

Further Instrumentation		
Location	Sensor	Working
TS1-1	TC8	
TS2-1	TC10	
TS3-1	TC12	
TS4-1	TC14	
R1-1	IP3	
R1-2	IP4	
R1-3	IP5	
R2-1	#N/A	
R2-2	#N/A	
R2-3	#N/A	
R3-1	IP11	
R3-2	IP12	
R3-3	IP13	
R4-1	IP15	
R4-2	IP16	
R4-3	IP17	
RS-1	IP19	
RS-2	IP20	
RS-3	IP21	
KU3	TC7	
KU4	TC9	
KU6	TC13	
pitot	TC11	

Ionisation Probe	Light Blue
Pressure Transducer	Dark Blue
Thermocouple	Orange
Optical Probe	Red

Item	Location	DAQ	Channel	Measurement	Instrument	Supplier	Range	Signal	Excitation	S/R
IP0	FS1-3	PXIe	PXI Slot2/ai0	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP1	FS1-6	PXIe	PXI Slot2/ai1	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP2	FS2-3	PXIe	PXI Slot2/ai2	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP3	R1-1	PXIe	PXI Slot2/ai3	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP4	R1-2	PXIe	PXI Slot2/ai4	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP5	R1-3	PXIe	PXI Slot2/ai5	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP6	FS2-6	PXIe	PXI Slot2/ai6	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP7		PXIe	PXI Slot2/ai7	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP8		PXIe	PXI Slot6/ai0	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP9		PXIe	PXI Slot6/ai1	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP10	FS3-3	PXIe	PXI Slot6/ai2	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP11	R3-1	PXIe	PXI Slot6/ai3	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP12	R3-2	PXIe	PXI Slot6/ai4	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP13	R3-3	PXIe	PXI Slot6/ai5	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP14	FS3-6	PXIe	PXI Slot6/ai6	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP15	R4-1	PXIe	PXI Slot6/ai7	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP16	R4-2	PXIe	PXI Slot7/ai0	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP17	R4-3	PXIe	PXI Slot7/ai1	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP18	FS4-2	PXIe	PXI Slot7/ai2	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP19	RS-1	PXIe	PXI Slot7/ai3	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP20	RS-2	PXIe	PXI Slot7/ai4	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP21	RS-3	PXIe	PXI Slot7/ai5	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP22	FS4-5	PXIe	PXI Slot7/ai6	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
IP23	FS4-6	PXIe	PXI Slot7/ai7	Flame Presence	Ionisation Probe	Bruce Ewan	TBC	-5 to 5V	60V	100 kHz
OP0	NS1-6	PXIe	PXI1Slot4/ai0	Flame Presence	Optical Probe	Bruce Ewan	TBC	-5 to 5V	30V	100 kHz
