

VIEW ON END PLATE

INSTRUMENT PORTS

76 - INSTRUMENT PORTS IN 5T 40mm HIGH TAPPED THROUGH ISO - 3/4" BSPP, 15 x 1" BSPP & 11 - 1/4" BSPP HOLES THROUGH PLATE WILL BE (5mm ± 0.25mm) ON EACH HEAT EXCHANGER THERE IS 1 - 3/4" TAPPED HOLE IN THE TOP TUBEPLATE

SECTION 1: 2 - 3/4" ON EACH SIDE OF SECTION 1
SECTION 2: 2 - 1" ON TOP, 1 - 1" ON BASE, 2 - 1/4" ON EACH SIDE, 4 - 3/4" ON EACH SIDE
SECTION 3: 1 - 1/4" ON CENTRE & 2 - 3/4" ALL ON REAR SIDE
HEAT EXCHANGERS: 3 - 3/4" ON ONE SIDE & 1 - 3/4" BSPP TAPPED HOLE IN TOP TUBEPLATE
SECTION 4: 1 - 1" ON TOP, 1 - 1" ON BASE, 1 - 1/4" ON CENTRE OF EACH SIDE, 4 - 3/4" ON EACH SIDE
SECTION 5: 1 - 1" ON TOP, 1 - 1" ON BASE, 1 - 1/4" ON EACH SIDE, 3 - 3/4" ON EACH SIDE
SECTION 6: 1 - 1" ON TOP, 2 - 1" ON BASE, 1 - 1/4" ON EACH SIDE, 6 - 3/4" ON EACH SIDE
END PLATE: 1 - 1" & 1 - 3/4" ON VERTICAL CENTRELINE, 2 - 1" ON HORIZONTAL CENTRELINE, 2 - 1" ON LOWER CORNERS (50mm from corners)

Naming Convention		
Section Identifier i.e. HE, HR, CD or EP	HR 1 - R 1 U	Vertical position in section (sides only) i.e. U, M or L. Absence of letter denotes centreline
Section Number (1-6) Numbered from downstream to upstream	Side i.e. R, L, T or B	Longitudinal position in section (numbered from 1)

Key			
CD	Circular duct	U	Upper
HR	HRSG	M	Middle
HE	Heat Exchanger	L	Lower
EP	End Plate	R	Right Side (when viewed downstream from engine)
		L	Left Side
		T	Top
		B	Bottom

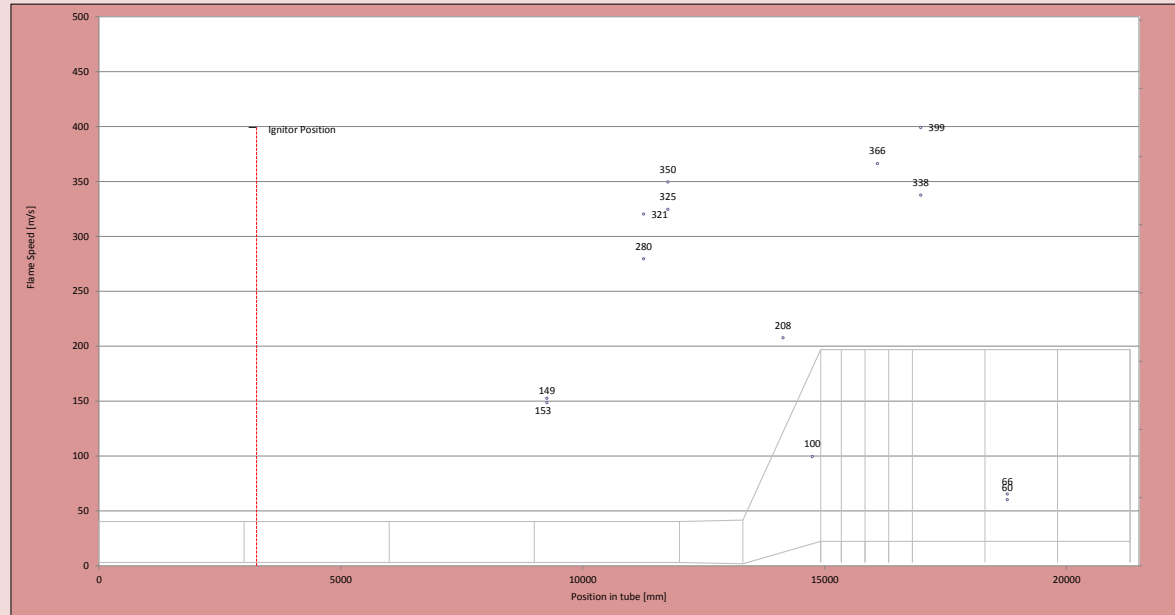
There are 13 sections on the rig

- 4 circular duct sections (CD1 to CD4)
- 6 HRSG sections (HR1 to HR6)
- 3 heat exchanger sections (HE1 to HE3) located between HR3 and HR4

