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INTRODUCTION:

- Poorly damped low-frequency oscillations is a significant issue that can limit the power transfer capability and even deteriorate power system security.
- The wide-area damping control (WADC) system using a measurement-driven transfer function model was designed to adaptively enhance the low frequency oscillation stability.
- The field deployment of the WADC at Terna was introduced and the testing results demonstrate that the WADC can improve the damping ratio of the targeted oscillation mode.

WADC SYSTEM REALIZATION AND FIELD DEPLOYMENT:

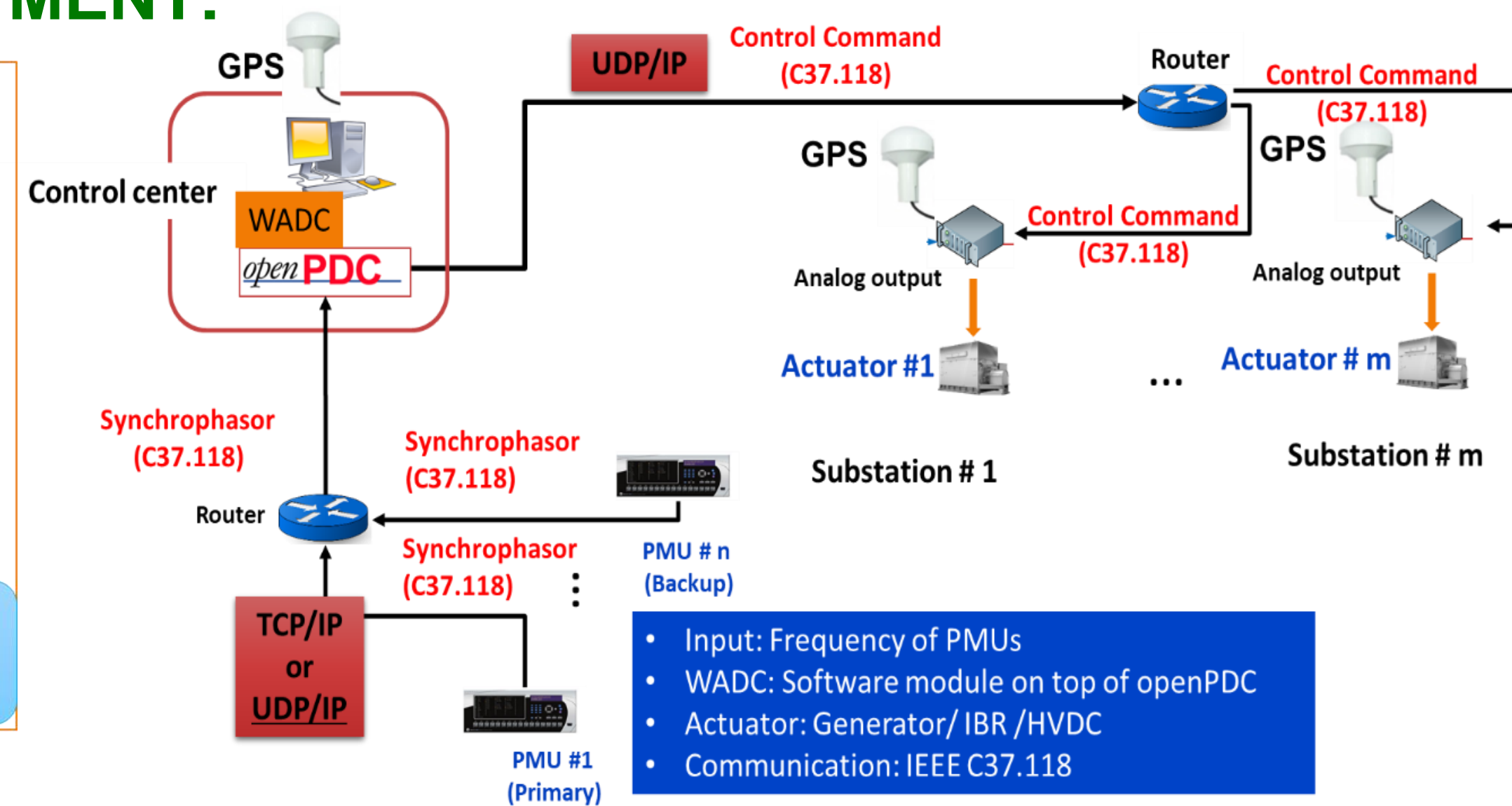
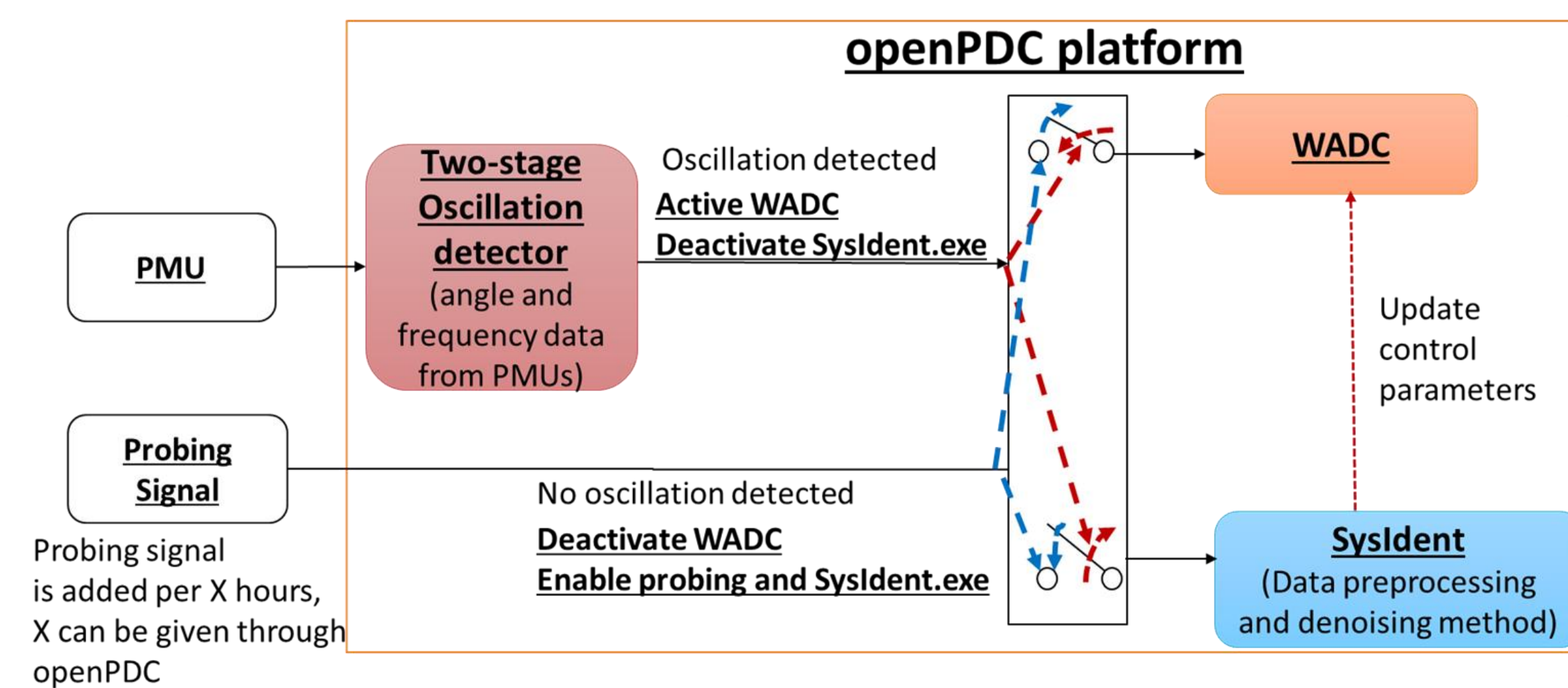


Figure 1. Measurement-driven adaptive WADC system realization.

