

GEOP 501 - Fall 2017 - HW # 8 and 9 - (Due date: 26/12/2017)

The following is a list of the input information from known geologic and equipment factors:

- existing 2-D data of good quality have 100 fold
- steepest (and target) dip = 25°
- shallowest depth of interest = 800 m
- target depth (Z) = 4000 m
- target two-way time (T_0) = 2.2 s
- V_{RMS} to the target horizon = 4000 m/s
- V_i at the target horizon = 4500 m/s
- f_d at the target horizon = 20 Hz
- f_{max} at the target horizon = 55 Hz
- target size = 150 m
- $T_d = 3.5$ s.
- The allowed stretch factor $S_{NMO} = 0.5$
- Assume that the near-surface layer is a multiple-generating layer whose thickness is $H_I = 50$ m and velocity is $V_I = 800$ m/s.

- (1) Calculate the bin size (B) according to the target size rule.
- (2) Calculate the bin size (B) according to the aliasing rule.
- (3) Calculate the bin size (B) according to the resolution rule.
- (4) Calculate the recommended bin size (B). Assuming a square bin, calculate the recommended RI and SI .
- (5) Calculate the recommended range of X_{min} .
- (6) Calculate the recommended RLI and SLI assuming a square box. Note that all box dimensions have to be multiples of RI and SI .
- (7) Compute the X_{max} according to the target depth rule.
- (8) Compute the X_{max} according to the maximum allowable NMO stretch rule.
- (9) Compute the X_{max} according to the NMO discrimination rule.
- (10) Compute the X_{max} according to the multiple cancellation rule.
- (11) Compute the X_{max} according to the AVO effects rule.

- (12) What is the range of values for the X_{max} ?
- (13) Assuming wide-azimuth patch, calculate the recommended NRL and number of receivers per receiver line. Note that all patch dimensions have to be multiples of RLI and SLI .
- (14) Calculate the number of channels for this survey?
- (15) Calculate the inline, crossline dimensions, actual X_{max} , and the aspect ratio of your patch.
Does the actual X_{max} fall within the acceptable range of values? If not, try another combination of inline and crossline dimensions until it does.
- (16) Calculate the recommended range of the 3-D total fold (F).
- (17) Calculate the recommended inline (F_I) and crossline (F_X) folds.
- (18) Calculate the actual F ? Does it fall within the acceptable range of values? If not, try another combination of inline and crossline dimensions until it does.
- (19) Calculate the recommended fold taper in the inline and crossline directions.
- (20) Calculate the migration aperture according to the diffraction rule.
- (21) Calculate the migration aperture according to the displacement rule.
- (22) Calculate the migration aperture according to the Fresnel rule.
- (23) Calculate the recommended migration aperture.
- (24) Calculate the recommended record length (T_R).
- (25) Draw a scaled figure of a box showing the receiver and source lines, arrangements of receivers and sources, X_{min} , and a CMP bin (showing 4 source-receiver pairs associated with this bin).
- (26) Draw a scaled figure of a patch showing the receiver and source lines, X_{max} , the inline and crossline dimensions, and the inline and crossline directions.
- (27) Assuming a swath shooting method, draw a scaled figure of 2 adjacent swaths showing the receiver and source lines, several patches, several salvos, and show the acquisition movement direction and the inline and crossline rollovers.