0	3000	6000	9000	12000	13310	14920	15345	15835	16325	16815	18315	19815	21315	21315	19815	16815	16325	15835	15345	14920	13310	12000	9000	6000	3000	0
600	600	600	600	600	620	3120	3120	3120	3120	3120	3120	3120	3120	310	310	310	310	310	310	310	-20	0	0	0	0	0

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)
IP4	CD4-L1	Flameion_4	9258	21.5233	149
IP5	CD4-R1	Flameion_5	9258	21.5223	153
IP2	CD4-L5	Flameion_2	11258	21.5305	280
IP3	CD4-R5	Flameion_3	11258	21.5285	321
IP0	CD4-L6	Flameion_0	11758	21.5319	350
IP1	CD4-R6	Flameion_1	11758	21.5300	325
IP6	HR1-R2	Flameion_6	13160		
IP7	HR2-R3M	Flameion_7	14140	21.5415	208
IP8	HR2-R5M	Flameion_8	14745	21.5476	100
IP10	HE2-R1M	Flameion_10	16090	21.5512	366
IP12	HR4-R1M	Flameion_12	16985	21.5539	338
IP13	HR4-L1L	Flameion_13	16985	21.5532	399
IP14	HR4-R5M	Flameion_14	18165		
IP15	HR5-R2M	Flameion_15	18775	21.5835	60
IP16	HR5-L2L	Flameion_16	18775	21.5805	66
IP17	HR6-R1M	Flameion_17	19985		
IP19	HR6-L3L	Flameion_19	20575		
IP18	HR6-R5M	Flameion_18	21165		
IP20	HR6-L5L	Flameion_20	21165		
IP9	#N/A	Flameion_9	#N/A		
IP11	#N/A	Flameion_11	#N/A		
IP21	#N/A	Flameion_21	#N/A		
IP22	#N/A	Flameion_22	#N/A		
IP23	#N/A	Flameion_23	#N/A		

