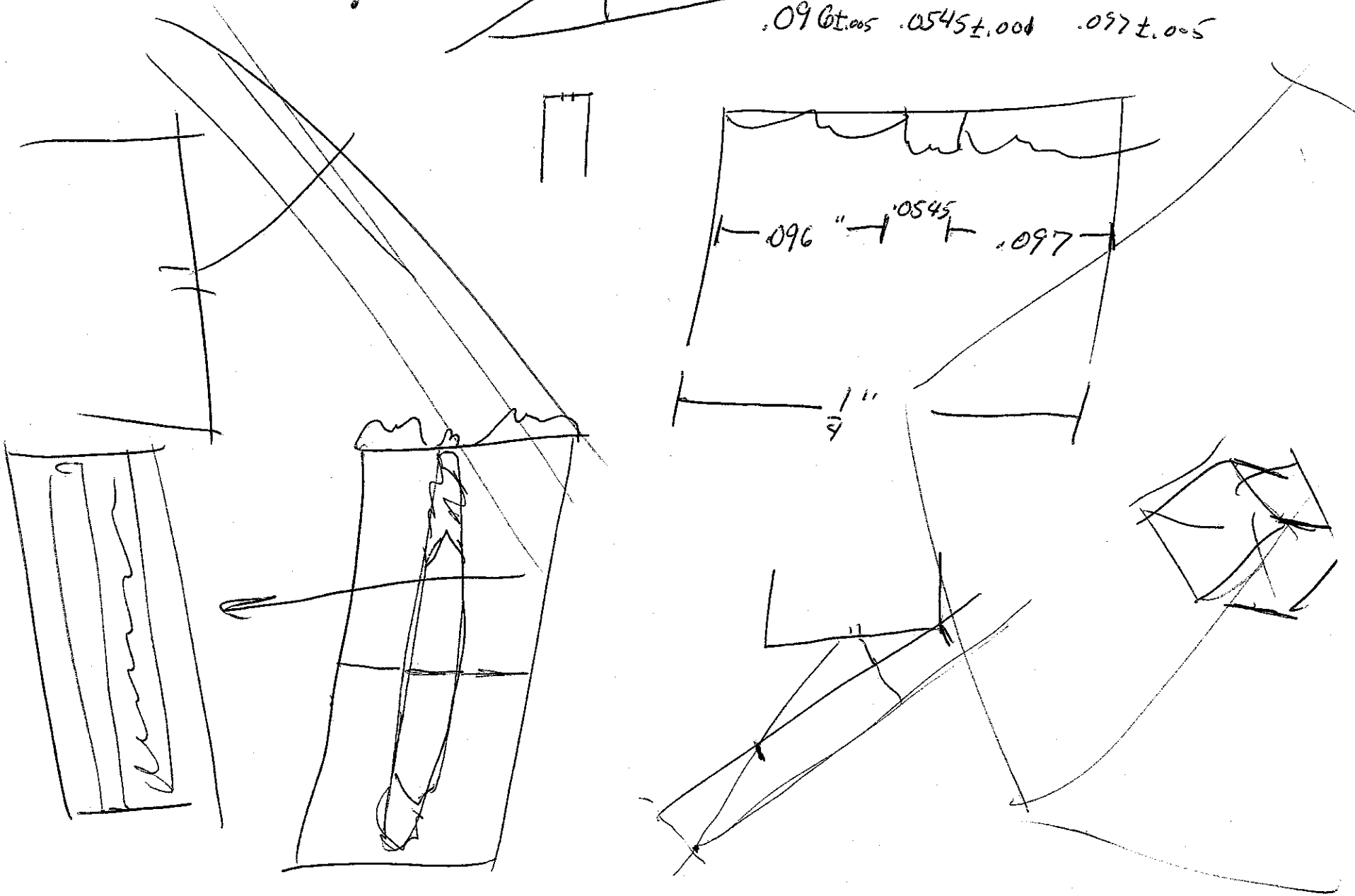
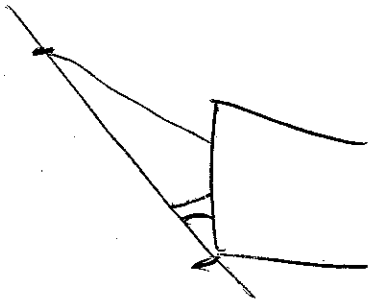
Half → .547" @ 45°