OP1	NS3-5	PXIe	PXI1Slot4/ai1	Flame Presence	Optical Probe	Bruce Ewan	TBC	-5 to 5V	30V	100 kHz
OP2	NS4-2	PXIe	PXI1Slot4/ai2	Flame Presence	Optical Probe	Bruce Ewan	TBC	-5 to 5V	30V	100 kHz
OP3	NS4-5	PXIe	PXI1Slot4/ai3	Flame Presence	Optical Probe	Bruce Ewan	TBC	-5 to 5V	30V	100 kHz
OP4		PXIe	PXI1Slot4/ai4	Flame Presence	Optical Probe	Bruce Ewan	TBC	-5 to 5V	30V	100 kHz
OP5		PXIe	PXI1Slot4/ai5	Flame Presence	Optical Probe	Bruce Ewan	TBC	-5 to 5V	30V	100 kHz
TC0	NS1-3	PXIe	SC1Mod4/ai0	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC1	NS1-5	PXIe	SC1Mod4/ai1	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC2	NS2-2	PXIe	SC1Mod4/ai2	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC3	NS2-3	PXIe	SC1Mod4/ai3	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC4	NS2-5	PXIe	SC1Mod4/ai4	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC5		PXIe	SC1Mod4/ai5	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC6	NS3-2	PXIe	SC1Mod4/ai6	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC7	KU3	PXIe	SC1Mod4/ai7	Gas Temperature (Wall)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC8	TS1-1	PXIe	SC1Mod4/ai8	Temperature (surface)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC9	KU4	PXIe	SC1Mod4/ai9	Temperature (kulite body)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC10	TS2-1	PXIe	SC1Mod4/ai10	Temperature (surface)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC11	pitot	PXIe	SC1Mod4/ai11	Temperature (kulite body)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC12	TS3-1	PXIe	SC1Mod4/ai12	Temperature (surface)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC13	KU6	PXIe	SC1Mod4/ai13	Temperature (kulite body)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC14	TS4-1	PXIe	SC1Mod4/ai14	Temperature (surface)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
TC15	NS4-3	PXIe	SC1Mod4/ai15	Temperature (pitot)	K-Type Thermocouple	TC-Direct	1100°C	Conditioned	None	5 kHz
KU0	NS1-4	PXIe	SC1Mod1/ai0	Pressure	Kulite					100 kHz
KU1		PXIe	SC1Mod1/ai1	Pressure	Kulite					100 kHz
KU2		PXIe	SC1Mod1/ai2	Pressure	XTEH-190M-50BARA			0-100 mV		100 kHz
KU3	NS3-1	PXIe	SC1Mod1/ai3	Pressure	Kulite					100 kHz
KU4		PXIe	SC1Mod1/ai4	Pressure	Kulite					100 kHz
KU5	NS3-3	PXIe	SC1Mod1/ai5	Pressure	Kulite					100 kHz
KU6	NS3-6	PXIe	SC1Mod1/ai6	Pressure	Kulite					100 kHz
KU7	NS4-6	PXIe	SC1Mod1/ai7	Pressure	Kulite					100 kHz
PB1		PXIe	PXI Slot3/ai0	Pressure	113B24	PCB	68 bar	0-5 V	20-30 V	1 MHz
PB2		PXIe		Pressure	113B25	PCB	68 bar	0-5 V	20-30 V	1 MHz