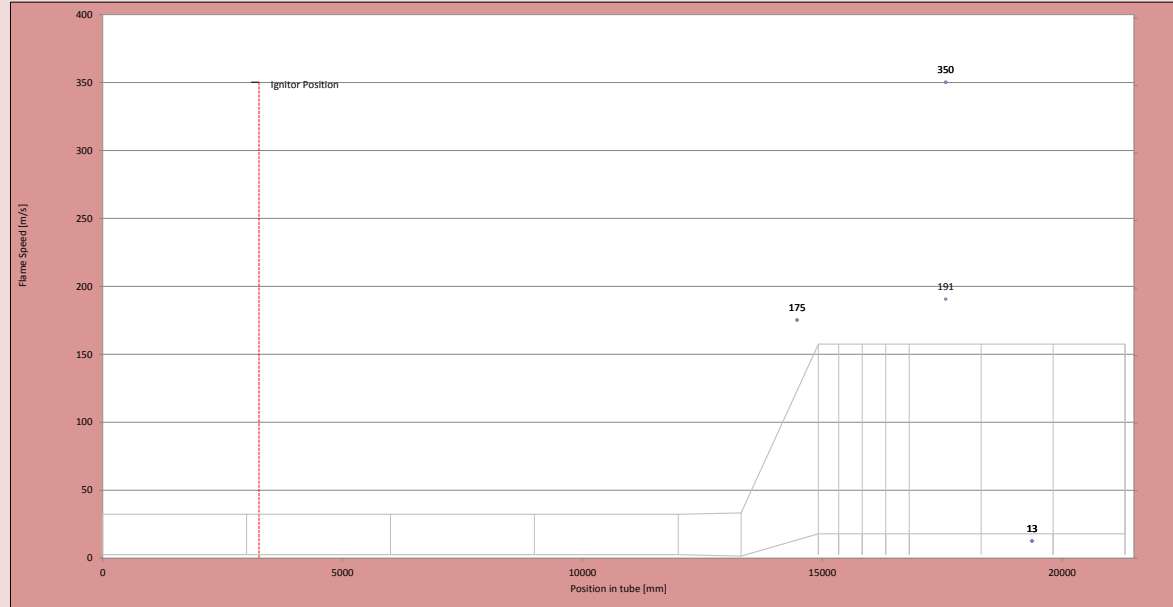


Location of igniter 3258 mm

Time of ignition 21.48298 seconds

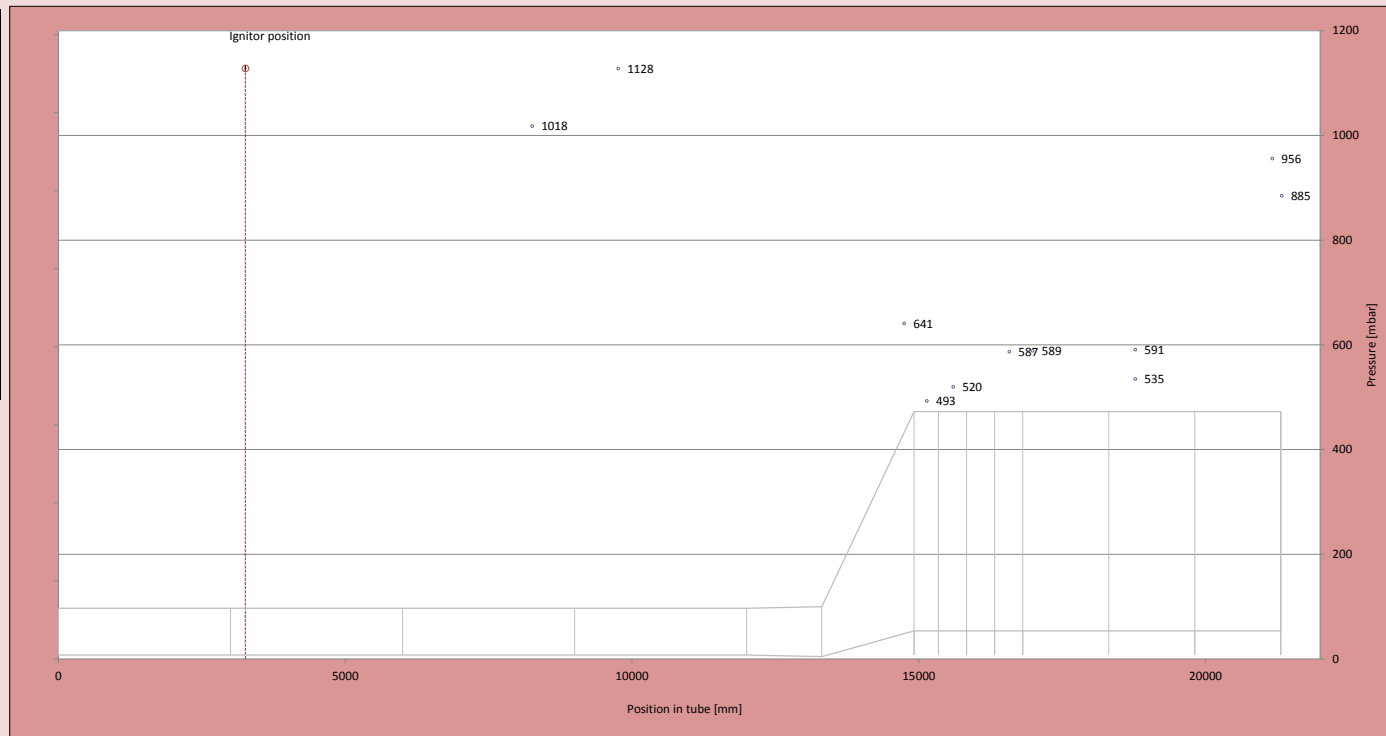
Rake Number	IP Number	Location label	Data Name	Position in tube (mm)	Flame arrival time (s)	Avg Flame speed from last sensor (m/s)
RA1	IP24	HR2-R2M	IP24	13785		
RA1	IP25	HR2-R2M	IP25	13785		
RA1	IP26	HR2-R2M	IP26	13785		
RA2	IP27	HR2-R4M	IP27	14475		
RA2	IP28	HR2-R4M	IP28	14475	21.5470	175
RA2	IP29	HR2-R4M	IP29	14475	21.5470	175
RA3	IP30	HR4-R3M	IP30	17575	21.5581	191
RA3	IP31	HR4-R3M	IP31	17575	21.5558	350
RA3	IP32	HR4-R3M	IP32	17575	21.5558	350
RA4	IP33	HR5-R4M	IP33	19375	21.6979	13
RA4	IP34	HR5-R4M	IP34	19375	21.6979	13
RA4	IP35	HR5-R4M	IP35	19375	21.6979	13

Some of the rake responses were weak, particularly RA1, and RA2 flame velocities are shown as average from point of ignition. The flame speed is increased after the HE.



