Formula Masking #1

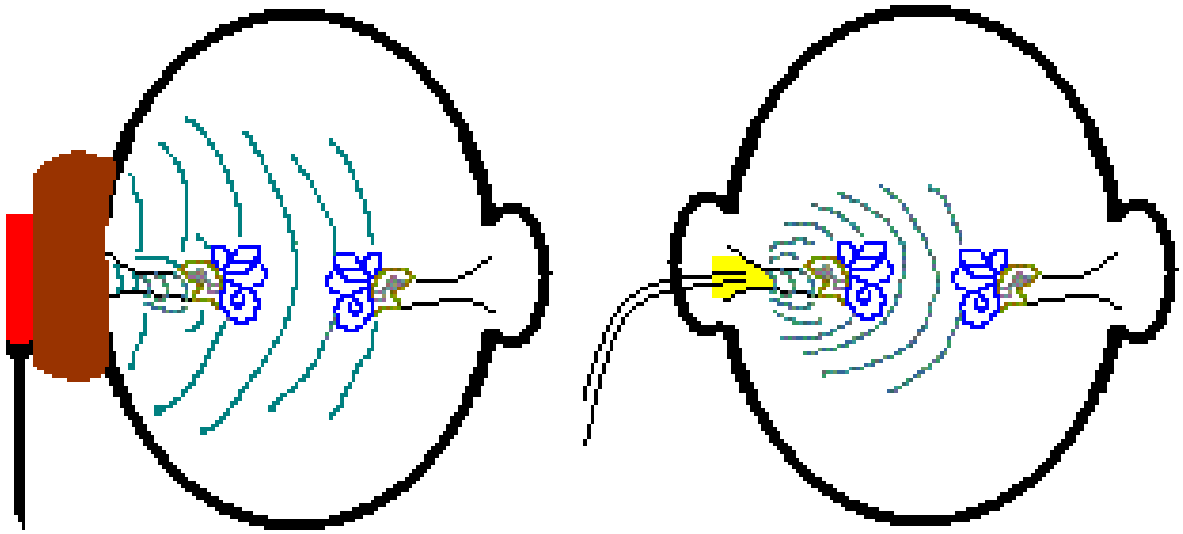
A Review of General Masking Concepts and the Masking Plateau

Overview

- Mastery of plateau masking is important
- Sometimes you cannot plateau
  - Speech discrim testing
  - ABR testing
- Sometimes it is more efficient to formula masking
  - Time savings in any busy practice
  - Limited test time (children)
- Sometimes you will want to revert to plateau masking if at all possible
  - Too many unknowns, too complicated, too great a chance for errors. (Conductive loss bilat or to NTE)

Masking Fundamentals

- All crossover happens by bone conduction, even if the stimuli are presented by air conduction.



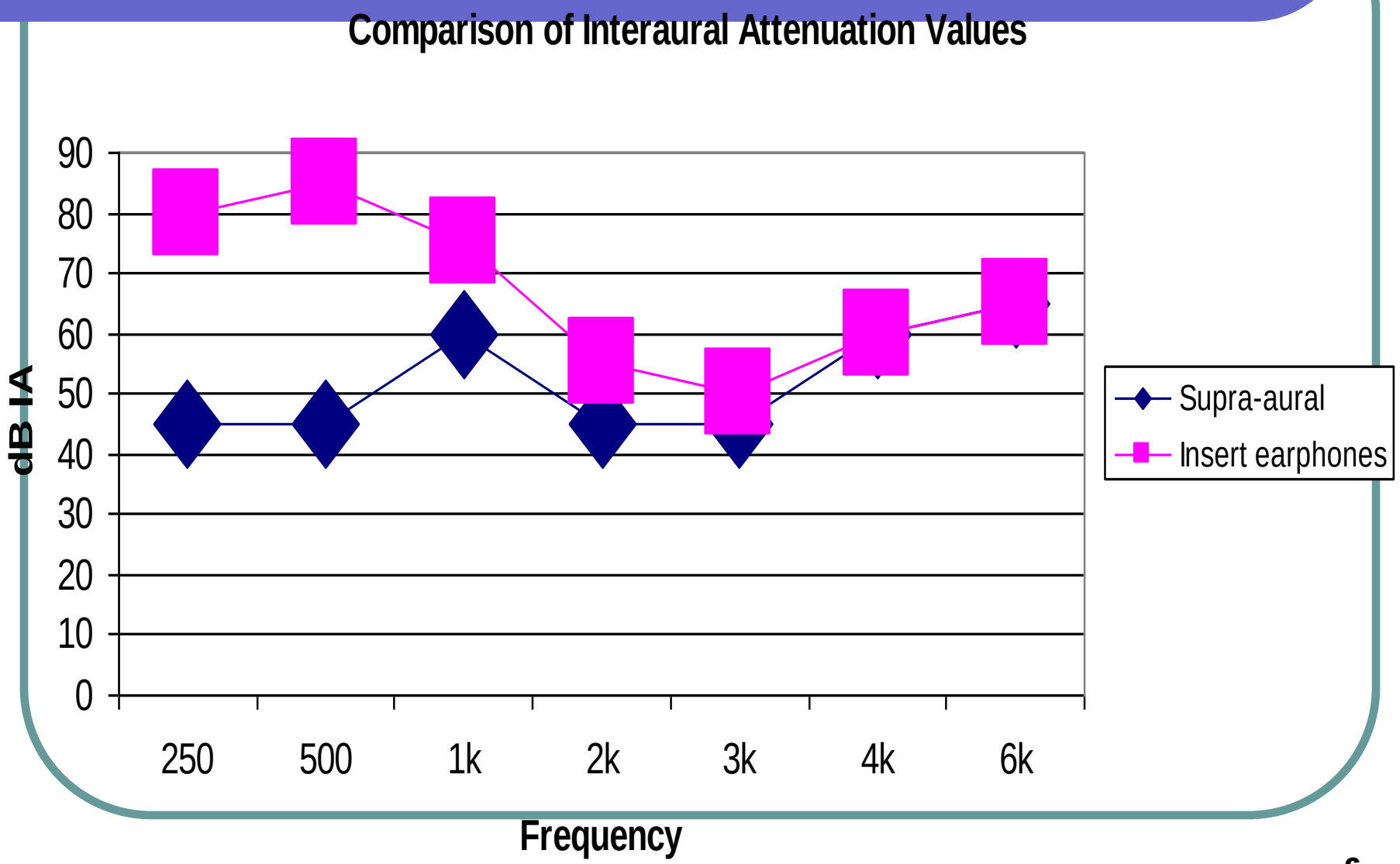
Interaural Attenuation is…

- The loss of sound intensity as it goes from one ear to the NTE **COCHLEA.**
- Depends upon
  - Frequency
  - Transducer
  - Individual skull characteristics
    - Since we don't know who has a "thick skull" we assume the worst case scenario. Assume minimal IA.

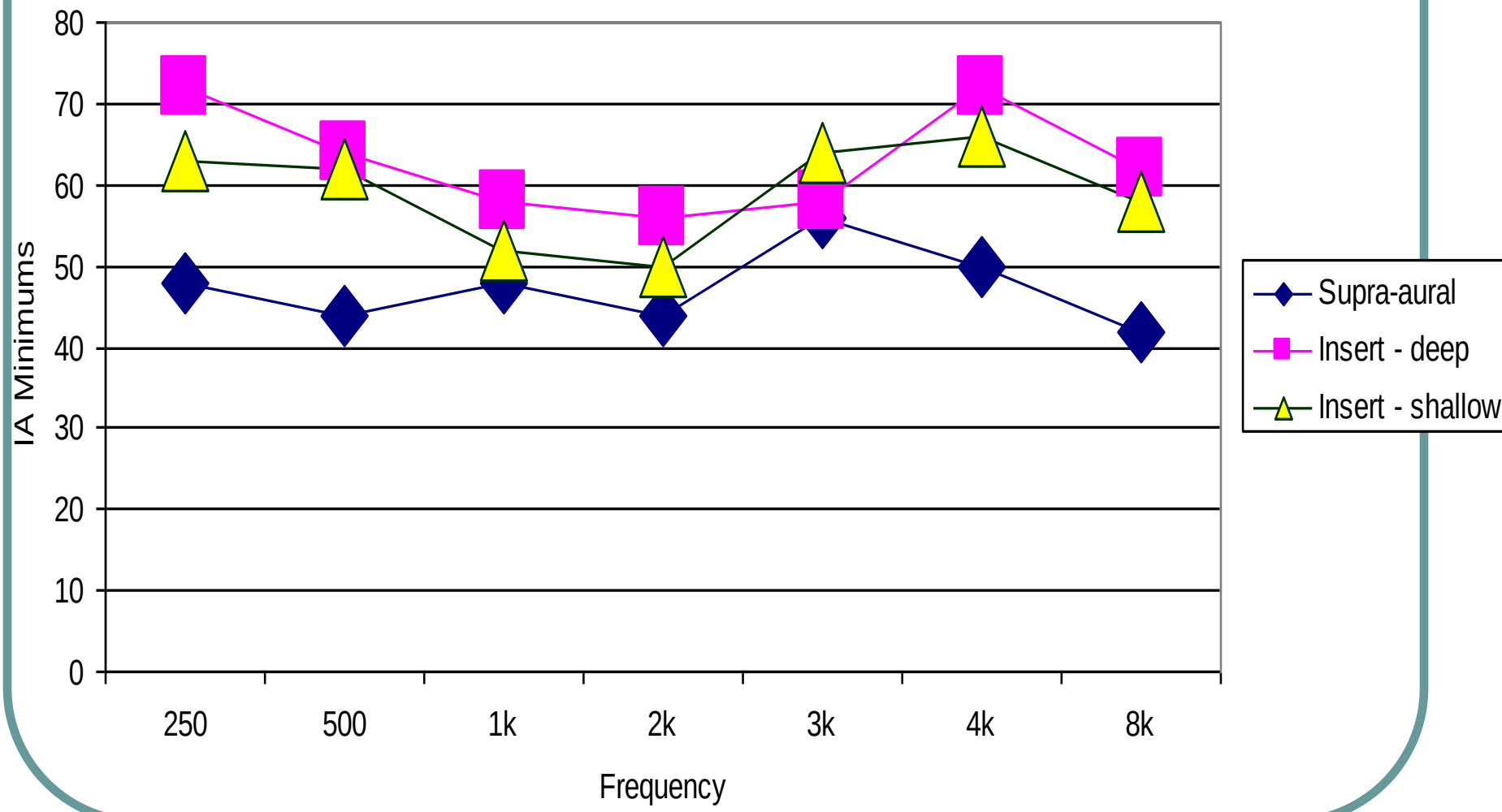
Interaural attentuation values

- 40 is the commonly used minimum IA value for TDH/MX41AR
  - It is probably a bit conservative. 45 is probably appropriate, with a median IA of 60. However, tradition dictates using 40.
  - Deeply inserted insert phones give 15-20 more IA.
    - Viewing the next two figures, what minimum IA value will you use?

Minimum Values, per Sklare & Denenberg, 1987



Min. IA Munro & Agnew (1999)



Yacullo
From Katz 6th edition

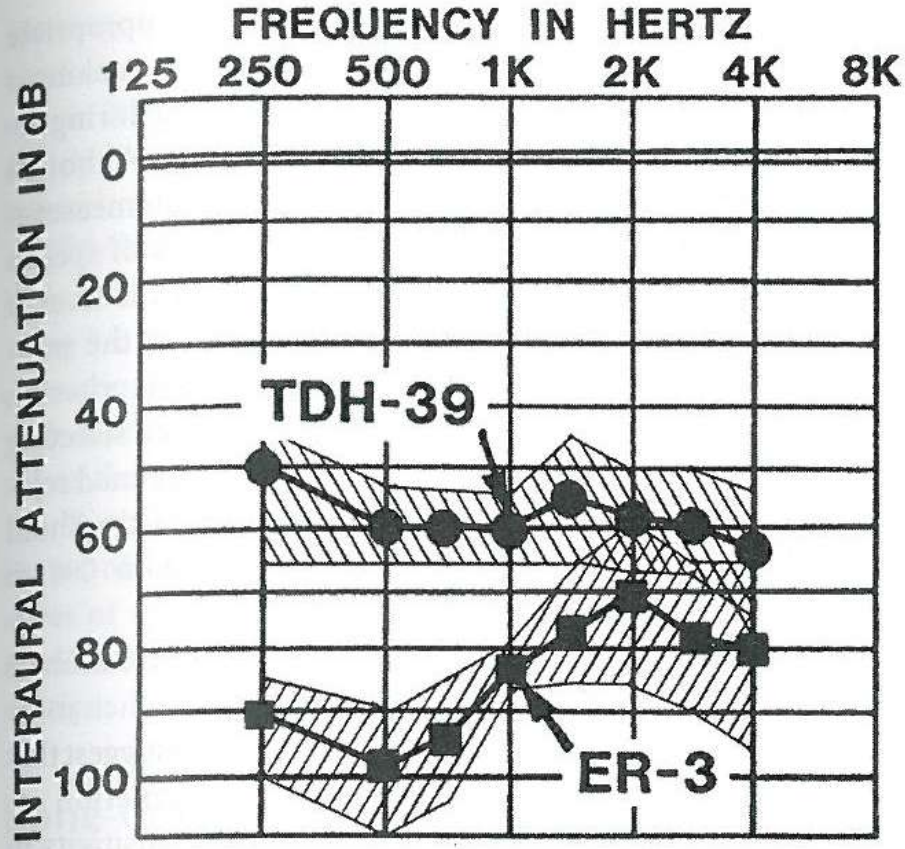
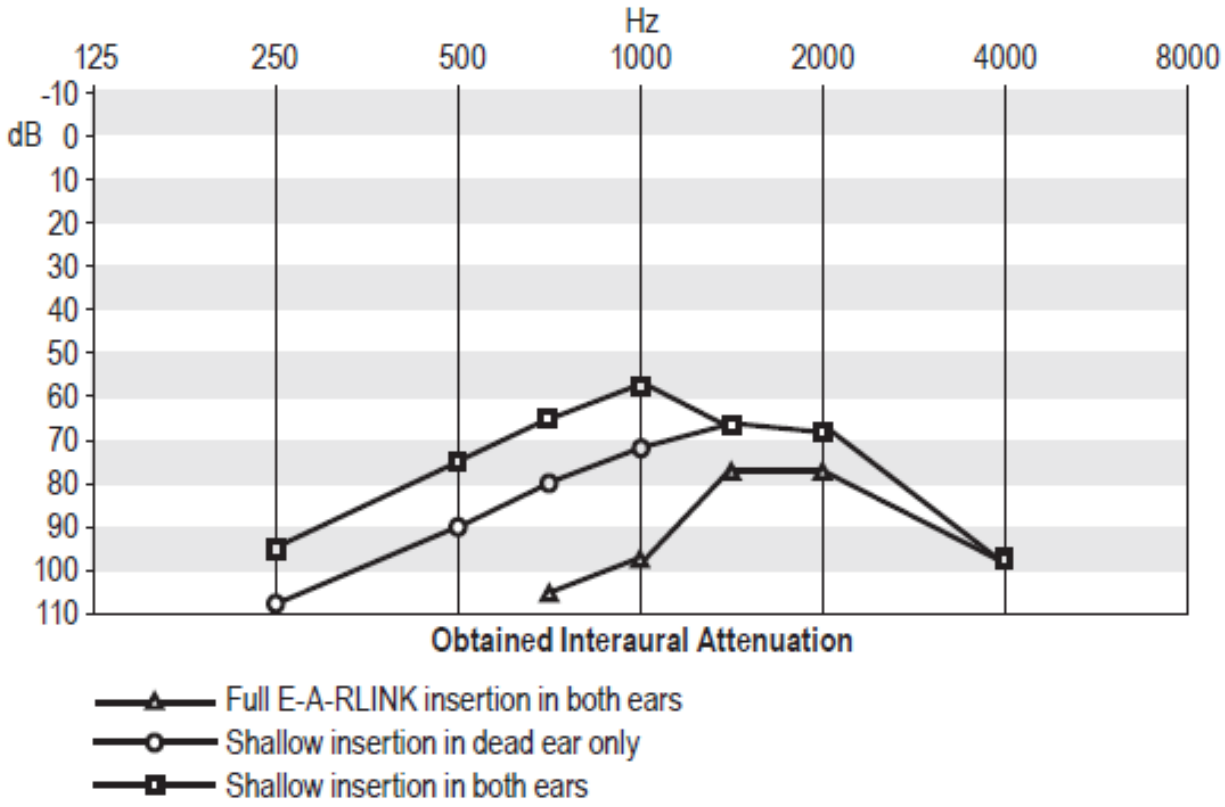


FIGURE 6.3 Average and range of interaural attenuation values obtained on six subjects using two earphones: TDH-39 encased in MX-41/AR supra-aural cushion (•) and ER-3A insert earphone with deeply inserted foam eartip (■). (From Killion MC, Wilber LA, Gudmundsen GI. [1985] Insert earphones for more interaural attenuation. *Hearing Instruments*. 36, 34. Copyright © 1985. *Hearing Instruments* is a copyrighted publication of Advanstar Communications Inc. All rights reserved. Reprinted by permission of the publisher.)

From the EARTone manual



Opinions vary

- What do you plan to do?
  - Mask whenever 40/50 rules met
  - Use Yacullo's rule: 50 in high freq, 75 at 1k and below
  - Have a frequency-specific chart of IA values per transducer
  - Pros
  - Cons

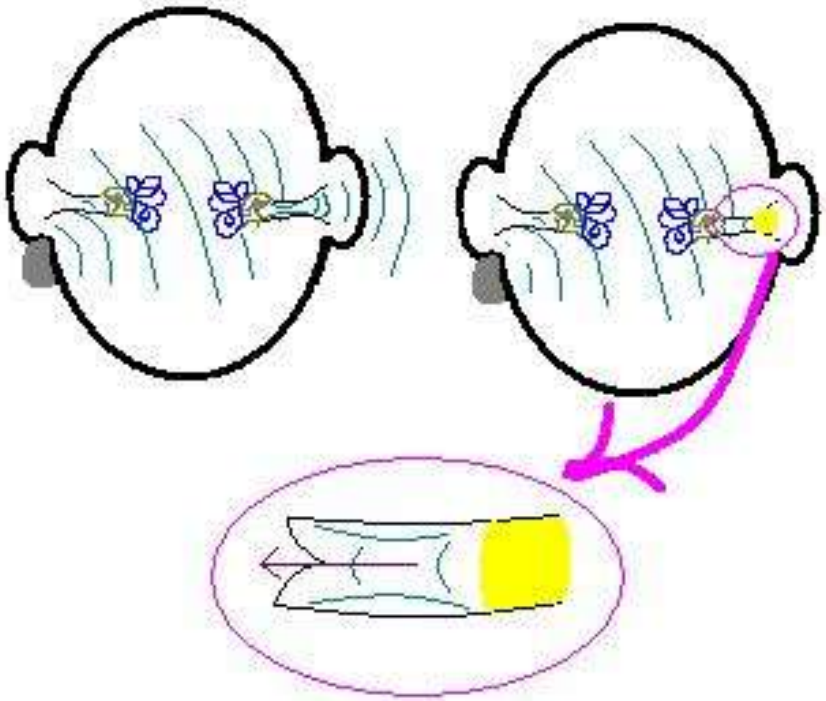
Speech & click IA

- When testing w/ a wide-band signal (speech, click) some say use the same minimum IA – you don't know which frequency is crossing over & heard. However, clicks and speech are wide-band signals, meaning less energy at any single frequency region, and appear to have greater IAs. Supraaural earphones, 50 is a good minimum number; 60 for inserts. You can be more conservative if desired.

Next big point – Occlusion Effect

- BONE CONDUCTED sound is enhanced when the NTE is covered.
  - The three mechanisms for BC are:
    - Compression / distortion of cochlea shell
    - Inertial lag of stapes in oval window
    - BONE CONDUCTION BY AIR CONDUCTION

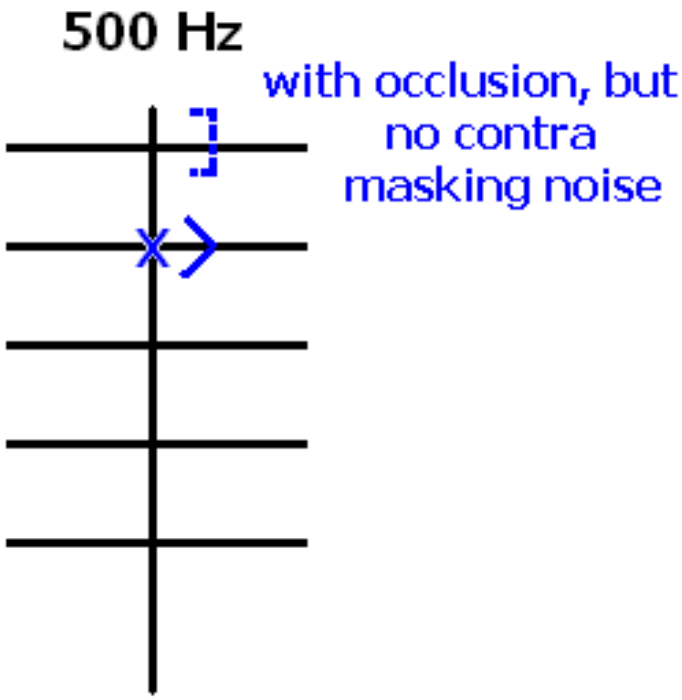
- Covering NTE enhances the BC signal



So… don't cover NTE unless you are going to mask

- If you put oscillator on the left ear, and an insert in the right ear, the "unmasked" threshold (dotted line in illustration) is artificially lowered by the amount of the occlusion effect for that person/ear. Bone will be better than it would be without masking.

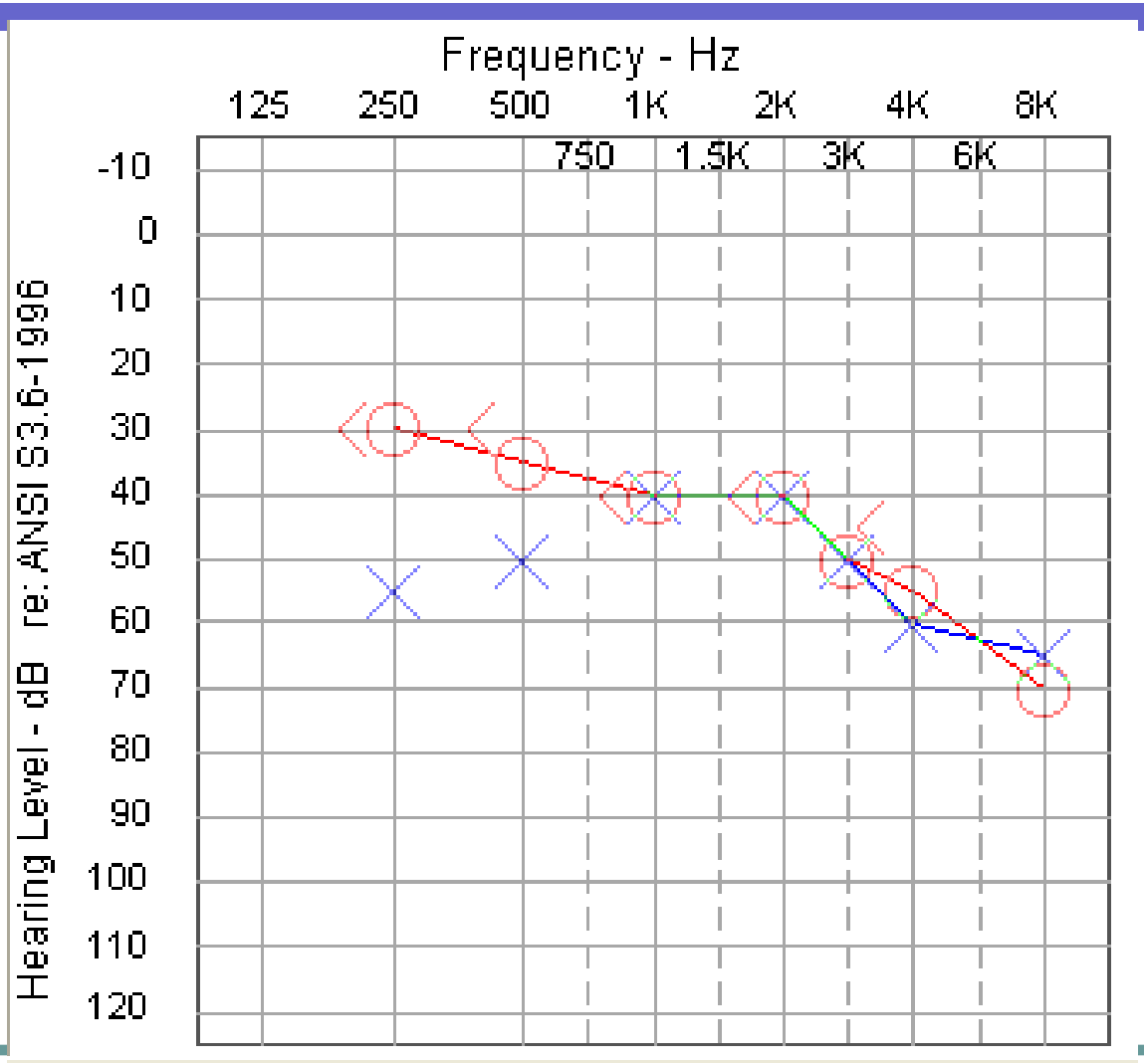
e.g. Right ear is NTE and has normal hearing. The occluded, unmasked threshold is RE w/ OE.



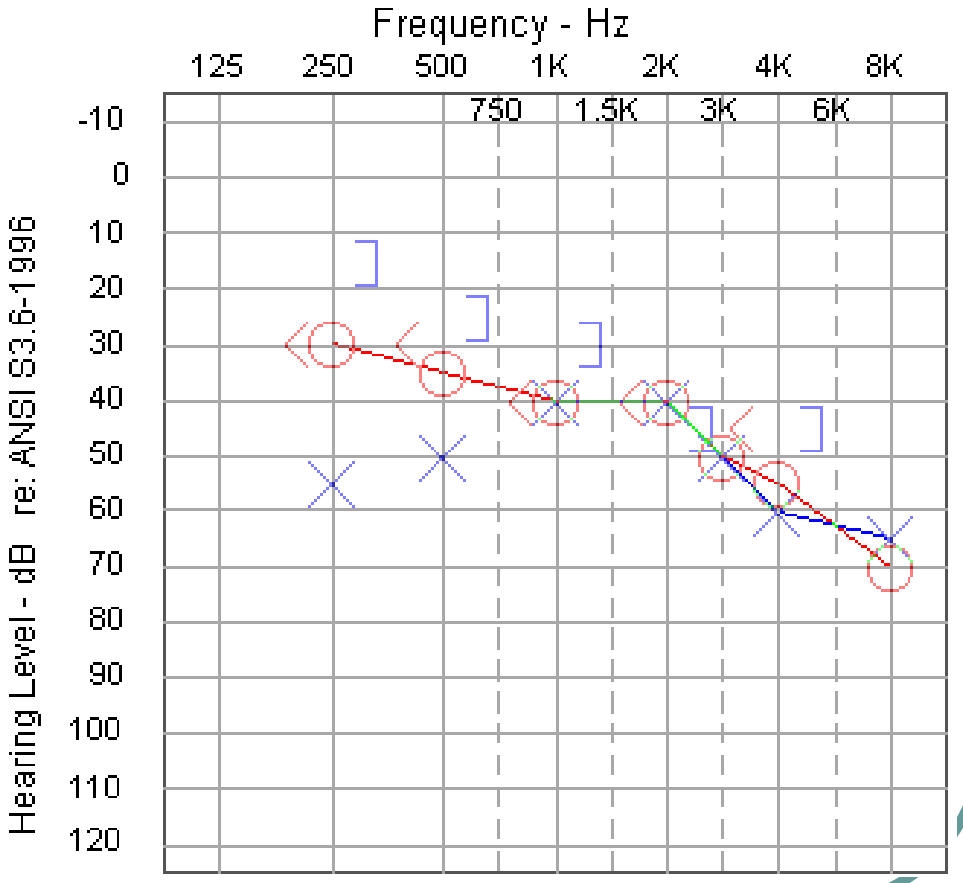
- If you record an unmasked symbol, it is inappropriate to have used contralateral occlusion… you are not communicating the results in a way that lends itself to replication of findings.

My bad!

- 84 year old male. Tymps normal. Reflexes present probe right, ipsi & contra, but I couldn’t get a seal on very elliptical ear canals left side.
- Tested the patient w/o a student.

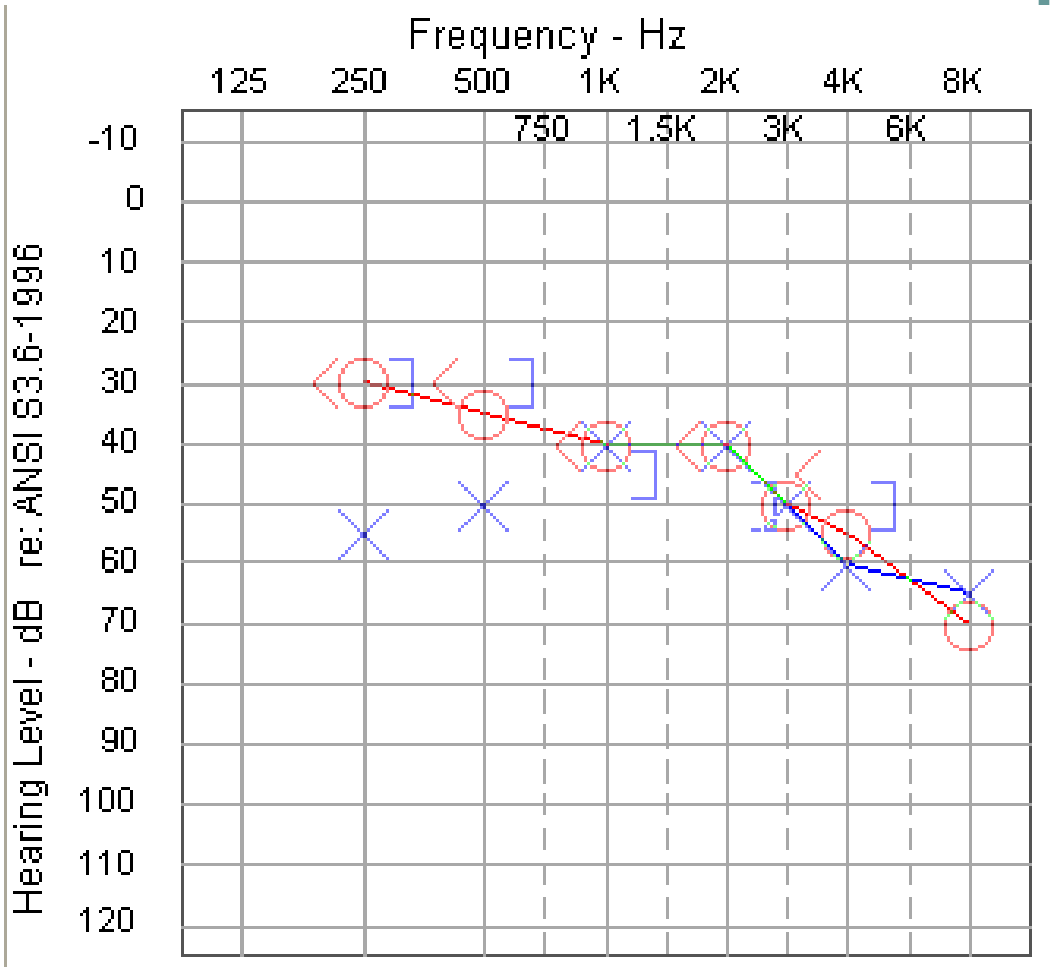

Frequency - Hz
125
250
500
750
1K
1.5K
2K
3K
4K
6K
8K
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
Hearing Level - dB re: ANSI S3.6-1996

- 1st patient of the day. What's wrong with this picture?
- Obviously my brain was on holiday before my body; what is my mistake?



Masking levels: 60 / 70 / 60 / 60 / 70 at 250-4k respectively.

