Anti-Noise Synthetic Jet Enhanced Heat Sinks
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Objective

Optimize the performance of heat sinks with multiple embedded synthetic jets to achieve minimal acoustic noise emission.

Impact

Synthetic jets have excellent potential for spot cooling in confined geometries. This research uses adjacent rectangular synthetic jets to:

(i) Maximize cooling efficiency

$\eta = hA\Delta T / Pel$

(ii) Maximum acoustic attenuation

$\alpha = hA\Delta T / Pac$

Selected Publications

- T Persoons, A McGuinn, DB Murray, *Int J Heat Mass Transfer* 54(17-18): 3900-3908, 2011.
- T Persoons, SV Garimella, *Workshop on Thermal Management in Telecomm. Syst. and Data Centers*, Richardson, TX, 25-26 Oct 2010
- P Valiorgue, T Persoons, A McGuinn, DB Murray, *Exp Therm Fluid Sci* 33(4): 597-603, 2009.
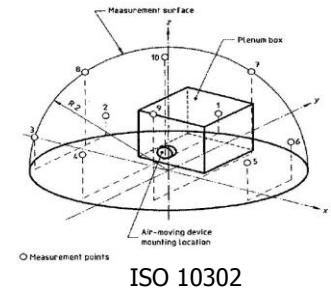- T Persoons, TS O'Donovan, *Phys Fluids* 19(12): 128104, 2007.

Approach

Double jet configuration

Thermal Characterization
- Phase-controlled fluid motion
- Acoustic noise cancellation

Acoustic Characterization

IR thermal imaging camera
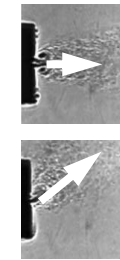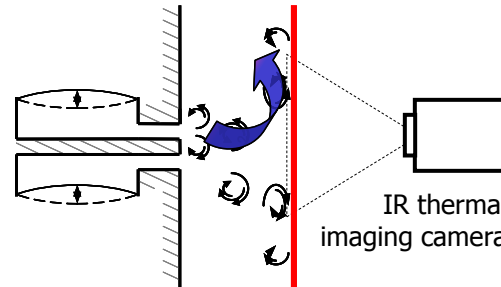
Smith & Glezer *AIAA J,* 2005

ISO 10302

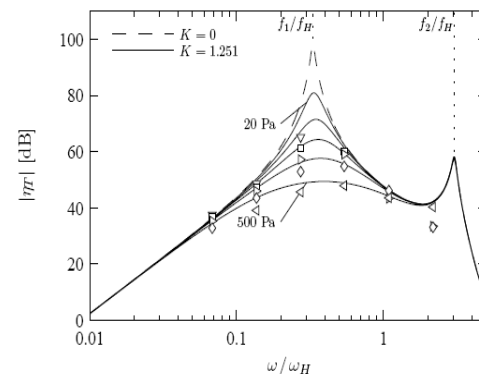## Selected Results

Physics-based model predicts behavior:
- Efficiency (heat removal / energy input)
- Acoustic noise
- Optimal operating frequency, amplitude

Distributions of local surface temperature and heat transfer coefficient

$T(x,y)$ [°C] $Re = 282$, $L_0/d = 19.4$, $\phi = -180$

$h(x,y)$ [W/(m^{2}K)] $Re = 282$, $L_0/d = 19.4$, $\phi = -180$