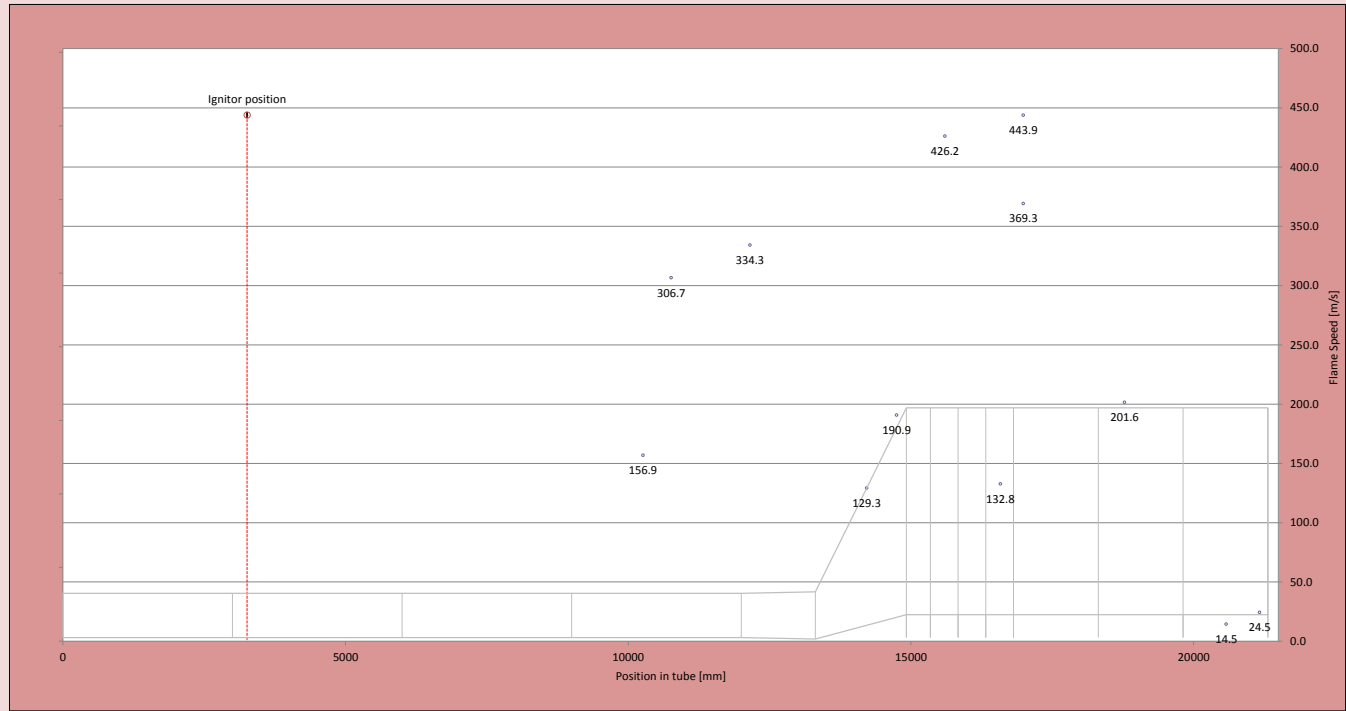
Location of igniter mm

Transducer number	Location	Position in tube [mm]	ΔP_{max} [mbar]	Time ΔP_{max} [mbar]
KU6	CD3-R5	8258	#####	21.5802
KU7	CD4-R2	9758	#####	21.5775
KU8	HR2-T5	14745	641	21.5706
KU9	HR3-L1L	15140	493	21.5770
KU0	HE1-R1U	15600	520	21.5520
KU1	HE3-R1L	16580	587	21.5675
KU2	HR4-R1U	16985	589	21.5561
KU3	HR5-R2L	18775	535	21.5647
KU4	HR5-L2M	18775	591	21.5645
KU5	HR6-LSM	21165	956	21.5600
PCB	EP-1M	21330	885	21.5603
KU10	#N/A	#N/A		
KU11	#N/A	#N/A		