Date

26 August 2014

Time

16:51

Test Number

9

Mixture Composition

100% H2

Ambient Temperature

14 °C

Ambient Pressure

965

Wind Speed

3 m/s

Wind direction

NE

Relative Humidity

100.00%

Equivalence Ratio

0.40

General Comments: (weather, rig configuration)

Weather: Overcast with occasional sunny spells. Light breeze from the West.

Tube configuration:

4 x 3m tube sections
uncongested
igniter 250mm from beginning of tube section

Target equivalence ratio was 0.4

First of series using 100% H2. Stoichiometric condition and oxygen met satisfactorily. Useful data obtained although low equivalence and weak flame results in an absence of signals for the IPs suggesting flame front doesn't travel along side walls. OP sensors show clear signals and provide a flame speed record. Flame speeds are low as are peak pressures.

Headlines

Max overpressure

73

mbar

Max. flame speed

0

m/s

[ionisation probes]

Max. temperature

760

°C

93

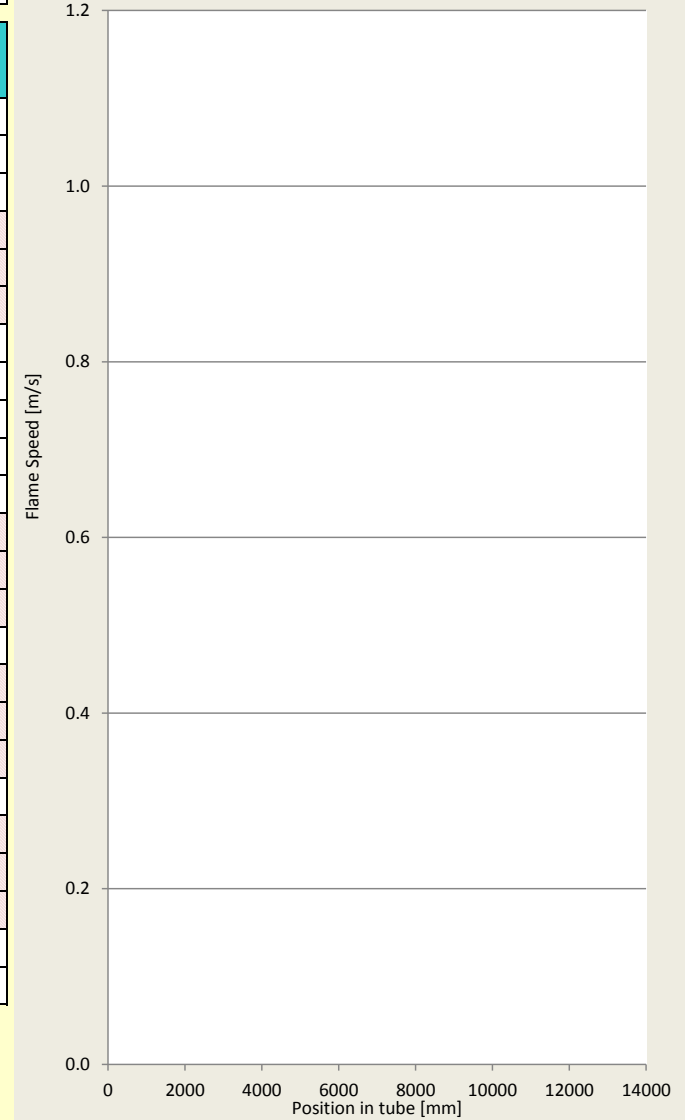
m/s

[optical probes]

Location of igniter mm

Time of ignition seconds

IP Number	Location label	Data Name	Position in tube (mm)	Flame arrival time (s)	Avg Flame speed from last sensor (m/s)
REF	#N/A	Flameion_0	#N/A		
IP1	FS1-6	Flameion_1	2750		
IP2	FS2-3	Flameion_2	4250		
IP3	R1-1	Flameion_3	4750		
IP4	R1-2	Flameion_4	4750		
IP5	R1-3	Flameion_5	4750		
IP6	FS2-6	Flameion_6	5750		
IP7	0	Flameion_7	#N/A		
IP8	0	Flameion_8	#N/A		
IP9	0	Flameion_9	#N/A		
IP10	FS3-3	Flameion_10	7250		
IP11	R3-1	Flameion_11	7750		
IP12	R3-2	Flameion_12	7750		
IP13	R3-3	Flameion_13	7750		
IP14	FS3-6	Flameion_14	8750		
IP15	R4-1	Flameion_15	9250		
IP16	R4-2	Flameion_16	9250		
IP17	R4-3	Flameion_17	9250		
IP18	FS4-2	Flameion_18	9750		
IP19	R5-1	Flameion_19	10750		
IP20	R5-2	Flameion_20	10750		
IP21	R5-3	Flameion_21	10750		
IP22	FS4-5	Flameion_22	11250		
IP23	FS4-6	Flameion_23	11750		

