



## List of FIR lines seen with the Edinburgh Instruments range of FIR lasers

These lines have been obtained either at Edinburgh Instruments or by users of FIRL100, 295 or 195 lasers (the majority of these lasers were pumped by a 50 W CO<sub>2</sub> pump source).

Molecule	Wavelength (μm)	CO <sub>2</sub> Pump Line	Typical Powers (mW)
CD <sub>3</sub> OD	41	10R18	1
CD <sub>3</sub> OH	53.8	9R34	pyro
CH <sub>3</sub> OH	67.5	9R18	10
CH <sub>3</sub> OH	70.6	9P34	20
<sup>15</sup> NH <sub>3</sub>	78.5	10P24 ( <sup>13</sup> C)	pyro
CH <sub>3</sub> OH	86.2	9R 8	10
CH <sub>3</sub> OD	86.7	9R28 ( <sup>13</sup> C)	1
CH <sub>3</sub> OH	96.5	9R10	90
CH <sub>2</sub> F <sub>2</sub>	109.2	9R24	pyro
<sup>15</sup> NH <sub>3</sub>	112.3	10P14 ( <sup>13</sup> C)	M
CH <sub>2</sub> F <sub>2</sub>	117.7	9R20	pyro
CH <sub>3</sub> OH	118.8	9P36	150
CH <sub>2</sub> F <sub>2</sub>	122.4	9R22	40
CH <sub>3</sub> OH	133.1	9P24	1
CH <sub>2</sub> F <sub>2</sub>	133.9	9P22	pyro
CH <sub>2</sub> F <sub>2</sub>	139.9 (cascade?)	9P22	pyro
CD <sub>3</sub> OD	143.8	9P18 ( <sup>13</sup> C)	pyro
<sup>15</sup> NH <sub>3</sub>	152.7	10R18 ( <sup>13</sup> C)	150
CH <sub>2</sub> F <sub>2</sub>	158.5	9P10	pyro
CH <sub>3</sub> OH	163	10R38	36
CH <sub>3</sub> OH	164.6	9P16	pyro
CD <sub>3</sub> OD	184	10R24	30
CH <sub>2</sub> F <sub>2</sub>	184.3	9R32	150
CH <sub>2</sub> F <sub>2</sub>	193.9	9R22	10
CH <sub>2</sub> F <sub>2</sub>	214.6	9R34	100
CD <sub>3</sub> OH	221	9P36 ( <sup>13</sup> C)	pyro
CD <sub>3</sub> OD	255	10R36	5
CD <sub>3</sub> OH	292.1	9P38	10
CH <sub>3</sub> Cl	333.9	9P42	pyro
CD <sub>3</sub> OD	355.5	10R16	2
<sup>15</sup> NH <sub>3</sub>	373.4	10R42	50
CD <sub>3</sub> Cl	383.2	9R34	25
<sup>15</sup> NH <sub>3</sub>	388.5	10R10 ( <sup>13</sup> C)	M
HCOOH	393.6	9R18	40
HCOOH	418.6	9R22	30

Molecule	Wavelength ( $\mu\text{m}$ )	CO <sub>2</sub> Pump Line	Typical Powers (mW)
HCOOH	432.6	9R20	40
CD <sub>3</sub> Cl	443.3	9P10	M
CH <sub>3</sub> I	447.1	10P18	M
CH <sub>3</sub> F	496.1	9P20	M
HCOOH	513	9R28	20
CD <sub>3</sub> OH	530.4	9P20 ( <sup>13</sup> C)	pyro
CH <sub>3</sub> OH	570.6	9P16	M
C <sub>2</sub> H <sub>2</sub> F <sub>2</sub>	662.8	10P24	pyro
<sup>13</sup> CD <sub>3</sub> I	690	10P10	20
HCOOH	742.6	9R40	2
HCOOH	744	9R24	pyro
<sup>13</sup> CD <sub>3</sub> I	806	10P12	4
C <sub>2</sub> H <sub>2</sub> F <sub>2</sub>	889	10P22	pyro
CH <sub>3</sub> OD	917	9R24 ( <sup>13</sup> C)	pyro (Metal)
CH <sub>3</sub> Cl	944	9R12	pyro (Metal)
C <sub>2</sub> H <sub>2</sub> F <sub>2</sub>	1020	10P14	pyro (Metal)
<sup>13</sup> CH <sub>3</sub> F	1221.9	9P32	1 (Glass) 7 (Metal)
CH <sub>3</sub> Cl	1886.7	9P26	Golay (Metal)

### Other FIR lines not uniquely identified

Molecule	Wavelength ( $\mu\text{m}$ )	CO <sub>2</sub> Pump Line	Typical Powers (mW)
CH <sub>3</sub> OH	43.1 or 53.5	10R36	pyro
CH <sub>3</sub> OH	100/194 or 209	9R14	pyro
CH <sub>3</sub> OH	62/69/77	10R16	3
CH <sub>3</sub> OH	Not listed (short wavelength)	9P28	pyro
CH <sub>3</sub> OH	unknown	10P24	pyro

#### Key to Tables

Pyro	Indicates a pyroelectric detector was used and suggests powers < 1 mW.
Golay	Indicates a Golay detector was used and suggests powers < 0.1 mW.
Metal	Indicates a metal waveguide was used.
M	Indicates powers in the 1-10 mW region.
<sup>13</sup> C	Indicates that the CO <sub>2</sub> laser was sealed off and used the Carbon 13 isotope of CO <sub>2</sub> .

For further information about FIR lines, please refer to Millimetre and Submillimetre Wavelength Lasers - A Handbook of cw Measurements. by Nigel Douglas. Springer Verlag, Optical Sciences Series, Vol. 61 ISBN 3 540 50827 9.