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)
OP11	CD4-L3	10258	21.5276	156.9
OP10	CD4-R4	10758	21.5292	306.7
OP0	HR1-R1	12152	21.5334	334.3
OP1	HR2-T3	14215	21.5494	129.3
OP2	HR2-LSM	14745	21.5511	190.9
OP3	HE1-T1	15600	21.5526	426.2
OP4	HE3-T1	16580	21.5600	132.8
OP5	HR4-R1L	16985	21.5557	443.9
OP6	HR4-T1	16985	21.5564	369.3
OP7	HR5-T2	18775	21.5652	201.6
OP8	HR6-T3	20575	21.6890	14.5
OP9	HR6-R5U	21165	21.7131	24.5
OP12	#N/A	#N/A		
OP13	#N/A	#N/A		
OP14	#N/A	#N/A		
OP15	#N/A	#N/A		

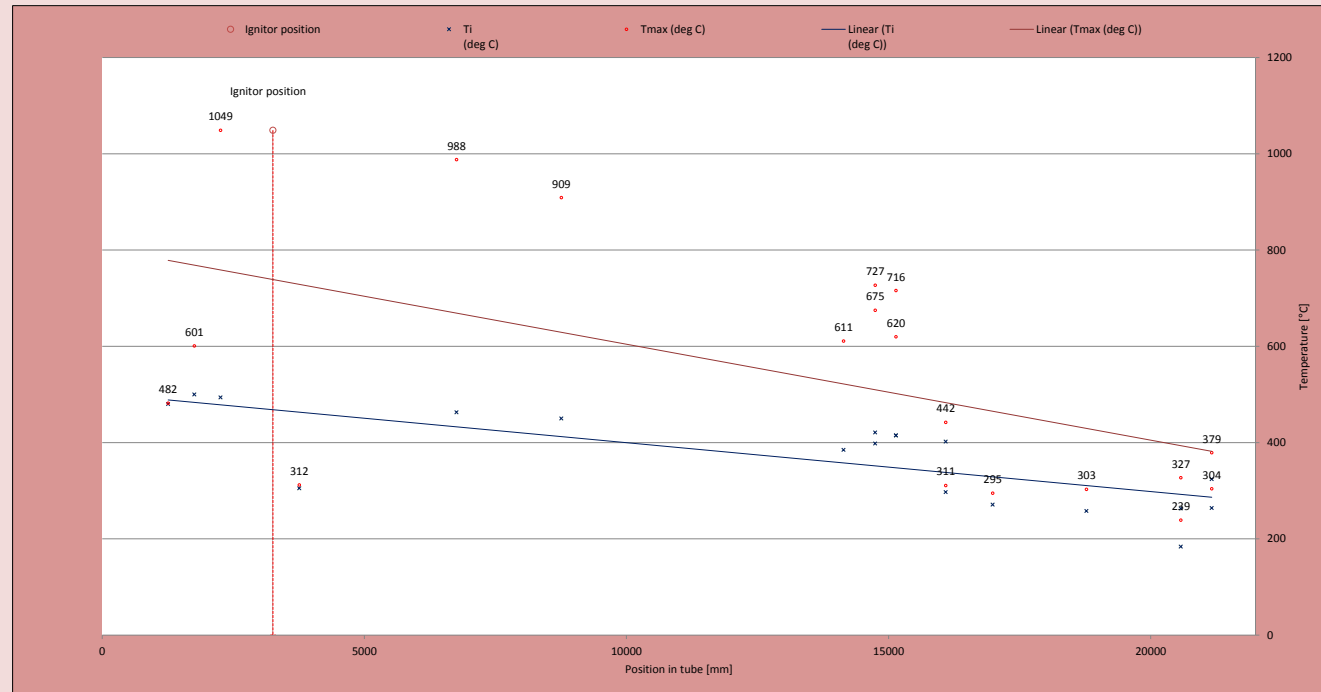


Location of igniter 3258 mm

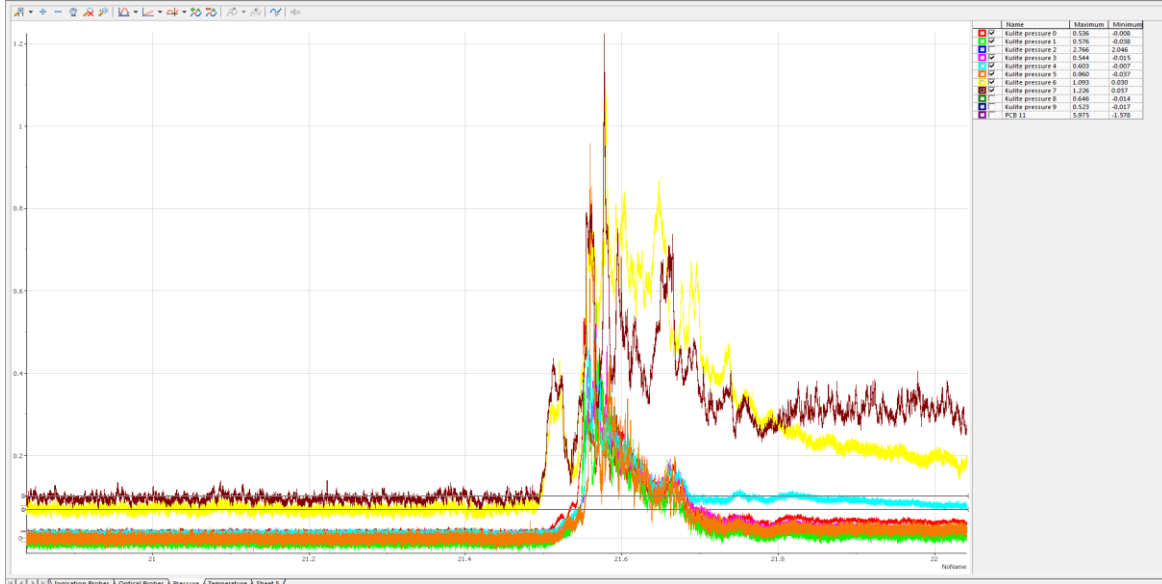
Thermocouple number	Location	Position in tube (mm)	T _{max} (deg C)	T _i (deg C)
TC0	CD1-R3	1258	482	480
TC2	CD1-R4	1758	601	500
TC3	CD1-R5	2258	1049	494
