



# iPOP – Phonak Dynamic Offset Protocol

## 1. Introduction

This document describes how a Dynamic FM system should be verified with a test box. The protocol is valid for **inspiro** (both with iLapel and iBoom microphones), SmartLink+, ZoomLink+ and EasyLink+.

When verifying SmartLink+, ZoomLink+ or EasyLink+, make sure you put the transmitter into the omnidirectional microphone mode (this requires a reprogramming of the EasyLink+, for which the default setting of the microphone is Zoom). In omnidirectional mode, these three transmitters do not feature Adaptive FM Advantage, Voice Activity Detector, Beamforming or Noise Cancellation, all of which may interfere with test box measurements. **inspiro** can only be verified in “Verification mode”, which can be activated using FM SuccessWare 4.2. and later versions.

In the “Verification mode” all features which may prevent a reliable measurement outcome are deactivated. After verification, “Verification mode” must be switched off again.

Please note that the sensitivity of iBoom is 7 dB less than the sensitivity of iLapel, which has an impact on the required input level (see below). In daily usage this is advantageous because of the proximity of iBoom to the teacher’s mouth. **inspiro** automatically detects which microphone (iLapel or iBoom) is attached when switched on. iBoom can also be attached over the adaptor to SmartLink+, ZoomLink+ or EasyLink+. When verifying this combination make sure the built in microphones of the SmartLink+, ZoomLink+ or EasyLink+ are switched off.

## 2. Protocol and background information

The protocol is based on the fact that the 10 dB FM advantage setting of the FM receiver results in a transparent behaviour below the transmitter kneepoint, i.e. below 75 dB SPL. All measurements are done in FM+M mode, but only one signal path is being tested at any one time.

Nomenclature:


**FM(+M)65** means a measurement with 65 dB SPL input to the FM microphone and the hearing instrument microphone muffled

**FM(+M)72** means a measurement with 72 dB SPL input to the FM microphone and the hearing instrument microphone muffled

**(FM+)M65** means a measurement with 65 dB SPL input to the hearing instrument microphone and the FM microphone muffled

	Step	Comment / FAQ
<b>1.</b>	<b>Measurement requirements</b>	
1.1.	System of hearing instrument, audio shoe, FM receiver and FM transmitter, as used by the customer.	
1.2.	Audio test equipment	



<p>1.3.</p>	<p>The FM receiver should be programmed at its default value (10 dB FM advantage) as a starting point. Reset the “Personal preference” to 0 dB value.</p> <p><b>inspiro</b> must be set into the “Verification mode”.</p> <p>SmartLink+, ZoomLink+ or EasyLink+ must be set into omnidirectional mode.</p>	<p>10 dB FM advantage is the factory pre-set value.</p> <p>FM SuccessWare 4.2. (or higher) → Extended Fitting → Prepare device → Personal preference → press “Re-set default” FM SuccessWare 4.2. (or higher) → Extended Fitting → Prepare device → Configuration → Verification mode</p> <p>On SmartLink+ and ZoomLink+ the omnidirectional mode is directly accessible on the device by pressing the Omni button:  EasyLink+ needs to be programmed for the omnidirectional mode: FM SuccessWare 4.3 (or higher) → Extended Fitting → Prepare Device → Reset the zoom for EasyLink+ → tick <input type="radio"/> Omni → Program Device</p>
<p>1.4.</p>	<p>FM SuccessWare and FM Programming Interface, or FM SuccessWare and <b>inspiro</b> in case of Dynamic FM receivers.</p>	
<p>1.5.</p>	<p>The hearing instrument should be programmed / fitted as used by the customer, but do observe 1.6</p>	<p>The objective is to determine/adjust the FM advantage for the system as it is used by the customer.</p>
<p>1.6.</p>	<p>Disable noise cancelling, feedback management and directional microphones in the hearing instrument, as these features may lead to artefacts.</p>	<p>Pure tones may be recognized as noise or feedback by many noise and feedback cancelling algorithms, which makes reliable measurements impossible.</p>
<p>1.7.</p>	<p>Ideal stimuli are broadband noises (speech shaped), as long as individual frequency results can be obtained; if broadband stimuli are not available use pure tone sweeps.</p>	
<p><b>2.</b></p>	<p><b>Set-up HI and receiver</b></p>	
<p>2.1.</p>	<p>Program hearing instrument to desired use settings and switch off noise canceller and feedback manager (and automatic program selection). Set VC to reproducible level (leave attached with programming cable).</p>	
<p>2.2.</p>	<p>Attach</p> <ul style="list-style-type: none"> <li>▪ appropriate audio shoe with connected receiver</li> <li>▪ or: design integrated receiver to hearing instrument</li> </ul>	