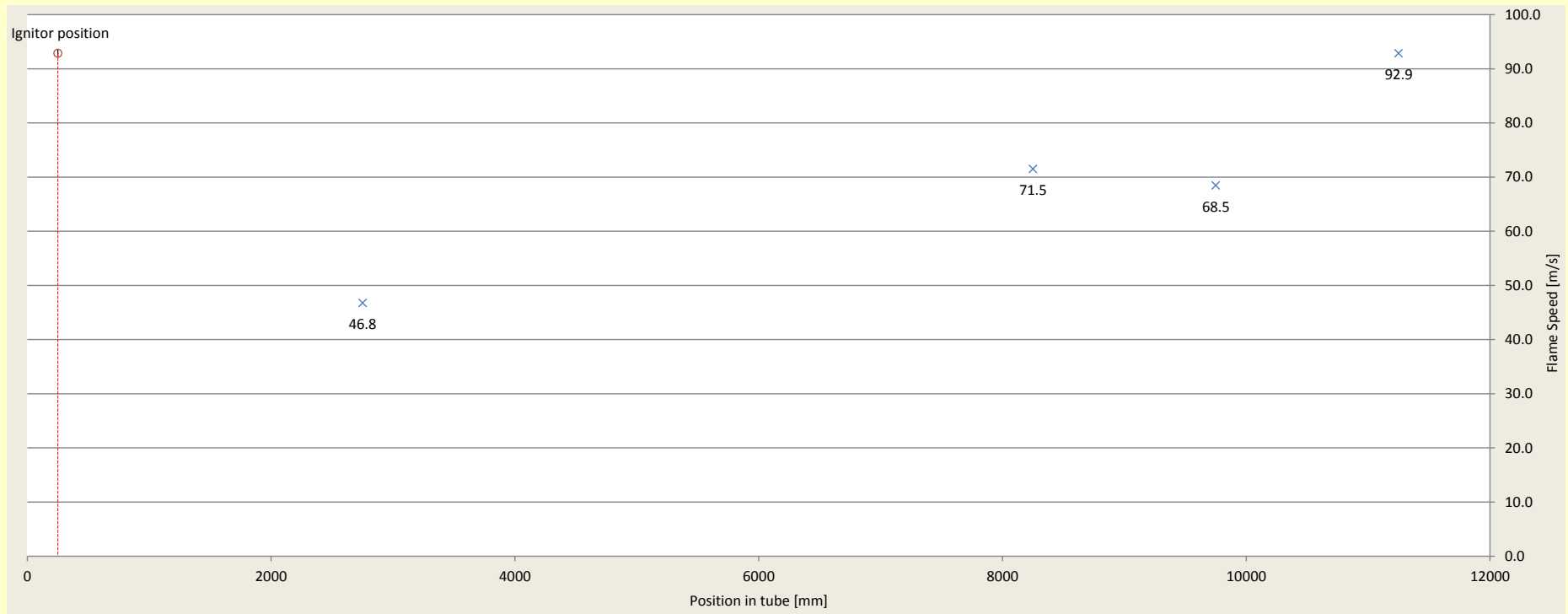


Note - weak flame results in ionisation signals which are too weak to interpret

Location of igniter mm

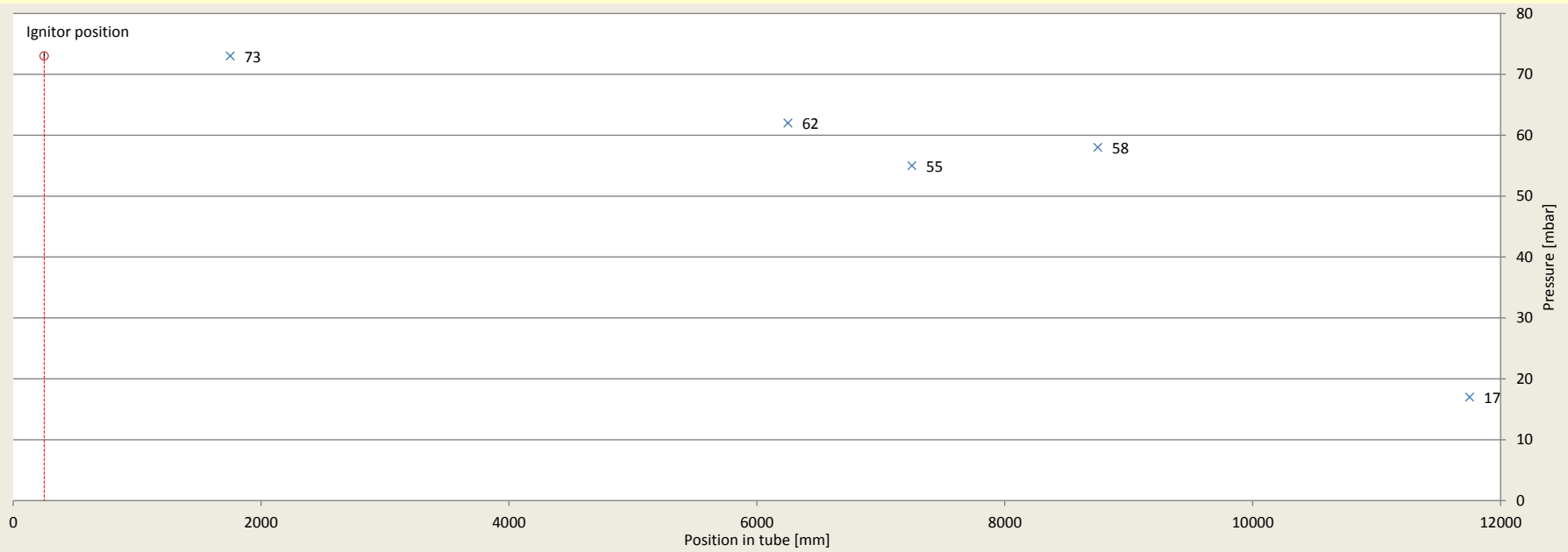
Time of ignition seconds

OP Number	Location label	Position in tube (mm)	Flame arrival time (s)	Average flame speed (m/s)
OP0	NS1-6	2750	1.31020	46.8
OP1	NS3-5	8250	1.38710	71.5