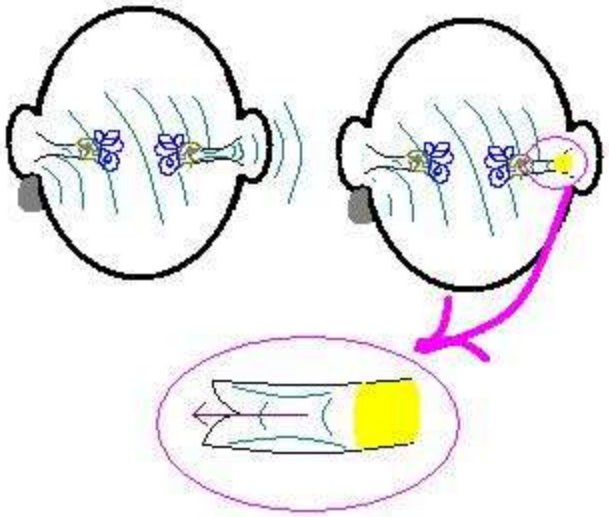
- Too bad I couldn't get reflexes on the left ear!
- Anything else occlusion effect wise that could help us figure out if left really has a conductive loss?



Masking levels 75/70/60/60/70

Another note on occlusion

If there is a conductive loss in the NTE, then the extra AC by BC is not likely to help hearing – the sound from the “BC by AC mechanism” is attenuated by the conductive loss; the other BC mechanisms predominate. If there is a outer ear conductive, eg plug of wax, then you might already have an OE.



Next topic.
My term: “safety pad”

- When you start plateau masking for AC, you don’t start w/ the noise right at threshold, you start at 10 (?) above, right?
- And for bone, you start at the OE plus this pad
  - The rule “Bone 25/25/20” comes from OE (15/10) + pad (10)

Technically… you can omit OE

- If you know that the ear has a conductive loss (e.g. flat tymps and absent reflexes bilaterally), you could omit the occlusion effect from the formula you use for masking.

When plateau – ing …

- What if there is a small air-bone gap were at just one frequency, would you not add the OE just at that one frequency?
  - Probably should use OE even at that one frequency. It's likely a "fluke" that there is an ABG, so be conservative and add OE in.
  - *(More to come. In formula masking, you'll hear that you add into the calculation 'the larger of OE or ABG' which I only mention here so that when you study for the test this slide doesn't confuse you.)*

Masking Assignment One

- Measure a friend's hearing
  - Forehead bone unmasked:
    - 250 – 4k Hz. Use forehead symbol
  - Better ear (if there is one) bone unoccluded:
    - 250 – 4k Hz. Typical symbol.
  - Same ear bone with NTE occlusion with insert earphone.
    - Retest, mark $>^{O}$
  - Each ear air conduction unmasked
  - **Do not stop at zero, establish threshold in the negative # range**

Record using table below & submit with your name & initials of your “subject”

	250	500	1k	2k	4k
Forehead					
UnOcc					
NTE Occ					
Right Air					
Left Air					

Remember – go below zero with thresholds!

VT threshold limits

	250	500	1k	2k	4k
Mastoid					
Fingers					
Ankle bone - medial					

Why???

- We will examine
  - How much shift came from occluding?
  - Is forehead equal to mastoid?
  - Are we seeing “routine” air bone gaps?
  - What is a low end & a realistic VT threshold?
  - Ankle bone – exploratory; test of peripheral neuropathy

Bergin et al 1995
250 Hz results BC = “audiometer”

Table 2 Vibration perception and body sway in normal controls and patients with polyneuropathy

	Normal controls (n = 32) Mean (SD)	*Patients (n = 25) Mean (SD)*	*Significance Z Value*	*p Value*
Neurothesiometer (V):				
Right ankle	12·5 (9·2)	30·8 (16·0)	4·2	< 0·001
Left ankle	12·8 (9·0)	28·5 (16·1)	3·7	< 0·001
Right tibia	14·4 (8·2)	27·8 (15·7)	3·5	< 0·001
Left tibia	13·8 (8·4)	26·5 (14·4)	3·5	< 0·001
Audiometer (dB):				
Right ankle	36·4 (12·2)	55·0 (14·2)	4·7	< 0·001
Left ankle	35·6 (13·8)	55·6 (14·3)	4·6	< 0·001
Right tibia	34·9 (13·7)	52·3 (15·2)	4·1	< 0·001
Left tibia	35·2 (13·2)	53·4 (14·8)	4·4	< 0·001
Tuning fork (arbitrary units):				
Right ankle	7·9 (0·7)	4·6 (3·0)	3·2	0·001
Left ankle	7·9 (0·4)	4·7 (3·0)	3·2	0·001
Right tibia	7·8 (0·8)	4·9 (2·5)	3·0	0·002
Left tibia	7·9 (0·5)	5·2 (2·8)	4·4	0·001
Body sway (mm/min):				
Eyes open	145·2 (43·4)	497·2 (678·7)	4·9	< 0·001
Eyes closed	280·4 (156·5)	1150·3 (1179·5)	5·1	< 0·001
Romberg (eyes closed/eyes open)	1·9 (0·6)	2·7 (1·0)	3·6	< 0·001
Foam: eyes open	178·1 (66·7)	468·7 (576·5)	4·1	< 0·001
Foam: eyes closed	356·8 (128·9)	1118·7 (790·7)	5·3	< 0·001
Foam: Romberg	2·1 (0·6)	3·0 (1·2)	2·9	0·003

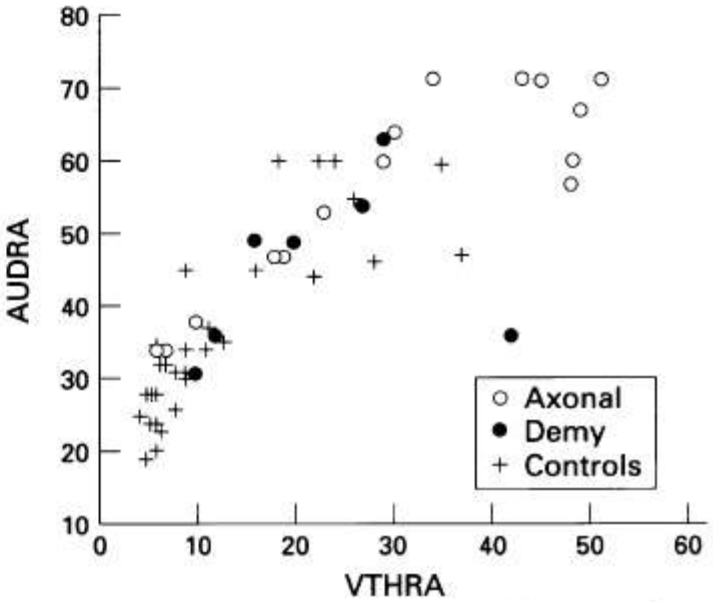


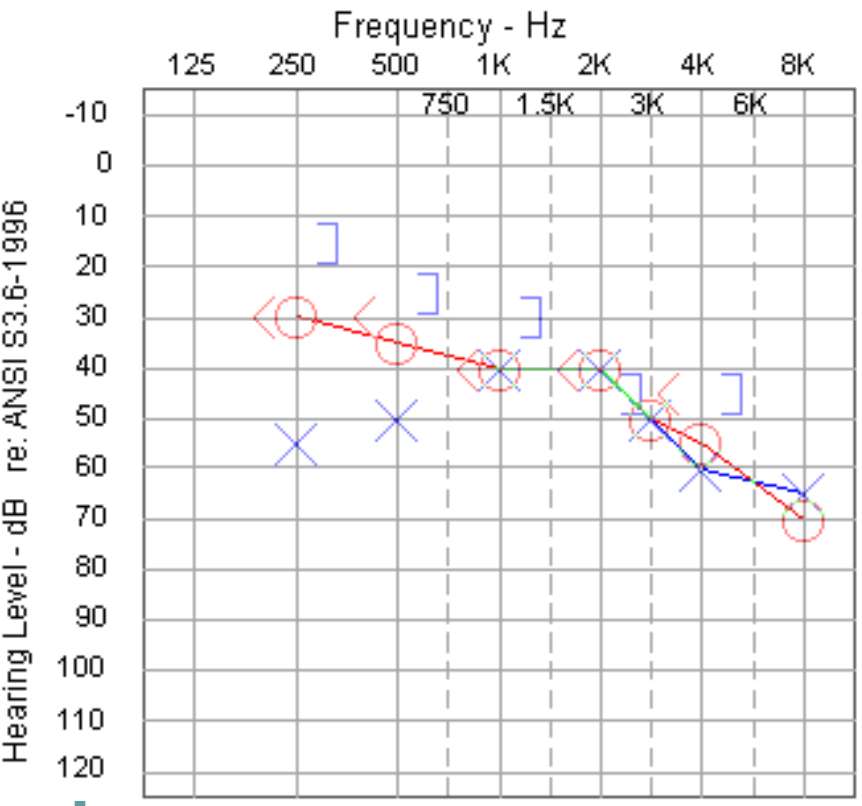
Figure 1 Scatterplot of vibration thresholds measured at the right ankle with the neurothesiometer in “volt units” (VTHRA) and with the audiometer in dB (AUDRA) for patients with axonal and demyelinating neuropathies, and for normal controls.

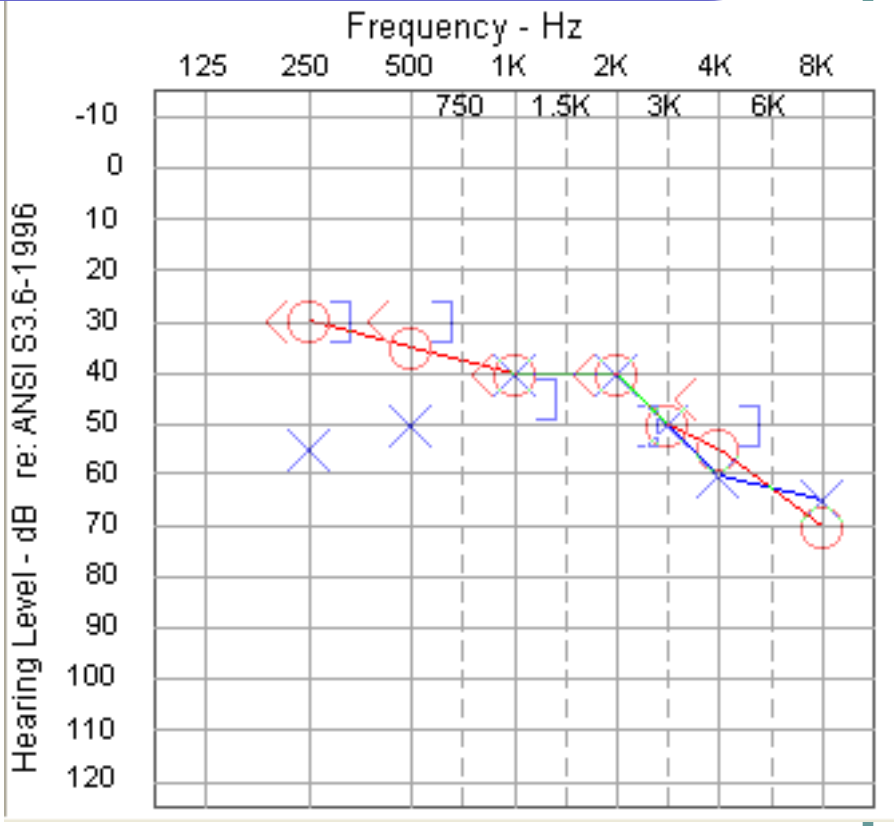
Occlusion effects minimized by insert earphones, too

- While supra-aural earphone OEs were
  - 250 500 1k
  - 21 18 3
- Insert earphone values were:
  - 250 500 1k
  - 17 12 3
    - Average of deep/shallow insertion, AJA (2000) p 132.
- Less area of ear canal to vibrate w/ insert earphones
- We will use the more traditional
  - 250 500 1k
  - 15 15 10

With 10-15 “safety pad” you are OK if the person’s OE is bigger than average

What size OE for this patient?





15 / 5 / 15 / 5 / 5 – so my patient isn't average

If it's critical, you can measure the OE size

- Just as I did in my error, test w/ ear unoccluded. Retest occluded w/o masking. The difference is the OE. You could add that value when masking rather than estimating.
- Fortunately it's seldom that critical!

Defining Effective Masking

- EM definition – if masking noise of that level is in the ear, and the tone is put into the same ear at equal in intensity, you have masked. E.g. 50 dB EM masks 50 dB PT in SAME ear.
- So, if crossed over… if the tone crosses over at 10 dB HL, theoretically, putting in 10 dB EM in NTE, that would be enough (if there is no conductive loss to reduce the level at the cochlea.)
- Padding adds a safety factor (e.g. the IA is a little lower or OE bigger than you think, or if the calibration is a little off.)

Where are you in your thoughts on masking?

- Some really thinking clicker questions…

And a gratuitous Dixi picture, since I know you've missed seeing her!

Q #1. If a signal crosses over, think about whether it could be heard by examining the relationship of the crossed-over signal to…

50% 1. NTE air conduction threshold

50% 2. NTE bone conduction threshold

Masking noise is put into the

25%	1.	Test ear by air conduction
25%		Test ear by bone conduction
25%	3.	Non-test ear by air conduction
25%	4.	Non-test ear by bone conduction

Over masking occurs when…

50%	1. The masking noise prevents the TE from hearing the signal
50%	2. The masking noise prevents the NTE from hearing the signal

Over masking is a problem when

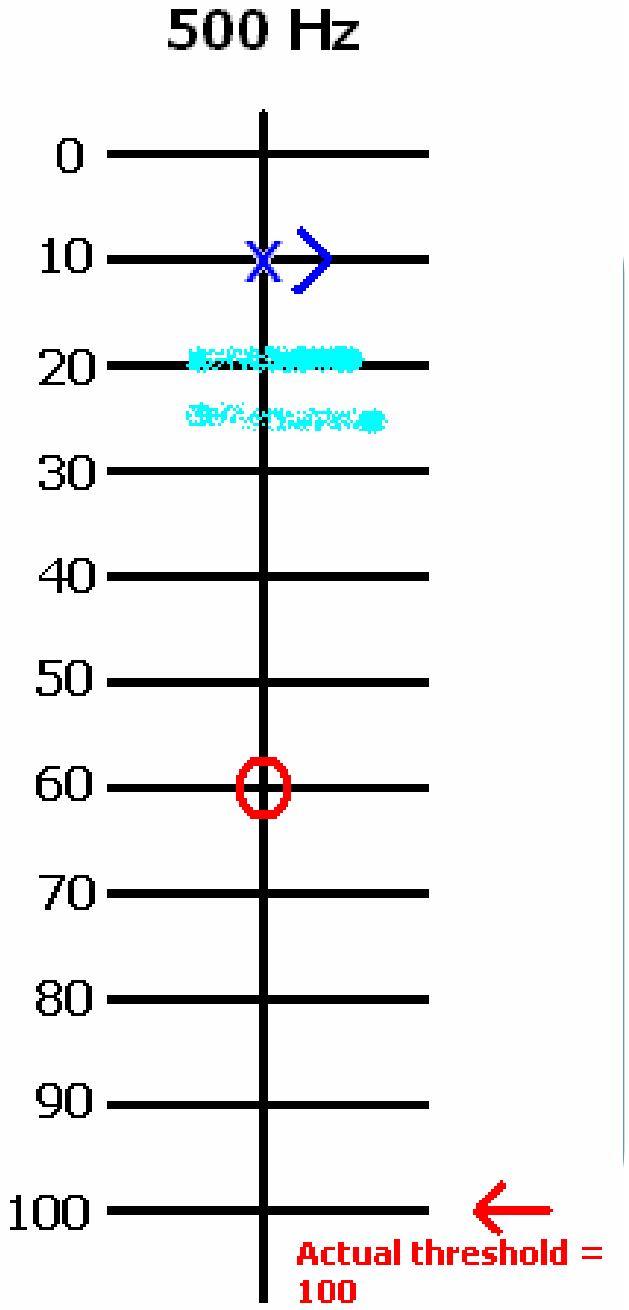
50%	1. The NTE noise crosses over by air conduction
50%	2. The NTE crosses over by bone conduction

Is the interaural attenuation the same for air-conducted tones and for air-conducted NBN masking?

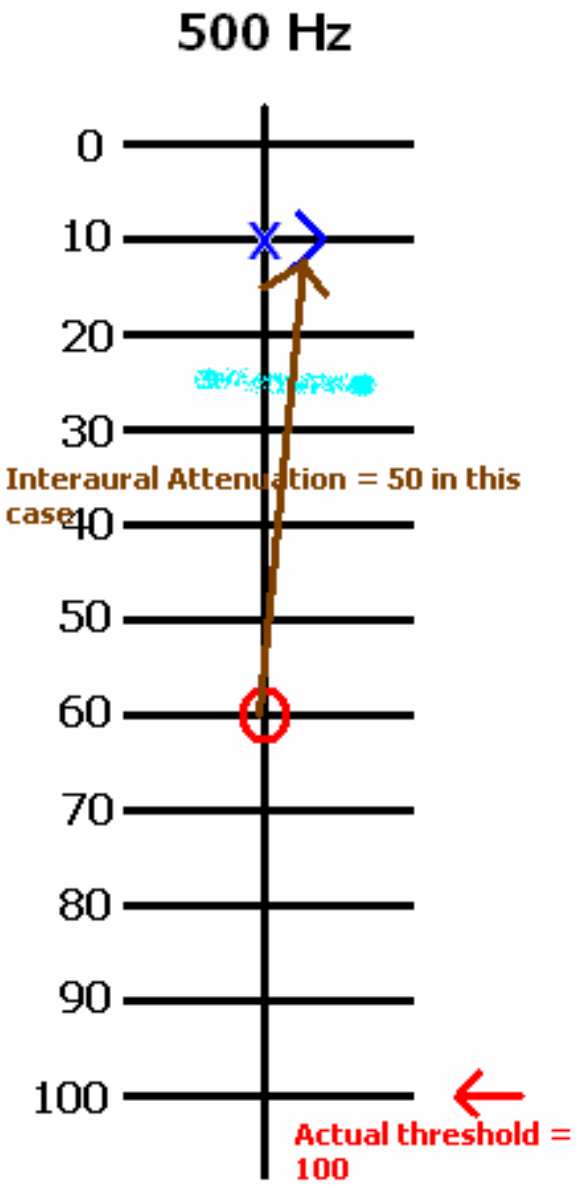
50%	1.	Yes
50%	2.	No

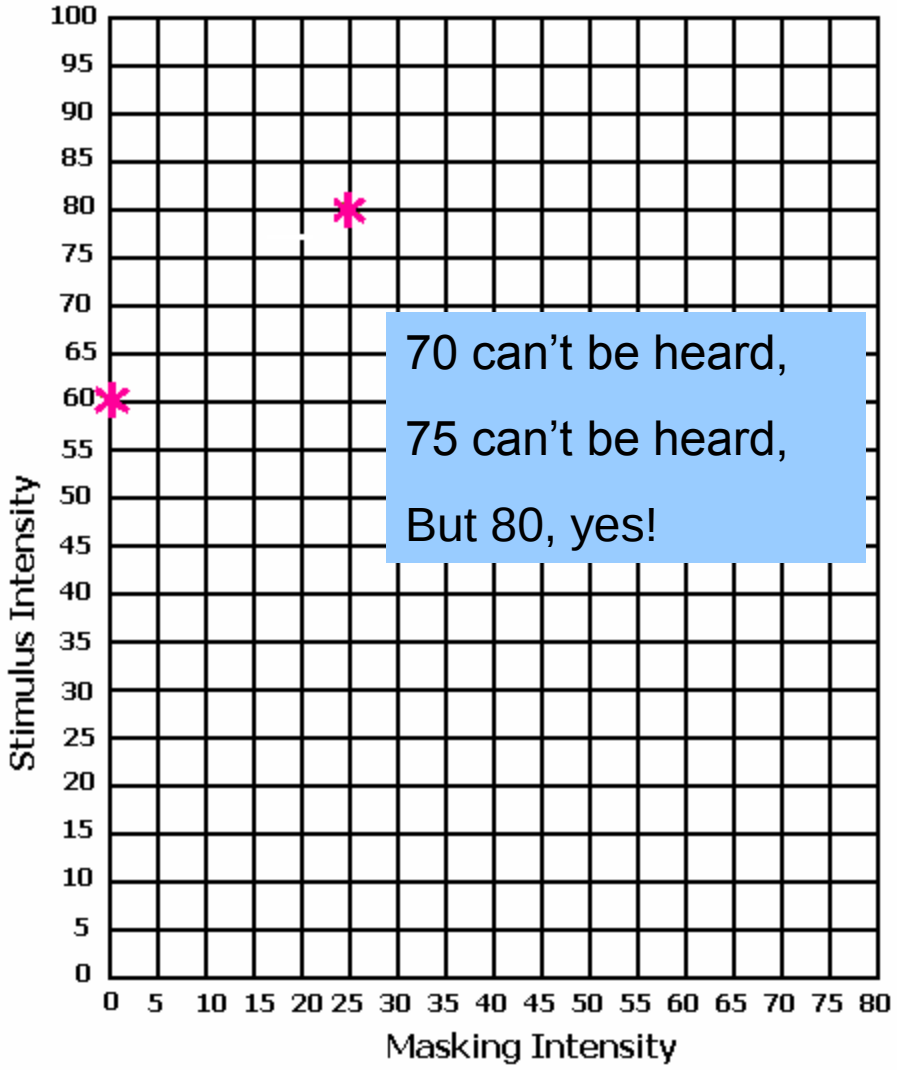
Plateau Review

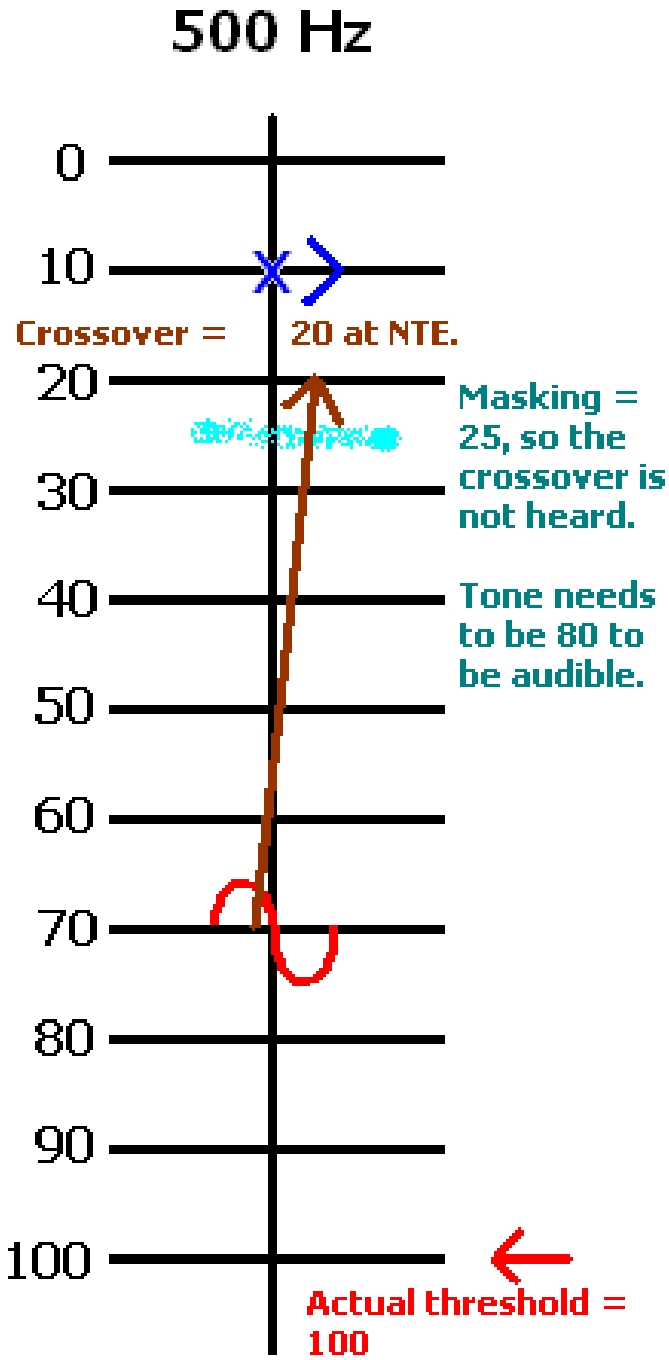
- If masking is needed, begin with the NTE threshold + OE if testing bone + safety pad.
- E.g. AC. Testing right, put 20-25 EM left (threshold plus your 10 or 15 pad)



- Assume the unmasked R threshold was due to crossover – heard by left bone. Now the left ear has 25 dB of masking noise and will not hear the crossed over pure tone. The threshold will shift. How much? Can a 70 dB tone be heard? (next slide)



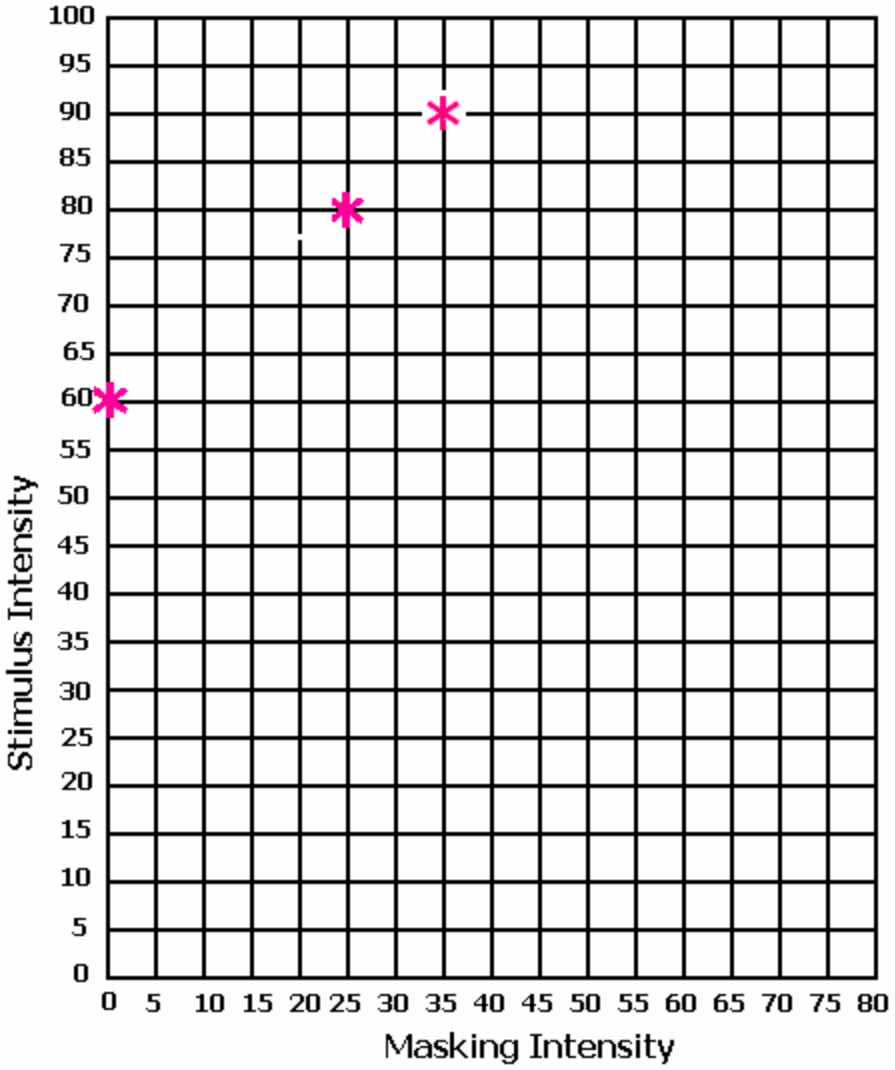

Stimulus Intensity
Masking Intensity
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
100 95 90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
70 can't be heard,
75 can't be heard,
But 80, yes!

