

**Beam Dynamics in Super-ACO with a New 500 MHz Fifth Harmonic RF System\***,  
M. BILLARDON, ESPCI; M.-E. COUPRIE,  
D. NUTARELLI, LURE/SPAM; G. FLYNN,  
P. MARIN, R. ROUX, M. SOMMER, LURE - A new 500 MHz fifth harmonic RF system has recently been installed on the Super-ACO storage ring with the goal of reducing bunch-length for Free electron laser (FEL) and time-resolved synchrotron radiation experiments. Bunches have been shortened by factors between 2 and 3.5. This is accompanied by several new coherent instabilities. In particular, a single-bunch transverse instability causing vertical beam dimension blow-up occurs for positive chromaticity at around 10 mA. This instability is highly sensitive to lattice non-linearities but rather insensitive to chromaticity although very strong vertical chromaticity does at least partially cure it. Longitudinal coherent instabilities begin at less than 2 mA per bunch. They are manifested by complex bunch phase and shape oscillations at frequencies close to the synchrotron frequency and its harmonics as well as by low frequency (several hundred Hz) phase and length variations. We describe various experimental results concerning these phenomena, including double-sweep streak camera bunch profile observations, as well as our attempts to understand them in terms of collective effects theory.

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