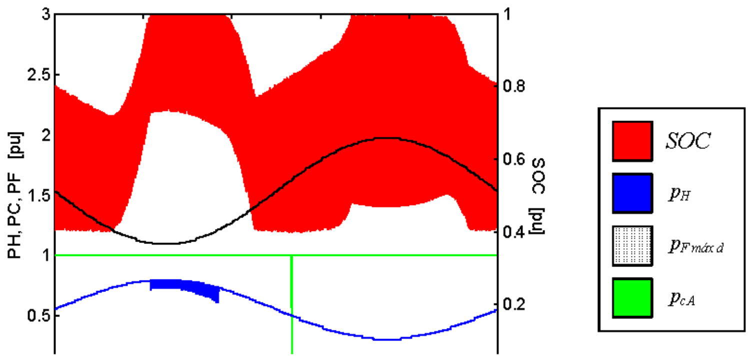

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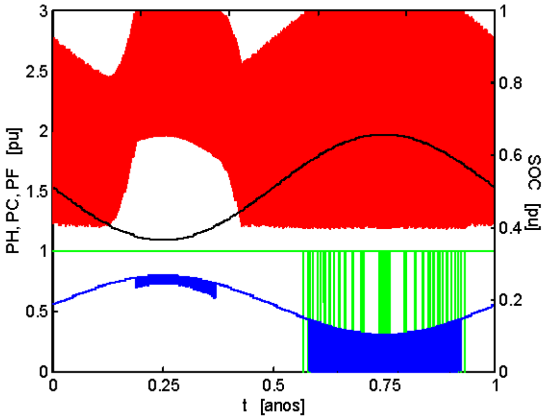

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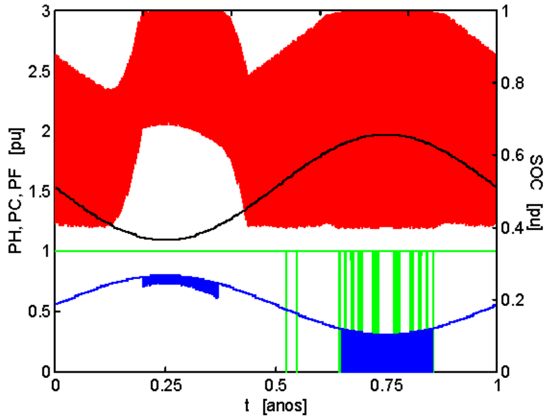

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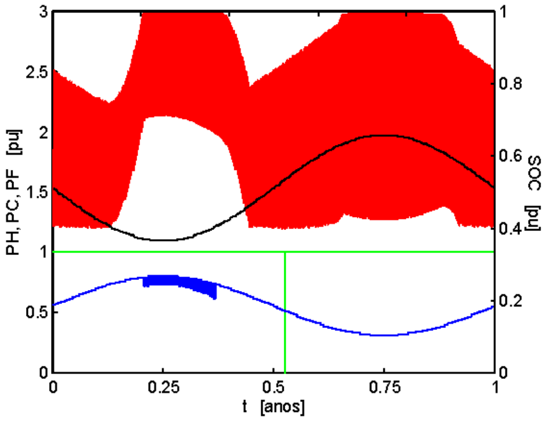

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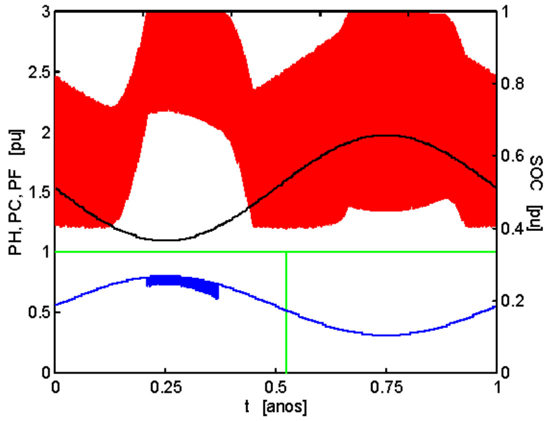