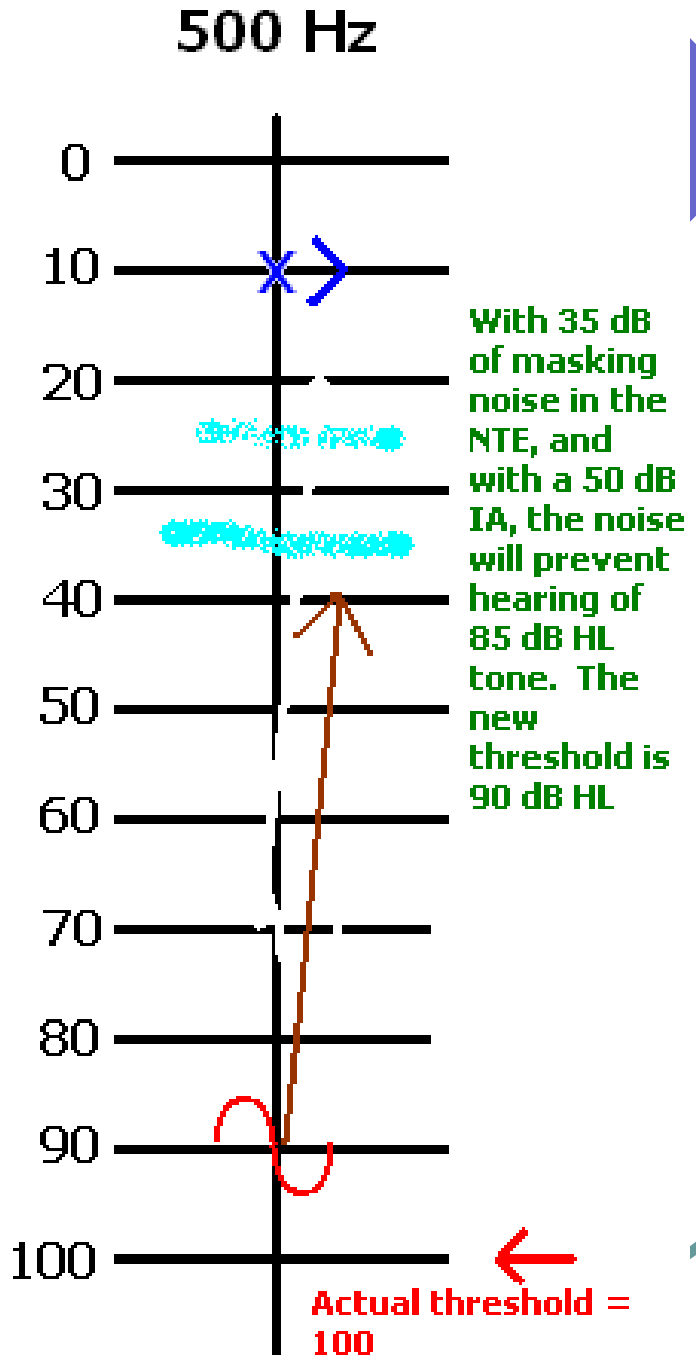

500 Hz
0
10
Crossover = 20 at NTE.
20
30
40
50
60
70
80
90
100
Masking = 25, so the crossover is not heard.
Tone needs to be 80 to be audible.
Actual threshold = 100

Plateau steps

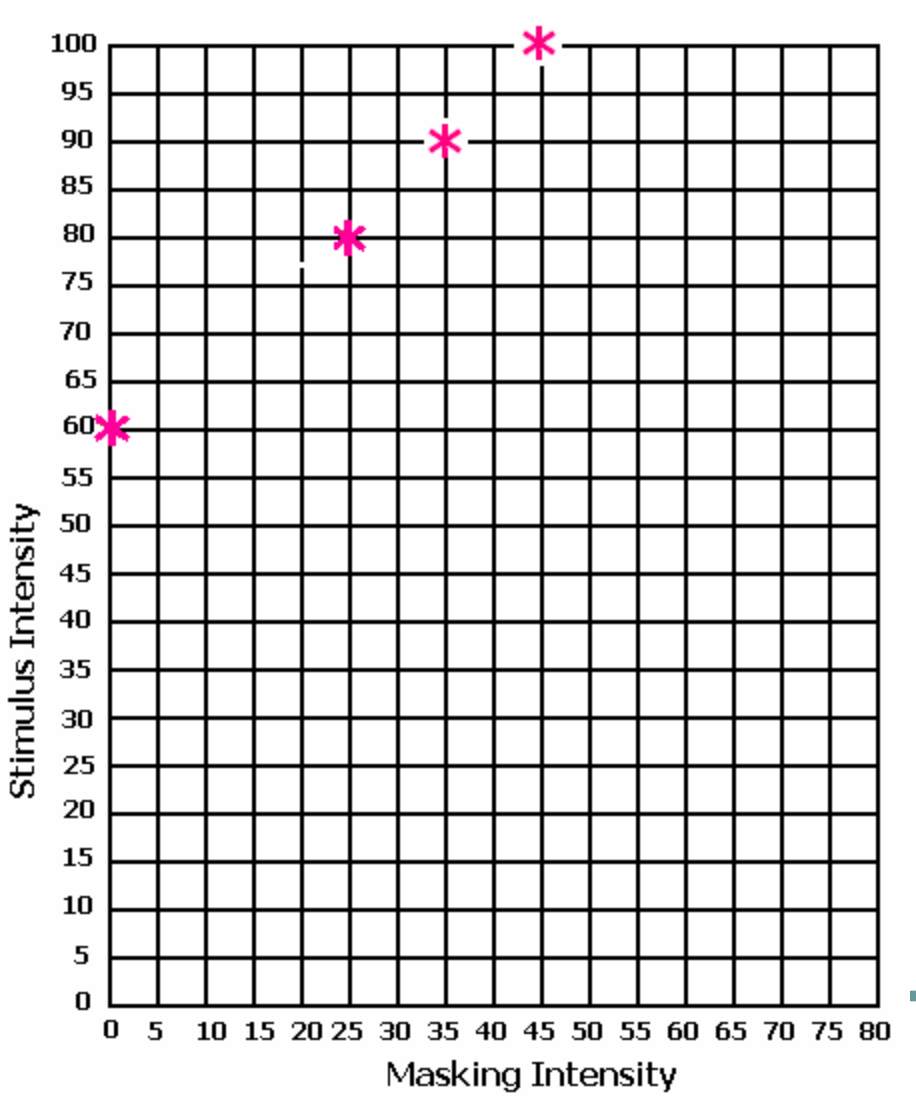
- Increase the masking in 5 dB increments until you have at least 3 increases (15 dB plateau) with no change in threshold.
- *(I am going to raise the noise 10 for a few slides to speed things along.)*

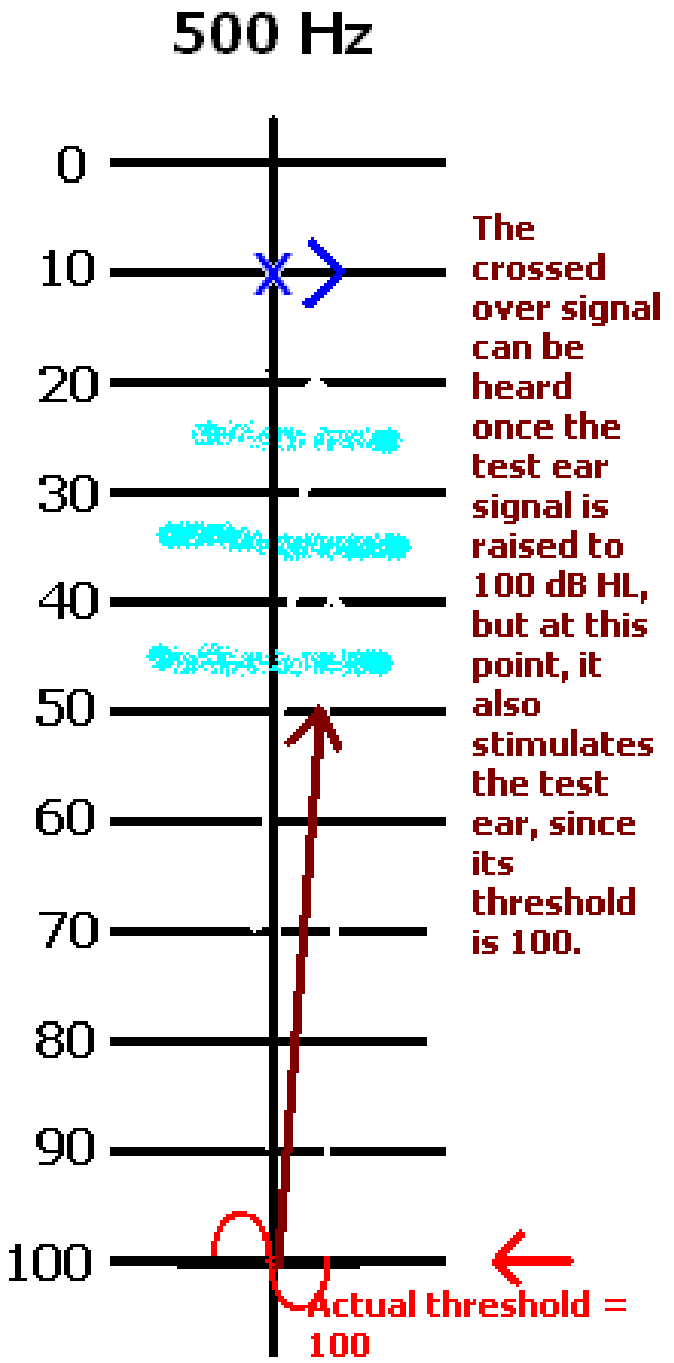
Undermasking

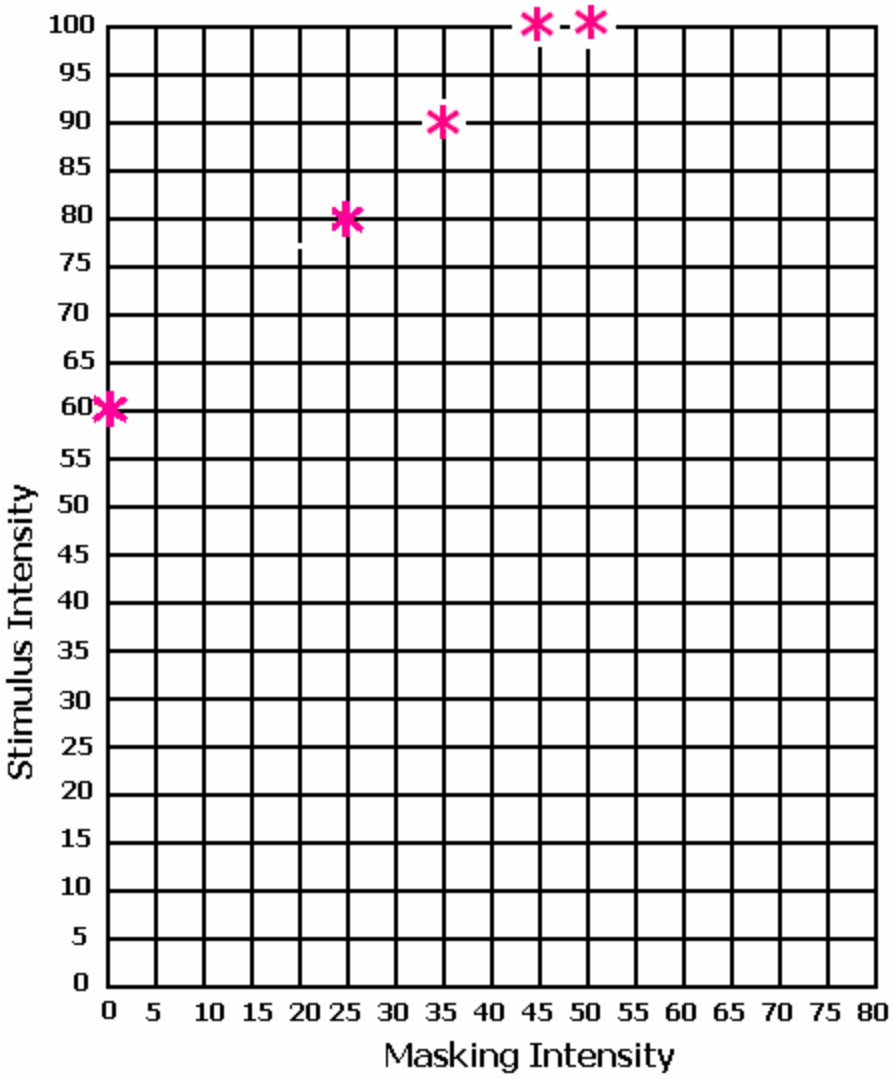


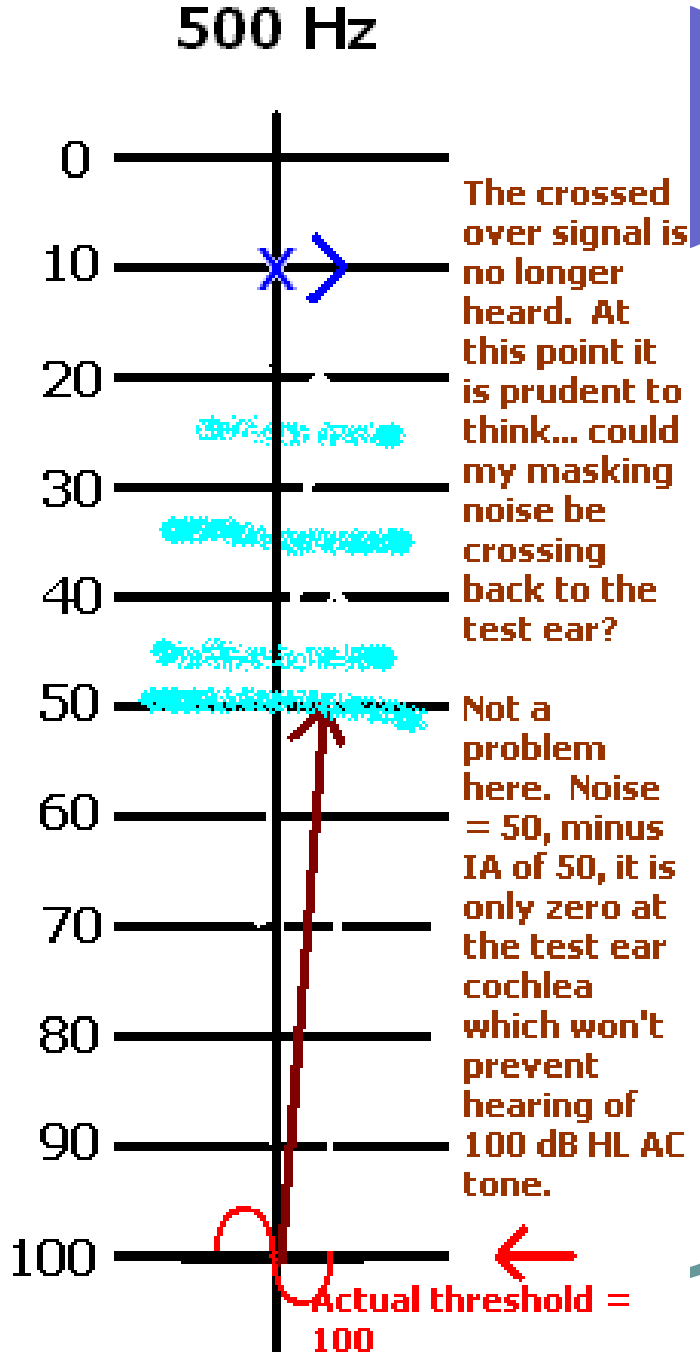


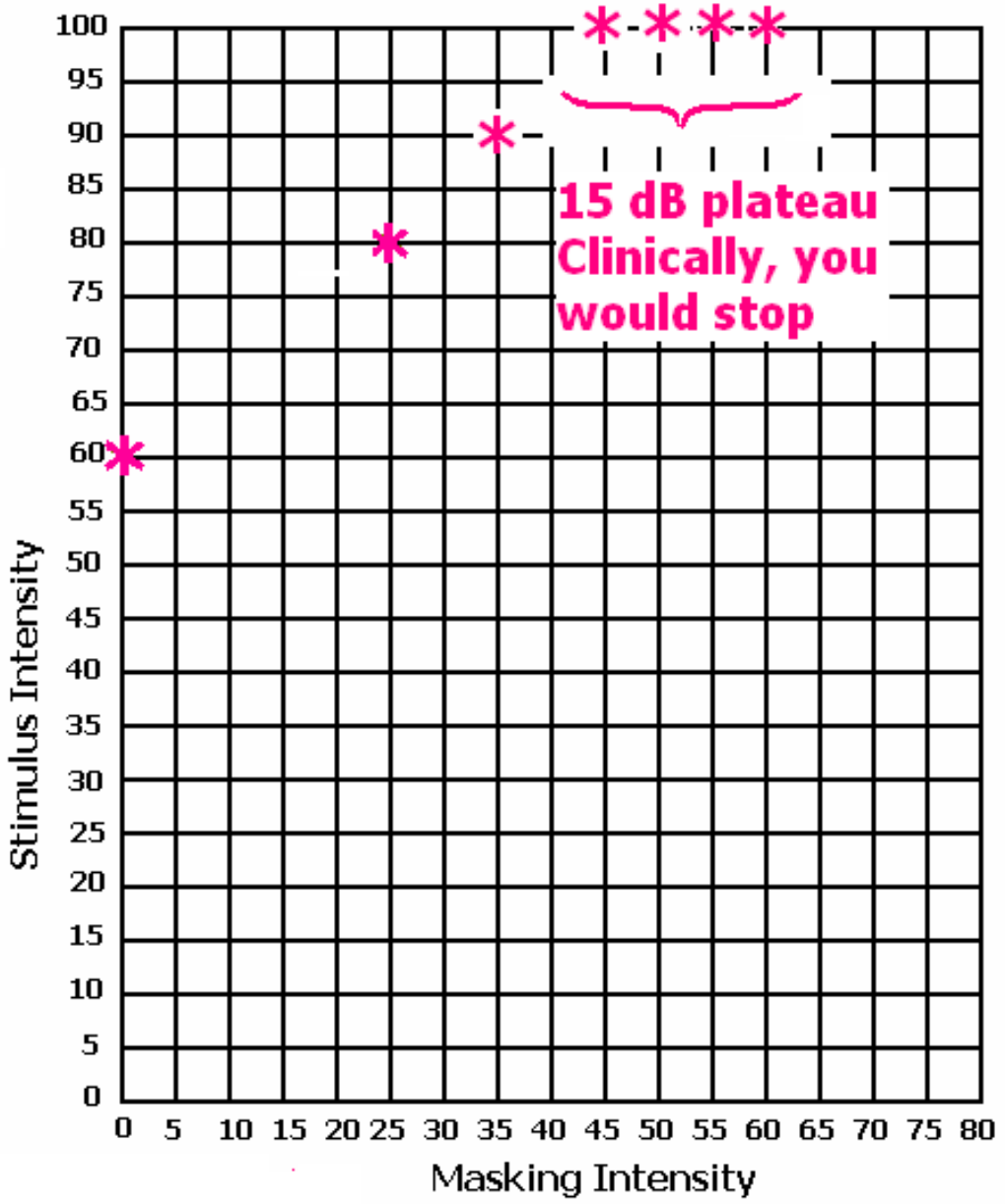
Noise up 10 more

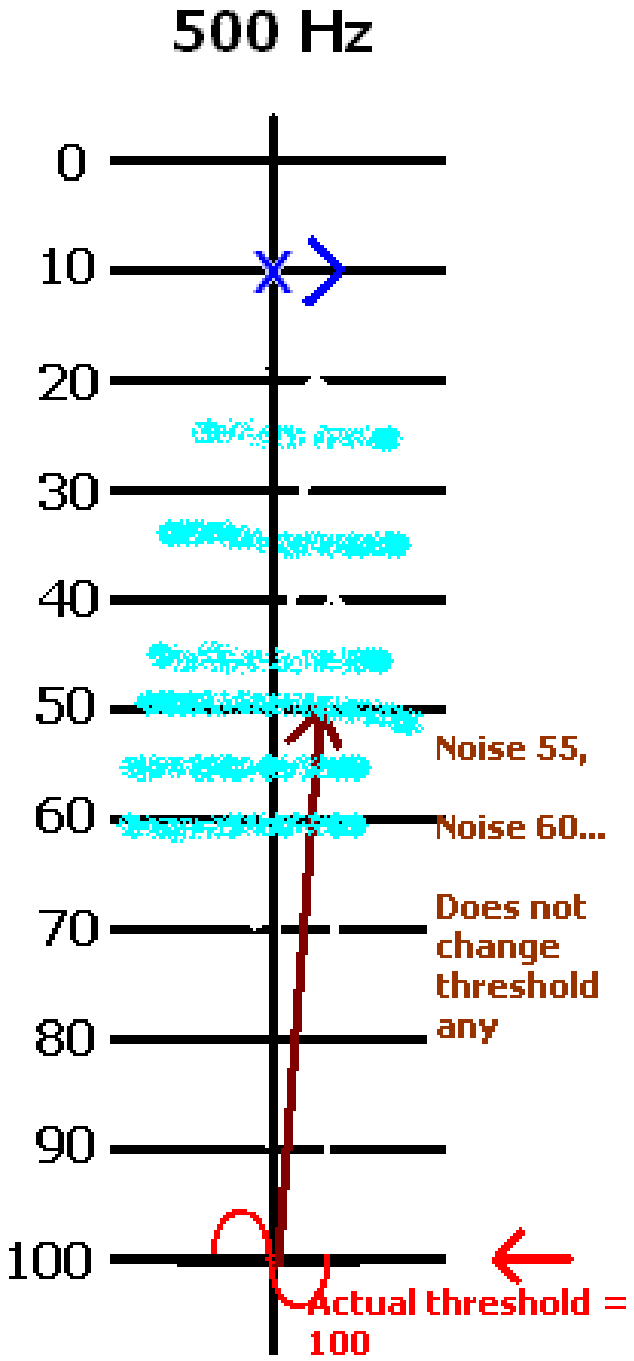





Stimulus Intensity
Masking Intensity
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80


500 Hz
0
10
20
30
40
50
60
70
80
90
100
The crossed over signal is no longer heard. At this point it is prudent to think... could my masking noise be crossing back to the test ear?
Not a problem here. Noise = 50, minus IA of 50, it is only zero at the test ear cochlea which won't prevent hearing of 100 dB HL AC tone.
Actual threshold = 100

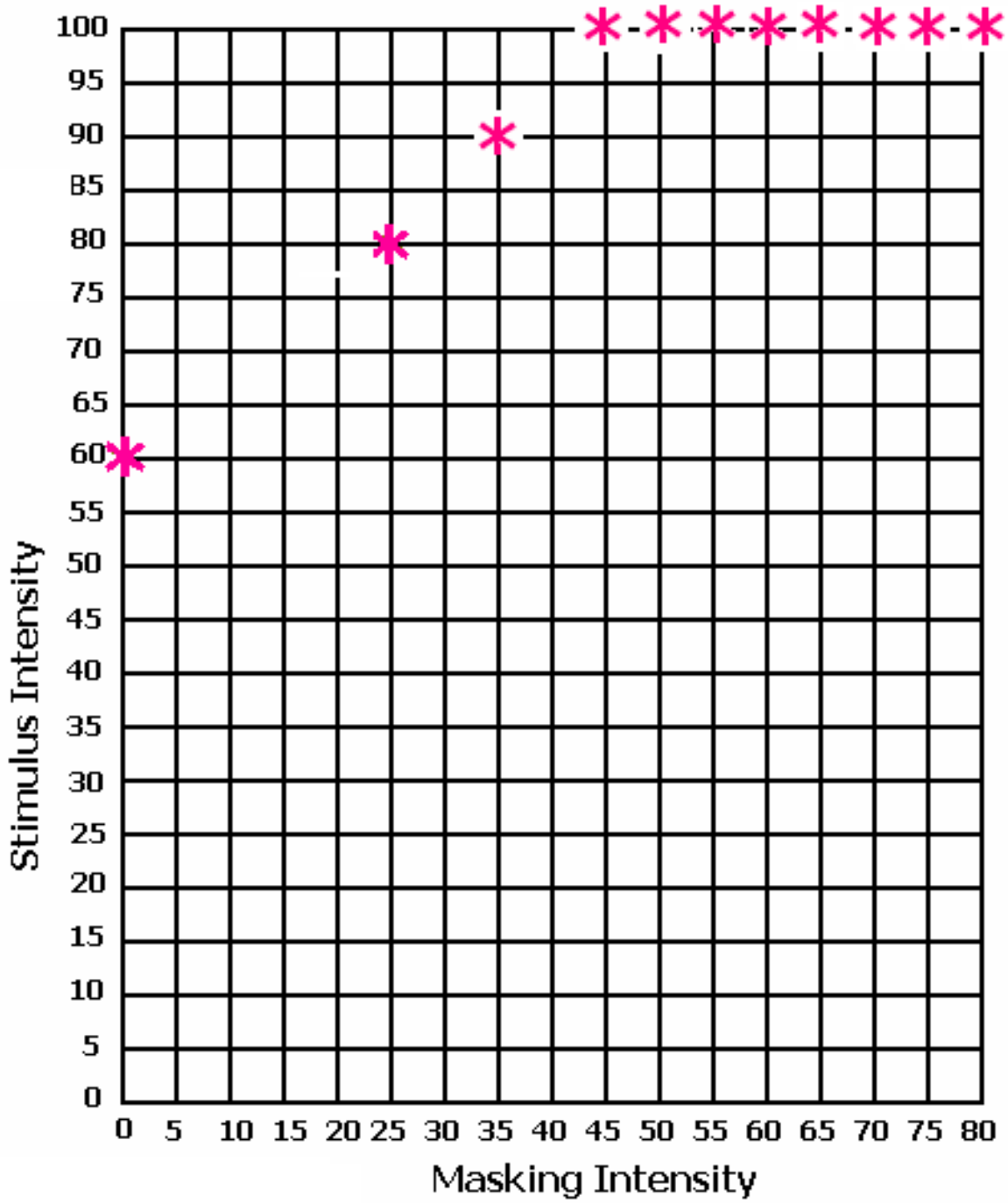

Stimulus Intensity
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Masking Intensity
15 dB plateau
Clinically, you
would stop

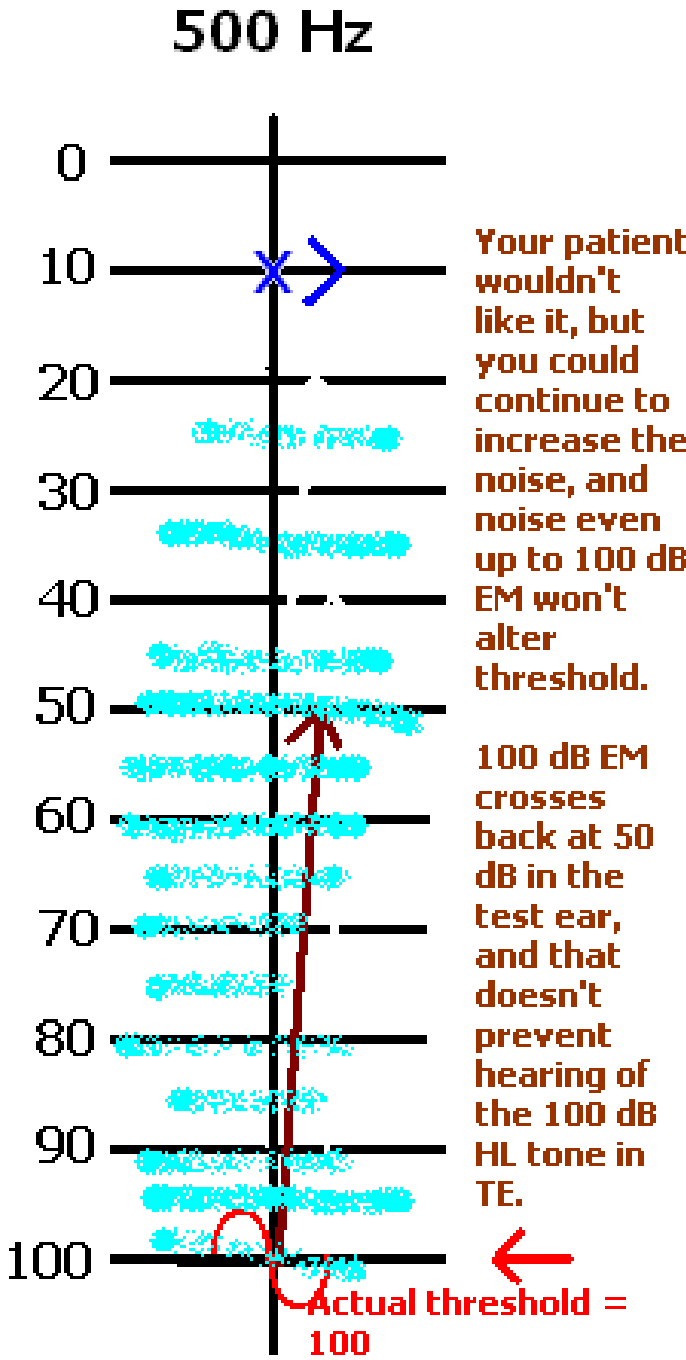

500 Hz
0
10
20
30
40
50
60
70
80
90
100
Noise 55,
Noise 60...
Does not
change
threshold
any
Actual threshold =
100

Clinical speed tip


Dixi running in flooded back yard

- The traditional masking technique is to increase the noise in 5 dB steps for three sequential times. No threshold shift = plateau.
- Why not increase noise by 15 dB? If there is no shift, you are done! Faster! If there is a shift, then just go back to the 5 dB way of doing it and find the plateau.


Stimulus Intensity
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80
Masking Intensity


500 Hz
0
10
20
30
40
50
60
70
80
90
100
Your patient wouldn't like it, but you could continue to increase the noise, and noise even up to 100 dB EM won't alter threshold.
100 dB EM crosses back at 50 dB in the test ear, and that doesn't prevent hearing of the 100 dB HL tone in TE.
Actual threshold = 100

Speed tip expanded

- In simple cases such as this unilateral SNHL, the plateau is wide. The hint of “go up 15 dB with your masking noise” will work well.
- Lead in to formula masking. If I think it’s a case like this, where the real plateau is wide, then I will be selecting a noise level that should put me well on the plateau. I put in that noise, find the threshold. I do some checking to see if all is well. If so, there is **no increasing the noise level and re-measuring threshold. Done!**
- Formula masking does not use sequential noise adjustments so it is even faster than the “up 15 & check” if you have estimated the range of the “real threshold” correctly.

When to mask PT AC. First rule is:

50%

1. When the two ears differ in AC thresholds by 40 dB for TDH or 50 dB for inserts

50%

2. Masking, we've done that before?

Does anyone remember a second “when to mask PT AC” rule?

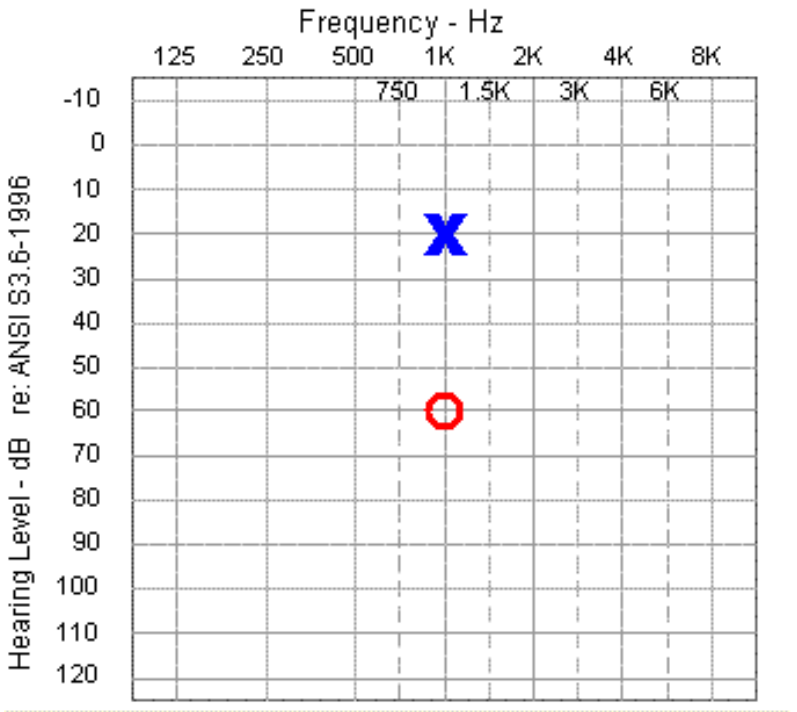
And the answer is…

- Compare the AC threshold to the non-test ear BONE conduction threshold.
  - The signal crosses over to the NTE **cochlea** and of course, BC tests the cochlear reserve.

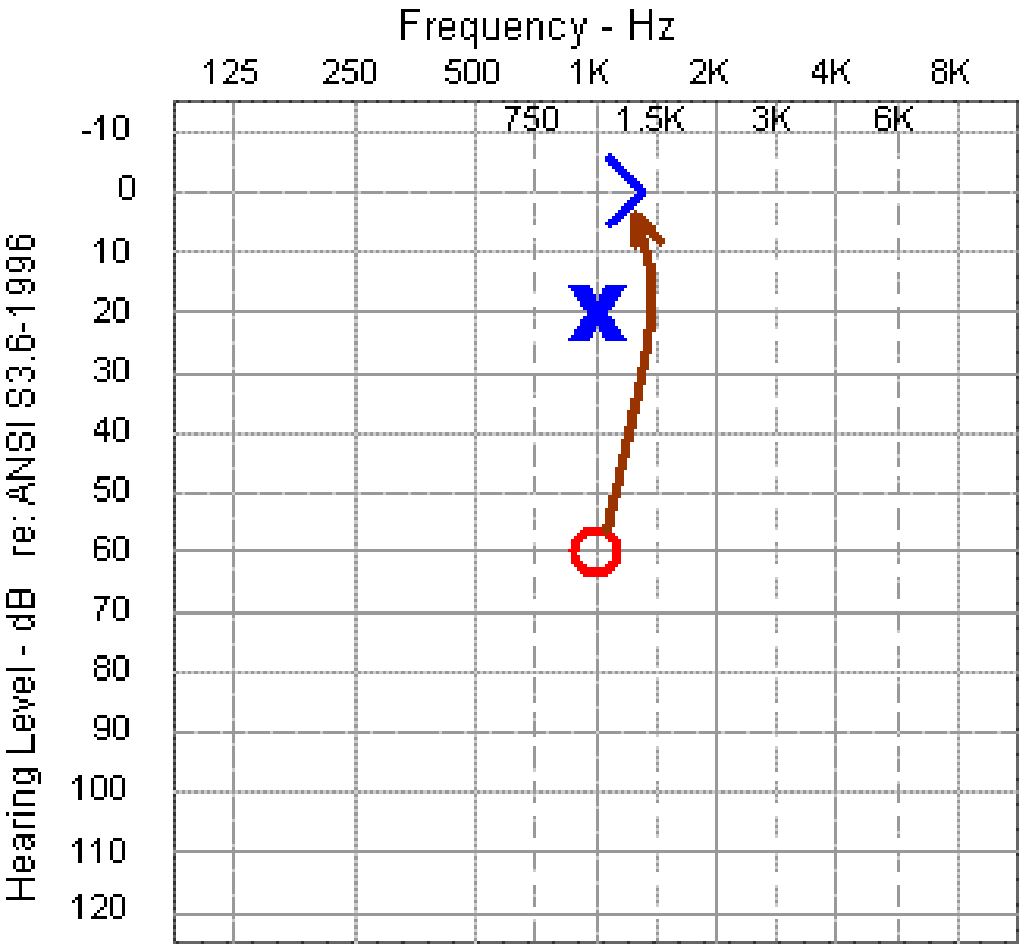
What is “central masking” and how big an effect is it?

Next “plateau & think” case

- Right ear unmasked AC threshold = 60
- Left ear unmasked AC threshold = 20
- Testing with <u>insert earphones.</u>
- At this point, do you know if you need to mask?