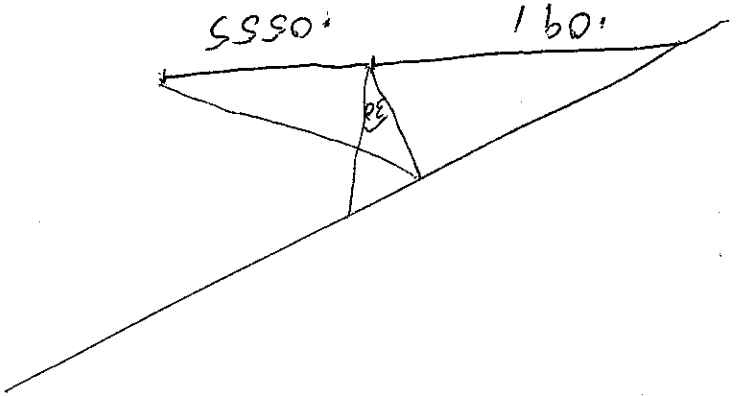
.45

1.46" Ref

.096±.005 .0545±.001 .097±.005






5550'
180'
38

Cuvette-experiment :

GOAL :- The goal of this experiment is to verify the glucose-predicting ability of D1000 in an *in-vitro* phantom whose optical properties mimic that of biological tissue.

MATERIALS :- Three 2mm quartz cuvettes, glucose, DI water, polystyrene latex spheres (1.05 μm dia), urea.

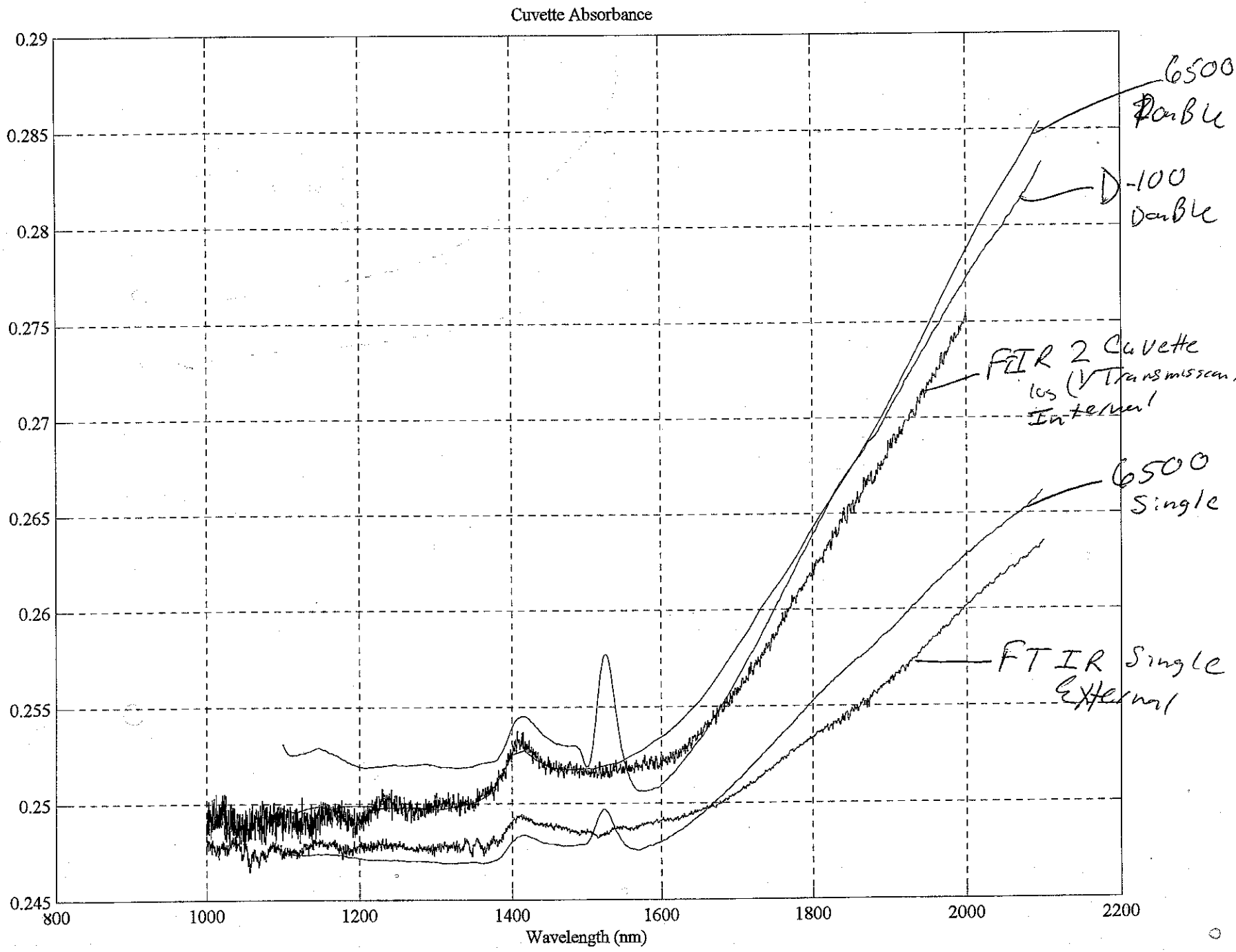
BACKGROUND :- A simple tissue phantom whose scattering and absorption properties mimic that of biological tissue can be made in-house. Glucose being the analyte of interest, its concentration would be varied from 0 mg/dL to 800 mg/dL in the suspension. Biological tissues have approximately 70% to 90% water, and hence, water is chosen as the base solvent for the suspension. Turbidity on the suspension can be achieved by adding polystyrene latex spheres. Its volume fraction can be adjusted to achieve a particular value of scattering coefficient of the suspension. The effect of changes in the magnitude of water absorption due to displacement of water by glucose might overshadow the changes in magnitudes of glucose absorption. Thus if we use PLS to create a calibration model, the B-vector could "lock" to water changes instead of glucose changes. To avoid this situation another water-soluble compound, urea, is added to the suspension whose volume fraction can be varied independently. In order to mimic the actual application , the ambient conditions like temperature and humidity will not be controlled.