2.3.	Ensure that the DPAI='yes' or DPAI='no' selection in the FM SuccessWare is correct (and programmed into the receiver in case of non-Dynamic FM receivers).  For Dynamic FM receivers this is selected automatically by the receiver itself.	If you select 'no' when the instrument has DPAI, the incoming FM signal may be unexpectedly strong and even distorted. If you select 'yes' when the HI does <i>not</i> have DPAI, the receiver switch will not change between 'FM only' and FM+M, and 'FM only' will not be available.
2.4.	Ensure that the 10 dB FM advantage (default value) is programmed into the receiver.	10 dB FM advantage is the factory setting.
2.5.	Switch a non-Dynamic FM receiver to FM+M and set hearing instrument to usual M program (DPAI='no') or program FM+M (DPAI='yes').	MLxi default setting is on and FM+M. <b>Note:</b> After switching on, wait a full 60 seconds before running the curve → 3.3. This delay gives the system time to finish booting up and ensures it is running in stable operation mode. Not waiting for 60 seconds will lead to inaccurate results.
2.6.	Verify that the transmitter is switched on and the receiver is synchronized.	This is true for all measurements (make sure that the FM receiver does not go into squelch or sleep mode, by keeping the transmitter active).
<b>3.</b>	<b>Baseline hearing instrument measurement</b>	
3.1.	Verify that the transmitter is switched on and the receiver synchronized. Mute the <b>inspiro</b> microphone. In case of SmartLink+, ZoomLink+ or EasyLink+, muffle the two microphone openings on the side. Do not switch the transmitter off.	
3.2.	Attach hearing instrument to 2cc coupler and place into test box.	
3.3.	Run curve with 65 dB-SPL input → <b>(FM+)M65</b> tracing.	
3.4.	Perform discrete frequency signal analysis, calculate the average for 3 different frequencies (750, 1000, 2000 Hz) or evaluate response at 1kHz or another speech frequency.	
<b>4.</b>	<b>Set-up for FM measurement</b>	
4.1.	Verify that the transmitter is switched on, unmuted or unmuffled, and synchronized with the receiver.	
4.2.	Move 2cc coupler together with hearing instrument out of text box.	
4.3.	Keep receiver in FM+M and hearing instrument in usual M program (DPAI='no') or program FM+M (DPAI='yes').	Exactly the same configuration as in 2.5.
4.4.	Muffle the hearing instrument's microphone.	