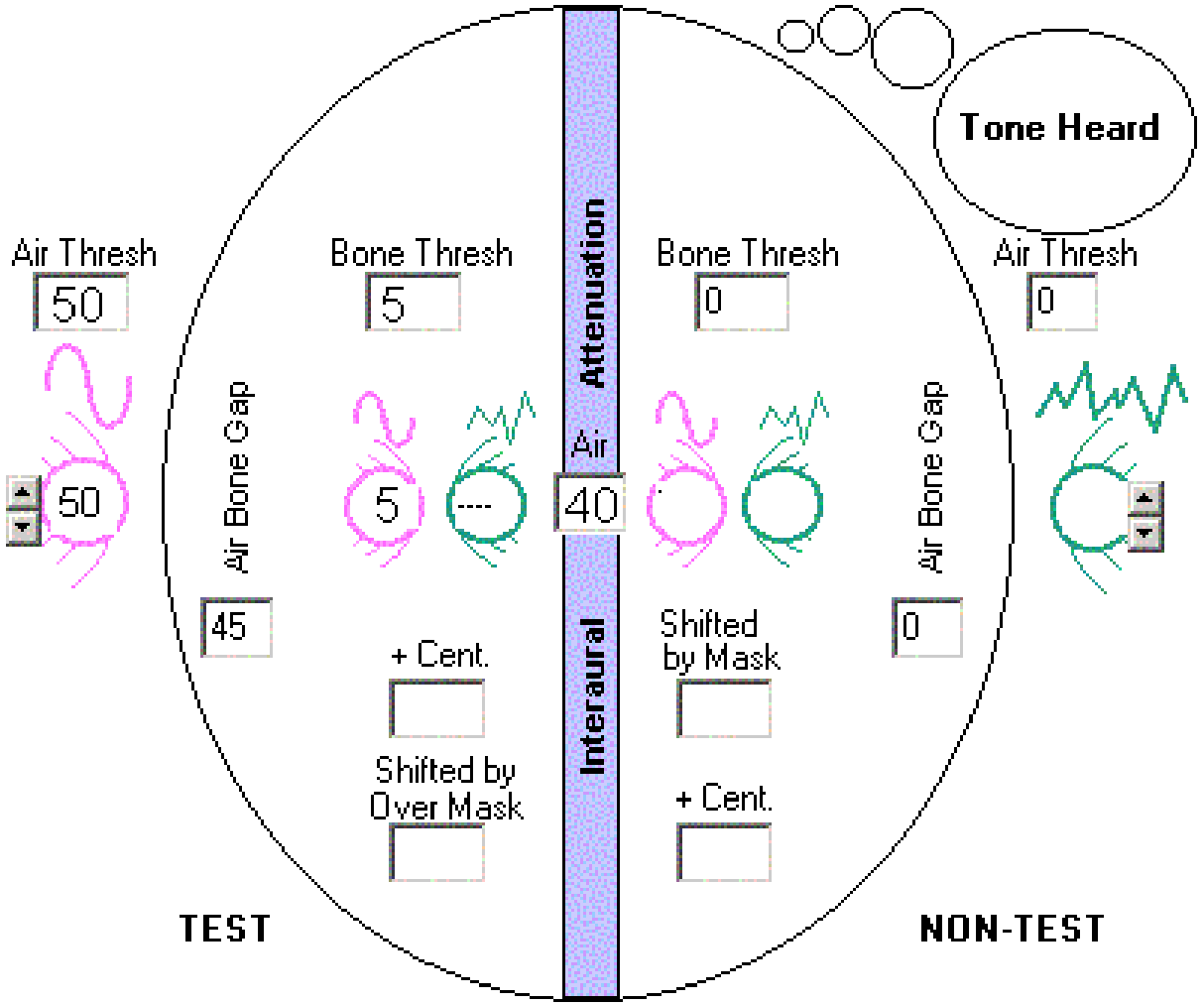
What if… left bone is normal?



Introducing MASKING HEAD

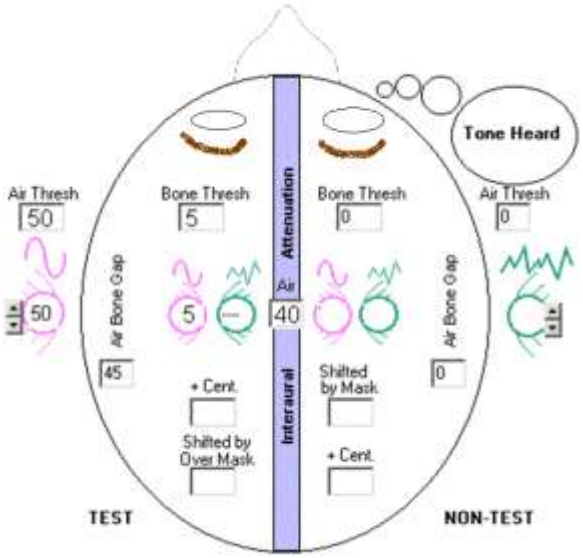
- We are going to switch away from this example in the next slides, sorry.
- Generic info about audsim & masking head next.
- The worst problems masking come in with TDH earphones, w/ IA of 40, so we are going to switch to that example.

Pink = signal, Green = noise
Test ear always on the left

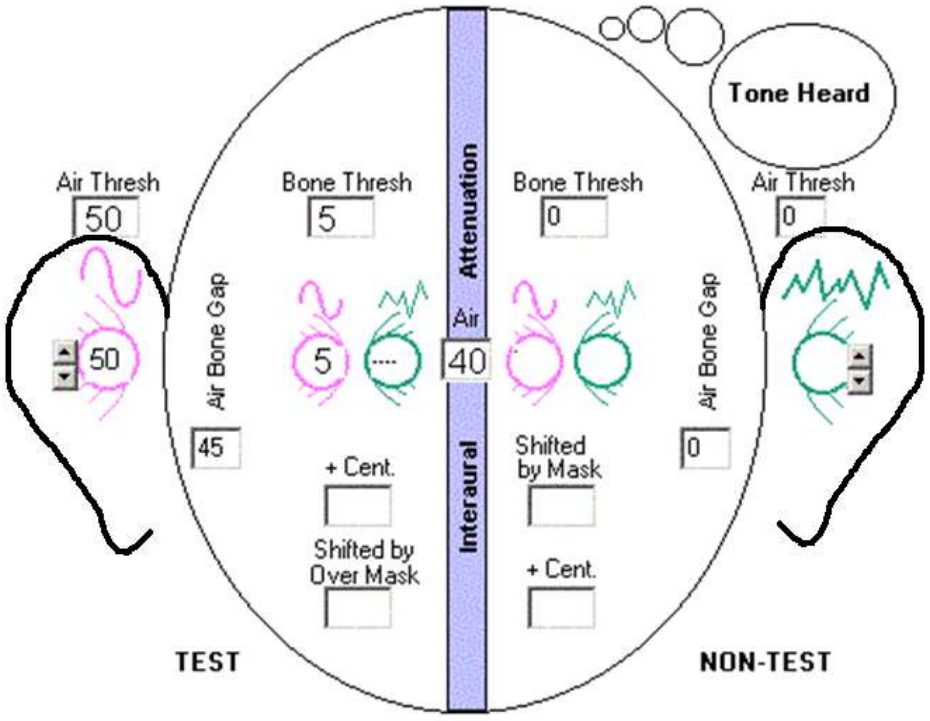


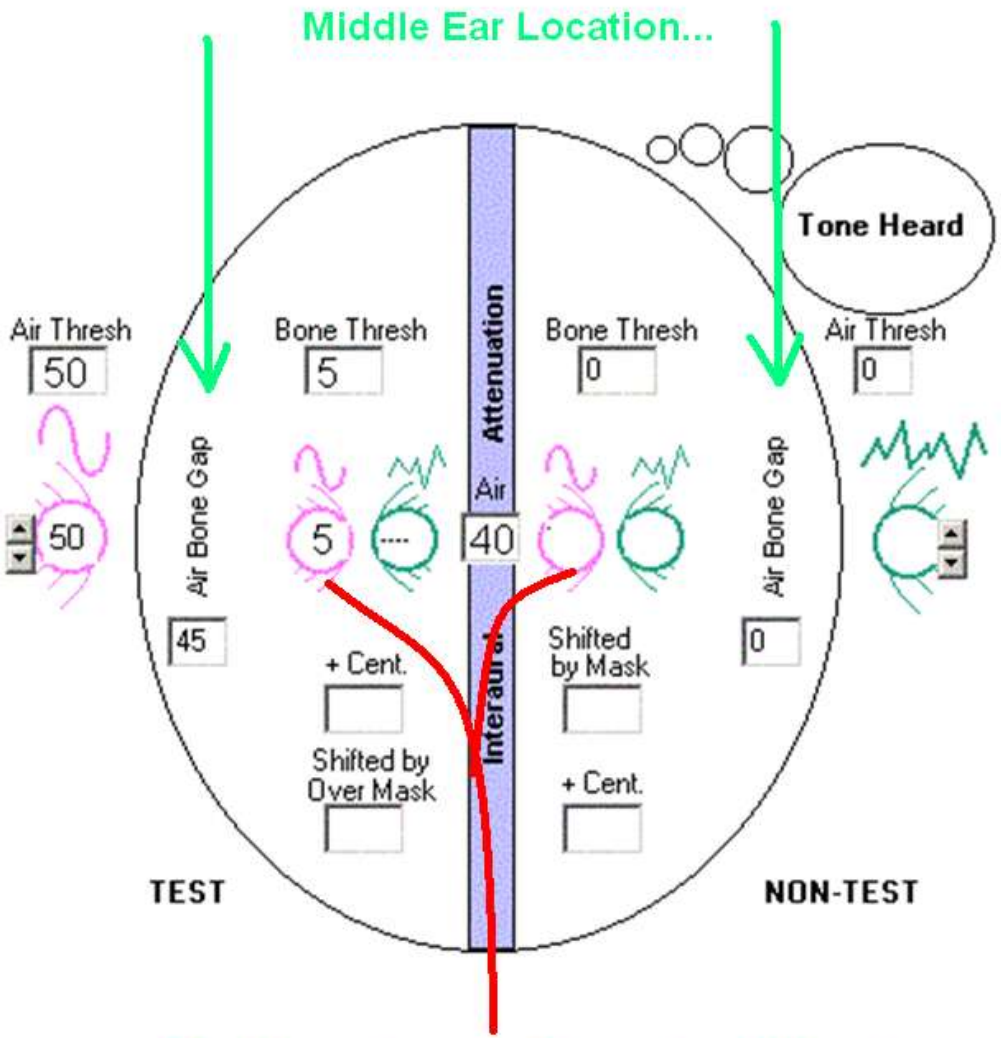
If it helps…

- You could think of masking head as looking down on the person where the test ear is always the left ear



Or when you are testing the right ear, think of the head …



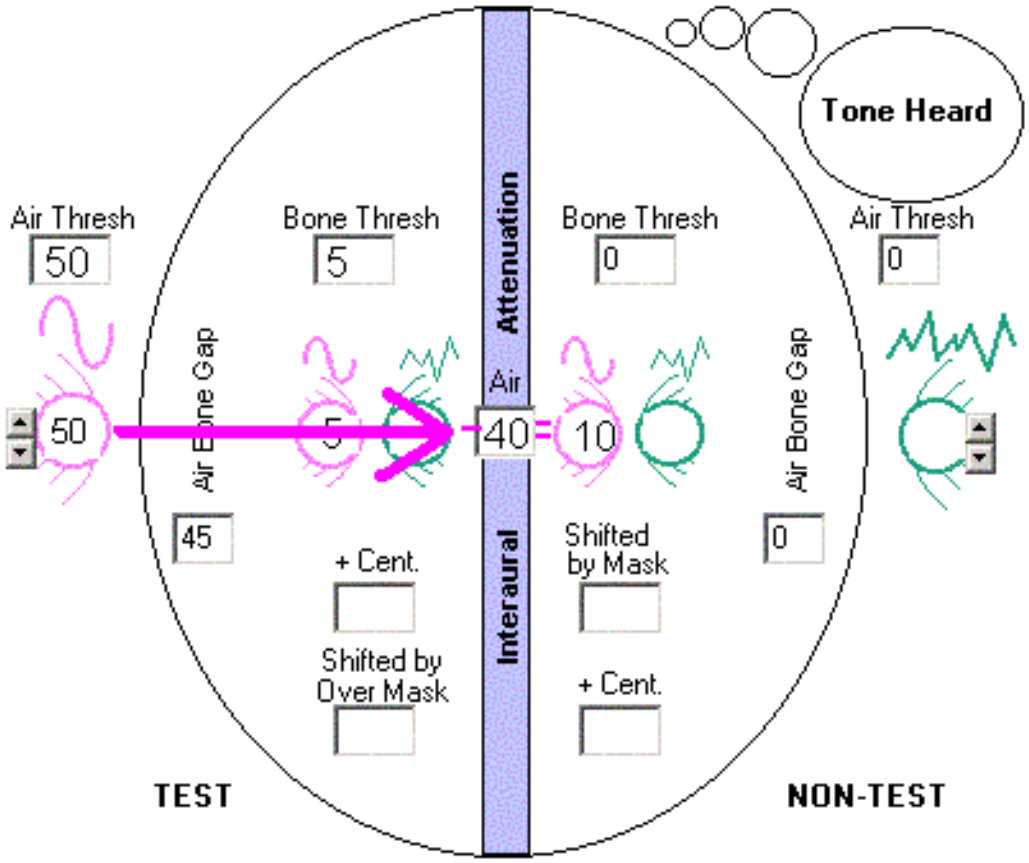

Middle Ear Location...
Tone Heard
Air Thresh
50
Bone Thresh
5
Attenuation
Air
40
Bone Thresh
0
Air Thresh
0
50
Air Bone Gap
45
5
+ Cent.
Shifted by Over Mask
Interaural
Shifted by Mask
+ Cent.
Air Bone Gap
0
TEST
NON-TEST
Cochlea... towards the center (OK, not anatomically correct...)

Understanding masking head

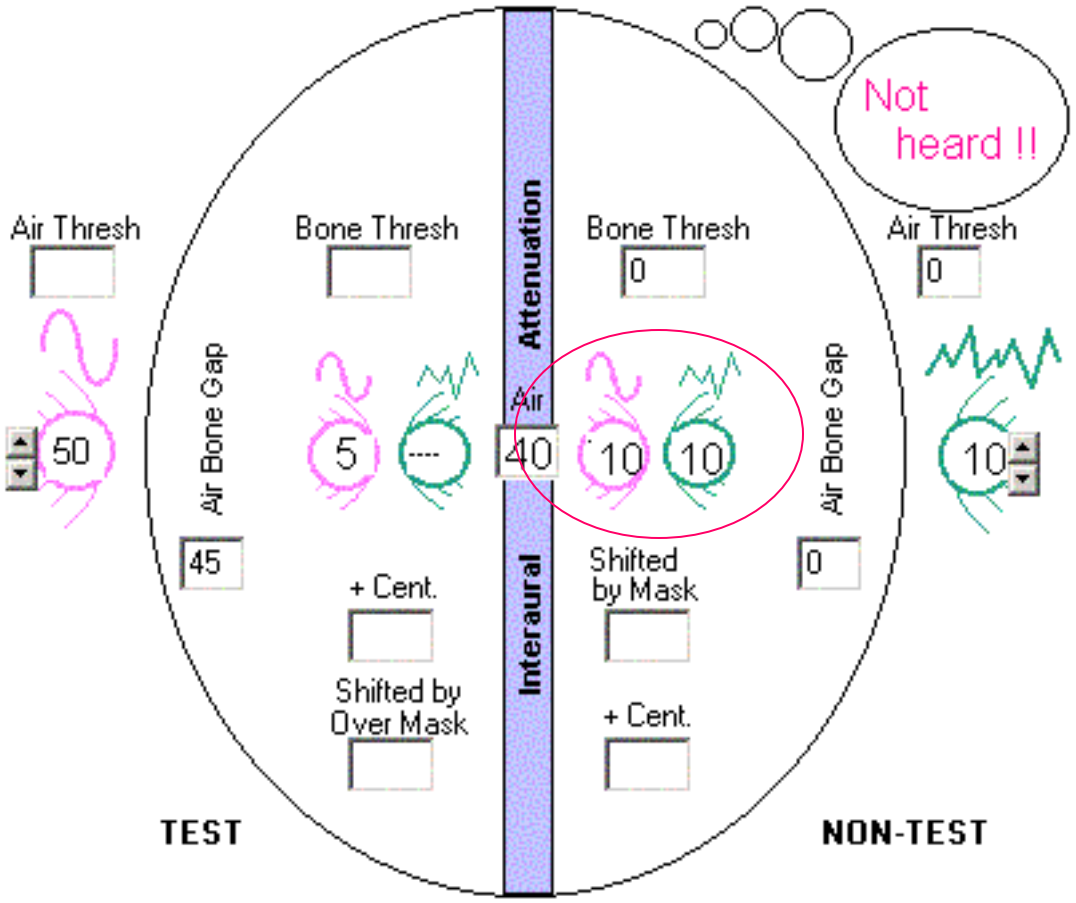
- Next, we will step through using masking head to determine if a sound is or is not heard / is or is not masked properly.
- Step 1. Calculate the crossover to the NTE COCHLEA
- Step 2. Compare crossed over signal to BC NTE threshold to determine if masking is necessary – will this crossed over AC tone be heard?
- Step 3. Find out what level of masking noise is needed to prevent the crossed over sound from being heard.
- Step 4. Determine how much noise can cross back to the TE cochlea
- Step 5. Compare the crossed-back level to the TE bone conduction threshold. If the cross back is equal to or greater than the TE BC threshold, overmasking is problematic.

Step one, calculate the crossover to the NTE COCHLEA:

- TE stimulus level minus the IA = level at NTE cochlea
- Note: the crossed over signal level doesn't change if it's conductive problem. Has nothing to do yet with the NTE middle ear condition.

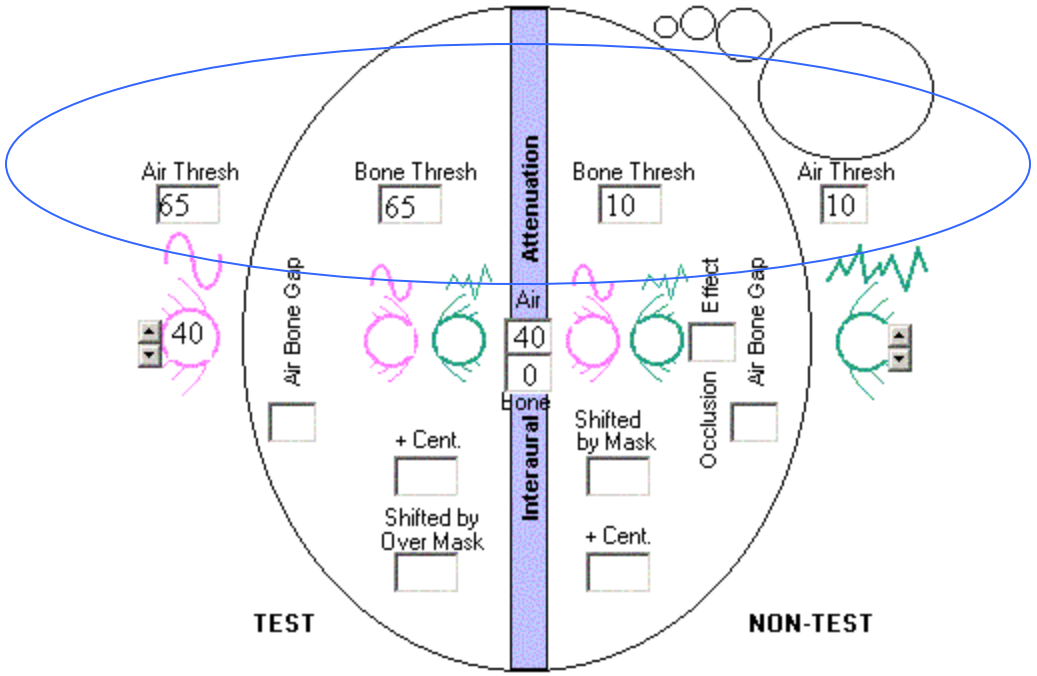


Masking will occur if you get the noise in the NTE cochlea to be equal to or greater than the stim level at NTE cochlea

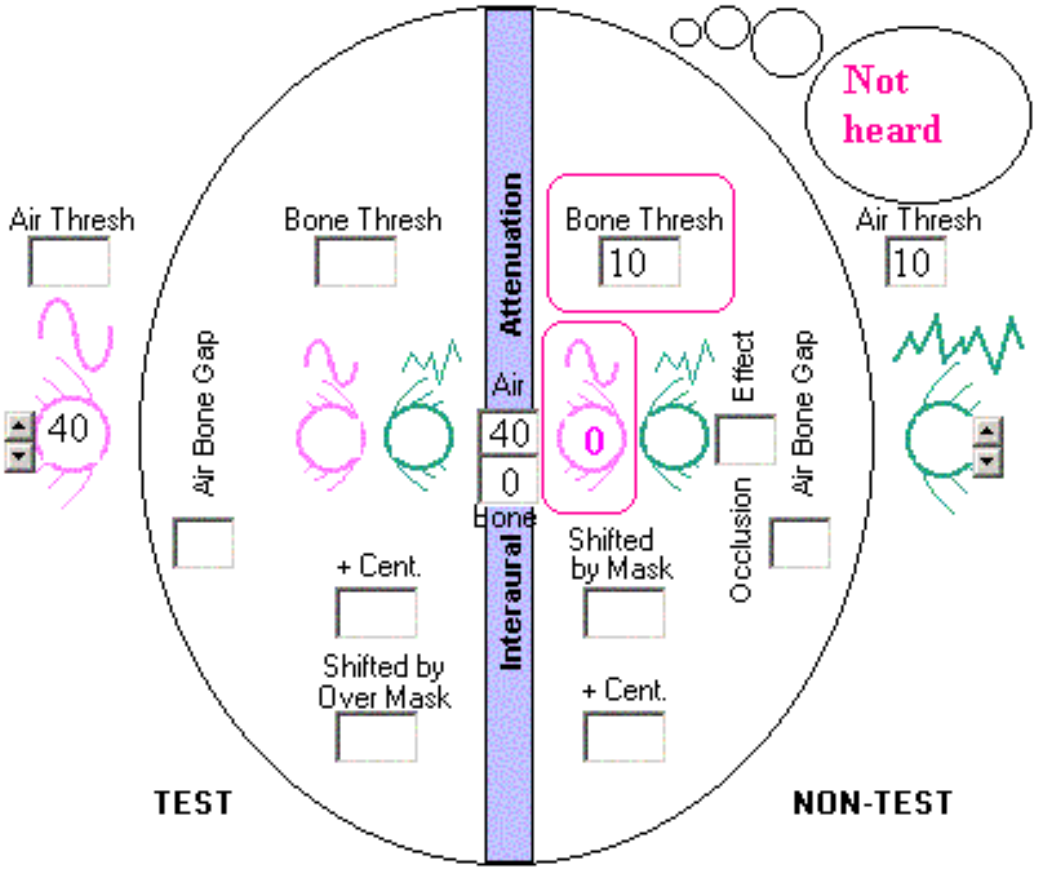


Masking head is teaching you to think about masking. Not real life.

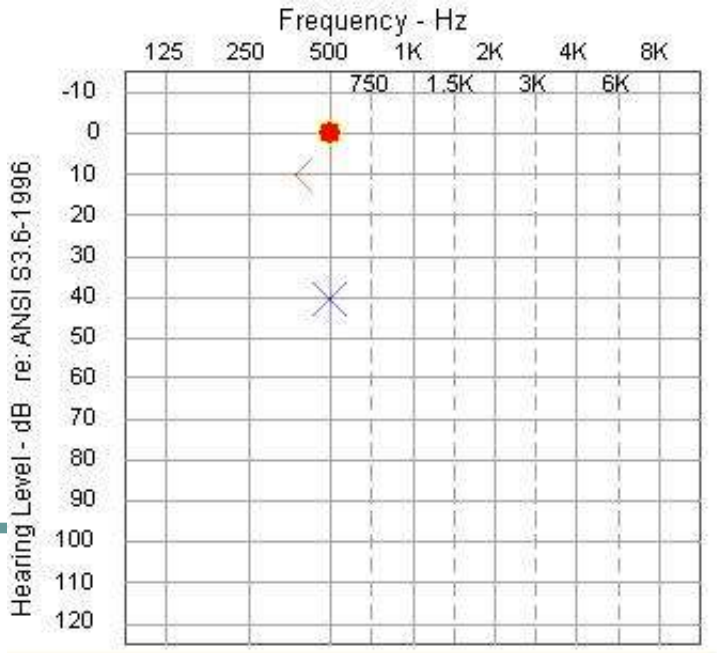
- It shows you what the actual “true” thresholds are. (Your measured thresholds may differ due to test/retest variability and/or central masking.)



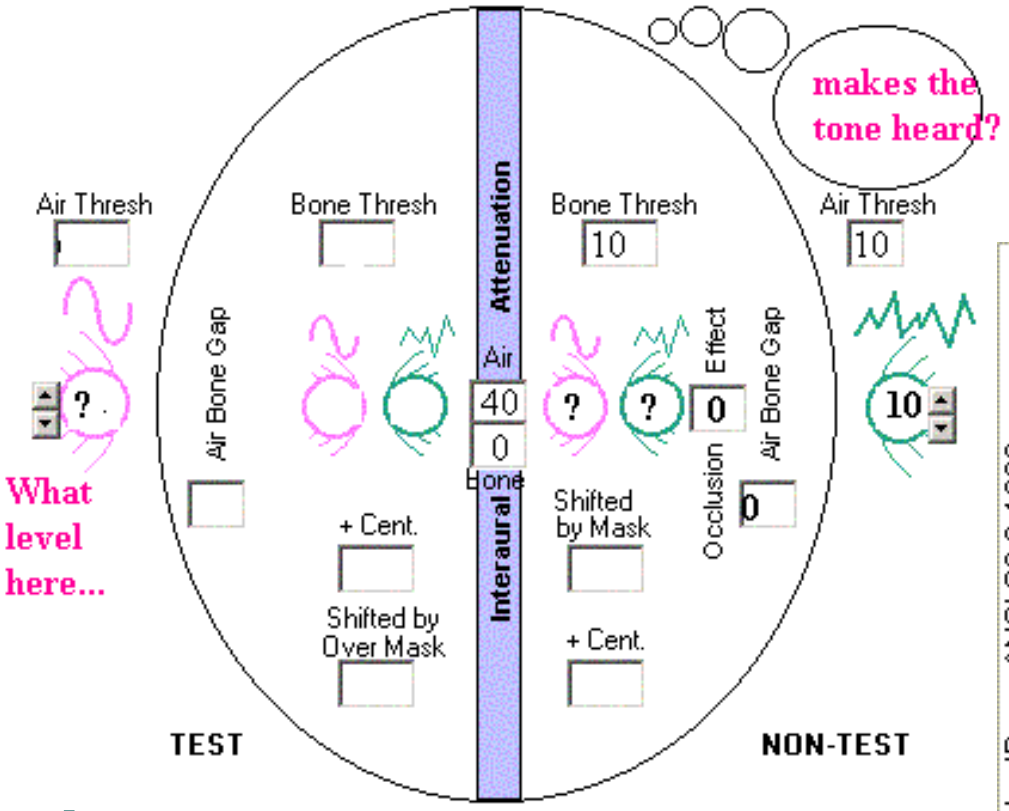
Step 2. Compare crossed over signal to BC NTE threshold to determine if masking is necessary – will this crossed over AC tone be heard?



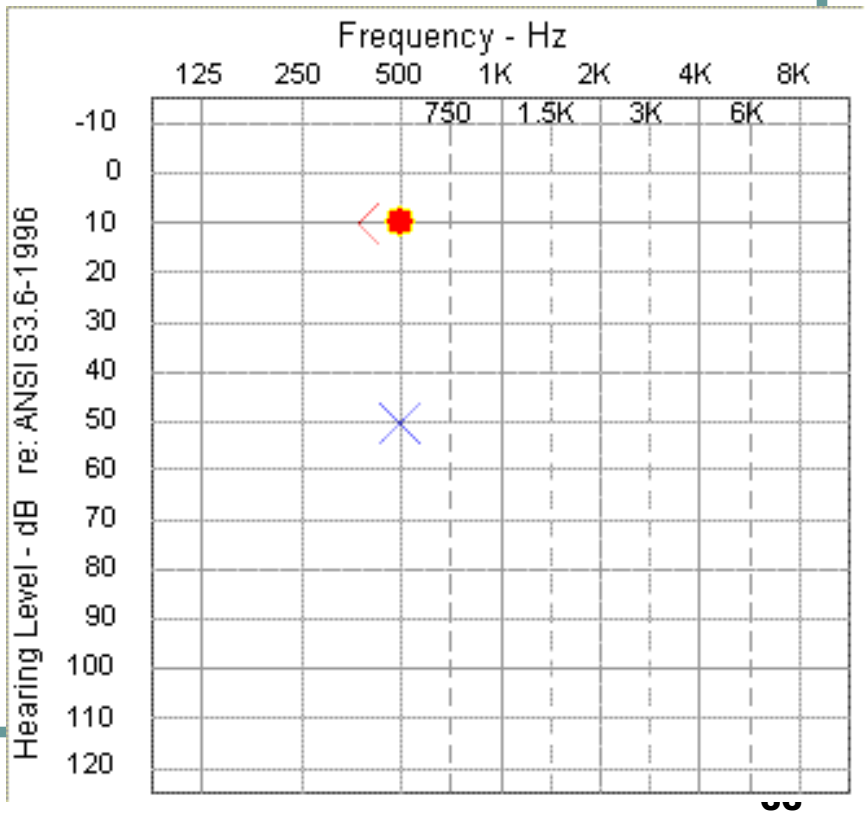
Step one was see if it crossed over, step two is see if you care!



