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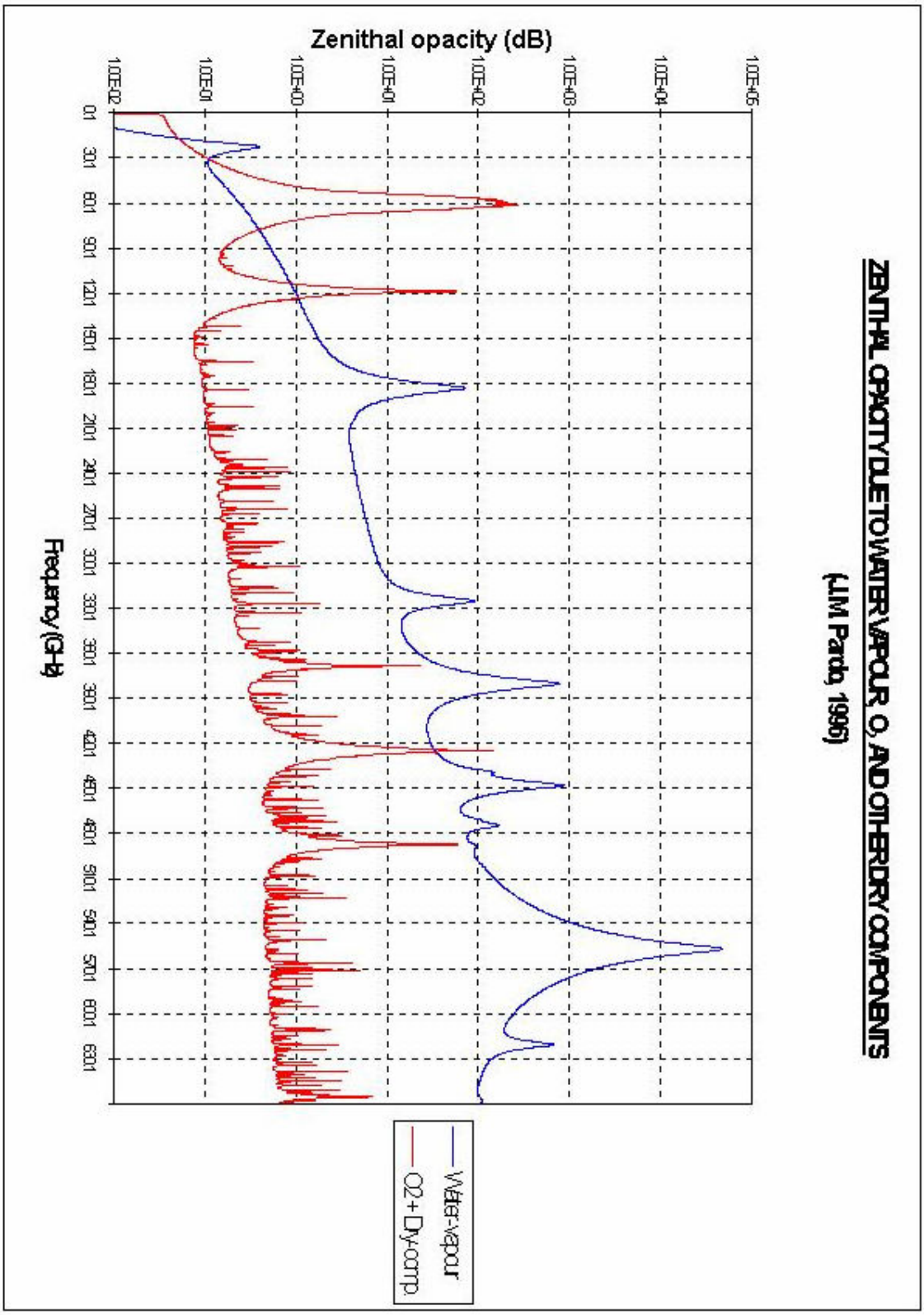
Appendix A


ZENITHAL OPACITY DUE TO WATER VAPOUR, O2 AND OTHER DRY COMPONENTS
(J.M Pardo, 1996)
Zenithal opacity (dB)
1.0E+05
1.0E+04
1.0E+03
1.0E+02
1.0E+01
1.0E+00
1.0E-01
1.0E-02
1
301
601
901
1201
1501
1801
2101
2401
2701
3001
3301
3601
3901
4201
4501
4801
5101
5401
5701
6001
6301
Frequency (GHz)
Water-vapour
O2+Dry-comp.