4.5.	Place the <b>inspiro</b> microphone in test box in test position, or place the SmartLink+, ZoomLink+ or EasyLink+ in the test box in test position.	
<b>5.</b>	<b>Transparency test</b>	
5.1.	Run curve with 65 dB SPL / 72 dB SPL input into the transmitter microphone situated in test box → <b>FM(+M)65</b> tracing for <b>inspiro</b> with iLapel, SmartLink+, ZoomLink+ or EasyLink+ → <b>FM(+M)72</b> tracing for <b>inspiro</b> (or SmartLink+/ZoomLink+/EasyLink+) with iBoom	The +10 dB advantage setting leads to transparency below the transmitter kneepoint. The FM response at 65 dB SPL / 72 dB SPL for a 10 dB FM advantage setting is the same as the hearing instrument MIC response at 65 dB SPL.
5.2.	Perform discrete frequency signal analysis, calculate the average for 3 different frequencies (750, 1000, 2000 Hz) or evaluate response at 1kHz or another speech frequency.	
5.3.	Compare → (FM+)M65 tracing to FM(+M)65 tracing for <b>inspiro</b> with iLapel, SmartLink+, ZoomLink+ or EasyLink+ → (FM+)M65 tracing to FM(+M)72 tracing for <b>inspiro</b> (or SmartLink+/ZoomLink+/EasyLink+) with iBoom They should be very close, within 2 dB or overlay.	
5.4.	The offset is the difference between both measurements.	
<b>6.</b>	<b>Offset correction / balancing</b>	
6.1.	This step is performed if the transparency test indicates a need for an offset correction.	
6.2.	<b>Offset = FM(+M)65</b> minus <b>(FM+)M65</b> for for <b>inspiro</b> with iLapel, SmartLink+, ZoomLink+ or EasyLink+ <b>Offset = FM(+M)72</b> minus <b>(FM+)M65</b> for <b>inspiro</b> (or SmartLink+/ZoomLink+/EasyLink+) with iBoom	For the offset calculation you may use one single value, e.g. 1kHz, but preferably a mean value of several frequencies.
6.3.	If offset is between -2 dB and +2 dB: do not change anything, the FM advantage is within ±2 dB of its target value.	
6.4.	If offset value is greater than that, correct for the FM offset.	
6.5.	Open FM SuccessWare and correct the indicated personal preference in FM+M (there is only one slider for DPAL='yes' HI) by the decibel difference obtained in the transparency test.	



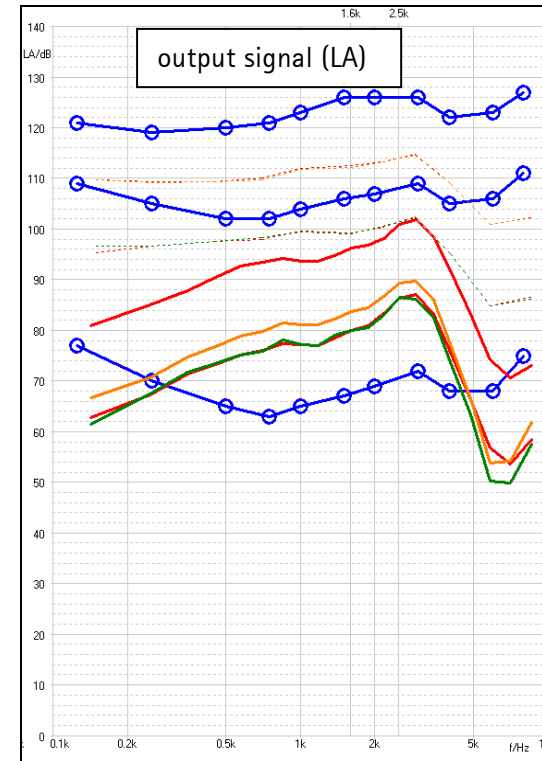
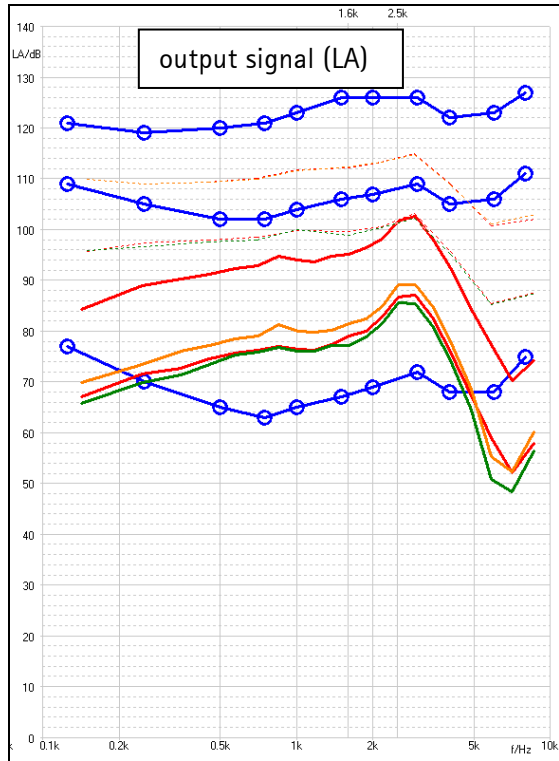
6.6.	Place the hearing instrument with attached receiver into the FM Programming Interface or program through the <b>inspiro</b> if it is a Dynamic FM receiver and program the offset.	
<b>7.</b>	<b>Cross-check transparency, only to be done in case of off-set correction</b>	
7.1.	Repeat step 5 to cross-check for transparency.	
7.2.	If not within $\pm 2$ dB repeat 6 and 7.	
<b>8.</b>	<b>MPO Safety</b>	
	Run curves with → 90 dB SPL input into the <b>inspiro</b> with iLapel microphone, SmartLink+, ZoomLink+ or EasyLink+ situated in test box, and with 90 dB SPL input to hearing instrument microphone → 97 dB SPL input into the <b>inspiro</b> (or SmartLink+/ZoomLink+/EasyLink+) iBoom microphone situated in test box, and with 90 dB SPL input to hearing instrument microphone	Make sure the output does not exceed MPO targets.
<b>9.</b>	<b>Set-up after FM measurement</b>	
	Switch off "Verification mode" in <b>inspiro</b> using the FM SuccessWare, or reprogram the EasyLink+ to the preferred microphone mode if needed.	Must be done to make sure all Dynamic FM features are activated in <b>inspiro</b> .