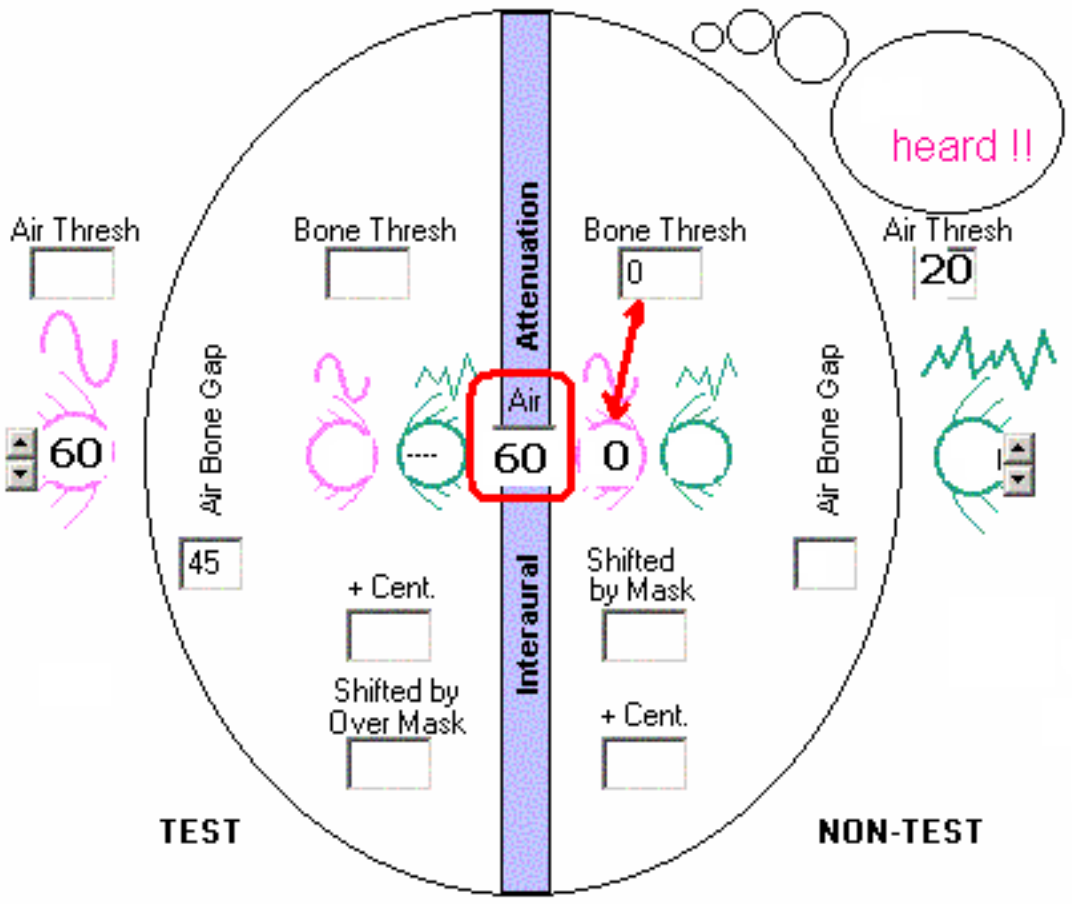
But… if the signal were louder



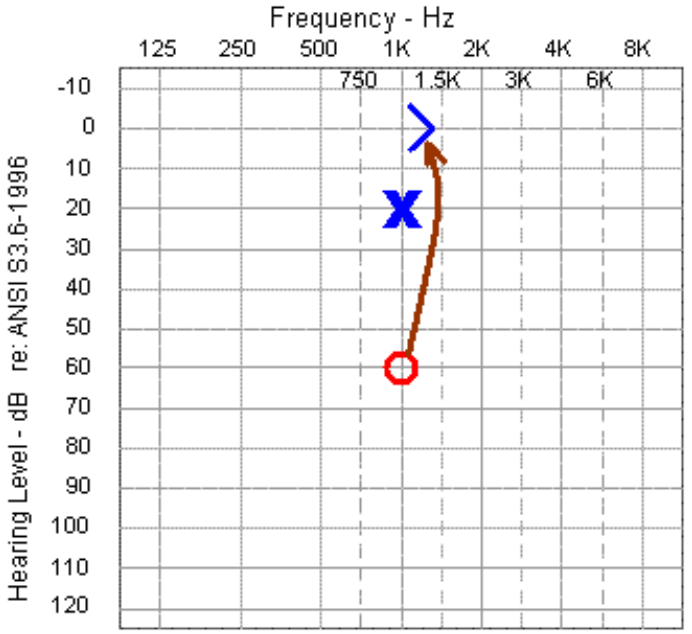
TDH earphones



Returning to our original example slide 53: application of step 2



This patient's actual IA = 60

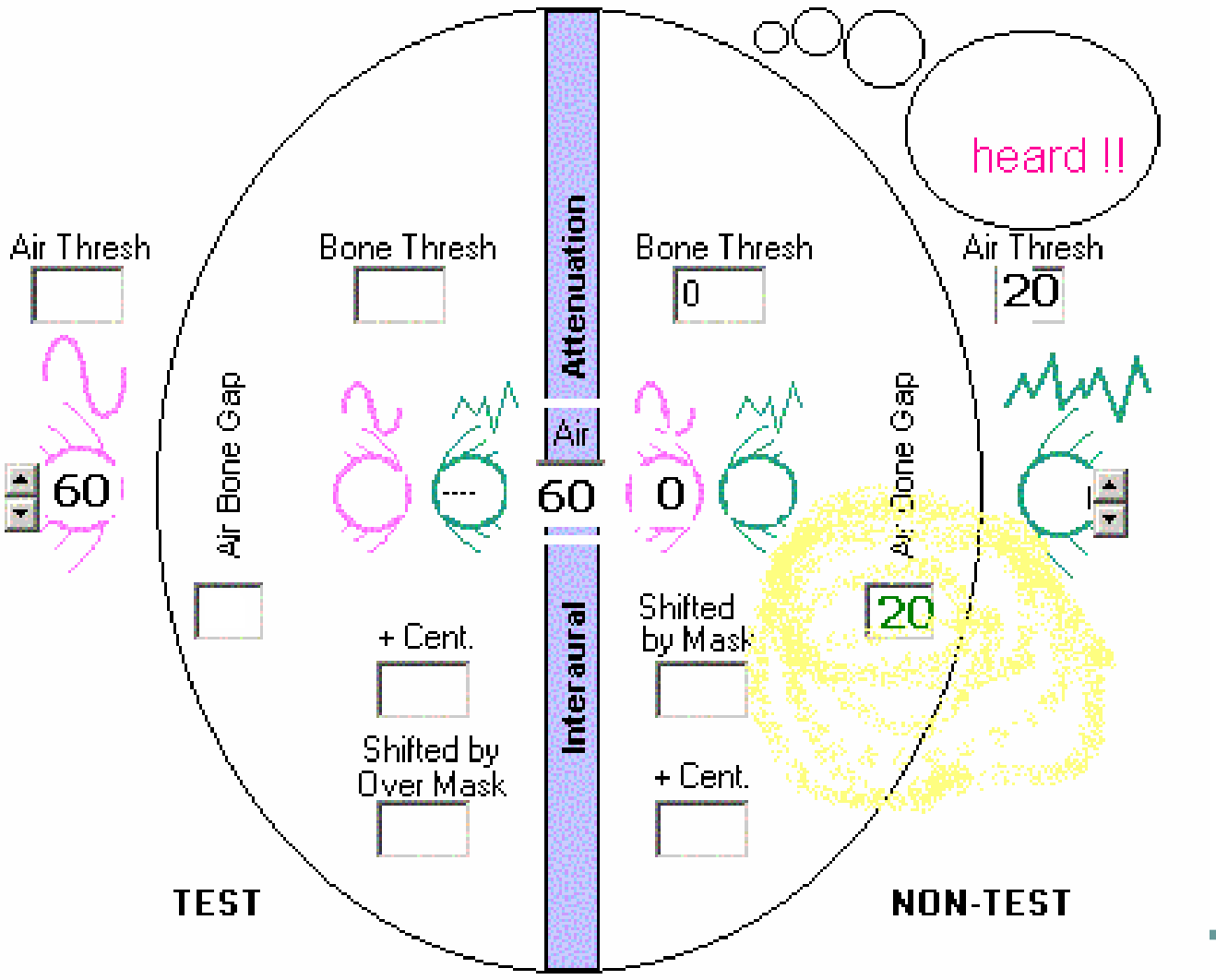


AudSim often, but not always, uses minimal IA values. They are so low you think there's an error. Remember: if using TDH earphones the values are low.

What's step 3?

- Step three in general is to find out what level of masking noise is needed to prevent the crossed over sound from being heard.
- This is the formula part, but in this lecture we are going to look at the elements that go into that formula.

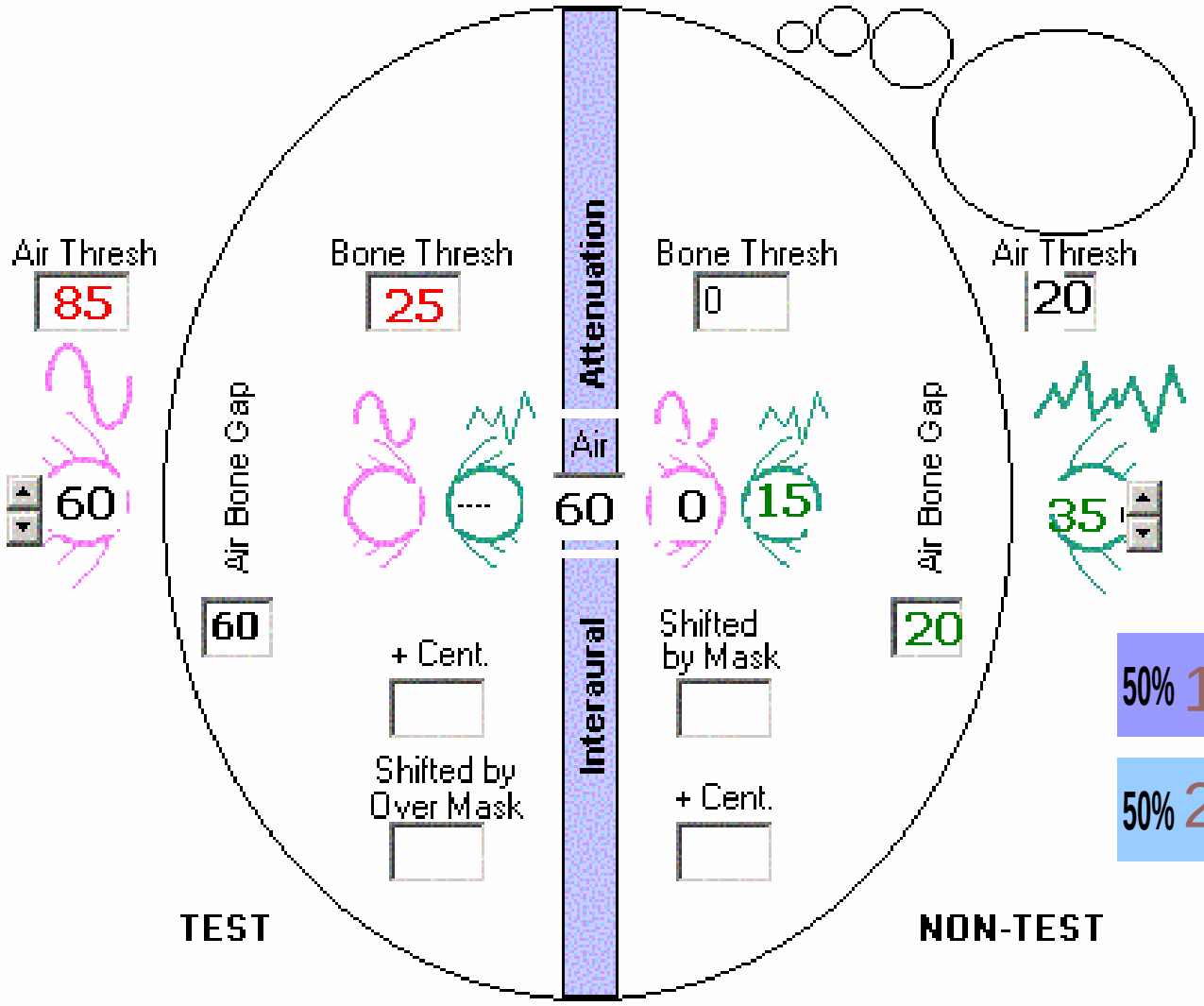
Air bone gap in NTE (or TE) – doesn't reduce the crossover!

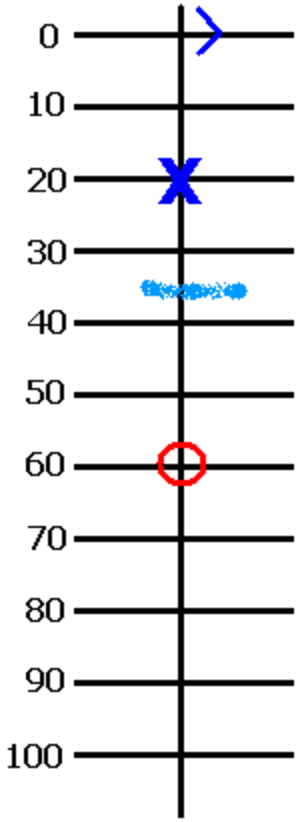


But it will increase the level of noise needed in the NTE.

Let's see how that works … next slide

Let's plateau.
NTE Thresh + 15. Clickers please!

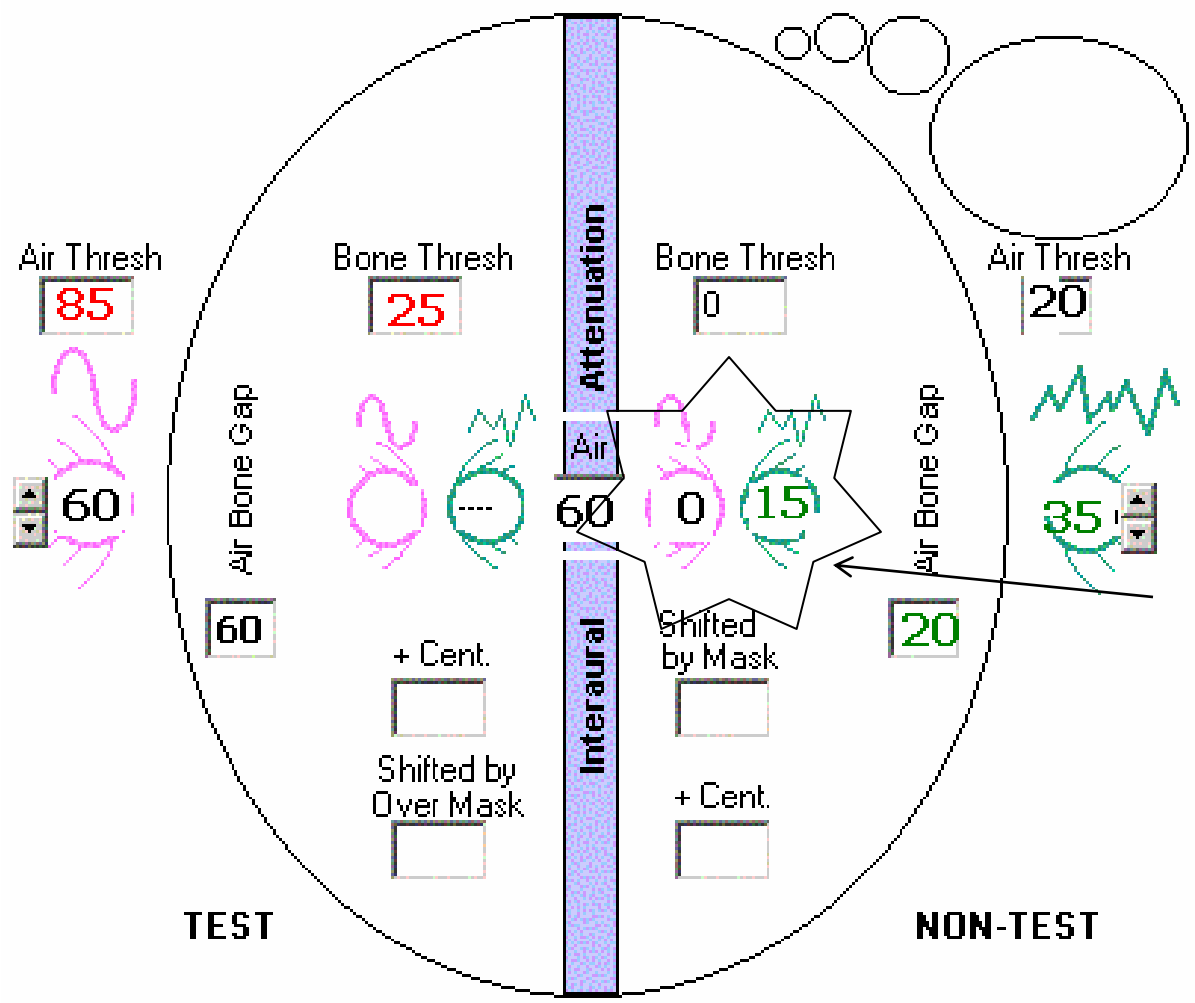


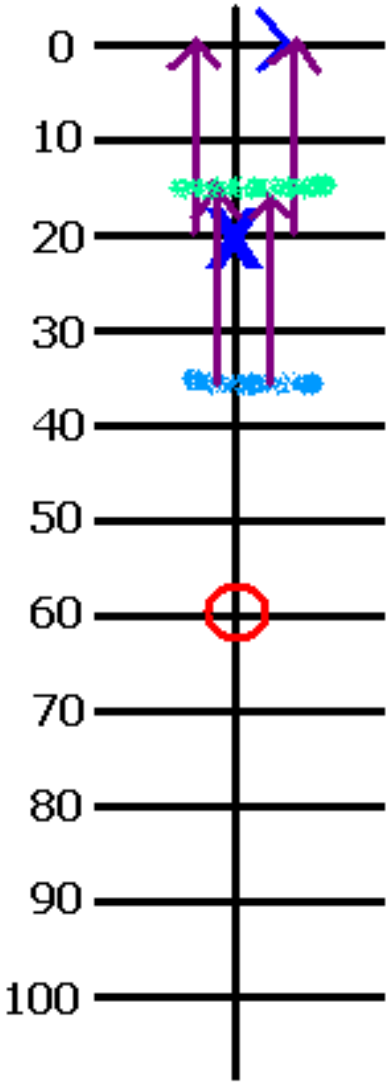


50% 1. Heard

50% 2. Not heard

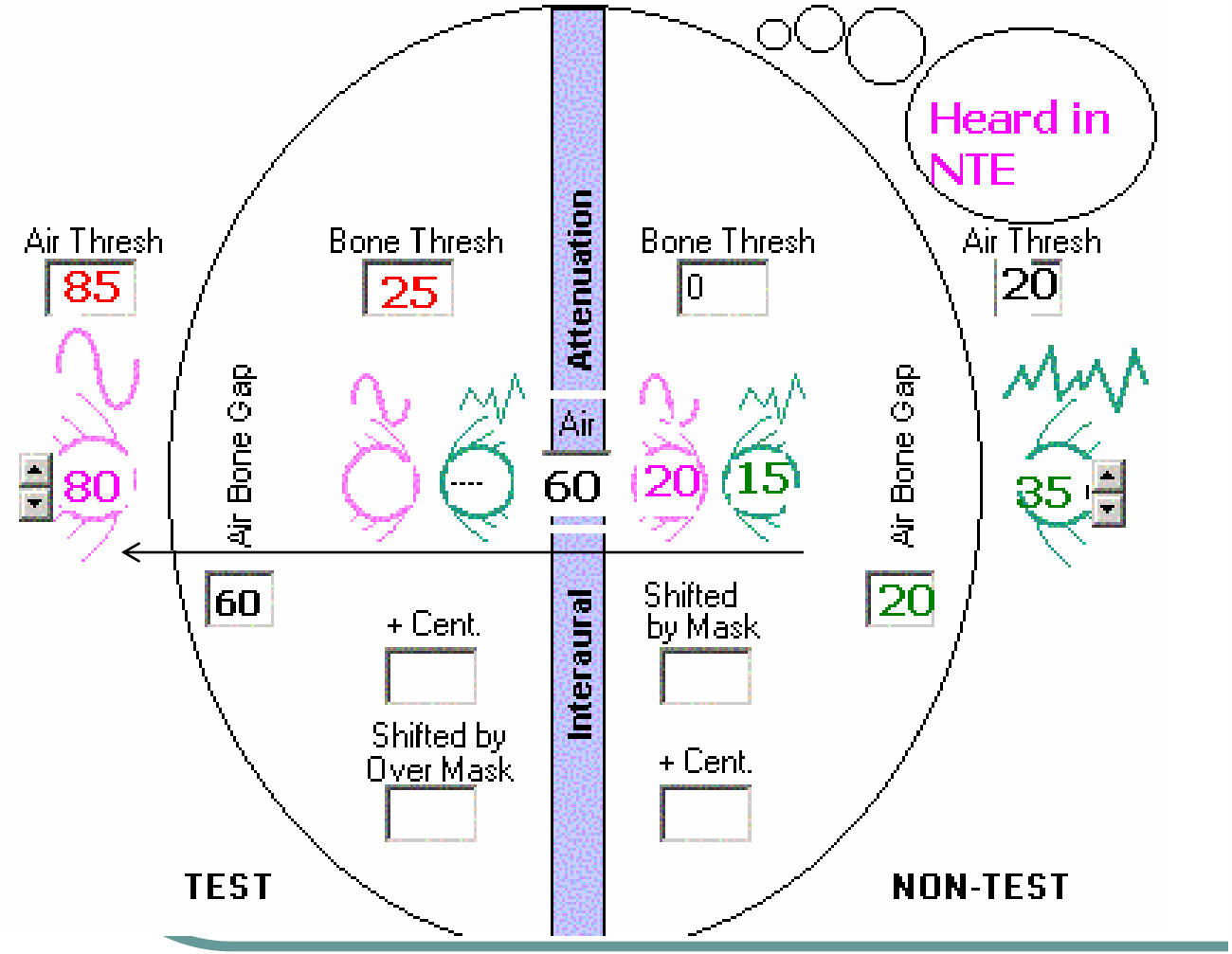
ABG reduces effectiveness of NTE noise

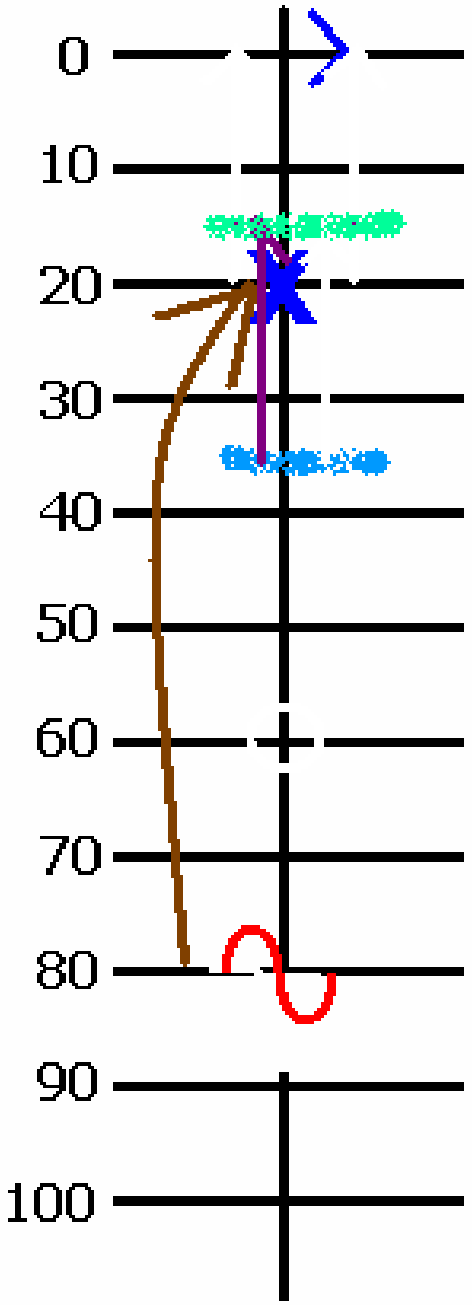




But the “15 at the cochlea” is enough to keep you from hearing 0 crossover

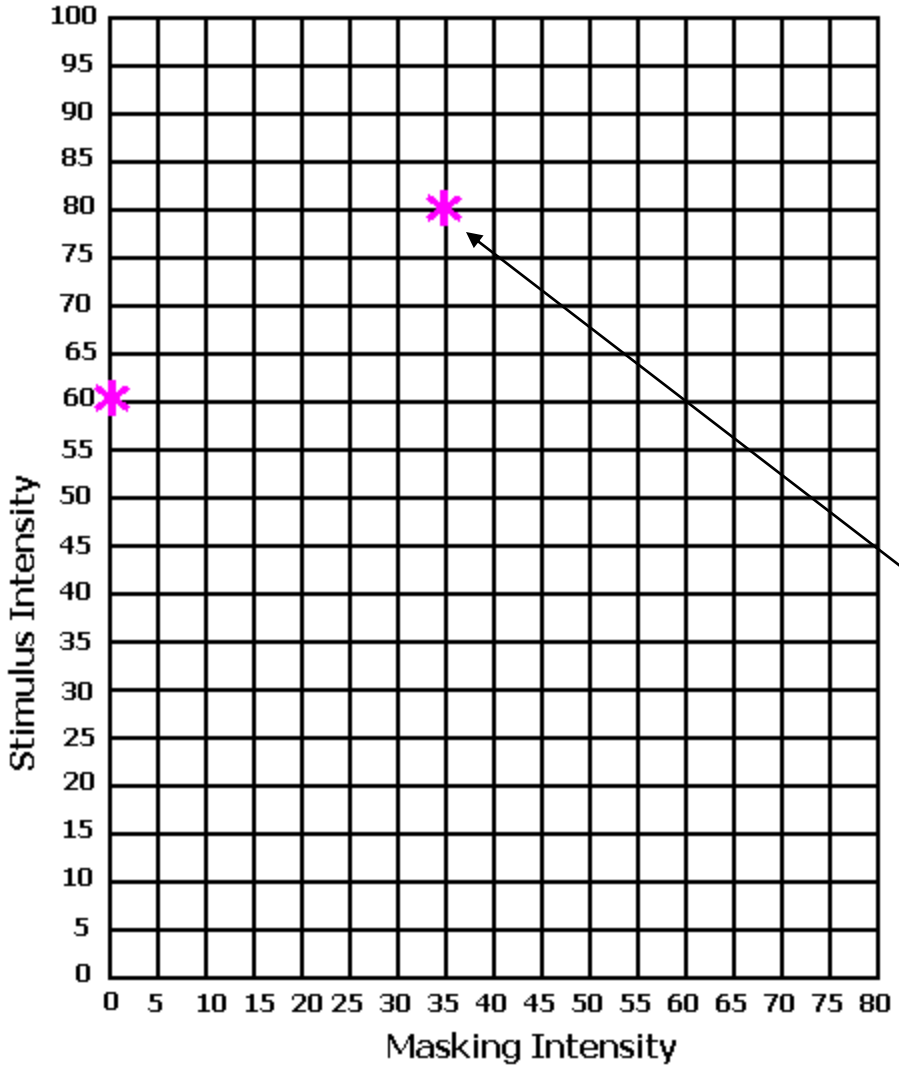
What will this patient's threshold be w/ 35 c-EM?

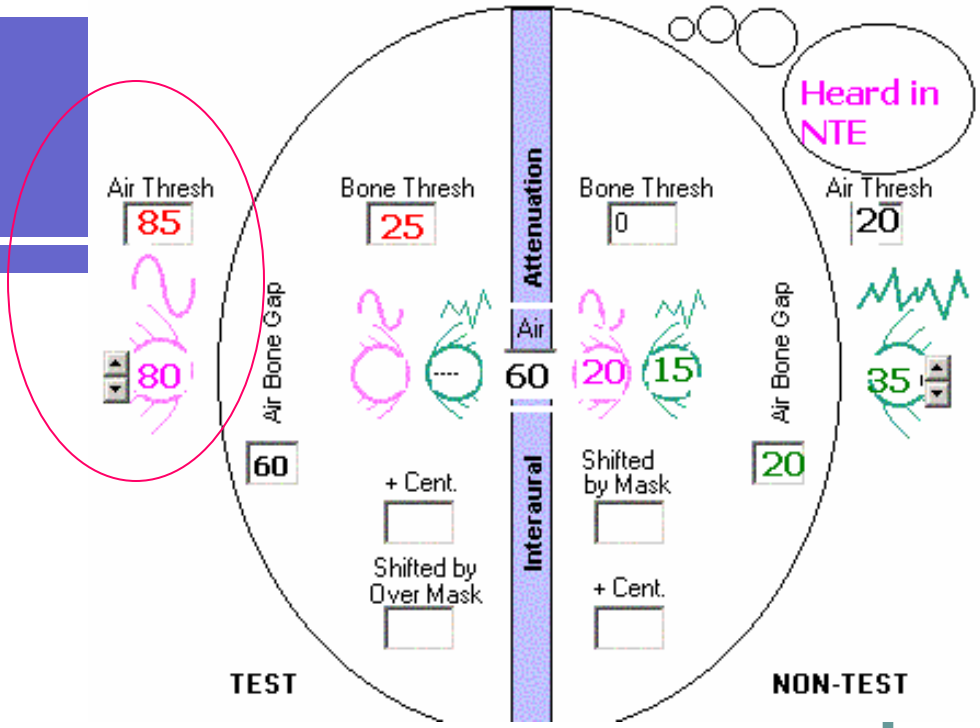




Work backwards – level at NTE cochlea needs to be 20 to be heard + IA = threshold at test ear

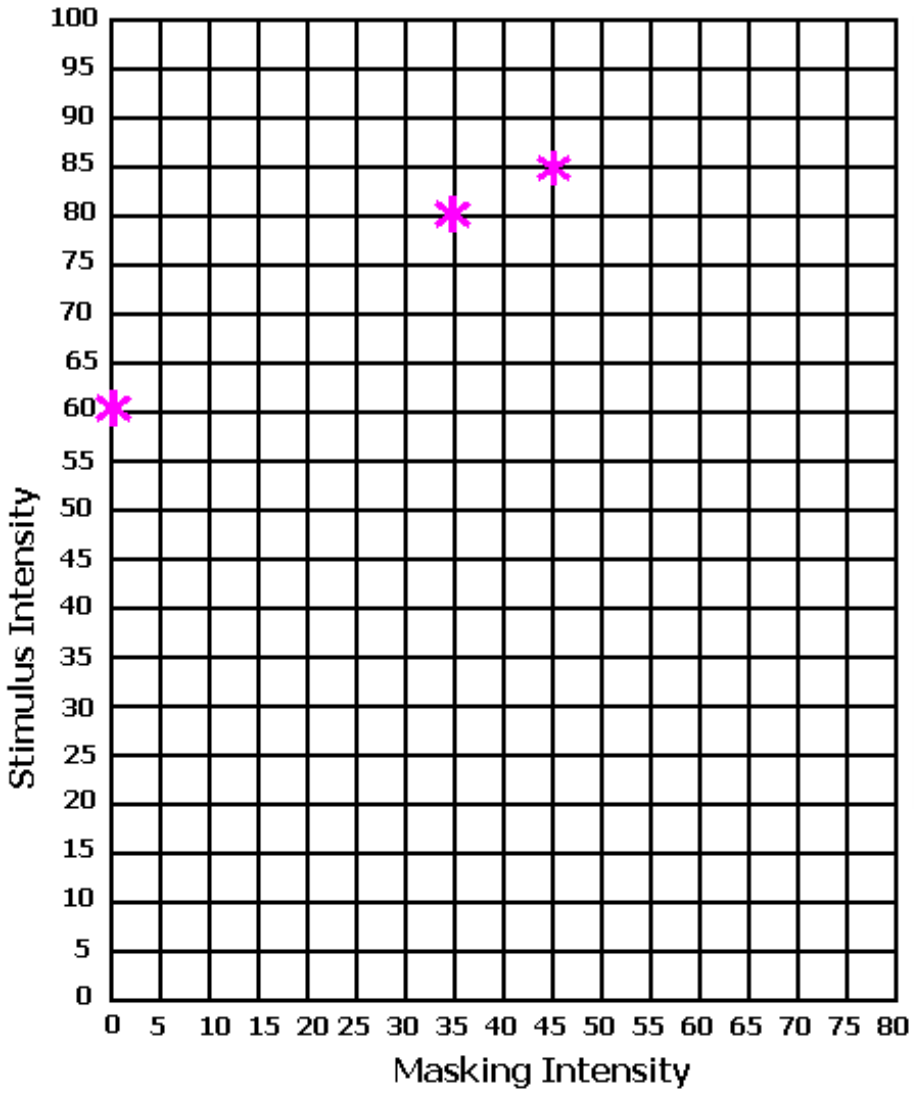
Plateau it

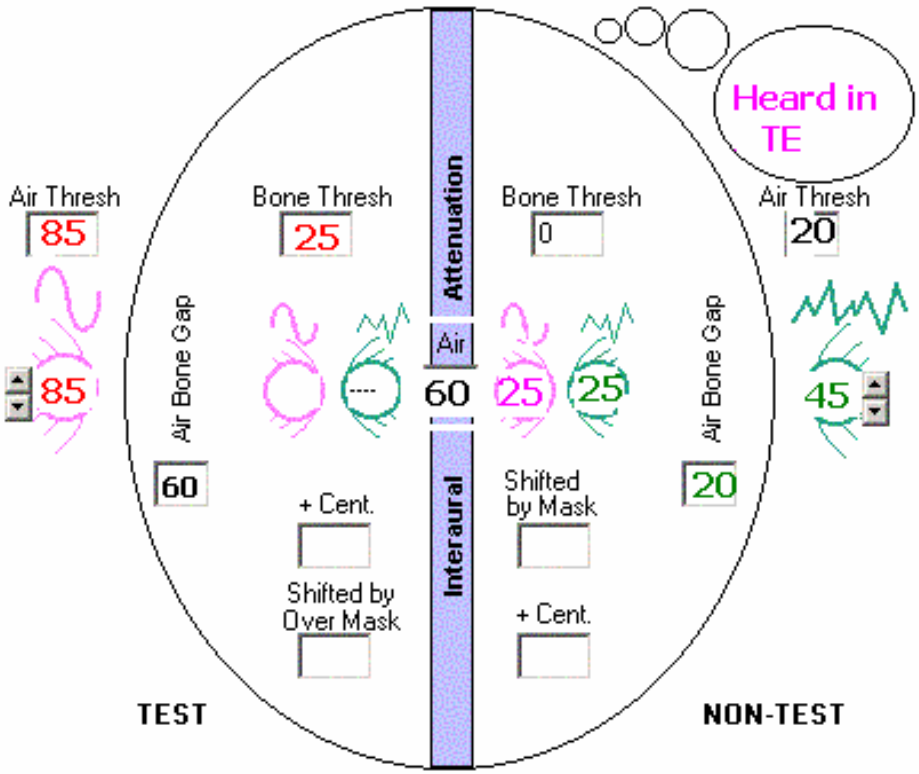




Undermasking

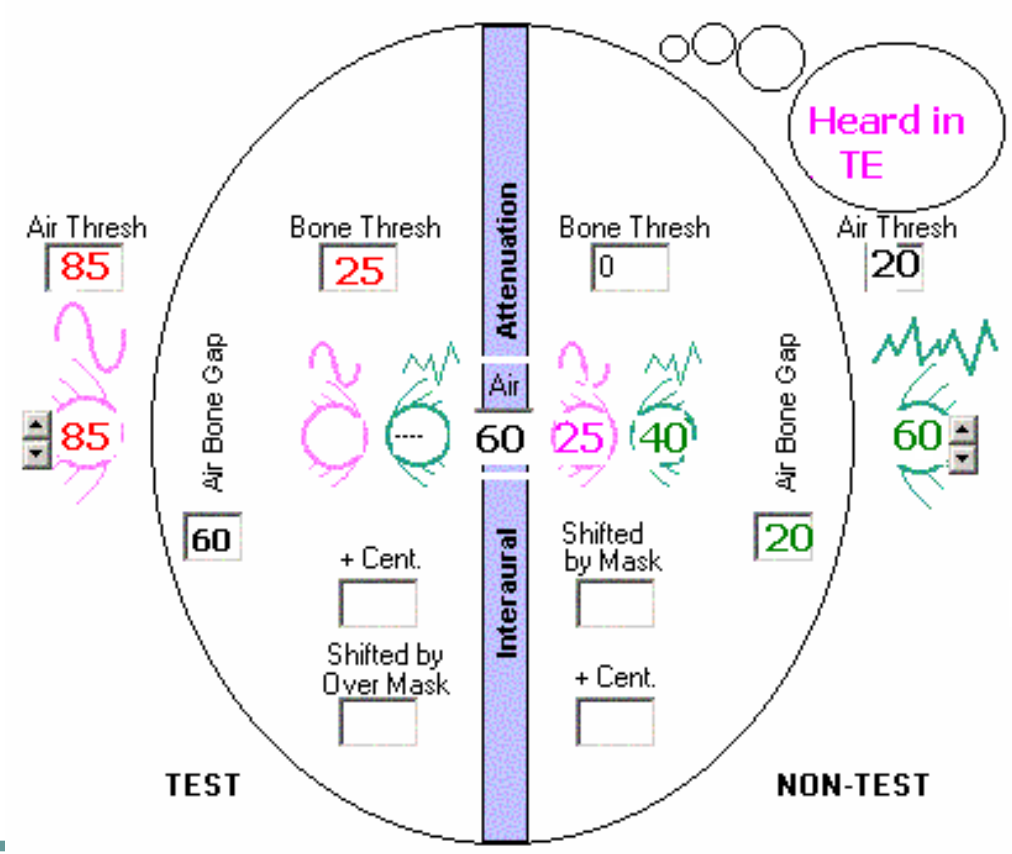
Increasing the noise 10 only shifts threshold 5, because it is now heard in TE