Appendix B

From D.Pooley, Z-DNA forming potential of the lux operon. submitted 2003

One fundamental relationship that describes the topology of ccDNA relates the integer linking number *L*, with the number of helical turns T and the writhe number W so that *L = T+W*. L cannot change unless the phosphodiester backbone is cleaved with a enzyme. The free energy of ccDNA is described by the equation $\Delta G^0 = K\Delta Lk^2$ where K = 1100RT/N for a plasmid N base pairs in size (Drlica 1990). In a B-Z transition L partitions between T and W and this depends on nucleation energy, propagation energy and the number of supercoils relaxed by the structure transition (Ho et al. 1986). This partition function (Q) for the B-Z transition of all the combinations of nucleotides is shown in equation [1] where S_j is the equilibrium constant, and a_j is the degree of helical unwinding for the propagating Z-DNA at the *j*th dinucleotide, σ the equilibrium constant and *b* is the degree of unwinding for the nucleation step (Ho, Ellison, Quigley, & Rich1986).

$$Q = 1 + \sum_{i=1}^{n} \sum_{k+1}^{n} \sigma \left(\prod_{j=1}^{k} S_j \right) x \exp\left\{ \left\{ \frac{-k}{RT} \left[\Delta Lk - \left(\left(\sum_{j=1}^{k} a_j \right) - 2b \right]^2 \right\} \right\} \quad [1]$$

The probability of finding Z-DNA in a particular sequence can be calculated using equation [2] (Schroth, Chou, & Ho 1992).

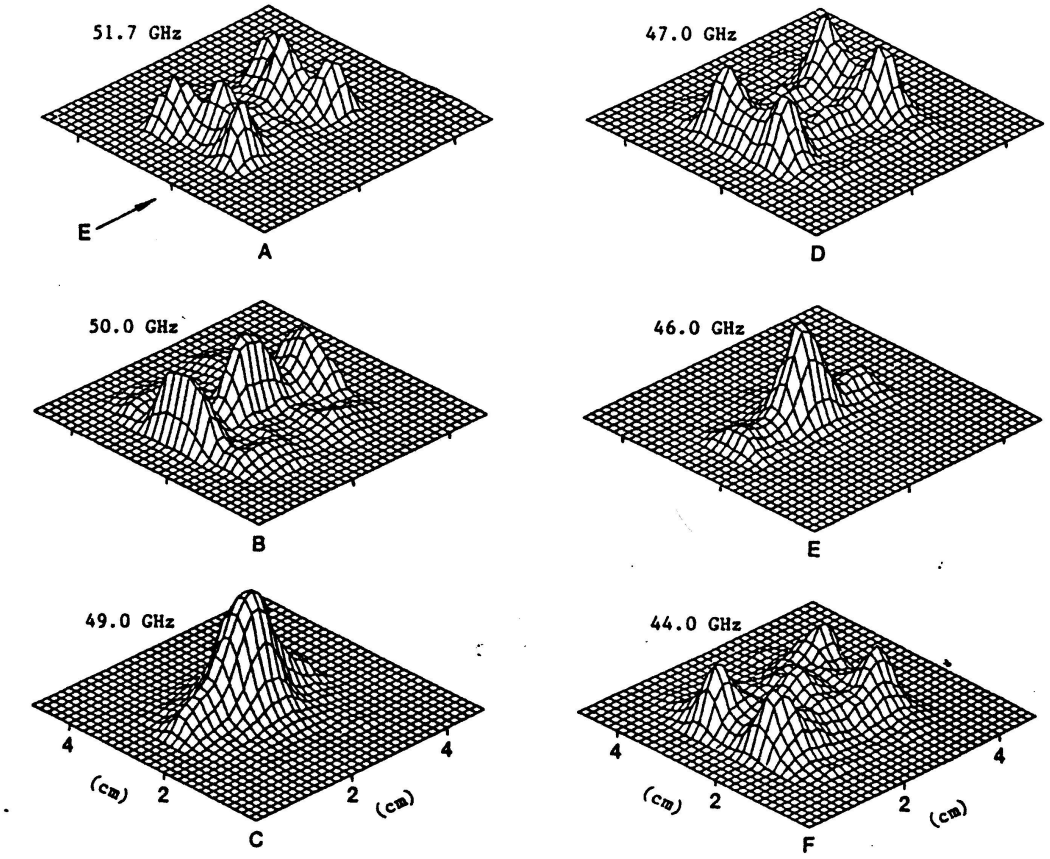
$$\langle \Delta Tw \rangle = Q^{-1} \left\{ \sum_{i=1}^{n} \sum_{k=1}^{n} \left[\left(\left(\sum_{j=1}^{k} a_j \right) + b \right) \sigma \left(\prod_{j=1}^{k} S_j \right) x \exp \left[\frac{-K}{RT} \left(\Delta Lk - \left(\sum_{j=i}^{k} a_j \right) - 2b \right)^2 \right] \right] \right\}$$