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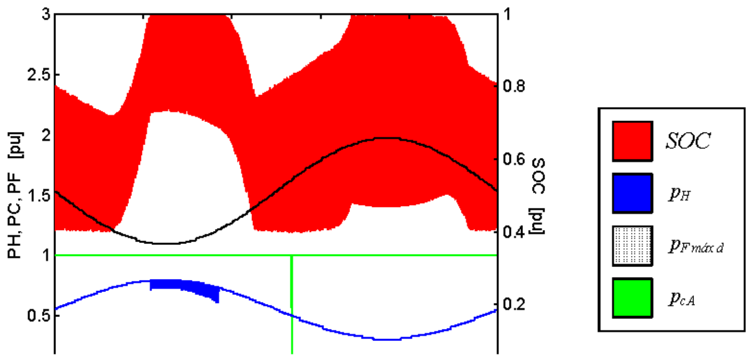

(5) TFA=1,11d, i_f=0,0030.

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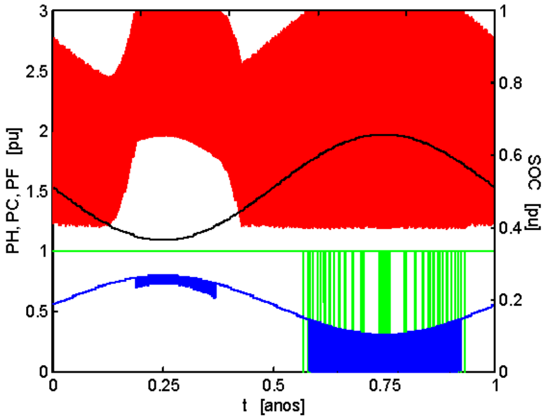

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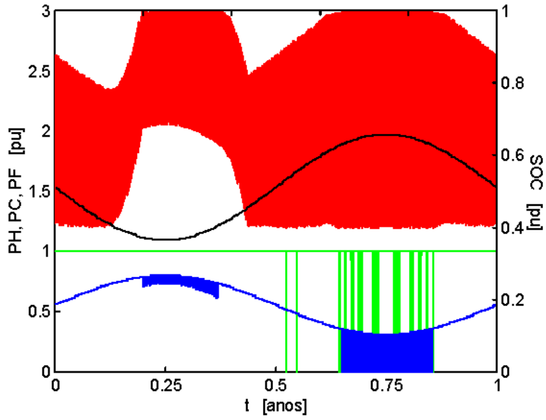

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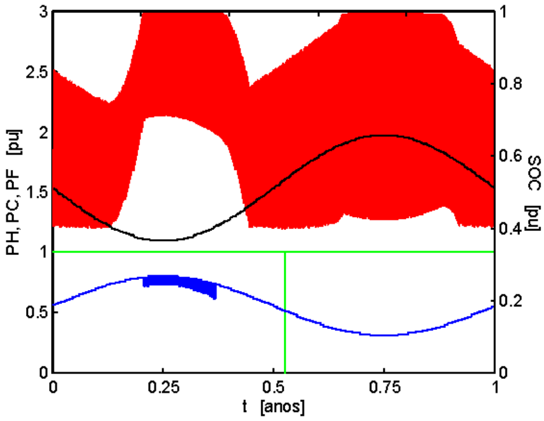

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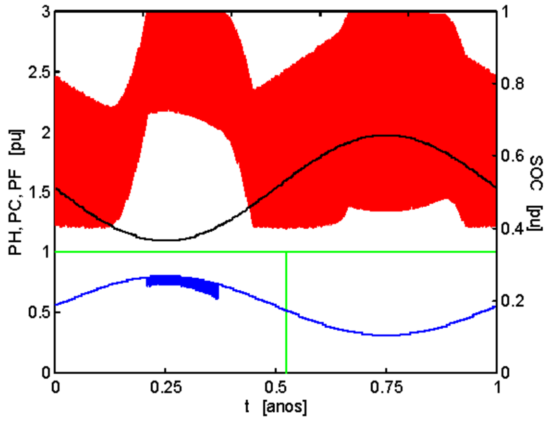