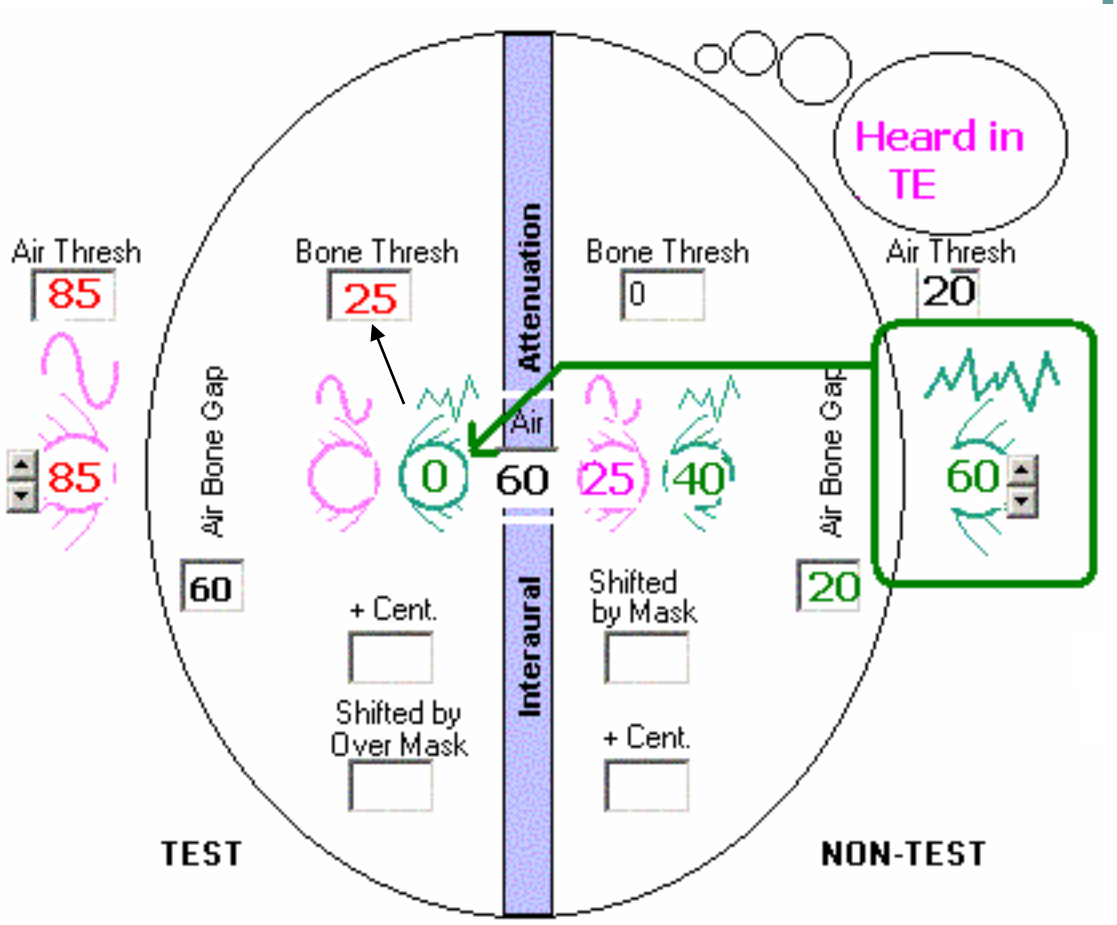
Let's try the shortcut. Increase noise 15 dB & see if threshold stays the same

- Good so far…

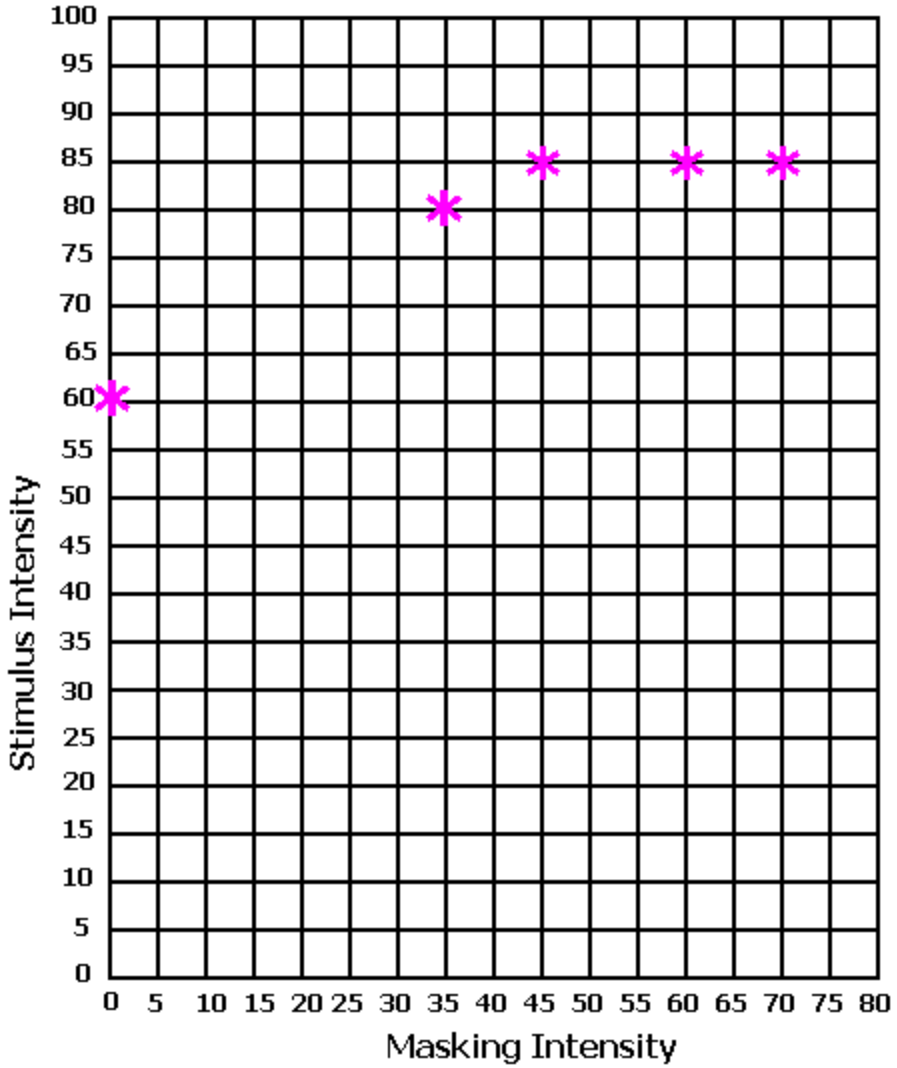


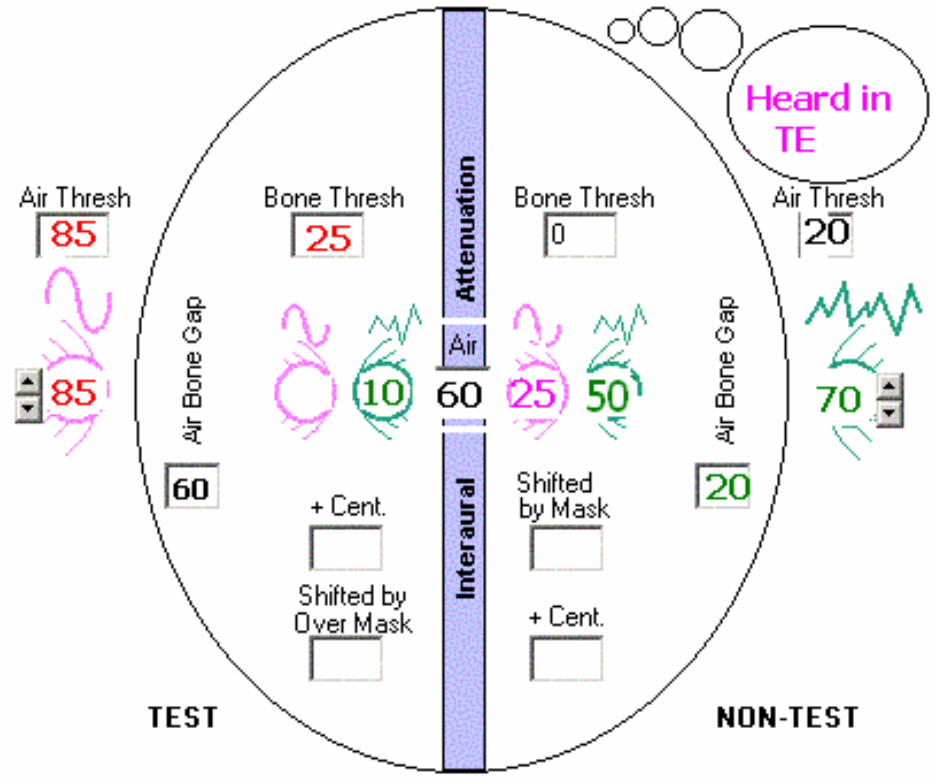
But, we also have to consider "cross back" – NTE noise to TE cochlea

- We are OK. The cross back noise at 0 won't keep the TE cochlea from hearing the 25 dB at the cochlea tone.

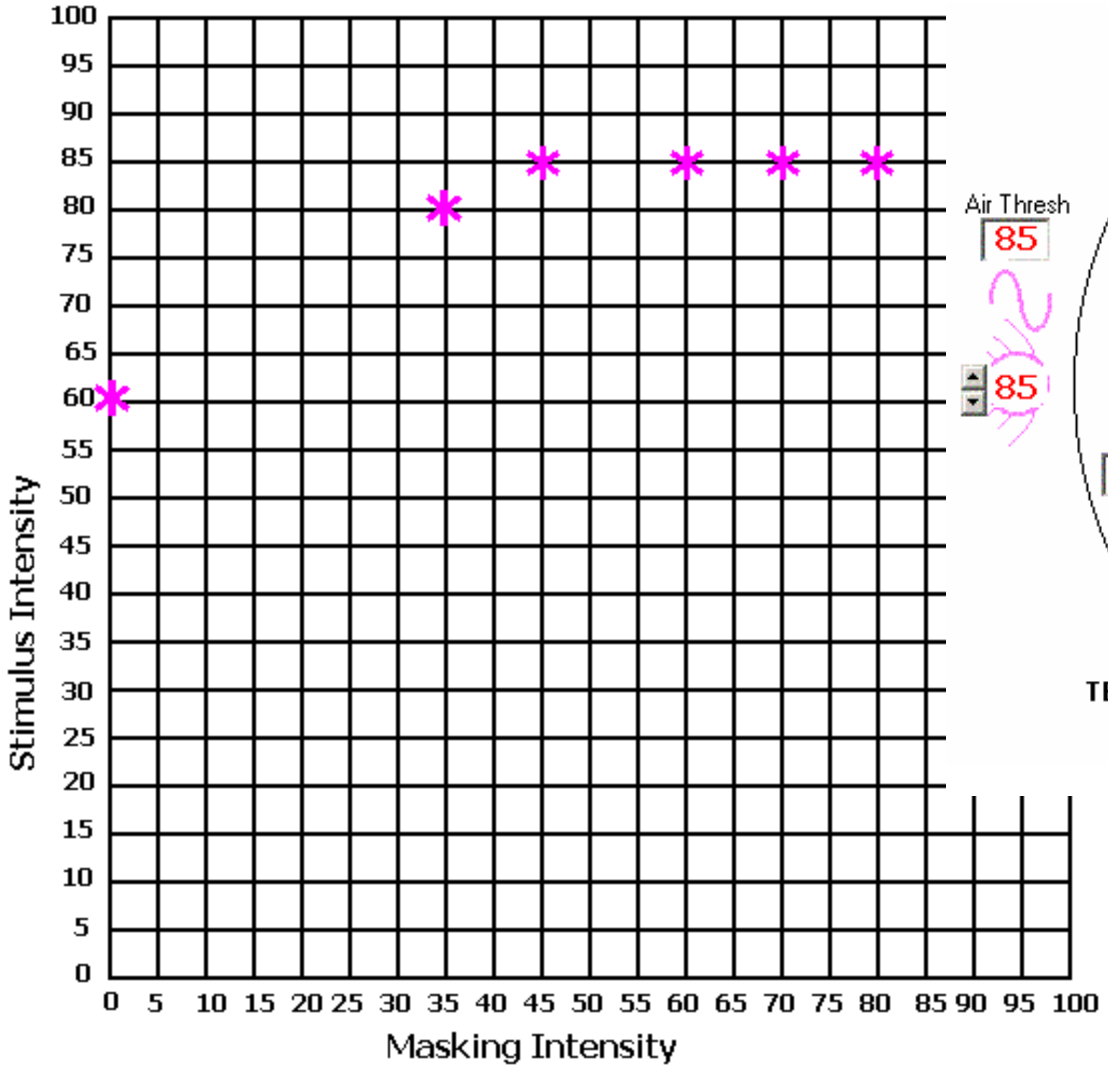


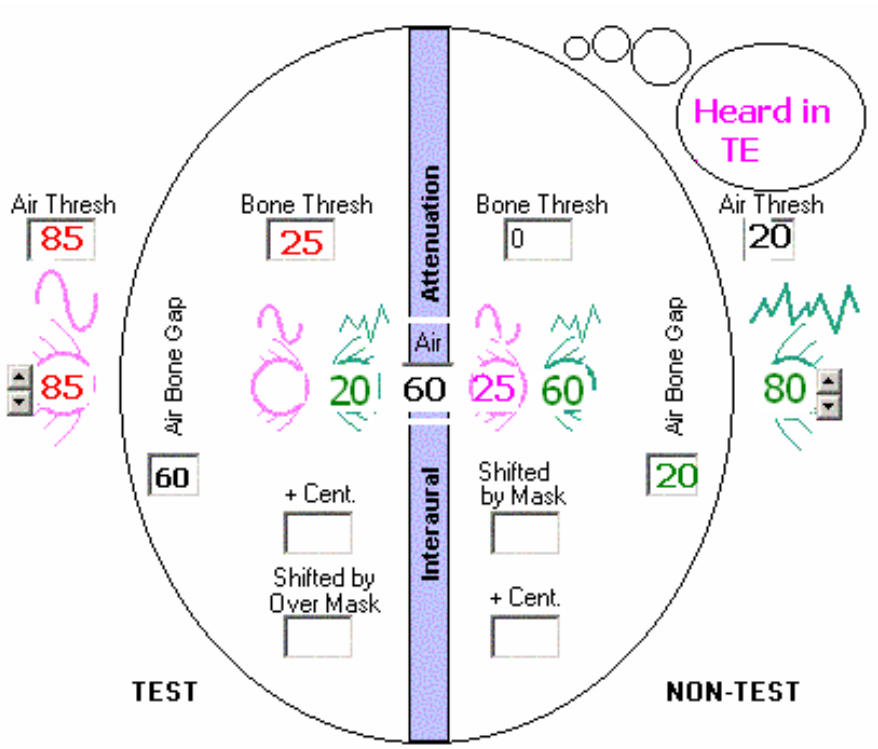
Let’s continue the plateau



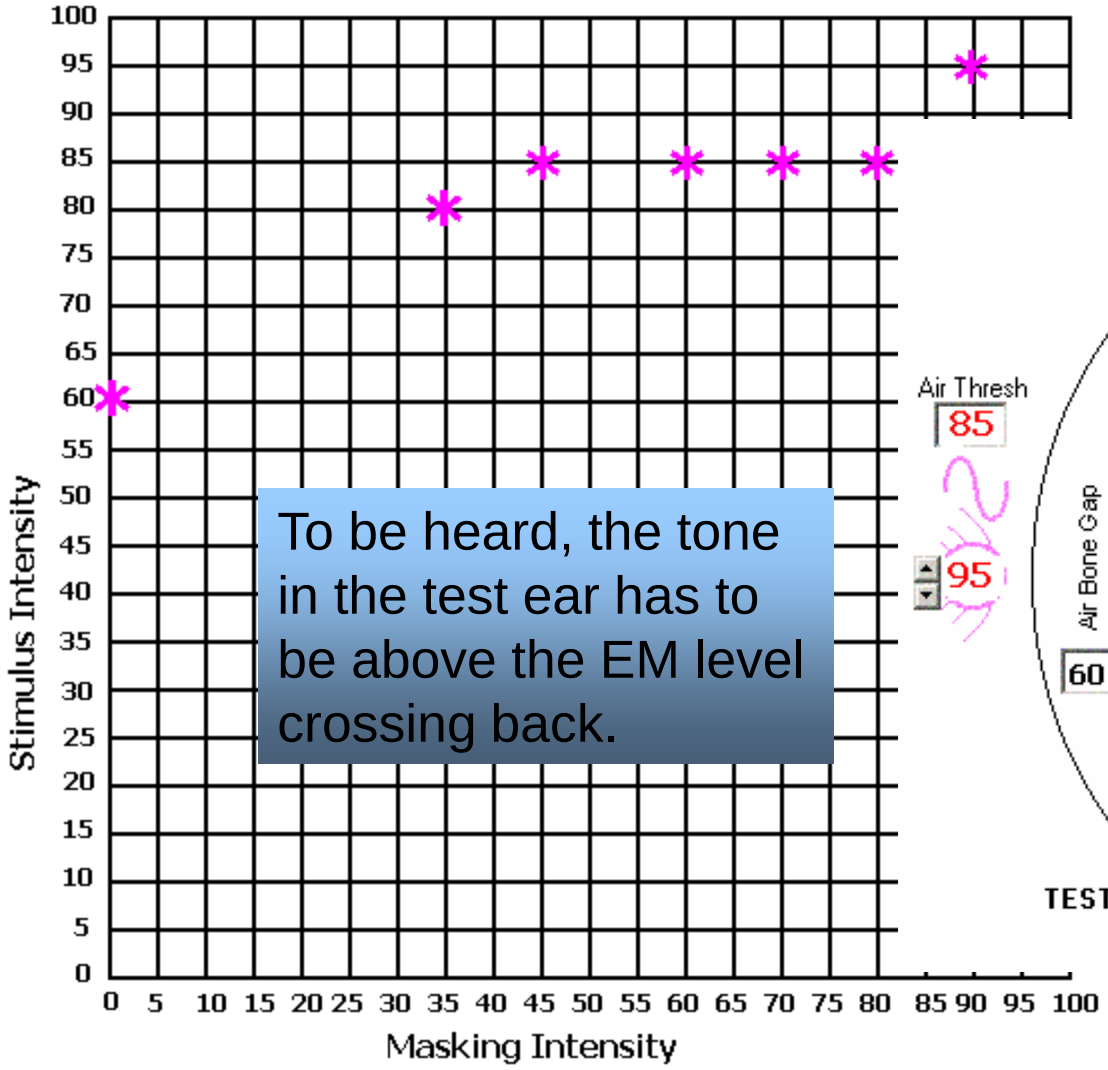


Still no problem w/ cross back

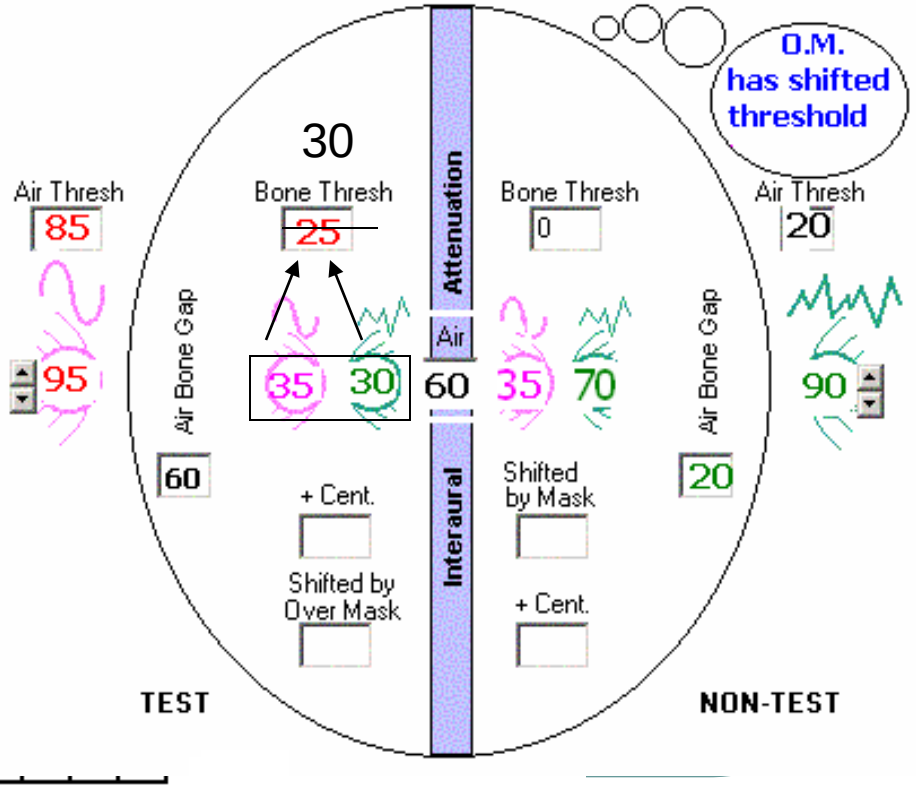




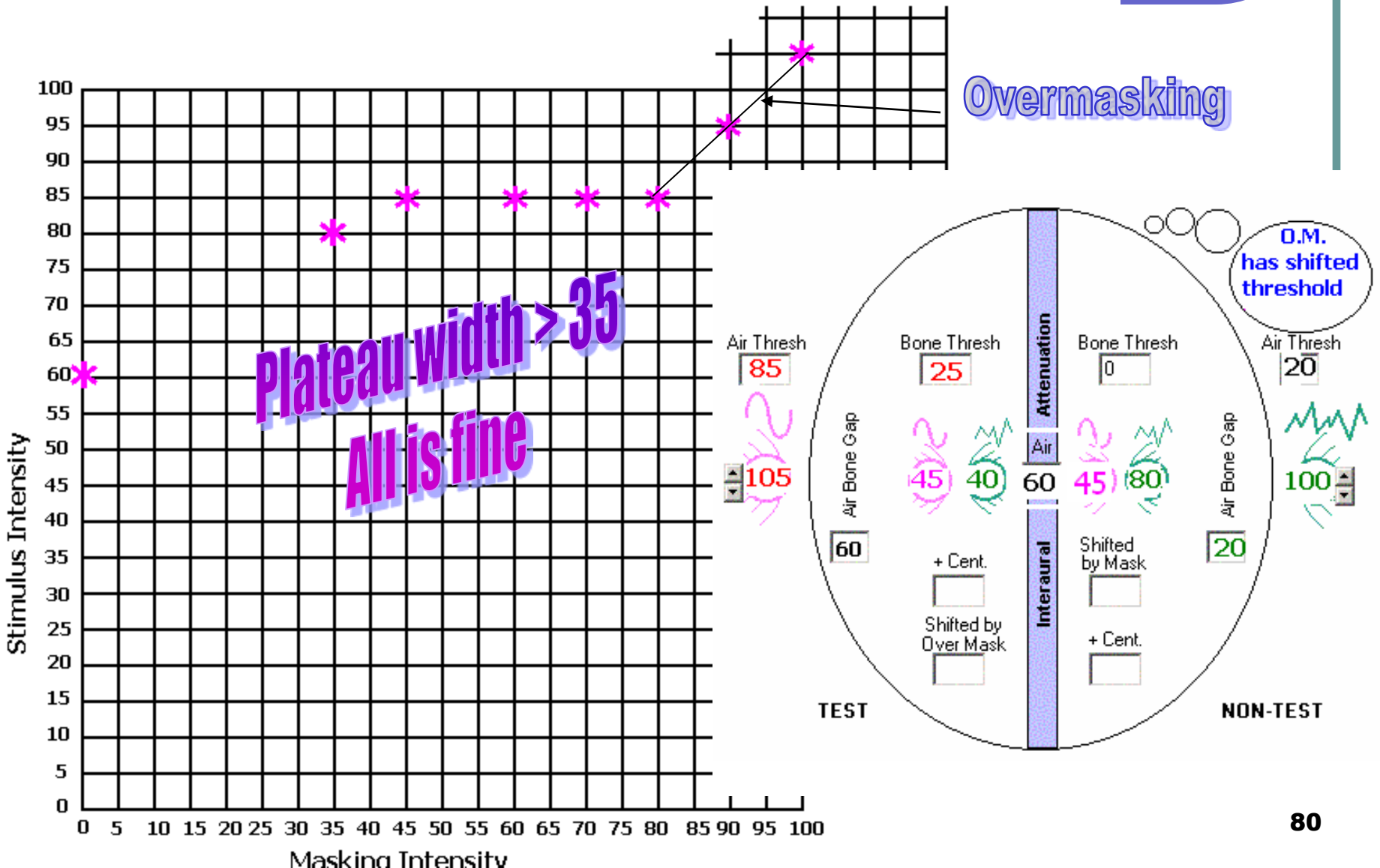
Problem! Threshold is increased because of the overmasking.



To be heard, the tone in the test ear has to be above the EM level crossing back.