TC4	CD1-R6	2758		
TC5	CD2-R2	3758	312	305
TC7	CD3-R2	6758	988	463
TC9	CD3-R6	8758	909	450
TC11	#N/A	#N/A		
TC12	#N/A	#N/A		
TC13	#N/A	#N/A		
TC14	#N/A	#N/A		
TC15	#N/A	#N/A		
TC16	HR2-R5L	14745	727	421
TC17	HE2-R1U	16090	311	297
TC18	HR6-R3L	20575	239	184
TC19	#N/A	#N/A		
TC20	HE2-R1L	16090	442	402
TC22	#N/A	#N/A		
TC23	HR6-R5L	21165	304	264
TC24	HR2-L3M	14140	611	385
TC25	HR2-L5L	14745	675	398
TC26	HR3-L1M	15140	716	415
TC27	HR3-L1U	15140	620	415
TC28	HR4-L1M	16985	295	271
TC29	HR5-L2U	18775	303	258
TC30	HR6-L3U	20575	327	263
TC31	HR6-L5U	21165	379	324

surface thermocouples [not plotted]

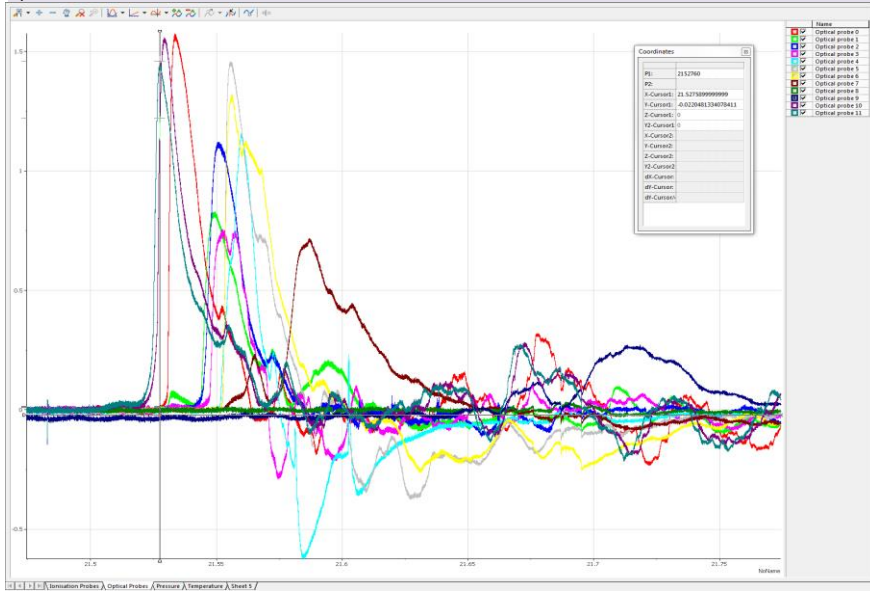
TC1	CD1-T2	1508		
TC6	CD2-T2	4508	272	266
TC8	CD3-T2	7508	289	282
TC10	CD4-T2	10508	256	251
TC21	HR5-R1M	18455	52	50