[2]

The above equations are applied in a search strategy whereby a window between 6 and 8 dinucleotides in length advances along the sequence. This length chosen to reflect the shortest sequence that can form Z-DNA. The windows overlap so that a good Z-DNA forming sequence cannot be truncated. Each window is simulated within a 5000 bp closed circular plasmid of N base pairs, through a range of superhelical densities. For

further details see Ho *et al* (Ho, Ellison, Quigley, & Rich1986; Schroth, Chou, & Ho1992).

Appendix C



From Khizhnyak & Ziskin 1996, Frequency-dependent non-uniform heating pattern formed with horn antennas.

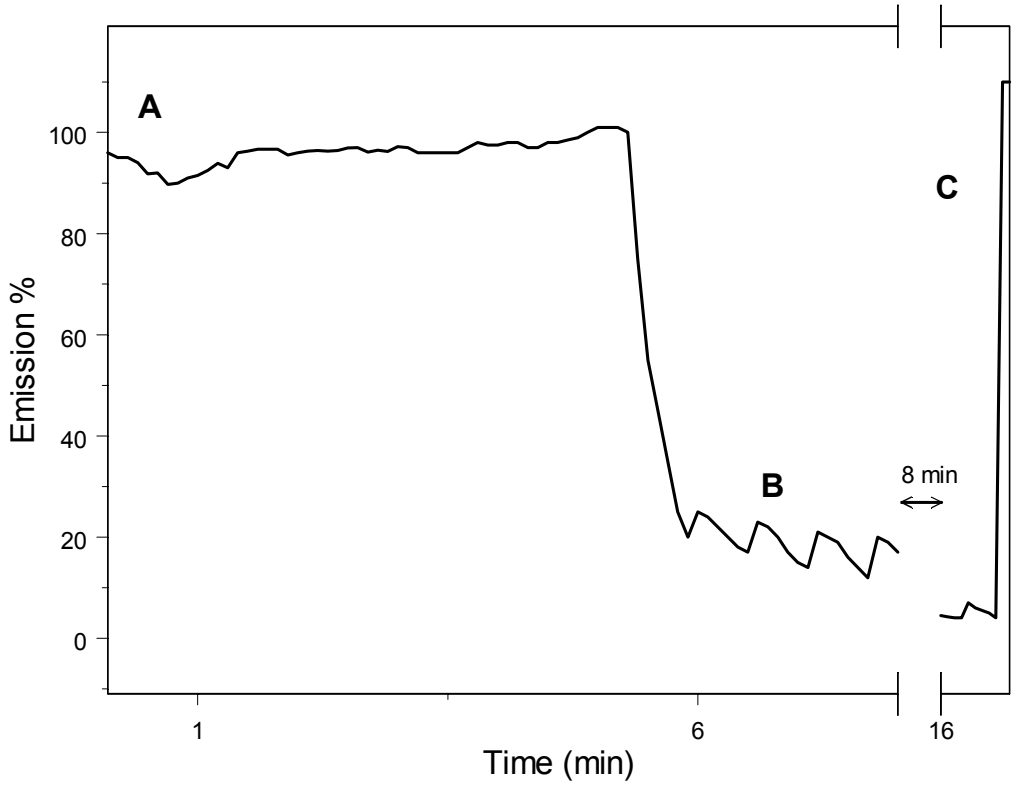
Appendix D

Mol^{-1} L^{-1}

Compound	EC_{50} values
KCN	$3.9x10^{-6}$
Phenol	1.8×10^{-3}
FCCP	$1.56x10^{-13}$
Venturicidin	$1x10^{-14}$