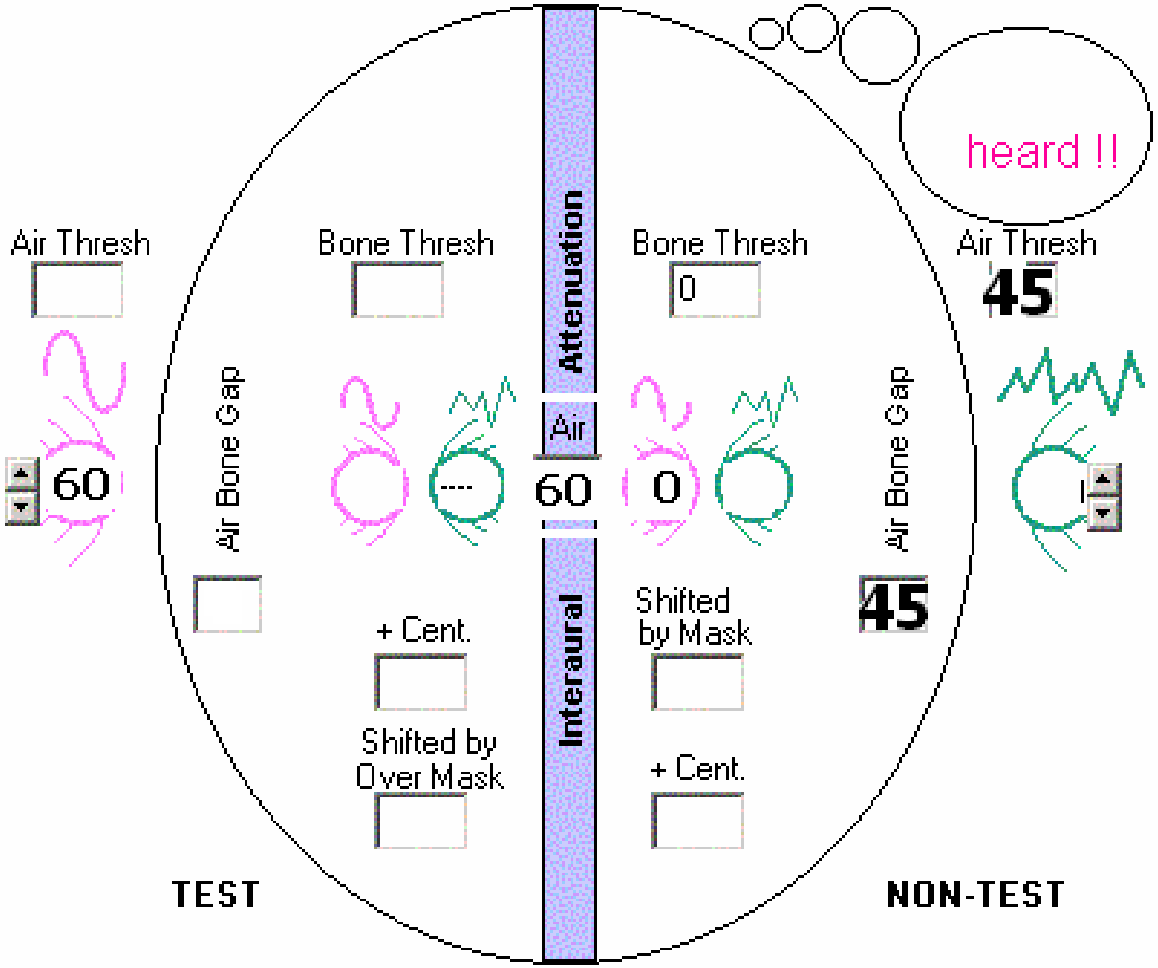
When overmasking, increasing noise 10 shifts threshold 10

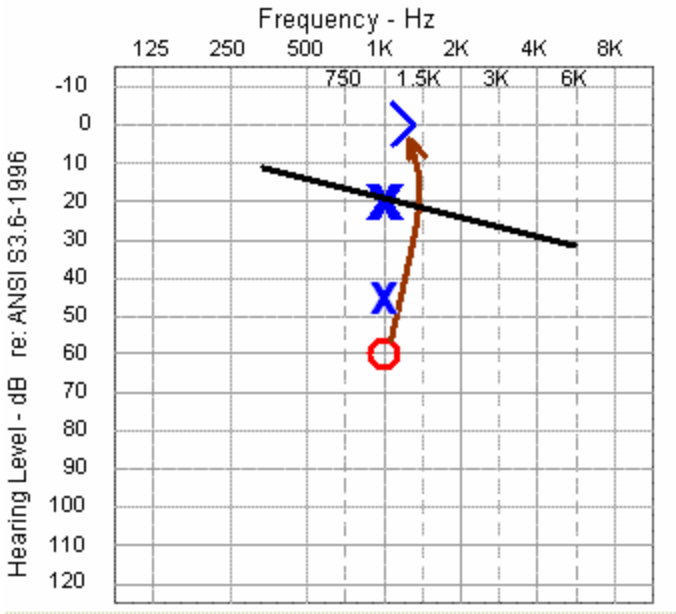


Conductive loss in NTE narrows plateau width

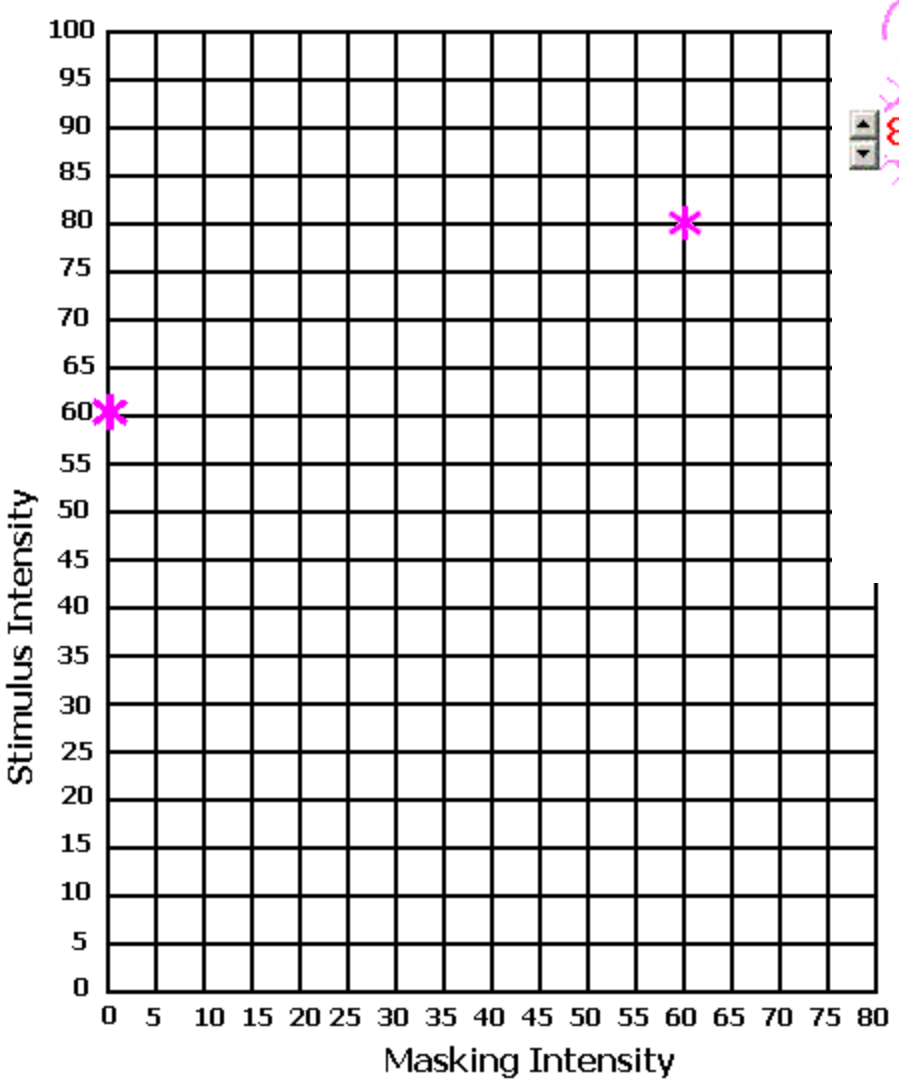
- When the noise in the NTE has to be raised to compensate for the ABG, you will find that the noise crosses back to the test ear sooner.
  - You need a lot of noise to “get through” the conductive component in the NTE and properly mask.
  - Just a bit more and you will be crossing back and overmasking.

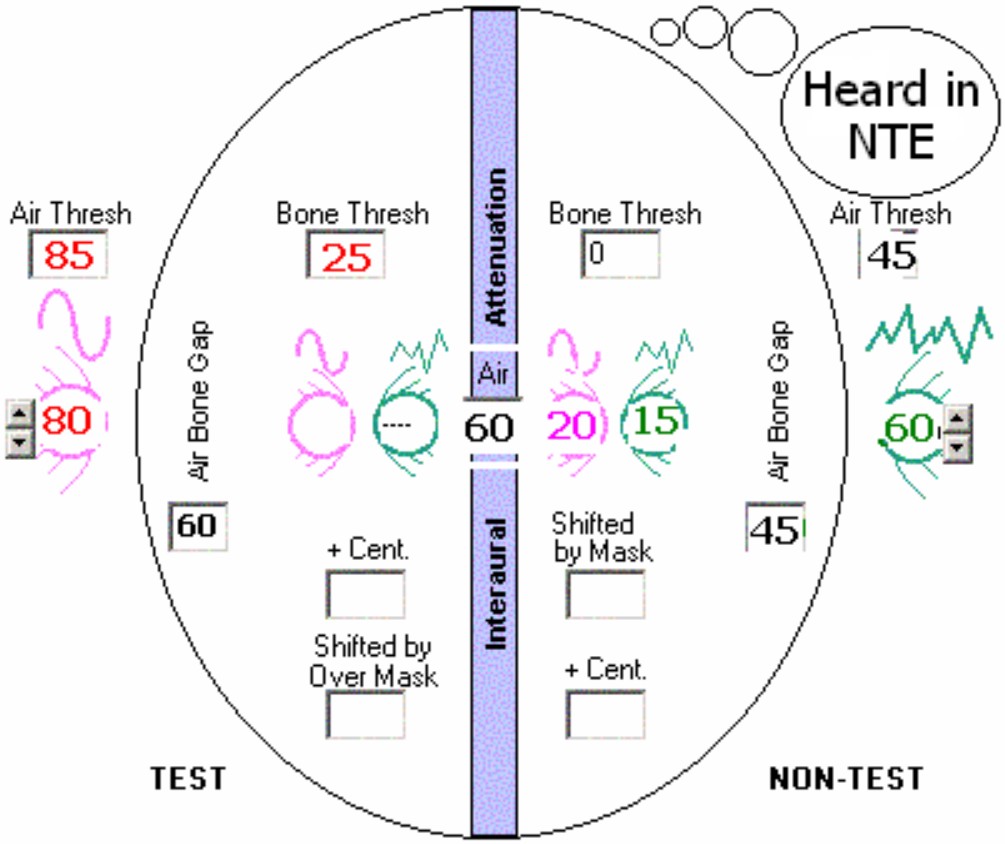
Let's make the NTE ABG even larger to further illustrate that ABG NTE reduces plateau width





Let's plateau. NTE Thresh + 15

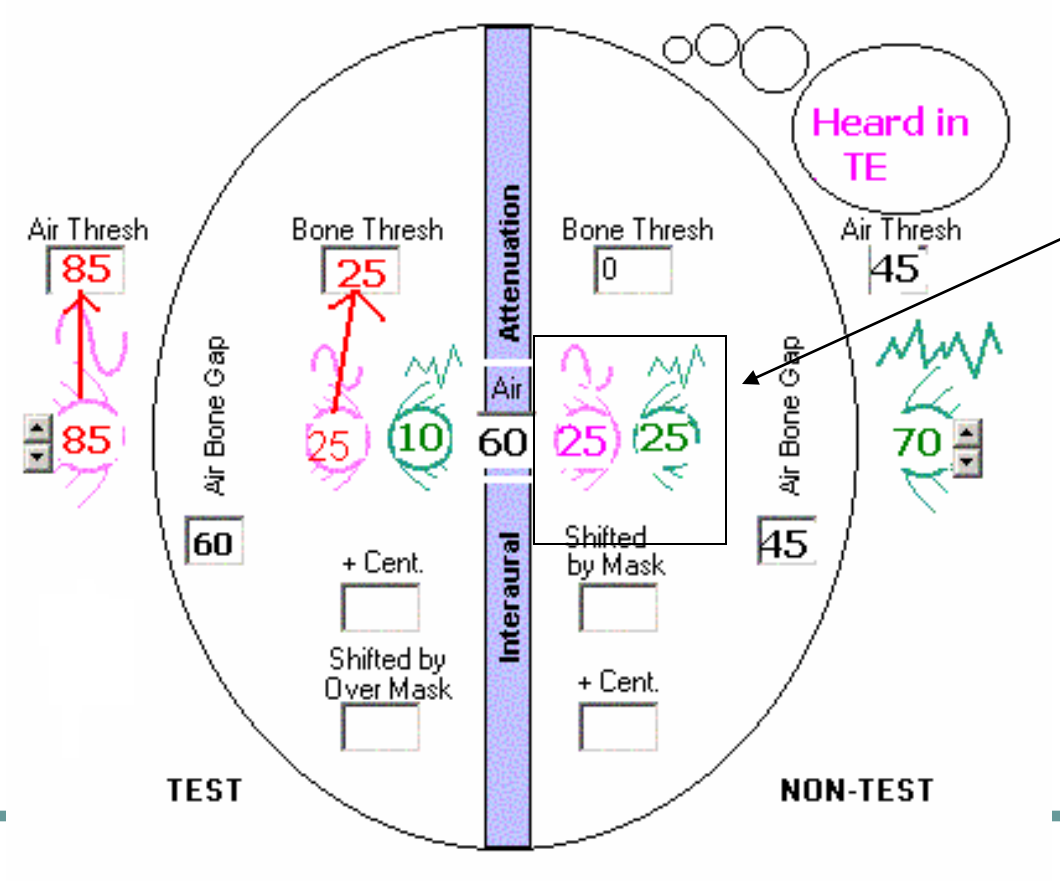




How do I know the threshold will be 80? I looked at the NTE noise (15), I know the crossed over level has to be 20 to be heard. I can see the IA.

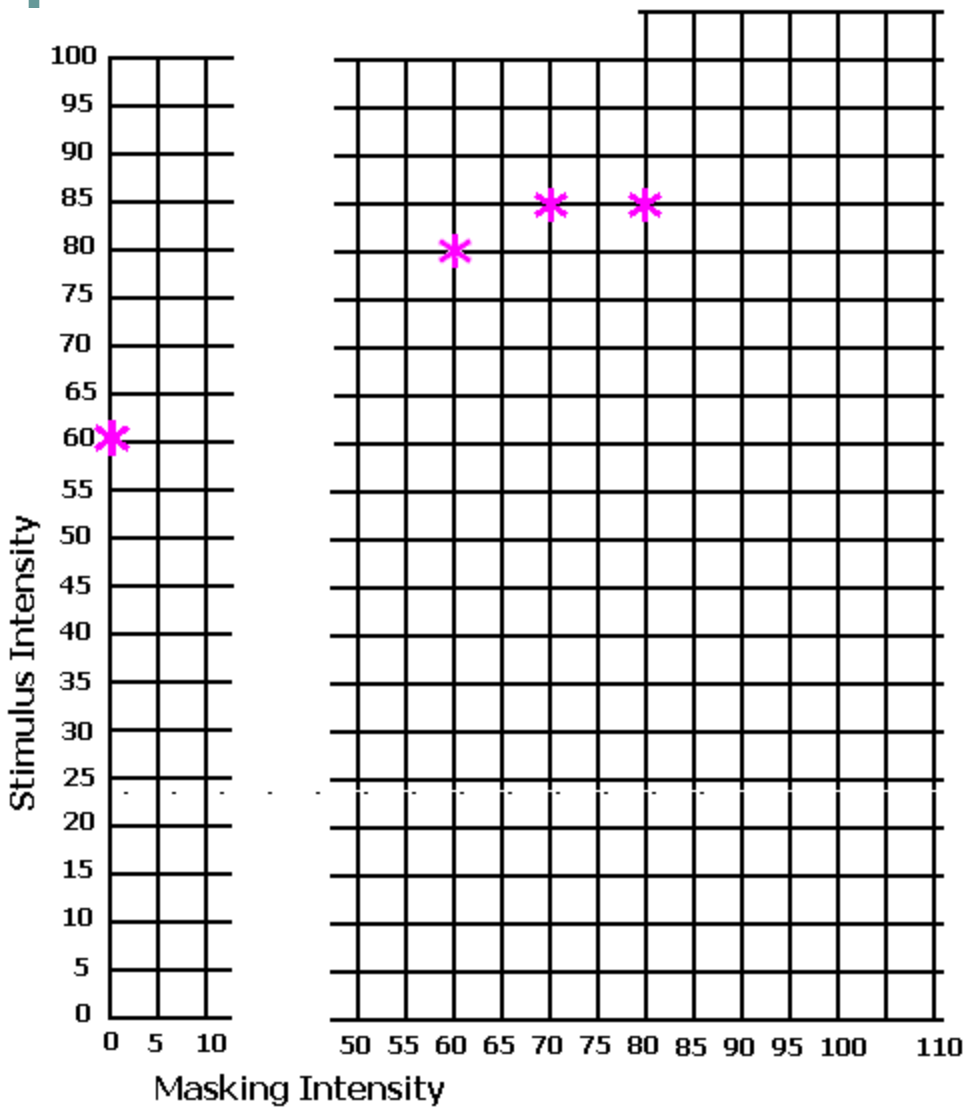
To save a bit of time in this illustration, let's turn the noise up in 10 dB increments

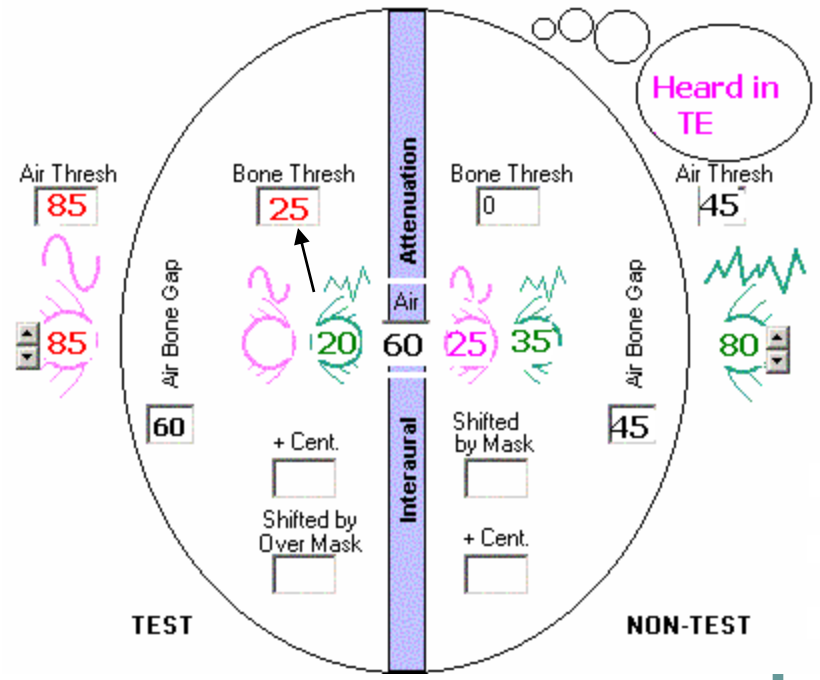
- Signal now heard in TE



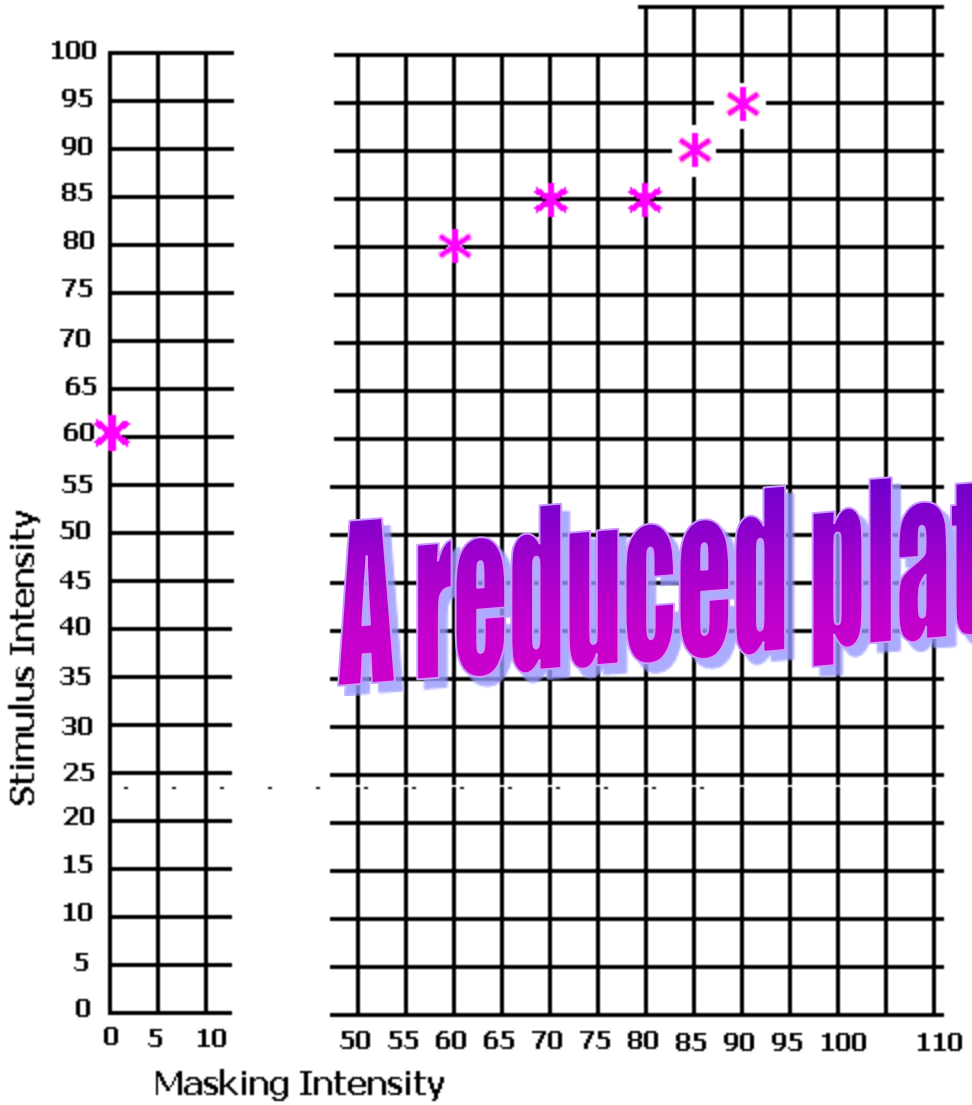
Not heard in NTE, right?

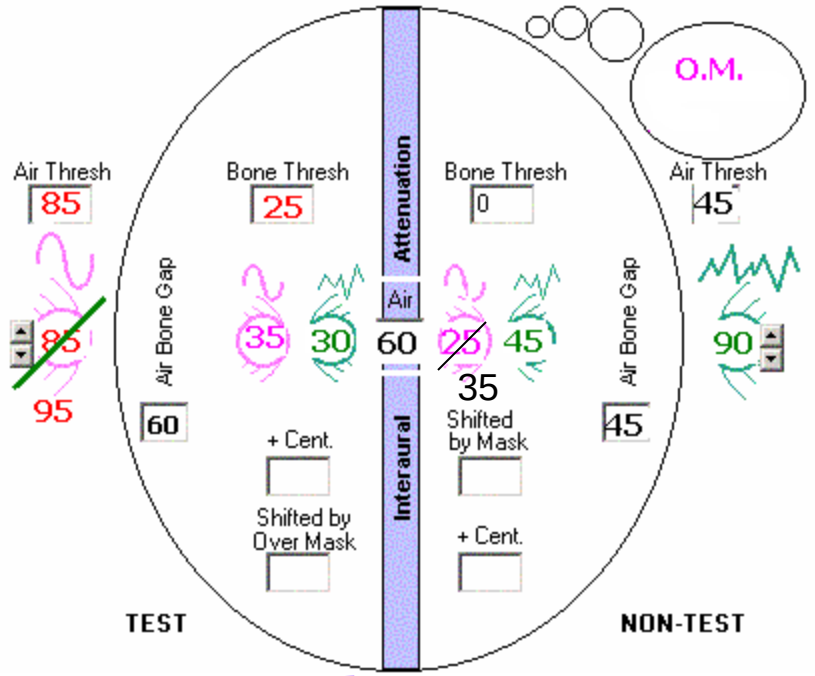
Noise to 80. Still good …still heard in TE We are not over masking





Now overmasking





A reduced plateau width

Plateau width = IA – ABG = 15 dB. If you tested 65 masking noise you would see that 15 plateau, so clinically, you could plateau this patient if you were careful.

The dictionary defined “dilemma” as

1. **50%** A difficult situation, one that requires considerable effort to resolve.
2. **50%** A predicament that defies a satisfactory resolution – there are no good choices (damned if you do…)

The ‘hard case’ we just went through is NOT a masking dilemma

Note: in ethics dilemma =

- When two solutions have equally balanced alternatives
  - E.g. action A hurts person B;

  the alternative, action C, hurts person D. One has to do either action A or action C, even though you don't want to hurt anyone.

Masking dilemma

- I need to mask, if I don’t the threshold will be incorrect, it will be of the NTE potentially.
- If I mask, the TE threshold will be elevated and inaccurate.

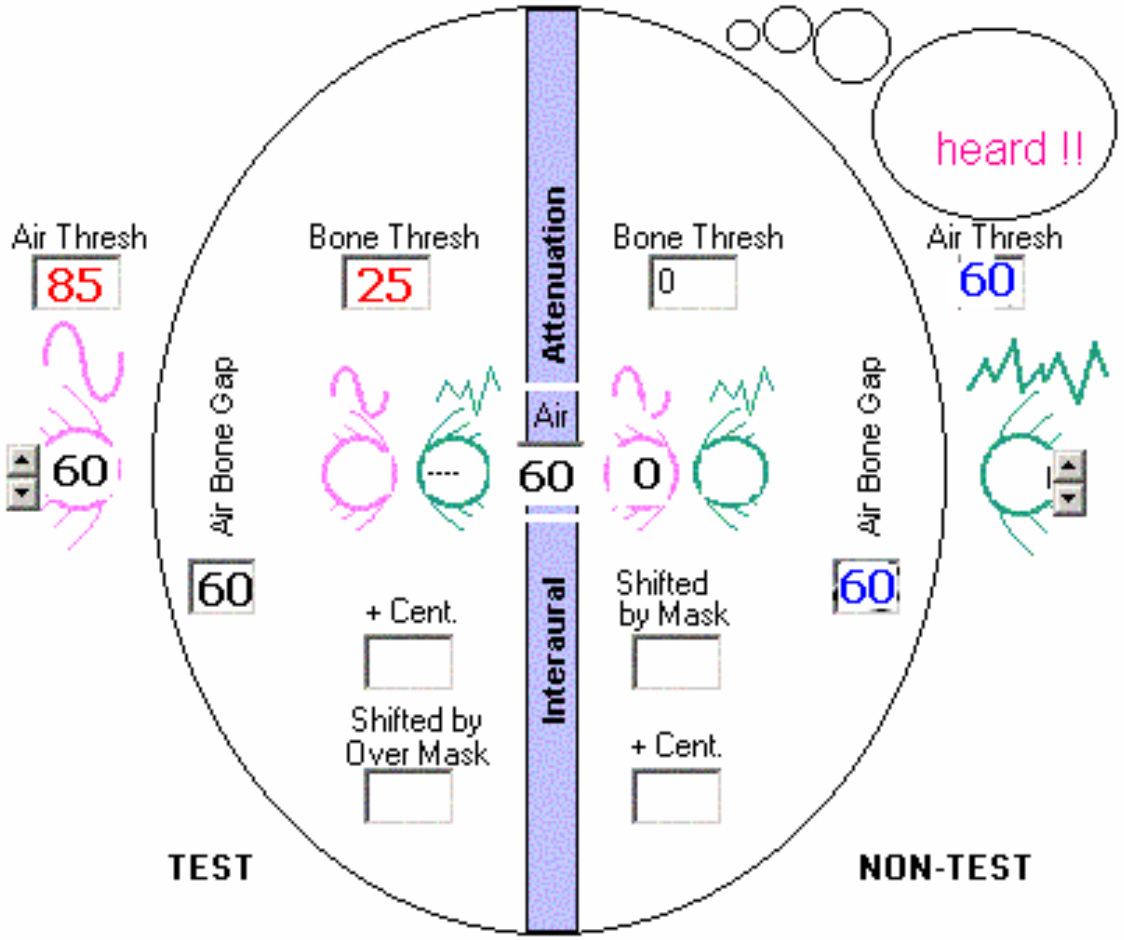
- I need to mask, I can’t mask

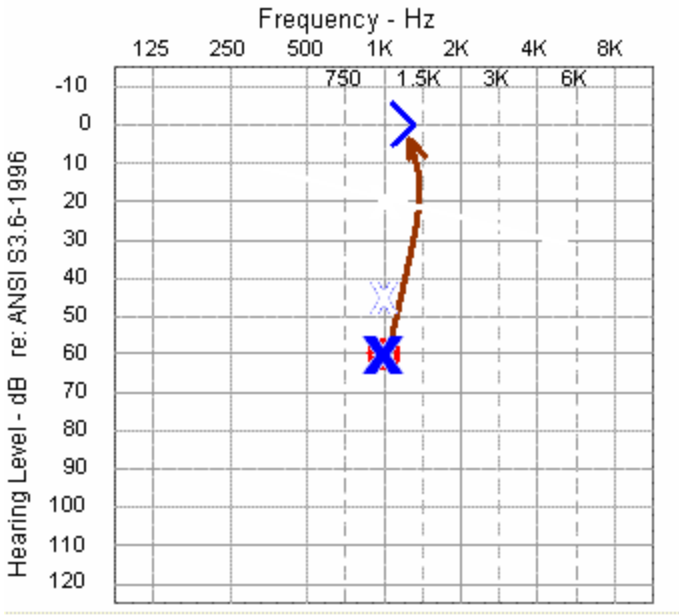
The greater the NTE ABG, the narrower the plateau.

Masking dilemma = when you can't mask, it crosses over as soon as the noise is effective.

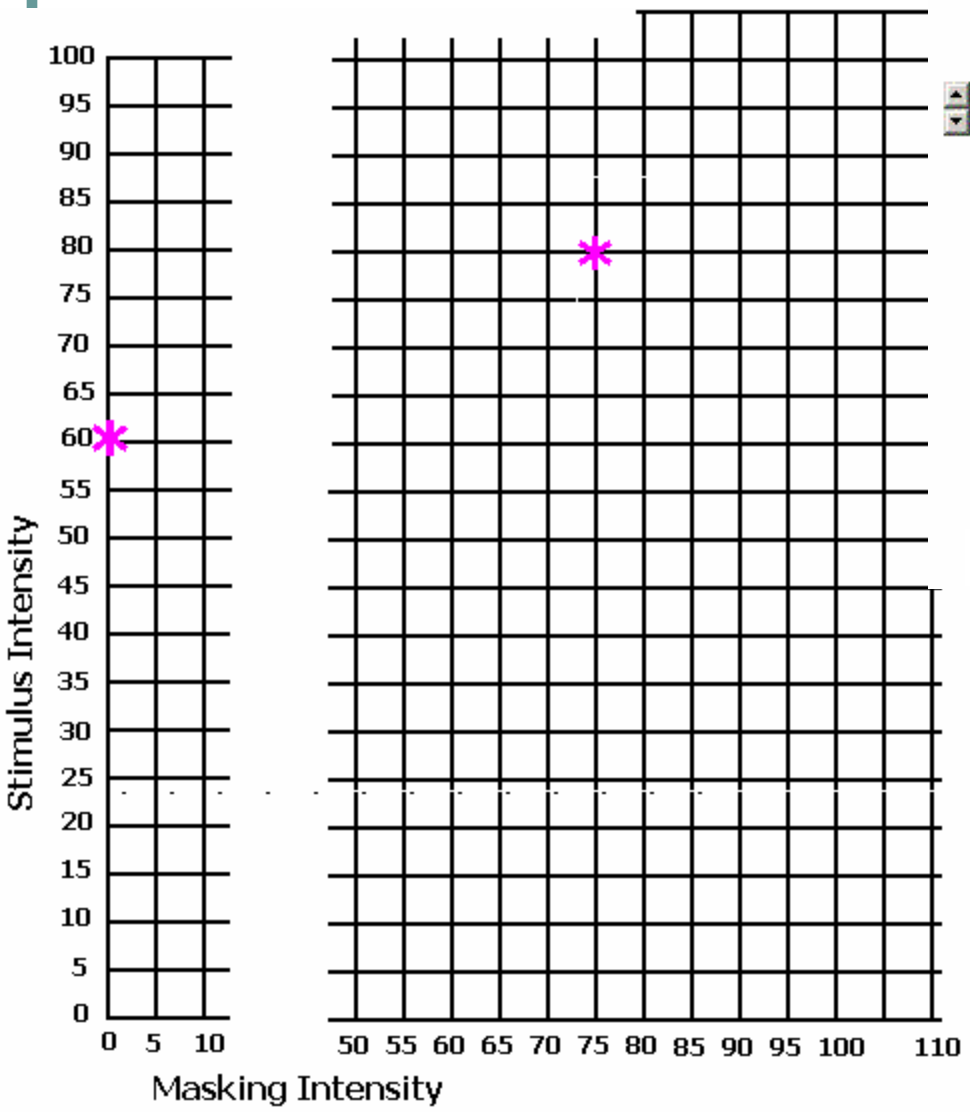
- Next example, let's make the ABG in the NTE = to that in the TE and = to the IA.