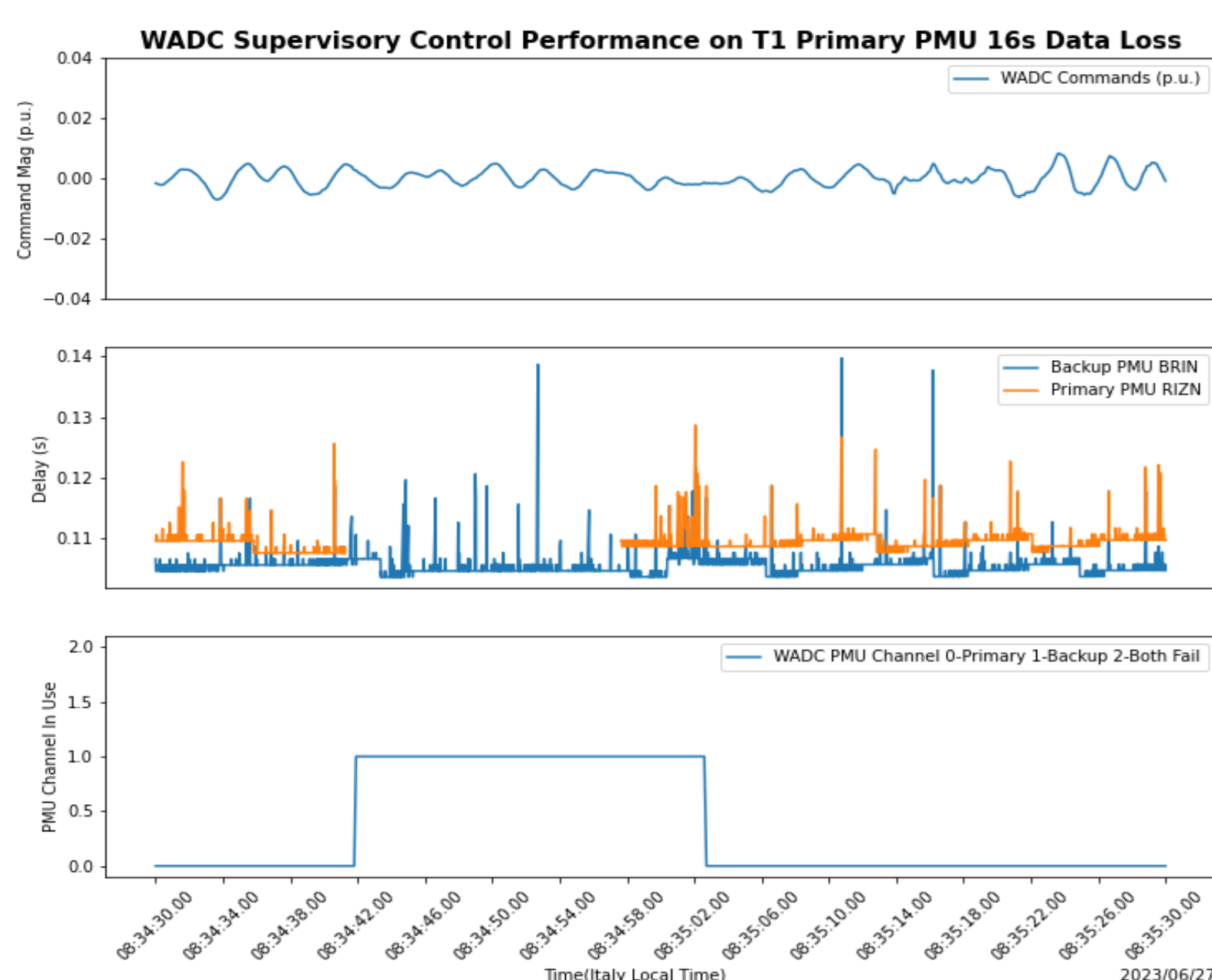
Figure 2. WADC deployment at the power grid.

FIELD TEST RESULTS:

WADC performance under communication uncertainties

- 16 s long consecutive data loss was experienced by the primary PMU
- WADC input signal can switch from primary PMU to backup PMU when primary PMU communication failed.
- WADC can switch back to primary after it has 5s of stable communication.