OP2	NS4-2	9750	1.40900	68.5
OP3	NS4-5	11250	1.42515	92.9
OP4	0	#N/A		
OP5	0	#N/A		



Location of igniter mm

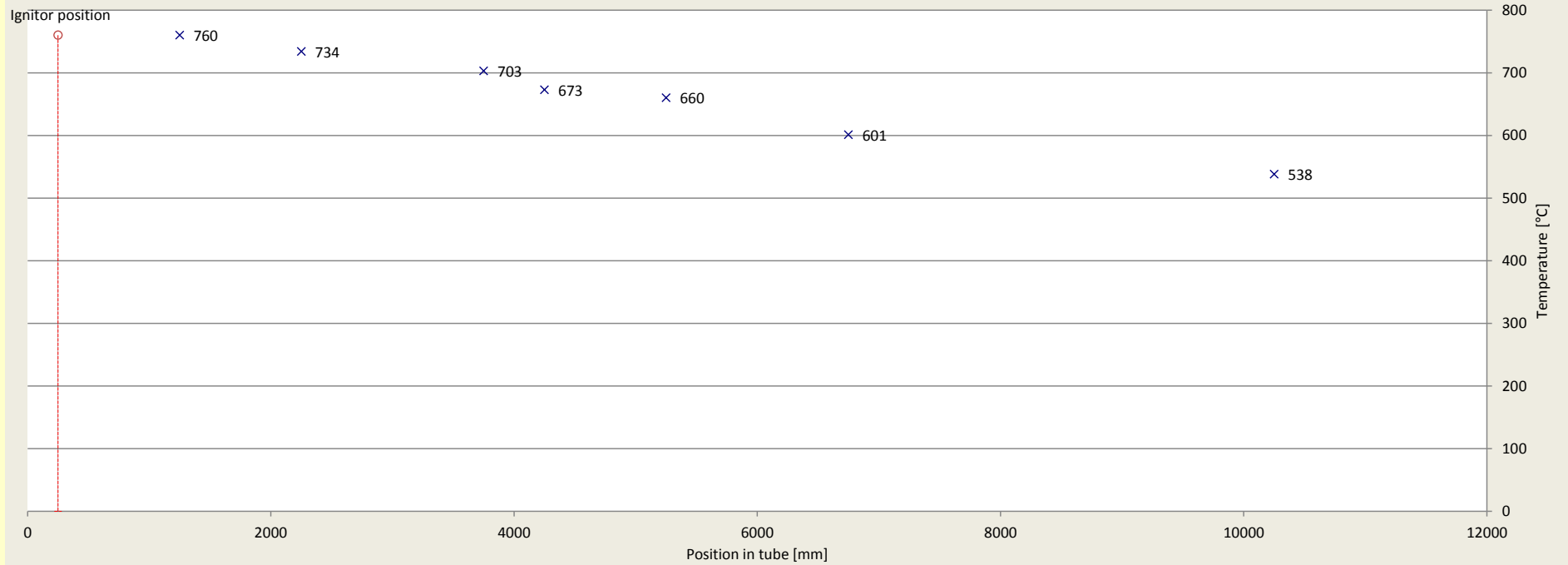
Transducer number	Location	Position in tube [mm]	ΔP_{max} [mbar]
KU0	NS1-4	1750	73
KU1	0	#N/A	
KU2	0	#N/A	
KU3	NS3-1	6250	62
KU4	0	#N/A	
KU5	NS3-3	7250	55
KU6	NS3-6	8750	58
KU7	NS4-6	11750	17