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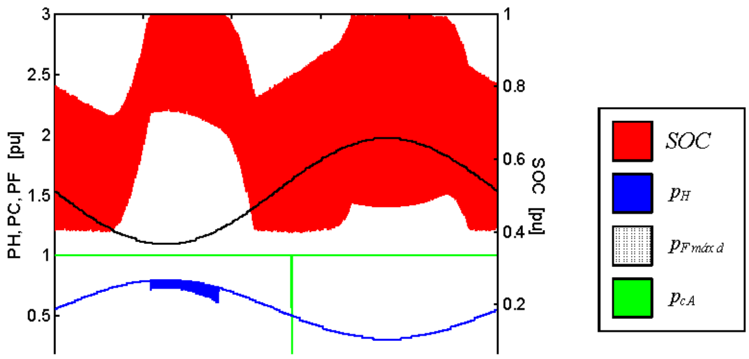

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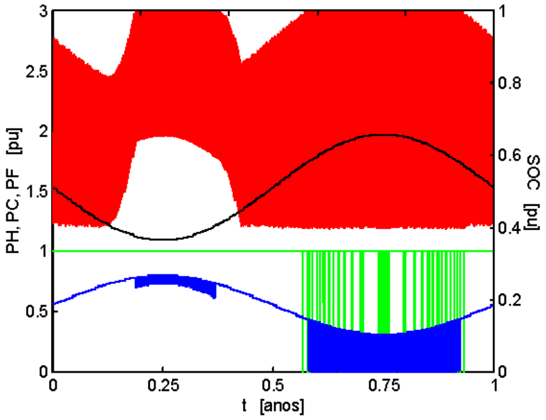

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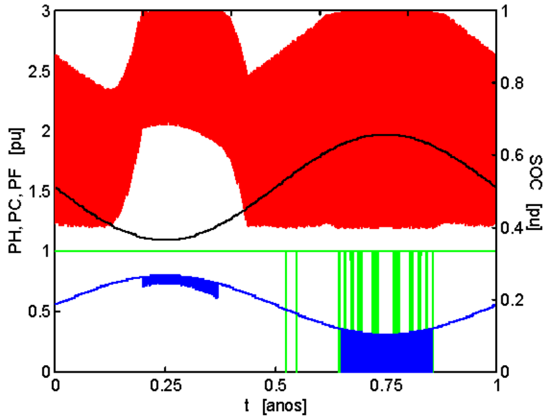

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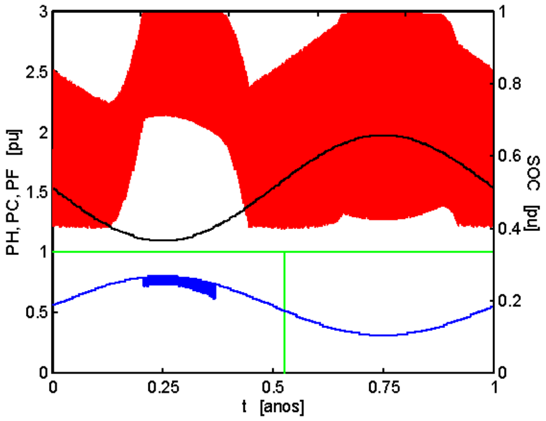

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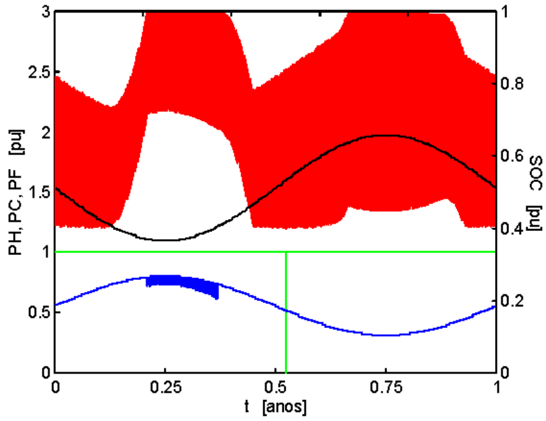

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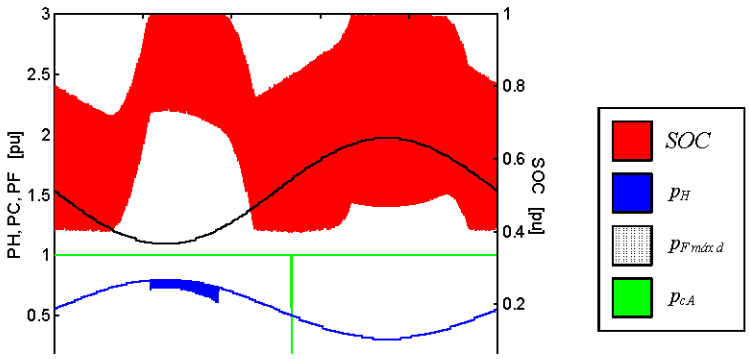