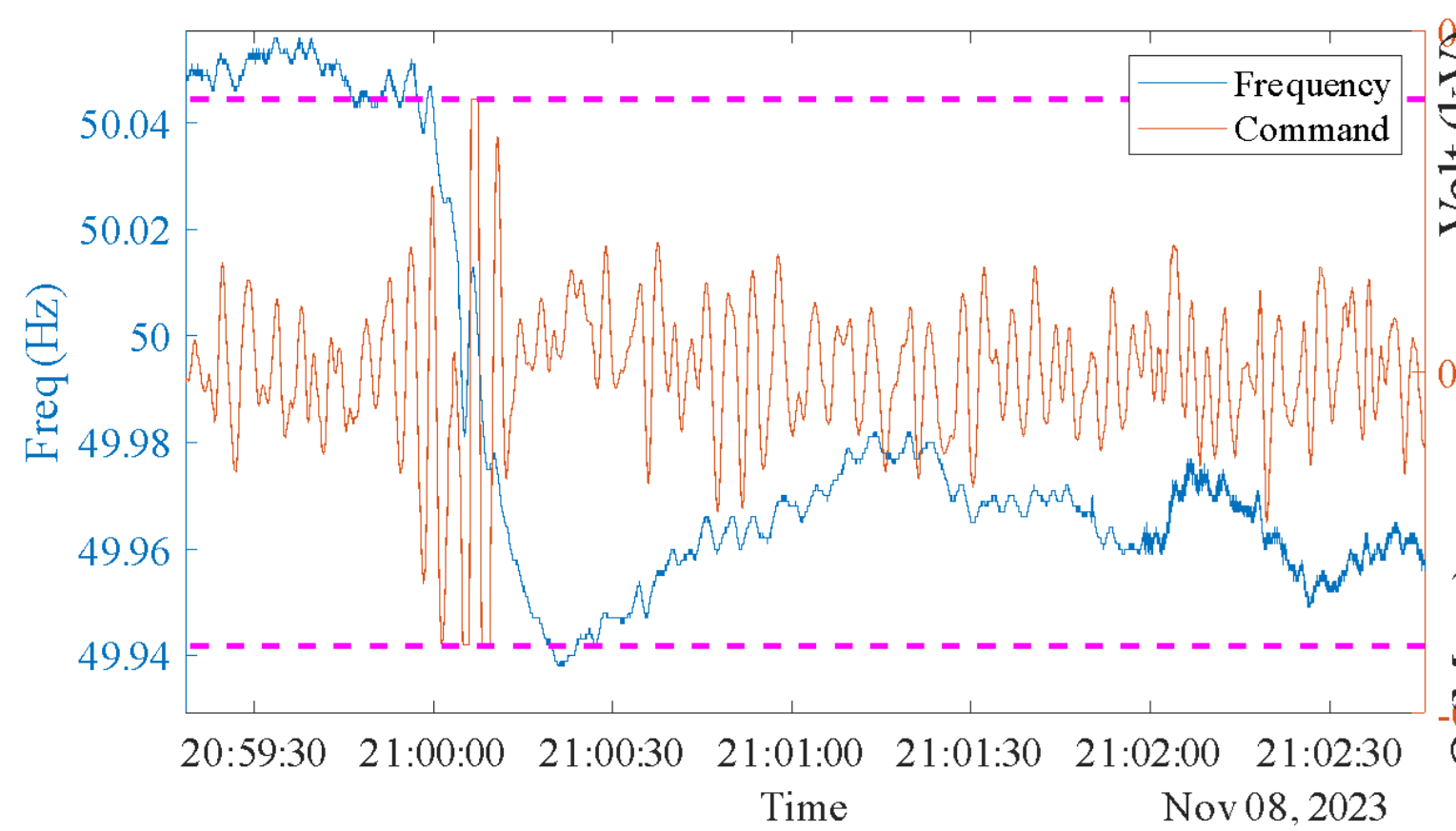
Control command and PMU delays during the chunk data loss