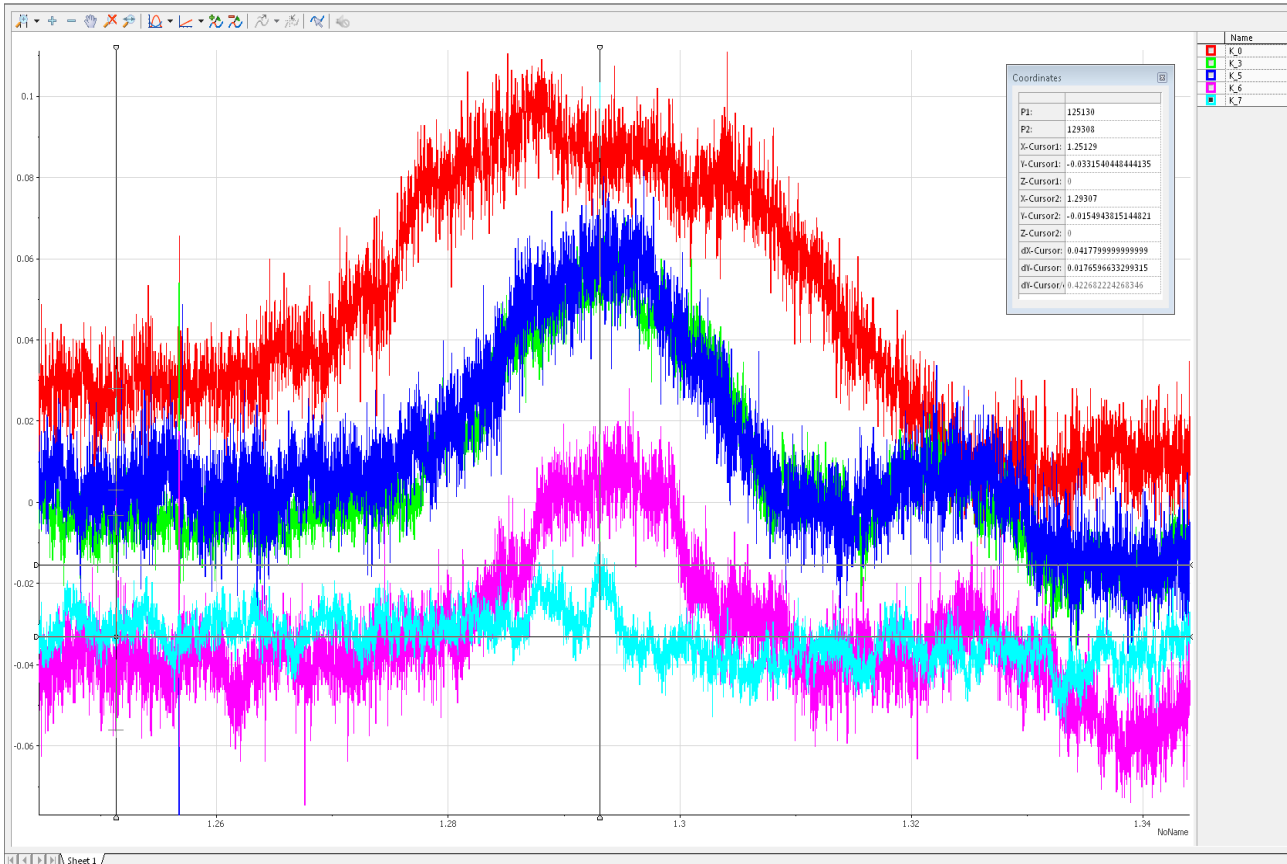


Location of igniter

250 mm

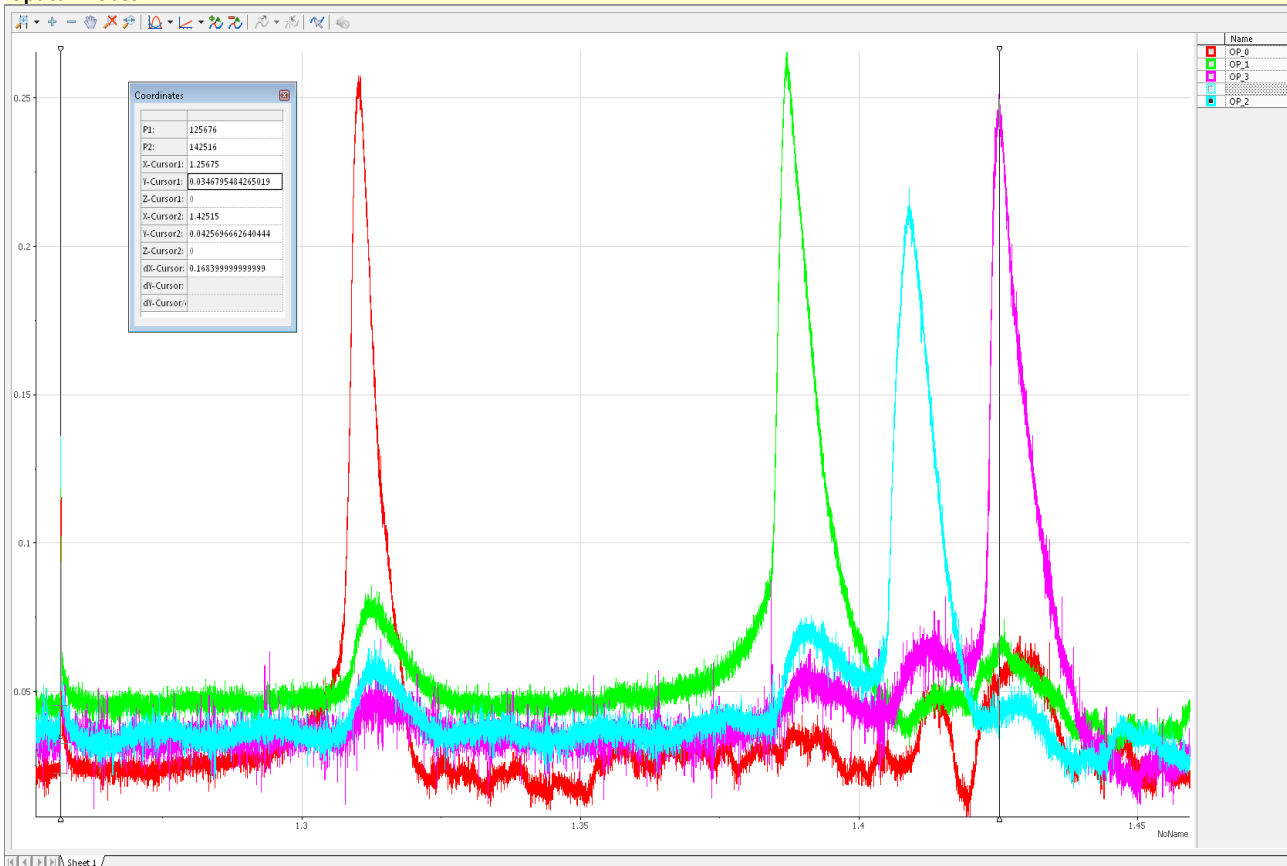
Thermocouple number	Location	Position in tube (mm)	T _{max} (deg C)
TC0	NS1-3	1250	760
TC1	NS1-5	2250	734
TC2	NS2-2	3750	703
TC3	NS2-3	4250	673
TC4	NS2-5	5250	660
TC5	0	#N/A	
TC6	NS3-2	6750	601
TC15	NS4-3	10250	538

