

# Fuel Adaptability of an Advanced Vortex-tube Combustor: LES with sgs-pdf Approach

Reporter :Shoujun RenAdviser :Prof. W.P JonesInstitution:Imperial College LondonDate :1st December

# 1. Physical model of the Stratified Vortex-tube Combustor (SVC)



The structure of the Stratified Vortex-tube Combustor (SVC).

The swirl number of the SVC is 13.46

LES with stochastic field method via BOFFIN-LESc

Fuels :	gaseous methane, ethanol, propane, n-heptane, kerosene of 300 K;
Oxidant :	<u>air of 300 K</u> ;
Pressure:	<u>101325 Pa</u> ;
$oldsymbol{arphi}_{ extsf{g}}$ :	<u>0.1 ~ 1.0</u> ;
<b>q</b> <sub>f</sub> :	<u>12.0 L/min ;</u>
Mesh :	structured grid with 960,000 elements; the grid quality is above 0.85.

Flame configuration

#### Species and temperature



# 3. Results: combustion performance

 $q_{\rm f} = 12.0$  L/min &  $\varphi_{\rm q} = 0.6$ 



#### **Pressure fluctuation**



#### 3. Results: combustion performance

Flame topology

$$q_{\rm f}$$
 = 12.0 L/min and  $\varphi_{\rm g}$  = 0.6





![](_page_7_Figure_1.jpeg)

#### Transport flux of enthalpy $J_h$ and species J

#### Methane $q_{\rm f}$ = 12.0 L/min and $\varphi_{\rm q}$ = 0.6

![](_page_8_Figure_3.jpeg)

![](_page_9_Figure_1.jpeg)

![](_page_10_Figure_1.jpeg)

10

![](_page_11_Picture_0.jpeg)