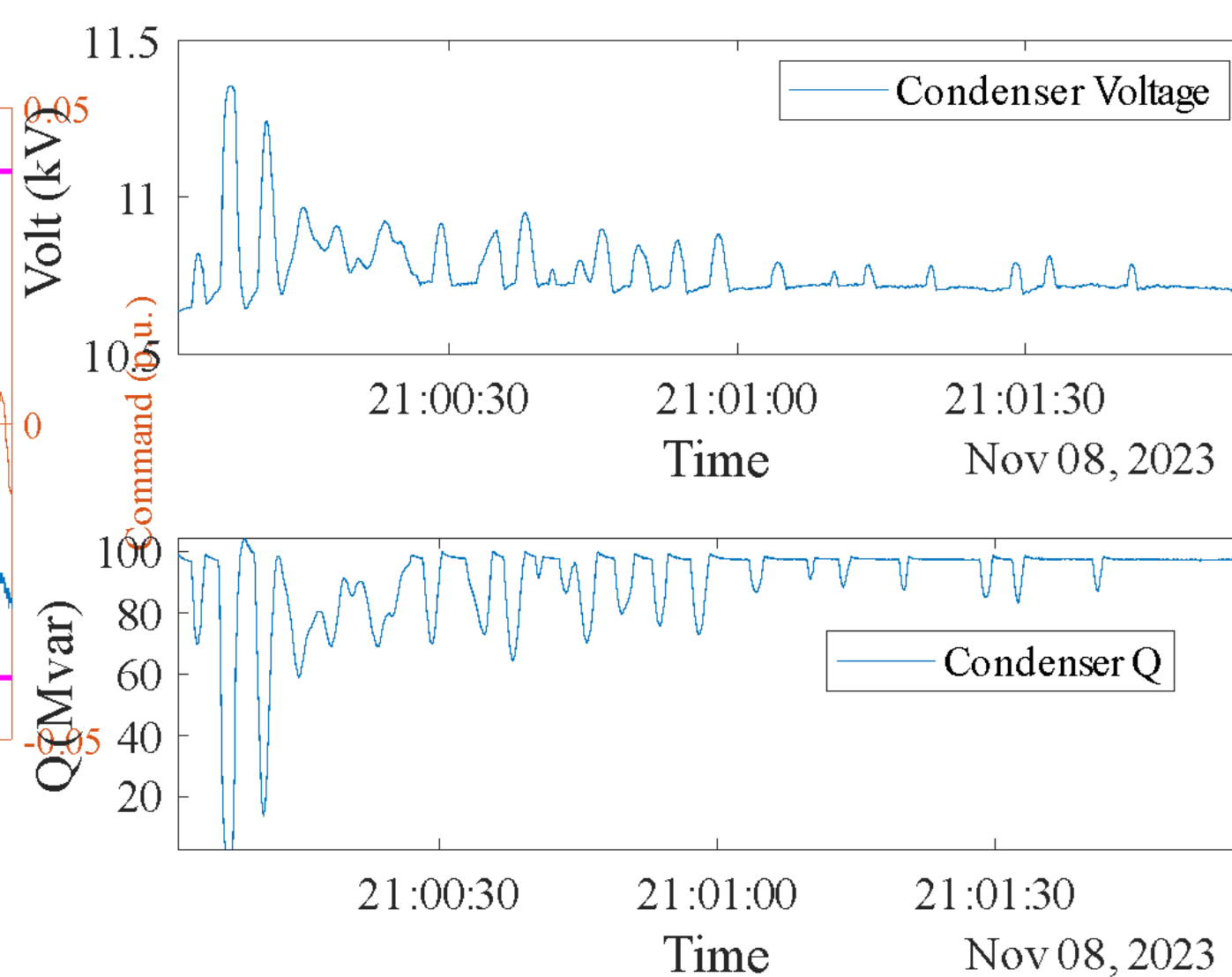
Closed-loop field test with WADC under large disturbance

- WADC damping control performance under large disturbance (~300MW)
- WADC can generate proper control command based on input frequency during the disturbance
- WADC can improve damping ratio of both the 0.27 Hz and 0.20 Hz oscillation modes from 12% to 19%.

Frequency and control command during the disturbance



Condenser voltage and reactive power during the disturbance



Data Type	WADC	PSS	Mode #1		Mode #2	
			Freq. (Hz)	Damping (%)	Freq. (Hz)	Damping (%)
Ambient	ON	ON	0.212	19.42	0.261	17.02
Event	ON	ON	N/A	N/A	0.262	20.46
Ambient	OFF	ON	0.200	12.23	0.286	11.67