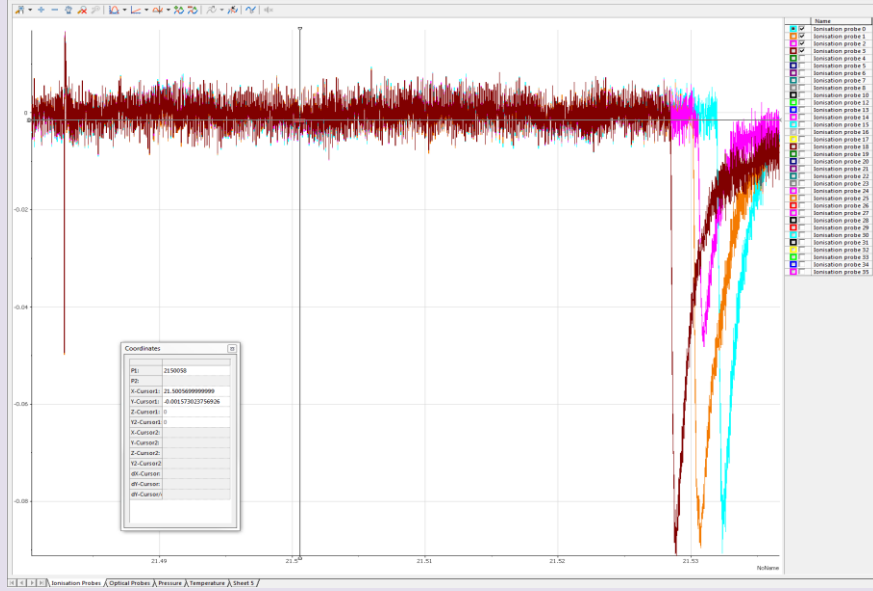
Pressure



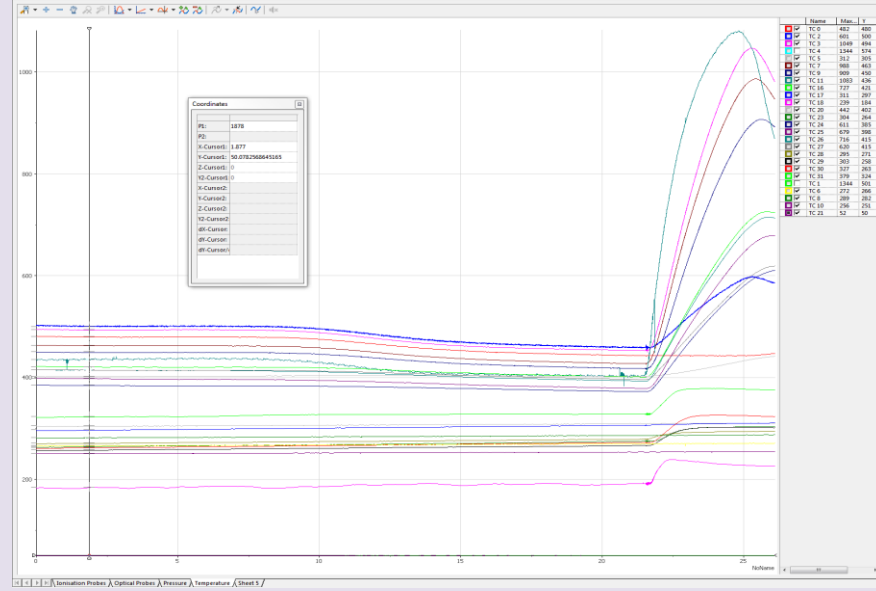
Optical Probes



Ionisation Probes



Temperature



Sensor	OLD DESIGNATION	NEW DESIGNATION	Section	Section Number	Side	Horizontal Location	Vertical Location	PORT REF	SIZE	"X"	"Y"	"Z"
OPO		HR1-R1	HR	1	R	1		57	3/4" BSPP	308	0	12152
IP6		HR1-R2	HR	1	R	2		59	3/4" BSPP	393	0	13160
RA1		HR2-R2M	HR	2	R	2	M	61	11/4" BSPP	448	70	13785
IP7		HR2-R3M	HR	2	R	3	M	63	3/4" BSPP	528	410	14140
OP1		HR2-T3	HR	2	T	3		65	1" BSPP	0	1122	14215
RA2		HR2-R4M	HR	2	R	4	M	66	11/4" BSPP	598	700	14475
KU8		HR2-T5	HR	2	T	5		69	1" BSPP	0	2315	14745
TC16		HR2-R5L	HR	2	R	5	L	70	3/4" BSPP	662	310	14745
IP8		HR2-R5M	HR	2	R	5	M	72	3/4" BSPP	662	975	14745
-		HR2-R5U	HR	2	R	5	U	74	3/4" BSPP	662	1660	14745
-		HE1-R1L	HE	1	R	1	L	79	3/4" BSPP	700	400	15600
-		HE1-R1M	HE	1	R	1	M	80	3/4" BSPP	700	1335	15600
KU0		HE1-R1U	HE	1	R	1	U	81	3/4" BSPP	700	2270	15600
TC20		HE2-R1L	HE	2	R	1	L	83	3/4" BSPP	700	400	16090
IP10		HE2-R1M	HE	2	R	1	M	84	3/4" BSPP	700	1335	16090
TC17		HE2-R1U	HE	2	R	1	U	85	3/4" BSPP	700	2270	16090
KU1		HE3-R1L	HE	3	R	1	L	87	3/4" BSPP	700	400	16580
-		HE3-R1M	HE	3	R	1	M	88	3/4" BSPP	700	1335	16580
-		HE3-R1U	HE	3	R	1	U	89	3/4" BSPP	700	2270	16580