PHANTOM PREPARATION :- The reduced scattering coefficient of the suspension would be kept at 1.0 and 1.5 mm^{-1} (at 1100 nm) by adjusting the volume fraction of intralipid. For each of these two scattering coefficients, fix the glucose concentration at one value from 0.0 to 0.8% volumetrically (in the steps on 0.1%). For each glucose concentration, vary the urea fraction from 0% to 4% (in the steps of 1%). The volume fraction of the fourth compound, water, would be 100 - [glucose% + urea% + intralipid%]. Thus, we can have 2 x 5 x 9 = 90 phantoms.

EXPERIMENTAL PROCEDURE :- After the machine has stabilized, take a reference spectrum with an empty cuvette. Then fill the cuvette with one of the 90 different combinations of the suspension, and take another spectrum. Pull out the cuvette and repeat the above with another cuvette. In the mean time, clean the first cuvette. The following points should be taken care of while taking the spectra (on calibration as well as prediction day):

1. Randomize the selection of these 90 samples.
2. Use one particular concentration sample in all the three cuvettes, at the beginning, middle and the end of the day to account for the cuvette variations.

Once the spectra has been collected for the entire calibration day, use PLS to create the calibration model. This model would later be used to predict the glucose concentration of the samples on the following days for a period of 4 weeks. The results would be shown in error grids and remember, all outlier criteria should be turned off.


Cuvette Absorbance
0.29
0.285
0.28
0.275
0.27
0.265
0.26
0.255
0.25
0.245
800
1000
1200
1400
1600
1800
2000
2200
Wavelength (nm)
6500 Double
D-100 Double
FTIR 2 Cuvette
6500 Single
FTIR Single External

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DATE: June 16, 1997

FAX #: 412 349 8610

COMPANY: Biocontrol Technologies

ATTN: Jeremy Grata

FROM: Liz Chae

RE: Settling velocity of particles

Total Pages: 1

Hi Jeremy,

Here is the formula for the settling velocity of particles:

$$V = \frac{(\rho_p - \rho_f) d^2 g}{18\eta}$$

where:

$\rho_p = 1.05$ g/cc

ρ_f = density of fluid

d = diameter of particle, cm

g = gravity $\approx 981 \text{cm/s}^2$

η = fluid viscosity $\approx 0.01 \frac{\text{dyn} \cdot \text{s}}{\text{cm}^2}$

V = velocity $= \frac{\text{cm}}{\text{s}}$

Contact me if you have further questions or comments.

Sincerely,

Liz Chae