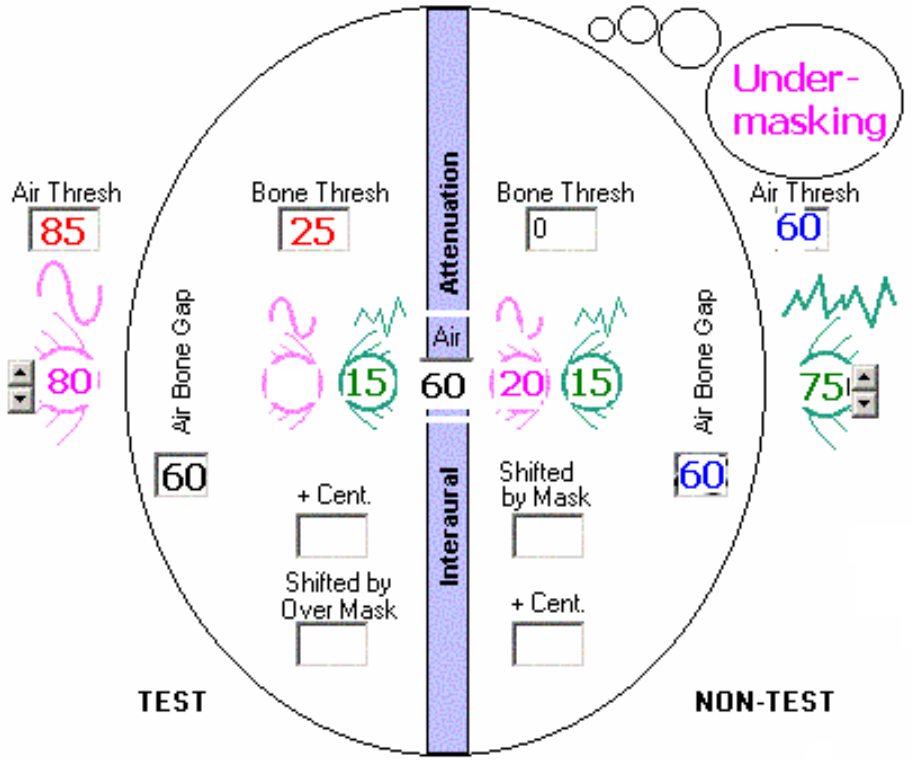
Let's make the NTE ABG even larger to further illustrate that ABG NTE reduces plateau width





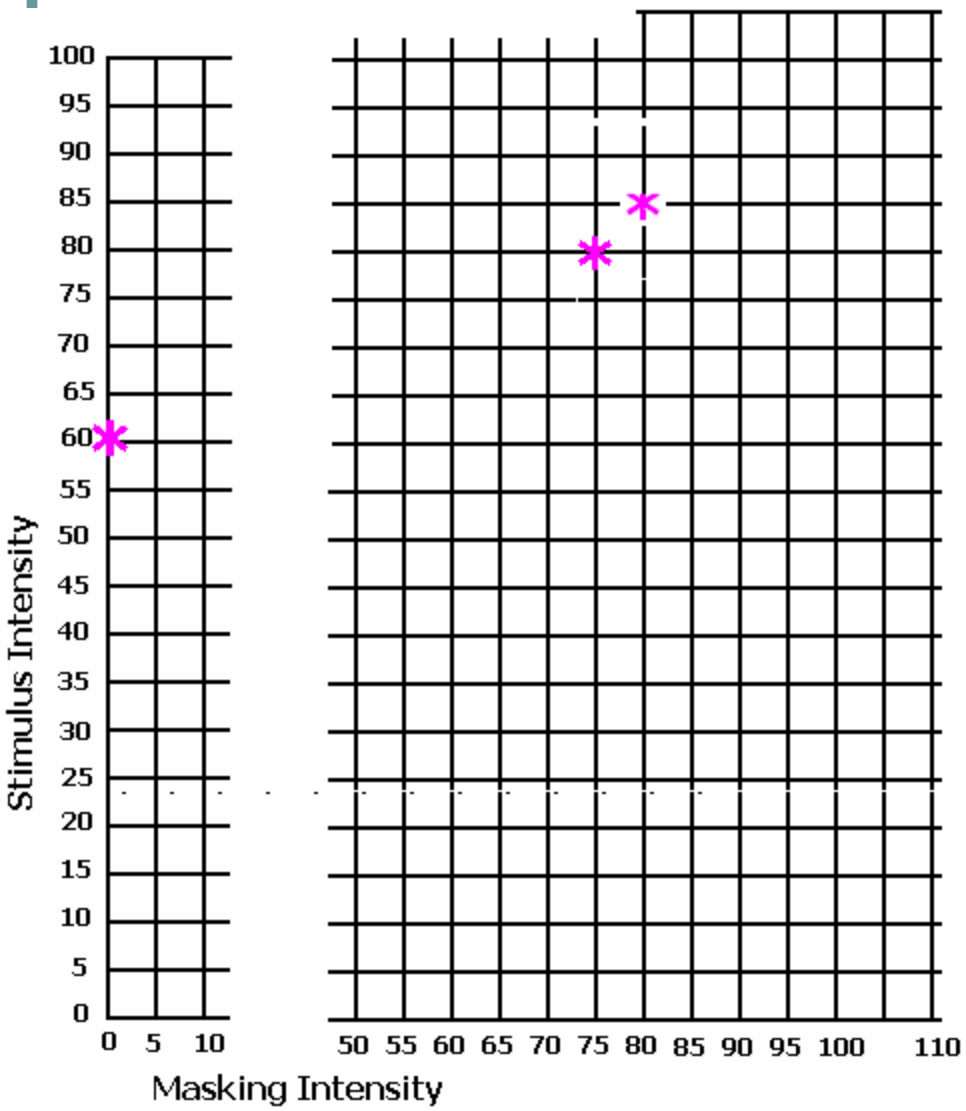
Let's plateau.
NTE Thresh + 15

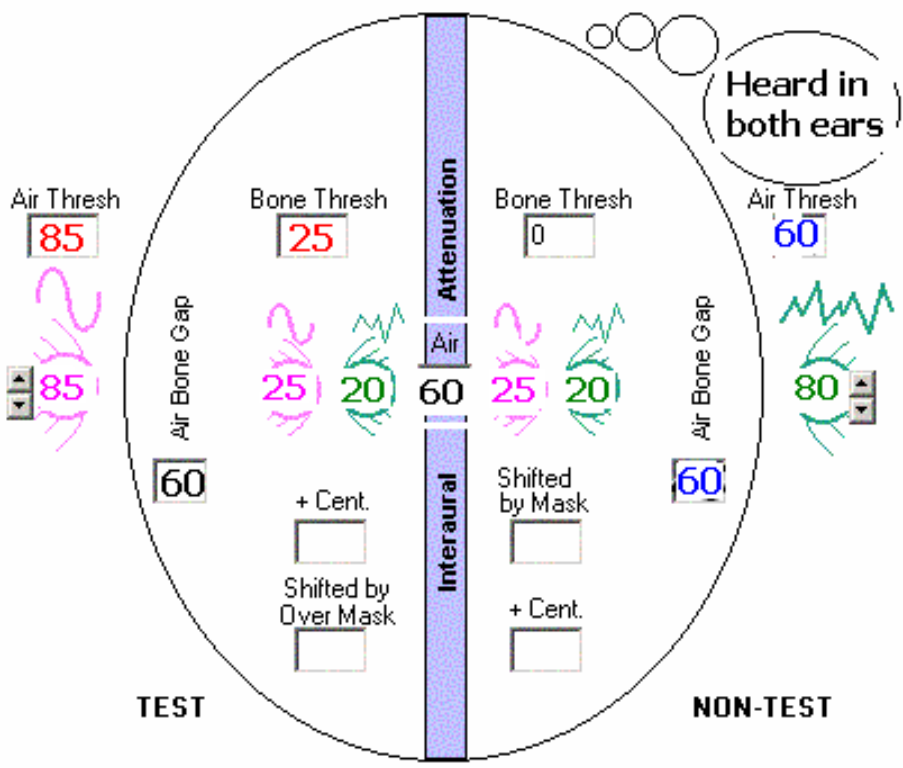




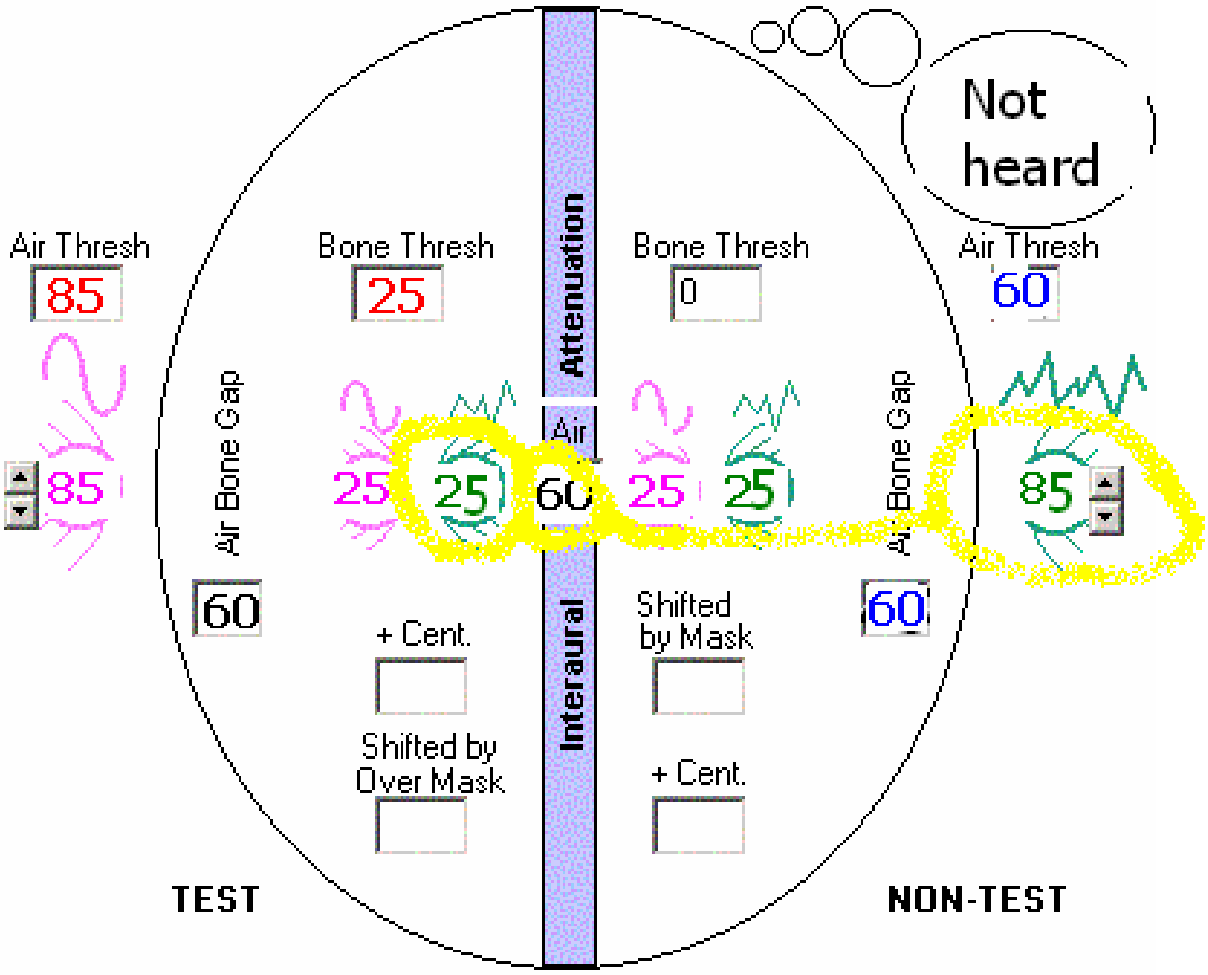
75 dB of masking shifts test ear threshold but the sound is heard in NTE

While undermasking, increasing masking 5 increases threshold 5

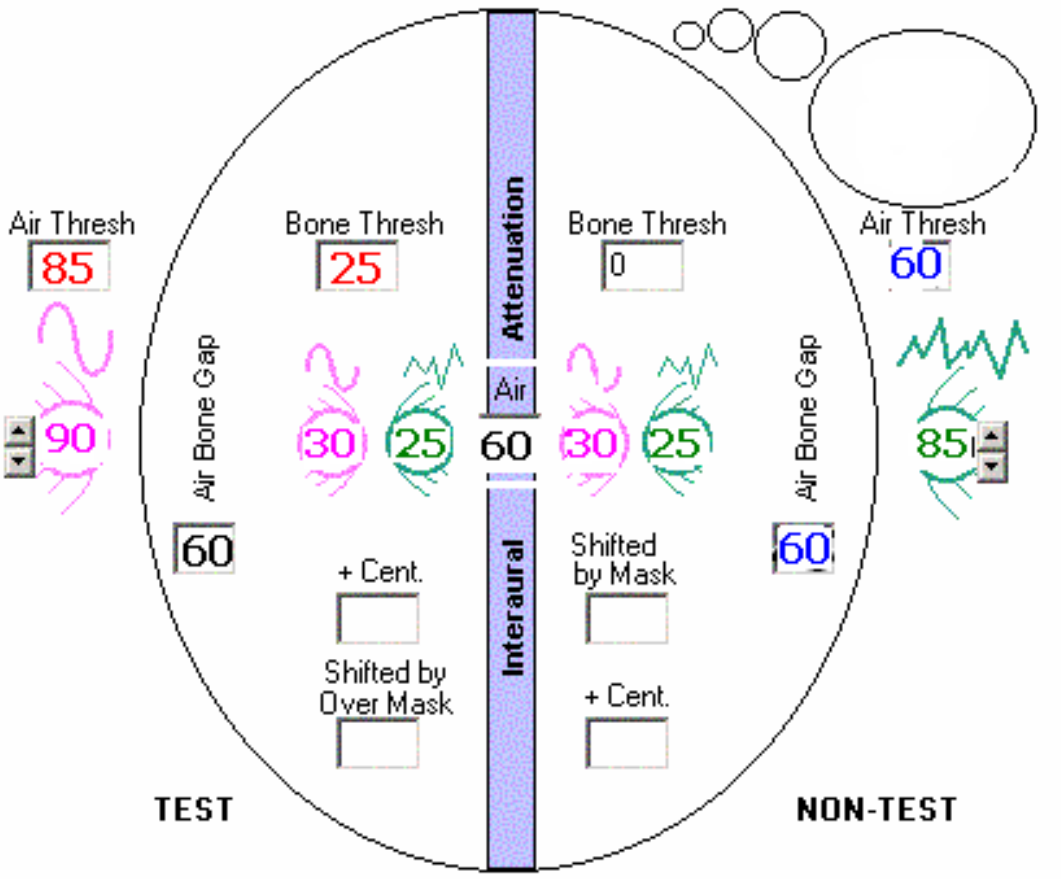




Raise the noise 5 more – sweet! Masked. Wait, nope, overmasked!



Raising noise just causes more crossover, elevating threshold



Now it could be crossing again...
When threshold was raised by overmasking, the each time you increase the masking noise 5 dB threshold increases by 5 dB.

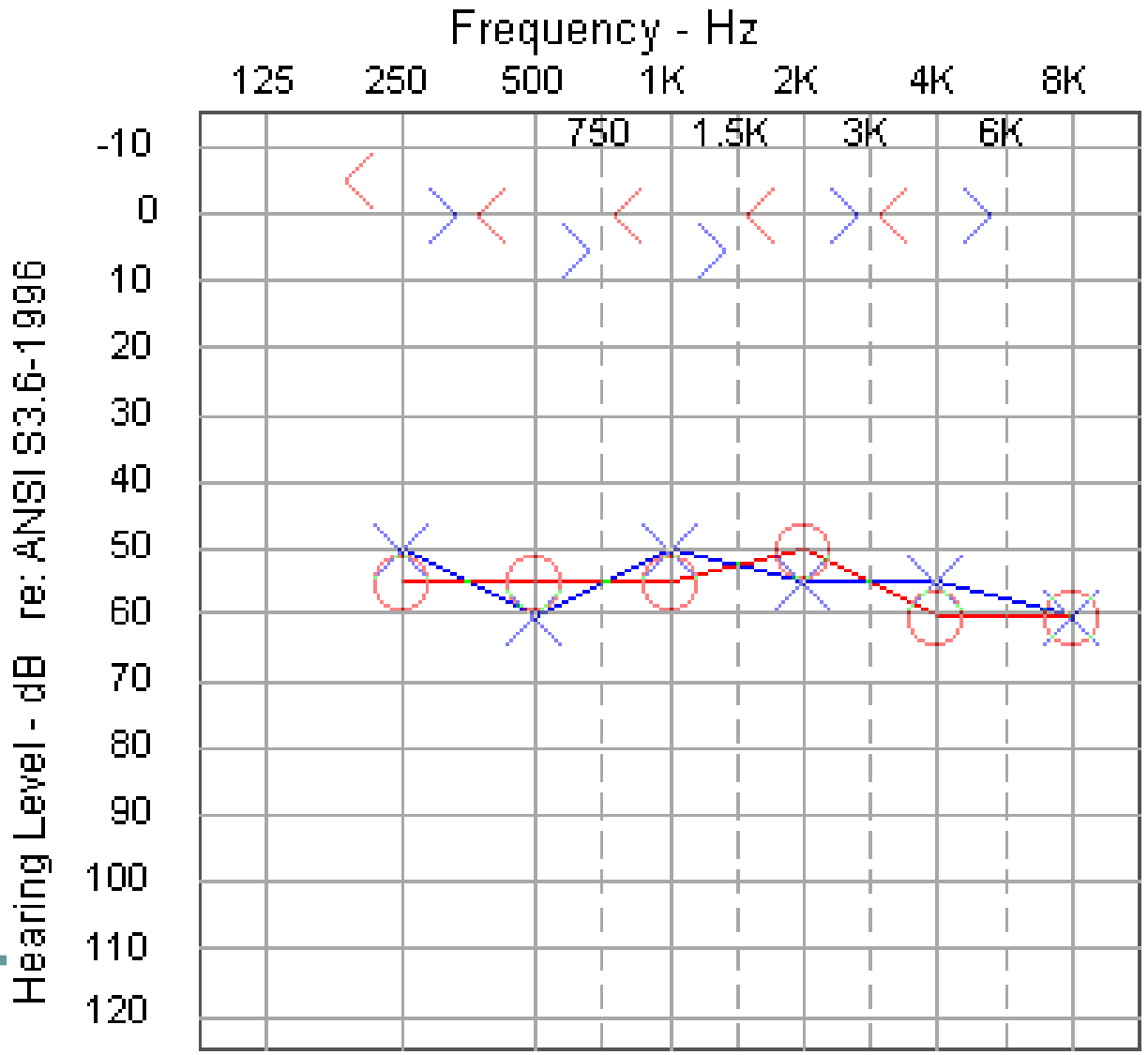
- When the noise required to exclude NTE participation shifts the TE threshold… when you go right from undermasking to overmasking…

Masking Dilemma!

Bilateral conductive loss

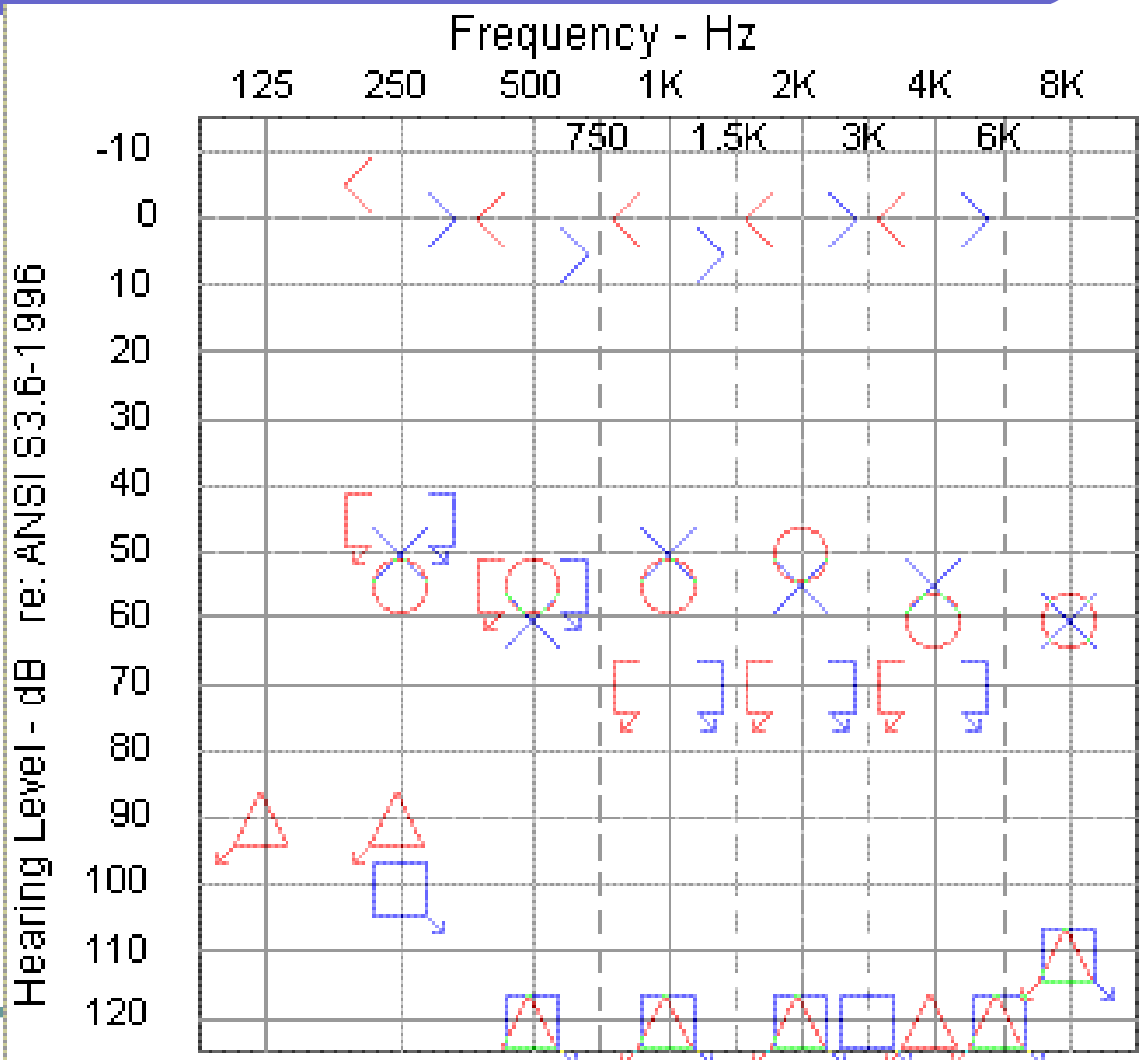
- May narrow the plateau
  - But you may find plateau if you look carefully
  - If narrow, note on your audiogram with asterisk – “narrowed plateau width” in comment section
- Maximum conductive loss bilaterally is a masking dilemma. You cannot mask.
  - If you are **“chasing threshold”** and cannot plateau, you know you have a problem!

What that “chase” starts as



And what it ends up looking like

- Which of course, makes no sense. Both ears can't be dead if you had responses from one/both unmasked!



Remember this when "chasing threshold"

- *In years past, students reported that AudSim **wasn't working right.** They measured dead ears bilaterally, yet the results showed that the patient had hearing. **The problem must be with the computer, this doesn't happen in clinic!** (And the student swears s/he knows how to mask.) (How often do you see bilat moderate conductive loss in clinic?)*

Summary

- Plateau masking is the old stand by
- Conductive loss in NTE narrows plateau widths. (Note narrow plateau on audiogram in comments section.)
- In cases of a large conductive loss in the NTE, there may be no plateau, which is a masking dilemma.

Leading us towards formula masking

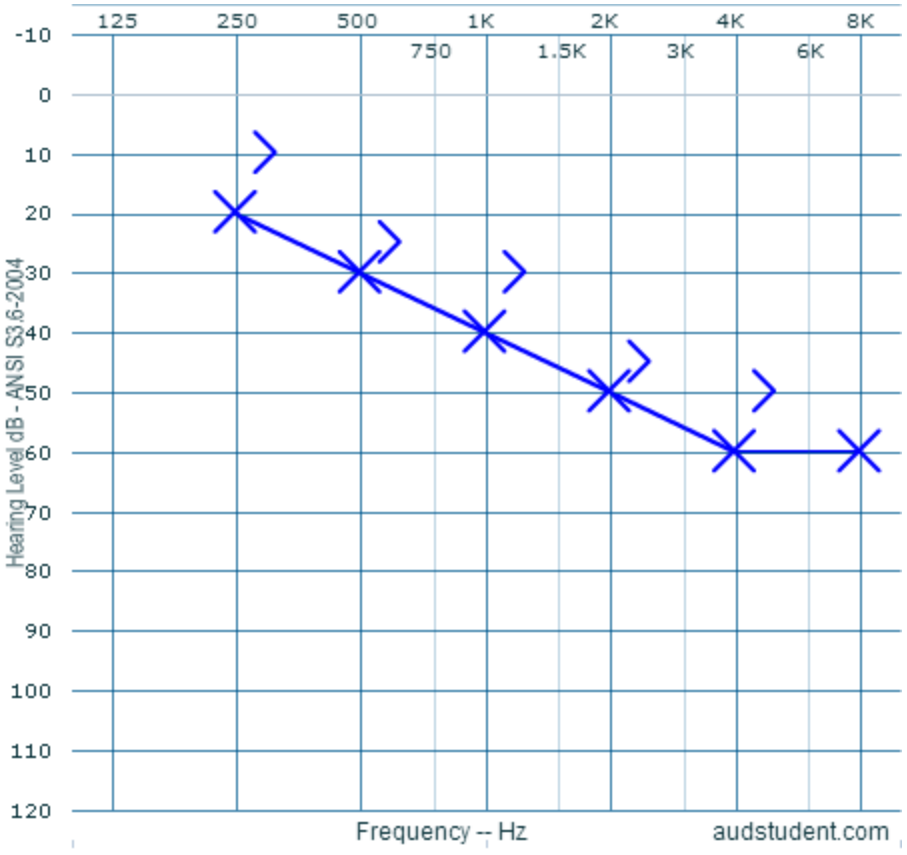
- If there is conductive loss, particularly in NTE, formula masking may be too “tricky”. If you can, plateau.
- There are certain times when you cannot plateau, though
  - ABR
  - Word recognition testing
  - You have to formula mask, but you also have to recognize if that isn’t going to work.

What, no talk of bone conduction?

- We will discuss bone conduction formula masking as well.
- What is IA for bone?
- What is the “rule” then for when to mask for bone?
  - ABG in **TEST** ear.

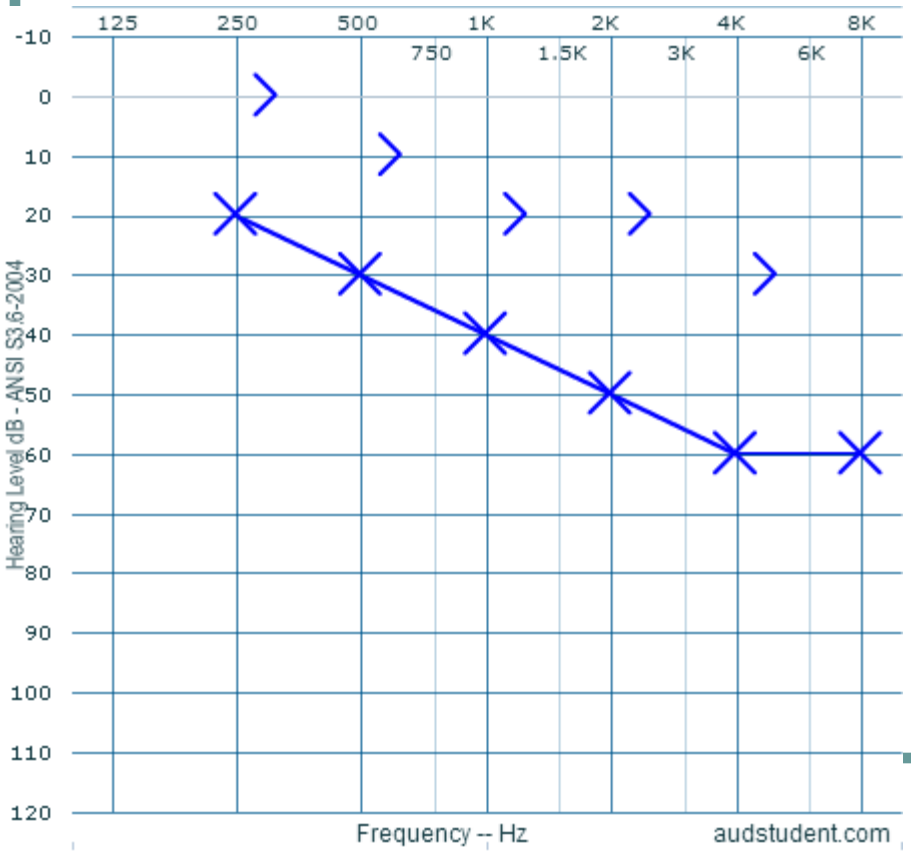
Why is that the rule?

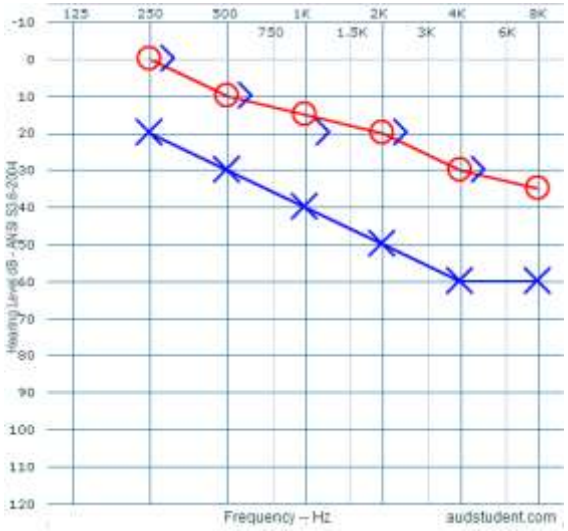
- What is the site of lesion in this case?
- Would contra masking make the bone scores better or worse?
- Other than t/rt var & cal var, can bone be worse than air?
- Would you care if the minor air-bone gaps closed?



If there are ABGs, I do care

- My diagnosis changes if, with masking, the left ABGs are eliminated.





Vibrotactile thresholds

- When does an AC signal become VT?
- Bone?
  - Does everyone have equal VT thresholds?
  - Will a VT shift w/ contra masking?

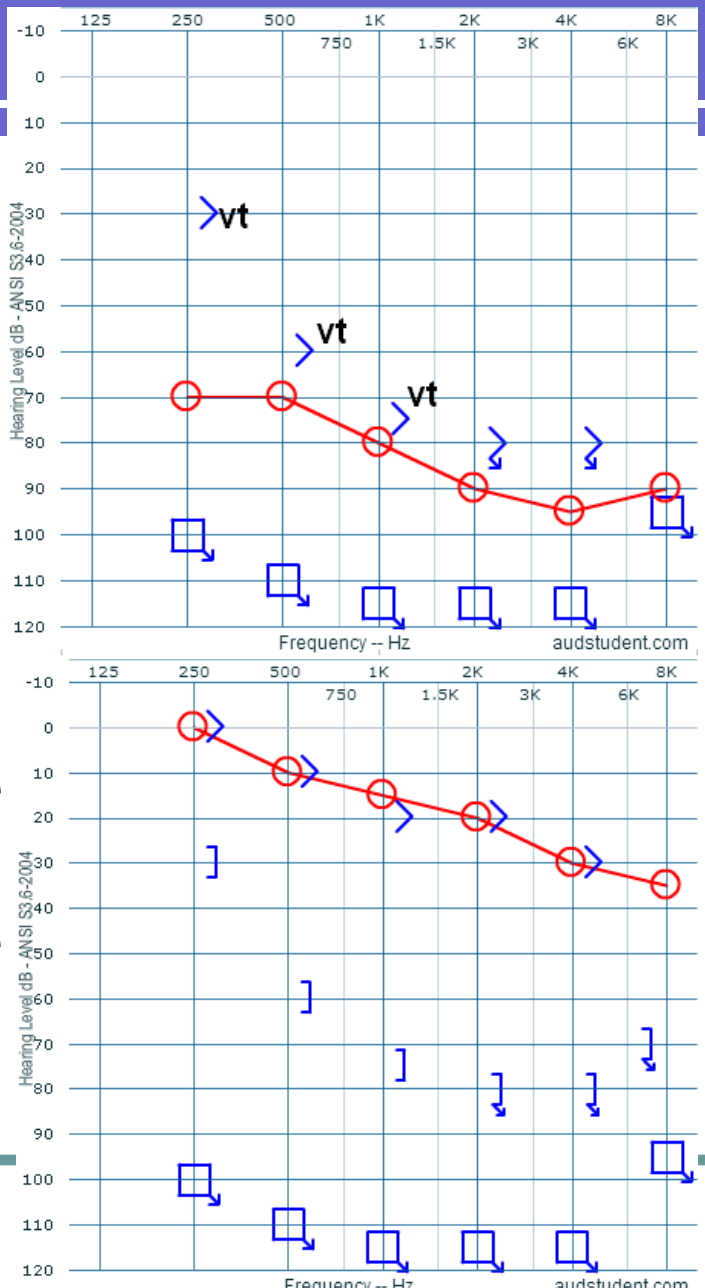
#s to use for this class

- Thresholds may be vibrotactile if equal to or above:

	250	500	1000 Hz
Air Conduction	85 dB HL	105 dB HL	120 dB HL
Bone Conduction	25 dB HL	55 dB HL	75 dB HL

And what does VT have to do with masking?

- If you know a BC threshold is VT, it won't shift higher with contralateral masking.
- Masking a VT is senseless; masking if you are unsure if it is or is not VT does make sense.



What does the > indicate? Left ear hearing sensitivity?

Introduction to Masking Assign 2

- Purpose: to have you recognize when masking is needed, not just using the “easy rule” of 40/50 dB difference between air conduction thresholds, but the rule of 50 dB from AC to NTE BC

The Rules

- See assignment
- Notes to self: in class start cases 1 & 6

Self-test Questions

- What is meant by “formula masking?”
- What are some cases where you can not plateau mask?
- How does an AC signal cross to the NTE?
- How does masking noise cross back to (potentially) over mask?