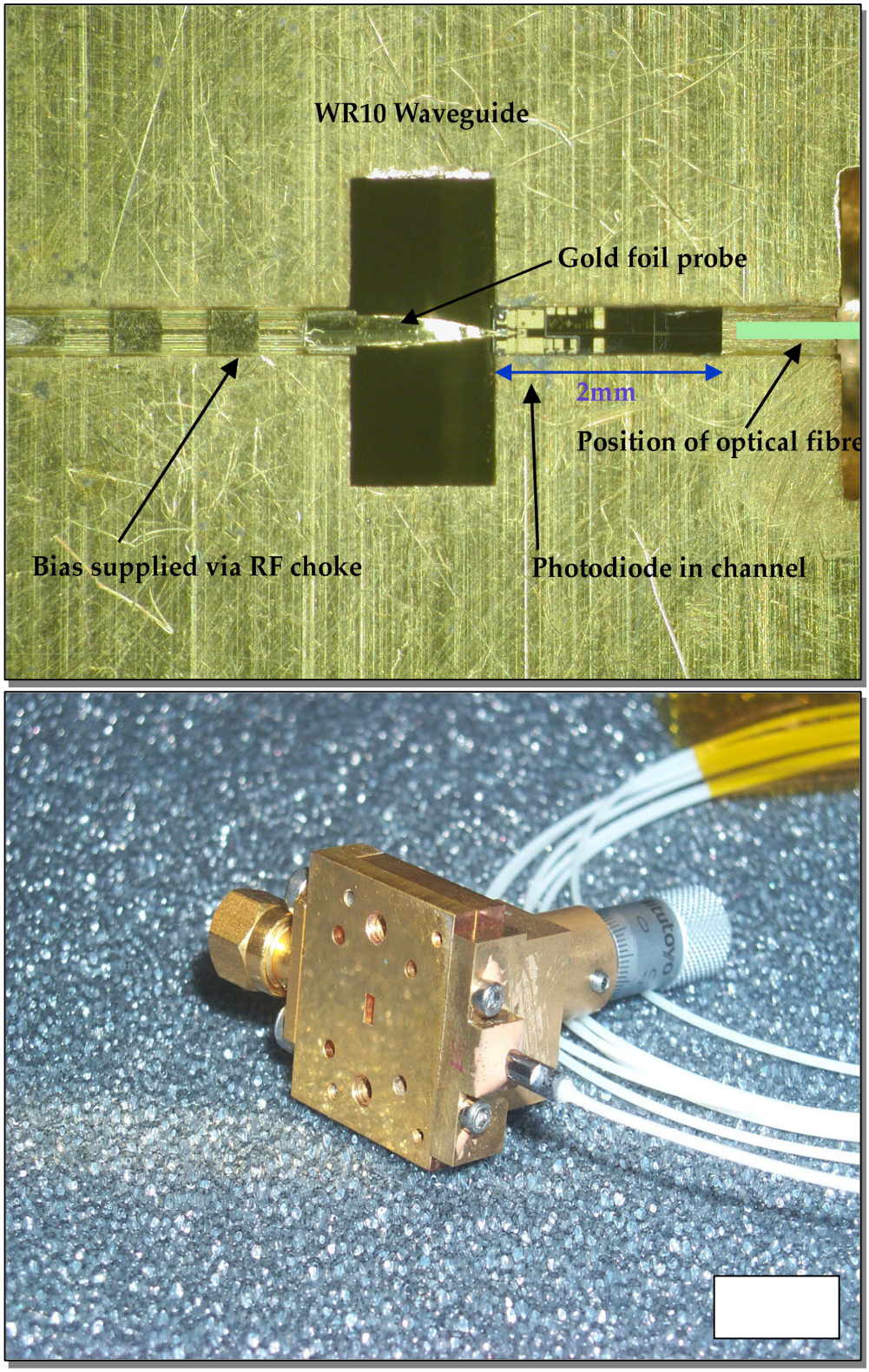
Inhibitory concentrations of some chemicals on bacterial bioluminescence

Appendix E



Effect of switching off air supply to bioluminostat. A: air supply switched off B: Residual luminescence C: "Excess flash" with reintroduction of air into the culture vessel.

Appendix F



Photographs of photomixing devices

Appendix G

Block diagram of potential photomixing scheme for large bandwidths