OP3		HE1-T1	HE	1	T	1		82	3/4" BSPP HOLE	-47	2735	15600
-		HE2-T1	HE	2	T	1		86	3/4" BSPP HOLE	0	2735	16090
OP4		HE3-T1	HE	3	T	1		90	3/4" BSPP HOLE	-47	2735	16580
OP6		HR4-T1	HR	4	T	1		91	1" BSPP	0	2735	16985
OP5		HR4-R1L	HR	4	R	1	L	93	3/4" BSPP	700	400	16985
IP12		HR4-R1M	HR	4	R	1	M	95	3/4" BSPP	700	1335	16985
KU2		HR4-R1U	HR	4	R	1	U	97	3/4" BSPP	700	2270	16985
RA3		HR4-R3M	HR	4	R	3	M	99	11/4" BSPP	700	1335	17575
IP14		HR4-R5M	HR	4	R	5	M	101	3/4" BSPP	700	1335	18165
TC21		HR5-R1M	HR	5	R	1	M	NA	SURFACE	700	1200	18455
OP7		HR5-T2	HR	5	T	2		103	1" BSPP	0	2735	18775
KU3		HR5-R2L	HR	5	R	2	L	105	3/4" BSPP	700	400	18775
IP15		HR5-R2M	HR	5	R	2	M	107	3/4" BSPP	700	1335	18775
-		HR5-R2U	HR	5	R	2	U	109	3/4" BSPP	700	2270	18775
RA4		HR5-R4M	HR	5	R	4	M	111	11/4" BSPP	700	1335	19375
IP17		HR6-R1M	HR	6	R	1	M	113	3/4" BSPP	700	1335	19985
OP8		HR6-T3	HR	6	T	3		115	1" BSPP	0	2735	20575
TC18		HR6-R3L	HR	6	R	3	L	117	3/4" BSPP	700	400	20575
-		HR6-R3M	HR	6	R	3	M	119	11/4" BSPP	700	1335	20575
-		HR6-R3U	HR	6	R	3	U	121	3/4" BSPP	700	2270	20575
TC23		HR6-R5L	HR	6	R	5	L	124	3/4" BSPP	700	400	21165
IP18		HR6-R5M	HR	6	R	5	M	126	3/4" BSPP	700	1335	21165
OP9		HR6-R5U	HR	6	R	5	U	128	3/4" BSPP	700	2270	21165