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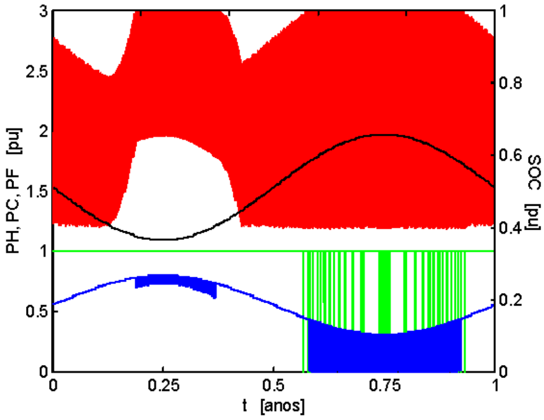

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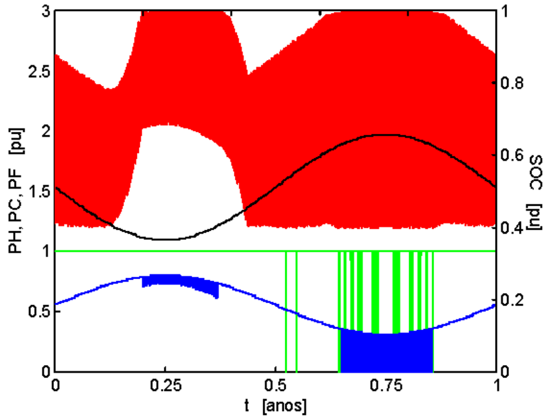

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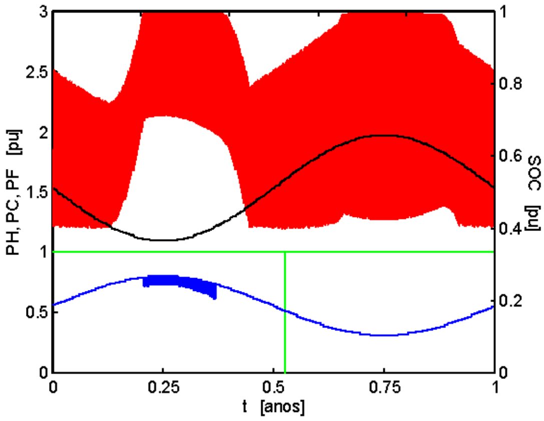

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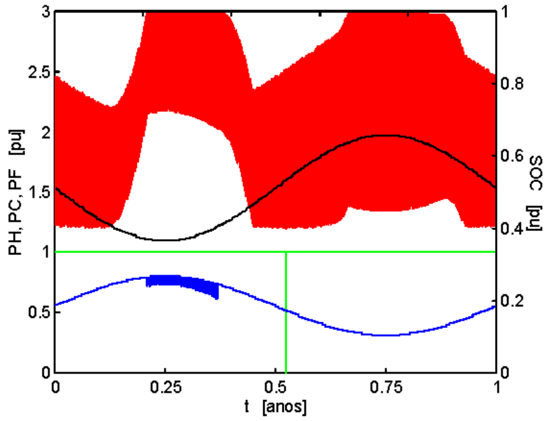

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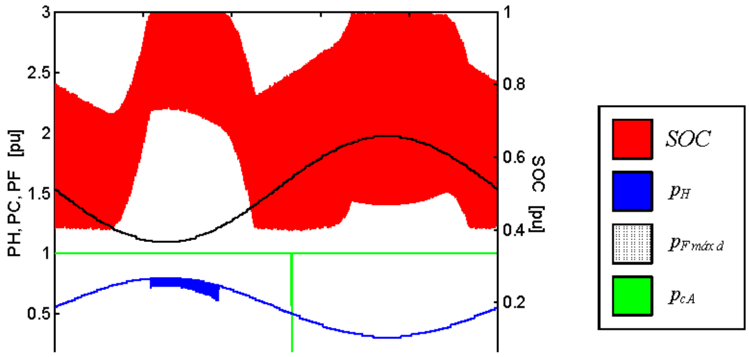