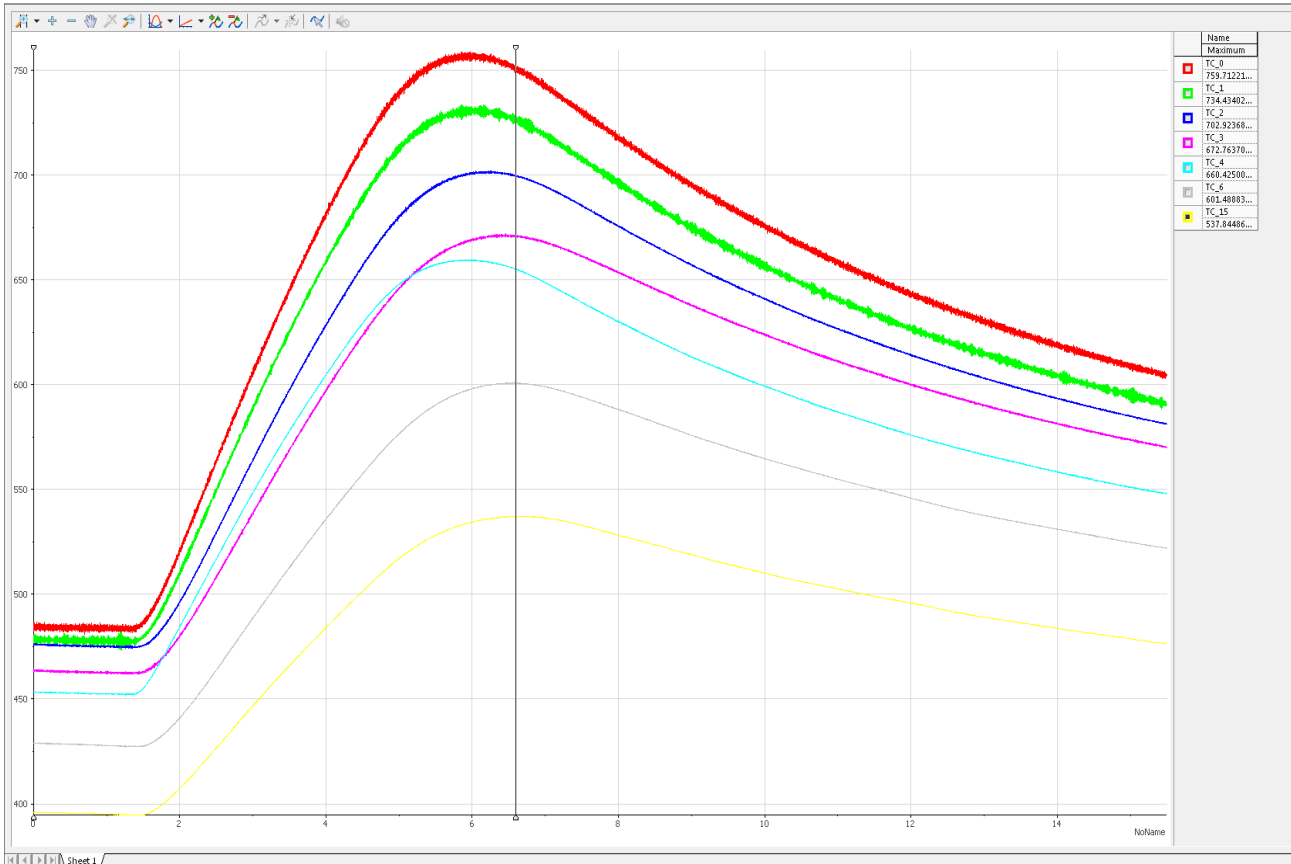




Pressure

Optical Probes





Temperature