**Measurement examples:**

**a) inspiro with iLapel and Exélia M with MLxi**

**b) inspiro with iLapel and eXtra 211 AZ with MLxi**



red (down) = (FM+)M65 curve  
 red (up) = (FM+)M90 curve  
 green = FM(+M)65 curve  
 orange = FM(+M)90 curve



## FM Advantage Worksheet

### FM Advantage: Phonak Dynamic FM Offset Protocol (iPOP)

1. (FM+)M65 - match target
2. FM(+M)65 for **inspiro** with iLapel, SmartLink+, ZoomLink+ or EasyLink+ - transparency with hearing instrument only, difference is offset
3. FM(+M)72 for **inspiro** (or SmartLink+/ZoomLink+/EasyLink+) with iBoom - transparency with hearing instrument only, difference is offset
4. (FM+)M90 – ensure hearing instrument response does not exceed MPO targets
5. FM(+M)90 for **inspiro** with iLapel – ensure response does not exceed MPO targets
6. FM(+M)97 for **inspiro** (or SmartLink+/ZoomLink+/EasyLink+) with iBoom – ensure response does not exceed MPO targets

All measurements must be done in FM+M mode (including those in hearing instrument only), with the transmitter always active to avoid the receiver entering sleepmode.

Real Ear Measures	@750 Hz	@ 1kHz	@ 2 kHz		
FM(+M)65 curve (dB) for iLapel (or SL+/ZL+/EL+) FM(+M)72 curve (dB) for iBoom					
Minus (FM+)M65 curve	-	-	-		
Equals FM Offset (dB)	=	=	=	Add the offset values in this row and divide by 3 →	average Offset =

### AVERAGE OFFSET VALUES:

1. If your offset value is between +/- 2 dB, you are done! The default +10 dB of receiver gain is achieved. Your FM response is transparent at equal inputs, so when you have a loud (FM input) simultaneously with a softer input (conversational input through the hearing instrument mic), true FM advantage will be achieved!
2. If your FM offset is equal to or more than +2 dB you will need to reduce the FM gain level in the receiver by the offset value. This will make it transparent with the hearing instrument at equal inputs.
3. If your FM offset is equal to or less than -2 dB, you will need to increase the FM internal gain setting by the offset value to make it transparent at equal inputs.