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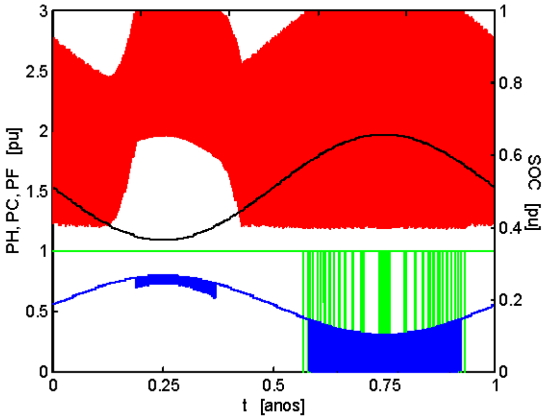

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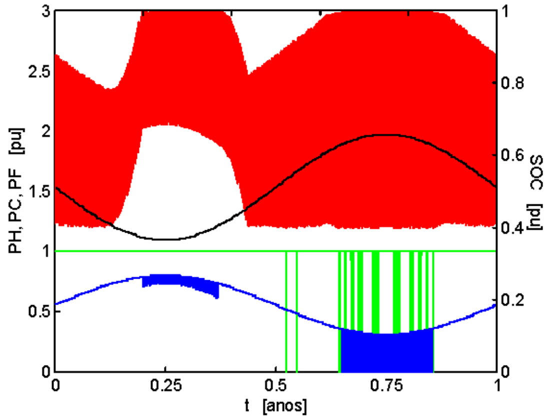

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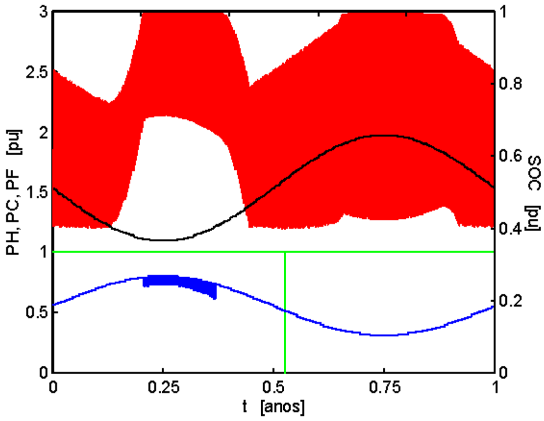

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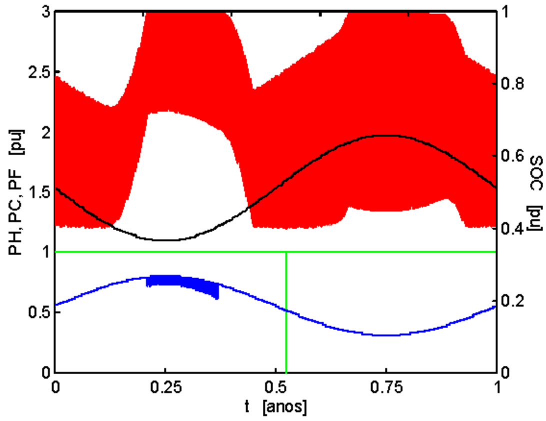

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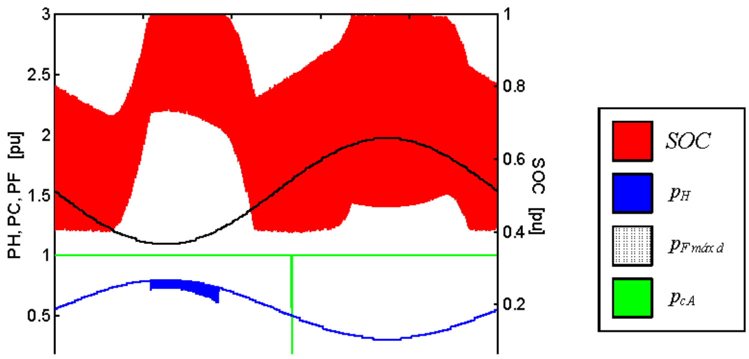

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